

## 5 350 - 5 460 MHz

### 1. Band Introduction

The Department of Defense (DoD) uses this band for a wide variety of tactical anti-air warfare radars, which are part of an advanced ground-based air defense missile system. Other tactical radars operating in this band include shipborne radars for surface search, navigation and weapons fire control. Airborne weather navigation radars for storm avoidance also operate in this band.

The DoD also operates aeronautical telemetering mobile stations in this band for transmitting data directly related to the airborne testing of vehicles or major components. This band supports the testing of unmanned aircraft systems (UAS) downlinks to ground control stations.

Additionally, the DoD and the National Aeronautics and Space Administration (NASA) use this band for test and launch range instrumentation radars to track rockets, missiles, satellites, launched vehicles, and other targets. These radars are usually the prime coverage system for range safety.

Federal agencies operate ground-based meteorological radar systems in this band. These meteorological radar systems locate precipitation, calculate its motion, estimate its type (rain, snow, hail, wind-shear, etc.), and the data is used for meteorological forecasts. Modern weather radars are capable of detecting the motion of rain droplets in addition to intensity of the precipitation. Both types of data can be analyzed to determine the structure of storms and their potential to cause severe weather.

NASA, in joint ventures with the French agency, Centre National d'Etudes Spatiales (CNES), also operates a satellite based transmitter in this band that is used to perform space-based observations and measurements of surface topography, soil moisture, sea surface height, etc.

### 2. Allocations

#### 2a. Allocation Table

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

*Table of Frequency Allocations**United States Table*

<b>Federal Table</b>	<b>Non-Federal Table</b>	<b>FCC Rule Part(s)</b>
5 350 - 5 460 EARTH EXPLORATION-SATELLITE (active) 5.448B SPACE RESEARCH (active) AERONAUTICAL RADIONAVIGATION 5.449 RADIOLOCATION G56 US390 G130	5 350 - 5 460 AERONAUTICAL RADIONAVIGATION 5.449 Earth exploration-satellite (active) 5.448B Space research (active) Radiolocation US390	Aviation (87) Private Land Mobile (90)

**2b. Additional Allocation Table Information**

**5.449** The use of the band 5 350 - 5 470 MHz by the aeronautical radionavigation service is limited to airborne radars and associated airborne beacons.

**5.448B** The Earth exploration-satellite service (active) operating in the band 5 350 - 5 570 MHz and space research service (active) operating in the band 5 460 - 5 570 MHz shall not cause harmful interference to the aeronautical radionavigation service in the band 5 350 - 5 460 MHz, the radionavigation service in the band 5 460 - 5 470 MHz and the maritime radionavigation service in the band 5 470 - 5 570 MHz.

**US390** Federal stations in the space research service (active) operating in the band 5 350 - 5 460 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.

**G59** In the bands 902 - 928 MHz, 3 100 - 3 300 MHz, 3 500 - 3 650 MHz, 5 250 - 5 350 MHz, 8 500 - 9 000 MHz, 9 200 - 9 300 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.

**G130** Federal stations in the radiolocation service operating in the band 5 350 - 5 470 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.

### 3. Federal Agency Use

#### 3a. Federal Agency Frequency Assignments Table

The following table identifies the frequency band, types of allocations, types of applications, and the number of frequency assignments by agency.

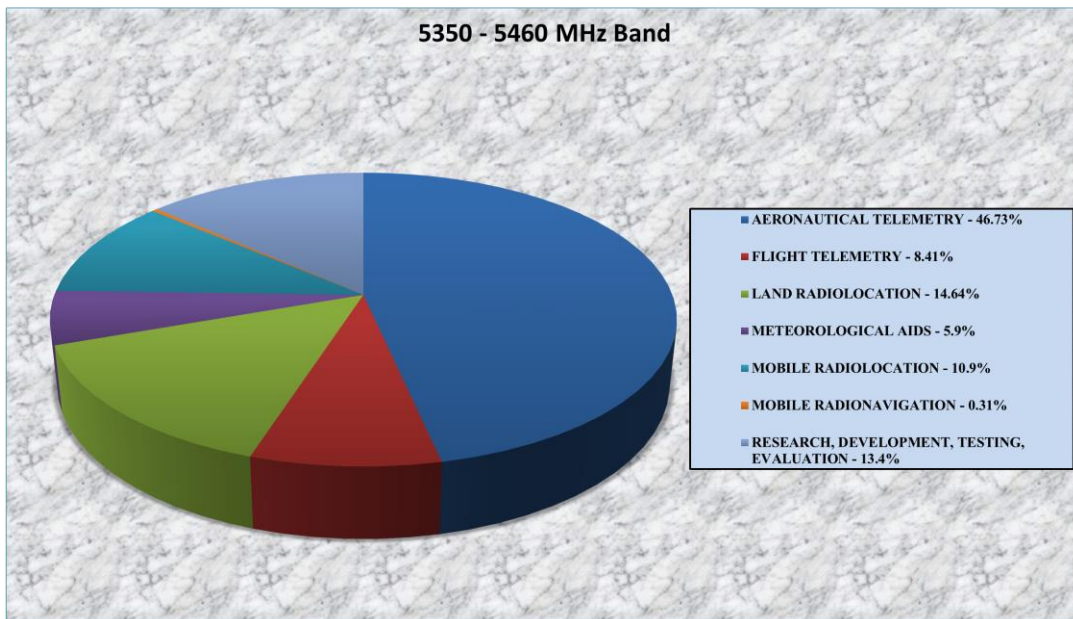
*Federal Agency Assignment Table*

5350 - 5460 MHz Band								
SHARED BAND								
AGENCY	AERONAUTICAL RADIONAVIGATION EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACERESEARCH (active)							
	TYPE OF APPLICATION							
	AERONAUTICAL TELEMETRY	FLIGHT TELEMETRY	LAND RADIOLOCATION	METEOROLOGICAL AIDS	MOBILE RADIOLOCATION	MOBILE RADIONAVIGATION	RESEARCH DEVELOPMENT TESTING EVALUATION	TOTAL
AF	106	15	18	1	1		17	158
AR	8		5		10		1	24
DHS	26			16				42
DOC					2	1	1	4
DOE			1		4		4	9
MC	2							2
N	8		13		18		19	58
NASA		12	10	1			1	24
NSF				1				1
<b>TOTAL</b>	<b>150</b>	<b>27</b>	<b>47</b>	<b>19</b>	<b>35</b>	<b>1</b>	<b>43</b>	<b>322</b>

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 assignments.

### 3b. Percentage of Frequency Assignments Chart

The following chart displays the percentage of frequency assignments from the Government Master File for the applications operating in the band 5 350 - 5 460 MHz.



## 4. Frequency Band Analysis by Application

The 5 350 - 5 460 MHz band is used by a wide variety of Federal Government systems operating in several different radio services.

### 4a. Aeronautical Mobile Telemetry and Telecommand

The DoD operates aeronautical telemetering mobile stations in this band for transmitting data directly related to the airborne testing of vehicles or major components. This band supports the testing of unmanned aircraft systems (UAS)<sup>1</sup> downlinks to ground control stations. This testing ensures proper functioning of the command and control link to control the unmanned aerial vehicle (UAV).<sup>1</sup> Also, testing ensures that the transmit payload imagery and system data path are processing correctly and relayed to intelligence collection center. DoD uses this band for UAS telemetry and video uplink supporting research, development, testing and evaluation and flight operations.

<sup>1</sup> UAS refers to the unmanned aircraft system including payload and communications. UAV refers only to the unmanned platform.

This band supports daily DoD and Department of Homeland Security (DHS) UAS missions to provide command and control of aircraft and camera as the mission and aircraft dictate. However, UAS missions are also used in support of disaster relief (i.e. firefighting operations in California). This expanded role results in a requirement to deploy UAS in proximity to U.S. cities and along the national borders.

NASA current, primary use of the 5 350 - 5 460 MHz band is by radars supporting tracking operations related to research balloons, aircraft and launch vehicles.

#### **4b. Radiolocation**

The 5 350 - 5 460 MHz band is used extensively for test range instrumentation radars to track rockets, missiles and other targets. In addition, DoD uses this band for radars that are part of an advanced ground-based air defense missile system.

The Navy uses a shipborne radar system and its variations for surface search and navigation. This includes a wide range of range and target acquisition requirements.

Federal agencies operate ground-based meteorological radar systems in this band. These meteorological radar systems locate precipitation, calculate its motion, estimate its type (rain, snow, hail, wind-shear, etc.), and the data is used for meteorological forecasts. Modern weather radars are capable of detecting the motion of rain droplets in addition to intensity of the precipitation. Both types of data can be analyzed to determine the structure of storms and their potential to cause severe weather.

The Federal radar systems operating in the 5 350 - 5 460 MHz band are primarily used by the military. These military radars have the operational capability to tune across the entire 5 250 - 5 725 MHz frequency range. The military radars that operate in this band include both target search and tracking radars that can use a single frequency or can employ frequency hopping techniques across the entire band. In the past, these radars have been limited to operating on or near military installations. However, there are situations where these radars are used in support of homeland security. One of the areas of concern in assessing interference to military radars regards future radar deployments and the expanding role of military radars in support of homeland defense.

#### **4c. Earth Exploration-Satellite and Space Research**

NASA participates in joint ventures with the French agency, Centre National d'Etudes Spatiales (CNES) on space-based observations and measurements of surface topography, soil moisture, sea surface height, etc. This is accomplished under the NASA research, development, testing, and evaluation assignment in this band and through utilization of CNES furnished data for systems allocated internationally in this band.

### **5. Planned Use**

The DoD use of the 5 350 - 5 460 MHz band for UAS and radar systems will continue for

the foreseeable future. One of the areas of concern in assessing interference to military radars and UAS missions involves future deployments and the expanding role of military operations in support of homeland defense. This expanded role could result in a requirement to deploy military radars and UAS in cities and metropolitan areas. In addition, the Navy is considering this band for their next generation major shipborne radar.

DoD and NASA use of aeronautical mobile telemetry and telecommand in the 5 350 - 5 460 MHz band will continue for the foreseeable future. This includes range telemetry, mission telecommand, and tracking.

NASA also intends to make independent use of this band for space-based active sensing in the future.