

RECOMMENDATION ITU-R F.1334*

**PROTECTION CRITERIA FOR SYSTEMS IN THE FIXED SERVICE SHARING
THE SAME FREQUENCY BANDS IN THE 1 TO 3 GHz RANGE
WITH THE LAND MOBILE SERVICE**

(Question ITU-R 133/9)

(1997)

The ITU Radiocommunication Assembly,

considering

- a) that systems in the fixed service (FS) and land mobile service (LMS) share many frequency bands between 1 and 3 GHz;
- b) that many systems in the FS are operational or are planned for operation in these shared bands, both analogue and digital for point-to-point (P-P) and point-to-multipoint (P-MP) applications;
- c) that it is necessary to specify the maximum allowable interference into the FS;
- d) that reasonable geographic separations are necessary to permit sharing of overlapping frequency assignments;
- e) that geographic separations are necessary in certain cases to permit sharing of orthogonally polarized assignments;
- f) that the typical receiver thermal noise of systems in the FS as given in Recommendation ITU-R F.758 is of the order of -140 dB(W/MHz) ,

recommends

- 1** that the protection criteria for the FS sharing frequency bands between 1 and 3 GHz with the LMS be established as follows (see Note 1):
 - the maximum aggregate interference from the LMS including base stations and mobile stations should be such that the degradation to a FS receiver threshold does not exceed 1 dB under normal propagation conditions;
- 2** that Annex 1 should be referred to for the additional information relating to the protection of systems in the FS sharing frequency bands between 1 and 3 GHz with the LMS.

NOTE 1 – In certain situations of unfavourable propagation conditions, it may become necessary to establish an additional criterion to avoid excessive degradation to a FS threshold (for example, degradation exceeding 10 dB) for a small time percentage. The level of such degradation and the time percentage should be agreed by the administrations concerned.

NOTE 2 – Further study should be continued to improve this Recommendation in close collaboration with Radiocommunication Study Group 8 (Working Party 8A). Administrations and other organizations are requested to submit contributions to the ITU-R.

* This Recommendation should be brought to the attention of Radiocommunication Study Group 3 (Working Parties 3K and 3M) and Radiocommunication Study Group 8 (Working Party 8A and Task Group 8/1).

Considerations for the protection of the FS sharing frequency bands between 1 and 3 GHz with the LMS

1 Introduction

The World Administrative Radio Conference for Dealing with Frequency Allocations in Certain Parts of the Spectrum (Malaga-Torremolinos, 1992) (WARC-92) made many amendments and additions to the Table of Frequency Allocations. In the case of future public land mobile telecommunication systems (FPLMTS), identification of the bands 1885-2025 MHz and 2110-2200 MHz was made by way of Footnote 746A (S5.388) of Radio Regulations. These bands are already extensively used by radio-relay systems. Now that WARC-92 decisions are known, sharing studies of affected services should continue.

Resolution 113 (WARC-92) specifically addresses sharing and adjustments to the FS as consequences of changes to frequency allocations in the range 1-3 GHz.

Fixed radio-relay systems operating in the 1-3 GHz band form a vital part of the telecommunications service of many administrations. Thus, the study of spectrum sharing with other services must include due consideration for maintaining the high availability and performance standards required for telecommunications services.

This Annex examines, by way of example, the feasibility of frequency sharing between point-to-point radio-relay systems in the FS and systems in the LMS.

The approach adopted in this Annex recognizes that:

- the formulation of sharing guidelines for both the fixed systems and land-mobile systems should reflect the characteristics of, and performance objectives for the respective systems;
- a study based on the consideration of several spectrum sharing examples can provide a broader understanding of the technical issues involved, and
- the mutual interference between the FS and land-mobile systems may be meaningfully described on a statistical basis, and consequently by applying a statistical approach to this spectrum sharing question guidelines can be formulated which will properly reflect the performance under sharing. The actual levels of interference may also need to be considered deterministically for each situation.

Systems in the mobile service (MS) encompass a number of operating environments. They include, for example, personal, mobile and satellite communications. In this Annex, the mobile (R1 interface) segment is concerned with the communications services between vehicles and base stations. The personal (R2 interface) segment postulates the use of personal communications in a pedestrian environment indoors and outdoors. The satellite segment may be concerned with services such as paging functions, linking remote base stations or providing temporary system extension. This sharing study is restricted to the R1 and R2 interfaces of systems in the LMS.

2 Characteristics of FS and MS

2.1 Fixed systems

Examples of the technical characteristics of some radio-relay systems are given in Table 1.

TABLE 1a

Example 1-3 GHz digital radio-relay systems

Modulation	O-QPSK	64-QAM
Antenna gain, G_{FS} (dBi)	33	33
Transmit power, P_{FS} (dBW)	7	1
e.i.r.p. (dBW)	40	34
Noise floor (dBW)	−125	−130
Bandwidth, B_f (MHz)	29	10
Maximum I ($I/N = -6$) (dBW)	−131	−136

O-QPSK: quadrature phase shift keying

64-QAM: quadrature amplitude modulation.

TABLE 1b

Example 1-3 GHz P-MP systems

Parameter	Central station	Outstation
Antenna type	Omni/sectoral	Dish/horn
Antenna gain (dBi)	10/13	20 (analogue) 27 (digital)
e.i.r.p. (maximum) (dBW):		
– analogue	12	21
– digital	24	34
Noise figure (dB)	3.5	3.5
Feeder loss (dB)	2	2
IF bandwidth (MHz)	3.5	3.5
Maximum permissible long-term interference power (20% time):		
– total (dBW)	−142	−142
– (dB(W/4 kHz))	−170	−170
– (dB(W/MHz))	−147	−147

Other characteristics relevant to the operation of fixed systems include:

- the nature of the propagation, which is generally characterized by distinct non-fading and fading periods, where fading occurs as the result of anomalous propagation conditions (often late at night and/or during the early hours of the morning) including possible obstruction effects;
- the operating flat fade margin, which is typically 30-40 dB;
- the primary mechanism of errors. For low capacity systems (under 10 Mbit/s) this is signal level fading (rather than dispersive effects), and
- the performance requirements, which are described in Recommendations ITU-R F.594, ITU-R F.634, ITU-R F.696, ITU-R F.697, ITU-R F.1092 and ITU-R F.1189.