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Digital Enhanced Cordless Telecommunications (DECT); Test specification; Part 2:
Speech

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Digital Enhanced Cordless Telecommunications (DECT); Test specification; Part 2: Speech

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Project Digital Enhanced Cordless Telecommunications (DECT).

The present document contains text pertaining to approval testing of the Digital Enhanced Cordless Telecommunications (DECT) Common Interface. Such text should be considered as guidance to approval (or licensing) authorities.

Details of the DECT Common Interface may be found in EN 300 175 parts 1 [1] to 8 [8]. Further details of the DECT system may be found in the ETSI Technical Reports, TR 101 178 [31] and ETR 043 [32].

The present document is part 2 of a multi-part deliverable covering the approval test specification for Digital Enhanced Cordless Telecommunications (DECT), as identified below:

Part 1: "Radio";

Part 2: "Speech". <https://standards.iteh.ai/catalog/standards/sist/8495e9ba-595c-4dec-8efe-2b206bab7415/sist-en-300-176-2-v1-5-1-2006>

National transposition dates

Date of adoption of this EN:	19 December 2003
Date of latest announcement of this EN (doa):	31 March 2004
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 September 2004
Date of withdrawal of any conflicting National Standard (dow):	30 September 2004

1 Scope

The present document specifies the tests applicable to all Digital Enhanced Cordless Telecommunications (DECT) equipment accessing the DECT frequency band 1 880 MHz to 1 900 MHz (including provisions for testing other or extended frequency bands) and the tests applicable to DECT speech transmission using ITU-T Recommendation G.726 [17] ADPCM speech codec at 32 kbit/s.

The aims of the present document are to ensure:

- efficient use of frequency spectrum;
- no harm done to any connected network and its services;
- no harm done to other radio networks and services;
- no harm done to other DECT equipment or its services;
- interworking of terminal equipment via the public telecommunications network,

through testing those provisions of EN 300 175, parts 1 [1] to 8 [8] which are relevant to these aims.

The tests of EN 300 176 are split into two parts:

- part 1 covers testing of radio frequency parameters, security elements and those DECT protocols that facilitate the radio frequency tests and efficient use of frequency spectrum;
- part 2 (the present document) describes testing of DECT 32 kbit/s ADPCM speech requirements between network interface and DECT PT, or between a DECT CI air interface and alternatively a DECT PT or FT. This part is not applicable to terminal equipment specially designed for the disabled (e.g. with amplification of received speech as an aid for the hard of hearing).

DECT terminal equipment consists of the following elements:

- a) Fixed Part (FP); <https://standards.iteh.ai/catalog/standards/sist/8495e9ba-595c-4dec-8efe-2b206bab7415/sist-en-300-176-2-v1-5-1-2006>
- b) Portable Part (PP);
- c) Cordless Terminal Adapter (CTA);
- d) Wireless Relay Station (WRS) (FP and PP combined).

The present document is structured to allow tests of either:

- a) the FP and PP together; or
- b) the FP and PP as separate items.

Where the DECT FP is connected to a PSTN, and there are any peculiarities in the requirements for voice telephony, these shall be accommodated within the FP.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

- [1] ETSI EN 300 175-1: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 1: Overview".
- [2] ETSI EN 300 175-2: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 2: Physical layer (PHL)".
- [3] ETSI EN 300 175-3: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 3: Medium Access Control (MAC) layer".
- [4] ETSI EN 300 175-4: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 4: Data Link Control (DLC) layer".
- [5] ETSI EN 300 175-5: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 5: Network (NWK) layer".
- [6] ETSI EN 300 175-6: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 6: Identities and addressing".
- [7] ETSI EN 300 175-7: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 7: Security features".
- [8] ETSI EN 300 175-8: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 8: Speech coding and transmission".
- [9] ETSI ETS 300 111: "Integrated Services Digital Network (ISDN); Telephony 3,1 kHz teleservice; Service description".
- [10] ETSI TBR 008 (1998): "Integrated Services Digital Network (ISDN); Telephony 3,1 kHz teleservice; Attachment requirements for handset terminals".
- [11] ITU-T Recommendation G.101 (2003): "The transmission plan".
- [12] ITU-T Recommendation G.111 (1993): "Loudness ratings (LRs) in an international connection".
- [13] ITU-T Recommendation G.122 (1993): "Influence of national systems on stability and talker echo in international connections".
- [14] ITU-T Recommendation G.223 (1988): "Assumptions for the calculation of noise on hypothetical reference circuits for telephony".
- [15] ITU-T Recommendation G.711 (1988): "Pulse code modulation (PCM) of voice frequencies".
- [16] ITU-T Recommendation G.712 (2001): "Transmission performance characteristics of pulse code modulation channels".
- [17] ITU-T Recommendation G.726 (1990): "40, 32, 24, 16 kbit/s Adaptive Differential Pulse Code Modulation (ADPCM)".
- [18] ITU-T Recommendation O.132 (1988): "Quantizing distortion measuring equipment using a sinusoidal test signal".

- [19] ITU-T Recommendation O.133 (1993): "Equipment for measuring the performance of PCM encoders and decoders".
- [20] ITU-T Recommendation P.50 (1999): "Artificial voices".
- [21] ITU-T Recommendation P.51 (1996): "Artificial mouth".
- [22] ITU-T Recommendation P.57 (2002): "Artificial ears".
- [23] ITU-T Recommendation P.64 (1999): "Determination of sensitivity/frequency characteristics of local telephone systems".
- [24] ITU-T Recommendation P.79 (1999): "Calculation of loudness ratings for telephone sets".
- [25] ISO 3 (1973): "Preferred numbers - Series of preferred numbers".
- [26] ISO 9614: "Acoustics - Determination of sound power levels of noise sources using sound intensity".
- [27] ETSI TBR 038: "Public Switched Telephone Network (PSTN); Attachment requirements for a terminal equipment incorporating an analogue handset function capable of supporting the justified case service when connected to the analogue interface of the PSTN in Europe".
- [28] ETSI EN 300 700: "Digital Enhanced Cordless Telecommunications (DECT); Wireless Relay Station (WRS)".
- [29] ETSI EN 300 176-1: "Digital Enhanced Cordless Telecommunications (DECT); Test specification; Part 1: Radio".
- [30] ETSI I-ETS 300 245-3: "Integrated Services Digital Network (ISDN); Technical characteristics of telephony terminals; Part 3: Pulse Code Modulation (PCM) A-law, loudspeaking and handsfree telephony".
- [31] ETSI TR 101 178: "Digital Enhanced Cordless Telecommunications (DECT); A High Level Guide to the DECT Standardization".
- [32] ETSI ETR 043: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Services and facilities requirements specification".
- [33] Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (Low Voltage Directive).

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Acoustic Reference Level (ARL): acoustic level that corresponds to a power level of -10 dBm₀ at the TAP

conducted measurements: measurements which are made using a direct connection to the Equipment Under Test (EUT)

dBPa: sound pressure level relative to 1 Pa (no weighting)

duplex bearer: use of two simplex bearers operating in opposite directions on two physical channels. These pairs of channels always use the same radio Frequency (RF) carrier and always use evenly spaced slots (i.e. separated by 0,5 Time Division Multiple Access (TDMA) frame)

Cordless Terminal Adapter (CTA): physical grouping that contains a DECT portable termination and a line interface

Equipment Under Test (EUT): equipment submitted to the test laboratory for type examination

fixed geometry PP: PP in which the electro-acoustic transducers and their associated acoustic components are held in fixed relative positions and/or orientations during all on-line conditions of the PP

Fixed Part (DECT Fixed Part) (FP): physical grouping that contains all of the elements in the DECT network between the local network and the DECT air interface

NOTE: A DECT fixed part contains the logical elements of at least one fixed radio termination, plus additional implementation specific elements.

Fixed radio Termination (FT): logical group of functions that contains all of the DECT processes and procedures on the fixed side of the DECT air interface

NOTE: A fixed radio termination only includes elements that are defined in EN 300 175 parts 1 [1] to 8 [8]. This includes radio transmission elements (layer 1) together with a selection of layer 2 and layer 3 elements.

Full Slot (SLOT): one 24th of a TDMA frame which is used to support one physical channel

handset echo: echo, perceptible by the far-end user, resulting from the coupling between the receive and send directions of the handset, mostly due to acoustic coupling between transducers

NOTE: It is particularly cumbersome in communications including a satellite and an echo canceller, as the DECT handset echo may be out of range of the echo canceller.

inter-operability: capability of fixed parts and portable parts, that enable a portable part to obtain access to teleservices in more than one location area and/or from more than one operator (more than one service provider)

Local echo Loss (LLe): sum of the reflections measured at the digital interface of the RePP

NOTE: It is calculated according to ITU-T Recommendation G.122 [13], annex B.4, Trapezoidal rule.

Lower Tester (LT): logical grouping that contains the test equipment, a functionally equivalent DECT PT, a functionally equivalent DECT FT and a test controller

network echo: echo, perceptible by the DECT user, resulting from reflections in the network. It is mostly due to hybrid impairments at both ends of the communication. The protection consists of an additional echo loss located in the receive path of the DECT system

Portable HandSet (PHS): single physical grouping that contains all of the portable elements that are needed to provide a teleservice to the user

NOTE: Portable handset is a subset of all possible portable parts. This subset includes all physical groupings that combine one portable radio termination plus at least one portable application in a single physical box.

Portable Part (PP): physical grouping that contains all elements between the user and the DECT air interface

NOTE 1: Portable Part (PP) is a generic term that may describe one or several physical pieces.

NOTE 2: A portable part is logically divided into one portable termination plus one or more portable applications.

Portable radio Termination (PT): logical group of functions that contains all of the DECT processes and procedures on the portable side of the DECT air interface

NOTE: A PT only includes elements that are defined in EN 300 175 parts 1 [1] to 8 [8]. This includes radio transmission elements together with a selection of layer 2 and layer 3 elements.

public: attribute indicating that the application of the so qualified term is used to provide access to a public network for the general public

NOTE: The term does not imply any legal or regulatory aspect, nor does it imply any aspects of ownership.

Test Access Point (TAP): digital interface with a relative level of 0 dB_r providing the access to the PCM speech channels in both transmission directions

telephony 3,1 kHz teleservice: definition for telephony 3,1 kHz teleservice is to be found in ETS 300 111

NOTE: Work is currently being undertaken by ETSI to analyse the mouth-to-ear characteristics of voice communication. The results of this work can have consequences for the essential requirements of the present document.

test laboratory: body which performs testing and is designated to perform third party testing

variable geometry PP: PP that allows the position and/or orientation of its electro-acoustic transducers and their associated acoustic components to be changed during all on-line conditions of the PP

3.2 Symbols

For the purposes of the present document, the following symbols apply:

dBm	dB relative to 1 mW
dBm0	absolute power level in decibels referred to a point of zero relative level
dBPa	sound pressure level relative to 1 Pa, expressed in dB
dBr	relative power level in decibels
L_{in}	input level
L_{out}	output level
LL_e	Local echo Loss
L_{meST}	Telephone Sidetone Path Loss
Ssi(diff)	The difference of the send sensitivities between diffuse and direct sound
Ssi(direct)	The sending sensitivities for the direct sound

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3.3 Abbreviations (standards.iteh.ai)

For the purposes of the present document, the following abbreviations apply:

ADPCM	Adaptive Differential Pulse Code Modulation
ARL	Acoustic Reference Level
CSS	Composite Source Signal
CTA	Cordless Terminal Adapter
e.m.f	electromotive force
ERP	Ear Reference Point
EUT	Equipment Under Test
FFT	Fast Fourier Transformation
FP	Fixed Part
FT	Fixed radio Termination
GAP	Generic Access Profile
LNR	Low Noise Room
LRGP	Loudness Rating Guard-ring Position
LST	Listener Sidetone
LSTR	Listener Sidetone Rating
LT	Lower Tester
MRP	Mouth Reference Point
PCM	Pulse Code Modulation
PHS	Portable HandSet
PP	Portable Part
PT	Portable radio Termination
ReFP	Reference Fixed Part (for speech testing)
RePP	Reference Portable Part (for speech testing)
RF	Radio Frequency
RH	Relative Humidity
RLR_H	Receiving Loudness Rating of the Handset
rms	root mean square
SL	Linear input Signal, see ITU-T Recommendation G.726
SLR_H	Sending Loudness Rating of the Handset

SR	Reconstructed Signal, see ITU-T Recommendation G.726
STMR	SideTone Masking Rating
TAP	Test Access Point
TCL	Terminal Coupling Loss
TCLw	weighted Terminal Coupling Loss
TDMA	Time Division Multiple Access
TELR	Talker Echo Loudness Rating
WRS	Wireless Relay Stations

4 Interpretation of the measurement results

The interpretation of the results recorded in a test report for the measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit shall be used to decide whether an equipment meets the minimum requirements of the standard;
- the actual measurement uncertainty of the test laboratory carrying out the measurement, for each particular measurement, shall be included in the test report;
- the values of the actual measurement uncertainty shall be, for each measurement, equal to or lower than the values in clause 5.3.4.

5 General test requirements

Those functions and procedures which are optional, as indicated directly or indirectly by "if provided", shall be subject to a conformance test if they are implemented. Whether an optional function/procedure has been implemented shall be indicated by the Apparatus Suppliers declaration.

Wireless Relay Stations (WRS), EN 300 700 [28], tested according to the DECT test specification (see EN 300 176-1 [29]), also belong to telephony applications. Testing according to the present document is however not applicable to a WRS.

NOTE: A WRS conforms to a defined frame multiplexing scheme, see EN 300 700 [28], which provides a transparent digital bit pipe for the user data, and which automatically provides an acceptable upper bound of the incremental delay introduced by a WRS. See EN 300 175-8 [8], clause 8.4.1 for modified echo control requirements for multi-hop architectures.

5.1 Test philosophy

5.1.1 Equipment supporting an ETSI approved profile

Equipment falling into this category is defined in EN 300 175-1 [1].

In this case, a test equipment capable of emulating a PT or FT that conforms to EN 300 175 parts 1 [1] to 8 [8] operating an ETSI approved profile corresponding to that supported by the EUT is required. Consequently, each test set-up consists of the test equipment being connected to the EUT, either by a radio link or via an antenna connector, and a call being established. Figures 1 and 2 show the possible test configurations.