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| **Recommendation ITU-R M.1827-1**  **(01/2015)** |
| **Guideline on technical and operational requirements for stations of the aeronautical mobile (R) service limited to surface application at airports  in the frequency band 5 091-5 150 MHz** |
| **M Series**  **Mobile, radiodetermination, amateur**  **and related satellite services** |

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.

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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.

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| 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 |

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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.1827-1

Guideline on technical and operational requirements for stations of the aeronautical mobile (R) service limited to surface application at airports in the frequency band 5 091-5 150 MHz

(2007-2015)

Scope

This Recommendation provides technical and operational requirements for stations of the aeronautical mobile (route) service (AM(R)S) limited to surface applications at airports in the frequency band 5 091-5 150 MHz that should be used by administrations as a technical guideline for establishing conformance requirements for stations for worldwide use.

Keywords

AM(R)S, FSS, airport, conformance.

Abbreviations/Glossary

AM(R)S Aeronautical mobile (route) service

ARNS Aeronautical radionavigation service

FSS Fixed satellite service

The ITU Radiocommunication Assembly,

considering

*a)* that the aeronautical stations will operate on a national, regional and international basis around the world;

*b)* that circulation of aeronautical stations is usually a subject of a number of national and international rules and regulations including satisfactory conformance to a mutually agreed technical standard and operational requirements of the International Civil Aviation Organisation;

*c)* that there is a need for identifying the technical and operational requirements for the conformance testing of the aeronautical stations;

*d)* that the identification of technical and operational requirements for aeronautical stations would provide a common technical basis for facilitating conformance testing of aeronautical stations by various national, regional and international authorities and the development of mutual recognition arrangements for conformance of aeronautical stations;

*e)* that the technical and operational requirements need to achieve an acceptable balance between radiocommunication equipment complexity and the need for effective use of the radio-frequency spectrum,

considering also

*a)* that there is a requirement to fully protect all primary services in the band 5 091‑5 150 MHz;

*b)* that results of the studies conducted in accordance with Resolution **414 (Rev.WRC‑03)** showed the feasibility of using the frequency band 5 091-5 150 MHz by the AM(R)S limited to surface application at airports on a primary basis under certain conditions;

*c)* that the identification by ITU‑R of technical and operational requirements for aeronautical stations operating in the frequency band 5 091-5 150 MHz should prevent unacceptable interference to other services;

*d)* that technical and operational characteristics should be continuously and accurately measurable and controllable,

recognizing

*a)* that the frequency band 5 000-5 250 MHz is allocated to the aeronautical radionavigation service (ARNS) on a primary basis;

*b)* that the frequency band 5 030-5 150 MHz is to be used for the operation of the international standard microwave landing system for precision approach and landing. The frequency band 5 091-5 150 MHz is also used in the FSS for feeder links for non-geostationary mobile-satellite service systems. The requirements of the international standard microwave landing system shall take precedence over other uses of the band 5 030-5 091 MHz in accordance with No. **5.444** of the Radio Regulations,

recommends

**1** that the technical and operational requirements for stations of AM(R)S limited to surface application at airports in the frequency band 5 091-5 150 MHz given in Annex 1 should be used by administrations as a guideline for ensuring compatibility with the fixed satellite service (FSS).

**2**the following Note is considered as part of this Recommendation.

NOTE ‒ Due to the fact that other limits may also be acceptable and that all essential requirements are not covered by this Recommendation, further study is required, in particular with respect to the flexible apportionment of Δ*Ts*/*Ts* approach used in this Recommendation

Annex 1  
  
Essential requirements related to compatibility with fixed satellite service networks in the frequency band 5 091-5 150 MHz

For the analyses that follow, Table 1 summarizes the assumed FSS receiver characteristics.

TABLE 1

Parameter values used in satellite interference calculations

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| --- | --- | --- |
| Parameter | Units | HIBLEO-4 FL |
| Satellite receiver noise temperature *T* | K | 550 |
| Antenna effective area at 5 120 MHz | dB(m2) | –35.6 |
| Polarization discrimination *Lp* | dB | 1 |
| Feed loss *Lfeed* | dB | 2.9 |
| Satellite receiver bandwidth *B* | MHz | 1.23 |
| Satellite receive antenna gain *Gr* | dBi | 4 |

NOTE – The compliance with the pfds defined below would be obtained under free-space propagation conditions.

Requirements on the aeronautical mobile (route) service

The requirements that follow represent technical guidelines to be used by administrations for establishing conformance requirements for stations for worldwide use. Other limits may also be acceptable, however further study is required.

The pfd defined in this section is based on ensuring that the increase in noise temperature of the FSS satellite due to operation in the frequency band 5 091-5 150 MHz of the AM(R)S (i.e. (Δ*Ts*/*Ts*)AM(R)S) does not exceed the greater of the following two values:

1) 2%

2) 5% – (Δ*Ts*/*Ts*)ARNS

where:

(Δ*Ts*/*Ts*)ARNS: is the increase in noise temperature due to the ARNS in the same band.

Three examples of this calculation are provided below. The first assumes that the (Δ*Ts*/*Ts*)ARNS is 3%. The second assumes that no ARNS is present in the band. The third assumes that (Δ*Ts*/*Ts*)ARNS is >3%. The methodology assumes 2502 co-channel AM(R)S transmitters operating concurrently within the field of view of the FSS satellite.

Example 1: (Δ*Ts*/*Ts*)ARNS = 3%

In this case, 5% – (Δ*Ts*/*Ts*)ARNS equals 2%, hence, (Δ*Ts*/*Ts*)AM(R) S = 2%, i.e. –17 dB.

Assuming the Table 1 characteristics for the FSS, the maximum aggregate interference level tolerable at the receiver input is *IAgg-Rec*:



where:

*K*: Boltzmann’s constant (1.38 × 10–23 J/K)

*T*: receiver noise temperature (K)

*B*: receiver bandwidth (Hz).

Therefore at the satellite receiver antenna input the maximum pfd level produced by one AM(R)S transmitter is:



where:

*Gr*: FSS receiver antenna gain

250: maximum number of AM(R)S stations emitting simultaneously in the FSS receiver bandwidth.

Example 2: (Δ*Ts*/*Ts*)ARNS = 0

In this case, 5% – (Δ*Ts*/*Ts*)ARNS equals 5%, which is greater than 2%, Hence, (Δ*Ts*/*Ts*)AM(R)S = 5%, i.e. –13 dB.

Hence:



Therefore at the satellite receiver antenna input the maximum pfd level produced by one AMRS transmitter is:



Example 3: (Δ*Ts*/*Ts*)ARNS > 3%

In this case, 5% – (Δ*Ts*/*Ts*)ARNS is smaller than 2%, Hence, (Δ*Ts*/*Ts*)AM(R)S **=** 2%, i.e. –17 dB, as inExample 1, and the same *pfdMax* value is obtained as in Example 1.