



**Recommendation ITU-R SA.1161-3**  
(08/2019)

**Sharing and coordination criteria  
for data transmission systems in  
the Earth exploration-satellite and  
meteorological-satellite services  
using satellites in geostationary orbit**

**SA Series**  
**Space applications and meteorology**

## Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

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Series	Title
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<b>BT</b>	Broadcasting service (television)
<b>F</b>	Fixed service
<b>M</b>	Mobile, radiodetermination, amateur and related satellite services
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<b>RA</b>	Radio astronomy
<b>RS</b>	Remote sensing systems
<b>S</b>	Fixed-satellite service
<b>SA</b>	<b>Space applications and meteorology</b>
<b>SF</b>	Frequency sharing and coordination between fixed-satellite and fixed service systems
<b>SM</b>	Spectrum management
<b>SNG</b>	Satellite news gathering
<b>TF</b>	Time signals and frequency standards emissions
<b>V</b>	Vocabulary and related subjects

*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 SA.1161-3

**Sharing and coordination criteria for data transmission systems in the Earth exploration-satellite and meteorological-satellite services using satellites in geostationary orbit**

(1995-1999-2017-2019)

**Scope**

The purpose of this Recommendation is to provide sharing and coordination criteria for data transmission links for GSO satellites in the Earth exploration-satellite and meteorological-satellite services.

**Keywords**

EESS, MetSat, GSO satellites, data transmission, sharing criteria

**Related Recommendations and Reports**

Recommendations ITU-R SA.1160, ITU-R SA.1023.

The ITU Radiocommunication Assembly,

*considering*

- a) that the frequency bands allocated to the Earth exploration-satellite service (EESS) and the meteorological-satellite (MetSat) service may be shared by several systems, including those operating in other services;
- b) that Recommendation ITU-R SA.1160 specifies the aggregate interference criteria needed to determine the sharing criteria;
- c) that the sharing criteria may be determined using the methodology described in Recommendation ITU-R SA.1023;
- d) that the typical deployment of interfering stations may change over a period of years as a result of growth in the number of systems and revisions to frequency band allocations that are adopted by world radiocommunication conferences;
- e) that by governing the use of the radio-frequency spectrum in their territory and through international coordination of frequency assignments, administrations may exercise a degree of control over the number of systems that may generate interference at significant levels;
- f) that the interference level encountered by ship-borne earth stations in the MetSat service is unlikely to be worse than that encountered by earth stations operating on land,

*recommends*

- 1 that the single-entry interference levels presented in Table 1 should be used as sharing criteria for the protection of stations operating in the EESS and MetSat service;
- 2 that the criteria specified in § 1 should be used as the basis for coordination thresholds for receiving stations operating in the EESS and MetSat service in bands shared with terrestrial services;
- 3 that a 6% increase in equivalent link noise temperature should be used as the threshold for coordination between transmitting space stations and receiving earth stations operating in the EESS and MetSat service;

4 that the deployment of interferers specified in the Annex be reviewed periodically in order to determine whether the typical interference environment and consequential sharing criteria should be revised.

NOTE 1 – The sharing criteria of Table 1 (including the Notes thereto) are intended to be applied in frequency sharing analyses and the coordination of frequency assignments (i.e. as the minimum levels of accepted interference for applicable earth stations). In coordination applications, the actual interference seen by the receiving earth station should be compared with that assumed in Annex 1 in order to help determine whether an interfering signal power greater than the permissible single entry level can be accepted. Generally, this consideration may enable acceptance of interference levels that may be as high as those specified in the applicable interference criteria in Recommendation ITU-R SA.1160.

NOTE 2 – The coordination threshold specified in § 3 is sufficiently conservative to assure that interference will be below permissible levels in cases where coordination is not triggered. In order to apply that criterion when determining whether interference from transmitting spacecraft might be unacceptable, the methodology of Appendix 8 to the Radio Regulations may be adapted and applied to the stations concerned. In order to avoid unnecessary coordination, administrations may wish to assume that a certain amount of antenna discrimination is available from the receiving station (e.g., a level of discrimination that is available for 99.9% of the time).

NOTE 3 – The criteria in Table 1 are based on the interference environment given in the Annex.

TABLE 1  
Sharing criteria for stations in the EES and MetSat services using  
spacecraft in geostationary orbit

Frequency band	Interfering signal power (dBW) in the reference bandwidth to be exceeded for no more than 20% of the time		Interfering signal power (dBW) in the reference bandwidth to be exceeded for no more than $p$ % of the time	
	Space	Terrestrial	Space	Terrestrial
1 670-1 710 MHz	-178.1 dBW per 1 MHz <sup>(1)</sup>	-158.1 dBW per 1 MHz <sup>(1)</sup>	-154.4 dBW per 1 MHz <sup>(1)</sup> $p = 0.0025$	-153.6 dBW per 1 MHz <sup>(1)</sup> $p = 0.011$
25.5-27 GHz	-164.6 dBW per 10 MHz <sup>(2)</sup>	-147.7 dBW per 10 MHz <sup>(2)</sup>	-133.3 dBW per 10 MHz <sup>(2)</sup> $p = 0.05$	-133.2 dBW per 10 MHz <sup>(2)</sup> $p = 0.1$

<sup>(1)</sup> The interfering signal powers (dBW) in the reference bandwidths are specified for reception at elevation angles  $\geq 3^\circ$ .

<sup>(2)</sup> The interfering signal powers (dBW) in the reference bandwidths are specified for reception at elevation angles  $\geq 5^\circ$ .

*Notes to Table 1:*

NOTE 1 – The single-entry interfering signal power thresholds in Table 1 is the permissible level of interfering signal power that falls within the specified reference bandwidth. Accordingly, the total power in interfering signals that are narrower than the reference bandwidth should be considered in frequency sharing analyses. In cases where the interfering bandwidth exceeds the reference bandwidth or does not fully overlap the passband of a specific receiver under study, the available frequency dependent rejection should be applied in conjunction with the specified permissible interference levels. The pertinent ITU-R SM Series Recommendations should be consulted for guidance on this matter.

NOTE 2 – The sharing criteria presented in Table 1 are based on representative stations having the specified antenna gain values.

NOTE 3 – In deriving the above sharing criteria from permissible total levels of interfering signal power, no allowance has been made for interference from spurious emissions.

NOTE 4 – The specified level of single-entry interfering signal power may be directly converted to, and applied as, equivalent values of pfd only for earth stations that use low-gain, non-tracking antenna.

NOTE 5 – Both the long-term (20% of the time) and short-term ( $p$ % of the time) sharing criteria are to be met in order for interference to be at or below permissible levels.

NOTE 6 – Sharing criteria specified for terrestrial signal paths are applicable to transmitting stations in terrestrial services and transmitting earth stations.

## Annex

### Basis for determination of the sharing criteria

#### 1 Introduction

This Annex presents the implementation of Recommendation ITU-R SA.1023 using the interference criteria given in Recommendation ITU-R SA.1160. The permissible interference levels are subdivided according to Recommendation ITU-R SA.1023 into space and terrestrial categories and then into the number of anticipated interferers in each category. The basis for these allotments is shown in Table 2 and a discussion of the interference environment in each band is presented below.

TABLE 2

**Parameters used to derive sharing criteria  
(using methodology in Recommendation ITU-R SA.1023)**

Frequency band	Long-term apportionment between categories of interferers		Short-term apportionment between categories of interferers		Equivalent number of long-term interferers		Equivalent number of short-term interferers	
	Interfering signal path		Interfering signal path		Interfering signal path		Interfering signal path	
	Space-Earth	Terrestrial	Space-Earth	Terrestrial	Space-Earth	Terrestrial	Space-Earth	Terrestrial
1 670-1 710 MHz	1%	99%	10%	90%	1	1	1	2
25.5-27.0 GHz	1%	99%	20%	80%	1	2	1	2

#### 2 Considerations for the 1 670-1 710 MHz band

The 1 670-1 690 MHz band is allocated on a primary basis to the MetSat (space-to-Earth), meteorological-aids and fixed services. In addition, the 1 670-1 675 MHz band is allocated on a primary basis to the mobile and mobile-satellite (Earth-to-space) services whereas the



1 675-1 690 MHz band is allocated on a primary basis to the mobile (except aeronautical mobile) service.

The 1 690-1 700 MHz band is allocated on a primary basis to the meteorological-aids and MetSat (space-to-Earth) services. The EESS is permitted provided such operations do not interfere with primary allocations. In five countries in Regions 2 and 3 a primary allocation exists for the fixed and mobile (except aeronautical mobile) services. In Region 1, the band is allocated to the fixed and mobile (except aeronautical mobile) services on a secondary allocation but, for a number of countries, these allocations are made on a primary basis.

The 1 700-1 710 MHz band is allocated on a primary basis to the fixed, mobile (except aeronautical mobile), and MetSat (space-to-Earth) services. The EESS is permitted provided such operations do not interfere with primary allocations. In Region 3 space research (space-to-Earth) is allocated on a primary basis in three countries.

Space-to-Earth systems in the 1 670-1 675 MHz band may need to limit their emissions in order to protect the radio astronomy service operating in the adjacent band, such that terrestrial stations produce most of the interference. Above 1 675 MHz, it is expected that a greater number of space stations will operate and produce about the same long-term interference levels as terrestrial systems and relatively greater interference levels in the short term (i.e. as a result of temporal variations in MetSat earth station antenna gain towards the interfering satellites). The expectation that mobile earth stations could contribute substantially to interference arriving via terrestrial paths does not warrant different interference allocations for interfering terrestrial paths in Region 2, since terrestrial stations and mobile earth stations are unlikely to use the same frequencies in the same area. Further information is provided in Recommendation ITU-R SA.1158.

### **3 Considerations for the 25.5-27 GHz band**

The 25.5-27.0 GHz band is allocated to the Earth exploration-satellite and space research (space-to-Earth), fixed, mobile, and inter-satellite services on a primary basis. Potential sources of interference on Earth exploration-satellite space-to-Earth paths are other Earth exploration-satellite system satellites, inter-satellite service satellites and terrestrial fixed and mobile systems. No long-term interference is assumed to occur on the Earth exploration-satellite space-to-Earth path due to Earth exploration-satellite and inter-satellite service satellite emissions because of either the constant movement of the non-GSO satellites or the fact that GSO satellites operates on a coordinated basis. Most of the long-term interference to GSO EESS satellites is expected from terrestrial path.

In the short term, interference may occur between Earth exploration-satellite and inter-satellite service satellite systems on space-to-Earth paths, although interference on terrestrial signal paths will predominate.

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