MANUAL OF REGULATIONS AND PROCEDURES FOR FEDERAL RADIO FREQUENCY MANAGEMENT

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U.S. DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration

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1.2 May/September 2009 Revisions of the January 2008 Edition of the NTIA Manual 3
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1.3 January 2009 Revision of the January 2008 Edition of the NTIA Manual 7
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Introduction

This section of the manual contains information concerning the authority for the NTIA Manual and details concerning the January 2008 reissue.

Holders Letter

This letter informs the holders of the reissue or revision of the NTIA Manual.

Promulgation Letter

This letter signed by the Assistant Secretary for Communications and Information lists the authority for this manual and approves its distribution.

Preface

The preface provides details on the documents authorizing this manual and the areas for which the manual is responsible.

Summary of Changes

This section contains information on the areas of the manual that have been revised. The manual was reissued January 2008. In the following revisions of this manual, revised pages will have the revision date shown in parenthesis. An example of this is *1/2008 (Rev. 5/2008)*, this shows that this page of January 2008 Edition of the NTIA Manual was revised by the May 2008 revision.

Holders Letter

UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and
Information Administration
Washington, D.C. 20230

MAY 19 2010

To: HOLDERS OF THE NTIA MANUAL OF REGULATIONS AND PROCEDURES FOR FEDERAL RADIO FREQUENCY MANAGEMENT

Subject: May 2010 Revision of the January 2008 Edition of the NTIA Manual

The Assistant Secretary for Communications and Information has approved the May 2010 Revision of the January 2008 Edition of the NTIA Manual for use by the agencies and establishments of the Federal Government.

Karl B. Nebbia
Associate Administrator
Office of Spectrum Management

Enclosure

MAY 19 2010

Promulgation

By virtue of the authority vested in me pursuant to Reorganization Plan No. 1 of 1977, Executive Order 12046 of March 26, 1978, and Department of Commerce Organization Order 10-10 of October 5, 1992, I hereby approve this Manual of Regulations and Procedures for Federal Radio Frequency Management for the use of agencies and establishments of the Federal Government.

This order is UNCLASSIFIED.

Lawrence E. Strickling
Assistant Secretary for
Communications and Information

PREFACE

This Manual is issued by the Assistant Secretary of Commerce for Communications and Information (hereafter referred to as the Assistant Secretary) and is specifically designed to cover his/her frequency management responsibilities pursuant to delegated authority under Section 305 of the Communications Act of 1934, as amended. Its contents are based on the advice, as appropriate, of the Interdepartment Radio Advisory Committee.

Within the jurisdiction of the United States Government, use of the radio frequency spectrum for radio transmissions for telecommunications or for other purposes shall be made by United States Government stations only as authorized by the Assistant Secretary. Such use shall, unless specific provision is made otherwise, comply with the provisions of this Manual.

The Communications Act of 1934, as amended, vests in the Federal Communications Commission (FCC) responsibility for the regulation of non-Government interstate and foreign telecommunication, including the assignment of space in the radio frequency spectrum among private users, regulation of this use of that space, and authorization of alien amateur operators, licensed by their governments, for operation in the United States under reciprocal arrangements.

The Act, in recognition of the Constitutional powers of the President, provides that radio stations “belonging to and operated by the United States” shall use frequencies as determined to be in the national interest, to authorize foreign governments to construct and operate radio stations in the fixed service at the United States seat of government, and to assign frequencies thereto (47 U.S.C. 305(d)).

The President by Reorganization Plan No. 1 of 1977 and Executive Order 12046 of March 26, 1978, delegated to the Secretary of Commerce authority to act in the discharge of certain of the President's telecommunication functions under the Communications Act of 1934 and the Communications Satellite Act of 1962.

The Secretary of Commerce has delegated this Presidential authority to the Assistant Secretary of Commerce for Communications and Information (Administrator of the National Telecommunications and Information Administration, NTIA).

The Assistant Secretary discharges these radiocommunication and frequency management functions as the Administrator of NTIA with the aid of the Interdepartment Radio Advisory Committee (IRAC).

The IRAC is now comprised of representatives of the Departments of Agriculture, Army, Air Force, Commerce, Energy, Health and Human Services, Homeland Security, Interior, Justice, Navy, State, Treasury and Veteran's Affairs; the U.S. Coast Guard, the Federal Aviation Administration, the General Services Administration, the National Aeronautics and Space Administration, the National Science Foundation, the Broadcasting Board of Governors and the U.S. Postal Service. The FCC is not a member of the IRAC; however, the Commission has designated a Liaison Representative to the IRAC, who works with the IRAC and its subcommittees. The Officers of the IRAC and the Chairmen of its subcommittees are appointed by the Assistant Secretary.

National frequency coordination and assignments are effected as follows:

Each Government agency decides, in the light of policies, rules, regulations, frequency allocations, and the availability of frequencies, whether, what, and how many mission requirements can be fulfilled by using telecommunications systems. Each agency makes the necessary technical studies, selects potential frequencies, coordinates with other agencies involved, and prepares and files an application with the NTIA, Office of Spectrum Management (OSM), Spectrum Services Division (SSD), for consideration by the Frequency Assignment Subcommittee (FAS) of the IRAC.

The FCC FAS Representative submits frequency assignment applications for non-Government use of the spectrum in shared bands and other bands where there might be an impact on, or from, Government operations. The FCC, as a Government entity, also submits frequency requests to the FAS for FCC spectrum requirements.

The OSM/SSD, using a combination of computer and manual procedures, reviews the applications for accuracy, completeness, and compliance with regulations and procedures. The FAS agendas are distributed to each FAS member agency for study regarding the protection of their existing assignments. OSM/SSD reviews the agendas to ensure adequate justification, compliance with policy and regulations, technical appropriateness, potential for major problems, whether or not spectrum support for the system, if applicable, has been certified by the Spectrum Planning Subcommittee (SPS) of the IRAC, and whether there is a conflict with the assignments of the FAS non-member agencies.

Each month the FAS considers pending items and takes action within established policy guidelines. When additional policy guidance is needed, agreement cannot be reached, the IRAC has so directed, or an agency requests, applications are referred to the IRAC. Matters that cannot be resolved with the IRAC, those that NTIA directs, or those requested by an agency, are referred to the Deputy Associate Administrator (OSM), NTIA, who resolves them or refers them to the Associate Administer (OSM) and if necessary to the Administrator, NTIA, for decision. Government frequency assignment decisions made by the Administrator, NTIA, may be appealed to the Director of the Office of Management and Budget (OMB) per paragraph 3-2 of Executive Order 12046.

Matters of considerable importance, such as changes to the National Tables of Frequency Allocations, significant Government use of non-Government frequency bands, and advice to the Department of State, are recommended to NTIA for consultation with the FCC or other appropriate agencies. Although Government applications are not heard in public for security reasons, the public is represented by the FCC who may object, concur, or give tacit approval.

After each FAS meeting when the FAS minutes have been approved by the Deputy Associate Administrator of OSM, the Government Master File (GMF) is updated.

International frequency coordination is carried out through the International Telecommunication Union (ITU) and with other countries within the ITU provisions, by or under the aegis of the Department of State.

(Last Page in this Section)

Chapter 1
Authority and Organization

1.1 AUTHORITY

The Communications Act of 1934, as amended, provides for the regulation of interstate and foreign commerce in communication by wire or radio. This Act is printed in Title 47 of the U.S. Code, beginning with Section 151.

The functions relating to assigning frequencies to radio stations belonging to and operated by the United States, or to classes thereof, conferred upon the President by the provisions of Section 305(a) of the Communications Act of 1934, were transferred to the Secretary of Commerce by Reorganization Plan No. 1 of 1977 and Executive Order 12046 of March 26, 1978. The National Telecommunications and Information Administration (NTIA) Organization Act, as revised, directs the Secretary to assign to the Assistant Secretary and the NTIA the responsibility for the performance of the Secretary's communications and information functions, including those above.

These functions were transferred to the Assistant Secretary of Commerce for Communications and Information (Administrator, NTIA) by Department of Commerce Organization Order (DOO) 10-10 of October 5, 1992. This authority and delegation has been codified in the NTIA Organization Act, Pub. L. No. 102-538, 106 Stat. 3533 (1992) (codified at 47 U.S.C. 901 et seq.) and is reproduced below.

ASSISTANT SECRETARY FOR COMMUNICATIONS AND INFORMATION

Section 1. Purpose.

.01 This Order prescribes the scope of authority and functions of the Assistant Secretary for Communications and Information. (The functions of the National Telecommunications and Information Administration (NTIA) are covered in DOO 25-7.)

.02 This revision reflects the deletion of the position of Deputy Administrator for Operations, and incorporates outstanding amendments to the Order.

Section 2. Administrative Designation.

The position of Assistant Secretary of Commerce for Communications and Information (the "Assistant Secretary") was established by Section 4 of Reorganization Plan No. 1 of 1977. The Assistant Secretary is appointed by the President by and with the advice and consent of the Senate.

Section 3. Scope of Authority.

.01 The National Telecommunications and Information Administration is hereby established as an operating unit of the Department of Commerce.

.02 The Assistant Secretary shall head NTIA as the Administrator.

.03 The Deputy Assistant Secretary for Communications and Information shall be the Assistant Secretary's principal policy advisor; shall perform such other functions as the Assistant Secretary shall from time to time assign or delegate; and shall act as Assistant Secretary during the absence or disability of the Assistant Secretary or in the event of a vacancy in the office of the Assistant Secretary.

Section 4. Transfer of Functions.

Pursuant to the authority vested in the Secretary of Commerce by Reorganization Plan No. 5 of 1950, Section 4 and 5.B of Reorganization Plan No. 1 of 1977 and Executive Order 12046 of March 26, 1978; the functions, personnel, funds, property, and records transferred to the Secretary of Commerce pursuant to Reorganization Plan No. 1 of 1977 are hereby transferred to the NTIA.

Section 5. Delegation of Authority.

.01 Pursuant to the authority vested in the Secretary of Commerce by law, and subject to such policies and directives as the Secretary may prescribe, the Assistant Secretary is hereby delegated the authority vested in the Secretary of Commerce under:

a. Section 5.B of Reorganization Plan No. 1 of 1977, and by Executive Order 12046; including:

1. Subsection 201(a) of the Communications Satellite Act of 1962 (47 U.S.C. 701 et seq.) as amended to advise and assist the President in connection with the functions previously conferred upon the President as described more particularly in Part B, Section 7 of Executive Order 12046.

2. Subsection 305(a) of the Communications Act of 1934 (47 U.S.C. 305(a)) to assign frequencies to, and amend, modify, and revoke frequency assignments for radio stations belonging to and operated by the United States, subject to the disposition of appeals by the Director, Office of Management and Budget (OMB), and make frequency allocations.

3. Subsection 305(d) of the Communications Act of 1934, as amended, (47 U.S.C. 305(d)), to authorize a foreign government to construct and operate a radio station pursuant to this subsection and the assignment of a frequency for its use shall be made only upon recommendation of the Secretary of State and after consultation with the Attorney General and the Chairperson of the Federal Communications Commission.

b. 15 U.S.C. 3710a and Executive Order 12591 to transfer federal telecommunications technology by, among other things, entering into cooperative research and development agreements (CRADAs) with other federal laboratories, State and local governments, universities and the private sector and by licensing, assigning or waiving rights to intellectual property developed pursuant to such CRADAs or from within individual laboratories.

c. 15 U.S.C. 272(12) and (13), which relate to the investigation of the conditions which affect transmission of radio waves and to the compilation and distribution of information about such transmissions.

d. 15 U.S.C. 272(9), the functions which relate to the investigation of non-ionizing radiation, its uses, and means of protection of persons from harmful effects, to the extent appropriate to coordination of research throughout the Executive Branch.

e. 47 U.S.C. sections 390-393A and 397 (contained in the Communications Act of 1934, as amended), which govern the implementation and administration of assistance for public telecommunications facilities.

f. Section 5112(b) of the Omnibus Trade and Competitiveness Act of 1988 (P.L. 100-418) relating to telecommunications research and the publication of results.

g. 47 U.S.C. section 394 (contained in the Communications Act of 1934, as amended), which establishes the National Endowment for Children's Educational Television. (P.L. 101-437 of October 18, 1990.)

.02 The Assistant Secretary may exercise other authorities of the Secretary to the extent applicable to performing the functions assigned in this Order. This includes the use of administrative and monetary authorities contained in 15 U.S.C. 271 et seq., as may be necessary or desirable to perform the NTIA functions; and the authority to foster, promote, and develop the foreign and domestic commerce of the United States in effecting, and as such commerce may be affected by, the development and implementation of telecommunications and information systems

.03 The Assistant Secretary may redelegate any authority conferred by this Order to any employee of the NTIA, and may authorize further redelegation by any such employee as appropriate, subject to such conditions as may be prescribed.

Section 6. General Functions And Objectives.

The Assistant Secretary shall:

a. Serve as the President's principal advisor on telecommunications policies pertaining to the Nation's economic and technological advancement and to the regulation of the telecommunications industry.

b. Advise the Director, OMB on the development of policies for procurement and management of federal telecommunications systems.

c. Conduct studies and evaluations concerning telecommunications research and development, the initiation, improvement, expansion, testing, operation, and use of federal telecommunications systems and programs, and make recommendations concerning their scope and funding to appropriate agency officials and to the Director, OMB.

d. Actively promote the transfer of telecommunications technology developed in NTIA's laboratory and offices to State and local governments, universities and the private sector.

e. Develop and set forth, in coordination with the Secretary of State and other interested agencies, plans, policies, and programs which relate to international telecommunications issues, conferences, and negotiations. The Assistant Secretary shall coordinate economic, technical, operational, and related preparations, for U.S. participation in international telecommunications conferences and negotiations; provide advice and assistance to the Secretary of State with respect to international telecommunications policies to strengthen the position and serve the best interests of the United States in the conduct of foreign affairs.

f. Provide for the coordination of the telecommunications activities of the Executive Branch and assist in the formulation of policies and standards for the telecommunications activities of the Executive Branch including considerations of interoperability, privacy, security, spectrum use, and emergency readiness.

g. Develop and set forth telecommunications policies pertaining to the Nation's economic and technological advancement and the regulation of the telecommunications industry.

h. Ensure that the Executive Branch views on telecommunications matters are effectively presented to the Federal Communications Commission and, in coordination with the Director, OMB, and the Congress.

i. Assign frequencies to, and amend, modify, and revoke frequency assignments for radio stations belonging to and operated by the United States, make frequency allocations, establish policies concerning spectrum assignment allocation and use, and provide the various departments and agencies with guidance to assure that their conduct of telecommunications activities is consistent with these policies.

j. Develop, in cooperation with the Federal Communications Commission, a comprehensive long-range plan for improved management of all electromagnetic spectrum resources, including jointly determining the National Table of Frequency Allocations.

k. Conduct studies and develop, set forth or recommend policies concerning the impact of the convergence of computer and communications technology and the emerging economic and social implications of the greater ability to originate, manipulate and move information.

l. Coordinate federal telecommunications assistance to State and local governments; conduct studies to identify and provide assistance to remove barriers to telecommunications applications; conduct needs assessments to aid in the design of telecommunications services and provide experimental and pilot tests of telecommunications applications to fulfill national goals; and provide for the application of telecommunications technologies and services to avoid waste and achieve an efficient delivery of public services in the furtherance of national goals.

m. Participate with and perform staff services for the National Security Council and the Director, Office of Science and Technology Policy in carrying out their functions under Executive Order 12046.

n. Participate in evaluating the capability of telecommunications resources in recommending remedial actions and in developing policy options.

o. Review and coordinate research into the side effects of non-ionizing electromagnetic radiation and coordinate, develop and set forth plans, policies, and programs thereof.

p. Acquire, analyze, synthesize and disseminate data and perform research in general on the description and prediction of electromagnetic wave propagation and the conditions which affect propagation, on the nature of electromagnetic noise and interference, and on methods for the more efficient use of the electromagnetic spectrum for telecommunications purposes; and prepare and issue predictions of electromagnetic wave propagation conditions and warnings of disturbances in those conditions.

q. To the extent it is deemed necessary to continue the Interdepartment Radio Advisory Committee (IRAC), that Committee shall serve in an advisory capacity to the Assistant Secretary.

r. Perform analysis, engineering, and administrative functions, including the maintenance of necessary files and data bases, as necessary in the performance of assigned responsibilities for the management of electromagnetic spectrum.

s. Conduct research and analysis of electromagnetic propagation, radio systems characteristics, and operating techniques affecting the utilization of the electromagnetic spectrum, in coordination with specialized, related research and analysis performed by other federal agencies in their areas of responsibility.

t. Conduct research and analysis in the general field of telecommunications sciences in support of assigned functions and in support of other government agencies.

u. Conduct and coordinate economic and technical analyses of telecommunications policies, activities, and opportunities in support of assigned responsibilities.

v. Make grants, enter into cooperative agreements, or make proposals for contracts related to any aspect of assigned responsibilities, in accordance with Department rules.

w. Issue such rules and regulations as may be necessary to carry out the functions delegated by this Order.

x. Conduct such other activities as are incident to the performance of telecommunications and information functions assigned in this Order.

y. Enter into CRADAs and intellectual property licenses for the transfer and/or commercialization of telecommunications technology, as needed.

z. Protect valuable telecommunications technology by obtaining legal protection for intellectual property rights associated with such technology.

Section 7. Effect On Other Orders.

This Order supersedes Department Organization Order 10-10, dated May 9, 1978, as amended.

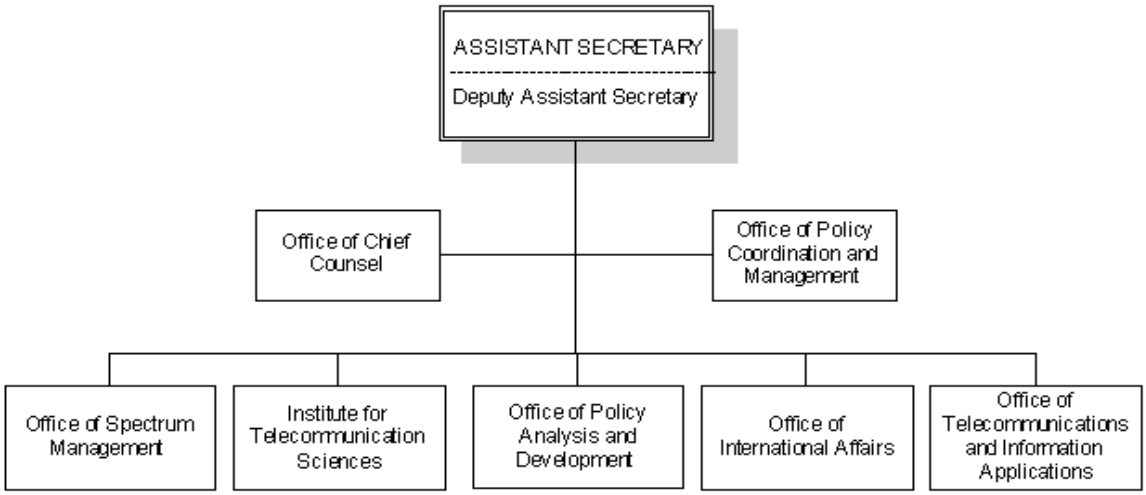
(signed) Secretary of Commerce

1.2 NTIA AND ITS FREQUENCY MANAGEMENT SUPPORT ORGANIZATION

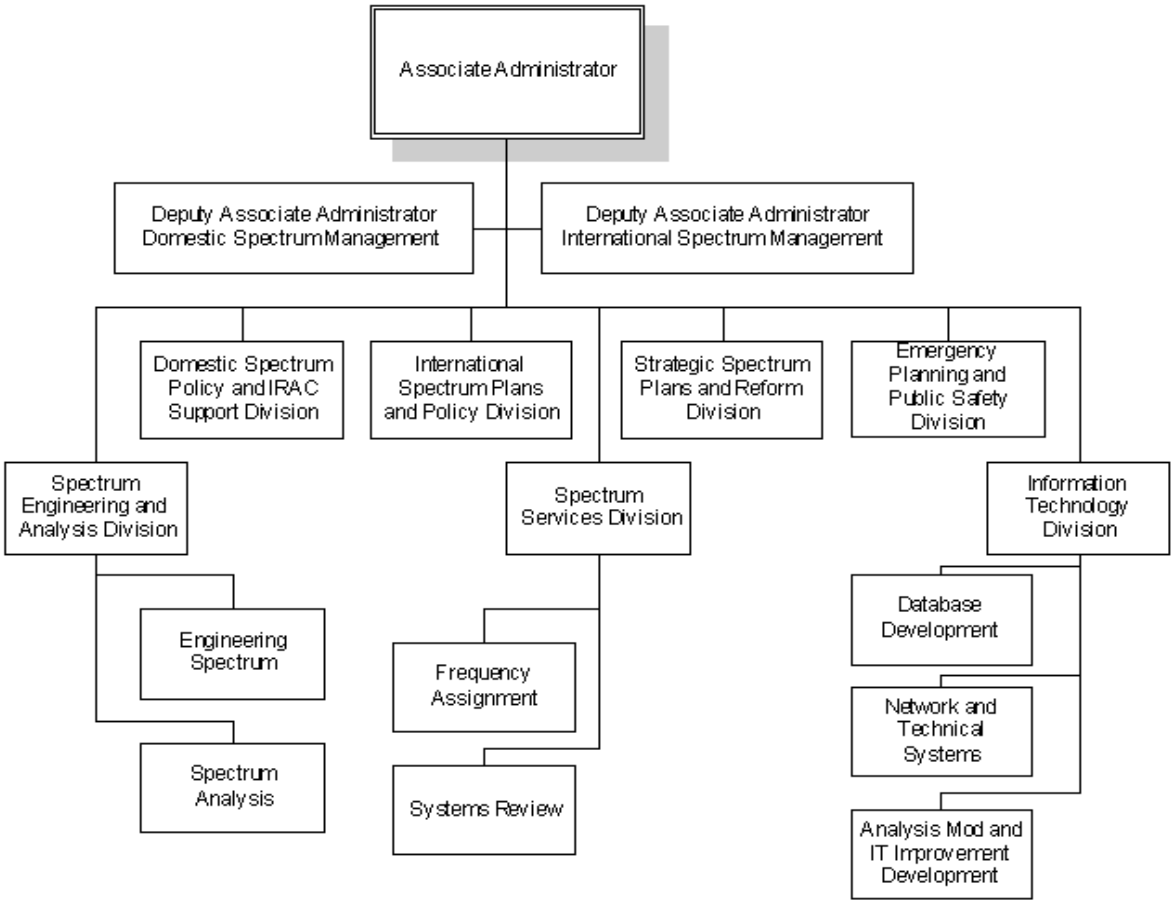
The following charts display the organization of NTIA and its Office of Spectrum Management. Spectrum management within NTIA is under the direction of its Associate Administrator, Office of Spectrum Management. The Office of Spectrum Management among other things, provides the staff for the Interdepartment Radio Advisory Committee (IRAC).

1.2.1 Organization Charts

NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION



Office of Spectrum Management



1.3 INTERDEPARTMENT RADIO ADVISORY COMMITTEE

1.3.1 Status

The Interdepartment Radio Advisory Committee (IRAC), organized by mutual agreement of the federal departments concerned on June 1, 1922, reconstituted on October 6, 1952, with status, mission, and functions officially defined on December 10, 1964, was continued by the Assistant Secretary pursuant to Executive Order 12046 of March 27, 1978 and the National Telecommunications and Information Administration Organization Act, as revised. The IRAC serves in an advisory capacity to the Assistant Secretary and reports to the Deputy Associate Administrator for Domestic Spectrum Management, Office of Spectrum Management.

1.3.2 Bylaws

Article I - Name and Location

Section 1 - The Committee shall be known as the Interdepartment Radio Advisory Committee (IRAC).

Section 2 - The office of the IRAC shall be at the seat of the Federal Government.

Article II - Mission, Functions, and Role

Section 1 - The mission of the IRAC is to assist in the discharge of the Assistant Secretary's responsibilities pertaining to the use of the electromagnetic spectrum, as contained in Executive Order 12046, the National Telecommunications and Information Administration Organization Act, as revised and Department of Commerce Order 10-10.

Section 2 - The basic functions of the IRAC are to assist the Assistant Secretary in assigning frequencies to U.S. Government radio stations and in developing and executing policies, programs, procedures, and technical criteria pertaining to the allocation, management, and use of the electromagnetic spectrum.

Section 3 - The basic role of representatives appointed to serve on the IRAC is to function, when in Committee, in the interest of the United States as a whole.

Article III - Composition

Section 1 - Membership

a. The IRAC shall consist of the following member departments, and agencies together with such other departments and agencies as the Deputy Associate Administrator for Domestic Spectrum Management, Office of Spectrum Management may hereafter designate.

Agriculture
Air Force
Army
Broadcasting Board of Governors
Coast Guard
Commerce
Energy
Federal Aviation Administration
Homeland Security
Interior
Justice
National Aeronautics and Space Administration
Navy
National Science Foundation
State
Transportation
Treasury
U.S. Postal Service
Veterans Affairs

b. Any federal department or agency that uses radio frequencies shall be eligible for membership in the IRAC.

c. Applications for membership in the IRAC shall be addressed to the Deputy Associate Administrator for Domestic Spectrum Management, Office of Spectrum Management via the Executive Secretary. The Deputy Associate Administrator for Domestic Spectrum Management shall review the applications, and with the advice of the IRAC, determine whether an agency will be granted membership.

d. Each member of the IRAC shall have the right to appoint, via a letter to the Executive Secretary, a representative to the IRAC and to any of the subcommittees and ad hoc groups on which the member desires to participate. Each member may also appoint one or more alternates to function in the absence of its representative at the IRAC, its subcommittees or ad hoc groups. Any representative or alternate may be accompanied to meetings of the IRAC by such assistants as desired. Each representative and alternate shall be an employee of the department or agency they represent, except as provided in Section 1.e of this Article.

e. Nonmember departments and agencies may designate one of the members to act as its accredited agent on the IRAC, its subcommittees, or ad hoc groups. The following nonmembers are represented, at their request, having designated the IRAC member shown below, to act as its accredited agent on the IRAC, its subcommittees, and ad hoc groups.

Agency	**Represented by**
Department of Education	Treasury
Federal Reserve System	Treasury
International Boundary and Water Commission (U.S. Section)	Interior
Small Business Administration	Treasury
Tennessee Valley Authority	Interior
Volpe National Transportation Systems Center	FAA

f. Nonmember departments and agencies shall be eligible to become members of subcommittees or ad hoc groups. Requests for such membership shall be addressed to the Deputy Associate Administrator for Domestic Spectrum Management, Office of Spectrum Management via the Executive Secretary. The Deputy Associate Administrator for Domestic Spectrum Management shall review the applications, and with the advice of the IRAC, determine whether an agency will be granted membership to the specific subcommittees and ad hoc groups requested. As a member of specific subcommittees or ad hoc groups, these departments and agencies shall have the right to appoint, via a letter to the Executive Secretary, a representative and one or more alternates to function in the absence of its representative at those subcommittees or ad hoc groups. Any representative or alternate may be accompanied to meetings by such assistants as desired. Each representative and alternate shall be an employee of the department or agency they represent, except as provided in Section 1.e of this Article.

g. Members of the IRAC, its subcommittees and ad hoc groups, shall ensure that, during any fiscal year, an accredited representative or alternate participates in at least 75 percent of the regular meetings of the group of which they are a member. Within the first month of each fiscal year, the chairpersons of each subcommittee and conveners of each ad hoc group shall report to the IRAC regarding attendance. With the advice of the IRAC and considering the nature of the work conducted by each particular subcommittee or ad hoc group, the Deputy Associate Administrator for Domestic Spectrum Management shall review these reports as well as the attendance of the IRAC, and make a determination regarding the membership of the agencies not meeting the criteria above.

Section 2 - Liaison with the Federal Communications Commission (FCC)

Liaison between the IRAC, its subcommittees and ad hoc groups, and the Federal Communications Commission (FCC) shall be affected by a liaison representative (within each group) appointed by the Commission to serve in that capacity.

Section 3 - Observers

a. Nonmember federal departments and agencies shall be eligible for status as observers.

b. Applications for observer status shall be addressed to the Deputy Associate Administrator for Domestic Spectrum Management, Office of Spectrum Management via the Executive Secretary. The Deputy Associate Administrator for Domestic Spectrum Management shall review the applications, and with the advice of the IRAC, determine whether an agency will be granted observer status.

c. Each observer shall have the right to appoint, via a letter to the Executive Secretary, one or more observers for the IRAC and any of the subcommittees or ad hoc groups which it desires to observe. Any observer may be accompanied to meetings of the IRAC by such assistants as desired. Each observer shall be an employee of the department or agency they represent. In this capacity, they have access to IRAC documentation. They may, at the request of the chairperson or one of the members, address the IRAC or any of its subcommittees or ad hoc groups on which they sit as observers.

Section 4 - Assistants, Consultants, Advisors, Visitors, and Guests

Assistants, consultants, advisors, visitors or guests (be they federal employees or employees of entities outside the federal government) may attend an IRAC, subcommittee or ad hoc group meeting under the sponsorship of NTIA, a member or observer department or agency, or the FCC. Sponsors must ensure that these assistants, consultants, advisors, visitors and guests understand that information gained through IRAC attendance is used only for official government business related to the conduct of IRAC activity. Assistants, consultants, advisors, visitors and guests may speak only at the request of the

Chairperson or their sponsor. If a representative or alternate of their sponsor agency is not present, they may still attend the meeting if another agency notifies the Chairperson that they will accept the responsibilities of sponsorship for that meeting. However, in these cases, those assistants, consultants, advisor, visitors and guests may not speak on behalf of their absent sponsor.

Article IV - Officers

Section 1 - The officers of the IRAC shall consist of a Chairperson, Vice Chairperson, an Executive Secretary, and an Assistant Executive Secretary. The officers of subcommittees shall consist of a Chairperson, Vice Chairperson, and a Secretary. The officers of ad hoc groups shall consist of a Convener (and if necessary a co-Convener) and a Secretary.

Section 2 - The officers of the IRAC, its subcommittees and ad hoc groups, shall be appointed by the NTIA.

Article V - Substructure

Section 1 - The permanent substructure of the IRAC shall consist of the Emergency Planning Subcommittee (EPS), Frequency Assignment Subcommittee (FAS), the Radio Conference Subcommittee (RCS), the Space Systems Subcommittee (SSS), the Spectrum Planning Subcommittee (SPS), the Technical Subcommittee (TSC), and the Secretariat. As necessary to deal with specific topics, the IRAC may establish ad hoc groups operating under a written terms of reference. As necessary to deal with specific topics, subcommittees and ad hoc groups may establish working groups. Subcommittees and ad hoc groups may appoint whatever officers necessary to conduct the work of their working groups.

Section 2 - The Frequency Assignment Subcommittee

a. The FAS shall have as its normal function the carrying out of those functions given in Article II related to the assignment and coordination of radio frequencies and the development and execution of procedures therefore.

b. The FAS shall consist of a representative appointed by each of the following member departments and agencies together with such other members of the IRAC as the Deputy Associate Administrator for Domestic Spectrum Management, Office of Spectrum Management may hereafter designate.

Agriculture
Air Force
Army
Broadcasting Board of Governors
Coast Guard
Commerce
Defense
Energy
Federal Aviation Administration
Federal Communications Commission
Homeland Security
Interior
Justice
National Aeronautics and Space Administration
National Science Foundation
Navy
Transportation
Treasury
U.S. Postal Service
Veterans Affairs

c. The Aeronautical Assignment Group (AAG) of the FAS, chaired by the Federal Aviation Administration, is responsible for engineering AAG frequency assignments and determining whether or not applications for frequency assignment action in the following designated bands of primary concern to the aeronautical mobile and aeronautical radionavigation services should be approved by NTIA.

190-285 kHz	978-1020 MHz inclusive
285-435 kHz[1]	1030 MHz
510-535 kHz	1031-1087 MHz inclusive
74.800-75.200 MHz	1090 MHz
108.000-121.9375 MHz	1104-1146 MHz inclusive
123.5875-128.8125 MHz	1157-1213 MHz inclusive
132.0125-137.000 MHz	5000-5250 MHz
328.600-335.400 MHz	

The members of the AAG shall consist of the Federal Aviation Administration (FAA), the FCC, and the Departments of Air Force, Army, and Navy. The Federal Aviation Administration shall designate one of its employees as the Chairperson of AAG. Any matter not unanimously agreed shall be referred to the FAS for appropriate action.

d. The Military Assignment Group (MAG) is established under the cognizance of the NTIA IRAC Frequency Assignment Subcommittee (FAS) to provide guidance and procedures for the management of the 225.000-328.600 and 335.400-399.900 MHz frequency bands (herafter referred to as "*the MAG bands*"), which are of primary concern to the military departments.

1. The MAG is responsible for determining whether or not applications for frequency assignments in the MAG bands should be approved by the NTIA. The MAG shall provide spectrum-related guidance for the services in these bands including the development, review, and recommendations to appropriate allotment plans. The MAG shall:

(a) Recommend and provide guidance and procedures to ensure the effective and efficient operation and management of spectrum-dependent devices that access the MAG bands;

(b) Be cognizant of the operational requirements of all stakeholders in the bands, especially the unique military tactical and training requirements;

(c) Manage assignments as they relate to the allotment plan for the MAG bands;

(d) Coordinate spectrum policy guidance involving the MAG bands with the members of the applicable NTIA subcommittees and ad hoc groups;

(e) Provide minutes of all MAG meetings to the FAS Chair, Secretary and representatives.

2. In order to facilitate coordination and access to the MAG bands, and to minimize interference among electronic systems, the FAS and the MAG shall observe established coordination procedures.

3. Meetings will be scheduled as required to successfully complete the assigned workload by established target dates.

4. The MAG shall consist of one primary and one alternate member from the Army, Navy, Air Force and the Federal Aviation Administration (FAA). The Department of the Air Force, Air Force Frequency Management Agency (AFFMA) shall designate one of its employees as the MAG Chair. Personnel from other Department components or Federal agencies may participate in meetings, as authorized by the MAG Chair.

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[1] In these bands only applications for stations in the Aeronautical Radionavigations Service (See Table A, Section 6.1.4) shall be sent to the Chairman of the AAG.

5. Any matter not agreed upon may be referred to the FAS for appropriate action.

Section 3 - The Spectrum Planning Subcommittee

a. The SPS will be responsible to the IRAC for the carrying out of those functions given in Article II that relate to planning for the use of the electromagnetic spectrum in the National interest to include the apportionment of spectrum space for the support of established or anticipated radio services, as well as the the apportionment of spectrum space among federal activities and between federal and non-federal activities, and other such matters as the IRAC may direct. In the furtherance of the above the SPS shall:

1. Maintain a continuing appraisal of the current and future needs of the various radio services and make recommendations to the IRAC for changes in the Table of Frequency Allocations or other actions, as appropriate;

2. Consider:

(a) Current and planned National and International frequency uses, and the optimum placement of radio services with a view to the most effective use of spectrum in the overall National interest;

(b) The anticipated needs of all radio services at various points in the future, e.g., 5, 10, 15, and 20 years ahead;

(c) New developments in existing services;

(d) New techniques, the application of which may require revision of the Table of Frequency Allocations;

(e) New services for which the current Table makes no provisions;

(f) Specific proposals for expansion, reduction, or other changes in the allocated frequency bands; and the International aspects of changes recommended to the IRAC.

3. In order to ensure electromagnetic compatibility among electronic systems and observance of the provisions of Section 8.2.5, develop procedures enabling the Subcommittee to:

(a) Develop and maintain pertinent documentation on all planned and operational satellite systems including their technical and operational characteristics;

(b) Ascertain in the early stages of system concept development, where compatibility may not exist;

(c) Make recommendations as to potential electromagnetic compatibility problem areas, and proposed courses of action to resolve these problems;

(d) Make recommendations as to technical parameters necessary to facilitate sharing between systems;

(e) Review as appropriate the effectiveness of existing systems with a view toward rectifying compatibility deficiencies.

b. The SPS shall consist of a representative appointed by each of the following member departments and agencies together with such other departments and agencies as the Deputy Associate Administrator for Domestic Spectrum Management, Office of Spectrum Management may hereafter designate.

Agriculture
Air Force
Army
Broadcasting Board of Governors
Coast Guard
Commerce
Energy
Federal Aviation Administration
Homeland Security
Interior
Justice
National Aeronautics and Space Administration
National Science Foundation
Navy
State
Treasury
Veterans Affairs

Section 4 - The Technical Subcommittee

a. The TSC shall have as its normal function the carrying out of those functions given in Article II that relate to the technical aspects of the use of the electromagnetic spectrum, and such other matters as the IRAC may direct. In furtherance of the above, the TSC shall:

1. develop recommended new standards and improvement of existing standards pertaining to use of the radio spectrum;

2. maintain awareness of the radio propagation (including natural radio noise) programs and needs of the federal government for purposes of evaluating and making recommendations leading to a better utilization of the radio spectrum;

3. evaluate and make recommendations, in the form of technical reports, on new and existing techniques from the standpoint of their ability to optimize use of the radio spectrum (recommendations to include implementation steps); and,

4. evaluate and make recommendations, in the form of technical reports, regarding the EMC capabilities and needs of the Federal Government in support of spectrum management, including techniques and criteria leading to greater inter- and intra-radio service sharing of available spectrum and the reduction of man-made radio noise.

5. evaluate current and proposed efforts regarding:

(a) the adequacy of the technical bases for spectrum management;

(b) the effectiveness of specific programs with regard to improved use of the spectrum; and

(c) the need for new criteria, procedures, and methodologies for use of the spectrum.

b. The TSC shall consist of a representative appointed by each of the following member departments and agencies together with such other members as the Deputy Associate Administrator for Domestic Spectrum Management, Office of Spectrum Management may hereafter designate.

Agriculture
Air Force
Army
Broadcasting Board of Governors
Coast Guard
Commerce
Energy
Federal Aviation Administration
Homeland Security
Interior
Justice
National Aeronautics and Space Administration
Navy
Treasury

c. To the extent feasible, the TSC shall conduct its activities in working groups reporting thereon to the TSC. Any number of department or agency personnel may be appointed to a working group with no distinction being made as to representative or alternate. Each agency's representative (or alternate) on the TSC shall be that agency's coordinator and contact with respect to working group activities.

Section 5 - The Radio Conference Subcommittee

a. The Radio Conference Subcommittee (RCS) will be responsible to the IRAC for the carrying out of those functions given in Article II that relate to preparing for International Telecommunication Union (ITU) conferences, including the development of recommended U.S. proposals and positions. In the furtherance of the above the RCS shall undertake preparatory work relating to international radio conferences.

1. Develop recommended proposals for consideration by the Inter-American Telecommunications Commission (CITEL),

2. Maintain close liaison with related conference preparatory activities of the United States for the ITU Radiocommunication Sector (ITU-R) including the ITU-R Conference Preparatory Meetings held prior to Radiocommunication Conferences,

3. Coordinate with other U.S. groups considering radio conferences related issues within other international and regional organizations such as the North Atlantic Treaty Organization, the European Conference of Postal and Telecommunications Administrations, the International Maritime Organization, the International Civil Aeronautics Organization, the World Meteorological Organization, and the Asia-Pacific Telecommunity;

4. Take into account:

(a) Current and planned national and international frequency uses, and the optimum placement of radio services with a view to the most effective use of spectrum in the overall national interest;

(b) The anticipated needs of all radiocommunication services at various points in the future;

(c) New developments in existing services;

(d) New techniques, the application of which may require revision of regulations concerning radio frequency matter; and,

(e) New services for which the current regulations makes no provisions.

5. Provide a forum for information sharing and discussion of preparatory activities, including when necessary, the development of Federally recommended U.S. proposals and positions, related to ITU Plenipotentiary Conferences, ITU Radiocommunication Assembly, ITU Council as it pertains to matters involving radiocommunications, the Radiocommunication Advisory Group, and the Radio Regulations Board.

b. The RCS shall consist of an appointed Federal representative from each of the following member departments and agencies together with such other members as the Deputy Associate Administrator for Domestic Spectrum Management, Office of Spectrum Management may hereafter designate.

Agriculture
Air Force
Army
Broadcasting Board of Governors
Coast Guard
Commerce
Defense Information Systems Agency
Energy
Federal Aviation Administration
Homeland Security
Interior
Justice
National Aeronautics and Space Administration
National Science Foundation
Navy
State
Treasury
Veterans Affairs

Section 6 - The Space Systems Subcommittee

a. The SSS, chaired by NTIA, will be responsible to the IRAC for international registration of federal government satellite systems with the ITU. In the furtherance of the above the SSS shall, on behalf of the IRAC and after coordination with the Deputy Associate Administrator for Domestic Spectrum Management, Office of Spectrum Management, take action to:

1. review, modify, develop, and maintain the procedures for national implementation of the provisions of the ITU Radio Regulations related to space systems;

2. advance publish, coordinate, and notify federal government space systems under the applicable provisions of the ITU Radio Regulations;

3. respond to the data furnished by other Administrations and the Radiocommunication Bureau (BR) regarding proposed space telecommunications systems in accordance with the applicable provisions of the ITU Radio Regulations;

4. process internationals actions through the FCC.

b. The SSS shall consist of a representative appointed by each of the following member departments and agencies together with such other members as the Deputy Associate Administrator for Domestic Spectrum Management, Office of Spectrum Management may hereafter designate.

Air Force
Army
Commerce
Energy
Federal Aviation Administration
Interior
National Aeronautics and Space Administration
National Science Foundation
Navy
State

c. The FCC Liaison representative shall be NTIA's point of contact for correspondence with the BR and other administrations.

Section 7 - The Emergency Planning Subcommittee (EPS)

a. In general, the EPS shall formulate, guide, and review National Security and Emergency Preparedness (NSEP) planning for spectrum-dependent systems. In the furtherance of the above the EPS shall specifically:

1. Review and recommend changes to the NTIA Emergency Readiness Plan for Use of the Radio Spectrum (ERP) to reflect current plans and procedures;

2. Review, in accordance with the provisions of Chapters 1 (Section 1.3.2, Article V, Section 7), 7 (Part 7.3), and 10 (Sections 10.1.4 and 10.5.5) of the NTIA Manual, the NSEP functions supported by spectrum-dependent systems and their proposed, associated Telecommunications Service Priorities for Radiocommunications or TSP-Rs (spectrum-use priorities); and,

3. Ensure emergency spectrum management planning and practice are in accordance with current NSEP telecommunications policy.

b. The EPS shall consist of a representative appointed by each of the following member departments and agencies together with such other members as the Deputy Associate Administrator for Domestic Spectrum Policy, Office of Spectrum Management may hereafter designate.

Agriculture
Air Force
Army
Broadcasting Board of Governors
Coast Guard
Commerce
Energy
Federal Aviation Administration
Federal Communications Commission (Liaison)
Homeland Security
Interior
Justice
National Aeronautics and Space Administration
National Security Agency (Observer)
National Science Foundation
Navy
State
Treasury
United States Postal Service
Veterans Affairs

Section 8 - The Secretariat

a. The Secretariat shall consist of the Executive Secretary, who shall be its principal officer, the Assistant Executive Secretary, and the Secretaries of the Subcommittees and ad hoc groups, together with such clerical and technical personnel as are determined by the Deputy Associate Administrator for Domestic Spectrum Management, Office of Spectrum Management to be necessary to carry out the work of the IRAC.

b. The Executive Secretary shall be responsible for the administration of the affairs of the IRAC and of the Secretariat. The Executive Secretary shall:

1. function as Secretary of the IRAC;
2. appoint the Secretaries of the Subcommittees; and
3. provide the IRAC with the necessary secretarial, clerical, and technical assistance.

c. As the principal officer of the Secretariat, the Executive Secretary shall perform all necessary administrative and staff functions, reporting thereon to the Chairperson of the Committee. The secretaries of the subcommittees and ad hoc groups shall perform all necessary administrative and staff functions, reporting to the Executive Secretary regarding procedures and performance of duties and to the chairperson or convener regarding the activity of the subcommittee or ad hoc group.

Article VI - Meetings

Section 1 - Meetings of the IRAC, its subcommittees, and ad hoc groups may be called by the associated chairperson. In general, for the convenience of the members and to plan IRAC-related activity, the meetings shall be called for regularly scheduled dates. The chairperson shall also call meetings whenever requested by a majority of its members. When so requested by a majority of the members, and where the chairperson is unavailable, the vice-chairperson, or the Executive Secretary may call a meeting.

Section 2 - In establishing IRAC agendas, the IRAC Chairperson shall provide the opportunity for open and closed portions. Attendance during the open portion of a meeting is unrestricted except with respect to available space and limitations derived from the need to escort visitors. Attendance during the closed portion of a meeting is restricted to employees of the federal government and their assistants (as provided in Article III, Section 1, paragraph e and Article III Section 4). An open portion of the agenda for any given IRAC meeting shall be established only when individuals outside the federal government have requested via the Chairperson to address the IRAC in accordance with procedures given in Chapter 11.

Section 3 - To the maximum extent practicable, the work of the AAG and the MAG shall be conducted without formal meetings; however, meetings shall be convened at the request of any member.

Section 4 – While attendance at the meetings continues to be an essential responsibility of agency representatives and is vital to member interaction and the formulation of advice, Chairmen and Conveners may, on an exceptional basis at the request of a member, the FCC or NTIA staff, provide for attendance of unclassified portions of meetings via tele- or video-conference. Considering the number of off-site participants, the practical requirements for the efficient functioning and control of the meeting, and the tools available, the Chairman/Convener may specify limitations to be placed on the off-site participants. For example, with a large group and no means to recognize requests to speak, the Chairman/Convener may require that off-site participants remain silent or communicate, prior to the meeting, on which items they intend to communicate. The Chairman/Convener could then call on them at the appropriate time. At any point where the Chairman/Convener determines that off-site participation is detracting from the work of the group, he/she may terminate the practice.

Article VII - Conduct of Work

Section 1 - The work of the IRAC, its subcommittees and ad hoc groups, is not limited to meetings. As necessary and as guided by the respective chairperson or convener, the distribution of documents, provision of agency advice, consolidation of consensus views, voting, and conclusion on recommendations may proceed by electronic means. Thus, much of the work of the IRAC, its subcommittees and ad hoc groups, may occur outside meetings or between meetings.

Article VIII - Procedure and Voting

Section 1 - Recognizing that business may be conducted outside of meetings, all members of the IRAC, its subcommittees and ad hoc groups, are "present" and a quorum always exists for the purpose of conducting business. If a vote is taken at a meeting, then a majority of the members eligible to vote shall constitute a quorum for voting at that meeting. However, the Chairperson may extend the voting outside the meeting to accommodate agencies not present.

Section 2 - The IRAC, its subcommittees and ad hoc groups, may establish procedures they consider necessary to discharge their duties. All meetings shall be conducted in accordance with parliamentary procedure as outlined in Robert's Rules of Order.

Section 3 - Each of the members shall have one vote and no proxies may be voted.

Section 4 - In the event that unanimous agreement on a issue is not obtained, a minority opinion may be filed in the record; The minority opinion shall be forwarded by subcommittees and ad hoc groups to the IRAC and by the IRAC to NTIA if so requested by any member.

Section 5 - Motions are carried by a majority of the votes cast.

Section 6 - An item under consideration by a subcommittee shall be tabled and referred to the IRAC (1) upon the request of any member or the FCC; (2) if it is a matter for which policy has not heretofore been established; or (3) at the request of the IRAC.

Section 7 - Amendments to these bylaws shall require the approval of not less than two-thirds of the members of the IRAC. Proposals to amend shall be documented and tabled for at least the interval between two regular meetings before they can be acted upon by the IRAC.

Article IX - Personnel Security Clearances

Section 1 - Representatives, alternates and observers on the IRAC, its subcommittees and ad hoc groups, shall be cleared for access to SECRET information in accordance with standards established by Executive Order 12958, as amended. Their clearances shall be registered with NTIA's security officer.

Section 2 - Assistants, consultants, advisors, visitors or guests shall be sponsored by NTIA, a member or an observer and shall possess a security clearance equal to the classification of the information being considered. Such clearances will be in accordance with standards established by Executive Order 12958, as amended. Their clearances shall be registered with NTIA's security officer.

Section 3 - Assistants, consultants, advisors, visitors or guests not having registered a Secret clearance with the NTIA Security Officer shall be escorted by their sponsor at all times within the IRAC area.

Section 4 - Inquiries related to the security clearance of personnel shall be addressed to the Security Officer, National Telecommunications and Information Administration, Herbert Hoover Building, 1401 Constitution Avenue, N.W., Room 4890, Washington, D.C. 20230.

Section 5 - The Executive Secretary shall maintain a current record of approved clearances and shall make this record available to secretaries of subcommittees and ad hoc groups.

Section 6 - The IRAC Secretariat will provide, on an annual basis on or before 1 November, to the IRAC Representatives a listing of those representatives or alternates of IRAC, its subcommittees and ad hoc groups, that currently hold a security clearance for access to IRAC sponsored meetings. The Representatives will review and amend this list as appropriate and forward it to their respective agency security office for validation of the clearance. The agency security office shall validate the list and return it to the Security Officer, NTIA, by 31 December of each year.

Article X - Safeguarding Official Information

Security information is marked and handled in accordance with Executive Order 12958, e.g., CONFIDENTIAL, SECRET, etc.

Article XI - Documentation Procedures

Section 1 - Distribution of documents for consideration by the IRAC (including its subcommittees or ad hoc groups) will be restricted to the NTIA; FCC; member agency representatives or alternates of the IRAC, its subcommittees and ad hoc groups; and observers. Those individuals on distribution for documentation must ensure that the documents are not provided outside the components of the Federal Government whose expertise and support are needed to respond to IRAC-related issues. Those within this distribution, may provide the documentation to their assistants, consultants and advisors, but must ensure that the documents are used only for official government business to support the members in the conduct of IRAC activity.

Section 2 - Documents to be considered by the IRAC, its subcommittees or ad hoc groups, must be submitted to the IRAC Executive Secretary or applicable secretary in sufficient time (five working days) to be processed and distributed prior to the scheduled meeting. If the document is received after the distribution cutoff date it will be distributed as soon as practicable and will be placed on the agenda of the next scheduled meeting unless waived by the Chairperson (placement on a future agenda does not mean that work cannot proceed until the next meeting.). When the Chairperson waives the cutoff date for a specific document, the Secretariat will distribute the document as soon as possible. Such documents not distributed 24 hours before a meeting, will be provided in hard copy at the meeting in addition to electronic distribution.

Section 3 - Documents submitted to the IRAC from the subcommittees and ad hoc groups must have the coordination or stated minority non-concurrence of the members of the respective subcommittee or ad hoc group. This does not preclude the referral of any item referenced in Article VII, Section 8.

Section 4 - Documents will be distributed electronically as soon after receipt as practicable. Records of documents will be maintained electronically.

Article XII - Reports

IRAC Subcommittee Chairpersons and Ad Hoc Group Conveners will provide status reports to the IRAC in January of each year to cover the previous calendar year. These reports are to include the participant agencies, the accomplishments during the period and the projected completion date of any specific tasks outlined in the terms of reference. The IRAC will prepare a report of its accomplishments during the year, consolidating the reports of the subcommittees and ad hoc groups into an annual report.

1.4 REIMBURSEMENT REGARDING AUTHORIZATION FOR SPECTRUM USE

Pub. L. 107-77, title II, Nov. 28, 2001, 115 Stat. 772, provided in part: "That hereafter, notwithstanding any other provision of law, NTIA [National Telecommunications and Information Administration] shall not authorize spectrum use or provide any spectrum functions pursuant to the National Telecommunications and Information Administration Organization Act, 47 U.S.C. 902-903 [47 U.S.C. 901 et seq.], to any federal entity without reimbursement as required by NTIA for such spectrum management costs, and federal entities withholding payment of such cost shall not use spectrum." Annual appropriations acts for NTIA provide the total amount of the fees to be collected.

(Last Page In Chapter One)

Chapter 2

Telecommunication Policy

2.1 OBJECTIVES FOR THE USE OF THE RADIO SPECTRUM APPLYING TO AGENCIES AND ESTABLISHMENTS OF THE FEDERAL GOVERNMENT

The United States is vitally dependent upon the use of the radio spectrum to carry out national policies and achieve national goals. Use of the spectrum is vital to the security and welfare of the Nation and to the conduct of its foreign affairs. This use exerts a powerful influence upon our everyday lives, in countless ways, annually contributing significantly to the Nation's growth and economy.

The radio spectrum is a limited natural resource which is accessible to all nations. It is imperative that we develop and administer our use of this resource wisely so as to maintain a free democratic society and to stimulate the healthy growth of the Nation, while ensuring its availability to serve future requirements in the best interest of the Nation.

Therefore, consistent with our international treaty obligations and with due regard for the rights of other nations, the national objectives for the use of the radio spectrum are to make effective, efficient, and prudent use of the spectrum in the best interest of the Nation, with care to conserve it for uses where other means of communication are not available or feasible. Specifically, in support of national policies and the achievement of national goals, the primary objectives are:

(a) to enhance the conduct of foreign affairs;
(b) to serve the national security and defense;
(c) to safeguard life and property;
(d) to support crime prevention and law enforcement;
(e) to support the national and international transportation systems;
(f) to foster conservation of natural resources;
(g) to provide for the national and international dissemination of educational, general, and public interest information and entertainment;
(h) to make available rapid, efficient, nationwide, and worldwide radiocommunication services;
(i) to promote scientific research, development, and exploration;
(j) to stimulate social and economic progress; and
(k) in summary, to improve the well being of man.

The following areas of interest are associated with the national objectives listed above:

- Agriculture
- Amateur (emergency preparedness, self-training and technical investigation)
- Commerce
- Computers and data processing
- Consumer expenditures and savings
- Education
- Entertainment (Broadcasting)
- Health
- International (AID, conduct of Foreign Affairs and information exchange)
- Natural resources (including pollution abatement)
- National Security and Defense

- Oceanography
- Public Safety
- Research and Development
- Outer Space
- Social Welfare
- Transportation (other than urban areas)
- Urbanization (housing, transportation, and telecommunications)

These areas of interest are identified to assist in the frequency management process and are not intended to be all inclusive. Priorities among these areas of interest are normally determined on a case-by-case basis and are dependent upon many factors, including past and foreseen political and administrative decisions.

2.2 FORMULATION OF TELECOMMUNICATIONS POLICY

The formulation and enunciation of national telecommunication policies designed to ensure achievement of the national objectives is an essential element of the role of the Federal Government. Telecommunication policies are made by the Congress, by the Court, by the President and the Assistant Secretary of Commerce for Communications and Information with respect to the agencies and establishments of the Federal Government, and by the Federal Communications Commission for the public. Policy is made through treaties to which the United States adheres with the advice and consent of the Senate, through executive agreements, by executive departments and agencies in the discharge of their telecommunication responsibilities, and by custom and precedent. These policies may be separated into three categories: National Telecommunication Policy; Telecommunication Policy applying to the agencies and establishments of the Federal Government; and Federal Communications Commission Telecommunication Policy.

The Congress, in the Communications Act of 1934, provided for the regulation of interstate and foreign commerce in communication by wire and radio "so as to make available, so far as possible, to all the people of the United States a rapid, efficient, Nationwide, and world-wide wire and radio communication service, with adequate facilities at reasonable charges, for the purpose of the national defense, for the purpose of promoting safety of life and property through the use of wire and radio communication," and created the Federal Communications Commission to execute and enforce the provisions of that Act. Sections 301 and 303 of the Act set forth the general powers of the Commission to regulate radio stations, and stipulate that such stations cannot be operated except under and in accordance with the Act and with a license granted under the provisions of the Act. The Congress, by Section 305 of the Act, excluded "Radio stations belonging to and operated by the United States" from the provisions of Sections 301 and 303 of the Act. It provided that all such stations use such frequencies as shall be assigned by the President.

The Congress, in the Communications Satellite Act of 1962, declared: "...it is the policy of the United States to establish, in conjunction and in cooperation with other countries, as expeditiously as practicable a commercial communications satellite system, as part of an improved global communications network, which will be responsive to public needs and national objectives, which will serve the communication needs of the United States and other countries, and which will contribute to world peace and understanding.... United States participation in the global system shall be in the form of a private corporation, subject to appropriate governmental regulation.... It is not the intent of Congress by this Act to preclude the use of the communications satellite system for domestic communication services where consistent with the provisions of this Act nor to preclude the creation of additional communications satellite systems, if required to meet unique governmental needs or if otherwise required in the national interest." The Congress provided in Section 201 of the Act: "In order to achieve the objectives and to

carry out the purposes of this Act-(a) the President shall-... (7) so exercise his authority as to help attain coordinated and efficient use of the electromagnetic spectrum and the technical compatibility of the system with existing communications facilities both in the United States and abroad...."

The President by Reorganization Plan No. 1 of 1977 and Executive Order 12046 of March 26, 1978, established the Assistant Secretary of Commerce for Communications and Information and delegated to the Secretary of Commerce the authority to:

1. Assign frequencies to Federal radio stations and classes of stations, and amend, revoke or modify such assignments;
2. Authorize a foreign government to construct and operate a radio station at the seat of the U.S. Government;
3. Help attain coordinated and efficient use of the electromagnetic spectrum and the technical compatibility of the communications satellite system with existing communications facilities both in the United States and abroad;
4. Develop and set forth, in coordination with the Secretary of State and other interested agencies, plans, policies and programs relating to international telecommunication issues, conferences and negotiations;
5. Coordinate preparations for United States participation in international telecommunication conferences;
6. Coordinate policies and standards for spectrum use and related emergency readiness activities with the Executive Branch;
7. Ensure that the Executive Branch views on telecommunication matters are effectively presented to the Federal Communications Commission;
8. Establish policies concerning the use of the spectrum by Federal Government agencies; and
9. Develop, in coordination with the Federal Communications Commission, a comprehensive long-range plan for improved management of the spectrum.

2.3 TELECOMMUNICATIONS POLICY APPLYING TO AGENCIES AND ESTABLISHMENTS OF THE FEDERAL GOVERNMENT

The following policies have been established regarding the use of telecommunications by the agencies and establishments of the Federal Government:

2.3.1 General

Telecommunication Development and Regulation

The Federal Government shall encourage the development and regulate the use of radio and wire communications subject to its control so as to meet the needs of national security, safety of life and property, international relations, and the business, social, educational, and political life of the Nation.

International Telecommunication Regulation

The Federal Government considers the International Telecommunication Union the principal competent and appropriate international organization for the purpose of formulating international regulations on telecommunication matters.

The Federal Government recognizes that other international bodies, such as the International Civil Aviation Organization, International Maritime Organization and the World Meteorological Organization are appropriate international organizations for considering specialized telecommunication matters.

The United States shall be appropriately represented at international conferences dealing with telecommunications when such conferences appear to involve its national interests.

The Federal Government shall foster and encourage the participation, for the purpose of coordination and provision of advice and information, of experts from its commercial communication, scientific, and educational communities as advisers in the preparation for and participation in international telecommunication conferences, in consonance with national policy and security considerations.

Operating Capability of Industry

The Federal Government regards the operating capability of the privately-owned telecommunication industry as a vital national asset and shall encourage and promote the development of that industry in consonance with other national policy and security considerations.

2.3.2 Functions to be Achieved

National Defense

The United States in time of war or national emergency, as proclaimed by the President, shall have available to the Federal Government the total telecommunication resources of the Nation for utilization with due regard to the extent of the war or emergency and to the continuing operation of services considered to be essential or desirable for the welfare and interest of the United States during such a time.

On a continuing and current basis, all common carriers shall be encouraged and assisted in planning and preparing for their immediate readiness to meet emergency or war conditions so that telecommunications responsiveness to NSEP requirements can be instantaneous with the occurrence of such conditions.

In advance of war or a national security emergency, all desirable and possible measures and procedures necessary for use during emergency or war conditions will be developed and made available as needed so that they can be effected concurrently with the onset or threatened onset of emergency war conditions.

Safety at Sea

The Federal Government shall aggressively foster the development, investigation, selection, and standardization of a worldwide system of radio and electronic aids for marine navigation and communication, since the national security, the Nation's sea commerce, and the assurance of adequate safety of life and property at sea for ships of all nations require such an efficient, integrated, and standardized system.

Safety in the Air

The Federal Government shall aggressively foster the development, investigation, selection, and standardization of a worldwide system of radio and electronic aids for air navigation and communication, since the national security, the Nation's air commerce, and the assurance of adequate safety of life and property in flight require such an efficient, integrated, and standardized system.

Protection of Life, Property, and National Resources

The Federal Government shall promote the development and use of radio for the protection of the lives and property of its citizens and of other national resources where other means of communication are not appropriate or available.

Research

The Federal Government shall foster such research and development activities in the telecommunication field as will permit and encourage the most beneficial use of the radio spectrum in the national interest.

Promotion of Efficiency and Economy of Federal Government Operations

The Federal Government shall promote the development and use of radio to improve the efficiency and economy of Federal Government operations where other means of communication are not appropriate or available.

2.3.3 Federal Government Use of Commercial Telecommunication Service

The Federal Government places heavy reliance on the private sector in providing telecommunication service for its own use. This means that all functions normally associated with providing the service shall be performed by the private sector. These functions include design, engineering, system management and operation, maintenance, and logistical support.

In order to emphasize the Federal Government's proper role as a user, any proposal designed to provide needed telecommunication service, which requires the Federal Government to perform any of the "provider" functions, such as those listed above, shall be adopted only if commercial service is:

a) not available to the user during the time needed;

b) not adequate from either a technical or operational standpoint; or

c) significantly more costly.

A non-commercial service approach is acceptable if such an approach will result in significant savings over an otherwise acceptable commercial service offering. To be considered significant the savings must exceed ten percent of the cost of the commercial service. The cost estimate of the non-commercial approach must include, as a minimum, all of the factors called out by OMB Circular A-76. If the proposed approach involves heavy investment, rapid obsolescence, or uncertain requirements, the minimum savings threshold should be increased to reflect these factors.

The Federal Government shall establish separate communication satellite systems only when they are required to meet unique governmental needs, or are otherwise required in the national interest.

2.3.4 Use of Space Radiocommunication Techniques in the Aeronautical Services

The Federal Government shall promote the use of space radiocommunication techniques in the aeronautical services when economy of operation, improved service, and the more effective use of the radio spectrum will thereby result. The Federal Government shall promote the use of frequencies in the band 1535-1660 MHz for the aeronautical mobile (R) service for international civil aviation operations.

2.3.5 Role of Leadership by the Federal Government

The Government shall exercise leadership in the application of technological advances of operational procedures that will result in more efficient and effective use of the radio spectrum. Periodically, it shall measure the status of current technical and operational capabilities to determine necessary changes in technical standards, allocations, or assignments which should be effected.

2.3.6 Radio Spectrum Administration

The Federal Government regards the radio frequency spectrum as a world resource in the public domain; consequently it shall adopt policies and measures to insure that this resource is used in the best interest of this Nation, but with high regard to the needs and rights of other nations.

The supervision and administration of Federal use of the radio frequency spectrum shall have the objective of assuring that such use is efficient, effective, and prudent.

The Federal Government considers the radio frequency spectrum to be a vital national resource. Any rights of United States users to operate on any radio frequency are rights held by the United States as a whole. Such rights may be transferred by this Federal Government from one user to another, as required in the overall national interest.

The Federal Government considers that the basic guide to follow in the normal assignment of radio frequencies for transmission purposes is the avoidance of harmful interference and the use of frequencies in a manner which permits and encourages the most beneficial use of the radio frequency spectrum in the national interest.

Within the jurisdiction of the Federal Government, use of the radio frequency spectrum for radio transmissions for telecommunications or for other purposes shall be made by Federal Government stations only as authorized by the Assistant Secretary.

In view of the limitations of the usable radio frequency spectrum, and to insure the best possible return from the use thereof, the Federal Government in time of peace shall require all users to:

a) justify any except an emergency request for radio frequencies prior to the assignment or use of such frequencies;

b) confirm periodically the justification of continued use;

c) employ up-to-date spectrum conserving techniques as a matter of normal procedure; and

d) assure the ability to discontinue the electronic functioning of any emission system including satellites when required in the interest of communication efficiency and effectiveness.

In recognition of the congestion of that portion of the radio frequency spectrum which is suitable for long-distance communication, only in exceptional circumstances shall frequencies below 30 MHz be assigned in the domestic fixed service.

Normally, radio frequencies shall be assigned in the following order:

Frequencies used primarily, predominantly, and directly for national security and defense, for purposes which are vital to the safety of the Nation.

Frequencies used primarily, predominantly, and directly to safeguard life and property in conditions of distress.

Frequencies used primarily, predominantly, and directly to safeguard life and property in other than conditions of distress where other means of communication are not available.

Frequencies used in scientific research and those used in services that have no adequate means of rapid communication, when such use is considered to be necessary or desirable in the national interest.

Frequencies used for all other purposes, the assignment of which must be judged upon the merits of the intended use.

2.3.7 Spurious Emissions

In principle, spurious emissions from stations of one radio service shall not cause harmful interference to stations of the same or another radio service within the recognized service areas of the latter stations, whether operated in the same or different frequency bands.

Providing appropriate spectrum standards in Chapter 5 are met, an existing station is recognized as having priority over a new or modified station. Nevertheless engineering solutions to mitigate interference may require the cooperation of all parties involved in the application of reasonable and practicable measures to avoid causing or being susceptible to harmful interference.

2.3.8 Ionosphere Sounders

Ionosphere sounders have demonstrated their value in providing data for:

(a) increasing scientific knowledge of the Earth's atmosphere;

(b) real-time evaluation of propagation conditions to increase the reliability of high frequency communications;

(c) real-time monitoring of upper atmosphere phenomena;

(d) improving utilization of the radio spectrum;

(e) predicting disturbed ionosphere conditions; and

(f) enhancing survival communications, particularly in a nuclear environment.

Since uncontrolled growth in the number of ionosphere sounder transmitters could result in mutual, harmful interference among them and could be a potential source of harmful interference to established radio services, radio frequency support for ionosphere sounder transmitters shall be effected only in accordance with the provisions of Sections 8.2.21 and 8.2.22.

2.3.9 Safety Service

ITU Radio Regulation **1.59** defines a safety service as "any radiocommunication service used permanently or temporarily for the safeguarding of human life and property". The intent of RR **1.59** is that the safety service connotation should be applied to individual uses (assignments) of the radio frequency spectrum, irrespective of the radio service normally applied. This is a very important point since assignments which do entail the providing of a safety-of-life function require an appropriate degree of protection. It does not mean that such assignments have any special status which would in any way alter the normal rules applied with respect to primary, and secondary allocations, noting that priority of communications are otherwise provided in the Radio Regulations (Articles **44** and **53**).

From a spectrum management point of view, the domestic and international policies regarding safety service are consistent. Accordingly, the following guidance is applicable:

(a) The protection and status afforded to the categories of Services and allocations and to stations in all services is governed, inter alia, by Art. **5**, Sec. II. ITU Radio Regulations (RR).

(b) request for assistance in the case of harmful interference (RR **1.169**) caused to stations of the radionavigation service in a frequency band where the service is allocated under the Table of Frequency Allocations on a secondary basis would be treated by terms of RR **5.28** through **5.31**.

(c) request for assistance in the case of harmful interference (RR **1.169**) caused to stations of the radionavigation service in a frequency band where the service is allocated under the Table of Frequency Allocations on a coequal primary basis would be treated in accordance with normal practices based upon which operation was first brought into use unless it can be demonstrated that a "safety-of-life function is being served." In other words, any radiocommunication service, which uses the spectrum for safety purposes may be regarded in that case as a safety service and, in this respect, the appropriate provisions of the Radio Regulations would apply.

2.3.10 Use of Spectrum Conserving Methods for Radio Communication Systems

The Federal Government, in its role of leadership in the application of advanced technology, shall foster the application of spectrum conserving methods for radio communication systems used by the Federal Government. Spectrum conserving systems are new or existing systems that make use of innovative designs or unique applications that result in efficient use of frequency, space and time. Efficient use is a mission-oriented factor that combines the requirements of the mission with available techniques to provide the most effective solution. Federal agencies are encouraged to use spectrum conserving technologies and methods where they will satisfy agency operational requirements and will enhance service, economy of operation, and the more efficient and effective use of the radio spectrum. However, where spectrum is readily available due to geographic considerations or other factors, or where mission requirements mandate, security, economics, or some technical or system performance criterion may be the determining factor in system selection.

Land Mobile Systems

1. Spectrum conserving methods that should be considered for land mobile operations include trunked systems, narrowband FM (NBFM), and amplitude compandored single sideband (ACSSB).

a. Trunking is a technique that uses dynamic channel assignment to potentially obtain a higher degree of channel loading and increased spectrum utilization.

b. NBFM is conventional FM with channel spacing of 12.5 kHz or less. It may be capable of interoperation with conventional FM equipment using 25 kHz channel spacing.

c. ACSSB is a single-sideband modulation scheme with a necessary bandwidth of approximately 3.0 kHz, a standardized pilot carrier for synchronization, and amplitude compandoring.

2. The Federal Government shall foster the development of and standards for trunked land mobile systems used in appropriate bands allocated to the Federal Government.

3. The Federal Government shall foster the development of, and standards for, narrowband land mobile systems used in appropriate band allocated to the Federal Government. Further, to implement the objectives of the "Land Mobile Spectrum Efficiency Plan", submitted to Congress in October 1993 (IRAC Doc. 28497), mandated in the National Telecommunications Authorizations Act of 1992, P.L.102-538) (IRAC Doc. 27964), the Federal Government shall institute plans to narrowband land mobile systems operating in the following bands and in accordance with the following schedule:

a. After January 1, 1995, all new systems, and after January 1, 2005, all systems in the 162-174 MHz band must conform to the provision of paragraph 4.3.7A of this manual.

b. After January 1, 1995, all new systems and after January 1, 2008, all systems in the 406.1-420 MHz band must conform to the provisions of paragraph 4.3.9 of this manual.

c. After January 1, 1997, all new systems and after January 1, 2008 all systems in the 138-150.8 MHz band must conform to the technical standards contained in paragraph 5.3.5.2 of this manual.

2.3.11 Reserved

2.3.12 Proof of Compliance with FCC Licensing Requirements

Section 104(e) of the National Telecommunications and Information Administration Organization Act, as amended, requires that NTIA have proof of compliance with FCC licensing requirements for non-government operations of a radio station utilizing a government frequency or utilization of a government radio station for non-government purposes. Federal agencies must include the FCC file number of any non-government entity using government facilities or radio frequencies for non-government purposes in the application for an NTIA frequency assignment.[1]

2.3.13 Special Conditions for Department of Defense Use of the Spectrum

1. As mandated by Title X, Subpart G, Section 1062 of the National Defense Authorization Act for Fiscal Year 2000, the Department of Defense shall not surrender use of any band of frequencies in which the Department of Defense is a primary user for non-federal use, unless the following conditions are met.

a. NTIA, in consultation with the FCC, has identified and made available to the Department of Defense for its primary use[i], if necessary, an alternative band or bands of frequencies with comparable technical characteristics as a replacement; and,

b. The Secretary of Commerce, the Secretary of Defense, and the Chairman of the Joint Chiefs of Staff have jointly certified to the Committee on Armed Services and the Committee on Commerce, Science and Transportation of the Senate; and the Committee on Armed Services and the Committee on Commerce of the House of Representatives, that the replacement band or bands of frequencies identified in a. above provides comparable technical characteristics to restore essential military capability that will be lost when the band of frequencies is surrendered.

2. Paragraph 1. shall not apply to any band or bands of frequencies identified for reallocation in accordance with Title VI of the Omnibus Budget Reconciliation Act of 1993 (Public Law 103-66; 107 Stat. 379) and Title III of the Balanced Budget Act of 1997 (Public Law 105-33, 111 Stat. 258), other than a band or bands of frequencies reclaimed in accordance with Title X, Subtitle G, Section 1062 of the National Defense Authorization Act for Fiscal Year 2000 (The 139.0-140.5 MHz, 141.5-143.0 MHz, and the 1385-1390 MHz bands identified for reallocation under the Balanced Budget Act of 1997).

3. Other than when implementing the provisions of this Section, nothing in Paragraph 1 shall abridge the authority of NTIA to assign frequencies to radio stations or classes of radio stations belonging to and operated by the United States, including the authority to amend, modify, or revoke such assignments.

2.4 BASIC COORDINATION ARRANGEMENT BETWEEN NTIA AND THE FCC WITH RESPECT TO DECISIONS REGARDING THE USE OF THE RADIO SPECTRUM

2.4.1 The following arrangement was agreed by the NTIA and the FCC January 31, 2003:

The FCC will cooperate with the NTIA and endeavor to give notice of all proposed actions that could potentially cause interference to government operations. Where possible, such notice will be given in time for the NTIA to comment prior to final action and a minimum of 15 business days prior to final action. A different review period may be agreed to by NTIA's Associate Administrator for Spectrum Management and the FCC's Chief of the Office of Engineering and Technology. Final action by the FCC, however, does not require approval of the NTIA.

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[1] See IRAC Doc. 28420/1-2.2.5.

The NTIA will cooperate with the FCC and endeavor to give notice of all proposed actions that could potentially cause interference to non-government operations. Where possible, such notice will be given in time for the FCC to comment prior to final action and minimum of 15 business days prior to final action. A different review period may be agreed to by NTIA's Associate Administrator for Spectrum Management and the FCC's Chief of Office of Engineering and Technology. Final action by the NTIA, however, does not require approval of the FCC.

The FCC and the NTIA will resolve technical, procedural, and policy differences by consensus whenever possible.

The FCC and the NTIA will maintain current lists of their authorized frequency assignments and will exchange such information as appropriate to coordinate spectrum use.

EndNote

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[i] As used in this Section, a "band of frequencies in which the Department of Defense is a primary user" is a band of frequencies, or part thereof, listed in the National Table of Frequency Allocations under the Federal Government column heading allocated on a primary basis to any radiocommunication service in which the Department of Defense operates spectrum-dependent equipment, as evidenced by one or more operational frequency assignment authorizations listed in the Government Master File for one or more primary services in that band, and as determined by NTIA, in consultation with the Office of the Secretary of Defense and the Joint Staff, based upon:

(1) the number of permanent and temporary authorizations,
(2) the number of current and planned systems,
(3) the geographical areas of operation,
(4) the amount of bandwidth occupied,
(5) the cost of reaccommodating systems, or
(6) the nature of the essential national security mission supported in the band.

The provisions of Title X, Subpart G, Section 1062 of the National Defense Authorization Act for Fiscal Year 2000 shall not apply to Federal Government stations operating as "end-users" with non-Federal systems.

(Last Page in Chapter 2)

Chapter 3
International Matters

3.1 TREATIES AND AGREEMENTS

The primary treaties and other international agreements in force relating to radio communication and to which the United States is a party are as follows:

The International Telecommunication Convention was signed at Nairobi on November 6, 1982. The United States deposited its instrument of ratification on January 7, 1986.

The Radio Regulations annexed to the International Telecommunication Convention were signed at Geneva on December 6, 1979 and entered into force with respect to the United States on January 1, 1982.

The United States-Canada Agreement relating to the Coordination and Use of Radio Frequencies Above 30 Megacycles per Second was effected by an exchange of notes at Ottawa on October 24, 1962. A revision to the Technical Annex to the Agreement, made in October 1964 at Washington, was effected by an exchange of notes signed by the United States on June 16, 1965 and by Canada on June 24, 1965. The revision entered into force on June 24, 1965. A revision to this Agreement to add Arrangement E (Arrangement the Department of Communications of Canada between Industry Canada and the National Telecommunications and Information Administration and the Federal Communications Commission of the United States concerning the use of the 406.1 to 430 MHz band in Canada-United States Border Areas) was effected by an exchange of notes signed by the United States on February 26, 1982 and Canada on April 7, 1982 and entered into force on April 7, 1982. Another revision to this Agreement to add Arrangement F (Arrangement Between the Department of Communications of Canada and the Federal Communications Commission of the United States Concerning the Use of the Band 806-890 MHz along the Canada-United States Border) was effected by an exchange of notes signed by Canada on November 2, 1993 and by the United States on January 4, 1994 and entered into force on January 4, 1994. An additional revision to this Agreement to add Arrangement G (Sharing Arrangement Between the Department of Industry of Canada and the Federal Communications Commission of the United States of America Concerning the Use of the Frequency Bands 764 to 776 MHz and 794 to 806 MHz by the Land Mobile Service along the Canada-United States Border) was effected by an exchange of notes signed by Canada on June 15, 2005 and by the United States on June 20, 2005 and entered into force on June 20, 2005.

Inquiries concerning the purchase of copies of the International Telecommunication Union (ITU) Constitution and Convention, the Radio Regulations, and the partial revisions thereto, should be sent to the Sales and Marketing Division, International Telecommunication Union, Place des Nations, CH-1211 Geneva 20, Switzerland. Inquiries concerning the substance of the publications should be addressed either to the Office of International Communications and Information Policy, Department of State, or to the Assistant Secretary of Commerce for Communications and Information.

Inquiries concerning copies of the U.S.-Canada Agreement should refer to “Treaties and Other International Acts Series 5205 and 5833" and should be sent to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

3.2 THE INTERNATIONAL TELECOMMUNICATION UNION

The International Telecommunication Union (ITU) was established in 1865 to manage the first international telegraph networks. The ITU is a specialized agency of the United Nations (UN) headquartered in Geneva, Switzerland. It also has a number of regional and sub-regional offices. It is responsible for international frequency allocations, worldwide telecommunications standards and telecommunication development activities. The ITU is unique among international organizations in that it was founded on the principle of cooperation between governments and the private sector. One hundred ninety-one (191) Countries are Members of the ITU. Any administration (country) that accedes to the ITU Convention can become a Member of the Union. Member Countries have voting privileges in all ITU Organs. International and regional organizations with an interest in telecommunications, public and private operators, broadcasters, and scientific and industrial companies can become members of components of the ITU known as sectors. Sector members participate in most Union activities on an advisory basis but do not have voting rights. There are over 700 Sector Members and Associate Members. Additional information on the ITU can be found at www.itu.int.

The broad functions of the ITU are the regulation, coordination and development of international telecommunications. The United States is an active member of the ITU and its work is considered critical to the interests of the United States.

3.2.1 Purposes of the Union

The ITU's mission is to enable the growth and sustained development of telecommunications and information networks, and to facilitate universal access so that people everywhere can participate in, and benefit from, the emerging information society and global economy. The ability to communicate freely is a pre-requisite for a more equitable, prosperous and peaceful world. The ITU assists in mobilizing the technical, financial and human resources needed to make this vision a reality.

The purposes of the Union are to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including those using satellite orbits and the radio astronomy service, and to carry out studies and approve recommendations on radiocommunication matters, develop information and communication technology/telecom standards to meet the needs of industry and consumers, and to ensure world-wide interoperability and promote the right to communicate of all inhabitants of the planet through access to infrastructure and information and communication services.

3.2.2 Structure of the Union

The ITU Constitution states that the Union shall comprise: the Plenipotentiary Conference, which is the supreme authority of the Union; the Council, which acts on behalf of the Plenipotentiary Conference; world conferences on international telecommunications; the Radiocommunication Sector, including world and regional radiocommunication conferences, radiocommunication assemblies and the Radio Regulations Board; the Telecommunication Standardization Sector, including world telecommunication standardization conferences; the Telecommunication Development Sector, including world and regional telecommunication development conferences; and the General Secretariat.

3.2.3 Plenipotentiary Conference

The Plenipotentiary Conference is convened every four years. This conference adopts the fundamental policies of the Union and decides its organization and activities by means of a treaty known as the International Telecommunication Constitution and Convention. These conferences focus on long-term policy issues. They take decisions on draft Strategic Plans submitted by the Council outlining the objectives, work, programs and expected outcome for each constituent of the Union until the following Conference. Plenipotentiary Conferences elect members of the Council, the Secretary-General and Deputy Secretary-General, the Bureau Directors in the three Bureau Sectors of the ITU, and the members of the Radio Regulations Board. ITU Member States control the events at Plenipotentiary Conferences; Sector Members may attend the Conferences as observers.

3.2.4 The Council

The Council of the ITU is composed of 25% (46 Members) of the total number of Member States, which are elected by the Plenipotentiary Conference, with due regard to the need for equitable distribution of the seats on the Council among the five world regions (Americas, Western Europe, Eastern Europe, Africa, Asia and Australasia). The role of the Council is to consider, in the interval between two Plenipotentiary Conferences, broad telecommunication policy issues in order to ensure that the Union's policies and strategy fully respond to the constantly changing telecommunication environment. The Council is responsible for ensuring the efficient coordination of the work of the Union and for exercising an effective financial control over the General Secretariat and the three Sectors. The Council takes all steps to facilitate the implementation by Members of the provision of the Constitution, the Convention, the Administrative Regulations of the Plenipotentiary conferences and, where appropriate, of the decisions of other conferences and meetings of the Union. Additional information regarding the Council is located at http://www.itu.int/council/index.html.

3.2.5 General Secretariat

The General Secretariat manages the administrative and financial aspects of the Union's activities, including the provision of conference services, information services, long-range strategic planning, and corporate functions (communications, legal advice, finance, personnel and common services). The General Secretariat's work in managing the Union's many meetings, regional and international assemblies and conferences covers organizational and logistical support, the provision of administrative services, documentation, and the provision of translation and interpretation services in the six working languages of the Union. In addition, its work involves providing legal advice, communication support and media relations services for these events. Through an extensive document preparation and handling center, the General Secretariat is also charged with the production and printing of documents and publications as well as with marketing, sales and dispatch of publications to customers worldwide. The management of the finances of the Union is also the responsibility of the General Secretariat. Activities include advising and informing the membership and legislative bodies of the Union on financial and budgetary matters, preparation of the Union's draft budget, preparation of cost analysis, and financial reporting. Additional information regarding the General Secretariat is located at http://www.itu.int/net/gs/index.aspx.

3.2.6 Radiocommunication Sector

The Radiocommunication Sector (ITU-R) ensures the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including those using the geostationary-satellite orbit, and carries out studies without limit of frequency range on the basis of which recommendations are adopted. Subjects covered include: spectrum utilization and monitoring; inter-service sharing and compatibility; science services; radio wave propagation; the fixed satellite, fixed, and mobile services and sound and television broadcasting. The Radiocommunication Sector operates through World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by study groups (legislative functions), an Advisory Group (strategic advice) and a Bureau headed by a Director (administrative functions). Additional information regarding the Radio Communication Sector is located at http://www.itu.int/ITU-R/index.asp.

3.2.7 Telecommunication Standardization Sector

The Telecommunication Standardization Sector (ITU-T) studies technical, operating and tariff questions and issues recommendations with a view to standardizing telecommunications on a worldwide basis, including recommendations on interconnection of radio systems in public telecommunication networks and on the performance required for these interconnections. Activities cover: telecommunication services and network operation; telecommunication tariffs and accounting principles; maintenance; protection of outside plant; data communication; terminal for telematic services; switching, signaling and man-machine language; transmission performance, systems and equipment; and ISDN. The Standardization Sector operates through World Telecommunication Standardization Conferences which are supported by study groups (legislative) and convened every four years, and an Advisory Group on Standardization (strategic advice and a Standardization Bureau headed by a Director (administrative function). Additional information regarding the Standardization Sector is located at http://www.itu.int/ITU-T/index.html.

3.2.8 Telecommunication Development Sector

The Telecommunication Development Sector (ITU-D) activities include policy and regulatory advice, advice on the financing of telecommunications and on low-cost technology options, assistance in human resource management, and the development of initiatives targeting rural development and universal access. Throughout all these activities, ITU-D maintains a strong emphasis on brokering partnerships with the private sector, with a view to harnessing the commercial drive of industry to meet the needs of developing nations. The World Telecommunication Development Conference (WTDC) provides direction to the Telecommunications Development Bureau (BDT), setting guidelines for development priorities, planning BDT activities and establishing the Bureau's work program. WTDC also establishes study groups to undertake studies on issues of relevance to developing countries, including development policies, financing, network planning, and introduction of new services, and is charged with examining the reports of such study groups. Additional information regarding the Development Sector is located at http://www.itu.int/net/ITU-D/index.aspx.

3.3 SUBMISSION OF INFORMATION TO THE ITU

3.3.1 Notification of Frequency Assignments

Frequencies assigned to Federal radio stations shall be notified to the Radiocommunication Bureau, Geneva, Switzerland.

3.3.2 Provision of Information Regarding Satellite Networks in Planned Satellite Systems

In order to ensure compliance with the provisions of the ITU Radio Regulations, any Federal agency intending to establish a satellite system shall provide to the Spectrum Planning Subcommittee (SPS) and the Space Systems Subcommittee (SSS) the details contained in Appendix **4** to the ITU Radio Regulations for each satellite network within the planned satellite system, including changes in the technical characteristics and the employment and deployment of stations contained therein.

The information in Appendix **4** of the ITU Radio Regulations shall be furnished to the SPS in accordance with the instructions appearing in Chapter 10 of this Manual.

The information in Appendix **4** shall be furnished to the SSS in accordance with the current ITU Radio Regulations and applicable Radiocommunication Bureau (BR) Circular Letters. The Appendix **4** information required for Advance Publication shall be provided to the SSS at the same time as the request for Stage 2 Systems Review under Chapter 10 of this Manual, and shall not normally be transmitted to the Radiocommunication Bureau for Advance Publication until Stage 2 certification of Spectrum Support has been granted or earlier if sufficient information is available. The Appendix 4 information required for coordination and notification shall be provided at the same time as the Stage 3 Systems Review approval request under Chapter 10 of this Manual. After Stage 3 approval, the required coordination will be initiated. Notification of frequency assignments to the BR will be made after Stage 4 approval has been granted and any required coordination has been accomplished. Operational frequency assignments will not normally be granted until notification has been initiated.

Before Stage 2, 3, or 4 support is granted the SSS must indicate that the appropriate Appendix **4** data have been submitted and reviewed.

The SSS will review the information and:

(a) Notify the SPS that the required data is on file.

(b) Request the FCC Liaison Representative to submit the appropriate data to the BR or to other administrations under the provisions of the ITU Radio Regulations.

With regard to satellite network cost recovery fees, the responsible Federal agency will submit payment of its satellite network cost recovery, in accordance with ITU Council Decision 482, directly to the ITU upon receipt of the invoice from the BR. The responsible agency will ensure current point of contact information is supplied to the BR.

The submission of information to the BR concerning earth stations located outside the jurisdiction of the United States may be the responsibility of the country on whose territory the earth station is located.

As a matter of policy, advance publication information, coordination information (as necessary), and notices of frequency assignments relating to space systems shall be submitted to the BR. Exceptions to this policy will be made only by the NTIA on a case-by-case basis.

It is the practice of the United States not to submit space system information to the BR if: i) the intended use is for a short period of time (on the order of 12 months or less); ii) the intended use is not in accordance with the Table of Frequency Allocations of the ITU RR, or iii) national security is affected.

An agency requesting exemption from international registration for a particular satellite system shall submit a request that the international registration be waived to the SSS. The submission to the SSS shall include the following:

(a) a statement that the agency has reviewed the existing satellite systems registered with the ITU and determined their system is compatible;

(b) a statement that the agency will continue to monitor the international registration process for satellite systems that operate co-channel to the system for which they have requested a waiver and be responsible for taking the measures necessary to ensure compatibility with any new system; and

(c) a statement that the agency recognizes that should a waiver of the international registration requirement be approved and interference occurs to or from their unregistered system, they have no status or rights under the ITU Radio Regulations (RR). Agencies operating such a system, without the benefit of the recognition and protection afforded by the international registration process, assume full responsibility for making modifications required to resolve any interference problems with systems operating in accordance with the RR.

3.3.3 Provision of Information Regarding Terrestrial Systems

Any Federal agency intending to register a terrestrial station assignment with the ITU Radiocommunication Bureau (BR) shall provide the coordination information, if necessary, and notification information, as contained in Appendix **4** to the ITU Radio Regulations, to the Federal Communications Commission (Notification Branch, Planning and Negotiations Division, International Bureau) for submission to the BR.

3.4 AGREEMENT BETWEEN THE UNITED STATES OF AMERICA AND CANADA CONCERNING THE COORDINATION AND USE OF RADIO FREQUENCIES ABOVE 30 MEGACYCLES PER SECOND

3.4.1 General

The United States-Canada Agreement relating to the Coordination and Use of Radio Frequencies Above 30 Megacycles per Second contains a Technical Annex which is composed of an Index and seven frequency sharing/coordination Arrangements lettered A, B, C, D, E, F, and G, respectively.

The Index to the Technical Annex indicates for each of the seven Arrangements the frequency bands involved and the authorized coordination agencies or channels in each country for each band.

The National Telecommunications and Information Administration (NTIA) and Industry Canada (The Canadian Department of Industry, known as Industry Canada, has superceded the Department of Communications which had previously superceded the Department of Transport as the authorized coordination agency or channel for Canada with respect to certain frequency bands.) are the authorized coordination agencies for the bands shown in the following tabulation:

Band (MHz)	Arrangement	Type Assignments Involved
32.0-33.0	D	Experimental and military tactical & training excluded
34.0-35.0	D	Same as above
36.0-37.0	D	Same as above
38.0-39.0	D	Same as above
40.0-42.0	D	Same as above
46.6-47.0	ITU RR 228	Ionospheric scatter only
49.6-50.0	ITU RR 228	Same as above
138.0-144.0	D	Experimental and military radar and tactical & training excluded
148.0-149.9	D	Same as above
150.05-150.8	D	Same as above
162.0-174.0	D	Experimental and military tactical & training excluded
406.1-430.0	E	Same as above
1540.0-1660.0	B	Space techniques only
1710.0-1850.0	D	Experimental and military tactical & training excluded
2110.0-2120.0	D	Experimental excluded
2200.0-2290.0	D	Experimental and military tactical & training excluded
2900.0-3100.0	C	Non-military radar only
4200.0-4400.0	B	Space techniques only
4400.0-4990.0	D	Experimental and military tactical & training excluded
5000.0-5250.0	B	Space techniques only

5460.0-5650.0	C	Non-military radar only
7125.0-7250.0	D	Experimental and military tactical & training excluded
7250.0-7750.0	D	Experimental excluded
7750.0-7900.0	D	Experimental and military tactical & training excluded
7900.0-8400.0	D	Experimental excluded
9300.0-9500.0	C	Non-military radar only
15400.0-15700.0	B	Space techniques only

3.4.2 Index to the Technical Annex

(The Index to the Technical Annex, Arrangements C and D, and the pertinent portion of Arrangement B are reproduced below.)

Item	Frequency	Authorized Coordination Agencies or Channels		Coordination Arrangements Remarks
		US	Canada	
1	30.56-32.0	FCC	DOT	Arrangement A
2	32.0-33.0	IRAC	DOT	Arrangement D
3	33.0-34.0	FCC	DOT	Arrangement A
4	34.0-35.0	IRAC	DOT	Arrangement D
5	35.0-36.0	FCC	DOT	Arrangement A
6	36.0-37.0	IRAC	DOT	Arrangement D
7	37.0-38.0	FCC	DOT	Arrangement A
8	38.0-39.0	IRAC	DOT	Arrangement D
9	39.0-40.0	FCC	DOT	Arrangement A
10	40.0-42.0	IRAC	DOT	Arrangement D
11	42.0-46.6	FCC	DOT	Arrangement A
12	46.6-47.0	IRAC	DOT	ITU RR 228
13	47.0-49.6	FCC	DOT	Arrangement A
14	49.6-50.0	IRAC	DOT	ITU RR 228
15	72.0-73.0	FCC	DOT	Arrangement A
16	74.6-75.4	FAA	DOT	Arrangement B
17	75.4-76.0	FCC	DOT	Arrangement A
18	108.0-117.975	FAA	DOT	Arrangement B
19	117.975-121.975	FAA	DOT	Arrangement B
20	121.975-123.075	FCC	DOT	Arrangement B
21	123.075-123.575	FCC	DOT	Arrangement B
22	123.575-128.825	FAA	DOT	Arrangement B
23	128.825-132.025	FCC	DOT	Arrangement B
24	132.025-136.0	FAA	DOT	Arrangement B
25	138.0-144.0	JCS	CDS*	Arrangement C
26	148.0-149.9	IRAC	DOT	Arrangement D
27	148.0-149.9	JCS	CDS	Arrangement C
28	150.05-150.8	IRAC	DOT	Arrangement D
29	150.05-150.8	JCS	CDS*	Arrangement C
30	150.8-174.0	FCC	DOT	Arrangement A
31	162.0-174	IRAC	DOT	Arrangement D
32	216.0-225.0	JCS	CDS*	Arrangement C
33	328.6-335.4	FAA	DOT	Arrangement B
33bis	406.1-430.0	NTIA	DOC	Arrangement E
34	420.0-450.0	JCS	CDS*	Arrangement C
35	450.0-470.0	FCC	DOT	Arrangement A
35bis	764-776	FCC	IC	Arrangement G
35ter	794-806	FCC	IC	Arrangement G
35quar	806-890	FCC	DOC	Arrangement F
36	890.0-942.0	JCS	CDS*	Arrangement C
37	942.0-960.0	FCC	DOT	Arrangement A
38	960.0-1215.0	FAA	DOT	Arrangement B

Item	Frequency	Authorized Coordination Agencies or Channels		Coordination Arrangements Remarks
		US	Canada	
39	1215.0-1400.0	JCS	CDS*	Arrangement C
40	1300.0-1350.0	FAA	DOT	Arrangement C
41	1535.0-1540.0			Coordination not required at this time
42	1540.0-1660.0	IRAC	DOT	Arrangement B
43	1710.0-1850.0	IRAC	DOT	Arrangement D
44	1850.0-2200.0	FCC	DOT	Arrangement A
45	2110.0-2120.0	IRAC	DOT	Arrangement D
46	2200.0-2290.0	IRAC	DOT	Arrangement D
47	2300.0-2450.0	JCS	CDS*	Arrangement C
48	2450.0-2690.0	FCC	DOT	Arrangement A
49	2700.0-2900.0	FAA	DOT	Arrangement C
50	2700-3700.0	JCS	CDS*	Arrangement C
51	2900-3100.0	IRAC	DOT	Arrangement C
52	3700.0-4200.0	FCC	DOT	Arrangement A
53	4200.0-4400.0	IRAC	DOT	Arrangement B
54	4400.0-4990.0	IRAC	DOT	Arrangement D
55	5000.0-5250.0	IRAC	DOT	Arrangement B
56	5250.0-5925.0	JCS	CDS*	Arrangement C
57	5460.0-5650.0	IRAC	DOT	Arrangement C
58	5925.0-7125.0	FCC	DOT	Arrangement A
59	7125.0-8400.0	IRAC	DOT	Arrangement D
60	8400.0-8500.0			Coordination not required at this time
61	8500.0-10500.0	JCS	CDS*	Arrangement C
62	9000.0-9200.0	FAA	DOT	Arrangement C
63	9300.0-9500.0	IRAC	DOT	Arrangement C
64	10.55-10.68 GHz	FCC	DOT	Arrangement A
65	10.70-13.25 GHz	FCC	DOT	Arrangement A
66	13.25-13.4 GHz			Coordination not required at this time
67	13.4-14.0 GHz	JCS	CDS*	Arrangement C
68	14.0-15.4 GHz			Coordination not required at this time
69	15.4-15.7 GHz	IRAC	DOT	Arrangement B
70	15.7-17.7 GHz	JCS	CDS*	Arrangement C
71	17.7-23.0 GHz			Coordination not required at this time
72	23.0-24.25 GHz	JCS	CDS*	Arrangement C
73	24.25-33.4 GHz			Coordination not required at this time
74	33.4-36.0 GHz	JCS	CDS*	Arrangement C
75	36.0 GHz and above			Coordination not required at this time

*CDS - Chief of Defence Staff - Authorized Coordination Channel only.Coordination of Frequency Assignments in the 138-144 MHz Band

Without amendment of the Agreement, the IRAC and the Canadian Department of Communications agreed to coordinate fixed and mobile service (excluding Tactical and Training) assignments in the band 138-144 MHz in accordance with the provisions of Arrangement D of the Agreement (Ref. IRAC Doc. 20638/1).

3.4.3 No. 228 of the ITU Radio Regulations

No. **228,** as well as other provisions of the Radio Regulations relating to ionospheric scatter assignments, was not carried over from the World Administrative Radio Conference (Geneva, 1979). References to No. **228** in the Agreement are no longer valid and remain in Sections 3.4.1 and 3.4.2 of the Manual pending renegotiation of the Agreement, including Arrangement D, with the Government of Canada.

3.4.4 Text of Arrangement B

Arrangement For the Exchange of Frequency Assignment Information and Engineering Comments on Proposed Assignments Along the Canada/United States Borders in Certain Aviation Bands.

(Adopted Ottawa, March 1962; Revised Washington, D.C., October 1964)

(1) This arrangement involves assignments in the frequency bands set forth in paragraph 8 hereof.

(2) In the interest of the planned use of the spectrum, information concerning future expansions and adjustments of the services allocated these bands, in the coordination zones stipulated in the Appendices attached hereto, shall be exchanged to the maximum extent practicable.

(3) The Agency proposing to establish a new station, or to modify the basic characteristics of an existing station, shall furnish to the appropriate Agency the technical data necessary to complete coordination, in accordance with the attached Appendices.

(4) The Agency responsible for coordination shall examine the information provided and shall reply as soon as practicable advising whether or not a conflict is anticipated. If so, the detail of the conflict and the particulars of the station likely to experience interference shall be supplied. New proposals or discussions may be initiated with the object of resolving the problem.

(5) In the interest of planned use of the frequency bands allocated for use of space techniques in the Aeronautical Mobile (R) and Aeronautical Radionavigation Services, information concerning assignments to stations using space techniques in these bands shall be exchanged to the maximum extent practicable. This will involve assignments for a) all spacecraft and b) transmitting stations and receiving stations which use space techniques.

(6) Whenever differences of opinion concerning the probability of harmful interference exist, which cannot be resolved otherwise, or in cases where the information available makes it difficult to determine whether harmful interference would be created by the proposed operation, mutual arrangement should be made for actual on-the-air tests to be observed by representatives of the U.S. agencies concerned and the Department of Transport. Should harmful interference be caused to the existing station, the Agency having jurisdiction over the proposed operation should be notified promptly so that the transmissions of the interfering station may be halted.

(7) Neither the U.S. agencies concerned nor the Department of Transport shall be bound to act in accordance with the views of the other. However, to keep such instances to a minimum, each Agency should cooperate to the fullest extent practicable with the other by furnishing such additional data as may be required.

(8) The bands treated and the agreed action on each are as follows:

Frequency Band Mc/s	Authorized Coordination Agency		Remarks
	U.S.	Canada	
74.60-75.40	FAA	DOT	Coordination not required at this time
108.0-117.975	FAA	DOT	SEE APPENDIX 1
117.975-121.975	FAA	DOT	SEE APPENDIX 2
121.975-123.075	FCC	DOT	Coordination not required at this time
123.075-123.575	FCC	DOT	Coordination not required at this time
123.575-128.825	FAA	DOT	SEE APPENDIX 2
128.825-132.025	FCC	DOT	SEE APPENDIX 3
132.025-135.0	FAA	DOT	SEE APPENDIX 2
135.0-136.0	FAA	DOT	SEE APPENDIX 4
328.6-335.4	FAA	DOT	SEE APPENDIX 1
960.0-1215.0	FAA	DOT	SEE APPENDIX 1
1540-1660	IRAC	DOT	Coordination not required at this time except for applications involving the use of space techniques
4200-4400	IRAC	DOT	Coordination not required at this time except for applications involving the use of space techniques
5000-5250	IRAC	DOT	Coordination not required at this time except for applications involving the use of space techniques
15.4-15.7 Gc/s	IRAC	DOT	Coordination not required at this time except for applications involving the use of space techniques

NOTE: "Coordination not required at this time" in the Remarks column indicates that the present use of these frequencies does not cause conflict in their application, either in the United States or Canada. However, authorized agencies are designated to coordinate any future use, which may be capable of causing harmful interference. (Appendices 1 through 4 of Arrangement B are not reproduced in this Manual.)

3.4.5 Text of Arrangement C

Arrangement for Frequency Coordination of Fixed Installation Radars

(Adopted Ottawa, March 1962, and revised Washington, D.C., October 1964)

It is agreed that:

(1) Coordination shall be effected in those frequency bands used by fixed installation radars, some of which are essential to the defense of North America, whenever there is considered to be a likelihood of harmful interference. For this purpose information will be exchanged through the authorized coordination agencies, as follows:

(a) All relevant existing assignments as of the effective date of this arrangement, as soon as practicable.

(b) Current editions of the information in (a), as requested.

(c) Proposed or planned assignments as far in advance as practicable.

(2) The authorized agencies responsible for taking action on the coordinations are specified in the Index to the Technical Annex. In the case of U.S. military coordinations, the coordination data will be transmitted via the established coordination channel. The Canadian military will coordinate as necessary with the DOT who will be responsible for the technical examination and completion of Canadian coordination in conjunction with cognizant Canadian military agencies. In the case of Canadian originated military coordinations, after internal coordination with the DOT, the data will be passed to the U.S. via the established coordination channel. Non-military coordinations, after complete internal coordination, will be transmitted direct between the authorized non-military coordination agencies shown in the Index for each particular band.

(3) Detailed characteristics of transmitting and receiving equipment, for both radar and any relevant non-radar equipment, will be exchanged in advance of the coordination referred to above. The minimum desirable information is as follows:

(a) Frequency band or operating frequencies
(b) Location name and geographical coordinates
(c) Site elevation above mean sea level and antenna height above ground
(d) Class of emission and necessary bandwidth
(e) Power (peak) delivered to the antenna
(f) Function
(g) Antenna gain and orientation

(4) Until the bands covered by this arrangement have been cleared of potential conflicts, at installations where there is a possibility of harmful interference, evaluation testing of radar installations will be carried out at the time of activation and maximum cooperation will be extended in obtaining the best engineering solution to any harmful interference problems. It is recognized that special problems exist in bands presently in use for non-radar purposes. These problems require continuous further study as regards both the procedures and the necessity of allocation adjustments so as to accommodate radars essential to the defense of North America.

(5) Radar assignments in use on the effective date of this arrangement are not subject to further coordination by virtue of this arrangement.

(6) Mobile radar assignments are not subject to this arrangement.

NOTE: For the purpose of complying with the provisions of paragraph 1 of Arrangement C, the IRAC shall coordinate all proposed non-military assignments to stations, other than mobile stations, with a power of one kilowatt peak or over, which are located within the coordination zone specified in paragraph 2(a) of Arrangement D.)

3.4.6 Text of Arrangement D

Arrangement Between the Department of Transport and the Interdepartment Radio Advisory Committee For the Exchange of Frequency Assignment Information and Engineering Comments on Proposed Assignments Along the Canada-United States Borders in Certain Frequency Bands Above 30 Mc/s.

(Adopted Washington, D.C., June 1956; Revised Ottawa, March 1962 and Washington, D.C., October 1964).

1. This arrangement provides for the exchange of frequency assignment information and engineering comments on proposed assignments in the following frequency bands:

(a) Mc/s	32.00-33.00	40.00-42.00	1710.00-1850.00	**(b) Mc/s**	2110.00-2120.00
	34.00-35.00	148.00-149.90	2200.00-2290.00		7250.00-7750.00
	36.00-37.00	150.05-150.80	4400.00-4990.00		7900.00-8400.00
	38.00-39.00	162.00-174.00	7125.00-7250.00		
			7750.00-7900.00		

2. (a) For the bands below 1000 MHz, the areas involved are those bounded by:

Line A-Begins at Aberdeen, Wash. running by great circle arc to the intersection of 48°N., 120°W., thence along parallel 48°N., to the intersection of 95°W., thence by great circle arc through the southernmost point of Duluth, Minn., thence by great circle arc to 45°N., 85°W., thence southward along meridian 85°W., to its intersection with parallel 41°N., thence along parallel 41°N., to its intersection with meridian 82°W., thence by great circle arc through the southernmost point of Bangor, ME, thence by great circle arc through the southernmost point of Searsport, ME, at which point it terminates; and

Line B-Begins at Tofino, B.C., running by great circle arc to the intersection of 50°N, 125°W, thence along parallel 50°N., to the intersection of 90°W., thence by great circle arc to the intersection of 45°N., 79°30'W, thence by great circle arc through the northernmost point of Drummondville, Quebec (Lat: 45°52'N., Long: 72°30'W.), thence by great circle arc to 48°30'N, 70°W., thence by great circle arc through the northernmost point of Campbellton, N.B., thence by great circle arc through the northernmost point of Liverpool, N.S., at which point it terminates. Line C-Begins at the intersection of 70°N., 144°W., thence by great circle arc to the intersection of 60°N., 143°W., thence by great circle arc so as to include all of the Alaskan Panhandle; and

Line D-Begins at the intersection of 70°N., 138°W., thence by great circle arc to the intersection of 61°20'N., 139°W. (Burwash Landing), thence by great circle arc to the intersection of 60° 45'N., 135°W., thence by great circle arc to the intersection of 56°N., 128°W., thence south along 128° meridian to Lat. 55°N., thence by great circle arc to the intersection of 54°N., 130°W., thence by great circle arc to Port Clements, thence to the Pacific Ocean where it ends.

(b) For any station of a terrestrial service using a band above 1000 MHz, the areas involved are as follows:

(1) For a station the antenna of which looks within the 200° sector toward the Canada-United States borders, that area in each country within 35 miles of the borders;

(2) For a station the antenna of which looks within the 160° sector away from the Canada-United States borders, that area in each country within 5 miles of the borders; and,

(3) The area in either country within the coordination distance (paragraph 8) of a receiving earth station in the other country which uses the same band.

(c) For the bands above 1000 MHz, coordination of an earth station is required if any portion of the Canada-United States borders lies within the coordination distance (paragraph 8) of the earth station.

3. Current records of frequency assignments in the frequency bands listed in paragraph 1 will be exchanged as required.

4. (a) Before either Agency takes final action on any proposal for the use of any frequency, other than for military tactical and training operations in the bands listed in paragraph (1)(a), in the areas stipulated in paragraph (2):

(1) in the bands below 1000 MHz, listed in paragraph (1) involving power in excess of 5 watts; or,

(2) in the bands above 1000 MHz, listed in paragraph (1);

it will refer the pertinent particulars of the proposed assignment (see Appendix 1, 2 or 3, as appropriate) to the other Agency for comment on whether the granting of an authorization will be liable to result in the causing of harmful interference to any existing radio operations of the Agency whose views are sought, or, in the case of a receiving earth station, whether harmful interference would be caused to reception at the earth station by any existing radio operations of

the Agency whose views are sought.

(b) If adverse comment is not received within 30 calendar days from the date of the receipt of the proposal, the initiating Agency may go ahead with the operation after having notified the other Agency. In an emergency, coordination may be effected after the assignment is put into operation.

(c) Neither the Interdepartment Radio Advisory Committee nor the Department of Transport shall be bound to act in accordance with the views of the other. However, to keep such instances to a minimum, each Agency should cooperate to the fullest extent practicable with the other by furnishing such additional data as may be required.

5. In cases where the information available makes it difficult to determine whether harmful interference would be created by the granting of a particular authorization, arrangements may be made for actual on-the-air tests to be observed by representatives of each Agency and further exchanges of engineering comments following such tests.

6. In the interest of planned use of the spectrum, information about future expansions and adjustments of the services allocated the use of the bands listed in paragraph (1), in the areas stipulated herein, may be exchanged to the maximum extent practicable.

7. Where a previously coordinated frequency assignment is in use and an additional assignment is proposed for the same frequency in the same area, the additional assignment must also be coordinated, attention being drawn to the previous coordination. This does not apply to the addition of mobile units to a previously coordinated land mobile system.

8. Coordination distance shall be the distance, calculated for any station, according to Recommendation 1A of the Final Acts of the EARC, Geneva, 1963.

APPENDIX 1 TO ARRANGEMENT D

Basic Data Required for the Coordination of Terrestrial Stations in the Bands Below 1000 MHz

a. Class of station
b. Number of stations (including, when available, number of mobile stations)
c. Location and coordinates
d. Frequency
e. Power (mean) delivered to the antenna
f. Class of emission and necessary bandwidth
g. Antenna gain (dB) and azimuth, when available
h. Antenna elevation in feet above mean sea level (MSL), when available

APPENDIX 2 TO ARRANGEMENT D

Basic Data Required for the Coordination of Terrestrial Stations in the Bands Above 1000 MHz

a. Class of station
b. Number of stations (including, when available, number of mobile stations)
c. Location and coordinates
d. Frequency
e. Power (mean) delivered to the antenna
f. Class of emission and necessary bandwidth
g. Antenna gain (dB), azimuth and, when available, elevation angle
h. Antenna elevation in feet above mean sea level (MSL)
i. Polarization of transmitted wave

j. Topographic map of territory between stations at fixed locations and the Canada-United States borders (required only for stations within the coordination distance of a previously coordinated receiving station which uses the same band)

APPENDIX 3 TO ARRANGEMENT D

Basic Data Required for the Coordination of Earth Stations in the Space Service

a. Class of station
b. Frequencies
c. Location and coordinates
d. Azimuthal and elevation coverage of celestial hemisphere as defined by main axis of antenna
e. Class of emission and necessary bandwidth
f. Power (mean) delivered to the antenna and, where applicable, estimated terminal coupling losses
g. Maximum gain of antenna in the horizontal plane as a function of azimuth
h. Maximum gain of antenna (referred to isotropic)
i. Antenna elevation in feet above mean sea level (MSL)
j. Polarization of transmitted wave
k. Topographic map of territory between earth station and Canada-United States borders in the sector wherein the coordination distance exceeds the distance to the border
l. Numerical values of terrain shielding in the pertinent directions

3.4.7 Determination of the Coordination Area Around an Earth Station

With respect to paragraph 8 of Arrangement D, Recommendation 1A of the Final Acts of the Extraordinary Administrative Radio Conference (Geneva, 1963) has been superceded. The method for determination of the coordination area around an earth station in the frequency bands between 100 MHz and 105 GHz shall now be in accordance with Appendix **7 (Rev.WRC-03)** of the ITU Radio Regulations.

3.4.8 Text of Arrangement E

Arrangement Between the Department of Communications of Canada and the National Telecommunications and Information Administration and the Federal Communications Commission of the United States Concerning the Use of the 406.1 MHz to 430 MHz Band in Canada-United States Border Areas

1. General

1.1-This Arrangement between the Department of Communications of Canada and the National Telecommunications and Information Administration and the Federal Communications Commission of the United States, herein referred to as the Agencies, provides for the operation of Canadian Fixed and Mobile Services and United States Fixed and Mobile Services in the 406.1-430 MHz band and United States Radiolocation Service in the 420-430 MHz band. In accordance with the international Table of Frequency Allocations contained in the Final Acts of the World Administrative Radio Conference (Geneva, 1979), aeronautical mobile radio services are excluded from the band 406.1 to 430 MHz.

1.2-Section 6 of this Arrangement sets forth the conditions for the shared use of the 420-430 MHz band by the Fixed and Mobile Services in Canada (the Mobile Service being primary and Fixed Service being secondary in Canada) and the Radiolocation Service in the United States (the Radiolocation Service being primary in the United States).

1.3-The areas involved in this Arrangement concerning sharing by the Canadian and United States Fixed and Mobile Services are those set forth in sub-paragraph 2(a) of Arrangement D of this Agreement; hereafter these areas are referred to in this Arrangement as the Coordination Zone.

1.4-For the purpose of coordinating assignments to stations in the Fixed and Mobile Services in the 406.1-430 MHz band with 25 kHz spacing between channels and 16 kHz necessary bandwidth, a minimum interstitial channel (12.5 kHz offset) selectivity of 25 dB will be assumed. The standard definition and method of measurement is defined in the United States Electronic Industries Association (EIA) specification RS-204B, titled "Adjacent Channel Selectivity and Desensitization", dated April 1980.

1.5-The coordination channel for this Arrangement is the Department of Communications in Canada and the National Telecommunications and Information Administration in the United States, in accordance with the procedures of Arrangement D of this Agreement.

2. Exceptions

2.1-It is recognized that in the band 406.1-420 MHz there are limited requirements for airborne operations. When the possibility exists that assignments outside of the normal Coordination Zone might result in harmful interference to the radio services of the other country due to their particular circumstances, i.e., aircraft altitude, power, etc., the assignment of the frequencies involved will, to the extent practicable, be subject to special coordination between the National Telecommunications and Information Administration and the Department of Communications.

2.2-The Amateur Service is excluded from the band 420-430 MHz in the Coordination Zone. Additionally, airborne operations associated with stations in the Fixed and Mobile Services are excluded from this band.

2.3-Stations in the Fixed and Mobile Services will not operate in the 420-430 MHz band within 250 km of the United States-Canada border in the state of Alaska or the Yukon Territory.

3. The Use of the 406.1-420 MHz Band by the Fixed and Mobile Services

3.1-Proposed frequency assignments in this band are subject to coordination between Industry Canada and the National Telecommunications and Information Administration in accordance with the procedures of Arrangement D of this Agreement.

3.2-Except for the bands identified in paragraph 3.6, the frequencies identified in paragraph 3.7 and the band identified in paragraph 3.9, all existing frequency assignments in the two countries which are included in the lists appended to this Arrangement as Annex A (Canada) and Annex B [1](United States) are accepted as coordinated by the Department of Communications and the National Telecommunications and Information Administration and have equal status under this Agreement.

3.3-The United States will channel and use the band for assignments with 16 kHz or less necessary bandwidth on center frequencies spaced 25 kHz apart, from 406.125 to 419.975 MHz inclusive. Canada will channel and use the band for assignments with 16 kHz or less necessary bandwidth on center frequencies spaced 25 kHz apart from 406.1125 to 419.9875 MHz inclusive.

3.4-The use of a necessary bandwidth greater than 16 kHz is discouraged but is permitted as an exception subject to coordination on a case by case basis in accordance with the procedures specified in Arrangement D of this Agreement.

3.5-Canada, within its Coordination Zone, agrees to protect the existing and future unrestricted geographic use in the United States of the bands 406.1875-406.4625 and 408.6875-408.9625 MHz. Coordination with Canada of assignments in the United States in these bands is not required.

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[1] Not printed herein. The annex is deposited in the archives of the Department of State where it is available for reference.

3.6-Use of the bands 406.1875-406.4625 and 408.6875-408.9625 MHz by Canada within its Coordination Zone is to be coordinated on a case by case basis and must meet the terms of 3.5 above. It is understood that any such Canadian use of these bands will only be attempted as a last resort when a requirement cannot be met outside these bands. Any such coordinated radio system must be adjusted or removed if it causes interference to existing United States radio systems or is anticipated to cause interference to planned United States radio systems.

3.7-Canada, within its Coordination Zone, agrees to protect the existing and future unrestricted geographic use in the United States of the following center frequencies with 16 kHz or less necessary bandwidth (all MHz):

415.850	416.000	418.475
415.875	416.025	418.500
415.900	418.375	418.525
415.925	418.400	418.550
415.950	418.425	418.600
415.975	418.450	

Coordination with Canada of assignments in the United States on these frequencies is not required.

3.8-Canadian use of the above listed center frequencies within its Coordination Zone is to be coordinated on a case by case basis and must meet the terms of 3.7 above. It is understood that any such Canadian use of these frequencies will only be attempted as a last resort when a requirement cannot be met on other frequencies. Any such coordinated radio system must be adjusted or removed if it causes interference to existing United States radio systems or is anticipated to cause interference to planned United States radio systems.

3.9-With the exception of United States use of the frequency 409.625 MHz, the United States, within its Coordination Zone, agrees to protect the existing and future unrestricted geographic use in Canada of the band 409-410 MHz. Canadian use of the 409-410 MHz band is primarily for mobile stations paired with base stations in the 420-421 MHz band. Coordination with the United States of assignments in Canada in this band is not required. The protection of the existing and future unrestricted geographic use of the frequency 409.625 MHz in the United States is based on 16 kHz necessary bandwidth.

3.10-With the exception of the United States use of the frequency 409.625 MHz, other use of the 409-410 MHz band by the United States within its Coordination Zone is to be coordinated on a case by case basis and must meet the terms of 3.9 above. It is understood that any such United States use of the 409-410 MHz band within its Coordination Zone will only be attempted as a last resort when a requirement cannot be met outside the band. Any such coordinated radio system must be adjusted or removed if it causes interference to existing Canadian radio systems or is anticipated to cause interference to planned radio systems.

3.11-It is recognized that Canada and the United States have unrestricted geographic use of the bands and/or frequencies specified in 3.5, 3.7 and 3.9. When the possibility exists that assignments outside the Coordination Zone may result in harmful interference to the radio services of the other country, due to the particular characteristics of such assignments (e.g., antenna height, power, directive arrays, etc.), special coordination may be initiated by that Agency which does not have the unrestricted geographic use.

4. The Use of the 420-421 MHz Band by the Fixed and Mobile Services

4.1-The United States, within its Coordination Zone, agrees to protect the existing and future unrestricted geographic use in Canada of the band 420-421 MHz from Fixed and Mobile Services. Canadian use of the 420-421 MHz band is primarily for base stations paired with mobile stations in the 409-410 MHz band. Coordination with the United States of assignments in Canada in this band is not required, except as specified in 6.3.

4.2-United States use of the 420-421 MHz band within its Coordination Zone is to be coordinated on a case by case basis and must meet the terms of 4.1 above. It is understood that any such United States use of 420-421 MHz within its Coordination Zone will only by attempted as a last resort when a requirement cannot be met outside the band. Any such coordinated radio system must be adjusted or removed if it causes interference to existing Canadian radio systems or is anticipated to cause interference to planned radio systems.

4.3-It is recognized that Canada has unrestricted geographic use in Canada of the band 420-421 MHz, except as specified in Section 6. When the possibility exists that assignments in the Fixed and Mobile Services outside of the Coordination Zone in the United States might result in harmful interference to the radio services in Canada, due to the particular characteristics of the U.S. assignments (e.g., antenna height, power, directive arrays, etc.), the U.S. Agency may effect special coordination of the frequencies involved.

5. The Use of the 421-430 MHz Band by the Fixed and Mobile Services

5.1-Sharing of this band is carried out by the Agencies within the terms and conditions specified in this section. Figures 1, 2 and 3 represent the text of this section in chart and map form.

5.2-The 421.000-424.9875 MHz and 426.000-429.9875 MHz bands will be used for Fixed and Mobile Services systems which will operate on frequency pairs: one frequency from each band. Mobile systems will operate with the mobile receivers on the lower band and mobile transmitters on the upper band. The 424.9875-426.000 MHz band will also be utilized for Fixed and Mobile Service systems.

5.3-Except as provided in Paragraph 5.4 and Section 6, the 421-430 MHz band will be shared between the two countries as follows: a) Canada will have unrestricted geographic use of the bands 421.000-423.000 MHz and 425.500-428.000 MHz. b) The United States will have unrestricted geographic use of the bands 423.0125-425.4875 MHz and 428.0125-429.9875 MHz.

5.4-In recognition of demographic circumstances, the division of spectrum between Canada and the United States varies from the general sharing provisions of Paragraph 5.3 in the two sectors defined below:

a) Sector I is defined to be the portions of the Coordination Zone in the United States and Canada, bounded on the west by 85°W longitude and on the east by 81°W longitude. In this sector of the Coordination Zone, the United States will have the unrestricted geographic use of the bands 422.1875-425.4875 MHz and 427.1875-429.9875 MHz; Canada will have the unrestricted geographic use of the bands 421.000-422.175 MHz, and 425.500-427.175 MHz.

b) Sector II is defined to be the portions of the Coordination Zone in the United States and Canada bounded on the west by 81°W longitude and on the east by 71°W longitude. In this sector of the Coordination Zone, the United States will have the unrestricted geographic use of the bands 423.8125-425.4875 MHz and 428.8125-429.9875 MHz; Canada will have the unrestricted geographic use of the bands 421.000-423.800 MHz and 425.500-428.800 MHz.

5.5-As a result of the special sharing arrangements of Paragraph 5.4, the overlap of frequency bands occurs in the following geographical areas:

5.5.1-The geographical area in Canada is enclosed by the United States-Canada border; the meridian 71°W; and the line beginning at the intersection of 72°20'W and the United States-Canada border, thence running north along the meridian 72°20'W to the intersection of 46°N, thence running east along 46°N to the meridian 71°W. Canada will channel and use the 423.0125-423.800 MHz and 428.0125-428.800 MHz bands for assignments with 16 kHz or less necessary bandwidth on center frequencies spaced 25 kHz apart from 423.0375 to 423.7875 MHz inclusive and 428.0375 to 428.7875 MHz inclusive.

The geographical area in the United States is enclosed by the United States-Canada border; the meridian 71°W; and the line beginning at the intersection of 44°13'N, 71°W, running by great circle arc to the intersection of 45°N and 69°40'W, thence north along the meridian 69°40'W, to the intersection of 46°N, thence running west along 46°N to the intersection of the United States-Canada border. The United States will channel and use the 423.0125-423.800 MHz and 428.0125-428.000 MHz bands for assignments with 16 kHz or less necessary bandwidth on center frequencies spaced 25 kHz apart from 423.025 to 423.775 MHz inclusive and 428.025 to 428.775 MHz inclusive.

Coordination of proposed frequency assignments in the bands 423.0125-423.800 MHz and 428.0125-428.800 MHz is required in two areas as follows:

(a) The geographical area in Canada is enclosed by the United States-Canada border; the meridian 71°W; and the line beginning at the intersection of 72°W and the United States-Canada border, thence running north along meridian 72°W to the intersection of 45°45'N, thence running along 45°45'N to the meridian 71°W.

(b) The geographical area in the United States is enclosed by the United States-Canada border; the meridian 71°W and the line beginning at the intersection of 44°25'N and 71°W, thence running by great circle arc to the intersection of 45°N and 70°W, thence north along meridian 70°W to the intersection of 45°45'N, thence running west along 45°45'N to the intersection of the United States-Canada border.

5.5.2-Within the land area in the United States enclosed by the line of 81°W longitude, the arc of a circle of 120 km radius centered at the intersection of 81°W longitude and the northern shore of Lake Erie and drawn clockwise from the southerly intersection with 81°W longitude to the westerly intersection with the United States-Canada border, and the United States-Canada border, the United States will channel and use the bands 422.1875-423.800 MHz and 427.1875-428.800 MHz for assignments with 16 kHz or less necessary bandwidth on center frequencies spaced 25 kHz apart from 422.200 to 423.775 MHz inclusive and 427.200 to 428.775 MHz inclusive.

Within the land area in Canada enclosed by the line of 81°W longitude, the arc of a circle of 120 km radius centered at the intersection of 81°W longitude and the southern shore of Lake Erie drawn clockwise from the northerly intersection with 81°W longitude to the easterly intersection with the United States-Canada border, and the United States-Canada border, Canada will channel and use the bands 422.1875-423.800 MHz and 427.1875-428.800 MHz for assignments with 16 kHz or less necessary bandwidth on center frequencies spaced 25 kHz apart from 422.2125 to 423.7875 MHz inclusive and 427.2125 to 428.7875 MHz inclusive.

5.5.3-Within the land area in the United States enclosed by the line of 85°W longitude, the arc of a circle of 120 km radius centered at the intersection of 85°W longitude and the Ontario-Lake Superior shore, and drawn counter-clock-wise from the southerly intersection with 85°W longitude to the easterly intersection with the United States-Canada border, and the United States-Canada border, the United States will channel and use the bands 422.1875-423.000 MHz and 427.1875-428.800 MHz for assignments with 16 kHz or less necessary bandwidth on center frequencies spaced 25 kHz apart from 422.200 to 422.975 MHz and 427.200 to 427.975 MHz inclusive.

Within the land area in Canada enclosed by the line of 85°W longitude, the arc of a circle of 120 km radius centered at the intersection of 85°W longitude and Michigan-Lake Superior shore, drawn counter-clockwise from the northerly intersection with 85°W longitude to the westerly intersection with the United States-Canada border, and the United States-Canada border, Canada will channel and use the bands 422.1875-423.000 MHz and 427.1875-428.000 MHz for assignments with 16 kHz or less necessary bandwidth on center frequencies spaced 25 kHz apart from 422.2125 to 422.9875 MHz inclusive and 427.2125 to 427.9875 MHz inclusive.

5.6-In order to minimize the need for coordination in the band 421-430 MHz, Effective Radiated Power (ERP) and Effective Antenna Height (EAH) guidelines have been established as provided in Annex C. If these ERP values are exceeded, within the corresponding EAH ranges, coordination is required in accordance with the procedures specified in Arrangement D of this Agreement.

6. Conditions for the Shared Use of the 420-430 MHz Band by the Canadian Fixed and Mobile Services with the United States Radiolocation Service

6.1-Existing United States fixed installation radars, with exception of the installation at Concrete, N.D. and those in Alaska, which will receive or cause harmful interference from or to fixed and mobile operations in Canadian territory, will restrict their operational use to the 430-450 MHz band except during emergency periods when the United States reserves the right to operate all radiolocation devices on an unrestricted basis. The United States radar at Concrete, N.D. and Canadian fixed and mobile systems in the adjacent border area will be protected from interference by observation in Canada of fixed and mobile system power and height restrictions.

No use of this band by the Fixed and Mobile Services will be allowed to advertently impact the operation of the radar at Concrete, N.D. If the United States reports harmful interferences to its radar at Concrete, N.D., which is caused by fixed or mobile operations in Canada, Canada will cooperate in the immediate identification and elimination of such harmful interference. Subsequently the United States will cooperate to attempt to reach a mutually satisfactory resolution of the problem.

6.2-The United States reserves the right, irrespective of other provisions of this Arrangement, to operate in the band 420-430 MHz radiolocation stations on board fixed wing aircraft. However, the United States will minimize use of this band on flights when they are within possible interference range of fixed and mobile operations in major Canadian population areas. If Canada reports harmful interference to Canadian fixed or mobile operations which is caused by radiolocation transmission from United States fixed wing aircraft, the United States will cooperate in resolution of such harmful interference to the maximum extent possible.

6.3-Proposed assignments for Canadian fixed and mobile systems which are not in accordance with the constraints specified for mutual compatibility with the radar at Concrete, N.D. and with radars aboard U.S. ships transiting the Strait of Juan de Fuca and Puget Sound and any other proposed assignment whose compatibility with these radiolocation units is in doubt, will be coordinated with the National Telecommunications and Information Administration.

6.4-Experimental research and development transmissions by fixed radiolocation systems in this band in the United States within 250 km of the United States-Canada border will be on a non-interference basis and with notification to Canada.

6.5-Except for operations on fixed wing aircraft, United States tactical and training radiolocation operations in the 420-430 MHz band will be on a non-interference basis.

6.6-Except for the state of Alaska, any future fixed installation radiolocation system proposed for United States operation within 250 km of the United States-Canada border which would normally operate in the 420-430 MHz band will be subject to prior coordination with Canada. The United States will confer with Canada concerning proposed modifications to the characteristics of current radiolocation systems or their replacement, if such modifications or replacements could impose further restrictions on Canadian operations in the Fixed and Mobile Services. In the event that radiolocation operations in the band 420-430 MHz, at Concrete, N.D. or on ships in the Strait of Juan de Fuca are terminated the United States will notify Canada, and the special arrangements herein will cease to apply in the affected Canadian area.

ANNEX C

Limits of Effective Radiated Power and Effective Antenna Height for the Band 421-430 MHz

Effective Radiated Power (ERP) is defined as the product of the power supplied to the antenna and its gain relative to a half-wave dipole in a given direction.

For base stations in the Coordination Zone, Table C1 lists the limits of ERP corresponding to the Effective Antenna Height (EAH) ranges shown. EAH is calculated by subtracting the Assumed Average Terrain Elevation (AATE) given in Table C2 from the antenna elevation above mean sea level.

TABLE C1: Limits of ERP and EAH

Effective Antenna Height		Maximum Effective Radiated Power (ERP) towards the border, Watts
Feet	**Meters**	
up to 500	up to 152	250
501-1000	153-305	150
1001-1500	306-457	75
1501-2000	458-609	40
2001-2500	610-762	20
2501-3000	763-914	15
3001-4000	915-1210	10
above 4000	above 1210	5

Table C2 lists the value of Assumed Average Terrain Elevations (AATE) within the Coordination Zone on both sides of the United States-Canada Border.

TABLE C2: Values of Assumed Average Terrain Elevations (AATE)

Longitude (ϕ)	Latitude ϕ	Assumed Average Terrain Elevations			
		U.S.		Canada	
		Ft	m	Ft	m
$65 \le \phi < 69$	$\theta < 45$	0	0	0	0
$65 \le \phi < 69$	$45 < \theta < 46$	300	91	300	91
$65 \le \phi < 69$	$\theta \ge 46$	1000	305	1000	305
$69 \le \phi < 73$	all	2000	609	1000	305
$73 \le \phi < 74$	all	500	152	500	152
$74 \le \phi < 78$	all	250	76	250	76
$78 \le \phi < 80$	$\theta < 43$	500	152	500	152
$78 \le \phi < 80$	$\theta \ge 43$	250	76	250	76
$80 \le \phi < 90$	all	600	183	600	183
$90 \le \phi < 98$	all	1000	305	1000	305
$98 \le \phi < 102$	all	1500	457	1500	457
$102 \le \phi < 108$	all	2500	762	2500	762
$108 \le \phi < 111$	all	3500	1066	3500	1066
$111 \le \phi < 113$	all	4000	1219	3500	1066
$113 \le \phi < 114$	all	5000	1524	4000	1219
$114 \le \phi < 121.5$	all	3000	914	3000	914
$\phi \ge 121.5$	all	0	0	0	0

Map. Canada/United States Sharing Arrangement

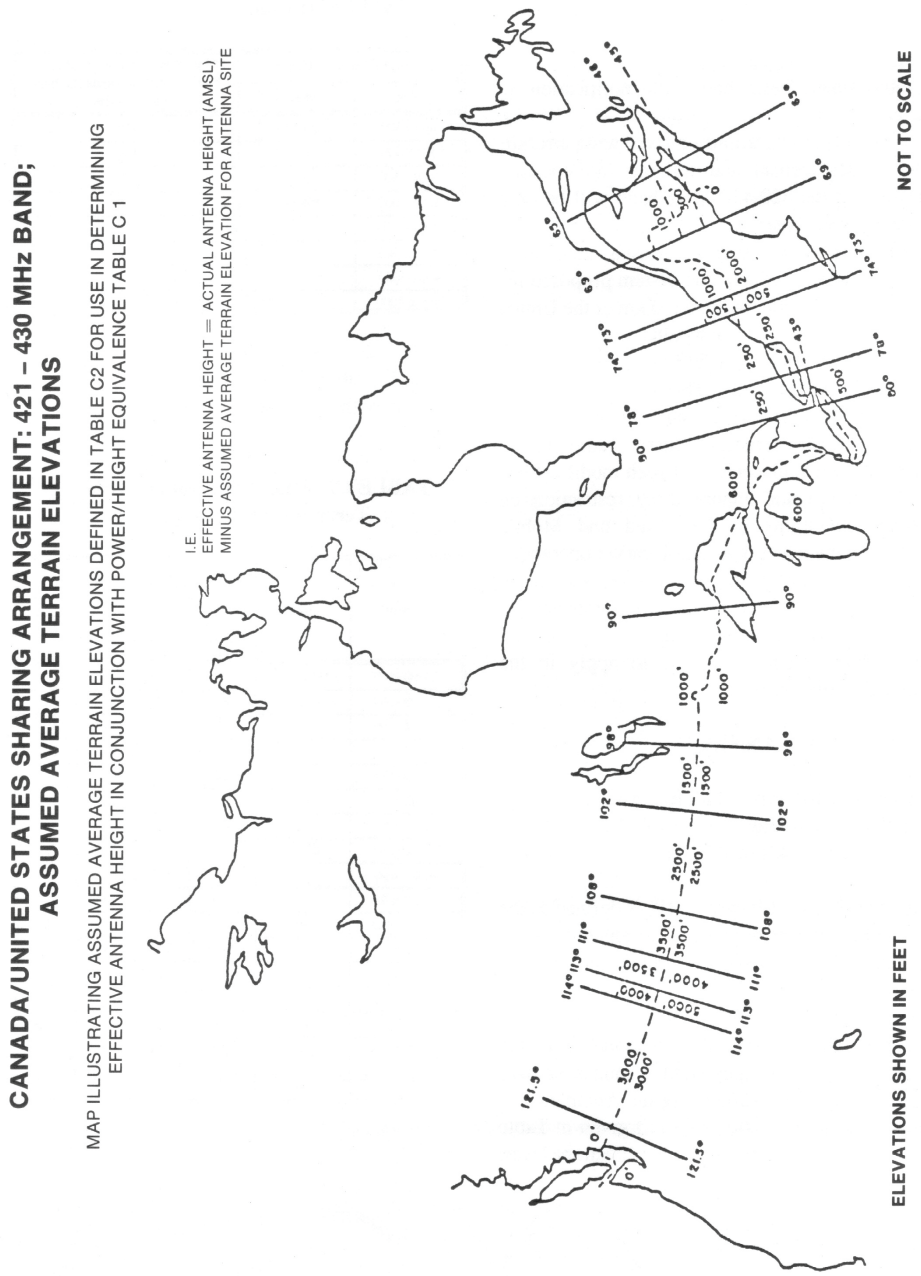


Figure 1. Canada/United States Sharing Arrangement 421-430 MHz Band

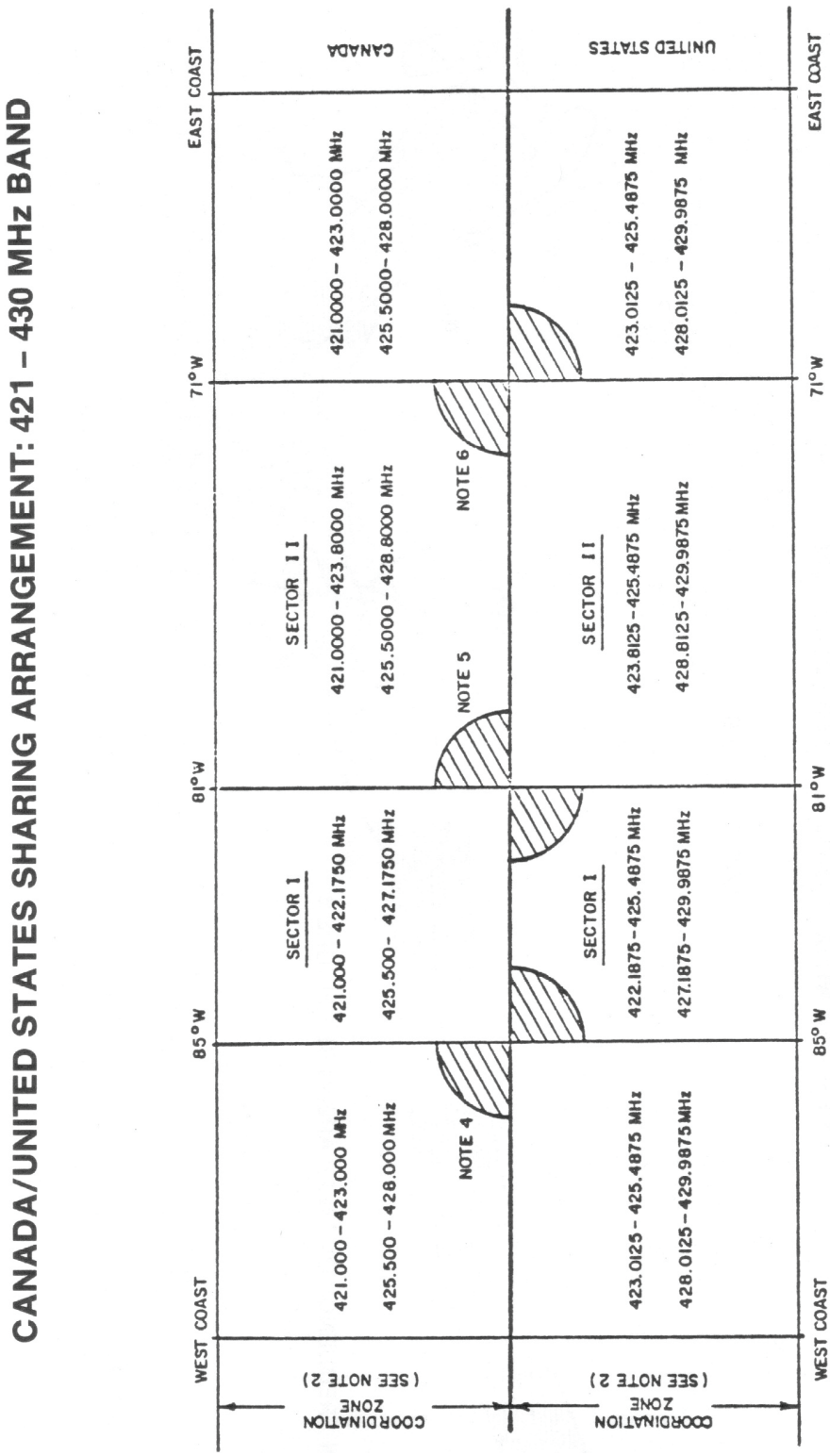


Figure 2. Canada/United States Sharing Arrangement 421-430 MHz Band Coordination Zones

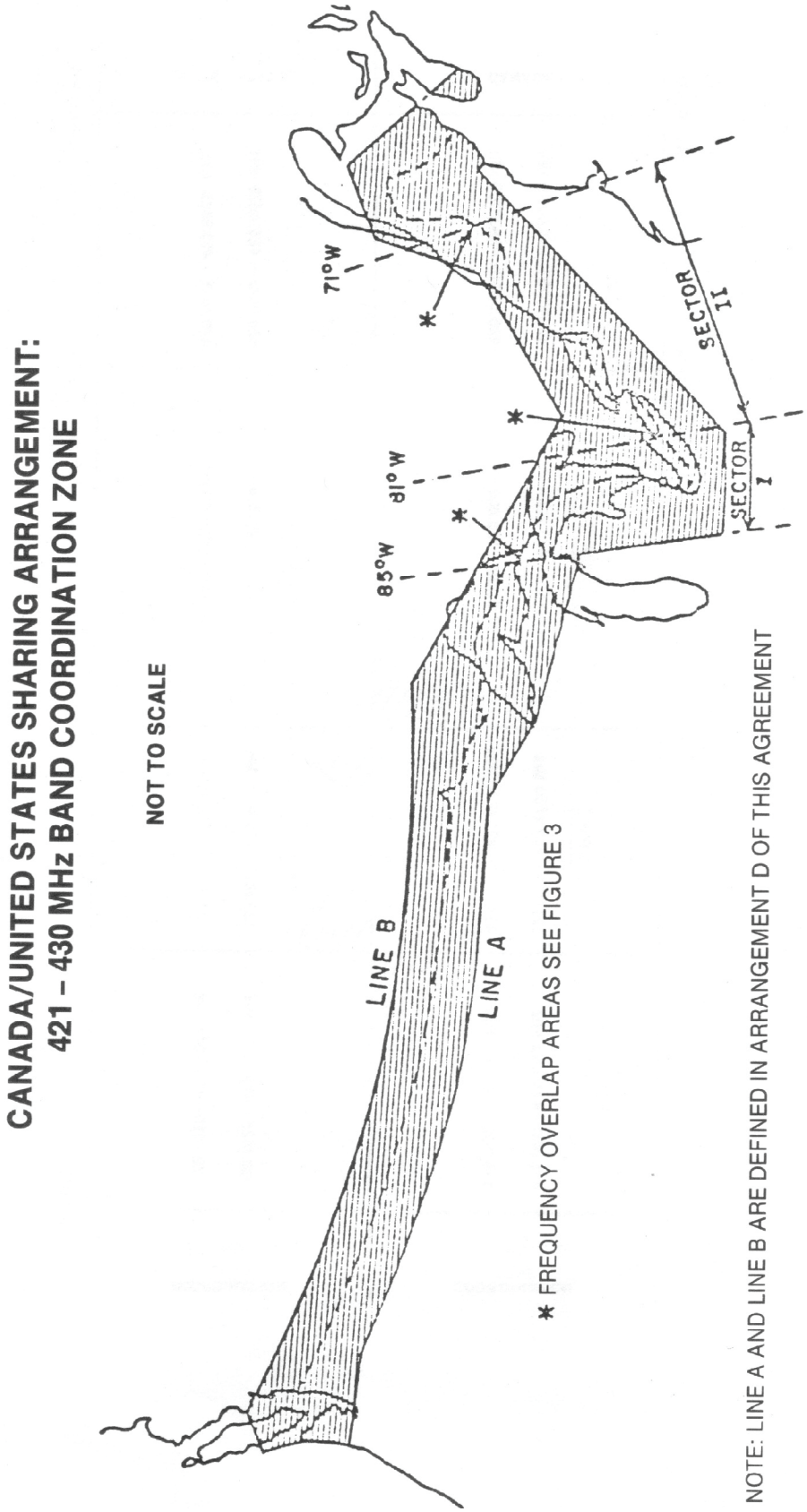
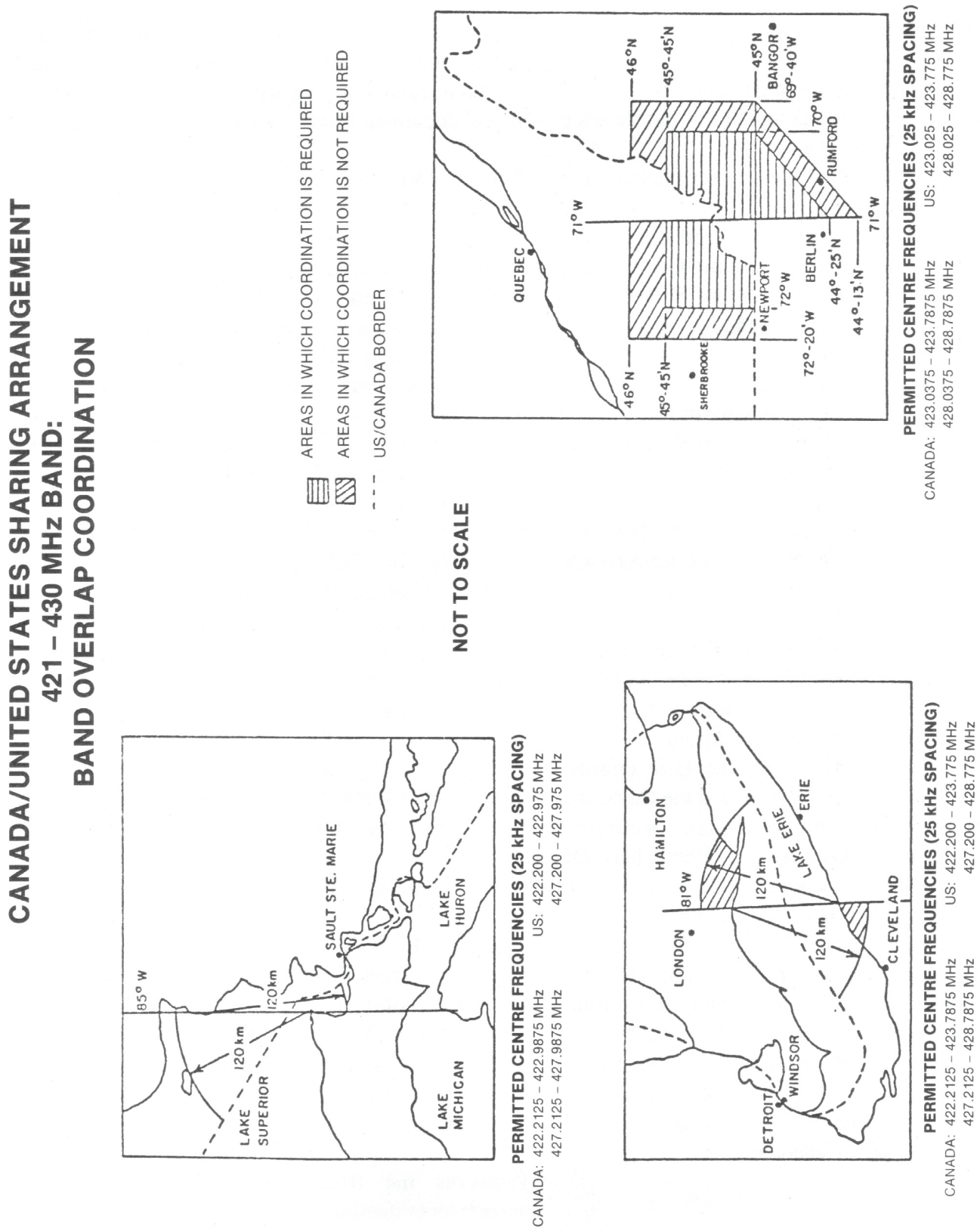


Figure 3. Canada/United States Sharing Arrangement 421-430 MHz Band Overlap Coordination



3.5 FOREIGN REPORTS TO FCC OF INTERFERENCE FROM U.S. GOVERNMENT STATIONS

The FCC takes the following action upon receipt from another country of a complaint of interference from a U.S. Federal Government station:

(1) When practicable, the interfering station is positively identified.

(2) The complaint is acknowledged and sent by letter of transmittal to the cognizant Federal agency, with copies to the Assistant Secretary of Commerce for Communications and Information and the Department of State.

(3) If the cognizant Federal agency responds via FCC channels, the letter or telegram of response is forwarded by the FCC without comment to the government concerned.

3.6 PROCEDURE FOR RESOLVING HARMFUL INTERFERENCE FROM CANADIAN STATIONS

Within the U.S./Canadian coordination border zone, some intermittent interference can be expected; however, if the interfering Canadian station has been positively identified and the coordination date is earlier than the U.S. coordination date, little can be done provided the Canadian station is operating in accordance with the provisions of the coordination. When harmful interference from a Canadian station is severe enough to interrupt a U.S. radiocommunications service and relief from Canada is desired, an interference report (see Section 8.2.30) and any comments which are deemed pertinent for resolution of the harmful interference must be forwarded to the Executive Secretary of the IRAC if the IRAC Secretariat is expected to assist in the resolution of the interference. The Executive Secretary will then take formal action with Canada to attempt to resolve the interference.

3.7 APPLICATIONS TO OPERATE WITHIN THE INMARSAT SYSTEM

The current procedure for processing Federal applications to operate within the International Maritime Satellite (INMARSAT) Organization is contained in Annex E of this manual. Federal Government applicants are to submit their applications through the designated point-of-contact for their agency or department as indicated in the IRAC document referenced above.

3.8 INTERNATIONAL AGREEMENTS

Frequently U.S. Government agencies consummate agreements/understandings with foreign entities (government agencies or international organizations) which include provisions regarding the use of the radio spectrum by U.S. entities. When such agreements/understandings are being developed it is essential that the U.S. agencies involved ensure that the spectrum provisions do not conflict with U.S. policy or spectrum uses, including U.S. overseas operations. The assistance of NTIA and FCC shall be sought if there is any doubt as to conflict with U.S. policy or spectrum use prior to the conclusion of such agreements/understandings.

When such agreements/understandings which have a potential impact on U.S. spectrum use are consummated the responsible agency will promptly provide copies of the spectrum related provisions to NTIA.

3.9 UNITED STATES – MEXICO SHARING AND COORDINATION AGREEMENTS, PROTOCOLS AND ARRANGEMENTS

3.9.1 General

On June 16, 1994, the United States and Mexico signed an agreement for frequency bands used by terrestrial non-broadcasting radiocommunications services (IRAC Document 28874). Protocols which deal with specific frequency bands and radiocommunications services will be annexed to this agreement as they are signed.

The following table indicates for each of the Protocols the frequency bands and types of assignments involved:

Band	Coordination Remarks	Type of Assignments Involved
190-285 kHz	Protocol 9	Aeronautical
285-435 kHz	Protocol 9	Aeronautical
510-535 kHz	Protocol 9	Aeronautical
74.8-75.2 MHz	Protocol 9	Aeronautical
108-118 MHz	Protocol 9	Aeronautical
118-137 MHz	Protocol 9	Aeronautical
162-174 MHz	Administrative Arrangements	Fixed and Mobile
220-222 MHz	Protocol 1	Land Mobile
328.6-335.4 MHz	Protocol 9	Aeronautical
470-512 MHz	Protocol 2	Land Mobile
806-824 MHz	Protocol 3	Land Mobile
824-849 MHz	Protocol 4	Cellular
849-851 MHz	Protocol 5	Public Air-to-Ground
851-869 MHz	Protocol 3	Land Mobile
869-894 MHz	Protocol 4	Cellular
894-896 MHz	Protocol 5	Public Air-to-Ground
896-901 MHz	Protocol 3	Land Mobile
901-902 MHz	Protocol 7	Personal Communications
930-931 MHz	Protocol 7	Personal Communications
932-932.5 MHz	Protocol 6	Fixed
932.5-935 MHz	Protocol 10	Fixed
935-940 MHz	Protocol 3	Land Mobile
940-941 MHz	Protocol 7	Personal Communications
941-941.5 MHz	Protocol 6	Fixed
941.5-944 MHz	Protocol 10	Fixed
960-1215 MHz	Protocol 9	Aeronautical
1215-1400 MHz	Protocol 9	Aeronautical
1850-1990 MHz	Protocol 8	Personal Communications
2700-2900 MHz	Protocol 9	Aeronautical
4200-4400 MHz	Protocol 9	Aeronautical
5000-5250 MHz	Protocol 9	Aeronautical
5350-5470 MHz	Protocol 9	Aeronautical
9000-9200 MHz	Protocol 9	Aeronautical
13.25-13.4 GHz	Protocol 9	Aeronautical
15.4-15.7 GHz	Protocol 9	Aeronautical

Specific protocols and memoranda of understanding involving bands allocated for Federal Government use are given in subsequent sections of this part.

3.9.2 Agreement Between the Government of the United States of America and the Government of the United Mexican States Concerning the Allocation and Use of Frequency Bands by Terrestrial Non-Broadcasting Radiocommunication Services along the Common Border

(Signed Williamsburg, VA, June 16, 1994)

The Government of the United States of America and the Government of the United Mexican States, the Parties, desiring to continue their mutual understanding and cooperation regarding telecommunications services, recognizing the sovereign right of both countries to manage their telecommunications, taking into account the provisions of Article **24** of the International Telecommunication Convention Nairobi, 1982, and Article 6 of the Radio Regulations (1982 edition), considered an annex to the Convention, in order to establish the conditions for the use of frequency bands by terrestrial non-broadcasting radiocommunication services along their common border, have agreed as follows:

ARTICLE I.

Purposes

The purposes of this Agreement are:

1. To establish and adopt common plans for the equitable use of frequency bands by terrestrial non-broadcasting radiocommunications services in areas on either side of the common border.
2. To achieve an equitable distribution of the available frequencies.
3. To establish the conditions and technical criteria to regulate the use of the frequencies.

ARTICLE II.

Conditions of Use

The allocation of frequency bands for specific radio services and the conditions for their use shall be as agreed in Protocols which form an integral part of this Agreement and which shall be included in Annex I to this Agreement. A listing of the Protocols shall be maintained in the Index to Annex I.

ARTICLE III.

Termination of Previous Agreements

Upon entry into force, this Agreement supersedes existing agreements between the United States of America and the United Mexican States and memoranda of understanding between the agencies of the governments thereof listed in Annex II of this Agreement and replaces them with the corresponding Protocols included in Annex I of this Agreement.

ARTICLE IV.

Implementing Entities

The entities responsible for implementing this Agreement, herein referred to as the Authorities, shall be, for the United Mexican States, the Secretaría de Comunicaciones y Transportes and, for the United States of America, the Department of State.

The entities responsible for implementing each of the Protocols included in Annex I to this Agreement, herein referred to as the Administrations, shall be as designated by the Authorities in each of the Protocols. In those cases where an Authority designates more than one Administration responsible for implementation of a Protocol, one of the Administrations shall be designated as responsible for coordination with the Administration of the other Party.

ARTICLE V.

Amendment of the Agreement and Protocols

This Agreement may be amended by agreement of the Parties. Said amendments shall enter into force on the date on which both Parties have notified each other by exchange of diplomatic notes that they have complied with the requirements of their respective national legislation.

The annexed Protocols may be amended and additional Protocols concluded by written agreement of the Administrations. Such amendments and additional Protocols shall be included in Annex I of this Agreement by the Parties.

ARTICLE VI.

Entry into Force and Duration

This Agreement shall enter into force on the date on which both Parties have notified each other by exchange of diplomatic notes that they have complied with the requirements of their respective national legislation for entry into force. It shall remain in force until it is replaced by a new agreement or until it is terminated by either Party in accordance with Article VII of this Agreement.

ARTICLE VII.

Termination of the Agreement

This Agreement may be terminated by mutual agreement of the Parties or by either Party by written notice of termination to the other Party through diplomatic channels. Such notice of termination shall enter into effect one year after receipt of the notice.

Any of the Protocols annexed to this Agreement may be terminated by agreement of the Administrations or by either Administration by written notice of termination to the other Administration(s). Such notice of termination shall enter into effect one year after receipt of the notice. Upon termination, Annex I of this Agreement shall be appropriately modified by the Parties.

ANNEX I

Index of Protocols Annexed to the Agreement

Protocol 1

Protocol Concerning the Allocation and Use of the Channels in the 220-222 MHz Band For Land Mobile Services Along the Common Border

Protocol 2

Protocol Concerning Use of the 470-512 MHz Band For Land Mobile Services Along the Common Border

Protocol 3

Protocol Concerning the Use of the 806-824/851-869 and 896-901/935-940 MHz Bands for Land Mobile Services Along the Common Border

Protocol 4

Protocol Concerning Conditions of Use of the 824-849 and 869-894 MHz Bands for Public Radiocommunications Services Using Cellular Systems Along the Common Border

Protocol 5

Protocol Concerning the Use of the 849-851 and 894-896 MHz Bands For Public Air-to-Ground Services

Protocol 6

Protocol Concerning the Allotment and Use of Channels in the 932-932.5 and 941-941.5 MHz Bands for Fixed Point-to-Multipoint Services Along the Common Border

Protocol 7

Protocol Concerning the Allocation and Use of the Bands 901-902 MHz, 930-931 MHz, and 940-941 MHz Bands for Personal Communications Services Along the Common Border

Protocol 8

Protocol Concerning the Use of the Band 1850-1990 MHz for Personal Communications Services Along the Common Border

Protocol 9

Protocol Concerning the Use of Bands Allocated to the Aeronautical Radionavigation and Aeronautical Communications Services Along the Common Border

Protocol 10

Protocol Concerning the Use of Channels in the 932.5-935 MHz and the 941.5-944 MHz Bands for Fixed Point-to-Point Services Along the Common Border

Protocol 11

Protocol Concerning the Allotment and Use of the 406.1-420 MHz Band for Fixed and Mobile Services Along the Common Border

Protocol 12

Protocol (on an interim basis) Concerning the Allotment and Use of the 380-399.9 MHz Band for the Fixed and Mobile Terrestrial Non-broadcasting Services Along the Common Border

Protocol 13

Protocol (on an interim basis) Concerning the Allotment and Use of the 138-144 MHz Band for Terrestrial Non-Broadcasting Radiocommunication Services Along the Common Border

ANNEX II

List of Agreements and Memoranda of Understanding Terminated by Article III of this Agreement

Agreement between the United States of America Government and the Government of the United Mexican States Concerning Land Mobile Service in the Bands 470-512 MHz and 806-890 MHz along their Common Border (Signed Mexico City, June 18, 1982.)

Agreement between the Governments of the United States of America and the United Mexican States Regarding Conditions for Utilization of the Bands 825-845 MHz and 870-890 MHz, for Public Radiocommunications Services Using Cellular Systems along the Common U.S.-Mexican Border (Signed Mexico City, September 12, 1988.)

Memorandum of Understanding between the Federal Communications Commission of the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States Concerning Conditions of Use of the 824-825, 845-849, and 869-870 MHz Bands for Public Radiocommunications Services Using Cellular Systems along the Common Border (Signed Washington, DC, June 21, 1993.)

Memorandum of Understanding between the Federal Communications Commission of the Government of the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States Concerning Conditions of Use of the 890-894 MHz Band for Public Radiocommunications Services Using Cellular Systems along the Common Border (Signed Queretaro, Mexico, August 11, 1992.)

Memorandum of Understanding between the Federal Communications Commission of the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States Concerning Private Land Mobile Use of the Bands 821-824 MHz and 866-869 MHz along the Common Border (Signed Chestertown, MD, July 2, 1991.)

Memorandum of Understanding between the Federal Communications Commission of the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States Concerning the Use of the 896-901 and 935-940 MHz Bands for the Land Mobile Service along the Common Border (Signed Queretaro, Mexico, August 11, 1992.)

Agreement between the United States of America and the United Mexican States Concerning the Allocation and Use of the Channels in the 220-222 MHz Band along the Common Border (Signed Queretaro, Mexico, August 11, 1992.)

3.9.3 Protocol 1 Concerning the Allocation and Use of the Channels in the 220-222 MHz Band for Land Mobile Services along the Common Border

(Signed Williamsburg, VA, June 16, 1994)

This Protocol is being concluded pursuant to the Agreement Between the Government of the United States of America and the Government of the United Mexican States Concerning the Allocation and Use of Frequency Bands by Terrestrial Non-Broadcasting Radiocommunication Services Along the Common Border signed June 16, 1994, herein referred to as the Agreement.

ARTICLE I.

Purposes

The purposes of this Protocol are:

1. To establish and adopt a common plan for the use of the 220-222 MHz frequency band within a distance of 120 kilometers on each side of the common border (Sharing Zone) and to achieve an equitable distribution of the available channels.
2. To establish technical criteria to regulate the use of the channels.
3. To establish conditions of use so that each Administration may use the channels allotted to the other country, provided this causes no interference.

ARTICLE II.

Definitions

For the purpose of this Protocol and as provided for in Article IV of the Agreement, the term Administration(s) shall refer to the Federal Communications Commission and the National Telecommunications and Information Administration of the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States.

ARTICLE III.

Conditions of Use

1. In the agreed Sharing Zone, the Administrations shall use the frequency plan in the Table of Allotment appearing as the Appendix to this Protocol, which shall form an integral part of this Protocol.

2. Within the Sharing Zone, the frequencies in the 220-222 MHz band shall be shared by the Administrations in accordance with the Appendix to this Protocol.

3. The following channels shall be available for the Administrations on an unprotected basis and operated with a maximum effective radiated power (ERP) of 2 watts and a maximum antenna height of 6.1 meters above ground.

Channel	Base	Mobile
195	220.9725 MHz	221.9725 MHz
196	220.9775 MHz	221.9775 MHz
197	220.9825 MHz	221.9825 MHz
198	220.9875 MHz	221.9875 MHz
199	220.9925 MHz	221.9925 MHz
200	220.9975 MHz	221.9975 MHz

4. The assignments which an Administration makes of its own primary use frequencies within the Sharing Zone shall be authorized subject to the effective radiated power (ERP) and antenna height limits specified in the following table:

Antenna Height Above Mean Sea Level Meters	ERP Watts (Maximum)
Up to 150	500
Above 150 to 225	250
Above 225 to 300	125
Above 300 to 450	60
Above 450 to 600	30
Above 600 to 750	20
Above 750 to 900	15
Above 900 to 1,050	10
Above 1,050	5

The maximum effective radiated power allowable for portable/mobile units shall be 50 watts.

5. Each Administration that authorizes the development of major wide area systems in the 220-222 MHz band shall provide the Administration(s) of the other country information about these systems to promote mutual compatibility and benefits.

6. Frequencies allotted for the primary use of one Administration may be assigned by the Administration(s) of the other country within the Sharing Zone in accordance with the following conditions:

a. The maximum power flux density (pfd) at any point at or beyond the border shall not exceed -86 dBW/m^2.

b. Administrations shall take proper measures to eliminate any harmful interference caused by their licensees.

c. Each Administration shall grant protection to stations that have primary use of the authorized frequency.

d. Stations operating under this provision shall be considered as secondary and shall not be granted protection against harmful interference from stations that have primary use of the authorized frequency.

ARTICLE IV.

Exchange of Data

In May of each year, the Federal Communications Commission of the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States shall exchange summary lists of all of their country's assignments in the 220-222 MHz band within Sharing Zone.

ARTICLE V.

Entry Into Force and Termination

This Protocol shall enter into force on the same date as the Agreement. It shall remain in force until it is replaced by a new Protocol, or until it is terminated in accordance with Article VII of the Agreement.

APPENDIX - TABLE OF ALLOTMENT (220-222 MHz Band)

Channel	Base Frequency	Mobile Frequency	Country
1	220.0025	221.0025	Mexico
2	220.0075	221.0075	Mexico
3	220.0125	221.0125	Mexico
4	220.0175	221.0175	Mexico
5	220.0225	221.0225	Mexico
6	220.0275	221.0275	Mexico
7	220.0325	221.0325	Mexico
8	220.0375	221.0375	Mexico
9	220.0425	221.0425	Mexico
10	220.0475	221.0475	Mexico
11	220.0525	221.0525	Mexico
12	220.0575	221.0575	Mexico
13	220.0625	221.0625	Mexico
14	220.0675	221.0675	Mexico
15	220.0725	221.0725	Mexico
16	220.0775	221.0775	United States
17	220.0825	221.0825	United States
18	220.0875	221.0875	United States
19	220.0925	221.0925	United States
20	220.0975	221.0975	United States
21	220.1025	221.1025	United States

APPENDIX - TABLE OF ALLOTMENT (220-222 MHz Band)			
Channel	**Base Frequency**	**Mobile Frequency**	**Country**
22	220.1075	221.1075	United States
23	220.1125	221.1125	United States
24	220.1175	221.1175	United States
25	220.1225	221.1225	United States
26	220.1275	221.1275	United States
27	220.1325	221.1325	United States
28	220.1375	221.1375	United States
29	220.1425	221.1425	United States
30	220.1475	221.1475	United States
31	220.1525	221.1525	Mexico
32	220.1575	221.1575	Mexico
33	220.1625	221.1625	Mexico
34	220.1675	221.1675	Mexico
35	220.1725	221.1725	Mexico
36	220.1775	221.1775	Mexico
37	220.1825	221.1825	Mexico
38	220.1875	221.1875	Mexico
39	220.1925	221.1925	Mexico
40	220.1975	221.1975	Mexico
41	220.2025	221.2025	Mexico
42	220.2075	221.2075	Mexico
43	220.2125	221.2125	Mexico
44	220.2175	221.2175	Mexico
45	220.2225	221.2225	Mexico
46	220.2275	221.2275	United States
47	220.2325	221.2325	United States
48	220.2375	221.2375	United States
49	220.2425	221.2425	United States
50	220.2475	221.2475	United States
51	220.2525	221.2525	United States
52	220.2575	221.2575	United States
53	220.2625	221.2625	United States
54	220.2675	221.2675	United States
55	220.2725	221.2725	United States
56	220.2775	221.2775	United States
57	220.2825	221.2825	United States
58	220.2875	221.2875	United States
59	220.2925	221.2925	United States
60	220.2975	221.2975	United States
61	220.3025	221.3025	Mexico
62	220.3075	221.3075	Mexico
63	220.3125	221.3125	Mexico
64	220.3175	221.3175	Mexico

APPENDIX - TABLE OF ALLOTMENT (220-222 MHz Band)			
Channel	**Base Frequency**	**Mobile Frequency**	**Country**
65	220.3225	221.3225	Mexico
66	220.3275	221.3275	Mexico
67	220.3325	221.3325	Mexico
68	220.3375	221.3375	Mexico
69	220.3425	221.3425	Mexico
70	220.3475	221.3475	Mexico
71	220.3525	221.3525	Mexico
72	220.3575	221.3575	Mexico
73	220.3625	221.3625	Mexico
74	220.3675	221.3675	Mexico
75	220.3725	221.3725	Mexico
76	220.3775	221.3775	United States
77	220.3825	221.3825	United States
78	220.3875	221.3875	United States
79	220.3925	221.3925	United States
80	220.3975	221.3975	United States
81	220.4025	221.4025	United States
82	220.4075	221.4075	United States
83	220.4125	221.4125	United States
84	220.4175	221.4175	United States
85	220.4225	221.4225	United States
86	220.4275	221.4275	United States
87	220.4325	221.4325	United States
88	220.4375	221.4375	United States
89	220.4425	221.4425	United States
90	220.4475	221.4475	United States
91	220.4525	221.4525	Mexico
92	220.4575	221.4575	Mexico
93	220.4625	221.4625	Mexico
94	220.4675	221.4675	Mexico
95	220.4725	221.4725	Mexico
96	220.4775	221.4775	Mexico
97	220.4825	221.4825	Mexico
98	220.4875	221.4875	Mexico
99	220.4925	221.4925	Mexico
100	220.4975	221.4975	Mexico
101	220.5025	221.5025	Mexico
102	220.5075	221.5075	Mexico
103	220.5125	221.5125	Mexico
104	220.5175	221.5175	Mexico
105	220.5225	221.5225	Mexico
106	220.5275	221.5275	United States
107	220.5325	221.5325	United States

APPENDIX - TABLE OF ALLOTMENT (220-222 MHz Band)			
Channel	**Base Frequency**	**Mobile Frequency**	**Country**
108	220.5375	221.5375	United States
109	220.5425	221.5425	United States
110	220.5475	221.5475	United States
111	220.5525	221.5525	United States
112	220.5575	221.5575	United States
113	220.5625	221.5625	United States
114	220.5675	221.5675	United States
115	220.5725	221.5725	United States
116	220.5775	221.5775	United States
117	220.5825	221.5825	United States
118	220.5875	221.5875	United States
119	220.5925	221.5925	United States
120	220.5975	221.5975	United States
121	220.6025	221.6025	Mexico
122	220.6075	221.6075	Mexico
123	220.6125	221.6125	Mexico
124	220.6175	221.6175	Mexico
125	220.6225	221.6225	Mexico
126	220.6275	221.6275	Mexico
127	220.6325	221.6325	Mexico
128	220.6375	221.6375	Mexico
129	220.6425	221.6425	Mexico
130	220.6475	221.6475	Mexico
131	220.6525	221.6525	Mexico
132	220.6575	221.6575	Mexico
133	220.6625	221.6625	Mexico
134	220.6675	221.6675	Mexico
135	220.6725	221.6725	Mexico
136	220.6775	221.6775	United States
137	220.6825	221.6825	United States
138	220.6875	221.6875	United States
139	220.6925	221.6925	United States
140	220.6975	221.6975	United States
141	220.7025	221.7025	United States
142	220.7075	221.7075	United States
143	220.7125	221.7125	United States
144	220.7175	221.7175	United States
145	220.7225	221.7225	United States
146	220.7275	221.7275	Mexico
147	220.7325	221.7325	Mexico
148	220.7375	221.7375	Mexico
149	220.7425	221.7425	Mexico
150	220.7475	221.7475	Mexico

APPENDIX - TABLE OF ALLOTMENT (220-222 MHz Band)			
Channel	**Base Frequency**	**Mobile Frequency**	**Country**
151	220.7525	221.7525	Mexico
152	220.7575	221.7575	Mexico
153	220.7625	221.7625	Mexico
154	220.7675	221.7675	Mexico
155	220.7725	221.7725	Mexico
156	220.7775	221.7775	United States
157	220.7825	221.7825	United States
158	220.7875	221.7875	United States
159	220.7925	221.7925	United States
160	220.7975	221.7975	United States
161	220.8025	221.8025	United States
162	220.8075	221.8075	United States
163	220.8125	221.8125	United States
164	220.8175	221.8175	United States
165	220.8225	221.8225	United States
166	220.8275	221.8275	Mexico
167	220.8325	221.8325	Mexico
168	220.8375	221.8375	Mexico
169	220.8425	221.8425	Mexico
170	220.8475	221.8475	Mexico
171	220.8525	221.8525	Mexico
172	220.8575	221.8575	Mexico
173	220.8625	221.8625	Mexico
174	220.8675	221.8675	Mexico
175	220.8725	221.8725	Mexico
176	220.8775	221.8775	Mexico
177	220.8825	221.8825	Mexico
178	220.8875	221.8875	United States
179	220.8925	221.8925	United States
180	220.8975	221.8975	United States
181	220.9025	221.9025	United States
182	220.9075	221.9075	United States
183	220.9125	221.9125	United States
184	220.9175	221.9175	United States
185	220.9225	221.9225	United States
186	220.9275	221.9275	United States
187	220.9325	221.9325	United States
188	220.9375	221.9375	United States
189	220.9425	221.9425	United States
190	220.9475	221.9475	United States
191	220.9525	221.9525	United States
192	220.9575	221.9575	United States
193	220.9625	221.9625	United States

APPENDIX - TABLE OF ALLOTMENT (220-222 MHz Band)			
Channel	**Base Frequency**	**Mobile Frequency**	**Country**
194	220.9675	221.9675	United States
195	220.9725	221.9725	Both Countries
196	220.9775	221.9775	Both Countries
197	220.9825	221.9825	Both Countries
198	220.9875	221.9875	Both Countries
199	220.9925	221.9925	Both Countries
200	220.9975	221.9975	Both Countries

3.9.4 Protocol 6 Concerning the Allotment and Use of Channels in the 932-932.5 and 941-941.5 MHz Bands for Fixed Point-to-multipoint Services along the Common Border

(Signed Williamsburg, VA, June 16, 1994)

This Protocol is being concluded pursuant to the Agreement Between the Government of the United States of America and the Government of the United Mexican States Concerning the Allocation and Use of Frequency Bands by Terrestrial Non-Broadcasting Radiocommunication Services Along the Common Border signed June 16, 1994, herein referred to as the Agreement.

ARTICLE I.

Purposes

The purposes of this Protocol are:

1. To establish and adopt an allotment plan for the use of channels in the 932-932.5 and 941-941.5 MHz bands within a distance of 113 kilometers on each side of the common border (Sharing Zone) for fixed point-to-multipoint radiocommunication stations and to achieve an equitable distribution of the available channels.
2. To establish technical criteria to regulate point-to-multipoint radiocommunication stations in the 932-932.5 and 941-941.5 MHz bands.
3. To establish conditions of use so that each Administration may use the channels allotted to the other country, if this use causes no interference.

ARTICLE II.

Definition

For the purpose of this Protocol and as provided for in Article IV of the Agreement, the term Administration(s) shall refer to the Federal Communications Commission and the National Telecommunications and Information Administration of the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States.

ARTICLE III.

Conditions of Use

1. In the agreed Sharing Zone, Administrations shall use the frequency plan in the Table of Allotment appearing as the Appendix to this Protocol, which shall form an integral part of this Protocol.

2. Within the Sharing Zone, the frequencies in the 932-932.5 and 941-941.5 MHz bands shall be shared by the Administrations in accordance with the Appendix to this Protocol.

3. The assignments which a country makes of its own primary use frequencies within the Sharing Zone shall be authorize subject to the effective isotropic radiated power (EIRP) and antenna height limits specified in the following table:

a. Station use of the 941-941.5 MHz band:

Antenna Height/Above Mean Sea Level (Meters)	Maximum Effective Radiated Power (Watts)	Isotropic (EIRP) (dBW)
Up to 152	1000	30
Above 152 to 182	630	28
Above 182 to 213	500	27
Above 213 to 243	400	26
Above 243 to 274	315	25
Above 274 to 305	250	24
Above 305	200	23

b. Stations using the 932-932.5 MHz band shall be limited to the maximum effective isotropic radiated power of 50 watts (17 dBW).

4. Frequencies allotted for the primary use of one country may be assigned by the other country within the Sharing Zone in accordance with the following conditions:

a. The maximum power flux density (pfd) at any point at or beyond the border shall not exceed - 100 dBW/m^2.

b. Administrations shall take proper measures to eliminate any harmful interference caused by their licensees.

c. Each Administration shall grant protection to stations that have primary use of the authorized frequency.

d. Stations operating under this provision shall be considered as secondary and shall not be granted protection against harmful interference from stations that have primary use of the authorized frequency.

ARTICLE IV.

Transborder Traffic

Administrations will make their best efforts to satisfy the needs of transborder traffic.

ARTICLE V.

Exchange of Data

In October of each year, the Federal Commission for the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States shall exchange summary lists of all of their country's assignments in the 932-932.5 and 941-941.5 MHz bands within Sharing Zone.

ARTICLE VI.

Entry Into Force and Termination

This Protocol shall enter into force on the same date as the Agreement. It shall remain in force until it is replaced by a new Protocol, or until it is terminated in accordance with Article VII of the Agreement.

APPENDIX - TABLE OF ALLOTMENT 932-932.5 and 941-941.5 MHz Bands

Channel Pairs for Point-to-Multipoint Assignments			
Mexico		United States	
932.00625	941.00625	932.25625	941.25625
932.01875	941.01875	932.26875	941.26875
932.03125	941.03125	932.28125	941.28125
932.04375	941.04375	932.29375	941.29375
932.05625	941.05625	932.30625	941.30625
932.06875	941.06875	932.31875	941.31875
932.08125	941.08125	932.33125	941.33125
932.09375	941.09375	932.34375	941.34375
932.10625	941.10625	932.35625	941.35625
932.11875	941.11875	932.36875	941.36875
932.13125	941.13125	932.38125	941.38125
932.14375	941.14375	932.39375	941.39375
932.15625	941.15625	932.40625	941.40625
932.16875	941.16875	932.41875	941.41875
932.18125	941.18125	932.43125	941.43125
932.19375	941.19375	932.44375	941.44375
932.20625	941.20625	932.45625	941.45625
932.21875	941.21875	932.46875	941.46875
932.23125	941.23125	932.48125	941.48125
932.24375	941.24375	932.49375	941.49375

3.9.5 Protocol 9 Concerning the Use of Bands Allocated to the Aeronautical Radionavigation and Aeronautical Communications Services Along the Common Border.

(Signed Morelia, Mexico, April 26, 1996)

This Protocol is being concluded pursuant to the Agreement Between the Government of the United States of America and the Government of the United Mexican States Concerning the Allocation and Use of Frequency Bands by Terrestrial Non-Broadcasting Radiocommunication Services Along the Common Border signed June 16, 1994, herein referred to as the Agreement.

ARTICLE I.

Purposes

The purposes of this Protocol are:

1. To establish a procedure for the coordination of frequency assignment information and the exchange of engineering comments on proposed frequency assignments for Aeronautical Radionavigation and Aeronautical Communications Services along the Mexico/United States common border.
2. To establish the frequency bands and technical criteria that is to be provided as part of the coordination of proposed frequency assignments.
3. To establish conditions of use so that each Administration has access to all of the channels in each of the frequency bands, provided that the use does not cause harmful interference to stations in the other country.

ARTICLE II.

Definition

For the purpose of this Protocol and as provided for in Article IV of the Agreement, the term Administration(s) shall refer to the Federal Aviation Administration and the Federal Communications Commission of the United States of America and the Secretaría de Comunicaciones y Transportes (SCT/SENEAM) of the United Mexican States.

ARTICLE III.

Conditions of Use

1. The frequency bands set forth in the table below shall be used for aeronautical radionavigation, and aeronautical communications and associated uses in accordance with Appendix I:

Item	Frequency Band	Authorized Coordination Agencies	
		U.S.	Mexico
1	190-285 kHz	FAA	SCT/SENEAM
2	285-435 kHz	FAA	SCT/SENEAM
3	510-535 kHz	FAA	SCT/SENEAM
4	74.8-75.2 MHz	FAA	SCT/SENEAM
5	108-118 MHz	FAA/FCC	SCT/SENEAM
6	118-137 MHz	FAA/FCC	SCT/SENEAM
7	328.6-335.4 MHz	FAA	SCT/SENEAM
8	960-1215 MHz	FAA	SCT/SENEAM
9	1215-1400 MHz	FAA	SCT/SENEAM
10	2700-2900 MHz	FAA	SCT/SENEAM
11	4200-4400 MHz	*	*
12	5000-5250 MHz	FAA/FCC	SCT/SENEAM
13	5350-5470 MHz	*	*
14	9000-9200 MHz	FAA/FCC	SCT/SENEAM
15	13.25-13.4 GHz	*	*
16	15.4-15.7 GHz	*	*

* No coordination required at this time.

2. The above-mentioned frequency bands are available for use by both countries subject to coordination in the zones established in Appendix I.

ARTICLE IV.

Coordination Procedures

1. Before an Administration authorizes a new assignment or a modification to an existing assignment in the frequency bands governed by this protocol in the coordination zones established in Appendix I, it shall coordinate the assignment with the other country. A coordination request shall include the information required for that communication service as listed in Appendix I. The Program Director for Spectrum Policy and Management of the Federal Aviation Administration and the Gerencia de Normas Operacionales de la Secretaría de Comunicaciones y Transportes (SCT/SENEAM) shall conduct the coordination. The medium used for providing the information shall be established by mutual agreement, and the receiving Administration shall acknowledge receipt of the coordination request.

2. The affected Administration shall examine the coordination request and shall reply as soon as practicable advising whether or not a conflict is anticipated. If so, the details of the conflict and the particulars of the station likely to experience interference shall be supplied. A counter proposal or discussions on the initial proposal may be initiated with the objective of resolving any problem.

3. If adverse comment is not received from the affected Administration with 30 days from the date of the receipt of the proposal, the initiating administration may go ahead with the operation after having notified the other Administration.

4. Whenever differences of opinion concerning the probability of harmful interference exist, which cannot be resolved otherwise, or in cases where the information available makes it difficult to determine whether harmful interference would be created by the proposed operation, mutually acceptable arrangements should be made for actual on-the-air tests to be observed by representatives of both the Federal Aviation Administration and Secretaría de Comunicaciones y Transportes/SENEAM. Should harmful interference be caused to the existing station, the administration having jurisdiction over the proposed operation should be notified promptly so that the transmissions of the interfering station may be halted.

5. Neither the Federal Aviation Administration nor Secretaría de Comunicaciones Y Transportes/SENEAM shall be bound to act in accordance with the views of the other. However, to keep such instances to a minimum, each agency should cooperate to the fullest extent practicable with the other by furnishing such additional data as may be required.

ARTICLE V.

Master List of Aeronautical Stations

1. Appendices III and IV* to this Protocol list the existing stations (and their associated technical parameters) of each Administration that are in the frequency bands covered by this Protocol. These stations comprise the initial Master List and are entitled to the protections accorded stations coordinated pursuant to this Protocol. Any future modifications to these stations shall be coordinated with the other Administration in accordance with Article IV of this Protocol.

2. In June of each year, the Federal Aviation Administration and Secretaría de Comunicaciones y Transportes/SENEAM shall exchange recapitulative lists of all of their country's assignments for Aeronautical Radionavigation and Aeronautical Communications Services within the coordination zones.

* Appendix III (List of U.S. Assignments) and Appendix IV (List of Mexican Assignments) to be maintained by the FAA.

ARTICLE VI.

Entry into Force and Termination

This Protocol shall enter into force on the date of signing. It shall remain in force until it is replaced by a new Protocol, or until it is terminated in accordance with Article VII of the Agreement.

APPENDIX I

AERONAUTICAL RADIONAVIGATION SERVICE

NDB	190-285, 285-435 and 510-535 kHz
OM/MM	74.8-75.2 MHz
ILS-LOC	108-112 MHz
VOR	108-117.975 MHz
ILS-GS	328.6-335.4 MHz
DME/TACAN	960-1215 MHz
SSR	1030 MHz
Radar	1215-1400 MHz, 2700-2900 MHz, 9000-9200 MHz
MLS	5000-5150 MHz*

* At the present time, there is no MLS use in the band 5091-5150 MHz.

Technical Data Required for Coordination

(a) Frequency (provide pulse repetition frequency for SSR
(b) Location Name and Geographical Coordinates (NAD-83)
(c) Class of Emission and Necessary Bandwidth
(d) Transmitter Mean Power Output (Peak for DME and SSR)
(e) Antenna Azimuth and Gain in the Event of a Directional Antenna Array
(f) Facility Service Volume in Terms of Altitude and Radius Protected. (Not applicable to OM/MM. Radius only for NDB's)

Coordination Zones

NDB 0-25W	135 NM of U.S./Mexican Border
26-400W	250 NM of U.S./Mexican Border
OVER 400W	350 NM of U.S./Mexican Border
OM/MM	10 NM of U.S./Mexican Border
ILS-LOC/GS/DME	120 NM of U.S./Mexican Border
VOR/DME/TACAN up to 18,000 ft	200 NM of U.S./Mexican Border
VOR/DME/TACAN up to 75,000 ft	400 NM of U.S./Mexican Border
SSR	200 NM of U.S./Mexican Border
Radar	150 NM of U.S./Mexican Border
MLS	200 NM of U.S./Mexican Border

Note 1 - The power for NDB's is the transmitter mean power output.
Note 2 - DME Channels 1 through 16 and 60 through 69 are excluded from coordination between FAA/Mexico.
Note 3 - The frequency of 1090 MHz is excluded from coordination.

AERONAUTICAL MOBILE (R) SERVICE - AIR TRAFFIC CONTROL 117.975-137.000 MHz

Technical Data Required for Coordination

(a) Frequency
(b) Location Name and Geographic Coordinates
(c) Class of Emission and Necessary Bandwidth
(d) Transmitter Mean Power Output
(e) Antenna Gain and Azimuth in the Event of a Directional Antenna Array
(f) Facility Service Volume and Function, e.g., Typical Function Service Volumes:

Helicopter Control	30 NM up to 5,000 ft
Local Control and VFR Radar Advisory	30 NM up to 20,000 ft
Approach Control Including Radar	60 NM up to 25,000 ft
Departure Control including Radar	60 NM up to 20,000 ft
Basic Altitude En Route	100 NM up to 15,000 ft
Intermediate Altitude En Route	100 NM up to 24,000 ft
High Altitude En Route	200 NM up to 75,000 ft

Coordination Zones

Ground Control Frequencies

121.6-121.9 MHz	25 NM of U.S./Mexican Border
Low Altitude (up to 24,000 ft)	400 NM of U.S./Mexican Border
High Altitude (up to 75,000 ft)	600 NM of U.S./Mexican Border

Note 1: The frequency 121.5 MHz is excluded from coordination.
Note 2: For definitions of abbreviations, see Appendix II, Glossary

APPENDIX II

GLOSSARY

1. **DISTANCE MEASURING EQUIPMENT (DME)** - Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.

2. **INSTRUMENT LANDING SYSTEM (ILS)** - A precision instrument approach system which normally consists of the following electronic components and visual aids:

a. Localizer (LOC) - Provides course guidance to the runway.

b. Glideslope (GS) - Provides vertical guidance for aircraft during approach and landing.

c. Outer Marker (OM) - A 75 MHz beacon at or near the glideslope intercept altitude of an ILS approach. The OM is normally located four to seven miles from the runway threshold on the extended centerline of the runway.

d. Middle Marker (MM) - A 75 MHz marker beacon that defines a point along the glideslope of an ILS normally located at or near the point of decision height (ILS category I - 200 ft.).

e. Approach Lighting System (ALS) - An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams in a directional pattern by which the pilot aligns the aircraft with the extended centerline of the runway on his final approach for landing.

3. MICROWAVE LANDING SYSTEM (MLS) - A precision landing system operating in the 5 GHz band.

4. NONDIRECTIONAL BEACON (NDB) - A low/medium frequency (L/MF) or ultra high (UHF) frequency radio beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his bearing to or from the radio beacon and "home" or track to or from the station. When the radio beacon is installed in conjunction with the Instrument Landing System (ILS) marker, it is normally called a Compass Locator.

5. SECONDARY SURVEILLANCE RADAR (SSR) - Also known as a Radar Beacon. A radar system in which the object to be detected is fitted with cooperative equipment in the form of a radio receiver/transmitter (transponder). Radar pulses transmitted from the search transmitter/receiver (interrogator) site are received in the cooperative equipment and used to trigger a distinctive transmission from the transponder.

6. TACTICAL AIR NAVIGATION (TACAN) - A UHF electronic rho-theta air navigation aid which provides suitably equipped aircraft a continuous indication of bearing and distance to the TACAN station.

7. VHF OMNIDIRECTIONAL RANGE (VOR) - A ground-based electronic navigation aid transmitting VHF navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the National Air Space. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.

3.9.6 Protocol 10 Concerning the Use of Channels in the 932.5-935 MHz and the 941.5-944 MHz Bands for Fixed Point-to-point Services Along the Common Border

(Signed Morelia, Mexico, April 26, 1996)

This Protocol is being concluded pursuant to the Agreement Between the Government of the United States of America and the Government of the United Mexican States Concerning the Allocation and Use of Frequency Bands by Terrestrial Non-Broadcasting Radiocommunication Services Along the Common Border signed June 16, 1994, herein referred to as the Agreement.

ARTICLE I.

Purposes

The purposes of this Protocol are:

1. To establish and adopt a common plan for the use of the 932.5-935 and 941.5-944 MHz bands within a distance of 60 kilometers on each side of the common border (Sharing Zone) for fixed point-to-point radiocommunication stations.

2. To establish the technical criteria that will permit each Administration to have equitable access to the available channels.

3. To establish conditions of use so that each Administration may use the channels allotted to the other country, provided this causes no interference.

ARTICLE II.

Definition

For the purpose of this Protocol and as provided for in Article IV of the Agreement, the term Administration(s) shall refer to the Federal Communications Commission and the National Telecommunications and Administration of the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States.

ARTICLE III.

Conditions of Use

1. In the Sharing Zone, the frequencies in the 932.5-935 MHz and 941.5-944 MHz bands shall be shared by the Administrations in accordance with the channeling plan in Appendix I* to this Protocol, which is an integral part hereof. These frequencies can be used singly but any paired use must be in accordance with the Table.

2. For each of the emission bandwidths provided for in Appendix I, the individual channels are designated as being either for the primary use of Mexico or primary use of the United States of America or reserved for future use.

* In recognition of the fact that Mexico needs to move its present users of these frequencies in the bands 932.5-935 MHz and 941.5-944 MHz to other frequency bands before it can make use of the new frequency allocation, the parties have agreed to this protocol and channeling plan until action is taken under Articles VII and VIII. It is the objective of the Administrations to replace the channeling plan and promote the most efficient use of the channels and maximize the sharing of the channels by both countries.

ARTICLE IV.

Technical Criteria

1. For fixed point-to-point stations in the Sharing Zone, the maximum equivalent isotropically radiated power shall not exceed 26 dBW (400 watts) within 120 degrees in the direction of the common border.

2. The stations must employ antennas that meet or exceed the performance standards for Category B. Category A antennas may be required where coordination or interference problems can be resolved by their use. (See the Table, below.) If Category A antennas are necessary to allow a proposed assignment to be made, they must be employed, beginning with the Administration proposing the assignment.

TABLE. ANTENNA PERFORMANCE STANDARDS

Antenna Category	Maximum Beamwidth to 3 dB Points (Included angle in degrees)	Minimum Radiation Suppression to Angle in Degrees from Centerline of Main Beam in Decibels					
		10 to 15	15 to 20	20 to 30	30 to 100	100 to 140	140 to 180
A	14	6	11	14	17	20	24
B	20	--	6	10	13	15	20

ARTICLE V.

Transborder Traffic

Transborder transmissions by means of private point-to-point links are permitted subject to the authorizations by both administrations in accordance with their regulations in force. Requests for coordination for this type of transmission shall include information on the transborder service to be provided. See Appendix II.

ARTICLE VI.

Exchange of Information

In October of each year, the Federal Communications Commission of the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States shall exchange recapitulative lists of all the assignments made by their countries in the 932.5-935 MHz and 941.5-944 MHz bands within the Sharing Zone, in accordance with Appendix II.

ARTICLE VII.

Negotiation of a New Protocol

Two years from the date of entry into force of this Protocol, the Administrations shall initiate a review of the use of the bands with the objective of preparing a new Protocol prior to the termination of this Protocol which maximizes the use of the radio electric spectrum, while keeping in mind the existing assignments and the needs of the two countries.

ARTICLE VIII.

Entry Into Force and Termination

This Protocol shall enter into force on the date of signing. It shall remain in force until it is replaced by a new Protocol. If a replacement Protocol is not concluded within three years from the entry into force of this Protocol, it is terminated on that date, unless it is mutually agreed by the Administrations to extend it.

APPENDIX I

TABLE OF CHANNELS - 932.5-935 AND 941.5-945 MHz BANDS PAIRED FREQUENCIES FOR POINT-TO-POINT ASSIGNMENTS 25 kHz BANDWIDTH PAIRS			
MEXICO		UNITED STATES	
MHz		MHz	
932.5125	941.5125	934.8375	943.8375
932.5375	941.5375	934.8625	943.8625
932.5625	941.5625	934.8875	943.8875
932.5875	941.5875	934.9125	943.9125
932.6125	941.6125	934.9375	943.9375
932.6375	941.6375	934.9625	943.9625
932.6625	941.6625	934.9875	943.9875

TABLE OF CHANNELS - 932.5-935 AND 941.5-945 MHz BANDS PAIRED FREQUENCIES FOR POINT-TO-POINT ASSIGNMENTS 50 kHz BANDWIDTH PAIRS			
MEXICO		UNITED STATES	
MHz		MHz	
932.7000	941.7000	934.8000	943.8000
* RESERVED - 932.7500 and 941.7500 MHz			

TABLE OF CHANNELS - 932.5-935 AND 941.5-945 MHz BANDS PAIRED FREQUENCIES FOR POINT-TO-POINT ASSIGNMENTS 100 kHz BANDWIDTH PAIRS			
MEXICO		UNITED STATES	
MHz		MHz	
932.8250	941.8250	934.5250	943.5250
932.9250	941.9250	934.6250	943.6250
933.0250	942.0250	934.7250	943.7250

TABLE OF CHANNELS - 932.5-935 AND 941.5-945 MHz BANDS PAIRED FREQUENCIES FOR POINT-TO-POINT ASSIGNMENTS 200 kHz BANDWIDTH PAIRS			
MEXICO		UNITED STATES	
MHz		MHz	
933.1750	942.1750	933.9750	942.9750
933.3750	942.3750	934.1750	943.1750
933.5750	942.5750	934.3750	943.3750
* RESERVED - 933.7750 and 942.7750 MHz			

* An assignment on a reserved channel can be made by one country only with the concurrence of the other country. An administration requesting concurrence for such an assignment shall provide full justification for its need including an indication that it is not able to satisfy its requirement on any other frequency in the channel plan. Such assignments will be coordinated on a case-by-case basis.

APPENDIX II

DATA ELEMENTS USED FOR THE EXCHANGE OF LISTS OF ASSIGNMENTS*

(a) Identify number for the assignment
(b) Radio frequency in Megahertz
(c) Locations: city and state of the transmitter and receiver
(d) Latitude and longitude of the transmitter antenna and receiver antenna (degrees, minutes, seconds)
(e) Emission designator for each carrier
(f) Total e.i.r.p. in dBW for each carrier
(g) Transmitter antenna azimuth
(h) Transmitter antenna polarization
(i) Maximum transmitter antenna gain in dBi
(j) Transmitter antenna site ground elevation in meters above mean sea level
(k) Transmitter antenna radiation centerline height above ground in meters
(l) Transmitter antenna manufacturer and model number
(m) Transmitter antenna performance (Category A, B or Other)
(n) Any other optional information

* If an administration submits a request for coordination, such a request should include as a minimum, the data elements listed in this Appendix.

3.9.7 Protocol 11 - Protocol Between the Department of State of the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States Concerning the Allotment and Use of the 380-399.9 MHz Band for Fixed and Mobile Terrestrial Non-Broadcasting Services Along the Common Border

This Protocol is being concluded on an interim basis pursuant to the Agreement Between the Government of the United States of America and the Government of the United Mexican States Concerning the Allocation and Use of Frequency Bands by Terrestrial Non-Broadcasting Radiocommunication Services Along the Common Border signed in Williamsburg, Virginia June 16, 1994, (herein referred to as the “Agreement”).

ARTICLE I.

Purposes

1. The purposes of this Protocol are:

a. To establish and adopt a plan for the equitable allotment on an interim basis of the frequency sub-bands in the 380-399.9 MHz band within the Sharing Zone defined in this Protocol;

b. To allow for new assignments in frequency sub-bands allotted as primary for each Administration in the 380-399.9 MHz band within the Sharing Zone defined in this Protocol on an interim basis until a more complete protocol governing both new assignments and existing stations can be negotiated and concluded; and

c. To allow for temporary cross-border communications on an interim basis as set forth under Article IV, herein.

2. This Protocol does not apply to existing stations for fixed and mobile services in the 380-399.9 MHz band within the Sharing Zone defined in this Protocol.

ARTICLE II.

Designation of Administrations and Definitions

1. For the purpose of this Protocol and as provided for in Article IV of the Agreement, the term Administration or Administrations will refer with equal effect to the National Telecommunications and Information Administration of the Department of Commerce United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States are hereby designated the Administrations responsible for the implementation of this Protocol for the United States (hereinafter United States) and the United Mexican States (hereinafter Mexico), respectively, as provided for in Article IV of the Agreement.

2. The Sharing Zone is defined to include the border areas within the United States and Mexico and their respective territorial waters as set forth in Appendix I.

ARTICLE III.

Restriction on Use of Mobile Satellite Service

Neither Administration shall introduce the mobile satellite service into the sub-bands allotted for the primary use of the other Party within the Sharing Zone defined herein.

ARTICLE IV.

Conditions of Use

1. Within the Sharing Zone, the radio frequency sub-bands in the 380-399.9 MHz band shall be allotted for the primary use of each Administration in accordance with Appendix II. Each Administration shall ensure that new assignments made on or after the date that this Protocol enters into force are operated in such a way that the transmission bandwidth shall not exceed the primary frequency allotments in Appendix II.

2. Each Administration shall ensure that fixed and mobile stations assigned to primary frequency allotments within the Sharing Zone shall be operated on an interim basis in accordance with the effective radiated power (ERP) and antenna height limitations specified in the following table (Table I):

Table I		
Average of the Antenna Height Above Average Terrain on Standard Radials in the Direction of the Common Border[2]	**Maximum ERP in Any Direction Toward the Common Border**	
Meters	Watts	dBm
Up to 150	500	+56.98
Above 150 to 225	350	+55.44
Above 225 to 300	250	+53.98
Above 300 to 450	200	+53.01
Above 450 to 600	150	+51.76
Above 600 to 750	100	+50.00
Above 750 to 900	75	+48.75
Above 900 to 1,050	50	+46.98
Above 1,050	30	+44.77

3. Notwithstanding Article IV, paragraph 1 herein, which limits new assignments to primary allotments for each Administration, new assignments on the frequencies and their associated bandwidths shown in Appendix III are allowed on a temporary basis at certain stations in the United States so that those U.S. stations may engage in cross-border communications with counter-part stations in Mexico. Those U.S. stations are located in the State of Arizona in the United States and are identified in Appendix IV of this Protocol. Appendix IV also lists the counter-part stations in Mexico. Such temporary new assignments are not allowed on other U.S. stations in any of the border states of the United States.

a. The U.S. Administration may make new temporary assignments to the U.S. stations listed in Appendix IV under the exception set forth in this paragraph only on the condition that no harmful interference is caused to stations in Mexico. In the case of harmful interference to the U.S. stations listed in Appendix IV from Mexican stations, the U.S. Administration will request cooperation from the Mexican Administration in order to ensure viable direct cross-border communications between the stations in each country.

b. The limited temporary use permitted under the terms set forth in the prior provisions of this paragraph may continue only until the two Administrations either find and agree upon an alternative radio-frequency band for the assigned use or until July 1, 2008, whichever occurs first. If the two Administrations agree upon an alternative radio-frequency band for the assigned use for any U.S. station prior to July 1, 2008, the limited temporary use of the frequencies by that U.S. station shall end when cross-border operations are deployed and transmissions by that U.S. station begins on the alternative frequency band.

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[2] Standard radials are 000, 045, 090, 135, 180, 225, 270 and 315 relative to True North.

ARTICLE V.

Appendices

Appendices I, II, III, and IV are an integral part of this Protocol.

ARTICLE VI.

Entry into Force and Termination

This Protocol shall enter into force on the date of signature. It shall remain in force until it is replaced by a Protocol governing both new assignments and existing stations, or until it is terminated in accordance with Article VII of the Agreement.

APPENDIX I

Areas Within Which the Frequencies Are to Be Protected

U.S.- MEXICO SHARING ZONE

The Sharing Zone is defined on an interim basis as the area covered by a distance of 145 kilometers (90.1 miles) from the U.S.-Mexico common border into the national territory of each country and includes areas of the Pacific Ocean and the Gulf of Mexico.

These areas are enclosed by the boundaries shown on the map below and are further defined in Table II.

Table II

The following geographic coordinates define the U.S. - Mexico Sharing Zone on an interim basis in the national territory of each country. Point 1 is located in the Pacific Ocean due west from the U.S.-Mexico common border and is the starting point in defining the Sharing Zone. The boundary of the Sharing Zone is then defined by plotting each geographic point in advancing numerical order in a clockwise direction. Each distance path between consecutive points is traversed by great circle arc.

No.	Degrees/Minutes/Seconds	Decimal Degrees
1	32 14’16”N 118 37’09”W	32.2378N 118.6192W
2	33 44’18”N 119 58’13”W	33.7384N 119.9704W
3	34 00’16”N 114 28’01”W	34.0044N 114.4670W
4	32 37’24”N 110 51’01”W	32.6234N 110.8505W
5	32 38’60”N 109 18’02”W	32.6500N 109.3006W
6	33 05’47”N 108 15’42”W	33.0965N 108.2617W
7	33 01’27”N 106 06’30”W	33.0242N 106.1083W
8	32 46’33”N 105 30’38”W	32.7757N 105.5105W
9	31 21’30”N 103 55’51”W	31.3584N 103.9309W
10	30 39’31”N 103 34’01”W	30.6587N 103.5670W
11	31 11’40”N 102 26’12”W	31.1945N 102.4368W
12	31 02’47”N 101 04’18”W	31.0465N 101.0717W
13	30 51’19”N 100 36’43”W	30.8553N 100.6120W
14	29 54’03”N 099 28’55”W	29.9007N 099.4820W
15	27 21’20”N 097 48’03”W	27.3556N 097.8009W
16	27 21’05”N 095 42’14”W	27.3516N 095.7038W
17	25 58’50”N 095 42’22”W	25.9805N 095.7061W
18	24 33’14”N 095 42’46”W	24.5539N 095.7128W
19	24 32’41”N 097 48’44”W	24.5448N 097.8122W
20	25 15’14”N 099 40’56”W	25.2539N 099.6823W
21	25 40’42”N 100 10’59”W	25.6782N 100.1833W
22	27 52’01”N 101 35’16”W	27.8669N 101.5877W
23	28 29’18”N 101 57’45”W	28.4884N 101.9625W
24	27 58’15”N 102 11’48”W	27.9709N 102.1967W
25	27 38’22”N 103 16’32”W	27.6394N 103.2755W
26	27 54’33”N 103 59’11”W	27.9093N 103.9863W
27	28 30’31”N 105 15’57”W	28.5085N 105.2659W
28	29 13’30”N 105 45’37”W	29.2249N 105.7604W
29	30 19’17”N 106 57’15”W	30.3215N 106.9544W
30	30 01’37”N 107 56’47”W	30.0271N 107.9464W
31	30 01’18”N 111 15’28”W	30.0216N 111.2579W
32	31 14’10”N 115 05’28”W	31.2361N 115.0911W
33	31 21’26”N 115 20’31”W	31.3572N 115.3419W
34	31 14’34”N 116 21’25”W	31.2427N 116.3570W
35	31 08’09”N 117 53’38”W	31.1359N 117.8939W

APPENDIX II

Allotment of Frequency Sub-bands in the 380-399.9 MHz Band

Mexico Primary[3]	U.S. Primary[3]
380.0000 - 384.9500	384.9500 - 389.9500
389.9500 - 394.9500	394.9500 - 399.9000

APPENDIX III

Temporary Cross-Border Frequencies [4]

382.3000 392.3000

Each frequency employs an associated bandwidth of plus and minus 12.5 kHz relative to the center carrier frequency, i.e 382.2875-382-3125 MHz and 392.2875-392.3125.

APPENDIX IV

List of Certain U.S. and Associated Mexican Stations. The U.S. Stations May Be Assigned Frequencies Set Forth in Appendix III on a Limited Temporary Basis under Article IV, Paragraph 3

In the State of Arizona:

1) U.S. Customs & Border Protection Station, Nogales
2) U.S. Customs & Border Protection Station, Naco
3) U.S. Customs & Border Protection Station, Douglas
4) U.S. Border Patrol Sector Communications Center, Yuma
5) County of Santa Cruz, Office of Emergency Management, Nogales
6) Police Department of City of Nogales, Nogales
7) Cochise County Sheriffs Department, Bisbee
8) Police Department of City of Douglas, Douglas
9) Police Department of City of San Luis, San Luis
10) Police Department of City of Somerton, Somerton

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[3] All Frequencies in MHz

[4] These two frequencies and their associated bandwidths are designated as primary for new assignments by Mexico and may also be assigned for temporary cross-border use only as set forth in Article IV, paragraph 3, to the U.S. stations listed in Appendix IV of this Protocol.

In the State of Sonora:

1) C4 Station, Nogales
2) C4 Station, Naco
3) C4 Station, Agua Prieta (site at Prima Loma)
4) C4 Station, San Luis Rio Colorado
5) C4 Station, Nogales
6) C4 Station, Nogales
7) C4 Station, Agua Prieta (site at Prima Loma)
8) C4 Station, Agua Prieta (site at Prima Loma)
9) C4 Station, San Luis Rio Colorado
10) C4 Station, San Luis Rio Colorado

3.9.8 Protocol 12 - Protocol Between the Department of State of the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States Concerning the Allotment and Use of the 406.1-420 MHz Band for Fixed and Mobile Services Along the Common Border

This Protocol is being concluded pursuant to the Agreement Between the Government of the United States of America and the Government of the United Mexican States Concerning the Allocation and Use of Frequency Bands by Terrestrial Non-Broadcasting Radiocommunication Services Along the Common Border signed in Williamsburg, Virginia June 16, 1994, (herein referred to as the "Agreement").

ARTICLE I.

Purposes

The purposes of this Protocol are:

1. To establish and adopt a plan for the equitable allotment and use of frequency sub-bands in the 406.1-420 MHz band within the Sharing Zone defined in this Protocol;
2. To establish technical criteria to regulate the use of the frequency sub-bands referred to in paragraph 1 of this Article;
3. To establish conditions of use so that each Administration may use the frequency sub-bands allotted to the other country for fixed and mobile services, provided this causes no harmful interference; and
4. To provide special interference protection for certain critical receiver stations specifically identified in Appendix I.

ARTICLE II.

Definitions

1. For the purpose of this Protocol and as provided for in Article IV of the Agreement, the term Administration or Administrations will refer with equal effect to the National Telecommunications and Information Administration of the Department of Commerce of the United States of America (hereinafter United States) and to the Secretaría de Comunicaciones y Transportes of the United Mexican States (hereinafter Mexico).
2. The Sharing Zone is defined to include the border areas within the United States and Mexico and their respective territorial waters as set forth in Appendix II.
3. Special interference protection is defined as that protection from harmful interference afforded only to those critical receiver stations specifically identified in Appendix I.

ARTICLE III.

Conditions of Use

1. In the Sharing Zone, the radio frequency sub-bands in the 406.1-420 MHz band shall be allotted for the primary use of each Administration in accordance with Appendix III. Each Administration shall ensure that all stations subject to its jurisdiction in the 406.1-420 MHz band are operated in such a way that the transmission bandwidth on radio channels shall not exceed the primary frequency allotments in Appendix III.
2. Each Administration shall ensure that fixed and mobile stations assigned to primary frequency allotments within the Sharing Zone shall be operated in accordance with the effective radiated power (ERP) and antenna height limitations specified in the following table (Table I):

Table I		
Average of the Antenna Height Above Average Terrain on Standard Radials in the Direction of the Common Border[5]	**Maximum ERP in Any Direction Toward the Common Border**	
Meters	**Watts**	**dBm**
Up to 150	500	+56.98
Above 150 to 225	350	+55.44
Above 225 to 300	250	+53.98
Above 300 to 450	200	+53.01
Above 450 to 600	150	+51.76
Above 600 to 750	100	+50.00
Above 750 to 900	75	+48.75
Above 900 to 1,050	50	+46.98
Above 1,050	30	+44.77

Existing stations in primary frequency allotments shall conform with the above power limitations on or before January 1, 2008.

[5] Standard radials are 000, 045, 090, 135, 180, 225, 270 and 315 relative to True North.

3. Each Administration shall ensure that the operation of stations on aircraft is limited to portable stations situated inside the aircraft, which have a maximum power of 5.0 watts and which do not employ antennas externally mounted on the aircraft. Such stations may only operate in the primary frequency allotments for their Administrations and at an altitude of up to 20,000 feet (6096 meters) above mean sea level. Each Administration shall take measures to eliminate any harmful interference caused by its portable stations situated inside aircraft.

4. Frequencies in sub-bands that are allotted for the primary use of one Administration may be assigned by the other Administration to stations located within the latter Administration's territorial segment of the Sharing Zone in accordance with the following conditions:

a. The maximum power flux density (PFD) at any point at or beyond the common border shall not exceed -143 dBW/m.

b. Land mobile stations and ship station's shall not be operated within 30 kilometers of the common border, and in addition to this distance separation, the power flux density of transmissions from land mobile stations and ship stations shall, in no case, exceed -143 dBW/m at any point at or beyond the common border.

c. Land portable stations shall not be operated within 10 kilometers of the common border, and in addition to this distance separation, the power flux density of transmissions from portable stations shall, in no case, exceed -143 dBW/m at any point at or beyond the common border.

d. Each Administration shall take proper measures to eliminate any harmful interference caused by stations operating within its own territory pursuant to this Protocol.

e. Each Administration shall ensure protection to stations assigned to radio frequencies in primary allotments of the other Administration operating in accord with this Protocol.

f. Stations operating in accordance with the conditions set forth in this paragraph 4 shall be considered as secondary and shall not be granted protection against harmful interference from stations whose Administration has primary use of the frequency allotment.

5. Beyond the Sharing Zone, each Administration shall have unrestricted use of the 406.1-420 MHz band.

ARTICLE IV.

Transition Arrangement for Existing Stations

1. Each Administration shall ensure that existing stations within the Sharing Zone that are operating in primary frequency sub-bands allotted to the other Administration shall either cease transmissions or assume secondary status on or before January 1, 2008, in accordance with paragraph 2 or 3 below except for the stations listed in Appendix I which are governed by Article V of this Protocol.

2. Existing stations in the following categories, which are operating in primary frequency allotments of the other Administration, shall cease transmissions on or before January 1, 2008:

a. Stations at fixed locations that do not meet the pfd limitation set forth in subparagraph 4.a of Article III of this Protocol;

b. Land mobile stations, ship stations and land portable stations that are located in the areas set forth in subparagraphs 4.b and 4.c of Article III of this Protocol; and

c. Portable stations operated in aircraft located in the Sharing Zone defined in paragraph 2 of Article II.

3. Existing stations that are able to assume secondary status as provided in paragraph 1 of this Article shall conform to the provisions of subparagraphs 4.d, 4.e and 4.f of Article III of this Protocol.

ARTICLE V.

Special Interference Protection for Critical Receiver Stations

1. The critical receiver stations within the 406.1-420 MHz band specifically identified in Appendix I shall be afforded special interference protection from harmful interference notwithstanding the provisions of Article III and Article IV.

2. Any station within the Sharing Zone that causes harmful interference to a critical receiver station or stations specifically identified in Appendix I shall take all remedial measures necessary to eliminate the harmful interference to the protected station or stations and their referenced parameters.

ARTICLE VI.

Relation to Other Agreements

This Protocol forms an integral part of the Agreement and shall be referred to as the Protocol for the 406.1 - 420 MHz band in the Index of Annex I of the Agreement.

ARTICLE VII.

Appendices

Appendices I, II and III are an integral part of this Protocol.

ARTICLE VIII.

Entry into Force and Termination

This Protocol shall enter into force on the date of signature. It shall remain in force until it is replaced by a new Protocol, or until it is terminated in accordance with Article VII of the Agreement.

APPENDIX I

CRITICAL RECEIVER STATIONS IN MEXICO IN THE 406.1-420 MHz BAND THAT WILL BE AFFORDED SPECIAL INTERFERENCE PROTECTION

No.	Receiver Station Name	Receiver Frequency in MHz	Receiver Emission Designator	Receiver Geographic Coordinates (NAD 83) Latitude (N) Longitude (W)	Receiver Antenna Azimuth Relative to True North (N. 000 E.) (NAD 83)	Receiver Antenna Type, Beamwidth in Degrees & Polarization "H" or "V"	Receive Antenna Height Above Ground Level In Meters
1	Rep. Cedros	413.9250	3M75F8EJF	25 32 52 100 58 51	187 42 05	Parabolic 14 V	40
2	S.E. Ramos Arizpe Potencia	410.1750	3M75F8EJF	25 35 46 100 54 45	232 03 54	Parabolic 14 V	45
3	Rio Escondido	413.9250	3M75F8EJF	28 29 30 100 41 08	230 52 48	Yagi 45 H	40.9

No.	Theoretical PFD Level of Desired Signal at Receiver in dBm	Associated Transmitter Station Name	Associated Transmitter Location Latitude (N) Longitude (W)	Nominal Power (dBW)	Antenna Gain (dBd)	Effective Radiated Power ERP (dBW)	Equivalent Isotropically Radiated Power EIRP (dBW)
1 (Cont'd)	-12.8	S.E. Saltillo	25 24 35 101 00 05	10	23	30 *	32.16 *
2 (Cont'd)	-12.8	Rep. Cedros	25 32 52 100 58 51	10	23	30 *	32.16 *
3 (Cont'd)	-36.3	Nava	28 26 00 100 46 00	10	12	19 *	21.16 *

* Calculation includes 3 dB loss for transmission line

CRITICAL RECEIVER STATIONS IN THE UNITED STATES IN THE 406.1-420 MHz BAND THAT WILL BE AFFORDED SPECIAL INTERFERENCE PROTECTION

No.	Receiver Station Name	Receiver Frequency in MHz	Receiver Emission Designator	Receiver Geographic Coordinates (NAD 27) Latitude (N) Longitude (W)	Receiver Antenna Azimuth Relative to True North (N.000 E.) (NAD27)	Receiver Antenna Type, Beamwidth in Degrees & Polarization "H" or "V"	Receiver Antenna Height Above Ground Level in Meters
1	Laguna Dredge	406.1875	11K00F2D	32 51 19 114 28 55	58	Yagi 60 V	18
2	Telegraph Pass	406.5000	11K00F3E	32 40 12 114 20 06	228	Yagi 45 H	6
3	Gila Substation	407.7875	11K00F2D	32 41 05 114 28 09	304	Yagi 60 V	24
4	Hidden Shores Substation	415.1875	11K00F2D	32 52 05 114 27 28	238	Yagi 60 V	6
5	San Luis	416.4000	11K00F3E	32 29 42 114 45 57	64	Yagi 45 H	6
6	Siphon Drop	416.7875	11K00F2D	32 46 45 114 38 05	124	Yagi 60 V	8

No.	Theoretical PFD Level of Desired Signal at Receiver in dBm	Associated Transmitter Station Name	Associated Transmitter Location Latitude (N) Longitude (W)	Nominal Power (dBW)	Antenna Gain (dBd)	Effective Radiated Power ERP (dBW)	Equivalent Isotropically Radiated Power EIRP (dBW)
1 (Cont'd)	-44.6	Hidden Shores Substation	32 52 05 114 27 28	7	6	13	15.15
2 (Cont'd)	-57	Sonora Substation	32 28 48 114 35 14	7	10	17	19.15
3 (Cont'd)	-60	Siphon Drop	32 46 45 114 38 05	7	6	13	15.15
4 (Cont'd)	-45	Laguna Dredge	32 51 19 114 28 55	7	6	13	15.15
5 (Cont'd)	-58	Telegraph Pass	32 40 12 114 20 06	7	10	17	19.15
6 (Cont'd)	-61	Gila Substation	32 41 05 114 28 09	7	6	13	15.15

Appendix II

Areas Within Which the Frequencies Are to Be Protected

U.S. - MEXICO SHARING ZONE

The Sharing Zone is defined as the areas covered by a distance of 145 kilometers (90.1 miles) from the U.S.-Mexico common border into the national territory of each country and includes areas of the Pacific Ocean and the Gulf of Mexico.

These areas are enclosed by the boundaries shown on the map below and are further defined in Table II.

Table II

The following geographic coordinates define the U.S. - Mexico Sharing Zone in the national territory of each country. Point 1 is located in the Pacific Ocean due west from the U.S.-Mexico common border and is the starting point in defining the Sharing Zone. The boundary of the Sharing Zone is then defined by plotting each geographic point in advancing numerical order in a clockwise direction. Each distance path between consecutive points is traversed by great circle arc.

No.	Degrees/Minutes/Seconds	Decimal Degrees
1	32 14’16”N 118 37’09”W[6]	32.3772N 118.6192W
2	33 44’18”N 119 58’13”W	33.7384N 119.9704W
3	34 00’16”N 114 28’01”W	34.0044N 114.4670W
4	32 37’24”N 110 51’01”W	32.6234N 110.8505W
5	32 38’60”N 109 18’02”W	32.6500N 109.3006W
6	33 05’47”N 108 15’42”W	33.0965N 108.2617W
7	33 01’27”N 106 06’30”W	33.0242N 106.1083W
8	32 46’33”N 105 30’38”W	32.7757N 105.5105W
9	31 21’30”N 103 55’51”W	31.3584N 103.9309W
10	30 39’31”N 103 34’01”W	30.6587N 103.5670W
11	31 11’40”N 102 26’12”W	31.1945N 102.4368W
12	31 02’47”N 101 04’18”W	31.0465N 101.0717W
13	30 51’19”N 100 36’43”W	30.8553N 100.6120W
14	29 54’03”N 099 28’55”W	29.9007N 099.4820W
15	27 21’20”N 097 48’03”W	27.3556N 097.8009W
16	27 21’05”N 095 42’14”W	27.3516N 095.7038W
17	25 58’50”N 095 42’22”W	25.9805N 095.7061W
18	24 33’14”N 095 42’46”W	24.5539N 095.7128W
19	24 32’41”N 097 48’44”W	24.5448N 097.8122W
20	25 15’14”N 099 40’56”W	25.2539N 099.6823W
21	25 40’42”N 100 10’59”W	25.6782N 100.1833W
22	27 52’01”N 101 35’16”W	27.8669N 101.5877W
23	28 29’18”N 101 57’45”W	28.4884N 101.9625W
24	27 58’15”N 102 11’48”W	27.9709N 102.1967W
25	27 38’22”N 103 16’32”W	27.6394N 103.2755W
26	27 54’33”N 103 59’11”W	27.9093N 103.9863W
27	28 30’31”N 105 15’57”W	28.5085N 105.2659W
28	29 13’30”N 105 45’37”W	29.2249N 105.7604W
29	30 19’17”N 106 57’15”W	30.3215N 106.9544W
30	30 01’37”N 107 56’47”W	30.0271N 107.9464W
31	30 01’18”N 111 15’28”W	30.0216N 111.2579W
32	31 14’10”N 115 05’28”W	31.2361N 115.0911W
33	31 21’26”N 115 20’31”W	31.3572N 115.3419W
34	31 14’34”N 116 21’25”W	31.2427N 116.3570W
35	31 08’09”N 117 53’38”W	31.1359N 117.8939W

6 The "Table II" of the Appendix for the Sharing Zone, coordinate 1 expressed in Decimal Degrees has has an appreciable error. The coordinate expressed in Degrees, Minutes and Seconds (DMS) is correct. The DMS coordinate 32 14 16 is shown as Decimal Degrees 32.3772. The conversion to Decimal Degrees should read 32.2378. The Department of State is taking diplomatic action to correct this error.

APPENDIX III

Allotment of Frequency Sub-bands in the 406.1-420 MHz Band

Mexico Primary[7]	U.S. Primary[7]
406.10000 - 408.51875	408.51875 - 410.93125
410.93125 - 413.05000	413.05000 - 415.16875
415.16875 - 417.58125	417.58125 - 420.00000

3.9.9 Protocol 13 - Protocol Between the Department of State of the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States Concerning the Allotment And Use of the 138-144 MHz Band For Terrestrial Non-Broadcasting Radiocommunication Services Along the Common Border

This Protocol is being concluded pursuant to the Agreement Between the Government of the United States of America and the Government of the United Mexican States Concerning the Allocation and Use of Frequency Bands by Terrestrial Non-Broadcasting Radiocommunication Services Along the Common Border signed at Williamsburg, Virginia June 16, 1994, (herein referred to as the "Agreement").

ARTICLE I.

Purposes

1. The purposes of this Protocol are:

a. To establish and adopt a plan for the equitable allotment and use by the two Administrations of frequency sub-bands in the 138-144 MHz band within the Sharing Zone defined in this Protocol;

b. To establish technical criteria to regulate the use of the frequency sub-bands referred to in paragraph 1 of this Article for existing stations as well as for newly assigned stations; and

c. To establish conditions of use so that each Administration may use the frequency sub-bands allotted for primary use of the other country for fixed and mobile services, provided this causes no harmful interference.

ARTICLE II.

Designation of Administrations and Definitions

1. The National Telecommunications and Information Administration of the Department of Commerce of the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States are hereby designated the Administrations responsible for the implementation of this Protocol for the United States of America (hereinafter "United States") and the United Mexican States (hereinafter "Mexico"), respectively, as provided for in Article IV of the Agreement.

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[7] All Frequencies are in MHz.

2. The Sharing Zone is defined to include the border area within the United States and Mexico and their respective territorial waters as set forth in Appendix I.

ARTICLE III.

Supersession

1. Upon entry into force, this Protocol supersedes the provisions of the Memorandum of Understanding (MOU) Between the Department of Agriculture Forest Service and the Federal Communications Commission of the United States of America and the Secretaría de Comunicaciones y Transportes of the United Mexican States for the Use of Radio-Frequencies, Coordination and Cooperation for Emergency Purposes, signed at Washington and Mexico City December 9, 1998 to the extent that the MOU's provisions pertain to the two frequencies 139.150 MHz and 142.725 MHz.

2. Upon entry into force, this Protocol also supersedes, in its entirety, the Protocol Between the Department of State of the United States of America and the Secretariat of Communications and Transportation of the United Mexican States Concerning the Allotment and Use of the 138-144 MHz Band for Terrestrial Non-Broadcasting Radiocommunication Services along the Common Border, which Protocol was concluded on an interim basis and was signed at Washington July 17, 2006.

ARTICLE IV.

Conditions of Use

1. Within the Sharing Zone, the frequency sub-bands in the 138-144 MHz band shall be allotted for the primary use of each Administration in accordance with Appendix II. Each Administration shall ensure that stations within its national territory in the 138-144 MHz band are assigned and operated in such a way that the transmissions of those stations shall not exceed the primary frequency allotments in Appendix II.

2. Each Administration shall ensure that fixed and mobile stations assigned to primary frequency allotments within the Sharing Zone shall be operated in accordance with the equivalent isotropically radiated power (EIRP) and antenna height limitations specified in the following table:

Table I		
Average of the Antenna Height Above Average Terrain on Standard Radials in the Direction of the Common Border[8]	Maximum EIRP in Any Direction Toward the Common Border	
Meters	Watts	dBm
Up to 150	500	+56.98
Above 150 to 225	350	+55.44
Above 225 to 300	250	+53.98
Above 300 to 450	200	+53.01
Above 450 to 600	150	+51.76
Above 600 to 750	100	+50.00
Above 750 to 900	75	+48.75
Above 900 to 1,050	50	+46.98
Above 1,050	30	+44.77

[8] Standard radials are 000°, 045°, 090°, 135°, 180°, 225°, 270° and 315° relative to True North.

Existing stations in primary frequency allotments shall conform to the above power limitations on or before January 1, 2011. New assignments shall conform to these limitations beginning on the date of entry into force of this Protocol.

3. Each Administration shall ensure that its stations on aircraft only operate with a maximum EIRP of 10.0 watts, only operate in the primary frequency allotments for that Administration and only operate at an altitude of less than 3,500 feet (1067 meters) above average terrain. Each Administration shall take measures to eliminate any harmful interference caused by its aircraft stations to stations operating on primary allotments or beyond the Sharing Zone in the other country.

4. Frequencies in sub-bands that are allotted for the primary use of one Administration may be assigned by the other Administration to stations located within the latter Administration's territorial segment of the Sharing Zone only in accordance with the following conditions:

a. The maximum power flux density (PFD) at any point at or beyond the common border shall not exceed -143 dBW/m^2.

b. Land mobile stations and ship stations shall not be operated within 30 kilometers of the common border, and in addition to this distance separation, the PFD of transmissions from land mobile stations and ship stations shall, in no case, exceed -143dBW/m^2 at any point at or beyond the common border.

c. Land portable stations shall not be operated within 10 kilometers of the common border, and in addition to this distance separation, the PFD of transmissions from portable stations shall, in no case, exceed -143 dBW/m^2 at any point at or beyond the common border.

d. New assignments in sub-bands that are allotted for the primary use of one Administration may not be made by the other Administration until January 1, 2011.

e. Each Administration shall take proper measures to eliminate harmful interference in order to ensure protection to stations that are operating on radio frequencies in primary allotments of the other Administration in accord with this Protocol.

f. Stations operating in accordance with the conditions set forth in paragraph 4 of this Article shall be considered as secondary and shall not be granted protection against harmful interference from stations whose Administration has primary use of the frequency allotment.

5. Beyond the Sharing Zone, the Administrations' use of the 138-144 MHz band shall in no way be restricted by this Protocol.

ARTICLE V.

Transition Arrangement for Existing Stations

1. Each Administration shall ensure that existing stations within the Sharing Zone that are operating in primary frequency sub-bands allotted to the other Administration shall either cease transmissions or assume secondary status on or before January 1, 2011, in accordance with either paragraph 2 or 3 below.

2. Existing stations in the following categories, which are operating in primary frequency allotments of the other Administration, shall cease operation on or before January 1, 2011:

a. Stations at fixed locations that do not meet the PFD limitation set forth in subparagraph 4.a of Article IV of this Protocol;

b. Land mobile stations, ship stations and land portable stations that are located in the areas set forth in subparagraphs 4.b and 4.c of Article IV of this Protocol; and

c. Aircraft stations located in the Sharing Zone defined in Appendix I to this Protocol.

3. Existing stations that are able to assume secondary status as provided in paragraph 1 of this Article shall conform to the provisions of subparagraphs 4.e and 4.f of Article IV of this Protocol.

ARTICLE VI.

Relation to the Agreement

This Protocol forms an integral part of the Agreement and shall be referred to as Protocol 16, "Protocol Between the Department of State of the United States of America and the Secretariat of Communications and Transportation of the United Mexican States Concerning the Allotment and Use of the 138-144 MHz Band for Terrestrial Non-Broadcasting Radiocommunication Services Along the Common Border," in the Index of Annex I of the Agreement.

ARTICLE VII.

Appendices

Appendices I and II are integral parts of this Protocol.

ARTICLE VIII.

Entry into Force and Termination

This Protocol shall enter into force on the date of signature, and shall remain in force until it is replaced by a new Protocol, or until it is terminated in accordance with Article VII of the Agreement.

IN WITNESS WHEREOF, the respective representatives have signed the present Protocol.

Done at Mexico City this third day of August, 2007, in duplicate, in the English and Spanish languages, both texts being equally authentic.

FOR THE DEPARTMENT OF STATE OF THE UNITED STATES OF AMERICA

/s/ David A. Gross

Amb. David A. Gross
U.S. Coordinator for International Communications and Information Policy

FOR THE SECRETARIAT OF COMMUNICATIONS AND TRANSPORTATION OF THE UNITED MEXICAN STATES

/s/ Rafael del Villar Alrich

Dr. Rafael del Villar Alrich
Under Secretary of Communications

/s/ Hector G. Osuna Jaime

Arq. Héctor G. Osuna Jaime
Chairman, Federal Telecommunications Commission

APPENDIX I
Areas Within Which the Frequencies Are to Be Protected

U.S. - MEXICO SHARING ZONE

The Sharing Zone is defined as the areas covered by a distance of 145 kilometers (90.1 miles) from the U.S.-Mexico common border into the national territory of each country and includes areas of the Pacific Ocean and the Gulf of Mexico.

These areas are enclosed by the boundaries shown on the map below and are further defined in Table II.

Table II

The following geographic coordinates define the U.S.-Mexico Sharing Zone in the national territory of each country. Point 1 is located in the Pacific Ocean due west from the U.S.-Mexico common border and is the starting point in defining the Sharing Zone. The boundary of the Sharing Zone is then defined by plotting each geographic point in advancing numerical order in a clockwise direction. Each distance path between consecutive points is traversed by great circle arc.

No.	Degrees/Minutes/Seconds	Decimal Degrees
1	32 14’16”N 118°37’09”W	32.2378N 118.6192W
2	33 44’18”N 119°58’13”W	33.7384N 119.9704W
3	34 00’16”N 114°28’01”W	34.0044N 114.4670W
4	32 37’24”N 110°51’01”W	32.6234N 110.8505W
5	32 38’60”N 109°18’02”W	32.6500N 109.3006W
6	33 05’47”N 108°15’42”W	33.0965N 108.2617W
7	33 01’27”N 106°06’30”W	33.0242N 106.1083W
8	32 46’33”N 105°30’38”W	32.7757N 105.5105W
9	31 21’30”N 103°55’51”W	31.3584N 103.9309W
10	30 39’31”N 103°34’01”W	30.6587N 103.5670W
11	31 11’40”N 102°26’12”W	31.1945N 102.4368W
12	31 02’47”N 101°04’18”W	31.0465N 101.0717W
13	30 51’19”N 100°36’43”W	30.8553N 100.6120W
14	29 54’03”N 099°28’55”W	29.9007N 099.4820W
15	27 21’20”N 097°48’03”W	27.3556N 097.8009W
16	27 21’05”N 095°42’14”W	27.3516N 095.7038W
17	25 58’50”N 095°42’22”W	25.9805N 095.7061W
18	24 33’14”N 095°42’46”W	24.5539N 095.7128W
19	24 32’41”N 097°48’44”W	24.5448N 097.8122W
20	25 15’14”N 099°40’56”W	25.2539N 099.6823W
21	25 40’42”N 100°10’59”W	25.6782N 100.1833W
22	27 52’01”N 101°35’16”W	27.8669N 101.5877W
23	28 29’18”N 101°57’45”W	28.4884N 101.9625W
24	27 58’15”N 102°11’48”W	27.9709N 102.1967W
25	27 38’22”N 103°16’32”W	27.6394N 103.2755W
26	27 54’33”N 103°59’11”W	27.9093N 103.9863W
27	28 30’31”N 105°15’57”W	28.5085N 105.2659W
28	29 13’30”N 105°45’37”W	29.2249N 105.7604W
29	30 19’17”N 106°57’15”W	30.3215N 106.9544W
30	30 01’37”N 107°56’47”W	30.0271N 107.9464W
31	30 01’18”N 111°15’28”W	30.0216N 111.2579W
32	31 14’10”N 115°05’28”W	31.2361N 115.0911W
33	31 21’26”N 115°20’31”W	31.3572N 115.3419W
34	31 14’34”N 116°21’25”W	31.2427N 116.3570W
35	31 08’09”N 117°53’38”W	31.1359N 117.8939W

APPENDIX II

Allotment of Frequency Sub-bands in the 138-144 MHz Band

Mexico Primary *	U.S. Primary *
138.0 - 139.0	139.0 - 140.0
140.0 - 141.0	141.0 - 142.0
142.0 - 143.0	143.0 - 144.0

* All frequencies in MHz

3.9.10 Administrative Arrangement Between the United States of America and the United Mexican States Concerning Frequencies Used by the International Boundary and Water Commission

(Signed Queretaro, Mexico, August 11, 1992)

In accordance with the provisions of Article **7** of the Radio Regulations, considered annexed to the International Telecommunications Convention, Nairobi, 1982, the United States of America and the United Mexican States, the Parties, in recognition of the need to protect from harmful interference certain radio frequencies that are used by the United States and Mexican Sections of the International Boundary and Water Commission, have reached an understanding as set forth in the following:

ARTICLE I.

Purposes

The purposes of this Administrative Arrangement are:

1. To establish and to protect from harmful interference the radio frequencies used by the United States and Mexican Sections of the International Boundary and Water Commission in administering existing treaties on the subject.
2. To establish that the United States and Mexican Sections of the International Boundary and Water Commission can communicate with each other on their own or each other's radio frequencies set forth in this arrangement.

ARTICLE II.

Frequencies to be Protected

The frequencies used along the United States/Mexico Border by the United States and Mexican Sections of the International Boundary and Water Commission vary from location to location along the border. The frequencies to be used on a shared basis by both Sections of the Commission for land mobile systems are as follows:

In the Border Area East of 101 West

162.025/162.175 MHz -- Repeater transmit, base station/mobile receive only.
164.175 MHz -- Repeater receive, base station/mobile transmit only.

In the Border Area Between 101 and 103 West

162.025 MHz -- Repeater transmit, mobile receive only.
164.175 MHz -- Repeater receive, mobile transmit only.

In the Border Area Between 104 and 110 West

172.475 MHz -- Repeater receive, base/gage station/mobile transmit only.
173.175 MHz -- Repeater/base station/mobile transmit, base station/mobile receive, gage station receive only.

In the Border Area Between 113 50' and 115 15' West

164.475 MHz -- Base station/mobile transmit and receive (Simplex channel).
168.575 MHz -- Repeater receive, base station/mobile transmit only.
172.775 MHz -- Repeater/base station/mobile transmit, base station/mobile receive.

In the Border Area Within 50 km of 32 33' North and 117 02' West

164.475 MHz -- Base station/mobile transmit and receive (Simplex system).
172.475 MHz -- Mobile only transmit and receive.

The frequencies for the exclusive use of the United States Section for hydrological systems and for data collection etc., and that must be protected from harmful interference, are as follows:

In the Border Area East of 101 West

172.4/173.9625 MHz -- Backbone control of repeaters.
169.425 MHz -- Gage stations transmit, repeater/data collection center receive.
173.175 MHz -- Repeater transmit, gage stations receive.

In the Border Area Between 101 and 103 West

169.525 MHz -- Gage stations/data collection center transmit, repeater receive.
171.925 MHz -- Repeater transmit, gage stations/data collection center receive.

The frequencies for the exclusive use of the Mexican Section of the Commission that must be protected from harmful interference are as set forth below:

In the Border Area East of 101 West

171.850 MHz -- Systems of voice and data transmission
172.600 MHz -- Systems of voice and data transmission

In the Border Area Between 101 and 103 West

171.825 MHz -- Systems of voice and data transmission
172.625 MHz -- Systems of voice and data transmission

ARTICLE III.

Technical Parameters of Equipment Associated with the Assignments to be Protected

The technical parameters of the equipment associated with the radio frequency assignments to be protected by this Administrative Arrangement are set forth in Annex I.

ARTICLE IV.

Areas Within which the Frequencies are to be Protected

The areas within which both Administrations will protect the frequencies lie between the following two lines and the common border between the United States and Mexico:

> The United States line begins at Point Estero on the coast of California at 35 30'N, 121 W running by great circle arc to the intersection of 34 N, 114 W, thence by great circle arc to the intersection of 33 N, 112 W, thence along the parallel 33 N to the intersection of 106 W, thence by great circle arc to the intersection of 31 30'N, 104 W, thence by great circle arc to the intersection of 31 N, 100 W, thence by great circle arc to the intersection of 29 N, 99 W, thence by great circle arc to the intersection of 27 10'N and the Padre Island - Gulf of Mexico shore at 97 23'W, at which point it terminates.
>
> The Mexican line begins at the Pacific Ocean of Baja California, thence along parallel 31 20'N to the Gulf of California, thence by great circle arc to the intersection of 30 10'N, 111 W, thence along parallel 30 10'N to the intersection of 107 W, thence by great circle arc to the intersection of 27 30'N, 104 W, thence by great circle arc to the intersection of 28 N, 102 W, thence by great circle arc to the intersection of 24 40'N, 100 W, thence along parallel 24 40'N to the Gulf of Mexico, at which point it terminates.

The above-mentioned areas are those designated in Annex II to this Arrangement.

As stated in Article II above, not all the frequencies to be protected require protection along the entire border, but, rather, within the interference range of the individual stations.

ARTICLE V.

Protection to be provided

In recognition of the fact that both Parties have already made a considerable number of frequency assignments in the frequency bands that are used by stations of the International Boundary and Water Commission, both Parties will provide one another with an initial listing of all existing assignments on the frequencies to be protected by this Arrangement and, before issuing a frequency authorization for any new or modified frequency assignment on the frequencies used by the other Party, coordinate and request the concurrence of the other Party.

ARTICLE VI.

Period of Effect of the Administrative Arrangement and Amendments

This Administrative Arrangement shall enter into force on its date of signature and may be amended by mutual consent of the Parties.

ARTICLE VII.

Termination of the Administrative Arrangement

This Administrative Arrangement may be terminated by mutual agreement of the Parties or by either Party upon six month notice in writing by one of the Parties.

ANNEX I

Technical Data for International Boundary & Water Commission, United States Section, VHF Radio Equipment

Transmitter:

Channel spacing: 25 kHz

Frequency separation between transmitter and receiver (repeater operation):
0.5 MHz minimum with duplexer

Power output:
Base and/or repeater stations -- 15 to 100 watts
Mobiles -- 15 to 110 watts
Handie-talkies -- 5 watts

Modulation: 16KF3E +/- 5 kHz for 100% at 1000 Hz

Oscillator frequency stability: 0.0005% from -30C to +60C ambient.

Frequency tolerance:
Fixed/Mobile -- 5 ppm
Handie-talkie -- 25 ppm

Transmitter sideband noise:
-90 dB @ +/- 30 kHz
-105 dB @ +/- 1 MHz

Spurious & harmonics: more than 85 dB below carrier

Receiver:

Oscillator frequency stability: 0.0005% from -30C to +60C ambient

Sensitivity:
20 dB Quieting -- 0.5 *u*V
EIA Sinad -- 0.35 *u*V
Selectivity (EIA Sinad): -90 dB
Intermediation (EIA Sinad): -80 dB
Spurious & image rejection: 100 dB minimum
Squelch sensitivity: 0.2 *u*V or less

General:

Type of antenna:
Fixed system --
0 to 6 dB omnidirectional
8 to 10 dB directional
Antenna polarization: Vertical
Hours: 24 hours (continuous)

Technical Data for International Boundary & Water Commission, Mexican Section, VHF Radio Equipment

Channel spacing: 25 kHz
Transmitter and receiver frequency separation, duplex system: from 600 kHz to 4.5 MHz

Maximum power output:

Repeater	100 watts
Base	60 watts
Mobile	45 watts
Handie-Talkies	5 watts
Necessary bandwidth:	16 kHz
Emission designator:	16KF3E

Maximum deviation for 100% modulation with 1000 Hz +/- 5 kHz
Type of antenna: directional or omnidirectional
Polarization: horizontal or vertical
Hours: 24 hours
-105 dB, +/- 1 kHz
Spurious and harmonics: more than 85 dB below carrier

Receiver:

Oscillator frequency stability: 0.0005% from -30C to +60C
Sensitivity: 20 dB Quieting: 0.5 *u*V
EIA Sinad: 0.35 uV
Selectivity (EIA Sinad): -90 dB
Intermodulation (EIA Sinad): -80 dB

Transmitter:

Channel spacing: 25 kHz

Frequency separation between transmitter and receiver (repeater operation):
0.5 MHz minimum with duplexer

Power output:
Base and/or repeater stations -- 15 to 110 watts
Mobiles -- 15 to 110 watts
Handie-talkies -- 5 watts

Modulation: 16KF3E +/- 5 kHz for 100% at 1000 Hz

Oscillator frequency stability: 0.0005% from -30C to +60C

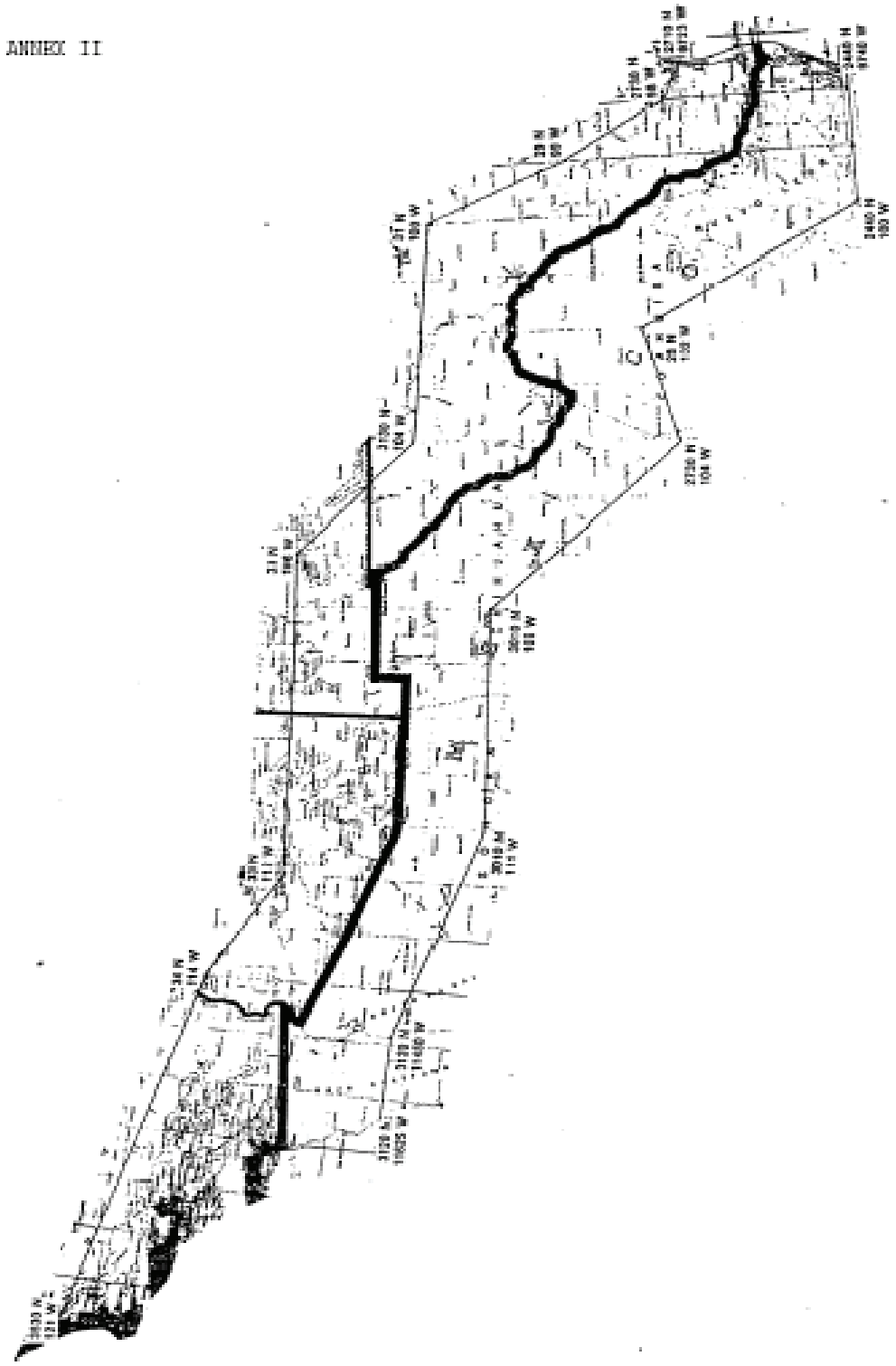
Frequency tolerance:
Fixed/Mobile -- 5 ppm
Handie-talkie -- 25 ppm

Transmitter sideband noise: -90 dB, +/- 30 kHz
Spurious and image rejection: 100 dB minimum
Squelch sensitivity: 0.2 uV or less

General:

Type of antenna:
Fixed system --
0 to 6 dB omnidirectional
8 to 10 dB directional
Antenna polarization: vertical
Hours of operation: 24 hours a day

MAP ANNEX II



3.9.11 U.S. and Mexican Special Purpose Operations

The United States and Mexico signed an administrative arrangement on July 2, 1991, concerning radio frequencies used for special purposes (IRAC Doc. 28470). In accordance with this agreement, the Department of the Homeland Security FAS Representative will notify to the Government Master File (GMF) the Mexican frequency uses.

3.9.12 Interference Resolution

Mexico and the United States have established a commission to effect informal coordination and interference resolution known as the U.S. – Mexico Joint Commission on Resolution of Radio Interference. This commission is also referred to as the "Joint Commission" or "CMERAR" based on its Spanish acronym. The primary purpose of the "Joint Commission" is to resolve interference between U.S. and Mexican users. (Procedures for reporting harmful interference are shown in Section 8.2.30.) The resolution of an interference situation may require either the U.S. user or the Mexican user to change frequency. In order to avoid interference to the same operations in the future, protection shall be afforded both operations.

In the United States, the affected U.S. Federal agency FAS Representative shall prepare and submit to the FAS[9] for review and approval the Mexican use if both Administrations agree that Mexico is to remain on the frequency. If the Mexican user is to change frequency, the U.S. Federal agency FAS Representative shall prepare and submit to the FAS for review and approval the proposed Mexican frequency. Until the proposed frequency is approved by the FAS it shall not be proposed to the Mexican user, or agreed to between any U.S. agency and Mexican authorities. In the case where the U.S. agency is proposing a replacement frequency, this is to be done prior to proposing the frequency to Mexico. In the case where the Mexicans are proposing the frequency, this is to be done **prior** to agreeing to their proposal.

The Mexican applications will appear on the daily FAS agendas for review. The Mexican application shall bear a "Mexican" serial number. "Mexican" serial numbers are obtained from the FAS.

3.9.13 U.S. and Mexico Shared Radio Frequencies and Equipment for Firefighting, Certain Other Emergency, and Disaster Relief Operations

MEMORANDUM OF UNDERSTANDING BETWEEN THE DEPARTMENT OF AGRICULTURE FOREST SERVICE AND THE FEDERAL COMMUNICATIONS COMMISSION OF THE UNITED STATES OF AMERICA AND THE SECRETARÍA DE COMUNICACIONES Y TRANSPORTES OF THE UNITED MEXICAN STATES FOR THE USE OF RADIO-FREQUENCIES, COORDINATION AND COOPERATION FOR EMERGENCY PURPOSES

The Department of Agriculture (USDA) Forest Service and the Federal Communications Commission (FCC) of the United States of America and the Secretaría de Comunicaciones y Transportes (SCT) of the United Mexican States, hereinafter referred to as the Parties;

CONSIDERING the provisions of Article **7** of the Radio Regulations considered annexed to the International Telecommunications Constitution (Geneva, 1992);

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[9] The FAS was delegated authority to address the issues in Section 3.9.12 by the IRAC.

RECOGNIZING the need to establish shared radio frequencies and radio equipment for firefighting, and certain other emergency, and disaster relief operations,

Have agreed as follows:

ARTICLE I

Purposes

The purposes of this Memorandum of Understanding (hereinafter MOU) are:

1. To establish procedures for coordinating and cooperating on firefighting, and certain other emergency and disaster relief operations.
2. To identify the Departments and/or agencies that shall cooperate in the sharing of radio equipment to support firefighting, and certain other emergency and disaster relief operations.
3. To establish, and to protect from harmful interference, the radio frequencies to be used by the Parties on a shared basis (hereinafter, emergency frequencies) to support firefighting, and certain other emergency and disaster relief operations.
4. To establish that each Party may use the emergency frequencies in the areas of the common border for the purposes established in this MOU. Within the United States, in the area defined in Annex I, Section II, paragraph 1, the emergency frequencies will be used to support firefighting, and certain other emergency and disaster relief operations that require radio equipment from the National Interagency Fire Center (NIFC). Within Mexico, in the area defined in Annex I, Section II, paragraph 1, the emergency frequencies will be used to support firefighting, and certain other emergency and disaster relief operations.

ARTICLE II

Other Participating Departments and/or Agencies

1. On behalf of the United States, the other participating Department and/or agency in this MOU is the Department of the Interior, acting through the Bureau of Land Management. The National Interagency Fire Center (NIFC), a joint operation of several United States government agencies, including the USDA Forest Service and the Bureau of Land Management, will administer the program of cooperation involving the shared use of radio equipment detailed in Article III of this MOU.
2. On behalf of Mexico, the other participating Departments and/or agencies in this MOU are: the Comisión Federal de Telecomunicaciones (CFT), the Secretaría del Medio Ambiente, Recursos Naturales y Pesca (SEMARNAP), acting through the Dirección General of Forestal, and the Secretaría de Gobernación (SEGOB), acting through the Dirección General de Protección Civil.

ARTICLE III

Shared Use of Radio Equipment

1. The participating Departments and/or agencies in Mexico may request and receive radio equipment provided by NIFC.

2. Requests for radio equipment may be made by written communications or through rapid communication methods between the participating Departments and/or agencies. If the request is not made in writing, it shall be confirmed in writing as soon as possible after the request. Written requests will shall provide an itemization of equipment needed, together with a commitment to make reimbursement in accordance with Annex III of this MOU. Each such request shall be signed by an authorized official as designated in Annex III, Section II.

3. The receiving Departments and/or agencies in Mexico shall reimburse the NIFC in accordance with Annex III, Section II, Letter (D) for any loss, damage, or expense incurred in the operation of the equipment subject to this MOU. Receiving Departments and/or agencies in Mexico shall also reimburse the NIFC for the cost of all expendable materials and transportation. The reimbursement shall be made within one hundred and twenty days after the receipt by the requesting/receiving Department and/or agency of an itemized statement of such costs.

4. Upon signature of this MOU and during the first trimester of each year, the participating Departments and/or agencies shall exchange the names of officials designated to request or provide services under this MOU as part of the establishment of annual operational guidelines (see Annex III for the Operational Guidelines for 1998) for implementation of this MOU. In accordance with the cooperative nature of this MOU, it is permissible and desirable for the participating Departments and/or agencies to exchange recommendations and suggestions designed to render more effective the operational procedures to be followed in requesting assistance and reimbursing expenses.

5. The technical parameters of the radio equipment available for use pursuant to this MOU are set forth in Annex IV. This Annex may be modified or otherwise updated when the operational guidelines are established each year.

ARTICLE IV

Frequency Use and Protection

In accordance with Annex I, the Parties shall protect from harmful interference the emergency frequencies programmed in the radio equipment used by both Parties on a shared basis to support firefighting, and certain other emergency and disaster relief operations.

ARTICLE V

Settlement of Disputes

1. Nothing in this MOU shall be construed as affecting any existing cooperative arrangements for firefighting or other emergency or disaster relief operations.

2. Any disagreement regarding the application and interpretation of this MOU shall be resolved by agreement between the two parties.

Article VI

General Provisions

1. Nothing in this MOU shall be construed as obligating the Parties to make expenditures or enter into obligations, contractual or otherwise, for the payment of money in excess of appropriations authorized by law and allocated for firefighting or certain other emergency or disaster relief operations.

2. Except for costs set forth in Article III, paragraph 3 of this MOU, neither Party, nor its officials or employees shall be liable on account of any act or omission in consequence of performance of or intended performance of this MOU.

ARTICLE VII

Entry Into Force and Amendments

This MOU shall enter into force upon signature by both Parties and may be amended by mutual agreement of the Parties. Amendments shall enter into force on a date specified by the Parties through an exchange of written modification.

ARTICLE VIII

Termination of the Memorandum

This MOU may be terminated by mutual agreement of the Parties; by its replacement by another bilateral instrument; or by a written notice of termination from either Party. Such notice of termination shall enter into force six months after its is received.

Done in Washington, this ninth day of the month of December of the year nineteen hundred and ninety eight, and in Mexico City, this ninth day of the month of December of the year nineteen hundred and ninety eight, in duplicate, in the English and Spanish languages, both texts being equally authentic.

FOR THE DEPARTMENT OF AGRICULTURE FOREST SERVICE OF THE UNITED STATES OF AMERICA:

Clyde Thompson
Deputy Chief for Business Operations

FOR THE SECRETARÍA DE COMUNICACIONES Y TRANSPORTES OF THE UNITED MEXICAN STATES:

Jorge Nicoln Fischer
Undersecretary for Communications

FOR THE FEDERAL COMMUNICATIONS COMMISSION OF THE UNITED STATES OF AMERICA:

William E. Kennard
Chairman

Javier Lozano Alarcón
Chairman of the Comisión Federal De Telecomunicaciones

ANNEX I

FREQUENCY USE AND PROTECTION

This Annex establishes the areas for use and procedures for protection of the emergency frequencies in the radio equipment used by both Parties for firefighting, and certain other emergency and disaster relief operations.

I. Frequencies to be Protected

1. The following emergency frequencies (in MHz) shall be protected from harmful interference within the border area, in accordance with Section III of this Annex:

166.6125	166.675	167.100	167.950	142.725[10]
168.075	168.100	168.400	168.475	
168.550	168.625	168.700	169.150	
169.200	169.750	170.000	170.425	
170.450	170.975	173.8125	139.150[10]	

2. The following additional emergency frequencies (in MHz) are used for firefighting operations and shall be protected from harmful interference, in accordance with Section III of this Annex, within the border area described in Section II west of 114 degrees West:

151.190	151.280	151.295	151.310
159.225			

II. Areas Within Which the Frequencies Are To Be Protected

1. The border areas within which both Parties shall protect the emergency frequencies referred to in Section I lie between the following two lines and the common border between the United States and Mexico:

The United States' line begins at Point Estero on the coast of California at 35 30 N, 121 00 W, running by great circle arc to the intersection of 34 N, 114 W, thence by great circle arc to the intersection of 33 N, 112 W, thence along parallel 33 N to the intersection of 106 W,thence by great circle arc to the intersection of 31 30 N, 104 W, thence by great circle arc to the intersection of 31 N, 100 W, thence by great circle arc to the intersection of 29 N, 99 W, thence by great circle arc to the interection of 27 30 N, 98 W, and thence by great circle arc to the intersection of 27 10 N, and the Padre Island - Gulf of Mexico shore at 97 23 W, at which point it terminates.

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[10] Note suppression for this frequency in the Interim Protocol for the 138-144 MHz band.

The Mexican line begins at the Pacific Coast of Baja California, running along parallel 31 20 N to the Gulf of California, thence by great circle arc to the intersection of 30 10 N, 111 W, thence along parallel 30 10 N to the intersection of 107 W, thence by great circle arc to the intersection of 27 30 N, 104 W, thence by great circle arc to the intersection of 28 N, 102 W, thence by great circle arc to the intersection of 24 40 N, 100 W, thence along parallel 24 40 N to the Gulf of Mexico, at which point it terminates.

The areas described above are outlined on the attached map, Annex II.

2. Recognizing the fact that radios may be used outside these areas for emergency purposes, both Parties are encouraged to minimize use of the frequencies for other than these purposes.

III. Protection to be provided

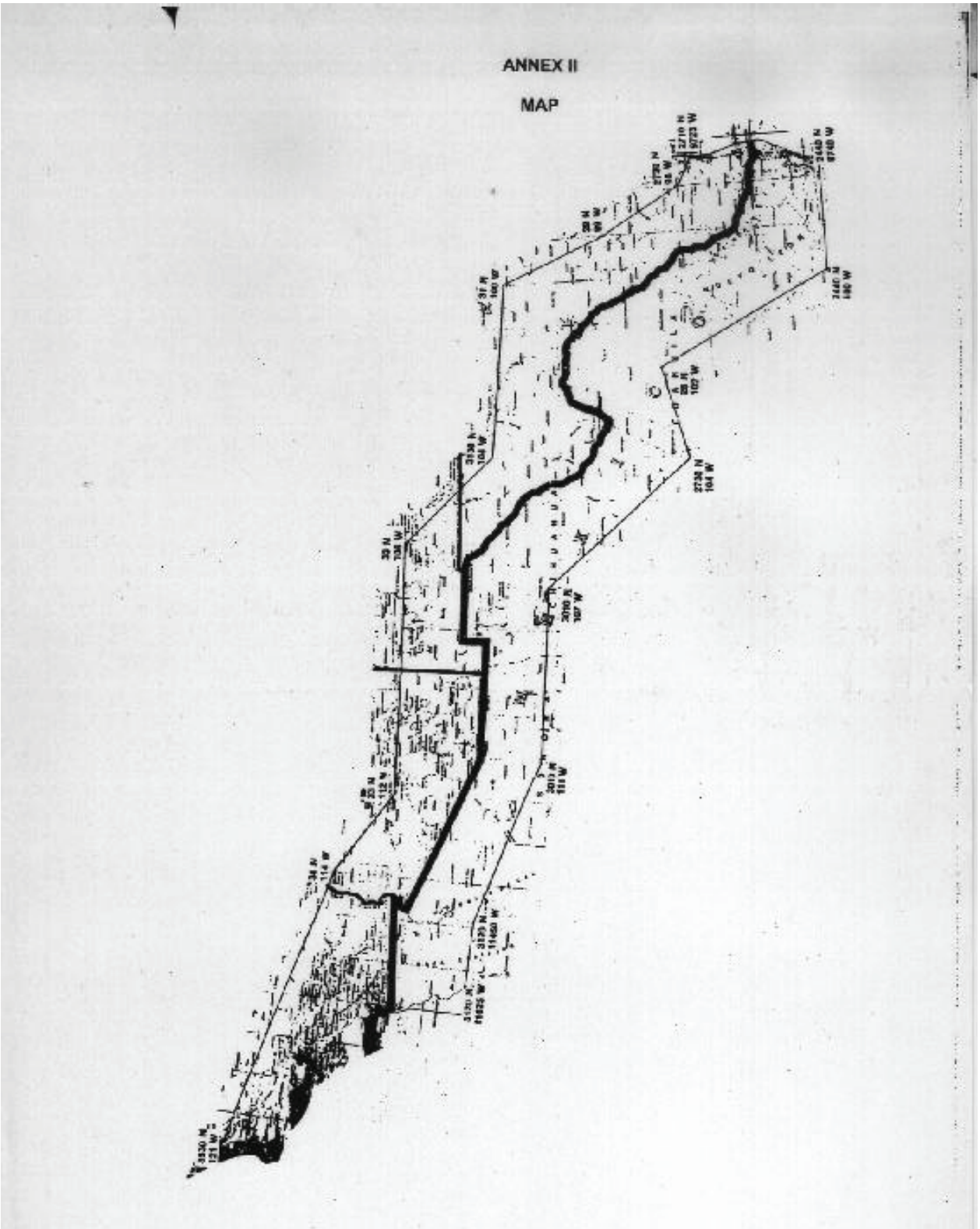
1. The use of emergency frequencies listed in Section I, shall be protected from harmful interference by both Parties as follows:

l.1. In recognition of the fact that there are already a considerable number of assignments on the frequencies designated herein as emergency frequencies, each Party shall provide the other with a listing of all existing assignments on the frequencies to be protected by this MOU until they can be moved to other frequencies. Upon entry into force of this MOU, the Parties agree not to authorize use of these frequencies for any purpose inconsistent with this MOU. Furthermore, if, in the course of firefighting or certain other emergency or disaster relief operations, a Party finds that there is harmful interference on an emergency frequency, it may ask the other Party to turn off the transmitter responsible for the interference or modify its operational parameters in order to resolve the interference problem for the duration of the emergency. The Party receiving such a request will comply with it as quickly as possible.

1.2. In the United States, within the border area described in Section II, paragraph 1 of this Annex, use of emergency frequencies listed in Section I, paragraph 1 shall be coordinated with the U.S. National Interagency Fire Center prior to each use, and use of emergency frequencies listed in Section I, paragraph 2 shall be coordinated with the FCC, San Diego Office. Use of emergency frequencies in Mexico shall be coordinated with the Secretaríaó de Comunicaciones y Transportes acting through the Comisión Federal de Telecomunicaciones, prior to each use within the border area described in Section II, paragraph 1 of this Annex.

1.3. Each year, during the first trimester, the United States-Mexico Mixed Commission Charged with Resolving Cases of Radio Interference shall undertake monitoring and coordination activities in order to ensure that, in accordance with paragraph 1.1 above, any unauthorized stations using emergency frequencies are closed down before the peak firefighting season begins.

ANNEX II
MAP



ANNEX III

OPERATIONAL GUIDELINES FOR 1998

ANNEX IV

NATIONAL INCIDENT RADIO SUPPORT CACHE

USER'S GUIDE

1998

Note: Annex III does not apply to spectrum mangagement and has not been included in this manual. Annex IV refers to a Users Guide which is updated annually and is maintained by the U.S. Forest Service, National Interagency Incident Communications Division (NIICD). If you require further information concerning these Annexes contact:

DEPARTMENT OF AGRICULTURE

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Chapter 4
Allocations, Allotments and Plans

4.1 FREQUENCY ALLOCATIONS

4.1.1 ITU Table of Frequency Allocations ITU Table of Frequency Allocations

The ITU Table of Frequency Allocations is that table contained in Article **5** of the ITU Radio Regulations, 2008 Edition.

4.1.2 National Table of Frequency Allocations

The National Table of Frequency Allocations is comprised of Federal and non-Federal Tables of Frequency Allocations. The National Table indicates the normal national frequency allocation planning and the degree of conformity with the ITU Table. When required in the national interest and consistent with national rights, as well as obligations undertaken by the United States to other countries that may be affected, additional uses of frequencies in any band may be authorized to meet service needs other than those provided for in the National Table.

Specific exceptions to the National Table of Frequency Allocations are as follows:

A Federal frequency assignment may be authorized in a band allocated exclusively for non-Federal use, as an exception, provided a) the assignment is coordinated with the FCC and b) no harmful interference will be caused to the service rendered by non-Federal stations, present or future.

A non-Federal frequency assignment may be authorized in a band allocated exclusively for Federal use, as an exception, provided a) the assignment is coordinated with the IRAC and b) no harmful interference will be caused to the service rendered by Federal stations, present or future.

In the case of bands shared by Federal and non-Federal services, frequency assignments therein shall be subject to coordination between the NTIA (via IRAC) and the FCC and no priority is recognized unless the terms of such priority are specifically defined in the National Table of Frequency Allocations or unless they are subject to mutually agreed arrangements in specific cases.

4.1.3 Federal Table of Frequency Allocations

The Federal Table of Frequency Allocations shall be used as a guide in the assignment of radio frequencies to Federal radio stations in the United States and Possessions. Exceptions to the Table may be made by the IRAC after careful consideration to avoid harmful interference and to ensure compliance with the ITU Radio Regulations.

For the use of frequencies by Federal radio stations outside the United States and Possessions, Federal agencies shall be guided insofar as practicable by the ITU Table of Frequency Allocations and, where applicable, by the authority of the host government. Maximum practicable effort should be made to avoid the possibility of harmful interference to other authorized U.S. operations. If harmful interference is considered likely, it is incumbent upon the agency conducting the operation to coordinate with other U.S. Flag users, as provided for in Section 8.3.11.

Application of the Federal Table is subject to the recognition that:

below 25000 kHz the Table is only applicable in the assignment of frequencies after September 5, 1961;

under Article **48** of the International Telecommunication Constitution, administrations "retain their entire freedom with regard to military radio installations of their army, naval and air forces"; and under No. **4.4** of the ITU Radio Regulations, administrations may assign frequencies in derogation of the ITU Table of Frequency Allocations "on the express condition that harmful interference shall not be caused to services carried on by stations operating in accordance with the provisions of the Convention and of these Regulations."

Some frequency assignments below 25000 kHz that were made before September 5, 1961, are not in conformity with the Federal Table of Frequency Allocations. Because of the exception mentioned in the first subparagraph above, the status of these assignments can be determined only on a case-by-case basis. With this exception, the rules pertaining to the relative status between radio services are as follows:

Station of a secondary services: are on a non-interference basis to the primary service:

(a) shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date;

(b) cannot claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or may be assigned at a later date;

(c) can claim protection, however, from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date.

Additional allocation - where a band is indicated in a footnote of the Table as "also allocated" to a service in an area smaller than a Region, or in a particular country. For example, an allocation which is added in this area or in this country to the service or services which are indicated in the Table.

Alternative allocation - where a band is indicated in a footnote of the Table as "allocated" to one or more services in an area smaller than a Region, or in a particular country. For example, an allocation which replaces, in this area or in this country, the allocation indicated in the Table.

Different category of service - where the allocation category (primary or secondary) of the service in the Table is changed. For example, the Table reflects the allocation as Fixed, Mobile and RADIOLOCATION, the category of these services are changed by the footnote to FIXED, MOBILE and Radiolocation.

An allocation or a footnote to the Federal Table of Frequency Allocations denoting relative status between radio services automatically applies to each assignment in the band to which the footnote or allocation pertains, unless at the time of a particular frequency assignment action a different provision is decided upon for the assignment concerned.

A priority note reflecting the same provisions as an allocation or an applicable footnote to the U.S. Federal Table of Frequency Allocations is redundant and shall not be applied to frequency assignments.

An assignment that is in conformity with the service allocation (as amplified by pertinent footnotes) for the band in which it is contained takes precedence over assignments therein that are not in conformity unless, at the time of the frequency assignment action, a different provision is decided upon.

Where in this Table a band is indicated as allocated to more than one service, such services are listed in the following order:

(a) services, the names of which are printed in all capital letters (example: FIXED); these services are called "primary" services;

(b) services, the names of which are printed in "normal characters" (example: Mobile); these are "secondary" services.

The international allocations are contained on the left side of the table, while the U.S. provisions are shown on the right side of the table. Three columns are contained under the U.S. portion of the table. Column 1 contains services allocated for use by Federal users. Column 2 provides services allocated for use by non-Federal users. Column 3 contains remarks. If all the allocations in Columns 1 and 2 are the same, these columns are shown merged.

Column 1 indicates the band limits for the Federal allocations including all "US" and "G" (retained from previously used terminology) footnotes considered to be applicable to the Federal users nationally. Where the allocated service is followed by a function in parentheses, e.g., SPACE (space-to-Earth), the allocation is limited to the function shown.

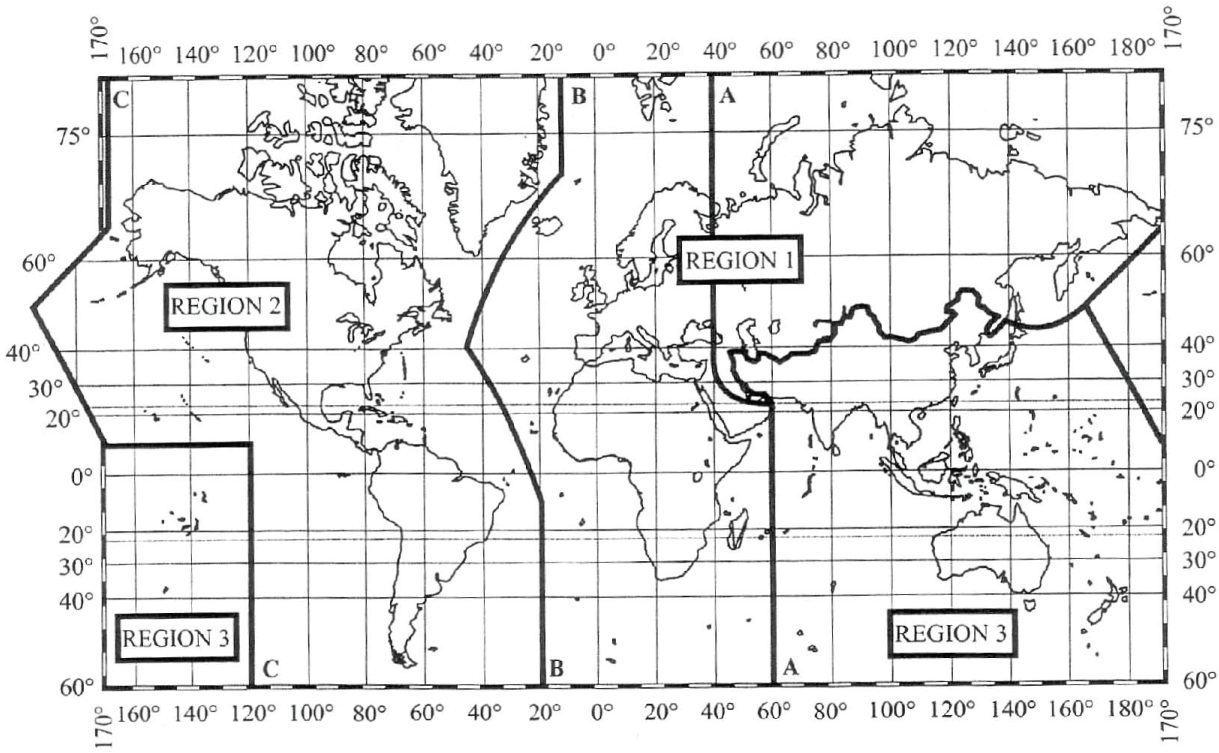
Column 2 indicates the band limits for the non-Federal allocations including all "US" footnotes, and certain "NG" footnotes as contained in Part 2 of the FCC Rules and Regulations. Where the allocated service is followed by a function in parentheses, e.g., SPACE (space-to-Earth), the allocation is limited to the function shown. This non-Federal (NG–retained from previously used terminology "Non-Government".) data has been included in the Federal table for information purposes only.

Column 3 contains such remarks as serve to amplify the Federal and non-Federal allocation or point out understanding between the FCC and NTIA in respect thereof. The numbers in parenthesis ( ) refer to the FCC Rule Part number. The international footnotes shown in the columns to the left of the double line are applicable only in the relationships between the United States and other countries. An international footnote is applicable to the U.S. Table of Allocations if the number also appears in Columns 1 and 2 of the U.S. Table.

The international footnote is then applicable to both Federal and non-Federal use. The text of the footnotes in this table are listed in numerical order at the end of the table, in sections headed International, United States (US), Non-Federal (NG) and Federal (G) footnotes.

Chart of Regions as Defined in the Table of Frequency Allocations

5.2 For the allocation of frequencies the world has been divided into three Regions as shown in the following map in Nos. **5.3** and **5.9**:



The shaded part represents the Tropical Zones as defined in Nos. **5.16** to **5.20** and **5.21**.

5-01

Table of Frequency Allocations			0-275 kHz (VLF/LF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
Below 9 (Not Allocated) 5.53 5.54			Below 9 (Not Allocated) 5.53 5.54		
9-14 RADIONAVIGATION			9-14 RADIONAVIGATION US18 US294		
14-19.95 FIXED MARITIME MOBILE 5.57 5.55 5.56			14-19.95 FIXED MARITIME MOBILE 5.57 US294	14-19.95 Fixed US294	
19.95-20.05 STANDARD FREQUENCY AND TIME SIGNAL (20 kHz)			19.95-20.05 STANDARD FREQUENCY AND TIME SIGNAL (20 kHz) US294		
20.05-70 FIXED MARITIME MOBILE 5.57 5.56 5.58			20.05-59 FIXED MARITIME MOBILE 5.57 US294	20.05-59 FIXED US294	
			59-61 STANDARD FREQUENCY AND TIME SIGNAL (60 kHz) US294		
			61-70 FIXED MARITIME MOBILE 5.57 US294	61-70 FIXED US294	
70-72 RADIONAVIGATION 5.60	70-90 FIXED MARITIME MOBILE 5.57 MARITIME RADIONAVIGATION 5.60 Radiolocation	70-72 RADIONAVIGATION 5.60 Fixed Maritime mobile 5.57 5.59	70-90 FIXED MARITIME MOBILE 5.57 Radiolocation	70-90 FIXED Radiolocation	Private Land Mobile (90)
72-84 FIXED MARITIME MOBILE 5.57 RADIONAVIGATION 5.60 5.56		72-84 FIXED MARITIME MOBILE 5.57 RADIONAVIGATION 5.60			
84-86 RADIONAVIGATION 5.60		84-86 RADIONAVIGATION 5.60 Fixed Maritime mobile 5.57 5.59			
86-90 FIXED MARITIME MOBILE 5.57 RADIONAVIGATION 5.56	5.61	86-90 FIXED MARITIME MOBILE 5.57 RADIONAVIGATION 5.60	US294	US294	

90-110 RADIONAVIGATION 5.62 Fixed 5.64			90-110 RADIONAVIGATION 5.62 US18 US104 US294		Aviation (87) Private Land Mobile (90)
110-112 FIXED MARITIME MOBILE RADIONAVIGATION 5.64	110-130 FIXED MARITIME MOBILE MARITIME RADIONAVIGATION 5.60 Radiolocation 5.61 5.64	110-112 FIXED MARITIME MOBILE RADIONAVIGATION 5.60 5.64	110-130 FIXED MARITIME MOBILE Radiolocation 5.64 US294		Maritime (80) Private Land Mobile (90)
112-115 RADIONAVIGATION 5.60		112-117.6 RADIONAVIGATION 5.60 Fixed Maritime mobile 5.64 5.65			
115-117.6 RADIONAVIGATION 5.60 Fixed Maritime mobile 5.64 5.66					
117.6-126 FIXED MARITIME MOBILE RADIONAVIGATION 5.60 5.64		117.6-126 FIXED MARITIME MOBILE RADIONAVIGATION 5.60 5.64			
126-129 RADIONAVIGATION 5.60		126-129 RADIONAVIGATION 5.60 Fixed Maritime mobile 5.64 5.65			
129-130 FIXED MARITIME MOBILE RADIONAVIGATION 5.60 5.64		129-130 FIXED MARITIME MOBILE RADIONAVIGATION 5.60 5.64			
130-148.5 FIXED MARITIME MOBILE 5.64 5.67	130-160 FIXED MARITIME MOBILE 5.64	130-160 FIXED MARITIME MOBILE RADIONAVIGATION 5.64	130-160 FIXED MARITIME MOBILE 5.64 US294		Maritime (80)
148.5-255 BROADCASTING	160-190 FIXED	160-190 FIXED Aeronautical radionavigation	160-190 FIXED MARITIME MOBILE US294	160-190 FIXED US294	
	190-200 AERONAUTICAL RADIONAVIGATION		190-200 AERONAUTICAL RADIONAVIGATION US18 US226 US294		Aviation (87)
5.68 5.69 5.70	200-275 AERONAUTICAL RADIONAVIGATION Aeronautical mobile	200-285 AERONAUTICAL RADIONAVIGATION Aeronautical mobile	200-275 AERONAUTICAL RADIONAVIGATION US18 Aeronautical mobile US294		
255-283.5 BROADCASTING AERONAUTICAL RADIONAVIGATION 5.70 5.71					

Table of Frequency Allocations — 275-2065 kHz (LF/MF)

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
(See previous page)	275-285 AERONAUTICAL RADIONAVIGATION Aeronautical mobile Maritime radionavigation (radiobeacons)	(See previous page)	275-285 AERONAUTICAL RADIONAVIGATION Aeronautical mobile Maritime radionavigation (radiobeacons) US18 US294		Aviation (87)
283.5-315 AERONAUTICAL RADIONAVIGATION MARITIME RADIONAVIGATION (radiobeacons) 5.73 5.72 5.74	285-315 AERONAUTICAL RADIONAVIGATION MARITIME RADIONAVIGATION (radiobeacons) 5.73		285-325 MARITIME RADIONAVIGATION (radiobeacons) 5.73 Aeronautical radionavigation (radiobeacons) US18 US294 US364		
315-325 AERONAUTICAL RADIONAVIGATION Maritime radionavigation (radiobeacons) 5.73 5.72 5.75	315-325 MARITIME RADIONAVIGATION (radiobeacons) 5.73 Aeronautical radionavigation	315-325 AERONAUTICAL RADIONAVIGATION MARITIME RADIONAVIGATION (radiobeacons) 5.73			
325-405 AERONAUTICAL RADIONAVIGATION 5.72	325-335 AERONAUTICAL RADIONAVIGATION Aeronautical mobile Maritime radionavigation (radiobeacons)	325-405 AERONAUTICAL RADIONAVIGATION Aeronautical mobile	325-335 AERONAUTICAL RADIONAVIGATION (radiobeacons) Aeronautical mobile Maritime radionavigation (radiobeacons) US18 US294		Aviation (87)
	335-405 AERONAUTICAL RADIONAVIGATION Aeronautical mobile		335-405 AERONAUTICAL RADIONAVIGATION (radiobeacons) US18 Aeronautical mobile US294		
405-415 RADIONAVIGATION 5.76 5.72	405-415 RADIONAVIGATION 5.76 Aeronautical mobile		405-415 RADIONAVIGATION 5.76 US18 Aeronautical mobile US294		Maritime (80) Aviation (87)
415-435 MARITIME MOBILE 5.79 AERONAUTICAL RADIONAVIGATION 5.72	415-495 MARITIME MOBILE 5.79 5.79A Aeronautical radionavigation 5.80		415-435 MARITIME MOBILE 5.79 AERONAUTICAL RADIONAVIGATION US294		
435-495 MARITIME MOBILE 5.79 5.79A Aeronautical radionavigation 5.72 5.82	5.77 5.78 5.82		435-495 MARITIME MOBILE 5.79 5.79A Aeronautical radionavigation 5.82 US231 US294	435-495 MARITIME MOBILE 5.79 5.79A 5.82 US231 US294	
495-505 MOBILE (distress and calling) 5.83			495-505 MOBILE (distress and calling) 5.83		
505-526.5 MARITIME MOBILE 5.79 5.79A 5.84 AERONAUTICAL RADIONAVIGATION 5.72	505-510 MARITIME MOBILE 5.79	505-526.5 MARITIME MOBILE 5.79 5.79A 5.84 AERONAUTICAL RADIONAVIGATION Aeronautical mobile Land mobile	505-510 MARITIME MOBILE 5.79		Maritime (80)
	510-525 MOBILE 5.79A 5.84 AERONAUTICAL RADIONAVIGATION		510-525 MARITIME MOBILE (ships only) 5.79A 5.84 AERONAUTICAL RADIONAVIGATION (radiobeacons) US18 US14 US225		Maritime (80) Aviation (87)

526.5-1606.5 BROADCASTING 5.87 5.87A	525-535 BROADCASTING 5.86 AERONAUTICAL RADIONAVIGATION	526.5-535 BROADCASTING Mobile 5.88	525-535 MOBILE US221 AERONAUTICAL RADIONAVIGATION (radiobeacons) US18 US239		Aviation (87) Private Land Mobile (90)
	535-1605 BROADCASTING	535-1606.5 BROADCASTING	535-1605	535-1605 BROADCASTING NG1 NG128	Radio Broadcast (AM)(73) Alaska Fixed (80) Private Land Mobile (90)
1606.5-1625 FIXED MARITIME MOBILE 5.90 LAND MOBILE 5.92	1605-1625 BROADCASTING 5.89 5.90	1606.5-1800 FIXED MOBILE RADIOLOCATION RADIONAVIGATION	1605-1615 MOBILE US221 G127 1615-1705 US299	1605-1705 BROADCASTING 5.89 US299 NG1 NG128	
1625-1635 RADIOLOCATION 5.93 1635-1800 FIXED MARITIME MOBILE 5.90 LAND MOBILE 5.92 5.96	1625-1705 FIXED MOBILE BROADCASTING 5.89 Radiolocation 5.90 1705-1800 FIXED MOBILE RADIOLOCATION AERONAUTICAL RADIONAVIGATION	5.91	1705-1800 FIXED MOBILE RADIOLOCATION US240		Maritime (80) Private Land Mobile (90)
1800-1810 RADIOLOCATION 5.93 1810-1850 AMATEUR 5.98 5.99 5.100 5.101	1800-1850 AMATEUR	1800-2000 AMATEUR FIXED MOBILE except aeronautical mobile RADIONAVIGATION Radiolocation	1800-1900	1800-1900 AMATEUR	Amateur (97)
1850-2000 FIXED MOBILE except aeronautical mobile 5.92 5.96 5.103	1850-2000 AMATEUR FIXED MOBILE except aeronautical mobile RADIOLOCATION RADIONAVIGATION 5.102	5.97	1900-2000 RADIOLOCATION US290		Private Land Mobile (90) Amateur (97)
2000-2025 FIXED MOBILE except aeronautical mobile (R) 5.92 5.103 2025-2045 FIXED MOBILE except aeronautical mobile (R) Meteorological aids 5.104 5.92 5.103	2000-2065 FIXED MOBILE		2000-2065 FIXED MOBILE US340	2000-2065 MARITIME MOBILE NG19 US340	Maritime (80)

Table of Frequency Allocations			2065-4438 kHz (MF/HF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
2045-2160 FIXED MARITIME MOBILE LAND MOBILE 5.92	(See previous page)		(See previous page)		
	2065-2107 MARITIME MOBILE 5.105 5.106		2065-2107 MARITIME MOBILE 5.105 US296 US340		Maritime (80)
2160-2170 RADIOLOCATION 5.93 5.107	2107-2170 FIXED MOBILE		2107-2170 FIXED MOBILE US340	2107-2170 FIXED MOBILE except aeronautical mobile NG19 US340	Maritime (80) Private Land Mobile (90)
2170-2173.5 MARITIME MOBILE			2170-2173.5 MARITIME MOBILE (telephony) US340	2170-2173.5 MARITIME MOBILE US340	Maritime (80)
2173.5-2190.5 MOBILE (distress and calling) 5.108 5.109 5.110 5.111			2173.5-2190.5 MOBILE (distress and calling) 5.108 5.109 5.110 5.111 US279 US340		Maritime (80) Aviation (87)
2190.5-2194 MARITIME MOBILE			2190.5-2194 MARITIME MOBILE (telephony) US340	2190.5-2194 MARITIME MOBILE US340	Maritime (80)
2194-2300 FIXED MOBILE except aeronautical mobile (R) 5.92 5.103 5.112	2194-2300 FIXED MOBILE 5.112		2194-2495 FIXED MOBILE US340	2194-2495 FIXED MOBILE except aeronautical mobile NG19 US340	Maritime (80) Private Land Mobile (90)
2300-2498 FIXED MOBILE except aeronautical mobile (R) BROADCASTING 5.113 5.103	2300-2495 FIXED MOBILE BROADCASTING 5.113				
2498-2501 STANDARD FREQUENCY AND TIME SIGNAL (2500 kHz)	2495-2501 STANDARD FREQUENCY AND TIME SIGNAL (2500 kHz)		2495-2505 STANDARD FREQUENCY AND TIME SIGNAL (2500 kHz) US1 US340		
2501-2502 STANDARD FREQUENCY AND TIME SIGNAL Space research					
2502-2625 FIXED MOBILE except aeronautical mobile (R) 5.92 5.103 5.114	2502-2505 STANDARD FREQUENCY AND TIME SIGNAL				
2625-2650 MARITIME MOBILE MARITIME RADIONAVIGATION 5.92	2505-2850 FIXED MOBILE		2505-2850 FIXED MOBILE US285	2505-2850 FIXED MOBILE except aeronautical mobile US285	Maritime (80) Aviation (87) Private Land Mobile (90)
2650-2850 FIXED MOBILE except aeronautical mobile (R) 5.92 5.103			US340	US340	

2850-3025 AERONAUTICAL MOBILE (R) 5.111 5.115			2850-3025 AERONAUTICAL MOBILE (R) 5.111 5.115 US283 US340		Aviation (87)
3025-3155 AERONAUTICAL MOBILE (OR)			3025-3155 AERONAUTICAL MOBILE (OR) US340		
3155-3200 FIXED MOBILE except aeronautical mobile (R) 5.116 5.117			3155-3230 FIXED MOBILE except aeronautical mobile (R) US340		Maritime (80) Private Land Mobile (90)
3200-3230 FIXED MOBILE except aeronautical mobile (R) BROADCASTING 5.113 5.116					
3230-3400 FIXED MOBILE except aeronautical mobile BROADCASTING 5.113 5.116 5.118			3230-3400 FIXED MOBILE except aeronautical mobile Radiolocation US340		Maritime (80) Aviation (87) Private Land Mobile (90)
3400-3500 AERONAUTICAL MOBILE (R)			3400-3500 AERONAUTICAL MOBILE (R) US283 US340		Aviation (87)
3500-3800 AMATEUR FIXED MOBILE except aeronautical mobile 5.92	3500-3750 AMATEUR 5.119	3500-3900 AMATEUR FIXED MOBILE	3500-4000 US340	3500-4000 AMATEUR US340	Amateur (97)
3800-3900 FIXED AERONAUTICAL MOBILE (OR) LAND MOBILE	3750-4000 AMATEUR FIXED MOBILE except aeronautical mobile (R)				
3900-3950 AERONAUTICAL MOBILE (OR) 5.123		3900-3950 AERONAUTICAL MOBILE BROADCASTING			
3950-4000 FIXED BROADCASTING	5.122 5.125	3950-4000 FIXED BROADCASTING 5.126			
4000-4063 FIXED MARITIME MOBILE 5.127 5.126			4000-4063 FIXED MARITIME MOBILE US340		Maritime (80)
4063-4438 MARITIME MOBILE 5.79A 5.109 5.110 5.130 5.131 5.132 5.128			4063-4438 MARITIME MOBILE 5.79A 5.109 5.110 5.130 5.131 5.132 US82 US296 US340		Maritime (80) Aviation (87)

Table of Frequency Allocations			4438-8100 kHz (HF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
4438-4650 FIXED MOBILE except aeronautical mobile (R)		4438-4650 FIXED MOBILE except aeronautical mobile	4438-4650 FIXED MOBILE except aeronautical mobile (R) US340		Maritime (80) Aviation (87) Private Land Mobile (90)
4650-4700 AERONAUTICAL MOBILE (R)			4650-4700 AERONAUTICAL MOBILE (R) US282 US283 US340		Aviation (87)
4700-4750 AERONAUTICAL MOBILE (OR)			4700-4750 AERONAUTICAL MOBILE (OR) US340		
4750-4850 FIXED AERONAUTICAL MOBILE (OR) LAND MOBILE BROADCASTING 5.113	4750-4850 FIXED MOBILE except aeronautical mobile (R) BROADCASTING 5.113	4750-4850 FIXED BROADCASTING 5.113 Land mobile	4750-4850 FIXED MOBILE except aeronautical mobile (R) US340		Maritime (80) Private Land Mobile (90)
4850-4995 FIXED LAND MOBILE BROADCASTING 5.113			4850-4995 FIXED MOBILE US340	4850-4995 FIXED US340	Aviation (87) Private Land Mobile (90)
4995-5003 STANDARD FREQUENCY AND TIME SIGNAL (5000 kHz)			4995-5005 STANDARD FREQUENCY AND TIME SIGNAL (5000 kHz) US1 US340		
5003-5005 STANDARD FREQUENCY AND TIME SIGNAL Space research					
5005-5060 FIXED BROADCASTING 5.113			5005-5060 FIXED US340		Maritime (80) Aviation (87) Private Land Mobile (90)
5060-5250 FIXED Mobile except aeronautical mobile 5.133			5060-5450 FIXED Mobile except aeronautical mobile US212 US340 US381		Maritime (80) Aviation (87) Private Land Mobile (90) Amateur (97)
5250-5450 FIXED MOBILE except aeronautical mobile					
5450-5480 FIXED AERONAUTICAL MOBILE (OR) LAND MOBILE	5450-5480 AERONAUTICAL MOBILE (R)	5450-5480 FIXED AERONAUTICAL MOBILE (OR) LAND MOBILE	5450-5680 AERONAUTICAL MOBILE (R) 5.111 5.115 US283 US340		Aviation (87)
5480-5680 AERONAUTICAL MOBILE (R) 5.111 5.115					
5680-5730 AERONAUTICAL MOBILE (OR) 5.111 5.115			5680-5730 AERONAUTICAL MOBILE (OR) 5.111 5.115 US340		

5730-5900 FIXED LAND MOBILE	5730-5900 FIXED MOBILE except aeronautical mobile (R)	5730-5900 FIXED Mobile except aeronautical mobile (R)	5730-5900 FIXED MOBILE except aeronautical mobile (R) US340		Maritime (80) Aviation (87) Private Land Mobile (90)
5900-5950 BROADCASTING 5.134 5.136			5900-5950 BROADCASTING 5.134 US340 US366		Radio Broadcast (HF)(73)
5950-6200 BROADCASTING			5950-6200 BROADCASTING US340		
6200-6525 MARITIME MOBILE 5.109 5.110 5.130 5.132 5.137			6200-6525 MARITIME MOBILE 5.109 5.110 5.130 5.132 US82 US296 US340		Maritime (80)
6525-6685 AERONAUTICAL MOBILE (R)			6525-6685 AERONAUTICAL MOBILE (R) US283 US340		Aviation (87)
6685-6765 AERONAUTICAL MOBILE (OR)			6685-6765 AERONAUTICAL MOBILE (OR) US340		
6765-7000 FIXED MOBILE except aeronautical mobile (R) 5.138 5.138A 5.139			6765-7000 FIXED MOBILE except aeronautical mobile (R) 5.138 US340 US394		ISM Equipment (18) Private Land Mobile (90)
7000-7100 AMATEUR AMATEUR-SATELLITE 5.140 5.141 5.141A			7000-7100 US340	7000-7100 AMATEUR AMATEUR-SATELLITE US340	Amateur (97)
7100-7200 AMATEUR 5.141A 5.141B 5.141C 5.142			7100-7300 US340 US395	7100-7300 AMATEUR 5.142 US340 US395	Radio Broadcast (HF)(73) Amateur (97)
7200-7300 BROADCASTING	7200-7300 AMATEUR 5.142	7200-7300 BROADCASTING			
7300-7400 BROADCASTING 5.134 5.143 5.143A 5.143B 5.143C 5.143D			7300-7400 BROADCASTING 5.134 US340 US366 US396		Radio Broadcast (HF)(73) Maritime (80) Private Land Mobile (90)
7400-7450 BROADCASTING 5.143B 5.143C	7400-7450 FIXED MOBILE except aeronautical mobile (R)	7400-7450 BROADCASTING 5.143A 5.143C	7400-8100 FIXED MOBILE except aeronautical mobile (R) US340		Radio Broadcast (HF)(73) Maritime (80) Aviation (87) Private Land Mobile (90)
7450-8100 FIXED MOBILE except aeronautical mobile (R) 5.143E 5.144					

Table of Frequency Allocations			8100-13600 kHz (HF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
8100-8195 FIXED MARITIME MOBILE			8100-8195 FIXED MARITIME MOBILE US340		Maritime (80)
8195-8815 MARITIME MOBILE 5.109 5.110 5.132 5.145 5.111			8195-8815 MARITIME MOBILE 5.109 5.110 5.132 5.145 US82 5.111 US296 US340		Maritime (80) Aviation (87)
8815-8965 AERONAUTICAL MOBILE (R)			8815-8965 AERONAUTICAL MOBILE (R) US340		Aviation (87)
8965-9040 AERONAUTICAL MOBILE (OR)			8965-9040 AERONAUTICAL MOBILE (OR) US340		
9040-9400 FIXED			9040-9400 FIXED US340		Maritime (80) Private Land Mobile (90)
9400-9500 BROADCASTING 5.134 5.146			9400-9500 BROADCASTING 5.134 US340 US366		Radio Broadcast (HF)(73)
9500-9900 BROADCASTING 5.147			9500-9900 BROADCASTING US340 US367		
9900-9995 FIXED			9900-9995 FIXED US340		Private Land Mobile (90)
9995-10003 STANDARD FREQUENCY AND TIME SIGNAL (10000 kHz) 5.111			9995-10005 STANDARD FREQUENCY AND TIME SIGNAL (10000 kHz)		
10003-10005 STANDARD FREQUENCY AND TIME SIGNAL Space research 5.111			5.111 US1 US340		
10005-10100 AERONAUTICAL MOBILE (R) 5.111			10005-10100 AERONAUTICAL MOBILE (R) 5.111 US283 US340		Aviation (87)
10100-10150 FIXED Amateur			10100-10150 US247 US340	10100-10150 AMATEUR US247 US340	Amateur (97)
10150-11175 FIXED Mobile except aeronautical mobile (R)			10150-11175 FIXED Mobile except aeronautical mobile (R) US340		Private Land Mobile (90)

11175-11275 AERONAUTICAL MOBILE (OR)	11175-11275 AERONAUTICAL MOBILE (OR) US340		
11275-11400 AERONAUTICAL MOBILE (R)	11275-11400 AERONAUTICAL MOBILE (R) US283 US340		Aviation (87)
11400-11600 FIXED	11400-11600 FIXED US340		Private Land Mobile (90)
11600-11650 BROADCASTING 5.134 5.146	11600-11650 BROADCASTING 5.134 US340 US366		Radio Broadcast (HF)(73)
11650-12050 BROADCASTING 5.147	11650-12050 BROADCASTING US340 US367		
12050-12100 BROADCASTING 5.134 5.146	12050-12100 BROADCASTING 5.134 US340 US366		
12100-12230 FIXED	12100-12230 FIXED US340		Private Land Mobile (90)
12230-13200 MARITIME MOBILE 5.109 5.110 5.132 5.145	12230-13200 MARITIME MOBILE 5.109 5.110 5.132 5.145 US82 US296 US340		Maritime (80)
13200-13260 AERONAUTICAL MOBILE (OR)	13200-13260 AERONAUTICAL MOBILE (OR) US340		
13260-13360 AERONAUTICAL MOBILE (R)	13260-13360 AERONAUTICAL MOBILE (R) US283 US340		Aviation (87)
13360-13410 FIXED RADIO ASTRONOMY 5.149	13360-13410 RADIO ASTRONOMY US342 G115	13360-13410 RADIO ASTRONOMY US342	
13410-13570 FIXED Mobile except aeronautical mobile (R) 5.150	13410-13570 FIXED Mobile except aeronautical mobile (R) 5.150 US340	13410-13570 FIXED 5.150 US340	ISM Equipment (18) Private Land Mobile (90)
13570-13600 BROADCASTING 5.134 5.151	13570-13600 BROADCASTING 5.134 US340 US366		Radio Broadcast (HF)(73)

Table of Frequency Allocations			13600-19800 kHz (HF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
13600-13800 BROADCASTING			13600-13800 BROADCASTING US340		Radio Broadcast (HF)(73)
13800-13870 BROADCASTING 5.134 5.151			13800-13870 BROADCASTING 5.134 US340 US366		
13870-14000 FIXED Mobile except aeronautical mobile (R)			13870-14000 FIXED Mobile except aeronautical mobile (R) US340	13870-14000 FIXED US340	Private Land Mobile (90)
14000-14250 AMATEUR AMATEUR-SATELLITE			14000-14350	14000-14250 AMATEUR AMATEUR-SATELLITE US340	Amateur (97)
14250-14350 AMATEUR 5.152			US340	14250-14350 AMATEUR US340	
14350-14990 FIXED Mobile except aeronautical mobile (R)			14350-14990 FIXED Mobile except aeronautical mobile (R) US340	14350-14990 FIXED US340	Private Land Mobile (90)
14990-15005 STANDARD FREQUENCY AND TIME SIGNAL (15000 kHz) 5.111			14990-15010 STANDARD FREQUENCY AND TIME SIGNAL (15000 kHz)		
15005-15010 STANDARD FREQUENCY AND TIME SIGNAL Space research			5.111 US1 US340		
15010-15100 AERONAUTICAL MOBILE (OR)			15010-15100 AERONAUTICAL MOBILE (OR) US340		
15100-15600 BROADCASTING			15100-15600 BROADCASTING US340		Radio Broadcast (HF)(73)
15600-15800 BROADCASTING 5.134 5.146			15600-15800 BROADCASTING 5.134 US340 US366		
15800-16360 FIXED 5.153			15800-16360 FIXED US340		Private Land Mobile (90)

16360-17410 MARITIME MOBILE 5.109 5.110 5.132 5.145	16360-17410 MARITIME MOBILE 5.109 5.110 5.132 5.145 US82 US296 US340		Maritime (80)
17410-17480 FIXED	17410-17480 FIXED US340		Private Land Mobile (90)
17480-17550 BROADCASTING 5.134 5.146	17480-17550 BROADCASTING 5.134 US340 US366		Radio Broadcast (HF)(73)
17550-17900 BROADCASTING	17550-17900 BROADCASTING US340		
17900-17970 AERONAUTICAL MOBILE (R)	17900-17970 AERONAUTICAL MOBILE (R) US283 US340		Aviation (87)
17970-18030 AERONAUTICAL MOBILE (OR)	17970-18030 AERONAUTICAL MOBILE (OR) US340		
18030-18052 FIXED	18030-18068 FIXED		Maritime (80) Private Land Mobile (90)
18052-18068 FIXED Space research	US340		
18068-18168 AMATEUR AMATEUR-SATELLITE 5.154	18068-18168 US340	18068-18168 AMATEUR AMATEUR-SATELLITE US340	Amateur (97)
18168-18780 FIXED Mobile except aeronautical mobile	18168-18780 FIXED Mobile US340		Maritime (80) Private Land Mobile (90)
18780-18900 MARITIME MOBILE	18780-18900 MARITIME MOBILE US82 US296 US340		Maritime (80)
18900-19020 BROADCASTING 5.134 5.146	18900-19020 BROADCASTING 5.134 US340 US366		Radio Broadcast (HF)(73)
19020-19680 FIXED	19020-19680 FIXED US340		Private Land Mobile (90)
19680-19800 MARITIME MOBILE 5.132	19680-19800 MARITIME MOBILE 5.132 US340		Maritime (80)

Table of Frequency Allocations			19800-26950 kHz (HF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
19800-19990 FIXED			19800-19990 FIXED US340		Private Land Mobile (90)
19990-19995 STANDARD FREQUENCY AND TIME SIGNAL Space research 5.111			19990-20010 STANDARD FREQUENCY AND TIME SIGNAL (20000 kHz) 5.111 US1 US340		
19995-20010 STANDARD FREQUENCY AND TIME SIGNAL (20000 kHz) 5.111					
20010-21000 FIXED Mobile			20010-21000 FIXED Mobile US340	20010-21000 FIXED US340	Private Land Mobile (90)
21000-21450 AMATEUR AMATEUR-SATELLITE			21000-21450 US340	21000-21450 AMATEUR AMATEUR-SATELLITE US340	Amateur (97)
21450-21850 BROADCASTING			21450-21850 BROADCASTING US340		Radio Broadcast (HF)(73)
21850-21870 FIXED 5.155A 5.155			21850-21924 FIXED US340		Aviation (87) Private Land Mobile (90)
21870-21924 FIXED 5.155B					
21924-22000 AERONAUTICAL MOBILE (R)			21924-22000 AERONAUTICAL MOBILE (R) US340		Aviation (87)
22000-22855 MARITIME MOBILE 5.132 5.156			22000-22855 MARITIME MOBILE 5.132 US82 US296 US340		Maritime (80)
22855-23000 FIXED 5.156			22855-23000 FIXED US340		Private Land Mobile (90)
23000-23200 FIXED Mobile except aeronautical mobile (R) 5.156			23000-23200 FIXED Mobile except aeronautical mobile (R) US340	23000-23200 FIXED US340	
23200-23350 FIXED 5.156A AERONAUTICAL MOBILE (OR)			23200-23350 AERONAUTICAL MOBILE (OR) US340		

23350-24000 FIXED MOBILE except aeronautical mobile 5.157	23350-24890 FIXED MOBILE except aeronautical mobile US340	23350-24890 FIXED US340	Private Land Mobile (90)
24000-24890 FIXED LAND MOBILE			
24890-24990 AMATEUR AMATEUR-SATELLITE	24890-24990 US340	24890-24990 AMATEUR AMATEUR-SATELLITE US340	Amateur (97)
24990-25005 STANDARD FREQUENCY AND TIME SIGNAL (25000 kHz)	24990-25010 STANDARD FREQUENCY AND TIME SIGNAL (25000 kHz) US1 US340		
25005-25010 STANDARD FREQUENCY AND TIME SIGNAL Space research			
25010-25070 FIXED MOBILE except aeronautical mobile	25010-25070 US340	25010-25070 LAND MOBILE US340 NG112	Private Land Mobile (90)
25070-25210 MARITIME MOBILE	25070-25210 MARITIME MOBILE US82 US281 US296 US340	25070-25210 MARITIME MOBILE US82 US281 US296 US340 NG112	Maritime (80) Private Land Mobile (90)
25210-25550 FIXED MOBILE except aeronautical mobile	25210-25330 US340	25210-25330 LAND MOBILE US340	Private Land Mobile (90)
	25330-25550 FIXED MOBILE except aeronautical mobile US340	25330-25550 US340	
25550-25670 RADIO ASTRONOMY 5.149	25550-25670 RADIO ASTRONOMY US74 US342		
25670-26100 BROADCASTING	25670-26100 BROADCASTING US25 US340		Radio Broadcast (HF)(73) Remote Pickup (74D)
26100-26175 MARITIME MOBILE 5.132	26100-26175 MARITIME MOBILE 5.132 US25 US340		Remote Pickup (74D) Low Power Auxiliary (74H) Maritime (80)
26175-27500 FIXED MOBILE except aeronautical mobile	26175-26480 US340	26175-26480 LAND MOBILE US340	Remote Pickup (74D) Low Power Auxiliary (74H)
	26480-26950 FIXED MOBILE except aeronautical mobile US340	26480-26950 US340	
5.150			

Table of Frequency Allocations			26.95-42 MHz (HF/VHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
(See previous page)			26.95-27.41 5.150 US340	26.95-26.96 FIXED 5.150 US340	ISM Equipment (18)
				26.96-27.23 MOBILE except aeronautical mobile 5.150 US340	ISM Equipment (18) Personal Radio (95)
				27.23-27.41 FIXED MOBILE except aeronautical mobile 5.150 US340	ISM Equipment (18) Private Land Mobile (90) Personal Radio (95)
27.5-28 METEOROLOGICAL AIDS FIXED MOBILE			27.41-27.54 US340	27.41-27.54 FIXED LAND MOBILE US340	Private Land Mobile (90)
			27.54-28 FIXED MOBILE US298 US340	27.54-28 US298 US340	
28-29.7 AMATEUR AMATEUR-SATELLITE			28-29.89 US340	28-29.7 AMATEUR AMATEUR-SATELLITE US340	Amateur (97)
29.7-30.005 FIXED MOBILE				29.7-29.8 LAND MOBILE US340	Private Land Mobile (90)
				29.8-29.89 FIXED US340	
			29.89-29.91 FIXED MOBILE US340	29.89-29.91 US340	
			29.91-30 US340	29.91-30 FIXED US340	
30.005-30.01 SPACE OPERATION (satellite identification) FIXED MOBILE SPACE RESEARCH			30-30.56 FIXED MOBILE	30-30.56	
30.01-37.5 FIXED MOBILE					

	30.56-32	30.56-32 FIXED LAND MOBILE NG124	Private Land Mobile (90)
	32-33 FIXED MOBILE	32-33	
	33-34	33-34 FIXED LAND MOBILE NG124	Private Land Mobile (90)
	34-35 FIXED MOBILE	34-35	
	35-36	35-36 FIXED LAND MOBILE	Public Mobile (22) Private Land Mobile (90)
	36-37 FIXED MOBILE US220	36-37 US220	
	37-37.5	37-37.5 LAND MOBILE NG124	Private Land Mobile (90)
37.5-38.25 FIXED MOBILE Radio astronomy 5.149	37.5-38 Radio astronomy US342	37.5-38 LAND MOBILE Radio astronomy US342 NG59 NG124	
	38-38.25 FIXED MOBILE RADIO ASTRONOMY US81 US342	38-38.25 RADIO ASTRONOMY US81 US342	
38.25-39.986 FIXED MOBILE	38.25-39 FIXED MOBILE	38.25-39	
39.986-40.02 FIXED MOBILE Space research	39-40	39-40 LAND MOBILE NG124	Private Land Mobile (90)
40.02-40.98 FIXED MOBILE 5.150	40-42 FIXED MOBILE 5.150 US210 US220	40-42 5.150 US210 US220	ISM Equipment (18) Private Land Mobile (90)

Table of Frequency Allocations — 42-137 MHz (VHF)

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
40.98-41.015 FIXED MOBILE Space research 5.160 5.161			(See previous page)		
41.015-44 FIXED MOBILE 5.160 5.161			42-46.6	42-43.69 FIXED LAND MOBILE NG124 NG141	Public Mobile (22) Private Land Mobile (90)
				43.69-46.6 LAND MOBILE NG124 NG141	Private Land Mobile (90)
44-47 FIXED MOBILE 5.162 5.162A			46.6-47 FIXED MOBILE	46.6-47	
47-68 BROADCASTING	47-50 FIXED MOBILE	47-50 FIXED MOBILE BROADCASTING 5.162A	47-49.6	47-49.6 LAND MOBILE NG124	Private Land Mobile (90)
			49.6-50 FIXED MOBILE	49.6-50	
	50-54 AMATEUR 5.162A 5.166 5.167 5.168 5.170		50-73	50-54 AMATEUR	Amateur (97)
5.162A 5.163 5.164 5.165 5.169 5.171	54-68 BROADCASTING Fixed Mobile 5.172	54-68 FIXED MOBILE BROADCASTING 5.162A		54-72 BROADCASTING NG115 NG128 NG142 NG149	Broadcast Radio (TV)(73) LPTV, TV Translator/Booster (74G) Low Power Auxiliary (74H)
68-74.8 FIXED MOBILE except aeronautical mobile	68-72 BROADCASTING Fixed Mobile 5.173	68-74.8 FIXED MOBILE			
	72-73 FIXED MOBILE			72-73 FIXED MOBILE NG3 NG49 NG56	Public Mobile (22) Aviation (87) Private Land Mobile (90) Personal Radio (95)
	73-74.6 RADIO ASTRONOMY 5.178		73-74.6 RADIO ASTRONOMY US74 US246		
	74.6-74.8 FIXED MOBILE		74.6-74.8 FIXED MOBILE US273		Private Land Mobile (90)
5.149 5.175 5.177 5.179		5.149 5.176 5.179			

74.8-75.2 AERONAUTICAL RADIONAVIGATION 5.180 5.181			74.8-75.2 AERONAUTICAL RADIONAVIGATION 5.180		Aviation (87)
75.2-87.5 FIXED MOBILE except aeronautical mobile 5.175 5.179 5.187	75.2-75.4 FIXED MOBILE 5.179		75.2-75.4 FIXED MOBILE US273		Private Land Mobile (90)
	75.4-76 FIXED MOBILE	75.4-87 FIXED MOBILE 5.182 5.183 5.188	75.4-88	75.4-76 FIXED MOBILE NG3 NG49 NG56	Public Mobile (22) Aviation (87) Private Land Mobile (90) Personal Radio (95)
	76-88 BROADCASTING Fixed Mobile 5.185	87-100 FIXED MOBILE BROADCASTING		76-88 BROADCASTING NG115 NG128 NG142 NG149	Broadcast Radio (TV)(73) LPTV, TV Translator/Booster (74G) Low Power Auxiliary (74H)
87.5-100 BROADCASTING 5.190	88-100 BROADCASTING		88-108 US93	88-108 BROADCASTING NG2 US93 NG128	Broadcast Radio (FM)(73) FM Translator/Booster (74L)
100-108 BROADCASTING 5.192 5.194					
108-117.975 AERONAUTICAL RADIONAVIGATION 5.197 5.197A			108-117.975 AERONAUTICAL RADIONAVIGATION US93 US343		Aviation (87)
117.975-137 AERONAUTICAL MOBILE (R) 5.111 5.198 5.199 5.200 5.201 5.202			117.975-121.9375 AERONAUTICAL MOBILE (R) 5.111 5.198 5.199 5.200 US26 US28		
			121.9375-123.0875 5.198 US30 US31 US33 US80 US102 US213	121.9375-123.0875 AERONAUTICAL MOBILE 5.198 US30 US31 US33 US80 US102 US213	
			123.0875-123.5875 AERONAUTICAL MOBILE 5.198 5.200 US32 US33 US112		
			123.5875-128.8125 AERONAUTICAL MOBILE (R) 5.198 US26		
			128.8125-132.0125 5.198	128.8125-132.0125 AERONAUTICAL MOBILE (R) 5.198	
			132.0125-136 AERONAUTICAL MOBILE (R) 5.198 US26		
			136-137 US244	136-137 AERONAUTICAL MOBILE (R) US244	

Table of Frequency Allocations			137-157.0375 MHz (VHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
137-137.025 SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208A 5.209 SPACE RESEARCH (space-to-Earth) Fixed Mobile except aeronautical mobile (R) 5.204 5.205 5.206 5.207 5.208			137-137.025 SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) US319 US320 SPACE RESEARCH (space-to-Earth) 5.208		Satellite Communications (25)
137.025-137.175 SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) Fixed Mobile-satellite (space-to-Earth) 5.208A 5.209 Mobile except aeronautical mobile (R) 5.204 5.205 5.206 5.207 5.208			137.025-137.175 SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) Mobile-satellite (space-to-Earth) US319 US320 5.208		
137.175-137.825 SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208A 5.209 SPACE RESEARCH (space-to-Earth) Fixed Mobile except aeronautical mobile (R) 5.204 5.205 5.206 5.207 5.208			137.175-137.825 SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) US319 US320 SPACE RESEARCH (space-to-Earth) 5.208		
137.825-138 SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) Fixed Mobile-satellite (space-to-Earth) 5.208A 5.209 Mobile except aeronautical mobile (R) 5.204 5.205 5.206 5.207 5.208			137.825-138 SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) Mobile-satellite (space-to-Earth) US319 US320 5.208		
138-143.6 AERONAUTICAL MOBILE (OR) 5.210 5.211 5.212 5.214	138-143.6 FIXED MOBILE RADIOLOCATION Space research (space-to-Earth)	138-143.6 FIXED MOBILE Space research (space-to-Earth) 5.207 5.213	138-144 FIXED MOBILE	138-144	
143.6-143.65 AERONAUTICAL MOBILE (OR) SPACE RESEARCH (space-to-Earth) 5.211 5.212 5.214	143.6-143.65 FIXED MOBILE RADIOLOCATION SPACE RESEARCH (space-to-Earth)	143.6-143.65 FIXED MOBILE SPACE RESEARCH (space-to-Earth) 5.207 5.213			
143.65-144 AERONAUTICAL MOBILE (OR) 5.210 5.211 5.212 5.214	143.65-144 FIXED MOBILE RADIOLOCATION Space research (space-to-Earth)	143.65-144 FIXED MOBILE Space research (space-to-Earth) 5.207 5.213	G30		

144-146 AMATEUR AMATEUR-SATELLITE 5.216			144-148	144-146 AMATEUR AMATEUR-SATELLITE	Amateur (97)
146-148 FIXED MOBILE except aeronautical mobile (R)	146-148 AMATEUR 5.217	146-148 AMATEUR FIXED MOBILE 5.217		146-148 AMATEUR	
148-149.9 FIXED MOBILE except aeronautical mobile (R) MOBILE-SATELLITE (Earth-to-space) 5.209 5.218 5.219 5.221	148-149.9 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.209 5.218 5.219 5.221		148-149.9 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) US319 US320 US323 US325 5.218 5.219 G30	148-149.9 MOBILE-SATELLITE (Earth-to-space) US319 US320 US323 US325 5.218 5.219	Satellite Communications (25)
149.9-150.05 MOBILE-SATELLITE (Earth-to-space) 5.209 5.224A RADIONAVIGATION-SATELLITE 5.224B 5.220 5.222 5.223			149.9-150.05 MOBILE-SATELLITE (Earth-to-space) US319 US320 RADIONAVIGATION-SATELLITE 5.223		
150.05-153 FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY 5.149	150.05-156.7625 FIXED MOBILE		150.05-150.8 FIXED MOBILE US216 G30	150.05-150.8 US216	
			150.8-152.855 US216	150.8-152.855 FIXED LAND MOBILE NG4 NG51 NG112 US216 NG124	Public Mobile (22) Private Land Mobile (90) Personal Radio (95)
153-154 FIXED MOBILE except aeronautical mobile (R) Meteorological aids			152.855-156.2475	152.855-154 LAND MOBILE NG4 NG124	Remote Pickup (74D) Private Land Mobile (90)
154-156.7625 FIXED MOBILE except aeronautical mobile (R) 5.226 5.227	5.225 5.226 5.227			154-156.2475 FIXED LAND MOBILE NG112 5.226 NG117 NG124 NG148	Maritime (80) Private Land Mobile (90) Personal Radio (95)
156.7625-156.8375 MARITIME MOBILE (distress and calling) 5.111 5.226			156.2475-157.0375 5.226 5.227 US77 US106 US107 US266	156.2475-157.0375 MARITIME MOBILE US77 US106 US107 NG117 5.226 5.227 US266 NG124	Maritime (80) Aviation (87)

Table of Frequency Allocations			157.0375-267 MHz (VHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
156.8375-174 FIXED MOBILE except aeronautical mobile	156.8375-174 FIXED MOBILE		(See previous page)		
			157.0375-157.1875 MARITIME MOBILE US214 5.226 US266 G109	157.0375-157.1875 5.226 US214 US266	Maritime (80) Private Land Mobile (90)
			157.1875-161.575	157.1875-157.45 MOBILE except aeronautical mobile US266 5.226 NG111	Maritime (80) Aviation (87) Private Land Mobile (90)
				157.45-161.575 FIXED LAND MOBILE NG28 NG111 NG112 5.226 NG6 NG70 NG124 NG148 NG155	Public Mobile (22) Remote Pickup (74D) Maritime (80) Private Land Mobile (90)
			161.575-161.625 5.226 US77	161.575-161.625 MARITIME MOBILE US77 5.226 NG6 NG17	Public Mobile (22) Maritime (80)
			161.625-161.775	161.625-161.775 LAND MOBILE NG6 5.226	Public Mobile (22) Remote Pickup (74D) Low Power Auxiliary (74H)
			161.775-162.0125 5.226 US266 US399	161.775-162.0125 MOBILE except aeronautical mobile US266 NG6 5.226 US399	Public Mobile (22) Maritime (80) Private Land Mobile (90)
			162.0125-173.2 FIXED US13 MOBILE 5.226 US8 US11 US216 US300 US312 US399 G5	162.0125-173.2 5.226 US8 US11 US13 US216 US300 US312 US399	Remote Pickup (74D) Maritime (80) Private Land Mobile (90)
			173.2-173.4	173.2-173.4 FIXED Land mobile	Private Land Mobile (90)
			173.4-174 FIXED MOBILE G5	173.4-174	
5.226 5.229	5.226 5.230 5.231 5.232				

174-223 BROADCASTING 5.235 5.237 5.243	174-216 BROADCASTING Fixed Mobile 5.234	174-223 FIXED MOBILE BROADCASTING 5.233 5.238 5.240 5.245	174-216	174-216 BROADCASTING NG115 NG128 NG142 NG149	Broadcast Radio (TV)(73) LPTV, TV Translator/Booster (74G) Low Power Auxiliary (74H)
	216-220 FIXED MARITIME MOBILE Radiolocation 5.241 5.242		216-217 Fixed Land mobile Radiolocation 5.241 G2 US210 US229	216-219 FIXED MOBILE except aeronautical mobile US210 US229 NG173	Maritime (80) Private Land Mobile (90) Personal Radio (95)
			217-220 Fixed Mobile US210 US229	219-220 FIXED MOBILE except aeronautical mobile Amateur NG152 US210 US229 NG173	Maritime (80) Private Land Mobile (90) Amateur (97)
	220-225 AMATEUR FIXED MOBILE Radiolocation 5.241		220-222 FIXED LAND MOBILE Radiolocation 5.241 G2 US335	220-222 FIXED LAND MOBILE US335	Private Land Mobile (90)
223-230 BROADCASTING Fixed Mobile 5.243 5.246 5.247		223-230 FIXED MOBILE BROADCASTING AERONAUTICAL RADIONAVIGATION Radiolocation 5.250	222-225 Radiolocation 5.241 G2	222-225 AMATEUR	Amateur (97)
	225-235 FIXED MOBILE		225-235 FIXED MOBILE	225-235	
230-235 FIXED MOBILE 5.247 5.251 5.252		230-235 FIXED MOBILE AERONAUTICAL RADIONAVIGATION 5.250	G27		
235-267 FIXED MOBILE 5.111 5.199 5.252 5.254 5.256 5.256A			235-267 FIXED MOBILE 5.111 5.199 5.256 G27 G100	235-267 5.111 5.199 5.256	

Table of Frequency Allocations			267-410 MHz (VHF/UHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
267-272 FIXED MOBILE Space operation (space-to-Earth) 5.254 5.257			267-322 FIXED MOBILE G27 G100	267-322	
272-273 SPACE OPERATION (space-to-Earth) FIXED MOBILE 5.254					
273-312 FIXED MOBILE 5.254					
312-315 FIXED MOBILE Mobile-satellite (Earth-to-space) 5.254 5.255					
315-322 FIXED MOBILE 5.254					
322-328.6 FIXED MOBILE RADIO ASTRONOMY 5.149			322-328.6 FIXED MOBILE US342 G27	322-328.6 US342	
328.6-335.4 AERONAUTICAL RADIONAVIGATION 5.258 5.259			328.6-335.4 AERONAUTICAL RADIONAVIGATION 5.258		Aviation (87)
335.4-387 FIXED MOBILE 5.254			335.4-399.9 FIXED MOBILE	335.4-399.9	
387-390 FIXED MOBILE Mobile-satellite (space-to-Earth) 5.208A 5.254 5.255					
390-399.9 FIXED MOBILE 5.254			G27 G100		

399.9-400.05 MOBILE-SATELLITE (Earth-to-space) 5.209 5.224A RADIONAVIGATION-SATELLITE 5.222 5.224B 5.260 5.220	399.9-400.05 MOBILE-SATELLITE (Earth-to-space) US319 US320 RADIONAVIGATION-SATELLITE 5.260		Satellite Communications (25)
400.05-400.15 STANDARD FREQUENCY AND TIME SIGNAL-SATELLITE (400.1 MHz) 5.261 5.262	400.05-400.15 STANDARD FREQUENCY AND TIME SIGNAL-SATELLITE (400.1 MHz) 5.261		
400.15-401 METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208A 5.209 SPACE RESEARCH (space-to-Earth) 5.263 Space operation (space-to-Earth) 5.262 5.264	400.15-401 METEOROLOGICAL AIDS (radiosonde) US70 METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) US319 US320 US324 SPACE RESEARCH (space-to-Earth) 5.263 Space operation (space-to-Earth) 5.264	400.15-401 METEOROLOGICAL AIDS (radiosonde) US70 MOBILE-SATELLITE (space-to-Earth) US319 US320 US324 SPACE RESEARCH (space-to-Earth) 5.263 Space operation (space-to-Earth) 5.264	Satellite Communications (25)
401-402 METEOROLOGICAL AIDS SPACE OPERATION (space-to-Earth) EARTH EXPLORATION-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) Fixed Mobile except aeronautical mobile	401-402 METEOROLOGICAL AIDS (radiosonde) US70 SPACE OPERATION (space-to-Earth) EARTH EXPLORATION-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) US345 US384	401-402 METEOROLOGICAL AIDS (radiosonde) US70 SPACE OPERATION (space-to-Earth) Earth exploration-satellite (Earth-to-space) Meteorological-satellite (Earth-to-space) US345 US384	MEDRadio (95I)
402-403 METEOROLOGICAL AIDS EARTH EXPLORATION-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) Fixed Mobile except aeronautical mobile	402-403 METEOROLOGICAL AIDS (radiosonde) US70 EARTH EXPLORATION-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) US345 US384	402-403 METEOROLOGICAL AIDS (radiosonde) US70 Earth exploration-satellite (Earth-to-space) Meteorological-satellite (Earth-to-space) US345 US384	
403-406 METEOROLOGICAL AIDS Fixed Mobile except aeronautical mobile	403-406 METEOROLOGICAL AIDS (radiosonde) US70 US345 G6	403-406 METEOROLOGICAL AIDS (radiosonde) US70 US345	
406-406.1 MOBILE-SATELLITE (Earth-to-space) 5.266 5.267	406-406.1 MOBILE-SATELLITE (Earth-to-space) 5.266 5.267		Maritime (80) Aviation (87) Personal Radio (95)
406.1-410 FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY 5.149	406.1-410 FIXED US13 MOBILE RADIO ASTRONOMY US74 US117 G5 G6	406.1-410 RADIO ASTRONOMY US74 US13 US117	Private Land Mobile (90)

Table of Frequency Allocations			410-698 MHz (UHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
410-420 FIXED MOBILE except aeronautical mobile SPACE RESEARCH (space-to-space) 5.268			410-420 FIXED US13 MOBILE SPACE RESEARCH (space-to-space) 5.268 G5	410-420 US13	Private Land Mobile (90)
420-430 FIXED MOBILE except aeronautical mobile Radiolocation 5.269 5.270 5.271			420-450 RADIOLOCATION US217 G2 G129 5.286 US7 US87 US230 US397 G8	420-450 Amateur US7 NG135 5.282 5.286 US87 US217 US230 US397	Private Land Mobile (90) Amateur (97)
430-432 AMATEUR RADIOLOCATION 5.271 5.272 5.273 5.274 5.275 5.276 5.277	430-432 RADIOLOCATION Amateur 5.271 5.276 5.277 5.278 5.279				
432-438 AMATEUR RADIOLOCATION Earth exploration-satellite (active) 5.279A 5.138 5.271 5.272 5.276 5.277 5.280 5.281 5.282	432-438 RADIOLOCATION Amateur Earth exploration-satellite (active) 5.279A 5.271 5.276 5.277 5.278 5.279 5.281 5.282				
438-440 AMATEUR RADIOLOCATION 5.271 5.273 5.274 5.275 5.276 5.277 5.283	438-440 RADIOLOCATION Amateur 5.271 5.276 5.277 5.278 5.279				
440-450 FIXED MOBILE except aeronautical mobile Radiolocation 5.269 5.270 5.271 5.284 5.285 5.286					
450-455 FIXED MOBILE 5.209 5.271 5.286 5.286A 5.286B 5.286C 5.286D 5.286E			450-454 5.286 US87	450-454 LAND MOBILE 5.286 US87 NG112 NG124	Remote Pickup (74D) Low Power Auxiliary (74H) Private Land Mobile (90)
			454-456	454-455 FIXED LAND MOBILE NG12 NG112 NG148	Public Mobile (22) Maritime (80)
455-456 FIXED MOBILE 5.209 5.271 5.286A 5.286B 5.286C 5.286E	455-456 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.286A 5.286B 5.286C 5.209	455-456 FIXED MOBILE 5.209 5.271 5.286A 5.286B 5.286C 5.286E		455-456 LAND MOBILE	Remote Pickup (74D) Low Power Auxiliary (74H)

456-459 FIXED MOBILE 5.271 5.287 5.288			456-460 5.287 5.288	456-460 FIXED LAND MOBILE 5.287 5.288 NG112 NG124 NG148	Public Mobile (22) Maritime (80) Private Land Mobile (90)
459-460 FIXED MOBILE 5.209 5.271 5.286A 5.286B 5.286C 5.286E	459-460 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.286A 5.286B 5.286C 5.209	459-460 FIXED MOBILE 5.209 5.271 5.286A 5.286B 5.286C 5.286E			
460-470 FIXED MOBILE Meteorological-satellite (space-to-Earth) 5.287 5.288 5.289 5.290			460-470 Meteorological-satellite (space-to-Earth) 5.287 5.288 5.289 US201 US209 US216	460-462.5375 FIXED LAND MOBILE 5.289 US201 US209 NG124	Private Land Mobile (90)
				462.5375-462.7375 LAND MOBILE 5.289 US201	Personal Radio (95)
				462.7375-467.5375 FIXED LAND MOBILE 5.287 5.289 US201 US209 US216 NG124	Private Land Mobile (90)
				467.5375-467.7375 LAND MOBILE 5.287 5.289 US201	Personal Radio (95)
				467.7375-470 FIXED LAND MOBILE 5.288 5.289 US201 US216 NG124	Private Land Mobile (90)
470-790 BROADCASTING 5.149 5.291A 5.294 5.296 5.300 5.302 5.304 5.306 5.312	470-512 BROADCASTING Fixed Mobile 5.292 5.293	470-585 FIXED MOBILE BROADCASTING 5.291 5.298	470-608	470-512 FIXED LAND MOBILE BROADCASTING NG66 NG115 NG128 NG142 NG149	Public Mobile (22) Broadcast Radio (TV)(73) LPTV, TV Translator/Booster (74G) Low Power Auxiliary (74H) Private Land Mobile (90)
	512-608 BROADCASTING 5.297	585-610 FIXED MOBILE BROADCASTING RADIONAVIGATION 5.149 5.305 5.306 5.307		512-608 BROADCASTING NG115 NG128 NG142 NG149	Broadcast Radio (TV)(73) LPTV, TV Translator/Booster (74G) Low Power Auxiliary (74H)
	608-614 RADIO ASTRONOMY Mobile-satellite except aeronautical mobile-satellite (Earth-to-space)		608-614 LAND MOBILE (medical telemetry and medical telecommand) RADIO ASTRONOMY US74 US246		Personal (95)
	614-806 BROADCASTING Fixed Mobile 5.293 5.309	610-890 FIXED MOBILE 5.317A BROADCASTING 5.149 5.305 5.306 5.307 5.320	614-698	614-698 BROADCASTING NG115 NG128 NG142 NG149	Broadcast Radio (TV)(73) LPTV, TV Translator/Booster (74G) Low Power Auxiliary (74H)

Table of Frequency Allocations			698-941 MHz (UHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
(See previous page)	(See previous page)	(See previous page)	698-890	698-763 FIXED MOBILE BROADCASTING NG128 NG142 NG159	Wireless Communications (27) Broadcast Radio (TV)(73) LPTV, TV Translator/Booster (74G)
				763-775 FIXED MOBILE NG128 NG142 NG158 NG159	LPTV, TV Translator/Booster (74G) Private Land Mobile (90R)
				775-793 FIXED MOBILE BROADCASTING NG115 NG128 NG142 NG159	Wireless Communications (27) Broadcast Radio (TV)(73) LPTV, TV Translator/Booster (74G) Low Power Auxiliary (74H)
790-862 FIXED BROADCASTING				793-805 FIXED MOBILE NG128 NG142 NG158 NG159	LPTV, TV Translator/Booster (74G) Private Land Mobile (90R)
				805-806 FIXED MOBILE BROADCASTING NG128 NG142 NG159	Wireless Communications (27) LPTV, TV Translator/Booster (74G)
	806-890 FIXED MOBILE 5.317A BROADCASTING			806-809 LAND MOBILE	Private Land Mobile (90)
				809-849 FIXED LAND MOBILE	Public Mobile (22) Private Land Mobile (90)
				849-851 AERONAUTICAL MOBILE	Public Mobile (22)
				851-854 LAND MOBILE	Private Land Mobile (90)
5.312 5.314 5.315 5.316 5.319 862-890 FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING 5.322 5.319 5.323	5.317 5.318			854-894 FIXED LAND MOBILE US116 US268	Public Mobile (22) Private Land Mobile (90)

890-942 FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING 5.322 Radiolocation	890-902 FIXED MOBILE except aeronautical mobile 5.317A Radiolocation 5.318 5.325	890-942 FIXED MOBILE 5.317A BROADCASTING Radiolocation	890-902 US116 US268 G2	894-896 AERONAUTICAL MOBILE US116 US268	Public Mobile (22)
				896-901 FIXED LAND MOBILE US116 US268	Private Land Mobile (90)
				901-902 FIXED MOBILE US116 US268	Personal Communications (24)
	902-928 FIXED Amateur Mobile except aeronautical mobile 5.325A Radiolocation 5.150 5.325 5.326		902-928 RADIOLOCATION G59 5.150 US218 US267 US275 G11	902-928 5.150 US218 US267 US275	ISM Equipment (18) Private Land Mobile (90) Amateur (97)
	928-942 FIXED MOBILE except aeronautical mobile 5.317A Radiolocation		928-932 US116 US268 G2	928-929 FIXED US116 US268 NG120	Public Mobile (22) Private Land Mobile (90) Fixed Microwave (101)
				929-930 FIXED LAND MOBILE US116 US268	Private Land Mobile (90)
				930-931 FIXED MOBILE US116 US268	Personal Communications (24)
				931-932 FIXED LAND MOBILE US116 US268	Public Mobile (22)
			932-935 FIXED US268 G2	932-935 FIXED US268 NG120	Public Mobile (22) Fixed Microwave (101)
			935-941 US116 US268 G2	935-940 FIXED LAND MOBILE US116 US268	Private Land Mobile (90)
				940-941 FIXED MOBILE US116 US268	Personal Communications (24)
5.323	5.325	5.327			

Table of Frequency Allocations			941-1435 MHz (UHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
(See previous page)			941-944 FIXED US268 US301 G2	941-944 FIXED US268 US301 NG30 NG120	Public Mobile (22) Aural Broadcast Auxiliary (74E) Fixed Microwave (101)
942-960 FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING 5.322 5.323	942-960 FIXED MOBILE 5.317A	942-960 FIXED MOBILE 5.317A BROADCASTING 5.320	944-960	944-960 FIXED NG120	Public Mobile (22) Aural Broadcast Auxiliary (74E) Low Power Auxiliary (74H) Fixed Microwave (101)
960-1164 AERONAUTICAL RADIONAVIGATION 5.328			960-1164 AERONAUTICAL RADIONAVIGATION 5.328 US224 US400		Aviation (87)
1164-1215 AERONAUTICAL RADIONAVIGATION 5.328 RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.328A			1164-1215 AERONAUTICAL RADIONAVIGATION 5.328 RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328A US224		
1215-1240 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.329 5.329A SPACE RESEARCH (active) 5.330 5.331 5.332			1215-1240 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION G56 RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) G132 SPACE RESEARCH (active) 5.332	1215-1240 Earth exploration-satellite (active) Space research (active)	
1240-1300 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.329 5.329A SPACE RESEARCH (active) Amateur 5.282 5.330 5.331 5.332 5.335 5.335A			1240-1300 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION G56 SPACE RESEARCH (active) AERONAUTICAL RADIONAVIGATION 5.332 5.335	1240-1300 AERONAUTICAL RADIONAVIGATION Amateur Earth exploration-satellite (active) Space research (active) 5.282	Amateur (97)
1300-1350 AERONAUTICAL RADIONAVIGATION 5.337 RADIOLOCATION RADIONAVIGATION-SATELLITE (Earth-to-space) 5.149 5.337A			1300-1350 AERONAUTICAL RADIONAVIGATION 5.337 Radiolocation G2 US342	1300-1350 AERONAUTICAL RADIONAVIGATION 5.337 US342	Aviation (87)
1350-1400 FIXED MOBILE RADIOLOCATION	1350-1400 RADIOLOCATION		1350-1390 FIXED MOBILE RADIOLOCATION G2 5.334 5.339 US311 US342 G27 G114	1350-1390 5.334 5.339 US311 US342	

		1390-1395 5.339 US311 US342 US351 US398	1390-1392 FIXED MOBILE except aeronautical mobile Fixed-satellite (Earth-to-space) US368 5.339 US311 US342 US351 US398 1392-1395 FIXED MOBILE except aeronautical mobile 5.339 US311 US342 US351 US398	Wireless Communications (27)
5.149 5.338 5.339	5.149 5.334 5.339	1395-1400 LAND MOBILE (medical telemetry and medical telecommand) 5.339 US311 US342 US351 US398		Personal (95)
1400-1427 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.341		1400-1427 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.341 US246		
1427-1429 SPACE OPERATION (Earth-to-space) FIXED MOBILE except aeronautical mobile 5.341		1427-1429.5 LAND MOBILE (medical telemetry and medical telecommand) US350 5.341 US352 US398	1427-1429.5 LAND MOBILE (telemetry and telecommand) Fixed (telemetry) 5.341 US350 US352 US398	Private Land Mobile (90) Personal (95)
1429-1452 FIXED MOBILE except aeronautical mobile	1429-1452 FIXED MOBILE 5.343	1429.5-1432 5.341 US350 US352 US398	1429.5-1430 FIXED (telemetry and telecommand) LAND MOBILE (telemetry and telecommand) 5.341 US350 US352 US398 1430-1432 FIXED (telemetry and telecommand) LAND MOBILE (telemetry and telecommand) Fixed-satellite (space-to-Earth) US368 5.341 US350 US352 US398	
		1432-1435 5.341 US361	1432-1435 FIXED MOBILE except aeronautical mobile 5.341 US361	Wireless Communications (27)
5.341 5.342	5.341			

Table of Frequency Allocations			1435-1668.4 MHz (UHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
(See previous page)			1435-1525 MOBILE (aeronautical telemetry) 5.341 US78		Aviation (87)
1452-1492 FIXED MOBILE except aeronautical mobile BROADCASTING 5.345 BROADCASTING-SATELLITE 5.345 5.347A 5.341 5.342	1452-1492 FIXED MOBILE 5.343 BROADCASTING 5.345 BROADCASTING-SATELLITE 5.345 5.347A 5.341 5.344				
1492-1518 FIXED MOBILE except aeronautical mobile 5.341 5.342	1492-1518 FIXED MOBILE 5.343 5.341 5.344	1492-1518 FIXED MOBILE 5.341			
1518-1525 FIXED MOBILE except aeronautical mobile MOBILE-SATELLITE (space-to-Earth) 5.348 5.348A 5.348B 5.341 5.342	1518-1525 FIXED MOBILE 5.343 MOBILE-SATELLITE (space-to-Earth) 5.348 5.348A 5.348B 5.341 5.344	1518-1525 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.348 5.348A 5.348B 5.341			
1525-1530 SPACE OPERATION (space-to-Earth) FIXED MOBILE-SATELLITE (space-to-Earth) 5.347A 5.351A Earth exploration-satellite Mobile except aeronautical mobile 5.349 5.341 5.342 5.350 5.351 5.352A 5.354	1525-1530 SPACE OPERATION (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.347A 5.351A Earth exploration-satellite Fixed Mobile 5.343 5.341 5.351 5.354	1525-1530 SPACE OPERATION (space-to-Earth) FIXED MOBILE-SATELLITE (space-to-Earth) 5.347A 5.351A Earth exploration-satellite Mobile 5.349 5.341 5.351 5.352A 5.354	1525-1535 MOBILE-SATELLITE (space-to-Earth) US315 US380 5.341 5.351		Satellite Communications (25) Maritime (80)
1530-1535 SPACE OPERATION (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.347A 5.351A 5.353A Earth exploration-satellite Fixed Mobile except aeronautical mobile 5.341 5.342 5.351 5.354	1530-1535 SPACE OPERATION (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.347A 5.351A 5.353A Earth exploration-satellite Fixed Mobile 5.343 5.341 5.351 5.354				
1535-1559 MOBILE-SATELLITE (space-to-Earth) 5.347A 5.351A 5.341 5.351 5.353A 5.354 5.355 5.356 5.357 5.357A 5.359 5.362A			1535-1559 MOBILE-SATELLITE (space-to-Earth) US308 US309 US315 US380 5.341 5.351 5.356		Satellite Communications (25) Maritime (80) Aviation (87)
1559-1610 AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.329A 5.341 5.362B 5.362C			1559-1610 AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.341 US208 US260 US343		Aviation (87)

1610-1610.6 MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION 5.341 5.355 5.359 5.364 5.366 5.367 5.368 5.369 5.371 5.372	1610-1610.6 MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION RADIODETERMINATION-SATELLITE (Earth-to-space) 5.341 5.364 5.366 5.367 5.368 5.370 5.372	1610-1610.6 MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION Radiodetermination-satellite (Earth-to-space) 5.341 5.355 5.359 5.364 5.366 5.367 5.368 5.369 5.372	1610-1610.6 MOBILE-SATELLITE (Earth-to-space) US319 US380 AERONAUTICAL RADIONAVIGATION US260 RADIODETERMINATION-SATELLITE (Earth-to-space) 5.341 5.364 5.366 5.367 5.368 5.372 US208	Satellite Communications (25) Aviation (87)
1610.6-1613.8 MOBILE-SATELLITE (Earth-to-space) 5.351A RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION 5.149 5.341 5.355 5.359 5.364 5.366 5.367 5.368 5.369 5.371 5.372	1610.6-1613.8 MOBILE-SATELLITE (Earth-to-space) 5.351A RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION RADIODETERMINATION-SATELLITE (Earth-to-space) 5.149 5.341 5.364 5.366 5.367 5.368 5.370 5.372	1610.6-1613.8 MOBILE-SATELLITE (Earth-to-space) 5.351A RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION Radiodetermination-satellite (Earth-to-space) 5.149 5.341 5.355 5.359 5.364 5.366 5.367 5.368 5.369 5.372	1610.6-1613.8 MOBILE-SATELLITE (Earth-to-space) US319 US380 RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION US260 RADIODETERMINATION-SATELLITE (Earth-to-space) 5.341 5.364 5.366 5.367 5.368 5.372 US208 US342	
1613.8-1626.5 MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to-Earth) 5.347A 5.341 5.355 5.359 5.364 5.365 5.366 5.367 5.368 5.369 5.371 5.372	1613.8-1626.5 MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION RADIODETERMINATION-SATELLITE (Earth-to-space) Mobile-satellite (space-to-Earth) 5.347A 5.341 5.364 5.365 5.366 5.367 5.368 5.370 5.372	1613.8-1626.5 MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to-Earth) 5.347A Radiodetermination-satellite (Earth-to-space) 5.341 5.355 5.359 5.364 5.365 5.366 5.367 5.368 5.369 5.372	1613.8-1626.5 MOBILE-SATELLITE (Earth-to-space) US319 US380 AERONAUTICAL RADIONAVIGATION US260 RADIODETERMINATION-SATELLITE (Earth-to-space) Mobile-satellite (space-to-Earth) 5.341 5.364 5.365 5.366 5.367 5.368 5.372 US208	
1626.5-1660 MOBILE-SATELLITE (Earth-to-space) 5.351A 5.341 5.351 5.353A 5.354 5.355 5.357A 5.359 5.362A 5.374 5.375 5.376			1626.5-1660 MOBILE-SATELLITE (Earth-to-space) US308 US309 US315 US380 5.341 5.351 5.375	Satellite Communications (25) Maritime (80) Aviation (87)
1660-1660.5 MOBILE-SATELLITE (Earth-to-space) 5.351A RADIO ASTRONOMY 5.149 5.341 5.351 5.354 5.362A 5.376A			1660-1660.5 MOBILE-SATELLITE (Earth-to-space) US308 US309 US380 RADIO ASTRONOMY 5.341 5.351 US342	Satellite Communications (25) Aviation (87)
1660.5-1668 RADIO ASTRONOMY SPACE RESEARCH (passive) Fixed Mobile except aeronautical mobile 5.149 5.341 5.379 5.379A			1660.5-1668.4 RADIO ASTRONOMY US74 SPACE RESEARCH (passive) 5.341 US246	
1668-1668.4 MOBILE-SATELLITE (Earth-to-space) 5.379B 5.379C RADIO ASTRONOMY SPACE RESEARCH (passive) Fixed Mobile except aeronautical mobile 5.149 5.341 5.379 5.379A 5.379D				

Table of Frequency Allocations			1668.4-2200 MHz (UHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
1668.4-1670 METEOROLOGICAL AIDS FIXED MOBILE except aeronautical mobile MOBILE-SATELLITE (Earth-to-space) 5.379B 5.379C RADIO ASTRONOMY 5.149 5.341 5.379D 5.379E			1668.4-1670 METEOROLOGICAL AIDS (radiosonde) RADIO ASTRONOMY US74 5.341 US99 US342		
1670-1675 METEOROLOGICAL AIDS FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (Earth-to-space) 5.379B 5.341 5.379D 5.379E 5.380A			1670-1675 5.341 US211 US362	1670-1675 FIXED MOBILE except aeronautical mobile 5.341 US211 US362	Wireless Communications (27)
1675-1690 METEOROLOGICAL AIDS FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.341			1675-1700 METEOROLOGICAL AIDS (radiosonde) METEOROLOGICAL-SATELLITE (space-to-Earth) 5.289 5.341 US211		
1690-1700 METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (space-to-Earth) Fixed Mobile except aeronautical mobile 5.289 5.341 5.382	1690-1700 METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (space-to-Earth) 5.289 5.341 5.381				
1700-1710 FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.289 5.341		1700-1710 FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.289 5.341 5.384	1700-1710 FIXED G118 METEOROLOGICAL-SATELLITE (space-to-Earth) 5.289 5.341	1700-1710 METEOROLOGICAL-SATELLITE (space-to-Earth) Fixed 5.289 5.341	
1710-1930 FIXED MOBILE 5.384A 5.388A 5.388B 5.149 5.341 5.385 5.386 5.387 5.388			1710-1755 5.341 US311 US378	1710-1755 FIXED MOBILE 5.341 US311 US378	Wireless Communications (27)
			1755-1850 FIXED MOBILE SPACE OPERATION (Earth-to-space) G42	1755-1850	

1930-1970 FIXED MOBILE 5.388A 5.388B 5.388	1930-1970 FIXED MOBILE 5.388A 5.388B Mobile-satellite (Earth-to-space) 5.388	1930-1970 FIXED MOBILE 5.388A 5.388B 5.388	1850-2025	1850-2000 FIXED MOBILE NG177	RF Devices (15) Personal Communications (24) Fixed Microwave (101)
1970-1980 FIXED MOBILE 5.388A 5.388B 5.388					
1980-2010 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.351A 5.388 5.389A 5.389B 5.389F				2000-2020 MOBILE-SATELLITE (Earth-to-space) US380 NG156	Satellite Communications (25)
2010-2025 FIXED MOBILE 5.388A 5.388B 5.388	2010-2025 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.388 5.389C 5.389E	2010-2025 FIXED MOBILE 5.388A 5.388B 5.388		2020-2025 FIXED MOBILE NG177	
2025-2110 SPACE OPERATION (Earth-to-space) (space-to-space) EARTH EXPLORATION-SATELLITE (Earth-to-space) (space-to-space) FIXED MOBILE 5.391 SPACE RESEARCH (Earth-to-space) (space-to-space) 5.392			2025-2110 SPACE OPERATION (Earth-to-space) (space-to-space) EARTH EXPLORATION-SATELLITE (Earth-to-space) (space-to-space) SPACE RESEARCH (Earth-to-space) (space-to-space) 5.391 5.392 US90 US222 US346 US347 US393	2025-2110 FIXED NG118 MOBILE 5.391 5.392 US90 US222 US346 US347 US393	TV Auxiliary Broadcasting (74F) Cable TV Relay (78) Local TV Transmission (101J)
2110-2120 FIXED MOBILE 5.388A 5.388B SPACE RESEARCH (deep space) (Earth-to-space) 5.388			2110-2120 US252	2110-2120 FIXED MOBILE US252	Public Mobile (22) Wireless Communications (27) Fixed Microwave (101)
2120-2170 FIXED MOBILE 5.388A 5.388B 5.388	2120-2160 FIXED MOBILE 5.388A 5.388B Mobile-satellite (space-to-Earth) 5.388 2160-2170 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.388 5.389C 5.389E	2120-2170 FIXED MOBILE 5.388A 5.388B 5.388	2120-2200	2120-2180 FIXED MOBILE NG153 NG178	
2170-2200 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A 5.388 5.389A 5.389F				2180-2200 MOBILE-SATELLITE (space-to-Earth) US380 NG168	Satellite Communications (25)

Table of Frequency Allocations			2200-2655 MHz (UHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
2200-2290 SPACE OPERATION (space-to-Earth) (space-to-space) EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to-space) FIXED MOBILE 5.391 SPACE RESEARCH (space-to-Earth) (space-to-space) 5.392			2200-2290 SPACE OPERATION (space-to-Earth) (space-to-space) EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to-space) FIXED (line-of-sight only) MOBILE (line-of-sight only including aeronautical telemetry, but excluding flight testing of manned aircraft) 5.391 SPACE RESEARCH (space-to-Earth) (space-to-space) 5.392 US303	2200-2290 US303	
2290-2300 FIXED MOBILE except aeronautical mobile SPACE RESEARCH (deep space) (space-to-Earth)			2290-2300 FIXED MOBILE except aeronautical mobile SPACE RESEARCH (deep space) (space-to-Earth)	2290-2300 SPACE RESEARCH (deep space) (space-to-Earth)	
2300-2450 FIXED MOBILE Amateur Radiolocation	2300-2450 FIXED MOBILE RADIOLOCATION Amateur		2300-2305 G122	2300-2305 Amateur	Amateur (97)
			2305-2310 US338 G122	2305-2310 FIXED MOBILE except aeronautical mobile RADIOLOCATION Amateur US338	Wireless Communications (27) Amateur (97)
			2310-2320 Fixed Mobile US339 Radiolocation G2 US327	2310-2320 FIXED MOBILE US339 BROADCASTING-SATELLITE RADIOLOCATION 5.396 US327	Wireless Communications (27) Aviation (87)
			2320-2345 Fixed Radiolocation G2 US327	2320-2345 BROADCASTING-SATELLITE 5.396 US327	Satellite Communications (25)
			2345-2360 Fixed Mobile US339 Radiolocation G2 US327	2345-2360 FIXED MOBILE US339 BROADCASTING-SATELLITE RADIOLOCATION 5.396 US327	Wireless Communications (27) Aviation (87)
			2360-2390 MOBILE US276 RADIOLOCATION G2 G120 Fixed	2360-2390 MOBILE US276	Aviation (87)

			2390-2395 MOBILE US276	2390-2395 AMATEUR MOBILE US276	Aviation (87) Amateur (97)
			2395-2400 G122	2395-2400 AMATEUR	Amateur (97)
			2400-2417 5.150 G122	2400-2417 AMATEUR 5.150 5.282	ISM Equipment (18) Amateur (97)
			2417-2450 Radiolocation G2	2417-2450 Amateur	
5.150 5.282 5.395	5.150 5.282 5.393 5.394 5.396		5.150	5.150 5.282	
2450-2483.5 FIXED MOBILE Radiolocation 5.150 5.397	2450-2483.5 FIXED MOBILE RADIOLOCATION 5.150 5.394		2450-2483.5 5.150 US41	2450-2483.5 FIXED MOBILE Radiolocation 5.150 US41	ISM Equipment (18) TV Auxiliary Broadcasting (74F) Private Land Mobile (90) Fixed Microwave (101)
2483.5-2500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A Radiolocation 5.150 5.371 5.397 5.398 5.399 5.400 5.402	2483.5-2500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A RADIODETERMINATION-SATELLITE (space-to-Earth) 5.398 RADIOLOCATION 5.150 5.402	2483.5-2500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A RADIOLOCATION Radiodetermination-satellite (space-to-Earth) 5.398 5.150 5.400 5.402	2483.5-2500 MOBILE-SATELLITE (space-to-Earth) US319 US380 US391 RADIODETERMINATION-SATELLITE (space-to-Earth) 5.398 5.150 5.402 US41	2483.5-2495 MOBILE-SATELLITE (space-to-Earth) US319 US380 RADIODETERMINATION-SATELLITE (space-to-Earth) 5.398 5.150 5.402 US41 NG147	ISM Equipment (18) Satellite Communications (25)
				2495-2500 FIXED MOBILE except aeronautical mobile MOBILE-SATELLITE (space-to-Earth) US319 US380 RADIODETERMINATION-SATELLITE (space-to-Earth) 5.398 5.150 5.402 US41 US391 NG147	ISM Equipment (18) Satellite Communications (25) Wireless Communications (27)
2500-2520 FIXED 5.410 MOBILE except aeronautical mobile 5.384A MOBILE-SATELLITE (space-to Earth) 5.351A 5.403 5.405 5.407 5.412 5.414	2500-2520 FIXED FIXED-SATELLITE (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A MOBILE-SATELLITE (space-to-Earth) 5.351A 5.403 5.404 5.407 5.414 5.415A		2500-2655 5.339 US205	2500-2655 FIXED US205 MOBILE except aeronautical mobile 5.339	Wireless Communications (27)
2520-2655 FIXED 5.410 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.339 5.403 5.405 5.412 5.417C 5.417D 5.418B 5.418C	2520-2655 FIXED FIXED-SATELLITE (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.339 5.403 5.417C 5.417D 5.418B 5.418C	2520-2535 FIXED FIXED-SATELLITE (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.403 5.415A 2535-2655 FIXED MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.339 5.417A 5.417B 5.417C 5.417D 5.418 5.418A 5.418B 5.418C			

Table of Frequency Allocations			2655-4990 MHz (UHF/SHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
2655-2670 FIXED 5.410 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.347A 5.413 5.416 Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.412 5.420	2655-2670 FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.420 5.347A	2655-2670 FIXED FIXED-SATELLITE (Earth-to-space) 5.415 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.347A 5.413 5.416 Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.420	2655-2690 Earth exploration-satellite (passive) Radio astronomy US269 Space research (passive) US205	2655-2690 FIXED US205 MOBILE except aeronautical mobile Earth exploration-satellite (passive) Radio astronomy Space research (passive) US269	Wireless Communications (27)
2670-2690 FIXED 5.410 MOBILE except aeronautical mobile 5.384A MOBILE-SATELLITE (Earth-to-space) 5.351A Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.412 5.419 5.420	2670-2690 FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.347A 5.415 MOBILE except aeronautical mobile 5.384A MOBILE-SATELLITE (Earth-to-space) 5.351A Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.419 5.420	2670-2690 FIXED FIXED-SATELLITE (Earth-to-space) 5.415 MOBILE except aeronautical mobile 5.384A MOBILE-SATELLITE (Earth-to-space) 5.351A Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.419 5.420			
2690-2700 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.422			2690-2700 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) US246		
2700-2900 AERONAUTICAL RADIONAVIGATION 5.337 Radiolocation 5.423 5.424			2700-2900 METEOROLOGICAL AIDS AERONAUTICAL RADIONAVIGATION 5.337 Radiolocation G2 5.423 US18 G15	2700-2900 5.423 US18	Aviation (87)
2900-3100 RADIOLOCATION 5.424A RADIONAVIGATION 5.426 5.425 5.427			2900-3100 RADIOLOCATION 5.424A G56 MARITIME RADIONAVIGATION 5.427 US44 US316	2900-3100 MARITIME RADIONAVIGATION Radiolocation US44 5.427 US316	Maritime (80) Private Land Mobile (90)
3100-3300 RADIOLOCATION Earth exploration-satellite (active) Space research (active) 5.149 5.428			3100-3300 RADIOLOCATION G59 Earth exploration-satellite (active) Space research (active) US342	3100-3300 Earth exploration-satellite (active) Space research (active) Radiolocation US342	Private Land Mobile (90)

3300-3400 RADIOLOCATION 5.149 5.429 5.430	3300-3400 RADIOLOCATION Amateur Fixed Mobile 5.149 5.430	3300-3400 RADIOLOCATION Amateur 5.149 5.429	3300-3500 RADIOLOCATION US108 G2 US342	3300-3500 Amateur Radiolocation US108 5.282 US342	Private Land Mobile (90) Amateur (97)
3400-3600 FIXED FIXED-SATELLITE (space-to-Earth) Mobile Radiolocation 5.431	3400-3500 FIXED FIXED-SATELLITE (space-to-Earth) Amateur Mobile Radiolocation 5.433 5.282 5.432				
3600-4200 FIXED FIXED-SATELLITE (space-to-Earth) Mobile	3500-3700 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile Radiolocation 5.433 5.435		3500-3650 RADIOLOCATION G59 AERONAUTICAL RADIONAVIGATION (ground-based) G110 US245	3500-3600 Radiolocation 3600-3650 FIXED-SATELLITE (space-to-Earth) US245 Radiolocation	Private Land Mobile (90)
			3650-3700 US348 US349	3650-3700 FIXED FIXED-SATELLITE (space-to-Earth) NG169 NG185 MOBILE except aeronautical mobile US348 US349	Satellite Communications (25) Private Land Mobile (90)
	3700-4200 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile		3700-4200	3700-4200 FIXED FIXED-SATELLITE (space-to-Earth) NG180	Satellite Communications (25) Fixed Microwave (101)
4200-4400 AERONAUTICAL RADIONAVIGATION 5.438 5.439 5.440			4200-4400 AERONAUTICAL RADIONAVIGATION 5.440 US261		Aviation (87)
4400-4500 FIXED MOBILE			4400-4500 FIXED MOBILE	4400-4500	
4500-4800 FIXED FIXED-SATELLITE (space-to-Earth) 5.441 MOBILE			4500-4800 FIXED MOBILE US245	4500-4800 FIXED-SATELLITE (space-to-Earth) 5.441 US245	
4800-4990 FIXED MOBILE 5.442 Radio astronomy 5.149 5.339 5.443			4800-4940 FIXED MOBILE US203 US342	4800-4940 US203 US342	
			4940-4990 5.339 US311 US342 G122	4940-4990 FIXED MOBILE except aeronautical mobile 5.339 US311 US342	Private Land Mobile (90)

Table of Frequency Allocations			4990-5925 MHz (SHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
4990-5000 FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY Space research (passive) 5.149			4990-5000 RADIO ASTRONOMY US74 Space research (passive) US246		
5000-5010 AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (Earth-to-space) 5.367			5000-5010 AERONAUTICAL RADIONAVIGATION US260 RADIONAVIGATION-SATELLITE (Earth-to-space) 5.367 US211 US344		Aviation (87)
5010-5030 AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.443B 5.367			5010-5030 AERONAUTICAL RADIONAVIGATION US260 RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.443B 5.367 US211 US344		
5030-5150 AERONAUTICAL RADIONAVIGATION 5.367 5.444 5.444A			5030-5250 AERONAUTICAL RADIONAVIGATION US260	5030-5150 AERONAUTICAL RADIONAVIGATION US260 5.367 5.444 5.444A US211 US344	Satellite Communications (25) Aviation (87)
5150-5250 AERONAUTICAL RADIONAVIGATION FIXED-SATELLITE (Earth-to-space) 5.447A MOBILE except aeronautical mobile 5.446A 5.446B 5.446 5.447 5.447B 5.447C			5.367 5.444 US211 US307 US344	5150-5250 AERONAUTICAL RADIONAVIGATION US260 FIXED-SATELLITE (Earth-to-space) 5.447A US344 5.447C US211 US307	RF Devices (15) Satellite Communications (25) Aviation (87)
5250-5255 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH 5.447D MOBILE except aeronautical mobile 5.446A 5.447F 5.447E 5.448 5.448A			5250-5255 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION G59 SPACE RESEARCH (active) 5.447D 5.448A	5250-5255 Earth exploration-satellite (active) Radiolocation Space research	RF Devices (15) Private Land Mobile (90)
5255-5350 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) MOBILE except aeronautical mobile 5.446A 5.447F 5.447E 5.448 5.448A			5255-5350 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION G59 SPACE RESEARCH (active) 5.448A	5255-5350 Earth exploration-satellite (active) Radiolocation Space research (active) 5.448A	
5350-5460 EARTH EXPLORATION-SATELLITE (active) 5.448B SPACE RESEARCH (active) 5.448C AERONAUTICAL RADIONAVIGATION 5.449 RADIOLOCATION 5.448D			5350-5460 EARTH EXPLORATION-SATELLITE (active) 5.448B SPACE RESEARCH (active) AERONAUTICAL RADIONAVIGATION 5.449 RADIOLOCATION G56 US390 G130	5350-5460 AERONAUTICAL RADIONAVIGATION 5.449 Earth exploration-satellite (active) 5.448B Space research (active) Radiolocation US390	Aviation (87) Private Land Mobile (90)

5460-5470 RADIONAVIGATION 5.449 EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) RADIOLOCATION 5.448D 5.448B			5460-5470 RADIONAVIGATION 5.449 US65 EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) RADIOLOCATION G56 5.448B US49 G130	5460-5470 RADIONAVIGATION 5.449 US65 Earth exploration-satellite (active) Space research (active) Radiolocation 5.448B US49	Maritime (80) Aviation (87) Private Land Mobile (90)
5470-5570 MARITIME RADIONAVIGATION MOBILE except aeronautical mobile 5.446A 5.450A EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) RADIOLOCATION 5.450B 5.448B 5.450 5.451			5470-5570 MARITIME RADIONAVIGATION US65 EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) RADIOLOCATION G56 5.448B US50 G131	5470-5570 MARITIME RADIONAVIGATION US65 RADIOLOCATION Earth exploration-satellite (active) Space research (active) US50	RF Devices (15) Maritime (80) Private Land Mobile (90)
5570-5650 MARITIME RADIONAVIGATION MOBILE except aeronautical mobile 5.446A 5.450A RADIOLOCATION 5.450B 5.450 5.451 5.452			5570-5600 MARITIME RADIONAVIGATION US65 RADIOLOCATION G56 US50 G131	5570-5600 MARITIME RADIONAVIGATION US65 RADIOLOCATION US50	
			5600-5650 MARITIME RADIONAVIGATION US65 METEOROLOGICAL AIDS RADIOLOCATION G56 5.452 US50 G131	5600-5650 MARITIME RADIONAVIGATION US65 METEOROLOGICAL AIDS RADIOLOCATION 5.452 US50	
5650-5725 MOBILE except aeronautical mobile 5.446A 5.450A RADIOLOCATION Amateur Space research (deep space) 5.282 5.451 5.453 5.454 5.455			5650-5925 RADIOLOCATION G2	5650-5830 Amateur 5.150 5.282	RF Devices (15) ISM Equipment (18) Amateur (97)
5725-5830 FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur 5.150 5.451 5.453 5.455 5.456	5725-5830 RADIOLOCATION Amateur 5.150 5.453 5.455				
5830-5850 FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur Amateur-satellite (space-to-Earth) 5.150 5.451 5.453 5.455 5.456	5830-5850 RADIOLOCATION Amateur Amateur-satellite (space-to-Earth) 5.150 5.453 5.455			5830-5850 Amateur Amateur-satellite (space-to-Earth) 5.150	
5850-5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.150	5850-5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Amateur Radiolocation 5.150	5850-5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Radiolocation 5.150	5.150 US245	5850-5925 FIXED-SATELLITE (Earth-to-space) US245 MOBILE NG160 Amateur 5.150	ISM Equipment (18) Private Land Mobile (90) Personal Radio (95) Amateur (97)

Table of Frequency Allocations — 5925-8025 MHz (SHF)

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
5925-6700 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B MOBILE 5.149 5.440 5.458			5925-6425 5.458 US342	5925-6425 FIXEDFIXED-SATELLITE (Earth-to-space) NG181 5.458 US342	Satellite Communications (25) Fixed Microwave (101)
			6425-6525 5.440 5.458	6425-6525 FIXED-SATELLITE (Earth-to-space) MOBILE 5.440 5.458	TV Broadcast Auxiliary (74F) Cable TV Relay (78) Fixed Microwave (101)
			6525-6700	6525-6700 FIXED FIXED-SATELLITE (Earth-to-space)	Fixed Microwave (101)
6700-7075 FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.441 MOBILE 5.458 5.458A 5.458B 5.458C			6700-7125 5.458	6700-6875 FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.441 5.458 5.458A 5.458B	Satellite Communications (25) Fixed Microwave (101)
				6875-7025 FIXED NG118 FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.441 MOBILE NG171 5.458 5.458A 5.458B	Satellite Communications (25) TV Broadcast Auxiliary (74F) Cable TV Relay (78)
				7025-7075 FIXED NG118 FIXED-SATELLITE (Earth-to-space) NG172 MOBILE NG171 5.458 5.458A 5.458B	TV Broadcast Auxiliary (74F) Cable TV Relay (78)
7075-7145 FIXED MOBILE 5.458 5.459				7075-7125 FIXED NG118 MOBILE NG171 5.458	
			7125-7145 FIXED 5.458 G116	7125-7190 5.458 US262	
7145-7235 FIXED MOBILE SPACE RESEARCH (Earth-to-space) 5.460 5.458 5.459			7145-7190 FIXED SPACE RESEARCH (deep space) (Earth-to-space) US262 5.458 G116		
			7190-7235 FIXED SPACE RESEARCH (Earth-to-space) G133 5.458	7190-7235 5.458	

7235-7250 FIXED MOBILE 5.458	7235-7250 FIXED 5.458	7235-7250 5.458	
7250-7300 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE 5.461	7250-7300 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Fixed G117	7250-8025	
7300-7450 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.461	7300-7450 FIXED FIXED-SATELLITE (space-to-Earth) Mobile-satellite (space-to-Earth) G117		
7450-7550 FIXED FIXED-SATELLITE (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.461A	7450-7550 FIXED FIXED-SATELLITE (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) Mobile-satellite (space-to-Earth) G104 G117		
7550-7750 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 7750-7850 FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) 5.461B MOBILE except aeronautical mobile	7550-7750 FIXED FIXED-SATELLITE (space-to-Earth) Mobile-satellite (space-to-Earth) G117 7750-7850 FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) 5.461B		
7850-7900 FIXED MOBILE except aeronautical mobile	7850-7900 FIXED		
7900-8025 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.461	7900-8025 FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) Fixed G117		

Table of Frequency Allocations			8025-10000 MHz (SHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
8025-8175 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.463 5.462A			8025-8175 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) Mobile-satellite (Earth-to-space) (no airborne transmissions) US258 G117	8025-8400	
8175-8215 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) MOBILE 5.463 5.462A			8175-8215 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) Mobile-satellite (Earth-to-space) (no airborne transmissions) US258 G104 G117		
8215-8400 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.463 5.462A			8215-8400 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) Mobile-satellite (Earth-to-space) (no airborne transmissions) US258 G117	US258	
8400-8500 FIXED MOBILE except aeronautical mobile SPACE RESEARCH (space-to-Earth) 5.465 5.466			8400-8450 FIXED SPACE RESEARCH (deep space) (space-to-Earth)	8400-8450 Space research (deep space) (space-to-Earth)	
			8450-8500 FIXED SPACE RESEARCH (space-to-Earth)	8450-8500 SPACE RESEARCH (space-to-Earth)	
8500-8550 RADIOLOCATION 5.468 5.469			8500-8550 RADIOLOCATION G59	8500-8550 Radiolocation	Private Land Mobile (90)
8550-8650 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) 5.468 5.469 5.469A			8550-8650 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION G59 SPACE RESEARCH (active)	8550-8650 Earth exploration-satellite (active) Radiolocation Space research (active)	

8650-8750 RADIOLOCATION 5.468 5.469	8650-9000 RADIOLOCATION G59 US53	8650-9000 Radiolocation US53	Aviation (87) Private Land Mobile (90)
8750-8850 RADIOLOCATION AERONAUTICAL RADIONAVIGATION 5.470 5.471			
8850-9000 RADIOLOCATION MARITIME RADIONAVIGATION 5.472 5.473			
9000-9200 AERONAUTICAL RADIONAVIGATION 5.337 Radiolocation 5.471	9000-9200 AERONAUTICAL RADIONAVIGATION 5.337 Radiolocation G2 US48 G19	9000-9200 AERONAUTICAL RADIONAVIGATION 5.337 Radiolocation US48	
9200-9300 RADIOLOCATION MARITIME RADIONAVIGATION 5.472 5.473 5.474	9200-9300 MARITIME RADIONAVIGATION 5.472 Radiolocation US110 G59 5.474	9200-9300 MARITIME RADIONAVIGATION 5.472 Radiolocation US110 5.474	Maritime (80) Private Land Mobile (90)
9300-9500 RADIONAVIGATION 5.476 Radiolocation 5.427 5.474 5.475	9300-9500 RADIONAVIGATION 5.476 US66 Radiolocation US51 G56 Meteorological aids 5.427 5.474 US67 US71	9300-9500 RADIONAVIGATION 5.476 US66 Radiolocation US51 Meteorological aids 5.427 5.474 US67 US71	Maritime (80) Aviation (87) Private Land Mobile (90)
9500-9800 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION SPACE RESEARCH (active) 5.476A	9500-9800 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active)	9500-9800 Earth exploration-satellite (active) Radiolocation Space research (active)	Private Land Mobile (90)
9800-10000 RADIOLOCATION Fixed 5.477 5.478 5.479	9800-10000 RADIOLOCATION 5.479	9800-10000 Radiolocation 5.479	

Table of Frequency Allocations			10-14.2 GHz (SHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
10-10.45 FIXED MOBILE RADIOLOCATION Amateur 5.479	10-10.45 RADIOLOCATION Amateur 5.479 5.480	10-10.45 FIXED MOBILE RADIOLOCATION Amateur 5.479	10-10.45 RADIOLOCATION G32 5.479 US58 US108	10-10.45 Amateur Radiolocation 5.479 US58 US108 NG42	Private Land Mobile (90) Amateur (97)
10.45-10.5 RADIOLOCATION Amateur Amateur-satellite 5.481			10.45-10.5 RADIOLOCATION G32 US58 US108	10.45-10.5 Amateur Amateur-satellite Radiolocation US58 US108 NG42 NG134	
10.5-10.55 FIXED MOBILE Radiolocation	10.5-10.55 FIXED MOBILE RADIOLOCATION		10.5-10.55 RADIOLOCATION US59		Private Land Mobile (90)
10.55-10.6 FIXED MOBILE except aeronautical mobile Radiolocation			10.55-10.6	10.55-10.6 FIXED	Fixed Microwave (101)
10.6-10.68 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY SPACE RESEARCH (passive) Radiolocation 5.149 5.482			10.6-10.68 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) US265 US277	10.6-10.68 EARTH EXPLORATION-SATELLITE (passive) FIXED US265 SPACE RESEARCH (passive) US277	
10.68-10.7 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.483			10.68-10.7 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) US246 US355		
10.7-11.7 FIXED FIXED-SATELLITE (space-to-Earth) 5.441 5.484A (Earth-to-space) 5.484 MOBILE except aeronautical mobile	10.7-11.7 FIXED FIXED-SATELLITE (space-to-Earth) 5.441 5.484A MOBILE except aeronautical mobile		10.7-11.7 US211	10.7-11.7 FIXED FIXED-SATELLITE (space-to-Earth) 5.441 US211 US355 NG104 NG182 NG186	Satellite Communications (25) Fixed Microwave (101)
11.7-12.5 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.492	11.7-12.1 FIXED 5.486 FIXED-SATELLITE (space-to-Earth) 5.484A Mobile except aeronautical mobile 5.485 5.488 12.1-12.2 FIXED-SATELLITE (space-to-Earth) 5.484A 5.485 5.488 5.489	11.7-12.2 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.492 5.487 5.487A	11.7-12.2	11.7-12.2 FIXED-SATELLITE (space-to-Earth) NG143 NG145 NG183 NG187 5.488 NG184	Satellite Communications (25)

5.487 5.487A	12.2-12.7 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.492 5.487A 5.488 5.490	12.2-12.5 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile BROADCASTING 5.484A 5.487	12.2-12.75	12.2-12.7 FIXED BROADCASTING-SATELLITE 5.487A 5.488 5.490	Satellite Communications (25) Fixed Microwave (101)
12.5-12.75 FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.494 5.495 5.496	12.7-12.75 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile	12.5-12.75 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A MOBILE except aeronautical mobile BROADCASTING-SATELLITE 5.493		12.7-12.75 FIXED NG118 FIXED-SATELLITE (Earth-to-space) MOBILE	TV Broadcast Auxiliary (74F) Cable TV Relay (78) Fixed Microwave (101)
12.75-13.25 FIXED FIXED-SATELLITE (Earth-to-space) 5.441 MOBILE Space research (deep space) (space-to-Earth)			12.75-13.25 US251	12.75-13.25 FIXED NG118 FIXED-SATELLITE (Earth-to-space) 5.441 NG104 MOBILE US251 NG53	Satellite Communications (25) TV Broadcast Auxiliary (74F) Cable TV Relay (78) Fixed Microwave (101)
13.25-13.4 EARTH EXPLORATION-SATELLITE (active) AERONAUTICAL RADIONAVIGATION 5.497 SPACE RESEARCH (active) 5.498A 5.499			13.25-13.4 EARTH EXPLORATION-SATELLITE (active) AERONAUTICAL RADIONAVIGATION 5.497 SPACE RESEARCH (active) 5.498A	13.25-13.4 AERONAUTICAL RADIONAVIGATION 5.497 Earth exploration-satellite (active) Space research (active)	Aviation (87)
13.4-13.75 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH 5.501A Standard frequency and time signal-satellite (Earth-to-space) 5.499 5.500 5.501 5.501B			13.4-13.75 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION G59 SPACE RESEARCH 5.501A Standard frequency and time signal-satellite (Earth-to-space) 5.501B	13.4-13.75 Earth exploration-satellite (active) Radiolocation Space research Standard frequency and time signal-satellite (Earth-to-space)	Private Land Mobile (90)
13.75-14 FIXED-SATELLITE (Earth-to-space) 5.484A RADIOLOCATION Earth exploration-satellite Standard frequency and time signal-satellite (Earth-to-space) Space research 5.499 5.500 5.501 5.502 5.503			13.75-14 RADIOLOCATION G59 Standard frequency and time signal-satellite (Earth-to-space) Space research US337 US356 US357	13.75-14 FIXED-SATELLITE (Earth-to-space) US337 Standard frequency and time signal-satellite (Earth-to-space) Space research Radiolocation US356 US357	Satellite Communications (25) Private Land Mobile (90)
14-14.25 FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504C 5.506A Space research 5.504A 5.505			14-14.2 Space research	14-14.2 FIXED-SATELLITE (Earth-to-space) NG183 NG187 Mobile-satellite (Earth-to-space) Space research	Satellite Communications (25)

Table of Frequency Allocations			14.2-17.7 GHz (SHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
(See previous page)			14.2-14.4	14.2-14.47 FIXED-SATELLITE (Earth-to-space) NG183 NG187 Mobile-satellite (Earth-to-space)	Satellite Communications (25)
14.25-14.3 FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.506A 5.508A Space research 5.504A 5.505 5.508					
14.3-14.4 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.506A 5.509A Radionavigation-satellite 5.504A	14.3-14.4 FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A 5.506 5.506B Mobile-satellite (Earth-to-space) 5.506A Radionavigation-satellite 5.504A	14.3-14.4 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.506A 5.509A Radionavigation-satellite 5.504A			
14.4-14.47 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.506A 5.509A Space research (space-to-Earth) 5.504A			14.4-14.47 Fixed Mobile	NG184	
14.47-14.5 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radio astronomy 5.149 5.504A			14.47-14.5 Fixed Mobile US203 US342	14.47-14.5 FIXED-SATELLITE (Earth-to-space) NG183 NG187 Mobile-satellite (Earth-to-space) US203 US342	
14.5-14.8 FIXED FIXED-SATELLITE (Earth-to-space) 5.510 MOBILE Space research			14.5-14.7145 FIXED Mobile Space research 14.7145-14.8 MOBILE Fixed Space research	14.5-14.8	
14.8-15.35 FIXED MOBILE Space research			14.8-15.1365 MOBILE SPACE RESEARCH Fixed US310	14.8-15.1365 US310	
5.339			15.1365-15.35 FIXED SPACE RESEARCH Mobile 5.339 US211	15.1365-15.35 5.339 US211	

15.35-15.4 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.511			15.35-15.4 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) US246		
15.4-15.43 AERONAUTICAL RADIONAVIGATION 5.511D			15.4-15.43 AERONAUTICAL RADIONAVIGATION US260 US211		Aviation (87)
15.43-15.63 FIXED-SATELLITE (Earth-to-space) 5.511A AERONAUTICAL RADIONAVIGATION 5.511C			15.43-15.63 AERONAUTICAL RADIONAVIGATION US260 5.511C US211 US359	15.43-15.63 FIXED-SATELLITE (Earth-to-space) AERONAUTICAL RADIONAVIGATION US260 5.511C US211 US359	Satellite Communications (25) Aviation (87)
15.63-15.7 AERONAUTICAL RADIONAVIGATION 5.511D			15.63-15.7 AERONAUTICAL RADIONAVIGATION US260 US211		Aviation (87)
15.7-16.6 RADIOLOCATION 5.512 5.513			15.7-16.6 RADIOLOCATION G59	15.7-17.2 Radiolocation	Private Land Mobile (90)
16.6-17.1 RADIOLOCATION Space research (deep space) (Earth-to-space) 5.512 5.513			16.6-17.1 RADIOLOCATION G59 Space research (deep space) (Earth-to-space)		
17.1-17.2 RADIOLOCATION 5.512 5.513			17.1-17.2 RADIOLOCATION G59		
17.2-17.3 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) 5.512 5.513 5.513A			17.2-17.3 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION G59 SPACE RESEARCH (active)	17.2-17.3 Earth exploration-satellite (active) Radiolocation Space research (active)	
17.3-17.7 FIXED-SATELLITE (Earth-to-space) 5.516 (space-to-Earth) 5.516A 5.516B Radiolocation 5.514	17.3-17.7 FIXED-SATELLITE (Earth-to-space) 5.516 BROADCASTING-SATELLITE Radiolocation 5.514 5.515 5.517	17.3-17.7 FIXED-SATELLITE (Earth-to-space) 5.516 Radiolocation 5.514	17.3-17.7 Radiolocation US259 G59 US402 G117	17.3-17.7 FIXED-SATELLITE (Earth-to-space) US271 BROADCASTING-SATELLITE US402 NG163 US259	Satellite Communications (25)

Table of Frequency Allocations			17.7-23.6 GHz (SHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
17.7-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE	17.7-17.8 FIXED FIXED-SATELLITE (space-to-Earth) (Earth-to-space) 5.516 BROADCASTING-SATELLITE Mobile 5.515 5.517	17.7-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE	17.7-17.8 US401	17.7-17.8 FIXED FIXED-SATELLITE (Earth-to-space) US271 US401 NG144	Satellite Communications (25) TV Broadcast Auxiliary (74F) Cable TV Relay (78) Fixed Microwave (101)
	17.8-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE		17.8-18.3 FIXED-SATELLITE (space-to-Earth) G117 5.519 US334	17.8-18.3 FIXED 5.519 US334 NG144	TV Broadcast Auxiliary (74F) Cable TV Relay (78) Fixed Microwave (101)
18.1-18.4 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B (Earth-to-space) 5.520 MOBILE 5.519 5.521			18.3-18.6 FIXED-SATELLITE (space-to-Earth) G117 US334	18.3-18.6 FIXED-SATELLITE (space-to-Earth) NG164 US334 NG144	Satellite Communications (25)
18.4-18.6 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B MOBILE					
18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.522B MOBILE except aeronautical mobile Space research (passive) 5.522A 5.522C	18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.522B MOBILE except aeronautical mobile SPACE RESEARCH (passive) 5.522A	18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.522B MOBILE except aeronautical mobile Space research (passive) 5.522A	18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED-SATELLITE (space-to-Earth) US255 G117 SPACE RESEARCH (passive) US254 US334	18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED-SATELLITE (space-to-Earth) US255 NG164 SPACE RESEARCH (passive) US254 US334 NG144	
18.8-19.3 FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.523A MOBILE			18.8-20.2 FIXED-SATELLITE (space-to-Earth) G117	18.8-19.3 FIXED-SATELLITE (space-to-Earth) NG165 US334 NG144	
19.3-19.7 FIXED FIXED-SATELLITE (space-to-Earth) (Earth-to-space) 5.523B 5.523C 5.523D 5.523E MOBILE				19.3-19.7 FIXED FIXED-SATELLITE (space-to-Earth) NG166 US334 NG144	Satellite Communications (25) TV Broadcast Auxiliary (74F) Cable TV Relay (78) Fixed Microwave (101)
19.7-20.1 FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B Mobile-satellite (space-to-Earth) 5.524	19.7-20.1 FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 5.526 5.527 5.528 5.529	19.7-20.1 FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B Mobile-satellite (space-to-Earth) 5.524		19.7-20.1 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.525 5.526 5.527 5.528 5.529 US334	Satellite Communications (25)
20.1-20.2 FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 5.526 5.527 5.528			US334	20.1-20.2 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.525 5.526 5.527 5.528 US334	

20.2-21.2 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Standard frequency and time signal-satellite (space-to-Earth) 5.524			20.2-21.2 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Standard frequency and time signal-satellite (space-to-Earth) G117	20.2-21.2 Standard frequency and time signal-satellite (space-to-Earth)	
21.2-21.4 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive)			21.2-21.4 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) US263		Fixed Microwave (101)
21.4-22 FIXED MOBILE BROADCASTING-SATELLITE 5.347A 5.530	21.4-22 FIXED MOBILE	21.4-22 FIXED MOBILE BROADCASTING-SATELLITE 5.347A 5.530 5.531	21.4-22 FIXED MOBILE		
22-22.21 FIXED MOBILE except aeronautical mobile 5.149			22-22.21 FIXED MOBILE except aeronautical mobile US342		
22.21-22.5 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY SPACE RESEARCH (passive) 5.149 5.532			22.21-22.5 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY SPACE RESEARCH (passive) US263 US342		
22.5-22.55 FIXED MOBILE			22.5-22.55 FIXED MOBILE US211		
22.55-23.55 FIXED INTER-SATELLITE MOBILE 5.149			22.55-23.55 FIXED INTER-SATELLITE US278 MOBILE US342		Satellite Communications (25) Fixed Microwave (101)
23.55-23.6 FIXED MOBILE			23.55-23.6 FIXED MOBILE		Fixed Microwave (101)

Table of Frequency Allocations			23.6-30 GHz (SHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
23.6-24 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340			23.6-24 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) US246		
24-24.05 AMATEUR AMATEUR-SATELLITE 5.150			24-24.05 5.150 US211	24-24.05 AMATEUR AMATEUR-SATELLITE 5.150 US211	ISM Equipment (18) Amateur (97)
24.05-24.25 RADIOLOCATION Amateur Earth exploration-satellite (active) 5.150			24.05-24.25 RADIOLOCATION G59 Earth exploration-satellite (active) 5.150	24.05-24.25 Amateur Earth exploration-satellite (active) Radiolocation 5.150	ISM Equipment (18) Private Land Mobile (90) Amateur (97)
24.25-24.45 FIXED	24.25-24.45 RADIONAVIGATION	24.25-24.45 RADIONAVIGATION FIXED MOBILE	24.25-24.45	24.25-24.45 FIXED	Fixed Microwave (101)
24.45-24.75 FIXED INTER-SATELLITE	24.45-24.65 INTER-SATELLITE RADIONAVIGATION 5.533	24.45-24.65 FIXED INTER-SATELLITE MOBILE RADIONAVIGATION 5.533	24.45-24.65 INTER-SATELLITE RADIONAVIGATION 5.533		Satellite Communications (25)
	24.65-24.75 INTER-SATELLITE RADIOLOCATION-SATELLITE (Earth-to-space)	24.65-24.75 FIXED INTER-SATELLITE MOBILE 5.533	24.65-24.75 INTER-SATELLITE RADIOLOCATION-SATELLITE (Earth-to-space)		
24.75-25.25 FIXED	24.75-25.25 FIXED-SATELLITE (Earth-to-space) 5.535	24.75-25.25 FIXED FIXED-SATELLITE (Earth-to-space) 5.535 MOBILE	24.75-25.05 RADIONAVIGATION	24.75-25.05 FIXED-SATELLITE (Earth-to-space) NG167 RADIONAVIGATION	Satellite Communications (25) Aviation (87)
			25.05-25.25	25.05-25.25 FIXED FIXED-SATELLITE (Earth-to-space) NG167	Satellite Communications (25) Fixed Microwave (101)
25.25-25.5 FIXED INTER-SATELLITE 5.536 MOBILE Standard frequency and time signal-satellite (Earth-to-space)			25.25-25.5 FIXED INTER-SATELLITE 5.536 MOBILE Standard frequency and time signal-satellite (Earth-to-space)	25.25-25.5 Inter-satellite 5.536 Standard frequency and time signal-satellite (Earth-to-space)	

25.5-27 EARTH EXPLORATION-SATELLITE (space-to-Earth) 5.536B FIXED INTER-SATELLITE 5.536 MOBILE SPACE RESEARCH (space-to-Earth) 5.536C Standard frequency and time signal-satellite (Earth-to-space) 5.536A			25.5-27 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED INTER-SATELLITE 5.536 MOBILE SPACE RESEARCH (space-to-Earth) Standard frequency and time signal-satellite (Earth-to-space) 5.536A US258	25.5-27 Inter-satellite 5.536 Standard frequency and time signal-satellite (Earth-to-space) 5.536A US258	
27-27.5 FIXED INTER-SATELLITE 5.536 MOBILE	27-27.5 FIXED FIXED-SATELLITE (Earth-to-space) INTER-SATELLITE 5.536 5.537 MOBILE		27-27.5 FIXED INTER-SATELLITE 5.536 MOBILE	27-27.5 Inter-satellite 5.536	
27.5-28.5 FIXED 5.537A FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 MOBILE 5.538 5.540			27.5-30	27.5-29.5 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE	Satellite Communications (25) Fixed Microwave (101)
28.5-29.1 FIXED FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.523A 5.539 MOBILE Earth exploration-satellite (Earth-to-space) 5.541 5.540					
29.1-29.5 FIXED FIXED-SATELLITE (Earth-to-space) 5.516B 5.523C 5.523E 5.535A 5.539 5.541A MOBILE Earth exploration-satellite (Earth-to-space) 5.541 5.540					
29.5-29.9 FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 Earth exploration-satellite (Earth-to-space) 5.541 Mobile-satellite (Earth-to-space) 5.540 5.542	29.5-29.9 FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 MOBILE-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) 5.541 5.525 5.526 5.527 5.529 5.540 5.542	29.5-29.9 FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 Earth exploration-satellite (Earth-to-space) 5.541 Mobile-satellite (Earth-to-space) 5.540 5.542		29.5-29.9 FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) 5.525 5.526 5.527 5.529	Satellite Communications (25)
29.9-30 FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 MOBILE-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) 5.541 5.543 5.525 5.526 5.527 5.538 5.540 5.542				29.9-30 FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) 5.525 5.526 5.527 5.543	

Table of Frequency Allocations			30-39.5 GHz (EHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
30-31 FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) Standard frequency and time signal-satellite (space-to-Earth) 5.542			30-31 FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) Standard frequency and time signal-satellite (space-to-Earth) G117	30-31 Standard frequency and time signal-satellite (space-to-Earth)	
31-31.3 FIXED 5.543A MOBILE Standard frequency and time signal-satellite (space-to-Earth) Space research 5.544 5.545 5.149			31-31.3 Standard frequency and time signal-satellite (space-to-Earth) US211 US342	31-31.3 FIXED MOBILE Standard frequency and time signal-satellite (space-to-Earth) US211 US342	Fixed Microwave (101)
31.3-31.5 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340			31.3-31.8 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) US246		
31.5-31.8 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) Fixed Mobile except aeronautical mobile 5.149 5.546	31.5-31.8 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	31.5-31.8 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) Fixed Mobile except aeronautical mobile 5.149			
31.8-32 FIXED 5.547A RADIONAVIGATION SPACE RESEARCH (deep space) (space-to-Earth) 5.547 5.547B 5.548			31.8-32.3 RADIONAVIGATION US69 SPACE RESEARCH (deep space) (space-to-Earth) US262 5.548 US211	31.8-32.3 SPACE RESEARCH (deep space) (space-to-Earth) US262 5.548 US211	
32-32.3 FIXED 5.547A RADIONAVIGATION SPACE RESEARCH (deep space) (space-to-Earth) 5.547 5.547C 5.548					
32.3-33 FIXED 5.547A INTER-SATELLITE RADIONAVIGATION 5.547 5.547D 5.548			32.3-33 INTER-SATELLITE US278 RADIONAVIGATION US69 5.548		Aviation (87)
33-33.4 FIXED 5.547A RADIONAVIGATION 5.547 5.547E			33-33.4 RADIONAVIGATION US69 US360 G117		

33.4-34.2 RADIOLOCATION 5.549	33.4-34.2 RADIOLOCATION US360 G117	33.4-34.2 Radiolocation US360	Private Land Mobile (90)
34.2-34.7 RADIOLOCATION SPACE RESEARCH (deep space) (Earth-to-space) 5.549	34.2-34.7 RADIOLOCATION SPACE RESEARCH (deep space) (Earth-to-space) US262 US360 G34 G117	34.2-34.7 Radiolocation Space research (deep space) (Earth-to-space) US262 US360	
34.7-35.2 RADIOLOCATION Space research 5.550 5.549	34.7-35.5 RADIOLOCATION US360 G117	34.7-35.5 Radiolocation US360	
35.2-35.5 METEOROLOGICAL AIDS RADIOLOCATION 5.549			
35.5-36 METEOROLOGICAL AIDS EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) 5.549 5.549A	35.5-36 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) US360 G117	35.5-36 Earth exploration-satellite (active) Radiolocation Space research (active) US360	
36-37 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) 5.149	36-37 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) US263 US342		
37-37.5 FIXED MOBILE SPACE RESEARCH (space-to-Earth) 5.547	37-38 FIXED MOBILE SPACE RESEARCH (space-to-Earth)	37-37.5 FIXED MOBILE	
37.5-38 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE SPACE RESEARCH (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547		37.5-38.6 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE	Satellite Communications (25)
38-39.5 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Earth exploration-satellite (space-to-Earth) 5.547	38-38.6 FIXED MOBILE 38.6-39.5	38.6-39.5 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE NG175	Satellite Communications (25) Fixed Microwave (101)

Table of Frequency Allocations			39.5-50.2 GHz (EHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
39.5-40 FIXED FIXED-SATELLITE (space-to-Earth) 5.516B MOBILE MOBILE-SATELLITE (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547			39.5-40 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) US382 G117	39.5-40 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE NG175 US382	Satellite Communications (25) Fixed Microwave (101)
40-40.5 EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B MOBILE MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth exploration-satellite (space-to-Earth)			40-40.5 EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth exploration-satellite (space-to-Earth) G117	40-40.5 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth)	Satellite Communications (25)
40.5-41 FIXED FIXED-SATELLITE (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Mobile 5.547	40.5-41 FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile Mobile-satellite (space-to-Earth) 5.547	40.5-41 FIXED FIXED-SATELLITE (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Mobile 5.547	40.5-41 FIXED-SATELLITE (space-to-Earth) Mobile-satellite (space-to-Earth) US211 G117	40.5-41 FIXED-SATELLITE (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Fixed Mobile Mobile-satellite (space-to-Earth) US211	
41-42.5 FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile 5.547 5.551F 5.551H 5.551I			41-42.5 US211	41-42 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE BROADCASTING BROADCASTING-SATELLITE US211	
				42-42.5 FIXED MOBILE BROADCASTING BROADCASTING-SATELLITE US211	
42.5-43.5 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE except aeronautical mobile RADIO ASTRONOMY 5.149 5.547			42.5-43.5 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile RADIO ASTRONOMY US342	42.5-43.5 RADIO ASTRONOMY US342	

43.5-47 MOBILE 5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554		43.5-45.5 FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) G117	43.5-45.5	
		45.5-46.9 MOBILE MOBILE-SATELLITE (Earth-to-space) RADIONAVIGATION-SATELLITE 5.554		RF Devices (15)
		46.9-47 MOBILE MOBILE-SATELLITE (Earth-to-space) RADIONAVIGATION-SATELLITE 5.554	46.9-47 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) RADIONAVIGATION-SATELLITE 5.554	
47-47.2 AMATEUR AMATEUR-SATELLITE		47-48.2	47-47.2 AMATEUR AMATEUR-SATELLITE	Amateur (97)
47.2-47.5 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.552A			47.2-48.2 FIXED FIXED-SATELLITE (Earth-to-space) US297 MOBILE	Satellite Communications (25)
47.5-47.9 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 (space-to-Earth) 5.516B 5.554A MOBILE	47.5-47.9 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE			
47.9-48.2 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.552A				
48.2-48.54 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 (space-to-Earth) 5.516B 5.554A 5.555B MOBILE	48.2-50.2 FIXED FIXED-SATELLITE (Earth-to-space) 5.516B 5.552 MOBILE	48.2-50.2 FIXED FIXED-SATELLITE (Earth-to-space) US297 MOBILE US264		
48.54-49.44 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.149 5.340 5.555				
	5.149 5.340 5.555	5.555 US342		

Table of Frequency Allocations			50.2-71 GHz (EHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
49.44-50.2 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 (space-to-Earth) 5.516B 5.554A 5.555B MOBILE	(See previous page)		(See previous page)		
50.2-50.4 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340			50.2-50.4 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) US246		
50.4-51.4 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Mobile-satellite (Earth-to-space)			50.4-51.4 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space) G117	50.4-51.4 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space)	
51.4-52.6 FIXED MOBILE 5.547 5.556			51.4-52.6 FIXED MOBILE		
52.6-54.25 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340 5.556			52.6-54.25 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) US246		
54.25-55.78 EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.556A SPACE RESEARCH (passive) 5.556B			54.25-55.78 EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.556A SPACE RESEARCH (passive)		
55.78-56.9 EARTH EXPLORATION-SATELLITE (passive) FIXED 5.557A INTER-SATELLITE 5.556A MOBILE 5.558 SPACE RESEARCH (passive) 5.547 5.557			55.78-56.9 EARTH EXPLORATION-SATELLITE (passive) FIXED US379 INTER-SATELLITE 5.556A MOBILE 5.558 SPACE RESEARCH (passive) US263 US353		
56.9-57 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE 5.558A MOBILE 5.558 SPACE RESEARCH (passive) 5.547 5.557			56.9-57 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE G128 MOBILE 5.558 SPACE RESEARCH (passive) US263	56.9-57 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE 5.558 SPACE RESEARCH (passive) US263	

57-58.2 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE 5.556A MOBILE 5.558 SPACE RESEARCH (passive) 5.547 5.557	57-58.2 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE 5.556A MOBILE 5.558 SPACE RESEARCH (passive) US263		RF Devices (15)
58.2-59 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) 5.547 5.556	58.2-59 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) US353 US354		
59-59.3 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE 5.556A MOBILE 5.558 RADIOLOCATION 5.559 SPACE RESEARCH (passive)	59-59.3 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE 5.556A MOBILE 5.558 RADIOLOCATION 5.559 SPACE RESEARCH (passive) US353	59-59.3 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE 5.558 RADIOLOCATION 5.559 SPACE RESEARCH (passive) US353	
59.3-64 FIXED INTER-SATELLITE MOBILE 5.558 RADIOLOCATION 5.559 5.138	59.3-64 FIXED INTER-SATELLITE MOBILE 5.558 RADIOLOCATION 5.559 5.138 US353	59.3-64 FIXED MOBILE 5.558 RADIOLOCATION 5.559 5.138 US353	RF Devices (15) ISM Equipment (18)
64-65 FIXED INTER-SATELLITE MOBILE except aeronautical mobile 5.547 5.556	64-65 FIXED INTER-SATELLITE MOBILE except aeronautical mobile	64-65 FIXED MOBILE except aeronautical mobile	
65-66 EARTH EXPLORATION-SATELLITE FIXED INTER-SATELLITE MOBILE except aeronautical mobile SPACE RESEARCH 5.547	65-66 EARTH EXPLORATION-SATELLITE FIXED MOBILE except aeronautical mobile SPACE RESEARCH	65-66 EARTH EXPLORATION-SATELLITE FIXED INTER-SATELLITE MOBILE except aeronautical mobile SPACE RESEARCH	
66-71 INTER-SATELLITE MOBILE 5.553 5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554	66-71 MOBILE 5.553 5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554	66-71 INTER-SATELLITE MOBILE 5.553 5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554	

Table of Frequency Allocations			71-100 GHz (EHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
71-74 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth)			71-74 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth) US389		Fixed Microwave (101)
74-76 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE BROADCASTING BROADCASTING-SATELLITE Space research (space-to-Earth) 5.561			74-76 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Space research (space-to-Earth) US389	74-76 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE BROADCASTING BROADCASTING-SATELLITE Space research (space-to-Earth) US389	
76-77.5 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth) 5.149			76-77.5 RADIO ASTRONOMY RADIOLOCATION Space research (space-to-Earth) US342	76-77 RADIO ASTRONOMY RADIOLOCATION Amateur Space research (space-to-Earth) US342	RF Devices (15) Amateur (97)
				77-77.5 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth) US342	Amateur (97)
77.5-78 AMATEUR AMATEUR-SATELLITE Radio astronomy Space research (space-to-Earth) 5.149			77.5-78 Radio astronomy Space research (space-to-Earth) US342	77.5-78 AMATEUR AMATEUR-SATELLITE Radio astronomy Space research (space-to-Earth) US342	
78-79 RADIOLOCATION Amateur Amateur-satellite Radio astronomy Space research (space-to-Earth) 5.149 5.560			78-79 RADIO ASTRONOMY RADIOLOCATION Space research (space-to-Earth) 5.560 US342	78-79 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth) 5.560 US342	
79-81 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth) 5.149			79-81 RADIO ASTRONOMY RADIOLOCATION Space research (space-to-Earth) US342	79-81 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth) US342	

81-84 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY Space research (space-to-Earth) 5.149 5.561A	81-84 FIXED FIXED-SATELLITE (Earth-to-space) US297 MOBILE MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY Space research (space-to-Earth) US342 US388 US389		Fixed Microwave (101)
84-86 FIXED FIXED-SATELLITE (Earth-to-space) 5.561B MOBILE RADIO ASTRONOMY 5.149	84-86 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY US342 US388 US389		
86-92 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	86-92 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) US246		
92-94 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149	92-94 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION US342 US388		RF Devices (15) Fixed Microwave (101)
94-94.1 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) Radio astronomy 5.562 5.562A	94-94.1 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) Radio astronomy 5.562 5.562A	94-94.1 RADIOLOCATION Radio astronomy 5.562A	RF Devices (15)
94.1-95 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149	94.1-95 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION US342 US388		RF Devices (15) Fixed Microwave (101)
95-100 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.149 5.554	95-100 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554 US342		

Table of Frequency Allocations			100-155.5 GHz (EHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
100-102 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.341			100-102 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) 5.341 US246		
102-105 FIXED MOBILE RADIO ASTRONOMY 5.149 5.341			102-105 FIXED MOBILE RADIO ASTRONOMY 5.341 US342		
105-109.5 FIXED MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) 5.562B 5.149 5.341			105-109.5 FIXED MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) 5.562B 5.341 US342		
109.5-111.8 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.341			109.5-111.8 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) 5.341 US246		
111.8-114.25 FIXED MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) 5.562B 5.149 5.341			111.8-114.25 FIXED MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) 5.562B 5.341 US342		
114.25-116 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.341			114.25-116 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) 5.341 US246		
116-119.98 EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.562C SPACE RESEARCH (passive) 5.341			116-122.25 EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.562C SPACE RESEARCH (passive)		ISM Equipment (18)
119.98-122.25 EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.562C SPACE RESEARCH (passive) 5.138 5.341			5.138 5.341 US211		

122.25-123 FIXED INTER-SATELLITE MOBILE 5.558 Amateur 5.138	122.25-123 FIXED INTER-SATELLITE MOBILE 5.558 5.138	122.25-123 FIXED INTER-SATELLITE MOBILE 5.558 Amateur 5.138	ISM Equipment (18) Amateur (97)
123-130 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) RADIONAVIGATION RADIONAVIGATION-SATELLITE Radio astronomy 5.562D 5.149 5.554	123-130 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) RADIONAVIGATION RADIONAVIGATION-SATELLITE Radio astronomy 5.554 US211 US342		
130-134 EARTH EXPLORATION-SATELLITE (active) 5.562E FIXED INTER-SATELLITE MOBILE 5.558 RADIO ASTRONOMY 5.149 5.562A	130-134 EARTH EXPLORATION-SATELLITE (active) 5.562E FIXED INTER-SATELLITE MOBILE 5.558 RADIO ASTRONOMY 5.562A US342		
134-136 AMATEUR AMATEUR-SATELLITE Radio astronomy	134-136 Radio astronomy	134-136 AMATEUR AMATEUR-SATELLITE Radio astronomy	Amateur (97)
136-141 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite 5.149	136-141 RADIO ASTRONOMY RADIOLOCATION US342	136-141 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite US342	
141-148.5 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149	141-148.5 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION US342		
148.5-151.5 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	148.5-151.5 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) US246		
151.5-155.5 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149	151.5-155.5 FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION US342		

Table of Frequency Allocations			155.5-238 GHz (EHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
155.5-158.5 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) 5.562B 5.149 5.562F 5.562G			155.5-158.5 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) 5.562B 5.562F 5.562G US342		
158.5-164 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth)			158.5-164 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth) US211		
164-167 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340			164-167 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) US246		
167-174.5 FIXED FIXED-SATELLITE (space-to-Earth) INTER-SATELLITE MOBILE 5.558 5.149 5.562D			167-174.5 FIXED FIXED-SATELLITE (space-to-Earth) INTER-SATELLITE MOBILE 5.558 US211 US342		
174.5-174.8 FIXED INTER-SATELLITE MOBILE 5.558			174.5-174.8 FIXED INTER-SATELLITE MOBILE 5.558		
174.8-182 EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.562H SPACE RESEARCH (passive)			174.8-182 EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.562H SPACE RESEARCH (passive)		
182-185 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340			182-185 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) US246		
185-190 EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.562H SPACE RESEARCH (passive)			185-190 EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.562H SPACE RESEARCH (passive)		
190-191.8 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340			190-191.8 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) US246		

191.8-200 FIXED INTER-SATELLITE MOBILE 5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.149 5.341 5.554	191.8-200 FIXED INTER-SATELLITE MOBILE 5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.341 5.554 US211 US342	
200-209 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.341 5.563A	200-209 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) 5.341 5.563A US246	
209-217 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY 5.149 5.341	209-217 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY 5.341 US342	
217-226 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) 5.562B 5.149 5.341	217-226 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) 5.562B 5.341 US342	
226-231.5 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	226-231.5 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) US246	
231.5-232 FIXED MOBILE Radiolocation	231.5-232 FIXED MOBILE Radiolocation	
232-235 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Radiolocation	232-235 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Radiolocation	
235-238 EARTH EXPLORATION-SATELLITE (passive) FIXED-SATELLITE (space-to-Earth) SPACE RESEARCH (passive) 5.563A 5.563B	235-238 EARTH EXPLORATION-SATELLITE (passive) FIXED-SATELLITE (space-to-Earth) SPACE RESEARCH (passive) 5.563A 5.563B	

Table of Frequency Allocations			238-1000 GHz (EHF)		
International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
238-240 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE RADIOLOCATION RADIONAVIGATION RADIONAVIGATION-SATELLITE			238-240 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE RADIOLOCATION RADIONAVIGATION RADIONAVIGATION-SATELLITE		
240-241 FIXED MOBILE RADIOLOCATION			240-241 FIXED MOBILE RADIOLOCATION		
241-248 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite 5.138 5.149			241-248 RADIO ASTRONOMY RADIOLOCATION 5.138 US342	241-248 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite 5.138 US342	ISM Equipment (18) Amateur (97)
248-250 AMATEUR AMATEUR-SATELLITE Radio astronomy 5.149			248-250 Radio astronomy US342	248-250 AMATEUR AMATEUR-SATELLITE Radio astronomy US342	Amateur (97)
250-252 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.563A			250-252 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) 5.563A US246		
252-265 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.149 5.554			252-265 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554 US211 US342		
265-275 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY 5.149 5.563A			265-275 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY 5.563A US342		
275-1000 (Not allocated) 5.565			275-1000 (Not allocated) 5.565		Amateur (97)

INTERNATIONAL FOOTNOTES[1]

5.53 Administrations authorizing the use of frequencies below 9 kHz shall ensure that no harmful interference is caused thereby to the services to which the bands above 9 kHz are allocated.

5.54 Administrations conducting scientific research using frequencies below 9 kHz are urged to advise other administrations that may be concerned in order that such research may be afforded all practicable protection from harmful interference.

5.55 *Additional allocation:* in Armenia, Azerbaijan, Bulgaria, Georgia, Kyrgyzstan, the Russian Federation, Tajikistan and Turkmenistan, the band 14-17 kHz is also allocated to the radionavigation service on a primary basis.

5.56 The stations of services to which the bands 14-19.95 kHz and 20.05-70 kHz and in Region 1 also the bands 72-84 kHz and 86-90 kHz are allocated may transmit standard frequency and time signals. Such stations shall be afforded protection from harmful interference. In Armenia, Azerbaijan, Belarus, Bulgaria, the Russian Federation, Georgia, Kazakhstan, Mongolia, Kyrgyzstan, Slovakia, the Czech Rep., Tajikistan and Turkmenistan, the frequencies 25 kHz and 50 kHz will be used for this purpose under the same conditions.

5.57 The use of the bands 14-19.95 kHz, 20.05-70 kHz and 70-90 kHz (72-84 kHz and 86-90 kHz in Region 1) by the maritime mobile service is limited to coast radiotelegraph stations (A1A and F1B only). Exceptionally, the use of class J2B or J7B emissions is authorized subject to the necessary bandwidth not exceeding that normally used for class A1A or F1B emissions in the band concerned.

5.58 *Additional allocation:* in Armenia, Azerbaijan, the Russian Federation, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan and Turkmenistan, the band 67-70 kHz is also allocated to the radionavigation service on a primary basis.

5.59 *Different category of service:* in Bangladesh and Pakistan, the allocation of the bands 70-72 kHz and 84-86 kHz to the fixed and maritime mobile services is on a primary basis (see No. 5.33).

5.60 In the bands 70-90 kHz (70-86 kHz in Region 1) and 110-130 kHz (112-130 kHz in Region 1), pulsed radionavigation systems may be used on condition that they do not cause harmful interference to other services to which these bands are allocated.

5.61 In Region 2, the establishment and operation of stations in the maritime radionavigation service in the bands 70-90 kHz and 110-130 kHz shall be subject to agreement obtained under No. 9.21 with administrations whose services, operating in accordance with the Table, may be affected. However, stations of the fixed, maritime mobile and radiolocation services shall not cause harmful interference to stations in the maritime radionavigation service established under such agreements.

5.62 Administrations which operate stations in the radionavigation service in the band 90-110 kHz are urged to coordinate technical and operating characteristics in such a way as to avoid harmful interference to the services provided by these stations.

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[1] The international footnotes in this section reflect the formating used in the ITU Radio Regulations.

5.64 Only classes A1A or F1B, A2C, A3C, F1C or F3C emissions are authorized for stations of the fixed service in the bands allocated to this service between 90 kHz and 160 kHz (148.5 kHz in Region 1) and for stations of the maritime mobile service in the bands allocated to this service between 110 kHz and 160 kHz (148.5 kHz in Region 1). Exceptionally, class J2B or J7B emissions are also authorized in the bands between 110 kHz and 160 kHz (148.5 kHz in Region 1) for stations of the maritime mobile service.

5.65 *Different category of service:* in Bangladesh, the allocation of the bands 112-117.6 kHz and 126-129 kHz to the fixed and maritime mobile services is on a primary basis (see No. 5.33).

5.66 *Different category of service:* in Germany, the allocation of the band 115-117.6 kHz to the fixed and maritime mobile services is on a primary basis (see No. 5.33) and to the radionavigation service on a secondary basis (see No. 5.32).

5.67 *Additional allocation:* in Azerbaijan, Bulgaria, Mongolia, Kyrgyzstan, Romania and Turkmenistan, the band 130-148.5 kHz is also allocated to the radionavigation service on a secondary basis. Within and between these countries this service shall have an equal right to operate.

5.68 *Alternative allocation:* in Angola, Burundi, Congo (Rep. of the), Malawi, the Dem. Rep. of the Congo, Rwanda and South Africa, the band 160-200 kHz is allocated to the fixed service on a primary basis.

5.69 *Additional allocation:* in Somalia, the band 200-255 kHz is also allocated to the aeronautical radionavigation service on a primary basis.

5.70 *Alternative allocation:* in Angola, Botswana, Burundi, Cameroon, the Central African Rep., Congo (Rep. of the), Ethiopia, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Nigeria, Oman, the Dem. Rep. of the Congo, Rwanda, South Africa, Swaziland, Tanzania, Chad, Zambia and Zimbabwe, the band 200-283.5 kHz is allocated to the aeronautical radionavigation service on a primary basis.

5.71 *Alternative allocation:* in Tunisia, the band 255-283.5 kHz is allocated to the broadcasting service on a primary basis.

5.72 Norwegian stations of the fixed service situated in northern areas (north of 60° N) subject to auroral disturbances are allowed to continue operation on four frequencies in the bands 283.5-490 kHz and 510-526.5 kHz.

5.73 The band 285-325 kHz (283.5-325 kHz in Region 1) in the maritime radionavigation service may be used to transmit supplementary navigational information using narrow-band techniques, on condition that no harmful interference is caused to radiobeacon stations operating in the radionavigation service.

5.74 *Additional Allocation:* in Region 1, the frequency band 285.3-285.7 kHz is also allocated to the maritime radionavigation service (other than radiobeacons) on a primary basis.

5.75 *Different category of service:* in Armenia, Azerbaijan, Belarus, Georgia, Moldova, Kyrgyzstan, the Russian Federation, Tajikistan, Turkmenistan, Ukraine and the Black Sea areas of Bulgaria and Romania, the allocation of the band 315-325 kHz to the maritime radionavigation service is on a primary basis under the condition that in the Baltic Sea area, the assignment of frequencies in this band to new stations in the maritime or aeronautical radionavigation services shall be subject to prior consultation between the administrations concerned.

5.76 The frequency 410 kHz is designated for radio direction-finding in the maritime radionavigation service. The other radionavigation services to which the band 405-415 kHz is allocated shall not cause harmful interference to radio direction-finding in the band 406.5-413.5 kHz.

5.77 *Different category of service:* in Australia, China, the French Overseas Territories of Region 3, India, Indonesia (until 1 January 2005), Iran (Islamic Republic of), Japan, Pakistan, Papua New Guinea and Sri Lanka, the allocation of the band 415-495 kHz to the aeronautical radionavigation service is on a primary basis. Administrations in these countries shall take all practical steps necessary to ensure that aeronautical radionavigation stations in the band 435-495 kHz do not cause interference to reception by coast stations of ship stations transmitting on frequencies designated for ship stations on a worldwide basis (see No. 52.39).

5.78 *Different category of service:* in Cuba, the United States of America and Mexico, the allocation of the band 415-435 kHz to the aeronautical radionavigation service is on a primary basis.

5.79 The use of the bands 415-495 kHz and 505-526.5 kHz (505-510 kHz in Region 2) by the maritime mobile service is limited to radiotelegraphy.

5.79A When establishing coast stations in the NAVTEX service on the frequencies 490 kHz, 518 kHz and 4209.5 kHz, administrations are strongly recommended to coordinate the operating characteristics in accordance with the procedures of the International Maritime Organization (IMO) (see Resolution 339 (Rev.WRC-97))[3].

5.80 In Region 2, the use of the band 435-495 kHz by the aeronautical radionavigation service is limited to non-directional beacons not employing voice transmission.

5.82 In the maritime mobile service, the frequency 490 kHz is, from the date of full implementation of the GMDSS (see Resolution 331 (Rev.WRC-97))[3], to be used exclusively for the transmission by coast stations of navigational and meteorological warnings and urgent information to ships, by means of narrow-band direct-printing telegraphy. The conditions for use of the frequency 490 kHz are prescribed in Articles 31 and 52. In using the band 415-495 kHz for the aeronautical radionavigation service, administrations are requested to ensure that no harmful interference is caused to the frequency 490 kHz.

5.83 The frequency 500 kHz is an international distress and calling frequency for Morse radiotelegraphy. The conditions for its use are prescribed in Articles 31 and 52**,** and in Appendix 13.

5.84 The conditions for the use of the frequency 518 kHz by the maritime mobile service are prescribed in Articles 31 and 52 and in Appendix 13.

5.86 In Region 2, in the band 525-535 kHz the carrier power of broadcasting stations shall not exceed 1 kW during the day and 250 W at night.

5.87 *Additional allocation:* in Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland and Zimbabwe, the band 526.5-535 kHz is also allocated to the mobile service on a secondary basis.

5.87A *Additional allocation:* in Uzbekistan, the band 526.5-1606.5 kHz is also allocated to the radionavigation service on a primary basis. Such use is subject to agreement obtained under No. 9.21 with administrations concerned and limited to ground-based radiobeacons in operation on 27 October 1997 until the end of their lifetime.

5.88 *Additional allocation:* in China, the band 526.5-535 kHz is also allocated to the aeronautical radionavigation service on a secondary basis.

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[3] *Note by the Secretariat:* This Resolution was revised by WRC-03.

5.89 In Region 2, the use of the band 1605-1705 kHz by stations of the broadcasting service is subject to the Plan established by the Regional Administrative Radio Conference (Rio de Janeiro, 1988).

The examination of frequency assignments to stations of the fixed and mobile services in the band 1625-1705 kHz shall take account of the allotments appearing in the Plan established by the Regional Administrative Radio Conference (Rio de Janeiro, 1988).

5.90 In the band 1605-1705 kHz, in cases where a broadcasting station of Region 2 is concerned, the service area of the maritime mobile stations in Region 1 shall be limited to that provided by ground-wave propagation.

5.91 *Additional allocation:* in the Philippines and Sri Lanka, the band 1606.5-1705 kHz is also allocated to the broadcasting service on a secondary basis.

5.92 Some countries of Region 1 use radiodetermination systems in the bands 1606.5-1625 kHz, 1635-1800 kHz, 1850-2160 kHz, 2194-2300 kHz, 2502-2850 kHz and 3500-3800 kHz, subject to agreement obtained under No. 9.21. The radiated mean power of these stations shall not exceed 50 W.

5.93 *Additional allocation:* in Angola, Armenia, Azerbaijan, Belarus, Georgia, Hungary, Kazakhstan, Latvia, Lithuania, Moldova, Mongolia, Nigeria, Uzbekistan, Poland, Kyrgyzstan, Slovakia, the Czech Rep., the Russian Federation, Tajikistan, Chad, Turkmenistan and Ukraine, the bands 1625-1635 kHz, 1800-1810 kHz and 2160-2170 kHz and, in Bulgaria, the bands 1625-1635 kHz and 1800-1810 kHz, are also allocated to the fixed and land mobile services on a primary basis, subject to agreement obtained under No. 9.21.

5.96 In Germany, Armenia, Austria, Azerbaijan, Belarus, Denmark, Estonia, the Russian Federation, Finland, Georgia, Hungary, Ireland, Iceland, Israel, Kazakhstan, Latvia, Liechtenstein, Lithuania, Malta, Moldova, Norway, Uzbekistan, Poland, Kyrgyzstan, Slovakia, the Czech Rep., the United Kingdom, Sweden, Switzerland, Tajikistan, Turkmenistan and Ukraine, administrations may allocate up to 200 kHz to their amateur service in the bands 1715-1800 kHz and 1850-2000 kHz. However, when allocating the bands within this range to their amateur service, administrations shall, after prior consultation with administrations of neighbouring countries, take such steps as may be necessary to prevent harmful interference from their amateur service to the fixed and mobile services of other countries. The mean power of any amateur station shall not exceed 10 W.

5.97 In Region 3, the Loran system operates either on 1850 kHz or 1950 kHz, the bands occupied being 1825-1875 kHz and 1925-1975 kHz respectively. Other services to which the band 1800-2000 kHz is allocated may use any frequency therein on condition that no harmful interference is caused to the Loran system operating on 1850 kHz or 1950 kHz.

5.98 *Alternative allocation:* in Angola, Armenia, Azerbaijan, Belarus, Belgium, Bulgaria, Cameroon, Congo (Rep. of the), Denmark, Egypt, Eritrea, Spain, Ethiopia, the Russian Federation, Georgia, Greece, Italy, Kazakhstan, Lebanon, Lithuania, Moldova, the Syrian Arab Republic, Kyrgyzstan, Somalia, Tajikistan, Tunisia, Turkmenistan, Turkey and Ukraine, the band 1810-1830 kHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.99 *Additional allocation:* in Saudi Arabia, Austria, Bosnia and Herzegovina, Iraq, the Libyan Arab Jamahiriya, Uzbekistan, Slovakia, Romania, Serbia and Montenegro, Slovenia, Chad, and Togo, the band 1810-1830 kHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.100 In Region 1, the authorization to use the band 1810-1830 kHz by the amateur service in countries situated totally or partially north of 40° N shall be given only after consultation with the countries mentioned in Nos. 5.98 and 5.99 to define the necessary steps to be taken to prevent harmful nterference between amateur stations and stations of other services operating in accordance with Nos. 5.98 and 5.99.

5.101 *Alternative allocation:* in Burundi and Lesotho, the band 1810-1850 kHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.102 *Alternative allocation:* in Argentina, Bolivia, Chile, Mexico, Paraguay, Peru, Uruguay and Venezuela, the band 1850-2000 kHz is allocated to the fixed, mobile except aeronautical mobile, radiolocation and radionavigation services on a primary basis.

5.103 In Region 1, in making assignments to stations in the fixed and mobile services in the bands 1850-2045 kHz, 2194-2498 kHz, 2502-2625 kHz and 2650-2850 kHz, administrations should bear in mind the special requirements of the maritime mobile service.

5.104 In Region 1, the use of the band 2025-2045 kHz by the meteorological aids service is limited to oceanographic buoy stations.

5.105 In Region 2, except in Greenland, coast stations and ship stations using radiotelephony in the band 2065-2107 kHz shall be limited to class J3E emissions and to a peak envelope power not exceeding 1 kW. Preferably, the following carrier frequencies should be used: 2065.0 kHz, 2079.0 kHz, 2082.5 kHz, 2086.0 kHz, 2093.0 kHz, 2096.5 kHz, 2100.0 kHz and 2103.5 kHz. In Argentina and Uruguay, the carrier frequencies 2068.5 kHz and 2075.5 kHz are also used for this purpose, while the frequencies within the band 2072-2075.5 kHz are used as provided in No. 52.165.

5.106 In Regions 2 and 3, provided no harmful interference is caused to the maritime mobile service, the frequencies between 2065 kHz and 2107 kHz may be used by stations of the fixed service communicating only within national borders and whose mean power does not exceed 50 W. In notifying the frequencies, the attention of the Bureau should be drawn to these provisions.

5.107 *Additional allocation:* in Saudi Arabia, Eritrea, Ethiopia, Iraq, the Libyan Arab Jamahiriya, Lesotho, Somalia and Swaziland, the band 2160-2170 kHz is also allocated to the fixed and mobile, except aeronautical mobile (R), services on a primary basis. The mean power of stations in these services shall not exceed 50 W.

5.108 The carrier frequency 2182 kHz is an international distress and calling frequency for radiotelephony. The conditions for the use of the band 2173.5-2190.5 kHz are prescribed in Articles 31 and 52 and in Appendix 13.

5.109 The frequencies 2187.5 kHz, 4207.5 kHz, 6312 kHz, 8414.5 kHz, 12577 kHz and 16804.5 kHz are international distress frequencies for digital selective calling. The conditions for the use of these frequencies are prescribed in Article 31.

5.110 The frequencies 2174.5 kHz, 4177.5 kHz, 6268 kHz, 8376.5 kHz, 12520 kHz and 16695 kHz are international distress frequencies for narrow-band direct-printing telegraphy. The conditions for the use of these frequencies are prescribed in Article 31.

5.111 The carrier frequencies 2182 kHz, 3023 kHz, 5680 kHz, 8364 kHz and the frequencies 121.5 MHz, 156.8 MHz and 243 MHz may also be used, in accordance with the procedures in force for terrestrial radiocommunication services, for search and rescue operations concerning manned space vehicles. The conditions for the use of the frequencies are prescribed in Article 31 and in Appendix 13.

The same applies to the frequencies 10003 kHz, 14993 kHz and 19993 kHz, but in each of these cases emissions must be confined in a band of ± 3 kHz about the frequency.

5.112 *Alternative allocation:* in Bosnia and Herzegovina, Denmark, Malta, Serbia and Montenegro, and Sri Lanka, the band 2194-2300 kHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.113 For the conditions for the use of the bands 2300-2495 kHz (2498 kHz in Region 1), 3200-3400 kHz, 4750-4995 kHz and 5005-5060 kHz by the broadcasting service, see Nos. 5.16 to 5.20, 5.21 and 23.3 to 23.10.

5.114 *Alternative allocation:* in Bosnia and Herzegovina, Denmark, Iraq, Malta, and Serbia and Montenegro, the band 2502-2625 kHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.115 The carrier (reference) frequencies 3023 kHz and 5680 kHz may also be used, in accordance with Article 31 and Appendix 13 by stations of the maritime mobile service engaged in coordinated search and rescue operations.

5.116 Administrations are urged to authorize the use of the band 3155-3195 kHz to provide a common worldwide channel for low power wireless hearing aids. Additional channels for these devices may be assigned by administrations in the bands between 3155 kHz and 3400 kHz to suit local needs.

It should be noted that frequencies in the range 3000 kHz to 4000 kHz are suitable for hearing aid devices which are designed to operate over short distances within the induction field.

5.117 *Alternative allocation:* in Bosnia and Herzegovina, Côte d'Ivoire, Denmark, Egypt, Liberia, Malta, Serbia and Montenegro, Sri Lanka and Togo, the band 3155-3200 kHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.118 *Additional allocation:* in the United States, Mexico, Peru and Uruguay, the band 3230-3400 kHz is also allocated to the radiolocation service on a secondary basis.

5.119 *Additional allocation:* in Honduras, Mexico, Peru and Venezuela, the band 3500-3750 kHz is also allocated to the fixed and mobile services on a primary basis.

5.122 *Alternative allocation:* in Argentina, Bolivia, Chile, Ecuador, Paraguay, Peru and Uruguay, the band 3750-4000 kHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.123 *Additional allocation:* in Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe, the band 3900-3950 kHz is also allocated to the broadcasting service on a primary basis, subject to agreement obtained under No. 9.21.

5.125 *Additional allocation:* in Greenland, the band 3950-4000 kHz is also allocated to the broadcasting service on a primary basis. The power of the broadcasting stations operating in this band shall not exceed that necessary for a national service and shall in no case exceed 5 kW.

5.126 In Region 3, the stations of those services to which the band 3995-4005 kHz is allocated may transmit standard frequency and time signals.

5.127 The use of the band 4000-4063 kHz by the maritime mobile service is limited to ship stations using radiotelephony (see No. 52.220 and Appendix 17).

5.128 In Afghanistan, Argentina, Armenia, Azerbaijan, Belarus, Botswana, Burkina Faso, the Central African Rep., China, Georgia, India, Kazakhstan, Mali, Niger, Kyrgyzstan, Russian Federation, Tajikistan, Chad, Turkmenistan and Ukraine, in the bands 4063-4123 kHz, 4130-4133 kHz and 4408-4438 kHz, stations of limited power in the fixed service which are situated at least 600 km from the coast may operate on condition that harmful interference is not caused to the maritime mobile service.

5.130 The conditions for the use of the carrier frequencies 4125 kHz and 6215 kHz are prescribed in Articles 31 and 52 and in Appendix 13.

5.131 The frequency 4209.5 kHz is used exclusively for the transmission by coast stations of meteorological and navigational warnings and urgent information to ships by means of narrow-band direct-printing techniques.

5.132 The frequencies 4210 kHz, 6314 kHz, 8416.5 kHz, 12579 kHz, 16806.5 kHz, 19680.5 kHz, 22376 kHz and 26100.5 kHz are the international frequencies for the transmission of maritime safety information (MSI) (see Appendix 17).

5.133 *Different category of service:* in Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Latvia, Lithuania, Moldova, Uzbekistan, Kyrgyzstan, Russian Federation, Tajikistan, Turkmenistan and Ukraine, the allocation of the band 5130-5250 kHz to the mobile, except aeronautical mobile, service is on a primary basis (see No. 5.33).

5.134 The use of the bands 5900-5950 kHz, 7300-7350 kHz, 9400-9500 kHz, 11600-11650 kHz, 12050-12100 kHz, 13570-13600 kHz, 13800-13870 kHz, 15600-15800 kHz, 17480-17550 kHz and 18900-19020 kHz by the broadcasting service as from 1 April 2007 is subject to the application of the procedure of Article 12. Administrations are encouraged to use these bands to facilitate the introduction of digitally modulated emissions in accordance with the provisions of Resolution 517 (Rev.WRC-03).

5.136 The band 5900-5950 kHz is allocated, until 1 April 2007, to the fixed service on a primary basis, as well as to the following services: in Region 1 to the land mobile service on a primary basis, in Region 2 to the mobile except aeronautical mobile (R) service on a primary basis, and in Region 3 to the mobile except aeronautical mobile (R) service on a secondary basis, subject to application of the procedure referred to in Resolution 21 (Rev.WRC-95)[3]. After 1 April 2007, frequencies in this band may be used by stations in the above-mentioned services, communicating only within the boundary of the country in which they are located, on the condition that harmful interference is not caused to the broadcasting service. When using frequencies for these services, administrations are urged to use the minimum power required and to take account of the seasonal use of frequencies by the broadcasting service published in accordance with the Radio Regulations.

5.137 On condition that harmful interference is not caused to the maritime mobile service, the bands 6200-6213.5 kHz and 6220.5-6525 kHz may be used exceptionally by stations in the fixed service, communicating only within the boundary of the country in which they are located, with a mean power not exceeding 50 W. At the time of notification of these frequencies, the attention of the Bureau will be drawn to the above conditions.

5.138 The following bands:

6765-6795 kHz (centre frequency 6780 kHz),

433.05-434.79 MHz (centre frequency 433.92 MHz) in Region 1 except in the countries mentioned in No. 5.280,

61-61.5 GHz (centre frequency 61.25 GHz),

122-123 GHz (centre frequency 122.5 GHz), and

244-246 GHz (centre frequency 245 GHz)

are designated for industrial, scientific and medical (ISM) applications. The use of these frequency bands for ISM applications shall be subject to special authorization by the administration concerned, in agreement with other administrations whose radiocommunication services might be affected. In applying this provision, administrations shall have due regard to the latest relevant ITU-R Recommendations.

5.138A Until 29 March 2009, the band 6765-7000 kHz is allocated to the fixed service on a primary basis and to the land mobile service on a secondary basis. After this date, this band is allocated to the fixed and the mobile except aeronautical mobile (R) services on a primary basis.

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[3] *Note by the Secretariat:* This Resolution was revised by WRC-03.

5.139 *Different category of service:* until 29 March 2009, in Armenia, Azerbaijan, Belarus, the Russian Federation, Georgia, Kazakhstan, Latvia, Lithuania, Moldova, Mongolia, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan and Ukraine, the allocation of the band 6765-7000 kHz to the land mobile service is on a primary basis (see No. 5.33).

5.140 *Additional allocation:* in Angola, Iraq, Kenya, Rwanda, Somalia and Togo, the band 7000-7050 kHz is also allocated to the fixed service on a primary basis.

5.141 *Alternative allocation:* in Egypt, Eritrea, Ethiopia, Guinea, the Libyan Arab Jamahiriya and Madagascar, the band 7000-7050 kHz is allocated to the fixed service on a primary basis.

5.141A *Additional allocation:* in Uzbekistan and Kyrgyzstan, the bands 7000-7100 kHz and 7100-7200 kHz are also allocated to the fixed and land mobile services on a secondary basis.

5.141B *Additional allocation:* after 29 March 2009, in Algeria, Saudi Arabia, Australia, Bahrain, Botswana, Brunei Darussalam, China, Comoros, Korea (Rep. of), Diego Garcia, Djibouti, Egypt, United Arab Emirates, Eritrea, Indonesia, Iran (Islamic Republic of), Japan, Jordan, Kuwait, the Libyan Arab Jamahiriya, Morocco, Mauritania, New Zealand, Oman, Papua New Guinea, Qatar, the Syrian Arab Republic, Singapore, Sudan, Tunisia, Viet Nam and Yemen, the band 7100-7200 kHz is also allocated to the fixed and the mobile, except aeronautical mobile (R), services on a primary basis.

5.141C In Regions 1 and 3, the band 7100-7200 kHz is allocated to the broadcasting service until 29 March 2009 on a primary basis.

5.142 Until 29 March 2009, the use of the band 7100-7300 kHz in Region 2 by the amateur service shall not impose constraints on the broadcasting service intended for use within Region 1 and Region 3. After 29 March 2009 the use of the band 7200-7300 kHz in Region 2 by the amateur service shall not impose constraints on the broadcasting service intended for use within Region 1 and Region 3.

5.143 The band 7300-7350 kHz is allocated, until 1 April 2007, to the fixed service on a primary basis and to the land mobile service on a secondary basis, subject to application of the procedure referred to in Resolution 21 (Rev.WRC-95)[3]. After 1 April 2007, frequencies in this band may be used by stations in the above-mentioned services, communicating only within the boundary of the country in which they are located, on condition that harmful interference is not caused to the broadcasting service. When using frequencies for these services, administrations are urged to use the minimum power required and to take account of the seasonal use of frequencies by the broadcasting service published in accordance with the Radio Regulations.

5.143A In Region 3, the band 7350-7450 kHz is allocated, until 29 March 2009, to the fixed service on a primary basis and to the land mobile service on a secondary basis. After 29 March 2009, frequencies in this band may be used by stations in the above-mentioned services, communicating only within the boundary of the country in which they are located, on condition that harmful interference is not caused to the broadcasting service. When using frequencies for these services, administrations are urged to use the minimum power required and to take account of the seasonal use of frequencies by the broadcasting service published in accordance with the Radio Regulations.

5.143B In Region 1, the band 7350-7450 kHz is allocated, until 29 March 2009, to the fixed service on a primary basis and to the land mobile service on a secondary basis. After 29 March 2009, on condition that harmful interference is not caused to the broadcasting service, frequencies in the band 7350-7450 kHz may be used by stations in the fixed and land mobile services communicating only within the boundary of the country in which they are located, each station using a total radiated power that shall not exceed 24 dBW.

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[3] *Note by the Secretariat:* This Resolution was revised by WRC-03.

5.143C *Additional allocation:* after 29 March 2009 in Algeria, Saudi Arabia, Bahrain, Comoros, Djibouti, Egypt, United Arab Emirates, Iran (Islamic Republic of), the Libyan Arab Jamahiriya, Jordan, Kuwait, Morocco, Mauritania, Oman, Qatar, the Syrian Arab Republic, Sudan, Tunisia and Yemen, the bands 7350-7400 kHz and 7400-7450 kHz are also allocated to the fixed service on a primary basis.

5.143D In Region 2, the band 7350-7400 kHz is allocated, until 29 March 2009, to the fixed service on a primary basis and to the land mobile service on a secondary basis. After 29 March 2009, frequencies in this band may be used by stations in the above-mentioned services, communicating only within the boundary of the country in which they are located, on condition that harmful interference is not caused to the broadcasting service. When using frequencies for these services, administrations are urged to use the minimum power required and to take account of the seasonal use of frequencies by the broadcasting service published in accordance with the Radio Regulations.

5.143E Until 29 March 2009, the band 7450-8100 kHz is allocated to the fixed service on a primary basis and to the land mobile service on a secondary basis.

5.144 In Region 3, the stations of those services to which the band 7995-8005 kHz is allocated may transmit standard frequency and time signals.

5.145 The conditions for the use of the carrier frequencies 8291 kHz, 12290 kHz and 16420 kHz are prescribed in Articles 31 and 52 and in Appendix 13.

5.146 The bands 9400-9500 kHz, 11600-11650 kHz, 12050-12100 kHz, 15600-15800 kHz, 17480-17550 kHz and 18900-19020 kHz are allocated to the fixed service on a primary basis until 1 April 2007, subject to application of the procedure referred to in Resolution 21 (Rev.WRC-95)[3]. After 1 April 2007, frequencies in these bands may be used by stations in the fixed service, communicating only within the boundary of the country in which they are located, on condition that harmful interference is not caused to the broadcasting service. When using frequencies in the fixed service, administrations are urged to use the minimum power required and to take account of the seasonal use of frequencies by the broadcasting service published in accordance with the Radio Regulations.

5.147 On condition that harmful interference is not caused to the broadcasting service, frequencies in the bands 9775-9900 kHz, 11650-11700 kHz and 11975-12050 kHz may be used by stations in the fixed service communicating only within the boundary of the country in which they are located, each station using a total radiated power not exceeding 24 dBW.

5.149 In making assignments to stations of other services to which the bands:

13360-13410 kHz,	4990-5000 MHz,	94.1-100 GHz,
25550-25670 kHz,	6650-6675.2 MHz,	102-109.5 GHz,
37.5-38.25 MHz,	10.6-10.68 GHz,	111.8-114.25 GHz,
73-74.6 MHz in Regions 1 and 3,	14.47-14.5 GHz,	128.33-128.59 GHz,
150.05-153 MHz in Region 1,	22.01-22.21 GHz,	129.23-129.49 GHz,
322-328.6 MHz,	22.21-22.5 GHz,	130-134 GHz,
406.1-410 MHz,	22.81-22.86 GHz,	136-148.5 GHz,
608-614 MHz in Regions 1 and 3,	23.07-23.12 GHz,	151.5-158.5 GHz,
1330-1400 MHz,	31.2-31.3 GHz,	168.59-168.93 GHz,
1610.6-1613.8 MHz,	31.5-31.8 GHz in Regions 1 and 3,	171.11-171.45 GHz,

[3] *Note by the Secretariat:* This Resolution was revised by WRC-03.

1660-1670 MHz,	36.43-36.5 GHz,	172.31-172.65 GHz,
1718.8-1722.2 MHz,	42.5-43.5 GHz,	173.52-173.85 GHz,
2655-2690 MHz,	42.77-42.87 GHz,	195.75-196.15 GHz,
3260-3267 MHz,	43.07-43.17 GHz,	209-226 GHz,
3332-3339 MHz,	43.37-43.47 GHz,	241-250 GHz,
3345.8-3352.5 MHz,	48.94-49.04 GHz,	252-275 GHz
4825-4835 MHz,	76-86 GHz,	
4950-4990 MHz,	92-94 GHz,	

are allocated, administrations are urged to take all practicable steps to protect the radio astronomy service from harmful interference. Emissions from spaceborne or airborne stations can be particularly serious sources of interference to the radio astronomy service (see Nos. 4.5 and 4.6 and Article 29).

5.150 The following bands:

13553-13567 kHz (centre frequency 13560 kHz),

26957-27283 kHz (centre frequency 27120 kHz),

40.66-40.70 MHz (centre frequency 40.68 MHz),

902-928 MHz in Region 2 (centre frequency 915 MHz),

2400-2500 MHz (centre frequency 2450 MHz),

5725-5875 MHz (centre frequency 5800 MHz), and

24-24.25 GHz (centre frequency 24.125 GHz)

are also designated for industrial, scientific and medical (ISM) applications. Radiocommunication services operating within these bands must accept harmful interference which may be caused by these applications. ISM equipment operating in these bands is subject to the provisions of No. 15.13.

5.151 The bands 13570-13600 kHz and 13800-13870 kHz are allocated, until 1 April 2007, to the fixed service on a primary basis and to the mobile except aeronautical mobile (R) service on a secondary basis, subject to application of the procedure referred to in Resolution 21 (Rev.WRC-95)[3]. After 1 April 2007, frequencies in these bands may be used by stations in the above-mentioned services, communicating only within the boundary of the country in which they are located, on the condition that harmful interference is not caused to the broadcasting service. When using frequencies in these services, administrations are urged to use the minimum power required and to take account of the seasonal use of frequencies by the broadcasting service published in accordance with the Radio Regulations.

5.152 *Additional allocation:* in Armenia, Azerbaijan, China, Côte d'Ivoire, the Russian Federation, Georgia, Iran (Islamic Republic of), Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan and Ukraine, the band 14250-14350 kHz is also allocated to the fixed service on a primary basis. Stations of the fixed service shall not use a radiated power exceeding 24 dBW.

5.153 In Region 3, the stations of those services to which the band 15995-16005 kHz is allocated may transmit standard frequency and time signals.

5.154 *Additional allocation:* in Armenia, Azerbaijan, the Russian Federation, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Ukraine, the band 18068-18168 kHz is also allocated to the fixed service on a primary basis for use within their boundaries, with a peak envelope power not

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[3] *Note by the Secretariat:* This Resolution was revised by WRC-03.

exceeding 1 kW.

5.155 *Additional allocation:* in Armenia, Azerbaijan, Belarus, Bulgaria, the Russian Federation, Georgia, Kazakhstan, Moldova, Mongolia, Uzbekistan, Kyrgyzstan, Slovakia, the Czech Rep., Tajikistan, Turkmenistan and Ukraine, the band 21850-21870 kHz is also allocated to the aeronautical mobile (R) service on a primary basis.

5.155A In Armenia, Azerbaijan, Belarus, Bulgaria, Georgia, Kazakhstan, Moldova, Mongolia, Uzbekistan, Kyrgyzstan, Slovakia, the Czech Rep., the Russian Federation, Tajikistan, Turkmenistan and Ukraine, the use of the band 21850-21870 kHz by the fixed service is limited to provision of services related to aircraft flight safety.

5.155B The band 21870-21924 kHz is used by the fixed service for provision of services related to aircraft flight safety.

5.156 *Additional allocation:* in Nigeria, the band 22720-23200 kHz is also allocated to the meteorological aids service (radiosondes) on a primary basis.

5.156A The use of the band 23200-23350 kHz by the fixed service is limited to provision of services related to aircraft flight safety.

5.157 The use of the band 23350-24000 kHz by the maritime mobile service is limited to inter-ship radiotelegraphy.

5.160 *Additional allocation:* in Botswana, Burundi, Lesotho, Malawi, Dem. Rep. of the Congo, Rwanda and Swaziland, the band 41-44 MHz is also allocated to the aeronautical radionavigation service on a primary basis.

5.161 *Additional allocation:* in Iran (Islamic Republic of) and Japan, the band 41-44 MHz is also allocated to the radiolocation service on a secondary basis.

5.162 *Additional allocation:* in Australia and New Zealand, the band 44-47 MHz is also allocated to the broadcasting service on a primary basis.

5.162A *Additional allocation:* in Germany, Austria, Belgium, Bosnia and Herzegovina, China, Vatican, Denmark, Spain, Estonia, Finland, France, Ireland, Iceland, Italy, Latvia, The Former Yugoslav Republic of Macedonia, Liechtenstein, Lithuania, Luxembourg, Moldova, Monaco, Norway, the Netherlands, Poland, Portugal, Slovakia, the Czech Rep., the United Kingdom, the Russian Federation, Sweden and Switzerland the band 46-68 MHz is also allocated to the radiolocation service on a secondary basis. This use is limited to the operation of wind profiler radars in accordance with Resolution 217 (WRC-97).

5.163 *Additional allocation:* in Armenia, Azerbaijan, Belarus, the Russian Federation, Georgia, Hungary, Kazakhstan, Latvia, Lithuania, Moldova, Mongolia, Uzbekistan, Kyrgyzstan, Slovakia, the Czech Rep., Tajikistan, Turkmenistan and Ukraine, the bands 47-48.5 MHz and 56.5-58 MHz are also allocated to the fixed and land mobile services on a secondary basis.

5.164 *Additional allocation:* in Albania, Germany, Austria, Belgium, Bosnia and Herzegovina, Botswana, Bulgaria, Côte d'Ivoire, Denmark, Spain, Estonia, Finland, France, Gabon, Greece, Ireland, Israel, Italy, Jordan, Lebanon, the Libyan Arab Jamahiriya, Liechtenstein, Luxembourg, Madagascar, Mali, Malta, Morocco, Mauritania, Monaco, Nigeria, Norway, the Netherlands, Poland, Syrian Arab Republic, the United Kingdom, Serbia and Montenegro, Slovenia, Sweden, Switzerland, Swaziland, Chad, Togo, Tunisia and Turkey, the band 47-68 MHz, in Romania the band 47-58 MHz, in South Africa the band 47-50 MHz, and in the Czech Rep. the band 66-68 MHz, are also allocated to the land mobile service on a primary basis. However, stations of the land mobile service in the countries mentioned in connection with each band referred to in this footnote shall not cause harmful interference to, or claim protection from, existing or planned broadcasting stations of countries other than those mentioned in

connection with the band.

5.165 *Additional allocation:* in Angola, Cameroon, Congo (Rep. of the), Madagascar, Mozambique, Somalia, Sudan, Tanzania and Chad, the band 47-68 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.166 *Alternative allocation:* in New Zealand, the band 50-51 MHz is allocated to the fixed, mobile and broadcasting services on a primary basis; the band 53-54 MHz is allocated to the fixed and mobile services on a primary basis.

5.167 *Alternative allocation:* in Bangladesh, Brunei Darussalam, India, Indonesia, Iran (Islamic Republic of), Malaysia, Pakistan, Singapore and Thailand, the band 50-54 MHz is allocated to the fixed, mobile and broadcasting services on a primary basis.

5.168 *Additional allocation:* in Australia, China and the Dem. People's Rep. of Korea, the band 50-54 MHz is also allocated to the broadcasting service on a primary basis.

5.169 *Alternative allocation:* in Botswana, Burundi, Lesotho, Malawi, Namibia, the Dem. Rep. of the Congo, Rwanda, South Africa, Swaziland, Zambia and Zimbabwe, the band 50-54 MHz is allocated to the amateur service on a primary basis.

5.170 *Additional allocation:* in New Zealand, the band 51-53 MHz is also allocated to the fixed and mobile services on a primary basis.

5.171 *Additional allocation:* in Botswana, Burundi, Lesotho, Malawi, Mali, Namibia, Dem. Rep. of the Congo, Rwanda, South Africa, Swaziland and Zimbabwe, the band 54-68 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.172 *Different category of service:* in the French Overseas Departments in Region 2, Guyana, Jamaica and Mexico, the allocation of the band 54-68 MHz to the fixed and mobile services is on a primary basis (see No. 5.33).

5.173 *Different category of service:* in the French overseas departments and communities in Region 2, Guyana, Jamaica and Mexico, the allocation of the band 68-72 MHz to the fixed and mobile services is on a primary basis (see No. 5.33).

5.175 *Alternative allocation:* in Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Latvia, Lithuania, Moldova, Mongolia, Uzbekistan, Kyrgyzstan, the Russian Federation, Tajikistan, Turkmenistan and Ukraine, the bands 68-73 MHz and 76-87.5 MHz are allocated to the broadcasting service on a primary basis. The services to which these bands are allocated in other countries and the broadcasting service in the countries listed above are subject to agreements with the neighbouring countries concerned.

5.176 *Additional allocation:* in Australia, China, Korea (Rep. of), Estonia (subject to agreement obtained under No. 9.21), the Philippines, the Dem. People's Rep. of Korea and Samoa, the band 68-74 MHz is also allocated to the broadcasting service on a primary basis.

5.177 *Additional allocation:* in Armenia, Azerbaijan, Belarus, Bulgaria, the Russian Federation, Georgia, Kazakhstan, Latvia, Moldova, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan and Ukraine, the band 73-74 MHz is also allocated to the broadcasting service on a primary basis, subject to agreement obtained under No. 9.21.

5.178 *Additional allocation:* in Colombia, Costa Rica, Cuba, El Salvador, Guatemala, Guyana, Honduras and Nicaragua, the band 73-74.6 MHz is also allocated to the fixed and mobile services on a secondary basis.

5.179 *Additional allocation:* in Armenia, Azerbaijan, Belarus, Bulgaria, China, the Russian Federation, Georgia, Kazakhstan, Lithuania, Moldova, Mongolia, Kyrgyzstan, Slovakia, Tajikistan,

Turkmenistan and Ukraine, the bands 74.6-74.8 MHz and 75.2-75.4 MHz are also allocated to the aeronautical radionavigation service, on a primary basis, for ground-based transmitters only.

5.180 The frequency 75 MHz is assigned to marker beacons. Administrations shall refrain from assigning frequencies close to the limits of the guardband to stations of other services which, because of their power or geographical position, might cause harmful interference or otherwise place a constraint on marker beacons.

Every effort should be made to improve further the characteristics of airborne receivers and to limit the power of transmitting stations close to the limits 74.8 MHz and 75.2 MHz.

5.181 *Additional allocation:* in Egypt, Israel and the Syrian Arab Republic, the band 74.8-75.2 MHz is also allocated to the mobile service on a secondary basis, subject to agreement obtained under No. 9.21. In order to ensure that harmful interference is not caused to stations of the aeronautical radionavigation service, stations of the mobile service shall not be introduced in the band until it is no longer required for the aeronautical radionavigation service by any administration which may be identified in the application of the procedure invoked under No. 9.21.

5.182 *Additional allocation:* in Western Samoa, the band 75.4-87 MHz is also allocated to the broadcasting service on a primary basis.

5.183 *Additional allocation:* in China, Korea (Rep. of), Japan, the Philippines and the Dem. People's Rep. of Korea, the band 76-87 MHz is also allocated to the broadcasting service on a primary basis.

5.185 *Different category of service:* in the United States, the French overseas departments and communities in Region 2, Guyana, Jamaica, Mexico and Paraguay, the allocation of the band 76-88 MHz to the fixed and mobile services is on a primary basis (see No. 5.33).

5.187 *Alternative allocation:* in Albania, the band 81-87.5 MHz is allocated to the broadcasting service on a primary basis and used in accordance with the decisions contained in the Final Acts of the Special Regional Conference (Geneva, 1960).

5.188 *Additional allocation:* in Australia, the band 85-87 MHz is also allocated to the broadcasting service on a primary basis. The introduction of the broadcasting service in Australia is subject to special agreements between the administrations concerned.

5.190 *Additional allocation:* in Monaco, the band 87.5-88 MHz is also allocated to the land mobile service on a primary basis, subject to agreement obtained under No. 9.21.

5.192 *Additional allocation:* in China and Korea (Rep. of), the band 100-108 MHz is also allocated to the fixed and mobile services on a primary basis.

5.194 *Additional allocation:* in Azerbaijan, Lebanon, Syria, Kyrgyzstan, Somalia and Turkmenistan, the band 104-108 MHz is also allocated to the mobile, except aeronautical mobile (R), service on a secondary basis.

5.197 *Additional allocation:* in Japan, Pakistan and Syria, the band 108-111.975 MHz is also allocated to the mobile service on a secondary basis, subject to agreement obtained under No. 9.21. In order to ensure that harmful interference is not caused to stations of the aeronautical radionavigation service, stations of the mobile service shall not be introduced in the band until it is no longer required for the aeronautical radionavigation service by any administration which may be identified in the application of the procedures invoked under No. 9.21.

5.197A The band 108-117.975 MHz may also be used by the aeronautical mobile (R) service on a primary basis, limited to systems that transmit navigational information in support of air navigation and surveillance functions in accordance with recognized international aviation standards. Such use shall be

in accordance with Resolution 413 (WRC-03) and shall not cause harmful interference to nor claim protection from stations operating in the aeronautical radionavigation service which operate in accordance with international aeronautical standards.

5.198 *Additional allocation:* the band 117.975-136 MHz is also allocated to the aeronautical mobile-satellite (R) service on a secondary basis, subject to agreement obtained under No. 9.21.

5.199 The bands 121.45-121.55 MHz and 242.95-243.05 MHz are also allocated to the mobile-satellite service for the reception on board satellites of emissions from emergency position-indicating radiobeacons transmitting at 121.5 MHz and 243 MHz (see Appendix 13).

5.200 In the band 117.975-136 MHz, the frequency 121.5 MHz is the aeronautical emergency frequency and, where required, the frequency 123.1 MHz is the aeronautical frequency auxiliary to 121.5 MHz. Mobile stations of the maritime mobile service may communicate on these frequencies under the conditions laid down in Article 31 and Appendix 13 for distress and safety purposes with stations of the aeronautical mobile service.

5.201 *Additional allocation:* in Angola, Armenia, Azerbaijan, Belarus, Bulgaria, Estonia, the Russian Federation, Georgia, Hungary, Iran (Islamic Republic of), Iraq, Japan, Kazakhstan, Latvia, Moldova, Mongolia, Mozambique, Uzbekistan, Papua New Guinea, Poland, Kyrgyzstan, Slovakia, the Czech Rep., Romania, Tajikistan, Turkmenistan and Ukraine, the band 132-136 MHz is also allocated to the aeronautical mobile (OR) service on a primary basis. In assigning frequencies to stations of the aeronautical mobile (OR) service, the administration shall take account of the frequencies assigned to stations in the aeronautical mobile (R) service.

5.202 *Additional allocation:* in Saudi Arabia, Armenia, Azerbaijan, Belarus, Bulgaria, the United Arab Emirates, the Russian Federation, Georgia, Iran (Islamic Republic of), Jordan, Latvia, Moldova, Oman, Uzbekistan, Poland, the Syrian Arab Republic, Kyrgyzstan, Slovakia, the Czech Rep., Romania, Tajikistan, Turkmenistan and Ukraine, the band 136-137 MHz is also allocated to the aeronautical mobile (OR) service on a primary basis. In assigning frequencies to stations of the aeronautical mobile (OR) service, the administration shall take account of the frequencies assigned to stations in the aeronautical mobile (R) service.

5.204 *Different category of service:* in Afghanistan, Saudi Arabia, Bahrain, Bangladesh, Bosnia and Herzegovina, Brunei Darussalam, China, Cuba, the United Arab Emirates, India, Indonesia, Iran (Islamic Republic of), Iraq, Malaysia, Oman, Pakistan, the Philippines, Qatar, Serbia and Montenegro, Singapore, Thailand and Yemen, the band 137-138 MHz is allocated to the fixed and mobile, except aeronautical mobile (R), services on a primary basis (see No. 5.33).

5.205 *Different category of service:* in Israel and Jordan, the allocation of the band 137-138 MHz to the fixed and mobile, except aeronautical mobile, services is on a primary basis (see No. 5.33).

5.206 *Different category of service:* in Armenia, Azerbaijan, Belarus, Bulgaria, Egypt, the Russian Federation, Finland, France, Georgia, Greece, Kazakhstan, Lebanon, Moldova, Mongolia, Uzbekistan, Poland, Kyrgyzstan, the Syrian Arab Republic, Slovakia, the Czech Rep., Romania, Tajikistan, Turkmenistan and Ukraine, the allocation of the band 137-138 MHz to the aeronautical mobile (OR) service is on a primary basis (see No. 5.33).

5.207 *Additional allocation:* in Australia, the band 137-144 MHz is also allocated to the broadcasting service on a primary basis until that service can be accommodated within regional broadcasting allocations.

5.208 The use of the band 137-138 MHz by the mobile-satellite service is subject to coordination under No. 9.11A.

5.208A In making assignments to space stations in the mobile-satellite service in the bands 137-138 MHz, 387-390 MHz and 400.15-401 MHz, administrations shall take all practicable steps to protect the radio astronomy service in the bands 150.05-153 MHz, 322-328.6 MHz, 406.1-410 MHz and 608-614 MHz from harmful interference from unwanted emissions. The threshold levels of interference detrimental to the radio astronomy service are shown in Table 1 of Recommendation ITU-R RA.769-1.

5.209 The use of the bands 137-138 MHz, 148-150.05 MHz, 399.9-400.05 MHz, 400.15-401 MHz, 454-456 MHz and 459-460 MHz by the mobile-satellite service is limited to non-geostationary-satellite systems.

5.210 *Additional allocation:* in France, Italy, the Czech Rep. and the United Kingdom, the bands 138-143.6 MHz and 143.65-144 MHz are also allocated to the space research service (space-to-Earth) on a secondary basis.

5.211 *Additional allocation:* in Germany, Saudi Arabia, Austria, Bahrain, Belgium, Bosnia and Herzegovina, Denmark, the United Arab Emirates, Spain, Finland, Greece, Ireland, Israel, Kenya, Kuwait, The Former Yugoslav Republic of Macedonia, Liechtenstein, Luxembourg, Mali, Malta, Norway, the Netherlands, Qatar, the United Kingdom, Somalia, Sweden, Switzerland, Tanzania, Tunisia, Turkey and Yugoslavia, the band 138-144 MHz is also allocated to the maritime mobile and land mobile services on a primary basis.

5.212 *Alternative allocation:* in Angola, Botswana, Burundi, Cameroon, the Central African Rep., Congo (Rep. of the), Gabon, Gambia, Ghana, Guinea, Iraq, Jordan, Lesotho, Liberia, Libyan Arab Jamahiriya, Malawi, Mozambique, Namibia, Oman, Uganda, the Dem. Rep. of the Congo, Rwanda, Sierra Leone, South Africa, Swaziland, Chad, Togo, Zambia and Zimbabwe, the band 138-144 MHz is allocated to the fixed and mobile services on a primary basis.

5.213 *Additional allocation:* in China, the band 138-144 MHz is also allocated to the radiolocation service on a primary basis.

5.214 *Additional allocation:* in Bosnia and Herzegovina, Croatia, Eritrea, Ethiopia, Kenya, The Former Yugoslav Republic of Macedonia, Malta, Somalia, Sudan, Tanzania and Yugoslavia, the band 138-144 MHz is also allocated to the fixed service on a primary basis.

5.216 *Additional allocation:* in China, the band 144-146 MHz is also allocated to the aeronautical mobile (OR) service on a secondary basis.

5.217 *Alternative allocation:* in Afghanistan, Bangladesh, Cuba, Guyana and India, the band 146-148 MHz is allocated to the fixed and mobile services on a primary basis.

5.218 *Additional allocation:* the band 148-149.9 MHz is also allocated to the space operation service (Earth-to-space) on a primary basis, subject to agreement obtained under No. 9.21. The bandwidth of any individual transmission shall not exceed ± 25 kHz.

5.219 The use of the band 148-149.9 MHz by the mobile-satellite service is subject to coordination under No. 9.11A. The mobile-satellite service shall not constrain the development and use of the fixed, mobile and space operation services in the band 148-149.9 MHz.

5.220 The use of the bands 149.9-150.05 MHz and 399.9-400.05 MHz by the mobile-satellite service is subject to coordination under No. 9.11A. The mobile-satellite service shall not constrain the development and use of the radionavigation-satellite service in the bands 149.9-150.05 MHz and 399.9-400.05 MHz.

5.221 Stations of the mobile-satellite service in the band 148-149.9 MHz shall not cause harmful interference to, or claim protection from, stations of the fixed or mobile services operating in accordance with the Table of Frequency Allocations in the following countries: Albania, Algeria, Germany, Saudi Arabia, Australia, Austria, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Benin, Bosnia and

Herzegovina, Botswana, Brunei Darussalam, Bulgaria, Cameroon, China, Cyprus, Congo (Rep. of the), Korea (Rep. of), Côte d'Ivoire, Croatia, Cuba, Denmark, Egypt, the United Arab Emirates, Eritrea, Spain, Estonia, Ethiopia, the Russian Federation, Finland, France, Gabon, Ghana, Greece, Guinea, Guinea Bissau, Hungary, India, Iran (Islamic Republic of), Ireland, Iceland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, The Former Yugoslav Republic of Macedonia, Lesotho, Latvia, Lebanon, the Libyan Arab Jamahiriya, Liechtenstein, Lithuania, Luxembourg, Malaysia, Mali, Malta, Mauritania, Moldova, Mongolia, Mozambique, Namibia, Norway, New Zealand, Oman, Uganda, Uzbekistan, Pakistan, Panama, Papua New Guinea, Paraguay, the Netherlands, the Philippines, Poland, Portugal, Qatar, the Syrian Arab Republic, Kyrgyzstan, Slovakia, Romania, the United Kingdom, Senegal, Serbia and Montenegro, Sierra Leone, Singapore, Slovenia, Sri Lanka, South Africa, Sweden, Switzerland, Swaziland, Tanzania, Chad, Thailand, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Ukraine, Viet Nam, Yemen, Zambia, and Zimbabwe.

5.222 Emissions of the radionavigation-satellite service in the bands 149.9-150.05 MHz and 399.9-400.05 MHz may also be used by receiving earth stations of the space research service.

5.223 Recognizing that the use of the band 149.9-150.05 MHz by the fixed and mobile services may cause harmful interference to the radionavigation-satellite service, administrations are urged not to authorize such use in application of No. 4.4.

5.224A The use of the bands 149.9-150.05 MHz and 399.9-400.05 MHz by the mobile-satellite service (Earth-to-space) is limited to the land mobile-satellite service (Earth-to-space) until 1 January 2015.

5.224B The allocation of the bands 149.9-150.05 MHz and 399.9-400.05 MHz to the radionavigation-satellite service shall be effective until 1 January 2015.

5.225 *Additional allocation:* in Australia and India, the band 150.05-153 MHz is also allocated to the radio astronomy service on a primary basis.

5.226 The frequency 156.8 MHz is the international distress, safety and calling frequency for the maritime mobile VHF radiotelephone service. The conditions for the use of this frequency are contained in Article 31 and Appendix 13.

In the bands 156-156.7625 MHz, 156.8375-157.45 MHz, 160.6-160.975 MHz and 161.475-162.05 MHz, each administration shall give priority to the maritime mobile service on only such frequencies as are assigned to stations of the maritime mobile service by the administration (see Articles 31 and 52, and Appendix 13).

Any use of frequencies in these bands by stations of other services to which they are allocated should be avoided in areas where such use might cause harmful interference to the maritime mobile VHF radiocommunication service.

However, the frequency 156.8 MHz and the frequency bands in which priority is given to the maritime mobile service may be used for radiocommunications on inland waterways subject to agreement between interested and affected administrations and taking into account current frequency usage and existing agreements.

5.227 In the maritime mobile VHF service the frequency 156.525 MHz is to be used exclusively for digital selective calling for distress, safety and calling. The conditions for the use of this frequency are prescribed in Articles 31 and 52, and Appendices 13 and 18.

5.229 *Alternative allocation:* in Morocco, the band 162-174 MHz is allocated to the broadcasting service on a primary basis. The use of this band shall be subject to agreement with administrations having services, operating or planned, in accordance with the Table which are likely to be affected.

Stations in existence on 1 January 1981, with their technical characteristics as of that date, are not affected by such agreement.

5.230 *Additional allocation:* in China, the band 163-167 MHz is also allocated to the space operation service (space-to-Earth) on a primary basis, subject to agreement obtained under No. 9.21.

5.231 *Additional allocation:* in Afghanistan, China and Pakistan, the band 167-174 MHz is also allocated to the broadcasting service on a primary basis. The introduction of the broadcasting service into this band shall be subject to agreement with the neighbouring countries in Region 3 whose services are likely to be affected.

5.232 *Additional allocation:* in Japan, the band 170-174 MHz is also allocated to the broadcasting service on a primary basis.

5.233 *Additional allocation:* in China, the band 174-184 MHz is also allocated to the space research (space-to-Earth) and the space operation (space-to-Earth) services on a primary basis, subject to agreement obtained under No. 9.21. These services shall not cause harmful interference to, or claim protection from, existing or planned broadcasting stations.

5.234 *Different category of service:* in Mexico, the allocation of the band 174-216 MHz to the fixed and mobile services is on a primary basis (see No. 5.33).

5.235 *Additional allocation:* in Germany, Austria, Belgium, Denmark, Spain, Finland, France, Israel, Italy, Liechtenstein, Malta, Monaco, Norway, the Netherlands, the United Kingdom, Sweden and Switzerland, the band 174-223 MHz is also allocated to the land mobile service on a primary basis. However, the stations of the land mobile service shall not cause harmful interference to, or claim protection from, broadcasting stations, existing or planned, in countries other than those listed in this footnote.

5.237 *Additional allocation:* in Congo (Rep. of the), Eritrea, Ethiopia, Gambia, Guinea, the Libyan Arab Jamahiriya, Malawi, Mali, Sierra Leone, Somalia, Chad and Zimbabwe, the band 174-223 MHz is also allocated to the fixed and mobile services on a secondary basis.

5.238 *Additional allocation:* in Bangladesh, India, Pakistan and the Philippines, the band 200-216 MHz is also allocated to the aeronautical radionavigation service on a primary basis.

5.240 *Additional allocation:* in China and India, the band 216-223 MHz is also allocated to the aeronautical radionavigation service on a primary basis and to the radiolocation service on a secondary basis.

5.241 In Region 2, no new stations in the radiolocation service may be authorized in the band 216-225 MHz. Stations authorized prior to 1 January 1990 may continue to operate on a secondary basis.

5.242 *Additional allocation:* in Canada, the band 216-220 MHz is also allocated to the land mobile service on a primary basis.

5.243 *Additional allocation:* in Somalia, the band 216-225 MHz is also allocated to the aeronautical radionavigation service on a primary basis, subject to not causing harmful interference to existing or planned broadcasting services in other countries.

5.245 *Additional allocation:* in Japan, the band 222-223 MHz is also allocated to the aeronautical radionavigation service on a primary basis and to the radiolocation service on a secondary basis.

5.246 *Alternative allocation:* in Spain, France, Israel and Monaco, the band 223-230 MHz is allocated to the broadcasting and land mobile services on a primary basis (see No. 5.33) on the basis that, in the preparation of frequency plans, the broadcasting service shall have prior choice of frequencies; and allocated to the fixed and mobile, except land mobile, services on a secondary basis. However, the

stations of the land mobile service shall not cause harmful interference to, or claim protection from, existing or planned broadcasting stations in Morocco and Algeria.

5.247 *Additional allocation:* in Saudi Arabia, Bahrain, the United Arab Emirates, Jordan, Oman, Qatar and Syrian Arab Republic, the band 223-235 MHz is also allocated to the aeronautical radionavigation service on a primary basis.

5.250 *Additional allocation:* in China, the band 225-235 MHz is also allocated to the radio astronomy service on a secondary basis.

5.251 *Additional allocation:* in Nigeria, the band 230-235 MHz is also allocated to the aeronautical radionavigation service on a primary basis, subject to agreement obtained under No. 9.21.

5.252 *Alternative allocation:* in Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe, the bands 230-238 MHz and 246-254 MHz are allocated to the broadcasting service on a primary basis, subject to agreement obtained under No. 9.21.

5.254 The bands 235-322 MHz and 335.4-399.9 MHz may be used by the mobile-satellite service, subject to agreement obtained under No. 9.21, on condition that stations in this service do not cause harmful interference to those of other services operating or planned to be operated in accordance with the Table of Frequency Allocations except for the additional allocation made in footnote No. 5.256A.

5.255 The bands 312-315 MHz (Earth-to-space) and 387-390 MHz (space-to-Earth) in the mobile-satellite service may also be used by non-geostationary-satellite systems. Such use is subject to coordination under No. 9.11A.

5.256 The frequency 243 MHz is the frequency in this band for use by survival craft stations and equipment used for survival purposes (see Appendix 13).

5.256A *Additional allocation:* in China, the Russian Federation, Kazakhstan and Ukraine, the band 258-261 MHz is also allocated to the space research service (Earth-to-space) and space operation service (Earth-to-space) on a primary basis. Stations in the space research service (Earth-to-space) and space operation service (Earth-to-space) shall not cause harmful interference to, nor claim protection from, nor constrain the use and development of the mobile service systems and mobile-satellite service systems operating in the band. Stations in space research service (Earth-to-space) and space operation service (Earth-to-space) shall not constrain the future development of fixed service systems of other countries.

5.257 The band 267-272 MHz may be used by administrations for space telemetry in their countries on a primary basis, subject to agreement obtained under No. 9.21.

5.258 The use of the band 328.6-335.4 MHz by the aeronautical radionavigation service is limited to Instrument Landing Systems (glide path).

5.259 *Additional allocation:* in Egypt, Israel, Japan, and Syria, the band 328.6-335.4 MHz is also allocated to the mobile service on a secondary basis, subject to agreement obtained under No. 9.21. In order to ensure that harmful interference is not caused to stations of the aeronautical radionavigation service, stations of the mobile service shall not be introduced in the band until it is no longer required for the aeronautical radionavigation service by any administration which may be identified in the application of the procedure invoked under No. 9.21.

5.260 Recognizing that the use of the band 399.9-400.05 MHz by the fixed and mobile services may cause harmful interference to the radionavigation satellite service, administrations are urged not to authorize such use in application of No. 4.4.

5.261 Emissions shall be confined in a band of ± 25 kHz about the standard frequency 400.1 MHz.

5.262 *Additional allocation:* in Saudi Arabia, Armenia, Azerbaijan, Bahrain, Belarus, Bosnia and Herzegovina, Botswana, Bulgaria, Colombia, Costa Rica, Cuba, Egypt, the United Arab Emirates,

Ecuador, the Russian Federation, Georgia, Hungary, Iran (Islamic Republic of), Iraq, Israel, Jordan, Kazakhstan, Kuwait, Liberia, Malaysia, Moldova, Uzbekistan, Pakistan, the Philippines, Qatar, the Syrian Arab Republic, Kyrgyzstan, Romania, Serbia and Montenegro, Singapore, Somalia, Tajikistan, Turkmenistan and Ukraine, the band 400.05-401 MHz is also allocated to the fixed and mobile services on a primary basis.

5.263 The band 400.15-401 MHz is also allocated to the space research service in the space-to-space direction for communications with manned space vehicles. In this application, the space research service will not be regarded as a safety service.

5.264 The use of the band 400.15-401 MHz by the mobile-satellite service is subject to coordination under No. 9.11A. The power flux-density limit indicated in Annex 1 of Appendix 5 shall apply until such time as a competent world radiocommunication conference revises it.

5.266 The use of the band 406-406.1 MHz by the mobile-satellite service is limited to low power satellite emergency position-indicating radiobeacons (see also Article 31 and Appendix 13).

5.267 Any emission capable of causing harmful interference to the authorized uses of the band 406-406.1 MHz is prohibited.

5.268 Use of the band 410-420 MHz by the space research service is limited to communications within 5 km of an orbiting, manned space vehicle. The power flux-density at the surface of the Earth produced by emissions from extra-vehicular activities shall not exceed –153 dB(W/m²) for $0° \leq \delta \leq 5°$, $-153 + 0.077\ (\delta - 5)$ dB(W/m²) for $5° \leq \delta \leq 70°$ and –148 dB(W/m²) for $70° \leq \delta \leq 90°$, where δ is the angle of arrival of the radio-frequency wave and the reference bandwidth is 4 kHz. No. 4.10 does not apply to extra-vehicular activities. In this frequency band the space research (space-to-space) service shall not claim protection from, nor constrain the use and development of, stations of the fixed and mobile services.

5.269 *Different category of service:* in Australia, the United States, India, Japan and the United Kingdom, the allocation of the bands 420-430 MHz and 440-450 MHz to the radiolocation service is on a primary basis (see No. 5.33).

5.270 *Additional allocation:* in Australia, the United States, Jamaica and the Philippines, the bands 420-430 MHz and 440-450 MHz are also allocated to the amateur service on a secondary basis.

5.271 *Additional allocation:* in Azerbaijan, Belarus, China, India, Latvia, Lithuania, Kyrgyzstan and Turkmenistan, the band 420-460 MHz is also allocated to the aeronautical radionavigation service (radio altimeters) on a secondary basis.

5.272 *Different category of service:* in France, the allocation of the band 430-434 MHz to the amateur service is on a secondary basis (see No. 5.32).

5.273 *Different category of service:* in the Libyan Arab Jamahiriya, the allocation of the bands 430-432 MHz and 438-440 MHz to the radiolocation service is on a secondary basis (see No. 5.32).

5.274 *Alternative allocation:* in Denmark, Norway and Sweden, the bands 430-432 MHz and 438-440 MHz are allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.275 *Additional allocation:* in Bosnia and Herzegovina, Croatia, Estonia, Finland, Latvia, The Former Yugoslav Republic of Macedonia, Libya, Slovenia and Yugoslavia, the bands 430-432 MHz and 438-440 MHz are also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.276 *Additional allocation:* in Afghanistan, Algeria, Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, Burkina Faso, Burundi, Egypt, the United Arab Emirates, Ecuador, Eritrea, Ethiopia,

Greece, Guinea, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Italy, Jordan, Kenya, Kuwait, Lebanon, Libya, Liechtenstein, Malaysia, Malta, Nigeria, Oman, Pakistan, the Philippines, Qatar, Syria, the Dem. People's Rep. of Korea, Singapore, Somalia, Switzerland, Tanzania, Thailand, Togo, Turkey and Yemen, the band 430-440 MHz is also allocated to the fixed service on a primary basis and the bands 430-435 MHz and 438-440 MHz are also allocated to the mobile, except aeronautical mobile, service on a primary basis.

5.277 *Additional allocation:* in Angola, Armenia, Azerbaijan, Belarus, Cameroon, Congo (Rep. of the), Djibouti, the Russian Federation, Georgia, Hungary, Israel, Kazakhstan, Mali, Moldova, Mongolia, Uzbekistan, Poland, Kyrgyzstan, Slovakia, the Czech Rep., Romania, Rwanda, Tajikistan, Chad, Turkmenistan and Ukraine, the band 430-440 MHz is also allocated to the fixed service on a primary basis.

5.278 *Different category of service:* in Argentina, Colombia, Costa Rica, Cuba, Guyana, Honduras, Panama and Venezuela, the allocation of the band 430-440 MHz to the amateur service is on a primary basis (see No. 5.33).

5.279 *Additional allocation:* in Mexico, the bands 430-435 MHz and 438-440 MHz are also allocated on a primary basis to the land mobile service, subject to agreement obtained under No. 9.21.

5.279A The use of this band by sensors in the Earth exploration-satellite service (active) shall be in accordance with Recommendation ITU-R RS.1260-1. Additionally, the Earth exploration-satellite service (active) in the band 432-438 MHz shall not cause harmful interference to the aeronautical radionavigation service in China.

The provisions of this footnote in no way diminish the obligation of the Earth exploration-satellite service (active) to operate as a secondary service in accordance with Nos. 5.29 and 5.30.

5.280 In Germany, Austria, Bosnia and Herzegovina, Croatia, The Former Yugoslav Republic of Macedonia, Liechtenstein, Portugal, Slovenia, Switzerland and Yugoslavia, the band 433.05-434.79 MHz (centre frequency 433.92 MHz) is designated for industrial, scientific and medical (ISM) applications. Radiocommunication services of these countries operating within this band must accept harmful interference which may be caused by these applications. ISM equipment operating in this band is subject to the provisions of No. 15.13.

5.281 *Additional allocation:* in the French overseas departments and communities in Region 2 and India, the band 433.75-434.25 MHz is also allocated to the space operation service (Earth-to-space) on a primary basis. In France and in Brazil, the band is allocated to the same service on a secondary basis.

5.282 In the bands 435-438 MHz, 1260-1270 MHz, 2400-2450 MHz, 3400-3410 MHz (in Regions 2 and 3 only) and 5650-5670 MHz, the amateur-satellite service may operate subject to not causing harmful interference to other services operating in accordance with the Table (see No. 5.43). Administrations authorizing such use shall ensure that any harmful interference caused by emissions from a station in the amateur-satellite service is immediately eliminated in accordance with the provisions of No. 25.11. The use of the bands 1260-1270 MHz and 5650-5670 MHz by the amateur-satellite service is limited to the Earth-to-space direction.

5.283 *Additional allocation:* in Austria, the band 438-440 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.284 *Additional allocation:* in Canada, the band 440-450 MHz is also allocated to the amateur service on a secondary basis.

5.285 *Different category of service:* in Canada, the allocation of the band 440-450 MHz to the radiolocation service is on a primary basis (see No. 5.33).

5.286 The band 449.75-450.25 MHz may be used for the space operation service (Earth-to-space) and the space research service (Earth-to-space), subject to agreement obtained under No. 9.21.

5.286A The use of the bands 454-456 MHz and 459-460 MHz by the mobile-satellite service is subject to coordination under No. 9.11A.

5.286B The use of the band 454-455 MHz in the countries listed in No. 5.286D, 455-456 MHz and 459-460 MHz in Region 2, and 454-456 MHz and 459-460 MHz in the countries listed in No. 5.286E, by stations in the mobile-satellite service, shall not cause harmful interference to, or claim protection from, stations of the fixed or mobile services operating in accordance with the Table of Frequency Allocations.

5.286C The use of the band 454-455 MHz in the countries listed in No. 5.286D, 455-456 MHz and 459-460 MHz in Region 2, and 454-456 MHz and 459-460 MHz in the countries listed in No. 5.286E, by stations in the mobile-satellite service, shall not constrain the development and use of the fixed and mobile services operating in accordance with the Table of Frequency Allocations.

5.286D *Additional allocation:* in Canada, the United States, Mexico and Panama, the band 454-455 MHz is also allocated to the mobile-satellite service (Earth-to-space) on a primary basis.

5.286E *Additional allocation:* in Cape Verde, Indonesia, Nepal, Nigeria and Papua New Guinea, the bands 454-456 MHz and 459-460 MHz are also allocated to the mobile-satellite (Earth-to-space) service on a primary basis.

5.287 In the maritime mobile service, the frequencies 457.525 MHz, 457.550 MHz, 457.575 MHz, 467.525 MHz, 467.550 MHz and 467.575 MHz may be used by on-board communication stations. Where needed, equipment designed for 12.5 kHz channel spacing using also the additional frequencies 457.5375 MHz, 457.5625 MHz, 467.5375 MHz and 467.5625 MHz may be introduced for on-board communications. The use of these frequencies in territorial waters may be subject to the national regulations of the administration concerned. The characteristics of the equipment used shall conform to those specified in Recommendation ITU-R M.1174 (see Resolution 341 (WRC-97)[7]).

5.288 In the territorial waters of the United States and the Philippines, the preferred frequencies for use by on-board communication stations shall be 457.525 MHz, 457.550 MHz, 457.575 MHz and 457.600 MHz paired, respectively, with 467.750 MHz, 467.775 MHz, 467.800 MHz and 467.825 MHz. The characteristics of the equipment used shall conform to those specified in Recommendation ITU-R M.1174-1.

5.289 Earth exploration-satellite service applications, other than the meteorological-satellite service, may also be used in the bands 460-470 MHz and 1690-1710 MHz for space-to-Earth transmissions subject to not causing harmful interference to stations operating in accordance with the Table.

5.290 *Different category of service:* in Afghanistan, Azerbaijan, Belarus, China, Japan, Mongolia, Uzbekistan, Kyrgyzstan, Slovakia, the Russian Federation, Tajikistan, Turkmenistan and Ukraine, the allocation of the band 460-470 MHz to the meteorological-satellite service (space-to-Earth) is on a primary basis (see No. 5.33), subject to agreement obtained under No. 9.21.

5.291 *Additional allocation:* in China, the band 470-485 MHz is also allocated to the space research (space-to-Earth) and the space operation (space-to-Earth) services on a primary basis subject to agreement obtained under No. 9.21 and subject to not causing harmful interference to existing and planned broadcasting stations.

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[7] *Note by the Secretariat:* This Resolution was abrogated by WRC-03.

5.291A *Additional allocation:* in Germany, Austria, Denmark, Estonia, Finland, Liechtenstein, Norway, Netherlands, the Czech Rep. and Switzerland, the band 470-494 MHz is also allocated to the radiolocation service on a secondary basis. This use is limited to the operation of wind profiler radars in accordance with Resolution 217 (WRC-97).

5.292 *Different category of service:* in Mexico and Venezuela, the allocation of the band 470-512 MHz to the fixed and mobile services, and in Argentina and Uruguay to the mobile service, is on a primary basis (see No. 5.33), subject to agreement obtained under No. 9.21.

5.293 *Different category of service:* in Canada, Chile, Colombia, Cuba, the United States, Guyana, Honduras, Jamaica, Mexico, Panama and Peru, the allocation of the bands 470-512 MHz and 614-806 MHz to the fixed and mobile services is on a primary basis (see No. 5.33), subject to agreement obtained under No. 9.21. In Argentina and Ecuador, the allocation of the band 470-512 MHz to the fixed and mobile services is on a primary basis (see No. 5.33), subject to agreement obtained under No. 9.21.

5.294 *Additional allocation:* in Burundi, Cameroon, Congo (Rep. of the), Côte d'Ivoire, Ethiopia, Israel, Kenya, Lebanon, the Libyan Arab Jamahiriya, Malawi, the Syrian Arab Republic, Sudan, Chad and Yemen, the band 470-582 MHz is also allocated to the fixed service on a secondary basis.

5.296 *Additional allocation:* in Germany, Austria, Belgium, Côte d'Ivoire, Denmark, Spain, Finland, France, Ireland, Israel, Italy, the Libyan Arab Jamahiriya, Lithuania, Malta, Morocco, Monaco, Norway, the Netherlands, Portugal, the Syrian Arab Republic, the United Kingdom, Sweden, Switzerland, Swaziland and Tunisia, the band 470-790 MHz is also allocated on a secondary basis to the land mobile service, intended for applications ancillary to broadcasting. Stations of the land mobile service in the countries listed in this footnote shall not cause harmful interference to existing or planned stations operating in accordance with the Table in countries other than those listed in this footnote.

5.297 *Additional allocation:* in Costa Rica, Cuba, El Salvador, the United States, Guatemala, Guyana, Honduras, Jamaica and Mexico, the band 512-608 MHz is also allocated to the fixed and mobile services on a primary basis, subject to agreement obtained under No. 9.21.

5.298 *Additional allocation:* in India, the band 549.75-550.25 MHz is also allocated to the space operation service (space-to-Earth) on a secondary basis.

5.300 *Additional allocation:* in Israel, Libya, Syria and Sudan, the band 582-790 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a secondary basis.

5.302 *Additional allocation:* in the United Kingdom, the band 590-598 MHz is also allocated to the aeronautical radionavigation service on a primary basis. All new assignments to stations in the aeronautical radionavigation service, including those transferred from the adjacent bands, shall be subject to coordination with the Administrations of the following countries: Germany, Belgium, Denmark, Spain, France, Ireland, Luxembourg, Morocco, Norway and the Netherlands.

5.304 *Additional allocation:* in the African Broadcasting Area (see Nos. 5.10 to 5.13), the band 606-614 MHz is also allocated to the radio astronomy service on a primary basis.

5.305 *Additional allocation:* in China, the band 606-614 MHz is also allocated to the radio astronomy service on a primary basis.

5.306 *Additional allocation:* in Region 1, except in the African Broadcasting Area (see Nos. 5.10 to 5.13), and in Region 3, the band 608-614 MHz is also allocated to the radio astronomy service on a secondary basis.

5.307 *Additional allocation:* in India, the band 608-614 MHz is also allocated to the radio astronomy service on a primary basis.

5.309 *Different category of service:* in Costa Rica, El Salvador and Honduras, the allocation of the band 614-806 MHz to the fixed service is on a primary basis (see No. 5.33), subject to agreement obtained under No. 9.21.

5.312 *Additional allocation:* in Armenia, Azerbaijan, Belarus, Bulgaria, the Russian Federation, Georgia, Hungary, Kazakhstan, Moldova, Mongolia, Uzbekistan, Poland, Kyrgyzstan, Slovakia, the Czech Rep., Romania, Tajikistan, Turkmenistan and Ukraine, the band 645-862 MHz is also allocated to the aeronautical radionavigation service on a primary basis.

5.314 *Additional allocation:* in Austria, Italy, Moldova, Uzbekistan, the United Kingdom and Swaziland, the band 790-862 MHz is also allocated to the land mobile service on a secondary basis.

5.315 *Alternative allocation:* in Greece, Italy and Tunisia, the band 790-838 MHz is allocated to the broadcasting service on a primary basis.

5.316 *Additional allocation:* in Germany, Saudi Arabia, Bosnia and Herzegovina, Burkina Faso, Cameroon, Côte d'Ivoire, Croatia, Denmark, Egypt, Finland, Greece, Israel, the Libyan Arab Jamahiriya, Jordan, Kenya, The Former Yugoslav Republic of Macedonia, Liechtenstein, Mali, Monaco, Norway, the Netherlands, Portugal, the United Kingdom, the Syrian Arab Republic, Serbia and Montenegro, Sweden and Switzerland, the band 790-830 MHz, and in these same countries and in Spain, France, Gabon and Malta, the band 830-862 MHz, are also allocated to the mobile, except aeronautical mobile, service on a primary basis. However, stations of the mobile service in the countries mentioned in connection with each band referred to in this footnote shall not cause harmful interference to, or claim protection from, stations of services operating in accordance with the Table in countries other than those mentioned in connection with the band.

5.317 *Additional allocation:* in Region 2 (except Brazil and the United States), the band 806-890 MHz is also allocated to the mobile-satellite service on a primary basis, subject to agreement obtained under No. 9.21. The use of this service is intended for operation within national boundaries.

5.317A Administrations wishing to implement International Mobile Telecommunications-2000 (IMT-2000) may use those parts of the band 806-960 MHz which are allocated to the mobile service on a primary basis and are used or planned to be used for mobile systems (see Resolution 224 (WRC-2000)). This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations.

5.318 *Additional allocation:* in Canada, the United States and Mexico, the bands 849-851 MHz and 894-896 MHz are also allocated to the aeronautical mobile service on a primary basis, for public correspondence with aircraft. The use of the band 849-851 MHz is limited to transmissions from aeronautical stations and the use of the band 894-896 MHz is limited to transmissions from aircraft stations.

5.319 *Additional allocation:* in Belarus, the Russian Federation and Ukraine, the bands 806-840 MHz (Earth-to-space) and 856-890 MHz (space-to-Earth) are also allocated to the mobile-satellite, except aeronautical mobile-satellite (R), service. The use of these bands by this service shall not cause harmful interference to, or claim protection from, services in other countries operating in accordance with the Table of Frequency Allocations and is subject to special agreements between the administrations concerned.

5.320 *Additional allocation:* in Region 3, the bands 806-890 MHz and 942-960 MHz are also allocated to the mobile-satellite, except aeronautical mobile-satellite (R), service on a primary basis, subject to agreement obtained under No. 9.21. The use of this service is limited to operation within national boundaries. In seeking such agreement, appropriate protection shall be afforded to services operating in accordance with the Table, to ensure that no harmful interference is caused to such services.

5.322 In Region 1, in the band 862-960 MHz, stations of the broadcasting service shall be operated only in the African Broadcasting Area (see Nos. 5.10 to 5.13) excluding Algeria, Egypt, Spain, the Libyan Arab Jamahiriya, Morocco, Namibia, Nigeria, South Africa, Tanzania, Zimbabwe and Zambia, subject to agreement obtained under No. 9.21.

5.323 *Additional allocation:* in Armenia, Azerbaijan, Belarus, Bulgaria, the Russian Federation, Hungary, Kazakhstan, Moldova, Mongolia, Uzbekistan, Poland, Kyrgyzstan, Slovakia, the Czech Rep., Romania, Tajikistan, Turkmenistan and Ukraine, the band 862-960 MHz is also allocated to the aeronautical radionavigation service on a primary basis. Such use is subject to agreement obtained under No. 9.21 with administrations concerned and limited to ground-based radiobeacons in operation on 27 October 1997 until the end of their lifetime.

5.325 *Different category of service:* in the United States, the allocation of the band 890-942 MHz to the radiolocation service is on a primary basis (see No. 5.33), subject to agreement obtained under No. 9.21.

5.325A *Different category of service:* in Cuba, the allocation of the band 902-915 MHz to the land mobile service is on a primary basis.

5.326 *Different category of service:* in Chile, the band 903-905 MHz is allocated to the mobile, except aeronautical mobile, service on a primary basis, subject to agreement obtained under No. 9.21.

5.327 *Different category of service:* in Australia, the allocation of the band 915-928 MHz to the radiolocation service is on a primary basis (see No. 5.33).

5.328 The use of the band 960-1215 MHz by the aeronautical radionavigation service is reserved on a worldwide basis for the operation and development of airborne electronic aids to air navigation and any directly associated ground-based facilities.

5.328A Stations in the radionavigation-satellite service in the band 1164-1215 MHz shall operate in accordance with the provisions of Resolution 609 (WRC-03) and shall not claim protection from stations in the aeronautical radionavigation service in the band 960-1215 MHz. No. 5.43A does not apply. The provisions of No. 21.18 shall apply.

5.328B The use of the bands 1164-1300 MHz, 1559-1610 MHz and 5010-5030 MHz by systems and networks in the radionavigation-satellite service for which complete coordination or notification information, as appropriate, is received by the Radiocommunication Bureau after 1 January 2005 is subject to the application of the provisions of Nos. 9.12, 9.12A and 9.13. Resolution 610 (WRC–03) shall also apply.

5.329 Use of the radionavigation-satellite service in the band 1215-1300 MHz shall be subject to the condition that no harmful interference is caused to, and no protection is claimed from, the radionavigation service authorized under No. 5.331. Furthermore, the use of the radionavigation-satellite service in the band 1215-1300 MHz shall be subject to the condition that no harmful interference is caused to the radiolocation service. No. 5.43 shall not apply in respect of the radiolocation service. Resolution 608 (WRC-03) shall apply.

5.329A Use of systems in the radionavigation-satellite service (space-to-space) operating in the bands 1215-1300 MHz and 1559-1610 MHz is not intended to provide safety service applications, and shall not impose any additional constraints on other systems or services operating in accordance with the Table.

5.330 *Additional allocation:* in Angola, Saudi Arabia, Bahrain, Bangladesh, Cameroon, China, the United Arab Emirates, Eritrea, Ethiopia, Guyana, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, the Libyan Arab Jamahiriya, Japan, Jordan, Kuwait, Lebanon, Mozambique, Nepal, Pakistan, the Philippines, Qatar, the Syrian Arab Republic, Somalia, Sudan, Chad, Togo and Yemen, the band 1215-1300 MHz is also allocated to the fixed and mobile services on a primary basis.

5.331 *Additional allocation:* in Algeria, Germany, Saudi Arabia, Australia, Austria, Bahrain, Belarus, Belgium, Benin, Bosnia and Herzegovina, Brazil, Burkina Faso, Burundi, Cameroon, China, Korea (Rep. of), Croatia, Denmark, Egypt, the United Arab Emirates, Estonia, the Russian Federation, Finland, France, Ghana, Greece, Guinea, Equatorial Guinea, Hungary, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Jordan, Kenya, Kuwait, The Former Yugoslav Republic of Macedonia, Lesotho, Latvia, Liechtenstein, Lithuania, Luxembourg, Madagascar, Mali, Mauritania, Nigeria, Norway, Oman, the Netherlands, Poland, Portugal, Qatar, the Syrian Arab Republic, Slovakia, the United Kingdom, Serbia and Montenegro, Slovenia, Somalia, Sudan, Sri Lanka, South Africa, Sweden, Switzerland, Thailand, Togo, Turkey, Venezuela and Viet Nam, the band 1215-1300 MHz is also allocated to the radionavigation service on a primary basis. In Canada and the United States, the band 1240-1300 MHz is also allocated to the radionavigation service, and use of the radionavigation service shall be limited to the aeronautical radionavigation service.

5.332 In the band 1215-1260 MHz, active spaceborne sensors in the Earth exploration-satellite and space research services shall not cause harmful interference to, claim protection from, or otherwise impose constraints on operation or development of the radiolocation service, the radionavigation-satellite service and other services allocated on a primary basis.

5.334 *Additional allocation:* in Canada and the United States, the band 1350-1370 MHz is also allocated to the aeronautical radionavigation service on a primary basis.

5.335 In Canada and the United States in the band 1240-1300 MHz, active spaceborne sensors in the earth exploration-satellite and space research services shall not cause interference to, claim protection from, or otherwise impose constraints on operation or development of the aeronautical radionavigation service.

5.335A In the band 1260-1300 MHz, active spaceborne sensors in the Earth exploration-satellite and space research services shall not cause harmful interference to, claim protection from, or otherwise impose constraints on operation or development of the radiolocation service and other services allocated by footnotes on a primary basis.

5.337 The use of the bands 1300-1350 MHz, 2700-2900 MHz and 9000-9200 MHz by the aeronautical radionavigation service is restricted to ground-based radars and to associated airborne transponders which transmit only on frequencies in these bands and only when actuated by radars operating in the same band.

5.337A The use of the band 1300-1350 MHz by earth stations in the radionavigation-satellite service and by stations in the radiolocation service shall not cause harmful interference to, nor constrain the operation and development of, the aeronautical-radionavigation service.

5.338 In Azerbaijan, Mongolia, Kyrgyzstan, Slovakia, the Czech Rep., Romania and Turkmenistan, existing installations of the radionavigation service may continue to operate in the band 1350-1400 MHz.

5.339 The bands 1370-1400 MHz, 2640-2655 MHz, 4950-4990 MHz and 15.20-15.35 GHz are also allocated to the space research (passive) and Earth exploration-satellite (passive) services on a secondary basis.

5.340 All emissions are prohibited in the following bands:

1400-1427 MHz,

2690-2700 MHz, except those provided for by No. 5.422,

10.68-10.7 GHz, except those provided for by No. 5.483,

15.35-15.4 GHz, except those provided for by No. 5.511,

23.6-24 GHz,

31.3-31.5 GHz,

31.5-31.8 GHz, in Region 2,

48.94-49.04 GHz, from airborne stations,

50.2-50.4 GHz[2],

52.6-54.25 GHz,

86-92 GHz,

100-102 GHz,

109.5-111.8 GHz,

114.25-116 GHz,

148.5-151.5 GHz,

164-167 GHz,

182-185 GHz,

190-191.8 GHz,

200-209 GHz,

226-231.5 GHz,

250-252 GHz.

5.341 In the bands 1400-1727 MHz, 101-120 GHz and 197-220 GHz, passive research is being conducted by some countries in a programme for the search for intentional emissions of extraterrestrial origin.

5.342 *Additional allocation:* in Armenia, Azerbaijan, Belarus, Bulgaria, the Russian Federation, Uzbekistan, Kyrgystan and Ukraine, the band 1429-1535 MHz is also allocated to the aeronautical mobile service on a primary basis exclusively for the purposes of aeronautical telemetry within the national territory. As of 1 April 2007, the use of the band 1452-1492 MHz is subject to agreement between the administrations concerned.

5.343 In Region 2, the use of the band 1435-1535 MHz by the aeronautical mobile service for telemetry has priority over other uses by the mobile service.

5.344 *Alternative allocation:* in the United States, the band 1452-1525 MHz is allocated to the fixed and mobile services on a primary basis (see also No. 5.343).

5.345 Use of the band 1452-1492 MHz by the broadcasting-satellite service, and by the broadcasting service, is limited to digital audio broadcasting and is subject to the provisions of Resolution 528 (WARC-92)[3].

5.347A In the bands:

1452-1492 MHz,

1525-1559 MHz,

1613.8-1626.5 MHz,

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[2] 5.340.1 The allocation to the Earth exploration-satellite service (passive) and the space research service (passive) in the band 50.2-50.4 GHz should not impose undue constraints on the use of the adjacent bands by the primary allocated services in those bands.

[3] *Note by the Secretariat:* This Resolution was revised by WRC-03.

2655-2670 MHz,

2670-2690 MHz,

21.4-22 GHz,

Resolution 739 (WRC-03) applies.

5.348 The use of the band 1518-1525 MHz by the mobile-satellite service is subject to coordination under No. 9.11A. In the band 1518-1525 MHz stations in the mobile-satellite service shall not claim protection from the stations in the fixed service. No. 5.43A does not apply.

5.348A In the band 1518-1525 MHz, the coordination threshold in terms of the power flux-density levels at the surface of the Earth in application of No. 9.11A for space stations in the mobile-satellite (space-to-Earth) service, with respect to the land mobile service use for specialized mobile radios or used in conjunction with public switched telecommunication networks (PSTN) operating within the territory of Japan, shall be –150 dB(W/m²) in any 4 kHz band for all angles of arrival, instead of those given in Table 5-2 of Appendix 5. In the band 1518-1525 MHz stations in the mobile-satellite service shall not claim protection from stations in the mobile service in the territory of Japan. No. 5.43A does not apply.

5.348B In the band 1518-1525 MHz, stations in the mobile-satellite service shall not claim protection from aeronautical mobile telemetry stations in the mobile service in the territory of the United States (see Nos. 5.343 and 5.344) and in the countries listed in No. 5.342. No. 5.43A does not apply.

5.349 *Different category of service:* in Saudi Arabia, Azerbaijan, Bahrain, Bosnia and Herzegovina, Cameroon, Egypt, France, Iran (Islamic Republic of), Iraq, Israel, Kazakhstan, Kuwait, The Former Yugoslav Republic of Macedonia, Lebanon, Morocco, Qatar, Syria, Kyrgyzstan, Romania, Turkmenistan, Yemen and Yugoslavia, the allocation of the band 1525-1530 MHz to the mobile, except aeronautical mobile, service is on a primary basis (see No. 5.33).

5.350 *Additional allocation:* in Azerbaijan, Kyrgyzstan and Turkmenistan, the band 1525-1530 MHz is also allocated to the aeronautical mobile service on a primary basis.

5.351 The bands 1525-1544 MHz, 1545-1559 MHz, 1626.5-1645.5 MHz and 1646.5-1660.5 MHz shall not be used for feeder links of any service. In exceptional circumstances, however, an earth station at a specified fixed point in any of the mobile-satellite services may be authorized by an administration to communicate via space stations using these bands.

5.351A For the use of the bands 1525-1544 MHz, 1545-1559 MHz, 1610-1626.5 MHz, 1626.5-1645.5 MHz, 1646.5-1660.5 MHz, 1980-2010 MHz, 2170-2200 MHz, 2483.5-2500 MHz, 2500-2520 MHz and 2670-2690 MHz by the mobile-satellite service, see Resolutions 212 (Rev.WRC-97) and 225 (WRC-2000)[3].

5.352A In the band 1525-1530 MHz, stations in the mobile-satellite service, except stations in the maritime mobile-satellite service, shall not cause harmful interference to, or claim protection from, stations of the fixed service in France and French overseas communities of Region 3, Algeria, Saudi Arabia, Egypt, Guinea, India, Israel, Italy, Jordan, Kuwait, Mali, Malta, Morocco, Mauritania, Nigeria, Oman, Pakistan, the Philippines, Qatar, Syrian Arab Republic, Tanzania, Viet Nam and Yemen notified prior to 1 April 1998.

5.353A In applying the procedures of Section II of Article 9 to the mobile-satellite service in the bands 1530-1544 MHz and 1626.5-1645.5 MHz, priority shall be given to accommodating the spectrum requirements for distress, urgency and safety communications of the Global Maritime Distress and Safety System (GMDSS). Maritime mobile-satellite distress, urgency and safety communications shall have

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[3] *Note by the Secretariat:* This Resolution was revised by WRC-03.

priority access and immediate availability over all other mobile satellite communications operating within a network. Mobile-satellite systems shall not cause unacceptable interference to, or claim protection from, distress, urgency and safety communications of the GMDSS. Account shall be taken of the priority of safety-related communications in the other mobile-satellite services. (The provisions of Resolution 222 (WRC-2000) shall apply.)

5.354 The use of the bands 1525-1559 MHz and 1626.5-1660.5 MHz by the mobile-satellite services is subject to coordination under No. 9.11A.

5.355 *Additional allocation:* in Bahrain, Bangladesh, Congo (Rep. of the), Egypt, Eritrea, Iraq, Israel, Kuwait, Lebanon, Malta, Qatar, Syrian Arab Republic, Somalia, Sudan, Chad, Togo and Yemen, the bands 1540-1559 MHz, 1610-1645.5 MHz and 1646.5-1660 MHz are also allocated to the fixed service on a secondary basis.

5.356 The use of the band 1544-1545 MHz by the mobile-satellite service (space-to-Earth) is limited to distress and safety communications (see Article 31).

5.357 Transmissions in the band 1545-1555 MHz from terrestrial aeronautical stations directly to aircraft stations, or between aircraft stations, in the aeronautical mobile (R) service are also authorized when such transmissions are used to extend or supplement the satellite-to-aircraft links.

5.357A In applying the procedures of Section II of Article 9 to the mobile-satellite service in the bands 1545-1555 MHz and 1646.5-1656.5 MHz, priority shall be given to accommodating the spectrum requirements of the aeronautical mobile-satellite (R) service providing transmission of messages with priority 1 to 6 in Article 44. Aeronautical mobile-satellite (R) service communications with priority 1 to 6 in Article 44 shall have priority access and immediate availability, by pre-emption if necessary, over all other mobile-satellite communications operating within a network. Mobile-satellite systems shall not cause unacceptable interference to, or claim protection from, aeronautical mobile-satellite (R) service communications with priority 1 to 6 in Article 44. Account shall be taken of the priority of safety-related communications in the other mobile-satellite services. (The provisions of Resolution 222 (WRC-2000) shall apply.)

5.359 *Additional allocation:* in Germany, Saudi Arabia, Armenia, Austria, Azerbaijan, Belarus, Benin, Bosnia and Herzegovina, Bulgaria, Cameroon, Spain, the Russian Federation, France, Gabon, Georgia, Greece, Guinea, Guinea-Bissau, Hungary, Jordan, Kazakhstan, Kuwait, Lebanon, the Libyan Arab Jamahiriya, Lithuania, Mauritania, Moldova, Mongolia, Uganda, Uzbekistan, Pakistan, Poland, the Syrian Arab Republic, Kyrgyzstan, the Dem. People's Rep. of Korea, Romania, Swaziland, Tajikistan, Tanzania, Tunisia, Turkmenistan and Ukraine, the bands 1550-1559 MHz, 1610-1645.5 MHz and 1646.5-1660 MHz are also allocated to the fixed service on a primary basis. Administrations are urged to make all practicable efforts to avoid the implementation of new fixed-service stations in these bands.

5.362A In the United States, in the bands 1555-1559 MHz and 1656.5-1660.5 MHz, the aeronautical mobile-satellite (R) service shall have priority access and immediate availability, by pre-emption if necessary, over all other mobile-satellite communications operating within a network. Mobile-satellite systems shall not cause unacceptable interference to, or claim protection from, aeronautical mobile-satellite (R) service communications with priority 1 to 6 in Article 44. Account shall be taken of the priority of safety-related communications in the other mobile-satellite services.

5.362B *Additional allocation:* The band 1559-1610 MHz is also allocated to the fixed service on a primary basis until 1 January 2005 in Germany, Armenia, Azerbaijan, Belarus, Benin, Bosnia and Herzegovina, Bulgaria, Spain, the Russian Federation, France, Gabon, Georgia, Greece, Guinea, Guinea-Bissau, Hungary, Kazakhstan, Lithuania, Moldova, Mongolia, Nigeria, Uganda, Uzbekistan, Pakistan, Poland, Kyrgyzstan, the Dem. People's Rep. of Korea, Romania, Senegal, Swaziland, Tajikistan, Tanzania, Turkmenistan and Ukraine, and until 1 January 2010 in Saudi Arabia, Cameroon, Jordan, Kuwait, Lebanon, the Libyan Arab Jamahiriya, Mali, Mauritania, the Syrian Arab Republic and

Tunisia. After these dates, the fixed service may continue to operate on a secondary basis until 1 January 2015, at which time this allocation shall no longer be valid. Administrations are urged to take all practicable steps to protect the radionavigation-satellite service and the aeronautical radionavigation service and not authorize new frequency assignments to fixed-service systems in this band.

5.362C *Additional allocation:* in Bahrain, Bangladesh, Congo, Egypt, Eritrea, Iraq, Israel, Jordan, Kuwait, Lebanon, Malta, Morocco, Qatar, Syria, Somalia, Sudan, Chad, Togo and Yemen, the band 1559-1610 MHz is also allocated to the fixed service on a secondary basis until 1 January 2015, at which time this allocation shall no longer be valid. Administrations are urged to take all practicable steps to protect the radionavigation-satellite service and not authorize new frequency assignments to fixed-service systems in this band.

5.364 The use of the band 1610-1626.5 MHz by the mobile-satellite service (Earth-to-space) and by the radiodetermination-satellite service (Earth-to-space) is subject to coordination under No. 9.11A. A mobile earth station operating in either of the services in this band shall not produce a peak e.i.r.p. density in excess of –15 dB(W/4 kHz) in the part of the band used by systems operating in accordance with the provisions of No. 5.366 (to which No. 4.10 applies), unless otherwise agreed by the affected administrations. In the part of the band where such systems are not operating, the mean e.i.r.p. density of a mobile earth station shall not exceed –3 dB(W/4 kHz). Stations of the mobile-satellite service shall not claim protection from stations in the aeronautical radionavigation service, stations operating in accordance with the provisions of No. 5.366 and stations in the fixed service operating in accordance with the provisions of No. 5.359. Administrations responsible for the coordination of mobile-satellite networks shall make all practicable efforts to ensure protection of stations operating in accordance with the provisions of No. 5.366.

5.365 The use of the band 1613.8-1626.5 MHz by the mobile-satellite service (space-to-Earth) is subject to coordination under No. 9.11A.

5.366 The band 1610-1626.5 MHz is reserved on a worldwide basis for the use and development of airborne electronic aids to air navigation and any directly associated ground-based or satellite-borne facilities. Such satellite use is subject to agreement obtained under No. 9.21.

5.367 *Additional allocation:* The bands 1610-1626.5 MHz and 5000-5150 MHz are also allocated to the aeronautical mobile-satellite (R) service on a primary basis, subject to agreement obtained under No. 9.21.

5.368 With respect to the radiodetermination-satellite and mobile-satellite services the provisions of No. 4.10 do not apply in the band 1610-1626.5 MHz, with the exception of the aeronautical radionavigation-satellite service.

5.369 *Different category of service:* in Angola, Australia, Burundi, China, Eritrea, Ethiopia, India, Iran (Islamic Republic of), Israel, Lebanon, Liberia, Libyan Arab Jamahiriya, Madagascar, Mali, Pakistan, Papua New Guinea, Syrian Arab Republic, Dem. Rep. of the Congo, Sudan, Swaziland, Togo and Zambia, the allocation of the band 1610-1626.5 MHz to the radiodetermination-satellite service (Earth-to-space) is on a primary basis (see No. 5.33), subject to agreement obtained under No. 9.21 from countries not listed in this provision.

5.370 *Different category of service:* in Venezuela, the allocation to the radiodetermination-satellite service in the band 1610-1626.5 MHz (Earth-to-space) is on a secondary basis.

5.371 *Additional allocation:* in Region 1, the bands 1610-1626.5 MHz (Earth-to-space) and 2483.5-2500 MHz (space-to-Earth) are also allocated to the radiodetermination-satellite service on a secondary basis, subject to agreement obtained under No. 9.21.

5.372 Harmful interference shall not be caused to stations of the radio astronomy service using the band 1610.6-1613.8 MHz by stations of the radiodetermination-satellite and mobile-satellite services (No. 29.13 applies).

5.374 Mobile earth stations in the mobile-satellite service operating in the bands 1631.5-1634.5 MHz and 1656.5-1660 MHz shall not cause harmful interference to stations in the fixed service operating in the countries listed in No. 5.359.

5.375 The use of the band 1645.5-1646.5 MHz by the mobile-satellite service (Earth-to-space) and for inter-satellite links is limited to distress and safety communications (see Article 31).

5.376 Transmissions in the band 1646.5-1656.5 MHz from aircraft stations in the aeronautical mobile (R) service directly to terrestrial aeronautical stations, or between aircraft stations, are also authorized when such transmissions are used to extend or supplement the aircraft-to-satellite links.

5.376A Mobile earth stations operating in the band 1660-1660.5 MHz shall not cause harmful interference to stations in the radio astronomy service.

5.379 *Additional allocation:* in Bangladesh, India, Indonesia, Nigeria and Pakistan, the band 1660.5-1668.4 MHz is also allocated to the meteorological aids service on a secondary basis.

5.379A Administrations are urged to give all practicable protection in the band 1660.5-1668.4 MHz for future research in radio astronomy, particularly by eliminating air-to-ground transmissions in the meteorological aids service in the band 1664.4-1668.4 MHz as soon as practicable.

5.379B The use of the band 1668-1675 MHz by the mobile-satellite service is subject to coordination under No. 9.11A.

5.379C In order to protect the radio astronomy service in the band 1668-1670 MHz, the aggregate power flux-density (pfd) values produced by mobile earth stations in a network of the mobile-satellite service operating in this band shall not exceed –181 dB(W/m²) in 10 MHz and –194 dB(W/m²) in any 20 kHz at any radio astronomy station recorded in the Master International Frequency Register, for more than 2% of integration periods of 2000 s.

5.379D For sharing of the band 1668-1675 MHz between the mobile-satellite service and the fixed, mobile and space research (passive) services, Resolution 744 (WRC-03) shall apply.

5.379E In the band 1668.4-1675 MHz, stations in the mobile-satellite service shall not cause harmful interference to stations in the meteorological aids service in China, Iran (Islamic Republic of), Japan and Uzbekistan. In the band 1668.4-1675 MHz, administrations are urged not to implement new systems in the meteorological aids service and are encouraged to migrate existing meteorological aids service operations to other bands as soon as practicable.

5.380A In the band 1670-1675 MHz, stations in the mobile-satellite service shall not cause harmful interference to, nor constrain the development of, existing earth stations in the meteorological-satellite service notified in accordance with Resolution 670 (WRC-03).

5.381 *Additional allocation:* in Afghanistan, Costa Rica, Cuba, India, Iran (Islamic Republic of) and Pakistan, the band 1690-1700 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.382 *Different category of service:* in Saudi Arabia, Armenia, Azerbaijan, Bahrain, Belarus, Bosnia and Herzegovina, Bulgaria, Congo (Rep. of the), Egypt, the United Arab Emirates, Eritrea, Ethiopia, the Russian Federation, Guinea, Hungary, Iraq, Israel, Jordan, Kazakhstan, Kuwait, the Former Yugoslav Republic of Macedonia, Lebanon, Mauritania, Moldova, Mongolia, Oman, Uzbekistan, Poland, Qatar, Syrian Arab Republic, Kyrgyzstan, Romania, Serbia and Montenegro, Somalia, Tajikistan, Tanzania, Turkmenistan, Ukraine and Yemen, the allocation of the band 1690-1700 MHz to the fixed and mobile,

except aeronautical mobile, services is on a primary basis (see No. 5.33), and in the Dem. People's Rep. of Korea, the allocation of the band 1690-1700 MHz to the fixed service is on a primary basis (see No. 5.33) and to the mobile, except aeronautical mobile, service on a secondary basis.

5.384 *Additional allocation:* in India, Indonesia and Japan, the band 1700-1710 MHz is also allocated to the space research service (space-to-Earth) on a primary basis.

5.384A The bands, or portions of the bands, 1710-1885 MHz and 2500-2690 MHz, are identified for use by administrations wishing to implement International Mobile Telecommunications-2000 (IMT-2000) in accordance with Resolution 223 (WRC-2000). This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations.

5.385 *Additional allocation:* the band 1718.8-1722.2 MHz is also allocated to the radio astronomy service on a secondary basis for spectral line observations.

5.386 *Additional allocation:* the band 1750-1850 MHz is also allocated to the space operation (Earth-to-space) and space research (Earth-to-space) services in Region 2, in Australia, Guam, India, Indonesia and Japan on a primary basis, subject to agreement obtained under No. 9.21, having particular regard to troposcatter systems.

5.387 *Additional allocation:* in Azerbaijan, Belarus, Georgia, Kazakhstan, Mongolia, Kyrgyzstan, Slovakia, Romania, Tajikistan and Turkmenistan, the band 1770-1790 MHz is also allocated to the meteorological-satellite service on a primary basis, subject to agreement obtained under No. 9.21.

5.388 The bands 1885-2025 MHz and 2110-2200 MHz are intended for use, on a worldwide basis, by administrations wishing to implement International Mobile Telecommunications-2000 (IMT-2000). Such use does not preclude the use of these bands by other services to which they are allocated. The bands should be made available for IMT-2000 in accordance with Resolution 212 (Rev.WRC-97). (See also Resolution 223 (WRC-2000).)

5.388A In Regions 1 and 3, the bands 1885-1980 MHz, 2010-2025 MHz and 2110-2170 MHz and, in Region 2, the bands 1885-1980 MHz and 2110-2160 MHz may be used by high altitude platform stations as base stations to provide International Mobile Telecommunications-2000 (IMT-2000), in accordance with Resolution 221 (Rev.WRC-03). Their use by IMT-2000 applications using high altitude platform stations as base stations does not preclude the use of these bands by any station in the services to which they are allocated and does not establish priority in the Radio Regulations.

5.388B In Algeria, Saudi Arabia, Bahrain, Benin, Burkina Faso, Cameroon, Comoros, Côte d'Ivoire, China, Cuba, Djibouti, Egypt, United Arab Emirates, Eritrea, Ethiopia, Gabon, Ghana, India, Iran (Islamic Republic of), Israel, the Libyan Arab Jamahiriya, Jordan, Kenya, Kuwait, Mali, Morocco, Mauritania, Nigeria, Oman, Uganda, Qatar, the Syrian Arab Republic, Senegal, Singapore, Sudan, Tanzania, Chad, Togo, Tunisia, Yemen, Zambia and Zimbabwe, for the purpose of protecting fixed and mobile services, including IMT-2000 mobile stations, in their territories from co-channel interference, a high altitude platform station (HAPS) operating as an IMT-2000 base station in neighbouring countries, in the bands referred to in No. 5.388A, shall not exceed a co-channel power flux-density of -127 dB(W/(m² · MHz)) at the Earth's surface outside a country's borders unless explicit agreement of the affected administration is provided at the time of the notification of HAPS.

5.389A The use of the bands 1980-2010 MHz and 2170-2200 MHz by the mobile-satellite service is subject to coordination under No. 9.11A and to the provisions of Resolution 716 (WRC-95)[4]. The use of

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[4] *Note by the Secretariat:* This Resolution was revised by WRC-2000.

these bands shall not commence before 1 January 2000; however the use of the band 1980-1990 MHz in Region 2 shall not commence before 1 January 2005.

5.389B The use of the band 1980-1990 MHz by the mobile-satellite service shall not cause harmful interference to or constrain the development of the fixed and mobile services in Argentina, Brazil, Canada, Chile, Ecuador, the United States, Honduras, Jamaica, Mexico, Peru, Suriname, Trinidad and Tobago, Uruguay and Venezuela.

5.389C The use of the bands 2010-2025 MHz and 2160-2170 MHz in Region 2 by the mobile-satellite service shall not commence before 1 January 2002 and is subject to coordination under No. 9.11A and to the provisions of Resolution 716 (WRC-95)[4].

5.389E The use of the bands 2010-2025 MHz and 2160-2170 MHz by the mobile-satellite service in Region 2 shall not cause harmful interference to or constrain the development of the fixed and mobile services in Regions 1 and 3.

5.389F In Algeria, Benin, Cape Verde, Egypt, Iran (Islamic Republic of), Mali, Syrian Arab Republic and Tunisia, the use of the bands 1980-2010 MHz and 2170-2200 MHz by the mobile-satellite service shall neither cause harmful interference to the fixed and mobile services, nor hamper the development of those services prior to 1 January 2005, nor shall the former service request protection from the latter services.

5.391 In making assignments to the mobile service in the bands 2025-2110 MHz and 2200-2290 MHz, administrations shall not introduce high-density mobile systems, as described in Recommendation ITU-R SA.1154, and shall take that Recommendation into account for the introduction of any other type of mobile system.

5.392 Administrations are urged to take all practicable measures to ensure that space-to-space transmissions between two or more non-geostationary satellites, in the space research, space operations and Earth exploration-satellite services in the bands 2025-2110 MHz and 2200-2290 MHz, shall not impose any constraints on Earth-to-space, space-to-Earth and other space-to-space transmissions of those services and in those bands between geostationary and non-geostationary satellites.

5.393 *Additional allocation:* in the United States, India and Mexico, the band 2310-2360 MHz is also allocated to the broadcasting-satellite service (sound) and complementary terrestrial sound broadcasting service on a primary basis. Such use is limited to digital audio broadcasting and is subject to the provisions of Resolution 528 (WARC-92), with the exception of *resolves* 3 in regard to the limitation on broadcasting-satellite systems in the upper 25 MHz.

5.394 In the United States, the use of the band 2300-2390 MHz by the aeronautical mobile service for telemetry has priority over other uses by the mobile services. In Canada, the use of the band 2300-2483.5 MHz by the aeronautical mobile service for telemetry has priority over other uses by the mobile services.

5.395 In France and Turkey, the use of the band 2310-2360 MHz by the aeronautical mobile service for telemetry has priority over other uses by the mobile service.

5.396 Space stations of the broadcasting-satellite service in the band 2310-2360 MHz operating in accordance with No. 5.393 that may affect the services to which this band is allocated in other countries shall be coordinated and notified in accordance with Resolution 33 (Rev.WRC-97)[3]. Complementary terrestrial broadcasting stations shall be subject to bilateral coordination with neighbouring countries prior to their bringing into use.

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[3] *Note by the Secretariat:* This Resolution was revised by WRC-03.

5.397 *Different category of service:* in France, the band 2450-2500 MHz is allocated on a primary basis to the radiolocation service (see No. 5.33). Such use is subject to agreement with administrations having services operating or planned to operate in accordance with the Table of Frequency Allocations which may be affected.

5.398 In respect of the radiodetermination-satellite service in the band 2483.5-2500 MHz, the provisions of No. 4.10 do not apply.

5.399 In Region 1, in countries other than those listed in No. 5.400, harmful interference shall not be caused to, or protection shall not be claimed from, stations of the radiolocation service by stations of the radiodetermination satellite service.

5.400 *Different category of service:* in Angola, Australia, Bangladesh, Burundi, China, Eritrea, Ethiopia, India, Iran (Islamic Republic of), the Libyan Arab Jamahiriya, Lebanon, Liberia, Madagascar, Mali, Pakistan, Papua New Guinea, the Dem. Rep. of the Congo, the Syrian Arab Republic, Sudan, Swaziland, Togo and Zambia, the allocation of the band 2483.5-2500 MHz to the radiodetermination-satellite service (space-to-Earth) is on a primary basis (see No. 5.33), subject to agreement obtained under No. 9.21 from countries not listed in this provision.

5.402 The use of the band 2483.5-2500 MHz by the mobile-satellite and the radiodetermination-satellite services is subject to the coordination under No. 9.11A. Administrations are urged to take all practicable steps to prevent harmful interference to the radio astronomy service from emissions in the 2483.5-2500 MHz band, especially those caused by second-harmonic radiation that would fall into the 4990-5000 MHz band allocated to the radio astronomy service worldwide.

5.403 Subject to agreement obtained under No. 9.21, the band 2520-2535 MHz (until 1 January 2005 the band 2500-2535 MHz) may also be used for the mobile-satellite (space-to-Earth), except aeronautical mobile-satellite, service for operation limited to within national boundaries. The provisions of No. 9.11A apply.

5.404 *Additional allocation:* in India and Iran (Islamic Republic of), the band 2500-2516.5 MHz may also be used for the radiodetermination-satellite service (space-to-Earth) for operation limited to within national boundaries, subject to agreement obtained under No. 9.21.

5.405 *Additional allocation:* in France, the band 2500-2550 MHz is also allocated to the radiolocation service on a primary basis. Such use is subject to agreement with the administrations having services operating or planned to operate in accordance with the Table which may be affected.

5.407 In the band 2500-2520 MHz, the power flux-density at the surface of the Earth from space stations operating in the mobile-satellite (space-to-Earth) service shall not exceed -152 dB(W/(m² · 4 kHz)) in Argentina, unless otherwise agreed by the administrations concerned.

5.410 The band 2500-2690 MHz may be used for tropospheric scatter systems in Region 1, subject to agreement obtained under No. 9.21.

5.412 *Alternative allocation:* in Azerbaijan, Bulgaria, Kyrgyzstan and Turkmenistan, the band 2500-2690 MHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.413 In the design of systems in the broadcasting-satellite service in the bands between 2500 MHz and 2690 MHz, administrations are urged to take all necessary steps to protect the radio astronomy service in the band 2690-2700 MHz.

5.414 The allocation of the frequency band 2500-2520 MHz to the mobile-satellite service (space-to-Earth) shall be effective on 1 January 2005 and is subject to coordination under No. 9.11A.

5.415 The use of the bands 2500-2690 MHz in Region 2 and 2500-2535 MHz and 2655-2690 MHz in Region 3 by the fixed-satellite service is limited to national and regional systems, subject to agreement obtained under No. 9.21, giving particular attention to the broadcasting-satellite service in Region 1. In the direction space-to-Earth, the power flux-density at the Earth's surface shall not exceed the values given in Article 21, Table 21-4.

5.415A *Additional allocation:* in India and Japan, subject to agreement obtained under No. 9.21, the band 2515-2535 MHz may also be used for the aeronautical mobile-satellite service (space-to-Earth) for operation limited to within their national boundaries.

5.416 The use of the band 2520-2670 MHz by the broadcasting-satellite service is limited to national and regional systems for community reception, subject to agreement obtained under No. 9.21.

5.417A In applying provision No. 5.418, in Korea (Rep. of) and Japan, *resolves* 3 of Resolution 528 (Rev.WRC-03) is relaxed to allow the broadcasting-satellite service (sound) and the complementary terrestrial broadcasting service to additionally operate on a primary basis in the band 2605-2630 MHz. This use is limited to systems intended for national coverage. An administration listed in this provision shall not have simultaneously two overlapping frequency assignments, one under this provision and the other under No. 5.416. The provisions of No. 5.416 and Table 21-4 of Article 21 do not apply. Use of non-geostationary-satellite systems in the broadcasting-satellite service (sound) in the band 2605-2630 MHz is subject to the provisions of Resolution 539 (Rev.WRC-03). The power flux-density at the Earth's surface produced by emissions from a geostationary broadcasting-satellite service (sound) space station operating in the band 2605-2630 MHz for which complete Appendix 4 coordination information, or notification information, has been received after 4 July 2003, for all conditions and for all methods of modulation, shall not exceed the following limits:

-130 dB(W/(m² · MHz))	for $0° \leq \theta \leq 5°$
$-130 + 0.4\ (\theta - 5)$ dB(W/(m² · MHz))	for $5° < \theta \leq 25°$
-122 dB(W/(m² · MHz))	for $25° < \theta \leq 90°$

where θ is the angle of arrival of the incident wave above the horizontal plane, in degrees. These limits may be exceeded on the territory of any country whose administration has so agreed. In the case of the broadcasting-satellite service (sound) networks of Korea (Rep. of), as an exception to the limits above, the power flux-density value of –122 dB(W/(m² · MHz)) shall be used as a threshold for coordination under No. 9.11 in an area of 1000 km around the territory of the administration notifying the BSS (sound) system, for angles of arrival greater than 35°.

5.417B In Korea (Rep. of) and Japan, use of the band 2605-2630 MHz by non-geostationary-satellite systems in the broadcasting-satellite service (sound), pursuant to No. 5.417A, for which complete Appendix 4 coordination information, or notification information, has been received after 4 July 2003, is subject to the application of the provisions of No. 9.12A, in respect of geostationary-satellite networks for which complete Appendix 4 coordination information, or notification information, is considered to have been received after 4 July 2003, and No. 22.2 does not apply. No. 22.2 shall continue to apply with respect to geostationary-satellite networks for which complete Appendix 4 coordination information, or notification information, is considered to have been received before 5 July 2003.

5.417C Use of the band 2605-2630 MHz by non-geostationary-satellite systems in the broadcasting-satellite service (sound), pursuant to No. 5.417A, for which complete Appendix 4 coordination information, or notification information, has been received after 4 July 2003, is subject to the application of the provisions of No. 9.12.

5.417D Use of the band 2605-2630 MHz by geostationary-satellite networks for which complete Appendix 4 coordination information, or notification information, has been received after 4 July 2003 is subject to the application of the provisions of No. 9.13 with respect to non-geostationary-satellite systems

in the broadcasting-satellite service (sound), pursuant to No. 5.417A, and No. 22.2 does not apply.

5.418 *Additional allocation:* in Korea (Rep. of), India, Japan, Pakistan and Thailand, the band 2535-2655 MHz is also allocated to the broadcasting-satellite service (sound) and complementary terrestrial broadcasting service on a primary basis. Such use is limited to digital audio broadcasting and is subject to the provisions of Resolution 528 (Rev.WRC-03). The provisions of No. 5.416 and Table 21-4 of Article 21, do not apply to this additional allocation. Use of non-geostationary-satellite systems in the broadcasting-satellite service (sound) is subject to Resolution 539 (Rev.WRC-03). Geostationary broadcasting-satellite service (sound) systems for which complete Appendix 4 coordination information has been received after 1 June 2005 are limited to systems intended for national coverage. The power flux-density at the Earth's surface produced by emissions from a geostationary broadcasting-satellite service (sound) space station operating in the band 2630-2655 MHz, and for which complete Appendix 4 coordination information has been received after 1 June 2005, shall not exceed the following limits, for all conditions and for all methods of modulation:

-130 dB(W/(m² · MHz)) for $0° \leq \theta \leq 5°$
$-130 + 0.4\,(\theta - 5)$ dB(W/(m² · MHz)) for $5° < \theta \leq 25°$
-122 dB(W/(m² · MHz)) for $25° < \theta \leq 90°$

where θ is the angle of arrival of the incident wave above the horizontal plane, in degrees. These limits may be exceeded on the territory of any country whose administration has so agreed. As an exception to the limits above, the pfd value of –122 dB(W/(m² · MHz)) shall be used as a threshold for coordination under No. 9.11 in an area of 1500 km around the territory of the administration notifying the broadcasting-satellite service (sound) system. In addition, the pfd value shall not exceed -100 dB(W/(m^2 · MHz)) anywhere on the territory of the Russian Federation.

In addition, an administration listed in this provision shall not have simultaneously two overlapping frequency assignments, one under this provision and the other under No. 5.416 for systems for which complete Appendix 4 coordination information has been received after 1 June 2005.

5.418A In certain Region 3 countries listed in No. 5.418, use of the band 2630-2655 MHz by non-geostationary-satellite systems in the broadcasting-satellite service (sound) for which complete Appendix 4 coordination information, or notification information, has been received after 2 June 2000, is subject to the application of the provisions of No. 9.12A, in respect of geostationary-satellite networks for which complete Appendix 4 coordination information, or notification information, is considered to have been received after 2 June 2000, and No. 22.2 does not apply. No. 22.2 shall continue to apply with respect to geostationary-satellite networks for which complete Appendix 4 coordination information, or notification information, is considered to have been received before 3 June 2000.

5.418B Use of the band 2630-2655 MHz by non-geostationary-satellite systems in the broadcasting-satellite service (sound), pursuant to No. 5.418, for which complete Appendix 4 coordination information, or notification information, has been received after 2 June 2000, is subject to the application of the provisions of No. 9.12.

5.418C Use of the band 2630-2655 MHz by geostationary-satellite networks for which complete Appendix 4 coordination information, or notification information, has been received after 2 June 2000 is subject to the application of the provisions of No. 9.13 with respect to non-geostationary-satellite systems in the broadcasting-satellite service (sound), pursuant to No. 5.418 and No. 22.2 does not apply.

5.419 The allocation of the frequency band 2670-2690 MHz to the mobile-satellite service shall be effective from 1 January 2005. When introducing systems of the mobile-satellite service in this band, administrations shall take all necessary steps to protect the satellite systems operating in this band prior to 3 March 1992. The coordination of mobile-satellite systems in the band shall be in accordance with No. 9.11A.

5.420 The band 2655-2670 MHz (until 1 January 2005 the band 2655-2690 MHz) may also be used for the mobile-satellite (Earth-to-space), except aeronautical mobile-satellite, service for operation limited to within national boundaries, subject to agreement obtained under No. 9.21. The coordination under No. 9.11A applies.

5.422 *Additional allocation:* in Saudi Arabia, Armenia, Azerbaijan, Bahrain, Belarus, Bosnia and Herzegovina, Brunei Darussalam, Congo (Rep. of the), Côte d'Ivoire, Cuba, Egypt, the United Arab Emirates, Eritrea, Ethiopia, the Russian Federation, Gabon, Georgia, Guinea, Guinea-Bissau, Iran (Islamic Republic of), Iraq, Israel, Jordan, Lebanon, Mauritania, Moldova, Mongolia, Nigeria, Oman, Uzbekistan, Pakistan, the Philippines, Qatar, Syrian Arab Republic, Kyrgyzstan, the Dem. Rep. of the Congo, Romania, Serbia and Montenegro, Somalia, Tajikistan, Tunisia, Turkmenistan, Ukraine and Yemen, the band 2690-2700 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. Such use is limited to equipment in operation by 1 January 1985.

5.423 In the band 2700-2900 MHz, ground-based radars used for meteorological purposes are authorized to operate on a basis of equality with stations of the aeronautical radionavigation service.

5.424 *Additional allocation:* in Canada, the band 2850-2900 MHz is also allocated to the maritime radionavigation service, on a primary basis, for use by shore-based radars.

5.424A In the band 2900-3100 MHz, stations in the radiolocation service shall not cause harmful interference to, nor claim protection from, radar systems in the radionavigation service.

5.425 In the band 2900-3100 MHz, the use of the shipborne interrogator-transponder (SIT) system shall be confined to the sub-band 2930-2950 MHz.

5.426 The use of the band 2900-3100 MHz by the aeronautical radionavigation service is limited to ground-based radars.

5.427 In the bands 2900-3100 MHz and 9300-9500 MHz, the response from radar transponders shall not be capable of being confused with the response from radar beacons (racons) and shall not cause interference to ship or aeronautical radars in the radionavigation service, having regard, however, to No. 4.9.

5.428 *Additional allocation:* in Azerbaijan, Cuba, Mongolia, Kyrgyzstan, Romania and Turkmenistan, the band 3100-3300 MHz is also allocated to the radionavigation service on a primary basis.

5.429 *Additional allocation:* in Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, China, Congo (Rep. of the), Korea (Rep. of), the United Arab Emirates, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Japan, Jordan, Kenya, Kuwait, Lebanon, Libyan Arab Jamahiriya, Malaysia, Oman, Pakistan, Qatar, Syrian Arab Republic, Dem. People's Rep. of Korea and Yemen, the band 3300-3400 MHz is also allocated to the fixed and mobile services on a primary basis. The countries bordering the Mediterranean shall not claim protection for their fixed and mobile services from the radiolocation service.

5.430 *Additional allocation:* in Azerbaijan, Cuba, Mongolia, Kyrgyzstan, Romania and Turkmenistan, the band 3300-3400 MHz is also allocated to the radionavigation service on a primary basis.

5.431 *Additional allocation:* in Germany, Israel and the United Kingdom, the band 3400-3475 MHz is also allocated to the amateur service on a secondary basis.

5.432 *Different category of service:* in Korea (Rep. of), Japan and Pakistan, the allocation of the band 3400-3500 MHz to the mobile, except aeronautical mobile, service is on a primary basis (see No. 5.33).

5.433 In Regions 2 and 3, in the band 3400-3600 MHz the radiolocation service is allocated on a primary basis. However, all administrations operating radiolocation systems in this band are urged to

cease operations by 1985. Thereafter, administrations shall take all practicable steps to protect the fixed-satellite service and coordination requirements shall not be imposed on the fixed-satellite service.

5.435 In Japan, in the band 3620-3700 MHz, the radiolocation service is excluded.

5.438 Use of the band 4200-4400 MHz by the aeronautical radionavigation service is reserved exclusively for radio altimeters installed on board aircraft and for the associated transponders on the ground. However, passive sensing in the Earth exploration-satellite and space research services may be authorized in this band on a secondary basis (no protection is provided by the radio altimeters).

5.439 *Additional allocation:* in Iran (Islamic Republic of) and Libyan Arab Jamahiriya, the band 4200-4400 MHz is also allocated to the fixed service on a secondary basis.

5.440 The standard frequency and time signal-satellite service may be authorized to use the frequency 4202 MHz for space-to-Earth transmissions and the frequency 6427 MHz for Earth-to-space transmissions. Such transmissions shall be confined within the limits of ± 2 MHz of these frequencies, subject to agreement obtained under No. 9.21.

5.441 The use of the bands 4500-4800 MHz (space-to-Earth), 6725-7025 MHz (Earth-to-space) by the fixed-satellite service shall be in accordance with the provisions of Appendix 30B. The use of the bands 10.7-10.95 GHz (space-to-Earth), 11.2-11.45 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space) by geostationary-satellite systems in the fixed-satellite service shall be in accordance with the provisions of Appendix 30B. The use of the bands 10.7-10.95 GHz (space-to Earth), 11.2-11.45 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space) by a non-geostationary-satellite system in the fixed-satellite service is subject to application of the provisions of No. 9.12 for coordination with other non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the fixed-satellite service operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information, as appropriate, for the non-geostationary-satellite systems in the fixed-satellite service and of the complete coordination or notification information, as appropriate, for the geostationary-satellite networks, and No. 5.43A does not apply. Non-geostationary-satellite systems in the fixed-satellite service in the above bands shall be operated in such a way that any unacceptable interference that may occur during their operation shall be rapidly eliminated.

5.442 In the bands 4825-4835 MHz and 4950-4990 MHz, the allocation to the mobile service is restricted to the mobile, except aeronautical mobile, service.

5.443 *Different category of service:* in Argentina, Australia and Canada, the allocation of the bands 4825-4835 MHz and 4950-4990 MHz to the radio astronomy service is on a primary basis (see No. 5.33).

5.443B In order not to cause harmful interference to the microwave landing system operating above 5030 MHz, the aggregate power flux-density produced at the Earth's surface in the band 5030-5150 MHz by all the space stations within any radionavigation-satellite service system (space-to-Earth) operating in the band 5010-5030 MHz shall not exceed –124.5 dB(W/m²) in a 150 kHz band. In order not to cause harmful interference to the radio astronomy service in the band 4990-5000 MHz, radionavigation-satellite service systems operating in the band 5010-5030 MHz shall comply with the limits in the band 4990-5000 MHz defined in Resolution 741 (WRC-03).

5.444 The band 5030-5150 MHz is to be used for the operation of the international standard system (microwave landing system) for precision approach and landing. The requirements of this system shall take precedence over other uses of this band. For the use of this band, No. 5.444A and Resolution 114 (Rev.WRC-03) apply.

5.444A *Additional allocation:* the band 5091-5150 MHz is also allocated to the fixed-satellite service

(Earth-to-space) on a primary basis. This allocation is limited to feeder links of non-geostationary mobile-satellite systems in the mobile-satellite service and is subject to coordination under No. 9.11A.

In the band 5091-5150 MHz, the following conditions also apply:

– prior to 1 January 2018, the use of the band 5091-5150 MHz by feeder links of non-geostationary-satellite systems in the mobile-satellite service shall be made in accordance with Resolution 114 (Rev.WRC-03);

– prior to 1 January 2018, the requirements of existing and planned international standard systems for the aeronautical radionavigation service which cannot be met in the 5000-5091 MHz band, shall take precedence over other uses of this band;

– after 1 January 2012, no new assignments shall be made to earth stations providing feeder links of non-geostationary mobile-satellite systems;

– after 1 January 2018, the fixed-satellite service will become secondary to the aeronautical radionavigation service.

5.446 *Additional allocation:* in the countries listed in Nos. 5.369 and 5.400, the band 5150-5216 MHz is also allocated to the radiodetermination-satellite service (space-to-Earth) on a primary basis, subject to agreement obtained under No. 9.21. In Region 2, the band is also allocated to the radiodetermination-satellite service (space-to-Earth) on a primary basis. In Regions 1 and 3, except those countries listed in Nos. 5.369 and 5.400, the band is also allocated to the radiodetermination-satellite service (space-to-Earth) on a secondary basis. The use by the radiodetermination-satellite service is limited to feeder links in conjunction with the radiodetermination-satellite service operating in the bands 1610-1626.5 MHz and/or 2483.5-2500 MHz. The total power flux-density at the Earth's surface shall in no case exceed -159 dB(W/m²) in any 4 kHz band for all angles of arrival.

5.446A The use of the bands 5150-5350 MHz and 5470-5725 MHz by the stations in the mobile service shall be in accordance with Resolution 229 (WRC-03).

5.446B In the band 5150-5250 MHz, stations in the mobile service shall not claim protection from earth stations in the fixed-satellite service. No. 5.43A does not apply to the mobile service with respect to fixed-satellite service earth stations.

5.447 *Additional allocation:* in Israel, Lebanon, Pakistan, the Syrian Arab Republic and Tunisia, the band 5150-5250 MHz is also allocated to the mobile service, on a primary basis, subject to agreement obtained under No. 9.21. In this case, the provisions of Resolution 229 (WRC-03) do not apply.

5.447A The allocation to the fixed-satellite service (Earth-to-space) is limited to feeder links of non-geostationary-satellite systems in the mobile-satellite service and is subject to coordination under No. 9.11A.

5.447B *Additional allocation:* the band 5150-5216 MHz is also allocated to the fixed-satellite service (space-to-Earth) on a primary basis. This allocation is limited to feeder links of non-geostationary-satellite systems in the mobile-satellite service and is subject to provisions of No. 9.11A. The power flux-density at the Earth's surface produced by space stations of the fixed-satellite service operating in the space-to-Earth direction in the band 5150-5216 MHz shall in no case exceed –164 dB(W/m^2) in any 4 kHz band for all angles of arrival.

5.447C Administrations responsible for fixed-satellite service networks in the band 5150-5250 MHz operated under Nos. 5.447A and 5.447B shall coordinate on an equal basis in accordance with No. 9.11A with administrations responsible for non-geostationary-satellite networks operated under No. 5.446 and brought into use prior to 17 November 1995. Satellite networks operated under No. 5.446 brought into use after 17 November 1995 shall not claim protection from, and shall not cause harmful interference to, stations of the fixed-satellite service operated under Nos. 5.447A and 5.447B.

5.447D The allocation of the band 5250-5255 MHz to the space research service on a primary basis is limited to active spaceborne sensors. Other uses of the band by the space research service are on a secondary basis.

5.447E *Additional allocation:* The band 5250-5350 MHz is also allocated to the fixed service on a primary basis in the following countries in Region 3: Australia, Korea (Rep. of), India, Indonesia, Iran (Islamic Republic of), Japan, Malaysia, Papua New Guinea, Philippines, Sri Lanka, Thailand and Viet Nam. The use of this band by the fixed service is intended for the implementation of fixed wireless access systems and shall comply with Recommendation ITU-R F.1613. In addition, the fixed service shall not claim protection from the radiodetermination, Earth exploration-satellite (active) and space research (active) services, but the provisions of No. 5.43A do not apply to the fixed service with respect to the Earth exploration-satellite (active) and space research (active) services. After implementation of fixed wireless access systems in the fixed service with protection for the existing radiodetermination systems, no more stringent constraints should be imposed on the fixed wireless access systems by future radiodetermination implementations.

5.447F In the band 5250-5350 MHz, stations in the mobile service shall not claim protection from the radiolocation service, the Earth exploration-satellite service (active) and the space research service (active). These services shall not impose on the mobile service more stringent protection criteria, based on system characteristics and interference criteria, than those stated in Recommendations ITU-R M.1638 and ITU-R RS.1632.

5.448 *Additional allocation:* in Azerbaijan, Libyan Arab Jamahiriya, Mongolia, Kyrgyzstan, Slovakia, Romania and Turkmenistan, the band 5250-5350 MHz is also allocated to the radionavigation service on a primary basis.

5.448A The Earth exploration-satellite (active) and space research (active) services in the frequency band 5250-5350 MHz shall not claim protection from the radiolocation service. No. 5.43A does not apply.

5.448B The Earth exploration-satellite service (active) operating in the band 5350-5570 MHz and space research service (active) operating in the band 5460-5570 MHz shall not cause harmful interference to the aeronautical radionavigation service in the band 5350-5460 MHz, the radionavigation service in the band 5460-5470 MHz and the maritime radionavigation service in the band 5470-5570 MHz.

5.448C The space research service (active) operating in the band 5350-5460 MHz shall not cause harmful interference to nor claim protection from other services to which this band is allocated.

5.448D In the frequency band 5350-5470 MHz, stations in the radiolocation service shall not cause harmful interference to, nor claim protection from, radar systems in the aeronautical radionavigation service operating in accordance with No. 5.449.

5.449 The use of the band 5350-5470 MHz by the aeronautical radionavigation service is limited to airborne radars and associated airborne beacons.

5.450 *Additional allocation:* in Austria, Azerbaijan, Iran (Islamic Republic of), Mongolia, Kyrgyzstan, Romania, Turkmenistan and Ukraine, the band 5470-5650 MHz is also allocated to the aeronautical radionavigation service on a primary basis.

5.450A In the band 5470-5725 MHz, stations in the mobile service shall not claim protection from radiodetermination services. Radiodetermination services shall not impose on the mobile service more stringent protection criteria, based on system characteristics and interference criteria, than those stated in Recommendation ITU-R M.1638.

5.450B In the frequency band 5470-5650 MHz, stations in the radiolocation service, except ground-based radars used for meteorological purposes in the band 5600-5650 MHz, shall not cause harmful interference to, nor claim protection from, radar systems in the maritime radionavigation service.

5.451 *Additional allocation:* in the United Kingdom, the band 5470-5850 MHz is also allocated to the land mobile service on a secondary basis. The power limits specified in Nos. 21.2, 21.3, 21.4 and 21.5 shall apply in the band 5725-5850 MHz.

5.452 Between 5600 MHz and 5650 MHz, ground-based radars used for meteorological purposes are authorized to operate on a basis of equality with stations of the maritime radionavigation service.

5.453 *Additional allocation:* in Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, Cameroon, China, Congo (Rep. of the), Korea (Rep. of), Côte d'Ivoire, Egypt, the United Arab Emirates, Gabon, Guinea, Equatorial Guinea, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, the Libyan Arab Jamahiriya, Japan, Jordan, Kenya, Kuwait, Lebanon, Madagascar, Malaysia, Nigeria, Oman, Pakistan, the Philippines, Qatar, the Syrian Arab Republic, the Dem. People's Rep. of Korea, Singapore, Sri Lanka, Swaziland, Tanzania, Chad, Thailand, Togo, Viet Nam and Yemen, the band 5650-5850 MHz is also allocated to the fixed and mobile services on a primary basis. In this case, the provisions of Resolution 229 (WRC-03) do not apply.

5.454 *Different category of service:* in Azerbaijan, the Russian Federation, Georgia, Mongolia, Uzbekistan, Kyrgyzstan, Tajikistan and Turkmenistan, the allocation of the band 5670-5725 MHz to the space research service is on a primary basis (see No. 5.33).

5.455 *Additional allocation:* in Armenia, Azerbaijan, Belarus, Cuba, the Russian Federation, Georgia, Hungary, Kazakhstan, Latvia, Moldova, Mongolia, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan and Ukraine, the band 5670-5850 MHz is also allocated to the fixed service on a primary basis.

5.456 *Additional allocation:* in Cameroon, the band 5755-5850 MHz is also allocated to the fixed service on a primary basis.

5.457A In the bands 5925-6425 MHz and 14-14.5 GHz, earth stations located on board vessels may communicate with space stations of the fixed-satellite service. Such use shall be in accordance with Resolution 902 (WRC-03).

5.457B In the bands 5925-6425 MHz and 14-14.5 GHz, earth stations located on board vessels may operate with the characteristics and under the conditions contained in Resolution 902 (WRC-03) in Algeria, Saudi Arabia, Bahrain, Comoros, Djibouti, Egypt, United Arab Emirates, the Libyan Arab Jamahiriya, Jordan, Kuwait, Morocco, Mauritania, Oman, Qatar, the Syrian Arab Republic, Sudan, Tunisia and Yemen, in the maritime mobile-satellite service on a secondary basis. Such use shall be in accordance with Resolution 902 (WRC-03).

5.458 In the band 6425-7075 MHz, passive microwave sensor measurements are carried out over the oceans. In the band 7075-7250 MHz, passive microwave sensor measurements are carried out. Administrations should bear in mind the needs of the Earth exploration-satellite (passive) and space research (passive) services in their future planning of the bands 6425-7025 MHz and 7075-7250 MHz.

5.458A In making assignments in the band 6700-7075 MHz to space stations of the fixed-satellite service, administrations are urged to take all practicable steps to protect spectral line observations of the radio astronomy service in the band 6650-6675.2 MHz from harmful interference from unwanted emissions.

5.458B The space-to-Earth allocation to the fixed-satellite service in the band 6700-7075 MHz is limited to feeder links for non-geostationary satellite systems of the mobile-satellite service and is subject

to coordination under No. 9.11A. The use of the band 6700-7075 MHz (space-to-Earth) by feeder links for non-geostationary satellite systems in the mobile-satellite service is not subject to No. 22.2.

5.458C Administrations making submissions in the band 7025-7075 MHz (Earth-to-space) for geostationary-satellite systems in the fixed-satellite service after 17 November 1995 shall consult on the basis of relevant ITU-R Recommendations with the administrations that have notified and brought into use non-geostationary-satellite systems in this frequency band before 18 November 1995 upon request of the latter administrations. This consultation shall be with a view to facilitating shared operation of both geostationary-satellite systems in the fixed-satellite service and non-geostationary-satellite systems in this band.

5.459 *Additional allocation:* in Russian Federation, the frequency bands 7100-7155 MHz and 7190-7235 MHz are also allocated to the space operation service (Earth-to-space) on a primary basis, subject to agreement obtained under No. 9.21.

5.460 The use of the band 7145-7190 MHz by the space research service (Earth-to-space) is restricted to deep space; no emissions to deep space shall be effected in the band 7190-7235 MHz. Geostationary satellites in the space research service operating in the band 7190-7235 MHz shall not claim protection from existing and future stations of the fixed and mobile services and No. 5.43A does not apply.

5.461 *Additional allocation:* the bands 7250-7375 MHz (space-to-Earth) and 7900-8025 MHz (Earth-to-space) are also allocated to the mobile-satellite service on a primary basis, subject to agreement obtained under No. 9.21.

5.461A The use of the band 7450-7550 MHz by the meteorological-satellite service (space-to-Earth) is limited to geostationary-satellite systems. Non-geostationary meteorological-satellite systems in this band notified before 30 November 1997 may continue to operate on a primary basis until the end of their lifetime.

5.461B The use of the band 7750-7850 MHz by the meteorological-satellite service (space-to-Earth) is limited to non-geostationary satellite systems.

5.462A In Regions 1 and 3 (except for Japan), in the band 8025-8400 MHz, the Earth exploration-satellite service using geostationary satellites shall not produce a power flux-density in excess of the following provisional values for angles of arrival (θ), without the consent of the affected administration:

-174 dB(W/m²) in a 4 kHz band for $0° \leq \theta < 5°$

$-174 + 0.5\,(\theta - 5)$ dB(W/m²) in a 4 kHz band for $5° \leq \theta < 25°$

-164 dB(W/m²) in a 4 kHz band for $25° \leq \theta \leq 90°$

These values are subject to study under Resolution 124 (WRC-97)[6].

5.463 Aircraft stations are not permitted to transmit in the band 8025-8400 MHz.

5.465 In the space research service, the use of the band 8400-8450 MHz is limited to deep space.

5.466 *Different category of service:* in Israel, Singapore and Sri Lanka, the allocation of the band 8400-8500 MHz to the space research service is on a secondary basis (see No. 5.32).

5.468 *Additional allocation:* in Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, Burundi, Cameroon, China, Congo (Rep. of the), Costa Rica, Egypt, the United Arab Emirates, Gabon, Guyana,

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[6] *Note by the Secretariat:* This Resolution was revised by WRC-2000.

Indonesia, Iran (Islamic Republic of), Iraq, the Libyan Arab Jamahiriya, Jamaica, Jordan, Kenya, Kuwait, Lebanon, Malaysia, Mali, Morocco, Mauritania, Nepal, Nigeria, Oman, Pakistan, Qatar, Syrian Arab Republic, the Dem. People's Rep. of Korea, Senegal, Singapore, Somalia, Swaziland, Tanzania, Chad, Togo, Tunisia and Yemen, the band 8500-8750 MHz is also allocated to the fixed and mobile services on a primary basis.

5.469 *Additional allocation:* in Armenia, Azerbaijan, Belarus, the Russian Federation, Georgia, Hungary, Lithuania, Moldova, Mongolia, Uzbekistan, Poland, Kyrgyzstan, the Czech Rep., Romania, Tajikistan, Turkmenistan and Ukraine, the band 8500-8750 MHz is also allocated to the land mobile and radionavigation services on a primary basis.

5.469A In the band 8550-8650 MHz, stations in the Earth exploration-satellite service (active) and space research service (active) shall not cause harmful interference to, or constrain the use and development of, stations of the radiolocation service.

5.470 The use of the band 8750-8850 MHz by the aeronautical radionavigation service is limited to airborne Doppler navigation aids on a centre frequency of 8800 MHz.

5.471 *Additional allocation:* in Algeria, Germany, Bahrain, Belgium, China, the United Arab Emirates, France, Greece, Indonesia, Iran (Islamic Republic of), Libya, the Netherlands, Qatar and Sudan, the bands 8825-8850 MHz and 9000-9200 MHz are also allocated to the maritime radionavigation service, on a primary basis, for use by shore-based radars only.

5.472 In the bands 8850-9000 MHz and 9200-9225 MHz, the maritime radionavigation service is limited to shore-based radars.

5.473 *Additional allocation:* in Armenia, Austria, Azerbaijan, Belarus, Bulgaria, Cuba, the Russian Federation, Georgia, Hungary, Moldova, Mongolia, Uzbekistan, Poland, Kyrgyzstan, Romania, Tajikistan, Turkmenistan and Ukraine, the bands 8850-9000 MHz and 9200-9300 MHz are also allocated to the radionavigation service on a primary basis.

5.474 In the band 9200-9500 MHz, search and rescue transponders (SART) may be used, having due regard to the appropriate ITU-R Recommendation (see also Article 31).

5.475 The use of the band 9300-9500 MHz by the aeronautical radionavigation service is limited to airborne weather radars and ground-based radars. In addition, ground-based radar beacons in the aeronautical radionavigation service are permitted in the band 9300-9320 MHz on condition that harmful interference is not caused to the maritime radionavigation service. In the band 9300-9500 MHz, ground-based radars used for meteorological purposes have priority over other radiolocation devices.

5.476 In the band 9300-9320 MHz in the radionavigation service, the use of shipborne radars, other than those existing on 1 January 1976, is not permitted until 1 January 2001.

5.476A In the band 9500-9800 MHz, stations in the Earth exploration-satellite service (active) and space research service (active) shall not cause harmful interference to, or constrain the use and development of, stations of the radionavigation and radiolocation services.

5.477 *Different category of service:* in Algeria, Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, Cameroon, Egypt, the United Arab Emirates, Eritrea, Ethiopia, Guyana, India, Indonesia, Iran (Islamic Republic of), Iraq, Jamaica, Japan, Jordan, Kuwait, Lebanon, Liberia, Malaysia, Nigeria, Oman, Pakistan, Qatar, the Dem. People's Rep. of Korea, Singapore, Somalia, Sudan, Trinidad and Tobago, and Yemen, the allocation of the band 9800-10000 MHz to the fixed service is on a primary basis (see No. 5.33).

5.478 *Additional allocation:* in Azerbaijan, Bulgaria, Mongolia, Kyrgyzstan, Romania, Turkmenistan

and Ukraine, the band 9800-10000 MHz is also allocated to the radionavigation service on a primary basis.

5.479 The band 9975-10025 MHz is also allocated to the meteorological-satellite service on a secondary basis for use by weather radars.

5.480 *Additional allocation:* in Argentina, Brazil, Chile, Costa Rica, Cuba, El Salvador, Ecuador, Guatemala, Honduras, Mexico, Paraguay, Peru, Uruguay and Venezuela, the band 10-10.45 GHz is also allocated to the fixed and mobile services on a primary basis.

5.481 *Additional allocation:* in Germany, Angola, Brazil, China, Costa Rica, Côte d'Ivoire, El Salvador, Ecuador, Spain, Guatemala, Hungary, Japan, Kenya, Morocco, Nigeria, Oman, Uzbekistan, Paraguay, Peru, the Dem. People's Rep. of Korea, Tanzania, Thailand and Uruguay, the band 10.45-10.5 GHz is also allocated to the fixed and mobile services on a primary basis.

5.482 In the band 10.6-10.68 GHz, stations of the fixed and mobile, except aeronautical mobile, services shall be limited to a maximum equivalent isotropically radiated power of 40 dBW and the power delivered to the antenna shall not exceed –3 dBW. These limits may be exceeded subject to agreement obtained under No. 9.21. However, in Saudi Arabia, Armenia, Azerbaijan, Bahrain, Bangladesh, Belarus, China, the United Arab Emirates, Georgia, India, Indonesia, Iran (Islamic Republic of), Iraq, Japan, Kazakhstan, Kuwait, Latvia, Lebanon, Moldova, Nigeria, Pakistan, the Philippines, Qatar, Syrian Arab Republic, Tajikistan and Turkmenistan, the restrictions on the fixed and mobile, except aeronautical mobile, services are not applicable.

5.483 *Additional allocation:* in Saudi Arabia, Armenia, Azerbaijan, Bahrain, Belarus, Bosnia and Herzegovina, China, Colombia, Korea (Rep. of), Costa Rica, Egypt, the United Arab Emirates, Georgia, Iran (Islamic Republic of), Iraq, Israel, Jordan, Kazakhstan, Kuwait, Lebanon, Mongolia, Uzbekistan, Qatar, Kyrgyzstan, the Dem. People's Rep. of Korea, Romania, Serbia and Montenegro, Tajikistan, Turkmenistan and Yemen, the band 10.68-10.7 GHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. Such use is limited to equipment in operation by 1 January 1985.

5.484 In Region 1, the use of the band 10.7-11.7 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service.

5.484A The use of the bands 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.75 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Region 1, 13.75-14.5 GHz (Earth-to-space), 17.8-18.6 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 27.5-28.6 GHz (Earth-to-space), 29.5-30 GHz (Earth-to-space) by a non-geostationary-satellite system in the fixed-satellite service is subject to application of the provisions of No. 9.12 for coordination with other non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the fixed-satellite service operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information, as appropriate, for the non-geostationary-satellite systems in the fixed-satellite service and of the complete coordination or notification information, as appropriate, for the geostationary-satellite networks, and No. 5.43A does not apply. Non-geostationary-satellite systems in the fixed-satellite service in the above bands shall be operated in such a way that any unacceptable interference that may occur during their operation shall be rapidly eliminated.

5.485 In Region 2, in the band 11.7-12.2 GHz, transponders on space stations in the fixed-satellite service may be used additionally for transmissions in the broadcasting-satellite service, provided that such transmissions do not have a maximum e.i.r.p. greater than 53 dBW per television channel and do

not cause greater interference or require more protection from interference than the coordinated fixed-satellite service frequency assignments. With respect to the space services, this band shall be used principally for the fixed-satellite service.

5.486 *Different category of service:* in Mexico and the United States, the allocation of the band 11.7-12.1 GHz to the fixed service is on a secondary basis (see No. 5.32).

5.487 In the band 11.7-12.5 GHz in Regions 1 and 3, the fixed, fixed-satellite, mobile, except aeronautical mobile, and broadcasting services, in accordance with their respective allocations, shall not cause harmful interference to, or claim protection from, broadcasting-satellite stations operating in accordance with the Regions 1 and 3 Plan in Appendix 30.

5.487A *Additional allocation:* in Region 1, the band 11.7-12.5 GHz, in Region 2, the band 12.2-12.7 GHz and, in Region 3, the band 11.7-12.2 GHz, are also allocated to the fixed-satellite service (space-to-Earth) on a primary basis, limited to non-geostationary systems and subject to application of the provisions of No. 9.12 for coordination with other non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the broadcasting-satellite service operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information, as appropriate, for the non-geostationary-satellite systems in the fixed-satellite service and of the complete coordination or notification information, as appropriate, for the geostationary-satellite networks, and No. 5.43A does not apply. Non-geostationary-satellite systems in the fixed-satellite service in the above bands shall be operated in such a way that any unacceptable interference that may occur during their operation shall be rapidly eliminated.

5.488 The use of the band 11.7-12.2 GHz by geostationary-satellite networks in the fixed-satellite service in Region 2 is subject to application of the provisions of No. 9.14 for coordination with stations of terrestrial services in Regions 1, 2 and 3. For the use of the band 12.2-12.7 GHz by the broadcasting-satellite service in Region 2, see Appendix 30.

5.489 *Additional allocation:* in Peru, the band 12.1-12.2 GHz is also allocated to the fixed service on a primary basis.

5.490 In Region 2, in the band 12.2-12.7 GHz, existing and future terrestrial radiocommunication services shall not cause harmful interference to the space services operating in conformity with the broadcasting-satellite Plan for Region 2 contained in Appendix 30.

5.492 Assignments to stations of the broadcasting-satellite service which are in conformity with the appropriate regional Plan or included in the Regions 1 and 3 List in Appendix 30 may also be used for transmissions in the fixed-satellite service (space-to-Earth), provided that such transmissions do not cause more interference, or require more protection from interference, than the broadcasting-satellite service transmissions operating in conformity with the Plan or the List, as appropriate.

5.493 The broadcasting-satellite service in the band 12.5-12.75 GHz in Region 3 is limited to a power flux-density not exceeding –111 dB(W/(m² · 27 MHz)) for all conditions and for all methods of modulation at the edge of the service area.

5.494 *Additional allocation:* in Algeria, Angola, Saudi Arabia, Bahrain, Cameroon, the Central African Rep., Congo (Rep. of the), Côte d'Ivoire, Egypt, the United Arab Emirates, Eritrea, Ethiopia, Gabon, Ghana, Guinea, Iraq, Israel, the Libyan Arab Jamahiriya, Jordan, Kuwait, Lebanon, Madagascar, Mali, Morocco, Mongolia, Nigeria, Qatar, the Syrian Arab Republic, the Dem. Rep. of the Congo, Somalia, Sudan, Chad, Togo and Yemen, the band 12.5-12.75 GHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.495 *Additional allocation:* in Bosnia and Herzegovina, Croatia, France, Greece, Liechtenstein, Monaco, Uganda, Portugal, Romania, Serbia and Montenegro, Slovenia, Switzerland, Tanzania and Tunisia, the band 12.5-12.75 GHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a secondary basis.

5.496 *Additional allocation:* in Austria, Azerbaijan, Kyrgyzstan and Turkmenistan, the band 12.5-12.75 GHz is also allocated to the fixed service and the mobile, except aeronautical mobile, service on a primary basis. However, stations in these services shall not cause harmful interference to fixed-satellite service earth stations of countries in Region 1 other than those listed in this footnote. Coordination of these earth stations is not required with stations of the fixed and mobile services of the countries listed in this footnote. The power flux-density limit at the Earth's surface given in Table 21-4 of Article 21, for the fixed-satellite service shall apply on the territory of the countries listed in this footnote.

5.497 The use of the band 13.25-13.4 GHz by the aeronautical radionavigation service is limited to Doppler navigation aids.

5.498A The Earth exploration-satellite (active) and space research (active) services operating in the band 13.25-13.4 GHz shall not cause harmful interference to, or constrain the use and development of, the aeronautical radionavigation service.

5.499 *Additional allocation:* in Bangladesh, India and Pakistan, the band 13.25-14 GHz is also allocated to the fixed service on a primary basis.

5.500 *Additional allocation:* in Algeria, Angola, Saudi Arabia, Bahrain, Brunei Darussalam, Cameroon, Egypt, the United Arab Emirates, Gabon, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Jordan, Kuwait, Lebanon, Madagascar, Malaysia, Mali, Malta, Morocco, Mauritania, Nigeria, Pakistan, Qatar, the Syrian Arab Republic, Singapore, Sudan, Chad and Tunisia, the band 13.4-14 GHz is also allocated to the fixed and mobile services on a primary basis.

5.501 *Additional allocation:* in Azerbaijan, Hungary, Japan, Mongolia, Kyrgyzstan, Romania, the United Kingdom and Turkmenistan, the band 13.4-14 GHz is also allocated to the radionavigation service on a primary basis.

5.501A The allocation of the band 13.4-13.75 GHz to the space research service on a primary basis is limited to active spaceborne sensors. Other uses of the band by the space research service are on a secondary basis.

5.501B In the band 13.4-13.75 GHz, the Earth exploration-satellite (active) and space research (active) services shall not cause harmful interference to, or constrain the use and development of, the radiolocation service.

5.502 In the band 13.75-14 GHz, an earth station of a geostationary fixed-satellite service network shall have a minimum antenna diameter of 1.2 m and an earth station of a non-geostationary fixed-satellite service system shall have a minimum antenna diameter of 4.5 m. In addition, the e.i.r.p., averaged over one second, radiated by a station in the radiolocation or radionavigation services shall not exceed 59 dBW for elevation angles above 2º and 65 dBW at lower angles. Before an administration brings into use an earth station in a geostationary-satellite network in the fixed-satellite service in this band with an antenna size smaller than 4.5 m, it shall ensure that the power flux-density produced by this earth station does not exceed:

– –115 dB(W/(m² · 10 MHz)) for more than 1% of the time produced at 36 m above sea level at the low water mark, as officially recognized by the coastal state;

– –115 dB(W/(m² · 10 MHz)) for more than 1% of the time produced 3 m above ground at the border of the territory of an administration deploying or planning to deploy land mobile radars in this band, unless prior agreement has been obtained.

For earth stations within the fixed-satellite service having an antenna diameter greater than or equal to 4.5 m, the e.i.r.p. of any emission should be at least 68 dBW and should not exceed 85 dBW.

5.503 In the band 13.75-14 GHz, geostationary space stations in the space research service for which information for advance publication has been received by the Bureau prior to 31 January 1992 shall operate on an equal basis with stations in the fixed-satellite service; after that date, new geostationary space stations in the space research service will operate on a secondary basis. Until those geostationary space stations in the space research service for which information for advance publication has been received by the Bureau prior to 31 January 1992 cease to operate in this band:

– in the band 13.77-13.78 GHz, the e.i.r.p. density of emissions from any earth station in the fixed-satellite service operating with a space station in geostationary-satellite orbit shall not exceed:

  i) $4.7D + 28$ dB(W/40 kHz), where D is the fixed-satellite service earth station antenna diameter (m) for antenna diameters equal to or greater than 1.2 m and less than 4.5 m;

  ii) $49.2 + 20 \log(D/4.5)$ dB(W/40 kHz), where D is the fixed-satellite service earth station antenna diameter (m) for antenna diameters equal to or greater than 4.5 m and less than 31.9 m;

  iii) 66.2 dB(W/40 kHz) for any fixed-satellite service earth station for antenna diameters (m) equal to or greater than 31.9 m;

  iv) 56.2 dB(W/4 kHz) for narrow-band (less than 40 kHz of necessary bandwidth) fixed-satellite service earth station emissions from any fixed-satellite service earth station having an antenna diameter of 4.5 m or greater;

– the e.i.r.p. density of emissions from any earth station in the fixed-satellite service operating with a space station in non-geostationary-satellite orbit shall not exceed 51 dBW in the 6 MHz band from 13.772 to 13.778 GHz.

Automatic power control may be used to increase the e.i.r.p. density in these frequency ranges to compensate for rain attenuation, to the extent that the power flux-density at the fixed-satellite service space station does not exceed the value resulting from use by an earth station of an e.i.r.p. meeting the above limits in clear-sky conditions.

5.504 The use of the band 14-14.3 GHz by the radionavigation service shall be such as to provide sufficient protection to space stations of the fixed-satellite service.

5.504A In the band 14-14.5 GHz, aircraft earth stations in the secondary aeronautical mobile-satellite service may also communicate with space stations in the fixed-satellite service. The provisions of Nos. 5.29, 5.30 and 5.31 apply.

5.504B Aircraft earth stations operating in the aeronautical mobile-satellite service in the band 14-14.5 GHz shall comply with the provisions of Annex 1, Part C of Recommendation ITU-R M.1643, with respect to any radio astronomy station performing observations in the 14.47-14.5 GHz band located on the territory of Spain, France, India, Italy, the United Kingdom and South Africa.

5.504C In the band 14-14.25 GHz, the power flux-density produced on the territory of the countries of Saudi Arabia, Botswana, Côte d'Ivoire, Egypt, Guinea, India, Iran (Islamic Republic of), Kuwait, Lesotho, Nigeria, Oman, Syrian Arab Republic and Tunisia by any aircraft earth station in the aeronautical mobile-satellite service shall not exceed the limits given in Annex 1, Part B of Recommendation ITU-R M.1643, unless otherwise specifically agreed by the affected administration(s). The provisions of this footnote in no way derogate the obligations of the aeronautical mobile-satellite service to operate as a secondary service in accordance with No. 5.29.

5.505 *Additional allocation:* in Algeria, Angola, Saudi Arabia, Bahrain, Bangladesh, Botswana, Brunei Darussalam, Cameroon, China, Congo (Rep. of the), Korea (Rep. of), Egypt, the United Arab Emirates, Gabon, Guatemala, Guinea, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Japan, Jordan, Kuwait, Lesotho, Lebanon, Malaysia, Mali, Morocco, Mauritania, Oman, Pakistan, the Philippines, Qatar, Syrian Arab Republic, the Dem. People's Rep. of Korea, Singapore, Somalia, Sudan, Swaziland, Tanzania, Chad and Yemen, the band 14-14.3 GHz is also allocated to the fixed service on a primary basis.

5.506 The band 14-14.5 GHz may be used, within the fixed-satellite service (Earth-to-space), for feeder links for the broadcasting-satellite service, subject to coordination with other networks in the fixed-satellite service. Such use of feeder links is reserved for countries outside Europe.

5.506A In the band 14-14.5 GHz, ship earth stations with an e.i.r.p. greater than 21 dBW shall operate under the same conditions as earth stations located on board vessels, as provided in Resolution 902 (WRC-03). This footnote shall not apply to ship earth stations for which the complete Appendix 4 information has been received by the Bureau prior to 5 July 2003.

5.506B Earth stations located on board vessels communicating with space stations in the fixed-satellite service may operate in the frequency band 14-14.5 GHz without the need for prior agreement from Cyprus, Greece and Malta, within the minimum distance given in Resolution 902 (WRC-03) from these countries.

5.508 *Additional allocation:* in Germany, Bosnia and Herzegovina, France, Italy, Libyan Arab Jamahiriya, The Former Yugoslav Rep. of Macedonia, the United Kingdom, Serbia and Montenegro and Slovenia, the band 14.25-14.3 GHz is also allocated to the fixed service on a primary basis.

5.508A In the band 14.25-14.3 GHz, the power flux-density produced on the territory of the countries of Saudi Arabia, Botswana, China, Côte d'Ivoire, Egypt, France, Guinea, India, Iran (Islamic Republic of), Italy, Kuwait, Lesotho, Nigeria, Oman, the Syrian Arab Republic, the United Kingdom and Tunisia by any aircraft earth station in the aeronautical mobile-satellite service shall not exceed the limits given in Annex 1, Part B of Recommendation ITU-R M.1643, unless otherwise specifically agreed by the affected administration(s). The provisions of this footnote in no way derogate the obligations of the aeronautical mobile-satellite service to operate as a secondary service in accordance with No. 5.29.

5.509A In the band 14.3-14.5 GHz, the power flux-density produced on the territory of the countries of Saudi Arabia, Botswana, Cameroon, China, Côte d'Ivoire, Egypt, France, Gabon, Guinea, India, Iran (Islamic Republic of), Italy, Kuwait, Lesotho, Morocco, Nigeria, Oman, the Syrian Arab Republic, the United Kingdom, Sri Lanka, Tunisia and Viet Nam by any aircraft earth station in the aeronautical mobile-satellite service shall not exceed the limits given in Annex 1, Part B of Recommendation ITU-R M.1643, unless otherwise specifically agreed by the affected administration(s). The provisions of this footnote in no way derogate the obligations of the aeronautical mobile-satellite service to operate as a secondary service in accordance with No. 5.29.

5.510 The use of the band 14.5-14.8 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service. This use is reserved for countries outside Europe.

5.511 *Additional allocation:* in Saudi Arabia, Bahrain, Bosnia and Herzegovina, Cameroon, Egypt, the United Arab Emirates, Guinea, Iran (Islamic Republic of), Iraq, Israel, Kuwait, Lebanon, Libya, Pakistan, Qatar, Syria, Slovenia, Somalia and Yugoslavia, the band 15.35-15.4 GHz is also allocated to the fixed and mobile services on a secondary basis.

5.511A The band 15.43-15.63 GHz is also allocated to the fixed-satellite service (space-to-Earth) on a primary basis. Use of the band 15.43-15.63 GHz by the fixed-satellite service (space-to-Earth and Earth-to-space) is limited to feeder links of non-geostationary systems in the mobile-satellite service, subject to coordination under No. 9.11A. The use of the frequency band 15.43-15.63 GHz by the fixed-satellite service (space-to-Earth) is limited to feeder links of non-geostationary systems in the mobile-satellite service for which advance publication information has been received by the Bureau prior to 2 June 2000. In the space-to-Earth direction, the minimum earth station elevation angle above and gain towards the local horizontal plane and the minimum coordination distances to protect an earth station from harmful interference shall be in accordance with Recommendation ITU-R S.1341. In order to protect the radio astronomy service in the band 15.35-15.4 GHz, the aggregate power flux-density radiated in the 15.35-15.4 GHz band by all the space stations within any feeder-link of a non-geostationary system in the mobile-satellite service (space-to-Earth) operating in the 15.43-15.63 GHz band shall not exceed the level of -156 dB(W/m^2) in a 50 MHz bandwidth, into any radio astronomy observatory site for more than 2% of the time.

5.511C Stations operating in the aeronautical radionavigation service shall limit the effective e.i.r.p. in accordance with Recommendation ITU-R S.1340. The minimum coordination distance required to protect the aeronautical radionavigation stations (No. 4.10 applies) from harmful interference from feeder-link earth stations and the maximum e.i.r.p. transmitted towards the local horizontal plane by a feeder-link earth station shall be in accordance with Recommendation ITU-R S.1340.

5.511D Fixed-satellite service systems for which complete information for advance publication has been received by the Bureau by 21 November 1997 may operate in the bands 15.4-15.43 GHz and 15.63-15.7 GHz in the space-to-Earth direction and 15.63-15.65 GHz in the Earth-to-space direction. In the bands 15.4-15.43 GHz and 15.65-15.7 GHz, emissions from a non-geostationary space station shall not exceed the power flux-density limits at the Earth's surface of –146 dB(W/(m^2 · MHz)) for any angle of arrival. In the band 15.63-15.65 GHz, where an administration plans emissions from a non-geostationary space station that exceed –146 dB(W/(m^2 · MHz)) for any angle of arrival, it shall coordinate under No. 9.11A with the affected administrations. Stations in the fixed-satellite service operating in the band 15.63-15.65 GHz in the Earth-to-space direction shall not cause harmful interference to stations in the aeronautical radionavigation service (No. 4.10 applies).

5.512 *Additional allocation:* in Algeria, Angola, Saudi Arabia, Austria, Bahrain, Bangladesh, Bosnia and Herzegovina, Brunei Darussalam, Cameroon, Congo (Rep. of the), Costa Rica, Egypt, El Salvador, the United Arab Emirates, Eritrea, Finland, Guatemala, India, Indonesia, Iran (Islamic Republic of), Jordan, Kenya, Kuwait, Libyan Arab Jamahiriya, Malaysia, Mali, Morocco, Mauritania, Mozambique, Nepal, Nicaragua, Oman, Pakistan, Qatar, Serbia and Montenegro, Singapore, Slovenia, Somalia, Sudan, Swaziland, Tanzania, Chad, Togo and Yemen, the band 15.7-17.3 GHz is also allocated to the fixed and mobile services on a primary basis.

5.513 *Additional allocation:* in Israel, the band 15.7-17.3 GHz is also allocated to the fixed and mobile services on a primary basis. These services shall not claim protection from or cause harmful interference to services operating in accordance with the Table in countries other than those included in No. 5.512.

5.513A Spaceborne active sensors operating in the band 17.2-17.3 GHz shall not cause harmful interference to, or constrain the development of, the radiolocation and other services allocated on a primary basis.

5.514 *Additional allocation:* in Algeria, Angola, Saudi Arabia, Austria, Bahrain, Bangladesh, Bosnia and Herzegovina, Cameroon, Costa Rica, El Salvador, the United Arab Emirates, Finland, Guatemala, India, Iran (Islamic Republic of), Iraq, Israel, Italy, Japan, Jordan, Kuwait, Libyan Arab Jamahiriya, Lithuania, Nepal, Nicaragua, Nigeria, Oman, Uzbekistan, Pakistan, Qatar, Kyrgyzstan, Serbia and Montenegro, Slovenia and Sudan, the band 17.3-17.7 GHz is also allocated to the fixed and mobile services on a secondary basis. The power limits given in Nos. 21.3 and 21.5 shall apply.

5.515 In the band 17.3-17.8 GHz, sharing between the fixed-satellite service (Earth-to-space) and the broadcasting-satellite service shall also be in accordance with the provisions of § 1 of Annex 4 of Appendix 30A.

5.516 The use of the band 17.3-18.1 GHz by geostationary-satellite systems in the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service. The use of the band 17.3-17.8 GHz in Region 2 by systems in the fixed-satellite service (Earth-to-space) is limited to geostationary satellites. For the use of the band 17.3-17.8 GHz in Region 2 by feeder links for the broadcasting-satellite service in the band 12.2-12.7 GHz, see Article 11. The use of the bands 17.3-18.1 GHz (Earth-to-space) in Regions 1 and 3 and 17.8-18.1 GHz (Earth-to-space) in Region 2 by non-geostationary-satellite systems in the fixed-satellite service is subject to application of the provisions of No. 9.12 for coordination with other non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the fixed-satellite service operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information, as appropriate, for the non-geostationary-satellite systems in the fixed-satellite service and of the complete coordination or notification information, as appropriate, for the geostationary-satellite networks, and No. 5.43A does not apply. Non-geostationary-satellite systems in the fixed-satellite service in the above bands shall be operated in such a way that any unacceptable interference that may occur during their operation shall be rapidly eliminated.

5.516A In the band 17.3-17.7 GHz, earth stations of the fixed-satellite service (space-to-Earth) in Region 1 shall not claim protection from the broadcasting-satellite service feeder-link earth stations operating under Appendix 30A, nor put any limitations or restrictions on the locations of the broadcasting-satellite service feeder-link earth stations anywhere within the service area of the feeder link.

5.516B The following bands are identified for use by high-density applications in the fixed-satellite service:

17.3-17.7 GHz (space-to-Earth) in Region 1,

18.3-19.3 GHz (space-to-Earth) in Region 2,

19.7-20.2 GHz (space-to-Earth) in all Regions,

39.5-40 GHz (space-to-Earth) in Region 1,

40-40.5 GHz (space-to-Earth) in all Regions,

40.5-42 GHz (space-to-Earth) in Region 2,

47.5-47.9 GHz (space-to-Earth) in Region 1,

48.2-48.54 GHz (space-to-Earth) in Region 1,

49.44-50.2 GHz (space-to-Earth) in Region 1,

and

27.5-27.82 GHz (Earth-to-space) in Region 1,

28.35-28.45 GHz (Earth-to-space) in Region 2,

28.45-28.94 GHz (Earth-to-space) in all Regions,

28.94-29.1 GHz (Earth-to-space) in Region 2 and 3,

29.25-29.46 GHz (Earth-to-space) in Region 2,

29.46-30 GHz (Earth-to-space) in all Regions,

48.2-50.2 GHz (Earth-to-space) in Region 2.

This identification does not preclude the use of these bands by other fixed-satellite service applications or by other services to which these bands are allocated on a co-primary basis and does not establish priority in these Regulations among users of the bands. Administrations should take this into account when considering regulatory provisions in relation to these bands. See Resolution 143 (WRC-03).

5.517 In Region 2, the allocation to the broadcasting-satellite service in the band 17.3-17.8 GHz shall come into effect on 1 April 2007. After that date, use of the fixed-satellite (space-to-Earth) service in the band 17.7-17.8 GHz shall not claim protection from and shall not cause harmful interference to operating systems in the broadcasting-satellite service.

5.519 *Additional allocation:* the band 18.1-18.3 GHz is also allocated to the meteorological-satellite service (space-to-Earth) on a primary basis. Its use is limited to geostationary satellites and shall be in accordance with the provisions of Article 21, Table 21-4.

5.520 The use of the band 18.1-18.4 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links of geostationary-satellite systems in the broadcasting-satellite service.

5.521 *Alternative allocation:* in Germany, Denmark, the United Arab Emirates and Greece, the band 18.1-18.4 GHz is allocated to the fixed, fixed-satellite (space-to-Earth) and mobile services on a primary basis (see No. 5.33). The provisions of No. 5.519 also apply.

5.522A The emissions of the fixed service and the fixed-satellite service in the band 18.6-18.8 GHz are limited to the values given in Nos. 21.5A and 21.16.2, respectively.

5.522B The use of the band 18.6-18.8 GHz by the fixed-satellite service is limited to geostationary systems and systems with an orbit of apogee greater than 20 000 km.

5.522C In the band 18.6-18.8 GHz, in Algeria, Saudi Arabia, Bahrain, Egypt, the United Arab Emirates, the Libyan Arab Jamahiriya, Jordan, Lebanon, Morocco, Oman, Qatar, the Syrian Arab Republic, Tunisia and Yemen, fixed-service systems in operation at the date of entry into force of the Final Acts of WRC-2000 are not subject to the limits of No. 21.5A.

5.523A The use of the bands 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space) by geostationary and non-geostationary fixed-satellite service networks is subject to the application of the provisions of No. 9.11A and No. 22.2 does not apply. Administrations having geostationary-satellite networks under coordination prior to 18 November 1995 shall cooperate to the maximum extent possible

to coordinate pursuant to No. 9.11A with non-geostationary-satellite networks for which notification information has been received by the Bureau prior to that date, with a view to reaching results acceptable to all the parties concerned. Non-geostationary-satellite networks shall not cause unacceptable interference to geostationary fixed-satellite service networks for which complete Appendix 4 notification information is considered as having been received by the Bureau prior to 18 November 1995.

5.523B The use of the band 19.3-19.6 GHz (Earth-to-space) by the fixed-satellite service is limited to feeder links for non-geostationary-satellite systems in the mobile-satellite service. Such use is subject to the application of the provisions of No. 9.11A, and No. 22.2 does not apply.

5.523C No. 22.2 shall continue to apply in the bands 19.3-19.6 GHz and 29.1-29.4 GHz, between feeder links of non-geostationary mobile-satellite service networks and those fixed-satellite service networks for which complete Appendix 4 coordination information, or notification information, is considered as having been received by the Bureau prior to 18 November 1995.

5.523D The use of the band 19.3-19.7 GHz (space-to-Earth) by geostationary fixed-satellite service systems and by feeder links for non-geostationary-satellite systems in the mobile-satellite service is subject to the application of the provisions of No. 9.11A, but not subject to the provisions of No. 22.2. The use of this band for other non-geostationary fixed-satellite service systems, or for the cases indicated in Nos. 5.523C and 5.523E, is not subject to the provisions of No. 9.11A and shall continue to be subject to Articles 9 (except No. 9.11A) and 11 procedures, and to the provisions of No. 22.2.

5.523E No. 22.2 shall continue to apply in the bands 19.6-19.7 GHz and 29.4-29.5 GHz, between feeder links of non-geostationary mobile-satellite service networks and those fixed-satellite service networks for which complete Appendix 4 coordination information, or notification information, is considered as having been received by the Bureau by 21 November 1997.

5.524 *Additional allocation:* in Afghanistan, Algeria, Angola, Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, Cameroon, China, the Congo, Costa Rica, Egypt, the United Arab Emirates, Gabon, Guatemala, Guinea, India, Iran (Islamic Republic of), Iraq, Israel, Japan, Jordan, Kuwait, Lebanon, Malaysia, Mali, Morocco, Mauritania, Nepal, Nigeria, Oman, Pakistan, the Philippines, Qatar, the Dem. Rep. of the Congo, Syria, the Dem. People's Rep. of Korea, Singapore, Somalia, Sudan, Tanzania, Chad, Togo and Tunisia, the band 19.7-21.2 GHz is also allocated to the fixed and mobile services on a primary basis. This additional use shall not impose any limitation on the power flux-density of space stations in the fixed-satellite service in the band 19.7-21.2 GHz and of space stations in the mobile-satellite service in the band 19.7-20.2 GHz where the allocation to the mobile-satellite service is on a primary basis in the latter band.

5.525 In order to facilitate interregional coordination between networks in the mobile-satellite and fixed-satellite services, carriers in the mobile-satellite service that are most susceptible to interference shall, to the extent practicable, be located in the higher parts of the bands 19.7-20.2 GHz and 29.5-30 GHz.

5.526 In the bands 19.7-20.2 GHz and 29.5-30 GHz in Region 2, and in the bands 20.1-20.2 GHz and 29.9-30 GHz in Regions 1 and 3, networks which are both in the fixed-satellite service and in the mobile-satellite service may include links between earth stations at specified or unspecified points or while in motion, through one or more satellites for point-to-point and point-to-multipoint communications.

5.527 In the bands 19.7-20.2 GHz and 29.5-30 GHz, the provisions of No. 4.10 do not apply with respect to the mobile-satellite service.\

5.528 The allocation to the mobile-satellite service is intended for use by networks which use narrow spot-beam antennas and other advanced technology at the space stations. Administrations operating systems in the mobile-satellite service in the band 19.7-20.1 GHz in Region 2 and in the band 20.1-20.2 GHz shall take all practicable steps to ensure the continued availability of these bands for administrations operating fixed and mobile systems in accordance with the provisions of No. 5.524.

5.529 The use of the bands 19.7-20.1 GHz and 29.5-29.9 GHz by the mobile-satellite service in Region 2 is limited to satellite networks which are both in the fixed-satellite service and in the mobile-satellite service as described in No. 5.526.

5.530 In Regions 1 and 3, the allocation to the broadcasting-satellite service in the band 21.4-22 GHz shall come into effect on 1 April 2007. The use of this band by the broadcasting-satellite service after that date and on an interim basis prior to that date is subject to the provisions of Resolution 525 (WARC-92)[3].

5.531 *Additional allocation:* in Japan, the band 21.4-22 GHz is also allocated to the broadcasting service on a primary basis.

5.532 The use of the band 22.21-22.5 GHz by the Earth exploration-satellite (passive) and space research (passive) services shall not impose constraints upon the fixed and mobile, except aeronautical mobile, services.

5.533 The inter-satellite service shall not claim protection from harmful interference from airport surface detection equipment stations of the radionavigation service.

5.535 In the band 24.75-25.25 GHz, feeder links to stations of the broadcasting-satellite service shall have priority over other uses in the fixed-satellite service (Earth-to-space). Such other uses shall protect and shall not claim protection from existing and future operating feeder-link networks to such broadcasting satellite stations.

5.535A The use of the band 29.1-29.5 GHz (Earth-to-space) by the fixed-satellite service is limited to geostationary-satellite systems and feeder links to non-geostationary-satellite systems in the mobile-satellite service. Such use is subject to the application of the provisions of No. 9.11A, but not subject to the provisions of No. 22.2, except as indicated in Nos. 5.523C and 5.523E where such use is not subject to the provisions of No. 9.11A and shall continue to be subject to Articles 9 (except No. 9.11A) and 11 procedures, and to the provisions of No. 22.2.

5.536 Use of the 25.25-27.5 GHz band by the inter-satellite service is limited to space research and Earth exploration-satellite applications, and also transmissions of data originating from industrial and medical activities in space.

5.536A Administrations operating earth stations in the Earth exploration-satellite service or the space research service shall not claim protection from stations in the fixed and mobile services operated by other administrations. In addition, earth stations in the Earth exploration-satellite service or in the space research service should be operated taking into account Recommendations ITU-R SA.1278 and ITU-R SA.1625, respectively.

5.536B In Germany, Saudi Arabia, Austria, Belgium, Brazil, Bulgaria, China, Korea (Rep. of), Denmark, Egypt, United Arab Emirates, Spain, Estonia, Finland, France, Hungary, India, Iran (Islamic Republic of), Ireland, Israel, Italy, Jordan, Kenya, Kuwait, Lebanon, Libya, Liechtenstein, Lithuania, Moldova, Norway, Oman, Uganda, Pakistan, the Philippines, Poland, Portugal, Syria, Slovakia, the

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[3] *Note by the Secretariat:* This Resolution was revised by WRC-03.

Czech Rep., Romania, the United Kingdom, Singapore, Sweden, Switzerland, Tanzania, Turkey, Viet Nam and Zimbabwe, earth stations operating in the Earth exploration-satellite service in the band 25.5-27 GHz shall not claim protection from, or constrain the use and deployment of, stations of the fixed and mobile services.

5.536C In Algeria, Saudi Arabia, Bahrain, Botswana, Brazil, Cameroon, Comoros, Cuba, Djibouti, Egypt, United Arab Emirates, Estonia, Finland, Iran (Islamic Republic of), Israel, Jordan, Kenya, Kuwait, Lithuania, Malaysia, Morocco, Nigeria, Oman, Qatar, Syrian Arab Republic, Somalia, Sudan, Tanzania, Tunisia, Uruguay, Zambia and Zimbabwe, earth stations operating in the space research service in the band 25.5-27 GHz shall not claim protection from, or constrain the use and deployment of, stations of the fixed and mobile services.

5.537 Space services using non-geostationary satellites operating in the inter-satellite service in the band 27-27.5 GHz are exempt from the provisions of No. 22.2.

5.537A In Bhutan, Korea (Rep. of), the Russian Federation, Indonesia, Iran (Islamic Republic of), Japan, Kazakhstan, Lesotho, Malaysia, Maldives, Mongolia, Myanmar, Uzbekistan, Pakistan, Philippines, Kyrgyzstan, the Dem. People's Rep. of Korea, Sri Lanka, Thailand and Viet Nam, the allocation to the fixed service in the band 27.5-28.35 GHz may also be used by high altitude platform stations (HAPS). The use of HAPS within the band 27.5-28.35 GHz is limited, within the territory of the countries listed above, to a single 300 MHz sub-band. Such use of 300 MHz of the fixed-service allocation by HAPS in the above countries is further limited to operation in the HAPS-to-ground direction and shall not cause harmful interference to, nor claim protection from, other types of fixed-service systems or other co-primary services. Furthermore, the development of these other services shall not be constrained by HAPS. See Resolution 145 (WRC-03).

5.538 *Additional allocation:* the bands 27.500-27.501 GHz and 29.999-30.000 GHz are also allocated to the fixed-satellite service (space-to-Earth) on a primary basis for the beacon transmissions intended for up-link power control. Such space-to-Earth transmissions shall not exceed an equivalent isotropically radiated power (e.i.r.p.) of +10 dBW in the direction of adjacent satellites on the geostationary-satellite orbit. In the band 27.500-27.501 GHz, such space-to-Earth transmissions shall not produce a power flux-density in excess of the values specified in Article 21, Table 21-4 on the Earth's surface.

5.539 The band 27.5-30 GHz may be used by the fixed-satellite service (Earth-to-space) for the provision of feeder links for the broadcasting-satellite service.

5.540 *Additional allocation:* the band 27.501-29.999 GHz is also allocated to the fixed-satellite service (space-to-Earth) on a secondary basis for beacon transmissions intended for up-link power control.

5.541 In the band 28.5-30 GHz, the earth exploration-satellite service is limited to the transfer of data between stations and not to the primary collection of information by means of active or passive sensors.

5.541A Feeder links of non-geostationary networks in the mobile-satellite service and geostationary networks in the fixed-satellite service operating in the band 29.1-29.5 GHz (Earth-to-space) shall employ uplink adaptive power control or other methods of fade compensation, such that the earth station transmissions shall be conducted at the power level required to meet the desired link performance while reducing the level of mutual interference between both networks. These methods shall apply to networks for which Appendix 4 coordination information is considered as having been received by the Bureau after 17 May 1996 and until they are changed by a future competent world radiocommunication

conference. Administrations submitting Appendix 4 information for coordination before this date are encouraged to utilize these techniques to the extent practicable.

5.542 *Additional allocation:* in Algeria, Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, Cameroon, China, Congo, Egypt, the United Arab Emirates, Eritrea, Ethiopia, Guinea, India, Iran (Islamic Republic of), Iraq, Japan, Jordan, Kuwait, Lebanon, Malaysia, Mali, Morocco, Mauritania, Nepal, Pakistan, the Philippines, Qatar, Syria, the Dem. People's Rep. of Korea, Somalia, Sudan, Sri Lanka and Chad, the band 29.5-31 GHz is also allocated to the fixed and mobile services on a secondary basis. The power limits specified in Nos. 21.3 and 21.5 shall apply.

5.543 The band 29.95-30 GHz may be used for space-to-space links in the Earth exploration-satellite service for telemetry, tracking, and control purposes, on a secondary basis.

5.543A In Bhutan, Korea (Rep. of), the Russian Federation, Indonesia, Iran (Islamic Republic of), Japan, Kazakhstan, Lesotho, Malaysia, Maldives, Mongolia, Myanmar, Uzbekistan, Pakistan, Philippines, Kyrgyzstan, the Dem. People's Rep. of Korea, Sri Lanka, Thailand and Viet Nam, the allocation to the fixed service in the band 31-31.3 GHz may also be used by systems using high altitude platform stations (HAPS) in the ground-to-HAPS direction. The use of the band 31-31.3 GHz by systems using HAPS is limited to the territory of the countries listed above and shall not cause harmful interference to, nor claim protection from, other types of fixed-service systems, systems in the mobile service and systems operated under No. 5.545. Furthermore, the development of these services shall not be constrained by HAPS. Systems using HAPS in the band 31-31.3 GHz shall not cause harmful interference to the radio astronomy service having a primary allocation in the band 31.3-31.8 GHz, taking into account the protection criterion as given in Recommendation ITU-R RA.769. In order to ensure the protection of satellite passive services, the level of unwanted power density into a HAPS ground station antenna in the band 31.3-31.8 GHz shall be limited to –106 dB(W/MHz) under clear-sky conditions, and may be increased up to –100 dB(W/MHz) under rainy conditions to take account of rain attenuation, provided the effective impact on the passive satellite does not exceed the impact under clear-sky conditions as given above. See Resolution 145 (WRC-03).

5.544 In the band 31-31.3 GHz the power flux-density limits specified in Article 21, Table 21-4 shall apply to the space research service.

5.545 *Different category of service:* in Armenia, Azerbaijan, Georgia, Mongolia, Kyrgyzstan, Tajikistan and Turkmenistan, the allocation of the band 31-31.3 GHz to the space research service is on a primary basis (see No. 5.33).

5.546 *Different category of service:* in Saudi Arabia, Armenia, Azerbaijan, Belarus, Egypt, the United Arab Emirates, Spain, Estonia, the Russian Federation, Finland, Georgia, Hungary, Iran (Islamic Republic of), Israel, Jordan, Latvia, Lebanon, Moldova, Mongolia, Uzbekistan, Poland, Syrian Arab Republic, Kyrgyzstan, Romania, the United Kingdom, South Africa, Tajikistan, Turkmenistan and Turkey, the allocation of the band 31.5-31.8 GHz to the fixed and mobile, except aeronautical mobile, services is on a primary basis (see No. 5.33).

5.547 The bands 31.8-33.4 GHz, 37-40 GHz, 40.5-43.5 GHz, 51.4-52.6 GHz, 55.78-59 GHz and 64-66 GHz are available for high-density applications in the fixed service (see Resolutions 75 (WRC-2000) and 79 (WRC-2000)). Administrations should take this into account when considering regulatory provisions in relation to these bands. Because of the potential deployment of high-density applications in the fixed-satellite service in the bands 39.5-40 GHz and 40.5-42 GHz (see No. 5.516B), administrations should further take into account potential constraints to high-density applications in the fixed service, as appropriate.

5.547A Administrations should take practical measures to minimize the potential interference between stations in the fixed service and airborne stations in the radionavigation service in the 31.8-33.4 GHz band, taking into account the operational needs of the airborne radar systems.

5.547B *Alternative allocation:* in the United States, the band 31.8-32 GHz is allocated to the radionavigation and space research (deep space) (space-to-Earth) services on a primary basis.

5.547C *Alternative allocation:* in the United States, the band 32-32.3 GHz is allocated to the radionavigation and space research (deep space) (space-to-Earth) services on a primary basis.

5.547D *Alternative allocation:* in the United States, the band 32.3-33 GHz is allocated to the inter-satellite and radionavigation services on a primary basis.

5.547E *Alternative allocation:* in the United States, the band 33-33.4 GHz is allocated to the radionavigation service on a primary basis.

5.548 In designing systems for the inter-satellite service in the band 32.3-33 GHz, for the radionavigation service in the band 32-33 GHz, and for the space research service (deep space) in the band 31.8-32.3 GHz, administrations shall take all necessary measures to prevent harmful interference between these services, bearing in mind the safety aspects of the radionavigation service (see Recommendation 707).

5.549 *Additional allocation:* in Saudi Arabia, Bahrain, Bangladesh, Egypt, the United Arab Emirates, Gabon, Indonesia, Iran (Islamic Republic of), Iraq, Israel, the Libyan Arab Jamahiriya, Jordan, Kuwait, Lebanon, Malaysia, Mali, Malta, Morocco, Mauritania, Nepal, Nigeria, Oman, Pakistan, the Philippines, Qatar, the Syrian Arab Republic, the Dem. Rep. of the Congo, Singapore, Somalia, Sudan, Sri Lanka, Togo, Tunisia and Yemen, the band 33.4-36 GHz is also allocated to the fixed and mobile services on a primary basis.

5.549A In the band 35.5-36.0 GHz, the mean power flux-density at the Earth's surface, generated by any spaceborne sensor in the Earth exploration-satellite service (active) or space research service (active), for any angle greater than 0.8º from the beam centre shall not exceed –73.3 dB(W/m^2) in this band.

5.550 *Different category of service:* in Armenia, Azerbaijan, Belarus, the Russian Federation, Georgia, Mongolia, Uzbekistan, Kyrgyzstan, Tajikistan and Turkmenistan, the allocation of the band 34.7-35.2 GHz to the space research service is on a primary basis (see No. 5.33).

5.551F *Different category of service:* in Japan, the allocation of the band 41.5-42.5 GHz to the mobile service is on a primary basis (see No. 5.33).

5.551H The equivalent power flux-density (epfd) produced in the band 42.5-43.5 GHz by all space stations in any non-geostationary-satellite system in the fixed-satellite service (space-to-Earth), or in the broadcasting-satellite service (space-to-Earth) operating in the 42-42.5 GHz band, shall not exceed the following values at the site of any radio astronomy station for more than 2% of the time:

–230 dB(W/m²) in 1 GHz and –246 dB(W/m²) in any 500 kHz of the 42.5-43.5 GHz band at the site of any radio astronomy station registered as a single-dish telescope; and

–209 dB(W/m²) in any 500 kHz of the 42.5-43.5 GHz band at the site of any radio astronomy station registered as a very long baseline interferometry station.

These epfd values shall be evaluated using the methodology given in Recommendation ITU-R S.1586 and the reference antenna pattern and the maximum gain of an antenna in the radio astronomy service given in Recommendation ITU-R RA.1631 and shall apply over the whole sky and for

elevation angles higher than the minimum operating angle θ_{min} of the radiotelescope (for which a default value of 5° should be adopted in the absence of notified information).

These values shall apply at any radio astronomy station that either:

– was in operation prior to 5 July 2003 and has been notified to the Radiocommunication Bureau before 4 January 2004; or

– was notified before the date of receipt of the complete Appendix 4 information for coordination or notification, as appropriate, for the space station to which the limits apply.

Other radio astronomy stations notified after these dates may seek an agreement with administrations that have authorized the space stations. In Region 2, Resolution 743 (WRC-03) shall apply. The limits in this footnote may be exceeded at the site of a radio astronomy station of any country whose administration so agreed.

5.551I The power flux-density in the band 42.5-43.5 GHz produced by any geostationary space station in the fixed-satellite service (space-to-Earth), or the broadcasting-satellite service (space-to-Earth) operating in the 42-42.5 GHz band, shall not exceed the following values at the site of any radio astronomy station:

–137 dB(W/m²) in 1 GHz and –153 dB(W/m²) in any 500 kHz of the 42.5-43.5 GHz band at the site of any radio astronomy station registered as a single-dish telescope; and

–116 dB(W/m²) in any 500 kHz of the 42.5-43.5 GHz band at the site of any radio astronomy station registered as a very long baseline interferometry station.

These values shall apply at the site of any radio astronomy station that either:

– was in operation prior to 5 July 2003 and has been notified to the Bureau before 4 January 2004; or

– was notified before the date of receipt of the complete Appendix 4 information for coordination or notification, as appropriate, for the space station to which the limits apply.

Other radio astronomy stations notified after these dates may seek an agreement with administrations that have authorized the space stations. In Region 2, Resolution 743 (WRC-03) shall apply. The limits in this footnote may be exceeded at the site of a radio astronomy station of any country whose administration so agreed.

5.552 The allocation of the spectrum for the fixed-satellite service in the bands 42.5-43.5 GHz and 47.2-50.2 GHz for Earth-to-space transmission is greater than that in the band 37.5-39.5 GHz for space-to-Earth transmission in order to accommodate feeder links to broadcasting satellites. Administrations are urged to take all practicable steps to reserve the band 47.2-49.2 GHz for feeder links for the broadcasting-satellite service operating in the band 40.5-42.5 GHz.

5.552A The allocation to the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz is designated for use by high altitude platform stations. The use of the bands 47.2-47.5 GHz and 47.9-48.2 GHz is subject to the provisions of Resolution 122 (WRC-97)[3].

5.553 In the bands 43.5-47 GHz and 66-71 GHz, stations in the land mobile service may be operated subject to not causing harmful interference to the space radiocommunication services to which these bands are allocated (see No. 5.43).

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[3] *Note by the Secretariat:* This Resolution was revised by WRC-03.

5.554 In the bands 43.5-47 GHz, 66-71 GHz, 95-100 GHz, 123-130 GHz, 191.8-200 GHz and 252-265 GHz, satellite links connecting land stations at specified fixed points are also authorized when used in conjunction with the mobile-satellite service or the radionavigation-satellite service.

5.554A The use of the bands 47.5-47.9 GHz, 48.2-48.54 GHz and 49.44-50.2 GHz by the fixed-satellite service (space-to-Earth) is limited to geostationary satellites.

5.555 *Additional allocation:* the band 48.94-49.04 GHz is also allocated to the radio astronomy service on a primary basis.

5.555B The power flux-density in the band 48.94-49.04 GHz produced by any geostationary space station in the fixed-satellite service (space-to-Earth) operating in the bands 48.2-48.54 GHz and 49.44-50.2 GHz shall not exceed –151.8 dB(W/m²) in any 500 kHz band at the site of any radio astronomy station.

5.556 In the bands 51.4-54.25 GHz, 58.2-59 GHz and 64-65 GHz, radio astronomy observations may be carried out under national arrangements.

5.556A Use of the bands 54.25-56.9 GHz, 57-58.2 GHz and 59-59.3 GHz by the inter-satellite service is limited to satellites in the geostationary-satellite orbit. The single-entry power flux-density at all altitudes from 0 km to 1000 km above the Earth's surface produced by a station in the inter-satellite service, for all conditions and for all methods of modulation, shall not exceed -147 dB(W/(m² · 100 MHz)) for all angles of arrival.

5.556B *Additional allocation:* in Japan, the band 54.25-55.78 GHz is also allocated to the mobile service on a primary basis for low-density use.

5.557 *Additional allocation:* in Japan, the band 55.78-58.2 GHz is also allocated to the radiolocation service on a primary basis.

5.557A In the band 55.78-56.26 GHz, in order to protect stations in the Earth exploration-satellite service (passive), the maximum power density delivered by a transmitter to the antenna of a fixed service station is limited to –26 dB(W/MHz).

5.558 In the bands 55.78-58.2 GHz, 59-64 GHz, 66-71 GHz, 122.25-123 GHz, 130-134 GHz, 167-174.8 GHz and 191.8-200 GHz, stations in the aeronautical mobile service may be operated subject to not causing harmful interference to the inter-satellite service (see No. 5.43).

5.558A Use of the band 56.9-57 GHz by inter-satellite systems is limited to links between satellites in geostationary-satellite orbit and to transmissions from non-geostationary satellites in high-Earth orbit to those in low-Earth orbit. For links between satellites in the geostationary-satellite orbit, the single entry power flux-density at all altitudes from 0 km to 1000 km above the Earth's surface, for all conditions and for all methods of modulation, shall not exceed –147 dB(W/(m² · 100 MHz)) for all angles of arrival.

5.559 In the band 59-64 GHz, airborne radars in the radiolocation service may be operated subject to not causing harmful interference to the inter-satellite service (see No. 5.43).

5.560 In the band 78-79 GHz radars located on space stations may be operated on a primary basis in the Earth exploration-satellite service and in the space research service.

5.561 In the band 74-76 GHz, stations in the fixed, mobile and broadcasting services shall not cause harmful interference to stations of the fixed-satellite service or stations of the broadcasting-satellite service operating in accordance with the decisions of the appropriate frequency assignment planning conference for the broadcasting-satellite service.

5.561A The 81-81.5 GHz band is also allocated to the amateur and amateur-satellite services on a secondary basis.

5.561B In Japan, use of the band 84-86 GHz, by the fixed-satellite service (Earth-to-space) is limited to feeder links in the broadcasting-satellite service using the geostationary-satellite orbit.

5.562 The use of the band 94-94.1 GHz by the Earth exploration-satellite (active) and space research (active) services is limited to spaceborne cloud radars.

5.562A In the bands 94-94.1 GHz and 130-134 GHz, transmissions from space stations of the Earth exploration-satellite service (active) that are directed into the main beam of a radio astronomy antenna have the potential to damage some radio astronomy receivers. Space agencies operating the transmitters and the radio astronomy stations concerned should mutually plan their operations so as to avoid such occurrences to the maximum extent possible.

5.562B In the bands 105-109.5 GHz, 111.8-114.25 GHz, 155.5-158.5 GHz and 217-226 GHz, the use of this allocation is limited to space-based radio astronomy only.

5.562C Use of the band 116-122.25 GHz by the inter-satellite service is limited to satellites in the geostationary-satellite orbit. The single-entry power flux-density produced by a station in the inter-satellite service, for all conditions and for all methods of modulation, at all altitudes from 0 km to 1000 km above the Earth's surface and in the vicinity of all geostationary orbital positions occupied by passive sensors, shall not exceed -148 dB(W/m² · MHz)) for all angles of arrival.

5.562D *Additional allocation:* In Korea (Rep. of), the bands 128-130 GHz, 171-171.6 GHz, 172.2-172.8 GHz and 173.3-174 GHz are also allocated to the radio astronomy service on a primary basis until 2015.

5.562E The allocation to the Earth exploration-satellite service (active) is limited to the band 133.5-134 GHz.

5.562F In the band 155.5-158.5 GHz, the allocation to the Earth exploration-satellite (passive) and space research (passive) services shall terminate on 1 January 2018.

5.562G The date of entry into force of the allocation to the fixed and mobile services in the band 155.5-158.5 GHz shall be 1 January 2018.

5.562H Use of the bands 174.8-182 GHz and 185-190 GHz by the inter-satellite service is limited to satellites in the geostationary-satellite orbit. The single-entry power flux-density produced by a station in the inter-satellite service, for all conditions and for all methods of modulation, at all altitudes from 0 to 1000 km above the Earth's surface and in the vicinity of all geostationary orbital positions occupied by passive sensors, shall not exceed –144 dB(W/(m² · MHz)) for all angles of arrival.

5.563A In the bands 200-209 GHz, 235-238 GHz, 250-252 GHz and 265-275 GHz, ground-based passive atmospheric sensing is carried out to monitor atmospheric constituents.

5.563B The band 237.9-238 GHz is also allocated to the Earth exploration-satellite service (active) and the space research service (active) for spaceborne cloud radars only.

5.565 The frequency band 275-1000 GHz may be used by administrations for experimentation with, and development of, various active and passive services. In this band a need has been identified for the following spectral line measurements for passive services:

– radio astronomy service: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz;

– Earth exploration-satellite service (passive) and space research service (passive): 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.

Future research in this largely unexplored spectral region may yield additional spectral lines and continuum bands of interest to the passive services. Administrations are urged to take all practicable steps to protect these passive services from harmful interference until the date when the allocation Table is established in the above-mentioned frequency band.

United States (US) Footnotes

(These footnotes, each consisting of the letters "US" followed by one or more digits, denote stipulations applicable to both Federal and non-Federal operations and thus appear in both the Federal Table and the non-Federal Table.)

US1 The bands 2501-2502 kHz, 5003-5005 kHz, 10003-10005 kHz, 15005-15010 kHz, 19990-19995 kHz, 20005-20010 kHz, and 25005-25010 kHz are also allocated to the space research service on a secondary basis for Federal use. In the event of interference to the reception of the standard frequency and time broadcasts, these space research transmissions are subject to immediate temporary or permanent shutdown.

US7 In the band 420-450 MHz and within the following areas, the peak envelope power output of a transmitter employed in the amateur service shall not exceed 50 watts, unless expressly authorized by the FCC after mutual agreement, on a case-by-case basis, between the District Director of the applicable field office and the military area frequency coordinator at the applicable military base. For areas (e) through (g), the appropriate military coordinator is located at Peterson AFB, CO.

(a) Arizona, Florida, and New Mexico.

(b) Within those portions of California and Nevada that are south of latitude 37° 10' N.

(c) Within that portion of Texas that is west of longitude 104° W.

(d) Within 322 km (200 miles) of Eglin AFB, FL (30° 30' N, 86° 30' W); Patrick AFB, FL (28° 21' N, 80° 43' W); and the Pacific Missile Test Center, Point Mugu, CA (34° 09' N, 119° 11' W).

(e) Within 240 km (150 miles) of Beale AFB, CA (39° 08' N, 121° 26' W).

(f) Within 200 km (124 miles) of Goodfellow AFB, TX (31° 25' N, 100° 24' W) and Warner Robins AFB, GA (32° 38' N, 83° 35' W).

(g) Within 160 km (100 miles) of Clear, AK (64° 17' N, 149° 10' W); Concrete, ND (48° 43' N, 97° 54' W); and Otis AFB, MA (41° 45' N, 70° 32' W).

US8 The use of the frequencies 170.475, 171.425, 171.575, and 172.275 MHz east of the Mississippi River, and 170.425, 170.575, 171.475, 172.225 and 172.375 MHz west of the Mississippi River may be authorized to fixed, land and mobile stations operated by non-Federal forest firefighting agencies. In addition, land stations and mobile stations operated by non-Federal conservation agencies, for mobile relay operation only, may be authorized to use the frequency 172.275 MHz east of the Mississippi River and the frequency 171.475 MHz west of the Mississippi River. The use of any of the foregoing nine frequencies shall be on the condition that no harmful interference will be caused to Government stations.

US11 On the condition that harmful interference is not caused to present or future Federal stations in the band 162-174 MHz, the frequencies 166.25 MHz and 170.15 MHz may be authorized to non-Federal stations, as follows:

(a) Eligibles in the Public Safety Radio Pool may be authorized to operate in the fixed and land mobile services for locations within 150 miles (241.4 kilometers) of New York City; and

(b) Remote pickup broadcast stations may be authorized to operate in the land mobile service for locations within the conterminous United States, excluding locations within 150 miles of New York City and the Tennessee Valley Authority Area (TVA Area). The TVA Area is bounded on the west by the Mississippi River, on the north by the parallel of latitude 37° 30' N, and on the east and south by that arc of the circle with center at Springfield, IL, and radius equal to the airline distance between Springfield, IL and Montgomery, AL, subtended between the foregoing west and north boundaries.

US13 The following center frequencies, each with a channel bandwidth not greater than 12.5 kHz, are available for assignment to non-Federal fixed stations for the specific purpose of transmitting hydrological and meteorological data in cooperation with Federal agencies, subject to the condition that harmful interference will not be caused to Federal stations:

Hydro Channels (MHz)			
169.425	170.2625	171.100	406.1250
169.4375	170.275	171.1125	406.1750
169.450	170.2875	171.125	412.6625
169.4625	170.300	171.825	412.6750
169.475	170.3125	171.8375	412.6875
169.4875	170.325	171.850	412.7125
169.500	171.025	171.8625	412.7250
169.5125	171.0375	171.875	412.7375
169.525	171.050	171.8875	412.7625
170.225	171.0625	171.900	412.7750
170.2375	171.075	171.9125	415.1250
170.250	171.0875	171.925	415.1750

New assignments on the frequencies 406.125 MHz and 406.175 MHz are to be primarily for paired operations with the frequencies 415.125 MHz and 415.175 MHz, respectively.

US14 When 500 kHz is being used for distress purposes, ship and coast stations using morse telegraph may use 512 kHz for calling.

US18 In the bands 9-14 kHz, 90-110 kHz, 190-415 kHz, 510-535 kHz, and 2700-2900 MHz, navigation aids in the U.S. and its insular areas are normally operated by the Federal Government. However, authorizations may be made by the FCC for non-Federal operations in these bands subject to the conclusion of appropriate arrangements between the FCC and the Federal agencies concerned and upon special showing of need for service which the Federal Government is not yet prepared to render.

US25 The use of frequencies in the band 25.85-26.175 MHz may be authorized in any area to non-Federal remote pickup broadcast base and mobile stations on the condition that harmful interference is not caused to stations of the broadcasting service in the band 25.85-26.1 MHz and to stations of the

maritime mobile service in the band 26.1-26.175 MHz. Frequencies within the band 26.1-26.175 MHz may also be assigned for use by low power auxiliary stations.

US26 The bands 117.975-121.4125 MHz, 123.5875-128.8125 MHz and 132.0125-136.0 MHz are for air traffic control communications.

US28 The band 121.5875-121.9375 MHz is for use by aeronautical utility land and mobile stations, and for air traffic control communications.

US30 The band 121.9375-123.0875 MHz is available to FAA aircraft for communications pursuant to flight inspection functions in accordance with the Federal Aviation Act of 1958.

US31 The frequencies 122.700, 122.725, 122.750, 122.800, 122.950, 122.975, 123.000, 123.050 and 123.075 MHz may be assigned to aeronautical advisory stations. In addition, at landing areas having a part-time or no airdrome control tower or FAA flight service station, these frequencies may be assigned on a secondary non-interference basis to aeronautical utility mobile stations, and may be used by FAA ground vehicles for safety related communications during inspections conducted at such landing areas.

The frequencies 122.850, 122.900 and 122.925 MHz may be assigned to aeronautical multicom stations. In addition, 122.850 MHz may be assigned on a secondary noninterference basis to aeronautical utility mobile stations. In case of 122.925 MHz, US213 applies.

Air carrier aircraft stations may use 122.000 and 122.050 MHz for communication with aeronautical stations of the Federal Aviation Administration and 122.700, 122.800, 122.900 and 123.000 MHz for communications with aeronautical stations pertaining to safety of flight with and in the vicinity of landing areas not served by a control tower.

Frequencies in the band 121.9375-122.6875 MHz may be used by aeronautical stations of the Federal Aviation Administration for communication with aircraft stations.

US32 Except for the frequencies 123.3 and 123.5 MHz, which are not authorized for Federal use, the band 123.1125-123.5875 MHz is available for FAA communications incident to flight test and inspection activities pertinent to aircraft and facility certification on a secondary basis.

US33 The band 123.1125-123.5875 MHz is for use by flight test and aviation instructional stations. The frequency 121.950 MHz is available for aviation instructional stations.

US41 In the band 2450-2500 MHz, the Federal radiolocation service is permitted on condition that harmful interference is not caused to non-Federal services.

US44 In the band 2900-3100 MHz, the non-Federal radiolocation service may be authorized on the condition that no harmful interference is caused to Federal services.

US48 In the band 9000-9200 MHz, the use of the radiolocation service by non-Federal licensees may be authorized on the condition that harmful interference is not caused to the aeronautical radionavigation service or to the Federal radiolocation service.

US49 In the band 5460-5470 MHz, the non-Federal radiolocation service may be authorized on the condition that it does not cause harmful interference to the aeronautical or maritime radionavigation services or to the Federal radiolocation service.

US50 In the band 5470-5650 MHz, the radiolocation service may be authorized for non-Federal use on the condition that harmful interference is not caused to the maritime radionavigation service or to the Federal radiolocation service.

US51 In the band 9300-9500 MHz, the radiolocation service may be authorized for non-Federal use on the condition that harmful interference is not caused to the Federal radiolocation service.

US53 In view of the fact that the band 13.25-13.4 GHz is allocated to doppler navigation aids, Federal and non-Federal airborne doppler radars in the aeronautical radionavigation service are permitted in the band 8750-8850 MHz only on the condition that they must accept any interference that may be experienced from stations in the radiolocation service in the band 8500-10000 MHz.

US58 In the band 10-10.5 GHz, pulsed emissions are prohibited, except for weather radars on board meteorological satellites in the band 10-10.025 GHz. The amateur service and the non-Federal radiolocation service, which shall not cause harmful interference to the Federal radiolocation service, are the only non-Federal services permitted in this band. The non-Federal radiolocation service is limited to survey operations as specified in footnote US108.

US59 The band 10.5-10.55 GHz is restricted to systems using type NON (AO) emission with a power not to exceed 40 watts into the antenna.

US65 The use of the band 5460-5650 MHz by the maritime radionavigation service is limited to shipborne radars.

US66 The use of the band 9300-9500 MHz by the aeronautical radionavigation service is limited to airborne radars and associated airborne beacons. In addition, ground-based radar beacons in the aeronautical radionavigation service are permitted in the band 9300-9320 MHz on the condition that harmful interference is not caused to the maritime radionavigation service.

US67 The use of the band 9300-9500 MHz by the meteorological aids service is limited to ground-based radars. Radiolocation installations will be coordinated with the meteorological aids service and, insofar as practicable, will be adjusted to meet the requirements of the meteorological aids service.

US69 In the band 31.8-33.4 GHz, ground-based radionavigation aids are not permitted except where they operate in cooperation with airborne or shipborne radionavigation devices.

US70 The meteorological aids service allocation in the band 400.15-406.0 MHz does not preclude the operation therein of associated ground transmitters.

US71 In the band 9300-9320 MHz, low-powered maritime radionavigation stations shall be protected from harmful interference caused by the operation of land-based equipment.

US74 In the bands 25.55-25.67, 73.0-74.6, 406.1-410.0, 608-614, 1400-1427 (see US368), 1660.5-1670.0, 2690-2700, and 4990-5000 MHz, and in the bands 10.68-10.7, 15.35-15.4, 23.6-24.0, 31.3-31.5, 86-92, 100-102, 109.5-111.8, 114.25-116, 148.5-151.5, 164-167, 200-209, and 250-252 GHz, the radio astronomy service shall be protected from unwanted emissions only to the extent that such radiation exceeds the level which would be present if the offending station were operating in compliance with the technical standards or criteria applicable to the service in which it operates. Radio astronomy observations in these bands are performed at the locations listed in US311.

US77 Federal stations may also be authorized: (a) Port operations use on a simplex basis by coast and ship stations of the frequencies 156.6 and 156.7 MHz; (b) Duplex port operations use of the frequency 157.0 MHz for ship stations and 161.6 MHz for coast stations; (c) Inter-ship use of 156.3 MHz on a simplex basis; and (d) Vessel traffic services under the control of the U.S. Coast Guard on a simplex basis by coast and ship stations on the frequencies 156.25, 156.55, 156.6 and 156.7 MHz. (e) Navigational bridge-to-bridge and navigational communications on a simplex basis by coast and ship stations on the frequencies 156.375 and 156.65 MHz.

US78 In the mobile service, the frequencies between 1435 and 1525 MHz will be assigned for aeronautical telemetry and associated telecommand operations for flight testing of manned or unmanned aircraft and missiles, or their major components. Permissible usage includes telemetry associated with launching and reentry into the Earth's atmosphere as well as any incidental orbiting prior to reentry of manned objects undergoing flight tests. The following frequencies are shared with flight telemetry

mobile stations: 1444.5, 1453.5, 1501.5, 1515.5, and 1524.5 MHz.

US80 Federal stations may use the frequency 122.9 MHz subject to the following conditions: (a) All operations by Federal stations shall be restricted to the purpose for which the frequency is authorized to non-Federal stations, and shall be in accordance with the appropriate provisions of the Commission's Rules and Regulations, Part 87, Aviation Services; (b) Use of the frequency is required for coordination of activities with Commission licensees operating on this frequency; and (c) Federal stations will not be authorized for operation at fixed locations.

US81 The band 38-38.25 MHz is used by both Federal and non-Federal radio astronomy observatories. No new fixed or mobile assignments are to be made and Federal stations in the band 38-38.25 MHz will be moved to other bands on a case-by-case basis, as required, to protect radio astronomy observations from harmful interference. As an exception, however, low powered military transportable and mobile stations used for tactical and training purposes will continue to use the band. To the extent practicable, the latter operations will be adjusted to relieve such interference as may be caused to radio astronomy observations. In the event of harmful interference from such local operations, radio astronomy observatories may contact local military commands directly, with a view to effecting relief. A list of military commands, areas of coordination, and points of contact for purposes of relieving interference may be obtained upon request from the Office of Engineering and Technology, FCC, Washington, DC 20554.

US82 In the bands 4146-4152 kHz, 6224-6233 kHz, 8294-8300 kHz, 12353-12368 kHz, 16528-16549 kHz, 18825-18846 kHz, 22159-22180 kHz, and 25100-25121 kHz, the assignable frequencies may be authorized on a shared non-priority basis to Federal and non-Federal ship and coast stations (SSB telephony, with peak envelope power not to exceed 1 kW).

US87 The band 449.75-450.25 MHz may be used by Federal and non-Federal stations for space telecommand (Earth-to-space) at specific locations, subject to such conditions as may be applied on a case-by-case basis. Operators shall take all practical steps to keep the carrier frequency close to 450 MHz.

US90 In the band 2025-2110 MHz, the power flux-density at the Earth's surface produced by emissions from a space station in the space operation, Earth exploration-satellite, or space research service that is transmitting in the space-to-space direction, for all conditions and all methods of modulation, shall not exceed the following values in any 4 kHz sub-band:

(a) -154 dBW/m^2 for angles of arrival above the horizontal plane (δ) of 0° to 5°,

(b) $-154 + 0.5(\delta-5)$ dBW/m^2 for δ of 5° to 25°, and

(c) -144 dBW/m^2 for δ of 25° to 90°.

US93 In the conterminous United States, the frequency 108.0 MHz may be authorized for use by VOR test facilities, the operation of which is not essential for the safety of life or property, subject to the condition that no interference is caused to the reception of FM broadcasting stations operating in the band 88-108 MHz. In the event that such interference does occur, the licensee or other agency authorized to operate the facility shall discontinue operation on 108 MHz and shall not resume operation until the interference has been eliminated or the complaint otherwise satisfied. VOR test facilities operating on 108 MHz will not be protected against interference caused by FM broadcasting stations operating in the band 88-108 MHz nor shall the authorization of a VOR test facility on 108 MHz preclude the Commission from authorizing additional FM broadcasting stations.

US99 In the band 1668.4-1670 MHz, the meteorological aids service (radiosonde) will avoid operations to the maximum extent practicable. Whenever it is necessary to operate radiosondes in the band 1668.4-1670 MHz within the United States, notification of the operations shall be sent as far in

advance as possible to the Electromagnetic Management Unit, Room 1030, National Science Foundation, 4201 Wilson Blvd., Arlington, VA 22230.

US102 In Alaska only, the frequency 122.1 MHz may also be used for air carrier air traffic control purposes at locations where other frequencies are not available to air carrier aircraft stations for air traffic control.

US104 In the band 90-110 kHz, the LORAN radionavigation system has priority in the United States and its insular areas. Radiolocation land stations making use of LORAN type equipment may be authorized to both Federal and non-Federal licensees on a secondary basis for offshore radiolocation activities only at specific locations and subject to such technical and operational conditions (*e.g.*, power, emission, pulse rate and phase code, hours of operation), including on-the-air testing, as may be required on a case-by-case basis to ensure protection of the LORAN radionavigation system from harmful interference and to ensure mutual compatibility among radiolocation operators. Such authorizations to stations in the radiolocation service are further subject to showing of need for service which is not currently provided and which the Federal Government is not yet prepared to render by way of the radionavigation service.

US106 The frequency 156.75 MHz is available for assignment to Federal and non-Federal stations for environmental communications in accordance with an agreed plan.

US107 The frequency 156.8 MHz is the national distress, safety and calling frequency for the maritime mobile VHF radiotelephone service for use by Federal and non-Federal ship and coast stations. Guard bands of 156.7625-156.7875 and 156.8125-156.8375 MHz are maintained.

US108 In the bands 3300-3500 MHz and 10-10.5 GHz, survey operations, using transmitters with a peak power not to exceed five watts into the antenna, may be authorized for Federal and non-Federal use on a secondary basis to other Federal radiolocation operations.

US110 In the band 9200-9300 MHz, the use of the radiolocation service by non-Federal licensees may be authorized on the condition that harmful interference is not caused to the maritime radionavigation service or to the Federal radiolocation service.

US112 The frequency 123.1 MHz is for search and rescue communications. This frequency may be assigned for air traffic control communications at special aeronautical events on the condition that no harmful interference is caused to search and rescue communications during any period of search and rescue operations in the locale involved.

US116 In the bands 890-902 MHz and 935-941 MHz, no new assignments are to be made to Federal radio stations after July 10, 1970, except on case-by-case basis to experimental stations. Federal assignments existing prior to July 10, 1970, shall be on a secondary basis to stations in the non-Federal land mobile service and shall be subject to adjustment or removal from the bands 890-902 MHz, 928-932 MHz, and 935-941 MHz at the request of the FCC.

US117 In the band 406.1-410 MHz, the following provisions shall apply:

(a) Stations in the fixed and mobile services are limited to a transmitter output power of 125 watts, and new authorizations for stations, other than mobile stations, are subject to prior coordination by the applicant in the following areas:

(1) Within Puerto Rico and the United States Virgin Islands, contact Spectrum Manager, Arecibo Observatory, HC3 Box 53995, Arecibo, PR 00612. Phone: 787-878-2612, Fax: 787-878-1861, E-mail: prcz@naic.edu.

(2) Within 350 km of the Very Large Array (34° 04' 44" N, 107° 37' 06" W), contact Spectrum Manager, National Radio Astronomy Observatory, P.O. Box O, 1003 Lopezville Road, Socorro, NM

87801. Phone: 505-835-7000, Fax: 505-835-7027, E-mail: nrao-rfi@nrao.edu.

(3) Within 10 km of the Table Mountain Observatory (40° 07' 50" N, 105° 14' 40" W) and for operations only within the sub-band 407-409 MHz, contact Radio Frequency Coordinator, Department of Commerce, 325 Broadway, Boulder, CO 80303. Phone: 303-497-6548, Fax: 303-497-3384.

(b) Non-Federal use is limited to the radio astronomy service and as provided by footnote US13.

US201 In the band 460-470 MHz, space stations in the Earth exploration-satellite service may be authorized for space-to-Earth transmissions on a secondary basis with respect to the fixed and mobile services. When operating in the meteorological-satellite service, such stations shall be protected from harmful interference from other applications of the Earth exploration-satellite service. The power flux-density produced at the Earth's surface by any space station in this band shall not exceed -152 dBW/m²/4 kHz.

US203 Radio astronomy observations of the formaldehyde line frequencies 4825-4835 MHz and 14.470-14.500 GHz may be made at certain radio astronomy observatories as indicated below:

Bands to be observed		Observatory
4 GHz	14 GHz	
X		National Astronomy and Ionosphere Center, Arecibo, Puerto Rico.
X	X	National Radio Astronomy Observatory, Green Bank, W. Va.
X	X	National Radio Astronomy Observatory, Socorro, New Mexico.
X	X	Hat Creek Observatory (U of Calif.), Hat Creek, Cal.
X	X	Haystack Radio Observatory (MIT-Lincoln Lab), Tyngsboro, Mass.
X	X	Owens Valley Radio Observatory (Cal. Tech.), Big Pine, Cal.
	X	Five College Radio Astronomy Observatory, Quabbin Reservoir (near Amherst), Massachusetts

Every practicable effort will be made to avoid the assignment of frequencies to stations in the fixed or mobile services in these bands. Should such assignments result in harmful interference to these observations, the situation will be remedied to the extent practicable.

US205 Tropospheric scatter systems are prohibited in the band 2500-2690 MHz.

US208 Planning and use of the band 1559-1626.5 MHz necessitate the development of technical and/or operational sharing criteria to ensure the maximum degree of electromagnetic compatibility with existing and planned systems within the band.

US209 The use of frequencies 460.6625, 460.6875, 460.7125, 460.7375, 460.7625, 460.7875, 460.8125, 460.8375, 460.8625, 465.6625, 465.6875, 465.7125, 465.7375, 465.7625, 465.7875, 465.8125, 465.8375, and 465.8625 MHz may be authorized, with 100 mW or less output power, to Federal and non-Federal radio stations for one-way, non-voice bio-medical telemetry operations in hospitals, or medical or convalescent centers.

US210 In the bands 40.66-40.7 MHz and 216-220 MHz, frequencies may be authorized to Federal and non-Federal stations on a secondary basis for the tracking of, and telemetering of scientific data from, ocean buoys and wildlife. Operation in these bands is subject to the technical standards specified in: (a) Section 8.2.42 of the NTIA Manual for Federal use, or (b) 47 CFR 90.248 for non-Federal use. After January 1, 2002, no new assignments shall be authorized in the band 216-217 MHz.

US211 In the bands 1670-1690, 5000-5250 MHz and 10.7-11.7, 15.1365-15.35, 15.4-15.7, 22.5-22.55, 24-24.05, 31.0-31.3, 31.8-32.0, 40.5-42.5, 116-122.25, 123-130, 158.5-164, 167-168, 191.8-200, and 252-265 GHz, applicants for airborne or space station assignments are urged to take all practicable steps to protect radio astronomy observations in the adjacent bands from harmful interference; however, US74 applies.

US212 In, or within 92.6 km (50 nautical miles) of, the State of Alaska, the carrier frequency 5167.5 kHz (assigned frequency 5168.9 kHz) is designated for emergency communications. This frequency may also be used in the Alaska-Private Fixed Service for calling and listening, but only for establishing communications before switching to another frequency. The maximum power is limited to 150 watts peak envelope power (PEP).

US213 The frequency 122.925 MHz is for use only for communications with or between aircraft when coordinating natural resources programs of Federal or State natural resources, agencies, including forestry management and fire suppression, fish and game management and protection and environmental monitoring and protection.

US214 The frequency 157.1 MHz is the primary frequency for liaison communications between ship stations and stations of the United States Coast Guard.

US216 The frequencies 150.775 MHz, 150.790 MHz, 152.0075 MHz, and 163.250 MHz, and the bands 462.94688-463.19688 MHz and 467.94688-468.19688 shall be authorized for the purpose of delivering or rendering medical services to individuals (medical radiocommunication systems), and shall be authorized on a primary basis for Federal and non-Federal use. The frequency 152.0075 MHz may also be used for the purpose of conducting public safety radio communications that include, but are not limited to, the delivering or rendering of medical services to individuals.

(a) The use of the frequencies 150.775 MHz and 150.790 MHz is limited to mobile stations operating with a maximum e.r.p. of 100 watts. Airborne operations are prohibited.

(b) The use of the frequencies 152.0075 MHz and 163.250 MHz is limited to base stations that are authorized only for one-way paging communications to mobile receivers. Transmissions for the purpose of activating or controlling remote objects on these frequencies shall not be authorized.

(c) Non-Federal licensees in the Public Safety Radio Pool holding a valid authorization on May 27, 2005, to operate on the frequencies 150.7825 MHz and 150.7975 MHz may, upon proper renewal application, continue to be authorized for such operation; provided that harmful interference is not caused to present or future Federal stations in the band 150.05-150.8 MHz and, should harmful interference result, that the interfering non-Federal operation shall immediately terminate.

US217 In the band 420-450 MHz, pulse-ranging radiolocation systems may be authorized for use along the shoreline of the conterminous United States and Alaska. In the sub-band 420-435 MHz, spread spectrum radiolocation systems may be authorized within the conterminous United States and Alaska. All stations operating in accordance with this provision shall be secondary to stations operating in accordance with the Table of Frequency Allocations. Authorizations shall be granted on a case-by-case basis; however, operations proposed to be located within the following geographic areas should not expect to be accommodated:

(a) Arizona, Florida, and New Mexico.

(b) Those portions of California and Nevada that are south of latitude 37° 10' N.

(c) That portion of Texas that is west of longitude 104° W.

(d) Within 322 km (200 miles) of Eglin AFB, FL (30° 30' N, 86° 30' W); Patrick AFB, FL (28° 21' N, 80° 43' W); and the Pacific Missile Test Center, Point Mugu, CA (34° 09' N, 119° 11' W).

(e) Within 240 km (150 miles) of Beale AFB, CA (39° 08' N, 121° 26' W).

(f) Within 200 km (124 miles) of Goodfellow AFB, TX (31° 25' N, 100° 24' W) and Warner Robins AFB, GA (32° 38' N, 83° 35' W).

(g) Within 160 km (100 miles) of Clear, AK (64° 17' N, 149° 10' W); Concrete, ND (48° 43' N, 97° 54' W); and Otis AFB, MA (41° 45' N, 70° 32' W).

US218 The band 902-928 MHz is available for Location and Monitoring Service (LMS) systems subject to not causing harmful interference to the operation of all Federal stations authorized in this band. These systems must tolerate interference from the operation of industrial, scientific, and medical (ISM) equipment and the operation of Federal stations authorized in this band.

US220 The frequencies 36.25 and 41.71 MHz may be authorized to Federal stations and non-Federal stations in the petroleum radio service, for oil spill containment and cleanup operations. The use of these frequencies for oil spill containment or cleanup operations is limited to the inland and coastal waterway regions.

US221 Use of the mobile service in the bands 525-535 kHz and 1605-1615 kHz is limited to distribution of public service information from Travelers Information stations operating on 530 kHz and 1610 kHz.

US222 In the band 2025-2035 MHz, geostationary operational environmental satellite (GOES) earth stations in the space research and Earth exploration-satellite services may be authorized on a coequal basis for Earth-to-space transmissions for tracking, telemetry, and telecommand at Honolulu, HI (21° 21' 12" N, 157° 52' 36" W); Seattle, WA (47° 34' 15" N, 122° 33' 10" W); and Wallops Island, VA (37° 56' 44" N, 75° 27' 42" W).

US224 Federal systems utilizing spread spectrum techniques for terrestrial communication, navigation and identification may be authorized to operate in the band 960-1215 MHz on the condition that harmful interference will not be caused to the aeronautical radionavigation service. These systems will be handled on a case-by-case basis. Such systems shall be subject to a review at the national level for operational requirements and electromagnetic compatibility prior to development, procurement or modification.

US225 In addition to its present Federal use, the band 510-525 kHz is available to Federal and non-Federal aeronautical radionavigation stations inland of the Territorial Base Line as coordinated with the military services. In addition, the frequency 510 kHz is available for non-Federal ship-helicopter operations when beyond 100 nautical miles from shore and required for aeronautical radionavigation.

US226 In the State of Hawaii, stations in the aeronautical radionavigation service shall not cause harmful interference to U.S. Navy reception from its station at Honolulu on 198 kHz.

US229 Federal use of the fixed and land mobile services in the band 216-220 MHz and of the aeronautical mobile service in the sub-band 217-220 MHz shall be limited to telemetering and associated telecommand operations. NTIA shall not authorize new Federal assignments in the sub-band 216-217 MHz. The sub-band 216.88-217.08 MHz is allocated to the radiodetermination service on a primary basis for Federal use, limited to the Navy's Space Surveillance (SPASUR) radar system at the following nine sites.

(a) Three stations transmit at a very high power and other operations may be affected within the following areas:

Transmitter sites	Coordinates	Frequency	Interference radius
Gila River (Phoenix), AZ……..	33° 06' 32" N, 112° 01' 45" W	216.97 MHz	150 km (93.2 miles)
Lake Kickapoo (Archer City), TX…….....	33° 32' 47" N, 98° 45' 46" W	216.983 MHz	250 km (155.3 miles)
Jordan Lake (Wetumpka), AL…	32° 39' 33" N, 86° 15' 52" W	216.99 MHz	150 km

(b) Reception of the sub-band 216.965-216.995 MHz shall be protected from harmful interference within 50 kilometers (31.1 miles) of the following sites:

Receive sites	Coordinates
Elephant Butte, NM……..	33° 26' 35" N, 106° 59' 50" W
Fort Stewart, GA……...	31° 58' 36" N, 081° 30' 34" W
Hawkinsville, GA…….....	32° 17' 20" N, 083° 32' 10" W
Red River, AR……..	33° 19' 48" N, 093° 33' 01" W
San Diego, CA…..……	32° 34' 42" N, 116° 58' 11" W
Silver Lake, MS……	33° 08' 42" N, 091° 01' 16" W

US230 The bands 422.1875-425.4875 MHz and 427.1875-429.9875 MHz are allocated to the land mobile service on a primary basis for non-Federal use within 80.5 kilometers (50 miles) of Cleveland, OH (41° 29' 51.2" N, 81° 41' 49.5" W) and Detroit, MI (42° 19' 48.1" N, 83° 02' 56.7" W). The bands 423.8125-425.4875 MHz and 428.8125-429.9875 MHz are allocated to the land mobile service on a primary basis for non-Federal use within 80.5 kilometers of Buffalo, NY (42° 52' 52.2" N, 78° 52' 20.1" W).

US231 When an assignment cannot be obtained in the bands between 200 kHz and 525 kHz, which are allocated to aeronautical radionavigation, assignments may be made to aeronautical radiobeacons in the maritime mobile band 435-490 kHz, on a secondary basis, subject to the coordination and agreement of those agencies having assignments within the maritime mobile band which may be affected. Assignments to Federal aeronautical radionavigation radiobeacons in the band 435-490 kHz shall not be a bar to any required changes to the maritime mobile radio service and shall be limited to non-voice emissions.

US239 Aeronautical radionavigation stations (radiobeacons) may be authorized, primarily for off-shore use, in the band 525-535 kHz on a non-interference basis to travelers information stations.

US240 The bands 1715-1725 and 1740-1750 kHz are allocated on a primary basis and the bands 1705-1715 kHz and 1725-1740 kHz on a secondary basis to the aeronautical radionavigation service (radiobeacons).

US244 The band 136-137 MHz is allocated to the non-Federal aeronautical mobile (R) service on a primary basis, and is subject to pertinent international treaties and agreements. The frequencies 136, 136.025, 136.05, 136.075, 136.1, 136.125, 136.15, 136.175, 136.2, 136.225, 136.25, 136.275, 136.3, 136.325, 136.35, 136.375, 136.4, 136.425, 136.45, and 136.475 MHz are available on a shared basis to the Federal Aviation Administration for air traffic control purposes, such as automatic weather observation stations (AWOS), automatic terminal information services (ATIS), flight information services-broadcast (FIS-B), and airport control tower communications.

US245 In the bands 3600-3650 MHz (space-to-Earth), 4500-4800 MHz (space-to-Earth), and 5850-5925 MHz (Earth-to-space), the use of the non-Federal fixed-satellite service is limited to international inter-continental systems and is subject to case-by-case electromagnetic compatibility analysis. The FCC's policy for these bands is codified at 47 CFR 2.108.

US246 No station shall be authorized to transmit in the following bands:

73-74.6 MHz,

608-614 MHz, except for medical telemetry equipment,[1]

1400-1427 MHz,

1660.5-1668.4 MHz,

2690-2700 MHz,

4990-5000 MHz,

10.68-10.7 GHz,

15.35-15.4 GHz,

23.6-24 GHz,

31.3-31.8 GHz,

50.2-50.4 GHz,

52.6-54.25 GHz,

86-92 GHz,

100-102 GHz,

109.5-111.8 GHz,

114.25-116 GHz,

148.5-151.5 GHz,

164-167 GHz,

182-185 GHz,

190-191.8 GHz,

200-209 GHz,

226-231.5 GHz,

250-252 GHz.

US247 The band 10100-10150 kHz is allocated to the fixed service on a primary basis outside the United States and its insular areas. Transmissions from stations in the amateur service shall not cause harmful interference to this fixed service use and stations in the amateur service shall make all necessary adjustments (including termination of transmission) if harmful interference is caused.

US251 The band 12.75-13.25 GHz is also allocated to the space research (deep space) (space-to-Earth) service for reception only at Goldstone, CA (35° 20' N, 116° 53' W).

US252 The band 2110-2120 MHz is also allocated to the space research service (deep space) (Earth-to-space) on a primary basis at Goldstone, CA (35° 20' N, 116° 53' W).

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[1] Medical telemetry equipment shall not cause harmful interference to radio astronomy operations in the band 608-614 MHz and shall be coordinated under the requirements found in 47 CFR 95.1119.

US254 In the band 18.6-18.8 GHz the fixed and mobile services shall be limited to a maximum equivalent isotropically radiated power of +35 dBW and the power delivered to the antenna shall not exceed -3 dBW.

US255 In addition to any other applicable limits, the power flux-density across the 200 MHz band 18.6-18.8 GHz produced at the surface of the Earth by emissions from a space station under assumed free-space propagation conditions shall not exceed -95 dB(W/m²) for all angles of arrival. This limit may be exceeded by up to 3 dB for no more than 5% of the time.

US258 In the bands 8025-8400 MHz and 25.5-27 GHz, the Earth exploration-satellite service (space-to-Earth) is allocated on a primary basis for non-Federal use. Authorizations are subject to a case-by-case electromagnetic compatibility analysis.

US259 In the band 17.3-17.7 GHz, Federal stations in the radiolocation service shall operate with an e.i.r.p. of less than 51 dBW.

US260 Aeronautical mobile communications which are an integral part of aeronautical radionavigation systems may be satisfied in the bands 1559-1626.5 MHz, 5000-5250 MHz and 15.4-15.7 GHz.

US261 The use of the band 4200-4400 MHz by the aeronautical radionavigation service is reserved exclusively for airborne radio altimeters. Experimental stations will not be authorized to develop equipment for operational use in this band other than equipment related to altimeter stations. However, passive sensing in the Earth-exploration satellite and space research services may be authorized in this band on a secondary basis (no protection is provided from the radio altimeters).

US262 The band 7145-7190 MHz is also allocated to the space research service (deep space) (Earth-to-space) on a secondary basis for non-Federal use. Federal and non-Federal use of the bands 7145-7190 MHz and 34.2-34.7 GHz by the space research service (deep space) (Earth-to-space) and of the band 31.8-32.3 GHz by the space research service (deep space) (space-to-Earth) is limited to Goldstone, CA (35° 20' N, 116° 53' W).

US263 In the bands 21.2-21.4 GHz, 22.21-22.5 GHz, 36-37 GHz, and 56.26-58.2 GHz, the space research and Earth exploration-satellite services shall not receive protection from the fixed and mobile services operating in accordance with the Table of Frequency Allocations.

US264 In the band 48.94-49.04 GHz, airborne stations shall not be authorized.

US265 In the band 10.6-10.68 GHz, the fixed service shall be limited to an e.i.r.p. of 40 dBW and the power delivered to the antenna shall not exceed -3 dBW per 250 kHz.

US266 Non-Federal licensees in the Public Safety Radio Pool holding a valid authorization on June 30, 1958, to operate in the frequency band 156.27-157.45 MHz or on the frequencies 161.85 MHz or 161.91 MHz may, upon proper application, continue to be authorized for such operation, including expansion of existing systems, until such time as harmful interference is caused to the operation of any authorized station other than those licensed in the Public Safety Radio Pool.

US267 In the band 902-928 MHz, amateur stations shall transmit only in the sub-bands 902-902.4, 902.6-904.3, 904.7-925.3, 925.7-927.3, and 927.7-928 MHz within the States of Colorado and Wyoming, bounded by the area of latitudes 39° N and 42° N and longitudes 103° W and 108° W.

US268 The bands 890-902 MHz and 928-942 MHz are also allocated to the radiolocation service for Federal ship stations (off-shore ocean areas) on the condition that harmful interference is not caused to non-Federal land mobile stations. The provisions of footnote US116 apply.

US269 In the band 2655-2690 MHz, radio astronomy observations are performed at the locations listed in US311. Licensees are urged to coordinate their systems through the Electromagnetic Spectrum Management Unit, Division of Astronomical Sciences, National Science Foundation, Room 1030, 4201 Wilson Blvd., Arlington, VA 22230.

US271 The use of the band 17.3-17.8 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links for broadcasting-satellite service.

US273 In the bands 74.6-74.8 MHz and 75.2-75.4 MHz, stations in the fixed and mobile services are limited to a maximum power of 1 watt from the transmitter into the antenna transmission line.

US275 The band 902-928 MHz is allocated on a secondary basis to the amateur service subject to not causing harmful interference to the operations of Federal stations authorized in this band or to Location and Monitoring Service (LMS) systems. Stations in the amateur service must tolerate any interference from the operations of industrial, scientific, and medical (ISM) devices, LMS systems, and the operations of Federal stations authorized in this band. Further, the amateur service is prohibited in those portions of Texas and New Mexico bounded on the south by latitude 31° 41' North, on the east by longitude 104° 11' West, and on the north by latitude 34° 30' North, and on the west by longitude 107° 30' West; in addition, outside this area but within 150 miles of these boundaries of White Sands Missile Range the service is restricted to a maximum transmitter peak envelope power output of 50 watts.

US276 Except as otherwise provided for herein, use of the band 2360-2395 MHz by the mobile service is limited to aeronautical telemetering and associated telecommand operations for flight testing of aircraft, missiles or major components thereof. The following three frequencies are shared on a co-equal basis by Federal and non-Federal stations for telemetering and associated telecommand operations of expendable and reusable launch vehicles, whether or not such operations involve flight testing: 2364.5 MHz, 2370.5 MHz, and 2382.5 MHz. All other mobile telemetering uses shall not cause harmful interference to, or claim protection from interference from, the above uses.

US277 The band 10.6-10.68 GHz is also allocated on a primary basis to the radio astronomy service. However, the radio astronomy service shall not receive protection from stations in the fixed service which are licensed to operate in the one hundred most populous urbanized areas as defined by the 1990 U.S. Census. For the list of observatories operating in this band *see* 47 CFR 2.106, footnote US355.

US278 In the bands 22.55-23.55 GHz and 32.3-33 GHz, non-geostationary inter-satellite links may operate on a secondary basis to geostationary inter-satellite links.

US279 The frequency 2182 kHz may be authorized to fixed stations associated with the maritime mobile service for the sole purpose of transmitting distress calls and distress traffic, and urgency and safety signals and messages.

US281 In the band 25070-25210 kHz, non-Federal stations in the Industrial/Business Pool shall not cause harmful interference to, and must accept interference from, stations in the maritime mobile service operating in accordance with the Table of Frequency Allocations.

US282 In the band 4650-4700 kHz, frequencies may be authorized for non-Federal communication with helicopters in support of off-shore drilling operations on the condition that harmful interference will not be caused to services operating in accordance with the Table of Frequency Allocations.

US283 In the bands 2850-3025 kHz, 3400-3500 kHz, 4650-4700 kHz, 5450-5680 kHz, 6525-6685 kHz, 10005-10100 kHz, 11275-11400 kHz, 13260-13360 kHz, and 17900-17970 kHz, frequencies may be authorized for non-Federal flight test purposes on the condition that harmful interference will not be caused to services operating in accordance with the Table of Frequency Allocations.

US285 Under exceptional circumstances, the carrier frequencies 2635 kHz, 2638 kHz, and 2738 kHz may be authorized to coast stations.

US290 In the band 1900-2000 kHz, amateur stations may continue to operate on a secondary basis to the radiolocation service, pending a decision as to their disposition through a future rule making proceeding in conjunction with the implementation of the standard broadcasting service in the band 1625-1705 kHz.

US294 In the spectrum below 490 kHz, electric utilities operate Power Line Carrier (PLC) systems on power transmission lines for communications important to the reliability and security of electric service to the public. These PLC systems operate under the provisions of 47 CFR part 15 or Chapter 7 of the *NTIA Manual*, on an unprotected and noninterference basis with respect to authorized radio users. Notification of intent to place new or revised radio frequency assignments or PLC frequency uses in the bands below 490 kHz is to be made in accordance with the Rules and Regulations of the FCC and NTIA, and users are urged to minimize potential interference to the degree practicable. This footnote does not provide any allocation status to PLC radio frequency uses.

US296 In the bands designated for ship wide-band telegraphy, facsimile and special transmission systems, the following assignable frequencies are available to non-Federal stations on a shared basis with Federal stations: 2070.5 kHz, 2072.5 kHz, 2074.5 kHz, 2076.5 kHz, 4154 kHz, 4170 kHz, 6235 kHz, 6259 kHz, 8302 kHz, 8338 kHz, 12370 kHz, 12418 kHz, 16551 kHz, 16615 kHz, 18848 kHz, 18868 kHz, 22182 kHz, 22238 kHz, 25123 kHz, and 25159 kHz.

US297 The bands 47.2-49.2 GHz and 81-82.5 GHz are also available for feeder links for the broadcasting-satellite service.

US298 Channels 27555 kHz, 27615 kHz, 27635 kHz, 27655 kHz, 27765 kHz, and 27860 kHz are available for use by forest product licensees on a secondary basis to Federal operations including experimental stations. Non-Federal operations on these channels will not exceed 150 watts output power and are limited to the states of Washington, Oregon, Maine, North Carolina, South Carolina, Tennessee, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas (eastern portion).

US299 In Alaska, the band 1615-1705 kHz is also allocated to the maritime mobile and Alaska fixed services on a secondary basis to Region 2 broadcast operations.

US300 The frequencies 169.445, 169.505, 170.245, 170.305, 171.045, 171.105, 171.845 and 171.905 MHz are available for wireless microphone operations on a secondary basis to Federal and non-Federal operations.

US301 Except as provided in NG30, broadcast auxiliary stations licensed as of November 21, 1984, to operate in the band 942-944 MHz may continue to operate on a co-equal primary basis to other stations and services operating in the band in accordance with the Table of Frequency Allocations.

US303 In the band 2285-2290 MHz, non-Federal space stations in the space research, space operations and Earth exploration-satellite services may be authorized to transmit to the Tracking and Data Relay Satellite System subject to such conditions as may be applied on a case-by-case basis. Such transmissions shall not cause harmful interference to authorized Federal stations. The power flux-density at the Earth's surface from such non-Federal stations shall not exceed -144 to -154 dBW/m²/4 kHz, depending on angle of arrival, in accordance with ITU Radio Regulation 21.16.

US307 The band 5150-5216 MHz is also allocated to the fixed-satellite service (space-to-Earth) for feeder links in conjunction with the radiodetermination-satellite service operating in the bands 1610-1626.5 MHz and 2483.5-2500 MHz. The total power flux-density at the Earth’s surface shall in no case exceed -159 dBW/m² per 4 kHz for all angles of arrival.

US308 In the bands 1549.5-1558.5 MHz and 1651-1660 MHz, those requirements of the aeronautical mobile-satellite (R) service that cannot be accommodated in the bands 1545-1549.5 MHz, 1558.5-1559 MHz, 1646.5-1651 MHz and 1660-1660.5 MHz shall have priority access with real-time preemptive capability for communications in the mobile-satellite service. Systems not interoperable with the aeronautical mobile-satellite (R) service shall operate on a secondary basis. Account shall be taken of the priority of safety-related communications in the mobile-satellite service.

US309 In the bands 1545-1559 MHz, transmissions from terrestrial aeronautical stations directly to aircraft stations, or between aircraft stations, in the aeronautical mobile (R) service are also authorized when such transmissions are used to extend or supplement the satellite-to-aircraft links. In the band 1646.5-1660.5 MHz, transmissions from aircraft stations in the aeronautical mobile (R) service directly to terrestrial aeronautical stations, or between aircraft stations, are also authorized when such transmissions are used to extend or supplement the aircraft-to-satellite links.

US310 In the band 14.896-15.121 GHz, non-Federal space stations in the space research service may be authorized on a secondary basis to transmit to Tracking and Data Relay Satellites subject to such conditions as may be applied on a case-by-case basis. Such transmissions shall not cause harmful interference to authorized Federal stations. The power flux-density (pfd) produced by such non-Federal stations at the Earth's surface in any 1 MHz band for all conditions and methods of modulation shall not exceed:

-124 dB(W/m²) for $0° < \theta \leq 5°$

$-124 + (\theta - 5)/2$ dB(W/m²) for $5° < \theta \leq 25°$

-114 dB(W/m²) for $25° < \theta \leq 90°$

where θ is the angle of arrival of the radio-frequency wave (degrees above the horizontal). These limits relate to the pfd and angles of arrival which would be obtained under free-space propagation conditions.

US311 Radio astronomy observations may be made in the bands 1350-1400 MHz, 1718.8-1722.2 MHz, and 4950-4990 MHz on an unprotected basis at the following radio astronomy observatories:

Allen Telescope Array, Hat Creek, CA	Rectangle between latitudes 40° 00' N and 42° 00' N and between longitudes 120° 15' W and 122° 15' W.	
NASA Goldstone Deep Space Communications Complex, Goldstone, CA	80 kilometers (50 mile) radius centered on 35° 20' N, 116° 53' W.	
National Astronomy and Ionosphere Center, Arecibo, PR	Rectangle between latitudes 17° 30' N and 19° 00' N and between longitudes 65° 10' W and 68° 00' W.	
National Radio Astronomy Observatory, Socorro, NM	Rectangle between latitudes 32° 30' N and 35° 30' N and between longitudes 106° 00' W and 109° 00' W.	
National Radio Astronomy Observatory, Green Bank, WV	Rectangle between latitudes 37° 30' N and 39° 15' N and between longitudes 78° 30' W and 80° 30' W.	
National Radio Astronomy Observatory, Very Long Baseline Array Stations	80 kilometer radius centered on:	
	North latitude	West longitude
Brewster, WA	48° 08'	119° 41'
Fort Davis, TX	30° 38'	103° 57'
Hancock, NH	42° 56'	71° 59'
Kitt Peak, AZ	31° 57'	111° 37'
Los Alamos, NM	35° 47'	106° 15'

Mauna Kea, HI	19° 48'	155° 27'
North Liberty, IA	41° 46'	91° 34'
Owens Valley, CA	37° 14'	118° 17'
Pie Town, NM	34° 18'	108° 07'
Saint Croix, VI	17° 45'	64° 35'
Owens Valley Radio Observatory, Big Pine, CA	Two contiguous rectangles, one between latitudes 36° 00' N and 37° 00' N and between longitudes 117° 40' W and 118° 30' W and the second between latitudes 37° 00' N and 38° 00' N and between longitudes 118° 00' W and 118° 50' W.	

In the bands 1350-1400 MHz and 4950-4990 MHz, every practicable effort will be made to avoid the assignment of frequencies to stations in the fixed and mobile services that could interfere with radio astronomy observations within the geographic areas given above. In addition, every practicable effort will be made to avoid assignment of frequencies in these bands to stations in the aeronautical mobile service which operate outside of those geographic areas, but which may cause harmful interference to the listed observatories. Should such assignments result in harmful interference to these observatories, the situation will be remedied to the extent practicable.

US312 The frequency 173.075 MHz may also be authorized on a primary basis to non-Federal stations in the Public Safety Radio Pool, limited to police licensees, for stolen vehicle recovery systems (SVRS). As of May 27, 2005, new SVRS licenses shall be issued for an authorized bandwidth not to exceed 12.5 kHz. Stations that operate as part of a stolen vehicle recovery system that was authorized and in operation prior to May 27, 2005 may operate with an authorized bandwidth not to exceed 20 kHz until May 27, 2019. After that date, all SVRS shall operate with an authorized bandwidth not to exceed 12.5 kHz.

US315 In the bands 1530-1544 MHz and 1626.5-1645.5 MHz, maritime mobile-satellite distress and safety communications, *e.g.*, GMDSS, shall have priority access with real-time preemptive capability in the mobile-satellite service. Communications of mobile-satellite system stations not participating in the GMDSS shall operate on a secondary basis to distress and safety communications of stations operating in the GMDSS. Account shall be taken of the priority of safety-related communications in the mobile-satellite service.

US316 The band 2900-3000 MHz is also allocated to the meteorological aids service on a primary basis for Federal use. Operations in this service are limited to Next Generation Weather Radar (NEXRAD) systems where accommodation in the band 2700-2900 MHz is not technically practical and are subject to coordination with existing authorized stations.

US319 In the bands 137-138 MHz, 148-149.9 MHz, 149.9-150.05 MHz, 399.9-400.05 MHz, 400.15-401 MHz, 1610-1626.5 MHz, and 2483.5-2500 MHz, Federal stations in the mobile-satellite service shall be limited to earth stations operating with non-Federal space stations.

US320 The use of the bands 137-138 MHz, 148-150.05 MHz, 399.9-400.05 MHz, and 400.15-401 MHz by the mobile-satellite service is limited to non-voice, non-geostationary satellite systems and may include satellite links between land earth stations at fixed locations.

US323 In the band 148-149.9 MHz, no individual mobile earth station shall transmit on the same frequency being actively used by fixed and mobile stations and shall transmit no more than 1% of the time during any 15 minute period; except, individual mobile earth stations in this band that do not avoid frequencies actively being used by the fixed and mobile services shall not exceed a power density of −16 dBW/4 kHz and shall transmit no more than 0.25% of the time during any 15 minute period. Any single transmission from any individual mobile earth station operating in this band shall not exceed 450 ms in duration and consecutive transmissions from a single mobile earth station on the same frequency shall be separated by at least 15 seconds. Land earth stations in this band shall be subject to electromagnetic compatibility analysis and coordination with terrestrial fixed and mobile stations.

US324 In the band 400.15-401 MHz, Federal and non-Federal satellite systems shall be subject to electromagnetic compatibility analysis and coordination.

US325 In the band 148-149.9 MHz fixed and mobile stations shall not claim protection from land earth stations in the mobile-satellite service that have been previously coordinated; Federal fixed and mobile stations exceeding 27 dBW EIRP, or an emission bandwidth greater than 38 kHz, will be coordinated with existing mobile-satellite service space stations.

US327 The band 2310-2360 MHz is allocated to the broadcasting-satellite service (sound) and complementary terrestrial broadcasting service on a primary basis. Such use is limited to digital audio broadcasting and is subject to the provisions of Resolution 528.

US334 In the band 17.8-20.2 GHz, Federal space stations in both geostationary (GSO) and non-geostationary satellite orbits (NGSO) and associated earth stations in the fixed-satellite service (space-to-Earth) may be authorized on a primary basis. For a Federal geostationary satellite network to operate on a primary basis, the space station shall be located outside the arc, measured from east to west, 70° West longitude to 120° West longitude. Coordination between Federal fixed-satellite systems and non-Federal space and terrestrial systems operating in accordance with the United States Table of Frequency Allocations is required.

(a) In the sub-band 17.8-19.7 GHz, the power flux-density (pfd) at the surface of the Earth produced by emissions from a Federal GSO space station or from a Federal space station in a NGSO constellation of 50 or fewer satellites, for all conditions and for all methods of modulation, shall not exceed the following values in any 1 MHz band:

(1) -115 dB(W/m²) for angles of arrival above the horizontal plane (δ) between 0° and 5°,

(2) -115 + 0.5(δ - 5) dB(W/m²) for δ between 5° and 25°, and

(3) -105 dB(W/m²) for δ between 25° and 90°.

(b) In the sub-band 17.8-19.3 GHz, the pfd at the surface of the Earth produced by emissions from a Federal space station in an NGSO constellation of 51 or more satellites, for all conditions and for all methods of modulation, shall not exceed the following values in any 1 MHz band:

(1) -115 - X dB(W/m²) for δ between 0° and 5°,

(2) -115 - X + ((10 + X)/20)(δ - 5) dB(W/m²) for δ between 5° and 25°, and

(3) -105 dB(W/m²) for δ between 25° and 90°; where X is defined as a function of the number of satellites, n, in an NGSO constellation as follows:

For n ≤ 288, X = (5/119) (n - 50) dB; and

For n > 288, X = (1/69) (n + 402) dB.

US335 In the band 220-222 MHz, Federal and non-Federal use of the fixed and land mobile services is restricted as follows:

(a) The sub-bands 220-220.55/221.0-221.55, 220.6-220.8/221.6-221.8, 220.85-220.9/221.85-221.9 and 220.925-221/221.925-222 MHz (Channels 1-110, 121-160, 171-180 and 186-200, respectively) are available for exclusive non-Federal use. These sub-bands are also available for temporary fixed geophysical telemetry operations on a secondary basis to the fixed and land mobile services.

(b) The sub-bands 220.55-220.6/221.55-221.6 MHz (Channels 111-120) are available for exclusive Federal use.

(c) The sub-bands 220.8-220.85/221.8-221.85 and 220.9-220.925/221.9-221.925 MHz (Channels 161-170 and 181-185, respectively) are available for shared Federal and non-Federal use.

US337 In the band 13.75-13.8 GHz, the FCC shall coordinate earth stations in the fixed-satellite service with NTIA on a case-by-case basis in order to minimize harmful interference to the Tracking and Data Relay Satellite System's forward space-to-space link (TDRSS forward link-to-LEO).

US338 In the band 2305-2310 MHz, space-to-Earth operations are prohibited. Additionally, in the band 2305-2320 MHz, the FCC shall coordinate all Wireless Communications Service (WCS) operations within 50 km of NASA's Deep Space facility in Goldstone, CA (35° 20" N, 116° 53" W) with NTIA in order to minimize harmful interference to deep space reception in the band 2290-2300 MHz.

US339 The bands 2310-2320 and 2345-2360 MHz are also available for aeronautical telemetering and associated telecommand operations for flight testing of manned or unmanned aircraft, missiles or major components thereof on a secondary basis to the Wireless Communications Service. The following two frequencies are shared on a co-equal basis by Federal and non-Federal stations for telemetering and associated telecommand operations of expendable and re-usable launch vehicles whether or not such operations involve flight testing: 2312.5 and 2352.5 MHz. Other mobile telemetering uses may be provided on a non-interference basis to the above uses. The broadcasting-satellite service (sound) during implementation should also take cognizance of the expendable and reusable launch vehicle frequencies 2312.5 and 2352.5 MHz, to minimize the impact on this mobile service use to the extent possible.

US340 The band 2-30 MHz is available on a non-interference basis to Federal and non-Federal maritime and aeronautical stations for the purposes of measuring the quality of reception on radio channels. See 47 CFR 87.149 for the list of protected frequencies and bands within this frequency range. Actual communications shall be limited to those frequencies specifically allocated to the maritime mobile and aeronautical mobile services.

US342 In making assignments to stations of other services to which the bands:

13360-13410 kHz	42.77-42.87 GHz*
25550-25670 kHz	43.07-43.17 GHz*
37.5-38.25 MHz	43.37-43.47 GHz*
322-328.6 MHz*	48.94-49.04 GHz*
1330-1400 MHz*	76-86 GHz
1610.6-1613.8 MHz*	92-94 GHz
1660-1660.5 MHz*	94.1-100 GHz

1668.4-1670 MHz*	102-109.5 GHz
3260-3267 MHz*	111.8-114.25 GHz
3332-3339 MHz*	128.33-128.59 GHz*
3345.8-3352.5 MHz*	129.23-129.49 GHz*
4825-4835 MHz*	130-134 GHz
4950-4990 MHz	136-148.5 GHz
6650-6675.2 MHz*	151.5-158.5 GHz
14.47-14.5 GHz*	168.59-168.93 GHz*
22.01-22.21 GHz*	171.11-171.45 GHz*
22.21-22.5 GHz	172.31-172.65 GHz*
22.81-22.86 GHz*	173.52-173.85 GHz*
23.07-23.12 GHz*	195.75-196.15 GHz*
31.2-31.3 GHz	209-226 GHz
36.43-36.5 GHz*	241-250 GHz
42.5-43.5 GHz	252-275 GHz

are allocated (*indicates radio astronomy use for spectral line observations), all practicable steps shall be taken to protect the radio astronomy service from harmful interference. Emissions from spaceborne or airborne stations can be particularly serious sources of interference to the radio astronomy service (*see* ITU *Radio Regulations* at Nos. 4.5 and 4.6 and Article 29).

US343 Differential-Global-Positioning-System (DGPS) Stations, limited to ground-based transmitters, may be authorized on a primary basis in the bands 108-117.975 and 1559-1610 MHz for the specific purpose of transmitting DGPS information intended for aircraft navigation. Such use shall be in accordance with ITU Resolution 413 (WRC-03).

US344 In the band 5091-5250 MHz, the FCC shall coordinate earth stations in the fixed-satellite service (Earth-to-space) with NTIA (see Recommendation ITU-R S.1342). In order to better protect the operation of the international standard system (microwave landing system) in the band 5000-5091 MHz, non-Federal tracking and telecommand operations should be conducted in the band 5150-5250 MHz.

US345 In the band 401-406 MHz, the mobile, except aeronautical mobile, service is allocated on a secondary basis and is limited to, with the exception of military tactical mobile stations, Medical Device Radiocommunication Service (MedRadio) operations. MedRadio stations are authorized by rule on the condition that harmful interference is not caused to stations in the meteorological aids, meteorological-satellite, and Earth exploration-satellite services, and that MedRadio stations accept interference from stations in the meteorological aids, meteorological-satellite, and Earth exploration-satellite services.

US346 Except as provided for below and by US222, Federal use of the band 2025-2110 MHz by the space operation service (Earth-to-space), Earth exploration-satellite service (Earth-to-space), and space research service (Earth-to-space) shall not constrain the deployment of the Television Broadcast Auxiliary Service, the Cable Television Relay Service, or the Local Television Transmission Service. To facilitate compatible operations between non-Federal terrestrial receiving stations at fixed sites and Federal earth station transmitters, coordination is required. To facilitate compatible operations between

non-Federal terrestrial transmitting stations and Federal spacecraft receivers, the terrestrial transmitters in the band 2025-2110 MHz shall not be high-density systems (see Recommendations ITU-R SA.1154 and ITU-R F.1247). Military satellite control stations at the following sites shall operate on a co-equal, primary basis with non-Federal operations:

Facility	Coordinates	
Naval Satellite Control Network, Prospect Harbor, ME	44° 24' 16" N	068° 00' 46" W
New Hampshire Tracking Station, New Boston AFS, NH	42° 56' 52" N	071° 37' 36" W
Eastern Vehicle Check-out Facility & GPS Ground Antenna & Monitoring Station, Cape Canaveral, FL	28° 29' 09" N	080° 34' 33" W
Buckley AFB, CO	39° 42' 55" N	104° 46' 36" W
Colorado Tracking Station, Schriever AFB, CO	38° 48' 21" N	104° 31' 43" W
Kirtland AFB, NM	34° 59' 46" N	106° 30' 28" W
Camp Parks Communications Annex, Pleasanton, CA	37° 43' 51" N	121° 52' 50" W
Naval Satellite Control Network, Laguna Peak, CA	34° 06' 31" N	119° 03' 53" W
Vandenberg Tracking Station, Vandenberg AFB, CA	34° 49' 21" N	120° 30' 07" W
Hawaii Tracking Station, Kaena Pt, Oahu, HI	21° 33' 44" N	158° 14' 31" W
Guam Tracking Stations, Anderson AFB, and Naval CTS, Guam	13° 36' 54" N	144° 51' 18" E

US347 In the band 2025-2110 MHz, non-Federal Earth-to-space and space-to-space transmissions may be authorized in the space research and Earth exploration-satellite services subject to such conditions as may be applied on a case-by-case basis. Such transmissions shall not cause harmful interference to Federal and non-Federal stations operating in accordance with the Table of Frequency Allocations.

US348 The band 3650-3700 MHz is also allocated to the Federal radiolocation service on a primary basis at the following sites: St. Inigoes, MD (38° 10' N, 76° 23' W); Pascagoula, MS (30° 22' N, 88° 29' W); and Pensacola, FL (30° 21' 28" N, 87° 16' 26" W). The FCC shall coordinate all non-Federal operations within 80 km of these sites with NTIA on a case-by-case basis.

US349 The band 3650-3700 MHz is also allocated to the Federal radiolocation service on a non-interference basis for use by ship stations located at least 44 nautical miles in off-shore ocean areas on the condition that harmful interference is not caused to non-Federal operations.

US350 In the band 1427-1432 MHz, Federal use of the land mobile service and non-Federal use of the fixed and land mobile services is limited to telemetry and telecommand operations as described below:

(a) *Medical operations.* The use of the band 1427-1432 MHz for medical telemetry and telecommand operations (medical operations) shall be authorized for both Federal and non-Federal stations.

(1) Medical operations shall be authorized on a primary basis in the band 1427-1429.5 MHz and on a secondary basis in the band 1429.5-1432 MHz in the United States and its insular areas, except in the following locations: Austin/Georgetown, TX; Detroit and Battle Creek, MI; Pittsburgh, PA; Richmond/Norfolk, VA; Spokane, WA; and Washington, DC metropolitan area (collectively, the "carved-out" locations). See 47 CFR 90.259(b)(4) and 95.630(b) for a detailed description of these locations.

(2) In the carved-out locations, medical operations shall be authorized on a primary basis in the band 1429-1431.5 MHz and on a secondary basis in the bands 1427-1429 MHz and 1431.5-1432 MHz.

(b) *Non-medical operations.* The use of the band 1427-1432 MHz for non-medical telemetry and telecommand operations (non-medical operations) shall be limited to non-Federal stations.

(1) Non-medical operations shall be authorized on a secondary basis to the Wireless Medical Telemetry Service (WMTS) in the band 1427-1429.5 MHz and on a primary basis in the band 1429.5-1432 MHz in the United States and its insular areas, except in the carved-out locations.

(2) In the carved-out locations, non-medical operations shall be authorized on a secondary basis in the band 1429-1431.5 MHz and on a primary basis in the bands 1427-1429 MHz and 1431.5-1432 MHz.

US351 In the band 1390-1400 MHz, Federal operations (except for medical telemetry and telecommand operations in the sub-band 1395-1400 MHz) are on a non-interference basis to non-Federal operations and shall not constrain implementation of non-Federal operations. However, Federal operations authorized as of March 22, 1995 at 17 sites identified below will be continued on a fully protected basis until January 1, 2009.

80 km radius of operation centered on:		
State	Site	Coordinates
AK	Ft. Greely	63° 47' N, 145° 52' W
AL	Ft. Rucker	31° 13' N, 085° 49' W
AL	Redstone	34° 35' N, 086° 35' W
AZ	Ft. Huachuca	31° 33' N, 110° 18' W
AZ	Yuma	32° 29' N, 114° 20' W
CA	China Lake	35° 41' N, 117° 41' W
CA	Edwards AFB	34° 54' N, 117° 53' W
CA	Pacific Missile Range	34° 07' N, 119° 30' W
FL	Eglin AFB	30° 28' N, 086° 31' W
MD	Aberdeen PG	39° 29' N, 076° 08' W
MD	Patuxent River	38° 17' N, 076° 25' W
NC	Cherry Point	34° 57' N, 076° 56' W
NM	Holloman AFB	33° 29' N, 106° 50' W
NM	WSM Range	32° 10' N, 106° 21' W
OH	Wright-Patterson AFB	39° 50' N, 084° 03' W
UT	Dugway PG	40° 11' N, 112° 53' W
UT	Utah Test Range	40° 57' N, 113° 05' W

US352 In the band 1427-1432 MHz, Federal operations, except for medical telemetry and medical telecommand operations, are on a non-interference basis to authorized non-Federal operations and shall not hinder the implementation of any non-Federal operations.

US353 In the bands 56.24-56.29 GHz, 58.422-58.472 GHz, 59.139-59.189 GHz, 59.566-59.616 GHz, 60.281-60.331 GHz, 60.41-60.46 GHz, and 62.461-62.511 GHz, space-based radio astronomy observations may be made on an unprotected basis.

US354 In the band 58.422-58.472 GHz, airborne stations and space stations in the space-to-Earth direction shall not be authorized.

US355 In the band 10.7-11.7 GHz, non-geostationary satellite orbit licensees in the fixed-satellite service (space-to-Earth), prior to commencing operations, shall coordinate with the following radio astronomy observatories to achieve a mutually acceptable agreement regarding the protection of the radio telescope facilities operating in the band 10.6-10.7 GHz:

Observatory	North latitude	West longitude	Elevation (in meters)
Arecibo Observatory, PR…….....	18° 20' 39"	66° 45' 10"	496
Green Bank Telescope (GBT), WV…..…….....	38° 25' 59"	79° 50' 23"	825
Very Large Array (VLA), Socorro, NM…...…	34° 04' 44"	107° 37' 06"	2126
Very Long Baseline Array (VLBA) Stations:			
Brewster, WA…….……	48° 07' 52"	119° 41' 00"	255
Fort Davis, TX…….…..	30° 38' 06"	103° 56' 41"	1615
Hancock, NH…….....	42° 56' 01"	71° 59' 12"	309
Kitt Peak, AZ…….....	31° 57' 23"	111° 36' 45"	1916
Los Alamos, NM…….....	35° 46' 30"	106° 14' 44"	1967
Mauna Kea, HI…….…….....	19° 48' 05"	155° 27' 20"	3720
North Liberty, IA……...	41° 46' 17"	91° 34' 27"	241
Owens Valley, CA…….....	37° 13' 54"	118° 16' 37"	1207
Pie Town, NM…….....	34° 18' 04"	108° 07' 09"	2371
St. Croix, VI……..	17° 45' 24"	64° 35' 01"	16

US356 In the band 13.75-14 GHz, an earth station in the fixed-satellite service shall have a minimum antenna diameter of 4.5 m and the e.i.r.p. of any emission should be at least 68 dBW and should not exceed 85 dBW. In addition the e.i.r.p., averaged over one second, radiated by a station in the radiolocation service shall not exceed 59 dBW. Receiving space stations in the fixed-satellite service shall not claim protection from radiolocation transmitting stations operating in accordance with the United States Table of Frequency Allocations. ITU Radio Regulation No. 5.43A does not apply.

US357 In the band 13.75-14 GHz, geostationary space stations in the space research service for which information for advance publication has been received by the ITU Radiocommunication Bureau (Bureau) prior to 31 January 1992 shall operate on an equal basis with stations in the fixed-satellite service; after that date, new geostationary space stations in the space research service will operate on a secondary basis. Until those geostationary space stations in the space research service for which information for advance publication has been received by the Bureau prior to 31 January 1992 cease to operate in this band:

a) the e.i.r.p. density of emissions from any earth station in the fixed-satellite service operating with a space station in geostationary-satellite orbit shall not exceed 71 dBW in any 6 MHz band from 13.77 to 13.78 GHz;

b) the e.i.r.p. density of emissions from any earth station in the fixed-satellite service operating with a space station in non-geostationary-satellite orbit shall not exceed 51 dBW in any 6 MHz band from 13.77 to 13.78 GHz.

Automatic power control may be used to increase the e.i.r.p. density in any 6 MHz band in these frequency ranges to compensate for rain attenuation, to the extent that the power flux-density at the fixed-satellite service space station does not exceed the value resulting from use by an earth station of an e.i.r.p. of 71 dBW or 51 dBW, as appropriate, in any 6 MHz band in clear-sky conditions.

US359 In the band 15.43-15.63 GHz, use of the fixed-satellite service (Earth-to-space) is limited to non-Federal feeder links of non-geostationary systems in the mobile-satellite service. The FCC shall coordinate earth stations in this band with NTIA (see Annex 3 of Recommendation ITU-R S.1340).

US360 The band 33-36 GHz is also allocated to the fixed-satellite service (space-to-Earth) on a primary basis for Federal use. Coordination between Federal fixed-satellite service systems and non-Federal systems operating in accordance with the United States Table of Frequency Allocations is required.

US361 In the band 1432-1435 MHz, Federal stations in the fixed and mobile services may operate indefinitely on a primary basis at the 23 sites listed below. All other Federal stations in the fixed and mobile services shall operate in the band 1432-1435 MHz on a primary basis until reaccommodated in accordance with the National Defense Authorization Act of 1999.

Location	North Latitude/ West Longitude	Operating Radius	Location	North Latitude/ West Longitude	Operating Radius
China Lake/ Edwards AFB, CA	35° 29' / 117° 16'	100 km	AUTEC	24° 30' / 078° 00'	80 km
White Sands Missile Range/Holloman AFB, NM	32° 11' / 106° 20'	160 km	Beaufort MCAS, SC	32° 26' / 080° 40'	160 km
Utah Test and Training Range/ Dugway Proving Ground, Hill AFB, UT	40° 57' / 113° 05'	160 km	MCAS Cherry Point, NC	34° 54' / 076° 53'	100 km
Patuxent River, MD	38° 17' / 076° 24'	70 km	NAS Cecil Field, FL	30° 13' / 081° 52'	160 km
Nellis AFB, NV	37° 29' / 114° 14'	130 km	NAS Fallon, NV	39° 30' / 118° 46'	100 km
Fort Huachuca, AZ	31° 33' / 110° 18'	80 km	NAS Oceana, VA	36° 49' / 076° 01'	100 km
Eglin AFB/Gulfport ANG Range, MS/Fort Rucker, AL	30° 28' / 086° 31'	140 km	NAS Whidbey Island, WA	48° 21' / 122° 39'	70 km
Yuma Proving Ground, AZ	32° 29' / 114° 20'	160 km	NCTAMS, GUM	13° 35' / 144° 51' (East)	80 km
Fort Greely, AK	63° 47' / 145° 52'	80 km	Lemoore, CA	36° 20' / 119° 57'	120 km
Redstone Arsenal, AL	34° 35' / 086° 35'	80 km	Savannah River, SC	33° 15' / 081° 39'	3 km
Alpene Range, MI	44° 23' / 083° 20'	80 km	Naval Space Operations Center, ME	44° 24' / 068° 01'	80 km
Camp Shelby, MS	31° 20' / 089° 18'	80 km			

US362 The band 1670-1675 MHz is allocated to the meteorological-satellite service (space-to-Earth) on a primary basis for Federal use. Earth station use of this allocation is limited to Wallops Island, VA (37° 56' 44" N, 75° 27' 37" W), Fairbanks, AK (64° 58' 22" N, 147° 30' 04" W), and Greenbelt, MD (39° 00' 02" N, 76° 50' 29" W). Applicants for non-Federal stations within 100 kilometers of the Wallops Island or Fairbanks coordinates and within 65 kilometers of the Greenbelt coordinates shall notify NOAA in accordance with the procedures specified in 47 CFR 1.924.

US364 Consistent with US18, stations may be authorized on a primary basis in the band 285-325 kHz for the specific purpose of transmitting differential global positioning system information.

US366 In the bands 5900-5950 kHz, 7300-7350 kHz, 9400-9500 kHz, 11600-11650 kHz, 12050-12100 kHz, 13570-13600 kHz, 13800-13870 kHz, 15600-15800 kHz, 17480-17550 kHz, and 18900-19020 kHz, the following provisions shall apply to stations in the fixed and mobile except aeronautical mobile services:

(a) *All Stations*. Federal and non-Federal stations shall:

(1) Be limited to communicating only within the United States and its insular areas;

(2) Not cause harmful interference to the reception of, and must accept interference from, international broadcast stations;

(3) Be limited to the minimum power required to achieve reliable communications; and

(4) Take account of the seasonal use of frequencies by the broadcasting service published in accordance with Article 12 of the ITU *Radio Regulations*.

(b) *Existing and Future Federal Stations*.

(1) Frequencies in all of the above listed frequency bands may be used by existing and future Federal stations in the fixed service; and

(2) Frequencies in the bands 5900-5950 kHz, 7300-7350 kHz, 13570-13600 kHz, and 13800-13870 kHz may also be used by existing and future Federal stations in the mobile except aeronautical mobile service.

(c) *Grandfathered non-Federal Stations*.

(1) Frequencies in the bands 5900-5950 kHz, 7300-7350 kHz, 9400-9500 kHz, 11600-11650 kHz, 12050-12100 kHz, 13800-13870 kHz, and 15600-15800 kHz may continue to be used by non-Federal stations in the fixed service that were licensed prior to March 25, 2007; and

(2) Frequencies in the bands 5900-5950 kHz and 7300-7350 kHz may continue to be used by non-Federal stations in the mobile except aeronautical mobile service that were licensed prior to March 25, 2007.

US367 On the condition that harmful interference is not caused to the broadcasting service, frequencies in the bands 9775-9900 kHz, 11650-11700 kHz, and 11975-12050 kHz may be used by Federal stations in the fixed service communicating within the United States and its insular areas that are authorized as of June 12, 2003. Each such station shall be limited to a total radiated power of 24 dBW.

US368 (a) The use of the bands 1390-1392 MHz and 1430-1432 MHz by the fixed-satellite service is limited to feeder links for the Non-Voice Non-Geostationary Mobile-Satellite Service and is contingent on:

(1) The completion of ITU-R studies on all identified compatibility issues as shown in Annex 1 of Resolution 745 (WRC-2003);

(2) Measurement of emissions from equipment that would be employed in operational systems and demonstrations to validate the studies as called for in Resolution 745 (WRC-2003); and

(3) Compliance with any technical and operational requirements that may be imposed at WRC-07 to protect other services in these bands and passive services in the band 1400-1427 MHz from unwanted emissions.

(b) The FCC shall coordinate individual assignments with NTIA (see, for example, Recommendations ITU-R RA.769-2 and ITU-R SA.1029-2) to ensure the protection of passive services in the band 1400-1427 MHz. As part of the coordination requirements, the feeder uplink and downlink systems shall be tested and certified to be in conformance with the technical and operational out-of-band

requirements for the protection of passive services in the band 1400-1427 MHz. Certification and all supporting documentation shall be submitted to the FCC at least three months prior to launch.

US378 In the band 1710-1755 MHz, the following provisions apply:

(a) Federal fixed and tactical radio relay stations may operate indefinitely on a primary basis within 80 km of Cherry Point, NC (34° 58' N, 076° 56' W) and Yuma, AZ (32° 32' N, 113° 58' W).

(b) Federal fixed and tactical radio relay stations shall operate on a secondary basis to primary non-Federal operations at the 14 sites listed below:

80 km radius of operation centered on:		
State	Location	Coordinates
CA	China Lake	35° 41' N 117° 41' W
CA	Pacific Missile Test Range/Point Mugu	34° 07' N 119° 30' W
FL	Eglin AFB	30° 29' N 086° 31' W
MD	Patuxent River	38° 17' N 076° 25' W
NM	White Sands Missile Range	33° 00' N 106° 30' W
NV	Nellis AFB	36° 14' N 115° 02' W
UT	Hill AFB	41° 07' N 111° 58' W
50 km radius of operation centered on:		
AL	Fort Rucker	31° 13' N 085° 49' W
CA	Fort Irwin	35° 16' N 116° 41' W
GA	Fort Benning	32° 22' N 084° 56' W
GA	Fort Stewart	31° 52' N 081° 37' W
KY	Fort Campbell	36° 41' N 087° 28' W
NC	Fort Bragg	35° 09' N 079° 01' W
WA	Fort Lewis	47° 05' N 122° 36' W

(c) In the sub-band 1710-1720 MHz, precision guided munitions shall operate on a primary basis until inventory is exhausted or until December 31, 2008, whichever is earlier.

(d) All other Federal stations in the fixed and mobile services shall operate on a primary basis until reaccommodated in accordance with the Commercial Spectrum Enhancement Act.

US379 In the band 55.78-56.26 GHz, in order to protect stations in the Earth exploration-satellite service (passive), the maximum power density delivered by a transmitter to the antenna of a fixed service station is limited to -28.5 dB(W/MHz).

US380 In the bands 1525-1544 MHz, 1545-1559 MHz, 1610-1645.5 MHz, 1646.5-1660.5 MHz, 2000-2020 MHz, 2180-2200 MHz, and 2483.5-2500 MHz, a non-Federal licensee in the mobile-satellite service (MSS) may also operate an ancillary terrestrial component in conjunction with its MSS network, subject to the Commission's rules for ancillary terrestrial components and subject to all applicable conditions and provisions of its MSS authorization.

US381 The frequencies 5332 kHz, 5348 kHz, 5368 kHz, 5373 kHz, and 5405 kHz are allocated to the amateur service on a secondary basis. Amateur use of these frequencies shall be limited to 50 watts e.r.p. and to single sideband suppressed carrier modulation (emission designator 2K8J3E), upper sideband

voice transmissions only.

US382 In the band 39.5-40 GHz, Federal earth stations in the mobile-satellite service (space-to-Earth) shall not claim protection from non-Federal stations in the fixed and mobile services. ITU Radio Regulation No. 5.43A does not apply.

US384 In the band 401-403 MHz, the non-Federal Earth exploration-satellite (Earth-to-space) and meteorological-satellite (Earth-to-space) services are limited to earth stations transmitting to Federal space stations.

US388 In the bands 81-86 GHz, 92-94 GHz, and 94.1-95 GHz and within the coordination distances indicated below, assignments to allocated services shall be coordinated with the following radio astronomy observatories. New observatories shall not receive protection from fixed stations that are licensed to operate in the one hundred most populous urbanized areas as defined by the U.S. Census Bureau for the year 2000.

NOTE: Satisfactory completion of the coordination procedure utilizing the automated mechanism, see 47 CFR 101.1523, will be deemed to establish sufficient separation from radio astronomy observatories, regardless of whether the distances set forth above are met.

Telescope and site	150 kilometer (93 mile) radius centered on:	
	North latitude	West longitude
National Radio Astronomy Observatory (NRAO), Robert C. Byrd Telescope, Green Bank, WV…….	…….38° 25' 59"	……...79° 50' 23"
NRAO, Very Large Array, Socorro, NM……	…….34° 04' 44"	…….107° 37' 06"
University of Arizona 12-m Telescope, Kitt Peak, AZ	…….31° 57' 12"	…….111° 36' 53"
Caltech Telescope, Owens Valley, CA……..	…….37° 13' 54"	…….118° 17' 36"
Five College Observatory, Amherst, MA……..	……42° 23' 30"	……...72° 20' 42"
Haystack Observatory, Westford, MA……..	……42° 37' 24"	……...71° 29' 18"
James Clerk Maxwell Telescope, Mauna Kea, HI…..	……19° 49' 33"	…….155° 28' 47"
Combined Array for Research in Millimeter-wave Astronomy (CARMA), CA	37° 16' 43"	118° 08' 32"
NRAO, Very Long Baseline Array Stations	25 kilometer (15.5 mile) radius centered on:	
	North latitude	West longitude
Brewster, WA……...	…….48° 07' 52"	……119° 41' 00"
Fort Davis, TX…….…	…….30° 38' 06"	……103° 56' 41"
Hancock, NH……	…….42° 56' 01"	..……..71° 59' 12"
Kitt Peak, AZ……...	…….31° 57' 23"	…….111° 36' 45"
Los Alamos, NM……..	…….35° 46' 30"	…….106° 14' 44"
Mauna Kea, HI…….	…….19° 48' 05"	…….155° 27' 20"
North Liberty, IA……..	…….41° 46' 17"	……...91° 34' 27"
Owens Valley, CA……	…….37° 13' 54"	…….118° 16' 37"
Pie Town, NM……..	…….34° 18' 04"	…….108° 07' 09"
Saint Croix, VI	17° 45' 24"	64° 35' 01"

US389 In the bands 71-76 GHz and 81-86 GHz, stations in the fixed, mobile, and broadcasting services shall not cause harmful interference to, nor claim protection from, Federal stations in the fixed-satellite service at any of the following 28 military installations:

Military Installation	State	Nearby city
Redstone Arsenal…….....	AL	Huntsville
Fort Huachuca……	AZ	Sierra Vista
Yuma Proving Ground…….....	AZ	Yuma
Beale AFB……..	CA	Marysville
Camp Parks Reserve Forces Training Area……...……	CA	Dublin
China Lake Naval Air Weapons Station……	CA	Ridgecrest
Edwards AFB…….	CA	Rosamond
Fort Irwin……...……	CA	Barstow
Marine Corps Air Ground Combat Center……...….	CA	Twentynine Palms
Buckley AFB……...……..…….	CO	Aurora (Denver)
Schriever AFB……...…	CO	Colorado Springs
Fort Gordon…….....	GA	Augusta
Naval Satellite Operations Center……...…..	GU	Finegayan (Guam)
Naval Computer and Telecommunications Area Master Station, Pacific…..…….....	HI	Wahiawa (Oahu Is.)
Fort Detrick……	MD	Frederick
Nellis AFB…….	NV	Las Vegas
Nevada Test Site……	NV	Amargosa Valley
Tonapah Test Range Airfield……...…….	NV	Tonapah
Cannon AFB…….....	NM	Clovis
White Sands Missile Range…….....	NM	White Sands
Dyess AFB…….	TX	Abilene
Fort Bliss……	TX	El Paso
Fort Sam Houston……..	TX	San Antonio
Goodfellow AFB……	TX	San Angelo
Kelly AFB…….……...……..	TX	San Antonio
Utah Test and Training Range…….……..	UT	…..
Fort Belvoir……	VA	Alexandria
Naval Satellite Operations Center……...…….	VA	Chesapeake

US390 Federal stations in the space research service (active) operating in the band 5350-5460 MHz shall not cause harmful interference to, nor claim protection from, Federal and non-Federal stations in the aeronautical radionavigation service nor Federal stations in the radiolocation service.

US391 In the band 2495-2500 MHz, the mobile-satellite service (space-to-Earth) shall not receive protection from non-Federal stations in the fixed and mobile except aeronautical mobile services operating in that band.

US393 In the band 2025-2110 MHz, the military services may operate stations in the fixed and mobile except aeronautical mobile services on a secondary and coordinated basis at the following sites:

Site	Coordinates	Radius of Operation (km)
Nellis AFB, NV……..……	36° 14' N 115° 02' W	80
China Lake, CA…….	35° 41' N 117° 41' W	50
Ft. Irwin, CA……...	35° 16' N 116° 41' W	50
Pacific Missile Test Range/Pt. Mugu, CA…..	34° 07' N 119° 30' W	80
Yuma, AZ……...……	32° 32' N 113° 58' W	80
White Sands Missile Range, NM……..….	33° 00' N 106° 30' W	80

US394 Until 29 March 2009, the band 6765-7000 kHz is allocated to the fixed service on a primary basis and to the mobile service on a secondary basis. After this date, this band is allocated to the fixed and the mobile except aeronautical mobile (R) services on a primary basis.

US395 Until March 29, 2009, the use of the band 7100-7200 kHz in Region 1 and Region 3 by the amateur service shall not impose constraints on the broadcasting service intended for use within Region 1 and Region 3.

US396 The band 7350-7400 kHz is allocated exclusively to the broadcasting service in accordance with the schedule specified below, except that, in Alaska, the sub-band 7368.5-7371.3 kHz is allocated to the fixed service on an exclusive basis for non-Federal use in accordance with 47 CFR 80.387.

(a) Until March 29, 2009, the band 7350-7400 kHz is allocated to the fixed service on a primary basis and to the mobile except aeronautical mobile service on a secondary basis for Federal and non-Federal use.

(b) After March 29, 2009, authority to operate in the band 7350-7400 kHz shall not be extended to new non-Federal stations in the fixed and mobile except aeronautical mobile services.

(c) After March 29, 2009, Federal and non-Federal stations in the fixed and mobile except aeronautical mobile services shall:

(1) Be limited to communications wholly within the United States and its insular areas;

(2) Not cause harmful interference to the broadcasting service;

(3) Be limited to the minimum power needed to achieve communications; and

(4) Take account of the seasonal use of frequencies by the broadcasting service published in accordance with Article 12 of the ITU *Radio Regulations*.

US397 In the band 432-438 MHz, the Earth exploration-satellite service (active) is allocated on a secondary basis for Federal use. Stations in the Earth exploration-satellite service (active) shall not be operated within line-of-sight of the United States except for the purpose of short duration pre-operational testing. Operations under this allocation shall not cause harmful interference to, nor claim protection from, any other services allocated in the band 432-438 MHz in the United States, including secondary services and the amateur-satellite service.

US398 In the bands 1390-1400 MHz and 1427-1432 MHz, airborne and space-to-Earth operations, except for feeder downlinks for the Non-Voice Non-Geostationary Mobile-Satellite Service in the band 1430-1432 MHz (see US368), are prohibited.

US399 The frequency bands 161.9625-161.9875 MHz (AIS 1 with its center frequency at 161.975 MHz) and 162.0125-162.0375 MHz (AIS 2 with its center frequency at 162.025 MHz) are allocated to the maritime mobile service on a primary basis for Federal Government and non-Federal Government use, and shall be used exclusively for Automatic Identification Systems (AIS). However, in VHF Public Coast Service Areas (VPCSAs) 1-9, site-based stations licensed prior to November 13, 2006, may

continue to operate on a co-primary basis in the frequency band 161.9625-161.9875 MHz until expiration of the license term for licenses in active status as of November 13, 2006. Also, in VPCSAs 10-42, site-based stations licensed in the frequency band 161.9625-161.9875 MHz prior to March 2, 2009 may remain authorized to operate on a co-primary basis in that frequency band until March 4, 2024, and geographical stations licensed in the frequency band 161.9625-161.9875 MHz prior to March 2, 2009 may continue to operate on a co-primary basis in that frequency band until March 2, 2011. *See* 47 CFR 80.371(c)(1)(ii) for the definitions of VPCSAs, and geographic license.

US400 The use of the center frequency 978 MHz may be authorized to Universal Access Transceiver (UAT) stations on a primary basis for the specific purpose of transmitting datalink information in support of the Automatic Dependent Surveillance – Broadcast (ADS-B) Service, Traffic Information Services – Broadcast (TIS-B), and Flight Information – Broadcast (FIS-B).

US401 In the band 17.7-17.8 GHz, Federal earth stations in the fixed-satellite service (space-to-Earth) may be authorized in the Denver, CO and Washington, DC areas on a primary basis. Before commencement of operations, the FCC shall coordinate fixed service applications supporting Multichannel Video Programming Distributors (MVPD) with NTIA.

US402 In the band 17.3-17.7 GHz, existing Federal satellites and associated earth stations in the fixed-satellite service (Earth-to-space) are authorized to operate on a primary basis in the frequency bands and areas listed below. Receiving earth stations in the broadcasting-satellite service within the bands and areas listed below shall not claim protection from Federal earth stations in the fixed-satellite service.

(a) 17.600-17.700 GHz for stations within a 120 km radius of 38° 49' N latitude and 76° 52' W longitude.

(b) 17.375-17.475 GHz for stations within a 160 km radius of 39° 42' N latitude and 104° 45' W longitude.

NON-FEDERAL GOVERNMENT (NG) FOOTNOTES

(These footnotes, each consisting of the letters ‘‘NG’’ followed by one or more digits, denote stipulations applicable only to non-Federal operations and thus appear solely in the non-Federal Table.)

NG1 The band 535-1705 kHz is also allocated to the mobile service on a secondary basis for the distribution of public service information from Travelers Information Stations operating in accordance with the provisions of 47 CFR 90.242 on 10 kilohertz spaced channels from 540 kHz to 1700 kHz.

NG2 Facsimile broadcasting stations may be authorized in the band 88-108 MHz.

NG3 Control stations in the domestic public mobile radio service may be authorized frequencies in the band 72-73 and 75.4-76 MHz on the condition that harmful interference will not be caused to operational fixed stations.

NG4 The use of the frequencies in the band 152.84-153.38 MHz may be authorized, in any area, to remote pickup broadcast base and mobile stations on the condition that harmful interference will not be caused to stations operating in accordance with the Table of Frequency Allocations.

NG6 Stations in the public safety radio services authorized as of June 30, 1958, to use frequencies in the band 159.51-161.79 MHz in areas other than Puerto Rico and the Virgin Islands may continue such operation, including expansion of existing systems, on the condition that harmful interference will not be caused to stations in the services to which these bands are allocated. In Puerto Rico and the Virgin Islands this authority is limited to frequencies in the band 160.05-161.37 MHz. No new public radio service system will be authorized to operate on these frequencies.

NG12 Frequencies in the bands 454.40-455 MHz and 459.40-460 MHz may be assigned to domestic public land and mobile stations to provide a two-way air-ground public radiotelephone service.

NG17 Stations in the land transportation radio services authorized as of May 15, 1958 to operate on the frequency 161.61 MHz may, upon proper application, continue to be authorized for such operation, including expansion of existing systems, on the condition that harmful interference will not be caused to the operation of any authorized station in the maritime mobile service. No new land transportation radio service system will be authorized to operate on 161.61 MHz.

NG19 Fixed stations associated with the maritime mobile service may be authorized, for purposes of communication with coast stations, to use frequencies assignable to ship stations in this band on the condition that harmful interference will not be caused to services operating in accordance with the Table of Frequency Allocations.

NG28 In Puerto Rico and the United States Virgin Islands, the band 160.86-161.4 MHz is available for assignment to remote pickup broadcast stations on a shared basis with stations in the Industrial/Business Pool.

NG30 In Puerto Rico, the band 942-944 MHz is alternatively allocated to the fixed service (aural broadcast auxiliary stations).

NG42 In the band 10-10.5 GHz, non-Federal stations in the radiolocation service shall not cause harmful interference to the amateur service.

NG49 The following frequencies may be authorized for mobile operations in the Manufacturers Radio Service subject to the condition that no interference is caused to the reception of television stations operating on channels 4 and 5 and that their use is limited to a manufacturing facility:

MHz				
72.02	72.10	72.18	72.26	72.34
72.04	72.12	72.20	72.28	72.36
72.06	72.14	72.22	72.30	72.38
72.08	72.16	72.24	72.32	72.40

Further, the following frequencies may be authorized for mobile operations in the Special Industrial Radio Service, Manufacturers Radio Service, Railroad Radio Service and Forest Products Radio Service subject to the condition that no interference is caused to the reception of television stations operating on channels 4 and 5; and that their use is limited to a railroad yard, manufacturing plant, logging site, mill, or similar industrial facility.

MHz				
72.44	72.52	72.60	75.48	75.56
72.48	72.56	75.44	75.52	75.60

NG51 In Puerto Rico and the United States Virgin Islands, the use of band 150.8-151.49 MHz by the fixed and land mobile services is limited to stations in the Industrial/Business Pool.

NG53 In the band 13.15-13.25 GHz, the following provisions shall apply:

(a) The sub-band 13.15-13.2 GHz is reserved for television pickup (TVPU) and cable television relay service (CARS) pickup stations inside a 50 km radius of the 100 television markets delineated in 47 CFR 76.51; and outside these areas, TVPU stations, CARS stations and non-geostationary satellite orbit fixed-satellite service (NGSO FSS) gateway earth stations shall operate on a co-primary basis.

(b) The sub-band 13.2-13.2125 GHz is reserved for TVPU stations on a primary basis and for CARS pickup stations on a secondary basis inside a 50 km radius of the 100 television markets delineated in 47 CFR 76.51; and outside these areas, TVPU stations and NGSO FSS gateway earth

stations shall operate on a co-primary basis and CARS stations shall operate on a secondary basis.

(c) In the band 13.15-13.25 GHz, fixed television auxiliary stations licensed pursuant to applications accepted for filing before September 1, 1979, may continue operation, subject to periodic license renewals.

(d) In the sub-band 13.15-13.2125 GHz, NGSO FSS gateway uplink transmissions shall be limited to a maximum e.i.r.p. of 3.2 dBW towards 0° on the radio horizon.

NOTE: The above provisions shall not apply to geostationary satellite orbit (GSO) FSS operations in the band 12.75-13.25 GHz.

NG56 In the bands 72-73 and 75.4-76 MHz, the use of mobile radio remote control of models is on a secondary basis to all other fixed and mobile operations. Such operations are subject to the condition that interference will not be caused to common carrier domestic public stations, to remote control of industrial equipment operating in the band 72-76 MHz, or to the reception of television signals on channels 4 (66-72 MHz) or 5 (76-82 MHz). Television interference shall be considered to occur whenever reception of regularly used television signals is impaired or destroyed, regardless of the strength of the television signal or the distance to the television station.

NG59 The frequencies 37.60 and 37.85 MHz may be authorized only for use by base, mobile, and operational fixed stations participating in an interconnected or coordinated power service utility system.

NG66 The band 470-512 MHz (TV channels 14-20) is allocated to the broadcasting service on an exclusive basis throughout the United States and its insular areas, except as described below:

(a) In the urbanized areas listed in the table below, the indicated frequency bands are allocated to the land mobile service on an exclusive basis for assignment to eligibles in the Public Mobile Services, the Public Safety Radio Pool, and the Industrial/Business Radio Pool, except that:

(1) Licensees in the land mobile service that are regulated as Commercial Mobile Radio Service (CMRS) providers may also use their assigned spectrum to provide fixed service on a primary basis.

(2) The use of the band 482-488 MHz (TV channel 16) is limited to eligibles in the Public Safety Radio Pool in or near (i) the Los Angeles urbanized area; and (ii) New York City; Nassau, Suffolk, and Westchester Counties in New York State; and Bergen County, NJ.

Urbanized area	Bands (MHz)	TV channels
Boston, MA……...……...	470-476, 482-488……..….....	14, 16
Chicago, IL-Northwestern IN……..…	470-476, 476-482……...…….....	14, 15
Cleveland, OH……..	470-476, 476-482…….....	14, 15
Dallas-Fort Worth, TX…….……	482-488……...…....….	16
Detroit, MI……...	476-482, 482-488……..…….....	15, 16
Houston, TX…….	488-494…….....….....	17
Los Angeles, CA……..	470-476, 482-488, 506-512……...	14, 16, 20
Miami, FL…….....	470-476…….....	14
New York, NY-Northeastern NJ……...…....	470-476, 476-482, 482-488…….....	14, 15, 16
Philadelphia, PA-NJ……..……...	500-506, 506-512…….....	19, 20
Pittsburgh, PA……..	470-476, 494-500.....	14, 18
San Francisco-Oakland, CA…….	482-488, 488-494…….....	16, 17

Washington, DC-MD-VA……..….....	488-494, 494-500…….....	17, 18

(b) In the Gulf of Mexico offshore from the Louisiana-Texas coast, the band 476-494 MHz (TV channels 15-17) is allocated to the fixed and mobile services on a primary basis for assignment to eligibles in the Public Mobile and Private Land Mobile Radio Services.

(c) In Hawaii, the band 488-494 MHz (TV channel 17) is allocated exclusively to the fixed service for use by common carrier control and repeater stations for point-to-point inter-island communications only.

(d) The use of these allocations is further subject to the conditions set forth in 47 CFR parts 22 and 90.

NG70 In Puerto Rico and the Virgin Islands only, the bands 159.240-159.435 and 160.410-160.620 MHz are also available for assignment to base stations and mobile stations in the special industrial radio service.

NG104 The use of the bands 10.7-11.7 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space) by the fixed-satellite service in the geostationary-satellite orbit shall be limited to international systems, *i.e.*, other than domestic systems.

NG111 The band 157.4375-157.4625 MHz may be used for one way paging operations in the special emergency radio service.

NG112 The frequencies 25.04, 25.08, 150.980, 154.585, 158.445, 159.480, 454.000 and 459.000 MHz may be authorized to stations in the Industrial/Business Pool for use primarily in oil spill containment and cleanup operations and secondarily in regular land mobile communication.

NG115 In the bands 54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz, and 614-698 MHz, wireless microphones and wireless assist video devices may be authorized on a non-interference basis, subject to the terms and conditions set forth in 47 CFR part 74, subpart H.

NG117 The frequency 156.050 and 156.175 MHz may be assigned to stations in the maritime mobile service for commercial and port operations in the New Orleans Vessel Traffic Service (VTS) area and the frequency 156.250 MHz may be assigned to stations in the maritime mobile service for port operating in the New Orleans and Houston VTS areas.

NG118 In the bands 2025-2110 MHz, 6875-7125 MHz, and 12.7-13.25 GHz, television translator relay stations may be authorized to use frequencies on a secondary basis to other stations in the Television Broadcast Auxiliary Service that are operating in accordance with the Table of Frequency Allocations.

NG120 Frequencies in the band 928-960 MHz may be assigned for multiple address systems and mobile operations on a primary basis as specified in 47 CFR part 101.

NG124 In the bands 30.85-34, 37-38, 39-40, 42-47.41, 150.995-156.25, 158.715-159.465, 453.0125-453.9875, 458.0125-458.9875, 460.0125-465.6375, and 467.9375-467.9875 MHz, police licensees are authorized to operate low power transmitters on a secondary basis in accordance with the provisions of 47 CFR 2.803 and 90.20(e)(5).

NG128 In the band 535-1705 kHz, AM broadcast licensees or permittees may use their AM carrier on a secondary basis to transmit signals intended for both broadcast and non-broadcast purposes. In the band 88-108 MHz, FM broadcast licensees or permittees are permitted to use subcarriers on a secondary basis to transmit signals intended for both broadcast and non-broadcast purposes. In the bands 54-72, 76-88, 174-216, 470-608 and 614-806 MHz, TV broadcast licensees or permittees are permitted to use subcarriers on a secondary basis for both broadcast and non-broadcast purposes.

NG134 In the band 10.45-10.5 GHz, non-Federal stations in the radiolocation service shall not cause harmful interference to the amateur and amateur-satellite services.

NG135 In the 420-430 MHz band the amateur service is not allocated north of line A (def. § 2.1).

NG141 In Alaska, the frequencies 42.4 MHz and 44.1 MHz are authorized on a primary basis for meteor burst communications by fixed stations in the Rural Radio Service operating under the provisions of 47 CFR part 22. In Alaska, the frequencies 44.2 MHz and 45.9 MHz are authorized on a primary basis for meteor burst communications by fixed private radio stations operating under the provisions of 47 CFR part 90. The private radio station frequencies may be used by Common Carrier stations on a secondary, noninterference basis and the Common Carrier frequencies may be used by private radio stations for meteor burst communications on a secondary, noninterference basis. Users shall cooperate to the extent practical to minimize potential interference. Stations utilizing meteor burst communications shall not cause harmful interference to stations of other radio services operating in accordance with the Table of Frequency Allocations.

NG142 TV broadcast stations authorized to operate in the bands 54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz, and 614-806 MHz may use a portion of the television vertical blanking interval for the transmission of telecommunications signals, on the condition that harmful interference will not be caused to the reception of primary services, and that such telecommunications services must accept any interference caused by primary services operating in these bands.

NG143 In the band 11.7-12.2 GHz, protection from harmful interference shall be afforded to transmissions from space stations not in conformance with ITU Radio Regulation No. 5.488 only if the operations of such space stations impose no unacceptable constraints on operations or orbit locations of space stations in conformance with No. 5.488.

NG144 Stations authorized as of September 9, 1983 to use frequencies in the bands 17.7-18.3 GHz and 19.3-19.7 GHz may, upon proper application, continue operations. Fixed stations authorized in the band 18.3-19.3 GHz that remain co-primary under the provisions of 47 CFR 21.901(e), 74.502(c), 74.602(g), 78.18(a)(4), and 101.147(r) may continue operations consistent with the provisions of those sections.

NG145 In the band 11.7-12.2 GHz, transponders on space stations in the fixed-satellite service may be used additionally for transmissions in the broadcasting-satellite service, provided that such transmissions do not have a maximum e.i.r.p. greater than 53 dBW per television channel and do not cause greater interference or require more protection from interference than the coordinated fixed-satellite service frequency assignments. With respect to the space services, this band shall be used principally for the fixed-satellite service.

NG147 In the band 2483.5-2500 MHz, non-Federal stations in the fixed and mobile services that are licensed under 47 CFR parts 74, 90, or 101, which were licensed as of July 25, 1985, and those whose initial applications were filed on or before July 25, 1985, may continue to operate on a primary basis with the mobile-satellite and radiodetermination-satellite services, and in the sub-band 2495-2500 MHz, these grandfathered stations may also continue to operate on a primary basis with stations in the fixed and mobile except aeronautical mobile services that are licensed under 47 CFR part 27.

NG148 The frequencies 154.585 MHz, 159.480 MHz, 160.725 MHz, 160.785 MHz, 454.000 MHz and 459.000 MHz may be authorized to maritime mobile stations for offshore radio-location and associated telecommand operations.

NG149 The bands 54-72 MHz, 76-88 MHz, 174-216 MHz, 470-512 MHz, 512-608 MHz, and 614-698 MHz are also allocated to the fixed service to permit subscription television operations in accordance with 47 CFR part 73.

NG152 The use of the band 219-220 MHz by the amateur service is limited to stations participating, as forwarding stations, in point-to-point fixed digital message forwarding systems, including intercity

packet backbone networks.

NG153 The band 2160-2165 MHz is reserved for future emerging technologies on a co-primary basis with the fixed and mobile services. Allocations to specific services will be made in future proceedings. Authorizations in the band 2160-2162 MHz for stations in the Multipoint Distribution Service applied for after January 16, 1992 shall be on a secondary basis to emerging technologies.

NG155 The bands 159.500-159.675 MHz and 161.375-161.550 MHz are allocated to the maritime service as described in 47 CFR part 80. Additionally, the frequencies 159.550, 159.575 and 159.600 MHz are available for low-power intership communications.

NG156 The band 2000-2020 MHz is also allocated to the fixed and mobile services on a primary basis for facilities where the receipt date of the initial application was prior to June 27, 2000, and on a secondary basis for all other initial applications. Not later than December 9, 2013, the band 2000-2020 MHz is allocated to the fixed and mobile services on a secondary basis.

NG158 The bands 763-775 MHz and 793-805 MHz are available for assignment to the public safety services, as described in 47 CFR part 90.

NG159 In the band 698-806 MHz, stations authorized under 47 CFR part 74, subparts E, F, and G may continue to operate indefinitely on a secondary basis to all other stations operating in that band.

NG160 In the band 5850-5925 MHz, the use of the non-Federal mobile service is limited to Dedicated Short Range Communications operating in the Intelligent Transportation System radio service.

NG163 The use of the band 17.3-17.7 GHz by the broadcasting-satellite service is limited to geostationary satellites.

NG164 The use of the band 18.3-18.8 GHz by the fixed-satellite service (space-to-Earth) is limited to systems in the geostationary-satellite orbit.

NG165 The use of the band 18.8-19.3 GHz by the fixed-satellite service (space-to-Earth) is limited to systems in non-geostationary-satellite orbits.

NG166 The use of the band 19.3-19.7 GHz by the fixed-satellite service (space-to-Earth) is limited to feeder links for the mobile-satellite service.

NG167 The use of the band 24.75-25.25 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service.

NG168 The band 2180-2200 MHz is also allocated to the fixed and mobile services on a primary basis for facilities where the receipt date of the initial application was prior to January 16, 1992, and on a secondary basis for all other initial applications. Not later than December 9, 2013, the band 2180-2200 MHz is allocated to the fixed and mobile services on a secondary basis.

NG169 After December 1, 2000, operations on a primary basis by the fixed-satellite service (space-to-Earth) in the band 3650-3700 MHz shall be limited to grandfathered earth stations. All other fixed-satellite service earth station operations in the band 3650-3700 MHz shall be on a secondary basis. Grandfathered earth stations are those authorized prior to December 1, 2000, or granted as a result of an application filed prior to December 1, 2000, and constructed within 12 months of initial authorization. License applications for primary operations for new earth stations, major amendments to pending earth station applications, or applications for major modifications to earth station facilities filed on or after December 18, 1998, and prior to December 1, 2000, shall not be accepted unless the proposed facilities are within 16.1 kilometers (10 miles) of an authorized primary earth station operating in the band 3650-3700 MHz. License applications for primary operations by new earth stations, major amendments to pending earth station applications, and applications for major modifications to earth station facilities,

filed after December 1, 2000, shall not be accepted, except for changes in polarization, antenna orientation or ownership of a grandfathered earth station.

NG171 In the band 6875-7125 MHz, the following two channels should be used for airborne TV pickup stations, wherever possible: 7075-7100 MHz and 7100-7125 MHz.

NG172 In the band 7025-7075 MHz, the fixed-satellite service (space-to-Earth) is allocated on a primary basis, but the use of this allocation shall be limited to two grandfathered satellite systems. Associated earth stations located within 300 meters of the following locations shall be grandfathered: (a) In the band 7025-7075 MHz, Brewster, WA (48º 08' 46.7" N, 119º 42' 8.0" W); and (b) In the sub-band 7025-7055 MHz, Clifton, TX (31º 47' 58.5" N, 97º 36' 46.7" W) and Finca Pascual, PR (17º 58' 41.8" N, 67º 8' 12.6" W).

NG173 In the band 216-220 MHz, secondary telemetry operations are permitted subject to the requirements of 47 CFR 90.259. After January 1, 2002, no new assignments shall be authorized in the sub-band 216-217 MHz.

NG175 In the band 38.6-40 GHz, television pickup stations that were authorized on or before April 16, 2003, may continue to operate on a secondary basis to stations operating in accordance with the Table of Frequency Allocations.

NG177 In the bands 1990-2000 MHz and 2020-2025 MHz, where the receipt date of the initial application for facilities in the fixed and mobile services was prior to June 27, 2000, said facilities shall operate on a primary basis and all later-applied-for facilities shall operate on a secondary basis to any service licensed pursuant to the allocation adopted in FCC 03-16, 68 FR 11986, March 13, 2003 ("Advanced Wireless Services"). Not later than December 9, 2013, all such facilities in the bands 1990-2000 MHz and 2020-2025 MHz shall operate on a secondary basis to Advanced Wireless Services.

NG178 In the band 2165-2180 MHz, where the receipt date of the initial application for facilities in the fixed and mobile services was prior to January 16, 1992, said facilities shall operate on a primary basis and all later-applied-for facilities shall operate on a secondary basis to any service licensed pursuant to the allocation adopted in FCC 03-16, 68 FR 11986, March 13, 2003 ("Advanced Wireless Services"). Not later than December 9, 2013, all such facilities in the band 2165-2180 MHz shall operate on a secondary basis to Advanced Wireless Services.

NG180 In the band 3700-4200 MHz (space-to-Earth) earth stations on vessels (ESVs) may be authorized to communicate with space stations of the fixed-satellite service and, while docked, may be coordinated for up to 180 days, renewable. ESVs in motion must operate on a secondary basis.

NG181 In the band 5925-6425 MHz (Earth-to-space), earth stations on vessels (ESVs) are an application of the fixed-satellite service (FSS) and may be authorized to communicate with space stations of the FSS on a primary basis.

NG182 In the bands 10.95-11.2 GHz and 11.45-11.7 GHz, earth stations on vessels (ESVs) may be authorized to communicate with U.S. earth stations through space stations of the fixed-satellite service but must accept interference from terrestrial systems operating in accordance with Commission Rules.

NG183 In the bands 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space), earth stations on vessels (ESVs) are an application of the fixed-satellite service (FSS) and may be authorized to communicate with space stations of the FSS on a primary basis.

NG184 Land mobile stations in the bands 11.7-12.2 GHz and 14.2-14.4 GHz and fixed stations in the band 11.7-12.1 GHz that are licensed pursuant to 47 CFR part 101, subpart J as of March 1, 2005 may continue to operate on a secondary basis until their license expires. Existing licenses issued pursuant to 47 CFR part 101, subpart J will not be renewed in the bands 11.7-12.2 GHz and 14.2-14.4 GHz.

NG185 In the band 3650-3700 MHz, the use of the non-Federal fixed-satellite service (space-to-Earth) is

limited to international inter-continental systems.

NG186 In the bands 10.95-11.2 GHz and 11.45-11.7 GHz (space-to-Earth), Vehicle-Mounted Earth Stations (VMES) as regulated under 47 CFR part 25 may be authorized to communicate with geostationary satellite orbit space stations of the fixed-satellite service but must accept interference from stations of the fixed service operating in accordance with the Commission's Rules.

NG187 In the bands 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space), Vehicle-Mounted Earth Stations (VMES) as regulated under 47 CFR part 25 are an application of the fixed-satellite service and may be authorized to communicate with geostationary satellite orbit space stations of the fixed-satellite service on a primary basis.

Federal Government (G) Footnotes

(These footnotes, each consisting of the letter ‘‘G’’ followed by one or more digits, denote stipulations applicable only to Federal operations and thus appear solely in the Federal Table.)

G2 In the bands 216-217 MHz, 220-225 MHz, 420-450 MHz (except as provided by US217 and G129), 890-902 MHz, 928-942 MHz, 1300-1390 MHz, 2310-2390 MHz, 2417-2450 MHz, 2700-2900 MHz, 3300-3500 MHz (except as provided by footnote US108), 5650-5925 MHz, and 9000-9200 MHz, the Federal radiolocation service is limited to the military services.

G5 In the bands 162.0125-173.2, 173.4-174, 406.1-410 and 410-420 MHz, use by the military services is limited by the provisions specified in the channeling plans shown in Sections 4.3.7 and 4.3.9 of the NTIA Manual.

G6 Military tactical fixed and mobile operations may be conducted nationally on a secondary basis: (a) To the meteorological aids service in the band 403-406 MHz; and (b) To the radio astronomy service in the band 406.1-410 MHz. Such fixed and mobile operations are subject to local coordination to ensure that harmful interference will not be caused to the services to which the bands are allocated.

G8 Low power Federal radio control operations are permitted in the band 420-450 MHz.

G11 Federal fixed and mobile radio services, including low power radio control operations, are permitted in the band 902-928 MHz on a secondary basis.

G15 Use of the band 2700-2900 MHz by the military fixed and shipborne air defense radiolocation installations will be fully coordinated with the meteorological aids and aeronautical radionavigation services. The military air defense installations will be moved from the band 2700-2900 MHz at the earliest practicable date. Until such time as military air defense installations can be accommodated satisfactorily elsewhere in the spectrum, such operations will, insofar as practicable, be adjusted to meet the requirements of the aeronautical radionavigation service.

G19 Use of the band 9000-9200 MHz by military fixed and shipborne air defense radiolocation installations will be fully coordinated with the aeronautical radionavigation service, recognizing fully the safety aspects of the latter. Military air defense installations will be accommodated ultimately out-side this band. Until such time as military defense installations can be accommodated satisfactorily elsewhere in the spectrum such operations will, insofar as practicable, be adjusted to meet the requirements of the aeronautical radionavigation services.

G27 In the bands 225-328.6 MHz, 335.4-399.9 MHz, and 1350-1390 MHz, the fixed and mobile services are limited to the military services.

G30 In the bands 138-144 MHz, 148-149.9 MHz, and 150.05-150.8 MHz, the fixed and mobile services are limited primarily to operations by the military services.

G32 Except for weather radars on meteorological satellites in the band 9975-10025 MHz and for Federal survey operations (see footnote US108), Federal radiolocation in the band 10-10.5 GHz is

limited to the military services.

G34 In the band 34.4-34.5 GHz, weather radars on board meteorological satellites for cloud detection are authorized to operate on the basis of equality with military radiolocation devices. All other non-military radiolocation in the band 33.4-36.0 GHz shall be secondary to the military services.

G42 The space operation service (Earth-to-space) is limited to the band 1761-1842 MHz, and is limited to space command, control, range and range rate systems.

G56 Federal radiolocation in the bands 1215-1300, 2900-3100, 5350-5650 and 9300-9500 MHz is primarily for the military services; however, limited secondary use is permitted by other Federal agencies in support of experimentation and research programs. In addition, limited secondary use is permitted for survey operations in the band 2900-3100 MHz.

G59 In the bands 902-928 MHz, 3100-3300 MHz, 3500-3650 MHz, 5250-5350 MHz, 8500-9000 MHz, 9200-9300 MHz, 13.4-14.0 GHz, 15.7-17.7 GHz and 24.05-24.25 GHz, all Federal non-military radiolocation shall be secondary to military radiolocation, except in the sub-band 15.7-16.2 GHz airport surface detection equipment (ASDE) is permitted on a co-equal basis subject to coordination with the military departments.

G100 The bands 235-322 MHz and 335.4-399.9 MHz are also allocated on a primary basis to the mobile-satellite service, limited to military operations.

G104 In the bands 7450-7550 and 8175-8215 MHz, it is agreed that although the military space radio communication systems, which include earth stations near the proposed meteorological-satellite installations will precede the meteorological-satellite installations, engineering adjustments to either the military or the meteorological-satellite systems or both will be made as mutually required to assure compatible operations of the systems concerned.

G109 All assignments in the band 157.0375-157.1875 MHz are subject to adjustment to other frequencies in this band as long term U.S. maritime VHF planning develops, particularly that planning incident to support of the National VHF-FM Radiotelephone Safety and Distress System (See Doc. 15624/1-1.9.111/1.9.125).

G110 Federal ground-based stations in the aeronautical radionavigation service may be authorized between 3500-3650 MHz when accommodation in the band 2700-2900 MHz is not technically and/or economically feasible.

G114 The band 1369.05-1390 MHz is also allocated to the fixed-satellite service (space-to-Earth) and to the mobile-satellite service (space-to-Earth) on a primary basis for the relay of nuclear burst data.

G115 In the band 13360-13410 kHz, the fixed service is allocated on a primary basis outside the conterminous United States. Within the conterminous United States, assignments in the fixed service are permitted, and will be protected for national defense purposes or, if they are to be used only in an emergency jeopardizing life, public safety, or important property under conditions calling for immediate communication where other means of communication do not exist.

G116 The band 7125-7155 MHz is also allocated for Earth-to-space transmissions in the Space Operations Service at a limited number of sites (not to exceed two), subject to established coordination procedures.

G117 In the bands 7.25-7.75 GHz, 7.9-8.4 GHz, 17.3-17.7 GHz, 17.8-21.2 GHz, 30-31 GHz, 33-36 GHz, 39.5-41 GHz, 43.5-45.5 GHz and 50.4-51.4 GHz, the Federal fixed-satellite and mobile-satellite services are limited to military systems.

G118 Federal fixed stations may be authorized in the band 1700-1710 MHz only if spectrum is not available in the band 1755-1850 MHz.

G120 Development of airborne primary radars in the band 2360-2390 MHz with peak transmitter power in excess of 250 watts for use in the United States is not permitted.

G122 In the bands 2300-2310 MHz, 2395-2400 MHz, 2400-2417 MHz, and 4940-4990 MHz, Federal operations may be authorized on a non-interference basis to authorized non-Federal operations, and shall not constrain the implementation of any non-Federal operations.

G127 Federal Travelers Information Stations (TIS) on 1610 kHz have co-primary status with AM Broadcast assignments. Federal TIS authorized as of August 4, 1994, preclude subsequent assignment for conflicting allotments.

G128 Use of the band 56.9-57 GHz by inter-satellite systems is limited to transmissions between satellites in geostationary orbit, to transmissions between satellites in geostationary satellite orbit and those in high-Earth orbit, to transmissions from satellites in geostationary satellite orbit to those in low-Earth orbit, and to transmissions from non-geostationary satellites in high-Earth orbit to those in low-Earth orbit. For links between satellites in the geostationary satellite orbit, the single entry power flux-density at all altitudes from 0 km to 1000 km above the Earth's surface, for all conditions and for all methods of modulation, shall not exceed -147 dB (W/m²/100 MHz) for all angles of arrival.

G129 Federal wind profilers are authorized to operate on a primary basis in the radiolocation service in the frequency band 448-450 MHz with an authorized bandwidth of no more than 2 MHz centered on 449 MHz, subject to the following conditions: 1) wind profiler locations must be pre-coordinated with the military services to protect fixed military radars; and 2) wind profiler operations shall not cause harmful interference to, nor claim protection from, military mobile radiolocation stations that are engaged in critical national defense operations.

G130 Federal stations in the radiolocation service operating in the band 5350-5470 MHz, shall not cause harmful interference to, nor claim protection from, Federal stations in the aeronautical radionavigation service operating in accordance with ITU Radio Regulation No. 5.449.

G131 Federal stations in the radiolocation service operating in the band 5470-5650 MHz, with the exception of ground-based radars used for meteorological purposes operating in the band 5600-5650 MHz, shall not cause harmful interference to, nor claim protection from, Federal stations in the maritime radionavigation service.

G132 Use of the radionavigation-satellite service in the band 1215-1240 MHz shall be subject to the condition that no harmful interference is caused to, and no protection is claimed from, the radionavigation service authorized under ITU Radio Regulation No. 5.331. Furthermore, the use of the radionavigation-satellite service in the band 1215-1240 MHz shall be subject to the condition that no harmful interference is caused to the radiolocation service. ITU Radio Regulation No. 5.43 shall not apply in respect of the radiolocation service. ITU Resolution 608 (WRC-03) shall apply.

G133 In the band 7190-7235 MHz, emissions to deep space are prohibited. Geostationary satellites in the space research service operating in the band 7190-7235 MHz shall not claim protection from existing and future stations in the fixed service and ITU Radio Regulation No. 5.43A does not apply.

G134 In the band 7190-7235 MHz, Federal earth stations operating in the meteorological-satellite service (Earth-to-space) may be authorized subject to the following conditions:

a. They are limited to communications with the Department of Commerce Geostationary Operational Environmental Satellites (GOES).

b. There shall not be more than five earth stations authorized at one time.

c. The GOES satellite receiver shall not claim protection from existing and future stations in the fixed service (ITU Radio Regulation No. **5.43A** does not apply).

4.2 FREQUENCY ALLOTMENTS

4.2.1 Allotment of 27575 and 27585 kHz for Short-Distance Low-Power Service

These allotments are to provide for intermittent miscellaneous U.S. Government short-distance low-power radio communications, radio signaling, and the control of remote objects or devices by means of radio (where the radiated power exceeds the limit established under Part 7.9).

The designated frequencies are allotted for use by U.S. Government agencies and may be authorized for use by agencies as required upon application. All stations operating on these frequencies shall meet the conditions and standards established for this service.

The designated frequencies are available on a shared basis only and will not be authorized for exclusive use of any one agency. No protection from interference can be assured to any station operating in this service. Services involving safety of life and property should not employ these frequencies in view of their unprotected status. All transmissions are to be restricted to official U.S. Government business that requires the use of radio.

Stations in this service shall utilize FCC type-accepted or type-approved Citizens Radio Band equipment or the equivalent. The maximum transmitter output power shall be five watts.

Stations shall be identified in accordance with the regulations of each agency.

The only class of station authorized is Mobile (including portable-type operation).

Frequencies 27575 and 27585 kHz with 6KA2A, 6KA2D and 6KA3E emission are designated for the U.S. Government short-distance low-power radio service.

All applications for the use of these frequencies must bear the note S159 which reads, "U.S. Government short-distance low-power service."

4.2.2 Allotments in the Band 1755-1850 MHz for Fixed Security Surveillance Systems

The frequencies 1760, 1780, and 1800 MHz are allotted for use in fixed security surveillance systems, on a secondary basis to other stations operating in accordance with the Federal Table of Frequency Allocations.

4.2.3 Allotments for Wide-Area, Common-Use Frequencies

1. Wide-Area, Common-Use frequencies are allotted for use by all Federal agencies and are to provide for radio communications that do not justify the assigning of a radio frequency exclusively to that use, i.e., the frequency can be shared with other users.

a. The following paired frequencies are to be used for wide-area (e.g., county-wide, state-wide, USA or USP) operations of a transient nature that require the use of a repeater station. Unpaired, single frequency operations will be permitted on the repeater transmit frequencies and on the repeater receive frequencies only if all other wide-area, common-use frequencies are in use, but only upon showing that none of the unpaired frequencies in subparagraph b., below, are available.

Frequencies (MHz)	
Repeater Transmit	**Repeater Receive**
163.100	168.350
409.050	418.050
409.3375	418.3375

The frequencies 409.05 and 409.3375 MHz shall not be used in the U.S./Canada Border Areas unless prior coordination has been effected with Canada under the provisions of paragraphs 3.9 and 3.10 of Section 3.4.7 of this Manual, or the output power is 5 watts or less and interference does not occur to Canadian operations.

b. The following frequencies are to be used only for wide-area (e.g., county-wide, state-wide, USA or USP) operations of a transient nature that do not require the use of a repeater station, and shall be used in a simplex mode (use of a base station is allowed):

Frequencies (MHz)	
412.825	412.8375
412.850	412.8625

2. All operations shall be authorized in accordance with Chapter 9 of this Manual. The frequencies are available on a shared, non-priority basis only, and will not be authorized for, nor are they intended for, the exclusive use of any one agency. No protection from interference will be provided to any station operating on these frequencies from other stations operating on the same frequency. The use of equipment with coded squelch is strongly encouraged to reduce nuisance interference from other users.

3. These allotments are for use by Federal stations in the Land and Maritime Mobile Services (Table of Services, Station Classes, and Stations, Chapter 6, Section 6.1.4 of this Manual refers), and the following restrictions apply.

a. the minimum ERP necessary to support the intended use shall be employed;

b. the maximum base or mobile station transmitter output power shall not exceed 30 watts;

c. the gain of the base station (or repeater station) antenna shall not exceed 6 dBi;

d. the height of the base station (or repeater station) antenna shall not exceed 6 meters above the height of the structure supporting the antenna;

e. all equipment shall conform to Part 5.3 of this Manual;

4. Applications for assignments on the frequencies listed in subparagraphs 1.a. and 1.b., above, shall be affixed with Record Note S355, “This assignment is for a wide-area, common-use frequency pursuant to Section 4.2.3 of the NTIA Manual.”

4.2.4 Allotments for Local-Area, Common-Use Frequencies

1. Local-Area, Common-Use frequencies are allotted for use by all Federal agencies and are to provide for radio communications that do not justify the assigning of a radio frequency exclusively to that use, i.e., the frequency can be shared with other users.

a. The following paired frequencies are to be used only for local area operations requiring the use of a repeater station at a fixed location. Unpaired, single frequency operations will be permitted on the repeater transmit frequencies, and on the repeater receive frequencies, only if all other local-area, common-use frequencies are in use, but only upon showing that none of the unpaired frequencies in subparagraph b., below, are available:

Frequencies (MHz)	
Repeater Transmit	**Repeater Receive**
173.625	167.1375
407.525	416.525
409.075	418.075

The frequency 409.075 MHz shall not be used in the U.S./Canada Border Areas unless prior coordination has been effected with Canada under the provisions of paragraphs 3.9 and 3.10 of Section 3.4.7 of this Manual, or the output power is 5 watts or less and interference does not occur to Canadian operations.

b. The following frequencies shall be used only for local area operations that do not require the use of a repeater station, and shall be used only in a simplex mode (use of base stations is allowed):

Frequencies (MHz)	
168.6125	163.7125
412.875	412.8875
412.9	412.9125

2. All operations shall be authorized in accordance with Chapter 9 of this Manual. The frequencies are available on a shared, non-priority basis only, and will not be authorized for, nor are they intended, for the exclusive use of any one agency. No protection from interference will be provided to any station operating on these frequencies from other stations operating on the same frequency. The use of equipment with coded squelch is strongly encouraged to reduce nuisance interference from other users.

3. These allotments are for use by Federal stations in the Land and Maritime Mobile Services (Table of Services, Station Classes, and Stations, Chapter 6, Section 6.1.4 of this Manual refers), and the following restrictions apply.

a. The minimum ERP necessary to support the intended use shall be employed;

b. the maximum base or mobile station transmitter output power shall not exceed 30 Watts;

c. the gain of the base station (or repeater station) antenna shall not exceed 6 dBi;

d. the height of the base station (or repeater station) antenna shall not exceed 6 meters above the height of the structure supporting the antenna;

e. all equipment shall conform to Part 5.3 of this Manual;

f. radius of operation for mobile stations is limited to 50 kilometers.

4. Applications for assignments on the frequencies listed in subparagraphs 1.a. and 1.b., above, shall be affixed with Record Note S356, "This assignment is for a local-area, common-use frequency pursuant to Section 4.2.4 of the NTIA Manual."

4.3 FREQUENCY PLANS

4.3.1 CW Phase Comparison Radiolocation Plan

This plan provides for the use of frequencies for low power, medium and high frequency radiolocation systems employing harmonically related N0N emission phase comparison frequencies and associated 1KA2D emission data link frequencies. These systems normally operate to distances of approximately 400 kilometers offshore and to considerably lesser distances inland.

The following phase comparison frequencies with N0N emission are available for assignment in all areas. Frequency assignments for a band of frequencies shall not be made. Where equipment or other limitations make it impracticable to operate on these channels, applications for other suitable frequencies will be considered on a case-by-case basis.

1650.0-1655.0 kHz						**3300.4-3310.4 kHz**				
1650.0	1651.0	1652.0	1653.0	1654.0		3300.4	3302.4	3304.4	3306.4	3308.4
1650.1	1651.1	1652.1	1653.1	1654.1		3300.6	3302.6	3304.6	3306.6	3308.6
1650.2	1651.2	1652.2	1653.2	1654.2		3300.8	3302.8	3304.8	3306.8	3308.8
1650.3	1651.3	1652.3	1653.3	1654.3		3301.0	3303.0	3305.0	3307.0	3309.0
1650.4	1651.4	1652.4	1653.4	1654.4		3301.2	3303.2	3305.2	3307.2	3309.2
1650.5	1651.5	1652.5	1653.5	1654.5		3301.4	3303.4	3305.4	3307.4	3309.4
1650.6	1651.6	1652.6	1653.6	1654.6		3301.6	3303.6	3305.6	3307.6	3309.6
1650.7	1651.7	1652.7	1653.7	1654.7		3301.8	3303.8	3305.8	3307.8	3309.8
1650.8	1651.8	16528	1653.8	1654.8		3302.0	3304.0	3306.0	3308.0	3310.0
1650.9	1651.9	1652.9	1653.9	1654.9		3302.2	3304.2	3306.2	3308.2	3310.2
				1655.0						3310.4

The assignment of suitable frequencies for the associated data links with 1KA2D emission shall be considered on a case-by-case basis.

The mean antenna power shall be limited to 100 watts for both N0N and 1KA2D emissions. Only radiolocation land stations and radiolocation mobile stations shall be authorized.

The designated frequencies shall be authorized on a shared non-priority basis only and shall not be authorized for the exclusive use of any one agency. Any harmful interference that may develop between authorized radiolocation operations shall be resolved locally by coordination between the users involved.

Frequency assignments shall be for a temporary period not to exceed two years, and may be renewed.

4.3.2 Plan for Wireless Microphones in the Band 162-174 MHz

The following channels have been allotted for use by wireless microphone systems under the conditions listed in (a) through (e) below:

169.445 MHz	171.045 MHz
169.505 MHz	171.105 MHz
170.245 MHz	171.845 MHz
170.305 MHz	171.905 MHz

(a) The emission bandwidth shall not exceed 54 kHz.

(b) The output power shall not exceed 50 milliWatts.

(c) The frequency stability of wireless microphones shall limit the total emission to within 32.5 kHz of the assigned frequency.

(d) All wireless microphone use will be on an unprotected basis and further will be on a non-interference basis to authorized Federal and non-Federal users with the exception of other wireless microphone users.

(e) Assignment applications for wireless microphone use will be considered on a case-by-case basis by the Frequency Assignment Subcommittee (FAS); and, assignment applications do not need to be coordinated with the Hydrology Subcommittee.

4.3.3 Plan for Hydrologic and Meteorological Operations in the Bands 162-174 and 406.1-420 MHz

1. Hydrologic Channels. This plan identifies the center frequencies of channels used primarily for hydrologic operations.

MHz	MHz	MHz	MHz
169.425	170.2625	171.1000	406.1250
169.4375	170.2750	171.1125	406.1750
169.4500	170.2875	171.1250	412.6625
169.4625	170.3000	171.8250	412.675
169.4750	170.3125	171.8375	412.6875
169.4875	170.3250	171.8500	412.7125
169.5000	171.025	171.8625	412.7250
169.5125	171.0375	171.8750	412.7375
169.5250	171.0500	171.8875	412.7625
170.2250	171.0625	171.9000	412.775
170.2375	171.0750	171.9125	415.1250
170.2500	171.0875	171.9250	415.1750

a. Use by Federal Agencies.

Federal agencies may use the frequencies listed in the table above only for hydrologic operations, except as indicated in Section 8.3.6 of this Manual.

b. Use by Non-Federal Agencies. As provided in Allocation footnote US13, non-Federal fixed stations may use the frequencies listed in the table above for the specific purpose of transmitting hydrologic and meteorological data in cooperation with agencies of the Federal Government.

c. Coordination. Agencies must coordinate with the Hydrology Subcommittee of the Federal Interagency Advisory Committee on Water Data, as prescribed in Section 8.3.6 of this Manual, when applying for an assignment on one of the frequencies listed in the table above.

d. Narrowband Hydrologic Operations. All new hydrologic systems are required to operate with a necessary bandwidth of less than 12.5 kHz, and may use all the frequencies shown in the table above.

e. Wideband Hydrologic Operations.

Existing systems authorized in the 162-174 MHz band may continue using equipment operating with necessary bandwidths equal to, or greater than, 12.5 kHz, using the center frequencies listed in the table above that are spaced 25 kHz apart and in the columns beginning with 169.425, 170.2625, and 171.1000 MHz, until December 31, 2004. After this date all such operations must have been converted to narrowband equipment operating with a necessary bandwidth of less than 12.5 kHz. In addition, existing systems operating in the 406.1-420 MHz band may, until December 31, 2007, continue using equipment operating with necessary bandwidths of 12.5 kHz or greater on the following frequencies: 406.125, 406.175, 409.675, 409.725, 412.625, 412.675, 412.725, and 412.775 MHz. After December 31, 2007, all hydrologic systems in the 406.1-420 MHz band must have transitioned to the center frequencies listed in the table above, and to equipment operating with necessary bandwidths of less than 12.5 kHz. New assignments on frequencies 406.1250 and 406.1750 MHz are to be primarily for paired operations with frequencies 415.1250 and 415.1750 MHz, respectively.

2. Meteorological and Quasi-Hydrologic Operations. The frequency 171.175 MHz is allotted for meteorological and quasi-hydrologic operations. Coordination with the Hydrology Subcommittee is not required.

4.3.4 Telemetering Plans

1. For the Band 1435-1535 MHz

a. Ninety-nine (99) one-megahertz channels are designated for use for telemetering and associated telecommand during the flight testing of manned or unmanned aircraft, missiles, or major components thereof (Station Classes MOEA, FLEA, MOD, FLD--see Chapter 6).

b. All assignments will be centered on frequencies at standard intervals of 1 MHz, beginning at 1435.5 MHz, and will be authorized bandwidths of 1, 3, or 5 MHz. Assignments with bandwidths greater than 1 MHz will be centered so that they do not extend outside the allocated band.

c. The frequencies 1444.5, 1453.5, 1501.5, 1515.5, 1524.5 and 1525.5 MHz will be shared with flight telemetering mobile stations (Station Classes MOEB, FLEB, MOD, FLD--see Chapter 6). Such uses will be limited to 1 MHz bandwidths except for frequencies 1524.5 and 1525.5 MHz where a bandwidth up to 2 MHz is permitted.

d. Included as permissible use of the 1435-1535 MHz band is telemetry associated with launching and reentry into the Earth's atmosphere, as well as any incidental orbiting prior to reentry, of manned or unmanned objects undergoing flight tests (Station Classes MOEA, FLEA, MOD, FLD apply).

e. Telecommand stations authorized operation in the 1435-1535 MHz band will:

(1) Directly support flight test aeronautical telemetering functions;

(2) Be limited to 1 MHz bandwidth; and,

(3) Use antennas having a half power beamwidth of no more than 8 degrees and a front-to-back ratio of at least 20 dB.

f. In the band 1435-1535 MHz, the channels designated for aeronautical telemetering are also available for space telemetering on a shared basis.

2. For the Band 2200-2300 MHz

a. In the band 2200-2290 MHz, 90 one-megahertz narrowband channels are designated, centered on 2200.5 MHz and each one-megahertz increment thereafter, through and including 2289.5 MHz. The use of emission bandwidths greater than 1 MHz is permitted, provided the assigned frequencies are centered on the center frequencies of narrowband channels. These channels are available for a) telemetering from space research space stations irrespective of their trajectories and b) aeronautical telemetering, including telemetry associated with launch vehicles, missiles, and upper atmosphere research rockets. Such use is on a coequal shared basis with fixed and mobile line-of-sight operations in the band conducted in accordance with the Federal Table of Frequency Allocations. No provision is made in this band for the flight testing of manned aircraft.

b. In the band 2290-2300 MHz, no specific channels have been established.

3. For the Band 2310-2390 MHz--The following applies to Mobile Telemetry and Associated Telecommand:

a. Seventy-three (73) one-megahertz channels are designated for use for telemetering and associated telecommand during the flight testing of manned or unmanned aircraft, missiles, or major components thereof (Station Classes MOEA, FLEA, MOD, FLD--see Chapter 6).

b. All assignments will be centered on frequencies at standard intervals of 1 MHz, beginning at 2310.5 MHz, and will normally be authorized bandwidths of 1, 3, or 5 MHz. Wider bandwidths may be authorized on a case-by-case basis to equipment capable of tuning the entire band. Assignments with bandwidths greater than 1 MHz will be centered so that they do not extend outside the allocated band. Telecommand assignments will be limited to 1 MHz bandwidths (see 3.d below)

c. The frequencies 2312.5, 2332.5, 2352.5, 2364.5, 2370.5, and 2382.5 MHz are also designated for use by both Federal and non-Federal stations on a co-equal basis for telemetering and associated telecommand operations of expendable and re-usable launch vehicles whether or not such operations involve flight testing. Such uses will be limited to 1 MHz bandwidths. (Station classes MOEA, MOEB, MOD, FLEA, FLEB, and FLD apply).

d. Telecommand stations, except as noted in 3c, above, authorized operation in the 2310-2390 MHz band will:

(1) Directly support flight test aeronautical telemetering functions;

(2) Be limited to 1 MHz bandwidth; and,

(3) Use antennas having a half power beamwidth of no more than 8 degrees and a front-to-back ratio of at least 20 dB.

4.3.5 VHF/UHF Plan for Aeronautical Radionavigation

TACAN-DME and VOR comprise the short-distance air navigational system in the common civil/military National Airspace System (NAS). TACAN is capable of providing range and azimuth information to aircraft. Normally range-only information is received by civil aircraft. DME provides range only and VOR provides azimuth only.

Frequencies at 1-MHz increments in the 960-1215 MHz band are used in airborne interrogating and ground transponder equipment as shown in the channel arrangement depicted below. This channel-pairing arrangement, which has been adopted by ICAO for facilities supporting operations in the international aeronautical service, also serves as a basis for all frequency planning and assignments for the NAS. TACAN and DME frequencies are designated on aeronautical charts by channel numbers 1-126. TACAN channels in the National Airspace System plan are paired with VOR or ILS localizer frequencies in the 108-118 MHz band and with glide slope frequencies in the 328.6-335.4 MHz band, as shown. This pairing arrangement facilitates the employment of a VOR in conjunction with a TACAN-DME beacon to form a VORTAC facility to provide simultaneous azimuth and range information to civil aircraft. Similarly TACAN-DME beacons may be paired with ILS facilities to provide both range and terminal guidance (azimuth and glide slope) information to properly equipped aircraft.

When a TACAN or DME transponder is intended to operate in association with a VHF navigational facility (VOR or ILS), the transponder is collocated with the VHF facility and frequency paired with it. If the system is to be used for terminal services such as for airport approach or landing, the facilities are considered to be collocated only if the transponder and VHF antennas are not more than 260 feet (80 meters) apart. For enroute procedures, collocation is considered to exist if the antenna separation does not exceed 2,000 feet (610 meters). Where the separation exceeds these figures, a VOR/ILS frequency from one pair and the TACAN-DME frequency from another pair must be assigned and suitable notations made on aeronautical charts to alert the user that he is not receiving azimuth and range information from the same point.

TACAN channels 17-59 and 70-126 are designated for use in the National Airspace System. Frequency assignments on these channels and for VOR and ILS operations are managed by the Aeronautical Assignment Group (AAG) of the FAS, under the provisions of Sections 1.3.2 and 9.14.1. Most of these TACAN channels are used by the FAA to provide air navigation services.

Channels 1-16 and 60-69 are designated for the military services for tactical uses and are not used in the NAS. The frequency subbands matching these channel designators are assigned to the military departments for use throughout the U. S. and Possessions. Assignments of specific frequencies to areas and locations are accomplished by individual military departments after appropriate coordination between departments. Land and shipborne beacons operating on these channels, as well as airborne beacons for air-to-air operations provide both azimuth and range information to military aircraft.

The FAA recognizes the need of the military services to use NAS frequencies for tactical purposes, including air-to-air operations, on a secondary basis. The military services recognize the need for frequency adjustments to provide protection for new or reclassified facilities of the NAS. Assignments and adjustments in support of these facilities shall be coordinated on a case-by-case basis through the AAG.

To minimize the possibility of harmful interference between the NAS and military operations, the FAA shall make every effort to avoid the use of TACAN Channels 17, 59, and 70 in areas of concentrated fleet activity. The military services shall coordinate in advance with the FAA relative to the use of TACAN Channels 16, 60, and 69 for land-based facilities.

Assignments of TACAN channels in the operational environment of ground radar facilities equipped with Selective Identification Features (SIF) of Secondary Surveillance Radars (SSR) must be considered carefully, in order to avoid interference. The ground SIF/SSR interrogator transmits on 1030 MHz (TACAN Channel 6 interrogator frequency) and the airborne SIF/SSR transponder transmits on 1090 MHz (TACAN Channel 66 interrogator frequency).

Channel	VOR MHz	DME/TACAN				ILS	
		Airborne		Ground			
		Int. Freq. MHz	Pulse Code usec	Reply Freq. MHz	Pulse Code usec	Localizer MHz	Glide Slope MHz
1X		1025	12	962	12		
1Y		1025	36	1088	30		
2X		1026	12	963	12		
2Y		1026	36	1089	30		
3X		1027	12	964	12		
3Y		1027	36	1090	30		
4X		1028	12	965	12		
4Y		1028	36	1091	30		
5X		1029	12	966	12		
5Y		1029	36	1092	30		
6X		1030	12	967	12		
6Y		1030	36	1093	30		
7X		1031	12	968	12		
7Y		1031	36	1094	30		
8X		1032	12	969	12		
8Y		1032	36	1095	30		
9X		1033	12	970	12		
9Y		1033	36	1096	30		
10X		1034	12	971	12		
10Y		1034	36	1097	30		
11X		1035	12	972	12		
11Y		1035	36	1098	30		
12X		1036	12	973	12		
12Y		1036	36	1099	30		
13X		1037	12	974	12		
13Y		1037	36	1100	30		
14X		1038	12	975	12		
14Y		1038	36	1101	30		
15X		1039	12	976	12		

Channel	VOR MHz	DME/TACAN				ILS	
		Airborne		Ground			
		Int. Freq. MHz	Pulse Code usec	Reply Freq. MHz	Pulse Code usec	Localizer MHz	Glide Slope MHz
15Y		1039	36	1102	30		
16X		1040	12	977	12		
16Y		1040	36	1103	30		
17X	108.00	1041	12	978	12		
17Y	108.05	1041	36	1104	30		
18X		1042	12	979	12	108.10	334.70
18Y		1042	36	1105	30	108.15	334.55
19X	108.20	1043	12	980	12		
19Y	108.25	1043	36	1106	30		
20X		1044	12	981	12	108.3	334.1
20Y		1044	36	1107	30	108.35	333.95
21X	108.40	1045	12	982	12		
21Y	108.45	1045	36	1108	30		
22X		1046	12	983	12	108.5	329.9
22Y		1046	36	1109	30	108.55	329.75
23X	108.6	1047	12	984	12		
23Y	108.65	1047	36	1110	30		
24X		1048	12	985	12	108.70	330.50
24Y		1048	36	1111	30	108.75	330.35
25X	108.80	1049	12	986	12		
25Y	108.85	1049	36	1112	30		
26X		1050	12	987	12	108.90	329.30
26Y		1050	36	1113	30	108.95	329.15
27X	109.00	1051	12	988	12		
27Y	109.05	1051	36	1114	30		
28X		1052	12	989	12	109.10	331.40
28Y		1052	36	1115	30	109.15	331.25
29X	109.20	1053	12	990	12		
29Y	109.25	1053	36	1116	30		
30X		1054	12	991	12	109.30	332.00
30Y		1054	36	1117	30	109.35	331.85
31X	109.40	1055	12	992	12		
31Y	109.45	1055	36	1118	30		
32X		1056	12	993	12	109.50	332.60
32Y		1056	36	1119	30	109.55	332.45
33X	109.60	1057	12	994	12		
33Y	109.65	1057	36	1120	30		
34X		1058	12	995	12	109.70	333.20
34Y		1058	36	1121	30	109.75	333.05
35X	109.80	1059	12	996	12		
35Y	109.85	1059	36	1122	30		
36X		1060	12	997	12	109.90	333.80

Channel	VOR MHz	DME/TACAN				ILS	
		Airborne		Ground			
		Int. Freq. MHz	Pulse Code usec	Reply Freq. MHz	Pulse Code usec	Localizer MHz	Glide Slope MHz
36Y		1060	36	1123	30	109.95	333.65
37X	110.00	1061	12	998	12		
37Y	110.05	1061	36	1124	30		
38X		1062	12	999	12	110.10	334.40
38Y		1062	36	1125	30	110.15	334.25
39X	110.20	1063	12	1000	12		
39Y	110.25	1063	36	1126	30		
40X		1064	12	1001	12	110.3	335
40Y		1064	36	1127	30	110.35	334.85
41X	110.40	1065	12	1002	12		
41Y	110.45	1065	36	1128	30		
42X		1066	12	1003	12	110.50	329.60
42Y		1066	36	1129	30	110.55	329.45
43X	110.60	1067	12	1004	12		
43Y	110.65	1067	36	1130	30		
44X		1068	12	1005	12	110.70	330.20
44Y		1068	36	1131	30	110.75	330.05
45X	110.80	1069	12	1006	12		
45Y	110.85	1069	36	1132	30		
46X		1070	12	1007	12	110.90	330.80
46Y		1070	36	1133	30	110.95	330.65
47X	111.00	1071	12	1008	12		
47Y	111.05	1071	36	1134	30		
48X		1072	12	1009	12	111.10	331.70
48Y		1072	36	1135	30	111.15	331.55
49X	111.20	1073	12	1010	12		
49Y	111.25	1073	36	1136	30		
50X		1074	12	1011	12	111.30	332.30
50Y		1074	36	1137	30	111.35	332.15
51X	111.40	1075	12	1012	12		
51Y	111.45	1075	36	1138	30		
52X		1076	12	1013	12	111.50	332.90
52Y		1076	36	1139	30	111.55	332.75
53X	111.60	1077	12	1014	12		
53Y	111.65	1077	36	1140	30		
54X		1078	12	1015	12	111.70	333.50
54Y		1078	36	1141	30	111.75	333.35
55X	111.80	1079	12	1016	12		
55Y	111.85	1079	36	1142	30		
56X		1080	12	1017	12	111.90	331.10
56Y		1080	36	1143	30	111.95	330.95
57X	112.00	1081	12	1018	12		

Channel	VOR MHz	DME/TACAN				ILS	
		Airborne		Ground			
		Int. Freq. MHz	Pulse Code usec	Reply Freq. MHz	Pulse Code usec	Localizer MHz	Glide Slope MHz
57Y	112.05	1081	36	1144	30		
58X	112.10	1082	12	1019	12		
58Y	112.15	1082	36	1145	30		
59X	112.20	1083	12	1020	12		
59Y	112.25	1083	36	1146	30		
60X		1084	12	1021	12		
60Y		1084	36	1147	30		
61X		1085	12	1022	12		
61Y		1085	36	1148	30		
62X		1086	12	1023	12		
62Y		1086	36	1149	30		
63X		1087	12	1024	12		
63Y		1087	36	1150	30		
64X		1088	12	1151	12		
64Y		1088	36	1025	30		
65X		1089	12	1152	12		
65Y		1089	36	1026	30		
66X		1090	12	1153	12		
66Y		1090	36	1027	30		
67X		1091	12	1154	12		
67Y		1091	36	1028	30		
68X		1092	12	1155	12		
68Y		1092	36	1029	30		
69X		1093	12	1156	12		
69Y		1093	36	1030	30		
70X	112.30	1094	12	1157	12		
70Y	112.35	1094	36	1031	30		
71X	112.40	1095	12	1158	12		
71Y	112.45	1095	36	1032	30		
72X	112.50	1096	12	1159	12		
72Y	112.55	1096	36	1033	30		
73X	112.60	1097	12	1160	12		
73Y	112.65	1097	36	1034	30		
74X	112.70	1098	12	1161	12		
74Y	112.75	1098	36	1035	30		
75X	112.80	1099	12	1162	12		
75Y	112.85	1099	36	1036	30		
76X	112.90	1100	12	1163	12		
76Y	112.95	1100	36	1037	30		
77X	113.00	1101	12	1164	12		
77Y	113.05	1101	36	1038	30		
78X	113.10	1102	12	1165	12		

Channel	VOR MHz	DME/TACAN				ILS	
		Airborne		Ground			
		Int. Freq. MHz	Pulse Code usec	Reply Freq. MHz	Pulse Code usec	Localizer MHz	Glide Slope MHz
78Y	113.15	1102	36	1039	30		
79X	113.20	1103	12	1166	12		
79Y	113.25	1103	36	1040	30		
80X	113.30	1104	12	1167	12		
80Y	113.35	1104	36	1041	30		
81X	113.40	1105	12	1168	12		
81Y	113.45	1105	36	1041	30		
82X	113.50	1106	12	1169	12		
82Y	113.55	1106	36	1043	30		
83X	113.60	1107	12	1170	12		
83Y	113.65	1107	36	1044	30		
84X	113.70	1108	12	1171	12		
84Y	113.75	1108	36	1045	30		
85X	113.80	1109	12	1172	12		
85Y	113.85	1109	36	1046	30		
86X	113.90	1110	12	1173	12		
86Y	113.95	1110	36	1047	30		
87X	114.00	1111	12	1174	12		
87Y	114.05	1111	36	1048	30		
88X	114.10	1112	12	1175	12		
88Y	114.15	1112	36	1049	30		
89X	114.20	1113	12	1176	12		
89Y	114.25	1113	36	1050	30		
90X	114.30	1114	12	1177	12		
90Y	114.35	1114	36	1051	30		
91X	114.40	1115	12	1178	12		
91Y	114.45	1115	36	1052	30		
92X	114.50	1116	12	1179	12		
92Y	114.55	1116	36	1053	30		
93X	114.60	1117	12	1180	12		
93Y	114.65	1117	36	1054	30		
94X	114.70	1118	12	1181	12		
94Y	114.75	1118	36	1055	30		
95X	114.80	1119	12	1182	12		
95Y	114.85	1119	36	1056	30		
96X	114.90	1120	12	1183	12		
96Y	114.95	1120	36	1057	30		
97X	115.00	1121	12	1184	12		
97Y	115.05	1121	36	1058	30		
98X	115.10	1122	12	1185	12		
98Y	115.15	1122	36	1059	30		
99X	115.20	1123	12	1186	12		

Channel	VOR MHz	DME/TACAN				ILS	
		Airborne		Ground			
		Int. Freq. MHz	Pulse Code usec	Reply Freq. MHz	Pulse Code usec	Localizer MHz	Glide Slope MHz
99Y	115.25	1123	36	1060	30		
100X	115.30	1124	12	1187	12		
100Y	115.35	1124	36	1061	30		
101X	115.40	1125	12	1188	12		
101Y	115.45	1125	36	1062	30		
102X	115.50	1126	12	1189	12		
102Y	115.55	1126	36	1063	30		
103X	115.60	1127	12	1190	12		
103Y	115.65	1127	36	1064	30		
104X	115.70	1128	12	1191	12		
104Y	115.75	1128	36	1065	30		
105X	115.80	1129	12	1192	12		
105Y	115.85	1129	36	1066	30		
106X	115.90	1130	12	1193	12		
106Y	115.95	1130	36	1067	30		
107X	116.00	1131	12	1194	12		
107Y	116.05	1131	36	1068	30		
108X	116.1	1132	12	1195	12		
108Y	116.15	1132	36	1069	30		
109X	116.20	1133	12	1196	12		
109Y	116.25	1133	36	1070	30		
110X	116.30	1134	12	1197	12		
110Y	116.35	1134	36	1071	30		
111X	116.40	1135	12	1198	12		
111Y	116.45	1135	36	1072	30		
112X	116.5	1136	12	1199	12		
112Y	116.55	1136	36	1073	30		
113X	116.6	1137	12	1200	12		
113Y	116.65	1137	36	1074	30		
114X	116.70	1138	12	1201	12		
114Y	116.75	1138	36	1075	30		
115X	116.80	1139	12	1202	12		
115Y	116.85	1139	36	1076	30		
116X	116.90	1140	12	1203	12		
116Y	116.95	1140	36	1077	30		
117X	117.00	1141	12	1204	12		
117Y	117.05	1141	36	1078	30		
118X	117.10	1142	12	1205	12		
118Y	117.15	1142	36	1079	30		
119X	117.20	1143	12	1206	12		
119Y	117.25	1143	36	1080	30		
120X	117.30	1144	12	1207	12		

Channel	VOR MHz	DME/TACAN				ILS	
		Airborne		Ground			
		Int. Freq. MHz	Pulse Code usec	Reply Freq. MHz	Pulse Code usec	Localizer MHz	Glide Slope MHz
120Y	117.35	1144	36	1081	30		
121X	117.40	1145	12	1208	12		
121Y	117.45	1145	36	1082	30		
122X	117.50	1146	12	1209	12		
122Y	117.55	1146	36	1083	30		
123X	117.60	1147	12	1210	12		
123Y	117.65	1147	36	1084	30		
124X	117.70	1148	12	1211	12		
124Y	117.75	1148	36	1085	30		
125X	117.80	1149	12	1212	12		
125Y	117.85	1149	36	1086	30		
126X	117.90	1150	12	1213	12		
126Y	117.95	1150	36	1087	30		

4.3.6 Channeling Plan for Assignments in the Band 29.89-50 MHz

This plan is a guide for identifying the center frequencies normally used for assignments with necessary bandwidths equal to or less than 16 kHz.

CONDITIONS AND LIMITATIONS

1. Narrowband Operations. Assignments with necessary bandwidths equal to or less than 16 kHz (narrowband assignments) may be authorized on the center frequencies shown in this plan and on qualified interstitial channels. A “qualified interstitial channel” is one which:

a. Has a center frequency which falls exactly halfway between two adjacent center frequencies shown in this plan,

b. does not overlap an all-government-agencies (AGA) channel,

c. will result in more efficient use of the spectrum, and

d. has been properly coordinated with all affected agencies.

2. Wideband Operations. Assignments with necessary bandwidths greater than 16 kHz (wideband assignments) may also be authorized in this band, provided such assignments:

a. do not exceed 40 kHz of necessary bandwidth,

b. do not overlap an all-government-agencies (AGA) channel,

c. are positioned between the center frequencies shown in this plan when this will result in more efficient use of the spectrum,

d. have been properly coordinated with all affected agencies, and

e. are needed to satisfy requirements which cannot be accommodated with narrowband state-of-the-art equipment, or

f. are in direct support of military tactical and training operations which conform to the conditions and limitations of Section 7.15.4.

3. Use of Coded Squelch. Coded squelch (squelch control techniques) will be used whenever this technique will promote more efficient use of the spectrum; e.g. use of fewer frequencies, sharing of frequencies, reduction or elimination of interference, etc.

EXCEPTIONS

Exceptions to the above conditions and limitations will be considered by the FAS on a case-by-case basis.

29.9								
30.01	32.01	34.01	36.01		40.01	41.01		
30.03	32.03	34.03	36.03		40.03	41.03		
30.05	32.05	34.05	36.05		40.05	41.05		
30.07	32.07	34.07	36.07		40.07	41.07		
30.09	32.09	34.09	36.09		40.09	41.09		
30.11	32.11	34.11	36.11		40.11	41.11		
30.13	32.13	34.13	36.13		40.13	41.13		
30.15	32.15	34.15	36.15		40.15	41.15		
30.17	32.17	34.17	36.17		40.17	41.17		
30.19	32.19	34.19	36.19		40.19	41.19		
30.21	32.21	34.21	36.21		40.21	41.21		
30.23	32.23	34.23	36.23		40.23	41.23		
30.25	32.25	34.25	36.25		40.25	41.25		
30.27	32.27	34.27	36.27	38.27	40.27	41.27		
30.29	32.29	34.29	36.29	38.29	40.29	41.29		
30.31	32.31	34.31	36.31	38.31	40.31	41.31		
30.33	32.33	34.33	36.33	38.33	40.33	41.33		
30.35	32.35	34.35	36.35	38.35	40.35	41.35		
30.37	32.37	34.37	36.37	38.37	40.37	41.37		
30.39	32.39	34.39	36.39	38.39	40.39	41.39		
30.41	32.41	34.41	36.41	38.41	40.41	41.41		
30.43	32.43	34.43	36.43	38.43	40.43	41.43		
30.45	32.45	34.45	36.45	38.45	40.45	41.45		
30.47	32.47	34.47	36.47	38.47	40.47	41.47		
30.49	32.49	34.49	36.49	38.49	40.49	41.49		
30.51	32.51	34.51	36.51	38.51	40.51	41.51		
30.53	32.53	34.53	36.53	38.53	40.53	41.53		
30.55	32.55	34.55	36.55	38.55	40.55	41.55		
	32.57	34.57	36.57	38.57	40.57	41.57		
	32.59	34.59	36.59	38.59	40.59	41.59		
	32.61	34.61	36.61	38.61	40.61	41.61	46.61	49.61
	32.63	34.63	36.63	38.63	40.63	41.63	46.63	49.63
	32.65	34.65	36.65	38.65	40.65	41.65	46.65	49.65
	32.67	34.67	36.67	38.67	40.67	41.67	46.67	49.67
	32.69	34.69	36.69	38.69	40.69	41.69	46.69	49.69
	32.71	34.71	36.71	38.71	40.71	41.71	46.71	49.71
	32.73	34.73	36.73	38.73	40.73	41.73	46.73	49.73
	32.75	34.75	36.75	38.75	40.75	41.75	46.75	49.75
	32.77	34.77	36.77	38.77	40.77	41.77	46.77	49.77
	32.79	34.79	36.79	38.79	40.79	41.79	46.79	49.79
	32.81	34.81	36.81	38.81	40.81	41.81	46.81	49.81
	32.83	34.83	36.83	38.83	40.83	41.83	46.83	49.83
	32.85	34.85	36.85	38.85	40.85	41.85	46.85	49.85
	32.87	34.87	36.87	38.87	40.87	41.87	46.87	49.87
	32.89	34.89	36.89	38.89	40.89	41.89	46.89	49.89
	32.91	34.91	36.91	38.91	40.91	41.91	46.91	49.91
	32.93	34.93	36.93	38.93	40.93	41.93	46.93	49.93

32.95	34.95	36.95	38.95	40.95	41.95	46.95	49.95
32.97	34.97	36.97	38.97	40.97	41.97	46.97	49.97
32.99	34.99	36.99	38.99	40.99	41.99	46.99	49.99

4.3.7 Channeling Plan for Assignments in the Band 162-174 MHz (12.5 kHz Plan)

The channeling plan for the band 162-174 MHz is a guide for identifying the center frequencies used for assignments with necessary bandwidths less than 12.5 kHz. The channeling plan is composed of 942 channels beginning with the center frequency 162.0125 MHz with intervals of 12.5 kHz, excluding frequencies contained within the sub-band 173.2-173.4 MHz.

CONDITIONS AND LIMITATIONS

1. Narrowband Operations. Narrowband assignments (with a necessary bandwidth of less than 12.5 kHz) may be authorized on the center frequencies identified in this plan.

2. Wideband Operations. Wideband assignments (with necessary bandwidths equal to or greater than 12.5 kHz) for new systems are not authorized. Renewals for wideband assignments may be granted with the understanding that operations are subject to the provisions set forth in paragraph 2a below and Section 5.3.5 of this Manual. As an exception, NOAA Weather Radio operations on channels in the frequency range 162.3625-162.5875 MHz may continue to operate with necessary bandwidths equal to 16 kHz. The Automatic Identification System (AIS) (162.025 MHz) will also continue to operate with a 25 kHz bandwidth pursuant to the International Telecommunication Union (ITU) and International Maritime Organization (IMO).

a. Wideband operations may continue after December 31, 2006 with the understanding that an agency with wideband operations ultimately bears responsibility to mitigate harmful interference (e.g. change to narrowband operations, alter technical operating characteristics, change frequency, or assist the narrowband user to find another frequency) within 180[4] days of notification of an adjacent narrowband use requirement. Agencies requiring use of frequencies for narrowband operations, where wideband operations overlap the proposed narrowband operations shall submit a frequency proposal as formal notice through the FAS assignment process after concluding that they do not have other available options. Prior to formal notification the agency requesting narrowband operations shall inform the agency(ies) with wideband operations of the intended use of the adjacent narrowband frequency (Section 8.2.2). If at any time prior to or within 60 days of formal notification, either agency concludes that they cannot identify between them a resolution, the agency with wideband operations shall submit documentation to the FAS substantiating the requirement for continued wideband operations and describing the options considered in their discussions with the narrowband user. Agencies with wideband operations who do not submit substantiating documentation to the FAS shall be considered in concurrence with the proposed narrowband operation. The FAS will evaluate the documentation and identify any options not previously considered or possibly not available to the two agencies involved. If the subcommittee cannot identify a solution that can be agreed by the two parties, the issue will be referred in accordance with Section 8.1.1 paragraph 4. In cases where no solution can be found, the wideband operations may continue on a non-interference basis.

3. Use of Coded Squelch. Coded squelch (squelch control techniques) will be used whenever this technique will promote more efficient use of the spectrum; e.g. use of fewer frequencies, sharing of frequencies, reduction or elimination of interference, etc.

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[4] For the purpose of this paragraph 180 days begins when the frequency proposal for the specific narrowband frequency first appears on an NTIA FAS Agenda.

4. Time Division Multiple Access (TDMA) Operations. TDMA systems, with at least 1 voice channel per 12.5 kHz, will be allowed and can be accommodated on adjacent 12.5 kHz channels listed in this channeling plan. The center frequency of the TDMA channel must be offset midway between the existing narrowband channels to avoid adjacent channel interference problems with existing or planned narrowband systems. Refer to Part 5.3.5 for technical standards.

5. Paired Frequency Operations. The channeling plan identifies 280 pairs of frequencies that are intended to be used for two-frequency simplex operations using equipment operating with a necessary bandwidth less than 12.5 kHz. The paired-use portion includes 359 channels, however 79 of these channels cannot be used for paired use due to existing limitations on the use of one of the frequencies that comprise these pairs (i.e., the 19 frequencies allotted for the NOAA weather radios, the 17 frequencies contained within the non-Federal sub-band 173.2-173.4 MHz, and 43 frequencies designated for other specified use by US footnote).

a. For paired frequency operations, the frequencies in the range 162.0500-166.4875 MHz will be used for land station receive (or mobile transmit), and frequencies in the range 169.5125-173.9875 MHz will be used for land station transmissions (or mobile receive).

b. Base stations with a power not greater than 125 Watts are permitted to transmit in the range 162.0500-166.4875 MHz for access to the repeater.

c. Mobile and base stations are permitted to use repeater transmit frequencies for talk-around communications.

d. Unpaired single frequency operations may be authorized using either of the paired frequencies, except pairs allotted AGA, if the requesting agency believes it to be a more effective use of the spectrum. All such assignments must bear the Record Note S396 (see Annex A). However, as long as an agency has assignments for unpaired single frequency operations on frequencies designated for paired operations, that agency shall not be authorized paired frequency assignments on designated paired frequencies allotted AGA, unless justified otherwise.

e . An agency may use any of their allotted frequencies in the range 162.0500-166.4875 MHz and any of their allotted frequencies in the range 169.5125-173.9875 MHz to make up a single channel pair.

f. An agency may use any of their allotted frequencies in the range 166.5-169.5 MHz and any of their allotted frequencies in the ranges 162.0500-166.4875 MHz and 169.5125-173.9875 MHz to make up a single channel pair if the requesting agency believes it to be more effective use of the spectrum and if it complies, in part, to the provisions of paragraph 5.a.

g. Existing assignments that do not conform to the provisions of this paragraph and assignments that were converted or are converting to comply with the narrowband mandate are grand fathered until a replacement to those systems are necessary. Additionally, expansion of existing systems will continue to be authorized on the system's current operating frequencies. After January 1, 2019, all assignments must conform to the provisions of paragraph 5a through 5f. After April 1, 2004, assignments for new systems (i.e., those without the Record Note S391) will be approved only if they follow the provisions of paragraph 5a through 5f.

6. Single Frequency Operations. The channeling plan identifies 382 center frequencies that are intended to be used for single frequency operations with necessary bandwidths less than 12.5 kHz. The number of frequencies available for single frequency operations includes the 241 center frequencies contained in the frequency range 166.5-169.5 MHz plus those that cannot be used for paired operations in the remainder of the band.

7. Use of the Band by Military Agencies. Use of the band 162-174 MHz by the military agencies is limited to non-tactical or intra-base radio operations with the following provisions:

a. Frequency assignments may be authorized on the center frequencies designated AF/AR.

b. Frequency assignments for certified trunked systems may be authorized on the center frequencies allotted primarily for non-military agencies or AGA, subject to the conditions imposed on the NTIA certification of spectrum support and coordination between the affected agencies. The priority note P074 shall be applied to assignments on center frequencies allotted primarily for non-military agencies and those allotted for shared use, unless the agency(ies) to which the frequency is primarily allotted agrees to waive this requirement. Applicant agencies obtaining waivers to the imposition of P074 on any assignment shall include in the assignment application the coordination note C095 (see Section 9.8.2, paragraph 18, and Annex A). If a waiver agreement contains any special arrangements, the terms or text of the arrangements must be submitted to the FAS Secretary, where an FAS administrative document number will be assigned. Reference to these arrangements (using the FAS administrative document number as a reference) also shall be included in the frequency assignment application as an *M002 note entry in the Circuit Remarks (see Section 9.8.2, paragraph 39k, Annex A).

c. Frequency assignments for purposes other than trunked systems may be authorized on the center frequencies allotted primarily for non-military agencies or AGA, provided the proper selection and coordination procedures have been followed, and provided the priority note P074 is applied to each such assignment.

8. Exceptions to the above conditions, limitations, and frequency selection/coordination procedures will be considered by the FAS on a case-by-case basis.

4.3.8 Splinter Channel Assignment Plan in the band 162-174 MHz (12.5 kHz plan)

The frequencies shown in this plan are available for assignment to all Federal agencies in accordance with allocation footnote G5 and as specified herein.

162.596875[2]	163.396875[2]	164.0[1]	165.796875[2]	166.421875[2]	167.196875[2]	171.221875[2]
.6[1]	.4[1]	164.003125[2]	.8[1]	.425000[1]	.2[1]	.225[1]
.603125[2]	.403125[2]	.009375[2]	.803125[2]	.428125[2]	.203125[2]	.228125[2]
.796875[2]	.596875[2]	.0125[1]	.809375[2]	.646875[2]	.796875[2]	.396875[2]
.8[1]	.6[1]	.015625[2]	.8125[1]	.650000[1]	.8[1]	.4[1]
.803125[2]	.603125[2]	.846875[2]	.815625[2]	.653125[2]	.803125[2]	171.403125[2]
.809375[2]	.609375[2]	.85[1]		.659375[2]	.809375[2]	.409375[2]
.81250[1]	.6125[1]	.853125[2]		.662500[1]	.8125[1]	.4125[1]
.815625[2]	.615625[2]			.665625[2]	.815625[2]	.415625[2]
	.796875[2]					
	.8[1]					
	.803125[2]					
	163.996875[2]					

[1] These frequencies are available for operations requiring a bandwidth up to 11 kHz.
[2] These frequencies are available for operations requiring a bandwidth up to 5 kHz.

CONDITIONS FOR USE

1. Use of voice or data with emissions less than 12.5 kHz on footnote one channels is authorized. New users shall ensure that they do not interfere with low power operations.
2. The technical standards applicable to the use of the channels listed above are shown in Section 5.3.6.
3. Directional antennas shall be used where practicable on point-to-point circuits.
4. Transmitter output power shall not exceed 5 watts.
5. Wherever practical, frequencies in the 406.1-420 MHz band, (Section 4.3.9) or the 932.5-935 and 941.5-944 MHz bands, (Section 4.3.14) should be used in lieu of the above frequencies.
6. Exceptions to these conditions will be considered on a case-by-case basis.

4.3.9 Channeling Plan for Assignments in the Band 406.1-420 MHz

This plan is a guide for identifying the center frequencies normally used for assignments with necessary bandwidths less than 12.5 kHz and, until December 31, 2007, for assignments with necessary bandwidths of 12.5 kHz or greater. Tables 1 and 2, below, list the center frequencies of the channels for assignments in the band 406.1-420 MHz. Table 1 contains 391 pairs of frequencies that are to be used primarily for two-frequency simplex operations. Table 2 contains 329 center frequencies that are to be used for single frequency operations.

CONDITIONS AND LIMITATIONS

1. Transition. To allow for an orderly transition from previous channel plans to this plan, the following apply:

a. Agencies shall develop transition plans that outline their plans to narrowband and to change frequencies where necessary. The transition plans will provide an estimated date for narrow banding each assignment not already narrowbanded, and for changing frequencies where necessary. The initial plans shall be presented to the FAS no later than the first FAS meeting held in the year 2001.

b. Agencies having assignments on, or overlapping, frequencies allotted for primary use by other agencies, shall make every attempt to move their operations to frequencies allotted primarily for their own use, or to frequencies allotted for their shared use. All moves shall be done at the earliest possible date, but by no later than December 31, 2007, unless a waiver (an authorization for continued assignment) is recommended by the IRAC's Frequency Assignment Subcommittee (FAS) and approved by NTIA.

c. Any wideband assignment authorized prior to December 31, 2007, and continued in use after that date, that is on, or overlaps, a narrowband frequency allotted for primary use by another agency, shall be vacated by the using agency(ies) within 180 days of a formal notice of requirement from the agency to which the frequency is allotted, provided the notifying agency has demonstrated a valid requirement for the frequency and the FAS recommends the using agency vacate the assignment.

2. Narrowband Operations. Assignments for transmitters with necessary bandwidths less than 12.5 kHz (i.e., narrowband assignments) may be authorized on all of the center frequencies shown in Tables 1 and 2 of this plan. However, until January 1, 2008, narrowband assignments should not be made on center frequencies adjacent to wideband assignments (assignments with bandwidths of 12.5 kHz or greater), unless consideration is given to additional distance separation that may be required due to the increased potential for adjacent channel interference, and then only after proper coordination with affected agencies.

3. Wideband Operations. Renewal of assignments to existing stations with necessary bandwidths of 12.5 kHz or greater may be authorized until December 31, 2007. Assignments for expansion of stations within existing networks operating with bandwidths of 12.5 kHz or greater may also be authorized, but only on the center frequencies listed for the even numbered channels beginning with channel 2 in Table 1 and Channel 392 in Table 2. All such assignments must bear Record Note S391 (see Annex A). By January 1, 2008, all assignments and equipment must conform to the provisions set forth in paragraph 1, above, and Section 5.3.5 of this Manual. The Automated Surface Observing System (ASOS) operations centered on channels 318 and 388 may continue to operate with necessary bandwidths greater than 12.5 kHz, but less than 25 kHz. Exceptions to these rules may be authorized on a case-by-case basis, provided the assignment with bandwidth(s) of 12.5 kHz or greater is needed to satisfy requirements, has been properly coordinated with all affected agencies, and has been recommended for approval by the FAS. However, the rule outlined in subparagraph 1c, above, applies.

4. Use of Coded Squelch. Coded squelch (squelch control techniques) will be used whenever this technique will promote more efficient use of the spectrum (e.g., use of fewer frequencies, sharing frequencies, or reduction or elimination of interference).

5. Time Division Multiple Access (TDMA) Operations. TDMA systems with at least one voice channel per 12.5 kHz will be allowed and accommodated on adjacent 12.5 kHz center frequencies listed in this channeling plan. The center frequency of the TDMA emission must be offset midway between the center frequencies listed in this plan to limit adjacent channel interference problems with existing or planned narrowband operations. Refer to Part 5.3 of this Manual for technical details.

6. Paired Frequency Operations. Table 1 contains a list of 391 pairs of frequencies that are to be used primarily for two-frequency simplex operations using equipment operating with a necessary bandwidth less than 12.5kHz.

a. For paired frequency operations, the frequencies in the range 406.1125-410.9875 MHz will be used for land station transmissions (or mobile receive), and frequencies in the range 415.1125-419.9875 MHz will be used for land station receive (or mobile transmit).

b. Base stations operating with a power not greater than 125 watts are permitted to transmit in the range 415.1125-419.9875 MHz for access to the repeater.

c. Mobile stations are permitted to use repeater transmit frequencies for talk-around communications.

d. Unpaired single frequency operations may be authorized using either of the paired frequencies, except those allotted AGA, if the requesting agency believes it to be a more effective use of the spectrum. All such assignments must bear Record Note S396 (see Annex A). However, as long as an agency has assignments for unpaired single frequency operations on frequencies listed in Table 1, that agency shall not be authorized paired frequency assignments on those frequencies in Table 1 allotted AGA, unless justified otherwise.

e. Agencies will first propose frequency pairs allotted primarily for their own use from the Table 1 structure.

f. If there are no agency allotted structured pairs available, agencies will then propose frequency pairs allotted primarily for AGA use from the Table 1 structure.

g. If there are no AGA allotted structured pairs available, an agency may use any of their allotted frequencies in the range 406.1125 – 410.9875 MHz and any of their allotted frequencies in the range 415.1125 – 419.9875 MHz to make up a single channel pair if the requesting agency believes it to be more effective use of the spectrum and if it complies, in part, to the provisions of paragraph 5.a.

h. If a pair cannot be found from the transmit and receive ranges, an agency may use any of their allotted frequencies in the range 406.1125 – 410.9875 MHz and any of their allotted frequencies in the ranges 411.000 – 415.1000 MHz or 415.1125 – 419.9875 MHz to make up a single channel pair if the requesting agency believes it to be more effective use of the spectrum.

i. Existing narrowband assignments that do not conform to the provisions of this paragraph are grand fathered until 01/01/22. Additionally, expansion of existing narrowband systems will continue to be authorized within this period of time.

7. Single Frequency Operations. Table 2 contains a list of 329 center frequencies that are to be used for single frequency operations with necessary bandwidths less than 12.5 kHz.

8. Use of the Band by Military Agencies. Use of the band 406.1-420 MHz by the military agencies is limited to non-tactical or intrabase radio operations with the following provisions:

a. Frequency assignments may be authorized on center frequencies allotted primarily for DOD.

b. Frequency assignments for certified trunked systems may be authorized on the center frequencies allotted primarily for non-military agencies or AGA, subject to the conditions imposed on the NTIA certification of spectrum support and coordination between the affected agencies. The priority note P076 shall be applied to assignments on center frequencies allotted primarily for non-military agencies and those allotted for shared use, unless the agency(ies) to which the frequency is primarily allotted agrees to waive this requirement. Applicant agencies obtaining waivers to the imposition of P076 on any assignment shall include in the assignment application the coordination note C095 (see Section 9.8.2, paragraph 18, and Annex A). If a waiver agreement contains any special arrangements, the terms or text of the arrangements must be submitted to the FAS Secretary, where an FAS administrative document number will be assigned. Reference to these arrangements (using the FAS administrative document number as a reference) also shall be included in the frequency assignment application as an *M002 note entry in the Circuit Remarks (see Section 9.8.2, paragraph 39k, Annex A).

c. Frequency assignments for purposes other than trunked systems may be authorized on the center frequencies allotted primarily for non-military agencies or AGA, provided the proper selection and coordination procedures have been followed, and provided the priority note P076 is applied to each such assignment.

d. The 406.1-420 MHz band channeling plans are contained in Tables 1 and Table 2. Table 1 contains the paired frequency channels, while Table 2 contains the single changes frequencies. In both tables the old numbered channels are for 12.5 kHz bandwidth assignments, while the even numbered channels are for either 12.5 or 25 kHz assignments. After December 31, 2007 all channels will be 12.5 kHz assignments.

Table 1: Paired Channels

Channel	Center Frequency	Center Frequency
1	406.1125	415.1125
2	406.1250	415.125
3	406.1375	415.1375
4	406.150	415.150
5	406.1625	415.1625
6	406.175	415.175
7	406.1875	415.1875
8	406.200	415.200
9	406.2125	415.2125
10	406.225	415.225
11	406.2375	415.2375

Table 1: Paired Channels

Channel	Center Frequency	Center Frequency
12	406.250	415.250
13	406.2625	415.2625
14	406.275	415.275
15	406.2875	415.2875
16	406.300	415.300
17	406.3125	415.3125
18	406.325	415.325
19	406.3375	415.3375
20	406.350	415.350
21	406.3625	415.3625
22	406.375	415.375

Table 1: Paired Channels

Channel	Center Frequency	Center Frequency
23	406.3875	415.3875
24	406.400	415.400
25	406.4125	415.4125
26	406.425	415.425
27	406.4375	415.4375
28	406.450	415.450
29	406.4625	415.4625
30	406.475	415.475
31	406.4875	415.4875
32	406.500	415.500
33	406.5125	415.5125

Table 1: Paired Channels

Channel	Center Frequency	Center Frequency
34	406.525	415.525
35	406.5375	415.5375
36	406.550	415.550
37	406.5625	415.5625
38	406.575	415.575
39	406.5875	415.5875
40	406.600	415.600
41	406.6125	415.6125
42	406.625	415.625
43	406.6375	415.6375
44	406.650	415.650
45	406.6625	415.6625
46	406.675	415.675
47	406.6875	415.6875
48	406.700	415.700
49	406.7125	415.7125
50	406.725	415.725
51	406.7375	415.7375
52	406.750	415.750
53	406.7625	415.7625
54	406.775	415.775
55	406.7875	415.7875
56	406.800	415.800
57	406.8125	415.8125
58	406.825	415.825
59	406.8375	415.8375
60	406.850	415.850
61	406.8625	415.8625
62	406.875	415.875
63	406.8875	415.8875
64	406.900	415.900
65	406.9125	415.9125
66	406.925	415.925
67	406.9375	415.9375

Table 1: Paired Channels

Channel	Center Frequency	Center Frequency
68	406.950	415.950
69	406.9625	415.9625
70	406.975	415.975
71	406.9875	415.9875
72	407.000	416.000
73	407.0125	416.0125
74	407.025	416.025
75	407.0375	416.0375
76	407.050	416.050
77	407.0625	416.0625
78	407.075	416.075
79	407.0875	416.0875
80	407.100	416.100
81	407.1125	416.1125
82	407.125	416.125
83	407.1375	416.1375
84	407.150	416.150
85	407.1625	416.1625
86	407.175	416.175
87	407.1875	416.1875
88	407.200	416.200
89	407.2125	416.2125
90	407.225	416.225
91	407.2375	416.2375
92	407.250	416.250
93	407.2625	416.2625
94	407.275	416.275
95	407.2875	416.2875
96	407.300	416.300
97	407.3125	416.3125
98	407.325	416.325
99	407.3375	416.3375
100	407.350	416.350
101	407.3625	416.3625

Table 1: Paired Channels

Channel	Center Frequency	Center Frequency
102	407.375	416.375
103	407.3875	416.3875
104	407.400	416.400
105	407.4125	416.4125
106	407.425	416.425
107	407.4375	416.4375
108	407.450	416.450
109	407.4625	416.4625
110	407.475	416.475
111	407.4875	416.4875
112	407.500	416.500
113	407.5125	416.5125
114	407.525	416.525
115	407.5375	416.5375
116	407.550	416.550
117	407.5625	416.5625
118	407.575	416.575
119	407.5875	416.5875
120	407.600	416.600
121	407.6125	416.6125
122	407.625	416.625
123	407.6375	416.6375
124	407.650	416.650
125	407.6625	416.6625
126	407.675	416.675
127	407.6875	416.6875
128	407.700	416.700
129	407.7125	416.7125
130	407.725	416.725
131	407.7375	416.7375
132	407.750	416.750
133	407.7625	416.7625
134	407.775	416.775
135	407.7875	416.7875

Table 1: Paired Channels		
Channel	**Center Frequency**	**Center Frequency**
136	407.800	416.800
137	407.8125	416.8125
138	407.825	416.825
139	407.8375	416.8375
140	407.850	416.850
141	407.8625	416.8625
142	407.875	416.875
143	407.8875	416.8875
144	407.900	416.900
145	407.9125	416.9125
146	407.925	416.925
147	407.9375	416.9375
148	407.950	416.950
149	407.9625	416.9625
150	407.975	416.975
151	407.9875	416.9875
152	408.000	417.000
153	408.0125	417.0125
154	408.025	417.025
155	408.0375	417.0375
156	408.050	417.050
157	408.0625	417.0625
158	408.075	417.075
159	408.0875	417.0875
160	408.100	417.100
161	408.1125	417.1125
162	408.125	417.125
163	408.1375	417.1375
164	408.150	417.150
165	408.1625	417.1625
166	408.175	417.175
167	408.1875	417.1875
168	408.200	417.200
169	408.2125	417.2125

Table 1: Paired Channels		
Channel	**Center Frequency**	**Center Frequency**
170	408.225	417.225
171	408.2375	417.2375
172	408.250	417.250
173	408.2625	417.2625
174	408.275	417.275
175	408.2875	417.2875
176	408.300	417.300
177	408.3125	417.3125
178	408.325	417.325
179	408.3375	417.3375
180	408.350	417.350
181	408.3625	417.3625
182	408.375	417.375
183	408.3875	417.3875
184	408.400	417.400
185	408.4125	417.4125
186	408.425	417.425
187	408.4375	417.4375
188	408.450	417.450
189	408.4625	417.4625
190	408.475	417.475
191	408.4875	417.4875
192	408.500	417.500
193	408.5125	417.5125
194	408.525	417.525
195	408.5375	417.5375
196	408.550	417.550
197	408.5625	417.5625
198	408.575	417.575
199	408.5875	417.5875
200	408.600	417.600
201	408.6125	417.6125
202	408.625	417.625
203	408.6375	417.6375

Table 1: Paired Channels		
Channel	**Center Frequency**	**Center Frequency**
204	408.650	417.650
205	408.6625	417.6625
206	408.675	417.675
207	408.6875	417.6875
208	408.700	417.700
209	408.7125	417.7125
210	408.725	417.725
211	408.7375	417.7375
212	408.750	417.750
213	408.7625	417.7625
214	408.775	417.775
215	408.7875	417.7875
216	408.800	417.800
217	408.8125	417.8125
218	408.825	417.825
219	408.8375	417.8375
220	408.850	417.850
221	408.8625	417.8625
222	408.875	417.875
223	408.8875	417.8875
224	408.900	417.900
225	408.9125	417.9125
226	408.925	417.925
227	408.9375	417.9375
228	408.950	417.950
229	408.9625	417.9625
230	408.975	417.975
231	408.9875	417.9875
232	409.000	418.000
233	409.0125	418.0125
234	409.025	418.025
235	409.0375	418.0375
236	409.050	418.050
237	409.0625	418.0625

Table 1: Paired Channels

Channel	Center Frequency	Center Frequency
238	409.075	418.075
239	409.0875	418.0875
240	409.100	418.100
241	409.1125	418.1125
242	409.125	418.125
243	409.1375	418.1375
244	409.150	418.150
245	409.1625	418.1625
246	409.175	418.175
247	409.1875	418.1875
248	409.200	418.200
249	409.2125	418.2125
250	409.225	418.225
251	409.2375	418.2375
252	409.250	418.250
253	409.2625	418.2625
254	409.275	418.275
255	409.2875	418.2875
256	409.300	418.300
257	409.3125	418.3125
258	409.325	418.325
259	409.3375	418.3375
260	409.350	418.350
261	409.3625	418.3625
262	409.375	418.375
263	409.3875	418.3875
264	409.400	418.400
265	409.4125	418.4125
266	409.425	418.425
267	409.4375	418.4375
268	409.450	418.450
269	409.4625	418.4625
270	409.475	418.475
271	409.4875	418.4875

Table 1: Paired Channels

Channel	Center Frequency	Center Frequency
272	409.500	418.500
273	409.5125	418.5125
274	409.525	418.525
275	409.5375	418.5375
276	409.550	418.550
277	409.5625	418.5625
278	409.575	418.575
279	409.5875	418.5875
280	409.600	418.600
281	409.6125	418.6125
282	409.625	418.625
283	409.6375	418.6375
284	409.650	418.650
285	409.6625	418.6625
286	409.675	418.675
287	409.6875	418.6875
288	409.700	418.700
289	409.7125	418.7125
290	409.725	418.725
291	409.7375	418.7375
292	409.750	418.750
293	409.7625	418.7625
294	409.775	418.775
295	409.7875	418.7875
296	409.800	418.800
297	409.8125	418.8125
298	409.825	418.825
299	409.8375	418.8375
300	409.850	418.850
301	409.8625	418.8625
302	409.875	418.875
303	409.8875	418.8875
304	409.900	418.900
305	409.9125	418.9125

Table 1: Paired Channels

Channel	Center Frequency	Center Frequency
306	409.925	418.925
307	409.9375	418.9375
308	409.950	418.950
309	409.9625	418.9625
310	409.975	418.975
311	409.9875	418.9875
312	410.000	419.000
313	410.0125	419.0125
314	410.025	419.025
315	410.0375	419.0375
316	410.050	419.050
317	410.0625	419.0625
318	410.075	419.075
319	410.0875	419.0875
320	410.100	419.100
321	410.1125	419.1125
322	410.125	419.125
323	410.1375	419.1375
324	410.150	419.150
325	410.1625	419.1625
326	410.175	419.175
327	410.1875	419.1875
328	410.200	419.200
329	410.2125	419.2125
330	410.225	419.225
331	410.2375	419.2375
332	410.250	419.250
333	410.2625	419.2625
334	410.275	419.275
335	410.2875	419.2875
336	410.300	419.300
337	410.3125	419.3125
338	410.325	419.325
339	410.3375	419.3375

Table 1: Paired Channels		
Channel	**Center Frequency**	**Center Frequency**
340	410.350	419.350
341	410.3625	419.3625
342	410.375	419.375
343	410.3875	419.3875
344	410.400	419.400
345	410.4125	419.4125
346	410.425	419.425
347	410.4375	419.4375
348	410.450	419.450
349	410.4625	419.4625
350	410.475	419.475
351	410.4875	419.4875
352	410.500	419.500
353	410.5125	419.5125
354	410.525	419.525
355	410.5375	419.5375
356	410.550	419.550
357	410.5625	419.5625
358	410.575	419.575
359	410.5875	419.5875
360	410.600	419.600
361	410.6125	419.6125
362	410.625	419.625
363	410.6375	419.6375
364	410.650	419.650
365	410.6625	419.6625
366	410.675	419.675
367	410.6875	419.6875
368	410.700	419.700
369	410.7125	419.7125
370	410.725	419.725
371	410.7375	419.7375
372	410.750	419.750
373	410.7625	419.7625

Table 1: Paired Channels		
Channel	**Center Frequency**	**Center Frequency**
374	410.775	419.775
375	410.7875	419.7875
376	410.800	419.800
377	410.8125	419.8125
378	410.825	419.825
379	410.8375	419.8375
380	410.850	419.850
381	410.8625	419.8625
382	410.875	419.875
383	410.8875	419.8875
384	410.900	419.900
385	410.9125	419.9125
386	410.925	419.925
387	410.9375	419.9375
388	410.950	419.950
389	410.9625	419.9625
390	410.975	419.975
391	410.9875	419.9875

Table 2: Single Channels	
Channel	**Center Frequency**
392	411.000
393	411.0125
394	411.025
395	411.0375
396	411.050
397	411.0625
398	411.075
399	411.0875
400	411.100
401	411.1125
402	411.125
403	411.1375
404	411.150
405	411.1625
406	411.175
407	411.1875
408	411.200
409	411.2125
410	411.225
411	411.2375
412	411.250
413	411.2625
414	411.275
415	411.2875
416	411.300
417	411.3125
418	411.325
419	411.3375
420	411.350
421	411.3625
422	411.375
423	411.3875
424	411.400
425	411.4125
426	411.425
427	411.4375
428	411.450

Table 2: Single Channels	
Channel	**Center Frequency**
429	411.4625
430	411.475
431	411.4875
432	411.500
433	411.5125
434	411.525
435	411.5375
436	411.550
437	411.5625
438	411.575
439	411.5875
440	411.600
441	411.6125
442	411.625
443	411.6375
444	411.650
445	411.6625
446	411.675
447	411.6875
448	411.700
449	411.7125
450	411.725
451	411.7375
452	411.750
453	411.7625
454	411.775
455	411.7875
456	411.800
457	411.8125
458	411.825
459	411.8375
460	411.850
461	411.8625
462	411.875
463	411.8875
464	411.900
465	411.9125

Table 2: Single Channels	
Channel	**Center Frequency**
466	411.925
467	411.9375
468	411.950
469	411.9625
470	411.975
471	411.9875
472	412.000
473	412.0125
474	412.025
475	412.0375
476	412.050
477	412.0625
478	412.075
479	412.0875
480	412.100
481	412.1125
482	412.125
483	412.1375
484	412.150
485	412.1625
486	412.175
487	412.1875
488	412.200
489	412.2125
490	412.225
491	412.2375
492	412.250
493	412.2625
494	412.275
495	412.2875
496	412.300
497	412.3125
498	412.325
499	412.3375
500	412.350
501	412.3625
502	412.375

Table 2: Single Channels	
Channel	**Center Frequency**
503	412.3875
504	412.400
505	412.4125
506	412.425
507	412.4375
508	412.450
509	412.4625
510	412.475
511	412.4875
512	412.500
513	412.5125
514	412.525
515	412.5375
516	412.550
517	412.5625
518	412.575
519	412.5875
520	412.600
521	412.6125
522	412.625
523	412.6375
524	412.650
525	412.6625
526	412.675
527	412.6875
528	412.700
529	412.7125
530	412.725
531	412.7375
532	412.750
533	412.7625
534	412.775
535	412.7875
536	412.800
537	412.8125
538	412.825
539	412.8375

Table 2: Single Channels	
Channel	**Center Frequency**
540	412.850
541	412.8625
542	412.875
543	412.8875
544	412.900
545	412.9125
546	412.925
547	412.9375
548	412.950
549	412.9625
550	412.975
551	412.9875
552	413.000
553	413.0125
554	413.025
555	413.0375
556	413.050
557	413.0625
558	413.075
559	413.0875
560	413.100
561	413.1125
562	413.125
563	413.1375
564	413.150
565	413.1625
566	413.175
567	413.1875
568	413.200
569	413.2125
570	413.225
571	413.2375
572	413.250
573	413.2625
574	413.275
575	413.2875
576	413.300

Table 2: Single Channels	
Channel	**Center Frequency**
577	413.3125
578	413.325
579	413.3375
580	413.350
581	413.3625
582	413.375
583	413.3875
584	413.400
585	413.4125
586	413.425
587	413.4375
588	413.450
589	413.4625
590	413.475
591	413.4875
592	413.500
593	413.5125
594	413.525
595	413.5375
596	413.550
597	413.5625
598	413.575
599	413.5875
600	413.600
601	413.6125
602	413.625
603	413.6375
604	413.650
605	413.6625
606	413.675
607	413.6875
608	413.700
609	413.7125
610	413.725
611	413.7375
612	413.750
613	413.7625

Table 2: Single Channels	
Channel	**Center Frequency**
614	413.775
615	413.7875
616	413.800
617	413.8125
618	413.825
619	413.8375
620	413.850
621	413.8625
622	413.875
623	413.8875
624	413.900
625	413.9125
626	413.925
627	413.9375
628	413.950
629	413.9625
630	413.975
631	413.9875
632	414.000
633	414.0125
634	414.025
635	414.0375
636	414.050
637	414.0625
638	414.075
639	414.0875
640	414.100
641	414.1125
642	414.125
643	414.1375
644	414.150
645	414.1625
646	414.175
647	414.1875
648	414.200
649	414.2125
650	414.225

Table 2: Single Channels	
Channel	**Center Frequency**
651	414.2375
652	414.250
653	414.2625
654	414.275
655	414.2875
656	414.300
657	414.3125
658	414.325
659	414.3375
660	414.350
661	414.3625
662	414.375
663	414.3875
664	414.400
665	414.4125
666	414.425
667	414.4375
668	414.450
669	414.4625
670	414.475
671	414.4875
672	414.500
673	414.5125
674	414.525
675	414.5375
676	414.550
677	414.5625
678	414.575
679	414.5875
680	414.600
681	414.6125
682	414.625
683	414.6375
684	414.650
685	414.6625
686	414.675
687	414.6875

688	414.700
689	414.7125
690	414.725
691	414.7375
692	414.750
693	414.7625
694	414.775
695	414.7875
696	414.800
697	414.8125
698	414.825
699	414.8375
700	414.850
701	414.8625
702	414.875
703	414.8875
704	414.900
705	414.9125
706	414.925
707	414.9375
708	414.950
709	414.9625
710	414.975
711	414.9875
712	415.000
713	415.0125
714	415.025
715	415.0375
716	415.050
717	415.0625
718	415.075
719	415.0875
720	415.100

4.3.10 Reserved

4.3.11 Plan for Bio-Medical Telemetry and Medical Radiocommunication

BIO-MEDICAL TELEMETRY ONLY

38-41 MHz	See Annex K
174-216 MHz	See Annex K
460.650-460.875 MHz	See US209 in Section 4.1.3
465.650-465.875 MHz	See US209 in Section 4.1.3

MEDICAL RADIOCOMMUNICATION

The following frequencies may be authorized for the purpose of conducting radio operations for the delivery or rendition of medical services to individuals, subject to the indicated limitations.

Frequency (MHz)	Class of Station(s)	Limitation
150.775	Base and Mobile	1
150.790	Base and Mobile	1
152.0075	Base	2
163.250	Base	2
462.950	Base and Mobile	3,5
462.975	Base and Mobile	3,5
463.000	Base and Mobile	3,4,6,7
463.025	Base and Mobile	3,4,6,7
463.050	Base and Mobile	3,4,6,7
463.075	Base and Mobile	3,4,7,8
463.100	Base and Mobile	3,4,7,8
463.125	Base and Mobile	3,4,7,8
463.150	Base and Mobile	3,4,7,8
463.175	Base and Mobile	3,4,7,8
467.950	Mobile Only	3,5,9
467.975	Mobile Only	3,5,9
468.000	Mobile Only	3,4,6,7,9
468.025	Mobile Only	3,4,6,7,9
468.050	Mobile Only	3,4,6,7,9
468.075	Mobile Only	3,4,6,7,9
468.100	Mobile Only	3,4,6,7,9
468.125	Mobile Only	3,4,6,7,9
468.150	Mobile Only	3,4,6,7,9
468.175	Mobile Only	3,4,6,7,9

1. This frequency may be authorized for base (FB or FC), mobile (ML or MS), mobile repeater (MLR), and for fixed (FX) operations to access a repeater which retransmits on a different frequency. This frequency shall be authorized for both federal and non-federal use with a maximum Effective Radiated Power (ERP) of 100 watts. Airborne operations on this frequency are prohibited. The fixed station classes included in this limitation are in addition to those mentioned in US216 (A).

2. This frequency may be authorized only for one-way paging communications to mobile receivers. Transmissions for the purpose of activating or controlling remote objects on this frequency will not be authorized.

3. For two-frequency systems, separation between base and mobile transmit frequencies is 5 MHz.

4. For applications for new radio systems received after August 15, 1974, the eight frequency pairs listed below will be assigned in a block for shared operations subject to the following:

a. For uniformity in usage, these frequency pairs may be referred to by channel name, as follows:

Base and Mobile MHz	Mobile Only MHz	Channel Name
463.000	468.000	MED-ONE
463.025	468.025	MED-TWO
463.050	468.050	MED-THREE
463.075	468.075	MED-FOUR
463.100	468.100	MED-FIVE
463.125	468.125	MED-SIX
463.150	468.150	MED-SEVEN
463.175	468.175	MED-EIGHT

b. Except as provided in subparagraphs e. and f. of this paragraph, mobile or portable stations must employ equipment which is both wired and equipped to transmit/receive, respectively, on each of these eight frequency pairs.

c. Except as provided in subparagraph f. of this paragraph, base and fixed stations[5] must employ equipment which is both wired and equipped to transmit/receive, respectively, on at least four (three, if bio-medical telemetry operation is not employed in the system) of these eight frequency pairs.

d. Multi-channel equipment requirements for use of these frequency pairs are intended to afford capability for alternating use of the individual frequencies, and ability to conduct simultaneous operations is not required. These requirements may be met in a single equipment unit or in any combination of equipment units suitable to the applicant's operations.

e. Portable (hand-held) units operated with a maximum output power of 2.5 watts are exempted from the multi-channel equipment requirements specified in subparagraph c. of this paragraph.

f. Stations located in the Canadian coordination zone (see Part 3.4), will be required to meet multi-channel equipment requirements only for those frequencies up to the number specified in subparagraphs b. and c. of this paragraph which have been assigned to the licensee after coordination with Canada in accordance with the applicable US-Canada agreement.

5. This frequency may be authorized for the dispatch of medical-care vehicles and personnel for the rendition or delivery of medical services. Central-dispatch operations serving multisystem requirements in an area-wide medical radio communications plan may be authorized and may include the designation of this frequency for intra-system and inter-system mutual assistance purposes.

6. This frequency may be authorized on a primary basis for operations in bio-medical telemetry systems. F1D, F2D, and F3E emissions may be authorized. On a secondary basis, subject to noninterference to bio-medical telemetry systems, this frequency may be authorized for the transmission of messages related to the efficient administration of organizations and facilities engaged in medical services operations.

7. The continuous carrier mode of operation may be authorized for use of telemetry emission on this frequency.

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[5] As indicated in Limitation 9, Section 4.3.11, transmissions by fixed stations are limited to the control of base station repeaters.

8. This frequency may be authorized on a primary basis for communications, between medical facilities, vehicles, and personnel, related to medical supervision and instruction for treatment and transport of patients in the rendition or delivery of medical services. F2D and F3E emissions may be authorized. On a secondary basis, subject to noninterference to the foregoing types of operations, this frequency may be authorized for the transmission of messages related to the efficient administration of organizations and facilities engaged in medical services operations and for bio-medical telemetry transmissions, including the use of F1D emission.

9. This frequency may be assigned to a fixed station for the control of a base station repeater (FBR) if it is also assigned to the associated mobile station. Fixed stations operating on this frequency shall comply with the following requirements if they are located within 120 kilometers of the center of urbanized areas of 200,000 or more population.

a. If the station is used to control one or more base station repeaters located within 45 degrees of azimuth, a directional antenna having a front-to-back ratio of at least 15 dB shall be used at the fixed station. For other situations, where a directional antenna cannot be used, a cardioid, bi-directional or omni-directional antenna may be employed. In each case, the antenna used must, consistent with reasonable design, produce a radiation pattern that provides only the coverage necessary to permit satisfactory control of each base station repeater and limit radiation in other directions to the extent feasible.

b. The strength of the signal of a fixed station, controlling a single base station repeater, may not exceed by more than 6 dB, at the antenna terminal of the base station repeater receiver, the signal strength produced there by a unit of the associated mobile station. When the station controls more than one base station repeater, the 6 dB control-to-mobile signal difference need be verified at only one of the base station repeater sites. The measurement of the signal strength of the mobile unit must be made when such unit is transmitting from the fixed station location or, if that is not practical, from a location within 400 meters of the fixed station site.

c. Each application for a fixed station to be authorized under the provisions of this paragraph shall be accompanied by a statement certifying that the output power of the proposed station transmitter will be adjusted to comply with the foregoing signal level limitation. Records of the measurements used to determine the signal ratio shall be kept with the station records and shall be made available for inspection upon request.

d. Urbanized areas of 200,000 or more population are defined in the U.S. Census Population, 1960, Vol. 1, Table 23, Page 50. The centers of urbanized areas are determined from the Appendix, page 226, of the U.S. Commerce publication "Air Line Distance Between Cities in the United States."

4.3.12 Channeling Plan for Assignments in the Fixed Service in the 14500.0 to 14714.5 and 15136.5 to 15350.0 MHz

1. The following channeling plan became effective on January 1, 1982, for all assignments in the Fixed Service.

2. Existing assignments as of January 1, 1982 in the Fixed Service which are in the bands 14500.0 to 14714.5 MHz and 15136.5 to 15350.0 MHz that are not in compliance with the channeling plan may be retained until January 1, 1997. However, if existing equipment is replaced prior to January 1, 1997, assignments for the replaced equipment must be in accordance with the channeling plan.

3. This channeling plan is only applicable to assignments in the Fixed Service in the bands 14500.0 to 14714.5 and 15136.5 to 15350.0 MHz. The assigned frequency shall be chosen such that the frequency "2 of its necessary bandwidth shall not extend beyond the upper or lower limits of bands indicated herein. A general breakdown of these bands is:

a. For emission bandwidths equal to or greater than 3.5 MHz:
14500.0 to 14710.0 MHz
15140.0 to 15350.0 MHz

b. For emission bandwidths less than 3.5 MHz:
14710.0 to 14714.5 MHz
15136.5 to 15140.0 MHz

4. Criteria for assignments in the Fixed Service with emission bandwidths equal to or greater than 3.5 MHz:

a. The assigned frequency must center on one of the frequencies given in Table 1.

b. Multiple contiguous channels are to be used for emission bandwidths of 3.5 MHz or greater.

c. In order to promote uniformity and to establish a natural guard band, it is strongly urged that frequencies be selected in pairs from the bands 14500.0 to 14710.0 and 15140.0 to 15350.0 on an equal basis.

5. Criteria for assignments in the Fixed Service with emission bandwidth of less than 3.5 MHz:

a. Assignments in the Fixed Service with emission bandwidths of less than 3.5 MHz are restricted to the bands:
14710.0 to 14714.5 MHz
and
15136.5 to 15140.0 MHz

b. Narrowband assignments, those with less than 3.5 MHz of necessary bandwidth, shall not be made in the bands 14500.0 to 14710.0 and 15140.0 to 15350.0 MHz.

Table 1. Center Frequencies (MHz) of 2.5 MHz Channels in the Bands 14500.0-14714.5 MHz and 15136.5-15350.0 MHz

14500.0-14714.5 MHz	15136.5-15350.0 MHz
*14501.25	*15141.25
14503.75	15143.75
14506.25	15146.25
14508.75	15148.75
14511.25	15151.25
14513.75	15153.75
14516.25	15156.25
14518.75	15158.75
14521.25	15161.25
14523.75	15163.75
14526.25	15166.25
14528.75	15168.75
14531.25	15171.25
14533.75	15173.75
14536.25	15176.25
14538.75	15178.75
14541.25	15181.25
14543.75	15183.75
14546.25	15186.25
14548.75	15188.75
14551.25	15191.25
14553.75	15193.75
14556.25	15196.25

Table 1. Center Frequencies (MHz) of 2.5 MHz Channels in the Bands 14500.0-14714.5 MHz and 15136.5-15350.0 MHz

14500.0-14714.5 MHz	15136.5-15350.0 MHz
14558.75	15198.75
14561.25	15201.25
14563.75	15203.75
14566.25	15206.25
14568.75	15208.75
14571.25	15211.25
14573.75	15213.75
14576.25	15216.25
14578.75	15218.75
14581.25	15221.25
14583.75	15223.75
14586.25	15226.25
14588.75	15228.75
14591.25	15231.25
14593.75	15233.75
14596.25	15236.25
14598.75	15238.75
14601.25	15241.25
14603.75	15243.75
14606.25	15246.25
14608.75	15248.75
14611.25	15251.25
14613.75	15253.75

Table 1. Center Frequencies (MHz) of 2.5 MHz Channels in the Bands 14500.0-14714.5 MHz and 15136.5-15350.0 MHz	
14500.0-14714.5 MHz	**15136.5-15350.0 MHz**
14616.25	15256.25
14618.75	15258.75
14621.25	15261.25
14623.75	15263.75
14626.25	15266.25
14628.75	15268.75
14631.25	15271.25
14633.75	15273.75
14636.25	15276.25
14638.75	15278.75
14641.25	15281.25
14643.75	15283.75
14646.25	15286.25
14648.75	15288.75
14651.25	15291.25
14653.75	15293.75
14656.25	15296.25
14658.75	15298.75
14661.25	15301.25
14663.75	15303.75
14666.25	15306.25
14668.75	15308.75
14671.25	15311.25
14673.75	15313.75
14676.25	15316.25
14678.75	15318.75
14681.25	15321.25
14683.75	15323.75
14686.25	15326.25
14688.75	15328.75
14691.25	15331.25
14693.75	15333.75
14696.25	15336.25
14698.75	15338.75
14701.25	15341.25
14703.75	15343.75
14706.25	15346.25
*14708.75	*15348.75
* These channels cannot be used for bandwidths greater than 2.5 MHz. Total number of channels available--168.	

4.3.13 Channeling Plan for Assignments in the Maritime Mobile Service in the Bands 4000-4063 and 8100-8195 kHz

1. For the band 4000-4063 kHz:

a. Frequency assignments for ship stations in the band 4000-4063 kHz must conform to the channeling plan shown below in accordance with Appendix **17** Part B Section I, Sub-Section C-1, of the International Radio Regulations.

b. Frequencies may be used by ship stations:

- or supplementing ship-to-shore channels for duplex operation with coast station channels listed in Table 1 of Annex H;
- for intership simplex (single-frequency) operation;
- for duplex operation with coast stations working in the band 4438-4650 kHz;
- for duplex operation with Channel Nos. 428 and 429 of Table 1, Annex H.

Table. Recommended Single-Sideband Transmitting Frequencies (in kHz) for Ship Stations in the Band 4000-4063 kHz

Channel No.	Carrier Frequency	Assigned Frequency
1	4000	4001.4
2	4003	4004.4
3	4006	4007.4
4	4009	4010.4
5	4012	4013.4
6	4015	4016.4
7	4018	4019.4
8	4021	4022.4
9	4024	4025.4
10	4027	4028.4
11	4030	4031.4
12	4033	4034.4
13	4036	4037.4
14	4039	4040.4
15	4042	4043.4
16	4045	4046.4
17	4048	4049.4
18	4051	4052.4
19	4054	4055.4
20	4057	4058.4
21	4060	4061.4*

* Effective 1 July 1991, in the maritime mobile service, this frequency is available exclusively for non-Federal use.

2. For the band 8100-8195 kHz:

a. Frequency assignments for maritime mobile stations in the band 8100-8195 kHz must conform to the channeling plan show below in accordance with Appendix 17 Part B Section I, Sub-Section C-2, of the International Radio Regulations.

b. Frequencies may be used by maritime mobile stations:

- for supplementing ship-to-shore channels for duplex operation with coast station channels listed in Table 1 of Annex H;
- for intership simplex (single-frequency) operations;
- for ship-to-shore or shore-to-ship simplex operations;
- for duplex operation with Channel Nos. 834, 835, 836 and 837 of Table 1, Annex H.

Table. Recommended Single-Sideband Transmitting Frequencies (in kHz) for Ship and Coast Stations in the Band 8100-8195 kHz

Channel No.	Carrier Frequency	Assigned Frequency
1	8101	8102.4
2	8104	8105.4
3	8107	8108.4
4	8110	8111.4
5	8113	8114.4*
6	8116	8117.4
7	8119	8120.4
8	8122	8123.4
9	8125	8126.4
10	8128	8129.4*
11	8131	8132.4
12	8134	8135.4
13	8137	8138.4
14	8140	8141.4
15	8143	8144.4
16	8146	8147.4
17	8149	8150.4
18	8152	8153.4
19	8155	8156.4
20	8158	8159.4
21	8161	8162.4
22	8164	8165.4
23	8167	8168.4
24	8170	8171.4
25	8173	8174.4
26	8176	8177.4
27	8179	8180.4
28	8182	8183.4
29	8185	8186.4
30	8188	8189.4
31	8191	8192.4

* Effective 1 July 1991, in the maritime mobile service, this frequency is available exclusively for non-Federal use.

4.3.14 Channeling Plan for Assignments in the Fixed Service in the Bands 932.4-935 MHz and 941.4-944 MHz

This plan is a guide for identifying the center frequencies of those paired frequencies that normally are used for assignments with a necessary bandwidth that can be accommodated within 12.5, 25, 50, 100 and 200 kHz. Transportable Operations are not permitted in the point-to-point bands 932.5-935.0 and 941.5-944.0 MHz. To permit flexibility, applicants for either point-to-point or point-to-multipoint channels will be permitted to combine channels upon a showing that there is a need and sufficient frequencies are available to permit this. Applicants may split channels if they choose to do so. The

frequencies listed in this plan are shared with non-Federal users, and applications for assignment from Federal users are subject to coordination with non-Federal users prior to NTIA approval.

CONDITIONS AND LIMITATIONS

1. Point-to-Multipoint Assignments:

Table 1 contains a list of five pairs of frequencies that are designated for use only in fixed point-to-multipoint assignments operating with a necessary bandwidth of 12.5 kHz or less.

a. For paired frequency operations the 941.4-941.5 MHz frequencies will be used to transmit to the multipoint receiving stations, and the 932.4-932.5 MHz frequencies will be used for reverse link communications.

b. Unpaired, single frequency, one-way point-to-multipoint operations are permitted, using either of the paired frequencies. However, when the multipoint receiving stations are located less than 48 kilometers (30 miles) from the transmitting station, frequencies from the 932-932.5 MHz band must be used.

c. Point-to-point use of the 932.4-932.5 MHz frequencies will be permitted but only when the transmission is relayed by a station transmitting in the 941.4-941.5 MHz band.

d. Frequencies will be used so as to facilitate communications on an interference-free basis in each operational/service area. In order to facilitate maximum reuse of frequencies, stations separated by 113 kilometers (70 miles) or more, and operating on the same frequency (co-channel), will be considered as interference free (see also Section 8.2.16). However, at distances of less than 113 km, reuse of a frequency (co-channel) will be permitted only upon providing evidence that the operation will not cause harmful interference to existing users.

e. Equivalent power and antenna-height restrictions:

Antenna Height in Meters	**Maximum Effective Radiated Power**	
	In Watts	**In dBm**
152.5 and below	1,000	60
Above 152.5 up to 182	630	58
Above 182 up to 213	500	57
Above 213 up to 244	400	56
Above 244 up to 274	315	55
Above 274 up to 305	250	54
Above 305	200	53

2. Point-to-Point Assignments:

Table 2 contains a list of thirty pairs of frequencies that are designated for two-way use in fixed point-to-point operations with a necessary bandwidth of 200 kHz or less. Frequencies shall be selected in pairs. However, unpaired frequency use, or single frequency one-way use, will be permitted, but only upon showing that spectrum is not available in other bands and that paired use will not be adversely affected.

EXCEPTIONS

Exceptions to the above conditions and limitations will be considered by the FAS on a case-by-case basis.

TABLE 1. Paired Frequencies for Point-to-Multipoint Assignments (12.5 kHz Bandwidth)	
MHz	**MHz**
932.44375	941.44375
932.45625	941.45625
932.46875	941.46875
932.48125	941.48125
932.49375	941.49375

TABLE 2. Paired Frequencies for Point-to-Point Assignments							
25 kHz Bandwidth Pairs		**50 kHz Bandwidth Pairs**		**100 kHz Bandwidth Pairs**		**200 kHz Bandwidth Pairs**	
MHz	**MHz**	**MHz**	**MHz**	**MHz**	**MHz**	**MHz**	**MHz**
932.5125	941.5125	932.7000	941.7000	932.8250	941.8250	933.1750	942.1750
932.5375	941.5375	932.7500	941.7500	932.9250	941.9250	933.3750	942.3750
932.5625	941.5625	934.8000	943.8000	933.0250	942.0250	933.5750	942.5750
932.5875	941.5875			934.5250	943.5250	933.7750	942.7750
932.6125	941.6125			934.6250	943.6250	933.9750	942.9750
932.6375	941.6375			934.7250	943.7250	934.1750	943.1750
932.6625	941.6625					934.3750	943.3750
934.8375	943.8375						
934.8625	943.8625						
934.8875	943.8875						
934.9125	943.9125						
934.9375	943.9375						
934.9625	943.9625						
934.9875	943.9875						

4.3.15 Channeling Plan for Land Mobile Assignments in the Band 220-222 MHz

The following channeling plan is composed of 200 frequency pairs for shared Federal/non-Federal land-mobile operations with necessary bandwidths less than or equal to 4 kHz. Of these 200 channel pairs, 60 pairs are for nationwide use and 140 pairs are for shared local use. Of the 60 nationwide channel pairs, 10 are for exclusive Federal use and 50 are for exclusive non-Federal use. Of the 140 shared local-use channel pairs, 100 are available for trunked operations or other operations of equivalent or greater efficiency, 20 are set aside for data only operations until March 31, 2000, 10 are available for public safety/mutual aid, and the remaining 10 channel pairs have no restrictions on use.

The following table indicates the channel designations of frequencies (channel number, base station frequency and function) available for assignment under the following conditions:

1) Frequencies shall be assigned in pairs, with base station frequencies taken from the 220-221 MHz band, corresponding mobile frequencies being 1 MHz higher, taken from the 221-222 MHz band.

2) Only the lower half of the frequency pairs is listed in the table.

TABLE OF 220-222 MHz CHANNEL DESIGNATIONS

(Channel Number, Base Frequency in MHz and Function)

Trunked Systems (See next paragraph for Trunked Channel Groups)			
Ch. #	**Base Frequency (in MHz)**	**Ch. #**	**Base Frequency (in MHz)**
1	220.0025	11	.0525
2	.0075	12	.0575
3	.0125	13	.0625
4	.0175	14	.0675
5	.0225	15	.0725
6	.0275	16	.0775
7	.0325	17	.0825
8	.0375	18	.0875
9	.0425	19	.0925
10	.0475	20	.0975

Non-Federal Nationwide System			
Ch. #	**Base Frequency (in MHz)**	**Ch. #**	**Base Frequency (in MHz)**
21	220.1025	26	220.1275
22	.1075	27	.1325
23	.1125	28	.1375
24	.1175	29	.1425
25	.1225	30	.1475

Trunked Systems (See next paragraph for Trunked Channel Groups)			
Ch. #	**Base Frequency (in MHz)**	**Ch. #**	**Base Frequency (in MHz)**
31	220.1525	41	220.2025
32	.1575	42	.2075
33	.1625	43	.2125
34	.1675	44	.2175
35	.1725	45	.2225
36	.1775	46	.2275
37	.1825	47	.2325
38	.1875	48	.2375
39	.1925	49	.2425
40	.1975	50	.2475

Non-Federal Nationwide Systems			
Ch. #	**Base Frequency (in MHz)**	**Ch. #**	**Base Frequency (in MHz)**
51	220.2525	56	.2775
52	.2575	57	.2825
53	.2625	58	.2875
54	.2675	59	.2925
55	.2725	60	.2975

Trunked Systems			
Ch. #	**Base Frequency (in MHz)**	**Ch. #**	**Base Frequency (in MHz)**
61	220.3025	71	.3525
62	.3075	72	.3575
63	.3125	75	.3625
64	.3175	74	.3675
65	.3225	75	.3725
66	.3275	76	.3775
67	.3325	77	.3825
68	.3375	78	.3875
69	.3425	79	.3925
70	.3475	80	.3975

Non-Federal Nationwide Systems			
Ch. #	**Base Frequency (in MHz)**	**Ch. #**	**Base Frequency (in MHz)**
81	220.4025	86	.4275
82	.4075	87	.4325
83	.4125	88	.4375
84	.4175	89	.4425
85	.4225	90	.4475

Trunked Systems			
Ch. #	**Base Frequency (in MHz)**	**Ch. #**	**Base Frequency (in MHz)**
91	220.4525	101	.5025
92	.4575	102	.5075
93	.4625	103	.5125
94	.4675	104	.5175
95	.4725	105	.5225
96	.4775	106	.5275
97	.4825	107	.5325
98	.4875	108	.5375
99	.4925	109	.5425
100	.4975	110	.5475

Federal Nationwide Systems			
Ch. #	**Base Frequency (in MHz)**	**Ch. #**	**Base Frequency (in MHz)**
111	220.5525	116	220.5775
112	.5575	117	.5825
113	.5625	118	.5875
114	.5675	119	.5925
115	.5725	120	.5975

Trunked Systems			
Ch. #	**Base Frequency (in MHz)**	**Ch. #**	**Base Frequency (in MHz)**
121	220.6025	131	220.6525
122	.6075	132	.6575
123	.6125	133	.6625
124	.6175	134	.6675
125	.6225	135	.6725
126	.6275	136	.6775
127	.6325	137	.6825
128	.6375	138	.6875
129	.6425	139	.6925
130	.6475	140	.6975

Non-Federal Nationwide Systems			
Ch. #	**Base Frequency (in MHz)**	**Ch. #**	**Base Frequency (in MHz)**
141	220.7025	151	.7525
142	.7075	152	.7575
143	.7125	153	.7625
144	.7175	154	.7675
145	.7225	155	.7725
146	.7275	156	.7775
147	.7325	157	.7825
148	.7375	158	.7875
149	.7425	159	.7925
150	.7475	160	.7975

Public Safety/Mutual Air Operations			
Ch. #	**Base Frequency (in MHz)**	**Ch. #**	**Base Frequency (in MHz)**
161	220.8025	166	220.8275
162	.8075	167	.8325
163	.8125	168	.8375
164	.8175	169	.8425
165	.8225	170	.8475

Available for any use			
Ch. #	**Base Frequency (in MHz)**	**Ch. #**	**Base Frequency (in MHz)**
171	220.8525	176	220.8775
172	.8575	177	.8825
173	.8625	178	.8875
174	.8675	179	.8925
175	.8725	180	.8975

Data Operations (See Note *)			
Ch. #	**Base Frequency (in MHz)**	**Ch. #**	**Base Frequency (in MHz)**
181	220.9025	191	220.9525
182	.9075	192	.9575
183	.9125	193	.9625
184	.9175	194	.9675
185	.9225	195	.9725
186	.9275	196	.9775
187	.9325	197	.9825
188	.9375	198	.9875
189	.9425	199	.9925
190	.9475	200	.9975

Note: Channels 181-185 and 196-200 are indefinitely reserved until further FCC action and are not currently available for assignment or use.

Trunked Channel Groups

The channel groups listed in the following Table are available to both Federal and non-Federal applicants for trunked operations.

Table - Trunked Channel Groups			
Group #	**Channel #**	**Group #**	**Channel #**
1	1-31-61-91-121	11	11-41-71-101-131
2	2-32-62-92-122	12	12-42-72-102-132
3	3-33-63-93-123	14	14-44-74-104-134
4	4-34-64-94-124	15	15-45-75-105-135
5	5-35-65-95-125	16	16-46-76-106-136
6	6-36-66-96-126	11	11-41-71-101-131
7	7-37-67-97-127	17	17-47-77-107-137
8	8-38-68-98-128	18	18-48-78-108-138
9	9-39-69-99-129	19	19-49-79-109-139
10	10-40-70-100-130	20	20-50-80-110-140

4.3.16 Plans for Federal Interoperability Channels for Interagency Law Enforcement and Incident Response Operations in the Bands 162-174 MHz and 406.1-420 MHz

CONDITIONS FOR USE

1. The plans shown in Tables 1 and 2 show frequencies available for assignment to all federal agencies to satisfy law enforcement and public safety incident response interoperability requirements. These frequencies will be referred to hereinafter as “Federal Interoperability Channels”.

2. The Federal Interoperability Channels are available for use among federal agencies and between federal agencies and non-federal entities with which federal agencies have a requirement to operate. The channels are available to federal agencies on a shared basis and will not be authorized for the exclusive use of any one federal agency.

3. The channels are available to non-federal entities to enable joint federal/non-federal operations for law enforcement and incident response, subject to the condition that harmful interference will not be caused to federal stations. These channels are restricted to interoperability communications and are not authorized for routine or administrative uses.

4. Extended operations and congestion may lead to frequency conflicts. Coordination with NTIA is required to resolve these conflicts.

5. Only narrowband emissions are to be used on the Federal Interoperability Channels.

6. Federal agencies should have an assignment in the Government Master File (GMF) or be included in the Joint Applications (*JNT) circuit remarks in accordance with Chapter 9 of this Manual.

7. Exceptions to the above restrictions will be considered by the Interdepartment Radio Advisory Committee (IRAC)/Frequency Assignment Subcommittee (FAS) on a case-by-case basis.

LAW ENFORCEMENT PLANS

1. Frequencies 167.0875 MHz and 414.0375 MHz are designated as National Calling Channels for initial contact and will be identified in the radio as indicated in Table 1.

2. Initial contact communications will be established using analog FM emission (11KF3E).

3. The interoperability channels will be identified in mobile and portable radios as follows with Continuous Tone-Controlled Squelch Systems (CTCSS) frequency 167.9 Hz and/or Network Access Code (NAC) $68F:

Table 1

LE VHF PLAN			LE UHF PLAN		
Identifier	**Mobile Transmit (MHz)**	**Mobile Receive (MHz)**	**Identifier**	**Mobile Transmit (MHz)**	**Mobile Receive (MHz)**
LEA	167.0875 (Simplex)	167.0875	LEB	414.0375 (Simplex)	414.0375
LE1	162.0875	167.0875	LE10	418.9875	409.9875
LE2	162.2625	167.2500	LE11	419.1875	410.1875
LE3	162.8375	167.7500	LE12	419.6125	410.6125
LE4	163.2875	168.1125	LE13	414.0625 (Simplex)	414.0625
LE5	163.4250	168.4625	LE14	414.3125 (Simplex)	414.3125
LE6	167.2500 (Simplex)	167.2500	LE15	414.3375 (Simplex)	414.3375
LE7	167.7500 (Simplex)	167.7500	LE16	409.9875 (Simplex)	409.9875
LE8	168. 1125 (Simplex)	168.1125	LE17	410. 1875 (Simplex)	410.1875
LE9	168.4625 (Simplex)	168.4625	LE18	410.6125 (Simplex)	410.6125

INCIDENT RESPONSE PLANS

1. Frequencies 169.5375 MHz, paired with 164.7125 MHz, and 410.2375 MHz, paired with 419.2375 MHz, are designated as the calling channels for initial contact and will be identified in the radio as indicated in Table 2.

2. Initial contact will be established using analog FM emission (11KF3E).

3. To ensure access by stations from outside the normal area of operation, CTCSS will not be used on the calling channels.

4. The interoperability channels will be identified in mobile and portable radios as follows:

Table 2

IR VHF PLAN				IR UHF PLAN			
Identifier	**Mobile Transmit (MHz)**	**Mobile Receive (MHz)**	**CTCSS**	**Identifier**	**Mobile Transmit (MHz)**	**Mobile Receive (MHz)**	**CTCSS**
NC 1 Calling	164.7125	169.5375	None	NC 2 Calling	419.2375	410.2375	None
IR1	165.2500	170.0125	As required	IR10	419.4375	410.4375	As required
IR2	165.9625	170.4125	As required	IR11	419.6375	410.6375	As required
IR3	166.5750	170.6875	As required	IR12	419.8375	410.8375	As required
IR4	167.3250	173.0375	As required	IR13	413.1875 (Simplex)	413.1875	As required
IR5	169.5375 (Simplex)	169.5375	As required	IR14	413.2125 (Simplex)	413.2125	As required
IR6	170.0125 (Simplex)	170.0125	As required	IR15	410.2375 (Simplex)	410.2375	As required
IR7	170.4125 (Simplex)	170.4125	As required	IR16	410.4375 (Simplex)	410.4375	As required
IR8	170.6875 (Simplex)	170.6875	As required	IR17	410.6375 (Simplex)	410.6375	As required
IR9	173.0375 (Simplex)	173.0375	As required	IR18	410.8375 (Simplex)	410.8375	As required

4.3.17 Plan for JTIDS TDMA Waveform Systems

1. The Joint Tactical Information Distribution System/Multifunctional Information Distribution System (JTIDS/MIDS) Time Division Multiple Access (TDMA) Waveform is the designation for the tactical data link system used by the military services, which is critical to the "Command and Control" infrastructure of the Department of Defense (DOD). This waveform designation applies to the JTIDS family of terminals (Class 1, Class 2, Class 2M and Class 2H); MIDS Low Volume Terminal (LVT) variants (LVT-1, LVT-2, LVT-3/Fighter Data Link); and future approved systems incorporating the JTIDS/MIDS TDMA Waveform implementation. These TDMA systems provide the DOD with totally Integrated Communications, Navigation and Identification (ICNI) capabilities. The DOD refers to these terminals collectively as "Link 16".

2. JTIDS/MIDS TDMA Waveform operation is authorized in the 960-1215 MHz band and in addition, the DOD and the Department of Transportation (DOT) have made agreements to assure spectrum access and to maintain mutual compatibility between Air Traffic Control (ATC) systems and JTIDS/MIDS TDMA Waveform systems within the United States and its possessions (US&P). The following paragraphs are consistent with DOD - DOT agreements:

a. Uncoordinated JTIDS/MIDS TDMA Waveform operations are authorized in the 960-1215 MHz band in accordance with the coordinations outlined in Authorizing NTIA Spectrum Certification Document(s).

b. The DOD shall incorporate engineering features in the JTIDS/MIDS TDMA Waveform equipment in accordance with the NTIA guidance and requirements for JTIDS/MIDS EMC features. The engineering features when implemented shall minimize the possibility for harmful interference between ATC and JTIDS/MIDS TDMA Waveform systems operating in the US&P.

c. The DOT will support US&P frequency assignments for JTIDS/MIDS TDMA Waveform operations, with the conditions identified in the authorizing NTIA Spectrum Certification Documents and as set forth herein.

d. The DOD will ensure that by 2020, all JTIDS/MIDS TDMA Waveform Terminals are capable of remapping frequencies. Any JTIDS/MIDS TDMA Waveform Terminal produced after July 1, 2007 will be capable of remapping and the capability will be added to all terminals produced prior to that date during any scheduled system updates/modifications or when the terminals are brought in for maintenance. All fielded JTIDS/MIDS TDMA Waveform Terminals will incorporate the remapping capability by 2020. The remapping implementation will be flexible, but there will not be a requirement to remap more that 14 carrier frequencies. The remapping capability will be utilized as necessary to prevent harmful interference with ATC systems that have been approved by a NTIA Stage 4 Spectrum Certification. The Legacy JTIDS Terminals (Class 1, 2, 2M, 2H) for operations prior to 2020 are not required to implement the remapping feature.

e. The DOT will ensure that planned and future systems/equipment subject to its jurisdiction that are to be implemented using spectrum not subject to remapping will be designed to satisfy their minimum performance standards in their intended electromagnetic environments. This environment includes JTIDS/MIDS TDMA Waveform systems operating in conformance with the remapping requirement. This will ensure that such new or modified systems shall incorporate features so as to not constrain JTIDS/MIDS TDMA Waveform Terminals operations in accordance with the approved NTIA Spectrum Certification.

f. Coordination procedures for JTIDS/MIDS TDMA Waveform operations involving all 51 frequencies, operations exceeding approved NTIA Spectrum Certification conditions and operations involving non-US and new terminals shall be cooperatively developed by DOD and DOT.

4.3.18 4400-4940 MHz Chanel Plan

1. This section describes the 4400-4940 MHz Channel Plan for stations operating in the fixed service and provides guidance on its implementation. This channel plan will become effective on August 1, 2009 and all incumbent frequency assignments in the 4400-4940 MHz band and will be grandfathered until the equipment or frequency is changed.[3]
2. Figure 1 provides an overview of the 4400-4940 MHz Channel Plan.

[3] Any system currently in the Government Master File or on the Frequency Assignment Subcommittee agenda before August 1, 2009 will be "grandfathered."

Figure 1: The 4400-4940 MHz Channel Plan

4400 - 4940 MHz CHANNEL PLAN

4.670 GHz → | ← 4.670 GHz

4 GHz Channel Bandwidths	Lower Band															Upper Band											
	← 4.400 GHz											4.640 GHz →				← 4.700 GHz											4.940 GHz →
40.00 MHz (A)	A1		A2		A3		A4		A5		A6					A1′		A2′		A3′		A4′		A5′		A6′	
30.00 MHz (B)	B1		B2		B3		B4		B5		B6		B7		B8	B9		B10		B1′		B2′		B3′		B4′	
20.00 MHz (C)	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C1′	C2′	C3′	C4′	C5′	C6′	C7′	C8′	C9′	C10′	C11′	C12′
10.00 MHz (D)	(D1-D4)		(20) 10 MHz (D5-D24)										25	26	27	28	29	30	(D1′ -D4′)	(20) 10 MHz (D5′-D24′)								
5.00 MHz (E)	(8) 5 MHz		(40) 5 MHz* (E9-E48)										(12) 5.00 MHz (E49-E60)						(8) 5 MHz	(40) 5 MHz* (E9′-E48′)								
2.50 MHz (F)	(16) 2.5 MHz		(80) 2.5 MHz* (F17-F96)										(24)2.50MHz (F97-F120)						(16) 2.5 MHz	(80) 2.5 MHz* (F17′-F96′)								
1.25 MHz (G)	(32) 1.25MHz		(160) 1.25 MHz* (G33-G192)										(48)1.25MHz(G193-G240)						(32) 1.25MHz	(160) 1.25 MHz* (G33′-G192′)								
													One-Way Applications														

NOTE: Paired channels will be implemented for fixed service assignments using A1 with A1', A2 with A2', etc.

3. Applicable Guidance. In implementing the 4400-4940 MHz Channel Plan, the following guidance applies.

a. This channel plan only applies to fixed and/or transportable fixed assignments. For mobile or airborne assignments, this channel plan should be used to the extent possible.

b. Incumbent fixed and/or transportable fixed assignments will be grandfathered until the end of the life-cycle of the equipment[7] and all replacement equipment will utilize frequencies in accordance with this channel. Other assignments should use this channel plan to the extent possible.

c. Any request for changes or modifications to "grandfathered" fixed service and/or transportable fixed assignments, except for the frequency, will be governed by existing NTIA procedures. However, if the operating frequency is to be modified, the replacement frequency will be selected in accordance with this channel plan.

d. The First Priority Channels will be considered first before the other designated channels.

e. The Second Priority Channels will be considered if the First Priority Channels are not available..

f. The wide-band Third Priority Channels (i.e., A1/A1'; B1/B1'; B9 and B10; C13, C14, and C15) will be considered only if their respective First and Second Priority Channels are not available.

g. The narrow-band Third Priority Channels (i.e., E-, F-, and G-Channels) will be considered only if their respective First Priority Channels are not available. The following narrow-band channels: E9/E9' and E10/E10'; F17/E17' through F20/F20'; G33/G33' through G40/G40' will be considered first before the other respective narrow-band channels.

h. Fixed and/or transportable fixed assignments, may use either channel of a paired-channel if the one-way link First Priority Channels are not available.[8] or if multiple one-way links assignments are required.

i. Fixed and/or transportable fixed assignments for which the emission bandwidth exceeds the bandwidth of a channel will use the next available wider channel in the channel plan. For example, an assignment with an emission bandwidth of 24 MHz will use a 30 MHz channel *(e.g., Channel B6 centered at 4565 MHz and see also Channel D17 in Table 4).*

j. Fixed and/or transportable fixed assignments for which the emission bandwidth exceeds 40 MHz may use concatenated channels[9] commensurate with the emission bandwidth However, the center frequency of the concatenated channels should be one of the center frequencies listed in the channel plan. For example, an assignments with a emission bandwidth of 60 MHz would require two concatenated 30 MHz channels, such as channels B7 and B8 with the center frequency being 4610 MHz *(see Channel C11 in Table 3).*

4. The following tables list the center frequencies for narrowband, wideband and single or unpaired channels.

a. Tables 1 through 4 show the center frequencies of the wide-band paired channels (*i.e.*, *Channels A-40 MHz, B-30 MHz, C-20 MHz, and D-10 MHz*) in the 4400-4940 MHz Channel Plan and their respective channel status.

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[7] Transportable fixed assignments, include assignments employing one-way link applications; such as video target scoring, air-to-ground video downlink, ground-to-ground video and/or voice transmissions, etc.

[8.] Currently, land mobile radio assignments are not deployed in the 4400-4940 MHz band. In such time that land mobile radio assignments will be deployed in the band, the base stations will transmit at channels from the upper portion of the channel plan (*i.e.*, 4670-4940 MHz band segment) and mobile units will transmit from the lower portion of the channel plan (*i.e.*, 4400-4670 MHz band segment).

[9.] The term "concatenated channels" means any two or more adjacent channels in the 4400-4940 MHz band joined together for the purpose of accommodating a assignment having an emission bandwidth that exceeds the widest channel bandwidth in the channel plan.

CENTER FREQUENCIES FOR THE WIDE-BAND PAIRED CHANNELS

Table 1: The Center Frequencies for the 40 MHz Wide-Band Paired Channels (A-Channels)

Table 1		
Channel (Frequencyin MHz)	**Channel (Frequencyin MHz)**	**Channel (Frequencyin MHz)**
First Priority Channels		
A2/A2′ (4460/4760)	A3/A3′ (4500/4800)	A4/A4′ (4540/4840)
Second Priority Channels		
A5/A5′ (4580/4880)	A6/A6′ (4620/4920)	
Third Priority Channels		
A1/A1′ (4420/4720)		

Table 2: The Center Frequencies for the 30 MHz Wide-Band Paired Channels (B-Channels)

Table 2		
Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
First Priority Channels		
B6/ B6′ (4565/4865)	B7/B7′ (4595/4895)	B8/B8′ (4625/4925)
Second Priority Channels		
B2/B2′ (4445/4745)	B4/B4′ (4505/4805)	B5/B5′ (4535/4835)
B3/B3′ (4475/4775)		
Third Priority Channels		
B1/B1′ (4415/4715)		

Table 3: The Center Frequencies for the 20 MHz Wide-Band Paired Channels (C-Channels)

Table 3		
Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
First Priority Channels		
C1/C1′ (4410/4710)	C2/C2′ (4430/4730)	
Second Priority Channels		
C3/C3′ (4450/4750)	C7/C7′ (4530/4530)	C10/C10′ (4590/4890)
C4/C4′ (4470/4770)	C8/C8′ (4550/4850)	C11/C11′ (4610/4910)
C5/C5′ (4490/4790)	C9/C9′ (4570/4870)	C12/C12′ (4630/4930)
C6/C6′ (4510/4810)		

Table 4: The Center Frequencies for the 10 MHz Wide-Band Paired Channels (D-Channels)

Table 4		
Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
First Priority Channels		
D1/D1′ (4405/4705)	D3/D3′ (4425/4725)	D4/D4′ (4435/4735)
D2/D2′ (4415/4715)		
Second Priority Channels		
D5/D5′ (4445/4745)	D12/D12′ (4515/4815)	D19/D19′ (4585/4885)
D6/D6′ (4455/4755)	D13/D13′ (4525/4825)	D20/D20′ (4595/4895)
D7/D7′ (4465/4765)	D14/D14′ (4535/4835)	D21D21′ (4605/4905)
D8/D8′ (4475/4775)	D15/D15′ (4545/4845)	D22/D22′ (4615/4915)
D9/D9′ (4485/4785)	D16/D16′ (4555/4855)	D23/D23′ (4625/4925)
D10/D10′ (4495/4795)	D17/D17′ (4565/4865)	D24/D24′ (4635/4935)
D11/D11′ (4505/4805)	D18/D18′ (4575/4875)	

b. Tables 5 through 7 show the center frequencies of the narrow-band paired channels (i.e., Channels E-5 MHz, F-2.5 MHz, and G-1.5 MHz) in the 4400-4940 MHz Channel Plan and their respective channel status.

CENTER FREQUENCIES FOR THE NARROW-BAND PAIRED CHANNELS

Table 5: The Center Frequencies for the 5 MHz Narrow-Band Paired Channels (E-Channels)[7]

Table 5		
Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
First Priority Channels		
E1/E1′ (4402.5/4702.5)	E4/E4′ (4417.5/4717.5)	E7/E7′ (4432.5/4732.5)
E2/E2′ (4407.5/4707.5)	E5/E5′ (4422.5/4722.5	E8/E8′ (4437.5/4737.5
E3/E3′ (4412.5/4712.5	E6/E6′ (4427.5/4727.5	
Third Priority Channels		
E9/E9′ (4442.5/4742.5)	E23/E23′ (4512.5/4812.5)	E37/E37′ (4582.5/4882.5)
E10/E10′ (4447.5/4747.5)	E24/E24′ (4517.5/4817.5)	E38/E38′ (4587.5/4887.5)
E11/E11′ (4452.5/4752.5)	E25/E25′ (4522.5/4822.5)	E39/E39′ (4592.5/4892.5)
E12/E12′ (4457.5/4757.5)	E26/E26′ (4527.5/4827.5)	E40/E40′ (4597.5/4897.5)
E13/E13′ (4462.5/4762.5)	E27/E27′ (4532.5/4832.5)	E41/E41′ (4602.5/4902.5)
E14/E14′ (4467.5/4767.5)	E28/E28′ (4537.5/4837.5)	E42/E42′ (4607.5/4907.5)
E15/E15′ (4472.5/4772.5)	E29/E29′ (4542.5/4842.5)	E43/E43′ (4612.5/4912.5)
E16/E16′ (4477.5/4777.5)	E30/E30′ (4547.5/4847.5)	E44/E44′ (4617.5/4917.5)
E17/E17′ (4482.5/4782.5)	E31/E31′ (4552.5/4852.5)	E45/E45′ (4622.5/4922.5)
E18/E18′ (4487.5/4787.5)	E32/E32′ (4557.5/4857.5)	E46/E46′ (4627.5/4927.5)
E19/E19′ (4492.5/4792.5)	E33/E33′ (4562.5/4862.5)	E47/E47′ (4632.5/4932.5)
E20/E20′ (4497.5/4797.5)	E34/E34′ (4567.5/4867.5)	E48/E48′ (4637.5/4937.5)

7. There are no secondary channels for the E-Channels (5 MHz channels).

Table 5		
Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
E21/E21′ (4502.5/4802.5)	E35/E35′ (4572.5/4872.5)	
E22/E22′ (4507.5/4807.5)	E36/E36′ (4577.5/4877.5)	

Table 6: The Center Frequencies for the 2.5 MHz Narrow-Band Paired Channels (F-Channels)[8]

Table 6		
Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
First Priority Channels		
F1/F1′ (4401.25/4701.25)	F7/F7′ (4416.25/4716.25)	F12/F12′ (4428.75/4728.75)
F2/F2′ (4403.75/4703.75)	F8/F8′ (4418.75/4718.25)	F13/F13′ (4413.25/4731.25)
F3/F3′ (4406.25/4706.25	F9/F9′ (4421.25/4721.25)	F14/F14′ (4433.75/4733.75)
F4/F4′ (4408.75/4708.25)	F10/F10′ (4423.75/4723.25)	F15/F15′ (4436.25/4736.25)
F5/E5′ (4411.25/4711.25)	F11/F11′ (4426.25/4726.25)	F16/F16′ (4438.75/4738.75)
F6/F6′ (4413.75/4713.25)		
Third Priority Channels		
F17/F17′ (4441.25/4741.25)	F44/F44′(4508.75/4808.75)	F71/F71′ (4576.25/4876.25)
F18/F18′ (4443.75/4743.75)	F45/F45′ (4511.25/4811.25)	F72/F72′ (4578.75/4878.75)
F19/F19′ (4446.25/4746.25)	F46/F46′ (4513.75/4813.75)	F73/F73′ (4581.25/4881.25)
F20/F20′ (4448.75/4748.75)	F47/F47′ (4516.25/4816.25)	F74/F74′ (4583.75/4883.75)
F21/F21′ (4451.25/4751.25)	F48/F48′ (4518.75/4818.75)	F75/F75′ (4586.25/4886.25)
F22/F22′ (4453.75/4753.75)	F49/F49′ (4521.25/4821.25)	F76/F76′ (4588.75/4888.75)
F23/F23′ (4456.25/4756.25)	F50/F50′ (4523.75/4823.75)	F77/F77′ (4591.25/4891.25)
F24/F24′ (4458.75/4758.75)	F51/F51′ (4526.25/4826.25)	F78/F78′ (4593.75/4893.75)
F25/F25′ (4461.25/4761.25)	F52/F52′ (4528.75/4828.75)	F79/F79′ (4596.25/4896.25)
F26/F26′ (4463.75/4763.75)	F53/F53′ (4531.25/4831.25)	F80/F80′ (4598.75/4898.75)
F27/F27′ (4466.25/4766.25)	F54/F54′ (4533.75/4833.75)	F81/F81′ (4601.25/4901.25)
F28/F28′ (4468.75/4768.75)	F55/F55′ (4536.25/4836.25)	F82/F82′ (4603.75/4903.75)
F29/F29′ (4571.25/4771.25)	F56/F56′ (4538.75/4838.75)	F83/F83′ (4606.25/4906.25)
F30/F30′ (4473.75/4773.75)	F57/F57′ (4541.25/4841.25)	F84/F84′ (4608.75/4908.75)
F31/F31′ (4476.25/4776.25)	F58/F58′ (4543.75/4843.75)	F85/F85′ (4611.75/4911.75)
F32/F32′ (4478.75/4778.75)	F59/F59′ (4546.25/4846.25)	F86/F86′ (4613.25/4913.25)
F33/F33′ (4481.25/4781.25)	F60/F60′ (4548.75/4848.75)	E87/F87′ (4616.25/4916.25)
F34/F34′ (4483.75/4783.75)	F61/F61′ (4551.25/4851.25)	F88/F88′ (4618.75/4918.75)
F35/F35′ (4486.25/4786.25)	F62/F62′ (4553.75/4853.75)	F89/F89′ (4621.25/4921.25)
F36/F36′ (4488.75/4788.75)	F63/F63′ (4556.25/4856.25)	F90/F90′ (4623.75/4923.75)
F37/F37′ (4491.25/4791.25)	F64/F64′ (4558.75/4858.75)	F91/F91′ (4626.25/4926.25)
F38/F38′ (4493.75/4793.75)	F65/F65′ (4561.25/4861.25)	F92/F92′ (4628.75/4928.75)
F39/F39′ (4496.25/4796.25)	F66/F66′ (4563.75/4863.75)	F93/F93′ (4631.25/4931.25)
F40/F40′ (4498.75/4798.75)	F67/F67′ (4566.25/4866.25)	F94/F94′ (4633.75/4933.75)
F41/F41′ (4501.25/4801.25)	F68/F68′ (4568.75/4868.75)	F95/F95′ (4636.25/4936.25)
F42/F42′ (4503.75/4803.75)	F69/F69′ (4571.25/4871.25)	F96/F96′ (4638.75/4938.75)

8. There are no secondary channels for the F-Channels (2.5 MHz channels).

Table 6		
Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
F43/F43′ (4506.25/4806.25)	F70/F70′ (4573.75/4873.75)	

Table 7: The Center Frequencies for the 1.25 MHz Narrow-Band Paired Channels (G-Channels)[9]

Table 7		
Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
First Priority Channels		
G1/G1′ (4400.625/4700.625)	G12/G12′ (4414.375/4714.375)	G23/G23′ (4428.125/4728.125)
G2/G2′ (4401.875/4701.875)	G13/G13′ (4415.625/4715.625)	G24/G24′ (4429.375/4729.375)
G3/G3′ (4403.125/4703.125)	G14/G14′ (4416.875/4716.875)	G25/G25′ (4430.625/4730.625)
G4/G4′ (4404.375/4704.325)	G15/G15′ (4418.125/4718.125)	G26/G26′ (4431.875/4731.875)
G5/G5′ (4405.625/4705.625)	G16/G16′ (4419.375/4719.375)	G27/G27′ (4433.125/4733.125)
G6/G6′ (4406.875/4706.825)	G17/G17′ (4420.625/4720.625)	G28/G28′ (4434.375/4734.375)
G7/G7′ (4408.125/4708.125)	G18/G18′ (4421.875/4721.875)	G29/G29′ (4435.625/4735.625)
G8/G8′ (4409.375/4708.375)	G19/G19′ (4423.125/4721.125)	G30/G30′ (4436.875/4736.875)
G9/G9′ (4410.625/4710.625)	G20/G20′ (4424.375/4724.375)	G31/G31′ (4438.125/4738.125)
G10/G10′ (4411.875/4711.875)	G21/G21′ (4425.625/4725.625)	G32/G32′ (4439.375/4789.375)
G11/G11′ (4413.125/4713.125)	G22/G22′ (4426.875/4726.875)	
Third Priority Channels		
G33/G33′ (4440.625/4740.625)	G87/G87′ (4508.125/4808.125)	G141/G141′ (4575.625/4875.625)
G34/G34′ (4441.875/4741.875)	G88/G88′ (4509.375/4809.375)	G142/G142′ (4576.875/4876.875)
G35/G35′ (4443.125/4743.125)	G89/G89′ (4510.675/4810.675)	G143/G143′ (4578.125/4878.125)
G36/G36′ (4444.375/4744.375)	G90/G90′ (4511.875/4811.875)	G144/G144′ (4579.375/4879.375)
G37/G37′ (4445.625/4745.625)	G91/G91′ (4513.125/4813.125)	G145/G145′ (4580.625/4880.625)
G38/G38′ (4446.875/4746.875)	G92/G92′ (4514.625/4814.625)	G146/G146′ (4581.875/4881.875)
G39/G39′ (4448.125/4748.125)	G93/G93′ (4515.625/4815.625)	G147/G147′ (4583.125/4883.125)
G40/G40′ (4449.375/4748.375)	G94/G94′ (4516.875/4816.875)	G148/G148′ (4584.375/4884.375)
G41/G41′ (4450.625/4750.625)	G95/G95′ (4518.125/4818.125)	G149/G149′ (4585.625/4885.625)
G42/G42′ (4451.875/4751.875)	G96/G96′ (4519.375/4819.375)	G150/G150′ (4586.875/4886.875)
G43/G43′ (4453.125/4753.125)	G97/G97′ (4520.625/4820.625)	G151/G151′ (4588.125/4888.125)
G44/G44′ (4454.375/4754.375)	G98/G98′ (4521.875/4821.875)	G152/G152′ (4589.375/4889.375)
G45/G45′ (4455.625/4755.625)	G99/G99′ (4523.125/4823.125)	G153/G153′ (4590.625/4890.625)
G46/G46′ (4456.875/4756.875)	G100/G100′ (4524.375/4824.375)	G154/G154′ (4591.875/4891.875)
G47/G47′ (4458.125/4758.125)	G101/G101 (4525.625/4825.625)	G155/G155′ (4593.125/4893.125)
G48/G48′ (4459.375/4759.375)	G102/G102 (4526.875/4826.875)	G156/G156′ (4594.375/4594.375)
G49/G49′ (4460.625/4760.625)	G103/G103′ (4528.125/4828.125)	G157/G157′ (4595.625/4895.625)
G50/G50′ (4461.875/4761.875)	G104/G104′ (4529.375/4829.375)	G158/G158′ (4596.875/4896.875)
G51/G51′ (4463.125/4763.125)	G105/G105′ (4530.625/4830.625)	G159/G159′ (4598.125/4898.125)
G52/G52′ (4464.375/4764.375)	G106/G106′ (4531.875/4831.875)	G160/G160′ (4599.375/4899.375)
G53/G53′ (4465.625/4765.625)	G107/G107′ (4533.125/4833.125)	G161/G161′ (4600.625/4900.625)
G54/G54′ (4466.875/4766.875)	G108/G108′ (4534.375/4834.375)	G162/G162′ (4601.875/4901.875)
G55/G55′ (4468.125/4768.125)	G109/G109′ (4535.625/4835.625)	G163/G163′ (4603.125/4903.125)
G57/G57′ (4470.625/4770.625)	G110/G110′ (4536.875/4836.875)	G164/G164′ (4604.375/4904.375)
G58/G58′ (4471.875/4771.875)	G111/G111′ (4538.125/4838.125)	G165/G165′ (4605.625/4905.625)
G59/G59′ (4473.125/4773.125)	G112/G112′ (4539.375/4889.375)	G166/G166′ (4606.875/4906.875)
G60/G60′ (4474.375/4774.375)	G113/G113′ (4540.625/4840.625)	G167/G167′ (4608.125/4908.125)
G61/G61′ (4475.625/4775.625)	G114/G114′ (4541.875/4841.875)	G168/G168′ (4609.375/4909.375)
G62/G62′ (4476.875/4776.875)	G115/G115′ (4543.125/4843.125)	G169/G169′ (4610.625/4910.625)

[9]. There are no secondary channels for the G-Channels (1.25 MHz channels).

Table 7		
Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
G63/G63′ (4478.125/4778.125)	G116/G116′ (4544.375/4844.375)	G170/G170′ (4611.875/4911.875)
G64/G64′ (4479.375/4779.375)	G117/G117′ (4545.625/4845.625)	G171/G171′ (4613.125/4913.125)
G65/G65′ (4480.625/4780.625)	G118/G118′ (4546.875/4846.875)	G172/G172′ (4614.375/4914.375)
G66/G66′ (4481.875/4781.875)	G119/G119′ (4548.125/4848.125)	G173/G173′ (4615.625/4915.625)
G67/G67′ (4483.125/4783.125)	G120/G120′ (4549.375/4849.375)	G174/G174′ (4616.875/4916.875)
G56/G56′ (4469.375/4768.375)	G121/G121′ (4550.625/4850.625)	G175/G175′ (4618.125/4918.125)
G68/G68′ (4484.375/4784.375)	G122/G122′ (4551.875/4851.875)	G176/G176′ (4619.375/4919.375)
G69/G69′ (4485.625/4785.625)	G123/G123′ (4553.125/4853.125)	G177/G177′ (4620.625/4920.625)
G70/G70′ (4486.875/4786.875)	G124/G124′ (4554.375/4854.375)	G178/G178′ (4621.875/4921.875)
G71/G71′ (4488.125/4788.125)	G125/G125′ (4555.625/4855.625)	G179/G179′ (4623.125/4923.125)
G72/G72′ (4489.375/4789.375)	G126/G126′ (4556.875/4856.875)	G180/G180′ (4624.375/4924.375)
G73/G73′ (4490.625/4790.625)	G127/G127′ (4858.125/4858.125)	G181/G181′ (4625.625/4925.625)
G74/G74′ (4491.875/4791.875)	G128/G128′ (4559.375/4559.375)	G182/G182′ (4626.875/4926.875)
G75/G75′ (4493.125/4793.125)	G129/G129′ (4560.625/4860.625)	G183/G183′ (4628.125/4928.125)
G76/G76′ (4494.375/4794.375)	G130/G130′ (4561.875/4861.875)	G184/G184′ (4629.375/4929.375)
G77/G77′ (4495.625/4795.625)	G131/G131′ (4563.125/4863.125)	G185/G185′ (4630.625/4930.625)
G78/G78′ (4496.875/4796.875)	G132/G132′ (4564.375/4864.375)	G186/G186′ (4631.875/4931.875)
G79/G79′ (4498.125/4798.125)	G133/G133′ (4565.625/4865.625)	G187/G187′ (4633.125/4933.125)
G80/G80′ (4499.375/4799.375)	G134/G134′ (4566.875/4866.875)	G188/G188′ (4634.375/4934.375)
G81/G81′ (4500.625/4800.625)	G135/G135′ (4568.125/4868.125)	G189/G189′ (4635.625/4935.625)
G82/G82′ (4501.875/4801.875)	G136/G136′ (4569.375/4869.375)	G190/G190′ (4636.875/4936.875)
G83/G83′ (4503.125/4803.125)	G137/G137′ (4570.625/4870.625)	G191/G191′ (4638.125/4938.125)
G84/G84′ (4504.375/4804.375)	G138/G138′ (4571.875/4871.825)	G192/G192′ (4639.375/4939.375)
G85/G85′ (4505.625/4805.625)	G139/G139′ (4573.125/4873.125)	
G86/G86′ (4506.875/4806.875)	G140/G140′ (4574.375/4874.375)	

c. Table 8 shows the center frequencies of the unpaired or single channels in the 4400-4940 MHz Channel Plan and their respective channel status.

CENTER FREQUENCIES OF THE UNPAIRED OR SINGLE CHANNELS

Table 8: The Center Frequencies for the Unpaired or Single Channels in the 4400-4940 MHz Channel Plan

Table 8		
Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
30 MHz Channels (Third Priority B-Channels)		
B9 (4655)	B10 (4685)	
20 MHz Channels (Third Priority C-Channels)		
C13 (4650)	C14 (4670)	C15 (4690)
10 MHz Channels (First Priority D-Channels)		
D25 (4645)	D27 (4665)	D29 (4685)
D26 (4655)	D28 (4675)	D30 (4695)
5 MHz Channels (First Priority E-Channels)		
E49 (4642.5)	E53 (4662.5)	E57 (4682.5)
E50 (4647.5)	E54(4667.5)	E58 (4687.5)
E51 (4652.5)	E55 (4672.5)	E59 (4692.5)
E52 (4657.5)	E56 (4677.5)	E60 (4697.5)

Table 8		
Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
2.5 MHz Channels (First Priority F-Channels)		
F97 (4641.25)	F105 (4661.25)	F113 (4681.25)
F98 (4643.75)	F106 (4663.75)	F114 (4683.75)
F99 (4646.25)	F107 (4666.25)	F115 (4686.25)
F100 (4648.75)	F108 (4668.75)	F116 (4688.75)
F101 (4651.25)	F109(4671.25)	F117 (4691.25)
F102 (4653.75)	F110 (4673.75)	F118 (4693.75)
F103 (4656.25)	F111 (4676.25)	F119 (4696.25)
F104 (4658.75)	F112 (4678.75)	F120 (4698.75)
1.25 MHz Channels (First Priority G-Channels)		
G193 (4640.625)	G209 (4660.625)	G225 (4680.625)
G194 (4641.875)	G210 (4661.875)	G226 (4681.875)
G195 (4643.125)	G211 (4663.125)	G227 (4683.125)
G196 (4644.375)	G212 (4664.375)	G228 (4684.375)
G197 (4645.625)	G213 (4665.625)	G229 (4685.625)
G198 (4646.875)	G214 (4666.875)	G230 (4686.875)
G199 (4648.125)	G215 (4668.125)	G231 (4688.125)
G200 (4649.375)	G216 (4669.375)	G232 (4689.375)
G201 (4650.625)	G217 (4670.625)	G233 (4690.625)
G202 (4651.875)	G218 (4671.875)	G234 (4691.875)
G203 (4653.125)	G219 (4673.125)	G235 (4693.125)
G204 (4654.375)	G220 (4674.375)	G236 (4694.375)
G205 (4655.625)	G221 (4675.625)	G237 (4695.625)
G206 (4656.875)	G222 (4676.875)	G238 (4696.875)
G207 (4658.125)	G223 (4678.125)	G239 (4698.125)
G208 (4659.375)	G224 (4679.375)	G240 (4699.375)

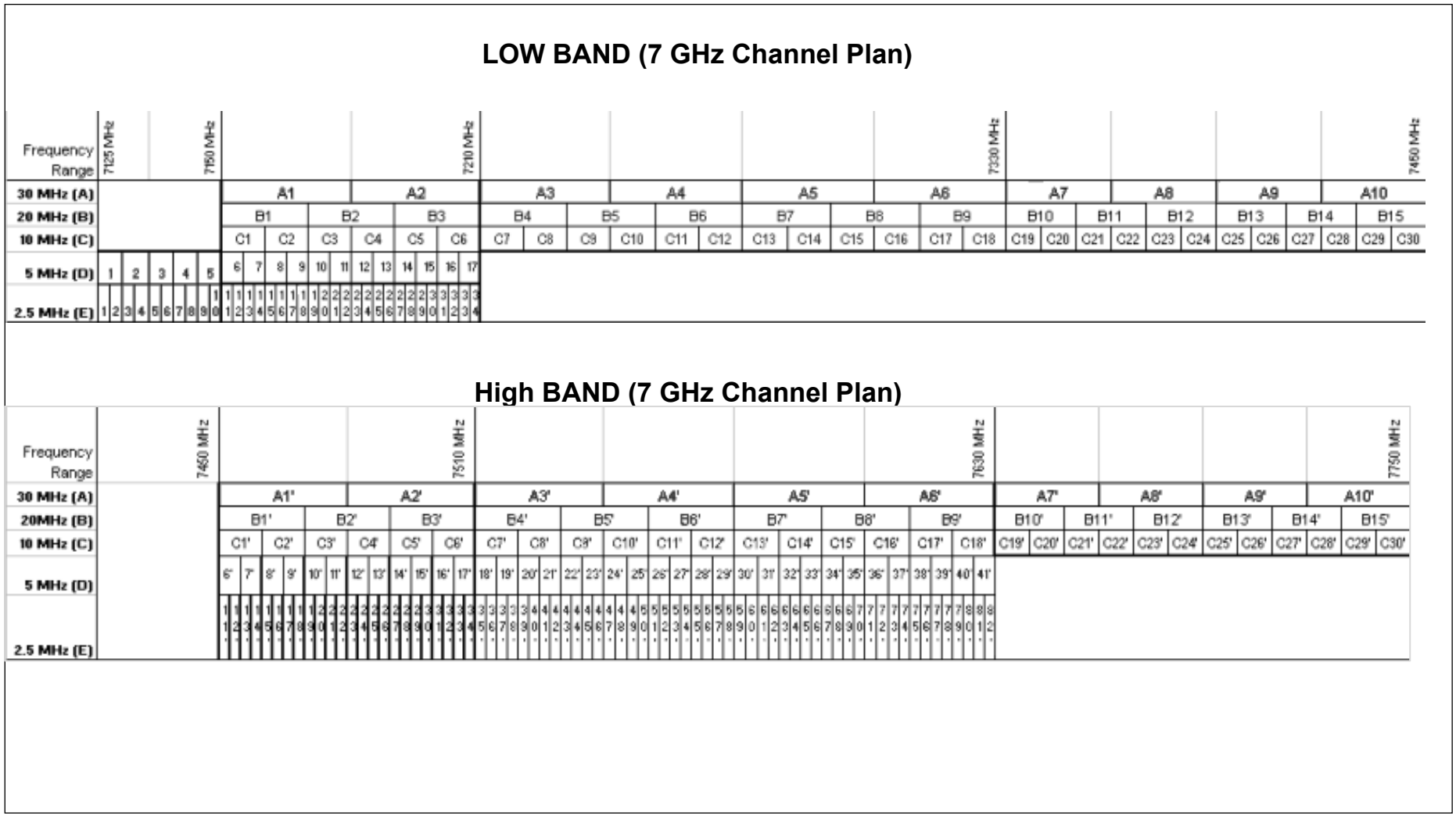
4.3.19 7125-8500 MHz Channel Plan

1. This section describes the 7125-8500 MHz Channel Plan for stations operating in the fixed service and provides guidance on its implementation. This plan will become effective December 1, 2009 and all incumbent frequency assignments in the 7125-8500 MHz band will be grandfathered until the equipment or frequency is changed.[10]

2. Figure 1 and 2 provide an overview of the 7125-8500 MHz Channel Plan. The plan consists of the 7125-7750 MHz (7GHz) Channel Plan (Figure 1) and the 7750-8500 MHz (8GHz) Channel Plan (Figure 2).

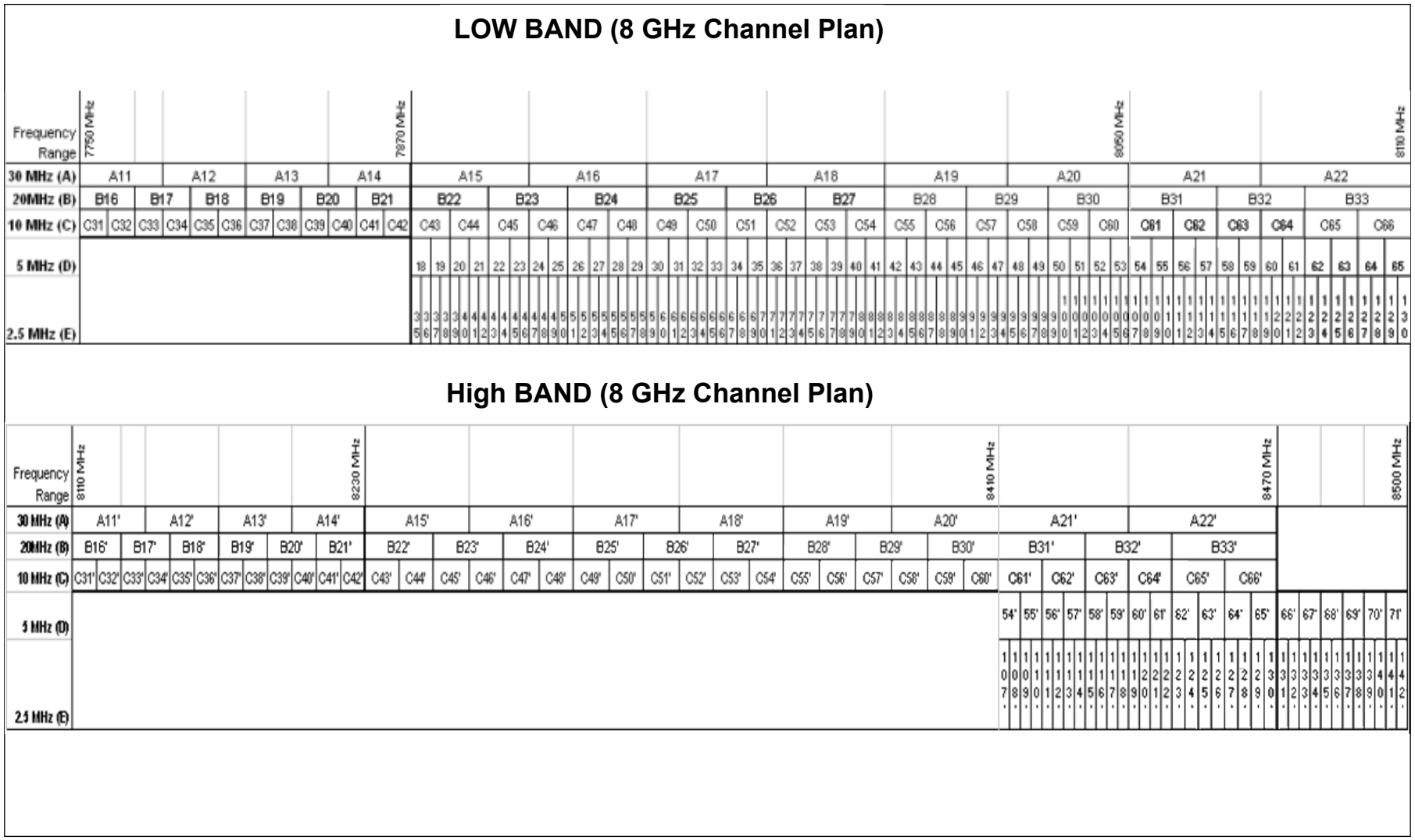
[10] Any system currently in the Government Master File or on the Frequency Assignment Subcommittee agenda before December 1, 2009 will be "grandfathered".

Figure 1: 7 GHz Channel Plan



Note: Paired channels will be implemented for fixed microwave operations using A1 with A1', A2 with A2', etc.

Figure 2: 8 GHz Channel Plan



Note: Paired channels will be implemented for fixed microwave operations using B16 with B16', B17 with B17', etc.

3. Procedure for Frequency Selection

a. The selection of frequencies for new fixed service systems (does not include transportable systems) will be performed by NTIA Spectrum Engineering and Analysis Division (SEAD) in conjunction with the NTIA Frequency Assignment Branch (FAB) within 9 workdays of receipt of complete data.

b. The federal agency submitting a frequency selection request must provide the following information in card format to SEADFASSupport@ntia.doc.gov.

(1) Transmitter and Receiver nomenclature and model (e.g. Alcatel MDR-8704S-155)

(2) Transmitter and Receiver coordinates of the proposed location(s) of deployment

(3) Transmitter power (in watts)

(4) Transmitter Equivalent Isotropically Radiated Power (in watts)

(5) Transmitter emission spectrum (i.e., -3dB, -20dB, and -60dB)

(6) Emission designator (modulation type and bandwidth) (e.g. 5M50D7W)

(7) Receiver radio frequency and intermediate frequency selectivity (i.e., -3dB, -20dB, and -60dB)

(8) Receiver noise figure (in dB)

(9) Transmitter and Receiver antenna model (e.g. Andrew HP6-44)

(10) Transmitter and Receiver antenna type

(11) Transmitter and Receiver mainbeam antenna gain (in dBi)

(12) Transmitter and Receiver antenna azimuth and elevation gain pattern (dB relative to mainbeam)

(13) Transmitter and Receiver antenna heights (in meters)

(14) Transmitter and Receiver antenna elevation (above mean sea level) (in meters)

(15) Transmitter and Receiver antenna polarization

c. SEAD will be provided to the requesting agency the selected frequencies for review. Upon agreeing to the frequencies identified, the agency will submit the selected frequencies to the FAS using the existing process. If the submitting agency disagrees with the selected frequencies, the agency will work with SEAD staff members to identify mutually agreeable frequencies.

4. Agency's shall enter the link ID number (seven digit number) and date at the bottom right hand corner of SEAD report in the GMF application remarks line.

5. Applicable Guidance. In implementing the 7125-8500 MHz Channel Plan, the following guidance applies.

a. This channel plan only applies to fixed and/or transportable assignments. This plan does not apply to mobile, airborne, air to ground (i.e. Space to Earth) or ground to air (i.e. Earth to space) operations, however, NTIA encourages that agencies use this channel plan whenever possible.

b. Incumbent fixed and/or transportable assignments will be grandfathered until the end of the life-cycle of the equipment and all replacement equipment will utilize frequencies in accordance with the channel plan. Other assignments should use this channel plan to the extent possible.

c. Any request for changes or modifications to "grandfathered" fixed and/or transportable assignments, except for the frequency, will be governed by existing NTIA procedures. However, if the operating frequency is to be modified, the replacement frequency will be selected in accordance with the channel plan.

d. The First Priority Channels will be considered first before the other designated channels.

e. The Second Priority Channels will be considered if the First Priority Channels are not available.

f. Fixed assignments may use either channel of a paired-channel if the one-way channels are not available and one-way channels may be used for paired assignments if paired channels are not available.

g. Fixed and/or transportable assignments for which the emission bandwidth of a channel will use the next available wider channel in the channel plan. For example, an assignment with an emission bandwidth of 24 MHz will use a 30 MHz channel.

h. Fixed and/or transportable assignments for which the emission bandwidth exceeds 40 MHz may use concatenated channels[11] commensurate with the emission bandwidth. However, the center frequency of the concatenated channels should be one of the center frequencies listed in the channel plan. For example, an assignment with an emission bandwidth of 60 MHz would require two concatenated 30 MHz channels.

i. Experimental stations may use any frequency in the 7125-8500 MHz under the condition that if the equipment/system becomes operational it must comply with the channel plan.

5. The following tables list the center frequencies of the paired-channels and single or unpaired channels.

a. Tables 1 through 5 shows the center frequencies of the paired-channels in the 7125-8500 MHz channel plan and their priority status.

Table 1: The Center Frequencies of the 30 MHz Paired Channels[12]

Channel (Frequency in MHz)	Channel (Frequency in MHz)	Channel (Frequency in MHz)
FIRST PRIORITY CHANNELS		
A1/A1' (7165 / 7465)	A7/A7' (7345 / 7645)	A9/A9' (7405 / 7705)
A2/A2' (7195 / 7495)	A8/A8' (7375 / 7675)	A10/A10' (7435 / 7735)
SECOND PRIORITY CHANNELS		
A11/A11' (7765 / 8125)	A13/A13' (7825 / 8185)	A21/A21' (8065 / 8425)
A12/A12' (7795 / 8155)	A14/A14' (7855 / 8215)	A22/A22' (8095 / 8455)

Table 2: The Center Frequencies of the 20 MHz Paired Channels

Channel (Frequency in MHz)	Channel (Frequency in MHz)	Channel (Frequency in MHz)
FIRST PRIORITY CHANNELS		
B16/B16' (7760 / 8120)	B18/B18' (7800 / 8160)	B20/B20' (7840 / 8200)
B17/B17' (7780 / 8140)	B19/B19' (7820 / 8180)	B21/B21' (7860 / 8220)
SECOND PRIORITY CHANNELS		
B1/B1' (7160 / 7460)	B11/B11' (7360 / 7660)	B15/B15' (7440 / 7740)
B2/B2' (7180 / 7480)	B12/B12' (7380 / 7680)	B31/B31' (8060 / 8420)
B3/B3' (7200 / 7500)	B13/B13' (7400 / 7700)	B32/B32' (8080 / 8440)
B10/B10' (7340 / 7640)	B14/B14' (7420 / 7720)	B33/B33' (8100 / 8460)

Table 3: The Center Frequencies of the 10 MHz Paired Channels

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[11]. The term "concatenated channels" means any two or more adjacent channels in the 7125-8500 MHz band joined together for the purpose of accommodating a radio communication system or operation having an emission bandwidth that exceeds the widest channel bandwidth in the channel plan.

[12] In the situation wherein one site is transmitting and receiving multiple 30 MHz bandwidth (BW) channels, unless a site engineering study is performed, precautions should be taken to allow a minimum transmit-receive (T/R) separation of 60 MHz between the transmit and receive frequencies to ensure sufficient isolation between the transmitter and the receiver. In this case, avoid assigning channels A1/A1' and A10/A10' (T/R = 30 MHz between A1' and A10) or A11/A11' and A22/A22' (T/R = 30 MHz between A11' and A22) at a single site.

Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
FIRST PRIORITY CHANNELS		
C61/C61' (8055 / 8415)	C63/C63' (8075 / 8435)	
C62/C62' (8065 / 8425)	C64/C64' (8085 / 8445)	
SECOND PRIORITY CHANNELS		
C1 /C1 ' (7155 / 7455)	C24/C24' (7385 / 7685)	C35/C35' (7795 / 8155)
C2 /C2 ' (7165 / 7465)	C25/C25' (7395 / 7695)	C36/C36' (7805 / 8165)
C3 /C3 ' (7175 / 7475)	C26/C26' (7405 / 7705)	C37/C37' (7815 / 8175)
C4 /C4 ' (7185 / 7485)	C27/C27' (7415 / 7715)	C38/C38' (7825 / 8185)
C5 /C5 ' (7195 / 7495)	C28/C28' (7425 / 7725)	C39/C39' (7835 / 8195)
C6 /C6 ' (7205 / 7505)	C29/C29' (7435 / 7735)	C40/C40' (7845 / 8205)
C19/C19' (7335 / 7635)	C30/C30' (7445 / 7745)	C41/C41' (7855 / 8215)
C20/C20' (7345 / 7645)	C31/C31' (7755 / 8115)	C42/C42' (7865 / 8225)
C21/C21' (7355 / 7655)	C32/C32' (7765 / 8125)	C65/C65' (8095 / 8455)
C22/C22' (7365 / 7665)	C33/C33' (7775 / 8135)	C66/C66' (8105 / 8465)
C23/C23' (7375 / 7675)	C34/C34' (7785 / 8145)	

Table 4: The Center Frequencies of the 5 MHz Paired Channels[13]

Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
FIRST PRIORITY CHANNELS		
D62/D62' (8092.5 / 8452.5)	D64/D64' (8102.5 / 8462.5)	
D63/D63' (8097.5 / 8457.5)	D65/D65' (8107.5 / 8467.5)	
SECOND PRIORITY CHANNELS		
D6 /D6 ' (7152.5 / 7452.5)	D13/D13' (7187.5 / 7487.5)	D56/D56' (8062.5 / 8422.5)
D7 /D7 ' (7157.5 / 7457.5)	D14/D14' (7192.5 / 7492.5)	D57/D57' (8067.5 / 8427.5)
D8 /D8 ' (7162.5 / 7462.5)	D15/D15' (7197.5 / 7497.5)	D58/D58' (8072.5 / 8432.5)
D9 /D9 ' (7167.5 / 7467.5)	D16/D16' (7202.5 / 7502.5)	D59/D59' (8077.5 / 8437.5)
D10/D10' (7172.5 / 7472.5)	D17/D17' (7207.5 / 7507.5)	D60/D60' (8082.5 / 8442.5)
D11/D11' (7177.5 / 7477.5)	D54/D54' (8052.5 / 8412.5)	D61/D61' (8087.5 / 8447.5)
D12/D12' (7182.5 / 7482.5)	D55/D55' (8057.5 / 8417.5)	

[13] In the situation wherein one site is transmitting and receiving multiple 20 MHz BW channels, unless a site engineering study is performed, precautions should be taken to allow a minimum T/R separation of 40 MHz between the transmit and receive frequencies to ensure sufficient isolation between the transmitter and the receiver. In this case, avoid assigning channels B1/B1' and B15/B15' (T/R = 20 MHz between B1' and B15) or B16/B16' and B33/B33' (T/R = 20 MHz between B16' and B33) at a single site.

Table 5: The Center Frequencies of the 2.5 MHz Paired Channels[14]

Channel (Frequency in MHz)	Channel (Frequency in MHz)	Channel (Frequency in MHz)
FIRST PRIORITY CHANNELS		
E123/E123' (8091.25/8451.25)	E126/E126' (8098.75 / 8458.75)	E129/E129' (8106.25 / 8466.25)
E124/E124' (8093.75/8453.75)	E127/E127' (8101.25 / 8461.25)	E130/E130' (8108.75 / 8468.75)
E125/E125' (8096.25/8456.25)	E128/E128' (8103.75 / 8463.75)	
SECOND PRIORITY CHANNELS		
E11 /E11 ' (7151.25 / 7451.25)	E25 /E25 ' (7186.25 / 7486.25)	E111/E111' (8061.25 / 8421.25)
E12 /E12 ' (7153.75 / 7453.75)	E26 /E26 ' (7188.75 / 7488.75)	E112/E112' (8063.75 / 8423.75)
E13 /E13 ' (7156.25 / 7456.25)	E27 /E27 ' (7191.25 / 7491.25)	E113/E113' (8066.25 / 8426.25)
E14 /E14 ' (7158.75 / 7458.75)	E28 /E28 ' (7193.75 / 7493.75)	E114/E114' (8068.75 / 8428.75)
E15 /E15 ' (7161.25 / 7461.25)	E29 /E29 ' (7196.25 / 7496.25)	E115/E115' (8071.25 / 8431.25)
E16 /E16 ' (7163.75 / 7463.75)	E30 /E30 ' (7198.75 / 7498.75)	E116/E116' (8073.75 / 8433.75)
E17 /E17 ' (7166.25 / 7466.25)	E31 /E31 ' (7201.25 / 7501.25)	E117/E117' (8076.25 / 8436.25)
E18 /E18 ' (7168.75 / 7468.75)	E32 /E32 ' (7203.75 / 7503.75)	E118/E118' (8078.75 / 8438.75)
E19 /E19 ' (7171.25 / 7471.25)	E33 /E33 ' (7206.25 / 7506.25)	E119/E119' (8081.25 / 8441.25)
E20 /E20 ' (7173.75 / 7473.75)	E34 /E34 ' (7208.75 / 7508.75)	E120/E120' (8083.75 / 8443.75)
E21 /E21 ' (7176.25 / 7476.25)	E107/E107' (8051.25 / 8411.25)	E121/E121' (8086.25 / 8446.25)
E22 /E22 ' (7178.75 / 7478.75)	E108/E108' (8053.75 / 8413.75)	E122/E122' (8088.75 / 8448.75)
E23 /E23 ' (7181.25 / 7481.25)	E109/E109' (8056.25 / 8416.25)	
E24 /E24 ' (7183.75 / 7483.75)	E110/E110' (8058.75 / 8418.75)	

b. Tables 6 through 10 shows the center frequencies of the unpaired-channels in the 7125-8500 MHz channel and their priority status.

Table 6: The Center Frequencies of the 30 MHz Unpaired Channels

Channel (Frequency in MHz)	Channel (Frequency in MHz)	Channel (Frequency in MHz)
FIRST PRIORITY CHANNELS		
[6]A3 (7225)	A6 (7315) [15]	A5' (7585)
[6]A4 (7255)	A3' (7525)	A6' (7615)
A5 (7285) [15]	A4' (7555)	

[14] In the situation wherein one site is transmitting and receiving multiple 10 MHz BW channels, unless a site engineering study is performed, precautions should be taken to allow a minimum T/R separation of 20 MHz between the transmit and receive frequencies to ensure sufficient isolation between the transmitter and the receiver. In this case, avoid assigning channels C1/C1' and C30/C30' (T/R = 10 MHz between C1' and C30) or C31/C31' and C66/C66' (T/R = 10 MHz between C31' and C66) at a single site.

[15] This channel may also be used for paring with a narrower bandwidth channel in the Unpaired Channels pool (e.g. A3/D'18, or A3/E'35) for applications that have asymmetric radio capacity requirement (i.e. radio capacity requirement in one direction is greater than the other direction).

SECOND PRIORITY CHANNELS		
A15 (7885)	A19 (8005)	A17' (8305)
A16 (7915)	A20 (8035)	A18' (8335)
A17 (7945)	A15' (8245)	A19' (8365)
A18 (7975)	A16' (8275)	A20' (8395)

Table 7: The Center Frequencies of the 20 MHz Unpaired Channels

Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
FIRST PRIORITY CHANNELS		
B22 (7880)	B26 (7960)	B24' (8280) [15]
B23 (7900)	B27 (7980)	B25' (8300) [15]
B24 (7920)	B22' (8240) [15]	B26' (8320) [15]
B25 (7940)	B23' (8260) [15]	B27' (8340) [15]
SECOND PRIORITY CHANNELS		
B4 (7220)	B4' (7520)	B28 (8000)
B5 (7240)	B5' (7540)	B29 (8020)
B6 (7260)	B6' (7560)	B30 (8040)
B7 (7280)	B7' (7580)	B28' (8360)
B8 (7300)	B8' (7600)	B29' (8380)
B9 (7320)	B9' (7620)	B30' (8400)

Table 8: The Center Frequencies of the 10 MHz Unpaired Channels

Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
FIRST PRIORITY CHANNELS		
C55 (7995)	C59 (8035)	C57' (8375) [15]
C56 (8005)	C60 (8045)	C58' (8385) [15]
C57 (8015)	C55' (8355) [15]	C59' (8395) [15]
C58 (8025)	C56' (8365) [15]	C60' (8405) [15]
SECOND PRIORITY CHANNELS		
C7 (7215)	C11' (7555)	C51 (7955)
C8 (7225)	C12' (7565)	C52 (7965)
C9 (7235)	C13' (7575)	C53 (7975)
C10 (7245)	C14' (7585)	C54 (7985)
C11 (7255)	C15' (7595)	C43' (8235)
C12 (7265)	C16' (7605)	C44' (8245)
C13 (7275)	C17' (7615)	C45' (8255)
C14 (7285)	C18' (7625)	C46' (8265)
C15 (7295)	C43 (7875)	C47' (8275)

C16 (7305)	C44 (7885)	C48' (8285)
C17 (7315)	C45 (7895)	C49' (8295)
C18 (7325)	C46 (7905)	C50' (8305)
C7' (7515)	C47 (7915)	C51' (8315)
C8' (7525)	C48 (7925)	C52' (8325)
C9' (7535)	C49 (7935)	C53' (8335)
C10' (7545)	C50 (7945)	C54' (8345)

Table 9: The Center Frequencies of the 5 MHz Unpaired Channels

Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
FIRST PRIORITY CHANNELS		
D1 (7127.5)	D5 (7147.5)	D69' (8487.5)
D2 (7132.5)	D66' (8472.5)	D70' (8492.5)
D3 (7137.5)	D67' (8477.5)	D71' (8497.5)
D4 (7142.5)	D68' (8482.5)	
SECOND PRIORITY CHANNELS		
D18 (7872.5)	D38 (7972.5)	D22' (7532.5)
D19 (7877.5)	D39 (7977.5)	D23' (7537.5)
D20 (7882.5)	D40 (7982.5)	D24' (7542.5)
D21 (7887.5)	D41 (7987.5)	D25' (7547.5)
D22 (7892.5)	D42 (7992.5)	D26' (7552.5)
D23 (7897.5)	D43 (7997.5)	D27' (7557.5)
D24 (7902.5)	D44 (8002.5)	D28' (7562.5)
D25 (7907.5)	D45 (8007.5)	D29' (7567.5)
D26 (7912.5)	D46 (8012.5)	D30' (7572.5)
D27 (7917.5)	D47 (8017.5)	D31' (7577.5)
D28 (7922.5)	D48 (8022.5)	D32' (7582.5)
D29 (7927.5)	D49 (8027.5)	D33' (7587.5)
D30 (7932.5)	D50 (8032.5)	D34' (7592.5)
D31 (7937.5)	D51 (8037.5)	D35' (7597.5)
D32 (7942.5)	D52 (8042.5)	D36' (7602.5)
D33 (7947.5)	D53 (8047.5)	D37' (7607.5)
D34 (7952.5)	D18' (7512.5)	D38' (7612.5)
D35 (7957.5)	D19' (7517.5)	D39' (7617.5)
D36 (7962.5)	D20' (7522.5)	D40' (7622.5)
D37 (7967.5)	D21' (7527.5)	D41' (7627.5)

Table 10: The Center Frequencies of the 2.5 MHz Unpaired Channels

Channel (Frequency in MHz)	**Channel (Frequency in MHz)**	**Channel (Frequency in MHz)**
FIRST PRIORITY CHANNELS		
E1 (7126.25)	E9 (7146.25)	E137' (8486.25)
E2 (7128.75)	E10 (7148.75)	E138' (8488.75)
E3 (7131.25)	E131' (8471.25)	E139' (8491.25)
E4 (7133.75)	E132' (8473.75)	E140' (8493.75)
E5 (7136.25)	E133' (8476.25)	E141' (8496.25)
E6 (7138.75)	E134' (8478.75)	E142' (8498.75)
E7 (7141.25)	E135' (8481.25)	
E8 (7143.75)	E136' (8483.75)	
SECOND PRIORITY CHANNELS		
E35 (7871.25)	E75 (7971.25)	E43' (7531.25)
E36 (7873.75)	E76 (7973.75)	E44' (7533.75)
E37 (7876.25)	E77 (7976.25)	E45' (7536.25)
E38 (7878.75)	E78 (7978.75)	E46' (7538.75)
E39 (7881.25)	E79 (7981.25)	E47' (7541.25)
E40 (7883.75)	E80 (7983.75)	E48' (7543.75)
E41 (7886.25)	E81 (7986.25)	E49' (7546.25)
E42 (7888.75)	E82 (7988.75)	E50' (7548.75)
E43 (7891.25)	E83 (7991.25)	E51' (7551.25)
E44 (7893.75)	E84 (7993.75)	E52' (7553.75)
E45 (7896.25)	E85 (7996.25)	E53' (7556.25)
E46 (7898.75)	E86 (7998.75)	E54' (7558.75)
E47 (7901.25)	E87 (8001.25)	E55' (7561.25)
E48 (7903.75)	E88 (8003.75)	E56' (7563.75)
E49 (7906.25)	E89 (8006.25)	E57' (7566.25)
E50 (7908.75)	E90 (8008.75)	E58' (7568.75)
E51 (7911.25)	E91 (8011.25)	E59' (7571.25)
E52 (7913.75)	E92 (8013.75)	E60' (7573.75)
E53 (7916.25)	E93 (8016.25)	E61' (7576.25)
E54 (7918.75)	E94 (8018.75)	E62' (7578.75)
E55 (7921.25)	E95 (8021.25)	E63' (7581.25)
E56 (7923.75)	E96 (8023.75)	E64' (7583.75)
E57 (7926.25)	E97 (8026.25)	E65' (7586.25)
E58 (7928.75)	E98 (8028.75)	E66' (7588.75)
E59 (7931.25)	E99 (8031.25)	E67' (7591.25)
E60 (7933.75)	E100 (8033.75)	E68' (7593.75)
E61 (7936.25)	E101 (8036.25)	E69' (7596.25)
E62 (7938.75)	E102 (8038.75)	E70' (7598.75)
E63 (7941.25)	E103 (8041.25)	E71' (7601.25)
E64 (7943.75)	E104 (8043.75)	E72' (7603.75)

E65 (7946.25)	E105 (8046.25)	E73' (7606.25)
E66 (7948.75)	E106 (8048.75)	E74' (7608.75)
E67 (7951.25)	E35' (7511.25)	E75' (7611.25)
E68 (7953.75)	E36' (7513.75)	E76' (7613.75)
E69 (7956.25)	E37' (7516.25)	E77' (7616.25)
E70 (7958.75)	E38' (7518.75)	E78' (7618.75)
E71 (7961.25)	E39' (7521.25)	E79' (7621.25)
E72 (7963.75)	E40' (7523.75)	E80' (7623.75)
E73 (7966.25)	E41' (7526.25)	E81' (7626.25)
E74 (7968.75)	E42' (7528.75)	E82' (7628.75)

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Chapter 5
Spectrum Standards

5.1 GENERAL

5.1.1 Introduction

This chapter contains Radio Frequency Spectrum Standards applicable to Federal radio stations and systems.

A radio frequency spectrum standard is a principle, rule, or criterion that bounds the spectrum-related parameters, and characteristics, of a radio station or system for the purpose of managing the Radio Frequency Spectrum. Application of spectrum standards include:

1. assisting consideration of telecommunications systems for the National spectrum review process (Chapter 10),
2. systems planning, design, and procurement,
3. consideration of protection devices for the transmission of classified, and/or sensitive but unclassified information, and their spectrum needs.

The standards contained herein are those associated with the potential impact of any system or station on the normal operation of other systems or stations.

If spectrum standards are not specified in this chapter, the appropriate provisions of the ITU Radio Regulations normally shall apply. If spectrum standards are not specified in this chapter or in the ITU Radio Regulations, the appropriate criteria contained in current Recommendations of the ITU-R shall be used as guidelines.

Compliance with standards contained in this chapter may not preclude the occurrence of interference. Therefore, compliance with the standards does not obviate the need for cooperation in resolving and implementing engineering solutions to harmful interference problems (see Section 2.3.7).

5.1.2 Consequences of Non-conformance with the Provisions of this Chapter

In any instance of harmful interference caused by nonconformance with the provisions of this chapter, the responsibility for eliminating the harmful interference normally shall rest with the agency operating in nonconformance.

5.1.3 Agency Procurement Specifications

Procurement specifications shall, as a minimum, assure compliance with the appropriate requirements of this chapter. Agencies may promulgate more stringent criteria for their own use.

5.1.4 Measurement Methods

Spectrum standards for this chapter are referenced to measurement methods in Annex M. Measurement methods referenced in the annex are provided only for clarification and uniform interpretation of the standards. In cases of harmful interference, the agencies involved are expected to utilize these or equivalent, mutually agreed upon, methods of measurement for resolution of any disagreement concerning compliance with the standards. Agencies may, at their discretion, use these measurement methods as minimum qualification test procedures, e.g., as part of factory test procedures.

5.1.5 Terminology

Definitions of Special Terms, Services, and Stations are contained in Chapter 6.

Desired Relationship of Occupied Bandwidth to Necessary Bandwidth

The emission designator(s) associated in the authorization for any particular frequency assignment specifies the value of the necessary bandwidth of emission for the particular type(s) of transmission permitted. The values of necessary bandwidth are generally idealized. All reasonable effort shall be made in equipment design and operation by Federal agencies to maintain the occupied bandwidth of the emission of any authorized transmission as close to the necessary bandwidth as is reasonably practicable. (See Annex J for additional information concerning the method of calculating necessary bandwidth.)

Authorized Bandwidth

For purposes of this Manual, the term "authorized bandwidth" is defined as the necessary bandwidth (bandwidth required for the transmission and reception of intelligence) and does not include allowance for transmitter drift or doppler shift. See, in addition, Chapter 6 for the definitions of special terms including authorized bandwidth and mean power.

Resolution Bandwidth

Resolution bandwidth is the 3 dB bandwidth of the measurement system used, e.g., in power spectral density measurements. The appropriate resolution bandwidth of the measurement system varies depending on the modulation type and frequency band but should not be greater than the necessary bandwidth of the transmitter being measured.

Power (RR)

Power is designated as:
- peak envelope power (PX or pX)
- mean power (PY or pY)
- carrier power (PZ or pZ)

p denotes power expressed in watts
P denotes power in dB relative to a reference level

Logarithm

In this chapter, $\text{Log}=\text{Log}_{10}$

5.2 FREQUENCY TOLERANCES AND UNWANTED EMISSIONS

5.2.1 Table of Frequency Tolerances

Frequency tolerance standards applicable to Federal stations are specified in Table 5.2.1. The table specifies standards for station types arranged within frequency bands.

Transmitter frequency tolerance is the maximum permissible departure from the assigned frequency by the center frequency of the frequency band occupied by an emission.

Receiver frequency tolerance is the maximum permissible departure of the center frequency of the IF passband from the desired center frequency of the IF passband.

In Table 5.2.1 the units for frequency tolerance are expressed in (±) parts per million (ppm) unless otherwise stated. For the purpose of this Manual, the "±" symbol will always be implied. For example, ± 10 ppm will appear as 10 ppm.

The power shown for the various categories of stations is the peak envelope power for single sideband transmitters and the mean power for all other transmitters, unless otherwise indicated. (RR)

Table 5.2.1 Table of Frequency Tolerances

Frequency Band 9 kHz to 535 kHz	Frequency Tolerance
I. Fixed Stations	
A. 9 - 50 kHz	100
B. 50 - 535 kHz	50
II. Mobile Stations	
A. Aeronautical Stations	
1. Aeronautical	50
2. Aircraft	50
3. Survival craft	500
B. Land Mobile Stations	
1. Base (TIS) (530 kHz)	100 Hz
2. Land Mobile	20
3. Direct Printing telegraph and data.	10 Hz
C. Maritime Mobile Stations	
1. Coast	100
2. Ship a. Direct printing telegraph and data. b. Other that above	 10 Hz 200
3. Ship Emergency Transmitters	500 (a)
4. Survival Craft	500
III. Radiodetermination Stations	100

Frequency Band 535 kHz to 1605 kHz	Frequency Tolerance
I. Broadcasting Stations	10 Hz (b)

Frequency Band 1605 kHz to 4000 kHz	Frequency Tolerance
I. Fixed Stations	
A. All, except SSB	10
B. SSB radiotelephone	20 Hz
II. Mobile (Aeronautical, Land, Maritime) Stations	
A. Aeronautical Mobile Stations	
1. Aeronautical a. pY ≤ 200W b. pY > 200W c. SSB radiotelephone	 20 10 10 Hz (c)
2. Aircraft a. All except SSB b. SSB radiotelephone	 20 20 Hz (d)
B. Land Mobile Stations	
1. Base a. pY ≤ 200W, except SSB b. pY > 200W, except SSB c. SSB radiotelephone	 20 (e) 10 20 Hz
2. Land Mobile a. All except SSB b. SSB radiotelephone	 50 20 Hz
C. Maritime Mobile Stations	
1. Coast a. pY ≤ 200W, except c and d below b. pY > 200W, except c and d below c. SSB Radiotelephone d. Direct printing telegraph and data	 100 50 20 Hz 10 Hz
2. Ship a. All except below b. SSB radiotelephone c. Direct printing telephony and data	 40 (f) 40 Hz 40 Hz
3. Survival Craft a. EPIRB	 100
D. Radiodetermination Stations	
1. Radionavigation a. pY ≤ 200W b. pY > 200W	 20 10
2. Radiolocation	10
E. Broadcasting Stations	10 Hz

Frequency Band 4 to 29.7 MHz	Frequency Tolerance
I. Fixed Stations	
A. pY ≤ 500W, except C and D below	20
B. pY > 500W, except C and D below	10
C. SSB/ISB Radiotelephone	20 Hz
D. Class F1B emissions	10 Hz
II. Mobile (Aeronautical, Land, Maritime) Stations	
A. Aeronautical mobile stations	
1. Aeronautical a. pY ≤ 500W, except SSB b. pY > 500W, except SSB c. SSB Radiotelephone	 30 10 10 Hz (c)
2. Aircraft a. All except SSB b. SSB Radiotelephone	 30 20 Hz
B. Land mobile stations	
1. Base a. pY ≤ 500W, except SSB b. pY > 500W, except SSB c. SSB Radiotelephone	 20 10 20 Hz
2. Land Mobile a. All except SSB b. SSB Radiotelephone	 30 20 Hz
C. Maritime mobile stations	
1. Coast a. SSB radiotelegraph b. Direct printing telegraph and data c. Other than above	 20 Hz 10 Hz 20 Hz (g)
2. Ship a. Class A1A emission b. Other than A1A emissions (1) SSB Radiotelephone (2) Direct printing, telegraphy and data (3) Other than above	 10 50 Hz 10 Hz 50 Hz (h)
3. Survival craft	50
III. Broadcasting stations	2
IV. Space and earth stations	20

Frequency Band 29.7 to 108 MHz	Frequency Tolerance
I. Fixed stations	
A. 29.7-50 MHz, single-channel analog/digital FM/PM	5 (i)
B. Other than above	
1. pY ≤ 10W	20
2. pY > 10W	5
II. Mobile (Aeronautical, Land, Maritime) Stations	
A. 29.7- 50 MHz, analog and digital FM/PM	
1. Land and mobile	5 (i)
2. Portables	20 (i)
B. Other than above	
1 pY ≤ 10W	20 (j)
2. pY > 10W	5
III. Aeronautical Radionavigation stations (Marker beacons on 75 MHz)	50
IV. Broadcasting stations	
A. TV sound and vision	500 Hz (k)(l)
B. Other than TV	
1. pY ≤ 10 W	3000 Hz
2. pY > 10 W	2000 Hz
V. Space and earth stations	20

Frequency Band 108 to 470 MHz	Frequency Tolerance
I. Fixed stations.	
A. 108 - 406.1 MHz, all except below.	5
B. 138 - 150.8 and 162 - 174 MHz, narrowband analog/digital FM/ PM except C below	1.5
C. 162 - 174 MHz, low power and splinter channels 1. pY ≤ 10W 2. pY ≤ 10W	 5 2
D. 406-470 MHz	
1. 406.1-420 MHz a. Multi-Channel b. Analog/Digital FM/PM (1) Wideband (2) Narrowband	 2.5 (m)(n) 2.5 (i) 1.0 (i)
2. Other than above a. pY ≤ 10 W b. pY > 10 W	 5 2.5
II. Mobile (Aeronautical, Land, Maritime) Stations	
A. Aeronautical mobile stations	
1. Aeronautical	
a. Analog/digital FM/PM (1) 162-174 MHz (a) Wideband (b) Narrowband (2) 406.1-420 MHz (a) Wideband (b) Narrowband b. Other than above	 5(i) 1.5(o) 2.5 (i) 1.0 (o) 20
2. Aircraft	
a. 156-174 and 406.1-420 MHz (1) 162-174 MHz analog/digital FM/PM (a) Wideband (b) Narrowband	5 5(i) 2.5 (o)

(2) 406.1-420 MHz analog/digital FM/PM	
(a) Wideband	5(i)
(b) Narrowband	2.5(o)
b. Other than above	20
B. Land mobile stations	
1. Base	
a. 108 - 406.1 MHz, all except below	5
b. 138-150.8 and 162 - 174 MHz analog/digital FM/PM	
(1) Wideband	5(i)
(2) Narrowband	1.5(o)(v)
c. 162 - 174 MHz, splinter channel	
(1) pY ≤ 10 W	5
(2) pY > 10 W	2
d. 220 - 222 MHz, single-channel, narrowband	0.1
e. 406.1 - 470 MHz	
(1) 406.1 - 420 MHz analog/digital FM/PM	
(a) Wideband	2.5 (i)
(b) Narrowband	1.0 (o)
(2) Other than above	
(a) pY ≤ 10 W	5
(b) pY > 10 W	2.5
2. Land Mobile	
a. 138-150.8 and 162-174 MHz, all except below	5 (j)
b. 138-150.8 and 162-174 MHz, analog/digital FM/PM	
(1) Wideband	5 (i)
(2) Narrowband	2.5 (o)
c. 162 - 174 MHz (splinter channels)	
(1) pY ≤ 10 W	5
(2) pY > 10 W	2
d. 220 - 222 MHz (single channel, narrowband)	1.5 (p)
e. 406.1- 420 MHz analog/digital FM/PM	
(1) Wideband	5 (i)
(2) Narrowband	
(a) portable (pY = 5 watts)	2.5 (o)(w)
(b) all others	2 (o)
f. Other than above	15
C. Maritime mobile stations	
1. Coast	
a. 150.8 - 162.0125 MHz	
(1) FM	
(a) pY < 3 W	100 (q)
(b) 3 W ≤ pY ≤ 50 W	50 (q)
(2) Other than above	
(a) pY < 3 W	10
(b) 3 W ≤ pY < 100 W	5
(c) pY ≥ 100 W	2.5
b. Outside of 150.8 - 162.0125 MHz	
(1)162 - 174 MHz, analog/digital FM/PM	
(a) Wideband	5 (i)
(b) Narrowband	1.5 (o)
(2) 406.1 - 420 MHz, analog/digital FM/PM	
(a) Wideband	2.5 (i)
(b) Narrowband	1.0 (o)
(3) Other than above	10
2. Ship	
a. 150.8 - 162.0125 MHz (FM, pY < 25 W)	100 (q)(r)
b. 156 - 162 MHz	10
c. 162 - 174 MHz, analog/digital FM/PM	
(1) Wideband	5 (i)
(2) Narrowband	2.5 (o)
d. 406.1 - 420 MHz, analog/digital FM/PM	
(1) Wideband	5 (i)
(2) Narrowband	2 (o)
(3) Other than above	5
e. 450 - 470 MHz	5
f. Outside above bands	20 (r)
3. Survival craft	
a. 156 - 174 MHz	10 (r)
b. Other than above	20 (s)
III. Radiodetermination Stations	
A. Radionavigation stations	
1. Radar	50
2. Other than radar	20
B. Radiolocation stations	
1. Radar	50 (t)
2. Other than radar	50
IV. Broadcasting Stations	
A. TV sound and vision	500 Hz (k)(o)
B. Other than TV	2000 Hz
V. Space and Earth Stations	20

Frequency Band 470 to 960 MHz	Frequency Tolerance
I. Fixed Stations	
A. Point-to-Multipoint (932 - 932.5, 941 - 941.5MHz)	1.5 (n)
B. Point-to-Point (932.5 - 935, 941.5 - 944 MHz)	2.5 (n)
C. Other than above	5
II. Mobile (Aeronautical, Land, Maritime) Stations	
A. Land (Aeronautical, Base, Coast)	5
B. Mobile (Aircraft, Land Mobile, Ship)	
1. pY ≤ 3 W	20
2. pY > 3 W	5
III. Radiolocation Stations	400
IV. Broadcasting Stations	
A. TV Broadcasting	500 Hz (k)(i)
B. TV Broadcasting Translators	200
V. Space and Earth Stations	20

Frequency Band 960 to 1215 MHz	Frequency Tolerance
I. Aeronautical Radionavigation Stations	
A. Aeronautical and Ship Stations	10
B. Aircraft	50
II. IFF/ATCRBS of similar type station	
A. Interrogators 1030 MHz	200 kHz
B. Transponders 1090 MHz	3 MHz

Frequency Band 1215 to 10500 MHz	Frequency Tolerance
I. Fixed Stations	
A. pY ≤ 100 W	
1. 1215 to 4000 MHz	30 (n)
2. 4 to 10500 MHz	50 (n)
B. pY > 100 W	10 (n)
II. Mobile (Aeronautical, Land, Maritime) Stations	
A. 1215 to 2450 MHz	20
B. 2450 to 4000 MHz	30
C. 4000 to 10500 MHz	50
III. Radiodetermination Stations	
A. 1215 to 2450 MHz	500
B. 2450 to 4000 MHz	800
C. 4000 to 10500 MHz	1250
IV. Space and Earth Stations	20

Frequency Band 10.5 to 30 GHz	Frequency Tolerance
I. Fixed Stations	
A. 21.2 - 23.6 GHz	300
B. 21.8 - 22 GHz and 23 -23.2 GHz	500 (u)
C. Other than above	50 (n)
II. Mobile (Aeronautical, Land, Maritime) Stations	100
III. Radiodetermination Stations	2500
IV. Space and Earth Stations	50

Frequency Band Greater than 30 GHz	Frequency Tolerance
I. Fixed Stations	75
II. Mobile (Aeronautical, Land, Maritime) Stations	150
III. Radiodetermination Stations	5000
IV. Space and Earth Stations	75

Notes For Frequency Tolerances

(a) If the emergency transmitter is used as the reserve transmitter for the main transmitter, the tolerance for ship station transmitters applies.

(b) In the area covered by the North American Regional Broadcasting Agreement (NARBA), the tolerance of 20 Hz may continue to be applied.

(c) 20 Hz is applicable to other than Aeronautical Mobile (R) frequencies.

(d) The tolerance for aeronautical stations in the Aeronautical Mobile (R) service is 10 Hz.

(e) Travelers Information Stations (TIS) on 1610 kHz have a tolerance of 100 Hz.

(f) For A1A emissions the tolerance is 50 ppm.

(g) For A1A emissions the tolerance is 10 ppm.

(h) For ship station transmitters in the band 26.175-27.5 MHz, on board small craft, with a carrier power not exceeding 5 W operating in or near coastal waters and utilizing A3E or F3E and G3E emissions, the frequency tolerance is 40 ppm.

(i) This tolerance is based on emissions with an analog input and a necessary bandwidth of 16 kHz. Stations with digital inputs may require a different necessary bandwidth, but still must meet all other standards. It does not apply to military equipment used for tactical and/or training operations, FM wireless microphone systems whose pY<0.1 watts, equipment on splinter channels, and fixed stations with multichannel emissions. Also, in the band 162-174 MHz, it does not apply to equipment operating on channels designated for low power systems as set forth in Sections 4.3.8 and 5.3.6, or NOAA Weather Radio Transmitters. The measurement method for the receiver frequency tolerance is contained in paragraph 2.1.2.E.1 of Annex M.

(j) 50 ppm applies to wildlife telemetry with mean power output less than 0.5 W.

(k) In the case of television stations of:

(1) 50 W (vision peak envelope power) or less in the band 29.7-100 MHz;

(2) 100 W (vision peak envelope power) or less in the band 100-965 MHz and which receive their input from other television stations or which serve small isolated communities. It may not, for operational reasons, be possible to maintain this tolerance. For such stations, this tolerance is 1000 Hz.

(l) For transmitters for system M(NTSC) the tolerance is 1000 Hz. However, for low power transmitters using this system note (m) applies.

(m) The receiver frequency tolerance shall be maintained within 10 ppm.

(n) See Annex M, paragraph 2.1.2.C.1.(a), for the measurement method of (1) multichannel equipment in the 406.1-420 MHz band, (2) point-to-point and point-to-multipoint equipment in the bands 932-935/941-944 MHz, or (3) point-to-point and transportable type equipment operating between 1710 MHz and 15.35 GHz (except for systems designed to use scatter techniques).

(o) This tolerance is for stations with emissions having a necessary bandwidth of 11 kHz or less. It does not apply to military equipment used for tactical and/or training operations, FM wireless microphone systems whose mean output power does not exceed 0.1 watt, equipment operating on channels designated for low power systems as set forth in Sections 4.3.8 and 5.3.6, and NOAA Weather Radio Transmitter.

(p) This standard is for narrowband operations with a necessary bandwidth of 4 kHz or less.

(q) The frequency tolerance standard is for maritime mobile stations using FM emissions in the band 150.8-162.0125 MHz with a necessary bandwidth of less than or equal to 16 kHz. See Annex M, paragraph 2.1.2.B, for the measurement method.

(r) Outside band 156-174 MHz, for transmitters used by on-board communications stations, a tolerance of 5 ppm shall apply.

(s) For transmitters used by on-board communications stations, a tolerance of 5 ppm applies.

(t) A frequency tolerance of 10 ppm applies to wind profiler radars operating on the frequency 449 MHz.

(u) Applies to frequency pairs 21.825 GHz, 23.025 GHz; 21.875, 23.075 GHz; 21.925, 23.125 GHz; and, 21.975 GHz, 23.175 GHz only.

(v) This tolerance is for new narrowband stations which will become effective on 1 January 2006. Stations already operational, procured prior to 1 January 2006 or have been approved by NTIA/SPS shall conform to a 2.5ppm tolerance standard.

(w) This tolerance is for new narrowband stations which will become effective on 1 January 2006.

5.2.2 Location of Standards for Levels of Unwanted Emissions

5.2.2.1 Location of Specific Standards

The location of levels of unwanted emission standards are provided in Table 5.2.2.1 below. The table specifies the section number for each standard by station type.

Table 5.2.2.1

Station Type: FIXED STATIONS	Location of Standards
Single Sideband and Independent Sideband Equipment (2-29.7 MHz)	5.3.1
Multichannel (406.1-420 MHz) Point-to-point and point-to-multipoint (932-935/941-944 MHz) Point-to-point and transportable, except for systems using scatter techniques (1.71-15.35 GHz)	5.3.3
Analog or Digital FM/PM Wideband Operations (29.7-50, 162-174, and 406.1-420 MHz)	5.3.5.1
Analog or Digital FM/PM Narrowband Operations (138-150.8,162-174, and 406.1-420 MHz)	5.3.5.2
Low Power Channels and Splinter Channels (162-174 MHz and 406.1-420 MHz)	5.3.6
Telemetry, Terrestrial (1435-1525, 2200-2290, 2310-2320 and 2345-2390 MHz)	5.3.7
Analog Transmissions and Low Power Transmit (21.2-23.6 GHz)	5.3.9
Other than above	5.2.2.2

Station Type: LAND and MOBILE STATIONS	Location of Standards
Single Sideband and Independent Sideband Equipment (2-29.7 MHz)	5.3.1
Maritime Mobile Stations using FM (150.8-162.0125 MHz)	5.3.2
Land Mobile, Single Channel Narrowband Operations (220-222 MHz)	5.3.4
Analog or Digital FM/PM Wideband Operations (29.7-50, 162-174, and 406.1-420 MHz)	5.3.5.1
Analog or Digital FM/PM Narrowband Operations (138-150.8, 162-174 MHz and 406.1-420. MHz)	5.3.5.2
Low Power Channels and Splinter Channels (162-174 MHz and 406.1-420 MHz)	5.3.6
Telemetry, Terrestrial (1435-1525, 2200-2290, 2310-2320 and 2345-2390 MHz)	5.3.7
Other than above	5.2.2.2

Station Type: RADIODETERMINATION STATIONS	Location of Standards
Primary radars including spacebased radars on a case-by-case bases (100 MHz to 40 GHz)	Part 5.5
Other than above	5.2.2.2

Station Type: BROADCASTING STATIONS	Location of Standards
All bands	5.2.2.2

Station Type: EARTH and SPACE STATIONS (excluding spacebased radars)	Location of Standards
Below 470 MHz	5.2.2.2
470 MHz and above	Part 5.6

5.2.2.2 General Standards

Below 29.7 MHz, the following standard applies when no other standard applies:

The mean power of any unwanted emissions supplied to the antenna transmission line, as compared with the mean power of the fundamental, shall be in accordance with the following:

1. On any frequency removed from the assigned frequency by more than 100 percent, up to and including 150 percent of the authorized bandwidth, at least 25 decibels attenuation;

2. On any frequency removed from the assigned frequency by more than 150 percent, up to and including 300 percent of the authorized bandwidth, at least 35 decibels attenuation; and

3. On any frequency removed from the assigned frequency by more than 300 percent of the authorized bandwidth, for transmitters with mean power of 5 kilowatts or greater, at least 80 decibels attenuation; and for transmitters with mean power less than 5 kilowatts, at least 43+10 log (pY) decibels attenuation (i.e., 50 microwatts absolute level), except that:

a. For transmitters of mean power of 50 kilowatts or greater and which operate over a frequency range approaching an octave or more, a minimum attenuation of 60 decibels shall be provided and every effort should be made to attain at least 80 decibels attenuation.

b. For hand portable equipment of mean power less that 5 watts, the attenuation shall be at least 30 decibels, but every effort should be made to attain 43+10 log(pY) decibels attenuation (i.e., 50 microwatts absolute level).

c. For mobile transmitters, any unwanted emissions shall be at least 40 decibels below the fundamental without exceeding the value of 200 milliwatts, but every effort should be made to attain 43+10 log(pY) decibels attenuation (i.e., 50 microwatts absolute level).

d. When A1A, F1B, or similar types of narrowband emissions are generated in an SSB transmitter, the suppressed carrier may fall more than 300 percent of the authorized bandwidth from the assigned frequency. Under these conditions, the suppressed carrier shall be reduced as much as practicable and shall be at least 50 decibels below the power of the fundamental emission.

29.7 MHz and above, the following standard applies when no other standard applies:

The mean power of any emission supplied to the antenna transmission line, as compared with the mean power of the fundamental, shall be in accordance with the following (above 40 GHz these are design objectives pending further experience at these orders of frequency):

1. On any frequency removed from the assigned frequency by more than 75 percent, up to and including 150 percent, of the authorized bandwidth, at least 25 decibels attenuation;

2. On any frequency removed from the assigned frequency by more than 150 percent, up to and including 300 percent, of the authorized bandwidth, at least 35 decibels attenuation; and

3. On any frequency removed from the assigned frequency by more than 300 percent of the authorized bandwidth:

a. For transmitters with mean power of 5 kilowatts or greater, attenuation shall be at least 80 decibels.

b. For transmitters with mean power less than 5 kilowatts, spurious output shall not exceed 50 microwatts (i.e., 43+10 log(pY)) decibels attenuation except for frequency modulated maritime mobile radiotelephone equipment above 30 MHz as follows:

(1) The mean power of modulation products falling in any other international maritime mobile channel shall not exceed 10 microwatts for mean transmitter power 20 watts or less.

(2) The mean power of any other unwanted emission on any discrete frequency within the international maritime mobile band shall not exceed 2.5 microwatts for transmitters with mean power of 20 watts or less.

(3) For maritime mobile transmitters of mean power above 20 watts, these 2.5 and 10 microwatt limits may be increased in proportion to the increase of the mean power of the transmitters above this 20 watts.

5.3 FIXED AND MOBILE STATIONS

5.3.1 HF Single Sideband and Independent Sideband Equipment (2-29.7 MHz)

This standard specifies that spectrum standards for single sideband equipment for single channel voice, direct printing telegraphy and data, in the Fixed and Mobile services between 2 and 29.7 MHz (Except in the bands allocated exclusively to the Aeronautical Mobile (R) service.) In using the spectrum standards indicated below, it should be recognized that they do not prohibit an agency from making improvements thereon.

A. Transmitter Standards

1. For unwanted emissions for fixed and mobile services (except the land mobile service), the peak power of any emission on any frequency removed from the center of the authorized bandwidth[1] (BW) by a displacement frequency (fd in kHz) shall be attenuated below the peak envelope power (pX) of the transmitter in accordance with the following schedule:

fd in kHz	Attenuation in dB
$50\%BW < f_d < 150\%BW$	26
$150\%BW < f_d \leq 250\%BW$	35
$f_d > 250\%$ BW	40 + 10 log(pX) or 80 whichever is the lesser attenuation.

Figure 5.3.1 below provides an example of HF SSB emission plotted using the measurement method described in Annex M. The figure also shows the standard superimposed on the plot to show conformance.

For the land mobile service, the peak power of any emission on any frequency removed from the center of the authorized bandwidth[1] (BW) by a displacement frequency (f_d in kHz) shall be attenuated below the peak envelope power (pX) of the transmitter in accordance with the following schedule:

fd in kHz	Attenuation in dB
1.75 kHz $f_d \leq$ 5.25 kHz	28
5.25 kHz $f_d \leq$ 8.75 kHz	38
$f_d >$ 8.75 kHz	43+10 log (pX)

2. Where suppressed carrier operation is employed, transmitters shall be capable of operation with the emitted carrier power attenuated at least 40 dB below peak envelope power.

3. Where interoperability with conventional double sideband AM receivers is required, single sideband transmitters shall have the capability to transmit the carrier at a level within 6 dB of the peak envelope power.

4. The upper sideband mode shall be employed where there is need for working among international services.

B. Receiver Standards

1. Selectivity. The passband[2] shall be no greater than the authorized bandwidth of emission and the slope of the selectivity characteristic outside the passband shall be 100 dB/kHz.

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[1] In other than exceptional cases the practice is to authorize 3 kHz as the necessary bandwidth for normal voice intelligibility. This is specified by the emission designator. In the practical case, to meet the minimum performance requirements of this paragraph the roll-off of the emission curve will begin at a value somewhat less than 1.5 kHz from the assigned frequency.

[2] Passband--The passband is the band of frequencies limited by the two frequencies for which the voltage is attenuated to one-half of the voltage of the most favored frequency.

2. Tunability. The equipment shall be capable of operation on any frequency within its tuning range. However, where a synthesizer is employed as the frequency controlling element, the receiver shall be capable of operation on any frequency which is an integral multiple of 0.1 kHz.

C. Antenna Standards [3]

Fixed Station

1. Directive antennas are not required below 4 MHz. Directive antennas shall be employed above 4 MHz unless in specific cases they are shown to be impracticable.

2. Minimum forward power gain over an isotropic radiator located at the same height over the same earth as directive antenna shall be 10 dB in the range 4 to 10 MHz and 15 dB in the range 10 to 30 MHz.[4] The gain of any reference antenna used in an actual measurement must be specified relative to an isotropic antenna.

3. The antenna gain in the desired direction over that of a lobe in any other direction shall be greater than 6 dB.

Mobile Station

To the extent practicable, land stations shall use antennas designed so as to reduce their radiation and/or their susceptibility to interference in those directions where service is not required.

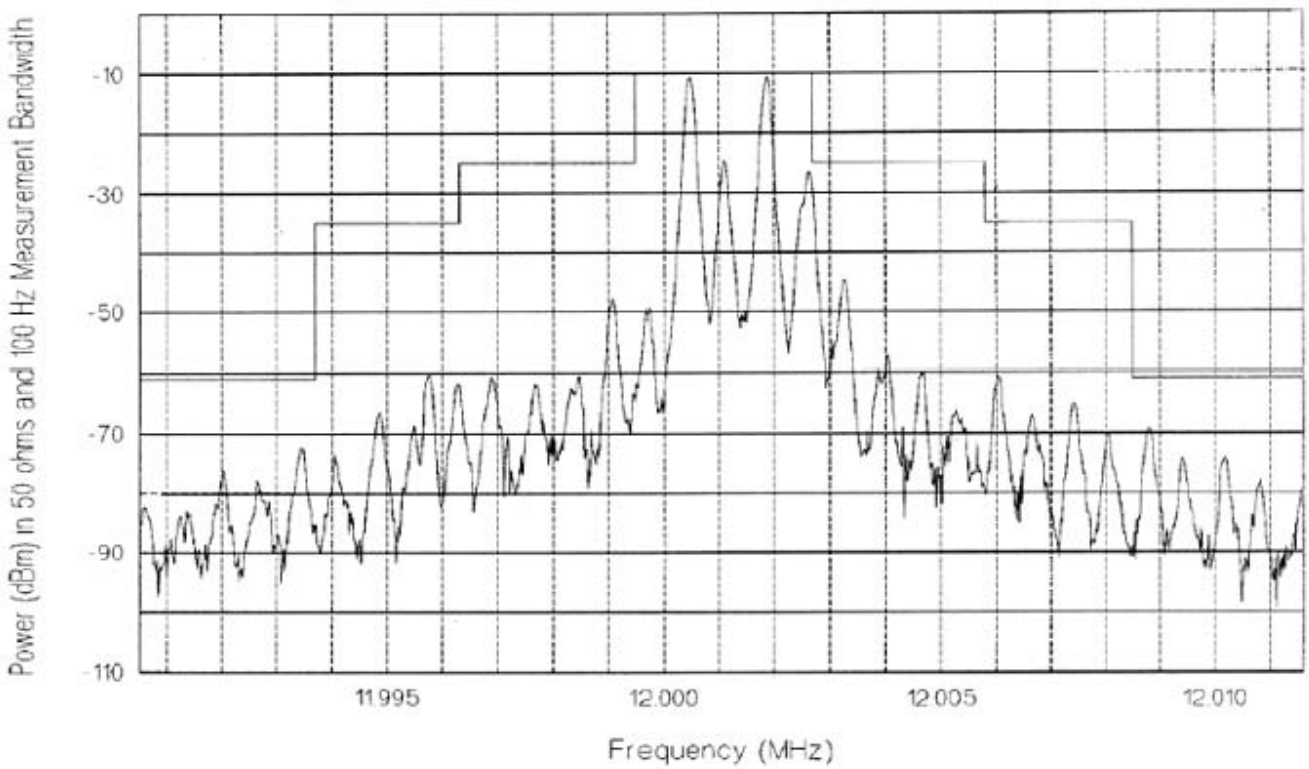

Figure 5.3.1 RSL (dBm) vs. Frequency (MHz)
Example of measured Emission for HF SSB Transmitter Fundamental with NTIA Standard in Section 5.3.1.
Modulation Tones = 400 Hz and 1800 Hz, Resolution BW = 100 Hz, Span = 21.1 kHz

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[3] Applies to both transmitting and receiving antennas, but to the latter only when protection from harmful interference is required.

[4] These gain figures would be approximately 6 dB greater if the gain were to be expressed relative to an isotropic antenna in free space, in order to account for ground reflection.

5.3.2 Maritime Mobile Stations using FM (150.8-162.0125 MHz)

This standard is for maritime mobile stations using FM emissions in the band 150.8-162.0125 MHz with a necessary bandwidth of less than or equal to 16 kHz.

After January 21, 1997, ship station transmitters, except portable ship station transmitter, must be capable of automatically reducing power to 1 watt or less when tuned to the frequency 156.375 MHz or 156.650 MHz. A manual override will permit full carrier power operation on these channels.

5.3.3 Fixed Services (406.1-420 MHz Band, the 932-935/941-944 MHz Bands, and the 1710 MHz-15.35 GHz Frequency Range)

The following standard is for Federal Government Fixed Services employing: (a) multichannel equipment in the 406.1-420 MHz band, (b) point-to-point and point-to-multipoint equipment in the bands 932-935/941-944 MHz, or (c) point-to-point and transportable type equipment operating between 1710 MHz and 15.35 GHz (except for systems designed to use scatter techniques).

This standard became effective on August 28, 1990, for fixed operations (point-to-point and point-to-multipoint) in the bands 932-935/941-944 MHz. These bands are partially allocated for Federal and non-Federal fixed service use on a co-primary basis. Standards for receivers operating in the bands 932-935/941-944 MHz, are not mandatory and are presented herein to provide guidelines to promote efficient and effective use of these shared frequencies.

This standard became effective on January 1, 1987, for multichannel equipment operating in the 406.1-420 MHz band. Such equipment placed in operation or contracted for prior to January 1, 1987, may continue to operate without regard to the requirements of this standard.

This standard became effective on January 1, 1979, for fixed equipment operating in the 1710 MHz - 15.35 GHz frequency range. Such equipment placed in operation or contracted for prior to January 1, 1979 may continue to operate without regard to the requirements of this standard until January 1, 1994.

A. Transmitter Standards

Unwanted Emissions. The mean power of any emission on any frequency removed from the center of the authorized bandwidth (BW) by a displacement frequency (fd in kHz) shall be attenuated below the mean output power (pY) of the transmitter in accordance with the following schedule. For cases where a resolution bandwidth is not specified, use 100 kHz for center frequencies less than 1 GHz and 1 MHz for center frequencies greater than or equal to 1 GHz:

(a) For transmission other than those employing digital modulation techniques:

fd in kHz	Attenuation in dB
$50\%BW < f_d \leq 100\%BW$	25
$100\%BW < f_d \leq 250\%BW$	35
$f_d > 250\%$ BW	43 + 10log (pY) or 80 whichever is the lesser attenuation

(see Figure 5.3.3a for a sample application of this standard)

(b) For transmissions employing digital modulation techniques:[5]

[5] Relatively narrowband digital radio systems may be unduly restricted by this standard. Work is in progress to define appropriate limitations for such narrowband systems. This standard will be modified in accordance with the findings and experience with such narrowband systems.

In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent, up to and including 250 percent, of the authorized bandwidth as specified by the following equation but at least 50 decibels:

$$A = 35 + .8(\% - 50) + 10\log(BW)$$

where:

A = attenuation (in decibels) below the mean output power level, % = percent of the authorized bandwidth removed from the assigned frequency.

and BW = authorized bandwidth in MHz.

Attenuation greater than 80 decibels is not required.

In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log(pY) decibels, or 80 decibels, whichever is the lesser attenuation. The Measurement Method is in paragraph 2.1.1.C.1.(b) of Annex M. (see Figure 5.3.3b for a sample application of this standard)

(c) In the bands 932-935 and 941-944 MHz, fixed point-to-multipoint stations using transmissions employing digital modulation techniques with a bandwidth of 12.5 kHz or less, the power of any emission shall be attenuated below the unmodulated carrier power (mean power can be used) of the transmitter (pY) in accordance with the following schedule:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 2.5 kHz up to and including 6.25 kHz: At least 53 log(f_d/2.5) decibels;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 6.25 kHz up to and including 9.5 kHz: At least 103 log(fd/3.9) decibels;

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 9.5 kHz up to and including 15 kHz: At least 157 log(f_d/5.3) decibels;

(4) On any frequency removed from the center of the authorized bandwidth by a displacement frequency greater that 15 kHz: At least 50+10 log(pY) or 70 decibels, whichever is the lesser attenuation.

(d) In the bands 932-935 and 941-944 MHz, fixed point-to-multipoint stations using transmissions employing digital modulation techniques with a bandwidth greater than 12.5 kHz, the power of any emission shall be attenuated below the unmodulated carrier power (mean power can be used) (pY) of the transmitter in accordance with the following schedule;

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz up to and including 10 kHz: At least 83 log (fd/5) decibels;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz up to and including 250 percent of the authorized bandwidth: At least 116 log(fd/6.1) or 50+10 log(pY) or 70 decibels, whichever is the lesser attenuation;

(3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43+10 log(pY) decibels or 80 decibels, whichever is the lesser attenuation.

2. The maximum equivalent isotropic radiated power (EIRP) shall not exceed the values specified below. However, the additional constraints of Section 8.2.34 of this manual apply.

Frequency Band (MHz)	Maximum Allowable EIRP (dBm)
406.1-420	80
932-932.5	47
932.5-935	70
941-941.5	60
941.5-944	70
1710-4990	80
7125-15350	85

B. Receiver Standards

1. The receiver unwanted signals shall be attenuated at least 60 dB relative to the receiver sensitivity at the center of the passband. The Measurement Method is in paragraph 2.1.1.C.2.(b) of Annex M.

2. Selectivity. Receiver selectivity is the degree to which a receiver is able to discriminate against the effects of undesired signals primarily outside the authorized emission bandwidth that arrive at its RF input terminals.

The –3 dB receiver bandwidth should be commensurate with the authorized emission bandwidth plus twice the frequency tolerance of the transmitter specified in Section 5.2.1. The –60 dB receiver bandwidth shall not exceed five times the –3 dB receiver bandwidth.

3. Conducted Undesired Emissions are those undesired signals generated in the receiver and leaving the receiver by way of the receiving transmission line.

Conducted emissions from the receiver on any frequency, as measured at the radio frequency interface point to the antenna system, shall not exceed –85 dBW. For the bands 406.1-420 MHz and 932-935/941-944 MHz, conducted emissions shall not exceed –57 dB.

4. Noise Figure. The noise figure of a receiver is the ratio expressed in dB of (1) the output noise power to (2) the portion of noise power attributable to thermal noise in the input termination at 290 kelvins.

The receiver noise figure including preamplifier should be 9 dB or less for frequencies below 4400 MHz, 12 dB or less for frequencies between 4400 MHz, and 10 GHz, and 14 dB or less for higher frequencies (up to 15.35 GHz).

C. Antenna Standards

The following limitations do not apply to transportable antenna systems when used in tactical and training operations. Additionally, the following limitations do not apply to multipoint distribution systems (point-to-multipoint) operating in the bands 406.1-420, 932-932.5 and 941-941.5 MHz.

1. Each station shall employ directional antennas with the major lobe of radiation directed toward the receiving station with which it communicates, or toward any passive repeater that may be used.

2. Antenna Radiation Pattern. The antenna radiation pattern is the relative power gain as a function of direction for the specified polarization.

Directional antennas shall meet the performance standards indicated in Table 5.3.3. For assignments in bands shared with satellite-space services, determination on additional beamwidth limitations shall be made on a case-by-case basis if mutual interference problems are likely to be involved.

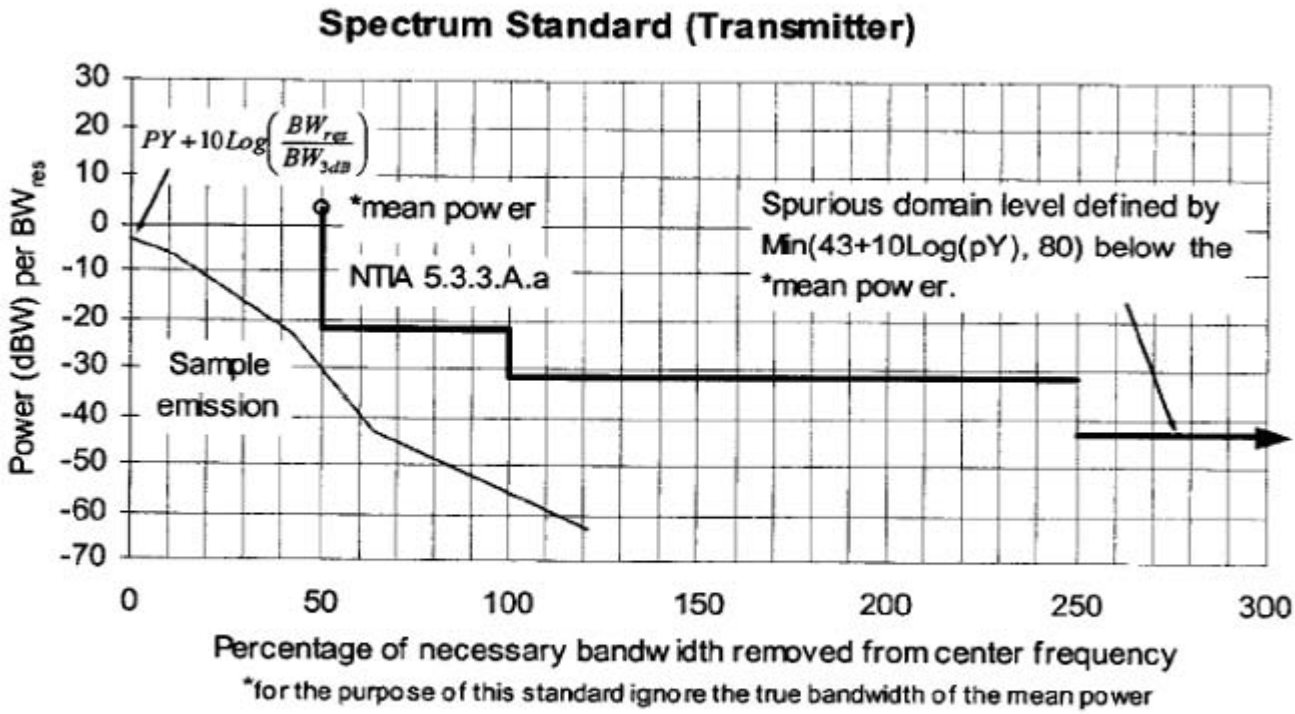

Figure 5.3.3a

Figure 5.3.3a shows a sample analog emission whose center frequency is 7.135 GHz, necessary bandwidth is 19.8 MHz, -3 dB bandwidth is 4 MHz, and mean output is 2 watts (3 dBW), plotted against the standard. The emission complies with the standard.

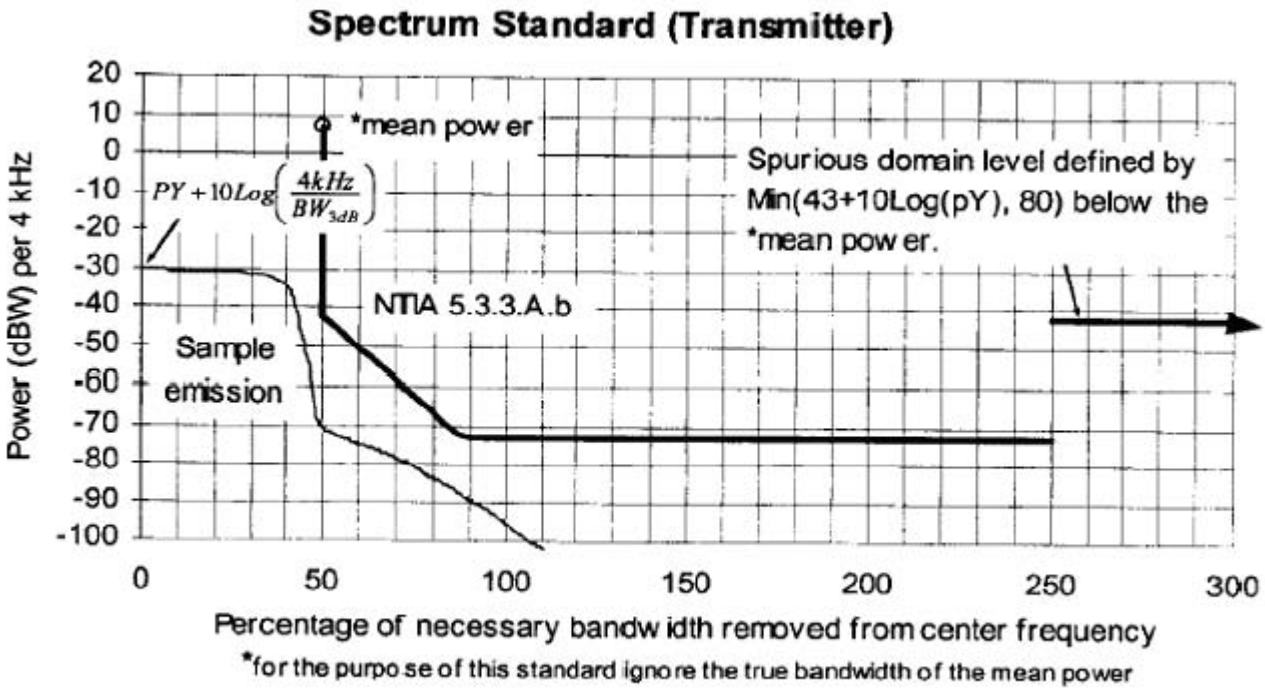

Figure 5.3.3b

Figure 5.3.3b shows a sample digital emission whose necessary bandwidth is 30 MHz, -3 dB bandwidth is 22 MHz, and mean output power is 5 watts (7 dBW), plotted against the standard. The emission complies with the standard.

TABLE 5.3.3

Frequency Band	Maximum beamwidth (3 dB point)	Minimum suppression at angle in degrees from center line of main beam (dB)						
		5-10	10-15	15-20	20-30	30-100	100-140	140-180
406.1-420 MHz[1]	80	-	-	-	-	10	10	10
a) 932.5-935 MHz 941.5-944 MHz[2]	14	-	6	11	14	17	20	24
b) 932.5-935 MHz 941.5-944 MHz[2]	20	-	-	6	10	13	15	20
1710-1850 MHz[3]	10	-	14	16	18	23	24	30
1710-1850 MHz[4]	8	5	18	20	20	25	28	36
2200-2400 MHz	8.5	4	12	16	16	24	25	30
4.4-4.99 GHz	4	13	20	23	24	29	31	31
7.125-8.5 GHz	2.5	19	23	28	30	34	35	43
14.4-15.35 GHz	1.5	21	26	31	35	37	41	48

1 - Any secondary lobe.

2 - Stations in this service must employ an antenna that meets the performance standard except that, in areas not subject to frequency congestion, subject to frequency coordination along the borders of the U.S., antennas meeting standards for category B may be employed. Note, however, the use of a high performance antenna may be required where interference problems can be resolved by the use of such antennas.

3 - These suppression levels could be met, e.g., by a 1.2 meter (4 foot) diameter parabolic antenna.

4 - This standard is applicable to new stations in the 1710-1850 MHz band placed in service after January 1, 1985, except for those located on the military test ranges specified in Section 7.17.1 and those limitations noted in paragraph 5.3.3.C. These suppression levels could be met, e.g., by a 1.83 meter (6 foot) diameter parabolic antenna.

Note: It is recognized that relatively narrowband systems may be unduly restricted by this standard. Work is in progress to define appropriate limitations for such narrowband systems. This standard will be modified in accordance with findings and experience with such narrowband systems.

5.3.4 Land Mobile, Single Channel Narrowband Operations (220-222 MHz Band)

The 220-222 MHz band was reallocated on September 6, 1988 to the land mobile service for shared Federal and non-Federal operations. The operations are limited to single channel, narrowband equipment. The 2 MHz available in this band are allocated in 400 channels each 5 kHz wide and paired to create 200 narrowband channel pairs. See Section 4.3.15 for the channeling plan. This standard became effective on January 1, 1992.

A. Transmitter Standards

1. Bandwidth Limitations: The maximum authorized bandwidth shall be 4 kHz.

2. Unwanted Emissions: On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz), the power of any emission shall be attenuated below the peak envelope power (pX) watts in accordance with the following schedule:

f_d in kHz		Attenuation in dB
$2 < f_d \leq 3.75$	the lesser of	$30 + 20(f_d-2)$ or $55 + 10\log(pX)$ or 65
$3.75 < f_d$	at least	$55 + 10\log(pX)$

The Measurement Method is in paragraph 2.1.1.D of Annex M.

B. Geographic Separation of Sub-Band A Base Station Receivers and Sub-Band B Base Station Transmitters

1. Base station receivers utilizing channels assigned for sub-band A as designated in Chapter 4 will be geographically separated from those base station transmitters utilizing channels removed 200 kHz or less and assigned from sub-band B as follows:

Separation Distances (Kilometers)	Effective Radiated Power (Watts)*
0.0 - 0.3	**
0.3 - 0.5	5
0.5 - 0.6	10
0.6 - 0.8	20
0.8 - 2.0	25
2.0 - 4.0	50
4.0 - 5.0	100
5.0 - 6.0	200
over 6.0	500

* Transmitter peak envelope power shall be used to determine effective radiated power.
** Stations separated by 0.3 km or less shall not be authorized. This table does not apply to the low-power mobile data channels 196-200. (See Section C.)

2. Except for nationwide assignments, the separation of co-channel base stations shall be 120 kilometers. Shorter separations will be considered on a case-by-case basis upon submission of a technical analysis indicating that at least a 10 dB protection will be provided to an existing station's 39 dB signal level contour.

C. Limitations on Power and Antenna Height:

1. The permissible effective radiated power (ERP) with respect to antenna heights shall be determined from the following table. These are maximum values and applications are required to justify power levels requested.

Table. ERP vs. Antenna Height

Antenna Height above Average Terrain (HAAT) Meters	Effective Radiated Power (ERP) Watts*
Up to 150	500
150 to 225	250
225 to 300	125
300 to 450	60
450 to 600	30
600 to 750	20
750 to 900	15
900 to 1050	10
Above 1050	5

* Transmitter PEP shall be used to determine ERP.

2. The maximum permissible ERP for mobile units is 50 watts. Portable units are considered as mobile units.

3. Channels 196-200 are limited to 2 watts ERP and a maximum antenna height of 6.1 meters (20 feet) above ground.

5.3.5 Standards for Fixed and Mobile Analog or Digital FM/PM Operations (29.7-50, 138-150.8, 162-174, and 406.1-420 MHz Bands)[6]

5.3.5.1 Standard for Fixed and Mobile Analog or Digital FM/PM Wideband Operations (29.7-50, 162-174, and 406.1-420 MHz Bands)

Standards in this section related specifically to digital systems became effective on October 1, 1990.

These standards do not apply to:

- Military equipment used for tactical and/or training operations.
- FM wireless microphone systems whose mean output power does not exceed 0.1 watt.
- Equipment operating on splinter channels. (See Section 5.3.6).
- Fixed stations equipment with multichannel emissions (see Section 5.3.3).

The following is for fixed and mobile/land mobile service employing fixed, land, mobile and portable stations using analog or digital FM or PM emissions in the bands 29.7-50, 162-174, and 406.1-420 MHz. These standards are based upon emissions with analog input and a necessary bandwidth of 16 kHz.[7]

Stations with digital input may require a different necessary bandwidth but still must meet all other standards.

A. Transmitter

1. Unwanted Emissions: The power of any unwanted emission on any frequency removed from the center of the authorized bandwidth (BW) by a displacement frequency (fd in kHz) shall be attenuated below the unmodulated carrier power (pZ) in accordance with the following and Figure 5.3.5.1.

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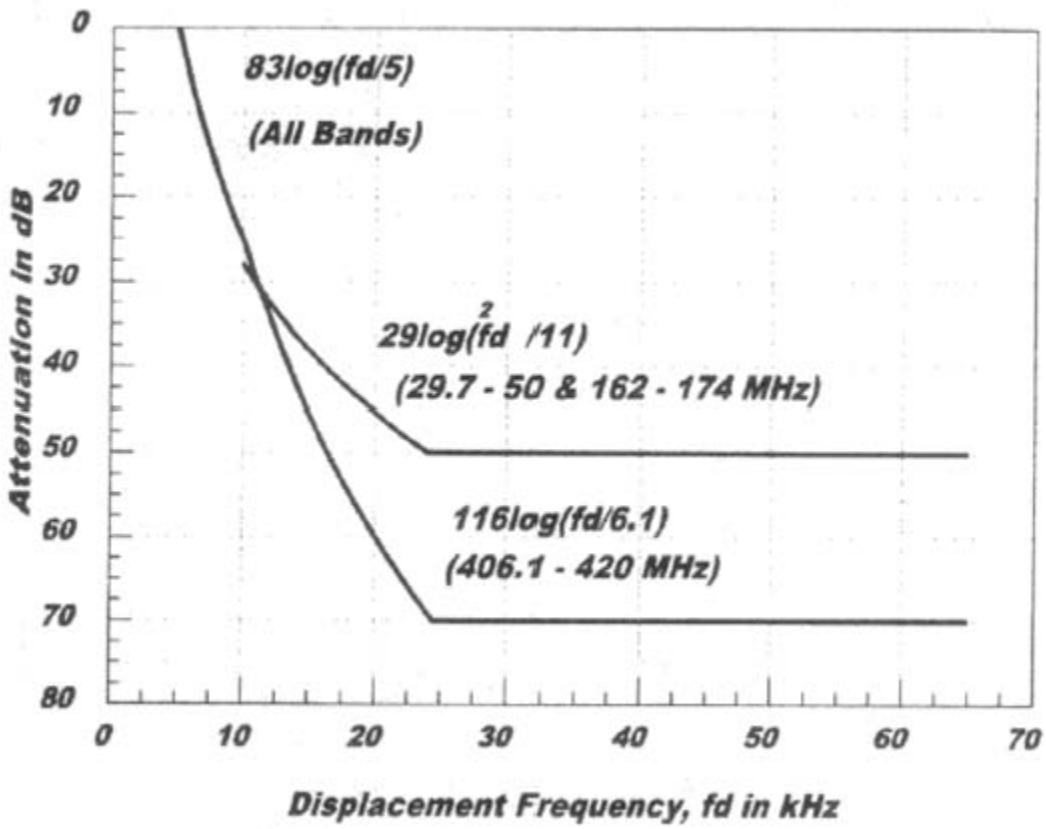
[6] In the band 406.1 - 410 MHz, power is limited to a maximum of 7 W/kHz of necessary bandwidth as specified in footnote US117 to the Tables of Frequency Allocations (Chapter 4).

[7] The spacing of channels (adjacent channel spacing) is 20 kHz in the 30-50 MHz band and 25 kHz in the 162-174 and 406.1 - 420 MHz bands.

fd in kHz	**Attenuation in dB**
5 kHz < f_d ≤ 10 kHz	All bands: 83log (f_d/5)
10 kHz < f_d ≤ 250% BW	29.7-50 MHz & 162-174 MHz: 29log (f_d^2/11) or 50 whichever is the lesser attenuation

Figure 5.3.5.1



406.1-420 MHz: 116log (f_d/6.1) or 50 + 10log (pZ) or 70 whichever is the lesser attenuation.

fd > 250% BW	All bands: 50 + 10log (pZ) (i.e. 10 microwatts absolute) Portable 43 + 10log (pZ) (i.e. 50 microwatts absolute)

Figure 5.3.5.1 shows the mask for a fixed or mobile station operating in the bands 29.7-50, 162-174 and 406.1- 420 MHz with an authorized bandwidth of 25 kHz and a mean power of 100 watts.

2. Frequency Deviation for all station classes and frequency bands shall not exceed 5 kHz. The Measurement Method is in paragraph 2.1.E.1 of Annex M.

B. Receiver

1. Spurious Response Attenuation:

Station Class	Band (MHz)		
	29.7-50	162-174	406.1-420
Land, Fixed, Mobile	85 dB	85 dB	85 dB
Portable	60 dB	60 dB	50 dB

2. Adjacent Channel Selectivity:

ANALOG			
Station Class	Band (MHz)		
	29.7-50	162-174	406.1-420
Land, Fixed, Mobile	80 dB	80 dB	80 dB
Portable	50 dB	70 dB	60 dB

DIGITAL			
Station Class	Band (MHz)		
	29.7-50	162-174	406.1-420
Land, Fixed, Mobile	50 dB	55 dB	55 dB
Portable	50 dB	50 dB	50 dB

3. Intermodulation Attenuation:

Station Class	Band (MHz)		
	29.7-50	162-174	406.1-420
Land, Fixed, Mobile	60 dB	70 dB	70 dB
Portable	50 dB	50 dB	50 dB

4. Conducted Spurious Emissions: All station classes and all bands –57 dBm.
5. The Measurement Method is in paragraph 2.1.1.E.1 of Annex M.

5.3.5.2 Standards for Fixed and Mobile Analog or Digital FM/PM Narrowband Operations in the 138-150.8, 162-174 and 406.1-420 MHz Bands

The standards outlined in this section apply to narrowband systems in the 138-150.8, 162-174 and 406.1-420 MHz bands. These standards do not apply to:

- Military equipment used for tactical and/or training operations in the 138-150.8 MHz band.
- FM wireless microphone systems whose mean output power does not exceed 0.1 watt.
- Equipment operating on channels designated for low-power systems as set forth in Sections 4.3.8, 4.3.10, 4.3.10a and 5.3.6.
- NOAA Weather Radio Transmitters.

Standards

The following standards apply to fixed and mobile/land mobile services employing fixed, land, mobile, and portable stations using analog or digital emissions in the 138-150.8, 162-174 and 406.1-420 MHz bands with a necessary bandwidth of 11 kHz or less. These standards are based upon either TIA/EIA 603-C for narrowband analog or TIA-102.CAAB-B for narrowband digital transmitters and receivers. Additionally, the receiver standards listed below are based upon Class A receiver limits as specified in the appropriate TIA publication.

Effective Dates

These standards for new narrowband stations operating within the subject frequency bands shall become effective on 1 January 2008. Stations already operational, procured prior to 1 January 2008 or have been approved by NTIA/SPS will be allowed to operate in accordance with existing standards and without modification until the end of the life cycle of the equipment.

Waivers

Waivers of the requirements herein may be requested when supported by reasonable justification. Waiver requests should be accompanied by technical data in support of the waiver and an explanation of the non-conforming parameters. Waivers granted will be subject to the provisions of Section 5.1.2.

A. Transmitter

1. Unwanted Emissions: The power of any unwanted emission on any frequency removed from the center of the authorized bandwidth (BW) by a displacement frequency (fd) shall be attenuated below the unmodulated carrier power (pZ) in accordance with the following and the emission mask in Figure 5.3.5.2.

Displacement Freq (fd)	**Attenuation (dB)**
$0 < f_d \leq 2.5$ kHz	0
2.5 kHz $< f_d <$ 12.5 kHz	$7(f_d-2.5)$
12.5 kHz $< f_d$	50 + 10log (pZ) or 70 whichever is the smaller

2. Frequency Deviation for all FM or PM station classes shall not exceed 2.5 kHz for analog emissions, and 3.11 kHz for digital emissions

3. The Measurement Method is in paragraph 2.1.E.2 of Annex M.

B. Receiver

1. Spurious Response Attenuation (all bands):

Station Class	**Digital**	**Analog**
Land, Fixed	90 dB	75 dB
Mobile	80 dB	75 dB
Portable	70 dB	70 dB

2. Adjacent Channel Selectivity (all bands):

Station Class	**Digital**	**Analog**
Land, Fixed	60 dB	45 dB
Mobile	60 dB	45 dB
Portable	60 dB	45 dB

3. Intermodulation Rejection (all bands):

Station Class	**Digital**	**Analog**
Land, Fixed	80 dB	75 dB
Mobile	75 dB	75 dB
Portable	70 dB	70 dB

4. Conducted Spurious Emissions for all station classes and all bands: -57 dBm.

5. The Measurement Method is in paragraph 2.1.E.2 of Annex M.

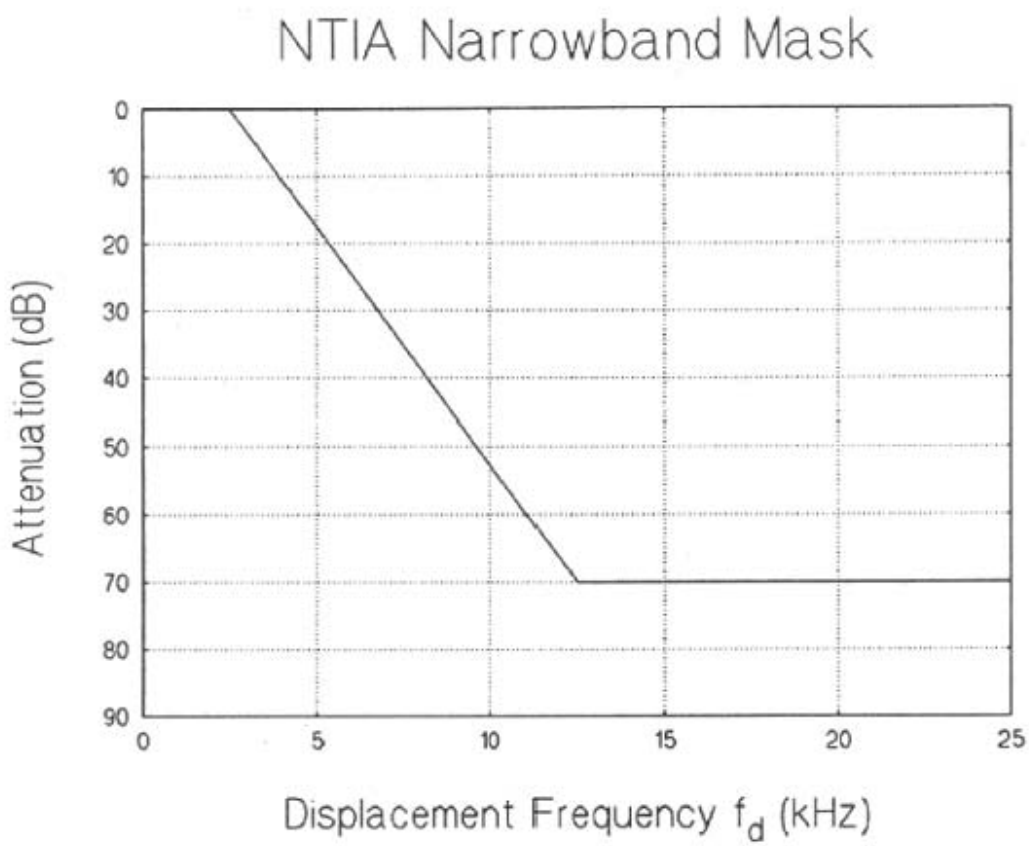


Figure 5.3.5.2 LEVELS OF UNWANTED EMISSIONS

Note: This emission mask represents the Telecommunications Industry Association (TIA) emission mask developed for narrowband FM and Digital systems designed to operate in 12.5 kHz channels in the 138-150.8 MHz, 162-174 MHz, and 406.1-420 MHz bands. (The mask assumes pZ=100 watts.)

5.3.6 Low Power Channels and Splinter Channels (162-174 MHz Band)

1. The following transmitter standards are for the use of fixed and mobile low power channels identified in Section 4.3.8 and splinter channels identified in Section 4.3.10.

2. Emission--For FM or PM emission the maximum frequency deviation plus the highest audio tone shall not exceed 0.5 times the authorized bandwidth (authorized bandwidth is equal to 2D + 2M).

3. Unwanted emission levels at the equipment antenna terminals on any frequency removed from the center of the authorized bandwidth (BW) by a displacement frequency (fd in kHz) shall be attenuated below the mean power (pY) of the unmodulated carrier output as specified by the following:

fd in kHz	Attenuation in dB
50%BW < $f_d \leq$ 100% BW	25
100%BW < $f_d \leq$ 250% BW	35
f_d > 250% BW	43 dB + 10 log (pY)

4. Power output--The maximum mean power of the unmodulated carrier output for operations on splinter channels in the 406-420 MHz band shall be limited to 30 watts.

5.3.7 Telemetry, Terrestrial (1435-1525, 2200-2290, 2310-2320 and 2345-2390 MHz Bands)

This standard is applicable to terrestrial telemetering stations, authorized for operation in the bands 1435-1525, 2200-2290, 2310-2320 and 2345-2390 MHz. The details of this standard can be found in Chapter 2 of the Range Commanders Council Telemetery IRIG Standard TG 106-## Part 1. This document can be found at http://www.ntia.doc.gov/osmhome/106.pdf or http://www.ntia.doc.gov/osmhome/106.doc. Subsequent revisions of this document will be reviewed by the Technical Subcommittee prior to adoption.

5.3.8 Low Power Transmit (21.8-22.0 and 23.0-23.2 GHz Band Segments)[8]

These standards apply to the following four frequency pairs within the above two band segments:

21.825 GHz	23.025 GHz
21.875 GHz	23.075 GHz
21.925 GHz	23.125 GHz
21.975 GHz	23.175 GHz

1. Unwanted Emissions.

When using transmissions other than those employing digital modulation techniques: the mean power of any emission supplied to the antenna transmission line, as compared with the mean power of the fundamental, shall be in accordance with the following (above 40 GHz these are design objectives pending further experience at these orders of frequency):

a. On any frequency removed from the assigned frequency by more than 50 percent, up to and including 100 percent of the authorized bandwidth, at least 25 decibels attenuation;

b. On any frequency removed from the assigned frequency by more than 100 percent, up to and including 250 percent of the authorized bandwidth, at least 35 decibels attenuation; and

c. On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth, at least 43 + 10 log(pY) decibels or 80 decibels, whichever is the lesser attenuation.

2. Maximum effective radiated power (ERP) shall be 55 dBm.
3. The rated transmitter output power shall not exceed 0.100 watts.
4. Upon showing need, a maximum bandwidth of 50 MHz may be authorized per frequency assigned.
5. These radio systems shall have no more than five hops in tandem, except upon showing of need, but in any event the maximum tandem length shall not exceed 40 km (25 miles).
6. Interfering signals at the antenna terminals of stations authorized shall not exceed -90 dBm and -70 dBm, respectively, for co-channel and adjacent channel interfering signals.
7. Antennas employing circular polarization may be used with these systems.
8. Maximum beamwidth shall not exceed 4 with a minimum front-to-back ratio of 38 dB.

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[8] These frequency pairs are shared between Federal and non-Federal users. Power constraints placed on the frequency pairs facilitate coordination due to the decreased interference potential.

5.4 DISTRESS AND SAFETY COMMUNICATIONS

1. Global Maritime Distress and Safety System (GMDSS):

Stations in the maritime and other radio services employing frequencies and techniques used in the GMDSS shall comply with the relevant ITU-R recommendations with respect to the technical characteristics of:

a. Digital selective calling (DSC) distress call formats (RR **32.9.3** and **34.2**);

b. DSC on VHF channel 70 (156.525 MHz):

(1) Capability of sensing the presence of a signal on channel 70, and

(2) Automatic prevention of transmitting a DSC call on channel 70, except for a distress and safety call by DSC, when the channel is occupied by calls (Volume 4, Rec. ITU-R M.489-2);

c. Other aspects of DSC equipment (RR **54.2**);

d. Narrowband direct printing (NBDP) message formats (Volume 4, Rec. ITU-R M.492-6) and error correction for distress, urgency, and safety messages (RR **32.43**, **33.17**, and **33.37**, respectively);

e. Transmissions from satellite emergency position-indicating radio beacons (EPIRBs) operating in the bands 406-406.1 MHz and 1645.5-1646.5 MHz (RR Appendix **13** Part A5, Section I(c) and RR **34.1**);

f. Transmissions from search and rescue radar transponders operating in the band 9200-9500 MHz (RR **5.474**); and

g. Broadcasts on 518 (NAVTEX) and other broadcasts of maritime safety information using NBDP in the bands 4-27.5 MHz (RR **33.41**).

Additionally, such stations when using DSC shall conform to the calling, acknowledgement, and operating procedures for DSC contained in the Radio Regulations (Article **32**) and the relevant ITU-R recommendation(s).

2. 121.5/243 MHz EPIRBs:

EPIRBs operating at 121.5 MHz and/or 243 MHz shall conform to the requirements of Volume 4, Rec. ITU-R M.690.1 and Annex 10 to the Convention on International Civil Aviation, to the extent that each provision is applicable.

5.5 RADAR SPECTRUM ENGINEERING CRITERIA (RSEC)

5.5.1 General Including RSEC-A

The wide application of radar for various functions makes large demands on the electromagnetic spectrum, and requires the application of effective frequency management measures for the equipment and systems involved. Criteria for certain equipment characteristics are specified herein to ensure an acceptable degree of electromagnetic compatibility among radar systems, and between such systems and those of other radio services sharing the frequency spectrum.

These criteria are concerned with promoting efficient use of the spectrum, and in specifying them there is no intent to require particular numerical values from the standpoint of the radar's mission. For example, characteristics such as power, sensitivity, pulse repetition rate, pulse duration, pulse rise and fall times, and the range of radio frequency emission are closely related to operational requirements. Accordingly, where limits for some of these characteristics are specified herein, the criteria have been chosen to avoid undue degradation of operational effectiveness. Moreover, the specification of these criteria is compatible with the policy of encouraging a free and unrestricted approach in further research looking toward more effective radars. Nevertheless, any proposals for new approaches and new system concepts involving radar must be reviewed from a frequency management viewpoint prior to development of new equipment.

Useful receiver techniques are available for reduction of the susceptibility of radars to low-duty-cycle pulse interference. The applicability of such devices as video integrators, correlators, PRF and pulse width discriminators varies with factors such as cost, availability, and their adaptability to specific equipment and environmental situations. While the mandatory incorporation of such devices is not specified herein, their application is recommended for low duty-cycle radars intended for operation in congested frequency bands and geographic areas.

All primary radars[9] shall be classified in one of five groups as shown in the following table and shall come under the criteria indicated for that group.

Applicability of RSEC [10, 11]

Radar Description	Applicable Criteria
Group A Non-pulsed radars of 40 watts or less rated average power; or Pulsed radars of 1 kW or less rated peak power; or Radars with an operating frequency above 40 GHz; or Man-portable10 radars; or Man-transportable11 radars; or Radionavigation radars in the band 9300-9500 MHz; as described above; or Expendable, non-recoverable radars on missiles	Criteria A Presently exempt from any RSEC
Group B Radars having a rated peak power of more than 1 kW but not more than 100 kW and operating between 2900 MHz and 40 GHz	Criteria B See 5.5.2
Group C All radars not included in Group A, B, D or E	Criteria C See 5.5.3
Group D All fixed radars in the 2700-2900 MHz band	Criteria D See 5.5.4
Group E Wind Profiler Radar (WPR) operating on 449 MHz	Criteria E See 5.5.5

For radars employing more than a single emitter, including phased array radars, variable PRF radars, radars whose modulation changes from pulse to pulse, and other special types of radars for which any of the following criteria cannot be directly applied, special methods may be required in establishing appropriate criteria. Pending adoption of technical criteria for such radars, values submitted for these parameters shall be accompanied by an explanation of their derivation.

The provisions of Section 5.5.2, Criteria B, are applicable to Class 1 spacebased radar systems[12] on a case-by-case basis. The provisions of Section 5.5.2 or Section 5.5.3 (i.e. Criteria B or C as appropriate) are applicable to Class 2 spacebased radar systems[13] and active spaceborne sensors[14] on a case-by-case basis.

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[9] *Primary Radar: A radiodetermination system based on the comparison of reference signals with radio signals reflected from the position to be determined. (No. 1.101 of the ITU Radio Regulations, 2004 Edition.)*

[10] *Man-portable: Items which are designed to be carried as a component part of individual, crew-served or team equipment in conjunction with assigned duties. These items are nominally less than 15 kilograms (32 pounds).*

[11] *Man-transportable: items which are usually transported on wheeled, tracked or air vehicles but have integral provisions to allow periodic handling by one or more individuals for limited distances (i.e., 100-500 meters). These items are nominally less than 30 kilograms (65 pounds).*

[12] *Spacebased Radiolocation System--Class 1: a radiolocation system in space the primary function of which is the detection and location of objects on or near the surface of the Earth.*

[13] *Spacebased Radiolocation System--Class 2: a radiolocation system installed aboard a spacecraft for the purpose of determining the relative positions or velocities of one or more extravehicular objects.*

[14] Active Spaceborne Sensor-- a measuring instrument in the earth exploration-satellite service, or in the space research service, by means of which physical measurement of various phenormena are obtained through transmission and reception of radio waves.

In the special case where Federal radionavigation radars operate in the shared Federal/non-Federal band 9300-9500 MHz, an acceptable degree of electromagnetic compatibility is deemed to be that degree of compatibility associated with the radar equipment commercially available to the non-Federal community of users. The vast preponderance of the use of this band by non-Federal domestic and foreign ships and aircraft creates a situation where relatively inexpensive commercial equipment is available "off the shelf" and at the same time equipment improvements which might be incorporated unilaterally by small numbers of Federal stations would have little effect on the band as a whole. Accordingly, Federal radionavigation radars to be operated in this band having a rated peak power of 100 kW or less are placed in Group A with the understanding that Federal agencies would procure equipment that are acceptable for non-Federal use and that this exemption will be re-examined should the situation in this band change. Measurement procedures for RSEC may be found in Annex M, paragraph 2.1.2.A RSEC.

Waivers

Waiver of the requirements herein may be requested when supported by reasonable justification. When technical and engineering data are supplied in support of a request for waiver or in evaluating the performance of equipment, an explanation of the non-conforming parameters and measurement methods employed shall be furnished. Manufacturer's data may be used where deemed appropriate and adequate.

Pulse Characteristics and Emissions Mask

Figure 1 shows a radar pulse and where the pulse rise time (t_r) and pulse width (t) are calculated. Figure 2 shows the radar emission bandwidth and emission levels for Criteria B, C, and D.

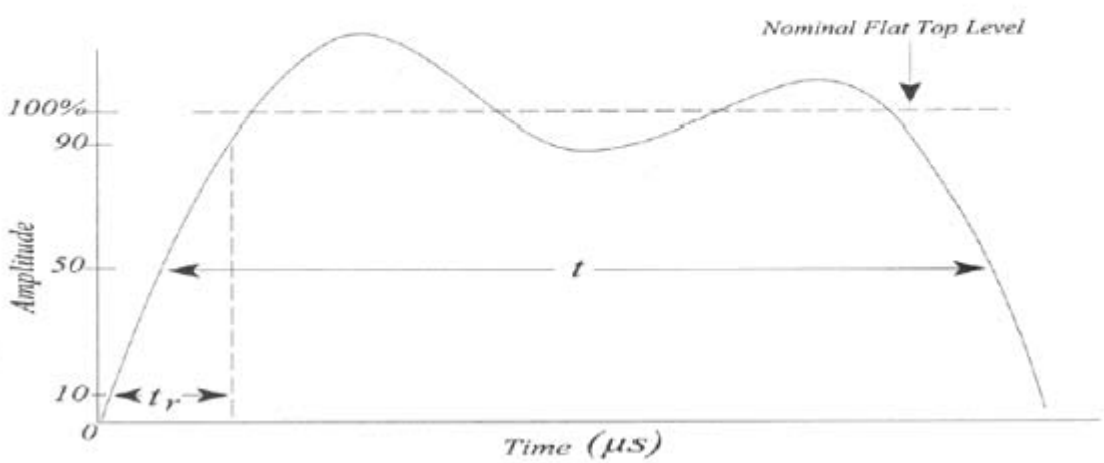
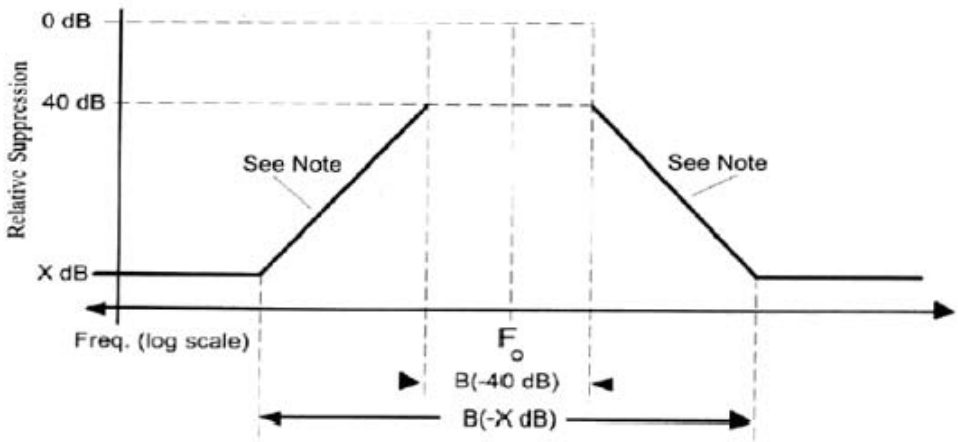


Figure 1. Determination of t and t_r



NOTE: The roll-off slope, S, from the -40 dB to -X dB points is at 20 dB per decade for Criteria B and C, and 40 to 80 dB per decade for Criteria D. The maximum emission spectrum level between the -40 dB and -X dB points for S dB per decade slope is described by the formula:

$$Suppression\ (dB) = -S \times \log \left| \frac{F - F_o}{\frac{1}{2}B(-40dB)} \right| - 40$$

$$Where:\ \frac{1}{2}B(-40dB) \le \left| F - F_o \right| \le \frac{1}{2}B(-XdB)$$

and: F is the frequency at which suppression is calculated

$$and:\ B(-XdB) = (10^a)\ B(-40dB)$$

$$a = \frac{X-40}{S}$$

Figure 2. Radar Emission Bandwidth and Emission Levels

Symbols Used

B = emission bandwidth, in MHz.

B_c = bandwidth of the frequency deviation. (The total frequency shift during the pulse duration) in MHz.

B_d = bandwidth of the frequency deviation (peak difference between instantaneous frequency of the modulated wave and the carrier frequency)--(FM/CW radar systems).

B_s = maximum range in MHz over which the carrier frequency will be shifted for a frequency hopping radar.

d = pulse compression ratio = emitted pulse duration/compressed pulsed duration (at 50% amplitude points).

F_o = operating frequency in MHz. For non-FM pulse radars the peak of the power spectrum; for FM pulse radars the average of the lowest and highest carrier frequencies during the pulse.

N = total number of chips (subpulses) contained in the pulse. (N = 1 for non-FM and FM pulse radars.)

PG = processing gain (dB).

P_p = peak power (dBm).

PRR = pulse repetition rate in pulses per second.

P_t = maximum spectral power density –dBm/kHz.

t = emitted pulse duration in μ sec. at 50% amplitude (voltage) points. For coded pulses the pulse duration is the interval between 50% amplitude points of one chip (sub-pulse). The 100% amplitude is the nominal flat top level of the pulse (see Fig. 1).

t_r = emitted pulse rise time in μ sec. from the 10% to the 90% amplitude points on the leading edge. See Fig. 1. For coded pulses it is the rise time of a sub-pulse; if the sub-pulse rise time is not discernible, assume that it is 40% of the time to switch from one phase or sub-pulse to the next.

t_f = emitted pulse fall time in μ sec. from the 90% to the 10% amplitude points on trailing edge. See Fig. 1 and endnote 15.

5.5.2 Criteria B

1. Effective Dates

Technical criteria for new radars became effective 1 October 1977 except as noted herein. (New radars are those for which development and subsequent procurement contracts are let after 1 October 1977.)

2. Applicability

These criteria are applicable to radars of Group B, "Radars having a rated peak power of more than 1 kW but not more than 100 kW and operating between 2900 MHz and 40 GHz."

3. Radar Emission Bandwidth

All radars procured prior to 1 January 1978 should be brought into compliance with the following standards when undergoing major overhaul.

The emission bandwidth for radars at the antenna input shall not exceed the following limits:

NOTE: There is also the "necessary bandwidth" parameter that is defined for radars. For the method of calculation, see Annex J.

3.1 For Non-FM pulse radars (including spread spectrum or coded pulse radars): [15]

$$B(-40dB) = \frac{7.6}{\sqrt{t_r t}} \quad \text{or} \quad \frac{64}{t}$$

whichever is less

3.2 For FM-pulse radars (intentional FM):[15]

$$B(-40dB) = \frac{7.6}{\sqrt{t_r t}} + 2(B_c + \frac{0.065}{t_r})$$

For FM-pulse radars with pulse rise time, t_r, of less than 0.1 microsecond, an operational justification for the short rise time shall be provided.

3.3 For FM pulse radars (intentional FM) with frequency hopping:[15], [16]

$$B(-40dB) = \frac{7.6}{\sqrt{t_r t}} + 2(B_c + \frac{0.065}{t_r}) + B_s$$

---

[15] *If t_f is less that t_r, as defined in Part 5.5, t_f is to be used in place of t_r when performing the emission bandwidth calculations.*

[16] These formulas yield the total composite B(–40 dB) bandwidth of a frequency hopping radar as if all channels included within B_s were operating simultaneously. Individual channels have a B(–40 dB) radar emission bandwidth given by the equations in paragraph 3.1 or 3.2 of Sections 5.5.2, 5.5.3, and 5.5.4.

For FM pulse radars (intentional FM) with frequency hopping, but with pulse rise time, t_r, of less than 0.1 microsecond an operational justification for the short rise time shall be provided.

3.4 For frequency hopping radars using non-FM pulses (including spread spectrum or coded pulses):[15, 16]

$$B(-40dB) = \frac{7.6}{\sqrt{t_r t}} + B_s$$

For this category of radars, an operational justification shall be provided if the pulse rise time, t_r, or fall time, tf, is less than 0.01 microseconds.

3.5 For CW radars:

$$B(-40dB) = 0.0003F_0$$

3.6 For FM/CW radars:

$$B(-40dB) = 0.0003F_0 + 2B_d$$

4. Emission Levels[17]

4.1 With the exception of CW and FM/CW radars, the radar emission level at the antenna input shall be no greater than the values obtainable from the curve in Figure 2. At the frequency B(–40dB)/2 displaced from F_0, the level shall be at least 40 dB below the maximum value. Between the –40dB and –XdB frequencies the level shall be below the 20dB per decade (S=20) roll-off lines in Figure 2. At and beyond the frequencies B(–XdB)/2 from F_0, the level shall be at least the dB value below the maximum spectral power density given by:

$$X(dB) = 60dB \quad \text{or} \quad X(dB) = P_t + 30$$

whichever is the larger value

NOTE: P_t may be measured or may for the purpose of these criteria be calculated from the following:

$$P_t = P_p + 20\log(N \times t) + 10\log(PRR) - PG - 90$$

where PG= 0, for non-FM, non-encoded pulse radars
10log(d), for FM pulse radars
10log(N), for coded pulse radars

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[17] *For frequency hopping radars, the radar spectrum shall not intrude into adjacent spectrum regions on the high or low side of the allocation band, defined by B_s, more than would occur if the radar were fixed tuned at carrier frequencies equivalent to the end values of B_s and was complying with the constraints given by paragraphs 4.1 and 4.2 of Sections 5.5.2, 5.5.3, and 5.5.4.*

4.2 For CW and FM/CW radars, the levels of all emissions at the antenna input shall be no greater than the values obtainable from the curve in Figure 2. At the frequencies B(–40 dB)/2 displaced from F_0, the level shall be at least 40 dB below the maximum value. Between the –40 dB and –X dB frequencies, the level shall be below the 20 dB per decade (S=20) rolloff lines in Figure 2. At and beyond the frequencies B(X dB)/2 from F_0, the level shall be at least 60 dB below the maximum level of the signal contained within B(–40 dB). All levels are specified for a 1.0 kHz measurement bandwidth.

5. Antenna Pattern

No requirement is specified at present.

6. Radar Tunability

Each radar shall be tunable in an essentially continuous manner either over the allocated bands for which it is designed to operate, or over a band which is 10% of the midband frequency. Crystal controlled radars conform to this requirement if operation at essentially any frequency across the band can be achieved with a crystal change.

7. Radar Receivers

The overall receiver selectivity characteristics shall be commensurate with or narrower than the transmitter bandwidth, as portrayed in Figure 2. Rejection of spurious responses, other than image responses, shall be 50 dB or better except where broadband front ends are required operationally.

Receivers shall not exhibit any local oscillator radiation greater than -40 dBm at the receiver input terminals. The frequency stability shall be commensurate with, or better than, that of the associated transmitter.

8. Measurement Capability

See paragraph 2.1.2.B of Annex M.

5.5.3 Criteria C

1. Effective Dates

Technical criteria for new radars shall become effective 1 October 1977 except as noted herein. (New radars are those for which development and subsequent procurement contracts are let after 1 October 1977.)

2. Applicability

These criteria are applicable to radars of Group C, "all radars below 40 GHz not included in Group A, B or D".

3. Radar Emission Bandwidth

All radars procured prior to 1 January 1978 should be brought into compliance with the following standards when undergoing major overhaul.

The emission bandwidth for radars at the antenna input shall not exceed the following limits:

NOTE: There is also the "necessary bandwidth" parameter that is defined for radars. For the method of calculation, see Annex J.

3.1 For non-FM pulse radars (including spread spectrum or coded pulse radars): [15]

$$B(-40dB) = \frac{6.2}{\sqrt{t_r t}} \quad \text{or} \quad \frac{64}{t}$$

whichever is less

3.2 For FM-pulse radars (intentional FM): [15]

$$B(-40dB) = \frac{6.2}{\sqrt{t_r t}} + 2(B_c + \frac{0.105}{t_r})$$

For FM pulse radars with pulse rise time, t_r, or fall time, t_f, of less than 0.1 microsecond, an operational justification for the short rise time shall be provided.

3.3 For FM pulse radars (intentional FM) with frequency hopping: [15, 16]

$$B(-40dB) = \frac{6.2}{\sqrt{t_r t}} + 2(B_c + \frac{0.105}{t_r}) + B_s$$

For FM pulse radars (intentional FM) with frequency hopping, but with pulse rise time, t_r, of less than 0.1 microsecond, an operational justification for the short rise time shall be provided.

3.4 For frequency hopping radars using non-FM pulses (including spread spectrum or coded pulses):[15, 16]

$$B(-40dB) = \frac{6.2}{\sqrt{t_r t}} + B_s$$

For this category of radars, an operational justification shall be provided if the pulse rise time, tr, is less than 0.01 microsecond.

3.5 For CW radars:

$$B(-40dB) = 0.0003F_0$$

3.6 For FM/CW radars:

$$B(-40dB) = 0.0003F_0 + 2B_d$$

4. Emission Levels[17]

4.1 With the exception of CW and FM/CW radars, the radar emission levels at the antenna input shall be no greater than the values obtainable from the curve in Figure 2. At the frequency ± B(–40 dB)/2 displaced from F_0, the level shall be at least 40 dB below the maximum value. Between the –40 dB and –X dB frequencies the level shall be below the 20 dB per decade (S=20) roll-off lines in Figure 2. At and beyond the frequencies ± B(–X dB)/2 from F_0, the level shall be at least the dB value below the maximum spectral power density given by:

$$X(dB) = 60dB \quad \text{or} \quad X(dB) = P_t + 30$$

whichever is the larger value

NOTE: Pt may be measured or may for the purpose of these criteria be calculated from the following:

$$P_t = P_p + 20\log(N \times t) + 10\log(PRR) - PG - 90$$

where PG = 0, for non-FM, non-encoded pulse radars
10log(d), for FM pulse radars
10log(N), for coded pulse radars

4.2 For CW and FM/CW radars, the levels of all emissions at the antenna input shall be no greater than the values obtainable from the curve in Figure 2. At the frequencies ± B(–40 dB)/2 displaced from F_0, the level shall be at least 40 dB below the maximum value. All levels are specified for a 1.0 kHz measurement bandwidth. Between the –40 dB and –X dB frequencies, the level shall be below the 20 dB per decade (S=20) rolloff lines in Figure 2. At and beyond the frequencies B(X dB)/2 from F_o, the level shall be at least 60 dB below the maximum level of the signal contained within B(–40 dB).

4.3 In the design and operation of systems in the radiolocation service that operate in the band 1350-1390 MHz, agencies are encouraged to take all feasible steps so that unwanted emission powers may not exceed −29 dBW in the Earth exploration-satellite service (passive) band 1400-1427 MHz.

5. Antenna Pattern

Since electromagnetic compatibility considerations involved phenomena which may occur at any angle, the allowable antenna patterns for many radars may be usefully described by "median gain" relative to an isotropic antenna.[18] Antennas operated by their rotation through 360° of the horizontal plane shall have a "median gain" of –10 dB or less, as measured on an antenna test range, in the principal horizontal plane. For other antennas, suppression of lobes other than the main antenna beam shall be provided to the following levels, referred to the main beam:

first three sidelobes: 17 dB;
all other lobes: 26 dB.

6. Radar Tunability

Each radar shall be tunable in an essentially continuous manner either over the allocated bands for which it is designed to operate, or over a band which is 10% of the midband frequency. Crystal controlled radars conform to this requirement if operation at essentially any frequency across the band can be achieved with a crystal change.

7. Radar Receivers

The overall receiver selectivity characteristics shall be commensurate with the transmitter bandwidth, as portrayed in Figure 2. Receivers shall be capable of switching bandwidth limits to appropriate values whenever the transmitter bandwidth is switched (pulse shape changed). Receiver image rejection shall be at least 50 dB; rejection of other spurious responses shall be at least 60 dB. Radar receivers shall not exhibit any local oscillator radiation greater than –40 dBm at the receiver input terminals. Frequency stability of receivers shall be commensurate with, or better than, that of the associated transmitters.

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[18] Median gain is defined as that level over an angular region at which the probability is 50% that the observed or measured gain at any position of the antenna will be less than or equal to that level.

8. Measurement Capability

See paragraph 2.1.2.C of Annex M.

5.5.4 Criteria D

1. Effective Dates

Technical criteria for new fixed radars in the 2700-2900 MHz band shall become effective on 1 October 1982. (New radars are those for which the initial system procurement contract is let after 1 October 1982.)

2. Applicability

These criteria are applicable to fixed radars in the 2700-2900 MHz band. All radars subject to these criteria shall be designed and constructed to meet the basic minimum electromagnetic compatibility (EMC) requirements stated herein. In addition to the basic minimum EMC requirements, radar systems in the 2700-2900 MHz band which are intended to operate in close proximity to other equipment in the band or operate in areas specified in Annex D shall be designed and constructed to permit, without modification to the basic equipment, field incorporation of EMC enhancement provisions. These additional provisions will improve the electromagnetic compatibility of the radar thus improving the accommodation of the radar system in the band. These provisions are stated in Section 5.5.4, paragraph 8.

3. Radar Emission Bandwidth

The emission bandwidth for radars at the antenna input shall not exceed the following limits:

3.1 For non-FM pulse radars (including spread spectrum or coded pulse radars):[15]

$$B(-40dB) = \frac{6.2}{\sqrt{t_r t}}$$

For non-FM pulse radars, a pulse rise time, t_r, or fall time, t_f, of less than 0.1t shall be justified:

3.2 For FM-pulse radars (intentional FM):[15]

$$B(-40dB) = \frac{6.2}{\sqrt{t_r t}} + 2(B_c + \frac{0.105}{t_r})$$

For FM pulse radars with pulse rise time, t_r, of less than 0.1 microsecond, a justification for the short rise time shall be provided.

3.3 For FM pulse radars (intentional FM) with frequency hopping: [15, 16]

For FM pulse radars (intentional FM) with frequency hopping, but with pulse rise time, t_r, of less than 0.1 microsecond, an operational justification for the short rise time shall be provided.

$$B(-40dB) = \frac{6.2}{\sqrt{t_r t}} + 2(B_c + \frac{0.105}{t_r}) + B_s$$

3.4 For frequency hopping radars using non-FM pulses (including spread spectrum coded pulses):[15, 16]

$$B(-40dB) = \frac{6.2}{\sqrt{t_r t}} + B_s$$

For this category of radars, an operational justification shall be provided if the pulse rise time, t_r, is less than 0.01 microsecond.

3.5 For CW radars:

$$B(-40dB) = 0.0003F_0$$

3.6 For FM/CW radars:

$$B(-40dB) = 0.0003F_0 + 2B_d$$

4. Emission Level [17]

4.1 With the exception of CW and FM/CW radars, the radar emission levels at the antenna input shall be no greater than the values obtainable from the curve in Figure 2. At the frequencies ± B(–40 dB)/2 displaced from F_0 the level shall be at least 40 dB below the maximum value. Beyond the frequencies ± B(–40 dB)/2 from F_0, the emission level(s), with the exception of harmonic frequencies, shall be below the 40 dB per decade (S=40) roll-off lines of Figure 2 down to a –X dB level that is 80 dB below the maximum spectral power density. All harmonic frequencies shall be at a level that is at least 60 dB below the maximum spectral power density.

4.2 For CW and FM/CW radars, the levels of all emissions at the antenna input shall be no greater than the values obtainable from the curve in Figure 2. At the frequencies ± B(–40 dB)/2 displaced from F_0, the level shall be at least 40 dB below the maximum value. Between the –40 dB and –X dB frequencies, the level shall be below the 40 dB per decade (S=40) rolloff lines in Figure 2. At and beyond the frequencies B(-X dB)/2 from F_0, the level shall be at least 80 dB below the maximum level of the signal contained with B(–40 dB). All levels are specified for a 1.0 kHz measurement bandwidth.

5. Antenna Pattern

Since electromagnetic compatibility considerations involved phenomena which may occur at any angle, the allowable antenna patterns for many radars may be usefully described by "median gain" relative to an isotropic antenna.[19] Antennas operated by their rotation through 360 degrees of the horizontal plane shall have a "median gain" of –10 dB or less, as measured on an antenna test range, in the principal horizontal plane. For other antennas, suppression of lobes other than the main antenna beam shall be provided to the following levels, referred to the main beam:

first three sidelobes--17 dB;
all other lobes--26 dB.

6. Radar Tunability

Radar systems shall be tunable over the entire 2700-2900 MHz band.

7. Radar Receiver

The overall receiver selectivity characteristics shall be commensurate with the transmitter bandwidth, as portrayed in Figure 2. Receivers shall be capable of switching bandwidth limits to appropriate values whenever the transmitter bandwidth is switched (pulse shape changed). Receiver image rejection shall be at least 50 dB; rejection of other spurious responses shall be at least 60 dB. Radar receivers shall not exhibit any local oscillator radiation greater than –40 dBm at the antenna input terminals. Frequency stability of receivers shall be commensurate with, or better than, that of the associated transmitters.

8. Additional EMC Provisions

To improve the accommodation of radar systems in the 2700-2900 MHz band which operate in close proximity to other equipment in the band or operate in areas specified in Annex D, the radar shall be designed and constructed to permit, without modification to the basic equipment, field incorporation of system EMC provisions. These provisions include the requirement to meet specifications in accordance with paragraphs a. and b. below and the recommendation to meet guidelines in accordance with paragraph c. below.

a. Emission Levels

The radar emission levels at the antenna input shall be no greater than the values obtainable from the curves in Figure 2. At the frequency ± B(–40 dB)/2 displaced from F_o, the level shall be at least 40 dB below the maximum value. Beyond the frequencies ± B(–40 dB)/2 from F_o, the equipment shall have the capability to achieve up to 80 dB per decade (S=80) roll-off lines of Figure 2. The emission levels, with the exception of harmonic frequencies, shall be below the appropriate dB per decade roll-off lines of Figure 2 down to a –X dB level that is 80 dB below the maximum spectral power density. All harmonic frequencies shall be at a level that is at least 60 dB below the maximum spectral power density.

b. Radar System PRF

The radar system shall be designed to operate with an adjustable pulse repetition frequency(s), PRF (s), with a nominal difference of 1% (minimum). This will permit the selection of PRF's to allow certain types of receiver interference suppression circuitry to be effective.

c. Receiver Interference Suppression Circuitry

Radar systems in this band should have provisions incorporated into the system to suppress pulsed interference. The following information is intended for use as an aid in the design and development of receiver signal processing circuitry or software to suppress asynchronous pulsed interference. A description of the parametric range of the expected environmental signal characteristics at the receiver IF output is:

Peak Interference-to-Noise Ratio: < 50 dB
Pulse width: 0.5 to 4.0 µsec
PRF: 100 to 2000 pps

8. Measurement Capability

See paragraph 2.1.2.C of Annex M.

5.5.5 Criteria E

1. Effective Dates

Technical criteria for new wind profiler radars (WPR) operating on 449 MHz shall become effective on 1 January 1994. (New WPRs are those for which the initial systems procurement contract is let after 1 January 1994.)

2. Applicability

These criteria are applicable to WPR's operating on 449 MHz.

3. Emission Bandwidth

The emission bandwidth for WPR's at the antenna input shall not exceed the following limits:

3.1 For non-FM pulse radars (including coded pulse radars): [15]

$$B(-40dB) = \frac{6.2}{\sqrt{t_r t}} \quad \text{or} \quad \frac{64}{t}$$

whichever is less.

3.2 For FM-pulse radars (intentional FM):[15]

$$B(-40dB) = \frac{6.2}{\sqrt{t_r t}} + 2(B_c + \frac{0.105}{t_r})$$

3.3 For wind profiler radars, an operational justification shall be provided if the pulse rise time, t_r, is less than 0.01 microsecond.

3.4 For CW radars

$$B(-40dB) = 0.0003F_0$$

3.5 For FM/CW radars

$$B(-40dB) = 0.0003F_0 + 2B_d$$

4. Emission Levels[17]

WPR emission levels at the antenna input shall be no greater than the values obtainable from the curve in Figure 3. At the Frequencies ± B(-40 dB)/2 displaced from F_0, the level shall be at least 40 dB below the maximum value. Between the -40 dB and -X dB frequencies, the level shall be below the 40 dB per decade (S=40) roll-off lines in Figure 3. At and beyond the frequencies ± B(-X dB)/2 from F0, the level shall be at least the dB value below the maximum spectral power density given by:

$$X(dB) = 60dB \quad \text{or} \quad X(dB) = P_t + 30$$

whichever is the greater attenuation

All harmonic frequencies shall be at a level that is at least 60 dB below the maximum spectral power density.

NOTE: P_t may be measured or may for the purpose of these criteria be calculated from the following:

$$P_t = P_p + 20\log(N \times t) + 10\log(PRR) - PG - 90$$

5. EIRP

The EIRP[19] of any WPR operating at 449 MHz shall not exceed the following values:

			Median	Maximum
for	elevation angle	> 70 deg[20]		110 dBm
for	60 <elevation angle	< 70 deg	83 dBm	95 dBm
for	45< elevation angle	< 60 deg	78 dBm	90 dBm
for	5< elevation angle	< 45 deg	73 dBm	85 dBm
for	elevation angle	< 5 deg	58 dBm	70 dBm

6. WPR Receiver

The -3 dB receiver bandwidth should be commensurate with the authorized emission bandwidth plus twice the transmitter frequency tolerance of 10 ppm (as specified in Section 5.2.1). The -60 dB receiver bandwidth shall be commensurate with the -60 dB emission bandwidth. Receivers shall be capable of switching bandwidth limits to appropriate values whenever the transmitter bandwidth is switched (pulse shape changed). Receiver IF image frequency rejection shall be at least 50 dB. Rejection of other spurious responses shall be at least 60 dB. WPR receivers shall not exhibit any local oscillator radiation greater than -40 dBm at the antenna input terminals.

7. EMC Provision

WPR's shall have the capacity to tolerate incoherent pulsed interference of duty cycles less than 1.5 percent such that peak interfering signal levels 30 dB greater than WPR receiver noise level at the IF output will not degrade WPR performance.

8. Measurement Capability

See paragraph 2.1.2.D of Annex M.

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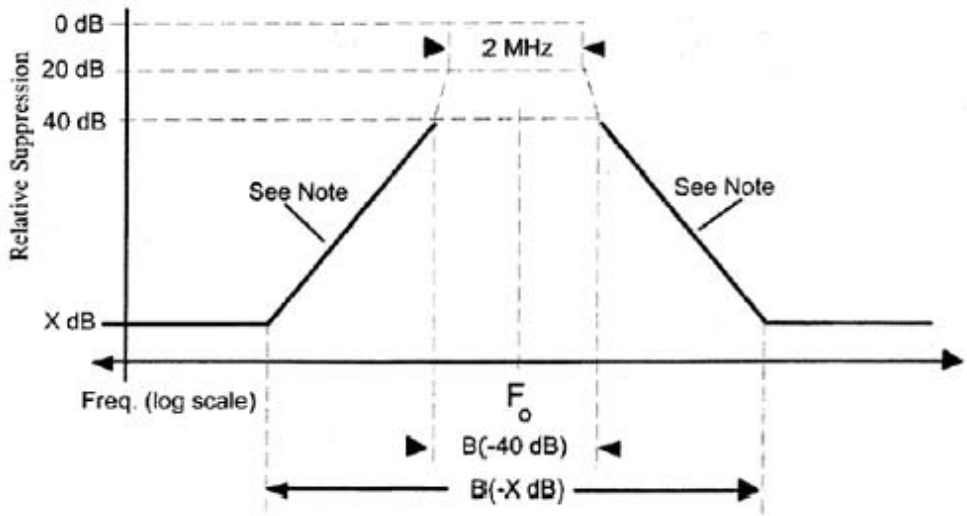
[19] EIRP is the sum of two quantities: peak transmitter power in dBm and antenna gain in dBi. The column labeled Median is based on median antenna gain and the column labeled Maximum is based on maximum antenna gain.

[20] The center of the antenna main beam generated at any time shall be limited to elevation angles greater than 70 degrees.



Note: The roll-off slope, S, from the -40 dB to -X dB points is at 40 dB per decade for Criteria E. The -20 dB bandwidth is limited to 2 MHz for Wind Profiler radars operating at 449 MHz. The maximum emission spectrum level between the -40 dB and -X dB points for S dB per decade slope is described by the formula:

$$Suppression\ (dB) = -S * \log\left|\frac{F - F_o}{\frac{1}{2}B(-40dB)}\right| - 40$$

$$Where:\ \frac{1}{2}B(-40dB) \le \left|F - F_o\right| \le \frac{1}{2}B(-XdB)$$

and: F is the frequency at which suppression is calculated

$$and:\ B(-XdB) = (10^a)\ B(-40dB)$$

$$a = \frac{X-40}{S}$$

Figure 3. Radar Emission Bandwidth and Emission Levels for Wind Profiler Radars at 449 MHz (Criteria E)

5.6 SPACE SERVICES

5.6.1 General

These requirements are applicable to Federal space systems including associated earth terminals and space stations operating in portions of the spectrum allocated to the space services above 470 MHz. They do not apply to transmissions from radars on the ground or aboard spacecraft. Standards for radars aboard spacecraft are contained in Part 5.5. Standards for earth and space stations operating in bands below 470 MHz are contained in Part 5.2.

For planning and evaluation purposes this standard cannot be used alone. Modulation type, emission spectrum, power output, frequency tolerance, and maximum expected Doppler shift should be considered and provided in accordance with Chapter 10 of this Manual.

The requirements of this standard do not apply to deep space spacecraft transmitters while operating at distances greater than 2,000,000 km from Earth, in those frequency bands allocated to space research (space-to-earth) (Deep Space Only). This exemption of deep space spacecraft transmitters from unwanted emissions standards will be reviewed every 5 years, beginning in the year 2005. Such a review will take account of radio astronomy requirements (see RR **22.22-22.25**), as soon as radio astronomy activities on the Shielded Zone of the Moon, or in Deep Space get under way.

5.6.2 Unwanted Emission Mask

For frequencies offset from the assigned frequency less than the 50% of the necessary bandwidth (B_n), no attenuation is required. At a frequency offset equal to 50% of the necessary bandwidth, an attenuation of at least 8 dB is required. Frequencies offset more than 50% of the necessary bandwidth should be attenuated by the following mask:

$$40 \times \log\left(\frac{2 \times |f_d|}{B_n}\right) + 8 \text{ dBsd}$$

where f_d is the frequency displaced from the center of the emission bandwidth.

1) Annex J gives procedures for determining B_n.
2) dBsd is dB attenuation in a 4 kHz bandwidth, relative to the maximum power in any 4 kHz bandwidth within the necessary bandwidth (0dBsd). Above 15 GHz, a 1 MHz bandwidth may be used.
3) Attenuation in this sense refers to the reduction in level relative to the reference, 0 dBsd, unless otherwise specified.
4) The unwanted emission mask rolls off at 40 dB per decade to a maximum attenuation of 60 dBsd, at which point it continues on both sides of the carrier for all frequencies beyond this point. See Figure 5.6.1. Annex M gives measurement requirements.
5) For any narrowband or single frequency unwanted emission which is not spread by the modulation process, the required attenuation shall be at least 60 dBc, where dBc is attenuation below the mean transmit power, rather than the dBsd value determined above.
6) In the design of systems and operation of stations in the fixed-satellite service (Earth-to-space) in the band 30-31 GHz, agencies are encouraged to take all reasonable steps such that unwanted emission powers do not exceed: [21]
   a) −9 dBW into the 200 MHz of the Earth exploration-satellite service (passive) band 31.3-31.5 GHz for earth stations having an antenna gain greater than or equal to 56 dBi; and
   b) −20 dBW into the 200 MHz of the Earth exploration-satellite service (passive) band 31.3-31.5 GHz for earth stations having an antenna gain less than 56 dBi.

5.6.3 Multi-carrier Emissions and Multi-transponder Satellites

Multi-carrier transmitters/transponders are those where multiple carriers may be transmitted simultaneously from a final amplifier or an active antenna. For systems with multiple carriers, the limit on unwanted emissions should start at the edges of the total assigned bandwidth. For satellite systems, the necessary bandwidth used in the masks in 5.6.2 should be taken to be the lesser of 3 dB transponder bandwidth or the total assigned bandwidth. This bandwidth applies even when some of the carriers are not transmitted continuously, or when some carriers change in frequency. More information on unwanted emission masks for multi-carrier and multi-transponder systems can be found in ITU-R Recommendation SM.1541 and Appendix **3** to the ITU-R Radio Regulations.

5.6.4 Unwanted Emissions From One Transponder Falling Within The Frequency Band of Another Transponder On The Same Satellite

A single satellite operating with more than one transponder in the same service area may have unwanted emissions from one transponder falling on a frequency at which a second companion

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[21] These recommended maximum levels apply under clear-sky conditions. During fading conditions, these levels may be exceeded by earth stations when using uplink power control.

transponder is transmitting. The limits should not be applied to those unwanted emissions of a satellite that fall within the necessary emission bandwidth of another transponder, on the same satellite, into the same service area.

5.6.5 Narrow Band Emissions

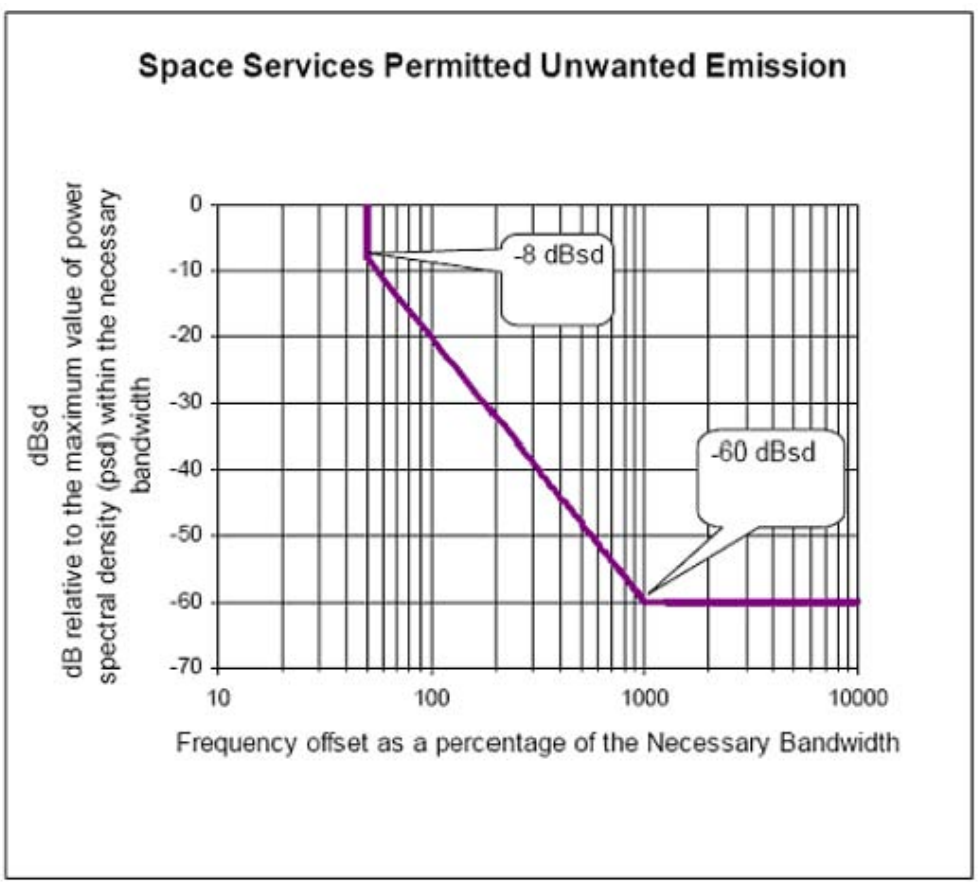
In the case of very narrow-band emissions where the necessary bandwidth is less than the minimum bandwidth (B_L) given in Table 5.6.1, B_L shall be used in place of B_n in Section 5.6.2 above. Examples include beacons, pilots and other unmodulated carriers.

5.6.6 Table 5.6.1 Minimum Bandwidth

Operating Frequency Range (f_c)	Minimum Bandwidth (B_L)
470 MHz < fc < 1 GHz	25 kHz
1 GHz < fc < 10 GHz	100 kHz
10 GHz < fc < 15 GHz	300 kHz
15 GHz < fc < 26 GHz	500 kHz
fc > 26 GHz	1 MHz

In Table 5.6.1, f_c is the center frequency of the emission. If the assigned frequency band of the emissions extends across two frequency ranges, then the values corresponding to the higher frequency range may be used for the whole assignment.

Figure 5.6.1 Maximum Unwanted Emission Levels for Space Services



(Last Page in Chapter 5)

Chapter 6

Definitions and Particulars of Assignments

6.1 DEFINITIONS

6.1.1 Special Terms (General)

Where a definition is followed by the parenthetical expression "(RR)," it is an indication the definition is in the ITU Radio Regulations.

Accepted Interference[1]: Interference at a higher level than that defined as permissible interference and which has been agreed upon between two or more administrations without prejudice to other administrations. (RR)

Active Satellite: A satellite carrying a station intended to transmit or retransmit radiocommunication signals. (RR)

Active Sensor: A measuring instrument in the Earth exploration-satellite service or in the space research service by means of which information is obtained by transmission and reception of radio waves. (RR)

Adaptive System: A radiocommunication system which varies its radio characteristics according to channel quality (RR).

Administration: Any governmental department or service responsible for discharging the obligations undertaken in the Constitution of the International Telecommunication Union, in the Convention of the International Telecommunication Union and in the Administrative Regulations. (RR)

Aeronautical Advisory Station: An aeronautical station used for advisory and civil defense communications primarily with private aircraft stations. Also called UNICOM Stations.

Aeronautical Broadcast Station: An aeronautical station which makes scheduled broadcasts of meteorological information and notices to airmen. (In certain instances, an aeronautical broadcast station may be placed on board a ship.)

Aeronautical Earth Station: An Earth Station in the fixed-satellite service, or, in some cases, in the aeronautical mobile-satellite service, located at a specified fixed point on land to provide a feeder link for the aeronautical mobile-satellite service. (RR)

Aeronautical Fixed Service: A radiocommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air transport. (RR)

Aeronautical Fixed Station: A station in the aeronautical fixed service. (RR)

Aeronautical Marker Beacon Station: A radionavigation land station in the aeronautical radionavigation service which employs a marker beacon.

Aeronautical Mobile Service: A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate; emergency position-indicating radiobeacon stations may also participate in this service on designated distress and emergency frequencies. (RR)

Aeronautical Mobile (OR) Service[2]: An aeronautical mobile service intended for communications, including those relating to flight coordination, primarily outside national or international civil air routes. (RR)

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[1] The terms "permissible" and "accepted interference" are used in the coordinationof frequency assignments between administrations. (RR)

[2] (OR): off-route (RR)

Aeronautical Mobile (R)[3] Service: An aeronautical mobile service reserved for communications relating to safety and regularity of flight, primarily along national or international civil air routes. (RR)

Aeronautical Mobile-Satellite Service: A mobile-satellite service in which mobile earth stations are located on board aircraft; survival craft stations and emergency position-indicating radiobeacon stations may also participate in this service. (RR)

Aeronautical Mobile-Satellite (OR)[2] Service: An aeronautical mobile-satellite service intended for communications, including those relating to flight coordination, primarily outside national and international civil air routes. (RR)

Aeronautical Mobile-Satellite (R)[3] Service: An aeronautical mobile-satellite service reserved for communications relating to safety and regularity of flight, primarily along national or international civil air routes. (RR)

Aeronautical Mobile-Satellite Space Station: A space station in the aeronautical mobile-satellite service.

Aeronautical Radiobeacon Station: A radiobeacon station in the aeronautical radionavigation service intended for the benefit of aircraft.

Aeronautical Radionavigation-Satellite Earth Station: An fixed earth station in the aeronautical radionavigation-satellite service.

Aeronautical Radionavigation-Satellite Mobile Earth Station: A mobile earth station in the aeronautical radionavigation-satellite service.

Aeronautical Radionavigation-Satellite Service: A radionavigation-satellite service in which earth stations are located on board aircraft. (RR)

Aeronautical Radionavigation Service: A radionavigation service intended for the benefit and for the safe operation of aircraft. (RR)

Aeronautical Radionavigation-Satellite Space Station: A space station in the aeronautical radionavigation-satellite service.

Aeronautical Station: A land station in the aeronautical mobile service. In certain instances, an aeronautical station may be located, for example, on board ship or on a platform at sea. (RR)

Aeronautical Telemetering Land Station: A telemetering land station used in the flight testing of manned or unmanned aircraft, missiles, or major components thereof.

Aeronautical Telemetering Mobile Station: A telemetering mobile station used for transmitting data directly related to the airborne testing of the vehicle (or major components), on which the station is installed.

Aeronautical Utility Land Station: A land station located at airdrome control towers and used for control of ground vehicles and aircraft on the ground at airdromes.

Aeronautical Utility Mobile Station: A mobile station used for communication at airdromes with the aeronautical utility land station, the airdrome control station, the FAA flight service station, ground vehicles, and aircraft on the ground. (All transmissions shall be subject to the control of the airdrome control station and shall be discontinued immediately when so requested by the airdrome control operators.)

Aircraft Earth Station: A mobile earth station in the aeronautical mobile-satellite service located on board an aircraft. (RR)

Aircraft Station: A mobile station in the aeronautical mobile service, other than a survival craft station, located on board an aircraft. (RR)

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[3] (R): route (R)

Airdrome Control Station: An aeronautical station providing communication between an airdrome control tower and aircraft.

Allocation (of a frequency band): Entry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more (terrestrial or space) radiocommunication services or the radio astronomy service under specified conditions. This term shall also be applied to the frequency band concerned. (RR)

Allotment (of a radio frequency or radio frequency channel): Entry of a designated frequency channel in an agreed plan, adopted by a competent conference, for use by one or more administrations for a terrestrial or space radiocommunication service in one or more identified countries or geographical areas and under specified conditions. (RR)

Altimeter Station: A radionavigation mobile station in the aeronautical radionavigation service which employs a radio altimeter.

Altitude of the Apogee or of the Perigee: The altitude of the apogee or perigee above a specified reference surface serving to represent the surface of the Earth. (RR)

Amateur-Satellite Service: A radiocommunication service using space stations on earth satellites for the same purposes as those of the amateur service. (RR)

Amateur Service: A radiocommunication service for the purpose of self-training, intercommunication and technical investigation carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest. (RR)

Amateur Station: A station in the amateur service. (RR)

ASDE: A radiolocation device employed for airport surface surveillance.

Assigned Frequency: The center of the Frequency Band assigned to a station.(RR)

Assigned Frequency Band: The frequency band within which the emission of a station is authorized; the width of the band equals the necessary bandwidth plus twice the absolute value of the frequency tolerance. Where space stations are concerned, the assigned frequency band includes twice the maximum Doppler shift that may occur in relation to any point of the Earth's surface. (RR)

Assignment (of a radio frequency or radio frequency channel): Authorization given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions. (RR)

Authorized Bandwidth: Authorized bandwidth is, for purposes of this Manual, the necessary bandwidth (bandwidth required for transmission and reception of intelligence) and does not include allowance for transmitter drift or Doppler shift.

Aviation Instructional Station: A land or mobile station in the aeronautical mobile service used for radiocommunications pertaining to instructions to students or pilots while actually operating aircraft or engaged in soaring activities.

Base Earth Station: An earth station in the fixed-satellite service or, in some cases, in the land mobile-satellite service, located at a specified fixed point or within a specified area on land to provide a feeder link for the land mobile-satellite service. (RR)

Base Station: A land station in the land mobile service. (RR)

Bridge-to-Bridge Station: A ship station operating in the port operations service in which messages are restricted to navigational communications and which is capable of operation from the ship's navigational bridge or, in the case of a dredge, from its main control station, operating on a frequency or frequencies in the 156-162 MHz band.

Broadcasting-Satellite Service: A radiocommunication service in which signals transmitted or retransmitted by space stations are intended for direct reception by the general public. In the broadcasting-satellite service, the term “direct reception” shall encompass both individual reception and community reception. (RR)

Broadcasting-Satellite Space Station: A space station in the broadcasting-satellite service (television).

Broadcasting Service: A radiocommunication service in which the transmissions are intended for direct reception by the general public. This service may include sound transmissions, television transmissions or other types of transmissions. (RR)

Broadcasting Station: A station in the broadcasting service. (RR)

Carrier Power (of a radio transmitter): The average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle taken under the condition of no modulation. (RR)

Characteristic Frequency: A frequency which can be easily identified and measured in a given emission. A carrier frequency may, for example, be designated as the characteristic frequency. (RR) (See also Reference Frequency.)

Chip-Rate: The rate of encoding.

Class of Emission: The set of characteristics of an emission, designated by standard symbols, e.g., type of modulation of the main carrier, modulating signal, type of information to be transmitted, and also if appropriate, any additional signal characteristics. (RR)

Coast Earth Station: An earth station in the fixed-satellite service or, in some cases, in the maritime mobile-satellite service, located at a specified fixed point on land to provide a feeder link for the maritime mobile-satellite service. (RR)

Coast Station: A land station in the maritime mobile service. (RR)

Coded Squelch: A system wherein radio receivers are equipped with devices which allow audio signals to appear at the receiver output only when a carrier modulated with a specific signal is received.

Cognitive Radio System: A radiocommunication system that is aware of its environment and internal state and can make decisions about, and adjust, its operating characteristics based on information and predefined objectives.

Community Reception (in the broadcasting-satellite service): The reception of emissions from a space station in the broadcasting-satellite service by receiving equipment, which in some cases may be complex and have antennae larger than those used for individual reception, and intended for use:

- by a group of the general public at one location; or
- through a distribution system covering a limited area. (RR)

Conterminous United States: The term "Conterminous United States" includes the 48 contiguous States and the District of Columbia. (See also definitions for "United States" and "United States and Possessions."

Coordination Area: The area associated with an earth station outside of which a terrestrial station sharing the same frequency band neither causes nor is subject to interfering emissions greater than a permissible level. (RR)

Coordination Contour: The line enclosing the coordination area. (RR)

Coordination Distance: Distance on a given azimuth from an earth station beyond which a terrestrial station sharing the same frequency band neither causes nor is subject to interfering emissions greater than a permissible level. (RR)

Coordinated Universal Time (UTC): Time scale, based on the second (SI), as defined in ITU-R recommendation ITU-R TF.460-6. (RR)

Deep Space: Space at distances from the Earth equal to or greater than 2×10^6 kilometers. (RR)

Direct Sequence Spread Spectrum: A signal structuring technique utilizing a digital code sequence having a chip rate much higher than the information signal bit rate. Each information bit of a digital signal is transmitted as a pseudo-random sequence of chips.

Distance Measuring Equipment (DME): Equipment that ascertains the distance of an interrogator from a transponder by measuring the time of transmission to and from the transponder.

Duplex Operation: Operating method in which transmission is possible simultaneously in both directions of a telecommunication channel.[4] (RR)

Earth Exploration-Satellite Earth Station: An earth station in the Earth exploration-satellite service.

Earth Exploration-Satellite Service: A radiocommunication service between earth stations and one or more space stations, which may include links between space stations, in which:

- information relating to the characteristics of the Earth and its natural phenomena including data relating to the state of the environment is obtained from active sensors or passive sensors on earth satellites; similar information is collected from active sensors or passive sensors on Earth satellites:
- airborne or earth-based platforms; such information may be distributed to earth stations within the system concerned; platform interrogation may be included. This service may also include feeder links necessary for its operation. (RR)

Earth Exploration-Satellite Space Station: A space station in the Earth exploration-satellite service.

Earth Station: A station located either on the Earth's surface or within the major portion of the Earth's atmosphere and intended for communication:

- with one or more space stations; or
- with one or more stations of the same kind by means of one or more reflecting satellites or other objects in space. (RR)

Effective Antenna Gain Contour (of a steerable satellite beam): An envelope of antenna gain contours resulting from moving the boresight of a steerable satellite beam along the limits of the effective boresight area. (RR)

Effective Boresight Area (of a steerable satellite beam): An area on the surface of the Earth within which the boresight of a steerable satellite beam is intended to be pointed. There may be more than one unconnected effective boresight area to which a single steerable satellite beam is intended to be pointed. (RR)

Effective Monopole Radiated Power (e.m.r.p.) (in a given direction): The product of the power supplied to the antenna and its gain relative to a short vertical antenna in a given direction. (RR)

Effective Radiated Power (e.r.p.) (in a given direction): The product of the power supplied to the antenna and its gain relative to a halfwave dipole in a given direction. (RR)

Electromagnetic Compatibility (EMC): Electromagnetic compatibility is the condition which prevails when telecommunications equipment is performing its individually designed function in a common electromagnetic environment without causing or suffering unacceptable degradation due to unintentional electromagnetic interference to or from other equipment in the same environment.

Emergency locator transmitter (ELT): A transmitter of an aircraft or survival craft actuated manually or automatically that is used as an alerting and locating aid for survival purposes.

Emergency Position-Indicating Radiobeacon Station: A station in the mobile service the emissions of which are intended to facilitate search and rescue operations. (RR)

Emission: Radiation produced, or the production of radiation, by a radio transmitting station. For example, the energy radiated by the local oscillator of a radio receiver would not be an emission but a radiation. (RR)

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[4] In general, duplex operation and semi-duplex operation require two frequencies in radiocommunications; simplex operation may use either one or two.(RR)

Environmental Communications: Communications in the maritime mobile service for the broadcast of information pertaining to the environmental conditions in which vessels operate, i.e., weather, sea conditions, time signals of a grade adequate for practical navigation, notices to mariners and hazards to navigation.

Equivalent Isotropically Radiated Power (e.i.r.p.): The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain). (RR)

Equivalent Satellite Link Noise Temperature: The noise temperature referred to the output of the receiving antenna of the earth station corresponding to the radio frequency noise power which produces the total observed noise at the output of the satellite link excluding noise due to interference coming from satellite links using other satellites and from terrestrial systems. (RR)

Expendable Launch Vehicle (ELV): A booster rocket that can be used only once to launch a payload, such as a missile or space vehicle.

Experimental Composite Station: An experimental station used in experimental operations of a complex nature not readily specified or used in operation which is a composite of two or more of the established experimental categories.

Experimental Contract Developmental Station: An experimental station used for the evaluation or testing under federal government contract of electronics equipment or systems in a design or development stage.

Experimental Developmental Station: An experimental station used for evaluation or testing of electronics equipment or systems in a design or development stage.

Experimental Export Station: An experimental station intended for export and used for the evaluation or testing of electronics equipment or systems in the design or development stage.

Experimental Research Station: An experimental station used in basic studies concerning scientific investigations looking toward the improvement of the art of radiocommunications.

Experimental Station: A station utilizing radio waves in experiments with a view to the development of science or technique. This definition does not include amateur stations. (RR)

Experimental Testing Station: An experimental station used for the evaluation or testing of electronics equipment or systems, including site selection and transmission path surveys, which have been developed for operational use.

Facsimile: A form of telegraphy for the transmission of fixed images, with or without half-tones, with a view to their reproduction in a permanent form. (RR)

Feeder Link: A radio link from an earth station at a given location to a space station, or vice versa, conveying information for a space radiocommunication service other than for the fixed-satellite service. The given location may be at a specified fixed point, or at any fixed point within specified areas. (RR)

Field-Disturbance Sensor: A restricted radiation device which establishes a radio frequency field in its vicinity and detects changes in that field resulting from the movement of persons or objects within the radio frequency field. Examples: microwave intrusion sensors; devices that use RF energy for production line counting and sensing.

Fixed Earth Station: An earth station intended to be used at a specified fixed point.

Fixed-Satellite Earth Station: An earth station in the fixed-satellite service.

Fixed-Satellite Service: A radiocommunication service between earth stations at given positions when one or more satellites are used; the given position may be a specified fixed point or any fixed point within specified areas; in some cases this service includes satellite-to-satellite links, which may also be operated in the inter-satellite service, the fixed-satellite service may also include feeder links for other space radiocommunication services. (RR)

Fixed-Satellite Space Station: A space station in the fixed-satellite service.

Fixed Service: A radiocommunication service between specified fixed points. (RR)

Fixed Station: A station in the fixed service. (RR)

Flight Telemetering Land Station: A telemetering land station the emissions of which are used for telemetering to a balloon; to a booster or rocket, excluding a booster or rocket in orbit about the Earth or in deep space; or to an aircraft, excluding a station used in the flight testing of an aircraft.

Flight Telemetering Mobile Station: A telemetering mobile station used for transmitting data from an airborne vehicle, excluding data related to airborne testing of the vehicle itself, (or major components thereof).

Flight Termination: An emergency action taken by range safety when a vehicle violates established safety criteria for the protection of life and property. This action circumvents the vehicles' normal control modes and ends its powered and/or controlled flight. This action may include any one or a combination of the following:

a. Complete vehicle destruction by explosive means.
b. Aerodynamic disruption of the flight mechanism.
c. Deployment of high drag devices.
d. Fuel cut-off to the combustion chambers of ignited motors.
e. Inhibit ignition of unburned motors.
f. Other special actions dictated by the vehicle configuration or special problems.

These actions may be activated by manual, computerized, and/or automatic modes.

Flight Test Station: An aeronautical station used for the transmission of essential communications in connection with the testing of aircraft or major components of aircraft.

Frequency-Hopping Spread Spectrum: A signal structuring technique employing automatic switching of the transmitted frequency. Selection of the frequency to be transmitted is typically made in a pseudo-random manner from a set of frequencies covering a band wider than the information band-width. The intended receiver would frequency-hop in synchronization with the code of the transmitter in order to retrieve the desired information.

Frequency Sharing: The common use of the same portion of the radio frequency spectrum by two or more users where a probability of interference exists.

Frequency-Shift Telegraphy: Telegraphy by frequency modulation in which the telegraph signal shifts the frequency of the carrier between predetermined values. (RR)

Frequency Tolerance: The maximum permissible departure by the center frequency of the frequency band occupied by an emission from the assigned frequency or, by the characteristic frequency of an emission from the reference frequency. The frequency tolerance is expressed in parts in 106 or in Hertz. (RR)

Full Carrier Single-Sideband Emission: A single-sideband emission without reduction of the carrier. (RR)

Gain of an Antenna: The ratio, usually expressed in decibels, of the power required at the input of a loss free reference antenna to the power supplied to the input of the given antenna to produce, in a given direction, the same field strength or the same power flux-density at the same distance. When not specified otherwise, the gain refers to the direction of maximum radiation. The gain may be considered for a specified polarization. Depending on the choice of the reference antenna a distinction is made between:

• absolute or isotropic gain (G_i), when the reference antenna is an isotropic antenna isolated in space;

• gain relative to a half-wave dipole (G_d), when the reference antenna is a half-wave dipole isolated in space whose equatorial plane contains the given direction;

• gain relative to a short vertical antenna (G_v), when the reference antenna is a linear conductor, much shorter than one quarter of the wavelength, normal to the surface of a perfectly conducting plane which contains the given direction. (RR)

Geostationary Satellite: A geosynchronous satellite whose circular and direct orbit lies in the plane of the Earth's equator and which thus remains fixed relative to the Earth; by extension, a geosynchronous satellite which remains approximately fixed relative to the Earth. (RR)

Geostationary Satellite Orbit: The orbit of a geosynchronous satellite whose circular and direct orbit lies in the plane of the Earth's equator. (RR)

Geosynchronous Satellite: An earth satellite whose period of revolution is equal to the period of rotation of the Earth about its axis. (RR)

Glide Path (Slope) Station: A radionavigation land station which provides vertical guidance to aircraft during approach to landing.

Harmful Interference: Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with these Regulations. (RR)

Hertz: A unit of frequency which is equivalent to one cycle per second.

Hybrid Spread Spectrum: A combination of Frequency Hopping Spread Spectrum and Direct Sequence Spread Spectrum.

Hydrologic and Meteorological Fixed Station: A fixed station the emissions of which are used for the automatic transmission of either hydrologic or meteorological data, or both.

Hydrologic and Meteorological Land Station: A land station the emissions of which are used for the automatic transmission of either hydrologic or meteorological data, or both.

Hydrologic and Meteorological Mobile Station: A mobile station the emissions of which are used for the automatic transmission of either hydrologic or meteorological data, or both.

Incidental Radiation Device: A device that radiates radio frequency energy during the course of its operation although the device is not intentionally designed to generate radio frequency energy.

Inclination of an Orbit (of an earth satellite): The angle determined by the plane containing the orbit and the plane of the Earth's equator. (RR)

Individual Reception (in the broadcasting-satellite service): The reception of emissions from a space station in the broadcasting-satellite service by simple domestic installations and in particular those possessing small antennae. (RR)

Industrial Heating Equipment: Any apparatus which utilizes a radio frequency oscillator or any other type of radio frequency generator and transmits radio frequency energy used for or in connection with industrial heating operations utilized in a manufacturing or production process.

Industrial, Scientific and Medical (ISM) Applications (of radio frequency energy): Operation of equipment or appliances designed to generate and use locally radio frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications. (RR)

Instrument Landing System (ILS): A radionavigation system which provides aircraft with horizontal and vertical guidance just before and during landing and, at certain fixed points, indicates the distance to the reference point of landing. (RR)

Instrument Landing System Glide Path: A system of vertical guidance embodied in the instrument landing system which indicates the vertical deviation of the aircraft from its optimum path of descent. (RR)

Instrument Landing System Localizer: A system of horizontal guidance embodied in the instrument landing system which indicates the horizontal deviation of the aircraft from its optimum path of descent along the axis of the runway. (RR)

Interference: The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy. (RR)

International Broadcasting Station: A broadcasting station, employing frequencies allocated to the broadcasting service between 5950 kHz and 26100 kHz, whose transmissions are intended to be received directly by the general public in foreign countries.

Inter-Satellite Service: A radiocommunication service providing links between artificial earth satellites. (RR)

Inter-Satellite Space Station: A space station in the inter-satellite service.

Ionosphere Sounder: A device that transmits signals for the purpose of determining ionospheric conditions.

Ionospheric Scatter: The propagation of radio waves by scattering as a result of irregularities or discontinuities in the ionization of the ionosphere. (RR)

Land Earth Station: An earth station in the fixed-satellite service or, in some cases, in the mobile-satellite service, located at a specified fixed point or within a specified area on land to provide a feeder link for the mobile-satellite service. (RR)

Land Mobile Earth Station: A mobile earth station in the land mobile-satellite service capable of surface movement within the geographical limits of a country or continent. (RR)

Land Mobile-Satellite Service: A mobile-satellite service in which mobile earth stations are located on land. (RR)

Land Mobile-Satellite Space Station: A space station in the land mobile-satellite service.

Land Mobile Service: A mobile service between base stations and land mobile stations, or between land mobile stations. (RR)

Land Mobile Station: A mobile station in the land mobile service capable of surface movement within the geographical limits of a country or continent. (RR)

Land Station: A station in the mobile service not intended to be used while in motion. (RR)

Left-Hand (or Anti-Clockwise) Polarized Wave: An elliptically or circularly-polarized wave, in which the electric field vector, observed in any fixed plane, normal to the direction of propagation, whilst looking in the direction of propagation, rotates with time in a left-hand or anticlockwise direction. (RR)

Localizer Station: A radionavigation land station in the aeronautical radionavigation service which employs an Instrument Landing System Localizer.

Loran Station: A long distance radionavigation land station transmitting synchronized pulses. Hyperbolic lines of position are determined by the measurement of the difference in the time of arrival of these pulses.

Low-Power Communication Device: A restricted radiation device, exclusive of those employing conducted or guided radio frequency techniques, used for the transmission of signs, signals (including control signals), writing, images and sounds or intelligence of any nature by radiation of electromagnetic energy. Examples: Wireless microphone, phonograph oscillator, radio-controlled garage door opener, and radio-controlled models.

Marine Broadcast Station: A coast station which makes scheduled broadcasts of time, meteorological, and hydrographic information.

Marine Radiobeacon Station: A radiobeacon station in the maritime radionavigation service intended for the benefit of ships.

Maritime Mobile-Satellite Service: A mobile-satellite service in which mobile earth stations are located on board ships; survival craft stations and emergency position-indicating radiobeacon stations may also participate in this service. (RR)

Maritime Mobile-Satellite Space Station: A space station in the maritime mobile-satellite service.

Maritime Mobile Service: A mobile service between coast stations and ship stations, or between ship stations, or between associated on-board communication stations; survival craft stations and emergency position-indicating radiobeacon stations may also participate in this service. (RR)

Maritime Radionavigation-Satellite Earth Station: An fixed earth station in the maritime radionavigation-satellite service.

Maritime Radionavigation-Satellite Mobile Earth Station: A mobile earth station in the maritime radionavigation-satellite service.

Maritime Radionavigation-Satellite Service: A radionavigation-satellite service in which earth stations are located on board ships. (RR)

Maritime Radionavigation-Satellite Space Station: A space station in the maritime radionavigation-satellite service.

Maritime Radionavigation Service: A radionavigation service intended for the benefit and for the safe operation of ships. (RR)

Marker Beacon: A transmitter in the aeronautical radionavigation service which radiates vertically a distinctive pattern for providing position information to aircraft. (RR)

Mean Power (of a radio transmitter): The average power supplied to the antenna transmission line by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation taken under normal operating conditions. (RR)

Medical Diathermy Equipment: Any apparatus (other than surgical diathermy apparatus designed for intermittent operation with low power), which utilizes a radio frequency oscillator or any other type of radio frequency generator and transmits radio frequency energy used for therapeutic purposes.

Meteor Burst Communications: Communications by the propagation of radio signals reflected by ionized meteor trails.

Meteorological Aids Service: A radiocommunication service used for meteorological, including hydrological, observations and exploration. (RR)

Meteorological Radar Station: A station in the meteorological aids service employing radar.

Meteorological-Satellite Earth Station: An earth station in the meteorological-satellite service.

Meteorological-Satellite Service: An Earth exploration-satellite service for meteorological purposes. (RR)

Meteorological-Satellite Space Station: A space station in the meteorological-satellite service.

Miscellaneous ISM Equipment: Any apparatus other than that defined as medical diathermy equipment or industrial heating equipment, or otherwise excepted by those definitions, in which radio frequency energy is applied to materials to produce physical, biological, or chemical effects such as heating, ionization of gases, mechanical vibrations, hair removal, and acceleration of charged particles, which do not involve communications or the use of radio receiving equipment.

Mobile Earth Station: An earth station in the mobile-satellite service intended to be used while in motion or during halts at unspecified points. (RR)

Mobile-Satellite Service: A radiocommunication service:

- between mobile earth stations and one or more space stations, or between space stations used by this service; or
- between mobile earth stations by means of one or more space stations.

This service may also include feeder links necessary for its operation. (RR)

Mobile-Satellite Space Station: A space station in the mobile-satellite service.

Mobile Service: A radiocommunication service between mobile and land stations, or between mobile stations. (RR)

Mobile Station: A station in the mobile service intended to be used while in motion or during halts at unspecified points. (RR)

Multi-Function System: A system that provides for more than one type of telecommunication with the same equipment. This system can have one or more principal functions and may have one or more secondary functions contained within the signal format or structure. The signal structure technique can be either of a conventional or spread spectrum type.

Multi-Satellite Link: A radio link between a transmitting earth station and a receiving earth station through two or more satellites, without any intermediate earth station. A multi-satellite link comprises one up-link, one or more satellite-to-satellite links and one downlink. (RR)

Necessary Bandwidth: For a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions. (RR) (See Annex J for formulas used to calculate necessary bandwidth.)

Non-Interference Basis (NIB): A condition of use relative to other specified uses that affords no protection from harmful interference from the other specified users, and prohibits causing harmful interference to the other specified users.

Occupied Bandwidth: The width of a frequency band such that, below the lower and above the upper frequency limits, the *mean powers* emitted are each equal to a specified percentage $\beta/2$ of the total mean power of a given *emission*.

Unless otherwise specified by the ITU-R Recommendation for the appropriate *class of emission*, the value of $\beta/2$ should be taken as 0.5%. (RR)

Oceanographic Data Interrogating Station: A station in the maritime mobile service the emissions of which are used to initiate, modify or terminate functions of equipment directly associated with an oceanographic data station, including the station itself.

Oceanographic Data Station: A station in the maritime mobile service located on a ship, buoy, or other sensor platform the emissions of which are used for transmission of oceanographic data.

Omnidirectional Range Station: A radionavigation land station in the aeronautical radionavigation service providing direct indication of the bearing (omnibearing) of that station from an aircraft.

On-Board Communication Station: A low- powered mobile station in the maritime mobile service intended for use for internal communications on board a ship, or between a ship and its lifeboats and life rafts during lifeboat drills or operations, or for communication within a group of vessels being towed or pushed, as well as for line handling and mooring instructions. (RR)

Orbit: The path, relative to a specified frame of reference, described by the center of mass of a satellite or other object in space subjected primarily to natural forces, mainly the force of gravity. (RR)

Out-of-Band Domain (of an emission): The frequency range, immediately outside the necessary bandwidth but excluding the spurious domain, in which out-of-band emissions generally predominate. Out-of-band emissions, defined based on their source, occur in the out-of-band domain and, to a lesser extent, in the spurious domain. Spurious emissions likewise may occur in the out-of-band domain as well as in the spurious domain. (RR)

Out-of-band Emission: Emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emission. (RR)

Passive Sensor: A measuring instrument in the Earth exploration-satellite service or in the space research service by means of which information is obtained by reception of radio waves of natural origin. (RR)

Peak Envelope Power (of a radio transmitter): The average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle at the crest of the modulation envelope taken under normal operating conditions. (RR)

Perimeter Protection System: A field disturbance sensor which uses buried leaky cables installed around a facility to detect any unauthorized entry or exit.

Period (of a satellite): The time elapsing between two consecutive passages of a satellite through a characteristic point on its orbit. (RR)

Permissible Interference:[5] Observed or predicted interference which complies with quantitative interference and sharing criteria contained in these Regulations or in ITU-R Recommendations or in special agreements as provided for in these Regulations. (RR)

Port Operations Service: A maritime mobile service in or near a port, between coast stations and ship stations, or between ship stations, in which messages are restricted to those relating to the operational handling, the movement and the safety of ships and, in emergency, to the safety of persons. Messages which are of a public correspondence nature shall be excluded from this service. (RR)

Portable Aircraft Station: A portable station operating in the aeronautical mobile service.

Port Station: A coast station in the port operations service. (RR)

Portable Land Mobile Station: A portable station operating in the land mobile service.

Portable Mobile Station: A portable station operating in the mobile service.

Portable Radiolocation Station: A portable station operating in the radiolocation service.

Portable Ship Station: A portable station operating in the maritime mobile service.

Portable Station: A station designed to be carried by a person and capable of transmitting and/or receiving while in motion or during brief halts at unspecified locations.

Power: Whenever the power of a radio transmitter etc. is referred to it shall be expressed in one of the following forms, according to the class of emission, using the arbitrary symbols indicated:

- peak envelope power (PX or pX);
- mean power (PY or pY);
- carrier power (PZ or pZ).

For different classes of emission, the relationships between peak envelope power, mean power and carrier power, under the conditions of normal operation and of no modulation, are contained in ITU-R Recommendations which may be used as a guide. For use in formulae, the symbol p denotes power expressed in watts and the symbol P denotes power expressed in decibels relative to a reference level. (RR) (See also Carrier Power of a Radio Transmitter, Effective Radiated Power, Mean Power of a Radio Transmitter, and Peak Envelope Power of a Radio Transmitter.)

Primary Radar: A radiodetermination system based on the comparison of reference signals with radio signals reflected from the position to be determined. (RR)

Priority: Priority, unless specifically qualified, is the right to occupy a specific frequency for authorized uses, free of harmful interference from stations of other agencies.

Processing Gain: The ratio of the post processing signal-to-noise ratio to the received signal-to-noise ratio, usually expressed in dB.

Protection Ratio (R.F.): The minimum value of the wanted-to-unwanted signal ratio, usually expressed in decibels, at the receiver input determined under specified conditions such that a specified reception quality of the wanted signal is achieved at the receiver output. (RR)

Public Correspondence: Any telecommunication which the offices and stations must, by reason of their being at the disposal of the public, accept for transmission. (RR)

Radar: A radiodetermination system based on the comparison of reference signals with radio signals reflected, or retransmitted, from the position to be determined. (RR)

Radar Beacon (racon): A transmitter-receiver associated with a fixed navigational mark which, when triggered by a radar, automatically returns a distinctive signal which can appear on the display of the triggering radar, providing range, bearing and identification information. (RR)

Radar Beacon Precipitation Gage Station: A transponder station in the meteorological aids service, the emissions of which are used for telemetering.

Radar Beacon (racon) Station: A station which employs a radar beacon (racon).

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[5] The terms “permissible interference” and “acceptable interference” are used in the coordination of frequency assignments between administrations. (RR)

Radar Transponder: A receiver-transmitter facility the function of which is to transmit signals automatically when proper interrogation is received.

Radiation: The outward flow of energy from any source in the form of radio waves. (RR)

Radio: A general term applied to the use of radio waves. (RR)

Radio Altimeter: Radionavigation equipment, on board an aircraft or spacecraft, used to determine the height of the aircraft or the spacecraft above the Earth's surface or another surface. (RR)

Radio Astronomy: Astronomy based on the reception of radio waves of cosmic origin. (RR)

Radio Astronomy Service: A service involving the use of radio astronomy. (RR)

Radio Astronomy Station: A station in the radio astronomy service. (RR) (This is always a receiving station.)

Radio Beacon Mobile Station: A mobile station the emissions of which are used to determine its location.

Radiobeacon Station: A station in the radionavigation service the emissions of which are intended to enable a mobile station to determine its bearing or direction in relation to the radiobeacon station. (RR)

Radiocommunication: Telecommunication by means of radio waves. (RR)

Radiocommunication Service: A service as defined in this Section involving the transmission, emission and/or reception of radio waves for specific telecommunication purposes. In these regulations, unless otherwise stated, any radiocommunication service relates to terrestrial radiocommunication. (RR)

Radiodetermination: The determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves. (RR)

Radiodetermination-Satellite Earth Station: An fixed earth station in the radiodetermination-satellite service.

Radiodetermination-Satellite Mobile Earth Station: A mobile earth station in the radiodetermination-satellite service.

Radiodetermination-Satellite Service: A radiocommunication service for the purpose of radiodetermination involving the use of one or more space stations. This service may also include feeder links necessary for its own operation. (RR)

Radiodetermination-Satellite Space Station: A space station in the radiodetermination-satellite service.

Radiodetermination Service: A radiocommunication service for the purpose of radiodetermination. (RR)

Radiodetermination Station: A station in the radiodetermination service. (RR)

Radio Direction-Finding: Radiodetermination using the reception of radio waves for the purpose of determining the direction of a station or object. (RR)

Radio Direction-Finding Station: A radiodetermination station using radio direction-finding. (RR)

Radiolocation: Radiodetermination used for purposes other than those of radionavigation. (RR)

Radiolocation Land Station: A station in the radiolocation service not intended to be used while in motion. (RR)

Radiolocation Mobile Station: A station in the radiolocation service intended to be used while in motion or during halts at unspecified points. (RR)

Radiolocation-Satellite Service: A radiodetermination-satellite service used for the purpose of radiolocation. This service may also include the feeder links necessary for its operation. (RR)

Radiolocation Service: A radiodetermination service for the purpose of radiolocation. (RR)

Radionavigation: Radiodetermination used for the purposes of navigation, including obstruction warning. (RR)

Radionavigation Land Station: A station in the radionavigation service not intended to be used while in motion. (RR)

Radionavigation Land Test Station (Maintenance Test Facility): A radionavigation land station in the aeronautical radionavigation service which is used as a radionavigation calibration station for the transmission of essential information in connection with the testing and calibration of aircraft navigational aids, receiving equipment and interrogators at predetermined surface locations. The primary purpose of this facility is to permit maintenance testing by aircraft radio service personnel.

Radionavigation Land Test Station (Operational Test Facility): A radionavigation land station in the aeronautical radionavigation service which is used as a radionavigation calibration station for the transmission of essential information in connection with the testing and calibration of aircraft navigational aids, receiving equipment and interrogators at predetermined surface locations. The primary purpose of this facility is to permit the pilot to check a radionavigation system aboard the aircraft prior to takeoff.

Radionavigation Mobile Station: A station in the radionavigation service intended to be used while in motion or during halts at unspecified points. (RR)

Radionavigation-Satellite Earth Station: An earth station in the radionavigation-satellite service.

Radionavigation-Satellite Mobile Earth Station: A mobile earth station in the radionavigation-satellite service.

Radionavigation-Satellite Service: A radiodetermination-satellite service used for the purpose of radionavigation. This service may also include feeder links necessary for its operation. (RR)

Radionavigation-Satellite Space Station: A space station in the radionavigation-satellite service.

Radionavigation Service: A radiodetermination service for the purpose of radionavigation. (RR)

Radio Range Station: A radionavigation land station in the aeronautical radionavigation service providing radial equisignal zones. (In certain instances a radio range station may be placed on board a ship.)

Radiosonde: An automatic radio transmitter in the meteorological aids service usually carried on an aircraft, free balloon, kite, or parachute, and which transmits meteorological data. (RR)

Radiosonde Ground Station: A station in the meteorological aids service employing a ground station associated with a radiosonde.

Radiosonde Station: A station in the meteorological aids service employing a radiosonde.

Radiotelegram: A telegram, originating in or intended for a mobile station or a mobile earth station transmitted on all or part of its route over the radiocommunication channels of the mobile service or of the mobile-satellite service. (RR)

Radiotelemetry: Telemetry by means of radio waves. (RR)

Radiotelephone Call: A telephone call, originating in or intended for a mobile station or a mobile earth station, transmitted on all or part of its route over the radiocommunication channels of the mobile service or of the mobile-satellite service. (RR)

Radiotelex Call: A telex call, originating in or intended for a mobile station or a mobile earth station, transmitted on all or part of its route over the radiocommunication channels of the mobile service or the mobile-satellite service. (RR)

Radio Waves or Hertzian Waves: Electromagnetic waves of frequencies arbitrarily lower than 3000 GHz, propagated in space without artificial guide. (RR)

Reduced Carrier Single-Sideband Emission: A single-sideband emission in which the degree of carrier suppression enables the carrier to be reconstituted and to be used for demodulation. (RR)

Reference Frequency: A frequency having a fixed and specific position with respect to the assigned frequency. The displacement of this frequency with respect to the assigned frequency has the same absolute value and sign that the displacement of the characteristic frequency has with respect to the center of the frequency band occupied by the emission. (RR) (See also Characteristic Frequency.)

Reflecting Satellite: A satellite intended to reflect radiocommunication signals. (RR)

Restricted Radiation Device: A device in which the generation of radio frequency energy is intentionally incorporated into the design, and in which the radio frequency energy is conducted along wires or is radiated, exclusive of transmitters for which provisions are made under those parts of Chapter 7 other than Part 7.9, and exclusive of Industrial, Scientific, and Medical (ISM) equipment.

Re-usable Launch Vehicle (RLV): A booster rocket that can be recovered after launch, refurbished, and relaunched.

Right-Hand (or Clockwise) Polarized Wave: An elliptically or circularly-polarized wave, in which the electric field vector, observed in any fixed plane, normal to the direction of propagation, whilst looking in the direction of propagation, rotates with time in a right-hand or clockwise direction. (RR)

RF Stabilized Arc Welder: Any welding equipment that utilizes radio frequency energy to initiate and stabilize the arc. An RF stabilized arc welder includes the source of the RF and welding currents, the welding torch, and all interconnecting cables.

Safety Service: Any radiocommunication service used permanently or temporarily for the safeguarding of human life and property. (RR)

Satellite: A body which revolves around another body of preponderant mass and which has a motion primarily and permanently determined by the force of attraction of that other body. (RR)

Satellite Emergency Position-Indicating Radiobeacon: An earth station in the mobile-satellite service the emissions of which are intended to facilitate search and rescue operations. (RR)

Satellite Link: A radio link between a transmitting earth station and a receiving earth station through one satellite. A satellite link comprises one uplink and one downlink. (RR)

Satellite Network: A satellite system or a part of a satellite system, consisting of only one satellite and the cooperating earth stations. (RR)

Satellite System: A space system using one or more artificial earth satellites. (RR)

Secondary Radar: A radiodetermination system based on the comparison of reference signals with radio signals retransmitted from the position to be determined. (RR)

Semi-Duplex Operation: A method which is simplex operation at one end of the circuit and duplex operation at the other. [3](RR)

Ship Earth Station: A mobile earth station in the maritime mobile-satellite service located on board ship. (RR)

Ship's Emergency Transmitter: A ship's transmitter to be used exclusively on a distress frequency for distress, urgency or safety purposes. (RR)

Ship Movement Service: A safety service in the maritime mobile service other than a port operations service, between coast stations and ship stations, or between ship stations, in which messages are restricted to those relating to the movement of ships. Messages which are of a public correspondence nature shall be excluded from this service. (RR)

Ship Station: A mobile station in the maritime mobile service located on board a vessel which is not permanently moored, other than a survival craft station. (RR)

Simplex Operation: Operating method in which transmission is made possible alternately in each direction of a telecommunication channel, for example, by means of manual control. (RR)

Single-Sideband Emission: An amplitude modulated emission with one sideband only. (RR)

Software Defined Radio: A radio in which radio frequency operating parameters including, but not limited to, frequency range, modulation type, or output power is able to be set or altered by software after the normal installation process.

Sounder Network Station: A station equipped with an ionosphere sounder used for the realtime selection of frequencies for operational communication circuits.

Sounder Prediction Station: A station equipped with an ionosphere sounder for realtime monitoring of upper atmosphere phenomena or to obtain data for the prediction of propagation conditions.

Spacecraft: A man-made vehicle which is intended to go beyond the major portion of the Earth's atmosphere. (RR)

Space Operation Earth Station: An earth station in the space operation service.

Space Operation Service: A radiocommunication service concerned exclusively with the operation of spacecraft, in particular space tracking, space telemetry and space telecommand. These functions will normally be provided within the service in which the space station is operating. (RR)

Space Operation Space Station: A space station in the space operation service.

Space Radiocommunication: Any radiocommunication involving the use of one or more space stations or the use of one or more reflecting satellites or other objects in space. (RR)

Space Research Earth Station: An earth station in the space research service.

Space Research Service: A radiocommunication service in which spacecraft or other objects in space are used for scientific or technological research purposes. (RR)

Space Research Space Station: A space station in the space research service.

Space Station: A station located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth's atmosphere. (RR)

Space System: Any group of cooperating earth stations and/or space stations employing space radiocommunication for specific purposes. (RR)

Space Telecommand: The use of radiocommunication for the transmission of signals to a space station to initiate, modify or terminate functions of equipment on an associated space object, including the space station. (RR)

Space Telecommand Earth Station: An earth station the emissions of which are used for space telecommand.

Space Telecommand Space Station: A space station which receives emissions used for space telecommand.

Space Telemetering Earth Station: An earth station which receives emissions used for space telemetering.

Space Telemetering Space Station: A space station the emissions of which are used for space telemetering.

Space Telemetry: The use of telemetry for the transmission from a space station of results of measurements made in a spacecraft, including those relating to the functioning of the spacecraft. (RR)

Space Tracking: Determination of the orbit, velocity or instantaneous position of an object in space by means of radiodetermination, excluding primary radar, for the purpose of following the movement of the object. (RR)

Space Tracking Earth Station: An earth station which transmits or receives emissions used for space tracking.

Space Tracking Space Station: A space station which transmits or receives and retransmits emissions used for space tracking.

Space Transponder: A receiver-transmitter combination on board a satellite or space craft which receives a signal and transmits it at a different carrier frequency.

Special Service: A radiocommunication service, not otherwise defined in this Section, carried on exclusively for specific needs of general utility, and not open to public correspondence. (RR)

Specialized Mobile Radio Service: A radio service in which licensees provide land mobile communications services in the 800 MHz and 900 MHz bands on a commercial basis to entities eligible to be licensed under this part, federal government entities, and individuals.

Spread Spectrum: A signal structuring technique that employs direct sequence, frequency hopping or a hybrid of these, which can be used for multiple access and/or multiple functions. This technique decreases the potential interference to other receivers while achieving privacy and increasing the immunity of spread spectrum receivers to noise and interference. Spread spectrum generally makes use of a sequential noise-like signal structure to spread the normally narrowband information signal over a relatively wide band of frequencies. The receiver correlates the signals to retrieve the original information signal.

Spurious Domain (of an emission): The frequency range beyond the out-of-band domain in which spurious emissions generally predominate. (RR)

Spurious Emission: Emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions. (RR)

Squelch: A circuit function that acts to suppress the audio output of a receiver.

Standard Frequency and Time Signal Station: A station in the standard frequency and time signal service. (RR)

Standard Frequency and Time Signal-Satellite Service: A radiocommunication service using space stations on earth satellites for the same purpose as those of the standard frequency and time signal service. This service may also include feeder links necessary for its operation. (RR)

Standard Frequency and Time Signal-Satellite Space Station: A space station in the standard frequency and time signal-satellite service.

Standard Frequency and Time Signal Service: A radiocommunication service for scientific, technical and other purposes, providing the transmission of specified frequencies, time signals, or both, of stated high precision, intended for general reception. (RR)

Station: One or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service, or the radio astronomy service. Each station shall be classified by the service in which it operates permanently or temporarily. (RR)

Suppressed Carrier Single-Sideband Emission: A single-sideband emission in which the carrier is virtually suppressed and not intended to be used for demodulation. (RR) Steerable Satellite Beam: A satellite antenna beam that can be re-pointed. (RR)

Surface Telemetering Land Station: A telemetering land station the emission of which are intended to be received on the surface of the Earth.

Surface Telemetering Mobile Station: A telemetering mobile station located on the surface of the Earth and the emissions of which are intended to be received on the surface of the Earth.

Surveillance Radar Station: A radionavigation land station in the aeronautical radionavigation service employing radar to display the presence of aircraft within its range. (In certain instances, a surveillance radar station may be placed on board a ship.)

Survival Craft Station: A mobile station in the maritime mobile service or the aeronautical mobile service intended solely for survival purposes and located on any lifeboat, life-raft or other survival equipment. (RR)

Telecommand: The use of telecommunication for the transmission of signals to initiate, modify or terminate functions of equipment at a distance. (RR)

Telecommand Aeronautical Station: A land station in the aeronautical mobile service the emissions of which are used for terrestrial telecommand.

Telecommand Aircraft Station: A mobile station in the aeronautical mobile service the emissions of which are used for terrestrial telecommand.

Telecommand Base Station: A land station in the land mobile service the emissions of which are used for terrestrial telecommand.

Telecommand Coast Station: A land station in the maritime mobile service the emissions of which are used for terrestrial telecommand.

Telecommand Fixed Station: A fixed station in the fixed service the emissions of which are used for terrestrial telecommand.

Telecommand Land Station: A land station in the mobile service the emissions of which are used for terrestrial telecommand.

Telecommand Land Mobile Station: A mobile station in the land mobile service the emissions of which are used for terrestrial telecommand.

Telecommand Mobile Station: A mobile station in the mobile service the emissions of which are used for terrestrial telecommand.

Telecommand Ship Station: A mobile station in the maritime mobile service the emissions of which are used for terrestrial telecommand.

Telecommunication: Any transmission, emission or reception of signs, signals, writing, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems. (RR)

Telegram: Written matter intended to be transmitted by telegraphy for delivery to the addressee. This term also includes radiotelegrams unless otherwise specified. In this definition the term telegraphy has the same general meaning as defined in the Convention. (RR)

Telegraphy: A form of telecommunication in which the transmitted information is intended to be recorded on arrival as a graphic document; the transmitted information may sometimes be presented in an alternative form or may be stored for subsequent use. (RR)

Telemetering Fixed Station: A fixed station the emissions of which are used for telemetering.

Telemetering Land Station: A land station the emissions of which are used for telemetering.

Telemetering Mobile Station: A mobile station the emissions of which are used for telemetering.

Telemetry: The use of telecommunication for automatically indicating or recording measurements at a distance from the measuring instrument. (RR)

Telephony: A form of telecommunication primarily intended for the exchange of information in the form of speech. (RR)

Television: A form of telecommunication for the transmission of transient images of fixed or moving objects. (RR)

Terrestrial Radiocommunication: Any radiocommunication other than space radiocommunication or radio astronomy. (RR)

Terrestrial Station: A station effecting terrestrial radiocommunication. In these Regulations, unless otherwise stated, any station is a terrestrial station. (RR)

Time-Gated Direct Sequence Spread Spectrum: Direct-Sequence Spread Spectrum where the transmitter is on only for a short fraction of a time interval. The on-time can be periodic or random within a time interval.

Transportable Station: A station which is transferred to various fixed locations but is not intended to be used while in motion.

Travelers Information Station: A base station in the Land Mobile Service used to transmit non-commercial voice information pertaining to traffic and road conditions, traffic hazard and travelers advisories, directions, availability of lodging, rest stops and service stations, and descriptions of local points of interest.

Tropospheric Scatter: The propagation of radio waves by scattering as a result of irregularities or discontinuities in the physical properties of the troposphere. (RR)

Ultrasonic Equipment: Any apparatus which generates radio frequency energy and utilizes that energy to excite or drive an electro-mechanical transducer for the production of sonic or ultrasonic mechanical energy for industrial, scientific, medical, or other non-communication purposes.

Ultra-Wideband Radar: A radar having an instantaneous bandwidth greater than 25 percent of its center frequency.

United States: The term "United States" includes the 50 States and the District of Columbia. (See also definition for "Conterminous United States" and "United States and Possessions.")

United States and Possessions: The term "United States and Possessions" includes the 50 States, the District of Columbia, the Commonwealth of Puerto Rico, and the territories and possessions (but less the Canal Zone). (See also definitions for "Conterminous United States" and "United States.")

Unwanted Emissions: Consist of spurious emissions and out-of-band emissions. (RR)

War Emergency:[6] Any condition proclaimed by the President, under the war emergency power granted to him by Section 706 of the Communications Act of 1934, as amended, that affects the national defense or security of the United States.

Wired Radio Frequency Systems: Systems employing restricted radiation devices in which the radio frequency energy is conducted or guided along wires or in cables, including electric power and telephone lines.

6.1.2 Stations (alphabetical by classes)

1. Where a definition is followed by the parenthetical expression "(RR)," it is an indication that the definition is in the ITU Radio Regulations.

2. The suffix "R" shall be added to the established class of station (STC) symbol only if the station is to be used primarily as a repeater in the bands:

29.89-50.00 MHz (exclusive federal bands)
138.00-144.00 MHz
148.00-149.90 MHz
150.05-150.80 MHz
162.00-174.00 MHz
406.10-420.00 MHz

For this purpose, a repeater consists of a radio transmitter, a radio receiver and coupling between the two so as to retransmit unchanged in intelligence the received signal.

3. The following definitions of Stations and associated Station Class (STC-see Section 9.8.2, Para. 15a. through 15c.) symbols are used on Federal frequency assignments as applicable.

FAB--Aeronautical Broadcast Station: An aeronautical station which makes scheduled broadcasts of meteorological information and notices to airmen. (In certain instances, an aeronautical broadcast station may be placed on board a ship.)

TB--Aeronautical Earth Station: An earth station in the fixed-satellite service or in some cases in the aeronautical mobile-satellite service located at a specified fixed point on land to provide a feeder link for the aeronautical mobile-satellite service. (RR)

AX--Aeronautical Fixed Station: A station in the aeronautical fixed service. (RR)

ALA--Aeronautical Marker Beacon Station: A radionavigation land station in the aeronautical radionavigation service which employs a marker beacon.

EJ--Aeronautical Mobile-Satellite Space Station: A space station in the aeronautical mobile-satellite service. (RR)

ALC--Aeronautical Radar Beacon (racon) Station: A land station in the aeronautical radionavigation service which employs a radar beacon (racon).

ALB--Aeronautical Radiobeacon Station: A radiobeacon station in the aeronautical radionavigation service intended for the benefit of aircraft.

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[6] *According to Section 706, a war emergency may be proclaimed as a result of:*
(1) war,
(2) threat of war,
(3) a state of public peril,
(4) disaster,
(5) other national emergency, or
(6) to preserve the neutrality of the United States.

AL--Aeronautical Radionavigation Land Station: A land station in the aeronautical radionavigation service not intended for use while in motion.

AM--Aeronautical Radionavigation Mobile Station: A mobile station in the aeronautical radionavigation service intended to be used while in motion or during halts at unspecified points.

TZ--Aeronautical Radionavigation-Satellite Earth Station: A fixed earth station in the aeronautical radionavigation-satellite service.

TO--Aeronautical Radionavigation-Satellite Mobile Earth Station: A mobile earth station in the aeronautical radionavigation-satellite service. (RR)

EO--Aeronautical Radionavigation-Satellite Space Station: A space station in the aeronautical radionavigation-satellite service. (RR)

FA--Aeronautical Station: A land station in the aeronautical mobile service. In certain instances, an aeronautical station may be located, for example, on board ship or on a platform at sea. (RR)

FG--Aeronautical Station (OR): An aeronautical station in the aeronautical mobile (OR) service. (RR)

FD--Aeronautical Station (R): An aeronautical station in the aeronautical mobile (R) service. (RR)

FLEA--Aeronautical Telemetering Land Station: A telemetering land station used in the flight testing of manned or unmanned aircraft, missiles, or major components thereof.

MOEA--Aeronautical Telemetering Mobile Station: A telemetering mobile station used for transmitting data directly related to the airborne testing of the vehicle. (or major components), on which the station is installed.

FLU--Aeronautical Utility Land Station: A land station located at airdrome control towers and used for control of ground vehicles and aircraft on the ground at airdromes.

MOU--Aeronautical Utility Mobile Station: A mobile station used for communication at airdromes with the aeronautical utility land station, the airdrome control station, the FAA flight service station, ground vehicles, and aircraft on the ground. (All transmissions shall be subject to the control of the airdrome control station and shall be discontinued immediately when so requested by the airdrome control operators.)

TJ--Aircraft Earth Station: A mobile earth station in the aeronautical mobile-satellite service located on board an aircraft. (RR)

MA--Aircraft Station: A mobile station in the aeronautical mobile service, other than a survival craft station, located on board an aircraft. (RR)

FAC--Airdrome Control Station: An aeronautical station providing communication between an airdrome control tower and aircraft.

AMA--Altimeter Station: A radionavigation mobile station in the aeronautical radionavigation service which employs a radio altimeter.

TY--Base Earth Station: An earth station in the fixed-satellite service or in some cases in the land mobile-satellite service located at a specified fixed point or within a specified area on land to provide a feeder link for the land mobile-satellite service. (RR)

FB--Base Station: A land station in the land mobile service. (RR)

EB--Broadcasting-Satellite Space Station (sound broadcasting): A space station in the broadcasting-satellite service (sound broadcasting). (RR)

EV--Broadcasting-Satellite Space Station (television): A space station in the broadcasting-satellite service (television). (RR)

BC--Broadcasting Station (sound): A station (sound) in the broadcasting service. (RR)

BT--Broadcasting Station (television): A station (television) in the broadcasting service. (RR)

TI--Coast Earth Station: An earth station in the fixed-satellite service or in some cases in the maritime mobile-satellite service located at a specified fixed point on land to provide a feeder link for the maritime mobile-satellite service. (RR)

FC--Coast Station: A land station in the maritime mobile service. (RR)

DGP--Differential-Global-Positioning-System (DGPS) Station: a terrestrial station used for the transmission of differential correction information to DGPS receivers aboard aircraft for navigation.

TW--Earth Exploration-Satellite Earth Station: An earth station in the Earth exploration-satellite service. (RR)

E3--Earth Exploration-Satellite (active sensor) Space Station: An active sensor on a space station in the Earth exploration-satellite service.

E4--Earth Exploration-Satellite (passive sensor) Space Station: A passive sensor on a space station in the Earth exploration-satellite service.

EW--Earth Exploration-Satellite Space Station: A space station in the Earth exploration-satellite service. (RR)

TP--Earth Station (receiving): An earth station used for receiving. (RR) (TP is not used on applications.)

XM--Experimental Composite Station: An experimental station used in experimental operations of a complex nature not readily specified or used in operation which is a composite of two or more of the established experimental categories.

XC--Experimental Contract Developmental Station: An experimental station used for the evaluation or testing under federal government contract of electronics equipment or systems in a design or development stage.

XD--Experimental Developmental Station: An experimental station used for evaluation or testing of electronics equipment or systems in a design or development stage.

XE--Experimental Export Station: An experimental station intended for export and used for the evaluation or testing of electronics equipment or systems in the design or development stage.

XR--Experimental Research Station: An experimental station used in basic studies concerning scientific investigations looking toward the improvement of the art of radiocommunications.

EX--Experimental Station: A station utilizing radio waves in experiments with a view to the development of science or technique. This definition does not include amateur stations. (RR) (EX is not used on applications.)

XT--Experimental Testing Station: An experimental station used for the evaluation or testing of electronics equipment or systems, including site selection and transmission path surveys, which have been developed for operational use.

TC--Fixed-Satellite Earth Station: An earth station in the fixed-satellite service. (RR)

EC--Fixed-Satellite Space Station: A space station in the fixed-satellite service. (RR)

FX--Fixed Station: A station in the fixed service. (RR)

FLEB--Flight Telemetering Land Station: A telemetering land station the emissions of which are used for telemetering to a balloon; to a booster or rocket, excluding a booster or rocket in orbit about the Earth or in deep space; or to an aircraft, excluding a station used in the flight testing of an aircraft.

MOEB--Flight Telemetering Mobile Station: A telemetering mobile station used for transmitting data from an airborne vehicle, excluding data related to airborne testing of the vehicle itself, (or major components thereof).

FAT--Flight Test Station: An aeronautical station used for the transmission of essential communications in connection with the testing of aircraft or major components of aircraft.

ALG--Glide Path (Slope) Station: A radionavigation land station which provides vertical guidance to aircraft during approach to landing.

FXH--Hydrologic and Meteorological Fixed Station: A fixed station the emissions of which are used for the automatic transmission of either hydrologic or meteorological data, or both.

FLH--Hydrologic and Meteorological Land Station: A land station the emissions of which are used for the automatic transmission of either hydrologic or meteorological data, or both.

MOH--Hydrologic and Meteorological Mobile Station: A mobile station the emissions of which are used for the automatic transmission of either hydrologic or meteorological data, or both.

ES--Inter-Satellite Space Station: A space station in the inter-satellite service. (RR)

VA--Land Earth Station: An earth station in the fixed-satellite service or in some cases in the mobile-satellite service located at a specified point or within a specified area on land to provide a feeder link for the mobile-satellite service. (RR)

TU--Land Mobile Earth Station: A mobile earth station in the land mobile-satellite service capable of surface movement within the geographical limits of a country or continent. (RR)

EU--Land Mobile-Satellite Space Station: A space station in the land mobile-satellite service. (RR) ML--Land Mobile Station: A mobile station in the land mobile service capable of surface movement within the geographical limits of a country or continent. (RR)

FL--Land Station: A station in the mobile service not intended to be used while in motion. (RR)

ALL--Localizer Station: A radionavigation land station in the aeronautical radionavigation service which employs an Instrument Landing System Localizer.

RNL--Loran Station: A long distance radionavigation land station transmitting synchronized pulses. Hyperbolic lines of position are determined by the measurement of the difference in the time of arrival of these pulses.

FCB--Marine Broadcast Station: A coast station which makes scheduled broadcasts of time, meteorological, and hydrographic information.

NLC--Maritime Radar Beacon (racon) Station: A land station in the maritime radionavigation service which employs a radar beacon (racon).

NLM--Maritime Radiobeacon Station: A radiobeacon station in the maritime radionavigation service intended for the benefit of ships.

EG--Maritime Mobile-Satellite Space Station: A space station in the maritime mobile-satellite service. (RR)

NL--Maritime Radionavigation Land Station: A land station in the Maritime radionavigation service not intended for use while in motion.

TX--Maritime Radionavigation-Satellite Earth Station: A fixed earth station in the maritime radionavigation-satellite service. (RR)

TQ--Maritime Radionavigation-Satellite Mobile Earth Station: A mobile earth station in the maritime radionavigation-satellite service. (RR)

EQ--Maritime Radionavigation-Satellite Space Station: A space station in the maritime radionavigation-satellite service. (RR)

SM--Meteorological Aids Base Station: A land station in the meteorological aids service not intended for use while in motion.

SA--Meteorological Aids Mobile Station: A mobile station in the meteorological aids service intended to be used while in motion or during halts at unspecified points.

SMD--Meteorological Radar Station: A station in the meteorological aids service employing radar.

TM--Meteorological-Satellite Earth Station: An earth station in the meteorological-satellite service. (RR)

EM--Meteorological-Satellite Space Station: A space station in the meteorological-satellite service. (RR)

UA--Mobile Earth Station: An earth station in the mobile-satellite service intended to be used while in motion or during halts at unspecified points. (RR)

EI--Mobile-Satellite Space Station: A space station in the mobile-satellite service. (RR)

MO--Mobile Station: A station in the mobile service intended to be used while in motion or during halts at unspecified points. (RR)

OE--Oceanographic Data Interrogating Station: A station in the maritime mobile service the emissions of which are used to initiate, modify or terminate functions of equipment directly associated with an oceanographic data station, including the station itself.

OD--Oceanographic Data Station: A station in the maritime mobile service located on a ship, buoy, or other sensor platform the emissions of which are used for transmission of oceanographic data.

ALO--Omnidirectional Range Station: A radionavigation land station in the aeronautical radionavigation service providing direct indication of the bearing (omnibearing) of that station from an aircraft.

MAP--Portable Aircraft Station: A portable station operating in the aeronautical mobile service.

MLP--Portable Land Mobile Station: A portable station operating in the land mobile service.

MRP--Portable Radiolocation Station: A portable station operating in the radiolocation service.

MOP--Portable Mobile Station: A portable station operating in the mobile service.

MSP--Portable Ship Station: A portable station operating in the maritime mobile service.

FP--Port Station: A coast station in the port operations service.(RR)

SMB--Radar Beacon Precipitation Gage Station: A transponder station in the meteorological aids service, the emissions of which are used for telemetering.

RA--Radio Astronomy Station: A station in the radio astronomy service. (RR) (This is always a receiving station.)

MOB--Radio Beacon Mobile Station: A mobile station the emissions of which are used to determine its location.

TF--Radiodetermination-Satellite Earth Station: A fixed earth station in the radiodetermination-satellite service. (RR)

TL--Radiodetermination-Satellite Mobile Earth Station: A mobile earth station in the radiodetermination-satellite service. (RR)

EF--Radiodetermination-Satellite Space Station: A space station in the radiodetermination-satellite service. (RR)

RG--Radio Direction-Finding Station: A radiodetermination station using radio direction-finding. (RR)

LR--Radiolocation Land Station: A station in the radiolocation service not intended to be used while in motion. (RR)

MR--Radiolocation Mobile Station: A station in the radiolocation service intended to be used while in motion or during halts at unspecified points. (RR)

RN--Radionavigation Land Station: A station in the radionavigation service not intended to be used in motion. (RR)

ALTM--Radionavigation Land Test Station (Maintenance Test Facility): A radionavigation land station in the aeronautical radionavigation service which is used as a radionavigation calibration station for the transmission of essential information in connection with the testing and calibration of aircraft navigational aids, receiving equipment and interrogators at predetermined surface locations. The primary purpose of this facility is to permit maintenance testing by aircraft radio service personnel.

ALTO--Radionavigation Land Test Station (Operational Test Facility): A radionavigation land station in the aeronautical radionavigation service which is used as a radionavigation calibration station for the transmission of essential information in connection with the testing and calibration of aircraft navigational aids, receiving equipment and interrogators at predetermined surface locations. The primary purpose of this facility is to permit the pilot to check a radionavigation system aboard the aircraft prior to takeoff.

NR--Radionavigation Mobile Station: A station in the radionavigation service intended to be used while in motion or during halts at unspecified points. (RR)

TN--Radionavigation-Satellite Fixed Earth Station: A fixed earth station in the radionavigation-satellite service. (RR)

UM--Radionavigation-Satellite Mobile Earth Station: A mobile earth station in the radionavigation-satellite service. (RR)

EN--Radionavigation-Satellite Space Station: A space station in the radionavigation-satellite service. (RR)

ALR--Radio Range Station: A radionavigation land station in the aeronautical radionavigation service providing radial equisignal zones. (In certain instances a radio range station may be placed on board a ship.)

SAR--Radiosonde Station: A station in the meteorological aids service employing a radiosonde.

SMRG--Radiosonde Ground Station: A station in the meteorological aids service employing a ground station associated with a radiosonde.

TE--Satellite EPIRB Station: A satellite Emergency Position-Indicating Radio Beacon (EPIRB) in the mobile-satellite service. (RR)

TG--Ship Earth Station: A mobile earth station in the maritime mobile-satellite service located on board ship. (RR)

MS--Ship Station: A mobile station in the maritime mobile service located on board a vessel which is not permanently moored, other than a survival craft station. (RR)

SN--Sounder Network Station: A station equipped with an ionosphere sounder used for the real-time selection of frequencies for operational communication circuits.

SP--Sounder Prediction Station: A station equipped with an ionosphere sounder for real-time monitoring of upper atmosphere phenomena or to obtain data for the prediction of propagation conditions.

TT--Space Operation Earth Station: An earth station in the space operation service. (RR)

ET--Space Operation Space Station: A space station in the space operation service. (RR)

TH--Space Research Earth Station: An earth station in the space research service. (RR)

EH--Space Research Space Station: A space station in the space research service.

E1--Space Research (active sensor) Space Station: An active sensor on a space station in the space research service.

E2--Space Research (passive sensor) Space Station: A passive sensor on a space station in the space research service.

ME--Space Station: A station located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth's atmosphere. (RR) (ME is not used on applications.)

TD--Space Telecommand Earth Station: An earth station the emissions of which are used for space telecommand.

ED--Space Telecommand Space Station: A space station which receives emissions used for space telecommand.

TR--Space Telemetering Earth Station: An earth station which receives emissions used for space telemetering.

ER--Space Telemetering Space Station: A space station the emissions of which are used for space telemetering.

TK--Space Tracking Earth Station: An earth station which transmits or receives emissions used for space tracking.

EK--Space Tracking Space Station: A space station which transmits or receives and retransmits emissions used for space tracking.

SS--Standard Frequency and Time Signal Station: A station in the standard frequency and time signal service. (RR)

EE--Standard Frequency Satellite Space Station: A space station in the standard frequency satellite service. (RR)

FLEC--Surface Telemetering Land Station: A telemetering land station the emissions of which are intended to be received on the surface of the Earth.

MOEC--Surface Telemetering Mobile Station: A telemetering mobile station located on the surface of the Earth and the emissions of which are intended to be received on the surface of the Earth.

ALS--Surveillance Radar Station: A radionavigation land station in the aeronautical radionavigation service employing radar to display the presence of aircraft within its range. (In certain instances, a surveillance radar station may be placed on board a ship.)

FAD--Telecommand Aeronautical Station: A land station in the aeronautical mobile service the emissions of which are used for terrestrial telecommand.

MAD--Telecommand Aircraft Station: A mobile station in the aeronautical mobile service the emissions of which are used for terrestrial telecommand.

FBD--Telecommand Base Station: A land station in the land mobile service the emissions of which are used for terrestrial telecommand.

FCD--Telecommand Coast Station: A land station in the maritime mobile service the emissions of which are used for terrestrial telecommand.

FXD--Telecommand Fixed Station: A fixed station in the fixed service the emissions of which are used for terrestrial telecommand.

FLD--Telecommand Land Station: A land station in the mobile service the emissions of which are used for terrestrial telecommand.

MLD--Telecommand Land Mobile Station: A mobile station in the land mobile service the emissions of which are used for terrestrial telecommand.

MOD--Telecommand Mobile Station: A mobile station in the mobile service the emissions of which are used for terrestrial telecommand.

MSD--Telecommand Ship Station: A mobile station in the maritime mobile service the emissions of which are used for terrestrial telecommand.

FXE--Telemetering Fixed Station: A fixed station the emissions of which are used for telemetering.

FLE--Telemetering Land Station: A land station the emissions of which are used for telemetering.

MOE--Telemetering Mobile Station: A mobile station the emissions of which are used for telemetering.

6.1.3 Stations (alphabetical by symbols)

1. Where a definition is followed by the parenthetical expression "(RR)," it is an indication that the definition is in the ITU Radio Regulations.

2. The suffix "R" shall be added to the established class of station (STC) symbol only if the station is to be used primarily as a repeater in the bands:

29.89-50.00 MHz (exclusive federal government bands).
138.00-144.00 MHz
148.00-149.90 MHz
150.05-150.80 MHz
162.00-174.00 MHz
380-399.9 MHz (G27)
406.10-420.00 MHz

For this purpose, a repeater consists of a radio transmitter, a radio receiver and coupling between the two so as to retransmit unchanged in intelligence the received signal.

3. The following definitions of Stations and associated Station Class (STC) (see Section 9.8.2, paragraph 15a through 15c) symbols are used on Federal frequency assignments as applicable.

AL--Aeronautical Radionavigation Land Station: A land station in the aeronautical radionavigation service not intended for use while in motion.

ALA--Aeronautical Marker Beacon Station: A radionavigation land station in the aeronautical radionavigation service which employs a marker beacon.

ALB--Aeronautical Radiobeacon Station: A radiobeacon station in the aeronautical radionavigation service intended for the benefit of aircraft.

ALC--Aeronautical Radar Beacon (racon) Station: A land station in the aeronautical radionavigation service which employs a radar beacon (racon).

ALG--Glide Path (Slope) Station: A radionavigation land station which provides vertical guidance to aircraft during approach to landing.

ALL--Localizer Station: A radionavigation land station in the aeronautical radionavigation service which employs an Instrument Landing System Localizer.

ALO--Omnidirectional Range Station: A radionavigation land station in the aeronautical radionavigation service providing direct indication of the bearing (omnibearing) of that station from an aircraft.

ALR--Radio Range Station: A radionavigation land station in the aeronautical radionavigation service providing radial equisignal zones. (In certain instances a radio range station may be placed on board a ship.)

ALS--Surveillance Radar Station: A radionavigation land station in the aeronautical radionavigation service employing radar to display the presence of aircraft within its range. (In certain instances, a surveillance radar station may be placed on board a ship.)

ALTM--Radionavigation Land Test Station (Maintenance Test Facility): A radionavigation land station in the aeronautical radionavigation service which is used as a radionavigation calibration station for the transmission of essential information in connection with the testing and calibration of aircraft navigational aids, receiving equipment and interrogators at predetermined surface locations. The primary purpose of this facility is to permit maintenance testing by aircraft radio service personnel.

ALTO--Radionavigation Land Test Station (Operational Test Facility): A radionavigation land station in the aeronautical radionavigation service which is used as a radionavigation calibration station for the transmission of essential information in connection with the testing and calibration of aircraft navigational aids, receiving equipment and interrogators at predetermined surface locations. The primary purpose of this facility is to permit the pilot to check a radionavigation system aboard the aircraft prior to takeoff.

AM--Aeronautical Radionavigation Mobile Station: A mobile station in the aeronautical radionavigation service intended to be used while in motion or during halts at unspecified points.

AMA--Altimeter Station: A radionavigation mobile station in the aeronautical radionavigation service which employs a radio altimeter.

AX--Aeronautical Fixed Station: A station in the aeronautical fixed service. (RR)

BC--Broadcasting Station (sound): A station (sound) in the broadcasting service. (RR)

BT--Broadcasting Station (television): A station (television) in the broadcasting service. (RR)

EB--Broadcasting-Satellite Space Station (sound broadcasting): A space station in the broadcasting-satellite service (sound broadcasting). (RR)

DGP--Differential-Global-Positioning-System (DGPS) Station: a terrestrial station used for the transmission of differential correction information to DGPS receivers aboard aircraft for navigation.

EC--Fixed-Satellite Space Station: A space station in the fixed-satellite service. (RR)

ED--Space Telecommand Space Station: A space station which receives emissions used for space telecommand. (RR)

EE--Standard Frequency Satellite Space Station: A space station in the standard frequency satellite service. (RR)

EF--Radiodetermination-Satellite Space Station: A space station in the radiodetermination-satellite service. (RR)

EG--Maritime Mobile-Satellite Space Station: A space station in the maritime mobile-satellite service. (RR)

EH--Space Research Space Station: A space station in the space research service. (RR)

EI--Mobile-Satellite Space Station: A space station in the mobile-satellite service. (RR)

EJ--Aeronautical Mobile-Satellite Space Station: A space station in the aeronautical mobile-satellite service. (RR)

EK--Space Tracking Space Station: A space station which transmits or receives and retransmits emissions used for space tracking.

EM--Meteorological-Satellite Space Station: A space station in the meteorological-satellite service. (RR)

EN--Radionavigation-Satellite Space Station: A space station in the radionavigation-satellite service. (RR)

EO--Aeronautical Radionavigation-Satellite Space Station: A space station in the aeronautical radionavigation-satellite service. (RR)

EQ--Maritime Radionavigation-Satellite Space Station: A space station in the maritime radionavigation-satellite service. (RR)

ER--Space Telemetering Space Station: A space station the emissions of which are used for space telemetering.

ES--Inter-Satellite Space Station: A space station in the inter-satellite service. (RR)

ET--Space Operation Space Station: A space station in the space operation service. (RR)

EU--Land Mobile-Satellite Space Station: A space station in the land mobile-satellite service. (RR)

EV--Broadcasting-Satellite Space Station (television): A space station in the broadcasting-satellite service (television). (RR)

EW--Earth Exploration-Satellite Space Station: A space station in the Earth exploration-satellite service. (RR)

EX--Experimental Station: A station utilizing radio waves in experiments with a view to development of science or technique. (RR) (EX is not used on applications.)

E1--Space Research (active sensor) Space Station: An active sensor on a space station in the space research service.

E2--Space Research (passive sensor) Space Station: A passive sensor on a space station in the space research service.

E3--Earth Exploration-Satellite (active sensor) Space Station: An active sensor on a space station in the Earth exploration-satellite service.

E4--Earth Exploration-Satellite (passive sensor) Space Station: A passive sensor on a space station in the Earth exploration-satellite service.

FA--Aeronautical Station: A land station in the aeronautical mobile service. In certain instances, an aeronautical station may be located, for example on board ship or on a platform at sea. (RR)

FAB--Aeronautical Broadcast Station: An aeronautical station which makes scheduled broadcasts of meteorological information and notices to airmen. (In certain instances, an aeronautical broadcast station may be placed on board a ship.)

FAC--Airdrome Control Station: An aeronautical station providing communication between an airdrome control tower and aircraft.

FAD--Telecommand Aeronautical Station: A land station in the aeronautical mobile service the emissions of which are used for terrestrial telecommand.

FAT--Flight Test Station: An aeronautical station used for the transmission of essential communications in connection with the testing of aircraft or major components of aircraft.

FB--Base Station: A land station in the land mobile service. (RR)

FBD--Telecommand Base Station: A land station in the land mobile service the emissions of which are used for terrestrial telecommand.

FC--Coast Station: A land station in the maritime mobile service. (RR)

FCB--Marine Broadcast Station: A coast station which makes scheduled broadcast of time, meteorological, and hydrographic information.

FCD--Telecommand Coast Station: A land station in the maritime mobile service the emissions of which are used for terrestrial telecommand.

FD--Aeronautical Station (R): An aeronautical station in the aeronautical mobile (R) service. (RR)

FG--Aeronautical Station (OR): An aeronautical station in the aeronautical mobile (OR) service. (RR)

FL--Land Station: A station in the mobile service not intended to be used while in motion. (RR)

FLD--Telecommand Land Station: A land station in the mobile service the emissions of which are used for terrestrial telecommand.

FLE--Telemetering Land Station: A land station the emissions of which are used for telemetering.

FLEA--Aeronautical Telemetering Land Station: A telemetering land station used in the flight testing of manned or unmanned aircraft, missiles, or major components thereof.

FLEB--Flight Telemetering Land Station: A telemetering land station the emissions of which are used for telemetering to a balloon; to a booster or rocket, excluding a booster or rocket in orbit about the Earth or in deep space; or to an aircraft, excluding a station used in the flight testing of an aircraft.

FLEC--Surface Telemetering Land Station: A telemetering land station the emissions of which are intended to be received on the surface of the Earth.

FLH--Hydrologic and Meteorological Land Station: A land station the emissions of which are used for the automatic transmission of either hydrologic or meteorological data, or both.

FLU--Aeronautical Utility Land Station: A land station located at airdrome control towers and used for control of ground vehicles and aircraft on the ground at airdromes.

FP--Port Station: A coast station in the port operations service. (RR)

FX--Fixed Station: A station in the fixed service. (RR)

FXD--Telecommand Fixed Station: A fixed station in the fixed service the emissions of which are used for terrestrial telecommand.

FXE--Telemetering Fixed Station: A fixed station the emissions of which are used for telemetering.

FXH--Hydrologic and Meteorological Fixed Station: A fixed station the emissions of which are used for the automatic transmission of either hydrologic or meteorological data, or both.

LR--Radiolocation Land Station: A station in the radiolocation service not intended to be used while in motion. (RR)

MA--Aircraft Station: A mobile station in the aeronautical mobile service other than a survival craft station, located on board an aircraft. (RR)

MAD--Telecommand Aircraft Station: A mobile station in the aeronautical mobile service the emissions of which are used for terrestrial telecommand.

MAP--Portable Aircraft Station: A portable station operating in the aeronautical mobile service.

ME--Space Station: A station located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth's atmosphere. (RR) (ME is not used on applications.)

ML--Land Mobile Station: A mobile station in the land mobile service capable of surface movement within the geographical limits of a country or continent. (RR)

MLD--Telecommand Land Mobile Station: A mobile station in the land mobile service the emissions of which are used for terrestrial telecommand.

MLP--Portable Land Mobile Station: A portable station operating in the land mobile service.

MO--Mobile Station: A station in the mobile service intended to be used while in motion or during halts at unspecified points. (RR)

MOB--Radio Beacon Mobile Station: A mobile station the emissions of which are used to determine its location.

MOD--Telecommand Mobile Station: A mobile station in the mobile service the emissions of which are used for terrestrial telecommand.

MOE--Telemetering Mobile Station: A mobile station the emissions of which are used for telemetering.

MOEA--Aeronautical Telemetering Mobile Station: A telemetering mobile station used for transmitting data directly related to the airborne testing of the vehicle, (or major components), on which the station is installed.

MOEC--Surface Telemetering Mobile Station: A telemetering mobile station located on the surface of the Earth and the emissions of which are intended to be received on the surface of the Earth.

MOEB--Flight Telemetering Mobile Station: A telemetering mobile station used for transmitting data from an airborne vehicle, excluding data related to airborne testing of the vehicle itself, (or major components thereof).

MOH--Hydrologic and Meteorological Mobile Station: A mobile station the emissions of which are used for the automatic transmission of either hydrologic or meteorological data, or both.

MOP--Portable Mobile Station: A portable station operating in the mobile service.

MOU--Aeronautical Utility Mobile Station: A mobile station used for communication at airdromes with the aeronautical utility land station, the airdrome control station, the FAA flight service station, ground vehicles, and aircraft on the ground. (All transmissions shall be subject to the control of the airdrome control station and shall be discontinued immediately when so requested by the airdrome control operators.)

MR--Radiolocation Mobile Station: A station in the radiolocation service intended to be used while in motion or during halts at unspecified points. (RR)

MRP--Portable Radiolocation Station: A portable station operating in the radiolocation service.

MS--Ship Station: A mobile station in the maritime mobile service located on board a vessel which is not permanently moored, other than a survival craft station. (RR)

MSD--Telecommand Ship Station: A mobile station in the maritime mobile service the emissions of which are used for terrestrial telecommand.

MSP--Portable Ship Station: A portable station operating in the maritime mobile service.

NL--Maritime Radionavigation Land Station: A land station in the Maritime Radionavigation Service not intended for use while in motion.

NLC--Maritime Radar Beacon (racon) Station: A land station in the maritime radionavigation service which employs a radar beacon (racon).

NLM--Marine Radiobeacon Station: A radiobeacon station in the maritime radionavigation service intended for the benefit of ships.

NR--Radionavigation Mobile Station: A station in the radionavigation service intended to be used while in motion or during halts at unspecified points. (RR)

OD--Oceanographic Data Station: A station in the maritime mobile service located on a ship, buoy or other sensor platform the emissions of which are used for the transmission of oceanographic data.

OE--Oceanographic Data Interrogating Station: A station in the maritime mobile service the emissions of which are used to initiate, modify, or terminate functions of equipment directly associated with an oceanographic data station, including the station itself.

RA--Radio Astronomy Station: A station in the radio astronomy service. (RR) (This is always a receiving station.)

RG--Radio Direction-Finding Station: A radiodetermination station using radio direction-finding. (RR)

RN--Radionavigation Land Station: A station in the radionavigation service not intended to be used in motion. (RR)

RNL--Loran Station: A long distance radionavigation land station transmitting synchronized pulses. Hyperbolic lines of position are determined by the measurement of the difference in the time of arrival of these pulses.

SA--Meteorological Aids Mobile Station: A mobile station in the meteorological aids service intended to be used while in motion or during halts at unspecified points.

SAR--Radiosonde Station: A station in the meteorological aids service employing a radiosonde.

SM--Meteorological Aids Base Station: A land station in the meteorological aids service not intended for use while in motion.

SMB--Radar Beacon Precipitation Gage Station: A transponder station in the meteorological aids service, the emissions of which are used for telemetering.

SMD--Meteorological Radar Station: A station in the meteorological aids service employing radar.

SMRG--Radiosonde Ground Station: A station in the meteorological aids service employing a ground station associated with a radiosonde.

SN--Sounder Network Station: A station equipped with an ionosphere sounder used for the real-time selection of frequencies for operational communi-cation circuits.

SP--Sounder Prediction Station: A station equipped with an ionosphere sounder for real-time monitoring of upper atmosphere phenomena or to obtain data for the prediction of propagation conditions.

SS--Standard Frequency and Time Signal Station: A station in the standard frequency and time signal service. (RR)

TB--Aeronautical Earth Station: An earth station in the fixed-satellite service or in some cases in the aeronautical mobile-satellite service located at a specified fixed point on land to provide a feeder link for the aeronautical mobile-satellite service. (RR)

TC--Fixed-Satellite Earth Station: An earth station in the fixed-satellite service. (RR)

TD--Space Telecommand Earth Station: An earth station the emissions of which are used for space telecommand.

TE--Satellite EPIRB Station: A satellite Emergency Position-Indicating Radio Beacon (EPIRB) in the mobile-satellite service (RR).

TF--Radiodetermination-Satellite Earth Station: A fixed earth station in the radiodetermination-satellite service. (RR)

TG--Ship Earth Station: A mobile earth station in the maritime mobile-satellite service located on board ship. (RR)

TH--Space Research Earth Station: An earth station in the space research service. (RR)

TI--Coast Earth Station: An earth station in the fixed-satellite service or in some cases in the maritime mobile-satellite service located at a specified fixed point on land to provide a feeder link for the maritime mobile-satellite. (RR)

TJ--Aircraft Earth Station: A mobile earth station in the aeronautical mobile-satellite service located on board an aircraft. (RR)

TK--Space Tracking Earth Station: An earth station which transmits or receives emissions used for space tracking.

TL--Radiodetermination-Satellite Mobile Earth Station: A mobile earth station in the radiodetermination-satellite service. (RR)

TM--Meteorological-Satellite Earth Station: An earth station in the meteorological-satellite service. (RR)

TN--Radionavigation-Satellite Fixed Earth Station: A fixed earth station in the radionavigation-satellite service. (RR)

TO--Aeronautical Radionavigation-Satellite Mobile Earth Station: A mobile earth station in the aeronautical radionavigation-satellite service. (RR)

TP--Earth Station (receiving): An earth station used for receiving. (RR) (TP is not used on applications.)

TQ--Maritime Radionavigation-Satellite Mobile Earth Station: A mobile earth station in the maritime radionavigation-satellite service. (RR)

TR--Space Telemetering Earth Station: An earth station which receives emissions used for space telemetering.

TT--Space Operation Earth Station: An earth station in the space operation service. (RR)

TU--Land Mobile Earth Station: A mobile earth station in the land mobile-satellite service capable of surface movement within the geographical limits of a country or continent. (RR)

TW--Earth Exploration-Satellite Earth Station: An earth station in the Earth exploration-satellite service. (RR)

TX--Maritime Radionavigation-Satellite Earth Station: A fixed earth station in the maritime radionavigation-satellite service. (RR)

TY-- Base Earth Station: An earth station in the fixed-satellite service or in some cases in the land mobile-satellite service located at a specified fixed point or within a specified area on land to provide a feeder link for the land mobile-satellite service. (RR)

TZ--Aeronautical Radionavigation-Satellite Earth Station: A fixed earth station in the aeronautical radionavigation-satellite service. (RR)

UA--Mobile Earth Station: An earth station in the mobile-satellite service intended to be used while in motion or during halts at unspecified points. (RR)

UM--Radionavigation-Satellite Mobile Earth Station: A mobile earth station in the radionavigation-satellite service. (RR)

VA--Land Earth Station: An earth station in the fixed-satellite service or, in some cases, in the mobile-satellite service, located at a specified fixed point or within a specified area on land to provide a feeder link for the mobile-satellite service. (RR)

XC--Experimental Contract Developmental Station: An experimental station used for the evaluation or testing under federal government contract of electronics equipment or systems in a design or development stage.

XD--Experimental Developmental Station: An experimental station used for evaluation or testing of electronics equipment or systems in a design or development stage.

XE--Experimental Export Station: An experimental station intended for export and used for the evaluation or testing of electronics equipment or systems in the design or development stage.

XM--Experimental Composite Station: An experimental station used in experimental operations of a complex nature not readily specified or used in an operation which is a composite of two or more of the established experimental categories.

XR--Experimental Research Station: An experimental station used in basic studies concerning scientific investigation looking toward the improvement of the art of radiocommunications.

XT--Experimental Testing Station: An experimental station used for the evaluation or testing of electronics equipment or systems, including site selection and transmission path surveys, which have been developed for operational use.

6.1.4 Table of Services, Station Classes, and Stations

Table A is used to determine the proper Station Class (STC) symbol (see Section 9.8.2, paragraph 15a through 15c) to be used versus the Service in which the transmitting station will operate. Frequency bands are allocated to Service(s) based upon the National Table of Frequency Allocations (see Section 4.1.3).

TABLE A. Table of Services, Station Classes, and Stations

Service	Station Class	Station
1. Amateur	None	Amateur
2. Broadcasting	BC BT	Broadcasting (sound) Broadcasting (television)
3. Broadcasting-Satellite	EB EV	Space (sound) Space (television)
4. Earth Exploration-Satellite	EW TW	Space Earth
Meteorological-Satellite	EM TM	Space Earth
5. Fixed	FX FXD FXE FXH	Fixed Telecommand Fixed Telemetering Fixed Hydrologic and Meteorological Fixed
Aeronautical Fixed	AX	Aeronautical Fixed
6. Fixed-Satellite	EC TC VA TB TI TY	Space Earth Land Earth Earth Coast Earth Base Earth
7. Inter-Satellite	ES	Space
8. Meteorological Aids	SA SAR SM SMB SMD SMRG	Meteorological Aids Mobile Station Radiosonde Meteorological Aids Base Station Radar Beacon Precipitation Gage Meteorological Radar Radiosonde Ground
9. Mobile	FL FLD FLE FLEA FLEB FLEC FLH FLU MO MOB MOD MOE MOEA MOEB MOEC MOH MOP MOU	Land Telecommand Land Telemetering Land Aeronautical Telemetering Land Flight Telemetering Land Surface Telemetering Land Hydrologic and Meteorological Land Aeronautical Utility Land Mobile Radio Beacon Mobile Telecommand Mobile Telemetering Mobile Aeronautical Telemetering Mobile Flight Telemetering Mobile Surface Telemetering Mobile Hydrologic and Meteorological Mobile Portable Mobile Aeronautical Utility Mobile

Aeronautical Mobile	FA FAB FAC FAD FAT MA MAD MAP	Aeronautical Aeronautical Broadcast Airdrome Control Telecommand Aeronautical Flight Test Aircraft Telecommand Aircraft Portable Aircraft
Aeronautical Mobile (OR)	FG	Aeronautical
Aeronautical Mobile (R)	FD	Aeronautical
Land Mobile	FB FBD ML MLD MLP	Base Telecommand Base Land Mobile Telecommand Land Mobile Portable Land Mobile
Maritime Mobile	FC FCB FCD MS MSD MSP OD OE	Coast Marine Broadcast Telecommand Coast Ship/Telecommand Ship Portable Ship Oceanographic Data Oceanographic Data Interrogating
10. Mobile-Satellite	UA TE EI VA	Mobile Earth Satellite EPIRB Space Land Earth
Aeronautical Mobile-Satellite	EJ TB TJ	Space Earth Aircraft Earth
Land Mobile-Satellite	EU TU TY	Space Land Mobile Earth Base Earth
Maritime Mobile-Satellite	EG TG TI	Space Ship Earth Coast Earth
11. Radio Astronomy	RA	Radio Astronomy
12. Radiodetermination	None RG	Radiodetermination Radio Direction-Finding
Radiolocation	LR MR MRP	Land Mobile Portable
Radionavigation	NR RNL RN	Mobile LORAN Land
Aeronautical Radionavigation	AL ALA ALB ALC ALG ALL ALO ALR ALS ALTM ALTO AM AMA	Land Marker Beacon Radio Beacon Radar Beacon (Racon) Glide Path (Slope) Localizer Omnidirectional Range Radio Range Surveillance Radar Land Test (Maintenance) Land Test (Operational) Mobile Altimeter

Maritime Radionavigation	NL NLC NLM	Land Radar Beacon (Racon) Marine Radio Beacon
13. Radiodetermination-Satellite	EF TF TL	Space Earth Mobile Earth
Radionavigation-Satellite	EN TN UM	Space Fixed Earth Mobile Earth
Aeronautical Radionavigation-Satellite	EO TO TZ	Space Mobile Earth Earth
Maritime Radionavigation-Satellite	EQ TQ TX	Space Mobile Earth Earth
14. Space Operation	ET TT	Space Earth
15. Space Research	EH TH	Space Earth
16. Standard Frequency and Time Signal	SS	Standard Frequency and Time Signal
17. Standard Frequency and Time Signal-Satellite	EE	Space
18. No Specific Service	DGP ED EK ER SN SP TD TK TR XC XD XE XM XR XT	Differential-Global-Positioning-System Space Telecommand Space Space Tracking Space Space Telemetering Space Sounder Network Sounder Prediction Space Telecommand Earth Space Tracking Earth Space Telemetering Earth Experimental Contract Developmental Experimental Developmental Experimental Export Experimental Composite Experimental Research Experimental Testing

6.2 FREQUENCY NOMENCLATURE

The terms "allocation," "allotment," and "assignment" are used to describe the distribution of frequencies or bands of frequencies. Allocations are made to radio services, for example, the fixed service, the aeronautical mobile service, and the space research service. Allotments are made to areas or countries and, within the Federal, to specific uses. Assignments are instruments of authorization of discrete frequencies to specific radio stations.

In the application of the provisions of this Manual, letters or numbers shall not be used to designate specific bands of frequencies, e.g., S-band, X-band, Ku-band. Such designations create confusion, because the band limits vary from one designator system or user group to another. This can be avoided by using the international system of citing in Hertz the actual numerical limits of specific frequency bands. Further, broader portions of the spectrum can be described by the following internationally adopted terms:

Frequency Subdivision	**Frequency Range**
VLF (very low)	3 kHz to 30 kHz
LF (low)	30 kHz to 300 kHz
MF (medium)	300 kHz to 3000 kHz
HF (high)	3 MHz to 30 MHz
VHF (very high)	30 MHz to 300 MHz
UHF (ultra high)	300 MHz to 3000 MHz
SHF (super high)	3 GHz to 30 GHz
EHF (extremely high)	30 GHz to 300 GHz
	300 GHz to 3000 GHz

Hz = hertz = cycles per second
K = kilo (10^3)
M = Mega (10^6)
G = giga (10^9)
T = tera (10^{12})

6.3 EMISSION DESIGNATORS

Emissions are designated according to their classification and their necessary bandwidth.

6.3.1 Classification of Emissions

Emissions are classified according to the type of modulation of the main carrier, the nature of signal(s) modulating the main carrier, and the type of information to be transmitted (see paragraph 16, Section 9.8.2 of this Manual). For a more complete description of an emission, two optional characteristics can be added; these are the details of signal(s) and the nature of multiplexing.

6.3.2 Necessary Bandwidth

1. Whenever the full designation of an emission is necessary, the symbol for that emission shall be preceded by a number indicating the necessary bandwidth of the emission.

2. See Annex J for methods used to determine necessary bandwidth and the relationship between occupied and necessary bandwidth. The value so determined shall be used when the full designation of an emission is required. However, the necessary bandwidth so determined is not the only characteristic of an emission to be considered in evaluating the interference that may be caused by that emission.

6.4 CLASSES OF EXPERIMENTAL STATIONS

Experiments, experimental operations and experimental activities as used herein refer to the utilization of radio waves in experiments with a view to the development of the science or technique of radio communication.

The classes of experimental stations included in Section 6.1.3 were adopted to allow more precise classification of experimental operations and to provide the means of identifying stations used in support of experimental activities. Two classes normally used by non-Federal services (XC and XE) are included for completeness. The broad class EX has been included for its parent definition, but it is not used in making frequency assignments. However, an experimental composite station (XM) has been included. It is the appropriate class for the composite or not-elsewhere-classified type of operation and is used only in those instances where the other classes are not applicable. When it is used, an explanation of the experimental operation must be included on the frequency application under Supplementary Details.

An experimental developmental station (XD) may be used for radiation measurements of a transmitter which is a prototype not yet in production or to determine radiation patterns of new antenna design.

While the classes included in section 6.1.3 provide a rather precise description of experimental stations, appropriate S-notes and informative remarks can be shown on frequency applications to further describe the intent or special nature of the proposed experimental operation.

Experimental classes of stations shall be on a secondary basis to stations of all other services and shall be authorized only by a temporary assignment; however, a space project assignment may be used to authorize a) an experimental station to be operated in the manner of a station in the space service, and b) an experimental station to be used for the static test (prelaunch ground-to-ground checkout) of space communication equipment.

6.5 CALL SIGNS

6.5.1 International Provisions

The international provisions concerning the identification of transmissions of radio stations are contained in Article **19** of the ITU Radio Regulations, 2001.

6.5.2 Use of Call Signs

While Federal agencies, users of radio, are required to comply with the aforementioned ITU Radio Regulations, the following procedure is the recommended practice where applicable in the conduct of operations in the types of services indicated:

Fixed and Land

Each station shall transmit its assigned call sign on each frequency in use at the beginning and end of operation, and at least once an hour. More frequent identification may be made if delay to traffic will not result.

Radiotelephony transmissions shall be identified by speaking the words "THIS IS" followed by the letters or alpha-numeric combination of the call sign; or by means of an automatic identifier transmitting in International Morse Code in the prosign, "DE" followed by the call sign. When an automatic identifier is used, it will be programmed to identify the station once every 30 minutes.

Radiotelegraphy transmissions shall be identified by sending in international morse code the prosign "DE" followed by the call sign.

Radioteletype transmissions shall be identified by transmitting the prosign "DE" followed by the call sign, in teletype characters.

Facsimile transmissions shall be identified by any one of the preceding methods after removing the facsimile signal. Pictures need not be interrupted to comply with the hourly identification.

Twin-channel single sideband circuits employing telephony on one or both channels shall be identified through the use of radiotelephony identification procedures on either channel.

Circuits employing single or multiple tone modulation shall be identified through the use of tone modulated telegraphy on at least one channel employing the procedure described under radiotelegraphy transmissions.

Mobile

A mobile station associated with a base station which transmits only on the transmitting frequency of the associated base station is not required to transmit any identification.

A mobile station which transmits on any frequency other than the transmitting frequency of the associated base station, or which has no associated base station, shall transmit the required identification at the end of each transmission or exchange of transmission or once each hour of the operating period.

Identification procedures shall be those set forth for the fixed service. A mobile station in the maritime mobile service is subject to the applicable provisions of the ITU Radio Regulations and all other international agreements in force to which the United States is a party.

Automatic Morse Equipment

Automatically activated equipment may be used to identify radiotelephone stations by the International Morse Code providing the following conditions are met:

(1) The signal output of the automatic identification equipment shall be connected to the transmitter at the microphone input or any other manufacturer provided signal input terminal and shall be adjusted to produce 40% + 10% of the maximum permissible modulation/deviation level. This adjustment shall be performed when all other modulating signals are absent.

(2) The Morse Code transmission rate shall be maintained between 20 and 25 words per minute.

(3) The frequency of the keyed tone comprising the identification signal shall be 1200 Hz + 800 Hz.

Miscellaneous

Stations which are entirely automatic in their operation such as telemetering, hydrological and weather reporting, and aeronautical instrumentation, are exempt from these requirements.

Stations employing complex systems which require special terminal equipment for normal reception of traffic will, so far as practicable, identify at least hourly.

6.5.3 Obtaining Call Signs

Section 305(c) of the Communications Act of 1934, as amended, provides that, "All stations owned and operated by the United States, except mobile stations of the Army of the United States, and all other stations on land and sea, shall have special call letters designated by the Commission."

Call signs to be used for the identification of transmissions of radio stations may be obtained by communicating with the Secretary, Federal Communications Commission, Washington, D.C. 20554.

6.6 MARITIME SERVICE IDENTITIES

Under the ITU Radio Regulations (RR 19.30), ship stations and ship earth stations to which the provisions of Chapter IX apply, and coast stations or coast earth stations, or other non-shipborne stations capable of communicating with such ship stations, shall have assigned to them maritime mobile service identities, as the need arises. Maritime mobile service identities are formed of a series of nine digits as described in Annexes 1 to 5 of Recommendation ITU-R M.585-4. The maritime identification digits (MID) are an integral part of the maritime mobile service identity and denote the administration responsible for the station so identified. Administrations shall follow Annexes 1 to 5 of Recommendation ITU-R M.585-4 concerning the assignment and use of maritime mobile service identities. In the United States the Federal Communications Commission is the responsible agency for the assignment of maritime mobile service identities. Maritime mobile service identities are used as unique addresses for maritime automatic identification systems (AIS) and digital selective calling and, in some cases, maritime mobile satellite services.

Agencies using maritime mobile service identities shall maintain an up-to-date registration of identities used and periodically provide that information electronically to the U.S. Coast Guard Operations Systems Center, 408 Coast Guard Drive, Kearneyville, WV 25430. Agencies may arrange with the Coast Guard which data elements will be provided.

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CHAPTER 7

Authorized Frequency Usage

7.1 GENERAL

Within the jurisdiction of the United States Government, use of the radio frequency spectrum for radio transmissions for telecommunications or for other purposes shall be made by United States Government stations only as authorized by the Assistant Secretary.

The frequency assignments mentioned in Part 7.2 result from the submission of applications by federal agencies (see Chapter 9). The other parts of this chapter contain authority for the use of certain frequencies under specified conditions, and the submission of applications therefore is not required. The use of any such equipment is also subject to any policy or guidance by their user agency.

7.1.1 LASERS AND OTHER SYSTEMS THAT OPERATE ABOVE 3000 GHz

No authorization is required for the use of frequencies above 3000 GHz. As a matter of information, agencies may inform the IRAC of such usage, but no record of it shall be kept in the Government Master File (GMF), the list of Frequency Assignments to Government Radio Stations.

NTIA has the authority under the Communications Act of 1934, as amended, to license stations that operate above 3000 GHz, including lasers, but at this time does not choose to do so.

7.2 USE OF FREQUENCIES CONTAINED IN THE LIST OF FREQUENCY ASSIGNMENTS TO FEDERAL GOVERNMENT RADIO STATIONS

The frequency assignments contained in the Government Master File (GMF) may be used by Federal agencies in accordance with the particulars of those assignments.

The complete listing of Federal Government frequency assignments, the GMF is also an important tool for spectrum management activities. Accordingly, data requirements for the particulars of frequency assignments in the GMF may be revised, updated, and expanded as needed to meet changing spectrum management requirements.

7.3 USE OF FREQUENCIES FOR NATIONAL SECURITY AND EMERGENCY PREPAREDNESS (NS/EP)

7.3.1 Overview

Whenever possible, normal policies and procedures governing Federal spectrum management contained elsewhere in this Manual should be followed. The procedures contained in this section relate to any emergency occasion, instance, or situation which requires a Federal response not covered by normal spectrum management policies and procedures. Specific NTIA policies for spectrum use and management in support of a response to emergency situations include:

- Continuing, insofar as possible, use of existing frequency assignments;
- Continuing to coordinate frequency assignments through Headquarters NTIA;
- Emphasizing the need to preplan the use and management of radio spectrum before emergencies arise;
- Ensuring that all agency communications are electromagnetically compatible with other users to reduce the possibility of interference;
- Providing for Federal, military, and civil, spectrum needs determined by a competent authority;

- Assuring use of the radio spectrum conforms to national priorities established by the Director of the Office of Science and Technology Policy (OSTP) as stated in the NTIA *Emergency Readiness Plan for the Use of the Radio Frequency Spectrum* (ERP), or by other competent authority;
- Providing, with minimal disruption to other services, radio spectrum resources as necessary to satisfy Federal emergency response requirements; and
- Recommending adjustments to spectrum use when situations require.

7.3.2 Spectrum Management in Support of the National Response Framework (Non-Wartime)

1. In the case of an emergency where FEMA activates procedures in accordance with the National Response Framework (NRF), NTIA will continue to perform its frequency management functions at its Headquarters, whether using its home office in Washington, DC or its Continuity of Operations (COOP) sites. Thus, processing of all frequency assignment requests continues to follow current published procedures. NTIA may also deploy spectrum managers to the emergency area as necessary to perform a liaison representing NTIA.

2. In the event of Department of Defense (DoD) involvement, the Defense Coordinating Officer (DCO) or Joint Task Force, will establish a Joint Spectrum Management Element (JSME) in accordance with Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3320.01B and other applicable procedures and guidelines. The JSME spectrum manager serves as the single point of contact for joint or single service task forces temporary or permanent spectrum requirements. The JSME forwards requirements through the appropriate military channels. In all instances, spectrum coordination will not be completed until the NTIA Office of Spectrum Management (OSM) Frequency Assignment Branch validates the spectrum use and authorizes a frequency assignment.

3. The deployed NTIA spectrum manager will assist agencies, as necessary, in forwarding requests to their appropriate agency headquarters or, if necessary, to NTIA for assignment action. All frequency requests must be processed through Headquarters NTIA.

7.3.3 Deployment of Spectrum Dependent Systems

1. For systems with US, USA, USP, Statewide and other similar area assignments in the GMF that have no specific coordinates, agencies shall notify NTIA that the agency intends to use the assignment in the affected emergency area. This includes all spectrum-dependent systems being deployed into the emergency area, or any existing area assignment within the emergency area that requires additional frequency authorizations.

2. Agencies should coordinate planned deployment of any emitters prior to entry into the emergency area. Upon entry into the emergency area, users will coordinate with their agency's spectrum management personnel, including any deployed personnel supporting the NRF. Any requests for frequency authorizations are to be forwarded to Headquarters NTIA for approval. Except as covered by 7.3.4, agencies shall, prior to operation, coordinate and receive approval by NTIA for all radio use intended for operation in the emergency area. Should an existing/incumbent system in the affected area no longer be operational, NTIA may authorize reuse of assigned frequencies or frequency allotments to support new operations. The reuse of these assigned frequencies or frequency allotments will be coordinated for use on a temporary basis or until such time as the original user is prepared to re-establish operations under the parameters of the original authorization. Should the emergency area fall within the area of responsibility of a DOD Area Frequency Coordinator (AFC) and requirements include spectrum covered under Section 8.3.26, the user will coordinate with the DCO prior to requesting authorization through NTIA.

7.3.4 Emergency Communications for which an Immediate Danger Exists to Human Life or Property

1. In situations where immediate danger exists to human life or property, an agency may operate temporarily on any regularly assigned frequency in a manner other than that specified in the terms of an existing assignment. Emergency operations under such situations should continue only as long as necessary to ensure that the danger to human life or property no longer exists. Emergency operations under these circumstances shall be reevaluated on a regular basis until such time as normal/routine operations can be reestablished.

2. Interoperable communications for disaster/emergency response involving Federal, State, local, and tribal entities shall be in conformance with Section 4.3.16 of this Manual. Additional information regarding interoperable communications can also be found in the National Interoperability Field Operations Guide (NIFOG) and the National Interoperability Frequency Guide (NIFG) promulgated by the Department of Homeland Security.

7.3.5 National Security and War Emergency Communications

1. Upon proclamation by the President of war, threat of war, state of public peril or disaster or other national emergency, or in order to preserve the neutrality of the United States, the President may exercise war emergency powers pursuant to 47 U.S.C. § 606. The Director, Office of Science and Technology Policy (OSTP) will execute these powers under 47 C.F.R. § 214.6. Under 47 C.F.R. § 202.1 (f), and subject to the overriding control of the Director, Office of Science and Technology Policy (OSTP) under the President's war emergency powers, NTIA will continue to authorize and assign radio frequencies until otherwise directed.

2. The Director, OSTP bears overall responsibility for the development and approval of radio spectrum priorities supporting the NS/EP telecommunications functions of the Federal government. 47 C.F.R. § 202.3 (c)(2) & (e)(1)(i). The OSTP Memorandum for the Secretary of Commerce, National Security Emergency Preparedness Priority System for Government-Owned/Leased Spectrum-Dependent Telecommunications Systems (May 19, 1989) designated NTIA to develop this system of priorities. NTIA has accordingly developed the Telecommunication Service Priorities for Radio (TSP-R). The ERP contains procedures for agencies to designate the appropriate TSP-R for their spectrum-dependent systems.

3. The ERP contains further guidance on spectrum use during these emergencies. NTIA prepares, maintains and disseminates the ERP, and ensures that it accurately reflects the projected NS/EP spectrum usage and priority requirements of Federal departments and agencies.

7.3.6 Emergency Use of Non-Federal Frequencies

In emergency situations, a Federal radio station may utilize any frequency authorized to a non-Federal radio station, under Part 90 of the FCC Rules and Regulations, when such use is necessary for communications with the authorized non-Federal stations and is directly related to the emergency at hand. Such use is subject to the following conditions:

- The non-Federal licensee has given verbal or written concurrence;
- Operations are conducted in accordance with the FCC Rules and Regulations;
- Use is restricted to the service area and station authorization of the licensee;
- All operations are under the direct control of the licensee and shall be immediately terminated when directed by the licensee;
- Operations do not exceed 60 days; and,

- The Federal agency shall provide, through the agency's FAS representative to the FCC as soon as practicable, a written report of each such use.

7.3.7 Status Reporting Procedures

Based on circumstances of a specific event, NTIA will direct the IRAC agencies to report information relative to spectrum-dependent systems within a disaster/emergency area. Non-member agencies will report through their point of contact in the OSM Frequency Assignment Branch. IRAC members and non-member agencies will keep NTIA informed regarding any changes to that status throughout the response/recovery period so that the appropriate adjustments can be made to the national-level databases.

7.3.8 Coordination and Use of Emergency Networks

1. FEMA National Emergency Coordination Net (NECN): After coordination with the FEMA program manager for FEMA National Radio System (FNARS), Federal high frequency (HF) radio stations are authorized to communicate with stations operating on the NECN when necessary for coordination in relation to NS/EP response efforts including tests and exercises. NECN provides pre-designated and ad hoc frequencies to support NS/EP response efforts. These frequencies are a virtual "meeting place" where responders from different agencies can make contact to coordinate their activities, exchange operational information, and receive support (such as relay, phone patch, information lookup, and third-party message handling) from the FEMA radio operators or other stations on the net.

a. The NECN provides the following:

(1) Communications support to Federal agencies that need to contact FEMA during NS/EP response efforts;

(2) Interoperability communications support between Federal agencies and State emergency operations centers via the FEMA HF radios installed there during NS/EP response efforts;

(3) High-power HF stations with emergency generator backup power, staffed by Federal or State employees; and,

(4) Capability for secure voice and data communications (These communications are exercised quarterly).

b. The NECN maintains a watch for expected traffic from stations directly involved in an emergency response or those stations communicating with stations directly involved in an emergency response.

c. Agencies should contact the FEMA FNARS program manager to arrange for access to the NECN:

FNARS Program Manager
DHS/FEMA MWEOC
19844 Blue Ridge Mountain Road
Mount Weather, VA 20135
Telephone: 540-542-2249

2. National Communications System (NCS) Shared Resources (SHARES) High Frequency Radio Program: As an additional means of HF communications, Federal agencies may use the Shared Resources (SHARES) HF Radio Program as a means of passing message traffic when their own networks are not available. The NCS through the IRAC established the NCS SHARES HF Radio Program, which is intended to facilitate the handling of emergency message traffic through the use of existing agency HF radio systems. Because systems operated within SHARES are used primarily to support agency missions, the acceptance of SHARES message traffic is at the discretion of the agency. Each agency determines if emergency message traffic can be handled, and if it can, the best means of delivery, given the agency's requirements.

a. Participation in SHARES requires common understanding and acceptance of procedures. The NCS promulgates a SHARES manual and a directory, based on the submissions of participating agencies. These publications are distributed by NCS to participating SHARES stations. Agencies are encouraged to include SHARES operational procedures in their emergency plans.

b. Agencies providing frequencies for the NCS SHARES HF Radio Program must have a US&P assignment in the GMF, with Record Notes S296 and S381. Additionally, the Circuit Remarks field must contain *NTS,M002, IRAC 24902 which defines the NCS SHARES concept of operation. Operations under these assignments are limited to SHARES operations and tests. Participating agencies in the NCS SHARES HF Radio Program are authorized to test the operating system periodically provided the respective agency FAS Representatives are notified at least 30 days in advance.

3. *Use of 5167.5 kHz in the State of Alaska*: U.S. Government stations may use the frequency 5168.9 kHz (carrier reference frequency 5167.5 kHz) with maximum power of 150 watts Peak Envelope Power (PEP) for emergency communications in the State of Alaska. Airborne stations are not authorized to use this frequency. Stations operating on this frequency shall be located within the State of Alaska or within 92 kilometers of its boundaries.

4. *Federal Communications with Radio Amateur Civil Emergency Service Stations*: Federal radio stations are authorized to communicate with stations in the Radio Amateur Civil Emergency Service (RACES) in accordance with FCC rules covered in 47 C.F.R. § 97.407.

7.4 USE OF FREQUENCIES BY FIXED AND LAND STATIONS

When it is indispensable to do so, and on the condition that the characteristics of the stations continue to conform to those in the GMF, a fixed station may, on a secondary basis, transmit on its assigned frequencies to mobile stations, and a land station may, on a secondary basis, transmit on its assigned frequencies to fixed stations or other land stations in the same category.

7.5 USE OF FREQUENCIES BY MOBILE STATIONS

7.5.1 Frequencies Assigned to Federal Stations in the Mobile Service and Mobile Earth Stations

A mobile station may transmit on a frequency assigned to a Federal station in the mobile service a) when directed to do so by the latter for the specific purpose of communicating with the station issuing the directive or with other stations in the same net or b) by directive from the agency operating the stations to which the frequency is assigned.

7.5.2 Frequencies Authorized by the FCC for Ship Stations

Frequencies authorized by the Federal Communications Commission for ship stations may be used by Federal mobile stations to communicate with non- Federal stations in the maritime mobile service.

7.5.3 Frequencies for the Safety of Life and Property

1. Aircraft, ship, survival craft and mobile earth stations may use the following frequencies provided such use is in accordance with the ITU Radio Regulations and Appendices as indicated:

500 kHz	Nos. **5.82**, Ap. **13** Part A2, Section I, A, ' 1
*2182 kHz	Nos. **5.108**, Ap. **13** Part A2, Section I,B, ' 2, Ap. 15
*3023 kHz	Ap. **15**, Ap. **13** Part A2, Section I, D, '3, Ap. **13** Part A2, Section I, F, '5, Ap. **15**, Ap. **27**, also see Section 8.2.24 of this Manual
*4125 kHz	Ap. **15**, Ap. **13** Part A2, Section I, E, ' 4, 1 and 2
*5680 kHz	See 3023 kHz above
*6215 kHz	Ap. **13** Part A2, Section I, G, ' 6, Ap. **15**
8364 kHz	Ap. **13** Part A2, Section I, H, ' 7
121.5 MHz	Nos.**5.200**, Ap. **13** Part A2, Section I, I, ' 8, 1A and 1B, Ap. **15**
123.1 MHz	Nos.**5.200**, Ap. **13** Part A2, Section I, I, ' 8, 1B and 2, Ap. **15**
156.3 MHz	Ap. **13** Part A2, Section I, J, '9, Ap. **15**
156.8 MHz	Nos.**5.226**, Ap **13** Part A2, Section I, L, ' 10, 1 and 3, Ap. **15**
243 MHz	Nos.**5.256**, Ap. **13** Part A5, Section I, '1, b
406-406.1 MHz	Nos.**5.266**, Ap. **13** Part A2, Section I, N, '10B, Ap. **15**
1645.5-1646.5 MHz	Nos.**5.375**, Ap. **13** Part A2, Section I, P, '10D, Ap. **15**

* Carrier frequencies

2. Mobile stations in the maritime mobile service, and mobile earth stations, may also use the following frequencies provided such use is in accordance with the provisions of ITU Radio Regulation No. 30.4 and Appendix **15**.

3. Ship stations may use the frequencies 156.650 and 156.375 MHz for ship-to-ship and ship-to-shore communications related to the safety of navigation in accordance with the Vessel Bridge-to-Bridge Radiotelephone Act (Public Law 92-63). (See ITU Radio Regulation Ap. **13** Part A2, Section I, K, § 9B, Ap. **15**, and Section 8.2.29 of this Manual.)

4. Emergency Position Indicating Radiobeacons (EPIRB) operating on the frequencies 156.75 and 156.8 MHz may be used aboard U.S. Government vessels that operate within 32 kilometers of shore and in the Great Lakes.

5. The frequency 40.5 MHz is designated as the military joint common frequency. Use of this channel is limited to communications necessary to establish contact when other channel information is not available and for emergency communications. This frequency also may be used for search and rescue communications.

6. The provisions of this Manual do not prevent mobile stations, or mobile earth stations, in distress from using any frequency at its disposal to attract attention, make known its position, and obtain help. (See ITU Radio Regulation Ap. **13** Part A1, § 6,1.)

7. To enhance protection of life and property, it is mandatory that each Emergency Position Indicating Radiobeacon (EPIRB), Emergency Locating Transmitter (ELT) or Personal Locator Beacon (PLB) operating on 406.025 MHz be registered with NOAA. Agencies shall advised NOAA in writing of any change in registration information. Initial registration forms are provided by the equipment manufacturer. NOAA will provide registrants with confirmation of registration and change of registration postcards. NOAA's address is: NOAA/NESDIS, SARSAT Operations Division, E/SP3, Federal Building #4, Room 0158, Washington, DC 20233. As an alternative, agencies may make special arrangements for the registration of these devices directly with the NOAA/NESDIS SARSAT Operations Division.

7.5.4 Frequencies for Coordinating Search and Rescue Operations

1. The carrier frequencies 3023 and 5680 kHz (Ap. **15**, Ap. **13** Part A2, Section I, D, § 3, Ap. 13 Part A2, Section I, F, § 5, and Part II, Appendix **27**) may be used by mobile stations for intercommunication between mobile stations engaged in coordinated search and rescue operations, including communication between the mobile stations and participating land stations, provided such use is in accordance with the provisions of Ap. **13** Part A2, Section I, D, § 3, Ap. **15**, Ap. **13** Part A2, Section I, F, § 5, and Ap. **15** of the ITU Radio Regulations and Appendix 27. Federal mobile stations shall use J3E emission, upper sideband only, when all stations participating in a search and rescue operation are capable of using that emission. Emissions A1A, A3E or H3E may also be used if necessary.

2. The frequency 123.1 MHz, using class A3E emission, may be used by stations of the aeronautical mobile service and by other mobile and land stations engaged in coordinated search and rescue operations.

3. The frequency 156.3 MHz may be used for communications between ship stations and aircraft stations, using G3E emission, engaged in coordinated search and rescue (SAR) operations. When control of the scene of a SAR incident is under a Coast Guard coast station, 156.3 MHz may be used by ship stations to communicate with that coast station.

7.5.5 Coast Station Frequencies

A mobile station may transmit on the same frequency as the coast station with which it is communicating, provided that a) the emission satisfies the frequency tolerance applicable to the coast station, b) the coast station requests the transmission, and c) no harmful interference is caused to other stations.

7.5.6 Frequencies for Marine Environmental Protection Operations

The frequency 157.075 MHz, 16K0F3E emission, may be used by mobile stations, and for portable-type operations, for communications required to coordinate marine environmental protection operations, e.g., communications pursuant to the Joint Canada-United States Marine Contingency Plan for Spills of Oil and Other Noxious Substances. All use of this frequency under this authority shall be in accordance with plans formulated by competent environment-protection authorities and shall be under the operational control of the designated on-scene commander/coordinator or deputy on-scene commander/coordinator.

7.5.7 Ship Station Frequencies in the Bands 4000-4063 and 8100-8195 kHz

Ship stations may transmit (emission: 2K80J3E), with power not exceeding 1.5 kW PEP, on frequencies designated for radiotelephony in the channeling plans of Section 4.3.13 for intership and ship-shore radiotelephony communications, provided no harmful interference is caused to other authorized users.

7.5.8 Federal Government Use of the Family Radio Service (FRS)

Federal government entities are authorized to purchase and operate radios certified by the FCC in the Family Radio Service (FRS), pursuant to Part 95 Subpart B of the FCC Rules and Regulations (Title 47, Code of Federal Regulations). Federal users will be accorded the same privileges as non-federal users. Because FRS users must share each channel and no user is assured protection from interference caused by another authorized user, federal entities may not purchase and operate FRS radios for planned communications operations that safeguard human life or property.

7.5.9 Federal Use of Medical Telemetry Devices in Certain Bands

Federal agencies may, without further authority from the Assistant Secretary, purchase and operate devices certified by the FCC in the Medical Device Radiocommunication Service (MedRadio), pursuant to 47 CFR Part 95 Subpart I. MedRadio is allocated in the 401-406 MHz band under footnote US345 on the condition that harmful interference is not caused to stations in the meteorological aids, meteorological-satellite, and Earth exploration-satellite services, and that MedRadio stations accept interference from stations in the meteorological aids, meteorological-satellite, and Earth exploration-satellite services. Subject to the foregoing, federal users have the same rights and obligations as non-federal users.

Federal agencies may, without further authority from the Assistant Secretary, purchase and operate devices certified by the FCC in the Wireless Medical Telemetry Service (WMTS), pursuant to 47 CFR Part 95 Subpart H. WMTS is allocated in the 608-614 MHz, 1395-1400 MHz, and 1427-1429.5 MHz bands. Subject to the foregoing, federal users have the same rights and obligations as non-federal users, e.g., 47 CFR 95.1111 which requires registration of all devices with a designated frequency coordinator.

7.6 USE OF FREQUENCIES BY AIRCRAFT STATIONS

Aircraft stations of any Federal agency may use any aeronautical mobile (R) band frequency below 30 MHz for communication only with aeronautical stations regularly serving the routes or areas to which those frequencies are specifically allotted by international agreement. Further, any high frequency authorized by the Federal Communications Commission for aircraft stations may be employed by aircraft stations of any Federal agency when communicating for safety purposes with aeronautical stations to which such frequencies are assigned, after arrangements have been made with the licensee of the non-Federal aeronautical stations for this use.

Since military aircraft will use UHF in lieu of VHF to the maximum extent practicable, aircraft stations of any Federal agency may use any frequency in the bands 117.975-123.0875, 123.5875-128.8125, and 132.0125-137.000 MHz for air traffic control, ground control, aeronautical advisory, aeronautical multicom, and flight service communication, as appropriate, only with aeronautical stations regularly serving the routes or areas to which those frequencies are authorized specifically. All operations by Federal aircraft stations under the provisions of this paragraph shall be restricted to the purpose for which the particular frequency is allotted and authorized to the Federal or non-Federal aeronautical station.

All operations by Federal aircraft stations under the provisions of the two preceding paragraphs shall comply with the appropriate provisions of Part 87 of the FCC Rules. Such provisions include, but are not limited to, those pertaining to power, type of emission, scope of service, permissible communications, and frequencies available, noting that the FCC does not issue type acceptance for equipment used aboard Federal-owned and operated aircraft.

The frequency 122.925 MHz may be used with 6K00A3E emission by aircraft when coordinating natural resources programs of Federal or State natural resources agencies, including forestry management and fire suppression, fish and game management and protection, and environmental monitoring and protection.

Radionavigation mobile stations aboard aircraft of any Federal agency may utilize frequencies in the 1025-1150 MHz band to operate with directly associated ground-based facilities in TACAN/DME and ATCRB systems, and frequencies in the 4200-4400 MHz band to operate radio altimeters.

7.7 USE OF FREQUENCIES BY MANNED SPACECRAFT

Stations aboard manned spacecraft may use the emergency, distress, survival craft, and search and rescue frequencies (2182 kHz, 3023 kHz, 5680 kHz, 8364 kHz, 121.5 MHz, 156.8 MHz and 243 MHz) of the aeronautical mobile and maritime mobile services for these purposes under the same rules and restrictions applicable to those services.

7.8 PURCHASE AND USE OF NON-LICENSED DEVICES

Federal Government agencies may, without further authority from the Assistant Secretary, purchase "off-the-shelf" non-licensed devices that conform to the applicable edition of Part 15 of the Federal Communication Commission's (FCC) Rules and Regulations (47 CFR 15) or non-licensed devices for which the FCC has granted a waiver of specific requirements of Part 15. NTIA maintains the authority to forbid the operation of specific non-licensed devices for which the FCC has a granted a waiver of Part 15 if NTIA deems the waiver to be inappropriate for the Federal Government. NTIA will identify in this section any such cases. The authorization stated in this section in no way abrogates the authority of any federal agency to forbid the operation of any non-licensed device by any user under its authority.

Non-licensed devices subject to FCC certification, notification or verification shall bear the appropriate FCC statement of limitations to operations. Agencies purchasing or using non-licensed devices for which the FCC has granted a waiver of specific requirements of Part 15, shall operate these devices in such a way as meet all the conditions of the waiver.

The agency operating a non-licensed device that causes interference to an authorized radio station shall promptly take steps to eliminate the interference. Upon notification by cognizant spectrum management personnel that the device is causing interference, the operator of the non-licensed device shall cease all radiations from the device. Operations shall not resume until the condition causing the interference has been corrected.

Agencies operating a purchased non-licensed device have no vested or recognized right to continued use of the device in any part of the radio frequency spectrum. Non-licensed device operations must accept any interference from any Federal or non-Federal authorized radio station, other non-licensed device, or industrial, scientific and medical (ISM) equipment.

Non-licensed devices, since they operate on a non-interference basis, may not provide sufficient reliability for critical radio communications functions affecting human life or property. Non-licensed devices, however, may provide valuable and unique supplemental or expendable radio communications services where needed. To ensure adequate regulatory protection, Federal entities should rely only on devices with frequency assignments in the Government Master File as principal radiocommunication systems for safeguarding human life or property.

7.9 DEVELOPMENT AND USE OF NON-LICENSED DEVICES

Annex K is based on Part 15 of the FCC's Rules and Regulations (47 CFR 15) which governs non-Federal use of radio frequency devices that do not require an individual license to operate (i.e., "non-licensed devices"). Federal Government telecommunication operations do not require an FCC license or authorization. The term "non-licensed device" used in this Part refers only to Federal devices - and operations of such devices - that conform to the technical criteria in Annex K.

Agencies may develop and operate devices that conform to the technical criteria in Annex K without further authority from the Assistant Secretary. Additionally, any operational capability that conforms to the technical criteria in Annex K may be incorporated into otherwise authorized telecommunication systems without further authority from the Assistant Secretary.

The agency operating a device developed under the technical criteria of Annex K that causes interference to any authorized station shall promptly take steps to eliminate the interference. Upon notification by cognizant spectrum management personnel that the device is causing interference, the operator of the non-licensed device shall cease all radiations from the device. Operation shall not resume until the condition causing the interference has been corrected.

Agencies operating a device developed under the technical criteria of Annex K, have no vested or recognized right to continued use of the device in any part of the radio frequency spectrum. These devices must accept any interference from any authorized Federal or non-Federal radio system, other non-licensed device, or industrial, scientific, or medical (ISM) equipment.

Non-licensed devices, since they operate on a non-interference basis, may not provide sufficient reliability for critical radio communications functions affecting human life or property. Non-licensed devices, however may provide valuable and unique supplemental or expendable radio communications services where needed. To ensure adequate regulatory protection, Federal entities should rely only on devices with frequency assignments in the Government Master File as principal radiocommunication systems for safeguarding human life or property.

7.10 USE OF FREQUENCIES BY INDUSTRIAL, SCIENTIFIC, AND MEDICAL (ISM) EQUIPMENT

Without further authority from the Assistant Secretary, ISM equipment may be operated under the conditions specified in this part for particular categories of equipment or types of operations.

7.10.1 Operation on Particular Frequencies Designated for ISM Equipment

The following frequencies are designated for use by ISM equipment, the emissions of which shall be confined within the frequency limits associated with each frequency:

6780 kHz	± 15.0 kHz	5800 MHz	± 75.0 MHz
13560 kHz	± 17.0 kHz	24.125 GHz	± 125.0 MHz
27120 kHz	± 163.0 kHz	61.25 GHz	± 250.0 MHz
40.68 MHz	± 20.0 kHz	122.5 GHz	± 500.0 MHz
915 MHz	± 13.0 MHz	245 GHz	± 1.0 GHz
2450 MHz	± 50.0 MHz		

In the event harmful interference is caused by ISM operation to any authorized radio service outside the frequency limits specified, the operator of the ISM equipment shall promptly take necessary steps to eliminate such interference, except in those cases where the interference is due to direct intermediate frequency pickup by a receiver of the fundamental frequency emissions of ISM equipment operating on an ISM frequency, and the operator otherwise complies with this section.

ISM equipment, other than industrial heating equipment, that is operated on the frequencies 915, 2450, 5800 MHz, and 24.125 GHz, is subject to the following conditions:

1. The energy radiated and the bandwidth of emission shall be reduced to the maximum extent practicable.
2. In the event harmful interference is caused to authorized radio services from spurious or harmonic radiation from ISM equipment, the operation of the ISM equipment shall be discontinued until necessary measures have been taken to eliminate such interference.

Medical diathermy equipment may be operated on the designated ISM frequencies without regard to the type or power of emissions being radiated, except as specified above. However, any harmonic or other spurious radiation outside the frequency limits specified in this section shall be suppressed so as not to exceed a strength of 25 uV/m at a distance of 300 meters. Measurements to determine field intensity shall be made in accordance with standard engineering procedures.

Industrial heating equipment and RF stabilized arc welders may be operated with unlimited radiation on any designated ISM frequency, but shall be adjusted to operate as close to that ISM frequency as practicable. Filtering between the industrial heating equipment and power lines must be provided to the extent necessary to prevent the radiation of energy from power lines on frequencies other than those designated for ISM, with a field strength in excess of 10 *u*V/m at a distance of 1600 meters from the industrial heating equipment, and at a distance of 15 meters from the power line.

Miscellaneous ISM equipment may be operated on the designated ISM frequencies without regard to the type or power of emissions being radiated, provided any harmonic or other spurious radiation outside the frequency limits specified in this section is suppressed so as to not exceed:

25 uV/m at a distance of 300 meters or,

for equipment generating more than 500 watts of RF power on the fundamental frequency, 25 uV/m times the square root of P/500 (where P is the actual RF power generated), but not to exceed 10 uV/m at 1600 meters, provided this increase is not permitted for equipment located in a predominantly residential area and operating on a frequency below 1000 MHz.

7.10.2 Operation on Frequencies Other than Those Designated for ISM Equipment

Operation of ISM equipment within the following safety, search and rescue frequency bands is prohibited: 490-510 kHz, 2170-2194 kHz, 8354-8374 kHz, 121.4-121.6 MHz, 156.7-156.9 MHz, and 242.8-243.2 MHz.

In the event harmful interference is caused to any authorized radio service outside the frequency limits specified in Section 7.10.1, by ISM operation conducted pursuant to this section, the operator of the ISM equipment shall promptly take the necessary steps to eliminate the interference.

Medical diathermy equipment shall be provided with a rectified and filtered plate power supply, powerline filters, and shall be constructed so that any radiated radio frequency energy (including harmonic or other spurious emissions) on a frequency outside the frequency limits specified in Section 7.10.1 does not exceed a strength of 15 µV/m at a distance of 300 meters. Measurements to determine field intensity shall be made in accordance with standard engineering procedures.

Industrial heating equipment and RF stabilized arc welders may be operated provided all of the following conditions are met:

1. Radiation on the fundamental carrier frequency, as well as spurious and harmonic radiations resulting from any source frequency, and falling outside the frequency limits specified in Section 7.10.1, shall be suppressed so that:

   a) below 5725 MHz the field strength does not exceed 10 µV/m at a distance of 1600 meters and;

   b) above 5725 MHz it is reduced to the greatest extent practicable.

2. Filtering between the industrial heating equipment and power lines shall be provided to the extent necessary to prevent the radiation of energy from power lines on frequencies other than the designated ISM frequencies, with a field strength in excess of 10 µV/m at a distance of 1600 meters from the industrial heating equipment and at a distance of 15 meters from the power line.

Miscellaneous ISM equipment may be operated on frequencies other than those designated for ISM equipment provided all of the following conditions are met:

1. The equipment shall be provided with a rectified and filtered plate power supply and power line filters.

2. Any radiated radio frequency energy outside the frequency limits specified in Section 7.10.1 (including harmonic or other spurious emissions) shall not exceed:

15 µV/m at a distance of 300 meters; or,

for equipment generating more than 500 watts of RF power on the fundamental frequency, 15 uV/m times the square root of P/500 (where P is the actual RF power generated), but not to exceed 10 µV/m at 1600 meters, provided this increase is not permitted for equipment located in a predominantly residential area and operating on a frequency below 1000 MHz.

Operation of ultrasonic equipment shall not result in radiation exceeding the following limits:

1. Below 490 kHz

2400 µV/m at 300 meters/Frequency (in kHz)

Between 490 and 1600 kHz

24000 µV/m at 30 meters/Frequency (in kHz)

Over 1600 kHz (excluding frequencies within the limits specified in Section 7.10.1)

15 µV/m at 30 meters

2. For equipment operating below 490 kHz and generating more than 500 watts of RF power on the fundamental frequency.

2400 µV/m at 300 meters "Frequency (in kHz) times the square root of P/500 (where P is the actual RF power generated), but not to exceed 10 µV/m at 1600 meters", provided this increase is not permitted for equipment located in a predominantly residential area.

3. On any frequency 490 kHz and above, the radio frequency voltage appearing on each power line shall not exceed 200 µV; below 490 kHz it shall not exceed 1000 µV.

7.11 USE OF FREQUENCIES BY CERTAIN EXPERIMENTAL STATIONS

Except as provided in the following paragraph, Federal experimental radio stations at the locations listed below are authorized to use any radio frequency for short or intermittent periods without prior authorization of specific frequencies provided that a) such operations are confined to the immediate vicinity of the station; b) the nature or duration of the requirement is such that the assignment of specific frequencies is impracticable; and c) all reasonable measures are taken before such frequencies are used to ensure that harmful interference will not be caused to authorized services, and, in this regard, consideration should be given to the propagation characteristics of the frequency to be utilized and to the operational nature of the services normally operating on frequencies of the order of that selected.

This authority is limited to radio frequency usage which is an integral part of an experimental operation and shall not be construed as authorizing frequency usage for administrative or operational use related thereto. No priority rights shall derive from the use of a specific frequency for an operation conducted pursuant to this authority nor shall any specific frequency usage constitute a bar to the authorization of other uses. The following frequency bands are specifically excluded from this authority:

kHz	MHz	GHz
495.0-510.0	73.0-74.8	10.68-10.70
2173.5-2190.5	121.4-121.6	15.35-15.40
8354.0-8374.0	156.7-156.9	23.60-24.00
21850.0-21870.0	242.8-243.2	31.20-31.50
	1400.0-1427.0	58.20-59.00
	1559.0-1610.0	64.00-65.00
	2690.0-2700.0	86.00-92.00
	4990.0-5000.0	101.00-102.00
		130.00-140.00
		182.00-185.00
		230.00-240.00

(This restriction shall not be construed as precluding the measurement of antenna characteristics in these bands. In such cases, however, the power delivered to the antenna under test shall be for the sole purpose of carrying out the desired measurements and shall be no greater than is required by the measurement technique being utilized.)

Experimental operations conducted pursuant to this authority shall be terminated immediately upon receipt of notice that harmful interference is being caused to an authorized service. To that end, the following listings of the experimental stations include sufficient information to permit the prompt delivery at all times of notices of harmful interference.

Air Force, Department of the
Space and Missile Systems Center
SMC/EAB
483 N. Aviation Blvd.
El Segundo, CA 90245-2808
Telephone: 310-653-1428, DSN: 633-1428

Air Force Flight Test Center
650 ABW/SCT
Building 3940, Room 153
35 N Wolfe Avenue
Edwards AFB, CA 93524-1110
Telephone: 805-277-2390, DSN: 527-2390

Eastern Area Frequency Coordinator (EAFC)
45 CS/SCMMP
1225 Pershing Street
Patrick AFB, FL 32925-3340
Telephone: 407-494-5837/5838
DSN: 854-5837/5838
Fax: 407-494-5555, DSN: 854-5555

DOD Gulf Area Frequency Coordinator
96 CG/SCXF
201 W. Eglin Blvd., Ste 256
Eglin AFB, FL 32542-6829
Telephone: 850-883-7535, DSN: 875-7535
FAX: 850-882-3523, DSN: 872-3523

6585 Test Group
Frequency Manager (DC)
Holloman AFB, NM 88330-5000
Telephone: 505-479-1375, DSN: 867-1375

Air Force Research Laboratory/Phillips Research Site
3550 Aberdeen Avenue, S.E.
Kirtland AFB, NM 87117-5776
Telephone: 505-853-4313. DSN: 246-4313

Aeronautical Systems Center (AFMC)
RF Spectrum Management Branch
88th Communications Group/SCCF
2960 K Street, Bldg 47, Area B
Wright-Patterson AFB, OH 45433-7661
Telephone: 937-255-2181, DSN: 785-2181

Electronics Systems Center (AFMC)
66SPTG/SCXC
50 Griffiss Street
Hanscom AFB, MA 01731-1621
Telephone: 617-377-7511, DSN: 478-7511

Area Frequency Coordinator
554CS/SCXF
5870 Devlin Drive
Nellis AFB, NV 89191-7075
Telephone: 702-652-3417, DSN: 683-3417

Rome Laboratory
525 Brooks Road
Griffiss AFB, NY 13441-4505
Telephone: 315-330-2243, DSN: 587-2243

Geophysics Directorate of Phillips Laboratory
ESC/SCXM
50 Griffis Street
Hanscom AFB, MA 01731-1621
Telephone: 617-377-7511, DSN: 478-7511

Western Space & Missile Center
Frequency Manager (SFDS)
Vandenberg AFB, CA 93437-6021
Telephone: 805-866-6695, DSN: 276-6695

Armstrong Laboratory
648 C-CSS/SCR
Brooks AFB, TX 78235-6346
Telephone: 512-536-4765, DSN: 240-4765

Arnold Engineering Development Center
AEDC/SCX
100 Kindell Drive, Suite B111
Arnold AFB, TN 37389-2111
Telephone: 615-454-5978, DSN: 340-5978

Air Force Civil Engineering Center
Frequency Manager (LG)
Tyndall AFB, FL 32401-6001
Telephone: 904-283-6406, DSN: 970-6406

Pacific Alaska Range Complex (PARC)
Joint Frequency Management Office Alaska
HQ Alaskan Command, J64
Elmendorf AFB, AK 99506-2001
Telephone: 907-552-8223
FAX: 907-552-6965

Army, Department of the
Commander
Aberdeen Proving Ground
ATTN: ASNC-TAB
Aberdeen, MD 21005-5055
Telephone: 301-278-4696 or 2211
DSN: 870-4696 or 2211

Area Frequency Coordinator
ATTN: SFIS-FAC-SH
Fort Huachuca, AZ 85613-6000
Telephone: 602-538-6423, or 6424
DSN: 879-6423 or 6424

Commander
U.S. Army Communications-Electronics Command
ATTN: AMSEL-RD-ST-WL-AA
Fort Monmouth, NJ 07703-5203
Telephone: 732-427-2415, DSN: 987-2415

Commander
Picatinny Arsenal
ATTN: ASNC-APT
Dover, NJ 07801-5001
Telephone: 201-328-4001, DSN: 880-4001

Commander
Army Aviation and Missile Command
ATTN: AMSAM-RD-MG-GA
Redstone Arsenal, AL 35898-5253
Telephone: 205-876-1688, DSN: 746-1688

Area Frequency Coordinator
ATTN: SFIS-FAC-SS
White Sands Missile Range,
NM 88002-5526
Telephone: 505-678-3702 or 5417
DSN: 258-5417

Harry Diamond Laboratories
Communications-Electronics Office
2800 Powder Mill Road
Adelphi, MD 20783-1197
Telephone: 202-394-1804, DSN: 290-1804

Pueblo of Laguna Army RF Test Area
Attn: Area Frequency Coordinator
White Sands Missile Range
New Mexico 88002-5526
Telephone 505-678-3702 or 5417
DSN 258-5427

Commander
Fort Dix, New Jersey Test Area
ATTN: AFMO CONUS
Ft. Sam Houston, TX 78234-5032
Telephone: 210-2050 or 2820
DSN: 471-2050 or 2820

Coast Guard
Coast Guard Research and Development Center
1 Chelsea Street
New London, CT 06320
Telephone: 860-271-2600

Coast Guard Academy
Department of Engineering
New London, CT 06320
Telephone: 203-444-8546

Electronics Engineering Center
Wildwood, NJ 08260
Telephone: 609-522-7781

Field Testing and Development Center
Coast Guard Yard
Curtis Bay, MD 21226
Telephone: 301-789-1600

Coast Guard Telecommunications and
Information Systems Command
Alexandria, VA 22315
Telephone: 703-313-5700 (Duty Hours)
703-313-5400 (Off-Duty Hours)

Commerce, Department of
NIST; NOAA/NGDC, ERL, MASC, ARL;
NTIA/ITS
Boulder Laboratories and Associated Field
Activities-NOAA R/E1
325 Broadway
Boulder, CO 80303
Telephone: 303-497-6548, FTS: 320-6548
Radio Freq. Management Officer

NOAA/ERL
Boulder Atmospheric Observatory
c/o Department of Commerce
325 Broadway
Boulder, CO 80303
Telephone: 303-497-6816, FTS: 320-6816

NOAA/ERL
Fritz Peak
Route 4, Box 500
Golden, CO 80401
Telephone: 303-497-3436, FTS: 320-3436

NIST
Radio Stations WWV, WWVB and WWVL
2000 East County Road 58
Fort Collins, CO 80521
Telephone: 303-444-3507 or 303-497-3914
FTS: 323-5228 or 320-3914

NBS/NML
Radio Station WWVH
P.O. Box 417, Kekaha
Kauai, HI 96572
Telephone: 808-335-4361/4362

NOAA/NWS
Sterling Research and Development Center
Sterling, VA 22170
Telephone: 703-471-5302

Energy, Department of
Los Alamos National Laboratory
Los Alamos, NM 87115
Telephone: 702-295-4766 or
702-734-3343 (nights and holidays)

Lawrence Livermore National Laboratory
Livermore, CA 94551
Telephone:702-295-4766 or 702-734-3343
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Sandia National Laboratory
Livermore, CA 94551
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Nevada Test Site
Mercury, NV 89023
Telephone: 702-295-4766 or 702-734-3343
(nights and holidays)

Frequency Coordinator
U.S. Department of Energy
Nevada Operations Office
Las Vegas, NV 89114
Telephone: 702-295-4766 or 702-734-3343
(nights and holidays)

Sandia National Laboratory
Albuquerque, NM 87115
Telephone: 505-845-8028

Idaho National Engineering and Environmental Laboratory
Idaho Falls, ID 83402
Telephone: 208-526-0600 or
208-526-1515 (nights and holidays)

Federal Aviation Administration
Technical Center
Atlantic City, NJ 08405
Telephone: 609-484-5509

Aeronautical Center
Spectrum Management Officer, AML-500
Mike Monroney Center
6500 South MacArthur
Oklahoma City, OK 73125
Telephone: 405-954-7922

Federal Communications Commission
Equipment Development Group
Enforcement Bureau
3600 Hiram-Lithia Springs Rd.
Hiram, GA 30141-6370
Telephone: 770-222-4220

Laboratory Division
Office of Engineering and Technology
7435 Oakland Mills Road
Columbia, MD 21046
Telephone: 301-362-3000

Health and Human Services
Department of National Institute of Health
Bethesda, MD 20892
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Power Source Laboratory
Division of Electronic Products
Bureau of Radiological Health
12720 Twinbrook Parkway
Rockville, MD 20852
Telephone: 301-443-3840

Justice, Department of
Engineering Research Facility
Building 27958A
Quantico, VA 22135
Attention: Radio Engineering Unit
Telephone: (703) 632-6701
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DEA Office of Investigation Technology
10555 Furnace Road
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Navy, Department of the
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Naval Surface Warfare Center
Dahlgren Division
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Naval Surface Weapons Center
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Naval Underwater Systems Center
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Pacific Missile Range Facility
Hawaiian Area
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Pacific Missile Test Center
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Naval Air Warfare Center Aircraft Division
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Patuxent River, MD 20670-1183
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Naval Research Laboratory
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Naval Research Laboratory
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Transportation, Department of
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Cambridge, MA 02142
Telephone: 617-494-2424

Transportation Test Center
Pueblo, CO 81001
Telephone: 303-326-9218

7.12 USE OF FREQUENCIES AUTHORIZED TO NON-FEDERAL STATIONS UNDER PART 90 OF THE FCC RULES

A Federal radio station may utilize any frequency authorized to a non-Federal radio station under Part 90 of the Rules of the Federal Communications Commission where such utilization is necessary for intercommunication with non-Federal stations or required for coordination with non-Federal activities, provided a mutually approved arrangement has been concluded between the Federal agency concerned, the Federal Communications Commission, and the non-Federal licensee involved. All operations by Federal stations under these provisions a) shall be conducted in essentially the same geographical area as those of the non-Federal licensee, b) shall be restricted to the purpose for which the particular frequency is authorized to non-Federal stations, c) shall be in accordance with the Federal Communications Commission Rules and Regulations, d) shall be subject to immediate termination if harmful interference is caused to the service rendered by non-Federal stations, and e) shall not bar in any way the expansion of non-Federal services for which the frequencies are allocated. The procedure for concluding a mutually-approved arrangement required by this provision is given in Section 8.3.3.

FCC regulations provide that non-Federal stations licensed by the FCC may be authorized the use of frequencies assigned to Federal radio stations upon appropriate showing by the applicant that such assignment is necessary for intercommunication with Federal stations or required for coordination with activities of the Federal Government. Such provision is subject to determination by the FCC, after consultation with the appropriate Federal agency or agencies, that the assignment is necessary.

7.13 MILITARY COMMUNICATIONS UNDER APPENDIX 13 (Part A2), INTERNATIONAL TELECOMMUNICATION CONVENTION

Stations in the mobile service (including portable-type operations) of the Air Force, Army, Coast Guard, and Navy, when engaged in exercises or tactical operations, may employ any frequencies, in accordance with Appendix **13** (Part A2) of the International Telecommunication Convention provided they cause no interference with the authorized services operating on the frequencies selected.

When required by military necessity and in consonance with the provisions set forth in Appendix **13** (Part A2) of the International Telecommunication Convention, minimum performance requirements applicable to the use of Communications-Electronics equipment as prescribed in this Manual[1] may not be met.

Where under normal peacetime conditions harmful interference arises to (or from) other operations, performed in accordance with applicable regulatory provisions, as a result of such minimum performance requirements not being met, the military service(s) involved shall to the extent practicable take all reasonable measures to mitigate the harmful interference.

7.14 USE OF FREQUENCIES FOR THE PERFORMANCE OF ELECTRONIC ATTACK TEST, TRAINING, AND EXERCISE OPERATIONS

IRAC Document 34279/1 is the Joint Chiefs of Staff Manual CJCSM 3212.02B , dated October 15, 2003 titled, Performing Electronic Attack in the United States and Canada for Tests, Training, and Exercises. Use of CJCSM 3212.02B, is mandatory for all DoD components and contractors. The manual contains the details concerning authorized frequency bands, geographical restrictions and frequency clearance procedures for conducting electronic attack in the U.S. and Canada. CJCSM 3212.02B is only approved for limited release to DoD components (to include the combatant commands) and other Federal agencies. Copies of this manual are available through controlled Internet access only (limited to.mil and .gov users) at http://www.dtic.mil/cjcs_directives/cjcs/manuals.htm.

7.15 MILITARY COMMUNICATIONS FOR TACTICAL AND TRAINING OPERATIONS

7.15.1 Military Communications in the Bands 3500-4000, 20010-22000, and 22855-24990 kHz for Tactical and Training Operations

To meet local military peacetime tactical and training requirements within the United States and Possessions, the military services may employ frequencies in the bands 3500-4000, 20010-22000, and 22855-24990 kHz on a secondary basis to the services of stations authorized on frequencies within these bands provided that:

1. Operations shall be with field-type portable and mobile equipment.
2. Minimum antenna power shall be used commensurate with the actual communication requirement but not in excess of 50 watts.
3. The bandwidth of emission shall not exceed 6 kHz for the lower band or 36 kHz for the upper bands.
4. Prior to transmission, responsible military personnel shall ascertain that services being performed in the local area will not be disrupted or suffer harmful interference as a result of such military use of frequencies within the local area.
5. The use of any frequency authorized herein shall be terminated immediately upon notification that harmful interference is being caused.

7.15.2 Military Communications in the Broadcast Bands between 4 and 27 MHz, the Maritime Mobile Band between 4.005 and 4.063 MHz, and Specified Frequencies between 2 and 27 MHz for Tactical and Training Operations

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1 *Necessary bandwidths as prescribed in Section 6.3.2. Frequency tolerance as prescribed in Part 5.1. Other minimum performance requirements as prescribed in Parts 5.5 and 5.6.*

The military services may employ frequencies in the bands as indicated in paragraph 1 below and specified frequencies in paragraph 2 below in order to meet local peacetime tactical and training requirements within the United States and Possessions (or as indicated below). Such use of frequencies shall be on a secondary basis and subject to the avoidance of harmful interference a) to all operations established in accordance with the international allocations applicable to those bands and b) to all other operations regularly authorized within the United States and Possessions on specific frequencies within those bands or on the specified frequencies.

1. The use of frequencies within the following bands will be conducted as indicated in subparagraphs a) and b) and with minimum antenna power commensurate with the actual communication requirement, but not to exceed the power for specific types of emission as indicated:

kHz	**kHz**
4005 - 4063	13600 - 13800
5950 - 6200	15100 - 15600
9500 - 9900	21450 - 21850
	25670 – 26100

a. For field type portable and mobile equipment the following parameters apply:

1K10F1B	100 watts mean
100HA1A	200 watts peak
3K00J3E	250 watts peak
2K00A2B	300 watts peak
3K00J7B, 4K00J7B	400 watts peak
3K00J9W, 4K00J9W, 6K00J9W	600 watts peak
6K00B9W	800 watts peak

b. For shipboard mobile equipment the following parameters apply:

100HA1A	500 watts peak
100HJ2A	500 watts peak
3K00J3E, 2K80J3E	500 watts peak
3K00J7B	1000 watts peak
6K00B9W	2000 watts peak

2. The use of the following frequencies, as indicated below, will be controlled by and coordinated between the Military Departments Frequency Management Offices for operations conducted a) normally between transportable and fixed facilities engaged in long haul HF operations and b) with minimum antenna power commensurate with the actual communication requirement, but not to exceed 10 KW, and with 6K00B9W, 9K00B9W and 12K00B9W emissions only.

kHz	**kHz**	**kHz**
2001.0	9958.0	17500.0
2582.0*	9970.0(4)	17519.0(3)
2618.0(9)	10586.0(2)	18036.0(1)
2664.0(12)	10690.0	18060.0
2797.0*	10720.0(5)	18162.5(11)
3373.0	10730.0	19005.0
4445.0	11410.0(6)	19047.0

4505.0(4)	11422.5(5)	19160.0
4528.0	11482.5	19510.0(4)
4562.5	11513.5(4)	20035.0
4595.0(6)	11535.0	20050.0
4985.0(4)	11995.0(10)	20075.0
5370.0(4)	12045.0(2)(10)	20124.0
5400.0(3)	12060.0	20151.0
5434.0	12090.0	20350.0(8)
5817.5(2)	12105.0	20400.0
5820.0(2)	12240.0(10)	20425.0
5835.0*	12255.0(2)(10)	20438.0(5)
6830.0	12324.0(4)(10)	20550.0
6897.5(1)	13545.0	20763.0
6905.0	13610.0(4)(10)	20950.0(5)
6912.5	13680.0(10)*	21856.0(6)
6989.0	14375.0	21886.0(6)
7362.5(5)	14385.0	21918.0(6)
7469.0(1)	14646.0	23180.0
7690.0(1)	14667.0(6)	23500.0
7935.0	14867.5	23600.0
8000.0(5)	15595.0(1)(10)	23690.0
8041.0	15895.0	23700.0
8060.0	16090.0	24120.0
8064.0	16100.0	24510.0
8162.0(10)	16170.0	25360.0
8170.0(10)	16225.0(5)	25425.0
9145.0	16340.0	25516.0
9190.0(3)(9)	16422.5(6)(10)	26575.0(9)
9259.0(7)	17410.0(1)(8)(10)	26650.0(5)
9320.0(4)	17460.0	26750.0
9417.5	17480.0	26850.0

* 6KB9W and 9KB9W only

[1] Transmit east of 100° west only

[2] Transmit west of 100° west only

[3] Transmit east of 117° west only

[4] Transmit west of 117° west only

[5] NAVCOMMSTA Stockton transmit only

[6] USA to USA only

[7] Not to be used to/from Norfolk, VA

[8] Military services to coordinate with Justice before use

[9] 6KB9W only

[10] This frequency is available until implementation procedures and schedules are determined by future conferences of the International Telecommunication Union (ITU) for Broadcasting or Maritime Mobile Services.

[11] This frequency is available until reaccommodation actions of the International Telecommunication Union (ITU) are completed or until July 1, 1989, whichever is earlier.

[12] For use within central U.S. Coordinate with Coast Guard prior to use near Coast Guard/Coastal areas.

7.15.3 Military Communications in Non-Federal Bands Above 25 MHz for Tactical and Training Operations

The military services may employ frequencies in certain non-Federal bands above 25 MHz, after coordination between FCC field personnel and military field personnel, for tactical and training operations in the U.S. and Possessions in accordance with the arrangement between the FCC and the Military entitled "Field Coordination of Military Tactical and Training Assignments 25-2400 MHz." The military use of non-Federal frequencies under the procedures stipulated will not be a bar to the present or future assignment, through the normal IRAC/FCC process, of non-Federal frequencies to non-military Federal agencies, and, in such military use of non-Federal frequencies, protection shall be afforded to Federal operations authorized on specific frequencies within the non-Federal frequency bands concerned. The text of the arrangement between the FCC and the Military follows.

1. In order to provide for military tactical and training assignments in the United States and Possessions, FCC field personnel and military field personnel are authorized to coordinate such assignments without referring these matters to Washington headquarters.

2. Military agencies have agreed that prior to coordinating tactical and training frequency assignments with FCC field offices, military field representatives will first establish that proposed assignments have a good chance of being compatible with non-Federal assignments. Consequently, FCC Field Engineers in Charge (EIC) are not expected to "engineer" such assignments for the Military.

3. The following procedures will apply to the use of the non-Federal bands between 25 and 2400 MHz specified herein:

a. The Military will not request the use of frequencies allocated to non-Federal services whenever the tactical and training requirements can be met through the use of Federal bands.

b. Military tactical and training assignments shall cause no harmful interference to non-Federal assignments and military operations shall be terminated immediately upon notification that harmful interference has occurred.

c. Military tactical and training assignments must accept such interference as may be caused by non-Federal assignments.

d. Tactical and training assignments shall be temporary for a period of no longer than one year and the military representatives shall recoordinate if continued use is desired. The military field representatives shall maintain a current list of such assignments and furnish the EIC with three copies thereof annually.

4. The following shall be used as a guide for the coordination of military tactical and training assignments when it has been determined that the use of non-Federal bands is necessary:

a. Bands allocated to the Broadcasting Service for domestic use.

(1) The following are the bands between 25 and 2400 MHz that are allocated for this purpose:

MHz	**MHz**
54-72	174-216
76-100 (ex. Alaska)	470-608
100-108	614-890

(2) FCC field engineers are acquainted with the areas being served by broadcasting stations and these engineers will not permit military tactical and training assignments on TV or FM channels in the areas where the public is receiving service. In many instances such service is received far beyond the normal service ranges of broadcasting stations. However, reception in such areas shall be protected regardless of the quality of such reception.

b. Bands used for auxiliary broadcast purposes.

(1) The following are the bands between 25 and 2400 MHz that are allocated for this use:

MHz	Use
25.85-26.48	Remote Pickup
152.86-153.35	Remote Pickup
160.86-161.40	Remote Pickup (Puerto Rico and Virgin Islands only)
161.625-161.775	Remote Pickup (except in Puerto Rico and Virgin Islands)
450-451	Remote Pickup
455-456	Remote Pickup
942-952	STL
1990-2110	TV Pickup, TV-STL

(2) Frequencies in bands used by remote pickup, studio transmitter links and other broadcast auxiliaries may be used for military tactical and training purposes providing FCC field engineers coordinate such use with the appropriate broadcast station licensees. For example, there is no objection to a military tactical and training assignment co-channel to a remote pickup assignment in the same area provided the broadcast licensee is cognizant of such arrangements and can be assured that in the event a remote broadcast pickup is necessary, any military operations that may be on the air will shut down immediately upon notification.

As an additional example, frequencies which are assigned to studio transmitter links may be utilized by military tactical and training assignments, providing these assignments are coordinated by the FCC Field Representative with the broadcast licensees involved and the tactical and training assignments so arranged as to cause no harmful interference to an STL. In all cases where a tactical and training assignment is made on an auxiliary broadcast service frequency within interference range of a co-channel FCC licensee, the licensee should be given the name of the military representative to contact in the event interference is caused.

c. Public Safety, Citizens Radio, Industrial, Land Transportation and Maritime Mobile Bands.

(1) The following bands between 25 and 2400 MHz are allocated for this purpose:

MHz	MHz	MHz
25.01-25.33	39.00-40.00	156.675-156.725
26.96-27.54	42.00-43.20	156.875-157.025
29.70-29.80	43.68-46.601	157.45-157.74
30.56-32.00	47.00-49.60	158.10-158.46
33.00-34.00	150.80-152.00	158.70-161.775
35.00-35.20	152.24-152.48	173.20-173.40
35.68-36.00	152.84-156.25	451.00-454.00
37.00-38.00	156.325-156.625	456.00-459.00
		460.00-470.00

(2) Frequencies in bands allocated to these services for land mobile use may be authorized for military tactical and training assignments provided the assignments are coordinated between FCC field engineers and military field representatives. The set of curves attached hereto should be used as a guide in these matters. These curves are a combination of propagation theory backed up by considerable measurement data and they do not necessarily represent finite values upon which engineering determinations may be made. Consequently, personnel in the field will need to take into consideration such factors as local terrain. For example, an obstruction such as a hill or a mountain range might lower considerably the distance between a non-Federal and a military tactical and training assignment. On the other hand, there are certain locations where better than average radio propagation conditions exist, and it will be necessary for FCC field engineers and military representatives to take this into account. If doubt exists as to the practicability of a proposed tactical and training assignment, tests should be conducted.

d. Bands allocated to non-Federal fixed service (excluding common carriers).

(1) The following are the bands between 25 and 2400 MHz that are allocated for this purpose:

MHz	**MHz**
72.0-73.0	1850-1990
75.4-76.0	2130-2160
76.0-100 (In Alaska)	2180-2200
952-960	

(2) In bands allocated to the non-Federal fixed service (excluding common carrier), military tactical and training assignments may be authorized after coordination with appropriate FCC field offices. It is not possible to develop typical standards for the coordination of such assignments in fixed bands due to the fact that, in general, highly directive antennas are used and problems of interference protection will vary greatly. Since many military tactical and training operations involve the use of highly directive antennas, it may sometimes be possible to coordinate such assignments, although they may be in the same area as non-Federal assignments, by taking into account directive antenna features of the installations involved. In coordinating such assignments FCC field engineers are urged to coordinate proposed military tactical and training assignments with FCC licensees whenever there is a doubt as to the compatibility of the proposed military assignments. Tests should be conducted if necessary.

e. Bands allocated to non-Federal aeronautical fixed and international fixed public services.

(1) The following bands between 25 and 2400 MHz are allocated for this purpose:

MHz
26.95-26.96
29.80-29.89
29.91-30.00

(2) In the above bands, military tactical and training assignments may be authorized after coordination with appropriate FCC Field Offices provided that the military use is limited to those periods when propagation conditions would not normally support long distance communication, and therefore could be expected to confine to the local area the potential of interference to non-Federal services.

f. Amateur Bands

(1) The following are the bands between 25 and 2400 MHz that are allocated for this purpose:

MHz	**MHz**
28-29.7	420-450
50-54	215-1300
144-148	2300-2400 (This band extends to 2450 MHz.)
222-225	

(2) The following provisions are applicable in the use of the above bands for communication purposes (i.e. for other than radiolocation purposes).

(a) Subject to the provisions of the rules adopted by the Federal Communications Commission, amateur stations generally are operated freely on any frequency within the established amateur bands. Therefore, great care needs to be taken in the coordination and in the use of such frequencies by the Military.

(b) The following conditions shall be observed in the military use of amateur frequency bands between 25 and 2400 MHz for routine day to day tactical and training purposes:

1 Operations on such frequencies will be confined normally to the hours of 0600-1800 local civil time.

2 Prior to transmission on specific frequencies, military personnel should ascertain that such frequencies are not in actual use by amateur stations within the local area in a manner which is likely to suffer harmful interference if the frequencies were used for military operation.

3[2] In recognition of the primary status of amateur stations as against the secondary status of military frequency use in such bands in peacetime, military personnel have responsibility in the event of, evidence of, or actual complaints of interference, to take effective remedial action without undue delay.

4 Insofar as practical, consideration should be given in planning the use of such frequencies to their employment in a manner or at transmitter locations well removed from areas of civilian population where amateur use is likely. Appropriate measures should be adopted to minimize interference as by the use of minimum radiated power and intermittent transmissions of short duration.

5 It should be recognized that long distance propagation characteristics of the 28 MHz and 50 MHz bands, especially in the case of the former, require that good judgment be exercised in military use of these bands. Only when sky-wave propagation is not present is it practicable to use these bands for anything except extremely low power.

5. The attached curves have been constructed through the use of the latest ITU-R PN series Recommendations and FCC radio propagation data for frequencies in the order of 150 MHz. These curves include corrections for tropospheric propagation and, as a rough guide, may be used for frequencies between 25 and 470 MHz.

The assumption has been made that it is necessary to protect non-Federal services on the basis of a desired/undesired signal ratio of 12 dB (desired signal 12 dB higher than undesired signal). Additionally, it has been assumed that this protection is to be provided 90 percent of the time at 90 percent of the locations within a mobile system's service area. Also, the antenna heights of non-Federal base stations have been assumed as 30 meters.

Three examples of the use of these curves have been plotted as follows:

	Undesired		**Desired**		**Separation**
	PU	**HU**	**PU**	**HU**	
1.	20W	3M	100W	30m	138km
2.	10W	15M	100W	30m	134km
3.	5W	30M	100W	30m	124km

The curves have been constructed for a desired station antenna height of 30 meters. As a rule of thumb, it may be said that a 50% reduction of desired station antenna height will reduce the desired station's service range by about 25% at service distance ranges in the order of 32 to 48 kilometers. However, at distances much greater than this, the reduction in service range due to reduction in antenna height is less and may amount to as little as 10%.

In the examples shown above, a reduction of desired station antenna height from 30 to 15 meters would permit a reduction in station separation by 10% or so.

These curves should serve field engineers as a guide but should be used with a certain amount of caution, since local propagation conditions may vary considerably over the average terrain which has been assumed in the construction of the attachment.

These curves do not apply to TV and FM broadcasting. The desired to undesired signal ratio for TV signals must be 45 dB or more at the TV receiver. The desired to undesired signal ratio for FM signals must be 20 dB or more at the FM receiver.

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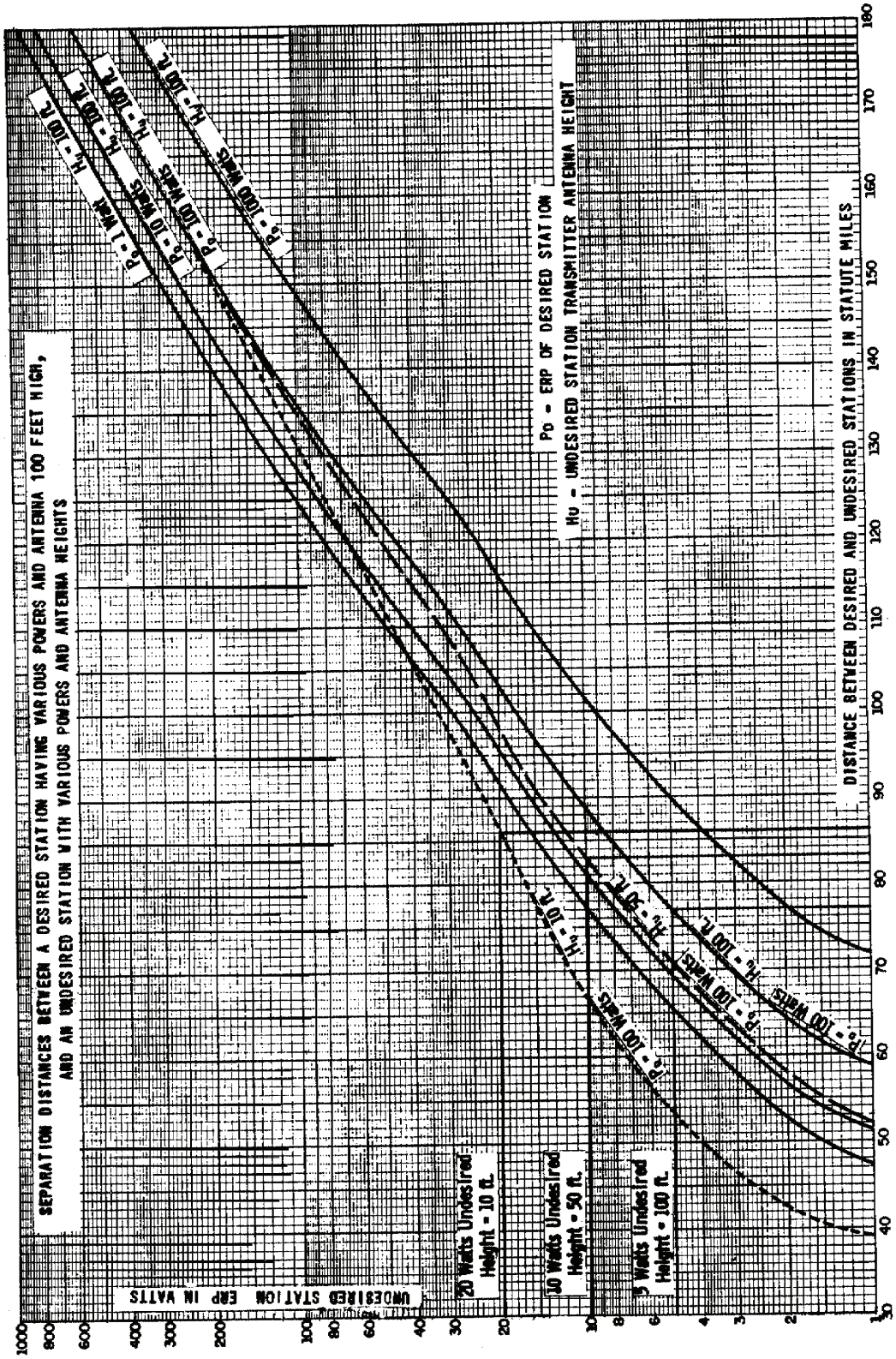
2 This refers to military use for communication purposes and not to military radio location uses which have priority status in the amateur bands above 222 MHz.

Graph. Frequency Band 25-470 MHz



7.15.4 Military Communications in the Federal Bands Between 30 and 50 MHz for Tactical and Training Operations

To meet local military peacetime tactical and training requirements within the United States and Possessions, the military services may employ frequencies in the bands 30.00 to 30.56, 32.00 to 33.00, 34.00 to 35.00, 36.00 to 37.00, 38.00 to 39.00, 40.00 to 42.00, 46.60 to 47.00, and 49.60 to 50.00 MHz on a secondary basis to the services of other Federal stations authorized on frequencies within these bands provided that:

1. Operations shall be with field-type portable and mobile equipment.
2. Minimum antenna power shall be used commensurate with the actual communication requirement but not in excess of 50 watts.
3. The bandwidth of emission shall not exceed 6 kHz with type A3E emission or 36 kHz with type F3E emission.
4. Prior to transmission, responsible military personnel shall ascertain that services being performed by other Federal agencies in the local area will not be disrupted or suffer harmful interference as a result of such military use of frequencies within the local area.
5. The use of any frequency authorized herein shall be terminated immediately upon notification that harmful interference is being caused.

7.16 (RESERVED)

7.17 MILITARY COMMUNICATIONS AT TEST RANGES IN NON-FEDERAL BANDS ABOVE 25 MHz

The military departments may employ frequencies in certain non-Federal bands above 25 MHz at specified military test ranges after cooriation between FCC field personnel and military field personnel.

7.17.1 Locations

The military test ranges and the Geographical Areas of Cognizance are as follows:

Activity	Geographical Area of Cognizance	Service Responsibility
Weapons and Tactics Center, Nellis AFB, Nevada	Entire State of Nevada plus Utah west of 111° W and Idaho South of 44°N.	Air Force
Air Force Eastern Test Range, Patrick AFB, Florida	Area bounded by 24°N, 31°30'N, 77°W, and 83°W.	Air Force
DoD Gulf Area Coordinator, Eglin AFB, Florida	Area bounded by 24°N, 33°30'N, 83°W and 90°W.	Air Force
Pacific Missile Test Center, Pt. Mugu, California	Area enclosed within 322 kilometer radius of Headquarters Building, PMR, and the area of California that lies south of 37°30'N.	Navy
Army Electronic Proving Ground, Ft. Huachuca, Arizona	Entire State of Arizona	Army
Military Ranges within the State of Hawaii	Area enclosed by 322 kilometer radius of Honolulu, Hawaii	CINCPAC

Activity	Geographical Area of Cognizance	Service Responsibility
White Sands Missile Range, Las Cruces, New Mexico	Entire State of New Mexico and other U.S. territory enclosed with a 240 kilometer radius of the Headquarters Building, WSMR, plus the area of the States of Utah and Colorado that lies south of 41°N and between 108°W and 111°W.	Army
Military Ranges within the State of Alaska	Entire State of Alaska	USPACOM

7.17.2 Frequency Bands

Frequencies in the following bands may be used in these geographical areas in support of the mission of these ranges, subject to the conditions and procedures specified in this part:

MHz	MHz
25.01-25.33	144.0-148.0
25.85-26.48	150.8-156.25
26.95-27.54	156.35-156.7
28.00-29.89	156.9-157.0375
29.91-30.00	157.1875
30.56-32.00	162.0125
33.00-34.00	174.0-216.0
35.00-36.00	450.0-608.0
37.00-38.00	614.0-890.0
39.00-40.00	942.0-960.0
42.00-46.60	1850-2110
47.00-49.60	2450-2690
50.00-73.00	6425-7125
75.40-108.00	10550-10680
	11700-13250

Frequency bands above 13250 MHz are under consideration and will be designated later.

7.17.3 Conditions

Non-Federal allocated bands will not be used if the frequency requirements can be satisfied in Federal allocated bands.

Proposed operations on non-Federal frequencies should normally be limited to those of a highly intermittent nature which can be suspended or adjusted immediately upon notice that interference is being caused to a non-Federal service. Care should be exercised in the selection of frequencies for proposed operations to avoid the likelihood of harmful interference to known non-Federal operations. Where practicable, provision shall be made for identification of the transmissions of the military station either by the transmission of a call sign or periodic interruption of the transmissions in accordance with a prearranged schedule.

Military users of any frequency assigned pursuant to this procedure shall accept any interference that may be caused by non-Federal services, shall not cause interference to any non-Federal service, and shall not preclude new non-Federal assignments on such a frequency.

This procedure does not apply to the development of military systems or concepts which may require changes in the National Table of Frequency Allocations. Any such development must be coordinated through appropriate Washington channels.

7.17.4 Coordination

Proposed Federal operations on non-Federal frequencies which come within the purview of this procedure shall be coordinated with the FCC Engineer in Charge of the Radio District in which the contemplated operation will occur, prior to the commencement of such operation. No operation on non-Federal frequencies shall be conducted without prior concurrence by the FCC District Engineer. If the FCC District Engineer is unable to concur in a proposed operation and circumstances appear to warrant further consideration by higher authority, the request may be referred to military headquarters. Similarly, if the FCC District Engineer believes that circumstances warrant such action he may refer the matter to the Washington Office of the FCC. Requests for coordination submitted to the FCC District Engineer shall include the following information:

1. Security classification, if any.
2. Frequency or frequencies proposed to be used.
3. Transmitter location or area of proposed operation. (If the transmitter is at a fixed location, give the geographic coordinates to the nearest minute as well as the nearest identifiable community. If the operation is portable or mobile, describe the area of proposed operation. If the transmitter is airborne, so specify and describe the general range of operations.)
4. Emission and bandwidth. (If pulsed emissions are used, give the approximate risetime and repetition rate.)
5. Power. (Output power of transmitter.)
6. Antenna. (Give type of antenna (whip, dipole, yagi, parabolic, etc.) approximate height of antenna above ground, power gain if any, and direction of main radiation lobe if a directive transmitting antenna is employed.)
7. Time of operation. (To the extent practicable, indicate whether the proposed operation will take place at specified hours or during certain periods of the day, whether the transmissions during operation will be continuous or intermittent with some indication as to the degree of intermittence, and whether the contemplated use will occur frequently or only upon special occasions. Such information will assist the FCC District Engineer in properly evaluating potential interference.)
8. Call signs. (Call sign information should be supplied, if appropriate. If identification is to be accomplished through periodic interruptions of the transmissions in accordance with a prearranged schedule, supply such a schedule.)
9. Expected duration of the proposed operation.
10. Remarks. (Any additional information which will be helpful in assessing potential interference.)

Military frequency coordinators shall not coordinate proposed frequencies with the FCC until it has been ascertained, to the coordinator's satisfaction, that the terms of this document can be met.

7.17.5 Frequency Assignment Lists

On an annual basis the military frequency coordinators will furnish in duplicate to the appropriate FCC Engineers in Charge a list of current assignments made pursuant to these arrangements.

7.18 MILITARY TELEMETERING AND TERRESTRIAL TELECOMMAND IN RADIOLOCATION BANDS

In order to transmit command signals to airborne vehicles being tracked and to receive status information from the vehicles, military telemetering and terrestrial telecommand operations are

authorized in the bands 3100-3650, 5250-5925, 8500-10,000 MHz, 13.4-14.0 and 15.7-17.3 GHz when conducted as an integral part of the operation of authorized stations in the radiolocation service. Such telemetering and terrestrial telecommand operations shall be on a secondary basis to authorized stations operating in accordance with the National Table of Frequency Allocations.

7.19 RESERVED

7.20 USE OF NON-FEDERAL FREQUENCIES BY THE FCC FIELD OPERATIONS BUREAU

The FCC Field Operations Bureau is authorized to transmit on any frequency that is allocated for non-Federal use under FCC Rule Parts 21, 22, 73, 74, 81, 83, 87, 90, 95 and 97 for the purpose of enforcement and/or interference resolution.

7.21 TEMPEST ZONE TESTING OF PHYSICAL FACILITIES

1. Federal stations are authorized to transmit necessary emissions for TEMPEST zone testing in the frequency range 10 to 1000 MHz on a non-interference basis to other operations in this band. These TEMPEST zone tests shall be conducted with the following restrictions:

a. The frequency range 10-1000 MHz will be broken into four bands for testing: 10-110 MHz, 100-200 MHz, 200-500 MHz and 500-1000 MHz. A bi-conical antenna will be used for 10-200 MHz. A log periodic antenna will be used above 200 MHz.

b. Testing will be done with a signal generator which produces a continuously swept sine wave. Sweep durations will not exceed two seconds for bands 10-110 and 100-200 MHz; or five seconds for the band 200-500 MHz; or 10 seconds for the band 500-1000 MHz.

c. The transmitting antenna will always be inside a building, and power will not exceed 3.5 watts input to the antenna.

2. Prior to conducting a test, coordination by the test Agency's Frequency Assignment Subcommittee (FAS) Representative shall be effected with FAS Representatives of all Federal agencies and the FCC whenever such tests could affect their radio stations or FCC licensees.

3. Non-Federal stations conducting TEMPEST zone testing under contract should apply for license under Part 5 (Experimental Radio Services) of the FCC Rules. These operations shall be coordinated with the contracting agency and other Federal agencies by the FCC FAS Representative, as appropriate.

7.22 USE OF FREQUENCIES 10.525 GHz AND 24.150 GHz OR THE BAND 33.4-36.0 GHz FOR RADIOLOCATION DEVICES

Federal agencies may operate radio units for the purpose of determining distance, direction, speed or position by means of a radiolocation device on the frequencies 10.525 GHz and 24.150 GHz or in the band 33.4-36.0 GHz, provided FCC type-accepted equipment or equipment developed with identical standards or specifications is used.

7.23 FEDERAL GOVERNMENT AGENCIES AS END USERS OF FCC LICENSED COMMERCIAL SERVICES

Federal Government entities may, without further authority from the Assistant Secretary of Commerce for Communications and Information, operate radio devices as end users in commercial FCC-licensed systems in the services listed below. Operation of end user radio devices is under the control of the FCC licensee, and Federal use must be in accordance with FCC rules governing the specified service. This section does not relieve Federal users from any other policy requirements and it is the responsibility

of the Federal user to determine if its operations are eligible to operate under the FCC license or under the FCC rules.

- Paging
- Cellular
- Personal Communications Service
- Specialized Mobile Radio
- Wireless Communications Service
- Blanket Licenses[3] for Earth Stations in the Fixed-Satellite (e.g., 6/4 and 14/12 GHz) and Mobile-Satellite Services

7.24 ESTABLISHING INTEROPERABILITY BETWEEN FEDERAL ENTITIES AND NON-FEDERAL PUBLIC SAFETY ENTITIES

Interoperability may be established between Federal entities and non-Federal public safety licensees via memorandum of understanding (MOU). The MOU must be agreed to by the Federal and non-Federal public safety entities.

One method of achieving interoperability involves the use of a passive cross patch switch that is installed on the non-Federal public safety entity's transmitter. It is important to note that the attachment of any device to the FCC licensed transmitter has the potential to alter the operating characteristics of the transmitter. However, if the cross patch switch is passive and does not alter the transmitting characteristics of the licensed non-Federal public safety entity's transmitter, no modified FCC issued license is necessary to permit operation of the non-Federal public safety entity's transmitter with the passive cross patch switch.

7.25 USE OF ELECTRONIC COUNTERMEASURES/EQUIPMENT IN RESPONSE TO RADIO-CONTROLLED IMPROVISED EXPLOSIVE DEVICES

The Department of Justice is authorized to conduct electronic countermeasures in accordance with IRAC Document 35906/3, titled *AUTHORIZATION OF RADIO TRANSMISSION AND THE CONTROL OF INTERFERENCE* APPLICABLE TO THE DEPARTMENT OF JUSTICE (DOJ) *PROGRAM FOR APPLYING ELECTRONIC COUNTERMEASURES (ECM) IN THE UNITED STATES IN RESPONSE TO THREATS OF RADIO-CONTROLLED IMPROVISED EXPLOSIVE DEVICES (RCIEDs)* (LES/FOUO). This document contains details of a federally-sponsored electronic countermeasures program designed to address the requirements of U.S. bombs squads in response to radio-controlled improvised explosive devices. The document describes required training and certification procedures for program participants, equipment to be used in the program, and summarizes the general program operations, such as coordination and reporting requirements for frequency management and interference mitigation and control. This document is only approved for limited release to the program's sponsors and contractors, to trained and certified program participants, and to other Federal agencies as necessary in connection with the program. Copies of IRAC Document 35906/3 (LES/FOUO) are available to the above approved entities only through a controlled distribution by the Federal Bureau of Investigation, the program's lead federal agency or by the IRAC pursuant to its document distribution procedures. The Department of Justice will review this document annually and provide updates to NTIA/IRAC accordingly.

(Last Page in Chapter 7)

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[3] "Blanket license" has the meaning given these terms in Part 25 of the FCC's rules, 47 CFR. Part 25.

Chapter 8

Procedures and Principles for the Assignment and Coordination of Frequencies

8.1 AUTHORIZING FREQUENCY USAGE

8.1.1 General Procedure for Authorizing Frequency Usage

1. Each Federal agency decides, in the light of policies, rules, regulations, frequency allocations, and availability of frequencies, whether, what, and how many mission requirements can be fulfilled by using telecommunications systems. Each agency makes the necessary technical studies, selects potential frequencies, coordinates with other agencies involved, and prepares and files an application with the NTIA, Office of Spectrum Management (OSM), Spectrum Services Division (SSD), for consideration by the Frequency Assignment Subcommittee (FAS) of the IRAC.

2. The FCC FAS Representative submits frequency assignment applications for non-Federal use of the spectrum in shared bands and other bands where there might be an impact on, or from, Federal operations. The FCC, as a Government entity, also submits frequency requests to the FAS for FCC spectrum requirements.

3. The OSM processes all applications through a series of automated routines to check them for completeness, accuracy, and compliance with regulations and procedures in so far as possible, then publishes these applications in an agenda for FAS review (FAS Agenda). The FAS agendas are distributed to each FAS member agency for study regarding the protection of their existing assignments. The OSM with assistance from the FAS member agencies, also performs a manual review of these applications to ensure adequate justification, compliance with policy and regulations, technical appropriateness, and whether or not NTIA, with the advice of the Spectrum Planning Subcommittee of the IRAC, has certified spectrum support for the system, if applicable. The OSM also reviews these applications to determine whether or not there is a conflict with the assignments of the FAS non-member agencies. FAS member agencies finding problems with applications listed in the FAS agendas may table these applications for further review, correction, or referral to a formal meeting of the FAS. Tabling action shall be limited to the categories listed previously in this paragraph describing manual review.

4. The FAS considers pending items on a daily basis and takes action within established policy guidelines. When additional policy guidance is needed, agreement cannot be reached, the IRAC has so directed, or an agency so requests, applications are referred to the IRAC. Matters that cannot be resolved with the IRAC, those that NTIA directs, or those requested by an agency, are referred to the Deputy Associate Administrator, Office of Spectrum Management, NTIA, who resolves them or refers them to the Administrator, NTIA, for decision. Federal frequency assignment decisions made by the Administrator, NTIA, may be appealed to the Director of the Office of Management and Budget (OMB) per paragraph 3-2 of Executive Order 12046.

5. Matters of considerable importance, such as changes to the National Tables of Frequency Allocations, significant Federal use of non-Federal frequency bands, and advice to the Department of State, are recommended to NTIA for consultation with the FCC or other appropriate agencies. Although Federal applications are not heard in public for security reasons, the public is represented by the FCC who may object, concur, or give tacit approval.

6. The Government Master File (GMF) will be updated weekly to reflect those frequency assignment actions agreed upon by the FAS and approved by the Deputy Associate Administrator, Office of Spectrum Management, NTIA, and, for electromagnetic compatibility analysis purposes, those Canadian assignments along the U.S./Canada border that have been coordinated with the U.S. Government frequency management community under the provisions of the U.S./Canada Coordination Agreement (see Section 3.4).

a. Upon request, the GMF data, including extracts or the entire GMF on CD-ROM, will be distributed by NTIA to Federal Government agencies. However, since the GMF data is classified CONFIDENTIAL, it shall be distributed only in accordance with the provisions of Executive Order 12958.

b. Upon request, NTIA will issue written authorization for those frequency assignment applications which are approved.

c. Requests for distribution of the GMF, extracts thereof, and other listings must be made through the agency's IRAC or FAS representative and directed to:

Chief, Frequency Assignment Branch
NTIA/OSM/SSD, Room 1805
U.S. Dept. of Commerce
1401 Constitution Ave, NW
Washington, DC 20230

8.1.2 Authorizing Frequency Assignments to Stations of Foreign Governments in Washington, DC

1. Public Law 87-795 amended the Communications Act of 1934 by adding subsection 305(d)[1] which vested in the President the authority to authorize a foreign government to construct and operate a radio station at the seat of government, where (1) he determines that the authorization is in the national interest of the U.S., and (2) where such foreign government has provided reciprocal privileges to the U.S. to construct and operate radio stations within territories subject to its jurisdiction. Under the President's Reorganization Plan No. 1 of 1977, this authority was delegated to the Secretary of Commerce by Executive Order 12046 of March 26, 1978.

2. The Secretary of Commerce has delegated this Presidential authority to the Assistant Secretary of Commerce for Communications and Information (Administrator, NTIA), by Department of Commerce Order 10-10 of May 9, 1978, which states in part,"... Authorization for the construction and operation of a radio station pursuant to this section and the assignment of a frequency for its use shall be made only upon recommendation of the Secretary of State and after consultation with the Attorney General and the Chairperson of the Federal Communications Commission."

3. Following the approval in principle by the Assistant Secretary of Commerce of the establishment of a radio station in Washington, DC, by a particular foreign government, the Department of State will sponsor the necessary frequency applications in the Interdepartment Radio Advisory Committee (IRAC). IRAC shall review the applications and submit its recommendations to NTIA. The IRAC will be provided with the instruments of authorization as approved by the Deputy Associate Administrator, Office of Spectrum Management, NTIA.

4. The technical conditions and the procedures for IRAC consideration of these applications are as follows:

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[1] The Communications Act of 1934 was amended in 1996, this text is now contained in subsection 305(c).

a. The Department of State representative to IRAC will submit the applications to the Executive Secretary of the IRAC for technical consideration by IRAC's Frequency Assignment Subcommittee (FAS). Such application will indicate that the foreign administration involved has granted privileges to the U.S. for radio stations in the high frequency bands, antenna configuration and location, the hours of operation, and the name of the embassy will be included on the form. For radio stations operating as earth stations in the fixed-satellite service, the data specified in the applicable portion of Appendix **4** of the ITU Radio Regulations (RR) will be included as a minimum. However, when the earth station is proposed to operate in a band which is shared with terrestrial operations, the FAS shall not take action until the IRAC's Spectrum Planning Subcommittee (SPS) has indicated that coordination has been accomplished with the appropriate terrestrial operations.

b. For earth stations operating in a band which is shared with terrestrial operations, the Department of State IRAC representative will submit the data specified in the applicable portions of Appendix **4** of the RR to SPS for coordination with the appropriate terrestrial operations. Additionally, for earth stations in the fixed-satellite service, the proposed frequency usage shall be coordinated as required by 25.203 of the FCC Rules and Regulations. The results of that coordination together with the data and interference analysis will be included as part of the submission to the SPS.

c. Any embassy obtaining an authorization for an earth station operating in bands allocated for the fixed-satellite service must designate a representative to act in future coordination matters regarding terrestrial and satellite stations in the Washington, DC area.

d. A call sign or suitable designator will be furnished by the FCC.

e. Frequencies to be authorized shall be limited to those in bands allocated in the U.S. to the fixed service or the fixed-satellite service, as appropriate.

f. The bandwidth of emission to be authorized will normally be limited to that associated with diplomatic communications.

g. The antenna to be authorized shall be limited to the minimum size and configuration that will support the diplomatic communications system.

h. Applications that clear the FAS shall be referred to the IRAC by the FAS with its recommendations. IRAC shall forward the applications together with its recommendations to NTIA. The Executive Secretary (IRAC) has discretionary power to act for IRAC except in the case of applications for new authorizations.

i. Approved assignments shall be recorded in the Government Master File of frequency assignments with an indication of (a) the embassy involved; (b) the fact that the assignment was made by the Assistant Secretary under Public Law 87-795; and (c) the fact that the Department of State is responsible for the assignment.

5. The following regulations have been established concerning the operation of these stations:

a. The characteristics of the transmitted signals and the conduct of the operation shall be such as to comply with the provisions of law and treaty that govern operation of other stations under the jurisdiction of the United States and with any other provisions that may be prescribed by the President.

b. The operation is subject to adjustment, including termination, in the event of harmful interference to other authorized operations having the right to protection.

c. The station will be operated upon reasonable request by the Department of State for the purpose of conducting brief technical monitoring observations.

d. In general, notification to the ITU of the authorized operation shall be effected by the United States.

8.2 FREQUENCY ASSIGNMENT PRINCIPLES

8.2.1 Frequency Sharing

Sharing of frequencies is necessary for the fullest utilization of the radio spectrum. This may entail the acceptance of some interference but does not contemplate requiring the acceptance of harmful interference.

8.2.2 Planned Frequency Utilization

1. In the interest of planned and orderly utilization of the radio frequency spectrum, agencies are encouraged to inform the IRAC of planned frequency utilization.
2. This information normally should be furnished to the IRAC as a separate item of business. It may also be furnished to the IRAC or the FAS during the consideration of another agency's frequency assignment application when the proposed assignment has a bearing on the planned frequency utilization.
3. Whether such information will provide any prior rights for the operations concerned shall be determined by specific IRAC or FAS action on a case-by-case basis, taking into account all pertinent factors.

8.2.3 Consideration of Applications

Recognizing that the demand for radio frequencies greatly exceeds the supply, and to make the most efficient and orderly use of available frequencies in the national interest, frequency assignment action is predicated on consideration of all available data, including international regulations, national laws, established Government policies, national interest, availability of other possible communication facilities, and technical aspects.

8.2.4 Justification for Frequency Assignments

1. Applications for authority to use radio frequencies must be justifiable for reasons such as:
   Specific legislative directive
   International commitments
   To carry out the established mission of the applicant
2. Applications will indicate the purpose for which the frequency will be used, for example:
   Broadcasting
   Civil defense
   Emergency communications (as when normal communication facilities are disrupted or are inadequate as a result of hurricane, fire, flood, earthquake, or similar disaster affecting safety of life or property)
   Environmental data collection and dissemination
   Law enforcement
   Management and protection of federal property or personnel
   National defense
   National security
   Protection of national resources (for example, forests and waterways)

Power transmission and distribution
Research and experimentation
Safety
Space exploration

3. Description of the operation involved, and the specific objective to be satisfied, should be supplied in each instance, in sufficient detail to facilitate consideration of the application.

4. Where the application is for a new assignment, or for the modification of an existing assignment, the justification shall contain information concerning such of the below listed items as are pertinent, together with such other data as may be appropriate to substantiate the application:

a. Name of project; if new, a brief description thereof.

b. If the requested assignment is for use in a new circuit, net or system, or for a significant expansion of an existing system.

c. If it is a replacement frequency.

d. If the frequency applied for is already authorized the applicant, sufficient data concerning the existing authorization(s) to enable an assessment to be made of the expected effect of the requested assignment on the electromagnetic environment.

e. If one or more basic characteristics are unusual for the frequency band or radio service[2] specified, the reason therefor.

f. If the application is for a multiple listing of a particular circuit or operation.

g. The extent to which coordination has been achieved.

5. Applications for authority to use a radio frequency for a service which duplicates adequate existing facilities shall not be approved in other than exceptional cases.

8.2.5 Withholding Funds Pending Availability of Frequency Support

1. The obligation of funds by Federal agencies for the development or procurement of communication-electronic equipment, requiring the assignment and protection of radio frequencies for their use, should be withheld pending assurance of the availability of appropriate frequency assignment support. Requirements for obtaining frequency support for telecommunications systems or major modifications of an existing system are under Chapter 10. This includes the selection, procurement, and development of earth or terrestrial station sites and facilities as indicated in Section 8.2.8. This is particularly important in the selection of sites and frequencies for earth and terrestrial stations to be operated in the co-equally shared bands as indicated in Section 8.2.33 (see Sections 8.3.12-8.3.15) and in the bands where there are no Federal allocations. In addition, in the case of a Federal funded study, or a Federal funded equipment procurement, by non-Federal interests, wherein the use of radio frequencies is foreseen as a result of the study or procurement, the Federal Government agency concerned should, as far as practicable, apprise the contractor(s)/grantee(s) of the need for ensuring that radio frequency support appears feasible. In this regard, it may be necessary for the Federal agency, the non-Federal entity, or both, to coordinate with the FCC.

2. This subject is covered in Section 33.4 of OMB Circular No. A-11, as follows: "you must obtain a certification by the National Telecommunications and Information Administration, Department of Commerce that the radio frequency required is available before you submit estimates for the development or procurement of major radio spectrum dependent communications-electronics systems (including all systems employing space satellite techniques)".

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[2] Stations operating in a radio service on a secondary basis shall comply with the provisions of this Chapter with respect to stations operating in a radio service allocated on a primary basis.

3. Before procuring transportable Advanced Wireless Service (AWS), Cellular (Cell), or Personal Communications Service (PCS) systems, including Cell-On-Wheels (COW) and Cell-On-Light-Truck (COLT), operating in the bands 698-758, 775-788, 805-806, 824-849, 869-894, 901-902, 930-931, 940-941, 1710-1755, 1850-1990, 2110-2155 MHz, Federal agencies shall obtain a certification by NTIA.

8.2.6 Programs to Determine How the Spectrum is Used

Frequency Assignment Review Program

1. Each Federal agency shall maintain a program of continuing review of frequency assignments to its radio stations and shall delete or amend such assignments as appropriate. The objectives of this program are a) to ensure that frequency assignments are in current use and are correctly reflected in the Government Master File (GMF), b) to ensure that frequency assignments are required for continued operations for the purpose stated in their justification, and c) to ensure that frequency assignments are still qualified for authorization under the provisions of the regulations contained in this Manual. Each assignment shall be reviewed in the manner specified in Annex F, unless by the terms of its authorization it is subject to review more frequently.

Spectrum Measurement Program

2. A spectrum measurement program was established in October 1973 under which a van-mounted Radio Spectrum Measurement System (RSMS), operated by the Department of Commerce under the direction of NTIA, is used

a. to determine whether radio installations operated by the Federal Government are utilizing authorized frequencies and are operating in accordance with applicable regulations,

b. to provide information to help determine whether additional uses can be made in a particular band at a particular location, and

c. to provide information to prevent or resolve cases of interference between two or more users.

3. The use of radio frequencies by Federal agencies is subject to observation and measurement by the RSMS, in support of the spectrum management activities of NTIA. Notice of this was given to the applicable Federal agencies in October 1973. Such agencies should ensure that their field personnel remain informed, as appropriate.

Spectrum Management Survey Program

4. A program to survey spectrum management activities within the Federal Government was established in February 1965. The objectives of this program are to determine at the operational level the degree of implementation of the applicable provisions of this Manual, whether frequency usage is in accordance with authorizations, and to exchange information with a view toward improving spectrum management in general. Surveys are conducted by NTIA personnel by means of on-site observation of communication-electronic facilities and discussions with local frequency managers. Surveys are initiated through coordination with headquarters personnel, who are encouraged to participate in the surveys if possible.

Spectrum Resource Assessment Program

5. NTIA manages a program to assess spectrum use and to identify potential spectrum sharing problems within specific frequency bands allocated to the Federal Government. The objectives of this program include:

a. the review and documentation of the characteristics and deployment of existing and proposed systems in specified bands,

b, the identification of potential band sharing problems which may impact on the efficient use of the spectrum,

c. the evaluation of any identified electromagnetic compatibility problems, and

d. the identification of alternative spectrum management approaches to resolving these problems.

6. The sources of data used in completing these studies include the Government Master File, system data submitted in accordance with Chapter 10 of this Manual, data collected during the spectrum measurement and survey programs, as well as direct contact with the user agencies. These studies may be used in the development of spectrum policy, as background material for the systems review process (Chapter 10 of this Manual), and are available to the frequency managers of the various Federal agencies for planning purposes. Agencies are encouraged to cooperate and participate in the development of these spectrum resource assessments and make use of the spectrum resource assessment assistance which can be provided.

8.2.7 Notification of Discontinuance of Service

Assignment of a frequency to a particular station or class of station imposes upon the assignee the responsibility of duly notifying all interested agencies of proposed discontinuance of a station or a material change in character of service rendered, when other agencies are known to be dependent thereon or materially affected thereby.

8.2.8 Stations Located in Close Geographic Proximity

In general, the inherent right of the station first established is recognized as regards a proposed new station whether transmitting or receiving. Nevertheless, for stations located in close geographic proximity and particularly in the case of installations involving very high effective radiated powers (50 kW or greater), digital system receivers having high carrier to noise ratio requirements or receivers intended for reception of very low level radiation (-100 dBW or less), engineering solutions may require the cooperation of all agencies involved in the application of reasonable and practicable measures within the state of the art to avoid causing or being susceptible to harmful interference.

8.2.9 Authorized Area of Operations of Mobile Stations

For an assignment to a land station and one or more mobile stations, the area described under receiver ANTENNA LOCATION for the reception of transmissions from the land station by the mobile stations shall be considered also as the area in which transmissions from the mobile stations, associated with the land station, are authorized.

8.2.10 Relative Priority of Frequency Assignments

1. Priority, unless specifically qualified, is the right to occupy a specific frequency for authorized uses, free of harmful interference from stations of other agencies.

2. The relative status between radio services and between frequency assignments with respect to their conformity to the Table of Frequency Allocations is indicated in Part 4.1.

3. Unless specifically agreed otherwise at the time a frequency assignment is made, the relative priority between two frequency assignments which are substantially equal is determined by their dates of assignment. The frequency assignment with the earlier date has priority over the frequency assignment with the later date.

4. If a temporary or trial assignment is renewed or converted to a regular assignment, the applicable date of assignment for priority purposes is the original date from which continuous authorization has been in effect. If the particulars of an existing assignment are expanded (e.g., expansion of bandwidth, addition of new receiver antenna location, increase in power), but at a later date the assignment is changed back to the lesser particulars, the applicable date of assignment for priority purposes is the date on which the lesser particulars were first authorized.

5. The priority of a mobile station applies only in the geographical area designated in the particulars of the frequency assignment, as limited by the provisions of any limitation note which is part of the assignment.

6. The priority of a fixed station applies only at the geographical locality of the receiver antenna location designated in the frequency assignment, as limited by the provisions of any limitation note which is part of the assignment.

7. Priority notes shall not be applied to frequency assignments below 25000 kHz. Above 25000 kHz they shall be kept to a minimum.

8. Experimental classes of stations and classes of stations in support of experimental operations are on a secondary basis to stations of all other services.

9. Where, in adjacent Regions or sub-Regions, a band of frequencies is allocated to different services of the same category (i.e. both Primary or both Secondary), the basic principle is the equality of right to operate. Accordingly, the stations of each service in one Region or sub-Region must operate so as not to cause harmful interference to services in other Regions or sub-Regions.

8.2.11 Use of Radio Frequencies Below 30 MHz for Domestic Fixed Service

1. To insure that, insofar as practicable, sufficient high frequencies will be available for the operation of radio circuits essential to the national security and defense and to conserve frequencies below 30 MHz for services which cannot be operated adequately without them, only in the following circumstances shall departments and agencies of the Executive Branch of the Government use frequencies below 30 MHz for domestic fixed service[3] (within conterminous United States):

a. When it is indispensable to do so, and on the condition that the characteristics of the stations continue to conform to those in the United States list "Government Master File (GMF)," a land station may communicate, on a secondary basis, with fixed stations or other land stations in the same category, using its assigned frequencies.

b. Where technical and operational requirements dictate, fixed stations may transmit to other fixed stations for the domestic haul of overseas traffic in transit, or destined for the United States. Such domestic radio haul shall be a segment of the overall overseas radio system. (These assignments will bear record note S208-see Annex A)

c. When there is a need to provide instantaneous transmission of vital emergency, operational command and alerting traffic of such importance as to affect the immediate survival and defense of the Nation. (These assignments are Category 1 assignments and will bear record note S148--see Annex A)

(1) Circuits in this category will be maintained in operational status at all times, with on-the-air test transmissions to insure the highest degree of readiness.

(2) Frequency assignments for such circuits shall be afforded protection commensurate with the importance of the communications for which the circuit is intended.

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[3] Authorization in the fixed service with Note S362 are not construed to come within the term "domestic fixed service".

d. When required for use in an emergency jeopardizing life, public safety, or important property under conditions calling for immediate communication where other means of communication do not exist or are temporarily disrupted or inadequate. To insure that radio equipment for emergency use is maintained in satisfactory operating condition, testing on frequencies in this category is permitted, provided that insofar as practicable transmitters shall be tested with a non-radiating load and the test use of a radiating antenna held to a minimum and provided further that such testing shall be restricted to test message traffic and shall not include operator training. (These assignments are Category 2 assignments and will bear record note L012 or L113--see Annex A)

e. When there is a need to provide for a communications system manned by fully qualified operators who are military reservists or affiliates. Except in emergencies, frequency assignments in this category shall not be used as a means for passing traffic that in the absence of such assignments would require delivery by other means. (These assignments are Category 3 assignments and will bear record note S012--see Annex A)

f. When other telecommunication facilities do not exist, are inadequate, or are impracticable of installation, and when the use of frequencies above 30 MHz is not practicable. (These assignments are Category 4 assignments and will bear record note S206--see Annex A)

g. In an emergency where it has not been feasible to make prior arrangements for alternate means of communications, it is permissible to operate temporarily on regularly assigned frequencies in a manner other than that specified in the terms of an existing assignment or on other appropriate frequencies under the following special circumstances:

(1) An emergency must actually exist or imminently threaten. An emergency for the purpose of this provision means a situation of temporary duration resulting directly or indirectly from a natural catastrophe or other occurrence which seriously affects the welfare of a community or of an area to the extent of endangering human life and property and in connection with which special communications facilities are required temporarily.

(2) Emergency operations shall be discontinued as soon as substantially normal communications facilities are restored.

2. With respect to subparagraphs 1c, 1d, 1e and 1f above, requests for the authorization of frequencies below 30 MHz for new systems, or in circumstances where the pressure on the radio spectrum would be increased materially, shall be referred by the Chairman, FAS to NTIA for review prior to assignment action. Approved assignments will be recorded in the GMF, and will bear record note C078 (see Annex A).

a. In compliance with the foregoing, the Chairman, FAS shall refer all applications that meet the following conditions:

(1) The frequency is below 30 MHz.

(2) The type of action is NEW, NOTIFICATION or MODIFICATION.

(3) The class of station is FX or AX.

(4) Record note S362 is not applicable.

(5) The transmitter and receiver ANTENNA LOCATIONS (XAL and RAL) are both located within the conterminous United States.

(6) The proposed frequency usage falls within category 1, 2, 3 or 4 above.

b. However, referral to NTIA is not required for the following exceptions:

(1) EXCEPTION 1--For a change in frequency of an existing station when an existing assignment for a frequency of the same general kilohertz order for that station is simultaneously deleted. (These assignments will bear Record note S358--see Annex A)

(2) EXCEPTION 2--For the addition of a new station to an existing domestic fixed circuit or network, provided the addition would not result in an extension of the hours of use of the frequency because of wave propagation. (These assignments will bear Record note S359-see Annex A)

(3) EXCEPTION 3--For the modification of an existing assignment, provided the modification would not increase materially the impact on the use of the radio spectrum below 30 MHz. (These assignments will bear Record note S360-see Annex A)

3. In order to establish adequate radio backup of wireline facilities in advance for use during an emergency, subparagraphs 1c and 1d above are interpreted to embrace the following elements:

a. the predetermination of essential communication circuits which cannot tolerate disruption;

b. the installation of the necessary equipment;

c. the selection and assignment of frequencies to be employed on those circuits; and

d. necessary testing.

8.2.12 Explanation of the Term "Tactical and Training"

1. The descriptive term "tactical and training" has been used for many years in connection with the assignment of radio frequencies and their operational use by units of the Army (the field Army), Navy (Fleet and Marine Forces), and Air Force (Tactical and Strategic Air Forces).

a. The term "tactical" emphasizes the aspect of mobility and flexibility required by such units as components of a military force whose operations (and tactics) are directed by the responsible military commander. Organizational equipment, including all communications-electronics (C-E) equipment, issued to such military units is designed specifically to meet their peculiar needs under combat conditions. Such C-E equipment includes that required to effect communications internal to the particular unit and its components, as well as communication to the next higher/lower echelon of command and for other special-purpose C-E systems used for surveillance, weapons control, aeronautical and meteorological aids, etc.

b. "Training." In peacetime within the United States and Possessions, military operations are normally in connection with training and the obtaining of proficiency in all aspects of their ultimate employment as a military force in an emergency situation. The simulation of wartime operations in day-to-day use, field and fleet exercises and major maneuvers, is an essential requirement to assure immediate operational readiness.

2. The specific frequencies designated and authorized for military tactical and training purposes are primarily utilized as a group to meet the more essential needs, on a day-to-day basis, by operating forces throughout the United States and Possessions. Generally, all of these frequencies are assigned for use by major military commands. Where the source of frequencies is inadequate to meet special needs of these commands, e.g., in large exercises and major field and fleet maneuvers, they are supplemented by the use of frequencies in both Federal and non-Federal bands, subject to established procedures to insure the avoidance of harmful interference to the operations of the primary agencies and activities.

3. In addition to the principal use of such frequencies as set out in the preceding paragraphs, the following uses of a corollary nature, while not necessarily tactical and training, must be recognized where suitable frequencies such as those authorized for tactical and training purposes must be utilized:

a. In event of civil disturbances or other emergencies, military units may be required to assist in maintaining order and in safeguarding human life and property.

b. In the development, type acceptance, and compatibility testing or evaluation of C-E equipment intended for tactical purposes.

c. In effecting training of individuals and units at special service schools and test ranges.

d. In providing demonstrations of military weapons and C-E equipment at laboratories, proving grounds, and test ranges.

4. A further very important aspect which is associated with these tactical and training frequencies, is the fact that this group of frequencies constitutes the limited base to support military needs under initial mobilization conditions. Experience gained from peacetime utilization of the specific frequencies designated and authorized for military tactical and training purposes materially enhances their value and usability in the event of a mobilization situation, particularly during the initial transition phase.

5. Certain military C-E equipment includes both portable and transportable types. In any operational situation it assumes a radio service classification in accordance with the nature of its actual operation. A portable or transportable station may at one moment be operating with a station in the fixed service; alternatively, when communication is involved with an aircraft or a ship, the station may be operating in the aeronautical or maritime mobile service.

8.2.13 Guidance on Use of Frequencies by Stations in Certain HF Bands

1. WARC-79 and WARC-92 adopted a number of allocation changes in the 3000-27500 kHz portion of the radio frequency spectrum. The changes reduce the spectrum allocated for the fixed and mobile services and increase the spectrum allocated for HF broadcasting. The effective implementation dates for the expanded radio services will vary over a long period of time; due to the complex re-accommodation process and access restrictions that vary by band. WRC-95 made available for use the HF broadcasting spectrum allocated by WARC-79, effective 1 January 1996. The use of this spectrum is on the basis of Article 12 and taking into account the provisions of RR **5.148**.

2. WARC-79 allocated the following HF Bands to the broadcasting service on a primary basis. Exceptionally, fixed service assignments in the bands 9775-9900, 11650-11700, and 11975-12050 kHz, meeting the criteria of RR 5.147, may be retained.

kHz	kHz
9775-9900	15450-15600
11650-11700	17550-17700
11975-12050	21750-21850

3. WARC-92 allocated the following HF bands to the broadcasting service on a primary basis, with an implementation date of 1 April 2007. In these bands, the broadcasting service is limited to single-sideband emissions and characteristics, specified in ITU RR Appendix **11**, and subject to planning procedures contained in Article **12**:

kHz	kHz
5900-5950	13570-13600
7300-7350	13800-13870
9400-9500	15600-15800
11600-11650	17480-17550
12050-12100	18900-19020

After 1 April 2007, continued use of these bands by the fixed and mobile services is internationally governed by the provisions of RR **5.136**, **5.143**, **5.146** and **5.151** as applicable. Additionally, Resolution **21** provides for implementation of these bands for broadcasting by a future WRC and the reaccommodation of "Class of Operation A" frequency assignments contained in the Master International Frequency Register as of 1 April 1992. Resolution **21** also provides for a transition period from 1 April 1992 to 1 April 2007. Federal agencies should, to the maximum extent feasible, adhere to the following principles when making fixed and mobile service assignments in these bands:

a. Avoid internationally notifying assignments to the fixed and mobile services. If assignments are notified they are subject to review by the BR on 1 April 2007 to determine if they are in conformity with the Table of Frequency Allocations and other provisions of the Radio Regulations.

b. Review assignments of "Class of Operation A" in order to determine if they can be downgraded to "Class of Operation B or C".

c. Identify "Class of Operation A" assignments during the transition period and move them to appropriate frequency bands with notification to the BR. In this regard if only the assigned frequency and no other characteristics of the assignment are changed, the assignment will retain its original date.

d. New frequency assignments that are only required for a short period of time or until 1 April 2007, not requiring international protection, should be made in these bands so that the remaining HF bands allocated to the fixed and mobile services can be used to accommodate "Class of Operation A" assignments.

8.2.14 Applications for Frequency Assignments in Bands Allocated to the Radio Astronomy Service

In the bands allocated to the Radio Astronomy Service by the Federal Table of Frequency Allocations, the FAS shall keep the IRAC informed of all applications for assignments that are not in accordance with that Table, including requests for renewals and modifications, except modifications that are of an administrative or non-technical nature.

8.2.15 Referral of Applications Related to the Space Service

In the bands allocated to the space service by the Federal Table of Frequency Allocations, the FAS shall refer to the IRAC all applications for assignments that are:

a. not in accordance with the Table except when the application is for:

(1) the renewal of an existing assignment; or

(2) test, and operation of electronic threat simulators during military tactical and training exercises; or

b. for experimental stations except when the application is for:

(1) the renewal of an existing assignment; or

(2) the static (ground-to-ground) test of a space system; or

(3) experimentation that is consistent with the use for which the band is allocated.

8.2.16 Assigning the Most Heavily Occupied Frequency Channel

In order to have available the greatest possible spectrum support for future radiocommunication requirements, each new frequency assignment should be made in such a way that the increase in the total spectrum space committed is as small as possible. Accordingly, it shall be the normal practice, where feasible and consistent with frequency allocation and assignment plans, to assign the most heavily occupied frequency channel before resorting to those less heavily occupied.

8.2.17 Determining Whether a Station is a Federal Station

1. The following guidelines are to assist in the determination of whether or not a station belongs to and is operated by the United States as specified in Section 305(a) of the Communications Act of 1934:

a. The department or agency concerned should be able to exercise effective control over the radio equipment and its operation; and

b. The department or agency concerned assumes responsibility for contractor compliance with Executive Branch, departmental, or agency instructions and limitations regarding use of the equipment and ensures that such instructions and limitations are met when operating under the authority of an Executive Branch frequency authorization to the department or agency; and

c. The station should be operated by an employee of the department or agency or by a person who operates under the control of the department or agency on a contractual or cooperative agreement basis, and who is under supervision of the department or agency sufficient to ensure that Executive Branch, departmental, or agency instructions and limitations are met.

2. It is recognized that a Federal agency may make a contract arrangement for maintenance or operation of a radio station under its control without diminishing the effective control of, or responsibility for, such station, provided the appropriate limitations or requirements are specified.

3. Since the foregoing may not cover every case, or where there may be doubt, the determination will be made by the department or agency concerned after consultation with the NTIA/FCC as appropriate.

8.2.18 Assignment of a Band of Frequencies to a Station

When a band of frequencies is assigned to a station, e.g., 400-406 MHz, the necessary bandwidth of the station shall be so located within the band that it does not extend beyond the upper or lower limits of the band.

8.2.19 Limitation of Radiated Power

Federal radio stations shall radiate only as much power as is necessary to ensure a satisfactory service.

8.2.20 Conversion of Fixed Stations to SSB Transmission

1. In the bands below 30 MHz, radiotelephone stations in the fixed service that use double sideband (DSB) transmission shall be converted by January 1, 1974 to single sideband (SSB) or independent sideband (ISB) transmission with suppressed or reduced carrier. Exceptionally, however, such stations with mean power of less than 50 watts and those used for military tactical or training operations may continue to use double sideband transmission.

2. The FAS shall refer to the IRAC all applications for double sideband operations in the fixed service between 4000 and 27500 kHz with A3E emission and bandwidth of 6 kHz or more. However, exempt from referral are those applications involving average powers less than 50 watts, those for military tactical and training operations, and those where there is a statement on the applications to the effect that the applicant has a program for conversion to SSB within a reasonable period of time.

8.2.21 Use of Ionosphere Sounders

1. The use of ionosphere sounders for realtime selection of frequencies for operational communication circuits, realtime monitoring of upper atmosphere phenomena, and for the predicting of propagation conditions will be authorized only under the following conditions:

a. When it has been determined that no existing authorized ionosphere sounder transmitter is capable of meeting the requirement under a common user concept.

b. Operations shall be on a secondary basis to authorized radio services.

c. Transmissions in the bands 2495-2505, 4995-5005, 9995-10005, 13360-13410, 14990-15010, 19990-20010, 21850-21870, 24990-25010, 25550-25670 kHz and 38.00-38.25 MHz shall be avoided for sounders capable of frequency suppression.

d. Transmissions shall be swept or stepped through the operating range of the equipment at a rate or time interval expected to avoid harmful interference.

e. Transmitters shall be designed to eliminate emissions on any frequency channel where harmful interference is caused to authorized radio services.

2. Applications for frequency assignments to sounder network stations or sounder prediction stations shall include the following basic information in the SUPPLEMENTARY DETAILS (SUP) field:

Channeling plan(s) (required for all sounder network stations and, as applicable, for sounder prediction stations)[4]

Pulse duration(s)
Pulse repetition frequency(ies)
Pulse per channel
Scan rate(s)
Scan interval(s) (time between scans)
Antenna type(s)
Antenna azimuth
Antenna orientation(s) (If directional, indicate orientation of major lobe.)

3. All applications for sounders shall include a statement that the applicant has determined that no existing authorized ionosphere sounder transmitter is capable of meeting the requirement.

8.2.22 Use of Ionosphere Sounders for Purposes Other Than Those Mentioned in Section 8.2.21

The use of ionosphere sounders for purposes other than those mentioned in Section 8.2.21 shall be authorized only as experimental stations. The conditions to be applied shall be determined on a case-by-case basis.

8.2.23 Minimum Data Recommended for Inclusion on Applications for Antenna Testing Assignments Above 30 MHz

The following minimum data are recommended for inclusion, when applicable, on each application for frequency assignment for the testing of antennas above 30 MHz, in order to expedite action on the application and to enable present users of the frequencies to evaluate the potential interference.

1. Frequency and Transmission Data
   a. Frequencies or Frequency Band Required

NOTE--The use of individual frequencies rather than a frequency band will greatly facilitate consideration of the request.

   b. Transmission Characteristics
      (1) transmitter output power
      (2) effective radiated power (if ERP is unknown, give a reasonable estimate)
      (3) types of emission
      (4) bandwidth for each type of emission
2. Supporting Information
   a. Name of geographical location and latitude and longitude of antenna site to the nearest second.
   b. Test Environment
      (1) profile of terrain-by description, maps and/or other means
      (2) if tests are to be conducted within shielded enclosures, so state, and give the attenuation (in dB) of the enclosure
   c. Antenna Configuration
      (1) type of antenna

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[4] e.g.--First octave: 2.075 to 3.975 MHz, 20 channels spaced 100 kHz.

(2) whether full scale or less than full scale
(3) azimuth of the main lobe
(4) gain
(5) beam width in azimuth and elevation
(6) height above ground
(7) height above mean sea level

d. Period of Operation

(1) duration of requirement, including the dates it will be required.

(2) estimated hours of use, in local time; for example, 0800 to 1700 daily Monday through Friday; daytime only Monday through Friday.

3. Justification

a. Except in very extraordinary circumstances, applications should not be made for bands where regulations prohibit the granting of assignments, for example, the radio astronomy bands, the standard frequency bands, certain space bands. (See U.S. Table of Frequency Allocations.) If an assignment falling in a prohibited band is requested, a complete and adequate justification must be given as to why operation within the prohibited band is required.

b. The service should be specified for which the operational use of the antenna under test is intended, for example, radiolocation, radionavigation, fixed, space.

c. Unusual conditions should be justified, for example, high power for breakdown tests.

d. If the testing is being done under a Federal Government contract, the Federal agency and contract number should be specified.

8.2.24 Use of Frequencies in the Bands Between 2850 and 22000 kHz Allocated Exclusively to the Aeronautical Mobile Service

1. The bands allocated exclusively to the aeronautical mobile service are subdivided into categories defined in Article **43** of the RR as follows:

a. Frequencies in any band allocated to the aeronautical mobile (R) service are reserved for communications related to safety and regularity of flight between any aircraft and those aeronautical stations primarily concerned with flight along national or international civil air routes.

b. Frequencies in any band allocated to the aeronautical mobile (OR) service are reserved for communications between any aircraft and aeronautical stations other than those primarily concerned with flight along national or international civil air routes.

2. National planning for the use of these bands is governed by the provisions of Article **43** and Appendices **20** and **27** of the RR. These appendices allot specific (R) channels for use in particular areas, allot specific (OR) channels for use by particular countries, and set forth technical and operational principles governing this usage. The use of these bands by Federal stations is subject to the normal procedures for coordination and assignment, except as provided by Sections 7.5.3 and 7.5.4, and, in addition, such use shall comply with the pertinent international regulations and plans mentioned above and more specifically referenced below.

Aeronautical Mobile (R) Bands

3. Frequency assignments to stations in the aeronautical mobile (R) service, in the bands allocated exclusively to that service between 2850 and 22000 kHz, shall be assigned in conformity with the provisions and the allotment plan of Appendix **27** to the RR. Such assignments shall conform to the plan for the allotment of frequencies to (a) Major World Air Route Areas (MWARA's), (b) Regional and Domestic Air Route Areas (RDARA's), (c) VOLMET Allotment Areas, and (d) Worldwide Allotment Areas contained in Appendix 27 or, to meet operational requirements not otherwise met by the Allotment Plan, comply with the provisions of Appendix 27 for the adaptation of allotment procedures (27/20,

27/21 and 27/22). Assignments in support of International Air Routes (MWARA and VOLMET allotments) are also within the purview of applicable ICAO frequency assignment plans that have been agreed internationally and are recognized in the ITU Radio Regulations.

4. Single sideband operations only are permitted in the bands allocated exclusively to the Aeronautical Mobile (R) Service in accordance with the provisions of Appendix **27** Part I, Section II, C. This section of Appendix **27** also contains information on the use of several emissions subject to compliance with special provisions applicable to each use.

5. As a matter of general policy, high frequencies are not used for aeronautical mobile (R) communications in the domestic services within the conterminous United States, the need for such frequencies having been generally eliminated through successful use of VHF communications. However, Appendix **27** Part II, Section I, Article **2** provides for the allotment of frequencies to the RDARA's, which include the conterminous United States (RDARA 27/151), and also Alaska (27/143), Hawaii (27/154), and Puerto Rico and the Virgin Islands (27/157). This then affords for special and certain related aeronautical communication requirements, not conforming fully to the definition of the Aeronautical Mobile (R) Service, to be satisfied by use of frequencies from these allotments within the limitations of the following national criteria established jointly with the FCC:

a. Communications related to safety and regularity of flight between aircraft and those aeronautical stations primarily concerned with flight along national or international civil air routes shall have absolute priority over all other uses.

b. Use of (R) band high frequencies shall be limited to single sideband air/ground and incidental air/air communications beyond the range of VHF/ UHF facilities.

c. Users shall share to the maximum extent possible.

d. Requirements shall be handled on a case-by- case basis.

e. A showing must be made that the accommodation of the requirements in the bands other than aeronautical mobile (R), e.g., fixed bands, is not satisfactory for technical, operational, or economic reasons.

f. Only those requirements will be considered where the primary need for communications is for the safety of the aircraft and its passengers or for operational control communications, i.e. "communications required for exercising authority over initiation, continuation, diversion, or termination of a flight in accordance with the provisions of Annex 6" (ICAO).

g. Use of aeronautical mobile (R) high frequencies in accordance with the foregoing normally shall be limited to non-military.

h. If the aforementioned criteria are met, the stipulation that (R) bands are to be used only for flights along national and international civil air routes need not be met.

6. The following frequencies are available to all Federal users as frequencies that may be used for operational control and safety of civil government aircraft in the specified areas:

Assigned Frequency (kHz)	Carrier Reference Frequency (kHz)	Available Area
2897.4	2896	AK, HI, CONUS
2948.4	2947	AK, HI, CONUS
3002.4	3001	AK, HI, CONUS
6539.4	6538	CONUS Only
8886.4	8885	CONUS Only
8910.4	8909	AK, HI, CONUS
10055.4	10054	HI Only
11307.4	11306	CONUS Only
17950.4	7949	AK, HI, CONUS
21926.4	21925	AK, HI, CONUS
21929.4	21928	AK, HI, CONUS
21935.4	21934	AK, HI, CONUS

7. These frequencies are intended for users in support of operations not exclusively enroute in nature. These frequencies were chosen so as to avoid those channels which might result in harmful interference to aeronautical stations dedicated to the safety and regularity of flight. The use of these channels by U.S. Federal Government stations with a maximum peak envelope power of 6 KW for Aeronautical terrestrial stations and 400 watts for aircraft stations is allowed under Provision 27/60 of Appendix **27** of the RR. (A list of additional frequencies available to designated agencies in specified areas is contained in the IRAC Supplement to this Manual.) It is assumed that the maximum peak envelope power specified above for aeronautical terrestrial stations will produce the mean effective radiated power of 1 KW used as a basis for the interference range contours.

8. Federal aeronautical stations that operate in the aeronautical mobile (R) service within U.S. and Possessions are normally authorized only for the Federal Aviation Administration. Non-Federal stations in this service are authorized by the FCC. Coordination is accomplished as appropriate for assignments to these stations, and to those fulfilling the joint national criteria, through established IRAC/FCC procedures.

Aeronautical Mobile (OR) Bands

9. Frequencies in bands allocated exclusively to the (OR) service are internationally allocated to countries by Appendix **26** of the RR, which also establishes sharing criteria, protection ratios, and other technical and operational principles. These principles recognize the possible necessity for the adaptation of the allotment plan to meet valid requirements of the various administrations, provided these adaptations do not decrease the protection to frequencies assigned in strict adherence to the plan.

10. Frequencies in the bands allocated exclusively to the (OR) service are nationally used primarily for the satisfaction of military aeronautical requirements. Assignment of frequencies in these bands is subject to coordination with the Military Departments through the IRAC mechanism.

Channels Common to the Aeronautical Mobile (R) and (OR) Services

11. Section 7.5.3 authorizes aircraft, ships, and survival craft stations to use the channels common to the (R) and (OR) services, carrier (reference) frequencies 3023 and 5680 kHz, provided such use is in accordance with Appendix **13** Part A2, Section I, D, §3 and Appendix **13** Part A2, Section I, F, § 5 of the RR, the appropriate provisions of Appendices **27**. Section 7.5.4 authorizes additional uses by mobile stations engaged in coordinated search and rescue operations. Any use of these channels by land stations engaged in the coordination of search and rescue operations shall be in accordance with the same provisions, and shall be authorized by applications submitted and processed through normal assignment procedures.

8.2.25 Use of Frequency Diversity for LOS Transmissions in the Bands Allocated to the Fixed Service Above 1710 MHz

The necessity for employment of some form of diversity operation on selected LOS fixed radiosystems is recognized when such operation is required to provide acceptable levels of quality and reliability. However, in view of the growing demands on the frequency spectrum and the recognized effectiveness of space diversity techniques, the use of frequency diversity in the bands 1710-1850, 2200-2290, 4400-4990, 7125-7250, 7300-7975, and 8025-8400 MHz is limited as follows:

a. The use of frequency diversity for new Federal LOS fixed radio systems shall be limited to those systems for which frequency diversity can be justified. Existing systems employing frequency diversity may continue until such time as frequency assignment congestion dictates the need for reevaluation.

b. The justification for the use of frequency diversity shall include a statement of the requirement for a high degree of systems reliability and another that an engineering evaluation has been made which demonstrates that the required reliability necessitates frequency diversity. The justification shall be submitted in accordance with the provisions of Section 9.8.2, paragraph 80e.

8.2.26 Use of Radio Frequencies to be in Accordance with ITU Provisions

Except as otherwise provided in this Manual or by the terms of a frequency authorization, present or future, the use of radio frequencies by Federal radio stations within the US&P shall be in accordance with the provisions of the ITU Convention and Radio Regulations.

8.2.27 Experimental Use of Certain Radio Spectrum

Experimental use of any shared Federal/non-Federal frequency band or exclusive Federal frequency band may be authorized so that non-Federal developers may advance the state of technology. Experimental usage will be authorized for the period required subject to not exceeding five years, which may be extended with appropriate justification. However, in order to protect operations on frequencies assigned or required for operation of the National Airspace System, the frequency bands under the Aeronautical Assignments Group area of responsibility as defined in Section 1.3.2, and those bands designated in Section 8.3.16, will normally be authorized for a period not to exceed two years. Any use of these bands for experimental use beyond two years may be authorized on a case-by-case basis with appropriate justification.

8.2.28 RADIO FREQUENCY ELECTROMAGNETIC FIELD SAFETY AND PROTECTION

1. Exposure to radio frequency (RF) electromagnetic fields may present potential health hazards. Federal agencies shall take actions consistent with existing safety and health standards/guidelines, applicable voluntary national standards/guidelines, and prescribed Federal regulations to ensure that people are protected from such emissions.

2. Federal agencies shall implement an RF safety program to protect exposed persons. RF safety programs may be individualized by agency and may be a part of an overall general safety program. Agencies may adopt recognized emission exposure standards/guidelines or portions of recognized standards/guidelines to develop an RF safety program most suitable for their facilities. Agencies should ensure that the most current versions of their chosen standard/guideline are used.

3. RF emitters licensed by the Federal Communications Commission (FCC) but located on Federal property must comply with the FCC's existing safety and health standards/guidelines, applicable voluntary national standards/guidelines, and prescribed Federal regulations. NTIA-authorized emitters on non-Federal property must comply with existing safety and health standards/guidelines, applicable voluntary national standards/guidelines, and prescribed Federal regulations used by the Federal agency operating the emitter.

4. All RF emitters at or near a specific location must be taken into consideration in a complete RF safety evaluation. Agencies shall use the most current methodologies for the calculations and/or measurements to ensure compliance with existing safety and health standards/guidelines, applicable voluntary national standards/guidelines, and prescribed Federal regulations.

8.2.29 Use of Frequencies by Stations in the Maritime Mobile Service

1. Stations in the maritime mobile service utilize bands allocated either exclusively to this service or on a shared basis with other services. Several international plans detail the specific uses of certain frequencies. The maritime mobile service is provided with detailed operational and frequency regulations contained in the ITU RR. In addition, an abstracted manual which includes pertinent ITU Radio and Telegraph and Telephone Regulations entitled "Manual for Use by the Maritime Mobile Service," is issued by the ITU, and shall be carried by Federal ships as required by and in accordance with regulations of the user agency (RR Appendix **16**).

2. National planning for the use of the maritime mobile bands closely follows the international use. Exceptions are indicated in the National Table of Frequency Allocations (see Chapter 4) and as noted herein. For the bands 4-27.5 MHz, the assignable frequencies listed in RR Appendix 17 Part A for each maritime mobile function are delineated in Annex H.

Maritime Mobile Telegraphy

3. Ship stations use working frequencies in the bands 415-490 kHz and 510-535 kHz, specified by RR **52.39**, for transmissions to coast stations. Coast stations transmit on other frequencies in these bands. Initial contact is usually established by calling on 500 kHz and shifting to appropriate working frequencies. Special provisions for morse telegraphy calling allow the use of 512 kHz when 500 kHz is being used for distress (RR **52.41-52.44**). All ship stations equipped with NBDP to work in these bands shall be able to receive class F1B emissions on 518 kHz, if complying with the provisions of RR Chapter VII (GMDSS). (See RR **51.45** and **52.97**).

4. Frequencies in the bands between 4 and 27.5 MHz, allocated exclusively for this service, are used for several telegraphy modes. The frequency sub-bands available for assignment for each mode to coast and ship stations shall be as specified in RR **52.12**, **52.13**, and Appendix **17**. Coast station frequencies for Maritime Safety Information (MSI) use are listed in Annex H (Table 11).

5. Several limitations apply to use of frequencies in the exclusive maritime mobile bands between 4 and 27.5 MHz:

a. Power limits for coast stations are:

(1) Single Channel A1A or F1B emissions (RR **52.56** and **52.104**):

Maximum Power (kW)		
Band (MHz)	**A1A (pX)**	**F1B (pY)**
4	10	5
6	10	5
8	20	10
12	30	15
16	30	15
18	No A1A	15
22	30	15
25	No A1A	15

(2) Multichannel telegraphy (RR **52.172**):

2.5 kW (mean) per 500 Hz bandwidth

(3) For digital selective calling and acknowledgement, and for types of transmissions other than those indicated in (1) or (2) above, the maximum mean power shall not exceed the power specified for F1B emission in (1) above.

b. Power limits for ship stations:

Except for transmissions, in the exclusive maritime mobile bands between 4 and 27.5 MHz, of digital selective calls and acknowledgements, which are limited to a mean power of 1.5 kW, international radio regulations have no power limit for ship stations (MS) operating in the radiotelegraphy mode. The power used should be the minimum power, consistent with transmitter capability, necessary to provide satisfactory communications. The power listed in Annex H is not intended to serve as a power limit, but is a guide reflecting current practice.

c. RR Appendix **17** provides for ship and coast use in several functional allocations:

(1) Wideband telegraphy, facsimile and special transmission systems--Assignments to ship stations using wideband telegraphy, facsimile and special transmission systems may be adjusted to meet needs of systems using these bands provided they remain within the band limits (RR **52.170**). The shared use of certain of these ship station frequencies between Federal and non-Federal shall be in accordance with US296. See Annex H, Table 3 for frequencies available to ship stations and Annex H, Table 10 for frequencies available to coast stations.

(2) A1A Morse calling--See Annex H, Table 7 for frequencies available.

(3) Oceanographic data transmission--Use of these frequencies is limited to the transmission of oceanographic and meteorological data from ships and buoys. Oceanographic data interrogating stations may use these frequencies for interrogation of ships and buoys. The power of ship stations used for oceanographic data transmission (Station Class OD), including buoys or other sensor platforms, is limited to 100 Watts. See Annex H, Table 4 for frequencies available.

(4) Narrowband direct-printing telegraph and data transmission systems--See Annex H, Tables 5 and 6 for frequencies available.

(a) Narrowband direct-printing telegraph--International technical standards for narrowband direct printing telegraphy systems are contained in ITU- R M.476-5 and shall be used nationally.

(b) Data transmission systems--Standards for data transmission systems have not been established by the ITU.

(5) A1A Morse working--See Annex H, Table 9 for frequencies available.

(6) Digital selective calling--See Annex H, Tables 8 and 11 for frequencies available.

Maritime Mobile Radiotelephony

6. Bands available to the maritime mobile service for radiotelephony are divided generally into exclusive maritime bands and bands shared with other services. The class of emission authorized in each band is described below. Where single sideband is specified, the authorized bandwidth is 2.8 kHz, upper sideband mode only is permitted, the assigned frequency must be 1.4 kHz above the carrier, and technical standards of ITU-R M.1173 shall be followed. Where FM is specified, technical standards of ITU-R M489-2 shall be followed. The principal bands within which maritime mobile radiotelephony may be authorized are:

a. 1605-3500 kHz -- Portions of these bands are allocated to the Maritime Mobile Service exclusively, while other portions are shared with the fixed, mobile, and other services. Class J3E emission only may be authorized for U.S. ship and coast stations.

(1) Coast stations shall be limited to 5 kW PEP when located north of 32°N and 10 kW peak envelope power (PEP) when located south of 32°N.

(2) The use of J3E emission in U.S. waters is mandatory on carrier frequency 2182 kHz; however, H3E emission is also authorized for communications with foreign ship and coast stations (Appendix 13, Part A2, Section I, C'2). Class A3E emission on this frequency is no longer authorized except for such apparatus (at ship stations) provided solely for distress, urgency and safety purposes (51.53).

(3) Digital selective calling for distress and safety purposes shall be conducted on the frequency 2187.5 kHz. Digital selective calling for other than distress and safety purposes may be conducted on 2189.5 kHz (ship-to-shore) and 2177 kHz (ship-to-ship and shore-to-ship).

(4) Provisions for the use of the single sideband radiotelephone channels within the band 2170-2173.5 kHz and 2190.5-2194 kHz are:

(a) The assignable frequencies are 2171.9 and 2192.4 kHz.

(b) Emission is limited to J3E.

(c) Power is limited to 400 Watts PEP.

b. 4.0-23.0 MHz--Nationally and internationally only single sideband class J3E emission may be authorized. The PEP of ship stations shall not exceed 1.5 kW. The PEP of coast stations shall not exceed 10 kW. Within these limitations, frequencies in certain cases, are available to the maritime mobile service in exclusive bands for duplex and simplex use as set forth below:

(1) Duplex--Both ship station and coast station single sideband frequencies are designated in RR Appendix **17**, Part A, Section I, Subsection A, on a paired basis, as shown in Annex H, Table 1. In addition, RR Appendix **25** provides an international frequency allotment plan by areas for use of those frequencies designated in Appendix **17**, Part A, Section I, Subsection A. In general, while ships normally do not transmit on coast station frequencies in certain cases, Federal ship stations are authorized to do so by Section 7.5.5. International notification of allocated channels are made in accordance with the provisions of ITU Appendix **25** and Article **17**. National requirements developed in IRAC Documents 18380 and 25934 provided the basis for such notifications.

(2) Simplex--The frequencies of RR **17** Part B, Section I, Sub-section B as shown in Annex H, Table 2 may be authorized for use on a simplex basis by coast and ship stations. Additionally, the assigned frequencies 4126.4, 4418.4 and 6517.4 kHz also may be so authorized. The use of 6517.4 kHz for this purpose should be limited to day-time operation. Simplex frequencies may be authorized for both ship/coast stations and intership communications. Intership operations may be on two frequencies if they are cross banded. Power for these simplex frequencies shall not exceed 1 kW peak, and emission is limited to class J3E. These frequencies are shared equally on a non-priority basis by both Federal and non-Federal coast and ship stations in a manner consistent with the provisions of US82.

c. 156-162 MHz--Within these limits, the band is divided into numbered channels which are listed in RR Appendix **18**, along with recommended use. Assignments not in accordance with Appendix 18 are subject to adjustment to other frequencies in this band as long term U.S. maritime VHF planning develops.

(1) The band 157.0375-157.1875 MHz is allocated to the Federal for maritime mobile operations. The band is divided into six channels. Two of these channels have a specialized use associated with non-Federal maritime mobile operations. Channel 22, 157.1 MHz, is the primary frequency for Federal and non-Federal liaison communications with the Coast Guard. Channel 81, 157.075 MHz, is primarily for environmental protection operations as outlined in Section 7.5.6.

(2) The remainder of the VHF channels in the band 156-162 MHz are allocated to the non-Federal; however, channels are available to the Federal Government as outlined below:

(a) Channels 12 and 14, 156.6, 156.7 MHz, and the Channel 20 duplex pair, 157.0 and 161.6 MHz, may be authorized for port operations. Record note L283 applies for coast stations.

(b) Channel 6, 156.3 MHz, may be authorized for intership operations. It is already authorized for coordinated operations at the scene of a SAR incident as outlined in Section 7.5.4. Record Note S063 applies. Coast stations may use 156.3 MHz for exchange of traffic dealing with safety of life or property when other means of communication are not practicable. Record Note L330 applies.

(c) Channels 12, 14, 11 and 13, 156.6, 156.7, 156.55 and 156.65 MHz in priority order, may after coordination with the FCC, be authorized for Vessel Traffic System (VTS) operation.

(d) Channel 13, 156.65 MHz, may be authorized for bridge-to-bridge operations according to provisions set forth hereafter.

(e) Channel 16, 156.8 MHz, is designated nationally and internationally for distress, safety and calling. Federal ship and coast stations, during their hours of service of VHF radiotelephony, shall maintain a watch for reception of 156.8 MHz whenever practicable. Federal ships transiting portions of the St. Lawrence Seaway or a Coast Guard operated VTS may terminate the listening watch on 156.8 MHz when directed by the Seaway or VTS authorities to call and work on a designated ship movement frequency. Assignments on 156.8 MHz shall include Record Note S035.

(f) For public correspondence purposes ship stations are authorized to communicate with public correspondence coast stations. In these instances, the ship station shall transmit on the designated ship frequency appropriate to the public correspondence channel assigned to the coast station. Assignments for such use shall include Record Note L197. The specific receiving coast station shall be listed in Receiver Antenna Location field; however, if there are more than three receiver locations, list the area in which the receiving stations are located.

(g) Other authorized use of frequencies by mobile stations to communicate with non-Government stations is contained in Section 7.5.2. Record Note S165 applies.

(3) Port operations channels may be used in lock and waterway operations in addition to operations at or near ports.

(4) Stations on board aircraft may communicate with stations of the maritime mobile service. The communications of an aircraft station shall be brief and limited to operations in which maritime mobile stations are primarily involved, and where direct communications between aircraft and the ship or coast station is required.

(a) The mean power of aircraft stations shall not exceed five Watts, however, a power of one Watt or less shall be used to the maximum extent possible.

(b) While using the frequency band the altitude of aircraft stations should not exceed 305 meters (1000 feet) except for reconnaissance aircraft participating in ice-breaking operations where an altitude of 457 meters (1500 feet) is allowed. The frequencies 156.3 and 156.8 MHz may be used by aircraft stations for safety purposes only.

(5) Stations operating in the maritime mobile service in the band 156-162 MHz are subject to the technical standards and power limitations of Sections 5.3.2 and 5.2.1.

(6) Stations on board Federal vehicles used for towing trailered boats engaged in SAR operations, or SAR training exercises, are authorized to operate on VHF FM maritime mobile frequencies with stations in the maritime mobile service. Such stations are subject to the technical standards and power limitations applicable to the maritime mobile service.

Bridge-to-Bridge Communications and Navigational Communications on 156.65 MHz or 156.375 MHz

7. General. Public Law 92-63 (33 USCA, Sections 1201-1208), the Vessel Bridge-to-Bridge Radiotelephone Act, provides the statutory basis for the national designation of "a specific frequency or frequencies dedicated to the exchange of navigational information on navigable waters of the United States".

a. The primary purpose of the act, and for the designation of a navigational communications frequency pursuant thereto, is to "provide a positive means whereby the operators of approaching vessels can communicate their intentions to one another through voice radio." Thus, the primary use of the designated navigational communications frequency provided for by the act is ship-to-ship. However, it is clear from the act's regulatory history that limited use of this frequency by certain shore stations would be "clearly in the interest of navigational safety" and, therefore, permissible.[5]

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[5] Hearing before Merchant Marine Subcommittee, Committee on Commerce, U.S. Senate, Serial No. 91-98, p. 29.

b. The act applies to both U.S. Government vessels and non-Federal vessels and, for obvious reasons, effective implementation requires that all vessels subject to its provisions operate under compatible requirements. The FCC has promulgated, in Part 80 of its Rules, regulations governing non-Federal vessels subject to the act. The regulations herein, effective for all U.S. Government vessels subject to the Act, are fully compatible with the FCC regulations. [6]

c. The Navigational Communications Frequencies. Pursuant to Section 2 of the aforementioned Act, and except for a limited area of the Southern Louisiana section of the Mississippi River System, the frequency 156.65 MHz, 16K0F3E emission, has been designated as the national "navigational communications frequency." The frequency 156.375 MHz has been designated as the "navigational communications frequency" in the lower Mississippi River. For the purpose of these regulations "navigational communications" are those communications between ship stations, or between coast stations and ship stations, in which messages are restricted to those relating to the maneuvering and the safety of ships and, in emergency, to the safety of persons.

d. Use of 156.65 or 156.375 MHz for Navigational Communications. The frequency 156.65 or 156.375 MHz, 16K0F3E emission, is available for assignment to:

(1) Bridge-to-bridge stations aboard Federal vessels subject to the provisions of the Vessel Bridge-to-Bridge Radiotelephone Act for use in conformity with the purpose of the Act and the definition of such stations in Section 6.1.3 of this Manual,[7] and

(2) Federal coast stations for navigational communications with vessels.

e. Use of the frequency 156.65 or 156.375 MHz by any Federal station shall be limited exclusively to navigational communications as defined herein or for necessary tests.

f. Since the navigational communication frequency necessarily will be shared by a large number of users, and in recognition of the safety of life aspect inherent in the operations involved, it is essential that the communication range of all stations using this frequency be restricted. Unless specifically authorized otherwise, a mean power not to exceed one watt shall normally be used. A maximum power of 25 watts for vessels and 10 watts for shore stations may be used in exceptional cases when communications cannot be established using one watt. Antenna height and gain limitations are under consideration; in the interim, heights should be limited to the minimum required for reliable communications over the distance involved.

g. Transmissions on the frequency 156.65 or 156.375 MHz shall be identified by the name of the vessel, or the facility in the case of a coast station, in lieu of a call sign.

h. All Federal use of 156.65 or 156.375 MHz is subject to the technical standards in Chapter 5 of this Manual. Vessel bridge-to-bridge radiotelephone installations are, additionally, subject to the requirements of the following paragraphs.

i. Vessel Bridge-to-Bridge Radiotelephone Installation. Section 2 of the Act states that the purpose is "to provide a positive means whereby the operators of approaching vessels can communicate their intentions to one another through voice radio...." Thus, the Act clearly imposes a total system communications requirement which, necessarily, involves both transmitting and receiving capabilities, on all vessels subject to the Act.

j. It is considered that the basic operational objectives of the Act will be met by transmitting and receiving installations having the following minimum performance characteristics:

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[6] For vessels navigating on those waters governed by navigation rules for the Great Lakes and their connecting and tributary waters, see the following sub- section entitled "Bridge-to-Bridge" Communications for Vessels Navigating on the Great Lakes.

[7] Where the Act describes vessels in "gross tons," a useful conversion is: Each 100 cubic feet of enclosed space is equivalent to one gross ton.

(1) Vessel transmitters--For navigational communications, transmitters should be capable of effective transmission of 16K0F3E emissions with at least 8 watts mean power into 50 ohms effective resistance in the case of non-portable transmitters and at least 0.75 watt in the case of portable transmitters. Each non-portable transmitter, and each portable transmitter of more than one watt, shall have provisions for readily reducing the power to a value not less than 0.75 watt and not more than one watt. After January 21, 1997, non-portable transmitters must automatically reduce the carrier power to one watt or less when tuned to the frequency 156.375 MHz or 156.650 MHz. A manual override device must be provided which when held by the operator will permit full carrier power operation on these channels. Transmitters should be adjusted so that the transmission of speech normally produces peak modulation within the limits 75-100%. (Note: Other applicable standards are in Chapter 5.)

(2) Vessel receivers--Receivers should be capable of effective reception of 16K0F3E emission on navigational communication frequencies and should comply with the following characteristics:

(a) Frequency stability within 0.001%.

(b) Usable sensitivity of 0.5 microvolt, maximum, for nonportable receivers and 1.0 microvolt, maximum, for portable receivers.

(c) Adjacent channel selectivity and desensitization of 70 dB, minimum, for non-portable receivers and 40 dB, minimum, for portable receivers.

(d) Modulation acceptance bandwidth of 7 kHz, minimum.

(e) Spurious response attenuation of 85 dB, minimum, for nonportable receivers and 50 dB, minimum, for portable receivers.

(3) Vessel Antenna--Antennas should be as non directional (horizontally) and as efficient as is practicable for the reception of ground waves at 156.65 MHz.

(4) Channel 22A Requirement--The radiotelephone installation required by this section must also be capable of transmitting and receiving on channel 22A (157.1 MHz).

(5) Channel 67 Requirement--While transiting any of the following waters, vessels subject to the Act also must have on board a radiotelephone capable of transmitting and receiving on channel 67 (156.375 MHz):

(a) The lower Mississippi River from the territorial sea boundary, and within either the Southwest Pass safety fairway or the South Pass safety fairway specified in 33 CFT 166.200, to mile 242.4 AHP (Above Head of Passes) near Baton Rouge,

(b) The Mississippi River-Gulf Outlet from the territorial sea boundary, and with the Mississippi River-Gulf Outlet safety fairway specified in 33 CFR 166.200, to that channel's junction with the Inner Harbor Navigation Canal; and,

(c) The full length of the Inner Harbor Navigation Canal from its junction with the Mississippi River to that canal's entry to Lake Pontchartrain at the New Seabrook vehicular bridge.

k. For operating regulations, maintenance requirements, and limitations on use of the bridge-to-bridge radiotelephone installation, see Title 33 CFR, Chapter 1, Part 26.

l. Exemptions of Vessels from Requirements of the Act. Applications for the exemption of vessels from the provisions of the Vessel Bridge-to-Bridge Radiotelephone Act should be forwarded directly to the Commandant, U.S. Coast Guard.

Bridge-to-Bridge Communications for Vessels Navigating On The Great Lakes

8. **General**. Each Federal vessel navigating on the waters under the navigational rules for the Great Lakes and their connecting and tributary waters and to which the Vessel Bridge-to-Bridge Radiotelephone Act (33 USCA, Sections 1201- 1208) applies, is exempt from the regulations of the act under Sections 26.03, 26.04, 26.05, 26.06, and 26.07 of Title 33, Code of Federal Regulations, Part 26. These exempted sections comprise those regulations pertaining to the type of radiotelephone required; the use of the designated frequency 156.65 MHz; the use, maintenance, and failure of the radiotelephone; and the use of the English language. Sections 26.01, 26.02, 26.08, 26.09 (a), and 26.10 of Title 33 CFR remain in effect. These sections deal with the purpose of the act, definitions, exemption procedures, and penalties.

9. Each of these vessels must comply with the appropriate provisions of "The Agreement between the United States and Canada for Promotion of Safety on the Great Lakes by means of Radio, 1973", outlined in the following paragraphs, that provide for a bridge-to-bridge communications capability considered to be in constructive compliance with the Vessel Bridge- to-Bridge Radiotelephone Act.[8]

10. Radiotelephone Installation. Each Federal vessel shall be fitted with radiotelephone installations that are capable of effectively transmitting and receiving G3E emissions on at least the following VHF channels:

Channel 16--156.8 MHz (Distress, safety and calling)
Channel 6--156.3 MHz (Primary intership)
Channel 13--156.65 MHz (Navigational bridge-to-bridge)
Channel 12--156.6 MHz
Channel 14--156.7 MHz

a. Additionally, such other frequencies as required for the vessel's service and to include the capability to receive VHF-FM marine navigation warnings for the area of operation.

b. The radiotelephone station, exclusive of the antennas and source of electric energy, shall be located as high as practicable on the vessel, preferably on the bridge.

c. The principal operating position of the radiotelephone installation shall be on the bridge, convenient to the conning position.

d. Where the radiotelephone station is located elsewhere than on the bridge, provision shall be made for complete operational control of the equipment at that location and at the bridge operating position. However, provision shall be made to take immediate and complete control of the equipment at the bridge operating position.

e. Provision shall be made for illuminating the operating controls at the principal operating position.

f. Means shall be provided for charging any storage battery used in connection with the radiotelephone station.

g. The radiotelephone transmitter shall be capable of delivering at least 10 Watts carrier power to the antenna. Provision shall be made to reduce this power readily to one Watt.

h. The radiotelephone receiver shall have a sensitivity of at least two microvolts across 50 ohm or equivalent input terminals, for a 20 decibel signal- to-noise ratio.

i. The associated antennas shall be effective, vertically polarized, and located as high as practicable on the masts or superstructure of the vessel. The transmission line shall be effective and, to the extent practicable, shall impose a minimum loss.

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[8] Reference 40 Federal Register 87 (May 5, 1975).

j. The radiotelephone installation is subject to the technical standards in Chapter 5 of this Manual.

11. Vessel Bridge-to-Bridge Watch. Each Federal vessel shall, when underway, maintain a continuous and effective watch on channel 13 (156.65 MHz). Vessels are exempt from this requirement while transiting the St. Lawrence Seaway and complying with the Joint Regulations of the St. Lawrence Seaway Authority and the Saint Lawrence Seaway Development Corporation between the lower exit of St. Lambert Lock at Montreal and Crossover Island, New York, and in the Welland Canal and approaches between calling-in points No. 15 and No. 16.

a. Sequential monitoring techniques alone are not sufficient to meet this requirement.

b. Portable VHF equipment may be used to meet this requirement.

c. This watch shall be maintained by the master, or person designated by the master, who may perform other duties provided they do not interfere with the effectiveness of the watch.

12. The UHF frequencies and technical standards for on-board communication stations as provided by RR 5.287, 5.288 and ITU-R M.1174, respectively are:

a. The preferred two simplex (duplex) frequencies for use in the territorial waters of the United States for on-board communications are paired as follows:

On-Board Communications	
On-Board Repeater (Transmit) (MHz)	**On-Board Mobile (Transmit) (MHz)**
457.525	467.750
457.550	467.775
457.575	467.800
457.600	467.825

Use of these frequencies by Government stations is subject to agreement with the FCC in the IRAC/ FCC mechanism.

b. Technical characteristics:

(1) Effective radiated power not to exceed 2 Watts. Whenever practicable the equipment should include a device to readily reduce the power by at least 10 dB.

(2) In the case of equipment installed at a fixed point on the ship, the height of antenna shall not be more than 3.5 meters (approximately 10 feet) above the highest working deck.

(3) Only FM with a pre-emphasis of 6 dB/octave (phase modulation) shall be used.

(4) Deviation not to exceed 5 kHz.

(5) Tolerance shall be 5 parts in 106.

(6) The audio-frequency band shall be limited to 3000 Hz.

8.2.30 Procedure in a Case of Harmful Interference

1. In the use of the radio frequency spectrum, interference must be expected; however, the acceptance of harmful interference is not contemplated.

2. Harmful interference is "Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with these Regulations." (RR)

3. When harmful interference is received, the following actions should be taken in the absence of agency instructions to the contrary:

a. Determine the source, if possible. Within the United States the FCC district offices and monitoring stations can assist in determining the source of harmful interference and may be contacted directly for such assistance.

b. If the source is identified, try to eliminate the harmful interference by dealing directly with individuals located at the source.

c. If direct action is impracticable or unsuccessful, report the circumstances to the frequency management authority of your agency.

4. In taking any of these actions, provide all possible information concerning the interference. An interference report should include as much of the following as practicable:

a. Particulars concerning the station causing the interference:
(1) Name or call sign
(2) Frequency measured
(3) Class of emission
(4) Bandwidth
(5) Station class
(6) Bearing
(7) Nature of interference

b. Particulars concerning the transmitting station whose transmissions are being interfered with:
(1) Name or call sign
(2) Frequency assigned
(3) Frequency measured
(4) Class of emission
(5) Bandwidth
(6) Station class
(7) Geographic location

c. Particulars furnished by the receiving station experiencing the interference:
(1) Name or call sign
(2) Station class
(3) Geographic location
(4) Dates and times of occurrence of harmful interference

d. Other supporting data:
(1) Reporting agency
(2) Canadian coordination data
(3) Other information

5. Within the U.S./Mexican border area, some intermittent interference can be expected. When harmful interference from a Mexican station is severe enough to interrupt a U.S. radiocommunications service and relief from Mexico is desired, an interference report in the prescribed format (see the following "Initial Report of Radio Interference to U.S. Stations from Mexico") and any comments which deemed pertinent for resolution of the harmful interference must be forwarded to the local FCC District Director.

Copies of this report must be forwarded to your agency IRAC/FAS representative and to the FAS Secretary at NTIA at the following address to assist in the resolution of the interference:

U.S. Department of Commerce
NTIA/OSM/SSD
ATTN: FAS Secretary
Room 1805, Herbert C. Hoover Bldg.
1401 Constitution Avenue, N.W.
Washington, DC 20230

6. In the event the harmful interference cannot be resolved satisfactorily at the agency level, the matter may be referred to the IRAC or the NTIA, as appropriate, for assistance.

INITIAL REPORT OF RADIO INTERFERENCE TO U.S. STATIONS FROM MEXICO

(When Federal Agencies are receiving harmful interference from Mexican stations, this format may be completed and provided to the Federal Communications Commission (FCC) to assist in the resolution of the problem.)

1) COMPLAINANT DATA

a) Department/Bureau:

1) *Name:*

2) *Facility:*

3) *Address:*

4) *Telephone No.:*

b) Approximate Distance From Your Station To The US/Mexican Border:

2) PARTICULARS REGARDING STATION EXPERIENCING THE INTERFERENCE

a) Name/Call Sign/STN ID:

b) Freq(s) Receiving Interference:

c) Government Master File (GMF) Agency Serial Numbers:

d) Station Classes and Emission Designators

e) Geographic Location and Elevation of Receiver:

1) *State/Country (RSC):*

2) *Antenna Location (RAL):*

3) *Latitude (RLA):*

4) *Longitude (RLG):*

5) *Antenna Dimensions (RAD):*

6) *Is Tone Squelch or Digital Squelch Used On Victims Receiver?*

f) Date and Time Interference Started:

g) Date and Time Interference Most Disruptive:

h) Date and Time Interference Ended:

i) Description of Harm Caused By The Interference:

_____ *HARMFUL TO SAFETY OF LIFE? or* _____ *NON-SAFETY?*
(Obstructs Communications in Progress)

j) Description Of The Interfering Source *(Provide as much detail as possible, e.g., recordings, etc.):*

k) Description Of How The Interference Disrupts Your Activity:

8.2.31 Conversion of Stations in the Aeronautical Mobile Service to SSB or ISB Transmission

In the bands below 30 MHz, equipment procured for the aeronautical mobile service shall be capable of single sideband or independent sideband emission with suppressed or reduced carrier. In the case of stations in the aeronautical mobile (R) service, the use of single sideband shall be determined by the international requirements pertaining to that service.

8.2.32 Control of Emissions from Space Stations

The use of frequencies by space stations will be authorized only in those cases where such stations are equipped so as to ensure the ability to turn on or to provide immediate cessation of emissions by telecommand.

8.2.33 Selection of Sites and Frequencies for Earth and Terrestrial Stations in the Bands Above 1 GHz Shared with Equal Rights by Terrestrial Radiocommunication and Space Radiocommunication Services

Sites and frequencies for terrestrial stations and earth stations, operating in frequency bands shared with equal rights between terrestrial radiocommunication and space radiocommunication services, shall be selected having regard to the relevant ITU-R Recommendations with respect to geographical separation between earth stations and terrestrial stations.

8.2.34 Power and Direction of Maximum Radiation of Stations in the Fixed or Mobile Service in Certain Bands Shared with Stations in the Space Radiocommunication Services (Earth-to-Space) on an Equal Rights Basis

1. As far as practicable, sites for transmitting stations, in the fixed or mobile service, employing maximum values of equivalent isotropically radiated power (e.i.r.p.) exceeding the values given in Table 8.2.34-1 in the frequency bands indicated, should be selected so that the direction of maximum radiation of any antenna will be separated from the geostationary-satellite orbit (GSO) by at least the angle in degrees shown in the Table, taking into account the effect of atmospheric refraction. Information on this subject is given in the most recent version of Recommendation ITU-R SF.765.

2. For their own protection receiving stations in the fixed or mobile service operating in bands shared with space radiocommunication services (space-to-Earth) should also avoid directing their antennas toward the GSO if their sensitivity is sufficiently high that interference from space station transmissions may be significant.

3. For frequency bands above 15 GHz (except 25.25 - 27.5 GHz), there is no restriction on the angular separation for transmitting stations of the fixed or mobile service. This matter is being studied, e.g., in the ITU-R.

Table 8.2.34-1

Frequency band (GHz)	E.i.r.p. value (dBW) (see also paragraphs 1 and 5)	Minimum separation angle with respect to geostationary-satellite orbit (degrees)
1 - 10	+35	2
10 - 15	+45	1.5
25.25 - 27.5	+24 (in any 1 MHz band)	1.5
Other bands above 15GHz	+55	No limit

4. The maximum e.i.r.p. of a station in the fixed or mobile service shall not exceed +55 dBW.

5. Where compliance with paragraph 1 for frequency bands between 1 GHz and 10 GHz is impracticable, the maximum e.i.r.p. of a station in the fixed or mobile service shall not exceed:

+47 dBW in any direction within 0.5° of the GSO; or

+47 dBW to +55 dBW, on a linear decibel scale (8 dB per degree), in any direction between 0.5° and 1.5° of the GSO, taking into account the effect of atmospheric refraction.

6. The power delivered by a transmitter to the antenna of a station in the fixed or mobile service shall not exceed +13 dBW in frequency bands between 1 GHz and 10 GHz or +10 dBW in frequency bands above 10 GHz.

7. The limits given in paragraphs 1, 5, 6, and 7 apply, where applicable, to the services and frequency bands indicated in Table 8.2.34-2 for reception by space stations where the frequency bands are shared with equal rights with the fixed or mobile service:

Table 8.2.34-2

Frequency Band	Service	Limit as specified in paragraphs
2200-2290 MHz 7900-8025 MHz 8025-8400 MHz	Fixed-Satellite Meteorological-Satellite Space Research Space Operation Earth Exploration-Satellite Mobile-Satellite	1, 4, 5, and 6
14.4-14.5 GHz 14.5-14.7145 GHz 14.7145-14.8 GHz	Fixed-Satellite	1, 4, and 6
25.25-27.5 GHz	Inter-Satellite	1, 4, and 6

8. Trans-horizon systems in the 1700-1710 MHz band may exceed the limits given in paragraphs 4 and 6, but the provisions of paragraphs 1 and 5 should be observed. Considering the difficult sharing conditions with other services, the number of trans-horizon systems in these bands should be kept to a minimum.

9. A computer program is available in the NTIA for checking compliance of fixed stations with the foregoing provisions. One version of this program is used in checking frequency assignment applications. A separate version is used in support of the SPS in the system review process (see Chapter 10) and will be used by the NTIA upon request from agencies not having direct access to the NTIA computer. To provide more general assistance to agencies in the earlier stages of planning of fixed and mobile systems for operation in these bands, a table is provided in Annex B which identifies transmitter pointing angles that should be avoided under certain postulated conditions.

8.2.35 Power and Direction of Maximum Radiation of Earth Stations in Certain Bands Shared with Stations in the Fixed or Mobile Service

1. The equivalent isotropically radiated power (e.i.r.p.) transmitted in any direction towards the horizon by an earth station shall not exceed the following limits except as provided in paragraphs 3 or 4:

a. in frequency bands between 1 GHz and 15 GHz

+40 dBW in any 4 kHz band for $\theta \leq 0°$

+40 + 3 θ dBW in any 4 kHz band for $0° < \theta \leq 5°$; and

b. in frequency bands above 15 GHz

+64 dBW in any 1 MHz band for $\theta \leq 0°$

+64 + 3 θ dBW in any 4 kHz band for $0° < \theta \leq 5°$;

where θ is the angle of elevation of the horizon viewed from the centre of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

2. For angles of elevation of the horizon greater than 5° there shall be no restriction as to the e.i.r.p. transmitted by an earth station towards the horizon.

3. As an exception to the limits given in paragraph 1, the e.i.r.p. towards the horizon for an earth station in the space research service (deep space) shall not exceed +55 dBW in any 4 kHz band in frequency bands between 1 GHz and 15 GHz, or +79 dBW in any 1 MHz band in frequency bands above 15 GHz.

4. The limits given in paragraphs 1 and 3, as applicable, may be exceeded by not more than 10 dB. However, when the resulting coordination area extends into the territory of another country, such increase shall be subject to agreement by the administration of that country.

5. The limits given in paragraph 1 apply, where applicable, to the services and frequency bands indicated in Table 8.2.35 below for transmission by earth stations where the frequency bands are shared with equal rights with the fixed or mobile service:

Table 8.2.35

Frequency band	Services
1761-1842 2 025-2 110 MHz 7 900-7 975 MHz 8 025-8 400 MHz	Fixed-satellite Earth-exploration-satellite Meteorological-satellite Mobile-satellite Space operation Space research

6. Earth Stations Operating in the 1610-1626.5 MHz Band

a. In accordance with No. **5.364** of the RR:

A mobile earth station operating in either the mobile-satellite service or radiodetermination-satellite service in the band 1610-1626.5 MHz shall not produce a peak e.i.r.p. density in excess of -15 dB(W/4 kHz) in the part of the band used by systems operating in accordance with the provisions of RR **5.366** (airborne electronic aids to air navigation and any directly associated ground-based or satellite-borne facilities) unless agreed by affected administrations.

In the part of the band where such systems are not operating, the mean e.i.r.p. density of a mobile earth station shall not exceed -3 dB(W/4 kHz).

b. The e.i.r.p. transmitted in any direction by an earth station in the radiodetermination-satellite service in the band 1610-1626.5 MHz shall not exceed -3 dBW in any 4 kHz band.

7. Earth station antennas shall not be employed for transmission at elevation angles of less than 3° measured from the horizontal plane to the direction of maximum radiation, except when agreed to by agencies or administrations concerned and those whose services may be affected. In case of reception by an earth station, the above value shall be used for coordination purposes if the operating angle of elevation is less than that value.

8. As an exception to paragraph 7, earth station antennas in the space research service (near Earth) shall not be employed for transmission at elevation angles of less than 5°, and earth station antennas in the space research service (deep space) shall not be employed for transmission at elevation angles of less than 10°, both angles being those measured from the horizontal plane to the direction of maximum radiation. In the case of reception by an earth station, the above values shall be used for coordination purposes if the operating angle of elevation is less than those values.

9. Earth Station Off-axis Power Limitations

The level of (e.i.r.p.) emitted by the earth station at angles in the direction the geostationary-satellite orbit off the mainbeam axis has a significant impact of interference caused to other geostationary satellite networks. Enhanced utilization of the geostationary-satellite orbit and easier coordination would be attained by minimizing such off- axis radiation and administrations are encouraged to achieve the lowest value practicable bearing in mind the latest studies, e.g, ITU-R Recommendations. Minimizing such levels is particularly important in intensively used uplink bands.

8.2.36 Power Flux-Density Limits

1. Limits at the Surface of the Earth from Space Stations

a. The power flux-density at the surface of the Earth produced by emissions from a space station, including emissions from a reflecting satellite, for all conditions and for all methods of modulation, shall not exceed the limit given in Table 8.2.36. The limit relates to the power flux-density which would be obtained under assumed free-space propagation conditions and applies to emissions by a space station of the service indicated where the frequency bands are shared with equal rights with the fixed or mobile service, unless otherwise stated.

Table 8.2.36 (Section 1)

Frequency band	Service	Limit in dB(W/m²) for angle of arrival (δ) above the horizontal plane			Reference bandwidth
		0°- 5°	5°- 70°	70°- 90°	
410-420 MHz	Space Research (S-S) (Limited to communications within 5 km of an orbiting manned space vehicle, see No. **5.268**)	-153	-153 + 0.077(δ - 5)	-148	4 kHz

Table 8.2.36 (Section 2)

Frequency band	Service	Limit in dB(W/m²) for angle of arrival (δ) above the horizontal plane			Reference bandwidth
		0°- 5°	5°- 25°	25°- 90°	
460 - 470 MHz	Earth Exploration-Satellite (S-E) allocation, see US201)	-152			4 kHz
1670 - 1700 MHz	Earth Exploration-Satellite Meteorological-Satellite	-133 (value based on sharing with meteorological aids service)			1.5 MHz
1670 - 1690 MHz[3)] 1690 - 1700 MHz (Nos. 5.381 and 5.382) 1700 - 1710 MHz 1761-1842 MHz [5)] (See G42) 2025-2110 MHz [5),6)] 2200-2300 MHz	Space Research (S-E)(S-S) Space Operation (S-E)(S-S) Earth Exploration-Satellite (S-E)(S-S)	-154 [2)]	-154 + 0.5 (δ - 5)[2)]	-144 [2)]	4 kHz
7250-7850 MHz	Fixed-Satellite (S-E) Meteorological-Satellite (S- E) Mobile-Satellite	-152	-152 + 0.5 (δ – 5)	-142	4 kHz

Table 8.2.36 (Section 2)

Frequency band	Service	Limit in dB(W/m²) for angle of arrival (δ) above the horizontal plane			Reference bandwidth
		0°- 5°	5°- 25°	25°- 90°	
8 025-8500 MHz	Earth Exploration-Satellite (S- E) Space Research (S-E)	-150	-150 + 0.5 (δ -5)	-140	4 kHz
13.4-14.05 GHz [5)]	Space Research (secondary allocation)	-152			4 kHz
14.5-15.35 GHz	Space Research (14.5-14.8 GHz is a secondary allocation)	-124	-124 + 0.5 (δ - 5)	-114	1 MHz
17.8-19.7 GHz [1)]	Fixed-Satellite (S-E) (geostationary-satellite orbit and NGSO constellation of 50 or fewer satellites)	-115 [7) 8)]	-115 + 0.5 (δ - 5) [7) 8)]	-105 [7) 8)]	1 MHz
17.8-19.3 GHz	Fixed-Satellite (S-E) (geostationary-satellite orbit and NGSO constellation of 51 or more satellites)	-115-X [4) 8)]	-115-X + ((10+X)/20) (δ – 5) [4) 8)]	-105 [8)]	1 MHz
18.6-18.8 GHz	Fixed-Satellite (S-E)	-95 This limit may be exceeded by up to 3 dB for no more than 5% of this time. (Value based on sharing with Earth exploration-satellite (passive) service and space research (passive) service. (See **US255**)			200 MHz
19.3 -19.7 GHz [1)] 22.55 - 23.55 GHz 24.45 - 24.75 GHz 25.25 - 27.5 GHz	Earth Exploration-Satellite (S- E) Inter-Satellite Space Research (S-E)	-115	-115 + 0.5 (δ-5)	-105	1 MHz
31.0-31.3 GHz	Space research (see No. **5.544**)	–115	–115 + 0.5(δ – 5)	–105	1 MHz
31.8-32.3 GHz	Space research	–120 [9)]	–120 + 0.75(δ – 5) [9)]	–105 [9)]	1 MHz
35.5-36 GHz	Earth Exploration-Satellite (Active) Space Research (active) (see No. **5.549A**)	The mean power flux-density at the Earth's surface, generated by any spaceborne sensor, for any angle greater than 0.8º from the beam centre shall not exceed –73.3 dB(W/m^2) in this band			
37.0-38.0 GHz	Space Research (non-geostationary-satellite orbit)	-120 [9)]	-120 + 0.75 (δ - 5) [9)]	-105	1 MHz
37-38 GHz	Space research (geostationary-satellite orbit)	-125	–125 + (δ – 5)	-105	1 MHz
39.5-40 GHz	Fixed-satellite (non-geostationary-satellite orbit) Mobile-satellite (non-geostationary-satellite orbit)	–120 [10) 11)]	–120 + 0.75(δ – 5) [10) 11)]	–105 [10) 11)]	1 MHz
39.5-40 GHz	Fixed-satellite (geostationary-satellite orbit) Mobile-satellite (geostationary-satellite orbit)	–127 [11)]	5°-20° –127 + (4/3) (δ – 5) [11)] 20°-25° –107 + 0.4(δ – 20) [11)]	–105 [11)]	1 MHz
40-40.5 GHz	Fixed-satellite	–115	–115 + 0.5(δ – 5)	–105	1 MHz

Table 8.2.36 (Section 2)					
Frequency band	**Service**	**Limit in dB(W/m²) for angle of arrival (δ) above the horizontal plane**			**Reference bandwidth**
		0°- 5°	**5°- 25°**	**25°- 90°**	
40.5-42 GHz	Fixed-satellite (non-geostationary-satellite orbit) Broadcasting-satellite (non-geostationary-satellite orbit)	-115 [10)11)]	–115 + 0.5(δ – 5) [10) 11)]	–105 [10) 11)]	1 MHz
40.5-42 GHz	Fixed-satellite (geostationary-satellite orbit) Broadcasting-satellite (geostationary-satellite orbit)	–120 [10)]	5°-15° –120 + (δ – 5) [10)] 15°-25° –110 + 0.5(δ – 15) [10)]	–105 [10)]	1 MHz
48.2-48.54 GHz 49.44-50.2 GHz	Fixed-Satellite (geostationary-satellite orbit)	The power flux-density in the band 48.94-49.04 GHz produced by any geostationary space station in the fixed-satellite service (space-to-Earth) operating in the bands 48.2-48.54 GHz and 49.44-50.2 GHz shall not exceed – 151.8 dB(W/m²) in any 500 kHz band at the site of any radio astronomy station. (see No. **5.555B**)			500 kHz
54.25-56.9 GHz 56.9-57 GHz 57-58.2 GHz 59-59.3 GHz	Inter-Satellite (geostationary-satellite orbit)	The single-entry power flux-density at all altitudes from 0 km to 1000 km above the Earth's surface produced by a space station, for all conditions and for all methods of modulation, shall not exceed -147 dB(W/(m² · 100 MHz)) for all angles of arrival. (see No. **5.556A** and **G128**) (value based on sharing with NGSO space research (passive) and Earth exploration-satellite (passive) services)			100 MHz
116-122.25 GHz	Inter-Satellite (geostationary-satellite orbit)	The single-entry power flux-density produced by a space station, for all conditions and for all methods of modulation, at all altitudes from 0 km to 1000 km above the Earth's surface and in the vicinity of all geostationary orbital positions occupied by passive sensors, shall not exceed -148 dB (W/m² · MHz)) for all angles of arrival. (see No. **5.562C**) (value based on sharing with GSO and NGSO space research (passive) and Earth exploration-satellite (passive) services)			1 MHz
174.8-182 GHz	Inter-Satellite (geostationary-satellite orbit)	The single-entry power flux-density produced by a space station, for all conditions and for all methods of modulation, at all altitudes from 0 to 1000 km above the Earth's surface and in the vicinity of all geostationary orbital positions occupied by passive sensors, shall not exceed -144 dB(W/(m² · MHz)) for all angles of arrival. (value based on sharing with GSO and NGSO space research (passive) and Earth exploration-satellite (passive) services)			1 MHz

[1)] The equality of right to operate when a frequency band is allocated in different Regions to different services of the same category is established in No. **4.8**. Therefore, any limits concerning inter-Regional interference which may appear in ITU-R Recommendations should, as far as practicable, be observed by administrations.

[2)] These power flux-density values are derived on the basis of protecting the fixed service using line-of-sight techniques. Where a fixed service using tropospheric scatter operates in the bands listed in the first column and there is insufficient frequency separation, there must be sufficient angular separation between the direction to the space station and the direction of maximum radiation of the antenna of the receiving station of the fixed service using tropospheric scatter, in order to ensure that the interference power at the receiver input of the fixed-service station does not exceed - 168 dBW in any 4 kHz band.

[3)] These values are applicable where this band is shared with equal rights with meteorological aids service.

[4)] X is defined as a function of the number of satellites, n, in an NGSO constellation as follows:

For $n \leq 288$, $X = (5/119)(n - 50)$ dB; and

For $n > 288$, $X = (1/69)(n + 402)$ dB.

[5)] The limits set forth in this table are applicable to the Space Transportation System and the Tracking and Data Relay Satellite System or any satellites or spaceborne radiocommunication transmitters associated with these systems. See IRAC Doc. 22860.

[6)] Limits may be exceeded by 3 dB in the U.S., see IRAC Doc. 22860.

[7)] These limits apply to emissions of a geostationary space station in the meteorological-satellite service.

[8)] See US334.

[9)] During the launch and near-Earth operational phase of deep-space facilities, non-geostationary satellite systems in the space research service shall not exceed a power flux-density value of:

-115 dB(W/m^2) for $\delta < 5°$

$-115 + 0.5(\delta - 5)$ dB(W/m^2) for $5° \leq \delta \leq 25°$

-105 dB(W/m^2) for $\delta > 25°$

in any 1 MHz band, where δ is the angle of arrival above the horizontal plane.

[10)] The values given in this table entry shall apply to emissions of space stations of non-geostationary satellites in systems operating with 99 or fewer satellites. Further study concerning the applicability of these values is necessary in order to apply them to systems operating with 100 or more satellites.

[11)] When addressing the sharing conditions between the fixed service and the fixed-satellite service in the bands 39.5-40 GHz and 40.5-41 GHz, the power flux-density at the Earth's surface from any FSS satellite should be no greater than the level(s) required to meet the FSS link availability and performance objectives of the subject applications, taking into account the technical and operational requirements of the overall design of the satellite network. In any case, the levels shall not exceed the applicable power flux-density limits in Table 8.2.36.

b. The limits given in Table 8.2.36 may be exceeded on the territory of the US&P subject to NTIA approval or of any country whose administration has so agreed.

2. Radio Astronomy in the Shielded Zone of the Moon

a. The shielded zone of the Moon comprises the area of the surface of the Moon and an adjacent volume of space which are shielded from emissions originating within a distance of 100000 km from the center of the Earth.

b. In the shielded zone of the Moon emissions causing harmful interference to radio astronomy observations and to other users of passive services shall be prohibited in the entire frequency spectrum except in the following bands:

(1) the frequency bands allocated to the space research service using active sensors;

(2) the frequency bands allocated to the space operation service, the Earth exploration-satellite service using active sensors, and the radiolocation service using stations on spaceborne platforms, which are required for the support of space research, as well as for radiocommunications and space research transmissions within the lunar shielded zone.

c. The level of harmful interference is determined by agreement between the administrations concerned, with the guidance of the relevant ITU-R Recommendations.

d. In frequency bands in which emissions are not prohibited by sub-paragraphs (a)-(c), radio astronomy observations and passive space research in the shielded zone of the Moon may be protected from harmful interference by agreement between administrations concerned.

8.2.37 Control of Interference between Geostationary-Satellite Systems and Non-Synchronous Inclined Orbit-Satellite Systems

1. Non-geostationary space stations shall cease or reduce to a negligible level their emissions, and their associated earth stations shall not transmit to them, whenever there is unacceptable interference[9] to geostationary-satellite space systems in the fixed-satellite service operating in accordance with these regulations.

2. Whenever the emissions from geostationary satellites in the inter-satellite service operating in the bands 22.55-23.55, 24.45-24.75, and 25.25-27.5 GHz are directed towards space stations at distances from Earth greater than that of the geostationary-satellite orbit, the boresight of the antenna mainbeam of the geostationary satellite shall not be pointed within 15° of any point on the geostationary-satellite orbit.

3. In the frequency band 8025-8400 MHz, which the Earth exploration-satellite service using non-geostationary satellites shares with the fixed- satellite service (Earth-to-space) or the meteorological-satellite service (Earth-to-space), the maximum power flux-density produced at the geostationary-satellite orbit by any Earth exploration-satellite service space station shall not exceed -174 dB(W/m^2) in any 4 kHz band.

8.2.38 Station Keeping of Space Stations

1. Space stations on geostationary satellites shall have the capability of maintaining their positions within the tolerance specified. In the case of space stations on board geosynchronous satellites with circular orbits having an angle of inclination greater than 5 degrees, the positional tolerance shall relate to the nodal point.

2. Space stations on board geostationary satellites which use any frequency band allocated to the fixed-satellite service or the broadcasting-satellite service:[10]

a. shall have the capability of maintaining their positions within 0.1 degrees of the longitude of their nominal positions;

b. shall maintain their positions within 0.1 degree of longitude of their normal positions; but

c. experimental stations on board geostationary satellites need not comply with a) or b) above, but shall maintain their positions within 0.5 degree of longitude of their nominal positions;

d. however, space stations need not comply with b) or c) above, as appropriate, as long as the satellite network to which the space station belongs does not cause unacceptable interference to any other satellite network whose space station complies with the limits given in b) and c) above.

3. Space stations on board geostationary satellites which do not use any frequency band allocated to the fixed-satellite service or the broadcasting- satellite service:

a. shall have the capability of maintaining their positions within 0.5 degree of longitude of their nominal positions;

b. shall maintain their positions within 0.5 degree of longitude of their nominal positions; but

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[9] The level of accepted interference shall be fixed by agreement between the administrations/agencies concerned, using the relevant ITU-R Recommendations as a guide.

[10] Space stations in the broadcasting-satellite service on geostationary satellites operating in the band 11.7-12.7 GHz are exempted from these provisions but shall maintain their positions in accordance with Appendix 30 of the Radio Regulations.

c. need not comply with b) above as long as the satellite network to which the space station belongs does not cause unacceptable interference to any other satellite network whose space station complies with the limits given in b) above.

4. Space stations[11] on board geostationary satellites which are put into service prior to 1 January 1987, with advance publication information for the network having been published before 1 January 1982, are exempted from provisions of paragraph 2 above; however, they:

a. shall have the capability of maintaining their positions within 1 degree of the longitude of their nominal positions; but efforts should be made to achieve a capability of maintaining their positions at least within 0.5 degree of the longitude of their nominal positions;

b. shall maintain their positions within ±0.1 degree of the longitude of their nominal positions; but

c. need not comply with b) above as long as the satellite network to which the space station belongs does not cause unacceptable interference to any other satellite network whose space station complies with the limits given in b) above.

8.2.39 Pointing Accuracy of Antennas on Geostationary Satellites

1. The pointing direction of maximum radiation of any earthward beam of antennas (intended for less than earth coverage) on geostationary satellites shall be capable of being maintained within:

a. 10% of the half power beamwidth relative to the nominal pointing direction or

b. 0.3 degree relative to the nominal pointing direction, whichever is greater.[11]

2. In the event that the beam is not rotationally symmetrical about the axis of maximum radiation, the tolerance in any plane containing this axis shall be related to the half power beamwidth in that plane.

3. This accuracy shall be maintained only if it is required to avoid unacceptable interference[11] to the other systems.

8.2.40 Space Research in Bands other than those Allocated to the Space Research Service

In carrying out space developmental responsibilities, it is necessary and desirable that NASA conduct research by and on space techniques, especially in bands allocated to the various space services. Thus NASA may find it necessary to propose satellite research in various Federal and non-Federal bands. In general, assignments to space research space and earth stations will be experimental, i.e., on a non-interference basis to operational systems in accordance with the Table of Frequency Allocations.

8.2.41 Space Systems Using Necessary Bandwidths Greater Than 5 MHz for Transmissions from Space in the Band 2200-2290 MHz

1. In the band 2200-2290 MHz, space-to-Earth and space-to-space operations should make use of transmissions that have necessary bandwidths constrained to no more than 5 MHz. For transmissions that require necessary bandwidths of greater than 5 MHz, the requesting agency shall submit justification on why a bandwidth exceeding 5 MHz is necessary; furthermore agencies are to explain why the radiocommunications requirement cannot be satisfied through use of transmissions using less bandwidth, i.e., 5 MHz or less, e.g., through use of more spectrally efficient modulation. Spread spectrum missions (e.g., space-to-Tracking and Data Relay Satellite, communications and lunar downlink, and lunar data relay satellite communications) that enable multiple users on the same channel and require a necessary bandwidth of approximately 6.16 MHz are exempt from this policy.

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[11] Transmitting antennas of space stations in the broadcasting-satellite service operating in the band 11.7-12.7 GHz are not subject to these provisions but shall maintain their pointing accuracy in accordance with Section 3.14.1 of Annex 5 to Appendix 30 of the Radio Regulations.

2. Agencies intending to use wide necessary bandwidths are to submit justification for the wide bandwidths to the Spectrum Planning Subcommittee, whenever the bandwidths of transmissions in the band 2200-2290 MHz from space stations exceed 5 MHz. The information will be subject to SPS review in association with requests for certification of spectrum support for such systems, in accordance with direction contained Chapter 10 of the NTIA Manual. Specific data requirements are contained in Section 10.8.2A of the NTIA Manual.

8.2.42 Wildlife and Ocean Buoy Tracking and Telemetering

1. Pursuant to footnote US210 to the National Table of Frequency Allocations, the use of frequencies in the bands 40.66-40.70 and 216-220 MHz may be authorized to U.S. Federal and non-Federal stations stations on a secondary basis for the tracking of, and telemetering of scientific data from, ocean buoys and wildlife, subject to the following conditions:

a. Airborne wildlife telemetering in the band 216-220 MHz will be authorized in only the 216.0-216.1 MHz portion of the band. After January 1, 2002, no new assignments shall be authorized in the band 216-217 MHz.

b. All transmitters shall be FCC type accepted, or the equivalent, as specified in 47 CFR 90.248.

c. Classes of emission shall be limited to N0N, A1D, A2D, F1D, F2D, F9D.

d. Occupied bandwidth shall not exceed 1 kHz.

e. Maximum carrier power shall not exceed 1 milliwatt for airborne wildlife applications, 10 milliwatts for terrestrial wildlife applications, and 100 milliwatts for ocean buoys.

f. In the band 216-220 MHz, the carrier frequency shall be maintained within 0.005 percent of the assigned frequency.

g. In the band 40.66-40.70 MHz, the bandwidth required for frequency tolerance plus the occupied bandwidth of any emissions must be adjusted so as to be confined within this band, except as permitted by paragraph h below.

h. The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 decibels;

(2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 decibels;

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth; at least 43 plus 10 Log_{10} (mean output power in watts) decibels or 80 decibels, whichever is the lesser attenuation.

2. Wildlife telemetry in the 162-174 MHz band are authorized on a unprotected, non-interfering basis for the tracking of, and the telemetering from, wildlife. Multiple agency operations will be conducted under a Memorandum of Agreement between cooperating agencies and subject to the following conditions:

a. Radio frequency assignments on specific operational frequencies are maintained in the Government Master File (GMF).

b. Class of emission shall be limited to V1D.

c. Authorized bandwidth shall not exceed 1 kHz.

d. Maximum carrier power shall not exceed 10 mW.

e. The carrier frequency shall be maintained within 0.003 percent of the assigned frequency.

8.2.43 Frequency Assignments to Transportable Earth Stations in the 7300-7750 and 8025-8400 MHz Bands

Frequency assignments to transportable earth stations in the bands 7300-7750 and 8025-8400 MHz will be on a temporary/renewable basis with an expiration date not to exceed five years. These assignments may be used over a small geographical area, normally this area will not be in excess of radius of 48 kilometers from the assignment location. Operations within the confines of this geographical area may be restricted if such operations are in conflict with existing uses in the band. These area assignments may be further restricted if new requirements for authorized services indicate such restrictions are required in order to provide for compatible operations. In addition, those assignments for transportable operations (Special Note S362) in the bands 7300-7750 and 8025-8400 MHz shall bear the Special Note S370 (See Annex A).

8.2.44 Frequency Assignments for Fixed Service Stations in the 7900-7975 MHz Band

1. Those fixed service stations authorized in the 7900-7975 MHz band before April 15, 1981 and identified in IRAC Doc. 22017/2 may continue to operate and are protected from harmful interference from all earth stations of the DSCS-III Satellite System until January 1, 1984. After January 1, 1984, protection from harmful interference is provided to those fixed service stations identified in IRAC Doc. 22017/2 and authorized in:

   a. the 7900-7950 MHz band from DSCS-III earth stations that operate in the fixed-satellite service and the aeronautical mobile-satellite and the land mobile-satellite services; and,

   b. the 7950-7975 MHz band from all DSCS-III earth stations.

2. Such protection is limited to a 36 month period after written notice has been provided by the military department of their intent to operate an earth station in the 7900-7975 MHz band that may cause interference.

8.2.45 Frequency Assignments to Mobile Stations in Certain Frequency Bands Shared with Passive Sensors

Remote sensing operations conducted in the Earth Exploration-Satellite Service (passive) and the Space Research Service (passive) can be disrupted if interference power level arriving at the sensor approaches the level of natural radiation being measured by the sensor. Mobile systems have the potential for creating an interference environment which could make sharing with passive sensors difficult. Therefore, although US263 provisions apply, agencies requesting frequency assignments for mobile stations operating with transmitter powers in excess of 2 watts will consider other mobile bands to meet the required operation before assignments are requested in the following bands:

21.2-21.4 GHz	50.2-50.4 GHz	174.5-176.5 GHz
22.21-22.5 GHz	54.25-58.2 GHz	200-202 GHz
36-37 GHz	116-126 GHz	255-238 GHz
150-151 GHz		

8.2.46 Radiolocation Operations in the Band 15.7-17.3 GHz

Airborne radars, except those authorized before January 1983, shall have the capability to cease operation in the 15.7 to 16.2 GHz band when within a minimum distance of the airport surface detection equipment (ASDE) determined for each new airborne radar system when NTIA certifies spectrum support for that system.

8.2.47 Shared Federal/Non-Federal Radio Systems

The term "shared system" as used in this section means a radio system using one or more frequencies authorized by the NTIA and one or more frequencies licensed by the FCC. "Agreement" or "Agreements," as specified in this section refer to Memorandums or Letters of Understanding or Agreement between federal agencies and non-federal partners. Shared systems may be authorized under the following conditions (Operations conducted under Section 7.3.6 or Part 7.12 of the Manual, which allow a federal radio station to utilize any frequency authorized to a non-federal radio station under specified conditions, are exempt from this policy.). The federal agencies signing the Agreement shall:

a. prior to signing any Agreement, submit to the IRAC, for information and planning purposes, a copy of any Agreement which has been coordinated between the parties to the Agreement. The Agreement shall state that it is contingent on NTIA's approval of any supporting certifications, authorizations, or modifications. The Agreement shall contain conditions for the return of frequencies authorized by NTIA in the event that NTIA determines that: the frequencies can no longer be made available for non-federal use, all federal participants withdraw from the shared system, or the return is required for convenience of the government.

b. obtain spectrum certification from NTIA prior to requesting authorization for frequency assignments from NTIA.

c. in accordance with the procedures specified in Chapter 10, submit a request for system review to the Spectrum Planning Subcommittee (SPS) for the proposed shared system and obtain NTIA Certification of Spectrum Support. The following information shall be submitted to the SPS: In accordance with Section 10.1.3 of the NTIA Manual, a request for certification of spectrum support for the proposed system; a frequency plan for federal spectrum access requirements; and a copy of the signed Agreement between the requesting federal agency and the non-federal system partner. If equipment to be used by the federal agencies has already been certified, it is sufficient to provide the SPS numbers of the certifications in lieu of detailed equipment characteristics. Upon receipt of NTIA certification, agencies may submit requests for permanent frequency assignments or modification to existing assignments to support the shared system.

d. apply for frequency authorizations in accordance with Chapter 9 of this Manual. In addition, federal agencies:

(1) shall obtain authorizations from NTIA for all frequencies (regardless of the frequency band) that will be used by federal stations;

(2) may request authorization for a band assignment vice discrete frequency assignments for spectrum used by the shared system and allocated for non-federal use, e.g., 150.8-162.0125 MHz;

(3) shall make the non-federal partner aware that, in order to have access to spectrum allocated to the Federal Government, the non-federal partner must obtain an FCC license through the normal FCC licensing process (this application will be coordinated by the FCC through the Frequency Assignment Subcommittee); and

(4) shall include in their proposals:

(i) Remarks line that shows the joint operations by the agency, non-federal, and other agencies:

Example: REM05 *JNT,I , NG , J , A , DHS

(ii) Information in the supplementary details identifying the agreement reached between the federal agency(ies) and non-federal partners:

Example: SUP01 DOI and Wyoming Agreement 6 Dec 2006

(iii) Special Note S402:

NTS01 S402

(iv) *NTS, M015 entry with the IRAC and SPS document numbers for this system:

Example: REM07 *NTS,M015,IRAC,XXXXX,SPSXXXXX

(v) Paired frequency data referencing the system-wide FCC spectrum band assignment:

Example: REM03 *PRD,M150.8000,I 080001

(vi) Supplementary remarks listing each maritime frequency or two digit maritime channel number used, if maritime frequencies are included in a band assignment:

Example: SUP02 Marine Channel XX included in band assignment

(vii) When a band assignment is used for spectrum allocated for non-federal use, the assignment must list the individual frequencies in the supplementary details or reference an FAS document that contains the individual frequencies in the circuit remarks M001 entry:

Examples:

SUP01 FCC licensed frequencies in use, MXXX.XXXX,
REM05 *NTS, M001,FAS,XXXXX

e. have (1) an assignment for each frequency which is allocated on a primary basis for federal use; and (2) individual assignments or a band assignment for operations allocated on a non-primary basis for federal use.

f. ensure that the non-federal partner has FCC licenses for operations on frequencies which are allocated on a primary basis for federal use.

8.2.48 Trunked Land-Mobile Radio Systems

1. Trunked land-mobile radio systems may be established in any frequency band allocated for Federal use on a primary basis for the fixed and mobile services. Accommodating a trunked system requires consolidation of existing land mobile systems by the applicant(s) unless they present justification.

2. Trunked land-mobile radio systems may be established by an individual agency or cooperatively by several agencies. Innovative methods of using commercial entities to design and operate trunking systems under sponsorship of one or more Federal agencies are encouraged. Frequency assignments for shared trunked land-mobile radiocommunication systems shall be obtained by the installing, sponsoring or lead agency which is responsible for managing the system. Individual user agencies are not required to obtain frequency assignments to share the system if operated in accordance with provisions of Paragraph 4, Section 9.1.2.

3. Trunked land mobile systems will be submitted to the Spectrum Planning Subcommittee for system review prior to application for frequency assignment. This system review is based on the need to consider the system as a whole, which is not possible with the unconnected and separate frequency proposals made to the FAS. Data requirements for SPS submission are contained in Part 10.9.

4. Federal agencies managing trunked systems shall allow access to the trunked systems by other agencies where such access is technically and operationally feasible.

8.2.48A Land Mobile Radio Communications

1. Federal Government agencies implementing new land mobile communication systems and replacing aging ones should use available commercially offered land mobile services, or share land mobile services operated by other Federal, state or local government agencies whenever possible. When commercial or shared systems are unavailable, their use would not meet mission requirements, would cause unacceptable delays or disruptions, or would cost more than operating their own system, Federal Agencies may operate their own spectrum-efficient, cost-effective systems.

2. The provisions in paragraphs 8.2.48A, 3 to 6 apply to land-mobile systems operating in frequency bands above 30 MHz. Systems defined as tactical and training as explained in Section 8.2.12 are not included, however, those supporting training operations are included.

3. Agencies seeking to operate their own new land-mobile radiocommunication systems shall, before obtaining frequency assignment authorizations, establish and document their requirements. Agencies should first conduct a requirements analysis commensurate with the size and complexity of their need. Using the results of the requirements analysis as the basis, agencies shall conduct an analysis of alternatives to operating their own land mobile system commensurate with the size and complexity of the requirement to identify the most advantageous alternative to the Government. The analysis should address the use of NTIA-authorized trunked land mobile communication systems operated by other agencies or commercial services providers, and commercially offered land mobile radio services to determine their ability to meet mission requirements. This analysis shall be documented and retained by the submitting agency.

4. As a function of their oversight responsibility, NTIA will review authorization requests for selected land mobile systems prior to radio frequency authorization and may require the agency to submit the retained analysis documentation. NTIA may require, on a case-by-case basis, additional information including written technical details on the analysis undertaken by the applicant agency.

5. All requests for frequency assignments to support Federal owned and operated conventional or trunked land mobile radio systems within 30 km of an existing NTIA-authorized trunked land-mobile system, whether operated by a Federal agency or a commercial vendor, shall be accompanied by a justification that indicates why use of the existing system could not meet agency requirements. The agency FAS representative will be the primary point of contact, unless another Federal Official is identified, for obtaining additional information regarding the selection of a separate system. Criteria for selecting a separate system include:

a. Communications services are required in areas where the existing system cannot provide service, its use would not meet mission requirements, would cause unacceptable delays or disruptions, or would cost more than operating a separate system.

b. The existing system cannot provide the type or quality of service required, its use would not meet mission requirements, would cause unacceptable delays or disruptions, or would cost more than operating a separate system.

c. A separate system is required to fill a gap in the existing system, which will be generally used to meet the applicant's requirements.

8.2.49 (Reserved)

8.2.50 Federal/Non-Federal Frequency Sharing in the 932-935 MHz and 941- 944 MHz Bands

The bands 932-935 MHz and 941-944 MHz are shared by the Federal and non-Federal on a co-equal basis for the Fixed Service. Applications for assignments in these bands will be processed on a daily basis, and assignments will be made based on first come, first-served. Therefore, if a non-Federal application is filed one or more days before a Federal application, the non-Federal application will be granted. The converse therefore also applies. If a situation arises where Federal and non-Federal

applications are filed on the same day for the same frequency to be used in the same geographic location (mutually exclusive applications), and agreements cannot be made to satisfy one or both applicants, then a joint lottery shall be held to determine whether the Federal or non-Federal entity shall be assigned the frequency.

8.2.51 Redeployment Requirement of Weather Radars

Within the bands 2700-2900 MHz and 5350-5650 MHz, conventional magnetron or coaxial magnetron output tubes used in WSR-57, WSR-74S, WSR-74C, AN/FPQ-21 and AN/FPS-77 weather radars have inherent spurious emission levels that may cause radio frequency interference to digital radio-relay microwave systems in the 3700-4200 MHz and 5925-6425 MHz range. Prior to redeployment of these weather radars by any Federal agency, an RF waveguide filter which reduces the spurious emission levels by at least 40 dB shall be installed.

8.2.52 Federal Use of the Band 220-222 MHz

1. Frequencies in the 220-222 MHz band are available for land mobile use for both Federal and non-Federal operations. This Section sets out the policies and procedures governing the authorization and use of Federal systems operating in the 220-222 MHz band.

2. All Federal systems operating in this band will be submitted to the Spectrum Planning Subcommittee for systems review under the provisions of Chapter 10 prior to submission of requests for frequency assignment.

3. As set forth in Section 4.3.15, two blocks of 5 contiguous channel pairs have been set aside for exclusive Federal use in the development of nationwide systems and 140 channel pairs set aside for shared Federal and non-Federal local use.

4. Each application for review of a system using a nationwide block must certify that within ten years of receiving Certification of Spectrum Support from NTIA, the system will be fully constructed and all proposed channels in use. The application shall include a schedule for implementation of the system. The user shall file a systems progress report with the Frequency Assignment Subcommittee and the Spectrum Planning Subcommittee 2, 4, 6 and 10 years from the date of certification of spectrum support demonstrating compliance with the schedule. Failure to comply with the schedule will lead to forfeiture of existing assignments or curtailment of the Certification of Spectrum Support for use of the nationwide block of channels unless sufficient justification as to why a progress report was not submitted or schedule was not met.

5. Each application for review of a non-nationwide system shall include a schedule for implementation. The period for implementation shall normally be one year but extensions up to 3 years may be authorized upon full justification. The user shall file a systems progress report with the Frequency Assignment Subcommittee and Spectrum Planning Subcommittee at the end of the implementation period approved in the Certification of Spectrum Support demonstrating compliance with the schedule. Failure to submit a progress report or comply with the approved schedule will lead to forfeiture of existing assignments or curtailment of the Certification of Spectrum Support unless sufficient justification as to why a progress report was not submitted or schedule was not met.

8.2.53 Tracking, Telemetry and Telecommand Operations

The tracking, telemetry, and telecommand operations of a satellite network shall have Stage 4 NTIA spectrum certification and frequency assignments with operational station class(es) before the launch of the spacecraft.

8.2.54 Policy on the Use of the Frequency Bands Between 406.1 and 450 MHz by Range Safety Operations

The following policy is established with respect to use of the bands between 406.1 and 450 MHz by range safety operations (i.e., command destruct/flight termination):

1. Range safety operations may be authorized in the 420-450 MHz band, but will be limited to Federal Government test ranges. Transmitted power shall be limited to 1 kW except at Vandenberg AFB, CA, White Sands Missile Range, NM, and Cape Canaveral Air Force Station, FL, where the maximum transmitted power shall not exceed 10 kW. Any requirement for transmitted powers above 1 kW at federal test ranges other than the three aforementioned locations must be agreed to by the FCC.

2. Range safety operations are authorized in the 406.1-420 MHz band but limited to:

a. use of the frequency 416.5 MHz at Jonathan Dickinson Missile Tracking Annex, Jupiter, FL, Wallops Island, VA, and Cape Canaveral AFB, FL for support of the NASA Space Shuttle through December 31, 2014; and

b. use of the frequency 416.5 MHz at Pillar Point AFS, CA, Laguna, CA, Point Mugu, CA, and Vandenberg AFB, CA through December 31, 2014. The use of command destruct at the California locations is limited to the Army MDA program and any other use of the frequencies must be requested using the STA process in 8.3.31.

8.2.55 Wideband and Narrowband Emission Level and Temporal Measurements in the Navstar Global Positioning System Frequency Bands

1. Federal agencies requesting Stage 4 Spectrum Certification for systems operating in the 390-413 MHz, and 960-1710 MHz frequency bands must provide measurements of the emission levels generated in the frequency bands used by the Navstar Global Positioning System. The measurements of the wideband emission levels expressed in units of dBW/MHz and narrowband emission levels expressed in units of dBW are required in the 1164-1240 MHz and 1559-1610 MHz frequency bands.

2. For pulsed systems operating in the 390-413 MHz, and 960-1710 MHz frequency bands, measurements of the temporal characteristics of the emissions in the 1164.45-1188.45 MHz, 1215.6-1239.6 MHz, and 1563.42-1587.42 MHz bands can also be provided.

3. For systems operating in the subject frequency bands, this requirement will become effective on July 1, 2009. Systems already operational, procured prior to July 1, 2009, or submitted for review by the Spectrum Planning Subcommittee prior to July 1, 2009 will be exempt from this requirement.

8.2.56 Aeronautical Use by Mobile Stations of Frequencies in the Bands 162.05-173.2, 173.4-174, and 406.125-420 MHz on an Exceptional Basis

Aircraft operations using this exception are operated occasionally and are not the primary use of the radio frequency operations. If a land or maritime mobile system is only used by aircraft on an exceptional basis, the authorization for the station should have a station class in the land mobile (ML) or maritime mobile (MS) service and the following provisions shall apply:

a. For the bands 162.0500-173.2, 173.4-174, and 406.1250-420 MHz, the transmitter output power should be the minimum required to provide the service, but must not exceed 10 watts.

b. The station class MA will not be entered on the GMF application since the operations are on an exceptional basis and are not protected.

c. These stations can only be operated within the coverage area of the associated land mobile or maritime mobile system and at a minimum altitude required to achieve satisfactory communications which should not exceed 3500 feet above ground level. This is required in order to reduce the potential of harmful interference to other users.

d. If interference is experienced by an authorized land or maritime station, the aircraft will cease transmissions immediately upon notification. It is the responsibility of the agency operating the aeronautical station to resolve any harmful interference that may be caused to other users. The radio astronomy service uses the band 406.1 – 410 MHz and is particularly susceptible to interference from airborne stations.

8.3 COORDINATION OF FREQUENCY USAGE

It is the responsibility of the agency proposing a new frequency assignment or a new radio station (transmitting or receiving), for which protection is desired from the operation of the same or other radio services, to ascertain from other agencies that may be involved whether harmful interference is likely to be caused to or from such proposed operations as a result of the established operations of those agencies.

8.3.1 Basic Coordination Arrangement Between the IRAC and the FCC

The arrangement described in Part 2.4 includes cooperation with respect to the coordination of frequency authorizations which would tend to cause interference to stations operations under the jurisdiction of the other party. With respect to the time agreed for review of frequency assignments requests, time periods less than 15 working days may apply as determined by the FAS.

8.3.2 Coordination of the Policy and Economic Aspects of Certain Federal Proposals to Use Non-Federal and Amateur Frequency Bands

As stated in Section 4.1.2, a Federal frequency assignment may be authorized in a non- Federal band provided the assignment is coordinated with the FCC.

Federal use of non-Federal frequency bands may involve policy and economic, as well as technical, considerations. In order that coordination of each of these aspects may be achieved in the assignment of frequencies to Federal radio stations, within the United States and Possessions, which contemplate a) the use of a non- Federal or amateur band above 25000 kHz, or b) the use of one or more frequencies below 25000 kHz which, because of probable impact upon assignments by the FCC, warrants special attention, the following procedures should be observed:

1. New uses not provided for by Chapter 7 and not covered by existing agreements with the FCC:

The Federal agency concerned may coordinate the proposed assignment informally with the FCC.

If the matter can be readily resolved and if the FCC indicates that formal policy coordination with the Commission is not required, the agency desiring the assignment will submit an application to the IRAC for processing in accordance with established procedures.

Should there be a problem which cannot be resolved informally, or should the FCC indicate that formal policy coordination with the Commission is necessary, the matter will be referred to NTIA by the Federal agency concerned for appropriate action.

Upon satisfactory completion of coordination with the FCC, NTIA will inform the Federal agency concerned of the results and, upon acceptance by that agency of any conditions involved, instruct the IRAC to process the application, when filed by that agency, in accordance with established procedures.

2. Proposed assignments provided for by Chapter 7 or those which are within the scope of existing agreements with the FCC:

The Federal agency concerned will submit an application to the IRAC for processing in accordance with established procedures, supplemented, if appropriate, by advance informal coordination with the FCC.

3. These procedures notwithstanding, any Federal agency may refer any such matters to NTIA whenever the agency considers it desirable to do so.

8.3.3 Coordination of Frequencies Used for Communication with Non-Federal Stations Licensed Under Part 90 of the FCC Rules

Provision is made in Part 7.12 for a Federal radio station to use any frequency authorized to a non-Federal radio station under Part 90 of the Rules of the Federal Communications Commission where such utilization is necessary for intercommunication with non-Federal stations or required for coordination with non-Federal activities, provided a mutually-approved arrangement has been concluded between the Federal agency concerned, the Federal Communications Commission, and the non-Federal licensee involved.

Two steps are required to conclude a mutually- approved arrangement. The Federal agency must obtain from the non-Federal licensee a written certification that the Federal operation is necessary, and, after receipt of the certification, the Federal agency must coordinate the proposed usage with the FCC.

8.3.4 Coordination of Military Use of Non-Federal Bands at Test Ranges and for Tactical and Training Operations

See section 7.15.3 and part 7.17.

8.3.5 Intra-Military Coordination of Frequency Applications

Army, Navy, and Air Force dockets for the FAS agenda will have had complete military coordination and will normally be concurred in by the three military services at the FAS meetings.

If, due to unforeseen circumstances, it becomes necessary for one of the military services to request tabling of another military service's docket that appears on the regular agenda, the docket will be tabled. If there is no resolution at the next regular FAS meeting, the docket will be withdrawn unless the applicant requests referral to IRAC.

8.3.6 Coordination for the Use of Hydrologic Channels in the Bands 162-174 and 406.1-420 MHz

The frequencies shown in paragraph 1 of Section 4.3.3 are primarily for hydrologic operations. Federal agencies may also use these frequencies for non-hydrologic purposes when all other possibilities (except AGA(4) channels) have been exhausted, and when such use will not conflict with present or probable future hydrologic operations. Validation of hydrologic use by the Hydrology Coordinator must be accomplished prior to the submission of any hydrologic proposal into the frequency assignment process.

1. *The Hydrology Coordinator*. The Hydrology Coordinator under the Subcommittee on Hydrology of the Federal Interagency Advisory Committee on Water Information is responsible for validating the hydrologic use.

2. *Preparing Proposals for Submission to the Hydrology Coordinator*. A Federal agency having a requirement to use a hydrologic channel, whether for hydrologic or non-hydrologic purposes, shall prepare a proposal as outlined in subparagraph a below. Additionally, if the frequency will be used to support hydrologic operations, the applicant shall comply with the special instructions in subparagraph b; if for non-hydrologic operations, the applicant shall comply with the provisions of subparagraph c.

a. *General Instructions*. All proposals for the use of hydrologic channels shall consist of the following basic elements:

(1) An Application for Frequency Assignment Action, completed in accordance with Part 9.8 of this Manual. All such applicants shall bear Record Note C075.

(2) A cover letter containing (at a minimum) the name, mailing address, and telephone number of the applicant.

b. *Instructions for Hydrologic Proposals*. If the frequency is to be used for hydrologic purposes, the applicant shall provide the following additional information in either the cover letter, the Agency Remarks (*AGN) or Supplementary Details (SUP) fields of the application, or in a separate attachment to the proposal package:

(1) Type of station (i.e. relay, command, or sensing).

(2) Kind of data to be transmitted (e.g. river stage, precipitation, etc.).

(3) Type of transmission (i.e. voice, data, combination of voice and data, etc.)

(4) Operation schedule (e.g. on call, automatic for 15 minutes each hour, etc.).

(5) latitude and longitude of the station.

(6) The name of the Federal agency sponsoring this application, along with supporting documentation.

c. *Instructions for Non-Hydrologic Proposals*. If the frequency is to be used for non-hydrologic purposes, the following instructions apply:

(1) Before deciding to use a hydrologic channel, the applicant must first go through the standard frequency selection process as described in the IRAC Supplement to the NTIA Manual:

--First choice shall be given to those frequencies which bear the applicant's own symbol;

--Second choice to those bearing the symbol AGA, except AGA(4) and AGA(8);

--Third choice to those bearing the symbol of another agency;

--Fourth choice to those bearing the symbol of AGA(8); and

--Fifth choice to those bearing the symbol of AGA(4).

(2) If the frequency is to be used exclusively in a point-to-point configuration (i.e. no mobile stations, either transmitting or receiving, are involved), the applicant shall include in the proposal a simplified network diagram showing how the frequency will be employed.

d. *Instructions for Federal Agencies Sponsoring non-Federal Entities.* Federal agencies may sponsor non-Federal entities who want to use Federal hydrologic frequencies. Non-Federal entities' use of Federal hydrologic frequencies on a secondary basis:

(1) The Federal agency sponsoring a non-Federal entity will provide a letter of endorsement that supports the hydrologic frequency usage. Qualified agencies include the Department of Commerce (i.e. the National Weather Service), the Department of the Interior (i.e. the United States Geological Survey), the Department of Agriculture (i.e. Forest Service), the Tennessee Valley Authority, and the United States Army Corps of Engineers.

(2) Non-Federal entities who desire to operate stations on these frequenies obtain authorization from the Federal Communications Commission (FCC).

3. *The Coordination Process*

a. *Submitting Proposals to the Hydrology Coordinator*. Submit the proposal and all required supporting documents in PDF format electronically to: hydro.radio.freq@noaa.gov.

b. *Hydrology Coordinator Review*. The Hydrology Coordinator reviews the proposed use and verify the use of the frequency for hydrological purposes. The Hydrology Coordinator will email the applicant a letter of validation. The applicant will submit the proposal, this letter of validation, and all supporting documents into the frequency assignment process.

4. *Submitting Applications by the Federal agencies to the FAS.* The requesting agency submits its Application for Frequency Assignment Action to the FAS after receipt of the letter of validation from the Hydrology Coordinator. Federal agencies will use their standard method to submit their applications for frequency assignments. (include in circuit remarks the date of the letter of validation and reference number.) Supporting documents required by the Hydrology Coordinator, such as maps and network diagrams, need not be submitted to the FAS. If the application appears on the FAS agenda before receipt of Hydrology Coordinator comments by the FAS Secretariat, the request will be tabled until the coordination process has been completed.

a. *Non-Federal Applications*. The FCC shall ensure non-Federal applications submitted to the FAS include the name or abbreviation (Annex G) of the sponsoring Federal agency in the Circuit

Remarks (*AGN) or SUP field.

b. *Routine Modifications and Five-Year Reviews*. If the modification will appear on the routine FAS agenda, it need not be sent to the Hydrology Coordinator for re-coordination.

c. *Significant Modifications*. If the modification will appear on the regular FAS agenda, the applicant will submit an Application for Frequency Assignment Action to the Hydrologic Coordinator. According to the nature of the modification, the Coordinator will effect whatever coordination is considered necessary.

d. *Wireless Microphone Systems*. Coordination with the Hydrology Coordinator is not required for wireless microphone systems using the channels listed in Section 4.3.2.

8.3.7 Coordination of Meteorological Aids Operations in the Bands 400.15-406 and 1668.4-1700 MHz

The characteristic frequency drift of radiosonde equipment and the requirement for flexibility in the operation of radiosondes preclude effective suballocation, channeling, or the granting of authority to use specific frequencies in the bands 400.15-406 and 1668.4-1700 MHz. The shared use of these bands corresponds essentially, for interference considerations, to shared use of a single nominal center band frequency assignment.

Interference to the meteorological aids service that can result in spoiled observations is, by the nature of the service and the resources usually available, inherently difficult to identify and locate.

Mutual interference is possible between radiosondes operating simultaneously within 160 kilometers of each other. Line-of-sight distance to the horizon is greater than 480 kilometers from a radiosonde at an altitude of 15 kilometers.

Since these bands are available for the use of all Federal agencies responsible for the conduct of meteorological observations, each agency shall take appropriate measures to avoid interference through local coordination of specific operations if interference is indicated.

In application of allocation footnote US99, whenever it is necessary to operate radiosondes in the band 1668.4-1670 MHz within the United States, notification of the operations shall be sent, as far in advance as possible, to the Division of Astronomical Sciences, National Science Foundation, 4201 Wilson Boulevard, Room 1045, Arlington, VA 22230, with a copy to the Executive Secretary, IRAC.

8.3.7A Coordination of GOES Satellite Terrestrial Data Collection Platforms

Use of the GOES Satellite terrestrial data collection platforms (DCP) in the band 401 - 402.2756 MHz shall be coordinated and registered with the Department of Commerce National Oceanic and Atmospheric Administration (NOAA) office of National Environmental Satellite Date Information Service (NESDIS). There are two satellites in operation to receive data from DCP, one in the east at 75 degrees which uses even numbered GOES channels and one in the west at 135 degrees which uses odd number GOES channels. The satellites collect data from the DCP at set time intervals and relays information to a central processing center. NESDIS controls all time slots and operating collection codes.

Since NESDIS controls all operations, codes, time slots and assigns the frequencies to be used to avoid interference, it has determined that collecting data on each location site is not necessary. Therefore, each agency may register the use of the GOES ground transmitters as an area assignment (US, USA, USP or a state) for large systems or spot locations for small systems on each frequency used. Each assignment must have a entry in the notes field of S594. For area assignments a circuit remark entry of *NRM to indicate approximately how many transmitters are in the system and an additional note of S361 will be needed to indicate multiple transmitting stations in the system.

Agencies wishing to register a GOES data collection platform should contact NESDIS at the following address:

NOAA/NESDIS Office of Satellite Data and Distribution
WWB Room 607
5200 Auth Road
Camp Springs, MD 20746-4304
E-Mail: GOES.DCS@NOAA.GOV

8.3.8 Coordination of Radio Operations in the Vicinity of Fort Huachuca, Arizona

In order to minimize possible mutual harmful interference between electronic tests of the U.S. Army Electronic Proving Ground (USAEPG), Fort Huachuca, Arizona, and the transmissions of Federal radio stations located in the vicinity of Fort Huachuca, each agency having radio operations in the coordination zone given below shall notify the Area Frequency Coordinator, Fort Huachuca, or the Army IRAC Representative, of the frequency, power, location, and type emission of the radio operations. In addition, the local address and telephone contact of the office or persons supervising or operating such stations should be reported if applicable. Transmissions of mobile stations located within 24 kilometers of Fort Huachuca (31°31'48"N, 110°21'05"W) shall be minimized to the extent feasible.

The coordination zone is the area bounded by connecting lines running along Highway 80 from Tucson to Bisbee, due south from Bisbee to the international border, west along the border to a point due south of Dateland, due north to Dateland, along Highway 80 from Dateland to Gila Bend, and along Highway 84 from Gila Bend to Tucson (traffic on Highways 80 and 84 excluded).

For the protection of the USAEPG, signal levels should not exceed the following limits within 24 kilometers of Fort Huachuca:

10-540 kHz	20 millivolts per meter
540-1600 kHz	50 millivolts per meter
1.6-20 MHz	20 millivolts per meter
20-54 MHz	50 millivolts per meter
54-148 MHz	20 millivolts per meter
above 148 MHz	50 microvolts per meter

8.3.9 Coordination of Assignments to Stations (Other than Mobile and Transportable) to be Located in the National Radio Quiet Zone

1. The National Radio Quiet Zone (NRQZ) was established in IRAC Document 3867/2, March 26, 1958, subparagraph (a), for the protection of radio astronomy observations. The NRQZ encompasses an area of approximately 33,700 square kilometers of Virginia and West Virginia as shown on the map, Figure 1. This area encloses:

a. The National Radio Astronomy Observatory site at Green Bank, Pocahontas County, West Virginia, and

b. The Navy Research Station site at Sugar Grove, Pendleton County, West Virginia.

2. In order to minimize harmful interference to operations at the sites designated above, all requests for frequency assignments to stations within the area:

South of 39°15'N
North of 37°30'N
West of 78°30'W
East of 80°30'W

shall be coordinated by the applicant, prior to submission to NTIA with:

Director (Attn: Interference Office)
National Radio Astronomy Observatory
P.O. Box 2
Green Bank, WV 24944
Telephone 304-456-2107

Send by email to nrqz@nrao.edu all new applications and GMF modifications that may increase the potential of interference.

The National Radio Quiet Zone coordinator will reply to all coordination requests in approximately 30 days or less. All applications submitted to NTIA shall include in the supplementary remarks "NRQZ" followed by the NRQZ coordination number provided by the NRQZ coordinator, and the date that the NRQZ coordinator provided concurrence for the proposal. This supplementary information shall be included in the GMF entry for the authorization.

This procedure applies to all stations except mobile and transportable stations.

The reference coordinates for Green Bank are:

North latitude 38d 25m 59.2s (NAD83)
West longitude 79d 50m 23.4s (NAD83)
Height above terrain: 139.6 m
Terrain elevation above mean sea level (NAVD88): 806 m

Additional information about NRQZ and coordination is available at URL http://www.gb.nrao.edu/nrqz.

3. The Record Note C081 will be inserted in the NOTES (NTS) field on all such assignment requests. These assignment requests shall not be approved until notice of successful coordination has been received from the NRQZ coordinator.

8.3.10 Coordination of Assignments to Stations Located in the Vicinity of the United States/Canada Borders

The United States/Canada Agreement relating to the Coordination and Use of Radio Frequencies above 30 MHz provides for the coordination by the IRAC with the Canadian Department of Communications of certain frequency assignments. The text of the applicable portion of the Agreement is given in Part 3.4. This Agreement, in many cases, contains multiple coordination channels, e.g., assignments in the bands 1215-1400 MHz, 2700-3700 MHz, and 8500-10500 MHz are indicated in the Index of the Technical Annex to the Agreement as being coordinated between the JCS on the U.S. side and CDS on also indicated as being coordinated by FAA with DOT, Canada. To ensure that comments concerning proposals received from Canada under the terms of the Agreement take into consideration the comments of other authorized U.S. coordination agencies, the agency receiving proposals from Canada will coordinate its reply to Canada with all U.S. agencies also indicated in the Agreement as a Coordination Agency for the band or portion of the band in which the proposed frequency is located.

8.3.11 Coordination of Frequency Usage Outside the United States and Possessions

In order that harmful interference may be avoided insofar as possible, Federal agencies shall coordinate with the IRAC the use of frequencies by their stations located outside the United States and Possessions. Coordination ordinarily shall be limited to stations likely to cause harmful interference to those authorized by NTIA or the FCC. Coordination of the use of frequencies by military stations shall be subject to the requirements of military urgency and security. However, all U.S. Federal Government radio stations operated within the Trust Territory of the Pacific Islands (Republic of Palau), except those of the U.S. military, shall be coordinated with the FAS prior to activation. All U.S. Federal Government radio stations operated in the Federated States of Micronesia and the Republic of the Marshall Islands shall be coordinated with the U.S. Competent Authority in accordance with Annex L.

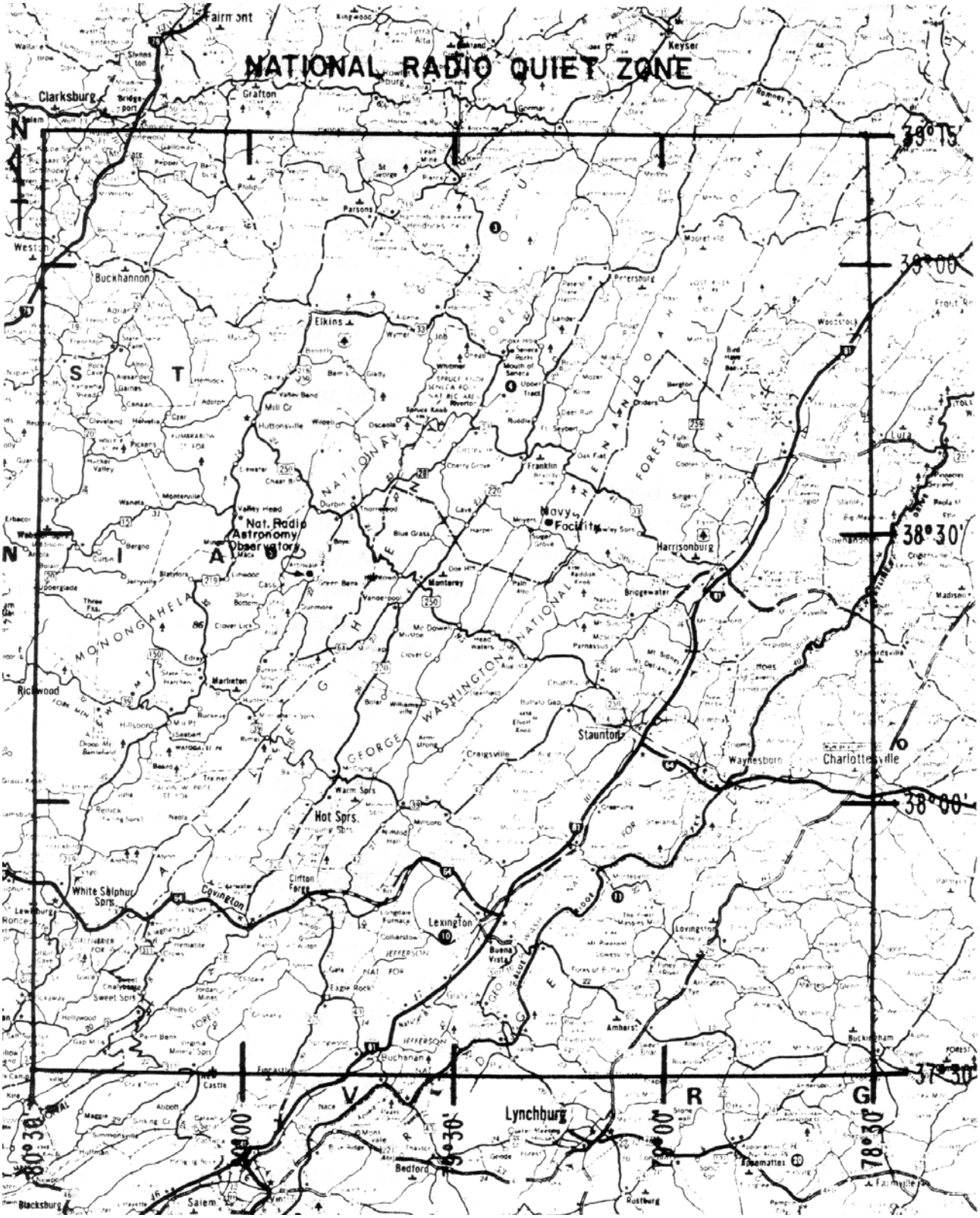
An agency initiating coordination in the FAS under this section may use either of these methods:

a. Using the procedure of Chapter 9 of the Manual with the Note S141 in the NOTES (NTS) field when listing in the Government Master File is desired.

b. By Memorandum providing the essential assignment details.

Comments of the FAS shall be entered in the FAS Meeting Minutes.

Figure 1. National Radio Quiet Zone



8.3.12 Coordination of Assignments for Transmissions by Terrestrial Stations Located Within the Coordination Area of a Receiving Earth Station

1. General Provisions

a. Before an assignment to a terrestrial station is brought into use within the coordination area of a receiving earth station of another country utilizing the same band above 1 GHz allocated internationally with equal rights to terrestrial and space radiocommunication services (space-to-Earth) and within the bands listed in 2 below, coordination must be effected with that country to ensure interference will not be caused to the receiving earth station. (See **9.18** of the RR).

b. Nationally, the ITU RR procedure for coordinating terrestrial stations also is followed to identify possible interference to receiving earth stations located within the United States and Possessions.

2. Frequency Bands

a. The coordination procedure specified in this Section applies in the following frequency bands:

1215-1260 MHz	8025-8500 MHz
1559-1610 MHz	15.43-15.63 GHz
1670-1710 MHz	81-84 GHz
2200-2300 MHz	102-105 GHz
3600-3650 MHz	134-142 GHz
4500-4635 MHz	149-164 GHz
4685-4800 MHz	190-200 GHz
5150-5216 MHz	231-241 GHz
7250-7750 MHz	252-265 GHz

b. The procedure for obtaining terrestrial station frequency assignments located within the coordination area of a receiving earth station along the U.S./Canada and U.S./Mexico Borders has not yet been established for the 3500-3600 MHz frequency band.

3. Specific Provisions

a. For major terrestrial systems, or major modifications of existing systems, national and international coordination will be initiated during the systems review procedure outlined in Chapter 10. The SPS shall initiate coordination, as appropriate, with the country having the receiving earth station.

b. For assignments to terrestrial stations in systems not considered under the systems review procedure, Chapter 10, and to be located within the coordination area of a United States receiving earth station listed in Section 8.3.15, the applicant shall effect prior coordination with the agency operating the receiving earth station. In cases where such terrestrial stations are within the coordination area of a receiving earth station of another country listed in Section 8.3.15, the applicant shall provide to the FAS, in addition to the application for frequency assignment, the data required by No. **9.31** of the ITU RR. The FAS, as appropriate, shall initiate the international coordination required.

c. Final assignment action shall not be taken in the FAS until national coordination has been accomplished, and international coordination has been initiated, where it has been determined to be necessary.

d. The provisions of this Section are equally applicable to any proposed change in the technical characteristics of a currently authorized frequency assignment for transmission by a terrestrial station, if the change increases the probability of harmful interference being caused by the terrestrial station.

e. Coordination pursuant to this Section is not required for an experimental station or for a station whose frequency assignment would not be in accordance with the national or international Table of Frequency Allocations.

8.3.13 Coordination of Assignments for Transmission or Reception by Earth Stations

1. *General Provisions*

a. Before an assignment to an earth station, whether for transmitting or receiving, is brought into use in a particular band allocated with equal rights to space and terrestrial radiocommunication services in the spectrum above 1 GHz and in the bands listed in 2a below, coordination must be effected with any country whose territory lies within the coordination area of the earth station to ensure that interference will not be caused to or by terrestrial stations. (See **9.17** of the RR). The coordination area is determined in accordance with Appendices **5** and **7** of the RR.

b. Before an assignment to an earth station, whether for transmitting or receiving, is brought into use in a particular band allocated with equal rights to space radiocommunication services in both directions of transmission and in the bands listed in 2b below, coordination must be effected with any country whose territory lies within the coordination area of the earth station or the earth station is located within the coordination area of a coordinated earth station to ensure that interference will not be caused to or by earth stations operating in the opposite direction of transmission. (See No. **9.17A** of the RR.) The coordination area is determined based on Recommendations ITU-R IS.847, IS.848, and IS.849.

c. Nationally, the ITU RR procedure for coordinating earth stations also is followed to identify possible interference between such earth stations and terrestrial stations located within the United States and Possessions.

d. Coordination contours should be submitted to:

(1) The Spectrum Planning Subcommittee as part of the system review procedure outlined in Chapter 10, when submitting Notices of Frequency Assignment for earth stations for use in international coordination and registration activities.

(2) Subsequent to NTIA assignment approval the contours for all earth stations of the U.S. Federal Government or of foreign administrations when such contours both include territory of the U.S. and operate in bands used by U.S. Federal Government terrestrial stations shall be published in the NTIA Manual.

e. A computer program for the calculation of coordination areas, with respect to terrestrial stations, has been developed jointly by the NTIA, Department of Commerce, the Joint Spectrum Center (JSC), Defense Information Systems Agency and the Department of Defense. A personal computer based version of this computer program, developed by NTIA, is available on the Government Master File CD-Rom and may be used by Federal agencies to comply with the provisions of this section. Agencies may request NTIA to furnish the service. The ITU Radiocommunication Bureau has also developed a PC based version of Appendix **7** which can be purchased from the ITU. Agencies that have earth stations that require international coordination should consider purchasing the ITU program since this program will be used to determine whether an administration has coordinated with all affected administrations. The ITU also has for sale a PC based version of Recommendation ITU-R IS.847.

2. *Frequency Bands*

a. (Earth Station/Terrestrial Station Coordination)

The coordination procedure specified in sub-paragraph 1a of this section applies in the following frequency bands:

1215-1260 MHz, 1559-1610 MHz, 1610-1626.5 MHz, 1675-1710 MHz, 1761-1842 MHz, 2025-2120 MHz, 2200-2300 MHz, 7125-7235 MHz, 7250-7750 MHz*, 7900-8500 MHz*, 32-32.3 GHz, 34.2-34.7 GHz, 37-38 GHz, 39.5-40.0 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-51.4 GHz, 66-71 GHz, 71-75.5 GHz, 81-84 GHz, 92-100 GHz, 102-105 GHz, 134-142 GHz, 149-164 GHz, 190-200 GHz, 202-217 GHz, 231-241 GHz, 252-275 GHz

** Nationally, coordination contours are not required in the bands 7250-7300 MHz and 7900- 8025 MHz.*

b. (Earth Station/Earth Station Coordination)

The coordination procedure specified in sub-paragraph 1b of this Section applies in the following frequency bands:

8025-8400 MHz, 19.3-19.7 GHz, 25.5-27 GHz, 40-40.5 GHz, 45.5-47 GHz, 66-71 GHz, 95-100 GHz, 134-142 GHz, 190-200 GHz, 252-265 GHz

3. *Specific Provisions*

a. International coordination relating to earth stations will be initiated by the SSS outlined in Section 3.3.2.

b. Applications for frequency assignments to earth stations shall indicate the status of coordination with affected agencies and countries. Final assignment action shall not be taken by the FAS until national coordination has been accomplished, and international coordination initiated where it has been determined to be necessary.

c. The provisions of this Section are equally applicable to any proposed change in the technical characteristics of a currently authorized frequency assignment, for transmission or reception by an earth station, if the change increases the probability of harmful interference being caused to or by a terrestrial station or earth station, as appropriate.

8.3.13A Administrative Due Diligence Applicable to Some Satellite Communication Services

1. Resolution **49 (WRC-2000)** of the RR requires the application of an administrative due diligence procedure as from 22 November 1997 for a satellite network or satellite system of the fixed-satellite service or mobile-satellite service for which the advance publication information under No. **9.2B** of the Radio Regulations has been received by the ITU's Radiocommunication Bureau from 22 November 1997. The administrative due diligence procedure with respect to Federal satellite networks is contained in 8.3.13B.

2. For a satellite network or satellite system within the scope of paragraph 1 of 8.3.13B not yet recorded in the ITU's Master International Frequency Register (MIFR), for which the advance publication information under No. 1042 of the Radio Regulations has been received by the Bureau before 22 November 1997, complete due diligence information in accordance with 8.3.13C shall be provided to the Bureau not later than 21 November 2003, or before the expiry of the notified period for bringing the satellite network into use, plus any extension period which shall not exceed three years pursuant to the application of No. **1550** of the Radio Regulations, whichever date comes earlier.

3. For a satellite network or satellite system within the scope of paragraph 1 of 8.3.13B recorded in the MIFR, complete due diligence information in accordance with 8.3.13C shall be submitted to the Bureau not later than 21 November 2000.

4. If the complete due diligence information is not received by the Bureau before the expiry date specified in paragraphs 2 or 3 above, the request for coordination will be canceled.

8.3.13B Due-diligence Procedures

1. Any satellite network or satellite system of the fixed-satellite service or mobile-satellite service with frequency assignments that are subject to coordination under Nos. **9.7**, **9.12**, **9.13** and Resolution **46 (Rev.WRC-97)** of the RR, shall be subject to these procedures.

2. When the USA Administration requests coordination for a satellite network under paragraph 1 above, it shall send to the Bureau as early as possible before bringing into use, but in any case to be received before the end of the 5-year period established as a limit to bringing into use in No. **9.1** of the RR, the due diligence information relating to the identity of the satellite network and the spacecraft manufacturer specified in 8.3.13C.

3. The information to be submitted in accordance with paragraph 2 above shall be signed by an authorized official of the USA Administration.

4. On receipt of the due diligence information under paragraph 2 above, the Bureau will examine that information for completeness. If the information is found to be complete, the Bureau will publish the complete information in a special section of the Weekly Circular.

5. If the information is found to be incomplete, the Bureau will request the USA Administration to submit the missing information. In all cases, the complete due diligence information shall be received by the Bureau within the appropriate time period specified in paragraph 2 above, as the case may be, relating to the date of bringing the satellite network into use.

6. Six months before expiry of the period specified in paragraph 2 above and if the USA Administration has not submitted the due diligence information under paragraph 2 above, the Bureau will send a reminder to the USA Administration.

7. If the complete due diligence information is not received by the Bureau within the time limits specified, the networks covered by paragraph 1 above will no longer be taken into account and will not be recorded in the MIFR. The provisional recording in the MIFR will be deleted by the Bureau after it has informed the USA Administration. The Bureau will publish this information in the Weekly Circular.

8. Before the Bureau extends the date of bringing into use under No. **11.44** of the Radio Regulations, the complete due diligence information under paragraph 2 above shall have been submitted by the USA Administration.

9. When the USA Administration notifies a satellite network under paragraph 1 above for recording in the MIFR, it shall send to the Bureau as early as possible before bringing into use, but in any case before the date of bringing into use, the due diligence information relating to the identity of the satellite network and the launch services provider specified in 8.3.13C.

10. When the USA Administration has completely fulfilled the due diligence procedure but has not completed coordination, this does not preclude the application of No. **11.41** of the RR by the USA Administration.

8.3.13C Administrative Due-diligence Information

1. Identity of the satellite network
   a) Identity of the satellite network
   b) Name of the administration
   c) Country symbol
   d) Reference to the advance publication information
   e) Reference to the request for coordination
   f) Frequency band(s)
   g) Name of the operator
   h) Name of the satellite
   i) Orbital characteristics
2. Spacecraft manufacturer
   a) Name of the spacecraft manufacturer
   b) Date of execution of the contract
   c) Contractual "delivery window"
   d) Number of satellites procured
3. Launch services provider
   a) Name of the launch vehicle provider
   b) Date of execution of the contract
   c) Anticipated launch or in-orbit delivery window
   d) Name of the launch vehicle
   e) Name and location of the launch facility

4. In cases where a contract for satellite procurement covers more than one satellite, the relevant information shall be submitted for each satellite.

8.3.14 Coordination of Assignments to Earth and Space Stations Which Utilize Geostationary-Satellites Networks

1. *General Provisions*

a. Before bringing into use an assignment to an earth or space station in a satellite network using the geostationary-satellite orbit (GSO), coordination must be effected, in certain cases, with other countries operating or planning such networks in the same band to ensure compatibility between different satellite networks. (See No. **9.7** of the RR). Coordination is required if the proposed satellite network would cause or receive a 6% or greater increase in receiving system or equivalent satellite-link noise temperature, as appropriate, with respect to other geostationary-satellite networks. (See Appendix **8** of the RR.)

b. Additionally, in certain frequency bands to which Nos. **9.11A** and **9.21** of the RR apply, coordination of frequency assignments to geostationary-satellite networks may be required with assignments of non-geostationary-satellite networks or systems or terrestrial stations.

c. Nationally, coordination of assignments to stations in satellite networks using the GSO is effected through the IRAC, SPS, and FAS processes, as appropriate.

2. *Specific Provisions*

a. International coordination of satellite networks which utilize the GSO will be initiated by the SSS as outlined in Section 3.3.2.

b. For systems utilizing the GSO, which require international advance publication, under the provisions of No. **9.1**, and coordination under the provisions of Nos. **9.7**, **9.11A** and **9.21**, as appropriate, of the ITU RR, the SSS shall initiate advance publication and coordination with the Radiocommunication Bureau and the country(ies) involved.

c. Applications for frequency assignments to either earth or space stations in networks using the GSO shall indicate the status of coordination with agencies and countries having or planning space systems in the same band which employ the GSO. Final assignment action shall not be taken by the FAS until national coordination has been accomplished, and international coordination has been initiated, where it has been determined to be necessary.

8.3.14A Coordination of Assignments to Stations of Non-geostationary-Satellite Networks in Accordance with No. 9.11A of the ITU Radio Regulations

1. *General Provisions*

a. Before bringing into use an assignment to an earth or space station in a geostationary or nongeostationary-satellite network, in bands subject to No. **9.11A** of the RR, coordination must be effected, in certain cases, with other countries operating or planning geostationary-satellite networks, non-geostationary satellite networks or systems, or terrestrial stations, as appropriate, to ensure compatibility. The requirements for coordination are dependent on the frequency band concerned.

b. Nationally, coordination of assignments to stations of non-geostationary-satellite networks or systems is effected through the IRAC, SPS, and FAS processes, as appropriate.

2. Specific Provisions

a. International coordination of non-geostationary- satellite networks or systems will be initiated by the SSS as outlined in Section 3.3.2.

b. For non-geostationary-satellite networks or systems which require international advance publication and coordination under the provisions of Nos. **9.1** and **9.11A**, respectively, of the ITU RR; the SSS shall initiate advance publication and coordination with the Radiocommunication Bureau and the country(ies) involved.

c. Determination of the need for coordination between space stations (space-to-Earth) and terrestrial services sharing the same frequency band below 1 GHz.

Coordination of space station assignments in the 137-138 MHz and 400.15-401 MHz bands is required only if the power flux-density produced by the space station exceeds -125 dB(W/m^2/4kHz) at the surface of the Earth.

d. Method for the determination of the need for coordination between MSS space stations (space-to-Earth) and terrestrial services sharing the same frequency band in the 1 to 3 GHz range

Coordination of transmitting space station assignments of the mobile-satellite service with respect to terrestrial services is not required if the power flux-density produced at the surface of the Earth or the fractional degradation in performance (FDP) of a station in the fixed service does not exceed the threshold values shown in the following table.

Table 8.3.14A

Frequency Band (MHz)	**Service to be protected**	**Coordination threshold values**				
		Geostationary space stations		**Non-geostationay space stations**		**% FDP (in 1 MHz) (Note 1)**
		pfd (per space station) calculation factors (Note 2)		**pfd (per space station) calculation factors (Note 2)**		
		P dB (W/m2) in 4 kHz	*r dB/deg*	*P dB (W/m2) in 4 kHz*	*r dB/deg*	
1525 - 1530	analog FS	-152	0.5	-152	0.5	
	digital FS	-152	0.5			25
	other terrestrial services (Note 4)	-152	0.5	-152	0.5	
2483.5 - 2500	fixed	-152	0.5	-150	0.65	
	other terrestrial services (Note 4)	-152	0.5	-150	0.65	

NOTE 1: The calculation of FDP (fractional degradation in performance) is contained in Resolution 46 Section A2.1.2.2.1, using reference FS parameters contained in Sections A2.1.2.2.2.1 and A2.1.2.2.2.3.

NOTE 2: The following formula should be used for deriving the coordination threshold in terms of power flux-density:

$$PdB(W/m^2/4kHz) \quad \text{for} \quad \leq 0° \delta \leq 5°$$

$$P + r(\Delta - 5)dB(W/m^2/4kHz) \quad \text{for} \quad \leq 5° \delta \leq 25°$$

$$P + 20dB(W/m^2/4kHz) \quad \text{for} \quad \leq 25° \delta \leq 90°$$

where δ is the angle of arrival (degrees).

The threshold values are obtained under assumed free-space propagation conditions.

NOTE 3: Not used

NOTE 4: The coordination threshold factors applicable to other terrestrial services may be reviewed at a future conference, as necessary.

e. Applications for frequency assignments to either earth or space stations in non-geostationary-satellite networks or systems shall indicate the status of coordination with affected agencies and countries. Final assignment action shall not be taken by the FAS until national coordination has been accomplished, and international coordination has been initiated, where it has been determined to be necessary.

8.3.14B Coordination of Assignments to Stations of Non-geostationary-Satellite Networks in Accordance with No. 9.21 of the ITU Radio Regulations

1. *General Provisions*

a. Before bringing into use an assignment to an earth or space station in a non-geostationary-satellite network or system, in bands subject to No. **9.21** of the RR, coordination must be effected, in certain cases, with other countries operating or planning geostationary-satellite networks, non-geostationary satellite networks or systems, or terrestrial stations, as appropriate, to ensure compatibility.

b. Nationally, coordination of assignments to stations of non-geostationary-satellite networks or systems is effected through the IRAC, SPS, and FAS processes, as appropriate.

2. *Specific Provisions*

a. International coordination of non-geostationary-satellite networks or systems will be initiated by the SSS as outlined in section 3.3.2.

b. For non-geostationary-satellite networks or systems which require international advance publication and coordination under the provisions of Nos. **9.1** and **9.21**, respectively, of the RR; the SSS shall initiate advance publication and coordination with the Radiocommunication Bureau and the country(ies) involved.

c. Applications for frequency assignments to either earth or space stations in non-geostationary-satellite networks or systems shall indicate the status of coordination with affected agencies and countries. Final assignment action shall not be taken by the FAS until national coordination has been accomplished, and international coordination has been initiated, where it has been determined to be necessary.

8.3.15 List of Coordinated Earth Stations

TRANSMITTING EARTH STATIONS					
BAND (MHz)	**LOCATION**	**COORDINATES**	**NOMINAL COORDINATION DISTANCE* (KILOMETERS)**	**IRAC/ SPS/FAS DOCUMENT**	**AGENCY/ COUNTRY**
1750-1850	CA, Camp Parks	374400N1215200W	1036	27198	AF
	CO, Boulder	400010N1051600W	598	27198	AF
1761-1842	CA, Azusa	341259N1175232W	525	33720	AF
	CA, Laguna Peak	340655N1190450W	913	28562	N
	CA, Vandenberg AFB	344924N1203154W	400	20037	AF
	CO, Buckley Field	394300N1044600W	584	I7106428-A	AF
	CO, Schriever AFB	384754N1043128W	528	30274	AF
	FL, Cape Canaveral	282909N0803430W	1012	28443	AF
	Guam, Andersen AFB	133648N1445112E	801	20037	AF
	HI, Kaena Point	213418N1581634W	760	20037	AF
	MD, Blossom Point	382553N0770516W	997	29819	Navy
	ME, Loring	4700XXN06810W	584	7321493	AF
	ME, Prospect Harbor	442455N0680150W	992	28562	N

TRANSMITTING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/FAS DOCUMENT	AGENCY/ COUNTRY
	NH, New Boston	425654N0713824W	420	20037	AF
	NM, Kirtland AFB	350300N1062400W	426	30397	AF
	VA, Ft. Belvoir	384407N0770913W	900	37249	AF
	VA, Quantico	382952N0772223W	1004	29819	Navy
	WA, Fairchild	4734XXN11810W	584	7321494	AF
1763-1840	TX, Kelly AFB	294800N0983600W	1345	29873	AF
1766-1839	GA, Atlanta	335747N0840514W	400	36584	Air Force
1767	CA, Monterey	363600N1215324W	624	35566	Navy
	MD. Annapolis	385848N0792924W	504	35566	Navy
2025-2035	AK, Fairbanks	645835N1473119W	394	29584	C
	HI, Honolulu	212112N1575236W	600	17183	C
	VA, Wallops Island	375644N0752742W	400	16761	C
	VA, Wallops Island	375734N0752817W	1001	29584	C
	WA, Seattle	473415N1223310W	320	17183	C
2025-2110	AK, Fairbanks	645838N1473054W	500	20086	NASA
	AK, Fairbanks	645131N1475127W	523	34188, 37751	NASA
	AK, North Pole	644818N1473000W	500	30976	NASA
	AK, Poker Flat	650600N1470300W	500	28862	NASA
	AK, Poker Flat	650825N1473042W	500	29585, 29653	NASA
	AK, Poker Flat	650700N1472742W	400	31927	NASA
	AK, Poker Flat (Site 2)	644610N1472230W	400	31927	NASA
	AK, Poker Flat (Site 3)	650702N1472733W	400	31927	NASA
	AL, UAH Huntsville	344317N0863826W	625	32130	NASA
	Antarctica, McMurdo	775021S1664001E	1000	31927	NASA
	AZ, Kitt Peak	315700N1113700W	1000	29584	NASA
	CA, Berkeley	375248N1221438W	1000	31668	NASA
	CA, Edwards AFB	345729N1175442W	1000	28561	NASA
	CA, Goldstone	352030N1165225W	700	20086	NASA
	CA, Goldstone (DSS-16)	352030N1165222W	1000	28964	NASA
	CA, Goldstone (SWAS)	351800N1165400W	1050	28862	NASA
	CA, Goldstone	352533N1165322W	600	36182	NASA
	CA, Goldstone	352024N1165229W	600	36182	NASA
	CA, Goldstone	351418N1164636W	600	36182	NASA
	CA, Goldstone (JWST)	352533N1165322W	530	37391	NASA
	CA, Monument Peak	325330N1162522W	1000	28105	NASA
	CA, Quincy	395830N1205641W	910	28105	NASA
	CA, Table Mountain	342256N1174056W	1000	30825	NASA
	FL, Merritt Island	283030N0804137W	999	20086	NASA
	FL, New Smyrna Beach	290300N0805300W	1375	28561, 30382	NASA
	Guam, GRGT	133655N1445122E	1350	30038	NASA
	HI, Kamaoa-Puueo	190049N1553948W	1400	30710	NASA
	HI, Kauai	220700N1594016W	1207	10782	NASA
	HI, Nelha	190111N1554532W	1375	30900	NASA
	HI, South Point	190048N1553947W	1375	30976	NASA
	HI, South Point	190613N1553947W	1400	31668	NASA
	MA, Boston	422100N0710619W	1000	30129	NASA
	MA, Westford	423724N0712918W	1000	29584	NASA
	MD, Blossom Point	382553N0770516W	1000	32075	NASA
	MD, Blossom Point (12W)	382544N0770502W	900	35903	NASA
	MD, Blossom Point (41W)	382544N0770502W	900	35903	NASA
	MD, Blossom Point (150W)	382544N0770502W	900	35903	NASA

TRANSMITTING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/FAS DOCUMENT	AGENCY/ COUNTRY
	MD, Greenbelt	385955N0765034W	700	20086	NASA
	MD, Laurel	391100N0765400W	1100	30536	NASA
	MD, Laurel	391003N0765356W	912	36438	Navy
	MD, Pomonkey	382548N0770512W	1001	28562	N
	NC, Rosman	351200N0823219W	390	20086	NASA
	NM, Los Alamos	355218N1061941W	375	37391	E
	NM, Las Cruces	321619N1064445W	375	33411, 33728	NASA
	NM, White Sands	322059N1063631W	375	29148	NASA
	NM, White Sands (STGT)	323240N1063648W	375	30038	NASA
	NM, White Sands (WSGT)	322954N1063631W	375	30038, 37751	NASA
	PA, Horsham	401210N0751028W	1050	30900	NASA
	PA, Horsham	401209N0751029W	1050	30976	NASA
	PTR, Mayaguez	181242N0670813W	1400	30710	NASA
	VA, Chantilly	385324N0775024W	1000	29585	NASA
	VA, Dulles	390047N0772538W	1000	30825	NASA
	VA, Herndon	385800N0772300W	1025	29585	NASA
	VA, Quantico	382952N0772223W	995	29147	N
	VA, Wallops Island	375538N0752831W	1000	27266	NASA
	VA, Wallops Island (SWAS)	373000N0755600W	1025	28862	NASA
	VA, Wallops Island	375537N0752831W	1000	28964, 37751	NASA
	VA, Wallops Island	375530N0752835W	1202	31927,34188, 37751	NASA
	VA, Wallops Island (Site 2)	375523N0752839W	1000	31927, 37751	NASA
	WV, Fairmont	391536N0800636W	1000	28561	NASA
2025-2120	CA, Goldstone (DSS-16)	352030N1165222W	1000	29585	NASA
	CA, Goldstone (DSS-24)	352024N1165229W	1000	29585	NASA
	CA, Goldstone (DSS-27)	351418N1164644W	925	29585	NASA
	Ontario, Shirley Bay	452056N0755323W	520	SPS-893	Canada
2036.3	AK, Fairbanks	645840N1472940W	375	36537	C
2036.3	FL, Richmond	253600N0802400W	1130	36537	C
2036.3	GUM, Guam Seismic Observatory	133218N1445442E	1195	36537	C
2036.3	HI, Kamuela	200036N1554006W	680	36537	C
2036.3	HI, Hawaii N.P.	192524N1551727W	675	36537	C
2036.3	HI, Ahua Kilauea	192256N1551608W	760	36537	C
2036.3	HI, Sandhill Kilauea	192345N1551739W	740	36537	C
2039	RMI, Kwajalein	084301N1674301E	975	36536	Air Force
2110-2120	CA, Goldstone	352529N1165324W	600	19906	NASA
	Guam, Marianas	131833N1444404E	1521	11589	NASA
	NC, Rosman	351200N0825219W	375	20086	NASA
2200-2290	AZ, Scottsdale	332735N1115435W	350	29148	NASA
	NM, Las Cruces	321619N1064445W	400	33728	NASA
	OH, Cincinnati	391950N0841740W	500	30310	NASA
	PA, Valley Forge	400448N0752400W	1000	30038, 37751	NASA
	TX, Houston	293340N0950533W	950	35902	NASA
	TX, Houston (41W)	293340N0950533W	800	35902	NASA
	TX, Houston (171W)	293340N0950533W	645	35902	NASA
5925-6425	Nova Scotia, Mill Village	441119N 0644012W	805	11804	Canada
	Quebec, Bouchette	461318N0755230W	451	11804	Canada
7145-7190	CA, Goldstone (DSS-15)	352519N1165311W	1000	29819, 29979	NASA
	CA, Goldstone (DSS-25)	352016N1165231W	1000	29653, 29979	NASA
	CA, Goldstone (DSS-26)	352009N1165223W	1000	30825	NASA

TRANSMITTING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/FAS DOCUMENT	AGENCY/ COUNTRY
	CA, Goldstone (Deep Space)	352519N1165311W	1123	28298	NASA
7145-7235	CA, Goldstone (DSS-24)	352024N1165229W	1000	32866,33192	NASA
	CA, Goldstone (DSS-25)	352015N1165231W	1000	32866, 33192	NASA
	CA, Goldstone (DSS-26)	352008N1165223W	1000	32866, 33192	NASA
	Goldstone, CA (DSS-14)	352533N1165319W	435	36470	NASA
7190-7235	CA, Goldstone (DSS-13)	351450N1164738W	875	29584	NASA
	CA, Goldstone (DSS-23)	352024N1165220W	1025	29584, 37751	NASA
7900-7975	NC, Ft. Bragg	351000N0790100W	778	26516	AR
	VA, Ft. Belvoir	384337N0770853W	1026	26971	AR
7900-8400	CA, Vandenberg AFB (52.5W)	344405N1203251W	440	36889	AF
	CA, Vandenberg AFB (135W)	344405N1203251W	440	36889	AF
	CA, Vandenberg AFB (52.5W)	344406N1203253W	440	36889	AF
	CA, Vandenberg AFB (135W)	344406N1203253W	440	36889	AF
	CO, Schriever (DSCS 3 E-PAC)	384754N1043128W	163	27569	AF
	CO, Schriever (DSCS 3 W-ATL)	384754N1043128W	822	27569	AF
	HI, Kunia	212847N1580316W	1372	27197	AR
	IL, Scott AFB	383207N0895106W	369	27198	AF
	MD, Andrews AFB	384850N0765320W	150	37802	Air Force
	NC, Rosman	351207N0825220W	153	27991	AR
	NM, Kirtland AFB	350300N1062400W	228	30397	AF
7900-7975, 8025-8400	AK, Eareckson AFB	624342N1740539E	250	19807	AF
	AK, Elmendorf	611513N1494730W	200	19808	AF
	CA, Camp Roberts	354403N1204513W	225	19697	AR
	CA, Onizuka (Sunnyvale) AFS	372423N1220133W	175	17378, 19811	AF
	GA, Ft. Gordon	332520N0821058W	200	19759	AR
	Guam, Finegayan	133555N1445050E	300	19812	N
	HI, Wahiawa	212529N1580546W	225	19739	N
	MD, Brandywine	384040N0765042W	349	12997	AF
	MD, Fort Detrick	392636N0772453W	249	16632, 19480, 19698	AR
	NE, Offutt AFB	410809N0955454W	110	19527	AF
	NH, Manchester	425600N0713800W	200	19526	AF
	Ontario, Carp	452100N0760310W	412	15524	Canada
	VA, Northwest	363329N0761503W	475	19893	N
	CA, Camp Parks	374358N1215241W	1015	28443	AF
	CA, Camp Roberts	354403N1204513W	1013	28252	AR
	CO, Buckley ANGB	394255N1044629W	481	28252	AF
	GA, Ft. Gordon	332520N0821058W	1004	28252	AR
	MA, Cape Cod AFS	414511N0703218W	1009	28252	AF
	MD, Fort Detrick	392636N0772453W	1030	28252	AR
	MD, Fort Meade	390614N0764526W	1052	28252	AR
	NJ, Ft. Monmouth	401901N0740206W	1016	28252	AR
	PR, Cabre de Tierra	181300N0653700W	350	20042	N
	TX, Lackland AFB	292230N0983730W	1139	28252	AF

TRANSMITTING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/FAS DOCUMENT	AGENCY/ COUNTRY
	VA, Northwest	363336N0761503W	972	28298	N
14600-15225	MD, Blossom Point (12W)	382544N0770502W	230	35903	NASA
	MD, Blossom Point (41W)	382544N0770502W	152	35903	NASA
34200-34700	CA, Goldstone (DSS-25)	352015N1165231W	185	SPS-12658	NASA
* The nominal coordination distance shown is the maximum coordination distance derived from the coordination contour.					

RECEIVING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/FAS DOCUMENT	AGENCY/ COUNTRY
1670-1690	MA, Hanscom Field	422800N0712800W	177	19251	AF
1670-1710	AK, Fairbanks	645835N1473119W	399	29584	C
	CO, Boulder	400750N1051422W	100	17183	C
	HI, Honolulu	212112N1575236W	100	17183	C
	MD, Greenbelt	390002N0765029W	975	29339	NASA
	MD, Suitland	385106N0765554W	160	16761	C
	VA, Wallops Island	375644N0752742W	160	16761	C
	VA, Wallops Island	375734N0752817W	882	29584	C
	WA, Seattle	473415N1223310W	405	17183	C
1700-1710	Japan, Katsuura	351200N1401800E	3200	SPS-1108	Japan
	Japan, Masuda	303300N311800E	2900	SPS-1108	Japan
2025-2110	NM, Las Cruces	321619N1064445W	400	33728	NASA
	PA, Valley Forge	400448N0752400W	925	30038	NASA
2200-2290	AK, Fairbanks	645838N1473054W	1600	20086	NASA
	AK, Fairbanks	645131N1475127W	523	34188	NASA
	AK, Fairbanks	645833N1473119W	399	29584	C
	AK, North Pole	644818N1473000W	400	30976	NASA
	AK, North Pole	644800N1473000W	272	35566	NASA
	AK, Poker Flat	650600N1470300W	440	28862	NASA
	AK, Poker Flat	650825N1473042W	400	29585, 29653	NASA
	AL, UAH Huntsville	344317N0863826W	475	32130	NASA
	AZ, Kitt Peak	315700N1113700W	925	29584	NASA
	CA, Azusa	341259N1175232W	475	33720	AF
	CA, Berkeley	375248N1221438W	1000	31668	NASA
	CA, Camp Parks	374400N1215200W	1053	27198	AF
	CA, Edwards AFB	345729N1175442W	925	28561, 29148	NASA
	CA, Goldstone	352030N1165223W	2150	20086	NASA
	CA, Goldstone (DSS-16)	352030N1165223W	900	28964	NASA
	CA, Goldstone (SWAS)	351800N165400W	950	28862, 37751	NASA
	CA, Goldstone(TOMS-EO)	352030N1165222W	900	28964, 37751	NASA
	CA, Goldstone	352533N1165322W	400	36182	NASA
	CA, Goldstone	352024N1165229W	400	36182	NASA
	CA, Goldstone	351418N1164636W	400	36182	NASA
	CA, Goldstone (JWST)	352533N1165322W	450	37391	NASA
	CA, Laguna Peak	340655N1190450W	909	28562	N
	CA, Table Mountain	342256N1174056W	875	30825	NASA
	CO, Schriever AFB	384754N1043128W	423	30274	AF
	FL, Cape Canaveral	282909N0803430W	905	28443	AF
	FL, Merritt Island	283030N0804137W	3000	20086	NASA
	FL, New Smyrna Beach	290300N0805300W	1225	30382	NASA
	GA, Atlanta	335747N0840514W	500	36584	Air Force

RECEIVING EARTH STATIONS					
BAND (MHz)	**LOCATION**	**COORDINATES**	**NOMINAL COORDINATION DISTANCE* (KILOMETERS)**	**IRAC/ SPS/FAS DOCUMENT**	**AGENCY/ COUNTRY**
	Guam, GRGT	133655N1445122E	1300	30038	NASA
	Guam, NCTAMS WESTPAC	133455N1445050E	1207	28562	N
	Guam, Marianas	131833N1444404E	1505	11589	NASA
	HI, Kamaoa-Puueo	190049N1553948W	1225	30710	NASA
	HI, Kauai	220731N1594003W	1505	11589	NASA
	HI, Nelha	190111N1554532W	1225	30900	NASA
	HI, South Point	190048N1553947W	1225	30976	NASA
	HI, South Point	190613N1553947W	1225	31668	NASA
	HI, South Point	190000N1550600W	1200	35566	NASA
	MA, Boston	422100N0710619W	900	30129	NASA
	MA, Westford	423724N0712918W	925	29584	NASA
	MD, Blossom Point	382553N0770516W	900	32075	NASA
	MD, Blossom Point (12W)	382544N0770502W	900	35903, 37751	NASA
	MD, Blossom Point (41W)	382544N0770502W	900	35903, 37751	NASA
	MD, Blossom Point (150W)	382544N0770502W	900	35903, 37751	NASA
	MD, Greenbelt	385955N0765034W	1850	20086	NASA
	MD, Laurel	391100N0765400W	925	30536	NASA
	MD, Laurel	391003N0765356W	900	36438	Navy
	MD, Pomonkey	382548N0770512W	898	28562	N
	ME, Prospect Harbor	442455N0680150W	893	28562	N
	NC, Rosman	351200N0825219W	1550	20086	NASA
	NM, Albuquergue	350500N1065300W	310	37391	E
	NM, Kirtland AFB	350300N1062400W	330	30397	AF
	NM, Los Alamos	355218N1061941W	375	37391	E
	NM, Las Cruces	321619N1064445W	400	33411, 33728	NASA
	NM, White Sands (STGT)	323240N1063648W	375	30038	NASA
	NM, White Sands (WSGT)	322954N1063631W	375	30038	NASA
	NM, White Sands (WSGT-TDRS East)	322059N1063631W	375	30353	NASA
	NM, White Sands (WSGT-TDRS Central)	322059N1063631W	325	30353	NASA
	NM, White Sands (WSGT-TDRS West)	322059N1063631W	375	30353	NASA
	OK, Norman	351048N0973357W	528	27685	Commerce
	Ontario, Shirley Bay	452056N0755323W	575	SPS-893	Canada
	PA, Horsham	401210N0751028W	900	30900	NASA
	PA, Horsham	401209N0751029W	900	30976	NASA
	PTR, Mayaguez	181242N0670813W	1200	30710	NASA
	TX, Kelly AFB	294800N0983600W	1193	29873	AF
	VA, Chantilly	385324N0775024W	910	29585	NASA
	VA, Dulles	390047N0772538W	875	30825	NASA
	VA, Ft. Belvoir	384407N0770913W	900	37249	AF
	VA, Herndon	385800N0772300W	925	29585	NASA
	VA, Quantico	382952N0772223W	1047	29147	N
	VA, Wallops Island	375538N0752831W	900	27266	NASA
	VA, Wallops Island (SWAS)	375600N0753000W	975	28862	NASA
	VA, Wallops Island	375530N0752835W	747	34188	NASA
	VA, Wallops Island	375734N0752817W	882	29584	C
	WV, Fairmont	391536N0800636W	385	28561, 29148	NASA
2200-2300	AK, Eareckson AFB	5243XXN017407E	409	I7106428-A	AF
	CA, Goldstone (DSS-16)	352030N1165222W	925	29585	NASA
	CA, Goldstone (DSS-24)	352024N1165229W	925	29585	NASA
	CA, Goldstone (DSS-27)	351418N1164644W	925	29585	NASA

RECEIVING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/FAS DOCUMENT	AGENCY/ COUNTRY
	CA, Vandenberg AFB	342924N1203154W	700	20037	AF
	CO, Buckley AFB	3943XXN 0446W	589	I7106428-A	AF
	FL, Cape Kennedy	2824XXN 8030W	589	I7106428-A	AF
	Guam, Andersen AFB	133648N1445112W	1300	20037	AF
	HI, Kaena Point	213418N1581634W	1350	20037	AF
	MD, Blossom Point	382553N0770516W	900	29819	Navy
	ME, Loring AFB	4700XXN06801W	568	I7106428-A	AF
	NH, New Boston	425654N0713824W	700	20037	AF
	VA, Quantico	382952N0772223W	903	29819	Navy
	WA, Fairchild AFB	4730XXN11810W	568	I7106428-A	AF
2215	RMI, Kwajalein	084301N1674301E	1200	36536	Air Force
2290-2300	CA, Goldstone	352529N1165324W	1800	19906	NASA
	CA, Goldstone (DSS-14)	352533N1165319W	650	36470, 37751	NASA
3700-4200	Nova Scotia, Mill Village	441119N0644012W	756	11804	Canada
	Quebec, Bouchette	461318N0755230W	475	11804	Canada
7250-7300	NC, Ft. Bragg	351000N0790100W	823	26516	AR
	VA, Ft. Belvoir	384337N0770853W	1042	26971	AR
7250-7750	CA, Vandenberg AFB (52.5W)	344405N1203251W	460	36889	AF
	CA, Vandenberg AFB (135W)	344405N1203251W	460	36889	AF
	CA, Vandenberg AFB (52.5W)	344406N1203253W	460	36889	AF
	CA, Vandenberg AFB (135W)	344406N1203253W	460	36889	AF
	CO, Schriever (DSCS 3 E-PAC)	384754N1043128W	1344	27569	AF
	CO, Schriever (DSCS 3 W-ATL)	384754N1043128W	453	27569	AF
	HI, Kunia	212847N1580316W	1392	27197	AR
	IL, Scott AFB	383207N0895106W	438	27198	AF
	MD, Andrews AFB	384850N765320W	830	37802	Air Force
	NC, Rosman	350245N0825233W	541	27991	AR
	NM, Kirtland AFB	350300N1062400W	400	30397	AF
7300-7750	AK, Clear AFS	642039N1491113W	465	28252	AF
	AK, Eareckson AFB	524342N1740539E	500	19807	AF
	AK, Elmendorf	611513N1494730W	575	19808	AF
	CA, Beale AFB	390815N1212647W	1042	28252	AF
	CA, Camp Parks	374358N1215241W	1054	28443	AF
	CA, Camp Roberts	354403N1204513W	1025	28252	AR
	CA, Camp Roberts	354403N1204513W	400	19697	AR
	CA, Onizuka (Sunnyvale) AFS	372423N1220133W	375	17378, 19811	AF
	CO, Buckley ANGB	394255N1044629W	483	28252	AF
	CO, Peterson AFB	384831N1044235W	454	28252	AF
	GA, Ft. Gordon	332520N0821058W	1051	28252	AR
	GA, Ft. Gordon	332520N0821058W	650	19759	AR
	GA, Robins AFB	323819N0833631W	620	28252	AF
	Guam, Finegayan	133455N1445050E	575	19812	N
	HI, Hickam AFB	211939N1575652W	1357	28252	AF
	HI, Hilo	194300N1550328W	1500	28252	AF
	HI, Wahiawa	212529N1580546W	775	19739	N
	MA, Cape Cod AFS	414511N0703218W	1046	28252	AF

RECEIVING EARTH STATIONS					
BAND (MHz)	**LOCATION**	**COORDINATES**	**NOMINAL COORDINATION DISTANCE* (KILOMETERS)**	**IRAC/ SPS/FAS DOCUMENT**	**AGENCY/ COUNTRY**
	MD, Brandywine	384040N0765042W	169	12997	AF
	MD, Fort Detrick	392636N0772453W	1045	28252	AR
	MD, Fort Detrick	392636N0772453W	700	16632, 19480, 19698	AR
	MD, Fort Meade	390614N0764526W	1102	28252	AR
	MD, Fort Ritchie	394225N0772915W	490	28252	AR
	ND, Cavalier AFS	484331N0975356W	403	28252	AF
	NE, Offutt AFB	410809N0955454W	475	19527	AF
7300-7750	NH, Manchester	425600N0713800W	550	19526	AF
	NJ, Ft. Monmouth	401901N0740206W	1045	28252	AR
	Ontario, Carp	452100N0760310W	550	15524	Canada
	PR, Cabre de Tierra	1813XXN06537W	750	20042	N
	TX, Eldorado AFS	311030N1003308W	470	28252	AF
	TX, Lackland AFB	292230N0983730W	1117	28252	AF
7300-7750	VA, Northwest	364903N0763216W	650	19893	N
	VA, Northwest	363336N0761503W	1051	28298	N
8025-8400	AK, Fairbanks	645137N1475050W	385	28561	NASA
	HI, Nelha	190111N1554532W	875	30900	NASA
	HI, South Point	190613N1553947W	600	33411, 33728	NASA
	PA, Horsham	401210N0751028W	725	30900	NASA
8200-8500	CA, Goldstone (DSS-26)	352009N1165223W	1050	30825	NASA
8215-8400	MD, Greenbelt	385959N0765103W	809	26971	Commerce
	OK, Norman	351048N0973357W	427	27685	Commerce
8400-8450	CA, Goldstone (DSS-14)	352533N1165319W	1025	29979	NASA
	CA, Goldstone (DSS-15)	352519N1165311W	1025	29979, 29819	NASA
8400-8500	CA, Goldstone	352529N165324W	1700	19906, 37751	NASA
	CA, Goldstone (DSS-24)	352024N1165229W	950	32866, 33192	NASA
	CA, Goldstone (DSS-25)	352015N1165231W	975	32866, 33192	NASA
	CA, Goldstone (DSS-26)	352008N1165223W	925	32866, 33192	NASA
	MD, Laurel	391003N0765356W	912	36438/1	Navy
8450-8500	CA, Goldstone (DSS-13)	351450N1164738W	975	29584	NASA
	CA, Goldstone (DSS-23)	352024N1165220W	950	29584	NASA
25500-27000	CA, Goldstone (JWST)	352024N1165229W	100	37391	NASA
	NM, White Sands	323002N1063616W	80	33721, 37751	NASA
31800-32300	CA, Goldstone (DSS-13)	351450N1164740W	200	32075	NASA
	CA, Goldstone (DSS-25)	352015N1165231W	185	SPS-12658	NASA
* The nominal coordination distance shown is the maximum coordination distance derived from the coordination contour.					

8.3.16 Procedures for Field Level Coordination of the Use of the Frequencies 1030 and 1090 MHz and Frequencies in the Bands 1215-1400, 2700-2900 and 9000-9200 MHz

1. Applicability--These procedures are applicable for all frequency assignment actions for use by U.S. Federal Government radio stations within the U.S. and Possessions for the purposes indicated:

1030 MHz--Interrogators
1090 MHz--Ground Transponders
1215-1400 MHz--Radars
2700-2900 MHz--Radars
9000-9200 MHz--Radars

These procedures are implemented to provide for the local selection of frequencies and minimize, through effective coordination, the possibility of harmful interference.

2. Field Level Coordinators--The Federal Aviation Administration (FAA), as the National Airspace System (NAS) manager and having primary responsibility for flight safety, has established Regional Frequency Management offices throughout the U.S. and Possessions to effect field level selection and coordination of frequencies used for control of aeronautical operations within the NAS. Annex D, Table 1 is a list of FAA Regional Coordinators and indicates their geographical areas of responsibility and Figure 1 is a map depicting those areas.

3. Procedures

a. General--All proposed frequency assignment actions as described above shall be coordinated by the applicant with the appropriate FAA Regional Coordinator. The FAA Regional Coordinator will recommend a frequency and pulse repetition rate (PRR) based on the applicant's requirements and the technical particulars furnished by the applicant. If an interference free frequency or PRR can not be engineered, the FAA Regional Coordinator will inform the applicant of such and will recommend alternatives and/or restrictions to preclude such interference problems.

b. Interrogators (1030 MHz) and Transponders (1090 MHz)

(1) The concentration of usage for secondary surveillance radar (SSR) (IFF/SIF) systems on a single pair of frequencies, 1030 MHz and 1090 MHz, requires special measures to assure compatibility of operations. Strict control of operational parameters (i.e., power, pulse repetition rate, side lobe suppression, etc.) is necessary to prevent unacceptable degradation to the military mission and flight safety.

(2) Agencies shall cooperate with the FAA in the coordination, selection, and control of critical operational parameters to provide optimum sharing and maximum assurance of compatible operations within the limits of equipment availability and operational requirements. This cooperation shall include timely responses to FAA proposals for changes of PRRs, powers, SLS, etc., which may be required for relief of harmful interference, and submission of a modification or replacement action to the FAS to amend that frequency assignment record.

(3) Accordingly, all Federal agencies requiring the use of 1030 MHz for interrogators or 1090 MHz for ground transponders, and either frequency for test equipment that radiate pulsed emissions, shall, prior to filing applications for new and modified requirements, coordinate the planned operational parameters for each new interrogator or ground transponder and every change of each existing interrogator with the appropriate FAA Regional Coordinator listed in Annex D, Table 1.

(4) Shipboard Interrogators--Operational agreements with the applicable FAA Regional Coordinator are required when operations are within 185 kilometers of the U.S. Coast or its possessions or as modified by local agreement. Further coordination is not required when parameters are within guidelines established by operational agreements.

(5) Land-based Mobile Interrogators--Operational agreements with the applicable FAA Regional Coordinator are required when an interrogator is to be operated at transient locations, such as during military maneuvers. Further coordination is not required when parameters are within guidelines established by operational agreements.

(6) Airborne Interrogators--Prior national-level coordination is required and operational capabilities and parameters must be established when an interrogator is operated airborne. Further coordination is not required when parameters are within established guidelines.

c. Radars (1215-1400, 2700-2900, 9000-9200 MHz)

(1) The concentration of usage for radar systems requires special measures to assure compatibility of operations. The planning, coordination, and control required to provide separation between frequencies and pulse repetition rates and operations within mutual interference range, are necessary to prevent unacceptable degradation where flight safety and meteorological radars are concerned.

(2) Agencies shall cooperate with the FAA in the coordination, selection, and control of power, frequencies and PRRs to provide optimum sharing and maximum assurance of compatible operations within the limits of equipment availability and operational requirements. This cooperation shall include timely responses to FAA proposals for changes of power, frequencies and PRRs which may be required for relief of harmful interference, and submission of a modification or replacement action to the FAS to amend that frequency assignment record.

(3) Accordingly, all Federal agencies requiring the use of 1215-1400, 2700-2900, 9000-9200 MHz for radars and for test equipment that radiate pulsed emissions, shall, prior to filing applications for new and modified requirements, coordinate the planned power, frequencies and PRRs for new radars and every change of existing radars through the appropriate FAA Regional Coordinator listed in Annex D, Table 1.

(4) There are certain areas in the United States where it is difficult to accommodate additional radars in the 2700-2900 MHz band (see Annex D, Figure 2 and TABLE 2). Radar systems which comply with RSEC Criteria D, under Part 5.5 of this manual, have the capability of incorporating additional Electromagnetic Compatibility (EMC) provisions to enhance their accommodation in designated heavily used areas or for collocated operation. The FAA Regional Coordinator and the agency requesting the assignment will assess the requirement for these additional EMC provisions when coordinating frequency assignments in the 2700-2900 MHz band. Frequency assignments in designated heavily used areas or for collocated operation for radars which comply with RSEC Criteria D and do not have the additional EMC provisions installed, shall bear the Record Note S373 (see Annex A).

(5) Shipboard Radars--Operational agreements with the applicable FAA Regional Coordinator are required when operations are within 100 NM of the U.S. Coast or its possessions or as modified by local agreement. Further coordination is not required when parameters are within guidelines established by operational agreements.

(6) Land-based Mobile Radars--Operational agreements with the applicable FAA Regional Coordinators are required when a radar is to be operated at transient locations, such as during military maneuvers. Further coordination is not required when parameters are within guidelines established by operational agreements.

(7) Airborne Radars--Prior national-level coordination is required and operational capabilities and parameters must be established when a radar is operated airborne. Further coordination is not required when parameters are within established guidelines.

4. Applicants shall ensure that the coordination comments of the FAA Regional Coordinator are included on all assignment actions submitted to the Frequency Assignment Subcommittee (FAS). The FAS shall not recommend approval of assignment actions that do not bear the appropriate Coordination Note indicating completion of the coordination required by these procedures (see Annex A and Annex D, Table 1).

5. The NTIA will inform each FAA Regional Coordinator quarterly of all frequency assignment actions affecting the applicable frequencies and bands and areas specified in these procedures.

8.3.17 Procedures for Field Level Coordination, and Coordination with the Aerospace and Flight Test Radio Coordinating Council (AFTRCC), of the Frequency Band 1435-1525, 2310-2320 and 2345-2390 MHz

1. Applicability--These procedures are applicable for all frequency assignment actions for use of frequencies in the bands 1435-1525, 2310-2320 and 2345-2390 MHz by U.S. Federal Government radio stations within the Conterminous United States, and are implemented to minimize, through local selection of frequencies and effective coordination, the possibility of harmful interference.

2. Field Level Coordinators.

a. Non-Federal: The AFTRCC is comprised of representatives of the aerospace manufacturing industry using the Federal/non-Federal shared 1435-1525, 2310-2320 and 2345-2390 MHz bands during the research and development phases of manned and unmanned aircraft, missiles, booster rockets and other expendable vehicles, or their major components. In 1969 the FCC recognized the AFTRCC as the Frequency Coordinating Advisory Committee for non-Federal flight test telemetry station assignments in the band 1435-1525 MHz, and in 1984 extended this recognition to the 2310-2320, and 2345-2390 MHz band. The AFTRCC Coordinator (point of contact for coordination) is listed in Annex D, Table 3.

b. Federal: The military services, as major users of the radio frequency spectrum during research, development and testing of systems, have established Area Frequency Coordinators (AFCs) that are responsible for coordination of frequency use within designated military ranges or geographical areas of the United States. In 1971[12] the IRAC agreed that certain military AFCs would be the principal Federal entities responsible for field level coordination of all U.S. Federal use of the band 1435-1525 MHz, and in 1984 extended this procedure to include the 2310-2320 and 2345-2390 MHz band. Annex D, Table 3 lists these AFCs and indicates their areas of responsibility and Figure 3 is a map depicting those areas.

3. Coordination.

a. All proposed frequency assignment actions shall be coordinated by the applicant with the appropriate AFC listed in Annex D, Table 3 and Figure 3. The procedures for coordination will be those mutually agreeable to the AFC and applicant concerned.

b. AFCs shall coordinate all proposed frequency assignment actions, except those in the Radiolocation Service, with the AFTRCC Coordinator. AFCs shall notify the AFTRCC Coordinator of all proposed frequency assignment actions in the Radiolocation Service in the 2310-2320 and 2345-2390 MHz band. The procedures for coordination and/or notification will be those mutually agreeable between the AFTRCC Coordinator and AFC concerned.

c. AFCs will inform applicants of any probability of harmful interference involving proposed frequency assignment actions. If appropriate, the AFC will recommend alternatives and/or restrictions to preclude interference problems. If the applicant wishes, the AFC will recommend a frequency based on the applicant's requirements and the technical particulars furnished by the applicant. The AFC's comments and/or recommendations to the applicant will be based on authorized spectrum usage within the AFC's area of responsibility, coordination with the AFTRCC, and such additional coordination with other entities and activities which the AFC deems appropriate.

4. Applicants shall ensure that the coordination comments of the AFC are included on all frequency assignment actions submitted to the Frequency Assignment Subcommittee (FAS). The FAS shall not recommend approval of assignment actions that do not bear the appropriate Coordination Note indicating completion of the coordination required by these procedures (see Annex A and Annex D, Table 3).

5. To ensure periodic re-evaluation, an expiration date not exceeding five years from the date of authorization or revision is required on each frequency assignment in the bands 1435-1525, 2310-2320 and 2345-2390 MHz, except those in the Radiolocation Service in the 2310-2390 MHz band.

6. The NTIA will inform each AFC monthly of all frequency assignment actions affecting the bands 1435-1525, 2310-2320 and 2345-2390 MHz in the areas specified in these procedures.

8.3.18 Reserved

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[12] The original agreement covered the band 1435-1535 MHz ,which was later modified to 1435-1525 MHz.

8.3.19 Coordination of Assignments in the Band 406.1-410 MHz to Stations (Other Than Mobile) in the Vicinity of Certain Radio Astronomy Observatories

In order to minimize possible harmful interference to radio astronomy observations, all proposed frequency assignments in the band 406.1-410 MHz to stations (including stations to be established under group authority), other than mobile stations, within the following areas, shall be coordinated by the applicant through the National Science Foundation, 4201 Wilson Boulevard, Room 1030, Arlington, VA 22230, Telephone: 703-292-4896.

Arecibo Observatory

Rectangle between latitudes 17°30'N and 19°00'N and between longitudes 65°10'W and 68°00'W.

Owens Valley Radio Observatory

Two contiguous rectangles, one between latitudes 36°N and 37°N and longitudes 117°40'W and 118°30'W, and the second between latitudes 37°N and 38°N and longitudes 118°W and 118°50'W.

Sagamore Hill Radio Observatory

Rectangle between latitudes 42°10'N and 43E00'N and longitudes 70°31'W and 71°31'W.

Table Mountain Solar Observatory

(NOAA) Boulder, Colorado (407-409 MHz only) Rectangle between latitudes 39°30'N and 40°30'N and longitudes 104°30'W and 106°00'W or the Continental Divide, whichever is farther east.

8.3.20 Coordination of Assignments to Stations (other than Mobile) to be located in the Vicinity of the Table Mountain Radio Receiving Site, Boulder, Colorado

In order to minimize possible harmful interference at the Table Mountain Receiving Site of the Department of Commerce Boulder Research Laboratories, Boulder County, Colorado, all proposed frequency assignments to stations (including assignments to stations to be established under group authority), other than mobile stations, within specified conditions of power and radial distances from a central point on the Table Mountain Receiving Site (coordinates, 40°07'50"N latitude, 105°14'40"W longitude) as given below, shall be coordinated prior to authorization with the Radio Frequency Management Coordinator, Department of Commerce, Boulder, CO 80303; telephone 303-499-1000, ext. 6548 (FTS 323-6548).

The conditions of power and radial distances are:

1. All stations within 2.4 kilometers.
2. Stations with 50 W or more ERP within 4.8 kilometers.
3. Stations with 1 kW or more ERP within 16 kilometers.
4. Stations with 25 kW or more ERP within 80 kilometers.

Field strengths of any radiated signals (excluding reflected signals) received on this 1800 acre site resulting from the operation of radio stations authorized after January 1, 1973, or from the modification or relocation of stations authorized after that date, should not exceed the following instantaneous values:

Frequency Range	Field Strength (mV/m) in Authorized Bandwidth of Service	Power Flux Density* (dBWm5) in Authorized Band width of Service
Below 540 kHz	10	- 65.8
540-1600 kHz	20	- 59.8
1.6-470 MHz	10	- 65.8 **
470-890 MHz	30	- 56.2 **
Above 890 MHz	1	- 85.8 **

* Equivalent values of power flux-density are calculated assuming a free-space characteristic impedance of 20 (approximately 376.7) ohms.

** Space stations shall conform to the power flux- density limits at the Earth's surface specified in Section 8.2.36, but in no case should exceed the above levels in any 4 kHz band for all angles of arrival.

The field strengths as given above should be determined in accordance with current engineering standards and practices.

The foregoing is not intended to establish a policy of exclusion but each proposal will be considered on its merits, on a case-by-case basis.

8.3.21 Coordination of High Frequencies for Projects and Systems Involving Oceanographic Data Transmissions

Radio frequencies in the bands 4063.3-4064.8, 6261.3-6262.5, 8340.3-8341.5, 12420.3-12421.5, 16617.3-16618.5, and 22240.3-22241.5 kHz used for transmission and reception of oceanographic data require specialized coordination procedures.

Accordingly, any operational use of the Appendix **17** oceanographic data transmission frequencies should be in accord and/or compatible with the Plan(s) developed by the IOC/WMO, if international protection and BR registration are desired.

8.3.22 Reserved

8.3.23 Coordination of Assignments to Federal Broadcasting Stations (other than international broadcasting)

1. Proposed assignments to Federal broadcasting stations (AM, FM, and TV) within areas where the FCC exercises jurisdiction over non-Federal radio services in the bands 535-1605 kHz (AM), 54-72 MHz (TV), 76-88 MHz (TV), 88-108 MHz (FM), 174-216 MHz (TV), and 470- 806 MHz (TV), shall be coordinated with the FCC Liaison Representative, IRAC. General criteria applicable to such Federal broadcasting are:

a. The use of a broadcasting frequency by a station licensed by the FCC, as prescribed in its rules and standards, shall not be restricted or precluded.

b. The station shall not provide service to civilian populations being served by non-Federal broadcasting stations, except in emergencies.

c. The station shall not cause harmful interference, as determined under FCC rules, to FCC-licensed broadcasting stations or to stations in other countries in contravention of existing treaties or agreements.

d. Operation of the station shall be discontinued upon notification by the FCC that harmful interference is being caused to any authorized non- Federal broadcasting station.

e. Concurrence by the FCC may be reconsidered if continued operation is judged to impede the orderly development of private broadcasting or otherwise contravene the public interest.

f. Proposals shall be coordinated with the FCC at least 80 days before the operation is expected to commence.

g. The following general limitations shall apply to Federal broadcasting stations:

(1) Medium wave AM, TV, and FM stations (except for G2 below) will not be authorized within the conterminous United States. This restriction does not apply to translators. (See II B below.)

(2) Federal low power educational FM stations in the conterminous United States will be limited to Federal educational institutions offering curriculums similar to those of private or state supported colleges and universities.

2. Such request for coordination with the FCC shall contain the following information:

a. For all proposals:

(1) Frequency

(2) Transmitter power (rated)

(3) Name of transmitter location

(4) Antenna location (latitude/longitude)

(5) Bandwidth/emission

(6) Definition of the area to be served (preferably on a local map)

(7) Applicable IRAC record notes

(8) Letter of consent from the owner of commercial and educational stations if their programming is to be rebroadcast or retransmitted.

(9) Statement indicating why the service desired is not available from commercial or educational stations.

(10) Identity of broadcasting stations presently providing service to the area (AM, FM, and TV stations, including translators).

(11) Identity of broadcasting stations considered in electromagnetic interference or feasibility studies and the potential interference impact upon them from the proposed operation.

b. For FM and TV proposals, the following is also required:

(1) Effective radiated power

(2) Antenna type and gain

(3) Antenna height above mean sea level

(4) For translators furnish height above ground. For other operations provide antenna height above average terrain:

(a) Average elevation of terrain along each of 8 radials from 3.2 to 16 kilometers from antenna at 45 degree azimuth intervals starting at zero degrees azimuth.

(b) Average elevation of all 8 radials.

(5) Plot of the horizontal and vertical field intensity radiation patterns if a directional antenna is used (including beam tilt).

c. For AM broadcast proposals for transmitters of 100 watts output power or more, the following additional information shall be supplied in order for the FCC to make its studies and to provide the required international notifications pursuant to applicable international broadcasting agreements (not related to ITU notifications):

(1) The power into the antenna feed point, if significantly different from the transmitter output power.

(2) Description of antenna system to include, but not limited to the following:

(a) Effective radiating height

(b) Diagram of top-loading or sectionalizing, if used

(c) Number of ground systems radials and radial length

(d) For omni-directional antennas--Predicted unattenuated radiated field (mV/m/kW)

(e) For directional antennas--The directional antenna radiation patterns; horizontal only for daytime and horizontal and vertical angles for nighttime operations at increments of 10° through and including 60° in the vertical. Also, the theoretical values for each tower of field ratio and current phase angle, and tower placement sketch showing spacing and orientation of towers.

8.3.24 Coordination of Frequencies Used for Communications with Non-Federal Citizens Band Stations

1. A Federal radio station may utilize frequencies in the range 26960-27410 kHz which are allocated to the Citizens Band (CB) Radio Service under Part 95, Subpart D of the FCC Rules provided:

a. an appropriate showing can be made by the applicant that such an assignment is necessary for intercommunications with non-Federal stations, and

b. the requirement is coordinated with and concurred in by the FCC.

2. All operations by Federal stations under this provision shall be in accordance with FCC Rules and Regulations Part 95, Subpart D. Transmitters shall be operated only by employees of the Federal Government and only for the purpose of interfacing with non-Federal licensees to coordinate essential and mutual activities. The authority shall be subject to being revoked by the FCC at its discretion at any time. These assignments shall include record note S348.

3. The specific channels are:

Channel	Frequency (kHz)	Channel	Frequency (kHz)
1	26965	21	27215
2	26975	22	27225
3	26985	23	27255
4	27005	24	27235
5	27015	25	27245
6	27025	26	27265
7	27035	27	27275
8	27055	28	27285
9	27065	29	27295
10	27075	30	27305
11	27085	31	27315
12	27105	32	27325
13	27115	33	27335
14	27125	34	27345
15	27135	35	27355
16	27155	36	27365
17	27165	37	27375
18	27175	38	27385
19	27185	39	27395
20	27205	40	27405

8.3.25 Coordination Procedures for the 932-935 MHz and 941-944 MHz Bands

The frequencies shown in Section 4.3.14 are shared by the Federal and non-Federal on a co-equal basis for the fixed service. Although coordination and frequency assignment procedures are unique to Federal and non- Federal users, these procedures are similar enough to allow for concurrent processing of applications.

a. For filing applications, Federal and non-Federal applicants will continue to use the existing procedures; i.e., Federal applications will be submitted to the NTIA and non- Federal applications will be submitted to the FCC.

b. Non-Federal applications will be provided to the NTIA by the FCC through their FAS representative, and Federal applications will be provided to the FCC's FAS representative by NTIA. To effect Federal/non-Federal coordination, both Federal and non-Federal applications will be placed on the FAS agenda and will be listed in a public notice to be released by the FCC.

c. The following data fields are identified as the minimum necessary for Federal/non-Federal coordination:

FAS docket number (DKT), frequency (FRQ), emission characteristics including bandwidth (EMS), output power (PWR), station class (STC), transmitter state/country (XSC), transmitter antenna latitude and longitude (XLA, XLG)[13,14], transmitter antenna dimensions (XAD)[14], transmitter antenna polarization (XAP)[14], transmitter antenna azimuth (XAZ)[14], receiver state/country (RSC), receiver antenna latitude and longitude (RLA, RLG)[13,14], antenna dimensions (RAD)[14], receiver antenna polarization (RAP)[14] and receiver antenna azimuth (RAZ)[14].

8.3.26 Coordination of Federal Radio Operations With DoD Area Frequency Coordinators in Frequency Bands Above 420 MHz

The following policy applies to federal ground or airborne transmitters in the subject frequency range planned to operate within radio line-of-sight of, or close enough to cause interference to, the areas listed in Table 8.3.26. For the purpose of this procedure line-of-sight is defined by the formula $D = \sqrt{2h_r} + \sqrt{2h_t}$, where D is the radio line-of-sight distance in miles and ht is the height of the transmitter antenna in feet, and hr is the height of the receiver antenna in feet.

In order to minimize potential mutual electro- magnetic interactions in, near and within line-of- sight of, DoD test ranges, DoD Area Frequency Coordinator(s) (AFC) shall be notified of:

1. Pending actions (e.g., new, modifications, etc.) directly from the NTIA. AFCs must forward any comments to the appropriate MILDEP Frequency Assignment Subcommittee (FAS) representative within 10 working days of the initial processing date (IPD) indicated on each action.

2. Activation of approved USA/USP, wide area, band, and transportable assignments by representatives of federal government agencies, including DoD, prior to transmitting.

Notification for ground based systems must include agency point-of-contact (POC), frequency, power, location, type emission including bandwidth, antenna gain, antenna information (height, elevation, azimuth) and any other information that will help to define, eliminate or manage any potential operational conflicts. In addition, airborne operations (other than for standard aircraft flight navigation and communication systems) require data such as flight profile, duration of mission, elevation, etc.

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[13] The degree of accuracy of all latitudes shall be to the nearest second.

[14] For applications bearing Special Note S361 or S362, the rules of Section 9.8.2 apply.

Table 8.3.26 - DoD Test Ranges, Areas of Concern, and Applicable Coordination Note

Activity	Area of Concern	Coordination Note
U.S. Air Force Weapons and Tactics Center Nellis AFB, NV DSN: 683-3417 (702) 652-3417	Entire State of Nevada plus Utah West of 111°W and Idaho South of 44°N.	C067
U.S. Air Force Eastern Test Range Patrick AFB, FL DSN: 854-5837 (407) 494-5837/5838	Area bounded by 24°N, 31°30'N, 77°W, and 83°W.	C004
U.S. Air Force Air Armament Center Eglin AFB, FL DSN: 875-7535 (850) 850-7535	Area bounded by 24°N, 33°30'N, 83°W and 90°W	C010
U.S. Naval Air Warfare Center Weapons Division China Lake, CA (NAWCWD) DSN: 437-6948 (760) 939-6948	Area enclosed within a 322 kilometer radius of 340649N1190654W and the area of California that lies south of 37°30'N.	C002
U.S. Army Electronics Proving Ground Ft. Huachuca, AZ DSN: 879-6423 (602) 538-6423	Entire State of Arizona	C008
CINCPAC (JFMOPAC) Military Ranges within the State of Hawaii (U.S. Air Force) DSN: 315-477-1054 (808) 477-1054	Area enclosed by a 322 kilometer radius of 211900N1575200W	C012
U.S. Navy Atlantic Fleet Weapons Training Facility, Roosevelt Roads, Puerto Rico (AFWTF) DSN: 831-5227/3270, (809) 865-5227/3270	Area within a 370 kilometer radius of 181500N0653800W	C093
U.S. Army White Sands Missile Range Las Cruces, NM (WSMR) DSN: 258-5417 (505) 678-5417	Entire State of New Mexico, Texas west of 104°W and the areas of Utah and Colorado between 108°W and 111°W.	C006
U.S. Navy, Naval Air Warfare Center Aircraft Division, Patuxent River, MD (NAWCAD) DSN: 342-1532/1194, (301) 342-1532/1194	Area enclosed by a 100 kilometer radius of 381718N0762500W	C094

8.3.27 Notification in the Bands 10-490 kHz

1. The frequencies 10-490 kHz are used to operate electric utility Power Line Carrier (PLC) systems on power transmissions lines for communications essential to the reliability and security of electric services to the public, in accordance with footnote US294 of the Table of Frequency Allocations and Part 15 of the FCC Rules. PLC systems in this band operate on a noninterference basis to radio systems assigned frequencies by NTIA or licensed by the FCC and are not protected from interference caused by these radio operations.

2. Any electric utility that generates, transmits, or distributes electrical energy for use by the general public by the member of a cooperative organization may operate PLC systems and shall supply, to the FCC/NTIA recognized industry-operated entity, information on all existing, changes to existing, and proposed systems for inclusion in a data base.

a. Such information shall include the frequency, power, location of transmitter(s), location of receivers and other technical and operational parameters, which would characterize the system's potential both to interfere with authorized radio users, and to receive harmful interference from these users.

b. In an agreed format, the industry-operated entity shall inform the NTIA and the FCC of these systems' characteristics prior to implementation of any proposed PLC system and shall provide monthly or periodic lists with supplements of PLC systems.

3. The FCC and NTIA will supply appropriate application and licensing information to the notification activity regarding authorized radio stations operating in the band.

8.3.28 Use of Fixed Devices That Re-Radiate Signals Received From the Global Positioning System

Except as otherwise authorized under Part 7.14, federal agencies and departments may, under the following conditions, operate fixed devices that re-radiate signals received from the Global Positioning System (GPS).

1. Individual authorization is for indoor use only, and is required for each device at a specific site.
2. Applications for frequency assignment should be applied for as an XT station class with a note indicating the device is to be used as an "Experimental RNSS Test Equipment for the purpose of testing GPS receivers" and describing how the device will be used.
3. Approved applications for frequency assignment will be entered in the GMF.
4. The maximum length of the assignment will be two years, with possible renewal.
5. The area of potential interference to GPS reception (e.g., military or contractor facility) has to be under the control of the user.
6. The maximum equivalent isotropically radiated power (EIRP) must be such that the calculated emissions are no greater than -140 dBm/24 MHz as received by an isotropic antenna at a distance of 100 feet (30 meters) from the building where the test is being conducted. The calculations showing compliance with this requirement must be provided with the application for frequency assignment and should be based on free space propagation with no allowance for additional attenuation (e.g., building attenuation.)
7. GPS users in the area of potential interference to GPS reception must be notified that GPS information may be impacted for periods of time.
8. The use is limited to activity for the purpose of testing RNSS equipment/systems.
9. A "Stop Buzzer" point of contact for the authorized device must be identified and available at all times during GPS re-radiation operation of the device under any condition.

8.3.29 Use of Mobile Devices That Re-Radiate Signals Received From the Global Positioning System

Except as otherwise authorized under 7.14, federal government agencies and departments may, under the following conditions, operate mobile devices that re-radiate signals received from the Global Positioning System (GPS) at 1575.42 ±12 MHz (Ll).

1. Use is restricted to inside armored ground vehicles operating within a federal government controlled range/facility/installation or cordoned zone.
2. Applications for frequency assignment shall be applied for as an "NR" station class with a note describing how the device will be used.
3. Approved applications for frequency assignment will be entered in the GMF.
4. The maximum length of assignment will be two years, with possible renewal.
5. The application for frequency assignment shall indicate the agency or department controlled range/facility/installation or cordoned zone of operation and the number of vehicles equipped with these devices.
6. The entire area of potential interference to GPS reception (e.g., military/federal range/facility/installation or cordoned area) must be under the control of the Federal user.

7. The maximum equivalent isotropically radiated power (EIRP) must be such that the calculated emissions are no greater than -88 dBm/24 MHz at the output of GPS reradiator antenna (-144 dBm/24 MHz at 10 meters as received by an isotropic antenna) from an armored ground vehicle.

8. GPS users within the area of potential interference to GPS reception must be notified that GPS information may be impacted for periods of time.

9. A "Stop Buzzer" point of contact for the authorized device must be identified and available at all times during GPS re-radiation operation.

10. Any airborne use of these devices is not authorized.

11. These devices operate on a non-interference, unprotected basis.

8.3.30 Coordinated Use of Federal Fixed Ultrawideband Systems Not Intended for Operation under Parts 7.8 or 7.9

Federal agencies may, on a non-interference basis, operate fixed ultrawideband (UWB) systems that do not conform to Parts 7.8 or 7.9 provided that those systems receive spectrum support in accordance with the provisions of Chapter 10, which with identify the coordination requirements for each operating station, and an approved frequency assignment in accordance with the provisions of Chapter 9. This section is not applicable to mobile systems.

8.3.31 Coordination of Special Temporary Authorization Assignments for Federal Agencies

1. The National Telecommunications and Information Administration (NTIA), in consultation with the Frequency Assignment Subcommittee (FAS) of the Interdepartment Radio Advisory Committee (IRAC), may provide short-term temporary authorizations (called a “Special Temporary Authorization” (STA)) to federal users of the electromagnetic spectrum in the United States and its Possessions (US&P). STAs may support requirements including, but not limited to: exercises, short term events, or equipment tests and evaluations. The Federal Communications Commission will coordinate their STAs with NTIA in accordance with FCC rules and regulations as required.

2. The approval of an STA does not ensure the FAS will approve the permanent use of the frequency for a GMF assignment. No agency should make long term decisions based on the short term use of an STA. Agencies may approve STAs based on limitations of time/use, but require restrictions or object when the same request is for a permanent GMF assignment.

3. NTIA will provide a minimum of five (5) business days (excluding holidays and weekends) to circulate non-emergency requests among the impacted users as it deems appropriate. The submitting agency shall clearly identify STA requests for emergency situations such as disasters and NTIA will set the comment due date based on the time and dates of the proposed operation.

4. Agencies may seek an STA for a period of up to 180 days. Data regarding STAs is not entered into the Government Master File (GMF). Twenty-four hour/seven days per week stop buzzer contact information will be provided when requested by other agencies or the FCC when interference is anticipated.

5. Prior to requesting an STA, Federal agencies need to use assets already registered in the GMF as long as the requirement does not exceed the parameters listed in the permanent authorization.

6. The minimum data required for Federal agencies submitting a proposal to the FAS is as follows:

a. CLA (Classification of the request)

b. FOI (as applicable) (Releasable or not releasable under a Freedom of Information Act (FOIA) request)

c. TYP (Type is always “N”)

d. SER (Serial number assigned by the requestor)

e. FRQ (Specific frequency or frequency band)

f. EXD (expiration date of the STA)

g. STC (Station class)
h. EMS (Emission)
i. PWR (Power)
j. XSC (Transmitter state code)
k. XAL (Transmitter antenna location)
l. XLA (Transmitter antenna latitude)
m. XLG (Transmitter antenna longitude)
n. XAD (as applicable)[15] (Transmitter antenna dimensions)
o. XAZ (Antenna azimuth)
p. XAP (as applicable) (Antenna polarization)
q. RSC (Receive State code)
r. RAL (Receive antenna Location)
s. RLA (Receive antenna latitude)
t. RLG (Receive antenna longitude)
u. RAD (as applicable [15] (receive antenna dimensions)
v. NTS (as applicable) (Record notes; e.g., S, P, M, or L)
w. *RAD (Radius)
x. EQT (as applicable)[15] (Transmitter equipment)
y. SUP, for explanation of operations to include start date.
z. *PRD (as applicable) (Paired-with another frequency)
aa. *FRB (as applicable) (Upper and lower limits of the requested band)
bb. *FBE (as applicable) (Excluded frequency band data)
cc. *PRR (as applicable) (Pulse repetition rate, for radar)
dd. *AGN (as applicable) (agency data pertinent to the proposed STA but not intended to be a part of the authority requested)
ee. *NTS (as applicable) (Used for "Minute" notes, only)

7. Processing of a Federal STA proposal may be delayed or denied based on, but not limited to, the following criteria:

a. Harmful interference is anticipated to existing, licensed agency operations. The serial number(s) of the potential victim assignment(s) shall be provided to NTIA by the agency objecting to the proposal.

b. If the STA proposal requests access to a specified frequency or band of frequencies without proper pre-coordination, approval may be delayed while coordination is completed.

c. If the information provided in the STA proposal is incomplete or inconsistent with the minimum data elements of paragraph 6.

8. The following paragraph will be placed at the bottom of all unclassified Special Temporary Authorization (STA) requests: "I _____ have checked the STA and attachments and certify that there is no classified information in this STA request."

8.4 Cognitive Radio System and Software Defined Radio

Radiocommunication systems using Cognitive Radio or Software Defined techniques in any radiocommunications service shall operate in accordance with the provisions of NTIA rules governing those services.

(Last Page in Chapter 8)

NOTE 1 - IF XAD and/or RAD are not provided, the proposed height above mean sea level (AMSL) is assumed to be at 6 meters or less.

CHAPTER 9

Preparation of Applications for Frequency Assignment Action

9.1 DETERMINING WHEN THE SUBMISSION OF AN APPLICATION IS REQUIRED

9.1.1 When the Submission of an Application is Required to Obtain Authority to Use a Frequency

1. Except as provided in Section 9.1.2, the submission of an application is required to obtain authority for a Federal radio station to use a frequency within the United States and Possessions.

2. For satellite systems employing multiple space stations with the same general characteristics, a separate application shall be submitted for each space station on geostationary satellites; for nongeostationary satellites, one application shall be submitted covering all the space stations in the system.

9.1.2 When the Submission of an Application is Not Required to Obtain Authority to Use a Frequency

1. In accordance with the provisions of Part 7.1, the submission of an application is not required to obtain authority to use a frequency above 3000 GHz.

2. Parts 7.3 through 7.17 authorize the use of certain frequencies under specified conditions. The submission of an application is not required to obtain authority for such use, inasmuch as the authority is granted by the Parts cited; however, an application may be submitted, at the option of the applicant, to provide an entry in the Government Master File (GMF).

3. Mobile stations are authorized as a class of station rather than as individual stations, e.g., 25 mobile stations may be authorized by a single application as opposed to 25 applications. The submission of an application is not required to obtain authority for individual mobile stations to use a frequency in those cases in which the frequency is authorized to the agency for use by mobile stations as a class, provided such stations do not exceed the authority granted.

4. Individual user agencies are not required to submit applications to obtain frequency authority for stations operating in a trunked land-mobile radio system. The agency, or designated lead agency managing the system, will obtain authority for all stations that use the system.

5. Transportable operations may be authorized to defined classes of stations, e.g., fixed (FX), by including on the application the record note S362 (Transportable operations). As in the case cited above for mobile stations, transportable operations are authorized to a class of station rather than to individual stations, e.g., 25 fixed stations may be authorized for transportable operations within a specified geographic area by the submission of a single application as opposed to 25 applications. The submission of an application is not required to obtain authority for individual stations to use a frequency for transportable operations, provided the frequency is authorized to the agency for use by such stations as a class, the assignment includes the Record Note S362, and the stations do not exceed the authority of the frequency assignment.

9.1.3 When the Submission of an Application is Required for the Notification of the Use of a Frequency

Section 9.1.1 provides for the use of an application to obtain authority for a Federal radio station to use a frequency. An application also is used to notify the bringing into use or the intended bringing into use of a frequency under the terms of existing frequency assignment authority or where no frequency assignment authority is required. The cases involving the submission of an application for the notification of the use of a frequency are as follows:

1. The establishment of a station under the authority of a GROUP frequency assignment (see Section 9.6.5) shall be notified prior to the commencement of operations in the following cases:

a. When coordination with Canada is required (see Part 3.4).

b. When coordination in respect of the National Radio Quiet Zone is required (see Section 8.3.9).

c. When coordination in respect of the Table Mountain Radio Receiving Site is required (see Section 8.3.20).

2. The establishment of a station under the authority of a GROUP FREQUENCY ASSIGNMENT shall be notified prior to or soon after the commencement of operations in the following cases:

a. For the use of a frequency in the bands:

30.00-50.00 MHz	148.00-149.90 MHz	162.00-174.00 MHz
138.00-144.00 MHz	150.05-150.80 MHz	406.10-420.00 MHz

except for periods so limited (on the order of six months or less) that notification would be impracticable, as determined by the applicant, e.g., certain tactical or training operations.

b. For the use of a frequency in the bands:

400.15-406.00 MHz 1660.00-1700.00 MHz

by meteorological aids at other than transient locations or for periods in excess of 15 days.

c. For the use of any frequency authorized by an assignment bearing Note S322 in the NOTES field, except for periods of use so limited (on the order of six months or less) that notification would be impracticable (see Section 9.6.5).

3. The establishment of a station under the authority of Section 7.5.2 or Part 7.12, may be notified at the option of the agency concerned when it is determined that notification is practicable and desirable.

4. Section 8.3.11 provides that Federal agencies shall coordinate with the IRAC certain uses of frequencies by their stations located outside the United States and Possessions. For those uses requiring coordination, such coordination may be effected, at the option of the agency concerned, by the submission of an application for the notification of the use of the frequency.

9.1.4 Applications Required for Private Contractors

1. If a private contractor requires the use of radio frequencies under the terms of a Federal Government contract, a determination must be made as to whether the Federal agency should apply to the IRAC for the frequency authorization or whether the contractor should apply to the FCC. The determination is based upon whether the radio station “belongs to and is operated by” the Federal agency or the contractor. Section 305 of the Communications Act of 1934, as amended, provides in part that “Radio stations belonging to and operated by the United States shall not be subject to the provisions of Sections 301 and 303 of this Act. All such Federal stations shall use such frequencies as shall be assigned to each or to each class by the President” (see Section 8.2.17).

2. When the FCC coordinates with the Frequency Assignment Subcommittee (FAS) of the IRAC a proposed radio frequency authorization to be used directly in support of a Federal Government contract (excluding a grant), the contracting Federal agency is responsible for:

a. verifying the validity of the contract, and

b. certifying that the proposed frequency authorization or its equivalent is necessary for the fulfillment of the contract.

9.2 SPECIAL INSTRUCTIONS CONCERNING CERTAIN APPLICATIONS

9.2.1 Applications Handled by AAG or MAG

Application for the use of frequencies in the following bands shall be in accordance with the provisions of Part 9.14 (all ranges are inclusive):

AAG		
190-285 kHz	285-435 kHz*	510-535 kHz*
74.800-75.200 MHz	108.000-121.9375 MHz	123.5875-128.8125 MHz
132.0125-137.000 MHz	328.6-335.4 MHz	978-1020 MHz inclusive
1030 MHz	1031-1087 MHz inclusive	1090 MHz
1104-1146 MHz inclusive	1157-1213 MHz inclusive	5000-5250 MHz
* In these bands only applications for stations in the Aeronautical Radionavigation Service (see Table A, Section 6.1.4) shall be sent to the Chairman of the AAG.		

MAG	
225.0-328.6 MHz	335.4-399.9 MHz

9.2.2 Applications for Sounder Network Stations or Sounder Prediction Stations

Applications will be in accordance with Section 8.2.21 and include the following in the SUPPLEMENTARY DETAILS (SUP) field:

a. Channeling plan(s) (required for all sounder network stations and, as applicable, for sounder prediction stations) FOR EXAMPLE:

First octave: 2.075 to 3.975 MHz, 20 channels spaced 100 kHz.

Second octave: 4.150 to 7.950 MHz, 20 channels spaced 200 kHz.

Third octave: 8.300 to 15.900 MHz, 20 channels spaced 400 kHz.

Fourth octave: 16.600 to 31.800 MHz, 20 channels spaced 800 kHz.

For those sounders in which the tuning rate is independent of the pulse rate (e.g., Sounder types C2, C3, and C4), wherein the specific frequencies sounded differ from scan to scan, a channeling plan is not a meaningful item. In application for such sounders, so state.

b. Pulse duration(s)

c. Pulse repetition rate(s)

d. Pulses per channel

e. Scan rate(s)

f. Scan interval(s) (time between scans)

g. Antenna type

h. Antenna azimuth (if directional, indicate azimuth of major lobe).

9.2.3 (Reserved)

9.2.4 Use of Data Plots and Coordination Contour Maps

1. When requesting assignments, it may be necessary to review a data plot and/or coordination contour map prior to receiving authority to operate:

a. in the bands:

1710-1850 MHz	2200-2290 MHz	4400-4990 MHz
7125-7250 MHz	7300-7975 MHz	8025-8500 MHz

for fixed stations involving a communications system which consists of more than two stations that are interconnected (transportable stations and those located outside of the western hemisphere and south of the equator are exempt); or

b. in the band 7900-8400 MHz for transportable earth stations.

2. Before requesting data plots or coordination contour maps, and prior to submitting the frequency assignment proposal to NTIA, the proposing agency shall coordinate with other agencies having existing assignments in the frequency band(s) and geographic area(s) in which the proposed assignment is being requested.

a. If coordination is successful between concerned agencies without the need for data plots or coordination contour maps, the frequency assignment proposal shall include a statement in the Frequency Assignment Subcommittee (FAS) field that coordination between concerned agencies determined that data plots and/or coordination contour maps were not required.

b. If any concerned agency desires to review a data plot prior to coordinating on the proposed assignment, the applicant shall submit a copy of the application to the FAS Secretary covered by a memorandum indicating data plots are being requested. The applicant shall include a statement in the FAS field that data plots have been requested.

3. For transportable earth station proposals in the band 7900-8400 MHz, successful coordination may not be accomplished even after data plots have been prepared and reviewed. In these cases, the applicant shall provide coordination contour maps to the FAS Secretary. The proposing agency shall include a statement in the FAS field that coordination contour maps have been provided. The methods described in OTP Report 76-99 “Electromagnetic Compatibility of the Department of Defense Ground Mobile Forces Transportable Earth Terminals with Terrestrial Systems within the 7.2-8.4 GHz Spectrum” shall be used to produce the coordination contour maps.

4. The procedures of Section 9.2.4 paragraphs 1 through 3 shall be used in the processing of applications for NEW actions and for MODIFICATION actions which would increase the probability of harmful interference. In the latter case, the record replacement procedure shall be used in lieu of submitting an assignment modification action.

5. Data plots and coordination contour maps will be distributed by the FAS Secretary to agencies having a direct interest in the proposal.

9.2.5 Frequency Assignments for Use of Federal Fixed Ultrawideband Systems Not Intended for Operation under Parts 7.8 or 7.9

Agencies desiring to deploy fixed UWB systems that do not conform to Parts 7.8 or 7.9 and having received spectrum support in accordance with Chapter 10, Section 10.3.8 shall request a frequency assignment prior to operation. Considering the analyses that resulted in spectrum support, no further analysis regarding protection of federal operations should be required to approve these assignments. The FCC will have the opportunity to review the request with respect to protection of non-federal users. Each successfully coordinated operation will be approved to operate on a non-interference basis. Therefore, if in the future any federal agency or non-federal entity implements or expands an authorized system at distances from the UWB devices that are closer than has been demonstrated to be compatible, the UWB system will have to cease operation unless its compatibility can be reestablished prior to operation of the authorized system. Furthermore, in the future, federal agencies or non-federal users may develop new authorized radiocommunication systems that will have to be evaluated. Calculation of associated distances may indicate that the deployment of these new authorized systems will be at distances from the UWB devices that are closer than has been demonstrated to be compatible. Similar to the previously noted situation, the UWB device will need to cease operations unless its compatibility can be reestablished prior to the operation of the authorized system.

In this context, NTIA will consider any such requests received from the FCC through the FAS for non-federal UWB operations that do not conform to the FCC Rules Part 15. In each case, the requested location will be evaluated in terms of its separation distance from federal systems on the List. Operations proposed for locations at closer distances will require further evaluation through measurements or analyses. NTIA will support such non-federal use if it falls outside the distances that NTIA has determined as necessary for compatibility with federal systems on the List. This support will only be given with the understanding that such non federal operations will be required to meet the same non-interference requirement with respect to existing and future authorized operations, including ceasing operations unless, prior to the operation of new federal authorized systems, compatibility has been established at distances closer than has been previously demonstrated to be compatible.

9.3 SUBMISSION OF FAS AGENDA MATERIAL

9.3.1 Frequency Assignment Applications

1. Applications from FAS Member Agencies shall be submitted as indicated below. See also Part 14 for frequency applications which will be considered by the Aeronautical Assignment Group (AAG) or the Military Assignment Group (MAG). Applications classified CONFIDENTIAL may be transmitted employing STU III or compatible technology or on magnetic discs.

a. Electronic Transmission. Applications may be transmitted electronically to NTIA, Spectrum Services Division (SSD) via the dial-up telephone microcomputer system located in the NTIA/SSD office. Procedures for use of this system are provided by FAS Administrative Agenda memoranda.

b. Magnetic Disc. Under special circumstances and by prior arrangement with the FAS Chairman, agencies may physically deliver a magnetic disc to the NTIA/OSM/SSD at:

U.S. Department of Commerce
NTIA/OSM/SSD
Room 1805, Herbert C. Hoover Building
1401 Constitution Avenue, N.W.
Washington, DC 20230

2. U.S. Government agencies that are not members of the FAS and are not represented on the FAS by an FAS Member Agency are represented by the NTIA/OSM/SSD. Those agencies shall send their frequency assignment requests to:

U.S. Department of Commerce
NTIA/OSM/SSD
Room 1805, Herbert C. Hoover Bldg.
1401 Constitution Avenue, N.W.
Washington, DC 20230

9.3.2 SECRET Documents, Supplemental Material and Administrative Agenda Items

Documents containing SECRET data, supplemental materials supporting frequency assignment applications (such as charts, maps, etc.), and items for the FAS Administrative Agenda shall be forwarded to the FAS Secretary. Items for the Administrative Agenda must reach the FAS Secretary no later than the close of business four (4) working days prior to the FAS meeting.

U.S. Department of Commerce
NTIA/OSM/SSD
ATTN: FAS Secretary
Room 1805, Herbert C. Hoover Bldg.
1401 Constitution Avenue, N.W.
Washington, DC 20230

9.4 SECURITY CLASSIFICATION OF APPLICATIONS

1. Classified applications forwarded to NTIA in printed form shall contain all of the security information markings specified for documents in Executive Order 12958 (E. O. 12958) of April 17, 1995. These markings shall be done as defined in the Office of Management & Budget's Information Security Oversight Office (ISOO) Directive No. 1 (32 CFR Part 2001).

2. Special Instructions for Secret Applications.

a. On applications which are classified SECRET:

(1) A statement should be inserted at a convenient place to the effect that reproduction by the FAS Secretary is authorized; however, this statement need not be included if the applicant has previously given the Executive Secretary of the IRAC written authority to reproduce classified documents. In those cases where the statement is inserted on an application, the statement shall not be included on electronically transmitted applications.

(2) The information that is classified SECRET shall be provided AFTER all other data are completed. An intervening statement preceding the SECRET data noting that the “THE FOLLOWING DATA, WHEN ASSOCIATED WITH THE FOREGOING DATA MAKES THE ENTIRE APPLICATION SECRET” must be included just prior to identifying the secret data.

(3) Information inserted in all other areas of the application shall be unclassified or classified CONFIDENTIAL.

b. As a minimum, for all SECRET applications that are to be considered by the FAS and subsequently recorded in the GMF, the following data items must be included in the CONFIDENTIAL or UNCLASSIFIED portion of the applications:

(1) Agency Serial Number (entered on the COMMAND ENTRY).
(2) Type of Action (TYP).
(3) Security Classification (CLA).
(4) Frequency (FRQ).
(5) Missing Data Indicator (MSD).
(6) Transmitter State/Country (XSC).

c. In addition to the minimum data fields noted in subparagraph 2b above, the following data items shall also be included in all CONFIDENTIAL portions for all SECRET applications:

(1) Declassification Date (CDD).
(2) Original Classification Authority (Circuit Remarks *CLA); or,
(3) Derivative Classification Authority (Circuit Remarks *CLF).
(4) Reason for Classification (Circuit Remarks *CLR), if the Circuit Remarks *CLA entry is included.
(5) Classified Data Fields (Circuit Remarks *CLC or *CLS).
(6) Unclassified Data Fields (Circuit Remarks *CLU).
(7) Extended Declassification Date (Circuit Remarks *CDE), if a declassification year and month, or the declassification exemption category 25X1, is not entered in the field CDD.

d. The Missing Data Indicator (MSD) shall contain the letter Z.

e. The information that is classified SECRET shall not be entered on MODIFICATION, RENEWAL, and DELETION actions.

f. SECRET applications will be distributed in accordance with Part 9.3.

g. SECRET data shall not be included on magnetic discs.

9.5 (RESERVED)

9.6 DESCRIPTION OF TYPES OF FREQUENCY ASSIGNMENTS

9.6.1 Regular Assignment

A REGULAR assignment is a frequency assignment for an unspecified period of time; however, the provisions of Section 8.2.6 apply.

9.6.2 (Reserved)

9.6.3 Temporary Assignment

1. A TEMPORARY assignment is made for a specified period of time not to exceed five years.

a. All assignments with experimental station classes are TEMPORARY assignments.

b. TEMPORARY assignments expire on the date shown in EXD.

c. TEMPORARY assignments may be renewed for additional periods as necessary.

(1) TEMPORARY assignment RENEWAL actions which are to be considered by the FAS shall be submitted at least one month prior to the Expiration Date (EXD) of the assignment.

2. When a TEMPORARY assignment is renewed or converted to a REGULAR assignment, the date of assignment for PRIORITY purposes shall be the original date from which continuous authorization has been in effect.

9.6.4 Trial Assignment

1. A TRIAL assignment is a frequency assignment for the purpose of selecting a suitable SPECIFIC OPERATING FREQUENCY for REGULAR assignment.

a. TRIAL assignments shall be made whenever a trial:

(1) is considered necessary; or

(2) will provide a reasonable basis for judging harmful interference potentialities; or

(3) will resolve objections to a proposed REGULAR or TEMPORARY assignment which are based upon anticipated harmful interference.

b. TRIAL assignment operations MUST cease upon notice from the IRAC that harmful interference is being caused.

c. Objections based on PRIORITY shall not bar TRIAL assignments.

d. TRIAL assignments initially are not to exceed two years; however, a TRIAL assignment may be renewed for additional periods as necessary. The provisions of Section 9.6.3, paragraph 1.c.(1) applies. TRIAL assignments expire on the date shown in EXD.

2. Conversion from a TRIAL to a REGULAR assignment:

a. Before a TRIAL assignment is converted to a REGULAR assignment there shall have been adequate use of the frequency concerned and evidence thereof presented.

b. Additional limitations shall not be applied to an assignment at the conclusion of a trial period unless the trial develops the need for such limitations.

c. When a TRIAL assignment is converted to a REGULAR assignment, the applicable date of assignment for PRIORITY purposes shall be the original date from which continuous authorization has been in effect.

9.6.5 Group Assignment

1. A GROUP assignment is made only to terrestrial stations and:

a. provides authority to operate but does not represent continuing operations; or

b. provides an assignment for planning purposes.

2. GROUP assignments shall not be made to telemetering stations in the band 2200-2290 MHz.

3. GROUP assignments may be authorized as REGULAR, TEMPORARY, or TRIAL assignments.

4. There are two types of GROUP assignments:

a. The first type is one that PROVIDES AUTHORITY to operate but which does not represent continuing operations. The following applies to such assignments:

(1) Note S322 shall be entered in the NOTES (NTS) field. (see Annex A for S322 definition).

(2) The establishment of stations under the authority of these assignments shall be notified prior to or soon after the commencement of operations, except when the period of operation is so limited (on the order of six months or less) that notification would be impracticable (see Section 9.1.3).

b. The second type of GROUP assignment is one used for PLANNING PURPOSES and represents continuing or definitely anticipated requirements. The following applies to such assignments:

(1) Note S321 shall be entered in the NOTES (NTS) field. (see Annex A for S321 definition).

(2) Such assignments shall not exceed three years.

(3) The technical particulars of these assignments shall describe the intended use of the frequency to the maximum extent practicable at the time of application.

(4) Operations conducted under the authority of this type of GROUP assignment shall be limited to such uses as site surveys and path testing associated with the intended use. This type of GROUP assignment shall not be considered operational but strictly as a planning assignment set aside to satisfy an identified future requirement. However, all S321 assignments are accorded protection and may be coordinated with Canada at the option of the applicant.

9.7 FREQUENCY APPLICATION

9.7.1 Uses of the Application Format

The APPLICATION FORMAT is used for the following frequency assignment actions:

a. NEW (N)--To apply for a new frequency assignment, the particulars of which, when approved, will be entered in the Government Master File (GMF). See Section 9.8.2, paragraph 40 for special provisions when using a NEW action as a REPLACEMENT for an existing GMF record.

b. NOTIFICATION (F)--To notify the bringing into use of a frequency by stations under the authority of:

(1) Section 9.6.5, or
(2) Section 9.1.3, or
(3) Section 7.5.2, or
(4) Part 7.12, or
(5) Section 8.3.11.

When approved, NOTIFICATION assignment particulars are also entered into the GMF. See Section 9.8.2, paragraph 40, for special provisions when using a NOTIFICATION action as a REPLACEMENT for an existing GMF record.

c. MODIFICATION (M)--To apply for the addition, substitution, or removal of one or more of the particulars, other than the Frequency (FRQ), the Agency Serial Number (SER), or the Transmitter State/Country (XSC), of an existing frequency assignment. The following provisions apply:

(1) No more than 60 data fields of an assignment can be modified at one time.

(2) If more than 60 data fields require modification submit either a NEW or NOTIFICATION action using the record replacement feature described in Section 9.8.2, paragraph 40, or a simultaneous DELETION and NEW or NOTIFICATION action.

d. RENEWAL (R)--To apply for the extension of the period of a TEMPORARY or TRIAL assignment (see Part 9.6) and to simultaneously update other particulars of the assignment.

e. DELETION (D)--To apply for the cancellation of a frequency assignment and the removal of all its particulars from the GMF.

9.7.2 Rules for the Use of the Application Format

1. Requests in the APPLICATION FORMAT may be submitted electronically or on magnetic disc. All individual data which are to be recorded in the GMF are submitted in accordance with the existing rules listed in Chapter 9.

2. Each request submitted in the APPLICATION FORMAT must contain two types of entries:

--COMMAND ENTRY; and
--DATA ENTRIES.

3. The following formatting rules must be adhered to:

a. COMMAND ENTRY. The COMMAND ENTRY must always be the first entry. This entry consists of the application processing COMMAND and the RECORD IDENTIFIER (Agency Serial Number (SER)).

(1) The COMMAND is designated with one of three coded entries:

(a) $$ADD--for NEW and NOTIFICATION actions; or

(b) $$CHG--for MODIFICATION, RENEWAL, and DELETION actions.

(c) $$MOD--for use only with MODIFICATION actions in accordance with paragraph 9 below.

(2) The RECORD IDENTIFIER is ALWAYS the Agency Serial Number (SER) of the frequency assignment record.

(a) if $$ADD is used, the Agency Serial Number MUST be unique and MUST NOT already be recorded in the GMF.

(b) if $$CHG or $$MOD is used, the Agency Serial Number MUST be one which is recorded in the GMF.

Example: $$ADD AF 821234

b. DATA ENTRIES. DATA ENTRIES follow the COMMAND ENTRY. Each DATA ENTRY shall address only one data field and specify the:

(1) DATA FIELD MNEMONIC--a three letter code which identifies the data field being addressed. (See the Data Field Title line for each data field listed in Section 9.8.2).

(2) OCCURRENCE NUMBER--a two-digit number denoting which occurrence (first, second, etc.) of the field is being addressed, use a leading zero if necessary.

(3) REQUIRED DATA--submitted in accordance with specific instructions listed in Section 9.8.2.

(4) Generally, only those symbols allowed or specified in Section 9.8.2 shall be used as data. However, specifically, the following symbols shall not be used in any data field:

& -- And	: -- Colon	] -- Right square bracket
[-- Left square bracket	@ -- At	# -- Number or pound
\ -- Reversed virgule	; -- Semicolon	? -- Question
< -- Less than	> --Greater than	% -- Percent
! -- Exclamation	^ -- Insert (caret)	" -- Quotation
' -- Apostrophe		

Example: FRQ01 M123.4
--the DATA FIELD MNEMONIC is: FRQ
--the OCCURRENCE NUMBER is: 01
--the REQUIRED DATA is: M123.4

4. Each application must contain one TYPE OF ACTION (TYP) data entry. The TYPE OF ACTION data entry must consist of one of the following:

N--for NEW actions
F--for NOTIFICATION actions
M--for MODIFICATION actions
R--for RENEWAL actions
D--for DELETION actions

5. Each application must also contain a preparation DATE (DAT) entry, which consists of the date in year, month, and day order; use leading zeros for the month and day as necessary.

Example: DAT01 820131

6. The following data fields are multiple occurring; the OCCURRENCE NUMBER must be 01 or greater, but must NOT exceed the maximum allowed for that field.

Table. Occurrence Number			
Codes	**Max. Allowable Occurrences**	**Codes**	***Max. Allowable Occurrences***
STC	20	RAZ	*30*
EMS	20	RAD	*30*
PWR	20	RAP	*30*
NTS	10	ACL	*30*
RSC	30	REM	*30*
RAL	30	SRS	*09*
RRC	30	SEX	*09*
RLA	30	SUP	*15*
RLG	*30*	*FAS*	*05*

7. All other data fields are single occurring. Only the number 01 following the mnemonic will be accepted.

8. $$CHG ACTIONS 0

a. $$CHG is used, along with the TYP data entry to identify a MODIFICATION, RENEWAL or DELETION action.

b. When submitting a MODIFICATION, RENEWAL or DELETION action, it is extremely important to accurately indicate the proper GMF data field and corresponding occurrence number which the applicant desires to modify. FAILURE TO ACCURATELY INDICATE THE PROPER GMF DATA FIELD AND CORRESPONDING OCCURRENCE NUMBER WILL RESULT IN AN INCORRECT CHANGE.

c. When submitting a MODIFICATION action, it is possible to add another occurrence of a multiple occurring field to an existing record; in effect, change BLANKS to DATA. The applicant must, however, address the next blank GMF occurrence of the data field(s) to be modified. For example, if a GMF record contains two station classes (STC), emissions (EMS), and power (PWR), and a third occurrence of each is necessary, the applicant submits:

```
$$CHG     FAA 723409
TYP01     M
DAT01     810901
EMS03     6KA3E
STC03     MA
PWR03     W10
```

9. $$MOD ACTIONS

a. Modifications may also be submitted using the COMMAND $$MOD. This optional procedure allows the applicant to submit both NEW and LISTED DATA in the same application, thus providing a means of comparison without having to refer to separate records. This procedure shall be used only with assignment records retrieved from the GMF in the Card Format, and re-submitted back to the NTIA/SSD via electronic transmission or on magnetic discs or tape

b. $$MOD actions require:

(1) Re-submission in Card Format;

(2) All new data be entered with an EQUAL SIGN (=) between the data field code occurrence number and the data;

(3) The Type of Action always be entered as TYP01=M; and,
(4) The date always be entered as DAT01=nnnnnn (date format is YYMMDD).

Example:

```
$$MOD A    810771
TYP01=M
DAT01=850828
CLA01 U
FRQ01 M168.625
BUR01 F3
STC01 MO
STC01=ML
EMS01 16K00F3E
PWR01 W5
PWR01=W25
NTS01 S362
NTS01=(in this case NEW data is blank -- deleting listed data)
TME01 1
TME01=3
XSC01 NM
XAL01 NEW MEXICO
XRC02 RGNLOFFC
RSC01 NM
RAL02 NEW MEXICO
REM01 *NRM, 00140,REGION 3 AIR OPS
REM01=*NRM, 00300,REGION 3 MOBILE OPS
REM02 *EQS,LMS
REM03 *SYS,NATURAL RESOURCES
SUP01   FOR PROTECTION OF NATIONAL FOREST LANDS
SUP01=WILDFIRE COMMUNICA  TIONS
```

10. Information for AGENCY USE, other than SECRET data, shall be provided after all other data are entered. The intervening statement FOR AGENCY USE must precede the data. The statement “FOR AGENCY USE” and subsequent data SHALL NEVER appear on magnetic disc or electronic submissions.

Example:

```
$$CHG AR 28306
TYP01 M
DAT01 791108
EMS03 6KA3E
RTN01 M
XSC01 VA
XAL01 NORFOLK
```

11. See Part 9.4, paragraph 2.b for rules on submission of SECRET data.

12. The following is a sample application.

```
$$ADD  NTIA991234
TYP01   N
DAT01  850701
FRQ01   M123.4
CLA01   U
NET01   AT013
ICI01     C
RTN01  R
BUR01  1A2A
EXD01  891215
STC01   FX
EMS01  16KF3E
PWR01  K1
STC02   FL
EMS02  16KF3E
PWR02  W100
NTS01   S361
NTS02   S362
XSC01   MD
XAL01  GLEN BURNIE
XLA01  392530N
XLG01  0764501W
XAP01  H
XAZ01  045
XCL01  AA 123
XAD01  03GDIPOLE   00050H0100T
TME01  1
RSC01   PA
RAL01   PHILADELPHIA
RRC01   DIV AX
RLA01   400201N
RLG01   0751502W
ACL01   WBW 22
RAP01   H
RAZ01   225
RAD01   10GHORN
RSC02    DE
RAL02   WILMINGTON AIRPORT
RLA02   395010N
RLG02   0753515W
ACL02   OLD341
RAP02   V
RAZ02   ND
RAD02   03GDIPOLE
REM01  *RAD,0050R
REM02  *NRM,00102,NET
SUP01   THIS IS A SAMPLE
```

9.8 PREPARATION OF A NEW OR NOTIFICATION ACTION

9.8.1 Introduction

Before submitting a NEW or NOTIFICATION action, read Part 9.7. The following index of data field codes, which are described in detail in Section 9.8.2, is provided for easy reference.

Table. Index of Field Codes

Codes	Section 9.8.2 Paragraph No.	Codes	Section 9.8.2 Paragraph No.	Codes	Section 9.8.2 Paragraph No.
ACL	37	*CLR	39aa	*SBW	39t
BIN	11	*CDE	39bb	*SGN	39t
BUR	13	*CLC	39cc	*SYS	39u
CDD	7	*CLS	39cc	*TRN	39ee
CLA	6	*CLU	39dd	*USA	39w
DAT	3	*DOC	39g	RLA	33
EMS	16	*EBW	39t	RLG	34
EXD	14	*EGN	39t	RRC	32
FAS	79	*EQR	39o	RSC	30
FOI	41	*EQS	39o	RTN	4
FRQ	8	*EQT	39o	SER	1
ICI	10	*ESB	39e	SEX	40c
LSR	5	*ESR	39e	SPD	20
MSD	12	*EST	39e	SRS	40b
NET	9	*FRB	39b	STC	15
NTS	18	*FBE	39c	SUP	80
PWR	17	*FLN	39x	TME	19
RAD	38	*JNT	39i	TYP	2
RAL	31	*LSB	39e	XAD	29
RAP	35	*LSR	39e	XAL	22
RAZ	36	*LST	39e	XAP	26
REM	39	*MEX	39v	XAZ	27
*AGN	39j	*NRM	39m	XCL	28
*ARB	39f	*NTS	39k	XLA	24
*ARR	39f	*ORB	39q	XLG	25
*ART	39f	*PRD	39ff	XRC	23
*CAN	39l	*PRR	39n	XSC	21
*CLA	39y	*RAD	39d		
*CLF	39z	*RPT	39h		

9.8.2 Application Data Requirements

1. SER--Applicant Serial Number (10 Characters-1 Occurrence)

a. This field is for the applicant's Serial Number (SER) of the application. This serial number becomes the unique identifier for the application on the FAS agenda and for the assignment record, when approved, in the GMF. Once an application is on the FAS agenda, serial numbers MAY NOT be altered. The Serial Number must ALWAYS be entered on the COMMAND ENTRY which is ALWAYS $$ADD for a NEW or NOTIFICATION action, $$CHG for a MODIFICATION, RENEWAL, or DELETION action, or $$MOD for MODIFICATION action. Each application shall bear a unique 10 character Agency Serial Number composed of:

(1) the applicant's name abbreviation in characters 1-4; the abbreviation shall be the same as shown in Annex G, Part 1. If the applicant's name abbreviation is less than 4 characters, leave characters 2-4 blank, as applicable.

(2) the last two digits of the current calendar year in characters 5 and 6, and

(3) a four-digit number to indicate for that year and agency the numerical sequence of the proposed assignment action in characters 7-10.

b. Each year agencies must start a new cycle of Serial Numbers for new assignments. Agencies may start using the new year serial numbers on December 1 and must stop using the past years' serial numbers no later than January 31 (example: December 1, 2008 the Army could use AR 090001 and Army records with AR 08XXXX must be processed by NTIA onto an agenda by January 31, 2009). New assignments received by NTIA after January 31 with the previous year's serial numbers will be rejected.

c. On a joint application for a NEW action, insert the Serial Number for the agency that prepares the application. (Do not submit a joint application for a NOTIFICATION, MODIFICATION, RENEWAL or DELETION action.)

Example: AR 090001

2. TYP--Type of Action (1 Character--1 Occurrence)

Enter either the letter:

N--for a NEW action; or
F--for a NOTIFICATION action.

3. DAT--Date (6 Characters--1 Occurrence)

a. Enter the date in year, month, and day order on which the application is prepared by the applicant.

b. Use numeric characters only.

c. Leave no blanks.

Example: DAT01 811225

4. RTN--Routine (1 Character--1 Occurrence)

a. This field is used to indicate that the frequency application is to appear in the routine portion of the FAS agenda. Leave this field blank if the application is to appear in the regular portion of the FAS agenda. Only one of the letters A, or M or R may be entered in the RTN field.

b. Enter the letter:

(1) A--if the assignment request is for consideration by the AAG (see Section 9.14.1), or

(2) M--if the assignment request is for consideration by the MAG (see Section 9.14.2) or,

(3) R--if the assignment request is not to be considered by the AAG or MAG and:

(a) the application is a notification of a telecommunication laser; or

(b) the assignment will be used during distress, safety and calling on frequency 156.8 MHz; or

(c) the assignment is being made pursuant to Part 7.12; or

(d) Note L192, L197, or L199 applies; or

(e) the assignment is made pursuant to Section 8.3.24; or

(f) the assignment will be for speed meter use on frequency 10525 MHz or 24150 MHz; or

(g) there will be no increase in the probability of harmful interference.

c. If the ROUTINE field is left blank or contains a character other than A, M or R, the application will appear in the regular portion of the agenda unless one of the following criteria is met:

(1) if the assignment request is to be considered by the AAG or MAG, the letter A or M, as applicable, will be automatically entered in the ROUTINE field; or

(2) if the assignment request:

(a) is for 156.8 MHz; or

(b) includes one or more of the following Notes (NTS):

L192	S160
L197	S279
L199	S348

or,

(c) is for speed meter use on frequency 10525 MHz or 24150 MHz; or,

(d) is for the frequency band 401.7-402.1 MHz and includes the following Note (NTS): S594 the letter R will be automatically entered in the ROUTINE field.

5. LSR--List Serial Number (10 Characters--1 Occurrence)

a. This field is to be used only on NOTIFICATION actions when an agency notifies the bringing into use of a frequency by a particular station or stations under the authority of an authorized GROUP assignment.

b. Insert the Serial Number of the GROUP assignment as it is shown in the Government Master File (GMF). Do not close up blank spaces which appear in characters 2-4 of the recorded GMF Agency Serial Number.

6. CLA--Classification (1 Character--1 Occurrence)

a. This field is for the security classification of the assignment as determined in accordance with Executive Order 12958 of April 20, 1995.

b. Insert only one of the following codes in this field. ASSIGNMENTS ARE NEVER CLASSIFIED HIGHER THAN CONFIDENTIAL.

(1) U--Unclassified (2) C--Confidential

7. CDD-- Declassification Date (6 Characters - 1 Occurrence)

a. Complete this field for every application on which the CLA data field contains the letter C.

b. Enter the letters DE in the first two characters.

c. Beginning in character three,

(1) enter the year and month of the declassification date, in year and month (YYMM) order (The assignment will be automatically declassified on the last day of that month.). (If the declassification date has been extended beyond 10 years from the initial classification date, an entry is also required in the Circuit Remarks field *CLF); or,

(2) enter the letter X, immediately followed by from one to three numbers, in numerical sequence, that correspond to the applicable exemption categories listed in E.O. 12958, Section 1.6.d.; or,

(3) enter 25X, immediately followed by a number that corresponds to the applicable exemption category listed in E.O. 12958, Section 1.6.d. for those assignments that are exempt from the 25 year automatic declassification rule for permanently valuable information. (For all assignments not in the declassification exemption category 25X1, the date for declassification shall be included in the Circuit Remarks field *CDE.); or,

(4) enter OADR for those assignments that are classified derivatively based on source documents for which the declassification instructions are marked “Originating Agency's Determination Required,” or its acronym “OADR”. An entry of OADR in this data field requires an entry in the Circuit Remarks field *CLF.

(5) enter DEVENT for those assignments that will be declassified after the occurrence of an event as specified in E.O. 12958. An entry of DEVENT in this data field requires an entry in the Circuit Remarks field *DIC.

Examples:

CDD01 DE0603
CDD01 DEX358
CDD01 DE25X1
CDD01 DEOADR
CDD01 DEVENT

8. FRQ--Frequency (13 Characters--1 Occurrence)

Enter either a SPECIFIC OPERATING FREQUENCY (see paragraph 8.b.) or the lower limit of a FREQUENCY BAND ASSIGNMENT (see paragraph 8.c.) in accordance with the following instructions:

a. Composing the FRQ Entry

(1) In the first character enter one of the following codes to designate the category in which the frequency is being expressed:

K--for kiloHertz
M--for MegaHertz
G--for GigaHertz
T--for TeraHertz

Note: For frequencies expressed in kiloHertz, the applicant may optionally enter the letter K in character 1 or immediately begin entering the frequency in character 1 (see examples).

(2) Express the frequency in:
kiloHertz (kHz) thru 29999.999999 kHz,
MegaHertz (MHz) from 30 MHz thru 99999.999999 MHz,
GigaHertz (GHz) from 100 GHz thru 2999.999999 GHz, and
TeraHertz (THz) at 3 THz and above.

(3) Use a decimal point only if there is a significant (nonzero) digit to the right of the decimal.

(4) If a decimal point is used, enter no more than six significant digits to the right of the decimal.

b. Requesting SPECIFIC OPERATING FREQUENCIES

(1) A “SPECIFIC OPERATING FREQUENCY” (also referred to as “assigned frequency” or “authorized frequency”) identifies the center of that portion of the frequency spectrum occupied by the emitted signal. The lower and upper limits of the ASSIGNED FREQUENCY BAND, see Section 6.1.1,

Paragraph 44, are determined by:

(a) Subtracting from the SPECIFIC OPERATING FREQUENCY one-half the necessary bandwidth shown in the Emission field plus the absolute value of the frequency tolerance as derived from Chapter 5; and

(b) Adding to the SPECIFIC OPERATING FREQUENCY one-half the necessary bandwidth plus the absolute value of the frequency tolerance as derived from Chapter 5.

The result of this calculation determines the amount of spectrum which may be occupied by a SPECIFIC OPERATING FREQUENCY.

(2) A SPECIFIC OPERATING FREQUENCY shall always be entered in the FRQ field unless the transmitting station employs one of the techniques described in paragraph 8.c. below.

Examples:

14495.5--for 14495.5 kHz, or
K14495.5--for 14495.5 kHz
M165.0125--for 165.0125 MHz
G138.25--for 138.25 GHz

c. Requesting FREQUENCY BAND ASSIGNMENTS.

(1) Certain operations may necessitate the assignment of a range of frequencies in lieu of a specific operating frequency; this range is known as a "FREQUENCY BAND ASSIGNMENT." FREQUENCY BAND ASSIGNMENTS permit the transmitting station to operate on any specific frequency so located within the range that the necessary bandwidth plus twice the tolerance does not extend beyond the lower and upper limits shown in the Circuit Remarks *FRB field. See paragraph 8.b.(1) (a) and (b), for the method used to calculate the amount of spectrum which may be occupied by any specific emitted signal within the range of frequencies authorized by a FREQUENCY BAND ASSIGNMENT.

(2) Except as indicated in paragraph 8.c. (3), a FREQUENCY BAND ASSIGNMENT shall only be requested when one or more specific frequency assignments will not satisfy the requirement.

(3) FREQUENCY BAND ASSIGNMENTS are normally authorized only for the following:

(a) Transmitters which automatically sweep through all frequencies in a band.

(b) Radiosonde transmitters operating in either of the bands:

400.15-406.00 MHz 1670.00-1700.00 MHz

(c) Frequency agile radar beacons (racon) operating in either of the bands:

2900-3100 MHz 9300-9500 MHz

(d) Transmitters which use automatic frequency selection based upon changing propagation conditions along the transmission path.

(e) Transmitters which automatically pause at fifteen or more specific operating frequencies within a band.

(f) Operations which require the use of fifteen or more specific operating frequencies within a band for research, development, test and/or evaluation purposes.

(g) Operations which involve a multitude of mobile radiolocation or radionavigation transmitters. Whenever possible, at the option of the applicant, operational frequencies may be recorded in the CIRCUIT REMARKS *AGN sub-field.

(h) Tactical and/or Training assignments above 30 MHz which require the use of fifteen or more specific operating frequencies within a band.

(i) Operations devoted exclusively to electronic warfare (EW), electronic countermeasures (ECM), and/or electronic counter-countermeasures (ECCM).

(4) Requests for FREQUENCY BAND ASSIGNMENTS which do not meet the above criteria will be considered by the FAS on a case-by-case basis.

(5) Using the procedures in paragraph 8a, insert the frequency which identifies the lower limit of the FREQUENCY BAND ASSIGNMENTS.

(6) All applications for FREQUENCY BAND ASSIGNMENTS must include:

(a) A dash in the Frequency Band Indicator (BIN) field, and

(b) An entry in the Circuit Remarks *FRB field.

d. Special Coordination Requirements.

(1) If the frequency requires coordination under the provisions of the Sections (as applicable) in Part 8.3 or Part 9.14, the applicant shall, insofar as practicable, complete such coordination prior to submitting the application to the FAS.

9. NET--Net Control (5 Characters--1 Occurrence)

a. At the option of the applicant, this field may be used to identify within the applying agency:

(1) a specific user; or

(2) a command; or

(3) an activity; or

(4) a unit; or

(5) a project; etc.

b. The data may be alpha, numeric or alphanumeric.

10. ICI--International Coordination Identifier (1 Character--1 Occurrence)

a. When Canadian coordination is required by the IRAC in accordance with Part 3.4, enter the letter C in this field. The letter C should be entered on the application by the submitting agency; however, it will be entered by the Canadian Coordination computer program if this field is left blank and the application meets the criteria of Part 3.4.

b. When Canadian coordination is not required by the IRAC but the submitting agency determines it to be beneficial to coordinate with Canada, the submitting agency must enter the letter C in this field in order to initiate coordination action.

c. If the submitting agency desires Mexican coordination, enter the letter M in this field.

d. If both Canadian and Mexican coordination are desired, enter the letter B in this field.

e. When Canadian coordination is not required by Part 3.4 and neither Canadian or Mexican coordination are desired, leave this field blank.

Example: ICI01 C

f. The ICI field is also used to identify the U.S. Federal Government coordination channels for those Canadian assignments along the U.S./Canada border that have been included in the GMF for electromagnetic compatibility analysis purposes:

D = through NTIA with FAS member agencies

F = through the FAA

J = through the DoD's Joint Chiefs of Staff (JCS)

U = no indication of coordination

g. When Canadian coordination is required by the FCC for the 932.5 - 935.0 or 941.5 - 944.0 MHz bands in accordance with Part 3.4, enter the letter A in this field. The letter A should be entered on the application by the submitting agency; however it will be entered by the Canadian Coordination computer program if this field is left blank and the application meets the criteria of Part 3.4.

11. BIN--Frequency Band Indicator (1 Character--1 Occurrence)

a. Whenever a frequency band assignment is requested (see Section 9.8.2, paragraph 8.c.) enter a dash (-) in this field.

b. If a specific operating frequency is requested, leave this field blank.

Example: BIN01 --

12. MSD--Missing Data Indicator (1 Character-1 Occurrence)

a. Enter the letter Z for all applications which would be classified SECRET if all required data were provided.

b. If the letter Z does not apply, leave this field blank.

Example: MSD01 Z

13. BUR--Bureau (4 Characters--1 Occurrence)

a. At the option of the applicant, this field may be used to identify an organizational subunit of the applying agency.

b. If used, this field must contain an abbreviation from Annex G, Part 1.

14. EXD--Expiration Date (6 Characters--1 Occurrence)

a. This field is for the year, month and day on which a TEMPORARY or TRIAL assignment is to expire (see Part 9.6)

b. To compose the EXD entry:

(1) Insert in the first two characters the last two digits of the year; and

(2) Insert in characters three and four a two-digit number (01 through 12) for the month.

(3) Insert in characters five and six a two digit number (01 to 31) corresponding to the day of the month the application is to expire.

c. For TEMPORARY assignments the date shall not exceed five years.

d. For TRIAL assignments, the date shall not exceed two years.

e. For GROUP assignments used for planning purposes (NTS S321), the date shall not exceed three years.

f. Leave blank for a REGULAR assignment.

Example: EXD01 890615

15. STC--Station Class (6 Characters--20 Occurrences)

a. This field is for the Station Class symbol(s) as shown in Sections 6.1.2 (alphabetical by classes) and 6.1.3 (alphabetical by symbols). Enter only one such symbol per entry.

b. Each entry in the STATION CLASS field must also contain a corresponding entry in the POWER field and the EMISSION field.

c. The suffix “R” shall be added to the class of station (STC) symbol only if the station is also a repeater station in a corresponding frequency assignment and its use is reflected in the paired frequency (PRD) field.

29.89-50.00 MHz	148.00-149.90 MHz	162.00-174.00 MHz
138.00-144.00 MHz	150.05-150.80 MHz	406.10-420.00 MHz

For this purpose a repeater consists of a radio transmitter, a radio receiver and coupling between the two so as to retransmit unchanged in intelligence the received signal.

d. The station class symbol FL shall be used only when all three land stations, land, maritime and aeronautical mobile, will be in use at some time (i.e., FL to be used only when all three classes, FB, FC, and FA will be used).

e. The station class symbol MO shall be used when all three mobile stations, land, maritime and aeronautical mobile will be in use some time (i.e., MO to be used only when all three classes, ML, MS, and MA, will be used).

f. Each entry of the station class symbols: FL, FA, FAC, FAB, FLU, MO, MOU or MA operating in the bands 162 – 174 MHz and 406.1 – 420 MHz must also contain corresponding Circuit Remarks (REM) information on the maximum aircraft altitude (*NTS,M014, 9.8.2.39k) and commensurate authorized area of operation (*RAD).

g. Each entry of the station class symbol FA operating in the 118 – 136.475 MHz and 225 – 399.9 MHz bands must also contain the corresponding Circuit Remarks (REM) Agency Data (*AGN) information concerning the minimum altitude (FLL), maximum altitude (FLT) and Tailored Service Volume (TSV) as applicable to the assignment. (See Section 9.8.2.39 j)

16. EMS--Emission Designator (14 Characters--20 Occurrences)

The EMISSION DESIGNATOR consists of the necessary bandwidth and emission classification symbols.

a. The amount of radio spectrum which may be occupied by an authorized frequency assignment does not extend beyond:

(1) the ASSIGNED FREQUENCY BAND (see Section 6.1.1) which is determined by:

(a) subtracting from the specific operating frequency 1/2 the necessary bandwidth plus the absolute value of the frequency tolerance as derived from Chapter 5; and,

(b) adding to the specific operating frequency 1/2 the necessary bandwidth plus the absolute value of the frequency tolerance as derived from Chapter 5; or

(2) the lower and upper limits shown in the Circuit Remarks *FRB field for FREQUENCY BAND ASSIGNMENTS.

b. The authorized use is determined by the designated:

(1) type of modulation;

(2) nature of the signal(s) modulating the main carrier; and

(3) type of information to be transmitted.

c. An EMISSION DESIGNATOR must be entered for each type of transmission. For example, a 6KA3E EMISSION DESIGNATOR does not include authority for any other type of transmission such as CW or tone modulated telegraphy.

d. The EMISSION DESIGNATOR consists of the following:

(1) Necessary bandwidth.

(a) See Annex J for methods used to calculate necessary bandwidths.

(b) Doppler Shift shall not be included in the frequency tolerance or necessary bandwidth; however, at the option of the applicant, Doppler Shift may be shown as an extra item of information in the SUPPLEMENTARY DETAILS field.

(2) Emission classification symbols:

(a) First symbol--Indicates the type of modulation of the main carrier.

(b) Second symbol--Indicates the nature of signal(s) modulating the main carrier.

(c) Third symbol--Indicates the type of information to be transmitted.

(d) Fourth symbol--Indicates the details of the signal (Optional--recommend when applicable).

(e) Fifth symbol--Indicates the nature of multiplexing (Optional--recommend when applicable).

e. The EMISSION DESIGNATOR shall be entered according to the following rules:

(1) Necessary Bandwidth. To express the necessary bandwidth portion of the EMISSION DESIGNATOR, enter a maximum of five numerals and one letter. The letter occupies the position of the decimal point and represents the unit of bandwidth as follows:

H for Hertz
K for kiloHertz
M for MegaHertz
G for GigaHertz

Fractional bandwidths may be expressed to a maximum of two decimal places following the letter. The first character of the necessary bandwidth shall always be greater than zero unless the necessary bandwidth is less than 1 Hertz in which case the first character shall be the letter H. Express the necessary bandwidths according to the following:

(a) Necessary bandwidths between .01 and 999.99 Hz shall be expressed in Hertz using the letter H in lieu of the decimal; e.g., 15H is 15Hz of bandwidth; 15H01 is 15.01 Hz of bandwidth.

(b) Necessary bandwidths between 1.00 and 999.99 kHz shall be expressed in kiloHertz using the letter K in lieu of the decimal; e.g., 2K is 2 kHz of bandwidth; 2K85 is 2.85 kHz of bandwidth.

(c) Necessary bandwidths between 1.00 and 999.99 MHz shall be expressed in MegaHertz using the letter M in lieu of the decimal; e.g., 6M is 6 MHz of bandwidth; 6M25 is 6.25 MHz of bandwidth.

(d) Necessary bandwidths between 1.00 and 999.99 GHz shall be expressed in GigaHertz using the letter G in lieu of the decimal; e.g., 10G is 10 GHz of bandwidth; 10G05 is 10.05 GHz of bandwidth.

(2) Emission Classification Symbols. Enter the basic emission designator of three symbols, and if desired, two optional additional symbols, as derived from the following:

(a) First symbol--designates the type of modulation of the main carrier:

UNMODULATED	
Symbol	**Type of Emission**
N	Emission of an unmodulated carrier.
AMPLITUDE-MODULATED Emission in which the main carrier is amplitude-modulated (including cases where sub-carriers are angle-modulated):	
A	Double-sideband
B	Independent sidebands
C	Vestigial sideband
H	Single-sideband, full carrier
J	Single-sideband, suppressed carrier
R	Single-sideband, reduced or variable level carrier

ANGLE-MODULATED	
Emission in which the main carrier is angle-modulated:	
Symbol	**Type of Emission**
F	Frequency modulation
G	Phase modulation
AMPLITURE-MODULATED AND ANGLE-MODULATED	
Symbol	**Type of Emission**
D	Emission in which the main carrier is amplitude-modulated and angle-modulated either simultaneously or in a preestablished sequence.
PULSE	
Emission of pulses: (Emissions, where the main carrier is directly modulated by a signal which has been coded into quantized form (e.g., pulse code modulation), shall be designated as either an emission in which the main carrier is amplitude-modulated, or an emission in which the main carrier is angle-modulated).	
Symbol	**Type of Emission**
P	Sequence of unmodulated pulses.
A sequence of pulses:	
Symbol	**Type of Emission**
K	Modulated in amplitude
L	Modulated in width
M	Modulated in position
Q[4]	Carrier is angle-modulated during the period of the pulse
V	A combination of the foregoing or produced by other means
COMBINATION	
Symbol	**Type of Emission**
W	Cases not covered above, in which an emission consists of the main carrier modulated, either simultaneously or in a combination of two or more of the following modes: amplitude, angle, pulse.
X[1]	Cases not otherwise covered.

[4] Angle modulation includes either frequency or phase modulation.

[1] A full explanation for the selection of the letter X shall be provided in the Supplementary Details (SUP) unless the application is for a non-directional beacon in the bands 190-435 and 510-535 kHz.

(b) Second symbol--designates the nature of signal(s) modulating the main carrier:

Symbol	Type of Emission
0	No modulating signal.
1	A single channel[2] containing quantized or digital signals without the use of a modulating subcarrier. (This excludes time-division multiplex.)
2	A single channel[2] containing a quantized or a digital signal with the use of modulating subcarrier.
3	A single channel[2] containing an analogue signal.
7	Two or more channels[2] containing quantized or digital signals.
8	Two or more channels[2] containing analogue signals.
9	A composite system with one or more channels containing quantized or digital signals, together with one or more channels containing analogue signals.
X[1]	Cases not otherwise covered.

(c) Third symbol--designates the type of information to be transmitted (In this context the word "information" does not include information of a constant, unvarying nature such as provided by standard frequency emissions, continuous wave and pulse radars, etc.)

Symbol	Type of Emission
N	No information transmitted.
A	Telegraphy--for aural reception.
B	Telegraphy--for automatic reception.
C	Facsimile.
D	Data transmission, telemetry, telecommand; (the symbol D indicates that data, telemetry, or telecommand information is being transmitted individually or, that any combination of the three are being transmitted simultaneously. If any combination is being transmitted simultaneously, one of the multichannel symbols, 7, 8, or 9, must be used for the second symbol.)
E	Telephony (including sound broadcasting).
F	Television (video).
W	Combination of the above. (Use only for multi-channel systems having the capability of transmitting all information simultaneously).
X[1]	Cases not otherwise covered.

[2] In this context, the word "Channel(s)" refers to the radio frequency (RF) channel.

(d) Fourth symbol--designates the details of signal(s):

Symbol	Type of Emission
A	Two-condition code with elements of differing numbers and/or durations.
B	Two-condition code with elements of the same number and duration without error-correction.
C	Two-condition code with elements of the same number and duration with error-correction.
D	Four-condition code in which each condition represents a signal element (of one or more bits).
E	Multi-condition code in which each condition represents a signal element (of one or more bits).
F	Multi-condition code in which each condition or combination of conditions represents a character.
G	Sound of broadcasting quality (monophonic).
H	Sound of broadcasting quality (stereophonic or quadraphonic).
J	Sound of commercial quality (excluding categories defined for symbols K and L below).
K	Sound of commercial quality with the use of frequency inversion or band-splitting.
L	Sound of commercial quality with separate frequency-modulated signals to control the level of demodulated signal.
M	Monochrome.
N	Color.
W	Combination of the above.
X	Cases not otherwise covered.

(e) Fifth symbol--designates the nature of multiplexing:

Symbol	Type of Emission
N	None.
C	Code-division multiplex (This includes bandwidth expansion techniques.)
F	Frequency-division multiplex.
T	Time-division multiplex.
W	Combination of frequency-division multiplex and time-division multiplex.
X	Other types of multiplexing.

Examples:

Symbol	Type of Emission
N0N	Continuous wave.
1K24F1B	1.24 kHz necessary bandwidth for frequency modulated single channel telegraphy.
16KF3EJN	16 kHz necessary bandwidth for commercial telephony.

f. Each entry in the EMISSION (EMS) field must also contain a corresponding entry in the POWER (PWR) and STATION CLASS (STC) fields.

17. PWR--Power (12 Characters--20 Occurrences)

a. This field is for the transmitter output power NORMALLY supplied to the antenna transmission line and is entered according to the emission designator as follows:

(1) Carrier power (pZ) for A3E sound broadcasting in the Broadcasting Service.

(2) Mean power (pY) for other amplitude modulated emissions using unkeyed full carrier, and for all frequency modulated emissions.

(3) Peak envelope power (pX) for all emission designators other than those referred to in (1) and (2) above, including C3F television (video only).

b. For different emission designators, the relationships between peak envelope, mean, and carrier power, under the conditions of normal operation and of no modulation, are contained in Recommendation ITU-R SM.326-6 (1994).

c. The power shall be entered as follows:

(1) In character one enter the unit of power as:

W--for Watt
K-- for Kilowatt
M-- for Megawatt
G--for Gigawatt

(a) Enter W and show power in watts when less than 1 kilowatt.

(b) Enter K and show power in kilowatts for 1 to 999.99999 kilowatts, inclusive.

(c) Enter M and show power in Megawatts for 1 to 999.99999 Megawatts, inclusive.

(d) Enter G and show power in Gigawatts when 1 Gigawatt and above.

(2) Insert a decimal point only if there is a significant nonzero value to the right of the decimal.

(3) The power may be entered to a maximum of five characters to the right of the decimal.

Examples:

W.5 for 1/2 watt
K2.5 for 2 1/2 kilowatts

d. Each entry in the POWER (PWR) field must also contain a corresponding entry in the EMISSION (EMS) and STATION CLASS (STC) fields.

18. NTS--Record Notes (4 Characters--10 Occurrences)

a. The RECORD NOTES apply to the entire frequency assignment; therefore, a specific RECORD NOTE shall be entered only once in this field. Agencies may enter RECORD NOTES as applicable during the preparation of applications, or RECORD NOTES may be added at the FAS meeting.

b. Enter, as applicable, the appropriate RECORD NOTE(S) from the lists shown in Annex A.

c. The types of RECORD NOTES which may be entered are:

(1) COORDINATION (C_____)--Indicates specific coordination requirements.

(2) EMISSION (E_____)--Indicates emission limitations.

(3) LIMITATION (L_____)--Indicates operational limitations.

(4) PRIORITY (P_____)--Indicates assignment precedence in relation to other assignments.

(5) SPECIAL (S_____)--Indicates special conditions and/or amplifying data.

d. All assignment requests meeting one or more of the following criteria must indicate the applicable NOTE(S):

(1) For a station in the domestic FIXED service (see Section 8.2.11), enter, as appropriate:

C078	L012	S012	S148	S206
S208	S358	S359	S360	

(2) Enter the applicable NOTE(S) from the S500-S899 series if the assignment is for:

(a) a station in a Space radiocommunication service; or

(b) an experimental station to be operated in the manner of a station in a Space radiocommunication service; or

(c) an experimental station to be used for the static test (prelaunch ground-to-ground checkout) of communication equipment to be used in a Space radiocommunication service; or

(d) a station to be used to support a Space mission.

(3) Enter S321 or S322 for an assignment being made that is subject to the provisions of Section 9.6.5.

(4) Enter S348 if an assignment is for communications with Non-Federal Citizens Band (CB) stations and is made pursuant to Section 8.3.24.

e. For NOTIFICATION actions:

(1) Enter S160 or S165 if the assignment is being made under the authority of Part 7.12 or Section 7.5.2.

(2) Enter S141 if the assignment is to a transmitting station located outside the United States and Possessions.

(3) Enter the NOTES which were applied to the GROUP assignment (see Section 9.6.5); except that NOTES S149, S321, and S322 shall never be entered on the NOTIFICATION action. If the GROUP assignment bears either S170 or S171, these NOTES may be inserted or omitted at the option of the applicant.

f. Enter the NOTE S366 on applications for an area assignment whose parameters indicate that operations are outside the Canadian Zone but are suspect of Canadian Coordination or when:

(1) the parameters provided on the application meet the requirements for Canadian coordination as specified in Part 3.4; and

(2) the Transmitter Antenna Location (XAL) field contains an area that is within or partially within the U.S./Canadian Coordination Zone (see Part 3.4); and

(3) the Transmitter Antenna Latitude and Longitude (XLA and XLG) fields are blank on the application; but

(4) operations will be south of the U.S./Canada Coordination Zone; or

(5) for frequencies below 1000 MHz the power used while in the Zone will not exceed 5 watts.

19. TME--Time (4 Characters--1 Occurrence)

a. This field is for the period of time during which it is intended that the frequency will be either guarded (monitored) or used for transmission. The period indicated is not a limitation or restriction, but rather the normal period of time during which the frequency is required to satisfy the operational requirement described in Supplementary Details.

b. The entry shall indicate two characteristics.

(1) The first characteristic indicates whether the frequency is required occasionally or regularly during the period of a year. Examples of occasional use, without reference to priority, include construction projects, seasonal projects, major public events, civil disturbances, natural disasters, certain uses during space flights, and field surveys.

(2) The second characteristic indicates whether the frequency is required only during the normal workweek or for additional periods of the week. A normal workweek is considered to be the period between 6 AM and 6 PM, Monday through Friday.

c. Except for assignments containing:

(1) An Experimental station class; or

(2) Either of the Notes S321 or S322, this field shall be completed on applications for assignments in the bands:

29.89-50.0 (limited to exclusive Federal bands in this range)
138.00-144.0
148.00-149.9
150.05-150.8
162.00-174.0
406.10-420.0 MHz.

d. In all other bands above 29.89 MHz, this field shall be completed on applications with US, USA, or USP in the Transmitter State/Country (XSC) field except those containing S322 in the NOTES (NTS) field.

e. This field may be completed on other applications at the option of the applicant.

f. The period of time shall be indicated by use of one of the numbers 1 through 4, entered in the first character of the TIME (TME) field as follows, enter the number:

1--for regular/not limited to workweek; or
2--for regular/workweek; or
3--for occasional/not limited to workweek; or
4--for occasional/workweek.

g. In all bands below 29.89 MHz this field may also be used, at the option of the applicant, to indicate the period of the day that a circuit is in operation. Enter one of the following, as applicable:

H24--for 24-hour operation,
HJ--for day operation,
HN--for night operation,
HT--for transition period operation,
HX--for intermittent operation throughout the 24-hour day or no specific working hours.

Note that this entry applies to the period of operation of the circuit, not the period of operation of an individual frequency. If one of these symbols is entered in this field with one of the figures 1 through 4, the applicable figure is entered first.

20. SPD--Power Density (4 Characters--1 Occurrence)

a. On applications for assignments to earth or space stations, or to terrestrial stations (including experimental stations) employing earth or space station techniques, insert the maximum power density (in dB(W/Hz)) supplied to the antenna. For frequencies below 15 GHz, the power shall be averaged over the worst 4 kHz band; for frequencies at 15 GHz and above, the power shall be averaged over the worst 1 MHz band. The worst 4 kHz or 1 MHz band are defined as that 4 kHz or 1 MHz that has the highest power density within the assigned necessary bandwidth.

b. For negative values insert a dash in character one.

c. For positive values insert a zero in character one.
d. For values less than 10, insert a zero in characters two and three.
e. For values 10 to 99 inclusive, insert a zero in character two.

Examples: SPD01 –008 (The maximum power density per Hertz is –8 dBW/Hz.)
SPD01 0001 (The maximum power density per Hertz is 1 dBW/Hz.)

21. XSC--Transmitter State/Country (4 Characters--1 Occurrence)

a. Using one of the geographical abbreviations (State, Country, or Area) as shown in Annex G, Part 2, insert the abbreviation of the State, Country, or Area in which the site of the transmitting station is located.

b. If the State, Country, or Area in which the site of the transmitting station is located is classified SECRET, insert XXXX in this field.

c. For a station on board a satellite in space, insert SPCE.

d. For emanations from a natural or cosmic origin intended for reception by space-based Passive Sensor or Radio Astronomy stations, insert RCVR.

Example: XSC01 CO for Colorado

22. XAL--Transmitter Antenna Location (24 Characters--1 Occurrence)

a. This field is for the name of the city or other geographical subdivision in which the site of the transmitting antenna is physically located. A major installation, such as Dallas-Fort Worth International Airport or Andrews AFB, is considered to be a city or other geographical subdivision. In certain cases non-geographical data are used.

b. In certain cases it may be necessary to describe an area of operation for which no specific name can be applied. For locations described as an area of operation, it shall be recognized that transmissions might not occur in every square kilometer of the area indicated, and the area described might overlap into States that are not shown in the transmitter STATE/ COUNTRY field.

c. Such areas may be described:

(1) as a radius in kilometers extending from a given location;

Example:

In the case of transmissions by one or more mobile stations located at any point within 80 kilometers of Dallas, insert DALLAS in this field and a radius in the CIRCUIT REMARKS *RAD field; or

(2) by the use of geographical coordinates in Circuit Remarks.

Example:

In the case of transmissions by one or more mobile stations in the area south of 33 degrees N in the State of Arizona, insert Arizona in this field and the data pertaining to the coordinates in the CIRCUIT REMARKS field. An area of operation within several States also may be described in this field as US or USA with the included or excluded States being shown in the CIRCUIT REMARKS field. Similarly, USP may be used if the area includes a Possession.

d. While the data inserted normally shall be geographical names or descriptions, exceptions may be made for experimental operations, mobile operations where the XSC and XAL fields are identical, or for space operations. The following rules apply:

(1) For transmission by an experimental station, other than one in space, or to a mobile station having identical XSC and XAL fields, words such as AIRCRAFT, BALLOONS, or SHIPS may be used as appropriate.

(2) For transmission by a station aboard a geostationary satellite, insert GEOSTATIONARY.

(3) For transmission by a station aboard a nongeostationary satellite, insert NONGEOSTATIONARY.

(4) For transmission by a station located on a natural object in space, insert the name of the object, e.g., MOON.

(5) For transmission by a station aboard a space vehicle designed for operation in deep space (beyond the moon) where earth orbital data are irrelevant, insert DEEP SPACE followed by planet (s) name, or PROBE, for those vehicles that do not orbit other planetary objects.

(6) For emanations from a natural or cosmic origin intended for reception by a space-based Passive Sensor (station class E2 or E4 and note S385) or Radio Astronomy stations (station class RA and note S385), insert RCVR.

(7) For transmission by a station aboard a vehicle whose purpose is to carry a payload into orbit, transmissions could occur from launch through placing the payload into orbit, the term LAUNCH VEHICLE may be used.

e. Entries in this field are limited to ALPHA and NUMERIC characters.

23. XRC--Transmitter Control (8 Characters--1 Occurrence)

This field is optional and is primarily for the name of the facility that controls, either electrically or administratively, the transmitting station; however, other similar data may be inserted. If the name exceeds eight characters, abbreviate.

24. XLA--Transmitter Antenna Latitude (7 Characters 1 Occurrence)

a. Insert two characters each for the degrees, minutes, and seconds of the latitude of the site named in the TRANSMITTER ANTENNA LOCATION (XAL) field. Insert leading zeros for degrees, minutes, and seconds as required. Seconds shall be provided whenever possible; however, if it is impracticable to obtain the exact seconds, insert the closest seconds available. Coordinates will be referenced to the World Geodetic System Code 84/North American Datum 83. If another system code is used the type and reason will be entered in the supplementary remarks section.

b. Leave this field blank if:

(1) The site named in the TRANSMITTER ANTENNA LOCATION (XAL) field is an area, see Section 9.8.2, paragraph 22.c.(2) for which coordinates cannot be applied, e.g., Chicago District; or,

(2) If non geographical data are used, e.g., AIRCRAFT.

c. For a station aboard a Geostationary satellite, insert 000000N.

d. For a station aboard a Non-geostationary satellite or a Deep Space vehicle, leave this field blank.

e. Insert N for North or S for South latitude in the last space as applicable.

Example: XLA01 385351N

25. XLG--Transmitter Antenna Longitude (8 Characters--1 Occurrence)

a. Insert in degrees (3 characters), minutes (2 characters) and seconds (2 characters), the longitude of the site named in the TRANSMITTER ANTENNA LOCATION (XAL) field. Insert leading zeros for degrees, minutes, and seconds as required. Seconds shall be provided whenever possible; however, if it is impracticable to obtain the exact seconds, insert the closest seconds available. Coordinates will be referenced to the World Geodetic System Code 84/North American Datum 83. If another system code is used the type and reason will be entered in the supplementary remarks section.

b. Leave this field blank if:

(1) The site named in the TRANSMITTER ANTENNA LOCATION (XAL) field is an area for which coordinates cannot be applied, e.g., Chicago District; or,

(2) If non geographical data are used, e.g., AIRCRAFT.

c. For a station aboard a Geostationary satellite, insert the longitudinal position of the satellite in degrees (3 characters) and minutes (2 characters) East or West longitude. In this case always enter 00 in the seconds portion of this field. Use leading zeros as required.

d. For a station aboard a Non-geostationary satellite, or a Deep Space vehicle, leave this field blank.

e. Insert E for East or W for West longitude in the last space as applicable.

Example: XLG01 0770133W

26. XAP--Transmitter Antenna Polarization (3 Characters--1 Occurrence)

a. Transmitter antenna polarization is required on applications:

(1) for assignments above 1000 MHz that must be coordinated by the IRAC with the Canadian Department of Communications pursuant to Section 3.4.6, Appendices 3 and 4 of Arrangement D; or

(2) for transmitting Earth or Terrestrial stations (including experimental stations) employing Earth station techniques; or

(3) for transmitting Space or Terrestrial stations (including experimental stations) using Space station techniques;

(4) for assignments to TERRESTRIAL STATIONS at 420 MHz and above.

b. Transmitter Antenna Polarization is not required on applications for:

(1) Experimental stations except as indicated in 26.a.(2) and (3);

(2) Mobile stations;

(3) Portable stations;

(4) Radiolocation mobile stations;

(5) Radionavigation mobile stations;

(6) Transportable stations;

(7) Group assignments;

(8) A period of six months or less;

(9) Meteorological Aids in the 1660-1700 MHz band;

(10) TACAN/DME stations in the 960-1215 MHz band;

(11) Aeronautical Telemetering stations in the 1435-1535, 2200-2290 and 2310-2390 MHz bands.

c. This field may be completed on other applications at the option of the applicant.

d. If more than one antenna is to be used, insert the polarization of the antenna to be used most frequently; however, for a space station, antenna polarization may be listed for up to three antennas, provided they are entered in the same sequence as the antenna data entered in the TRANSMITTER ANTENNA DIMENSIONS (XAD) field.

e. Insert one of the following letters or combination of letters to indicate the antenna(s) polarization:

A--Elliptic, Left
B–Elliptic, Right
D--Rotating
E--Elliptical
F--45 degrees
H--Horizontal
J--Linear
L--Left Hand Circular
M–Oblique Angled, Left
N–Oblique Angled, Right
O–Oblique Angled, Crossed
R--Right Hand Circular
S--Horizontal and Vertical
T--Right and Left Hand Circular
V--Vertical
X--Other

Examples: XAP01 V (Vertically polarized transmissions)

XAP01 FJL (45 degrees, Linear, and Left Hand Circular polarized transmissions for three space station antennas)

27. XAZ--Transmitter Antenna Orientation (3 Characters--1 Occurrence)

a. TERRESTRIAL STATIONS: On applications for assignments to Terrestrial stations complete this field in accordance with the procedures given below for the applicable frequency range. Enter one of the following as applicable:

(1) For directive antennas oriented in a fixed direction, enter a three-digit number indicating the azimuth of the main antenna lobe in degrees east of True North, using leading zeros as necessary and 360 for True North.

(2) For stations using on-site passive reflectors, displaced vertically from the primary antenna or installed on the same antenna farm as the primary antenna (normally within 150 meters of the transmitter), enter the horizontal azimuth of the on-site passive reflector.

(3) S--For directive antennas that operate in fixed mode (direction) but are steerable in the horizontal plane, e.g., steerable log periodic.

(4) ND--For Non-directive antennas.

(5) R--For antennas rotating through a full 360 degree azimuth while in operation.

(6) SSH--For antennas scanning horizontally through a limited sector.

(7) SSV--For vertically scanning (nodding) antennas.

(8) T--For tracking antennas capable of continuous reorientation for the purpose of maintaining optimum observance of a moving station or object.

b. TERRESTRIAL STATIONS BELOW 29890 kHz

(1) On applications for assignments to fixed (FX) and aeronautical fixed (AX) stations in the band 3000 to 29890 kHz, enter the appropriate code in accordance with paragraph 27a.(1)-(8). This field may be left blank if the ANTENNA LOCATION is an area representing multiple transmitting stations, e.g., Chicago District, or if the application bears either the Note S362 or S189.

(2) On applications for assignments below 29890 kHz, other than those for fixed (FX) and aeronautical fixed (AX) stations in the band 3000 to 29890 kHz, this field may be completed at the option of the applicant in accordance with paragraph 27a.(1)-(8).

c. TERRESTRIAL STATIONS AT 29890 kHz AND ABOVE

(1) On applications for assignments to stations at 29890 kHz and above, enter the appropriate code in accordance with 27a.(1)-(8).

(2) This field may be left blank on applications for:

(a) Experimental stations;
(b) Mobile stations;
(c) Portable stations;
(d) Radiolocation mobile stations;
(e) Radionavigation mobile stations;
(f) Transportable stations;
(g) Group assignments;
(h) A period of six months or less;
(i) Marker Beacons in the 74.8-75.2 MHz band;
(j) VOR/ILS in the 108-117.975 MHz band;
(k) Stations in the Aeronautical Mobile service in the 117.975-136 MHz band;
(l) Stations in the Aeronautical and Maritime Mobile services in the 138-144, 148-150.8, 157.0375-157.1875, 225-328.6, 335.4-399.9 MHz bands, or on the frequencies 156.6, 156.7, 161.6 MHz;
(m) Glideslopes in the 328.6-335.4 MHz band;
(n) Meteorological Aids in the 400.05-406, and 1660-1700 MHz bands;
(o) TACAN/DME in the 960-1215 MHz band; and
(p) Aeronautical Telemetering stations in the 1435-1535, 2200-2290 and 2310-2390 MHz bands.

(3) On applications for assignments that are listed above as exceptions, this field may be completed at the option of the applicant.

d. EARTH STATIONS: For Earth and Terrestrial stations (including experimental stations) employing Earth station techniques, insert the letter V followed by a two-digit number expressing the minimum operating angle of elevation of the antenna, in degrees, from the horizontal.

e. SPACE STATIONS: For Space and Terrestrial stations (including experimental stations) employing Space station techniques, enter one of the following, whichever is applicable.

(1) NB--for narrow beam antennas, i.e., substantially less than earth coverage; or
(2) EC--for earth coverage antennas; or
(3) Leave the field blank in the case of space-to-space operations.

28. XCL--Transmitter Call Sign (8 Characters-1 Occurrence)

This field is for the call sign or identifier assigned to the station in accordance with Part 6.5.

a. Insert the full call sign left-justified; however, those that do not require eight spaces and that are formed by letters followed by numbers, insert the letters left-justified and the numbers right-justified.

b. For navigation aids this field is for the identifier instead of a call sign.

Example: XCL01 WUH 55

29. XAD--Transmitter Antenna Dimensions (24 Characters--1 Occurrence)

This field shall be completed in accordance with the following procedures. Each Entry is dependent upon frequency range and type of station, i.e., TERRESTRIAL, EARTH or SPACE. Antenna gain must be entered in decibels with reference to an isotropic (dBi) source. Where gain is derived from a source in reference to a dipole (dBd), the dBi gain can be determined by adding 2.15 to the dBd gain (dBd + 2.15 = dBi) (ref: ITT Reference Data for Radio Engineers). Enter data according to the following:

a. TERRESTRIAL Stations BELOW 29890 kHz:

(1) This field may be left blank if the ANTENNA LOCATION (XAL) is an area representing multiple transmitting stations, e.g., Chicago District, or if the application bears either of the Notes S362 or S189.

(2) Gain is required on applications for assignments to fixed (FX) and aeronautical fixed (AX) stations in the band 3000 to 29890 kHz. Only the gain shall be entered in characters 1-3 of this field. Characters 4-24 shall be blank. The following formatting instructions apply: Insert in characters one and two, an appropriate two digit number which represents the gain; use a leading zero if the gain is less than ten. Insert the letter G in the third character (e.g., 04G, 20G). If the gain is zero it shall be entered as 00G.

(3) On all other applications for assignments below 29890 kHz, this field may be completed at the option of the applicant. However, if completed it must be in accordance with (2) above.

b. TERRESTRIAL Stations at 29890 kHz and ABOVE:

(1) This field may be left blank on applications for:

(a) Experimental stations;
(b) Mobile stations;
(c) Portable stations;
(d) Radiolocation mobile stations;
(e) Radionavigation mobile stations;
(f) Transportable stations;
(g) Group assignments;
(h) A period of six months or less;
(i) Marker Beacons in the 74.8-75.2 MHz band;
(j) VOR/ILS in the 108-117.975 MHz band;
(k) Stations in the Aeronautical Mobile service in the 117.975-136 MHz band;
(l) Stations in the Aeronautical and Maritime Mobile service in the 138-144, 148-150.8, 157.0375-157.1875, 225-328.6, 335.4-399.9 MHz bands, or on the frequencies 156.6, 156.7, 161.6 MHz;
(m) Glideslopes in the 328.6-335.4 MHz band;
(n) Meteorological Aids in the 400.05-406, and 1660-1700 MHz bands;
(o) TACAN/DME in the 960-1215 MHz band;
(p) Aeronautical Telemetering stations in the 1435-1535, 2200-2290, and 2310-2390 MHz bands.

(2) On all applications for assignments above 29890 kHz that are listed in 29b.(1)(a)-(p) as exceptions, this field may be completed at the option of the applicant.

(3) If more than one antenna is to be used, insert the data for the antenna to be used most frequently.

(4) The following formatting instructions apply:

(a) GAIN--Insert in the first two characters a two-digit number representing the nominal gain of the antenna in decibels. Insert a zero in the first space if the gain is less than ten. Enter the letter G in the third space. If the gain is zero, enter 00G.

(b) NAME--Starting with the fourth character, insert the generic name of the antenna, using no more than ten spaces. If the name requires more than ten spaces, abbreviate, but use all ten spaces.

(c) ELEVATION--Starting with the 14th character, enter a five-digit number representing the site (terrain) elevation in meters above mean sea level (MSL). Use all five spaces, inserting leading zeros as applicable. For a site below MSL, enter a dash in the 14th space and a four digit number. Insert the letter H in the 19th space. Leave blank for assignments to transportable transmitter stations (S362).

(d) HEIGHT--Starting with the 20th character, insert a four-digit number representing the antenna height in meters above terrain. Use all four spaces, inserting leading zeros as applicable. Insert the letter T in the 24th space.

Example: XAD01 10GCRNRRFLCTR06550H0175T

c. EARTH Stations: The following formatting instructions apply to both Earth and Terrestrial stations (including experimental stations) employing Earth station techniques.

(1) Use the entire 24 characters to record the following particulars:

(a) GAIN--Insert in the first two characters a two-digit number representing the gain of the antenna in the direction of maximum radiation. Insert a zero in the first character if the gain is less than ten. Enter the letter G in character if the gain is less than ten. Enter the letter G in character three. For a negative gain, insert XXG and give the value in the CIRCUIT REMARKS *EGN field.

(b) BEAMWIDTH--Beginning with character four, insert a three-digit number representing the antenna beamwidth (degrees) at the half power points. Use all three spaces, inserting leading zeros as applicable. Enter the letter B in character seven.For a beamwidth requiring more than three spaces, insert XXXB and give the value in the CIRCUIT REMARKS *EBW field.

(c) AZIMUTH--In characters eight through fourteen, insert the azimuth angles (in degrees clockwise from True North) of the main beam. If the Earth station is to communicate with a single Geostationary satellite, insert the azimuth angle to the satellite in spaces eight through ten (use leading zeros), a slant bar in space eleven, and XXX in spaces twelve through fourteen. If it is to communicate with two geostationary satellites, insert the azimuth angle to the first in spaces eight through ten, a slant bar in space eleven, and the azimuth angle to the second satellite in spaces twelve through fourteen. If the Earth station is mobile or transportable, or is to communicate with nongeostationary satellites or with more than two geostationary satellites, indicate the range of azimuth angles over which the Earth station antenna will point by inserting in spaces eight through ten a three-digit number for one extreme azimuth, a hyphen in space eleven, and a three-digit number in spaces twelve through fourteen for the other extreme azimuth. Use leading zeros as necessary and 360 for True North. In character fifteen insert the letter A.

(d) ELEVATION--Starting with character sixteen, insert a five-digit number representing the site (terrain) elevation in meters above mean sea level (MSL). Use all five spaces, inserting leading zeros as necessary. In character twenty-one insert the letter H.

For mobile or transportable stations, leave blank.

(e) HEIGHT--Starting with character twenty-two, insert a three-digit number representing the antenna height in meters above terrain. Use all three spaces, inserting leading zeros as applicable. For an Earth station aboard an aircraft, insert a two-digit number followed by the letter K to denote the maximum operational altitude of the aircraft in thousands of feet above mean sea level.

For altitudes under 10,000 feet insert a leading zero.

Example: XAD01 35G106B010/130A05200H025

d. SPACE Stations: The following formatting instructions apply to both Space and Terrestrial stations (including experimental stations) using Space station techniques:

(1) This field provides room for the details of up to three antennas per Space station. If the station uses more than three antennas for the requested frequency, provide data for the three most frequently used antennas.

(2) Use characters one through seven for the details of the first antenna. Enter:

(a) GAIN–Insert in the first two characters a two-digit number representing the gain of the antenna in the direction of maximum radiation. Insert a zero in the first character if the gain is less than ten. Enter the letter G in character 3. For a negative gain, insert XXG and give the value in the CIRCUIT REMARKS *SGN field.

(b) BEAMWIDTH--Beginning with character four, insert a three-digit number representing the antenna beamwidth (degrees) at the half power points. Use all three spaces, inserting leading zeros as necessary. Insert the letter B in space seven. For a beamwidth requiring more than three spaces, insert XXXB and give the value in the CIRCUIT REMARKS *SBW field.

Examples:

XAD01 08G150B
XAD01 36G2.1B
XAD01 XXG125B
XAD01 20GXXXB

(3) If the assignment involves the use of a second antenna:

(a) Insert a slant bar in character eight; and,

(b) Use characters nine through fifteen for the details as specified in paragraph 29.d.(2)(a) and (b).

Example: XAD01 30G016B/30G0.1B

(4) If the assignment involves the use of a third antenna:

(a) Insert a slant bar in character sixteen; and,

(b) Use characters seventeen through twenty-three for the details of the third antenna as specified in paragraph 29.d.(2) (a) and (b).

Example: XAD01 30G016B/30G0.1B/20G.25B

(5) Leave character twenty-four blank.

30. RSC--Receiver State/Country (4 Characters--30 Occurrences)

a. Using one of the geographical abbreviations (state, country, or area) as shown in Annex G, Part 2, insert the abbreviation of the State, Country, or Area in which the site of the receiving station is located.

b. For a station on board a satellite in space, insert SPCE.

Example: RSC01 CO for Colorado.

31. RAL--Receiver Antenna Location (24 Characters--30 Occurrences)

a. This field is for the name of the city or other geographical subdivision in which the site of the receiving antenna is physically located. A major installation, such as Fort Monmouth or Andrews AFB, is considered to be a city or other geographical subdivision. In certain cases non-geographical data are used.

b. In certain cases it may be necessary to describe an area of operation for which no specific name can be applied. For locations described as an area of operation, it shall be recognized that reception might not occur in every square kilometer of the area indicated, and the area described might overlap into States that are not shown in the RECEIVER STATE/COUNTRY (RSC) field.

c. Such areas may be described:

(1) as a radius in kilometers extending from a given location:

Example:

In the case of reception by one or more mobile stations located at any point within 80 kilometers of Dallas, insert DALLAS in this field and a radius in the CIRCUIT REMARKS *RAD field; or

(2) by the use of geographical coordinates in Circuit Remarks.

Example:

In the case of reception by one or more mobile stations in the area south of 33 degrees N in the State of Arizona, insert Arizona in this field and the data pertaining to the coordinates in the CIRCUIT REMARKS field. An area of operation within several States also may be described in this field as US or USA with the included or excluded States being shown in the CIRCUIT REMARKS field. Similarly, USP may be used if the area includes a Possession.

d. While the data inserted normally shall be geographical names or descriptions, exceptions may be made for experimental operations, mobile operations where the RSC and RAL fields are identical, or for space operations. The following rules apply:

(1) For reception by an experimental station, other than one in space, or to a mobile station having identical RSC and RAL fields, words such as AIRCRAFT, BALLOONS, or SHIPS may be used as appropriate.

(2) For reception by a station aboard a geostationary satellite, insert GEOSTATIONARY.

(3) For reception by a station aboard a non-geostationary satellite, insert NONGEOSTATIONARY.

(4) For reception by a station located on a natural object in space, insert the name of the object, e.g., MOON.

(5) For reception by a station aboard a space vehicle designed for operation in deep space (beyond the moon) where earth orbital data are irrelevant, insert DEEP SPACE followed by planet(s) name, or PROBE, for those vehicles that do not orbit other planetary objects.

e. Entries in this field are limited to ALPHA and NUMERIC characters.

32. RRC--Receiver Control (8 Characters-30 Occurrences)

This field is optional and is primarily for the name of the facility that controls, either electrically or administratively, the receiving station; however, other similar data may be inserted. If the name exceeds eight characters, abbreviate.

33. RLA--Receiver Antenna Latitude (7 Characters--30 Occurrences)

a. Insert two characters each for the degrees, minutes, and seconds of the latitude of the site named in the RECEIVER ANTENNA LOCATION (RAL) field. Insert leading zeros for degrees, minutes, and seconds as required. Seconds shall be provided whenever possible; however, if it is impracticable to obtain the exact seconds, insert the closest seconds available. Coordinates will be referenced to the World Geodetic System Code 84/North American Datum 83. If another system code is used the type and reason will be entered in the supplementary remarks section.

b. Leave this field blank if:

(1) The site named in the RECEIVER ANTENNA LOCATION (RAL) field is an area, see Section 9.8.2, paragraph 31.c.(2) for which coordinates cannot be applied, e.g., Chicago District; or,

(2) If non-geographical data are used, e.g., AIRCRAFT.

c. For a station aboard a Geostationary satellite, insert 000000N.

d. For a station aboard a Non-geostationary satellite or a Deep Space vehicle, leave this field blank.

e. Insert N for North or S for South latitude in the last space as applicable.

f. For assignments where the transmitter and receiver equipment is not collocated then enter the RLA of the receiving antenna; otherwise, enter the same coordinates contained in XLA.

34. RLG--Receiver Antenna Longitude (8 Characters--30 Occurrences)

a. Insert in degrees (3 characters), minutes (2 characters) and seconds (2 characters), the longitude of the site named in the RECEIVER ANTENNA LOCATION (RAL) field. Insert leading zeros for degrees, minutes, and seconds as required. Seconds shall be provided whenever possible; however, if it is impracticable to obtain the exact seconds, insert the closest seconds available. Coordinates will be referenced to the World Geodetic System Code 84/North American Datum 83. If another system code is used the type and reason will be entered in the supplementary remarks section.

b. Leave this field blank if:

(1) the site named in the RECEIVER ANTENNA LOCATION (RAL) field is an area for which coordinates cannot be applied, e.g., Chicago District; or,

(2) if non geographical data are used, e.g., AIRCRAFT.

c. For a station aboard a Geostationary satellite, insert the longitudinal position of the satellite in degrees (3 characters) and minutes (2 characters) East or West longitude. In this case always enter 00 in the seconds portion of this field. Use leading zeros as required.

d. For a station aboard a Non-geostationary satellite, or a Deep Space vehicle, leave this field blank.

e. Insert E for East or W for West longitude in the last space as applicable.

f. For assignments where the transmitter and receiver equipment is not collocated then enter the RLG of the receiving antenna; otherwise, enter the same coordinates contained in XLG.

35. RAP--Receiver Antenna Polarization (3 Characters--30 Occurrences)

a. Receiver antenna polarization is required on applications:

(1) for receiving Earth or Terrestrial stations (including experimental stations) employing Earth station techniques; or

(2) for receiving Space or Terrestrial stations (including experimental stations) using Space station techniques; or

(3) for receiving Terrestrial stations at 420 MHz and above.

b. Receiver Antenna Polarization is not required on applications for:

(1) Experimental stations except as indicated in 26.a.(2) and (3);
(2) Mobile stations;
(3) Portable stations;
(4) Radiolocation mobile stations;
(5) Radionavigation mobile stations;
(6) Transportable stations;
(7) Group assignments;
(8) A period of six months or less;
(9) Meteorological Aids in the 1660-1700 MHz band;
(10) TACAN/DME stations in the 960-1215 MHz band;
(11) Aeronautical Telemetering stations in the1435-1535, 2200-2290, and 2310-2390 MHz bands;
(12) Stations using radar;
(13) Passive reflectors.

c. This field may be completed on other applications at the option of the applicant.

d. If more than one antenna is to be used, insert the polarization of the antenna to be used most frequently; however, for a space station, antenna polarization may be listed for up to three antennas, provided they are entered in the same sequence as the antenna data entered in the RECEIVER ANTENNA DIMENSIONS (RAD) field.

e. Insert one of the following letters or combination of letters to indicate the antenna(s) polarization:

A--Elliptic, Left
B--Elliptic, Right
D--Rotating
E--Elliptical
F--45 Degrees
H--Horizontal
J--Linear
L--Left Hand Circular
M--Oblique Angled, Left
N--Oblique Angled, Right
O--Oblique Angled, Crossed
R--Right Hand Circular
S--Horizontal and Vertical
T--Right and Left hand Circular
V--Vertical
X--Other

36. RAZ--Receiver Antenna Orientation (3 Characters--30 Occurrences)

a. TERRESTRIAL STATIONS: On applications for assignments to Terrestrial stations complete this field in accordance with the procedures given below for the applicable frequency range. Enter one of the following as applicable:

(1) For directive antennas oriented in a fixed direction, including off-site passive reflectors listed in the RECEIVER ANTENNA LOCATION (RAL) field, enter a three-digit number indicating the azimuth of the main antenna lobe in degrees east of True North, using leading zeros as necessary and 360 for True North.
(2) For stations using on-site passive reflectors, displaced vertically from the primary antenna or installed on the same antenna farm as the primary antenna (normally within 150 meters of the receiver), enter the horizontal azimuth of the on-site passive reflector.
(3) S--For directive antennas that operate in fixed mode (direction) but are steerable in the horizontal plane, e.g., steerable log periodic.
(4) ND--For non directive antennas.
(5) R--For antennas rotating through a full 360 degree azimuth while in operation.
(6) SSH--For antennas scanning horizontally through a limited sector.
(7) SSV--For vertically scanning (nodding) antennas.

(8) T--For tracking antennas capable of continuous reorientation for the purpose of maintaining optimum observance of a moving station or object.

b. TERRESTRIAL STATIONS BELOW 29890 kHz

(1) On applications for assignments to fixed (FX) and aeronautical fixed (AX) stations in the band 3000 to 29890 kHz, enter the appropriate code in accordance with paragraph 36a.(1) (8). This field may be left blank if the ANTENNA LOCATION is an area representing multiple receiving stations, e.g., Chicago District, or if the application bears either the Note S362 or S189.

(2) On applications for assignments below 29890 kHz, other than those for fixed (FX) and aeronautical fixed (AX) stations in the band 3000 to 29890 kHz, this field may be completed at the option of the applicant in accordance with paragraph 36a.(1)-(8).

c. TERRESTRIAL STATIONS AT 29890 kHz AND ABOVE

(1) On applications for assignments to stations at 29890 kHz and above enter the appropriate code in accordance with 36a.(1)-(8).

(2) This field may be left blank on applications for:

a) Experimental stations;
b) Mobile stations;
c) Portable stations;
d) Radiolocation mobile stations;
e) Radionavigation mobile stations;
f) Transportable stations;
g) Group assignments;
h) A period of six months or less;
i) Marker Beacons in the 74.8-75.2 MHz band;
j) VOR/ILS in the 108-117.975 MHz band;
k) Stations in the Aeronautical Mobile service in the 117.975-136 MHz band;
l) Stations in the Aeronautical and Maritime Mobile services in the 138-144, 148-150.8, 157.0375-157.1875, 225-328.6, 335.4-399.9 MHz bands, or on the frequencies 156.6, 156.7, 161.6 MHz;
(m) Glideslopes in the 328.6-335.4 MHz band;
(n) Meteorological Aids in the 400.05-406, and 1660-1700 MHz bands;
(o) TACAN/DME in the 960-1215 MHz band;
(p) Aeronautical Telemetering stations in the 1435-1535, 2200-2290, and 2310-2390 MHz bands; and
(q) Stations using radar.

(3) On applications for assignments that are listed above as exceptions, this field may be completed at the option of the applicant.

d. EARTH STATIONS: For Earth and Terrestrial stations (including experimental stations) employing Earth station techniques, insert the letter V followed by a two-digit number expressing the minimum operation angle of elevation of the antenna, in degrees, from the horizontal.

e. SPACE STATIONS: For Space and Terrestrial stations (including experimental stations) employing Space station techniques, enter one of the following, whichever is applicable.

(1) NB--for narrow beam antennas, i.e., substantially less than earth coverage; or
(2) EC--for earth coverage antennas; or
(3) Leave the field blank in the case of space-to-space operations.

37. ACL--Receiving Station Call Sign (8 Characters--30 Occurrences)

This field is optional and is for the call sign assigned to the station which will receive transmissions from the station listed in the Transmitter Antenna Location (XAL) field.

Insert the full call sign left-justified; however, those that do not require eight spaces and that are formed by letters followed by numbers, insert the letters left-justified and the numbers right-justified.

38. RAD--Receiver Antenna Dimensions (24 Characters--30 Occurrences)

This field shall be completed in accordance with the following procedures. Each entry is dependent upon frequency range and type of station, i.e., TERRESTRIAL, EARTH or SPACE. Antenna gain must be entered in decibels with reference to an isotropic (dBi) source. Where gain is derived from a source in reference to a dipole (dBd), the dBi gain can be determined by adding 2.15 to the dBd gain (dBd + 2.15 = dBi) (ref: ITT Reference Data for Radio Engineers). Enter data according to the following:

a. TERRESTRIAL STATIONS BELOW 29890 kHz:

(1) This field may be left blank if the ANTENNA LOCATION (RAL) is an area representing multiple receiving stations, e.g., Chicago District, or if the application bears either of the Notes S362 or S189.

(2) Gain is required on applications for assignments to fixed (FX) and aeronautical fixed (AX) stations in the band 3000 to 29890 kHz. Only the gain shall be entered in characters 1-3 of this field. Characters 4-24 shall be blank. The following formatting instructions apply: Insert in characters one and two, an appropriate two digit number which represents the gain; use a leading zero if the gain is less than ten. Insert the letter G in the third character (e.g., 04G, 20G). If the gain is zero it shall be entered as 00G.

(3) On all other applications for assignments below 29890 kHz, this field may be completed at the option of the applicant. However, if completed it must be in accordance with (2) above.

b. TERRESTRIAL STATIONS at 29890 kHz and ABOVE:

(1) This field may be left blank on applications for:

(a) Experimental stations;
(b) Mobile stations;
(c) Portable stations;
(d) Radiolocation mobile stations;
(e) Radionavigation mobile stations;
(f) Transportable stations;
(g) Group assignments;
(h) A period of six months or less;
(i) Marker Beacons in the 74.8-75.2 MHz band;
(j) VOR/ILS in the 108-117.975 MHz band;
(k) Stations in the Aeronautical Mobile service in the 117.975-136 MHz band;
(l) Stations in the Aeronautical and Maritime Mobile services in the 138-144, 148-150.8, 157.0375-157.1875, 225-328.6, 335.4-399.9 MHz bands, or on the frequencies 156.6, 156.7, 161.6 MHz;
(m) Glideslopes in the 328.6-335.4 MHz band;
(n) Meteorological Aids in the 400.05-406, and 1660-1700 MHz bands;
(o) TACAN/DME in the 960-1215 MHz band;
(p) Aeronautical Telemetering stations in the 1435-1535, 2200-2290, and 2310-2390 MHz bands;
(q) Stations using radar.

(2) On all applications for assignments above 29890 kHz that are listed in 38.b.(1)(a)-(q) as exceptions, this field may be completed at the option of the applicant.

(3) If more than one antenna is to be used, insert the data for the antenna to be used most frequently.

(4) The following formatting instructions apply:

(a) GAIN--Insert in the first two characters a two-digit number representing the nominal gain of the antenna in decibels. Insert a zero in the first space if the gain is less than ten. Enter the letter G in the third space. If the gain is zero, or antenna is a passive reflector, enter 00G.

(b) NAME--Starting with the fourth character, insert the generic name of the antenna, using no more than ten spaces. If the name requires more than ten spaces, abbreviate, but use all ten spaces. If a reflector is used then enter REFLECTOR as the antenna name.

(c) ELEVATION--Starting with the 14th character, enter a five-digit number representing the site (terrain) elevation in meters above mean sea level (MSL). Use all five spaces, inserting leading zeros as applicable. For a site below MSL, enter a dash in the 14th space and a four digit number. Insert the letter H in the 19th space. Leave blank for assignments to transportable receiving stations (S362).

(d) HEIGHT--Starting with the 20th character insert a four-digit number representing the antenna height in meters above terrain. Use all four spaces, inserting leading zeros as applicable. Insert the letter T in the 24th space.

Example: RAD01 10GCRNRRFLCTR06550H0175T

c. EARTH STATIONS: The following formatting instructions apply to both Earth and Terrestrial stations (including experimental stations) employing Earth station techniques.

(1) Use the entire 24 characters to record the following particulars:

(a) GAIN–Insert in the first two characters a two-digit number representing the gain of the antenna in the direction of maximum radiation. Insert a zero in the first character if the gain is less than ten. Enter the letter G in character three. For a negative gain, insert XXG and give the value in the CIRCUIT REMARKS *EGN field.

(b) BEAMWIDTH--Beginning with character four, insert a three-digit number representing the antenna beamwidth (degrees) at the half power points. Use all three spaces, inserting leading zeros as applicable. Enter the letter B in character seven. For a beamwidth requiring more than three spaces, insert XXXB and give the value in the CIRCUIT REMARKS *EBW field.

(c) AZIMUTH--In characters eight through fourteen, insert the azimuth angles (in degrees clockwise from True North) of the main beam. If the Earth station is to communicate with a single Geostationary satellite, insert the azimuth angle to the satellite in spaces eight through ten (use leading zeros), a slant bar in space eleven, and XXX in spaces twelve through fourteen. If it is to communicate with two or more geostationary satellites, separate applications are required for each Earth station azimuth. If the Earth station is to communicate with non-geostationary satellites or is mobile or transportable, and is to communicate with a geostationary satellite, indicate the range of azimuth angles over which the Earth station antenna will point by inserting in spaces eight through ten a three-digit number representing one of the extreme azimuth angles, a hyphen in space eleven, and a three-digit number in spaces twelve through fourteen representing the other extreme angle. Use leading zeros as necessary and 360 for True North. In character fifteen insert the letter A.

(d) ELEVATION--Starting with character sixteen, insert a five-digit number representing the site (terrain) elevation in meters above mean sea level (MSL). Use all five spaces, inserting leading zeros as necessary. In character twenty-one insert the letter H.

For mobile or transportable stations, leave blank.

(e) HEIGHT--Starting with character twenty-two, insert a three-digit number representing the antenna height in meters above terrain. Use all three spaces, inserting leading zeros as applicable. For an Earth station aboard an aircraft, insert a two-digit number followed by the letter K to denote the maximum operational altitude of the aircraft in thousands of feet above mean sea level.

For altitudes under 10,000 feet insert a leading zero.

Example: RAD01 35G106B010/XXXA05200H025

d. SPACE Stations: The following formatting instructions apply to both Space and Terrestrial stations (including experimental stations) using Space station techniques:

(1) This field provides room for the details of up to three antennas per Space station. If the station uses more than three antennas for the requested frequency, provide data for the three most frequently used antennas.

(2) Use characters one through seven for the details of the first antenna. Enter:

(a) GAIN–Insert in the first two characters a two-digit number representing the gain of the antenna in the direction of maximum radiation. Insert a zero in the first character if the gain is less than ten. Enter the letter G in character 3. For a negative gain, insert XXG and give the value in the CIRCUIT REMARKS *SGN field.

Examples:

RAD01 20G015B
RAD01 08G.25B
RAD01 XXG105B
RAD01 20GXXXB

(b) BEAMWIDTH--Beginning with character four, insert a three-digit number representing the antenna beamwidth (degrees) at the half power points. Use all three spaces, inserting leading zeros as necessary. Insert the letter B in space seven. For a beamwidth requiring more than three spaces, insert XXXB and give the value in the CIRCUIT REMARKS *SBW field.

(3) If the assignment involves the use of a second antenna:

(a) Insert a slant bar in character eight; and

(b) Use characters nine through fifteen for the details as specified in paragraph 38.d.(2)(a) and (b).

Examples: RAD01 20G016B/10G.30B

(4) If the assignment involves the use of a third antenna:

(a) Insert a slant bar in character sixteen; and

(b) Use characters seventeen through twenty three for the details of the third antenna as specified in paragraph 38.d(2) (a) and (b).

Example: RAD01 10G025B/20G.30B/30G1.9B

(5) Leave character twenty-four blank.

39. Circuit Remarks (REM) (40 Characters-30 Occurrences)

The CIRCUIT REMARKS field is used primarily to record frequency assignment characteristics that have no specific fields provided for them on the application, particularly amplifying data concerning the frequency, antenna location, and equipment characteristics. General rules for the formation of entries are given below followed by specific rules for each type of entry. The use of this field is limited to the following types of entries for which specific rules are given:

*AGN	*CLS	*EST	*NRM
*ARB	*CLU	*FBE	*NTS
*ARR	*DFI	*FLN	*ORB
*ART	*DOC	*FRB	*PRD
*CAN	*EBW	*IFI	*PRR
*CDD	*EGN	*JNT	*RAD
*CDE	*EQR	*LSB	*RPT
*CLA	*EQS	*LSR	*SBW
*CLC	*EQT	*LST	*SGN
*CLF	*ESB	*MEX	*TRN
*CLR	*ESR	*MFI	*USA

a. General Rules

(1) Entries are always preceded by the mnemonic REM, the occurrence number, an asterisk, and a three letter identifying code followed by a comma, e.g., REM01 *FRB,. In this field, an asterisk is used only for this purpose. Entries concerning frequency bands precede other entries. Enter these data immediately after the comma at the end of the identifying code. The data may be any combination of words and elements. An element is a code or a numeric value. If the data consist entirely of elements, the number of spaces for each element is specified, and the position of each element with respect to the identifying code is specified. If an element is numeric, fill all spaces using leading zeros as necessary. If an element is a code, left-justified in its allocated space, and, if it requires fewer spaces than are allocated, leave the spaces on the right side blank. To increase readability, a word may be used as a code.

(2) Where necessary, specific rules require an entry be completed within a single 40-character line. This is to prevent the division or breaking of an element between two lines. If the use of more than one entry is permitted and is necessary, the identifying code for that entry is entered again at the beginning of each line which is used. Such entries should not have a hyphenated word at the end of a line.

*b. Frequency Band Data (*FRB)*

On an application for a band of frequencies, e.g., 1200 MHz to 1300 MHz enter the lower limit of the band in the FREQUENCY field and both the lower and upper limits in the CIRCUIT REMARKS field.

(1) Insert the identifying code REM01 *FRB always as the first entry in the CIRCUIT REMARKS field.

(2) Insert a comma in the 5th space.

(3) Insert the lower limit of the frequency band in the 13 spaces immediately following the comma. Express the frequency in KiloHertz (kHz) below 30000 kHz; in MegaHertz (MHz) from 30 MHz to (but not including) 100,000 MHz; in GigaHertz (GHz) from 100 GHz to (but not including) 3000 GHz; and in TeraHertz (THz) at 3 THz and above. Insert in the first space after the comma the letter M if the frequency is expressed in MegaHertz, the letter G if the frequency is expressed in GigaHertz, and the letter T if the frequency is expressed in TeraHertz. Always insert a decimal point in the 7th space from the comma. The numeric value of the frequency must completely fill the 13 allotted spaces, leading zeros to the left of the decimal and ending zeros to the right of the decimal being used as necessary.

(4) Insert a comma in the 19th space immediately after the lower limit of the frequency band.

(5) Starting with the 20th space, insert the upper limit of the frequency band as explained in (3) above.

Examples:

REM01 *FRB,015010.000000,015100.000000
REM01 *FRB,010000.000000,M00050.000000
REM01 *FRB,M00162.012500,M00162.587500
REM01 *FRB,M90000.000000,G00110.000000

*c. Excluded Frequency Band Data (*FBE)*

In the case of an application for a band of frequencies where a portion of the band is to be excluded, the lower and upper limits of the band are inserted as the first entry as stated under Frequency Band Data above. The portion to be excluded is then inserted as the second entry in the CIRCUIT REMARKS field.

(1) Insert the identifying code *FBE always as the second entry.

(2) Insert a comma in the 5th space.

(3) Insert the lower limit of the excluded portion in the 13 spaces immediately following the comma.Express the frequency in kiloHertz (kHz) below 30000 kHz; in MegaHertz (MHz) from 30 MHz to (but not including) 100,000 MHz; in GigaHertz (GHz) from 100 GHz to (but not including) 3000 GHz; and in TeraHertz (THz) at 3 THz and above. Insert in the first space after the comma the letter M if the frequency is expressed in MegaHertz, the letter G if the frequency is expressed in GigaHertz, and the letter T if the frequency is expressed in TeraHertz. Always insert a decimal point in the 7th space from the comma. The numeric value of the frequency must completely fill the 13 allotted spaces, leading zeros to the left of the decimal and ending zeros to the right of the decimal being used as necessary.

(4) Insert a comma in the 19th space immediately after the lower limit of the excluded portion.

(5) Starting with the 20th space, insert the upper limit of the excluded portion as explained in 3 above.

(6) If additional portions of the frequency band are to be excluded, insert each portion on a succeeding entry in ascending order as explained in (1) through (5) above.

Examples:

REM01*FRB,M00960.000000,M01700.000000
REM02*FBE,M01400.000000,M01427.000000
REM03*FBE,M01660.000000,M01670.000000

Under this example the following bands would be authorized:

960-1400 MHz
1427-1660 MHz
1670-1700 MHz

*d. Authorized Area of Operation (*RAD)*

Enter a radius of operation from a given geographical location for mobile stations, transportable stations, and multiple transmitting and/or receiving stations (NOTE S361). Normally this geographical location is that of a fixed station; if no fixed station is involved, select a center point within the operating cell. A radius is required for:

--Multiple transmitting and/or receiving FIXED stations (NOTE S361) if coordinates are entered in the XLA/XLG and RLA/RLG fields.

--Mobile and transportable stations if coordinates are entered in the XLA/XLG and RLA/RLG fields.

--Multiple transmitting FIXED stations (NOTE S361) if coordinates are entered in the XLA/XLG fields.

--Mobile and transportable transmitter stations if coordinates are entered in the XLA/XLG fields.

--Multiple receiving FIXED stations (NOTE S361) if coordinates are entered in the RLA/RLG fields.

--Mobile and transportable receiver stations if coordinates are entered in the RLA/RLG fields.

(1) Complete the total entry within a single 40-space CIRCUIT REMARKS field, i.e., on one entry.

(2) Insert the identifying code REMnn *RAD.

(3) Insert a comma after the identifying code.

(4) After the comma insert in the next four spaces the radius in kilometers, using leading zeros as necessary.

(5) For assignments in the AAG frequency bands (see 9.2.1 to identify AAG bands), the radius shall be followed by a comma and its equivalent nautical mile value including the letters NM. If the applicant does not submit the nautical mile equivalent, it will be generated by NTIA.

(6) At the option of the applicant, amplifying data describing the area of operation may be included on the *RAD entry. Insert a comma after the radius followed by the amplifying data. THE ENTIRE RADIUS ENTRY INCLUDING ALL THE AMPLIFYING DATA SHALL BE CONTAINED WITHIN A SINGLE 40-SPACE CIRCUIT REMARKS LINE.

(7) Should the assignment contain the amplifying data B, R, or T in *RAD, these indicate:

B - Transmission authorized and reception protected within the radius drawn around the XLA/XLG and RLA/RLG coordinates,

R - Reception protected within the radius drawn around the RLA/RLG coordinates,

T - Transmission authorized within the radius drawn around the XLA/XLG coordinates after the last abbreviation.

Should the assignment contain multiple receiver locations and the area of operation shown applies to some but not all receiver locations, the receiver occurrence number may be shown in the optional data portion of *RAD. Likewise, if different values for an area of operation pertain to the transmitter and receiver locations, these values are followed by an R or T as indicated above.

*e. Authorized States (*ESB, *ESR, *EST, *LSB, *LSR, *LST)*

The transmitter and receiver ANTENNA LOCATION fields provide an area of operation within four or more States may be described in those fields as US or USA, with the included (*LSB,*LSR,*LST) States being shown in the CIRCUIT REMARKS field. The excluded states field codes (*ESB,*ESR,*EST) can be used on any US, USA or USP assignment and may exclude one or more states as long as four or more states remain. Similarly, USP may be used if the area includes a Possession.

(1) Insert one of the following identifying codes after REMnn:

*LST for transmitting in the States listed.
*LSR for receiving in all States listed.
*LSB for transmitting and receiving in the States listed.
*EST for transmitting in all States except those listed.
*ESR for receiving in all States except those listed.
*ESB for transmitting and receiving in all States except those listed.

(2) Insert a comma after the identifying code.

(3) After the comma insert the State or Possession abbreviation as shown in Annex G, Part 2, followed by another comma.

(4) After the comma insert the abbreviations for the additional States or Possessions, separating the abbreviations by commas. Do not insert a comma after the last abbreviation.

(5) If more than one entry is required, repeat the identifying code at the beginning of each entry.

(6) If the fact that operation in any one or more, but not all, of the areas listed under this data entry is classified, separate CIRCUIT REMARKS entries must be made for the classified data and unclassified data in order to comply with the requirements of subparagraphs cc (Classified Data Fields (*CLD)) and dd (Classified Data Fields (*CLC or *CLS)) and dd (Unclassified Data Fields (*CLU)) of paragraph 39 of this section.

Examples:

REM01 *LST,CA,OR,WA,NV (transmitting in 4 States)
REM03 *LSR,AL,GA,MS,FL,LA,GA (receiving in 6 States)
REM04 *LSB,IL,IN,OH,PA (transmitting and receiving in 4 States)
REM02 *EST,AZ,NM,TX (transmitting in all States except those listed)

*f. Authorized Areas (*ARB, *ARR, *ART)*

The CIRCUIT REMARKS field also may be used to describe areas which cannot be described under Authorized Area of Operation or Authorized States, e.g. a part of a State or parts of several contiguous States. In such cases the transmitter and/or receiver ANTENNA LOCATION fields would show the name of the State or USA.

(1) Complete the total entry for the Authorized Area within a single 40-space CIRCUIT REMARKS entry, unless the provisions of subparagraph (6) below apply.

(2) Insert one of the following identifying codes after REMnn:

*ART for transmitting in the area shown.

*ARR for receiving in the area shown.

*ARB for transmitting and receiving in the area shown.

(3) Insert a comma after the identifying code.

(4) After the comma insert the data concerning the area. It is preferable to always identify this area as either a square or rectangle, using the four points of the compass in degree and minutes. When this is not possible, use the abbreviations in Annex G, Part 2, to identify a State or Possession. Use E for east(ern), N for north(ern), S for south(ern) and W for west(ern).

(5) Separate elements by commas.

(6) If the fact that operation in any one or more, but not all, of the areas listed under this data entry is classified, separate CIRCUIT REMARKS entries must be made for the classified data and unclassified data in order to comply with the requirements of subparagraphs cc (*CLC or *CLS)) and dd (Unclassified Data Fields (*CLU)) of paragraph 39 of this section.

Examples:

REM01 *ARB,39N43N098W099W (use leading zero for longitude less than 100 degrees)
REM02 *ART,3915N4320N10016W10102W
REM03 *ARR,S OF 33N
REM01 *ART,S OF 40N,E OF 095W
REM03 *ART, SW WY, NE UT, NWCO

*g. Docket Numbers of Older Authorizations (*DOC)*

When renewing or modifying an assignment (see Part 9.9), the docket number applicable to the older authorization is automatically retained in the assignment record. When deleting an assignment and, simultaneously, submitting a NEW or NOTIFICATION action to replace it (see Part 9.7), the docket number applicable to the older authorization is not retained in the assignment records. The absence of the older docket number makes difficult any review of the history of a given authorization. In the latter case, the older docket number may be included in the CIRCUIT REMARKS field of the application immediately following the identifying code *DOC. In addition, the date of authorization of the older docket and/or the applicable agency serial number may be included, in that order, on the same entry immediately following the docket number.

(1) Complete the total entry within a single 40-space CIRCUIT REMARKS entry.

(2) Insert the identifying code REMnn *DOC.

(3) Insert a comma after the identifying code.

(4) After the comma insert the docket number(s)of the older authorization(s). Separate multiple docket numbers by commas.

(5) If a date and/or serial number is to be inserted, insert a comma followed by the pertinent data, separating by a comma the date and the agency serial number. Dates must have six digits indicating year, month, and day.

Examples:

REM02 *DOC,84729 (docket only)
REM11 *DOC,73621,570415 (docket and date)
REM08 *DOC,67543,551025,N 550142 (docket, date, and serial)

REM03 *DOC,I8143591,AF 810230 (docket and serial)
REM07 *DOC,89432,I6723419 (two dockets)

*h. Receiving Repeater (*RPT)*

This field is used only to identify a receiver location which is used as a repeater in the bands listed in Section 6.1.3, paragraph 2. If the station named in the receiver ANTENNA LOCATION field is used primarily as a repeater, it may be so identified in the CIRCUIT REMARKS field.

(1) Insert the identifying code REMnn *RPT.

(2) Insert a comma after the identifying code.

(3) After the comma insert the letter R. If there is more than one location entered in the receiver ANTENNA LOCATION field, and if each location is used primarily as a repeater, insert the letter R: however, if some but not all of the locations are used primarily as a repeater, insert the letter R followed by the appropriate receiver.

Examples:

REM01 *RPT,R (Each location entered in the receiver ANTENNA LOCATION field is used primarily as a repeater.)

REM02, *RPT,R02 (The location entered as the second receiver ANTENNA LOCATION field is used primarily as a repeater.)

*i. Joint Applications (*JNT)*

An application that is submitted jointly by two or more agencies is prepared by the agency identified in the AGENCY SERIAL NUMBER field, and all agencies involved are identified in the CIRCUIT REMARKS field, using the agency abbreviation as shown in Annex G, Part 1.

(1) Insert the identifying code REMnn *JNT.

(2) Insert a comma after the identifying code.

(3) After the comma insert in the next four spaces the abbreviation of the first agency. Left-justified the abbreviation, leaving blank the spaces to the right if the abbreviation has fewer than 4 characters.

(4) For the remaining agencies insert the appropriate abbreviations separated by commas.

(5) If more than one entry is required, repeat the identifying code at the beginning of each entry.

(6) If the fact that operation in any one or more, but not all, of the areas listed under this data entry is classified, separate CIRCUIT REMARKS entries must be made for the classified data and unclassified data in order to comply with the requirements of subparagraphs cc (Classified Data Fields (*CLC or *CLS)) and dd (Unclassified Data Fields (*CLU)) of paragraph 39 of this section.

Example:

REM08 *JNT,DOE ,AR ,NASA (for this example DOE's serial number would appear in the AGENCY SERIAL NUMBER field).

*j. Agency Data (*AGN)*

(1) This CIRCUIT REMARKS field may be used to record agency data that are pertinent to the proposed assignment but not intended to be a part of the authority requested. The data shall not include decodes of the particulars of the proposed assignment.

(2) This CIRCUIT REMARKS field will contain the mnemonics FLL, FLT and TSV as applicable to designate operational parameters of station class FA operating in the 118 – 136.475 MHz and 225 – 399.9 MHz bands, and would be in the following format:

*AGN,FLL=XXX,,FLT=XXX,TSV=XXXXX. [REMARKS]
*AGN,FLL=050,FLT=230
*AGN,FLL=200,FLT=360,TSV=ZDC50

(a) Insert the identifying code REMnn *AGN.
(b) Insert a comma after the identifying code.
(c) After the comma insert the agency data.
(d) If more than one entry is required, repeat the identifying code at the beginning of each entry.

Examples:

REM02 *AGN,VIA PASSIVE SATELLITE
REM03 *AGN,DELETE IN APRIL 1971
REM04 *AGN,WIRELESS MICROPHONE
REM05 *AGN,SHARED INTERBUREAU
REM06 *AGN,NARROWBAND IN FISCAL 1969

*k. Notes (*NTS)*

The CIRCUIT REMARKS *NTS field is used to complete the conditional comments of the MINUTE (M--) NOTE agreed to by the FAS. Insert the identifying code REMnn *NTS, a comma, the MINUTE NOTE, a comma, and the data to complete the MINUTE NOTE.

(1) *Examples*:

Note	**Entries**
M002	REM02 *NTS,M002,7640924,FCC TO NTIA
	REM11 *NTS,M002,IRAC, 13381
	REM07 *NTS,M002,FAS, 1700927B
M003	REM01 *NTS,M003,WRC/TV, WASHINGTON
	REM08 *NTS,M003,JOHN SMITH, 415/841/5121 REM03 *NTS,M003,ONR,MINNEAPOLIS
M004	Same as M003
M006	REM02*NTS,M006,ROCKVILLE, MD
M007	REM08 *NTS,M007,NAVY
	REM09 *NTS,M007,FCC,EIC,NY
M008	REM01 *NTS,M008,FAA,5965kHz, HONO/TOKYO
M009	REM01 *NTS,M009,AF
M010	Same as M009
M011	REM08 *NTS,M011,WABC,NY
	REM10 *NTS,M011,KHVO/TV, COWLICK,TX
M013	REM11 *NTS,M013,CG SUBJECT TO PRIOR COORD
M014	REM14 *NTS,M014,0010,AGL
M015	REM17 *NTS,M015,IRAC 33221/4,SPS 13928/4
M017	REM09 *NTS,M017,CO,AK
M018	REM07 *NTS,M018,FCC,070326,JKAM,060717-03

(2) M014: Each entry of the station class symbols: FL, FA, FAC, FAB, FLU, MO, MOU or MA must also contain corresponding information on the maximum aircraft altitude (*NTS,M014,).

(a) In characters 1 through 4 of the Circuit Remarks Field insert the identifying code *NTS.

(b) Insert a comma in the 5th space.

(c) Insert the M note M014 in spaces 6 thru 9.

(d) Insert a comma in space 10.

(e) Insert the aircraft altitude in 100s of feet in spaces 11 through 14.

1. 1000 feet 0010
2. 2000 feet 0020
3. 10,000 feet 0100
4. 35,000 feet 0350

(f) Insert a comma in the 15th space.

(g) Insert AGL if operations are Above Ground Level or MSL if operations are reference Mean Sea Level in spaces 16 through 18.

REMXX *NTS,M014,0010,AGL

(3) M018 Each entry of Pre-coordination Data:

This field is optional and may be used when a frequency application has been pre-coordinated between two agencies prior to the application being submitted to the Frequency Assignment Subcommittee. This field will indicate the agency, date, names and any restrictions/agreements made by the two agencies.

(a) Insert the identifying code REMnn, a space, then *NTS,M018 followed by a comma.

(b) After the comma, insert the agency abbreviation as specified in Annex G, Part 1 followed by blank spaces as necessary to complete the four character field with which the applicant agency pre-coordinated.

(c) Insert a comma after the agency's abbreviation.

(d) After the comma, insert the date of the coordination in YYMMDD format.

(e) Insert a comma followed by free text format but should include items such as: the name or initials of the coordinator from the commenting agency, pre-coordination reference, restrictions or agreement text if required.

(f) If additional lines of text are needed, the additional lines shall start with items 1-3 above and contain the continuation of free text.

Example: REM02 *NTS,M018,FCC,070326,J Kam,060717-03

In the above example, the record was pre-coordinated with the FCC, Mr. Jeff Kam, on March 26, 2007, and the pre-coordination reference is 060717-03.

*l. Canadian Coordination Data (*CAN)*

(1) An entry is required for all applications which have been coordinated with Canada (see Part 3.4).

(2) After NEW assignments have been coordinated with Canada, the Canadian comments will automatically be entered by NTIA's processing programs in the appropriate REMnn entry as *CAN, the U.S. coordination serial number, and, either:

(a) NHIA--No Harmful Interference Anticipated; or,

(b) the actual comment received from Canada

Examples:

REM08 *CAN,780029,NHIA
REM02 *CAN,750361,NO MOBILE USE WITHIN 64 KILOMETERS
REM03 *CAN,RAD OF BURNABY BC

(3) For updating GMF records, including the use of the record replacement action, the following procedure applies:

(a) If the updated assignment will not increase the probability of harmful interference, agencies are required to retain the existing *CAN entry, including CAN ORIG; these assignments will not be re-coordinated with Canada.

(b) If the probability of harmful interference is increased, the assignment will be re-coordinated with Canada and the agency should not retain *CAN data.

(4) If the frequency assignment is to be used in the Canadian coordination border zone defined in Arrangement D, Section 3.4.6, and,

(a) the frequency is 408.400 MHz the Canadian coordination program will automatically enter:

*CAN,CAN LTR 17 JAN 79. NO OBJ NIB.
*CAN,CANADA USE EXCL FOR RADIO ASTRONOMY

(b) the frequency is either 418.050, 418.075, or, 418.575 MHz the Canadian coordination program will automatically enter:

*CAN,CAN LTR 17 JAN 79, AGREE COMM CAN
*CAN,U.S. USE ON A SHARED NON PRI BASIS

*m. Number of Stations and System Name/Identifier (*NRM)*

(1) The Circuit Remarks (*NRM) field is used to indicate the number of stations and system name/identifier with which the assignment may be identified.

(2) A station is one or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service. A system is two or more stations that have a common property, usually geographic, administrative, functional, or operational in nature.

(3) System names/identifiers shall be determined by the applicant and may be alphabetic, numeric, or alphanumeric. Each shall be unique within an agency but may be used by more than one agency. Systems names/identifiers shall not contain more than 29 characters including spaces. If abbreviations are used, the system names/identifier shall be abbreviated the same way each time it is used within a given agency.

(4) The word NET may be used as the system name for each assignment that represents an entire system, e.g., a single base station and a number of mobile stations that communicate on a single frequency.

(5) If the identity of a system is applied to a particular frequency assignment, it is the responsibility of the applicant agency to ensure that the same name/identifier is recorded in the particulars of all assignments associated with that same system.

(6) The entry (*NRM), including the number of stations and system name/identifier is required if:

(a) the assignment is within one or more of the following frequency ranges:

30.0-50.0 MHz *
138.0-144.0 MHz
148.0-149.9 MHz
150.05-150.8 MHz
162.0-174.0 MHz
406.1-420 MHz
935.0-940.0 MHz *
* Limited to bands allocated exlusively to the Federal Government.

and

(b) the frequency assignment has one or more of the following station class symbols:

FB	FL	FLEC	MLP	MOEB	MS
FBD	FLD	FLH	MO	MOEC	MSD
FC	FLE	FLU	MOD	MOH	MSP
FCB	FLEA	ML	MOE	MOP	
FCD	FLEB	MLD	MOEA	MOU	

or

(c) the assignment is within one or more of the frequency ranges listed in (6)(a) and the letter "R" is appended to any of the station classes listed in (6)(b); or

(d) the assignment is within one or more of the frequency ranges in (6)(a) and the NOTES (NTS) field contains either S361 or S362. or,

(e) the assignment is for a frequency above 29890 kHz and the transmitter STATE/COUNTRY (XSC) field contains US, USA, or USP; except, where the NOTES (NTS) field contains S322.

(f) The assignment is for a Specialized Mobile Radio (SMR) service frequency in the 806-824, 851-869, 896-901 or 935-940 MHz land mobile bands.

(7) Except as provided in (6) above, the entry may be used to record only the system name/identifier of the system with which the assignment is associated (see (10)(e) below).

(8) At the option of the applicant *NRM data may be recorded for all other assignments or,

(9) The figure recorded for the number of stations in the SMR system will be the exact number. The figure recorded for the number of stations not in the SMR system shall represent either the exact number or a range of numbers determined as follows:

Within the range	Record the number
1-10	10
11-30	30
31-100	100
101-300	300
301-1000	1000
1001-3000	3000
3001-10000	10000
Above 10000	Nearest 10000

If the exact number is to be recorded, and if it is 10, 30, 100, 300, 1000, 3000, or a multiple of 10000, add one to the number in order to distinguish it from a figure that represents a range of numbers. The number recorded shall be the same on each application for an assignment associated with the particular system. If the figure changes, all associated assignments shall be amended.

(10) The following detailed instructions shall be used to record *NRM data:

(a) Complete the total entry within a single line.

(b) Insert the identifying code REMnn *NRM.

(c) Insert a comma in column 5.

(d) Beginning in column 6 insert a five digit number to indicate the number of stations. Use leading zeroes as necessary; or

(e) Beginning in column 6 insert in the next five spaces the letters XXXXX if data are being provided in accordance with (7) above.

(f) Insert a comma in column 11.

(g) Insert the system name/identifier beginning in column 12 (a maximum of 29 columns are available for this data).

Examples:

REM03 *NRM,00100,MIAMI (31 to 100 stations for the MIAMI system)
REM05 *NRM,00045,REGION2 (45 stations for the REGION 2 system)
REM01 *NRM,00010,NET (1 to 10 stations for a single assignment that represents an entire system)
REM04 *NRM,XXXXX,BD046
REM02 *NRM,XXXXX,ELLSWRTHD SATAF
REM01 *NRM,XXXXX,NOPRAIRI 2
REM09 *NRM,XXXXX,SOUTH JACKSONVILLE

(11) Agencies desiring to distinguish between the number of mobiles and portables in use for their assignments may do so in the following manner:

REM02 *NRM,00100,M,REGION3
REM03 *NRM,00275,P,REGION3

Indicating separate numbers for mobiles and portables is optional. If only one number is shown that number indicates the sum of both mobiles, portables and stations. The option exists even when an agency desires to indicate a portable station class in STC. Similarly, if an agency DID NOT desire to use a portable station class in STC that agency could indicate an *NRM line for the mobile stations and a separate *NRM line for the portable stations.

*n. Pulse Repetition Rate (*PRR)*

(1) On an application for assignment to a station using a secondary radar on the frequency 1030 MHz or for pulsed radars operating in the bands 1215-1400, 2700-2900, and 9000-9200 MHz, enter the pulse repetition rate in *PRR.

(2) Insert the field code REMnn followed by one space, the code *PRR, then a comma. After the comma insert the numeric value, preferable a measured value, for the specific pulse repetition rate to be used. PRR will be indicated in pulses per second up to and including 999 PPS and in thousands at 1000 PPS and above, adding the letter K at the end of the numeric value for the latter. For equipment having a capability for more than one specific PRR, insert the appropriate numerical values separated by a slant bar. For equipment having a capability for continuously variable PRR's over a wide range, insert upper and lower numerical values separated by a dash. At the option of the applicant, *PRR may be included on applications for pulsed equipment operating in any band.

*o. Equipment Characteristics (*EQR, *EQS, *EQT)*

(1) All applications for new stations above 29.89 MHz, except as indicated in paragraphs (2) and (3) below, shall contain the indicated data on equipment nomenclature and, where applicable, the data shall be entered as specified in paragraph (4) below. At the option of the applicant, data on nomenclature may be included on applications below 29.89 MHz.

(2) Equipment nomenclature is not required, neither EQT/EQR nor EQS, in the following cases, but may be included at the option of the applicant:

(a) On application with S321 or S322 in the Notes field.

(b) For XR class of station used for terrestrial radiocommunication. XR class of station used for space radiocommunication requires EQT and EQR.

(c) For MO, ML, MA, or MS classes of station, including whenever suffixed by one or two letters, e.g., MOE, MOEA.

(d) For doppler radars (speed meters or speed guns) on frequencies 10525 MHz, 24150 MHz, or 35.5 GHz, which are FCC type accepted.

(3) Receiver nomenclature (EQR) is not required for:

(a) BC, BCI, BT, EE, or SS classes of station;

(b) ECM or ECCM operations;

(c) TACAN/DME;

(d) Markers in the band 74.8-75.2 MHz; or signal generators; however, transmitter nomenclature (EQT) is required;

(e) 1030 MHz.

(4) The following special provisions apply in the case of certain types of applications:

(a) The nomenclature data entered on applications for group assignments (see Section 9.6.5) may be representative of the equipment concerned.

(b) For pulsed radars in the bands 1215-1400, 2700-2900, and 9000-9200 MHz, the tune-ability and pulse duration capability of the transmitter shall be entered on the EQT line after the transmitter nomenclature, except when the provisions of subparagraph (5) below apply. The pulse repetition rate shall be entered in *PRR.

(c) In the case of certain applications in the bands 29.89-50.00, 108.000-117.975, 150.8-174.0, 328.6-335.4, 406.1-420.0 and 450-512 MHz, a code may be entered instead of nomenclature to indicate the technical characteristics of typical equipment.

(5) If any of the data, but not all, to be entered in an equipment characteristics data field entry are classified, separate CIRCUIT REMARKS entries must be made for the classified data and unclassified data in order to comply with the requirements of subparagraphs cc (Classified Data Fields (*CLC or *CLS)) and dd (Unclassified Data Fields (*CLU)) of paragraph 39 of this section. (An example of such mixed data that would require separate entries is when the equipment nomenclature of a radar system is unclassified, yet the pulse duration or tunability is classified.)

Example:

REM04 *EQT,G,//AN/RADAR-12$AT-1221
REM05 *EQT,G,TC,PD2M/6M
REM08 *CLC,REM05,ETC,ETC,ETC
REM09 *CLU,ALL DATA NOT LISTED IN *CLC OR *CLS

General

1. The nomenclature for the transmitters and receivers associated with the assignment shall be indicated. If the nomenclature includes prefixes or suffixes such as MOD or MOD and a numeral, include these symbols. If the nomenclature includes the word “MARK”, use the abbreviation MK. In lieu of transmitter or receiver nomenclature, the system nomenclature may be indicated. (System nomenclature is defined, for purposes of this section, as that nomenclature assigned to a combination of equipment, e.g., AN/GRC-27 consisting of a T217 transmitter, an R278 receiver, and an AT197 antenna.)

2. Antenna nomenclature may be provided at the option of the applicant.

3. If both a Federal nomenclature and a commercial model number are associated with the same equipment, the Federal nomenclature is preferred.

4. If only a commercial model number is available, also indicate the manufacturer of the equipment. A list of manufacturer names and associated codes is printed in Annex G, Part 5. If the manufacturer's name is not listed, call the FAS Secretary.

5. If neither a Federal nomenclature nor a commercial model number has been assigned, the manufacturer's code and a short descriptive name of the equipment shall be entered in the CIRCUIT REMARKS field.

6. For commercial radars the Manufacturer Code is required to be entered for the first occurrence of *EQT and *EQR only.

7. Entries may be continued on additional Circuit Remarks lines, if necessary.

Transmitters

For transmitters insert the following:

Identifying Code

Insert the Identifying Code REMnn *EQT.

Commercial/Federal Government Equipment Code

Insert a comma after the Identifying Code followed by G for a Federal Government nomenclature, C for a commercial model number, or U if neither has been assigned.

Nomenclature (Transmitters)

Insert a comma after the Commercial/Federal Government Equipment Code followed by the nomenclature of the transmitter. If a commercial model number is used, enter the manufacturer's code before the model number. If more than one type of transmitter is used, separate the nomenclature/model numbers by commas. In lieu of the transmitter nomenclature, the system nomenclature may be provided by inserting two slant bars (//) followed by the system nomenclature. If neither a Federal Government nomenclature nor a commercial model number has been assigned enter *EQT,U, the abbreviation of the manufacturer's code, a short descriptive name of the transmitter, and disregard the instructions for antenna nomenclature in the following paragraph.

Nomenclature (Antenna)

If the transmitter is associated with a specific antenna nomenclature, it may be included, at the option of the applicant, by inserting the symbol $ followed by the antenna nomenclature.

Examples: (Transmitters)

REM02 *EQT,G,T128MOD2

A Federal Government nomenclature transmitter whose nomenclature is T128MOD2; this is a modification of the original T128 transmitter.

REM04 *EQT,C,MOTB93MPB

A commercial transmitter manufactured by Motorola, with model number B93MPB.

REM04 *EQT,G,//AN/ARC322$AS102

A Federal Government nomenclatured system AN/ARC322 which utilizes an AS102 antenna.

Pulsed Radars in the Bands 1215-1400, 2700-2900, and 9000-9200 MHz

Immediately after the transmitter nomenclature, insert the tunability and pulse duration capability of the radar transmitter, as described below. Enter the pulse repetition rate capability in *PRR. At the option of the applicant, these data may be included on applications for pulsed radars in other bands.

Tunability

After the transmitter nomenclature, insert a comma and one of the tunability codes FA, FX, FV, TC, or TS, according to the following:

FA For frequency agility radars which operate on various frequencies within a band, either in a specified or random mode.

FX For radars capable of operating only on a single discrete frequency.

FV For radars that operate on a discrete frequency determined by the characteristics of a fixed magnetron or similar radio frequency generating device.

TC For radars capable of being tuned to any frequency within the authorized band.

TS For radars capable of being tuned across the authorized band in discrete steps or increments.

Pulse Duration

After the tunability code, insert a comma and the letters PD followed by a numeric value indicating the characteristic pulse duration(s) of the equipment (at the half-power points). PD will be indicated in microseconds up to and including 999 microseconds and in milliseconds at one millisecond and above, adding the letter M at the end of the numeric value for the latter. Fractions may be shown to the nearest tenth by using a decimal. For equipment having a capability for more than one specific PD, insert the appropriate numerical values separated by a slant bar. For equipment having a capability for continuously variable PD's over a wide-range, insert upper and lower numerical values separated by a dash.

Examples:

PD1/3/5.6
PD2M/6M
PD1-25

Example: REM04 *EQT,G,//ASR-4,TC,PD0.833

Receivers

For receivers insert the following:

Identifying Code

Insert the Identifying Code *EQR.

Commercial/Federal Government Equipment Code

Insert a comma after the Identifying Code followed by G for a Federal Government nomenclature, C for a commercial model number, or U if neither has been assigned.

Nomenclature (Receivers)

Insert a comma after the Commercial/ Federal Government Equipment Code followed by the nomenclature of the receiver. If a commercial model number is used, enter the manufacturer's code before the model number. If more than one type of receiver is used, separate the nomenclature/model numbers by commas. In lieu of the receiver nomenclature, the system nomenclature may be provided by inserting two slant bars (//) followed by the system nomenclature. If neither a Federal Government nomenclature nor a commercial model number has been assigned, enter *EQR,U the abbreviation of the manufacturer's code, a short descriptive name of the receiver, and disregard the instructions for antenna nomenclature in the following paragraph.

Nomenclature (Antenna)

If the receiver is associated with a specific antenna nomenclature, it may be included, at the option of the applicant, by inserting the symbol $ followed by the antenna nomenclature.

Occurrence Label Indicator

If the indicated receiver is used at all receiving locations on the application, no occurrence label needs to be indicated. If the receiver nomenclature is associated with only some of the receiver locations, insert after the nomenclature a plus sign (+) followed by the associated receiver location. Separate the entries for other receiver locations by commas and begin each with the equipment code (G, C, or U).

Examples: (Receivers)

REM03 *EQR,G,RR201

A Federal Government nomenclatured receiver whose nomenclature is RR201 associated with all receiver locations on the application.

REM04 *EQR,C,RCACR 1004

RCA receiver model CR 1004 associated with all receiver locations on the application.

REM06 *EQR,G,//AN/GRC20$AS202

A Federal Government nomenclature system--AN/GRC20 system, using an AS202 antenna associated with all receiver locations on the application.

Transceivers

If a transceiver is used, and the transmitter and receiver do not have separate nomenclatures, the transceiver nomenclature shall be indicated under both *EQT and *EQR Identifying Codes.

Examples: (Transceivers)

REM04 *EQT,G,SCR1055

Transmitter entry for Federal Government nomenclature transceiver SCR1055.

REM05 *EQR,G,SCR1055

Receiver entry for Federal Government nomenclatured transceiver SCR1055.

If a transceiver and its antenna are included as part of the transceiver nomenclature, so indicate by entering the transceiver nomenclature followed by the symbol $ and the transceiver nomenclature.

Examples: (Transceivers/Antennas)

REM02 *EQT,G,SCR1055$SCR1055

Transmitter entry for Federal Government nomenclatured transceiver SCR1055 which includes an antenna within the nomenclature.

REM04 *EQR,G,SCR1055$SCR1055

Receiver entry for Federal Government nomenclatured transceiver SCR1055 which includes an antenna within the nomenclature.

Transmitter Antenna and Receiver Antenna

In certain instances a single nomenclature/model number has been assigned to combinations consisting of a transmitter and its associated antenna or a receiver and its associated antenna, i.e., the antenna does not have a nomenclature, but is considered to be part of the transmitter or receiver. In such cases, enter the nomenclature as a transmitter or receiver nomenclature followed by the symbol $ and the transmitter or receiver nomenclature.

Examples:

REM04 *EQT,G,AN/PRC201$AN/PRC201

A Federal Government nomenclatured transmitter AN/PRC201 which includes an antenna within the nomenclature.

REM02 *EQR,G,AN/PRR302$AN/PRR302

A Federal Government nomenclatured receiver AN/PRR302 which includes an antenna within the nomenclature.

Option for Indicating Certain Equipment in the Bands 29.89-50, 150.8-174, 406.1-420 & 450-512 MHz

If the equipment to be used in these bands have the characteristics, as outlined in Section 5.3.5, of typical single channel, fixed and land mobile, FM equipment with bandwidths not exceeding 16 kHz, the code LMS may be used instead of equipment nomenclature. When this optional procedure is used, insert the Identifying Code REMnn *EQS followed by a comma and the code LMS.

Example: REM02 *EQS,LMS

Transmitters and receivers associated with this assignment have characteristics as specified in Section 5.3.5.

Although the equipment characteristics are not outlined in Section 5.3.5, *EQS,LMS may be used in the 450-512 MHz band.

Option for Indicating Certain Equipment in the Bands 108-117.975 & 328.6-335.4 MHz

If the equipment to be used in these bands has the characteristics and is for the purpose specified in 2 below, the codes indicated in 1 below may be used instead of equipment nomenclature. When this optional procedure is used, insert the Identifying Code *EQS followed by a comma and the appropriate code from paragraph 1 below.

1. Typical VOR and ILS Equipment Codes

VOR1A	Standard VHF Omni-Range (100kHz channeling)
VOR1B	Doppler VHF Omni-Range (100kHz channeling)
VOR2A	Standard VHF Omni-Range (50kHz channeling)
VOR2B	Doppler VHF Omni-Range (50kHz channeling)
ILSLOC	ILS Localizer (50kHz channeling)
ILSGS	ILS Glide Slope (150kHz channeling)

Examples: (Typical VOR & ILS Equipment)

*EQS,VOR1A

Standard VOR with 100 kHz channelization having characteristics specified in 2 below.

*EQS,VOR1B

Doppler VOR with 100 kHz channelization having characteristics specified in 2 below.

*EQS,VOR2A

Standard VOR with 50 kHz channelization having characteristics specified in 2 below.

*EQS,VOR2B

Doppler VOR with 50 kHz channelization having characteristics specified in 2 below.

*EQS,ILSLOC

ILS Localizer having characteristics specified in 2 below.

*EQS,ILSGS

ILS Glide Slope having characteristics specified in 2 below.

2. Typical Equipment Characteristics

VHF OMNI-RANGE--100 kHz Channel
(Standard--VOR1A, Doppler--VOR1B)

1. Lower Frequency: 108.0 MHz; Upper Frequency: 117.95 MHz.
2. Frequency Tolerance: .002%.
3. Emission: 21KA9W (with voice) 21KA2A (without voice)
4. Power: 13 to 200 watts.
5. Modulator Bandwidth: 10 kHz.
6. Modulator Data: 30 Hz - 30%; 9960 Hz -30%; 1020 Hz - 8%; Voice - 28%.
7. Emission Falloff:

ΔF kHz	20	60
Level (dB)	-20	-60

8. Spurious Attenuation: -80 dB
9. Antenna Type: Alford Loop Array (Standard VOR) 50 element antenna array (Doppler VOR).
10. Horizontal Beamwidth: 360°.
11. Vertical Beamwidth: 85°.
12. Polarization: Horizontal.
13. Orientation: Non-directive.

VHF OMNI-RANGE (50 kHz Channel)
(Standard--VOR2A, Doppler VOR2B)

1. Lower Frequency: 108.0 MHz; Upper Frequency: 117.95 MHz.
2. Frequency: Tolerance: 002%
3. Emission: 21KA9W (with voice)
   21KA2A (without voice)
4. Power: 13 to 200 watts
5. Modulator Bandwidth: 10kHz.
6. Modulator Data: 30 Hz - 30%; 9960 Hz - 30%; 1020 Hz - 8%; Voice - 28%.
7. Emission Falloff:

ΔF kHz	20	30	40
Level (dB)	-30	-50	-60

8. Spurious Attenuation: -80dB
9. Antenna Type: Alford Loop Array (Standard VOR); 50 element antenna array (Doppler VOR).
10. Horizontal Beamwidth: 360°
11. Vertical Beamwidth: 80°
12. Polarization: Horizontal

ILS LOCALIZER (ILSLOC)

1. Lower Frequency: 108.1 MHz; Upper Frequency: 111.95 MHz.
2. Frequency Tolerance: 0.002%
3. Emission: 2K04A1A to 15KA9W
4. Power: 5 to 200 watts.
5. Modulator Bandwidth: 3kHz.
6. Modulator Data: 90 Hz - 20%; 150 Hz - 20%; Voice - 50%; 1020 Hz - 5%.
7. Spurious Attenuation: -75dB
8. Antenna Types: Standard 8-Loop (Alford); V-Ring, Waveguide; Traveling Wave (Alford); Dipole Array (MRN-7); SDF (Simplified Directional Facility).
9. Horizontal Beamwidth: 10° to 360°
10. Vertical Beamwidth: 40°
11. Polarization: Horizontal
12. Orientation: Fixed
13. Channelization: 50 kHz

ILS GLIDE SLOPE (ILSGS)

1. Lower Frequency: 329 MHz; Upper Frequency: 335 MHz.
2. Frequency Tolerance: 0.002%.
3. Emission: 300HA1N to 3K3A1N.
4. Power: 1 to 25 watts.
5. Modulation Bandwidth: 150 Hz.
6. Modulation Data: 90 Hz - 50%; 150 Hz - 40%.
7. Spurious Attenuation: -68dB
8. Antenna Types: Dipoles; Box Antenna; Wave Guide; Cavity.
9. Horizontal Beamwidth: 24° to 72°
10. Vertical Beamwidth: 128°
11. Polarization: Horizontal
12. Orientation: Fixed
13. Channelization: 150 kHz

Space Radiocommunication Assignments

If the application is for an assignment to earth or space stations or to terrestrial stations (including experimental stations) employing earth or space station techniques, insert the following data in the format indicated:

p. Reserved

*q. Orbital Information on Non-Geostationary Satellites (Transmitting and Receiving) (*ORB)*

For applications involving a single non-geostationary satellite or multiple non-geostationary satellites having similar orbital characteristics:

a. Enter the identifying Code REMnn *ORB followed by a comma.

b. In the next four spaces, enter the equatorial inclination angle in degrees, using leading zeros as necessary and a decimal with fractional degrees. In the next two spaces, enter the letters IN.

c. In the next five spaces, enter the apogee in kilometers, using leading zeros as necessary. In the next two spaces, enter the letters AP.

d. In the next five spaces, enter the perigee in kilometers, using leading zeros as necessary. In the next two spaces, enter the letters PE.

e. In the next six spaces enter the period, using leading zeros as necessary and a decimal for a fractional unit. If the period is less than 24 hours, enter the period in hours followed, in the next space, by the letter H; if 24 hours or more, enter the period in days followed in the next space, by the letter D.

f. In the next two spaces enter the number of satellites in the system, using a leading zero as necessary. In the next two spaces, enter the letters NR.

g. In the next three spaces, enter T01 for a non-geostationary transmitting satellite and R01, R02, etc. for each non-geostationary receiving satellite if the orbital information is for space-to-space transmissions. Entry is optional for other than space-to-space transmissions.

Example: *ORB,68.8IN40765AP00465PE12.283H01NR

One satellite in the system having orbital characteristics as follows: 68.8 inclination, 40,765 kilometer apogee, 465 kilometer perigee, 12.283-hour period.

For applications with multiple receiving space stations, indicate the orbital information for the satellite of each receiving space station in the Circuit Remarks, followed by the receiver involved (R01, R02, etc.).

Examples:

REM01 *ORB,68.2IN06900AP00239PE022.05H02NRR01
REM02 *ORB,72.9IN03209AP00655PE013.46H01NRR02

The orbital characteristics of the two satellites having similar characteristics specified in RAL field R01 are as follows: 68.2 inclination, 6,900 kilometer apogee, 239 kilometer perigee, 22.05-hour period. The orbital characteristics of the one satellite specified in the RAL field R02 are as follows: 72.9 inclination, 3,209 kilometer apogee, 655 kilometer perigee, 13.46-hour period.

h. If any, but not all, of the orbital data are classified, separate CIRCUIT REMARKS entries must be made for the classified and unclassified data in order to comply with the requirements of subparagraphs cc (Classified Data Fields (*CLC or *CLS)) and dd (Unclassified Data Fields (*CLU)) of paragraph 39 of this section. If the data for a non-geostationary transmitting satellite are included in separate entries because of classification, enter T01 in the last three characters of each entry. If the data for non-geostationary receiving satellites are included in separate entries because of classification, enter the appropriate receiving satellite designator R01, R02, etc., in the last three characters of each entry.

r. Reserved

s. Reserved

*t. Antenna Gain and Beamwidth Requiring Additional Spaces (Earth and Space Stations) (*EGN, *SGN, *EBW, *SBW)*

(1) The antenna gain for transmitting and receiving earth and space stations is entered in the transmitter and receiver ANTENNA DIMENSIONS fields. Two spaces are available for the value and one space for the letter G. If more than two spaces are required for value, XXG is entered in the ANTENNA DIMENSIONS field and the value is entered in the CIRCUIT REMARKS field following *EGN (for earth stations) or *SGN (for space stations). Enter "T" after the gain to identify the transmitter, or "R" to identify the receiver; for example, *EGN,1.5T or *SGN,-05R. For applications with multiple receiving stations with different gain values, the entry in the CIRCUIT REMARKS field is followed by R01, R02, etc., to identify the receiving station involved.

(2) Similarly, the antenna beamwidth for transmitting and receiving earth and space stations is entered in the transmitter and receiver ANTENNA DIMENSIONS fields. Three spaces are available for the value and one space for the letter B. If more than three spaces are required for the value, XXXB is entered in the ANTENNA DIMENSIONS field and the value is entered in the CIRCUIT REMARKS field following *EBW (earth) or *SBW (space). Enter "T" after the gain to identify the transmitter, or "R" to identify the receiver; for example, *EBW,1.25T or *SBW, 1.45R. For applications with multiple receiving stations with different beamwidths, the entry in the CIRCUIT REMARKS field is followed by R01, R02, etc. to identify the receiving station involved.

*u. Frequency Authorization Function (*MFI, *IFI, *DFI)*

(1) The Frequency Authorization Function entry indicates the functional use or purpose of a frequency authorization. This entry shall not restrict the applicant from using the frequency for other purposes as circumstances warrant, nor shall the applicant be required to obtain FAS approval before changing the functional use of an assignment. However, the user shall be expected to correct the functional use entry, if appropriate, whenever the assignment is modified or updated.

(2) A Frequency Authorization Function entry is required if:

(a) the frequency assignment falls within one of the following bands:

29.89 - 50.00 MHz*
162.0125 - 174.0 MHz
406.1 - 420.0 MHz
935.0 - 940.0 MHz*
* Limited to bands allocated exclusively to the Federal Government.

and,

(b) the assignment does not bear Record Notes S141 nor S322.

(3) The entry of a Frequency Authorization Function is optional for all other assignments.

(4) The Frequency Authorization Function entry is defined in three fields:

(a) Major Function Identifier (*MFI) - describes the primary/major function or purpose for which the frequency authorization will be used.

(b) Intermediate Function Identifier (*IFI) - describes the most significant sub-function or purpose for which the frequency authorization will be used.

(c) Detailed Function Identifier (*DFI) - describes in greater detail the function(s) or purpose for which the frequency authorization will be used.

(5) All assignments having a Frequency Authorization Function entry shall have an entry for a Major Function Identifier (*MFI). Entries for Intermediate Function Identifier (*IFI) and Detailed Function Identifier (*DFI) are optional. The Function Identifiers with Description lists in Parts 1 and 2, below, contain general and agency specific standard entries for use in any of the three fields.

(6) The Frequency Authorization Function entry is comprised of:

(a) the identifying code *MFI followed by a comma,

(b) a function identifier selected from the lists in Parts 1 and 2, below,

(c) and, if needed, the identifying code *IFI followed by a comma and the function identifier selected from the lists in Parts 1 and 2, below,

(d) and, if needed, the identifying code *DFI followed by a comma and the function identifier selected from the lists in Parts 1 and 2, below, or a description as noted in subparagraph (8)(j), below.

(7) The entries should be entered in the following order if more than one identifier is used: *MFI; *IFI; *DFI. See subparagraphs (8)(j), (k) and (l), below, for other specific instructions.

(8) General rules:

(a) Only one occurrence of *MFI and *IFI is allowed. Multiple occurrences of *DFI are allowed.

(b) Only standard functional identifiers (the name or abbreviation shown in bold in Parts 1 and 2, below) will be used in Frequency Authorization Function entries, except for entries in *DFI as noted in subparagraph (8)(j,k), below. The descriptions included inside the parenthesis in the lists in Parts 1 and 2, below, are shown only for information purposes to assist spectrum managers in selecting the correct data entry.

(c) A specific functional identifier may be entered only once in an application.

(d) Any of the General Function Identifiers listed in Part 1, below, may be used in any of the three function identifier fields, and there are no association restrictions.

(e) If the frequency authorization will be used for more than one function/purpose, select the functional identifier for the most important function/purpose for entry in the Major Function Identifier (*MFI). Select the second most important functional identifier for entry in the Intermediate Function Identifier (*IFI). Enter any additional functional identifier in the Detailed Function Identifier (*DFI).

(f) If two or more functions are equally important, choose the functional identifier for the function which will make most use of the assigned frequency for entry in the Major Function Identifier (*MFI). The second functional identifier may be entered in the Intermediate Function Identifier (*IFI). Additional amplifying information may then be entered in the Detailed Function Identifier (*DFI) to show other function(s) supported by the assignment.

Examples:

REM03 *MFI,FIRE (A single general function identifier entry)
REM11 *MFI,CONSTRUCTION (Two general function identifiers)
REM12 *IFI,MAINTENANCE
REM05 *MFI,GROUND OPERATIONS (An example with a new DFI)
REM06, *IFI,TRAINING
REM07, *DFI,NTC EVALUATION EXERCISES
REM03, *MFI,SUSTAINING BASE OPERATIONS (An example with multiple DFI's (with agency specific and general identifiers)
REM04, *IFI,MAINTENANCE
REM05, *DFI,EQUIPMENT CHECKS
REM06, *DFI,TEST AND CALIBRATION

(g) General and agency specific functional identifiers may be used in the same application.

(h) If none of the function names in the lists in Part 1 or Part 2, below, accurately reflect the function/purpose of a specific frequency application, enter MISC (Miscellaneous) as the Major Function Identifier (*MFI), then enter an amplifying description of the function of the assignment in the Detailed Function Identifier (*DFI). (See subparagraph (9), below.)

Example:

REM08 *MFI,MISC
REM09 *DFI,BALLOON RECOVERY OPERATIONS
REM10 *DFI,COMMAND AND CONTROL

(i) If SPECIAL PROJECTS is used in *MFI or *IFI, *DFI must contain an amplifying description of the project.

(j) If OTHER OPERATIONS is used, it must be entered in *MFI and amplifying description of the operation must be entered in the *IFI or *DFI.

(9) If MISC is used in *MFI, and *DFI contains an amplifying description, or if a new standard Major, Intermediate or Detailed Functional Identifier is proposed, the FAS Representative should submit to the FAS Secretary a request to add a new function name to either of the lists in Part 1 or Part 2, below. The request should contain the proposed function name and a brief description of the function.

Part 1 - General Function Identifiers with Description

The following list contains general function identifiers that have been approved for use by any agency in Major Function Identifier (*MFI), Intermediate Function Identifier (*IFI), and Detailed Function Identifier (*DFI).

ADMINISTRATIVE--Used for administrative management of personnel and/or material.
AIR TRAFFIC CONTROL--Used for ground-air and air-ground voice communications dedicated to controlling the movement of aircraft.
BACKBONE--Used for multiple-function point-to-point communications where landline systems are not available.
COMMANDER--Used by commanders at other than top executive echelons to directly command and control operations.
CONSTRUCTION--Used to support construction activities (e.g. road building, erection of power lines, construction of dams or bridges, etc.).
CONTINGENCY--Used only during unusual situations (e.g. civil disturbances, communications outages, natural disasters, etc.), and kept in service only for the duration of the situation.
COG/COOP--Used in support of Continuity of Government/Continuity of Operations during emergency situations and COG/COOP training and exercises.
EXECUTIVE--Used by the top echelon leadership of a government agency (e.g. normally used at department level and above where strategic policy is formulated).
FIRE--Used to notify the presence of a fire, or to direct, control, or coordinate the operations of fire response vehicles, equipment, and personnel during fire suppression or fire prevention activities.
HYDROLOGIC--Used for collection of information regarding the waters of the earth and its atmosphere, or for the control and management of these waters.
INSPECTION--Used during brief and infrequent visits to field sites and installations by inspection teams (e.g. operational readiness inspections, facility evaluations, Inspector General visits, etc.).
LAW ENFORCEMENT--Used to direct, control, or coordinate the activities of personnel engaged in law enforcement duties (e.g. building and installation security, criminal investigations, police activities, intelligence and counter-intelligence operations, intruder detection, etc.).
MAINTENANCE--Used to support maintenance activities (e.g. resurfacing of roads, maintenance of power lines, repair of dams or bridges, etc.).
MEDICAL--Used to direct, control, or coordinate the activities of medical personnel and emergency response vehicles.
MISC (Miscellaneous)--Used to support a function not shown elsewhere on this list. (Note: See subparagraph (9) above for additional instructions.)
MOBILE TELEPHONE--Used to provide an interconnection between vehicular radios and landline systems.
NATURAL RESOURCES--Used for the management, protection, and conservation of natural resources (e.g. national forests, public lands, wildlife, etc.).

NAVAIDS--Land stations used to furnish navigational assistance to aircraft and/or ships (e.g. instrument landing systems (ILS), non-directional beacons (NDB), long-range navigation (LORAN), racons, etc.).
NAVAIDS CONTROLS--Used to activate and deactivate visual or electronic navigational aids (e.g. runway lights, radio beacons, unmanned lighthouses, etc.).
PAGING--A one-way communications system used for selective calling of personnel. (Note: Although paging systems may be used in direct support of functions shown on this list, such as EXECUTIVE or MEDICAL, all paging assignments shall show PAGING as the function name.)
POSTAL OPERATIONS--Used to support the collection, processing and delivery of the U.S. Mail.
RDTE SUPPORT--Used for communications support of research, development, test, and evaluation (RDT&E) programs and projects. (These frequency assignments do not have an experimental station class.)
SEISMIC--Used to transmit measurements of stress, strain, or movements of the earth's crust.
SHORT TERM INCIDENT RESPONSE--Used to respond to short term emergency situations contained within a localized coordination area (e.g. hostage negotiation, bomb threats, locally contained disasters, etc.), and kept in service only for the duration of the incident.
SPECIAL COURIER--Used by personnel engaged in transporting valuable, sensitive, hazardous, or classified material.
SPECIAL PROJECTS--Used in support of communications electronics systems that are generally one-of-a-kind systems (e.g., Special Forces, intelligence, RF propagation systems, ground and avionics communications-electronics weapons systems, etc.). (Note: See subparagraph (8)(j) above for additional instructions.)
SURVEY--Used on an intermittent basis by field survey teams involved in measurement activities (e.g. geodetic surveys, radiation hazard monitoring, pre-construction site surveys, etc.).
TELECOMMAND--Used to remotely control the operations of an unmanned vehicle (land, sea, air, or space), or to activate and deactivate instruments or devices carried by the vehicle (e.g. missile destruct, guidance of remotely piloted vehicles (RPVs), control of overhead cranes, etc.).
TEST RANGE--Used in support of operations that are unique to a government test range (e.g. range control, range safety, range timing, etc.).
TRAINING--Used to train personnel in the accomplishment of a specific task or set of tasks.
TRANSPORTATION--Used to coordinate the routine movement of material and/or personnel from one point to another (e.g. messenger service, supply expeditor, taxi dispatch, etc.).
TRUNKING--Radiotelephony using standard land mobile trunking principles.
UTILITIES--Used for the management, control, and/or distribution of utilities (e.g. electric power, water, telephone service, oil and gas, etc.).
WEATHER--Used for the transmission of meteorological information (e.g. wind speed, temperature, barometric pressure, forecasts, etc.).
WIRELESS MIKE--A transmitting device used to provide the audio input to a speaker system. (Note: Although wireless mikes may be used in direct support of functions shown elsewhere on this list, such as RDTE SUPPORT or TRAINING, all assignments for these devices shall show WIRELESS MIKE as the function name.)

Part 2 – Agency Specific Function Identifiers with Description

The following list contains standard agency specific function identifiers that have been approved by one or more agencies for use in Major Function Identifier (*MFI), Intermediate Function Identifier (*IFI), and Detailed Function Identifier (*DFI).

A-EPLRS--Used in support of the Airborne Enhanced Position Location Reporting System (A-EPLARS), a secure, electronic warfare (EW)-resistant tactical transmission system supporting the Army Tactical Command and Control System (ATCCS) and the Army Battle Command System.

A2C2S (Army Airborne Command & Control System)--Used in support of Army Airborne Command & Control System.
ACS (Aerial Common Sensor)--Used in support of Intelligence and Electronic Warfare operations.
AEGIS--Used in support of AEGIS cruisers and destroyer weapon system operations.
AERO CLUB--Used in support of flight training and recreational flying clubs.
AFATDS--Used in support of Advanced Field Artillery Tactical Data System.
AFAUX/CAP (Air Force Auxiliary/Civil Air Patrol)--Provides Search & Rescue, Disaster Relief, Airborne Reconnaissance, Counter-drug Operations, Contingency Communications Support, and other National Security/Emergency Preparedness (NS/EP) functions.
AFSATCOM--Used for voice and/or data transmissions over the AFSATCOM system
AHFEWS (Army HF EW System)--Used in support of Intelligence and Electronic Warfare operations.
AIR DEFENSE--Used in supporting those defensive measures designed to destroy attacking enemy aircraft or missiles in the Earth's envelope of atmosphere, or to nullify or reduce the effectiveness of such attack.
AIR DEFENSE/INTERCEPT--Used in support of fire finding exercises and operations.
AIR DEFENSE WARNING--Used to identify the presence of hostile aircraft and or missiles.
AIR FORCE ONE--Used in support of presidential aircraft operations.
AIR FORCE SPECIAL OPERATIONS--Used to support AFSOF units (special operations wings and groups, special tactics groups, and special operations weather teams) which provide aircraft and other support for a variety of SOF missions.
AIR OPERATIONS--Used in supporting those functions which typically originate from the air and/or directly support the launching of, actual conduct of, and returning of airborne forces carrying out air operations whether over land or sea.
AIR ROUTE SURVEILLANCE RADAR-- Used for radar's that monitor aircraft routes.
AIR/GROUND/AIR COMMUNICATIONS--Used supporting voice and/or data transmissions between airborne and ground-based platforms.
AIR/AIR COMMUNICATIONS--Used in supporting voice and/or data transmissions between two airborne platforms.
AIRBORNE COMMAND CENTER--Used by airborne command post aircraft in support of the national authority or Combatant Commands.
AIRCRAFT--Used in supporting air operation under the jurisdiction of the Department of the Army.
AIRPORT SURVEILLANCE RADAR--Used for general coverage radars that are located at airdromes.
ALARM SYSTEMS--Used for physical security (e.g., Sensors, Motion Detectors, Intrusion & Duress Alarms, Etc.).
AMPS (Air Movement Planning System)--Used in support of Air movement operations.
AMSS (Automatic Meteorological Sensor System)--Used in support of Intelligence and Electronic Warfare operations.
ANTI-TERRORISM--Used in direct support of anti-terrorism.
APPROACH CONTROL--Used to provide a pilot conducting flight in accordance with instrument flight rules to commence an approach to an airport.
AQF (Advanced Quick Fix)--Used in direct support of command and control, fire control nets, also used for ground surveillance, counter/mortar, and counter/battery operations.
ARL (Aerial Reconnaissance-Low)--Used in support of Intelligence and Electronic Warfare operations.
ARMY AVIATION--Used in supporting the operation of fixed- and rotary-winged aircraft maintained by the Army; includes but is not limited to attack helicopters, scout helicopters, and utility aircraft
ARMY SPECIAL OPERATIONS--Used to support Army SOF units (civil affairs, psychological warfare, and ranger/ special forces) which are assigned a variety of SOF missions.
ARTILLERY--Used to provide internal command, control, and communications to division and below for fire support.

ARTS (Automated Remote Tracking System) (Telemetry)--Used in conjunction with the Space Ground Link Subsystem (SGLS).

ASAS (All Source Analysis System)--Used in support of Intelligence and Electronic Warfare operations.

ASOS (Automated Surface Observation System)--Used for the collection of weather information used by civil and military aircraft.

ASW (Anti-Submarine Warfare)--Used in support of anti-submarine warfare operations.

ATFP--Communications used in supporting fleet Anti-Terrorism Force Protection.

ATIS (Auto Terminal Information Service)--Used for the purpose of giving advice and information useful for the safe and efficient conduct of flights.

AVENGER-STC--Used in support of Short Range Air Search Radar (Stringer) operations.

AWACS--Used in supporting special DoD airborne early warning aircraft that are equipped with search and height-finding radar and communications equipment for controlling weapon systems and performs the air surveillance and control mission.

AWOS (Automatic Weather Observing System)--Observes weather conditions at specific locations and transmits continuously to aircraft in the area.

BASE OPERATIONS--Used in supporting the operations of an Air Terminal; a facility on an airfield that functions as an air transportation hub and accommodates the loading and unloading of airlift aircraft and the in-transit processing of traffic.

BATTLE COMMAND--Used in support of command, control, and communications, tactical Internet, and Warfighter Information Network/Satellite networks.

BEACON--Used in supporting Marker Beacons, Aeronautical Radio Beacons, and Radar Beacons for radio navigation land stations.

BLUE ANGELS--Used in support of the Navy Blue Angels demonstration team.

BMDS (Ballistic Missile Defense System)--Joint integrated and multilayered system defending the U.S. deployed forces and allies against ballistic missiles by engaging them in boost, mid-course and terminal phases of flight.

BMEWS (Ballistic Missile Early Warning System)--Used in DoD's electronic system for providing detection and early warning of attack by enemy inter-continental ballistic missiles.

BROADCAST--Used to support broadcasting signal via Television and/or Radio service.

C3 (Command, Control, & Communications)--Used in supporting those strategic, inter-/intra-theater, or inter-/intra service C3 functions NOT already covered under another category.

CARS (Contingency Airborne Reconnaissance System)--Used in support of Airborne Reconnaissance operations.

CAVALRY--Used in supporting those ground elements whose missions are reconnaissance, security, and economy of force; to find the enemy, to develop the situation and to provide the commander with reaction time and security.

CBR (Chemical, Biological, Radiological)--Chemical, biological and radiological teams that respond to terrorist incidents in order to assist local, state, or Federal agencies in the conduct of post-incident mitigation actions.

CID--Used in support of U.S. Army (Criminal Investigation Command) CID operations.

COMBATANT COMMAND/GENERAL OFFICER SUPPORT--Used in support of command and control, and supporting Combatant Commands/General Officers.

CIVIL AFFAIRS--Used for command activities centered on relationship between military forces and civil authorities and citizens in a friendly or occupied country or area. Command performance of certain functions or exercise of certain authority normally the responsibility of the local government.

CIVIL DISTURBANCES--Used to support civil disturbance operations.

CIVIL ENGINEERING--Used to support civil engineering activities.

CIVIL SUPPORT TEAM--Mobile support teams deploying to support national emergencies and natural disasters.

CIVIL WORKS--Used to support civil works activities.
CIWS (Close-In Weapons System)--Used in support of weapon system.
CLEARANCE DELIVERY--Used by air traffic control tower staff to communicate departure instructions to air crews while the aircraft are still on the ground.
CLOSE AIR SUPPORT (CAS)--Used in supporting air action by fixed- and rotary-wing aircraft against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces.
COLOR/HONOR GUARD--Used to support military color guard/honor activities.
COMBAT CONTROL TEAM--Used in support of Intelligence, Maneuver, Fire Support, Air Defense, Mobility and Survivability, Logistics and Battle Command.
COMMAND AND CONTROL--Used for command and control of military operations.
COMMAND DESTRUCT/TERMINATION--Used by range safety officers to destroy errant missiles or UAVs.
COMMAND NET--Used for command and control of the Commanders Net.
COMMAND POST--Used in supporting Command, Control, and Communications at the Command Post (CP).
COMMAND POST/CENTER--Used in supporting Command, Control, and Communications at the Command Post (CP).
COMMUNICATIONS--Used in supporting the collection by visual observation or other detection methods, information about the activities and resources of an enemy or potential enemy or supporting the passing of data concerning the communications characteristics of a particular area.
COMMUNITY ASSISTANCE--Used to support non-specific community assistance activities.
CONSEQUENCE MANAGEMENT--Used to support U.S. government interagency assistance to protect public health and safety, restore essential government services, and provide emergency relief to governments, businesses, and individuals affected by the results of a terrorist incident involving weapons of mass destruction.
CONSERVATION--Used to support resources conservation activities.
COUNTER DRUG--Used in direct support of counter drug operations.
CSSCS (Combat Service Support Control System)--Used by computer software system designed to assist commanders in the planning of Logistics operations.
CTT (Commander's Tactical Terminal)--Used to support Command Post operations.
DATA COLLECTION PLATFORM--Used to monitor the environment through the transmission of observations from surface-based platforms to NOAA satellites.
DATA LINK--Used in support of the operation of a data link.
DBRITE (Digital Bright Radar Indicator Tower Equipment)--Used for DBRITE operations.
DEPARTURE CONTROL--Used in controlling aircraft departing from airdromes until they are turned over to air route controllers or go on visual flight rules.
DIS (Defense Investigative Service)--Used by DIS organizations.
DISASTER PLANNING--Used in direct support of disaster operations.
DMSP (Defense Meteorological Satellite Program)--Used in direct support of the Defense Meteorological Satellite Program.
DOMESTIC SUPPORT OPERATIONS--Used for various types of military support provided to Federal, state, and local agencies in the areas of disaster assistance, environmental assistance, law enforcement, and community assistance.
DRONE CONTROL--Used in direct support of drone control operations.
DSCS (Defense Satellite Communication System)--Used for voice and/or data transmissions over the Defense Satellite Communication System.
DTSS (Digital Topographic Support System)--Used in direct support of DTSS operations.
EDUCATION--Used for military education activities.

ELECTRONIC WARFARE--Used in supporting the collection by visual observation or other detection methods, information about the activities and resources of an enemy or potential enemy or supporting the passing of data concerning the electronic characteristics of a particular area.

EMERGENCY SERVICES--Used in support of non-specific emergency services.

EMWIN--Emergency Managers Weather Information Network, used to provide a near-real-time round-the-clock digital data feed which is disseminated by radio, satellite and Internet broadcasts, and is intended for emergency managers and public safety officials who need timely weather information to make critical decisions.

ENGINEERS--Used in supporting Engineers that perform construction, demolition, surveying, road and bridge building.

ENVIRONMENTAL--Used to support environmental controls, surveys, and research operations.

ENVIRONMENTAL CLEANUP--Used to support environmental cleanup operations.

EOD (Emergency Ordinance Disposal)--Used in supporting EOD during destruction or demolition operations. This includes EOD robotic devices.

EPLRS (Enhanced Position Location Reporting System)--Used in support of EPLRS system.

EQUIPMENT CHECKS--Used to support equipment checks made prior to commencing normal operations.

ERCS (Emergency Rocket Communications Systems)--Used to support the Emergency Rocket Communication System or ECM Resistant Communications System.

ETCAS (Enhanced Traffic Collision Avoidance System)--Used by aircraft equipped with the ETCAS equipment.

ETRAC (Enhanced Tactical Radar Correlator)--Used to support tactical Radar operations.

EXERCISE--Used in supporting a military maneuver or simulated wartime operation involving planning, preparation, and execution.

EXPERIMENTAL--Used in supporting activities that require an experimental station class.

FAADC2 (Forward Area Air Defense, Command and Control)--Used for forward air defense operations.

FEEDER CONTROL--Feeder control transitions aircraft from the en route structure to the initial approach fix for landing.

FEMA (Federal Emergency Mgt Agency)--Used to support FEMA (Federal Emergency Mgt Agency) operations.

FIRE ALARM--Used in support of emergency fire-alarm systems.

FIRE SUPPORT--Used to support artillery in support of infantry, armored, airborne, and airborne mobile operations.

FLEET SUPPORT--Used to support fleet units/shore facilities.

FLIGHT FOLLOWING--Issues information and advisories to arriving, departing, and en route aircraft and monitors the flight progress of aircraft. Additionally, flight following posts and relays flight progress reports and posts information to flight data strips, boards, charts and maps.

FLIGHT INSPECTION--Normally accomplished by Federal Aviation Administration (FAA) flight check aircraft to determine if specific navigation aids (NAVAIDS) such as NDB, VOR, and TACAN are functioning properly.

FLIGHT TEST--Used to support flight test operations.

FLOOD WARNING SYSTEM--Provides flood warning information in the event of rain and or river/stream/creek overflow.

FLTSATCOM (Fleet Satellite Communications)--Used for voice and/or data transmissions over the FLTSATCOM system.

FORACS (Fleet Operational Readiness Accuracy Check Site)--Used to support Fleet Operational Readiness Sites.

FORWARD AIR CONTROL POST--Used in supporting a highly mobile USAF tactical air control

system radar facility subordinate to the control and reporting center and or control post used to extend radar coverage and control in the forward combat area.

GBCS-L (Ground Based Common Sensor-Light)--Used to support the ground based sensor system.

GBS (Global Broadcast System)--Used for voice and/or data transmissions over the Satellite system.

GCA (Ground Control Approach)--A radar approach system for aircraft arriving at an airfield.

GCCS (Global Command and Control System-Army)--Used to support GCCS operations.

GLOBAL--HF frequencies assigned to DoD global communications network.

GLOBAL ALE (Automatic Link Establishment)--Used in supporting ALE operations within the DoD global communications network.

GLOBAL BLACK--Used in support of the USAF Global HF Network for a non-secure email net.

GLOBAL DISCRETE--Unpublished (non-FLIP) HF frequencies assigned to DoD global communications network.

GLOBAL RED--Used in support of the USAF Global HF Network secure email net.

GMD (Ground Missile Defense)--Communications used in supporting Anti-Terrorism Force Protection.

GOES (Geostationary Operational Environmental Satellites)--GOES is a series of meteorological geostationary orbiting satellites that provide weather prediction data for the Western Hemisphere and particularly for the U.S.

GOLDEN KNIGHTS--Used by the Army's Golden Knights demonstration team.

GPS (Global Positioning System)--Used for precise positioning/navigation information.

GRCS (Guardrail Common Sensor)--Used in support collection and location system.

GRIZZLY (M1 Bleacher MineSweeper)--Used to support mine sweeping operations using CNR.

GROUND CONTROL--Used in supporting those functions which controls originate from the ground and directly support ground-based operations.

GROUND INTERDICTION--Used to support ground operations, convoy, scouting, surveillance etc.

GROUND OPERATIONS--Used in supporting those functions which originate from the ground and directly support ground-based operations.

GSR (Ground Surveillance Radar)--Used to support ground surveillance radar operations.

HAARP (High Frequency Active Auroral Research Program)--A scientific endeavor to study the properties and behavior of the ionosphere to understand its use to enhance communications and surveillance systems for both civilian and military purposes.

HARBOR-PORT OPERATIONS--Used for controlling movements of ships in harbors and ports.

HAVE QUICK--Used in supporting DoD's Jam-resistant UHF Communications Radio.

HAZARDOUS MATERIAL RELEASE--Used to support hazardous material release.

HAZMAT (Hazardous Materials)--Used to support operations dealing with hazardous materials.

HELO CONTROL--Used to control and coordinate helicopter transit between ships.

HICOM (High Command)--Used to support CINC HF high command net.

HYDRA (Hierarchical Yet Dynamically Reprogrammable Architecture)--Used in support of various shipboard voice communications requirements.

IEWCS (Intelligence Electronic Warfare Common Sensor)--Used in support of Intelligence and Electronic Warfare operations.

IFF/SIF--Used to support Identification Friend or Foe/Selective Identification Features activities.

ILS (Instrument Landing System)--Used to support localizer and glideslope aircraft Instrument Landing Systems.

IMETS (Integrated Meteorological System)--Used to support the collection of weather reports.

INDUSTRIAL CONTROLS--Used to support industrial controls.

INFANTRY--Used in supporting those ground-based elements designed to close with and destroy the enemy and which serve as a key element of combat power in close combat.

INSTALLATION PA SYSTEM (Giant Voice)--Used by installation public address systems.

INSTRUCTOR/STUDENT TRAINING--Used in supporting those activities during training which originate from the class room instructions. Mainly used for training purposes.

INTELLIGENCE--Used in support of the gathering of intelligence information.
INTERPLANE--Used between aircraft in flight.
INVENTORY/INVENTORY CONTROLS (e.g., Optical Scanners)--Used in support of gathering inventory data at exchange, supply, and other logistical type facilities.
IONOSPHERIC SOUNDER--Used in support of ionospheric sounder operations.
I-REMBASS (Improved-Remotely Monitored Battlefield Sensor System)--Used to support ground surveillance operations.
ISYSCON (Integrated System Control)--Used to manage multiple tactical communications systems.
JSS (Joint Surveillance System)--Used in supporting the Joint Surveillance System Radars.
JTIDS/MIDS (Joint Tactical Information Distribution System)--Used in support of the operation of JTIDS. Used in support of the operation of Link 16 Command and Control Tactical Data Systems. Also known as TADIL-B.
LAND WARRIOR--Used to support combat net radio operations for Corps and below.
LEASAT (Leased Satellite)--Used for voice and/or data transmissions over the LEASAT system.
LINEBACKER--Used to operate in forward combat areas, the Linebacker is capable of shooting down rotary- and fixed-wing aircraft, as well as cruise missiles.
LLDR (Lightweight Laser Designator Rangefinder)--Used in support of range finding operations.
LMRDFS (Light Man-portable Radio Direction Finding System)--Used to support direction finding system.
LOCAL CONTROL--Used by air traffic controllers in the vicinity of an airdrome.
LOCKS AND DAMS--Used in direct support of the operation of locks and dams.
LONGBOW (Apache Helicopter)--Used by the weapons radar on Apache helicopters.
LOOTING PREVENTION--Used in direct support of looting prevention.
M93A1 FOX--Used to support Bridge operations.
MARS (Military Affiliated Radio System)--Used for voice and/or data transmissions over the Military Affiliated Radio System.
METEOROLOGICAL--Used in supporting the collection by visual observation or other detection methods, information about the activities and resources of an enemy or potential enemy or supporting the passing of data concerning the meteorological characteristics of a particular area.
MFCS (Mortar Fire control System)--Used to support command and control of Mortar Fire Control operations.
MICROWAVE--Used to support Microwave data links.
MICROWAVE DATA LINK--Used in supporting the microwave data links.
MILITARY POLICE--Used to support security operations, military laws, orders and regulations, traffic control, crime prevention, investigations, logistics, coordination, and planning of police functions.
MILSTAR (Military Strategic and Tactical Relay System)--Used for voice and/or data transmissions over the MILSTAR system.
MISSILE--Used in supporting electronic fire distribution system designed for CONUS use in coordinating all elements of air defense from target detection to target destruction.
MITT/DTES (Mobile Integrated Tactical Terminal/Distributed Common Ground System Test and Evaluation Strategy)--Used to support mobile tactical terminal.
MLRS (Multiple Launch Rocket System)--Used to support the flight parameters of its main carrying missiles and submissiles.
MLS (Microwave Landing System)--Used to support Microwave Landing Systems.
MOMS (Man on the Move System)--Used in support of Man on the Move System operations.
MOTOR POOL--Used to support the motor pool.
MSE (Mobile Subscriber Equipment)--Used to provide secure, automatic digitized voice, data, and facsimile communications to the users, whether static or mobile operations.
MTS (Movement Tracking System)--Used to support the movement of personnel and equipment.
MUNITIONS--Used in support of the storage or movement of munitions.

MUTUAL AID--Used for fire, medical, police, and other emergency services between federal, state and local agencies.
MYSTIC STAR--Used to support the President of the U.S. and senior federal executives.
NAOC (National Airborne Operations Center)--Used in direct support of NAOC operations.
NASA--Used in support of NASA operations.
NAVAL GUNFIRE SUPPORT--Used in direct support of Naval Gunfire Support Operations.
NAVIGATION RADAR--Used for radar navigation in reduced visibility to assist the operator in determining the range and bearing to obstructions (e.g., other craft or buoys), avoiding obstacles, avoiding collisions, accessing the bank of a river or shore, and as an aid to maintain a vessel in a channel to avoid running aground.
NAVY SPECIAL OPERATIONS--Used for special, focused warfare operations conducted by Navy Sea, Air, Land (SEAL) teams, SEAL Delivery Vehicle Teams, and Special Boat Units (SBU) under the cognizance of the Naval Special Warfare Command.
NCIS (Naval Criminal Investigative Service)--Used by Naval Criminal Investigative Service organizations.
NDB--A signal (beacon) transmitting on a select frequency which is used by aircraft to determine their location in relation to the beacon signal. May serve as a guide to an airfield or location.
NEXRAD--Used in support of the Next Generation Weather Radar (NEXRAD).
NOAA WEATHER RADIO--Used for the dissemination of National Oceanic and Atmospheric Administration weather forecasts, weather warnings, and other critical information to the public.
NORAD (North American Air defense Command)--Used by the North American Air defense Command.
NTDR (Near Term Digital Radio)--Used to support the Army's data communication backbone for platoon to brigade.
OCCS SUPPORT--Used for communications support of Observer Controller Communication System (OCCS) programs and projects.
OPERATION ALLIANCE--Support interoperable communication between the Federal and non-Federal (State and local) law enforcement groups involved in drug interdiction activities.
OSI (Office of Special Investigation)--Used by Office of Special Investigation organizations.
OTHER OPERATIONS--Used in supporting those functions not covered in one of the categories listed herein. (Note: See subparagraph (8) (j) above for additional instructions.)
OTHR/ROTHR (Over-the-Horizon Radars)--Used in supporting the OTHR. Some systems are relocatable.
PAR (Precision Approach Radar)--Used for Precision Approach Radar operations.
PATRIOT-- An air defense missile system.
PAVE PAWS (Precision Acquisition Vehicle Entry Phased Array Warning System)--Used in supporting the Precision Acquisition Vehicle Entry Phased Array Warning System.
PILOT-TO-DISPATCHER--Used between the base operations dispatcher and air crews.
PILOT-TO-METRO--Used between the base weather facility and air crews.
PILOT-TO-PILOT--Communication between air crews in flight.
POL (Petroleum, Oil, and Lubricants)--Used to support POL activities during exercises and operations.
PRIME BEEF--Used in support of the Prime Beef construction team.
PRISON BUS--Used for immediate communications support to Prison and/or local police units during the transport of Federal Prisoners between Federal Correction Facilities, other transportation media, medical facilities, and/or U.S. Courts.
PROJECT COTHEN--Federal Anti-Drug Operations.
PSYCHOLOGICAL OPERATIONS--Used for planned psychological activities in peace and war directed to enemy, friendly and neutral audiences to influence attitudes and behavior affecting achievement of political and military objectives.

PUBLIC WORKS--Used to support public works.
RADAR (Radio Detection and Ranging)--Used to support the various types of radar functions.
RADIO RELAY--Used in supporting signal communication system using very high frequencies and line of sight radio transmitters and receivers in lieu of trunk wire circuits. This system, when used in conjunction with carrier equipment, will provide channels for both voice and Teletype operations.
RADIOLOCATION--Used in supporting the determination of relative direction, position, or motion of an object, or its detection, by means of the constant velocity of rectilinear propagation characteristics of radio waves.
RADIOSONDE--Airborne instrumentation platform for collection/transmission of atmospheric temperature, pressure, relative humidity, and wind speed and direction data. Data is used to provide a three-dimensional picture of atmospheric conditions, which is essential for weather forecasting and meteorological research.
RAMP CONTROL--Used to control the movement of aircraft and vehicle traffic on the flight line.
RANGE CONTROL--Used in supporting the Range Control functions on a DoD Range (e.g., Range scheduling).
RANGE OPERATIONS--Used in supporting general operations on a DoD Test Range or Military Training.
RANGER UNITS--Used in supporting those units that plan and conduct special military operations and have the ability to support conventional military operations.
RDMS (Range Data Management Subsystem)--Used to support the RDMS currently being used at the National Training Center (NTC).
RED HORSE--Used in support of Air Force tactical construction operations.
REFUELING--Used in supporting voice communications in support of air-air refueling operations.
REMOTE BARRIER CONTROL SYSTEMS--Used to control aircraft barrier systems.
REMOTE CONTROL CRANE--Used to control remotely controlled cranes such as in a shipyard, harbor or other major industrial facilities.
RESOURCES CONSERVATION--Used to support resource conservation research operations.
RESUPPLY--Used in support of re-supply operations.
RF TAGS--(Radio Frequency Tags and Interrogators)--Logistics and shipping container tracking and management devices.
RUNWAY ICE DETECTION SYSTEMS--Used to monitor runway ice detection systems.
RUNWAY LIGHTING CONTROL--Used to control remotely controlled runway lighting.
SAFETY--Used in support of Public works safety net.
SATELLITE COMMUNICATIONS--Used for voice and/or data transmissions over a non-specific **satellite system.**
SAWDS (Satellite Automated WX Dist Sys)--Network to disseminate weather information to DoD facilities.
SCAMP (Single Channel Anti-Jam Manportable Terminal)--Used to support voice and data links for battle command and control communications.
SCOPE SHIELD--Tactical handheld radios.
SEA OPERATIONS--Used in supporting those functions which originate from on board ship and/or directly support the launching of, actual conduct of, and returning of forces carrying out sea-based operations; operations in a maritime and littoral environment which contribute to gaining and maintaining freedom of action.
SEABEES--Used in support of SEABEES construction activities.
SEARCH AND RESCUE--Used in supporting Search and Rescue (SAR) operational use of aircraft, surface craft, submarines, specialized rescue teams and equipment to search for and rescue personnel in distress on land or at sea.
SECURITY FORCE--Used in providing installation physical security operations.

SENTINEL (AN/MPQ-64 Surveillance Radar)--Used for air surveillance and target acquisition/tracking sensor for Short Range Air Defense (SHORAD) weapons systems.
SGLS (Space Ground Link Subsystem) (Telemetry)--Used in conjunction with the Automated Remote Tracking System (ARTS).
SHIP/AIR OPERATIONS--Used in supporting airborne units assigned to US Naval ships.
SHIP/SHIP--Used in supporting ship-to-ship communications.
SHIP/SHORE OPERATIONS--Used in supporting ship-to-shore and shore-to-ship communications.
SHIPYARD--Used in supporting shipyard operations, except remote controlled cranes.
SHORE PATROL--Used by shore patrol activities.
SHUTTLE--Used in direct support of Space Shuttle operations.
SIMULATOR--Used to support simulator activities.
SINCGARS (Single Channel Ground and Airborne Radio System)--Used to support combat arms command and control operations.
SINCGARS-ASIP (Single Channel Ground and Airborne Radio System-Advanced System Improvement Plan)--Used to support combat arms command and control operations.
SNOW REMOVAL--Used to support snow removal activities.
SOF (Supervisor of Flying)--Used by the SOF to assist pilots.
SONOBUOY--Used for floating electronic sensors designed to provide various data for Navy antisubmarine warfare (ASW).
SORT--(Special Operations Response Team)--Used by Federal Officers specially trained in controlling disturbances within U.S. Penitentiaries or other Federal Correctional Facilities.
SPACE OPERATIONS--Used in supporting those functions that directly support operational space missions including satellite control and shuttle missions.
SPECIAL FORCES--Used for specially trained, equipped and organized force against strategic or tactical targets in pursuit of national military, political, economic, or psychological objectives. These operations may be conducted during peace or hostilities. They may support conventional operations, or be prosecuted independently when use of conventional forces is inappropriate or infeasible.
SPECIAL OPERATIONS--Used in directly supporting Special Operations; those operations conducted by specially trained, equipped, and organized DoD forces (e.g., SOF) against strategic or tactical targets during peacetime or during hostilities.
SPECIAL SECURITY OPERATIONS--Used in direct support of special security operations.
SPEED MEASUREMENT SYSTEMS--Used by law enforcement activities to measure the speed of vehicles.
SPITFIRE (SPITFIRE Manpack UHF SATCOM DAMA Terminal)--Used to support digital voice communications.
SQUADRON/WING COMMON--A common frequency used for communication within a squadron or wing; (AF) a unit composed normally of one primary mission group and the necessary supporting organizations; (Navy) the basic organizational and administrative unit for naval-, land-, and tender-based aviation; (Marines) a balanced task organization of aircraft groups/squadrons together with appropriate command, air control, administrative, service, and maintenance units.
STRIKER II (Advanced Fire Support/Scout/Surveillance System)--Used to support long range, reconnaissance, surveillance and fire support systems.
SUPPLY AND LOGISTICS--Used to support general supply and logistics operations.
SURFACE NAVAIDS--Ship stations used to furnish navigational assistance to aircraft and/or ships.
SURVEILLANCE/ RECONNAISSANCE--Used in supporting those strategic and tactical sensors and systems which provide warning of air breathing, ballistic missile, space-based, or tactical ground-based attack or to relay voice and/or data on the activities and resources of a potential or real enemy or the characteristics of a particular area obtained through visual observations or other detection methods.

SURVEILLANCE SYSTEMS--Used to support base security surveillance operations.
SUSTAINING OPERATIONS--Used in supporting those functions normally performed in conjunction with the continued operation of an Army Post, a Navy/Marine Corps Base, or an Air Force Base.
TACAN (Tactical Air Navigation)--Used by TACAN systems.
TACCS (Tactical Army Combat Service Support Computer System)--Used in support of the TACCS.
TACJAM (Tactical Communications Jamming System)--Used to support jamming operations.
TACTS (Tactical Trunk Signaling)--Used to support trunking systems.
TADIL-A--Used in support of the operation of Link 11 Naval Tactical Data System (ship to ship and ship to air) operations. Also used by the USAF for air to ground operations.
TADIL-C--High Frequencies (HF) used in support of the operation of Link 11 Naval Tactical Data Systems (ship to ship and ship to air) operations.
TARGET--Used to support target scoring and precision tracking radar etc.
TARGET ACQUISITION--Used within a system that identifies valid targets.
TARGET SCORING--Used to support target scoring of laser equipment.
TAXI--Used by base/installation taxi systems.
TCAS (Traffic Collision Avoidance System)--Used by aircraft equipped with the TCAS equipment.
TCRS (Target Control System)--Used to support target control functions and exercises at NTC.
TEAMMATE--Used to support collection and direction finding systems.
TECHNICAL ESCORT UNIT--Used to support a technical escort unit which is a deployable explosive and chemical/biological response team that identifies, escorts, decontaminates, disposes and mitigates explosive chemical and biological devices.
TELEMETRY--Used in supporting the transmission of telemetry data on a DOD range.
TEST AND MEASUREMENT--Used in supporting the test and measurement functions on a DoD Range.
TEST RANGE TIMING--Used in supporting the transmission of timing signals on a DoD Range.
TETHERED AREOSTAT RADAR--Used in supporting the Tethered Aerostat Radars and interface system.
THUNDERBIRDS--Used by the USAF THUNDERBIRDS demonstration team.
TIS or TRAVELERS INFORMATION SYSTEM--Used to provide travelers advisories.
TMGS (Transportable mobile ground subsystems)--Used in support of telecommand operations.
TOSS (TV Ordnance Scoring System)--Used in support of telecommand operations in scoring target accuracy on military ranges.
TOWER--Controls aircraft within assigned airspace and aircraft/vehicles on ground at airfields.
TRACKWOLF--Used to support ground based HF skywave communications intercept and direction finding systems.
TRAILBLAZER (Ground Based Communications Intelligence System)--Used by the Army to gather Intelligence.
TROJAN SPIRIT--Used to support the Transportable Trojan Spirit II satellite communications terminal.
TSU--Technical escort unit is a deployable explosive and chemical/biological response team that identifies, escorts, decontaminates, disposes and mitigates explosive chemical and biological devices.
UAV (Unmanned Aerial Vehicle)--Used in supporting the testing and/or operations of pilotless aircraft.
UNLICENSED DEVICE--Used by the government for use by low power devices normally operated without a license under the provisions of Part 15 of the FCC Regulations.
VORTAC (VHF Omni-range TACAN)--Used for VORTAC operations.
VOR (Very High Frequency Omnidirectional Range)--Used for Very High Frequency (VHF) Omnidirectional Range (VOR) operations.
WARNING SYSTEM--A signal or siren that warns of imminent danger (e.g., bomb alert, chemical, tornadoes, etc.).

WEAPON SYSTEMS--Used by major weapon systems.
WEAPONS STORAGE PROTECTION--Used to support weapons storage facilities.
WEATHER RADAR--Radar frequencies used by aircraft or ground based sites for weather purposes.
WHCA (White House Communications Agency)--Used in supporting WHCA operations.
WIDEBAND GLOBAL SATCOM--Used for voice, data and/or video transmissions in support of U.S. military operations using the Wideband Global Satcom (WGS) system.
WILDLIFE PRESERVATION--Used for game wardens, endangered species/wildlife preservation and tracking the movements of wild animals.
WIND PROFILER--Used for sensing wind shear in the vicinity of airports.
WIN-T (Warfighter Information Network-Tactical)--Used to support the Army's Tactical Intranet consisting of switching/routing/transport that provides voice, data and video services.
WIRELESS LOCAL AREA NETWORK--Used to support local area network frequency bands.
WOLVERINE (Assault Bridge)--Used to support command and control of bridge operations.

*v. Mexican Coordination Data (*MEX)*

(1) The information in this field is normally those comments that were added based on FAS ADM 800118, dated June 16, 1980. These comments are:

*MEX,21311, IRAC, MAR 1980, MAY 1980 GMF

(2) As these comments indicate that this record was provided to Mexico for coordination in the original list, do not delete this entry when updating the assignment. If a record replacement action is used, and the frequency and/or location does not change, the docket numbers of the older authorization should be retained in the circuit remarks (see subparagraph 39g, *DOC).

(3) Agencies may also use this field to enter coordination comments based upon actual coordination with Mexico.

(4) Use this field by inserting the identifying code REMnn followed by a space, then *MEX followed by a comma, then the data.

*w. U.S. Coordination Comments on Canadian and Mexican Proposals (*USA)*

(1) Proposals for frequency coordination from Canada (and at some future date from Mexico) are processed through the automated FAS agenda system. When coordination is completed, the records are added to the Government Master File (GMF) with the U.S. coordination comments indicated on the record by the code *USA followed by NHIA or NHIC.

(a) NHIA means no harmful interference is anticipated either to or from the proposals.

(b) NHIC means no harmful interference is anticipated, but additional information or a noting comment pertinent to the coordination is include.

(2) See Section 9.16.3 for instructions on formatting and voting *USA comments.

*x. FCC File Number (*FLN)*

This entry is used to identify an FCC File Number of an application received or license issued to a non-Federal entity allowed to use either an NTIA-authorized frequency or a U.S. Federal radio station on a frequency licensed by the FCC.

(1) Insert REMnn followed by a space and the identifying code *FLN followed by a comma.
(2) Immediately following the comma insert the FCC file number.

*y. Name, or Personal Identifier and Position, of Original Classification Authority (*CLA).*

(1) This field is used to identify, by name, or by personal identifier and position, the original classification authority for classified data. This entry shall be included for all classified applications for which the classification was originally applied by the applicant and was not determined from derivative methods. This entry shall include all data in a single occurrence.

(2) Enter the field code REMnn followed by a space. Following the space, enter the code *CLA followed by a comma. Immediately after the comma, enter the name, or personal identifier and position, of the original classification authority, or the statement EXCLUDED,1.7.B if entry of this information falls under the exclusion provision of E.O. 12958, Section 1.7.(b).

Example:

REM04 *CLA,ASD,CCCI,DOD
REM02 *CLA,COMDR,12AF,USAF”
REM05 *CLA,JOHN MCCLELLAN,AA,NTIA,DOC
REM03 *CLA,EXCLUDED,1.7.B

*z. Derivative Classification Authority (*CLF).*

(1) This field is used to identify the source document, or classification guide, used as the basis for derivatively classifying data in a frequency assignment. This entry shall be included in all applications that are derivatively classified or contain a declassification instruction of OADR in the data field CDD, and shall be composed such that the source document or classification guide can be readily identified. Use more than one entry if necessary.

(2) Enter the field code REMnn followed by a space. Following the space, enter the code *CLF followed by a comma. Immediately after the comma, enter the identity of the source document or classification guide. Include the title, date and agency or organization that published the source document.

(3) In those instances where the original classification authority extends a declassification date in the field CDD beyond the initial 10 year period, this field is used to identify the date the declassification was extended, the individual that approved the extension, and that individual's agency or organization. However, entry of this information is not necessary when the classification is derived from another source and the source is listed in accordance with subparagraph (2) above.

Examples:

REM06 *CLF,ASD,C3I,MEMO,SUBJ WINDOW
REM07 *CLF,3JULY95
****
REM04 *CLF,B-1B SCG,930815, OC-ALC/LAB
****
REM10 *CLF,NTIA SCG FOR FREQ ASSIGNMENT
REM11 *CLF,RECORDS,821108, ASCI (NTIA),DOC

*aa. Reason for Classification (*CLR).*

(1) This field is used to cite the category, or categories, of E.O. 12958, Section 1.5, that the original classification authority determined to be the reason(s) frequency assignment data in the assignment must be classified. This entry shall be included in all classified applications, except those classified derivatively, for which entry is optional. If this entry is used, all data shall be entered in a single occurrence.

(2) Enter the field code REMnn followed by a space. Following the space, enter the code *CLR followed by a comma. Immediately after the comma, enter the code 1.5, followed immediately by one, some or all of the letters a, b, c, d, e, f or g, tore present the classification categories listed in E.O. 12958, Section 1.5. If more than one category letter is entered, enter the letters in alphabetical order.

Example: REM05 *CLR,1.5ABCD”

*bb. Extended Declassification Date (*CDE).*

(1) This field is used to enter the declassification date for "permanently valuable" information when the field CDD contains an entry in the range DE25X2 - DE25X9. This entry shall include all data in a single occurrence.

(2) Enter the field code REMnn followed by a space. Following the space, enter the code *CDE followed by a comma. Immediately after the comma, enter the declassification date in year, month and day (YYMMDD) order.

*cc. Classified Data Fields (*CLC or *CLS).*

(1) These fields are used to identify those data fields in an assignment that are classified confidentical or secret. One or both of these entries must be included on all classified applications to indicate the classified information.

(2) Enter the field code REMnn followed by a space. Following the space, enter the code *CLC to indicate those data fields that are classified Confidential or *CLS to indicate those data fields that are classified Secret followed by a comma. Immediately after the comma, enter the mnemonic(s) (and occurrence number of multiple occurring fields) of the classified data field(s). If more than one mnemonic is entered, separate each with a comma. You must enter all classified data fields that are confidential in *CLC and all classified data fields that are Secret in *CLS.

(3) Use as many entries of *CLC or *CLS REM lines as necessary to list all classified data fields.

(4) The entry for Supplementary Details will always be SUP (See paragraph 80, subparagraph j, of this section.).

Example: REM09 *CLC,EMS01,PWR01,EMS02,PWR02,SUP
REM10 *CLS,XAD01, RAD03, REM11

*dd. Unclassified Data Fields (*CLU).*

(1) This field is used to identify those unclassified frequency assignment data fields in a classified assignment. This entry shall be included in all classified applications. This entry shall include all data in a single occurrence.

(2) Enter the field code REMnn followed by a space. Following the space, enter the code *CLU followed by a comma. Immediately after the comma, enter the statement ALL DATA FIELDS NOT LISTED IN *CLD if there are unclassified data fields, or the statement NO UNCLASSIFIED DATA FIELDS if there are no unclassified data fields.

*ee. Transition and Narrowband Planning Data (*TRN)*

This optional data field may be used to provide the planned date it is anticipated an assignment will be transitioned to a frequency allotted primarily to the agency and to provide the new frequency planned for the operation. This data field may also be used to provide the planned date it is anticipated the equipment in use that operate with emission bandwidths equal to, or greater than, 12.5 kHz, will be completely upgraded or replaced to comply with the narrowband requirements of Sections 4.3.7A, 4.3.9 or 5.3.5.2 of this Manual.

a. Insert the identifying code REMnn *TRN;

b. Following the identifying code, insert a comma;

c. After the comma, insert in the next six (6) characters the dated, in year, month, day (yymmdd) order, planned for the transition or narrowing to occur.

d. If the frequency to be transitioned to is known, insert a comma after the date, followed by the new frequency. Enter this data the same way frequency is entered into the data field FRQ.

e. If the date for the operations on an assignment to transition to another frequency assignment is unknown, but the frequency to be transitioned to is known, enter the frequency data where the date would be entered. When the date is known, the record may be modified to include this data, entering the data as outlined in a through d, above.

Examples:

REM06 *TRN, 050630, M416.225
REM05 *TRN, 030331
REM07 *TRN, M416.225

*ff. Paired Frequency (*PRD)*

This field identifies a repeater station or point-to-point operations using paired transmit or receive frequency, the associated agency serial number and any other information (e.g., repeater input, repeater output) associated with that frequency's assignment. This entry is required for all applications having a station class with the suffix "R" added, meaning the station is to be used primarily as a repeater, and the frequency being applied for is within one of the ranges listed in Section 6.1.2, paragraph 2 or Section 6.1.3, paragraph 2. This entry is also required for any application containing the Circuit Remarks entry "*RPT" (see paragraph 39h, above). For point to point operations this field applies to all frequency bands above 29890 kHz.

(1) Insert the identifying code REMnn, a space, then *PRD followed by a comma.

(2) After the comma, insert the repeater station transmit or receive frequency, followed by a comma. The frequency shall be entered with 4 digits beyond the decimal point (e.g. M39.0125; M166.0000), and shall be preceded by the letter designating the frequency band (e.g. M for mega-hertz)(see Chapter 6, Part 6.2)

(3) After the comma, insert the 10-digit serial number associated with the repeater station receive or transmit frequency assignment. However, if this field is used and multiple assignments for the repeater station frequency, include only one of those serial numbers as a representative of the group.

(4) (Optional) After a comma, insert associated information (e.g., repeater input, repeater output etc.).

Example:

REM01 *PRD,M166.0125,VA 000622,RPT OUT
REM02 *PRD,M39.0250,NASA010101,RPT IN
REM03 *PRD,M166.0000,NASA060001

*gg. Declassification Instructions Comment (*DIC)*

(1) This field is used to describe the event, when after its occurrence, the data field (CLA) Classification would be changed to U-Unclassified, data field (CDD) Declassification Date would be removed from the record, and any data item classified (C) or (S) would be reclassified to (U). (Note: The responsible agency is required to submit a modification transaction to declassify the assignment once the event described in this data field occurs.)

(2) Enter the field code REMnn followed by a space. Following the space enter the code *DIC followed by a comma. Immediately after the comma describe the event that is the basis for declassifying the assignment record.

Example:

REM08 *DIC, DECLASSIFY AFTER MISSILE LAUNCH

40. Serial Replaced (SRS) and Serial Replaced Expiration Date (SEX)

a. General Rules

(1) These two fields may be used to delete from the Government Master File one or more (maximum of nine) existing assignments simultaneously with a NEW or NOTIFICATION Action. If a New or NOTIFICATION Action is intended as a replacement for existing assignments, an entry for each replaced assignment is made in the SERIAL REPLACED (SRS) field and the SERIAL REPLACED EXPIRATION DATE (SEX) field.

(2) The assignment record to be deleted will be automatically converted to a temporary assignment with an expiration date corresponding to the date entered in the SEX field. It will be printed on the FAS agenda immediately following the new or notified record to which it refers. The new or notified action and the assignment to be deleted will appear in the Government Master File until the date entered in the SEX field has passed, at which time the latter will be deleted.

(3) Each entry in the SERIAL REPLACED (SRS) field must have a corresponding entry in the SERIAL REPLACED EXPIRATION DATE (SEX) field.

(4) If no assignment record is to be deleted, these fields shall be left blank.

b. Serial Replaced (SRS) (10 Characters--9 Occurrences)

Enter the identifying code SRSnn followed by the Serial Number of the assignment being replaced as it is shown in the Government Master File (GMF).

Examples: SRS01 AF 761234
SRS09 NASA783456

c. Serial Replaced Expiration Date (SEX) (6 Characters--9 Occurrences)

Enter the identifying code SEXnn followed by the desired date of deletion in year-month-day order. The date shall not exceed one year from the date of the application.

Examples: SEX01 880615
SEX09 880915

41. FOI--Exempt From FOIA (1 Character-1 Occurrence)

This field is used for identifying those assignments determined by the submitting agency's FOIA Officer to be exempt from release in accordance with the provisions of the Freedom of Information Act, 5 U.S.C. 552, as amended. Enter the letter X in this field if the assignment is exempt from release.

42-78. (Reserved)

79. Frequency Assignment Subcommittee (FAS) (72 Characters--5 Occurrences)

The FAS field shall be used to provide information that will not be recorded in the GMF. This field is used for information of value only to FAS Representatives and relevant only while the frequency assignment action remains on the FAS agenda. This data will not be recorded in the GMF.

Examples:

FAS01 THIS IS A RENEWAL OF AN EXISTING AUTHORIZATION.
FAS03 ROUTINE UPDATE. 5-YEAR REVIEW.
FAS01 TELEPHONE ACTION RE-QUESTED.
FAS05 AGA COORD WITH SMITH/NTIA, 8/1/85.

80. Supplementary Details (SUP) (72 Characters-15 Occurrences)

The SUPPLEMENTARY DETAILS (SUP) data field may contain an explanation of the proposed operation and supplemental data as required below.

a. *Experimental Station Classes*: If the application is for an assignment to an experimental station, insert information to further describe the intent or nature of the experimental operation (see Part 6.4).

b. *Canadian Coordination*:

(1) If Canadian coordination is required or desired, any amplifying data to be forwarded to Canada shall be entered in the SUPPLEMENTARY DETAILS in the following format:

(CANCOR . . . .);

Examples:

(CANCOR USE ALONG BORDER IS OCCASIONAL)
(CANCOR REF U.S. SERIAL I8190001)
(CANCOR NOTE 172.9 MHZ, U.S. SERIAL 760001)

The abbreviation CANCOR must immediately follow the initial parenthetic character. Only the data following "CANCOR" and preceding the closing parentheses sign will be forwarded to Canada.

(2) In addition to any other amplifying data, the following information is to be furnished Canada using the procedure in 80.b.(1) above:

(a) If abbreviations have been used in the transmitter and/or receiver Antenna Location fields, and complete spelling is not readily apparent, enter the complete spelling.

(b) If the frequency has been coordinated previously with Canada for use in the same geographic area, insert the U.S. Serial Number of the previous coordination as it appears on the *CAN line in the Circuit Remarks of the GMF assignment being cited.

(c) If an expeditious reply from Canada is necessary, insert EXPEDITIOUS REPLY REQUESTED.

d) If the application is for operations in two or more States along the border and S322 has not been inserted in the NOTES field, insert additional data to inform Canada of the extent to which the frequency will be used.

(e) While an application is Tabled on the FAS agenda during the Canadian coordination process, an agency may use the SUPPLEMENTARY DETAILS (SUP) field to request reconsideration of an adverse comment made by Canada. On the next available SUP line using the format (CANCOR), an agency shall request reconsideration of the Canadian comment and provide rationale for the request. Agencies may not request reconsideration with a frequency change. To change frequency a new application must be submitted.

Examples:

(CANCOR Rqst reconsideration based on 120 kilometer separation)
(CANCOR Rqst reconsideration with antenna changed to 7dB yagi and noting adjacent channel offset of 12.5 kHz)

See Part 9.16 for submitting FAS agenda corrections and changes.

c. Fixed Station and Transportable Transmitting Earth Station Coordination:

(1) If the application is for an assignment to a transportable Earth station in the band 7900-8400 MHz or to a fixed (FX) station in the bands 1710-1850, 2200-2290, 4400-4990, 7125-7250, 7300-7975, or 8025-8400 MHz whereby the requirement involves a communications system consisting of more than two stations that are interconnected (excluding stations to be used for transportable operation--Note S362), and a data plot or coordination contour map was circulated, enter the notation "data plot circulated" or "contour map circulated," as applicable in the Frequency Assignment Subcommittee (FAS) field (see Section 9.2.4 for details).

(2) If a data plot or coordination contour map was not circulated and successful coordination was effected with all agencies concerned, insert a statement to indicate that this coordination determined data plots and/or coordination contour maps were not required.

d. Transportable Receiving Earth Station: If the application is for transportable Earth stations in the band 7250-7750 MHz, insert a statement indicating that power flux density (PFD) at earth surface will not exceed the limits listed in Section 8.2.36.

e. Frequency Diversity: Applications for frequencies to be used in the frequency diversity mode of operation shall contain a statement of justification consistent with the provisions of Section 8.2.25. Frequency diversity applications for each individual radio path shall be cross-referenced by frequency, and the statement of justification shall be included in the SUPPLEMENTARY DETAILS field of each application.

f. Sounder Stations: If the application is for a sounder network or a sounder prediction station, insert a statement indicating that it has been determined no existing authorized ionospheric sounder transmitter is capable of meeting the requirement (see Section 8.2.21).

g. Notification Actions:

(1) For notification under the authority of Part 7.12, insert information to identify the coordination correspondence with the FCC regarding the proposed operation.

(2) If the application is a notification of a telecommunications laser, describe the function and purpose of the operation.

h. Emission Symbol Explanation: If the letter X is used in either of the first, second, or third emission designator symbol(s) (see Section 9.8.2, paragraph 16e(2)(a), (b), and (c)) an explanation of emission characteristics must appear in the Supplementary Details.

i. Separate System Justification: For assignments for land mobile systems that are within 30 km of an existing or planned trunked land mobile system authorized by NTIA, provide the information required under subparagraph 8.2.48a.

j. Classification of Supplementary Details: NTIA compresses this data field in order to preserve total assignment record size, and the information is treated as a single paragraph. Individual marking of separate line occurrences for the purposes of complying with paragraph 39, subparagraphs cc and dd, is not possible. Therefore, if any of the information entered in Supplementary Details is classified, the entire Supplementary Details entry becomes classified.

9.9 USE OF THE CARD FORMAT FOR MODIFICATION, RENEWAL, AND DELETION ACTION

1. The Card Format with the COMMAND CARD "$$MOD" is used only with MODIFICATIONS (see Section 9.7.2, paragraph 12, and below).

2. The Card Format with the COMMAND CARD "$$CHG" is used for the following purposes:

a. MODIFICATION (M)--To apply for the addition, substitution, or removal of one or more of the particulars, other than the frequency, the agency serial number, or the transmitter state/country, of an existing frequency assignment which is in the Government Master File (GMF). No more than 60 data fields of a particular assignment can be modified at one time (see Section 9.7.1, (subparagraph C).

b. RENEWAL (R)--To apply for the extension of the period of a temporary or trial assignment which is in the GMF (see Part 9.6) and to simultaneously update other particulars of the assignment.

c. DELETION (D)--To apply for the cancellation of a frequency assignment and the removal of all its particulars from the GMF.

3. The COMMAND CARD $$CHG may not be used to take action on the AGENCY SERIAL NUMBER, the transmitter STATE /COUNTRY, or the FREQUENCY fields.

9.10 USE OF FIELD CODES

Only the following field codes may be used for actions containing a $$CHG or $$MOD COMMAND CARD. The field code and occurrence number is used to identify the data field(s) which the applicant desires to address (see Section 9.7.1).

Table. Field Codes

Field Title	Field Code		Field Title	Field Code
Action Number	ACN		Receiver Antenna Location	RAL
Receiving Station Call Sign	ACL		Receiver Antenna Longitude	RLG
Bureau	BUR		Receiver Antenna Polarization	RAP
Circuit Remarks	REM		Receiver Antenna Orientation	RAZ
Classification	CLA		Receiver Control	RRC
Date	DAT		Receiver State/Country	RSC
Declassification Date	CDD		* Review Year	RYR
Emission	EMS		Routine	RTN
Expiration Date	EXD		Supplementary Details	SUP
Exempt From Release IAW FOIA	FOI		Station Class	STC
Frequency Assignment Subcommittee	FAS		Time	TME
International Coordination Indicator	ICI		Transmitter Antenna Orientation	XAZ
Missing Data Indicator	MSD		Transmitter Antenna Dimensions	XAD
Net Control	NET		Transmitter Antenna Latitude	XLA
Notes	NTS		Transmitter Antenna Location	XAL
Power	PWR		Transmitter Antenna Longitude	XLG
Power Density	SPD		Transmitter Antenna Polarization	XAP
Receiver Antenna Dimensions	RAD		Transmitter Call Sign	XCL
Receiver Antenna Latitude	RLA		Transmitter Control	XRC
			Type of Action	TYP

*See Annex F and Part 9.15.

Example:

$$CHG I 791882
TYP01 M
DAT01 791105
EMS03 20KF2B

indicates that the applicant desires to change the third emission in the GMF record I 791882 to 20KF2B.

9.11 PREPARATION OF THE CARD FORMAT FOR A MODIFICATION ACTION

1. Before submitting a Modification action, read Parts 9.7 and 9.9.

2. Assignments which have been previously coordinated with the Canadian Department of Communications pursuant to Part 3.4 may be modified without being recoordinated with Canada provided the modification will not increase the probability of harmful interference. If the Modification will increase the probability of harmful interference, the assignment must be re-coordinated with Canada.

3. The deletion of an entry in the EMISSION field, in the POWER field, or in the STATION CLASS field, requires a corresponding deletion be made in the other two fields.

4. Prepare the application for the Routine portion of the FAS agenda, according to the instructions below, when the modification:

-- Does not increase the probability of harmful interference, and
-- Does not extend or delete the expiration date.

Enter RTN01 followed by one of the letters A, M, or R:

-- Enter A if the assignment is in the AAG band (see Section 9.14.1).
-- Enter M if the assignment is in the MAG band (see Section 9.14.2).
-- Enter R if the assignment is neither in the AAG nor MAG bands. The letter R will be automatically entered by the computer in the ROUTINE field if the following conditions are met:

a. the frequency assignment being modified is not within the AAG or MAG bands (see 9.14.1 and 9.14.2); and

b. the existing assignment has or is being modified by adding one of the following:

L192	S035	S348
L197	S160	
L199	S279	

or

c. the following fields are modified, added or deleted either alone or in conjunction only with each other:

DAT	BUR	*AGN	*PRR	XLA[3]
ACN	XRC	*DOC	*JNT	XLG[3]
CLA	TME	*EQT	*CAN	RLA[3]
NET	XCL	*EQR		RLG[3]
RYR	RRC	*EQS		
FOI	ACL			

5. The following card formatting rules apply:

a. Each MODIFICATION requires:

(1) the COMMAND CARD:

$$CHG or $$MOD (Enter the serial number of the assignment being modified as it is recorded in the GMF)

(2) the TYPE OF ACTION (TYP) Card: TYP01

(3) the DATE (DAT) Card:

---

[3] If movement is less than 8 kilometers.

DAT01 (Enter the date (year/month/day) on which the application is prepared. Use numeric characters only; leave no blanks.)

(4) the data field and data being modified.

(a) Insert in the first three spaces the code for the field being modified. The codes are listed in Part 9.10. Insert in the last two spaces the occurrence number for that portion of the field being modified, as entered in the Government Master File. For example, insert EMS02 for the emission shown in the list on the second line of the EMISSION FIELD.

(b) Insert the new data that are to appear in the Government Master File as replacements for those entered under LISTED DATA. Enter the data in the same manner as prescribed in Part 9.8.

(c) If the data are to be deleted from the field being modified, enter the field code and leave the data field blank.

b. All other data fields listed in Part 9.10 may be used at the option of the applicant.

(1) Agency Action Number (ACN) (10 Characters--1 Occurrence) The format of the entry shall be identical to the Agency Serial Number (SER) as specified in Section 9.8.2.

(2) Supplementary Details (SUP) (72 Characters--15 Occurrences)

Agencies will review the SUPPLEMENTARY DETAILS for each assignment being modified to insure the data are correct and current. Comments relating to routine modifications (change of Bureau, Net, equipment, etc.) are not required and must be removed from the record. Agencies shall not reiterate the modification action in SUP. However, enter comments if the modification is to an assignment that must be RE-COORDINATED with Canada. Insert (CANCOR REFERENCE US SERIAL XXXXX followed by information to rationalize the re-coordination).

Example: SUP01 (CANCOR REFERENCE US SERIAL I8031849. INCREASE POWER.)

9.12 PREPARATION OF THE CARD FORMAT FOR A RENEWAL ACTION

1. Before submitting a RENEWAL action, read Section 9.7.1 and Part 9.9.
2. The following card formatting rules apply:

a. Each RENEWAL action requires:

(1) the COMMAND CARD:

$$CHG (Enter the serial number of the assignment being renewed as it is recorded in the GMF)

(2) the TYPE OF ACTION (TYP) Card: TYP01 R

(3) the DATE (DAT) Card:

DAT01 (Enter the date (year/month/day) on which the application is prepared. Use numeric characters only; leave no blanks.)

(4) the DATA CARD EXD: EXD01 880615

For the renewal of temporary assignments, the new date is not to exceed five years hence.

(5) Updates to other particulars of the assignment, e.g., REM06 *SYS, SURVEY

b. The ROUTINE (RTN) data field may not be used for renewal applications unless the assignment contains at least one of the following Notes: L192, L197, L199, S035, S160, S279, S348.

9.13 PREPARATION OF THE CARD FORMAT FOR A DELETION ACTION

1. Before submitting a DELETION action, read Section 9.7.1 and Part 9.9.
2. The following card formatting rules apply:

a. Each DELETION action requires:

(1) the COMMAND CARD:

$$CHG (Enter the serial number of the assignment being deleted as it is recorded in the GMF)

(2) the TYPE OF ACTION (TYP) Card: TYP01 D

(3) the DATE (DAT) Card:

DAT01 (Enter the date (year/month/ day) on which the application is prepared. Use numeric characters only; leave no blanks)

b. Agency Action Number (ACN) may be submitted on a DELETION action.

9.14 APPLICATIONS CONSIDERED BY THE AERONAUTICAL ASSIGNMENT GROUP (AAG) AND THE MILITARY ASSIGNMENT GROUP (MAG)

9.14.1 Applications Considered by AAG

1. The Aeronautical Assignment Group (AAG) is responsible for engineering AAG frequency assignments and determining whether or not applications for frequency assignment action in the following bands should be approved by NTIA.

190-285 kHz
285-435 kHz*
510-535 kHz*
74.800-75.200 MHz
108.000-121.9375 MHz
123.5875-128.8125 MHz
132.0125-136.000 MHz
328.600-335.400 MHz
978-1020 MHz inclusive
1030 MHz
1031-1087 MHz inclusive
1090 MHz
1104-1146 MHz inclusive
1157-1213 MHz inclusive
5000-5250 MHz

* In these bands only applications for stations in the Aeronautical Radionavigation Service (see Table A, Section 6.1.4) shall be sent to the Chairman of the AAG.

2. For frequency assignment proposals in the above bands, agencies shall transmit UNCLASSIFIED applications to NTIA via the dial-up telephone microcomputer system. Non-Federal applications may be sent directly to the Chairman, AAG, or directly to the NTIA at the option of the FCC FAS Representative; additionally, the requestor's point of contact must be included on the application.

3. Exceptionally, the following types of applications for assignment in the above bands shall be prepared and processed in accordance with the provisions of Parts 9.3 through 9.13.

a. those which are classified,

b. those which must be referred to the IRAC (see Part 10.9),

c. those for space radiocommunication, and

d. those known to be controversial.

4. Frequency assignment proposals in the above listed bands must be submitted for engineering analysis and review to FAA headquarters or the appropriate FAA regional spectrum management office. The applicable Coordination Note must be added to the Notes Field (NTS) on each proposal. (See Annex A and Annex D, Table 1). Additionally, the applicant may indicate the date of coordination and the FAA point of contact, and correspondence identification, if applicable, in the FAS data field.

5. After technical evaluation, coordination, and other appropriate action, the Chairman of the AAG as well as other AAG members shall vote their decision via the Automated Voting Procedures, Section 9.16.2.

9.14.2 Applications Considered by MAG

1. The Military Assignment Group (MAG) is responsible for determining whether or not applications for frequency assignment action in the bands 225.0-328.6 and 335.4-399.9 MHz should be approved by NTIA.

2. For assignment actions involving these bands, agencies will transmit UNCLASSIFIED applications to NTIA via the dial-up telephone microcomputer system.

3. Exceptionally, the following types of applications shall be prepared and processed in accordance with the provisions of Parts 9.3 through 9.13:

a. those which are classified SECRET,

b. those which must be referred to the IRAC,

c. those involving transmissions to or from space, and

d. those known to be controversial.

4. After technical evaluation, coordination (if necessary), and other appropriate action, the Chairman of the MAG as well as other MAG members shall vote their decision via the Automated Voting Procedures, Section 9.16.2.

9.15 OTHER GOVERNMENT MASTER FILE (GMF) FIELD CODES

The following field codes are presented for information. Only the field code RYR is addressable in a frequency assignment action (see Sections 9.10 and 9.11 and Annex F.)

a. *AUD--AUTHORIZATION DATE (6 Characters-1 Occurrence)*

The date on which the assignment was originally authorized. The format used in YYMMDD.

b. *AUS--AUTHORIZATION NUMBER (8 Characters)--10 Occurrences)*

(1) This unique number is generated internally by the agenda preparation programs each time an action on a frequency assignment appears on the Frequency Assignment Subcommittee's (FAS) agenda. This is the FAS docket (DKT) number of the action on the FAS agenda.

(2) Up to ten entries (occurrences) are retained in the assignment record in the GMF. The first entry will always be the most current authorization number. If there is more than one entry, the *ORIGINAL* authorization number will always be retained as the second entry. When the AUS fieldbecomes full (10 occurrences), more room is created by dropping the older, *NON-ORIGINAL*, entries and moving all others down.

c. *MBR--AGENCY MEMBERSHIP (1 Character--1 Occurrence)*

This field designates agency membership in the Frequency Assignment Subcommittee (FAS) community.

M Voting Member of the FAS

N Non-Voting/Non-Member of the FAS. NTIA represents these agencies in the FAS.

O Non-Voting/Non-Member of the FAS. Other FAS Member agencies represent these agencies in the FAS.

X Non-Voting/Non-Member of the FAS. Canadian and Mexican records in the GMF are currently identified by the letter X.

d. *RVD--REVISION DATE (6 Characters-1 Occurrence)*

The date on which the frequency assignment was most recently revised. The format used is YYMMDD.

e. *RYR--REVIEW YEAR (2 Characters--1 Occurrence)*

This field is used ONLY when no other changes are required (all parameters as listed are up-to-date) and it is necessary to indicate a review of an assignment has been completed (see Annex F). (If any change is being submitted to any character of any data field, the RYR need not be submitted.) The RYR field is not retained in the assignment record-it resets the date in the RVD field, which is retained in the GMF.

9.16 FAS AGENDA ACTIONS

9.16.1 FAS Votes and Agenda Corrections Directives

1. Directives are changes to a field(s) of a frequency application proposal on the FAS agenda. Directives shall be transmitted to the NTIA/SSD Automated Data Capture System via the telephone dial-up electronic data transfer method.

2. FAS agenda DIRECTIVES shall be prepared in card format, and the following rules apply:

a. A $$DIR COMMAND CARD and an AGC01 card are both required for each DIRECTIVE package.

(1) If the DIRECTIVE(s) applies to a single application, or to multiple applications NOT in numerical sequence by Docket Number (DKT), the Command Entry must be on the first line. Enter $$DIR, a space, then the docket number (DKT) of the application being addressed.

(2) If an identical DIRECTIVE(s) applies to a series of applications in numerical sequence by docket number, on the first line enter ENDREQ RANGE, a space, the FIRST docket number of the sequence, a slant bar, then the LAST docket number of the sequence. On the second line enter $$DIR, a space, then the FIRST docket number of the sequence.

(3) Enter the AGC01 card into the DIRECTIVE package at any place following the $$DIR card. Enter AGC01, a space, then the agency abbreviation of the agency submitting the DIRECTIVE package (see Annex G, Part 1).

b. DATA ENTRIES will follow the procedures specified in Section 9.7.2, paragraph 3b and as outlined in paragraphs 3 and 4 below.

c. Comments concerning an FAS agenda docket which the applicant or the NTIA/SSD wishes to make a part of the FAS agenda record, but not a part of the GMF record, may be entered using the field mnemonic FAS (see Section 9.8.2, paragraph 79).

3. Changes to applications on the FAS agenda may be made by submission of DIRECTIVES. However, no more than 99 data fields may be changed and the following rules apply:

a. Serial Numbers (SER) may never be changed.

b. The FREQUENCY (FRQ) field may not be changed on applications undergoing Canadian coordination. To change FRQ a new application must be submitted. (A new agency serial number is required unless the original application is withdrawn first.)

c. If the application is a MODIFICATION or RENEWAL no change may be made to the FREQUENCY (FRQ) and TRANSMITTER STATE/COUNTRY (XSC) fields.

d. If the application is a DELETION, no changes are allowed.

e. Changes to any field not listed in 3f, below, will result in the application being redistributed to the FAS representatives for additional review. All agencies, except the host, must vote on the redistributed application. A redistributed application previously TABLED by an agency other than the host will REMAIN TABLED until the tabling agency votes to accept (see paragraph 4, below).

f. The following fields may be changed without causing redistribution or rejection:

(1) ACL, ACN, BUR, *DFI, ICI, *IFI, *MFI, *PRD, NET, RAL, RAP, RAZ, RRC, RYR, SPD, SUP, XCL, XRC, VOT, *AGN, *CAN, *DOC, *EQT, *EQR, *EQS, *EBW, *SBW, *EGN, *SGN, *ENT, *RNT, *SNT, *JNT, *MEX, *ORB, *RPT, *USA.

(2) *ESB, *ESR, *EST--ONLY if added as a new occurrence.

(3) EXD--ONLY if changed from blank to numeric, or if the change decreases numeric value in the application.

(4) NTS--ONLY if added as a new occurrence and does not include a new entry of S148, S164, S288 or S322.

(5) XAL--However, if the FAS agenda item is a MODIFICATION action and the XAL was changed on initial submission, it may NOT be changed back to the ORIGINAL XAL via a directive. (If the agency desires to do this, the MODIFICATION or RENEWAL action must be withdrawn from the agenda and resubmitted at a later date with the correct XAL.)

(6) FAS--However, if changes are necessary, resubmit the entire FAS field with the changes incorporated.

4. VOTE DIRECTIVES shall be submitted using the mnemonic VOT with any two digit occurrence number, however 00 (zero zero) is recommended. A VOTE is a four part field - THE FIRST THREE MUST ALWAYS BE COMPLETED.

a. The first part consists of a single letter followed by a comma. Use:

(1) the letter A to accept the application;

(2) the letter T to table the application;

(3) the letter R to withdraw the application (only the submitting (host) agency or NTIA may vote R);

b. The second part consists of the abbreviation (see Annex G) of the FAS member agency submitting the VOTE DIRECTIVE followed by a comma.

c. The third part shall always be the five (5) digit number found in RVS for the application being voted. To insure votes are applied to the most current version of an application, votes that do not match the number found in RVS by NTIA's automated program will not be processed and registered.

d. IF PART FOUR IS USED, a COMMA must be included immediately AFTER THE SECTION NUMBER in part three. The fourth part is a 59 character field for agencies to use for comments concerning the application. As a minimum, agencies tabling an application shall include comments with reason for tabling, or provide a name and telephone number for further contact.

Examples:

```
$$DIR I8900006
AGC01 NTIA
VOT00 T,NTIA,00025,CONTACT JOHN SMITH,PH 202-202-2020

ENDREQ RANGE I8900290/I8900310
$$DIR I8900290
AGC01 BBG
VOT00 A,BBG ,00315
```

```
$$DIR I8900330
AGC01 BBG
VOT00 R,BBG ,00315,TO RESUBMIT

$$DIR I8900331
AGC01 BBG
REM02 *AGN,NEW INFO
REM03 *EQS,LMS
```

9.16.2 Agency Comments and Voting Procedures

1. CONDITIONAL comments, called Minute Notes, may be recorded on frequency assignment actions (see Section 9.8.2, Paragraph 39). These comments will not duplicate conditions specified in a Record Note (see Annex A) or a Footnote to the Table of Frequency Allocations (see Section 4.1), and will be submitted in card format as a DIRECTIVE in accordance with Section 9.16.1 and below.

a. Directives adding Minute Notes to an assignment action must be submitted only by the host agency. An agency wishing to record Minute Notes on another agency's application must submit a VOTE DIRECTIVE to table the application, and include comments as to the reason for the tabling action. Agencies may only vote to table another agency's application if harmful interference is anticipated, there are technical errors in the application that affect the electromagnetic environment or the request violates NTIA radio spectrum policy. If an agency tables an application due to a violation of NTIA radio spectrum policy, the tabling agency must cite the specific policy violated (not to include Chapters 6 or 9). The Frequency Assignment Branch (FAB) shall review the policy issue and report its decision to the FAS. Agencies are encouraged to communicate their concerns and attempt resolution prior to tabling an application, particularly where similar tabling actions may apply to many applications. Furthermore, agencies are encouraged to remove their tabling action promptly once the application has been corrected or the issue resolved.

b. Minute Notes that will exceed eight lines of the CIRCUIT REMARKS field must be submitted by letter to the Secretary, FAS. The Secretary, FAS, will assign an FAS Administrative (ADM) Docket number to the comments. The FAS ADM Docket number will then be recorded in the Circuit Remarks field of the affected application by the NTIA/SSD.

2. Frequency assignment actions on the FAS agenda will not normally be approved by NTIA until all voting is unanimous, or until 9 workdays after the Initial Processing Date (IPD) for NEW proposals and MODIFICATIONS, 5 workdays after the IPD, for routine MODIFICATIONS, and 1 workday after the IPD for DELETES. For exception for AAG, and Canada, see 2c below. All voting shall be in accordance with the following:

a. FAS member agencies MAY vote either to accept (A) or table (T) another agency's applications, and MAY vote to withdraw (R) their own applications. However, an agency MAY NOT vote to withdraw (R) another agency's applications.

b. FAS members that represent other agencies are considered the host and need not vote on the applications they submit on behalf of the represented agency, except to vote a withdrawal (R).

c. Applications, except those within the AAG area of responsibility or those from Canada and Mexico, will be automatically approved by NTIA 9 workdays after the IPD for NEW proposal and MODIFICATIONS 5 workdays after the IPD, and 1 workday after the IPD for DELETES unless a vote to TABLE has been recorded.

(1) Applications within the AAG area of responsibility, which have not been voted ACCEPT by the Chairman of the AAG within 9 workdays of the IPD will be automatically TABLED to the AAG Chairman.

(2) Applications from Canada and Mexico will be automatically approved by NTIA after 30 calendar days of the IPD unless a vote to TABLE has been recorded.

9.16.3 Agency Votes and Directives on Canadian and Mexican Frequency Assignment Proposals

1. Agency votes and directives on Canadian and Mexican frequency assignment proposals on the FAS agenda will be prepared in accordance with 9.16.1. NTIA's vote represents a vote on behalf of the non-member agencies.

2. Agencies may only vote A to ACCEPT, or T to TABLE. Agencies may not make directive changes to Canadian or Mexican proposals except to add a *USA entry to the Circuit Remarks (REM) field or revise their own *USA comment.

3. Only Canada or Mexico may vote R to REJECT/WITHDRAW their own proposals. NTIA may vote to REJECT a Canadian or Mexican proposal which is TABLED with an HIA comment, but only after some mutually agreed upon period of time with no resolution of the problem indicated by the HIA comment.

4. Vote A if the proposal is No Harmful Interference Anticipated - NHIA

```
$$DIR I9102222
AGC01 NASA
VOT00 A,NASA,00690,NHIA
```

5. If the proposal is NHIA but you wish to add some additional information or make a noting comment, vote A and use the acronym NHIC in the comment (VCM) portion of the vote card. Follow the vote card with an entry for the Circuit Remarks field (REM) using the identifier *USA for the comment. If the vote is NHIC and there is no *USA entry for Circuit Remarks, the reply will go to Canada or Mexico as NHIA. An agency card is mandatory in order to connect the appropriate agency with the associated remarks.

```
$$DIR I9102223
AGC01 J
VOT00 A,J  ,00690,NHIC
REM05 *USA,NHIC, Noting use of M163.4375,U.S.
REM06 *USA,NHIC,serial I8701234, Detroit, MI.
```

6. Vote T for Harmful Interference Anticipated -HIA. Use HIA in the VCM portion of the vote card. Follow the vote card with an entry for REM using the identifier *USA for the comment. An agency card is mandatory.

```
$$DIR I9102224
AGC01 AR
VOT00 T,AR ,00690,HIA
REM03 *USA,HIA,U.S. serial I8302345,  M169.25,
REM04 *USA,HIA,Detroit, MI.
```

9.16.4 Coordination and Referral of Applications for Frequency Assignment Action

1. In accordance with the agreement shown in Section 3.4, the NTIA's Spectrum Services Division (SSD) coordinates certain applications for frequency assignment action with the Canadian Department of Industry (Industry Canada). When it is determined that an application must be coordinated with Canada, the NTIA/SSD will table the application pending comments from Canada concerning the coordination.

2. By applying for a frequency assignment an agency coordinates with other agencies which might be affected by the applicant's use of the frequency through the FAS agenda process. In the event unfavorable coordination comments are received either before or subsequent to submission of an application for the FAS agenda, applicants may request the application be referred to a meeting of the FAS for deliberation.

a. To request referral, the host shall include a request for referral using the VOTE directive; the host shall vote to table and shall use only the words REFER TO FAS in the comments portion of the Vote directive (see 9.16.1 above).

b. If referral is requested, the host should also submit a letter to the Secretary, FAS with a copy of all unfavorable comments attached, explaining in detail why the application should be favorably considered. The FAS will deliberate the applications and recommend a course of action.

3. An item on the FAS agenda shall be referred to the IRAC for consideration:

a. Upon the specific request of any FAS member agency or the FAS Chairman;

b. if it cannot be resolved solely on the basis of technical considerations;

c. if it is a matter for which policy has not heretofore been established;

d. at the specific request of the IRAC; or,

e. if specifically directed by other Parts of this Manual.

4. The FAS shall take no action on an item referred to the IRAC until advice has been received from the IRAC. When referring items to the IRAC, the FAS should provide all pertinent information, including:

a. A statement of the problem;

b. facts bearing on the problem, including the background;

c. a list of agencies that favored approval and those that favored disapproval; and,

d. a brief statement of the basis given by those agencies that objected to approval of the item.

(Last Page in Chapter 9)

Chapter 10

Procedures for the Review of Telecommunication Systems for Frequency Availability, Electromagnetic Compatibility (EMC), and Telecommunications Service Priority for Radiocommunications (TSP-R)

10.1 GENERAL

10.1.1 Avoiding Interference

Federal agencies planning the use of, conducting experiments relating to, or developing and procuring telecommunication systems requiring the use of radio frequencies shall take all reasonable measures to ensure that such systems will neither cause nor receive harmful interference to or from other authorized users when placed in their intended operational environments. In planning telecommunication systems within the scope of this procedure, federal agencies shall develop systems for operational use in accordance with the applicable portions of the National Tables of Frequency Allocations and the provisions of this Manual, unless an exception is recommended by the Spectrum Planning Subcommittee (SPS) and approved by NTIA.

10.1.2 Satisfying OMB Circular A-11

OMB Circular No. A-11 specifies in Section 33.4: "You must obtain a certification by the National Telecommunications and Information Administration, Department of Commerce that the radio frequency required can be made available before you submit estimates for the development or procurement of major radio spectrum-dependent communications-electronics systems (including all systems employing space satellite techniques)". NTIA certification of spectrum support can be obtained using the procedures in this chapter. The matter of preparation and submission to OMB of budget estimates for federal systems is covered in Section 8.2.5.

10.1.3 SPS Review of New Systems

To assist federal agencies in meeting the above responsibilities and to support the NTIA and the IRAC in the management of radio spectrum resources for the satisfaction of federal requirements, and in the national interest, these procedures provide for the review of certain new federal telecommunication systems and subsystems by the SPS, at a number of the stages of their evolution, prior to the assignment of frequencies. Such review will, as appropriate, require an examination of the existing systems in the frequency band(s) being considered.

10.1.4 Administering the Telecommunications Service Priority for Radiocommunications (TSP-R) System

Executive Order 12472, April 3, 1984, specifies in Section 2 (c)(3) that: "The Director of the Office of Science and Technology Policy or his designee shall advise and assist the President in the administration of a system of radio spectrum priorities for those spectrum dependent telecommunications resources of the Federal Government which support national security or emergency preparedness functions." As the designee, NTIA, with advice from the Emergency Planning Subcommittee (EPS), reviews National Security and Emergency Planning (NSEP) spectrum dependent systems and assigns the appropriate TSP-R (spectrum use priority).

10.1.5 FCC Participation

Full participation of the FCC in these procedures, for the review of federal systems intended for operation in bands of mutual federal/non-federal interest, occurs through the normal FCC liaison representation on the IRAC and its subcommittees.

10.2 DEFINITIONS

10.2.1 Telecommunication System

A telecommunication system, for the purpose of this procedure, is a combination of facilities, stations, or circuits intended to perform an information transfer function by the use of the radio spectrum, e.g.:

a space station and its associated earth stations for provision of meteorological information;

a combination of aeronautical stations for communication support of air traffic control;

an interconnected network of fixed stations;

a combination of fixed and land mobile stations intended to provide communication support for law enforcement or protection activities on a local or area-wide basis;

a combination of facilities intended to provide a radionavigation service; or

a combination of facilities intended to provide a radiolocation (radar) service.

10.2.2 Telecommunication Subsystem

A telecommunication subsystem, for the purpose of this procedure, is a combination of facilities, stations, or circuits intended to provide telecommunication support to a broader functional telecommunication entity (e.g., the surveillance portion of an air defense system or an avionics package of a nomenclatures aircraft).

10.2.3 Major Terrestrial System or Subsystem

A major terrestrial system or subsystem is a telecommunication system or subsystem that does not involve the use of satellites or spacecraft, and which may have significant impact on existing or potential future use of the portion of the radio frequency spectrum in which it is intended to operate, taking into account systems of the same radio service and those of any other radio service with which the spectrum in question is shared.

10.2.4 Major Modification

A major modification is any change of the technical or operational characteristics of an existing telecommunication system or subsystem which may have significant impact on existing or potential future use of the portion of the radio frequency spectrum in which it is intended to operate, taking into account systems of the same radio service and those of other radio services with which the spectrum in question is shared.

10.2.5 System Review

The system review is a procedure used by the SPS to develop recommendations on behalf of the IRAC for the Deputy Associate Administrator, Office of Spectrum Management of NTIA, regarding certification of spectrum support for telecommunication systems or subsystems coming within the scope

of this chapter (see Part 10.2). A system can be reviewed at four stages as it matures into an operational status. These are:

a. Stage 1, Conceptual: The initial planning effort has been completed, including proposed frequency bands and other available characteristics;

b. Stage 2, Experimental: The preliminary design has been completed, and radiation, using such things as test equipment or preliminary models, may be required;

c. Stage 3, Developmental: The major design has been completed, and radiation may be required during testing; and

d. Stage 4, Operational: Development has been essentially completed, and final operating constraints or restrictions required to assure compatibility need to be identified.

(NOTE: The stages of review are discussed in greater detail in Section 10.4.1.)

10.2.6 Telecommunications Service Priority for Radio (TSP-R) Conflict

A TSP-R conflict occurs when two or more NSEP systems having the same level of TSP-R request spectrum support for the same location and operate in the same or overlapping frequency bands.

10.2.7 Notification of Transportable AWS, Cell and PCS Systems in Selected Bands

Agencies planning to procure transportable Advanced Wireless Service (AWS), Cellular, and Personal Communications Services (PCS) Systems, including Cell-On-Wheels (COW) and Cell-On-Light Truck (Colt) systems, which operate in the bands 698-758, 775-788, 805-806, 824-849 MHz, 901-902 MHz, 930-931 MHz, 940-941 MHz, 1710-1755 MHz, 1850-1990 MHz, and 2110-2155 MHz are required to obtain certification of spectrum support from NTIA, in accordance with Section 8.2.5 of the NTIA Manual. Requests for spectrum certification of such systems shall be submitted for review by the Spectrum Planning Subcommittee (SPS) and shall contain the following information:

a. Stage of Review: Indicate the stage of review requested.

b. Responsible Organization Entity and Point-of-Contract: Provide the name of the bureau, program office, or other organization entity responsible for the field-level deployment and management of the system, including a telephone point-of-contract.

c. Equipment Identification: Name of the manufacturer of the equipment and the name or model number of the specific equipment.

d. FCC Certification Identification Number(s): Provide the FCC ID Number(s) of all transmitters in the system.

e. Number of Units: Number of individually deployable transportable units that will be operating cooperatively and simultaneously within the deployed system.

f. Frequency Band(s): Identify the frequency band(s) in which the subject system is to operate.

g. Power: Transmitter power of each unit in the deployable system, in watts.

h. Emission Designator(s): Specify the emission designator(s) for transmitters within the system.

i. Rationale for the Procurement of the System: Submit justification for procurement of the system and an explanation of the plans and conditions under which the system would be deployed, including projected arrangements or constraints related to sharing of the system among other federal agencies.

j. Federal agency agreement with non-federal entity: Provide a summation of agreements established to facilitate the operation of the system.

10.3 SCOPE OF PROCEDURE

10.3.1 Applicability and Limitations

This procedure is applicable to systems and subsystems as defined in Part 10.2. It shall be limited to:

a. New telecommunication systems or subsystems, and major modifications to existing systems or subsystems, involving the use of satellites or spacecraft;

b. New major terrestrial systems or subsystems, and major modifications to existing systems or subsystems;

c. Such systems or facilities as may be referred to the SPS on a case-by-case basis by the NTIA, the IRAC, the FAS, or a cognizant federal agency. Such referral may result from factors of system cost or importance, or follow from estimates of unusual potential impact on other spectrum uses.

10.3.2 Experimental Projects

Experimental projects are included in this procedure.

10.3.3 EW/ECM Threat Simulators

EW/ECM threat simulators are generally required by their mission to operate in bands not allocated to appropriate radio services. Such operations usually utilize special one-of-a-kind or limited sets of equipment. They usually operate at military installations specified in Parts 7.11 and 7.17. Operations are in accordance with Part 7.14. EW/ECM threat simulator frequency assignments are exempt from the provisions of Chapter 10 of the Manual. This does not preclude the review of EW/ECM threat simulators by the IRAC.

10.3.4 Individual Stations, Links, or Networks

An individual radio station, an individual point-to-point radio link, or an individual network in the mobile radio service, any of which is to become a part of an existing identified telecommunication system or subsystem, for example, will normally not be considered for the purpose of this review procedure. Application and plans for such individual stations, radio links, and services will be reviewed by the SPS only upon direct referral for cogent reasons such as given in Subsection 10.3.1.3.

10.3.5 Individual Components

An individual component of a system or subsystem, as defined in Part 10.2, will normally not be considered for the purpose of this review procedure.

10.3.6 Federal Use of the Band 220-222 MHz

Nationwide systems using the 2 designated, exclusive federal nationwide 5-channel blocks and local systems operating on the channels shared with non-federal users in the band 220-222 MHz are included in this procedure. Detailed equipment characteristics of systems that have been type-accepted by the FCC or already received by the SPS will normally not be considered for the purpose of this review procedure. However, a list of all base stations (geographic coordinates when known and site names), with antenna heights, effective radiated power, and dates of construction and bringing into use for each nationwide and non-nationwide system shall be provided to the Spectrum Planning Subcommittee for review. Justification of any implementation dates more than 1 year after the requested date of Stage 4 Certification of Spectrum Support should be included for non-nationwide systems.

10.3.7 Non-Licensed Devices

Federal policy for non-licensed devices is covered in Parts 7.8 and 7.9 and such devices will normally not be considered for the purpose of this review procedure. Plans or proposals to operate non-licensed devices in space, however, shall be submitted to the SPS for record (this information should be submitted via a short memorandum and include the frequency bands, Part 15 FCC ID number if applicable, and how the equipment will be used). Agencies can request that information on a non-licensed device, regardless of whether it is to be used in a terrestrial application or in space, shall included a justification for SPS consideration of such a device.

10.3.8 Spectrum Support for Use of Federal Fixed Ultrawideband Systems Not Intended for Operation under Parts 7.8 or 7.9

Federal agencies desiring to deploy fixed UWB systems that do not conform to Parts 7.8 or 7.9 shall request spectrum support in accordance with Chapter 10. In response to spectrum support requests for such systems, NTIA, with the assistance of the SPS, will, considering the frequency range of operation, develop a list ("List") of federal systems that must be considered when evaluating the compatibility of the proposed UWB use. NTIA will use the analysis method provided in NTIA Special Publication 01-43, *Assessment of Compatibility between Ultrawideband Devices and Selected Federal Systems*, as the basis to develop coordination trigger distances for each of the federal systems on the List. In developing the coordination trigger distances, NTIA may, as necessary, also take into consideration other UWB application-specific factors (e.g., aggregate interference). NTIA will evaluate the intended location of the proposed UWB system in terms of these coordination trigger distances with respect to any federal operations related to systems on the List. If the proposed UWB location falls outside of the established distances, then the application will receive spectrum support. If its location falls within the established distances, then the requesting agency will have to work with the affected agency or agencies. As part of this effort, measurements or more detailed analyses, performed in cooperation with the affected agency or agencies, may be required. Such measurements or analyses may demonstrate, through consideration of additional technical factors or system characteristics, that the proposed UWB system is compatible with authorized systems on the List or may be operated at a distance less than the coordination trigger distance. Such measurements or analyses may require the support of the potentially impacted agency or agencies, including making the potentially impacted system or systems available for measurements. Where the measurements or analyses show compatibility, NTIA will grant spectrum support. Furthermore, any measurements or analyses used to establish compatibility will become a resource to be considered in future spectrum support assessments for the supported UWB system at other locations.

10.4 STAGES OF REVIEW AND SCHEDULING

10.4.1 Stages of Review

1. *Stage 1, Conceptual*: Certification of spectrum support for telecommunication systems or subsystems at Stage 1 provides guidance on the feasibility of obtaining certification of spectrum support at subsequent stages. Those systems or subsystems that have a major impact on spectrum usage as defined by the user agencies, IRAC, or NTIA, especially those that use new technological concepts or use existing technology in significant new ways, should be submitted. The guidance provided will indicate any modifications, including more suitable frequency bands, necessary to assure conformance with the National Table of Frequency Allocations and the provisions of Chapter 5.

2. *Stage 2, Experimental*: Certification of spectrum support for telecommunication systems or subsystems at Stage 2 is a prerequisite for NTIA authorization of radiation in support of experimentation for systems that are subject to these procedures (see Part 10.2). It also provides guidance for assuring certification of spectrum support at subsequent stages. Certification at Stage 2 may be requested for test equipment, modified operational equipment, or initial design models that can be used to determine which of several frequency bands or which of several proposed equipment configurations should be selected for continued investigation.

3. *Stage 3, Developmental*: Certification of spectrum support for telecommunication systems or subsystems at Stage 3 is a prerequisite for NTIA authorization of radiation in support of developmental testing for systems that are subject to these procedures. It also provides guidelines for assuring certification of spectrum support at Stage 4. At this point, the intended frequency band will normally have been determined and certification at Stage 3 will be required for testing of proposed operational hardware and potential equipment configurations.

4. *Stage 4, Operational*: Certification of spectrum support for telecommunication systems or subsystems at Stage 4 is a prerequisite for NTIA authorization of radiation from a station with an operational station class (i.e., other than experimental) for systems that are subject to these procedures. Tracking, telemetry, and telecommand operations for satellite networks shall have NTIA Stage 4 certification of spectrum support before the launch of the spacecraft (see Section 8.2.53). Stage 4 certification provides restrictions on the operation of the system or subsystem as may be necessary to prevent harmful interference.

10.4.2 Scheduling of Reviews

Systems or subsystems falling within the scope of this chapter shall be referred to the SPS in sufficient time to permit guidance to be developed by SPS and NTIA and applied by the agency. Routine system reviews can be typically completed and spectrum support guidance can be provided within two to six months from the date of submission to SPS. The submitter shall consider this time period and the provision of Subsection 10.5.3.1 requiring the FAS to withhold frequency assignments until the assignment particulars conform to the spectrum support guidance. For space systems, the submitter shall also consider the time requirements for international processing of advance publication, coordination, notification, and agreement documents.

10.5 RESPONSIBILITIES

10.5.1 Spectrum Planning Subcommittee (SPS)

1. In its system reviews, the SPS shall give consideration to:

a. system compliance with prevailing spectrum management policy, allocations, regulations, and technical standards (Federal, National, and International);

b. the predicted degree of EMC between the proposed system and the electromagnetic environment; and,

c. the possible need for and evaluation of the results of prototype EMC testing.

2. Upon assessment of a proposed system or subsystem, considering these criteria and any other pertinent factors, the SPS will make recommendations with supporting documentation to NTIA with an information copy to the IRAC, for:

a. approval of spectrum support for the system at its proposed stage of development, without qualification; or

b. approval of spectrum support subject to stated limitations or to modification of the proposed system; or

c. approval of spectrum support subject to limitations or modifications to systems already in the band; or

d. approval of spectrum support subject to submission of information for advance publication, agreement of affected foreign administrations, notices for coordination, and notification of frequency assignments for unclassified space systems, as appropriate, under the provisions of Articles **5**, **9** and **11** of the ITU Radio Regulations; or

e. disapproval of spectrum support.

3. The SPS will refer cases when the affected agencies are unable to reconcile specific points of potential EMC conflict to the IRAC for resolution.

10.5.2 Space Systems Subcommittee (SSS)

1. The SSS shall review the data furnished by federal agencies regarding the advance publication, agreement with affected administrations, and coordination and notification of frequency assignments for space telecommunication systems under the provisions of Articles **5**, **9** and **11** of the ITU Radio Regulations. The SSS shall give consideration to:

a. the conformance of the system to the provisions of the ITU Radio Regulations and applicable Radiocommunication Bureau (BR) Circular Letters;

b. the identification of those countries from whom agreement must be obtained under the provisions of the ITU Radio Regulations; and

c. the identification of those countries with whom the system must be coordinated under the provisions of the ITU Radio Regulations.

2. The SSS shall also review the correspondence furnished by the Radiocommunication Bureau (BR) and by other countries regarding proposed space telecommunication systems in accordance with the ITU Radio Regulations. The SSS will estimate the impact of foreign space systems on existing and planned federal space and terrestrial telecommunication systems and will develop appropriate replies. Information regarding foreign space systems that operate in bands shared with U.S. terrestrial stations will be furnished to the SPS for comment when it is appropriate.

3. Documents which have been approved by the SSS shall be coordinated with the Deputy Associate Administrator, Office of Spectrum Management, and provided to the FCC Liaison Representative for transmittal to the Radiocommunication Bureau (BR) and any concerned foreign countries.

10.5.3 Frequency Assignment Subcommittee (FAS)

1. The FAS shall not recommend the assignment of frequencies to stations in systems that are subject to these procedures until notice is received that frequency support for the system has been certified. The particulars of the assignments shall conform to the terms of the system approval. Assignment applications for such stations received in the FAS prior to system review shall be tabled until the appropriate stage of the system review procedure has been completed. The FAS shall inform the SPS of this action.

2. The FAS may recommend frequency assignment action for (a) additional stations and (b) the modification of assignments to stations in existing systems or systems approved under this procedure, provided the operations resulting from the assignment action will have only minor local effect upon the electromagnetic environment.

3. The FAS shall place emphasis on the careful review of applications involving sharing of the same frequency bands by terrestrial and space services. When necessary, the FAS may recommend to IRAC that further EMC analysis by NTIA, or other cognizant agency, be completed prior to assignment action. Any matters that cannot be resolved, and those applications for which approval could result in major effects on the future use of the frequency band concerned, shall be referred to the IRAC.

10.5.4 Technical Subcommittee (TSC)

The TSC and its working groups shall provide information from the ongoing programs in standards, criteria for spectrum sharing, propagation, trade-offs among telecommunication techniques, radio noise and interference environments, side effects of spectrum use, and federal-wide EMC capability. In addition, the TSC shall be guided in its work, scope, and priority by requirements identified by the IRAC for support of EMC reviews underway and expected in accordance with these procedures.

10.5.5 Emergency Planning Subcommittee (EPS)

The EPS shall:

1. Take note of the Telecommunications Service Priority for Radiocommunications (TSP-R) as determined by a department or agency for each of its systems supporting national security emergency preparedness (NSEP) functions approved under the provisions of this chapter.
2. Consider the NSEP function, the telecommunication system or systems which is or are to support the function, and the priority designated by the agency in relation to the function. Consideration of an agency-designated TSP-R is intended only to ensure consistency of TSP-R criteria interpretation. An assessment of the designated TSP-R in relation to other systems or functions of the submitting agency or those of other departments or agencies is not appropriate.
3. Incorporate the approved NSEP systems and their spectrum requirements and TSP-Rs into its recommendations to NTIA with an information copy to the IRAC. Upon receipt, NTIA shall annotate the NTIA Emergency Readiness Plan for Use of the Radio Spectrum (ERP).

10.5.6 Federal Agencies

1. Agencies will participate in the application of these procedures in the IRAC and its Subcommittees and shall provide information needed for the system review as specified in Parts 10.7 and 10.8.
2. IRAC representatives shall be responsible for determining within their agencies which systems come within the scope of this procedure (see Part 10.3) and should, therefore, be submitted to the SPS for system reviews. In making this determination, IRAC representatives should give serious consideration to the spectrum-related concerns of other member agencies. A system review under Chapter 10 entails consideration of a more detailed EMC analysis than is appropriate within the FAS.
3. Agencies will take into account recommendations provided as a result of the system review in the modification and resubmission of proposals to improve system EMC characteristics and facilitate frequency support. Agencies may recommend and will consider modifications to existing facilities and will facilitate the accommodation of new systems. Agencies may participate in EMC studies specified in Part 10.6 as an active associate to the degree required to assure responsiveness to their requirements and responsibilities and shall be consulted to assure development of realistic assignment criteria and other technical system considerations.

10.5.7 National Telecommunications and Information Administration (NTIA)

1. NTIA will review the information submitted by the EPS in regard to apparently-incompatible NSEP spectrum requirements and determine the best means of reconciliation. Each agency involved will be notified of this determination.

2. Should one or more agencies object to the proposed NTIA reconciliation described in Subsection 10.5.7.1, the agencies will report the basis for the objection to NTIA. NTIA will review the objection and attempt a final reconciliation. If the proposed reconciliation remains unacceptable to the agencies involved, the matter may be referred to the Office of Science and Technology Policy (OSTP) for its decision. The decision of the OSTP will be disseminated to the agencies involved and noted in the ERP.

3. NTIA will review the information submitted by the EPS in regard to apparently-inappropriate TSP-R and determine the best means of reconciliation. Each agency involved will be notified of this determination.

4. Should NTIA and the department or agency that submitted an apparently-inappropriate TSP-R conclude that the designated TSP-R is in fact appropriate or another TSP-R designation is mutually agreed to, NTIA shall notify the EPS of the finding. If no agreement can be reached that is acceptable to the submitting department or agency, the matter may be referred to OSTP for its decision. The decision of the OSTP will be disseminated to the agency involved and noted in the ERP.

10.6 EMC ANALYSIS SUPPORT

10.6.1 General

1. In reviewing and assessing the EMC and frequency availability aspects of proposed telecommunication systems, as defined herein, the SPS shall depend upon system and equipment characteristics data submitted by the proposing agency and upon available environmental information.

2. The SPS shall make use of the results of any available technical studies and any pertinent EMC analysis capabilities within federal agencies when assessing proposed systems. More specifically, the SPS shall arrange for and make use of existing EMC analysis capabilities and procedures of the DoD, NASA, and other federal agencies where they may expedite or enhance its assessment of a proposed system. Arrangement for such support will be obtained through NTIA. Moreover, the SPS shall promote the cooperative exchange of views and information among the agencies that may provide EMC analysis support to the subcommittee.

3. The SPS will be supported by NTIA and may refer to NTIA, as appropriate, system proposals for evaluation and recommendations regarding:

a. compliance with prevailing standards and sharing criteria;

b. predicted degree of EMC with the environment;

c. relative efficiency in the use of the radio spectrum by the proposed system;

d. system modification or alternatives, including modifications to stations already operating in the band(s) in question, where appropriate; and

e. technical solutions for systems having conflicting spectrum requirements within the US&P.

4. The SSS will be supported by NTIA and may refer to NTIA, as appropriate, U.S. and foreign space system proposals for evaluation and recommendations regarding:

a. conformance to applicable national and international rules and regulations;

b. predicted degree of EMC with the environment; and

c. system modifications or alternatives, including modifications to stations already operating in the band(s) in question, where appropriate.

10.6.2 Types of Analysis

1. Types of analysis will vary from a determination of gross impact on the spectrum to detailed EMC analysis. The level and complexity of analysis must depend on the quality of the data available at the various stages of system development.

2. In analyses leading to certification of spectrum support at Stage 1, Conceptual, much of the system data will be estimated, only gross calculations may be achievable for a general evaluation of spectrum impact that will be subject to adjustment during later stages. The system will be reviewed in conformance to International and National Allocation Tables. In addition, checks will be made against existing standards and sharing criteria, comparison will be made with known similar systems, and spectrum efficiency will be considered.

3. In analyses leading to certification of spectrum support at Stage 2, Experimental, the foregoing types of analysis will be applied where appropriate with more specific EMC analysis against a typical environment being added where experimental testing of technically defined equipment is involved. Recommendations for changes to equipment characteristics and contemplated operational employment/deployment will be provided, where appropriate. Calculations required in connection with national and international space coordination procedures in accordance with the methods of Appendices **7** and **8** of the ITU Radio Regulations will be performed to the extent practicable.

4. In analyses leading to certification of spectrum support at Stage 3, Developmental, more detailed EMC analyses will be performed, using measured data from experimentation when available. Appropriate recommendations as to equipment characteristics and/or operational employment/deployment will be developed. Calculations in connection with national and international space system coordination procedures will be performed or updated as appropriate.

5. In analyses leading to certification of spectrum support at Stage 4, Operational, detailed EMC analyses will be updated, as required, to include consideration of frequency assignments for specific system deployment. Appropriate recommendations as to equipment characteristics and/or operational limitations will be provided.

10.6.3 Prototype EMC Testing

When the results of EMC analyses so indicate, prototype EMC tests may be required as an input to the determination of spectrum availability and electromagnetic compatibility.

10.7 GENERAL DATA REQUIREMENTS

10.7.1 Minimum Data Required

Federal agencies shall provide data, as appropriate and categorized below, to the SPS for review at the various stages as systems mature, in accordance with the provisions of this chapter. All of the specified categories of data that are appropriate to the system under review are required for Stages 2, 3, and 4. While no specific minimums of data are specified for a Stage 1 review, beyond the guidance provided under the various categories below, agencies should provide sufficient data to allow determination of conformance with allocation tables and, for space systems, conformance with power flux density limitations.

10.7.2 Submission of Additional Data

The SPS may request the submission of additional data or data estimates during the course of its system review, or may endorse direct contact between the EMC analysis support agency (NTIA or other) and the requesting agency for development of data estimates.

10.7.3 Upgrading of Data Previously Provided

Agencies proposing new systems shall be responsible for the upgrading of data provided to the SPS for the earlier stages, as more valid information becomes available and as the system progresses through the various review stages to its final operational configurations.

10.7.4 Changes to Submissions

1. In between the time an agency submits a system to the SPS for review and prior to its NTIA approval, changes or additions to the system characteristics may occur. If these changes are easily correctable, they will be inserted by NTIA in the agency's original submission document. If the changes are more extensive, the submitting agency will revise the affected forms and submit them to NTIA for incorporation in the original submission document. The purpose of this procedure is to ensure that the latest available data is included in the final NTIA system review package. All changes will be reviewed by the SPS before its recommendations to NTIA are finalized.

2. Changes or additions to an NTIA approved Certification of Spectrum Support may occur after a system has been certified. Changes submitted will include the Certification of Spectrum Support to be modified. The purpose of this procedure is to ensure that the members of the SPS may see the salient spectrum management issues in their present state, including those of a classified nature; and, this inclusion may permit the SPS provide a ruling at the table. All changes will be reviewed by the SPS before its recommendations to NTIA are finalized.

10.7.5 Selective Upgrading of Data

The SPS may request the selective upgrading of electromagnetic environmental data for specific areas and radio services, where necessary to support realistic EMC analyses of new systems.

10.8 SPECIFIC DATA REQUIREMENTS

1. Certification requests shall contain information sufficient to enable NTIA and the SPS to evaluate systems for spectrum supportability. The information necessary to support the system review process is summarized in Sections 10.8.1 through 10.8.8. Additional information required for review of trunked land mobile radio systems is summarized in Part 10.9. Effective November 1, 2009, requests are to be prepared and submitted electronically in a format that is compatible with the Office of Spectrum Management Data Dictionary (OSMDD). NTIA has developed the Equipment Location – Certification Information Database (EL-CID) tool to facilitate preparation and submission of certification requests.

2. EL-CID is a suite of automated capabilities that provides a graphical, icon-based user interface that is supported by logic that captures relationships among and between groupings of data that characterize components of the system and modes in which the system operates. The tool facilitates entry of system parameters required to complete applications for certification of spectrum support. The EL-CID tool prompts users with displays and instructions for entering the specific data into a properly formatted file that can be used to conduct a system review. Help files are avaliable through the EL-CID user interface to assist in clarifying data requirements and ensuring that it is formatted correctly.

3. The EL-CID tool is available to federal agencies and supporting contractors at: http://www.ntia.doc.gov/osmhome/elcid

10.8.1 Information Required for all Systems

1. *Stage of Review Requested*: Indicate the stage of review requested.
2. *Purpose of the System*: Submit for all stages a summary description of the function of the system or subsystem (e.g., collect and disseminate meteorological data using satellite techniques; transmission of radar data for air traffic control; remote control of ATC radars).
3. *Information Transfer Requirement*: Submit for all stages the required character, quantities, data rates, and circuit quality/reliability.
4. *Estimated Termination Date (where applicable).*
5. *Estimated Initial Cost of the System*: Provide the estimated cost of the radiocommunication system, subsystem, or equipment for which certification is requested. If multiple units of the system are to be procured, the cost per unit and estimated number of units included in the procurement are to be specified. This item is for information to assist NTIA in monitoring the investment by federal agencies in spectrum-dependent systems and technology. It is not intended to be a determining factor in system reviews.
6. *Target Date*: Submit dates on which spectrum-related decisions must be made relative to system planning, development, procurement, and employment.
7. *System Relationship and Essentiality*: Submit for all stages a statement of the relationship between the proposed system and the function or operation it is intended to support. Include a brief statement of the essentiality to the supported function or operation.
8. *Replacement Information*: Identify the existing system(s) to be replaced by the proposed system, where applicable.
9. *Non-Conforming Operations*: Submit a justification for any telecommunication system or subsystem for which the proposed operations are not in accordance with the National Table of Frequency Allocations as directed in Section 10.1.1 of this Chapter. The justification should be accompanied by details of how it is feasible to conduct such non-conforming operations on a non-interference basis. This information is required for systems or subsystems that will operate in the United States, its possessions, or in space in a manner that is not in complete conformance with the National Table of Frequency Allocations.
10. *National Security Emergency and Preparedness Function*: A statement as to whether the proposed system, if it becomes operational, will support a NSEP function and require review in accordance with Section 10.1.4 of this Chapter.

10.8.2 Required Data for Space Systems

1. Stage 1 and 2 Requirements:
   a. Satellite orbital characteristics (longitude for geostationary satellites, and apogee, perigee, and inclination for non-geostationary satellites).
   b. Satellite transmitter maximum spectral power density for each transponder.
   c. Earth station locations (city and state) within the US&P, and frequencies or frequency bands used at each.
2. Stage 3 Requirements – In addition to satisfying all Stage 1 and 2 requirements the following data items are required for each Earth station transmitter and receiver site:
   a. Frequencies or frequency bands and satellites accessed.
   b. Coordinates.
   c. Emission designator for each frequency or frequency band.
   d. Maximum spectral power density and output power for each frequency or frequency band.
   e. Antenna gain and beamwidth.

f Minimum elevation angle of antenna main beam.

g. Range of azimuth angles.

h. Lowest total receiver noise temperature.

3. Stage 3 Requirements – In addition to satisfying all Stage 1 and 2 requirements for each space station transmitter and receiver:

a. Frequency or frequency bands and interoperating earth stations.

b. Satellite orbital information.

c. Emission designator for each frequency or frequency band.

d. Peak power and spectral power density for each frequency or frequency band for transmitters.

e. Receiver noise temperature.

f. Transmitter antenna pattern (only if PFD limits are exceeded).

4. Stage 4 Requirements: In addition to satisfying all Stage 3 requirements, the following data items are required for each earth station:

a. Horizon elevation angle diagram.

b. Antenna altitude above ground.

5. Unclassified space systems which have not been waived from the requirements of international registration as described in Part 3.3, similar information must be prepared in specific formats and submitted to the SSS in accordance with instructions in Part 3.3. The data required by the SSS to satisfy the specifications in Appendix 4 of the ITU Radio Regulations for:

a. Advance Publication shall be submitted at the same time as the Stage 2 system review request;

b. Coordination and Notification data shall be submitted at the same time as Stage 3 system review requests. If any of the frequency bands proposed for the satellite network or system are subject to coordination under the ITU Radio Regulations, the simplified advance publication information for those bands, as set forth in Sub-Section IB of Article 9 of the Radio Regulations, cannot be used in lieu of 10.8.2 data. In those cases where the simplified advance publication information is required by the ITU, the simplified information as well as the 10.8.2 data must be submitted.

10.8.2.A Supplemental Information for Space Systems Using Necessary Bandwidths Greater Than 5 MHz for Transmissions from Space in the Band 2200-2290 MHz

For space station transmitters that operate in the band 2200-2290 MHz and require use of necessary bandwidths that exceed 5 MHz, requests for certification shall include a justification explaining why such bandwidth is required. Additionally, the sponsoring agency must explain why the radio communications requirement cannot be satisfied using less bandwidth. Spread spectrum missions (e.g., space-to-Tracking and Data Relay Satellite communications, lunar downlinks, and lunar data relay satellite communications) that enable multiple users on the same channel and require a necessary bandwidth of approximately 6.16 MHz, are exempt from this policy.

10.8.3 Required Data for Terrestrial Systems (all stages)

Required Data For Terrestrial Systems:

a. Station class(es),

b. Number of units (for mobile systems),

c. Station locations and/or areas of operation, as appropriate (geographical coordinates required for Stages 2, 3, and 4),

d. Frequency requirements (i.e., band(s) or discrete frequencies required, bandwidth and emission designators, and netting information, where appropriate),

e. Proposed date of activation.

10.8.4 Related Analysis Data

1. For all stages, submit reports of any previous EMC studies, predictions, analyses, and prototype EMC testing that are relevant to the assessment of the system under review, or references thereto if previously provided to the IRAC/SPS, including references to previous system reviews of the same system or its predecessors.

2. For military requests for Stage 3 spectrum certification of 1030/1090 MHz systems, attach a copy of the Department of Defense (DoD) International AIMS Program Office (PO) box-level certification letter, and for Stage 4 reviews, attach a copy of the DoD AIMS Program Office platform certification letter.

10.8.5 Describe Equipment Characteristics

Technical characteristics of the system need to be provided to enable evaluation of compliance with applicable NTIA spectrum standards. Additionally, the equipment data needs to characterize operating modes by association of specific data elements on a mode-by-mode basis. The EL-CID tool has been designed to facilitate the collection of the required information in a manner that associates data elements with specific operational modes.

10.8.6 Required Transmitter Characteristics Data

Required Transmitter Characteristics Data:

a. The transmitter nomenclature/name model number and manufacturer.
b. The frequency stability.
c. The spurious emission level.
d. The harmonic emission levels.
e. The transmitter power delivered to the antenna terminals.
f. The frequency range through which the transmitter is capable of being tuned.
g. The emission designators for the types of emission capable of being used by the transmitter.
h. For each emission designator the emission bandwidth at the -3, -20, -40, -60 dB levels.
i. For each emission designator based on the modulation symbols and the description of the modulation methods the EL-CID tool will request the technical data required to describe the modulation.

10.8.7 Required Receiver Characteristics Data

Receiver Characteristics Data:

a..The receiver nomenclature/name model number and manufacturer.
b. The frequency stability.
c. The spurious rejection level.
d. The image rejection level.
e. The frequency range through which the receiver is capable of being tuned.
f. The emission designators identifying the types of emission for which this receiver is designed.
g. For each frequency band the RF bandwidths at the -3, -20, -60 dB levels.
h. For each emission designator the IF bandwidths at the -3, -20, -60 dB levels for the narrowest IF amplifier.
i. For each emission designator specify the receiver sensitivity and specify the criteria used.

10.8.8 Required Antenna Characteristics Data

Required Antenna Characteristics Data:

a. The antenna nomenclature/name model number and manufacturer.
b. The range of frequencies for which it is designed.
c. The polarization.
d. The maximum gain and beamwidth.
e. The maximum gain of the first side lobe and the angular displacement from the main beam.
f. The generic name and description of the antenna. The EL-CID tool will prompt for specific technical characteristics based on the antenna description.

10.8.9 Required Data for Wideband and Narrowband Emission Level and Temporal Measurements in the Navstar Global Positioning System Frequency Bands

When Stage 4 certification is requested for systems (excluding passive systems) operating in the bands 390-413 MHz, and 960-1710 MHz, measured data is to be submitted as specified in Section 8.2.55.

a. The measured emission levels are to be provided as shown in the example below:

GPS Wideband emission level: 1164-1240 MHz band is -XX dBW/MHz; 1559-1610 MHz band is -XX dBW/MHz

GPS Narrowband emission level: 1164-1240 MHz band is -YY dBW; 1559-1610 MHz band is -YY dBW

The EL-CID tool will prompt the user to provide the data when appropriate.

b. For pulsed systems a plot of the relative power level in the 1164.45-1188.45 MHz, 1215.6-1239.6 MHz, and 1563.42-1587.42 MHz bands as a function of time can also be submitted as an attachment to the EL-CID tool.

c. The guidelines for making the emission level and temporal measurements are provided in Annex M, Sub-Section M.2.1.F.

10.9 TRUNKED LAND MOBILE DATA REQUIREMENTS

Trunked system review is based on the need to consider the system as a whole, which is not possible with the unconnected and separate frequency proposals made to the FAS.

10.9.1 Requests for New Trunked Systems

Requests for spectrum certification of new trunked land mobile systems shall contain the following information:

a. Operating Location: Provide the city (or other geographic subdivision) and state.
b. Equipment Identification: Provide the manufacturer and model number/name of the equipment.
c. Docket Number of Previous Certification: Provide the SPS docket number of the NTIA Certification of Spectrum Support for the equipment. (Agencies may obtain this information from the SPS Secretary, who maintains a list of approved trunking systems and associated docket numbers.) If the equipment has not received NTIA Certification of Spectrum Support, provide the equipment characteristics identified in Section 10.8.6 using the EL-CID tool.

d. System Overview: Provide a line diagram representing the system configuration and method of connecting multiple sites. Specify if dispatcher uses phone lines or RF to connect to the base/repeater stations.

e. Coverage Information. Provide the following for each repeater site:

(1) Geographical Coordinates: (in degrees, minutes, and seconds)

(2) Site Elevation: (in meters above mean sea level)

(3) Antenna Height: (in meters above site elevation)

(4) Antenna Gain: (in dBi)

(5) Transmitter Power: (in watts)

(6) Radius of Operation: (in kilometers); or Geographical Plot of Required Coverage Area

f. Frequency Requirements:

(1) Frequency Band

(2) Number of Frequencies Required

g. Total Number of Users

h. Target Date for System Activation

i. Frequency Assignments to Be Replaced by this System:

(1) Assignments to Be Relinquished: Provide the existing Assigned Frequencies, Agency Serial Numbers, and Expected Relinquishment Date.

(2) Assignments to Be Used by the Trunked System: For each existing frequency assignment that will be incorporated into the trunked system, provide the existing Assigned Frequencies and Agency Serial Numbers.

j Estimated Initial Cost of the System

k. Separate System Justification: For trunked land mobile systems that are within 30 km of an existing or planned trunked land mobile system authorized by NTIA, provide the information required under Section 8.2.48A.

l. *National Security Emergency and Preparedness Function*: A statement as to whether the proposed system, if it becomes operational, will support a NSEP function and require review in accordance with Section 10.1.4 of this Chapter.

10.9.2 Requests for Expansion/Additional Channels

1. Requests for expansion or additional channels for previously certified trunked land mobile systems shall contain the following information:

a. *Docket Number of Previous Certification:* Provide the SPS docket number of the NTIA Certification of Spectrum Support for the existing trunked system.

b. *Additional Frequency Requirements*

(1) *Number of Additional Frequencies Required*

(2) *Rationale for Additional Frequencies:* (e.g., channel loading, queuing times, new users).

c. *Details of Expansion*

(1) *Additional Repeater Sites*: Provide the information listed in Section 10.9.1, paragraphs 5a-5f, for each additional repeater site.

(2) *Additional Users*: Provide the information listed in Section 10.9.1, paragraph 7 for additional users.

d. *Equipment Identification*

e. *Target Date for Expansion/Additional Channels Activation:*

f. *Estimated Cost of this Expansion*

g. *National Security Emergency and Preparedness Function*: A statement as to whether the proposed system, if it becomes operational, will support a NSEP function and require review in accordance with Section 10.1.4 of this Chapter.

10.9.3 Guidelines Regarding Certification of Spectrum Support for Trunked Systems

1. Certifications of spectrum support for trunked systems with a date of activation exceeding one year from the date of certification will include a recommendation that record note S321 be applied to the corresponding requests for frequency assignment.

2. The SPS, will consider whether record note S321 should be applied to existing frequency assignments for systems not activated within one year from the date of certification.

3. The SPS will review the certification of spectrum support for each trunked system not activated within five years from the date of certification. Unless the responsible agency submits adequate justification for an extension of the activation time limit, the SPS will recommend to NTIA that the certification and all associated frequency assignment be revoked.

4. Unless otherwise approved by the SPS, telephone interconnects will be limited to one for each five channels, but no more than three for any size system. A trunked system with telephone interconnect must have the capability to:

a. "time-out" the length of telephone messages, and

b. control and reduce the number of channels available for telephone interconnect as demand for dispatch calls increases. For planned expansions of trunked systems, the dedicated use and/or blockage caused by telephone interconnect will not be considered as the justification for a request of additional channels.

5. The SPS, when recommending to NTIA that spectrum support be certified for a new trunked system, includes in its recommendation the maximum number of channels (frequency pairs) which may be used by the system. In arriving at this figure, the SPS uses a basis of 100 subscriber stations per channel. For the purposes of determining compliance with trunked system loading requirements, the term "subscriber stations" includes control (or land) stations as well as vehicular and portable units.

a. *New Systems.* A federal agency requesting spectrum support for a new trunked system shall verify that a minimum of 70 subscriber stations for each channel authorized will be placed in operation within five years of the date of the certification of spectrum support.

b. *Expansion of Existing Systems.* The SPS will not recommend approval of any request for expansion of an existing trunked system unless the existing system has a loading level of at least 70 subscriber stations per channel.

c. Exceptions. Exceptions to the above loading criteria will be considered by the SPS on a case-by-case basis. Other factors (for example, the number of required failsoft channels) may be considered in addition to the criteria described above.

10.10 LAND MOBILE SYSTEM DATA REQUIREMENTS

An agency choosing to submit a conventional land mobile system for spectrum certification shall, for land mobile systems that are within 30 km of an existing or planning trunked land mobile system authorized by NTIA, provide the information required under Subparagraph 8.2.48A.

10.11 ULTRA-WIDEBAND RADARS

10.11.1 Frequency Availability

1. There are provisions in Parts 7.8 and 7.9 and Annex K of the NTIA Manual for federal agencies to operate systems that conform to either the Federal Communications Commission=s rules in 47 CFR Part 15 or those in NTIA Manual Annex K on a non-licensed, non-interference basis. Both 47 CFR Part 15 and Annex K include provisions for non-licensed operation of UWB devices that can be mass-marketed and operated largely without coordination with existing authorized stations.

2. This section provides guidance for agencies seeking to operate UWB systems that cannot conform to the 47 CFR Part 15 or Annex K rules for non-licensed operations. Such devices, like the non-licensed UWB systems, may only operate on a non-interference basis to stations operating in accordance with the allocation tables. Since UWB systems that do not conform to Part 15 or Annex K provisions will require certification of spectrum support, authorization for these UWB systems will be provided only when the requesting agency provides a suitable analysis and operating restrictions can be made to ensure compatible operation with existing authorized stations.

3. The requirements of this section do not apply to systems such as radars, fixed, or fixed-satellite systems with bandwidths greater than 500 MHz that are operated in bands that have been allocated sufficient bandwidth for such intended operations (e.g. 71-76 GHz, 92-95 GHz).

10.11.2 Electromagnetic Compatibility

In order to assure electromagnetic compatibility (EMC), agencies responsible for UWB operations shall:

a. at a minimum, ensure protection of safety-of-life, radionavigation satellite, search and rescue, satellite uplink, satellite downlink, passive sensing, radio astronomy, and aeronautical radionavigation operations.

b. in a timely manner, coordinate with other agencies that may be affected and may include provisions for real-time coordination during the period the UWB system is in operation.

c. immediately suspend such operations upon the request of an affected agency or non-federal entity in the event that the UWB system causes harmful interference to authorized stations.

10.11.3 Requests for Spectrum Support

1. All requests for spectrum support of ultra-wideband radars must be accompanied by a satisfactory justification for such operations.

2. Requests involving ultra-wideband radars developed by federal agencies, or those commercially available but without an FCC type-acceptance number, must initially be submitted at Stage 1, 2, or 3.

3. To simplify the system review process, requests involving ultra-wideband radars which have been type-accepted by the FCC can initially be submitted at Stage 4.

4. All requests must contain EMC/EMI test measurements, spectrum signature, or EMC analyses demonstrating the system's degree of electromagnetic compatibility with authorized services in the intended operating bands, adjacent bands, and possible harmonic frequency bands.

5. Requests involving ultra-wideband operations in frequency bands subject to footnote US246 must contain one of the following as justification for waiving the provisions of this footnote:

a. An EMC analysis showing that there will be no impact upon radio astronomy observations.

b. Evidence that the selection of operating locations will ensure a minimum potential for interference to radio astronomy observations.

c. Methods for protecting radio astronomy observations, such as attenuating emissions through filtering, thus meeting or exceeding the harmful interference levels specified by ITU-R Recommendation RA.769-2.

10.11.4 EMC Analysis

1. All Stage 1, 2, or 3 requests shall include an analysis demonstrating the system=s degree of EMC with authorized services in the intended operating bands, adjacent bands, and possible harmonic frequency bands as per Section 10.8.1.9 (Non-Conforming Operations) and shall specifically include Adetails of how operations on a non-interference basis are feasible.@

2. In frequency bands subject to footnote US246, the EMC analysis must show that there will be no impact upon radio astronomy observations and passive sensing operations. Various EMC methods may include:

a. an analysis showing evidence that the selection of operating locations will ensure protection of radio astronomy observations and Earth Exploration-Satellite Service passive sensing operations;

b. descriptions of design techniques incorporated in the UWB system for protecting radio astronomy observations and Earth Exploration-Satellite Service sensor operations, such as attenuating emissions through filtering; or

c. the use of interference levels specified by ITU-R Recommendation RA.769-2 or RS.1029-2 as a coordination trigger with the radio astronomy and Earth Exploration-Satellite Service passive sensor operations (If the UWB system emission levels are below the interference levels specified in ITU-R Recommendation RA.769-2 or RS.1029-21, coordination is not required).

3. The analysis shall clearly indicate the equivalent isotropically radiated power (e.i.r.p.) of the system expressed as average power per MHz based on the r.m.s. voltage as a function of frequency and victim receiver bandwidth, antenna gains, losses, propagation path losses, and the interference criteria of the victim receiver used in the analysis. For additional information on the details of performing EMC analyses, see ECAC-TN-78-005 EMC Analysis Handbook, NTIA Special Publication 01-43, and NTIA Technical Memorandum 04-408.

4. Additional power losses due to Aterrain, foliage, or building shielding@ or other phenomenon included in the analysis shall only be applied where it can be clearly demonstrated that such losses will occur consistently in all plausible operational scenarios. Polarization mismatch losses shall not be considered in the analysis. Such mismatches are only applicable where both the transmitter and receiver are fixed, and are within each-others mainbeam.

10.11.5 Measurements

1. All Stage 3 requests must contain a measured spectrum signature to a level at least 20 dB below the maximum value of the emission level of the system when measured as described herein. Depending on the magnitude of the emission level, measurement data might be required at even lower levels. (This level is 10 dB below the necessary bandwidth. Measurement to this level is not required for non-licensed devices since the power levels are generally low enough to be practicably unmeasurable at levels 20 dB below the maximum emission without specialized measurement equipment with very low noise figures.) The spectrum analyzer (SA) (or other suitable measurement instrument) used for the measurements shall have an r.m.s. detector function. The r.m.s. average field strength of the emission spectrum shall be measured over the entire -20 dB emission bandwidth with a 1 MHz resolution bandwidth and a video bandwidth greater than or equal to 1 MHz. Although a video bandwidth setting of 10 times the resolution bandwidth is generally recommended for this type of measurement, it is recognized that most SAs will typically have a maximum video bandwidth of 3 MHz and if available should be used. Where practicable, the SA should have sufficient dynamic range. The averaging time for the r.m.s. measurement is to be 1 millisecond or less. If the UWB system employs pulse gating, in which the transmitter is quiescent for intervals that are long compared to the pulse repetition interval, all measurements are to be made while the pulse train is gated on. Peak radiated emission measurements shall be made using a spectrum analyzer with a 3 MHz RBW and no less than a 3 MHz VBW. The SA should be used in a maximum-hold trace mode. Additional measurements shall be made in the frequency bands 1164-1240 MHz and 1559-1610 MHz with a resolution bandwidth of no less than 1 kHz.

2. To the maximum extent possible, the field strength measurements should be performed with the UWB system under test as it is intended to be used in actual operating conditions. The radiated field strength measurements must be made using the antenna to be employed with the UWB system under test. The measurement antenna must be sufficiently broad-band to cover the frequency range of the measurements, and the use of multiple measurement antennas may be required. All measurement antennas must be accurately calibrated and must demonstrate low phase dispersion over the frequency range of the measurement. The orientation of the measurement antenna shall be varied horizontally and vertically to determine the point that maximizes the measured field strength.

a. The spectrum to be measured should include at least the fundamental emission and the secondary lobe regardless of the center frequency. The frequency spectrum shall be measured from the lowest frequency generated within the UWB system, without going below 9 kHz, up to an upper frequency defined by adding three divided by the pulse width in seconds to the center frequency in Hz.

b. A measurement showing the SA noise floor level shall also be included so that it may be clearly distinguished from the emission spectrum of the UWB system under test.

c. The resultant field strength plots shall indicate the measurement distance.

d. The resultant graphs shall be corrected to account for amplifiers, attenuators, cables, and antennas used in the measurements before the information is submitted.

e. The measured data presented shall be a composite of the maximum measurements of field strength of both horizontal and vertical polarization at each frequency and indicate the measurement distance.

f. The measured field strength levels should then be converted to e.i.r.p. (i.e. dBm or dBW) that may be used directly in EMC analyses without further conversion using the following equations:

$$\text{e.i.r.p.} = E_o + 20 \text{ Log (D)} - 104.8 \text{ (dBm)}$$
$$\text{e.i.r.p.} = E_o + 20 \text{ Log (D)} - 134.8 \text{ (dBW)}$$

where

E_o is the field strength in dB
D is the measurement distance in meters.

g. The measured data shall be presented in graphical form with sufficient resolution for analytical purposes and be properly labeled.

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Chapter 11

Public Access to the Federal Spectrum Management Process

11.1 PREFACE

This Chapter sets forth policies and general guidance for the public to provide advice or information to NTIA regarding spectrum mananagement issues and to obtain information regarding NTIA activity and federal use of the radio spectrum. Sections 104(a) and (b) of the National Telecommunications and Information Administration Organization Act (Act), P.L. 102-538, codified at 47 U.S.C. 903 direct the Secretary of Commerce and NTIA to improve Federal spectrum management activities by (1) providing for a period at the beginning of each meeting of the Interdepartment Radio Advisory Committee to be open to the public to make presentations and receive advice, and provide the public with other meaningful opportunities to make presentations and receive advice; (2) publishing major spectrum management policy proposals that are not classified and that involve spectrum management, with adequate opportunity for public review and comment; (3) publishing major policy decisions that are not classified and that involve spectrum management; (4) making available nonclassified spectrum management information to the public, including access to electronic databases; and (5) providing prompt and impartial consideration of requests for access to Federal spectrum by the public, including disclosure of the status and ultimate disposition of any such request.

11.2 OPPORTUNITIES FOR THE PUBLIC TO PROVIDE INFORMATION AND ADVICE TO NTIA

The public may at any time provide advice or information to NTIA staff regarding spectrum management issues. Contact information is provided at NTIA's website www.ntia.doc.gov.

11.3 INFORMATION REGARDING NTIA SPECTRUM MANAGEMENT ACTIVITIES

Information regarding NTIA spectrum management activities may be found at NTIA's website www.ntia.doc.gov under "Spectrum Management".

11.4 PUBLIC PRESENTATIONS TO OR RECEIVING ADVICE FROM THE IRAC

Members of the public who would like to make a presentation to or receive advice from the IRAC should contact the IRAC Chairperson, the Deputy Associate Administrator for Domestic Spectrum Management at least two weeks before the intended IRAC meeting. If the Chairperson deems the subject to be in accordance with the guidance below, the IRAC Executive Secretary will place the item on an appropriate IRAC agenda. A period of up to twenty minutes will normally be provided for any presentation with additional time for responses from the IRAC.

Members of the public who are preparing presentations to the IRAC should consider the following: (1) the IRAC serves in an advisory capacity to NTIA and the Assistant Secretary for Communications and Information relative to spectrum issues and is not the Executive Branch decision body on spectrum management issues; (2) the member-agency representatives manage, or coordinate, spectrum use by diverse types of radiocommunications facilities and services in their respective agencies; (3) some of these services are obtained from Federal-owned facilities and some are obtained from privately-owned facilities; and (4) the member-agency representatives generally do not award grants or contracts for radio facilities or services of their respective agencies; (5) the IRAC awards neither grants nor contracts of any kind. Presentations to the IRAC by the public may include the following:

1. Descriptions of developing technologies or innovative applications of existing technologies that are relevant to radio frequency spectrum management or usage.
2. Proposals for new radiocommunication services or improved approaches for spectrum management.
3. Comments on spectrum issues currently being addressed by the IRAC.

Information provided by the public during the open portions of IRAC meetings shall have no distribution restrictions.

When plans have been made for members of the public to make a presentation to or receive advice from the IRAC, an announcement shall be placed on the NTIA website at http://www.ntia.doc.gov/osmhome/irac.html. This announcement shall (1) define the subject to be addressed; (2) indicate the scheduled date and place for the presentation; (3) provide a brief summary of the scheduled presentation; and (4) identify an individual who can answer detailed questions regarding the scheduled presentation and access procedures.

Members of the public desiring to attend a scheduled open portion of an IRAC meeting should contact the IRAC Secretariat in advance of the meeting date to ensure that adequate seating and security escort can be made available for the meeting. During the open portions of IRAC meetings, questions and comments by members of the public on presentations by others should be addressed to the Chairman of the IRAC.

11.5 REQUESTING FEDERAL GOVERNMENT SPECTRUM MANAGEMENT INFORMATION

A large amount of information related to Federal spectrum management is available on NTIA's website at www.ntia.doc.gov. For example, the website includes NTIA Manual of Spectrum Rules and Regulations, the U.S. Frequency Allocation Chart, spectrum studies and reports, and NTIA's spectrum filings before the Federal Communications Commission. For hard copies of documents not available electronically on NTIA's website, please contact NTIA's Office of Public Affairs.

Of course, information not available on the website may be available through a Freedom of Information Act request. Such a request must be in writing and can be submitted by mail, e-mail, or fax to the National Telecommunications and Information Administration, U.S. Department of Commerce. The request must include a statement that the request is being made under the Freedom of Information Act. Please mark the envelope "Freedom of Information Act Request." If you are making your request by e-mail, please include a mailing address. Please also include a daytime telephone number should we need to contact you for clarification. Send your request to:

FOIA Officer National Telecommunications and Information Administration
U.S. Department of Commerce
14th Street and Constitution Avenue, N.W.
Room 4713 Washington, DC 20230
E-mail address: FOIA@ntia.doc.gov
Fax number: 202-501-8013
Telephone Number: 202-482-1816

Please describe as best as possible the NTIA records you are requesting. In your description, please include information regarding the subject matter, date, and any other information you feel will assist us in our search for the records.

11.6 REQUESTING ACCESS TO SPECTRUM ALLOCATED FOR FEDERAL GOVERNMENT USE

NTIA shall provide prompt and impartial consideration to all public requests for access tothose portions of the spectrum that are allocated for Federal Government use.

All requests for use of spectrum that is allocated on an exclusive basis for federal government use or on a shared basis for federal and non-federal use are submitted to the FCC as the regulator of non-federal use of the radio spectrum. Such requests are coordinated with NTIA, with assistance from the IRAC FAS, to determine the likely impact on the Federal Government's existing and planned spectrum use. The FCC informs the requester of the results of this coordination.

When the public desires to seek NTIA consideration of a proposal for reallocation of spectrum, requests should be submitted in writing to the Deputy Associate Administrator of Domestic Spectrum Management.

The requests should, as appropriate, include the following information:

1. The radio frequency band or bands affected;
2. The reasons why the requirement for radio frequency spectrum use cannot be accommodated within spectrum allocated for non-Federal use;
3. The likely impact on the radiocommunication services currently using the spectrum;
4. The radiocommunication service proposed and a functional description, including technical parameters;
5. The geographic area to be served by the proposed radiocommunication service;
6. The planned schedule for implementing the proposed radiocommunication service;
7. A description of the actions by the FCC on the request; and
8. The name, address, telephone number, and facsimile number of the individual who can be contacted for more information regarding the request.

Upon receipt of such a request, the Deputy Associate Administrator for Domestic Spectrum Management shall notify the FCC of the request and shall advise the FCC of any preliminary conclusions. All allocations for non-federal use are provided through the FCC. The request and any NTIA response to the requester shall be made available to the public via the NTIA website.

11.7 PUBLICATION OF MAJOR FEDERAL SPECTRUM MANAGEMENT PROPOSALS AND DECISIONS

All major nonclassified policy proposals and decisions involving Federal spectrum management shall be published in the Federal Register. When policy proposals are published, specific procedures shall be included for the public to submit comments to NTIA. In addition to publishing major policy proposals and decisions in the Federal Register, summaries of current Federal spectrum management activities that are of general interest shall be made available to the public through the NTIA website.

(Last Page in Chapter 11)

ANNEX A

Record Notes

A.1 Coordination Notes

C002--Subject to coordination with the Western Area Frequency Coordinator located at the Naval Air Warfare Center, Weapons Division, China Lake, CA, prior to use within a 322 kilometer radius of Pt. Mugu or in California south of Latitude 37 30' North.

C003--This frequency assignment in one of the bands 1435-1525, 2310-2320 and 2345-2390 MHz was coordinated prior to authorization with the Western Area Frequency Coordinator (WAFC) who also coordinated it, as appropriate, with the Aerospace and Flight Test Radio Coordinating Council. Use of this frequency under the authority of this assignment is subject to such further coordination with the WAFC as necessary to ensure compatibility with existing uses.

C004--Subject to coordination with the Eastern Area Frequency Coordinator located at Patrick AFB, FL, prior to use within the area bounded by 24 N 31 30'N and 77 W 83 W.

C005--This frequency assignment in one of the bands 1435-1525, 2310-2320 and 2345-2390 MHz was coordinated prior to authorization with the Eastern Area Frequency Coordinator, Patrick AFB, FL, who also coordinated it, as appropriate, with Aerospace and Flight Test Radio Coordinating Council. Use of this frequency under the authority of this assignment is subject to such further coordination with the Eastern AFC, Patrick AFB, FL, as necessary to ensure compatibility with existing uses.

C006--Subject to coordination with the Area Frequency Coordinator located at White Sands Missile Range, NM, prior to use in the State of New Mexico or other U.S. territory within a 240 kilometer radius of WSMR plus the area of Utah and Colorado that lies south of 41 North and between 108 and 111 West; Telephone 505-678-5417 or 3702, DSN: 258-5417 or 3702.

C007--This frequency assignment in one of the bands 1435-1525, 2310-2320 and 2345-2390 MHz was coordinated prior to authorization with the Area Frequency Coordinator, WSMR, NM, who also coordinated it, as appropriate, with the Aerospace and Flight Test Radio Coordinating Council. Use of this frequency under the authority of this assignment is subject to such further coordination with the AFC, WSMR, NM, as necessary to ensure compatibility with the existing uses.

C008--Subject to Coordination with the Area Frequency Coordinator, State of Arizona, Attn: SFIS-FAC-SH, Ft. Huachuca, AZ 85613-5000; Telephone 520-538-6423; FAX 520-538-8525; DSN 879-6423.

C009--This frequency assignment in one of the bands 1435-1525, 2310-2320 and 2345-2390 MHz was coordinated prior to authorization with the Area Frequency Coordinator, Ft. Huachuca, AZ, who also coordinated it, as appropriate, with the Aerospace and Flight Test Radio Coordinating Council. Use of this frequency under the authority of this assignment is subject to such further coordination with the AFC, Ft. Huachuca, as necessary to ensure compatibility with existing uses.

C010--Subject to coordination with the Gulf Area Frequency Coordinator located at Eglin AFB, FL, prior to use within the area bounded by 24 N 33 30'N and 83 W 90 W.

C011--This frequency assignment in one of the bands 1435-1525, 2310-2320 and 2345-2390 MHz was coordinated prior to authorization with the Gulf Area Frequency Coordinator, Eglin AFB, FL, who also coordinated it, as appropriate, with the Aerospace and Flight Test Radio Coordinating Council. Use of this frequency under the authority of this assignment is subject to such further coordination with the Gulf AFC, Eglin AFB, FL, as necessary to ensure compatibility with existing uses.

C012--Subject to coordination with the Joint Frequency Management Office located at the Commander-in- Chief, Pacific Headquarters, Camp H. M. Smith, HI, prior to use with the area enclosed by 322 kilometer radius of Honolulu, HI.

C013--Subject to local coordination with Frequency Manager, AFFTC, Edwards AFB, CA.

C015--Subject to prior coordination with Frequency Manager, Air Force Space and Missile Technical Center, Vandenberg AFB, CA.

C016--This frequency assignment in one of the bands 1435-1525, 2310-2320 and 2345-2390 MHz was coordinated prior to authorization with the HQ USAF Frequency Coordinator, Alexandria, VA, who also coordinated it, as appropriate, with the Aerospace and Flight Test Radio Coordinating Council. Use of this frequency under the authority of this assignment is subject to such further coordination with the HQ USAF Frequency Coordinator, Alexandria, VA, as necessary to ensure compatibility with existing uses.

C019--Subject to prior coordination with Army Frequency Management Office (AFMO) - CONUS, 1214 Stanley Road, Suite 32, Ft. Sam Houston, TX 78234-5032; Telephone 210-221-2050/2820, (DSN 471).

C022--Subject to prior coordination with Frequency Manager, Army Missile Command, Huntsville, AL.

C024--This frequency assignment in one of the bands 1435-1525, 2310-2320 and 2345-2390 MHz was coordinated prior to its authorization with AFMO CONUS, Ft. Sam Houston, TX, who also coordinated it, as appropriate, with the Aerospace and Flight Test Radio Coordinating Council. Use of this frequency under the authority of this assignment is subject to such further coordination with AFMO CONUS, Ft. Sam Houston, TX, as necessary to ensure compatibility with existing uses.

C026--Subject to prior coordination with DOE Frequency Coordinator for Albuquerque Operations Office; Telephone 575-3458, FTS or 702-295-3458, Commercial, or 575-3343, FTS, 702-295-3343, Commercial (weekends, holidays, and off-duty hours).

C027--Subject to prior coordination with DOE Area Frequency Coordinator, Las Vegas, NV, when used within the State of Nevada or within a 160 kilometer radius of Mercury or Tonopah, NV; Telephone 575-3458 or 1162 FTS, 702-295-3458 or 1162, Commercial, and 575-3343 FTS or, 702-295-3343 Commercial (weekends, holidays, and off-duty hours).

C030--The Department of Commerce is designated as control for Federal use of this frequency. Use under this assignment is subject to initial coordination with, and subsequent coordination as indicated by, Radio Frequency Coordinator S.I.G. Research Facilities Center, NOAA, Department of Commerce, P.O. Box 520197, Miami, FL 33152; Telephone 305-526-2936 (FTS 350-2936).

C031--Subject to prior coordination with FAA Eastern Regional Office, JFK International Airport, NY 11430, Attn: Frequency Management Office; Telephone 718-712-8343.

C032--Subject to prior coordination with FAA Southern Regional Office, P. O. Box 20636, Atlanta, GA 30344, Attn: Frequency Management Office; Telephone 404-763-7385/6.

C033--Subject to prior coordination with FAA Central Regional Office, 601 East 12th Street, Kansas City, MO 64106, Attn: Frequency Management Office; Telephone 816-426-5647.

C034--Subject to prior coordination with FAA Southwest Regional Office, 4400 Blue Mound, Fort Worth, TX 76193-0483; Attn: Frequency Management Office; Telephone 817-740-3237.

C035--Subject to prior coordination with FAA Western Regional Office, P.O. Box 92007, Worldway Center, Los Angeles, CA 90009; Attn: Frequency Management Office; Telephone 310-297-1872.

C036--Subject to prior coordination with FAA Alaskan Regional Office, 222 West 7th Ave., Anchorage, AK 99513; Telephone 907-243-7246 or 4399.

C037--Subject to prior coordination with FAA Western Pacific Regional Office, Honolulu ARTCC, P.O. Box 50109, Honolulu, HI 96850-4983; Attn: Frequency Management Office; Telephone 808-541-1241.

C038--Subject to prior coordination with FAA New England Regional Office, 12 New England Executive Park, Burlington, MA 01803; Telephone 617-273-7177.

C039--Subject to prior coordination with FAA Great Lakes Regional Office, 2300 East Devon Avenue, Des Plaines, IL 60018; Telephone 312-694-7071.

C041--Subject to prior coordination with FAA Northwest Regional Office, 1601 Lind Avenue, S.W., Renton, WA 98055-4056; Telephone 206-227-2464.

C042--This frequency assignment on 1030 MHz or in one of the bands 1215-1400, 2700-2900 or 9000-9200 MHz was coordinated prior to authorization with the FAA Northwest Coordinator, Seattle, WA. Use of this frequency or band under the authority of this assignment is subject to such further coordination with the FAA Northwest Coordinator, Seattle, WA, as necessary to ensure compatibility with existing uses. This Note applied to an Aeronautical Assignment Group (AAG) frequency (see Section 1.3.2) indicates FAA Northwest regional coordination has been accomplished.

C043--This frequency assignment on 1030 MHz or in one of the bands 1215-1400, 2700-2900 or 9000-9200 MHz was coordinated prior to authorization with the FAA Western Coordinator, Los Angeles, CA. Use of the frequency or band under the authority of this assignment is subject to such further coordination with the FAA Western Coordinator, Los Angeles, CA, as necessary to ensure compatibility with existing uses. This Note applied to an Aeronautical Assignment Group (AAG) frequency (see Section 1.3.2) indicates FAA Western regional coordination has been accomplished.

C045--This frequency assignment on 1030 MHz or in one of the bands 1215-1400, 2700-2900 or 9000-9200 MHz was coordinated prior to authorization with the FAA Central Coordinator, Kansas City, MO. Use of this frequency or band under the authority of this assignment is subject to such further coordination with the FAA Central Coordinator, Kansas City, MO, as necessary to ensure compatibility with existing uses. This Note applied to an Aeronautical Assignment Group (AAG) frequency (see Section 1.3.2) indicates FAA Central regional coordination has been accomplished.

C046--This frequency assignment on 1030 MHz or in one of the bands 1215-1400, 2700-2900 or 9000-9200 MHz was coordinated prior to authorization with the FAA Southwest Coordinator, Ft. Worth, TX. Use of this frequency or band under the authority of this assignment is subject to such further coordination with the FAA Southwest Coordinator, Ft. Worth, TX, as necessary to ensure compatibility with existing uses. This Note applied to an Aeronautical Assignment Group (AAG) frequency (see Section 1.3.2) indicates FAA Southwest regional coordination has been accomplished.

C047--This frequency assignment on 1030 MHz or in one of the bands 1215-1400, 2700-2900 or 9000-9200 MHz was coordinated prior to authorization with the FAA Great Lakes Coordinator, Des Plaines, IL. Use of the frequency or band under the authority of this assignment is subject to such further coordination with the FAA Great Lakes Coordinator, Des Plaines, IL, as necessary to ensure compatibility with existing uses. This Note applied to an Aeronautical Assignment Group (AAG) frequency (see Section 1.3.2) indicates FAA Great Lakes regional coordination has been accomplished.

C048--This frequency assignment on 1030 MHz or in one of the bands 1215-1400, 2700-2900 or 9000-9200 MHz was coordinated prior to authorization with the FAA Southern Coordinator, Atlanta, GA. Use of the frequency or band under the authority of this assignment is subject to such further coordination with the FAA Southern Coordinator, Atlanta, GA, as necessary to ensure compatibility with existing uses. This Note applied to an Aeronautical Assignment Group (AAG) frequency (see Section 1.3.2) indicates FAA Southern regional coordination has been accomplished.

C049--This frequency assignment on 1030 MHz or in one of the bands 1215-1400, 2700-2900 or 9000-9200 MHz was coordinated prior to authorization with the FAA Eastern Coordinator, New York, NY. Use of the frequency or band under the authority of this assignment is subject to such further coordination with the FAA Eastern Coordinator, New York, NY, as necessary to ensure compatibility with existing uses. This Note applied to an Aeronautical Assignment Group (AAG) frequency (see Section 1.3.2) indicates FAA Eastern regional coordination has been accomplished.

C050--This frequency assignment on 1030 MHz or in one of the bands 1215-1400, 2700-2900 or 9000-9200 MHz was coordinated prior to authorization with the FAA New England Coordinator, Burlington, MA. Use of the frequency or band under the authority of this assignment is subject to such further coordination with the FAA New England Coordinator, Burlington, MA, as necessary to ensure compatibility with existing uses. This Note applied to an Aeronautical Assignment Group (AAG) frequency (see Section 1.3.2) indicates FAA New England regional coordination has been accomplished.

C052--Subject to local coordination with FCC Engineer-in-Charge to avoid interference to non-Federal services.

C057--Subject to prior coordination with NASA Spectrum Manager, Johnson Space Center, Houston, TX; Telephone (FTS) 525-0122 or (commercial) 713-483-0122.

C060--Prior to operational use, this frequency assignment must be coordinated with and concurred by the commander of the military installation listed.

C061--Operational use of this frequency assignment has been coordinated with and concurred by the commander of the military installation listed.

C062--DOE use of this frequency for telemetering is subject to prior coordination at the national level with agencies having assignments in the same band and will be subject, at the time of such coordination, to adjustment to preclude harmful interference.

C064--All transmissions to NASA's ATS-3 satellite shall be coordinated and scheduled with the ATS Project Manager, Mail Stop 54-5, Glenn Research Center, Cleveland, OH 44135; Telephone 216- 433-3483.

C065--Subject to coordination, prior to use, with the Department of the Interior, Bureau of Land Management, National Interagency Fire Center, Boise, ID; Telephone 208-387-5644.

C067--Subject to coordination with the Area Frequency Coordinator located at Nellis AFB, NV, prior to use in the states of Nevada, Utah west of 111 W and Idaho south of 44 N.

C068--This frequency assignment in one of the bands 1435-1525, 2310-2320 and 2345-2390 MHz was coordinated prior to authorization with the Area Frequency Coordinator, Nellis AFB, NV, who also coordinated it, as appropriate, with the Aerospace and Flight Test Radio Coordinating Council. Use of this frequency under the authority of this assignment is subject to such further coordination with the AFC as necessary to ensure compatibility with existing uses.

C069--Subject to coordination and scheduling with Mr. Dane Clark; National Environmental Satellite, Data, and Information Service (NESDIS); U.S. Department of Commerce; Direct Services Division (E/SP3); Room 3340 FB4 NOAA; 5200 Auth Road, Suitland, MD 20746-4304; Telephone 301-457-5681.

C071--This frequency assignment on 1030 MHz or in one of the bands 1215-1400, 2700-2900 or 9000-9200 MHz was coordinated prior to authorization with the FAA Alaskan Coordinator, Anchorage, AK. Use of the frequency or band under the authority of this assignment is subject to such further coordination with the FAA Alaskan Coordinator, Anchorage, AK, as necessary to ensure compatibility with existing uses. This Note applied to an Aeronautical Assignment Group (AAG) frequency (see Section 1.3.2) indicates FAA Alaskan regional coordination has been accomplished.

C072--This frequency assignment on 1030 MHz or in one of the bands 1215-1400, 2700-2900 or 9000-9200 MHz was coordinated prior to authorization with the FAA Pacific Coordinator, Honolulu, HI. Use of the frequency or band under the authority of this assignment is subject to such further coordination with the FAA Pacific Coordinator, Honolulu, HI, as necessary to ensure compatibility with existing uses. This Note applied to an Aeronautical Assignment Group (AAG) frequency (see Section 1.3.2) indicates FAA Pacific regional coordination has been accomplished.

C073--Subject to prior coordination with NASA Spectrum Manager, Wallops Flight Facility, Wallops Island, VA; Telephone 757-824-1623.

C074--Operational activities should be coordinated with NASA Spectrum Manager responsible for JPL/Goldstone Programs. Mail: 4800 Oak Grove Drive, Mail Stop 303-404, Pasadena, CA 91109; Telephone (FTS) 8-792-0068 or (commercial) 818-354-0068.

C075--This assignment has been coordinated with the Hydrology Coordinator in accordance with Section 8.3.6.

C076--This assignment has been coordinated with the Electromagnetic Spectrum Manager, National Science Foundation, 4201 Wilson Blvd., Arlington, VA 22230; E-mail: esm@nsf.gov, in accordance with Section 8.3.7, for the band 1660-1670 MHz, or Section 8.3.19 of the NTIA Manual.

C078--The domestic fixed aspects of this assignment have been coordinated with NTIA in accordance with Section 8.2.11 of the NTIA Manual.
C081--This assignment is for a station in the National Radio Quiet Zone. Successful coordination has been effected in accordance with Section 8.3.9 of the NTIA Manual.
C085--Subject to prior coordination with Army Frequency Coordinator, Military District of Washington, Attn: ASNK-OPB, Fort Lesley J. McNair, Washington, DC 20319-5050; Telephone 202-475-2554 or 2486, DSN 335-2554 or 2486.
C086--This frequency assignment in one of the bands 1435-1525, 2310-2320 and 2345-2390 MHz was coordinated prior to authorization with the Mid-Atlantic Area Frequency Coordinator, Patuxent River, MD, who also coordinated it, as appropriate, with the Aerospace and Flight Test Radio Coordinating Council. Use of this frequency under the authority of this assignment is subject to such further coordination with the AFC as necessary to ensure compatibility with existing uses.
C088--Prior to use, this frequency assignment must be scheduled with the Post Frequency Manager, Aberdeen Proving Ground, MD, Telephone 410-278-7591; DSN 298-7591.
C089--This frequency assignment was coordinated prior to authorization with FAA Headquarters, 800 Independence Avenue, S.W., Washington, DC 20591; Telephone: 202-267-8699.
C093--Subject to coordination with the Area Frequency Coordinator located at the Atlantic Fleet Weapons Training Facility, Roosevelt Roads, Puerto Rico, prior to use within the area 370 kilometers of Headquarters Building, Atlantic Fleet Weapons Training Facility, Roosevelt Roads, Puerto Rico.
C094--Subject to coordination with the Area Frequency Coordinator located at the Naval Air Warfare Center Aircraft Division, Patuxent River, MD, prior to use within the area enclosed by 100 kilometer radius of Headquarters Building, Naval Air Warfare Center Aircraft Division, Patuxent River, MD.
C095--The non-military agency allotted primary use of this frequency, or which shares primary allotment status with AGA, has agreed neither Record Notes PO74 nor P076 are required for this assignment.

A.2 Emission Notes

E013--A3 emission authorized for secondary and intermittent operation.
E023--Voice transmission is authorized for test and maintenance only.
E028--Lower sideband transmission. The carrier is higher than the assigned frequency shown by one half of the indicated bandwidth.[1]
E029--Upper sideband transmission. The carrier is lower than the assigned frequency shown by one half of the indicated bandwidth.[1]
E030--Lower sideband greater. The suppressed carrier is higher than the assigned frequency shown by 1.5 kHz.[2]
E031--Upper sideband greater. The suppressed carrier is lower than the assigned frequency shown by 1.5 kHz. [2]
E032--Lower sideband greater. The suppressed carrier is higher than the assigned frequency shown by .5 kHz.[2]
E033--Upper sideband greater. The suppressed carrier is lower than the assigned frequency shown by .5 kHz. [2]
E035--Lower sideband transmission. [1]
E036--Upper sideband transmission. [1]

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[1] Applies to SSB transmission.
[2] Applies to two or more independent sideband channels.

E037--Full-carrier SSB emission (3KH3E) shall be used except (1) when it is known that the receiving station is capable of receiving suppressed-carrier emission (3KJ3E) and (2) upon request of any station using the same carrier frequency (Ref: FCC 87.67b).
E038--When a single sideband emission is used from the various emissions shown on this HF assignment, the carrier frequency will be set to place the center of intelligence at the assigned frequency.
E039--The authorized emission bandwidth shall be so located within the band that it does not extend beyond the upper or lower limits of the authorized band shown in the *FRB entry of circuit remarks. If a portion(s) of the authorized band is to be excluded (*FBE) the authorized emission bandwidth must not extend into any portion(s) of the excluded band(s).

A.3 Limitation Notes

L2--Restricted to (daytime, nighttime, or indicated hours of operation.) Wherever used herein the term daytime means from two hours after local sunrise until two hours before local sunset. The term nighttime only means from two hours prior to local sunset until two hours after local sunrise at (a) specified point(s). Local time at transmitter is applicable unless otherwise specified.
L3--For communication with _____ stations only.
L012--To be used only in an emergency jeopardizing life, public safety, or important property under conditions calling for immediate communication where other means of communication do not exist or are temporarily disrupted or inadequate. To insure that radio equipment for emergency use is maintained in satisfactory operating condition, testing on such frequencies is permitted, provided that insofar as practicable, transmitters shall be tested with a non-radiating load and the test use of a radiating antenna held to a minimum and provided further that such testing shall be restricted to test message traffic and shall not include operator training.
L113--L012 FX
L116--L2 daytime
L121--L2 daytime Hawaii and westward
L125--L2 local sunrise to local sunset
L131--L2 nighttime
L168--L3 GCA or approach control
L171--L3 Agriculture
L174--L3 Army
L177--L3 Federal Aviation Administration
L180--L3 Coast Guard
L182--L3 Interior
L187--L3 Military
L188--L3 Military aircraft or aircraft authorized for military use
L190--L3 Navy
L192--L3 non-Federal
L195--L3 non-Federal coast stations
L197--L3 non-Federal public correspondence
L199--L3 non-Federal ships
L201--L3 public correspondence
L203--L3 U.S. Army Engineers
L242--L2 1300-2300 GMT
L255--L2 0200-0730 GMT
L256--L2 0200-0800 GMT and 1800-2300 GMT
L282--This assignment is for “back-up” use only when regular channels are either temporarily disrupted or inadequate.

L283--Limited to communications in or near a port, or in locks or waterways, between coast stations and ship stations, or between ship stations, in which messages are restricted to those related to the operational handling, the movement and the safety of ships, and, in emergency, to the safety of persons. Messages which are of a public correspondence nature shall be excluded.
L294--L2 1400-2200 GMT
L308--L3 Commerce
L309--L012 FB
L318--Authority under this assignment is limited to temporary periods and locations for telemetry of seismic data.
L330--This assignment is limited to communications with non-Federal ships for the exchange of traffic dealing with safety of life or property when other means of communication are not practicable.
L331--L2 0900-1300 and 1400-1600 GMT
L332--L2 2200-0300 GMT
L334--L2 0330-1830 GMT
L336--L2 1000-1700 GMT
L339--L2 1200-0300 GMT
L341--Limited to operations conducted in accordance with Bridge-to-Bridge portion of Section 8.2.29 of the NTIA Manual.
L343--L3 Tennessee Valley Authority
L347--L2 2330-2230 GMT
L350--Limited to use from November 15 to April 1.
L353--L2 0100-0600 Local
L355--Limited to ground transmissions only.
L357--This band assignment is authorized only for air/ground frequency assignment in the AAG/MAG bands (118-137 MHz and those frequencies utilized by the FAA for air traffic control in the 225-328.6 and 335.4-400 MHz band) and is for "back-up" use only when regular channels are either temporarily disrupted or inadequate. Actual frequencies will be listed in Agency Remarks.
L358--L2 1300-2200 GMT

A.4 M Notes

Do NOT enter "M" Notes in the NTS field. "M" Notes are to be entered on an *NTS line in the CIRCUIT REMARKS field (see Section 9.8.2, paragraph 39k).

M001--A note concerning this assignment is recorded in the minutes of the FAS meeting at which the application was approved. The source of the note is identified in the CIRCUIT REMARKS field (*NTS).
M002--This assignment was coordinated with IRAC or NTIA, and/or is subject to the conditions stated in the letter, the IRAC Document, the FAS Docket, or the FCC Regulation referenced in the CIRCUIT REMARKS field (*NTS).
M003--Subject to coordination prior to activation and, as appropriate, possible scheduling with the activity(ies) or station(s) listed in the CIRCUIT REMARKS field (*NTS).
M004--Subject to coordination prior to activation and, as appropriate, possible scheduling with the activity(ies) listed in the CIRCUIT REMARKS field (*NTS) when used within interference range of such activity(ies) or station(s).
M006--Subject to coordination prior to activation with the National Weather Service Meteorologist-In-Charge at the location(s) listed in the CIRCUIT REMARKS field (*NTS).
M007--Subject to notification of activation to the agency or activity listed in the CIRCUIT REMARKS field (*NTS).

M008--Operations under the authority of this assignment are subject to immediate adjustment, including cessation, if they result in harmful interference to the operations listed in the CIRCUIT REMARKS field (*NTS).
M009--Operations under the authority of this assignment a) are on a noninterference basis to the operations of the agency listed in the CIRCUIT REMARKS field (*NTS) on the same or adjacent channel and b) no protection can be afforded by that agency.
M010--This assignment was agreed to on a nonrenewable basis by the agency identified in the CIRCUIT REMARKS field (*NTS).
M011--Limited to the non-broadcast hours of and subject to coordination prior to activation with the station(s) listed in the CIRCUIT REMARKS field (*NTS).
M013--Subject to prior coordination with and concurrence by the organization/official listed in the CIRCUIT REMARKS field (*NTS) and to temporary cessation when required for marine environmental operations.
M014--During transmission, aircraft shall not exceed the altitude listed in the CIRCUIT REMARKS field (*NTS).
M015--The system using this assignment was reviewed by the SPS in accordance with Chapter 10 and the assignment is being made subject to conditions stated in the IRAC and SPS documents referenced in the CIRCUIT REMARKS field (*NTS).
M017--This non-Federal space station assignment is made with the understanding that protection cannot be guaranteed to reception of the non-Federal earth station(s) identified in the CIRCUIT REMARKS field (*NTS) due to the operation of existing transmitting earth stations and/or Federal fixed stations.
M018--When a frequency application has been pre-coordinated between two agencies prior to the application being submitted to the FAS use this CIRCUIT REMARKS field (*NTS) to indicate agency, person, date and limitations/reference. (optional)

A.5 Priority Notes

P032--Noninterference basis
P074--Not to preclude expansion and adjustment of operations within the band 162.0 to 174.0 MHz by non-military Federal agencies.
P076--Not to preclude expansion and adjustment of operations within the band 406.1 to 420.0 MHz by non-military Federal agencies.

A.6 Special Notes

S012--This operation does not include operator qualification training, but is a periodic operation of a communications system manned by fully qualified operators who are military reservists or affiliates. Except in emergencies, this frequency assignment will not be used as a means for passing traffic that in the absence of this authorization would require delivery by other means.
S015--Remote control
S017--This assignment is for the training of personnel in the technique and operational aspects of the electronic equipment.
S032--Common simplex channel for emergency and distress communications only. Available to all stations operating in or with aeronautical services.
S034--Disaster communications
S035--Distress, safety and calling
S038--FAC operation simultaneous with RLL
S041--For calibrating direction finders
S043--For emergency use at scene of air sea rescue
S047--For transmission of hydrologic and meteorological data

S048--For transmission of hydrologic data
S059--Radio direction finding
S063--Search and rescue communications
S067--Subject to Department to the Interior, Bureau of Indian Affairs net control
S068--Subject to immediate shutdown as needs of service may dictate
S070--Subject to immediate cancellation upon notice from FCC
S085--Training and testing operations
S120--Intermittent equipment tests
S139--Transmissions on this frequency will be discontinued upon receipt of notification to the effect that harmful interference is being caused to the international broadcasting service.
S141--This U.S. Government record is outside of the US&P and therefore does not fall within the jurisdiction of the NTIA and IRAC/FAS. This record is incorporated into the Government Master File for spectrum management, analysis and information purposes and does not constitute NTIA authority to transmit.
S142--Drone Control
S144--This assignment is not in complete conformity with the National Table of Frequency Allocations. Those operations that are conducted under the non-conforming portions of this assignment are on a secondary basis to operations conducted under assignments that are in conformity with the National Table of Frequency Allocations.
S145--This frequency is subject to adjustment upon notice from the military.
S147--These frequencies are used for a very short time only during actual nuclear test or dry runs prior to actual test. Such use of frequencies will be on a secondary basis subject to the avoidance of harmful interference to all operations established in accordance with international allocations applicable to these frequencies and to all other operations regularly authorized within the United States and Possessions on specific frequencies within these bands.
S148--This is an assignment for domestic service use in providing instantaneous transmission of vital emergency, operational command and alerting traffic of such importance as to affect the immediate survival and defense of the Nation. Circuits utilizing this frequency will be maintained in an operational status at all times, with on-the-air test transmissions to insure the highest degree of readiness. This assignment requires protection commensurate with the importance of the communications for which the circuit is intended.
S149--Any use of this assignment that is not at a transient location or that is for a period exceeding 15 days shall be notified to the FAS.
S150--This assignment is for a frequency that has been allotted for the primary use of another agency or for all government agencies (AGA); or, the emission bandwidth overlaps a frequency or frequencies allotted for primary use by another agency or all government agencies (AGA). If the frequency is allotted to another agency, the operations on this frequency must be moved to a properly allotted frequency, unless the agency to which the frequency is allotted agrees to the continued use of their allotted frequency. If the frequency is allotted for AGA and there are available frequencies allotted to the agency for its primary use, this operation should be moved to a frequency allotted primarily to the agency. The transition from this frequency in the 406.1-420 MHz band is in accordance with the provisions outlined in section 4.3.9 of the NTIA Manual.
S151--This assignment must be narrowbanded in accordance with either Section 4.3.7, 4.3.9, or 5.3.5.2 of the NTIA Manual.
S154--Scene of disaster frequency.
S155--For interception and retransmission of television signals.
S157--Non-Federal service
S159--U.S. Government short-distance low-power service
S160--This assignment has been made pursuant to Part 7.12 of the NTIA Manual and has been coordinated in accordance with Section 8.3.3.

S164--This assignment is not in complete conformity with the National Table of Frequency Allocations. Nevertheless, in the national interest, it is on an equal basis with assignments that are in conformity with the National Table of Frequency Allocations.

S165--This assignment has been made pursuant to Section 7.5.2 of the NTIA Manual for communication with non-Federal stations in the maritime mobile service.

S170--Authorized additionally in tactical and training operations when employing single sideband equipment with 3KH3E, 4KJ7B, 4KJ9W emissions for use with peak envelope powers not to exceed 2000 watts. In such operations the following additional conditions are applicable. All necessary emissions under the several modes of operation, including reduced carriers, shall be within kHz of the listed frequency. If harmful interference is caused to authorized operations, the power of this operation will be reduced to the mean power shown for this listing. In the determination of particular listed frequencies and associated carrier frequencies to meet individual tactical needs, due consideration will be given, particularly when utilizing powers in excess of the powers normally authorized on this frequency, to the avoidance of harmful interference to radio services authorized on the same or adjacent frequencies. With respect to the conduct of peacetime training operations, such use of the frequency is on a non-interference basis to the authorized operations of other agencies.

S171--Authorized additionally in tactical and training operations when employing single sideband equipment with 3KH3E, 4KJ7B, 4KJ9W emissions for use with peak envelope powers not to exceed 400 watts. In such operations the following additional conditions are applicable. All necessary emissions under the several modes of operation, including reduced carriers, shall be within kHz of the listed frequency. If harmful interference is caused to authorized operations, the power of this operation will be reduced to the mean power shown for this listing. In the determination of particular listed frequencies and associated carrier frequencies to meet individual tactical needs, due consideration will be given, particularly when utilizing powers in excess of the powers normally authorized on this frequency, to the avoidance of harmful interference to radio services authorized on the same or adjacent frequencies. With respect to the conduct of peacetime training operations, such use of the frequency is on a non-interference basis to the authorized operations of other agencies.

S179--Power shown is for emergencies only. Normal power is 4 kW or less.

S181--This assignment was authorized pursuant to Public Law 87-795.

S185--Secondary service. Maximum number of transmitters authorized: 10

S186--Power shown is for intermittent or emergency use. Normal power is 20 kW.

S189--Tactical and/or training operations

S195--Safety Communications

S196--This assignment is for range safety (command destruct/flight termination) in the band 406.1-420 MHz and is authorized in accordance with Section 8.2.54 of the NTIA Manual with an expiration date not to exceed December 31, 2014.

S199--Navy operations authorized by assignments bearing this note shall not cause harmful interference to those non-Federal operations existing at the time of authorization. The Navy agrees to make such adjustments of its group of high frequency coast telegraph assignments bearing this note as may be necessary to accommodate necessary expansion or adjustment of the non-Federal coast telegraph service.

S200--JCS communication circuit

S205--Civil defense network

S206--This assignment is for an operation for which other telecommunication facilities do not exist, are inadequate, or are impracticable of installation, and for which the use of frequencies above 30 MHz is not practicable. This note applies to FX or AX station classes only.

S208--This assignment is for the domestic haul of overseas traffic in transit or destined for the United States, for an operation where technical and operational requirements dictate such use. The domestic radio haul is a segment of the overall overseas radio system.

S211--50 kW mean power used during emergency or unusually poor propagation conditions. 10 kW mean power used during normal conditions. 2.5 kW mean power used during unusually good propagation conditions.
S219--Power shown is for emergency use. Normal power is 3 kW.
S227--Power shown is for emergency use. Normal power is 1.5 kW.
S233--This assignment is part of a frequency pool, and, with Department of State approval, it may be used by foreign embassies that are authorized the use of other frequency assignments under Public Law 87-795.
S242--The NASA Unified S-band system operates in the 2270-2290 MHz portion of the 2200-2290 MHz space telemetering band on a shared basis. This system will be utilized in space missions of extended duration. In certain geographical areas agencies conducting telemetering operations on the shared frequencies in the 2270-2290 MHz band may be requested by NASA to adjust such operations as necessary to support the space mission involved.
S264--This assignment will not be used except in the event that full-scale atmospheric nuclear testing is resumed, and it is further subject to prior coordination with PACOM.
S265--Transmissions shall be directed so as to avoid harmful interference to FAA stations in the Edwards AFB, CA area.
S267--Required for use in emergency areas when required to make initial contact with RACES units. Also for communications with RACES stations on matters requiring coordination.
S279--This listing represents a use of a laser(s) for telecommunication purposes and it is entered in the Government Master File (GMF) for information.
S286--The Coast Guard agrees to make such adjustments in its coast telegraph operations as necessary to provide an accommodation for non-Federal coast radiotelegraph operations anticipated by the designation of this frequency in Part 81, FCC Rules.
S288--This frequency assignment is to support the National Command Authority. Circuits utilizing this frequency will be maintained in operational status at all times.
S291--Operations are subject to compliance with FCC Rules and Regulations Part 87, subpart c. Advisory service shall be given to any private aircraft upon request. The use of this frequency shall not be a deterrent to the establishment of a non-Federal advisory station in this area. Operations on this frequency shall cease upon the establishment of non-Federal facilities or upon notice of harmful interference thereto.
S292--Not to be a bar to complete operational implementation of common system aids to air navigation.
S296--Not to preclude assignment of this frequency to other agencies at specific locations.
S297--This assignment is part of the Wide-area Multi-user Land Mobile Justice Wireless Network certified by NTIA in IRAC Doc. 31594. The provisions of paragraphs 3 through 5 of Section 8.2.48A of the NTIA Manual, except for the provisions of Paragraph 3 of that Section that require each agency to conduct requirements analysis of need and to conduct an analysis of alternatives to operating their own system, are waived for this assignment.
S298--Subject to Department of the Interior, U.S. Fish and Wildlife Service net control.
S299--Power shown is into a buried vertical dipole. ERP is approximately 1 kW.
S300--This assignment in the 162 to 174 MHz band supports the Federal Wildlife Telemetry program managed by the Department of the Interior's U.S. Fish and Wildlife Service. It is authorized on an non-interference basis and will be used for short-term periods at unspecified locations throughout the United States and possessions.
S301--Operations under the authority of this assignment a) are not protected from harmful interference which may be caused by authorized stations operating in accordance with the National Table of Frequency Allocations and b) are subject to immediate adjustment, including cessation, if they result in harmful interference to authorized stations operating in accordance with that table.
S302--Subject to the understanding that equipment will not be developed for operational use in this band.

S303--Subject to the understanding that there is not intended operational use of this equipment within USP.

S319--Federal Government use of frequencies in the 4940-4990 MHz band will be on a non interference basis to any non-Federal operations and shall not hinder the implementation of any non-Federal operations.

S320--This planning assignment is to assess the viability of the relocation of a current assignment from the 1710-1770 MHz band for the possible future accommodation of commercial advanced mobile wireless systems in that band. This assignment is not to exceed three years (see section 9.6.5 of the NTIA Manual). This note will be deleted if this assignment is activated.

S321--This assignment is for planning purposes not to exceed 3 years (see Section 9.6.5). The Note will be deleted after the assignment has been activated or this assignment will be deleted after specific locations have been notified.

S322--Stations established under the authority of this assignment shall conform to its technical particulars and shall be notified, as specified in Section 9.1.3 of the NTIA Manual, for inclusion in the list of Frequency Assignment to Federal Radio Stations.

S323--This assignment is for use in a system, or research and development looking toward such a system, for which funds have been committed for Stage 1 (Planning [conceptual]), as defined in Section 10.4.1 of the NTIA Manual prior to January 1, 1973. Follow-on stages in the system life cycle are subject to the provisions of Part 10.4 of the NTIA Manual.

S326--This assignment is for use in a system, or research and development looking toward such a system, for which funds had been committed for Stage 4 (Procurement), as defined in Section 10.4.1 of the NTIA Manual, prior to January 1, 1973.

S327--Marine environmental protection command/control/surveillance operations. Authorized additionally for other maritime mobile operations when not required for marine environmental purposes.

S328--This assignment is not planned for renewal. It has been replaced by another assignment.

S330--The equipment nomenclature or appropriate equipment coding is to be provided within six months after activation of the authorized stations.

S334--Subject to Department of the Interior, Bureau of Land Management net control.

S335--This telemetry assignment is on a non-interference, non-protected basis as concerns assignments in the aeronautical mobile service.

S340--To be used in support of DOE scientific missions with protected status for short periods of time during actual operations. Such use will require coordination between the DOD and DOE and will be on a scheduled basis.

S341--Subject to the continued applicability of note P074, this WSMR assignment is exempt from the requirement to be converted to a frequency listed in Section 4.3.7 of the NTIA Manual.

S344--This assignment has been granted a waiver and need not comply to the provisions of Section 8.2.20 of the NTIA Manual.

S345--DOE operations in the band 4400-4940 MHz under this authority will be for emergency deployment of the NEST system. For such use in a given area, DOE will select clear channels based upon current GMF records. If time permits, DOE will coordinate specific frequencies with the appropriate military frequency managers/coordinators in the field. Tests and training will not be conducted under this authority; frequency applications for such operations will be submitted to the FAS/IRAC on a case by case basis.

S348--Operations are subject to compliance with FCC Rules and Regulations, Part 95, Subpart D. Transmitters may be operated only by employees of the Federal Government only for the purpose of interfacing with Non-Federal licensees to coordinate essential and mutual activities. This authority may be revoked by the Federal Communications Commission in its discretion at any time.

S349--Not to preclude assignment of this frequency outside of normal land mobile interference range (excluding skip and sporadic E reflection etc.) of DOE receive stations.

S350--In the frequency band 30-400 MHz for this FAC operation, power shown is for primary equipment. Back-up equipment has been engineered and installed with output power up to 35 watts. Use of this back-up equipment is authorized during emergencies and/or failure of primary equipment.
S351--This assignment is planned for implementation or deletion as a consolidation of frequencies being used.
S354--This planned assignment is for a Space Project that has been approved in principle by NTIA in the research/development phase. Some operational characteristics have not been determined. This listing does not provide authority to transmit.
S355--This assignment is for a wide-area, common-use frequency pursuant to Section 4.2.3 of the NTIA Manual.
S356--This assignment is for a local-area, common-use frequency pursuant to Section 4.2.4 of the NTIA Manual.
S357--Power shown is for emergencies only. Normal power is 10 kW.
S358--This assignment is exempt from referral to NTIA by Exception 1 of the domestic fixed policy in Section 8.2.11 of the NTIA Manual.
S359--This assignment is exempt from referral to NTIA by Exception 2 of the domestic fixed policy in Section 8.2.11 of the NTIA Manual.
S360--This assignment is exempt from referral to NTIA by Exception 3 of the domestic fixed policy in Section 8.2.11 of the NTIA Manual.
S361--Multiple transmitting and/or receiving stations operating at FIXED locations are involved in this assignment; and, it is not feasible to indicate all specific locations. (The method of operation must be fully explained in supplementary details when S361 is applied to a frequency assignment.)
S362--One or more transportable transmitting and/or receiving stations are utilized in this assignment.
S366--All operations will be outside of the U.S./Canada Border Zone, or for assignments for frequencies below 1000 MHz the power used while operating in the Border Zone will not exceed 5 watts.
S367--This frequency assignment has been made on an exceptional basis for operation in the National Radio Quiet Zone on the conditions that use shall be minimized consistent with operational requirements and that any technical modification to this assignment shall be coordinated in accordance with Section 8.3.9 of the NTIA Manual.
S368--Subject to Department of the Interior, Bureau of Reclamation net control.
S369--This assignment is in accordance with Section 8.2.44 of the NTIA Manual.
S370--Transportable earth station operations in the 7300-7750 MHz and 8025-8400 MHz bands shall be deployed in such a manner as not to cause harmful interference to existing assignments and will adjust to allow additional stations of other radio services in these bands as required.
S371--This assignment is in accordance with Chapter 10 and Part 7.14 of the NTIA Manual.
S373--This assignment, in the 2700-2900 MHz band, is for operation in a designated heavily used area or for collocated operation (see Annex D of the NTIA Manual). This equipment has the capability of implementing the additional Electromagnetic Compatibility (EMC) provisions of RSEC Criteria D under Section 5.3 of the NTIA Manual. Implementation of this capability may be necessary at a later date.
S375--Operations authorized by assignments bearing this note shall be subject to the GMF recording method being developed in accordance with IRAC Doc. 23200/1 (FAS ADM 830029/1).
S376--Operations on this frequency under direct-control of the USDA, Forest Service.
S378--In emergency situations a maximum power of 25 watts for ship stations and 10 watts for coast stations is authorized.
S379--This assignment shall expire upon conclusion of the Operation Alliance mission.
S381--Operations under this assignment are for SHARES traffic in accordance with Section 7.3.5 of the NTIA Manual.
S382--This record is retained for spectrum management and analysis purposes and does not constitute an NTIA authority to transmit.

S383--This sounder assignment complies with Section 8.2.21 of the NTIA Manual. The frequency bands listed in paragraph 1.c. of Section 8.2.21 have been suppressed. The information required by paragraph 2 of Section 8.2.21 is provided in the supplementary details of this assignment.

S384--This assignment has been made pursuant to Part 4.3.2 of the NTIA Manual.

S385--This GMF listing identifies passive sensor or radio astronomy receiving stations for spectrum management and analysis purposes and does not constitute an NTIA authority to transmit. Interference protection to the receiving station is afforded only to the extent provided in the National Table of Frequency Allocations.

S386--Operations authorized by assignments bearing this note shall be restricted to direct support of the Operation Alliance mission, and are subject to the management and control of the U.S. Customs Service.

S387--Upon implementation of narrowband operations this channel will be vacated.

S388--This assignment supports DSCS Operations Center earth stations limited to locations at Fort Detrick, and Fort Meade, MD, and Camp Roberts, CA. This assignment shall not preclude new terrestrial assignments within or overlapping the frequency band 7250-7750 MHz provided each new terrestrial assignment does not exceed a maximum tolerable interfering power of -141.3 dBm in any 30 kHz bandwidth at the earth station receiver. In addition, this assignment has no priority over either future meteorological-satellite systems (See G104) or terrestrial assignments authorized prior to April 26, 1994.

S389--The bands 2390-2400 and 2402-2417 MHz were identified for immediate reallocation, effective August 10, 1994, for exclusive non-Federal use under Title VI of the Omnibus Budget Reconciliation Act of 1993. Effective August 10, 1994, any Federal operations in these bands are on a non-interference basis to non-Federal operations and shall not hinder the implementation of any non-Federal operations.

S390--This assignment for wideband telegraphy, facsimile and/or special transmission systems in the Maritime Mobile Service is being made in accordance with Section 8.2.29, paragraph 5.c.(1) of the NTIA Manual and ITU RR 52.170.

S391--This assignment is an expansion or enhancement of an existing system in the 138-150.8 or 406.1-420 MHz band which utilizes a band-width greater than 11 kHz.

S392--The bands 2300-2310 and 2400-2402 MHz were identified for reallocation, effective August 10, 1995, for exclusive non-Federal use under Title VI of the Omnibus Budget Reconciliation Act of 1993. Effective August 10, 1995, any Federal operations in these bands are on a non-interference basis to authorized non-Federal operations and shall not hinder the implementation of any non-Federal operations.

S393--The band 2417-2450 MHz was identified for reallocation, effective August 10, 1995, for mixed Federal and non-Federal use under Title VI of the Omnibus Budget Reconciliation Act of 1993.

S396--This assignment is in accordance with either Section 4.3.7, paragraph 5d, or Section 4.3.9, paragraph 6d of the NTIA Manual.

S397--This assignment is for a joint law enforcement requirement pursuant to Section 4.3.16 of this Manual.

S398--This assignment is for a joint incident response requirement pursuant to Section 4.3.16 of this Manual.

S399--Effective January 1, 2005, any Federal operation in the band 162-174 MHz, not conforming to the 12.5 kHz channel plan, is on a non-interference basis to all operations that do conform to the 12.5 kHz channel plan in accordance with Section 4.3.7 of the NTIA Manual.

S400--A temporary waiver has been granted to this assignment for continued wideband operations (emissions equal to or greater than 12.5 kHz) in the 162–174 MHz band not to exceed one calendar year.

S401--This record requires review every 10 years per NTIA Manual, Annex F.

S402--This assignment has been made pursuant to Section 8.2.47 of the NTIA Manual for a shared federal/non-federal radio system.

S514--This assignment supports the NASA Space Program ATS-3.

S544--This assignment supports the NASA Deep Space Program PIONEER.

S545--This assignment supports the NASA/Commerce Earth Exploration Service Space Program LANDSAT.
S553--This assignment shall expire upon completion of Space Project Defense Meteorological Satellite Program Block 5.
S558--This assignment shall expire upon completion of the SAMSO 080-70 space project.
S566--This assignment shall expire upon completion of the Advanced Technology Satellite Global Positioning System space project.
S567--This assignment shall expire upon completion of the Deep Space Program space project.
S569--This assignment shall expire upon completion of the Transit Improvement Program (TIP) space project.
S570--This assignment shall expire upon completion of FLEETSATCOM space project.
S572--This assignment shall expire upon completion of the Air Force Satellite Data System space project.
S575--This assignment supports the NASA TDRSS space program.
S576--This assignment supports the NASA Space SHUTTLE (STS) program.
S589--This assignment supports the NASA IMP-8 space program.
S594--This assignment supports the GOES Space System.
S595--This assignment shall expire upon completion of GPS Phase II space project.
S597--This assignment supports the Navy Space Surveillance System.
S603--This assignment supports the Space Ground Link Subsystem (SGLS) operations.
S604--This assignment supports foreign space operations.
S606--This assignment shall expire upon completion of the NATO IIIA space project.
S615--This assignment supports the FCC authorized EUTELSAT Atlantic Bird-2 satellite located at 8.0 WL.
S616--This assignment shall expire upon completion of the DSCS Phase II space project.
S617--This assignment supports the NASA SAR space program.
S619--This assignment supports the INTELSAT V satellite.
S621--This application supports a DOD space project.
S625--This assignment shall expire upon completion of the IUS space project.
S626--This assignment shall expire upon completion of the LEASAT (FLTSATCOM-A) space project.
S627--This assignment supports the Small Business satellite.
S629--This assignment supports the TIROS-N space system.
S632--This assignment supports the NASA Voyager Deep Space Program.
S634--This note is to be used in conjunction with S604, to reflect assignments used by NASA in a cooperative effort with the European Space Agency (ESA) in support of the ULYSSES (formerly known as the International Solar Polar Mission (ISPM)) space program.
S641--This assignment supports the NASA Hubble Space Telescope (HST) space program.
S643--This assignment shall expire upon completion of Space Project DSCS Phase III.
S647--This assignment supports the NASA ERBS space program.
S651--This assignment supports the NASA Space Station space program.
S661--This assignment supports the Strategic Defense Initiative (SDI) Program.
S662--This assignment is for Common Carrier service provided in a non-Federal Domestic Satellite System. The specific frequency and satellite is dependent upon the Common Carrier selected to provide the service.
S664--This assignment shall expire upon termination of the STATSIONAR Satellite System (USSR).
S665--This assignment is in the INMARSAT space system. If this assignment is for a transportable land-based or aeronautical INMARSAT terminal, it is subject to coordination with the Common Carrier Bureau of the Federal Communications Commission. This coordination will be conducted by the Communications Satellite Corporation in accordance with Annex E.

S666--This assignment supports the NATO IV space project.
S670-This assignment supports the FCC authorized INTELSAT Satellite System.
S671--This assignment supports the Orbital Sciences Corporation DATASAT Space System.
S673--This assignment supports the NASA Space Program Cosmic Background Explorer (COBE) satellite.
S678--This frequency supports the AF/DOE ALEXIS space project.
S680--This frequency supports the Commerce project Pan-Pacific Educational and Cultural Experiments by Satellite (PEACESAT).
S681--This assignment supports the NASA Extra-Vehicular Activity UHF Communications Subsystem.
S684--This assignment supports the NASA Solar Anomalous and Magnetospheric Particle Explorer (SAMPEX) in the Small Explorer (SMEX) project.
S690--This assignment supports the LIGHT-SAT Satellite System.
S692--This assignment supports the Motorola Satellite Communications, Inc.'s IRIDIUM Space System.
S696--This assignment supports the NASA Tropical Rainfall Measurement Mission (TRMM).
S698--This assignment will expire upon completion of the Space Project NATO IV.
S700--This assignment supports the NASA SeaWIFS project on the SeaStar spacecraft.
S701--This assignment supports the NASA Energy Transient Experiment (HETE).
S703--This assignment supports the NASA Summer Undergraduate Research Fellowship Satellites I and II (SURFSAT).
S707--This assignment supports the German SAFIR System.
S708--This assignment supports the NASA Total Ozone Monitoring Spectrometer Earth Probe (TOMS-EP).
S710--This assignment supports the MILSTAR Communications Satellite System.
S712--This assignment supports the DOE Proliferation Detection and Environmental Monitoring Satellite Program.
S713--This assignment supports the NASA Fast Auroral Snapshot Explorer (FAST).
S714--This assignment supports the NASA Submillimeter Wave Astronomy satellite (SWAS).
S715--This assignment supports the NASA International Solar Terrestrial Program (ISTP) Interplanetary Physics Laboratory WIND.
S717-- This assignment supports the NASA Earth Observing System AM (EOS-AM) which is also known as Terra Communications System.
S719--This assignment supports the NASA Advanced Composition Explorer (ACE).
S722--This assignment supports the NASA CASSINI Satellite System.
S723--This assignment supports the NASA Chandra X-Ray Observatory (CXO).
S724--This assignment supports commercial service using the Russian LOUTCH WSDRN satellite.
S726--This assignment supports the NASA Rossi X-Ray Timing Explorer (Rossi XTE).
S730--This assignment supports the NOAA K, L, and M Satellite System.
S731--This assignment supports the NASA Polar Plasma Laboratory Satellite System - POLAR.
S733--This assignment supports the EARTHWATCH Remote Sensing System.
S737--This assignment supports the Hughes Communications Galaxy, Inc. GALAXY VIII (I) satellite.
S738--This assignment supports the NASA Mars Global Surveyor.
S739--This assignment supports the NASA Transition Region and Coronal Explorer Satellite System (TRACE).
S740--This assignment supports the NASA Wide-Field Infrared Explorer satellite (WIRE).
S742--This assignment is for use by a Federal Government earth station supporting a foreign space operation. The responsible Federal agency has waived the NTIA spectrum certification process for the earth station operation. Therefore, although this operation may be in accordance with the National Table of Frequency Allocations, it must be conducted on an unprotected, non-interference basis to those U.S. operations that are in conformity with the National Table of Frequency Allocations.

S743--This assignment shall expire upon termination of the EXPRESS Satellite System (Russia).
S745--This assignment supports a federal government space program.
S747--This assignment is for a receive only earth station for the IRS-1B satellite.
S748--This assignment is for a receive only earth station for the IRS-1C satellite.
S749--This assignment is for a receive only earth station for the ERS-2 satellite.
S750--This assignment supports the Space Test Experiment Platform (STEP 0) program.
S752--This assignment supports the NASA Gravity Probe-B Satellite System.
S758--This assignment supports the PANAMSAT PAS-8 and PAS-9 satellites.
S759--This assignment supports the NASA Thermosphere-Ionosphere-Mesosphere-Energetics-Dynamics (Timed) Satellite System.
S760--This assignment supports the Ikonos-1 and Ikonos-2 Satellite System.
S761--This assignment supports the NASA Imager for Magnetopause-to-Aurora Global Exploration (IMAGE).
S762--This assignment supports the ICO Medium Orbit satellite constellation.
S763--This assignment supports a Federal Government program using a commercial contractor operating in the non-Federal space band. The license to operate is held by a non-Federal entity in support of this program. This record is incorporated into the Government Master File for spectrum analysis, and information purposes.
S765--This assignment supports the GLOBALSTAR Satellite System.
S767--This assignment supports the Orbview Space System.
S768--This assignment supports the NASA Microwave Anistropy (MAP) Satellite System.
S769--This assignment is for a receive only earth station for the IRS-1D satellite.
S771--This assignment supports the NASA Quickscat Satellite System.
S772--This assignment supports the NASA Lyman-Far Ultraviolet Spectroscopic Explorer (FUSE) Satellite System.
S775--This assignment supports the NASA Active Cavity Radiometer Irradiance Monitor Satellite System (ACRIMSAT).
S778--This assignment supports the NASA Stardust Satellite System.
S780--This assignment supports the NASA Earth Orbiter-1 (EO-1) Communications System.
S781--This assignment supports the NASA USAGenesis Communications System.
S782-- This assignment supports the NASA Earth Observation System-PM (EOS-PM), which is also known as Aqua.
S783--This assignment supports the NAHUEL-C Satellite System (Argentina).
S785--This assignment supports the NASA Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI) Communications System.
S786--This assignment supports the NASA Galaxy Evolution Explorer (GALEX) Satellite Communications System.
S787--This assignment supports the NASA Ice, Cloud, and Land Elevation (ICESAT) Satellite Communications System.
S788--This assignment supports the NASA Spitzer Space Telescope (formerly the Space Infrared Telescope Facility (SIRTF)) Communications System.
S789--This assignment supports the FCC Galaxy-11 Satellite System.
S791--This assignment supports the NASA Mars Surveyor 2001 Orbiter Communications System.
S792--This assignment supports the NASA Wire-less Video System (WVS) Communications System.
S795--This assignment supports the HISPASAT-1C Satellite System.
S796--This assignment supports the Astrovision Satellite System.
S797--This assignment supports the NASA Solar Radiation and Climate Experiment (SORCE) Satellite Communications System.

S799--This assignment supports the NASA Swift Gamma Ray Medium Class Experiment (MIDEX) Satellite Communications System.
S801--This assignment supports the NASA Cosmic Hot Intersteller Plasma Spectrometer (CHIPS) Mission Satellite Communications system.
S802--This assignment supports the FCC authorized AMC-4 (formerly GE-4) Satellite System.
S804--This assignment supports the PANAMSAT PAS-5 Satellite System.
S805--This assignment supports the PANAMSAT PAS-1R Satellite System.
S806--This assignment supports the NASA Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) (formerly PICASSO) Satellite Communications System.
S812--This assignment supports the NASA Earth Observing System (EOS) - Aura Satellite Communications System.
S814--This assignment supports the Atlantic Bird 2 (EUTELSAT) at 8.0 WL Satellite System.
S816--In the band 3600-3650 MHz, in accordance with **US245**,

i) an EMC analysis based on the NTIA TR-99-361 report was performed by the non-Federal applicant and the non-Federal applicant agrees to accept this potential for unacceptable interference, and

ii) these fixed-satellite service operations are limited to international inter-continental systems.

S817--In the band 3650-3700 MHz, in accordance with US348, an EMC analysis based on the NTIA TR-99-361 Report was performed by the non-Federal applicant and the non-Federal applicant agrees to accept this potential for unacceptable interference from the three stations identified in US348. Additionally, per US245, in the band 3650-3700 MHz, these fixed-satellite service operations are limited to international inter-continental systems.
S818--The band 5850-5925 MHz is shared on a co-primary basis with Federal Government radiolocation systems in the U.S. and Possessions. In accordance with US245,

i) the applicant is aware of the potential allocation and electromagnetic compatibility issues in the 5850-5925 MHz frequency band and the applicant agrees to accept this potential for unacceptable interference from radiolocation stations operating in accordance with footnote G2 and,

ii) these fixed-satellite service operations are limited to international inter-continental satellite systems.

S819--In the U.S. and Possessions, the band 5850-5925 MHz is shared on a co-primary basis with Federal radiolocation systems. In accordance with US245, this earth station transmitter has been successfully coordinated with the Federal Government. The Federal operators have evaluated the potential interference from this earth station transmitter to their radiolocation receivers and have concluded that no unacceptable interference will occur. Any conditions placed on the earth station transmitter are included in SUPPLEMENTARY DETAILS. Any conditions required to protect radiolocation receivers will also be included in the FCC license.
S820--This assignment supports the FCC authorized New Skies Satellite System.
S821--This assignment supports the NASA Mercury Surface Space Environment, Geochemistry and Ranging (MESSENGER) Satellite Communications System.
S823--This assignment supports the FCC authorized TELSTAR-6 Satellite System.
S824--This assignment supports the NASA Mars Exploration Rover 1 and 2 (MER-1 and MER-2) Satellite Communications System.
S825--This assignment supports the FCC authorized Mabuhay (AGUILA 2) satellite located at 146.0 EL.
S826--This assignment supports the FCC authorized GE-3 satellite located at 87.0 WL.
S828--This assignment supports the FCC authorized ECHOSTAR 1 satellite located at 148 WL.
S829--This assignment supports the FCC authorized ECHOSTAR 2 satellite located at 148 WL.
S830--This assignment supports the FCC authorized ECHOSTAR 4 satellite located at 119 WL.

S831--This assignment supports the FCC authorized ECHOSTAR 6 satellite located at 119 WL.
S832--This assignment supports the FCC authorized GALAXY III-C, GALAXY VIII(I)-R, and GALAXY VIII- I satellites located at 95.0 WL.
S833--This assignment supports the FCC authorized EUTELSAT Atlantic Bird-3 satellite located at 5.0 WL.
S834--This assignment supports the NASA EPOXI (formerly Deep Impact) Satellite Communications System.
S836--This assignment supports the NASA New Horizons Satellite Communications Systems.
S837--This assignment supports the NASA Mars Reconnaissance Orbiter Satellite Communications Systems.
S839--This assignment supports the NASA Solar Terrestrial Relations Observatory (STEREO) Satellite Communications System.
S840--This assignment supports the FCC authorized Marisat-F2 satellite located at 33.9 W.L.
S841--This assignment supports the FCC authorized AMOS satellite located at 4.0 W.L.
S842--This assignment supports the NASA DAWN Satellite Communications System.
S843--This assignment supports the FCC authorized ESTRELA DO SUL 1 satellite located at 63.0 W.L.
S844--This assignment supports the FCC authorized experimental non-voice non-geostationary Aprize satellite.
S845--This assignment supports the NASA Aeronomy of Ice in the Mesosphere (AIM) Satellite Communications Systems.
S848--This assignment supports the FCC authorized non-geostationary IRS-P6 satellite.
S849--This assignment supports the FCC authorized non-geostationary QUICKBIRD-1 satellite.
S850--This assignment supports the NASA Time History of Events and Macroscale Interactions during Substorms (THEMIS) Satellite Communications Systems.
S852--This assignment supports the FCC authorized ORBVIEW satellite.
S853--This assignment supports the FCC authorized Lockheed Martin-133W-RNSS satellite.
S854--This assignment supports the FCC authorized Lockheed Martin-UFO 7 satellite.
S855--This assignment supports the FCC authorized Cal Poly State University CP 1 satellite.
S856--This assignment supports the FCC authorized Mobile Satellite Ventures AMSC-1 satellite located at 100.95 W.L.
S857--This assignment supports the FCC authorized Mobile Satellite Ventures MSAT-1 satellite at 106.95 W L.
S858--This assignment supports the NASA Glory Satellite Communications System.
S859--This assignment supports the FCC authorized Lockheed Martin-107.3W-RNSS satellite.
S860--This assignment supports the FCC authorized AMC-9 satellite located at 0830000 RLG.
S861--This assignment supports the FCC authorized non-geostationary ORBVIEW-5 satellites.
S862--This assignment supports the FCC authorized Galaxy 27 satellite (formerly Intelsat IA-7) at 129 WL.
S863--This assignment supports the FCC authorized INTELSAT-IA-6-satellite.
S865--This assignment supports the geostationary satellite Apstar V at 1380000E.
S866--This assignment supports the geostationary satellite RPS-2.
S867--This assignment supports the non-geostationary satellite IKONOS-2.
S868--This assignment supports the non-geostationary satellite IRS-1C.
S869--This assignment supports the non-geostationary satellite IRS-ID.
S870--This assignment supports the non-geostationary satellite IRS-P6.
S871--This assignment supports of the non-geostationary CubeSat Test Bed (CSTB) satellite.
S873--This assignment supports the NASA Genesis spacecraft.
S874--This assignment supports the DOE Cobra Flight Experiment (CFE) Satellite System.
S875--This assignment supports the NASA Gamma Ray Large Area Telescope (GLAST).

S876--This assignment supports the DOC National Polar-Orbiting Operational Environmental Satellite System (NPOESS).
S877--This assignment supports the FCC authorized Orbit Orbcomm J1 satellite.
S879--This assignment supports the NASA Interstellar Boundary Explorer (IBEX) spacecraft.
S880--This assignment supports the NASA Mars Scout Lander System.
S881--This assignment supports the NASA Kepler Satellite Mission System.
S882--This assignment supports the NASA Phoenix Mars Scout System.
S883--This assignment supports the NASA Lunar Reconnaissance Orbiter System.
S885--This assignment supports the NASA Widefield Infrared Survey Explorer System.
S887--This assignment supports the NASA Fast Satellite (FASTSAT) System.
S888--This assignment supports the NASA Distress Alerting Satellite System.
S889--This assignment supports the NASA Orbiting Carbon Observatory (OCO).
S890--This assignment supports the NASA Mars Science Laboratory (MSL).
S891--This assignment supports the FCC authorized INTELSAT 805 satellite located at 55.500 WL.
S892--This assignment supports the FCC authorized HISPASAT 1C satellite located at 30.000 WL.
S893--This assignment supports the FCC authorized ANIK F1 satellite located at 107.300 WL.
S894--This assignment supports the FCC authorized ANIK E2 satellite located at 111.100 WL.
S895--This assignment supports the FCC authorized ANIK E1 satellite located at 118.700 WL.
S896--This assignment supports the FCC authorized AMC-9 satellite located at 83.000 WL.
S897--This assignment supports the FCC authorized AMC-5 (Formerly GE-5) satellite located at 79.000 WL.
S898--This assignment supports the FCC authorized AMC 6 satellite located at 72.000 WL.
S899--This assignment supports the FCC authorized TerreStar 1 satellite located at 111.100 WL.
S900--This assignment supports the NASA Global Precipitation Measurement (GPM) System.
S901--This assignment supports the FCC authorized SBS-6 at 74 WL.
S902--This assignment supports the FCC authorized Horizons-1 at 127 WL.
S903--This assignment supports of the FCC authorized Galaxy 28 (formerly Intelsat IA-8) at 89 WL.
S904--This assignment will expire upon completion of the Air Force WGS Project Phase I.
S906--This assignment supports the FCC authorized non-geostationary Worldview 60 (WV-1) satellite.
S907--This assignment supports the FCC authorized non-geostationary Worldview 110 (WV-2) satellite.
S908--This assignment supports the DOC Ocean Surface Topography Mission (OSTM).
S909--This assignment supports the NASA Space program James Webb Space Telescope (JWST).
S910--This assignment supports of the FCC authorized AMC satellite constellation.
S911--This assignment supports the FCC authorized fixed-satellite system, NEW DAWN.
S912--This assignment supports the NASA Space Program Radiation Belt Storm Probes (RBSP).
S913--This assignment supports the NASA Space Program Solar Dynamics Observatory (SDO).
S914--This assignment supports the DOC National Oceanic & Atmospheric Administration N'Satellite System (NOAA-N Prime).
S915--This assignment supports the NASA Landsat Data Continuity Mission (LDCM).
S916--This assignment supports the Air Force AMC-14 Satellite System.
S917--This assignment supports the FCC authorized Telstar satellite constellation.
S918--This assignment supports the DOC COSMIC Satellite System.
S919--This assignment supports the FCC authorized New Skies satellite.
S920--This assignment supports the NASA Aquarius mission.
S921--This assignment supports the NASA JASON-1 Microwave Radiometer (JMR) Mission.

S922--This assignment supports the NASA Commercial Orbital Transportation Services (COTS) Mission.
S923--This assignment supports the FCC authorized geostationary satellite system for DIRECTV.
S924--This assignment supports the Air Force Academy Falcon Satellite Program.
S925--This assignment supports the FCC authorized Hughes Network Satellite Systems.

(Last Page in Annex A)

ANNEX B

Data and Procedures for Assessing Interactions Among Stations in the Space and Terrestrial Services

B.1 GENERAL

Chapter 8 of this Manual contains criteria and procedures applicable to spectrum sharing among stations in the space radiocommunication services and between stations in the space and terrestrial radiocommunication services. This Annex supplements Chapter 8 with supporting data and verification procedures appropriately cross-referenced to the various Sections of Chapter 8.

B.1.1 Limitations on Power and Direction of Maximum Radiation of Stations in the Fixed Service in the Band 8025-8400 MHz

Power and antenna pointing limitations are specified in Section 8.2.34. A description is also provided therein of two computerized procedures for checking proposed new stations or systems for compliance with the specified limits during the FAS and SPS review processes.

The following table will assist in ensuring that the main antenna beam of a fixed or mobile station does not point at the geostationary orbit. This table is appropriate for use by Federal agencies in the earlier planning stages of systems in the fixed and mobile services, within the limitations imposed by the following basic assumptions:

(a) an e.i.r.p. of +55 dBW, and therefore, a required separation angle of 1.5° from the geostationary orbit;

(b) an angle of elevation of the antenna main beam between -1° and +4°; and,

(c) atmospheric refraction in the range of -2° to 0°.

For an assignment to a station with an antenna elevation angle between -1° and +4° with an e.i.r.p. of less than +55 dBW, the azimuthal sectors to be avoided will be smaller, but are contained within the sectors indicated in the table. This table cannot be used where the elevation angle is not between -1° and +4°. Calculation of the azimuthal sectors to be avoided for elevation angles not between -1° and +4° should be accomplished using ITU-R Report 393 (1990).

RANGES OF AZIMUTHS TO BE AVOIDED Northern Hemisphere

Latitude of Terrestrial Station (N)	From	To	From	To
0	88.50	91.50	268.50	271.50
1	88.60	91.73	268.27	271.40
2	88.70	91.95	268.05	271.30
3	88.80	92.18	267.82	271.20
4	88.90	92.41	267.59	271.10
5	88.99	92.63	267.37	271.01
6	89.09	92.86	267.14	270.91
7	89.19	93.09	266.91	270.81
8	89.29	93.33	266.67	270.71
9	89.38	93.56	266.44	270.62
10	89.48	93.80	266.20	270.52
11	89.58	94.04	265.96	270.42
12	89.68	94.28	265.72	270.32
13	89.78	94.52	265.48	270.22
14	89.88	94.76	265.24	270.12
15	89.97	95.01	264.99	270.03
16	90.07	95.26	264.74	269.93
17	90.17	95.52	264.48	269.83

Latitude of Terrestrial Station (N)	From	To	From	To
18	90.27	95.77	264.23	269.73
19	90.38	96.03	263.97	269.62
20	90.48	96.30	263.70	269.52
21	90.58	96.57	263.43	269.42
22	90.68	96.84	263.16	269.32
23	90.79	97.12	262.88	269.21
24	90.89	97.40	262.60	269.11
25	91.00	97.69	262.31	269.00
26	91.11	97.98	262.02	268.89
27	91.22	98.28	261.72	268.78
28	91.33	98.58	261.42	268.67
29	91.44	98.89	261.11	268.56
30	91.56	99.21	260.79	268.44
31	91.67	99.54	260.46	268.33
32	91.79	99.87	260.13	268.21
33	91.91	100.21	269.79	268.09
34	92.03	100.56	259.44	267.97
35	92.16	100.92	259.08	267.84
36	92.28	101.29	258.71	267.72
37	92.41	101.67	258.33	267.59
38	92.54	102.06	257.94	267.46
39	92.68	102.46	257.54	267.32
40	92.82	102.88	257.12	267.18
41	92.96	103.31	256.69	267.04
42	93.11	103.75	256.25	266.89
43	93.26	104.21	255.79	266.74
44	93.41	104.69	255.31	266.59
45	93.57	105.19	254.81	266.43
46	93.74	105.70	254.30	266.26
47	93.91	106.24	253.76	266.09
48	94.08	106.80	253.20	265.92
49	94.26	107.38	252.62	265.74
50	94.45	107.99	252.01	265.55
51	94.65	108.63	251.37	265.35
52	94.85	109.30	250.70	265.15
53	95.06	110.00	250.00	264.94
54	95.29	110.74	249.26	264.71
55	95.52	111.53	248.47	264.48
56	95.76	112.35	247.65	264.24
57	96.02	113.23	246.77	263.98
58	96.29	114.17	245.83	263.71
59	96.57	115.17	244.83	263.43
60	96.87	116.23	243.77	263.13
61	97.19	117.38	242.62	262.81
62	97.52	118.61	214.39	262.48
63	97.88	119.95	240.05	262.12
64	98.27	121.40	238.60	261.73
65	98.68	122.99	237.01	261.32
66	99.13	124.73	235.27	260.87
67	99.60	126.66	233.34	260.40
68	100.13	128.82	231.18	259.87
69	100.69	131.25	228.75	259.31
70	101.31	134.02	225.98	258.69
71	102.00	137.23	222.77	258.00

Latitude of Terrestrial Station (N)	From	To	From	To
72	102.75	141.03	218.97	257.25
73	103.60	145.68	214.32	256.40
74	104.55	151.67	208.33	255.45
75	105.62	160.34	199.66	254.38

RANGES OF AZIMUTHS TO BE AVOIDED Southern Hemisphere

Latitude of Terrestrial Station (N)	From	To	From	To
0	0.00	91.50	268.50	271.50
1	88.27	91.40	268.70	271.73
2	88.05	91.30	268.70	271.95
3	87.82	91.20	268.80	272.18
4	87.59	91.10	268.90	272.41
5	87.37	91.01	268.99	272.63
6	87.14	90.91	269.09	272.86
7	86.91	90.81	269.19	273.09
8	86.67	90.71	269.29	273.33
9	86.44	90.62	269.38	273.56
10	86.20	90.52	269.48	273.80
11	85.96	90.42	269.58	274.04
12	85.72	90.32	269.68	274.28
13	85.48	90.22	269.78	274.52
14	85.24	90.12	269.88	274.76
15	84.99	90.03	269.97	275.01
16	84.74	89.93	270.07	275.26
17	84.48	89.83	270.17	275.52
18	84.23	89.73	270.27	275.77
19	83.97	89.62	270.38	276.03
20	83.70	89.52	270.48	276.30
21	83.43	89.42	270.58	276.57
22	83.16	89.32	270.68	276.84
23	82.88	89.21	270.79	277.12
24	82.60	89.11	270.89	277.40
25	82.31	89.00	271.00	277.69
26	82.02	88.89	271.11	277.98
27	81.72	88.78	271.22	278.28
28	81.42	88.67	271.33	278.58
29	81.11	88.56	271.44	278.89
30	80.79	88.44	271.56	279.21
31	80.46	88.33	271.67	279.54
32	80.13	88.21	271.79	279.87
33	79.79	88.09	271.91	280.21
34	79.44	87.97	272.03	280.56
35	79.08	87.84	272.16	280.92
36	78.71	87.72	272.28	281.29
37	78.33	87.59	272.41	281.67
38	77.94	87.46	272.54	282.06
39	77.54	87.32	272.68	282.46
40	77.12	87.18	272.82	282.88
41	76.69	87.04	272.96	283.31
42	76.25	86.89	273.11	283.75
43	75.79	86.74	273.26	284.21
44	75.31	86.59	273.41	284.69
45	74.81	86.43	273.57	285.19
46	74.30	86.26	273.74	285.70
47	73.76	86.09	273.91	286.24

Latitude of Terrestrial Station (N)	From	To	From	To
48	73.20	85.92	274.08	286.80
49	72.62	85.74	274.26	287.38
50	72.01	85.55	274.45	287.99
51	71.37	85.35	274.65	288.63
52	70.70	85.15	274.85	289.30
53	70.00	84.94	275.06	290.00
54	69.26	84.71	275.29	290.74
55	68.47	84.48	275.52	291.53
56	67.65	84.24	275.76	292.35
57	66.77	83.98	276.02	293.23
58	65.83	83.71	276.29	294.17
59	64.83	83.43	276.57	295.17
60	63.77	83.13	276.87	296.23
61	62.62	82.81	277.19	297.38
62	61.39	82.48	277.52	298.61
63	60.05	82.12	277.88	299.95
64	58.60	81.73	278.27	301.40
65	57.01	81.32	278.68	302.99
66	55.27	80.87	279.13	304.73
67	53.34	80.40	279.60	306.66
68	51.18	79.87	280.13	308.82
69	48.75	79.31	280.69	311.25
70	45.98	78.69	281.31	314.02
71	42.77	78.00	282.00	317.23
72	38.97	77.25	282.75	321.03
73	34.32	76.40	283.60	325.68
74	28.33	75.45	284.55	331.67
75	19.66	74.38	285.62	340.34

B.1.2 Earth Station Antenna Elevation Angle and EIRP Toward the Horizon

For transmitting earth stations in the bands 7900-7975 and 8025-8400 MHz, Section 8.2.35 places an upper limit on the equivalent isotropically radiated power (EIRP) toward the horizon and a minimum antenna elevation angle above the horizontal plane.

Earth stations should be evaluated for compliance with those provisions before or at the time of the systems review under Chapter 10. An algorithm to perform this evaluation is presented below together with an illustrative example.

Algorithm

Frequency Check: Determine whether the system under consideration includes a transmitting earth station operating in either the 7900-7975 or 8025-8400 MHz band. If it does not, terminate the check. Does the transmitting earth station operate in either of the above bands?

YES _ NO _

Antenna Elevation Angle: Check for compliance with minimum antenna elevation angle requirements. Use the planned minimum operating elevation angle of the antenna as provided in the systems review data. The requirements for the various services are as follows:

Space Research (Deep Space) ≤ 10°
Space Research (Near Earth) ≤ 5°
Other Earth Stations ≤ 3°

If the appropriate limitation is not met, the constraints of Section 8.2.35 are violated. Does the station meet the criteria for the applicable service?

YES _ NO _

EIRP Limitations: These limitations are a function of the horizon elevation angle. As an upper bound on the EIRP limitation, determine the maximum EIRP in a 409 kHz band (antenna mainbeam gain in dB above isotropic + maximum power density in dBW/Hz + 36 dB [conversion from 1 Hz to 4 kHz]). If this value is below 40 dBW/4 kHz, then the system meets the EIRP criteria, if not, perform the more detailed examination explained below.

Compute the EIRP/4 kHz (Ph) radiated toward the horizon for each intended operating azimuth using the following data:

Note: All data elements are required under Chapter 10 by reference to Appendixes 3 and 4 to the ITU Radio Regulations.

- M Planned operating azimuth angles;
- · θ_2 Elevation angle of the horizon measured from the horizontal plane for the M azimuth;
- · θ_1 Operating elevation angle of the antenna above the horizontal plane for the M azimuth;
- · G Antenna pattern information; and
- · P Maximum power density in dBW/Hz averaged over the worst 409 kHz band.

Computation:

$P_h = P + 36 + G^M (\theta_1 - \theta_2)$dBW/4 kHz

Where G^M $(\theta_1 - \theta_2)$ is the gain of the antenna

$\theta_1 - \theta_2$ degrees off axis, determined for each azimuth M.

Check P_h (EIRP/4 kHz) for compliance with the following limits:

Horizon	P_h limits
$\theta_2 > 5°$	No restriction
$0° < \theta_2 \leq 5°$	$< 40 + 3\theta_2$ dBW/4 kHz
$\theta_2 \leq 0°$	< 40 dBW/4 kHz

If P_h exceeds these limits, the constraints of Section 8.2.35 are violated. Does the station meet the above EIRP limits?

YES _ NO _

A station to be in compliance with Section 8.2.35 must conform to the criteria under the three headings above for all azimuths.

Illustrative Example

Data Submitted:
Station: Earth Station in the Fixed-Satellite Service.
Frequency: 8.23 GHz.
Power Density: P = -6 dBW/Hz.
Mainbeam Azimuth: M = 103°
Mainbeam Elevation Angle: θ_1 = 8° for M =103°.
Horizon Elevation Angle: θ_2 = 3° for M = 103° (extracted from geographical data provided for horizon around earth station).
Mainbeam Antenna Gain: 51 dB.
Antenna Gain: $G^M(\theta_1 - \theta_2)$= 14.5 dB.
This gain is at the natural horizon at an azimuth of 103° and is taken from a point on the graphical antenna pattern 5° from the center of the mainbeam ($\theta_1 - \theta_2$= 5°).
Frequency Check: The submitted transmitting frequency is in one of the specified bands.
Operating Elevation Angle: The minimum operating elevation angle of 8° does meet the criteria for the fixed-satellite service.
EIRP Limitations: The maximum EIRP is 81 dBW/4 kHz (51 + 36 - 6 dBW/4 kHz). As this exceeds the value of 40 dBW/4 kHz, a detailed examination must be made.

Computation of EIRP toward the horizon:
Ph = -6 + 36 + 14.5 dBW/4 kHz
= 44.5 dBW/4 kHz
The criterion for a horizon elevation of 3° is 49 dBW/4 kHz (40 + 3.3°). The computed EIRP toward the horizon is less than the criterion and therefore complies with the constraint.
As the data in this example meet the criteria in each of the headings, the station complies with Section 8.2.35.

B.1.3 POWER FLUX DENSITY LIMITS

Section 8.2.36 specifies constraints on the power flux density (PFD) from space stations in certain bands. The constraints are of three forms: a) PFD limits at the Earth's surface in dBW/m^2/4 kHz (or in some bands /1 MHz or /1.5 MHz); b) power spectral density at the receiver input of a troposcatter system in dBW/4 kHz; and c) PFD limits in dBW/m^2/4 kHz at the geostationary orbit from space stations using non-geostationary orbits.
The latter constraint is applicable only to the space-to-Earth operations in the earth exploration-satellite service in the band 8025-8400 MHz. Compliance with this provision of Section 8.2.36 will be examined on a case-by-case basis and will not be further considered in the Annex.
The constraint on the power spectral density from a space station at the receiver input of a troposcatter system applies in the bands 1670-1700, 1700-1710, and 2200-2300 MHz. In view of the very small number of troposcatter systems within the US&P in these bands, examination of proposed systems for compliance with this provision will be considered on a case-by-case basis.

Limitations on the PFD at the Earth's surface from a space station are imposed in most of the downlink bands between 1670 MHz and 22 GHz which are shared with the terrestrial services. Evaluation of space stations for compliance with this provision should be accomplished before or at the time of the systems review under Chapter 10. An algorithm to perform this evaluation is presented below together with an illustrative example.

Algorithm

This algorithm checks compliance with the PFD limits at the Earth's surface from a space station in the geostationary orbit.

Frequency Band/Service Check: Determine whether the proposed system is for one of the combinations of frequency band and radio service given in Table 1. If it is not, terminate the check. Determine whether the satellite is in the geostationary orbit. If it is not, a case-by-case review is necessary. Is the space station in a geostationary orbit and in a frequency band and service combination given in Table 1?

YES _ NO _

Power Flux Density Limits: The PFD of the station at the Earth's surface must be computed and compared with established criteria. When earth coverage antennas are used in the satellite, the antenna gain across the visible portion of the Earth's surface is assumed to be constant. When spot beam antennas are used, a worst case is assumed (full gain) unless a complete description of the pattern, side lobes, and exact pointing direction is provided. In that case a detailed examination is necessary.

The most stringent PFD limitation on satellites with earth coverage antennas is imposed for low angles of arrival at the Earth's surface. Thus the computed PFD is compared with the limits imposed at low angles of arrival (see Table 1).

It is recognized that the limitations are referenced to different bandwidths, i.e., 4 kHz, 1 MHz, and 1.5 MHz. Thus it is necessary to select the appropriate bandwidth from Table 1 for the particular band and service under consideration.

In computing the PFD, it is assumed that:

(a) atmospheric losses are negligible;
(b) the geostationary orbit is 37,500 km; and,
(c) the Earth's radius is constant, i.e., the Earth is smooth.

To compute the power flux density PE at the Earth's surface, the following data are used:

P_D Maximum power spectral density in dBW/Hz averaged over the reference bandwidth (4 kHz, 1 MHz, or 1.5 MHz).
B_R Reference bandwidth in Hz.
G Mainbeam antenna gain in dB.

The computation to determine the power flux density is:

$$P_E = P_D + 10\log B_R + G - 163 dBW/m^2/B_R$$

Once this value is determined, it is checked against the appropriate criteria given in Table 1.

Is the computed PFD less than (more negative) than the applicable value given in Table 1?

YES _ NO _

A station to be in compliance with Section 8.2.36 must conform to the criteria specified in Table 1.

Illustrative Example

Data Submitted:

Frequency Band: 7300-7750 MHz.
Service: Fixed-Satellite.
Orbit: Geostationary.
Power Density: -46 dBW/Hz.
Antenna Gain: 17 dB.

Table: Power Flux Density Limits at the Earth's Surface from Space Stations in Bands Shared with the Fixed and Mobile Services

Frequency Band (MHz)	Space Radiocommunication Service	Limit
1670-1690	Meteorological-Satellite	-154 dBw/m^2/4 kHz
1690-1700	Meteorological & Earth Exploration-Satellite (for countries mentioned in ITU RR 5.382)	
1700-1710	Space Research	
2200-2300	Space Research	
7300-7750	Fixed-Satellite	
7450-7550	Meteorological-Satellite	-152 dBW/m^2/4 kHz
8025-8400	Fixed-Satellite	
8025-8400	Earth Exploration-Satellite	-150 dBW/m^2/4 kHz
8400-8500	Space Research	
21200-22000	Earth Exploration-Satellite	
1690-1700	Meteorological & Earth Exploration-Satellite	-133 dBW/m^2/4 kHz

Frequency Band/Service Check: The space station described above is in the geostationary orbit and operates in a frequency band and radiocommunication service given in Table 1.

Power Flux Density Limits: The reference bandwidth for the band under consideration is 4 kHz. Using this value and the above data, the computed power flux-density is -156 dBW/m^2/4 kHz (-46 + 36 + 17 -163 dBW/m^2/4 kHz). This value is less than (more negative) the limit of -152 dBW/m^2/4 kHz specified in Table 1, and, therefore, the station complies with the provisions in Section 8.2.36.

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ANNEX C

(RESERVED)

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ANNEX D

Procedure for Field Level Selection and Coordination of the Use of Radio Frequencies

Table 1 - FAA Coordinators, geographical areas of responsibility and applicable C-Notes for the frequencies 1030 MHz and 1090 MHz and the bands 1215-1400, 2700-2900 and 9000-9200 MHz

Office	Area	C-Notes (see Annex A)
Federal Aviation Administration Frequency Management Officer ANM-473 1601 Lind Avenue, S.W. Renton, Washington 98057 Telephone: (425) 227-2354 Fax: (425) 227-1324	Colorado; Idaho; Montana; Oregon; Utah; Washington; Wyoming	C042
Federal Aviation Administration Frequency Management Officer AWP-471 P.O. Box 92007 Los Angeles, California 90009-2007 Telephone: (310) 725-3667 Fax: (310) 725-6865	Arizona; California, including all offshore islands; Nevada	C043
Federal Aviation Administration Frequency Management Officer ACE-474 901 Locust Kansas City, Missouri 64106-2641 Telephone: (816) 329-3480 Fax: (816) 329-3657	Iowa; Kansas; Missouri; Nebraska	C045
Federal Aviation Administration Frequency Management Officer ASW-473 2601 Meacham Blvd. Fort Worth, Texas 76137-4298 Telephone: (817) 222-4710 Fax: (817) 222-5977	Arkansas; Louisiana; New Mexico; Oklahoma; Texas	C046
Federal Aviation Administration Frequency Management Officer AGL-474 O'Hare Lake Office Center 2300 East Devon Avenue Des Plaines, Illinois 60018 Telephone: (847) 294-8443 Fax: (847) 294-7133	Illinois; Indiana; Michigan; Minnesota; North Dakota; South Dakota; Ohio; Wisconsin	C047
Federal Aviation Administration Frequency Management Officer ASO-473 P.O. Box 20636 Atlanta, Georgia 30320 Telephone: (404) 305-6606 Fax: (404) 305-6677	Alabama; Florida; Georgia; Kentucky; Mississippi; North Carolina; Puerto Rico; South Carolina; Tennessee; U.S. Possessions in the Carribbean; Virgin Islands	C048
Federal Aviation AdministrationFrequency Management Officer AEA-472 1 Aviation Plaza JFK International Airport Jamaica, New York 11430-4809 Telephone: (718) 977-6516 Fax: (718) 977-6548	Delaware; District of Columbia; Maryland; New Jersey; New York; Pennsylvania; Virginia; West Virginia	C049

Table 1 - FAA Coordinators, geographical areas of responsibility and applicable C-Notes for the frequencies 1030 MHz and 1090 MHz and the bands 1215-1400, 2700-2900 and 9000-9200 MHz

Office	Area	C-Notes (see Annex A)
Federal Aviation Administration Frequency Management Officer ANE-471 12 New England Executive Park Burlington, Massachusetts 01803 Telephone: (781) 238-7471 Fax: (781) 238-7459	Connecticut; Maine; Massachusetts; New Hampshire; Rhode Island; Vermont	C050
Federal Aviation Administration Frequency Management Officer AAL-472 222 West 7th Avenue Anchorage, Alaska 99513 Telephone: (907) 271-5800 Fax: (907) 271-4810	Alaska	C071
Federal Aviation Administration Frequency Management Officer AWP-471 P.O. Box 50109 Honolulu, HI 96850-4983 Telephone: (808) 541-1241 Fax: (808) 541-2630	Hawaii; U.S. Possessions in the Pacific Ocean	C072

Figure 1. FAA Coordination Map

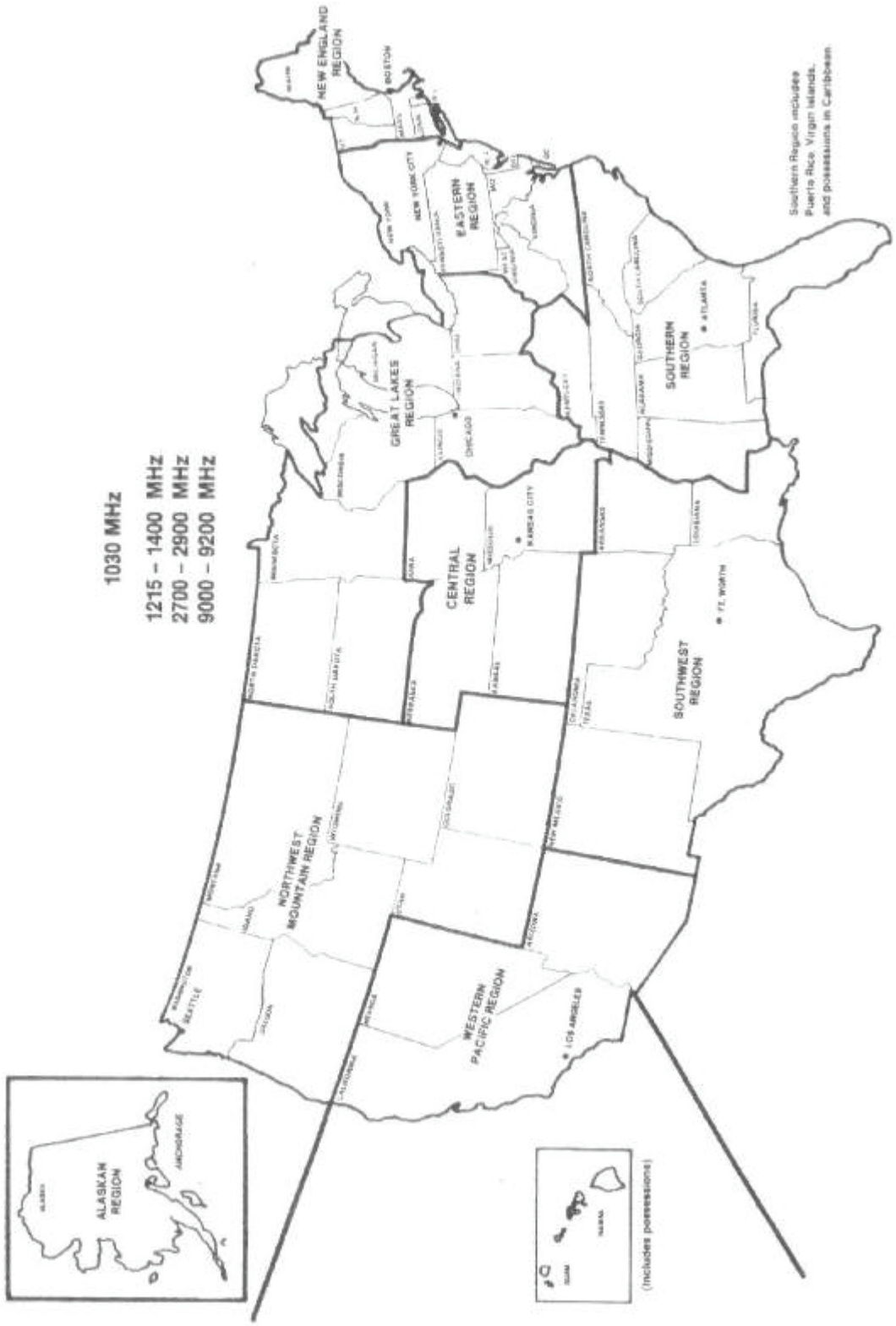
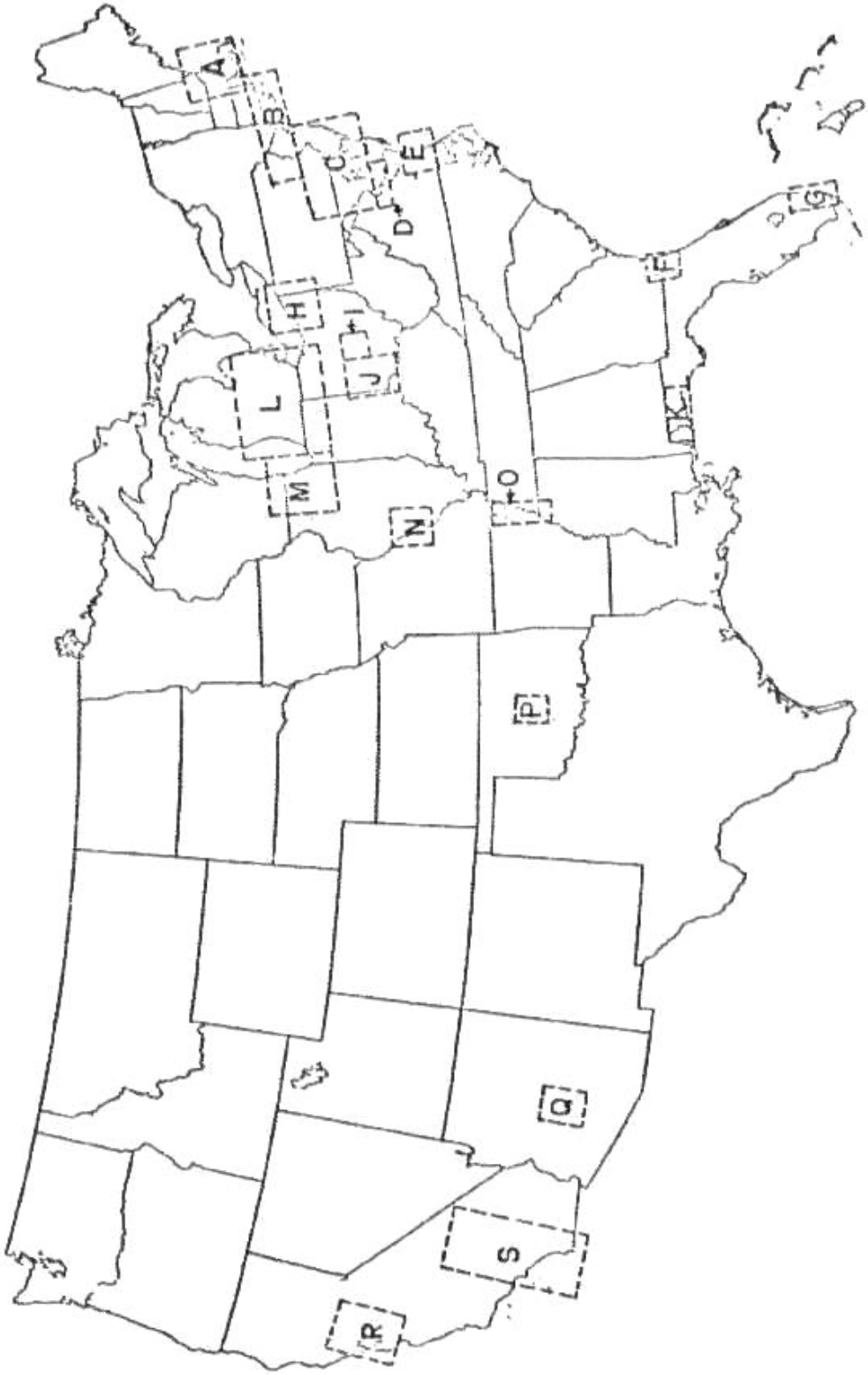


Figure 2. Designated Heavily Used Area in the 2700-2900 MHz Band



Designated Heavily Used Areas

TABLE 2 - Designated Heavily Used Areas		
Area	Latitude	Longitude
A	41-30-00	69-45-00
	43-15-00	69-45-00
	43-15-00	72-00-00
	41-30-00	72-00-00
B	40-30-00	71-30-00
	41-30-00	71-30-00
	41-30-00	76-00-00
	40-30-00	76-00-00
C	38-30-00	74-00-00
	40-30-00	74-00-00
	40-30-00	77-45-00
	38-30-00	77-45-00
D	38-00-00	76-00-00
	38-30-00	76-00-00
	38-30-00	77-45-00
	38-00-00	77-45-00
E	36-30-00	75-15-00
	37-30-00	75-15-00
	37-30-00	76-45-00
	36-30-00	76-45-00
F	30-00-00	81-20-00
	31-00-00	81-20-00
	31-00-00	82-20-00
	30-00-00	82-20-00
G	25-00-00	80-00-00
	26-30-00	80-00-00
	26-30-00	80-45-00
	25-00-00	80-45-00
H	40-45-00	80-00-00
	42-20-00	80-00-00
	42-20-00	82-00-00
	40-45-00	82-00-00
I	39-30-00	82-30-00
	40-20-00	82-30-00
	40-20-00	83-30-00
	39-30-00	83-30-00
J	38-45-00	83-30-00
	40-20-00	83-30-00
	40-20-00	85-00-00
	38-45-00	85-00-00
K	30-15-00	86-00-00
	31-00-00	86-00-00
	31-00-00	88-00-00
	30-15-00	88-00-00
L	41-00-00	82-40-00
	43-40-00	82-40-00
	43-40-00	87-00-00
	41-00-00	87-00-00
M	41-00-00	87-00-00
	43-00-00	87-00-00
	43-00-00	89-30-00
	41-00-00	89-30-00
N	38-15-00	89-40-00
	39-30-00	89-40-00
	39-30-00	91-00-00
	38-15-00	91-00-00
O	34-40-00	89-40-00
	36-30-00	89-40-00
	36-30-00	90-30-00
	34-40-00	90-30-00
P	35-00-00	97-00-00
	36-00-00	97-00-00
	36-00-00	98-00-00
	35-00-00	98-00-00
Q	33-00-00	111-30-00
	34-20-00	111-30-00
	24-20-00	112-40-00
	33-00-00	112-40-00
R	37-00-00	121-00-00
	39-00-00	121-00-00
	39-00-00	123-00-00
	37-00-00	123-00-00
S	32-15-00	116-30-00
	36-20-00	116-30-00
	36-20-00	118-14-00
	32-15-00	118-45-00

TABLE 3. Federal/non-Federal Field Level Coordination for the Bands 1435-1525, 2310-2320 and 2345-2390 MHz

Federal: Area Frequency Coordinators, geographical area of responsibility, and applicable C-Notes

Office	Area	C-Notes (see Annex A)
Western Area Frequency Coordinator Code 523G00D 130 Easy Road, M/S 3008 China Lake, CA 93555 Telephone: (760) 939-6948 DSN: 437-6948 FAX: (760) 939-0385	California south of 37°30'N, including all offshore islands	C003
Area Frequency Coordinator 99 CS/SCML 5870 Devlin Drive, Suite 120 Nellis AFB, Nevada 89191-7075 Telephone: (702) 652-3417 DSN: 682-3417	Nevada; Utah west of 111°W; Idaho south of 44°N	C068
Area Frequency Coordinator State of Arizona ATTN: NETC-EST-HU Ft. Huachuca, Arizona 85613-5000 Telephone: (520) 538-6423 FAX: (520) 538-8525 DSN: 879-6423 Email: sfis-fac-sh@hua.army.mil	Arizona	C009
Area Frequency Coordinator ATTN: NETC-EST-WS White Sands Missile Range Building 124, Room 327 New Mexico 88002-5526 Telephone: (505) 678-5417 DSN: 258-3702 FTS: 898-5017 Email: dod@wsmr.army.mil	Entire state of New Mexico, Texas west of 104°W and the areas of Utah and Colorado between 108°W and 111°W.	C007
Army Frequency Management Office Continental U.S. (AFMO CONUS) ATTN: NETC-EST-AC Building 1214, Suite 32 Ft. Sam Houston, TX 78234-5032 Telephone: (210) 221-2050/2820 FAX: (210) 221-2844 Email: afmo-conus@conus.army.mil	Arkansas; California north of 37°30' N; Colorado east of 108°W; Idaho north of 44°N; Illinois; Indiana; Iowa; Kansas; Louisiana west of 90°W; Michigan; Minnesota; Missouri; Montana; North Dakota; Oklahoma; Oregon; South Dakota; Texas east of 104°W; Wisconsin, Wyoming.	C024
Gulf Area Frequency Coordinator (GAFC) 96CG/SCXF Eglin AFB, Florida 32542 Telephone: (850) 883-7535, DSN: 875-7535 FAX (850) 882-3523, DSN 872-3523	Alabama south of 33°30'N; Florida west of 83°W; Georgia west of 83°W, south of 33°30'N; Louisiana east of 90°W; Mississippi east of 90°W, south of 33°33'N and north of 24°00'N	C011
Eastern Area Frequency Coordinator (EAFC) 1225 Pershing Place, MS 8200 Patrick AFB, FL 32925-3340 Telephone: (321) 494-5838/5860/5837 FAX: (321) 494-8715 Email: richard.akers@patrick.af.mil	Florida east of 83°W and north of 24°N; Georgia east of 83°W and south of 31° 30 minutes N; Atlantic Ocean south of 31° 30 minutes north and West of 77° W and north of 24° N	C005

Mid-Atlantic Area Frequency Coordinator ATTN: Mr. Mikel R. Ryan (Code 5.2.2.2) Unit 4, Building 2118, 23013 Cedar Point Road NAVAIRWARCENACDIV Patuxent River, MD 20670-1183 Telephone: (301) 342-1194/1532 DSN: 342-1194/1532 FAX: (301) 342-1200 STU III: (301) 342-1195 Email: mikel.ryan@navy.mil	That area of the eastern United States and the Atlantic Ocean south of 41°N; east of a line starting at the intersection of 41°N and 75°30'W running southwest to the intersection of 33°30'N and 83°W; north of 31°30'; west of 68°40'W	C086
Area Frequency Coordinator AF Frequency Management Agency (AFFMA) Hoffman 1, Suite 1203 2461 Eisenhower Avenue Alexandria, VA 22331-1500 Telephone: (703) 428-1544 DSN: 328-1544	Alabama north of 33°30'N; Connecticut; Kentucky; Maine; Massachusetts; Mississippi less east of 90°W, south of 33°30'N; New Hampshire; New Jersey north of 41°N; Ohio; Rhode Island; Tennessee; Vermont; West Virginia; and those areas of the following states west of the Mid-Atlantic AFC area: Georgia north of 33°30'N; Maryland; North Carolina; Pennsylvania including the north of 41°N; South Carolina; Virginia	C016
Joint Frequency Management Office Alaska HQ Alaskan Command, J64, Suite 310 Elmendorf AFB, AK 99506-2001 Telephone: (907) 552-8223 FAX: (907) 552-8120	322 km radius of Alaska	
Joint Frequency Management Office Pacific HQ US Pacific Command J613 PO Box 64029 Telephone: (808) 477-1050/51/52/53/54 FAX: (808) 477-0691	Hawaii and Guam (322 km radius centered around all islands).	C012
HQ USNORTHCOM/N-NC J636 250 S. Peterson Blvd. Suite 116 Peterson AFB, CO 80914-3190 Telephone: (719) 554-8014 FAX: (719) 554-0978 Email: nc.jfmonorth.omb.@northcom.mil		
Non-Federal: Aerospace and Flight Test Radio Coordinating Council Coordinator.		
Aerospace and Flight Test Radio Coordinating Council P.O. Box 200547 Cartersville, GA 30120-9010 Coordination point contact: Mr. Darryl J. Holtmeyer, Telephone: (314) 233-1117		

Figure 3. Coordination Zones for the 1435-1535 and 2310-2390 MHz Bands

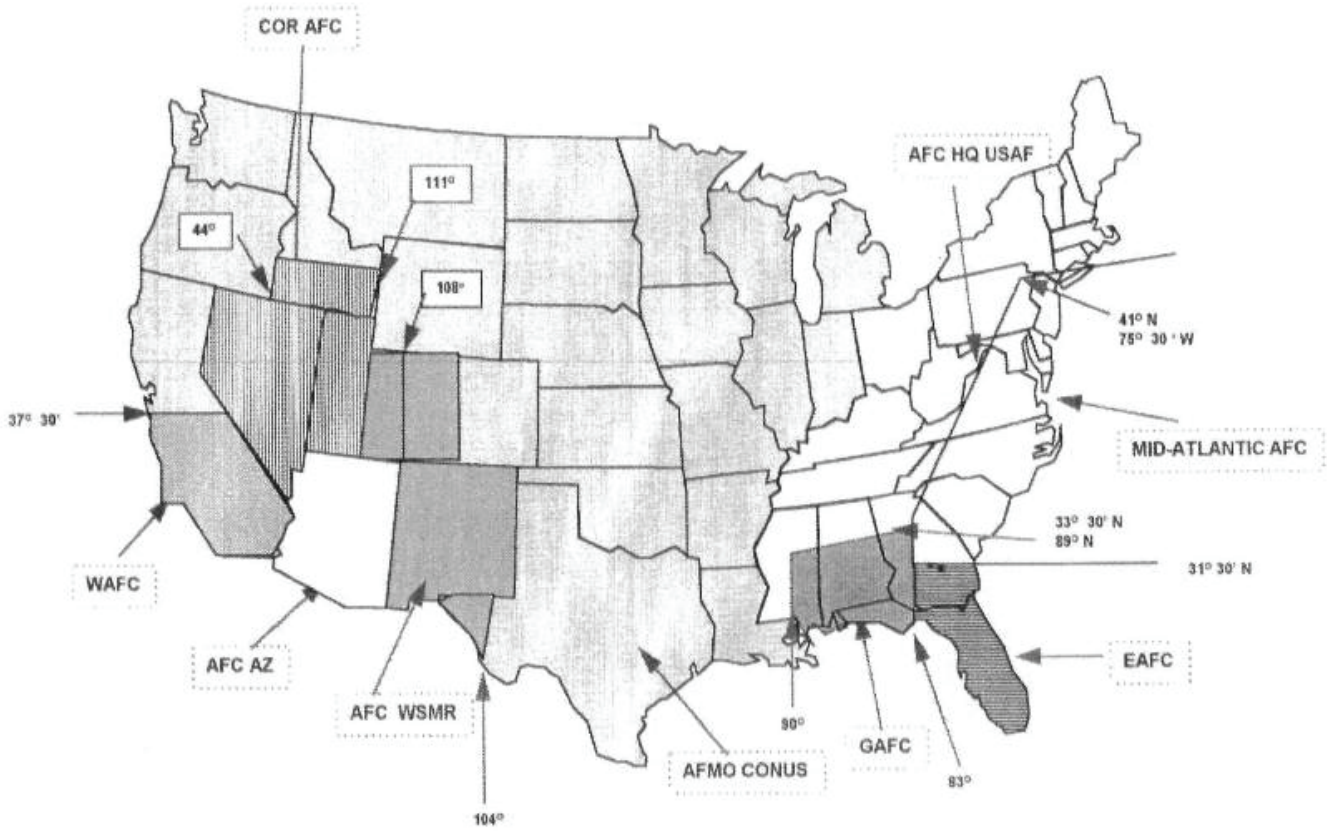
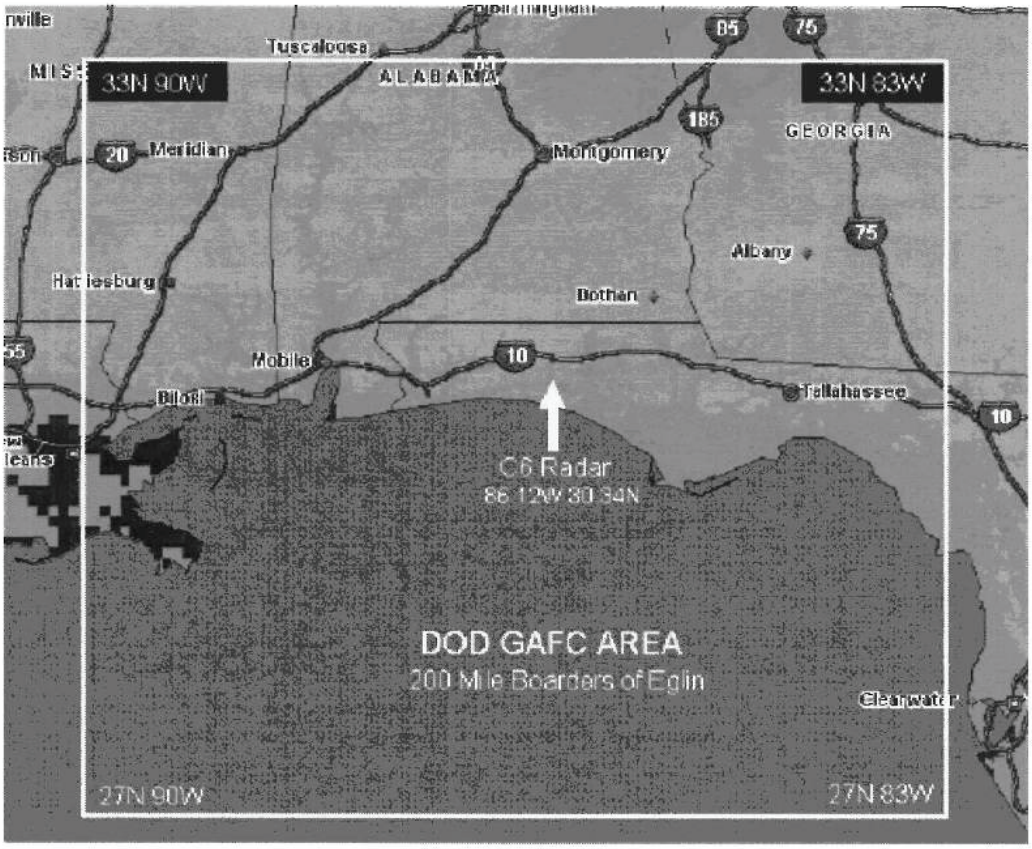


Figure 4. Gulf Area Coordinator Maps



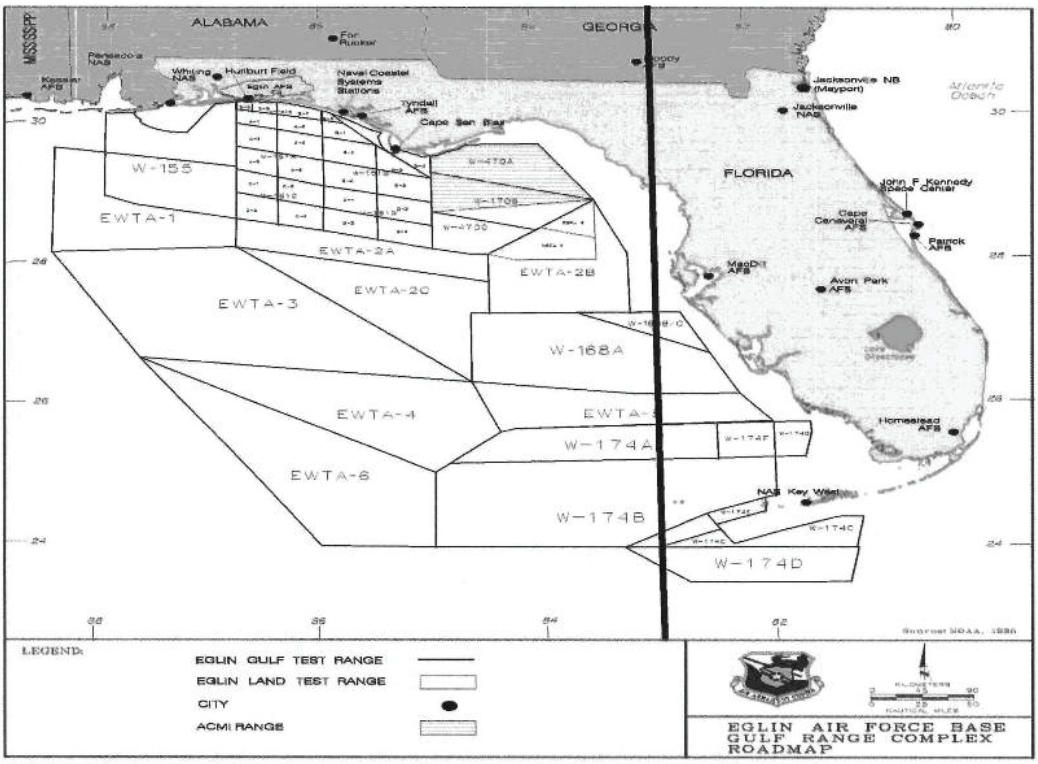
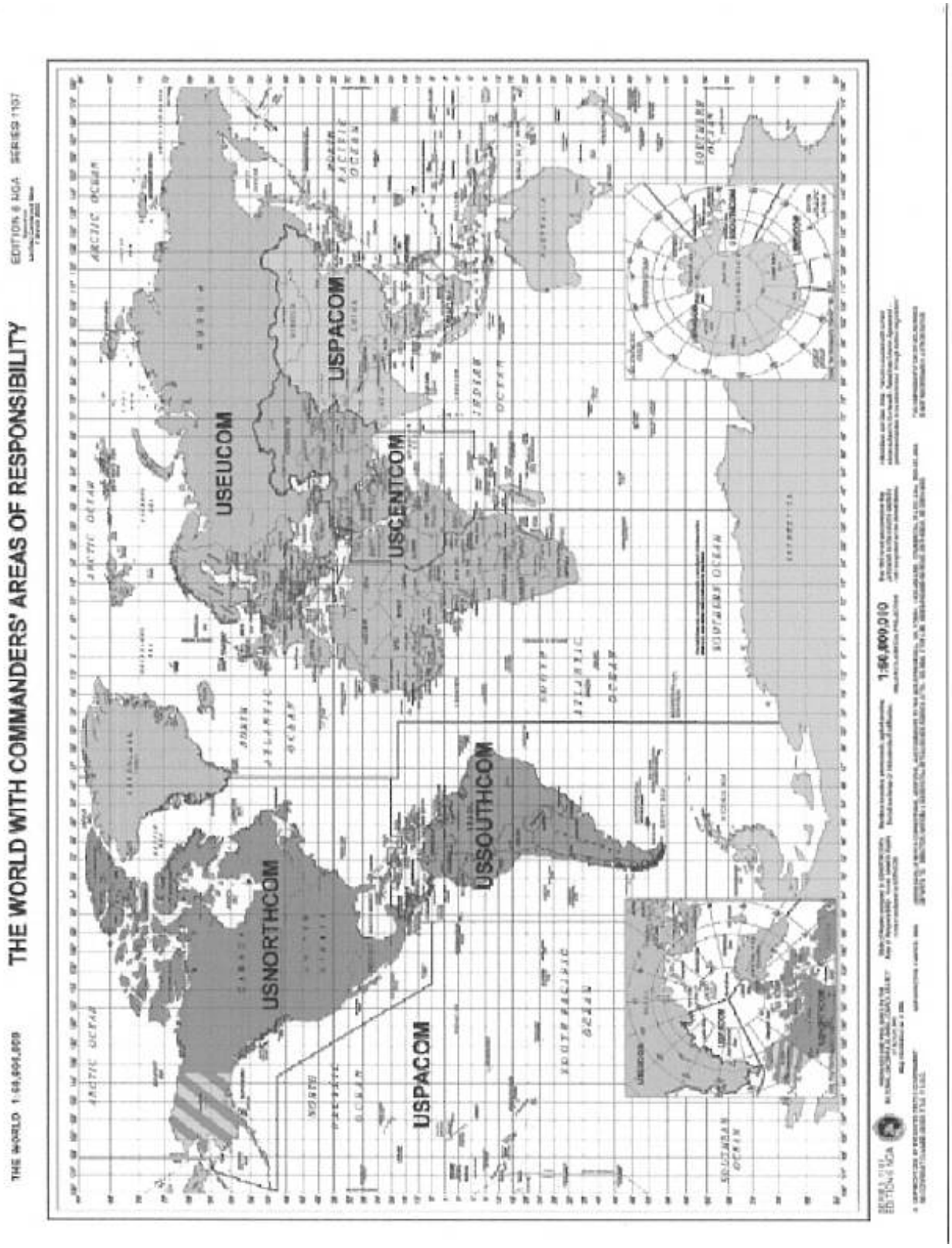


TABLE 4. Spectrum Management Areas of Responsibility for Geographic Combatant Commands

Combatant Commands	Area of Responsibility (see Figure 5)
USNORTHCOM'S	USNORTHCOM'S general geographic area of responsibility (AOR) for the conduct of normal operations is the 48 contiguous states and the District of Columbia (DC), Alaska, Canada, Mexico, the Caribbean Sea and its Island Nations and European possessions (Including Cuba, Puerto Rico, the Virgin Islands, and the Bahamas), and the Atlantic Ocean and its Island Nations and European possessions (excluding Greenland) within the area bounded by the Arctic Ocean from 169 W EAST TO 045 W, SOUTH TO 20 N, WEST TO 064 W, SOUTH TO 17 N, WEST TO 068 W, NORTH TO 21 N, WEST TO 073 W, SOUTHWEST TO 19 N, 075 W, WEST TO 079 W, NORTH TO 20 N, WEST TO MEXICO, SOUTH FROM MEXICO AT 092 W TO 08 N, WEST TO 112 W, NORTHWEST TO 50 N, 142 W, WEST TO 179 W, NORTHEAST TO 63 N, 173 W, NORTHEAST TO 64 N, 169 W, AND NORTH TO 90 N.
USPACOM'S	USPACOM'S general geographic area of responsibility (AOR) for the conduct of normal operations will be the Pacific Ocean from Antarctica at 092 W, NORTH TO 08 N, WEST TO 112 W, NORTHWEST TO 50 N, 142 W, WEST TO 179 W, NORTHEAST TO 63 N, 173 W, NORTHEAST TO 64 N, 169 W, NORTH TO 90 N, THE ARCTIC OCEAN WEST OF 169 W AND EAST OF 100 E, THE INDIAN OCEAN EAST OF 042 E (EXCLUDING THE WATERS NORTH OF 05 S AND WEST OF 068 E AND EXCLUDING THE SEYCHELLES); JAPAN; THE REPUBLIC OF KOREA; THE DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA; THE PEOPLE'S REPUBLIC OF CHINA; MONGOLIA; THE COUNTRIES OF SOUTHEAST ASIA AND THE SOUTHERN ASIAN LANDMASS TO THE WESTERN BORDER OF INDIA; MADAGASCAR; ANTARCTICA; AND OTHER ISLANDS IN THE ASSIGNED WATER AREAS.

Figure 5. US Combatant Commands Areas of Responsibility



(Last page in Annex D)

ANNEX E

Guidance for Submission of INMARSAT Commissioning Applications

E.1 INMARSAT

1. Established in 1979 to serve the maritime industry by developing satellite communications for ship management and distress and safety applications, Inmarsat currently operates a global satellite system, which is used by independent service providers to offer a range of voice and multimedia communications for customers on the move or in remote locations. While continuing to perform its original mandate, Inmarsat has since expanded into land, mobile and aeronautical communications.

2. On November 1, 1978, the United States Congress added Title V to the Communications Act of 1962. Sections 502(b), 503(a)(1) and 503(a)(3) in Title V stated that the participation of the United States in the INMARSAT Organization. Sections 502 and 503 of the Communications Satellite Act of 1962 ceased to be effective on the date Public Law 106-180 A Orbit Act" was signed on March 17, 2000.

3. On April 15, 1999, Inmarsat, the global mobile satellite communications provider, became the first inter-governmental organization to transition to a private company. Due to this change, agencies can now purchase INMARSAT services through any authorized service provider. To find the service providers for the United States, go to the INMARSAT internet URL, http://www.inmarsat.com/Services/Government/How_to_buy/default.aspx.

E.2 Agency Responsibilities

E.2.1 Agency Representatives

It is recommended that each Federal agency select representatives to act as a central point of contact for commissioning requirements. Agency representatives must assure that the vendor they select can commission the terminal and provide all the service that they will require.

E.2.2 Federal and Agency Regulations

Any Federal organization purchasing an Inmarsat terminal must assure they are in compliance with Federal, DOD, and or their agency's regulations concerning the procurement of telecommunications equipment.

E.2.3 Funding Documents

1. The purchaser must meet the commissioning requirements established by the Land Earth Station Operator (LESO) and or the Inmarsat Service Provider (ISP) and the Accounting Authority. An LESO routes calls beamed from mobiles via satellite to and from terrestrial telephone networks. These organizations are normally the first point of contact locally for anyone seeking to use the Inmarsat satellites. An ISP is an organization that has a contract with one or more LESOs to promote, retail and bill Inmarsat services to end-users. ISPs are likely to be specialized in serving selected markets for Inmarsat products and services. Accounting Authorities are organizations tasked with settling international accounts.

2. Each user should assure funds are set aside to pay for charges accruing at their ISP and at the Accounting Authority who will be settling their international accounts. A valid contract document must be secured, which the service provider can invoice against. This should consist of a purchase order or contract, a basic ordering agreement, a delivery order against a Federal contract (i.e., DITCO, GSA), or provision of a Federal Government credit card. Some service providers will require the funding document as part of the activation package. Users of the INMARSAT system incur service charges similar to users of public switched telephone systems. Normally bills will come from the Service Provider (SP) with whom the agency has contracted for services. Service Providers bill their customers for services provided through coast/land earth stations with whom, they have contracts both within the United States and in foreign countries. However, a foreign coast/land earth station bills access charges for using its facilities through the Accounting Authority identified in the commissioning documents for each terminal when it does not have an agreement with the terminal's service provider.

3. In the United States, the FCC is an Accounting Authority[1] and has certified several additional entities as Accounting Authorities to settle accounts with foreign telecommunication operators for U.S. vessels. The FCC, however, is the accounting authority of last resort for settling foreign charges; that is, foreign telecommunications operators send the FCC all accounts where the customer has not designated a specific accounting authority. The FCC's International Telecommunications Settlements (ITS) Section in Gettysburg, PA will, therefore, attempt to settle an account from a foreign INMARSAT coast/land earth station when a terminal operator dials its access code rather than the access code of its contractual ISP, unless the operator has an agreement with another Accounting Authority. In cases were an agency expects to use foreign earth stations, the agency representative should make advance financial provisions to settle accounts through the FCC ITS section.

E.2.4 Maritime Mobile Service Identities (MMSI)

1. A Maritime Mobile Service Identity (MMSI) is required for ship maritime terminals. NTIA's IRAC Secretariat controls the distribution of the MMSI numbers for Federal agencies. Contact this office at 202-482-0599 to obtain an MMSI number prior to submitting the application to the selected vendor.

2. If a ship terminal is transferred, replaced, or deactivated, the agency representative must inform the service provider, the accounting authority and NTIA IRAC Secretariat. The authorized "Contract Instrument or Purchase Order" must be revised if the equipment is replaced and deleted if the equipment is deactivated. A new activation package may be needed if the terminal is transferred to another ship.

E.2.5 Procedure for Obtaining Secondary Surveillance Radar (SSR) Mode S Code for Federal Government Aircraft Earth Station Commissioning Applications

1. Section 1.1.3 of the Aircraft Earth Station application form requires a 24-bit International Civil Aviation Organization (ICAO) technical address and a SSR Mode S Octal Code[2] . This information is obtained from the Federal Aviation Administration (FAA) who is the registering authority for commercial aircraft; the Air Force manages this program for military aircraft. DOD applicants who require an octal code should submit a letter to:

DoD International AIMS Program Office
380 Richard Ray Blvd., Ste 104
Robins AFB, GA 31098-1638
DSN 468-6123, commercial (478) 926-6123, and fax number 5390.

The request must contain:
- Point of Contact
- Identification of the aircraft (ex. C-135)
- Aircraft Tail Number
- Name and address of the major command and the unit to which the aircraft is assigned
- Location where the aircraft will be home-based
- Fax telephone number to receive octal code

2. Non-military Federal aircraft registered with the FAA should already have a Mode S Octal Code. Your aircraft maintenance section should be able to supply you with this information. If you are unable to determine the octal code, contact the FAA Aircraft Registration Branch at 405-954-3116. They will require the name and address of your agency, along with the tail number of the aircraft.

E.3 Endnotes

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[1] If the FCC has to inform the State Department that the charges are returned as "unable to collect" or "unable to locate," the foreign country where the INMARSAT service originated can bar communications to and from the terminal whose bill was not paid. If two countries bar a terminals communications, it is mandatory that all coast/land earth stations bar that terminals communications.

[2] The assignment of addresses for military aircraft is not processed in the same manner as those for commercial aircraft. The address for commercial aircraft is derived by using the tail number, however, the tail number is not used to derive a number for military aircraft. The Air Force representative assigns the next available number in the block of addresses provided to the Air Force by the FAA.

(Last Page in Annex E)

ANNEX F

Frequency Assignment Review Procedure

F.1 FREQUENCY ASSIGNMENT REVIEW PROCEDURE

1. The purpose of this procedure is to achieve the objectives stated in Section 8.2.6, paragraph 1, of this Manual. Normally this will be accomplished by reviewing within a given year all frequency assignments that were last reviewed during the previous five to ten years. (The date of the last review of an assignment can be determined by the entry in the REVISION DATE (RVD) field of the assignment record.) Assignment reviews shall be accomplished by the date in RVD plus:

a. Five years for those assignments not identified in b - d, below.

b. Ten years for those assignments considered by the Aeronautical Assignments Group (AAG).[1]

c. Ten years for assignments in which all the space stations are in a geostationary-satellite orbit.

d. Five years for assignments which include one or more space stations in a non-geostationary satellite orbit.

2. During the review the agency concerned will determine for each frequency assignment:

a. Whether the assignment is essential to meet the agency's requirements; and,

b. if so, whether other existing assignments will meet the requirements; and,

c. if not, whether the justification for and description of the assignment under review, are still accurate; and,

d. if so, whether the assignment is completely up to date.

3. An assignment is completely up to date if it contains in the proper fields all of the particulars required by this Manual.

4. Agencies will submit DELETION actions for those assignments that are not qualified for retention under 2a above. Those assignments qualified for retention, but not up to date in accordance with the particulars of this Manual, will be updated by submitting a MODIFICATION or SERIAL REPLACEMENT action using the procedures of Chapter 9.

5. Assignments qualified for retention, and completely up to date in accordance with the particulars of this Manual, will be certified as such by submission of MODIFICATION actions to update the date of last revision. This update is done by using the field code RYR with the last two digits of the current year (e.g., RYR01 00). This result in the data in the GMF field RVD being reset to the year, month and day the revision is approved. (See Section 9.15)

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[1] Reference Section 1.3.2

(Last Page in Annex F)

ANNEX G

Abbreviations

G.1 AGENCY, BUREAU, AND OTHER ORGANIZATIONAL ABBREVIATIONS

This part of Annex G contains those Agency and other Organizational Name and Bureau abbreviations that will be used in the Serial Number (SER), Bureau (BUR) and Circuit Remarks (REM) fields of the GMF. (See Chapter 9, Section 9.8.2).

Agency	Bureau	Abbreviation
Agency for International Development		AID
Agriculture, Department of		A
	Animal and Plant Health Inspection Service	APHS
	Agriculture Research Service	ARS
	Cooperative State Research Education & Extension Service	CSRE
	Farm Service Agency	FSA
	Farmers Home Administration	FHA
	Food & Nutrition Service	FNS
	Forest Service	F
	Forest Service - Region 1	F1
	Forest Service - Region 2	F2
	Forest Service - Region 3	F3
	Forest Service - Region 4	F4
	Forest Service - Region 5	F5
	Forest Service - Region 6	F6
	Forest Service - Region 8	F8
	Forest Service - Region 9	F9
	Forest Service - Region 10	F10
	Forest Service - Washington Office	FWO
	Food Safety and Inspection Service	FSIS
	Grain Inspection, Packers & Stockyards Administration	GIPS
	Natural Resources Conservation Service	NRCS
	Office of Inspector General	OIG
	Office of the Secretary	SEC
Air Force, Department of the		AF
Architect of the Capitol		AOTC
Army, Department of the		AR
	AFMO CONUS	AC
	United States Army, Alaska	AK
	Army Spectrum Management Office (outside US&P)	AR
	Corps of Engineers	CE
	Defense Information Systems Agency	DISA
	Military District of Washington	DW
	AFC, State of Arizona	HU
	U.S. Army (State of Hawaii)	HW
	National Training Center & Ft. Irwin	NTC
	U.S. Army Pacific (does includes Hawaii)	PA
	AFC, White Sands Missile Range	WS
Administrative Office of the United States Courts		AUSC
Broadcasting Board of Governors		BBG
Commerce, Department of		C
	Bureau of Export Administration	BXA
	Census Bureau	CEN
	Environmental Data Information Service	EDIS

Agency	Bureau	Abbreviation
	Environmental Research Laboratories	ERL
	International Trade Administration	ITA
	Institute for Telecommunications Science	ITS
	National Institute of Standards and Technology	NIST
	National Data Buoy Center	NDBC
	National Environmental Satellite, Data, and Information Service	NESS
	National Marine Fisheries Service	NMFS
	Under Secretary's Administrative Offices	USAO
	National Ocean Service	NOS
	National Telecommunications and Information Administration	NTIA
	National Technical Information Service	NTIS
	National Weather Service	NWS
	NOAA Marine and Aircraft Operations	NMAO
	NOAA Homeland Security Program Office	NHSP
	Patent and Trademark Office	PAT
	Office of Security	SEC
	Office of the Secretary	OSY
Coast Guard	Operating unit identifier is listed in the XRC field	CG
	Number Coast Guard Districts 1 through 17, including sub-units.	01-17
	Numbered Coast Guard Headquarters Units	20-96
	CG Headquarters, Washington DC	98
Central Intelligence Agency		CIA
Consumer Products Safety Commission		CPSC
Energy, Department of		DOE
	Alaska Power Administration	APA
	Albany Research Center	ARC
	Albuquerque Operations Office Amarillo Area Office Amarillo Pantex Plant Carlsbad Area Office Carlsbad Waste Isolation Pilot Project (WIPP) Dayton Area Office/Grand Junction Office Kansas City Area Office Kansas City Plant Kirtland Area Office Los Alamos Area Office Los Alamos National Lab Lovelace Respiratory Research Institute Sandia National Laboratory, California Sandia National Laboratory, New Mexico (Including all USA/USP assign.) Sandia National Laboratory, Pacific Operations Sandia National Laboratory, Tonopah Test Range, NV Tactical Security Division	AL
	Atlanta Regional Support Office Bartlesville Project Office	ARSO
	Bonneville Power Administration	BPA
	Boston Regional Support Office	BRSO
	Chicago Operations Office Ames Group Ames National Laboratory Argonne Group Argonne National Lab, East Argonne National Lab, West Brookhaven Group	CH

Agency	Bureau	Abbreviation
	Brookhaven National Lab Environmental Measurements Lab Environmental Programs Group Fermi Group Fermi National Accelerator Laboratory MIT Group New Brunswick Laboratory Princeton Group Princeton Plasma Physics Laboratory	
	Chicago Regional Support Office	CRSO
	Denver Regional Support Office	DRSO
	Federal Energy Technology Center Colorado Off-Site Support Office, Golden, Colorado Colorado Support Office, Denver, Colorado Federal Energy Technology Center North, Pittsburgh, Pennsylvania Federal Energy Technology Center South, Morgantown, West Virginia Georgia Support Office, Atlanta, Georgia Illinois Support Office, Chicago, Illinois Kansas City Remote Duty Station, Kansas City, Kansas Massachusetts Support Office, Boston, Massachusetts Montana Operations Office, Butte, Montana National Petroleum Technology Center National Renewable Energy Laboratory, Golden, Colorado National Renewable Energy Laboratory, Washington, DC New York Support Office, New York, New York Pennsylvania Support Office, Philadelphia, Pennsylvania Texas Support Office, Dallas, Texas Washington Support Office, Seattle, Washington Wyoming Operations Office, Gillette, Wyoming	FETC
	Golden Field Office Administration Division Office of Acquisition and Financial Assistance Office of Chief Counsel Office of Management and Administration Office of Laboratory Operations Office of Project Management	GFO
	Headquarters Contract Reform and Privatization Project Office Departmental Representative to the Defense Nuclear Facilities Safety Board Energy Information Administration Office of the Chief Financial Officer Office of the Chief Information Officer Office of the Civilian Radioactive Waste Management Office of Congressional and Intergovernmental Affairs Office of Counterintelligence Office of Defense Programs Office of Economic Impact and Diversity Office of Energy Efficiency and Renewable Energy Office of Environmental Management Office of Environment, Safety, and Health Office of Fissile Materials Disposition Office of Fossil Energy Office of the General Counsel Office of Hearings and Appeals Office of Independent Oversight and Performance Assurance	HQ

Agency	Bureau	Abbreviation
	Office of Inspector General Office of Intelligence Office of Internal Affairs Office of Management and Administration Office of Nonproliferation and National Security Office of Nuclear Energy, Science, and Technology Office of Public Affairs/Office of Science Office of the Secretary of Energy Advisory Board Office of Security and Emergency Operations Office of Worker and Community Transition The Office of Policy	
	Idaho Operations Office Idaho National Engineering and Environmental Laboratory INEL ESNET Connection Spectrum Support for Argonne National Laboratories Spectrum Support for Experimental Station Authorization at INEEL Spectrum Support for Fort Saint Vrain Spectrum Support for the Main M&O Contractor Spectrum Support for Naval Reactor Facility Spectrum Support for West Valley, New York	ID
	National Nuclear Security Administration Office of the Deputy Administrator for Defense Nuclear Non-proliferation Office of the Deputy Administrator for Defense Programs Office of the Deputy Administrator for Naval Reactors	NNSA
	Naval Petroleum Reserves in California Engineering Division/Planning, Analysis, and Program Division Support	NPR
	Naval Petroleum and Oil Shale Reserves in Colorado, Utah, & Wyoming	CO
	Nevada Operations Office Nevada Test Site Joint Test Operations (LANL, LLNL, SNL) Nevada Operations (Nevada Test Site & Las Vegas) Nevada Test Site Development Corp. Nevada Testing Institute, Inc. Pacific Area Operations, Honolulu, Hawaii Remote Sensing Lab, Nellis AFB, NV (Nuclear Emergency Search Team) Special Technologies Lab, Santa Barbara, CA Washington Area Measurements Operations, Washington, DC Yucca Mountain Project, NV	NV
	Oak Ridge Operations Office Cincinnati Operations Office, Cincinnati, Ohio Dallas Operations Office, Dallas, Texas East Tennessee Technology Park Laramie ETC/Oak Ridge Associated Universities Oak Ridge Institute for Science and Education Oak Ridge National Laboratory Oak Ridge Operations Environmental Management Program Oak Ridge Operations Office Federal Building Oliver Springs Area Office, Oliver Springs, Tennessee Paducah Operations Office, Paducah, Kentucky (Plant) Piketon Area Office Portsmouth Area Office (Plant)	OR

Agency	Bureau	Abbreviation
	Saint Charles Area Office Thomas Jefferson National Accelerator Facility University of Puerto Rico Weldon Springs Operations Office Y-12 Plant	
	Oakland Operations Office Lab of Structural Biology and Molecular Medicine Lawrence Berkley National Laboratory Lawrence Livermore National Laboratory Radiobiology and Environmental Health Laboratory Stanford Linear Accelerator Center	OAK
	Office of Scientific and Technical Information	OSTI
	Ohio Field Office Ashtabula Environmental Management Project Columbia Area Office/Columbus Environmental Management Project Fernald Environmental Management Project Miamisburg Environmental Management Project West Valley Project Office	OH
	Philadelphia Regional Support Office	PRSO
	Pittsburgh Naval Reactors Office Bettis Atomic Power Laboratory Idaho Branch Office	PNRO
	Pittsburgh Research Center Denver Federal Center, Denver, Colorado Spokane Research Center, Spokane, Washington	PRC
	Richland Operations Office Environmental Restoration Contractor Fast Flux Test Facility (FFTF), Standby Project Office Occupational Health Services Office of River Protection Pacific Northwest National Laboratory Project Hanford Management Contract Tank Farm Operations Tank Waste Privatization	RL
	Rocky Flats Field Office Deputy Manager Rocky Flats Environmental Technology Site	RFFO
	Savannah River Operations Office	SRO
	Schenectady Naval Reactors Office Knolls Atomic Power Laboratory	SNRO
	Seattle Regional Support Office	SRSO
	Southeastern Power Administration Office	SEPA
	Southwestern Power Administration Office Gore Area Office, Gore, Oklahoma Springfield Area Office, Springfield, Missouri	SWPA
	Strategic Petroleum Reserve Project Office	SPR
	Western Area Power Administration Corporate Services Office Desert Southwest Regional Office Rocky Mountain Regional Office Sierra Nevada Regional Office Upper Great Plains Regional Office	WAPA
	Yucca Mountain Site Characterization Office	YMSC
Department of Education		ED
Equal Employment Opportunity Commission		EEOC
Environmental Protection Agency		EPA
	Office of the Administrator/Deputy Administrator	AO

Agency	Bureau	Abbreviation
	Office of Administration and Resource Management	OARM
	Office of Air and Radiation	OAR
	Office of Enforcement and Compliance Assurance	OECA
	Office of Environmental Information	OEI
	Office of the Chief Financial Officer	OCPO
	Office of General Counsel	OGC
	Office of Inspector General	OIG
	Office of International Activities	OIA
	Office of Prevention, Pesticides, and Toxic Substances	OPTS
	Office of Research and Development	ORD
	Office of Solid Waste and Emergency Response	OWER
	Office of Water	OW
Federal Aviation Administration		FAA
	Transportation System Center	TSC
	FAA Alaskan Region	AL
	FAA Central Region	CE
	FAA Eastern Region	EA
	FAA Great Lakes Region	GL
	FAA Headquarters	HQ
	FAA New England Region	NE
	FAA Northwest Mountain Region	NM
	FAA Southern Region	SO
	FAA Southwest Region	SW
	FAA Western Pacific Region	WP
Federal Communications Commission		
	Enforcement Bureau	EB
	Office of Engineering and Technology	OET
	Office of Managing Director	OMD
	Wireless Telecommunications Bureau	WTB
Federal Mediation and Conciliation Service		FMCS
Federal Deposit Insurance Corporation		FDIC
Federal Reserve System		FRS
General Accounting Office		GAO
Government Printing Office		GPO
General Services Administration		GSA
	General Property Resources Service	D
	Office of Federal Supply and Services	F
	Office of Inspector General	J
	Office of Information Resources Management	K
	Public Buildings Service	P
	Office of Federal Protection and Safety	PS
Health and Human Services, Department of		HHS
	Department Wide	OSDW
	Immediate Office of the Secretary	OSIO
	Office of the Inspector General	OSIG
	Office of Public Health & Science	OSEP
	Administration for Children & Families	ACF
	Centers for Disease Control & Prevention	CDC
	Centers for Medicare and Medicaid	CMS
	Food and Drug Administration	FDA
	Health Care Financing Administration	HCFA
	Health Resources and Services Administration	HRSA
	Indian Health Services	HIS
	National Institutes of Health	NIH

Agency	Bureau	Abbreviation
	Program Support Center	PSC
	Substance Abuse & Mental Health Administration	SAMH
Homeland Security, Department of		DHS
	Bureau of Citizenship and Immigration Services	CIS
	Bureau of Customs and Border Protection	CBP
	Bureau of Immigrations and Customs Enforcement	ICE
	Department Offices	DO
	Federal Emergency Management Agency	FEMA
	Federal Law Enforcement Training Center	FLTC
	Federal Protective Service	FPS
	Information Analysis and Infrastructure Protection Directorate	IAIP
	Integrated Wireless Network	IWN
	Office of Emergency Communications	OEC
	Office of the Inspector General	OIG
	Office of the Secretary	O
	Science and Technology Directorate	ST
	Transportation Security Administration	TSA
	U.S. Secret Service	S
	White House Communications Agency	D
House of Representatives		HR
Housing and Urban Development, Department of		HUD
Interior, Department of the		I
	American Samoa, Government of	A
	Geological Survey	G
	Geological Survey - Administrative	GA
	Geological Survey - Biological Resources Division	GB
	Geological Survey - Geologic Division	GG
	Geological Survey - National Mapping Division	GT
	Geological Survey - Water Resources Division	GW
	Geological Survey - Not elsewhere classified	GZ
	Bureau of Indian Affairs	I
	Bureau of Indian Affairs - Aberdeen Area	IA
	Bureau of Indian Affairs - Anadarko Area	IB
	Bureau of Indian Affairs - Billings Area	IC
	Bureau of Indian Affairs - Juneau Area	IE
	Bureau of Indian Affairs - Minneapolis Area	IF
	Bureau of Indian Affairs - Muskogee Area	IG
	Bureau of Indian Affairs - Phoenix Area	IH
	Bureau of Indian Affairs - Sacramento Area	IJ
	Bureau of Indian Affairs - Central Office (Washington, DC)	IK
	Bureau of Indian Affairs - Law Enforcement	IL
	Bureau of Indian Affairs - Albuquerque Area	IM
	Bureau of Indian Affairs - Navajo Area	IN
	Bureau of Indian Affairs - Portland Area	IP
	Bureau of Indian Affairs - Eastern Area	IS
	Bureau of Indian Affairs - Joint use area	IW
	Bureau of Indian Affairs - Not elsewhere classified	IZ
	Bureau of Land Management	L
	Bureau of Land Management - Washington Office	LWO
	Bureau of Land Management - Alaska	LAK
	Bureau of Land Management - Arizona	LAZ
	Bureau of Land Management - California	LCA
	Bureau of Land Management - Colorado	LCO
	Bureau of Land Management - Idaho	LID
	Bureau of Land Management - Montana	LMT

Agency	Bureau	Abbreviation
	Bureau of Land Management - Nevada	LNV
	Bureau of Land Management - New Mexico	LNM
	Bureau of Land Management - Oregon	LOR
	Bureau of Land Management - Utah	LUT
	Bureau of Land Management - Wyoming	LWY
	Bureau of Land Management - Eastern States	LESO
	Bureau of Land Management - Denver Federal Center	LDFC
	Bureau of Land Management - National Training Center (PHX)	LNTC
	Bureau of Land Management - National Fire Center (Boise)	LNFC
	Minerals Management Service	MMS
	Office of the Secretary	O
	Aircraft Management Division	OAS
	Office of Surface Mining	OSM
	National Park Service	P
	National Park Service - Alaska Region	PAK
	National Park Service - Intermountain Region	PIM
	National Park Service - Northeast Region	PNE
	National Park Service - Midwest Region	PMW
	National Park Service - National Capital Field Area	PNC
	National Park Service - Pacific West Region	PPW
	National Park Service - Southeast Region	PSE
	National Park Service – Unites States Park Police	PPP
	National Park Service - Not elsewhere classified	PZZ
	Bureau of Reclamation	R
	Bureau of Reclamation - Great Plains	RGP
	Bureau of Reclamation - Lower Colorado	RLC
	Bureau of Reclamation - Mid-Pacific	RMP
	Bureau of Reclamation - Pacific Northwest	RPN
	Bureau of Reclamation - Upper Colorado	RUC
	Bureau of Reclamation - Not elsewhere classified	RZZ
	U.S. Fish and Wildlife Service	S
	GUM, HI, ID, MDW, OR, PAC, WA	S1
	AZ, NM, OK, TX	S2
	IA, IL, IN, MI, MN, MO, OH, WI	S3
	AL, AR, FL, GA, KY, LA, MS,NC, SC, TN, PR, VI	S4
	CT, DE, DC, ME, MD, MA, NH, NJ, NY, PA, RI, VT, VA, WV	S5
	CO, KS, MT, NE, ND, SD, UT, WY	S6
	AK	S7
	CA, NV	S8
	Not elsewhere classified	S9
	Trust Territory of the Pacific Islands, Government of the (including Government of the Northern Marianas)	T
International Trade Commission		ITC
International Boundary and Water Commission, U.S. and Mexico (U.S. Section)		IBWC
Justice, Department of		J
	Alcohol, Tobacco, Firearms and Explosives	A
	Bureau of Prisons	BP
	Drug Enforcement Administration	D
	Federal Bureau of Investigation	FB
	Immigration and Naturalization Service	IN
	Integrated Wireless Network	IWN
	Justice Management Division	JMD

Agency	Bureau	Abbreviation
	Justice-Wide (including Offices, Boards, and Divisions of the Department)	JW
	Justice Wireless Network	JWN
	U.S. Marshals Service	M
Labor, Department of		L
Library of Congress		LC
National Aeronautics and Space Administration		NASA
	Ames Research Center	ARC
	Dryden Flight Research Center	DFRC
	Glenn Research Center	GRC
	Goddard Space Flight Center	GSFC
	NASA Headquarters	HQS
	Jet Propulsion Laboratory	JPL
	Johnson Space Center	JSC
	Kennedy Space Center	KSC
	Langley Research Center	LARC
	Marshall Space Flight Center	MSFC
	Stennis Space Center	SSC
	Wallops Flight Facility	WFF
	White Sands Test Facility	WSTF
National Archives and Records Administration		NARA
National Endowment for the Arts		NEA
National Gallery of Art		NGAL
National Labor Relations Board		NLRB
National Security Agency		NS
National Science Foundation		NSF
	Kitt Peak National Observatory	KPNO
	National Astronomy and Ionosphere Center	NAIC
	National Center for Atmospheric Research	NCAR
	National Radio Astronomy Observatory	NRAO
	Sacramento Peak Observatory	SPO
Navy, Department of the (U.S. Navy)		N
	United States Navy	USN
	United States Naval Research Laboratory	NRL
Navy, Department of the (U.S. Marine Corps)		MC
	United States Marine Corps	USMC
Nuclear Regulatory Commission		NRC
Office of Personnel Management		OPM
Securities and Exchange Commission		SEC
Senate, U.S.		SEN
Small Business Administration		SBA
	Office of the Inspector General	G
Smithsonian Institution		SI
Social Security Administration		SSA
State, Department of		S
	Bureau of Economic and Business Affairs	EB
	Bureau of Information Resource Management	IRM
Supreme Court		SC
Tennessee Valley Authority		TVA
Transportation, Department of		TRAN
	Department Wide (less Federal Aviation Administration (FAA) and Transportation Systems Center (TSC))	DW
	Federal Highway Administration	H
	Federal Motor Carrier Safety Administration	FMC
	Federal Railroad Administration	R

Agency	Bureau	Abbreviation
	Federal Transit Administration	FTA
	Maritime Administration	MAR
	National Highway Traffic Safety Administration	T
	National Transportation Safety Board	NB
	Office of the Secretary	OS
	Pipeline and Hazardous Material Safety Administration	PHMS
	Railroad Technology Test Center	RATC
	Research and Innovative Technology Administration	RITA
	Research and Special Programs Administration	RSPA
	St. Lawrence Seaway Development Corporation	SL
Treasury, Department of the		T
	Departmental Offices	DO
	Bureau of Engraving and Printing (BEP)	BEP
	Financial Management Service	FMS
	Treasury Inspector General for Tax Administration (TIGTA)	IGTA
	IRS Criminal Investigations Division (IRS-CID)	IRCI
	Internal Revenue Service (IRS) Facilities	IRF
	Integrated Wireless Network	IWN
	US Mint	M
	Office of the Inspector General	OIG
	Office of the Secretary	O
	Bureau of Public Debt (BPD)	BPD
	Troubled Asset Relief Program	TARP
	Alcohol and Tobacco Tax and Trade Bureau	TTB
U.S. Capitol Police		USCP
U.S. Chemical Safety Hazard Investigations Board		CSB
U.S. Court of International Trade		CIT
U.S. Peace Corps		USPC
U.S. Postal Service		USPS
	Postal Inspection Service	IS
	Mail Processing and Distribution	MAIL
	National Network Service Center	NET
	National Systems Development	NSD
	Office of the Inspector General	OIG
	Security	SEC
U.S. Trade and Development Agency		TDA
U.S. Trade Representative		USTR
Veterans Affairs, Department of		VA
	National Cemetery Administration	NCA
	Office of Inspector General	OIG
	Veterans Benefits Administration	VBA
	Veterans Health Administration	VHA

G.1.1 Other Organizational Abbreviations

These abbreviations identify records which are recorded in the GMF for spectrum management and analysis purposes.

Organization	Abbreviation
CANADA	CAN
FEDERATED STATES OF MICRONESIA	FSM
MEXICO	MEX
NON-GOVERNMENT	NG
NON-GOVERNMENT RECORDS (70/80/90 GHz)	NGR
REPUBLIC OF PALAU	RP
REPUBLIC OF THE MARSHALL ISLANDS	RMI

G.2 GEOGRAPHICAL ABBREVIATIONS

This part of Annex G contains those abbreviations that will be used in the Transmitter and Receiver State/Country fields (XSC/RSC) of the GMF. (See Chapter 9, Section 9.8.2)

G.2.1 United States and Possessions - 50 United States and the District of Columbia

AK	Alaska
AL	Alabama
AR	Arkansas
AZ	Arizona
CA	California
CO	Colorado
CT	Connecticut
DC	District of Columbia
DE	Delaware
FL	Florida
GA	Georgia
HI	Hawaii
IA	Iowa
ID	Idaho
IL	Illinois
IN	Indiana
KS	Kansas
KY	Kentucky
LA	Louisiana
MA	Massachusetts
MD	Maryland
ME	Maine
MI	Michigan
MN	Minnesota
MO	Missouri
MS	Mississippi
MT	Montana
NC	North Carolina
ND	North Dakota
NE	Nebraska
NH	New Hampshire
NJ	New Jersey
NM	New Mexico
NV	Nevada
NY	New York
OH	Ohio
OK	Oklahoma
OR	Oregon
PA	Pennsylvania
RI	Rhode Island
SC	South Carolina
SD	South Dakota
TN	Tennessee
TX	Texas
UT	Utah
VA	Virginia
VT	Vermont
WA	Washington
WI	Wisconsin
WV	West Virginia
WY	Wyoming

G.2.2 Possession or Commonwealths of the United States (OTHER THAN the 50 United States and the District of Columbia)

Caribbean Area

-	Navassa Island
PR	Puerto Rico (including Culebra, Mona, and Vieques)
-	Quita Sueno Bank
-	Roncador Bank (Roncador Cay)
-	Serrana Bank (North Cay, Southwest Cay, Northwest Rocks, Dry Ledge) Serranilla Bank (West Breaker, Beacon Cay)
VI	Virgin Islands (St. Croix, St. John, St. Thomas)

Pacific Area

-	Baker Island
GUM	Guam
HWL	Howland Island
JAR	Jarvis Island
JON	Johnston Island (including Sand Island) Kingman Reef
MDW	Midway (Includes Eastern and Sand Islands)
MRA	(except Guam) Mariana Islands (Formerly Ladrone Islands) (Agrihan, Aguijan, Alamagan, Anatahan, Asuncion, Guguan, Maug, Medinilla, Pagan, Farallon de Pajaros, Rota, Saipan, Sarigan, and Tinian)
PLM	Palmyra Island (Some 50 islands make up the Atoll of Palmyra)
SMA	Samoa (American) (Aunuu, Manua Group [or Islands, i.e., Ofu, Olosega, Tau], Rose Island, Swains Island, Tutuila)
WAK	Wake Island

Area and Other Abbreviations

AFR	Africa
ANTR	Antarctica
ARCO	Arctic Ocean
ASIA	Continent of Asia
CAM	Central America
CBN	Caribbean
EUR	Europe
FE	Far East (Countries of China, Japan, Korea, Thailand, Brunei, Burma, Cambodia, Indonesia, Laos, Malaysia, Philippines, Vietnam and East India)
GLM	Gulf of Mexico
GTLK	Great Lakes (collectively)
INDO	Indian Ocean
LAM	Latin America
LANT	Atlantic Ocean
LERI	Lake Erie
LHUR	Lake Huron
LMIC	Lake Michigan
LONT	Lake Ontario
LSUP	Lake Superior
MED	Mediterranean Sea
MDE	Middle East
OCNA	Oceania
PAC	Pacific Ocean
RCVR	Restricted for use only in Passive Sensor and Radio Astronomy listings
SEA	Southeast Asia
SPCE	Space
US	For US only when transmitting and/or receiving in all 50 United States and the District of Columbia
USA	For use only when transmitting and/or receiving in the 48 Contiguous States of the United States and the District of Columbia (This Excludes Alaska and Hawaii)
USP	For use only when transmitting and/or receiving throughout the US (50 States and District of Columbia), the Commonwealth of Puerto Rico, and the Territories and Possessions (does not include the former Trust Territory of the Pacific Islands)
XXXX	See Chapter 9, Section 9.8.2 paragraph 21

Country Abbreviations

ABW	Aruba
AFG	Afghanistan (Islamic State of)
AFS	South Africa (Republic of)
AGL	Angola (Republic of)
AIA	Anguilla
ALB	Albania (Republic of)
ALG	Algeria (People's Democratic Republic of)
ALS	Alaska (not for use in GMF; for ITU use only)
AMS	Saint Paul and Amsterdam Islands
AND	Andorra (Principality of)
AOE	Western Sahara
ARG	Argentine Republic
ARM	Armenia (Republic of)
ARS	Saudi Arabia (Kingdom of)
ASC	Ascension
ATA	Antarctic
ATG	Antigua and Barbuda
ATN	Netherlands Antilles
AUS	Australia
AUT	Austria
AZE	Azerbaijani Republic
AZR	Azores
B	Brazil (Federative Republic of)
BAH	Bahamas (Commonwealth of the)
BDI	Burundi (Republic of)
BEL	Belgium
BEN	Benin (Republic of)
BER	Bermuda
BFA	Burkina Faso
BGD	Bangladesh (People's Republic of)
BHR	Bahrain (State of)
BIH	Bosnia & Herzegovina (Republic of)
BIO	British Indian Ocean Territory
BLR	Belarus (Republic of)
BLZ	Belize
BOL	Bolivia (Republic of)
BOT	Botswana (Republic of)
BRB	Barbados
BRM	Myanmar (Union of)
BRU	Brunei Darussalam
BTN	Bhutan (Kingdom of)
BUL	Bulgaria (Republic of)
CAF	Central African Republic
CAN	Canada
CAR	Caroline Islands
CBG	Cambodia (Kingdom of)
CHL	Chile (except Easter Island)
CHN	China (People's Republic of)
CHR	Christmas Island (Indian Ocean)
CKH	Cook Islands
CLM	Colombia (Republic of)
CLN	Sri Lanka (Democratic Socialist Republic of)
CME	Cameroon (Republic of)
CNR	Canary Islands
COG	Congo (Republic of the)
COM	Comoros (Islamic Federal Republic of the)
CPV	Cape Verde (Republic of)
CRO	Crozet Archipelago
CTI	Cote d'Ivoire (Republic of)
CTR	Costa Rica
CUB	Cuba
CVA	Vatican City State
CYM	Cayman Islands
CYP	Cyprus (Republic of)
CZE	Czech Republic
D	Germany (Federal Republic of)
DGA	Diego Garcia
DJI	Djibouti (Republic of)
DMA	Dominica (Commonwealth of)
DNK	Denmark
DOM	Dominican Republic
E	Spain
EGY	Egypt (Arab Republic of)
EQA	Ecuador
ERI	Eritrea
EST	Estonia (Republic of)
ETH	Ethiopia
F	France
FJI	Fiji (Republic of)
FLK	Falkland Islands (Malvinas)
FIN	Finland
FRO	Faroe Islands
FSM	Micronesia (Federated States of) (Kapingamarangi, Kosrae, Lamotrek, Namonuito, Nukuoro, Oroluk, Pohnpei, Truk, Ulithi, Woleai, Yap)

G	United Kingdom of Great Britain and Northern Ireland
GAB	Gabonese Republic
GCA	Territories of the United Kingdom in Region 1
GCC	Territories of the United Kingdom in Region 3
GDL	Guadeloupe (French Department of)
GEO	Georgia (Republic of)
GHA	Ghana
GIB	Gibraltar
GMB	Gambia (Republic of the)
GNB	Guinea-Bissau (Republic of)
GNE	Equatorial Guinea (Republic of)
GRC	Greece
GRD	Grenada
GRL	Greenland
GTM	Guatemala (Republic of)
GUF	Guiana (French Department of)
GUI	Guinea (Republic of)
GUM	Guam
GUY	Guyana
HKG	Hong Kong
HND	Honduras (Republic of)
HNG	Hungary (Republic of)
HOL	Netherlands (Kingdom of the)
HRV	Croatia (Republic of)
HTI	Haiti (Republic of)
HWA	Hawaii (not for use in GMF; for ITU use only)
I	Italy
ICO	Cocos Keeling Islands
IND	India (Republic of)
INS	Indonesia (Republic of)
IRL	Ireland
IRN	Iran (Islamic Republic of)
IRQ	Iraq (Republic of)
ISL	Iceland
ISR	Israel (State of)
J	Japan (includes Iwo Jima, Marcus Island, Ryu Kyu Islands)
JMC	Jamaica
JON	Johnston Island
JOR	Jordan (Hashemite Kingdom of)
KAZ	Kazakhstan (Republic of)
KEN	Kenya (Republic of)
KER	Kerguelen Islands
KGZ	Kyrgyz Republic
KIR	Kiribati (Republic of)
KOR	Korea (Republic of)
KRE	Democratic People's Republic of Korea
KWT	Kuwait (State of)
LAO	Lao People's Democratic Republic
LBN	Lebanon
LBR	Liberia (Republic of)
LBY	Libya (Socialist People's Libyan Arab Jamahiriya)
LCA	Saint Lucia
LIE	Liechtenstein (Principality of)
LSO	Lesotho (Kingdom of)
LTU	Lithuania (Republic of)
LUX	Luxembourg
LVA	Latvia (Republic of)
MAC	Macao
MAU	Mauritius (Republic of)
MCO	Monaco (Principality of)
MDA	Moldova (Republic of)
MDG	Madagascar (Democratic Republic of)
MDR	Madeira
MDW	Midway Islands
MEX	Mexico
MHL	Marshall Islands (Republic of the) (Ailinglapalap, Arno, Ebeye, Enewetak, Jaluit, Kwajalein, Majuro, Mili, Roi-Namur, Rongelap)
MKD	The Former Yugoslav Republic of Macedonia
MLA	Malaysia
MLD	Maldives (Republic of)
MLI	Mali (Republic of)
MLT	Malta
MNG	Mongolian People's Republic
MOZ	Mozambique (Republic of)
MRA	Mariana Islands (except Guam)
MRC	Morocco (Kingdom of)
MRN	Marion Island
MRT	Martinique (French Department of)
MSR	Montserrat
MTN	Mauritania (Islamic Republic of)

MWI	Malawi
MYT	Mayotte Island
NCG	Nicaragua
NCL	New Caledonia
NFK	Norfolk Island
NGR	Niger (Republic of the)
NIG	Nigeria (Federal Republic of)
NIU	Niue Island
NMB	Namibia (Republic of)
NOR	Norway
NPL	Nepal
NRU	Nauru (Republic of)
NZL	New Zealand
OCE	French Polynesia
OMA	Oman (Sultanate of)
PAK	Pakistan (Islamic Republic of)
PAQ	Easter Island (Chile)
PHL	Philippines (Republic of the)
PHX	Phoenix Islands
PLM	Palmyra Island (some 50 islands make up the Atoll of Palmyra)
PLW	Palau (Republic of)
PNG	Papua New Guinea
PNR	Panama (Republic of)
POL	Poland (Republic of)
POR	Portugal
PRG	Paraguay (Republic of)
PRU	Peru
PTC	Pitcairn Island
PTR	Puerto Rico (including Culebra, Mona, and Vieques) (not for use in GMF; for ITU use only)
QAT	Qatar (State of)
REU	Reunion (French Department of)
ROD	Rodriguez
ROU	Romania
RUS	Russian Federation
RRW	Rwandese Republic
S	Sweden
SCN	Saint Christopher and Nevis
SDN	Sudan (Republic of the)
SEN	Senegal (Republic of)
SEY	Seychelles (Republic of)
SHN	Saint Helena
SLM	Solomon Islands
SLV	El Salvador (Republic of)
SMA	American Samoa
SMO	Western Samoa (Independent State of)
SMR	San Marino (Republic of)
SNG	Singapore (Republic of)
SOM	Somali Democratic Republic
SPM	Saint Pierre and Miquelon (French Department of)
SRL	Sierra Leone STP Sao Tome and Principe (Democratic Republic of)
SUI	Switzerland (Confederation of)
SUR	Suriname (Republic of)
SVK	Slovak Republic
SVN	Slovenia (Republic of)
SWN	Swan Islands
SWZ	Swaziland (Kingdom of)
SYR	Syrian Arab Republic
TCA	Turks and Caicos Islands
TCD	Chad (Republic of)
TGO	Togolese Republic
THA	Thailand
TKL	Tokelau Islands
TJK	Tajikistan (Republic of)
TKM	Turkmenistan
TMP	East Timor
TON	Tonga (Kingdom of)
TRC	Tristan da Cunha
TRD	Trinidad and Tobago
TUN	Tunisia
TUR	Turkey
TUV	Tuvalu
TZA	Tanzania (United Republic of)
UAE	United Arab Emirates
UGA	Uganda (Republic of)
UKR	Ukraine
URG	Uruguay (Eastern Republic of)
USA	The 48 contiguous States of the United States of America and the District of Columbia (excludes the States of Alaska and Hawaii)
UZB	Uzbekistan (Republic of)

VCT	St. Vincent and the Grenadines
VEN	Venezuela (Republic of)
VIR	United States Virgin Islands (St. Croix, St. John, St. Thomas) (not for use in GMF; for ITU use only)
VRG	British Virgin Islands
VTN	Viet Nam (Socialist Republic of)
VUT	Vanuatu (Republic of)
WAK	Wake Island
WAL	Wallis and Futuna Islands
YEM	Yemen (Republic of)
YUG	Yugoslavia (Federal Republic of)
ZAI	Zaire (Republic of)
ZMB	Zambia (Republic of)
ZWE	Zimbabwe (Republic of)

G.3 AREAS, DIVISIONS, AND DISTRICTS WITHIN THE CONTERMINOUS UNITED STATES

This part of Annex G contains descriptions and/or maps of certain areas, divisions and districts within the Conterminous United States, which appear in the GMF. (Note: The FAA and FEMA maps are exceptions as they show overseas areas.)

Corps of Engineers Divisions and Districts (no description-see Figure 1)

Tennessee Valley Authority Area (see Figure 2)

The area bounded on the west by the Mississippi River, on the north by the parallel of latitude 37°30'N, and on the east and south by that arc of the circle with center at Springfield, Illinois, and radius equal to the airline distance between Springfield, Illinois, and Montgomery, Alabama, subtended between the foregoing west and north boundaries.

Coast Guard Areas and Districts (see Figure 3)

Atlantic Area-1st, 5th, 7th, 8th and 9th Districts.

Pacific Area-11th, 13th, 14th and 17th Districts.

1st District-Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York except that part north of 42N and West of 74-39W; that part of New Jersey north of 39-57N, east of 74-27W and northeast of a line from 39-57N West to the New York, New Jersey and Pennsylvania boundaries at Tristate.

5th District-Delaware, Maryland, Virginia, District of Columbia, North Carolina, that portion of New Jersey south of 39-57N, west of 74-27W and south of a line extending northwesterly from 39-57N, 74-27W to the New York, New Jersey and Pennsylvania boundaries at Tristate.

7th District-South Carolina; and Florida and Georgia, except that part of Florida and Georgia west of a line from the intersection of the Florida coast with longitude 83°50'W due north to a position 30°15'N 83°50'W, thence due west to a position 30°15'N 84°45'W, thence due north to the intersection with the south shore of Jim Woodruff Reservoir, thence along the east bank of the Jim Woodruff Reservoir and the east of the Flint River up stream to Montezuma, Georgia, thence to West Point, Georgia.

8th District- Wyoming, Colorado, New Mexico, Texas, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Arkansas, Louisiana, Mississippi, Alabama, Missouri, Iowa, West Virginia, Kentucky, Tennessee, and; Pennsylvania south of latitude 41° N and west of longitude 79° W; those parts of Ohio and Indiana south of latitude 41°N; Illinois, except that part north of latitude 41°N and east of longitude 90°W; Wisconsin south of latitude 46°20' N and west of longitude 90° W; Minnesota south of latitude 46°20'N and that part of Florida and Georgia west of a line from the intersection of the Florida

coast with longitude 83°50'W due north to a position 30°15'N 83°50'W; thence due west to a position 30°15'N 84°45'W; thence due north to the intersection with the south shore of Jim Woodruff Reservoir; thence along the east bank of the Jim Woodruff Reservoir and the east bank of the Flint River up stream to Montezuma, Georgia; thence to West Point, Georgia.

9th District-Michigan; New York north of latitude 42°N and west of longitude 74°39'W; Pennsylvania north of latitude 41°N and west of longitude 79°W; those parts of Ohio and Indiana north of latitude 41°N; Illinois north of latitude 41°N and east of longitude 90°W; Wisconsin except that part south of latitude 46°20'N and west of longitude 90°W; and Minnesota north of latitude 46°20'N.

11th District-California, Nevada, Arizona, and Utah.

13th District-Washington, Oregon, Idaho, and Montana.

14th District-Hawaii.

17th District-Alaska.

Navy-Marine Corps MARS Regions (see Fig. 4)

Region One -- Connecticut, Delaware, Massachusetts, Maine, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont.

Region Two -- Alabama, District of Columbia, Florida, Georgia, Kentucky, Maryland, Mississippi, North Carolina, Puerto Rico, South Carolina, Tennessee, Virginia, West Virginia.

Region Three -- Arkansas, Louisiana, New Mexico, Oklahoma, Texas.

Region Four -- Colorado, Iowa, Illinois, Indiana, Kansas, Michigan, Minnesota, Missouri, North Dakota, Nebraska, South Dakota, Wisconsin, Wyoming.

Region Five -- Arizona, California, Nevada, Utah.

Region Seven -- Alaska, Idaho, Montana, Oregon, Washington.

Region Eight -- Hawaii, Pacific Area U.S. Territories.

Army Areas (see Figure 5)

ARA1 - (States of Alabama, Connecticut, Delaware, Florida, Georgia, Kentucky, Maine, Maryland (less certain area which are included in the Military District of Washington), Massachusetts, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia (less certain areas which are included in the Military District of Washington), and West Virginia).

ARA5 - (Arkansas, Illinois, Indiana, Iowa, Kansas, Louisiana, Michigan, Minnesota, Missouri, Nebraska, Ohio, Oklahoma, Texas (less Fort Bliss), and Wisconsin).

ARA6 - (California, Colorado (less the area west of 108 deg. West), Idaho, Oregon, Montana, Nevada, North Dakota, South Dakota, Utah (less the area east of 111 deg. West), Washington, Wyoming).

Army Frequency Coordination Areas (see Fig. 6)

AFMO CONUS - Alabama, Arkansas, California, (less the National Training Center, Ft. Irwin), Colorado (less the area west of 108° West), Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland (less certain areas which are included in the Military District of Washington), Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas (less Fort Bliss and US Territory within 240 kilometers radius of White Sands Missile Range), Utah (less the area east of 111°West), Vermont, Virginia (less certain areas which are included in the Military District of Washington), Washington, West Virginia, Wisconsin, and Wyoming; Puerto Rico and the Virgin Islands.

Military District of Washington (Headquarters: Washington, D.C.)-District of Columbia, counties of Arlington, Fairfax (less Fort Belvoir, but including Davison AAF), and City of Alexandria in the state of Virginia, and counties of Montgomery and Prince Georges in the state of Maryland.

State of Arizona, Fort Huachuca, Arizona-Arizona.

White Sands Missile Range, New Mexico-New Mexico, U.S. territory within a 240 kilometer radius of WSMR (includes Fort Bliss, Texas), plus the area of Utah and Colorado that lies between 108°and 111°W.

FAA Regions (see Figure 7)

The FAA Regional Boundaries map, which includes regions outside the conterminous United States, is contained herein for information. The names of the regions do not appear in the list of Frequency Assignments to Federal Radio Stations.

NRC Regions (see Figure 8)

Region I-Headquarters at King of Prussia, PA, Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont.

Region II-Headquarters at Atlanta, GA, Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia.

Region III-Headquarters at Glen Ellyn, IL,

Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, Wisconsin.

Region IV-Headquarters at Arlington, TX, Arkansas, Colorado, Idaho, Kansas, Louisiana, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, Wyoming.

Region V-Headquarters at Walnut Creek, CA, Arizona, California, Nevada, Oregon, Washington.

FEMA Regions (see Figure 9)

Region I-Headquarters at Boston, MA, and underground Federal Response Center (FRC) at Maynard, MA; includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

Region II-Headquarters at New York, N.Y.; includes New Jersey, New York, Puerto Rico, and the Virgin Islands.

Region III-Headquarters at Philadelphia, PA; includes Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia.

Region IV-Headquarters at Atlanta, GA, and underground Federal Response Center (FRC) at Thomasville, GA; includes Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee.

Region V-Headquarters at Chicago, IL; includes Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin.

Region VI-Headquarters and underground Federal Response Center (FRC) at Denton, TX; includes Arkansas, Louisiana, New Mexico, Oklahoma, and Texas.

Region VII-Headquarters at Kansas City, MO; includes Iowa, Kansas, Missouri, and Nebraska.

Region VIII-Headquarters and underground Federal Response Center (FRC) at Denver, CO; includes Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

Region IX-Headquarters at San Francisco, CA; includes Arizona, California, Hawaii, Nevada, American Samoa, Guam, Commonwealth of the Northern Mariana Islands, and the Federated States of Micronesia.

Region X-Headquarters and underground Federal Response Center (FRC) at Bothell, WA; includes Alaska, Idaho, Oregon, and Washington.

EPA Regions (see Figure 10)

Region I-Headquarters at Boston, MA, Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont.

Region II-Headquarters at New York, N.Y. New Jersey, New York, Puerto Rico, Virgin Islands.

Region III-Headquarters at Philadelphia, PA, Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia.

Region IV-Headquarters at Atlanta, GA, Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee.

Region V-Headquarters at Chicago, IL, Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin.

Region VI-Headquarters at Dallas, TX, Arkansas, Louisiana, New Mexico, Oklahoma, Texas.

Region VII-Headquarters at Kansas City, KS, Iowa, Kansas, Missouri, Nebraska.

Region VIII-Headquarters at Denver, CO, Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming.

Region IX-Headquarters at San Francisco, CA, Arizona, California, Nevada, Hawaii, Guam, American Samoa.

Region X-Headquarters at Seattle, WA, Idaho, Oregon, Washington, Alaska.

GSA Regions (see Figure 11)

Region I-Headquarters at Boston, MA includes: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

Region II-Headquarters at New York, NY includes: New Jersey, New York, Puerto Rico, and Virgin Islands.

Region III-Headquarters at Philadelphia, PA includes: Delaware, Maryland, Pennsylvania, Virginia, and West Virginia.

Region IV-Headquarters at Atlanta, GA includes: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee.

Region V-Headquarters at Chicago, IL includes: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin.

Region VI-Headquarters at Kansas City, MS includes: Iowa, Kansas, Missouri, and Nebraska.

Region VII-Headquarters at Forth Worth, TX includes: Arkansas, Louisiana, New Mexico, Oklahoma, and Texas.

Region VIII-Headquarters at Denver, CO includes: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

Region IX-Headquarters at San Francisco, CA includes: American Samoa, Arizona, California, Guam, Hawaii, and Nevada.

Region X-Headquarters at Auburn WA includes: Alaska, Idaho, Oregon, and Washington. National Capital Region Headquarters in Washington, DC includes: the District of Columbia, Montgomery and Prince Georges counties in Maryland, Arlington, Alexandria, Fairfax, Loudon, and Prince William in Virginia.

USAF MARS Regions (see Figure 12)

Region One-Connecticut, Delaware, District of Columbia, Indiana, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont.

Region Two-Alabama, Florida, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia, West Virginia.

Region Three-Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Wisconsin.

Region Four-Arkansas, Louisiana, Mississippi, Oklahoma, Texas.

Region Five-Colorado, Idaho, Montana, Oregon, Utah, Washington, Wyoming.

Region Six-Arizona, California, Nevada, New Mexico.

Region Eight-Pacific (Hawaii and U.S. Territories only.

Region Nine-Alaska.

VA National Cemetery System Memorial Service Networks (MSN) by State

MSN 1-Maine, Vermont, New Hampshire, Connecticut, Rhode Island, Massachusetts, Pennsylvania, New Jersey, New York, Maryland, Delaware, Northern 4/5th of Virginia, West Virginia.

MSN 2-Arkansas, Tennessee, North Carolina, South Carolina, Mississippi, Alabama, Georgia, Louisiana, Florida, Puerto Rico, Southern 1/5th of Virginia along the North Carolina border.

MSN 3-North Dakota, Montana, South Dakota, Wyoming, Nebraska, Colorado, Kansas, Oklahoma, New Mexico, Texas.

MSN 4-Michigan, Minnesota, Wisconsin, Iowa, Illinois, Indiana, Missouri, Ohio, Kentucky.

MSN 5-Washington, Oregon, Idaho, Nevada, Utah, California, Arizona, Alaska, Hawaii.

VA Health Administration Integrated Service Network by (VISN) by Boundaries (See Figure13)

VISN 1 Maine, Vermont, New Hampshire, Connecticut, Rhode Island, Massachusetts.
VISN 2 Upper New York State.
VISN 3 Lower New York State. New York City.
VISN 4 Pennsylvania.
VISN 5 Delaware, Maryland.
VISN 6 Virginia, North Carolina.
VISN 7 South Carolina, Georgia, Alabama.
VISN 8 Florida.
VISN 9 Tennessee, Kentucky, West Virginia.
VISN 10 Ohio.
VISN 11 Northern Indiana, Michigan.
VISN 12 Northern Illinois, Wisconsin.
VISN 15 Southern Indiana, Southern Illinois, Missouri, Kansas.
VISN 16 Mississippi, Louisiana, Arkansas, East Texas, Oklahoma.
VISN 17 Central Texas.
VISN 18 West Texas, New Mexico, Arizona
VISN 19 Colorado, Utah, Wyoming, Montana.
VISN 20 Idaho, Washington, Oregon
VISN 21 Northern Nevada, Northern California.
VISN 22 Southern Nevada, Southern California.
VISN 23 Nebraska, Iowa, North Dakota, South Dakota, Minnesota.

Figure 1. Corps of Engineers

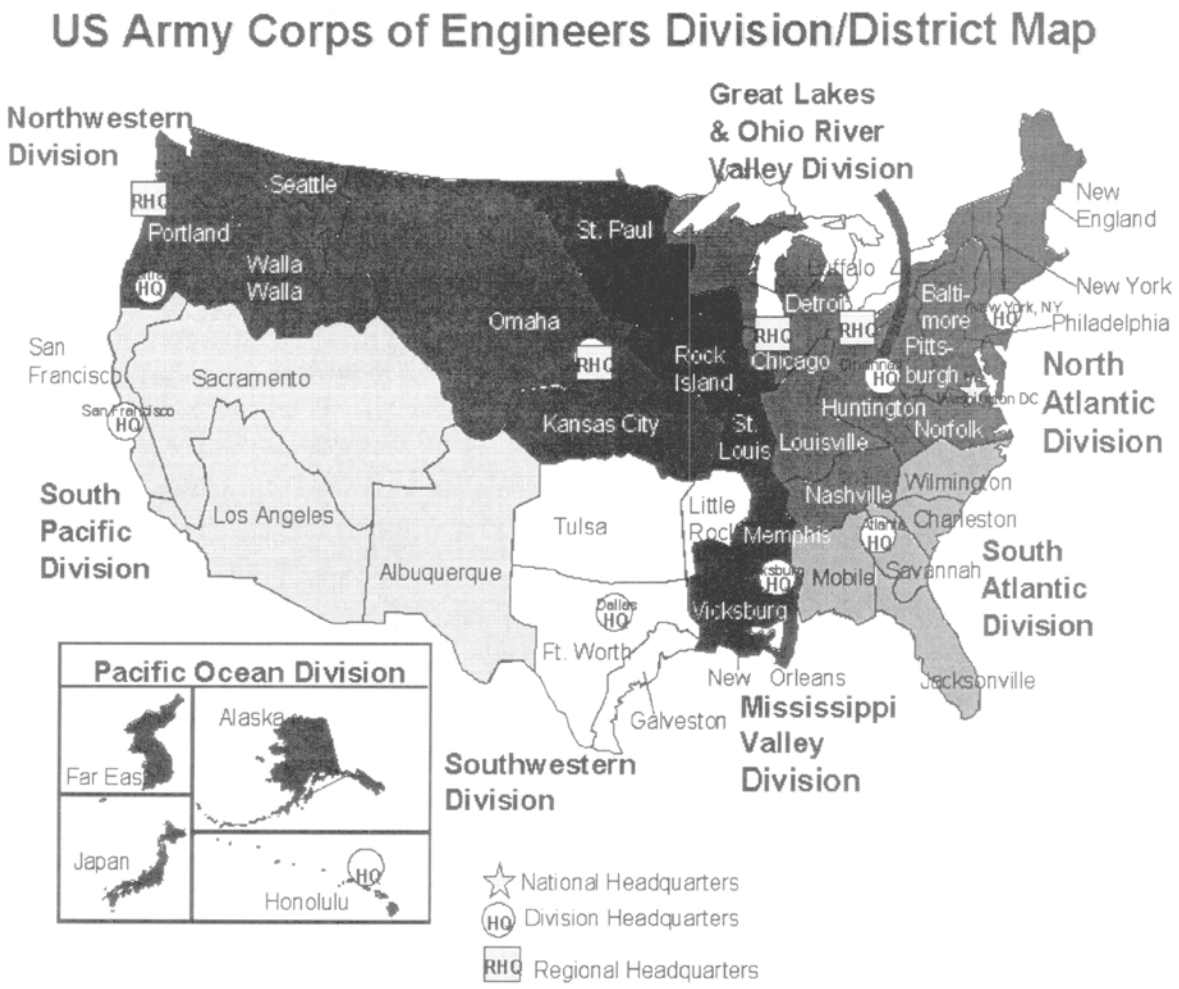


Figure 2. Tennessee Valley Authority

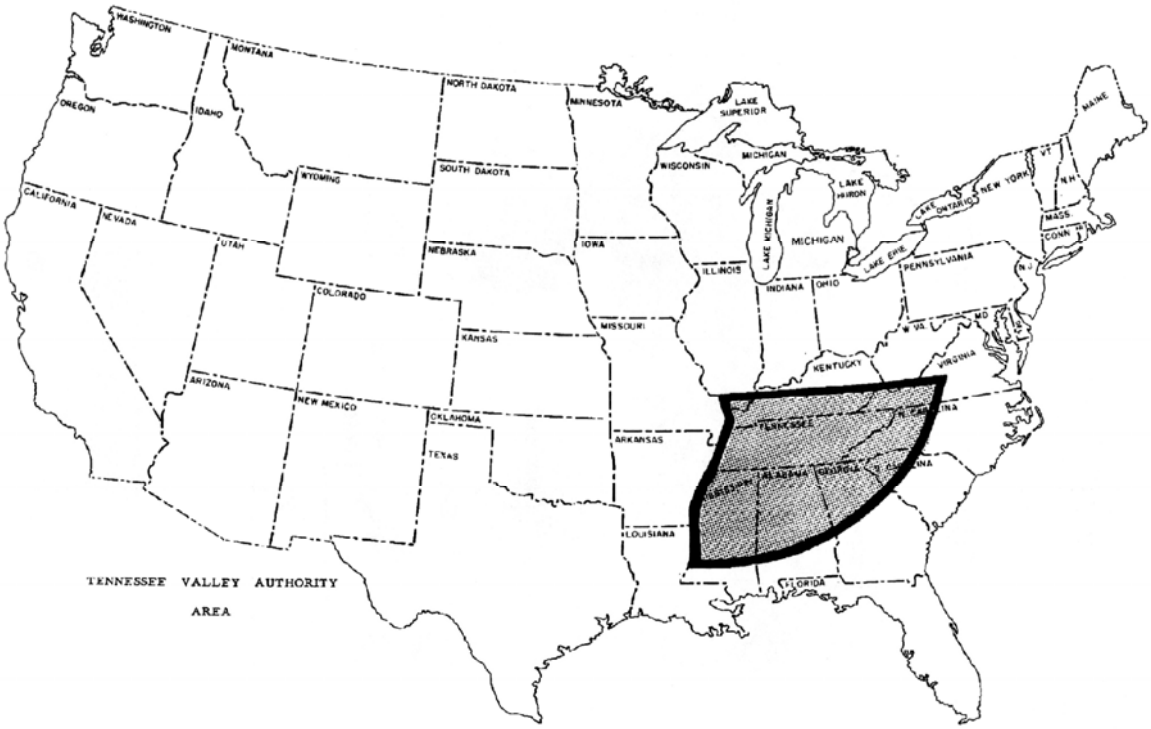


Figure 3. Coast Guard Districts

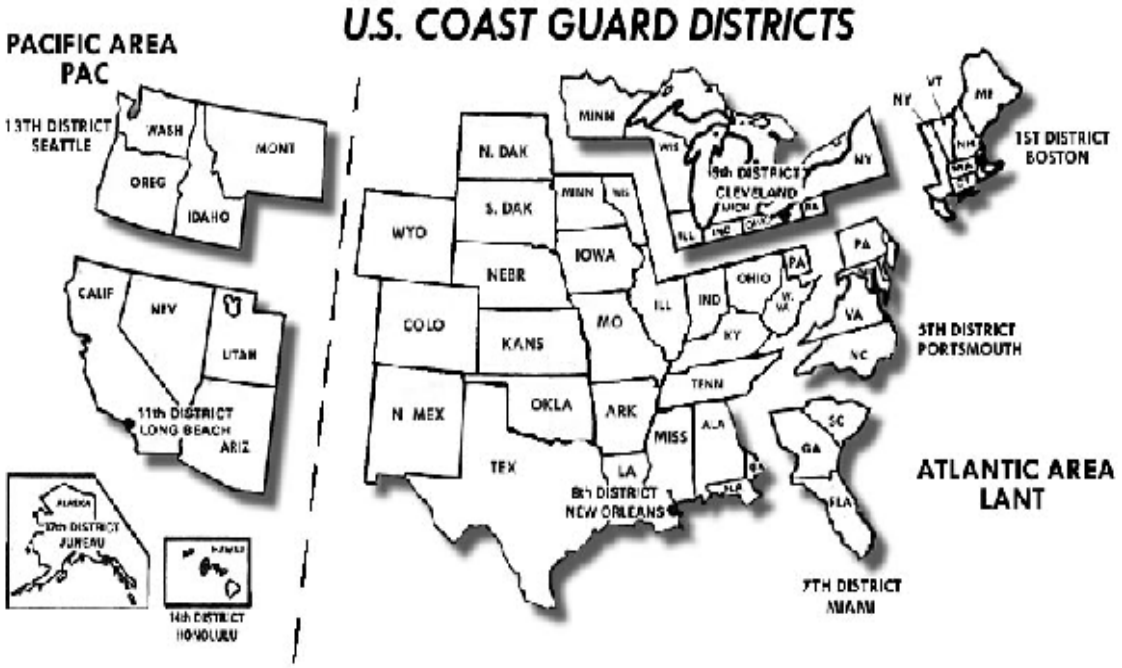


Figure 4. Navy-Marine Corps MARS Regions

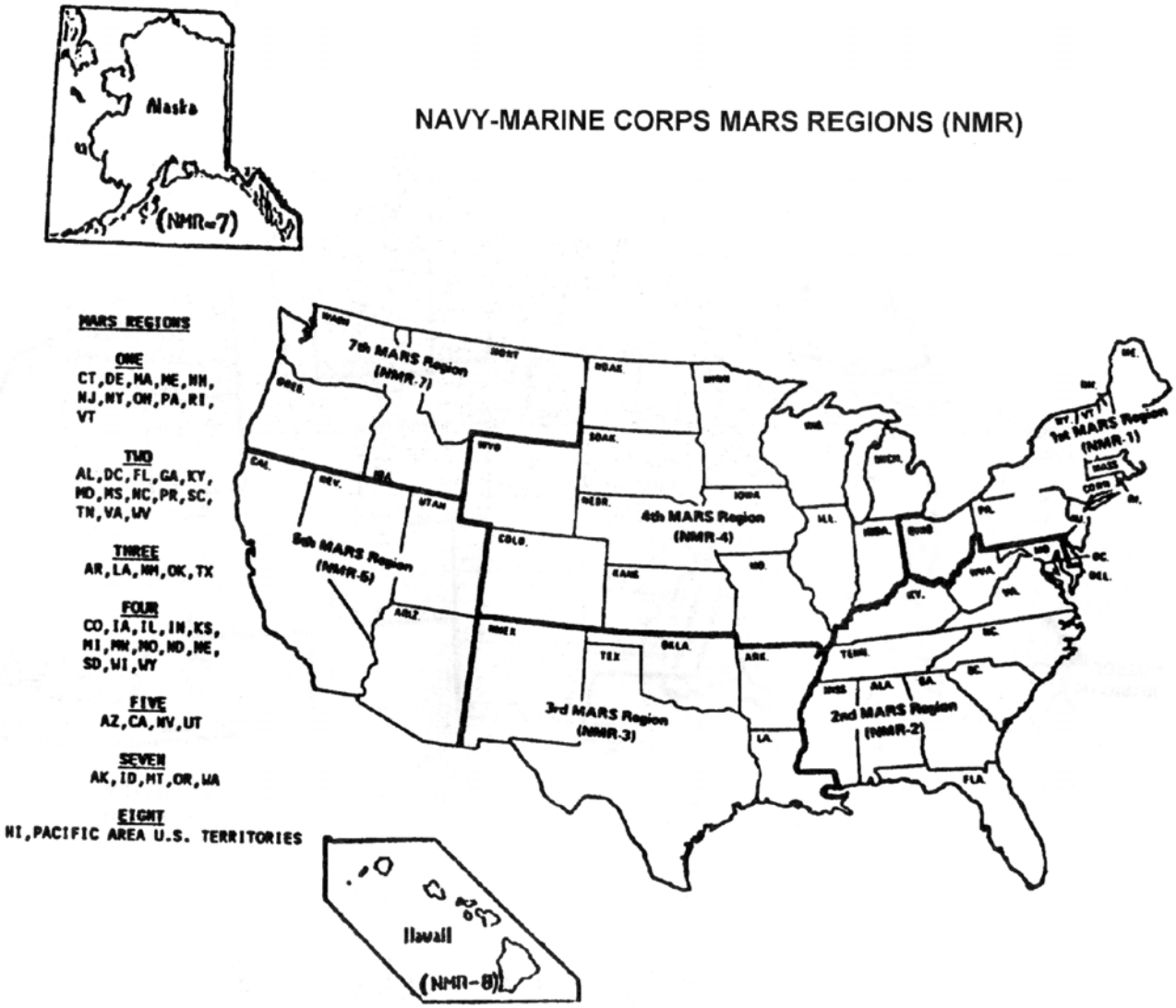


Figure 5. Army Area Coordinators

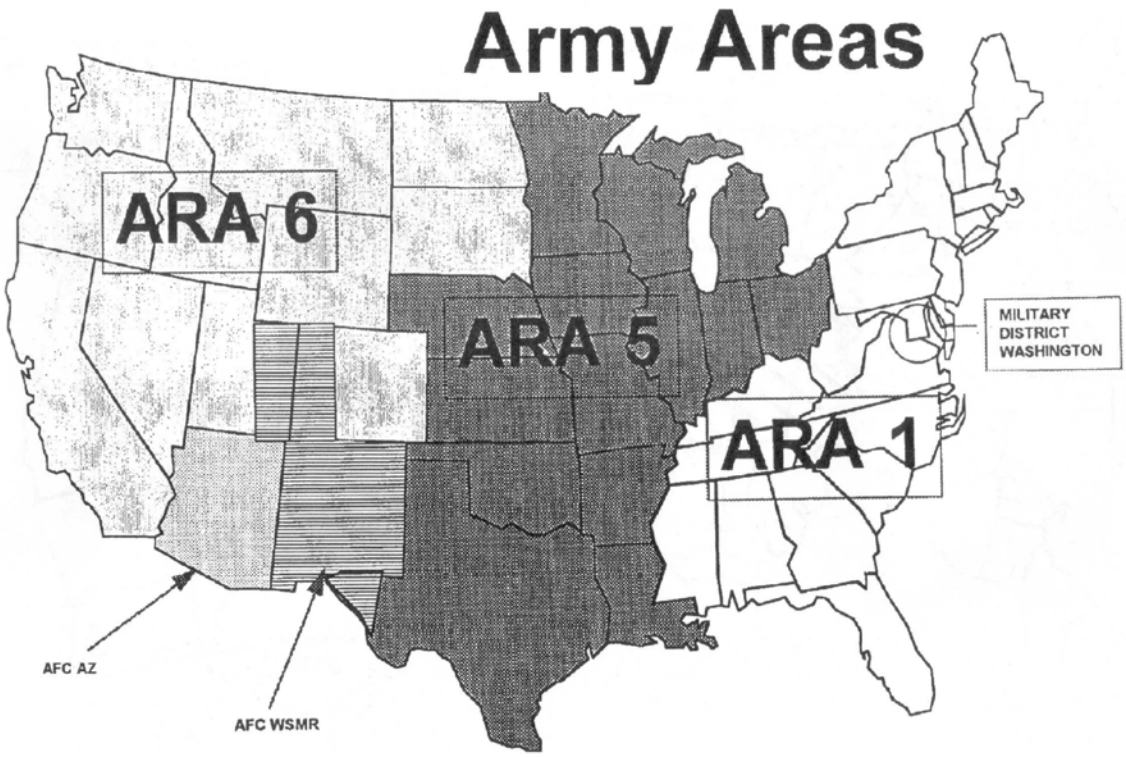


Figure 6. Army Area Frequency Coordinators

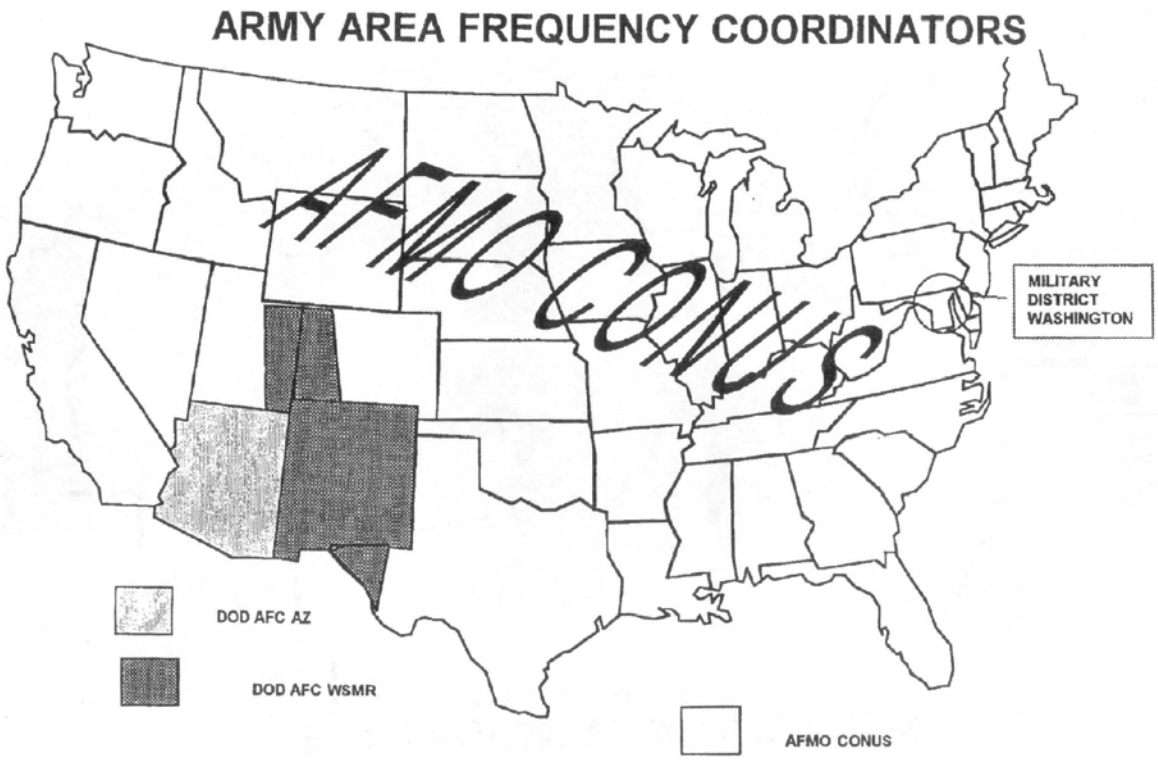


Figure 7. FAA Regions

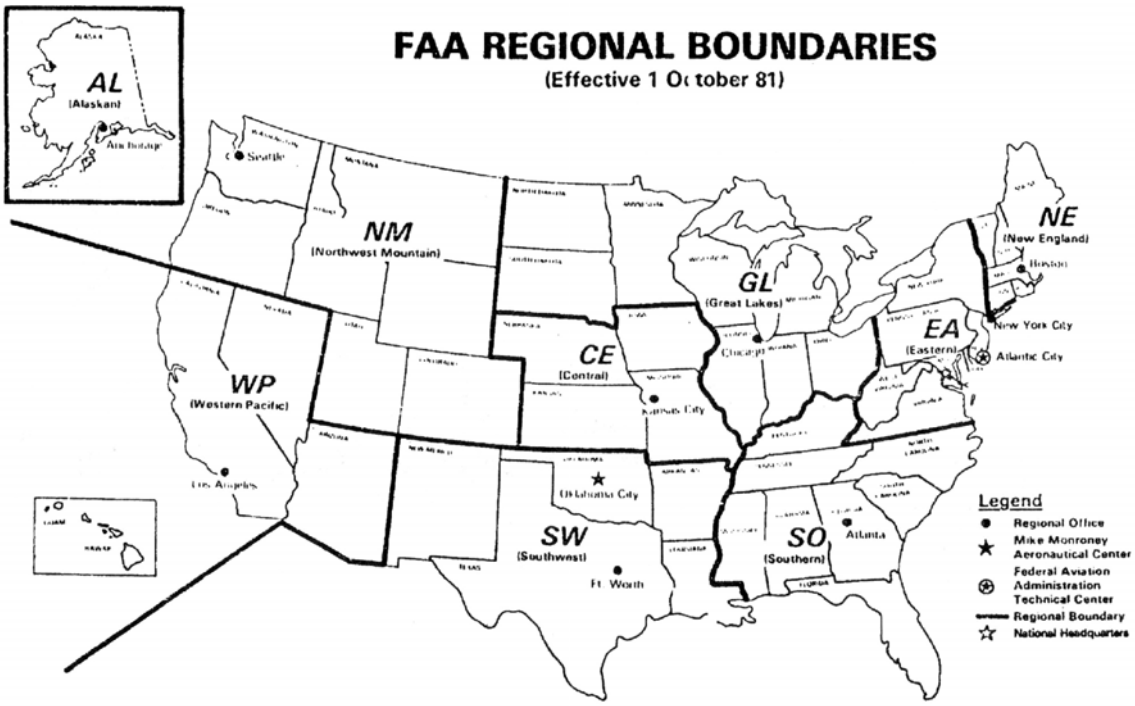


Figure 8. NRC Regions

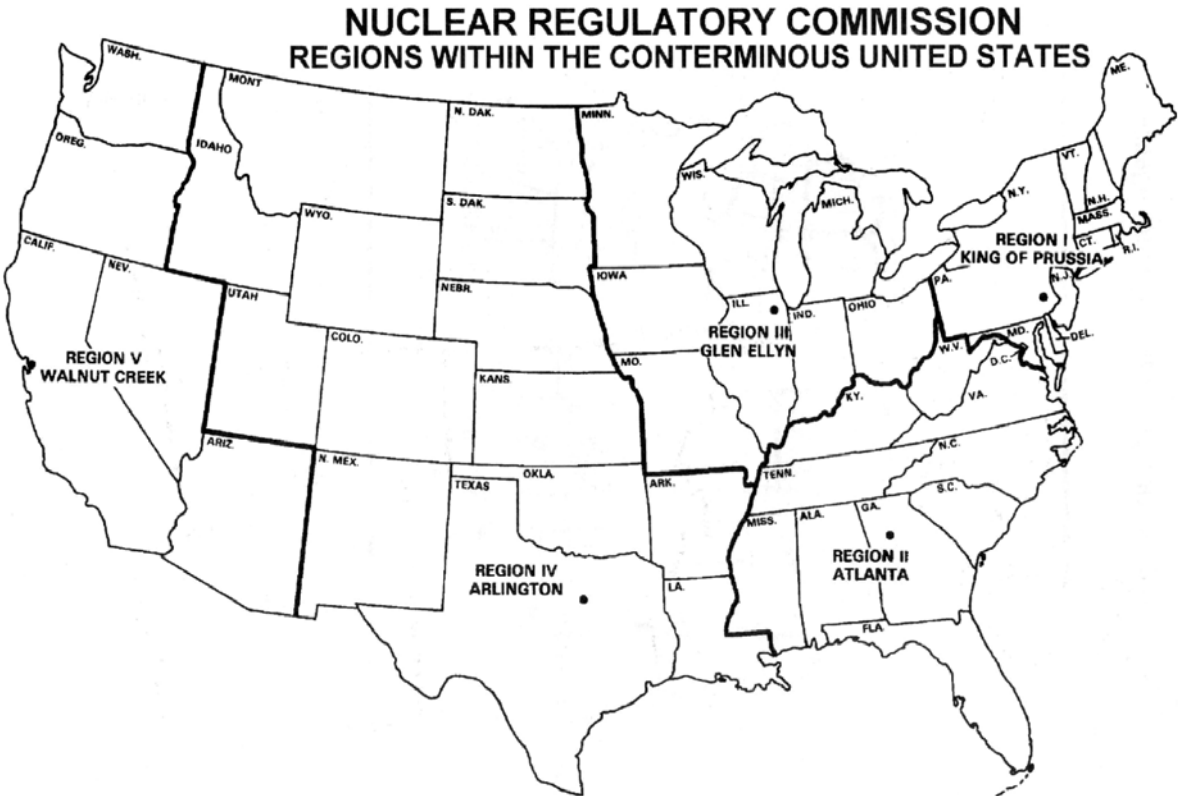


Figure 9. FEMA Regions

Figure 10. EPA Regions

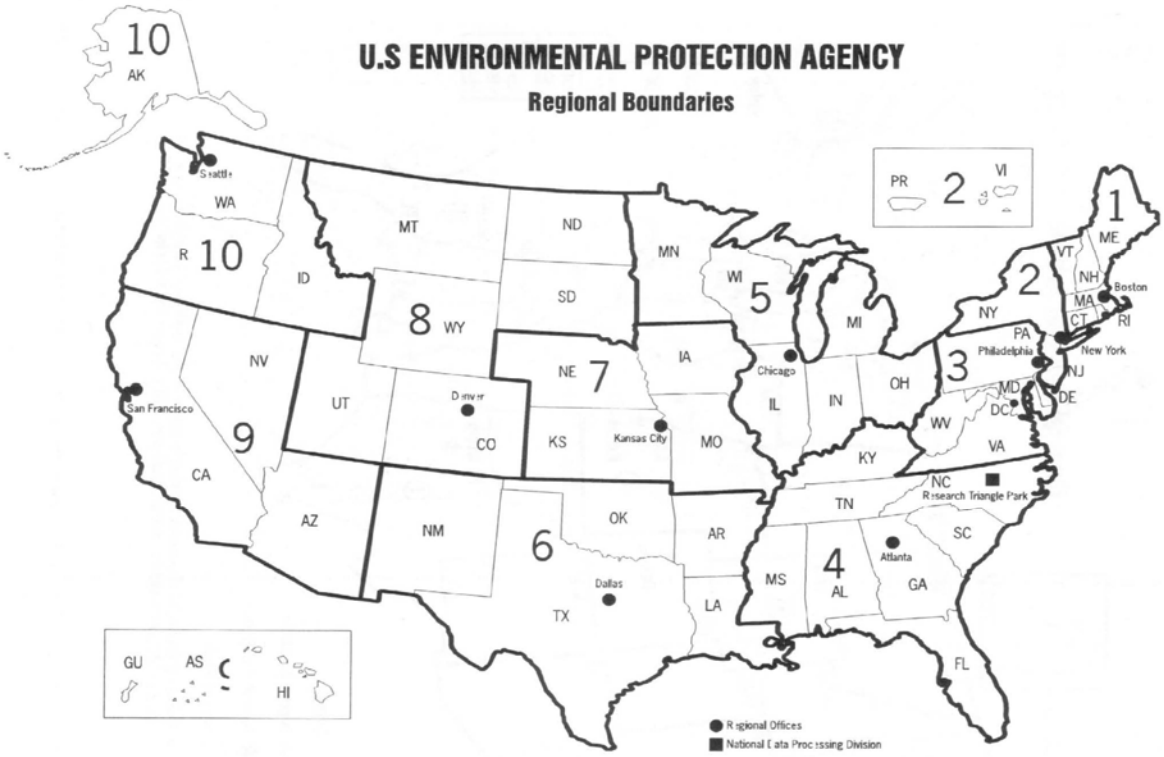


Figure 11. GSA Regions

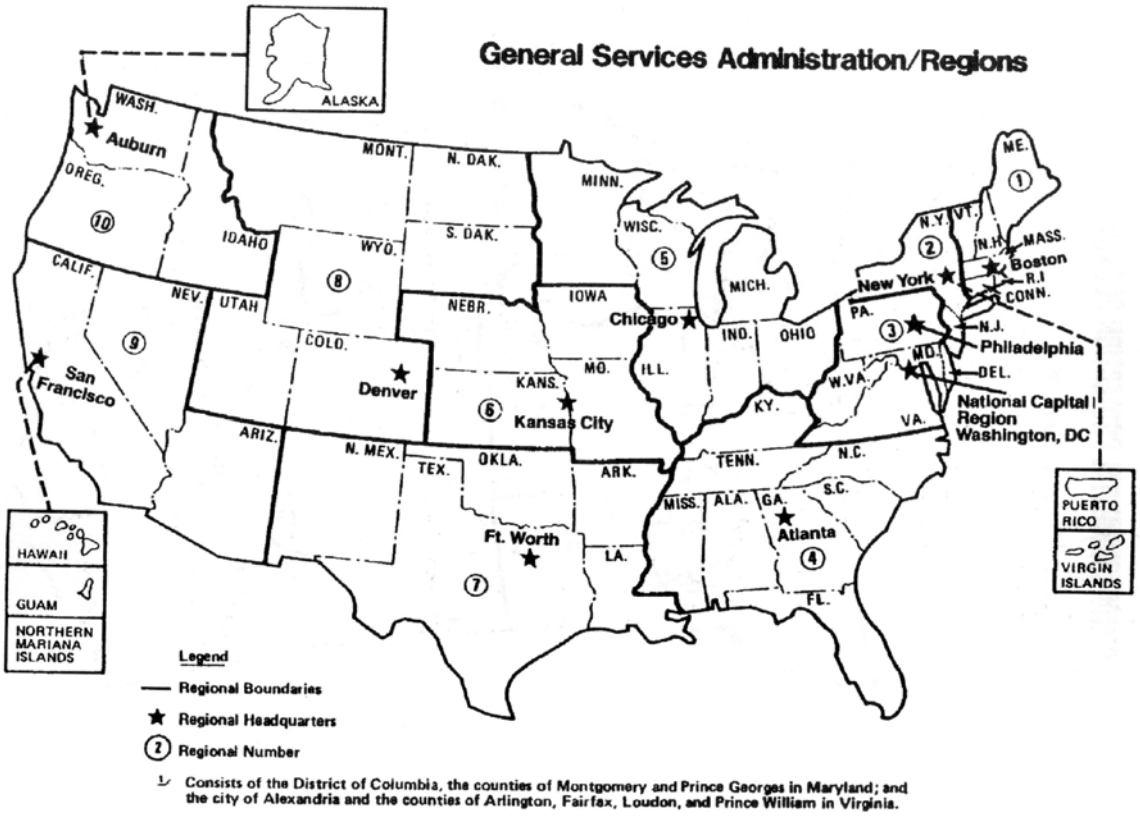


Figure 12. USAF Mars Regions

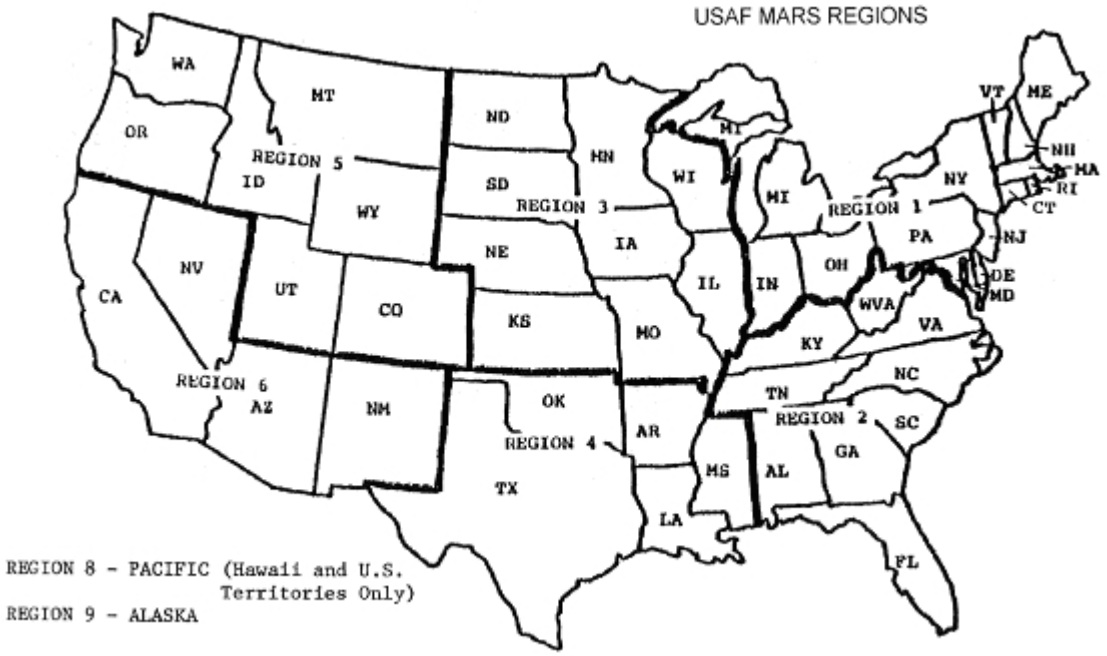
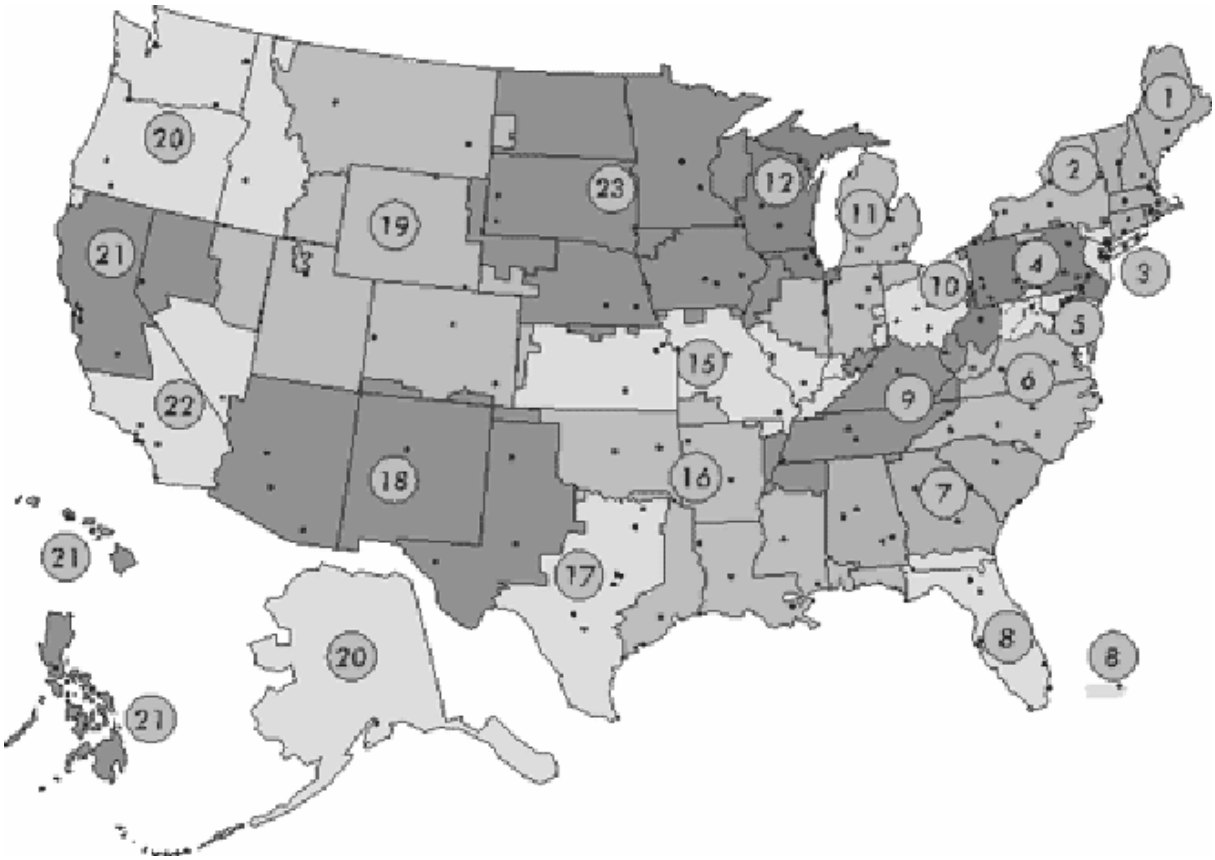


Figure 13. VA Health Administration Integrated Service Network by (VISN) by Boundaries



G.4 COMMON ABBREVIATIONS

AAF	ARMY AIR FIELD
ARA	ARMY AREA
ARPT	AIRPORT
CGD	COAST GUARD DISTRICT
CO	COUNTY
CY	CITY
DI	DISTRICT
DIV	DIVISION
FT	FORT
IAP	INTERNATIONAL AIRPORT
IS	ISLANDS
LNB	LARGE NAVIGATIONAL BUOY
MAP	MUNICIPAL AIRPORT
MT	MONT, MONTE, MOUNT(S)
MTN	MOUNTAIN(S)
PG	PROVING GROUND(S)
PT	POINT
ST	SAINT

G.5 MANUFACTURER CODES

This part of Annex G contains those manufacturer codes that will be used in the Circuit Remarks (REM) fields of the GMF (see Chapter 9, Section 9.8.2).

A

AAC	AACOMM, Inc.
AAE	Atlantic Aerospace Electronics Corp.
AAI	Aircraft Armaments Inc.
AAO	Aero Astro LLC
AAT	Airsys ATM
ABA	ABA Electronics Mechanical System
ACA	Aircraft Accessories Corp.
ACC	ACE Communications
ACE	Aeronautical Communications Equipment Inc.
ACI	Air Communications Inc.
ACL	ACR Electronics
ACR	Acrodyne or Acrodyne Industries Inc.
ACT	ALCATEL
ADC	Advanced Electronics
ADN	Advanced Navigation Inc.
ADS	General Electric/Astro Space Division
ADT	Advanced Videotech Corp.
ADV	Audio-Vac
ADY	Aerodyne
AEC	Allied Electronics Corp.
AEO	Aer-O-Com
AER	Aeronautical Electronic Inc.
AES	Aerosonic Corp.
AGI	Agilent
AGN	AGA Navigation Aids Limited
AHI	Aleth Inc.
AHR	Aethercomm Inc.
AIC	Atmospheric Instrumentation Research Corp.
AID	Audio Intelligence Devices Inc.
AIE	Aire-Sciences, Inc.
AII	Atmospheric Instrument Research, Inc.
AIL	Airborne Instrument Laboratories
AIM	Artemis Inc.
AIO	AIRONET
AIR	Aireon Manufacture Corp.
AIS	Air Science Inc.
ALC	Applied Research Corp.
ALL	Allison Electronics
ALN	Alenia Spazio
ALO	Alineco
ALP	Aleph Inc.
ALT	Altech Lansing
ALV	Alva Radio Industries
AMH	Amherst Systems, Inc.
AMO	American Optical Corp.
AMS	American Systems
AND	Andrew Corp.
ANO	ANACOM
ANP	Antenna Products Co.
ANS	Antenna Specialists Co.
ANT	Arnet
AOC	Air Associates Co.
API	Applied Research, Inc.
APN	Applied Concepts
APO	Apollo Manufacturing Co.
APS	Applied Systems Engineering
APT	Applied Technology
ARA	ARTAIS Inc.
ARC	Aircraft Radio Corp.
ARE	Atlantic Research Corp.
ARF	ARF Products, Inc.
ARI	Aerospace Research Inc.
ARJ	Aeronautical Radio Inc. or ARINC
ARM	Armstrong Transmitting Corp.
ARN	Aerotron, Inc.
ART	Allied Radio Shack
ARY	Airsys ATM Inc.
ASA	Asahi Optical Co.
ASC	Astronomics Corp.
ASE	Astral Electronics Inc.
ASG	Allied Signal Commercial Aviation System
ASI	Alto Scientific Inc.
ASM	Astromarine Products Corp.
ASP	A/S S.P. Radio
AST	Astro Communication Laboratories or Astaron Electronics Ltd.
ASY	Antenna Systems Inc.
ATA	Atacs Corp.
ATC	Astro Telecom Corp.
ATE	Advanced Tech Talk
ATF	Advanced Techcom Inc.
ATI	Amerasia Technology Inc.
ATM	Automation Inc.
ATR	Airtronics Inc.
ATS	Advanced Telemetry Systems, Inc.
ATT	American Telephone & Telegraph
ATX	Advanced Training Systems
AUA	Austin Custom Antennas
AUD	Audio-Sine, Inc.

AUM	Austin Microwave, Inc.
AVI	Avitron Inc.
AVK	Avantek
AVL	Avalon RF Inc.
AVM	AVM Instrument Co.
AVN	Aerovironment
AVT	Avtek Co.
AXM	Anixter-Mark Co.
AYD	Aydin
AYI	Airport Systems International, Inc.
AZD	Azden, Inc.
B	
BAB	Babcock Electronics Corp.
BAC	Barry Research Corp.
BAD	BAE Systems
BAE	Barth Engineering & Mfg. Co.
BAN	Belair Networks
BAR	Barrett Electronics
BDW	BridgeWave Communications
BEG	Bendix/King Mobile Communications
BEN	Bendix Corp. or Bendix Aviation Corp.
BER	Bertea Products or Bertea Corporation
BET	Beta Co
BLS	Balise
BLU	Bludworth or Bludworth Marine Division
BMS	Broadcast Microwave Services
BOA	Boeing Aerospace
BOE	Boeing Aircraft
BRG	BRG Precision Products
BRI	Bristol Aerospace Ltd.
BRN	Baron Services
BRT	Broadcast Electronics
BTI	Burle Technologies, Inc.
BUT	Butler National Corp.
BVS	Berkeley Varitronics Systems
BZR	Bonzer, Inc.
C	
CAB	Campbell Manufacture Company, Ltd.
CAC	Cessna Aircraft Co.
CAI	Communication Associates, Inc.
CAP	Communications Applied Technology
CAR	Canadian Radio Corp.
CAT	Canadian Telephone Co.
CAV	Cavotec Microcontrols
CBE	Crown Broadcast Electronics
CBM	CBM Electronics
CCB	Control Chiefs, Inc.
CCC	Cadion Communications Corp.
CCD	Control Industries
CCF	Coastal Climate Company
CCI	Communications Carriers, Inc.
CCJ	Communications Co., Inc.
CCK	Carlson Communication, Inc.
CCP	Continental Electric Corporation
CDN	Cardian Electronics
CDP	Codan Pty, Ltd
CDR	Codar Ocean Sensors
CDS	Cubic Defense Systems
CDS	Cubic Defense Systems
CDT	Communications & Documentation Technology Co.
CDW	Cardwell Mfg. Co.
CDW	Cardwell Mfg Co.
CEG	Ceragon Networks Inc.
CEL	Colorado Electronics
CEM	Continental Electronics Manufacturing Co.
CEO	Celesco Industries
CER	Centry Research Corp.
CET	CETEC Vega
CFM	California Microwave
CHA	Channel Master Corp.
CHM	Chesapeake Microwave
CIC	Cubic Industrial Corp.
CIN	Cincinnati Electronic Corp.
CKC	Cook Communications Corp.
CLU	Campbell Scientific Inc. Of Logan Utah
CMI	CMI, Inc.
CMO	Canadian Motorola
CMT	Communitranics
CMU	Communitronics Ltd
CNC	Conic Corp.
CNI	Contraves Italiana
CNR	Conifer
COA	Communication Specialities
COB	Cobra
COC	Communication Co.
COE	Communication Electronics Co.
COI	Comtech Lab, Inc.
COL	Collins Radio Co.
COM	Comrex
CON	Continental Electronics, Ltd.
COP	Communications Products Co.
COR	Continental Radio
COS	Cosser Electtonic
COU	Courier Communications, Inc.
CPI	CPI, Communications
CRB	Commercial Resources

	Communications
CRC	Collins Radio of Canada
CRH	Crouse-Hinds
CRP	Concord Electronics Corp.
CRT	Cartwright Electronics Inc.
CRU	Cruise Technology
CSC	Customs Signal Corp.
CSI	Control Science, Inc.
CSR	Citizen Ship Radio Corp.
CTL	Crescend Technologies LLC
CTR	Cattron, Inc.
CUB	Cubic Co.
CUM	Custom Electronic Manufacturing Co.
CUS	Cush Craft
CVR	Convair
CWE	Comwave
CWI	Cartwright, Inc.
CYB	Cybermation
CYT	Cybernet International, Inc.
D	
DAD	Door Alarm Devices Corp.
DAE	Davco Electronics Inc.
DAN	Daniels Electronics Limited
DAT	Data Control Systems
DBM	Three DBM Systems
DCE	Decatur Electronics, Inc.
DCI	Defense Communications Engineering Inc.
DCM	Delcom
DEA	Decca Radar Ltd. UK
DEC	Decibel Products, Inc.
DEF	Deferral
DEI	Defense Electronics
DEL	Delmar Engineering Laboratories
DES	Delstar Corp.
DET	Detroit Bullet Trap Co.
DGR	Douglas Randall Div. of W.K. Radio Alarm Box DHVDHV, Inc.
DIG	Digital Radio
DIT	Digitize, Inc.
DIX	Dixon Industries Corp.
DLN	Del Norte
DMC	Digital Microwave Corp.
DMI	Data Marine International
DMT	Defiance Machine Tool Co.
DNS	Decca Navigator Systems, Inc.
DNT	Del Norte Technology, Inc.
DOR	Dorsett Laboratories
DOS	Dorsett Electronics Division (LaBarge, Inc.)
DRA	Drake RF Co.
DRC	Dollar, Robert Co.
DRD	Dero Research Development Corp.
DRG	Deskin Research Group
DRI	Decca Radar, Inc.
DRK	Data Radio Corp.
DRP	DRS Precision Echo, Inc.
DSY	Defense Systems, Inc.
DTC	DTC Communications
DTE	Daytong Electronics, Ltd
DTM	Datum
DTW	Datawell
DUT	Duelatron
DXR	DX Radio Corp.
DYC	Dynamic Communications
DYR	Dynair Electronics
DYS	Dynascan Corp.
E	
EAD	European Aeronautic Defense and Space Company
EAG	Eagle-Picker Industries, Inc.
EAI	Elta-Ashdad Israel
EAR	Earmark, Inc.
ECE	Eclipse Electronic Systems, Inc.
ECL	Eaton Corp. AIL DIVN.
ECR	Edcor
EDO	EDO Corp.
EDR	EDO Aire
EEC	Electronic Engineering Co.
EEE	EMCEE, Co.
EFD	EF Data
EGX	Energy-Onix
EIP	Electromatic, Inc.
ELA	Ellason
ELB	Electrolab
ELI	Electrac, Inc.
ELM	Electronic Material International, Ltd.
ELS	Electromagnetic Sciences, Inc.
EMA	Electro Magnetic Sciences Co.
EMC	Electronics Missiles Communications, Inc.
EMH	Electro-Mechanics Co.
EMI	EMI-Cossor Electronics Ltd. or EMI Marine Division
EMR	Electro Mechanical Research, Inc.
EMW	Eastern Microwave Corp.
END	ENDECO
EPS	EPSCO, Inc.
ERA	Ericsson, L.M. Ltd.
ERC	ERCO Radio Laboratories

ERD	Emhiser Rand
ERI	Electronics Research Industries
ERN	Erichson
ERX	Emhiser Research, Inc.
ESD	ESL, Inc.
ESE	Electronic System Technology
ESI	Energy Systems, Inc.
ESN	Espey Mfg Electronics
ESR	Esterline
ESS	Electronic Support Systems, Inc
EST	Electric Service Co.
ESY	E-Systems
ETE	Enterprise Electronics, Inc.
ETR	Ecatek, Inc.
ETS	Electronic Systems Technology
EXE	Executive Communications
EXI	EXICOM New Zealand, Ltd.
EXT	Executone, Inc.
EXX	EXETEX
F	
FAA	Federal Aviation Administration
FAL	Frant, Alan I.W.
FAP	Fran Air Products Co.
FAR	Farnsworth TV Radio
FAS	Ford Aerospace Corp.
FEC	Farinon Electric
FEM	FEMCO, Inc. or FEMCO Div. Gulton Industries
FER	Ferguson Communications, Inc.
FGI	Fleetwood Group, Inc.
FLL	Flight Refuel, Ltd.
FMI	Farinon Microwave
FNT	Fonet, Inc.
FOR	Fort Worth Tower Co.
FOT	Fortress Technologies
FSI	Frequency Source, Inc.
FSR	Federal Signal Radio
FUJ	Fujitsu Tem Corp. of America
FUR	Furuno
FUT	Futaba
G	
GAB	Gabriel Corp.
GAE	General Aviation Electronics
GAI	Garmin International
GAL	Granger Associates ,Ltd.
GAT	Gates Radio Co.
GAW	Gamewell Division of Gulf Western
GDC	General Development Corp.
GDE	General Dynamics/Electronics
GDI	Godfrey Engineering, Inc.
GEC	GEC Telecommunications, Ltd.
GEI	Galaxy Electronics, Inc.
GEL	General Electronics Laboratories, Inc.
GEM	Gem Marine Products
GEN	General Electric Corp.
GEO	Geodyne Corp.
GEP	Genesys Systems
GEV	Genave
GIC	General Instrument Corp.
GIT	Georgia Institute of Technology
GLB	GLB Electronics, Buffalo, N.Y.
GLM	Global Microwave Systems
GMC	General Motors Corp.
GME	General Microwave Services
GMI	General Microwave Corporation
GMS	Galaxy Micro Systems, Inc.
GMW	Global Microwave, Inc.
GNI	GPS Networking Inc
GON	Gonset Corp. or Gonset Division of Aerotron or Dumont Division of Gonset
GRA	Granger Associates or Bauer Broadcast Division of Granger
GRC	General Radio Co.
GRO	Ground Data Corp.
GRT	General Radiotelephone Co.
GTE	GTE Sylvania
GTI	Skylink Uhf Wireless Network
GTL	GTE Lenkurt
GYE	Glenayre
H	
HAC	Harris Corp.
HAD	Harris Aerospace Systems Divn.
HAI	Hallmark Instruments, Inc.
HAM	Hammarlund Manufacturing Co. or Dumont Division of Hammarlund
HAN	Handar Company
HAR	Harvey Radio Laboratories, Inc.
HAS	Hastings Raydist, Inc.
HAZ	Hazeltine Corp.
HDS	Household Data Services, Inc.
HEA	Heath Co.
HEL	Hermes Electronics
HEP	Hewlett Packard
HER	Hermer Electronics, Ltd.
HFI	Harris Farinon, Inc.
HIC	Harris Intertype Corp.
HII	Herley Industries
HIS	Highway Information Systems, Inc.
HME	Hartman Marine Electronics Corp.

HMI	HM Electronics, Inc.
HMS	Herley Microwave Systems
HMT	Hamtronics
HNS	Hughes Network Systems
HON	Honeywell
HOR	Horizon
HRC	Henry Radio Co.
HRS	Hendy Radio Service
HSA	Hallands Signal Attaraten
HSC	Hawkeye Systems Corp.
HSI	Hi Sierra
HSS	Hydro Space Systems
HTI	Hamtronics, Inc.
HTS	HT Systems
HUG	Hughes Aircraft Co.
HUL	Hull Electronics Co.
HYE	Hy-Gain Electronics Corp.
HYP	Hyperlink Technologies
I	
IBM	International Business Machine Co.
ICM	ICOM
ICO	International Corp.
ICS	Industrial Comm Systems
ICX	ICX Technologies
ICX	Icx Technologies
IDE	IDC Electronics
IEC	IEC Electronics Corp.
IFR	Instrument Flight Research Corp.
ILS	International Laser Systems, Inc.
IMC	International Microwave Corp.
IMS	International Meteorological Systems
INC	INTRAC
INE	Intech, Inc.
INS	IN-SNEC
INT	Interstate Electronics Co.
ISC	International Signal and Control
ISS	Information Station Specialist
ITF	ITT Defense Communications
ITG	ITT Gilfillan
ITM	ITT Mackay Marine
ITO	ITT Aerospace/Optical
ITP	International Telephone & Telegraph Corp. or ITT Industrial Products
ITS	ITT Standard
ITT	ITT Federal Laboratories
J	
JDE	John Deere
JDT	Johnson Data Telemetry Corp.
JEP	Jet Propulsion Laboratory
JER	Jerrold Electronics Corp.
JHU	Johns Hopkins University
JNN	Johnson Associates
JOH	Johnson E.F.
JRC	Japan Radio Co.
JTC	Janteq Corp.
K	
KAM	Kaman Electronic Systems Division
KAN	Kantronics
KAR	Kaar Engineering
KDK	KDK Inc.
KED	Kenwood
KEI	Keith Anderson Co. or Keith V. Anderson
KEL	Kelvin Hughes, Ltd.
KEN	Kennedy Co.
KEY	Key Systems, Inc.
KFE	K-F Electronics
KIE	Kinn Electronics Corp.
KIG	Kingfisher
KIN	King Radio Corp.
KOD	Koden America, Inc
KRA	Kraft Systems
KTI	Keltec Industries
KUS	Kustom Signal Corp.
KUX	Kustom Electronics Inc.
L	
LAB	La Barge, Inc.
LAC	Loea Corporation
LAN	Lance Antenna Corp.
LAR	Largo Electronic Manufacturers Inc.
LCA	Univ. of Lowell Center for Atmospheric Research
LDS	Loral Data Systems
LEA	Lear, Inc.
LEC	Lorain Electronics Corp.
LED	Lucas Ledex
LEN	Lenkurt Electric Co.
LET	Lectrosonics, Inc.
LFE	Laboratory for Electronics, Inc.
LII	Litton Industries
LIL	Lincoln Laboratory
LIN	Ling Systems, Inc.
LLL	Lawrence Livermore Laboratory
LMB	Lambda RF Systems
LNR	LNR Communications, Inc.
LOA	Los Alamos National Laboratories
LOC	Lockheed Electronics
LOE	Loral Electronics Corp.
LOM	Lockheed Martin Astro Space
LOR	Lorrain County Radio Corp.

LOS	Lockheed Sanders, Inc.
LOT	Lotran, Inc.
LPB	Low Power Broadcast Co.
LRD	Laird Technologies
LSC	L-3 Space Communications
LUC	Lucos Air Space
LYN	Lynch Communications Systems, Inc.
M	
MAB	M/A Comm AC, Inc.
MAC	Marconi Instruments, Division of English Electronics
MAE	Marine-Air Systems, Ltd.
MAG	Magnavox Co.
MAH	Martch Co.
MAK	Mark IV Industries, Ltd.
MAM	M/A COMM MAC
MAR	Mark Products Co.
MAS	Mid American Relay Systems
MAX	Maxson Electronics Corp. (Electronics Design)
MBC	Meteor Communications Consultants, Inc.
MBE	Marcel Bassaulet Electronics
MBR	Malibu Research
MCC	Microcom Corp.
MCD	McDonnell Aircraft Corp.
MCE	Micro Electronics
MCF	Microflect
MCI	Marconi Radio
MCJ	Marconi Electronics
MCL	Microwave Cavity Laboratory
MCO	Micro Communications Co.
MCS	Micronetics
MCT	Micro Control Specialities
MDC	Microdyne Corp.
MDH	Madah-Com
MDM	Microwave Design Manufacturing, Inc.
MDS	Metrodata Systems
MDT	MDTT, Inc.
MDY	Microwave Data System
MET	Metrotek Electronics Co.
MFX	Morfax, Ltd.
MGI	Megapulse, Inc.
MHR	Minneapolis Honeywell Regulator
MHS	Microhard Systems Inc.
MIB	Mitsubishi Denki Co. or Mitsubishi Electric
MIC	Microdot, Inc.
MID	Microfix Instruments, Ltd.
MIF	Micromega, Divn of Bunker-Ramo Corp.
MIL	Micro-Linke Corp.
MIN	Midland Intlr. Corp.
MIQ	Miteq Corp.
MIT	Minatronics Corp.
MIW	Microwave Associates, Inc.
MKY	Mackay Radio-Telegraph Co.
MLR	R. A. Miller Industries
MMA	Martin Marietta Air Space
MML	Micromil Electronics, Ltd.
MMT	Millimeter Wave Technology
MNI	Microwave Network, Inc.
MNT	Montec (Divn of E-Systems)
MOC	Model Rectifier Co.
MOD	Modar Electronics
MOE	Monaco Enterprises, Inc.
MON	Monitor Electronics
MOT	Motorola Corp.
MOX	Mobile Communications
MPD	Microwave Power Devices, Inc.
MPH	MPH Industries, Inc.
MPI	Microwave Products, Inc.
MPN	Multipoint Network
MRC	Midwest Radio Corp.
MRE	Monicor Electronics
MRF	Mid-Atlanlic RF Ssytems
MRR	Marti
MRS	Micro Systems, Inc.
MRT	Marti Electronics
MSD	Marconi Space and Defense Systems
MSI	Microhard System Inc.
MSR	Mid-State Radio
MSY	Meteric Systems Corp.
MTH	Martech, Inc.
MTI	Mobile Telesystem, Inc.
MTN	Monitron Corp.
MTR	Meteor, Communications Corp.
MTS	Mobile Telesystems
MUI	Multronics, Inc.
MUL	Multi-Elmac Co.
MUN	Muniquip Co.
MUT	Multitone Electronics, Ltd.
MVI	M/A-COM Video Systems, Inc.
MWB	Microwave Bypass Systems
MWO	Microwave Radio Corp.
MWS	Microwave Sensors
MWT	Marconi Wireless Telegraph Co., Ltd.
MXN	Maxon Electronics, Inc.
N	
NAR	Narda Microwave Corp.

NAU	Nautel
NAV	Naval Avionics
NCC	Nutex Communications Corp
NCF	National Center for Atmospheric Research
NCR	National Cash Register of Canada
NDS	Norand Data Systems, Inc.
NEA	NEC America, Inc.
NEB	NEUTEC
NEC	Nemsclarke
NER	Nera
NEU	Neulink, Divn of Celltronics
NIE	Nippon Electronic Company Ltd.
NMT	New Mexico Tech
NOC	Northrop Corp.
NOI	Nokia
NOR	Northeast Medal Industries
NOV	Nova-Tech/Avionics or Nova Tech Inc.
NRA	Northern Radio Co. or Northern Electronic Co.
NRB	NARCO
NRC	National Aeronautic Corp.
NSI	Nady System, Inc.
NSM	News And Sports Microwave
NTA	Nextiva
NUC	Nucomm
O	
OAI	Oklahoma Aerotronics, Inc.
OAO	OAO Corp.
OAR	Ocean Applied Research Corp.
OKA	Oklahoma Electronics Co.
OKI	OKI Denki Co. or
OMN	Omnitek
OOS	Odom Offshore Survey
OPH	Ophir
OPS	Opos Electronics
OSC	Orbital Sciences Corp.
P	
PAD	Pacific Advanced Engineering, Inc.
PAE	Park Aire Electronics
PAI	Pacific Aerosystem, Inc.
PAL	Palmer, B. Co.
PAR	Parsons Electronics
PAS	Park Air Systems
PAU	Pauldon
PAV	PAVCO
PCC	Pace Communications Corp.
PCE	Page Communications Engineers, Inc.
PCL	PC Electronics
PCM	Pacific Communications
PCR	Pacific Crest Corp.
PCS	Proportional Control Systems
PDL	Paradise Datacom LLC/LTD
PEA	Pearce Simpson, Inc.
PEG	Peninsula Engineering Corp.
PFE	Professional Electronics
PHL	Philips Gloeilampene Abreiken (Neth) or Philips Broadcast Equipment Corp.
PLE	Plessey Company, Ltd. (UK)
PMH	Pacific Microwave Research
PMX	Primex Wireless Clock System
POE	Pointer Electronics
POX	Polytronics Communications or Pro-Line Electronics
PPI	Peter Pepper Inc.
PRI	Polytronics Research, Inc.
PRL	Polar Research Lab.
PRO	Podelin, Inc.
PRT	Pitchard Brown
PRX	Poxim
PST	Pwer Systems Technology, Inc.
PTI	Ptection Technology, Inc.
PYR	Pyramid Co.
Q	
QEI	QEI Corp.
QEN	Quadrant Engineering, Inc.
QSC	Quanta System Corp.
QUA	Qualimetrics Corp.
QUC	QALCOMM
QUI	Quintron Corp.
QUT	QUALI-TRON
R	
RAC	Racal Communications, Ltd.
RAD	Radiation, Inc.
RAE	Racal Electronics, Ltd.
RAG	Radian Corp.
RAJ	Ray Jefferson Co.
RAM	Raymarine Inc.
RAN	Rantec Corp.
RAS	Radio Shack
RAT	Ratelco, Inc.
RAW	Radwin
RAY	Raytheon Co. or Raytheon Manufacturing Co.
RCA	Radio Corporation of America
RCN	Racon, Inc.
RCV	RCA Victor Company, Ltd.
RDA	Radair, Inc.
RDE	Radtec Engineering
RDN	Raydyne, Inc.

RDS	Radio Specialty Co.
RDW	Radio Waves Inc.
REA	Realtons Electronics, Inc.
REB	Remcon
REC	Reach Electronics Corp.
RED	Redifon, Ltd.
REE	Reaction Instruments, Inc.
REF	Republic Electronics Films, Inc.
REG	Ross Engineering
REI	Regency Electronics, Inc.
REL	Radio Electronics Laboratories
REM	Remler Company, Ltd.
REP	Repco, Inc. or R.G.P. Co.
RES	Resdel Engineering Corp.
RFC	RF Communications Associates, Inc.
RFE	Rafael
RFI	Radio Frequency Communications, Inc.
RFT	R. F. Technology
RGC	Ranger Communications
RHG	RHG Electronics Laboratories
RIE	Rockwell International Electronics
RIT	Ritcon, Inc.
RLC	Realistic Co.
RMC	Relm Communications, Inc.
RMI	Racal Decca Marine, Inc.
RMT	Remotec, Inc.
RMX	Radiometrix
RNS	Radionics
ROB	Robinson Electronics
ROC	Recon Optical, Inc.
ROE	Robinson Engineering Co.
ROS	Rohde Schwarz
ROT	Rothenbuhler Engineering
RQM	Racon, Inc. Quality Microwave
RRC	Radio Receptor Co.
RSI	Radio Systems, Inc.
RSM	Radio Specialty Manufacturing
RSS	RS Systems, Inc.
RTK	REFTEK
RTR	Ritron, Inc.
RWC	Rockwell, Collins
S	
SAB	SAAB
SAC	Sabre Communications Corp.
SAD	Sandia Corp.
SAI	Springer Aircraft Radio Corp.
SAL	Salco Manufacturing Co.
SAN	Sanders Associates, Inc.
SAR	Stoddard Aircraft Radio Co.
SAT	Sarkes Tarzian, Inc.
SBE	Seaboard Electronics
SCA	Scala Radio Corp.
SCC	Secode Corp.
SCI	Scientific Atlanta Co.
SCM	SCM Melabs, Inc.
SCO	Scope, Inc.
SCT	Science Applications International Technology, Inc.
SDI	Safety Devices, Inc.
SEA	Sears Roebuck Co.
SEC	Struthers Electronics Corp.
SEI	Seiscor Manufacturing Co.
SEL	Selenia S.P.A. (Italy)
SEM	Seatron, Inc.
SEN	Sennheiser Electronic Corp.
SEO	SEMCO
SER	Servo Corp. of America
SFC	Safecom (Radionics)
SFI	Stanford Telecommunications, Inc.
SGC	Sperry Gyroscope Company of Canada, Ltd.
SHU	Shure Brothers, Inc.
SIA	Stephens Engineering Associates, Inc.
SIC	SRI International
SID	Sierra Digital
SIE	Sierra Electronic Division of Philco
SIG	Signal Communications
SIH	Siemens-Halske
SII	Sirit Corp
SIM	Simpson Electronics
SIN	Spectrum Communications, Inc.
SIP	Sippian Ocean Systems
SIR	Sitra
SLM	Spacelabs Medical
SLT	Satellite Transmission Systems, Inc.
SMG	Symbol Technology, Inc.
SML	Space Microwave Lab.
SMO	Sierra Misco
SMT	Samson Technologies Corp.
SMW	Southern California Microwave
SNC	Sierra Nevada Corp.
SNS	Senstar Corp.
SNT	Santec
SOA	Southern Avionics
SON	Sonar Radio Corp.
SOY	Sony
SOZ	Southcom International, Inc.
SPA	Spar Aerospace, Ltd.
SPB	System Planning Co.
SPC	Space Technical Laboratories

SPD	Sperry Corp.
SPE	Space Electronics
SPG	Space General
SPK	Spike Technologies, Inc.
SPN	Sparton Electronics
SPR	Sperry Corp. or Servo Corporation of America
SPZ	Sperry Marine Systems
SQA	Square D Co.
SQL	Spacequest LTD
SRM	Sierra Monolithics, Inc.
SRS	Scientific Radio Systems, Inc.
SRU	SATEL Radio USA
SSI	Surface System, Inc.
SSN	Sensis Corp.
SSR	Sensor Systems
SSY	Stellar System
STA	Standard Electronics
STB	Standard Communications
STD	Standard Electrik Lorenz
STE	Stephenson
STM	ST Microwave
STR	Stromberg Carlson Products Co.
STS	Standard Electrica S.A.
STW	Stewart Warner Corporation of Canada, Ltd.
STX	SI-Tex Marine Electronics, Inc.
STY	Sensor Technology Systems, Inc.
SUM	Summers & Mills
SUN	Sunair Electronics, Inc.
SUR	Sur-Tec, Inc.
SUT	Sutron Co.
SWI	Swintek Cordless Microphone Co.
SWM	Southwest Microwave Co., Inc.
SWR	Southwest Research Institute
SWS	Swiss Phone
SYA	Syracuse Research Corp.
SYE	Systems Engineering & Management Corporation
SYL	Sylvania Electronics Defense Laboratory or Sylvania Electronics Products
SYN	Synergetics
SYS	Systron Donner Corp (Demornay Bonardi)
T	
TAC	Technical Appliance Corp.
TAD	TAD-American Corp.
TAE	Tait Electronics, Ltd.
TAT	Thrane & Thrane
TBL	Trimble Navigation
TBN	Tayburn
TCD	Techdyn Systems Corp.
TCI	Tel Com Industries
TCM	TCOM Industries, Inc.
TCO	Temco Aerosystems
TCT	Transcidtronic
TDA	Tridea Electric Corp.
TDC	Teledyne T/M Co.
TDI	TeleDesign
TDL	Tidelands
TDY	Tele-Dynamics
TEC	Telviso Electronics
TED	Teldex
TEI	Texas Instrument, Inc.
TEK	Te-Ka-De Co.
TEL	Telrex Laboratories
TEN	Teletronix Engineering Co.
TEO	Telemotive
TEP	Tepco Corp.
TEQ	Tenna Corp.
TER	Terra-Com
TES	Technisonic Industries
TET	Tactical Electronics Corp.
THA	Thales ATM
THC	Thomson CSF
THE	Thorn EMI Electronics, Inc.
THY	Technology Service Corp.
TIA	Television Technology Corp.
TIE	Tel Instrument Electronics
TII	Teledyne Industries, Inc.
TIL	Transcript International
TIM	Time Domain Corporation
TIN	Telinstrument Co.
TIS	Tadiran Israel Industries, Ltd.
TKL	Teklogix, Inc.
TKM	TEK Mark Company
TLA	Telonica Corp.
TLC	TRT Groupe
TLF	Telefunken Gmbh.
TLM	Telemobile, Inc.
TLP	Telephonic Corp.
TLR	Telline Radio
TLX	Telex Co.
TMA	Tampa Microwave
TMC	Technical Materiel Corp.
TMD	TMC Systems & Power Corp. or Telemotive Division of Dynascan
TMR	Terma Elektronik
TNC	Technocom

TNS	Telonics
TOA	Townsend Associates
TOS	Toshiba Co.
TPL	Technology Proprietary, Ltd.
TRA	Transco Products, Inc.
TRB	Trans World Communications, Inc.
TRF	TRF Company
TRI	Tracor, Inc.
TRM	Tram/Diamond Corp.
TRN	Tran-Com
TRP	Tri-Com, Inc.
TRW	TRW Electronics
TRZ	Travelers Information Services, Inc.
TSB	Transcience
TSC	Teledyne Systems Co.
TSI	Tactical Systems, Inc.
TSS	Telesystems, Inc.
TTC	Titian Corp.TTI
TTK	Tron-Tek, Inc.
TTS	Telesciences Transmission System, Inc.
TTT	Tactical Technology, Inc.
TXA	Textron Defense Systems
TXC	Telxon Corporation
TYC	Tycho-Tech
U	
UDN	Uniden
UNI	Univac Corp.
UNS	Unisys Corp.
USE	Use Corporation
USN	Universal Space Network Inc.
V	
VAI	Vaisala
VAL	Valcom, Ltd.
VAR	Varian Associates
VAT	Viatec
VEC	Vector Manufacture Co.
VEG	Vega Electronics Corp.
VER	Versa-Count
VEX	Vertex Communications Corp.
VHF	VHF Engineering Co.
VIA	Victoreen Instrument Co.
VIL	Vitel
VIS	Visual Manufacturing Division
VIT	Vitro Electronics
VIX	Vista Manufacturing Co.
VIZ	VIZ Corp.
VST	Viasat Techologies Co.
VTC	Vectran Corp.
VUA	Vector Division of United Aircraft
VYT	Vytek, Inc.
W	
WAT	Washington Technological Assn., Inc
WAV	Wavetek
WBL	Weibel Scientific, Inc.
WEC	Western Electric Company, Inc.
WED	Winston Electronics Division
WEI	Ward Electronic Industries
WES	Westinghouse Electric Co.
WHD	Windermere HDS
WHE	Whelen
WIK	Wilkinson Electronics, Inc.
WIL	Wilcox Electric Corp.
WIN	Wind Data
WJO	Watkins Johnson Co.
WLC	Wilson Electronic Corp.
WMC	Weather Measure Corp.
WMX	Western Multiplex Corporation
WRL	World Radio Laboratories
WSM	Western Space and Marine
WUL	Wulfsberg Electronics
X	
XCM	Xicom Technology
XON	Xontech, Inc.
XTR	Xetron Corp.
Y	
YDI	Yarnell Data, Inc.
YEA	Yaesu
Z	
ZEP	Zephyrus
ZET	Zeta Laboratories

(Last Page in Annex G)

ANNEX H

Assignment Guide for Maritime Mobile Bands 4-26 MHz

TABLE 1: Table of Single-Sideband Transmitting Frequencies (kHz) for Duplex (Two-Frequency) Operation

(ITU RR Appendix 17 Part B Section I, Sub-Section A, and Appendix 25)

Assignable Frequencies:

Channel No.	4 MHz Band			
	Coast Stations 4352.4-4436.4 kHz		Ship Stations 4066.4-4144.4 kHz	
	Carrier Freq.	Assigned Freq.	Carrier Freq.	Assigned Freq.
401	4357	4358.4	4065	4066.4
402	4360	4361.4	4068	4069.4
403	4363	4364.4	4071	4072.4
404	4366	4367.4	4074	4075.4
405	4369	4370.4	4077	4078.4
406	4372	4373.4	4080	4081.4
407	4375	4376.4	4083	4084.4
408	4378	4379.4	4086	4087.4
409	4381	4382.4	4089	4090.4
410	4384	4385.4	4092	4093.4
411	4387	4388.4	4095	4096.4
412	4390	4391.4	4098	4099.4
413	4393	4394.4	4101	4102.4
414	4396	4397.4	4104	4105.4
415	4399	4400.4	4107	4108.4
416	4402	4403.4	4110	4111.4
417	4405	4406.4	4113	4114.4
418	4408	4409.4	4116	4117.4
419	4411	4412.4	4119	4120.4
420	4414	4415.4	4122	4123.4
421	4417*	4418.4*	4125* [4]	4126.4*
422	4420	4421.4	4128	4129.4
423	4423	4424.4	4131	4132.4
424	4426	4427.4	4134	4135.4
425	4429	4430.4	4137	4138.4
426	4432	4433.4	4140	4141.4
427 [2]	4435	4436.4	4143	4144.4
428 [1 2 3]	4351	4352.4	-	-
429 [1 2 3]	4354	4355.4	-	-

TABLE 1 - Continued				
Channel No.	**6 MHz Band**			
	Coast Stations 6502.4-6523.4 kHz		**Ship Stations 6201.4-6222.4 kHz**	
	Carrier Freq.	**Assigned Freq.**	**Carrier Freq.**	**Assigned Freq.**
601	6501	6502.4	6200	6201.4
602	6504	6505.4	6203	6204.4
603	6507	6508.4	6206	6207.4
604	6510	6511.4	6209	6210.4
605	6513	6514.4	6212	6213.4
606	6516*	6517.4*	6215* [5]	6216.4*
607 [2]	6519	6520.4	6218	6219.4
608 [2]	6522	6523.4	6221	6222.4

TABLE 1 - Continued				
Channel No.	**8 MHz Band**			
	Coast Stations 8708.4-8813.4 kHz		**Ship Stations 8196.4-8292.4 kHz**	
	Carrier Freq.	**Assigned Freq.**	**Carrier Freq.**	**Assigned Freq.**
801	8719	8720.4	8195	8196.4
802	8722	8723.4	8198	8199.4
803	8725	8726.4	8201	8202.4
804	8728	8729.4	8204	8205.4
805	8731	8732.4	8207	8208.4
806	8734	8735.4	8210	8211.4
807	8737	8738.4	8213	8214.4
808	8740	8741.4	8216	8217.4
809	8743	8744.4	8219	8220.4
810	8746	8747.4	8222	8223.4
811	8749	8750.4	8225	8226.4
812	8752	8753.4	8228	8229.4
813	8755	8756.4	8231	8232.4
814	8758	8759.4	8234	8235.4
815	8761	8762.4	8237	8238.4
816	8764	8765.4	8240	8241.4
817	8767	8768.4	8243	8244.4
818	8770	8771.4	8246	8247.4
819	8773	8774.4	8249	8250.4
820	8776	8777.4	8252	8253.4
821	8779*	8780.4*	8255*	8256.4*
822	8782	8783.4	8258	8259.4
823	8785	8786.4	8261	8262.4
824	8788	8789.4	8264	8265.4

825	8791	8792.4	8267	8268.4
826	8794	8795.4	8270	8271.4
827	8797	8798.4	8273	8274.4
828	8800	8801.4	8276	8277.4
829	8803	8804.4	8279	8280.4
830	8806	8807.4	8282	8283.4
831	8809	8810.4	8285	8286.4
832	8812	8813.4	8288	8289.4
833	8291 [7]	8292.4	8291[7]	8292.4
834	8707	8708.4		
835 [2 3 6]	8710	8711.4		
836 [2 3 6]	8713	8714.4		
837 [2 3 6]	8716	8717.4		

TABLE 1 - Continued

Channel No.	**12/13 MHz Band**			
	Coast Stations 13078.4-13198.4 kHz		**Ship Stations 12331.4-12351.4 kHz**	
	Carrier Freq.	**Assigned Freq.**	**Carrier Freq.**	**Assigned Freq.**
1201	13077	13078.4	12230	12231.4
1202	13080	13081.4	12233	12234.4
1203	13083	13084.4	12236	12237.4
1204	13086	13087.4	12239	12240.4
1205	13089	13090.4	12242	12243.4
1206	13092	13093.4	12245	12246.4
1207	13095	13096.4	12248	12249.4
1208	13098	13099.4	12251	12251.4
1209	13101	13102.4	12254	12255.4
1210	13104	13105.4	12257	12258.4
1211	13107	13108.4	12260	12261.4
1212	13110	13111.4	12263	12264.4
1213	13113	13114.4	12266	12267.4
1214	13116	13117.4	12269	12270.4
1215	13119	13120.4	12272	12273.4
1216	13122	13123.4	12275	12276.4
1217	13125	13126.4	12278	12279.4
1218	13128	13129.4	12281	12282.4
1219	13131	13132.4	12284	12285.4
1220	13134	13135.4	12287	12288.4
1221	13137*	13138.4*	12290* [8]	12291.4*
1222	13140	13141.4	12293	12294.4
1223	13143	13144.4	12296	12297.4
1224	13146	13147.4	12299	12300.4

1225	13149	13150.4	12302	12303.4
1226	13152	13153.4	12305	12306.4
1227	13155	13156.4	12308	12309.4
1228	13158	13159.4	12311	12312.4
1229	13161	13162.4	12314	12315.4
1230	13164	13165.4	12317	12318.4
1231	13167	13168.4	12320	12321.4
1232	13170	13171.4	12323	12324.4
1233 [2]	13173	13174.4	12326	12327.4
1234 [2]	13176	13177.4	12329	12330.4
1235 [2]	13179	13180.4	12332	12333.4
1236 [2]	13182	13183.4	12335	12336.4
1237 [2]	13185	13186.4	12338	12339.4
1238 [2]	13188	13189.4	12341	12342.4
1239 [2]	13191	13192.4	12344	12345.4
1240 [2]	13194	13195.4	12347	12348.4
1241 [2]	13197	13198.4	12350	12351.4

TABLE 1 - Continued

Channel No.	16/17 MHz Band			
	Coast Stations 17243.4-17408.4 kHz		Ship Stations 16361.4-17526.4 kHz	
	Carrier Freq.	Assigned Freq.	Carrier Freq.	Assigned Freq.
1601	17242	17243.4	16360	16361.4
1602	17245	17246.4	16363	16364.4
1603	17248	17249.4	16366	16367.4
1604	17251	17252.4	16369	16370.4
1605	17254	17255.4	16372	16373.4
1606	17257	17258.4	16375	16376.4
1607	17260	17261.4	16378	16379.4
1608	17263	17264.4	16381	16382.4
1609	17266	17267.4	16384	16385.4
1610	17269	17270.4	16387	16388.4
1611	17272	17273.4	16390	16391.4
1612	17275	17276.4	16393	16394.4
1613	17278	17279.4	16396	16397.4
1614	17281	17282.4	16399	16400.4
1615	17284	17285.4	16402	16403.4
1616	17287	17288.4	16405	16406.4
1617	17290	17291.4	16408	16409.4
1618	17293	17294.4	16411	16412.4
1619	17296	17297.4	16414	16415.4
1620	17299	17300.4	16417	16418.4

1621	17302*	17303.4*	16420* [9]	16421.4*
1622	17305	17306.4	16423	16424.4
1623	17308	17309.4	16426	16427.4
1624	17311	17312.4	16429	16430.4
1625	17314	17315.4	16432	16433.4
1626	17317	17318.4	16435	16436.4
1627	17320	17321.4	16438	16439.4
1628	17323	17324.4	16441	16442.4
1629	17326	17327.4	16444	*16445.4*
1630	17329	17330.4	16447	*16448.4*
1631	17332	17333.4	16450	*16451.4*
1632	17335	17336.4	16453	*16454.4*
1633	17338	17339.4	16456	*16457.4*
1634	17341	17342.4	16459	*16460.4*
1635	17344	17345.4	16462	*16463.4*
1636	17347	17348.4	16465	*16466.4*
1637	17350	17351.4	16468	*16469.4*
1638	17353	17354.4	16471	*16472.4*
1639	17356	17357.4	16474	*16475.4*
1640	17359	17360.4	16477	*16478.4*
1641	17362	17363.4	16480	*16481.4*
1642 [2]	17365	17366.4	16483	*16484.4*
1643 [2]	17368	17369.4	16486	*16487.4*
1644 [2]	17371	17372.4	16489	*16490.4*
1645 [2]	17374	17375.4	16492	*16493.4*
1646 [2]	17377	17378.4	16495	*16495.4*
1647 [2]	17380	17381.4	16498	*16499.4*
1648 [2]	17383	17384.4	16501	*16502.4*
1649 [2]	17386	17387.4	16504	*16505.4*
1650 [2]	17389	17390.4	16507	*16508.4*
1651 [2]	17392	17393.4	16510	*16511.4*
1652 [2]	17395	17396.4	16513	*16514.4*
1653 [2]	17398	17399.4	16516	*16517.4*
1654 [2]	17401	17402.4	16519	*16520.4*
1655 [2]	17404	17405.4	16522	*16523.4*
1656 [2]	*17407*	*17408.4*	*16525*	*16526.4*

TABLE 1 - Continued

Channel No.	18/19 MHz Band			
	Coast Stations 19756.4-19798.4 kHz		Ship Stations 18781.4-18823.4 kHz	
	Carrier Freq.	Assigned Freq.	Carrier Freq.	Assigned Freq.
1801 [2]	19755	19756.4	18780	18781.4
1802 [2]	19758	19759.4	18783	18784.4
1803 [2]	19761	19762.4	18786	18787.4
1804 [2]	19764	19765.4	18789	18790.4
1805 [2]	19767	19768.4	18792	18793.4
1806	19770*	19771.4*	18795*	18796.4*
1807 [2]	19773	19774.4	18798	18799.4
1808 [2]	19776	19777.4	18801	18802.4
1809 [2]	19779	19780.4	18804	18805.4
1810 [2]	19782	19783.4	18807	18808.4
1811 [2]	19785	19786.4	18810	18811.4
1812 [2]	19788	19789.4	18813	18814.4
1813 [2]	19791	19792.4	18816	18817.4
1814 [2]	19794	19795.4	18819	18820.4
1815 [2]	19797	19798.4	18822	18823.4

TABLE 1 - Continued

Channel No.	22 MHz Band			
	Coast Stations 22697.4-22853.4 kHz		Ship Stations 22001.4-22157.4 kHz	
	Carrier Freq.	Assigned Freq.	Carrier Freq.	Assigned Freq.
2201	22696	22697.4	22000	22001.4
2202	22699	22700.4	22003	22004.4
2203	22702	22703.4	22006	22007.4
2204	22705	22706.4	22009	22010.4
2205	22708	22709.4	22012	22013.4
2206	22711	22712.4	22015	22016.4
2207	22714	22715.4	22018	22019.4
2208	22717	22718.4	22021	22022.4
2209	22720	22721.4	22024	22025.4
2210	22723	22724.4	22027	22028.4
2211	22726	22727.4	22030	22031.4
2212	22729	22730.4	22033	22034.4
2213	22732	22733.4	22036	22037.4
2214	22735	22736.4	22039	22040.4
2215	22738	22739.4	22042	22043.4
2216	22741	22742.4	22045	22046.4
2217	22744	22745.4	22048	22049.4

2218	22747	22748.4	22051	22052.4
2219	22750	22751.4	22054	22055.4
2220	22753	22754.4	22057	22058.4
2221	22756*	22757.4*	22060*	22061.4*
2222	22759	22760.4	22063	22064.4
2223	22762	22763.4	22066	22067.4
2224	22765	22766.4	22069	22070.4
2225	22768	22769.4	22072	22073.4
2226	22771	22772.4	22075	22076.4
2227	22774	22775.4	22078	22079.4
2228	22777	22778.4	22081	22082.4
2229	22780	22781.4	22084	22085.4
2230	22783	22784.4	22087	22088.4
2231	22786	22787.4	22090	22091.4
2232	22789	22790.4	22093	22094.4
2233	22792	22793.4	22096	22097.4
2234	22795	22796.4	22099	22100.4
2235	22798	22799.4	22102	22103.4
2236	22801	22802.4	22105	22106.4
2237	22804	22805.4	22108	22109.4
2238	22807	22808.4	22111	22112.4
2239	22810	22811.4	22114	22115.4
2240	22813	22814.4	22117	22118.4
2241 [2]	22816	22817.4	22120	22121.4
2242 [2]	22819	22820.4	22123	22124.4
2243 [2]	22822	22823.4	22126	22127.4
2244 [2]	22825	22826.4	22129	22130.4
2245 [2]	22828	22829.4	22132	22133.4
2246 [2]	22831	22832.4	22135	22136.4
2247 [2]	22834	22835.4	22138	22139.4
2248 [2]	22837	22838.4	22141	22142.4
2249 [2]	22840	22841.4	22144	22145.4
2250 [2]	22843	22844.4	22147	22148.4
2251 [2]	22846	22847.4	22150	22151.4
2252 [2]	22849	22850.4	22153	22154.4
2253 [2]	22852	22853.4	22156	22157.4

TABLE 1 - Continued				
Channel No.	**25/26 MHz Band**			
	Coast Stations 26146.4-26173.4 kHz		**Ship Stations 25071.4-25098.4 kHz**	
	Carrier Freq.	**Assigned Freq.**	**Carrier Freq.**	**Assigned Freq.**
2501 [2]	26145	26146.4	25070	25071.4
2502 [2]	26148	26149.4	25073	25074.4
2503 [2]	26151	26152.4	25076	25077.4
2504 [2]	26154	26155.4	25079	25080.4
2505 [2]	26157	26158.4	25082	25083.4
2506	26160	26161.4	25085	25086.4
2507 [2]	26163	26164.4	25088	25089.4
2508 [2]	26166	26167.4	25091	25092.4
2509 [2]	26169	26170.4	25094	25095.4
2510	26172*	26173.4*	25097*	25098.4*

1 These coast station frequencies may be paired with a ship station frequency from the table of simplex frequencies for ship and coast stations (see Table 2) or with a frequency from the band 4000-4063 kHz (see Sections 4.3.13 and 7.5.7 of this Manual).
2 Planned for exclusive non-Federal use.
3 These channels may also be used for simplex (single frequency) operation.
4 For the conditions of use of the carrier frequency 4125 kHz, see ITU RR Nos. **52.224**, **52.225** and Appendix **15**.
5 For the conditions of use of the carrier frequency 6215 kHz, see ITU RR Appendix **15**.
6 These coast station frequencies may be paired with a ship station frequency from the table of simplex frequencies for ship and coast stations (see Table 2) or with a frequency from the band 8100-8195 kHz (see Sections 4.3.13 and 7.5.7 of this Manual).
7 For the conditions of use of the carrier frequency 8291 kHz, see ITU RR Appendix **15.**
8 For the conditions of use of the carrier frequency 12290 kHz, see ITU RR Appendix **15**.
9 For the conditions of use of the carrier frequency 16420 kHz, see ITU RR Appendix **15**.
* The frequencies followed by an asterisk are calling frequencies (see ITU RR **52.221** and **52.222**).

Emission: **2K80J3E**

Maximum Mean Power: FC ≤ 10kW MS ≤ 1.5 kW

Class of Station: FC, MS. Coast and ship station frequencies must be paired in accordance with Table 1, except for the following authorized simplex operations.

The carrier frequencies 4417 kHz and 6516 kHz (and in the United Stations also the carrier frequency 4125 kHz) may be used on a simplex basis provided that the peak envelope power of such stations does not exceed 1 kW. The use of 6516 kHz for this purpose should be limited to daytime operation. (See ITU RR Nos. **52.221.1** and **52.222.2**.)

The carrier frequencies 4125 kHz, 6215 kHz, 8291 kHz, 12290 kHz, and 16420 kHz are also authorized for common use by coast and ship stations for single-sideband radiotelephony on a simplex basis for distress and safety traffic (See ITU RR **52.221.3**).

The carrier frequencies 4125 kHz and 6215 kHz may also be used on a simplex basis for call and reply, provided that the peak envelope power of such stations does not exceed 1 kW. The use of 6215 kHz (carrier frequency) for working purposes is not permitted (See ITU RR Nos. **52.221.1** and **52.221.2**).

TABLE 2: Ship and Coast Telephony (Simplex)

(ITU RR Appendix 17, Part A Sub-Section B)

Assignable Frequencies:

4 MHz	6 MHz	8 MHz	12 MHz	16 MHz	18 MHz	22 MHz	25 MHz
4147.4	6225.4	8295.4	12354.4	16529.4	18826.4	22160.4	25101.4
4150.4	6228.4	8298.4	12357.4	16532.4	18829.4	22163.4	25104.4
	6231.4		12360.4	16535.4	18832.4	22166.4	25107.4
			12363.4	16538.4	18835.4	22169.4	25110.4
			12366.4	16541.4	18838.4	22172.4	25113.4
				16544.4	18841.4	22175.4	25116.4
				16547.4	18844.4	22178.4	25119.4

Emission: 2K80J3E
Power: pX ≤ 1KW
Class of Station: FC, MS
Other: Shared non-priority basis Federal and non-Federal.

TABLE 3: Ship Wideband Telegraphy, Facsimile and Special Transmission Systems

Assignable Frequencies:

4 MHz	6 MHz	8 MHz	12 MHz	16 MHz	18 MHz	22 MHz	25 MHz
4154	6235	8302	12370	16551	18848	22182	25123
4158	6239	8306	12374	16555	18852	22186	25127
4162	6243	8310	12378	16559	18856	22190	25131
4166	6247	8314	12382	16563	18860	22194	25135
4170	6251	8318	12386	16567	18864	22198	25139
	6255	8322	12390	16571	18868	22202	25143
	6259	8326	12394	16575		22206	25147
		8330	12398	16579		22210	25151
		8334	12402	16583		22214	25155
		8338	12406	16587		22218	25159
			12410	16591		22222	
			12414	16595		22226	
			12418	16599		22230	
				16603		22234	
				16607		22238	
				16611			
				16615			

Emission: Wide-band telegraphy, facsimile and special transmission systems.

Power: ≤ 1.5 kW (As set forth in Section 8.2.29, this power reflects current practice and is not intended to serve as a power limit.)

Class of Station: MS

TABLE 4: Oceanographic Data Transmission

Assignable Frequencies:

4 MHz	6 MHz	8 MHz	12 MHz	16 MHz	22 MHz
4063.3	6261.3	8340.3	12420.3	16617.3	22240.3
4063.6	6261.6	8340.6	12420.6	16617.6	22240.6
4063.9	6261.9	8340.9	12420.9	16617.9	22240.9
4064.2	6262.2	8341.2	12421.2	16618.2	22241.2
4064.5	6262.5	8341.5	12421.5	16618.5	22241.5
4064.8					

Emission: ≤ 300HF1D or 300HJ2D

Power: ≤ 100 watts (OD only)

Class of Station: OD and OE

See Section 8.2.29 of this Manual for rules governing the assignment of frequencies in the oceanographic data bands.

TABLE 5: Ship and Coast (Paired) NBDP Telegraph and Data Transmission Systems

(ITU RR Appendix 17, Part B, Section II)

Assignable Frequencies:

Channel	4 MHz		6 MHz		8 MHz	
	Coast	Ship	Coast	Ship	Coast	Ship
1	4210.5	4172.5	6314.5	6263	8376.5	8376.5
2	4211	4173	6315	6263.5	8417	8377
3	4211.5	4173.5	6315.5	6264	8417.5	8377.5
4	4212	4174	6316	6264.5	8418	8378
5	4212.5	4174.5	6316.5	6265	8418.5	8378.5
6	4213	4175	6317	6265.5	8419	8379
7	4213.5	4175.5	6317.5	6266	8419.5	8379.5

8	4214	4176	6318	6266.5	8420	8380
9	4214.5	4176.5	6318.5	6267	8420.5	8380.5
10	4215	4177	6319	6267.5	8421	8381
11	4177.5	4177.5	6268	6268	8421.5	8381.5
12	4215.5	4178	6319.5	6268.5	8422	8382
13	4216	4178.5	6320	6269	8422.5	8382.5
14	4216.5	4179	6320.5	6269.5	8423	8383
15	4217	4179.5	6321	6270	8423.5	8383.5
16	4217.5	4180	6321.5	6270.5	8424	8384
17	4218	4180.5	6322	6271	8424.5	8384.5
18	4218.5	4181	6322.5	6271.5	8425	8385
19	4219	4181.5	6323	6272	8425.5	8385.5
20			6323.5	6272.5	8426	8386
21			6324	6273	8426.5	8386.5
22			6324.5	6273.5	8427	8387
23			6325	6274	8427.5	8387.5
24			6325.5	6274.5	8428	8388
25			6326	6275	8428.5	8388.5
26			6326.5	6275.5	8429	8389
27			6327	6281	8429.5	8389.5
28			6327.5	6281.5	8430	8390
29			6328	6282	8430.5	8390.5
30			6328.5	6282.5	8431	8391
31			6329	6283	8431.5	8391.5
32			6329.5	6283.5	8432	8392
33			6330	6284	8432.5	8392.5
34			6330.5	6284.5	8433	8393
35					8433.5	8393.5
36					8434	8394
37					8434.5	8394.5
38					8435	8395
39					8435.5	8395.5
40					8436	8396

Channel	12 MHz	
	Coast	Ship
1	12579.5	12477
2	12580	12477.5
3	12580.5	12478
4	12581	12478.5
5	12581.5	12479
6	12582	12479.5
7	12582.5	12480
8	12583	12480.5
9	12583.5	12481
10	12584	12481.5
11	12584.5	12482
12	12585	12482.5
13	12585.5	12483
14	12586	12483.5
15	12586.5	12484
16	12587	12484.5
17	12587.5	12485
18	12588	12485.5
19	12588.5	12486
20	12589	12486.5
21	12589.5	12487
22	12590	12487.5
23	12590.5	12488
24	12591	12488.5
25	12591.5	12489
26	12592	12489.5
27	12592.5	12490
28	12593	12490.5
29	12593.5	12491
30	12594	12491.5
31	12594.5	12492
32	12595	12492.5
33	12595.5	12493
34	12596	12493.5
35	12596.5	12494
36	12597	12494.5
37	12597.5	12495
38	12598	12495.5
39	12598.5	12496
40	12599	12496.5
41	12599.5	12497
42	12600	12497.5
43	12600.5	12498
44	12601	12498.5
45	12601.5	12499
46	12602	12499.5
47	12602.5	12500
48	12603	12500.5
49	12603.5	12501
50	12604	12501.5
51	12604.5	12502
52	12605	12502.5
53	12605.5	12503
54	12606	12503.5
55	12606.5	12504
56	12607	12504.5
57	12607.5	12505
58	12608	12505.5
59	12608.5	12506
60	12609	12506.5
61	12609.5	12507
62	12610	12507.5
63	12610.5	12508
64	12611	12508.5
65	12611.5	12509
66	12612	12509.5
67	12612.5	12510
68	12613	12510.5
69	12613.5	12511
70	12614	12511.5
71	12614.5	12512
72	12615	12512.5
73	12615.5	12513
74	12616	12513.5
75	12616.5	12514
76	12617	12514.5
77	12617.5	12515
78	12618	12515.5
79	12618.5	12516
80	12619	12516.5
81	12619.5	12517
82	12620	12517.5
83	12620.5	12518
84	12621	12518.5
85	12621.5	12519
86	12622	12519.5
87	12520	12520
88	12622.5	12520.5
89	12623	12521
90	12623.5	12521.5
91	12624	12522
92	12624.5	12522.5
93	12625	12523
94	12625.5	12523.5
95	12626	12524
96	12626.5	12524.5
97	12627	12525
98	12627.5	12525.5
99	12628	12526
100	12628.5	12526.5
101	12629	12527
102	12629.5	12527.5
103	12630	12528
104	12630.5	12528.5
105	12631	12529
106	12631.5	12529.5
107	12632	12530
108	12632.5	12530.5
109	12633	12531
110	12633.5	12531.5
111	12634	12532
112	12634.5	12532.5
113	12635	12533
114	12635.5	12533.5
115	12636	12534
116	12636.5	12534.5
117	12637	12535
118	12637.5	12535.5
119	12638	12536
120	12638.5	12536.5
121	12639	12537
122	12639.5	12537.5
123	12640	12538
124	12640.5	12538.5
125	12641	12539
126	12641.5	12539.5
127	12642	12540
128	12642.5	12540.5
129	12643	12541
130	12643.5	12541.5
131	12644	12542
132	12644.5	12542.5
133	12645	12543
134	12645.5	12543.5
135	12646	12544
136	12646.5	12544.5
137	12647	12545
138	12647.5	12545.5
139	12648	12546
140	12648.5	12546.5
141	12649	12547
142	12649.5	12547.5
143	12650	12548
144	12650.5	12548.5
145	12651	12549
146	12651.5	12549.5
147	12652	12555
148	12652.5	12555.5
149	12653	12556
150	12653.5	12556.5
151	12654	12557
152	12654.5	12557.5
153	12655	12558
154	12655.5	12558.5
155	12656	12559
156	12656.5	12559.5

Channel	16 MHz	
	Coast	**Ship**
1	16807	16683.5
2	16807.5	16684
3	16808	16684.5
4	16808.5	16685
5	16809	16685.5
6	16809.5	16686
7	16810	16686.5
8	16810.5	16687
9	16811	16687.5
10	16811.5	16688
11	16812	16688.5
12	16812.5	16689
13	16813	16689.5
14	16813.5	16690
15	16814	16690.5
16	16814.5	16691
17	16815	16691.5
18	16815.5	16692
19	16816	16692.5
20	16816.5	16693
21	16817	16693.5
22	16817.5	16694
23	16818	16694.5
24	16695	16695
25	16818.5	16695.5
26	16819	16696
27	16819.5	16696.5
28	16820	16697
29	16820.5	16697.5
30	16821	16698
31	16821.5	16698.5
32	16822	16699
33	16822.5	16699.5
34	16823	16670
35	16823.5	16700.5
36	16824	16701
37	16824.5	16701.5
38	16825	16702
39	16825.5	16702.5
40	16826	16703
41	16826.5	16703.5
42	16827	16704
43	16827.5	16704.5
44	16828	16705
45	16828.5	16705.5
46	16829	16706
47	16829.5	16706.5
48	16830	16707
49	16830.5	16707.5
50	16831	16708
51	16831.5	16708.5
52	16832	16709
53	16832.5	16709.5
54	16833	16710
55	16833.5	16710.5
56	16834	16711
57	16834.5	16711.5
58	16835	16712
59	16835.5	16712.5
60	16836	16713
61	16836.5	16713.5
62	16837	16714
63	16837.5	16714.5
64	16838	16715
65	16838.5	16715.5
66	16839	16716
67	16839.5	16716.5
68	16840	16717
69	16840.5	16717.5
70	16841	16718
71	16841.5	16718.5
72	16842	16719
73	16842.5	16719.5
74	16843	16720
75	16843.5	16720.5
76	16844	16721
77	16844.5	16721.5
78	16845	16722
79	16845.5	16722.5
80	16846	16723
81	16846.4	16723.5
82	16847	16724
83	16847.5	16724.5
84	16848	16725
85	16848.5	16725.5
86	16849	16726
87	16849.5	16726.5
88	16850	16727
89	16850.5	16727.5
90	16851	16728
91	16851.5	16728.5
92	16852	16729
93	16852.5	16729.5
94	16853	16730
95	16853.5	16730.5
96	16854	16731
97	16854.5	16731.5
98	16855	16732
99	16855.5	16732.5
100	16856	16733
101	16856.5	16733.5
102	16857	16739
103	16857.5	16739.5
104	16858	16740
105	16858.5	16740.5
106	16859	16741
107	16859.5	16741.5
108	16860	16742
109	16860.5	16742.5
110	16861	16743
111	16861.5	16743.5
112	16862	16744
113	16862.5	16744.5
114	16863	16745
115	16863.5	16745.5
116	16864	16746
117	16864.5	16746.5
118	16865	16747
119	16865.5	16747.5
120	16866	16748
121	16866.5	16748.5
122	16867	16749
123	16867.5	16749.5
124	16868	16750
125	16868.5	16750.5
126	16869	16751
127	16869.5	16751.5
128	16870	16752
129	16870.5	16752.5
130	16871	16753
131	16871.5	16753.5
132	16872	16754
133	16872.5	16754.5
134	16873	16755
135	16873.5	16755.5
136	16874	16756
137	16874.5	16756.5
138	16875	16757
139	16875.5	16757.5
140	16876	16758
141	16876.5	16758.5
142	16877	16759
143	16877.5	16759.5
144	16878	16760
145	16878.5	16760.5
146	16879	16761
147	16879.5	16761.5
148	16880	16762
149	16880.5	16762.5
150	16881	16763
151	16881.5	16763.5
152	16882	16764
153	16882.5	16764.4
154	16883	16765
155	16883.5	16765.5
156	16884	16766
157	16884.5	16766.5
158	16885	16767
159	16885.5	16767.5
160	16886	16768
161	16886.5	16768.5

162	16887	16769
163	16887.5	16769.5
164	16888	16770
165	16888.5	16770.5
166	16889	16771
167	16889.5	16771.5
168	16890	16772
169	16890.5	16772.5
170	16891	16773
171	16891.5	16773.5
172	16892	16774
173	16892.5	16774.5
174	16893	16775
175	16893.5	16775.5
176	16894	16776
177	16894.5	16776.5
178	16895	16777
179	16895.5	16777.5
180	16896	16778
181	16896.5	16778.5
182	16897	16779
183	16897.5	16779.5
184	16898	16780
185	16898.5	16780.5
186	16899	16781
187	16899.5	16781.5
188	16900	16782
189	16900.5	16782.5
190	16901	16783
191	16901.5	16783.5
192	16902	16784
193	16902.5	16784.5

Channel	18-19 MHz	
	Coast	Ship
1	19681	18870.5
2	19681.5	18871
3	19682	18871.5
4	19682.5	18872
5	19683	18872.5
6	19683.5	18873
7	19684	18873.5
8	19684.5	18874
9	19685	18874.5
10	19685.5	18875
11	19686	18875.5
12	19686.5	18876
13	19687	18876.5
14	19687.5	18877
15	19688	18877.5
16	19688.5	18878
17	19689	18878.5
18	19689.5	18879
19	19690	18879.5
20	19690.5	18880
21	19691	18880.5
22	19691.5	18881
23	19692	18881.5
24	19692.5	18882
25	19693	18882.5
26	19693.5	18883
27	19694	18883.5
28	19694.5	18884
29	19695	18884.5
30	19695.5	18885
31	19696	18885.5
32	19696.5	18886
33	19697	18886.5
34	19697.5	18887
35	19698	18887.5
36	19698.5	18888
37	19699	18888.5
38	19699.5	18889
39	19700	18889.5
40	19700.5	18890
41	19701	18890.5
42	19701.5	18891
43	19702	18891.5
44	19702.5	18892
45	19703	18892.5

Channel	22 MHz	
	Coast	Ship
1	22376.5	22284.5
2	22377	22285
3	22377.5	22285.5
4	22378	22286
5	22378.5	22286.5
6	22379	22287
7	22379.5	22287.5
8	22380	22288
9	22380.5	22288.5
10	22381	22289
11	22381.5	22289.5
12	22382	22290
13	22382.5	22290.5
14	22383	22291
15	22383.5	22291.5
16	22384	22292
17	22384.5	22292.5
18	22385	22293
19	22385.5	22293.5
20	22386	22294
21	22386.5	22294.5
22	22387	22295
23	22387.5	22295.5
24	22388	22296
25	22388.5	22296.5
26	22389	22297
27	22389.5	22297.5
28	22390	22298
29	22390.5	22298.5
30	22391	22299
31	22391.5	22299.5
32	22392	22300
33	22392.5	22300.5
34	22393	22301
35	22393.5	22301.5
36	22394	22302
37	22394.5	22302.5
38	22395	22303
39	22395.5	22303.5
40	22396	22304
41	22396.5	22304.5
42	22397	22305
43	22397.5	22305.5
44	22398	22306
45	22398.5	22306.5
46	22399	22307
47	22399.5	22307.5
48	22400	22308
49	22400.5	22308.5
50	22401	22309
51	22401.5	22309.5
52	22402	22310
53	22402.5	22310.5
54	22403	22311
55	22403.5	22311.5
56	22404	22312
57	22404.5	22312.5
58	22405	22313
59	22405.5	22313.5
60	22406	22314
61	22406.5	22314.5
62	22407	22315
63	22407.5	22315.5
64	22408	22316.5
65	22408.5	22316.5
66	22409	22317
67	22409.5	22317.5
68	22410	22318
69	22410.5	22318.5
70	22411	22319
71	22411.5	22319.5
72	22412	22320
73	22412.5	22320.5
74	22413	22321
75	22413.5	22321.5
76	22414	22322
77	22414.5	22322.5
78	22415	22323

79	22415.5	22323.5
80	22416	22324
81	22416.5	22324.5
82	22417	22325
83	22417.5	22325.5
84	22418	22326
85	22418.5	22326.5
86	22419	22327
87	22419.5	22327.5
88	22420	22328
89	22420.5	22328.5
90	22421	22329
91	22421.5	22329.5
92	22422	22330
93	22422.5	22330.5
94	22423	22331
95	22423.5	22331.5
96	22424	22332
97	22424.5	22332.5
98	22425	22333
99	22425.5	22333.5
100	22426	22334
101	22426.5	22334.5
102	22427	22335
103	22427.5	22335.5
104	22428	22336
105	22428.5	22336.5
106	22429	22337
107	22429.5	22337.5
108	22430	22338
109	22430.5	22338.5
110	22431	22339
111	22431.5	22339.5
112	22432	22340
113	22432.5	22340.5
114	22433	22341
115	22433.5	22341.5
116	22434	22342
117	22434.5	22342.5
118	22435	22343
119	22435.5	22343.5
120	22436	22344
121	22436.5	22344.5
122	22437	22345
123	22437.5	22345.5
124	22438	22346
125	22438.5	22346.5
126	22439	22347
127	22439.5	22347.5
128	22440	22348
129	22440.5	22348.5
130	22441	22349
131	22441.5	22349.5
132	22442	22350
133	22442.5	22350.5
134	22443	22351
135	22443.5	22351.5

Channel	**25-26 MHz**	
	Coast	**Ship**
1	26101	25173
2	26101.5	25173.5
3	26102	25174
4	26102.5	25174.5
5	26103	25175
6	26103.5	25175.5
7	26104	25176
8	26104.5	25176.5
9	26105	25177
10	26105.5	25177.5
11	26106	25178
12	26106.5	25178.5
13	26107	25179
14	26107.5	25179.5
15	26108	25180
16	26108.5	25180.5
17	26109	25181
18	26109.5	25181.5
19	26110	25182
20	26110.5	25182.5
21	26111	25183
22	26111.5	25183.5
23	26112	25184
24	26112.5	25184.5
25	26113	25185
26	26113.5	25185.5
27	26114	25186
28	26114.5	25186.5
29	26115	25187
30	26115.5	25187.5
31	26116	25188
32	26116.5	25188.5
33	26117	25189
34	26117.5	25189.5
35	26118	25190
36	26118.5	25190.5
37	26119	25191
38	26119.5	25191.5
39	26120	25192
40	26120.5	25192.5

Emission: F1B with bandwidth ≤ 300 Hz (total frequency shift of 170 Hz) NBDP and data transmission at speeds not exceeding 100 bauds for FSK and 200 bauds for PSK.

Maximum Mean Power:

FC -	4 MHz	5 kW
	6 MHz	5 kW
	8 MHz	10 kW
	10 MHz	15 kW
	12 MHz	15 kW
	16 MHz	15 kW
	18 MHz	15 kW
	22 MHz	15 kW
	25 MHz	15 kW

MS - ≤ 1.5 kW (As set forth in Section 8.2.29, this power reflects current practice and is not intended to serve as a power limit.)

Class of Station: FC, MS

<u>In all bands</u>:

Coast and ship frequencies must be paired on the same channels.

<u>In the 4 and 6 MHz bands</u>:

Channel 11 is used for distress and safety traffic. (See ITU RR Appendix **15**.)

<u>In the 4 MHz band</u>:

Channels 16 and 17 are planned for exclusive non-Federal use.
With the exception of channel 11, ship stations may also transmit A1A and A1B Morse telegraphy (working).

<u>In the 6 MHz band</u>:

Channels 25 through 29 are planned for exclusive non-Federal use.
Ship stations may also transmit A1A and A1B Morse telegraphy (working) on channels 30 through 34.

<u>In the 8 MHz band</u>:

Channel 1 is used for distress and safety traffic. (See ITU RR Appendix **15**.)

Channels 29 through 34 are planned for exclusive non-Federal use.
Ship stations may also transmit A1A and A1B Morse telegraphy (working) on channels 35 through 40.

In the 12 MHz band:

Channels 58 through 107 are planned for exclusive non-Federal use.
Channel 87 is used for distress and safety traffic. (See ITU RR Appendix **15**.)
Ship stations may also transmit A1A and A1B Morse telegraphy (working) on channels 108 through 156.

In the 16 MHz band:

Channel 24 is used for distress and safety traffic. (See ITU RR Appendix **15**.)
Channels 71 through 132 are planned for exclusive non-Federal use.
Ship stations may also transmit A1A and A1B Morse telegraphy (working) on channels 133 and through 193.

In the 18-19 MHz bands:

Channels 1 through 22 are planned for exclusive non-Federal use.
In the 22 MHz band:
Channels 68 through 101 are planned for exclusive non-Federal use. Ship stations may also transmit A1A and A1B Morse telegraphy (working) on channels 102 through 135.

In the 25-26 MHz bands:

Channels 1 through 20 are planned for exclusive non-Federal use.

TABLE 6: Ship (Non-paired) Narrowband Direct-Printing Telegraph and Data Transmission Systems

(ITU RR Appendix 17, Part B, Section III)

Assignable Frequencies:

Channel	4 MHz	6 MHz	8 MHz	12 MHz	16 MHz	18 MHz	22 MHz	25 MHz
1	4202.5	6300.5	8396.5	12560	16785	18893	22352	25193
2	4203	6301	8397	12560.5	16785.5	18893.5	22352.5	25193.5
3	4203.5	6301.5	8397.5	12561	16786	18894	22353	25194
4	4204	6302	8398	12561.5	16786.5	18894.5	22353.5	25194.5
5	4204.5	6302.5	8398.5	12562	16787	18895	22354	25195
6	4205	6303	8399	12562.5	16787.5	18895.5	22354.5	25195.5
7	4205.5	6303.5	8399.5	12563	16788	18896	22355	25196
8	4206	6304	8400	12563.5	16788.5	18896.5	22355.5	25196.5
9	4206.5	6304.5	8400.5	12564	16789	18897	22356	25197
10	4207	6305	8401	12564.5	16789.5	18897.5	22356.5	25197.5
11		6305.5	8401.5	12565	16790	18898	22357	25198
12		6306	8402	12565.5	16790.5		22357.5	25198.5
13		6306.5	8402.5	12566	16791		22358	25199
14		6307	8403	12566.5	16791.5		22358.5	25199.5
15		6307.5	8403.5	12567	16792		22359	25200
16		6308	8404	12567.5	16792.5		22359.5	25200.5
17		6308.5	8404.5	12568	16793		22360	25201
18		6309	8405	12568.5	16793.5		22360.5	25201.5
19		6309.5	8405.5	12569	16794		22361	25202

20		6310	8406	12569.5	16794.5		22361.5	25202.5
21		6310.5	8406.5	12570	16795		22362	25203
22		6311	8407	12570.5	16795.5		22362.5	25203.5
23		6311.5	8407.5	12571	16796		22363	25204
24			8408	12571.5	16796.5		22363.5	25204.5
25			8408.5	12572	16797		22364	25205
26			8409	12572.5	16797.5		22364.5	25205.5
27			8409.5	12573	16798		22365	25206
28			8410	12573.5	16798.6		22365.5	25206.5
29			8410.5	12574	16799		22366	25207
30			8411	12574.5	16799.5		22366.5	25207.5
31			8411.5	12575	16800		22367	25208
32			8412	12575.5	16800.5		22367.5	
33			8412.5	12576	16801		22368	
34			8413	12576.5	16801.5		22368.5	
35			8413.5		16802		22369	
36			8414		16802.5		22369.5	
37					16803		22370	
38					16803.5		22370.5	
39					16804		22371	
40							22371.5	
41							22372	
42							22372.5	
43							22373	
44							22373.5	
45							22374	

Use: These frequencies are also assignable to ship stations for A1A and A1B Morse telegraphy (working).

Emission: F1B with BW ≤ 300 Hz (total frequency shift of 170 Hz or less) NBDP and data transmission systems shall not exceed 100 bauds for FSK and 200 bauds for PSK.

Power: ≤ 1.5 kW (As set forth in Section 8.2.29, this power reflects current practice and is not intended to serve as a power limit.)

Class of Station: MS

TABLE 7: Ship Calling A1 Morse Telegraphy

(ITU RR Appendix 17, Part B, Section IV)

Assignable Frequencies:

4 MHz	6 MHz	8 MHz	12 MHz	16 MHz	22 MHz	25 MHz
4181.8	6275.8	8365.8	12549.8	16733.8	22279.3	25171.3
4181.9	6275.9	8365.9	12549.9	16733.9	22279.4	25171.4
4182.0	6276.0	8366.0	12550.0	16734.0	22279.5	25171.5
4182.1	6276.1	8366.1	12550.1	16734.1	22279.6	25171.6
4182.2	6276.2	8366.2	12550.2	16734.2	22279.7	25171.7
4182.3	6276.3	8366.3	12550.3	16734.3	22279.8	25171.8
4182.4	6276.4	8366.4	12550.4	16734.4	22279.9	25171.9
4182.5	6276.5	8366.5	12550.5	16734.5	22280.0	25172.0
4182.6	6276.6	8366.6	12550.6	16734.6	22280.1	25172.1
4182.7	6276.7	8366.7	12550.7	16734.7	22280.2	25172.2
4182.8	6276.8	8366.8	12550.8	16734.8	22280.3	25172.3
4182.9	6276.9	8366.9	12550.9	16734.9	22280.4	25172.4
4183.0	6277.0	8367.0	12551.0	16735.0	22280.5	25172.5
4183.1	6277.1	8367.1	12551.1	16735.1	22280.6	25172.6
4183.2	6277.2	8367.2	12551.2	16735.2	22280.7	25172.7
4183.3	6277.3	8367.3	12551.3	16735.3	22280.8	
4183.4	6277.4	8367.4	12551.4	16735.4	22280.9	
4183.5	6277.5	8367.5	12551.5	16735.5	22281.0	
4183.6	6277.6	8367.6	12551.6	16735.6	22281.1	
4183.7	6277.7	8367.7	12551.7	16735.7	22281.2	
4183.8	6277.8	8367.8	12551.8	16735.8	22281.3	
4183.9	6277.9	8367.9	12551.9	16735.9	22281.4	
4184.0	6278.0	8368.0	12552.0	16736.0	22281.5	
4184.1	6278.1	8368.1	12552.1	16736.1	22281.6	
4184.2	6278.2	8368.2	12552.2	16736.2	22281.7	
4184.3	6278.3	8368.3	12552.3	16736.3	22281.8	
4184.4	6278.4	8368.4	12552.4	16736.4	22281.9	
4184.5	6278.5	8368.5	12552.5	16736.5	22282.0	
4184.6	6278.6	8368.6	12552.6	16736.6	22282.1	
4184.7	6278.7	8368.7	12552.7	16736.7	22282.2	
4184.8	6278.8	8368.8	12552.8	16736.8	22282.3	
4184.9	6278.9	8368.9	12552.9	16736.9	22282.4	
4185.0	6279.0	8369.0	12553.0	16737.0	22282.5	
4185.1	6279.1	8369.1	12553.1	16737.1	22282.6	
4185.2	6279.2	8369.2	12553.2	16737.2	22282.7	
4185.3	6279.3	8369.3	12553.3	16737.3	22282.8	
4185.4	6279.4	8369.4	12553.4	16737.4	22282.9	
4185.5	6279.5	8369.5	12553.5	16737.5	22283.0	
4185.6	6279.6	8369.6	12553.6	16737.6	22283.1	
4185.7	6279.7	8369.7	12553.7	16737.7	22283.2	
4185.8	6279.8	8369.8	12553.8	16737.8	22283.3	
4185.9	6279.9	8369.9	12553.9	16737.9	22283.4	
4186.0	6280.0	8370.0	12554.0	16738.0	22283.5	
4186.1	6280.1	8370.1	12554.1	16738.1	22283.6	

4186.2	6280.2	8370.2	12554.2	16738.2	22283.7	
4186.3	6280.3	8370.3	12554.3	16738.3	22283.8	
4186.4	6280.4	8370.4	12554.4	16738.4	22283.9	
4186.5	6280.5	8370.5	12554.5	16738.5	22284.0	
4186.6	6280.6	8370.6	12554.6	16738.6	22284.1	
4186.7	6280.7	8370.7	12554.7	16738.7	22284.2	

Frequencies ending in .0 or .5 are the center frequency of each channel listed in ITU RR Appendix **17** and should be assigned only to ship stations solely equipped with crystal controlled transmitters using harmonically related oscillators. Only the common channels in the 4, 6, 8, 12, and 16 MHz band are harmonically related. As far as possible, assignments on the two frequencies at +/- 100 Hz from the harmonically related common channel should be avoided.

Power: ≤ 1.5 kW (As set forth in Section 8.2.29, this power reflects current practice and is not intended to serve as a power limit.)

Emission: 100HA1A

Class of Station: MS

Usage: See ITU RR Resolution **312**

TABLE 8: Digital Selective Calling

Assignable Frequencies:

Coast Station Frequencies							
4219.5	6331.0	8436.6	12657.0	16903.0	19703.5	22444.0	26121.0
4220.0	6331.5	8437.0	12657.5	16903.5	19704.0	22444.5	26121.5
4220.5	6332.0	8437.5	12658.0	16904.0	19704.5	22445.0	26122.0
Ship Station Frequencies							
4207.5*	6312.0*	8414.5*	12577.0*	16804.5*	18898.5	22374.5	25208.5
4208.0	6312.5	8415.0	12577.5	16805.0	18999.0	22375.0	25209.0
4208.5	6313.0	8415.5	12578.0	16805.5	18999.5	22375.5	25209.5
4209.0	6313.5	8416.0	12578.5	16806.0			

* Used exclusively for distress and safety selective calling. For the use of these frequencies by ship and coast stations for distress and safety purposes, see ITU RR Article **31** and Appendix **15**.

Emission (Ship and Coast Stations): F1B
Ship Station:

Class of Station: MS
Power: 1.5 kW (As set forth in Section 8.2.29, this power reflects current practice and is not intended to serve as a power limit.)

Coast Station:

Class of Station: FC
Maximum Mean Power:

4 MHz	5 kW	16 MHz	15 kW
6 MHz	5 kW	18 MHz	15 kW
8 MHz	10 kW	22 MHz	15 kW
12 MHz	15 kW	25 MHz	15 kW

TABLE 9: Ship Working A1A, Morse Telegraphy

(ITU RR Appendix 17, Part B, Section V)

Assignable Frequencies:

Channel	4 MHz	6 MHz	8 MHz	12 MHz	16 MHz	22 MHz	25 MHz
1	4187	6285	8342	12422	16619	22242	25161.5
2	4187.5	6285.5	8342.5	12422.5	16619.5	22242.5	25162
3	4188	6286	8343	12423	16620	22243	25162.5
4	4188.5	6286.5	8343.5	12423.5	16620.5	22243.5	25163
5	4189	6287	8344	12424	16621	22244	25163.5
6	4189.5	6287.5	8344.5	12424.5	16621.5	22244.5	25164
7	4190	6288	8345	12425	16622	22245	25164.5
8	4190.5	6288.5	8345.5	12425.5	16622.5	22245.5	25165
9	4191	6289	8346	12426	16623	22246	25165.5
10	4191.5	6289.5	8346.5	12426.5	16623.5	22246.5	25166
11	4192	6290	8347	12427	16624	22247	25166.5
12	4192.5	6290.5	8347.5	12427.5	16624.5	22247.5	25167
13	4193	6291	8348	12428	16625	22248	25167.5
14	4193.5	6291.5	8348.5	12428.5	16625.5	22248.5	25168
15	4194	6292	8349	12429	16626	22249	25168.5
16	4194.5	6292.5	8349.5	12429.5	16626.5	22249.5	25169
17	4195	6293	8350	12430	16627	22250	25169.5
18	4195.5	6293.5	8350.5	12430.5	16627.5	22250.5	25170
19	4196	6294	8351	12431	16628	22251	25170.5
20	4196.5	6294.5	8351.5	12431.5	16628.5	22251.5	25171
21	4197	6295	8352	12432	16629	22252	
22	4197.5	6295.5	8352.5	12432.5	16629.5	22252.5	
23	4198	6296	8353	12433	16630	22253	
24	4198.5	6296.5	8353.5	12433.5	16630.5	22253.5	
25	4199	6297	8354	12434	16631	22254	
26	4199.5	6297.5	8354.5	12434.5	16631.5	22254.5	
27	4200	6298	8355	12435	16632	22255	
28	4200.5	6298.5	8355.5	12435.5	16632.5	22255.5	
29	4201	6299	8356	12436	16633	22256	
30	4201.5	6299.5	8356.5	12436.5	16633.5	22256.5	
31	4202	6300	8357	12437	16634	22257	
32			8357.5	12437.5	16634.5	22257.5	
33			8358	12438	16635	22258	
34			8358.5	12438.5	16635.5	22258.5	
35			8359	12439	16636	22259	
36			8359.5	12439.5	16636.5	22259.5	
37			8360	12440	16637	22260	
38			8360.5	12440.5	16637.5	22260.5	

39			8361	12441	16638	22261	
40			8361.5	12441.5	16638.5	22261.5	
41			8362	12442	16639	22262	
42			8362.5	12442.5	16639.5	22262.5	
43			8363	12443	16640	22263	
44			8363.5	12443.5	16640.5	22263.5	
45			8364	12444	16641	22264	
46			8364.5	12444.5	16641.5	22264.5	
47			8365	12445	16642	22265	
48			8365.5	12445.5	16642.5	22265.5	
49			8371	12446	16643	22266	
50			8371.5	12446.5	16643.5	22266.5	
51			8372	12447	16644	22267	
52			8372.5	12447.5	16644.5	22267.5	
53			8373	12448	16645	22268	
54			8373.5	12448.5	16645.5	22268.5	
55			8374	12449	16646	22269	
56			8374.5	12449.5	16646.5	22269.5	
57			8375	12450	16647	22270	
58			8375.5	12450.5	16647.5	22270.5	
59			8376	12451	16648	22271	
60				12451.5	16648.5	22271.5	
61				12452	16649	22272	
62				12452.5	16649.5	22272.5	
63				12453	16650	22273	
64				12453.5	16650.5	22273.5	
65				12454	16651	22274	
66				12454.5	16651.5	22274.5	
67				12455	16652	22275	
68				12455.5	16652.5	22275.5	
69				12456	16653	22276	
70				12456.5	16653.5	22276.5	
71				12457	16654	22277	
72				12457.5	16654.5	22277.5	
73				12458	16655	22278	
74				12458.5	16655.5	22278.5	
75				12459	16656	22279	
76				12459.5	16656.5		
77				12460	16657		
78				12460.5	16657.5		
79				12461	16658		
80				12461.5	16658.5		
81				12462	16659		
82				12462.5	16659.5		
83				12463	16660		
84				12463.5	16660.5		
85				12464	16661		
86				12464.5	16661.5		
87				12465	16662		
88				12465.5	16662.5		
89				12466	16663		
90				12466.5	16663.5		
91				12467	16664		
92				12467.5	16664.5		

93				12468	16665		
94				12468.5	16665.5		
95				12469	16666		
96				12469.5	16666.5		
97				12470	16667		
98				12470.5	16667.5		
99				12471	16668		
100				12471.5	16668.5		
101				12472	16669		
102				12472.5	16669.5		
103				12473	16670		
104				12473.5	16670.5		
105				12474	16671		
106				12474.5	16671.5		
107				12475	16672		
108				12475.5	16672.5		
109				12476	16673		
110					16673.5		
111					16674		
112					16674.5		
113					16675		
114					16675.5		
115					16676		
116					16676.5		
117					16677		
118					16677.5		
119					16678		
120					16678.5		
121					16679		
122					16679.5		
123					16680		
124					16680.5		
125					16681		
126					16681.5		
127					16682		
128					16682.5		
129					16683		

Power: ≤ 1.5 kW (As set forth in Section 8.2.29, this power reflects current practice and is not intended to serve as a power limit.)

Class of Service: MS

Other Assignable Frequencies:

Additionally frequencies interleaved between the assignable frequencies, above, may be assigned in multiples of 100 Hz. Such assignments shall be uniformly distributed.

See Notes to Tables 5 and 6 for information on which NBDP channels may be used for Morse telegraphy.

TABLE 10: Coast Wideband Telegraphy, Facsimile and Special Transmission Systems

Frequency Bands:

4221 - 4351	16904.5 - 17242
6332.5 - 6501	22445.5 - 22696
8438 - 8707	26122.5 - 26145
12658.5 - 13077	

Frequency Plan: None
Emission: Any telegraphy.
Power:

Band	A1A(pX)	F1B(pY)	Multichannel	Other
4 MHz	10	5	2.5kW (mean) per 500 Hz Bandwidth	5
6 MHz	10	5		5
8 MHz	20	10		10
12 MHz	30	15		15
16 MHz	30	15		15
18 MHz	30	15		15
22 MHz	30	15		15
25 MHz	30	15		15

Class of Station: FC

Other: MS stations are authorized to communicate with Coast stations on channels in these bands in accordance with the provisions of ITU RR **4.18**.

TABLE 11: Maritime Safety Information (MSI)

MSI Coast Station Assignable Frequencies (all kHz):

4210.0	16806.5
6314.0	19680.5
8416.5	22376.5
12579.0	26100.5

Frequency Plan: None

Emission:

NBDP and data transmission at speeds not exceeding 100 bauds for FSK and 200 bauds for PSK.

F1B with BW ≤ 300 Hz (total frequency shift of 170 Hz)

Maximum Mean Power:

FC	4 MHz	5 kW
	6 MHz	5 kW
	8 MHz	10 kW
	12 MHz	15 kW
	16 MHz	15 kW
	18 MHz	15 kW
	22 MHz	15 kW
	25 MHz	15 kW

MS - Receive only.

Class of Station: FC

Other: These are the exclusive international frequencies for the transmission of MSI (see ITU RR **33.48**).

(Last Page in Annex H)

ANNEX I

Procedure for Evaluating Frequency Proposals in the 162-174 MHz and 406.1-420 MHz Bands

I.1 Procedure for Evaluating Frequency Proposals in the 162-174 MHz and 406.1-420 MHz Bands

The purpose of this procedure is to evaluate potential interference involving Fixed and/or Mobile stations in the 162-174 MHz and 406.1-420 MHz bands. The propagation portion of the discussion was derived from the Longley-Rice Model (1968). Certain assumptions have been made in the propagation calculations for ease of presentation and use. In all cases, the assumptions used will result in conservative estimates of propagation loss, i.e., the actual interfering signal level should be less than that predicted.

The data used to indicate the rejection off-tuned interfering signals is based upon characteristics of recent model VHF/UHF signal channel FM voice receivers using crystal lattice type IF filters. The curves used are the adjacent channel selectivity and desensitization data taken in accordance with the latest revision of EIA/TIA-603.

STEP 1. *Choose an Interfering Threshold*

Using Figure 1, if necessary to convert from V to dBW, choose an appropriate criteria for acceptable interference. This will depend to a large extent on the RF noise environment in which the receiver operates. Several typical values are indicated on Figure 1. Enter the chosen interference threshold on Table 1.

STEP 2. *Enter Transmitter Power*

Using Figure 2, if necessary, enter the interfering transmitter power in dBW on table 1.

STEP 3. *Enter Antenna Gains*

Enter the antenna gains in dB above a dipole (dBd) of the interfering transmitter and your receiver. If the antennas are not omni directional, an estimate must be made of the respective antenna gains along their common line of direction.

STEP 4. *Determine Propagation Loss*

By the use of Figures 3 thru 9 determine an estimate of the propagation loss between the antennas. The first step is to determine the mean height (i.e., geometric mean) of the two antennas. This is found by use of either the nomogram or equation shown on Figure 3. Next, using the appropriate curves from Figures 4 through 9, the propagation loss is estimated for the given mean antenna height and distance separation. Enter the value on Table 1.

STEP 5. *Enter Additional System Loss*

Enter into Table 1 any additional known system losses at both the transmitter and receiver such as that due to coaxial cables, cavity filters, isolators, etc. If not known, enter zero. The use of zero will further slant the predictions towards conservative results.

STEP 6. *Enter Off Frequency Rejection*

If the interfering transmitter and the receiver are separated in frequency between 0 and 25 kHz, additional losses may be included to account for off frequency rejection. Figure 10 is provided as a guide to determine this value. The four curves show the adjacent channel selectivity and desensitization for: Analog to Digital, Digital to Digital, Digital to Analog, and Analog to Analog systems. Select the appropriate curve for the case being modeled and enter the resulting value in Table 1. Non-synthesized equipment will normally give an additional 5 dB of selectivity for offsets equal to or greater than 25 kHz. If this is the case of the system being modeled, add 5 dB to the value selected from the curve.[1]

STEP 7. *Calculate Predicted Received Signal*

Total the values entered on Table 1 observing plus and minus signs as appropriate. The resultant predicted value of received signal compared with the chosen interference criteria will indicate the likelihood of interference.

TABLE 1	
Transmitter Power	+ dBW
Transmitter Antenna Gain	+ dBd
Receiver Antenna Gain	+ dBd
Propagation Loss	- dB
System Losses	- dB
OFF Frequency Rejection	- dB
A. Predicted Received Power	dBW
B. Chosen Interference Threshold	dBW
If A is greater than B, unacceptable interference may result.	

[1] Data supporting Figure 10 was taken from NTIA TM-87-122 and TM-88-137.

Figure 1. Voltage to Power Conversion

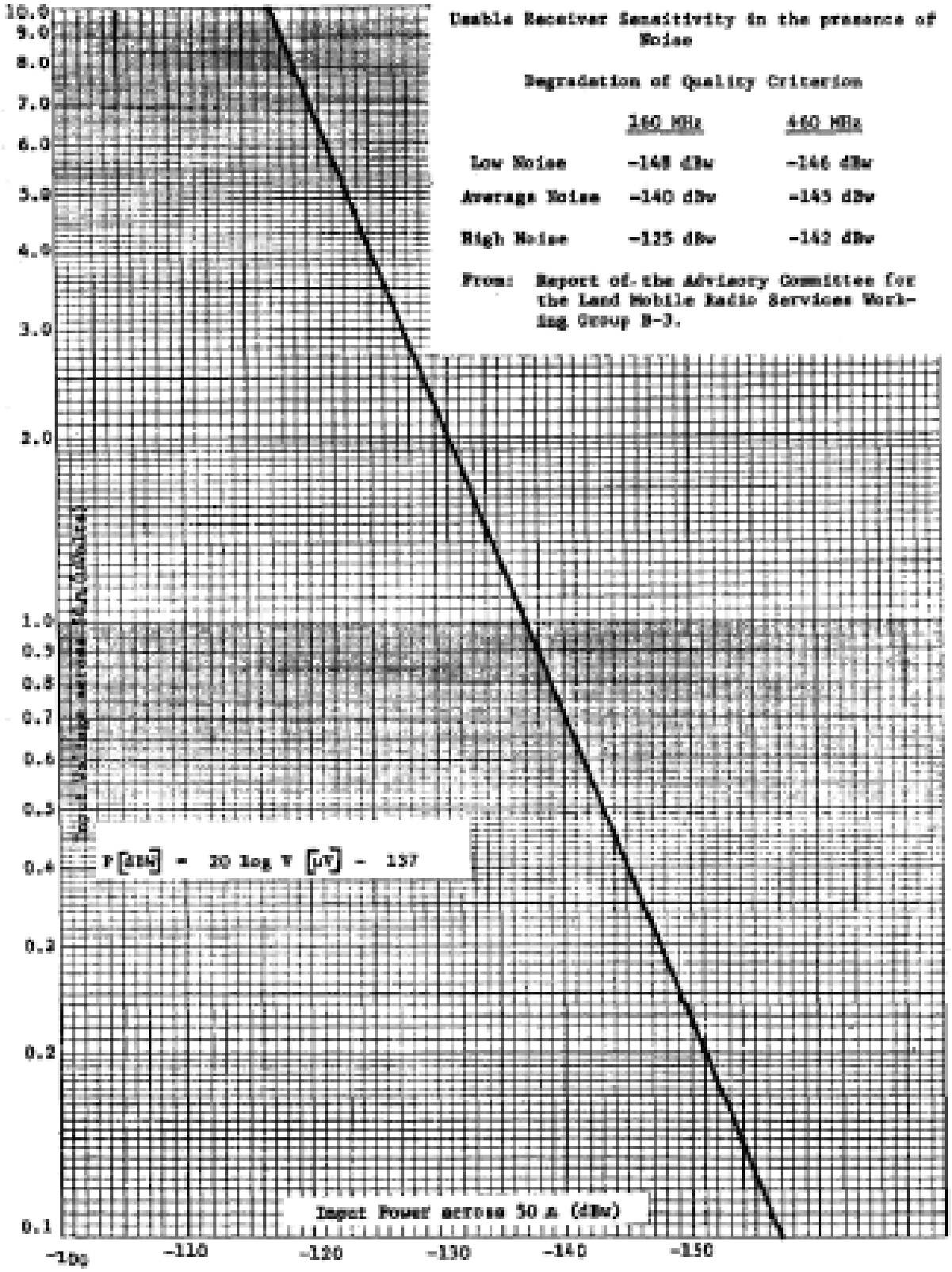


Figure 2. Power to dBw Conversion

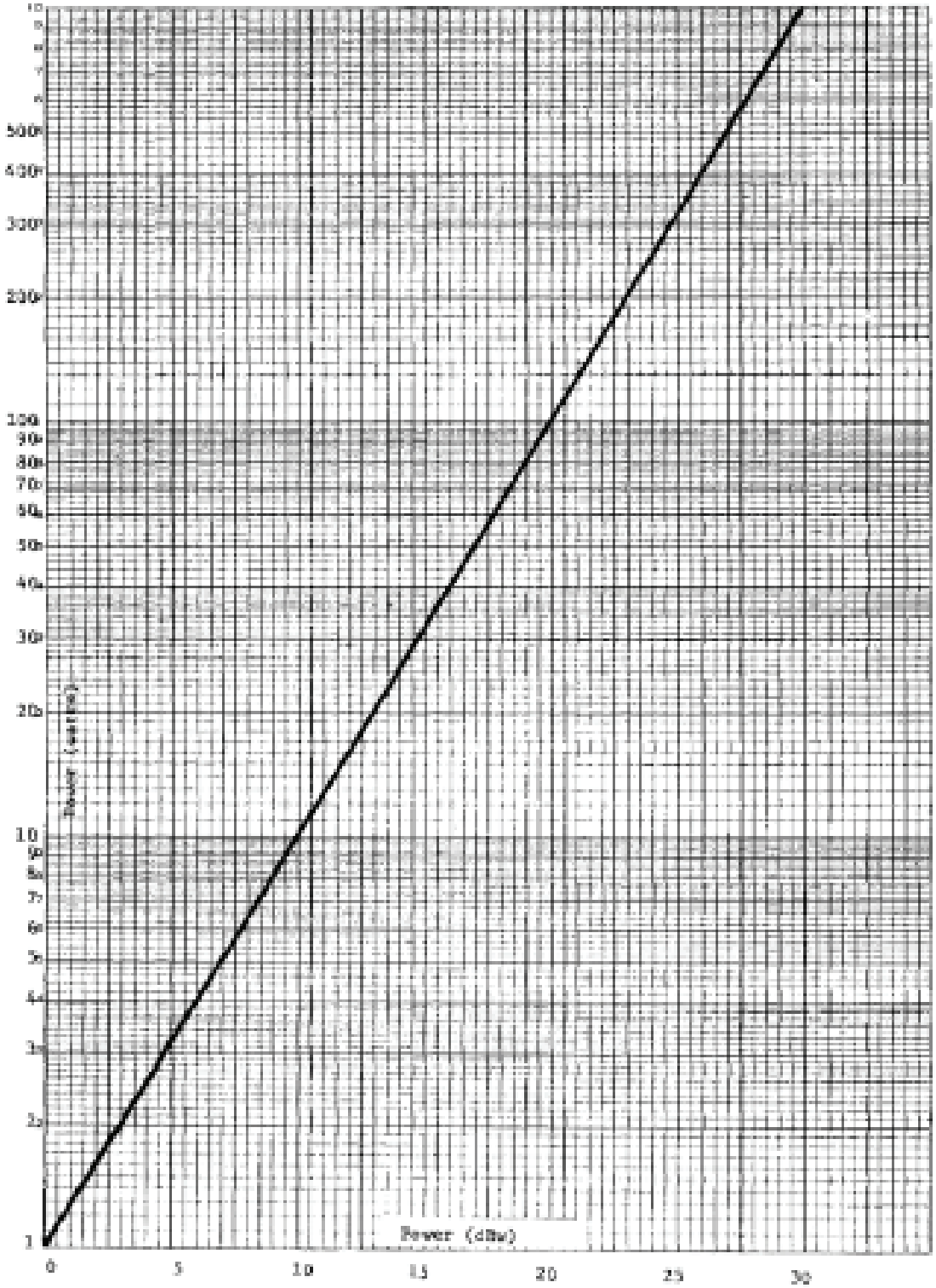


Figure 3. Calculations of Mean Antenna Height

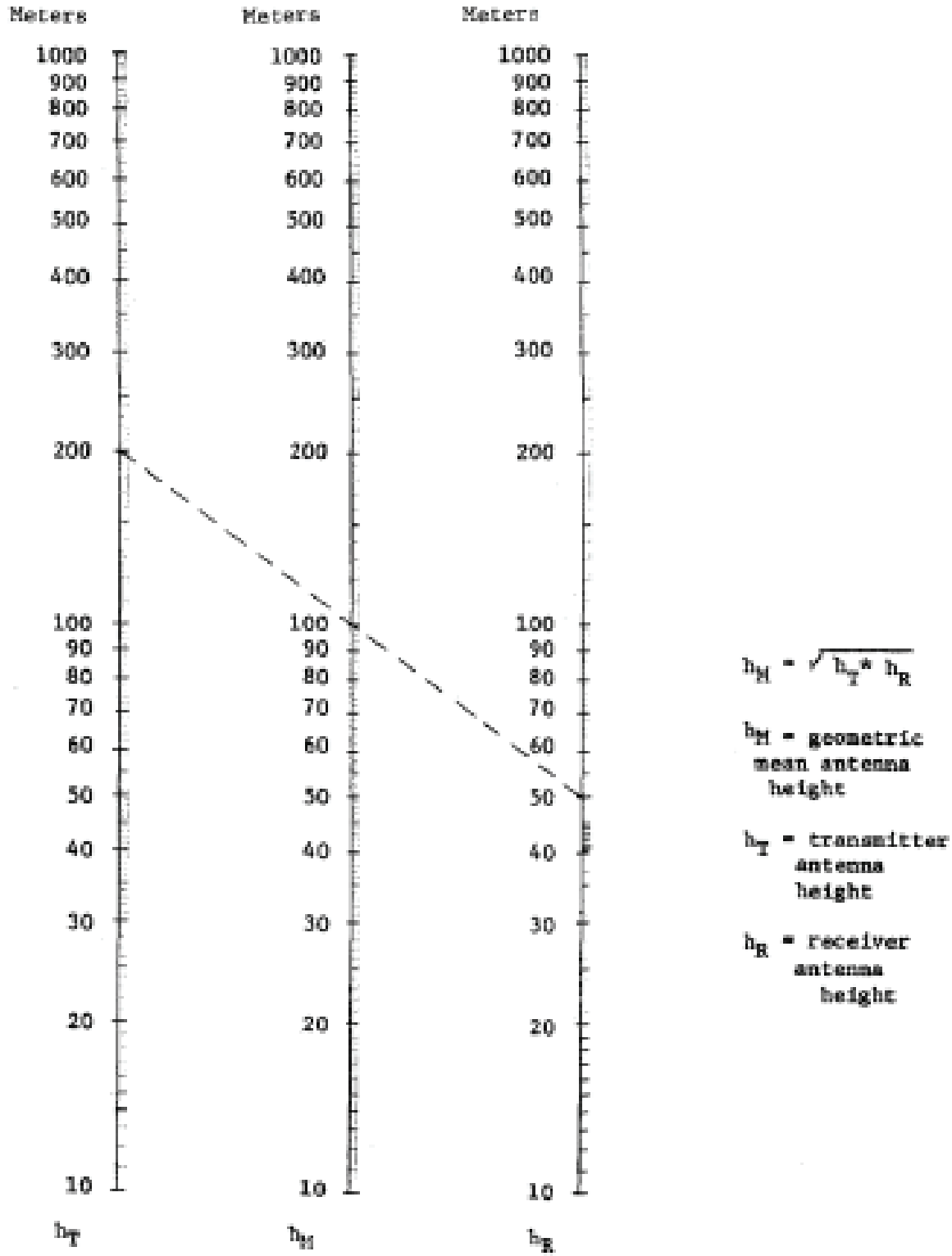


Figure 4. Propagation Loss for 168 MHz, Average Land

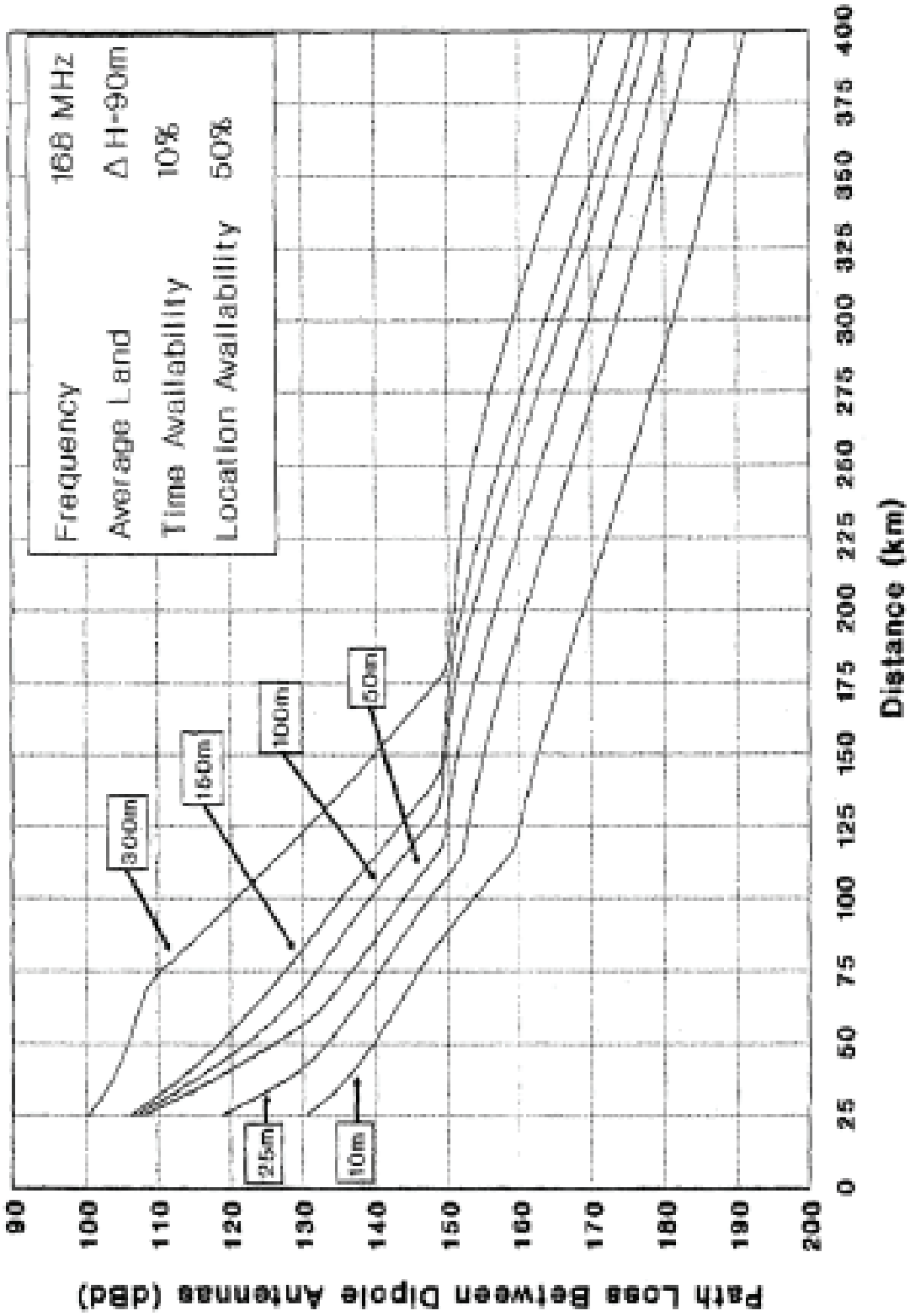


Figure 5. Propagation Loss for 413 MHz, Average Land

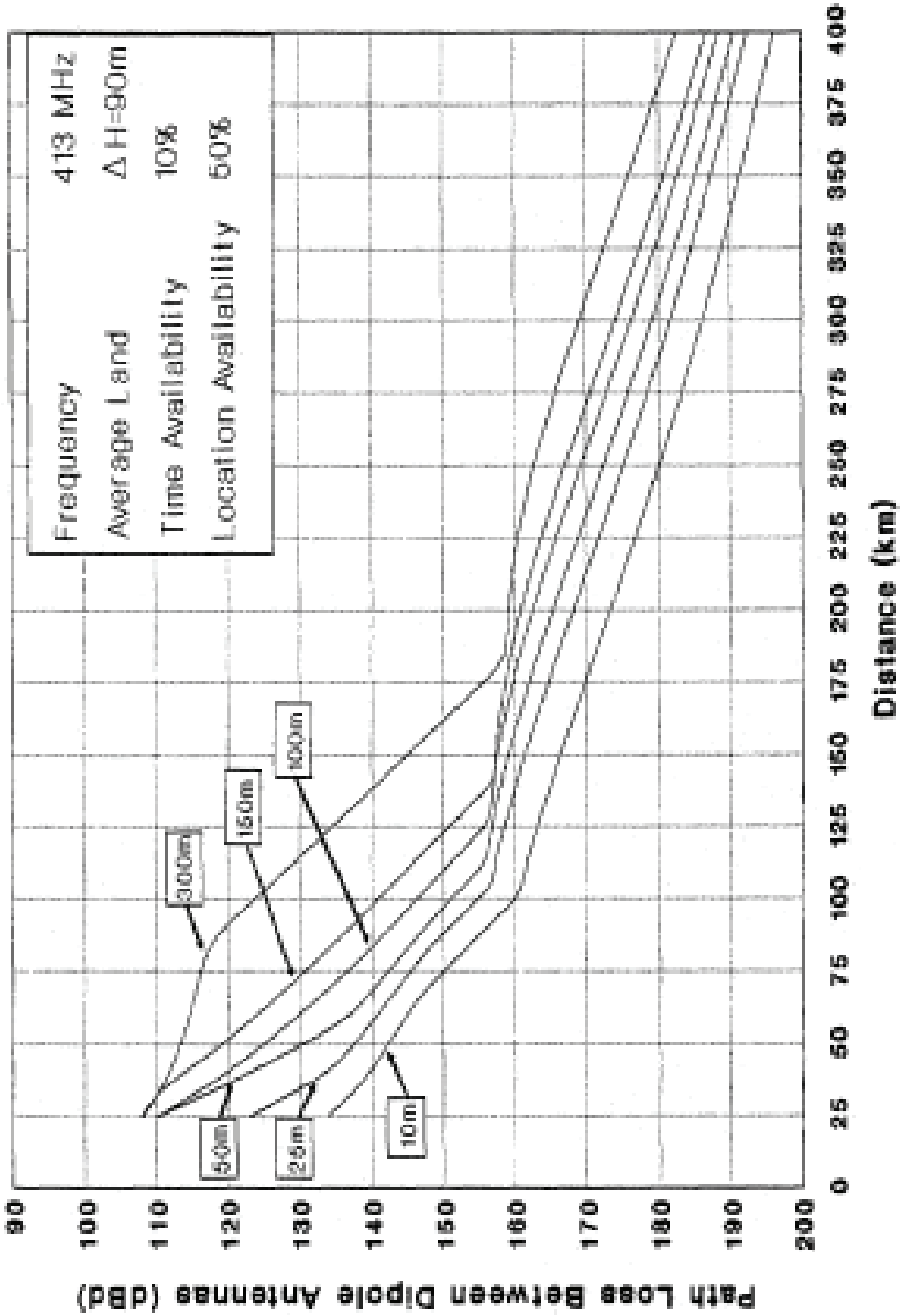


Figure 6. Propagation Loss for 168 MHz, Fresh Water

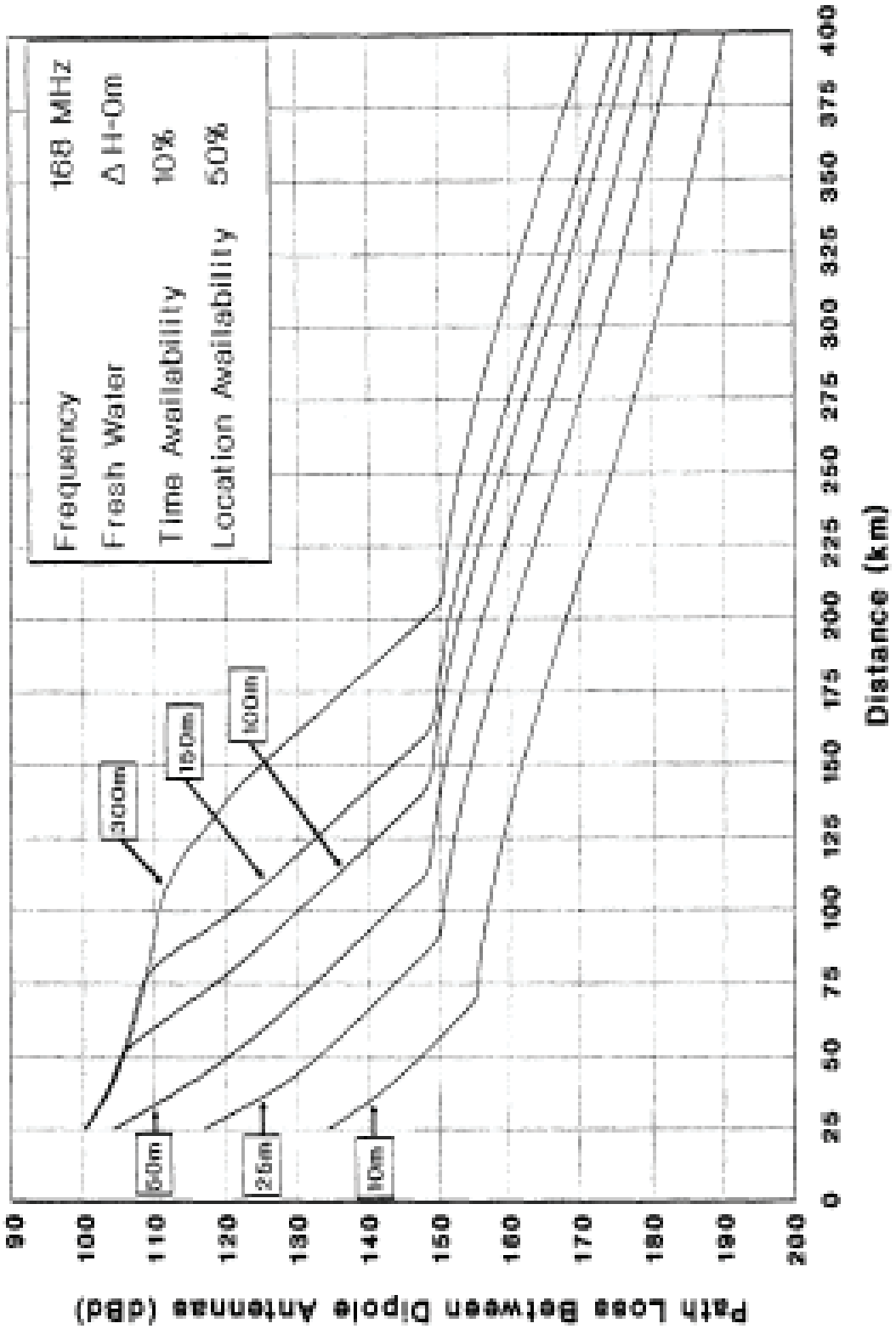


Figure 7. Propagation Loss for 413 MHz, Fresh Water

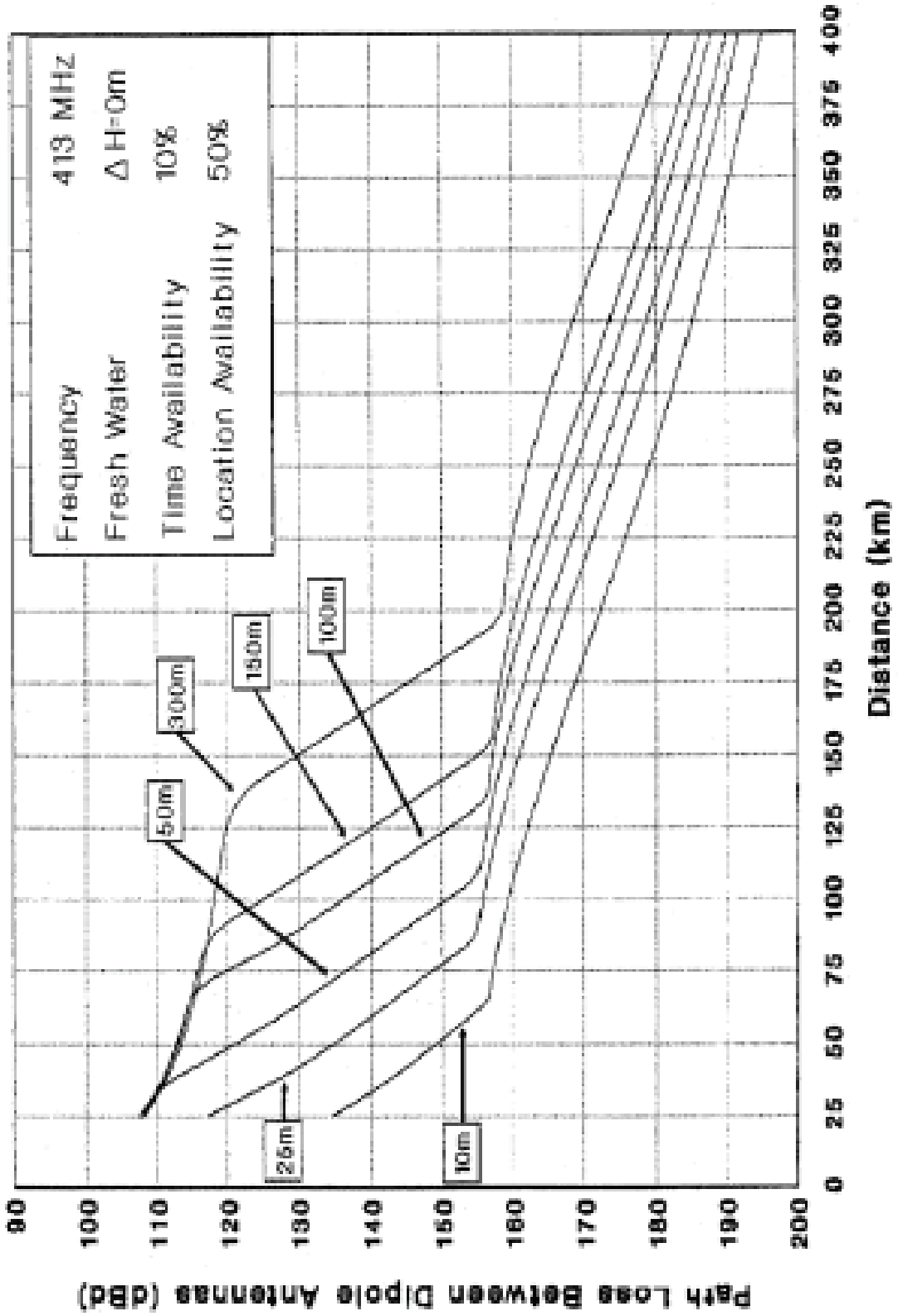


Figure 8. Propagation Loss for 413 MHz, Salt Water

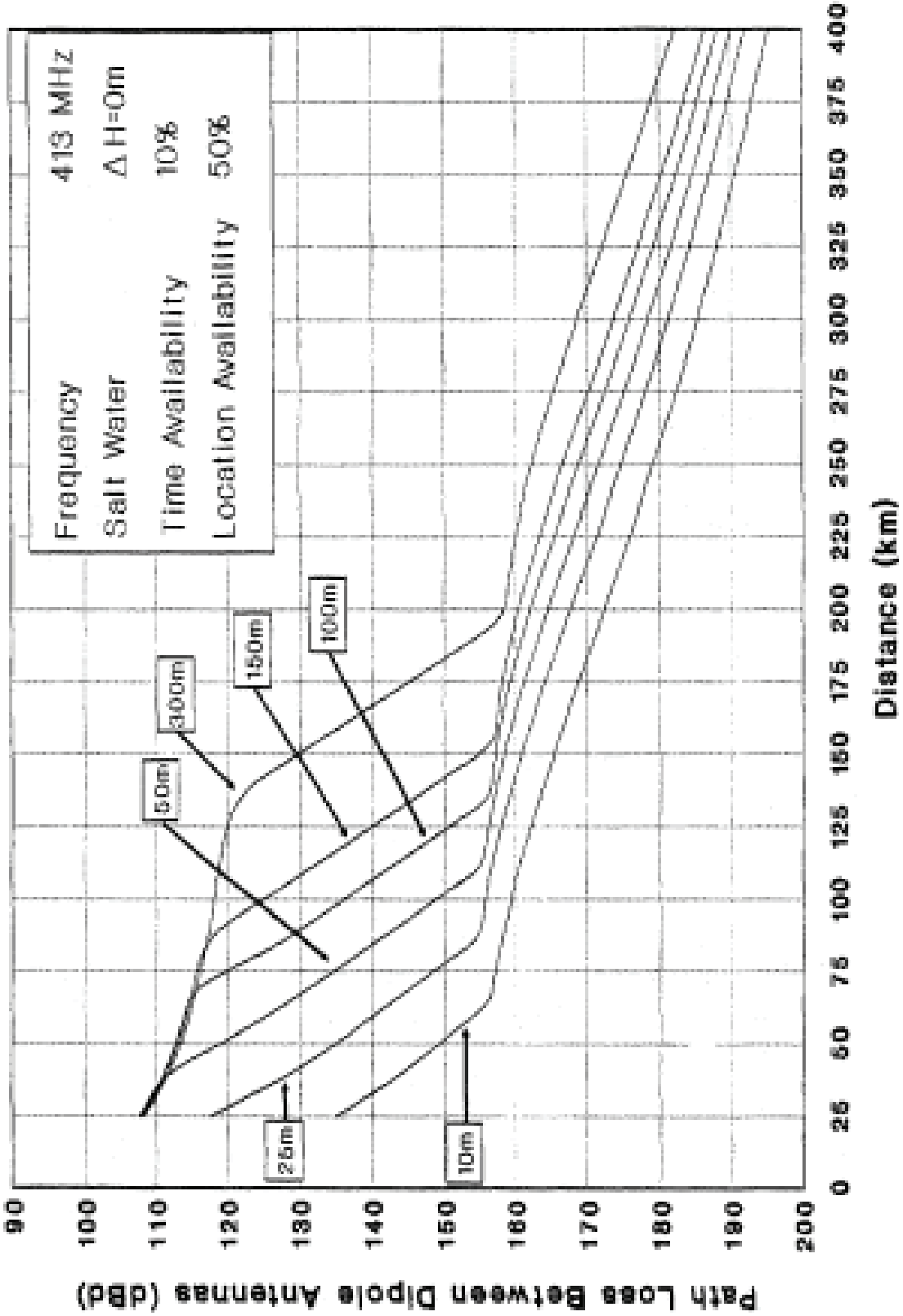


Figure 9. Propagation Loss for 168 MHz, Salt Water

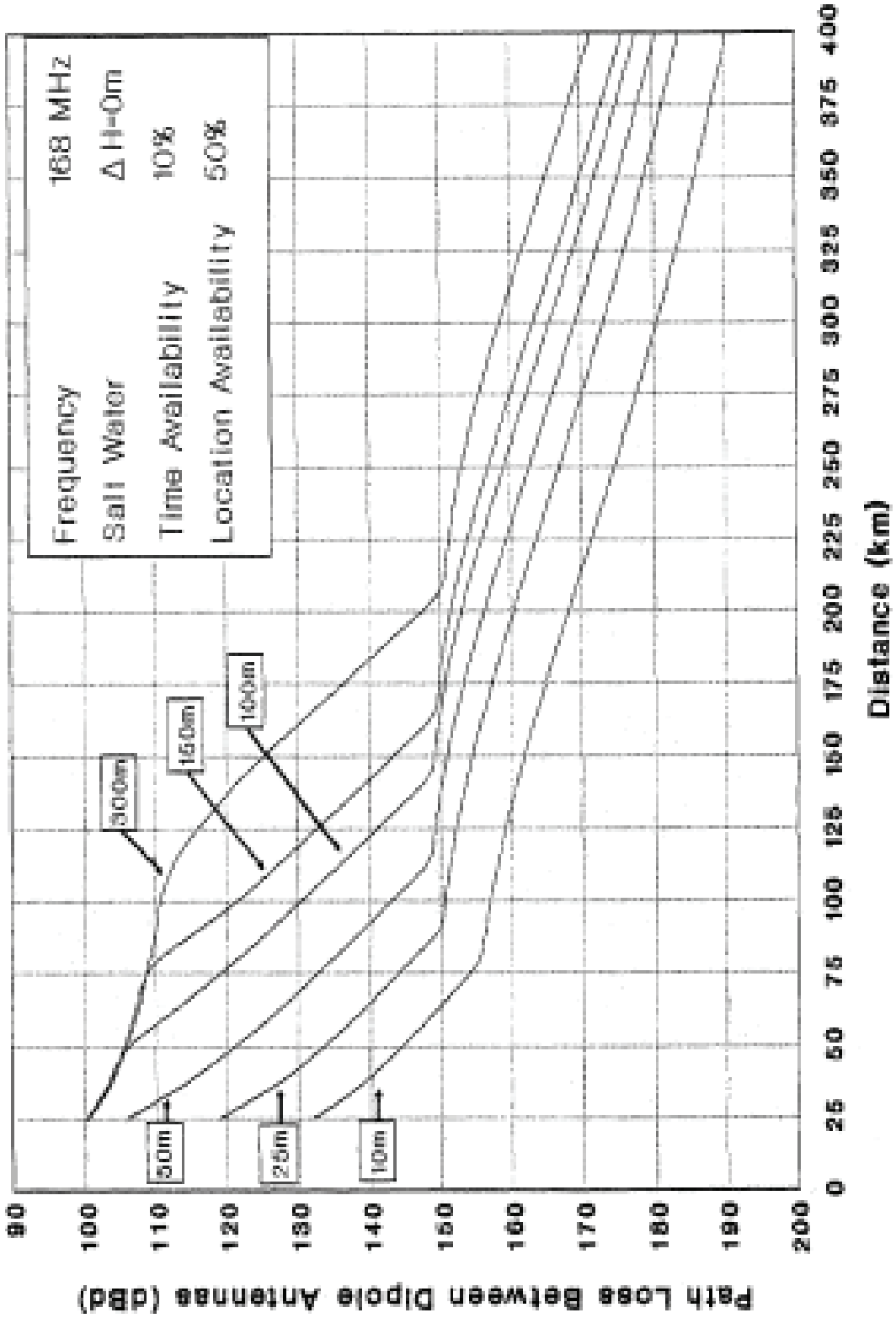
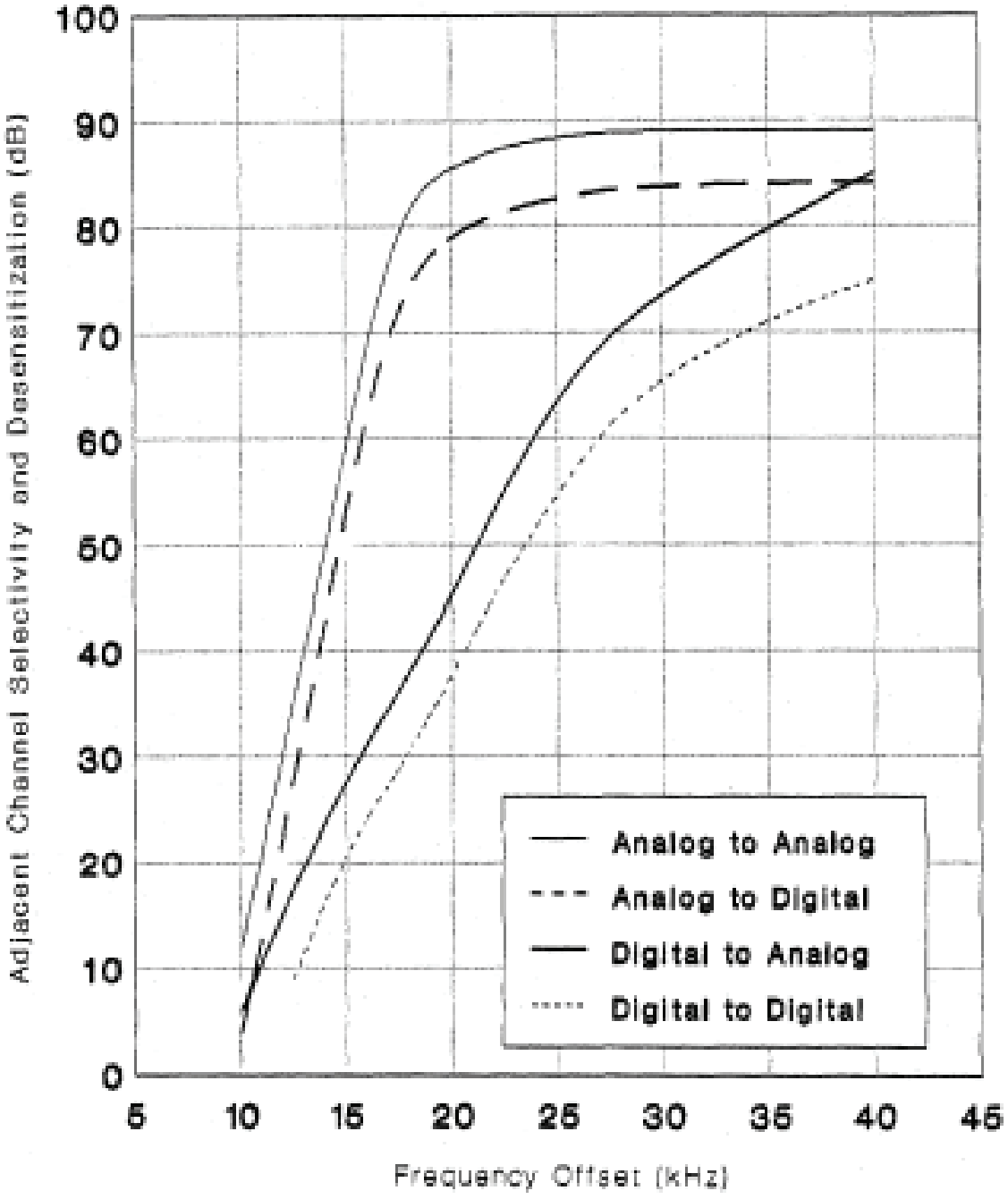


Figure 10. Adjacent Channel Selectivity and Desensitization



APPENDIX

Determination of Propagation Loss

For purposes of this procedure, the prediction of path loss between antennas was based on the methods described by Longley and Rice (1968). That report discusses a computer method for predictions of long-term median radio transmission over irregular terrain. The method is based on well established propagation theory and has been tested and validated against a large number of propagation measurements.

This model is statistical in nature and is most useful over paths where specific coordinates of the endpoints are not known. The program does require knowledge of general atmospheric and terrain parameters. One principal atmospheric parameter is the surface refractivity which largely determines the degree of bending of the radio wave through the atmosphere. A convenient method of accounting for this refracting of the radio wave is by assuming that the earth has an effective radius larger than its actual value. The value used here is an effective earth radius of 4/3 the actual size. A second atmospheric parameter to be specified is the general climate type. A continental temperature climate was assumed.

Three principal terrain dependent factors are used in the model; ground conductivity (σ) , ground dielectric constant (ε) and a terrain roughness factor (Δh). The first two are constants which depends on electrical characteristics of the surface over which the radio waves propagate with the following values assumed:

	(σ)	(ε)
Average ground	0.005 mho/m	15
Fresh Water	0.01 mho/m	81
Salt Water	5.0 mho/m	81

The terrain roughness factor is a parameter to describe the general irregularity of the surface. When surface endpoint locations are known, the (Δh) can be calculated from a terrain profile drawn between the points. Specifically, a straight line is drawn on the profile such that 10% of the points lie above the line. Similarly, a line is drawn with 10% of the points below the line. The (Δh) is the difference in elevations between these lines. When terrain profiles are not available, estimates of (Δh) may be obtained from the following:

Type of Terrain	(Δ) **in Meters**
Water	0-5
Smooth Plains	5-20
Slightly Rolling Plains	20-40
Rolling Plains	40-80
Hills	80-150
Mountains	150-300
Rugged Mountains	300-700
Very Rugged Mountains	>700

For this procedure, a (Δh) of 0 was used for water and 90 meters used as average land somewhat typical of the Eastern rolling hills.

Specific parameters for the radio link include frequency, polarization, antenna heights and a general siting criteria. Since antenna heights for both transmitter and receiver are variable, a very extensive family of curves would be required to consider all possible combinations. A more simplified approach was taken in which the geometric mean of the two antennas is calculated. The ARPROP model is then exercised using this mean antenna height at both ends of the path. Thus, transmitter/receiver heights of 100/100 m or 50/200 m would both be represented as 100 m (see figure 3). This approach greatly reduces the required number of curves while introducing only small differences in the results with the more exact approach. Moreover, such differences always result in conservative estimates of propagation loss.

A general siting parameter is also an input parameter to the model as either being random siting, careful siting or very careful siting. The former is most applicable to mobile equipment whereas the latter two are applicable to fixed or base stations where advantage is often taken of hilltops. In these cases the effective height of the antennas are increased somewhat above the actual height. Careful siting was chosen for the calculations used in attachment 1 since, in general, the results will be used for base or fixed stations.

The results of the model provide propagation loss estimates versus distance as a statistical function of both time and location. The time variation represents the long term variations of the median propagation loss such as daily and seasonal changes. Short term fading statistics are not included. The location variation statistic accounts for the fact that propagation loss over two paths of equal length but different locations will, in general, differ. These differences are represented statistically by a distribution of values around a median value (50 percentile) and any other desired value. For purposes of this procedure, values of 10% and 50% were chosen for the time and location parameters. The 10% value implies that the actual propagation loss is expected to be lower than the predicted value only 10% of the time on a long term basis. The 50% value for the location variability implies simply a median or average value. It is noted that these values are the same as those used by the Federal Communications Commission for similar propagation predictions used in interference calculations.

REFERENCES

1. Longley, A.G. and P.L. Rice (July, 1968) Prediction of Tropospheric Radio Transmission Loss Over Irregular Terrain-A Computer Method, ERL 79-ITS-67, Institute of Telecommunications Sciences, Boulder, Colorado.

2. Frazier, W.E. (October 1978) Operations manual for the APPROP Computer Model (Area Propagation) as Implemented at NTIA/Annapolis NTIA-TN-78-3.

(Last Page in Annex I)

ANNEX J

Guidance for Determination of Necessary Bandwidth

J.1 INTRODUCTION

This Annex contains guidance relating to the necessary bandwidth parameter. Necessary bandwidth forms part of the emission designator used for frequency management purposes and is used as a parameter in spectrum standards, frequency assignments, etc., throughout this Manual.

J.2 GENERAL

Except for radars, the necessary bandwidth may be determined by one of the following methods with the order of preference shown:

1. Use of the appropriate formula from Table A in this Annex.[1]
2. Computation in accordance with the Recommendations ITU-R SM.328-8 (1994) and SM.853 (1994).
3. Measurements of specialized modulations not covered by 1. or 2. above.
4. Use of the best available technical information from other sources.

The value so determined shall be used when the full designation of an emission is required for example, as indicated in Chapter 9.

See Section 5.1.5 for the desired relationship of occupied bandwidth to necessary bandwidth.

J.3 RADAR SYSTEMS

For radars the necessary bandwidth shall be determined at a point that is 20 dB below the peak envelope value of the spectrum by one of the following with the order of preference shown:

1. Computation in accordance with the radar formulas from Table A in this Annex.
2. Results of actual measurement.
3. Use of the best available technical information from other sources.

J.4 ANALOG FM

The basis of the formulas in Table A for the necessary bandwidth of analog FM and FDM/FM systems is Carson's Rule. This bandwidth is given by $B_1 = 2(D+M) = 2(a+1)M$, where D is the peak frequency deviation, "a" is the peak modulation index and M is the maximum modulating frequency. This rule represents an additive combination of the bandwidth expressions for extreme high $(B_1 \sim 2D = 2aM)$ and low $(B_1 \sim 2M)$ modulation index conditions. One of these two expressions prevails over the other for $\alpha >> 1$ or $\alpha << 1$, so that their linear superposition always yields the bandwidth measure for extreme index conditions.

An accepted relationship between analog FM bandwidth and a measure of performance such as allowable distortion as a function of the modulation index is not available. There is no distortion measure or criterion that is generally accepted for evaluation purposes, because of difficulties arising from the variety of modulating signal characteristics and models that occur in practice.

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[1] Individual formulas may be based on theoretical models for the modulation technique.

The normalized FM bandwidth (B1/M) for single tone sinusoidal modulation is shown in Figure 1 for various power percentages included. Each stepped line corresponds to a fixed power percentage (p). The solid stepped line represents p=99% power included. The normalized bandwidth based on Carson's Rule is given by (B1/M) =2(a+1), shown in Figure 1 by the solid straight line. Carson's Rule essentially follows the p=99% line for indices in the 0.9 < a < 4.3 range. It also includes more power at lower indices, but falls progressively below the 99% power curve at higher indices outside this range.

The case of a random modulating signal with a uniform baseband spectrum has also been analyzed using included power as the band-limiting distortion criterion. A peak to rms load ratio of 11 dB has been assumed to simulate representative conditions of FDM/FM telephony. The resultant normalized bandwidth can be estimated by (B1/M) = 2Z(a,q) where Z is a function of "a" and the fractional power rejected q=1-(p/100) as follows (Refs b and c):

$$Z(q,a) = a\left\lfloor\sqrt{1-\log_{(q^{5/7}\cdot 3^3)}-0.05}\right\rfloor + 0.75$$

This expression is an effective approximation to a complicated integral formulation for moderate index values (1 < a < 5). The normalized bandwidth (B1/M) is shown in Figure 2 for various (q) values, along with the bandwidth formula corresponding to Carson's Rule. The latter can be noted to represent a power rejection in the $10^{-10} < q < 10^{-8}$ range, which is negligible.

The modulation cases shown in Figures 1 and 2 are extreme energy distribution conditions, in that one has all the baseband energy concentrated on a single frequency while the other has it spread uniformly over the baseband. The implication of Figures 1 and 2 is that Carson's Rule represents an effective bound to calculating analog FM bandwidth from a power included standpoint for modulation indices below five. The results also indicate that Carson's Rule includes considerably more power when the baseband modulation has a spread rather than concentrated spectral characteristic. Carson's Rule represents a q=0.01 power rejection for simple sinusoidal modulation, and $10^{-10} < q < 10^{-8}$ power rejection for a random modulation with a uniform baseband spectrum.

The necessary bandwidth of analog FM systems with modulation indices greater than 5.0 should be based on the methods of subparagraphs 2, 3 and 4 of the above GENERAL section.

See References a, b, and c.

J.5 SYMBOLS

As appropriate, the following table shall be used for calculation of necessary bandwidth. The following symbols are used in this table:

B =	Digital symbol rate for telegraphy (i.e. baud)
B_c =	Bandwidth of the frequency deviation (the total frequency shift during the pulse duration) in MHz.
B_d =	Bandwidth of the frequency deviation (peak difference between instantaneous frequency of the modulated wave and the carrier frequency for FM/CW radar systems)
B_n =	Necessary bandwidth
C =	Sub-carrier frequency
C_{max} =	Highest sub-carrier frequency used.
C_s =	Separation in frequency between adjacent sub-carriers or carriers of a multi-carrier modulation.
D =	Peak deviation, i.e., half the difference between the maximum and minimum values of the instantaneous frequency.
f_p =	Continuity pilot sub-carrier frequency (continuous signal utilized to verify performance of frequency-division multiplex systems).

K = An overall numerical factor which varies according to the emission and which depends upon the allowable signal distortion.

M = Maximum modulation frequency

N_c = Number of baseband channels in radio systems employing multichannel multiplexing.

N_s = Number of Sub-carriers.

R = Total bit rate, which includes data, encoding, and any other overhead bits.

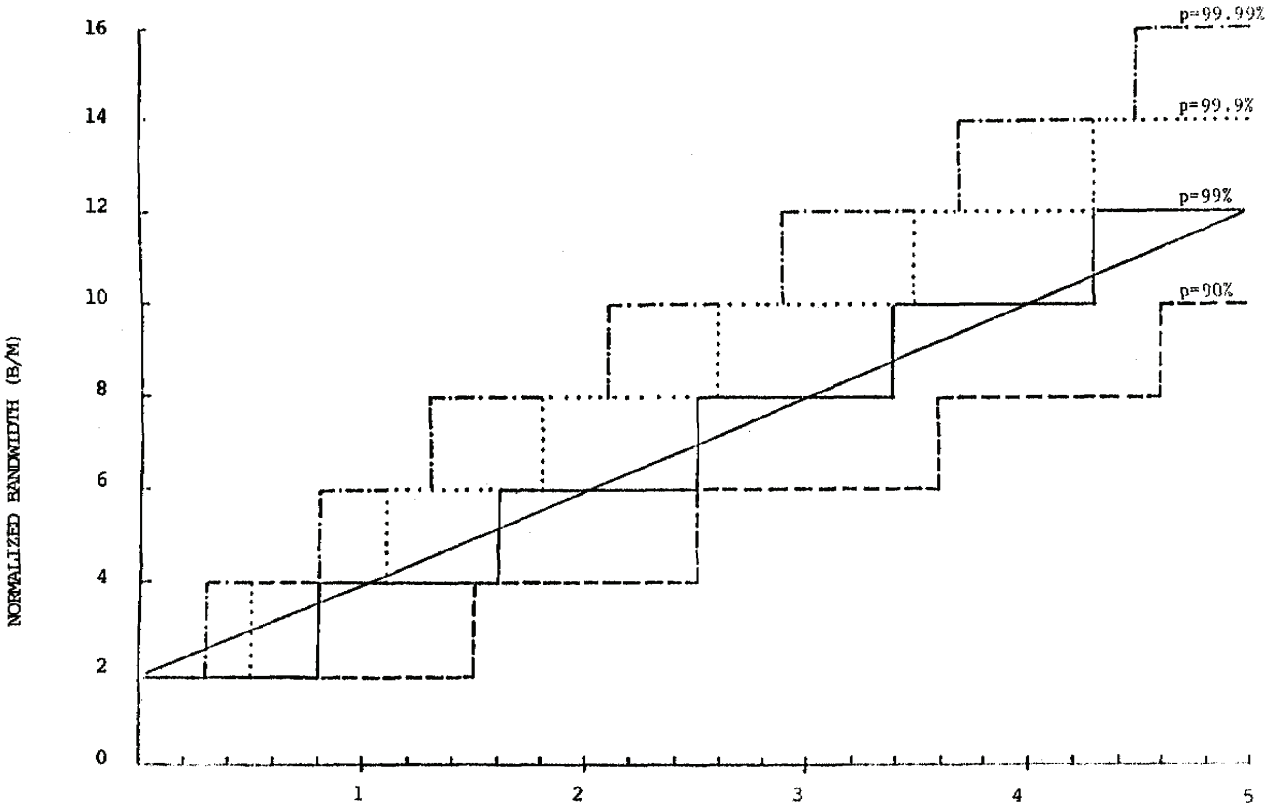
S = Number of equivalent non-redundant signaling states.

t = Emitted pulse duration in µsec at 50% amplitude (voltage) points. The 100% amplitude is the nominal peak level of the pulse.

t_f = Emitted pulse fall time in *µsec* from the 90% to the 10% amplitude points on the trailing edge.

t_r = Emitted pulse rise time in *µsec* from the 10% to the 90% amplitude points on the leading edge.

X = Average "talker power level" (in dBm0) used to determine the peak frequency deviation in FM/FDM systems. These values are normally specified by the equipment manufacturer (see Table B later in this annex for more information).



MODULATION INDEX (a)

FIGURE 1. FM Bandwidth Occupancy and Power Preservation with Sinusoidal Modulation

(Note: Carson's Rule is the Straight Line)

(Legend: p is the Power Percentage Preserved)

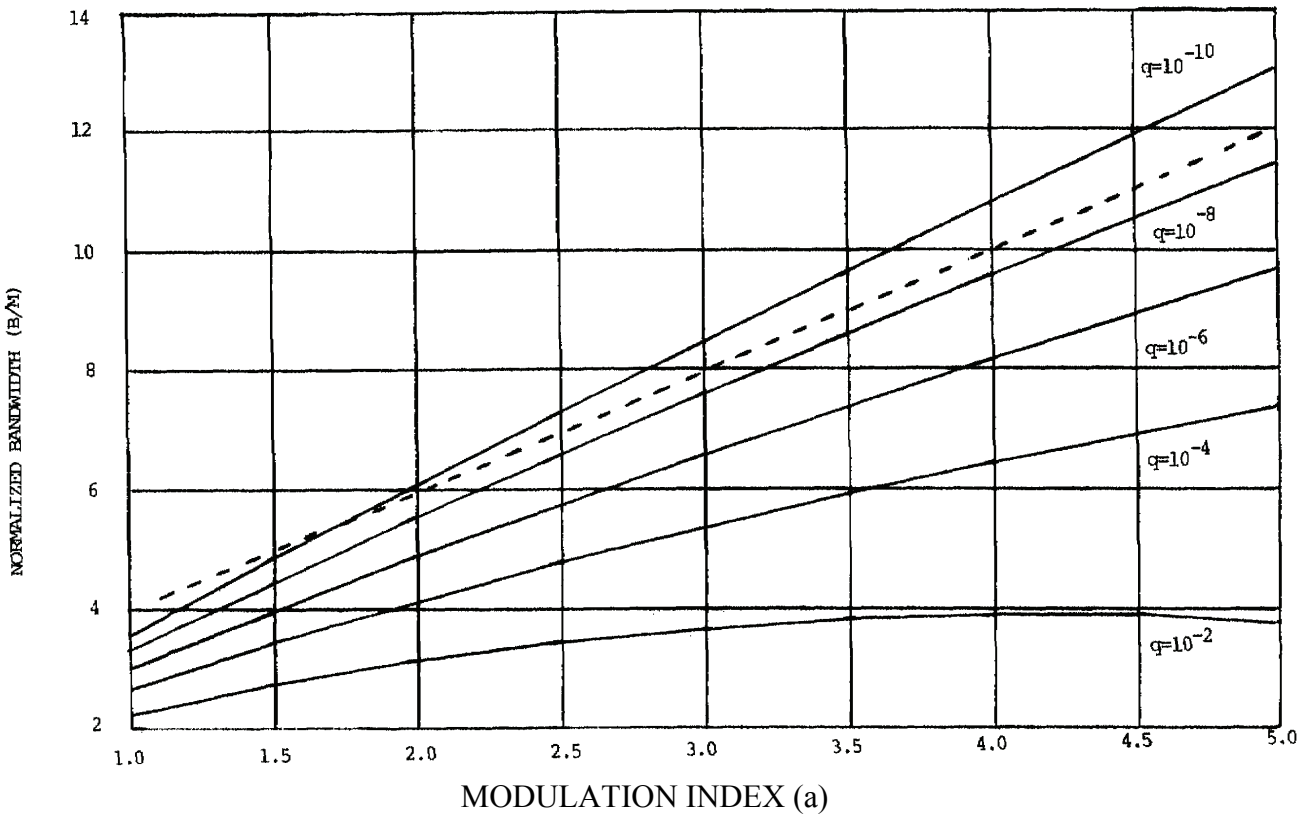


FIGURE 2. FM Bandwidth Occupancy and Power Preservation with Band-Limited White Modulation

(Note: Carson's Rule is the Dotted Line)

(Legend: q is the Power Fraction Rejected)

TABLE A. Necessary Bandwidth Calculations

Description of Emission	Formula	Sample Calculation	Sample Emission Designator
NO MODULATION			
Continuous wave emission	$B_n = 0$	Satellite downlink beacon	N0N
CW radars [2]	$B_n = 0$	Speed measuring CW radar $B_n =$ 0 Hz	0H00N0N
ANALOG			
Amplitude Modulation			
Broadcasting			
Sound broadcasting, double-sideband	$B_n = 2M$ M may vary between 4000 and	Speech and music $M = 4000$	8K00A3EGN

2 The emission bandwidth of a CW transmitter typically will not be zero due to noise and other considerations. However, designating zero as the necessary bandwidth is a valid method for identifying such equipment.

Description of Emission	Formula	Sample Calculation	Sample Emission Designator
	10000 depending on the quality desired.	B_n = 8000 Hz = 8 kHz	
Sound broadcasting, single-sideband, suppressed carrier	$B_n = M$ (lowest modulation frequency)	Speech and music M = 4500 lowest modulation frequency = 50 Hz B_n = 4450 Hz = 4.45 kHz	4K45J3EGN
Sound broadcasting, singlesideband, reduced carrier (single channel)	$B_n = M$ M may vary between 4000 and 10000 depending on the quality desired	Speech and music M = 4000 B_n = 4000 Hz = 4 kHz	4K00R3EGN
Radio Relay			
Double-sideband radiorelay system, frequency division multiplex	$B_n = 2M$	10 voice channels occupying base band between 1 kHz and 164 kHz M = 164000 B_n = 328000 Hz = 328 kHz	328K00A8E
Double-sideband, television relay	$B_n = 2C + 2M + 2D$	Video limited to 5 MHz, audio on 6.5 MHz frequency modulated subcarrier, sub-carrier deviation = 50 kHz: $C = 6.5 \times 10^6$ $D = 50 \times 10^3$ Hz M = 15000 $B_n = 13.13 \times 10^6$ Hz = 13.13 MHz	13M13A8W
Telephony			
Telephony, double sideband (single channel)	$B_n = 2M$	M = 3000 B_n = 6000 Hz = 6 kHz	6K00A3EJN
Telephony, independent sideband (two or more channels)	B_n = sum of M for each side band	2 channels M = 3000 B_n = 6000 Hz = 6 kHz	6K00B8EJN
Telephony, single-sideband, full carrier (single channel)	$B_n = M$	M = 3000 B_n = 3000 Hz = 3 kHz	3K00H3EJN
Telephony, single-sideband, suppressed carrier (single channel)	$B_n = M$ (lowest modulation frequency)	M = 3000 lowest modulation frequency = 300 Hz B_n = 2700 Hz = 2.7 kHz	2K70J3EJN
Telephony with privacy, single-sideband, suppressed carrier (two or more channels)	$Bn = N_c M$ (lowest modulation frequency in the lowest channel)	Nc = 2 M = 3000 lowest modulation frequency = 250 Hz B_n = 5750 Hz = 5.75 kHz	5K75J8EKF
Telephony with separate frequency modulated signal to control the level of demodulated speech signal, single- sideband, reduced carrier (Lincompex) (single channel)	$B_n = M$	Maximum control frequency = 2990 Hz M = 2990 B_n = 2990 Hz = 2.99 kHz	2K99R3ELN
Television			
Television, vision and sound	Refer to Recommendations ITU-R BT.470 and BO.650 for the	Number of lines = 525 Number of lines per second =	5M75C3F 250K0F3EGN

Description of Emission	Formula	Sample Calculation	Sample Emission Designator
	bandwidths of the com monly used television sys tems.[3]	15,750 Video bandwidth: 4.2 MHz Total visual bandwidth: 5.75 MHz FM aural bandwidth including guard bands: 250 kHz Total bandwidth: 6 MHz	
Miscellaneous			
Double-sideband emission of VOR with voice (VOR: VHF omnidirectional radio range)	$B_n = 2C_{max} + 2M + 2DK$ $K = 1$ (typically)	The main carrier is modulated by: a 30 Hz sub-carrier a carrier resulting from a 9960 Hz tone frequency modulated by a 30 Hz tone a telephone channel a 1020 Hz keyed tone for con tinual Morse identification $C_{max} = 9960$ $M = 30$ $D = 480$ Hz $B_n = 20940$ Hz = 20.94 kHz	20K9A9WWF
Angle Modulation			
Broadcasting			
Sound broadcasting	$B_n = 2M + 2DK$ $K = 1$ (typically)	Monaural $D = 75000$ Hz $M = 15000$ $B_n = 180000$ Hz = 180 kHz	180KF3EGN
Stereophonic sound broad casting with multiplexed subsidiary telephony sub-carrier	$B_n = 2M + 2DK$ $K = 1$ (typically)	Pilot tone system; $M = 75000$ $D = 75000$ Hz $B_n = 300000$ Hz = 300 kHz	300K0F8EHF
Radar			
FM/CW radars	$B_n = 2B_d$	FM-CW Doppler radar sweeps ±100 MHz from center frequency over a sweep duration of 50 msec. $B_n = 200$ MHz	200MF3N
Radio Relay			
Radio-relay system; frequency division multiplex	$B_n = 2M+2DK$ K = 1 (typically)	960 data channels that operate at a uniform power level of -15 dBm occupying baseband between 60 kHz and 4028 kHz; rms per channel deviation: 200 kHz; continuity pilot at 4715 kHz produces 140 kHz rms deviation of main carrier.[4] X = -15 D = (200 x 10^3) (3.76) (5.5) = 4.14 x 10^6 Hz; M = 4.028 x 10^6; f_p = 4.715 x 10^6, (2M + 2DK) >	16M4F8DJF

3 ITU-R Recommendations and other publications are available on the internet at http://www.itu.int/ITU-R/pub lications/index.html.

4 See the Table B instructions.

Description of Emission	Formula	Sample Calculation	Sample Emission Designator
		$2f_p$ $B_n = 16.34 \times 10^6$ Hz = 16.34 MHz	
Radio-relay system, frequency division multiplex	$B_n = 2f_p$	600 telephone channels occupying baseband between 60 kHz and 2540 kHz; rms per-channel deviation: 200 kHz continuity pilot at 8500 kHz produces 1440 kHz rms deviation of main carrier. For X = -19.6: $D = (200 \times 10^3)(3.76)(2.56) = 1.93 \times 10^6$ Hz $M = 2.54 \times 10^6$ $K = 1$ $f_p = 8.5 \times 10^6$ Use $2f_p$ since it is > (2M + 2DK).[4] Bn = 17×10^6 Hz = 17 MHz	17M0F8EJF
Radio-relay systems, frequency division multiplex	$B_n = 2f_p + 2DK$ K = 1 (typically)	60 all voice telephone channels occupying baseband between 60 kHz and 300 kHz; rms per-channel deviation: 200 kHz; continuity pilot at 331 kHz produces 100 kHz rms deviation of main carrier For X = -5.6: $D = (200 \times 10^3)(3.76)(1.19) = 8.95 \times 10^5$ Hz; $M = 0.3 \times 10^6$ $f_p = 0.331 \times 10^6$ Hz Use $2f_p + 2DK$ since $f_p > M$.[4] $B_n = 2.45 \times 10^6$ Hz = 2.45 MHz	2M45F8EJF
Telephony			
Commercial telephony	$B_n = 2M + 2DK$ $K = 1$ (typically, but under certain conditions a higher value of K may be necessary)	For an average case of commercial telephony, $D = 5000$ Hz $M = 3000$ $B_n = 16000$ Hz = 16 kHz	16K0F3EJN
Digital			
Amplitude Modulation			
Telegraphy			
Continuous wave telegraphy, Morse code	$B_n = BK$ $K = 5$ for fading circuits $K = 3$ for non-fading circuits	25 words per minute $B = 20$, $K = 5$ $B_n = 100$ Hz	100H0A1AAN
Telegraphy by on-off key ing of a tone modulated car rier, Morse code	$B_n = BK + 2M$ $K = 5$ *for* fading circuits $K = 3$ for non-fading circuits	25 words per minute $B = 20$, $M = 1000$, $K = 5$ $B_n = 2100$ Hz = 2.1 kHz	2K10A2AAN
Independent sidebands; sev eral telegraph channels with error-correction together with several telephone channels with privacy; frequency division multiplex	B_n = sum of M for each sideband	Normally composite systems are operated in accordance with standardized channel arrangements (e.g. Rec. ITU-R F.348). 3 telephone channels and 15 telegraphy channels require the	12K0B9WWF

Description of Emission	Formula	Sample Calculation	Sample Emission Designator
		bandwidth: 12000 Hz = 12 kHz	
Selective calling signal using sequential single frequency code, single-sideband full carrier	$B_n = M$	Maximum code frequency is: 2110 Hz $M = 2110$ B_n = 2110 Hz = 2.11 kHz	2K11H2BFN
Direct-printing telegraphy using a frequency shifted modulating sub-carrier, with error-correction, single-side band, suppressed carrier (single channel)	$B_n = 2M + 2DK$ $M = \frac{B}{2}$	$B = 50$ D = 35 Hz (70 Hz shift) $K = 1.2$ B_n = 134 Hz	134H0J2BCN
Telegraphy, multichannel with voice frequency, error correction, some channels are time-division multi plexed, single-sideband, reduced carrier	B_n = (highest central frequency) + M + DK $M = \frac{B}{2}$	15 channels; highest central frequency is: 2805 Hz $B = 100$ D = 42.5 Hz (85 Hz shift) $K = 0.7$ B_n = 2885 Hz = 2.885 kHz	2K89R7BCW
Angle Modulation			
Telegraphy			
Telegraphy, narrow-band direct-printing with error correction (single channel) or Selective calling signal	$B_n = 2M + 2DK$ $M = \frac{B}{2}$ $K = 1.2$ (typically)	$B = 100$ D = 85 Hz (170 Hz shift) B_n = 304 Hz	304H0F1BCN
Telegraphy without error-correction (single channel)	$B_n = 2M + 2DK$ $M = \frac{B}{2}$ $K = 1.2$ (typically)	$B = 100$ D = 85 Hz (170 Hz shift) B_n = 304 Hz	304H0F1BBN
Four-frequency duplex telegraphy	$B_n = 2M + 2DK$ B = modulation rate in bauds of the faster channel. If the channels are synchronized: $M = \frac{B}{2}$ (otherwise, $M = 2B$) $K = 1.1$ (typically)	Spacing between adjacent frequencies = 400 Hz Synchronized channels $B = 100$ $M = 50$ D = 600 Hz B_n = 1420 Hz = 1.42 kHz	1K42F7BDX
Miscellaneous			
Binary Frequency Shift Keying [5]	If $\left(0.03 < \frac{2D}{R} < 1.0\right)$ Then $B_n = 3.86D + 0.27R$ If $\left(1.0 < \frac{2D}{R} < 20\right)$ Then $B_n = 2.4D + 1.0R$	Digital modulation used to send 1 megabit per second by frequency shift keying with 2 signaling states and 0.75 MHz peak deviation of the carrier. R = 1 x 10^6 bits per second; D = 0.75 x 10^6 Hz; B_n = 2.8 MHz	2M80F1DBC

[5] See References g, h, and i for further details.

Description of Emission	Formula	Sample Calculation	Sample Emission Designator
Multilevel Frequency Shift Keying	$B_n = \frac{R}{\log_2 S} + 2DK$ $K \leq 0.89$ (99% bandwidth, Bn=R/$\log_2$S + 1.78D)	Digital modulation to send 10 Mbps by use of frequency shift keying with 4 signaling states and 2 MHz peak deviation of the main carrier. R = 10^7 bps; D = 2 MHz; K = 0.89; S = 4; B_n = 8.56 MHz	8M56F1DDT
Gaussian Minimum Shift Keying (GMSK)	$B_n = \frac{R}{\log_2 S} + 0.5RK$ $K \leq 0.28$ (99% bandwidth, B_n= (1/$\log_2$S - 0.14)R)	Digital modulation used to send 10 megabits per second by use of GMSK (S=2) R=10 x 10^6 bits per second; B_n = 8.6 MHz	8M60G1DDN
Minimum Shift Keying	$B_n = \frac{R}{\log_2 S} + 0.5RK$ $K \leq 0.36$ (99% bandwidth, $B_n = (1/\log_2 S + 0.18)R$)	Digital modulation used to send 2 megabits per second using 2-ary minimum shift keying: R = 2Mbps S = 2 B_n = 2.36 x 10^6 Hz = 2.36 MHz	2M36G1DBN
Feher-patented Quadrature Phase Shift Keying (FQPSK-B)	$B_n = 0.78R$	Digital modulation to send 10 megabits per second by use of FQPSK-B R = 10 x 10^6 bits per second; B_n = 7.8 MHz	7M80G1DDN
Phase Shift Keying	$B_n = 2RK / \log_2 S$ $0.5 \leq K \leq 1$ K = 0.7 to 0.8 (typically) [6]	Digital modulation used to send 10 megabits per second by use of phase shift keying with 4 signaling states R = 10 x 10^6 bits per second; K = 1; S = 4; B_n = 10 MHz	10M00G1DDT
Combination Modulation			
Quadrature Amplitude Modulation (QAM)	$B_n = \frac{2RK}{Log_2 S}$ $K \leq 0.81$ (99% bandwidth, $B_n = 1.62R / \log_2 S$)	64 QAM is used to send 135 Mbps; R = 135 x 10^6 bps; S = 64; Roll-off = 1; K = 0.81 B_n = 36.45 MHz	36M45D1D
Orthogonal Frequency Division Multiplexing (OFDM)	$B_n = (N_S + 16.25)C_S$ $N_S > 16$	OFDM is used to send 20 Mbps. Guard time is 0.8 μs. 48 sub-carriers are used, each spaced 250 kHz apart. 16-QAM is used with rate ½ coding.	16M1D1DEF

[6] The value for K here can theoretically vary from 0.5 to 1. For fixed microwave systems use of a value of K larger than 0.7 should be further justified.

Description of Emission	Formula	Sample Calculation	Sample Emission Designator
		B_n = (48 +16.25)0.25 = 16.1 MHz	
PULSED			
Radar			
Non-FM pulsed radars (including spread spectrum or coded pulse radars):[7]	*If* $\frac{t}{t_r} \langle 12.6$, then: $B_n = B(-20dB) = \frac{1.79}{\sqrt{t_r t}}$ [8] *Otherwise:* $B_n = B(-20dB) = \frac{6.36}{t}$	A radar transmits unmodulated pulses at 1172 pulses per sec. The pulse width is 1.03 *u*sec. Rise and fall times are 0.2 *µsec* and 0.15 *µsec*, respectively. Use t_f since it is smaller than t_r Since t is obviously less than 12.6 t_f, use the first equation B_n = 4.55 MHz	4M55P0N
Phase coded pulse radars (including spread spec trum):[7]	If $\frac{t}{t_r} \langle 12.6$ then: $B_n = B(-20dB) = \frac{1.79}{\sqrt{t_r t}}$, [8 9] Otherwise: $B_n = B(-20dB) = \frac{6.36}{\sqrt{t}}$	A Doppler pulse radar transmits 3000 pulses per second. The pulse width including a 13 bit Barker code is 6.6 µsec. Each chip has a 50% amplitude width of 0.5 µsec. Chip rise time is 0.02 *µsec*. Since t/t_r = 0.5/0.02 is obviously larger than 12.6, use the second equation: $B_n = 6.36/0.5 = 12.7 MHz$	12M7Q1N
FM-pulse radars (intentional FM)[7]	$B_n = B(-20dB) = \frac{1.79}{\sqrt{t_r t}} + 2B_c$ [8]	FM pulsed radar chirping over 2.89 MHz with a 25.6 *µsec* pulse width and 150 nsec rise time B_n = 6.69 MHz	6M69Q3N
Composite Emissions			
Radio-relay system	$B_N = \frac{2K}{t}$ $K \leq 1.6$ [10]	Pulse position modulated by 36 voice channel baseband; pulse width at half amplitude = 0.4 *µsec* B_n = 8 10^6 Hz = 8 MHz (Bandwidth independent of the number of voice channels)	8M00M7EJT
Composite transmission digital modulation using DSB-AM (Microwave radio relay system)	$B_n = 2RK / \log_2 S$	Digital modulation used to send 5 megabits per second by use of amplitude modulation of the main carrier with 4 signaling states R = 5 x 10^6 bits per second; K = 1; S = 4	5M00K7DD

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[7] For frequency hopping systems the necessary bandwidth is the instantaneous one of an individual channel.

[8] If t_f is less than t_r, then t_f is to be used in place of tr when performing the necessary bandwidth calculations.

[9] For phase coded pulse signals the pulse width and rise times are thoses associated with a single sub-pulse. If the rise time of a single sub-pulse is not availabl, assume it is 40 % of the time to swich from one phase or sub-pulse to the next (see Sigure 1)

[10] In this case *K* depends upon the ratio of pulse width to pulse rise time. Its value usually falls between 1 and 10 and in many cases does not need to exceed 6. K = 1.6 roughly corresponds to rise time equal to pulse width, which is typical for these systems.

Description of Emission	Formula	Sample Calculation	Sample Emission Designator
		B_n = 5 MHz	

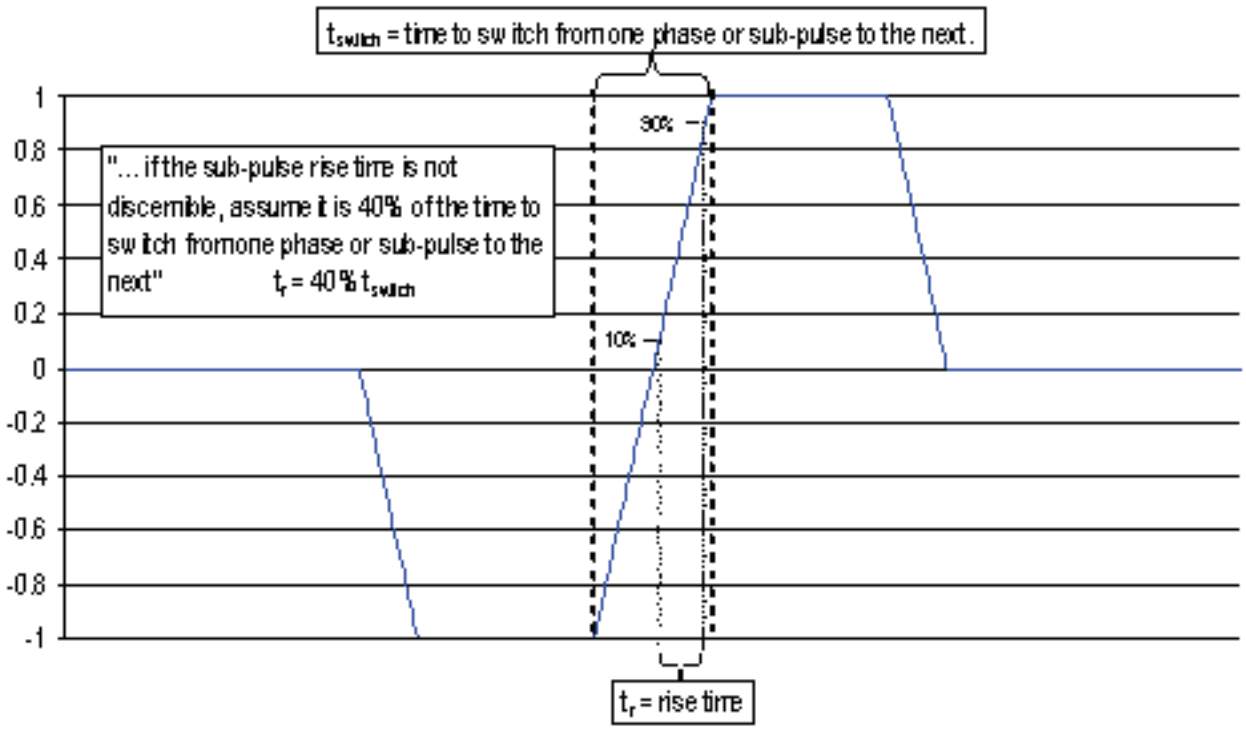

FIGURE 3. Estimation of chip rise time for phase coded pulse signals

TABLE B. MULTIPLYING FACTORS FOR USE IN COMPUTING D, PEAK FREQUENCY DEVIATION, IN FM FREQUENCY DIVISION MULTIPLEX (FM/FDM) MULTI-CHANNEL EMISSIONS

For FM/FDM systems the necessary bandwidth is (for systems having no continuity pilot sub-carrier or having a continuity pilot sub-carrier whose frequency is not the highest modulating the main carrier):

$$B_n = 2M + 2DK$$

The value of D, or peak frequency deviation, in these formulas for B_n is calculated by multiplying the rms value of per-channel deviation by the appropriate "multiplying factor" shown below.

In the case where a continuity pilot of frequency f_p exists above the maximum modulation frequency, M, the general formula becomes:

$$B_n = 2f_p + 2DK$$

In the case where the modulation index of the main carrier produced by the pilot is less than 0.25, and the rms frequency deviation of the main carrier produced by the pilot is less than or equal to 70 percent of the rms value of per-channel deviation, or in a radio system for television, the rms deviation of the main carrier due to the pilot does not exceed 3.55 percent of the peak deviation of the main carrier, the general formula becomes either: $B_n = 2f_p$ or $B_n = 2M + 2DK$ whichever is greater.

The selection of the values used to determine the multiplying factor are highly dependent upon the information transfer requirements placed upon the FM/FDM systems. Available technical information indicates that (depending on the number of channels) a value of "X" of -2, - 5.6 or -19.6 should be appropriate for modern commercial telephone circuits where most of the channels are actual speech. In smaller or older FM/FDM systems and those where most of the circuits are used for data transmission, "X" values of +2.6, -1.0 or -15 should be appropriate since typical commercial multichannel data circuits operate at power levels from -13 to -15 dBm0.

Number telephone channels N_c	Multiplying factors	Limits of X(P_{avg}(dBm0)
$3 < N_c < 12$	4.47 x antilog x $\frac{x}{20}$ X= a value in dB specified by the equipment manufacturer or station licensee, subject to NTIA approval	Not applicable
$12 < N_c < 60$	3.76 antilog $\frac{(X+2 \log_{10} N_c)}{20}$	X: -2 to +2.6
$60 < N_c < 240$	3.76 antilog $\frac{(X+4 \log_{10} N_c)}{20}$	X: -5.6 to -1.0
$N_c > 240$	3.76 antilog $\frac{(X+10 \log_{10} N_c)}{20}$	X: -19.6 to -15.0

Where Nc is the number of circuits in the multiplexed message load; 4.47 corresponds to a peak load factor of 13.0 dB, and 3.76 corresponds to a peak load factor of 11.5 dB.

REFERENCES

a. Taub and Schilling (1971), "Principles of Communication Systems", McGraw-Hill Book Company, Chapter 4.

b. Filippi, C. (1983), "FM Spectral Modeling and FDM/FM Simulation Programs", NTIA Report 83-134, available from National Technical Information Service, Springfield, VA 22161.

c. Medhurst, R. G. and Plotkin, S. C. (1968), "Comments on FM Bandwidth as a Function of Distortion and Modulation Index", IEEE transaction on Communication Technology, p. 500 (June).

d. Bellamy, J. (1982), "Digital Telephony, John Wiley & Sons, Chapter 6.

e. Cohen, D. (1983), "Necessary Bandwidth and Spectral Properties of Digital Modulation", NTIA-TR 84-168, available from National Technical Information Service, Springfield, VA 22161.

f. Prabhu, V. K. (1981), "MSK and Offset QPSK Modulation with Bandlimiting Filters", IEEE Transactions on Aerospace and Electronic Systems, Volume AES-17, No. 1 (January).

g. K. L. McAdoo, "Speech Volumes on Bell System Message Circuits-1960 Survey", Bell System Technical Journal, Vol. 42, No. 5, September 1963.

h. W. C. Ahern, F. P. Duffy, J. A. Maher, "Speech Signal Power in the Switched Message Network", Bell System Technical Journal, Vol. 57, No. 7, Part 2, September 1978, pp 2695- 2726.

i. Federal Communications Commission (FCC), Report and Order, "In the Matter of Amendment of Parts 2 and 21, of the Commissions' Rules Concerning Calculations of Necessary Bandwidth for Frequency Modulation Microwave Radio Relay Systems", General Docket No. 81-743, Rule Making 3625, adopted March 3, 1983.

(Last Page in Annex J)

ANNEX K

Technical Standards for Federal "Non-Licensed" Devices

K.1 INTRODUCTION

This Annex sets out the Federal Government regulations and technical specifications under which a low power intentional, unintentional or incidental radiator or device may be developed and operated officially by a Federal Government Agency without an NTIA approved frequency assignment as described in Section 7.9 of this Manual. Non-Federal operations of these radiators, called non-licensed devices or Part 15 devices, are regulated by the Federal Communications Commission (FCC) Code of Federal Government Regulations, Title 47, Part 15. FCC regulations and standards do not apply to the Federal Government although many low power devices are operated by the Agencies without an NTIA approved frequency assignment. The NTIA thus provides the regulations and standards in this Annex for regulating Federal Government official development of low power radiators as non-licensed devices. The regulations and standards in this Annex are a subset of the FCC Part 15 regulations. The IRAC/TSC will continue to maintain an awareness of FCC changes to the Part 15 rules and, where appropriate, incorporate such changes in this Annex.

A "Cross Reference" of the regulations in this Annex and those in the FCC CFR 47, Part 15 regulations is given at the end of this Annex.

K.1.1 DEFINITIONS

Auditory Assistance Device: An intentional radiator used to provide auditory assistance to a handicapped person or persons. Such a device may be used for auricular training in an educational institution, for auditory assistance at places of public gatherings, such as a church, theater, or auditorium, and for auditory assistance to handicapped individuals, only, in other locations.

Biomedical Telemetry Device: An intentional radiator used to transmit measurements of either human or animal biomedical phenomena to a receiver.

Carrier Current System: A system that transmits radio frequency energy by conduction over the electric power lines. A carrier current system can be designed such that the signals are received by conduction directly from connection to the electric power lines (unintentional radiator) or the signals are received over-the-air due to radiation of the radio frequency signals from the electric power lines (intentional radiator).

Class A Digital Device: A digital device that is for use in a commercial, industrial or business environment, exclusive of a device which is for use by the general public or is intended to be used in the home.

Class B Digital Device: A digital device that is for use in a residential environment notwithstanding use in commercial, business or industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public.

NOTE: The responsible party may also qualify a device intended to be in a commercial, business or industrial environment as a Class B device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use.

Cordless Telephone System: A system consisting of two transceivers, one a base station that connects to the public switched telephone network and the other a mobile handset unit that communicates directly with the base station. Transmissions from the mobile unit are received by the base station and then placed on the public switched telephone network. Information received from the switched telephone network is transmitted by the base station to the mobile unit.

NOTE: The Domestic Public Cellular Radio Telecommunications Service is considered to be part of the switched telephone network. In addition, intercom and paging operations are permitted provided these are not intended to be the primary modes of operation.

Digital Device (previously defined as a computing device): An unintentional radiator (device or system) that generates and uses timing signals or pulses at a rate in excess of 9,000 pulses (cycles) per second and uses digital techniques; inclusive of telephone equipment that uses digital techniques or any device or system that generates and uses radio frequency energy for the purpose of performing data processing functions, such as electronic computations, operations, transformations, recording, filing, sorting, storage, retrieval, or transfer. A radio frequency device that is specifically subject to an emanation requirement in any other part or section of the NTIA Manual or an intentional radiator subject to Section K.3 of this Annex that contains a digital device is not subject to the standards for digital devices, provided the digital device is used only to enable operation of the radio frequency device and the digital device does not control additional functions or capabilities.

NOTE: Computer terminals and peripherals that are intended to be connected to a computer are digital devices.

External Radio Frequency Power Amplifier: A device which is not an integral part of an intentional radiator as manufactured and which, when used in conjunction with an intentional radiator as a signal source, is capable of amplifying that signal.

Direct Sequence Systems: A spread spectrum system in which the carrier has been modulated by a high speed spreading code and an information data stream. The high speed code sequence dominates the "modulation function" and is the direct cause of the wide spreading of the transmitted signal.

Field Disturbance Sensor: A device that establishes a radio frequency field in its vicinity and detects changes in that field resulting from the movement of persons or objects within its range.

Frequency Hopping Systems: A spread spectrum system in which the carrier is modulated with the coded information in a conventional manner causing a conventional spreading of the RF energy about the frequency carrier. The Frequency of the carrier is not fixed but changes at fixed intervals under the direction of a coded sequence. The wide RF bandwidth needed by such a system is not required by spreading of the RF energy about the carrier but rather to accommodate the range of frequencies to which the carrier frequency can hop. A frequency hopping system should select operating frequencies from among those in the hop set such that all frequencies are used with equal probability, and all frequency transitions are equally probable.

Hop Set: The set of all frequencies upon which a frequency hopping transmitter may operate.

Incidental Radiator: A device that generates radio frequency energy during the course of its operation although the device is not intentionally designed to generate or emit radio frequency energy. Examples of incidental radiators are DC motors, mechanical light switches, etc.

Intentional Radiator: A device that intentionally generates and emits radio frequency energy by radiation or induction.

Perimeter Protection System: A field disturbance sensor that employs RF transmission lines as the radiating source. These RF transmission line are installed in such a manner that allows the system to detect movement within the protected area.

Unintentional Radiator: A device that intentionally generates radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Ultrawideband system/device: A system or device or field disturbance sensor that intentionally radiates over a bandwidth of not less than 500 MHz as further described under Section K.3.6 of this Annex.

K.1.2 INCIDENTAL RADIATORS[1]

Manufacturers of these devices shall employ good engineering practices to minimize the risk of harmful interference.

An intentional or unintentional radiator shall be constructed in accordance with good engineering design and manufacturing practice. Emanations from the device shall be suppressed as much as practicable, but in no case shall the emanations exceed the levels specified in these rules.

An intentional or unintentional radiator must be constructed such that the adjustments of any control that is readily accessible by or intended to be accessible to the user will not cause operation of the device in violation of the regulations.

K.1.3 SUSCEPTIBILITY TO INTERFERENCE

Agencies responsible for equipment compliance are advised to consider the proximity and the high power of non-Federal licensed radio stations, such as broadcast, amateur, land mobile, and non-geostationary mobile satellite feeder link earth stations, and of U.S. Government radio stations, which could include high-powered radar systems, when choosing operating frequencies during the design and acquisition of their equipment so as to reduce the susceptibility for receiving harmful interference.

K.1.4 LABELING REQUIREMENTS

Federal agencies should insure that non-licensed devices purchased under the provisions of Section 7.8 of this manual have the appropriate FCC label affixed.

Federal agencies should insure that non-licensed devices developed under the provisions of Section 7.9 and Annex K should have a reference to Section 7.9 and Annex K in the appropriate training and/or operations manual or other documentation.

K.1.5 EMISSION LIMITS

The conducted and radiated emission limits shown in this part are based on the following, unless otherwise specified:

a. On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrument using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electrotechnical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, as long as the same bandwidths as indicated for CISPR quasi-peak measurements are employed.

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[1] This section includes text from CFR 47 Parts 13 and 15.

NOTE: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.

b. On any frequency or frequencies above 1000 MHz, the radiated limits shown are based on the use of measurement instrumentation employing an average detector function. When average radiated emission measurements are specified in the regulations, including emission measurements below 1000 MHz, there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit for the frequency being investigated. Measurements of AC power line conducted emissions are performed using a CISPR quasi-peak detector, even for devices for which average radiated emission measurements are specified.

c. When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measured field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in those cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

K.1.6 Frequency Range and Distance Extrapolation of Radiated Measurements

1. Unless otherwise noted in the specific section in this Annex under which the equipment operates for an intentional radiator the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

a. If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

b. If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

c. If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

d. If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1)-(a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

2 For unintentional radiators:

a. Except as otherwise indicated in paragraphs (b)(2) or (b)(3), for an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

Highest frequency generated or Upper frequency of measurement used in the device or on which the range (MHz) device operates or tunes (MHz)	
Below 1.705	30
1.705 - 108	1000
108 - 500	2000
500 - 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

b. A unintentional radiator, excluding a digital device, in which the highest frequency generated in the device, the highest frequency used in the device and the highest frequency on which the device operates or tunes are less than 30 MHz and which, in accordance with Section K.2.2 of this Annex, is required to comply with standards on the level of radiated emissions within the frequency range 9 kHz to 30 MHz, such as a CB receiver or a device designed to conduct its radio frequency emissions via connecting wires or cables, e.g., a carrier current system not intended to radiate, shall be investigated from the lowest radio frequency generated or used in the device, without going below 9 kHz (25 MHz for CB receivers), up to the frequency shown in the following table. If the unintentional radiator contains a digital device, the upper frequency to be investigated shall be that shown in the table below or in the table in paragraph (b)(1) above, as based on both the highest frequency generated and the highest frequency used in the digital device, whichever range is higher.

Highest frequency generated or Upper frequency of measurement used in the device or on which the range (MHz) device operates or tunes (MHz)	
Below 1.705	30
1.705 - 10	400
10 - 30	500

c. Except for a CB receiver, a receiver employing superheterodyne techniques shall be investigated from 30 MHz up to at least the second harmonic of the highest local oscillator frequency generated in the device. If such receiver is controlled by a digital device, the frequency range shall be investigated up to the higher of the second harmonic of the highest local oscillator frequency generated in the device or the upper frequency of the measurement range specified for the digital device in paragraph (b)(1) of this section.

3. The above specified frequency ranges of measurements apply to the measurement of radiated emissions and, in the case of receivers, the measurement to demonstrate compliance with the antenna conduction limits specified in Sections K.2.2 and K.3.3 of this Annex. The frequency range of measurements for AC power line conducted limits is specified in Sections K.2.1 and K.3.3 of this Annex and applies to all equipment subject to those regulations. In some cases, depending on the frequency(ies) generated and used by the equipment, only signals conducted onto the AC power lines are required to be measured.

4. Particular attention should be paid to harmonics and subharmonics of the fundamental frequency as well as to those frequencies removed from the fundamental by multiples of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.

5. To the extent practicable, the device authorized under this annex shall be measured at the distance specified in the appropriate section of this annex. The distance specified corresponds to the horizontal distance between the measurement antenna and the closest point of the equipment under test, support equipment or interconnecting cables as determined by the boundary defined by an imaginary straight line periphery describing a simple geometric configuration enclosing the system containing the equipment under test. The equipment under test, support equipment and any interconnecting cables shall be included within this boundary.

a. At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

b. At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

c. The extrapolation method used in the device certification will be specified.

d. When measurement distances of 30 meters or less are specified, the equipment will be measured at the distance specified unless measurement at that distance results in measurements being performed in the near field. When measurement distances of greater than 30 meters are specified in the regulations, the equipment can be tested at a closer distance, usually 30 meters, extrapolating the measured field strength to the specified distance using the methods shown in this section.

K.2 UNINTENTIONAL RADIATORS

K.2.1 CONDUCTED LIMITS

1. Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed 250 microvolts. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

2. For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed the limits in the following table. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.

Frequency of Emission (MHz)	Conducted Limit (microvolts)
0.450-1.705	1000
1.705-30.0	3000

3. For carrier current systems used as unintentional radiators whose emissions are contained within the frequency range 450 kHz to 30 MHz, the provisions of this part shall not apply. Such systems are subject to radiated emission limits as provided in Section K.2.2 of this Annex.

4. Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of AC adaptors or battery eliminators or that connect to the AC power line indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

K.2.2 RADIATED EMISSION LIMITS

1. Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength (microvolts/meter)
30-88	100
88-216	150
216-960	200
above 960	500

2. The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

Frequency of Emission (MHz)	Field Strength (microvolts/meter)
30-88	90
88-216	150
216-960	210
above 960	300

3. In the emission tables above, the tighter limit applies at the band edges. Section K.1.5 of this Annex specifies the frequency range over which radiated emissions are to be measured.

K.3 INTENTIONAL RADIATORS

K.3.1 ANTENNA REQUIREMENTS

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible agency shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this part. The agency may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections K.3.5.2, K.3.5.3, or K.3.5.4 of this Annex.

K.3.1.1 External Radio Frequency Power Amplifiers and Antenna Modifications

1. Except as otherwise described in paragraph two of this section no Federal agency shall use or lease any external radio frequency power amplifier or amplifier kit intended for use with a Part 15 intentional radiator.

2. A transmission system consisting of an intentional radiator, an external radio frequency power amplifier, and an antenna, may be authorized for use under this section. However, when a transmission system is authorized as a system, it must always be used as a complete system and must always be used in the configuration in which it was authorized. An external radio frequency power amplifier shall be used only in the system configuration with which the amplifier is authorized and shall not be used as a separate product.

3. Only the antenna with which an intentional radiator is authorized may be used with the intentional radiator.

K.3.2 RESTRICTED BANDS OF OPERATION

1. Except as specified in paragraph 5 of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

2. The table below identifies how each of the restricted bands, as identified above, are used.

Restricted Bands by Use

Band (MHz)	Allocation/Use
0.090-0.110	Loran C radionavigation
0.495-0.505	Maritime distress frequency
2.1735-2.1905	Mobile distress frequency
4.125-4.128	Global Maritime Distress and Safety System
4.17725-4.17775	Global Maritime Distress and Safety System
4.20725-4.20775	Global Maritime Distress and Safety System
6.215-6.218	Global Maritime Distress and Safety System
6.26775-6.26825	Global Maritime Distress and Safety System
6.31175-6.31225	Global Maritime Distress and Safety System
8.291-8.294	Global Maritime Distress and Safety System
8.362-8.366	Maritime & aeronautical survival craft search and rescue
8.37625-8.38675	Global Maritime Distress and Safety System
8.41425-8.41475	Global Maritime Distress and Safety System
12.29-12.293	Global Maritime Distress and Safety System
12.51975-12.52025	Global Maritime Distress and Safety System
12.57675-12.57725	Global Maritime Distress and Safety System
13.36-13.41	Radio astronomy
16.42-16.423	Global Maritime Distress and Safety System
16.69475-16.69525	Global Maritime Distress and Safety System
16.80425-16.80475	Global Maritime Distress and Safety System
25.5-25.67	Radio astronomy

Restricted Bands by Use

Band (MHz)	**Allocation/Use**
37.5-38.25	Radio astronomy
73-75.2	73-74.6 MHz: radio astronomy, 74.8-75.2 MHz: aeronautical radionavigation marker beacon (75 MHz) and guard bands
108-121.94	108-117.975 MHz: aeronautical radionavigation (aircraft-to-tower), 117.975-121.9375 MHz: aeronautical mobile for safety and regularity of flight, 121.4-121.6 MHz: search and rescue (SARSAT)
123-138	123-123.2 MHz: coordinated search and rescue by mobile, land and aeronautical, 123.2-123.8 MHz: aeronautical flight test voice communications, 123.5875-137 MHz: aeronautical mobile for safety and regularity of flight 137-138 MHz: satellite down link
149.9-150.05	Radionavigation satellite down link
156.52475-156.52525	Global Maritime Distress and Safety System
156.7-156.9	Search and rescue (maritime mobile distress and calling on 156.7625-156.8375 MHz)
162.0125-167.17 167.72-173.2	Wind shear detection around airports and to warn pilots when emergency action is needed, protection of national and visiting foreign dignitaries, and tracking of endangered and dangerous wildlife, law enforcement
240-285	243 MHz (SARSAT), satellite down links, military satellites, glide slope indicators, instrument landing systems
322-335.4	322-328.6 MHz: radio astronomy, 328.6-335.4 MHz: aeronautical radionavigation-instrument landing systems
399.9-410	399.9-400.05 MHz: radionavigation satellite, 400.05-400.15 MHz: standard frequency and time signal, 400.15-402 MHz: satellite down links, 402-406 MHz: meteorological aids (radiosondes), 406-406.1 MHz: emergency position-indicating radiobeacon (EPIRB), 406.1-410 MHz: radio astronomy
608-614	Radio astronomy
960-1240	960-1215 MHz: aeronautical radionavigation, 1215-1240 MHz: satellite down link
1300-1427	1300-1350 MHz: aeronautical radionavigation, 1350-1400 MHz: spectral line observation of neutral hydrogen, 1400-1427 MHz: radio astronomy
1435-1626.5	1435-1525 MHz: aeronautical flight test telemetry, 1525-1559 MHz: satellite down links, 1559-1610 MHz: radionavigation satellite down link (GPS) and aeronautical radionavigation, 1610-1626.5 MHz: aeronautical radionavigation, 1610.6-1613.8 MHz: spectral line observation
1645.5-1646.5	Global Maritime Distress and Safety System
1660-1710	1660-1668.4 MHz: radio astronomy, 1668.4-1670 MHz: radio astronomy and radiosonde, 1670-1710 MHz: satellite down link and radiosonde
1718.8-1722.2	Radio astronomy
2200-2300	Satellite down link
2310-2390	Aeronautical flight test telemetry
2483.5-2500	Radiodetermination satellite down link (Geostar)
2655-2900	2655-2690 MHz: radio astronomy and satellite down link, 2690-2700 MHz: radio astronomy, 2700-2900 MHz: air traffic control radars
3260-3267	Spectral line observations (radio astronomy)
3332-3339	Spectral line observations (radio astronomy)
3345.8-3358	Spectral line observation (radio astronomy)
3600-4400	3600-4200 MHz: satellite down link, 4200-4400 MHz: aeronautical radionavigation
4500-5150	4500-4800 MHz: satellite down link, 4800-5000 MHz: radio astronomy, 5000-5150 MHz: aeronautical radionavigation
5350-5460	Aeronautical radionavigation

Restricted Bands by Use

Band (MHz)	**Allocation/Use**
7250-7750	Satellite down link
8025-8500	Satellite down link
9000-9200	Aeronautical radionavigation
9300-9500	Radar transponders for maritime search and rescue, airborne weather and ground mapping radar for airborne radionavigation
10600-12700	10600-10700 MHz: radio astronomy, 10700-12200 MHz: satellite down link, 12200-12700 MHz: direct broadcast satellite
13250-13400	Aeronautical radionavigation
14470-14500	Spectral line observation (radio astronomy)
15350-16200	15350-15400 MHz: radio astronomy, 15400-15700 MHz: shuttle landing system, airborne weather and ground mapping radar for radionavigation, 15700-16200 MHz: airport surface detection equipment used to locate and navigate aircraft while on the ground
17700-21400	Satellite down link
22010-23120	22010-22500 MHz: radio astronomy, 22500-23000 MHz: broadcast satellite and radio astronomy, 23000-23070 MHz: fixed/inter-satellite/mobile, 23070-23120 MHz: radio astronomy
23600-24000	Radio astronomy
31200-31800	Radio astronomy
36430-36500	Radio astronomy
Above 38600	Satellite down link, Radio astronomy

3. Except as specified in paragraphs 5 and 6, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section K.3.4 of this Annex. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section K.3.4 of this Annex shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section K.3.4 of this Annex shall be demonstrated based on the average value of the measured emissions. The provisions in Section K.1.5 of this Annex apply to these measurements.

4. Except as specified in paragraphs 5 and 6 of this section, regardless of the field strength limits specified elsewhere in this Annex, the provisions of this part apply to emissions from any intentional radiator.

5. The following devices are exempt from the requirements of this part:

a. Swept frequency field disturbance sensors operating between 1.705 and 37 MHz provided their emissions only sweep through the bands listed in paragraph 1, the sweep is never stopped with the fundamental emission within the bands listed in paragraph 1, and the fundamental emission is outside of the bands listed in paragraph 1 more that 99% of the time the device is actively transmitting, without compensation for duty cycle.

b. Transmitters used to detect buried electronic markers at 101.4 kHz which are employed by telephone companies.

6. Harmonic emissions appearing in the restricted bands above 17.7 GHz from field disturbance sensors operating under the provisions of Section K.3.5.16 of this Annex shall not exceed the limits specified in paragraph 2 of Section K.3.5.16.

7. While the Powerline Carriers (PLC) operate on a non-interference basis, in accordance with footnote US294 to the U.S. Table of Allocations, a Powerline Carrier Data Base (PLCDB) has been established to provide information necessary for identification and notification of potential interference between PLC and Federal authorized users and Federal Communications Commission licensees. The contact for this data base will be an FCC/NTIA recognized industry-operated entity. Periodic updates with be available though this entity, see Section of 8.3.27 of the manual.

K.3.3 CONDUCTED LIMITS

1. For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed 250 microvolts. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

2. The limit in paragraph 1 shall not apply to intentional radiators operated as carrier current systems in the frequency range of 450 kHz to 30 MHz. Such systems are subject to radiated emission limits as provided in Sections K.3.2 and K.3.4 of this Annex.

3. Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

K.3.4 RADIATED EMISSION LIMITS, GENERAL REQUIREMENTS

1. Except as provided elsewhere in this part, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meters)	Measurement Distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30-88	100*	30
88-216	150*	3
216-960	200*	3
Above 960	500	3

* Except as provided in paragraph 6, fundamental emissions from intentional radiators operating under this part shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz, or 470-806 MHz.

2. In the emission table above, the tighter limit applies at the band edges.

3. The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other parts and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

4. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

5. The provisions in Section K.1.5 and 1.6 of this Annex for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this section .

6. Operation in the frequency bands allocated to TV broadcast stations:

a. Perimeter protection systems operating under the provisions of this section of Annex K in the frequency bands allocated to TV broadcast stations, as shown in Chapter 4 of this Manual, shall contain their fundamental emissions within the frequency bands 54-72 MHz and 76-88 MHz. Further, the use of such perimeter protection systems is limited to industrial, business and commercial applications.

b. Biomedical telemetry devices operating under the provisions of this section of Annex K in the frequency bands allocated to TV broadcast stations, as shown in Chapter 4 of this Manual, shall contain their fundamental emissions within the frequency band 312-566 MHz. Further, the marketing and the use of biomedical telemetry devices operating under this paragraph shall be limited to hospitals.

K.3.5 RADIATED EMISSION LIMITS, ADDITIONAL PROVISIONS

K.3.5.1 Additional Provisions to the General Radiated Emission Limitations

1. The regulations in Sections K.3.5.2 through K.3.5.19 of this Annex provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.

2. In most cases, unwanted emissions outside of the frequency bands shown in these alternative provisions must be attenuated to the emission limits shown in Section K.3.4 of this Annex. In no case shall the level of the unwanted emission from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission.

3. For those bands of frequencies where alternative radiated emission limitations apply and for which a frequency stability is not specified, it is recommended that the fundamental frequency be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

4. Where the following sections specify limits on the bandwidth of the emissions, the bandwidth limits include the effects of frequency sweeping, frequency hopping, and other modulation techniques which may be employed.

K.3.5.2 Operation in the Band 160-190 kHz

1. The total input power to the final radio frequency stage (exclusive of filament or heater power) shall not exceed one watt.

2. The total length of the transmission line, antenna, and ground lead (if used) shall not exceed15 meters.

3. All emissions below 160 kHz or above 190 kHz shall be attenuated at least 20 dB below the level of the unmodulated carrier. Determination of compliance with the 20 dB attenuation specification may be based on measurements at the intentional radiator's antenna output terminal unless the intentional radiator uses a permanently attached antenna, in which case compliance shall be demonstrated by measuring the radiated emissions.

K.3.5.3 Operation in the Band 510-1705 kHz

1. The total input power of the final radio frequency stage (exclusive of filament or heater power) shall not exceed 100 milliwatts.

2. The total length of the transmission line, antenna and ground lead (if used) shall not exceed 3 meters.

3. All emissions below 510 kHz or above 1705 kHz shall be attenuated at least 20 dB below the level of the unmodulated carrier. Determination of compliance with the 20 dB attenuation specification may be based on measurements at the intentional radiator's antenna output terminal unless the intentional radiator uses a permanently attached antenna, in which case compliance shall be demonstrated by measuring the radiated emissions.

K.3.5.4 Operation in the Band 525-1705 kHz

1. The provisions of this section are restricted to the operation of an AM broadcast station on a college or university campus or on the campus of any other educational institution. Operation is restricted to the grounds of the campus. For the band 535-1705 kHz, the frequency of operation shall be chosen such that operation is not within the protected field strength contours of licensed AM stations.

2. On the campus, the field strength of emissions appearing outside of this frequency band shall not exceed the general radiated emission limits shown in Section K.3.4 of this Annex as measured from the radiating source. There is no limit on the field strength of emissions appearing within this frequency band, except that the provisions of Section 7.8 of the NTIA Manual continue to apply.

3. At the perimeter of the campus, the field strength of any emissions, including those within the frequency band 525-1705 kHz shall not exceed the general radiated emission limits in Section K.3.4 of this Annex.

4. The conducted limits specified in Section K.3.3 of this Annex apply to the radio frequency voltage on the public utility power lines outside of the campus. Due to the large number of radio frequency devices which may be used on the campus, contributing to the conducted emissions, as an alternative to measuring conducted emissions on the AC power lines outside of the campus, it is acceptable to demonstrate compliance with this provisions by measuring each individual intentional radiator employed in the system at the point where it connects to the AC power lines. As provided inSection K.3.3, paragraph 2 of this Annex, if only a carrier current system is employed, the AC power line conducted limits do not apply. However, the radiated emission limits provided in this section apply to carrier current systems.

K.3.5.5 Operation in the Band 1.705-10 MHz

1. The field strength of any emission within the band 1.705-10 MHz shall not exceed 100 microvolts/meter at a distance of 30 meters. However, if the bandwidth of the emission is less than 10% of the center frequency, the field strength shall not exceed 15 microvolts/meter or (the bandwidth of the device in kHz) divided by (the center frequency of the device in MHz) microvolts/meter at a distance of 30 meters, whichever is the higher level. For the purposes of this section, bandwidth is determined at the point 6 dB down from the modulated carrier. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in Section K.1.5 of this Annex for limiting peak emissions apply.

2. The field strength of emissions outside of the band 1.705-10 MHz shall not exceed the general radiated emission limits in Section K.3.4 of this Annex.

K.3.5.6 Operation Within the Band 13.553-13.567 MHz

1. The field strength of any emission within this band shall not exceed 10,000 microvolts/meter at 30 meters.

2. The field strength of any emissions appearing outside of this band shall not exceed the general radiated emission limits shown in Section K.3.4 of this Annex.

3. The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

K.3.5.7 Operation Within the Band 26.96-27.28 MHz

1. The field strength of any emission within this band shall not exceed 10,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section K.1.5 of this Annex for limiting peak emissions apply.

2. The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section K.3.4 of this Annex.

K.3.5.8 Operation Within the Band 40.66-40.70 MHz

1. Unless operating pursuant to the provisions in Section K.3.5.9 of this Annex, the field strength of any emission within this band shall not exceed 1000 microvolts/meter at 3 meters.

2. As an alternative to the limit in paragraph 1, perimeter protection systems may demonstrate compliance with the following: the field strength of any emissions within this band shall not exceed 500 microvolts/meter at 3 meters, as determined using measurement instrumentation employing an average detector. The provisions of Section K.1.5 of this Annex for limiting peak emissions apply where compliance of these devices is demonstrated under this alternative emission limit.

3. The field strength of any emissions appearing outside of this band shall not exceed the general radiated emission limits in Section K.3.4 of this Annex.

4. The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

K.3.5.9 Periodic Operation in the Band 40.66-40.70 MHz and Above 70 MHz

1. The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph 5 of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Radio control of toys is not permitted. Continuous transmissions, such as voice or video, and data transmissions, are not permitted. The prohibition against data transmissions does not preclude the use of recognition codes. Those codes are used to identify the sensor that is activated or to identify the particular component as being part of the system. The following conditions shall be met to comply with the provisions for this periodic operation:

a. A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

b. A transmitter activated automatically shall cease transmission within 5 seconds after activation.

c. Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions to determine system integrity or transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter.

d. Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

2. In addition to the provisions of Section K.3.2 of this Annex, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meters)	Field Strength of Spurious Emissions (microvolts/meters)
40.66-40.70	2,-250	225
70-130	1,250	125
130-174	1,250 to 3,750*	125 to 375*
174-260	3,750	375
260-470	2,750 to 12,500*	375 to 1,250*
Above 470	12,500	1,250

* linear interpolations

a. The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

b. Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in Section K.1.5 of this Annex for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of Section K.3.2 of this Annex shall be demonstrated using measurement instrumentation with a CISPR quasi-peak detector.

c. The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average limits shown in this table or to the general limits shown in Section K.3.4 of this Annex, as measured with a CISPR quasi-peak detector, whichever limit permits a higher field strength.

3. The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

4. For devices operating within the frequency band 40.66-40.70 MHz, the bandwidth of the emission shall be confined within the band edges and the frequency tolerance of the carrier shall be ±0.01%. This frequency tolerance shall be maintained for a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

5. Intentional radiators may operate at a periodic rate exceeding that specified in paragraph 1 and may be employed for any type of operation, including operation prohibited in paragraph 1, provided the intentional radiator complies with the provisions of paragraphs 2 through 4 of this section, except the field strength table in paragraph 2 is replaced by the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500*	50 to 150*
174-260	1,500	150
260-470	1,500 to 5,000*	150 to 500*
Above 470	5,000	500

* linear interpolations

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

K.3.5.10 Operation Within the Bands 46.60-46.98 MHz and 49.66-50.0 MHz

1. The provisions shown in this section are restricted to cordless telephones.

2. An intentional radiator used as part of a cordless telephone system shall operate on one or more of the following frequency pairs:

Channel	Base Transmitter (MHz)	Handset Transmitter (MHz)
1	46.610	49.670
2	46.630	49.845
3	46.670	49.860
4	46.710	49.770
5	46.730	49.875
6	46.770	49.830
7	46.830	49.890
8	46.870	49.930
9	46.930	49.990
10	46.970	49.970

3. The field strength of the fundamental emission shall not exceed 10,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section K.1.5 of this Annex for limiting peak emissions apply.

4. The fundamental emission shall be confined within a 20 kHz band centered on the actual carrier frequency. Modulation products outside of this 20 kHz band shall be attenuated at least 26 dB below the level of the unmodulated carrier or to the general limits in Section K.3.4 of this Annex, whichever permits the higher emission levels. Emissions on any frequency more than 20 kHz removed from the center frequency shall consist solely of unwanted emissions and shall not exceed the general radiated emission limits in Section K.3.4 of this Annex.

5. If the device provides for the connection of external accessories, including external electrical input signals, the device must be tested with the accessories attached. The emission tests shall be performed with the device and accessories configured in a manner which tends to produce the maximum level of emissions within the range of variations that can be expected under normal operating conditions.

6. The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency. The tolerance shall be maintained for a temperature variation of -20 degrees C to +50 degrees C at normal supply voltage, and for variation in the primary voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

K.3.5.11 Operation Within the Band 49.82-49.90 MHz

1. The field strength of any emission within this band shall not exceed 10,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section K.1.5 of this Annex for limiting peak emissions apply.

2. The field strength of any emissions appearing between the band edges and up to 10 kHz above and below the band edges shall be attenuated at least 26 dB below the level of the unmodulated carrier or to the general limits in Section K.3.4 of this Annex, whichever permits the higher emission levels. The field strength of any emissions removed by more than 10 kHz from the band edges shall not exceed the general radiated emission limits in Section K.3.4 of this Annex. All signals exceeding 20 microvolts/meter at 3 meters shall be reported in the application for certification.

K.3.5.12 Operation in the Bands 72.0-73.0 MHz and 75.4-76.0 MHz

1. The intentional radiator shall be restricted to use as an auditory assistance device.

2. Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the above specified frequency ranges.

3. The field strength of any emissions within the permitted 200 kHz band shall not exceed 80 millivolts/meter at 3 meters. The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed 1500 microvolts/meter at 3 meters. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in Section K.1.5 of this Annex for limiting peak emissions apply.

K.3.5.13 Operation in the Band 88-108 MHz

1. Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range 88-108 MHz.

2. The field strength of any emissions within the permitted 200 kHz band shall not exceed 250 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section K.1.5 of this Annex for limiting peak emissions apply.

3. The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in Section K.3.4 of this Annex.

K.3.5.14 Operation in the Band 174-216 MHz

1. Operation under the provisions of this section is restricted to biomedical telemetry devices.

2. Emissions from the device shall be confined within a 200 kHz band which shall lie wholly within the frequency range 174-216 MHz.

3. The field strength of any emissions radiated within the specified 200 kHz band shall not exceed 1500 microvolts/meter at 3 meters. The field strength of emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed 150 microvolts/meter at 3 meters. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in Section K.1.5 of this Annex for limiting peak emissions apply.

K.3.5.15 Operation in the Band 890-940 MHz

1. Operation under the provisions of this section is restricted to devices that use radio frequency energy to measure the characteristics of a material. Devices operated pursuant to the provisions of this section shall not be used for voice communications or the transmission of any other type of message.

2. The field strength of any emissions radiated within the specified frequency band shall not exceed 500 microvolts/meter at 30 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section K.1.5 of this Annex for limiting peak emissions apply.

3. The field strength of emissions radiated on any frequency outside of the specified band shall not exceed the general radiated emission limits in Section K.3.4 of this Annex.

4. The device shall be self-contained with no external or readily accessible controls which may be adjusted to permit operation in a manner inconsistent with the provisions of this section. Any antenna that may be used with the device shall be permanently attached thereto and shall not be readily modifiable by the user.

K.3.5.16 Operation Within the Bands 902-928 MHz, 2435-2465 MHz, 5785-5815 MHz, 10500-10550 MHz and 24075-24175 MHz

1. Operation under the provisions of this section is limited to intentional radiators used as field disturbance sensors, excluding perimeter protection systems.

2. The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (millivolts/meters)	Field Strength of Harmonics (millivolts/meters)
902-928	500	1.6
2435-2465	500	1.6
5785-5815	500	1.6
10500-10550	2500	25.0
24075-24175	2500	25.0

a. Regardless of the limits show in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in Section K.3.2 of this Annex, shall not exceed the field strength limits shown in Section K.3.4 of this Annex. Harmonic emissions in the restricted bands at and above 17.7 GHz, and below 40 GHz, shall not exceed the following field strength limits:

(1) For field disturbance sensors designed for use only within a building or to open building doors, 25.0 mV/m.

(2) For all other field disturbance sensors, 7.5 *m*V/m.

(3) Field disturbance sensors designed to be used in motor vehicles or aircraft must include features to prevent continuous operation unless their emissions in the restricted bands fully comply with the limits given in Section K.3.4 of this Annex. Continuous operation of field disturbance sensors designed to be used in farm equipment, vehicles such as fork lifts that are intended primarily for use indoors or for very specialized operations, or railroad locomotives, railroad cars and other equipment which travels on fixed tracks is permitted. A field disturbance sensor will be considered not to be operating in a continuous mode if its operation is limited to specific activities of limited duration (e.g., putting a vehicle into reverse gear, activating a turn signal, etc.).

b. Field strength limits are specified at a distance of 3 meters.

c. Emissions radiated outside of the specified frequency bands, except harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section K.3.4 of this Annex, whichever is the lesser attenuation.

d. The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in Section K.1.5 of this Annex for limiting peak emissions apply.

K.3.5.17 Operation Within the Bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

1. Operation under the provisions of this section is limited to frequency hopping and direct sequence spread spectrum intentional radiators that comply with the following provisions:

a. Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(1) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

(2) Frequency hopping systems operating in the 2400-2483.5 MHz and 5725-5850 MHz bands shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

b. For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

2. The maximum peak output power of the intentional radiator shall not exceed the following:

a. For frequency hopping systems operating in the 2400-2483.5 MHz or 5725-5850 MHz band and for all direct sequence systems: 1 watt.

b. For frequency hopping systems operating in the 902-928 MHz: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under subparagraph 1.a.(1) of this section.

c. Except as shown below, with a transmitting antenna having directional gain greater than 6 dBi, the peak output power from the intentional radiator shall be reduced below the above stated values by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(1) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

(2) Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations my employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

(3) Fixed, point-to-point operation, as used in subparagraphs 2.c.(1) and 2.c.(2) of this subsection, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the radiator shall contain language in the instillation instructions informing the operator and the installer of this responsibility.

(4) Systems operating under the provisions of this part shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the national guidelines expressed in this manual in Section 8.2.28.

3. In any 100 kHz bandwidth outside the frequency band, in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, whichever yields the highest value. Attenuation below the general limits specified in paragraph 1 of Section K.3.4 is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section K.3.2, must also comply with the radiated emission limits specified in paragraph 1 of Section K.3.4.

4. For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

5. The processing gain of a direct sequence system shall be at least 10 dB. The processing gain represents the improvement to the received signal-to-noise ratio, after filtering to the information bandwidth, from the spreading/despreading function. The processing gain may be determined using one of the following methods:

a. As measured at the demodulated output of the receiver: the ratio in dB of the signal-to-noise ratio with the system spreading code turned off to the signal-to-noise ratio with the systems spreading code turned on.

b. As measured using the CW jamming margin method: a signal generator is stepped in 50 kHz increments across the passband of the system, recording at each point the generator level required to produce the recommended Bit Error Rate (BER). This level is the jammer level the output power of the intentional radiator is measured at the same point. Then jammer-to-signal ratio (J/S) is then calculated, discarding the worst 20% of the J/S data points. The lowest remaining J/S ratio is used to calculate the processing gain, as follows: Gp=(S/N)O+Mj+Lsys, where Gp=processing gain of the system, (S/N)O=signal-to-noise ratio required for the chosen BER, Mj=J/S ratio, and Lsys=system losses.

Note that total losses in a system, including intentional radiator and receiver, should be assumed to be no more than 2 dB.

6. Hybrid systems that employ a combination of both direct sequence and frequency hopping modulation techniques shall achieve a processing gain of at least 17 dB from the combined techniques. The frequency hopping operation of the hybrid system, with the direct sequence operation turned off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4. The direct sequence operation of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph 4 of this Section.

7. Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

8. The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

NOTE: Spread spectrum systems are sharing these bands on a non-interference basis with systems supporting critical Federal requirements that have been allocated the usage of these bands, secondary only to ISM equipment. Many of these Federal systems are airborne radiolocation systems that emit a high EIRP which can cause interference to other users. Also, investigations of the effect of spread spectrum interference to U.S. Government operations in the 902-938 MHz band may require a future decrease in the power limits allowed for spread spectrum operation.

K.3.5.18 Operation Within the Bands 902-928 MHz 2400-2483.5 MHz, 5725-5875 MHz and 24.0-24.25 GHz

1. The field strength from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

2. Field strength limits are specified at a distance of 3 meters.

3. Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section K.3.4 of this Annex, whichever is the lesser attenuation.

4. As shown in Section K.1.5 of this Annex, for frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

K.3.5.19 Operation Within the Bands 2.9-3.26 GHz, 3.267-3.332 GHz, 3.339-3.3458 GHz and 3.358-3.6 GHz

1. Operation under the provisions of this section is limited to automatic vehicle identification systems (AVIS) which use swept frequency techniques for the purpose of automatically identifying transportation vehicles.

2. The field strength anywhere within the frequency range swept by the signal shall not exceed 3000 microvolts/meter/MHz at 3 meters in any direction. Further, an AVIS, when in its operating position, shall not produce a field strength greater than 400 microvolts/meter/MHz at 3 meters in any direction within ±10 degrees of the horizontal plane. In addition to the provisions of Section K.3.2 of this Annex, the field strength of radiated emissions outside the frequency range swept by the signal shall be limited to a maximum of 100 microvolts/meter/MHz at 3 meters, measured from 30 MHz to 20 GHz for the complete system. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in Section K.1.5 of this Annex for limiting peak emissions apply.

3. The minimum sweep repetition rate of the signal shall not be lower than 4000 sweeps per second, and the maximum sweep repetition rate of the signal shall not exceed 50,000 sweeps per second.

4. An AVIS shall employ a horn antenna or other comparable directional antenna for signal emission.

5. Provision shall be made so that signal emission from the VIS shall occur only when the vehicle to be identified is within the radiated field of the system.

K.3.5.20 Unlicensed National Information Infrastructure Devices

K.5.20.1 General

These paragraphs set out the regulations for Unlicensed National Information Infrastructure devices operating in the 5.15-5.35 GHz and 5.725-5.825 GHz bands. The provisions of all other parts of this Annex apply to unlicensed devices except where specific provisions are contained in this part. The requirements of this part apply only to the radio transmitter contained in the Section K.3.5.20. Other aspects of the operation of such devices may be subject to requirements contained elsewhere in this annex. In particular, such devices that include digital circuitry not directly associated with the radio transmitter in this section are also subject to the requirement for unintentional radiators found elsewhere in this annex.

K.3.5.20.2 U-NII Definitions

Average Symbol Envelope Power: The average symbol envelope power is the average, taken over all symbols in the signaling alphabet, of the envelope power for each symbol.

Digital Modulation: The process by which the characteristics of a carrier wave are varied among a set of predetermined discrete values in accordance with a digital modulating function as specified in document ANSI C63.17-1998.

Emission Bandwidth: For the purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emission bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

Peak Power Spectral Density: The peak power spectral density is the maximum power spectral density, within the specified measurement bandwidth, within the device's operating band.

Peak Transmit Power: The maximum transmit power as measured over an interval of time of at most 30/B (where B is the 26-dB emission bandwidth in MHz) or the transmission pulse duration of the device, whichever is less, under all conditions of modulation.

Power Spectral Density: The power spectral density is the total energy output per unit bandwidth from a pulse or sequence of pulses for which the transmit power is at its peak or maximum level, divided by the total duration of the pulses. This total time does not include the time between pulses during which the transmit power is off or below its maximum level.

Pulse: A pulse is a continuous transmission of a sequence of modulation symbols, during which the average symbol envelope power is constant.

Transmit Power: The total energy transmitted over a time interval of at most 30/B (where B is the 26 dB emission bandwidth of the signal in hertz) or the duration of the transmission pulse, whichever is less, divided by the interval duration.

U-NII devices: Intentional radiators operating in the frequency bands 5.15 - 5.35 GHz and 5.725 - 5.825 GHz that use wideband digital modulation techniques and provide a wide array of high data rate mobile and fixed communications for individuals, businesses, and institutions.

K.3.5.20.3 U-NII General Technical Requirements

a. Power limits:

(1) For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10logB (where B is the 26-dB emission bandwidth in MHz). In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10logB (where B is the 26-dB emission bandwidth in MHz). In addition, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.825 GHz, the peak transmit power over the frequency band of operation shall not exceed 1 W or 17 dBm + 10logB (where B is the 26-dB emission bandwidth in MHz). In addition, the peak power spectral density shall not exceed 17 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain up to 23 dBi without any corresponding reduction in the transmitter peak output power or peak power spectral density. For fixed, point-to-point U-NII transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in peak transmitter power and peak power spectral density for each 1 dB of antenna gain in excess of 23 dBi would be required. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

NOTE: The NTIA strongly recommends that parties employing these devices to provide critical communications services should determine if there are any nearby Federal radar systems that could affect their operation.

(4) The peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement conforming to the above definitions for the emission in question.

(5) The peak power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A resolution bandwidth less than the measurement bandwidth can be used, provided that the measured power is integrated to show total power over the measurement bandwidth. If the resolution bandwidth is approximately equal to the measurement bandwidth, and much less than the emission bandwidth of the equipment under test, the measured results shall be corrected to account for any difference between the resolution bandwidth of the test instrument and its actual noise bandwidth.

(6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

b. Undesirable Emission Limits: Except as shown in Paragraph b.(6) of this Section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

(3) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.

(4) The above emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(5) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section K.3.4. Further, any devices using an AC power line are required to comply also with the conducted limits set forth in Section K.3.3.

(6) The provisions of Section K.3.2 of this Annex apply to intentional radiators operating under this section.

(7) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

c. The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

d. Any device that operates in the 5.15-5.25 GHz band shall use a transmitting antenna that is an integral part of the device.

e. Within the 5.15-5.25 GHz band, devices will be restricted to indoor operations to reduce any potential for harmful interference to aeronautical radionavigation and co-channel MSS operations.

f. Devices are subject to the radio frequency radiation exposure requirements specified in Section 8.2.28, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the NTIA upon request.

g. Manufacturers of these devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

K.3.5.21 Unlicensed Personal Communications Service Devices

K.3.5.21.1 PCS General

This section sets out the regulations for unlicensed personal communication service (PCS) operating in the 1920-1930 MHz band.

K.3.5.21.2 PCS Definitions

Asynchronous devices: Devices that transmit RF energy at irregular time intervals, as typified by local area network data systems.

Coordinatable PCS device: PCS devices whose geographical area of operation is sufficiently controlled either by necessity of operation with a fixed infrastructure or by disabling mechanisms to allow adequate coordination of their locations relative to incumbent fixed microwave facilities.

Emission bandwidth: For purposes of this section the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Compliance with the emissions limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

Isochronous devices: Devices that transmit at a regular interval, typified by time-division voice systems.

Non-coordinatable PCS device: A PCS device that is capable of randomly roaming and operating in geographic areas containing incumbent microwave facilities such that operation of the PCS device will potentially cause harmful interference to the incumbent microwave facilities.

Peak transmit power: The peak power output as measured over an interval of time equal to the frame rate or transmission burst of the device under all conditions of modulation. Usually this parameter is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used.

Personal Communications Service (PCS) Devices [Unlicensed]: Intentional radiators operating in the frequency bands 1910-1930 MHz and 2390-2400 MHz that provide a wide array of mobile and ancillary fixed communication services to individuals and businesses.

Spectrum window: An amount of spectrum equal to the intended emission bandwidth in which operation is desired.

Sub-band: For purposes of this section the term sub-band refers to the spectrum allocated for isochronous or asynchronous transmission.

Thermal noise power: The noise power in watts defined by the formula N=kTB where N is the noise power in watts, k is Boltzmann's constant, T is the absolute temperature in degrees Kelvin (e.g., 295° K) and B is the emission bandwidth of the device in hertz.

Time window: An interval of time in which transmission is desired.

K.3.5.21.3 PCS Equipment Authorization Requirement

PCS devices operating under this Annex shall be authorized by the Commission under the procedures in Title 47, Subpart J of Part 2 of the FCC Rules and Regulations before marketing. The application for authorization must contain sufficient information to demonstrate compliance with the requirements of this section.

K.3.5.21.4 PCS Coordination with Fixed Microwave Service

a. Operations of unlicensed PCS devices are required to protect systems in the Private Operational-Fixed Microwave Service. Coordination in the Fixed Microwave services is facilitated through UTAM, Inc. (Unlicensed Transition and Management for Microwave relocation in the 2 GHz band). Funding for coordination and relocation of fixed microwave systems, when necessary, is covered by fees payed to UTAM by the manufacturers of the unlicensed PCS devices.

b. Operations under the provisions of this section are required to protect systems in the Private Operational-Fixed Microwave Service operating within the 1850-1990 MHz band until the dates and conditions specified in the FCC Rules and Regulations (under Title 47, Part 101.69 - 101.73) of this section for termination of primary status. Interference protection is not required for Title 47, Part 101 stations in this band licensed on a secondary basis.

c. The operator of a PCS device that is relocated from the coordinated area specified by UTAM, Inc., must cease operating the device until coordination for the new location is verified by UTAM, Inc. UTAM may be contacted at 800-429-8826 or by contacting UTAM, Inc. directly at UTAM, Inc., 991 US Highway 22, Suite 104, P.O. Box 8126, Bridgewater, NJ 08807 (Phone: 908-526-3636 or their FAX: 908-526-0115).

K.3.5.21.5 PCS Labeling Requirements

In addition to the labeling requirements of Section K.1.4, all devices operating in the frequency band 1910-1930 MHz authorized under this section must bear a prominently located label with the following statement:

Installation of this equipment is subject to notification and coordination with UTAM, Inc. Any relocation of this equipment must be coordinated through, and approved by UTAM. Directions for contacting UTAM are specified in subparagraph 4.c of this may be contacted at 800-429-8826 or by contacting UTAM, Inc. directly at: UTAM, Inc., 991 US Highway 22, Suite 104, P.O. Box 8126, Bridgewater, NJ 08807 (Phone: 908-526-3636 or their FAX: 908-526-0115).

K.3.5.21.6 PCS Measurement Procedures

Measurements must be made in accordance with Annex K, Section K.1.5, except where specific procedures are specified in Section K.3.5.21. If no guidance is provided, the measurement procedure must be in accordance with good engineering practice.

K.3.5.21.7 PCS Conducted Limits

An unlicensed PCS device that is designed to be connected to the public utility (AC) power line must meet the limits specified in Section K.3.3 of this Annex.

K.3.5.21.8 PCS Antenna Requirement

An unlicensed PCS device must meet the antenna requirement of Section K.3.1 of this Annex.

K.3.5.21.9 PCS General Technical Requirements

a. [Reserved]

b. All transmissions must use only digital modulation techniques.

c. Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in hertz. Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

d. Power spectral density shall not exceed 3 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.

e. The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.

f. The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

g. Notwithstanding other technical requirements specified in this section, attenuation of emissions below the general emission limits in Section K.3.4 is not required.

h. Where there is a transition between limits, the tighter limit shall apply at the transition point.

i. Unlicensed PCS devices operating under the provision of this part shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the national guidelines expressed in this manual in Section 8.2.28.

K.3.5.21.10 Specific Requirements for Devices Operating in the 1920-1930 MHz sub-Band

a. Operation shall be contained within one of eight 1.25 MHz channels starting with 1920-1921.25 MHz and ending with 1928.75-1930 MHz. Further sub-division of a 1.25 MHz channel is permitted with a reduced power level, as specified in Section K.3.5.21 subparagraph 9.c., but in no event shall the emission bandwidth be less than 50 kHz.

b. Intentional radiators with an intended emission bandwidth less than 625 kHz shall start searching for an available time and spectrum window within 3 MHz of the sub-band edge at 1920 MHz and search upward from that point. Devices with an intended emission bandwidth greater than 625 kHz shall start searching for an available time and spectrum window within 3 MHz of the sub-band edge at 1930 MHz and search downward from that point.

c. Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(1) Immediately prior to initiating transmission, devices must monitor the combined time and spectrum windows in which they intend to transmit for a period of at least 10 milliseconds for systems designed to use a 10 millisecond or shorter frame period or at least 20 milliseconds for systems designed to use a 20 millisecond frame period.

(2) The monitoring threshold must not be more than 30 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth of the device.

(3) If no signal above the threshold level is detected, transmission may commence and continue with the same emission bandwidth in the monitored time and spectrum windows without further monitoring. However, occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.

(4) Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgements must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signalling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which time the access criteria must be repeated.

(5) If access to spectrum is not available as determined by the above, and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level below a monitoring threshold of 50 dB above the thermal noise power determined for the emission bandwidth may be accessed. A device utilizing the provisions of this paragraph must have monitored all access channels defined for its system within the last 10 seconds and must verify, within the 20 milliseconds (40 milliseconds for devices designed to use a 20 millisecond frame period) immediately preceding actual channel access that the detected power of the selected time and spectrum windows is no higher than the previously detected value. The power measurement resolution for this comparison must be accurate to within 6 dB. No device or group of cooperating devices located within 1 meter of each other shall occupy more than three 1.25 MHz channels during any frame period. Devices in an operational state that are utilizing the provision of this section are not required to use the search provisions of (b) above.

(6) If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same windows after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available.

(7) The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission and have a maximum reaction time less than 50xSQRT(1.25/emission bandwidth in MHz) microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds. If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be 35xSQRT(1.25/emission bandwidth in MHz) microseconds but shall not be required to be less than 35 microseconds.

(8) The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.

(9) Devices that have a power output lower than the maximum permitted under the rules may increase their monitoring detection threshold by one decibel for each one decibel that the transmitter power is below the maximum permitted.

(10) An initiating device may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows. If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window. If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.

(11) An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a co-located (within one meter) transmitter of the same system, may monitor the portions of the time and spectrum windows in which they intend to receive over a period of at least 10 milliseconds. The monitored time and spectrum window must total at least 50 percent of the 10 millisecond frame interval and the monitored spectrum must be within the 1.25 MHz frequency channel(s) already occupied by that device or co-located co-operating devices. If the access criteria is met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commence.

(12) The provisions of Section K.3.5.21 subparagraph 11.c(10) or Section K.3.5.21 subparagraph 11.c(11) shall not be used to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.

d. Emissions shall be attenuated below a reference power of 112 milliwatts as follows: 30 dB between the channel edges and 1.25 MHz above or below the channel; 50 dB between 1.25 and 2.5 MHz above or below the channel; and 60 dB at 2.5 MHz or greater above or below the channel. Systems that further sub-divide a 1.25 MHz channel into X sub-channels must comply with the following emission mask: In the bands between 1B and 2B measured from the center of the emission bandwidth the total power emitted by the device shall be at least 30 dB below the transmit power permitted for that device; in the bands between 2B and 3B measured from the center of the emission bandwidth the total power emitted by an intentional radiator shall be at least 50 dB below the transmit power permitted for that radiator; in the bands between 3B and the 1.25 MHz channel edge the total power emitted by an intentional radiator in the measurement bandwidth shall be at least 60 dB below the transmit power permitted for that radiator. "B" is defined as the emission bandwidth of the device in MHz. Compliance with the emission limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

e. The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in these sub-bands shall be 20 milliseconds/X where X is a positive whole number. Each device that implements time division for the purposes of maintaining a duplex connection on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 50 parts per millions (ppm). Each device which further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 10 ppm. The jitter (time-related, abrupt, spurious variations in the duration of the frame interval) introduced at the two ends of such a communication link shall not exceed 25 microseconds for any two consecutive transmissions. Transmissions shall be continuous in every time and spectrum window during the frame period defined for the device.

f. The frequency stability of the carrier frequency of the intentional radiator shall be maintained within ± 10 ppm over 1 hour or the interval between channel access monitoring, whichever is shorter. The frequency stability shall be maintained over a temperature variation of -20° to +50° degrees C at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20° C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.

K.3.5.22 Operation within the band 57-64 GHz

1. Operation under the provisions of this section is not permitted for the following products:

a. Equipment used on aircraft or satellites,

b. Field disturbance sensors, including vehicle radar systems, unless the field disturbance sensors are employed for fixed operation. For the purposes of this section, the reference to fixed operation includes field disturbance sensors installed in fixed equipment, even if the sensor itself moves within the equipment.

2. Within the 57-64 GHz band, emission levels shall not exceed the following:

a. For products other than fixed field disturbance sensors, the average power density of any emission, measured during the transmit interval, shall not exceed 9 uW/cm^2, as measured three meters from the radiating structure, and the peak power density of any emission shall not exceed 18 uW/cm^2, as measured three meters from the radiating structure.

b. For fixed field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0-61.5 GHz, the average power density of any emission, measured during the transmit interval, shall not exceed 9 uW/cm^2, as measured three meters from the radiating structure, and the peak power density of any emission shall not exceed 18 uW/cm^2, as measured three meters from the radiating structure. In addition, the average power density of any emission outside of the 61.0-61.5 GHz band, measured during the transmit interval, but still within the 57-64 GHz band, shall not exceed 9 nW/cm, as measured three meters from the radiating structure, and the peak power density of any emission shall not exceed 18 nW/cm^2, as measured three meters from the radiating structure.

c. For fixed field disturbance sensors other than those operating under the provisions of paragraph (b)(2) of this section, the peak transmitter output power shall not exceed 0.1 *m*W and the peak power density shall not exceed 9 nW/cm^2 at a distance of three meters.

d. Peak power density shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-64 GHz band and has a video bandwidth of at least 10 MHz, or using an equivalent measurement method.

e. The average emission limits shall be calculated, based on the measured peak levels, over the actual time period during which transmission occurs.

3. Limits on spurious emissions:

a. The power density of any emissions outside the 57-64 GHz band shall consist solely of spurious emissions.

b. Radiated emissions below 40 GHz shall not exceed the general limits in Section 15.209.

c. Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 *p*W/cm^2 at a distance of three meters.

d. The levels of the spurious emissions shall not exceed the level of the fundamental emission.

4. Only spurious emissions and transmissions related to a publicly-accessible coordination channel, whose purpose is to coordinate operation between diverse transmitters with a view towards reducing the probability of interference throughout the 57-64 GHz band, are permitted in the 57-57.05 GHz band.

NOTE: The 57-57.05 GHz is reserved exclusively for a publicly-accessible coordination channel. The development of standards for this channel shall be performed pursuant to authorizations issued under Part 5 of this chapter.

5. Except as specified below, the total peak transmitter output power shall not exceed 500 mW.

a. Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter output power to the product of 500 *m*W times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, if not stationary during normal operation (e.g. for frequency hopping devices).

b. Peak transmitter output power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-64 GHz, band and that has a video bandwidth of at least 10 MHz, or using an equivalent measurement method.

c. For purposes of demonstrating compliance with this paragraph, corrections to the transmitter output power may be made due to the antenna and circuit loss.

6. Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

7. Regardless of the power density levels permitted under this section, devices operating under the provisions of this section are subject to the radio frequency radiation exposure requirements specified in § 1.1307(b), § 2.1091 and § 2.1093 of this chapter, as appropriate. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

8. Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

9. For all transmissions that emanate from inside a building, within any one second interval of signal transmission, each transmitter with a peak output power equal to or greater than 0.1 *m*W or a peak power density equal to or greater than 3 nW/cm^2, as measured three meters from the radiating structure, must transmit a transmitter identification at least once. Each application for equipment authorization must declare that the equipment that will be used inside a building contains the required transmitter identification feature and must specify a method whereby interested parties can obtain sufficient information, at no cost, to enable them to fully detect and decode this transmitter identification information. Upon the completion of decoding, the transmitter identification data block must provide the following fields:

a. FCC Identifier, which shall be programmed at the factory,

b. Manufacturer's serial number, which shall be programmed at the factory,

c. Provision for at least 24 bytes of data relevant to the specific device, which shall be field programmable. The grantee must implement a method that makes it possible for users to specify and update this data. The recommended content of this field is information to assist in contacting the operator.

K.3.6 OPERATION of NON-LICENSED ULTRAWIDEBAND SYSTEMS (UWB) AND DEVICES

K.3.6.1 Definitions:

ULTRAWIDEBAND (UWB) Bandwidth: UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated fH and the lower boundary is designated fL. The frequency at which the highest radiated emission occurs is designated fM.

Center frequency: The center frequency, fC, equals (fH + fL)/2.

Fractional bandwidth: The fractional bandwidth equals 2(fH - fL)/(fH + fL).

UWB transmitter: An intentional radiator that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

Imaging system: A general category of UWB consisting of ground penetrating radar systems, medical imaging systems, wall imaging systems through-wall imaging systems and surveillance systems. As used in this subpart, imaging systems do not include systems designed to detect the location of tags or systems used to transfer voice or data information.

Ground penetrating radar (GPR) system: A field disturbance sensor that is designed to operate only when in contact with, or within one meter of, the ground for the purpose of detecting or obtaining the images of buried objects or determining the physical properties within the ground. The energy from the GPR is intentionally directed down into the ground for this purpose.

Medical imaging system: A field disturbance sensor that is designed to detect the location or movement of objects within the body of a person or animal.

Wall imaging system: A field disturbance sensor that is designed to detect the location of objects contained within a "wall" or to determine the physical properties within the "wall." The "wall" is a concrete structure, the side of a bridge, the wall of a mine or another physical structure that is dense enough and thick enough to absorb the majority of the signal transmitted by the imaging system. This category of equipment does not include products such as "stud locators" that are designed to locate objects behind gypsum, plaster or similar walls that are not capable of absorbing the transmitted signal.

Through-wall imaging system: A field disturbance sensor that is designed to detect the location or movement of persons or objects that are located on the other side of an opaque structure such as a wall or a ceiling. This category of equipment may include products such as "stud locators" that are designed to locate objects behind gypsum, plaster or similar walls that are not thick enough or dense enough to absorb the transmitted signal.

Surveillance system: A field disturbance sensor used to establish a stationary radio frequency perimeter field that is used for security purposes to detect the intrusion of persons or objects.

EIRP: Equivalent isotropically radiated power, i.e., the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna. The EIRP, in terms of dBm, can be converted to a field strength, in dBV/m at three meters, by adding 95.2. EIRP refers to the highest signal strength measured in any direction and at any frequency from the UWB device, as tested in accordance with the procedures specified later in this section.

Hand held: A hand held device is a portable device, such as a lap top computer or a Personal Data Assistant, that is primarily hand held while being operated and that does not employ a fixed infrastructure.

K.3.6.2 Qualification statements

1. The provisions of Footnote US246 to the Table of Frequency Allocations do not apply to systems and devices operated under this section.

2. A UWB device that contains digital circuitry not directly associated with the operation of the transmitter also is subject to the requirements for unintentional radiators in Section K.2 of this Annex. Similarly, an associated receiver that operates (tunes) within the frequency range 30 MHz to 960 MHz is subject to the requirements for unintentional radiators in Section K.2 of this Annex K.

K.3.6.3 Technical requirements for low frequency imaging systems

1. The UWB bandwidth of an imaging system operating under the provisions of this Section must be below 960 MHz.

2. Operation under the provisions of this section is limited to GPRs, wall and through-wall imaging systems. These systems require coordination, as detailed in Section K.3.6.9 of this Annex.

3. An imaging system shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In addition, it is permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator.

4. The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in Section K.3.4 of this Annex. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960-1610	-65.3
1610-1990	-53.3
Above 1990	-51.3

5. In addition to the radiated emission limits specified in the above table, UWB transmitters shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164-1240	-75.3
1559-1610	-75.3

6. The peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM, shall not exceed 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described Section K.3.6.10.

K.3.6.4 Technical requirements for mid-frequency imaging systems

1. The UWB bandwidth of an imaging system operating under the provisions of this section must be contained between 1990 MHz and 10,600 MHz.

2. Operation under the provisions of this section is limited to through-wall imaging systems and fixed surveillance systems. These systems require coordination as detailed in Section K.3.6.9 of this Annex.

3. A through-wall imaging system shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In addition, it is permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator.

4. The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in Section K.3.4 of this Annex. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960-1610	-53.3
1610-1990	-51.3
1990-10600	-41.3
Above 10600	-51.3

5. In addition to the radiated emission limits specified in the above table, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164-1240	-63.3
1559-1610	-63.3

6. The peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM, shall not exceed 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described Section K.3.6.10.

K.3.6.5 Technical requirements for high frequency imaging systems

1. The UWB bandwidth of an imaging system operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

2. Operation under the provisions of this section is limited to GPRs and wall imaging systems and medical imaging systems used at the direction of, or under the supervision of, a licensed health care practitioner. The operation of these systems requires coordination, as detailed in Section K.3.6.9 of this Annex.

3. An imaging system shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In addition, it is permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator.

4. The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in Section K.3.4 of this Annex. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960-1610	-65.3
1610-1990	-53.3
1990-3100	-51.3
3100-10600	-41.3
Above 10600	-51.3

5. In addition to the radiated emission limits specified in the above table, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164-1240	-75.3
1559-1610	-75.3

6. The peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM, shall not exceed 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described later in Section K.3.6.10.

K.3.6.6 Technical requirements for indoor UWB systems

1. Operation under the provisions of this section is limited to UWB transmitters employed solely for indoor operation.

a. Indoor UWB devices, by the nature of their design, must be capable of operation only indoors. The necessity to operate with a fixed indoor infrastructure, e.g., a transmitter that must be connected to the AC power lines, may be considered sufficient to demonstrate this.

b. The emissions from equipment operated under this section shall not be intentionally directed outside of the building in which the equipment is located, such as through a window or a doorway, to perform an outside function, such as the detection of persons about to enter a building.

c. The use of outdoor mounted antennas, e.g., antennas mounted on the outside of a building or on a telephone pole, or any other outdoors infrastructure is prohibited.

d. Field disturbance sensors installed inside of metal or underground storage tanks are considered to operate indoors provided the emissions are directed towards the ground.

e. A communications system shall transmit only when the intentional radiator is sending information to an associated receiver.

2. The UWB bandwidth of a UWB system operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

3. The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in Section K.3.4 of this Annex. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960-1610	-75.3
1610-1990	-53.3
1990-3100	-51.3
3100-10600	-41.3
Above 10600	-51.3

4. In addition to the radiated emission limits specified in the above table, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164-1240	-85.3
1559-1610	-85.3

5. The peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM, shall not exceed 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described Section K.3.6.10.

6. UWB systems operating under the provisions of this section shall bear the following or similar statement in a conspicuous location on the device or in the instruction manual supplied with the device: *"This equipment may only be operated indoors"*

K.3.6.7 Technical requirements for handheld UWB systems

1. UWB devices operating under the provisions of this section must be hand held, i.e., they are relatively small devices that are primarily hand held while being operated and do not employ a fixed infrastructure.

a. A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgment from the associated receiver that its transmission is being received. An acknowledgment of reception must continued to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

b. The use of antennas mounted on outdoor structures, e.g., antennas mounted on the outside of a building or on a telephone pole, or any fixed outdoors infrastructure is prohibited. Antennas may be mounted only on the hand-held UWB device.

c. UWB devices operating under the provisions of this section may operate indoors or outdoors.

2. The UWB bandwidth of a device operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

3. The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in Section K.3.4 of this Annex. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960-1610	-75.3
1610-1990	-63.3
1990-3100	-61.3
3100-10600	-41.3
Above 10600	-61.3

4. In addition to the radiated emission limits specified in the above table, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164-1240	-85.3
1559-1610	-85.3

5. The peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM, shall not exceed 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described Section K.3.6.10.

K.3.6.8 Technical requirements applicable to all UWB devices

1. Operation of UWB devices onboard an aircraft, a ship or a satellite is not prohibited. However, because of safety concerns, use by passengers aboard such vessels is prohibited. Moreover, UWB systems involving mission critical or safety of life services, which must be protected from other emitters, or involving aggregations of UWB devices aboard several mobile platforms cannot be operated under these provisions.

2. Digital circuitry that is used only to enable the operation of a transmitter and that does not control additional functions or capabilities is not classified as a digital device. Instead, the emissions from that digital circuitry are subject to the same limits as those applicable to the transmitter. If it can be clearly demonstrated that an emission from a UWB transmitter is due solely to emissions from digital circuitry contained within the transmitter and that the emission is not intended to be radiated from the transmitter's antenna, the limits shown in Section K.3.4 of this Annex shall apply to that emission rather than the limits specified in this section.

3. Within the tables in the above rule sections, the tighter emission limit applies at the band edges. Radiated emission levels at and below 960 MHz are based on measurements employing a CISPR quasi-peak detector. Radiated emission levels above 960 MHz are based on RMS average measurements over a 1 MHz resolution bandwidth. The RMS average measurement is based on the use of a spectrum analyzer with a resolution bandwidth of 1 MHz, an RMS detector, and a 1 millisecond or less averaging time. If pulse gating is employed where the transmitter is quiescent for intervals that are long compared to the nominal pulse repetition interval, measurements shall be made with the pulse train gated on.

4. The frequency at which the highest radiated emission occurs, fM, must be contained within the UWB bandwidth.

5. Imaging systems may be employed only for the type of information exchange described in their specific definitions contained earlier in this section. The detection of tags or the transfer or data or voice information is not permitted under the standards for imaging systems.

6. When a peak measurement is required, it is acceptable to use a resolution bandwidth other than the 50 MHz specified in this subpart. This resolution bandwidth shall not be lower than 1 MHz or greater than 50 MHz, and the measurement shall be centered on the frequency at which the highest radiated emission occurs, fM. If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be 20 log (RBW/50) dBm where RBW is the resolution bandwidth in megahertz that is employed. This may be converted to a peak field strength level at 3 meters using E(dBμV/m) = P(dBm EIRP) + 95.2.

7. The highest frequency employed in Section K.1.6 of this Annex to determine the frequency range over which radiated measurements are made shall be based on the center frequency, fC, unless a higher frequency is generated within the UWB device. For measuring emission levels, the spectrum shall be investigated from the lowest frequency generated in the UWB transmitter, without going below 9 kHz, up to the frequency range shown in Section K.1.6of this Annex or up to fC + 3/(pulse width in seconds), whichever is higher. There is no requirement to measure emissions beyond 40 GHz provided fC is less than 10 GHz; beyond 100 GHz if fC is at or above 10 GHz and below 30 GHz; or beyond 200 GHz if fC is at or above 30 GHz.

8. Agencies are reminded of the other standards and requirements in this Annex such as a limit on emissions conducted onto the AC power lines.

K.3.6.9 Coordination requirements

1. UWB imaging systems require coordination through the FAS before the equipment may be used. The operator shall comply with any constraints on equipment usage resulting from this coordination.

2. The users of UWB imaging devices shall supply detailed operational areas to NTIA. The information provided by the UWB operator shall include the name, address and other pertinent contact information of the user, the desired geographical area of operation, and the FCC ID number and other nomenclature of the UWB device.

3. Users of authorized, coordinated UWB systems may transfer them to other qualified users and to different locations upon coordination of change of ownership or location with the FAS and coordination with existing authorized operations.

4. The FAS coordination report shall include any needed constraints that apply to day-to-day operations. Such constraints could specify prohibited areas of operations or areas located near authorized radio stations for which additional coordination is required before operation of the UWB equipment. If additional local coordination is required, a local coordination contact will be provided.

K.3.6.10 Measurement Procedures

These measurement procedures are intended to provide general guidance for compliance measurements of UWB devices developed pursuant to Section 7.9 of this Manual. Except as otherwise described herein, measurements shall be made in accordance with the procedures specified in Part 15 of Title 47 of the Code of Federal Regulations.

a. Ground penetrating radars (GPRs) and wall imaging systems shall be tested under conditions that are representative of actual operating conditions. UWB devices intended for these types of application shall be compliance tested with the transducer at an operationally representative height above a twenty-inch thick bed of dry sand. The use of this medium, particularly for larger GPRs (e.g., those that are towed behind vehicles), will likely preclude the use of a turntable in the measurement procedure. For these cases, directionality gradients shall be analyzed and measurements shall be performed at a sufficient number of radials around the equipment under test to determine the radial at which the field strength values of the radiated emissions are maximized.

b. Field strength measurements of through-wall imaging systems may be made with a "thick gypsum or drywall board placed between the UWB device antenna and the measurement system antenna.

c. RMS average field strength measurements, required for all frequencies above 960 MHz, shall be made using techniques to obtain true RMS average. This can be accomplished by using a spectrum analyzer that incorporates a RMS detector. The resolution bandwidth of the analyzer shall be set to 1 MHz, the RMS detector selected, and a video integration time of 1 ms or less is to be used. If the transmitter employs pulse gating, in which the transmitter is quiescent for intervals that are long compared to the nominal pulse repetition interval, all measurements shall be made while the pulse train is gated on. Alternatively, a true RMS level can be measured using a spectrum analyzer that does not incorporate a RMS detector. This approach requires a multiple step technique beginning with a peak detection scan of the UWB spectrum with a RBW of 1 MHz and a VBW of no less than 1 MHz. The resulting trace is to be used to identify the frequency and bandwidth of the five highest peaks in the spectrum. The analyzer is then to be placed in a "zero span" mode, with a RBW of 1 MHz, a video bandwidth equal to or greater than 1 MHz, and a detector selected that does not distort or smooth the instantaneous signal levels (e.g., a "sample" detector). With these settings, a minimum of ten independent instantaneous points, representing the highest amplitude readings, are to be obtained during the time that a pulse is present, in each 1 MHz frequency bin across the bandwidth of each of the five highest peaks identified in the previous step. Note that when the PRF of the device under test is less than the measurement bandwidth of 1 MHz, a significant number of samples may be required to ensure that a minimum of 10 samples with the pulse present are obtained. The data obtained from these measurements must then be post-processed to determine true RMS average power levels. The post-processing of the data can be performed manually or with the aid of appropriate software.

d. On any frequency or frequencies below or equal to 960 MHz, the field strength shall be measured with equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified.

e. In the frequency bands 1164-1240 MHz and 1559-1610 MHz, average radiated field strength measurements shall be made with a resolution bandwidth of no less than 1 kHz, using techniques as described previously for determining true RMS average power levels.

f. Peak radiated emission measurements shall be made using a spectrum analyzer with a 3 MHz resolution bandwidth and no less than a 3 MHz video bandwidth. The analyzer should be used in a maximum-hold trace mode. The peak power level expressed in a 3 MHz bandwidth and the frequency at which this level was measured shall be reported in the application for certification. A different resolution bandwidth between 1 MHz and 50 MHz may be employed with appropriate changes to the standard. If a resolution bandwidth greater than 3 MHz is employed, a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing must be submitted to the Commission. It is recommended that measurements using a resolution bandwidth greater than 3 MHz be coordinated with the Commission's laboratory staff in advance of the submission for certification.

g. Field strength measurements may be performed without the use of a ground plane; however, a factor of 4.7 dB must be added to the measurement results thus obtained.

h. To the extent practicable, the device under test should be measured at the distance specified in the appropriate section of this Annex. However, in order to obtain an adequate signal-to-noise ratio in the measurement system, radiated measurements may have to be made at distances less than specified. In these cases, measurements may be performed at a distance other than what is specified, provided: measurements are not made in the near field of the measurement or device under test antenna, except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and, it can be demonstrated that the signal levels necessitated a measurement at the distance employed in order to be accurately detected by the measurement equipment.

i. To the maximum extent possible, field strength measurements should be performed with the equipment under test positioned as it is intended to be used in actual operating conditions.

j. Radiated field strength measurements must be made using the antenna to be employed with the UWB device under test. The measurement antenna must be sufficiently broad band to cover the frequency range of the measurements, and the use of multiple measurement antennas may be required. All measurement antennas used must be accurately calibrated and must demonstrate low phase dispersion over the frequency range of measurement. The orientation of the measurement antenna shall be varied to determine the polarization that maximizes the measured field strength.

k. The spectrum to be investigated should include at least the fundamental emission and the secondary lobe regardless of the center frequency. In order to accomplish this, the frequency spectrum shall be investigated from the lowest frequency generated within the device, without going below 9 kHz, up to the frequency range shown in Section K.1.6 of this Annex. up to an upper frequency defined by adding three divided by the pulse width in seconds to the center frequency in Hz, whichever is greater. The frequency range in Section K.1.6 is based on the center frequency unless a higher frequency, e.g., a carrier frequency, is generated within the device. There is no requirement to measure emissions beyond 40 GHz provided the center frequency is less than 10 GHz; beyond 100 GHz if the center frequency is at or above 10 GHz and below 30 GHz; or beyond 200 GHz if the center frequency is at or above 30 GHz.

K.4 CONVERSION FORMULAS

To convert from EIRP (i.e., product of the power supplied to the antenna and the antenna gain) values to field strength use the formula:

$$E = \frac{(30 \times P_t \times G_t)^{1/2}}{R}$$

where:

E = Field Strength, V/m
P = Power supplied to the antenna, watts
G = Numerical antenna gain ratio relative to isotropic at the given frequency
R = Distance, meters

This formula assumes wave spreading (i.e., "free-space") losses only.

The power supplied to the antenna is the transmitter output power less any line losses. In most cases, the line losses for these devices are difficult to quantify.

Example: Determine if a field disturbance sensor operating at a frequency of 915 MHz with a power output of 1 mW, no line losses and an antenna gain of 3 dBi meets the field strength criterion in Section K.3.5.16 of this Annex.

Step 1: Convert the decibel antenna gain to a numerical ratio.
Numerical gain ratio = 10 (decibel value/10)
= 10 (3/10)
= 2

Step 2: Use the EIRP to field intensity conversion formula.

$$E = \frac{(30 \times 0.001 \times 2)^{1/2}}{3}$$

E=0.0816 V/m = 81,600 μV/m

Since the criterion is 500,000 μV/m at 3m, the device meets the indicated criterion in Section K.3.5.16 and can be operated without further authority from the Assistant Secretary as indicated in Section 7.9 of this manual.

K.5 CROSS-REFERENCE OF NON-LICENSE DEVICE STANDARDS IN ANNEX K AND THOSE IN THE FCC CFR 47 PART 15.

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ANNEX L

Freely Associated States

L.1 INTRODUCTION

The United States has administered the United Nations Trust Territory of the Pacific Islands (TTPI) since July, 1947. The area involved now includes four separate political jurisdictions: the Commonwealth of the Northern Mariana Islands (CNMI) (see Possessions or Commonwealths of the United States in Annex G, Part 2); the Federated States of Micronesia (FSM); the Republic of the Marshall Islands (RMI); and the Republic of Palau (RP). During negotiations on the TTPI's future, the United States offered the status of United States territory to each jurisdiction. Elected representatives of FSM, RMI, and RP rejected that status in favor of a different relationship involving greater local autonomy but retaining strong ties with the United States. While this concept of "free association" has no precise definition in international law, it is recognized in resolutions of the United Nations General Assembly as an appropriate political alternative to independence or metropolitan (territorial) status for political entities emerging from a colonial or trusteeship status.

The United States concluded Compacts of Free Association with the Governments of the Federated States of Micronesia and the Republic of the Marshall Islands in 1982 and 1983, respectively. Following approval by those island nations, the Compacts were approved in the United States by Public Law 99-239 of January 14, 1986 ("Compact of Free Association Act of 1985") and entered into force later in 1986. A similar Compact of Free Association was concluded with the Republic of Palau and subsequently approved by the United States in 1986. However, Palau did not complete its approval process until much later and the Compact did not enter into force until October, 1994.

The Compacts with the FSM, RMI and Palau are extensive. Article III includes provisions on communications and the operation of U.S. telecommunications services in the Islands. Specifically, Section 131 deals with the United States role as representative for the Freely Associated States in the International Telecommunication Union and with Federal Communications Commission's jurisdiction over earth terminal stations owned or operated by U.S. common carriers. Section 132 deals with the operation of U.S. telecommunications services, including the installation and operation of facilities and the use of associated radio frequencies. In addition, there are supplementary agreements which establish the authority and responsibilities of our respective Governments under Sections 131 and 132 of the Compacts. Two major provisions are that each Signatory Government must designate a "Competent Authority to carry out the provisions of the agreements and that a "Joint Telecommunication Board" be established with each of the Island nations to harmonize telecommunication operations of the United States with the respective Governments.

On October 16, 1986, the President signed Executive Order 12569 on management of the Compacts which vested authority and responsibility in the Secretary of State to ensure that the obligations of the United States as set forth in the Compacts and their related agreements are carried out. E.O. 12569 also required the Department of the Interior to seek appropriation of funds and to make available economic and financial assistance appropriated pursuant to the Compacts.

On June 30, 1987, the Department of State's Office of Radio Spectrum Policy (previously the Office of International Radio Communications), Bureau of Economics and Business Affairs, was designated by the Assistant Secretary of State for East Asian and Pacific Affairs as the "Competent Authority" to act on behalf of the United States in carrying out the Section 131 and 132 Agreements. On July 9, 1987, the National Security Council acknowledged this appointment. The Office of Radio Spectrum Policy has established and provides the chairman for an Interagency Working Group on Micronesia responsible for telecommunications issues pertaining to the Freely Associated States, including preparation for meetings of the Joint Telecommunication Boards.

L.2 AUTHORITY FOR USE OF THE RADIO FREQUENCY SPECTRUM

As sovereign Governments, the Federated States of Micronesia (FSM), the Republic of the Marshall Islands (RMI), and the Republic of Palau have full authority and responsibility to regulate their respective domestic and foreign communications, including use of the radio spectrum. Section 132 of the Compacts, however, requires the FSM, RMI and Palau to permit the U.S. Government to operate telecommunications services to the extent necessary to fulfill its obligations under the Compact. Concurrently, the United States is obliged to coordinate changes to telecommunications facilities and extraordinary activities or exercises to avoid interference.

The requirement to coordinate facilities and to avoid radio interference was given a high priority at the first meetings of the Joint Telecommunication Boards, resulting in the adoption of procedures for the assignment of radio frequencies in the FSM, RMI and Palau. Under these procedures, the Competent Authority for the United States, i.e., the Department of State's Office of Radio Spectrum Policy, issues frequency authorizations to U.S. Government agencies after appropriate coordination with the respective Governments.

L.3 PROCEDURES FOR OBTAINING A FREQUENCY AUTHORIZATION

Submission of frequency assignment applications to the Frequency Assignment Subcommittee (FAS) for inclusion in the Government Master File (GMF) for record purposes is required for a Federal radio station to use a radio frequency within the Freely Associated States. Except for Department of Defense (DoD) use of the radio spectrum within 200 nautical miles of the U.S. Army Kwajalein Atoll in the Republic of the Marshall Islands, the Department of the Interior, acting on behalf of the Competent Authority, will effect the necessary coordination with the FSM, RMI and Palau before recommending approval to the Competent Authority.

The islands administered by the Republic of the Marshall Islands (State/Country abbreviation -MHL), the Federated States of Micronesia (State/Country abbreviation - FSM), and the Republic of Palau (State/Country abbreviation -PLW) are listed in Annex G, Part 2.

Procedures for the U.S. Army Kwajalein Atoll, Republic of the Marshall Islands (RMI)

All Department of Defense (DoD) users who want to operate a system or equipment which emits a hertzian wave requiring temporary or permanent spectrum assignments within 200 nautical miles of the U.S. Army Kwajalein Atoll, Republic of Marshall Islands must comply with the following:

a. Temporary frequency assignments for a maximum of 60 days.

1. Equipment/systems must be spectrum certified.

2. Users must submit a frequency proposal at least 90 days prior to the required date of use to the Frequency Manager Kwajalein Missile Range with an information copy to JFMO PAC, Honolulu, HI and the appropriate MILDEF frequency management office (i.e. AFFMA, NAVEMSCEN, US Army CESO) in the standard frequency action format (SFAF).

3. The Frequency Manager Kwajalein Missile Range will thoroughly review the request against all the assignments in the Kwajalein database and forward them to JFMC PAC, Honolulu, HI for action with comments.

4. JFMO PAC will review the frequency proposals and crosscheck them against the Department of State (DoS) master frequency list of assignments/frequency bands coordinated with the Republic of Marshall Islands (RMI). Frequency proposals which fall within the DoS master frequency list of coordinated assignments will be processed, and those frequency proposals not covered by the master list of assignments will be forwarded to the Department of State by JFMOPAC with an information copy to the appropriate MILDEP for action.

b. Permanent Frequency Assignments

1. In order to obtain a permanent frequency assignment, equipment/systems must be spectrum certified.

2. A user must submit a frequency proposal via the Frequency Resource Record System (FRRS) to the Frequency Manager Kwajalein Missile Range in the SFAF. The Frequency Manager Kwajalein Missile Range will review the frequency proposal, recommend a frequency, assign a PAC serial number (i.e. PAC YY6000-YY6999), and forward it to JFMO PAC.

3. JFMO PAC will review the frequency proposal and crosscheck it against the Department of State (DoS) master frequency list of assignments/frequency bands coordinated with the Republic of Marshall Islands (RMI). Upon completion of the validation process, JFMO PAC will forward the permanent frequency assignment to the appropriate MILDEP for inclusion in the Government Master File (GMF). If the proposal does not fall within the DoS master frequency list of assignments/frequency bands coordinated with the RMI, see paragraph 6 below.

4. The Frequency Manager Kwajalein Missile Range will be required to maintain an accurate database of all temporary and permanent assigned frequencies within 200 nautical miles of U.S. Army Kwajalein Atoll, RMI, for coordination of frequency assignments and resolution of reported interference.

5. The Frequency Manager Kwajalein Missile Range, in coordination with appropriate user agencies, will ensure that five-year assignment record reviews are conducted for all permanent frequency assignments within the Kwajalein area of responsibility.

6. If the frequency proposal does not fall within an assignment in the DoS master list, JFMO PAC will submit the proposal to the Department of State for coordination with the RMI with an information copy to the appropriate MILDEP frequency management office. Upon approval from the Department of State, JFMO PAC will request that the Frequency Manager Kwajalein Missile Range assign a PAC serial number and process the request per the above procedures.

L.4 REVIEW PROCEDURE FOR COMMUNICATIONS SYSTEMS

Federal agencies planning to use, develop, procure or experiment with telecommunication systems requiring the use of radio frequencies in the Federated States of Micronesia, the Republic of the Marshall Islands or the Republic of Palau may be required to undergo system review prior to receiving frequency authorization from the Competent Authority. This procedure applies to:

a. new telecommunications systems or subsystems, and major modifications to existing systems or subsystems, involving the use of satellites or spacecraft; and,

b. new major terrestrial systems or subsystems, and major modifications to existing systems or subsystems.

The Competent Authority will apply this procedure on a case-by-case basis when it is necessary to determine the impact of a new telecommunications system on other authorized or planned systems. When a system review is required, affected non-DoD agencies shall provide the appropriate data (in accordance with Chapter 10 of the NTIA Manual) to the Department of State which may submit it to the Spectrum Planning Subcommittee (SPS) for consideration. DoD services and agencies shall submit such documentation through established military system review channels to the Department of State. NTIA and/or the military review channels will provide recommendations, particularly with respect to spectrum support and potential for interference, to the Competent Authority which shall make the final decision in consultation with the Government involved.

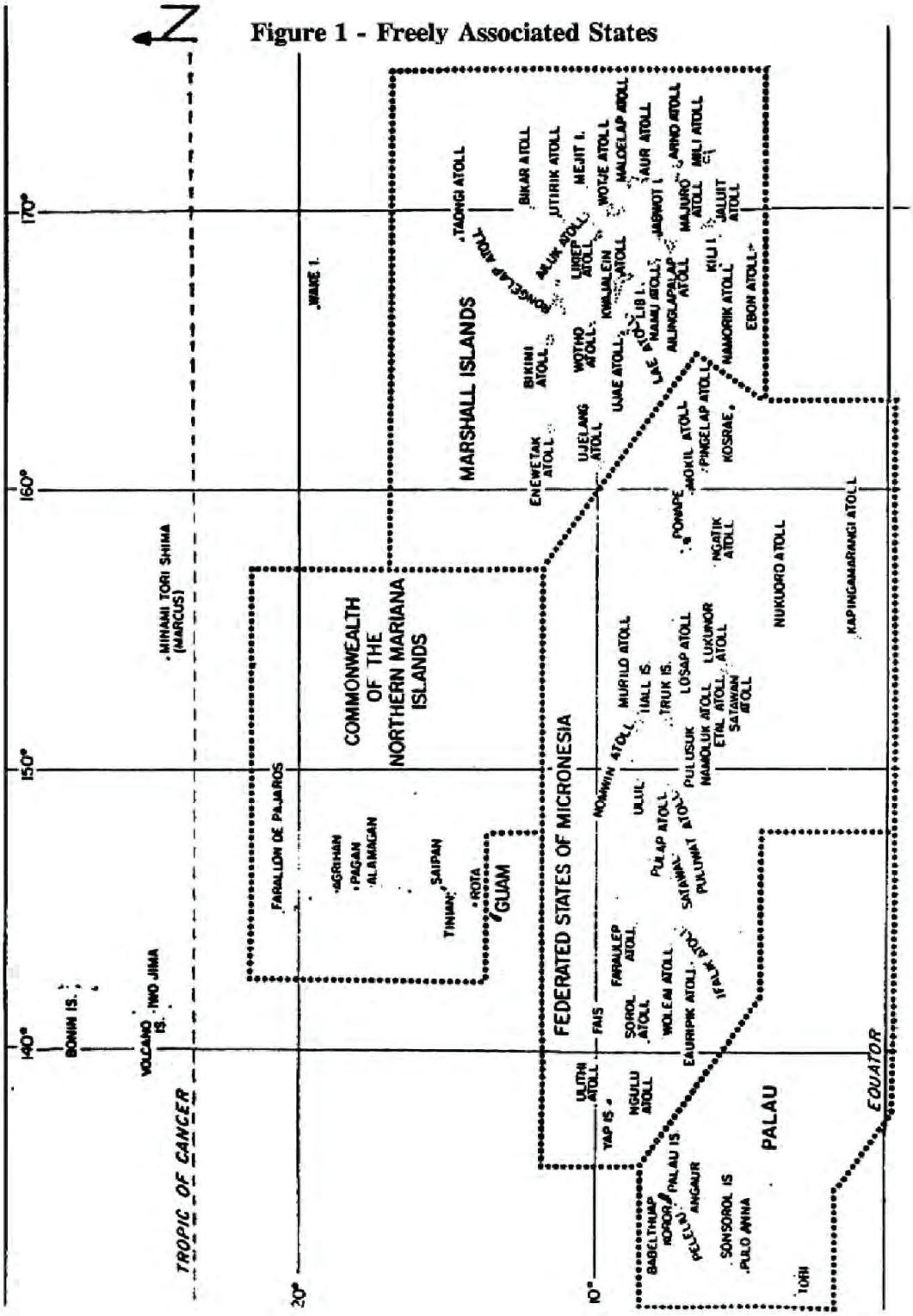

Figure 1 - Freely Associated States

(Last Page In Annex L)

ANNEX M

Measurement Methods

M.1 GENERAL

M.1.1 Introduction

Chapter 5 of this Manual contains Radio Frequency Spectrum Standards applicable to Federal radio stations and systems. This Annex supplements Chapter 5 with the measurement methods appropriately referenced from the various sections of Chapter 5. A measurement method, in turn, is referenced back to Chapter 5. Cross-references to the FCC CFR and/or other measurement method procedures are also provided in this annex.

M.1.2 Measurement Methods

1. Measurement methods included or referenced in this annex are provided only for clarification and uniform interpretation of the standards. In cases of harmful interference, the agencies involved are expected to utilize these or equivalent, mutually agreed upon, methods of measurement for resolution of any disagreement concerning compliance with the standards. Agencies may, at their discretion, use these measurement methods as minimum qualification test procedures, e.g., as part of factory test procedures.

2. NTIA standards are available for purchase from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. Electronic Industries Association and Telecommunications Industry Association (EIA/TIA) standards may be obtained by calling Global Engineering Documents (1-800-854-7179).

M.1.3 Resolution Bandwidth

Resolution bandwidth is the 3 dB bandwidth of the measurement system used, e.g., in power spectral density measurements. The appropriate resolution bandwidth of the measurement system varies depending on the modulation type and frequency band but should not be greater than the necessary bandwidth of the transmitter being measured.

M.2 MEASUREMENT METHODS

M.2.1 FIXED AND MOBILE SERVICES

A. Fixed and Mobile Single Sideband and Independent Sideband Equipment (2-29.7 MHz)

This measurement method is referenced from Section 5.3.1. For HF single sideband transmitters, the transmitter without a device to limit modulation or peak envelope power shall be modulated as follows. The input level of the modulating signal shall be that necessary to produce rated peak envelope power. HF single sideband transmitters in J3E, H3E, or R3E emission modes shall be modulated by two tones at frequencies on 400 Hz and 1800 Hz (for 3.0 kHz authorized bandwidth), applied simultaneously. The input levels of the tones shall be so adjusted that the two principal frequency components of the radio frequency signal produced are equal in magnitude and 3 dB below the maximum received signal level (RSL) as indicated in Figure 5.3.1 of Chapter 5. The plot of the spectrum shall have a span of 21.1 kHz or that necessary to identify intermodulation products up through the 13th and a resolution bandwidth of 100 Hz. This measurement method is also contained in Title 47 CFR Section 2.989 (d)(2).

B. Maritime Mobile, FM Operation (150.8 - 162.0125 MHz)

This measurement method is referenced from Section 5.2.1, see Note (q). The Measurement method for frequency tolerances to be used is as given in the Electronic Industries Association (EIA) Standard TIA/EIA-603, Land Mobile FM or PM Communications Equipment Measurement and Performance Standards (ANSI/TIA/EIA-603-92), Chapters 2, 3 and 4, or equivalent.

C. Fixed Services (406.1 - 420 MHz, 932 - 935/941 - 944 MHz, and 1.71 - 15.35 GHz)

1. Transmitter Standards

a. Measurement Method for Frequency Tolerance of Transmitter (referenced from Section 5.2.1, see Note (u)): A sample of the unmodulated carrier at the center frequency should be measured with equipment having an accuracy of at least five times that of the minimum to be measured.

b. Measurement Method for Unwanted Emissions of Transmitters Employing Digital Modulation Techniques (referenced from Section 5.5.3): A sample of the transmitter output at the interface point with the antenna transmission line shall be measured using a measurement system with 4 kHz resolution bandwidth. The full unmodulated carrier power output is used as the transmitter average output reference.

c. Measurement of the unwanted emissions shall be made from the lowest radio frequency generated by the equipment to the third harmonic of the carrier with the transmitter modulated as follows:

(1) Analog-white noise generator in accordance with EIA RS-252A recommended loading levels.

(2) Digital-pseudorandom code generator with appropriate loading levels and format.

2. Receiver Standards

a. Receiver Intermediate Frequency (IF) Measurement Method, (referenced from Section 5.3.3): The IF shall be measured with equipment having an accuracy of at least five times greater than the frequency tolerance to be measured. The measurement shall be made with an unmodulated input signal on the assigned frequency coupled to the input of the receiver at a level greater than 20 dB above the receiver ambient noise.

b. Receiver Unwanted Signals Measurement Method, (referenced from Section 5.3.3): Couple two signal generators to the input of the receiver and connect a spectrum analyzer to the baseband output. The unmodulated output of one signal generator (desired signal) on the assigned frequency shall be adjusted to reduce the baseband noise by 3 dB as observed on the spectrum analyzer. The unmodulated output of the second signal generator (unwanted signals) shall be adjusted to 70 dB above that of the desired signal. The output frequency of the unwanted signals shall be varied over a range of ±1 percent of the assigned frequency excluding frequencies within the receiver 60 dB selectivity bandwidth.

c. At each receiver response of the unwanted frequency, adjust the output of the unwanted signal generator for a 3 dB reduction in baseband noise. The difference, expressed in dB, in the output levels of the two signal generators is the unwanted signal attenuation.

D. Land Mobile, Single Channel Narrowband Operations (220 - 222 MHz)

1. This measurement method is referenced from 5.3.4. A sample of the unmodulated carrier at the center frequency should be measured with equipment having an accuracy of at least five times that of the minimum to be measured.

2. Measurement Method for Resolution Bandwidth. The resolution bandwidth of the instrumentation used to measure the emission power shall be 100 Hz for measuring emissions up to and including 250 kHz from the edge of the authorized bandwidth, and 10 kHz for measuring emissions more than 250 kHz from the edge of the authorized bandwidth. If a video filter is used, its bandwidth shall not be less than the resolution bandwidth. The power level of the highest emission within the channel to which the attenuation is referenced shall be remeasured for each change in resolution bandwidth.

3. Additional guidelines may be obtained from the latest revision of Electronic Industries Association (EIA) TSB-57, Sideband Spectrum Measurement Procedure for Transmitters Intended for Use in the 220-222 MHz Band. Modulation is referenced to FCC regulations (CFR 47 2.989).

E. Analog or Digital FM/PM Operations

1. Wideband (29.7 - 50, 162 - 174, and 406.1 - 420 MHz)

a. Measurement Methods for Transmitter Frequency Deviation and Receiver Conducted Spurious Emissions, All Station Classes and Bands, (referenced from Section 5.3.5.1): The prescribed measurement methods to be used are given in the latest revision of Electronic Industries Association (EIA) Standard TIA/EIA-603, Land Mobile FM or PM Communications Equipment Measurement and Performance Standards (ANSI/TIA/EIA-603-92), Chapters 2, 3 and 4.

The present EIA measurement methods were written for analog systems. Some of these methods are not appropriate for digital systems. Appropriate analog to digital or digital to analog test sets will have to be used.

b. Measurement Method for Frequency Tolerance, (referenced from Section 5.2.1, see Note (i)): An unmodulated standard input signal source, adjusted to the standard input frequency as specified in the latest revision of Electronic Industries Association (EIA) Standard RS-204, Minimum Standards for Land Mobile Communications FM or PM Transmitter, 25 - 866 MHz shall be connected to the receiver under test and adjusted for an output of 20 dB above the receiver sensitivity. The center frequency of the IF passband shall be measured with equipment having a degree of accuracy of at least five times the minimum tolerance to be measured.

2. Narrowband (138 - 150.8, 162 - 174, and 406.1 - 420 MHz Bands)

a. Transmitter and Receiver Measurement Methods (referenced from Section 5.3.5.2): The measurement methods to be used are as given in the Telecommunications Industries Association standard TIA/EIA-603-C for narrowband analog equipment, and TIA-102.CAAA-B for narrowband digital equipment. Where these methods are not specified for a particular system type, appropriate test procedures should be applied.

F Wideband and Narrowband Emission Level and Temporal Measurements in the Navstar Global Positioning System Bands

1. The wideband and narrowband radiated equivalent isotropically radiated power (EIRP) levels in the 1164-1240 MHz and 1559-1610 MHz frequency bands are to be measured for systems operating in the frequency bands: 390-413 MHz, and 960-1710 MHz. The following guidelines are to be used in measuring the wideband and narrowband EIRP levels:

a. The radiated EIRP levels in these frequency bands are to be measured using a root mean square (RMS) spectrum analyzer detector function.

b. The wideband emission levels are to be measured using a 1 MHz resolution bandwidth.

c. The narrowband emission levels are to be measured using a 1 kHz resolution bandwidth.

d. For the wideband emission measurement, the RMS levels are to be measured using a 2 millisecond averaging time over each 1 MHz segment.

e. The video bandwidth of the spectrum analyzer should not be less than the resolution bandwidth.

f. The measurement system must have a noise floor of approximately -141 dBW as measured in a 1 MHz resolution bandwidth.

2. The following guidelines are to be used in measuring the temporal characteristics of the emissions in the 1164.45-1188.45 MHz, 1215.6-1239.6 MHz, and 1563.42-1587.42 MHz bands:

a. The system under test should be tuned to its assignable channel that is closest to the GPS frequency band under consideration.

b. A time-domain measurement of the waveform envelope in a 20 MHz bandwidth can be measured using an antenna with appropriate gain and frequency response characteristics connected to either a notch filter or a bandstop filter. The filter is connected to a low noise amplifier (LNA) that operates across the frequency range of at least 1100-1600 MHz. The LNA is connected to a vector signal analyzer (VSA).

c. Tune the VSA sequentially to the 1164.45-1188.45 MHz, 1215.6-1239.6 MHz, and 1563.42-1587.42 MHz bands and perform time-domain measurements using the full VSA bandwidth of 36 MHz.

d. Subsequent to the data capture, the time-domain waveform envelopes are processed in a 20 MHz bandwidth.

e. Alternative techniques to perform these measurements should be provided to NTIA for review.

M.2.2 Radar Spectrum Engineering Criteria (RSEC)

A. General including RSEC-A

This measurement method is referenced from Section 5.5.1. NTIA Report 84-157 (NTIS Accession No. PB 85-119022), Measurement Procedures for the Radar Spectrum Engineering Criteria, August 1984, presents one or more test procedures(s) for each of the equipment parameters covered by RSEC that will yield adequate measured data for checking against the RSEC. These test procedures are not meant to replace any existing agency radar measurement procedures.

B. RSEC B

This measurement method is referenced from Section 5.5.2. In order to coordinate radar operations in the field, an accurate measurement of the operating frequency is necessary. An accuracy of 1 ppm is desirable, although, for most radars 100 ppm is adequate. Of comparable importance is the capability to measure pulse rise time and spectrum occupancy. Accordingly, each Federal agency shall have access to the instrumentation necessary to make a frequency measurement to at least 100 ppm and suitable oscilloscopes and spectrum analyzers to measure time and frequency parameters necessary to determine conformance with these criteria. For fast rise devices, such as magnetrons, oscilloscopes with bandwidths of at least 50 MHz should be used.

C. RSEC C and RSEC D

This measurement method is referenced from Sections 5.5.3 and 5.5.4. In order to coordinate radar operations in the field, an accurate measurement of the operating frequency is necessary. An accuracy of 100 ppm is adequate. Of comparable importance is the capability to measure pulse rise time and spectrum occupancy. Accordingly, each Federal agency shall have access to the instrumentation necessary to make a frequency measurement to at least 100 ppm and suitable oscilloscopes and spectrum analyzers to measure time and frequency parameters necessary to determine conformance with these criteria. For fast rise devices, such as magnetrons, oscilloscopes with bandwidths of at least 50 MHz should be used.

D. RSEC E

This measurement method is referenced from Section 5.5.5. In order to coordinate radar operations in the field, an accurate measurement of the operating frequency is necessary. An accuracy of 1 ppm is adequate. Of comparable importance is the capability to measure pulse rise time and spectrum occupancy. Accordingly, each Federal agency shall have access to the instrumentation necessary to make a frequency measurement to at least 1 ppm and suitable oscilloscopes and spectrum analyzers to measure time and frequency parameters necessary to determine conformance with these criteria. Measurement instruments shall have resolution bandwidths of at least 10 kHz to measure close in bandwidth limits, and otherwise 100 kHz bandwidth below 1 GHz and 1 MHz bandwidth at and above 1 GHz should be used.

(Last Page in Annex M)

ANNEX N

Special Considerations for Federal Travelers Information Stations Operating on 1610 kHz

N.1 Federal Travelers Information Stations (TIS) Operating on 1610 kHz

This annex provides regulations and guidance concerning existing and future assignment and protection of Federal Travelers Information Stations (TIS) operating on 1610 kHz. The information contained herein has been extracted from the FCC Memorandum Opinion and Order, FCC 95-385, "Reconsideration of Implementation of the AM Expanded Band Allotment Plan," adopted September 1, 1995, as agreed upon by the NTIA and FCC.

1. Three international agreements (Region 2, Canadian, and Mexican) affect the allotment of expanded band stations. FCC Rules (see 47CFR) state that the Commission will not make any assignment that does not conform to international requirements and restrictions on spectrum use. Therefore, in the United States-Canadian and United States-Mexican border areas, the 1610 kHz frequency may not be available for Federal TIS operations in order to fulfill the United States' obligations pursuant to agreements with Canada and Mexico. In South Florida, Puerto Rico and the U.S. Virgin Islands, frequency allotments are restricted to those specified in the Region 2 treaty covering the expanded AM Band and stations in those regions will only be assigned on the frequencies permitted by the treaty.

2. Existing federal travelers information stations operating on 1610 kHz have co-primary status with expanded band allotments. Therefore, federal travelers information stations authorized as of August 4, 1994, preclude subsequent assignment for conflicting allotments.

3. The following federal travelers information station criteria, which were agreed upon between the Commission and NTIA, will be used:

a. All projections are based on the daytime operation of the expanded band station assuming Model I facilities. FCC Rules (see 47CFR) define Model I facilities as a ninety electrical degree (90E) antenna height and ground system and an antenna input power of ten kilowatts daytime and one kilowatt night-time. Daytime, a Model I facility will produce an unattenuated inverse distance field of 971 mV/m at 1 kilometer.

b. Soil conductivities will be taken from Figure M3 of the Commission's Rules notwithstanding the fact that FCC Rules elsewhere specify the use of the measured 0.5 mV/m contour in determining the minimum spacing for a federal travelers information station from a broadcast facility. This is consistent with all other computations made in the allotment process and follows the procedures illustrated in the calculation of the sample allotment plan. Furthermore, this ground conductivity data base produces the needed certainty in the allotment plan and can be used to immediately implement the expanded band.

c. Federal travelers information station protection will be defined by the distance between the expanded band and federal travelers information station transmitter. For co-channel and first adjacent channel projections, we will use the following distances: distance to the expanded band station's 0.5 mV/m contour plus 130 km for co-channel; distance to the 0.5 mV/m contour +15 km for first adjacent channel.

d. Because FCC Rules (see 47CFR) discuss second and third adjacent channel protection of broadcast stations by federal travelers information stations, but does not establish standards, standard broadcast engineering procedure will be followed which specifies that second adjacent channels may have no overlap of the 5 mV/m contours and third adjacent channels may have no overlap of the 25 mV/m contours. Since federal travelers information stations are low power with the 25 mV/m and 5 mV/m contours being close to the federal travelers information station site, we will not permit the proposed expanded band 5 mV/m contour to encompass the federal travelers information station site for second adjacent channel allotments (1630 kHz). Third adjacent channel protection (1640 kHz) is provided if the expanded band station's 25 mV/m contour will not encompass the federal travelers information station site.

4. Existing stations operating on 810, 820, 830, 840 and 850 kHz have the potential to cause interference to stations operating at twice their carrier frequencies, i.e., 1620, 1640, 1660, 1680 and 1700 kHz. Under FCC Rules (see 47CFR) two stations, one with a frequency twice of the other should not be assigned in the same groundwave service area unless special precautions are taken to avoid interference from the second harmonic of the station operating on the lower frequency. The service area of a station is that area protected from interference, and is defined as the 0.5 mV/m for rural areas in Section 73.182(d) of the rules. An expanded band allotment will be precluded if the service area of an existing station operating on 810 to 850 kHz would overlap the service area of a potential expanded band station operating with Model I facilities as defined in FCC Rules (see 47CFR). In accordance with prior procedures in this proceeding, the service area will be calculated using conductivities taken from Figure M3 of the FCC Rules (see 47CFR).

5. Allotments will not be proposed that do not maintain co-channel, first and second adjacent channel spacing in accordance with the minimum spacing requirements from existing station operations on 1580, 1590, and 1600 kHz.

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ANNEX O

Relocation of Federal Government Radio Systems In Accordance With the Commercial Spectrum Enhancement Act

O.1 INTRODUCTION

Title II of Public Law 108-494, 118 Stat.3896 (2004), (Commercial Spectrum Enhancement Act) amended the National Telecommunications and Information Administration Organization Act, hereinafter the NTIA Organization Act, to provide that Federal Government entities will be reimbursed for relocation of their radio frequency-dependent systems from one or more frequencies due to reallocation. Reimbursement costs are funds to be paid by non-government entities as a result of competitive bidding (auction) of frequencies vacated by the federal government entities. Proceeds from the competitive bidding are transferred to a fund (Spectrum Relocation Fund), administered by the Office of the Management and Budget (OMB), on which the Federal entities can withdraw the reimbursement funds. The total proceeds of the competitive bidding must be at least 110 percent of the total estimated relocation costs, as provided to the Federal Communications Commission (FCC) by NTIA on behalf of the Federal entities.

This Annex contains relevant information with regard to relocating federal government radio systems from affected bands to other bands or to alternate technology.

O.1.1 PURPOSE

The purpose of this Annex is to provide guidance regarding the relocation of federal government radio systems from frequency bands specified under subsection 3.0 of this Annex to other bands or to alternate technology.

O.2 ELIGIBLE FEDERAL ENTITIES

Any federal entity that operates a federal government station assigned to a band of frequencies specified in subsection 3.0 of this Annex and that incurs relocation costs because of the reallocation of frequencies from federal use to non-federal use shall receive payment for such costs from the Spectrum Relocation Fund.

O.2.1 FEDERAL POWER AGENCIES

For the purposes of this Annex, the federal power agencies are the Tennessee Valley Authority, the Bonneville Power Administration, the Western Area Power Administration, the Southwestern Power Administration, or the Southeastern Power Administration.

Exempted federal power agencies, identified in the eligible frequency bands below, that choose to relocate from the frequencies identified for reallocation are eligible to receive payment under this paragraph.

O.3 ELIGIBLE FREQUENCY BANDS

The bands of eligible frequencies are as follows:

a. the 216-220 MHz band,[1] the 1432-1435 MHz band,[2] the 1710-1755 MHz band, and the 2385-2390 MHz band[3] of frequencies; and

b. any other band of frequencies reallocated from federal use to non-federal use after January 1, 2005, that is assigned by competitive bidding pursuant to section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)), except for bands of frequencies previously identified by NTIA in the Spectrum Reallocation Final Report, NTIA Special Publication 95-32 (1995).

O.4 NOTIFICATION OF ESTIMATED RELOCATION COSTS AND TIMELINES TO THE FCC

NTIA, on behalf of the federal entities and after review by OMB shall provide the federal entities' estimated relocation cost and timelines information to the FCC six (6) months prior to the commencement of any auction of eligible frequencies defined in subsection 3.0 of this Annex.

Upon notification by NTIA, federal entities that may be required to relocate or modify radio frequency dependent systems shall notify NTIA at least nine (9) months before the auction of the relocation costs and timelines anticipated to be associated with relocation or with modifications necessary to accommodate prospective licensees in the format required by NTIA for a particular band.

Agencies should work with their respective budget offices and OMB contacts in the Resource Management Offices to determine what, if any, additional information is required for the review and approval of relocation cost estimates and timelines.

O.4.1 SPECIFIC INFORMATION TO BE PROVIDED TO FCC

To the extent practicable and consistent with national security considerations, the NTIA shall provide the following specific information to the FCC that is attributable to the costs and timelines:

a. List of federal government frequency assignments and/or stations;

b. Federal government agency operating each frequency assignment and/or station;

c. Geographic location of each station using these frequency assignments; and

d. Technical characteristics associated with an assignment and/or station, if appropriate.

Notwithstanding Section 9.8.2, Part 2, Paragraph 41 of the NTIA Manual regarding designation of frequency assignment data exempt from release under the Freedom of Information Act, NTIA will provide the information about all unclassified assignments to the FCC in this format six (6) months prior to commencement of an auction.

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[1] *The 216-220 MHz band has been reallocated on a mixed-use basis for federal and non-federal users. The FCC has not auctioned this band.*

[2] *The 1432-1435 MHz band has been reallocated on a mixed-use basis for federal and non-federal users. Federal operations are protected at the sites defined in subsection 8.1 of this Annex.*

[3] *The 2385-2390 MHz band had been considered for reallocation for exclusive non-federal use; however, the federal allocation for primary mobile use will be retained and the band will be shared to support aeronautical telemetering (see FCC Seventh Report and Order, ET Docket No. 00-258, Oct. 2004).*

With respect to classified assignments and systems, federal entities located on the spectrum to be auctioned will provide a single, consolidated and unclassified figure to NTIA for the cost of relocating or modifying all classified systems and NTIA will provide this information to the FCC six (6) months prior to the commencement of an auction.

O.5 DEFINITION OF RELOCATION COSTS AND TIMELINES

O.5.1 Relocation Costs

Relocation costs as defined in Section 113(g) of the NTIA Organization Act (47 U.S.C. 923(g)) means the costs incurred by a federal entity to achieve comparable capability of systems, regardless of whether that capability is achieved by relocating to a new frequency assignment or by utilizing an alternative technology. These costs include:

a. the costs of any modification or replacement of equipment, software, facilities, operating manuals, training costs, or regulations that are attributable to relocation;

b. the costs of all engineering, equipment, software, site acquisition and construction costs, as well as any legitimate and prudent transaction expense, including outside consultants, and reasonable additional costs incurred by the federal entity that are attributable to relocation, including increased recurring costs associated with the replacement facilities;

c. the costs of engineering studies, economic analyses, or other expenses reasonably incurred in calculating the estimated relocation costs that are provided to the FCC pursuant to this Act;

d. the one-time costs of any modification of equipment reasonably necessary to accommodate commercial use of such frequencies prior to the termination of the federal entity's primary allocation or protected status, when the eligible frequencies as defined in this Act are made available for private sector uses by competitive bidding and a federal entity retains primary allocation or protected status in those frequencies for a period of time after the completion of the competitive bidding process; and

e. the costs associated with the accelerated replacement of systems and equipment if such acceleration is necessary to ensure the timely relocation of systems to a new frequency assignment.

O.5.2 RELOCATION TIMELINES

Relocation timelines are projected dates or date on which a federal entity's relocation or modification of radio communications systems/stations from the eligible frequencies defined in subsection 3.0 of this Annex will be completed.

O.5.3 DEFINITION OF COMPARABLE CAPABILITY OF SYSTEMS

The term comparable capability means that the replacement facility restores the capabilities of the original facility to an equal or superior level taking into account at least four factors: communications throughput; system reliability; operating costs; and operational capability.

(A) Communications Throughput

The term communications throughput means the amount of information transferred within the system for a given amount of time. For digital systems, the communications throughput is measured in bits per second (bps); for analog systems, the communications throughput is measured by the number of voice, video or data channels.

(B) Systems Reliability

The term system reliability means the percentage of time information is accurately transmitted within a system. The reliability of a system is a function of equipment failures (e.g., transmitters, feed lines, antennas, receivers and battery back-up power), the availability of the frequency channel given the propagation characteristics (e.g., frequency, terrain, atmospheric condition and noise), and equipment sensitivity. System reliability also includes the ability of a radio-communications station to perform a required function under stated conditions for a stated period of time. System reliability may involve three concepts: attaining a specified level of performance; the probability of achieving that level; and maintaining that level for a specified time. For digital systems, system reliability shall be measured by the percentage of time the bit error rate (BER) exceeds a desired value; and for analog transmissions, this would be measured by the percentage of time that the received carrier-to-noise ratio exceeds the receiver threshold.

(C) Operating Costs

The term operational costs mean the cost to operate and maintain the Federal entity's replacement facility. Relocation costs include any increased recurring costs associated with the replacement facilities. Recurring costs shall include, but not be limited to, additional rental payments and increased utility fees.

(D) Operational Capability

The term operational capability means the measure of a system's ability to perform its validated functions within doctrinal requirements, including service, joint service, and allied interoperability requirements with related systems.

O.6 NOTIFICATION OF ESTIMATED RELOCATION COSTS AND TIMELINES TO CONGRESSIONAL COMMITTEES AND GOVERNMENT ACCOUNTABILITY OFFICE (GAO)

The NTIA shall, at the time of providing an initial estimate of relocation costs to FCC under subsection 4.0 of this Annex, submit to Committees on Appropriations and Energy and Commerce of the House of Representatives, to the Committees on Appropriations and Commerce, Science, and Transportation of the Senate, and to the Comptroller General, a copy of such estimate and the timelines for relocation.

O.7 NTIA ANNUAL REPORT TO VARIOUS COMMITTEES AND GAO

The NTIA will submit an annual report to the various committees, as defined in subsection 6.0 of this Annex, and the Comptroller General on:

a. the progress made in adhering to the timelines applicable to relocation from eligible frequencies, as defined under subsection 3,0 of this Annex, separately stated on a communication system-by-system basis and on auction-by-auction basis; and

b. with respect to each relocated communication systems and auction, a statement of the estimate of relocation costs required under subsection 4.0 of this Annex, the actual relocation costs incurred, and the amount of such costs paid from the Spectrum Relocation Fund.

O.8 FEDERAL GOVERNMENT PROTECTED SITES

O.8.1 1432-1435 MHz Band

Essential federal government operations at the sites listed below are protected indefinitely.

LOCATION	COORDINATES	Protection Radius
China Lake/Edwards AFB, CA	35 29'N 117 16'W	100 km
White Sands Missile Range/Holloman AFB, NM	32 11'N 106 20'W	160 km
Utah Test and Training Range/Dugway Proving Ground/Hill AFB,UT	40 57'N 113 05'W	70 km
Patuxent River, MD	38 17'N 076 24'W	70 km
Nellis AFB, NV	36 14'N 115 02'W	130 km
Fort Huachuca, AZ	31 33'N 110 18'W	80 km
Eglin & Tyndall AFB,FL/Gulfport ANG Range, MS/Ft. Rucker, AL	30 28'N 086 31'W	140 km
Yuma Proving Ground, AZ	32 29'N 114 20'W	160 km
Fort Greely, AK	63 47'N 145 52'W	80 km
Redstone Arsenal, AL	34 35'N 086 35'W	80 km
Alpene Range, MI	44 23'N 083 20'W	80 km
Camp Shelby, MS	31 20'N 089 18'W	80 km
AUTEC	24 30'N 078 00'W	80 km
MCAS Beaufort. SC	32 26'N 080 40'W	160 km
MCAS Cherry Point, NC	34 54'N 076 53'W	100 km
NAS Cecil Field, FL	30 13'N 081 53'W	160 km
NAS Fallon, NV	39 30'N 118 46'W	100 km
NAS Oceana, VA	36 49'N 076 01'W	100 km
NAS Whidbey Island, WA	48 21'N 122 39'W	70 km
NCTAMS, GUAM	13 35'N 144 51'W	80 km
Lemoore, CA	36 20'N 119 57'W	120 km
Naval Space Operation Center, ME	44 24'N 068 01'W	80 km
Savannah River, SC	33 15'N 081 39'W	3 km

O.8.2 1710-1755 MHz Band

The Department of Defense operates communications systems in this band at 16 protected sites (see FCC Service Rules).

At the Yuma, AZ and Cherry Point, NC sites, all operations shall be protected indefinitely. At the remaining 14 sites, airborne and military test range operations shall be protected until such time as these systems are relocated to other spectrum, and precision guided munitions (PGM) operations shall be protected until such time as these systems are relocated to other spectrum or until PGM inventory at each facility is exhausted.

LOCATION	COORDINATES	Radius of Operation
Cherry Point, NC	34 58'N 076 56'W	100 km
Yuma, AZ	32 32'N 113 58'W	120 km
China Lake, CA	35 41'N 117 41'W	120 km
Eglin AFB, FL	30 29'N 086 31'W	120 km
Pacific Missile Test Range, Point Mugu, CA	34 07'N 119 30'W	80 km
Nellis AFB, NV	36 14'N 115 02'W	160 km
Hill AFB, UT	41 07'N 111 58'W	160 km
Patuxent River, MD	38 17'N 076 25'W	80 km
White Sands Missile Range, NM	33 00'N 106 30'W	80 km
Fort Irwin, CA	35 16'N 116 41'W	50 km
Fort Bragg, NC	35 09'N 079 01'W	50 km
Fort Rucker, AL	31 13'N 085 49'W	50 km
Fort Campbell, KY	36 41'N 087 28'W	50 km
Fort Lewis, WA	47 05'N 122 36'W	50 km
Fort Benning GA	32 22'N 084 56'W	50 km
Fort Stewart, GA	31 52'N 081 37'W	50 km

O.9 OTHER DEFINITIONS

For the purposes of this Annex, the terms below are defined as follows:

a. The term auction means the use of competitive bidding as set forth in Section 309(j) of the Communications Act of 1934(47 U.S.C. 309(j)).

b. The term classified assignment means a frequency assignment and information related to a frequency assignment that has been determined pursuant to Executive Order 12958 or any predecessor order or successor executive order to require protection against unauthorized disclosure and that is marked as "confidential," "secret," or "top secret" to indicate its classified status when in documentary form.

c. The term federal entity means any department, agency or other instrumentality of the federal government that utilizes a government station authorization obtained under section 305 of the Communications Act of 1934 (47 U.S.C. 305).

d. The term frequency assignment means authorization issued by NTIA for a government radio station to use a radio frequency or frequencies or radio frequency channel or channels under specified conditions.

e. The term licensee refers to a person awarded a license by the FCC for use of the bands identified in subsection 3.0 of this Annex.

(Last Page in Annex O)

Summary of Changes

Summary of Changes and Instructions

1.1 January/May 2010 Revisions of the January 2008 Edition of the NTIA Manual

The Cover Page and the Table of Contents were updated.

Preface

Revised the introduction and added new holders and promulgation letters.

Chapter 1

Section 1.3.2, Article XI, minor edits were made to this section. (37585/1)

Chapter 4

Section 4.1.3, deleted footnote NG41 and modified footnotes NG155 and NG159. (37607/1)

- Removed references to footnote "NG115" and "Low Power Auxiliary (74H)" from the band 698-806 MHz.
- Removed the reference to footnote "NG41" and "International Fixed (23)" from the bands 3700-4200 and 5925-6425 MHz.
- In the list of Non-Federal Government (NG) Footnotes, removed footnote NG41 and revised footnotes NG115 and NG159.

Section 4.1.3, removed G124 from the 2417-2450 MHz band. (37584/1)
Section 4.1.3, editorial corrections were made to the formulas in footnotes 5.417A and 5.418.
Section 4.1.3, deleted G124 from the list of government footnotes. (37584/1)
Section 4.3.5, corrected the data for 20Y in the ILS coloum. (37589/1)
Section 4.3.10, the text for this section was deleted. (37588/1)
Section 4.3.19, this new section was added to the manual. (37480/1)

Chapter 5

Section 5.3.5.1 (2), replaced four tables that has been inadvertantly removed from this section.

Chapter 6

Section 6.1.3, editorial correction replacing a word missing in the following definition: **TY**--Base Earth Station: An earth station in the fixed-satellite service or in some cases in the land mobile-satellite service located at a specified <u>fixed</u> point….

Chapter 7

Section 7.1, editorial corrections were made to the text in second paragraph. (37417/1)
Section 7.18, the band listed in the first sentence 3600-3700 was changed to read 3600-3650. (37477/1)

Chapter 8

Section 8.2.37, subparagraph three, made an editorial correction to the formulas adding ^{2} after the m, (-

174 dB(W/m^2).
Section 8.3.9 was modified adding additional coordination text for the NRQZ Quiet Zone. (37772/1)
Section 8.3.12, subparagraph two, the band 3600-3700 was changed to read 3600-3650. (37477/1)
Section 8.3.15, added data for an Air Force site located at Andrews AFB, MD to the table. (37802/1)
Section 8.3.15, made editorial corrections to coordinate and coordination data in the table. (37751/1)

Chapter 9

Section 9.8.2, subparagraph 7.c, made changes to the Event Oriented Declassification Dates. (37723/1)
Section 9.8.2, subparagraph 22(d)(6), corrected station class text "station class E2~~EW~~ or E4~~EH~~ and special note S385." (37525/1)
Section 9.8.2, made changes to *MFI, *IFI and *DFI Standard Data Entries in subparagraph 39 u, Part 1 and Part 2. (37526/1)
Section 9.8.2, subparagraph 39u, Part 2, corrected the spelling of sonobuoy. (37678/1)
Section 9.8.2, subparagraph 39u, modified the following items:

Part 1 – General Function Identifiers with Description:

NAVAIDS--Land stations u~~U~~sed to furnish navigational assistance to aircraft and/or ships (e.g. instrument landing systems (ILS), non-directional beacons (NDB), ~~long-range~~long-range navigation (LORAN), racons, etc.).

Part 2 – Agency Specific Identifiers with Description (Extracts)

ATFP--Communications used in supporting fleet Anti-Terrorism Force Protection.
AIRBORNE COMMAND CENTER--Used by airborne command post aircraft in support of the national authority or ~~CINCS~~ Combatant Commands.
~~CINC~~COMBATANT COMMAND/GENERAL OFFICER SUPPORT--Used in support of command and control, and ~~logistics,~~ supporting ~~CINC~~Combatant Commands/General Officers.
HELO CONTROL--Used to control and coordinate helicopter transit between ships.
HYDRA (Hierarchical Yet Dynamically Reprogrammable Architecture)--Used in support of various shipboard voice communications requirements.

Section 9.8.2, new subparagraph 39gg was added to this section. (37723/1)

Annex A

Part A.6, modified special notes S717 and S782 and added S920. (37478/1)
Part A.6, added new special notes S921 through S925. (37679/1) (37803/1)
Part A.6, deleted special notes S674, S794, S811, S878, S886 and S905. (37721/1)

Annex G

Part G.1, added DISA to the Army abbreviations and Centers for Medicare and Medicaid to the HHS abbreviations (37479/1).
Part G.1, added DHS abbreviations for Federal Protective Service and Office of Emergency Communications. (37722/1)
Part G.5, added several new manufacturer codes. (37804/1)

Annex H

Table 5, made an editorial correction, frequency 8277.5 was corrected to read 8377.5 on page H-10.

Annex J

In the previous revision many of formulas did not convert properly from Word to PDF. All of this annex has been updated to correct this problem.

The Summary of Changes and the Index were updated.

1.1.1 Instructions

Effected Pages: Cover Page, Table of Contents, Preface i through iii, 1-17, 4-30, 4-39, 4-41, 4-44, 4-102, 4-103, 4-155 through 4-156, 4-161, 4-163, 4-173, 4-192 through 4-197, 4-210, 4-212, 4-213, 4-216 through 4-226, 5-20, 6-31, 7-1, 8-37, 8-42 through 8-66, 9-17, 9-30, 9-67, 9-68, 9-69, 9-72, 9-76, 9-81, A-4, A-16, A-17, A-20, A-21, G-1, G-6, G-28 through G-38, H-10, All of Annex J, the Summary and the Index.

Replace Pages: Cover Page, Table of Contents, Preface i through iv, 1-17 through 1-18, 4-29 through 4-30; 4-39 through 4-44, 4-101 through 4-164, 4-173 through 4-174, 4-191 through 4-198, 4-209 through 4-226, 5-19 through 5-42, 6-31 through 6-32, 7-1 through 7-2, 8-37 through 8-38, 8-41 through 8-54, 8-57 through 8-66, 9-17 through 9-20, 9-29 through 9-30, 9-67 through 9-76, 9-81 through 9-94, A-3 through A-4, A-15 through A-22, G-1 through G-12, G-27 through G-38, H-9 through H-10, all of Annex J, the Summary and the Index.

1.2 May/September 2009 Revision of the January 2008 Edition of the NTIA Manual

The Cover Page and the Table of Contents were updated.

Preface

The introduction was revised and new holders and promulgation letters were added.

Chapter 1

Section 1.3.2, Bylaws, Article V – Substructure, Section 2.d, the text addressing the Military Assignment Group (MAG) was modified and additional text was added. (37322/1)
Section 1.3.2, Section 6, subparagraph 4 was revised under the SSS information. (37006/1)
Section 1.3.2, Section 7 updated the information for the EPS. (36931/1)

Chapter 2

Section 2.3.1, editorial corrections were made to this section. (37316/1)
Section 2.3.11 was deleted and marked reserved. (37048/1)

Chapter 3

Section 3.3.2, (b), a new subparagraph was added to this section. (37006/1)

Chapter 4

Section 4.1.3, the international portion of the allocation table was updated with information from the 2008 version of the ITU Regulations.

Section 4.1.3, updated the text for footnote US345 and added this footnote to the 401-402 MHz band. (37112/1)
Section 4.1.3, added NG186 to the 10.7 GHz band and added NG187 to the 11.7-12.2, 14-14.2, 14.47-14.5, GHz bands. (37319/1)
Section 4.1.3, the text for NG186 and NG187 was added to the footnotes. (37319/1)
Section 4.2.3, the first paragraph of this section was deleted and the last section of "1. Wide-Area" was deleted. (37321/1)
Section 4.2.4, the first paragraph of this section was deleted and the last section of "1. Local-Area" was deleted. (37321/1)
Section 4.3.11, the table for Medical Radiocommication was updated. (36932/1)
Section 4.3.18, this new section titled "4400-4940 MHz Chanel Plan" was added to Chapter 4.

Chapter 5

Section 5.3.5.2, editorial updates were made under "Standards", in the second sentence the references to TIA documents were updated. Under "Effective Dates" the dates were changed, under "Waviers" in (b) the tables referring to equipment procured prior to Jan 2006 were removed and the headings for the old tables were also deleted. (37108/1)
Editorial corrections were made throughout this chapter to several equations that were corrected to read ≤ instead of < .
Section 5.5.3, Criteria C, a new subparagraph 4.3 was added addressing systems in the radiolocation service. (37275/1)
Section 5.6.2 was revised adding some additional text. (37275/1)

Chapter 6

Section 6.1.1, footnote 2 which referenced the term (RR) was removed since it duplicated text in the first paragraph.
Section 6.1.1, the definition for occuipied bandwidth was updated. (37107/1)
Secton 6.6, a formating change was made moving the text for Section 6.6 up to page 6-37.

Chapter 7

Part 7.1, text in this part was modified because of the addition of Section 7.5.9 "Federal Use of Medical Telemetry Devices in Certain Bands". (37417/1)
Section 7.5.9, new section addressing "Federal Use of Medical Telemetry Devices in Certain Bands". (37417/1)
Part 7.11, updated the name for the Air Force Research Laboratory/Phillips Research Site. (37103/1)
Part 7.11, updated the office code for the Gulf Area Frequency Coordinator (GAFC) 96CG/~~SCWF~~SCXF. (37389/1)
Part 7.11, corrected a formating error in the last experimental site in Part 7.11.
Part 7.11, removed the CIA experimental station. (37144/1)
Parts 7.18-7.27 revised. Corrections were made to Part 7.19 through the end of Chapter 7. Corrected mistakes in the headings and text of Parts 7.19 and 7.20. These changes also affected other recently approved revisions to Parts 7.24 and 7.26. (36556/1)
Part 7.26, the current text was deleted and this Part was marked reserved. (36556/1)

Chapter 8

Reformated text starting on page 8-7 to the end of the chapter.

Section 8.2.41, paragragh 2 was modified due to changes in Chapter 10, the reference to Section 10.8.3A was updated to read 10.8.2A. (37171/1)
Section 8.2.47, new text was added for "Shared Federal/Non-Federal Radio Systems". (37009/1)
Section 8.2.54, extended the termination date and added the Army MDA to this section.

2. Range safety operations are authorized in the 406.1-420 MHz band but limited to:

a. use of the frequency 416.5 MHz at Jonathan Dickinson Missile Tracking Annex, Jupiter, FL, Wallops Island, VA, and Cape Canaveral AFB, FL for support of the NASA Space Shuttle through ~~September 30~~December 31, ~~2010~~2014; and

b. use of the frequency 416.5 MHz at Pillar Point AFS, CA, Laguna, CA, Point Mugu, CA, and Vandenberg AFB, CA through December 31, ~~2008~~2014. The use of command destruct at the California locations is limited to the Army MDA program and any other use of the frequencies must be requested using the STA process in 8.3.31. (37104/1)

Section 8.2.56, this new section titled "Aeronautical Use by Mobile Stations of Frequencies in the Bands 162.05-173.2, 173.4-174, and 406.125-420 MHz on an Exceptional Basis" was added to the manual. (37053/1)
Section 8.3.15:

a. an editorial correction was made in the 8025-8400 MHz, AL, Fairbanks was corrected to read AK, Fairbank.

b. Added transmitter earth stations (20225-2110) for Goldstone (JWST) and Los Alamos and receiving stations (2200-2290) for Goldstone (JWST), Los Alamos, and Albuquergue. (37391/1)

c. Added a receiving stations (25500-27000) for Goldstone (JWST). (37391/1)

d. Added transmitter earth station (1761-1842) and receiver earth station (2200-2290) for Ft. Belvoir. (37249/1)

e. Several corrections were made to the coordination distances and and the coordinates were corrected for two receive stations. (37146/1)

Section 8.3.18, this section was deleted and marked as Reserved. (37321/1)
Section 8.3.31, 7.c., editiorial correction, the minimum data elements of paragraph 5." was corrected to read, "...paragraph 6."

Chapter 9

Part 9.4, 2, c (5) Classified Data Fields, removed *CLD and added *CLC/*CLS (Circuit Remarks *CLC or *CLS~~D~~). (36970/1)
Section 9.8.1, removed *PRC from the 9.8.1 table. (36933/1)
Section 9.8.1, removed *CLD and added *CLC/*CLS to the tabled. (36970/1)
Section 9.8.2, 1. SER--Applicant Serial Number (10 Characters-1 Occurrence), subparagraph b and the example in this section were modified. (37051/1)
Section 9.8.2, 39, Circuit Remarks (REM) (40 Characters-30 Occurrences) removed *CLD and added *CLC/*CLS to the tabled. (36970/1)
Section 9.8.2, 39.e (6) updated the text related to the removal of CLD and addition of *CLC/*CLS. (36970/1)
Section 9.8.2, 39.f (6) updated the text related to the removal of CLD and addition of *CLC/*CLS. (36970/1)
Section 9.8.2, 39.i (6) updated the text related to the removal of CLD and addition of *CLC/*CLS. (36970/1)
Section 9.8.2, 39.j (2) corrected the example: *AGN,FLL=XXX,~~,~~FLT=XXX,TSV=XXXXX~~.~~ [REMARKS].
Section 9.8.2, 39.k (1 and examples) added M013 through M018. (36933/1)
Section 9.8.2, 39.k, added (3) M018 Each entry of Pre-coordination Data. (36933/1)

Section 9.8.2, 39.o (6 and the example) updated the text related to the removal of CLD and addition of *CLC/*CLS. (36970/1)
Section *9.8.2, 39.q (h)* updated the text related to the removal of CLD and addition of *CLC/*CLS.
Section 9.8.2, 39.u, Part 2 – Agency Specific Function Identifiers; the reference in "Other Operations -- Used in supporting those functions not covered in one of the categories listed herein. (Note: See subparagraph (8) (~~k~~j) above for additional instructions.)" was modified (37210/1)
Section 9.8.2.39. cc, the following changes were made:

cc. Classified Data Fields (~~CLD~~CLC or *CLS).*

(1) These~~is~~ fields ~~is~~are used to identify those data fields in an assignment that are classified confidential or secret. One or both of these~~This~~ entries~~y~~ ~~shall~~ must be included ~~in~~ on all classified applications to indicate the classified information.

(2) Enter the field code REMnn followed by a space. Following the space, enter the code *CLC~~D~~ to indicate those data fields that are classified Confidential or *CLS to indicate those data fields that are classified Secret followed by a comma. Immediately after the comma, enter the mnemonic(s) (and occurrence number of multiple occurring fields) of the classified data field(s). If more than one mnemonic is entered, separate each with a comma. You must enter all classified data fields that are confidential in *CLC and all classified data fields that are Secret in *CLS.

(3) Use as many entries of *CLC or *CLS~~D~~ REM lines as necessary to list all classified data fields.

(4) The entry for Supplementary Details will always be SUP (See paragraph 80, subparagraph j, of this section.).

Example: REM09 *CLC~~D~~,EMS01,PWR01,EMS02,PWR02,SUP
REM10 *CLS,XAD01, RAD03, REM11

Section 9.8.2, 39.dd (2) updated the text related to the removal of CLD and addition of *CLC/*CLS. (36970/1)
Section 9.8.2, 39.gg, was deleted. (36933/1)

Chapter 10

A total rewrite was done to this chapter to include the changes for the EL-CID project. (37171/1)

Annex A

Annex A was revised writing the Notes in a consistent manner. Editorial corrections were also made to this annex. (37271/1)
Part A.6, new special notes S914, S915, S916, and S917 were added to this annex. (36969/1) (37052/1) (37105/1)
Part A.4, removed M016 and added M018 to this section. (36933/1)

Annex D

Annex D, updated the office code for the Gulf Area Frequency Coordinator (GAFC) 96CG/~~SCWF~~SCXF in Table 3.

Annex G

Part G.1, modified the Department of Interior abbreviaitons. (37248/1)
Part G.1, added new abbreviation for Treasury's Troubled Asset Relief Program (TARP) (37106/1)
Part G.1, modified the abbreviation for Treasury's Alcohol, Tobacco, Firearms and Explosives.

(36969/1)
Part G.1, modified the Department of Transportation abbreviations. (36185/1)
Part G.1, modifed the NASA abbreviations. (37415/1)
Part G.5, a large number of the manufacture codes were deleted. (37340/1)

Annex H

Editorial corrections were made on page H-10, Table 5, 8 MHz/Ship column. Channel 3: 8277.5.5 corrected to read 8277.5 and Channel 5: 8378.5.5 corrected to read 8378.5.
Editorial corrections were made on page H-11, Table 5, channel 14, (last column) corrected to read 8383 vice 8423. Also channel 18 (last column) corrected to read 8385 vice 8395.
Formating corrections were made to pages H-16 through H-17.

Annex J

Annex J, corrected the footnote number references in this annex. (33880/1) (33951/1)
J.3.1, corrected the text in this paragraph. (33880/1) (33951/1)
J.5, corrected the subscript in the symbols in this part. (33880/1) (33951/1)
J.5, Table A, corrected the subscript and superscript numbers in the formulas. (33880/1) (33951/1)

Annex M

Section M.2.1.E, corrections were made to subparagragh 2. (37109/1)

2. Narrowband (138-150.8, 162-174 and 406.1-420 MHz Bands)

a. Transmitter and Receiver Measurement Methods (referenced from Section 5.3.5.2): ~~As adopted by NTIA, the~~ The measurement methods to be used are as given in the Telecommunications Industries Association standard TIA/EIA-603-~~B~~ C for narrowband analog ~~emission~~ equipment, and ~~Telecommunications Systems Bulletin TSB~~ TIA-102.CAAA-~~A~~ B for narrowband digital ~~emission~~ equipment. Where these methods are not specified for a particular system type, appropriate test procedures should be applied.

~~b. The present EIA measurement methods were written for analog systems. Some of these methods are not appropriate for digital systems. Appropriate analog-to-digital or digital- to-analog test sets will have to be used.~~

The Summary of Changes and the Index were updated.

1.2.1 Instructions

Effected Pages: Cover Page, Table of Contents, Preface i through iii, 1-9, 1-14, 2.4, 2-8, 3-3 through 3-16, 4 3 through 4-216, 5-4, 5-5-, 5-9 through 5-12, 5-17 through 5-40, 5-41, 6-1, 6-11, 6-24, 6-37, 6-38, 7-13, 7-14, 7-18, 7-21, 7-31 through 7-32, 8-7 through the end of this chapter, 9-7 through 9-8, 9-13 through 9-18, 9-43 through 9-44, 9-47 through 9-84, all of Chaper 10, all of Annex A, D-6, G-8, G-10, G-29 through G-50, H-5, H-6, H-10, H-11, H-16, H-17, all of Annex J, M-3, all of the Summary and the Index.

Replace Pages: Cover Page, Table of Contents, Preface i through iv, 1-7 through 1-14, 2-3 through 2-4, 2-7 through 2-10, 3-5 through 3-16, 4-3 through 4-216, 5-3 through 5-6, 5-9 through 5-12, 5-17 through 5-40, 6-1 through 6-2, 6-11 through 6-12, 6-23 through 6-24, 6-35 through 6-38, 7-7 through 7-22, 7-29 through 7-32, 8-7 through 8-78, 9-7 through 9-8, 9-13 through 9-18, 9-43 through 9-44, 9-47 through 9-84, all of Chaper 10, all of Annex A, D-5 through D-6, G-7 through G-18, G-27 through G-38, H-9

through H-12, H-15 through H-18, all of Annex J, M-3 through M-4, all of the Summary and the Index.

1.3 January 2009 Revision of the January 2008 Edition of the NTIA Manual

The Cover Page and the Table of Contents were updated.

Preface

The introduction was revised and new holders and promulgation letters were added.

Chapter 4

Section 4.1.3, the following footnotes were modified:
US216, a formating correction was made to this footnote.
US229 was modified changing the responsible agency to the Air Force Space Surveillance System (AFSSS). (36531/1)
US323 and US324, editorial corrections were made to these footnotes.
US378, a formating correction was made to this footnote.

Chapter 5

Section 5.5.1, editorial, moved Figure 2 text under the diagram on page 5-28.

Chapter 6

Section 6.1.3, an editorial correction was made to the station definition for VA, Land Earth Station.

Chapter 7

Part 7.11, removed the Air Force Frank J Seiler Rearch Laboratory and the Navy's Naval Surface Weapons Center, White Oak, sites for this section. The Air Force Pacific Alaska Range Complex (PARC) was added. (36715/1) (36831/1)

Section 7.17.1, added USPACOM information to the table for the state of Alaska. (36831/1)

Chapter 8

Section 8.2.24, 5(a) removed an unneeded "and" from the sentence.
Section 8.2.29, 3 removed an unneeded "-" from the word "established" in the second sentence.
Section 8.2.55, added this new section. (36832/1)
Section 8.3.6, revised the text for the use of hydrologic channels. (36608/1)
Section 8.3.15, the following locations were added to the List of Coordinated Earth Station Table:
a. Added transmitter earth stations (1766-1839 MHz) and receiving earth stations (2200-2290 MHz) for Atlanta, GA. (36612/1)
b. Added transmitter earth stations (7145-7190 MHz) and receiving stations (2290-2300 MHz) for Goldstone, CA (DSS-14) (36470/1)
Section 8.3.31, revised the text in this section. (36852/1)

Chapter 9

Section 9.8.2, minor edits were made to sub-paragraph 34. (36674/1)

Chapter 10

Section 10.8.7, added new text to the end of paragraph 24, item 21. (36832/1)
Part 10.9, editorial corrections were made to this Part.

Annex A

Section A.6, special notes S402, S912 and S913 were added to this section. (37009/1) (36715/1)

Annex M

The outline numbering of Annex M was changed to match the other parts of the manual. (36832/1)
Section M.2.1 subparagraph e (2) was revised updating the reference documents listed in this paragraph. (37039/1) (34136/1)
Section M.2.1, added new subparagraph F, "Wideband and Narrowband Emission Level and Temporal Measurements in the Navstar Global Positioning System Bands." (36832/1)

1.3.1 Instructions

Effected Pages: Cover Page, Table of Contents, Preface i through iii, 4-133, 4-136, 4-142, 4-149, 5-28, 5-29, 6-31, 7-13, 7-18, 7-19, 7-29, 8-45, 8-47, 8-60, 8-62, 8-64, 8-77, 8-78, 9-38, 10-16, 10-23, A-22, M-1, M-3, M-4, the Summary of Changes and the Index.

Replace Pages: Cover Page, Table of Contents, Preface i through iv, 4-133 through 4-136, 4-141 through 4-142, 4-149 through 4-150, 5-27 through 5-30, 6-31 through 6-32, 7-13 through 7-14, 7-17 through 7-20, 7-29 through 7-30, 8-45 through 8-52, 8-59 through 8-66, 8-77 through 8-78, 9-37 through 9-38, 10-15 through 10-28, A-21 through A-22, Annex M, the Summary of Changes and the Index.

1.4 September 2008 Revision of the January 2008 Edition of the NTIA Manual

The Cover Page and the Table of Contents was updated.

Preface

The introduction was revised and new holders and promulgation letters were added to the preface.

Chapter 3

Part 3.2 was revised with current ITU information. (36615/1)

Chapter 4

Section 4.1.1, updated the information related to the ITU Regulations.
Section 4.1.3, in the list of international footnotes, revised footnotes 5.155, 5.237, 5.339, 5.438, 5.462A, 5.469A, and 5.476A.

In the list of United States (US) footnotes added footnote US1; revised footnotes US7, US11, US81, US90, US93, US99, US116, US117, US201, US216, US217, US222, US229, US230, US247, US251,

US252, US259, US262, US265, US267, US273, US285, US290, US294, US299, US301, US307, US308, US309, US310, US311, US315, US316, US323, US324, US334, US335, US337, US338, US342, US344, US346, US348, US351, US353, US354, US355, US359, US360, US362, US366, US368, US378, US381, US388, US396, US397, US399, and US401; and removed footnotes US215, US302, US321, and US387.

In the list of non-Federal Government (NG) added footnotes NG1 and NG30; revised footnotes NG28, NG51, NG53, NG56, NG66, NG112, NG124, NG141, NG143, NG144, NG147, NG149, NG155, NG158, NG159, NG160, NG163, NG167, NG172, NG173, NG175, NG184 and removed footnote NG31.

In the list of Federal Government (G) footnotes revised G2, G6, and G133; removed G31 and G106; and added G127. New footnote G134 was also added to this section. (36557/1)

Section 4.2.2, modified the title and text in this section (removed frequencies 1720 and 1740 MHz).
Section 4.3.5, an editorial correction was made to the DME/TACAN table (pg. 4-171). The Ground Reply frequency 21Y was corrected to read 1108 vice 982 MHz.

Chapter 6

Section 6.1.1, Special Terms (General), added a new definition for Adaptive System (36694/1), Cognitive Radio System and Software Defined Radio. (36750/1)
Part 6.2, Corrected the superscript formating for K = kilo (10^3), M = Mega (10^6), G = giga (10^9), T = tera (10^{12}).
Part 6.6 was revised with current ITU information. (36614/1)
Chapter 7
Part 7.3, "Use of Frequencies for National Security and Emergency Preparedness (NS/EP)" was completely revised. (36348/2)
Part 7.11, the information for the Air Force Aeronautical Systems Center (AFMC) was revised. (36437/1)
Part 7.11, the Agriculture site was removed and the Air Force Phillips Laboratory site was revised. (36554/1)
Part 7.24, the current text was deleted and replaced with a new Part 7.24 titled "FEDERAL GOVERNMENT AGENCIES AS END USERS OF FCC LICENSED COMMERCIAL SERVICES".

Chapter 8

Section 8.1.2, corrected the reference to Public Law 87-975 to read Public Law 87-795 on page 8-3.
Section 8.2.5, added a new section titled "Withholding Funds Pending Availability of Frequency Support". (36665/1)
Section 8.2.49 was deleted and marked as "Reserved".
Section 8.3.15 (Table), added Navy Earth Station data for the Naval Air Warfare Center (NAWC) and John Hopkins University, Applied Physics Laboratory (JHU/APL) Earth Station located at Laurel, MD. (36438/1)
Section 8.3.15 (Table) added contour data for the Air Force Trailblazer Micro-Satellite and PnPSat Earth Station Coordination Contours for Kwajalein, Republic of the Marshall Islands (36555/1) and Commerce Jason-2 DORIS Transmitting Earth Station Coordination Contours for Richmond, FL; Kamuela, HI; Hawaii National Park, HI; Ahua Kilauea, HI; Sandhill Kilauea, HI; Fairbanks, AK; and Guam Seismic Observatory, GUM. (36555/1)
Part 8.4 is a new addition to the manual titled "Cognitive Radio System and Software Defined Radio".

(36750/1)

Chapter 9

Section 9.8.1, revised the Index of Field Codes Table. (36296/1)
Section 9.8.2, (16), revised Pulse emissions L - Modulated in width or duration and M - Modulated in position or phase. (36440/1)
Section 9.8.2, minor edits were made to sub-paragraphs 24, 25, 33 and 34. (36674/1)
Section 9.8.2, 39.k, editorial correction on page 9-51.
Section 9.8.2, 39.m(6)(a), updated the list of frequencies and the footnotes. (36556/1)
Section 9.8.2, 39.u(2)(a), removed the frequency bands 806.0 - 824.0 MHz, 851.0 - 869.0 MHz, 896.0 - 901.0 MHz, and deleted the footnote, "** Limited exclusively to the Specialized Mobile Radio (SMR) service (see 8.2.49)".

Annex A

A.6 Special Notes, added new notes S908, S909, S910 and S911. (36609/1) (36469/1)

Annex B

Corrected the Power Flux-Density Limits Table on page B-8.

Annex G

All the Part headings were revised in Annex G. (36611/1)
Part G.1, revised some of the Department of Interior information. (36559/1)
Part G-1 added a new bureau abbreviation under the Department of Commerce. (36469/1)
Part G.1, editorial corrections were made to Navy information on page G-9.
Part G.5, added abreviations BDW and ICX. (36610/1)
Part G.5, added several new Manufacturer Codes. (36469/1)

Annex H

Page H-8, updated the ITU references on this page. (36613/1)
Some formating changes were made throughout Annex H.

1.4.1 Instructions

Effected Pages: Cover Page, Table of Contents, Preface i through iii, 3-2, 3-3, 3-4, All of Chapter 4, 6-1, 6-4, 6-15, 6-31, 6-35, 6-36, 6-37, 6-38, 7-1, 7-2, 7-3, 7-4, 7-5, 7-14, 7-15, 7-32, 8-3, 8-5, 8-6, 8-43, 8-61, 8-62, 8-66, 8-78, 9-14, 9-23, 9-30, 9-31, 9-38, 9-51, 9-52, 9-63, 9-65, 9-66, 10-3, 10-4, 10-28, A-22, B-8, G-1, G-2, G-8, G-11, G-16, G-28 through G-48, all of Annex H, the Summary of Changes and the Index.

Replace Pages: Cover Page, Table of Contents, Preface i through iv, 3-1 through 3-6, All of Chapter 4, 6-1 through 6-4, 6-15 through 6-16, 6-31 through 6-32, 6-35 through 6-38, All of Chapter 7, 8-3 through 8-6, 8-43 through 8-52, 8-61 through 8-66, 8-77 through 8-78, 9-13 through 9-14, 9-23 through 9-24, 9-29 through 9-32, 9-37 through 9-38, 9-51 through 9-52, 9-63 through 9-66, 10-3 through 10-18, 10-27 through 10-28, A-21 through A-22, B-7 through B-8, G-1 through G-12, G-15 through G-16, G-27 through G-50, All of Annex H, the Summary of Changes and the Index.

1.5 May 2008 Revision of the January 2008 Edition of the NTIA Manual

The Cover Page and the Table of Contents will be updated.

Preface

The introduction was revised and new holders and promulgation letters were added.

Chapter 1

Section 1.3, Section 5, the Radio Conference Subcommittee text was revised. (36376/1)

Chapter 4

Section 4.1.3, the formating of footnote **5.138** was corrected.
Section 4.1.3, in US216 "MHz" was added after 468.19688.
Section 4.1.3, in US294 the reference was corrected to read Chapter 8 instead of Chapter 7. (36387/1)
Sections 4.2.3 and 4.2.4, editorial corrections were made to these sections. (36400/1)
Section 4.3.7,(2)(a) was revised correcting the formating in the fourth sentence.

Chapter 5

Section 5.3.5.1 was revised correcting the header spacing.
Sections 5.5.2, 5.5.3, and 5.5.5 were revised correcting the formula
$P_t = P_p + 20\log(N \times t) + 10\log(PRR) - PG - 90$. The text N_t was changed to ($N \times t$).

Chapter 6

Section 6.1.1, the Deep Space distances equation was corrected to read 2 x 10^6 kilometers instead of 2 x 106 kilometers.
Sections 6.1.2 and 6.1.3 were revised adding four station classes (E1 through E4) for Earth Exploration-Satellite (active sensor) Space Stations and Space Research (active sensor) Space Stations. (35932/1)

Chapter 8

Section 8.1.2 was revised correcting Public Law 87-975 to read Public Law 87-795 and a related information footnote was added.
Section 8.2.6 (2), the spelling of "van-mounted" was corrected.
Section 8.2.28 was rewritten to provide current guidance concerning radio frequency electromagnetic field safety and protection. (36361/1)
Table 8.2.36, major revisions were made to this table. (36322/1)
Section 8.3.11, the reference to Note 141 was corrected to read Note S141.

Chapter 9

Section 9.8.1 was revised adding new field codes TRN and PRD to the Index of Field Codes. (36296/1)
Section 9.8.2, 15, Station Class (STC) and Section 9.8.2, 39, Circuit Remarks (REM) was revised. These changes clarify the use of FL and MO station classes and require the use of altitude on station classes using aircraft. The existing FAA and DOD flight level formats will be used for AAG and MAG bands, while the M014 format will be used for all other bands. (36214/1)

Section 9.8.2, 16 was revised. (36440/1)
Section 9.8.2 (39.b.5), the spacing in the example was corrected.
Section 9.8.2 (39.f.6), the spacing in the example was corrected.
Section 9.8.2, General, added new text "6. For commercial radars the Manufacturer Code is required to be entered for the first occurrence of *EQT and *EQR only." (36165/1)
Section 9.8.2 (79.h-j), the formating of these paragraphs were modified.
Section 9.10, the abreviation for Action Number (ACN) was corrected.

Annex A

Part A.6, a stray mark in the text of S297 was removed.
Part A.6, corrected the references in footnotes S355 and S356. (36400/1)
Part A.6, deleted footnotes S872 and added S401, S905, S906 and S907. (36186/1)
Part A.6, added new footnotes S891 through S899 for FCC satellite systems. (36321/1)
Part A.6, formating corrected between footnotes S698 and S700.

Annex D

Table 3 was revised updating the email address for the Army Frequency Management Office Continental U.S. (AFMO CONUS). (36295/1)

Annex G

Part G.1 was revised updating the U.S. Navy/Marine Corps information.
Part G.1.1, added "NON-GOVERNMENT RECORDS (70/80/90 GHz) NGR". (36320/1)

Annex H

Formating corrections were made on pages H-5 and H-6.

1.5.1 Instructions

Effected Pages: Cover Page, Table of Contents, Preface i through iii, 1-13 through 1-14, 4-75, 4-134, 4-139, 4-149, 4-164, 4-165, 4-178, 5-18, 5-31, 5-33, 5-38, 6-4, 6-21, 6-24, 6-27, 8-2, 8-6, 8-17, 8-51, 9-19 through 9-20, 9-23, 9-45, 9-49 through 9-51, 9-55, 9-85, A-13, A-15, A-12, A-17, A-22, D-5, G-6 through G-12, H-5, H-6, the Summary and the Index.

Replace Pages: Cover Page, Table of Contents, Preface i through iv, 1-13 through 1-14, 4-75 through 4-76, 4-133 through 4-134, 4-139 through 4-140, 4-149 through 4-150, 4-163 through 4-166, 4-177 through 4-178, 5-17 through 5-18, 5-31 through 5-38, 6-3 through 6-4, 6-21 through 6-32, 8-1 through 8-2, 8-5 through 8-6, 8-17 through 8-58, 9-19 through 9-24, 9-45 through 9-46, 9-49 through 9-94, A-11 through 18, A-21 through A-22, D-5 through D-6, G-5 through G-12, H-5 through H-6, the Summary, and the Index.

1.6 January 2008 Edition of the NTIA Manual

The font was changed from CG Times to Times New Roman throughout the manual, except for the allocation table, which continues to use Arial Narrow.

The terms government and non-Government were revised to read Federal and non-Federal in many

places in the NTIA Manual. In areas of the manual that reference text from other documents these changes were not made.

Cover Page, Table of Contents and the Preface, these sections of the manual were updated.

Chapter 1

Section 1.3.2 subsection 3, the last sentence in the first paragragh was rewritten.
Section 1.3.2, "ByLaws", in this section the articles "Conduct of Work" and "Procedure and Voting" were both listed as Article VII. The article "Procedure and Voting" was renumbered as Article VIII and the remaining articles were renumbered.

Chapter 3

Section 3.9.9, the text in this section was replaced.
Section 3.9.11, modified the text replacing Treasury with Homeland Security.
Section 3.9.12, modified the text related to CMERAR and other editorial changes.

Chapter 4

Section 4.1.3, changes were made to the following footnotes:
Deleted US223
Modified G133
Editorial corrections were made to US222, US342 and US362
Sections 4.2.3 and 4.2.4 were previously marked as Reserved, these sections were removed and the following section was renumbered.
Section 4.3.7 was revised.

Chapter 5

Section 5.2.1, Table 5.2.1 "Table of Frequency Tolerances", Note (e), changed 1630 kHz to 1610 kHz.
Section 5.6.2, corrected an error in the "Unwanted Emission Mask" formulas.

Chapter 7

The "Part" and "Section" numbering for all of this chapter was corrected.
Part 7.11, updated the Air Force, Space and Missile Systems Center and NASA information.
Part 7.27, added this new part titled "Use of Electronic Countermeasures/Equipment In Response To Radio-Controlled Improvised Explosive Devices".

Chapter 8

Section 8.2.41, added this new section titled "Space Systems Using Necessary Bandwidths Greater Than 5 MHz for Transmissions from Space in the Band 2200-2290 MHz".

Chapter 9

Section 9.8.1, added gg to the Table. Index of Field Codes
Section 9.8.2, added subparagraph 39 (U)
Part 1, updated the text for:

MISC (Miscellaneous) and SPECIAL PROJECTS
Added Short Term Incident Response
Part 2, Updated the text for:
OTHER OPERATION
SHIP/SHORE OPERATIONS
CAP was modified to AFAUX/CAP
Added new text for:
WIDEBAND GLOBAL SATCOM
Replaced the definition for CAP and added a definition for AFAUX/CAP
39. Circuit Remarks (REM) (40 Characters-30 Occurrences**)**
Added gg. Pre-coordination Data (*PRC)

Chapter 10

Section 10.8.3A, added this new section to the manual.

Annex A

Changes were made to the following footnotes.
Added S-Notes 900 – 904
Modified S862
Modified S264 replacing CINCPAC with PACOM
Deleted S846

Annex G

Part 1, Revised the formating of the table for "Agency, Bureau, and Other Organizational Abbreviations".
Part 1, removed the Interstate Commerce Commission and updated the Treasury text.
Part 3, updated the text for the Coast Guard Areas and Districts.
Deleted the CAP text and related figures, renumbered the figures following the deleted figure.
Part 5, added CDS – CubicDefense Systems to the list of abreviations.

1.6.1 Instructions

The January 2008 Edition replaces in its entirety the May 2003 Edition and all revisions.

(Last Page in this Section)

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