

## RECOMMENDATION ITU-R SA.1743

**Maximum allowable degradation to radiocommunication links of the space research and space operation services arising from interference from emissions and radiations from other radio sources**

(Question ITU-R 129/7)

(2005-2006)

**Scope**

This Recommendation provides guidance for the apportionment of interference from emissions and radiations from other radio sources that can contribute to the maximum allowable degradation of radiocommunication links of the space research and space operations services.

The ITU Radiocommunication Assembly,

*considering*

- a) that emissions from radio transmitting devices may cause interference to victim receivers of the space research service (SRS) and space operation service (SOS);
- b) that the growth of radio-frequency spectrum use by terrestrial and space systems is continuing;
- c) that the growth is occurring both in bands allocated to and in bands adjacent to those allocated to the SRS and SOS;
- d) that the increasing use of the radio-frequency spectrum requires that a budget be established for the maximum degradation of the radiocommunication link due to the various sources of interference;
- e) that the protection criteria for SRS and SOS radiocommunication links provide the basis for apportioning the acceptable degradation due to emissions of other stations;
- f) that Recommendations ITU-R F.758, ITU-R F.1094 and ITU-R S.1432 provide similar guidance for the fixed service (FS) and the fixed-satellite service (FSS);
- g) that the applicable protection criteria for stations operating in the space research and space operation services are given in Recommendations ITU-R SA.363, ITU-R SA.578, ITU-R SA.609, ITU-R SA.1155, ITU-R SA.1157 and ITU-R SA.1396;
- h) that several ITU-R SA-series Recommendations set forth criteria for SRS and SOS networks sharing with networks of other radiocommunication services in specific bands;
- j) that it would be helpful to have general guidelines for SRS and SOS networks applicable to those bands for which sharing criteria have not been developed and for sources of interference which have not been taken into account,

*recommends*

- 1 that all necessary precautions should be taken in establishing SRS and SOS radiocommunication links and networks so that interference should not degrade the link performance and availability objectives in excess of those defined by the applicable ITU-R SA-series Recommendations;

2 that in bands allocated to the SRS or SOS for which there are no sharing criteria or for which there are sources of interference which have not been taken into account:

2.1 that the total degradation should be apportioned into three categories:

- *category 1* for in-band sharing with radio stations in other SRS or SOS networks;
- *category 2* for sharing with other radiocommunication services allocated in the same frequency band on a co-equal basis;
- *category 3* for all other radio sources of interference;

2.2 that the degradation for categories 1 and 2 combined should not be more than 99% of the total allowable degradation, and the degradation for category 3 should not be more than 1% of the total allowable degradation (see Notes 1 and 2);

2.3 that the total long-term degradation of the radiocommunication link performance and availability objectives, as determined from the sum of interference apportioned to categories 1-3 radio sources should not exceed the applicable protection criteria given in Recommendations ITU-R SA.363, ITU-R SA.578, ITU-R SA.609, ITU-R SA.1155, ITU-R SA.1157 and ITU-R SA.1396;

3 that Annex 1 should be referred to for additional guidance on the application of this Recommendation.

NOTE 1 – The apportionment of the 99% degradation between categories 1 and 2 is subject to further study.

NOTE 2 – In Recommendation ITU-R F.1094 referenced in *considering f)*, the apportionment for categories 1 and 2 are 89% and 10%, respectively, subject to further study.

## Annex 1

### **Basic considerations related to the maximum acceptable degradation of radiocommunication link performance arising from interference from emissions from other sources**

#### **1 Introduction**

There is increasing use of the radio-frequency spectrum by space and terrestrial services to satisfy not only conventional applications, but also new and innovative applications. The possibility of interference to radiocommunication systems is also increasing from in-band and out-of-band emissions from those radio stations that are operating in accordance with the Radio Regulations. Recognizing this possibility, other radiocommunication services have adopted Recommendations to account for interference from in-band and out-of-band emissions from other radio stations. These include Recommendations ITU-R F.758, ITU-R F.1094 and ITU-R S.1432 that provide similar guidance for the FS and FSS.

## **2 Degradation of the radiocommunication link due to frequency sharing on a co-equal basis**

Acceptable degradation of the performance of a radiocommunication link for space research or space operation services systems due to in-band frequency sharing on a co-equal basis, i.e. categories 1 and 2 sources of interference, may be derived from the protection criteria given in the appropriate Recommendations in the SA-series. These Recommendations establish either an acceptable ratio of the aggregate interference power,  $I$ , to the receiving system noise power,  $N$ , in a reference bandwidth or an acceptable level of the aggregate interference power in a reference bandwidth. For the purpose of this Recommendation, the guideline value for  $I$  that satisfies the applicable protection criteria is 99% (categories 1 and 2 combined) of the total acceptable interference from all radio sources, i.e. intra-system interference, interference from in-band sharing with stations of other radiocommunication services on a co-equal basis.

## **3 Degradation of the radiocommunication link due to interference from all other sources**

The approach used in § 2 may not be applicable to interference which comes from:

- emissions from radiocommunication services with lower allocation status than SRS or SOS sharing the same frequency band;
- unwanted emissions from radiocommunication services allocated to adjacent bands;
- conventional and innovative applications (such as ISM, UWB, etc.).

It seems reasonable that the sum of the interferences from such emissions should produce degradations, which are much smaller than that from systems sharing the same frequency band on a co-equal basis. For the purpose of this Recommendation, the maximum allowable degradation of SRS and SOS radiocommunication links from the emissions of non-co-equal stations and emissions from stations or devices operating in other bands is 1% of the applicable protection criteria.

## **4 Mitigation techniques**

Further study for categories 1 and 2 is required to determine suitable mitigation techniques. However, Recommendation ITU-R SM.1540 should be consulted for guidance on mitigation techniques involving interference from unwanted emissions in the out-of-band domain falling into adjacent bands.

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