

Measurement Specification for CAT-iq Interoperability Tests, CAT-iq 1.0

VERSION 2.0

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VERSION	DATE	EDITOR	REMARKS
1.3	31-Aug-07	Erich Kamperschroer	Draft on inputs of documents form CAT-iq WG (Infineon, SHC, CETECOM)
1.4	05-Sept-07	Sabine Schulze	Input of CAT-iq WG Meeting 04-Sept-07
1.5	10-Sept-07	Ruth Wilson/ Sabine Schulze	Comments, CETECOM table deleted
1.6	14-Sept-07	Erich Kamperschroer	Minor corrections, resolved open comments
1.7	02-Oct-07	Ingolf Karls	Input of conf. call 26-Sept-07

VERSION	DATE	EDITOR	REMARKS
1.8	27-Nov-07	Karl-Heinz Pflaum	Amendment and corrections of ITU-T P.311
1.9	03-Dec-08	Ingolf Karls	Amendment and corrections of ITU-T P.311 chapter 4.2 and 5.2
1.91	16-Dec-08	Sabine Schulze	Minor corrections: vb Profile -> CAT-iq 1.0
2.0	19-Dec-08	Roland Schmidt	Board Approval as V 2.0

Measurement Specification for CAT-iq Interoperability Tests, vb* Profile

* Wideband Voice Basic interoperability

The DECT Forum concluded to establish a certification program for CAT-iq to ensure sufficient interoperability of devices from different vendors for the functionalities defined in CAT-iq and to ensure minimum audio and RF quality levels.

Therefore all CAT-iq devices claiming to be compliant with CAT-iq standards and wanting to get certification must be tested according to the functionalities defined as mandatory by the CAT-iq standards.

CAT-iq is a registered trademark owned by the DECT Forum, it references features and procedures to corresponding ETSI Specifications, this specification references to ETSI TS 102 527-1.

The scope of this document is to define the measurement requirements for the CAT-iq compliance tests for CAT-iq vb profile, .Details regarding overlaying framework of the CAT-iq certification programme and to relevant costs regarding certification are defined in separate documents.

1 References

Reference documents as part of the measurement requirements meet the requirements as follows:

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

2 RF Requirements

2.1 Scope:

As an IMT-2000 Member DECT is specified as IMT-2000 FDMA/TDMA system within Recommendation ITU-R M.1457. Following the ITU Radio Regulations, the frequency band 1880 to 1900 MHz is allocated to DECT and CAT-iq (Note: DECT 6.0 products utilize the appropriate frequency band of 1920 – 1930 MHz which has been allocated by Federal Communications Commission in the USA).

CAT-iq equipment which will be tested is Fixed Part (FP), Portable Part (PP) as well as a CAT-iq system comprised of FP and PP.

2.2 References

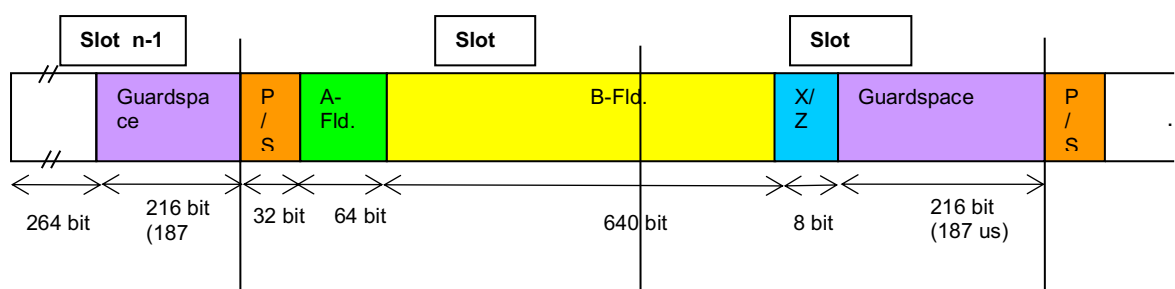
Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

ETSI EN 300 175-2 (V1.7.1): "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 2: Physical layer (PHL)"

ETSI EN 301 406 V1.5.1 Digital Enhanced Cordless Telecommunications (DECT); Harmonized EN for Digital Enhanced Cordless Telecommunications (DECT) covering essential requirements under article 3.2 of the R&TTE Directive; Generic radio

2.3 Long slot Definition for CAT-iq 1.0:

Type P00J; J=640 (4bit CRC)



2.4 Test cases, see also EN 301 406

General overview Test cases:

1	Accuracy and stability of RF carriers 4.5.1
2	Timing jitter: slot-slot on the same channel 4.5.2
3	Reference timing accuracy of a RFP
4	Measurement of packet timing accuracy
5	Transmission Burst 4.5.3
6	Transmitted power: PP and RFP with an integral antenna 4.5.4.1.1
7	Transmitted power: PP and RFP with an external antenna connector 4.5.4.1.2
8	RF carrier modulation 4.5.5
9	Emissions due to modulation 4.5.6.2
10	Emissions due to transmitter transients 4.5.6.3
11	Emissions due to intermodulation 4.5.6.4
12	Spurious emissions when allocated a transmit channel 4.5.6.5
13	Radio receiver sensitivity 4.5.7.1
14	Radio receiver reference bit error ratio 4.5.7.2
15	Radio receiver interference performance 4.5.7.3
16	Radio receiver blocking case 1 4.5.7.4
17	Radio receiver blocking case 2 4.5.7.5
18	Receiver intermodulation performance 4.5.7.6
19	Spurious emissions when the radio endpoint has no allocated transmit channel 4.5.7.7
20	Synchronization port 4.5.8
21	Equipment identity verification/safeguards 4.5.9
22	Efficient use of radio spectrum 4.5.10
23	WRS 4.5.11*
24	PP to PP communication 4.5.12*
25	Direct communication 4.5.13*
26	Higher level modulation 4.5.14*

* not relevant for CAT-iq 1.0

2.5 RF Tests with long slot

All measurements to EN 301406 with full slot, additional measurements with long slot Type P00J; J=640. Technical influence by the difference to long slot could be: "Accuracy and stability of RF carriers"; "Transmission Burst" and "Frequency Drift". A technical influence for receiver tests, timing and emissions is it not probably.

2.5.1 Accuracy and stability of RF carriers (TC 1 of EN301406)

This test case will be measured at nominal temperature and nominal voltage.

Definitions, criteria and test setup see EN 301406;

For this measurement a reference device is required.

2.5.2 Transmission Burst (TC 5 of EN301406)

This test case will be measured at nominal temperature and nominal voltage.

Definitions, criteria and test setup see EN 301406;
For this measurement a reference device is required.

2.5.3 RF carrier modulation part 4: frequency Drift (TC 8 part 4 of EN301406)

This test case will be measured at nominal temperature and nominal voltage.
Definitions, criteria and test setup see EN 301406;
For this measurement a reference device is required.

2.6 Limitation

RF tests are not required if those tests already included in the Test-report of the regulatory tests.

3 Audio Requirements

3.1 Scope:

CAT-iq terminal equipment under test is Portable Part (PP).

3.2 References

ITU-T P.311, Transmission characteristics for wideband (150-7000 Hz) digital handset telephones

TBR10, Transmission characteristics for narrowband (300-3400 Hz) digital handset phones

ETSI I-ETS 300 245-5: Integrated Services Digital Network (ISDN); Technical characteristics for telephony terminals; Part 5 Wideband (7 kHz) handset telephony

ETSI I-ETS 300 245-6: Integrated Services Digital Network (ISDN); Technical characteristics for telephony terminals, Part 6 Wideband (7kHz) loudspeaking and handsfree terminals

3.3 Requirements

Handset mode wideband: Measurements have to be undertaken as required in ITU-T P.311 with the following amendments: (Changes are marked in red)

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4.1 Loudness rating

The electro-acoustic gain in the sending direction should be adjusted in terms of wideband loudness rating, calculated according to Annex G/P.79 [7]. When measured in this manner, the Sending Loudness Rating (SLR) shall be +4 dB \pm 3.5 dB.

4.2. Sensitivity/frequency characteristics

The sending sensitivity/frequency characteristic shall fall between the upper and lower limits given in Table 1 (Figure 1/P.311 – Handset sending characteristic shall not be used).

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4.3 Noise

With the microphone muted acoustically (equivalent to an ambient noise level of < 30 dBA), the noise in the sending direction at the digital interface shall not exceed –64 dBm0p

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Table 2/P.311

Input Level (dB re ARL)	Signal-to-distortion ratio limit (dB)		
	200 Hz	1 kHz	6 kHz
+5 to -10	29.0	35.0	29.0

5.1 Loudness rating

The electro-acoustic gain in the receiving direction should be adjusted in terms of wideband loudness rating calculated according to Annex G/P.79 [7]. When measured this way, the Receiving Loudness Rating (RLR) shall be +2 dB \pm 3.5 dB.

5.2 Sensitivity/frequency characteristics

The receiving sensitivity/frequency characteristics shall fall between the upper and lower limits given in Table 3, Figure 2 shall not be used. All sensitivities are in dB on an arbitrary scale.

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Table 4/P.311

Receiving Level at the digital interface (dBm0)	Signal-to-distortion ratio limit (dB)		
	200 Hz	1 kHz	6 kHz
+5	0	35.0	29.0
+0 to -10	29.0	35.0	29.0
-20	27.0	27	0

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7.1 Weighted terminal coupling loss

With the handset suspended in the free air, the value of TCLw shall be at least 42 dB when corrected to the nominal values of SLR and RLR as specified in 4.1 and 5.1, respectively. If a receiving volume control is provided, the requirement applies at a setting as close as possible to the nominal value of RLR as specified in 5.1.

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A.3.1 Artificial mouths and ears

The Mouth Reference Point (MRP) and Ear Reference Point (ERP) used for wideband audio measurements are defined in Annex A/P.64 [5].

The Loudness Rating Guarding Position (LRGP) is defined in Annex C/P.64 [5].

The artificial mouth specified in ITU-T Rec. P.51 [3] shall be used for making wideband sending measurements.

NOTE – If the Brüel and Kjaer type 4227 artificial mouth is used, the rounded face plate is recommended.

For making handset receiving measurements, a Type 3 artificial ear shall be used, as specified in ITU-T Rec. P.57 [4].

Sound pressure levels could be referred to ERP using the correction factors given in Tables 2a and 2b/P.57.

The manufacturer shall declare the type of artificial ear.

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A.4.4 Distortion

The handset is mounted in the LRGP [5] and the earpiece is coupled to the artificial ear [4]. A sinusoidal signal at the measurement frequency is applied at the MRP. The

level of this signal is adjusted until the output signal at the output of the reference codec is -10 dBm0. This acoustic level at the MRP [5] is by definition the Acoustic Reference Level (ARL). The test signal is applied at the following levels, with the proviso that the sound pressure level at the MRP shall not exceed $+6$ dBPa: -10 , -5 , 0 , 5 dB relative to ARL.

The ratio of the signal to total distortion power at the output of the reference codec is measured.

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A.5.4 Distortion

The handset is mounted in the LRGP [5] and the earpiece is coupled to the artificial ear [4]. A sinusoidal signal at the measurement frequency is applied to the input of the reference codec at the following levels:

-10 , -5 , 0 , 5 , 8 dBm0.

The ratio of signal-to-total distortion power measured at 1 kHz is incremented by 6 dB.

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A.6.2 Distortion

The handset is mounted in the LRGP [5] and the earpiece is coupled to the artificial ear [4]. A sinusoidal tone of -4.7 dBPa is applied at the MRP [5] at frequencies of 200 Hz, 315 Hz, 500 Hz, 1000 Hz and 2000 Hz. At each frequency, the third harmonic distortion of the acoustic signal in the artificial ear is measured.

Handset Mode narrowband: Measurements have to be undertaken as required in the TBR 10 with the following remarks:

- Test-cases of TBR 10 are limited to the Measurements of the ITU-TP.311 content

Hands free mode narrowband and wideband: Because there are currently no recommendations for PP hands free available there should be in a first step no reference for these modes included.

Note: All existing standards or recommendations are only suitable for desk top phones. They could not be fulfilled by handsets. Therefore it seems necessary to create a new standard for PP with hands free functionality.

4 Interoperability Requirements

4.1 Scope

Test plan for protocol interoperability testing, consisting of TBR22/A1 tests against a TBR22/A1 test-system and interoperability tests against golden devices. CAT-iq equipment under test is PP, FP and system comprised of FP and PP.

4.2 References

ETSI TS 102 527-1, DECT; New Generation DECT; Part 1: Wideband speech
EN 300 444 Ver. 1.4.2, Digital Enhanced Cordless Telecommunications (DECT);
Generic Access Profile (GAP)
TBR 22/A1 Edition 1, Radio Equipment and Systems (RES); Attachment
Requirements for Terminal Equipment for Digital Enhanced Cordless
Telecommunications (DECT) Generic Access Profile (GAP) Applications

4.3 Required devices

4.3.1 ETSI TBR22 Test system

4.3.2 Golden Devices:

- Two Golden wideband handsets (WB-PP)
- Two Golden wideband base stations (WB-FP)

4.3.3 Reference devices:

- One narrow band GAP handset (NB-PP)
- One corded wideband SIP phone (SIP-WB-PH)
- One corded narrowband SIP phone (SIP-NB-PH)

4.3.4 SIP server

4.3.5 Equipment under Test

- Wideband handset (EUT-PP)
or
- Wideband base station (EUT-FP)

4.4 Test Scenarios against ETSI TBR22/A1

All mandatory features in EN 300 444 (DECT Generic Access Profile) shall be fulfilled, the tests shall be conducted as defined in ETSI TBR22/A1.

4.5 Test scenarios against Golden Devices

The following tests against Golden Devices shall be conducted to cover the following test cases which are not covered by the TBR22/A1 test cases:

- wideband voice
- codec negotiation
- CLIP as described in TS 102 527-1, annex F.1.1

4.5.1 Outgoing call Wideband

Test set-up:

A wideband corded SIP phone (SIP-WB-PH) is connected to the SIP server.

Two test cases:

- 1.) EUT-PP registered to Golden base station (WB-FP)
- 2.) Golden wideband handset (WB-PP) registered to EUT-FP

Tests:

An outgoing call is established from the wideband PP to the corded wideband phone.

Voice flow:

- 1.) EUT-PP <-> Golden WB-FP <-> SIP-Server <-> Corded Phone (SIP-WB-PH)
- 2.) Golden WB-PP <-> EUT-FP <-> SIP-Server <-> Corded Phone (SIP-WB-PH)

Result:

Test is successful, if a test audio signal (e.g. sine wave 6kHz) transmitted to/from the corded phone can be heard on both ends.

Example for possible sequence of messages:

Annex D1.2.1 or D1.2.2 of TS 102 527-1.

4.5.2 Outgoing call Narrowband

Test set-up:

A narrowband corded SIP phone (SIP-NB-PH) is connected to the SIP server.

Two test cases:

- 1.) EUT-PP registered to Golden base station (WB-FP)
- 2.) Golden wideband handset (WB-PP) registered to EUT-FP

Tests:

An outgoing call is established from the wideband PP to the corded narrowband phone.

Voice flow:

- 1.) EUT-PP <-> Golden WB-FP <-> SIP-Server <-> Corded Phone (SIP-NB-PH)
- 2.) Golden WB-PP <-> EUT-FP <-> SIP-Server <-> Corded Phone (SIP-NB-PH)

Result:

Test is successful, if a test audio signal (e.g. sine wave 2kHz) transmitted to/from the corded phone can be heard on both ends.

Example for possible sequence of messages:

Annex D1.2.5 of TS 102 527-1.

4.5.3 Incoming call Wideband

Test set-up:

A wideband corded SIP phone (SIP-WB-PH) is connected to the SIP server.

Two test cases:

- 1.) EUT-PP registered to Golden base station (WB-FP)
- 2.) Golden wideband handset (WB-PP) registered to EUT-FP

Tests:

An outgoing call is established from the corded wideband phone to the base station. The call is answered on the PP.

Voice flow:

- 1.) EUT-PP <-> Golden WB-FP <-> SIP-Server <-> Corded Phone (SIP-WB-PH)
- 2.) Golden WB-PP <-> EUT-FP <-> SIP-Server <-> Corded Phone (SIP-WB-PH)

Result:

Test is successful, if a test audio signal (e.g. sine wave 6kHz) transmitted to/from the corded phone can be heard on both ends.

Example for possible sequence of messages:

Annex D1.3.1 of TS 102 527-1.

4.5.4 Service Change

Test set-up:

One wideband corded SIP phone and one narrowband corded SIP phone are both connected to the SIP server.

Two test cases:

- 1.) EUT-PP registered to Golden base station (WB-FP)
- 2.) Golden wideband handset (WB-PP) registered to EUT-FP

Tests:

An external wideband call between the wideband handset (EUT-PP or Golden handset WB-PP) and the corded wideband phone is already ongoing (established e.g. as outgoing or incoming call according to annex D1.2.1/.2 or D1.3.1 of TS 102 527-1). Then a call transfer from the corded wideband phone to the corded narrowband phone is initiated by the corded wideband phone. This results in the SIP server re-negotiating from wideband to narrowband.

NOTE: Also alternative methods than the proceeding described herein are conceivable which also result in the SIP server re-negotiating from wideband to narrowband.

Voice flow:

- 1.) EUT-PP <-> Golden WB-FP <-> SIP-Server <-> Corded Phone (SIP-NB-PH)
- 2.) Golden WB-PP <-> EUT-FP <-> SIP-Server <-> Corded Phone (SIP-NB-PH)

Result:

Test is successful, if a test audio signal (e.g. sine wave 2kHz) transmitted to/from the corded narrowband phone can be heard on both ends.

Example for possible sequence of messages:

Annex D1.4.1 of TS 102 527-1.

4.5.5 CLIP tests

Test set-up:

A wideband corded SIP phone (SIP-WB-PH) is connected to the SIP server.

Two test cases depending on EUT device:

- 1.) Golden handset (WB-PP) registered to EUT-FP, EUT-FP is connected to SIP Server
- 2.) EUT-PP registered to Golden base station (WB-FP), WB-FP is connected to the SIP Server

Tests:

An outgoing call is established from the corded wideband phone to the base station. The call is signalled on the PP.

Result:

Test successful, if the PP, displays the IA5 characters given in the field <Calling party address> according to its display capabilities.

NOTE: The requirements regarding CLIP in TS 102 527-1 differs from the requirements in EN 300 444: FP shall send CLIP either in CC-SETUP or in CC-INFO; PP is required to support both.

References:

Mandatory requirements for CLIP implementation as described in TS 102 527-1, annex F.1.1 shall be fulfilled.

4.5.6 Internal call Wideband (optional)

This test case is an *optional* test case since internal call is not a mandatory feature in the CAT-iq 'vb' profile.

Test set-up:

Two Golden WB-PPs registered to EUT base station (EUT-FP)

Tests:

An internal call is established from the PP1 (Golden WB-PP) to PP2 (Golden WB-PP).

Voice flow:

Golden WB-PP [PP1] <-> EUT-FP <-> Golden WB-PP [PP2]

Result:

Test is successful, if a test audio signal (e.g. sine wave 6kHz) transmitted to/from the PP1 can be heard on both ends.

Example for possible sequence of messages:

Annex D1.5.1 of TS 102 527-1.

4.5.7 Internal call Wideband to Narrowband (optional)

This test case is an *optional* test case since internal call is not a mandatory feature in the CAT-iq 'vb' profile.

Test set-up:

One Golden WB-PP and one reference narrowband handset (NB-PP) registered to EUT base station (EUT-FP)

Tests:

An internal call is established from the PP1 (Golden WB-PP) to PP2 (reference narrowband handset (NB-PP)).

Voice flow:

Golden WB-PP [PP1] <-> EUT-FP <-> Reference NB-PP [PP2]

Result:

Test is successful, if a test audio signal (e.g. sine wave 2kHz) transmitted to/from the PP1 can be heard on both ends.

Example for possible sequence of messages:

Annex D1.5.3 of TS 102 527-1.