INTERNATIONAL TELECOMMUNICATION UNION

ITU-T G.153

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

TRANSMISSION SYSTEMS AND MEDIA

GENERAL CHARACTERISTICS OF INTERNATIONAL TELEPHONE CIRCUITS AND NATIONAL EXTENSION CIRCUITS

CHARACTERISTICS APPROPRIATE TO INTERNATIONAL CIRCUITS MORE THAN 2500 KM IN LENGTH

ITU-T Recommendation G.153

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation G.153 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.153

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(Geneva, 1964; amended at Mar del Plata, 1968, and Geneva, 1972 and 1980)

These circuits should meet the general requirements set forth in Recommendation G.151 and should, in addition, according to the kind of system on which they are set up, meet the particular provisions of §§ 1, 2, 3 and 4 below.

Note 1 - Some circuits which do not meet the noise objectives specified in the present Recommendation can nevertheless be used for telephony (if they are fitted with compandors), telegraphy or data transmission (§§ 2, 3 and 4 of Recommendation G.143; Table 1/G.153 summarizes these Recommendations).

Note 2 - Recommendation M.580 [1] deals with noise objectives for maintenance purposes. See Note 1 of Recommendation G.143, § 1.1).

1 Circuits more than 2500 km in length on cable or radio-relay systems, with no long submarine cable section

In many cases circuits of this kind, between 2500 km and about 25 000 km long will, throughout most of their length, be carried in land-cable systems or radio-relay systems already used to give international circuits not more than 2500 km long, and designed on the basis of the objectives already recommended for such systems in Recommendation G.222 [3].

Moreover, it is unlikely that the number of channel demodulations will exceed that envisaged in the corresponding part of the longest international connection referred to in Recommendation G.103. There will also be cases where it will be possible to establish such circuits on systems designed on the basis of national hypothetical reference circuits of the type referred to in the Recommendation cited in [4]. This being so, the CCITT issues the following recommendations:

1.1 *Variations in transmission loss with time*

Automatic level adjustment should be used on each group link on which the circuit is routed. In addition, all possible steps should be taken to reduce changes of transmission loss with time.

1.2 *Performance objectives for circuit noise*

It is provisionally recommended that systems to provide such international circuits not more than 25 000 km long should be designed on the basis of the noise objectives at present recommended for 2500-km hypothetical reference circuits.

TABLE 1/G.153

Noise objectives or limits [a] for very long circuits providing various services [b]

Psophometric power		Type of objective or limit	
pW0p	dBm0p	For a connection, a chain of circuits, or a leased circuit	For a circuit which may form part of a switched connection
40000	-44		Limit for a telephone circuit used without a compandor (Recommendation G.143, § 2)
50000	-43	Objective for a chain of 6 international circuits, obtained in practice by a combination of circuits with circuit performance objectives of 1, 2 or 4 pW/km (Recommendation G.143,§ 1)	
80000	-41	Limit for FM VF telegraphy, in accordance with CCITT standars (Recommendation H.22[2])	
100000	-40	Limit for data transmission over a leased circuit (Recommendation G.143,§ 4.1)	
250000	-36		Acceptable for data transmission over the switched network (Recommendation G.143, § 4.2). A circuit exceeding this limit without a compandor cannot be used in a chain of 6 telephone circuits, even if it is equipped with a compandor (Recommendation G.143, § 2)
10^6	-30	Tolerable for a certain system of synchronous telegraphy (Recommendation H.22[2])	

a) Only the mean psophometric power over one hour has been indicated, referred to a point of zero relative level of the international circuit, or of the first circuit of the chain.

b) The noise limits are determined according to the minimum performance requirements of each service. The noise objectives are commissioning objectives for various transmission systems.

Whenever possible lower noise objectives should be sought and it is recognized that in some large countries systems forming part of a circuit substantially longer than 2500 km (e.g. 5000 km) are constructed according to the principles referred to in the Recommendation cited in [4]. Alternatively lower noise figures can be obtained by a suitable choice of telephone channels making up the circuits. Provisionally the short-term noise performance objectives for circuits of this kind of length up to about 7500 km are as follows:

The one-minute mean noise power shall not exceed 50 000 pW (- 43 dBm0p) for more than 0.3% of any month and the unweighted noise power, measured or calculated with an integrating time of 5 ms, shall not exceed 106 pW (-30 dBm0) for more than 0.03% of any month. It is to be understood that these objectives are derived pro rata from the objectives for circuits of 2500 km length (Recommendation G.222 [3]; for lengths between 2500 and 7500 km proportionate intermediate values should apply.

The CCITT is not yet able to recommend objectives for short-term noise performance on circuits of the above type which exceed 7500 km in length.

2 Circuits more than 2500 km with a long submarine cable section

2.1 *Attenuation distortion*

A circuit of this kind may, for reasons of economy, comprise terminal equipments with carriers spaced 3 kHz apart, in accordance with Recommendation G.235 [5].

If terminal equipment be used with carrier spacing of 4 kHz, it must at least meet the requirements of Recommendation G.232 [6]. Some countries use improved terminal equipment in circuits permanently used for intercontinental operation.

2.2 *Performance objectives for circuit noise attributable to the submarine cable section*

2.2.1 *Without compandor*

The circuit performance objective for the mean noise per hour of a very long submarine-cable system designed for use without compandors and with no restrictions for telephony, voice-frequency telegraphy and data transmission should not exceed 3 pW/km on the worst channel. The circuit performance objective for the mean noise power for each direction of transmission, extended over all the channels used for the longest circuits, should not exceed 1 pW/km.

Note - However, it would be desirable that the circuits in a group to be operated with a speech concentrator system[1)] should all have more or less the same noise level.

2.2.2 *With compandor*

At present, the CCITT does not propose to study systems which, by relying on the *systematic* use of compandors, have noise objectives which are greatly different from those of § 2.2.1 above.

2.3 *Performance objectives for circuit noise attributable to other sections*

The other sections of the circuit should comply with the recommendations given in § 1 of this Recommendation.

3 Circuits on communication-satellite systems

The CCIR and the CCITT are considering the extent to which circuits set up on communication-satellite systems may be integrated into the worldwide network; some of the limitations on the use of such circuits are outlined in Recommendation Q.13 [7].

The CCIR has made recommendations as far as circuit noise is concerned and has defined a hypothetical reference circuit (CCIR Recommendation 352 [8]) and the allowable noise power in this reference circuit (CCIR Recommendation 353 [9]).

4 Circuits more than 2500 km in length set up on open-wire lines

Paragraph 4 is not published in this Book, but can be found under Part D of Recommendation G.153, *Orange Book,* ITU, Geneva, 1977.

References

[1] CCITT Recommendation *Setting-up and lining-up an international circuit for public telephony*, Vol. IV, Rec. M.580.

[2] CCITT Recommendation *Transmission requirements of international voice-frequency telegraph links (at 50, 100 and 200 bauds)*, Vol. III, Rec. H.22.

[3] CCITT Recommendation *Noise objectives for design of carrier-transmission systems of 2500 km*, Vol. III, Rec. G.222.

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1) See footnote 2) in Recommendation G.143, § 2.

[4] *Ibid., § 3*.

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

[6] CCITT Recommendation *12-channel terminal equipments*, Vol. III, Rec. G.232.

[7] CCITT Recommendation *The international routing plan*, Vol. VI, Rec. Q.13.

[8] CCIR Recommendation *Hypothetical reference circuits for telephony and television in the fixed satellite service*, Vol. IV, Rec. 352, ITU, Geneva, 1986.

[9] CCIR Recommendation *Allowable noise power in the hypothetical reference circuit for frequency-division multiplex telephony in the fixed satellite service*, Vol. IV, Rec. 353, ITU, Geneva, 1986.