SLOVENSKI STANDARD
SIST EN 300 175-2 V2.9.1:2022

01-maj-2022

Digitalne izboljšane brezvrvične telekomunikacije (DECT) - Skupni vmesnik (CI) - 2. del: Fizična plast (PHL)

Digital Enhanced Cordless Telecommunications (DECT) - Common Interface (CI) - Part 2: Physical Layer (PHL)

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Ta slovenski standard je istoveten z: ETSI EN 300 175-2 V2.9.1 (2022-03)

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ICS:

33.070.30	Digitalne izboljšane brezvrvične telekomunikacije (DECT)	Digital Enhanced Cordless Telecommunications (DECT)
35.100.10	Fizični sloj	Physical layer

SIST EN 300 175-2 V2.9.1:2022 en

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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ETSI EN 300 175-2 V2.9.1 (2022-03)

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Reference
REN/DECT-00352

Keywords
DECT, IMT-2000, mobility, radio, TDD, TDMA

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Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Digital Enhanced Cordless Telecommunications (DECT).

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The present document is part 2 of a multi-part deliverable ([1] to [8]). Full details of the entire series can be found in part 1 [1].

Further details of the DECT system may be found in ETSI TR 101 178 [i.1] and ETSI ETR 043 [i.2].

National transposition dates	
Date of adoption of this EN:	23 March 2022
Date of latest announcement of this EN (doa):	30 June 2022
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 December 2022
Date of withdrawal of any conflicting National Standard (dow):	31 December 2023

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1 Scope

The present document is one of the parts of the specification of the Digital Enhanced Cordless Telecommunications (DECT) Common Interface (CI).

The present document specifies the physical channel arrangements. DECT physical channels are radio communication paths between two radio end points. A radio end point is either part of the fixed infrastructure, a privately owned Fixed Part (FP), typically a base station, or a Portable Part (PP), typically a handset. The assignment of one or more particular physical channels to a call is the task of higher layers.

The Physical Layer (PHL) interfaces with the Medium Access Control (MAC) layer, and with the Lower Layer Management Entity (LLME). On the other side of the PHL is the radio transmission medium which has to be shared extensively with other DECT users and a wide variety of other radio services. The tasks of the PHL can be grouped into five categories:

a) to modulate and demodulate radio carriers with a bit stream of a defined rate to create a radio frequency channel;

b) to acquire and maintain bit and slot synchronization between transmitters and receivers;

c) to transmit or receive a defined number of bits at a requested time and on a particular frequency;

d) to add and remove the synchronization field and the Z-field used for rear end collision detection;

e) to observe the radio environment to report signal strengths.

The present document includes New Generation DECT, a further development of the DECT standard introducing wideband speech, improved data services, new slot types and other technical enhancements.

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2 References

2.1 Normative references

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[1] ETSI EN 300 175-1: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 1: Overview".

[2] Void.

[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".

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[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 and audio coding and transmission".

[9] ETSI EN 300 176-1: "Digital Enhanced Cordless Telecommunications (DECT); Test specification; Part 1: Radio".

[10] Recommendation ITU-R M.1457-15: "Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)".

[11] Recommendation ITU-T V.11: "Electrical characteristics for balanced double-current interchange circuits operating at data signalling rates up to 10 Mbit/s".

[12] Federal Communications Commission FCC 02-151: "Second Report and Order, Amendment of Part 15 of the Commission's Rules Regarding Spread Spectrum Devices".

[13] CEPT/ECC/DEC/(06)01: "ECC Decision of 24 March 2006 amended 02 November 2012 on the harmonised utilisation of the bands 1920-1980 MHz and 2110-2170 MHz for mobile/fixed communications networks (MFCN) including terrestrial IMT systems".

2.2 Informative references

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[i.1] ETSI TR 101 178: "Digital Enhanced Cordless Telecommunications (DECT); A High Level Guide to the DECT Standardization".

[i.2] ETSI ETR 043: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Services and facilities requirements specification".

[i.3] International Commission on Non-Ionizing Radiation Protection (ICNIRP): "Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz), Health Physics", vol. 74, pp 494-522, April 1998.

[i.4] Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (Official Journal of the European Communities, July 1999).

[i.5] EN 50360: "Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz - 3 GHz)", produced by European Committee for Electrotechnical Standardization (CENELEC), July 2001. (Harmonised standard listed under the R&TTE directive).

[i.6] EN 50385: "Product standard to demonstrate the compliance of radio base stations and fixed terminal stations for wireless telecommunication systems with the basic restrictions or the reference levels related to human exposure to radio frequency electromagnetic fields (110 MHz - 40 GHz) - General public", produced by European Committee for Electrotechnical Standardization (CENELEC), November 2001 (draft).

[i.7] EN 50383: "Basic standard for the calculation and measurement of electromagnetic field strength and SAR related to human exposure from radio base stations and fixed terminal stations for wireless telecommunication systems (110 MHz - 40 GHz)", produced by European Committee for Electrotechnical Standardization (CENELEC), November 2001 (draft).

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[i.8] IEEE 802.11b™: "Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".

3 Definition of terms, symbols and abbreviations

3.1 Terms

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

antenna diversity: See ETSI EN 300 175-1 [1].

cell: See ETSI EN 300 175-1 [1].

Central Control Fixed Part (CCFP): See ETSI EN 300 175-1 [1].

channel: See ETSI EN 300 175-1 [1].

cluster: See ETSI EN 300 175-1 [1].

Connection Oriented mode (C/O): See ETSI EN 300 175-1 [1].

Cordless Radio Fixed Part (CRFP): See ETSI EN 300 175-1 [1].

coverage area: See ETSI EN 300 175-1 [1].

DECT Network (DNW): See ETSI EN 300 175-1 [1].

double duplex bearer: See ETSI EN 300 175-1 [1].

double simplex bearer: See ETSI EN 300 175-1 [1].

double slot: See ETSI EN 300 175-1 [1].

down-link: See ETSI EN 300 175-1 [1].

duplex bearer: See ETSI EN 300 175-1 [1].

Fixed Part (DECT Fixed Part) (FP): See ETSI EN 300 175-1 [1].

Fixed radio Termination (FT): See ETSI EN 300 175-1 [1].

frame: See ETSI EN 300 175-1 [1].

full slot (slot): See ETSI EN 300 175-1 [1].

guard space: See ETSI EN 300 175-1 [1].

half slot: See ETSI EN 300 175-1 [1].

handover: See ETSI EN 300 175-1 [1].

IMT-2000: International Mobile Telecommunications, Third Generation Mobile Systems

IMT-FT: International Mobile Telecommunications, FDMA/TDMA

NOTE: This is the DECT family member of IMT-2000.

intercell handover: See ETSI EN 300 175-1 [1].

intracell handover: See ETSI EN 300 175-1 [1].

Lower Layer Management Entity (LLME): See ETSI EN 300 175-1 [1].

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multiframe: See ETSI EN 300 175-1 [1].

new Generation DECT: See ETSI EN 300 175-1 [1].

physical channel (channel): See ETSI EN 300 175-1 [1].

Portable Part (DECT Portable Part) (PP): See ETSI EN 300 175-1 [1].

Portable radio Termination (PT): See ETSI EN 300 175-1 [1].

public access service: See ETSI EN 300 175-1 [1].

radio channel: See ETSI EN 300 175-1 [1].

radio end point: See ETSI EN 300 175-1 [1].

Radio Fixed Part (RFP): See ETSI EN 300 175-1 [1].

Repeater Part (REP): See ETSI EN 300 175-1 [1].

RF carrier (carrier): See ETSI EN 300 175-1 [1].

RF channel: See ETSI EN 300 175-1 [1].

simplex bearer: See ETSI EN 300 175-1 [1].

Single Radio Fixed Part (SRFP): See ETSI EN 300 175-1 [1].

TDMA frame: See ETSI EN 300 175-1 [1].

Wireless Relay Station (WRS): See ETSI EN 300 175-1 [1].

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3.2 Symbols

Void.

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3.3 Abbreviations

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

AC	Accuracy
AM	Amplitude Modulation
BER	Bit Error Rate
BT	Bandwidth Time product (Gaussian filters)
CCFP	Central Control Fixed Part
CI	Common Interface (standard)
CRC	Cyclic Redundancy Check
CRFP	Cordless Radio Fixed Part
CTA	Cordless Terminal Adapter
dBm	dB relative to 1 milliwatt
DBPSK	Differential Binary Phase Shift Keying
DC	Direct Current
DLC	Data Link Control layer
DNW	DECT NetWork
DPSK	Differential Phase Shift Keying
DQPSK	Differential Quaternary Phase Shift Keying
D-SAP	Data field-Service Access Point
DSV	Digital Sum Variation
EIRP	Equivalent Isotropically Radiated Power
ERP	Effective Radiated Power
EVM	Error-Vector Magnitude
FMID	Fixed part MAC IDentity
FP	Fixed Part

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FT	Fixed radio Termination
Fy	Frequency
GFSK	Gaussian Frequency Shift Keying
GMSK	Gaussian Minimum Shift Keying
GPS	Global Positioning System
HLM	High Level Modulation
ICNIRP	International Commission on Non-Ionizing Radiation Protection
iDCS	instant Dynamic Channel Selection
IMT-FT	International Mobile Telecommunications - Frequency Time
ISM	Industrial, Scientific and Medical
ITU-T	International Telecommunication Union - Telecommunication
LCD	Largest Common Denominator
LLME	Lower Layer Management Entity
MAC	Medium Access Control layer
MCM	Minimum Common Multiple
ME	Management Entity
MF	Fading Margin
MFN	MultiFrame Number
MT	MAC control channel on A-tail field, or one message on such channel
NTP	Normal Transmitted Power
NWK	NetWorK
PCMCIA	Personal Computer Memory Card International Association
PHL	Physical Layer
PM-SAP	Physical layer Management entity - Service Access Point
PP	Portable Part
ppm	parts per million
PSCN	Primary receiver Scan Carrier Number
PT	Portable radio Termination
QAM	Quadrature Amplitude Modulation
QT	system information and Multiframe marker (MAC logical channel)
REP	Repeater Part
RF	Radio Frequency
RFP	Radio Fixed Part
RMS	Root Mean Square
RPN	Radio fixed Part Number
RSS	Radio Signal Strength
RSSp	Radio Signal Strength PP
SAP	Service Access Point
SAR	Specific Absorption Rate
SDU	Service Data Unit
SRFP	Single Radio Fixed Part
TDD	Time Division Duplex
TDM	Time Division Multiplex
TDMA	Time Division Multiple Access
UMTS	Universal Mobile Telecommunication System
UTC	Universal Time Coordinated
VF	cable Velocity Factor
WLAN	Wireless Local Area Network
WLL	Wireless Local Loop
WRS	Wireless Relay Station

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4 PHL services

4.0 General

A physical channel provides a simplex bit-pipe between two radio end points. To establish, for example, a duplex telephone connection, two physical channels have to be established between the endpoints.

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Radio spectrum is needed to create a physical channel. The radio spectrum space has three dimensions:

- geometric (geographic) space;
- frequency;
- time.

Spectrum is assigned to physical channels by sharing it in these three dimensions.

DECT provides a mechanism called "handover" to release a physical channel and to establish another one in any or all of the three dimensions without releasing the end-to-end connection.

The requirements of the present document should be read in conjunction with ETSI EN 300 176-1 [9].

The requirements specified apply for nominal conditions unless extreme conditions are stated. Tests at extreme conditions may include combinations of limit values of extreme temperature and of power supply variation, defined for each case in ETSI EN 300 176-1 [9].

Nominal and extreme temperature ranges are defined below:

Nominal temperature:	PP, FP, RFP, CCFP	+15 °C to +35 °C;
Extreme temperature:	PP	0 °C to +40 °C;
	FP, RFP, CCFP, class E1	+10 °C to +40 °C;
	FP, RFP, CCFP, class E2	-10 °C to +55 °C.

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The environmental class E1 refers to installation in indoor heated and/or cooled areas allowing for personal comfort, e.g. homes, offices, laboratories or workshops. The environmental class E2 refers to all other installations.

For nominal temperature, each measurement is made at the temperature of the test site, which shall be within +15 °C to +35 °C. For extreme temperatures, additional measurements are made, at each limit value of the extreme temperature.

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4.1 RF channels (access in frequency)

4.1.1 Nominal position of RF carriers

DECT carriers are specified for the whole frequency range 1 880 MHz to 1 980 MHz and 2 010 MHz to 2 025 MHz. Carrier positions in the 902 MHz to 928 MHz ISM band and the 2 400 MHz to 2 483,5 MHz ISM band have been defined for the US market [12].

DECT is also an IMT-2000 [10] family member, called IMT-FT, the only member that provides for uncoordinated installations on an unlicensed spectrum. RF carriers for IMT-FT applications of DECT are placed within the parts of the European UMTS spectrum applicable for TDD operation (see ECC/DEC/(06)01 [13]). E.g. within 1 900 MHz to 1 920 MHz, 1 920 MHz to 1 980 MHz and/or 2 010 MHz to 2 025 MHz.

The most common spectrum allocation is 1 880 MHz to 1 900 MHz, but outside Europe spectrum is also available in 1 900 MHz to 1 920 MHz and in 1 910 MHz to 1 930 MHz (several countries).

Ten RF carriers are defined in the frequency band 1 880 MHz to 1 900 MHz with centre frequencies Fc given by:

$$Fc = F0 - c \times 1{,}728 \text{ MHz};$$

where: $F0 = 1\,897{,}344$ MHz; and

$c = 0, 1, ..., 9$.

Above this band, additional carriers are defined in annex F. Annex F shows the carrier frequencies for c = 0 to 9 and for c ≥ 10 and RF bands 00001 to 01001 (see ETSI EN 300 175-3 [3], clauses 7.2.3.3 and 7.2.3.9).