

References

- [1] *Calculations of the stability of international connections established in accordance with the transmission and switching plan*, CCITT Green Book, Vol. III-2, Supplement No. 1, ITU, Geneva, 1973.
- [2] CCITT Recommendation *12-channel terminal equipments*, Vol. III, Rec. G.232, § 2.
- [3] CCITT manual *Transmission planning of switched telephone networks*, ITU, Geneva, 1976.
- [4] CCITT Recommendation *Reduction of the risk of instability by switching means*, Vol. VI, Rec. Q.32.
- [5] CCITT Recommendation *Conventional telephone signal*, Vol. III, Rec. G.227.
- [6] CCITT Question 8/XII, Annex 2, Contribution COM XII-No. 1, Study Period 1981-1984, Geneva, 1981.

Recommendation G.123

CIRCUIT NOISE IN NATIONAL NETWORKS

(Geneva, 1964; amended at Mar del Plata, 1968,
Geneva, 1972, 1976 and 1980 and Melbourne 1988)

1 Noise induced by power lines

The network performance objective for the psophometric e.m.f. of the noise produced by magnetic and/or electrostatic induction from all the power lines affecting one or more parts of a chain of telephone lines¹⁾ joining a subscriber's set to its international centre should not exceed 1 millivolt, this being the value at the line¹⁾ terminals of the subscriber's set (when receiving), it being assumed that the telecommunication installations inserted in that chain are balanced to earth as perfectly as possible, in conformity with the most modern equipment construction.

It should be noted that, even in the case of perfectly balanced lines¹⁾, the insertion of equipment having too great a degree of unbalance to earth may cause unacceptable noise at the terminals of a subscriber's receiver.

In every national network, it is usually possible, in practice, to find switching centres such that some of the lines¹⁾ that terminate at those centres (lines¹⁾ in cable, conforming to CCITT specifications) are free from noise arising from neighbouring power lines. It is then sufficient to determine the psophometric e.m.f.s arising from all the power lines¹⁾ affecting one or more parts of the chain of lines¹⁾ joining such a centre to the subscriber's set.

2 Noise contributed by transmission systems

2.1 Analogue systems

2.1.1 Very-long-distance circuits (about 2500-25 000 km)

If an extension circuit more than 2500 km long is used in a large country, it will have to meet all the recommendations applicable to an international circuit of the same length (Recommendation G.153). This implies that the equipment design objective for the line noise in channels used to provide these circuits should not exceed 2 pW0p/km.

¹⁾ "Line" as used in this § 1 should be understood as meaning subscriber's line, trunk junction or trunk circuit.

2.1.2 Circuit ranging in length from very short distances up to 2500 km

These circuits should meet the requirements of Recommendation G.152. This implies that according to the noise objectives of Recommendation G.222 [1] the accumulated line noise should correspond to an average of not more than 3 pW0p/km and the noise power produced by the various modulating equipments should meet the provisions of the Recommendation cited in [2].

Taking account of the particular structure of a real circuit the pertinent Recommendations CCITT/G.226 [3] (for cable systems) or CCIR/395 [4] (for radio-relay systems) must be applied when assessing its noise performance.

Note 1 – The permissible noise contributions from equipment do not depend on whether the circuits form part of the international 4-wire chain or are connected to it by 2-wire switching. However, the circuit noise powers assume that the hypothetical reference connections of Recommendation G.103 are, or will be in future, reasonably typical of connections. They also assume that the total length of circuits connecting the local exchange to the primary centre is not excessive. The attention of Administrations is drawn to a conclusion of studies carried out by the CCITT during the 1964-1968 Study Period, that if the additional percentage of “poor or bad” opinions on the quality of connections due to noise introduced by the circuits connecting the local exchange to the primary centre is not to exceed one half of that caused by the presence in the connection of all other sources of circuit noise, then the noise contributed by each one of these circuits should be limited to about 500 pW0p (mean for all the channels of the system during any hour).

Note 2 – Under the above conditions and assuming the maximum noise values permitted for pairs of channel modulators (200 pW0p), group modulators (80 pW0p) and supergroup modulators (60 pW0p), a total noise power of 500 pW0p will not be exceeded by a circuit connecting the local exchange to the primary centre (Figure 1/G.103) when its length is less than about 50 to 100 km.

Note 3 – In the case that those circuits are operated with compandors conforming to Recommendation G.162, the permitted noise powers are to be understood inclusive of the effect of the compandor gain.

2.2 Digital system

Circuits provided by PCM systems which accord with the G.700 Series of Recommendations, in particular Recommendation G.712 [5], will have an acceptable noise performance which is substantially independent of their length.

2.3 Mixed circuits

The noise value in a circuit provided by both analogue and digital transmission systems depends on the whole length of analogue sections and of the number of codecs in a circuit.

Noise limits and measurement methods for a mixed circuit are studied under Questions 26/XII, 16/IV and 18/IV.

3 Noise in a national 4-wire automatic exchange²⁾

3.1 Definition of a connection through an exchange

Noise conditions in a national 4-wire automatic exchange are defined by reference to a “connection” through this exchange. By “connection through an exchange” is to be understood the pair of wires corresponding to a direction of transmission and connecting the input point of a circuit incoming in the exchange to the output point of a different circuit outgoing from the exchange. These input or output points are those defined in Recommendation Q.45 (points A and D of Figure 1/Q.45 [8]) and are not necessarily the same as the text access points defined in Recommendation M.640 [9].

²⁾ In accordance with Recommendation Q.31 [6], the limits are the same as in Recommendation Q.45 [7].