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Spectrum Requirements for the Amateur and Amateur-satellite Services

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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 have a number of small frequency bands scattered throughout the radiofrequency spectrum. The IARU objective is to protect these allocations, promote their continued use and pursue modest amounts of additional spectrum to satisfy dynamic requirements.

The most recent allocation action was that the 2007 World Radiocommunication Conference made a worldwide secondary allocation of the low-frequency band 135.7-137.8 kHz to the Amateur Service subject to certain footnotes. The 7200-7300 kHz band was maintained in Region 2 but not extended to the other Regions. IARU did not achieve its objective of a new band around 5 MHz at WRC-07 nor its placement on a future Agenda. WRC-07 adopted some footnotes to permit International Mobile Telecommunications (IMT) in bands at 2.3 and 3.4 GHz in certain countries, which may impact the use of these bands by the Amateur Services. The 2007 conference adopted an Agenda item for WRC-11 to consider an allocation of 15 kHz around 500 kHz.

1. Introduction

On an ongoing basis beginning in July 1990, the International Amateur Radio Union (IARU) Administrative Council, starting from decisions taken at the regional conferences of the three regional organizations of the IARU, has identified the present and anticipated future requirements for radio spectrum allocations to the Amateur and Amateur-Satellite Services. These requirements are identified so that they may be taken into account in the formulation of national policies with respect to proposed and possible future international allocations conferences.

The position of the IARU on behalf of the worldwide Amateur and Amateur-Satellite Services takes into account the following factors, among others:

1.1. There are presently nearly 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 manual 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 limited at present.

1.4. As the amateur services migrate to digital emissions, particularly at VHF and higher, amateurs are adopting technologies that permit higher data rates for the same reasons as other radio services. This is leading to greater utilization of existing allocations for digital voice and data.

1.5. While sharing with some other services in some parts of the spectrum is a practical and viable solution for improved utilization of the spectrum, sharing with the Amateur Services as a solution to spectrum congestion in other services is limited by factors such as: the widespread geographic distribution of amateur stations, the variety of emissions used by amateur stations, and the relatively low signal levels that amateurs employ.

2. Existing Allocations

The following excerpts from the international Table of Frequency Allocations include only selected footnotes. 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 5.4C03 5.64 5.67	135.7-137.8 FIXED MARITIME MOBILE Amateur 5.4C03 5.64	135.7-137.8 FIXED MARITIME MOBILE RADIONAVIGATION Amateur 5.4C03 5.64 5.4C04

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. **5.4C03**.

2.2 160 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	

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.

2.3 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		
3 950-4 000 FIXED BROADCASTING	5.122 5.125	3 900-3 950 AERONAUTICAL MOBILE BROADCASTING
		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.

2.4 40 m (7000-7300 kHz) (Amateur allocation of 7100-7200 kHz in Regions 1 and 3 is in force after 29 March 2009)

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 5.141C 5.142	

7 200-7 300 BROADCASTING	7 200-7 300 AMATEUR 5.142	7 200-7 300 BROADCASTING
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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.

2.5 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.

2.6 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 communications.

2.7 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.

2.8 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.

2.9 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.

2.10 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.

2.11 6 m (50-54 MHz)

Allocation to services		
Region 1	Region 2	Region 3
47-68 BROADCASTING 5.162A 5.163 5.164 5.165 5.169 5.171
	50-54 AMATEUR 5.162A 5.166 5.167 5.168 5.170	

This band is used for local communication at all times, including telecommand of objects such as models. Sky wave, tropospheric scatter and meteor burst propagation are used for distances up to 2 000 km. Intercontinental communication is possible during periods of exceptionally high solar activity.

2.12 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.

2.13 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.

2.14 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	

This band is used for 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**.

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**).

2.15 33 cm (902-928 MHz)

Allocation to services		
Region 1	Region 2	Region 3
890-942 FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING 5.322 Radiolocation 5.323	...	890-942 FIXED MOBILE 5.317A BROADCASTING Radiolocation 5.327
	902-928 FIXED Amateur Mobile except aeronautical mobile 5.325A Radiolocation 5.150 5.325 5.326	
	...	

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.

2.16 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**.

2.17 13 cm 2300-2450)

Allocation to services		
Region 1	Region 2	Region 3
2 300-2 450 FIXED MOBILE Amateur Radiolocation 5.150 5.282 5.348A 5.395	2 300-2 450 FIXED MOBILE 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**.

2.18 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 5.430	3 300-3 400 RADIOLOCATION Amateur 5.149 5.429
3 400-3 600 FIXED FIXED-SATELLITE (space-to-Earth) Mobile ADD 5.AAA Radiolocation 5.431	3 400-3 500 FIXED FIXED-SATELLITE (space-to-Earth) Amateur Mobile ADD 5.ZZZ Radiolocation 5.433 5.282 5.432	3 400-3 500 FIXED FIXED-SATELLITE (space-to-Earth) Amateur Mobile ADD 5.BBB ADD 5AAA1 Radiolocation 5.433 5.282 5.432

Note: WRC-07 added (ADD) footnotes apply to conditions for IMT use of the band.

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**.

2.19 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. Amateur satellites may operate in the band 5650-5670 MHz limited to the Earth-to-space direction in accordance with No. **5.282**.

2.20 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.

2.21 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.

2.22 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.

2.23 4 mm (76-81 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.

2.24 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.

2.25 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.

2.26 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.

3. Spectrum Requirements

3.1 500 kHz

The Amateur Service seeks a worldwide, secondary allocation in the band 415-526.5 kHz

WRC-07 adopted the following Agenda item for WRC-11,

1.23 to consider an allocation of about 15 kHz in parts of the band 415-526.5 kHz to the amateur service on a secondary basis, taking into account the need to protect existing services;

This part of the spectrum is interesting to radio amateurs because of its unique propagation properties, which include both ground-wave and sky-wave modes. Its properties are sufficiently different from those of LF and the 160-metre band.

Since the beginning of ITU spectrum allocations, the frequency 500 kHz (495-505 kHz) had been allocated to the maritime mobile service for distress and safety. Technological advances such as the Global Maritime Distress and Safety System (GMDSS) have rendered the 500 kHz channel obsolete. Accordingly, WRC-07 suppressed RR No. **5.83**, which read:

5.83 The frequency 500 kHz is an international distress and calling frequency for Morse radiotelegraphy. The conditions for its use are prescribed in Articles **31** and **52**, and in Appendix **13**.

Allocations after WRC-07:

Allocation to services		
Region 1	Region 2	Region 3
415-435 MARITIME MOBILE 5.79 AERONAUTICAL RADIONAVIGATION 5.72	415-495 MARITIME MOBILE 5.79 5.79A Aeronautical radionavigation 5.80 5.77 5.78 5.82	
435-495 MARITIME MOBILE 5.79 5.79A Aeronautical radionavigation 5.72 5.82		

495-505 MOBILE 5.79B 5.4C01		
505-526.5 MARITIME MOBILE 5.79 5.79A 5.84 AERONAUTICAL RADIONAVIGATION 5.72	505-510 MARITIME MOBILE 5.79	505-526.5 MARITIME MOBILE 5.79 5.79A 5.84 AERONAUTICAL RADIONAVIGATION Aeronautical mobile Land mobile
	510-525 MOBILE 5.79A 5.84 AERONAUTICAL RADIONAVIGATION	

CPM 11-1 designated ITU-R Working Party 5A as the Responsible Group and WPs 5B, 5C and 6D as Concerned Groups. In February 2008, WP 5A initiated preparatory studies.

3.2 1800–2000 kHz

The Amateur Service seeks to (a) obtain access to the bands 1800-1810 kHz and 1850-2000 kHz in Region 1 and (b) encourage deletion of country names from footnotes limiting amateur access to the band 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	1 850-2 000 AMATEUR FIXED MOBILE except aeronautical mobile RADIOLOCATION RADIONAVIGATION	

WRC-07 made the following modifications to Article 5 footnotes for the band 1800-2000 kHz:

5.93 *Additional allocation:* in Angola, Armenia, Azerbaijan, Belarus, the Russian Federation, Georgia, Hungary, Kazakhstan, Latvia, Lithuania, Moldova, Mongolia, Nigeria, Uzbekistan, Poland, Kyrgyzstan, Slovakia, the Czech Rep., Tajikistan, Chad, Turkmenistan and Ukraine, the bands 1 625-1 635 kHz, 1 800-1 810 kHz and 2 160-2 170 kHz ~~and, in Bulgaria, the bands 1 625-1 635 kHz and 1 800-1 810 kHz~~, are also allocated to the fixed and land mobile services on a primary basis, subject to agreement obtained under No. **9.21**. (WRC-07)

5.98 *Alternative allocation:* in Angola, Armenia, Azerbaijan, Belarus, Belgium, ~~Bulgaria~~, Cameroon, the Congo (Rep. of the), Denmark, Egypt, Eritrea, Spain, Ethiopia, the Russian Federation, Georgia, Greece, Italy, Kazakhstan, Lebanon, Lithuania, Moldova, the Syrian Arab Republic, Kyrgyzstan, Somalia, Tajikistan, Tunisia, Turkmenistan, Turkey and Ukraine, the band 1 810-1 830 kHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-07)

5.99 *Additional allocation:* in Saudi Arabia, Austria, ~~Bosnia and Herzegovina~~, Iraq, the Libyan Arab Jamahiriya, Uzbekistan, Slovakia, Romania, Slovenia, Chad, Togo and Serbia and Montenegro, the band 1 810-1 830 kHz is also allocated to the fixed and mobile, except aeronautical mobile, radiolocation and radionavigation, services on a primary basis. (WRC-07)

5.102 *Alternative allocation:* in ~~Argentina~~, Bolivia, Chile, Mexico, Paraguay, Peru and Uruguay, the band 1 850-2 000 kHz is allocated to the fixed, mobile except aeronautical mobile, radiolocation and radionavigation services on a primary basis. (WRC-07)

An increasing number of countries in Region 1 are authorizing amateur operation above 1850 kHz on a low-power, noninterference basis. There is reason to believe that the growing use of Global Navigation Satellite Service (GPS, GLONASS and Galileo expected to become operational about 2013) positioning systems will render obsolete radiolocation systems operating in the band 1900–2000 kHz.

3.3 5 MHz

The Amateur Service seeks a worldwide secondary allocation of approximately 150 kHz near 5 MHz to bridge the propagation gap between the bands at 3.5 and 7 MHz.

Particularly in the higher latitudes, there are many times when the MUF is below 7 MHz but is too far above the next lowest amateur frequency band (3.8 or 4.0 MHz, depending upon the Region) for communication to be supported in that band using typical amateur antennas and power levels. Also, as amateur communication increasingly uses digital rather than analogue modes of emission, intersymbol distortion caused by multipath propagation becomes a more important factor and requires choice of an operating frequency as near as possible to the MUF.

Existing allocations in the range of interest:

Allocation to services		
Region 1	Region 2	Region 3
5 060-5 250	FIXED Mobile except aeronautical mobile 5.133	
5 250-5 450	FIXED MOBILE except aeronautical mobile	

The 2007 Conference Preparatory Meeting (CPM07-2) included Method 6 (Issue E): Modifications to RR Article 5 to provide a worldwide secondary allocation to the Amateur Service of 150 kHz at 5260-5410 kHz. WRC-07 considered but did not allocate the band 5260-5410 kHz to the Amateur Service, nor did it adopt a future conference Agenda item that might accommodate it.

While it is untimely at either WRC-11 or WRC-15, it is desirable to include a 5 MHz allocation on the Agenda of a future WRC. Meanwhile, Member-Societies should seek domestic allocations of discrete 3-kHz channels in the 5260-5410 kHz band to extend and enhance those already authorized (center frequencies specified):

5260	Canada, UK, Greenland
5269	Canada
5280	Canada, Finland, Greenland, Iceland, Ireland, Norway, UK
5290	Canada, Finland, Greenland, Iceland, Ireland, Norway, UK
5300	Finland
5319	Canada
5329	Canada
5332	Finland, Iceland, Norway, St. Lucia, USA
5348	Finland, Iceland, Norway, St. Lucia, USA
5368	Finland, Greenland, Iceland, Norway, UK, USA
5373	Finland, Greenland, Iceland, Norway, St. Lucia, USA
5400	Canada, Iceland, Ireland, Norway, UK
5405	Canada, Iceland, Ireland, Norway, St. Lucia, UK, USA

3.4 7 MHz

The Amateur Services seek to retain its existing primary allocations at 7 MHz and an exclusive primary allocation of the band 7200-7300 kHz to the Amateur Service in Regions 1 and 3.

WRC-03 made a primary allocation to the Amateur Service in the band 7100-7200 kHz in Regions 1 and 3 but a similar allocation in the band 7200-7300 kHz was not made at that conference. Region 2 amateurs retained a primary allocation in the band 7100-7300 kHz.

Existing allocations after WRC-03:

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 5.141C 5.142	
7 200-7 300 BROADCASTING	7 200-7 300 AMATEUR 5.142	7 200-7 300 BROADCASTING

WRC-03 approved the following transitional and alternative allocation footnotes having some bearing on the 40-metre amateur band:

5.140 *Additional allocation:* in Angola, Iraq, Kenya, Rwanda, Somalia and Togo, the band 7 000-7 050 kHz is also allocated to the fixed service on a primary basis. (WRC-03)

5.141A *Additional allocation:* in Uzbekistan and Kyrgyzstan, the bands 7 000-7 100 kHz and 7 100-7 200 kHz are also allocated to the fixed and land mobile services on a secondary basis. (WRC-03)

5.141B *Additional allocation:* after 29 March 2009, in Algeria, Saudi Arabia, Australia, Bahrain, Botswana, Brunei Darussalam, China, Comoros, Korea (Rep. of), Diego Garcia, Djibouti, Egypt, United Arab Emirates, Eritrea, Indonesia, Iran (Islamic Republic of), Japan, Jordan, Kuwait, Libyan Arab Jamahiriya, Morocco, Mauritania, New Zealand, Oman, Papua New Guinea, Qatar, Syrian Arab Republic, Singapore, Sudan, Tunisia, Viet Nam and Yemen, the band 7 100-7 200 kHz is also allocated to the fixed and the mobile, except aeronautical mobile (R), services on a primary basis. (WRC-03)

5.141C In Regions 1 and 3, the band 7 100-7 200 kHz is allocated to the broadcasting service until 29 March 2009 on a primary basis. (WRC-03)

5.142 Until 29 March 2009, the use of the band 7 100-7 300 kHz in Region 2 by the amateur service shall not impose constraints on the broadcasting service intended for use within Region 1 and Region 3. After 29 March 2009 the use of the band 7 200-7 300 kHz in Region 2 by the amateur service shall not impose constraints on the broadcasting service intended for use within Region 1 and Region 3. (WRC-03)

The amateur service requirement continues to be for a 300-kHz allocation. This requirement is even greater today than in the past, owing to the increasing number of amateur stations and the expanding diversity of modes of emission used in the amateur service. However, the requirement

is being met only in Region 2 and in certain countries in Regions 1 and 3 that permit their amateur stations to operate in 7100-7300 kHz under the provisions of Radio Regulation 4.4, and then only at those times (mostly during daylight hours) when broadcasting interference does not preclude full use of the band by amateur stations.

The 2007 Conference Preparatory Meeting (CPM07-2) provided Method 7 (Issue E): Modifications to RR Article 5 to provide a worldwide primary allocation to the Amateur Service of 7200-7300 kHz. However, WRC-07 did not make the allocation nor propose it for a future conference Agenda, leaving this part of the amateur requirement at 7 MHz as yet unfulfilled.

3.5 10 MHz

The Amateur Service seeks expansion of its present secondary allocation of 10100-10150 kHz to 10100-10350 kHz.

Existing allocations:

Allocation to services		
Region 1	Region 2	Region 3
10 100-10 150	FIXED Amateur	
10 150-11 175	FIXED Mobile except aeronautical mobile (R)	

The band 10100-10150 kHz was newly allocated to the Amateur Service at WARC-79, on a secondary basis. It is the only HF allocation to the Amateur Service on a secondary basis. The amateur service has been exceedingly careful to provide protection to the fixed service, which has the allocation on a primary basis. Harmful interference has been avoided by discouraging competitive activities and by avoiding telephony operation, which might cause congestion. Even with these restrictions, the band has proven highly popular to operators in the Amateur Service because it provides an essential "bridge" between the 7-MHz and the 14-MHz bands during changing propagation conditions.

While it is untimely at either WRC-11 or WRC-15, it is desirable to include a 10-MHz allocation on the Agenda of a future WRC. Meanwhile, Member-Societies should seek domestic allocations of discrete 3-kHz channels in the band 10150-10350 kHz on the basis of RR No. 4.4.

3.6 14000-14400 kHz

The Amateur Service seeks an expansion of the present allocation of 14000-14350 kHz to 14000-14400 kHz.

Existing allocations:

Allocation to services		
Region 1	Region 2	Region 3
14 000-14 250	AMATEUR AMATEUR-SATELLITE	
14 250-14 350	AMATEUR 5.152	
14 350-14 990	FIXED Mobile except aeronautical mobile (R)	

The 14-MHz band is the most heavily used band for international communications. It bears an extremely heavy load of both CW and SSB traffic. In recent years, amateurs have found it increasingly difficult to accommodate the newer digital modes within the 14-MHz allocation, thereby limiting the experimentation with new technologies.

At the Washington Conference of 1927 this allocation was established at 14000-14400 kHz, but at the Atlantic City Conference of 1947 it was reduced by 50 kHz, to 14000-14350 kHz.

3.7 18068-18168 kHz expansion

The Amateur Services seeks an expansion of the present allocation of the band 18068-18168 kHz to one of 250 kHz bandwidth.

Existing allocations:

Allocation to services		
Region 1	Region 2	Region 3
18 030-18 052	FIXED	
18 052-18 068	FIXED Space research	
18 068-18 168	AMATEUR AMATEUR-SATELLITE 5.154	
18 168-18 780	FIXED Mobile except aeronautical mobile	

The band 18068-18168 kHz was allocated to the amateur service at WARC-79, but full implementation was delayed for some ten years pending the re-accommodation of fixed service

stations. Now, most ITU member administrations permit their amateurs to use this allocation. It has proven to be very popular with operators who wish to avoid the congestion in the 14-MHz band and who are flexible in selecting the best operating frequency for a given path. Monitoring indicates that amateur utilization of this band is higher than the utilization of adjacent bands by other services.

3.8 24890-24990 kHz expansion

The Amateur Services seeks an expansion of the present allocation of the band 24890-24990 kHz to one of 250 kHz bandwidth.

Existing allocations:

Allocation to services		
Region 1	Region 2	Region 3
23 350-24 000	FIXED MOBILE except aeronautical mobile 5.157	
24 000-24 890	FIXED LAND MOBILE	
24 890-24 990	AMATEUR AMATEUR-SATELLITE	
24 990-25 005	STANDARD FREQUENCY AND TIME SIGNAL (25 000 kHz)	
25 005-25 010	STANDARD FREQUENCY AND TIME SIGNAL Space research	

The band 24890-24990 kHz was allocated to the amateur service at WARC-79, but full implementation was delayed for several years pending re-accommodation of fixed service stations. Now, most administrations permit amateurs to use this allocation. It has proven to be very popular, particularly at those times when the MUF is below the wider and extremely popular 28-MHz band. Monitoring indicates that amateur utilisation of this band is higher than the utilisation of adjacent bands by other services.

It is impractical to expand the band upward to achieve the desired 250 kHz bandwidth. Thus, the expanded band would necessarily come from below 24890 kHz.

3.9 29.7 – 50 MHz

The Amateur Service requires allocations to narrow bands between 30 and 50 MHz.

Existing allocations:

Allocation to services		
Region 1	Region 2	Region 3
29.7-30.005	FIXED MOBILE	
30.005-30.01	SPACE OPERATION (satellite identification) FIXED MOBILE SPACE RESEARCH	
30.01-37.5	FIXED MOBILE	
37.5-38.25	FIXED MOBILE Radio astronomy 5.149	
38.25-39.986	FIXED MOBILE	
39.986-40.02	FIXED MOBILE Space research	
40.02-40.98	FIXED MOBILE 5.150	
40.98-41.015	FIXED MOBILE Space research 5.160 5.161	
41.015-44	FIXED MOBILE 5.160 5.161	
44-47	FIXED MOBILE 5.162 5.162A	
47-68 BROADCASTING	47-50 FIXED MOBILE	47-50 FIXED MOBILE BROADCASTING 5.162A

As land mobile services vacate the band 29.7-50 MHz and migrate to higher frequencies, there appears to be an opportunity to gain shared allocations in this range for propagation experimentation, e.g., five, 50-kHz slots. Of particular interest is the 40.66-40.70 MHz ISM band centered at 40.68 MHz. Within the context of European harmonization IARU Region 1 has sought access to this ISM band, initially for propagation research beacons, and has received some encouragement. The slots above 30 MHz would be useful for the Amateur Service, where this frequency range is well suited for meteor-scatter propagation.

3.10 50–54 MHz

The Amateur Service requires retention of the exclusive 50-MHz allocation where it now exists, and provision of an allocation of at least 2 MHz in other geographic areas, with at least 500 kHz on an exclusive basis.

Existing allocations:

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

This band is used for local amateur communication on an around-the-clock basis, including radio control of objects. Tropospheric scatter and sky-wave propagation (principally sporadic-E and occasional F-layer propagation at sunspot maxima) are used for longer distances, as well as auroral propagation at the higher latitudes. Meteor scatter has been used for Morse code and voice communications primarily during meteor showers. Newer computer-based techniques make meteor scatter a routine propagation mode for distances up to 2000 km.

In Regions 2 and 3, and in some countries in Region 1, there is an allocation of 4 MHz to the Amateur Service. In some local areas, proximity to television broadcasting frequencies limits the usefulness of some portions of the band.

In the CEPT process of European harmonization, IARU Region 1 has achieved an amateur secondary allocation in the band 50-52 MHz in the CEPT European Common Allocation Table (ECA). It has also achieved a CEPT-ERC statement in support of global harmonization. WRC-07 considered this, but did not include it on the WRC-11 agenda. Action by member-societies

could be helpful in accelerating this process through achieving primary status nationally, as had already been accomplished in some countries.

3.11 70.0–70.5 MHz

The Amateur Service requires an allocation at or near 70 MHz of at least 500 kHz on a secondary basis in Region 1.

A Regional allocation is sought for Region 1, where the following countries are already authorized to use all or part of the band 70-70.5 MHz: Croatia, Cyprus, Denmark, Estonia, Faroe Islands, Gibraltar, Greece, Ireland, Italy, Luxembourg, Monaco, Montenegro, Portugal, Serbia, Slovenia, Somalia, South Africa, Sweden and United Kingdom. Such authorizations are rare outside Region 1 but include Greenland and Pakistan.

Existing allocations:

Allocation to services		
Region 1	Region 2	Region 3
68-74.8 FIXED MOBILE except aeronautical mobile	68-72 BROADCASTING Fixed Mobile 5.173	68-74.8 FIXED MOBILE

In countries where allocated, this band is used for local amateur communication on 24-hour basis, including radio control of objects. Tropospheric-scatter and sky-wave propagation (principally sporadic-E) are used for longer distances, as well as auroral propagation at the higher latitudes. Meteor scatter has been used for Morse code and voice communications primarily during meteor showers. Computer-based techniques make meteor scatter practical for distances up to 2000 km.

3.12 420-450 MHz

The Amateur Service requires retention of the existing allocations in the 420-450 MHz band and opposes new uses by other services or low-power devices except where sharing or compatibility studies have been satisfactorily concluded.

The Amateur-Satellite Service relies heavily on the sub-band 435-438 MHz, which presently is the only space-to-Earth amateur allocation between 146 MHz and 2.4 GHz. Because of the crowding of the existing band 435-438 MHz with unmanned amateur satellites and manned space stations, it is desirable to study expansion of the band.

Sharing in this band with the Radiolocation Service has been successful over many decades because of geographic separation and other factors. Recently, there has been interference from amateur stations to radiolocation stations, which has been resolved on a case-by-case basis by mitigation techniques or by taking amateur repeaters off the air.

A growing concern to the Amateur Service is the proliferation of low power devices in the ISM band 433.05-434.79 MHz (centre frequency 433.92 MHz) permitted in some European countries under RR No. **5.280**.

3.13 1240-1300 MHz

The Amateur Service seeks retention of the band 1240-1300 MHz. The Amateur-Satellite Service seeks retention of the band 1260-1270 MHz and deletion of the "Earth-to-space only" restriction.

WRC-2000 allocated the band 1240-1300 MHz to the radiodetermination-satellite service for space-to-space use. In addition, WRC-2000 allocated the band 1260-1300 MHz to the radiodetermination-satellite service for space-to-Earth use such as for the European *Galileo* positioning system. These actions do not change the Amateur and Amateur-Satellite Service allocations but present new sharing situations and potential operating restrictions.

3.14 2300-2450 MHz

The Amateur Service requires retention of access to the band 2300-2450 MHz and upgrading where possible the band 2390-2450 MHz to primary status, and the Amateur-Satellite Service requires retention of the band 2400-2450 MHz.

The band 2300-2450 MHz is allocated to the Amateur Service on a secondary basis in all three Regions. Actions by WARC-92 and certain administrations in their domestic allocations have reduced the amount of spectrum within this band available to the Amateur Service. The band 2400-2500 MHz is used for ISM applications and is increasingly being used for (unlicensed) low-power devices such as radio local area networks (RLANs) and cordless telephones.

3.15 3300-3500 MHz

Note: Additional study of this requirement is necessary in view of WRC-07 IMT decisions affecting this frequency range.

CEPT DSI Phase I established an Amateur Service secondary allocation at 3400-3500 MHz. In addition, the following footnote was adopted by the CEPT:

EU17: In the sub-bands 3400-3410 MHz, 5660-5670 MHz, 10.36-10.37 GHz and 10.45-10.46 GHz the amateur service operates on a secondary basis. In making assignments to other services, CEPT

administrations are requested wherever possible to maintain these sub-bands in such a way as to facilitate the reception of amateur emissions with minimal power flux densities.

In effect, EU17 encourages administrations to afford some consideration to amateur weak-signal operations in the band sub-band 3400-3410 MHz, among others.

There has been a major effort by the telecommunications industry to promote the band 3400-3800 MHz for wireless access applications. WRC-07 identified the band 3400-3500 MHz for IMT applications in certain countries, which would pose difficulty for the Amateur Services to achieve any improvement in the band 3400-3410 MHz with respect to upgrading the allocation or extending the allocation to Region 1. Instead of expending resources on the band 3400-3500 MHz or portions thereof, study should be given to possibilities in the band 3300-3400 MHz.

3.16 Frequencies above 275 GHz

The Amateur Services seek to obtain not less than 75 GHz of spectrum in the band 275-1000 GHz in order to provide for future development of the Amateur Services utilizing new technologies.

WRC-2000 extended the mandate of the ITU Radio Regulations from 275-400 GHz to 275-1000 GHz but did not make any specific allocations to radiocommunication services. However, the conference revised a footnote listing bands above 275 GHz used by passive services that should be avoided by active radiocommunication services. In addition, WRC-2000 adopted preliminary agenda item 2.3 for WRC-07 to review studies and consider allocations in the frequency bands above 275 GHz. The 2002 ITU Plenipotentiary Conference extended the mandate of the ITU to allocate much higher frequencies and studies have begun on frequencies up to 375 THz.

In order to continue with their activities, the Amateur Services will require allocations of sufficient bandwidth to permit experimentation spaced throughout the range 275-1000 GHz. Studies of Amateur Services' requirements in this range should be completed in preparation for WRC-11. The radio astronomy service has indicated a possibility of sharing with the Amateur Services in this range.

Analysis of attenuation due to gasses and precipitation through the atmosphere indicates that the following bands are better choices than others for the Amateur Services.

Better bands (GHz)	Attenuation (dB/km)
275 – 300	6
355 – 400	10
490 – 510	10
690 - 710	50

800 - 850	50
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The following are the bands preferred for the Amateur and Amateur-Satellite Services because they are within the better bands identified above and are free of other radio-frequency lines of the greatest importance to the radio astronomy service. Primary allocations within these bands appear feasible, and the bands from 510 GHz and below are the most ideal for the amateur services, based on atmospheric attenuation, and where the bulk of the allocations within these bands are preferred.

Preferred bands for the Amateur Services (GHz)	Available bandwidth (GHz)
280 – 294	14
358 – 363	5
365 – 371	6
389 – 400	11
493 – 496	3
506 – 510	4
692 – 710	18
810 – 850	40

The ITU has begun studies of frequency bands above 3000 GHz (3 THz), considered the beginning of the optical spectrum.
