

RECOMMENDATION ITU-R F.555-1

**PERMISSIBLE NOISE IN THE HYPOTHETICAL REFERENCE CIRCUIT
OF RADIO-RELAY SYSTEMS FOR TELEVISION***

(1978-1997)

The ITU Radiocommunication Assembly,

considering

- a) that the hypothetical reference circuit defined in ITU-T Recommendation J.61 (see Note 6) is intended as a guide to designers and constructors of actual systems;
- b) that the total noise power in a radio-relay system is dependent on the one hand upon a number of factors concerned with equipment design, and on the other hand upon the path attenuation and the variation of path attenuation with time, which are in turn dependent upon factors such as the spacing of stations and the nature of the intervening terrain;
- c) that the total noise power in the hypothetical reference circuit should not be such as would appreciably affect the transmission of television signals;
- d) that the minimum signal-to-noise ratios which should be achieved are stated in § 3.2.1 of Part D of ITU-T Recommendation J.61; however, certain difficulties arise in the use of a noise objective relating to 1% of a month and it is therefore desirable to express the noise objective in terms of other percentages of a month;
- e) that, on radio-relay systems, it may be necessary to accept slightly lower signal-to-noise ratios for very small percentages of time;
- f) that, on radio-relay systems, it is possible to provide a better signal-to-noise ratio for the majority of the time than is required by ITU-T Recommendation J.61;
- g) that the relative distribution with time of noise in radio-relay systems for television or frequency-division multiplex telephony, will be similar and it is appropriate therefore to employ similar methods for specifying the noise performance;
- h) that a simple method is required for defining the noise contributions of the different sections of the hypothetical reference circuit;
- j) that to take account of the daily and seasonal variations in radio propagation conditions the period of time considered should be long, e.g. a month;
- k) that in ITU-T Recommendation J.61, the use of instruments with an effective time constant or integrating time of 1 s, is recommended and administrations are asked to make measurements with instruments having this time constant,

recommends

1 that in the 2 500 km hypothetical reference circuit for the transmission of television, the ratio (dB), of the nominal amplitude of the luminance signal to the r.m.s. amplitude of the weighted noise, measured under the conditions given in Parts B and C of ITU-T Recommendation J.61, should not fall below the following values:

1.1 57 dB for more than 20% of a month,

1.2 45 dB for more than 0.1% of a month;

2 that, in a part of hypothetical reference circuit consisting of one or two of the three identical homogeneous sections defined by ITU-T Recommendation J.61, Part A, the mean noise power which should not be exceeded for more than 20% of a month shall be considered to be proportional to the number of homogeneous sections involved (see Note 3);

* The Recommendation relates only to "line-of-sight" radio-relay systems. For a definition of the characteristics of television systems see Recommendation ITU-R BT.470.

3 that, in a part of a hypothetical reference circuit consisting of one or two of the three identical homogeneous sections defined by ITU-T Recommendation J.61, Part A, the small percentages of a month, during which the signal-to-noise ratio may fall below the values indicated in § 1.2, shall be regarded as proportional to the number of homogeneous sections involved (see Note 4).

NOTE 1 – The requirements of the Recommendation are unlikely to be met unless the line-of-sight radio-relay system has adequate clearance over intervening terrain.

NOTE 2 – Based on the information obtained from measurements, with a time constant of one minute, of the total noise (thermal noise and cross-talk) of telephone circuits, it is likely that signal-to-thermal noise ratio for 20% of one month and the signal-to-thermal noise ratio for 0.1% of one month will differ by about 12 dB at the most; the signal-to-thermal noise ratio obtained during at least 99% of one month, mentioned by the television specialists, is likely to be lower by about 4 dB than the signal-to-noise ratio for 20% of a month; this explains the difference between the values 57 dB and 45 dB, see § 1.1 and 1.2, these values being such, that the signal-to-noise ratio obtained during at least 99% of a month will be 53 dB, which is specified in ITU-T Recommendation J.62 (see Note 6).

NOTE 3 – The law of proportionality given in § 2, is based on the assumption that noise due to fading can be neglected for all but 20% of a month. Therefore, the value of 57 dB given in § 1.1 can be regarded as the objective for the signal-to-weighted noise ratio in the absence of fading.

NOTE 4 – The law of proportionality given in § 3, is based on the assumption that individual fades which are of such magnitude that they occur for only very small percentages of time, and originate in different sections of a complete circuit, do not occur simultaneously. This assumption may not always be completely justifiable, but the error is small, and the approximation is regarded as acceptable.

NOTE 5 – This Recommendation relates to the hypothetical reference circuit. The figures given are design objectives, and it is not intended that they should be quoted in specifications of equipment or used for acceptance tests.

NOTE 6 – ITU-T Recommendations J.61 and J.62 are identical with the ex-CCIR Recommendations 567-3 and 568, respectively, developed by the ex-CMTT and are published in Volume XII of the XVIIth CCIR Plenary Assembly (Düsseldorf, 1990).
