

RECOMMENDATION ITU-R F.1398

**PERFORMANCE DEGRADATION DUE TO INTERFERENCE FROM OTHER SERVICES
SHARING THE SAME FREQUENCY BANDS ON A PRIMARY BASIS
WITH DIGITAL RADIO-RELAY SYSTEMS OPERATING AT OR
ABOVE THE PRIMARY RATE AND WHICH MAY FORM
PART OF THE NATIONAL PORTION OF A 27 500 km
HYPOTHETICAL REFERENCE PATH**

(Question ITU-R 127/9)

(1999)

The ITU Radiocommunication Assembly,

considering

- a) that systems in the fixed service share many frequency bands on a primary basis with other services;
- b) that many radio-relay systems employing digital modulation for telephony are operational or planned for operation in these shared frequency bands;
- c) that the ITU-T has specified the error performance parameters and objectives for international constant bit-rate (CBR) digital paths at or above the primary rate (see ITU-T Recommendation G.826);
- d) that the error performance objectives based on ITU-T Recommendation G.826 for digital radio-relay systems operating at or above the primary rate and which may form part of the national portion of a 27 500 km hypothetical reference path (HRP) are given in Recommendation ITU-R F.1189 and apply over the period of any month;
- e) that it is necessary to specify the maximum allowable degradation in performance of digital radio-relay systems operating in compliance with Recommendation ITU-R F.1189 due to interference from other services;
- f) that the allowable degradation in performance of digital radio-relay systems due to interference from systems of other services should be expressed as a permissible fraction of the error performance objectives (see Recommendation ITU-R F.1094);
- g) that the allowable performance degradation due to interference from other services sharing the same frequency bands on a primary basis with digital radio-relay systems operating at or above the primary rate and which may form part of the international portion of a 27 500 km HRP are given in Recommendation ITU-R F.1241,

recommends

- 1** that new digital radio-relay systems sharing the same frequency bands on a primary basis with systems of other services should be designed in such a manner that, in each direction of a radio-relay path of length L in the national portion of a constant bit-rate path at or above the primary rate, the allowable degradation in performance resulting from the aggregate of the emissions from systems of other services should not exceed the provisional limits given in Tables 1 to 3 in any month;

TABLE 1

**Objectives for degradation of performance due to interference (fraction of any month).
Error performance objectives for radio-relay paths forming the
long haul inter-exchange network section of the national
portion of the HRP at or above the primary rate**

Rate (Mbit/s)	1.5 to 5	>5 to 15	>15 to 55	>55 to 160	>160 to 3 500
Errored second ratio (ESR)	$0.004 \times A$	$0.005 \times A$	$0.0075 \times A$	$0.016 \times A$	(see Note 8)
Severely errored second ratio (SESR)	$0.0002 \times A$	$0.0002 \times A$	$0.0002 \times A$	$0.0002 \times A$	$0.0002 \times A$
Background block error ratio (BBLER)	$2 \times A \times 10^{-5}$ (see Note 1)	$2 \times A \times 10^{-5}$	$2 \times A \times 10^{-5}$	$2 \times A \times 10^{-5}$	$1 \times A \times 10^{-5}$

where:

$$A = A_1 + 0.01 L_r / 500$$

A_1 has provisionally been agreed to be in the range of 0.01 to 0.02 (1% to 2%) (see Notes 2 and 4).

L_r is the actual route length of the long haul section of the national portion, rounded up to the next multiple of 500 km.

If L_r , the actual route length of the long haul section of the national portion is not known, then the air route distance should also be used and multiplied by an appropriate routing factor. This routing factor is specified in ITU-T Recommendation G.826 as follows:

- if the air-route distance is <1 000 km, the routing factor is 1.5;
- if the air-route distance is \geq 1 000 km and <1 200 km, the calculated route length is taken to be 1 500 km;
- if the air-route distance is \geq 1 200 km, the routing factor is 1.25.

TABLE 2

**Error performance objectives for radio-relay paths forming the short haul inter-exchange
network section of the national portion of the HRP at or above the primary rate**

Rate (Mbit/s)	1.5 to 5	>5 to 15	>15 to 55	>55 to 160	>160 to 3 500
ESR	$0.004 \times B$	$0.005 \times B$	$0.0075 \times B$	$0.016 \times B$	(see Note 8)
SESR	$0.0002 \times B$	$0.0002 \times B$	$0.0002 \times B$	$0.0002 \times B$	$0.0002 \times B$
BBLER	$2 \times B \times 10^{-5}$ (see Note 1)	$2 \times B \times 10^{-5}$	$2 \times B \times 10^{-5}$	$2 \times B \times 10^{-5}$	$1 \times B \times 10^{-5}$

The value of B has provisionally been agreed to be in the range of 0.075 to 0.085 (7.5% to 8.5%) (see Notes 2, 3 and 4).

TABLE 3

Error performance objectives for radio-relay paths forming the access network section of the national portion of the HRP at or above the primary rate (see Note 5)

Rate (Mbit/s)	1.5 to 5	>5 to 15	>15 to 55	>55 to 160	>160 to 3 500
ESR	$0.004 \times C$	$0.005 \times C$	$0.0075 \times C$	$0.016 \times C$	(see Note 8)
SESR	$0.0002 \times C$	$0.0002 \times C$	$0.0002 \times C$	$0.0002 \times C$	$0.0002 \times C$
BBLER	$2 \times C \times 10^{-5}$ (see Note 1)	$2 \times C \times 10^{-5}$	$2 \times C \times 10^{-5}$	$2 \times C \times 10^{-5}$	$1 \times C \times 10^{-5}$

The value of C has provisionally been agreed to be in the range of 0.075 to 0.085 (7.5% to 8.5%) (see Notes 2, 3 and 4);

2 that in the case of frequency bands which are shared with space services on a primary basis, the limits on allowable degradation in performance given in *recommends* 1 are those resulting from the aggregate of the emissions of all earth stations and space stations sharing the same frequency bands on a primary basis, including associated telemetering, telecommand and tracking transmitters of the space services.

NOTE 1 – For systems installed based on designs prior to 1996, the BBLER interference objective is $3 \times 10^{-5} \times A$ (or B or C accordingly).

NOTE 2 – The sum of the percentages $A_1\% + B\% + C\%$ shall not exceed 17.5%, in accordance with the allocations to the national portion of an international CBR path given in ITU-T Recommendation G.826.

NOTE 3 – The provisional values agreed for $B\% + C\%$ are in the range 15.5% to 16.5%.

NOTE 4 – Depending on national network configurations administrations may reallocate the $A\%$, $B\%$ and $C\%$ block allowances among the sections of the national portion of a radio path.

NOTE 5 – There is a great variety in the architecture of access networks in different countries. If the radio path consists of more than one hop and/or forms only part of the access network section, it is at the discretion of administrations to make an appropriate apportionment of the objectives given in Table 3 as a block allowance to the elements forming the access network section. No distance dependent allocation is given to this section.

NOTE 6 – Error performance parameters used in this Recommendation are defined in ITU-T Recommendation G.826.

NOTE 7 – According to ITU-T Recommendation G.826 the suggested evaluation period is one month for any parameter. In radio-relay systems these objectives should be respected for any month (see Recommendation ITU-R P.581).

NOTE 8 – The ESR objective for higher bit rate (>160 to 3 500 Mbit/s) paths is still under study.

NOTE 9 – The limits on allowable interference from space services apply to the aggregate effect of emissions from space stations, direct long-term emissions from earth stations and interference due to the anomalous propagation of emissions from earth stations.