

RECOMMENDATION ITU-R F.1331*

**PERFORMANCE DEGRADATION DUE TO INTERFERENCE FROM OTHER
SERVICES SHARING THE SAME FREQUENCY BANDS ON A PRIMARY BASIS WITH
ANALOGUE RADIO-RELAY SYSTEMS FOR TELEVISION**

(Question ITU-R 127/9)

(1997)

The ITU Radiocommunication Assembly,

considering

- a) that systems in the fixed service share many frequency bands on a primary basis with other services;
- b) that there exist many analogue radio-relay systems for television operating in these shared frequency bands;
- c) that permissible noise in the hypothetical reference circuit of analogue radio-relay systems for television is specified in Recommendation ITU-R F.555;
- d) that in certain sharing situations, it may be necessary to assess interference from other services into analogue radio-relay systems for television and that, therefore, it is necessary to specify the maximum allowable degradation in performance of analogue radio-relay systems for television in compliance with Recommendation ITU-R F.555 due to interference from other services,

recommends

1 that in the 2 500 km hypothetical reference circuit for the transmission of analogue television, the ratio expressed in decibels, of the nominal amplitude of the luminance signal to the r.m.s. amplitude of the weighted noise due to interference from other services sharing the same frequency bands on a primary basis and measured under the conditions given in Parts B and C of ITU-T Recommendation J.61 (see Note 1), should not fall below the following values:

1.1 67 dB for more than 20% of a month;

1.2 45 dB for more than 0.01% of a month;

2 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 mean noise power due to interference 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;

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-interference ratio may fall below the value indicated in § 1.2 of *recommends* 1, shall be regarded as proportional to the number of homogeneous sections involved;

4 that in a real radio-relay link for television with length, L (km), shorter than one 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-interference ratio may fall below the value indicated in § 1.2 of *recommends* 1, should not exceed $\sqrt{(L/833)} \times 0.00333\%$;

5 that in the case of frequency bands shared with space services on a primary basis, the limits on allowable degradation in performance given above are those resulting from the aggregate of the emissions of earth stations and space stations, including associated telemetering, telecommand and tracking transmitters of the space services;

* This Recommendation should be brought to the attention of Radiocommunication Study Groups 4, 7, 8 and 11, and Telecommunication Standardization Study Group 9.

6 that Annex 1 should be referred to for weighting of interference noise in the transmission of television by analogue radio-relay systems.

NOTE 1 – ITU-T Recommendation J.61 is identical with the ex-CCIR Recommendation 567-3 developed by the ex-CMTT and is published in Volume XII of the XVIIth CCIR Plenary Assembly (Düsseldorf, 1990).

NOTE 2 – This Recommendation is applicable to analogue radio-relay systems for television which are designed to comply with the permissible noise objectives specified in Recommendation ITU-R F.555.

NOTE 3 – In the case of interference from non-GSO space stations in the mobile-satellite services operating in frequency bands below 3 GHz, the methods for coordination given in Recommendation ITU-R IS.1143 should be applied if one of the above *recommends* 1 to 4 is not met.

ANNEX 1

Weighting of interference noise in the transmission of television by analogue radio-relay systems

1 Information in ITU-T Recommendation J.61

According to ITU-T Recommendation J.61, the insertion loss A of the unified weighting network for random noise in the transmission of television is given by:

$$A = 10 \log \frac{1 + \left[\left(1 + \frac{1}{a} \right) \omega \tau \right]^2}{1 + \left[\frac{1}{a} \omega \tau \right]^2} \quad \text{dB}$$

where:

$$\tau = 245 \text{ ns}$$

$$a = 4.5.$$

Noise weighting factors in a 5 MHz band are as follows:

Flat noise: 7.4 dB

Triangular noise: 12.2 dB.

2 Weighting factors in the transmission of television by analogue radio-relay systems

Generally, analogue radio-relay systems employ pre-emphasis for transmission of television. In such case, weighting factors are different from those in § 1 above, where pre-emphasis effect is not considered.

According to Recommendation ITU-R F.405-1 (published in Volume IX, Düsseldorf, 1990), the preferred pre-emphasis characteristic for television is given by the following expression:

$$\text{relative deviation (dB)} = 10 \log [(1 + C f^2) / (1 + B f^2)] - A$$

where:

A : attenuation (dB) at a low frequency (< 0.01 MHz);

B and C : constants which determine the shape of the pre-emphasis characteristic

f : frequency (MHz).

The preferred values of *A*, *B* and *C* for 525- and 625-line systems are shown in Table 1.

TABLE 1
Values of coefficients of pre-emphasis characteristics

| Number of lines | 525 | 625 |
|----------------------------|--------|--------|
| <i>A</i> | 10.0 | 11.0 |
| <i>B</i> | 1.306 | 0.4083 |
| <i>C</i> | 28.58 | 10.21 |
| Cross-over frequency (MHz) | 0.7616 | 1.512 |

At the receiving end of a radio-relay system, de-emphasis circuit is employed to recover the original television signal.

Noise weighting factors in a 5 MHz band taking account of pre-emphasis effect are as follows (flat noise and triangular noise mean those before de-emphasis):

For 525-line system:

Flat noise: 3.0 dB

Triangular noise: 11.7 dB.

For 625-line system:

Flat noise: 2.9 dB

Triangular noise: 11.2 dB.

For other types of interference noise, the weighting factors should be evaluated in each case on the basis of the noise weighting curve and the pre-emphasis characteristics.
