INTERNATIONAL TELECOMMUNICATION UNION

ITU-T G.135

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

TRANSMISSION SYSTEMS AND MEDIA

GENERAL CHARACTERISTICS OF THE 4-WIRE CHAIN FORMED BY THE INTERNATIONAL CIRCUITS AND NATIONAL EXTENSION CIRCUITS

ERROR ON THE RECONSTITUTED FREQUENCY

ITU-T Recommendation G.135

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation G.135 was published in Fascicle III.1 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.135

ERROR ON THE RECONSTITUTED FREQUENCY

(Mar del Plata, 1968)

As the channels of any international telephone circuit should be suitable for voice-frequency telegraphy, the network performance objective for the accuracy of the virtual carrier frequencies should be such that the difference between an audiofrequency applied to one end of the circuit and the frequency received at the other end should not exceed 2 Hz, even when there are intermediate modulating and demodulating processes.

To attain this objective, the CCITT recommends that the channel and group carrier frequencies of the various stages should have the accuracies specified in the corresponding clauses of Recommendation G.225 [l].

Experience shows that, if a proper check is kept on the operation of oscillators designed to these specifications, the difference between the frequency applied at the origin of a telephone channel and the reconstituted frequency at the other end hardly ever exceeds 2 Hz if the channel has the same composition as the 2500-km hypothetical reference circuit for the system concerned.

Calculations indicate that, if these recommendations are followed, in the 4-wire chain forming part of the hypothetical reference connection defined in Figure 1/G.103[1)] there is about 1 % probability that the frequency difference between the beginning and the end of the connection will exceed 3 Hz and less than 0.1% probability that it will exceed 4 Hz.

The CCITT notes that in mixed circuits having several digital sections the requirements concerning frequency error are met more easily since digital systems do not change the frequency of an audio frequency. channel.

References

[1] CCITT Recommendation *Recommendations relating to the accuracy of carrier frequencies,* Vol. III, Rec. G.225.

[2] CCITT Recommendation *16-channel terminal equipments,* Vol. III, Rec. G.235.

[3] CCIR Report *The effects of doppler frequency-shifts and switching discontinuities in the fixed satellite service*, Vol. IV, Report 214, ITU, Geneva, 1986.

1) In fact, the chain considered for these calculations comprised 16 (instead of 12) modulator-demodulator pairs to allow for the possibility that submarine cables with equipments in conformity with Recommendation G.235 [2] might form part of the chain. No allowance was made, however, for the effects of Doppler frequency-shift due to inclusion of a non-stationary satellite; values for this shift are given in CCIR Report 214 [3].