Digital Enhanced Cordless Telecommunications (DECT); Implementing DECT in an arbitrary spectrum allocation
Contents

Intellectual Property Rights..........................................................................................................................4
Foreword ..........................................................................................................................................................4
1 Scope .........................................................................................................................................................5
2 References ....................................................................................................................................................5
3 Definitions and abbreviations .......................................................................................................................7
4 Introduction to DECT services and applications ..........................................................................................8
5 Requirements .................................................................................................................................................10

Annex A: Examples for frequency band allocations ......................................................................................12
A.1 DECT carrier numbers and carrier positions around 1.9 GHz .................................................................12
History ..........................................................................................................................................................13
Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for ETSI members and non-members, and can be found in ETR 314: "Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards", which is available free of charge from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://www.etsi.fr/ipr or http://www.etsi.org/ipr).

Pursuant to the ETSI Interim IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETR 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Report (TR) has been produced by the Digital Enhanced Cordless Telecommunications (DECT) Project of the European Telecommunications Standards Institute (ETSI).

The present document provides a guide on how to implement and test DECT systems operating at frequencies outside the frequency-bands described in TBR 6 [11].
1 Scope

The present document is a guide how to implement and test Digital Enhanced Cordless Telecommunications (DECT) systems operating at frequencies outside the frequency-bands described in TBR 6 [11]. The need to have this arises if DECT equipment is to be adapted to national requirements of countries which do not allow to use the basic 1 880 to 1 900 MHz DECT frequency band.

The present document is thereby also a guide for approval of such DECT systems in the above mentioned countries.

2 References

References may be made to:

a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or

b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or

c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or

d) publications without mention of a specific version, in which case 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 300 175-2: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 2: Physical layer (PHL)".

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

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

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

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

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

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

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

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

[11] TBR 6: "Digital Enhanced Cordless Telecommunications (DECT); General terminal attachment requirements".

[12] EN 300 444: "Digital Enhanced Cordless Telecommunications (DECT); Generic Access Profile (GAP)".
ETR 056: "Digital European Cordless Telecommunications (DECT); System description document".

ETS 300 700: "Digital European Cordless Telecommunications (DECT); Wireless Relay Station (WRS)".

ETS 300 765-1: "Digital Enhanced Cordless Telecommunications (DECT); Radio in the Local Loop (RLL) Access Profile (RAP); Part 1: Basic telephony services".

ETS 300 765-2: "Digital Enhanced Cordless Telecommunications (DECT); Radio in the Local Loop (RLL) Access Profile (RAP); Part 2: Advanced telephony services".

ETR 246: "Digital European Cordless Telecommunications (DECT); Application of DECT Wireless Relay Station (WRS)".

ETR 308: "Digital Enhanced Cordless Telecommunications (DECT); Services, facilities and configurations for DECT in the local loop".

ETR 310: "Digital Enhanced Cordless Telecommunications (DECT); Traffic capacity and spectrum requirements for multi-system and multi-service DECT applications co-existing in a common frequency band".

ETS 300 822: "Digital Enhanced Cordless Telecommunications (DECT); Integrated Services Digital Network (ISDN); DECT/ISDN interworking for intermediate system configuration; Interworking and profile specification".

ETR 185: "Digital European Cordless Telecommunications (DECT); Data Services Profile (DSP); Profile overview".

ETR 178: "Digital European Cordless Telecommunications (DECT); A high level guide to the DECT standardization".

TBR 22: "Attachment requirements for terminal equipment for Digital Enhanced Cordless Telecommunications (DECT) Generic Access Profile (GAP) applications".


3 Definitions and abbreviations

3.1 Definitions

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

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

**Portable Part (DECT Portable Part) (PP):** A physical grouping that contains all elements between the user and the DECT air interface. PP is a generic term that may describe one or several physical pieces.

3.2 Abbreviations

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

- CTA: Cordless Terminal Adapter
- CTR: Common Technical Regulation
- DAS: DECT Access Site
- DCS: Dynamic Channel Selection
- DECT: Digital Enhanced Cordless Telecommunications
- ERO: European Radio communications Office
- EUT: Equipment Under Test
- FDD: Frequency Division Duplex
- FP: Fixed Part
- FS: Fixed Service
- FSS: Fixed Satellite Service
- FWA: Fixed Wireless Access
- GAP: Generic Access Profile
- GPS: Global Positioning System
- ISDN: Integrated Services Digital Network
- LOS: Line Of Sight
- NLOS: Near Line Of Sight
- P-MP: Point-to-Multipoint
- POTS: Plain Old Telephone Service
- PP: Portable Part
- PSTN: Public Switched Telephone Network
- RAP: RLL Access Profile
- RF: Radio Frequency
- RFP: Radio Fixed Part
- RLL: Radio in the Local Loop
- TBR: Technical Basis for Regulation
- TDD: Time Division Duplex
- TE: Terminal Equipment
- UMTS: Universal Mobile Telecommunications System
- WLL: Wireless Local Loop
- WRS: Wireless Relay Station
4 Introduction to DECT services and applications

DECT is a general radio access technology for short range wireless telecommunications. It is a high capacity, pico-cellular digital technology, for cell radii ranging from about 10 m to 5 km depending on application and environment. It provides telephony quality voice services, and a broad range of data services, including Integrated Services Digital Network (ISDN). It can be effectively implemented in a range from simple residential cordless telephones up to large systems providing a wide range of telecommunications services.

The DECT instant or continuous dynamic channel selection, provides effective coexistence of uncoordinated installations of private and public systems on the common designated DECT frequency band, and avoids any need for traditional frequency planning. See ETR 310 [19] for further explanation.

Figure 1 gives a high level graphic overview of applications and features of DECT.

A list of all ETSI standards and ETSI technical reports for DECT are given in ETR 178 [22]. Annex A of ETR 178 [22] contains a list of the essential standards and reports.

The DECT standardization has developed a modern and complete standard within the area of cordless telecommunications.

The European wide allocation of the frequency band 1 880 - 1 900 MHz, has been reinforced by the Council Directive 91/287/EEC [25]. Spectrum allocation for DECT has also been adopted by many other countries worldwide.

DECT carriers have been defined for the whole spectrum range 1 880 - 1 939 MHz in the basic DECT standards EN 300 175, parts 1 to 8 [1] - [8] and TBR 6 [11]. This allows DECT services to be introduced in countries where the basic DECT frequencies 1 880 - 1 900 MHz are not available.

For rapid introduction DECT, Common Technical Regulations (CTRs) have been established for DECT relating to harmonized DECT standards, Technical Bases for Regulation (TBRs) and ENs. TBRs contain the technical requirements of a CTR. Approval to a CTR gives access to a single European market through a simplified legal procedure.

The Council Recommendation 91/288/EEC [26] recommends that the DECT standard should meet user requirements for residential, business, public pedestrian and radio in the local loop applications. The standard should also provide compatibility and multiple access rights to allow a single handset to access several types of systems and services, e.g. a residential system, a business system and one or more public systems. The public applications should be able to support full intersystem roaming of DECT handsets. The DECT standard provides these features. Of special importance is the Generic Access Profile (GAP) and the related TBR 22 [23], which define common mobility and interoperability requirements for private and public DECT speech services. For a more comprehensive overview of the DECT standardization see ETR 178 [22].

The European Commission has elaborated an amendment of Directive 90/388/EEC [27] on competition in the market for telecommunications services. This Directive defines DECT as an important alternative to the wired Public Switched Telephone Network (PSTN)/ISDN network access. Furthermore any restriction on the combination of DECT with other mobile technologies are to be withdrawn.

The emerging deregulation of fixed services will also speed up fixed-mobile convergence in service offerings from operators. The different DECT interoperability profile standards are designed to facilitate provision of mixtures of fixed and mobile services through a single infrastructure.

The aim of the present document is to provide technical requirements that can be applied for DECT approval in countries having a spectrum allocation for DECT, different from the European allocation. The present document consists of references to the relevant ETSI DECT standards (TBR 6 [11]) and amendments required for application in a general spectrum allocation band.
Figure 1: Overview of DECT applications and features
5 Requirements

This clause defines the minimum required functions and parameters for DECT equipment operating in the frequency band $F_L$ to $F_U$. $F_L$ defines the lower edge of the assigned frequency band and $F_U$ defines the upper edge of the frequency band. The technical requirements are contained in TBR 6 [11] together with the amendments which are defined in this clause.

5.1 Carrier positions

Examples of carrier allocations and carrier positions are given in annex A.

The frequencies to be used can be software controlled by the DECT base stations. They are indicated in a broadcast message to the portables.

DECT equipment should be capable of working on all assigned channels. This normally provides the most efficient use of the spectrum, but it is possible to limit specific applications, or a specific system, to part of the spectrum if this is suitable due to local circumstances.

5.2 General requirements


<table>
<thead>
<tr>
<th>Parameter</th>
<th>Characteristic/Value</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>accuracy and stability of Radio Frequency (RF) carriers</td>
<td>RFP: ± 50 kHz, PP: ± 100 kHz</td>
<td>7.2, 7.3, 7.4, 7.5</td>
</tr>
<tr>
<td>packet timing jitter</td>
<td>± 1 μs</td>
<td>8.3</td>
</tr>
<tr>
<td>reference timing accuracy of a Radio Fixed Part (RFP)</td>
<td>max 10 ppm</td>
<td>8.4</td>
</tr>
<tr>
<td>packet transmission accuracy of a PP</td>
<td>5 ms ± 2 μs</td>
<td>8.5</td>
</tr>
<tr>
<td>transmission burst</td>
<td>power-time template</td>
<td>9</td>
</tr>
<tr>
<td>transmitted power</td>
<td>max 250 mW</td>
<td>10</td>
</tr>
<tr>
<td>RF carrier modulation</td>
<td>digital modulation</td>
<td>11</td>
</tr>
<tr>
<td>unwanted emissions due to modulation</td>
<td>emission mask</td>
<td>12.2</td>
</tr>
<tr>
<td>unwanted emissions due to transmitter transient</td>
<td>emission mask</td>
<td>12.3</td>
</tr>
<tr>
<td>unwanted emissions due to intermodulation</td>
<td>1 μW</td>
<td>12.4</td>
</tr>
<tr>
<td>spurious emissions when allocated a transmit channel</td>
<td>250 nW below 1 GHz, 1 μW above 1 GHz</td>
<td>12.5</td>
</tr>
<tr>
<td>radio receiver sensitivity</td>
<td>-83 dBm at BER = $10^{-3}$</td>
<td>13.1</td>
</tr>
<tr>
<td>radio receiver reference BER</td>
<td>$10^{-3}$ at -73 dBm</td>
<td>13.2</td>
</tr>
<tr>
<td>radio receiver interference performance</td>
<td>BER &lt; $10^{-3}$</td>
<td>13.3</td>
</tr>
<tr>
<td>radio receiver blocking</td>
<td>See table 2</td>
<td>13.4</td>
</tr>
<tr>
<td>radio receiver intermodulation performance</td>
<td>BER &lt; $10^{-3}$</td>
<td>13.6</td>
</tr>
<tr>
<td>spurious emissions when the PP has no allocated transmit channel</td>
<td>2 nW</td>
<td>13.7</td>
</tr>
<tr>
<td>efficient use of the radio spectrum</td>
<td>channel handling</td>
<td>17.1, 17.2, 17.3</td>
</tr>
<tr>
<td>antennas with directivity</td>
<td>12 dBi</td>
<td>14.2</td>
</tr>
</tbody>
</table>

The tests cases in table 1 shall be performed, where relevant, on the two supported carriers nearest to the band edges and on one carrier inside the band. The applicant shall declare the band edge limits $F_L$ and $F_U$ and the carriers supported.
For the blocking requirements, table 2 shall be applied instead of the requirements given in table 12 of TBR 6 [11].

### Table 2

<table>
<thead>
<tr>
<th>Frequency (f)</th>
<th>Continuous wave interferer level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>For radiated measurements dB $\mu$V/m</td>
</tr>
<tr>
<td>$25 \text{ MHz} \leq f &lt; F_L - 100 \text{ MHz}$</td>
<td>120</td>
</tr>
<tr>
<td>$F_L - 100 \text{ MHz} \leq f &lt; F_L - 5 \text{ MHz}$</td>
<td>110</td>
</tr>
<tr>
<td>$</td>
<td>f - F_C</td>
</tr>
<tr>
<td>$F_U + 5 \text{ MHz} &lt; f \leq F_U + 100 \text{ MHz}$</td>
<td>110</td>
</tr>
<tr>
<td>$F_U + 100 \text{ MHz} &lt; f \leq 12.75 \text{ GHz}$</td>
<td>120</td>
</tr>
</tbody>
</table>

The Equipment Under Test (EUT) shall operate on the declared frequency allocation with the low band edge $F_L$ MHz and the high band edge $F_U$ MHz.
Annex A:
Examples for frequency band allocations

A.1 DECT carrier numbers and carrier positions around 1,9 GHz

DECT is specified for the whole frequency range 1880 – 1939 MHz.

For the frequency band 1880 - 1900 MHz 10 RF-carriers with centre frequencies \( F_c \) are given by:

\[
F_c = F_0 - c \times 1.728 MHz, \quad \text{where: } F_0 = 1897.344 MHz
\]

\( c = 0, 1, 2, \ldots, 9 \)

For carriers from 1899.072 to 1937.088 MHz the carrier frequencies are defined by:

\[
F_c = F_9 + c \times 1.728 MHz, \quad \text{where: } F_9 = 1881.792 MHz
\]

\( c = 10, 11, 12, \ldots, 32 \)

RF-band number = 00001 (see EN 300 175-2 [2], subclause 4.1.1 and EN 300 175-3 [3], subclause 7.2.3.3.1)

The above carrier frequencies are explicitly given in table A.1.

<table>
<thead>
<tr>
<th>Carrier number c</th>
<th>RF-band number</th>
<th>Carrier freq. MHz</th>
<th>Carrier number c</th>
<th>RF-band number</th>
<th>Carrier freq. MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>-</td>
<td>1881.792</td>
<td>17</td>
<td>00001</td>
<td>1911.168</td>
</tr>
<tr>
<td>8</td>
<td>-</td>
<td>1883.520</td>
<td>18</td>
<td>00001</td>
<td>1912.896</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>1885.248</td>
<td>19</td>
<td>00001</td>
<td>1914.624</td>
</tr>
<tr>
<td>6</td>
<td>-</td>
<td>1886.876</td>
<td>20</td>
<td>00001</td>
<td>1916.352</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>1888.704</td>
<td>21</td>
<td>00001</td>
<td>1918.080</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>1890.432</td>
<td>22</td>
<td>00001</td>
<td>1919.808</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>1892.160</td>
<td>23</td>
<td>00001</td>
<td>1921.536</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>1893.888</td>
<td>24</td>
<td>00001</td>
<td>1923.264</td>
</tr>
<tr>
<td>1</td>
<td>-</td>
<td>1895.616</td>
<td>25</td>
<td>00001</td>
<td>1924.992</td>
</tr>
<tr>
<td>0</td>
<td>-</td>
<td>1897.344</td>
<td>26</td>
<td>00001</td>
<td>1926.720</td>
</tr>
<tr>
<td>10</td>
<td>00001</td>
<td>1899.072</td>
<td>27</td>
<td>00001</td>
<td>1928.448</td>
</tr>
<tr>
<td>11</td>
<td>00001</td>
<td>1900.800</td>
<td>28</td>
<td>00001</td>
<td>1930.176</td>
</tr>
<tr>
<td>12</td>
<td>00001</td>
<td>1902.528</td>
<td>29</td>
<td>00001</td>
<td>1931.904</td>
</tr>
<tr>
<td>13</td>
<td>00001</td>
<td>1904.256</td>
<td>30</td>
<td>00001</td>
<td>1933.632</td>
</tr>
<tr>
<td>14</td>
<td>00001</td>
<td>1905.984</td>
<td>31</td>
<td>00001</td>
<td>1935.360</td>
</tr>
<tr>
<td>15</td>
<td>00001</td>
<td>1907.712</td>
<td>32</td>
<td>00001</td>
<td>1937.088</td>
</tr>
<tr>
<td>16</td>
<td>00001</td>
<td>1909.440</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Examples of current spectrum allocations for DECT in different parts of the world are:

1880 – 1900 MHz, 1900 – 1920 MHz and 1910 – 1930 MHz.

The DECT fixed part (base station) broadcast messages indicate the locally relevant carrier to ensure that portables and WLL subscriber units set up calls only within the locally allocated band.

New or modified bands can locally be defined when needed.
### History

<table>
<thead>
<tr>
<th>Document history</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1.1.1</td>
</tr>
<tr>
<td>V1.2.1</td>
</tr>
</tbody>
</table>