RECOMMENDATION ITU-R F.1092-1

ERROR PERFORMANCE OBJECTIVES FOR CONSTANT BIT RATE DIGITAL PATH
AT OR ABOVE THE PRIMARY RATE CARRIED BY DIGITAL RADIO-RELAY SYSTEMS
WHICH MAY FORM PART OF THE INTERNATIONAL PORTION OF A 27 500 km
HYPOTHETICAL REFERENCE PATH

(Question ITU-R 134/9)

(1994-1997)

The ITU Radiocommunication Assembly,

considering

a)   that the ITU-T has specified the error performance parameters and objectives for international constant bit rate digital paths at or above the primary rate (see ITU-T Recommendation G.826);

b)   that digital radio-relay systems play an important role in a 27 500 km hypothetical reference path (HRP) as defined in ITU-T Recommendation G.826;

c)   that it is necessary for the performance of radio-relay systems to be compliant with the end-to-end performance objectives specified in ITU-T Recommendation G.826;

d)   that digital radio-relay systems may be used in intermediate and terminating countries of an HRP;

e)   that for the international portion of a constant bit rate digital path at or above the primary rate ITU-T Recommendation G.826 specifies both distance-based as well as country-based allocations for the error performance objectives,

recommends

1   that future and, whenever practical, existing digital radio-relay systems at or above the primary rate should comply with error performance objectives aligned to ITU-T Recommendation G.826;

2   that error performance objectives applicable to radio-relay paths forming part of the international portion of a 27 500 km HRP should be based both on distance-based and on country-based allocations as specified in ITU-T Recommendation G.826;

3   that for each direction of a radio-relay path forming part of the international portion of a constant bit rate path at or above the primary rate, which extends:

–   from country border to country border for an intermediate country, or

–   from the international gateway (IG) to country border for a terminating country,

the allocated error performance objectives shall be composed of:

–   a distance based allocation of 1%/500 km, and

–   at least part of or all of the country based allocation of:

    –   2% per intermediate country, or

    –   1% per terminating country,

of the total allocations for the 27 500 km HRP;

4   that the following use is made of the country-based allocation:

–   a constant value (up to the maximum value as given in § 3) shall be applied to radio-relay paths with a length L greater than:

 –   a reference length, L_{ref} for intermediate countries

 –   half of the reference length, L_{ref} for terminating countries

–   a fraction of the constant value, proportional to length L, shall be applied to radio-relay paths with a length L equal to or less than:

 –   a reference length, L_{ref} for intermediate countries

 –   half of the reference length, L_{ref} for terminating countries.

The value of the reference length L_{ref} is provisionally taken to be 1 000 km (see Note 8). A minimum value L_{min} for the length L is under study;

5   that for the error performance objectives applicable to each direction of a radio-relay path of length L in the international portion of a constant bit rate path at or above the primary rate the values in Table 1 for the error performance objectives shall apply.

TABLE 1

Rate (Mbit/s)	1.5 to 5	> 5 to 15	> 15 to 55	> 55 to 160	> 160 to 3 500
Errored second ratio (ESR)	$0.04 \times (F_L + B_L)$	$0.05 \times (F_L + B_L)$	$0.075 \times (F_L + B_L)$	$0.16 \times (F_L + B_L)$	See Note 5
Severely errored seconds ratio	$0.002 \times (F_L + B_L)$				
Background block error ratio (BBER)	$2 \times 10^{-4} \times (F_L + B_L)$ (see Note 9)	$2 \times 10^{-4} \times (F_L + B_L)$			

distance allocation factor $F_L = 0.01 \times L / 500$ L (km) (see Note 6)

block allowance factor, B_L

  –   for intermediate countries $B_L = B_R \times 0.02 \times (L / L_{ref})$ for $L_{min} < L \le L_{ref}$
                                                              $= B_R \times 0.02$ for $L > L_{ref}$

  –   for terminating countries $B_L = B_R \times 0.01 \times (L / L_{ref}/2)$ for $L_{min} < L \le L_{ref}/2$
                                                              $= B_R \times 0.01$ for $L > L_{ref}/2$

block allowance ratio, B_R $(0 < B_R \le 1)$

reference length, L_{ref} $L_{ref} = 1 000$ km (provisionally).

NOTE 1 – The maximum values for the block allowance B_L (for $B_R = 1$) are based on the apportionment principles given in ITU-T Recommendation G.826. Further studies are required to determine what portion of the total value of the block allowance given in ITU-T Recommendation G.826 can be used for transmission components. Administrations may tentatively decide to use the block allowance up to the total value ($B_R = 1$)

NOTE 2 – The effects of interference and all other sources of performance degradations are included in the values in Table 1.

NOTE 3 – The error performance objectives apply only when the system is considered to be available. The entry and exit criteria into and from the unavailable state are defined in Annex 1 of ITU-T Recommendation G.826.

NOTE 4 – According to ITU-T 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 5 – The ESR objective for higher bit rate paths is still under study.

NOTE 6 – Only the overall length of the international path passing through one or more countries should be rounded up to the nearest multiple of 500 km. This should be taken into account by administrations when they establish the objectives for their countries.

NOTE 7 – The allocation principle chosen for the country based block allowance in radio-relay paths with a length below the reference length L_{ref} and above the minimum length L_{min} ($L_{min} < L < L_{ref}$) giving an overall allocation proportional to length L will allow direct derivation of error performance objectives for real radio-relay links by subdivision according to the real hop length. It is intended to specify error performance objectives for real radio-relay links in a separate Recommendation.

NOTE 8 – The provisional value of the reference length L_{ref} was chosen to cover the country border to country border distances of the majority of countries. The value of reference length for the terminating countries being half that of the full reference length, L_{ref}, for intermediate countries, is based on the assumption that the distance from country border to international gateway is, on average for most countries, half of the distance from country border to country border. This is considered to be consistent with definitions in ITU-T Recommendation G.826.

NOTE 9 – For systems designed prior to 1996, the BBER objective is 3×10^{-4}.