

# **Spectrum Requirements for the Amateur and Amateur-satellite Services**

**Revised August 2011**

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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-12 to consider a secondary allocation of about 15 kHz between 415 and 526.5 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
<b>135.7-137.8</b> FIXED MARITIME MOBILE Amateur 5.67A  5.64 5.67 5.67B	<b>135.7-137.8</b> FIXED MARITIME MOBILE Amateur 5.67A  5.64	<b>135.7-137.8</b> 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**.

### 2.2 160 m (1800-2000 kHz)

Allocation to services		
Region 1	Region 2	Region 3
<b>1 800-1 810</b> RADIOLOCATION 5.93	<b>1 800-1 850</b> AMATEUR	<b>1 800-2 000</b> AMATEUR FIXED MOBILE except aeronautical mobile RADIONAVIGATION Radiolocation
<b>1 810-1 850</b> AMATEUR 5.98 5.99 5.100 5.101		
<b>1 850-2 000</b> FIXED MOBILE except aeronautical mobile  5.92 5.96 5.103	<b>1 850-2 000</b> 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.

**2.3 80 m (3500-4000 kHz)**

Allocation to services		
Region 1	Region 2	Region 3
<b>3 500-3 800</b> AMATEUR FIXED MOBILE except aeronautical mobile 5.92	<b>3 500-3 750</b> AMATEUR 5.119	<b>3 500-3 900</b> AMATEUR FIXED MOBILE
	<b>3 750-4 000</b> AMATEUR FIXED MOBILE except aeronautical mobile (R)	
<b>3 800-3 900</b> FIXED AERONAUTICAL MOBILE (OR) LAND MOBILE	5.122 5.125	<b>3 900-3 950</b> AERONAUTICAL MOBILE BROADCASTING
<b>3 900-3 950</b> AERONAUTICAL MOBILE (OR) 5.123		<b>3 950-4 000</b> FIXED BROADCASTING
<b>3 950-4 000</b> 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 since 29 March 2009)

Allocation to services		
Region 1	Region 2	Region 3
<b>7 000-7 100</b>	AMATEUR AMATEUR-SATELLITE 5.140 5.141 5.141A	
<b>7 100-7 200</b>	AMATEUR 5.141A 5.141B 5.141C 5.142	

<b>7 200-7 300</b> BROADCASTING	<b>7 200-7 300</b> AMATEUR 5.142	<b>7 200-7 300</b> 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
<b>10 100-10 150</b>	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
<b>14 000-14 250</b>	AMATEUR AMATEUR-SATELLITE	
<b>14 250-14 350</b>	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
<b>18 068-18 168</b>	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	<b>50-54</b> AMATEUR 5.162A 5.166 5.167 5.167A 5.168 5.170	
	...	...

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.

**2.12 2 m (144-148 MHz)**

Allocation to services		
Region 1	Region 2	Region 3
<b>144-146</b>	AMATEUR AMATEUR-SATELLITE 5.216	
<b>146-148</b> FIXED MOBILE except aeronautical mobile (R)	<b>146-148</b> AMATEUR  5.217	<b>146-148</b> 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.

**2.13 1.25 m (220-225 MHz)**

Allocation to services		
Region 1	Region 2	Region 3
<b>174-223</b> BROADCASTING	...	...
5.235 5.237 5.243	...	
	<b>220-225</b>	

<b>223-230</b> BROADCASTING Fixed Mobile	AMATEUR FIXED MOBILE Radiolocation 5.241	<b>223-230</b> FIXED MOBILE BROADCASTING
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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
<b>420-430</b>	FIXED MOBILE except aeronautical mobile Radiolocation 5.269 5.270 5.271	
<b>430-432</b> AMATEUR RADIOLOCATION 5.271 5.272 5.273 5.274 5.275 5.276 5.277	<b>430-432</b> RADIOLOCATION Amateur  5.271 5.276 5.277 5.278 5.279	
<b>432-438</b> AMATEUR RADIOLOCATION Earth exploration-satellite (active) 5.279A 5.138 5.271 5.272 5.276 5.277 5.280 5.281 5.282	<b>432-438</b> RADIOLOCATION Amateur Earth exploration-satellite (active) 5.279A  5.271 5.276 5.277 5.278 5.279 5.281 5.282	
<b>438-440</b> AMATEUR RADIOLOCATION 5.271 5.273 5.274 5.275 5.276 5.277 5.283	<b>438-440</b> RADIOLOCATION Amateur  5.271 5.276 5.277 5.278 5.279	
<b>440-450</b>	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**.

**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
<b>890-942</b> FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING 5.322 Radiolocation  5.323	...	<b>890-942</b> FIXED MOBILE 5.317A BROADCASTING Radiolocation
	<b>902-928</b> 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
<b>1 240-1 300</b>	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 MHz)**

Allocation to services		
Region 1	Region 2	Region 3
<b>2 300-2 450</b> FIXED MOBILE 5.384A Amateur Radiolocation 5.150 5.282 5.395	<b>2 300-2 450</b> 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**.

**2.18 9 cm (3300-3500 MHz)**

Allocation to services		
Region 1	Region 2	Region 3
<b>3 300-3 400</b> RADIOLOCATION  5.149 5.429 5.430	<b>3 300-3 400</b> RADIOLOCATION Amateur Fixed Mobile 5.149	<b>3 300-3 400</b> RADIOLOCATION Amateur  5.149 5.429

<p><b>3 400-3 600</b> FIXED FIXED-SATELLITE (space-to-Earth) Mobile 5.430A Radiolocation  5.431</p>	<p><b>3 400-3 500</b> FIXED FIXED-SATELLITE (space-to-Earth) Amateur Mobile 5.431A Radiolocation 5.433  5.282</p>	<p><b>3 400-3 500</b> FIXED FIXED-SATELLITE (space-to-Earth) Amateur Mobile 5.432B Radiolocation 5.433  5.282 5.432 5.432A</p>
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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
<p><b>5 650-5 725</b></p>	<p>RADIOLOCATION MOBILE except aeronautical mobile 5.446A 5.450A Amateur Space research (deep space) 5.282 5.451 5.453 5.454 5.455</p>	
<p><b>5 725-5 830</b> FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur 5.150 5.451 5.453 5.455 5.456</p>	<p><b>5 725-5 830</b> RADIOLOCATION Amateur  5.150 5.453 5.455</p>	
<p><b>5 830-5 850</b> FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur Amateur-satellite (space-to-Earth) 5.150 5.451 5.453 5.455 5.456</p>	<p><b>5 830-5 850</b> RADIOLOCATION Amateur Amateur-satellite (space-to-Earth)  5.150 5.453 5.455</p>	
<p><b>5 850-5 925</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE</p>	<p><b>5 850-5 925</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Amateur Radiolocation</p>	<p><b>5 850-5 925</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Radiolocation</p>

5.150	5.150	5.150
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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
<b>10-10.45</b> FIXED MOBILE RADIOLOCATION Amateur 5.479	<b>10-10.45</b> RADIOLOCATION Amateur 5.479 5.480	<b>10-10.45</b> FIXED MOBILE RADIOLOCATION Amateur 5.479
<b>10.45-10.5</b>	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
<b>24-24.05</b>	AMATEUR AMATEUR-SATELLITE 5.150	
<b>24.05-24.25</b>	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	

<b>248-250</b>	AMATEUR AMATEUR-SATELLITE Radio astronomy 5.149
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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-12,

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.

As can be seen in the list below an increasing number of countries are permitting amateur operation in a frequency segment between 461 kHz and 515 kHz on a low-power, non-interference basis.

The following countries have issued either amateur allocations, experimental licenses or beacons in the 461-515 kHz range:

Secondary allocations:

501-504 kHz Belgium, Netherlands (expected, until 1 January 2014)

493-510 kHz Norway

501-504 kHz United Kingdom (incl. Gibraltar) A Notice of Variation is required.

505-515 kHz New Zealand (on a temporary basis)

Experimental licenses:

493-510 kHz Croatia

493-510 kHz Iceland

501-504 kHz Denmark

501-504 kHz Ireland

501-504 kHz Malta (until 31 December 2011)

501-508 kHz Sweden

504-509 kHz Canada

461-478 and 495-510kHz USA – WD2XSH, 42 stations (ARRL, expires 1 August 2015)

460-480 and 493-515 kHz USA – WE2XGR, 10 stations (expires 1 September 2012)

There are a few other experimental licenses issued to individuals in the USA, mostly for operation at 505-510 kHz.

Scientific licenses:

505-515 kHz Australia (only communications between 6 licensees allowed, beacon allowed)

Beacons:

Czech Republic (OK0EMW on 505.06 kHz)

Germany (six experimental beacon stations on 505.1 kHz)

Ongoing studies have also revealed some administrations in all three Regions are reluctant to consider any allocation above 510 kHz while the International Maritime Organisation has indicated that plans are in hand to use the segment 495-505 kHz for Port and vessel security purposes. This led to the segment being dropped as a possible Method of addressing Agenda Item 1.23 at WRC-12.

Further studies have also revealed that many administrations would be sympathetic to an amateur service allocation below 487 kHz.

CPM12-2 Output. The CPM (Feb. 2011) report provides:

“After taking studies into account, the following methods to satisfy this agenda item have been proposed:

**Method A**

A secondary allocation of up to 15 kHz to the ARS on a worldwide basis between 472 kHz and 487 kHz.

**Method B**

Two non-contiguous worldwide secondary allocations to the ARS at 461-469 kHz and 471-478 kHz, totalling 15 kHz.

**Method C**

No change to the Radio Regulations.”

Allocations after WRC-07:

Allocation to services		
Region 1	Region 2	Region 3
<b>415-435</b> MARITIME MOBILE 5.79 AERONAUTICAL RADIONAVIGATION 5.72	<b>415-495</b> MARITIME MOBILE 5.79 5.79A Aeronautical radionavigation 5.80	
<b>435-495</b> MARITIME MOBILE 5.79 5.79A Aeronautical radionavigation 5.72 5.82	5.77 5.78 5.82	
<b>495-505</b> MOBILE 5.82A 5.82B		
<b>505-526.5</b> MARITIME MOBILE 5.79 5.79A 5.84 AERONAUTICAL RADIONAVIGATION  5.72	<b>505-510</b> MARITIME MOBILE 5.79	<b>505-526.5</b> MARITIME MOBILE 5.79 5.79A 5.84 AERONAUTICAL RADIONAVIGATION Aeronautical mobile Land mobile
	<b>510-525</b> 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
<b>1 800-1 810</b> RADIOLOCATION 5.93	<b>1 800-1 850</b> AMATEUR	<b>1 800-2 000</b> AMATEUR FIXED MOBILE except aeronautical mobile RADIONAVIGATION Radiolocation
<b>1 810-1 850</b> AMATEUR 5.98 5.99 5.100 5.101		
<b>1 850-2 000</b> FIXED MOBILE except aeronautical mobile  5.92 5.96 5.103	<b>1 850-2 000</b> AMATEUR FIXED MOBILE except aeronautical mobile RADIOLOCATION RADIONAVIGATION  5.102	

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 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, 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 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)

Based on Article 5 footnote 5.96 an increasing number of countries in Region 1 are authorizing amateur operation above 1850 kHz on a low-power, noninterference basis, while several countries allow this amateur operation just on a noninterference base. 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.

**5.96** In Germany, Armenia, Austria, Azerbaijan, Belarus, Denmark, Estonia, the Russian Federation, Finland, Georgia, Hungary, Ireland, Iceland, Israel, Kazakhstan, Latvia, Liechtenstein, Lithuania, Malta, Moldova, Norway, Uzbekistan, Poland, Kyrgyzstan, Slovakia, the Czech Rep., the United Kingdom, Sweden, Switzerland, Tajikistan, Turkmenistan and Ukraine, administrations may allocate up to 200 kHz to their amateur service in the bands 1 715-1 800 kHz and 1 850-2 000 kHz. However, when allocating the bands within this range to their amateur service, administrations shall, after prior consultation with administrations of neighbouring countries, take such steps as may be necessary to prevent harmful interference from their amateur service to the fixed and mobile services of other countries. The mean power of any amateur station shall not exceed 10 W. (WRC-03)

### 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-12 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, Czech Republic
5269	Canada
5280	Canada, Finland, Greenland, Iceland, Ireland, UK
5290	Canada, Finland, Greenland, Iceland, Ireland, Portugal, UK
5300	Finland
5319	Canada
5329	Canada
5332	Finland, Iceland, St. Lucia, USA
5348	Finland, Iceland, St. Lucia, USA
5368	Finland, Greenland, Iceland, UK, USA
5373	Finland, Greenland, Iceland, Portugal, St. Lucia, USA
5400	Canada, Iceland, Ireland, UK
5405	Canada, Iceland, Ireland, Portugal, St. Lucia, UK, USA
5250-5450 kHz	Secondary allocation in Trinidad and Tobago
5260-5410 kHz	Temporary experimental license in Croatia
5260-5410 kHz	Secondary allocation in Norway

In Germany a propagation beacon operates on 5195 kHz with call sign DRA5

### 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
<b>7 000-7 100</b>	AMATEUR AMATEUR-SATELLITE 5.140 5.141 5.141A	
<b>7 100-7 200</b>	AMATEUR 5.141A 5.141B 5.141C 5.142	
<b>7 200-7 300</b> BROADCASTING	<b>7 200-7 300</b> AMATEUR 5.142	<b>7 200-7 300</b> 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 3 that permit their amateur stations to operate in 7200-7300 kHz under the provisions of RR No. 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
<b>10 100-10 150</b>	FIXED Amateur	
<b>10 150-11 175</b>	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-12 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	

<b>18 052-18 068</b>	FIXED Space research
<b>18 068-18 168</b>	AMATEUR AMATEUR-SATELLITE 5.154
<b>18 168-18 780</b>	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
<b>23 350-24 000</b>	FIXED MOBILE except aeronautical mobile 5.157	
<b>24 000-24 890</b>	FIXED LAND MOBILE	
<b>24 890-24 990</b>	AMATEUR AMATEUR-SATELLITE	
<b>24 990-25 005</b>	STANDARD FREQUENCY AND TIME SIGNAL (25 000 kHz)	
<b>25 005-25 010</b>	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. Based on this, Norway has 24740-24890 kHz as a secondary allocation.

### 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	

<b>41.015-44</b>	FIXED MOBILE 5.160 5.161	
<b>44-47</b>	FIXED MOBILE 5.162 5.162A	
<b>47-68</b> BROADCASTING	<b>47-50</b> FIXED MOBILE	<b>47-50</b> 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.

In some Region 1 countries limited permission has now been granted to operate beacons in the 40 MHz band on 40.021 MHz (Denmark) and 40.050 MHz (UK). Additionally, in the UK a beacon is now operational on 60.050 MHz.

### 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. A harmonised allocation for the Amateur Satellite Service is also sought, to bridge the gap between 28 MHz and 144 MHz.**

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 5.167A 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.

A number of African countries have alternatively allocated 50 – 54 MHz to the amateur service on a primary basis by article 5 footnote 5.169

5.169 *Alternative allocation:* in Botswana, Burundi, Lesotho, Malawi, Namibia, the Dem. Rep. of Congo, Rwanda, South Africa, Swaziland, Zambia and Zimbabwe, the band 50-54 MHz is allocated to the amateur service on a primary basis.

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-12 agenda.

In the Arab Spectrum Management Group Bahrain and Oman have allocated spectrum to the amateur service in the band 50 – 52 MHz.

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 a growing number of countries are already authorized to use all or part of the band 70-70.5 MHz including: Croatia, Cyprus, Czech Republic, Denmark, Estonia, Faroe Islands, Gibraltar, Greece, Iceland, Ireland, Italy, Luxembourg, Monaco, Montenegro, Netherlands (expected), Norway, Portugal, Romania, Serbia, Slovak Republic, Slovenia, Somalia, South Africa, Spain, Sweden, UAE and United Kingdom. In addition several other countries now issue permits for amateur experimentation. Authorizations are rare outside Region 1 but include Greenland and Pakistan.

Belgium authorizes amateurs to use 69.950 MHz

The requirement for an allocation at 70 MHz has been acknowledged by CEPT in Allocation Footnote EU9 which states "In a growing number of CEPT countries, part of the band 70.0-70.5 MHz is also allocated to the Amateur service on a secondary basis."

Existing allocations:

Allocation to services		
Region 1	Region 2	Region 3
<b>68-74.8</b> FIXED MOBILE except aeronautical mobile	<b>68-72</b> BROADCASTING Fixed Mobile 5.173	<b>68-74.8</b> 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, in the United States 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 many Region 1 countries under RR No. **5.280**, and increasingly in Region 2 and 3 countries.

### **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, WRC-07 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 congested by (unlicensed) low-power devices such as radio local area networks (RLANs) creating significant interference levels. Substitute spectrum for the Amateur Satellite Service, which is restricted to the ISM segment, is therefore sought.

### **3.15 3300-3500 MHz**

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

CEPT DSI Phase I considered an Amateur Service secondary allocation at 3400-3500 MHz. As a result, 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 allocates 3400-3410 MHz for amateur use in Europe and encourages administrations to afford some consideration to amateur weak-signal operations in the band. In Norway 3400-3410 MHz is allocated to the amateur and amateur satellite service on a secondary basis.

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 poses an additional difficulty for the Amateur Services in achieving improvement in the band 3400-3410 MHz with respect to upgrading the allocation or extending the allocation to Region 1.

### **3.16 Frequencies above 275 GHz**

**The Amateur Services seek to obtain spectrum in the band 275-1000 GHz in order to provide for future development of the Amateur Services**

Frequencies in this range have higher atmospheric absorption and a series of transmission windows and molecular resonances. As the potential for interference is relatively low, some

administrations already permit their amateurs to experiment at these frequencies resulting in a number of innovative developments.

WRC-2000 extended the mandate of the ITU Radio Regulations to 275-1000 GHz but did not make any specific allocations to radiocommunication services. However, it did introduce radio regulation footnote 5.565 which lists bands above 275 GHz used by passive services that should be avoided by active services.

WRC-07 adopted Agenda item 1.6 to review spectrum use by the passive services between 275 and 3000GHz. Ongoing studies suggest that the passive services are seeking a considerable expansion of the 5.565 bands. This creates concerns that this might in effect lead to a 'monopolisation' situation in the very 275-1000GHz range that is of particular interest to the Amateur Services and impede innovation. It is therefore important that the WRC-07 outcome maintains sufficient flexibility.

In order to continue with their activities, the Amateur Services will require globally harmonised allocations of sufficient bandwidth to permit experimentation spaced throughout the range 275-1000 GHz. Studies of Amateur Services' requirements in this range are ongoing in preparation for WRC-12 and beyond. Given the distribution of radio telescope sites there appears to be potential for sharing with the radio astronomy service.

Primary allocations within these bands appear feasible. Bands within the 275 - 510 GHz range are the most ideal for the Amateur and Amateur Satellite Services, based on atmospheric attenuation. Frequencies identified by previous IARU studies have been reviewed as part of preparations for WRC-12. Below are the results from these studies indicating bands within which allocations are preferred.

<b>Previous Studies, GHz</b>	<b>Recent Studies, GHz</b>
280 – 294	280-294
358 – 363	334-342
365 – 371	400-410
389 – 400	-
493 – 496	455-470
506 – 510	-
692 – 710	670-680
810 – 850	855-870

It should be noted that there is also an increasing preference by some administrations to consider licence-exemption as their default position. This may also facilitate near term amateur access for experimental purposes although not necessarily in the optimum bands

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

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