4400-4500 MHz

1. Band Introduction

The 4400-4500 MHz band is used for Federal Government fixed and mobile services. This band is one of the few available to the military for training. The band supports fixed Line of Sight (LOS) and transportable-fixed point-to-point microwave systems, drone vehicle control and telemetry systems. In addition to the military systems, the civilian Federal agencies also have systems in the band for nuclear emergencies and law enforcement activities. The 4400-4500 MHz band is a sub-band of the larger 4400-4940 MHz Federal Government band. Many systems authorized to operate in the 4400-4500 MHz band typically have a tuning capability from 4400-4940 MHz.

2. Allocations

2a. Allocation Table

The frequency allocation table shown below is extracted from NTIA's Manual of Regulations and Procedures for Federal Radio Frequency Management, Chapter 4 – Allocations, Allotments and Plans.

Table of Frequency Allocations

United States Table

Federal Table	**Non-Federal Table**	***FCC Rule Part(s)***
4400-4500 FIXED MOBILE	4400-4500	

2b. Additional Allocation Table Information

No Additional Allocation Table Information

3. Federal Agency Use

3a. Federal Agency Frequency Assignments Table

The following table identifies the frequency band, type(s) of allocation(s), types of application, and the number of frequency assignments by agency.

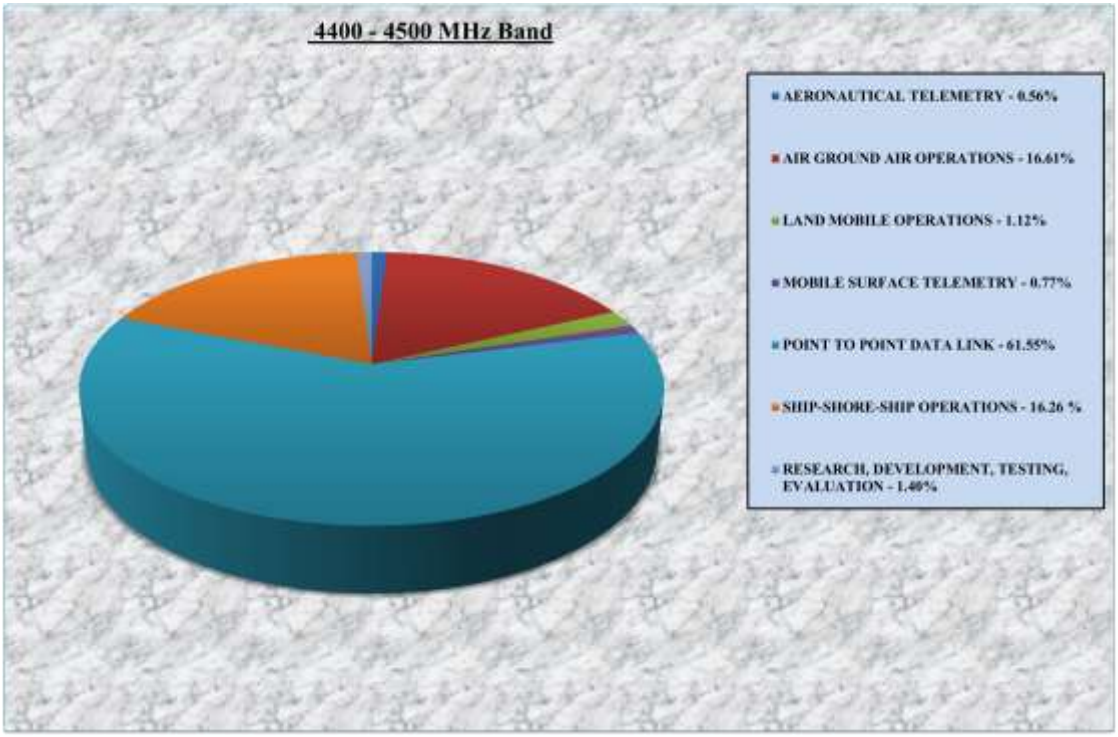
Federal Frequency Assignment Table

4400-4500 MHz Band								
FEDERAL EXCLUSIVE BAND								
	FIXED MOBILE							
	TYPE OF APPLICATION							
AGENCY	AERONAUTICAL TELEMETRY	AIR GROUNDAIR OPERATIONS	LAND MOBILE OPERATIONS	MOBILE SURFACE TELEMETRY	POINT TO POINT DATA LINK	SHIP SHORE SHIP OPERATIONS	RESEARCH DEVELOPMENT TESTING EVALUATION	TOTAL
A			1		24			25
AF	1	47	1	1	100		10	160
AR		73	10	9	167		10	269
CG					18			18
DHS					282			282
DOE		2		1	95			98
DOI		1			46			47
DOJ		102			89			191
MC		12	4		49			65
N	4	1	1		30	233		269
NASA	3				6			9
TOTAL	8	238	16	11	882	233	20	1433

The number of actual systems, or number of equipments, may exceed and sometimes far exceed, the number of frequency assignments in a band. Also, a frequency assignment may represent, a local, state, regional or nationwide authorization. Therefore, care must be taken in evaluating bands strictly on the basis of assignment counts or percentages of assignments.

3b. Percentage of Frequency Assignments Chart

The following chart displays the percentage of frequency assignments use for the different applications in the 4400-4500 MHz band.



4. Frequency Band Analysis By Application

The 4400-4500 MHz band is for Federal Government fixed and mobile applications. Fixed applications in the band include line-of-sight (LOS) point-to-point multichannel systems. There are transportable-fixed systems in the band interconnected to provide local wireless networks that gather all types of data. Mobile applications in the band include air ground operations to support Unmanned Aerial Vehicles (UAVs), target drones and flight test operations. The civilian agencies of the Federal Government also use the fixed and mobile services of the 4400-4500 MHz band for law enforcement, and drug interdiction communications systems throughout the US. An overview of the Federal Government applications in the band follows.

4a. Point-to-Point Data Link

Many Federal Government point-to-point or microwave data links operate in the 4400-4500 MHz band. The point-to-point data links can be fixed or transportable-fixed with dual capability of LOS operation at low power or trans-horizon modes for high power for long distance communications. The data links in the 4400-4500 MHz band are the communication backbones of central monitoring sites as they provide communications between various headquarters and support units by both active duty and reserve or National Guard units. The 4400-4500 MHz band systems carry both analog and digital traffic including facsimile, voice and data. Point-to-point data links relay data such as radar target location and tracks, weapons control, and air traffic control information In addition to the training exercises, the point-to-point data links also support logistics and administrative activities at military test range around the country.

The Department of Energy (DOE) operates fixed multi-site networks to monitor and control gas pipelines and electrical power lines as part of a Supervisory Control and Data Acquisition (SCADA) application. Point-to-point data links in the 4400-4500 MHz band also support communications for a DOE Nuclear Emergency Search Team (NEST). NEST responds to nuclear-related emergencies to protect the safety and health of life and property.

The Department of Homeland Security (DHS) operates point-to-point data links in the 4400-4500 MHz frequency band for border monitoring applications. The DHS systems in the band transmit audio, streaming video and sensor activations to many dispatch centers.[1]

The Department of Justice (DOJ) maintains a network of audio and video surveillance systems to support national law enforcement and border security. The DOJ network is typically used to connect various sites and to disseminate information that is crucial to national security.[2] Many DOJ systems are supported by point-to-point data links in the 4400-4500 MHz band.

NASA and the Department of Interior (DOI) also have a few systems in the 4400-4500 MHz band for point-to-point microwave links.

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[1] *Department of Homeland Security, Agency-Specific Spectrum Plan*, Report in response to the President's Spectrum Policy Initiatives.

[2] *Department of Justice Strategic Spectrum Plan*, 2007, Report in Response to the President's Spectrum Policy Initiatives.

4b. Air Ground Air Operations

Air ground air operations in the 4400-4500 MHz band support Unmanned Aerial Vehicles (UAVs) and law enforcement systems. Many air ground air operations in the 4400-4500 MHz band are associated with the development, testing and training activities of military UAVs. The UAV air ground air systems typically relay data and video information from onboard sensors to the ground control stations. DOE also has air-to-ground video/data down link from helicopters in support of law enforcement operations and for emergency situations such as, when NEST deployment is required. The DOE operations are conducted at the Savannah River Site in SC and in Los Alamos, NM.

4c. Ship Shore Ship Operations

Ship shore ship applications in the 4400-4500 MHz band are used to wirelessly internetwork platform operations between ships in a port and shore facilities. Generally, the wireless networks are connected to a wired network, either on the ship or shore or both. In the 4400-4500 MHz band, the Navy uses a wireless Ethernet backhaul bridge system between in-port ships and shore facilities in support of wireless pier connection networks.

4d. Mobile Operations

There is limited mobile operations in the 4400-4500 MHz to provide radiocommunications for data, voice and video, and support many range systems during tactical training exercises. The mobile operations in the band support many DOD range systems. For example, at DOD ranges, video on moving targets are normally transmitted to fixed locations. The mobile operations in the band also support navy coastal administrative systems such as wireless pier networks connecting different buildings.

4e. Aaeronautical and Flight Telemetry

DOD uses the 4400-4500 MHz band for aeronautical and flight telemetry. Flight telemetry in the band is typically used during missile testing, video target scoring on aircraft armaments, drone control, target drone control and acquisition of lightning data. Flight telemetry systems sense and measure data on airborne platforms and transmitting the data to a convenient location on the ground to be read and recorded. DOD and NASA use aeronautical telemetry applications in the band for video telemetry equipment during the development and testing of aircraft and unmanned vehicles.[3] DOD also uses aeronautical telemetry applications for missile development and testing.

[3] *Federal Spectrum Use Summary (June 2010).*

4f. Research Development Testing and Evaluation

In addition, the Federal Government operates a number of experimental radio communications in the band for basic research or for the evaluation or testing of electronic equipment or systems that have been developed for operational use.
The locations of 4400-4500 MHz Federal Government point-to-point data links in the Continental United States (CONUS) are shown in Figure 1.

Figure 1: 4400-4500 MHz Federal Government Stations – Continental United States

5. Planned Use

Spectrum usage in the 4400-4500 MHz band is expected to increase in the foreseeable future. The 4400-4500 MHz band is a possible comparable spectrum for federal systems vacating other spectrum as part of the Administration's initiative to identify 500 MHz for wireless broadband. DOD indicated that this band will be used to develop Unmanned Ground Systems (UGS) and Unmanned Aerial Systems (UAS) to support a variety of missions, increase combat effectiveness, and enhance personnel safety. The DOD states it will continue to develop these systems until 2020.[4]

[4] DoD Spectrum Strategic Spectrum Plan, page 88