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SERIES H: TRANSMISSION OF NON-TELEPHONE
SIGNALS

Characteristics of data signals

**Power levels for data transmission over
telephone lines**

ITU-T Recommendation H.51

Extract of **Red Book Fascicle III.4 (1984)**

NOTES

- 1 ITU-T Recommendation H.51 was published in Fascicle III.4 of the *Red Book*. This file is an extract from the *Red Book*. While the presentation and layout of the text might be slightly different from the *Red Book* version, the contents of the file are identical to the *Red 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.

POWER LEVELS FOR DATA TRANSMISSION OVER TELEPHONE LINES

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

The objectives in specifying data signal levels are as follows:

- a) To ensure satisfactory transmission and to permit coordination with devices such as signalling receivers or echo suppressors, the data signal levels on international circuits should be controlled as closely as possible.
- b) To ensure correct performance of multichannel carrier systems from the point of view of loading and noise, the mean power of data circuits should not differ much from the conventional value of channel loading (–15 dBm0 for each direction of transmission, see Note below). This conventional value makes allowance for a reasonable proportion P (dependent on the transmission systems and probably less than 50%; the value will have to be specified in subsequent studies) of the channels in a multichannel system being used for non-speech applications at fixed power levels at about –13 dBm0 for each direction of transmission.

If the proportion of non-speech applications (including data) does not exceed the above value P , the mean power of –13 dBm0 for each direction of transmission would be allowable for data transmission also.

However, assuming that the proportion of non-speech circuits is appreciably higher than P (due to the development of data transmission) on international carrier systems, a reduction of this power by 2 dB might be reasonable. (These values require further study).

Note – The distribution of long-term mean power among the channels in a multichannel carrier telephone system (conventional mean value of –15 dBm0), probably has a standard deviation in the neighbourhood of 4 dB (see [2]).

- c) It is probable that Administrations will wish to fix specific values for the signal power level of data modulators either at the subscribers' line terminals or at the local exchanges. The relation between these values and the power levels on international circuits depends on the particular national transmission plan; in any case, a wide range of losses among the possible connections between the subscriber and the input to international circuits must be expected.
- d) Considerations a) to c) suggest that specification of the maximum data signal level only is not the most useful form. One alternative proposal would be to specify the nominal power at the input to the international circuit. The nominal power would be the statistically estimated mean power obtained from measurement on many data transmission circuits.

For these reasons, the CCITT

unanimously recommends:

1 Data transmission over leased telephone-type circuits set up on carrier systems

- 1.1 The maximum power output of the subscriber's apparatus into the line shall not exceed 1 mW.
- 1.2 For systems transmitting tones continuously, e.g. frequency modulation systems, the maximum power level at the zero relative level point shall be –13 dBm0. When transmission of data is discontinued for any appreciable time, the power level should preferably be reduced to –20 dBm0 or lower.

¹⁾ Recommendation H.51 corresponds to Recommendation V.2 [1].

1.3 For systems not transmitting tones continuously, e.g. amplitude-modulation systems, the signal characteristics *should meet all of the following requirements*:

- i) The maximum value of the 1-minute mean power shall not exceed -13 dBm0.
- ii) Provisionally, the maximum value of the instantaneous power shall not exceed a level corresponding to that of a sine wave signal of 0 dBm0. This limit should be confirmed or amended after further study.
- iii) Provisionally, the maximum signal power determined for a 10-Hz bandwidth centred at any frequency shall not exceed -10 dBm0. This limit should be confirmed or amended after further study.

Note 1 – It is estimated that the proportion of international circuits which are carrying data transmissions is approximately 20%. If the proportion should reach a high level (approximately 50% or even less in the case of high-usage systems), the limits now proposed would need to be reconsidered.

Note 2 – Supplement No. 16 gives information on the out-of-band power of signals applied to leased telephone-type circuits.

2 Data transmission over the switched telephone network

2.1 The maximum power output of the subscriber's equipment into the line shall not exceed 1 mW at any frequency.

2.2 For systems transmitting tones continuously, such as frequency- or phase-modulation systems, the output power level of the subscriber's equipment should be fixed at the time of installation to allow for loss between his equipment and the point of entry to an international circuit, so that the corresponding nominal level of the signal at the international circuit input shall not exceed -13 dBm0.

2.3 For systems not transmitting tones continuously, e.g., amplitude-modulation systems, the signal characteristics *should meet all of the following requirements* (see also Note 1 to § 1.3):

- i) The maximum value of the 1-minute mean power shall not exceed -13 dBm0.
- ii) Provisionally, the maximum value of the instantaneous power shall not exceed a level corresponding to that of a sinewave signal of 0 dBm0. This limit should be confirmed or amended after further study.
- iii) Provisionally, the maximum signal power determined for a 10-Hz bandwidth centred at any frequency shall not exceed -10 dBm0. This limit should be confirmed or amended after further study.

Note 1 – In practice, it is no easy matter to assess the loss between a subscriber's equipment and the international circuit, so that § 2 of the present Recommendation should be taken as providing general planning guidance.

Note 2 – In switched connections, the loss between subscribers' telephones may be high: 30 to 40 dB. The level of the signals received will then be very low, and these signals may suffer disturbance from, for example, the dialling pulses sent over other circuits.

If there is likely to be a heavy demand for international connections for data transmission over the switched network, some Administrations might want to provide special 4-wire subscriber lines. If so, the levels to be used might be those proposed for leased circuits.

References

- [1] CCITT Recommendation *Power levels for data transmission over telephone lines*, Vol. VIII, Rec. V.2.
- [2] *Measurement of the load of telephone circuits under field conditions*, Yellow Book, Supplement No. 5, ITU, Geneva, 1981.