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A high level guide to the DECT standardization**

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Foreword

This ETSI Technical Report (ETR) has been produced by the Radio Equipment and Systems (RES) Technical Committee of the European Telecommunications Standards Institute (ETSI).

ETRs are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or the application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or an I-ETS.

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1 Scope

The ETR provides a high level description and overview of the various components of the Digital European Cordless Telecommunications (DECT) standardization, their inter-relationships and their relation to the different DECT services and applications. It presents the mandatory and optional aspects as well as possible evolutions of the standard. It contains an overview of existing and planned relevant documents.

It is directed towards regulators, operators and manufacturers without requiring a detailed knowledge of DECT as a prerequisite.

2 References

For the purposes of this ETR, the following references apply:

- [1] ETS 300 175-1: "Radio Equipment and System (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 1: Overview".
- [2] ETS 300 175-2: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunication (DECT); Common Interface (CI); Part 2: Physical Layer (PHL)".
- [3] ETS 300 175-3: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 3: Medium Access Control (MAC) layer".
- [4] ETS 300 175-4: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 4: Data Link Control (DLC) layer".
- [5] ETS 300 175-5: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 5: Network (NWK) layer".
- [6] ETS 300 175-6: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 6: Identities and addressing".
- [7] ETS 300 175-7: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 7: Security features".
- [8] ETS 300 175-8: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 8: Speech coding and transmission".
- [9] ETS 300 175-9: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 9: Public Access Profile (PAP)".
- [10] I-ETS 300 176: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Approval test specification".
- [11] ETR 015: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Reference document".
- [12] ETR 042: " Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); A guide to DECT features that influence the traffic capacity and the maintenance of high radio link transmission quality, including the results of simulations".

- [13] ETR 043: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common interface; Services and facilities requirements specification".
- [14] ETR 056: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); System description document".
- [15] ETR 139: "Radio Equipment and System (RES); Radio in the Local Loop (RLL)."
- [16] ETR 159: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Wide area mobility using the Global System for Mobile communications (GSM)."
- [17] ETR 183: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Conformance test specification."
- [18] ETR 185: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Data Services Profile Overview."
- [19] ETS 300 331: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); DECT Authentication Module (DAM)."
- [20] ETS 300 323-1: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Public Access Profile (PAP) test specification; Part 1: Overview".
- [21] ETS 300 323-2: "Radio Equipment and Systems (RES) ; Digital European Cordless Telecommunications (DECT) ; Public Access Profile (PAP) test specification; Part 2: PT Abstract Test Suite (ATS)".
- [22] ETS 300 323-3: "Radio Equipment and Systems (RES) ; Digital European Cordless Telecommunications (DECT); Public Access Profile (PAP) test specification; Part 3: PT PICS proforma".
- [23] ETS 300 323-4: "Radio Equipment and Systems (RES) ; Digital European Cordless Telecommunications (DECT); Public Access Profile (PAP) test specification; Part 4: PT PIXIT proforma".
- [24] ETS 300 323-5: "Radio Equipment and Systems (RES) ; Digital European Cordless Telecommunications (DECT); Public Access Profile (PAP) test specification; Part 5: FT Abstract Test Suite (ATS)".
- [25] ETS 300 323-6: "Radio Equipment and Systems (RES) ; Digital European Cordless Telecommunications (DECT); Public Access Profile (PAP) test specification; Part 6: FT PICS proforma".
- [26] ETS 300 323-7: "Radio Equipment and Systems (RES) ; Digital European Cordless Telecommunications (DECT); Public Access Profile (PAP) test specification; Part 7: FT PIXIT proforma".
- [27] TBR 006: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); General terminal attachment requirements".
- [28] TBR 010: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); General terminal attachment requirements: telephony applications".
- [29] TBR 011: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Attachment requirements for terminal equipment for Digital European Cordless Telecommunications (DECT); Public Access Profile (PAP) applications.

- [30] ETS 300 434: "Radio Equipment and Systems (RES); Digital European European Telecommunications (DECT) and Integrated Services Digital Network (ISDN) inter-working for end system configuration; Part 1: Inter-working specification and Part 2: Access profile."
- [31] DE/RES-03039: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); DECT/ISDN Interworking for Intermediate System Configuration, Part 1: Interworking Specification and Part 2: Access profile."
- [32] ETS 300 370: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); DECT/GSM Interworking Profile."
- [33] DE/RES-03025: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); DECT/GSM Interworking Test Specification. Part 1: Overview, Part 2: Portable Termination, Part 3: Fixed Termination."
- [34] ETS 300 435: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Data services profile; Base standard including inter-working to connectionless networks (Service types A and B, Class 1)."
- [35] DE/RES-03032: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Data Services Profile, Generic Frame Relay Service with Mobility (Service Types A and B, Class 2)."
- [36] RE/RES-03035: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Data Services Profile, Generic Data LinkService for Closed User Groups (Service Type C, Class 1)."
- [37] RE/RES-03036: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Data Services Profile, Generic data link service (Service Type C, Class 2)."
- [38] DE/RES-03038: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Data Services Profile, Multimedia Messaging Service with specific provision for Facsimile services (Service type F, Class 2)."
- [39] DE/RES-03078: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Data Services Profile, Low Rate Messaging Service (Service type E, Class 2)."
- [40] DTR/RES-03068: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Application of DECT, Wireless Relay Station (WRS)."
- [41] ETS 300 444: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Generic Access Profile (GAP)."
- [42] ETS 300 497: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); DECT Test Case Library."
- [43] ETS 300 339: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); General EMC Standard for Radio."
- [44] ETS 300 329: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); EMC Standard for DECT Equipment."
- [45] Commission Decision "DECT Access (CTR 06)" (Official Journal L194 94/471/EC).

- [46] Commission Decision "DECT Telephony (CTR 10)" (Official Journal L194 94/472/EC).
- [47] Draft Commission Decision "DECT Public Access Profile (CTR 11)".
- [48] 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 (Official Journal L128/1, 23/4/1991)".
- [49] 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 (Official Journal L144/45, 08/06/91)".
- [50] 91/288/EEC: "Council Recommendation of 03 June 1991 on the co-ordinated introduction of digital European cordless telecommunications (DECT) into the Community (Official Journal L144/47, 08/06/91)."
- [51] 89/336/EEC: "Council Directive of 3 May 1989 on the approximation of laws of the Member States relating to Electromagnetic Compatibility (Official Journal L139 of 23/5/89)" including 92/31/CEE.
- [52] NTRAC: "Handbook on CTRs"
- [53] NTRAC: "Procedure for the Production of CTRs."
- [54] ETR 041: "Transmission and Multiplexing (TM); Digital European Cordless Telecommunications (DECT); Transmission aspects 3,1 kHz telephony Interworking with other networks".
- [55] CEC/Scientific Generics: "Presentation of DECT trials for Local Loop, Neighbourhood Telepoint and 2-way Telepoint Applications." Budapest, April 1994.
- [56] CCITT Recommendation G.726: "40, 32, 24, 16 kbit/s adaptive differential pulse code modulation (ADPCM)".
- [57] DE/RES-03037: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Data Services Profile, Multimedia Messaging Service for Closed User Groups (Service type F, Class 1)"
- [58] TBR 022: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Attachment requirements for terminal equipment for Digital European Cordless Telecommunications (DECT): Generic Access Profile (GAP) applications."

3 Abbreviations

For the purposes of this ETR the following abbreviations apply:

AMPS	Advanced Mobile Phone Service
ARI	Access Rights Identity
CEC	Commission of the European Community
CEPT	European Conference of Postal and Telecommunications Administrations
CI	Common Interface
CTR	Common Technical Regulation
CTS	Conformance Testing Service
DAM	DECT Authentication Module
DECT	Digital European Cordless Telecommunications
EEC	European Economic Community
EMC	Electro-Magnetic Compatibility

EN	European Norm
ES	End System
FP	Fixed Part
FT	Fixed Termination
GAP	Generic Access Profile
GSM	Global System for Mobile communication
ISDN	Integrated Services Digital Network
IWP	Inter-Working Profile
IWU	Inter-Working Unit
LAN	Local Area Network
NMT	Nordic Mobile Telephone
NTRAC	New Telecommunications Regulations Applications Committee
PAP	Public Access Profile
PARK	Portable Access Rights Key
PCS	Personal Communications Services
PLMN	Public Land Mobile Network
PP	Portable Part
PSTN	Public Switched Telephone Network
PT	Portable Termination
RLL	Radio in the Local Loop
SARI	Secondary Access Rights Identity
SIM	Subscriber Identity Module
TACS	Total Access Communications System
WRS	Wireless Relay Station

4 General

The aim of the ETSI DECT standardization has been to develop a modern and complete common harmonised standard (see note) within the area of cordless telecommunications.

NOTE: Harmonised standards are those prepared and adopted on a European basis, with any conflicting national standards being withdrawn. European Standards (ENs), European Telecommunication Standards (ETs) and Technical Basis for Regulation (TBRs) are examples of such standards.

Figure 1 shows the broad scope for the DECT standardization.

The DECT standardization effort has received substantial legal and financial support from the European Commission (EC). The European Conference of Postal and Telecommunications Administrations (CEPT) European wide allocation of the frequency band 1 880 - 1 900 MHz, has been reinforced by Council Directive 91/287/EEC [49], stating:

"that the allocated frequency band has to be made available in each country from 1992 upon market demand. DECT shall have priority and be protected in the designated band".

The DECT real time Dynamic Channel Selection (DCS) provides effective co-existence of unco-ordinated installations of private and public systems on the common designated DECT frequency band, and avoids any need for traditional frequency planning.

For rapid introduction on a European wide bases, Council Directive 91/287/EEC [49] and Council Recommendation 91/288/EEC [50] refer to Council Directive 91/263/EEC [48] (Terminal Directive) for mutual recognition between countries of conformity. For this purpose Common Technical Regulations (CTRs), have been established for DECT relating to harmonised DECT Technical Basis for Regulations (TBRs) and ETs. Approval to a CTR gives access to a single European market through a simplified legal procedure.

CTRs regulate essential requirements, and tests for these requirements are included in the CTRs. Through its Conformance Testing Service (CTS) program (see Handbook on CTRs [52]), the EC supports development of software and hardware for CTR tests and for voluntary conformance testing above essential requirements, by issuing test development contracts to European test houses and related companies.

The Council Recommendation 91/288/EEC [50] states that the DECT standard should meet user requirements for residential, business, public 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 European roaming of DECT handsets.

The detailed requirements that have governed the DECT standardisation efforts are provided by ETR 043 [13], where one requirement is flexibility for additions and evolutionary applications.

In this ETR, clause 5 explains the concept of DECT being a general radio access technology. It further describes the resulting "tool box" character of the DECT Common Interface (CI) (basic) standard, and how coexistence, compatibility, and ETSI defined profile inter-working, is provided. A short overview of available supporting ETRs is also included.

Clause 6 describes existing ETSI defined profiles and their interrelations.

Clause 7 describes the CTR based regulatory regimes for DECT type approval.

Figure 5 shows in graphic form the relations between basic CTRs and profile standards.

Table 1 is an overview of status including time table for the DECT documents.

Clause 8 describes the flexibility for evolutionary developments of the DECT standard.

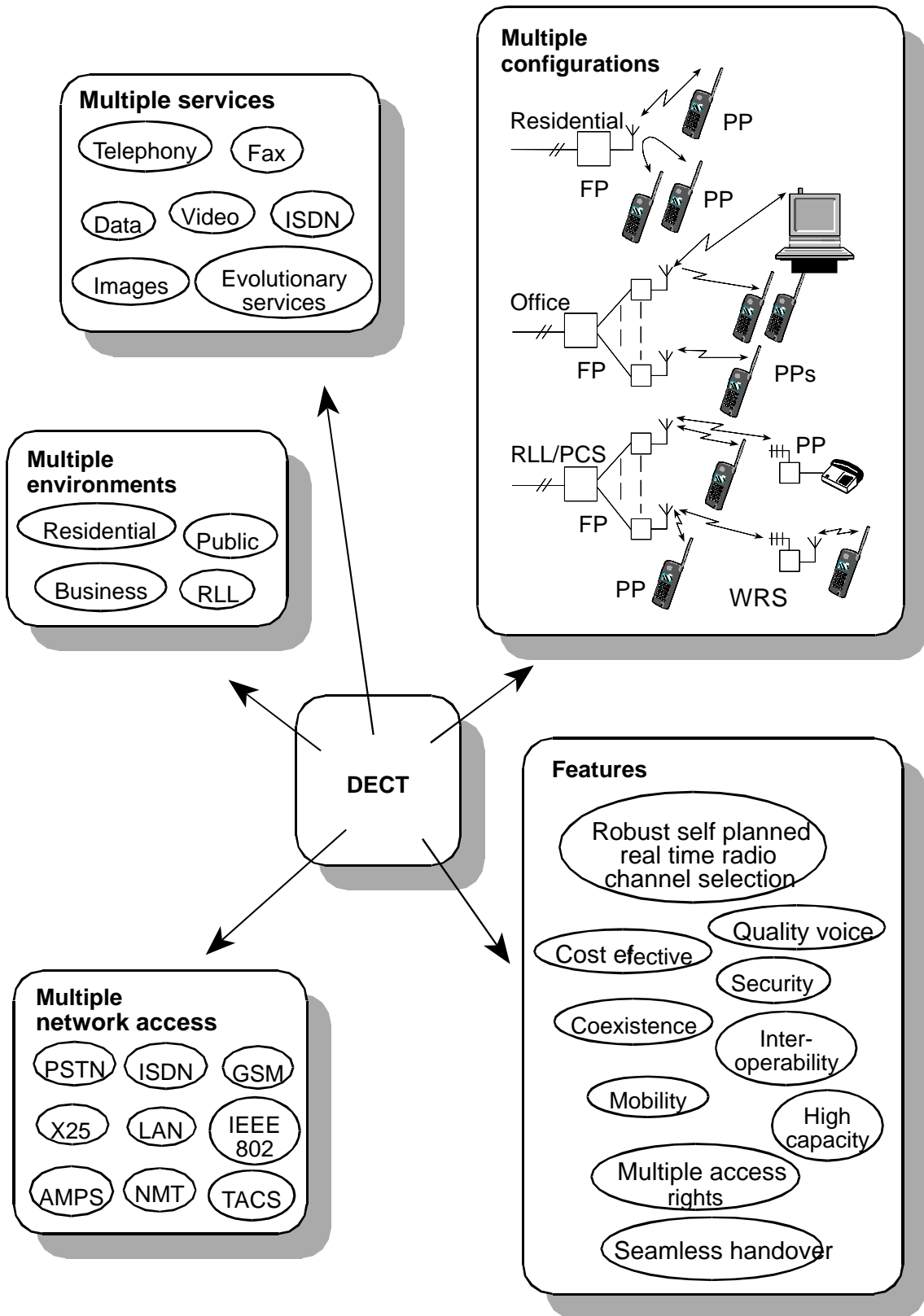


Figure 1: Overview of DECT applications and features

5 DECT CI standard

The DECT standardisation efforts have been governed by the very detailed requirements in ETR 043 [13].

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 1 km depending on application and environment. It provides telephony quality voice services, and a broad range of data services, including ISDN. It can be effectively implemented as a simple residential cordless telephone or as a system providing all telephone services in a city centre. Figure 1 gives a high level graphic overview of applications and features of DECT. The multiple configuration part of figure 1 shows a few examples of systems, however the Wireless Relay Station (WRS) and any kind of terminals indicated may be combined with any of the FPs.

5.1 A general radio access technology

It is essential to see the implications of the difference between an access technology and mobile radio systems like NMT, TACS, AMPS or GSM/DCS1800. In a mobile radio system the whole network is part of the specification and a mobile unit can only access the unique network that is part of the mobile radio system. DECT as a general access technology is specified to provide access to a large number of local and public networks.

Thus a local and/or public network is not part of the DECT specification. Figure 2 illustrates this.

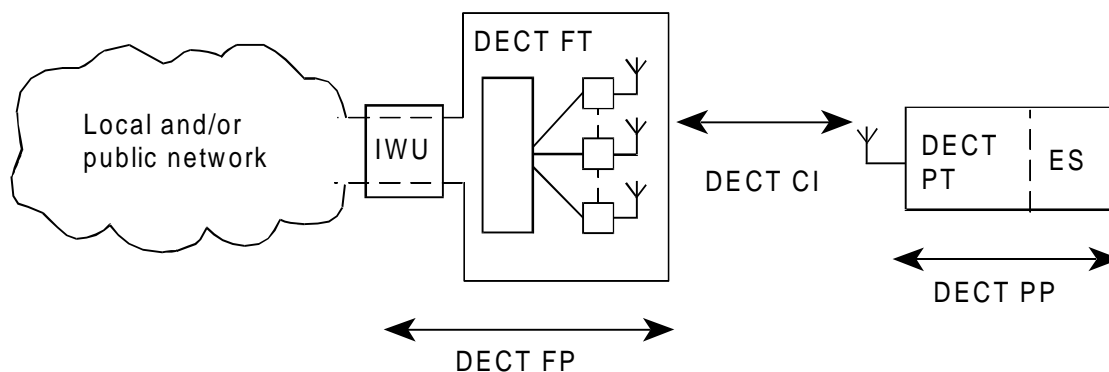


Figure 2: The DECT CI

The DECT CI regards in principle only the air interface between the DECT FP and Portable Part (PP). The Interworking Unit (IWU) between a network (see note 1) and the DECT Fixed radio Termination (FT) is network specific and is not part of the DECT CI specification, nor is the End System (ES) (see note 2) in a DECT PP. These parts are only specified as regards general end-to-end compatibility requirements e.g. on speech transmission. The IWU and ES are also subject to general attachment requirements for the relevant public network, e.g. the PSTN/ISDN, see also clause 7.

NOTE 1: The ETSI technical committee BTC is defining a 2 Mbit/s interface between PBXs and DECT, within a work item on inter-PBX interfaces with mobility management.

NOTE 2: An ES is e.g. microphone, speaker, keyboard and display.

For each specific network, local or global, the specific services and features of that network are made available via the DECT air interface to the users of DECT handsets. Except for cordless capability and mobility, DECT does not offer a specific service; it is transparent to the services provided by the connected network.

Thus the DECT CI standard is, and has to be, a tool box with protocols and messages from which a selection is made to access the actual network, and to provide means for market success for simple residential systems as well as for e.g. office ISDN services.

The DECT CI standard has a layered structure and is contained in ETS 300 175, Parts 1 to 9 [1] - [9]. It is a very complete set of requirements, procedures and messages. The messages also contain codes that are reserved for evolutionary applications and proprietary extensions.

The DECT authentication algorithm and the DECT encryption algorithm are not part of the CI standard, but are obtained from ETSI through a special legal procedure (see ETS 300 175-7 [7]).

The administration of global unique DECT identity codes for manufacturing, installation and public operation are also handled by ETSI (see ETS 300 175-6 [6]).

5.2 Telephony speech quality

The basic telephony speech quality is provided by application of the CCITT Recommendation G.726 [56] 32 kbit/s ADPCM speech codec and other speech transmission characteristics defined in ETS 300 175-8 [8]. Required echo control, for instance, is provided by low cost means in the DECT FP without the need to add any requirements on the attached local or public network. It is an essential requirement for any general radio access technology, not to add requirements to existing networks. Further information on DECT speech transmission aspects when inter-working with other networks are also found in ETR 041 [54].

5.3 Coexistence of unco-ordinated installations on a common frequency band

The mandatory real time DCS messages and procedures provide effective co-existence of unco-ordinated private and public systems on the common designated DECT frequency band. Each device has access to all channels (time/frequency combinations). When a connection is needed, a channel is selected so that, at that instant and locality, minimum interference of all the common access channels is caused. This avoids any need for traditional frequency planning, and greatly simplifies the installations. This procedure also provides higher and higher capacity by closer and closer base station installations, while maintaining a high radio link quality. Not needing to split the frequency resource between different services or users gives a very efficient use of the allocated spectrum.

5.4 Access to different systems by the same handset

Each DECT FP has a globally unique broadcast Access Rights Identity (ARI). To each ARI are linked the available services, the related protocols and, when required, a crypto-key and/or authentication-key. For each service, suitable protocols have been selected from the CI tool box to efficiently provide these services.

Similarly each DECT PP has one or more Portable Access Rights Keys (PARKs). One PARK relates to one FP or a group of FPs belonging to the same operator. To each PARK are linked the corresponding FP ARIs, related services and protocols, and when required a crypto-key and/or authentication-key.

Thus the same PP will have access to several different types of systems if equipped with the relevant PARKs and associated protocols. Thus, it is not a common protocol for all systems that provide inter system roaming, but it is that the PP is equipped with access rights and related protocols to the wanted systems. A detailed description of the flexible and powerful DECT identity provisions are found in ETS 300 175-6 [6].

5.5 Access to several applications through the same base station

DECT also provides the means for sharing base stations or systems between different operators or applications, e.g. hosting private user groups in a large public system, providing public access through a privately owned system or hosting public access to several services provided in a system owned by one of the service providers. The ARIs related to available additional accesses are broadcast as Secondary Access Rights Identities (SARIs) by a FP.

5.6 Interoperability by ETSI defined profiles

Interoperability with equipment from different manufacturers and with different systems is provided for a specific service and application if the equipment, FPs and PPs conform to an ETSI defined profile standard. A profile defines a selection of messages and procedures from the CI tool box and gives an unambiguous description of the air interface for specified service(s) and application(s). Examples are the DECT/GSM Interworking Profile (GIP) and the Generic Access Profile (GAP) further described in clause 6.

To provide roaming between FPs conforming to the same profile is very easy, since no additional protocol, but only the PARK and possibly an authentication Key (K) has to be provided for each new system to be accessed.

5.7 The DECT Authentication Module (DAM)

The DAM is a chip card that can be issued by a DECT operator to the DECT subscriber in order to supply him with the necessary subscription data. This data can contain the user identity, the access rights key, security parameters (e.g. cipher and authentication keys) and other operator specific information. Especially for private systems, the PPs normally only provide their internal memory for storing the subscription data and have no DAM interface. To use a DAM card, a PP has to be provided with the DAM interface. The DAM card is compatible with the corresponding card in GSM, called SIM (see ETS 300 331 [19]).

5.8 Supporting documents

The introduction and application of the DECT standards are supported by ETSI Technical Reports, ETRs.

ETR 015 [11], provides a rather detailed, description of services and features indicated in figure 1. The clause dealing with time scales is superseded by information in this ETR.

The radio aspects are further described in ETR 042 [12]. This ETR describes how high traffic densities, telephony speech quality and reliable data transfer is provided and maintained in an environment of uncoordinated installations. The conclusions are supported by numerous simulations for voice and data in office and residential environments. Requirements for Radio Local Loop (RLL) and outdoor Personal Communications Network (PCN) applications are not covered ETR 042 [12]. However, reports on trials and simulations for the latter applications, are in increasing numbers found in international magazines and conference proceedings, e.g. IEEE publications. Furthermore, the EC has sponsored trials in local loop, neighbourhood telepoint and 2-way telepoint applications carried out during 1994 in the UK and in Hungary (see CEC report [55]).

An overall description of the DECT system in terms of inter-working and interfacing to local and public networks such as PSTN, ISDN, X.25 etc. is provided in ETR 056 [14]. Emphasis has been placed on the special features, for example the identity structures allowing for attachment to different network types, aspects of mobility management, etc. along with recommendations for efficient inter-working of DECT and various networks.

An overall description of Wireless Relay Stations (WRS) is provided in DTR/RES-03068 [40]. WRS is an additional building block for the DECT fixed network. It is suitable to provide cost effective infrastructures for low traffic density applications.

Other ETRs, finished or under preparation, are given in the overview in table 1.

6 DECT profiles

A DECT profile standard is a chosen subset of the DECT CI standard for a specific application. It includes all requirements for interoperability for equipment from different manufacturers. If the CI standard has some ambiguity or lacks some provision, this is clarified or added in the profile standard. All defined features are process mandatory. This means that if a feature is used, it is used in a specified manner. Whether the provision of a feature is mandatory or optional is stated separately for FPs and PPs.

Creating new profiles is a means for enhancing the DECT standard and/or introducing evolutionary applications and services.

6.1 Public Access Profile (PAP)

This profile is intended for public DECT speech service using the PSTN/ISDN. It includes mobility management and security features for pan-European roaming. The requirements are covered by TBR 11 [29] and the ETS 300 323 PAP test specification [20]-[26].

NOTE: Only versions dated May 1994 and later of TBR 11 [29] and ETS 300 323 [20]-[26] are compatible with GAP, see subclause 6.3.

See subclause 7.3 for information on the regulatory aspects.

6.2 DECT/GSM interworking profile (GIP)

The DECT/GSM interworking profile (see ETS 300 370 [32] and DE/RES-03025 [33]) is intended for public DECT speech service using the GSM PLMN and its mobility functions. This profile is closely related to the PAP/GAP, but makes use of GSM identities (IMSI) in DECT PPs, which is an option supported in the DECT CI standard. From an interworking point of view, the DECT FP is connected via an IWU to the GSM PLMN network, which will see a DECT user as a GSM subscriber. This profile also contains requirements on the IWU and the DAM. The requirements for the GSM IWP regarding the DAM are specified in ETS 300 331 [19].

For further information see ETR 159 [16].

6.3 Generic Access Profile (GAP)

The GAP (see ETS 300 444 [41]) defines general interoperability requirements for any private or public DECT application supporting a 3,1 kHz telephony teleservice. It includes mobility management and security features.

The GAP is closely related to the PAP, but includes private and public applications. It has differentiated requirements on private and public FPs.

The GAP will become the industry standard for a basic fall back speech service with mobility management available on every DECT PP and FP providing a 3,1 kHz telephony teleservice. This basic service does not need to be generally used, but it will always be available, if requested by a roaming PP or by the FP to which the PP has roamed.

See subclause 7.4 regarding the regulatory aspects of the GAP.

6.4 DECT/ISDN interworking profiles

Two profiles are defined so far for the DECT/ISDN Interworking, the End System (ES) profile (see ETS 300 434 [30]) and the Intermediate System (IS) profile DE/RES-03039 [31].

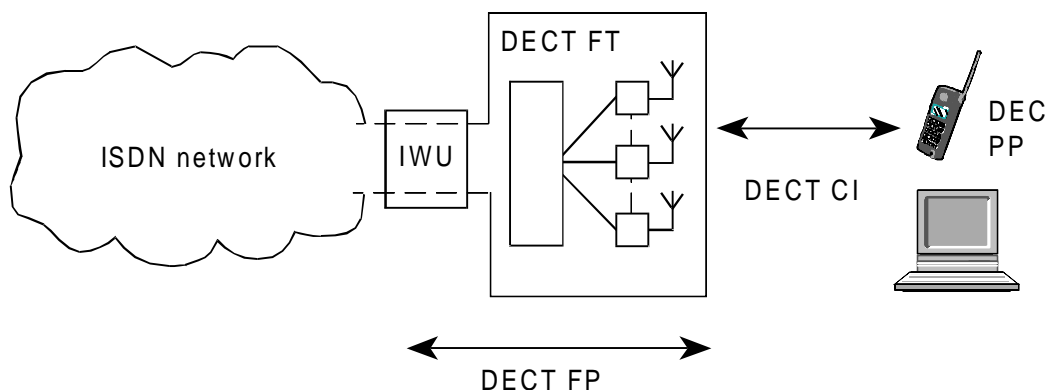


Figure 3: DECT ES

The PP has access to the services of the ISDN network via the FP using DECT signalling over the air interface.

The ES (see figure 3) provides for interoperability of FPs and PPs from different manufacturers allowing access to ISDN where the FP and the PP together appear to the network as an ISDN terminal (TE1).

The ES standard covers the following items:

- the FP provides for interworking between e.g. a GAP - PP and ISDN;
- the ISDN defined supplementary services are made available to the user by a suitable PP;
- access to the 64 kbit/s unrestricted digital information bearer service is possible via a suitable PP.

The IS (see figure 4) provides for a wireless link between an ISDN network and one or more ISDN terminals (TE1s) connected to an S-Interface at the S-Reference Point. The TE1s have transparent access to all network defined services based upon the basic channel structure 2*B+D. B-channels support is provided in an intelligent manner allowing for efficient use of the DECT spectrum.

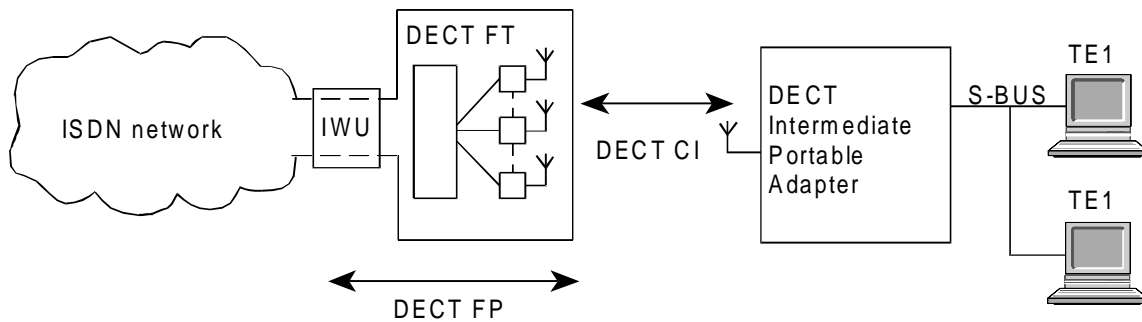


Figure 4: DECT IS

The ISDN terminals, TE1, have transparent access to the ISDN network services.

6.5 DECT data services profiles

DECT is equipped with powerful wireless data capabilities. A family of profiles complete the Open Standard character of such services, by ensuring inter-operability between products from different manufacturers. They all exploit the powerful lower-layer data services of DECT, which are specifically oriented towards LAN, multi-media and serial data capability, but each member of the profile family has been optimised for a different kind of user service. The different profiles are modular and closely related, so that they may be economically and efficiently implemented. The services and relationships of the different profiles are described in ETR 185 [18].

The family of profiles is planned to comprise the following members:

- ETS 300 435: Data services profile; Base standard including interworking to connectionless networks (Service types A and B, Class 1) [34]: this standard is the basis for all other data profiles, and includes annexes for interworking with Ethernet and Token Ring LANs at up to 69 kBytes/s (552 kbit/s);
- DE/RES-03032: Data Services Profile, Generic Frame Relay Service with Mobility (Service Types A and B, Class 2) [35]: supports similar services to ETS 300 435 [34], when applied to environments in which significant mobility is required;
- DE/RES-03035 Data Services Profile, Generic Data LinkService for Closed User Groups (Service Type C, Class 1) [36]: is aimed at applications for which a high degree of data integrity is necessary, and includes annexes for interworking with modems, RS-232 and X.25 networks;
- DE/RES-03036: Data Services Profile, Generic data link service (Service Type C, Class 2) [37]: extends the Data Stream service into environments, such as public services, where significant mobility is a characteristic;
- DE/RES-03037: Data Services Profile, Multimedia Messaging Service for Closed User Groups (Service type F, Class 1) [57]: a standard profile for ensuring inter-operability between non-voice DECT equipment offering specific telematic services, including facsimile, in the local environment;
- DE/RES-03038: Data Services Profile, Multimedia Messaging Service with specific provision for Facsimile services (Service type F, Class 2) [38]: creates high level inter-operability for a range of Telematic services, including fax, through a multi-media file transfer mechanism built on the data stream service, with full support for roaming and public services;
- DE/RES-03078: Data Services Profile, Low Rate Messaging Service (Service type E, Class 2) [39]: specifies a Link Access Protocol (LAP) service suitable for non-transparent transfer of asynchronous character streams and intended for use in private and public roaming applications.

Further profiles may be created to respond to market demand.

7 Regulatory regimes for DECT type approvals

Approval to a CTR gives access to a single European market through a simplified legal procedure. A CTR refers to a TBR which is a special type of ETSI deliverable with the formal status of a harmonised standard.

Development of test suites and establishment of European test facilities are supported by the CEC CTS program, specifically CTS-3 and CTS-5.

Further information on Council Directive 91/263/EEC [48], and its application, is found in NTRAC's "Handbook on CTRs" [52] and "Procedure for the Production of CTRs" [53].

7.1 CTR 06

Conformance to CTR 06 [45] is mandatory for all DECT equipment. It refers to TBR 006 [27].

CTR 06 [45] contains radio parameters, test messages and the DCS messages and procedures required for the effective co-existence of unco-ordinated private and public systems on the common designated DECT frequency band.

CTR 06 [45] also refers to European or national attachment requirements for the appropriate public network.

7.2 CTR 10

Conformance to CTR 10 [46] is mandatory for all DECT equipment supporting a 3,1 kHz telephony teleservice capable of direct or indirect interworking via the public PSTN/ISDN (see note). CTR 10 [46] refers to TBR 010 [28].

CTR 10 [46] contains the speech coding and speech transmission requirements. It ensures end to end speech compatibility, without the need to add any DECT specific restrictions on the attached local or public network.

All equipment where PPs are allowed to be tested as separate items under CTR 10 [46], the required speech characteristics are uniform. If a connection attempt between a separately approved PP and FP succeeds (related ARI and PARK), then the end-to-end speech characteristics and echo control requirements are met, independently of which access protocol was used. This is an essential feature for DECT as a general radio access technology, since a multitude of access protocols are supported.

NOTE: Tethered RLL applications only need to conform to CTR 06 and relevant national attachment requirements.

7.3 CTR 11

Conformance to CTR 11 [47] is mandatory for all DECT equipment declared to be PAP compliant. CTR 11 [47] refers to TBR 11 [29], which refers to the ETS 300 323 PAP test specification [20]-[26].

CTR 11 [47] provides interoperability, and includes mobility management and security features for pan-European roaming.

7.4 GAP "CTR candidate"

After a transition period, the GAP is intended to become mandatory for all DECT equipment that has to conform to CTR 10 [46].

The GAP-CTR [58] is the pragmatic way to extend "PAP" interoperability and mobility features to private applications by providing a basic fall back speech interoperability between all PPs and FPs supporting 3,1 kHz telephony teleservice.

The GAP speech service will not be mandated for all speech calls, but the GAP service will always have to be available upon request, e.g. by a roaming PP or by the FP to which the PP has roamed.

7.5 Combinations of CTRs and profiles

A graphic overview of the relations between CTRs and profiles is given in figure 5.

For example, equipment declared GSM compatible has to comply to CTR 06 [45], CTR 10 [46], DECT/GSM IWP (ETS 300 370 [32]) and in the future GAP.

This gives a clear structure where profile standards are based directly on the DECT CI standard ETS 300 175 Parts 1 to 8 [1]-[8].

The relationship to GAP can be expressed as each FP and PP supporting an interworking profile (e.g. DECT/GSM) supporting 3,1 kHz speech and has to be able to invoke both the services of the other network (e.g. GSM) and the GAP speech service.

As a consequence, all profile standards supporting 3,1 kHz speech should use GAP-like processes whenever appropriate, in order to minimise the complexity of equipment.

7.6 EMC requirements

DECT equipment also has to meet the proper EMC requirements given in ETS 300 329 [44] to give presumption of compliance to the Council Directive 89/336/EEC [51] referred to in TBR 6 [27].

8 Evolutionary developments

One essential requirement in the ETR 043 [13] is flexibility for additions and evolutionary applications. This has been provided by the above described tool box concept, and is further amplified by the provision of escape codes and a multitude of reserved codes in messages in every layer of the specification. These reserved codes are reserved for future ETSI defined enhancements and for proprietary additions.

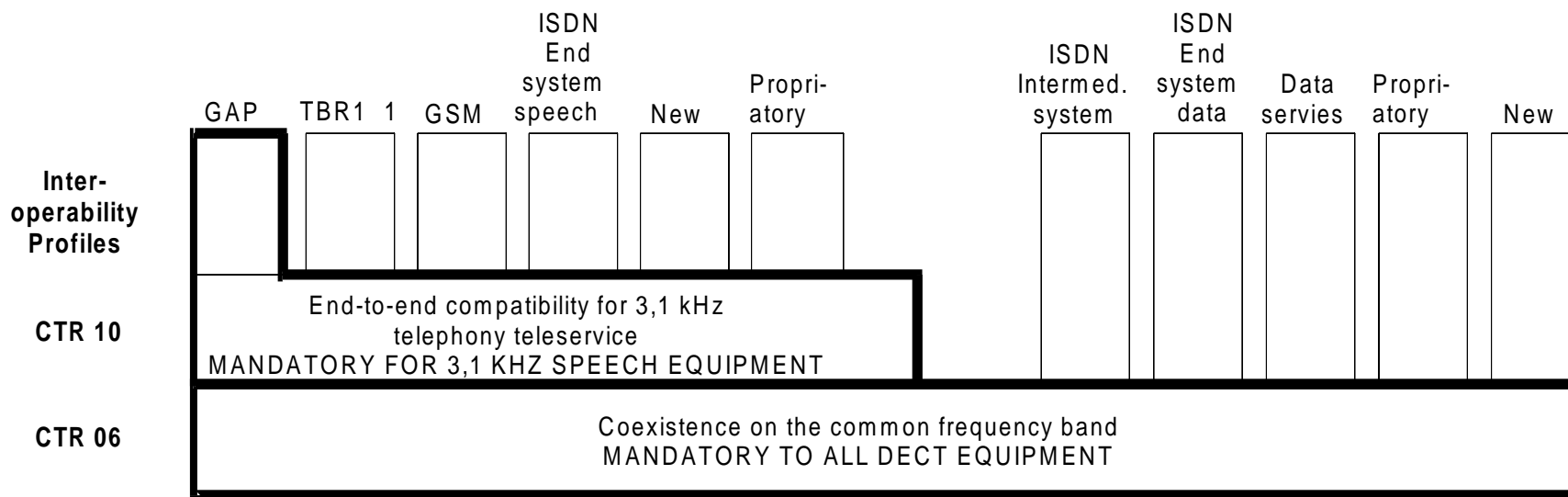
Besides defining new profiles from the existing tool box, it is also easy to add new contents to the tool box. Examples of new contents are 7 kHz telephony service provision, low bit rate speech codecs, lower and higher transmission bit rate options, new or extended frequency allocations (see note) (pan-European, national or outside Europe). Equipment based on these new features, could be required to be compliant to GAP or are not dependent upon the application.

NOTE: Extended or new frequency allocations do not cause regulatory difficulties for roaming DECT handsets. The reason is that it is mandatory for DECT FP to broadcast not only its ARIs, but also other information as regarding which carrier frequencies the specific FP is allowed to operate on. It is mandatory for PPs not to start transmission on carriers others than those informed to the PP by the FP in the FP broadcast messages.

It is possible to go further, e.g. by defining a dual mode physical layer, where the second layer is optimised for long range, improvement to the DECT coverage area in low density PCS applications may be achieved. Such a dual mode physical layer provision could, with a minimum amount of effort, enhance DECT to an attractive third generation PCS technology.

DECT instantaneous DCS provides co-existence between systems with different carrier spacing, different carrier bandwidth and different slot length. This allows possible sophisticated evolutions.

Figure 5: Overview of basic CTRs and profiles



A DECT equipment may conform to more than one profile.
The GAP is intended to become mandatory for equipment subject to CTR 10

Table 1: Status of DECT documents (August 1995)

Document no.	Abbreviated title	Status
ETSI Technical Reports		
ETR 015	DECT reference document	published
ETR 041	DECT, transmission aspects, 3.1 KHz telephony	published
ETR 042	Guide to features that influence traffic capacity	published
ETR 043	DECT services and facilities	published
ETR 056	DECT system description document	published
ETR 139	Radio in the Local Loop (RLL)	published
ETR 183	Conformance test specification for DECT	TC approved
ETR 159	DECT wide area mobility services using GSM	published
ETR 178	A high level guide to the DECT standardisation	published
ETR 185	Data services profile, overview	TC approved
DTR/RES-03068	Application of DECT Wireless Relay Stations (WRS)	TC approved
DTR/RES-03058	DECT/GSM interworking profile overview	started
DTR/RES-03074	Radio local loop Access Profile (RAP)	started
DTR/RES-03077	Traffic capacity and spectrum requirements for multi-system and multi-service applications co-existing in a common frequency band	started
DECT Common Interface standards		
ETS 300 175	DECT Common Interface (CI), parts 1 to 9	published
ETS 300 175	DECT Common Interface (CI), parts 1 to 9 (second edition)	on PE
I-ETS 300 176	Approval test specification	published
ETS 300 176	Approval test specification (upgrade to ETS)	approved for PE
ETS 300 476	CI PICS, parts 1 to 7	on PE
ETS 300 323	PAP test specification, parts 1 to 7	published
ETS 300 497	DECT CI Test Case Library (TCL)	on PE
DE/RES-03069	Wireless Relay Stations (WRS)	approved for PE
DECT Authentication Module standards		
ETS 300 331	DECT Authentication Module (DAM)	adopted
DE/RES-03046	DAM ICS	started
DE/RES-03019	DAM test specification	started
DECT Generic Access Profile standards		
ETS 300 444	Generic Access Profile (GAP)	adopted
ETS 300 474	GAP PICS, parts 1 and 2	on PE
ETS 300 494	GAP test specification, parts 1 to 3	on PE
DECT Data standards		
ETS 300 435	Data Services Profile, base standard including interworking with connectionless networks (Service Types A and B, Class 1)	approved for FV
DE/RES-03047	Conformance testing for DECT base data profile	started
DE/RES-03032	Data Services Profile, generic frame relay service with mobility (Service Types A and B, Class 2)	approved for PE
DE/RES-03035	Data Services Profile, generic data linkservice for closed user groups (Service Type C, Class 1)	approved for PE
ETS 300 651	Data Services Profile, generic data link service (Service Type C, Class 2)	approved for PE
DE/RES-03078	Data Services Profile, low rate messaging service (Service type E, Class 2)	started
DE/RES-03037	Data Services Profile, multimedia messaging service for closed user groups (Service type F, Class 1)	started

(continued)

Table 1 (concluded): Status of DECT documents (August 1995)

Document no.	Abbreviated title	Status
DECT-GSM interworking standards		
DE/RES-03038	Data Services Profile, multimedia messaging service with specific provision for facsimile services (Service type F, class 2)	started
ETS 300 466	DECT-GSM IWP, General description of service requirements	approved for FV
ETS 300 370	DECT-GSM IWP, 3.1kHz speech	published
ETS 300 370	DECT-GSM IWP, 3.1kHz speech (second edition)	started
DE/RES-03044	DECT-GSM IWP, Implementation of 3.1kHz speech, PICS	approved for PE
DE/RES-03025	DECT-GSM IWP, 3.1kHz speech, test specification	approved for PE
ETS 300 499	DECT-GSM IWP, FP to MSC interconnection	approved for PE
DE/RES-03050	DECT-GSM IWP, Implementation of GSM phase 2 supplementary services	approved for PE
DE/RES-03072	DECT-GSM IWP, Implementation of fax group 3	started
DE/RES-03071	DECT-GSM IWP, Implementation of bearer services	started
DE/RES-03057	DECT-GSM IWP, Implementation of GSM SMS	started
DECT-ISDN interworking standards		
ETS 300 434	DECT/ISDN IWP for end system configuration, parts 1 & 2	approved for FV
DE/RES-03045	DECT/ISDN IWP for end system configuration, PICS	approved for PE
DE/RES-03018	DECT/ISDN IWP for end system configuration, test specification	started
DE/RES-03039	DECT/ISDN IWP, Intermediate System Configuration, parts 1-2	started
DE/RES-03063	DECT access to GSM via ISDN+ interface, service description (stage 1)	started
DE/RES-03064	DECT access to GSM via ISDN+ interface, functional capabilities and information flows (stage 2)	started
DE/RES-03065	DECT access to GSM via ISDN+ interface (bearer and SMS services)	started
DE/RES-03066	DECT access to GSM PLMN via ISDN+ interface, basic call and mobility management	started
DE/RES-03067	DECT access to GSM via ISDN+ interface, GSM supplementary services	started
DECT Radio Local Loop standards		
DE/RES-03075	Radio local loop Access Profile (RAP)	started
DE/RES-03076	Radio local loop Access Profile (RAP) test specification	started
DECT EMC standard		
ETS 300 329	EMC standard for DECT equipment	published
DECT Technical Basis for Regulation		
TBR 006	General terminal attachment req.	published
TBR 006	General terminal attachment req. (second edition)	approved for PE
TBR 010	General terminal attachment req., telephony applications	published
TBR 010	General terminal attachment req., telephony applications (second edition)	approved for PE
TBR 011	PAP attachment for terminal equipment	published
TBR 022	GAP attachment for terminal equipment	on PE
TBR 036	DECT/GSM radio access	started
DTBR/RES-03060	DECT/GSM dual mode portables/mobiles	started
DTBR/RES-03061	TBR for DECT ISDN portable parts	started
DTBR/RES-03062	TBR for DECT ISDN fixed parts	started
Key: xxx	Number not yet allocated	
PE	Public enquiry	
FV	Formal vote	
TC	Technical Committee	

History

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