

2 Transmultiplexer application

The application on transmultiplexers for the interconnection of digital and analogue networks is illustrated in Supplement No. 28.

Reference

- [1] CCITT Recommendation *Recommendations concerning translating equipments*, Vol. III, Rec. G.233.

Recommendation G.792

CHARACTERISTICS COMMON TO ALL TRANSMULTIPLEXING EQUIPMENTS

(Geneva, 1980; further amended)

The CCITT,

recommends

that the characteristics below be respected by all the transmultiplexing equipments defined in Recommendation G.791.

Recommendation O.133 contains information about test equipment. Account should be taken of the measurement accuracy provided by test equipment designed in accordance with that Recommendation.

The following specifications are based on ideal measuring equipment. Therefore, they do not include any margin for measurement errors.

To avoid level errors produced as a result of the use of test frequencies which are sub-multiples of the PCM sampling rate, the use of integer sub-multiples of 8 kHz should be avoided.

Where a nominal reference frequency of 1020 Hz is indicated (measurement of attenuation/frequency distortion and adjustment of relative levels), the actual frequency should be 1020, +2 to -7 Hz in accordance with Recommendation O.6 [18].

1 Coding law

Transmultiplexers should satisfy Recommendation G.711, § 3.

2 Sampling rate of PCM channels

The nominal sampling rate of PCM channels is $8000 \text{ Hz} \pm 50 \cdot 10^{-6}$ according to Recommendation G.711, § 2.

3 Amplitude limitation of PCM channels

In accordance with Recommendation G.711, § 4, the theoretical load capacity of PCM channel is +3.14 dBm0 for the A-law and +3.17 dBm0 for the μ -law.

4 Accuracy of the analogue virtual carriers

The analogue virtual carriers should satisfy the Recommendation cited in [1].

5 Saturation level at the input of the analogue group

The transmultiplexers should be able to accept at their analogue inputs, levels corresponding to the equivalent peak powers defined in Table 3/G.223 [5] (for example, +19 dBm0 for a group and +20.8 dBm0 for a supergroup).

Note – Attention is drawn to the possibility of using a transmultiplexer on the interpolated side of a digital speech interpolation (DSI) device. Given an interpolation rate of 2, this would lead to equivalent peak powers of 19.5 dBm0 for TMUX-P and 21.2 dBm0 for TMUX-S (see Table 3/G.223 [5]).

6 Methods of measuring quality in the audio band

The various possible methods of measuring quality characteristics in the audio band are indicated in Figure 1/G.792.

Category	Measuring method	Remarks
A		Measurement in analogue carrier frequency
B		Measurement in PCM multiplexed level
C	* Group modulator is not required for the TMUX-P	Measurement in audio frequency
D		Measurement for one direction in PCM multiplexed level and analogue carrier frequency
E		Measurement in analogue carrier frequency
F		Measurement in PCM multiplexed level

T/F TDM-to-FDM conversion
F/T FDM-to-TDM conversion

S Sender
R Receiver

CCITT-27811

FIGURE 1/G.792

Block diagrams of measuring methods for transmultiplexers

When method B cannot be used because it requires digital signal generators and analyzers, which certain Administrations do not yet possess, method C can be used provisionally [looping of the digital ports, use of the terminals of auxiliary analogue channels (and possibly group modulators), assumption of the additivity of impairments and deduction of the impairments at the terminals of the channels (and possibly modulators) previously measured].

Method D corresponds in fact to four possible methods, depending on whether the emission of the test signal and its detection takes place on the analogue side or the digital side.

Methods E and F are used for crosstalk measurements.

For the sake of the convenience and precision of the measurements, it is desirable that the regulation, when included in the transmultiplexer, can be blocked with a gain equal to unity. The specifications in §§ 7 to 23 assume such blocking.

7 Attenuation distortion in the voice-frequency band as a function of frequency

The measuring method is method A.

The variation of the attenuation of each channel of a transmultiplexer as a function of frequency must remain within the limits of the mask in Figure 2/G.792. The level of emission is -10 dBm0; the reference frequency is 1020 Hz.

8 Group delay

8.1 Absolute value of the group delay

The measuring method is method A.

The absolute value of group delay defined as the minimum value of group delay in the speech band 300-3400 Hz should remain less than 3 ms for all the channels of a transmultiplexer.

Note — When the transmultiplexer is used for satellite digital communication at the earth station the minimum value of the group propagation time in the audiofrequency band may be increased from 3 ms to 6.5 ms. In all other cases, the value of 3 ms should be complied with.

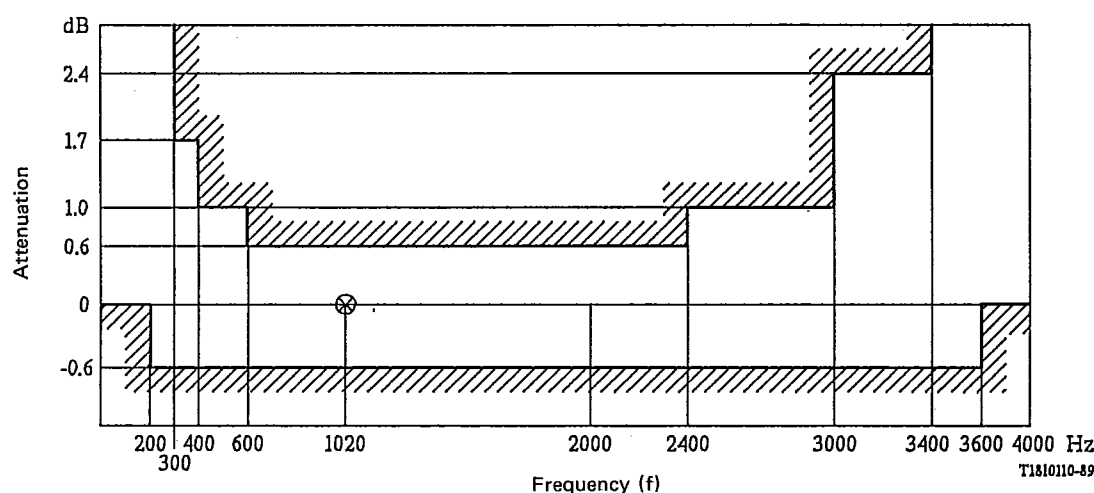


FIGURE 2/G.792

Attenuation distortion mask as a function of the frequency to be observed for all channels of a transmultiplexer

8.2 Group-delay distortion

The measuring method is method A.

The group-delay distortion should not exceed the limits of the mask in Figure 3/G.792.

The minimum group delay is taken as a reference; the power level at the input is 0 dBm0.

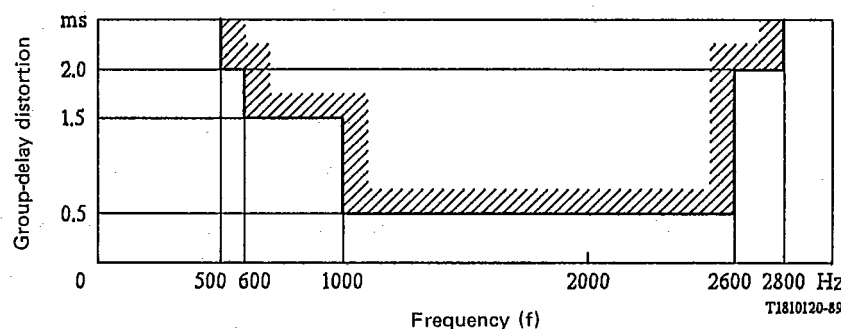


FIGURE 3/G.792

Mask of group-delay distortion as a function of frequency

9 Noise

9.1 Idle channel noise, with all channels idle

The measuring method is method B.

When a PCM signal corresponding to amplitude 0 for the μ -law and the number 1 for the A-law in all channels of the transmultiplexer is applied to the digital input of the transmultiplexer, the psophometric noise measured over any channel at the digital output should not exceed -65 dBm0p. The measurement is conducted in the presence of pilots.

9.2 Channel noise, with all channels loaded except the one measured

The measuring method is method A. In this case an intermodulation measuring set-up using the white noise method is employed, as described in the Recommendation cited in [6].

The level of emission of the noise signal being equal to the conventional load of the FDM signal considered (the Recommendation cited in [7]: 3.3 dBm0 for the group, 6.1 dBm0 for the supergroup), the noise measured in any given measuring slot should not exceed -62.5 dBm0p (i.e., -60 dBm0 in a 3100 Hz band).

The centre frequencies of the specified measuring slots (CCITT Recommendation G.230 [8] and CCIR Recommendation 482 [9]) applicable to the transmultiplexers are:

- for the base group: 70 and 98 kHz
- for the base supergroup: 394 and 534 kHz.

This measurement is carried out without emitting pilots or out-of-band signalling.

Note — Attention is drawn to the possibility of using a transmultiplexer on the interpolated side of a digital speech interpolation (DSI) device. Given an interpolation rate of 2, this would lead to conventional loads of 4.5 dBm0 for TMUX-P and 7.3 dBm0 for TMUX-S (see Table 2/G.223, [7]).