RECOMMENDATION ITU-R F.397-3*

Allowable noise power in the hypothetical reference circuit of trans-horizon radio-relay systems for telephony using frequency-division multiplex

(1963-1966-1970-1978)

The ITU Radiocommunication Assembly,

considering

a) that a hypothetical reference circuit for trans-horizon radio-relay systems is established in Recommendation ITU-R F.396, as a guide to the designers of systems in use in international telecommunication networks;

b) that wherever practicable, trans-horizon radio-relay systems should meet the same performance regarding noise as recommended for line-of-sight systems in Recommendation ITU-R F.393;

c) that, nevertheless, the achievement of this desirable objective would sometimes result in a very high, even prohibitive cost or a power that is impractically high, or such that is likely to result in harmful interference;

d) that this might well retard desirable extensions of the telephone network,

recommends

1 that, from the point of view of performance, trans-horizon radio-relay systems be divided into two classes;

2 that, when a trans-horizon system is intended to operate between two points for which other transmission systems could be used without excessive difficulty, e.g. line-of-sight radio-relay, underground cable, etc., the hypothetical reference circuit should be established in accordance with Recommendation ITU-R F.396. The noise power at the end of this hypothetical reference circuit will be calculated by statistical combination of the noise power in each of its radio sections. The statistical distribution curve of the one-minute mean psophometric power, during the most unfavourable month, should then pass below the points defined in Recommendation ITU-R F.393, § 1.1 and 1.2;

3 that, if a trans-horizon system is to be used between points, for which other transmission systems cannot be used without excessive difficulty, and if the condition laid down in Recommendation ITU-R F.393 cannot be met without excessive difficulty, the following conditions will apply, once the statistical noise power distribution at the end of the hypothetical reference circuit has been calculated by the method set out in § 2:

3.1 the mean psophometric power during one minute must not exceed 25 000 pW0p for more than 20% of any month;

3.2 the mean psophometric power during one minute must not exceed 63 000 pW0p for more than 0.5% of any month;

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

4 that for the two classes of system defined above, the unweighted noise power (with an integration time of 5 ms) must meet Recommendation ITU-R F.393, § 1.3, but with the percentage of the most unfavourable month changed to 0.05%, for the systems referred to in § 3 of the present Recommendation.

NOTE 1 – All the values given above include the intermodulation noise in the radio part of the system. On the other hand, noise within the frequency-division multiplex equipment is excluded. On a hypothetical reference circuit 2 500 km long, the ITU-T authorizes a mean value of 2 500 pW0p for this latter noise.

NOTE 2 – The method of statistical combination referred to in § 2 is described in detail in the paper "Thermal noise in multi-section radio links" by B. B. Jacobsen, IEE Monograph No. 262 R (1957).

NOTE 3 – The method of calculation of mean noise power in a telephone channel from the distribution of the received signal amplitude in each receiver is given in "Puissance moyenne de bruit dans les faisceaux hertziens transhorizon à modulation de fréquence" by L. Boithias and J. Battesti, *Annales des télécommunications* (May-June, 1963).

NOTE 4 – Systems which comply only with the terms of § 3 and 4, will be excluded from the main international and intercontinental routes; consequently in a world-wide connection, a maximum of one or two circuits of medium length will be encountered, which comply only with the terms of § 4 with a percentage of 0.05%; as far as telephone signalling is concerned, this state of affairs is acceptable. Under these conditions, the transmission of voice-frequency telegraphy is also satisfactory.