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| **Radiocommunication Study Groups** |  |
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| **28 April 2023** |
| **English only** |
| International Amateur Radio Union | |
| Preliminary draft new Recommendation ITU-R M.[AS GUIDANCE] | |
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Introduction

This contribution proposes refinements to Annex 6 of the Working Party (WP) 5A Chairman’s Report [5A/708](https://www.itu.int/md/R19-WP5A-C-0708/en) (PDNR ITU-R M.[AS GUIDANCE]). The PDNR ITU-R M.[AMATEUR.CHARACTERISTICS] provides details of many applications and operating modes in the amateur service operating in the band 1 240-1 300 MHz. One mode involves the reflection of narrow band amateur radio signals from the surface of the moon facilitating inter-continental communications in the band 1 240-1 300 MHz. This type of operation is commonly referred to as earth-moon-earth (EME) communication. Examination of the operational data provided by the amateur communities highlights that this mode of operation takes place in an agreed harmonised segment between 1 296 to 1 298 MHz. This mode of operation presents a significant engineering challenge to radio amateurs and requires a high performance amateur station and antenna to overcome the high path loss and the reflection losses from the imperfect lunar surface. The challenges are driving a growing interest in this mode of communication particularly in this band.

Stations using this mode can only operate when the moon is visible and at least 15 degrees above the horizon (in order to minimise the reception of ground noise and atmospheric effects). High performance parabolic antennas are the norm (typically high gain around 32 dBi as indicated in the PDNR ITU-R M.[AMATEUR.CHARACTERISTICS]) . The “Home Station 2” studies in Report ITU-R M.2513-0 section 10, show that the potential interference distance decreases when the amateur station antenna boresight is raised above the horizon.

Antenna Considerations

The draft report ITU-R M.[AS.CHARACTERISTICS] identifies the use of high performance parabolic antennas for EME communications, typically 4m in diameter. Using the procedure provided by Recommendation ITU-R F.699[[1]](#footnote-1) Section 2.2.1 a typical antenna gain pattern can be calculated:

Table 1a

4m parabolic dish pattern determined by Recommendation ITU-R F.699

|  |  |  |
| --- | --- | --- |
| Degrees | Gain dBi | Relative dB |
| 0 | 32,50664 | 0 |
| 3 | 32,37621 | -0,13043 |
| 4 | 20,60498 | -11,9017 |
| 5 | 20,60498 | -11,9017 |
| 6 | 20,1429 | -12,3637 |
| 10 | 14,59668 | -17,91 |
| 15 | 10,1944 | -22,3122 |
| 20 | 7,070929 | -25,4357 |
| 45 | -1,73363 | -34,2403 |
| 48 | -2,43435 | -34,941 |
| 50 | -2,40332 | -34,91 |
| 90 | -2,40332 | -34,91 |
| 180 | -2,40332 | -34,91 |

Table 1b

3m parabolic dish pattern determined by Recommendation ITU-R F.699

|  |  |  |
| --- | --- | --- |
| Degrees | Gain dBi | Relative dB |
| 0 | 30,00787 | 0 |
| 3 | 29,91004 | -0,09783 |
| 4 | 18,7309 | -11,277 |
| 5 | 18,7309 | -11,277 |
| 6 | 21,39228 | -8,61558 |
| 10 | 15,84607 | -14,1618 |
| 15 | 11,44378 | -18,5641 |
| 20 | 8,320316 | -21,6876 |
| 45 | -0,48425 | -30,4921 |
| 48 | -1,18497 | -31,1928 |
| 50 | -1,15393 | -31,1618 |
| 90 | -1,15393 | -31,1618 |
| 180 | -1,15393 | -31,1618 |

For a 3m diameter parabolic antenna, at 15 degrees, Recommendation ITU-R F.699-8 predicts a relative gain that is around -18 dB relative to the boresight gain.

Therefore, it is proposed that a higher emission power could be enabled when such high-performance antennas are directed above the horizon to support and encourage EME operation.

Proposal

In order to facilitate EME operations by stations operating in the amateur service an additional proposal is made for the Blocks A1 and A2 in Annex 1 of the WP5A Chairman’s Report [5A/708](https://www.itu.int/md/R19-WP5A-C-0708/en) Annex 6. Attachment 1 provides the relevant extract including this proposal in track changes.

ATTACHMENT 1

Relevant extract from the WP 5A Chairman’s Report [5A/708](https://www.itu.int/md/R19-WP5A-C-0708/en) Annex 6:

Annex 1

Guidance on preferred frequency blocks and associated power levels for the amateur and amateur-satellite services use of the band 1 240-1 300 MHz

To avoid harmful interference into the RNSS (space-to-Earth), the following preferred frequency blocks and associated transmitter power levels are {identified}{ should be considered and should be implemented in the frequency band 1 240-1 300 MHz by the amateur and amateur-satellite service.}

1) For narrowband applications in the amateur service:

a) Block A1: [1 296-1 298 MHz]; [Maximum transmitter power = 150W]

Block A2: 1 298-1 300 MHz; Maximum transmitter power = 150W

b) [Block B: [1 254-1 258 MHz]; [Maximum transmitter power = 100W]

Block B: [1 255-1 257 MHz ]: [Maximum transmitter power = 100W]]

c) [Block A’: [1 293-1 294 MHz]; [Maximum transmitter power = 1W]

[Block A’ [1 293.845-1 294.345 MHz][ 10W EIRP ] [Maximum transmitter power = 1W]

1a) For narrowband earth-moon-earth communications in the amateur service using a symmetric high performance antenna (e.g. boresight gain at least 30dBi) pointing at least 15 degrees above the horizontal:

a) Block A1: 1 296-1 298 MHz; Maximum transmitter power = 500W

Block A2: 1 298-1 300 MHz; Maximum transmitter power = 500W

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1. Reference radiation patterns for fixed wireless system antennas for use in coordination studies and interference assessment in the frequency range from 100 MHz to 86 GHz. [↑](#footnote-ref-1)