

**5030-5250 MHz**

**1. Band Introduction**

Federal agencies are developing unmanned aircraft systems (UAS) command links in the 5030-5091 MHz band. The Air Force uses the 5030-5091 MHz band for a microwave landing system (MLS) at military bases. The National Aeronautics and Space Administration (NASA) operates active sensor systems in the 5030-5150 MHz band on a non-interference basis. The Federal Aviation Administration (FAA) uses 5091-5150 MHz band for the Aeronautical Mobile Airport Communications System (AeroMACS) to support air traffic on the surface of airports. Federal agencies use the 5091-5150 MHz band to support flight testing.

**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* (NTIA Manual), Chapter 4 – Allocations, Allotments and Plans.

*Table of Frequency Allocations  
United States Table  
(NTIA Manual, Sept. 2017)*

| Federal Table  | Non-Federal Table   | FCC Rule Part(s)  |
|--|---|---|
| 5030 – 5091 MHz<br>AERONAUTICAL MOBILE (R) 5.443C<br>AERONAUTICAL MOBILE-SATELLITE (R) 5.443D<br>AERONAUTICAL RADIONAVIGATION US260<br><br>US211 US444                 |   | Aviation (87)   |
| 5091 - 5150 MHz<br>AERONAUTICAL MOBILE US111 US444B<br>AERONAUTICAL MOBILE-SATELLITE (R) 5.443AA<br>AERONAUTICAL RADIONAVIGATION US260<br><br>US211 US344 US444 US444A |   | Satellite Communications (25)<br>Aviation (87)                    |
| 5150 - 5250 MHz<br>AERONAUTICAL RADIONAVIGATION US260<br><br>US211 US307 US344   | 5150 - 5250 MHz<br>FIXED-SATELLITE (Earth-to-space) 5.447A<br>US344<br>AERONAUTICAL RADIONAVIGATION US260<br><br>5.447C US211 US307 | RF Devices (15)<br>Satellite Communications (25)<br>Aviation (87) |

**2b. Additional Allocation Table Information (Footnotes)**

**5.443AA** In the frequency bands 5000-5030 MHz and 5091-5150 MHz, the aeronautical mobile-satellite (R) service is subject to agreement obtained under No. 9.21. The use of

these bands by the aeronautical mobile-satellite (R) service is limited to internationally standardized aeronautical systems. (WRC-12)

**5.443C** The use of the frequency band 5030-5091 MHz by the aeronautical mobile (R) service is limited to internationally standardized aeronautical systems. Unwanted emissions from the aeronautical mobile (R) service in the frequency band 5030-5091 MHz shall be limited to protect RNSS system downlinks in the adjacent 5010-5030 MHz band. Until such time that an appropriate value is established in a relevant ITU-R Recommendation, the e.i.r.p. density limit of  $-75$  dBW/MHz in the frequency band 5010-5030 MHz for any AM(R)S station unwanted emission should be used. (WRC-12)

**5.443D** In the frequency band 5030-5091 MHz, the aeronautical mobile-satellite (R) service is subject to coordination under No. 9.11A. The use of this frequency band by the aeronautical mobile-satellite (R) service is limited to internationally standardized aeronautical systems. (WRC-12)

**5.447A** The allocation to the fixed-satellite service (Earth-to-space) in the band 5150-5250 MHz is limited to feeder links of non-geostationary-satellite systems in the mobile-satellite service and is subject to coordination under No. 9.11A.

**5.447C** 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.

**US111** In the band 5091-5150 MHz, aeronautical mobile telemetry operations for flight testing are conducted at various locations (see page 4-135 of NTIA Manual, May 2013 Edition (Rev. 9/2017)). Flight testing at additional locations may be authorized on a case-by-case basis.

**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.

**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.

**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/m<sup>2</sup> per 4 kHz for all angles of arrival.

**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.

**US444** The frequency band 5030-5150 MHz is to be used for the operation of the international standard system (microwave landing system) for precision approach and landing. In the frequency band 5030-5091 MHz, the requirements of this system shall have priority over other uses of this band. For the use of the frequency band 5091-5150 MHz, US444A and Resolution 114 (Rev.WRC-12) of the ITU *Radio Regulations* apply.

**US444A** The band 5091-5150 MHz is also allocated to the fixed-satellite service (Earth-to-space) on a primary basis for non-Federal use. This allocation is limited to feeder links of non-geostationary satellite systems in the mobile-satellite service and is subject to coordination under No. 9.11A of the ITU *Radio Regulations*. In the band 5091-5150 MHz, the following conditions also apply:

- (a) Prior to January 1, 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-12);
- (b) After January 1, 2016, no new assignments shall be made to earth stations providing feeder links of non-geostationary mobile-satellite systems; and
- (c) After January 1, 2018, the fixed-satellite service will become secondary to the aeronautical radionavigation service.

**US444B** In the band 5091-5150 MHz, the following provisions shall apply to the aeronautical mobile service:

- (a) Use is restricted to: (1) Systems operating in the aeronautical mobile (R) service (AM(R)S) in accordance with international aeronautical standards, limited to surface applications at airports, and in accordance with Resolution 748 (Rev.WRC-12) (*i.e.*, AeroMACS); and (2) Aeronautical telemetry transmissions from aircraft stations (AMT) in accordance with Resolution 418 (Rev.WRC-12).
- (b) Consistent with Radio Regulation No. 4.10, airport surface wireless systems operating in the AM(R)S have priority over AMT systems in the band.
- (c) Operators of AM(R)S and AMT systems at the following airports are urged to cooperate with each other in the exchange of information about planned deployments of their respective systems so that the prospects for compatible sharing of the band are enhanced: 1) Boeing Field/King County Intl Airport, Seattle, WA; 2) Lambert-St. Louis Intl Airport, St. Louis, MO; 3) Charleston AFB/Intl Airport, Charleston, SC; 4) Wichita Dwight D. Eisenhower National Airport, Wichita, KS; 5) Roswell Intl Air Center Airport, Roswell, NM; and 6) William P. Gwinn Airport, Jupiter, FL. Other airports may be addressed on a case-by-case basis.

(d) Aeronautical fixed communications that are an integral part of the AeroMACS system authorized in paragraph (a)(1) are also authorized on a primary basis.

### **3. Federal Agency Use**

This section shows the spectrum use by the federal agencies based upon unclassified frequency assignment data. Care must be taken in evaluating bands strictly on the basis of assignment counts or percentages of assignments. The assignment counts are based on mapping station classes to a particular service as specified in the NTIA Manual, Table 6.1.4 Services, Station Classes, and Stations. The total counts may be higher than the actual number of assignments as a single assignment may have more than one station class. The number of actual systems, or number of equipment, may exceed and sometimes far exceed, the number of frequency assignments in a band. Also, frequency assignment data could change daily. A frequency assignment may represent a local, state, regional or nationwide authorization, and/or a band assignment, and assignment count can change from day to day.

The agencies also operate ultra-wideband (UWB) systems in the federal bands, under very specific rules and regulations, for a variety of purposes and functions. These UWB systems can have station classes that are either radiolocation or mobile radiolocation and would operate on a non-licensed, non-interference basis to properly allocated radio services. They are not included in these counts or charts; due to their wide bandwidths, their assignments could appear in bands not allocated to the radiolocation or mobile radiolocation services.

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

The following tables identify, for both the 5030-5091 and 5091-5250 MHz bands, the number of unclassified frequency assignments by agency for each radio service.

**Table 1  
Federal Frequency Assignment Table (Unclassified)  
5030-5091 MHz**

| Agency   | Mobile   | Radionavigation | Research, Development, Testing,<br>Evaluation | Fixed    | Maritime Mobile | Total      |
|--|----------|-----------------|---|----------|-----------------|------------|
| Air Force  | 3        | 8               | 94  | NA       | NA              | 101        |
| Army   | NA       | NA              | 6   | NA       | NA              | 6          |
| Federal Aviation Administration                          | NA       | NA              | NA  | 1        | NA              | 1          |
| Navy   | NA       | 1               | 8   | NA       | 2               | 11         |
| <b>Total</b>   | <b>3</b> | <b>9</b>        | <b>108</b>                                    | <b>1</b> | <b>2</b>        | <b>123</b> |
| Note: NA is not applicable, as there are no assignments. |          |                 |   |          |                 |            |

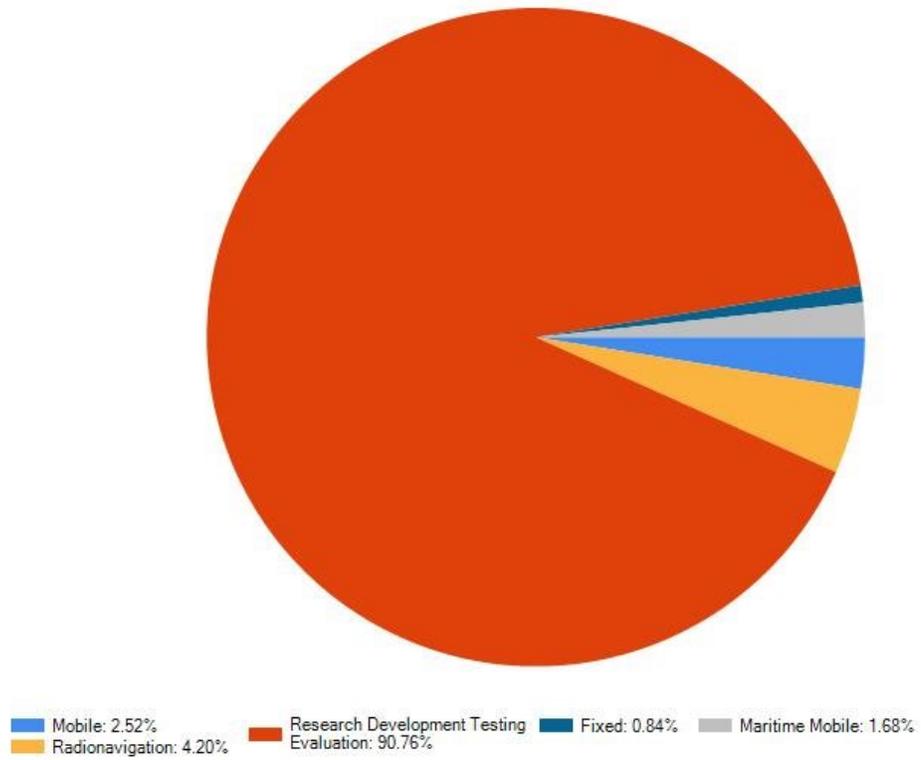
**Table 2  
Federal Frequency Assignment Table (Unclassified)  
5091-5250 MHz**

| Agency   | Mobile    | Research, Development, Testing,<br>Evaluation | Earth Exploration Satellite | Fixed     | Maritime Mobile | Total      |
|--|-----------|---|-----------------------------|-----------|-----------------|------------|
| Air Force  | 16        | 52  | NA                          | NA        | NA              | 68         |
| Army   | NA        | 10  | NA                          | NA        | NA              | 10         |
| Commerce   | NA        | NA  | 2                           | NA        | NA              | 2          |
| Energy   | NA        | 1   | NA                          | NA        | NA              | 1          |
| Federal Aviation Administration                          | NA        | 132   | NA                          | 91        | NA              | 223        |
| Navy   | 3         | 13  | NA                          | 3         | 5               | 24         |
| National Aeronautics and Space Administration            | NA        | 1   | NA                          | NA        | NA              | 1          |
| <b>Total</b>   | <b>19</b> | <b>209</b>                                    | <b>2</b>                    | <b>94</b> | <b>5</b>        | <b>329</b> |
| Note: NA is not applicable, as there are no assignments. |           |   |                             |           |                 |            |

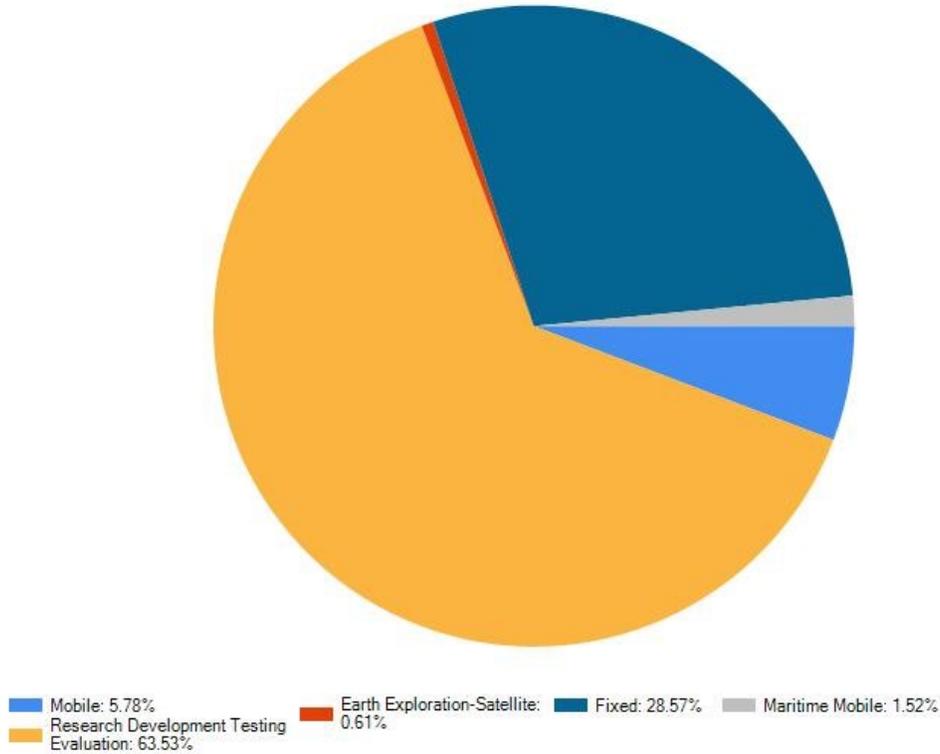
**3b. Percentage of Frequency Assignments Chart**

The following charts display the percentage of unclassified frequency assignments for the federal systems operating in the 5030-5091 and 5091-5250 MHz bands.

5030 - 5091 MHz



5091 - 5250 MHz



## 4. Frequency Band Analysis by Application

### 4a. Aeronautical Mobile (Route)

Federal agencies are developing applications for UAS terrestrial line-of-sight (LOS) control and non-payload communications (CNPC) links in the 5030-5091 MHz band. This band provides the high-integrity terrestrial CNPC links to enable operations of UAS in non-segregated airspace.<sup>1</sup> Additionally, it is expected that the movable portion of the AeroMACS could be licensed under AM(R)S in the future.

### 4b. Fixed

More than seventy-five percent of the assignments in the fixed service are for the AeroMACS. The FAA uses the 5091-5150 MHz band for AeroMACS, which provides high capacity and secure communications on the airport surface and supports air traffic

<sup>1</sup> Non-segregated airspace is a volume of airspace typically open for general aviation by aviation authorities. Segregated airspace is a volume of airspace where entry is restricted by aviation authorities.

control, airline operation, and airport communications, including point-to-point data systems.

#### **4c. Aeronautical Mobile Telemetry**

Federal agencies use the 5091-5150 MHz band for aeronautical mobile telemetry (AMT) downlinks to support flight testing in the designated test and training locations.

#### **4d. Aeronautical Radionavigation**

The Air Force has a number of assignments in the 5030-5091 MHz band for a transportable version of the MLS, an all-weather precision landing system for tactical purposes and has installed these systems at several Air Force bases. MLS provides precision navigation guidance for alignment and descent of aircraft on approach to a landing by providing azimuth, elevation, and distance.

#### **4e. Research and Development**

NASA uses the 5030-5150 MHz band on a non-interference basis for active sensor systems, used in joint programs with the French agency, Centre National d'Etudes Spatiales (CNES), for space-based observations and measurements of surface topography and ocean wave height.

### **5. Planned Use**

#### **5a. Aeronautical Mobile (Route)**

The 2007 World Radiocommunication Conference (WRC) allocated the 5091-5150 MHz band to aeronautical mobile (route) service (AM(R)S).<sup>2</sup> The FAA has since identified a number of AM(R)S applications for aeronautical safety communications on the airport surfaces. This worldwide allocation was limited to: 1) systems operating in the AM(R)S in accordance with international aeronautical standards, 2) surface applications at airports, 3) systems providing aeronautical telemetry from the aircraft station, and 4) systems providing aeronautical security transmissions.<sup>3</sup>

In general, those applications share the characteristics of short-range (a few kilometers maximum) and high bandwidth. Limitation to ground transmission and the geographic separation of airports will likely facilitate channel reuse between airports.

Existing AM(R)S bands are nearing saturation in high traffic areas. Federal agencies are developing new applications and concepts in air traffic management that will put further pressure on existing AM(R)S bands. One emerging application is for the integration of UAS command and control into air traffic services airspace.

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<sup>2</sup> Via RR 5.444B

<sup>3</sup> The aeronautical security transmission was identified at WRC-07 and subsequently removed at WRC-12

The United States has allocated the 5030-5091 MHz band to the AM(R)S as a result of the 2012 WRC decisions. The FAA plans to use this band for a variety of aeronautical applications including UAS support. This band will provide the terrestrial, line-of-sight communications for the CNPC links of UAS in non-segregated airspace. These flight operations currently take place in segregated airspace to ensure the safety of the air vehicle and other airspace users. To integrate into non-segregated airspace, UASs will require a high-integrity communication link between the unmanned vehicle and remote control center that is capable of relaying the necessary air traffic control messages and critical flight information.

While federal agencies will operate some of the CNPC links, it is expected that majority of CNPC operations will be for non-federal systems. FAA will not be a provider of UAS control links. The AM(R)S applications will be shared between the federal and non-federal users.

Both federal agencies and commercial sectors are considering the 5030-5091 MHz band and the 5091-5150 MHz band for a variety of AM(R)S applications, including support for UAS and airport surface operations. In parallel to the effort undertaken by the FAA, the FCC sought public comments on the use of UAS in the 5030-5091 MHz band<sup>4</sup> and recommended in a report to Congress<sup>5</sup> “the 5030-5091 MHz band as well as certain flexible-use bands are potential options for supporting such UAS communications.” The FCC has also released a Notice of Proposed Rulemaking (NPRM) to propose changes to their Part 87 Aviation Radio Service rules, which contains service rules for the use of AeroMACS in the 5091-5150 MHz band.<sup>6</sup>

### **5b. Fixed**

AeroMACS is a broadband wireless service operating in protected aeronautical frequency bands for use on the airport surface. In the near future, the FAA, airlines, and airport authorities will be using AeroMACS for some ground-to-ground communications. Broadband wireless communication systems such as AeroMACS will also open up opportunities to introduce new technology services for both the airport and aircraft. This wireless communication link will enable the airports to improve their operational efficiency and is less costly to install/maintain than traditional infrastructure.

### **5c. Aeronautical Mobile Telemetry**

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<sup>4</sup> FCC, GN Docket No. 19-356, available at <https://docs.fcc.gov/public/attachments/DA-19-1207A1.pdf>

<sup>5</sup> FCC, Report on Section 374 of the FAA Reauthorization Act of 2018, available at <https://www.fcc.gov/document/fcc-report-section-374-faa-reauthorization-act-2018>

<sup>6</sup> FCC, WT Docket No. 19-140, available at <https://www.fcc.gov/document/wtb-establishes-docket-aviation-safety-nprm>

The federal use of AMT at test and training ranges in the 5091-5150 MHz band is expected to continue for the foreseeable future<sup>7</sup>. The majority of the federal AMT use are for military systems not operated by FAA.

#### **5d. Microwave Landing System**

The FAA does not anticipate utilizing MLS installations at airports. However, the Air Force will continue to use MLS into the foreseeable future in order to provide landing guidance to military aircraft.

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<sup>7</sup> AeroMACS/AMT Memorandum of Understanding between the DOD and FAA, dated 14 November 2019.