

ITU-R

Radiocommunication Sector of ITU

Recommendation ITU-R F.1247-4 (09/2015)

Technical and operational characteristics of systems in the fixed service to facilitate sharing with the space research, space operation and Earth exploration-satellite services operating in the bands 2 025-2 110 MHz and 2 200-2 290 MHz

F Series
Fixed service



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.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

Policy on Intellectual Property Right (IPR)

ITU-R policy on IPR is described in the Common Patent Policy for ITU-T/ITU-R/ISO/IEC referenced in Annex 1 of Resolution ITU-R 1. Forms to be used for the submission of patent statements and licensing declarations by patent holders are available from <http://www.itu.int/ITU-R/go/patents/en> where the Guidelines for Implementation of the Common Patent Policy for ITU-T/ITU-R/ISO/IEC and the ITU-R patent information database can also be found.

Series of ITU-R Recommendations

(Also available online at <http://www.itu.int/publ/R-REC/en>)

Series	Title
BO	Satellite delivery
BR	Recording for production, archival and play-out; film for television
BS	Broadcasting service (sound)
BT	Broadcasting service (television)
F	Fixed service
M	Mobile, radiodetermination, amateur and related satellite services
P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

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

Electronic Publication
Geneva, 2015

© ITU 2015

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without written permission of ITU.

RECOMMENDATION ITU-R F.1247-4*

Technical and operational characteristics of systems in the fixed service to facilitate sharing with the space research, space operation and Earth exploration-satellite services operating in the bands 2025-2110 MHz and 2200-2290 MHz

(Question ITU-R 118/7)

(1997-2000-2009-2013-2015)

Scope

This Recommendation provides operational characteristics of fixed service systems to facilitate sharing with systems in the space science services that operate in the bands 2 025-2 110 MHz and 2 200-2 290 MHz. It provides, *inter alia*, the orbital locations of the GSO satellites toward which emissions should be limited.

Keywords

Data relay satellites, orbital locations, e.i.r.p., spectral density

The ITU Radiocommunication Assembly,

considering

- a) that the bands 2025-2110 MHz and 2200-2290 MHz are allocated in the Radio Regulations (RR) to the fixed, mobile, space research (SR), space operation (SO) and Earth exploration-satellite (EES) services on a primary basis;
- b) that a variety of point-to-point and point-to-multipoint fixed service (FS) systems operate in the 1-3 GHz range and are described in Recommendations ITU-R F.758 and ITU-R M.1143;
- c) that, as a result of the World Administrative Radio Conference for Dealing with Frequency Allocations in Certain Parts of the Spectrum (Malaga-Torremolinos, 1992) (WARC-92), other services were allocated in the 1-3 GHz range which has created incompatible sharing conditions with the fixed service;
- d) that the SR, SO and EES services have operated satisfactorily for many years with the fixed service in the bands 2025-2110 MHz and 2200-2290 MHz but, should large numbers of fixed service systems be introduced, it will be important to identify preferred fixed service technical and operational characteristics to ensure long-term compatibility;
- e) that the SR, SO and EES services operate space-to-space radiocommunication links in the bands 2025-2110 MHz and 2200-2290 MHz, in addition to Earth-to-space and space-to-Earth links, respectively;
- f) that these links, particularly the space-to-space links of a data relay satellite (DRS) network, are designed to operate with margins on the order of 2 dB to 4 dB;
- g) that the protection criteria for Earth-to-space and space-to-Earth links may be found in Recommendations ITU-R SA.363 and ITU-R SA.609, and the protection criteria for DRS links may be found in Recommendations ITU-R SA.1155 and ITU-R SA.1274;

* This Recommendation was jointly developed by Radiocommunication Study Groups 7 and 5, and future revision should be undertaken jointly.

- h) that the number of fixed service systems in these bands may increase to an extent that practical sharing criteria that are less stringent than Recommendation ITU-R SA.1155 may need to be used as given in Recommendation ITU-R SA.1274;
- j) that satellite links are susceptible to interference from the emissions of fixed service systems within a field-of-view that is of large geographical extent;
- k) that a limited number of DRS networks, as described in Recommendation ITU-R SA.1018, are either operating or planned for deployment in the geostationary orbit, as listed in Recommendation ITU-R SA.1275;
- l) that specifying particular orbit locations to be protected rather than the orbital arc will impose less burden on the fixed service for band sharing, particularly for those stations located at high latitudes;
- m) that studies summarized in Annex 1 have shown that technical means may be utilized by the fixed service to reduce the potential for unacceptable interference to the space research, space operation and EES services,

recommends

1 that fixed service stations in the bands 2 025-2 110 MHz and 2 200-2 290 MHz, where practicable use:

1.1 automatic transmit-power control (ATPC) such that the mean power is a minimum 10 dB below the maximum transmitter power;

1.2 the lowest practical transmitter power spectral density;

1.3 transmitting antennas with good radiation patterns taking into account Recommendation ITU-R F.699;

2 that, as far as practicable, point-to-point fixed service stations operating in the band 2 200-2 290 MHz avoid radiating at an e.i.r.p. spectral density greater than +8 dB(W/MHz) towards geostationary DRS locations specified in Recommendation ITU-R SA.1275 (see Notes 2 and 6);

2.1 that, as an exception to *recommends* 2, the e.i.r.p. spectral density of fixed service stations which employ ATPC may be increased above +8 dB(W/MHz) in the direction of the specified geostationary DRS location for less than 0.1% of the month (see Notes 7 and 8);

2.2 that fixed service stations which are unable to comply with *recommends* 2 should operate towards the lower part of the band 2 200-2 290 MHz (see Note 8);

3 that point-to-multipoint fixed service stations in the bands 2 025-2 110 MHz and 2 200-2 290 MHz, where practicable:

3.1 avoid radiating an e.i.r.p. density per link exceeding 5 dB(W/MHz) for both central and out-stations of high power/low density systems for more than 0.1% of the month taking into account ATPC (see Notes 1, 2, 3, 4, 5 and 7);

3.2 use at the central station omnidirectional transmitting antennas with minimal gain above the horizontal plane.

NOTE 1 – *recommends* 2 applies also to point-to-point links between or within point-to-multipoint systems.

NOTE 2 – The e.i.r.p. spectral density radiated towards a geostationary DRS should be calculated as the product of the transmitted power spectral density and the gain of the antenna in the direction of the DRS. In the absence of a radiation pattern for the fixed service antenna, the reference radiation pattern of Recommendation ITU-R F.699 should be used. The calculation should take into

account the effects of atmospheric refraction and the local horizon. A method for calculating separation angles is given in Annex 2 of Recommendation ITU-R F.1249.

NOTE 3 – *recommends* 2 also applies to out-stations of point-to-multipoint (P-MP) systems employing directional antennas with a maximum gain in excess of 14 dBi.

NOTE 4 – In a high power/low density P-MP system operating in intermittent transmission modes such as TDMA, the out-stations may increase their e.i.r.p. density levels by a factor corresponding to the number of subscribers connected to the out-stations belonging to a central station up to a maximum of 9 dB(W/MHz) (see § 3.7 of Annex 1).

NOTE 5 – *recommends* 3.1 applies primarily to lower density systems. For higher density systems, the appropriate power levels are lower. For example, parameters for a low power system used by at least one administration operates at typical non-faded e.i.r.p. densities per link in the order of –5 dB(W/MHz) for central stations and –14 dB(W/MHz) for out-stations, taking into account ATPC, where practicable.

NOTE 6 – Recommendation ITU-R SA.1275-4 identifies the following geostationary DRS orbital positions:

10.6° E, 16.4° E, 16.8° E, 21.5° E, 47° E, 59° E, 77° E, 80° E, 85° E, 89° E, 90.75° E, 95° E, 113° E, 121° E, 133° E, 160° E, 167° E, 171° E, 176.8° E and 177.5° E, 12° W, 16° W, 32° W, 41° W, 44° W, 46° W, 49° W, 62° W, 79° W, 139° W, 160° W, 164.2° W, 167.5° W, 170° W, 171° W and 174° W.

When Recommendation ITU-R SA.1275 is revised so that new DRS orbital locations are added, the protection of the space stations in these new orbital slots in revision to this Recommendation applies only to FS stations installed after the enforcement date of the revised Recommendation ITU-R SA.1275.

NOTE 7 – It should be noted that the time percentages in *recommends* 2.1 and 3.1 do not directly relate to the DRS time percentage sharing criteria as given in Recommendation ITU-R SA.1274.

NOTE 8 – A fixed service station employing ATPC, which is unable to comply with the requirement in *recommends* 2.1, should, where practicable, operate towards the lower part of the band 2 200-2 290 MHz, preferably 2 200-2 245 MHz and the e.i.r.p. spectral density (in the direction of the specified geostationary DRS location) of such station may be increased above +8 dB(W/MHz) for less than 5% of the month in order to restore performance during shallow fading events, but the time percentage exceeding +11 dB(W/MHz) should be less than 0.1%.

NOTE 9 – Annex 2 presents material to facilitate the application of this Recommendation to planning and design of new systems in the bands 2 025-2 110 MHz and 2 200-2 290 MHz.

... ..