|  |  |
| --- | --- |
| **Radiocommunication Study Groups** |  |
|  |  |
|  |  |
| Source: Document 5A/TEMP/67 | **Annex 10 to****Document 5A/198-E** |
| **19 November 2012** |
| **English only** |
| Annex 10 to Working Party 5A Chairman’s Report |
| PRELIMINARY DRAFT NEW REPORT ITU-R M.[5 MHz CHAR] |
| Characteristics of amateur radio stations in therange 5 250-5 450 kHz for sharing studies[[1]](#footnote-1) |

Scope

This Report describes the transmission characteristics of amateur radio systems most likely to be employed in amateur radio operations at frequencies in the range 5 250 to 5 450 kHz including an overview of antenna systems likely to be used in the amateur service at these frequencies.

TABLE OF CONTENTS

 Page

[1 Introduction 2](#_Toc340205840)

[2 Related ITU-R Recommendations 2](#_Toc340205841)

[3 Abbreviations 2](#_Toc340205842)

[4 General 2](#_Toc340205843)

[5 Characteristics of radiated signals 3](#_Toc340205844)

[6 Typical antenna systems 4](#_Toc340205845)

[7 Reference material 4](#_Toc340205846)

# 1 Introduction

Recommendation ITU-R M.1732 describes the characteristics of systems operating in the amateur and amateur-satellite services for use in sharing studies. This Report provides typical transmission modes and characteristics of stations in the amateur service that could be deployed in the range 5 250-5 450 kHz.

# 2 Related ITU-R Recommendations

Recommendation ITU-R M.1732 – Characteristics of systems operating in the amateur and amateur-satellite services for use in sharing studies.

[Recommendation ITU-R M.1798 – Characteristics of HF radio equipment for the exchange of digital data and electronic mail in the maritime mobile service.]

Recommandation ITU-R M.1677 – International Morse code.

[Recommendation ITU-R M.[VARICODE] – Telegraphic alphabet for data communication by phase shift keying at 31 baud in the amateur and amateur-satellite services.]

# 3 Abbreviations

ARQ Automatic Repeat reQuest error-correction

BPSK Binary phase shift keying

CW Continuous wave (Morse code) signaling

FEC Forward error correction

FSK Frequency-shift keying

NBDP Narrow-band direct printing

PACTOR Packet teleprinting over radio

PSK31 Phase shift keying 31.25 Hz

QPSK31 Quadrature phase shift keying 31.25 Hz

TPO Transmitter power output.

# 4 General

Amateur stations generally do not have assigned frequencies but dynamically select frequencies within a band allocated to the amateur service using a listen-before-talk protocol. Many bands allocated to the amateur service are shared with other radio services and amateur operators are aware of the sharing conditions. Amateur stations in the frequency range 5 250-5 450 kHz could perform a variety of functions similar in nature to those performed in other bands allocated to the amateur service, such as training, communication between amateur stations, disaster relief communications and technical investigations in radio techniques for personal as opposed to pecuniary interest.

# 5 Characteristics of radiated signals

The characteristics of the radiated signals may be taken from the in-force version of Recommendation ITU-R M.1732 “Characteristics of systems operating in the amateur and amateur-satellite services for use in sharing studies.” Although the scope of this Recommendation is limited to the frequency bands designated for the amateur service in Article **5**, the columns encompassing 1.8-7.3 MHz fairly characterize stations most likely to be employed in the frequency range 5 250‑5 450 kHz. The relevant characteristics from Recommendation ITU-R M.1732 are summarized in Table 1.

Table 1

Characteristics of transmissions in the range 5 250-5 450 kHz

|  |  |
| --- | --- |
| **Parameter** | **Value**  |
| Mode of operation | Continuous wave (CW) Morse10‑50 Bd*See Recommendation ITU-R M.1677* | PSK31 31 BdNBDP 50 Bd MFSK 16*See, e.g., Recommendation ITU-R M.**[VARICODE]* | PACTOR 3*See Recommendation ITU-R M.1798* | Single side-band (SSB) voice  | Digital voice  |
| Necessary bandwidth and class of emission (emission designator) | 150HA1A150HJ2A | 60H0J2B250HF1B316HJ2D | 2K20J2D | 2K70J3E | 2K70J2E |
| Transmitter power (dBW) | 3‑31.7 | 3‑31.7 | 3‑31.7 | 3‑31.7 | 3‑31.7 |
| Transmitter line loss (dB) | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Transmitting antenna gain (dBi) | −20 to 15 | −20 to 15 | −20 to 15 | −20 to 15 | −20 to 15 |
| Typical e.i.r.p. (dBW) | −17.2 to 46.5 | −17.2 to 52.5 | −17.2 to 46.5 | −16.8 to 46.5 | −16.8 to 46.5 |
| Antenna polarization | Horizontal,vertical | Horizontal, vertical | Horizontal,vertical | Horizontal, vertical | Horizontal, vertical |
| Receiver IF bandwidth (kHz) | 0.4 | 0.5 | 0.4 | 2.7 | 2.7 |
| Receiver noise figure (dB) | 13 | 13 | 13 | 13 | 13 |

Recommendation ITU-R M.1732 contemplates a broad range of transmitter power outputs, as maximum transmitter power varies among administrations in frequency bands allocated to the amateur service in the 1.8-7.3 MHz range. In the 5 250-5 450 kHz range, an e.i.r.p. limitation to protect incumbent services would be contemplated. In operations in one administration pursuant to Article **4.4**, an e.i.r.p. of 22.14 dBW has been implemented.

Amateur radio operators routinely use much lower power levels. Most commercial radio amateur equipment ranges from 100-150 Watts (TPO). The maximum TPO permitted to amateur radio operators is defined by the individual licensing administration.

# 6 Typical antenna systems

Antenna systems likely to be used by radio amateurs in 5 250 to 5 450 kHz would not differ significantly from antenna systems used in the amateur radio bands at 3.5 and 7.0 MHz. These antenna systems might include:

– Horizontal dipole antennas – typically one-half wavelength long.

– Vertical antennas, typically 1/4 or 5/8 wavelength with ground radials.

– Tuned “inverted L” antennas.

– Yagi or “beam” antennas – although size at 5 MHz would be a significant impediment.

# 7 Reference material

The following reference material lists a number of sources of further information on the history, use and technical characteristics of these modes.

ARRL HF Digital Handbook, American Radio Relay League, ISBN: 0-87259-103-4, 4th Edition 2007.

ARRL Handbook for Radio Communications, American Radio Relay League, ISBN: 978‑0‑87259‑667‑1, 89th Edition 2012.

RSGB Radio Communications Handbook, Radio Society of Great Britain **ISBN:** 9781-9050-8674-0.

Digital modes (RAC) <http://www.rac.ca/opsinfo/infodig.htm>.

Ham radio operating modes <http://www.ac6v.com/opmodes.htm>.

PSK31 <http://mars.superlink.net/~driller/page2.htm#PSK31>.

Ham radio digimodes <http://www.electronics-radio.com/articles/ham_radio/digimodes/digital-modes-summary.php>.

1. This Report has been prepared in support of World Radiocommunication Conference 2015 (WRC-15) Agenda item 1.4. In the event that WRC-15 does not make an allocation to the amateur service in this band, the Report will be suppressed. [↑](#footnote-ref-1)