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Business TeleCommunications (BTC); Special quality voice bandwidth 2-wire analogue leased line (A2S); Connection characteristics and network interface presentation

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Business TeleCommunications (BTC) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS resulted from a mandate from the Commission of the European Community (CEC) to provide harmonized standards for support of the Directive on Open Network Provision (ONP) of leased lines (92/44/EEC).

There is another standard directly related to this ETS:

ETS 300 450: "Business TeleCommunications (BTC); Ordinary and Special quality voice bandwidth 2-wire analogue leased lines (A2O and A2S); Terminal equipment interface".

This ETS is based on information from ITU-T Recommendations and ETSI publications and the relevant documents are quoted where appropriate.

Transposition dates	
Date of adoption of this ETS:	2 February 1996
Date of latest announcement of this ETS (doa):	31 May 1996
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	30 November 1996
Date of withdrawal of any conflicting National Standard (dow):	30 November 1996

Introduction

The Council Directive on the application of ONP to leased lines (92/44/EEC) concerns the harmonization of conditions for open and efficient access to, and use of, the leased lines provided over public telecommunications networks, and the availability throughout the European Union (EU) of a minimum set of leased lines with harmonized technical characteristics.

The consequence of the Directive is that telecommunications organizations within the EU shall make available a set of leased lines within and between points in these countries with specified connection characteristics and specified interfaces. Under the Second Phase Directive (91/263/EEC) terminal equipment for connection to these leased lines will be required to fulfil certain essential requirements.

CCITT Recommendation M.1020 (1988) is used as the basis for the connection characteristics.

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1 Scope

This European Telecommunication Standard (ETS) specifies the technical requirements and test principles for the connection characteristics and the physical and electrical characteristics of the network interface presentation of special quality, voice bandwidth, 2-wire, analogue leased lines, provided as part of the minimum set under the Council Directive on the application of Open Network Provision (ONP) to leased lines (92/44/EEC).

A connection is presented via interfaces at Network Termination Points (NTPs) and includes any equipment that may provide the NTP. Signals between terminal equipments are subject to impairments during their transfer over the connection. The limits to these impairments are stated in this ETS although in practice the overall performance may be considerably better.

The leased line provides access to the voice bandwidth (300 Hz to 3 400 Hz) with no restrictions on the use of the frequencies. The requirements of this standard have been chosen primarily for the transmission of data between terminal equipments without equalizers although there is no restriction on the use of the leased line for other types of traffic.

This ETS is applicable to leased lines, including part time leased lines, for which the establishment or release does not require any protocol exchange or other intervention at the NTP.

The tests specified in this ETS cannot be carried out, nor can performance be monitored by the leased line provider, while the leased line is in service, i.e. carrying user's traffic. Thus the tests are designed for bringing into and returning into service although there is no obligation to perform these tests each time the leased line is brought into or returned into service.

This ETS covers the physical, mechanical and electrical characteristics of the network interface and specifies the conformance tests for the connection characteristics and network interface. Some of the tests described in this ETS are not designed to be applied to the interface of an installed leased line; such tests may be applied to equipment of the kind used to provide the interface.

This ETS does not include details concerning the implementation of the tests nor does it include information on any regulations concerning testing.

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] CCITT Recommendation O.71 (1988): "Impulsive noise measuring equipment for telephone-type circuits".

[2] CCITT Recommendation O.81 (1988): "Group-delay measuring equipment for telephone-type circuits".

[3] CCITT Recommendation O.91 (1988): "Phase jitter measuring equipment for telephone-type circuits".

[4] CCITT Recommendation O.95 (1988): "Phase and amplitude hit counters for telephone-type circuits".

[5] CCITT Recommendation O.132 (1988): "Quantizing distortion measuring equipment using a sinusoidal test signal".

[6] EN 28877 (1989): "Information processing systems - Interface connector and contact assignments for ISDN basic access interface located at reference points S and T".

[7] EN 60950 (1992): "Safety of information technology equipment including electrical business equipment".

[8] ITU-T Recommendation O.41 (1993): "Psophometer for use on telephone-type circuits".

NOTE: This ETS also contains a number of informative references which have been included to indicate the sources from which material has been derived, hence they do not have an associated normative reference number. Details of these publications are given in Annex E. In some cases the same publication may have been referenced in both a normative and an informative manner.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETS, the following definitions apply:

group delay: A measure of the propagation time through the leased line. For a given frequency it is equal to the first derivative of the phase shift through the leased line, measured in radians, with respect to the angular frequency measured in radians per second.

group delay distortion: The difference between group delay at a given frequency and minimum group delay, in the frequency band of interest.

leased lines: The telecommunications facilities provided by a public telecommunication network that provide defined transmission characteristics between network termination points and that do not include switching functions that the user can control, (e.g. on-demand switching).

Network Termination Point (NTP): All physical connections and their technical access specifications which form part of the public telecommunications network and are necessary for access to and efficient communication through that public network.

reference impedance Z_R: This is a complex impedance made up of a resistance of 270 Ω in series with a parallel combination of 750 Ω and 150 nF. See also subclause A.1.2.

terminal equipment: Equipment intended to be connected to the public telecommunication network; i.e.:

- to be connected directly to the termination of a public telecommunication network; or
- to interwork with a public telecommunication network being connected directly or indirectly to the termination of a public telecommunication network,

in order to send, process, or receive information.

voice bandwidth: The band of frequencies over the range 300 Hz to 3 400 Hz.

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

a	Return loss in dB
$a(f)$	Return loss at frequency f in dB
a_w	Weighted return loss in dB
$A(f)$	Return loss at frequency f expressed as a ratio
A2S	Special quality voice bandwidth 2-wire analogue leased line
ADPCM	Adaptive Differential Pulse Coded Modulation
EMC	ElectroMagnetic Compatibility
f	frequency
NTP	Network Termination Point
ONP	Open Network Provision

qdu	quantizing distortion unit
rms	root mean square
TNV	Telecommunication Network Voltage (see subclause 3.4 of EN 60950 [7])
Z_R	Reference impedance

4 Requirements

4.1 Connection characteristics

The special quality voice bandwidth 2-wire analogue leased line is a bidirectional line, configured point-to-point, nominally covering the voice bandwidth. The connection is, in general, symmetrical, i.e. each direction of transmission has the same nominal characteristics, although the actual values are independent.

4.1.1 Tabulation of connection characteristics

The parameters defining the characteristics of the connection are given in table 1. These characteristics define the service offered.

Table 1: Network performance characteristics

Description	Nature	Reference subclause
Overall loss	0 ≤ overall loss ≤ 17 dB	4.1.2
Loss/frequency distortion	Table 2, figure 1	4.1.3
Transmission signals - maximum mean input power - maximum instantaneous power - maximum power in a 10 Hz bandwidth - maximum input power outside voice band	 -9 dBm +4 dBm no requirement no requirement	4.1.4 4.1.4.1 4.1.4.2 4.1.4.3 4.1.4.4
Transmission delay - terrestrial (for distance G in kilometres) - via satellite	 < (15 + 0,01 G) ms < 350 ms	4.1.5
Group delay distortion	Table 3, figure 3	4.1.6
Variation of overall loss with time - amplitude hits - other variations	 ≤ 10 in a 15 minute period ± 4 dB of that at 1 020 Hz	4.1.7 4.1.7.1 4.1.7.2
Random circuit noise	< -41 dBm0p (see note)	4.1.8
Impulsive noise	≤ 18 peaks ≥ -21 dBm0 in a 15 minute period (see note)	4.1.9
Phase jitter	≤ 10° peak to peak	4.1.10
Total distortion - quantizing distortion - total distortion	 ≤ 3 qdu; no ADPCM > 28 dB signal to distortion ratio	4.1.11 4.1.11.1 4.1.11.2
Single tone interference	≤ -44 dBm0 (see note)	4.1.12
Frequency error	≤ ± 5 Hz	4.1.13
Harmonic distortion	≥ 25 dB below fundamental	4.1.14
Echo and stability - Echo control devices - Talker echo - Listener echo - Stability	 no echo control > 10 dB > 20 dB 0 to 4 kHz	4.1.15 4.1.15.1.1 4.1.15.1.2 4.1.15.1.3 4.1.15.2
NOTE: Where the output relative level is not defined, an alternative value is specified in the reference subclause.		

4.1.2 Overall loss

Requirement: The overall loss, including long term variations, presented to a signal frequency of 1 020 Hz sent at a power level of -9 dBm in each direction of transmission with the line terminated in 600 Ω at each end shall be in the range:

$$0 \leq \text{overall loss} \leq 17 \text{ dB}.$$

NOTE: The overall loss in each direction can be different.

Test: The test shall be conducted according to subclause A.2.1.

4.1.3 Loss/frequency distortion

Requirement: The overall loss relative to that defined in subclause 4.1.2 above for the connection, presented to a signal sent at a power level of -9 dBm with the line terminated in 600 Ω at each end shall lie between the limits given in table 2 and figure 1.

Below 300 Hz and above 3 600 Hz the relative loss shall not be less than -2 dB and 0 dB respectively, but is otherwise unspecified.

Table 2: Limits for loss of the circuit relative to that at 1 020 Hz

Upper limit			Lower limit		
Point (see fig. 1)	**Frequency Hz**	**Relative loss dB**	**Point (see fig. 1)**	**Frequency Hz**	**Relative loss dB**
A	300	6	G	500	-2
B	500	6	H	500	-1
C	500	3	I	2 800	-1
D	2 800	3	J	2 800	-2
E	2 800	6	K	3 600	-2
F	3 000	6	L	3 600	0

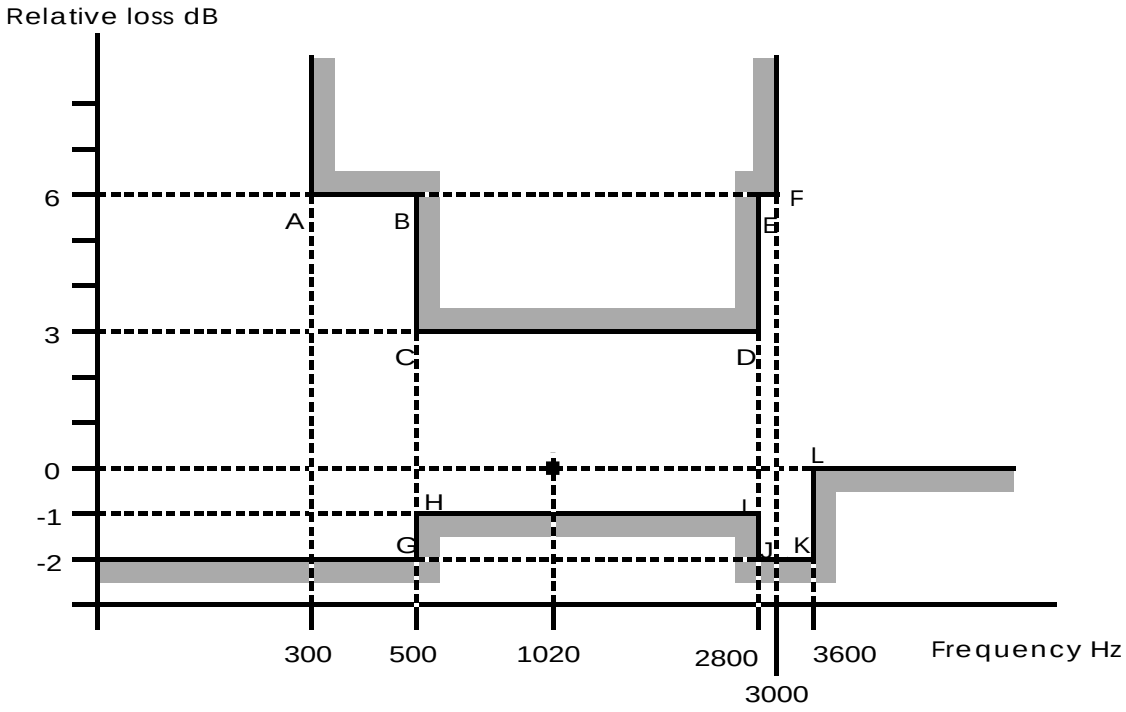

Figure 1: Limits for loss of the circuit relative to that at 1 020 Hz

Test: The test shall be conducted according to subclause A.2.2.

4.1.4 Transmission signals

4.1.4.1 Maximum mean input power

Requirement: The leased line shall be capable of carrying any signal presented at the input at a one minute mean power level of -9 dBm within a voice bandwidth of 300 Hz to 3 400 Hz with the line terminated in 600 Ω at each end.

Test: The test shall be conducted according to subclause A.2.2.

4.1.4.2 Maximum instantaneous power

Requirement: The leased line shall be capable of carrying a signal at the input having a maximum value equal to an instantaneous power which is 13 dB above the mean value of -9 dBm (i.e. +4 dBm).

NOTE: This value is based upon a provisional ITU-T value. See CCITT Recommendation V.2.

Test: The test shall be conducted according to subclause A.2.3.

4.1.4.3 Maximum power in a 10 Hz bandwidth

There is no requirement for maximum power in a 10 Hz bandwidth.

NOTE: However, there is a corresponding requirement on the terminal equipment specified in ETS 300 450.

4.1.4.4 Maximum input power outside the voice band

NOTE: The leased line interface is not suitable for the handling of signals below 300 Hz and above 3 400 Hz. Out of band signals from the terminal equipment are limited to avoid trouble in the network (see terminal equipment interface requirement in ETS 300 450).

4.1.5 Transmission delay

Requirement: The requirement depends upon whether satellite transmission is involved in the connection or not:

a) for connections where satellite transmission is not involved the one way end-to-end delay shall be less than (15 + 0,01 G) ms, where G is the geographical distance in kilometres**,** as shown in figure 2; or

b) for connections where satellite transmission is involved the one way end-to-end delay shall be less than 350 ms.

NOTE: Requirements a) and b) are based on subclauses 2.2 and 2.3 of ITU-T Recommendation G.114 with suitable adjustment to requirement a) to allow for the possible use of loaded cable.