

5/1/07 4000 - 6000 MHz GBT SPECTRUM SUMMARY

Current Allocated Usage

It is easier to talk about what chunks of spectrum *might* be available for RA than what probably won't be in this band. The only strong protection in this band exists from **4990-5000 MHz**, and even this does not protect from spurious emissions from systems in the adjacent aeronautical radio navigation band which starts at 5000 MHz (thanks to footnote US74). More fortunately, below 4990 MHz, usage is limited to ground based, licensed services. Bands where the current allocated usage is likely to produce long periods of incidental quiet are listed below. **Red text** indicates bands likely to be negatively impacted by proposals currently in negotiation:

4400 – 4500 MHz US gov't. fixed and mobile; licensed services which should be coordinated through NRQZ (including the fixed base stations of mobile services). No aeronautical uses are specified.

4800-4940 MHz US gov't. as well as private fixed and mobile; licensed services which should be coordinated through NRQZ (including the fixed base stations of mobile services). Private users are cautioned, in the footnotes, to avoid interference to RA facilities *to the extent practicable*. No aeronautical uses are specified.

4940-4990 MHz Private fixed and mobile; licensed services which should be coordinated through NRQZ (including the fixed base stations of mobile services). Private users are cautioned, in the footnotes, to avoid interference to RA facilities *to the extent practicable*. Aeronautical uses specifically disallowed.

4990-5000 MHz Radio Astronomy protected band. No active services are allowed to operate in this band. However, footnote US74 states "...the radio astronomy service shall be protected from unwanted emissions [in the RA bands] only to the extent that such radiation exceeds the level which would be present if the offending station [operating in an adjacent band] were operating in compliance with the technical standards or criteria applicable to the service in which it operates..." The potentially troublesome neighbor here is the aeronautical radio navigation band which starts at 5000 MHz.

5570-5600 MHz Private radiolocation services in this band are licensed services that should be coordinated through the NRQZ. The use of the band 5460-5650 MHz by the maritime radionavigation service is limited to shipborne radars. Unfortunately this band is also allocated to Part 15 intentional radiators, and our ability to mitigate that depends on how well we can administer the WVRAZ, as well as keeping unlicensed intentional radiators that operate in this band off the Green Bank site.

5650-5830 MHz Government radiolocation services in this band are licensed services that should be coordinated through the NRQZ. This band is also shared by the amateur radio community where usage can be minimal, and where friendly coordination is usually possible. Unfortunately this band is also allocated to Part 15 intentional radiators, as well

as the part 18 (ISM) band which has also been opened up for intentional radiator uses and our ability to mitigate that depends on how well we can administer the WVRAZ, as well as keeping unlicensed intentional radiators that operate in this band off the Green Bank site.

5925-6425 MHz Private Fixed and private Fixed-Satellite earth-to-space services, both of which should be coordinated through the NRQZ.

Future Developments

According to the NRAO Spectrum Manager, somewhere on the order 500-600 MHz of spectrum in the 4-6 GHz region is going to be allocated to airborne mobile telemetry and other uses. The final decision will not be made until November, but here is some wording from the ITU describing studies done under Agenda Item 1.5 of the upcoming WRC:

"Flight testing studies carried out in ITU-R have identified five candidate bands. The candidate bands studied are 4 400-4 940 MHz, 5 030-5 091 MHz, 5 091-5 150 MHz, 5 150-5 250 MHz and 5 925-6 700 MHz. Each band has its advantages and disadvantages and opinions vary as to which bands are appropriate and required."

The new allocation is part of a revamping of the air traffic control system to allow unmanned vehicles to be integrated into the normal commercial flight paths, coupled with desire for surveillance, on top of some needs for flight testing.

Some Encouragement

While it is probably useful to consider the allocations when designing adaptive filtering, it is also important to realize that useful studies have taken place in bands where the allocations are for services like "Earth Exploration Satellite – active", which raises a red flag for me. In searching our spotty records of RFI reports (currently enshrined in email folders) I recently reviewed a September, 2005 C-band RFI report that showed clean spectra from 5294 – 5306 MHz, AZ 202.7, EL 18.9 with the exception of a strong narrowband signal at 5300 MHz, and this in a band where the allocated use (the active EES), and the look angle of the telescope (about 20 degrees below the geostationary band, which put the top of the Rx line-of-sight, and likely within the main beam width of satellite sources) would suggest that much more interference would likely be present. What follows is a detailed summary of the current NTIA US allocations in the 4 – 6 GHz band, complete with the full text of relevant footnotes and remarks.

Color scheme key:

NTIA USA Allocations Rev. 9/2006; text of footnotes have been included. Bold numbers in parenthesis are references to pertinent 47CFR Part #'s.

Unlicensed uses, covered *in theory only* under WVRAZA. (Our efforts in this direction are at their infancy, spotty, and woefully inadequate to handle the problem.)

Frequency (MHz): 3700-4200

Allocated Use: FIXED NG41 FIXED-SATELLITE (space-to-Earth) NG180

Footnote Text/Remarks:

NG41 Frequencies in the bands 3700-4200 MHz and 5925-6425 MHz, may also be assigned to stations in the international fixed public and international control services located in Puerto Rico, the U.S. Virgin Islands, and Navassa Island.

NG180 In the band 3700-4200 MHz (space-to-Earth) earth stations on vessels (ESVs) may be authorized to communicate with space stations of the fixed-satellite service and, while docked, may be coordinated for up to 180 days, renewable. ESVs in motion must operate on a secondary basis.

International Fixed **(23)**

Satellite Communications **(25)**

Fixed Microwave **(101)**

Frequency (MHz): 4200-4400

Allocated Use: AERONAUTICAL RADIONAVIGATION 5.440 US261

Footnote Text/Remarks:

5.440 The standard frequency and time signal-satellite service may be authorized to use the frequency 4 202 MHz for space-to-Earth transmissions and the frequency 6 427 MHz for Earth-to-space transmissions. Such transmissions shall be confined within the limits of ± 2 MHz of these frequencies.

US261 The use of the band 4200-4400 MHz by the aeronautical radionavigation service is reserved exclusively for airborne radio altimeters. Experimental stations will not be authorized to develop equipment for operational use in this band other than equipment related to altimeter stations. However, passive sensing in the Earth-exploration satellite and space research services may be authorized in this band on a secondary basis (no protection is provided from the radio altimeters).

Aviation **(87)**

Frequency (MHz): 4400-4500

Allocated Use: FIXED and MOBILE (US Gov't.)

Frequency (MHz): 4500-4800

Allocated Use: MOBILE (US Gov't.) US245 FIXED-SATELLITE (space-to-Earth) 5.441

Footnote Text/Remarks:

US245 In the bands 3600-3650 MHz (space-to-Earth), 4500-4800 MHz (space-to-Earth), and 5850-5925 MHz (Earth-to-space), the use of the non-Federal fixed-satellite service is limited to international inter-continental systems and is subject to case-by-case electromagnetic compatibility analysis.

5.441 The use of the bands 4 500-4 800 MHz (space-to-Earth), 6 725-7 025 MHz (Earth-to-space) by the fixed-satellite service shall be in accordance with the provisions of Appendix 30B.

Frequency (MHz): 4800-4940

Allocated Use: FIXED and MOBILE US203 US342

Footnote Text/Remarks:

US203 Radio astronomy observations of the formaldehyde line frequencies 4825-4835 MHz and 14.470-14.500 GHz may be made at certain radio astronomy observatories as indicated below:

Bands to be observed	to	be	Observatory
4 GHz			14 GHz
X			National Astronomy and Ionosphere Center, Arecibo, Puerto Rico.
X	X		National Radio Astronomy Observatory, Green Bank, W. Va.
X	X		National Radio Astronomy Observatory, Socorro, New Mexico.
X	X		Hat Creek Observatory (U of Calif.), Hat Creek, Cal.
X	X		Haystack Radio Observatory (MIT-Lincoln Lab), Tyngsboro, Mass.
X	X		Owens Valley Radio Observatory (Cal. Tech.), Big Pine, Cal.
X			Five College Radio Astronomy Observatory, Quabbin Reservoir (near Amherst), Massachusetts

Every practicable effort will be made to avoid the assignment of frequencies to stations in the fixed or mobile services in these bands. Should such assignments result in harmful interference to these observations, the situation will be remedied to the extent practicable.

US342 In making assignments to stations of other services to which the bands:

4-145 5/2003 (Rev. 9/2006) 4.1.3

13360-13410 kHz	22.01-22.21 GHz*	111.8-114.25 GHz
25550-25670 kHz	22.21-22.5 GHz	128.33-128.59 GHz*

37.5-38.25 MHz	22.81-22.86 GHz*	129.23-129.49 GHz*
322-328.6 MHz*	23.07-23.12 GHz*	130-134 GHz
1330-1400 MHz*	31.2-31.3 GHz	136-148.5 GHz
1610.6-1613.8 MHz*	36.43-36.5 GHz*	151.5-158.5 GHz
1660-1660.5 MHz*	42.5-43.5 GHz	168.59-168.93 GHz*
1668.4-1670 MHz*	42.77-43.17 GHz*	171.11-171.45 GHz*
3260-3267 MHz*	43.07-43.17 GHz*	172.31-172.65 GHz*
3332-3339 MHz*	43.37-43.47 GHz*	173.52-173.85 GHz*
3345.8-3352.5 MHz*	48.94-49.04 GHz*	195.75-196.15 GHz*
4825-4835 MHz*	76-86 GHz	209-226 GHz
4950-4990 MHz	92-94 GHz	241-250 GHz
6650-6675.2 MHz*	94.1-100 GHz	252-275 GHz
14.47-14.5 GHz*	102-109.5 GHz	

are allocated (*indicates radio astronomy use for spectral line observations), all practicable steps shall be taken to protect the radio astronomy service from harmful interference. Emissions from spaceborne or airborne stations can be particularly serious sources of interference to the radio astronomy service (see Nos. 4.5 and 4.6 and Article 29 of the ITU Radio Regulations).

Frequency (MHz): 4940-4990

Allocated Use: PRIVATE FIXED and PRIVATE MOBILE except aeronautical mobile 5.339 S311 US342 G122

Footnote Text/Remarks:

US342 as in 4800-4940 allocation.

5.339 The bands 1 370-1 400 MHz, 2 640-2 655 MHz, 4 950-4 990 MHz and 15.20-15.35 GHz are also allocated to the space research (passive) and earth exploration-satellite (passive) services on a secondary basis.

US311 Radio astronomy observations may be made in the bands 1350-1400 MHz, 1718.8-1722.2 MHz, and 4950-4990 MHz on an unprotected basis at the following radio astronomy observatories:

4-142 5/2003 (Rev. 9/2006) 4.1.3

Allen Telescope Array, Hat Creek, California	
NASA Goldstone Deep Space Communications Complex, Goldstone, California	
National Astronomy and Ionosphere Center, Arecibo, Puerto Rico	
National Radio Astronomy Observatory, Socorro, New Mexico	
National Radio Astronomy Observatory, Green Bank, West Virginia	
80 National Radio Astronomy Observatory, Very Long Baseline Array Stations	
Latitude (North)	
Brewster, WA	48° 08'
Fort Davis, TX	30° 38'

Hancock, NH	42° 56'
Kitt Peak, AZ	31° 57'
Los Alamos, NM	35° 47'
Mauna Kea, HI	19° 48'
North Liberty, IA	41° 46'
Owens Valley, CA	37° 14'
Pie Town, NM	34° 18'
Saint Croix, VI	17° 46'
Owens Valley Radio Observatory, Big Pine, California	

Rectangle between latitudes 40° 00' N and 42° 00' N and between longitudes 120° 15' W and 122° 15' W.

80 kilometers (50 mile) radius centered on latitude 35° 18' N, longitude 116° 54' W.

Rectangle between latitudes 17° 30' N and 19° 00' N and between longitudes 65° 10' W and 68° 00' W.

Rectangle between latitudes 32° 30' N and 35° 30' N and between longitudes 106° 00' W and 109° 00' W.

Rectangle between latitudes 37° 30' N and 39° 15' N and between longitudes 78° 30' W and 80° 30' W.

kilometer radius centered on:

Longitude (West)

119° 41'

103° 57'

71° 59'

111° 37'

106° 15'

155° 27'

91° 34'

118° 17'

108° 07'

64° 35'

Two contiguous rectangles, one between latitudes 36° 00' N and 37° 00' N and between longitudes 117° 40' W and 118° 30' W and the second between latitudes 37° 00' N and 38° 00' N and between longitudes 118° 00' W and 118° 50' W. In the bands 1350-1400 MHz and 4950-4990 MHz, every practicable effort will be made to avoid the assignment of frequencies to stations in the fixed and mobile services that could interfere with radio astronomy observations within the geographic areas given above. In addition, every practicable effort will be made to avoid assignment of frequencies in these bands to stations in the aeronautical mobile service which operate outside of those geographic areas, but which may cause harmful interference to the listed observatories. Should such assignments result in harmful interference to these observatories, the situation will be remedied to the extent practicable.

G122 In the bands 2395-2400 MHz, 2402-2417 MHz, and 4940-4990 MHz, Federal operations may be authorized on a non-interference basis to authorized non-Federal operations, but shall not hinder the implementation of any non-Federal operations.

Private Land Mobile **(90)**

Frequency (MHz): 4990-5000

Allocated Use: RADIO ASTRONOMY US74 Space research (passive) US246

Footnote Text/Remarks:

US74 In the bands 25.55-25.67, 73.0-74.6, 406.1-410.0, 608-614, 1400-1427 (see US368), 1660.5-1670.0, 2690-2700, and 4990-5000 MHz, and in the bands 10.68-10.7, 15.35-15.4, 23.6-24.0, 31.3-31.5, 86-92, 100-102, 109.5-111.8, 114.25-116, 148.5-151.5, 164-167, 200-209, and 250-252 GHz, the radio astronomy service shall be protected from unwanted emissions only to the extent that such radiation exceeds the level which would be present if the offending station were operating in compliance with the technical standards or criteria applicable to the service in which it operates. Radio astronomy observations in these bands are performed at the locations listed in US311.

US246 4-138 5/2003 (Rev. 9/2006) 4.1.3

No station shall be authorized to transmit in the following bands:

73-74.6 MHz, 608-614 MHz, except for medical telemetry equipment⁶ 1400-1427 MHz, 1660.5-1668.4 MHz, 2690-2700 MHz, 4990-5000 MHz, 10.68-10.7 GHz, 15.35-15.4 GHz, 23.6-24 GHz, 31.3-31.8 GHz, 50.2-50.4 GHz, 52.6-54.25 GHz, 86-92 GHz, 100-102 GHz, 109.5-111.8 GHz, 114.25-116 GHz, 148.5-151.5 GHz, 164-167 GHz, 182-185 GHz, 190-191.8 GHz, 200-209 GHz, 226-231.5 GHz, 250-252 GHz.

⁶ Medical telemetry equipment shall not cause harmful interference to radio astronomy operations in the band 608-614 MHz and shall be coordinated under the requirements found in 47 C.F.R. § 95.1119.

Frequency (MHz): 5000-5010

Allocated Use: AERONAUTICAL RADIONAVIGATION US260 RADIONAVIGATION-SATELLITE (earth-to-space) 5.367 US211 US344

Footnote text/Remarks:

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.

5.367 Additional allocation: The bands 1 610-1 626.5 MHz and 5 000-5 150 MHz are also allocated to the aeronautical mobile-satellite (R) service on a primary basis, subject to agreement obtained under No. 9.21.

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.

US344 In the band 5091-5250 MHz, non-Federal earth stations in the fixed-satellite service (Earth-to-space) shall be coordinated through the Frequency Assignment Subcommittee (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.

Satellite Communications **(25)**

Aviation **(87)**

Frequency (MHz): 5010-5030

Allocated Use: AERONAUTICAL RADIONAVIGATION US260 RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.443B 5.367 US211 US344

Footnote text/Remarks:

US260, 5.367, US211, US344 as in 5000 – 5010 allocation, plus:

5.443B In order not to cause harmful interference to the microwave landing system operating above 5 030 MHz, the aggregate power flux-density produced at the Earth's surface in the band 5 030-5 150 MHz by all the space stations within any radionavigation-satellite service system (space-to-Earth) operating in the band 5 010-5 030 MHz shall not exceed -124.5 dB(W/m²) in a 150 kHz band. In order not to cause harmful interference to the radio astronomy service in the band 4 990-5 000 MHz, radionavigation-satellite service systems operating in the band 5 010- 5 030 MHz shall comply with the limits in the band 4 990-5 000 MHz defined in Resolution **741** (WRC-03).

Satellite Communications **(25)**

Aviation **(87)**

Frequency (MHz): 5030-5150

Allocated Use: AERONAUTICAL RADIONAVIGATION US260 5.367 US211 US344 5.444 5.444A
US307

Footnote text/Remarks:

US260, 5.367, US211, US344 as in 5000 – 5010 allocation, plus:

5.444 The band 5 030-5 150 MHz is to be used for the operation of the international standard system (microwave landing system) for precision approach and landing. The requirements of this system shall take precedence over other uses of this band. For the use of this band, No. 5.444A and Resolution 114 (Rev.WRC-03) apply. (WRC-03)

5.444A Additional allocation: the band 5 091-5 150 MHz is also allocated to the fixed-satellite service (Earth-to-space) on a primary basis. This allocation is limited to feeder links of non-geostationary mobile-satellite systems in the mobile-satellite service and is subject to coordination under No. 9.11A.

In the band 5 091-5 150 MHz, the following conditions also apply:

- prior to 1 January 2018, the use of the band 5 091-5 150 MHz by feeder links of non-geostationary-satellite systems in the mobile-satellite service shall be made in accordance with Resolution 114 (Rev.WRC-03);
- prior to 1 January 2018, the requirements of existing and planned international standard systems for the aeronautical radionavigation service which cannot be met in the 5000- 5091 MHz band, shall take precedence over other uses of this band;
- after 1 January 2012, no new assignments shall be made to earth stations providing feeder links of non-geostationary mobile-satellite systems;
- after 1 January 2018, the fixed-satellite service will become secondary to the aeronautical radionavigation service. (WRC-03)

US307 The sub-band 5150-5216 MHz is also allocated for space-to-Earth transmissions in the fixed satellite service for feeder links in conjunction with the radiodetermination satellite service operating in the bands 1610-1626.5 MHz and 2483.5-2500 MHz. The total power flux density at the Earth's surface shall in no case exceed -159 dBW/m² per 4 kHz for all angles of arrival.

Satellite Communications **(25)**

Aviation **(87)**

Frequency (MHz): 5150-5250

Allocated Use: AERONAUTICAL RADIONAVIGATION US260 5.367 US211 US344 FIXED-SATELLITE
(Earth-to-space) 5.447A 5.447C US307 **Part 15 unlicensed intentional radiators**

Footnote text/Remarks:

US260, 5.367, US211, US344 as in 5000 – 5010 allocation, **US307** as in 5030 – 5150 allocation, plus:

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

5.447C Administrations responsible for fixed-satellite service networks in the band 5 150- 5 250 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**.

RF Devices (15)

Satellite Communications (25)

Aviation (87)

Frequency (MHz): 5250-5350

Allocated Use: EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION G59 SPACE RESEARCH (active) 5.447D 5.448A Government assignments primary in this band; same assignments apply to private users on a secondary basis. **Part 15 unlicensed intentional radiators**

Footnote text/Remarks:

G59 In the bands 902-928 MHz, 3100-3300 MHz, 3500-3650 MHz, 5250-5350 MHz, 8500-9000 MHz, 9200-9300 MHz, 13.4-14.0 GHz, 15.7-17.7 GHz and 24.05-24.25 GHz, all Federal non-military radiolocation shall be secondary to military radiolocation, except in the sub-band 15.7-16.2 GHz airport surface detection equipment (ASDE) is permitted on a co-equal basis subject to coordination with the military departments.

5.447D The allocation of the band 5250 - 5255 MHz to the space research service on a primary basis is limited to active spaceborne sensors. Other uses of the band by the space research service are on a secondary basis.

5.448A The Earth exploration-satellite (active) and space research (active) services in the frequency band 5250 - 5350 MHz shall not claim protection from the radiolocation service. No. 5.43A does not apply. (WRC-03)

RF Devices (15)

Private Land Mobile (90)

Frequency (MHz): 5350-5460

Allocated Use: EARTH EXPLORATION-SATELLITE (active) 5.448B SPACE RESEARCH (active) AERONAUTICAL RADIONAVIGATION 5.449 RADIOLOCATION G56 US390 (Earth exploration-satellite (active), Space research (active) and Radiolocation allocated to the private sector on a secondary basis.)

Footnote text/Remarks:

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. (WRC-03)

5.449 The use of the band 5350-5470 MHz by the aeronautical radionavigation service is limited to airborne radars and associated airborne beacons.

US390 Federal stations in the space research service (active) operating in the band 5350-5460 MHz shall not cause harmful interference to, nor claim protection from, Federal and non-Federal stations in the aeronautical radionavigation service nor Federal stations in the radiolocation service.

Aviation **(87)**

Private Land Mobile **(90)**

Frequency (MHz): 5460-5470

Allocated Use: EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active)
RADIOLOCATION G56 5.448B US49 G130 (Earth exploration-satellite (active), Space research (active) and Radiolocation allocated to the private sector on a secondary basis.)

Footnote text/Remarks:

5.448B as in 5350 – 5460 allocation.

US49 In the band 5460-5470 MHz, the non-Federal radiolocation service may be authorized on the condition that it does not cause harmful interference to the aeronautical or maritime radionavigation services or to the Federal radiolocation service.

G130 Federal stations in the radiolocation service operating in the band 5350-5470 MHz, shall not cause harmful interference to, nor claim protection from, Federal stations in the aeronautical radionavigation service operating in accordance with ITU Radio Regulation No. 5.449.

G56 Federal radiolocation in the bands 1215-1300, 2900-3100, 5350-5650 and 9300-9500 MHz is primarily for the military services; however, limited secondary use is permitted by other Federal agencies in support of experimentation and research programs. In addition, limited secondary use is permitted for survey operations in the band 2900-3100 MHz.

Private Land Mobile **(90)**

Frequency (MHz): 5470-5570

Allocated Use: MARITIME RADIONAVIGATION US65 EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) RADIOLOCATION G56 5.448B US50 G131 (Earth exploration-satellite (active) and Space research (active) allocated to the private sector on a secondary basis.) **Part 15 unlicensed intentional radiators.**

Footnote text/Remarks:

5.448B as in 5350 – 5460 allocation.

US65 The use of the band 5460-5650 MHz by the maritime radionavigation service is limited to shipborne radars.

G56 Federal radiolocation in the bands 1215-1300, 2900-3100, 5350-5650 and 9300-9500 MHz is primarily for the military services; however, limited secondary use is permitted by other Federal agencies in support of experimentation and research programs. In addition, limited secondary use is permitted for survey operations in the band 2900-3100 MHz.

US50 In the band 5470-5650 MHz, the radiolocation service may be authorized for non-Federal use on the condition that harmful interference is not caused to the maritime radionavigation service or to the Federal radiolocation service.

G131 Federal stations in the radiolocation service operating in the band 5470-5650 MHz, with the exception of ground-based radars used for meteorological purposes operating in the band 5600-5650 MHz, shall not cause harmful interference to, nor claim protection from, Federal stations in the maritime radionavigation service.

RF Devices (15)

Maritime **(80)**

Private Land Mobile **(90)**

Frequency (MHz): 5570-5600

Allocated Use: MARITIME RADIONAVIGATION US65 RADIOLOCATION G56 US50 G131 (Both Gov't. and Private have primary allocation) **Part 15 unlicensed intentional radiators.**

Footnote text/Remarks:

G131, G56, US50 as in 5470 - 5570 allocation.

US65 The use of the band 5460-5650 MHz by the maritime radionavigation service is limited to shipborne radars.

RF Devices (15)

Maritime **(80)**

Private Land Mobile **(90)**

Frequency (MHz): 5600-5650

Allocated Use: MARITIME RADIONAVIGATION US65 METEOROLOGICAL AIDS RADIOLOCATION G56 5.452 US50 G131 **Part 15 unlicensed intentional radiators.**

Footnote text/Remarks:

G131, G56, US50 as in 5470 - 5570 allocation.

US65 as in 5570 - 5600 allocation.

5.452 Between 5 600 MHz and 5 650 MHz, ground-based radars used for meteorological purposes are authorized to operate on a basis of equality with stations of the maritime radionavigation service.

RF Devices (15)

Maritime **(80)**

Private Land Mobile **(90)**

Frequency (MHz): 5650-5830

Allocated Use: RADIOLOCATION G2 5.150 US245 Amateur 5.282 **Part 15 & 18 unlicensed intentional radiators.**

Footnote text/Remarks:

G2 In the bands 216-217 MHz, 220-225 MHz, 420-450 MHz (except as provided by US217 and G129), 890-902 MHz, 928-942 MHz, 1300-1390 MHz, 2310-2390 MHz, 2417-2450 MHz, 2700-

2900 MHz, 5650-5925 MHz, and 9000-9200 MHz, the Federal radiolocation service is limited to the military services.

5.150 The following bands:

13 553-13 567 kHz (centre frequency 13 560 kHz),
26 957-27 283 kHz (centre frequency 27 120 kHz),
40.66-40.70 MHz (centre frequency 40.68 MHz),
902-928 MHz in Region 2 (centre frequency 915 MHz),
2 400-2 500 MHz (centre frequency 2 450 MHz),
5 725-5 875 MHz (centre frequency 5 800 MHz), and
24-24.25 GHz (centre frequency 24.125 GHz)

are also designated for industrial, scientific and medical (ISM) applications. Radiocommunication services operating within these bands must accept harmful interference which may be caused by these applications. ISM equipment operating in these bands is subject to the provisions of No. 15.13.

US245 In the bands 3600-3650 MHz (space-to-Earth), 4500-4800 MHz (space-to-Earth), and 5850-5925 MHz (Earth-to-space), the use of the non-Federal fixed-satellite service is limited to international inter-continental systems and is subject to case-by-case electromagnetic compatibility analysis. The FCC's policy for these bands is codified at 47 C.F.R. § 2.108.

5.282 In the bands 435-438 MHz, 1 260-1 270 MHz, 2 400-2 450 MHz, 3 400-3 410 MHz (in Regions 2 and 3 only) and 5650-5670 MHz, the amateur-satellite service may operate subject to not causing harmful interference to other services operating in accordance with the Table (see No. 5.43). Administrations authorizing such use shall ensure that any harmful interference caused by emissions from a station in the amateur-satellite service is immediately eliminated in accordance with the provisions of No. 25.11. The use of the bands 1 260-1 270 MHz and 5 650-5 670 MHz by the amateur-satellite service is limited to the Earth-to-space direction.

RF Devices **(15)**

ISM Equipment **(18)**

Amateur **(97)**

Frequency (MHz): 5830-5850

Allocated Use: RADIOLOCATION G2 5.150 US245 Amateur and Amateur-satellite (space-to-Earth)
Part 18 unlicensed intentional radiators.

Footnote text/Remarks:

G2, 5.150, US245 as in the 5650-5830 MHz allocation.

ISM Equipment **(18)**

Amateur **(97)**

Frequency (MHz): 5850-5925

Allocated Use: RADIOLOCATION G2 5.150 US245 FIXED-SATELLITE (Earth-to-space) MOBILE
NG160 Amateur Part 18 & 95 unlicensed intentional radiators.

Footnote text/Remarks:

G2, 5.150, US245 as in the 5650-5830 MHz allocation.

NG160 In the 5850-5925 MHz band, the use of the non-Federal mobile service is limited to Dedicated Short Range Communications operating in the Intelligent Transportation System radio service.

ISM Equipment **(18)**

Amateur **(97)**

Private Land Mobile **(90)**

Personal Radio **(95)**

Frequency (MHz): 5925-6425

Allocated Use: FIXED (Private) NG41 FIXED-SATELLITE (Earth-to-space private) NG181

Footnote text/Remarks:

NG41 Frequencies in the bands 3700-4200 MHz and 5925-6425 MHz, may also be assigned to stations in the international fixed public and international control services located in Puerto Rico, the U.S. Virgin Islands, and Navassa Island.

NG181 In the band 5925-6425 MHz (Earth-to-space), earth stations on vessels (ESVs) are an application of the fixed-satellite service (FSS) and may be authorized to communicate with space stations of the FSS on a primary basis.

International Fixed **(23)**

Satellite Communications **(25)**

Fixed Microwave **(101)**