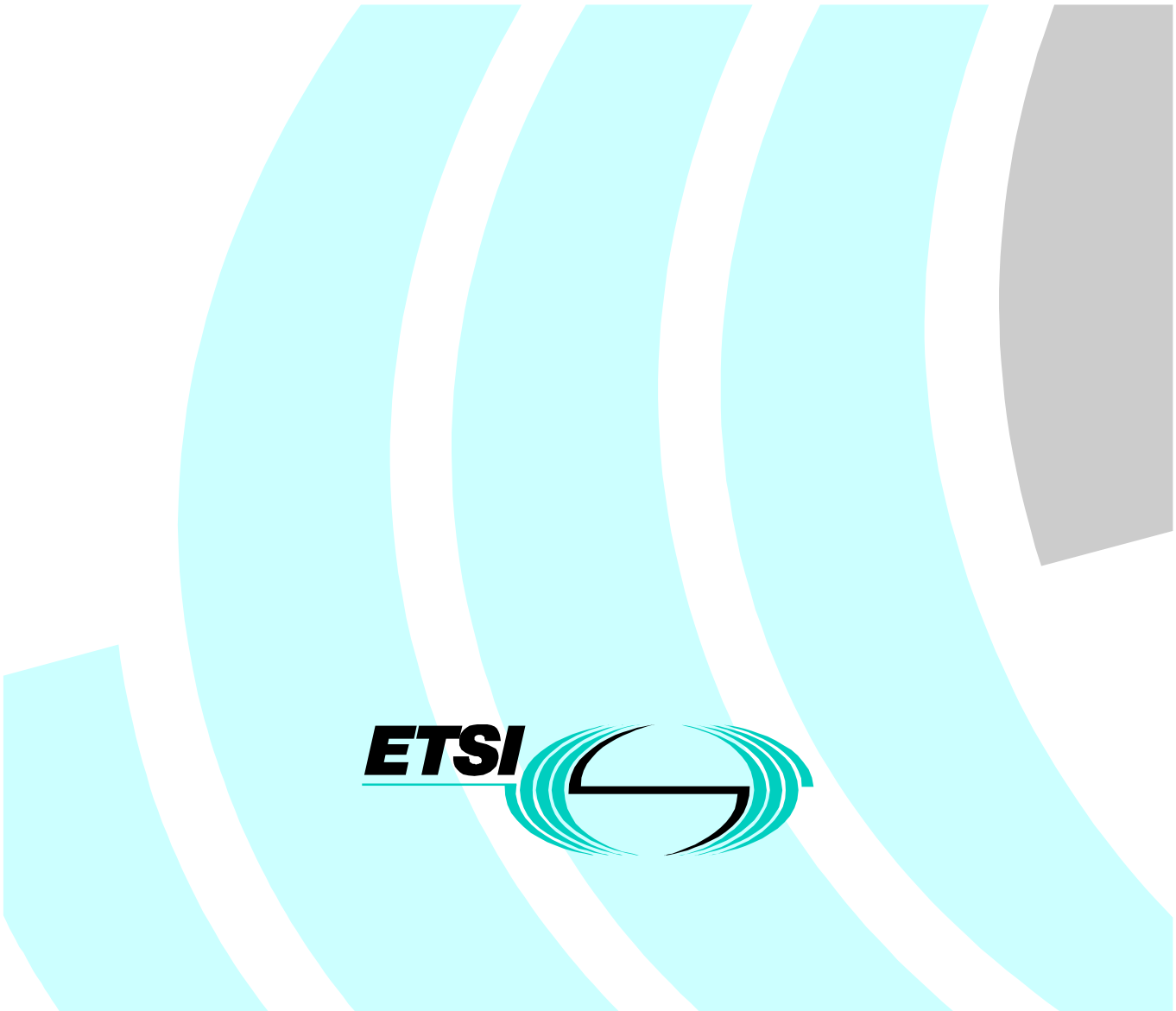
TR 101 159 V1.2.1 (1998-06)

Technical Report

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



Reference
RTR/DECT-050140 (aqc00ios.PDF)

Keywords
DECT, radio

ETSI

Postal address
F-06921 Sophia Antipolis Cedex - FRANCE

Office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16
Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Internet
secretariat@etsi.fr
http://www.etsi.fr
http://www.etsi.org

Contents

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)".

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

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

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

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

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

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

[19] 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".

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

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

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

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

[24] 91/263/EEC: "Council Directive of 29 April 1991 on the approximation of the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity" (Terminal Directive).

[25] 91/287/EEC: "Council Directive of 3 June 1991 on the frequency band to be designated for the co-ordinated introduction of digital European cordless telecommunications (DECT) into the Community".

[26] 91/288/EEC: "Council Directive of 3 June 1991 on the co-ordinated introduction of digital European cordless telecommunications (DECT) into the Community".

[27] 90/388/EEC: "Council Directive of 28 June 1990 on competition in the markets for telecommunications services".

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 continuos 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.

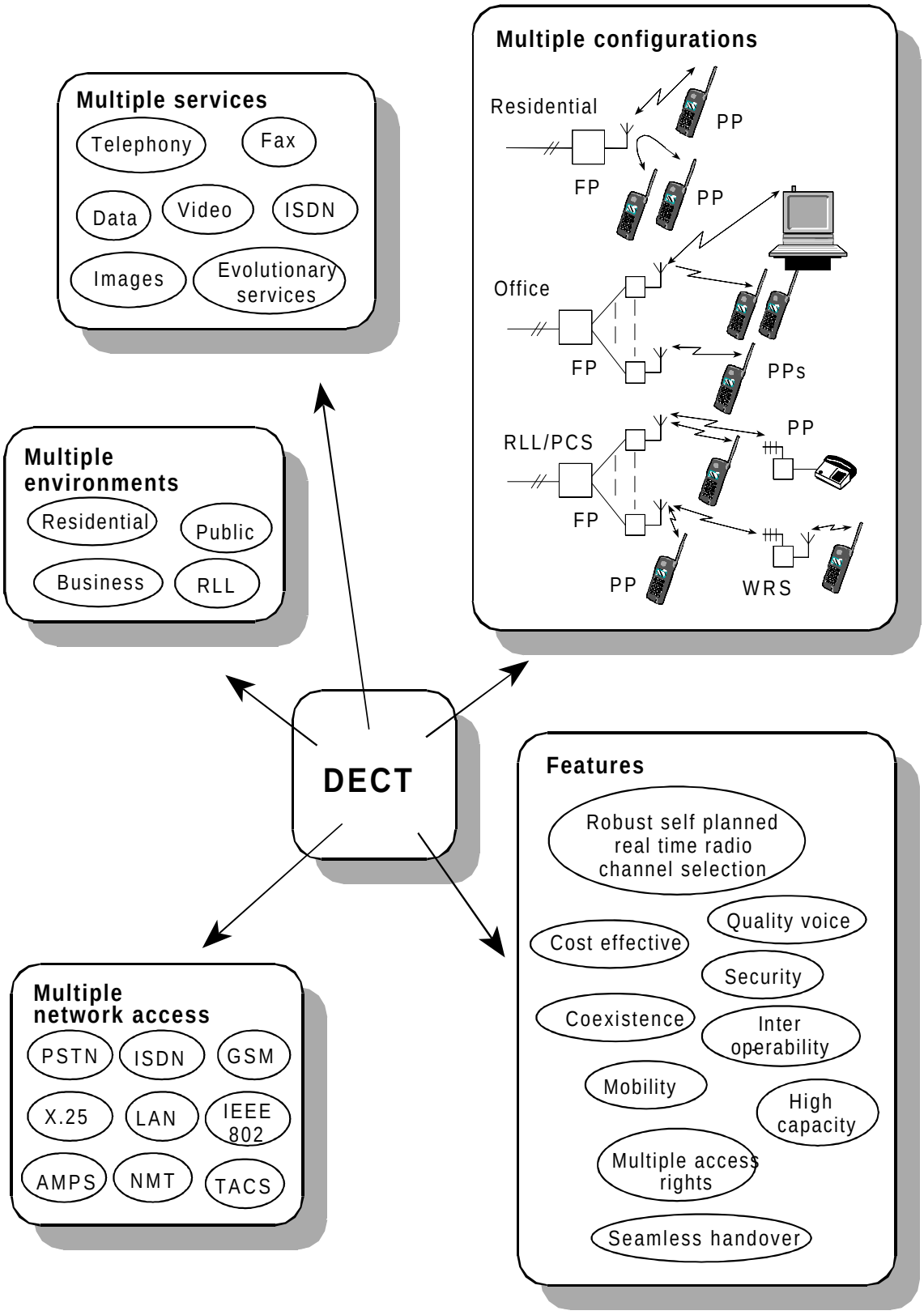


Figure 1: Overview of DECT applications and features

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

A summary of the main technical requirements of TBR 6 [11] is given in table 1.

Table 1

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

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

Frequency (f)	Continuous wave interferer level	
	For radiated measurements dB μV/m	For conducted measurements dBm
25 MHz ≤ f < F_L - 100 MHz	120	-23
F_L - 100 MHz ≤ f < F_L - 5 MHz	110	-33
$\lvert f - F_C \rvert$ > 6 MHz	100	-43
F_U + 5 MHz < f ≤ F_U + 100 MHz	110	-33
F_U + 100 MHz < f ≤ 12,75 GHz	120	-23

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 Fc are given by:

Fc = F0 - c * 1,728 MHz, where: F0 = 1897,344 MHz

c = 0, 1, 2, ..., 9

For carriers from 1899,072 to 1937,088 MHz the carrier frequencies are defined by:

Fc = F9 + c * 1,728 MHz, where: F9 = 1881,792 MHz

c = 10, 11, 12, ..., 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 A.1: Carrier numbers and carrier positions

Carrier number c	Rf-band number	Carrier freq. MHz	Carrier number c	Rf-band number	Carrier freq. MHz
9	-	1881,792	17	00001	1911,168
8	-	1883,520	18	00001	1912,896
7	-	1885,248	19	00001	1914,624
6	-	1886,876	20	00001	1916,352
5	-	1888,704	21	00001	1918,080
4	-	1890,432	22	00001	1919,808
3	-	1892,160	23	00001	1921,536
2	-	1893,888	24	00001	1923,264
1	-	1895,616	25	00001	1924,992
0	-	1897,344	26	00001	1926,720
10	00001	1899,072	27	00001	1928,448
11	00001	1900,800	28	00001	1930,176
12	00001	1902,528	29	00001	1931,904
13	00001	1904,256	30	00001	1933,632
14	00001	1905,984	31	00001	1935,360
15	00001	1907,712	32	00001	1937,088
16	00001	1909,440			

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

Document history		
V1.1.1	February 1998	Publication
V1.2.1	June 1998	Publication

ISBN 2-7437-2213-4
Dépôt légal : Juin 1998