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**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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*European Standard (Telecommunications series)*

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



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# Foreword

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

The present document is part 2 of a multi-part EN covering the Common Interface (CI) for the Digital Enhanced Cordless Telecommunications (DECT), as identified below:

Part 1: "Overview";

**Part 2: "Physical Layer (PHL)";**

Part 3: "Medium Access Control (MAC) layer";

Part 4: "Data Link Control (DLC) layer";

Part 5: "Network (NWK) layer";

Part 6: "Identities and addressing";

Part 7: "Security features";

Part 8: "Speech coding and transmission".



Further details of the DECT system may be found in ETR 015 [10], ETR 043 [12] and ETR 056 [13].

| National transposition dates | |
|---|---|
| Date of adoption of this EN: | 28 May 1999 |
| Date of latest announcement of this EN (doa): | 31 August 1999 |
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| Date of withdrawal of any conflicting National Standard (dow): | 29 February 2000 |

# 1 Scope

The present document gives an introduction and overview of the complete Digital Enhanced Cordless Telecommunications (DECT) Common Interface (CI).

The present document of the DECT CI 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 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.

# 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, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

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

[2] EN 300 175-3: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 3: Medium Access Control (MAC) layer".

[3] EN 300 175-4: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 4: Data Link Control (DLC) layer".

[4] EN 300 175-5: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 5: Network (NWK) layer".

[5] EN 300 175-6: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 6: Identities and addressing".

[6] EN 300 175-7: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 7: Security features".

[7] EN 300 175-8: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 8: Speech coding and transmission".

[8] EN 300 444: "Digital Enhanced Cordless Telecommunications (DECT); Generic Access Profile (GAP)".

[9] EN 300 176: "Digital Enhanced Cordless Telecommunications (DECT); Approval test specification; (Part 1: Radio; Part 2: Speech)".

[10] ETR 015: "Digital Enhanced Cordless Telecommunications (DECT); Reference document".

[11] Void.

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

[13] ETR 056: "Digital Enhanced Cordless Telecommunications (DECT); System description document".

[14] Void.

[15] ENV 50166-2: "Human exposure to electromagnetic fields, 10 kHz to 300 GHz".

[16] International Non-Ionizing Radiation Committee of the International Radiation Protection Association (IRPA) (1988): "Guidelines on limits of exposure to radio frequency electromagnetic fields in the frequency range from 100 kHz to 300 GHz".

[17] EIA-RS422-A-78: "Electrical characteristics of balanced voltage digital interface circuits".

# 3 Definitions and abbreviations



## 3.1 Definitions



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

**antenna diversity:** see EN 300 175-1 [1].

**cell:** see EN 300 175-1 [1].

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

**channel:** see EN 300 175-1 [1].

**cluster:** see EN 300 175-1 [1].

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

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

**coverage area:** see EN 300 175-1 [1].

**Dect Network (DNW):** see EN 300 175-1 [1].

**double duplex bearer:** see EN 300 175-1 [1].

**double simplex bearer:** see EN 300 175-1 [1].

**double slot:** one 12th of a TDMA frame which is used to support one high capacity physical channel.

**down-link:** see EN 300 175-1 [1].

**duplex bearer:** see EN 300 175-1 [1].

**Fixed Part (DECT Fixed Part) (FP):** see EN 300 175-1 [1].

**Fixed Radio Termination (FT):** see EN 300 175-1 [1].

**frame:** see EN 300 175-1 [1].

**full slot (slot):** see EN 300 175-1 [1].

**guard space:** see EN 300 175-1 [1].

**half slot:** see EN 300 175-1 [1].

**handover:** see EN 300 175-1 [1].

**intercell handover:** see EN 300 175-1 [1].

**intracell handover:** see EN 300 175-1 [1].

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

**multiframe:** see EN 300 175-1 [1].

**physical channel (channel):** see EN 300 175-1 [1].

**Portable Part (DECT Portable Part) (PP):** see EN 300 175-1 [1].

**Portable radio Termination (PT):** see EN 300 175-1 [1].

**public access service:** see EN 300 175-1 [1].

**radio channel:** no defined meaning. See RF channel or physical channel.

**radio end point:** see EN 300 175-1 [1].



**Radio Fixed Part (RFP):** see EN 300 175-1 [1].

**Repeater Part (REP):** see EN 300 175-1 [1].

**RF carrier (carrier):** see EN 300 175-1 [1].



**RF channel:** see EN 300 175-1 [1].

**simplex bearer:** see EN 300 175-1 [1].

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

**TDMA frame:** see EN 300 175-1 [1].

**Wireless Relay Station (WRS):** see EN 300 175-1 [1].

## 3.2 Abbreviations

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

| | |
|---|---|
| ACP | Adjacent Channel Power |
| ACK | Acknowledgement |
| CCFP | Central Control Fixed Part |
| CI | Common Interface (standard) |
| CRFP | Cordless Radio Fixed Part |
| dBc | dB relative to the peak power of an unmodulated carrier |
| dBm | dB relative to 1 milliwatt |
| DECT | Digital Enhanced Cordless Telecommunications |
| DLC | Data Link Control layer |
| EIRP | Effective Isotropic Radiated Power |
| ERP | Effective Radiated Power |
| FP | Fixed Part |
| FT | Fixed radio Termination |
| GFSK | Gaussian Frequency Shift Keying |
| GMSK | Gaussian Minimum Shift Keying |

| | |
|---|---|
| LLME | Lower Layer Management Entity |
| MAC | Medium Access Control layer |
| NTP | Normal Transmitted Power |
| PHL | Physical Layer |
| PHS | Portable HandSet |
| PP | Portable Part |
| ppm | parts per million |
| PT | Portable radio Termination |
| REP | Repeater Part |
| RF | Radio Frequency |
| RFP | Radio Fixed Part |
| RSSI | Radio Signal Strength Indicator |
| SAR | Specific Absorption Rate |
| TDD | Time Division Duplex |
| TDMA | Time Division Multiple Access |
| WRS | Wireless Relay Station |

# 4 PHL services

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.

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

- geometric (geographic) space;
- frequency; and
- 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 EN 300 176 [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 EN 300 176 [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. |

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.

# 4.1 RF channels (access in frequency)

## 4.1.1 Nominal position of RF carriers

Ten RF carriers shall be placed into the frequency band 1 880 - 1 900 MHz with centre frequencies $F_C$ given by:

Fc = F0 - c x 1,728 MHz.

where: F0 = 1 897,344 MHz; and

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

Above this band, additional carriers are defined with centre frequencies Fc given by:

Fc = F9 + c x 1,728 MHz;

and c ≥ 10 and RF band = 00001 (See EN 300 175-3 [2], subclause 7.2.3.3.1).

The frequency band between Fc - 1,728/2 MHz and Fc + 1,728/2 MHz shall be designated RF channel c.

NOTE: A nominal DECT RF carrier is one whose centre frequency is generated by the formula:

Fg = F0 - g x 1,728 MHz,

where g is any integer.

All DECT equipment shall be capable of working on all 10 RF channels, c= 0,1, ..., 9.



## 4.1.2 Accuracy and stability of RF carriers

At an RFP the transmitted RF carrier frequency corresponding to RF channel c shall be in the range Fc ± 50 kHz at extreme conditions.



At a PP the centre frequency accuracy shall be within ± 50 kHz at extreme conditions either relative to an absolute frequency reference or relative to the received carrier, except that during the first 1 s after the transition from the idle-locked state to the active-locked state the centre frequency accuracy shall be within ± 100 kHz at extreme conditions relative to the received carrier.

NOTE: The above state transition is defined in EN 300 175-3 [2].

The maximum rate of change of the centre frequency at both the RFP and the PP while transmitting, shall not exceed 15 kHz per slot.

# 4.2 Time Division Multiple Access (TDMA) structure (access in time)

## 4.2.1 Frame, full-slot, double-slot, and half-slot structure

To access the medium in time, a regular TDMA structure is used. The structure repeats in frames of 11 520 bits, and the data is transmitted at a bit rate of 1 152 kbit/s. Within this frame 24 full-slots are created, each consisting of two half-slots. A double slot has a length of two full slots, and starts concurrently with an even numbered full slot (see figures 1, 2 and 3).