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Part 1: General**

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## Foreword

This Interim European Telecommunication Standard (I-ETS) was prepared by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

An ETSI standard may be given I-ETS status as it is regarded either as a provisional solution ahead of a more advanced standard, or because it is immature and requires a "trial period". The life of an I-ETS is limited, at first, to three years after which it can be converted into an European Telecommunication Standard (ETS), have its life extended for a further two years, be replaced by a new version of the I-ETS or, finally, be withdrawn.

This is the first part of an I-ETS which is currently intended to comprise eight parts.

This I-ETS specifies technical characteristics for Integrated Services Digital Network (ISDN) telephony terminals as described in the scope of this I-ETS. The characteristics are additional to type approval requirements to which the terminal equipment is subject. The additional characteristics are meant to give improved performance.

In the present version of the I-ETS the following parts are included:

### **Part 1: General.**

Part 2: PCM A-law, handset telephony.

Part 3: PCM A-law, loudspeaking and handsfree telephony.

Part 4: Interface for additional equipment.

Part 5: Wideband (7 kHz) handset telephony.

Part 6: Wideband (7 kHz) handsfree telephony.

Part 7: Locally generated information tones.

Part 8: Terminal application of 16 kbit/s speech coding algorithms.

NOTE: Part 8 is still under study within ETSI.

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## 1 Scope

This Interim European Telecommunication Standard (I-ETS) specifies the technical characteristics (electrical, logical and acoustic) for telephony terminals to be used at the basic access of the coincident S and T reference point of the Integrated Services Digital Network (ISDN). The characteristics of this I-ETS are additional to those of the ISDN basic access attachment requirements (ETS 300 085 [1], ETS 300 104 [2] and ETS 300 153 [3]) and of any other Standard or attachment requirements to which the terminal equipment is subject. The additional characteristics of this I-ETS are meant to give improved performance relative to the attachment ETSs. However, this I-ETS is not intended to be used for type approval purposes or other mandatory requirements.

This I-ETS is applicable to telephony terminals as well as to telephony functions of multimedia or multiservice terminals.

This I-ETS is applicable to Terminal Equipment (TE) of the functional group defined as Terminal Equipment Type 1 (TE1) in CCITT Recommendation I.411 [4].

The characteristics specified in this I-ETS cover a number of functions or facilities which can be combined to form a particular terminal. The characteristics relevant for each speech coding algorithm, function or facility can be found in separate parts of the I-ETS. This Part (Part 1) covers the introduction to the I-ETS and the characteristics which are common to telephony terminals to be connected to a coincident S and T reference point to a public telecommunication network presented as an ISDN basic access point.

For multimedia or multiservice terminals, other requirements or standards may apply instead of, or in addition to, this I-ETS.

TE specially designed for the disabled (e.g. with amplification of received speech as an aid for the hard-of-hearing), may have characteristics which may be specified in separate parts of this I-ETS.

TE using a radio link (e.g. cordless telephones) will, due to the characteristics of the radio channel, be specified separately.

NOTE: In some countries, an interim ISDN service corresponding to, but not wholly compatible with, the ISDN basic access standards may be provided. This I-ETS does not apply for connection to such a service.

## 2 Normative references

This I-ETS incorporates by dated or 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 I-ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referenced to applies.

- [1] ETS 300 085 (1990): "Integrated Services Digital Network (ISDN); 3,1 kHz telephony teleservice, Attachment requirements for handset terminals".
- [2] ETS 300 104 (1991): "Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access, Layer 3 aspects (Candidate NET 3, Part 2)".
- [3] ETS 300 153 (1992): "Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access (Candidate NET 3, Part 1)".
- [4] CCITT Recommendation I.411 (1988): "Integrated Services Digital Network (ISDN) user-network interfaces - Reference configurations".

- [5] CCITT Recommendation P.10 (1988): "Vocabulary of terms on telephone transmission quality and telephone sets".
- [6] CCITT Recommendation G.701 (1988): "Vocabulary of digital transmission and multiplexing, and pulse code modulation (PCM) terms".
- [7] ETS 300 111 (1992): "Integrated Services Digital Network (ISDN); Telephony 3,1 kHz teleservice, Service description".
- [8] ETS 300 263 (1992): "Integrated Services Digital Network (ISDN); Telephony 7 kHz teleservice, Service description".
- [9] CCITT Recommendation I.430 (1988): "Integrated Services Digital Network (ISDN) user-network interfaces: layer 1 recommendations".
- [10] ETS 300 102-1 (1990) (including Amendment 1 (1993)): "Integrated Services Digital Network (ISDN); User-network interface layer 3, Specification for basic call control".
- [11] ETS 300 082 (1992): "Integrated Services Digital Network (ISDN); 3,1 kHz telephony teleservice, End-to-end compatibility".
- [12] I-ETS 300 281: "Integrated Services Digital Network (ISDN); Telephony 7 kHz teleservice, Terminal requirements necessary for end-to-end compatibility".
- [13] ETS 300 267 (1993): "Integrated Services Digital Network (ISDN); Telephony 7 kHz and videotelephony teleservices; Digital Subscriber Signalling System No. one DSS1) protocol".
- [14] prl-ETS 300 322: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1), Abstract test Suite (ATS) for user of signalling-network-layer protocol for circuit-mode basic call control".
- [15] CCITT Recommendation G.711 (1988): "Pulse code modulation (PCM) of voice frequencies".
- [16] CCITT Recommendation G.722 (1988): "7 kHz audio-coding within 64 kbit/s".
- [17] CCITT Recommendation E.164 (1991): "Numbering plan for the ISDN era".
- [18] CCITT Recommendation G.101 (1988): "The transmission plan".
- [19] ETS 300 012 (1992): "Integrated Services Digital Network (ISDN); Basic user-network interface, Layer 1 specification and test principles".



### 3 Definitions, symbols and abbreviations

#### 3.1 Definitions

For the purposes of this I-ETS, the relevant definitions given in CCITT Recommendations P.10 [5] and G.701 [6] apply along with the following.

**Telephony 3,1 kHz teleservice:** A description of the telephony 3,1 kHz teleservice is to be found in ETS 300 111 [7].

**Telephony 7 kHz teleservice:** A description of the telephony 7 kHz teleservice is to be found in ETS 300 263 [8].

**Restricted power condition:** As defined in CCITT Recommendation I.430 [9]. The condition is indicated by the reversed polarity of the phantom voltage at the coincident S and T reference point.

NOTE: For some networks restricted power condition will be the normal operating mode.

**Designated terminal:** Refers to the terminal which is permitted to draw power from Power source 1 under Restricted power conditions as specified in CCITT Recommendation I.430 [9].

**Telephony terminal:** A terminal which supports the telephony 3,1 kHz teleservice and/or the telephony 7 kHz teleservice.

**3,1 kHz terminal:** A terminal which supports the telephony 3,1 kHz teleservice.

**7 kHz terminal:** A terminal which supports the telephony 7 kHz teleservice.

**Loudspeaking telephony terminal:** A handset telephony terminal using a loudspeaker associated with an amplifier as a telephone receiver (see CCITT Recommendation P.10 [5]).

**Handsfree telephony terminal:** A telephony terminal using a loudspeaker associated with an amplifier as a telephone receiver and which can be used without a handset (see CCITT Recommendation P.10 [5]).

**Multiservice terminal:** A terminal which supports more than one service (bearer service or teleservice).

**Multimedia terminal:** A terminal which simultaneously supports two or more media (e.g. audio, video, text, data).

**Digital interface:** Refers to the B-channels available at the coincident S and T reference point at an ISDN basic access.

#### 3.2 Abbreviations

For the purposes of this I-ETS, the following abbreviations, plus the relevant abbreviations in CCITT Recommendations P.10 [5] and G.701 [6], apply.

BC	Bearer Capability (see ETS 300 102-1 [10])
DTMF	Dual Tone Multi Frequency (the same as MFPB - Multi Frequency Push Button)
ETS	European Telecommunication Standard
ETSI	European Telecommunications Standards Institute
HLC	High Layer Compatibility (see ETS 300 102-1 [10])
I-ETS	Interim European Telecommunication Standard
ISDN	Integrated Services Digital Network
LLC	Low Layer Compatibility (see ETS 300 102-1 [10])
UDI	Unrestricted Digital Information (see ETS 300 102-1 [10])
UDI-TA	Unrestricted Digital Information with Tones and Announcements (previously called 7 kHz audio in ETS 300 102-1 [10])

## 4 Access channel selection

Access through any B-channel shall be possible. Channel allocation shall be in accordance with ETS 300 102-1 [10].

The functional characteristics of the terminal shall be independent of the B-channel selected.

## 5 Call control functions

Call control functions for the telephony 3,1 kHz teleservice are specified in ETS 300 082 [11] and ETS 300 102-1 [10]. Call control functions for the telephony 7 kHz teleservice are specified in I-ETS 300 281 [12] and ETS 300 267 [13]. Call control functions for other telephony functions or services are specified below or in other parts of this I-ETS.

### 5.1 Outgoing calls

The complete procedures for both en-bloc and overlap sending according to ETS 300 102-1 [10] shall be implemented.

#### 5.1.1 Coding of Bearer capability information element

Compliance to the requirements specified in subclause 5.1.1 shall be checked using the tests specified in prI-ETS 300 322 [14].

##### 5.1.1.1 Telephony 3,1 kHz teleservice

When initiating an outgoing call on the telephony 3,1 kHz teleservice, the information transfer capability field of the Bearer capability information element(s) in the outgoing SETUP message shall be set to "speech" and the user information layer 1 protocol field shall be set to "G.711, A-law" as specified in ETS 300 102-1 [10], subclause 4.5.5.

##### 5.1.1.2 Telephony 7 kHz teleservice

When initiating an outgoing call on the telephony 7 kHz teleservice a fallback procedure to the telephony 3,1 kHz teleservice shall be available (fallback allowed).

NOTE: When this option is used, the network will reserve any required echo cancellation devices, A-law to  $\mu$ -law convertors, etc., in case a speech information transfer capability is used for the resultant connection.

It shall be possible to disable the fallback procedure (fallback not allowed).

The signalling procedures for fallback allowed and fallback not allowed are specified in ETS 300 267 [13], subclause 6.5.1.

##### 5.1.1.3 Short term solution before the introduction of telephony 7 kHz teleservice (optional)

For an interim period of time, some networks need not support the information transfer capability value "UDI-TA" in the Bearer capability information element(s) and the fallback procedure (the use of two Bearer capability information element(s) in the SETUP message).

In the first case, if a single Bearer Capability element, coded as specified in subclause 5.1.1.2 is sent, the call will be rejected by the network.

In the second case, if two Bearer Capability elements, coded as specified in subclause 5.1.1.2 are sent, only the first Bearer Capability element (containing the "speech" information transfer capability value) will be transmitted by the network to the called terminal.

As a short term procedure, where a terminal is attached to a network that does not support the normal operation as defined in the previous subclauses, the user may obtain a service similar to the telephony 7

kHz teleservice, possibly without tones and announcements, by requesting the circuit mode 64 kbit/s unrestricted 8 kHz structured bearer service category ("UDI"), with the user information layer 1 protocol field specifying "Recommendations H.221 and H.242", as specified in I-ETS 300 281 [12], subclause 5.5.

#### 5.1.1.4 Other services

In the case of other speech coding algorithms, a 64 kbit/s transparent channel may be required. In those cases "UDI-TA" or "UDI" can be used for the information transfer capability field of the Bearer capability information element(s). Details for the use of these Bearer Capability elements are given in other parts of this I-ETS and in other relevant standards (e.g. ETS 300 102-1 [10], subclause 4.5.5).

NOTE: If octet 3 of the Bearer capability information element(s) indicates "speech", "3,1 kHz audio" or "UDI-TA", networks conforming to ETS 300 102-1 [10] and ETS 300 267 [13] will provide information tones encoded to A-law in accordance with CCITT Recommendation G.711 [15] and transmitted on the B-channel (see also subclause 5.3).

#### 5.1.2 Coding of High layer compatibility information element

In order to avoid possible compatibility problems between a basic 3,1 kHz terminal (supporting only telephony 3,1 kHz teleservice) and a multimedia or multiservice terminal, the High layer compatibility information element(s) shall be included in the SETUP message from any telephony terminal complying with this I-ETS when using telephony 3,1 kHz or 7 kHz teleservice.

The encoding of the High layer compatibility information element(s) for the telephony 3,1 kHz teleservice and for the telephony 7 kHz teleservice shall be as specified in ETS 300 102-1 [10], subclause 4.5.16, with the high layer characteristic identification field set to "telephony".

Compliance shall be checked using the tests specified in prI-ETS 300 322 [14].

#### 5.1.3 Coding of Low layer compatibility information element

In order to avoid possible compatibility problems between a basic 3,1 kHz terminal and a multimedia or multiservice terminal, the Low layer compatibility information element(s) may, in most cases, be included in the SETUP message from telephony terminals.

In the case where two Bearer capability information elements are included in the SETUP message the Low layer compatibility information element(s) **shall not** be included in the SETUP message.

If the Low layer compatibility information element(s) is included in the SETUP message the encoding of the element for telephony 3,1 kHz teleservice shall be as specified in ETS 300 102-1 [10], subclause 4.5.18, with the information transfer capability field set to "speech" and, if optionally provided, the user information layer 1 protocol field set to "G.711, A-law".

Compliance shall be checked using the tests specified in prI-ETS 300 322 [14].

#### 5.1.4 Coding of Called Party Number information element

When initiating an outgoing call on a telephony teleservice (3,1 kHz or 7 kHz), the default coding of the "Type of number" and "Numbering plan identification" fields in the information element shall both be "unknown" as specified in ETS 300 102-1 [10], subclause 4.5.8.

In cases where it is possible for the human user to control the content of this element, other codings may be appropriate. See ETS 300 102-1 [10], subclause 4.5.8.

Compliance shall be checked using the tests specified in prI-ETS 300 322 [14].

NOTE: In the dialling procedure the separation between the Called Party Number and the Called Party Subaddress is for further study.

### 5.1.5 Indication of resultant service

If the originating terminal specifies a preferred service with fallback allowed, the resultant service shall be indicated to the originating terminal by the procedures specified in ETS 300 267 [13], Clauses 5 and 6. If fallback occurs, the requirements for telephony 7 kHz teleservice do no longer apply.

## 5.2 Incoming calls

### 5.2.1 Compatibility checking

For a multiservice terminal which supports the telephony 3,1 or 7 kHz teleservice, the terminal shall, in association with its function of supporting these services, meet the requirements specified in subclause 5.2 of this I-ETS for handling incoming telephony calls. However, in association with the support of other bearer services or teleservices, it may accept as compatible incoming calls with Bearer capability, High layer compatibility and Low layer compatibility information elements other than those specified in that subclause.

NOTE: In the future, there may exist telephony terminals which requires Bearer Capabilities other than "speech", "3,1 kHz audio telephony" or "UDI-TA" as well as other High layer compatibility information element(s) (e.g. low bit-rate telephony and multiservice terminals). Interworking between such terminals and 3,1 kHz telephony terminals is envisaged. The inclusion of compatibility checking procedures which take into account this interworking is for further study.

#### 5.2.1.1 Analysis of Bearer capability information element

A terminal which is using CCITT Recommendation G.711 [15] A-law speech encoding as the only mode of operation or as one of several modes of operation shall, in association with the support of the telephony 3,1 kHz teleservice, consider the Bearer Capability to be compatible if the Bearer capability information element(s) in the incoming SETUP message is coded as specified below:

- the user information layer 1 protocol is coded as "G.711, A-law";
- the information transfer capability field is coded as "speech", or "3,1 kHz audio".

The coding "3,1 kHz audio" shall only be accepted if it is combined with a Progress indicator (progress description #1 (call is not end-to-end ISDN: further progress information may be available in-band) or #3 (origination address is non-ISDN)). Details can be found in ETS 300 102-1 [10].

A 7 kHz terminal (which supports 7 kHz telephony using CCITT Recommendation G.722 [16] speech encoding) shall consider the Bearer capability information element(s) in the incoming SETUP message as compatible if one Bearer Capability element has the information transfer capability field set to "UDI-TA" and the user information layer 1 protocol field coded as "Recommendations H.221/H.242".

If two Bearer Capability elements are received in the incoming SETUP message and the terminal is compatible to both, the last Bearer Capability element shall be regarded as the one indicating the preferred mode of operation.

As a short term procedure, in order to provide a capability similar to the telephony 7 kHz teleservice, the information transfer field of the Bearer capability information element(s) can, optionally, be coded as "UDI". In order for this mechanism to operate, the destination terminal shall accept, as compatible, each of the two BC values "UDI-TA" and "UDI". The acceptance of the information transfer capability field value "UDI" for this purpose is, therefore, an allowed option. If the user information layer 1 protocol field is included in the Bearer capability information element(s), for this purpose it shall be coded as "H.221/H.242".

For the possible acceptance of other Bearer capability information element(s), see subclause 5.2.1.

Compliance shall be checked using the tests specified in prI-ETS 300 322 [14].

NOTE 1: Communication with CCITT Recommendation G.711 [15]  $\mu$ -law terminals over a transparent 64 kbit/s channel is for further study.

NOTE 2: An algorithm to determine whether the received speech is coded using A-law or  $\mu$ -law, can be found in Appendix I to CCITT Recommendation G.725.

#### **5.2.1.2 Analysis of High layer compatibility information element**

High Layer Capability analysis is optional for telephony terminals supporting only telephony 3,1 kHz teleservice. However, High Layer Capability analysis is recommended for all kinds of terminals and is mandatory for some terminals. Information can be found here or in other parts of this I-ETS.

If an High layer compatibility information element for the telephony 3,1 kHz or 7 kHz teleservice is received and analyzed, the terminal shall consider the check to be successful if high layer characteristics identification field of the High layer compatibility information element(s) in the incoming SETUP message is coded as "telephony", as specified in ETS 300 102-1 [10], subclause 4.5.16.

A compatibility check for telephony 7 kHz teleservice shall only be considered as successful if one High layer compatibility information element(s) in the incoming SETUP message is coded as specified above.

If two High Layer Capability elements are received in the incoming SETUP message and the terminal is compatible to both, the last High Layer Capability element shall be regarded as the one indicating the preferred mode of operation.

If an High layer compatibility information element is not received in the incoming SETUP message, the call shall be accepted as being a 3,1 kHz telephony call if one Bearer capability information element(s) specifies "speech".

For the possible acceptance of other High layer compatibility information element(s), see subclause 5.2.1 and relevant parts of this I-ETS or other relevant Standards.

Compliance shall be checked using the tests specified in prI-ETS 300 322 [14].

#### **5.2.1.3 Analysis of Low layer compatibility information element**

Within the scope of this I-ETS, any information received in a Low layer compatibility information element shall be ignored.

#### **5.2.1.4 Terminal selection**

A telephony terminal connected to an ISDN basic access can be selected by an ISDN number (Multiple Subscriber Number (MSN)) and/or subaddress, as defined in CCITT Recommendation E.164 [17], if present.

If the terminal supports MSN and/or Subaddressing (SUB) supplementary service and information for selection is stored, the terminal shall perform additional compatibility checks on the ISDN subscriber number and/or subaddress, if present in the incoming SETUP message. These checks are additional to the compatibility checks specified in subclauses 5.2.1.1 and 5.2.1.2. In case of MSN and/or SUB mismatch, the call shall be ignored. If the SETUP message does not contain a subaddress, though a subaddress is stored or programmed in the terminal, this shall not be a reason to ignore or reject the call.

When no information for selection on the basis of MSN or SUB is stored, the terminal shall respond to every incoming SETUP message if the compatibility checks specified in subclauses 5.2.1.1 and 5.2.1.2 are successful.

The programming and deleting of information for selection (MSN and/or SUB) shall be controlled by the user.

As an option, 7 kHz terminals may be programmed to receive 7 kHz calls only. It shall be possible to disable this option.

NOTE: Further detailed information can be found in ITU-T Recommendation I.333 which deals with the procedures carried out between a terminating ISDN exchange and an ISDN terminal equipment.

Compliance shall be checked using the tests specified in prl-ETS 300 322 [14].

### **5.2.2 Compatibility checking for the designated terminal under Restricted power condition**

Under Restricted power condition, but when local power is additionally available for the designated terminal, the designated terminal may respond to all incoming calls with:

- 1) Bearer Capability "speech"; or
- 2) Bearer Capability "3,1 kHz audio" combined with a progress description #1 (call is not end-to-end ISDN: further progress information may be available in-band) or #3 (origination address is non-ISDN).

If the restricted power is the only power available to the terminal, the designated terminal shall respond to all such incoming calls.

The response shall be independent of any other kind of operation programmed for Normal power condition.

Compliance shall be checked using the tests specified in prl-ETS 300 322 [14].

### **5.2.3 Response to incoming calls**

A terminal which is compatible to an incoming SETUP message, when considering a possible second Bearer capability information element and/or a possible second High layer compatibility information element(s) as described in subclause 5.2, shall include the relevant "second" information elements from the incoming SETUP message in the CONNECT message in order to indicate the resultant service to the network and to the originating terminal (specified in ETS 300 267 [13], subclause 6.5.2).

If the terminal is compatible only to the first of both the Bearer capability and High layer compatibility information element(s) (lowest priority, basic fallback teleservice) or in cases when only one Bearer capability information element and one High layer compatibility information element is received, the inclusion of Bearer capability and High layer compatibility information element(s) in the CONNECT message is an option (as specified in ETS 300 267 [13], subclause 5.5.2).

Compliance shall be checked using the tests specified in prl-ETS 300 322 [14].

## **5.3 Information tones**

### **5.3.1 Transmission of tones and announcements from the network**

The terminal shall be capable of transmitting to the human user audio information (tones and verbal announcements) received on the B-channel allocated to the call.

If octet 3 of the Bearer capability information element(s) in the SETUP message indicates "speech", "3,1 kHz audio" or "UDI-TA", most networks will provide information tones encoded to A-law in accordance with CCITT Recommendation G.711 [15] and transmitted on the B-channel allocated to the call. The decoding in the terminal shall be based upon the same coding law.

For 3,1 kHz telephony the A-law to mu-law conversion is managed by the network. For the initial phase of a 7 kHz telephony call the A-law or mu-law decoding shall be selected and performed by the terminals. The conditions related to this selection are covered by I-ETS 300 281 [12].

The acoustic receiver may be connected to the B-channel after the receipt of a SETUP ACKNOWLEDGE message (overlap sending) or a CALL PROCEEDING message (en-bloc sending).

NOTE: This allows transmission of any tone or announcement generated by or transmitted through the network, and applied to the B-channel without previous notification (i.e. without progress indicator, which is optional and will not be provided by all networks).

The receiver shall be connected to the B-channel after the receipt of a call control message containing Progress description #1 (call is not end-to-end ISDN: further progress information may be available in-band) or #8 (in-band information or appropriate pattern now available).

To reduce the reception of noise caused by random codes possibly present on the B-channel before connection through the network, the acoustic receiver may be temporarily switched off in the overlap sending state.

In order to be able to receive tones and announcements from the network the receiver may be connected or re-connected to the B-channel after the receipt of a DISCONNECT message with progress description #8 (in-band information or appropriate pattern now available).

The receiver shall be disconnected from the B-channel after the receipt of any of the messages: DISCONNECT without progress description #8 (in-band information or appropriate pattern now available), RELEASE or RELEASE COMPLETE.

### 5.3.2 Generation of tones by the terminal

The ability of the terminal to generate tones and verbal announcements for presentation to the human user, on the basis of local information and/or messages received on the D-channel, is a permitted option.

Such tones or announcements may be used to replace signals from the network and/or to give the human user audible information in cases when no B-channel is available or allocated or when no tones or announcements are provided by the network.

If the option is implemented, at least one of the following two modes shall be possible:

- **Normal mode:** locally generated tones or announcements are used in cases when no B-channel is available and to replace signals from the network;
- **Mixed mode:** locally generated tones or announcements are used in cases when no B-channel is available. Otherwise information transmitted on the B-channel is used.

NOTE: National requirements for locally generated information tones can be found in Annex B to ETS 300 085 [1]. If local generation of tones or messages is included in a terminal, it is recommended to include a European harmonized set of tones. A standard for such tones can be found in Part 7 of this I-ETS.

## 5.4 Dual Tone Multi Frequency (DTMF) signalling

### 5.4.1 General

As an option, the terminal may be equipped to send DTMF signals in the connected B-channel. If this option is implemented, the requirements of subclause 5.4 apply.

The encoding of DTMF signals shall use the same encoding algorithm as the speech transmission which is set up or which is going to be set up. The option may be provided independently for each coding used. If the option is provided it shall as a minimum be provided using CCITT Recommendation G.711 [15], A-law.

Compliance shall be checked using the tests specified in Annex A, Clause A.2.

### 5.4.2 Connection to B-channel

When the acoustic receiver is connected to the B-channel, as described in subclause 5.3.1, it shall be possible to connect the DTMF transmitter to the B-channel.

It shall not be possible to connect the DTMF transmitter to the B-channel until one of the messages specified in the subclause 5.3.1 is received. This applies also in the case when B-channel information is replaced by locally generated information, see subclause 5.3.2.

### 5.4.3 Signalling frequencies

Each signal consists of two simultaneous frequencies, one from a high and one from a low frequency group. Each frequency group consists of four frequencies.

		High frequency group			
		Hz	1 209	1 336	1 477
Low frequency group	697	1	2	3	A
	770	4	5	6	B
	852	7	8	9	C
	941	*	0	#	D

Figure 1: Signalling scheme for DTMF signals

The signalling frequencies and corresponding codes shall be in accordance with figure 1.

If DTMF signalling is implemented at least the codes for the digits 0 - 9, "\*" and "#" shall be included.

### 5.4.4 Frequency deviation

Each signal frequency shall not differ by more than 1,5 % from the nominal frequencies given in figure 1.

### 5.4.5 Level

The level of each frequency, measured selectively, shall be -15 dBm0 with a tolerance of  $\pm 2$  dB.

### 5.4.6 Timing

For manual operation, the signal shall be sent as long as the corresponding push button is depressed. If the time of the signals and/or pauses are automatically controlled by the terminal equipment, each signal and each pause shall not be less than 65 ms.

NOTE 1: A reference document for this signalling system is CCITT Recommendation Q.23.

NOTE 2: DTMF tones sent before the receipt of the CONNECT message are, in some cases, valid for terminals to interwork with supplementary and other services (not end-to-end).

## 6 Transmission aspects

### 6.1 Encoding

Any telephony terminal shall use the encoding law defined in CCITT Recommendation G.711 [15], A-law at 64 kbit/s as default speech encoding algorithm. Any other coding algorithm shall be additional.

### 6.2 Relative level

The digital interface is defined as a 0 dB<sub>r</sub> point according to CCITT Recommendation G.101 [18].



## **7 Power feeding**

### **7.1 General conditions**

The power supply requirements of a digital telephony terminal for ISDN shall be in accordance with those stated in ETS 300 012 [19] as far as power source 1 is concerned.

### **7.2 Restricted power condition**

The permitted option of being a designated terminal for use under Restricted power condition may be implemented in any terminal capable of supporting 3,1 kHz telephony, if it meets the requirements for a designated terminal given in this I-ETS and in ETS 300 085 [1].

It shall be possible to disable this option.

#### **7.2.1 Leakage current**

Under Restricted power condition, a non-designated terminal shall comply with leakage current requirements of ETS 300 012 [19].

#### **7.2.2 Operation of the designated terminal under Restricted power conditions**

Under Restricted power conditions a designated terminal shall fulfil the requirements for a designated terminal as specified in ETS 300 085 [1].

A multiservice or multimedia terminal (e.g. 7 kHz terminal) may be the designated terminal if it responds, on a default basis, to incoming calls with:

- 1) Bearer Capability "speech"; or
- 2) Bearer Capability "3,1 kHz audio" combined with progress description #1 (call is not end-to-end ISDN: further progress information may be available in-band) or #3 (origination address is non-ISDN), when it has no other power available than the restricted power. The response shall be independent of any other operation programmed for normal power condition.

## **8 Physical modules**

### **8.1 Handset**

Guidelines for handset modules are found in part 2 of this I-ETS.

### **8.2 Audible alerting module**

#### **8.2.1 Sound pressure level**

Requirements are given in ETS 300 085 [1].

For many applications it is desirable to have an adjustable sound pressure level (e.g. offices). It should therefore be possible to reduce the sound pressure level to 50 dBA, when measured as specified in ETS 300 085 [1].

#### **8.2.2 Frequency spectrum**

The sound pressure level in each of the frequency bands 179 Hz to 1 120 Hz and 1 120 Hz to 11 200 Hz shall not be more than 18 dB below the total unweighted sound pressure level.

At least one setting of the alerting module shall exist where these requirements are fulfilled.

NOTE: 179 Hz, 1 120 Hz and 11 200 Hz are edges of the third-octave bands centered at 200 Hz, 1 000 Hz and 10 000 Hz.

To ensure good audibility it is desirable to have an output with both low and high frequency content and a distinctive cadence.

Low frequency content is particularly important for those with impaired hearing.

It is advantageous to be able to change the signal so as to make it possible to distinguish between terminals.

## **Annex A (normative): Test specifications**

### **A.1 General conditions for testing**

The general conditions for testing (environment, power supply, test equipment requirements, etc.) are given in ETS 300 085 [1].

### **A.2 DTMF measurements**

#### **A.2.1 Frequency deviation**

A frequency measuring instrument with accuracy better than 0,2 % shall be used.

The frequencies shall be measured at the digital interface when each push button is pressed, or if appropriate, when a preprogrammed sequence is sent.

#### **A.2.2 Signal level**

The signal levels shall be measured selectively at the digital interface when each push button is pressed, or if appropriate, when stored sequences of equal symbols are sent.

#### **A.2.3 Signal timing**

The signal time sequence shall be measured at the digital interface when a stored sequence of DTMF symbols is sent.

The time when the signal is present is defined to be when the total level is less than 10 % below the maximum level.

The pause is defined to be when the total level is less than 10 % of the maximum level.

The maximum level shall be taken as the maximum peak voltage which corresponds to the maximum value of the final signal level attained during excitation of the sending terminal.

NOTE: A more precise definition for signal timing and levels is given in ETS 300 001, subclause 5.4.6.

## **Annex B (informative): Bibliography**

For the purposes of this part of the I-ETS, the following informative references have been given.

- 1) CCITT Recommendation G.725 (1988): "System aspects for the use of the 7 kHz audio codec within 64 kbit/s".
- 2) ITU-T Recommendation I.333: "Terminal selection in ISDN".
- .3) CCITT Recommendation Q.23 (1988): "Technical features of push-button telephone sets".
- 4) ETS 300 001: "Attachments to Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN (Candidate NET 4)".

## History

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