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| U.S. Radiocommunications Sector  Fact Sheet | |
| **Working Party:** ITU-R WP 4C | **Document No:** USWP4C-16 |
| **Ref:** Resolution 256(WRC-23), Administrative Circular CA/270 | **Date:** July 12th, 2024 |
| **Document Title:** MSS System Characteristics relevant to WRC-27 Agenda item 1.7 Studies | |
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| **Purpose/Objective:** According to Administrative Circular CA/270, WP 4C has the role as a contributing group for WRC-27 Agenda item 1.7, which principally regards the provision of characteristics of MSS/RDSS systems in the frequency bands listed for study in AI 1.7 and which are needed to undertake sharing and compatibility studies.  This contribution intends to provide additional material/content, as necessary, so that the characteristics of all available MSS/RDSS systems in the AI 1.7 candidate bands (namely in the 7/8 GHz range) are taken into account. | |
| **Abstract:**  Contribution provides edits and additions to Doc. 4C/77(Annex 11), "Material for the Reply Liaison Statement to WP 5D”, taking into account 5D/108, initial reply liaison statement to WP 5D on characteristics relevant to Agenda item 1.7 studies.  In this first draft columns have been inserted at the end of Tables 3, 4, and 10 which are placeholders for specific information and characteristics which will be incorporated into the revision to this draft, which will be the final draft. Edits which are already applied to the Attachment in this first draft are highlighted in yellow. | |

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| MSS System Characteristics relevant to WRC-27 Agenda item 1.7 Studies | |

Introduction

With regards to WRC-27 Agenda item 1.7 on the consideration of studies on sharing and compatibility and the development of technical conditions for the use of International Mobile Telecommunications (IMT) in the frequency bands 4 400-4 800 MHz, 7 125-8 400 MHz (or parts thereof), and 14.8-15.35 GHz for the terrestrial component of IMT CPM27-1 identified WP 4C as a contributing group, as indicated in Administrative Circular [CA/270](https://www.itu.int/md/R00-CA-CIR-0270/en), the circular for the results of the first session of the Conference Preparatory Meeting for WRC 27 (CPM27-1), and likewise in accordance with the guidelines given in the Attachment to Doc. [4C/2](https://www.itu.int/md/R23-WP4C-C-0002/en).

At its April 2024 meeting, WP 4C prepared an initial reply liaison statement to [4C/05](https://www.itu.int/md/R23-WP4C-C-0005/en) from WP 5D, Relevant technical information to support studies under agenda item 1.7, in [5D/108](https://www.itu.int/md/R23-WP5D-C-0108/en), to the 46th meeting of WP 5D, which focused on indicating the frequency bands allocated to the Mobile-Satellite Service subject to consideration by Agenda item 1.7.

In the following attachment this contribution provides amendments/additions to Annex 11 of Document 4C/77, “Relevant technical information on MSS and MMSS to support studies under WRC-27 agenda item 1.7”, the working document for a preliminary reply liaison statement to WP 5D that WP 4C initiated at its April 2024 meeting. Given that there are many track changes in the Attachment, proposed amendments/edits from the USA are highlighted in yellow.

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| **Radiocommunication Study Groups {ATTACHMENT}** |  |
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| Source: Document 4C/TEMP/2  Subject: WRC-27 agenda item 1.7 Resolution **256 (WRC‑23)** | **Annex 11 to Document 4C/77-E** |
| **3 May 2024** |
| **English only** |
| Annex 11 to Working Party 4C Chair’s Report | |
| REPLY LIAISON STATEMENT TO  WORKING PARTY 5D | |
| Relevant technical information [on MSS and MMSS] to support studies  under WRC-27 agenda item 1.7 | |

[Editor’s note: This preliminary draft reply Liaison Statement has not been fully reviewed nor agreed during the April 2024 WP 4C meeting. Further input contributions are invited at the next WP 4C meeting.]

WRC-27 agenda item (AI) 1.7 is 'to consider studies on sharing and compatibility and develop technical conditions for the use of International Mobile Telecommunications (IMT) in the frequency bands 4 400-4 800 MHz and 7 125-8 400 MHz (or parts thereof), and 14.8-15.35 GHz taking into account existing primary services operating in these, and adjacent, frequency bands, in accordance with Resolution **256 (WRC-23)**. Working Party (WP) 4C would like to thank WP 5D for its liaison statement contained in Document [4C/5](https://www.itu.int/md/R23-WP4C-C-0005/en) on the request for parameters needed to conduct studies under agenda item WRC-27 agenda item 1.7, which among others include the frequency range 7 125 to 8 400 MHz.

WP 4C provided to the June 2024 meeting of WP 5D an initial reply liaison statement in Document 5D/108, mostly regarding which frequency bands subject to consideration under Agenda item 1.7 were allocated to the MSS.

The frequency bands 7 250-7 375 MHz (space-to-Earth) and 7 900-8 025 MHz (Earth-to-space) are allocated to the mobile-satellite service on a primary basis, in accordance with Radio Regulations (RR) No. **5.461**. In addition, the frequency band 7 375-7 750 MHz is allocated to the maritime mobile-satellite service (space-to-Earth) limited to geostationary-satellite networks, in accordance with RR Nos. **5.461AA**, and **5.461AB**.

Working Party 4C provides the following MSS and MMSS networks characteristics:

[Editor’s note: Further discussion is needed on consideration of MMSS sharing scenarios given the status of the allocation in respect to Mobile operations.]

• [ Annex 1 provides a set of MSS and MMSS networks characteristics to be used in sharing and compatibility analysis with IMT in the frequency band 7 125-8 400 MHz or parts of it, for co-channel sharing analysis, or for adjacent bands analysis as appropriate.

• Annex 2 provides MSS and MMSS protection criteria to be used in the sharing and compatibility analysis under WRC-27 AI 1.7. ]

Working Party 4C is also considering to develop a possible new Recommendation or Report as appropriate, once the information is complete.

Working Party 4C looks forward to a close cooperation with WP 5D under this agenda item. WP 4C kindly asks to be kept informed on the progress of the studies under WRC-27 AI 1.7.

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| **Status:** For information | |
| **Contact:** [XXX] | **E-mail:** [[XXX](mailto:jean.pla@cnes.fr)] |

**Annexes: 2**

ANNEX 1

# [1 Interference scenario

[Editor’s note: Further discussion is needed on consideration of MMSS sharing scenarios given the status of the allocation in respect to Mobile operations. In addition, there was no agreement on the consideration of MSS into IMT scenarios under WRC-27 agenda item 1.7.]

Based on the allocations of the MSS and MMSS under purview of WP 4C, the following scenarios for the protection of these services were identified in the 7 125-8 400 MHz frequency range:

‒ Interference into MSS (space-to-Earth) from IMT in the frequency band 7 250-7 375 MHz;

‒ [ Interference into MMSS (space-to-Earth) from IMT in the frequency band 7 375-7 750 MHz; ]

‒ Interference into MSS (space-to-Earth) from IMT in the adjacent band(s) to 7 250-7 375 MHz frequency band;

‒ [ Interference into MMSS (space-to-Earth) from IMT in the adjacent band(s) to 7 375-7 750 MHz frequency band;

‒ Interference from MSS (Earth-to-space) into IMT in the frequency band 7 900-8 025 MHz; ]

‒ Interference into MSS (Earth-to-space) from IMT in the frequency band 7 900-8 025 MHz.

Figure 1

Interference scenarios to be considered





In the space-to-Earth direction, the transmitting MSS and MMSS space stations comply with pfd limits contained in Table **21-4** of RR Article **21** which are intended for the protection of terrestrial services. It is to be noted that those limits can be exceeded in some parts of the MSS/MMSS service area pending the agreement of the concerned administration(s).]

# 2 MSS Satellite system characteristics

## 2.1 Earth station characteristics

[Editor’s note: Some views were expressed that the inclusion of deployment density information was not required and that studies to model cross-border interference of IMT into MSS was not within the scope of the agenda item. Other views expressed that studies should include the reverse direction from MSS into IMT. Further discussions are needed to resolve this issue.]

The number of earth stations and their densities as deployed by some Administration are provided for information, at this stage.

[Editor’s note: Further information in this regard are most welcomed.]

Different types of MSS earth stations, as described in sections 2.1.1 and 2.1.2, could be divided in three categories:

• Hub earth stations: Earth station whose diameter ranges from 2 to 5 meters. A Hub is a transportable MSS earth station and can be located anywhere in the service area.

• User terminal earth stations: Earth stations whose diameter ranges from few centimeters to 1.5 meter. A user terminal can be located anywhere in the service area.

• Gateway earth stations: which are very large (typically with a diameter of more than 10 meters) and operate at fixed locations. This type of earth station is usually operated under FSS allocation, and therefore are not included here.

[Editor’s note: Given the similarity of characteristic information also provided to WP 4A, a clear distinction may need to be made between representative MSS earth stations and FSS earth stations that should be modeled.]

Information currently available in Table 1 shows the estimated numbers of earth stations for each category in a reference zone of 200 km², which can be in any environment (rural, suburban, urban).

[Editor’s note: the numbers in the following tables are assessed based on the information made available at the April 2024 meeting of WP 4C. Membership are kindly invited to check if these numbers are commensurate to their own evaluations so that WP 4C can agree on a representative number. The information lines containing “TBD” will be removed at the October 2024 WP 4C meeting if no figures are provided. The meeting is also invited to provide input contributions to the next WP 4C meeting with respect to the MSS systems to be included in this section.]

Table 1

Number of MSS earth stations per 200 km²

|  |  |  |  |
| --- | --- | --- | --- |
| ITU service | Earth station  type | Category | Earth stations  number of units |
| MSS | Type 1 | Hub | 3 |
| MSS | Type 2 | Hub | 5 |
| MSS | Type 3 | Hub | 5 |
| MSS | Type 4 | User terminals | 10 |
| MSS | Type 5 | User terminals | 20 |
| MSS | Type 6 | User terminals | 30 |

Hereunder the corresponding earth stations density:

Table 2

Density of MSS earth stations per square km

| Environment type | Estimated earth stations distribution density (users/square km) |
| --- | --- |
| Land – all types | 0.365 |
| Aeronautical | TBD |
| Maritime – all types | TBD |
| Add any other types as needed | TBD |

### 2.1.1 Earth station of GSO satellite systems

The earth stations as described in this paragraph correspond to GSO satellite systems. Several types of earth stations are to be considered, with technical characteristics as shown in the following Table.

[Editor’s note: Membership is invited to submit representative earth station parameters, taking into account Table 3 below.

Table 3

GSO earth station characteristics

| Characteristics of earth station | Units | Earth station type 1 | Earth station type 2 | Earth station type 3 | Earth station type 4 | Earth station type 5 | Earth station type 6 | Earth station type 7 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Antenna type |  | Parabolic | Parabolic | Parabolic | Parabolic | Parabolic | Quasi omnidirectional | TBD |
| Antenna height | (m) | > 5 | > 5 | > 5 | 0.4 | 1 | 1 | TBD |
| Beam positioning | (degrees) | All visible azimuth | | | | | | |
| **Transmission – Earth-to-space** | | | | | | | | |
| Transmit tuning range | (MHz) | 7 900-8 025 | 7 900-8 025 | 7 900-8 025 | 7 900-8 025 | 7 900-8 025 | 7 900-8 025 | 7 900-8 025 |
| Transmit antenna diameter | (m) | 3.5 | 2.5 | 1 | 0.7 | 0.35 | 0.05 | TBD |
| Transmit antenna peak gain | (dBi) | 47 | 43 | 36 | 34 | 29 | 10.5 | TBD |
| Transmit antenna –3 dB beamwidth | (deg.) | 0.81 | 1.11 | 2.66 | 3.64 | 7.59 | 57 | TBD |
| Transmit antenna pattern type |  | RR Appendix 8 Annex 3 | RR Appendix 8 Annex 3 | RR Appendix 8 Annex 3 | RR Appendix 8 Annex 3 | RR Appendix 8 Annex 3 | Non-directional | TBD |
| Transmit antenna minimum elevation angle towards the satellite | (deg.) | 5 | 5 | 5 | 5 | 5 | 5 | TBD |
| Tracking stability | (deg.) | 0.2 | 0.5 | 1.2 | 1.7 | 3.5 | N/A | TBD |
| Transmit antenna polarization |  | Circular | Circular | Circular | Circular | Circular | Circular | Circular |
| Transmit losses | (dB) | 2 | 2 | 2 | 2 | 2 | 2 | TBD |
| Maximum transmit e.i.r.p. spectral density | (dBW/Hz) | 16 | 12 | 0 | ‒5 | ‒10 | ‒15 | TBD |
| **Reception – Space-to-Earth** | | | | | | | |  |
| Receiver tuning range | (MHz) | 7 250-7 375 | 7 250-7 375 | 7 250-7 375 | 7 250-7 375 | 7 250-7 375 | 7 250-7 375 | 7 250-7 375 |
| Receive antenna diameter (if different from transmit) | (m) | - | - | - | - | - | - | TBD |
| Receive antenna peak gain (if different from transmit) | (dBi) | 43.3 | 42.8 | 35.6 | 33 | 28.5 | 9.7 | TBD |
| Receiving antenna –3 dB beamwidth | (deg.) | 0.88 | 1.21 | 2.89 | 3.97 | 8.27 | 62 | TBD |
| Receive antenna pattern type |  | RR Appendix 8 Annex 3 | RR Appendix 8 Annex 3 | RR Appendix 8 Annex 3 | RR Appendix 8 Annex 3 | RR Appendix 8 Annex 3 | Non-directional | TBD |
| Receive antenna minimum elevation angle towards the satellite | (deg.) | 5 | 4.5 | 3.5 | 3 | 1.5 | 0 | TBD |
| Receive antenna polarization |  | Circular | Circular | Circular | Circular | Circular | Circular | Circular |
| Receiver noise temperature | (K) | 160 | 160 | 160 | 160 | 160 | 250 | TBD |

### 2.1.2 Earth stations of non-GSO satellite systems

The earth stations as described in this paragraph correspond to non-GSO satellite systems. Several types of terminals are to be considered, with technical characteristics as shown in the following Table.

[Editor’s note: Membership is invited to submit representative earth station parameters, taking into account Table 4 below.]

Table 4

Non-GSO earth station characteristics

| Characteristics of earth station | Units | Earth station type 1 | | Earth station type 2 | | Earth station type 3 | | Earth station type 4 | | Earth station type 5 | | Earth station type 6 | | Earth station type 7 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Antenna type |  | Parabolic | | Parabolic | | Parabolic | | Parabolic | | Parabolic | | Quasi omnidirectional | | TBD |
| Antenna height | (m) | > 5 | | > 5 | | > 5 | | 0.4 | | 1 | | 1 | | TBD |
| Beam positioning | (degrees) | All visible azimuth | | | | | | | | | | | | |
| **Transmission – Earth-to-space** | | | | | | | | | | | | | |  |
| Transmit tuning range | (MHz) | 7 900-8 025 | | 7 900-8 025 | | 7 900-8 025 | | 7 900-8 025 | | 7 900-8 025 | | 7 900-8 025 | | 7 900-8 025 |
| Transmit antenna diameter | (m) | 3.5 | | 2.5 | | 1 | | 0.7 | | 0.35 | | 0.05 | | TBD |
| Transmit antenna peak gain | (dBi) | 47 | | 43 | | 36 | | 34 | | 29 | | 10.5 | | TBD |
| Transmit antenna –3 dB beamwidth | (deg.) | 0.81 | | 1.11 | | 2.66 | | 3.64 | | 7.59 | | 57 | | TBD |
| Transmit antenna pattern type |  | RR Appendix 8 Annex 3 | | RR Appendix 8 Annex 3 | | RR Appendix 8 Annex 3 | | RR Appendix 8 Annex 3 | | RR Appendix 8 Annex 3 | | Non-directional | | TBD |
| Transmit antenna minimum elevation angle towards the satellite | (deg.) | 5 | | 5 | | 5 | | 5 | | 5 | | 5 | | TBD |
| Tracking stability | (deg.) | 0.2 | | 0.5 | | 1.2 | | 1.7 | | 3.5 | | N/A | | TBD |
| Transmit antenna polarization |  | Circular | | Circular | | Circular | | Circular | | Circular | | Circular | | Circular |
| Transmit losses | (dB) | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | | TBD |
| Maximum transmit e.i.r.p. spectral density | (dBW/Hz) | Satellite System 1 | Satellite System 2 | Satellite System 1 | Satellite System 2 | Satellite System 1 | Satellite System 2 | Satellite System 1 | Satellite System 2 | Satellite System 1 | Satellite System 2 | Satellite System 1 | Satellite System 2 | TBD |
| ‒29 | ‒25 | ‒35 | ‒31 | ‒45 | ‒41 | ‒50 | ‒46 | ‒55 | ‒51 | ‒40 | ‒40 | TBD |
| **Reception – Space-to-Earth** | | | | | | | | | | | | | |  |
| Receiver tuning range | (MHz) | 7 250-7 375 | | 7 250-7 375 | | 7 250-7 375 | | 7 250-7 375 | | 7 250-7 375 | | 7 250-7 375 | | 7 250-7 375 |
| Receive antenna diameter (if different from transmit) | (m) | - | | - | | - | | - | | - | | - | | TBD |
| Receive antenna peak gain (if different from transmit) | (dBi) | 43.3 | | 42.8 | | 35.6 | | 33 | | 28.5 | | 9.7 | | TBD |
| Receiving antenna –3 dB beamwidth | (deg.) | 0.88 | | 1.21 | | 2.89 | | 3.97 | | 8.27 | | 62 | | TBD |
| Receive antenna pattern type |  | RR Appendix 8 Annex 3 | | RR Appendix 8 Annex 3 | | RR Appendix 8 Annex 3 | | RR Appendix 8 Annex 3 | | RR Appendix 8 Annex 3 | | Non-directional | | TBD |
| Receive antenna minimum elevation angle towards the satellite | (deg.) | 5 | | 4.5 | | 3.5 | | 3 | | 1.5 | | 0 | | TBD |
|  |  |  | |  | |  | |  | |  | |  | |  |
| Receive antenna polarization |  | Circular | | Circular | | Circular | | Circular | | Circular | | Circular | | Circular |
| Receiver noise temperature | (K) | 160 | | 160 | | 160 | | 160 | | 160 | | 250 | | TBD |

## 2.2 Technical characteristics of space stations

In the space-to-Earth direction, the transmitting MSS space stations comply with pfd limits contained in Table **21-4** of RR Article **21** which are intended for the protection of terrestrial services. It is to be noted that those limits can be exceeded in some parts of the MSS service area pending the agreement of the concerned administration(s).

### 2.2.1 Space stations of GSO satellite systems

The required parameters, to carry out compatibility studies, are shown in the tables below for geostationary space stations.

[Editor’s note: Membership is invited to submit representative system parameters, taking into account Table 5 below.]

Table 5

GSO space stations characteristics (in accordance with Recommendation ITU-R S.1328)

| GSO | Units | Value | Value | Value |
| --- | --- | --- | --- | --- |
| Uplink tuning frequency range | (MHz) | 7 900-8 025 | 7 900-8 025 | 7 900-8 025 |
| Receiving antenna gain | (dBi) | 20 | 33 | 30 |
| Uplink polarization (RHC, LHC, VL, HL or offset linear) |  | Circular | Circular | Circular |
| Downlink tuning frequency range | (MHz) | 7 250-7 375 | | |
| Downlink polarization |  | Circular | Circular | Circular |
| Peak transmit antenna gain | (dBi) | 20 | 33 | 27 |
| Receiver noise temperature | (K) | 900 | 700 | 500 |
| Transmit antenna gain pattern |  | Rec. ITU-R S.672 | Rec. ITU-R S.672 | Rec. ITU-R S.672 |
| Maximum Transmit e.i.r.p. spectral density | (dBW/Hz) | Complies with Table **21-4** of RR Article **21** | | |

### 2.2.2 Space stations of non-GSO satellite systems

The non-GSO systems orbital characteristics to be considered are summarized in the table below:

*[Editor’s note: the numbers in the following tables are assessed based on the information made available at the April 2024 meeting of WP 4C. Membership are kindly invited to check if these numbers are commensurate to their own evaluations so that WP 4C can agree on a representative number. The lines mentioning “TBD” will be removed if no figures are provided.*

*The meeting is also invited to provide input contributions with respect to the MSS systems to be included in this section.]*

Table 6

Non-GSO systems orbital characteristics

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | System 1 | System 2 | System 3 | System 4 |
| Apogee (km) | 500 | 1 200 | 500 | 40000 |
| Perigee (km) | 500 | 1 200 | 500 | 1000 |
| Inclination Angle(°) | 50 | 50 | 85 | 63 |
| Number of planes | 36 | 22 | 36 | 4 |
| Number of satellites per plane | 36 | 24 | 36 | 2 |

The required parameters to carry out compatibility studies are shown in the table below for non-geostationary space stations.

Table 7

Non-GSO space stations characteristics (in accordance with Recommendation ITU-R S.1328)

| Non-GSO | Units | System 1 | System 2 | System 3 | System 4 |
| --- | --- | --- | --- | --- | --- |
| Uplink tuning frequency range | (MHz) | 7 900-8 025 | | | |
| Receiving antenna gain | (dBi) | 40 | 40 | 40 | 30 |
| Receiver noise temperature | (K) | 600 | 600 | 600 | 500 |
| Uplink polarization (RHC, LHC, VL, HL or offset linear) |  | Circular | Circular | Circular | Circular |
| Downlink tuning frequency range | (MHz) | 7 250-7 375 | | | |
| Downlink polarization |  | Circular | Circular | Circular | Circular |
| Peak transmit antenna gain | (dBi) | 40 | 40 | 40 | 30 |
| Transmit antenna gain pattern |  | Rec. ITU-R S.1528 | | | |
| Maximum Transmit e.i.r.p. spectral density | (dBW/Hz) | Complies with Table **21-4** of RR Article **21**(\*) | | | |
| (\*) It is to be noted that those limits can be exceeded in some parts of the MSS service area pending the agreement of the concerned administration(s). | | | | | |

[Editor’s Note: This section requires further discussion as there is no agreement on the inclusion of the MMSS parameters for study.]

# 3 MMSS Satellite system characteristics

## 3.1 Maritime receiving earth station characteristics

The number of maritime earth stations and their densities are necessary to conduct aggregate interference analyses.

The different types of MMSS maritime earth stations can be divided in two categories:

• Hub earth stations: maritime earth station whose diameter ranges from 2 to 5 meters. A Hub is a transportable MMSS earth station and can be located anywhere in the service area.

• User terminal earth stations: maritime earth stations whose diameter ranges from few centimeters to 1.5 meter. A user terminal can be located anywhere in the service area.

[Editor’s note: the numbers in the following tables are assessed based on the information made available at the April 2024 meeting of WP 4C. Membership are kindly invited to check if these numbers are commensurate to their own evaluations so that WP 4C can agree on a representative number. The lines mentioning “TBD” will be removed if no figures are provided.

The meeting is also invited to provide input contributions with respect to the MSS systems to be included in this section.]

Table 8

Number of MMSS earth stations per 200 km²

|  |  |  |  |
| --- | --- | --- | --- |
| ITU service | Earth station  type | Category | Earth stations  number of units |
| MMSS | Type 1 | Hub | TBD |
| MMSS | Type 2 | Hub | TBD |
| MMSS | Type 3 | Hub | TBD |
| MMSS | Type 4 | User terminals | TBD |
| MMSS | Type 5 | User terminals | TBD |
| MMSS | Type 6 | User terminals | TBD |

Hereunder the corresponding earth stations density:

Table 9

Density of MMSS earth stations per square km

| Environment type | Estimated earth stations distribution density (users/square km) |
| --- | --- |
| Aeronautical | TBD |
| Maritime – all types | TBD |
| Add any other types as needed | TBD |

### 3.2 Maritime earth station of GSO satellite systems

The maritime earth stations as described in this paragraph correspond to GSO satellite systems. Several types of earth stations are to be considered, with technical characteristics as shown in the following Table.

Table 10

GSO earth station characteristics

| Characteristics of earth station | Units | Earth station type 1 | Earth station type 2 | Earth station type 3 | Earth station type 4 | Earth station type 5 | Earth station type 6 | Earth Station type 7 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Antenna type |  | Parabolic | Parabolic | Parabolic | Parabolic | Parabolic | Quasi omnidirectional | TBD |
| Antenna height | (m) | > 5 | > 5 | > 5 | 0.4 | 1 | 1 | TBD |
| Beam positioning | (degrees) | All visible azimuth | | | | | | |
| **Reception – Space-to-Earth** | | | | | | | | |
| Receiver tuning range | (MHz) | 7 375-7 750 | 7 375-7 750 | 7 375-7 750 | 7 375-7 750 | 7 375-7 750 | 7 375-7 750 | 7 375-7 750 |
| Receive antenna diameter (if different from transmit) | (m) | - | - | - | - | - | - | TBD |
| Receive antenna peak gain (if different from transmit) | (dBi) | 43.3 | 42.8 | 35.6 | 33 | 28.5 | 9.7 | TBD |
| Receiving antenna –3 dB beamwidth | (deg.) | 0.88 | 1.21 | 2.89 | 3.97 | 8.27 | 62 | TBD |
| Receive antenna pattern type |  | RR Appendix 8 Annex 3 | RR Appendix 8 Annex 3 | RR Appendix 8 Annex 3 | RR Appendix 8 Annex 3 | RR Appendix 8 Annex 3 | Non-directional | TBD |
| Receive antenna minimum elevation angle towards the satellite | (deg.) | 5 | 4.5 | 3.5 | 3 | 1.5 | 0 | TBD |
| Receive antenna polarization |  | Circular | Circular | Circular | Circular | Circular | Circular | TBD |
| Receiver noise temperature | (K) | 160 | 160 | 160 | 160 | 160 | 250 | TBD |

## 3.3 Technical characteristics of space stations of GSO systems

In the space-to-Earth direction, the transmitting MMSS space stations comply with pfd limits contained in Table **21-4** of RR Article **21** which are intended for the protection of terrestrial services. It is to be noted that those limits can be exceeded in some parts of the MMSS service area pending the agreement of the concerned administration(s).

The required parameters, to carry out compatibility studies, are shown in the tables below for geostationary space stations.

Table 11

GSO space stations characteristics (in accordance with Recommendation ITU-R S.1328)

| GSO | Units | Value | Value |
| --- | --- | --- | --- |
| Downlink tuning frequency range | (MHz) | 7 375-7 750 | |
| Downlink polarization |  | Circular | Circular |
| Peak transmit antenna gain | (dBi) | 20 | 33 |
| Receiver noise temperature | (K) | 900 | 700 |
| Transmit antenna gain pattern |  | Rec. ITU-R S.672 | Rec. ITU-R S.672 |
| Maximum Transmit e.i.r.p. spectral density | (dBW/Hz) | Complies with Table **21-4** of RR Article **21** | |

ANNEX 2

# 1 MSS and MMSS protection criteria

[Editor’s Note: Further discussions are needed on the development of the appropriate MSS protection criteria to be used for studies. Other proposals, including those made to the April 2024 WP 4C meeting include an I/N = ‒6

|  |  |
| --- | --- |
| *Percentage of time for which the I/N value could be exceeded (%)* | *I/N Criteria (dB)* |
| *20%*  *0.005%* | *‒10.5*  *‒1.3* |

Considering that receivers in the MSS and MMSS require protection from interference from other radiocommunication services, the protection criteria to be used for their protection in the sharing and compatibility studies with respect to IMT under WRC-27 agenda item 1.7 are summarized in the table below:

Table 12

MSS and MMSS protection criteria for GSO and non-GSO Earth-to-space and space-to-Earth

|  |  |  |  |
| --- | --- | --- | --- |
| *I/N*  (dB) | a | b | *I/N* CCDF  Percentage (P) of time |
|  | ‒3.3842 | ‒22.5235 | P > 0.6 % |
|  | ‒2.4619 | ‒16.9897 | P ≤ 0.6 % |

Figure 2

MSS/MMSS protection criteria to be used under WRC-27 agenda item 1.7

A graph with a blue line

Description automatically generated

It is to be noted that the protection criteria is expressed in terms of *I/N* vs percentage of time and is to be met for each individual MSS/MMSS earth station receiver anywhere within the service area in the space-to-Earth direction. In the Earth-to-space direction, this protection criteria is to be met for each non-GSO and GSO space station receiver.

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