June 15, 1999

Mr. Roderick K. Porter
Acting Chief of the International Bureau
Federal Communications Commission
Washington, D.C. 20554

Dear Mr. Porter:

The National Telecommunications and Information Administration on behalf of the Executive Branch Agencies, has approved two additional proposals for WRC-2000. The first proposal is concerned with agenda item 1.6.1 and contains the government draft proposal for the IMT-2000 system. The second proposal is concerned with agenda item 1.16 and addresses the re-allocation of frequency bands above 71 GHz. The proposed changes will accommodate the requirements of the radio astronomy and earth-exploration satellite (passive) services. These proposals are being forwarded to your WRC-2000 Advisory Committee for review. Karl Nebbia from my staff will contact Damon Ladson and reconcile any differences.

Sincerely,

Original Signed by Fred Wentland
William T. Hatch
Acting Associate Administrator
Office of Spectrum Management

Enclosures

United States of America

(DRAFT) PROPOSALS FOR THE WORK OF THE CONFERENCE

Proposals for Agenda Item 1.6.1

Review of spectrum and regulatory issues for advanced mobile application in the context of IMT-2000, noting that there is an urgent need to provide more spectrum for the terrestrial component of such applications and that priority should be given to terrestrial mobile spectrum needs, and adjustments to the table of frequency allocations as necessary.

Background Information: IMT-2000, also known as 3rd generation wireless, is intended to provide future public telecommunications capable of broadband and multi-media applications. Although the terrestrial component of IMT-2000 will be implemented on a national basis, seamless global roaming and a high degree of commonality of design and compatibility of services are considered essential attributes of IMT-2000 systems**.**

Studies completed by ITU-R Task Group 8/1 forecast that, by 2 010, 160 MHz of spectrum may be needed for terrestrial IMT-2000 systems. This requirement would be in addition to the 1 885-2 025/2 110-2 200 MHz bands already identified for FPLMTS in **S5.388**, and in addition to the spectrum already implemented by administrations for 1st and 2nd generation systems. In the U.S., the 1st and 2nd generation system bands include the bands 824-849/869-894 MHz (used for cellular telephones), 1 850-1 990 MHz (used for PCS), and bands at 800/900 MHz used by Enhanced SMR operations. The 1st and 2nd generation system bands are natural candidates for evolution to IMT-2000 services, assuming there is an evolution path that facilitates implementation from pre-IMT-2000 market technology.

The United States believes that a policy of flexibility for administrations to identify bands for assignment to IMT-2000 systems, which are essentially domestic radio systems, and to avoid seeking to have these identified within the ITU Radio Regulations. There appears to be sufficient mobile service allocations above and below 1 GHz to accommodate the needs of IMT-2000 systems. Moreover, detailed planning of bands could diminish flexibility of countries to accommodate domestic needs as these arise, often at different time scales, taking account of the different stages of development.

Because of the need to satisfy marketplace needs well before the time frame provided in the original IMT-2000 footnote from WARC-92, the United States and many other countries in Region 2 and Region 3, have implemented Personal Communications Services within much of the same band. IMT-2000 is most likely to be initially implemented in the PCS band plan in these countries, rather than the one specified in the WARC-92 footnote.

Administrations may implement IMT-2000 systems in any frequency band allocated to the mobile service, therefore a specific provision in Article **S5** of the Radio Regulations is not necessary and keeping in mind the requirement to minimise the number of footnotes in the Radio Regulations (Resolution **26**). It would be possible that both existing bands (**S5.388**) and additional bands could be listed in a new Resolution or Recommendation without any specific identification or priority given to a system, as opposed to service in a footnote to the Radio Regulations. Different dates of introduction for IMT-2000 bands can be provided in a new resolution. This avoids implying an allocation or a higher regulatory status for the IMT-2000 system,

over other systems in the mobile services and/or other radio services, by disassociating any spectrum identification for IMT-2000 from the table of frequency allocations.

The frequency bands 1525-1559 MHz and 1626.5-1660.5 MHz have been identified by TG8/1 as candidate bands for the satellite component of IMT-2000. There are a number of issues related to agenda item 1.10 and delineated in Resolution **218** for these bands that need to be resolved regarding AMS(R)S. If the satellite component of IMT-2000 utilizes these bands, account must be taken of the priority of AMS(R)S communications over all other communications as described in ITU RR **S5.357A** and **S5.362A**.

Proposal:

Section IV – Table of Frequency Allocations

1 710-2 025 MHz

	Allocation to services		
	Region 1	**Region 2**	**Region 3**
USA/1.6.1/1 MOD	**1 710-1 930** FIXED MOBILE S5.380 S5.149 S5.341 S5.385 S5.386 S5.387 ~~S5.388~~		
USA/1.6.1/2 MOD	1 930-1 970 FIXED MOBILE ~~S5.388~~	1 930-1 970 FIXED MOBILE Mobile-satellite (Earth-to-space) ~~S5.388~~	1 930-1 970 FIXED MOBILE ~~S5.388~~
USA/1.6.1/3 MOD	**1 970-1 980** FIXED MOBILE ~~S5.388~~		
USA/1.6.1/4 MOD	**1 980-2 010** FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) ~~S5.388~~ S5.389A S5.389B S5.389F		
USA/1.6.1/5 MOD	**2 010-2 025** FIXED MOBILE ~~S5.388~~	**2 010-2 025** FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) ~~S5.388~~ S5.389C S5.389D S5.389E S5.390	**2 010-2 025** FIXED MOBILE ~~S5.388~~

2 110-2 200 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
2 110-2 120	FIXED MOBILE SPACE RESEARCH (deep space) (Earth-to-space) ~~S5.388~~	
2 120-2 160 FIXED MOBILE ~~S5.388~~	**2 120-2 160** FIXED MOBILE Mobile-satellite (space-to-Earth) ~~S5.388~~	**2 120-2 160** FIXED MOBILE ~~S5.388~~
2 160-2 170 FIXED MOBILE ~~S5.388~~ S5.392A	**2 160-2 170** FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) ~~S5.388~~ S5.389C S5.389D S5.389E S5.390	**2 160-2 170** FIXED MOBILE ~~S5.388~~
2 170-2 200	FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) ~~S5.388~~ S5.389A S5.389F S5.392A	

USA/1.6.1/ 6
MOD

USA/1.6.1/ 7
MOD

USA/1.6.1/ 8
MOD

USA/1.6.1/ 9
MOD

USA/1.6.1/ 10 **S5.388**
SUP

Reasons: Detailed WRC-based planning can diminish the flexibility of countries to manage essentially short-range domestic radio, and has proven to be disadvantageous or irrelevant in certain instances. Footnotes like **S5.388** do not constitute an allocation and lack definition and regulatory purpose.

USA/1.6.1/ 11
SUP

~~**RESOLUTION 212 (Rev.WRC-97)**~~

~~**Implementation of International Mobile Telecommunications-2000 (IMT-2000)***~~

USA/1.6.1/ 12
ADD

RECOMMENDATION XXX (WRC-2000)

Global Mobile Telecommunication Systems including International Mobile Telecommunications-2000 (IMT-2000)

The World Radiocommunication Conference (Istanbul, 2000),

considering

a) that IMT-2000 is the ITU vision of global mobile access in the 21st century and is scheduled to start service around the year 2000;

b) that IMT-2000 is an advanced mobile communications concept intended to provide telecommunications services on a worldwide scale regardless of location, network or terminal used;

c) that through integration of terrestrial mobile and mobile satellite systems, different types of wireless access will be provided globally, including services available through the fixed telecommunications networks and those specific to mobile users;

d) that 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) and that such use does not preclude the use of these bands by other services to which they are allocated (WRC-97);

e) that ITU-R Report M.[IMT.SPEC] Spectrum Requirements for IMT-2000, forecasted a need for 160 MHz of spectrum on a global basis for the terrestrial component and 2x67 MHz for the satellite component in the year 2010, in addition to the frequency bands listed in considering d);

considering further

a) that ITU-R has not completed its studies regarding duplexing methods, modulation techniques, channeling arrangements, signaling or communication protocols;

b) that no worldwide intersystem numbering plan currently exists that would facilitate worldwide roaming,

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* IMT-2000 was previously known as Future Public Land Mobile Telecommunication Systems (FPLMTS).

noting

a) that Administrations may implement IMT-2000 systems in any frequency band allocated to the mobile service;

b) that IMT-2000, as well as other global terrestrial mobile systems do not have priority or a higher regulatory status over other services in the mobile service or other radio services;

c) that the implementation of the terrestrial component of IMT-2000, in some countries, in the bands 1885-2025 MHz and 2110-2200 MHz is expected to commence around the year 2000, subject to market and technical considerations;

d) that the availability of the satellite component of IMT-2000 in the bands 1980-2010 MHz and 2170-2200 MHz simultaneously with the terrestrial component of IMT-2000 in the bands 1885-2025 MHz and 2110-2200 MHz would improve the overall implementation and availability of IMT-2000 to both developed and developing countries,

invites administrations

to give due consideration to the accommodation of other services currently operating in these bands when implementing IMT-2000,

invites ITU-T

a) to complete its studies of signaling and communication protocols;

b) to develop a common worldwide intersystem numbering plan and associated network capabilities that will facilitate worldwide roaming,

recommends

a) that administrations planning to implement terrestrial IMT-2000 systems on a global basis, consider the use of the bands: 1 850-1 885 MHz, 1 885-2025 MHz/2110-2200 MHz, 2 520-2 670 MHz;

b) that administrations planning to implement satellite IMT-2000 systems on a global basis, consider the use of the bands 1 525-1 559/1 626.5-1 660.5 MHz, 1 610-1 626.5/2 483.5-2500 MHz, and 1980-2010/2170-2200 MHz;

c) that administrations planning to implement additional terrestrial IMT-2000 systems on a regional/national basis, consider the use of the band 800/900 MHz (Region 2);

d) that administrations planning to implement additional satellite IMT-2000 systems on a national/regional basis, consider the use of the bands 2520-2535/2655-2670 MHz (all Regions), 2500-2520/2670-2690 MHz (RR **S5.414** and **S5.419**) and 2010-2025/2160-2170 MHz (Region 2);

e) that administrations study and consider the possible use of the regional/national frequency bands listed in recommends c) and d) in the longer

term, with a view to harmonizing spectrum on a worldwide basis for IMT-2000 and other global telecommunication systems;

f) that administrations deploying IMT-2000 systems should use the relevant international technical characteristics, as identified by ITU-R and ITU-T Recommendations.

Reasons: IMT-2000 systems, as well as future generation mobile systems can be implemented on a worldwide and regional basis through the use of a WRC Recommendation. It is not necessary to have regulatory provisions in the radio regulations such as footnotes and resolutions.

United States of America

(DRAFT) PROPOSALS FOR THE WORK OF THE CONFERENCE

Proposals for Agenda Item 1.16

to consider allocations of frequency bands above 71 GHz to the earth-exploration satellite (passive) and radio astronomy services, taking into account Resolution 723

Background Information: The following proposals modify many of the allocation tables above 71 GHz to accommodate the requirements of the radio astronomy and earth-exploration satellite (passive) services.

GHz

71 – 74

Allocation to Services		
Region 1	Region 2	Region 3
71 – 74	FIXED ~~FIXED-SATELLITE (Earth-to-space)~~ FIXED-SATELLITE (space-to-Earth) MOBILE ~~MOBILE-SATELLITE (space-to-Earth)~~ MOBILE-SATELLITE (Earth-to-space) ~~S5.149 S5.556~~	

USA/ / 13
MOD

Reasons: MSS and FSS uplinks and downlinks in 71-74 GHz and 81-84 GHz bands have been interchanged to avoid satellite downlinks in bands needed by RAS. Atmospheric absorption is only slightly higher in 71-74 GHz band than in 81-84 GHz band. The RAS footnotes **S5.149** and **S5.556** have been deleted in favor of allocations above 76 GHz. The reference to the 72.77-72.91 GHz band in footnotes **S5.149** and **S5.556** has been deleted.

GHz

74 – 76

Allocation to Services		
Region 1	Region 2	Region 3
74 – 75.5	BROADCASTING-SATELLITE FIXED ~~FIXED-SATELLITE (Earth-to-space)~~ FIXED-SATELLITE (space-to-Earth) MOBILE Space Research (space-to-Earth) **MOD** S5.561 **ADD** S5.EEE	
75.5 – 76	~~AMATEUR~~ ~~AMATEUR-SATELLITE~~ BROADCASTING-SATELLITE FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Space Research (space-to-Earth) **MOD** S5.561 **ADD** S5.EEE	

USA/ / 14
MOD

USA/ / 15
MOD

Reasons: BSS, which is currently allocated to the 84-86 GHz band, has been relocated to this band to protect RAS above 76 GHz. Atmospheric absorption is

only slightly higher in 74-76 GHz band than in 84-86 GHz band. Amateur and Amateur-Satellite allocations have been shifted to 80.5-81 GHz. The new footnote **S5.EEE** protects existing Amateur and Amateur-Satellite operations in the 75.5-76 GHz band until the year 200[X]. The FSS (Earth-to-space) allocation has been moved to 84-86 GHz band. The proposed allocations in the 74-84 GHz range preserve a contiguous 10 GHz space research downlink (secondary), which is required for space VLBI purposes. The footnote **S5.561** has been modified to recognize the change in BSS allocation.

GHz

76 – 81

	Allocation to Services		
	Region 1	Region 2	Region 3
USA/ / 16 MOD	**76 – ~~81~~77.5**	RADIO ASTRONOMY **ADD S5.RAS** RADIOLOCATION Amateur Amateur-Satellite Space Research (space-to-Earth) ~~S5.560~~ **MOD** S5.149	
USA/ / 17 MOD	**77.5 – 78**	AMATEUR AMATEUR SATELLITE ~~RADIOLOCATION~~ ~~Amateur~~ ~~Amateur-Satellite~~ Radio Astronomy Space Research (space-to-Earth) ~~S5.560~~ **MOD** S5.149	
USA/ / 18 MOD	**78 – 81**	RADIO ASTRONOMY **S5.RAS** RADIOLOCATION Amateur Amateur-Satellite Space Research (space-to-Earth) S5.560 **MOD** S5.149	

Reasons: The existing 76 - 81 GHz band has been divided into three sub-bands. The addition of a radio astronomy allocation, footnote **S5.RAS,** and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide in both the 76 - 77.5 GHz and 78 – 81 GHz bands. Radio astronomy is added as a secondary allocation in the 77.5 – 78 GHz band. Amateur and amateur-satellite services are shifted by 0.5 GHz, to accommodate BS, FSS and MSS downlinks at the lower portion of atmospheric window, and to avoid sharing with vehicular radars, which some

Administrations have authorized to operate in the 76-77 GHz band. There is no change in sharing between services, except for introduction of RAS allocation in the upper and lower sub-bands. The bands has been added to those listed under **S5.149**. The footnote **S5.560** is deleted from the 76 - 77.5 and 77 - 78 GHz sub-bands, where it doesn't apply.

GHz

81 – 84

USA/ / 19
MOD

Allocation to Services		
Region 1	Region 2	Region 3
81 – 84	FIXED ~~FIXED-SATELLITE (space-to-Earth)~~ FIXED-SATELLITE (Earth-to-space) MOBILE ~~MOBILE-SATELLITE (space-to-Earth)~~ MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY **ADD S5.RAS** Space research (space-to-Earth) **MOD** S5.149 S5.DDD	

Reasons: The directions of MSS and FSS downlinks have been reversed to allow radio astronomy observations. The uplinks are paired with the 71-74 GHz downlinks. The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations worldwide. The footnote **S5.DDD** has been added to maintain the current amount of secondary amateur and amateur-satellite spectrum. This band has been added to footnote **S5.149**.

GHz

84 – 86

USA/ / 20
MOD

Allocation to Services		
Region 1	Region 2	Region 3
84 – 86	BROADCASTING ~~BROADCASTING-SATELLITE~~ FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY **ADD S5.RAS** **MOD** S5.149 ~~S5.561~~	

Reasons: The Broadcasting Satellite allocation has been relocated to 74-76 GHz band. The direction of satellite downlinks has been reversed to allow radio astronomy observations. The uplink has been paired with 74-76 GHz downlink.

The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations worldwide. This band has been added to footnote **S5.149**. The **S5.561** footnote is no longer relevant to this band; appropriately modified it now applies to the 74-75.5 GHz and 75.5 - 76 GHz bands.

GHz

86 – 92

Allocation to Services		
Region 1	Region 2	Region 3
86 – 92	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) S5.340	

USA/ / 21
NOC

Reasons: This band is of crucial importance to the RAS, SR (passive) and EES (passive) services; it is the window for the band around 118.75 GHz. No active services are acceptable in this band and no change in current allocations is feasible.

GHz

92 – 94

Allocation to Services		
Region 1	Region 2	Region 3
92 – 94	FIXED ~~FIXED-SATELLITE (Earth-to-space)~~ MOBILE RADIO ASTRONOMY **ADD S5.RAS** RADIOLOCATION **MOD** S5.149 ~~S5.556~~	

USA/ / 22
MOD

Reasons: The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. Previously, radio astronomy interest was recognised via footnote **S5.556**. The FSS (Earth-to-space) allocation, no longer needed to balance 102-105 GHz allocation, has been relocated to 71-76 GHz band. This band has been added to those listed under **S5.149**. Footnote **S5.556** has been deleted from this band, as it is no longer necessary.

GHz

94 – 94.1

Allocation to Services		
Region 1	Region 2	Region 3
94 – 94.1	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) <u>Radio Astronomy</u> S5.562	

USA/ / 23
MOD

Reasons: The radio astronomy service is secondary to the active services. No change in sharing between services is proposed, except for introduction of the RAS allocation in this band.

GHz

94.1 – 95

Allocation to Services		
Region 1	Region 2	Region 3
94.1 – 95	FIXED ~~FIXED-SATELLITE (Earth-to-space)~~ MOBILE <u>RADIO ASTRONOMY **ADD S5.RAS**</u> RADIOLOCATION **MOD** S5.149 ~~S5.556~~	

USA/ / 24
MOD

Reasons: The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. No change in sharing between existing services, except for introduction of RAS allocation in band. The FSS (Earth-to-space) allocation, no longer needed to balance 102-105 GHz, has been relocated to 71-76 GHz band. The footnote **S5.556** is deleted, as it is not relevant to this band (should have been suppressed consequential to WRC-97 actions). This band has been added to those listed under **S5.149**.

GHz

95 – 100

Allocation to Services		
Region 1	Region 2	Region 3
95 – 100	FIXED **MOD** S5.553	
	MOBILE **MOD** S5.553	
	~~MOBILE-SATELLITE~~	
	RADIO ASTRONOMY **ADD S5.RAS**	
	RADIOLOCATION	
	RADIONAVIGATION	
	RADIONAVIGATION-SATELLITE	
	~~Radiolocation~~	
	MOD S5.149 S5.554 ~~S5.555~~	

USA/ / 25
MOD

Reasons: The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. Radiolocation has been upgraded to primary, consequential to the addition of radio astronomy as a primary service. The mobile satellite service is deleted, as it cannot share with the Radiolocation service. This band has been added to those listed under **S5.149**. Footnote **S5.555**, which allocates the 97.88-98.08 GHz sub-band to the RAS on a primary basis has been deleted, and the band has been deleted from footnote **S5.555**. The footnote **S5.553** has been modified to include stations in the fixed service.

GHz

100 – 102

Allocation to Services		
Region 1	Region 2	Region 3
100 – 102	EARTH EXPLORATION-SATELLITE (passive)	
	FIXED	
	MOBILE	
	RADIO ASTRONOMY **ADD S5.RAS**	
	SPACE RESEARCH (passive)	
	MOD S5.149 S5.341	

USA/ / 26
MOD

Reasons: The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. There is no change in sharing between services, except for introduction of RAS allocation in band. This band is used by EES (passive) for limb sounding of atmospheric constituents (NO line at 100.49 GHz). This band added to those listed under **S5.149**.

GHz

102 – 105

Allocation to Services		
Region 1	Region 2	Region 3
102 – 105	FIXED ~~FIXED-SATELLITE (space-to-Earth)~~ MOBILE RADIO ASTRONOMY **ADD S5.RAS** **MOD** S5.149 S5.341	

USA/ / 27
MOD

Reasons: The FSS allocation has been moved to 74-76 GHz band, to eliminate downlinks in the middle of the atmospheric window needed for radio astronomy observations. Atmospheric absorption in these two windows is similar. The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. This band has been added to those listed under **S5.149.**

GHz

105 – 109.5

Allocation to Services		
Region 1	Region 2	Region 3
105 – ~~116~~109.5	~~EARTH EXPLORATION-SATELLITE (passive)~~ FIXED MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) 5.CCC **MOD** S5.149 ~~S5.340~~ S5.341	

USA/ / 28
MOD

Reasons: The 105-116 GHz range has been divided into 4 sub-bands to make additional spectrum available for other services and to adjust other passive allocations to areas of the spectrum that are more appropriate to meet scientific needs. Passive sensors have no known use for, and do not need the band 105-109.5 GHz, so they have been deleted. Fixed and mobile services have been added, relocated from 116 - 122.5 GHz band, where deletion of these services is needed to protect essential passive sensor operations. Since this band is no longer passive in nature, footnote **S5.340** should be deleted. This band is added to those included under S5.149, to reflect the need to protect radio astronomy in a band that is no longer passive. Footnote **S5.CCC** is added to limit Space Research (passive) allocation to space-based radio astronomy in this band.

GHz

109.5 – 111.8 GHz

Allocation to Services		
Region 1	Region 2	Region 3
<u>109.5 – 111.8</u>	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) S5.340 S5.341	

USA/ / 29
MOD

Reason: It is essential to maintain this passive band. The **MOD** refers to the band limits only; no change **<u>(NOC)</u>** is proposed to the allocations within this sub-band. This band contains an ozone line at 110.8 GHz, which is used for microwave limb sounding. The entire band is of vital importance to radio astronomy for observations of the CO lines at 109.8 and 110.2 GHz, and continuum observations.

GHz

111.8 – 114.25 GHz

Allocation to Services		
Region 1	Region 2	Region 3
<u>111.8 – 114.25</u>	~~EARTH EXPLORATION-SATELLITE (passive)~~ <u>FIXED</u> <u>MOBILE</u> RADIO ASTRONOMY SPACE RESEARCH (passive) <u>S5.CCC</u> **<u>MOD</u>** S5.149 ~~S5.340~~ S5.341	

USA/ / 30
MOD

Reason: Passive sensors do not need the band 111.8-114.25 GHz and have been deleted. Fixed and mobile services are added to this band, they were relocated from the 116 - 122.5 GHz band where deletion of these services is needed to protect essential passive sensor operations. This band is added to those included under **S5.149** to reflect the need to protect radio astronomy in a band that is no longer passive. The addition of the new footnote **S5.CCC** limits the Space Research (passive) allocation to space-based radio astronomy in this band.

GHz

111.8 – 114.25 GHz

Allocation to Services		
Region 1	Region 2	Region 3
114.25 – 116	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) S5.340 S5.341	

USA/ / 31
MOD

Reason: It is essential to maintain this passive band. The **MOD** refers to the band limits only; no change **(NOC)** is proposed to the allocations within this sub-band. The band 114.25-116 GHz is of vital importance to radio astronomy for observations of the 115.3 GHz CO line and is the first portion of the 114.25-122.25 GHz oxygen absorption band which is required for remote sensing, with a peak at 118.75 GHz.

GHz

116 – 122.25

	Allocation to Services		
	Region 1	Region 2	Region 3
USA/ / 32 **MOD**	**116 – 119.98**	EARTH EXPLORATION-SATELLITE (passive) ~~FIXED~~ INTER-SATELLITE **ADD** S5.XXX ~~MOBILE S5.558~~ SPACE RESEARCH (passive) ~~S5.138~~ S5.341	
USA/ / 33 **MOD**	**119.98 – 120.02**	EARTH EXPLORATION-SATELLITE (passive) ~~FIXED~~ INTER-SATELLITE **ADD** S5.XXX ~~MOBILE S5.558~~ SPACE RESEARCH (passive) ~~Amateur~~ S5.341	
USA/ / 34 **MOD**	**120.02 – ~~126~~22.25**	EARTH EXPLORATION-SATELLITE (passive) ~~FIXED~~ INTER-SATELLITE **ADD** S5.XXX ~~MOBILE S5.558~~ SPACE RESEARCH (passive) S5.138 ~~S5.341~~	

Reason: This band is of crucial importance for passive sensing, as it is comprised the majority of the necessary 114.25-122.25 GHz band, the oxygen absorption band, with its peak at 118.75 GHz. The fixed and mobile services have been moved down to 105 - 109.5 GHz and 111.8-114.25 GHz, as sharing with passive sensors would severely restrict these services in this portion of the spectrum. The inter-satellite service needs to be limited by footnote **S5.XXX** to links between GSO satellites only, with pfd limits as specified in sharing studies in order to share the band 116-122.25 GHz with passive sensors. The secondary allocation to amateur services in the band 119.98-120.02 GHz is also moved to 122.5-123 GHz band to avoid interference to passive sensors.

GHz

122.25 – 123

Allocation to Services		
Region 1	Region 2	Region 3
122.25 – 123	~~EARTH EXPLORATION-SATELLITE (passive)~~ FIXED INTER-SATELLITE MOBILE **MOD** S5.558 ~~SPACE RESEARCH (passive)~~ Amateur S5.138 ~~S5.341~~	

USA/ / 35
MOD

Reason: The passive sensor allocations have been deleted from this band, as they are not needed for remote sensing applications. A secondary amateur service allocation has been added to compensate for the deletion of their allocation in the 119.98-120.02 GHz band.

GHz

123 – 126

Allocation to Services		
Region 1	Region 2	Region 3
123 - 126	~~EARTH EXPLORATION-SATELLITE (passive)~~ FIXED FIXED-SATELLITE (space-to-Earth) INTER-SATELLITE MOBILE **MOD** S5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE ~~SPACE RESEARCH (passive)~~ Radio Astronomy ~~S5.138 S5.341~~	

USA/ / 36
MOD

Reasons: This band is not required for passive sensor operations and those allocations have been deleted. Satellite downlinks from 141-153 GHz band have been moved to the 123-130 GHz band to avoid interference to the radio astronomy service. The radio astronomy service is added on a secondary basis, for possible use in wide-band continuum observations. Sharing conditions between the ISS and the FSS, MSS, RNS and RNSS services need to be developed, but no imminent use of the band by these services is contemplated. The MSS directional indicator has been left undefined. The footnotes **S5.138** and **S5.341** do not apply to this band due to changed band limit, and are consequentially deleted.

GHz

126 – 130

USA/ / 37
MOD

Allocation to Services		
Region 1	Region 2	Region 3
126 – ~~134~~ 130	~~FIXED~~ FIXED SATELLITE (space-to-Earth) ~~INTER-SATELLITE~~ ~~MOBILE S5.558~~ MOBILE SATELLITE ~~RADIOLOCATION S5.559~~ RADIONAVIGATION RADIONAVIGATION-SATELLITE Radio Astronomy **MOD** S5.554	

Reasons: Satellite downlinks from 141-153 GHz band have been moved to the 123-130 GHz band to avoid interference to the radio astronomy service. The radio astronomy service is added on a secondary basis for spectral line and wide-band continuum observations. The fixed, mobile, inter-satellite and radiolocation allocations have been relocated to improve sharing situations. Sharing conditions between the FSS, MSS, RNS and RNSS services need to be developed, but no imminent use of the band by these services is contemplated. The MSS directional indicator has been left undefined. The footnote **S5.554** has been modified to include this band.

GHz

130 – 134

USA/ / 38
MOD

Allocation to Services		
Region 1	Region 2	Region 3
130 – 134	FIXED INTER-SATELLITE MOBILE **MOD** S5.558 RADIO ASTRONOMY **ADD S5.RAS** ~~RADIOLOCATION S5.559~~	

Reason: The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. Sharing conditions between the RAS and the ISS need to be developed. Footnote **S5.558** is modified to reflect new mobile service band limit. Radiolocation service has been relocated, to improve sharing conditions.

GHz

134 – 136

Allocation to Services		
Region 1	Region 2	Region 3
134 – ~~142~~ 136	AMATEUR AMATEUR-SATELLITE ~~MOBILE S5.553~~ ~~MOBILE-SATELLITE~~ ~~RADIONAVIGATION~~ ~~RADIONAVIGATION-SATELLITE~~ Radio Astronomy ~~Radiolocation~~ ~~S5.149 S5.340 S5.554 S5.555~~	

USA/ / 39
MOD

Reasons: The amateur and amateur-satellite services are moved here from 142-144 GHz band to avoid interference to radio astronomy at higher frequencies. Radio astronomy is added as secondary service. All footnotes are deleted, as they no longer apply to this band.

GHz

136 – 141

Allocation to Services		
Region 1	Region 2	Region 3
136 – 141	~~MOBILE S5.553~~ ~~MOBILE-SATELLITE~~ RADIO ASTRONOMY **ADD S5.RAS** RADIOLOCATION ~~RADIONAVIGATION~~ ~~RADIONAVIGATION-SATELLITE~~ Amateur Amateur-Satellite ~~Radiolocation~~ **MOD** S5.149 ~~S5.340 S5.554 S5.555~~	

USA/ / 40
MOD

Reasons: Services currently allocated to 144 -149 GHz band are moved to this band to facilitate realignment. The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations worldwide. This band added to those listed under **S5.149**. Since this band is no longer passive, it is removed from **S5.340**. The footnote **S5.554** no longer applies

to this band and is deleted. Footnote **S5.555** no longer needed, as the radio astronomy service is allocated on a primary basis in the entire 136-141 GHz band.

GHz

141 – 148.5

	Allocation to Services		
	Region 1	Region 2	Region 3
USA/ / 41 **MOD**	**141 – 142**	FIXED MOBILE ~~S5.553~~ ~~MOBILE-SATELLITE~~ RADIO ASTRONOMY **ADD S5.RAS** RADIOLOCATION ~~RADIONAVIGATION~~ ~~RADIONAVIGATION-SATELLITE~~ ~~Radiolocation~~ **MOD** S5.149 ~~S5.340 S5.554 S5.555~~	
USA/ / 42 **MOD**	**142 – 144**	~~AMATEUR~~ ~~AMATEUR-SATELLITE~~ FIXED MOBILE RADIO ASTRONOMY **ADD S5.RAS** RADIOLOCATION **MOD** S5.149	
USA/ / 43 **MOD**	**144 – ~~149~~ 148.5**	FIXED MOBILE RADIO ASTRONOMY **ADD S5.RAS** RADIOLOCATION ~~Amateur~~ ~~Amateur-Satellite~~ **MOD** S5.149 ~~S5.555~~	

Reasons: Allocations are transferred to the 141-148.5 GHz band from the 126-134 GHz band to allow for radio astronomy allocations in this band. The bandwidth has been reduced to 7.5 GHz to accommodate EES (passive) and SR (passive) requirements in the 148.5-151.5 GHz band. The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations worldwide. Since the 141-142 GHz sub-band is no longer passive, **S5.340** is deleted from that band and modified accordingly. All sub-bands are added to those listed under **S5.149**. Footnotes **S5.554** and **S5.555** no longer apply to any portion of this band and are deleted and modified accordingly.

GHz

148.5 – 151.5

	Allocation to Services		
	Region 1	Region 2	Region 3
USA/ / 44 **MOD**	**148.5 – 149**	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY ~~RADIOLOCATION~~ SPACE RESEARCH (passive) ~~Amateur~~ ~~Amateur-Satellite~~ ~~S5.149~~ **MOD** S5.340 ~~S5.555~~	
USA/ / 45 **MOD**	**149 – 150**	EARTH EXPLORATION-SATELLITE (passive) ~~FIXED~~ ~~FIXED-SATELLITE (space-to-Earth)~~ ~~MOBILE~~ RADIO ASTRONOMY SPACE RESEARCH (passive) **MOD** S5.340	
USA/ / 46 **MOD**	**150 – 151**	EARTH EXPLORATION-SATELLITE (passive) ~~FIXED~~ ~~FIXED-SATELLITE (space-to-Earth)~~ ~~MOBILE~~ RADIO ASTRONOMY SPACE RESEARCH (passive) ~~S5.149~~ **MOD** S5.340 ~~S5.385~~	
USA/ / 47 **MOD**	**151 – 151.5**	EARTH EXPLORATION-SATELLITE (passive) ~~FIXED~~ ~~FIXED-SATELLITE (space-to-Earth)~~ ~~MOBILE~~ RADIO ASTRONOMY SPACE RESEARCH (passive) **MOD** S5.340	

Reasons: The current passive allocation of 150-151 GHz has insufficient bandwidth for remote sensing observations and is not adequately protected from potential interference. The scientific requirement is for a 3 GHz band centered at 150 GHz for use in conjunction with water vapour observations around 183 GHz. Also, the 150.74 GHz nitrous oxide line at required for microwave limb sounding applications. All active services are relocated from this band to meet these

requirements. Since the 148.5-151.5 GHz band is now purely passive, it is added to those listed under **S5.340**. For the same reason, there is no need to include the band 150-151 GHz in **S5.149**, and it is deleted from this footnote. The footnotes **S5.385** (150-151 GHz band) and **S5.555** (148.5-149 GHz band) are no longer needed and are deleted from these bands

GHz

151.5 – 155.5

Allocation to Services		
Region 1	Region 2	Region 3
151.5 – 156 55.5	FIXED ~~FIXED-SATELLITE (space-to-Earth)~~ MOBILE RADIO ASTRONOMY **ADD S5.RAS** RADIOLOCATION **MOD** S5.149	

USA/ / 48
MOD

Reasons: The FSS downlink allocation is incompatible with radio astronomy requirements in this band and is relocated elsewhere. The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations worldwide. This band is added to those listed under footnote **S5.149**. The additional radiolocation allocation compensates for removal from the 126-134 GHz band.

GHz

155.5 – 158.5

	Allocation to Services		
	Region 1	Region 2	Region 3
USA/ / 49 **MOD**	**155.5 – 156**	EARTH EXPLORATION-SATELLITE (passive) **ADD** S5.AAA FIXED **ADD** S5.BBB ~~FIXED-SATELLITE (space-to-Earth)~~ MOBILE **ADD** S5.BBB RADIO ASTRONOMY **ADD S5.RAS** SPACE RESEACH (passive) **ADD** S5.CCC **MOD** S5.149	
USA/ / 50 **MOD**	**156 – 158**	EARTH EXPLORATION-SATELLITE (passive) **ADD** S5.AAA FIXED **ADD** S5.BBB ~~FIXED-SATELLITE (space-to-Earth)~~ MOBILE **ADD** S5.BBB RADIO ASTRONOMY **ADD S5.RAS** SPACE RESEACH (passive) **ADD** S5.CCC **MOD** S5.149	
USA/ / 51 **MOD**	**158 – ~~164~~58.5**	EARTH EXPLORATION-SATELLITE (passive) **ADD** S5.AAA FIXED **ADD** S5.BBB ~~FIXED-SATELLITE (space-to-Earth)~~ MOBILE **ADD** S5.BBB RADIO ASTRONOMY **ADD S5.RAS** SPACE RESEACH (passive) **ADD** S5.CCC **MOD** S5.149	

Reasons: The scientific requirement is for a 3 GHz band centered at 157 GHz for use in conjunction with water vapour observations around 183 GHz. This allocation is only required until 2018 since current planned and operational instruments are already in this band. By 2018, all of these applications will have transitioned to the 148.5-151.5 GHz band. The FSS downlink allocation is incompatible with radio astronomy requirements and is relocated. The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations worldwide. These sub-bands are added to those listed under **S5.149**. EES operations in the band 155.5-158.5 GHz need to be protected until 1/1/2018. After this date the fixed and mobile services need to co-ordinate with radio astronomy sites only. The space research (passive) allocation is limited to space-based radio astronomy in this band.

GHz

158.5 – 164

Allocation to Services		
Region 1	Region 2	Region 3
158.5 – 164	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth)	

USA/ / 52
MOD

Reasons: Mobile-satellite allocation has been added to partially compensate for loss of 134-142 GHz band.

GHz

164 – 167

Allocation to Services		
Region 1	Region 2	Region 3
164 – 1687	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) **MOD** S5.340	

USA/ / 53
MOD

Reasons: Passive sensors require only this 3 GHz band from the current 164-168 GHz passive allocation. It is essential to maintain the 164 - 167 GHz portion of the band passive. The **MOD** refers to the band limits and addition of the band to footnote **S5.340** only, no change **(NOC)** is proposed to the allocations within this sub-band. This band, along with the band 148.5-151.5 GHz will become the harmonised reference window for passive sensor observations of the 183.31 GHz water vapor line. The band is also used for microwave limb sounding of the 164.38 GHz ClO line. This passive band has been added to those listed under **S5.340**; the 164-168 GHz band had been omitted from **S5.340**.

GHz

167 – 174.8

	Allocation to Services		
	Region 1	Region 2	Region 3
USA/ / 54 MOD	**167 – 168**	~~EARTH EXPLORATION-SATELLITE (passive)~~ FIXED FIXED-SATELLITE (space-to-Earth) INTER-SATELLITE MOBILE **MOD** S5.558 ~~RADIO ASTRONOMY~~ ~~SPACE RESEARCH (passive)~~	
USA/ / 55 MOD	**168 – 170**	FIXED FIXED-SATELLITE (space-to-Earth) INTER-SATELLITE MOBILE **MOD** S5.558	
USA/ / 56 MOD	**170 – 174.5**	FIXED FIXED-SATELLITE (space-to-Earth) INTER-SATELLITE MOBILE **MOD** S5.558 ~~S5.149 S5.385~~	
USA/ / 57 MOD	**174.5 – 176.54.8**	~~EARTH EXPLORATION-SATELLITE (passive)~~ FIXED INTER-SATELLITE MOBILE **MOD** S5.558 ~~SPACE RESEARCH (passive)~~ ~~S5.149 S5.385~~	

Reasons: Passive services do not need the 167-168 GHz band and this band is yielded to displaced active services. Fixed, mobile and inter-satellite services are added to the 167-174.8 GHz band as well as fixed-satellite downlinks to the 167-174.5 GHz band to compensate for deletions in other bands. Passive sensor allocations are deleted from the 174.5-174.8 GHz band to properly adjust the band edge for the 183.3 GHz remote sensing requirement. Footnotes **S5.149** and **S5.385** are deleted from these bands and are appropriately modified. Footnote **S5.558** is added next to mobile allocations in this band and the footnote is modified to include the 167-174.8 GHz band due to sharing with the inter-satellite service.

GHz

174.8 – 191.8

	Allocation to Services		
	Region 1	Region 2	Region 3
USA/ / 58 **MOD**	**174.~~5~~8 – 176.5**	EARTH EXPLORATION-SATELLITE (passive) ~~FIXED~~ INTER-SATELLITE **ADD** S5.YYY ~~MOBILE S5.558~~ SPACE RESEARCH (passive) ~~S5.149 S5.385~~	
USA/ / 59 **MOD**	**176.5 – 182**	EARTH EXPLORATION-SATELLITE (passive) ~~FIXED~~ INTER-SATELLITE **ADD** S5.YYY ~~MOBILE S5.558~~ SPACE RESEARCH (passive) ~~S5.149~~ ~~S5.385~~	
USA/ / 60 **MOD**	**182 – 185**	EARTH EXPLORATION-SATELLITE (passive) ~~RADIO ASTRONOMY~~ SPACE RESEARCH (passive) **MOD** S5.340 S5.563	
USA/ / 61 **MOD**	**185 – 190**	EARTH EXPLORATION-SATELLITE (passive) ~~FIXED~~ INTER-SATELLITE **ADD** S5.YYY ~~MOBILE S5.558~~ SPACE RESEARCH (passive) ~~S5.149 S5.385~~	
USA/ / 62 **MOD**	**190 – ~~200~~191.8**	EARTH EXPLORATION-SATELLITE (passive) ~~MOBILE S5.553~~ ~~MOBILE-SATELLITE~~ ~~RADIONAVIGATION~~ ~~RADIONAVIGATION-SATELLITE~~ SPACE RESEARCH (passive) ~~S5.341 S5.554~~ **MOD** S5.340	

Reasons: The band 174.8-191.8 GHz is of crucial importance for passive sensing of the water vapour absorption line whose peak is at 183.31 GHz. Sharing with fixed and mobile services is not practical, so these services are relocated. The inter-satellite service needs to be limited to links between GSO satellites and to a pfd limit as specified in sharing studies. Footnote **S5.YYY** is added to reflect this requirement. The entire band is deleted from those listed under **S5.149**, **S5.385**

(secondary radio astronomy allocation). All applicable footnotes are appropriately modified. Since no terrestrial radio astronomy use of the band 182-185 GHz is possible due to high atmospheric absorption, the radio astronomy allocation is deleted. Active services are moved from the 190-191.8 GHz band to make room for the addition of passive sensor allocations. The footnote **S5.554** is deleted from this band, to reflect removal of active services, and modified to reflect this change. **S5.341** does not apply to this band and is deleted. The footnote **S5.340** has been modified to include this band.

GHz

191.8 – 200

Allocation to Services		
Region 1	Region 2	Region 3
USA/ / 63 **MOD** **<u>191.8</u> – 200**	<u>FIXED</u> **MOD** S5.553 <u>INTER-SATELLITE</u> MOBILE **MOD** S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE S5.341 **MOD** S5.554	

Reasons: Inter-satellite and fixed service allocations added to compensate for deletions from other bands. The footnotes **S5.553** and **S5.554** modified to reflect deletion of terrestrial services from 190.0 -191.8 GHz band, and to include stations in the fixed service, allocated to the 191.8-200 GHz band.

GHz

200 – 209

Allocation to Services		
Region 1	Region 2	Region 3
200 – 202	EARTH EXPLORATION-SATELLITE (passive) ~~FIXED~~ ~~MOBILE~~ RADIO ASTRONOMY SPACE RESEARCH (passive) **MOD** S5.340 S5.341	
202 – ~~217~~09	EARTH EXPLORATION-SATELLITE (passive) ~~FIXED~~ ~~FIXED-SATELLITE (Earth-to-space)~~ ~~MOBILE~~ RADIO ASTRONOMY SPACE RESEARCH (passive) **MOD** S5.340 S5.341	

USA/ / 64
MOD

USA/ / 65
MOD

Reasons: This band is the optimum band for microwave limb sounding of water vapour and other atmospheric constituents in the low troposphere. Fixed and mobile services as well as the fixed-satellite uplink in the 202-209 GHz band are all relocated to meet this requirement. Footnote **S5.340** is consequentially modified, to include this band. A radio astronomy allocation has been added to satisfy the requirement for radio astronomy spectral line and wide band continuum observations.

GHz

209 – 217

Allocation to Services		
Region 1	Region 2	Region 3
209 – 217	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY **ADD S5.RAS** **MOD** S5.149 S5.341	

USA/ / 66
MOD

Reasons: The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. This band has been added to those listed under **S5.149**.

GHz

217 – 226

Allocation to Services		
Region 1	Region 2	Region 3
217 – 231 26	~~EARTH EXPLORATION-SATELLITE (passive)~~ FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) **ADD** S5.CCC **MOD** S5.149 ~~S5.340~~ S5.341	

USA/ / 67
MOD

Reasons: Passive sensors do not need this band and the EESS allocation is deleted. Fixed and mobile services and fixed-satellite uplinks are moved to this band from other locations. This band is no longer passive; consequentially it now needs to be listed under footnote **S5.149**. This band has been removed from footnote **S5.340** and footnote **S5.340** has been deleted from this band.

GHz

226 – 231.5

Allocation to Services		
Region 1	Region 2	Region 3
226 – 231	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) **ADD** S5.CCC **MOD** S5.340 S5.341	
231 – 235 1.5	EARTH EXPLORATION-SATELLITE (passive) ~~FIXED~~ ~~FIXED-SATELLITE (space-to-Earth)~~ ~~MOBILE~~ RADIO ASTRONOMY SPACE RESEARCH (passive) S5.CCC ~~Radiolocation~~ **MOD** S5.340 S5.341	

USA/ / 68
MOD

USA/ / 69
MOD

Reasons: It is essential to maintain the 226-231.5 GHz band passive. The **MOD** refers to the band limits only; no change **(NOC)** is proposed to the allocations within this sub-band. Passive sensors require exclusive use of only the 226-231.5 GHz portion of the 217-231 GHz band for microwave limb sounding of atmospheric constituents. In addition, this band contains a 4 GHz reference window for higher frequency water vapor measurements. This band is of vital importance to the radio astronomy service for observations of the 230.5 GHz CO line. The footnote **S5.340** is modified to take into account that 217-226 GHz band is no longer passive, while adding the 231-231.5 GHz band. The fixed and mobile services, as well as the fixed-satellite downlinks, have been deleted from the 231-231.5 GHz portion, to allow passive observations in this band.

GHz

231.5 – 235

Allocation to Services		
Region 1	Region 2	Region 3
231.5 – 235	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Radiolocation	

USA/ / 70
MOD

Reasons: The only required change in this band is the 500 MHz upward adjustment of the lower band edge (see the previous modification).

GHz

235 – 238

Allocation to Services		
Region 1	Region 2	Region 3
235 – 238	EARTH EXPLORATION-SATELLITE (passive) FIXED ~~FIXED-SATELLITE (space-to-Earth)~~ MOBILE RADIO ASTRONOMY **ADD S5.RAS** SPACE RESEARCH (passive)	

USA/ / 71
MOD

Reasons: Passive sensors are limited to microwave limb sounding in the band 235-238 GHz and can share with terrestrial services due to the absorption characteristics of this band. The fixed-satellite downlink is not compatible with the radio astronomy requirement for this band and is reallocated elsewhere. The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide.

GHz

238 – 241

Allocation to Services		
Region 1	Region 2	Region 3
238 – 241	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE RADIOLOCATION RADIONAVIGATION RADIONAVIGATION-SATELLITE ~~Radiolocation~~	

USA/ / 72
MOD

Reasons: Additional allocations to the radiolocation, radionavigation and radionavigation-satellite services, to compensate for allocation changes in the 150-160 GHz frequency range.

GHz

241 – 248

Allocation to Services		
Region 1	Region 2	Region 3
241 – 248	RADIOLOCATION	
	RADIO ASTRONOMY **ADD S5.RAS**	
	Amateur	
	Amateur-Satellite	
	S5.138 **MOD** S5.149	

USA/ / 73
MOD

Reasons: The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. This band is added to those listed under footnote **S5.149**. There is no change in sharing between existing services, except for the introduction of the radio astronomy service allocation in band.

GHz

248 – 250

Allocation to Services		
Region 1	Region 2	Region 3
248 – 250	AMATEUR	
	AMATEUR-SATELLITE	
	Radio Astronomy	

USA/ / 74
MOD

Reasons: The radio astronomy service allocation is added on a secondary basis.

GHz

250 – 252

Allocation to Services		
Region 1	Region 2	Region 3
250 – 252	EARTH EXPLORATION-SATELLITE (passive)	
	SPACE RESEARCH (passive)	
	RADIO ASTRONOMY	
	~~S5.149 S5.555~~ **MOD** S5.340	

USA/ / 75
MOD

Reasons: Microwave limb sounding of nitrous oxide near 251 GHz defines the passive-sensing requirement for this band. Radio astronomy is added to the other passive services. The addition of another passive service does not alter sharing scenario. The footnotes **S5.149** and **S5.555** are consequentially deleted and band

lists in these footnotes are appropriately modified. The footnote **S5.340** is added to reflect the passive nature of band.

GHz

252 – 265

Allocation to Services		
Region 1	Region 2	Region 3
252 – 265	FIXED **MOD** S5.553 MOBILE **MOD** S5.553 MOBILE-SATELLITE (Earth-to-space) RADIONAVIGATION RADIONAVIGATION-SATELLITE RADIO ASTRONOMY **ADD S5.RAS** **MOD** S5.149 ~~S5.385~~ S5.554 ~~S5.555 S5.564~~	

USA/ / 76
MOD

Reasons: The fixed service is relocated to this band due to other allocation actions in other bands. The addition of a radio astronomy allocation and new footnote **S5.RAS**, along with **RES RAS** satisfy requirements for radio astronomy spectral line (current secondary allocation to radio astronomy at 257.5 - 258 GHz deleted) and wide band continuum observations from remote locations worldwide. The directional indicator added to mobile-satellite service allocation, which is paired with allocation in the 190-200 GHz band. Atmospheric absorption in the 252-265 GHz band is relatively constant and somewhat higher than in the paired downlink band. This entire band is added to those listed under footnote **S5.149**, and the band is deleted from **S5.385** and **S5.555**. The footnotes **S5.385** and **S5.555** have been modified to reflect changes. The footnote **S5.564** is no longer needed in this band due to the worldwide nature of the radio astronomy allocation.

GHz

265 – 275

Allocation to Services		
Region 1	Region 2	Region 3
265 – 275	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY **ADD S5.RAS** **MOD** S5.149	

USA/ / 77
MOD

Reasons: The only change is the addition of footnote **S5.RAS**, reflecting the protection requirement for only a limited number of radio astronomy sites worldwide.

GHz

275 – 400

Allocation to Services		
Region 1	Region 2	Region 3
275 – ~~400~~ 1000 (Not allocated) **MOD** S5.565		

USA/ / 78
MOD

Reasons: The change of the upper limit for applicability of footnote **MOD S5.565** is to account for various passive service needs above 275 GHz that have been identified by administrations. Many lines and windows required for radio astronomy observations and passive remote sensing of the Earth exist above 275 GHz.

USA/ / 79
MOD

S5.149 In making assignments to stations of other services to which the bands:

13 360-13 410 kHz,
25 550-25 670 kHz,
37.5-38.25 MHz,
73-74.6 MHz in Regions 1 and 3,
150.05-153 MHz in Region 1,
322-328.6 MHz*,
406.1-410 MHz,
608-614 MHz in Regions 1 and 3,
1 330-1 400 MHz*,
1 610.6-1 613.8 MHz*,
1 660-1 670 MHz,
1 718.8-1 722.2 MHz*,
2 655-2 690 MHz,
3 260-3 267 MHz*,
3 332-3 339 MHz*,
3 345.8-3 352.5 MHz*,
4 825-4 835 MHz*,
4 950-4 990 MHz,
4 990-5 000 MHz,
6 650-6 675.2 MHz*,
10.6-10.68 GHz,
14.47-14.5 GHz*,
22.01-22.21 GHz*,
22.21-22.5 GHz,
22.81-22.86 GHz*,
23.07-23.12 GHz*,
31.2-31.3 GHz,
31.5-31.8 GHz in Regions 1 and 3,
36.43-36.5 GHz*,
42.5-43.5 GHz,
42.77-42.87 GHz*,
43.07-43.17 GHz*,
43.37-43.47 GHz*,
48.94-49.04 GHz*,
~~72.77-72.91 GHz*,~~
76.5-81.5 GHz
81.5-84.5 GHz,
84.5-86 GHz
~~93.07-93.27 GHz*,~~
92-94 GHz,
94.1-95 GHz,
95-100 GHz,
~~97.88-98.08 GHz*,~~
100-102 GHz,
102-105 GHz,
105-109.5 GHz
111.8-114.25 GHz
140.69-140.98 GHz*,
141-148.5 GHz,
148.5-151.5 GHz
~~144.68-144.98 GHz*,~~
~~145.45-145.75 GHz*,~~
~~146.82-147.12 GHz*,~~
~~150-151 GHz*,~~
174.42-175.02 GHz*,
177-177.4 GHz*,
178.2-178.6 GHz*,
181-181.46 GHz*,
~~186.2-186.6 GHz*,~~
209-226 GHz
~~250-251 GHz*,~~
~~257.5-258 GHz*,~~
~~261-265 GHz,~~
~~262.24-262.76 GHz*,~~
252-265 GHz
265-275 GHz,
~~265.64-266.16 GHz*,~~
~~267.34-267.86 GHz*,~~
~~271.74-272.26 GHz~~

*

are allocated (* indicates radio astronomy use for spectral line observations), 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. **S4.5** and **S4.6** and Article **S29**).

Reasons: The changes to this footnote are consequential to the changes made to the related allocations.

USA/ / 80
MOD

S5.340 All emissions are prohibited in the following bands:

1 400 - 1 427 MHz,	
2 690 - 2 700 MHz	except those provided for by Nos. **S5.421** and **S5.422**,
10.68 - 10.7 GHz	except those provided for by No. **S5.483**,
15.35 - 15.4 GHz	except those provided for by No. **S5.511**,
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[1] GHz	except those provided for by No. **S5.555A**,
52.6 – 54.25 GHz	
86 - 92 GHz,	
~~105 - 116 GHz,~~	
109.5 - 111.8 GHz,	
114.25 - 116 GHz,	
~~140.69 - 140.98 GHz~~	~~from airborne stations and from space stations in the space-to-Earth direction~~,
148.5-151.5 GHz,	
164 - 167 GHz,	
182 - 185 GHz	except those provided for by No. **S5.563**,
190 - 191.8 GHz,	
200 - 202 GHz	
202 - 209 GHz	
~~217 - 228 GHz.~~	
226 - 231.5 GHz,	
250 - 252 GHz.	

Reasons: The changes to this footnote are consequential to the changes made to the related allocations.

USA/ / 81
NOC

S5.341 In the bands 1 400 - 1 727 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.

Reasons: This informational footnote is still accurate.

USA/ / 82
MOD

S5.385 *Additional allocation:* the band~~s~~ 1 718.8 - 1 722.2 MHz, ~~150 - 151 GHz, 174.42 - 175.02 GHz, 177 - 177.4 GHz, 178.2 - 178.6 GHz, 181 - 181.46 GHz, and 186.2 - 186.6 GHz and 257.5 - 258 GHz are~~ is also allocated to the radio astronomy service on a secondary basis for spectral line observations.

Reasons: The changes to this footnote are consequential to the changes made to the related allocations.

USA/ / 83
MOD

S5.553 In the bands 43.5 - 47 GHz, 66 - 71 GHz, 95 - 100 GHz, ~~134 - 142 GHz, 190~~191.8 - 200 GHz and 252 - 265 GHz, stations in the fixed and 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. **S5.43**).

Reasons: The changes to this footnote are consequential to the changes made to the related allocations.

USA/ / 84
MOD

S5.554 In the bands 43.5 - 47 GHz, 66 - 71 GHz, 95 -100 GHz, ~~134 - 142~~ 126 - 134 GHz, 19~~0~~1.8 - 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.

Reasons: The changes to this footnote are consequential to the changes made to the related allocations.

USA/ / 85
MOD

S5.555 *Additional allocation:* the band~~s~~ 48.94 - 49.04 GHz, ~~97.88 - 98.08 GHz, 140.69 - 140.98 GHz, 144.68 - 144.98 GHz, 145.45 - 145.75 GHz, 146.82 - 147.12 GHz, 250 - 251 GHz and 262.24 - 262.76 GHz are~~ is also allocated to the radio astronomy service on a primary basis.

Reasons: The changes to this footnote are consequential to the changes made to the related allocations.

USA/ / 86
MOD

S5.556 In the bands 51.4 - 54.25 GHz, 58.2 - 59 GHz~~,~~ and 64 - 65 GHz, ~~72.77 - 72.91 GHz and 93.07 - 93.27 GHz,~~ radio astronomy observations may be carried out under national arrangements.

Reasons: The changes to this footnote are consequential to the changes made to the related allocations.

USA/ / 87
MOD

S5.558 In the bands 55.78-58.2 GHz, 59-64 GHz, 66-71 GHz, ~~123 - 134~~ 122.5 - 126 GHz, ~~170 - 182~~ 167 – 174.8 GHz and 185-190 GHz, stations in the aeronautical mobile service may be operated subject to not causing harmful interference to the inter-satellite service (see No. **S5.43**).

Reasons: The changes to this footnote are consequential to the changes made to the related allocation.

USA/ / 88
MOD

S5.559 In the band~~s~~ 59 - 64 GHz ~~and 126 - 134 GHz,~~ airborne radars in the radiolocation service may be operated subject to not causing harmful interference to the inter-satellite service (see No. **S5.43**).

Reasons: The changes to this footnote are consequential to the changes made to the related allocation. The radiolocation and inter-satellite services are no longer co-allocated in this spectral region.

USA/ / 89
NOC

S5.560 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.

Reasons: No change is required to this footnote

USA/ / 90
MOD

S5.561 In the band ~~84 – 86~~ 74 - 76 GHz, stations in the fixed~~,~~ and mobile ~~and broadcasting~~ services shall not cause harmful interference to broadcasting-satellite stations operating in accordance with the decisions of the appropriate frequency assignment planning conference for the broadcasting-satellite service.

Reasons: The broadcasting satellite allocation has been transferred to the 74-76 GHz band and the broadcasting and broadcasting satellite services are no longer co-allocated.

USA/ / 91
NOC

S5.562 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.

Reasons: This footnote was the result of allocation decisions made at WRC-97 and no change is needed.

USA/ / 92
SUP

~~**S5.564** Additional allocation: in Germany, Argentina, Spain, Finland, France, India, Italy, the Netherlands and Sweden, the band 261 - 265 GHz is also allocated to the radio astronomy service on a primary basis.~~

Reasons: The radio astronomy allocation is now worldwide in the 261-265 GHz band, therefore a country footnote is no longer needed.

USA/ / 93
MOD

S5.565 The frequency band 275 - ~~400~~ 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: ~~278 - 280 GHz and 343 - 348~~ 275 - 323, 327-371, 388 - 43~~4~~ GHz, 426 - 442 GHz, 453 - 510 GHz, 323 - 711 GHz, and 795 - 909 GHz

– Earth exploration-satellite service (passive) and space research service (passive): 275 - 277 GHz, ~~300~~294 – 30~~2~~6 GHz, 3~~2~~416 – 3~~26~~34 GHz, 34~~5~~2 – 34~~7~~9 GHz, 363 – 365 GHz~~, and~~ 37~~9~~1 – 38~~1~~9 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 next competent world radio conference.

Reasons: These additional bands have been identified by various administrations as bands that will also be used for radio astronomy observations and spaceborne passive remote sensing.

USA/ / 94
ADD

S5.XXX Use of the bands 116-123 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 1 000 km above the Earth's surface and in the vicinity of all geostationary orbital positions occupied by passive sensors, produced by a station in the inter-satellite service, for all conditions and for all methods of modulation, shall not exceed -148 dBW/m^2/MHz for all angles of arrival.

Reasons: This footnote is required to protect passive sensors operating in this band.

USA/ / 95
ADD

S5.AAA 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.

Reasons: This allocation will not be needed by passive sensors after the termination date. By the termination date, all passive sensors will have transitioned to the 148.5 - 151.5 GHz band.

USA/ / 96
ADD

S5.BBB The date of entry for the allocation to the fixed and mobile services in the band 155.5 - 158.5 GHz shall be 1 January 2018.

Reasons: Passive sensors require the use of this band until 1 January 2018.

USA/ / 97
ADD

S5.CCC Use of this allocation is limited to space-based radio astronomy only.

Reasons: This band is a likely candidate for a future space based radio astronomy mission. No other space research use is contemplated.

USA/ / 98
ADD

S5.YYY Use of the bands 174.8-182 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 1 000 km above the Earth's surface and in the vicinity of all geostationary orbital positions occupied by passive sensors, produced by a station in the inter-satellite service, for all conditions and for all methods of modulation, shall not exceed -144 dBW/m^2/MHz for all angles of arrival.

Reasons: This footnote is required to protect passive sensors operating in this band.

USA/ / 99
ADD

S5.RAS Use of this band by the radio astronomy service shall be in accordance with the terms of Resolution **RAS**.

Reasons: To limit radio astronomy use of the band to coordination zones is required to protect radio observatories, and facilitate use of the band by the other co-allocated services.

USA/ / 100
ADD

RESOLUTION RAS

USE OF THE BANDS [ ] BY THE RADIO ASTRONOMY SERVICE

The World Radiocommunication Conference (Istanbul, 2000),

considering

a) that a large number of spectral lines of astrophysical interest above 71 GHz provide unique information about cosmic processes, such as the chemistry of the interstellar medium and the formation of stars and planets, and that this information cannot be obtained from any other source;

b) that Doppler shifted lines, which are also of great interest for astronomical studies, are found far removed from the rest frequency of some spectral lines and that highly Doppler shifted lines may offer the only means to obtain information about the very early Universe and the formation of galaxies;

c) that mm-wave radio astronomy receivers are designed to cover substantial portions of the atmospheric windows above 70 GHz to take advantage of the information contained in spectral lines, as well as in continuum radiation;

d) that several Administrations operate mm-wave radio astronomy observatories and that some are building or are planning to build a limited number of large new facilities to exploit the most advanced technologies; and that these facilities are intended to serve the needs of the worldwide scientific community;

f) that mm-wave observatories must be located on high mountain tops or plateaus to take advantage of the driest possible atmospheric conditions necessary to obtain high quality observations; and require substantial investments on behalf

of the scientific communities concerned, and that therefore their number will remain low,

noting

that sharing between the radio astronomy service and other terrestrial services operating in bands above 71 GHz is facilitated by the natural attenuation provided by atmospheric gases, and that it can be further facilitated by adequate geographic separation,

urges:

Administrations to establish coordination zones around mm-wave radio astronomy sites operating in bands above 71 GHz. Coordination zone radii should be determined following the procedure outlined in Rec. ITU-R RA.1031-1, separately for ground based transmitters, airborne transmitters and transmitters that may be located on High Altitude Platforms (HAPS).

resolves:

1. that in the frequency bands referred to in this Resolution, co-primary status of the radio astronomy service shall be recognized within coordination zones established by Administrations. No coordination requirements should be imposed upon terrestrial services outside established coordination zones.

2. that in the bands referred to in this Resolution, co-primary services operating stations within a coordination zone should coordinate their operations with affected radio astronomy stations within five years of the date of notification of the radio astronomy site to the Radiocommunication Bureau

Annex 1 lists the radio astronomy sites that operate, or plan to operate in the bands referred to in this Resolution as of [June 8, 2000]. Observatories that operate only up to 92 GHz are identified with *** under the SITE column.

Annex 1

Annex 1 is still under development

Reasons: The footnote **S5.RAS** limits radio astronomy use of the band to coordination zones required to protect radio observatories. **RES RAS** sets out the details of the limitation on the radio astronomy service. Annex 1 lists the observatories that operate in the radio astronomy service in bands shared with terrestrial services above 71 GHz at the time of WRC-00.