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| **Radiocommunication Study Groups** |  |
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| Annex 13 to Working Party 5A Chairman’s Report |
| PRELIMINARY DRAFT Revision to ITU-R Handbook for amateur and amateur-satellite services |
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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 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.

 [TBD]
 Chairman,
 Radiocommunication Working Party 5A
 (Working Group 1 – Amateur services)

CHAPTER 1

The amateur services

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CHAPTER 2

Amateur service

## 2.1 Applications of bands allocated to the amateur service

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| Metric reference | Frequency band(kHz)(R  Region) | Applications |
| 2200 m | 135.7-137.8 | Propagation in this band is via surface wave, guided between the earth and the D layer of the ionosphere. 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  | 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 either 1 W or 5 W e.i.r.p., depending on station location. |
| 160 m | 1 810-1 850 R1 | 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. |
| 1 800-2 000 R2, R3 |
| 80 m | 3 500-3 800 R1 | 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. |
| 3 500-4 000 R2 |
| 3 500-3 900 R3 |
| 40 m | 7 000-7 200 R1, R37 000-7 300 R2 | 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. |
| 30 m | 10 100-10 150all regions, secondary | This band is in use 24 hours each day, as a bridge between the 7 MHz and 14 MHz bands. |
| 20 m | 14 000-14 350 | This is the most popular band for international communications. |
| 17 m | 18 068-18 168 | The band is used as an alternative to 14 MHz which is often congested with traffic. |
| 15 m | 21 000-21 450 | These bands are used particularly during the daytime and when sunspot activity is high. |
| 12 m | 24 890-24 990 |
| 10 m | 28 000-29 700 |
|  | Frequency band(MHz) |  |
| 6 m | 50-52 or 50-54certain R1 countries | This band is used for local communication at all times, including telecommand of objects such as models. Sky wave, tropospheric scatter and meteor burst propagation are used for distances up to 2 000 km. |
| 50-54 R2, R3 |
| 2 m | 144-146 R1 | This band is heavily used throughout the world for short-range communications including the use of repeaters. |
| 144-148 R2, R3 |
| 1.25 m | 220-225 R2 | Where allocated, this band serves as an alternative to the 144 MHz band for short-range communications. |

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.

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| Metric reference | Frequency band(MHz) (*end*)(R  Region) | Applications |
| 70 cm | 430-440 all regions secondary | This band is used for short-range communications including amateur analogue and digital television. Amateur use of this band is generally secondary to radiodetermination. |
| 430-450 and 440-450 certain countries secondary RR No. 5.270 |
| 33 cm | 902-928 R2 secondary | The 902 MHz band is allocated to the amateur service only in Region 2, where it is also used for industrial, scientific and medical applications, and low-power devices.  |
| 23 cm | 1 240-1 300 secondary | These bands are used for short-range communications and for experimentation. |
| 13 cm | 2 300-2 450 secondary |
| 9 cm | 3 300-3 500 R2,R3 secondary |
| 5 cm | 5 650-5 850 R1, R3 |
| 5 650-5 925 R2 |
|  | Frequency band(GHz) |  |
| 3 cm | 10-10.5 secondary |  |
| 1.2 cm | 24-24.05 primary |
| 24.05-24.25 secondary |
| 6 mm | 47-47.2 |
| 4 mm | 76-77.5 secondary |
| 77.5-78 primary |
| 78-81 secondary |
| 2.5 mm | 122.25-123 secondary |
| 2 mm | 134-136 primary |
| 136-141 secondary |
| 1 mm | 241-248 secondary |
| 248-250 primary |

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[Editor’s Note: The new elements from the table below have been vetted, and should be appropriately formatted and incorporated into the table above by the May 2013 meeting of Working Party 5A.]

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| Metric reference | Frequency band(kHz)(R  Region),RR Radio Regulations | Application |
| 2 200 m | 135.7-137.8secondaryGeographical 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 secondaryGeographical 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 to either 1 W or 5 W e.i.r.p., depending on station location (see RR Nos. **5.80A** and **5.80B**). |
| 160 m | 1 810-1 850 R1(co-primary use with other servicessee RR Nos. **5.98**, **5.99**, **5.100**, **5 101**, **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 servicessee RR No. **5.102**) |
| 80 m | 3 500-3 800 R1(co-primary use with other services)- see 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. |
| 3 500-3 750 R2(see also RR No. **5.119**)(primary) |
| 3 750-4 000 R2(co-primary use with other services)- see also RR Nos. **5.122**, **5.125**) |
| 3 500-3 900 R3(co-primary use with other services) |
| 40 m | 7 000-7 200 R1, R3(primary) (see also RR Nos. **5.140**, **5.141**, **5.141A**, **5.142**)7 000-7 300 R2(primary)(see also RR No. **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. |

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| Metric reference | Frequency band(kHz)(R  Region),RR Radio Regulations | Application |
| 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) |
|  | Frequency band(MHz) |  |
| 6 m | 50-54 R1(Only allocated in 11 countries of the Africa Region where allocation is primary. See 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.] 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](http://en.wikipedia.org/wiki/Ionization) trails of [meteors](http://en.wikipedia.org/wiki/Meteors) (MS) . |
| 50-54 R2, R3(geographical constraints are given in RR Nos. **5.162A**, **5.166**, **5.167**, **5.167A**, **5.168**, **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](http://en.wikipedia.org/wiki/Ionization) trails of [meteors](http://en.wikipedia.org/wiki/Meteors) (MS) as well as ionosphere scattering in the circumpolar regions during the 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**) |

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| Metric reference | Frequency band(kHz)(R  Region),RR Radio Regulations | Application |
| 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 (see 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) make it possible to contact over distances of up to 1 000 km. It is also used for contacts with the use of 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 | The This band is allocated to the amateur service only in Region 2. |
| 23 cm | 1 240-1 300 secondary | This band is used for short-range communications using analog and digital modulation techniques, as well as for digital television and repeater networks. Tropospheric scattering and superrefraction (TROPO) make it possible to contact over distances of up to 1 000 km. This band is the most popular for Earth-Moon-Earth (EME) communications using analog and digital modulation methods. Also this band is used for contacts with the use of repeaters on board amateur satellites. |
| 13 cm | 2 300-2 450 secondary | This band is used for short-range communications and for experimentation, and also for contacts with the use of repeaters on board amateur satellites (space-to-Earth). |
| 9 cm | 3 300-3 500 R2,R3 secondary |  |
| 5 cm | 5 650-5 850 R1, R35 650-5 925 R2secondary in all three regions | This band is used for short-range communications and for Earth-Moon-Earth (EME) communications using analog and digital modulation methods. |
| 3 cm | 10-10.5 secondary | This band is used for short-range communications and for Earth-Moon-Earth (EME) communications using analog and digital modulation methods. In case of scattering due to atmospheric precipitations (RS), the communication range can be up to 500 km. |

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| Metric reference | Frequency band(kHz)(R  Region),RR Radio Regulations | Application |
| 1.2 cm | 24-24.05 primary | These bands (at 24 GHz, 47 GHz and 76 GHz) are used for short-range communications and for experimentation, and also for Earth-Moon-Earth (EME) communications. |
| 24.05-24.25 secondaryRR 5.150 |
| 6 mm | 47-47.2 primary |
| 4 mm | 76-77.5 secondary77.5-78 primary78-81 secondary |
| 2.5 mm | 122.25-123 secondary |
| 2 mm | 134-136 primary |
|  | 136-141 secondary |  |
| 1 mm | 241-248 secondary |
| 248-250 primary |

CHAPTER 3

Amateur-satellite service

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## 3.3 Operational amateur satellites

| 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 |
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|  |  |  |
| ARISS | Ongoing | Amateur Radio on the International Space Station (ARISS) includes voice communications, packet radio and several experiments. |
| NOTE – Additional information is available at <http://www.amsat.org>. |

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