

RF Test Specification for CAT-iq 2.0 Devices

Version 1.5

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DOCUMENT HISTORY:

VERSION	DATE	EDITOR	REMARKS
1.0	4 March 2010	Lasse A. Knudsen, RTX	First accepted version for CAT-iq 2.0 RF certification testing.
1.0	23 April 2010	Roland Schmidt	Board approval
1.1	17 April 2013	Ruth Wilson	Adding provision for regional variants
1.2	30 Sept 2013	Levi Schultz	Account for pragmatic test platform constraints as well as separate regulatory validation for regions other than the EU
1.3	02 Oct 2013	Mehdi Jazouli	Add requirement for regulatory test report in section 2.1.1
1.4	18 Nov 2013	Mehdi Jazouli	Clarification for US testing
1.5	25 Nov 2016	Ruth Wilson	Additional of CAT-iq 2.1
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1	Introduction	4
2	Setup	5
2.1	General	5
2.1.1	Requirements to Test Equipment for CAT-iq 2.0 RF Tests	5
2.1.2	Long slot definition for CAT-iq (P64)	5
2.2	Measurement setup	6
2.2.1	Fixed Part test setup	6
2.2.2	Portable Part test setup	6
3	Requirements	8
3.1	Scope	8
3.1.1	Carrier Numbering operation	8
3.2	Test cases	9
4	Normative references	12
	Annex A – Addendum to EN 300 175-3 for extended FORCE_TRANSMIT test command (informative)	13

1 Introduction

The RF specification for CAT-iq 2.0 is primarily based on the ETSI documents EN 300 176-1, EN 300 175-2, EN 300 175-3, EN 301 406 and TS 102 527-3. References to these documents will be outlined where applicable. The RF specification for CAT-iq 2.1 is the same as that for CAT-iq 2.0 and all further references in this document to CAT-iq 2.0 will also apply to CAT-iq 2.1.

Only mandatory requirements to the RF part in CAT-iq 2.0 are mentioned in this document. Devices must as a minimum comply with these mandatory requirements in order to achieve a CAT-iq 2.0 certification. Mandatory requirements will vary from region to region. Such variations are due to:

- a) Limitations of readily-available test platforms for the different regions
- b) Differing constraints imposed by the local regulatory authorities (ie, FCC, IC, TELEC)

These variations in requirements will be highlighted in this document

2 Setup

2.1 General

All RF measurements shall be performed with either a certified tester or equipment that qualifies as CAT-iq 2.0 RF test equipment. In any case the test equipment must as a minimum comply with the requirements outlined in section 2.1.1 of this document.

2.1.1 Requirements to Test Equipment for CAT-iq 2.0 RF Tests

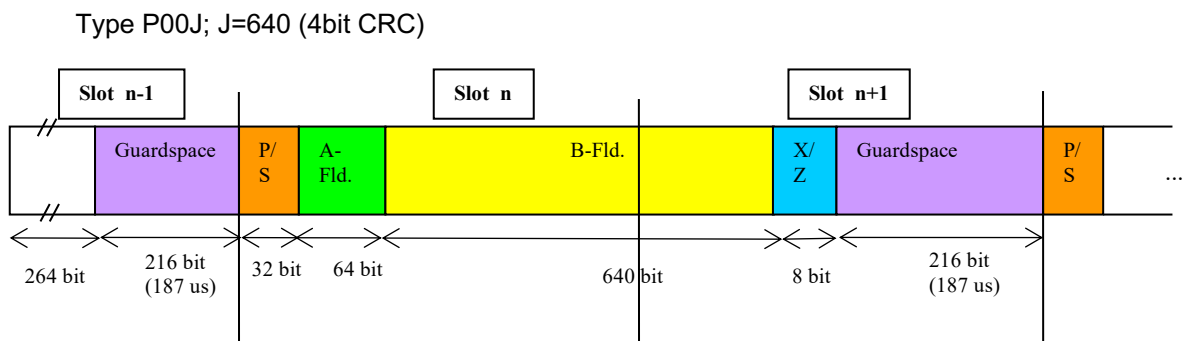
Test equipment for certification must adhere to the following requirements:

- Comply with EN 300 175-3 clauses 7.2.5.4 MAC layer test messages signalling and clauses 12 Medium access layer test message procedure. Exception: The change from Annex A can be implemented to test a specific slot type.
- Support for the mandatory long slot structure (see section 2.1.2).
- Unless otherwise noted (see Table 1 below), the overall measurement uncertainty of the test equipment must meet the requirements outlined in EN 301 406.
- Test Equipment should comply with the Channel Numbering Scheme shown in a Section 3

If some RF tests are already included in the test-report of the regulatory tests, they do not need to be redone for Certification if the Test report can be provided.

This will be the case for Table 1 test cases for Europe market (EN301406) and some items of Table 3 test cases for US/Canadian market.(The 47 CFR Part 15 – Unlicensed Personal Communication Service Device (Part D)

2.1.2 Long slot definition for CAT-iq (P64)

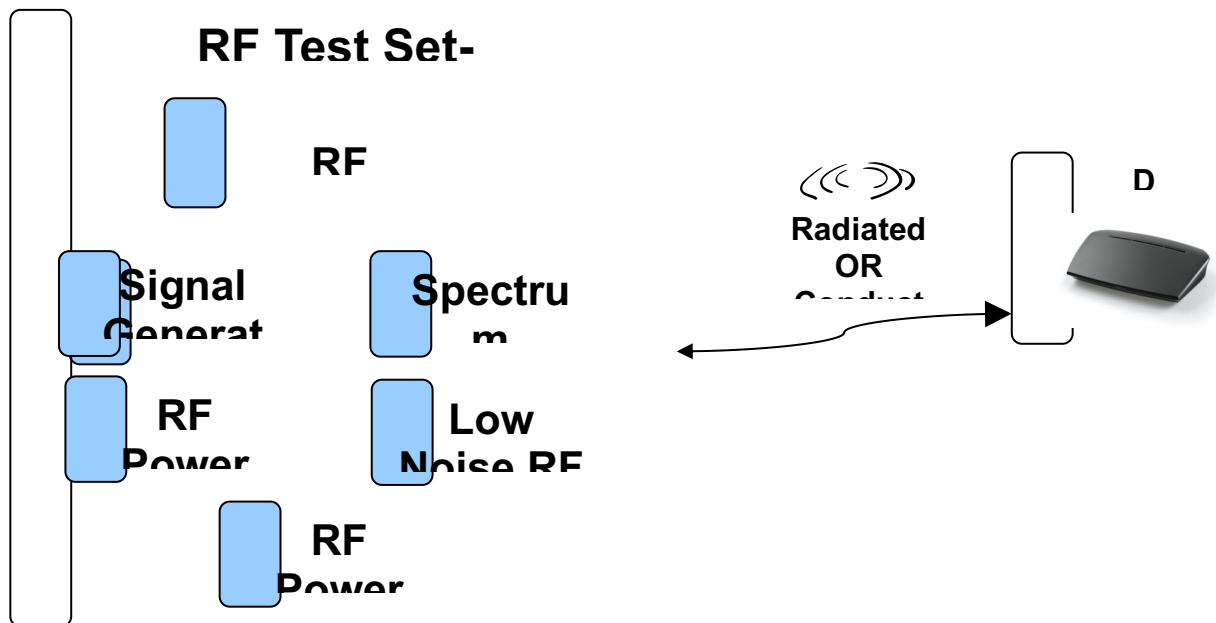


2.2 Measurement setup

The measurement setup must be done according to the test philosophy and test requirements outlined in chapter 5 of EN 301 406. Please note that the tests can either be performed as radiated or conducted tests.

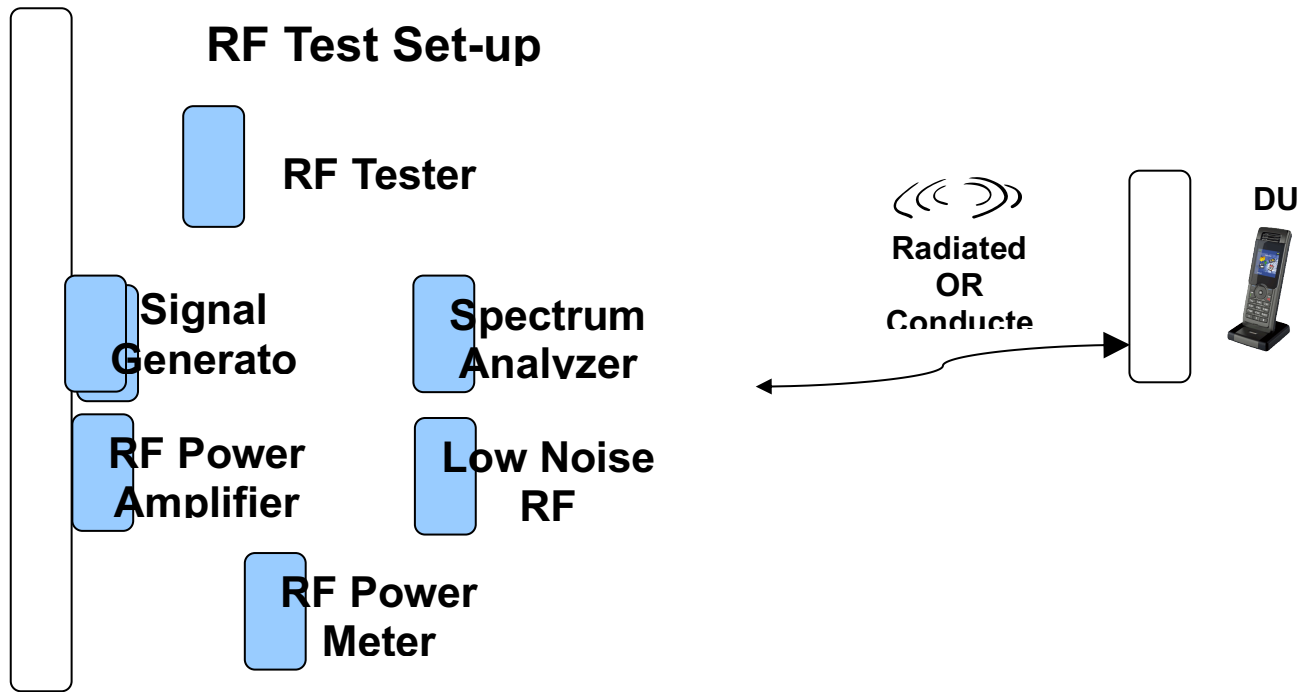
2.2.1 Fixed Part test setup

The figure below outlines a typical RF Test Set-up for testing a Fixed Part.



2.2.2 Portable Part test setup

The figure below outlines a typical RF Test Set-up for testing a Portable Part.



3 Requirements

3.1 Scope

Channel numbering is, however, only an issue when operating outside EU frequencies (e.g. DECT 6.0, Japan DECT, and Korean DECT frequencies).

CAT-iq equipment will be tested as Fixed Part (FP) or Portable Part (PP).

3.1.1 Carrier Numbering operation

Note: Channel Numbering for the Application Mode and Test Mode are the same.
Manufacturer should make sure that equipment submitted for CAT-IQ qualification complies with this.

- European carriers 0-9.
- Outside Europe:
 - Extended carrier numbering indicated by Q T (2) message.
 - Numbering reversed, so scan sequence, too.
 - Discontinuity between carrier 0 and carrier 10 (Japan).

Carrier Number	Frequency	Europe	Asia	LatAm	Brazil	USA	Japan
9	1881792						
8	1883520						
7	1885248						
6	1886976						
5	1888704						
4	1890432						
3	1892160						
2	1893888						
1	1895616						
0	1897344						
10	1899072						
11	1900800						
12	1902528						
13	1904256						
14	1905984						
15	1907712						
16	1909440						
17	1911168						
18	1912896						
19	1914624						
20	1916352						
21	1918080						
22	1919808						
23	1921536						
24	1923264						
25	1924992						
26	1926720						
27	1928448						

3.2 Test cases

Except where noted, all test cases outlined in table 1 are mandatory for CAT-iq 2.0 RF certification testing. For a detailed description of the test cases please refer to the outlined sections in EN 301 406 (Ref. [5]). In order to be fully compliant with EN 301 406 all tests must be performed with the longest supported slot type¹; for CAT-iq 2.0 equipment supporting only the mandatory slot types this is equal to the long slot type P64 outlined in section 2.1.2. However, in CAT-iq 2.0 RF certification the approach from CAT-iq 1.0 can be used as well, hence only performing a clearly defined subset of the RF test suite in addition to the complete set in full slot. It is therefore emphasized here that the test cases outlined in table 2 shall be done with the longest supported slot type (i.e. long-slot). These tests must be performed on at least three channels – the highest, lowest, and middle channel.

¹ See EN 301 406, clauses 5.1.10.3 paragraph b and EN 300 175-3, clauses 7.2.5.4.3 and 12.4.

The test cases outlined in table 2 will be measured at nominal temperature and nominal voltage. The definitions, criteria and test setup must also adhere to the descriptions given in EN 301 406. A reference device is required for these measurements.

Table 1 Test Cases applicable to units certified for EU Market

#	EN 301 406 test cases	Clause # (EN 301 406)
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	4.5.2
4	Measurement of packet timing accuracy	4.5.2
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

Table 2 Test Cases applicable to units certified for EU Market and US/CANADA Market

#	Long slot test cases
1	Accuracy and stability of RF carriers
2	Transmission Burst
3	RF carrier modulation part4: Frequency drift

Note 1 : All tests performed at Low, Mid and High Channels and in normal environmental conditions

Table 3 Test Cases applicable to units certified for US and Canadian Markets

#	EN 301 406 test cases	Comment
1	Accuracy and stability of RF carriers	(Frequency Offset and Drift) Per Clause 4.5.1 (See Note 2 below)
2	Timing jitter: slot-slot on the same channel	Per Clause 4.5.2
3	Reference timing accuracy of a RFP	Per Clause 4.5.2
4	Measurement of packet timing accuracy	Per Clause 4.5.2
5	Transmission Burst	(Power Template) Per Clause 4.5.3 (See Note 2 below)
6	Transmitted power: PP and RFP with an integral antenna	Not required (See Note 3 below)
7	Transmitted power: PP and RFP with an external antenna connector	Not required (See Note 3 below)
8	RF carrier modulation	Per Clause 4.5.5 (See Note 2 below)
9	Emissions due to modulation	Not required (See Note 3 below)
10	Emissions due to transmitter transients	Not required (See Note 3 below)
11	Emissions due to intermodulation	Not required (See Note 3 below)
12	Spurious emissions when allocated a transmit channel	Not required (See Note 3 below)
13	Radio receiver sensitivity	Per Clause 4.5.7.1
14	Radio receiver reference bit error ratio	Per Clause 4.5.7.2
15	Radio receiver interference performance	Not Required (See Note 4 below)
16	Radio receiver blocking case 1	Not Required (See Note 4 below)
17	Radio receiver blocking case 2	Not Required (See Note 4 below)
18	Receiver intermodulation performance	Not Required (See Note 4 below)
19	Spurious emissions when the radio endpoint has no allocated transmit channel	Not required (See Note 3 below)
20	Synchronization port	Not covered
21	Equipment identity verification/safeguards	Not covered
22	Efficient use of radio spectrum	Not covered

Note 1: All tests performed at Low, Mid and High Channels

Note 2: For these tests, accuracy as guaranteed by standard lab testers such as RTX2012 will suffice

Note 3: Testing to FCC Part 15 ensures sufficient compliance of NTP and transmission mask and spurious emissions

Note 4: These tests omitted due to test platform constraints

Note 5: test conducted in the table 3 must use the same environmental conditions than required in EN 301 406

Note 6 : test of table are conducted in Full Slot.

4 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

- [1] ETSI EN 300 176-1 v2.2.1: "Digital Enhanced Cordless Telecommunications (DECT); Test specification; Part 1: Radio".
- [2] ETSI EN 300 175-2 v2.2.1: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 2: Physical layer (PHL)".
- [3] ETSI EN 300 175-3 v2.2.1: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 3: Medium Access Control (MAC) layer".
- [4] ETSI TS 102 527-3 v1.1.12: "Digital Enhanced Cordless Telecommunications (DECT); New Generation DECT; Part 3: Extended wideband speech services".
- [5] ETSI EN 301 406 v2.1.1: "Digital Enhanced Cordless Telecommunications (DECT); Harmonized EN for Digital Enhanced Cordless Telecommunications (DECT) covering the essential requirements under the article 3.2 of the R&TTE Directive; Generic radio".
- [6] Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (codified version).

Annex A – Addendum to EN 300 175-3 for extended FORCE_TRANSMIT test command (informative)

This proposal describes new option for controlling the bearer type to be created by use of FORCED_TRANSMIT test command. It is proposed to use spare bits $a_{25} - a_{27}$ for control of requested bearer type.

7.2.5.4.2 FORCE_TRANSMIT

This message forces the IUT to transmit on a specific slot and RF frequency. Handover is prohibited by means of the "Handover Disable" (HD) bit. The particular slot the IUT shall transmit on is indicated in the Slot Number (SN) field of the test message. The destination RF carrier is encoded in the Carrier Number (CN) field of the test message.

The format of the FORCE_TRANSMIT test message is given in figure 7.48.

0	0	1	0	0	0	0	0	0	1	0	1	0	K	H	0	0	0	SN	SP	CN	0	0	0	0	1	1	1	1
a_8			a_{11}	a_{12}		a_{15}	a_{16}				a_{22}		P	D		a_{25}	a_{27}	a_{28}	a_{32}	a_{34}	a_{40}							a_{47}
																		a_{31}	a_{33}	a_{39}								

Figure 7.48: FORCE_TRANSMIT test message format

The KP bit is a_{23} . It is set to "1" to prevent release of existing bearers, and set to "0" to initiate releasing of existing bearers.

The HD bit is a_{24} . It is set to "1" to disable handover and set to "0" otherwise.

For the coding of the slot number, the start position, and the carrier number refer to clause 7.2.3.2.

See clause 12.3 for the relevant procedures.

Proposed new usage of bit $a_{25} - a_{27}$:

$a_{25} - a_{27}$	Slot type
0 0 0	Default slot type used by legacy devices. See Note 1.
0 0 1	Full slot (advance bearer setup procedure)
0 1 0	Long slot P00j, j=640 (P64)
0 1 1	Long slot P00j, j=672 (P67)
1 0 0	Double slot P80
1 0 1	Reserved
1 1 0	Reserved
1 1 1	Reserved

Note 1: Maximum slot length should be used for EN 300 175-3 compliance, but for some test purposes it might be a good idea with changeable "Default slot type".