Amateur and Amateur-satellite Service Spectrum

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Contents

Executive Summary

Spectrum is the lifeblood of Amateur Radio. As a result of work of the International Amateur Radio Union and its Member Societies since 1925, the Amateur and Amateur-Satellite Services enjoy access to a number of frequency bands located throughout the radiofrequency spectrum. The IARU objective is to protect these allocations, promote their continued use and pursue future opportunities for improvement and expansion.

This document sets out the current allocations to the Amateur and Amateur-Satellite Services. The IARU believes that, in the future and under the appropriate conditions, it may be possible to achieve some improvement in the allocations as the requirements of other services may change.

The most recent major allocation action affecting the amateur service was that the 2019 World Radiocommunication Conference (WRC-19) adopted a significant improvement in the amateur allocation at 50 MHz in ITU Region 1. The WRC-23 agenda does not include consideration of additional amateur allocations.

1. Introduction

The IARU notes the following factors that should be considered in assessing the current and future utilization of the radio spectrum by the worldwide Amateur and Amateur-Satellite Services:

1.1. There are presently approximately three million licensed Amateur Radio stations. Changes to Article 25 of the international Radio Regulations made at WRC-03, particularly deletion of the treaty obligation for Morse code, have had a positive effect on growth of these services.

1.2. The number and variety of modes of emission used by radio amateurs also are expanding greatly, creating internal pressures within the Amateur Services for their accommodation along with established modes such as single-sideband telephony and Morse telegraphy (CW) operations. These newer modes include digital voice, data and image. Their use improves the efficiency of amateur operations, but also increases the popularity of Amateur Radio and therefore the amount of congestion.

1.3. Spectrum-efficient modes such as single-sideband telephony, which has been in widespread use in the amateur service for more than fifty years, already are employed almost universally in the amateur services. Opportunities for additional spectrum efficiency in amateur operation at MF and HF are being pursued through the adoption of new digital data protocols.

1.4. As the amateur services migrate to digital emissions at VHF and higher, this is leading to greater utilization of existing allocations for digital voice and data.

1.5. Sharing of microwave spectrum by the amateur and radiolocation services has proven to be both practical and viable. As consumer broadband services such as IMT are introduced into these bands, the secondary status of the amateur services poses a significant problem given the widespread geographic distribution of amateur stations, the variety of emissions used by amateur stations, and the relatively low signal levels that amateurs employ.

1.6. The growing popularity of CubeSats and other very small satellites is placing increasing stress on amateur-satellite allocations in the VHF and low UHF frequency ranges.

2. Amateur Allocations

In the Table of Frequency Allocations a primary allocation is shown in upper-case letters (AMATEUR) while a secondary allocation is shown in lower case (Amateur). To understand the relative status of services in shared bands it is also important to read the relevant footnotes. The following excerpts from the international Table of Frequency Allocations include only selected footnotes. For the complete set of footnotes, refer to the current edition of the Radio Regulations. The amateur services have a continuing requirement for these allocations.

2.1 2200 m (135.7-137.8 kHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
135.7-137.8 FIXED MARITIME MOBILE Amateur 5.67A 5.64 5.67 5.67B	**135.7-137.8** FIXED MARITIME MOBILE Amateur 5.67A 5.64	**135.7-137.8** FIXED MARITIME MOBILE RADIONAVIGATION Amateur 5.67A 5.64 5.67B

This band was newly allocated to the Amateur Service at WRC-07 and is used for medium and long-range low-frequency experimentation within the 1 W e.i.r.p. limitation in No. **5.67A**.

2.2 630 m (472-479 kHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
472-479 MARITIME MOBILE 5.79 Amateur 5.80A Aeronautical radionavigation 5.77 5.80 5.72 5.82 5.80B		

This medium-frequency band was newly allocated to the Amateur Service at WRC-12 and is used for medium and long-range experimentation within the e.i.r.p. limitations in No. **5.80A**. The international allocation came into force on 1 January 2013.

2.3 160 m (1800-2000 kHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
1 800-1 810 RADIOLOCATION 5.93	**1 800-1 850** AMATEUR	**1 800-2 000** AMATEUR FIXED MOBILE except aeronautical mobile RADIONAVIGATION Radiolocation
1 810-1 850 AMATEUR 5.98 5.99 5.100 5.101		
1 850-2 000 FIXED MOBILE except aeronautical mobile 5.92 5.96 5.103	**1 850-2 000** AMATEUR FIXED MOBILE except aeronautical mobile RADIOLOCATION RADIONAVIGATION 5.102	5.97

This band's propagation characteristics allow short-range communications during daytime hours, and medium and long-range communications during night-time hours. It is particularly useful during sunspot minima, when the maximum usable frequency (MUF) is below 3500 kHz. Over time, administrations have permitted greater use of the band by amateurs as its use by other services has declined.

2.4 80 m (3500-4000 kHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
3 500-3 800 AMATEUR FIXED MOBILE except aeronautical mobile 5.92	**3 500-3 750** AMATEUR 5.119	**3 500-3 900** AMATEUR FIXED MOBILE
3 800-3 900 FIXED AERONAUTICAL MOBILE (OR) LAND MOBILE	**3 750-4 000** AMATEUR FIXED MOBILE except aeronautical mobile (R)	

3 900-3 950 AERONAUTICAL MOBILE (OR) 5.123		**3 900-3 950** AERONAUTICAL MOBILE BROADCASTING
3 950-4 000 FIXED BROADCASTING	5.122 5.125	**3 950-4 000** FIXED BROADCASTING 5.126

This band is used for contacts over distances of up to 500 km during the day, and for distances of 2 000 km and more at night. It is heavily used during communications emergencies.

2.5 60 m (5351.5-5366.5 kHz) The following international allocation came into force on 1 January 2017. Power limitations are set out in **5.133B**. Despite the power limitations, this narrow band provides a useful bridge between the propagation characteristics of the 3.5 MHz and 7 MHz bands. Some administrations permit higher power and/or the use of channels outside of the band under **RR 4.4**.

Allocation to services		
Region 1	**Region 2**	**Region 3**
5 351.5-5 366.5 FIXED MOBILE except aeronautical mobile Amateur 5.133B		

2.6 40 m (7000-7300 kHz in Region 2, 7000-7200 kHz in Regions 1 and 3)

Allocation to services		
Region 1	**Region 2**	**Region 3**
7 000-7 100	AMATEUR AMATEUR-SATELLITE 5.140 5.141 5.141A	
7 100-7 200	AMATEUR 5.141A 5.141B	
7 200-7 300 BROADCASTING	**7 200-7 300** AMATEUR 5.142	**7 200-7 300** BROADCASTING

The 7 MHz band is heavily used 24 hours each day. During daylight hours, the band carries the bulk of amateur sky wave communication over distances of less than 1300 km. It plays a key role in emergency communications planning and implementation in many countries.

2.7 30 m (10100-10150 kHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
10 100-10 150	FIXED Amateur	

This band is in use 24 hours each day, as a bridge between the 7 MHz and 14 MHz bands. Some administrations provide a primary amateur allocation on a domestic basis.

2.8 20 m (14000-14350 kHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
14 000-14 250	AMATEUR AMATEUR-SATELLITE	
14 250-14 350	AMATEUR 5.152	

This is the most popular band for international amateur communications.

2.9 17 m (18068-18168 kHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
18 068-18 168	AMATEUR AMATEUR-SATELLITE 5.154	

This band is used as an alternative to 14 MHz which is often congested with traffic. It often supports intercontinental communication when higher frequencies do not.

2.10 15 m (21000-21450 kHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
21 000-21 450	AMATEUR AMATEUR-SATELLITE	

This band is used particularly during the daytime and when sunspot activity is high.

2.11 12 m (24890-24990 kHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
24 890-24 990	AMATEUR AMATEUR-SATELLITE	

This band is used particularly during the daytime and when sunspot activity is high.

2.12 10 m (28-29.7 MHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
28-29.7	AMATEUR AMATEUR-SATELLITE	

This band is used particularly during the daytime and when sunspot activity is high. It is also used for amateur-satellite communication.

2.13 6 m (50-54 MHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
47-68 BROADCASTING	…	…
	50-54 AMATEUR 5.162A 5.166 5.167 5.167A 5.168 5.170	

5.162A 5.163 5.164 5.165 5.169 5.171	…	…

This band is used for local communication at all times, including telecommand of objects such as models. Ionospheric and tropospheric scatter and meteor burst propagation are used for distances up to 2 000 km, often using digital protocols specifically developed for these purposes. Sporadic E is a frequent occurrence at certain times of the year, including intercontinental communication via multi-hop paths. Intercontinental communication via the F layer is possible during periods of exceptionally high solar activity. Digital signal processing has made Earth-Moon-Earth communication practical at this order of frequency.

A Region 1 secondary allocation of 50-52 MHz to the amateur service was added to the Table of Frequency Allocations by WRC-19, effective 1 January 2021. Footnotes provide for primary allocations in all or part of the 50-54 MHz band in many countries in Region 1.

2.14 2 m (144-148 MHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
144-146	AMATEUR AMATEUR-SATELLITE 5.216	
146-148 FIXED MOBILE except aeronautical mobile (R)	**146-148** AMATEUR 5.217	**146-148** AMATEUR FIXED MOBILE 5.217

This band is heavily used throughout the world for short-range communications including the use of repeaters. It is also used for Earth-Moon-Earth communications and is one of the most heavily used for amateur satellite operations. Along with the 70 cm band it is most extensively used for local emergency and disaster communications.

2.15 1.25 m (220-225 MHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
174-223 BROADCASTING	…	…
	…	
5.235 5.237 5.243	**220-225**	

223-230 BROADCASTING Fixed Mobile	AMATEUR FIXED MOBILE Radiolocation 5.241	**223-230** FIXED MOBILE BROADCASTING

Where allocated, this band serves as an alternative to the 144-MHz band for short-range communications.

2.16 70 cm (420-450 MHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
420-430	FIXED MOBILE except aeronautical mobile Radiolocation 5.269 5.270 5.271	
430-432 AMATEUR RADIOLOCATION 5.271 5.272 5.273 5.274 5.275 5.276 5.277	**430-432** RADIOLOCATION Amateur 5.271 5.276 5.277 5.278 5.279	
432-438 AMATEUR RADIOLOCATION Earth exploration-satellite (active) 5.279A 5.138 5.271 5.272 5.276 5.277 5.280 5.281 5.282	**432-438** RADIOLOCATION Amateur Earth exploration-satellite (active) 5.279A 5.271 5.276 5.277 5.278 5.279 5.281 5.282	
438-440 AMATEUR RADIOLOCATION 5.271 5.273 5.274 5.275 5.276 5.277 5.283	**438-440** RADIOLOCATION Amateur 5.271 5.276 5.277 5.278 5.279	
440-450	FIXED MOBILE except aeronautical mobile Radiolocation 5.269 5.270 5.271 5.284 5.285 5.286	

Along with the 2 m band, this band is most extensively used for local emergency and disaster communications. It is used for other short-range communications including amateur analogue and digital television. It is also used for Earth-Moon-Earth communications. The band 435-438 MHz is heavily used for amateur satellites in accordance with No. **5.282**. No. **5.278** (WRC-19) provides primary status for the amateur service at 430-440 MHz in 11 countries in Region 2.

5.269 *Different category of service:* in Australia, the United States, India, Japan and the United Kingdom, the allocation of the bands 420-430 MHz and 440-450 MHz to the radiolocation service is on a primary basis (see No. **5.33**).

5.270 *Additional allocation:* in Australia, the United States, Jamaica and the Philippines, the bands 420-430 MHz and 440-450 MHz are also allocated to the amateur service on a secondary basis.

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 5 650-5 670 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.

5.284 *Additional allocation:* In Canada, the band 440-450 MHz is also allocated to the amateur service on a secondary basis.

5.285 *Different category of service:* In Canada, the allocation of the band 440-450 MHz to the radiolocation service is on a primary basis (see No. **5.33**).

2.17 33 cm (902-928 MHz)

<table>
<tr><th colspan="3">Allocation to services</th></tr>
<tr><th>Region 1</th><th>Region 2</th><th>Region 3</th></tr>
<tr><td rowspan="2">890-942
FIXED
MOBILE except aeronautical mobile 5.317A
BROADCASTING 5.322
Radiolocation</td><td>…</td><td rowspan="3">890-942
FIXED
MOBILE 5.317A
BROADCASTING
Radiolocation</td></tr>
<tr><td>902-928
FIXED
Amateur
Mobile except aeronautical mobile 5.325A
Radiolocation
5.150 5.325 5.326</td></tr>
<tr><td>5.323</td><td>…</td><td>5.327</td></tr>
</table>

This band is allocated to the amateur service only in Region 2, where it is also used for industrial, scientific and medical (ISM) applications, and low-power devices.

2.18 23 cm (1240-1300 MHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
1 240-1 300	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.329 5.329A SPACE RESEARCH (active) Amateur 5.282 5.330 5.331 5.332 5.335 5.335A	

This band is used for short-range communications such as repeaters and for experimentation. Amateur satellites may operate in the band 1260-1270 MHz limited to the Earth-to-space direction according to No. **5.282**.

2.19 13 cm 2300-2450 MHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
2 300-2 450 FIXED MOBILE 5.384A Amateur Radiolocation 5.150 5.282 5.395	**2 300-2 450** FIXED MOBILE 5.384A RADIOLOCATION Amateur 5.150 5.282 5.393 5.394 5.396	

This band is used for short-range communications such as repeaters and for experimentation. Amateur satellites operate in the band 2400-2450 MHz according to No. **5.282**. The usefulness of the 2400-2450 MHz band is greatly impaired by the presence of license-exempt WiFi.

2.20 9 cm (3300-3500 MHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
3 300-3 400 RADIOLOCATION 5.149 5.429 5.430	**3 300-3 400** RADIOLOCATION Amateur Fixed Mobile 5.149	**3 300-3 400** RADIOLOCATION Amateur 5.149 5.429
3 400-3 600 FIXED FIXED-SATELLITE (space-to-Earth) Mobile 5.430A Radiolocation 5.431	**3 400-3 500** FIXED FIXED-SATELLITE (space-to-Earth) Amateur Mobile 5.431A Radiolocation 5.433 5.282	**3 400-3 500** FIXED FIXED-SATELLITE (space-to-Earth) Amateur Mobile 5.432B Radiolocation 5.433 5.282 5.432 5.432A

This band is used for short-range communications and for experimentation. Amateur satellites may operate in the sub-band 3400-3410 MHz (in Regions 2 and 3 only) in accordance with No. **5.282**.

2.21 5 cm (5650-5925 MHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
5 650-5 725	RADIOLOCATION MOBILE except aeronautical mobile 5.446A 5.450A Amateur Space research (deep space) 5.282 5.451 5.453 5.454 5.455	
5 725-5 830 FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur 5.150 5.451 5.453 5.455 5.456	**5 725-5 830** RADIOLOCATION Amateur 5.150 5.453 5.455	

5 830-5 850 FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur Amateur-satellite (space-to-Earth) 5.150 5.451 5.453 5.455 5.456	**5 830-5 850** RADIOLOCATION Amateur Amateur-satellite (space-to-Earth) 5.150 5.453 5.455	
5 850-5 925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.150	**5 850-5 925** FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Amateur Radiolocation 5.150	**5 850-5 925** FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Radiolocation 5.150

This band is used for short-range communications and for experimentation. In addition to the secondary allocation of 5830-5850 MHz to the amateur-satellite service for space-to-Earth communication, amateur satellites may operate in the band 5650-5670 MHz limited to the Earth-to-space direction in accordance with No. **5.282**.

2.22 3 cm (10-10.5 GHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
10-10.45 FIXED MOBILE RADIOLOCATION Amateur 5.479	**10-10.45** RADIOLOCATION Amateur 5.479 5.480	**10-10.45** FIXED MOBILE RADIOLOCATION Amateur 5.479
10.45-10.5	RADIOLOCATION Amateur Amateur-satellite 5.481	

This band is used for short-range communications and for experimentation. Amateur satellites may operate in the band 10.45-10.5 GHz.

2.23 1.2 cm (24-24.25 GHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
24-24.05	AMATEUR AMATEUR-SATELLITE 5.150	
24.05-24.25	RADIOLOCATION Amateur Earth exploration-satellite (active) 5.150	

This band is used for short-range communications and for experimentation. Amateur satellites may operate in the band 24-24.05 GHz.

2.24 6 mm (47-47.2 GHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
47-47.2	AMATEUR AMATEUR-SATELLITE	

This band is used for short-range communications and experimentation, and may be used for amateur satellites.

2.25 4 mm (76-81.5 GHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
76-77.5	RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth) 5.149	
77.5-78	AMATEUR AMATEUR-SATELLITE Radio astronomy Space research (space-to-Earth) 5.149	

78-79	RADIOLOCATION Amateur Amateur-satellite Radio astronomy Space research (space-to-Earth) 5.149 5.560
79-81	RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth) 5.149

This band is used for short-range communications and experimentation, and may be used for amateur satellites. In addition to the Table allocations shown here, **5.561A** provides that the 81-81.5 GHz band is also allocated to the amateur and amateur-satellite services on a secondary basis. The band is under considerable pressure from short-range vehicular radar applications.

2.26 2.5 mm (122.25-123 GHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
122.25-123	FIXED INTER-SATELLITE MOBILE 5.558 Amateur 5.138	

This band is used for short-range communications and experimentation.

2.27 2 mm (134-141 GHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
134-136	AMATEUR AMATEUR-SATELLITE Radio astronomy	

136-141	RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite 5.149

This band is used for short-range communications and experimentation, and may be used for amateur satellites.

2.28 1 mm (241-250 GHz)

Allocation to services		
Region 1	**Region 2**	**Region 3**
241-248	RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite 5.138 5.149	
248-250	AMATEUR AMATEUR-SATELLITE Radio astronomy 5.149	

This band is used for short-range communications and experimentation, and may be used for amateur satellites.