



Recommendation ITU-R M.1480
(05/2000)

Essential technical requirements of mobile earth stations of geostationary mobile-satellite systems that are implementing the global mobile personal communications by satellite (GMPCS) – Memorandum of understanding arrangements in parts of the frequency band 1-3 GHz

M Series
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Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

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RECOMMENDATION ITU-R M.1480*,**

**ESSENTIAL TECHNICAL REQUIREMENTS OF MOBILE EARTH STATIONS OF
GEOSTATIONARY MOBILE-SATELLITE SYSTEMS THAT ARE IMPLEMENTING
THE GLOBAL MOBILE PERSONAL COMMUNICATIONS BY
SATELLITE (GMPCS) – MEMORANDUM OF
UNDERSTANDING ARRANGEMENTS IN PARTS
OF THE FREQUENCY BAND 1-3 GHz*****

(Question ITU-R 218/8)

(2000)

The ITU Radiocommunication Assembly,

considering

- a) that various technically different global and regional GSO systems in the mobile-satellite service (MSS) are operating and others are expected to commence operating around the beginning of the 2000s;
- b) that the circulation of mobile earth stations (MESs) among administrations is usually subject to a number of regulations including satisfactory type approval to an agreed Recommendation and/or technical standard;
- c) that there is a need for identifying the essential technical requirements for the type approval of MES for global and regional circulation and transborder roaming for GSO MSS systems;
- d) that the identification by the ITU-R of essential technical requirements for MESs operating with global and regional GSO MSS systems would provide a common technical basis for facilitating type approval of MES terminals by various national authorities, and mutual recognition of type approvals of MES terminals, and mutual recognition arrangements for circulation of MES terminals among administrations;
- e) that essential technical requirements be measurable and/or testable;
- f) that the essential technical requirements should achieve an acceptable balance between equipment design and production cost and the need for effective use of the RF spectrum and should be impartial with respect to all global and/or regional GSO MSS technologies, subject to the protection of other radio systems;
- g) that there is a need to protect safety services from harmful interference,

* This Recommendation should be brought to the attention of the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO).

** Radiocommunication Study Group 4 made editorial amendments to this Recommendation in 2009 in accordance with Resolution ITU-R 1.

*** In the case where MSS aircraft earth stations are operating in the AMS(R)S, ICAO standards and recommended practices (SARPs) applies. Applicability of ICAO SARPs to MESs that are not operating in the AMS(R)S has not been studied and therefore such MESs are not to be used on-board aircraft. Compliance with this Recommendation does not imply compliance with SARPs. Compliance with this Recommendation does not imply compliance with the IMO Regulations.

considering also

- a) that the World Telecommunication Policy Forum (WTPF-96) which addressed GMPCS issues, adopted Opinion 3, calling upon the three ITU Sectors, each within its competence, to initiate new studies or pursue current ones, and to reach conclusions as soon as practicable to facilitate the introduction of GMPCS on a global and regional basis;
- b) that the WTPF-96 on GMPCS issues, adopted Opinion 4, establishment of a Memorandum of Understanding (MoU) to facilitate the circulation of GMPCS user terminals (GMPCS-MoU) which, *inter alia*, led to the adoption of the final texts of the GMPCS-MoU and the Arrangements to facilitate the circulation of GMPCS user terminals;
- c) that the identification by ITU-R of essential technical requirements for MES terminals operating with GSO MSS systems would provide a common technical basis for facilitating type approval of MES terminals by various national authorities and the development of mutual recognition arrangements for type approvals of MES terminals and mutual recognition arrangements for circulation of MES terminals among administrations;
- d) that the identification by ITU-R of essential technical requirements for MESs operating with GSO MSS in the 1-3 GHz band would help protect other radio services from interference caused by unwanted emissions from MSS MESs;
- e) that, for a particular GMPCS system, some MES equipment parameters such as e.i.r.p. and necessary bandwidth which are not contained in this Recommendation, are contained in the information provided as part of the RR Appendix S4;
- f) that some existing GSO MSS systems may not have the capability to determine the location of the MES terminals, but it is anticipated that future GSO MSS systems that would be part of the GMPCS MoU would incorporate such capability;
- g) that MESs of GSO MSS systems that are part of the GMPCS MoU are required to incorporate other capabilities as required by the GMPCS MoU, which are not addressed in this Recommendation,

recognizing

- a) that existing regional MES standards covering minimum technical requirements for GSO MES in the 1-3 GHz band have evolved over many years and have been agreed by a significant number of administrations for the purpose of circulation, leading to a significant infrastructure of GSO MSS systems and MES terminals, which have been built based on these specifications;
- b) that the maximum unwanted emission levels stated in Annex 1 with respect to the band 1 559-1 610 MHz have been developed for application only to MSS MESs operating in the 1-3 GHz band, and are not intended to be applied to any other service without further study,

noting

- a) that this Recommendation does not cover those technical requirements covering the provision of traffic data originating in or routed to the national territory of a Member State, the identification of measures identifying unauthorized traffic flows to and from this Member State as well as unauthorized uses of both systems and their respective terminals on its territory, all being an integral part of the GMPCS-MoU and are prerequisites for the implementation of the GMPCS-MoU Arrangements;
- b) that the out-of-band emission levels in Annex 1 were based on technical studies of TDMA/FDMA systems, not all of the access methods have been considered and that further studies are necessary in this area,

recommends

- 1** that the essential technical requirements of MESs for global and regional GSO MSS systems in the band 1-3 GHz in Annex 1 should be used by administrations as a common technical basis for:
 - a) establishing type approval requirements for MES;
 - b) facilitating the licensing of MES operations;
 - c) facilitating the development of mutual recognition arrangements of type approval of MES,

- 2 that the further studies mentioned in Note 8 of Table 2a and in Note 10 of Table 2b of Annex 1 be initiated expeditiously and include study of the limits for the band 1 624.5-1 626.5 MHz and these studies be conducted in time to modify this Recommendation appropriately during the next study period;
- 3 that the threshold value of 15 dBW reflected in Tables 2a, 2b, 3a and 3b for MES e.i.r.p. is regarded as an upper limit and requires further studies;
- 4 that the technical requirements outlined in Annex 1 should apply only to those MESs of MSS systems that are implementing the GMPCS-MoU Arrangements.

ANNEX 1

Essential technical requirements of MESs for global GSO MSS systems providing voice and/or data communications in the band 1-3 GHz (See Note 1)

NOTE 1 – The maximum unwanted emission levels stated in this Annex with respect to the band 1 559-1 610 MHz have been developed for application only to MSS MESs operating in the 1-3 GHz range, and are not intended to be applied to any other service without further study.

1 Scope

This Annex specifies the technical requirements that apply to MESs operating in the 1 626.5-1 660.5 MHz band with the following characteristics:

- the MESs are operating in one or more frequency ranges of the MSS band;
- the MESs could be either vehicle mounted or portable equipment;
- the MESs operate through geostationary satellites as part of a network providing voice and/or data communications;
- the MESs operate with user bit-rates of up to 64 kbits/s.

The requirements have been selected to ensure an adequate level of compatibility with other radio services. The levels, however, do not cover extreme cases which may occur in any location but with a low probability of occurrence.

2 Definitions

For the purposes of this Annex, the following definitions apply:

Carrier-off state: An MES is in this state when either it is authorized by the network control facility to transmit but when it does not transmit any signal, or when it is not authorized by the network control facility to transmit.

Carrier-on state: An MES is in this state when it is authorized by the network control facility to transmit and when it transmits a signal.

Nominated bandwidth: The bandwidth of the MES RF transmission. The nominated bandwidth is wide enough to encompass all spectral elements of the transmission necessary for communication and which have a level greater than the specified unwanted emissions limits. The nominated bandwidth is wide enough to take account of the transmit carrier frequency stability. The nominated bandwidth is within the MSS transmit frequency band within which the MES operates.

Unwanted emissions: Unwanted emissions are those falling outside the nominated bandwidth.

3 Requirements

3.1 Unwanted emissions outside the band 1 626.5-1 660.5 MHz

Unwanted emissions from MESs outside the band 1 626.5-1 660.5 MHz shall be below the following limits:

- a) The unwanted emissions over the frequency range 30-1 000 MHz shall not exceed the limits in Table 1.

TABLE 1

**Limits of unwanted emissions up to 1 000 MHz
in a 120 kHz measurement bandwidth at
a measuring distance of 10 m**

| Frequency (MHz) | Quasi-peak limits (dB(μV/m)) |
|-----------------|------------------------------|
| 30-230 | 30 |
| 230-1 000 | 37 |

The lower limit shall apply at the transition frequency.

- b) The unwanted emissions e.i.r.p. above 1 000 MHz in the measurement bandwidth and in all directions shall not, according to the MES type, exceed the limits of Tables 2a or 2b, as appropriate:

TABLE 2a

**Limits of unwanted emissions above 1 000 MHz and outside the band
1 626.5-1 660.5 MHz for MESs with e.i.r.p. less than or equal to 15 dBW**

| Frequency range (MHz) | Carrier-on | | Carrier-off | |
|-----------------------|------------------------------------|-----------------------------|-------------------------------------|-----------------------------|
| | e.i.r.p. limit (dBW) | Measurement bandwidth (kHz) | e.i.r.p. limit (dBW) ⁽¹⁾ | Measurement bandwidth (kHz) |
| 1 000.0-1 525.0 | -61 | 1 000 | -77 | 100 |
| 1 525.0-1 559.0 | -61 | 1 000 | -97 | 100 |
| 1 559.0-1 600.0 | -70 | 1 000 ⁽²⁾ | -77 | 100 |
| 1 600.0-1 605.0 | -70 | 1 000 | -77 | 100 |
| 1 605.0-1 612.5 | -70 to -58.5 ⁽³⁾ | 1 000 | -77 | 100 |
| 1 612.5-1 616.5 | -55 to -50 ⁽³⁾ | 1 000 | -77 | 100 |
| 1 616.5-1 621.5 | -50 to -46 ⁽³⁾ | 1 000 | -77 | 100 |
| 1 621.5-1 624.5 | -60 | 30 | -77 | 100 |
| 1 624.5-1 625.0 | -60 to -57.5 ^{(3), (4)} | 30 | -77 | 100 |
| 1 625.0-1 625.125 | -57.5 to -57.2 ^{(3), (4)} | 30 | -77 | 100 |
| 1 625.125-1 625.8 | -57.2 to -50 ^{(3), (4)} | 30 | -77 | 100 |
| 1 625.8-1 626 | -50 to -47 ^{(3), (4)} | 30 | -77 | 100 |

TABLE 2a (end)

| Frequency range (MHz) | Carrier-on | | Carrier-off | |
|--------------------------|--------------------------------|-----------------------------------|--|-----------------------------------|
| | e.i.r.p. limit (dBW) | Measurement bandwidth (kHz) | e.i.r.p. limit (dBW) ⁽¹⁾ | Measurement bandwidth (kHz) |
| 1 626-1 626.2 | -47 to -40 ^{(3), (4)} | 30 | -77 | 100 |
| 1 626.2-1 626.5 | -40 ⁽⁴⁾ | 30 | -77 | 100 |
| 1 626.5-1 660.5 | (5) | (5) | (5) | (5) |
| 1 660.5-1 662.5 | (5) | (5) | (5) | (5) |
| 1 662.5-1 665.5 | -60 | 30 | -77 | 100 |
| 1 665.5-1 670.5 | -60 | 100 | -77 | 100 |
| 1 670.5-1 680.5 | -60 | 300 | -77 | 100 |
| 1 680.5-1 690.5 | -60 | 1 000 | -77 | 100 |
| 1 690.5-2 250 | -60 | 3 000 | -77 | 100 |
| 2 250-12 750 | -60 ^{(6), (7), (8)} | 3 000 | -77 | 100 |

⁽¹⁾ Peak-hold measurement techniques should be used in the bands 1 000-1 525 MHz and 1 559-1 626.5 MHz and from 1 662.5-12 750 MHz. These values should be at or below the values for the carrier-on state.

⁽²⁾ In the sub-band 1 573.42-1 580.42 MHz, the average measurement time is 20 ms.

⁽³⁾ Linearly interpolated (dBW) versus frequency.

⁽⁴⁾ The power limits specified in Table 2a in the 1 624.5-1 626.5 MHz band require further study. This study is important to determine whether less stringent limits may enhance spectrum efficiency and utilization immediately above 1 626.5 MHz.

⁽⁵⁾ The unwanted emissions in that frequency range are limited by § 3.2.

⁽⁶⁾ In the band 3 263.0-3 321.0 MHz the maximum e.i.r.p. in one, and only one, 300 kHz measurement bandwidth shall not exceed -38 dBW. Elsewhere in this band the power limit in Table 2a shall be applied.

⁽⁷⁾ In each of the bands 4 894.5-4 981.5 MHz, 6 526.0-6 642.0 MHz and 8 175.5-8 302.5 MHz the maximum e.i.r.p. in one, and only one, 300 kHz measurement bandwidth shall not exceed -48 dBW. Elsewhere in this band the power limit in Table 2a shall be applied.

⁽⁸⁾ In the band 9 789.0-9 963.0 MHz the maximum e.i.r.p. in one, and only one, 300 kHz measurement bandwidth shall not exceed -59 dBW. Elsewhere in this band the power limit in Table 2a shall be applied.

TABLE 2b

**Limits of unwanted emissions above 1 000 MHz and outside the band
1 626.5-1 660.5 MHz for MESSs with e.i.r.p. greater than 15 dBW**

| Frequency range (MHz) | Carrier-on | | Carrier-off | |
|--------------------------|---|-----------------------------------|--|-----------------------------------|
| | e.i.r.p. limit (dBW) | Measurement bandwidth (kHz) | e.i.r.p. limit (dBW) ⁽¹⁾ | Measurement bandwidth (kHz) |
| 1 000.0-1 525.0 | -61 | 1 000 | -72 | 100 |
| 1 525.0-1 559.0 | -61 | 1 000 | -103 | 3 |
| 1 559.0-1 600.0 | -70 | 1 000 | -77 | 100 |
| 1 600.0-1 605.0 | -70 | 1 000 | -77 | 100 |
| 1 605.0-1 610.0 | (2) | 1 000 | (3) | 1 000 |
| 1 610.0-1 621.5 | -46 ⁽²⁾ | 1 000 | -72 | 100 |
| 1 621.5-1 624.5 | -46 to -40 ⁽⁴⁾ | 1 000 | -72 | 100 |
| 1 624.5-1 625.0 | -60 to -57.5 ^{(4), (5), (6)} | 30 | -72 | 100 |
| 1 625.0-1 625.125 | -57.5 to -57.2 ^{(4), (5), (6)} | 30 | -72 | 100 |
| 1 625.125-1 625.8 | -57.2 to -50 ^{(4), (5), (6)} | 30 | -72 | 100 |
| 1 625.8-1 626.0 | -50 to -47 ^{(4), (5), (6)} | 30 | -72 | 100 |
| 1 626.0-1 626.2 | -47 to -40 ^{(4), (5), (6)} | 30 | -72 | 100 |
| 1 626.2-1 626.5 | -40 ^{(5), (6)} | 30 | -72 | 100 |
| 1 626.5-1 660.5 | (7) | (7) | (7) | (7) |
| 1 660.5-1 662.5 | (7) | (7) | (7) | (7) |
| 1 662.5-1 690.0 | -36 | 1 000 | -72 | 100 |
| 1 690.0-3 400.0 | -61 ⁽⁸⁾ | 1 000 | -72 | 100 |
| 3 400-10 700 | -55 ^{(9), (10)} | 1 000 | -72 | 100 |
| 10 700-12 750 | -49 | 1 000 | -76 | 100 |

- (1) Peak-hold measurement techniques should be used in the bands 1 000-1 525 MHz and 1 559-1 624.5 MHz and from 1 662.5-12 750 MHz. These values should be at or below the values for the carrier-on state.
- (2) Linearly interpolated from -70 dB(W/MHz) at 1 605.0 MHz to -46 dB(W/MHz) at 1 610.0 MHz. The Russian Federation states that a level of -70 dB(W/MHz) in the band 1 605-1 610 MHz and a linear interpolation between -70 dB(W/MHz) at 1 610 MHz and -36 dB(W/MHz) at 1 615 MHz shall be used to provide protection of GLONASS receiver operations.
- (3) Linearly interpolated from -70 dB(W/MHz) at 1 605.0 MHz to -62 dB(W/MHz) at 1 610.0 MHz.
- (4) Linearly interpolated (dBW) versus frequency.
- (5) The maximum e.i.r.p as specified in Table 2b may be exceeded in the 1 624.5-1 626.5 MHz band in a maximum of four separated 30 kHz measurement bandwidths. The upper limit for this excess power for any of these 30 kHz measurement bandwidths shall be 5 dB above the power limits defined in Table 2b. The total excess power from these four measurements should not exceed by 8 dB. Any two of the 30 kHz measurements bandwidths that exceed the power limits defined in Table 2b shall be separated by at least one 30 kHz measurement bandwidth compliant with the power limits defined in Table 2b.
- (6) The power limits specified in Table 2b in the 1 624.5-1 626.5 MHz band are set at the minimum level based on Table 2a. These limits require further study. This study is important to determine whether less stringent limits may enhance spectrum efficiency and utilization immediately above 1 626.5 MHz. This study should include the limits in Note (5).
- (7) The unwanted emissions in that frequency range are limited by § 3.2.
- (8) In the band 3 263.0-3 321.0 MHz the maximum e.i.r.p. in one, and only one, 300 kHz measurement bandwidth shall not exceed -38 dBW. Elsewhere in this band the power limit in Table 2b shall be applied.
- (9) In each of the bands 4 894.5-4 981.5 MHz, 6 526.0-6 642.0 MHz and 8 175.5-8 302.5 MHz the maximum e.i.r.p. in one, and only one, 300 kHz measurement bandwidth shall not exceed -48 dBW. Elsewhere in this band the power limit in Table 2b shall be applied.
- (10) In the band 9 789.0-9 963.0 MHz the maximum e.i.r.p. in one, and only one, 300 kHz measurement bandwidth shall not exceed -59 dBW. Elsewhere in this band the power limit in Table 2b shall be applied.

3.2 Maximum unwanted emissions within the 1 626.5-1 662.5 MHz band

3.2.1 Specification 1: Carrier-on state

The unwanted emission e.i.r.p. in any 3 kHz band within the 1 626.5-1 662.5 MHz band, but outside the nominated bandwidth, shall not exceed the limits of Tables 3a and 3b.

TABLE 3a

Limits for unwanted emissions within the 1 626.5-1 662.5 MHz band for MESs with an e.i.r.p. less than or equal to 15 dBW

| Offset from the edge of the band of the nominated bandwidth (kHz) | Maximum e.i.r.p. (dBW) |
|---|------------------------|
| 0-25 | 0 to -15 |
| 25-125 | -15 to -50 |
| 125-425 | -50 |
| 425-1 500 | -50 to -65 |
| 1 500-36 000 | -65 |

TABLE 3b

Limits for unwanted emissions within the 1 626.5-1 662.5 MHz band for MESs with an e.i.r.p. greater than 15 dBW

| Offset from the edge of the band of the nominated bandwidth (kHz) | Maximum e.i.r.p. (dBW) where E (dB) is the excess e.i.r.p. of the MES compared with 15 dBW (see Note 2) |
|---|---|
| 0-25 | 5 to -15 |
| 25-125 | -15 to $(-50 + E)$ |
| 125-425 | $-50 + E$ |
| 425-1 500 | $-50 + E$ to -60 |
| 1 500-36 000 | -60 |

NOTE 1 – The limits in Table 3 may be exceeded, provided that the sum (W) of the spectrum components exceeding the limits of Table 3 does not exceed -30 dBW.

NOTE 2 – In cases where the antenna directivity of the MES is greater than 15 dBi then the factor E shall be limited to a maximum value of +15 dB. In all other cases, the factor E shall be limited to a maximum value of +10 dB.

3.2.2 Specification 2: Carrier-off state

For MESs with an e.i.r.p. less than 15 dBW, the e.i.r.p. (peak hold) of any emission in any 100 kHz band within the 1 626.5-1 662.5 MHz band shall not exceed -77 dBW.

For MESs with an e.i.r.p. greater than 15 dBW, the e.i.r.p. (peak hold) of any emission in any 3 kHz band within the 1 626.5-1 662.5 MHz band shall not exceed -63 dBW.

