INTERNATIONAL TELECOMMUNICATION UNION

ITU-T G.221

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

INTERNATIONAL ANALOGUE CARRIER SYSTEMS

GENERAL CHARACTERISTICS COMMON TO ALL ANALOGUE CARRIER-TRANSMISSION SYSTEMS

OVERALL RECOMMENDATIONS RELATING TO CARRIER-TRANSMISSION SYSTEMS

ITU-T Recommendation G.221

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation G.221 was published in Fascicle III.2 of the *Blue Book*. This file is an extract from the *Blue Book.* While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Recommendation G.221

OVERALL RECOMMENDATIONS RELATING TO CARRIER-TRANSMISSION SYSTEMS

(amended at Geneva, 1972 and 1980)

1 Characteristics of complete circuits

The characteristics of complete circuits, measured between audio-frequency terminals (overall loss in terminal service and in transit service, frequency bands effectively transmitted and attenuation distortion, variation of overall loss with time, phase distortion, stability, crosstalk, etc.) should meet the general conditions for 4-wire telephone circuits indicated in Section 1 of the Series G Recommendations.

2 Linear crosstalk

2.1 *Overall requirements*

The requirements as regards crosstalk ratio between circuits in the case of telephony are the subjects of Recommendation G.134 [1] and the Recommendation cited in [2]; for go-to-return crosstalk the Recommendation cited in [3] applies.

As carrier transmission systems are also used for setting up sound-programme circuits, the relevant requirements given in the Series J Recommendations should be taken into consideration. Recommendation J.18 [4] gives general guidance on how the higher crosstalk ratios appropriate to sound-programme transmissions are achieved in a telephone network.

In any case the near-end crosstalk ratio between the two directions of transmission at all frequencies used for the regulating and measuring pilots on carrier systems should be not less than 40 dB.

2.2 *Intelligible crosstalk caused by intermodulation with a signal which is a multiple of 4 kHz*

Intelligible crosstalk may arise between circuits by way of intermodulation with a signal which is a multiple of 4 kHz, e.g. a line-regulating pilot. A design objective is that the intelligible crosstalk ratio in a single homogeneous section of the appropriate hypothetical reference circuit should be not less than 74 dB.

3 Noise transmitted between interconnected systems

A failure or malfunction in a chain of repeaters may lead to large values of noise in one or several signal bands being transmitted by that chain. It is known that such high noise levels are generally caused by the operation of particular types of automatic line regulators. Given that such high noise levels may be transmitted to other chain links, and may overload those to which they are interconnected, it is desirable and recommended that care should be taken in the future in order to avoid such troubles.

Possible methods of dealing with this problem are described in Supplement No. 4 [5].

In respect of radio-relay links, it will be the concern of CCIR to enumerate suitable precautions.

4 Single tone interference

The Recommendation cited in [6] indicates a limit for the single tone interference level in telephone circuits. Depending on the origin of such interferences, wide-band services and non-telephony services (e.g. soundprogramme circuits, etc.) may also be affected. This should be considered when defining limits for transmission systems.

Practical experience shows that broadcasting transmitters are the main external source of single tone interference. In order to be usable under normal environmental working conditions, the carrier transmission equipment should be designed in such a way that it allows a certain electromagnetic field strength in its vicinity, caused by transmitters. A figure of 0.5 to 0.7 V/m within a station should be tolerated by equipment which is installed as normally specified and working under normal conditions. Where higher field strengths are known to be expected, suitable screening measures in the building may have to be adopted. Special attention should also be given to the stating cabling including power distribution and to the wiring of distribution racks to prevent interferences from entering the equipment via these points.

Note - The Supplement No. 27 contains some information on possible measures to reduce effects from interference and on measuring methods concerning interference.

5 Total interference power

In addition to the above limitation of the single tone interference, it should be ascertained that the total interference power in each telephone channel within the band 300-3400 Hz, for each individual case of interference, should be lower than -65 dBm0.

References

[1] CCITT Recommendation *Linear crosstalk,* Vol. III, Rec. G.134.

[2] CCITT Recommendation *General performance objectives applicable to all modern international circuits and national extension circuits,* Vol. III, Rec. G.151, § 4.1.

[3] *Ibid., §* 4.2.

[4] CCITT Recommendation *Crosstalk in sound-programme circuits set up on carrier systems,* Vol. III, Rec. J. 18.

[5] *Certain methods of avoiding the transmission of excessive noise between interconnected systems,* Green Book, Vo1. III-2, Supplement No. 4, ITU, Geneva, 1973.

[6] CCITT Recommendation *General performance objectives applicable to all modern international circuits and national extension circuits,* Vol. III, Rec. G. 151, § 8.