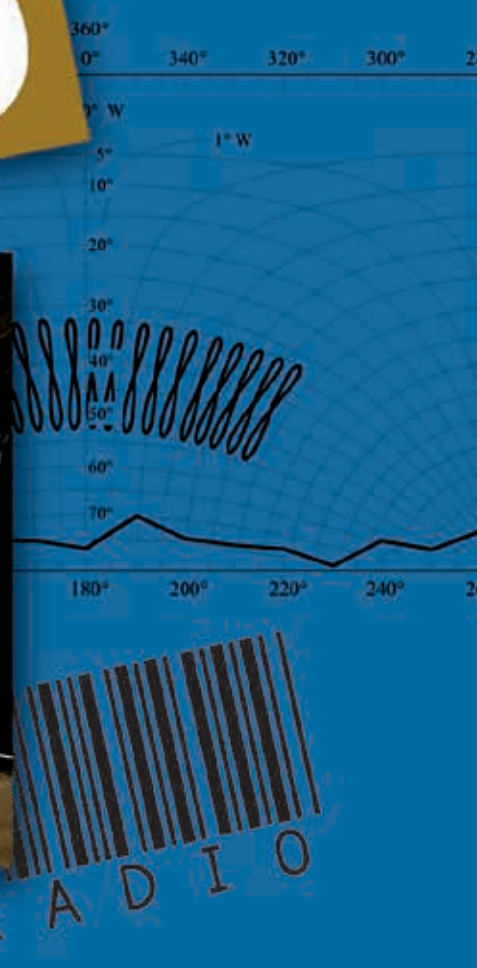


RADIO



HANDBOOK ON AMATEUR AND AMATEUR-SATELLITE SERVICES

EDITION OF 2014
RADIOCOMMUNICATION BUREAU



Handbook on Amateur and amateur-satellite services

Edition of 2014



Foreword

This Handbook provides general information about the amateur and amateur-satellite services. It also includes a compendium of existing ITU texts of relevance to the amateur and amateur-satellite services.

The amateur service is the oldest radio service and pre-dates regulation of radiocommunication. In 1912, amateurs could use any frequency above 1.5 MHz, as these frequencies were regarded “of no value for marine, governmental and commercial communications” or “undesirable and scarcely useful”. By 1924, amateurs made way for other services in bands above 1.5 MHz. Today, the amateur service operates in relatively small allocations throughout the spectrum.

The 1963 World Administrative Radio Conference (WARC) created Footnote 284A, which states: “In the band 144-146 MHz, artificial satellites may be used by the amateur service”. The amateur-satellite service was created and given frequency allocations at the 1971 Space WARC. Since then, scores of amateur satellites have been designed, constructed and operated by amateurs. In addition, amateur radio has been used aboard manned space stations including MIR and the International Space Station. Most astronauts and cosmonauts are licensed amateur radio operators.

Self-training is an important purpose of the amateur services, as articulated in the definition of the amateur service in No. **1.56** of the Radio Regulations (RR).

Radio amateurs have made significant technical contributions to the fields of radio propagation, high frequency single sideband radiotelephone, HF data communications, packet radio protocols and communication satellite design.

RR No. **25.9A** encourages administrations to allow amateur stations to support disaster relief. Amateur radio continues to provide basic radiocommunications especially in the early moments of a disaster causing the loss or overloading of normal telecommunications networks.

This Handbook is intended to present, in one publication, information about the amateur services for administrations and amateur radio organizations.

This work would not have been possible without the efforts of many volunteers and delegates over a number of years and their efforts should be recognised.

Dale HUGUES
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CHAPTER 1

THE AMATEUR SERVICES

1.1 Nature of the amateur services

The amateur service is the oldest radio service and pre-dates regulation of radiocommunication. The original reason for regulation of the radio spectrum was to improve maritime safety and to ensure that coast stations would communicate with all ships, not just those using their company's equipment. In 1912, amateurs could use any frequency above 1.5 MHz, as they were regarded as "of no commercial value for maritime, governmental and commercial communications". However, the value of the higher frequency bands was recognized in the 1920s. Today, the amateur service retains relatively narrow bands throughout the entire radio spectrum. These bands provide the whole range of radio wave propagation mechanisms and, through experimentation, amateurs have contributed to the understanding of propagation.

Radio amateurs have made significant technical contributions to the field of radio propagation, HF single-sideband radio, HF data communication systems, digital radio protocols and communications-satellite design.

Amateur radio continues to play an important role in disaster communications. It has a unique ability to provide radiocommunication independent of the telephone network or other radio services, particularly in the first few days before relief agencies are at the scene and have set up emergency telecommunication services.

The amateur services include self-training as an important purpose. This includes training of young people in radiocommunications. Radio amateurs have the opportunity of planning, designing, building, operating and maintaining a complete radio station, which contributes to the telecommunication human resources development of a country.

The International Amateur Radio Union (IARU) is the Federation of the national amateur radio associations existing in most countries. It represents the amateur and amateur-satellite services in the ITU and regional telecommunications organizations, and is a Sector Member of the ITU Radiocommunication and Telecommunication Development Sectors.

1.2 Training

Some national amateur radio societies have one or more training courses and publications designed for individuals preparing to take amateur licence examinations. Some have continuing education courses in a variety of subjects including courses on preparedness for emergencies.

1.3 Mutual recognition of amateur radio licences

Amateurs sometimes visit other countries and want to operate their amateur stations. The types of reciprocal operating authority are:

- CEPT Recommendation T/R 61-01
- International Amateur Radio Permit
- reciprocal agreement, and in some cases
- visitor licences issued by an administration based on showing of a valid licence from the operator's country of origin.

1.3.1 CEPT Recommendation T/R 61-01

The Conference of European Postal and Telecommunications Administrations (CEPT) Electronic Communications Committee (ECC) adopted Recommendation T/R 61-01 (revised Nicosia 2003) CEPT Radio Amateur Licence to make it possible for radio amateurs from CEPT countries to operate during short visits in other CEPT countries without obtaining an individual temporary licence from the visited CEPT country. The Recommendation permits non-CEPT countries to participate in this licensing system.

1.3.2 OAS International Amateur Radio Permit (IARP)

The IARP was created by the Organization of American States (OAS) at the recommendation of the Inter-American Telecommunication Commission (CITEL). It permits amateurs from signatory countries of the Americas to operate in other signatory countries of the Americas to operate without seeking a special licence or permit other than the IARP.

1.4 Standardized operator qualifications

1.4.1 Recommendation ITU-R M.1544

This Recommendation establishes minimum qualifications of radio amateurs. HAREC is a more detailed syllabus applicable to CEPT countries and others which have adopted it for convenience. Other countries have developed their own syllabi and pools of examination questions. National societies are aware of the systems used in other countries and there is a trend toward uniformity of approaches.

1.4.2 CEPT harmonized amateur radio examination certificate (HAREC)

CEPT Recommendation T/R 61-02 makes it possible for CEPT administrations to issue a Harmonized Amateur Radio Examination Certificate (HAREC). The HAREC document shows proof of successfully passing an amateur radio examination which complies with the Examination Syllabus for the HAREC. It facilitates the issuance of an individual licence to radio amateurs who stay in a country for a longer term than that mentioned in CEPT Recommendation T/R 61-01. It also facilitates the issuing of an individual licence to a radio amateur returning to his native country showing the HAREC certificate issued by a foreign administration. The Recommendation has a provision for non-CEPT countries to participate in this system.

1.5 Classification of amateur radio licences

Although there is variation by country, there may be two kinds of licences:

- operator licence and
- station licence.

The operator licence is a permit for a person to operate an amateur station. The operator licence may be valid for a specified number of years but there are some administrations issuing lifetime operator licences. Station licences are typically issued for a certain number of years to enable the administration to maintain a current database of amateur stations.

1.5.1 Individual amateur licence

Most amateur radio licences are issued to individual operators. The privileges of a licence may not be transferred to other persons but a licensee may permit another person to operate the amateur station provided that a licensee is in direct control of the transmissions.

1.5.2 Club stations

Administrations may issue club station licences to an amateur radio organization. Normally, the licence is issued to a “trustee” who is normally a licensed operator and is responsible for the proper operation of the club station. Club stations are particularly valuable for educational purposes.

The premier example of a radio club is the International Amateur Radio Club (IARC) using the call sign 4U1ITU operating in the ITU Varembe office building. It is available for use by ITU delegates who are licensed radio amateurs upon issuance of a visitor’s licence.

1.5.3 Special event stations

Some administrations issue temporary licences for special events, such as to commemorate a national anniversary. These licences may be issued to an individual or club.

1.6 Technical characteristics of stations

RR No. 25.7 provides that “The maximum power of amateur stations shall be fixed by the administrations concerned”. While the manner of regulating transmitter power varies among administrations, it is typically specified as peak envelope power output. The maximum power typically is set at between 26 and 33 dBW for the most qualified operators, with lower limits for certain frequency bands and classes of operator licence.

CHAPTER 2

AMATEUR SERVICE

2.1 Applications of bands allocated to the amateur service

The following table describes typical applications of frequency bands available to the amateur service. Refer to Article 5 of the Radio Regulations (RR) for the specific allocation status of each band. Refer to national regulations for specific allocations, as they may vary by country.

Wavelength	Frequency band (kHz) (R = Region)	Application
2 200 m	135.7-137.8 (secondary) Geographical constraints are given in RR Nos. 5.67A and 5.67B	Propagation in this band permits short-range communications during daytime hours and longer range communications via ionospheric refraction at night, when D layer absorption weakens. Power output is limited to 1 W e.i.r.p. which is sufficient for transcontinental and transoceanic transmissions at night.
630 m	472-479 (secondary) Geographical and technical constraints are given in RR Nos. 5.82 , 5.80A and 5.80B	Propagation in this band permits short-range communications during daytime hours and longer range communications via ionospheric refraction at night, when D layer absorption weakens. Power output is limited either 1 W or 5 W e.i.r.p., depending stations location (see RR Nos. 5.80A and 5.80B)
160 m	1 810-1 850 R1 (co-primary use with other services) RR Nos. 5.98 , 5.99 , 5.100 , 5.101 and 5.103	Its propagation characteristics allow short-range communications during daytime hours, and medium and long-range communications during night-time hours. This band is particularly useful during sunspot minima, when the maximum usable frequency (MUF) is below 3 500 kHz.
	1 800-1 850 R2	
	1 800-2 000 R2, R3 (co-primary use with other services) RR No. 5.102	

Wavelength	Frequency band (kHz) (R = Region)	Application
80 m	3 500-3 800 R1 (co-primary use with other services) RR No. 5.92	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.
80 m	3 500-3 750 R2 (primary) RR No. 5.119	
	3 500-3 900 R3 (co-primary use with other services)	
	3 750-4 000 R2 (co-primary use with other services) RR Nos. 5.122 and 5.125	
40 m	7 000-7 200 R1, R3 (primary) RR Nos. 5.40 , 5.141 , 5.141A , 5.142	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 1 300 km.
	7 000-7 300 R2 (primary) RR No. 5.142	
30 m	10 100-10 150 (secondary)	This band is in use 24 hours each day, as a bridge between the 7 MHz and 14 MHz bands.
20 m	14 000-14 250 (primary)	This is the most popular band for international communications.
	14 250-14 350 (Conditions of co-primary use with other services in a number of countries are given in RR No. 5.152)	
17 m	18 068-18 168 (conditions of co-primary use with other services in a number of countries are given in RR No. 5.154)	The band is used as an alternative to 14 MHz which is often congested with traffic.
15 m	21 000-21 450 (primary)	These bands are used particularly during the daytime and when sunspot activity is high.
12 m	24 890-24 990 (primary)	
10 m	28 000-29 700 (primary)	

Wavelength	Frequency band (kHz) (R = Region)	Application
6 m	50-54 R1 (Only allocated in 11 countries of the African Region where the allocation is primary). RR No. 5.169	This band is used for local communication at all times including via repeaters. Use of this band may also include telecommand of objects such as models by radio amateurs. The band may also be used on occasion for communication for distances up to 2 000 km by sky wave, tropospheric scatter, earth-moon-earth (EME), sporadic reflection from the E layer of the ionosphere (Es) and scattering by the ionized trails of meteors (MS).
	50-54 R2, R3 (geographical constraints are given in RR Nos. 5.162A, 5.166, 5.167, 5.167A, 5.158, 5.170)	
2 m	144-146 R1 (primary)	This band is heavily used throughout the world for short-range communications, including the use of repeaters. This band is actively used for Earth-Moon-Earth (EME) communications using analog and digital modulation techniques, for different types of radio waves propagation – tropospheric scattering and superrefraction (TROPO), scattering by irregularities in the lower ionosphere (FAI), scattering by the ionized trails of meteors (MS) as well as ionospheric scattering in the circumpolar regions during polar storms (AURORA) making it possible to contact, using analog and digital modulation techniques, over distances of up to 2 000-3 000 km. This band is actively used for local communications in times of disasters. It is also used for contacts with the use of repeaters on board amateur satellites.
	144-148 R2, R3 (conditions of co-primary use with other services in a number of countries are given in RR No. 5.217)	
1.25 m	220-225 R2	Where allocated, this band serves as an alternative to the 144 MHz band for short-range communications.
70 cm	430-440 (R1 co-primary use with other services) RR Nos. 5.138, 5.271, 5.272, 5.273, 5.274, 5.275, 5.276, 5.277, 5.279A, 5.280, 5.281, 5.282, 5.283	This band is used for short-range communications including repeaters and amateur analogue and digital television. It is also used for Earth-Moon-Earth (EME) communications using analogue and digital modulation techniques. Tropospheric scattering and superrefraction (TROPO) makes it possible to contact over distances of up to 1 000 km. It is also used for contacts with the repeaters on board amateur satellites.
	420-430 and 440-450 in several countries. R2, R3 on a secondary basis RR No. 5.270	
	430-440 R2, R3 (secondary)	
33 cm	902-928 R2 (secondary) RR No. 5.150	This band is allocated to the amateur service only in Region 2.

Wavelength	Frequency band (kHz) (R = Region)	Application	
23 cm	1 240-1 300 (secondary)	This band is used for communications using analog and digital modulation techniques, as well as for digital television and repeater networks. Tropospheric scattering and superrefraction (TROPO) makes it possible to contact over distances of over 1 000 km. This band is the most popular for Earth-Moon-Earth (EME) communications using analog and digital modulation techniques. Also this band is used for contacts on board amateur satellites.	
13 cm	2 300-2 450 (secondary)	This band is used for narrowband, data and television communications and for experimentation. It is also used for Earth-Moon-Earth (EME) communications and for contacts with the use of repeaters on board amateur satellites (mainly space-Earth)	
9 cm	3 300-3 500 R2, (R3 secondary)	This band is used for narrowband communications, data links and for Earth-Moon-Earth (EME) communications using analog and digital modulation techniques.	
5 cm	5 650-5 850 R1, R3 5 650-5 925 R2 (secondary in all three regions)	This band is used for narrowband communications, data links and for Earth-Moon-Earth communications using analog and digital modulation techniques.	
	Frequency band (GHz)		
3 cm	10-10.5 (secondary)	This band is used for narrowband communications, short range wideband communications, television (including repeaters), and for Earth-Moon-Earth (EME) communications using analog and digital modulation techniques. It is the most popular band above 1.3GHz. Certain propagation conditions such as TROPO or RAINSCATTER can result in communications ranges in excess of 1 000 km.	
1.2 cm	24-24.05 (primary)	These bands (at 24 GHz, 47 GHz and 76 GHz) are largely used for narrowband communications and for experimentation, and also for Earth-Moon-Earth (EME) communications.	
	24.05-24.25 (secondary) RR 5.150		
6 mm	47-47.2 (primary)		
4 mm	76-77.5 (secondary)		
	77.5-78 (primary)		
	78-81.5 (secondary)		
2.5 mm	122.25-123 (secondary)		
2 mm	134-136 (primary)		
1 mm	136-141 (secondary)		Bands at 122 GHz and above are largely used for narrowband communications and experimentation
	241-248 (secondary)		
	248-250 (primary)		

NOTE – Some administrations permit amateur experimentation at frequencies above 275 GHz, consistent with RR No. **5.565** (WRC-12).

2.2 Amateur radio band plans

The allocations of frequency bands for the amateur service are made by the ITU and are reflected in national regulations. The specific applications for parts of these allocations are recommended by “band plans”. Each IARU regional organization develops a regional band plan on the usage of frequencies. They are general guidance which may not take into account the variations of regulations of each country within the region. For this reason, some national societies develop national band plans complying with national regulations and being compatible to the extent possible with the regional band plan.

2.3 Amateur service operations and operator training

2.3.1 Typical operations

Typical operations within the amateur service consist of contacts between two, or among more, amateur stations as stated in RR No. **1.56**, that is “for the purpose of self-training, inter-communication and technical investigations carried out by amateurs”.

Normal operations include dialogue between operators on a variety of subjects including technical discussions. There is also an exchange of formal and informal messages now normally transmitted via data communications modes. A number of contests are carried out to demonstrate the level of proficiency, to challenge and raise the level of operator skills, demonstrate amateur station capabilities and commemorate special events.

2.3.2 Operating activities

Radio amateurs use their stations in a wide variety of operating modes. Many amateurs spend much of their time listening to other amateur stations making a two-way contact (known as a “QSO” – a Q code meaning “I can communicate with...”). They may join the contact and contribute to the ongoing conversation. The contacts may be lengthy lasting as much as an hour but are often very brief, simply the exchange of call signs, signal reports, names and locations. Brief contacts are common for amateur stations operating from locations (countries and call sign prefixes) which are rarely on the air.

Another operating mode is to call CQ (meaning “General call to all stations”) to invite any other station to make contact. If more than two stations are involved in a contact, it may be called a “roundtable”. A group contact made regularly (same day of the week, same time and frequency) is called a “net”. Nets exist for different purposes, such as exchange of messages related to emergencies, health and welfare information, weather conditions and others.

2.3.3 Radiosport

Radiosport is the term for a variety of amateur radio competitive activities. Some are sponsored by the IARU, others by amateur radio national societies or amateur radio magazines, and a few have their origins in state-sponsored sport programmes. These activities have formal rules published by the sponsors, have measures of performance or achievement, and normally involve publication of results and issuance of a certificate or diploma.

2.3.3.1 Contesting

Contesting is a competitive activity usually involving an attempt to reach a goal, perhaps to make contact with as many amateur stations as possible during a given time period, on certain frequencies and within specified geographical areas. There are contests throughout the year, particularly on weekends.

An example of a contest is the “CQ-M International DX Contest” sponsored by the Russian national amateur radio society – Soyuz Radiolyubitelei Rossii (SRR). The stated purpose of this contest is “to unite people in peaceful coexistence, foster mutual understanding, and engage in sportsmanship and cooperation through amateur radio”. It normally operates on a second full weekend in May of each year on amateur service bands at 1.8, 3.5, 7, 14, 21 and 28 MHz.

2.3.3.2 Awards programmes

In recognition of international two-way amateur radio communication, the IARU issues Worked-All-Continents (WAC) certificates to amateur radio stations of the world. Qualification for the WAC award is based on an examination by the International Secretariat, or a member-society, of the IARU of QSL (“I am acknowledging receipt”) cards that the applicant has received from other amateur stations in each of the six continents.

DXCC is an award issued by the American Radio Relay League (ARRL) for proof of a station contacting stations in at least 100 different countries.

Islands on the Air (IOTA), sponsored by the Radio Society of Great Britain (RSGB), is intended to encourage contacts with amateur stations on islands throughout the world.

Many national amateur radio societies issue certificates or diplomas for contacting a certain number of amateur stations in their territories under specified conditions.

2.3.3.3 DXpeditions

DX (meaning “long distance”) expeditions, “DXpeditions,” are organized to put rare locations (countries or remote places with few or no regularly operated amateur stations) on the air for limited times. They provide amateur stations the opportunity to make contact with these rare locations and exchange QSL cards as proof of contact.

2.3.3.4 Amateur radio direction finding

Amateur radio direction finding (ARDF), sometimes called “orienteeing” or “rabbit hunting,” is a time limited race to demonstrate skills in searching for radio transmitters. Amateur service bands at 3.5 MHz and 144 MHz are normally used. ARDF began in Northern and Eastern Europe but has spread world wide, particularly the Northern Hemisphere. Annual ARDF activities are conducted in a number of countries operating under IARU rules. IARU sponsors World Championships.

2.3.3.5 High speed telegraphy

High speed telegraphy (HST) challenges operators to correctly copy Morse code at the highest possible speeds. International world championships are sponsored by the IARU.

2.4 Role of the amateur service in emergency telecommunications

Its wide scope of activities and the skills of amateur radio operators make the amateur service a valuable asset in emergency telecommunications. It has a large number of operational amateur stations in almost all countries of the world, providing a robust network independent from any other. In many cases, it has provided the first, and sometimes the only, link outside the area affected by disaster. The amateur service has training programmes and emergency simulation exercises developed by some of the national amateur radio societies.

Typical situations for which the amateur service can supplement emergency communications include:

- *Initial emergency alerts* may originate from individual amateur stations to bring an incident to the attention of competent institutional emergency services.
- In *search and rescue* operations, amateur stations can reinforce the professional teams by increasing their communication capabilities and reporting observations.
- *Hospitals* and similar establishments might in the aftermath of a disaster be without communications. Local amateur radio emergency groups prepare in advance for such assistance.
- *Hazardous materials (HAZMAT)* and other incidents may require the evacuation of residents, and coordination between the disaster site and the evacuation sites or shelters. Amateur emergency stations may be asked to establish communications with such institutions.

2.4.1 Amateur networks available for emergency telecommunications

2.4.1.1 Short-range networks

Amateur short-range networks provide operational or tactical communications at the site of a disaster and with the surrounding areas. They can include fixed, mobile and nomadic equipment typically using frequencies in the bands 50-54 MHz, 144-148 MHz and 420-450 MHz, noting that there are regional and national differences in these frequency ranges.

Repeater stations are used to extend the communication range of VHF and UHF stations. Positioned in elevated locations, they allow communication between fixed or mobile amateur stations separated by obstructions such as mountains or tall buildings when operating in an urban environment. A repeater station receives on one channel and transmits on a different frequency, usually within the same frequency band.

2.4.1.2 Medium-range networks

Amateur medium-range networks typically provide communication from the disaster site to organizational and administrative centres outside an affected area, or to headquarters of response providers in neighbouring countries. They also ensure communication with vehicles, vessels and aircraft operating outside the coverage of available VHF or UHF networks. Communication at medium distances of up to 500 km may be accomplished by near-vertical-incidence sky-wave (NVIS) propagation at lower MF/HF in bands 1 800-2 000 kHz, 3 500-4 000 kHz and 7 000-7 300 kHz, noting that there are regional and national differences in these bands. In addition, several national administrations have designated specific frequencies (channels) for amateur radio emergency traffic and related training.

2.4.1.3 Long-range networks

Amateur long-range networks provide communication with headquarters of international emergency and disaster response providers. They serve as backup connections between offices of such institutions in different countries or on different continents. Amateur stations routinely communicate over long distances typically beyond 500 km, using oblique-incidence sky-wave propagation in bands from 3 500 kHz through 29.7 MHz.

2.5 Amateur systems

For the purpose of sharing studies, characteristics of typical amateur systems are documented in Recommendation ITU-R M.1732.

2.5.1 Telegraphy systems

Morse code – International Morse code in accordance with Recommendation ITU-R M.1677 continues to be used in the amateur service despite the removal of the mandatory requirement for demonstration of Morse proficiency from RR Article 25 at WRC-03. Some administrations have discontinued Morse testing while others have maintained an examination at 5 words per minute for certain classes of amateur licences. Morse code telegraphy does not require complex equipment and is a robust mode capable of operation with weak signals during poor conditions.

Radioteletype – Known as RTTY in the amateur service, this mode involves teleprinters at each end of the radio circuit. There continues to be 45 Bd, start-stop, frequency-shift RTTY operation and narrow-band direct-printing (NBDP) using a variant of Recommendation ITU-R M.476 (known as AMTOR) in the amateur service HF bands. The trend is toward replacing these modes with narrow-band PSK systems such as PSK31 and various data communications modes.

PSK31 – PSK31 is a digital communications mode intended for interactive keyboard operation between personal computers and an amateur single-sideband (SSB) transceiver. Its data rate is 31.25 Bd (about 30 words per minute) and its emission symbol is 60H0J2B. It is implemented using software written for personal computer sound cards.

2.5.2 Data communications systems

PACTOR-II – PACTOR-II is an adaptive data communications system using different modulation and encoding methods depending on channel quality. It uses two-tone differential phase-shift keying (DPSK) modulation. With data compression, its effective throughput is 1200 bit/s. Its emission symbol is 375HJ2D.

PACTOR-III – This and other voice-frequency bandwidth data communications systems are gaining increased use in the amateur service. It is a software upgrade for existing PACTOR-II modems. Through the use of compression, throughputs up to 5200 bit/s are achieved. Its emission symbol is 2K20J2D.

CLOVER 2000 – Data compression permits throughputs up to 5200 bit/s. Its emission symbol is 2K00J2D.

MFSK16 – This is a data communications system using 16-tone frequency-shift keying, affording a data rate of 3000 bit/s. Its emission symbol is 316HJ2D.

APRS – An automatic position reporting system (APRS) is in operation in the amateur service. Individual mobile units derive their locations from global positioning satellites, and report tracking, mapping and related data to amateur stations via HF or VHF amateur packet radio.

2.5.3 Internetworking

The Internet is used as an interconnection between amateur service networks. Several methods have been developed.

WinLink 2000 – This method permits automatic transfer of messages between the Internet and remote amateur stations.

IRLP – The Internet Radio Linking Project (IRLP) uses Voice over Internet Protocol (VoIP) for interconnection of amateur stations by means of the Internet.

EchoLink – This system links a personal computer to an amateur station via the Internet.

2.5.4 Telephony systems

SSB – Amateur single sideband suppressed carrier telephony has virtually replaced double-sideband amplitude-modulated telephony in the amateur service. The emission symbol is 2K70J3E, although there is some use of narrower and wider bandwidths. SSB is used on frequencies from 1.8 MHz through 47.2 GHz.

Digital voice – Digital voice has been used in the amateur service since the year 2000. Two orthogonal frequency division multiplexing (OFDM) technologies have been used, one based on the AMBE encoder-decoder and the other a variant of Digital Radio Mondiale (DRM) modified to fit inside a 2.7 kHz bandwidth. Early applications have been on HF including transatlantic tests. Use in VHF/UHF/microwave bands is expected to increase.

Frequency modulated voice – FM voice, emission symbols 11K0F3E and 16K0F3E, are in use from 29 MHz to 47.2 GHz. The use of FM repeaters for extension of range is common.

2.5.5 Image communications systems

SSTV – Amateurs use slow-scan television SSTV systems currently employing cameras and personal computers with special software for slow transmissions of colour images in voice-frequency bandwidths.

FSTV – Most amateur fast-scan television, using NTSC or PAL systems, involves the use of repeaters for extension of ranges. FSTV systems operate on frequencies above 420 MHz.

DATV – Radio amateurs have developed full-motion digital television using digital compression techniques in bandwidths of 1.5 Mbit/s to 2 Mbit/s in frequencies above 420 MHz.

2.5.6 Multimedia systems

There is continuing research in amateur systems capable of combining data, voice and image communications. There is some use of wireless-standard equipment in the band 2400-2450 MHz, in accordance with limitations of domestic amateur licences, to achieve extended ranges.

D-Star – This is a digital voice and data system developed by the Japan Amateur Radio League (JARL) in cooperation with the administration and industry. It is designed for user access at VHF. Digitized voice/audio signals and short data messages are supported. Modulation methods supported are: GMSK, QPSK and 4-FSK, at a data rate of 4.8 kbit/s. Voice encoding method is AMBE (2020) at 2.4 kbit/s within 6 kHz bandwidth. For data, the transmission rate is 128 kbit/s within a bandwidth of 150 kHz.

Backbone communication between repeaters containing multiplexed digitized voice/audio, user data, and link control data signals at 10 Mbit/s within a bandwidth of 10.5 MHz.

2.6 Experimentation in the amateur service

The amateur service is, at least in part, an experimental service offering the possibility of proving performance of new technologies.

2.6.1 System development

The most concentrated efforts by radio amateurs are developing advanced digital transmission of data and multimedia information.

2.6.2 Antenna design

Typical amateur stations are located in residences or in private automobiles. Both installations present antenna installation constraints, and there is a continual need to develop innovative antenna system designs.

2.6.3 Personal computers

Personal computers (PCs) are now part of virtually every amateur station. Nevertheless, there is need for development of software to assume functions heretofore performed by hardware. In addition to programmes implemented using the PC central processor, attention is being given to software to exploit the capabilities of PC sound cards for functions such as modems.

2.6.4 Propagation research

In the early days of radio, radio amateurs were credited with discovery and exploitation of propagation modes. While other communication services are interested in reliable propagation to deliver a required signal, amateurs are also motivated to find unusual propagation openings.

Radio amateurs operate a global HF beacon system known as the IARU Beacon Project, <http://www.ncdxf.org/beacons.html>. In addition, there are HF, VHF, UHF and SHF beacons in many countries to give real-time signals to indicate a propagation path.

2.6.5 Digital signal processing

There is work on DSP implementations of filters and modems. Radio amateurs have developed digital signal processing (DSP) algorithms for reduction or suppression of atmospheric noise (static), power-line noise and certain types of interfering signals. These techniques have been implemented in commercial products and experimentation continues.

CHAPTER 3

AMATEUR-SATELLITE SERVICE

3.1 Applications of bands allocated to the amateur-satellite service

The following table describes typical applications of frequency bands available to the amateur-satellite service. Refer to RR Article 5 for the specific allocation status of each band.

Wavelength	Frequency band (MHz) (R = Region)	Applications
40 m	7 000-7 100 (primary)	These bands are identified only for limited satellite application, such as ionospheric research, because of potential interference to and from terrestrial users. For example It is planned that South African Cubesat ZACube-1 will operate at 14 MHz to support auroral research
20 m	14 000-14 250 (primary)	
17 m	18 068-18 168 (conditions of co-primary use with other services in a number of countries are given in RR No. 5.154)	
15 m	21 000-21 450 (primary)	
12 m	24 890-24 990 (primary)	
10 m	28 000-29 700 (primary)	
	Frequency band (MHz)	
2 m	144-146 (primary)	These bands are in heavy use by numerous amateur satellites for inputs and outputs.
70 cm	435-438 (secondary) RR No. 5.282	
23 cm	1 260-1 270 (secondary) Earth-to-space only RR No. 5.282	These bands are used as alternatives to the 144 MHz and 435 MHz bands because of congestion.
13 cm	2 400-2 450 (secondary) RR No. 5.282	
9 cm	3 400-3 410 (secondary) Regions 2 and 3 only RR No. 5.282	
5 cm	5 650-5 670 (Secondary) Earth-to-space only RR No. 5.282	These bands are used for experimental amateur satellites.
	5 830-5 850 (secondary) Space-to-earth only	

Wavelength	Frequency band (MHz) (R = Region)	Applications
3 cm	10.45-10.5 (secondary)	These bands are used for experimental amateur satellite communications.
1.2 cm	24-24.05 (primary)	
6 mm	47-47.2 (primary)	These bands are used for experimental amateur satellites.
4 mm	76-77.5 (secondary)	
	77.5-78 (primary)	
	78-81 (secondary)	
2 mm	134-136 (primary)	
2 mm	136-141 (secondary)	
1 mm	241-248 (secondary)	
1 mm	248-250 (primary)	

3.2 Background

The amateur-satellite programme began in 1961 with the design and launch of OSCAR (the first satellite using the acronym Orbiting Satellite Carrying Amateur Radio). The original Project OSCAR group was responsible for the first 4 amateur satellites. In 1969 the Radio Amateur Satellite Corporation (AMSAT) was formed in the USA. This was followed by the establishment of organizations in other countries including Argentina, Australia, Brazil, Chile, Denmark, Germany, Italy, India, Japan, Republic of Korea, Malaysia, New Zealand, Portugal, the Russian Republic (and the former Soviet Union), the Republic of South Africa, Spain, Sweden, Turkey and the United Kingdom. With some exceptions, these satellites were built by licensed radio amateurs, including university students. Recent developments in nano and pico-satellites (such as Cubesats) have led to a considerable increase in university and other groups developing and launching amateur satellites in addition to the original AMSAT groups.

Most satellites have been of the low-Earth-orbiting (LEO) type. Some have been designed for highly elliptical orbits (HEOs). Owing to cost, there have been no geostationary satellite orbit (GSO) satellites in the amateur-satellite service. Technology developed in the amateur-satellite service has been applied directly to commercial LEO satellite systems, and the amateur-satellite service has served as a training ground for design engineers.

3.3 Operational amateur satellites

The following table is for illustrative purpose only and does not include every amateur service nano/pico-satellite. Note that there is no requirement for an OSCAR number to be assigned to a satellite in order for it to be legitimately recognized and used in the amateur satellite service.

Satellite	Launch	Observations
AMSAT-OSCAR 7	1974	Linear transponder, beacons (sunlight hours)
UoSat-OSCAR 11	1984	Telemetry beacon
AMRAD-OSCAR 27	1993	FM voice repeater, packet telemetry
Fuji-OSCAR 29	1996	9 600-Bd store-and forward, linear transponder, beacon, “digitalker”
Gurwin-OSCAR 32	1998	9 600-Bd packet bulletin board
SEDSat-OSCAR 33	1998	9 600-Bd packet repeater
Navy-OSCAR 44	2001	1 200-Bd store-and-forward digital repeater
Saudi-OSCAR 50	2002	FM repeater and several experiments
RS-22	2003	Telemetry beacon
VUSat-OSCAR 52	2005	Linear transponder and Morse CW beacon
CubeSat-OSCAR 55	2003	Telemetry beacons
CubeSat-OSCAR 57	2003	Beacon and telemetry
CubeSat-OSCAR 58	2005	Beacon and telemetry
GeneSat-1	2006	1 200-Bd telemetry beacon
Delfi-OSCAR 64	2008	1 200-Bd telemetry beacon
Cubesat OSCAR 65	2008	1 200-Bd telemetry beacon, 9 600-Bd digipeater
Cubesat OSCAR 66	2008	Morse CW beacon, FM packet repeater, digitalker
COMPASS-1	2008	Morse CW beacon
RS-30	2008	Morse CW beacon
PRISM	2009	Morse CW beacon, 1 200-Bd and 9 600-Bd telemetry beacons
KKS-1	2009	Morse CW beacon, digital down link
STARS	2009	Morse CW beacon, 1 200-Bd packet down link
SwissCube	2009	Morse CW beacon, 1 200-Bd telemetry beacon
ITUpSAT1	2009	Morse CW beacon, 19 200-Bd telemetry beacon
UWE-2	2009	9 600-Bd telemetry beacon
BEESAT	2009	Morse CW beacon, 4 800-Bd and 9 600-Bd telemetry beacons
Hope OSCAR 68	2009	Morse CW beacon
Fastrac OSCAR 69	2010	1 200-Bd telemetry beacon
Fastrac OSCAR 70	2010	1 200-Bd telemetry beacon
O/OREOS	2010	1 200-Bd telemetry beacon
SRMSAT	2011	Morse CW beacon
JUNGU	2011	Morse CW beacon
SRMSAT	2011	Morse CW beacon
Explorer 1 Prime Unit 2	2011	1 200-Bd telemetry beacon
MCubed	2011	9 600-Bd telemetry beacon
RAX-2	2011	9 600-Bd telemetry beacon
AO-71	2011	Morse CW beacon
PW-Sat	2012	Morse CW beacon
MO-72	2012	625-Bd and 1 250-Bd telemetry beacons
ARISS	Ongoing	Amateur Radio on the International Space Station (ARISS) includes voice communications, packet radio, digital television and several experiments.

NOTE – Additional information is available at <http://www.amsat.org>.

3.4 Amateur earth stations

Amateur earth stations in the amateur-satellite service fall into two classes: telecommand and users.

Telecommand stations located throughout the world are privileged to turn amateur satellites on and off, and to modify their operation in accordance with RR No. **25.11**.

User stations are licensed amateur stations with essentially the same equipment as used for terrestrial amateur operations. The primary differences are antennas and transmitter-receivers optimized for amateur-satellite operations.

An increasingly common practice is for multiple amateur stations to receive telemetry and automatically upload it to the telecommand station via the Internet to provide greater orbital coverage.

3.5 Experimentation in the amateur-satellite service

The amateur-satellite service is highly experimental. It was not certain at the beginning of the OSCAR programme whether small groups of amateurs could design satellites, arrange for their launch, develop sufficient financial resources, and manage orbiting satellites. These questions were answered positively in the early years of the programme. Each satellite offered new challenges that were successfully met by licensed amateurs.

Because resources were scarce and were scattered in different countries, it became necessary to use “distributed engineering” to accomplish design, construction and testing of amateur satellites. Internet e-mail, amateur-satellite conferences and amateur radio communications were instrumental in the coordination.

In addition to solving “radio” design challenges, many lessons were learned concerning the physical and thermal design of the spacecraft, attitude control, power system management and orbital mechanics. The amateur-satellite service has proven to be a good training ground for satellite technology.

3.6 Frequency co-ordination in the amateur-satellite service

The International Amateur Radio Union (IARU) provides advice and frequency co-ordination to assist amateur satellite builders and prospective builders. More information can be found regarding this at: <http://www.iaru.org/satellite.html>

CHAPTER 4

EXTRACTS OF RADIO REGULATIONS (EDITION OF 2012)

ARTICLE 1

Terms and definitions

Section III – Radio services

1.56 *amateur service*: A radiocommunication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest.

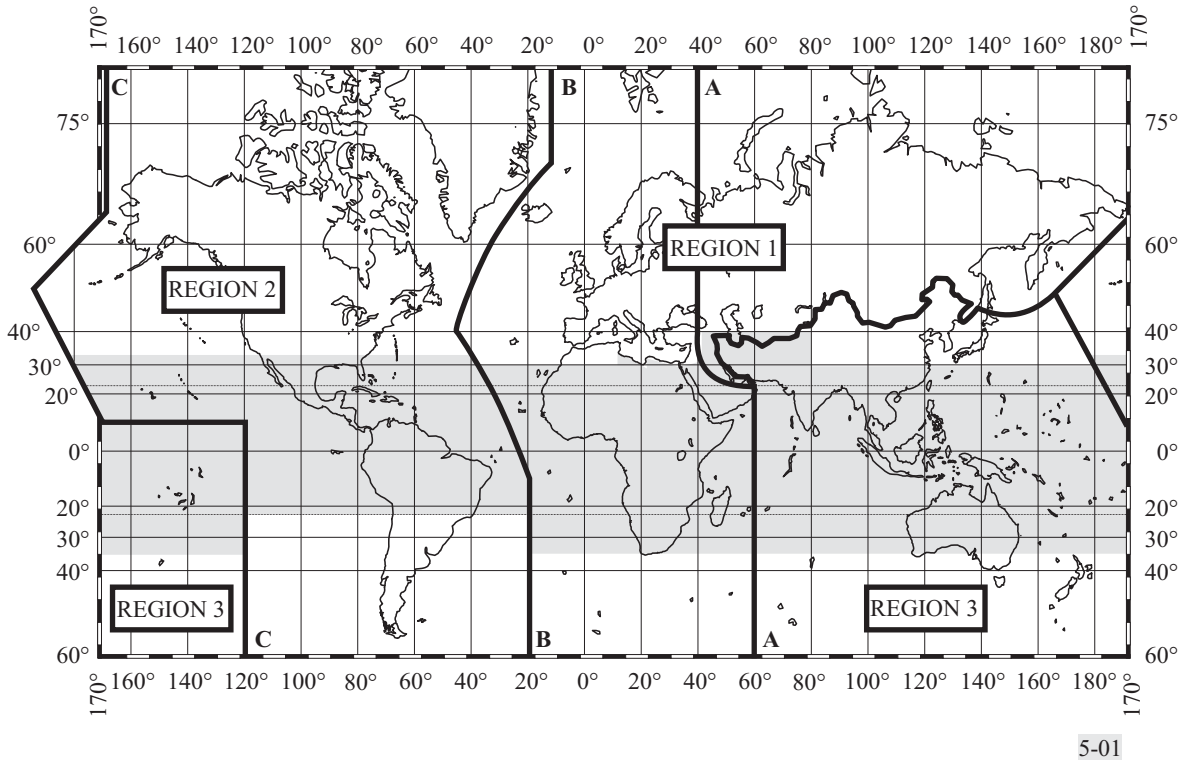
1.57 *amateur-satellite service*: A radiocommunication service using space stations on earth satellites for the same purposes as those of the *amateur service*.

ARTICLE 5

Frequency Allocations

Section I – Regions and areas

5.2 For the allocation of frequencies the world has been divided into three Regions¹ as shown on the following map and described in Nos. **5.3** to **5.9**:



The shaded part represents the Tropical Zones as defined in Nos. **5.16** to **5.20** and **5.21**.

5.3 *Region 1:* Region 1 includes the area limited on the east by line A (lines A, B and C are defined below) and on the west by line B, excluding any of the territory of the Islamic Republic of Iran which lies between these limits. It also includes the whole of the territory of Armenia, Azerbaijan, the Russian Federation, Georgia, Kazakhstan, Mongolia, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan, Turkey and Ukraine and the area to the north of Russian Federation which lies between lines A and C.

5.4 *Region 2:* Region 2 includes the area limited on the east by line B and on the west by line C.

5.5 *Region 3:* Region 3 includes the area limited on the east by line C and on the west by line A, except any of the territory of Armenia, Azerbaijan, the Russian Federation, Georgia, Kazakhstan, Mongolia, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan, Turkey and Ukraine and the area to the north of Russian Federation. It also includes that part of the territory of the Islamic Republic of Iran lying outside of those limits.

¹ **5.2.1** It should be noted that where the words “regions” or “regional” are without a capital “R” in these Regulations, they do not relate to the three Regions here defined for purposes of frequency allocation.

5.6 The lines A, B and C are defined as follows:

5.7 *Line A:* Line A extends from the North Pole along meridian 40° East of Greenwich to parallel 40° North; thence by great circle arc to the intersection of meridian 60° East and the Tropic of Cancer; thence along the meridian 60° East to the South Pole.

5.8 *Line B:* Line B extends from the North Pole along meridian 10° West of Greenwich to its intersection with parallel 72° North; thence by great circle arc to the intersection of meridian 50° West and parallel 40° North; thence by great circle arc to the intersection of meridian 20° West and parallel 10° South; thence along meridian 20° West to the South Pole.

5.9 *Line C:* Line C extends from the North Pole by great circle arc to the intersection of parallel 65° 30' North with the international boundary in Bering Strait; thence by great circle arc to the intersection of meridian 165° East of Greenwich and parallel 50° North; thence by great circle arc to the intersection of meridian 170° West and parallel 10° North; thence along parallel 10° North to its intersection with meridian 120° West; thence along meridian 120° West to the South Pole.

5.10 For the purposes of these Regulations, the term “African Broadcasting Area” means:

5.11 a) African countries, parts of countries, territories and groups of territories situated between the parallels 40° South and 30° North;

5.12 b) islands in the Indian Ocean west of meridian 60° East of Greenwich, situated between the parallel 40° South and the great circle arc joining the points 45° East, 11° 30' North and 60° East, 15° North;

5.13 c) islands in the Atlantic Ocean east of line B defined in No. 5.8 of these Regulations, situated between the parallels 40° South and 30° North.

5.14 The “European Broadcasting Area” is bounded on the west by the western boundary of Region 1, on the east by the meridian 40° East of Greenwich and on the south by the parallel 30° North so as to include the northern part of Saudi Arabia and that part of those countries bordering the Mediterranean within these limits. In addition, Armenia, Azerbaijan, Georgia and those parts of the territories of Iraq, Jordan, Syrian Arab Republic, Turkey and Ukraine lying outside the above limits are included in the European Broadcasting Area. (WRC-07)

5.15 The “European Maritime Area” is bounded to the north by a line extending along parallel 72° North from its intersection with meridian 55° East of Greenwich to its intersection with meridian 5° West, then along meridian 5° West to its intersection with parallel 67° North, thence along parallel 67° North to its intersection with meridian 32° West; to the west by a line extending along meridian 32° West to its intersection with parallel 30° North; to the south by a line extending along parallel 30° North to its intersection with meridian 43° East; to the east by a line extending along meridian 43° East to its intersection with parallel 60° North, thence along parallel 60° North to its intersection with meridian 55° East and thence along meridian 55° East to its intersection with parallel 72° North.

- 5.16** 1) The “Tropical Zone” (see map in No. **5.2**) is defined as:
- 5.17** a) the whole of that area in Region 2 between the Tropics of Cancer and Capricorn;
- 5.18** b) the whole of that area in Regions 1 and 3 contained between the parallels 30° North and 35° South with the addition of:
- 5.19** i) The area contained between the meridians 40° East and 80° East of Greenwich and the parallels 30° North and 40° North;
- 5.20** ii) that part of Libyan Arab Jamahiriya north of parallel 30° North.
- 5.21** 2) In Region 2, the Tropical Zone may be extended to parallel 33° North, subject to special agreements between the countries concerned in that Region (see Article **6**).
- 5.22** A sub-Region is an area consisting of two or more countries in the same Region.

Section II – Categories of services and allocations

5.23 *Primary and secondary services*

- 5.24** 1) Where, in a box of the Table in Section IV of this Article, a band is indicated as allocated to more than one service, either on a worldwide or Regional basis, such services are listed in the following order:
- 5.25** a) services the names of which are printed in “capitals” (example: FIXED); these are called “primary” services;
- 5.26** b) services the names of which are printed in “normal characters” (example: Mobile); these are called “secondary” services (see Nos. **5.28** to **5.31**).
- 5.27** 2) Additional remarks shall be printed in normal characters (example: MOBILE except aeronautical mobile).
- 5.28** 3) Stations of a secondary service:
- 5.29** a) shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date;
- 5.30** b) cannot claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or may be assigned at a later date;
- 5.31** c) can claim protection, however, from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date.
- 5.32** 4) Where a band is indicated in a footnote of the Table as allocated to a service “on a secondary basis” in an area smaller than a Region, or in a particular country, this is a secondary service (see Nos. **5.28** to **5.31**).

5.33 5) Where a band is indicated in a footnote of the Table as allocated to a service “on a primary basis”, in an area smaller than a Region, or in a particular country, this is a primary service only in that area or country.

5.34 *Additional allocations*

5.35 1) Where a band is indicated in a footnote of the Table as “also allocated” to a service in an area smaller than a Region, or in a particular country, this is an “additional” allocation, i.e. an allocation which is added in this area or in this country to the service or services which are indicated in the Table (see No. **5.36**).

5.36 2) If the footnote does not include any restriction on the service or services concerned apart from the restriction to operate only in a particular area or country, stations of this service or these services shall have equality of right to operate with stations of the other primary service or services indicated in the Table.

5.37 3) If restrictions are imposed on an additional allocation in addition to the restriction to operate only in a particular area or country, this is indicated in the footnote of the Table.

5.38 *Alternative allocations*

5.39 1) Where a band is indicated in a footnote of the Table as “allocated” to one or more services in an area smaller than a Region, or in a particular country, this is an “alternative” allocation, i.e. an allocation which replaces, in this area or in this country, the allocation indicated in the Table (see No. **5.40**).

5.40 2) If the footnote does not include any restriction on stations of the service or services concerned, apart from the restriction to operate only in a particular area or country, these stations of such a service or services shall have an equality of right to operate with stations of the primary service or services, indicated in the Table, to which the band is allocated in other areas or countries.

5.41 3) If restrictions are imposed on stations of a service to which an alternative allocation is made, in addition to the restriction to operate only in a particular country or area, this is indicated in the footnote.

5.42 *Miscellaneous provisions*

5.43 1) Where it is indicated in these Regulations that a service or stations in a service may operate in a specific frequency band subject to not causing harmful interference to another service or to another station in the same service, this means also that the service which is subject to not causing harmful interference cannot claim protection from harmful interference caused by the other service or other station in the same service. (WRC-2000)

5.43A 1bis) Where it is indicated in these Regulations that a service or stations in a service may operate in a specific frequency band subject to not claiming protection from another service or from another station in the same service, this means also that the service which is subject to not claiming protection shall not cause harmful interference to the other service or other station in the same service. (WRC-2000)

5.44 2) Except if otherwise specified in a footnote, the term “fixed service”, where appearing in Section IV of this Article, does not include systems using ionospheric scatter propagation.

Section IV – Table of Frequency Allocations

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

5.64 Only classes A1A or F1B, A2C, A3C, F1C or F3C emissions are authorized for stations of the fixed service in the bands allocated to this service between 90 kHz and 160 kHz (148.5 kHz in Region 1) and for stations of the maritime mobile service in the bands allocated to this service between 110 kHz and 160 kHz (148.5 kHz in Region 1). Exceptionally, class J2B or J7B emissions are also authorized in the bands between 110 kHz and 160 kHz (148.5 kHz in Region 1) for stations of the maritime mobile service.

5.67 *Additional allocation:* in Mongolia, Kyrgyzstan and Turkmenistan, the band 130-148.5 kHz is also allocated to the radionavigation service on a secondary basis. Within and between these countries this service shall have an equal right to operate. (WRC-07)

5.67A Stations in the amateur service using frequencies in the band 135.7-137.8 kHz shall not exceed a maximum radiated power of 1 W (e.i.r.p.) and shall not cause harmful interference to stations of the radionavigation service operating in countries listed in No. **5.67**. (WRC-07)

5.67B The use of the band 135.7-137.8 kHz in Algeria, Egypt, Iran (Islamic Republic of), Iraq, Lebanon, Syrian Arab Republic, Sudan, South Sudan and Tunisia is limited to the fixed and maritime mobile services. The amateur service shall not be used in the above-mentioned countries in the band 135.7-137.8 kHz, and this should be taken into account by the countries authorizing such use. (WRC-12)

5.77 *Different category of service:* in Australia, China, the French overseas communities of Region 3, Korea (Rep. of), India, Iran (Islamic Republic of), Japan, Pakistan, Papua New Guinea and Sri Lanka, the allocation of the frequency band 415-495 kHz to the aeronautical radionavigation service is on a primary basis. In Armenia, Azerbaijan, Belarus, the Russian Federation, Kazakhstan, Latvia, Uzbekistan and Kyrgyzstan, the allocation of the frequency band 435-495 kHz to the aeronautical radionavigation service is on a primary basis. Administrations in all the aforementioned countries shall take all practical steps necessary to ensure that aeronautical radionavigation stations in the frequency band 435-495 kHz do not cause interference to reception by coast stations of transmissions from ship stations on frequencies designated for ship stations on a worldwide basis. (WRC-12)

5.79 The use of the bands 415-495 kHz and 505-526.5 kHz (505-510 kHz in Region 2) by the maritime mobile service is limited to radiotelegraphy.

5.80A The maximum equivalent isotropically radiated power (e.i.r.p.) of stations in the amateur service using frequencies in the band 472-479 kHz shall not exceed 1 W. Administrations may increase this limit of e.i.r.p. to 5 W in portions of their territory which are at a distance of over 800 km from the borders of Algeria, Saudi Arabia, Azerbaijan, Bahrain, Belarus, China, Comoros, Djibouti, Egypt, United Arab Emirates, the Russian Federation, Iran (Islamic Republic of), Iraq, Jordan, Kazakhstan, Kuwait, Lebanon, Libya, Morocco, Mauritania, Oman, Uzbekistan, Qatar, Syrian Arab Republic, Kyrgyzstan, Somalia, Sudan, Tunisia, Ukraine and Yemen. In this frequency band, stations in the amateur service shall not cause harmful interference to, or claim protection from, stations of the aeronautical radionavigation service. (WRC-12)

5.80B The use of the frequency band 472-479 kHz in Algeria, Saudi Arabia, Azerbaijan, Bahrain, Belarus, China, Comoros, Djibouti, Egypt, United Arab Emirates, the Russian Federation, Iraq, Jordan, Kazakhstan, Kuwait, Lebanon, Libya, Mauritania, Oman, Uzbekistan, Qatar, Syrian Arab Republic, Kyrgyzstan, Somalia, Sudan, Tunisia and Yemen is limited to the maritime mobile and aeronautical radionavigation services. The amateur service shall not be used in the above-mentioned countries in this frequency band, and this should be taken into account by the countries authorizing such use. (WRC-12)

5.82 In the maritime mobile service, the frequency 490 kHz is to be used exclusively for the transmission by coast stations of navigational and meteorological warnings and urgent information to ships, by means of narrow-band direct-printing telegraphy. The conditions for use of the frequency 490 kHz are prescribed in Articles 31 and 52. In using the frequency band 415-495 kHz for the aeronautical radionavigation service, administrations are requested to ensure that no harmful interference is caused to the frequency 490 kHz. In using the frequency band 472-479 kHz for the amateur service, administrations shall ensure that no harmful interference is caused to the frequency 490 kHz. (WRC-12)

5.92 Some countries of Region 1 use radiodetermination systems in the bands 1 606.5-1 625 kHz, 1 635-1 800 kHz, 1 850-2 160 kHz, 2 194-2 300 kHz, 2 502-2 850 kHz and 3 500-3 800 kHz, subject to agreement obtained under No. **9.21**. The radiated mean power of these stations shall not exceed 50 W.

5.93 *Additional allocation:* in Angola, Armenia, Azerbaijan, Belarus, the Russian Federation, Georgia, Hungary, Kazakhstan, Latvia, Lithuania, Mongolia, Nigeria, Uzbekistan, Poland, Kyrgyzstan, Slovakia, 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-12)

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)

5.97 In Region 3, the Loran system operates either on 1 850 kHz or 1 950 kHz, the bands occupied being 1 825-1 875 kHz and 1 925-1 975 kHz respectively. Other services to which the band 1 800-2 000 kHz is allocated may use any frequency therein on condition that no harmful interference is caused to the Loran system operating on 1 850 kHz or 1 950 kHz.

5.98 *Alternative allocation:* in Angola, Armenia, Azerbaijan, Belarus, Belgium, Cameroon, Congo (Rep. of the), Denmark, Egypt, Eritrea, Spain, Ethiopia, the Russian Federation, Georgia, Greece, Italy, Kazakhstan, Lebanon, Lithuania, 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-12)

5.99 *Additional allocation:* in Saudi Arabia, Austria, Iraq, Libya, Uzbekistan, Slovakia, Romania, Slovenia, Chad, and Togo, the band 1 810-1 830 kHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-12)

5.100 In Region 1, the authorization to use the band 1 810-1 830 kHz by the amateur service in countries situated totally or partially north of 40° N shall be given only after consultation with the countries mentioned in Nos. **5.98** and **5.99** to define the necessary steps to be taken to prevent harmful interference between amateur stations and stations of other services operating in accordance with Nos. **5.98** and **5.99**.

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)

5.103 In Region 1, in making assignments to stations in the fixed and mobile services in the bands 1 850-2 045 kHz, 2 194-2 498 kHz, 2 502-2 625 kHz and 2 650-2 850 kHz, administrations should bear in mind the special requirements of the maritime mobile service.

3 230-5 003 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

5.119 *Additional allocation:* in Honduras, Mexico and Peru, the band 3 500-3 750 kHz is also allocated to the fixed and mobile services on a primary basis. (WRC-07)

5.122 *Alternative allocation:* in Bolivia, Chile, Ecuador, Paraguay, Peru and Uruguay, the band 3 750-4 000 kHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-07)

5.123 *Additional allocation:* in Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe, the band 3 900-3 950 kHz is also allocated to the broadcasting service on a primary basis, subject to agreement obtained under No. **9.21**.

5.125 *Additional allocation:* in Greenland, the band 3 950-4 000 kHz is also allocated to the broadcasting service on a primary basis. The power of the broadcasting stations operating in this band shall not exceed that necessary for a national service and shall in no case exceed 5 kW.

5.126 In Region 3, the stations of those services to which the band 3 995-4 005 kHz is allocated may transmit standard frequency and time signals.

5 003-7 450 kHz

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
7 300-7 400	BROADCASTING 5.134 5.143 5.143A 5.143B 5.143C 5.143D	
7 400-7 450 BROADCASTING 5.143B 5.143C	7 400-7 450 FIXED MOBILE except aeronautical mobile (R)	7 400-7 450 BROADCASTING 5.143A 5.143C

5.138 The following bands:

- 6 765-6 795 kHz (centre frequency 6 780 kHz),
433.05-434.79 MHz (centre frequency 433.92 MHz) in Region 1
except in the countries mentioned in No. **5.280**,
61-61.5 GHz (centre frequency 61.25 GHz),
122-123 GHz (centre frequency 122.5 GHz), and
244-246 GHz (centre frequency 245 GHz)

are designated for industrial, scientific and medical (ISM) applications. The use of these frequency bands for ISM applications shall be subject to special authorization by the administration concerned, in agreement with other administrations whose radiocommunication services might be affected. In applying this provision, administrations shall have due regard to the latest relevant ITU-R Recommendations.

5.140 *Additional allocation:* in Angola, Iraq, Kenya, Somalia and Togo, the band 7 000-7 050 kHz is also allocated to the fixed service on a primary basis. (WRC-12)

5.141 *Alternative allocation:* in Egypt, Eritrea, Ethiopia, Guinea, Libya, Madagascar and Niger, the band 7 000-7 050 kHz is allocated to the fixed service on a primary basis. (WRC-12)

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:* 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, Libya, Morocco, Mauritania, Niger, New Zealand, Oman, Papua New Guinea, Qatar, the Syrian Arab Republic, Singapore, Sudan, South 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-12)

5.141C (SUP - WRC-12)

5.142 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-12)

5.143 *Additional allocation:* frequencies in the band 7 300-7 350 kHz may be used by stations in the fixed service and in the land mobile service, communicating only within the boundary of the country in which they are located, on condition that harmful interference is not caused to the broadcasting service. When using frequencies for these services, administrations are urged to use the minimum power required and to take account of the seasonal use of frequencies by the broadcasting service published in accordance with the Radio Regulations. (WRC-07)

5.143A In Region 3, frequencies in the band 7 350-7 450 kHz may be used by stations in the fixed service on a primary basis and land mobile service on a secondary basis, communicating only within the boundary of the country in which they are located, on condition that harmful interference is not caused to the broadcasting service. When using frequencies for these services, administrations are urged to use the minimum power required and to take account of the seasonal use of frequencies by the broadcasting service published in accordance with the Radio Regulations. (WRC-12)

5.143B In Region 1, frequencies in the band 7 350-7 450 kHz may be used by stations in the fixed and land mobile services communicating only within the boundary of the country in which they are located on condition that harmful interference is not caused to the broadcasting service. The total radiated power of each station shall not exceed 24 dBW. (WRC-12)

5.143C *Additional allocation:* in Algeria, Saudi Arabia, Bahrain, Comoros, Djibouti, Egypt, United Arab Emirates, Iran (Islamic Republic of), Jordan, Kuwait, Libya, Morocco, Mauritania, Niger, Oman, Qatar, the Syrian Arab Republic, Sudan, South Sudan, Tunisia and Yemen, the bands 7 350-7 400 kHz and 7 400-7 450 kHz are also allocated to the fixed service on a primary basis. (WRC-12)

5.143D In Region 2, frequencies in the band 7 350-7 400 kHz may be used by stations in the fixed service and in the land mobile service, communicating only within the boundary of the country in which they are located, on condition that harmful interference is not caused to the broadcasting service. When using frequencies for these services, administrations are urged to use the minimum power required and to take account of the seasonal use of frequencies by the broadcasting service published in accordance with the Radio Regulations. (WRC-12)

7 450-13 360 kHz

Region 1	Region 2	Region 3
10 100-10 150	FIXED Amateur	

13 360-18 030 kHz

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

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

13 360-13 410 kHz,	4 950-4 990 MHz,	102-109.5 GHz,
25 550-25 670 kHz,	4 990-5 000 MHz,	111.8-114.25 GHz,
37.5-38.25 MHz,	6 650-6 675.2 MHz,	128.33-128.59 GHz,
73-74.6 MHz in Regions 1 and 3,	10.6-10.68 GHz,	129.23-129.49 GHz,
150.05-153 MHz in Region 1,	14.47-14.5 GHz,	130-134 GHz,
322-328.6 MHz,	22.01-22.21 GHz,	136-148.5 GHz,
406.1-410 MHz,	22.21-22.5 GHz,	151.5-158.5 GHz,
608-614 MHz in Regions 1 and 3,	22.81-22.86 GHz,	168.59-168.93 GHz,
1 330-1 400 MHz,	23.07-23.12 GHz,	171.11-171.45 GHz,
1 610.6-1 613.8 MHz,	31.2-31.3 GHz,	172.31-172.65 GHz,
1 660-1 670 MHz,	31.5-31.8 GHz in Regions 1 and 3,	173.52-173.85 GHz,
1 718.8-1 722.2 MHz,	36.43-36.5 GHz,	195.75-196.15 GHz,
2 655-2 690 MHz,	42.5-43.5 GHz,	209-226 GHz,
3 260-3 267 MHz,	48.94-49.04 GHz,	241-250 GHz,
3 332-3 339 MHz,	76-86 GHz,	252-275 GHz
3 345.8-3 352.5 MHz,	92-94 GHz,	
4 825-4 835 MHz,	94.1-100 GHz,	

are allocated, administrations are urged to take all practicable steps to protect the radio astronomy service from harmful interference. Emissions from spaceborne or airborne stations can be particularly serious sources of interference to the radio astronomy service (see Nos. **4.5** and **4.6** and Article **29**). (WRC-07)

5.150 The following bands:

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

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

5.152 *Additional allocation:* in Armenia, Azerbaijan, China, Côte d'Ivoire, the Russian Federation, Georgia, Iran (Islamic Republic of), Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan and Ukraine, the band 14 250-14 350 kHz is also allocated to the fixed service on a primary basis. Stations of the fixed service shall not use a radiated power exceeding 24 dBW. (WRC-03)

18 030-23 350 kHz

Allocation to services		
Region 1	Region 2	Region 3
18 068-18 168	AMATEUR AMATEUR-SATELLITE 5.154	
...		
21 000-21 450	AMATEUR AMATEUR-SATELLITE	

5.154 *Additional allocation:* in Armenia, Azerbaijan, the Russian Federation, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Ukraine, the band 18 068-18 168 kHz is also allocated to the fixed service on a primary basis for use within their boundaries, with a peak envelope power not exceeding 1 kW. (WRC-03)

23 350-27 500 kHz

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

27.5-47 MHz

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

5.162A *Additional allocation:* in Germany, Austria, Belgium, Bosnia and Herzegovina, China, Vatican, Denmark, Spain, Estonia, the Russian Federation, Finland, France, Ireland, Iceland, Italy, Latvia, The Former Yugoslav Republic of Macedonia, Liechtenstein, Lithuania, Luxembourg, Monaco, Montenegro, Norway, the Netherlands, Poland, Portugal, the Czech Rep., the United Kingdom, Serbia, Slovenia, Sweden and Switzerland the band 46-68 MHz is also allocated to the radiolocation service on a secondary basis. This use is limited to the operation of wind profiler radars in accordance with Resolution **217 (WRC-97)**. (WRC-12)

47-75.2 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	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	
	54-68 BROADCASTING Fixed Mobile 5.172	54-68 FIXED MOBILE BROADCASTING 5.162A

5.163 *Additional allocation:* in Armenia, Belarus, the Russian Federation, Georgia, Hungary, Kazakhstan, Latvia, Moldova, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan and Ukraine, the bands 47-48.5 MHz and 56.5-58 MHz are also allocated to the fixed and land mobile services on a secondary basis. (WRC-12)

5.164 *Additional allocation:* in Albania, Algeria, Germany, Austria, Belgium, Bosnia and Herzegovina, Botswana, Bulgaria, Côte d'Ivoire, Denmark, Spain, Estonia, Finland, France, Gabon, Greece, Ireland, Israel, Italy, Jordan, Lebanon, Libya, Liechtenstein, Lithuania, Luxembourg, Madagascar, Mali, Malta, Morocco, Mauritania, Monaco, Montenegro, Nigeria, Norway, the Netherlands, Poland, Syrian Arab Republic, Slovakia, Czech Rep., Romania, the United Kingdom, Serbia, Slovenia, Sweden, Switzerland, Swaziland, Chad, Togo, Tunisia and Turkey, the band 47-68 MHz, in South Africa the band 47-50 MHz, and in Latvia the band 48.5-56.5 MHz, are also allocated to the land mobile service on a primary basis. However, stations of the land mobile service in the countries mentioned in connection with each band referred to in this footnote shall not cause harmful interference to, or claim protection from, existing or planned broadcasting stations of countries other than those mentioned in connection with the band. (WRC-12)

5.165 *Additional allocation:* in Angola, Cameroon, Congo (Rep. of the), Madagascar, Mozambique, Niger, Somalia, Sudan, South Sudan, Tanzania and Chad, the band 47-68 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-12)

5.166 *Alternative allocation:* in New Zealand, the band 50-51 MHz is allocated to the fixed and mobile services on a primary basis; the band 53-54 MHz is allocated to the fixed and mobile services on a primary basis. (WRC-12)

5.167 *Alternative allocation:* in Bangladesh, Brunei Darussalam, India, Iran (Islamic Republic of), Pakistan, Singapore and Thailand, the band 50-54 MHz is allocated to the fixed, mobile and broadcasting services on a primary basis. (WRC-07)

5.167A *Additional allocation:* in Indonesia, the band 50-54 MHz is also allocated to the fixed, mobile and broadcasting services on a primary basis. (WRC-07)

5.168 *Additional allocation:* in Australia, China and the Dem. People's Rep. of Korea, the band 50-54 MHz is also allocated to the broadcasting service on a primary basis.

5.169 *Alternative allocation:* in Botswana, Lesotho, Malawi, Namibia, the Dem. Rep. of the Congo, Rwanda, South Africa, Swaziland, Zambia and Zimbabwe, the band 50-54 MHz is allocated to the amateur service on a primary basis. In Senegal, the band 50-51 MHz is allocated to the amateur service on a primary basis. (WRC-12)

5.170 *Additional allocation:* in New Zealand, the band 51-53 MHz is also allocated to the fixed and mobile services on a primary basis.

5.171 *Additional allocation:* in Botswana, Lesotho, Malawi, Mali, Namibia, Dem. Rep. of the Congo, Rwanda, South Africa, Swaziland, Zambia and Zimbabwe, the band 54-68 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-12)

137.175-148 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

5.216 *Additional allocation:* in China, the band 144-146 MHz is also allocated to the aeronautical mobile (OR) service on a secondary basis.

5.217 *Alternative allocation:* in Afghanistan, Bangladesh, Cuba, Guyana and India, the band 146-148 MHz is allocated to the fixed and mobile services on a primary basis.

220-335.4 MHz

Allocation to services		
Region 1	Region 2	Region 3
	220-225	
223-230 BROADCASTING Fixed Mobile 5.243 5.246 5.247	AMATEUR FIXED MOBILE Radiolocation 5.241	223-230 FIXED MOBILE BROADCASTING 5.250

5.241 In Region 2, no new stations in the radiolocation service may be authorized in the band 216-225 MHz. Stations authorized prior to 1 January 1990 may continue to operate on a secondary basis.

5.243 *Additional allocation:* in Somalia, the band 216-225 MHz is also allocated to the aeronautical radionavigation service on a primary basis, subject to not causing harmful interference to existing or planned broadcasting services in other countries.

5.246 *Alternative allocation:* in Spain, France, Israel and Monaco, the band 223-230 MHz is allocated to the broadcasting and land mobile services on a primary basis (see No. **5.33**) on the basis that, in the preparation of frequency plans, the broadcasting service shall have prior choice of frequencies; and allocated to the fixed and mobile, except land mobile, services on a secondary basis. However, the stations of the land mobile service shall not cause harmful interference to, or claim protection from, existing or planned broadcasting stations in Morocco and Algeria.

5.247 *Additional allocation:* in Saudi Arabia, Bahrain, the United Arab Emirates, Jordan, Oman, Qatar and Syrian Arab Republic, the band 223-235 MHz is also allocated to the aeronautical radionavigation service on a primary basis.

5.250 *Additional allocation:* in China, the band 225-235 MHz is also allocated to the radio astronomy service on a secondary basis.

410-460 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 5.278 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 5.278 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 5.278 5.279	
440-450	FIXED MOBILE except aeronautical mobile Radiolocation 5.269 5.270 5.271 5.284 5.285 5.286	

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.

5.271 *Additional allocation:* in Belarus, China, India, Kyrgyzstan and Turkmenistan, the band 420-460 MHz is also allocated to the aeronautical radionavigation service (radio altimeters) on a secondary basis. (WRC-07)

5.272 (SUP - WRC-12)

5.273 (SUP - WRC-12)

5.274 *Alternative allocation:* in Denmark, Norway, Sweden and Chad, the bands 430-432 MHz and 438-440 MHz are allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-12)

5.275 *Additional allocation:* in Croatia, Estonia, Finland, Libya, The Former Yugoslav Republic of Macedonia, Montenegro, Serbia and Slovenia, the bands 430-432 MHz and 438-440 MHz are also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-07)

5.276 *Additional allocation:* in Afghanistan, Algeria, Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, Burkina Faso, Djibouti, Egypt, the United Arab Emirates, Ecuador, Eritrea, Ethiopia, Greece, Guinea, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Italy, Jordan, Kenya, Kuwait, Libya, Malaysia, Niger, Nigeria, Oman, Pakistan, the Philippines, Qatar, the Syrian Arab Republic, the Dem. People's Rep. of Korea, Singapore, Somalia, Sudan, Switzerland, Tanzania, Thailand, Togo, Turkey and Yemen, the band 430-440 MHz is also allocated to the fixed service on a primary basis and the bands 430-435 MHz and 438-440 MHz are also allocated to the mobile, except aeronautical mobile, service on a primary basis. (WRC-12)

5.277 *Additional allocation:* in Angola, Armenia, Azerbaijan, Belarus, Cameroon, Congo (Rep. of the), Djibouti, the Russian Federation, Georgia, Hungary, Israel, Kazakhstan, Mali, Mongolia, Uzbekistan, Poland, the Dem. Rep. of the Congo, Kyrgyzstan, Slovakia, Romania, Rwanda, Tajikistan, Chad, Turkmenistan and Ukraine, the band 430-440 MHz is also allocated to the fixed service on a primary basis. (WRC-12)

5.278 *Different category of service:* in Argentina, Colombia, Costa Rica, Cuba, Guyana, Honduras, Panama and Venezuela, the allocation of the band 430-440 MHz to the amateur service is on a primary basis (see No. **5.33**).

5.279 *Additional allocation:* in Mexico, the bands 430-435 MHz and 438-440 MHz are also allocated on a primary basis to the land mobile service, subject to agreement obtained under No. **9.21**.

5.279A The use of this band by sensors in the Earth exploration-satellite service (active) shall be in accordance with Recommendation ITU-R SA.1260-1. Additionally, the Earth exploration-satellite service (active) in the band 432-438 MHz shall not cause harmful interference to the aeronautical radionavigation service in China. The provisions of this footnote in no way diminish the obligation of the Earth exploration-satellite service (active) to operate as a secondary service in accordance with Nos. **5.29** and **5.30**. (WRC-03)

5.280 In Germany, Austria, Bosnia and Herzegovina, Croatia, The Former Yugoslav Republic of Macedonia, Liechtenstein, Montenegro, Portugal, Serbia, Slovenia and Switzerland, the band 433.05-434.79 MHz (centre frequency 433.92 MHz) is designated for industrial, scientific and medical (ISM) applications. Radiocommunication services of these countries operating within this band must accept harmful interference which may be caused by these applications. ISM equipment operating in this band is subject to the provisions of No. **15.13**. (WRC-07)

5.281 *Additional allocation:* in the French Overseas Departments in Region 2 and India, the band 433.75-434.25 MHz is also allocated to the space operation service (Earth-to-space) on a primary basis. In France and in Brazil, the band is allocated to the same 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.

5.283 *Additional allocation:* in Austria, the band 438-440 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

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**).

5.286 The band 449.75-450.25 MHz may be used for the space operation service (Earth-to-space) and the space research service (Earth-to-space), subject to agreement obtained under No. **9.21**.

5.317A Those parts of the band 698-960 MHz in Region 2 and the band 790-960 MHz in Regions 1 and 3 which are allocated to the mobile service on a primary basis are identified for use by administrations wishing to implement International Mobile Telecommunications (IMT) – see Resolutions **224 (Rev.WRC-12)** and **749 (Rev.WRC-12)**, as appropriate. This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. (WRC-12)

5.322 In Region 1, in the band 862-960 MHz, stations of the broadcasting service shall be operated only in the African Broadcasting Area (see Nos. **5.10** to **5.13**) excluding Algeria, Burundi, Egypt, Spain, Lesotho, Libya, Morocco, Malawi, Namibia, Nigeria, South Africa, Tanzania, Zimbabwe and Zambia, subject to agreement obtained under No. **9.21**. (WRC-12)

890-1 300 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	902-928 FIXED Amateur Mobile except aeronautical mobile 5.325A Radiolocation 5.150 5.325 5.326	890-942 FIXED MOBILE 5.317A BROADCASTING Radiolocation 5.327	

	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		

5.325 *Different category of service:* in the United States, the allocation of the band 890-942 MHz to the radiolocation service is on a primary basis (see No. **5.33**), subject to agreement obtained under No. **9.21**.

5.325A *Different category of service:* in Cuba, the allocation of the band 902-915 MHz to the land mobile service is on a primary basis. (WRC-2000)

5.326 *Different category of service:* in Chile, the band 903-905 MHz is allocated to the mobile, except aeronautical mobile, service on a primary basis, subject to agreement obtained under No. **9.21**.

5.327 *Different category of service:* in Australia, the allocation of the band 915-928 MHz to the radiolocation service is on a primary basis (see No. **5.33**).

5.327A The use of the frequency band 960-1 164 MHz by the aeronautical mobile (R) service is limited to systems that operate in accordance with recognized international aeronautical standards. Such use shall be in accordance with Resolution **417 (Rev.WRC-12)**. (WRC-12)

5.328A Stations in the radionavigation-satellite service in the band 1 164-1 215 MHz shall operate in accordance with the provisions of Resolution **609 (Rev.WRC-07)** and shall not claim protection from stations in the aeronautical radionavigation service in the band 960-1 215 MHz. No. **5.43A** does not apply. The provisions of No. **21.18** shall apply. (WRC-07)

5.328B The use of the bands 1 164-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz by systems and networks in the radionavigation-satellite service for which complete coordination or notification information, as appropriate, is received by the Radiocommunication Bureau after 1 January 2005 is subject to the application of the provisions of Nos. **9.12**, **9.12A** and **9.13**. Resolution **610 (WRC-03)** shall also apply; however, in the case of radionavigation-satellite service (space-to-space) networks and systems, Resolution 610 (WRC-03) shall only apply to transmitting space stations. In accordance with No. **5.329A**, for systems and networks in the radionavigation-satellite service (space-to-space) in the bands 1 215-1 300 MHz and 1 559-1 610 MHz, the provisions of Nos. **9.7**, **9.12**, **9.12A** and **9.13** shall only apply with respect to other systems and networks in the radionavigation-satellite service (space-to-space). (WRC-07)

5.329 Use of the radionavigation-satellite service in the band 1 215-1 300 MHz shall be subject to the condition that no harmful interference is caused to, and no protection is claimed from, the radionavigation service authorized under No. **5.331**. Furthermore, the use of the radionavigation-satellite service in the band 1 215-1 300 MHz shall be subject to the condition that no harmful interference is caused to the radiolocation service. No. **5.43** shall not apply in respect of the radiolocation service. Resolution **608 (WRC-03)** shall apply. (WRC-03)

5.329A Use of systems in the radionavigation-satellite service (space-to-space) operating in the bands 1 215-1 300 MHz and 1 559-1 610 MHz is not intended to provide safety service applications, and shall not impose any additional constraints on radionavigation-satellite service (space-to-Earth) systems or on other services operating in accordance with the Table of Frequency Allocations. (WRC-07)

5.330 *Additional allocation:* in Angola, Saudi Arabia, Bahrain, Bangladesh, Cameroon, China, Djibouti, Egypt, the United Arab Emirates, Eritrea, Ethiopia, Guyana, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Japan, Jordan, Kuwait, Nepal, Oman, Pakistan, the Philippines, Qatar, the Syrian Arab Republic, Somalia, Sudan, South Sudan, Chad, Togo and Yemen, the band 1 215-1 300 MHz is also allocated to the fixed and mobile services on a primary basis. (WRC-12)

5.331 *Additional allocation:* in Algeria, Germany, Saudi Arabia, Australia, Austria, Bahrain, Belarus, Belgium, Benin, Bosnia and Herzegovina, Brazil, Burkina Faso, Burundi, Cameroon, China, Korea (Rep. of), Croatia, Denmark, Egypt, the United Arab Emirates, Estonia, the Russian Federation, Finland, France, Ghana, Greece, Guinea, Equatorial Guinea, Hungary, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Jordan, Kenya, Kuwait, The Former Yugoslav Republic of Macedonia, Lesotho, Latvia, Lebanon, Liechtenstein, Lithuania, Luxembourg, Madagascar, Mali, Mauritania, Montenegro, Nigeria, Norway, Oman, Pakistan, the Netherlands, Poland, Portugal, Qatar, the Syrian Arab Republic, Dem. People's Rep. of Korea, Slovakia, the United Kingdom, Serbia, Slovenia, Somalia, Sudan, South Sudan, Sri Lanka, South Africa, Sweden, Switzerland, Thailand, Togo, Turkey, Venezuela and Viet Nam, the band 1 215-1 300 MHz is also allocated to the radionavigation service on a primary basis. In Canada and the United States, the band 1 240-1 300 MHz is also allocated to the radionavigation service, and use of the radionavigation service shall be limited to the aeronautical radionavigation service. (WRC-12)

5.332 In the band 1 215-1 260 MHz, active spaceborne sensors in the Earth exploration-satellite and space research services shall not cause harmful interference to, claim protection from, or otherwise impose constraints on operation or development of the radiolocation service, the radionavigation-satellite service and other services allocated on a primary basis. (WRC-2000)

5.334 *Additional allocation:* in Canada and the United States, the band 1 350-1 370 MHz is also allocated to the aeronautical radionavigation service on a primary basis. (WRC-03)

5.335 In Canada and the United States in the band 1 240-1 300 MHz, active spaceborne sensors in the earth exploration-satellite and space research services shall not cause interference to, claim protection from, or otherwise impose constraints on operation or development of the aeronautical radionavigation service. (WRC-97)

5.335A In the band 1 260-1 300 MHz, active spaceborne sensors in the Earth exploration-satellite and space research services shall not cause harmful interference to, claim protection from, or otherwise impose constraints on operation or development of the radiolocation service and other services allocated by footnotes on a primary basis. (WRC-2000)

2 170-2 520 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	

5.384A The bands, or portions of the bands, 1 710-1 885 MHz, 2 300-2 400 MHz and 2 500-2 690 MHz, are identified for use by administrations wishing to implement International Mobile Telecommunications (IMT) in accordance with Resolution **223 (Rev.WRC-07)***. This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. (WRC-07)

5.393 *Additional allocation:* in the United States, India and Mexico, the band 2 310-2 360 MHz is also allocated to the broadcasting-satellite service (sound) and complementary terrestrial sound broadcasting service on a primary basis. Such use is limited to digital audio broadcasting and is subject to the provisions of Resolution **528 (WARC-92)***, with the exception of *resolves* 3 in regard to the limitation on broadcasting-satellite systems in the upper 25 MHz. (WRC-2000)

5.394 In the United States, the use of the band 2 300-2 390 MHz by the aeronautical mobile service for telemetry has priority over other uses by the mobile services. In Canada, the use of the band 2 300-2 483.5 MHz by the aeronautical mobile service for telemetry has priority over other uses by the mobile services.

5.395 In France and Turkey, the use of the band 2 310-2 360 MHz by the aeronautical mobile service for telemetry has priority over other uses by the mobile service. (WRC-03)

5.396 Space stations of the broadcasting-satellite service in the band 2 310-2 360 MHz operating in accordance with No. **5.393** that may affect the services to which this band is allocated in other countries shall be coordinated and notified in accordance with Resolution **33 (Rev.WRC-97)***. Complementary terrestrial broadcasting stations shall be subject to bilateral coordination with neighbouring countries prior to their bringing into use.

* *Note by the Secretariat:* This Resolution was revised by WRC-12.

* *Note by the Secretariat:* This Resolution was revised by WRC-03.

2 700-4 800 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

* *Note by the Secretariat:* This Resolution was revised by WRC-12.

* *Note by the Secretariat:* This Resolution was revised by WRC-03.

5.429 *Additional allocation:* in Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, Cameroon, China, Congo (Rep. of the), Korea (Rep. of), Côte d'Ivoire, Egypt, the United Arab Emirates, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Japan, Jordan, Kenya, Kuwait, Lebanon, Libya, Malaysia, Oman, Uganda, Pakistan, Qatar, the Syrian Arab Republic, the Dem. Rep. of the Congo, the Dem. People's Rep. of Korea and Yemen, the band 3 300-3 400 MHz is also allocated to the fixed and mobile services on a primary basis. The countries bordering the Mediterranean shall not claim protection for their fixed and mobile services from the radiolocation service. (WRC-12)

5.430 *Additional allocation:* in Azerbaijan, Mongolia, Kyrgyzstan and Turkmenistan, the band 3 300-3 400 MHz is also allocated to the radionavigation service on a primary basis. (WRC-12)

5.431 *Additional allocation:* in Germany, Israel and the United Kingdom, the band 3 400-3 475 MHz is also allocated to the amateur service on a secondary basis. (WRC-03)

5.432 *Different category of service:* in Korea (Rep. of), Japan and Pakistan, the allocation of the band 3 400-3 500 MHz to the mobile, except aeronautical mobile, service is on a primary basis (see No. 5.33). (WRC-2000)

5.432A In Korea (Rep. of), Japan and Pakistan, the band 3 400-3 500 MHz is identified for International Mobile Telecommunications (IMT). This identification does not preclude the use of this band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. At the stage of coordination the provisions of Nos. **9.17** and **9.18** also apply. Before an administration brings into use a (base or mobile) station of the mobile service in this band it shall ensure that the power flux-density (pfd) produced at 3 m above ground does not exceed $-154.5 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))}$ for more than 20% of time at the border of the territory of any other administration. This limit may be exceeded on the territory of any country whose administration has so agreed. In order to ensure that the pfd limit at the border of the territory of any other administration is met, the calculations and verification shall be made, taking into

account all relevant information, with the mutual agreement of both administrations (the administration responsible for the terrestrial station and the administration responsible for the earth station), with the assistance of the Bureau if so requested. In case of disagreement, the calculation and verification of the pfd shall be made by the Bureau, taking into account the information referred to above. Stations of the mobile service in the band 3 400-3 500 MHz shall not claim more protection from space stations than that provided in Table **21-4** of the Radio Regulations (Edition of 2004). (WRC-07)

5.432B *Different category of service:* in Bangladesh, China, French overseas communities of Region 3, India, Iran (Islamic Republic of), New Zealand and Singapore, the band 3 400-3 500 MHz is allocated to the mobile, except aeronautical mobile, service on a primary basis, subject to agreement obtained under No. **9.21** with other administrations and is identified for International Mobile Telecommunications (IMT). This identification does not preclude the use of this band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. At the stage of coordination the provisions of Nos. **9.17** and **9.18** also apply. Before an administration brings into use a (base or mobile) station of the mobile service in this band it shall ensure that the power flux-density (pfd) produced at 3 m above ground does not exceed $-154.5 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))}$ for more than 20% of time at the border of the territory of any other administration. This limit may be exceeded on the territory of any country whose administration has so agreed. In order to ensure that the pfd limit at the border of the territory of any other administration is met, the calculations and verification shall be made, taking into account all relevant information, with the mutual agreement of both administrations (the administration responsible for the terrestrial station and the administration responsible for the earth station) with the assistance of the Bureau if so requested. In case of disagreement, the calculation and verification of the pfd shall be made by the Bureau, taking into account the information referred to above. Stations of the mobile service in the band 3 400-3 500 MHz shall not claim more protection from space stations than that provided in Table **21-4** of the Radio Regulations (Edition of 2004). This allocation is effective from 17 November 2010. (WRC-12)

5.433 In Regions 2 and 3, in the band 3 400-3 600 MHz the radiolocation service is allocated on a primary basis. However, all administrations operating radiolocation systems in this band are urged to cease operations by 1985. Thereafter, administrations shall take all practicable steps to protect the fixed-satellite service and coordination requirements shall not be imposed on the fixed-satellite service.

5 570-7 250 MHz

Allocation to services		
Region 1	Region 2	Region 3
5 650-5 725	MOBILE except aeronautical mobile 5.446A 5.450A RADIOLOCATION 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

5.446A The use of the bands 5 150-5 350 MHz and 5 470-5 725 MHz by the stations in the mobile, except aeronautical mobile, service shall be in accordance with Resolution **229 (Rev.WRC-12)**. (WRC-12)

5.450 *Additional allocation:* in Austria, Azerbaijan, Iran (Islamic Republic of), Kyrgyzstan, Romania, Turkmenistan and Ukraine, the band 5 470-5 650 MHz is also allocated to the aeronautical radionavigation service on a primary basis. (WRC-12)

5.450A In the band 5 470-5 725 MHz, stations in the mobile service shall not claim protection from radiodetermination services. Radiodetermination services shall not impose on the mobile service more stringent protection criteria, based on system characteristics and interference criteria, than those stated in Recommendation ITU-R M.1638. (WRC-03)

5.450B In the frequency band 5 470-5 650 MHz, stations in the radiolocation service, except ground-based radars used for meteorological purposes in the band 5 600-5 650 MHz, shall not cause harmful interference to, nor claim protection from, radar systems in the maritime radionavigation service. (WRC-03)

5.451 *Additional allocation:* in the United Kingdom, the band 5 470-5 850 MHz is also allocated to the land mobile service on a secondary basis. The power limits specified in Nos. **21.2**, **21.3**, **21.4** and **21.5** shall apply in the band 5 725-5 850 MHz.

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

5.453 *Additional allocation:* in Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, Cameroon, China, Congo (Rep. of the), Korea (Rep. of), Côte d'Ivoire, Djibouti, Egypt, the United Arab Emirates, Gabon, Guinea, Equatorial Guinea, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Japan, Jordan, Kenya, Kuwait, Lebanon, Libya, Madagascar, Malaysia, Niger, Nigeria, Oman, Uganda, Pakistan, the Philippines, Qatar, the Syrian Arab Republic, the Dem. People's Rep. of Korea, Singapore, Sri Lanka, Swaziland, Tanzania, Chad, Thailand, Togo, Viet Nam and Yemen, the band 5 650-5 850 MHz is also allocated to the fixed and mobile services on a primary basis. In this case, the provisions of Resolution **229 (Rev.WRC-12)** do not apply. (WRC-12)

5.454 *Different category of service:* in Azerbaijan, the Russian Federation, Georgia, Kyrgyzstan, Tajikistan and Turkmenistan, the allocation of the band 5 670-5 725 MHz to the space research service is on a primary basis (see No. **5.33**). (WRC-12)

5.455 *Additional allocation:* in Armenia, Azerbaijan, Belarus, Cuba, the Russian Federation, Georgia, Hungary, Kazakhstan, Moldova, Mongolia, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan and Ukraine, the band 5 670-5 850 MHz is also allocated to the fixed service on a primary basis. (WRC-07)

5.456 *Additional allocation:* in Cameroon, the band 5 755-5 850 MHz is also allocated to the fixed service on a primary basis. (WRC-03)

10-11.7 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	

5.479 The band 9 975-10 025 MHz is also allocated to the meteorological-satellite service on a secondary basis for use by weather radars.

5.480 *Additional allocation:* in Argentina, Brazil, Chile, Costa Rica, Cuba, El Salvador, Ecuador, Guatemala, Honduras, Mexico, Paraguay, , Peru and Uruguay, the band 10-10.45 GHz is also allocated to the fixed and mobile services on a primary basis. In Venezuela, the band 10-10.45 GHz is also allocated to the fixed service on a primary basis. (WRC-07)

5.481 *Additional allocation:* in Germany, Angola, Brazil, China, Costa Rica, Côte d'Ivoire, El Salvador, Ecuador, Spain, Guatemala, Hungary, Japan, Kenya, Morocco, Nigeria, Oman, Uzbekistan, Pakistan, Paraguay, Peru, the Dem. People's Rep. of Korea, Romania, Tanzania, Thailand and Uruguay, the band 10.45-10.5 GHz is also allocated to the fixed and mobile services on a primary basis. (WRC-12)

22-24.75 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	

40-47.5 GHz

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

66-81 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	

5.560 In the band 78-79 GHz radars located on space stations may be operated on a primary basis in the Earth exploration-satellite service and in the space research service.

5.561 In the band 74-76 GHz, stations in the fixed, mobile and broadcasting services shall not cause harmful interference to stations of the fixed-satellite service or stations of the broadcasting-satellite service operating in accordance with the decisions of the appropriate frequency assignment planning conference for the broadcasting-satellite service. (WRC-2000)

119.98-151.5 GHz

Allocation to services		
Region 1	Region 2	Region 3
122.25-123	FIXED INTER-SATELLITE MOBILE 5.558 Amateur 5.138	
134-136	AMATEUR AMATEUR-SATELLITE Radio astronomy	
136-141	RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite 5.149	

200-248 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	

248-1 000 GHz

Allocation to services		
Region 1	Region 2	Region 3
275-1 000	(Not allocated) 5.565	

5.565 The following frequency bands in the range 275-1 000 GHz are identified for use by administrations for passive service applications:

- radio astronomy service: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz;
- Earth exploration-satellite service (passive) and space research service (passive):
275-286 GHz, 296-306 GHz, 313-356 GHz, 361-365 GHz, 369-392 GHz, 397-399 GHz, 409-411 GHz, 416-434 GHz, 439-467 GHz, 477-502 GHz, 523-527 GHz, 538-581 GHz, 611-630 GHz, 634-654 GHz, 657-692 GHz, 713-718 GHz, 729-733 GHz, 750-754 GHz, 771-776 GHz, 823-846 GHz, 850-854 GHz, 857-862 GHz, 866-882 GHz, 905-928 GHz, 951-956 GHz, 968-973 GHz and 985-990 GHz.

The use of the range 275-1 000 GHz by the passive services does not preclude use of this range by active services. Administrations wishing to make frequencies in the 275-1 000 GHz range available for active service applications are urged to take all practicable steps to protect these passive services from harmful interference until the date when the Table of Frequency Allocations is established in the above-mentioned 275-1 000 GHz frequency range.

All frequencies in the range 1 000-3 000 GHz may be used by both active and passive services. (WRC-12)

ARTICLE 19

Identification of stations**Section I – General provisions**

19.1 § 1 All transmissions shall be capable of being identified either by identification signals or by other means¹.

19.2 § 2 1) All transmissions with false or misleading identification are prohibited.

19.3 2) Where practicable and in appropriate services, identification signals should be automatically transmitted in accordance with relevant ITU-R Recommendations.

19.4 3) All transmissions in the following services should, except as provided in Nos. **19.13** to **19.15**, carry identification signals:

19.5 a) amateur service;

...

19.12 6) When identification signals are transmitted they shall comply with the provisions of this Article.

...

19.18 § 5 Identification signals shall wherever practicable be in one of the following forms:

19.19 a) speech, using simple amplitude or frequency modulation;

19.20 b) international Morse code transmitted at manual speed;

19.21 c) a telegraph code compatible with conventional printing equipment;

19.22 d) any other form recommended by the Radiocommunication Sector.

19.23 § 6 To the extent possible the identification signal should be transmitted in accordance with relevant ITU-R Recommendations.

...

¹ **19.1.1** In the present state of the technique, it is recognized nevertheless that the transmission of identifying signals for certain radio systems (e.g. radiodetermination, radio relay systems and space systems) is not always possible.

Section III – Formation of call signs

19.45 § 21 1) The twenty-six letters of the alphabet, as well as digits in the cases specified below, may be used to form call signs. Accented letters are excluded.

19.46 2) However, the following combinations shall not be used as call signs:

19.47 a) combinations which might be confused with distress signals or with other signals of a similar nature;

19.48 b) combinations in Recommendation ITU-R M.1172 that are reserved for the abbreviations to be used in the radiocommunication services. (WRC-03)

19.49 (SUP – WRC-03)

19.50 § 22 Call signs in the international series are formed as indicated in Nos. **19.51** to **19.71**. The first two characters shall be two letters or a letter followed by a digit or a digit followed by a letter. The first two characters or in certain cases the first character of a call sign constitute the nationality identification⁴.

...

19.67 *Amateur and experimental stations*

19.68 § 30 1)

- one character (provided that it is the letter B, F, G, I, K, M, N, R or W) and a single digit (other than 0 or 1), followed by a group of not more than four characters, the last of which shall be a letter, *or*
- two characters and a single digit (other than 0 or 1), followed by a group of not more than four characters, the last of which shall be a letter. (WRC-03)

19.68A 1A) On special occasions, for temporary use, administrations may authorize use of call signs with more than the four characters referred to in No. **19.68**. (WRC-03)

19.69 2) However, the prohibition of the use of the digits 0 and 1 does not apply to amateur stations.

...

⁴ **19.50.1** For call sign series beginning with B, F, G, I, K, M, N, R, W and 2, only the first character is required for nationality identification. In the cases of half series (i.e. when the first two characters are allocated to more than one Member State), the first three characters are required for nationality identification. (WRC-03)

ARTICLE 25

Amateur services**Section I – Amateur service**

25.1 § 1 Radiocommunication between amateur stations of different countries shall be permitted unless the administration of one of the countries concerned has notified that it objects to such radiocommunications. (WRC-03)

25.2 § 2 1) Transmissions between amateur stations of different countries shall be limited to communications incidental to the purposes of the amateur service, as defined in No. **1.56** and to remarks of a personal character. (WRC-03)

25.2A 1A) Transmissions between amateur stations of different countries shall not be encoded for the purpose of obscuring their meaning, except for control signals exchanged between earth command stations and space stations in the amateur-satellite service. (WRC-03)

25.3 2) Amateur stations may be used for transmitting international communications on behalf of third parties only in case of emergencies or disaster relief. An administration may determine the applicability of this provision to amateur stations under its jurisdiction.

25.4 (SUP – WRC-03)

25.5 § 3 1) Administrations shall determine whether or not a person seeking a licence to operate an amateur station shall demonstrate the ability to send and receive texts in Morse code signals. (WRC-03)

25.6 2) Administrations shall verify the operational and technical qualifications of any person wishing to operate an amateur station. Guidance for standards of competence may be found in the most recent version of Recommendation ITU-R M.1544. (WRC-03)

25.7 § 4 The maximum power of amateur stations shall be fixed by the administrations concerned. (WRC-03)

25.8 § 5 1) All pertinent Articles and provisions of the Constitution, the Convention and of these Regulations shall apply to amateur stations. (WRC-03)

25.9 2) During the course of their transmissions, amateur stations shall transmit their call sign at short intervals.

25.9A § 5A Administrations are encouraged to take the necessary steps to allow amateur stations to prepare for and meet communication needs in support of disaster relief. (WRC-03)

25.9B § 5B An administration may determine whether or not to permit a person who has been granted a licence to operate an amateur station by another administration to operate an amateur station while that person is temporarily in its territory, subject to such conditions or restrictions it may impose. (WRC-03)

Section II – Amateur-satellite service

25.10 § 6 The provisions of Section I of this Article shall apply equally, as appropriate, to the amateur-satellite service.

25.11 § 7 Administrations authorizing space stations in the amateur-satellite service shall ensure that sufficient earth command stations are established before launch to ensure that any harmful interference caused by emissions from a station in the amateur-satellite service can be terminated immediately (see No. **22.1**). (WRC-03)

APPENDIX 42 (Rev.WRC-12)

Table of allocation of international call sign series

(See Article 19)

Call sign series	Allocated to
AAA-ALZ	United States of America
AMA-AOZ	Spain
APA-ASZ	Pakistan (Islamic Republic of)
ATA-AWZ	India (Republic of)
AXA-AXZ	Australia
AYA-AZZ	Argentine Republic
A2A-A2Z	Botswana (Republic of)
A3A-A3Z	Tonga (Kingdom of)
A4A-A4Z	Oman (Sultanate of)
A5A-A5Z	Bhutan (Kingdom of)
A6A-A6Z	United Arab Emirates
A7A-A7Z	Qatar (State of)
A8A-A8Z	Liberia (Republic of)
A9A-A9Z	Bahrain (Kingdom of)
BAA-BZZ	China (People's Republic of)
CAA-CEZ	Chile
CFA-CKZ	Canada
CLA-CMZ	Cuba
CNA-CNZ	Morocco (Kingdom of)
COA-COZ	Cuba
CPA-CPZ	Bolivia (Republic of)
CQA-CUZ	Portugal
CVA-CXZ	Uruguay (Eastern Republic of)
CYA-CZZ	Canada
C2A-C2Z	Nauru (Republic of)
C3A-C3Z	Andorra (Principality of)
C4A-C4Z	Cyprus (Republic of)
C5A-C5Z	Gambia (Republic of the)
C6A-C6Z	Bahamas (Commonwealth of the)
*C7A-C7Z	World Meteorological Organization
C8A-C9Z	Mozambique (Republic of)
DAA-DRZ	Germany (Federal Republic of)
DSA-DTZ	Korea (Republic of)
DUA-DZZ	Philippines (Republic of the)
D2A-D3Z	Angola (Republic of)
D4A-D4Z	Cape Verde (Republic of)
D5A-D5Z	Liberia (Republic of)
D6A-D6Z	Comoros (Union of)
D7A-D9Z	Korea (Republic of)

Call sign series	Allocated to	
EAA-EHZ	Spain	
EIA-EJZ	Ireland	
EKA-EKZ	Armenia (Republic of)	
ELA-ELZ	Liberia (Republic of)	
EMA-EOZ	Ukraine	
EPA-EQZ	Iran (Islamic Republic of)	
ERA-ERZ	Moldova (Republic of)	
ESA-ESZ	Estonia (Republic of)	
ETA-ETZ	Ethiopia (Federal Democratic Republic of)	
EUA-EWZ	Belarus (Republic of)	
EXA-EXZ	Kyrgyz Republic	
EYA-EYZ	Tajikistan (Republic of)	
EZA-EZZ	Turkmenistan	
E2A-E2Z	Thailand	
E3A-E3Z	Eritrea	
E4A-E4Z	Palestinian Authority ¹	
E5A-E5Z	New Zealand – Cook Islands	(WRC-07)
E6A-E6Z	New Zealand – Niue ²	
E7A-E7Z	Bosnia and Herzegovina	(WRC-07)
FAA-FZZ	France	
GAA-GZZ	United Kingdom of Great Britain and Northern Ireland	
HAA-HAZ	Hungary (Republic of)	
HBA-HBZ	Switzerland (Confederation of)	
HCA-HDZ	Ecuador	
HEA-HEZ	Switzerland (Confederation of)	
HFA-HFZ	Poland (Republic of)	
HGA-HGZ	Hungary (Republic of)	
HHA-HHZ	Haiti (Republic of)	
HIA-HIZ	Dominican Republic	
HJA-HKZ	Colombia (Republic of)	
HLA-HLZ	Korea (Republic of)	
HMA-HMZ	Democratic People's Republic of Korea	
HNA-HNZ	Iraq (Republic of)	
HOA-HPZ	Panama (Republic of)	
HQA-HRZ	Honduras (Republic of)	
HSA-HSZ	Thailand	
HTA-HTZ	Nicaragua	
HUA-HUZ	El Salvador (Republic of)	
HVA-HVZ	Vatican City State	
HWA-HYZ	France	
HZA-HZZ	Saudi Arabia (Kingdom of)	
H2A-H2Z	Cyprus (Republic of)	
H3A-H3Z	Panama (Republic of)	
H4A-H4Z	Solomon Islands	
H6A-H7Z	Nicaragua	
H8A-H9Z	Panama (Republic of)	
IAA-IZZ	Italy	

¹ In response to Resolution 99 (Rev. Guadalajara 2010) of the Plenipotentiary Conference. (WRC-12)

² Added 3rd August 2012 after RR2012 went to print.

Call sign series	Allocated to
JAA-JSZ	Japan
JTA-JVZ	Mongolia
JWA-JXZ	Norway
JYA-JYZ	Jordan (Hashemite Kingdom of)
JZA-JZZ	Indonesia (Republic of)
J2A-J2Z	Djibouti (Republic of)
J3A-J3Z	Grenada
J4A-J4Z	Greece
J5A-J5Z	Guinea-Bissau (Republic of)
J6A-J6Z	Saint Lucia
J7A-J7Z	Dominica (Commonwealth of)
J8A-J8Z	Saint Vincent and the Grenadines
KAA-KZZ	United States of America
LAA-LNZ	Norway
LOA-LWZ	Argentine Republic
LXA-LXZ	Luxembourg
LYA-LYZ	Lithuania (Republic of)
LZA-LZZ	Bulgaria (Republic of)
L2A-L9Z	Argentine Republic
MAA-MZZ	United Kingdom of Great Britain and Northern Ireland
NAA-NZZ	United States of America
OAA-OCZ	Peru
ODA-ODZ	Lebanon
OEA-OEZ	Austria
OFA-OJZ	Finland
OKA-OLZ	Czech Republic
OMA-OMZ	Slovak Republic
ONA-OTZ	Belgium
OUA-OZZ	Denmark
PAA-PIZ	Netherlands (Kingdom of the)
PJA-PJZ	Netherlands (Kingdom of the) – Netherlands Antilles
PKA-POZ	Indonesia (Republic of)
PPA-PYZ	Brazil (Federative Republic of)
PZA-PZZ	Suriname (Republic of)
P2A-P2Z	Papua New Guinea
P3A-P3Z	Cyprus (Republic of)
P4A-P4Z	Netherlands (Kingdom of the) – Aruba
P5A-P9Z	Democratic People's Republic of Korea
RAA-RZZ	Russian Federation

Call sign series	Allocated to
SAA-SMZ	Sweden
SNA-SRZ	Poland (Republic of)
SSA-SSM	Egypt (Arab Republic of)
SSN-STZ	Sudan (Republic of the)
SUA-SUZ	Egypt (Arab Republic of)
SVA-SZZ	Greece
S2A-S3Z	Bangladesh (People's Republic of)
S5A-S5Z	Slovenia (Republic of)
S6A-S6Z	Singapore (Republic of)
S7A-S7Z	Seychelles (Republic of)
S8A-S8Z	South Africa (Republic of)
S9A-S9Z	Sao Tome and Principe (Democratic Republic of)
TAA-TCZ	Turkey
TDA-TDZ	Guatemala (Republic of)
TEA-TEZ	Costa Rica
TFA-TFZ	Iceland
TGA-TGZ	Guatemala (Republic of)
THA-THZ	France
TIA-TIZ	Costa Rica
TJA-TJZ	Cameroon (Republic of)
TKA-TKZ	France
TLA-TLZ	Central African Republic
TMA-TMZ	France
TNA-TNZ	Congo (Republic of the)
TOA-TQZ	France
TRA-TRZ	Gabonese Republic
TSA-TSZ	Tunisia
TTA-TTZ	Chad (Republic of)
TUA-TUZ	Côte d'Ivoire (Republic of)
TVA-TXZ	France
TYA-TYZ	Benin (Republic of)
TZA-TZZ	Mali (Republic of)
T2A-T2Z	Tuvalu
T3A-T3Z	Kiribati (Republic of)
T4A-T4Z	Cuba
T5A-T5Z	Somali Democratic Republic
T6A-T6Z	Afghanistan
T7A-T7Z	San Marino (Republic of)
T8A-T8Z	Palau (Republic of)
UAA-UIZ	Russian Federation
UJA-UMZ	Uzbekistan (Republic of)
UNA-UQZ	Kazakhstan (Republic of)
URA-UZZ	Ukraine

Call sign series	Allocated to	
VAA-VGZ	Canada	
VHA-VNZ	Australia	
VOA-VOZ	Canada	
VPA-VQZ	United Kingdom of Great Britain and Northern Ireland	
VRA-VRZ	China (People's Republic of) – Hong Kong	
VSA-VSZ	United Kingdom of Great Britain and Northern Ireland	
VT A-VWZ	India (Republic of)	
VXA-VYZ	Canada	
VZA-VZZ	Australia	
V2A-V2Z	Antigua and Barbuda	
V3A-V3Z	Belize	
V4A-V4Z	Saint Kitts and Nevis (Federation of)	
V5A-V5Z	Namibia (Republic of)	
V6A-V6Z	Micronesia (Federated States of)	
V7A-V7Z	Marshall Islands (Republic of the)	
V8A-V8Z	Brunei Darussalam	
WAA-WZZ	United States of America	
XAA-XIZ	Mexico	
XJA-XOZ	Canada	
XPA-XPZ	Denmark	
XQA-XRZ	Chile	
XSA-XSZ	China (People's Republic of)	
XTA-XTZ	Burkina Faso	
XUA-XUZ	Cambodia (Kingdom of)	
XVA-XVZ	Viet Nam (Socialist Republic of)	
XWA-XWZ	Lao People's Democratic Republic	
XXA-XXZ	China (People's Republic of) – Macao	(WRC-07)
XYA-XZZ	Myanmar (Union of)	
YAA-YAZ	Afghanistan	
YBA-YHZ	Indonesia (Republic of)	
YIA-YIZ	Iraq (Republic of)	
YJA-YJZ	Vanuatu (Republic of)	
YKA-YKZ	Syrian Arab Republic	
YLA-YLZ	Latvia (Republic of)	
YMA-YMZ	Turkey	
YNA-YNZ	Nicaragua	
YOA-YRZ	Romania	
YSA-YSZ	El Salvador (Republic of)	
YTA-YUZ	Serbia (Republic of)	(WRC-07)
YVA-YYZ	Venezuela (Bolivarian Republic of)	
Y2A-Y9Z	Germany (Federal Republic of)	
ZAA-ZAZ	Albania (Republic of)	
ZBA-ZJZ	United Kingdom of Great Britain and Northern Ireland	
ZKA-ZMZ	New Zealand	
ZNA-ZOZ	United Kingdom of Great Britain and Northern Ireland	
ZPA-ZPZ	Paraguay (Republic of)	

Call sign series	Allocated to
ZQA-ZQZ ZRA-ZUZ ZVA-ZZZ Z2A-Z2Z Z3A-Z3Z Z8A-Z8Z	United Kingdom of Great Britain and Northern Ireland South Africa (Republic of) Brazil (Federative Republic of) Zimbabwe (Republic of) The Former Yugoslav Republic of Macedonia South Sudan (Republic of) ³
	³ Added immediately after RR2012 went to print
2AA-2ZZ	United Kingdom of Great Britain and Northern Ireland
3AA-3AZ 3BA-3BZ 3CA-3CZ 3DA-3DM 3DN-3DZ 3EA-3FZ 3GA-3GZ 3HA-3UZ 3VA-3VZ 3WA-3WZ 3XA-3XZ 3YA-3YZ 3ZA-3ZZ	Monaco (Principality of) Mauritius (Republic of) Equatorial Guinea (Republic of) Swaziland (Kingdom of) Fiji (Republic of) Panama (Republic of) Chile China (People's Republic of) Tunisia Viet Nam (Socialist Republic of) Guinea (Republic of) Norway Poland (Republic of)
4AA-4CZ 4DA-4IZ 4JA-4KZ 4LA-4LZ 4MA-4MZ 4OA-4OZ 4PA-4SZ 4TA-4TZ *4UA-4UZ 4VA-4VZ 4WA-4WZ 4XA-4XZ *4YA-4YZ 4ZA-4ZZ	Mexico Philippines (Republic of the) Azerbaijani Republic Georgia Venezuela (Bolivarian Republic of) Montenegro Sri Lanka (Democratic Socialist Republic of) Peru United Nations Haiti (Republic of) Timor-Leste (Democratic Republic of) Israel (State of) International Civil Aviation Organization Israel (State of)
5AA-5AZ 5BA-5BZ 5CA-5GZ 5HA-5IZ 5JA-5KZ 5LA-5MZ 5NA-5OZ 5PA-5QZ 5RA-5SZ 5TA-5TZ 5UA-5UZ 5VA-5VZ 5WA-5WZ 5XA-5XZ 5YA-5ZZ	Libya Cyprus (Republic of) Morocco (Kingdom of) Tanzania (United Republic of) Colombia (Republic of) Liberia (Republic of) Nigeria (Federal Republic of) Denmark Madagascar (Republic of) Mauritania (Islamic Republic of) Niger (Republic of the) Togolese Republic Samoa (Independent State of) Uganda (Republic of) Kenya (Republic of)

(WRC-07)

(WRC-03)

Call sign series	Allocated to
6AA-6BZ	Egypt (Arab Republic of)
6CA-6CZ	Syrian Arab Republic
6DA-6JZ	Mexico
6KA-6NZ	Korea (Republic of)
6OA-6OZ	Somali Democratic Republic
6PA-6SZ	Pakistan (Islamic Republic of)
6TA-6UZ	Sudan (Republic of the)
6VA-6WZ	Senegal (Republic of)
6XA-6XZ	Madagascar (Republic of)
6YA-6YZ	Jamaica
6ZA-6ZZ	Liberia (Republic of)
7AA-7IZ	Indonesia (Republic of)
7JA-7NZ	Japan
7OA-7OZ	Yemen (Republic of)
7PA-7PZ	Lesotho (Kingdom of)
7QA-7QZ	Malawi
7RA-7RZ	Algeria (People's Democratic Republic of)
7SA-7SZ	Sweden
7TA-7YZ	Algeria (People's Democratic Republic of)
7ZA-7ZZ	Saudi Arabia (Kingdom of)
8AA-8IZ	Indonesia (Republic of)
8JA-8NZ	Japan
8OA-8OZ	Botswana (Republic of)
8PA-8PZ	Barbados
8QA-8QZ	Maldives (Republic of)
8RA-8RZ	Guyana
8SA-8SZ	Sweden
8TA-8YZ	India (Republic of)
8ZA-8ZZ	Saudi Arabia (Kingdom of)
9AA-9AZ	Croatia (Republic of)
9BA-9DZ	Iran (Islamic Republic of)
9EA-9FZ	Ethiopia (Federal Democratic Republic of)
9GA-9GZ	Ghana
9HA-9HZ	Malta
9IA-9JZ	Zambia (Republic of)
9KA-9KZ	Kuwait (State of)
9LA-9LZ	Sierra Leone
9MA-9MZ	Malaysia
9NA-9NZ	Nepal (Federal Democratic Republic of)
9OA-9TZ	Democratic Republic of the Congo
9UA-9UZ	Burundi (Republic of)
9VA-9VZ	Singapore (Republic of)
9WA-9WZ	Malaysia
9XA-9XZ	Rwanda (Republic of)
9YA-9ZZ	Trinidad and Tobago

* Series allocated to an international organization.

RESOLUTION 641 (Rev.HFBC-87)

Use of the frequency band 7 000-7 100 kHz

The World Administrative Radio Conference for the Planning of the HF Bands Allocated to the Broadcasting Service (Geneva, 1987),

considering

- a) that the sharing of frequency bands by the amateur and broadcasting services is undesirable and should be avoided;
- b) that it is desirable to have world-wide exclusive allocations for these services in band 7;
- c) that the band 7 000-7 100 kHz is allocated on a world-wide basis exclusively to the amateur service,

resolves

that the broadcasting service shall be prohibited in the band 7 000-7 100 kHz and that the broadcasting stations operating on frequencies in this band shall cease such operation,

urges

the administrations responsible for the broadcasting stations operating on frequencies in the band 7 000-7 100 kHz to take the necessary steps to ensure that such operation ceases immediately,

instructs the Secretary-General

to bring this Resolution to the attention of administrations.

RESOLUTION 642

Relating to the bringing into use of earth stations in the amateur-satellite service

The World Administrative Radio Conference (Geneva, 1979),

recognizing

that the procedures of Articles **9** and **11** are applicable to the amateur-satellite service,

recognizing further

- a) that the characteristics of earth stations in the amateur-satellite service vary widely;
- b) that space stations in the amateur-satellite service are intended for multiple access by amateur earth stations in all countries;
- c) that coordination among stations in the amateur and amateur-satellite services is accomplished without the need for formal procedures;
- d) that the burden of terminating any harmful interference is placed upon the administration authorizing a space station in the amateur-satellite service pursuant to the provisions of No. **25.11**,

notes

that certain information specified in Appendix **4** cannot reasonably be provided for earth stations in the amateur-satellite service,

resolves

1 that when an administration (or one acting on behalf of a group of named administrations) intends to establish a satellite system in the amateur-satellite service and wishes to publish information with respect to earth stations in that system it may:

1.1 communicate to the Radiocommunication Bureau all or part of the information listed in Appendix **4**; the Bureau shall publish such information in a Special Section of its BR IFIC requesting comments to be communicated within a period of four months after the date of publication;

1.2 notify under Nos. **11.2** to **11.8** all or part of the information listed in Appendix **4**; the Bureau shall record it in a special list;

2 that this information shall include at least the characteristics of a typical amateur earth station in the amateur-satellite service having the facility to transmit signals to the space station to initiate, modify, or terminate the functions of the space station.

RESOLUTION 644 (Rev.WRC-12)

Radiocommunication resources for early warning, disaster mitigation and relief operations

The World Radiocommunication Conference (Geneva, 2012),

considering

- a) that administrations have been urged to take all practical steps to facilitate the rapid deployment and effective use of telecommunication resources for early warning, disaster mitigation and disaster relief operations by reducing and, where possible, removing regulatory barriers and strengthening global, regional and transborder cooperation between States;
- b) that modern telecommunication technologies are an essential tool for disaster mitigation and relief operations and the vital role of telecommunications and ICT for the safety and security of relief workers in the field;
- c) the particular needs of developing countries and the special requirements of the inhabitants living in high risk areas exposed to disasters, as well as those living in remote areas;
- d) the work carried out by the Telecommunication Standardization Sector in standardizing the common alerting protocol (CAP), through the approval of the relevant CAP Recommendation;
- e) that, under the Strategic Plan of the Union 2012-2015, “the need for effective use of telecommunications/ICTs and modern technologies during critical emergencies, as a crucial part of disaster prediction, detection, early-warning, mitigation, management and relief strategies” is considered a priority for ITU in this period;
- f) that the majority of terrestrial networks in affected areas were damaged during recent disasters,

recognizing

- a) Article 40 of the Constitution, on priority of telecommunications concerning safety of life;
- b) Article 46 of the Constitution, on distress calls and messages;
- c) No. 91 of the Tunis Agenda for the Information Society adopted by the second phase of the World Summit on the Information Society and in particular provision c): “Working expeditiously towards the establishment of standards-based monitoring and worldwide early-warning systems linked to national and regional networks and facilitating emergency disaster response all over the world, particularly in high-risk regions”;
- d) Resolution 34 (Rev. Hyderabad, 2010) of the World Telecommunication Development Conference, on the role of telecommunications/information and communication technologies in disaster preparedness, early warning, rescue, mitigation, relief and response, as well as ITU-D Question 22-1/2 “Utilization of telecommunications/ICT for disaster preparedness, mitigation and response”;
- e) Resolution 36 (Rev. Guadalajara, 2010) of the Plenipotentiary Conference, on telecommunications/information and communication technology in the service of humanitarian assistance;

- f) Resolution 136 (Rev. Guadalajara, 2010) of the Plenipotentiary Conference, on the use of telecommunications/information and communication technologies for monitoring and management in emergency and disaster situations for early warning, prevention, mitigation and relief;
- g) Resolution ITU-R 53, on the use of radiocommunications in disaster response and relief;
- h) Resolution ITU-R 55, on the ITU-R studies of disaster prediction, detection, mitigation and relief,

noting

the close relation of this Resolution with Resolution **646 (Rev.WRC-12)**, on public protection and disaster relief, and Resolution **647 (Rev.WRC-12)**, on spectrum management guidelines for emergency and disaster relief radiocommunication, and the need to coordinate activities under these Resolutions in order to prevent any possible overlap,

resolves

- 1 that the ITU Radiocommunication Sector (ITU-R) continue to study, as a matter of urgency, those aspects of radiocommunications/ICT that are relevant to early warning, disaster mitigation and relief operations, such as decentralized means of telecommunications that are appropriate and generally available, including amateur terrestrial and satellite radio facilities, mobile and portable satellite terminals, as well as the use of passive space-based sensing systems;
- 2 to urge the ITU-R Study Groups, taking into account the scope of ongoing studies/activities appended to Resolution ITU-R 55, to accelerate their work, particularly in the areas of disaster prediction, detection, mitigation and relief,

instructs the Director of the Radiocommunication Bureau

- 1 to support administrations in their work towards the implementation of both Resolutions 36 (Rev.Guadalajara, 2010) and 136 (Rev.Guadalajara, 2010), as well as the Tampere Convention;
- 2 to collaborate, as appropriate, with the United Nations Working Group on Emergency Telecommunications (WGET);
- 3 to participate in, and contribute to, the Telecommunications for Disaster Relief and Mitigation – Partnership Coordination Panel (PCP-TDR);
- 4 to synchronize activities between this Resolution, Resolution **646 (Rev.WRC-12)** and Resolution **647 (Rev.WRC-12)** to prevent a possible overlap.

CHAPTER 5

ITU-R QUESTIONS RELEVANT TO THE AMATEUR SERVICES

QUESTION ITU-R 48-6/5

Techniques and frequency usage in the amateur service and amateur-satellite service

(1978-1982-1990-1993-1998-2003-2007)

<http://www.itu.int/pub/R-QUE-SG05.48>

QUESTION ITU-R 209-4/5

Use of the mobile, amateur and amateur satellite services in support of disaster radiocommunications

(1995-1998-2006-2007-2012)

<http://www.itu.int/pub/R-QUE-SG05.209>

CHAPTER 6**ITU-R RECOMMENDATIONS RELEVANT
TO THE AMATEUR SERVICES****RECOMMENDATION ITU-R M.1041-2****Future amateur radio systems**

(Question ITU-R 48/8)

(1994-1998-2003)

Scope

This Recommendation provides the design objectives and characteristics that should be taken into account when developing future systems in the amateur and amateur-satellite services. It includes general, technical and operational considerations.

<http://www.itu.int/rec/R-REC-M.1041/en>

RECOMMENDATION ITU-R M.1042-3**Disaster communications in the amateur
and amateur-satellite services**

(Question ITU-R 48/8)

(1994-1998-2003-2007)

Scope

This Recommendation provides guidance on the development of amateur and amateur-satellite service networks supporting preparedness and radiocommunications during disaster and relief operations.

<http://www.itu.int/rec/R-REC-M.1042/en>

RECOMMENDATION ITU-R M.1043-2

**Use of the amateur and amateur-satellite services
in developing countries**

(Question ITU-R 48/8)

(1994-1998-2003)

Scope

This Recommendation encourages administrations to facilitate the amateur and amateur-satellite services to include developing operator skills, training of technicians, and deployment of amateur stations in rural areas and in emergency situations. It encourages the use of volunteers and to accommodate the particular needs of developing countries.

<http://www.itu.int/rec/R-REC-M.1043/en>

RECOMMENDATION ITU-R M.1044-2

**Frequency sharing criteria in the amateur and
amateur-satellite services**

(Question ITU-R 48/8)

(1994-1998-2003)

Scope

This Recommendation lists the radiocommunication services with which the amateur and amateur-satellite services may readily share, and those services with which sharing would be difficult. It states that the amateur services operate with relatively weak signals and provides mitigation procedures that facilitate sharing.

<http://www.itu.int/rec/R-REC-M.1044/en>

RECOMMENDATION ITU-R M.1172

**Miscellaneous abbreviations and signals to be used
for radiocommunications in the maritime mobile service**

(1995)

<http://www.itu.int/rec/R-REC-M.1172/en>

RECOMMENDATION ITU-R M.1544

Minimum qualifications of radio amateurs

(Question ITU-R 48/8)

(2001)

Scope

This Recommendation defines minimum levels of operational and technical knowledge for use by administrations when verifying the qualifications of a person wishing to operate a station in the amateur services.

<http://www.itu.int/rec/R-REC-M.1544/en>

RECOMMENDATION ITU-R M.1677-1

International Morse code

(2004-2009)

Scope

This Recommendation confirms the International Morse code characters and the operational provisions applying to their use in radiocommunication services.

<http://www.itu.int/rec/R-REC-M.1677/en>

RECOMMENDATION ITU-R M.1732-1

Characteristics of systems operating in the amateur and amateur-satellite services for use in sharing studies

(Question ITU-R 48-6/5)

(2005-2012)

Scope

This Recommendation documents the technical and operational characteristics of systems used in the amateur service and amateur-satellite services for the purposes of carrying out sharing studies. The systems and their characteristics described in this Recommendation are considered representative of those operating in the frequency bands available to these services ranging from 135.7 kHz through 81.5 GHz.

<http://www.itu.int/rec/R-REC-M.1732/en>

RECOMMENDATION ITU-R M.2034

**Telegraphic alphabet for data communication by phase shift keying
at 31 Bd in the amateur and amateur-satellite services**

(Question ITU-R 48-6/5)

(2013)

Scope

This Recommendation establishes a telegraphic alphabet and transmission protocols for phase shift keying at 31 Bd in the amateur and amateur-satellite services.

<http://www.itu.int/rec/R-REC-M.2034/en>

CHAPTER 7

ITU-R REPORTS RELEVANT TO THE AMATEUR SERVICES

REPORT ITU-R M.2085-1

Role of the amateur and amateur-satellite services in support of disaster mitigation and relief

(Question ITU-R 209-3/5)

(2006-2011)

<http://www.itu.int/pub/R-REP-M.2085>

REPORT ITU-R M.2117-1

Software-defined radio in the land mobile, amateur and amateur-satellite services

(2012)

<http://www.itu.int/pub/R-REP-M.2117>

REPORT ITU-R M.2200

Characteristics of amateur radio stations in the range 415-526.5 kHz for sharing studies

(2010)

<http://www.itu.int/pub/R-REP-M.2200>

REPORT ITU-R M.2203

**Compatibility of amateur service stations with existing services
in the range 415-526.5 kHz**

(2010)

<http://www.itu.int/pub/R-REP-M.2203>

REPORT ITU-R M.2226

**Description of amateur and experimental operation between
415 and 526.5 kHz in some countries**

(Question ITU-R 48-6/5)

(2011)

<http://www.itu.int/pub/R-REP-M.2203>

CHAPTER 8

ITU-D RECOMMENDATIONS AND HANDBOOKS RELEVANT TO THE AMATEUR SERVICES

ITU-D Recommendations <http://www.itu.int/rec/D-REC-D/e>

ITU-D Handbooks <http://www.itu.int/pub/D-HDB>

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Printed in Switzerland
Geneva, 2014
Photo credit: ITU