

## RECOMMENDATION ITU-R F.1565\*

**Performance degradation due to interference from other services sharing the same frequency bands on a co-primary basis with real digital fixed wireless systems used in the international and national portions of a 27 500 km hypothetical reference path at or above the primary rate**

(Question ITU-R 127/9)

(2002)

The ITU-R Radiocommunication Assembly,

*considering*

- a) that Recommendation ITU-R F.1397, based on ITU-T Recommendations G.826 and G.828, specifies error performance objectives for real digital fixed wireless systems (FWS) links in the international portion of an hypothetical reference path (HRP);
- b) that Recommendation ITU-R F.1491, based on ITU-T Recommendations G.826 and G.828, specifies error performance objectives for real digital FWS links in the national portion of an HRP;
- c) that Recommendation ITU-R F.1241 specifies allowable aggregate performance degradation due to interference from other services sharing the same bands on a primary basis with digital FWS in the international portion of an HRP;
- d) that Recommendation ITU-R F.1398 specifies performance degradation due to interference from other services sharing the same frequency bands on a primary basis with digital FWS operating at or above the primary rate and which may form part of the national portion of an HRP;
- e) that there is a need to establish, based on Recommendations ITU-R F.1397 and ITU-R F.1491, the allowable aggregate performance degradation due to interference from other co-primary services sharing the same bands with real FWS links in the international and national portions of an HRP,

*recommends*

- 1** that, in each direction of any real digital FWS link of length  $L_{link}$ , in the international portion of an HRP 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 limits given by means of equation (1) in any month, using the values in Tables 1a and 1b for synchronous digital hierarchy (SDH) systems designed according to ITU-T Recommendation G.828 and values in Tables 2a and 2b for other systems designed according to ITU-T Recommendation G.826 (see Notes 1, 2, 3, 4, 10 and 11);

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\* As a consequence of the approval of this Recommendation, Recommendations ITU-R F.1241 and ITU-R F.1398 could be deleted.

$$\text{Degradation in EPO due to interference} = B_j \times (L_{\text{link}}/L_R) + C_j \quad (1)$$

where:

|         |                                                    |                        |
|---------|----------------------------------------------------|------------------------|
| $j = 1$ | for $L_{\min} \leq L_{\text{link}} \leq 1\,000$ km | (intermediate country) |
| $j = 2$ | for $1\,000 \text{ km} < L_{\text{link}}$          | (intermediate country) |
| $j = 3$ | for $L_{\min} \leq L_{\text{link}} \leq 500$ km    | (terminating country)  |
| $j = 4$ | for $500 \text{ km} < L_{\text{link}}$             | (terminating country)  |

EPO (error performance objective) is substituted by the parameters errored second ratio (ESR), severely errored second ratio (SESR) and background block error ratio (BBER) as appropriate.

$L_{\min}$ : lower limit of  $L_{\text{link}}$ , used to scale the objectives to the real case, provisionally equal to 50 km

$L_R$ : reference length,  $L_R = 2\,500$  km

$B_R$ : block allowance ratio,  $B_R = (0 < B_R \leq 1)$ ;

TABLE 1a

**Parameters for the objectives for degradation of performance due to interference for intermediate countries according to ITU-T Recommendation G.828**

| Parameter | Bit rate (kbit/s) | $L_{\min} \leq L_{\text{link}} \leq 1\,000$ km |       | $1\,000 \text{ km} < L_{\text{link}}$ |                               |
|-----------|-------------------|------------------------------------------------|-------|---------------------------------------|-------------------------------|
|           |                   | $B_1$                                          | $C_1$ | $B_2$                                 | $C_2$                         |
| ESR       | 1 664             | $5 \times 10^{-5} (1 + B_R)$                   | 0     | $5 \times 10^{-5}$                    | $2 \times 10^{-5} \times B_R$ |
| ESR       | 2 240             | $5 \times 10^{-5} (1 + B_R)$                   | 0     | $5 \times 10^{-5}$                    | $2 \times 10^{-5} \times B_R$ |
| ESR       | 6 848             | $5 \times 10^{-5} (1 + B_R)$                   | 0     | $5 \times 10^{-5}$                    | $2 \times 10^{-5} \times B_R$ |
| ESR       | 48 960            | $1 \times 10^{-4} (1 + B_R)$                   | 0     | $1 \times 10^{-4}$                    | $4 \times 10^{-5} \times B_R$ |
| ESR       | 150 336           | $2 \times 10^{-4} (1 + B_R)$                   | 0     | $2 \times 10^{-4}$                    | $8 \times 10^{-5} \times B_R$ |
| SESR      | 1 664-150 336     | $1 \times 10^{-5} (1 + B_R)$                   | 0     | $1 \times 10^{-5}$                    | $4 \times 10^{-6} \times B_R$ |
| BBER      | 1 664-48 960      | $2.5 \times 10^{-7} (1 + B_R)$                 | 0     | $2.5 \times 10^{-7}$                  | $1 \times 10^{-7} \times B_R$ |
| BBER      | 150 336           | $5 \times 10^{-7} (1 + B_R)$                   | 0     | $5 \times 10^{-7}$                    | $2 \times 10^{-7} \times B_R$ |

TABLE 1b

**Parameters for the objectives for degradation of performance due to interference for terminating countries according to ITU-T Recommendation G.828**

| Parameter | Bit rate (kbit/s) | $L_{\min} \leq L_{\text{link}} \leq 500$ km |       | $500 \text{ km} < L_{\text{link}}$ |                               |
|-----------|-------------------|---------------------------------------------|-------|------------------------------------|-------------------------------|
|           |                   | $B_3$                                       | $C_3$ | $B_4$                              | $C_4$                         |
| ESR       | 1 664             | $5 \times 10^{-5} (1 + B_R)$                | 0     | $5 \times 10^{-5}$                 | $1 \times 10^{-5} \times B_R$ |
| ESR       | 2 240             | $5 \times 10^{-5} (1 + B_R)$                | 0     | $5 \times 10^{-5}$                 | $1 \times 10^{-5} \times B_R$ |
| ESR       | 6 848             | $5 \times 10^{-5} (1 + B_R)$                | 0     | $5 \times 10^{-5}$                 | $1 \times 10^{-5} \times B_R$ |
| ESR       | 48 960            | $1 \times 10^{-4} (1 + B_R)$                | 0     | $1 \times 10^{-4}$                 | $2 \times 10^{-5} \times B_R$ |
| ESR       | 150 336           | $2 \times 10^{-4} (1 + B_R)$                | 0     | $2 \times 10^{-4}$                 | $4 \times 10^{-5} \times B_R$ |
| SESR      | 1 664-150 336     | $1 \times 10^{-5} (1 + B_R)$                | 0     | $1 \times 10^{-5}$                 | $2 \times 10^{-6} \times B_R$ |
| BBER      | 1 664-48 960      | $2.5 \times 10^{-7} (1 + B_R)$              | 0     | $2.5 \times 10^{-7}$               | $5 \times 10^{-8} \times B_R$ |
| BBER      | 150 336           | $5 \times 10^{-7} (1 + B_R)$                | 0     | $5 \times 10^{-7}$                 | $1 \times 10^{-7} \times B_R$ |

TABLE 2a

**Parameters for the objectives for degradation of performance due to interference for terminating countries according to ITU-T Recommendation G.826**

| Parameter         | Bit rate (Mbit/s) | $L_{min} \leq L_{link} \leq 1\,000$ km |             | $1\,000$ km $< L_{link}$ |                                 |
|-------------------|-------------------|----------------------------------------|-------------|--------------------------|---------------------------------|
|                   |                   | $B_3$                                  | $C_3$       | $B_4$                    | $C_4$                           |
| ESR               | 1.5-5             | $2 \times 10^{-4} (1 + B_R)$           | 0           | $2 \times 10^{-4}$       | $8 \times 10^{-5} \times B_R$   |
| ESR               | > 5-15            | $2.5 \times 10^{-4} (1 + B_R)$         | 0           | $2.5 \times 10^{-4}$     | $1 \times 10^{-4} \times B_R$   |
| ESR               | > 15-55           | $3.75 \times 10^{-4} (1 + B_R)$        | 0           | $3.75 \times 10^{-4}$    | $1.5 \times 10^{-4} \times B_R$ |
| ESR               | > 55-160          | $8 \times 10^{-4} (1 + B_R)$           | 0           | $8 \times 10^{-4}$       | $3.2 \times 10^{-4} \times B_R$ |
| ESR               | > 160-3 500       | Under study                            | Under study | Under study              | Under study                     |
| SESR              | 1.5-3 500         | $1 \times 10^{-5} (1 + B_R)$           | 0           | $1 \times 10^{-5}$       | $4 \times 10^{-6} \times B_R$   |
| BBER (see Note 6) | 1.5-3 500         | $1 \times 10^{-6} (1 + B_R)$           | 0           | $1 \times 10^{-6}$       | $4 \times 10^{-7} \times B_R$   |

TABLE 2b

**Parameters for the objectives for degradation of performance due to interference for terminating countries according to ITU-T Recommendation G.826**

| Parameter         | Bit rate (Mbit/s) | $L_{min} \leq L_{link} \leq 500$ km |             | $500$ km $< L_{link}$ |                                 |
|-------------------|-------------------|-------------------------------------|-------------|-----------------------|---------------------------------|
|                   |                   | $B_3$                               | $C_3$       | $B_4$                 | $C_4$                           |
| ESR               | 1.5-5             | $2 \times 10^{-4} (1 + B_R)$        | 0           | $2 \times 10^{-4}$    | $4 \times 10^{-5} \times B_R$   |
| ESR               | > 5-15            | $2.5 \times 10^{-4} (1 + B_R)$      | 0           | $2.5 \times 10^{-4}$  | $5 \times 10^{-5} \times B_R$   |
| ESR               | > 15-55           | $3.75 \times 10^{-4} (1 + B_R)$     | 0           | $3.75 \times 10^{-4}$ | $7.5 \times 10^{-5} \times B_R$ |
| ESR               | > 55-160          | $8 \times 10^{-4} (1 + B_R)$        | 0           | $8 \times 10^{-4}$    | $1.6 \times 10^{-4} \times B_R$ |
| ESR               | > 160-3 500       | Under study                         | Under study | Under study           | Under study                     |
| SESR              | 1.5-3 500         | $1 \times 10^{-5} (1 + B_R)$        | 0           | $1 \times 10^{-5}$    | $2 \times 10^{-6} \times B_R$   |
| BBER (see Note 6) | 1.5-3 500         | $1 \times 10^{-6} (1 + B_R)$        | 0           | $1 \times 10^{-6}$    | $2 \times 10^{-7} \times B_R$   |

2 that, in each direction of any real digital FWS link of length  $L_{link}$  belonging to the long-haul inter-exchange network section of the national portion of an HRP 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 in any month, the provisional limits given in Table 3a for SDH systems designed according to ITU-T Recommendation G.828 and in Table 3b for other systems designed according to ITU-T Recommendation G.826 (see Notes 1, 2, 3, 4, 10 and 11);