RECOMMENDATION ITU-R F.395-2[*,**]

Noise in the radio portion of circuits to be established over real radio-relay links for FDM telephony[***]

(1959-1963-1966-1978)

The ITU Radiocommunication Assembly,

considering

a) that provisional maximum values for the noise in hypothetical reference circuits are given in Recommendation ITU-R F.393 as a guide to designers of equipment;

b) that real circuits sometimes differ in composition from the hypothetical reference circuit (Recommendation ITU-R F.392) (see Fig. 1);

c) that the hypothetical reference circuit shows a single 2 500 km telephone circuit and that circuits carried over real links will share many of the component baseband sections with other telephone circuits of lesser length. While the performance requirements of these shorter circuits could safely be relaxed to ease the planning of links, the longer international circuits must not be allowed to suffer the full cumulative effect of any relaxations which are permissible for the shorter circuits;

d) that, in some circumstances, a planned real link may comprise a larger number of baseband points than is envisaged in the hypothetical reference circuit;

e) that equipment, which has been designed to satisfy the design objectives (Recommendation ITU-R F.393) for the hypothetical reference circuit (Recommendation ITU-R F.392), cannot be expected to give the same standard of performance when used in a circuit established over real links, the actual composition of which differs from that of the hypothetical reference circuit or its homogeneous section;

f) that, therefore, it is necessary to give planning objectives for noise as a guide in the planning of links forming part of international circuits;

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* This Recommendation applies only to line-of-sight radio-relay systems suitable for use in the international telephone network.

** Radiocommunication Study Group 9 made editorial amendments to this Recommendation in 2001 in accordance with Resolution ITU-R 44.

*** The term "circuit" is understood to refer to a circuit as defined in No. 02.06 of the ITU *List of Essential Telecommunication Terms*, Second Impression, Geneva, 1961, Part I. The calculations are performed between the points R' and R (see Recommendation ITU-R F.380) of each radio section which enters into the circuit under consideration.

g) that noise contributions arise from several sources; some of these contributions depend on the number of baseband equipments and others on the law of addition for intermodulation noise in a long chain of repeaters or in permanently connected group links (defined in ITU-T Recommendation G.211), and that these contributions differ in different parts of the baseband-frequency spectrum,

recommends

1 that, in circuits established over real links which do not differ appreciably from the hypothetical reference circuit, the psophometrically weighted* noise power at a point of zero relative level in the telephone channels of frequency-division multiplex radio-relay systems of length L, where L is between 280 and 2 500 km, should not exceed:

1.1 3 L pW one-minute mean power for more than 20% of any month;

1.2 47 500 pW one-minute mean power for more than $(L/2\,500) \times 0.1\%$ of any month; it is recognized that the performance achieved for very short periods of time is very difficult to measure precisely and that in a circuit carried over a real link, it may, after installation, differ from the planning objective;

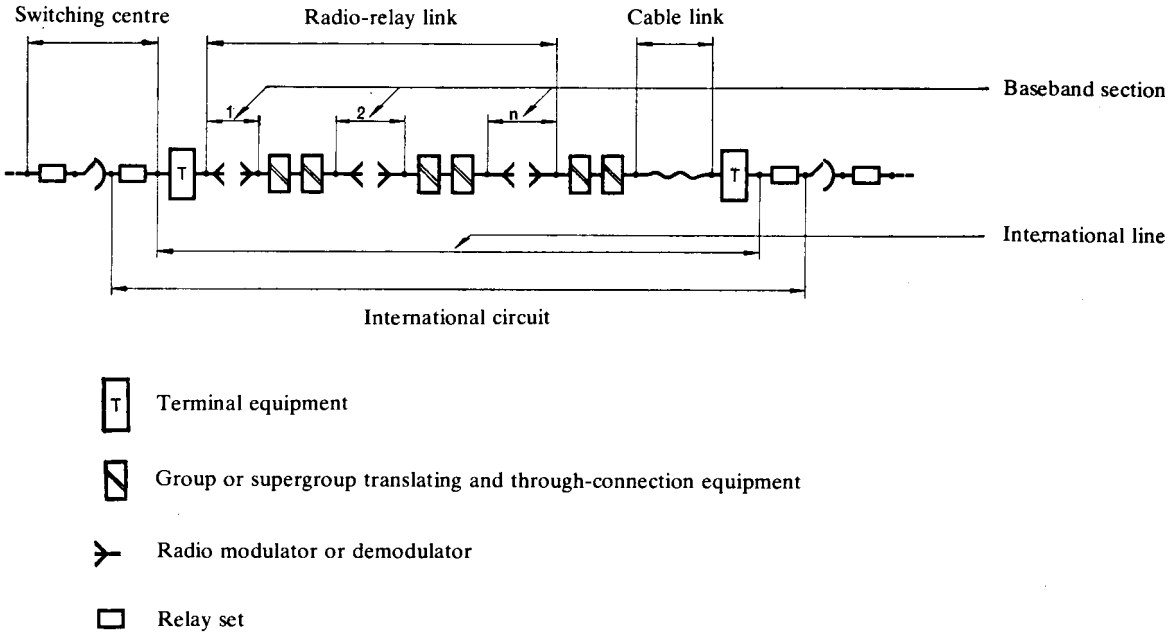

FIGURE 1 – *Constitution of an international circuit comprising real links on radio-relay and cable systems*

(The Figure is intended to illustrate the terms used in this Recommendation)

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* The level of uniform-spectrum noise power in a 3.1 kHz band must be reduced by 2.5 dB to obtain the psophometrically weighted noise power.

2 that circuits to be established over real links, the composition of which, for planning reasons, differs substantially from the hypothetical reference circuit, should be planned in such a way that the psophometrically weighted noise power at a point of zero relative level in a telephone channel of length L, where L is between 50 and 2 500 km, carried in one or more baseband sections of frequency-division multiplex radio links, should not exceed:

2.1 for 50 km ≤ L ≤ 840 km:

2.1.1 3 L pW + 200 pW one-minute mean power for more than 20% of any month,

2.1.2 47 500 pW one-minute mean power for more than (280/2 500) × 0.1% of any month when L is less than 280 km, or more than (L/2 500) × 0.1% of any month when L is greater than 280 km;

2.2 for 840 km < L ≤ 1 670 km:

2.2.1 3 L pW + 400 pW one-minute mean power for more than 20% of any month,

2.2.2 47 500 pW one-minute mean power for more than (L/2 500) × 0.1% of any month;

2.3 for 1 670 km < L ≤ 2 500 km:

2.3.1 3 L pW + 600 pW one-minute mean power for more than 20% of any month,

2.3.2 47 500 pW one-minute mean power for more than (L/2 500) × 0.1% of any month;

3 that the following Notes should be regarded as part of the Recommendation:

NOTE 1 – Noise in the frequency-division multiplex equipment is excluded. On a 2 500 km hypothetical reference circuit the ITU-T allows 2 500 pW mean value for this noise in any hour.

NOTE 2 – It is assumed that noise surges and clicks from power supply systems and from switching apparatus are reduced to negligible proportions and will not be taken into account when calculating the noise power.

NOTE 3 – It is permissible to assume that noise coming from individual baseband sections is power-additive, but only if the baseband spectra of adjacent baseband sections are substantially different.

NOTE 4 – It will be assumed that, during the busy hour, the multiplex signal can be represented by a uniform-spectrum signal, the mean power absolute level of which at a point of zero relative level, is equal to (−15 + 10 log N) dBm for 240 channels or more, and (−1 + 4 log N) dBm for numbers of channels between 12 and 240 (this value is provisional for systems the capacity of which is less than 60 channels), N being the number of channels for which the radio-relay system is designed.