Telecommunications Standards Advisory Committee (TSAC)

Technical Specification

Cordless Telephones and Telecommunication Systems

IMDA TS CT-CTS
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Technical Specification for Cordless Telephones and Telecommunication System

1. Scope

This Specification defines the minimum technical requirements for operating cordless telephones and cordless telecommunication systems (generally termed "cordless systems"). These cordless systems are intended for in-building or localised on-site operations, providing communications in radius of a few hundred metres. Applications are market segment dependent (residential or business). This Specification applies to common applications of the cordless systems such as cordless telephony (analogue or digital cordless telephones) and cordless PABX (digital cordless systems e.g. DECT and PHS). Other applications may include cordless local area networks and local loop replacement.

1.1. Cordless Telephony (Residential)

1.1.1. Cordless telephony is an application of cordless system in its basic form, comprising two parts:

(a) a fixed part (base station), which is connected to a PSTN line; and

(b) a portable set (mobile handset unit).

1.1.2. Each part shall use multi-channel access techniques and individually perform the following operations:

(a) search for idle channels;

(b) set up speech paths using the selected channel;

(c) check identification codes in the signals between the fixed part and the portable set in order to ensure that only associated units will lock to each other.

1.1.3. Digital cordless systems which support cordless telephony, DECT systems for instance, may have more advanced features such as connection to 2 PSTN lines, use of 2 or 4 portable sets, intercom facility via the base station and call transfer between handset units.

1.2. Cordless PABX

1.2.1. In addition to basic cordless telephony, cordless PABX are single cell or multi-cell systems intended to serve small or large businesses for cordless extensions and on-premises communications networks.

1.2.2. This Specification has included the technical requirements for operating two types of digital cordless systems, namely DECT and PHS, which support the cordless PABX application.

2. References

For the technical requirements captured in this Specification, reference has been made to the following standards. Where versions are not indicated, implementation of this Specification shall be based on current and valid versions of these standards published by the respective Standards Development Organisations.

ITU-R M.1033-1	Technical and Operational Characteristics of Cordless Telephones and Cordless Telecommunication Systems
ITU-T Rec. E.161 (02/2001)	Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network
FCC Part 15 Subpart A § 15.31 § 15.33 § 15.35	Radio Frequency Devices General Measurement Standards Frequency Range of Radiated Measurements Measurement Detector Functions and Bandwidths
FCC Part 15 Subpart C § 15.214 (d)	Radio Frequency Devices Intentional Radiators Cordless telephones
ETSI EN 300 175-1 to EN 300 175-8	Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 1 to Part 8
ETSI EN 301 406	Digital Enhanced Cordless Telecommunications (DECT); Harmonised EN for DECT covering essential requirements under article 3.2 of the R&TTE Directive; Generic radio
RCR STD – 28 V4.1	Personal Handy Phone System, ARIB Standard, Japan
ETSI EN 301 489-1	EMC standard for radio equipment and services; Harmonised Standard covering essential requirements of article 3.1(b) of the Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU; Part 1: Common technical requirements
ETSI EN 301 489-6	EMC standard for radio equipment and services; Part 6: Specific conditions for Digital Enhanced Cordless Telecommunications (DECT) equipment; Harmonised Standard covering essential requirements of article 3.1(b) of the Directive 2014/53/EU
ITU-T K.116	EMC requirements and test methods for radio telecommunication terminal equipment
IEC CISPR 32	Electromagnetic compatibility of multimedia equipment – Emission requirements Note: Validity of the IEC CISPR 22, EMC standard for information technology equipment, will lapse by 31 March 2017, in sync with IEC's timeline for withdrawing this CISPR standard, replacing it with the CISPR 32 standard.
IEC CISPR 24	Information technology equipment – Immunity

	characteristics – Limits and methods of measurement
IEC 60950-1	Information technology equipment – Safety – Part 1: General requirements
IEC 62368-1	Audio/video, information and communication technology equipment – Part 1: Safety requirements

3. Abbreviations

ADPCM	Adaptive Differential Pulse Code Modulation
CVSDM	Continuously Variable Slope Delta Modulation
DECT	Digital Enhanced Cordless Telecommunications
ETSI	European Telecommunications Standards Institute
FDD	Frequency Division Duplexing
FDMA	Frequency Division Multiple Access
GFSK	Gaussian Frequency Shift Keying
ISDN	Integrated Services Digital Network
PABX	Private Automatic Branch Exchange
PHS	Personal Handy phone System
PSTN	Public Switched Telephone Network
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
TDD	Time Division Duplex
TDMA	Time Division Multiple Access

4. General Requirements

4.1. Design of Cordless Systems

Cordless systems (cordless telephones and cordless telecommunication systems) shall be designed to meet the following basic objectives:

(a) The cordless system shall use the radio frequency spectrum efficiently with multi-channel access techniques to conserve the frequency spectrum.

(b) Where the fixed part of the cordless system is connected to PSTN or ISDN, in addition to complying with the applicable technical requirements defined in §5 of this Specification, it shall comply with the requirements for connection to PSTN or ISDN. The cordless system shall comply with the IMDA TS PSTN or TS ISDN whichever is applicable.

(c) The cordless system shall provide normal telephone features, including the use of alphanumeric keypads for dialling with letters and digits in relationships complying with ITU-T Recommendation E.161 as shown in the figure below.

1	2	3	
	ABC	DEF	Note:
4	5	3	The associated letters must not impair the legibility of the digit (§ 3.1.1, ITU-T Rec. E.161).
GHI	JKL	MNO	
7	8	9	The tactile identifier on the "5" button shall be provided (§ 3.6, ITU-T Rec. E.161).
PQRS	TUV	WXYZ	
*	0	#	

Alphanumeric Keypad Layout (§ 7.3/ITU-T Rec. E.161)

(d) The cordless system is intended for operating in unprotected and shared frequency bands. Its operation shall not cause interference with other authorised radio-communication services, and be able to tolerate any interference caused by other radio-communication services, electrical or electronic equipment.

(e) The cordless system shall not be constructed with any external or readily accessible control which permits the adjustment of its operation in a manner that is inconsistent with this Specification.

4.2. Power Supply

The cordless system may be AC powered or DC powered. For an AC powered equipment, the Specification shall be complied with when operating from an AC mains supply of voltage, 230V ± 10% and frequency, 50 Hz ± 2%. Where external power supply is used, e.g. power adaptor or charger, it shall not affect the capability of the cordless system to meet the requirements of this Specification.

4.3. Electromagnetic Compatibility (EMC) and Safety Requirements

4.3.1. EMC assessment

4.3.1.1. EMI or emission measurements

(a) Radiated emissions from associated ancillary equipment not incorporated in the cordless system shall be measured to Class B requirements defined in §4 and Tables A.4 and A.5 of CISPR 32**;** or §8.2 of EN 301 489-1.

(b) Conducted emission at the AC mains port shall be measured for cordless system with dedicated AC/DC power converter to Class B requirements defined in §4 and Table A.10 of CISPR 32; or §8.4 of EN 301 489-1. Equipment with DC power port which is powered by an external AC/DC power converter or charger/power adapter is defined as AC mains powered equipment (§3.1.1 of CISPR 32).

(c) Conducted emission at the wired network port[1] of the cordless system shall be measured to Class B requirements defined in Table A.12 of CISPR 32; or §8.7 of EN 301 489-1.

4.3.1.2. EMS or immunity testing

[1] Wired network port is used for voice, data and signaling transfers intended for connection to a communication network, e.g. PSTN, ISDN, ADSL and LAN (§3.1.32 of CISPR 32).

The following immunity tests may be performed on the cordless system to requirements defined in CISPR 24, §11 of ITU-T K.116 or §9 of EN 301 489-1, where applicable:

(a) RF electromagnetic field (80 MHz to 1 GHz and 1.4 GHz to 6 GHz) at the enclosure of equipment;

(b) Electrostatic discharge at the enclosure of equipment;

(c) Fast transients (common mode) at DC power and AC main power ports that have cables longer than 3 m;

(d) RF common mode 0.15 MHz to 80 MHz at DC power and AC mains power ports that have cables longer than 3 m;

(e) Voltage dips and interruptions at AC mains power port of equipment with dedicated AC/DC power converter or adapter/power charger; and

(f) Surges, common and differential mode at AC mains power port of equipment with dedicated AC/DC power converter or adapter/power charger.

4.3.2. Equipment safety testing

4.3.2.1. Equipment safety testing or assessment shall be performed to requirements defined in IEC 60950-1 or IEC 62368-1, based on the following assumptions:

(a) cordless system is powered by a dedicated external power supply, AC/DC power converter or charger/power adapter; and

(b) cordless system operates with SELV in environments where overvoltage from telecommunication networks is not possible. SELV refers to voltages not exceeding 42.4 V peak or 60 V DC.

4.3.2.2. For cordless system safety assessment performed with the hazard-based approach, the processes defined in IEC 62368-1 shall be used:

(a) Identify energy sources in the cordless system;

(b) Classify energy sources (effect on the body or combustible material, e.g. possibility of injury or ignition);

(c) Identify safeguards for protection against energy sources; and

(d) Consider the effectiveness of safeguards with respect to compliance criteria or requirements defined in the standard.

5. Technical Requirements

5.1. Analogue Cordless Telephones

The analogue cordless telephone shall comply with the characteristics given in Table 1 of this Specification, operating in its intended frequency band. It shall fulfil the requirements of this Specification on all the permitted frequencies and channels which it is intended to operate.

Table 1: Characteristics of Analogue Cordless Telephones			
Class of emission	F3E or G3E		
Multiple access scheme	FDMA		
Duplex type	FDD		
Transmit frequency band (MHz) – fixed part – portable set	 1.605 – 1.800 49.67 – 49.97	 43.72 – 46.97 48.76 – 49.97	 821 – 822 924 – 925
Transmitted output power (dBµV/m at 3 m) – fixed part – portable set	 ≤ 94 ≤ 90	 ≤ 90 ≤ 90	 ≤ 90 ≤ 90
Frequency stability/tolerance – fixed part – portable set	 ± 0.1 % ± 0.01 %	 ± 0.01 % ± 0.01 %	 ± 0.001 % ± 0.001 %
Number of speech channels	10	25	40
Operating frequencies and channel selection	Refer to Annex A of this Specification.		
Radio frequency channel spacing	Fundamental emission shall be confined within 20 kHz centred on the actual carrier frequency.		
Spurious emissions	Any emissions, including harmonics on any frequency outside the occupied bandwidth, shall be at least 32 dB below the level of the unmodulated carrier.		
Identification code	There shall be provisions for at least 256 possible discrete digital codes [FCC Part 15.214 (d)].		

5.2. Digital Cordless Systems

5.2.1. DECT

The DECT cordless system shall comply with the characteristics given in Table 2 of this Specification and the DECT common interface requirements given in ETSI EN 300 175-1 to 300 175-8, operating in its authorised frequency band. It shall be capable of communicating on all the 10 DECT RF channels and fulfil the requirements of this Specification on all the permitted frequencies and channels which it is intended to operate.

5.2.2. PHS

The PHS cordless system shall comply with the characteristics given in Table 2 of this Specification and the PHS common air interface standards given in RCR STD-28 V4.1, operating in its authorised frequency band. It shall be capable of and limited to communicating on the PHS channels 1 to 12 and fulfil the requirements of this Specification on all the permitted frequencies and channels which it is intended to operate.

Table 2: Characteristics of Digital Cordless Systems		
Digital Cordless System	**DECT (ETSI)**	**PHS (Japan)**
Class of emission	F1W and F7W	G1W and G7W
Multiple access scheme	Multi-carrier TDMA	Multi-carrier TDMA
Duplex type	TDD	TDD
Authorised frequency band (MHz)	1881.792 – 1897.344 (10 RF Carriers)	1895.00 – 1898.75 (Channel 1 to 12)
Radio frequency channel spacing (kHz)	1728	300
Gross bit rate per carrier (kbit/s)	1152	192 – 3200
Number of speech channels	12 (per carrier)	4 (per carrier)
Transmission power, mW EIRP – portable set – fixed part	Peak power over time-slot ≤ 250 ≤ 250	 ≤ 20 (personal station) ≤ 20 (cell and relay station, see Note 2)
Typical service range (m) – indoor – outdoor (See Note 1)	 30 200	 50 200
Voice signals – type of modulation – processing	 GFSK ADPCM or CVSDM	 π/4 QPSK ADPCM
Identification code	> 10^7 combinations	> 10^8 combinations
Note 1: Outdoor, non-localised or inter-building operation of cordless systems is subject to IDA's licensing. IDA may grant exemption of licensing to inter-building operation of cordless systems if they are located within the same premise i.e. the buildings and areas in between the buildings belong to the same owner. Note 2: Transmission power for public cell stations is ≤ 4 W EIRP, subject to IDA's approval.		

5.3. Testing for Compliance with Technical Requirements

5.3.1. The analogue cordless telephone shall be tested to comply with the applicable technical requirements stipulated in §5.1 of this Specification, following test methods given in FCC Part 15 Rules for radio frequency devices, § 15.31, § 15.33 and § 15.35.

5.3.2. The DECT cordless system shal be tested to comply with the requirements stipulated in §5.2.1 and Table 2 of this Specification, following the test conditions and methods given in ETSI EN 301 406.

5.3.3. The PHS cordless system shall be tested to comply with the requirements stipulated in §5.2.2 and Table 2 of this Specification, following measurement methods given in RCR STD-28 V4.1.

Annex A

Analogue Cordless Telephones
Operating Frequencies and Channel Selection

A.1 1.605 – 1.800 MHz/ 49 MHz

Channel No.	Transmitter Frequency	
	Base Station	Handset Unit
1	1.665 MHz	49.670 MHz
2	1.695 MHz	49.845 MHz
3	1.725 MHz	49.860 MHz
4	1.755 MHz	49.770 MHz
5	1.785 MHz	49.875 MHz
6	1.695 MHz	49.830 MHz
7	1.725 MHz	49.890 MHz
8	1.755 MHz	49.930 MHz
9	1.785 MHz	49.990 MHz
10	1.635 MHz	49.970 MHz

A.2 46 MHz/ 49 MHz

Channel No.	Transmitter Frequency	
	Base Station	Handset Unit
1	43.720 MHz	48.760 MHz
2	43.740 MHz	48.840 MHz
3	43.820 MHz	48.860 MHz
4	43.840 MHz	48.920 MHz
5	43.920 MHz	49.020 MHz
6	43.960 MHz	49.080 MHz
7	44.120 MHz	49.100 MHz
8	44.160 MHz	49.160 MHz
9	44.180 MHz	49.200 MHz
10	44.200 MHz	49.240 MHz
11	44.320 MHz	49.280 MHz
12	44.360 MHz	49.360 MHz
13	44.400 MHz	49.400 MHz
14	44.460 MHz	49.460 MHz
15	44.480 MHz	49.500 MHz
16	46.610 MHz	49.670 MHz
17	46.630 MHz	49.845 MHz
18	46.670 MHz	49.860 MHz
19	46.710 MHz	49.770 MHz
20	46.730 MHz	49.875 MHz
21	46.770 MHz	49.839 MHz
22	46.830 MHz	49.890 MHz
23	46.870 MHz	49.930 MHz
24	46.930 MHz	49.990 MHz
25	46.970 MHz	49.970 MHz

A.3 821 – 822MHz/ 924 – 925 MHz

Channel No.	Transmitter Frequency	
	Base Station	Handset Unit
1	821.0125 MHz	924.0125 MHz
2	821.0385 MHz	924.0375 MHz
3	821.0625 MHz	924.0625 MHz
4	821.0875 MHz	924.0875 MHz
5	821.1125 MHz	924.1125 MHz
6	821.1375 MHz	924.1375 MHz
7	821.1625 MHz	924.1625 MHz
8	821.1875 MHz	924.1875 MHz
9	821.2125 MHz	924.2125 MHz
10	821.2375 MHz	924.2375 MHz
11	821.2625 MHz	924.2625 MHz
12	821.2875 MHz	924.2875 MHz
13	821.3125 MHz	924.3125 MHz
14	821.3375 MHz	924.3375 MHz
15	821.3625 MHz	924.3625 MHz
16	821.3875 MHz	924.3875 MHz
17	821.4125 MHz	924.4215 MHz
18	821.4375 MHz	924.4375 MHz
19	821.4625 MHz	924.4625 MHz
20	821.4875 MHz	924.4875 MHz
21	821.5125 MHz	924.5125 MHz
22	821.5375 MHz	924.5375 MHz
23	821.5625 MHz	924.5625 MHz
24	821.5875 MHz	924.5875 MHz
25	821.6125 MHz	924.6125 MHz
26	821.6375 MHz	924.6375 MHz
27	821.6625 MHz	924.6625 MHz
28	821.6875 MHz	924.6875 MHz
29	821.7125 MHz	924.7125 MHz
30	821.7375 MHz	924.7375 MHz
31	821.7625 MHz	924.7625 MHz
32	821.7875 MHz	924.7875 MHz
33	821.8125 MHz	924.8125 MHz
34	821.8375 MHz	924.8375 MHz
35	821.8625 MHz	924.8625 MHz
36	821.8875 MHz	924.8875 MHz
37	821.9125 MHz	924.9125 MHz
38	821.9375 MHz	924.9375 MHz
39	821.9625 MHz	924.9625 MHz
40	821.9875 MHz	924.9875 MHz

Annex B
Addendum/Corrigendum

Revised TS		Items Changed	Date of Issue
Page	**Section**		
Changes to IDA TS CT-CTS Issue 1 Rev 1, April 2006			
5	§4.3	The IMDA TS CT-CTS Issue 1 (October 2016) has replaced the IDA TS CT-CTS Issue 1 Rev 1 (April 2006). Changes are largely editorial to provide updates and clarity in the application of EMC and safety requirements, in line with standards development that has taken place in the Standards Development Organisations concerned.	1 Oct 16

Page	TS Ref.	Items Changed	Effective Date
Changes to IDA TS CT-CTS Issue 1 Rev 1, Apr 06			
		Change of IDA's address at cover page to Mapletree Business City.	1 May 11
Changes to IDA TS CT-CTS, Issue 1, Dec 04			
3	§ 1.1.1	Editorial change: added "Other applications may include cordless local area networks and local loop replacement."	Apr 06
4	§ 1.2	Updated references to the related IDA Technical Specifications: IDA TS PSTN, TS ISDN-BA and TS ISDN-PRA.	Apr 06
7	§ 2.2	Updated references to the technical requirements: - ETSI EN 300 175-1 to 175-8 and EN 301 406 for DECT; and - RCR STD-28 V4.1 for PHS. Updated the following PHS requirements in Table 2: - Bit rate per carrier is 192 – 3200 kbit/s. - Max transmission power for the personal and cell/relay station is 20 mW EIRP (added Note 2 to indicate that the max transmission power for public cell station is 4 W EIRP, subject to IDA's approval).	Apr 06
8	§ 3	Updated references to the test methods: ETSI EN 300 406 for DECT and RCR STD-28 V4.1 for PHS. Added requirements for the fixed part to be tested according to IEC CISPR 22 for EMC and IEC 60950-1 for electrical safety.	Apr 06
Changes to IDA TS 1, DECT and PHS			
–	–	This Specification supersedes the following IDA Type Approval Specifications: a. IDA TS 1 Issue 1 Rev 6 b. IDA TS DECT Issue 1 Rev 6 c. IDA TS PHS V1 Issue 1 Rev 6 d. IDA TS PHS V2 Issue 1 Rev 3	Dec 04
–	–	Title of Specification has been renamed as "Technical Specification for Cordless Telephones and Cordless Telecommunication Systems" (IDA TS CT-CTS Issue 1). Changes are mainly editorial in nature. There are no changes in the technical requirements except for adding the provision for analogue cordless telephones to operate in the 821/924 MHz frequency band.	Dec 04