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FCC TEST REPORT

FCC 47 CFR Part 15D

Unlicensed Personal Communication Service Devices

Industry Canada RSS-213

2GHz License-exempt Personal Communications Service Devices (LE-PCS)

Report Reference No. ..... :	G0M-1702-6254-TFC15DPP-V03
Testing Laboratory ..... :	Eurofins Product Service GmbH
Address ..... :	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation ..... :	DAkkS - Registration number : D-PL-12092-01-03 (ISED) ISED Testing Laboratory site: 3470A-2 DAkkS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Des.-No.: DE0008 FCC Filed Test Laboratory, Reg.-No.: 129507
Applicant's name ..... :	Ceotronics AG
Address ..... :	Adam-Opel-Str. 6 63322 Rödermark GERMANY
Test specification:	
Standard..... :	47 CFR Part 15D 47 CFR Part 15C 47 CFR Part 15B RSS-213, Issue 3, 2015-03
Test scope…….. ..... :	partial Radio compliance test
Equipment under test (EUT):	
Product description	DECT/UPCS - Modul
Model No.	CT-DECT M7
Additional Model(s)	None
Brand Name(s)	CeoTronics
Hardware version	M7_0 DECT_HPB_1001421
Firmware / Software version	V1.0.0
	FCC-ID: L52CT-M7CEO1 IC: 9714A-CTM7CEO1
Test result	**Passed**

Possible test case verdicts:

- neither assessed nor tested ..... : N/N
- required by standard but not appl. to test object ..... : N/A
- required by standard but not tested ..... : N/T
- not required by standard for the test object ..... : N/R
- test object does meet the requirement ..... : P (Pass)
- test object does not meet the requirement ..... : F (Fail)

Testing:

Test Lab Temperature ..... :	20 – 23 °C	
Test Lab Humidity ..... :	32 – 38 %	
Date of receipt of test item ..... :	2017-02-16	
Date (s) of performance of tests ..... :	2017-02-21 – 2017-02-23	
Compiled by ..... :	Wilfried Treffke	
Tested by (+ signature) ..... : (Responsible for Test)	Wilfried Treffke	W. Treff .....
Approved by (+ signature) ..... : (Head of Lab)	Christian Weber	C. Weber .....
Date of issue ..... :	2020-10-12	
Total number of pages ..... :	74	

General remarks:

The test results presented in this report relate only to the object tested.
The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

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Additional comments:

The EUT uses two antenna ports with antenna diversity operation. For conducted compliance testing the antenna port (including dedicated antenna) with the highest output power was selected. For radiated testing both antenna ports were tested. Therefore antenna port 1 with antenna W200 was used for conducted compliance testing.

Version History

Version	Issue Date	Remarks	Revised by
01	2017-05-23	Initial Release	
02	2020-02-11	Replaced document: G0M-1702-6254-TFC15DPP-V01 Replaced by: G0M-1702-6254-TFC15DPP-V02 Reason: Page 1 & 6: FCC ID and IC added Page 6: PMN, HVIN, and FVIN added. Page 10: Pictures EUT without shielding changed. Page 11 & 12: Test setup pictures radiated emission corrected.	W. Treffke
03	2020-10-12	Replaced document: G0M-1702-6254-TFC15DPP-V02 Replaced by: G0M-1702-6254-TFC15DPP-V03 Reason: Page 1: FCC Filed Test Laboratory corrected Page 15: Day added to calibration information	C. Weber

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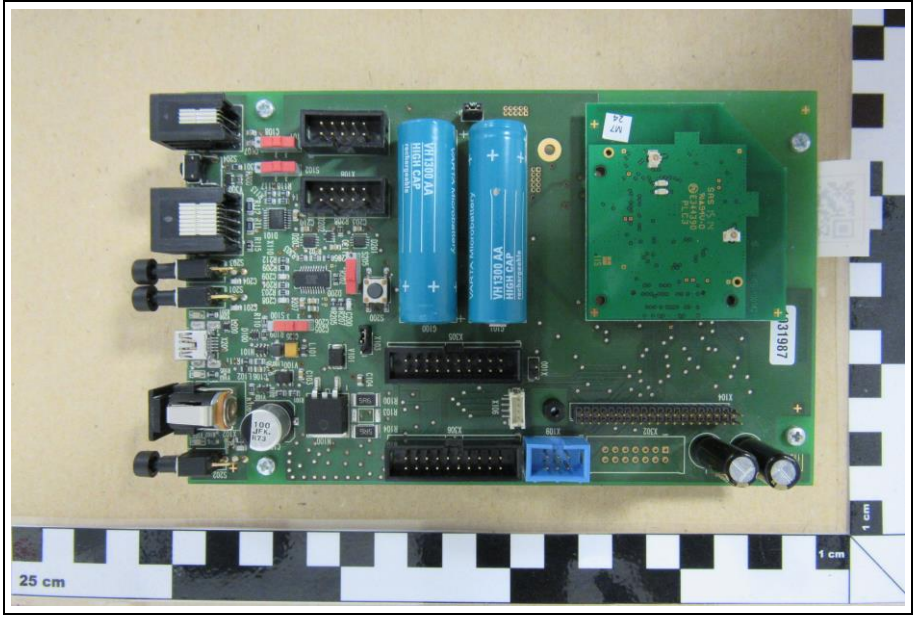
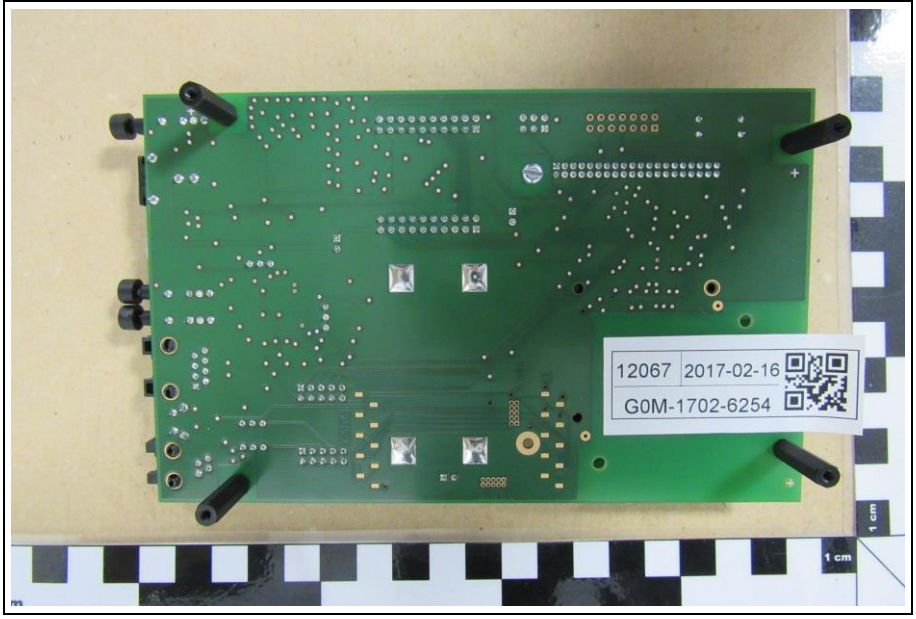
1 Equipment (Test item) Description

Description	DECT/UPCS - Modul	
Model	CT-DECT M7	
Additional Model(s)	None	
Brand Name(s)	CeoTronics	
Serial number	12069 / 12070	
Hardware version	M7_0 DECT_HPB_1001421	
Software / Firmware version	V1.0.0	
PMN	CT-DECT Module M7	
HVIN	DECT_DHW-1001450	
FVIN	FW_1001344_1001477_2_1_0_27014	
HMN	N/A	
FCC-ID	L52CT-M7CEO1	
IC	9714A-CTM7CEO1	
Equipment type	Radio Module	
Radio type	DECT Portable Part	
Number of Radios	1 transceivers is built into the device	
Radio technology	DECT 6.0	
Operating frequency range	1921.536 - 1928.448MHz	
Assigned frequency band	1920 - 1930MHz	
Number of RF channels	5	
Supported slots	even and odd	
Number of time slots	12 x Tx + 12 x RX = 24	
Channels	F_0	Ch:0 / 1928.448MHz
	F_1	Ch:1 / 1926.720MHz
	F_2	Ch:2 / 1924.992MHz
	F_3	Ch:3 / 1923.264MHz
	F_4	Ch:4 / 1921.536MHz
Main test frequencies	F_{LOW}	Ch:4 / 1921.536MHz
	F_{MID}	Ch:2 / 1924.992MHz
	F_{HIGH}	Ch:0 / 1928.448MHz
Modulations	GFSK	
Emission designator	F7D	
Nominal emission bandwidth	1.42 MHz	
Channel spacing	1728 kHz	
Spectrum access	Listen before transmit	
Threshold limit	-62 dBm	
Number of antennas	2 per transceiver	

Antenna 1	Type	Integrated, printed inverted F antenna
	Model	W200
	Manufacturer	Frauenhofer IIS
	Gain	3.5
Antenna 2	Type	Integrated, printed inverted F antenna
	Model	W201
	Manufacturer	Frauenhofer IIS
	Gain	1.5
Manufacturer	Ceotronics AG Adam-Opel-Str. 6 63322 Rödermark GERMANY	
Power supply	V_{NOM}	2.40 VDC
	V_{MIN}	2.20 VDC
	V_{MAX}	3.45 VDC
Temperature	T_{NOM}	25°C
	T_{MIN}	-30°C
	T_{MAX}	70°C

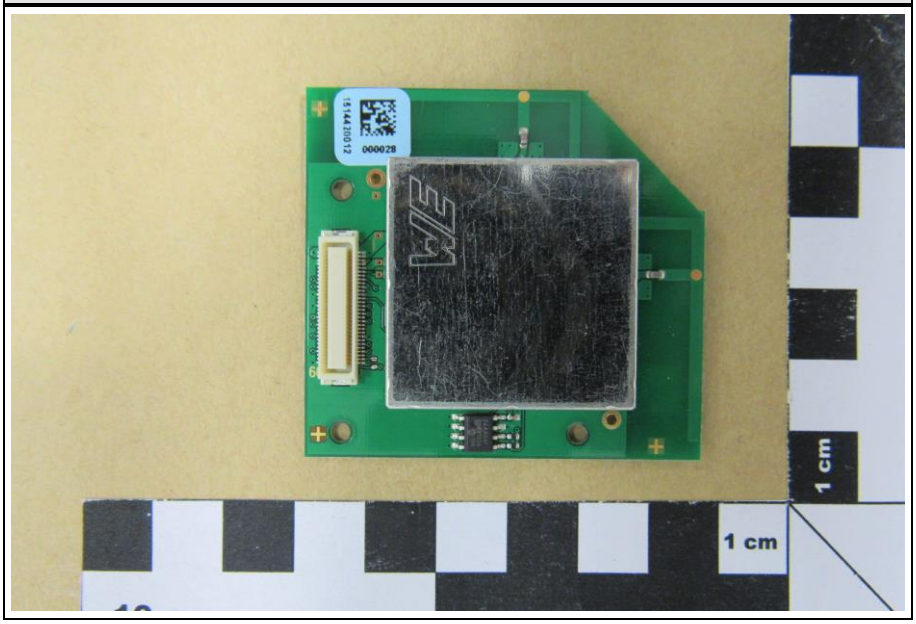
1.1 Photos - Equipment external

Evaluation Board with EUT, TOP


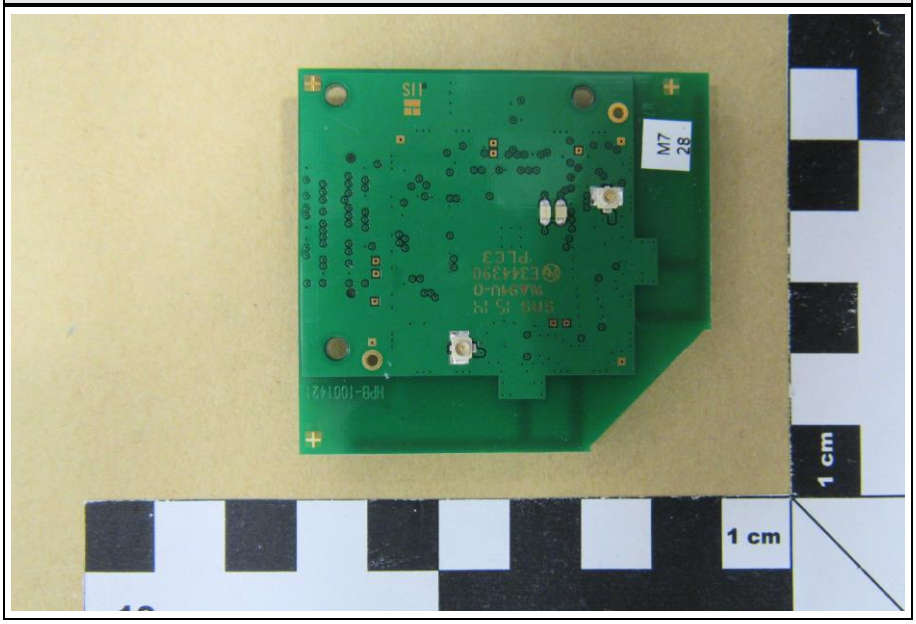
Evaluation Board with EUT, Bottom


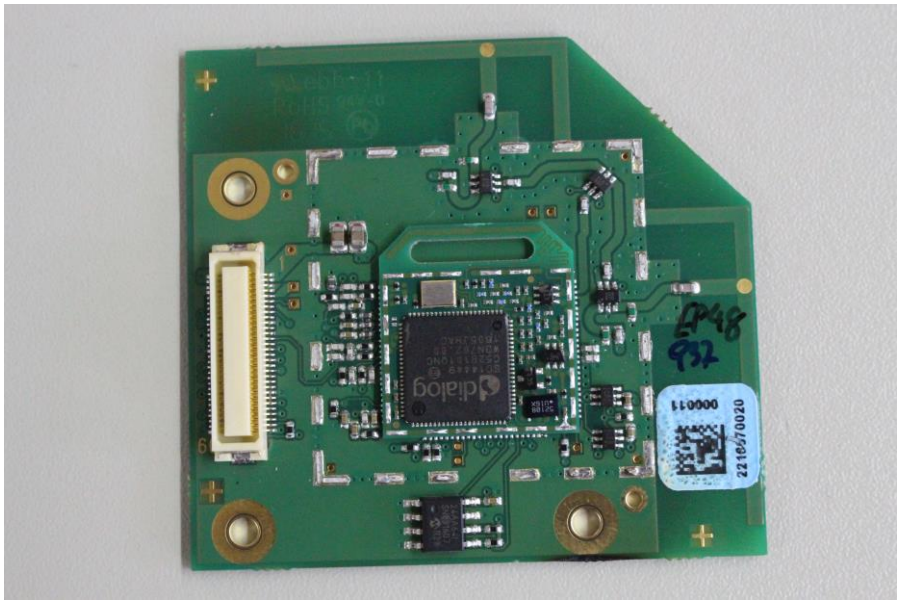
1.2 Photos - Equipment internal

EUT, Top



EUT Bottom



EUT without Shielding


1.4 Supporting Equipment Used During Testing

Product Type	Device	Manufacturer	Model	Comment
SIM	Communication Tester	Rohde & Schwarz	CMD 65	Signaling
AE	Carrier Board / Interfacing und Power	Fraunhofer IIS	M7EVAL_1	Evaluation board
AE	AC/DC Adapter	GOOBAY	NTS600-9VEUP	Power supply
Description:				
AE	Auxillary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
Comment:				

1.5 Test Modes

Mode #	Description	
TDMA PS	General conditions:	EUT powered by laboratory power supply. Active connection to companion device.
	Radio conditions:	Mode = Transmit mode Modulation = GFSK Duty cycle = 1/24 Power level = Maximum
TDMA BAT	General conditions:	EUT powered by fully charged battery. Active connection to companion device.
	Radio conditions:	Mode = Transmit mode Modulation = GFSK Duty cycle = 1/24 Power level = Maximum
Receive	General conditions:	EUT powered by fully charged battery.
	Radio conditions:	Mode = standalone receive Modulation = GFSK
AC-Powerline	General conditions:	Active data connection between EUT and companion device. EUT connected to AC main via AC/DC-Adaptor.
	Radio conditions:	Mode = Transmit mode Modulation = GFSK Duty cycle = 1/24 Power level = Maximum

1.6 Test Equipment Used During Testing

Measurement Software			
Description	Manufacturer	Name	Version
EMC Test Software	Dare Instruments	Radimation	2015.2.4

Conducted					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSP 30	EF00312	2016-02-26	2017-02-26
Signal Generator	R&S	SMP 02	EF00165	2015-05-20	2017-05-20
Signal Generator	R&S	SMIQ 03B	EF00153	2016-10-20	2018-10-20
Signal generator	R&S	SMIQ 03B	EF00152	2016-09-20	2018-09-20
Signal Generator	R&S	SMIQ 03B	EF00316	2015-06-15	2017-06-15
Signal Generator	R&S	SMT 03	EF00164	2015-04-21	2017-04-21
Step Attenuator	R&S	RSP	EF00155	2015-11-23	2017-11-23
Frequency Standard	EFRATOM Elektronik GmbH	MFS	EF00308	2013-05-23	2018-05-23
Power Meter	R&S	NRVD	EF00139	2016-10-05	2017-10-05
Diode Power Sensor	R&S	NRV-Z1	EF00314	2015-06-16	2017-06-16

Radiated spurious emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-anechoic chamber	Frankonia	AC 1	EF00062	2016-01-25	2019-01-25
Spectrum Analyzer	R&S	FSIQ26	EF00242	2016-04-20	2017-04-20
Biconical Antenna	R&S	HK 116	EF00012	2016-05-18	2019-05-18
LPD Antenna	R&S	HL 223	EF00187	2016-05-18	2019-05-18
LPD Antenna	R&S	HL 025	EF00327	2015-10-15	2018-10-15

AC powerline conducted emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
AMN	R&S	ESH2-Z5	EF00182	2017-01-06	2019-01-06
EMI Test Receiver	R&S	ESR 7	EF00943	2016-10-20	2017-10-20

1.7 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBµV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

Reading on Analyzer (dBµV) + A.F. (dB) = Net field strength (dBµV/m)

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dBµV/m). The FCC limits are given in units of µV/m. The following formula is used to convert the units of µV/m to dBµV/m:

Limit (dBµV/m) = 20*log (µV/m)

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

Reading	+	AF	=	Net Reading	:	Net reading - FCC limit = Margin
21.5 dBµV	+	26 dB	=	47.5 dBµV/m	:	47.5 dBµV/m - 57.0 dBµV/m = -9.5 dB

2 Result Summary

FCC 47 CFR Part 15D, 15C, IC RSS-213, IC RSS-Gen				
Product Specific Standard Section	**Requirement – Test**	**Reference Method**	**Result**	**Remarks**
FCC 15.309(b)	Cross reference to subpart B	declaration	N/A	
FCC 15.315 FCC 15.207 IC RSS-213 5.4 IC RSS-213 3.1 IC RSS-Gen 8.8	AC power line conducted emissions	ANSI C63.4	PASS	
FCC 15.317 FCC 15.203 IC RSS-213 4.1(e)	Antenna requirements	visual inspection	PASS	
FCC 15.319(b) IC RSS-213 5.1	Digital modulation	ANSI C63.17 6.1.4	PASS	
IC RSS-213 5.5 RSS-Gen 3.1	Occupied bandwidth	RSS-Gen 6.6	PASS	
FCC 15.323(a)	Emission Bandwidth	ANSI C63.17 6.1.3	PASS	
FCC 15.319(c) FCC 15.319(e) IC RSS-213 5.6	Peak transmit power	ANSI C63.17 6.1.2	PASS	
FCC 15.319(d) IC RSS-213 5.7	Power spectral density	ANSI C63.17 6.1.5	PASS	
FCC 15.323(f) IC RSS-213 5.3	Carrier frequency stability	ANSI C63.17 6.2.1	PASS	
FCC 15.323(d) IC RSS-213 5.8.2	Transmitter in-band unwanted emissions	ANSI C63.17 6.1.6.1	PASS	
FCC 15.323(d) IC RSS-213 5.8.1	Transmitter out-of-band emissions	ANSI C63.17 6.1.6.2 ANSI C63.4	PASS	
IC RSS-213 3.1 IC RSS-Gen 7.1	Receiver spurious emissions	ANSI C63.4	PASS	
FCC 15.319(f) IC RSS-213 5.2	Automatic discontinuation of transmission	functional test	PASS	
FCC 15.323(c)(5) IC RSS-213 5.2	LIC Confirmation	ANSI C63.17 7.3.2 / 7.3.3	PASS	Reference to “LIC procedure test” and “LIC Selected Channel Confirmation” only
FCC 15.323(c)(5) IC RSS-213 5.2	LIC Procedure Test	ANSI C63.17 7.3.2	PASS	
FCC 15.323(c)(1) IC RSS-213 5.2	LIC Selected Channel Confirmation	ANSI C63.17 7.3.3	PASS	
FCC 15.323(c)(8) IC RSS-213 5.2	Monitoring antenna	ANSI C63.17 4	PASS	
FCC 15.323(c)(7) IC RSS-213 5.2	Monitoring bandwidth	ANSI C63.17 7.4	PASS	
FCC 15.323(c)(7) IC RSS-213 5.2	Monitoring reaction time and monitoring interval	ANSI C63.17 7.5	PASS	

FCC 15.323(c)(6) IC RSS-213 5.2	Access criteria test interval	ANSI C63.17 8.1.1	N/A	Only FP
FCC 15.323(c)(6) IC RSS-213 5.2	Access criteria functional test	ANSI C63.17 8.1.2 / 8.1.3	N/A	Only FP
FCC 15.323(c)(4) IC RSS-213 5.2	Acknowledgements	ANSI C63.17 8.2.1	PASS	
FCC 15.323(c)(3) IC RSS-213 5.2	Transmission duration	ANSI C63.17 8.2.2	PASS	
FCC 15.323(c)(10) IC RSS-213 5.2	Duplex connections	ANSI C63.17 8.3	PASS	Only PP
FCC 15.323(c)(11) IC RSS-213 5.2	Alternative monitoring interval	ANSI C63.17 8.4	N/A	
FCC 15.323(c)(12) IC RSS-213 5.2	Fair access	declaration	PASS	
FCC 15.323(e) IC RSS-213 5.2	Frame period and Jitter	ANSI C63.17 6.2.3	PASS	
FCC 15.323(e) IC RSS-213 5.2	Frame repetition stability	ANSI C63.17 6.2.2	PASS	
FCC 15.323(c)(5) IC RSS-213 5.2	Maximum spectrum occupancy	declaration	PASS	
Remarks:				

3 Test Conditions and Results

3.1 Test Conditions and Results – Cross reference to subpart B

Cross reference to subpart B acc. to FCC 47 CFR 15D	**Verdict: N/A**
EUT requirement rule parts and clause	Reference
	FCC 15.309(b)
Test according to measurement reference	Reference Method
	Declaration
Requirements	
The requirements of subpart D apply only to the radio transmitter contained in the PCS device. Other aspects of the operation of a PCS device may be subject to requirements contained elsewhere in this chapter. In particular, a PCS device that includes digital circuitry not directly associated with the radio transmitter also is subject to the requirements for unintentional radiators in subpart B.	
Result	
The EUT does not contain any digital circuitry not directly associated with the radio transmitter	

3.2 Test Conditions and Results – AC power line conducted emissions

Conducted emissions acc. to FCC 47 CFR 15D / IC RSS-213				**Verdict: PASS**
EUT requirement rule parts and clause	Reference			
	FCC 15.315 / FCC 15.207 / IC RSS-213 5.4			
Test according referenced standards	Reference Method			
	ANSI C63.4			
Fully configured sample scanned over the following frequency range	Frequency range			
	0.15MHz to 30MHz			
Points of Application	Application Interface			
AC Mains	LISN			
EUT test mode	AC-Powerline			
Limits and results				
Frequency [MHz]	Quasi-Peak [dBµV]	Result	Average [dBµV]	Result
0.15 to 5	66 to 56*	PASS	56 to 46*	PASS
0.5 to 5	56	PASS	46	PASS
5 to 30	60	PASS	50	PASS
Comments: * Limit decreases linearly with the logarithm of the frequency.				

Conducted Emissions 1

EMI voltage test in the ac-mains according to FCC 15B

Project number: G0M-1702-6254

Applicant:	Ceotronics AG
EUT Name:	DECT/UPCS - Modul
Model:	CT-DECT M7
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 120 VAC AC/DC-Adaptor
LISN:	ESH2-Z5 N
Mode:	PP
Test Date:	2017-03-02
Note:	

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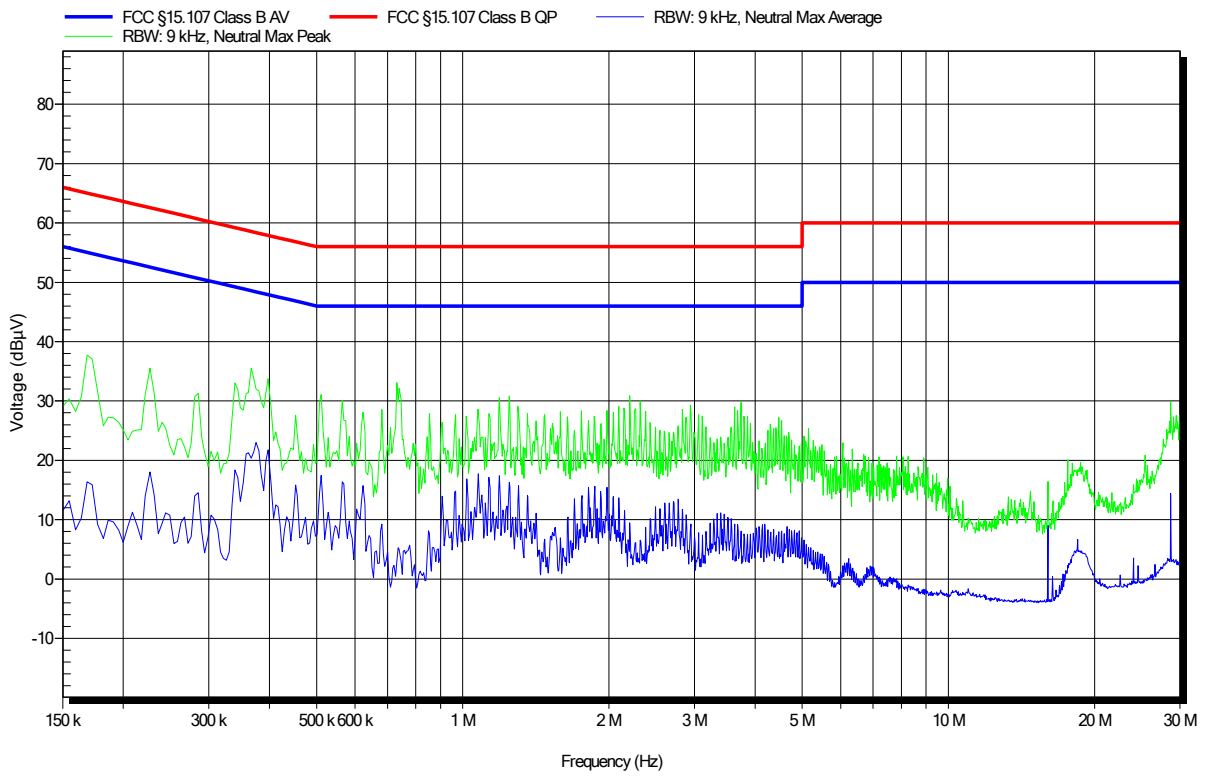

Conducted Emissions 2

EMI voltage test in the ac-mains according to FCC 15B

Project number: G0M-1702-6254

Applicant:	Ceotronics AG
EUT Name:	DECT/UPCS - Modul
Model:	CT-DECT M7
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 120 VAC AC/DC-Adaptor
LISN:	ESH2-Z5 L
Mode:	PP
Test Date:	2017-03-02
Note:	

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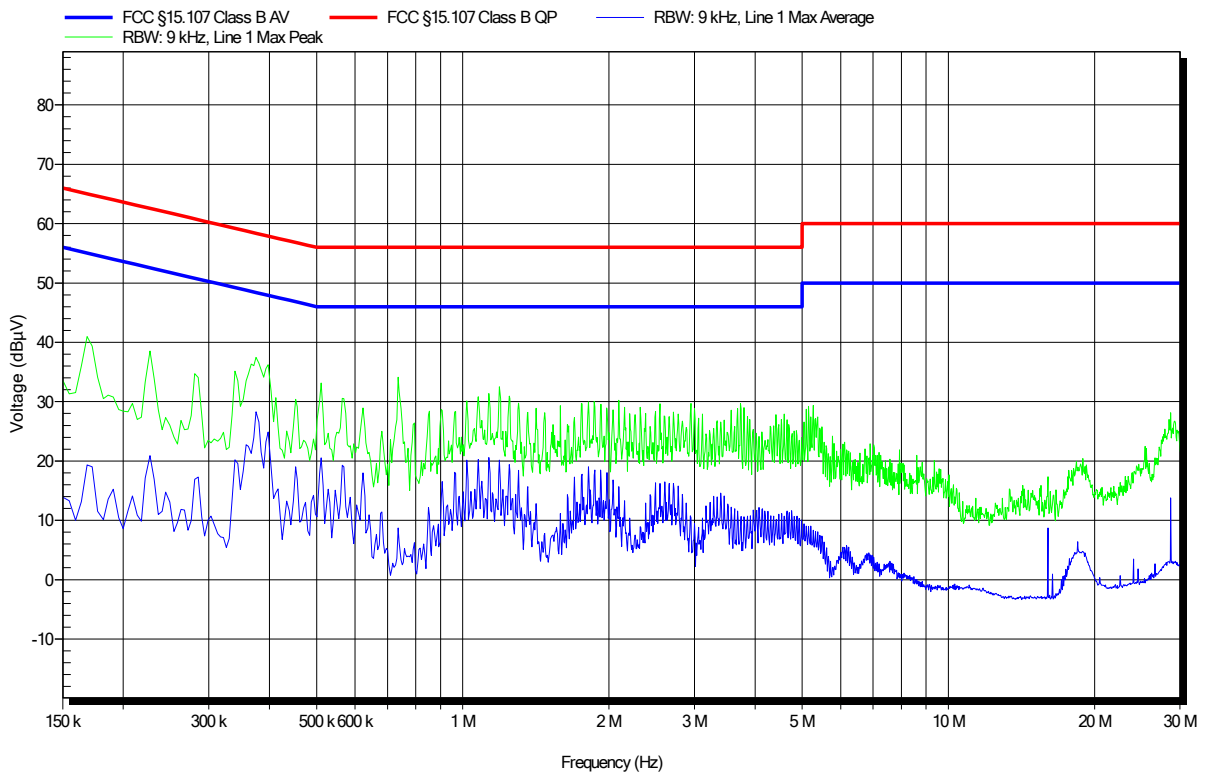


3.3 Test Conditions and Results – Antenna requirement

Antenna requirement acc. to FCC 47 CFR 15D	**Verdict: PASS**
EUT requirement rule parts and clause	Reference
	FCC 15.317 / FCC 15.203
Test according to measurement reference	Reference Method
	visual inspection & declaration

Requirements

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

When an antenna conducted measurement is used to determine the RF output power of the device, the effective gain of the antenna intended for the device must be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 3 dBi (3 dB above isotropic gain) shall be added to the measured RF output power before using the power limits

Results

Antenna No.	Type	Antenna gain [dBi]	Antenna gain in excess of 3dBi
1	internal	3.5	0.5
2	internal	1.5	0

3.4 Test Conditions and Results – Digital modulation

Antenna requirement acc. to FCC 47 CFR 15D / IC RSS-213	**Verdict: PASS**
EUT requirement rule parts and clause	Reference
	FCC 15.319(b) / IC RSS-213 5.1
Test according to measurement reference	Reference Method
	Declaration
Requirements	
All transmissions must use only digital modulation techniques.	
Results	
The test sample is an isochronous digital modulated device that operates in 1920-1930 MHz band. This device bases on DECT technology described in European Standards EN 300 175-2 and EN 300 175-3, now operating in frequency channels mentioned above. The operating modes are MC/TDMA/TDD (Multi carrier / Time Division Multiple Access / Time Division Duplex) using Digital GFSK modulation. For further details see operational description provided by manufacturer.	

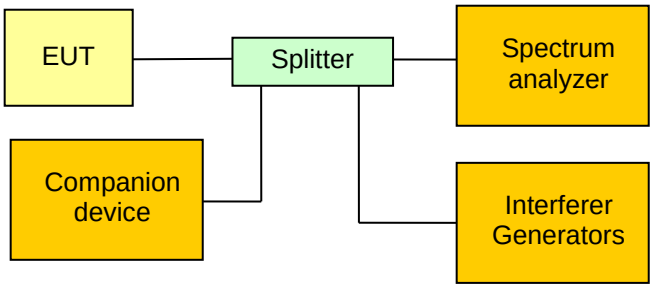
3.5 Test Conditions and Results – Occupied Bandwidth

Occupied Bandwidth acc. to IC RSS-213	**Verdict: PASS**
Test according to measurement reference	Reference Method
	IC RSS-213 5.5 / IC RSS-Gen 6.6
Tested frequencies	F_{LOW} / F_{MID} / F_{HIGH}
EUT test mode	TDMA

Limits

0.05 MHz ≤ Occupied Bandwidth < 2.5 MHz

Test setup



Test procedure

1. EUT is restricted to test channel with the interferes
2. Span set to at least twice the emission spectrum
3. Resolution bandwidth set to 1% of span
4. Occupied Bandwidth (99%) measurement with spectrum analyzer built in measurement function

Test results

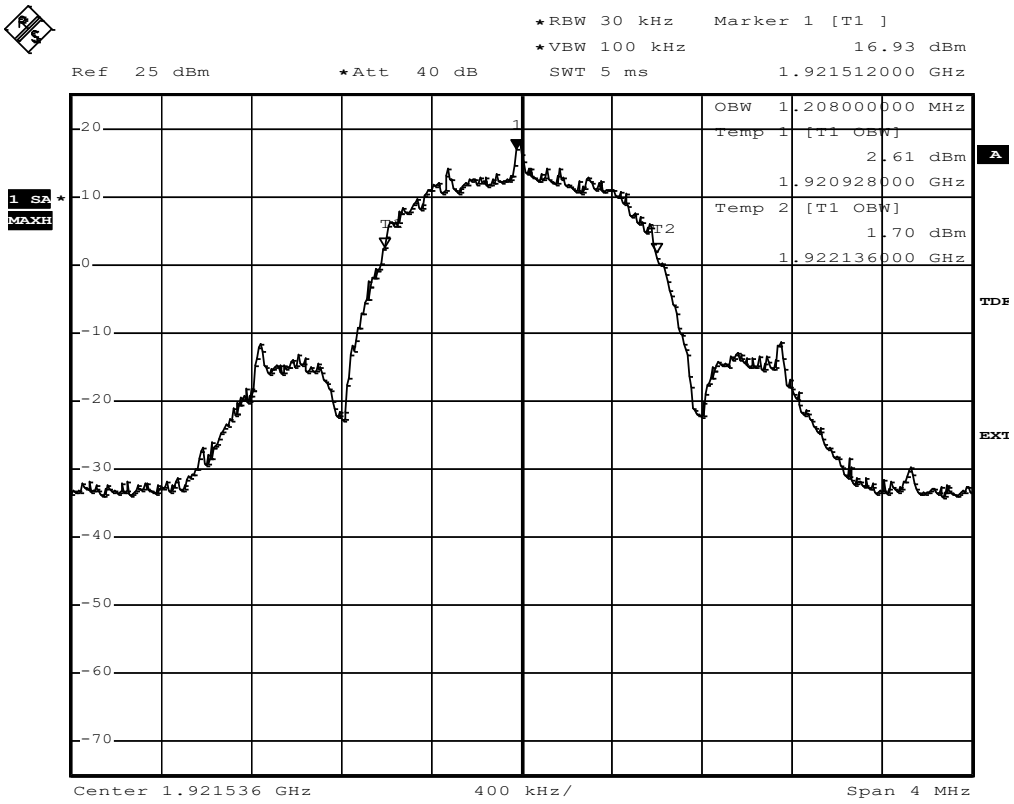
Channel	Center frequency [MHz]	Occupied Bandwidth [MHz]
F_{LOW}	1921.536	1.208
F_{MID}	1924.992	1.216
F_{HIGH}	1928.448	1.216

Comments:

Occupied Bandwidth - F_{LOW}

RSS Gen
Occupied Bandwidth

EUT	DECT / UPCS Module
Model	CT-DECT M7
Approval Holder	CeoTronics AG
Temperature / Voltage	tnom
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Occupied Bandwidth
Comment 1	Channel.: 4
Comment 2	A spectrum analyzer with an integrated 99% power BW function is used
Comment 3	OBW: 1.208 MHz

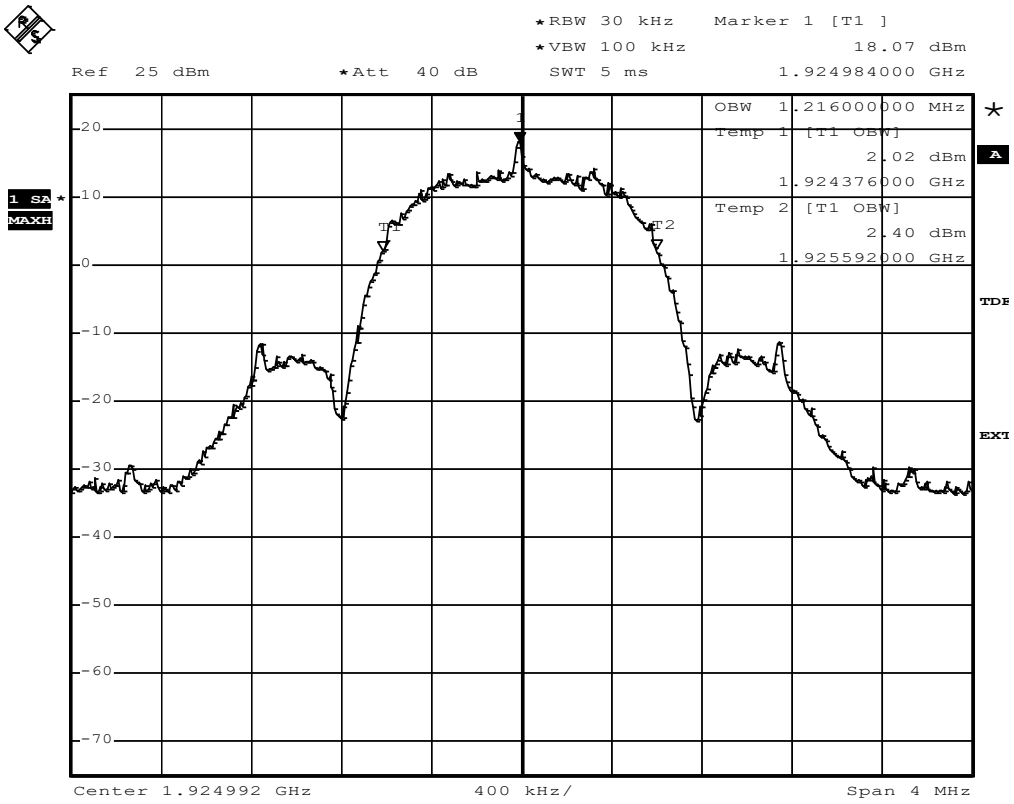


Comment: _
Date: 21.FEB.2017 15:08:41

Occupied Bandwidth – F_{MID}

RSS Gen
Occupied Bandwidth

EUT	DECT / UPCS Module
Model	CT-DECT M7
Approval Holder	CeoTronics AG
Temperature / Voltage	tnom
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Occupied Bandwidth
Comment 1	Channel.: 2
Comment 2	A spectrum analyzer with an integrated 99% power BW function is used
Comment 3	OBW: 1.216

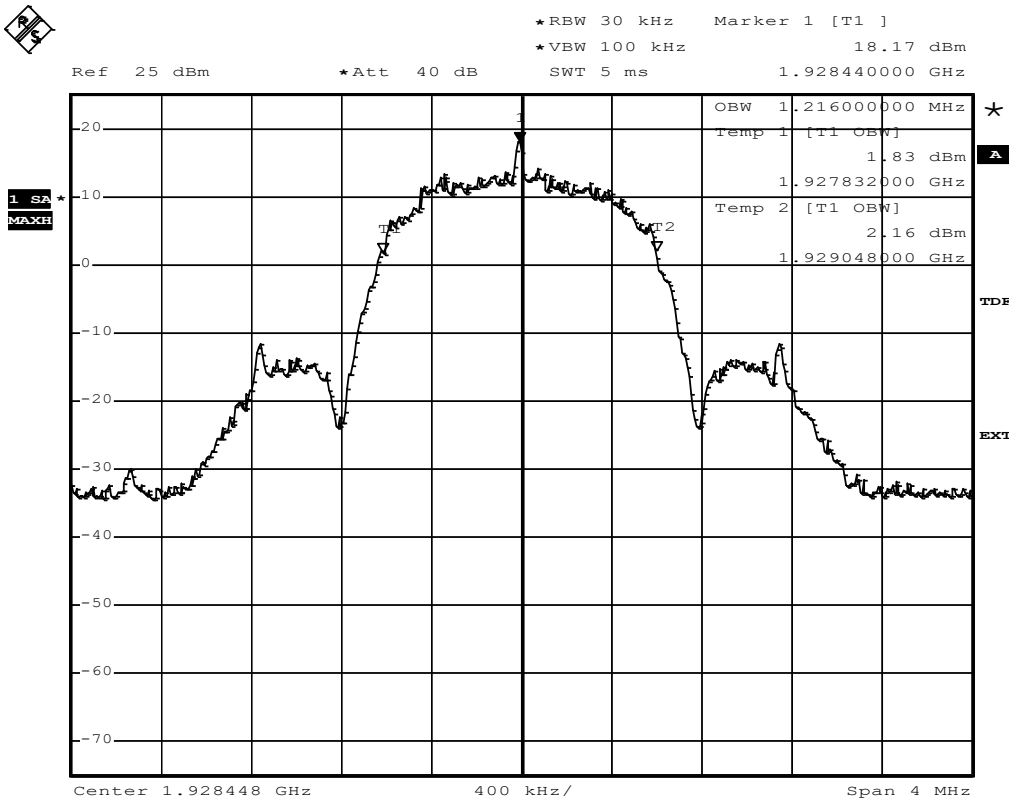


Comment: _
Date: 21.FEB.2017 15:31:02

Occupied Bandwidth – F_{HIGH}

RSS Gen
Occupied Bandwidth

EUT	DECT / UPCS Module
Model	CT-DECT M7
Approval Holder	CeoTronics AG
Temperature / Voltage	tnom
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Occupied Bandwidth
Comment 1	Channel.: 0
Comment 2	A spectrum analyzer with an integrated 99% power BW function is used
Comment 3	OBW: 1.216 MHz



Comment: _
Date: 21.FEB.2017 15:36:56

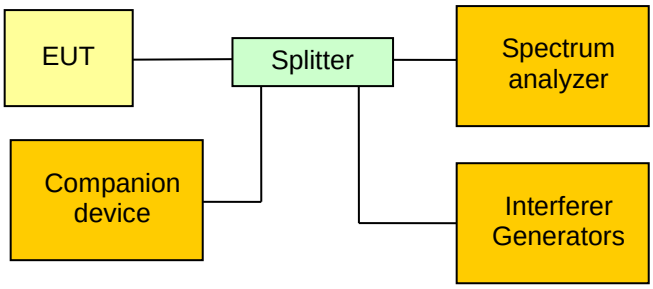
3.6 Test Conditions and Results – Emission Bandwidth

Emission Bandwidth acc. to FCC 47 CFR 15D	**Verdict: PASS**
EUT requirement rule parts and clause	Reference
	FCC 15.323(a)
Test according to measurement reference	Reference Method
	ANSI C63.17 6.1.3
Tested frequencies	F_{LOW} / F_{HIGH}
EUT test mode	TDMA

Limits

0.05 MHz ≤ Emission Bandwidth < 2.5 MHz

Test setup



Test procedure

1. EUT set to test mode
2. Span set to at least twice the emission spectrum
3. Resolution bandwidth set to 1% of emission bandwidth and detector is set to peak with max hold
4. The emission bandwidth is determined by the two -26dB points left and right of the maximum emission level
5. (The emission bandwidth is determined by the two -12dB points left and right of the maximum emission level)
6. (The emission bandwidth is determined by the two -6dB points left and right of the maximum emission level)

Test result

Channel	Center frequency [MHz]	Mode	Bandwidth [MHz]
F_{LOW}	1921.536	-26 dB	1.406
F_{HIGH}	1928.448	-26 dB	1.408
F_{LOW}	1921.536	-12 dB	1.160
F_{HIGH}	1928.448	-12 dB	1.164
F_{LOW}	1921.536	-6 dB	0.808
F_{HIGH}	1928.448	-6 dB	0.852

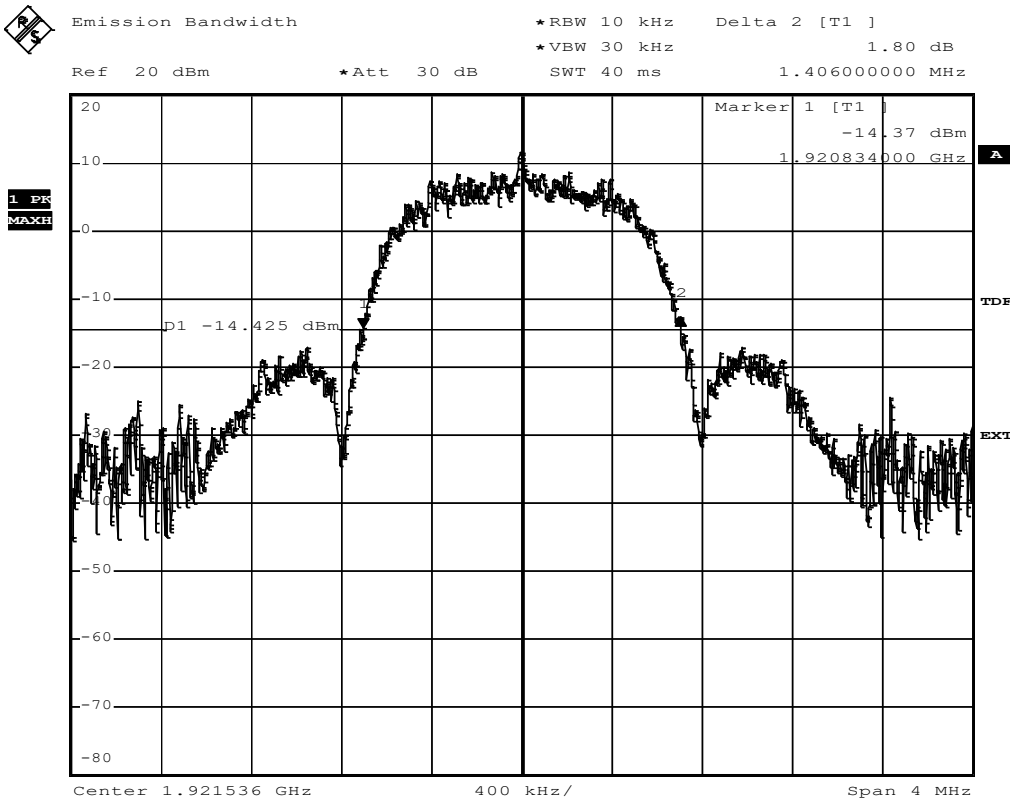
Comments:

Emission Bandwidth – F_{LOW}

FCC Part 15.303 Emission bandwidth

Testprocedure ANSI 63.17
UPCS

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	23°C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Emission bandwidth
Measured Bandwidth	Emission Bandwidth = 1.406MHz
Max. Permitted Power	Limit = 2.5 MHz
Test result	Verdict = PASS



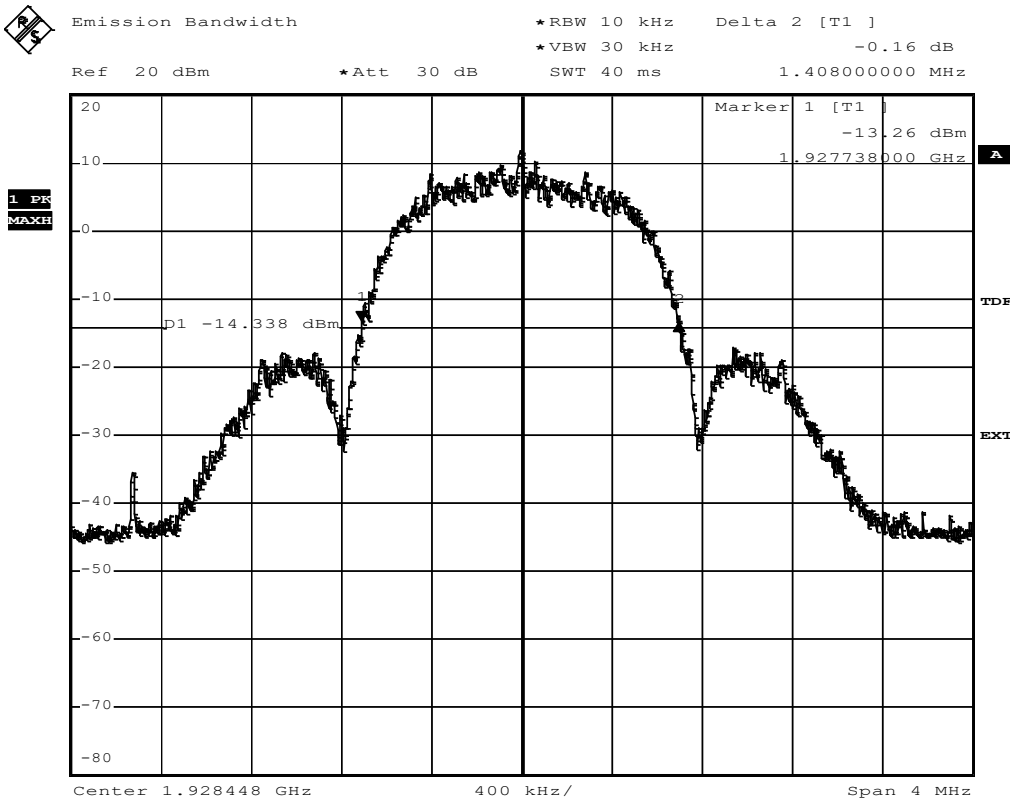
Comment: Ansi C63.17-2006 6.1.3
Date: 21.FEB.2017 15:45:23

Emission Bandwidth – F_{HIGH}

FCC Part 15.303 Emission bandwidth

Testprocedure ANSI 63.17
UPCS

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	23°C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Emission bandwidth
Measured Bandwidth	Emission Bandwidth = 1.408MHz
Max. Permitted Power	Limit = 2.5 MHz
Test result	Verdict = PASS



Comment: Ansi C63.17-2006 6.1.3
Date: 21.FEB.2017 15:55:16

3.7 Test Conditions and Results – Peak transmit power

Peak transmit power acc. to FCC 47 CFR 15D / IC RSS-213	**Verdict: PASS**
EUT requirement rule parts and clause	Reference
	FCC 15.319(c),(e) / IC RSS-213 5.6
Test according to measurement reference	Reference Method
	ANSI C63.17 6.1.2
Tested frequencies	F_{LOW} / F_{HIGH}
EUT test mode	TDMA
Antenna excess gain	0.5 dB

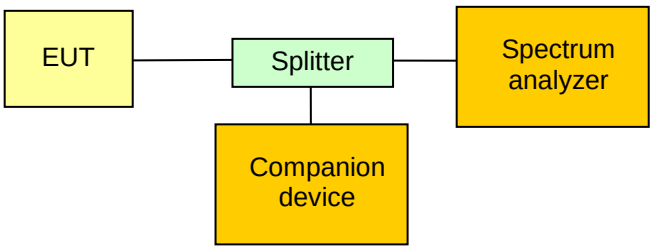
Limits

Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in hertz. The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.

$$P_{EUT}[dBm] \leq P_{limit} \; where \; P_{limit} = \begin{cases} P_{max} - (G_A - g), when \; G_A > 3 \; dBi \\ P_{max}, G_A < 3 \; dBi \end{cases}$$

$$P_{max}[dBm] = 5\log(Emission/Occupied \; Bandwidth \; [Hz]) - 10 \; dBm$$

Test setup



Test procedure

1. EUT set to test mode
2. The RBW is set to be larger than the emission bandwidth and VBW ≥ RBW
3. Transmission burst is measured in zero span and peak detector
4. The maximum level in the burst is recorded as peak transmit power

Test results - FCC

Channel	Frequency [MHz]	Peak Power [dbm]	Emission Bandwidth [Hz]	Excess gain [dB]	Limit [dbm]	Margin [dB]
F_{LOW}	1921.536	19.36	1406000	0.5	20.24	-00.88
F_{HIGH}	1928.448	19.36	1408000	0.5	20.24	-00.88

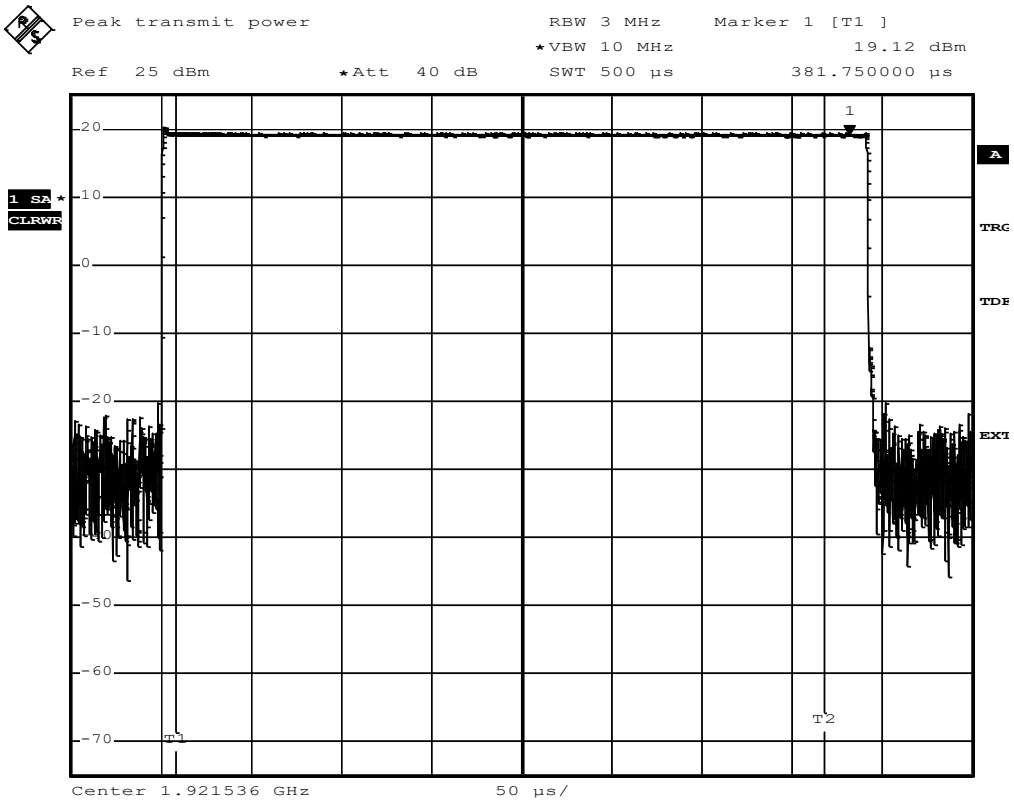
Test results - IC						
Channel	Frequency [MHz]	Peak Power [dbm]	Occupied Bandwidth [Hz]	Excess gain [dB]	Limit [dbm]	Margin [dB]
F_{LOW}	1921.536	19.36	1208000	0.5	19.91	-00.55
F_{HIGH}	1928.448	19.36	1216000	0.5	19.92	-00.56
Comments:						

Peak Power – F_{LOW}

FCC Part 15.319 Peak Transmit Power limit

Testprocedure ANSI 63.17
UPCS

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	23°C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Peak transmit power
Supply	
Measured Bandwidth	1.396MHz
Max. Permitted Power	20,24 dBm (FCC) / 19.91dBm (IC)
Measured Power	19,36 dBm
Test result	Verdict = PASS



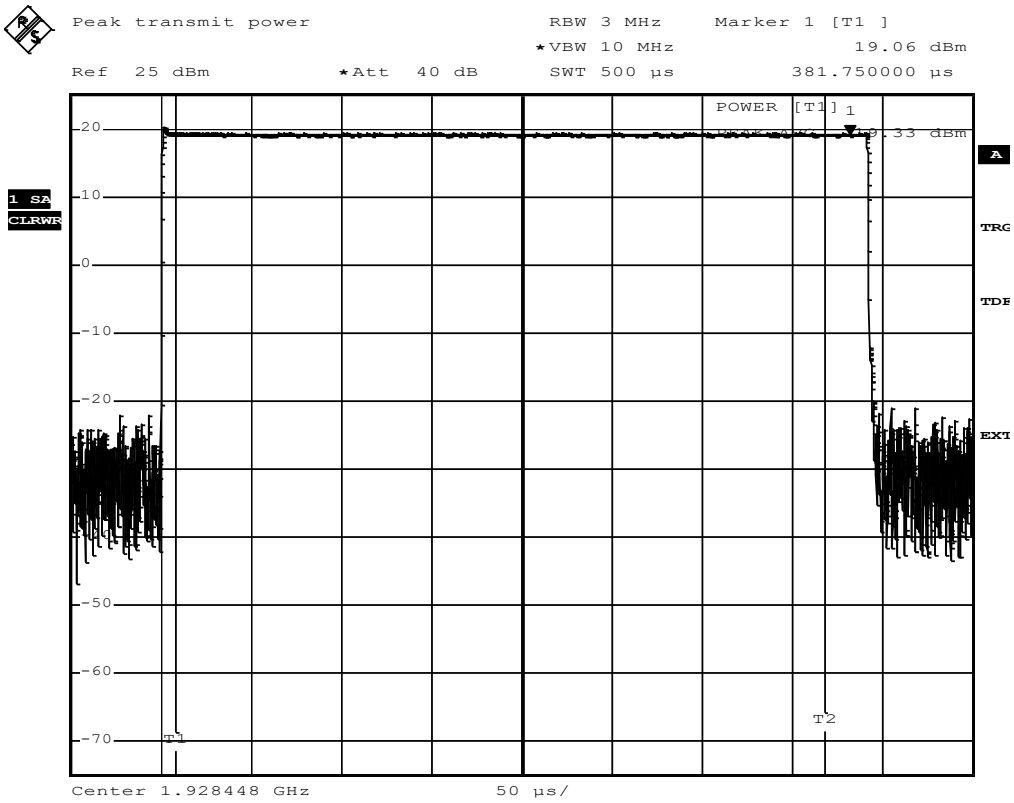
Comment: Ansi C63.17-2006 6.1.2
Date: 21.FEB.2017 16:17:25

Peak Power – F_{HIGH}

FCC Part 15.319 Peak Transmit Power limit

Testprocedure ANSI 63.17
UPCS

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	23°C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Peak transmit power
Supply	
Measured Bandwidth	1.396MHz
Max. Permitted Power	20,24 dBm (FCC) / 19.92 dBm (IC)
Measured Power	19,36 dBm
Test result	Verdict = PASS



Comment: Ansi C63.17-2006 6.1.2
Date: 21.FEB.2017 16:20:41

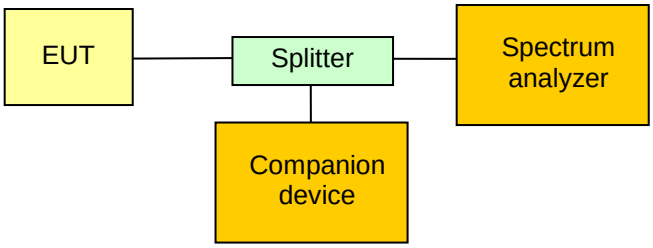
3.8 Test Conditions and Results – Power spectral density

Power spectral density acc. to FCC 47 CFR 15D / IC RSS-213	Verdict: PASS
EUT requirement rule parts and clause	Reference
	FCC 15.319(d) / IC RSS-213 5.7
Test according to measurement reference	Reference Method
	ANSI C63.17 6.1.5
Tested frequencies	F_{LOW} / F_{HIGH}
EUT test mode	TDMA

Limits

≤ 3 mW (4.77 dBm) / 3 kHz

Test setup



Test procedure

1. EUT set to test mode
2. The RBW is set to 3 kHz and VBW ≥ 3 x RBW
3. The center frequency is set to the maximum of the emission envelope and the span is set to zero
4. With sample detector and a minimum of 100 sweeps the -20 dB points below the first peak are determined and the data points between the two -20 dB points are summed and normalized to get the average pulse power in a 3 kHz bandwidth

Test results

Channel	Frequency [MHz]	Peak Density [dbm/3kHz]	Limit [dBm/3kHz]	Margin [dB]
F_{LOW}	1921.532	-1.0457	4.77	-05.82
F_{HIGH}	1928.444	-0.8914	4.77	-05.66

Comments:

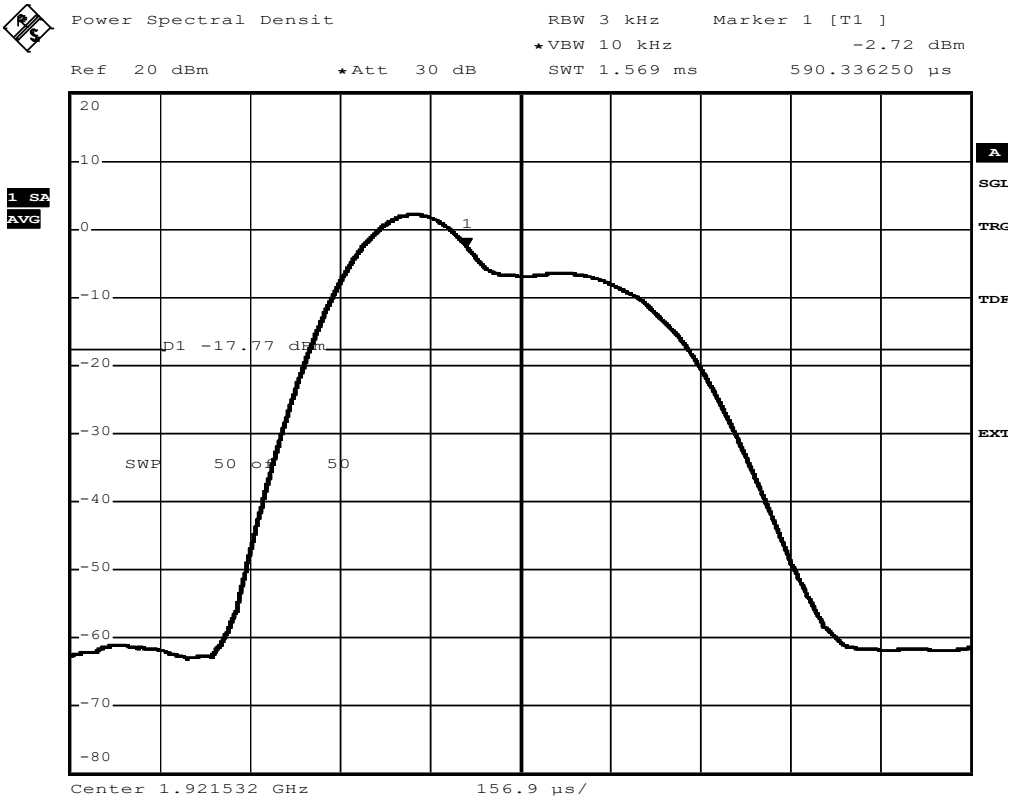
Power Spectral Density – F_{LOW}

FCC Part 15.319 Power spectral density

Testprocedure ANSI 63.17
UPCS

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	23°C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Power spectral density
Peak Frequency in MHz	1921,532000 MHz
Total pulse energy in mW	0,000308 mW
Wideband pulse duration in ms	0,392013 ms
PSD in mW	0,7860 mW
PSD in dBm	-1,0457 dBm

Pass criteria: PSD is less than 3mW Verdict = PASS



Comment: Ansi C63.17-2006 6.1.5
Date: 21.FEB.2017 16:06:07

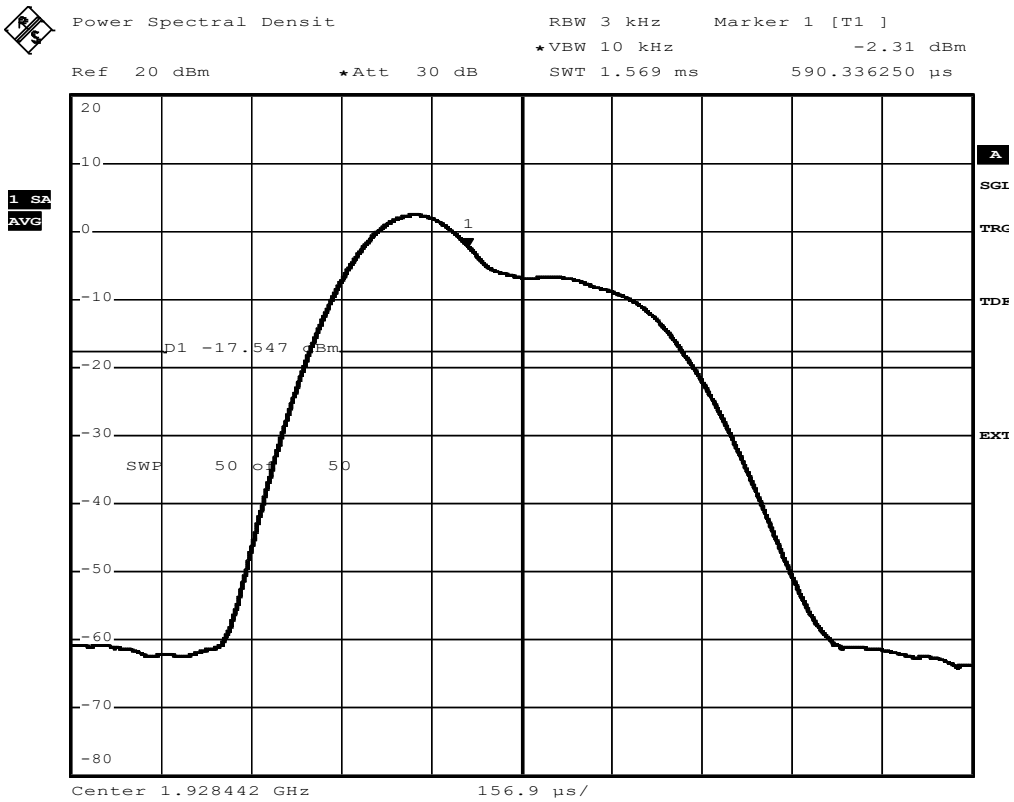
Power Spectral Density – F_{HIGH}

FCC Part 15.319 Power spectral density

Testprocedure ANSI 63.17
UPCS

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	23°C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Power spectral density
Peak Frequency in MHz	1928,442000 MHz
Total pulse energy in mW	0,000319 mW
Wideband pulse duration in ms	0,392013 ms
PSD in mW	0,8144 mW
PSD in dBm	-0,8914 dBm

Pass criteria: PSD is less than 3mW Verdict = PASS



Comment: Ansi C63.17-2006 6.1.5
Date: 21.FEB.2017 16:01:51

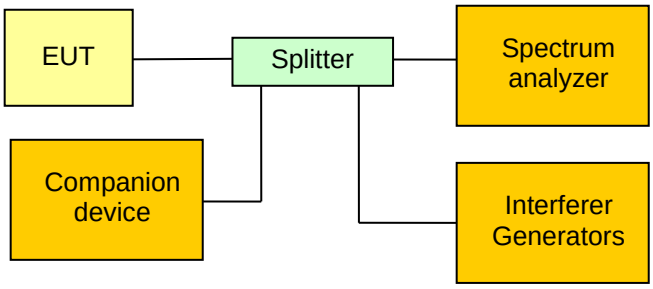
3.9 Test Conditions and Results – Carrier frequency stability

Carrier frequency stability acc. to FCC 47 CFR 15D / IC RSS-213	Verdict: PASS
EUT requirement rule parts and clause	Reference
	FCC 15.323(f) / IC RSS-213 5.3
Test according to measurement reference	Reference Method
	ANSI C63.17 6.2.1
Tested frequencies	F_{MID}
EUT test mode	TDMA

Limits

± 10 ppm / hour

Test setup



Test procedure

1. With interferer signals the EUT is forced to center channel and communication to companion device is established.
2. The demodulated carrier EUT signal is captured over time
3. The mean frequency is determined under all supply voltage and temperature conditions

Test results

Voltage	Temperature	Maximum Frequency deviation [ppm]	Limit [ppm]	Margin [ppm]
2.40 VDC	25°C	0.00 (reference)	±10.0	N/A
2.20 VDC	25°C	0.10	±10.0	-09.90
3.45 VDC	25°C	-0.10	±10.0	-09.90
2.40 VDC	-30°C	-0.41	±10.0	-09.59
2.40 VDC	70°C	-0.70	±10.0	-09.30

Comments:

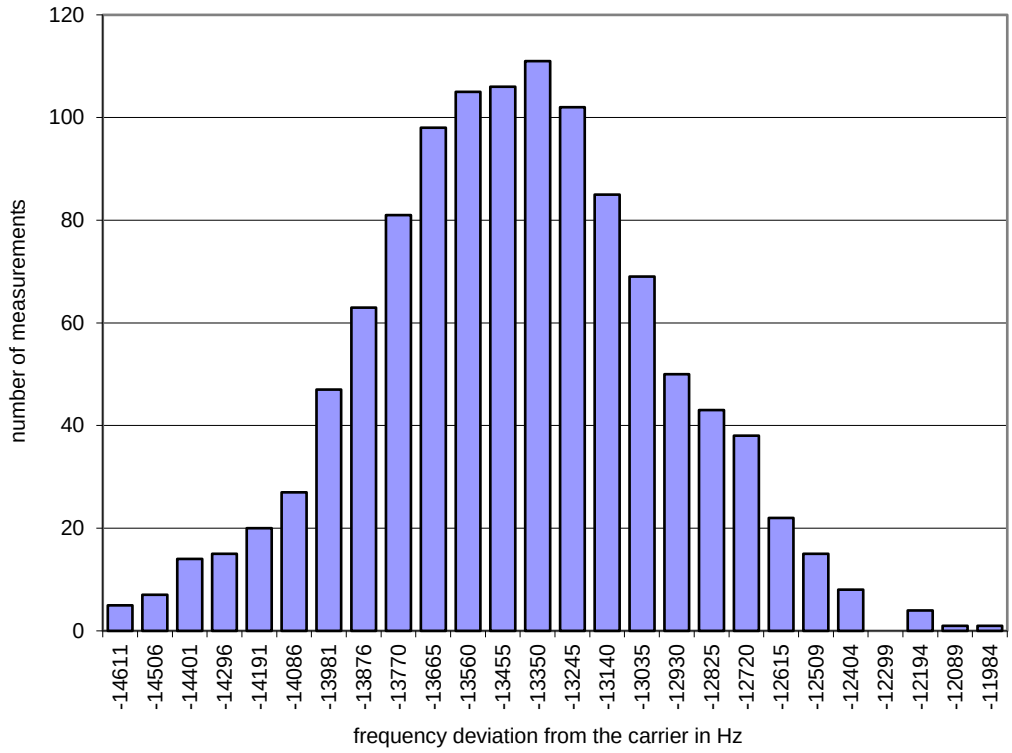
Carrier stability – Frequency stability – T_{NOM} V_{NOM}

FCC Part 15.323 Frequency Stability

Testprocedure ANSI 63.17

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	25 °C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Frequency stability
Power supply	Vnom
Frequency of carrier	1924,995650MHz
Measured mean	1924,995650 MHz
Stability (supply temp)	0 ppm (reference)
Result	Verdict = PASS
Stability over time	fmax : 0,75 ppm fmin : 0,62 ppm
Result	Verdict = PASS

Histogram



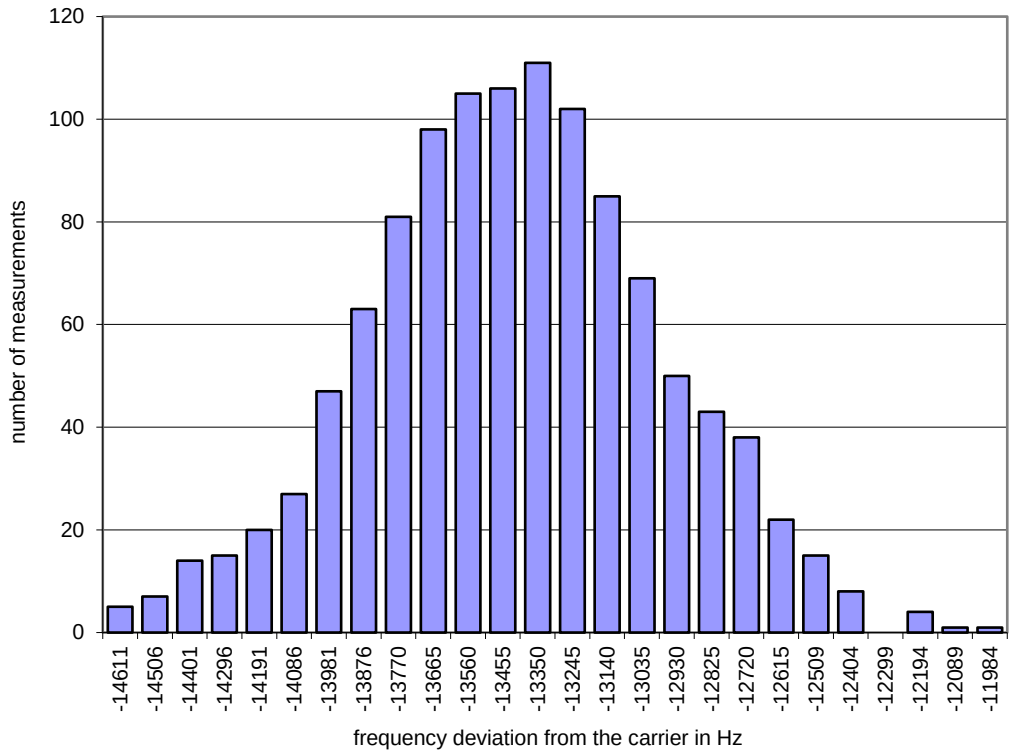
Carrier stability – Frequency stability – T_{NOM} V_{MIN}

FCC Part 15.323 Frequency Stability

Testprocedure ANSI 63.17

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	25 °C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Frequency stability
Power supply	Vmin
Frequency of carrier	1924.995650MHz
Measured mean	1924.995850 MHz
Stability (supply temp)	0.1 ppm
Result	Verdict = PASS
Stability over time	fmax : 0,75 ppm fmin : 0,62 ppm
Result	Verdict = PASS

Histogram



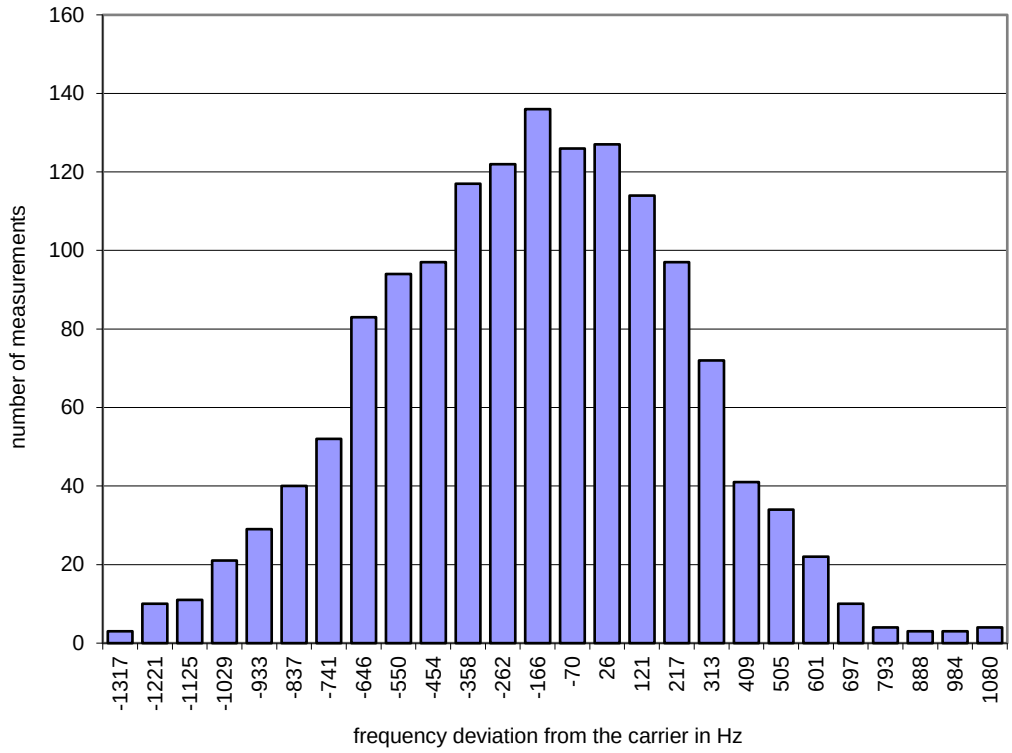
Carrier stability – Frequency stability – T_{NOM} V_{MAX}

FCC Part 15.323 Frequency Stability

Testprocedure ANSI 63.17

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	25 °C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Frequency stability
Power supply	Vmax
Frequency of carrier	1924,995650 MHz
Measured mean	1924,995461 MHz
Stability (supply temp)	-0,10 ppm
Result	Verdict = PASS
Stability over time	fmax : 0,66 ppm fmin : 0,59 ppm
Result	Verdict = PASS

Histogram



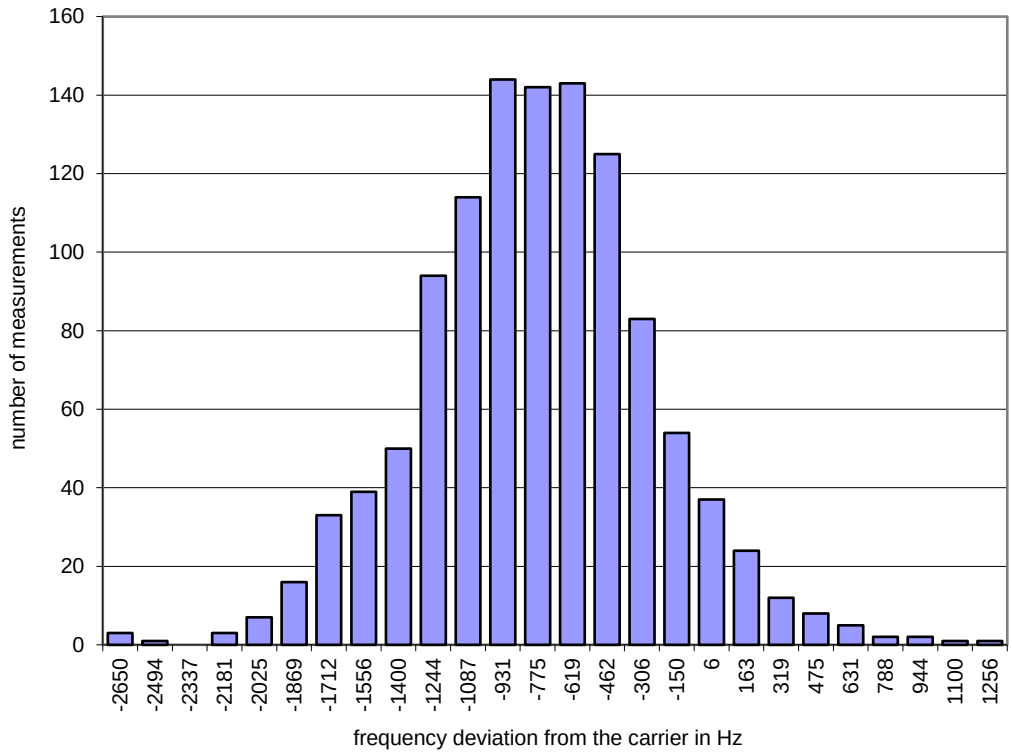
Carrier stability – Frequency stability – T_{MIN} V_{NOM}

FCC Part 15.323 Frequency Stability

Testprocedure ANSI 63.17

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	-30 °C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Frequency stability
Power supply	Vnom
Frequency of carrier	1924,995650 MHz
Measured mean	1924,994869 MHz
Stability (supply temp)	-0,41 ppm
Result	Verdict = PASS
Stability over time	fmax : 1,06 ppm fmin : 0,97 ppm
Result	Verdict = PASS

Histogram



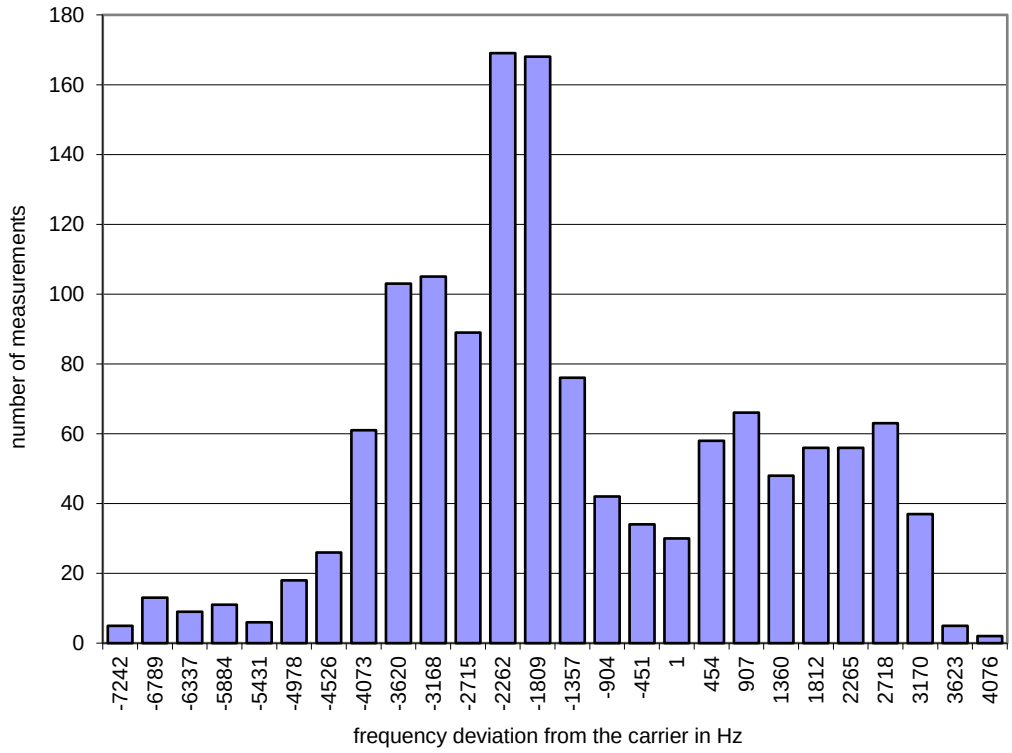
Carrier stability – Frequency stability – T_{MAX} V_{NOM}

FCC Part 15.323 Frequency Stability

Testprocedure ANSI 63.17

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	70 °C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Frequency stability
Power supply	Vnom
Frequency of carrier	1924,995650 MHz
Measured mean	1924,994298 MHz
Stability (supply temp)	-0,70 ppm
Result	Verdict = PASS
Stability over time	fmax : 2,82 ppm fmin : 3,06 ppm
Result	Verdict = PASS

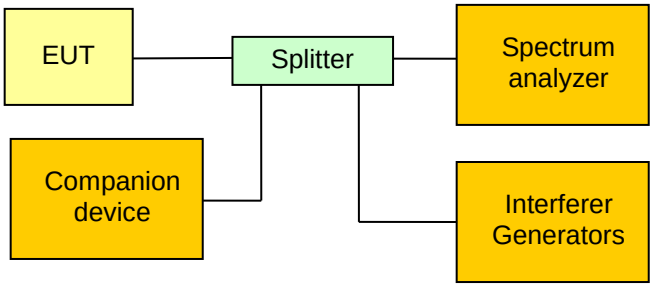
Histogram



3.10 Test Conditions and Results – Transmitter in-band unwanted emissions

Transmitter in-band unwanted emissions acc. to FCC 47 CFR 15D / IC RSS-213		**Verdict: PASS**
Test according referenced standards	Reference Method	
	FCC 15.323(d) / IC RSS-213 5.8.2	
Test according to measurement reference	Reference Method	
	ANSI C63.17 6.1.6	
Tested frequencies	F_{LOW} / F_{HIGH}	
Tested frequency range	1920 – 1930 MHz	
Limits		
Frequency range [MHz]	Detector	Limit [dBc]
1920 MHz to (F_c – 3B)	Peak	-60
(F_c – 3B) to (F_c – 2B)	Peak	-50
(F_c – 2B) to (F_c – 1B)	Peak	-30
(F_c + 1B) to (F_c + 2B)	Peak	-30
(F_c + 2B) to (F_c + 3B)	Peak	-50
(F_c + 3B) to 1930 MHz	Peak	-60
B = emission / occupied bandwidth of selected channel F_c = Center frequency of selected channel		

Test setup



Test procedure

1. With interferer signal the EUT is forced to the test channel and a communication session is established between the EUT and the companion device
2. The RBW of the spectrum analyzer is set to 1% of the emission bandwidth and the VBW is set to 3 times the RBW
3. With peak detector and max hold the emission spectrum is recorded over the corresponding frequency range

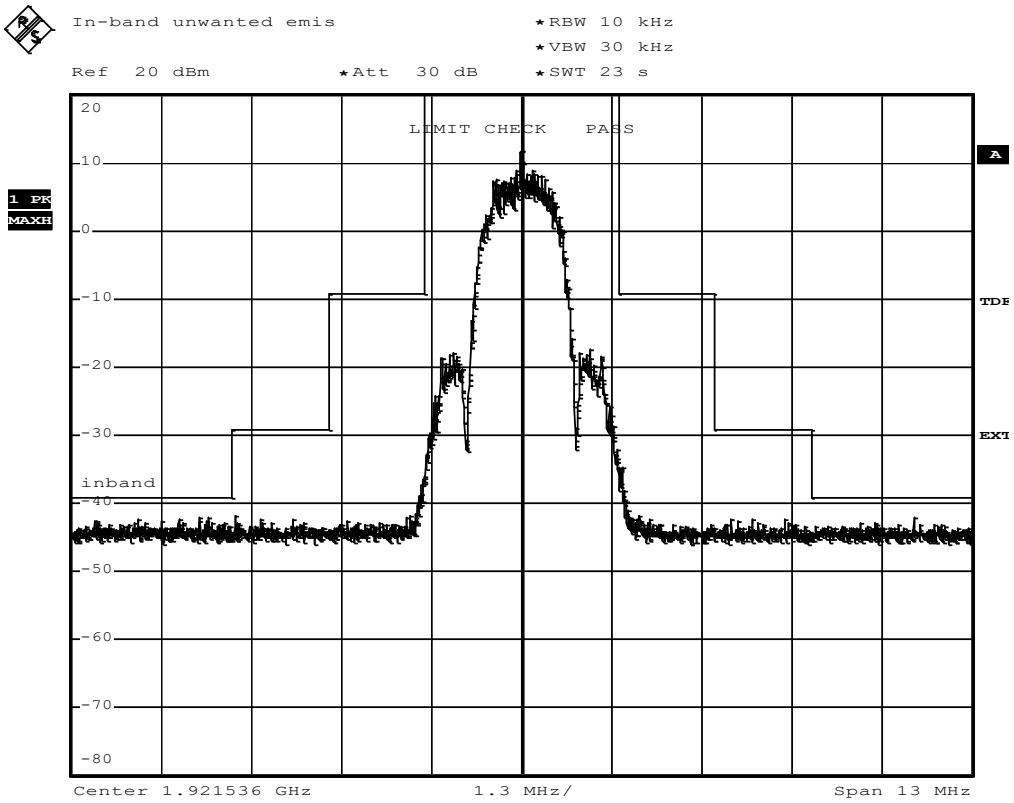
Test results		
Channel	Frequency [MHz]	Verdict
F_{LOW}	1921.536	PASS
F_{HIGH}	1928.448	PASS
Comments:		

Transmitter in-band unwanted emissions – F_{LOW}

FCC Part 15.323 In-band unwanted emission

Testprocedure ANSI 63.17
UPCS

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	23°C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	In-band unwanted emission
BW	1.406MHz



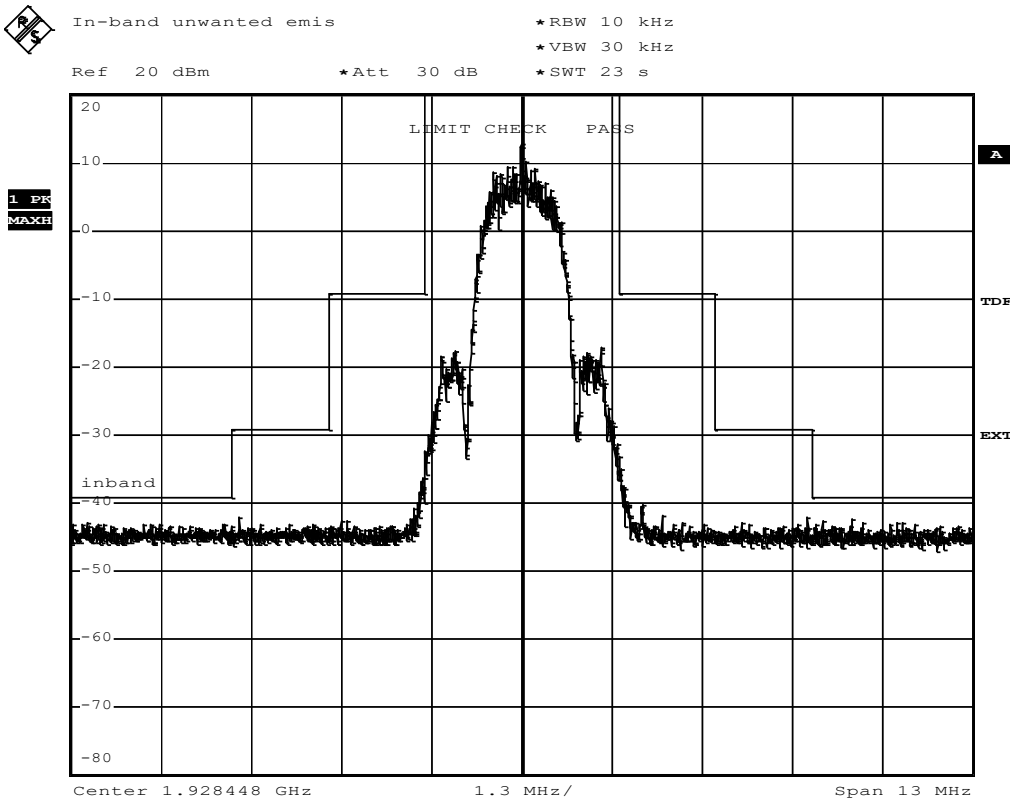
Comment: Ansi C63.17-2006 6.1.6.1
Date: 21.FEB.2017 16:28:09

Transmitter in-band unwanted emissions – F_{HIGH}

FCC Part 15.323 In-band unwanted emission

Testprocedure ANSI 63.17
UPCS

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	23°C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	In-band unwanted emission
BW	1.408MHz

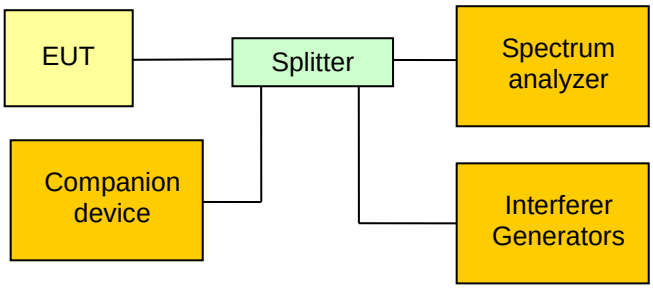


Comment: Ansi C63.17-2006 6.1.6.1
Date: 22.FEB.2017 13:26:00

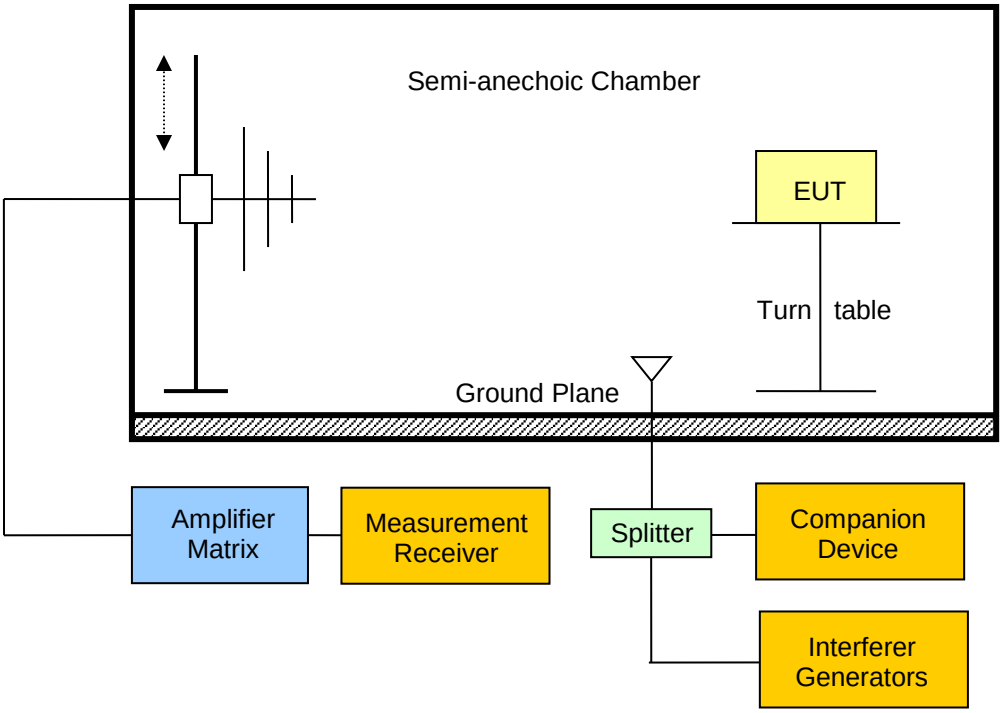
3.11 Test Conditions and Results – Transmitter out-of-band emissions

Transmitter out-of-band emissions acc. to FCC 47 CFR 15D / IC RSS-213			**Verdict: PASS**
Test according referenced standards		Reference Method	
		FCC 15.323(d) / IC RSS-213 5.8.1	
Test according to measurement reference		Reference Method	
		ANSI C63.17 6.1.6	
Tested frequencies		F_{LOW} / F_{HIGH}	
Tested frequency range		30 MHz – 10th Harmonic	
Test option		Tested according to option a), b) and d) in C63.17 6.1.6.2	
Limits			
Frequency range [MHz]	Detector	Limit	Limit Distance [m]
30 – 88	Quasi-Peak	100 µV/m (40 dBµV/m)	3
88 – 216	Quasi-Peak	150 µV/m (43.5 dBµV/m)	3
216 – 960	Quasi-Peak	200 µV/m (46 dBµV/m)	3
960 – 1000	Quasi-Peak	500 µV/m (54 dBµV/m)	3
1000 – 1917.5	Average	500 µV/m (54 dBµV/m)	3
1917.5 – 1918.75	Peak	-39.5 dBm *	N/A
1918.75 – 1920	Peak	-29.5 dBm *	N/A
1930 – 1931.25	Peak	-29.5 dBm *	N/A
1931.25 – 1932.5	Peak	-39.5 dBm *	N/A
1932.5 - 20000	Average	500 µV/m (54 dBµV/m)	3
Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)). When average radiated emission measurements are specified, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. * Measurement is performed with conducted measurement setup			

Test setup conducted



Test setup radiated



Test procedure

1. EUT is forced to test channel with the interferer generators and a communication session is established with the companion device
2. Span it set according to measurement range
3. Resolution bandwidth , video bandwidth and detector are set according to ANSI C63.17 or ANSI C63.4
4. All significant spurious emissions and the band edge emission envelops are recorded

Test results antenna 1								
Channel	Frequency [MHz]	Mode	Emission [MHz]	Level [dbµV/m]	Det.	Pol.	Limit [dbµV/m]	Margin [dB]
0	1928	Testmode	39.78	34.58	pk	ver	40	-5.42
0	1928	Testmode	39.78	22.87	qp	ver	40	-17.13
0	1928	Testmode	42.30	33.68	pk	ver	40	-6.32
0	1928	Testmode	42.30	23.51	qp	ver	40	-16.49
0	1928	Testmode	51.00	32.17	pk	ver	40	-7.83
0	1928	Testmode	51.00	22.64	qp	ver	40	-17.36
0	1928	Testmode	78.54	36.57	pk	ver	40	-3.43
0	1928	Testmode	78.54	24.11	qp	ver	40	-15.89
0	1928	Testmode	96.99	39.90	pk	ver	43.5	-3.60
0	1928	Testmode	96.99	29.22	qp	ver	43.5	-14.28
4	1921	Testmode	40.44	34.54	pk	ver	40	-5.46
4	1921	Testmode	40.44	24.31	qp	ver	40	-15.69
4	1921	Testmode	51.12	32.45	pk	ver	40	-7.55
4	1921	Testmode	51.12	22.80	qp	ver	40	-17.20
4	1921	Testmode	77.84	35.52	pk	ver	40	-4.48
4	1921	Testmode	77.84	24.00	qp	ver	40	-16.00
4	1921	Testmode	96.12	40.05	pk	ver	43.5	-3.45
4	1921	Testmode	96.12	29.17	qp	ver	43.5	-14.33
4	1921	Testmode	99.12	40.14	pk	ver	43.5	-3.36
4	1921	Testmode	99.12	29.11	qp	ver	43.5	-14.39
4	1921	Testmode	1934.1	55.22	pk	hor	73.90	-18.68
0	1928	Testmode	1934.1	33.33	avg	hor	53.90	-20.57
0	1928	Testmode	1935.6	54.82	pk	hor	73.90	-19.08
0	1928	Testmode	1935.6	32.89	avg	hor	53.90	-21.01
0	1928	Testmode	1936.2	53.18	pk	hor	73.90	-20.72
0	1928	Testmode	1936.2	32.90	avg	hor	53.90	-21.00
0	1928	Testmode	1936.3	55.52	pk	hor	73.90	-18.38
0	1928	Testmode	1936.3	32.90	avg	hor	53.90	-21.00
0	1928	Testmode	1937.9	52.75	pk	hor	73.90	-21.15
0	1928	Testmode	1937.9	32.91	avg	hor	53.90	-20.99
0	1928	Testmode	3857	45.80	pk	hor	73.90	-28.10
0	1928	Testmode	3857	22.38	avg	hor	53.90	-31.52
0	1928	Testmode	3857.6	46.83	pk	ver	73.90	-27.07
0	1928	Testmode	3857.6	22.19	avg	ver	53.90	-31.71

0	1928	Testmode	5785	48.59	pk	ver	73.90	-25.31
0	1928	Testmode	5785	24.21	avg	ver	53.90	-29.69
0	1928	Testmode	5785	51.09	pk	hor	73.90	-22.81
0	1928	Testmode	5785	24.71	avg	hor	53.90	-29.19
4	1921	Testmode	1916.2	55.36	pk	hor	73.90	-18.54
4	1921	Testmode	1916.2	32.49	avg	hor	53.90	-21.41
4	1921	Testmode	1916.8	56.36	pk	hor	73.90	-17.54
4	1921	Testmode	1916.8	32.50	avg	hor	53.90	-21.40
4	1921	Testmode	1917.4	56.84	pk	hor	73.90	-17.06
4	1921	Testmode	1917.4	32.97	avg	hor	53.90	-20.93
4	1921	Testmode	3843	47.03	pk	ver	73.90	-26.87
4	1921	Testmode	3843	23.02	avg	ver	53.90	-30.88
4	1921	Testmode	3843	49.79	pk	hor	73.90	-24.11
4	1921	Testmode	3843	24.29	avg	hor	53.90	-29.61
4	1921	Testmode	5765	47.03	pk	hor	73.90	-26.87
4	1921	Testmode	5765	23.78	avg	hor	53.90	-30.12
Comments:								

Test results antenna 2								
Channel	Frequency [MHz]	Mode	Emission [MHz]	Level [dbµV/m]	Det.	Pol.	Limit [dbµV/m]	Margin [dB]
0	1928	Testmode	40.20	34.53	pk	ver	40	-5.47
0	1928	Testmode	40.20	24.35	qp	ver	40	-15.65
0	1928	Testmode	51.24	32.75	pk	ver	40	-7.25
0	1928	Testmode	51.24	22.23	qp	ver	40	-17.77
0	1928	Testmode	77.55	37.54	pk	ver	40	-246
0	1928	Testmode	77.55	24.29	qp	ver	40	-15.71
0	1928	Testmode	95.88	41.15	pk	ver	43.5	-2.35
0	1928	Testmode	95.88	29.36	qp	ver	43.5	-14.14
0	1928	Testmode	99.90	39.60	pk	ver	43.5	-3.90
0	1928	Testmode	99.90	29.15	qp	ver	43.5	-14.35
4	1921	Testmode	40.56	35.54	pk	ver	40	-4.46
4	1921	Testmode	40.56	24.86	qp	ver	40	-15.14
4	1921	Testmode	42.36	34.52	pk	ver	40	-5.48
4	1921	Testmode	42.36	23.58	qp	ver	40	-16.42
4	1921	Testmode	76.80	37.35	pk	ver	40	-2.65
4	1921	Testmode	76.80	24.00	qp	ver	40	-16.00

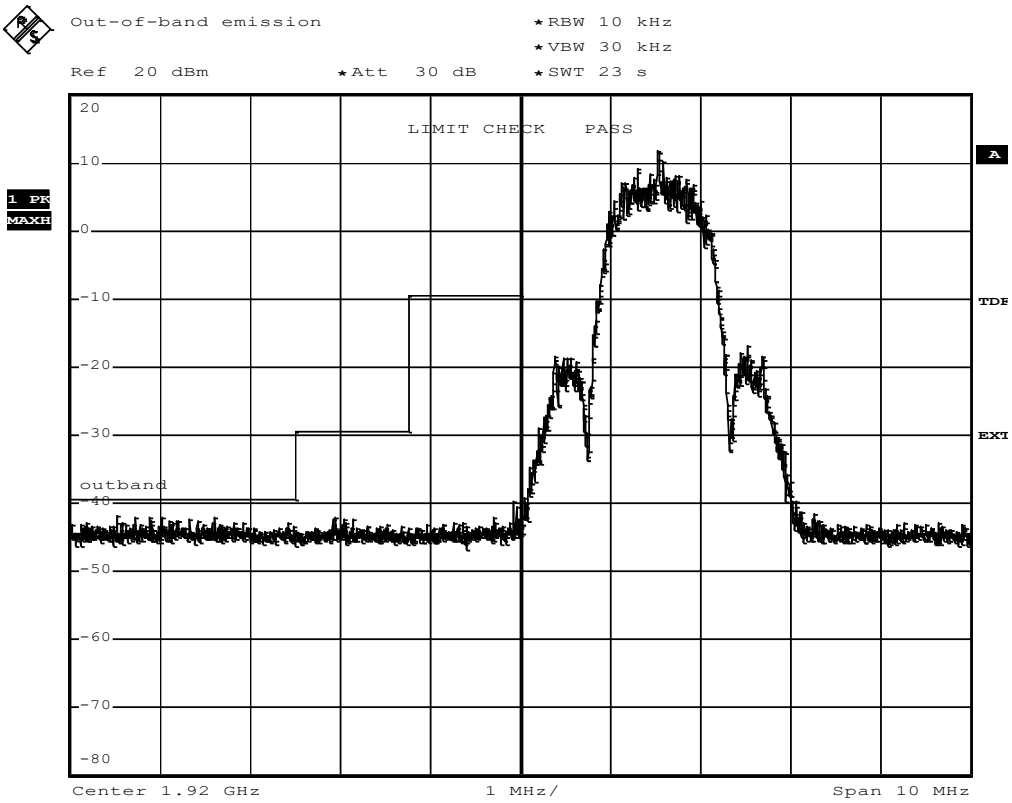
4	1921	Testmode	96.51	40.01	pk	ver	43.5	-3.49
4	1921	Testmode	96.51	29.44	qp	ver	43.5	-14.06
4	1921	Testmode	100.1	39.24	pk	ver	43.5	-4.26
4	1921	Testmode	100.1	28.93	qp	ver	43.5	-14.57
0	1928	Testmode	1932.5	61.73	pk	hor	73.90	-12.17
0	1928	Testmode	1932.5	40.49	avg	hor	53.90	-13.41
0	1928	Testmode	1933.7	55.15	pk	hor	73.90	-18.75
0	1928	Testmode	1933.7	33.55	avg	hor	53.90	-20.35
0	1928	Testmode	1934.4	51.93	pk	hor	73.90	-21.97
0	1928	Testmode	3856.2	47.89	pk	ver	73.90	-26.01
0	1928	Testmode	3856.2	22.73	avg	ver	53.90	-31.17
0	1928	Testmode	3856.2	46.82	pk	hor	73.90	-27.08
0	1928	Testmode	3856.2	22.55	avg	hor	53.90	-31.35
0	1928	Testmode	5785	49.57	pk	hor	73.90	-24.33
0	1928	Testmode	5785	24.27	avg	hor	53.90	-29.63
4	1921	Testmode	1914.3	54.92	pk	hor	73.90	-18.98
4	1921	Testmode	1914.3	32.48	avg	hor	53.90	-21.42
4	1921	Testmode	1914.6	54.55	pk	hor	73.90	-19.35
4	1921	Testmode	1914.6	32.48	avg	hor	53.90	-21.42
4	1921	Testmode	3843	48.09	pk	ver	73.90	-25.81
4	1921	Testmode	3843	23.52	avg	ver	53.90	-30.38
4	1921	Testmode	3843	50.42	pk	hor	73.90	-23.48
4	1921	Testmode	3843	24.58	avg	hor	53.90	-29.32
4	1921	Testmode	5765	48.40	pk	hor	73.90	-25.50
4	1921	Testmode	5765	23.99	avg	hor	53.90	-29.91
Comments:								

Transmitter out-of-band emissions – Band edge F_{LOW}

FCC Part 15.323 Out-of-band emission

Testprocedure ANSI 63.17
UPCS

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	23°C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Out-of-band emission
	measurement on the lowest carrier Carrier=1921.536MHz



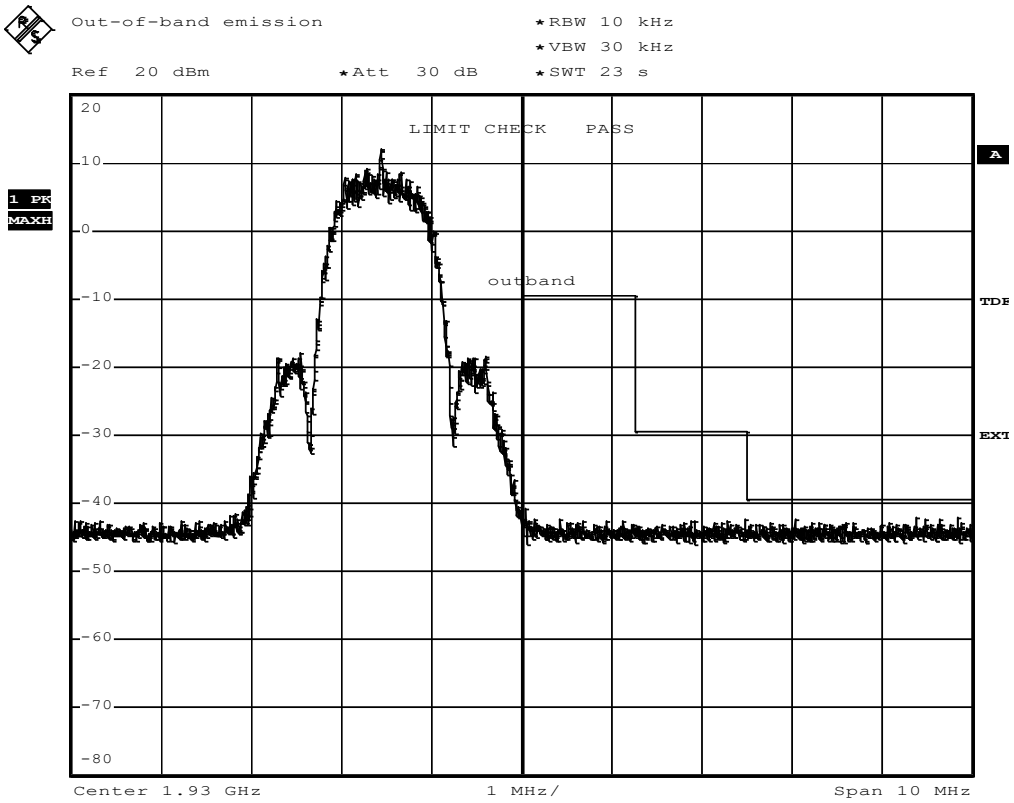
Comment: Ansi C63.17-2006 6.1.6.2
Date: 21.FEB.2017 16:30:49

Transmitter out-of-band emissions – Band edge F_{HIGH}

FCC Part 15.323 Out-of-band emission

Testprocedure ANSI 63.17
UPCS

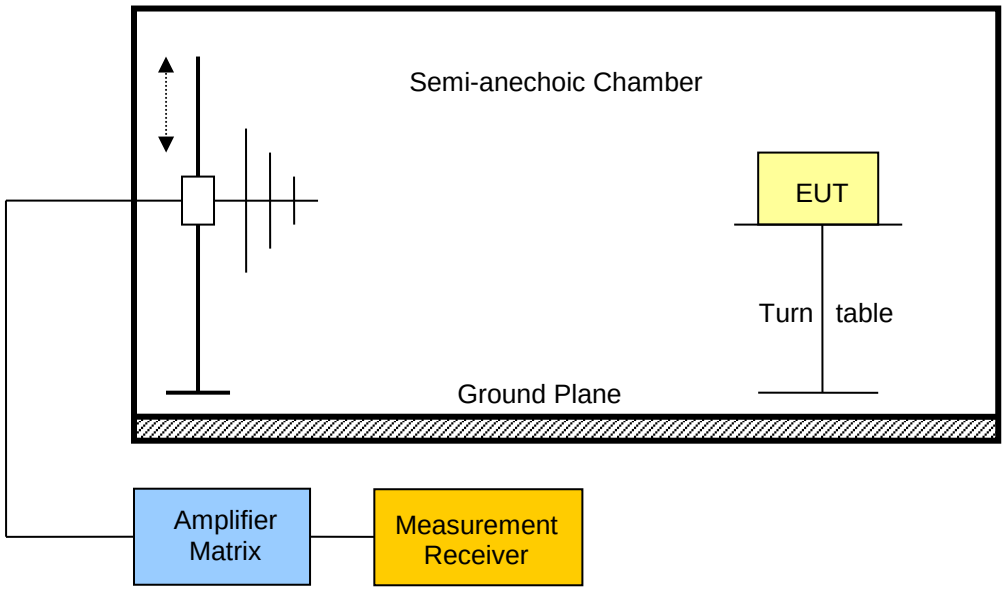
EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	23°C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Out-of-band emission
	measurement on the highest carrier Carrier=1928.448MHz



Comment: Ansi C63.17-2006 6.1.6.2
Date: 21.FEB.2017 16:34:03

3.12 Test Conditions and Results – Receiver spurious emissions

Receiver spurious emissions acc. to IC RSS-213				**Verdict: PASS**
Test according referenced standards	Reference Method			
	IC RSS-213 3.1			
Test according to measurement reference	Reference Method			
	ANSI C63.4			
Tested frequencies	Scan (All)			
Tested frequency range	30 MHz – 5th Harmonic			
EUT test mode	Receive			
Limits				
Frequency range [MHz]	Detector	Limit [µV/m]	Limit [dBµV/m]	Limit Distance [m]
30 – 88	Quasi-Peak	100	40	3
88 – 216	Quasi-Peak	150	43.5	3
216 – 960	Quasi-Peak	200	46	3
960 – 1000	Quasi-Peak	500	54	3
> 1000	Average	500	54	3
Test setup				



Test procedure
1. EUT set to receive mode (Communication tester is used if needed) 2. Span it set according to measurement range 3. Resolution bandwidth below 1 GHz is set according to CISPR 16 with peak/quasi-peak detector and RBW of 1 MHz with peak/average detector is used above 1 GHz 4. Markers are set to peak emission levels

Test results

Channel	Frequency [MHz]	Emission [MHz]	Emission Level [dbµV/m]	Pol.	Det.	Limit [dBµV/m]	Margin [dB]
F_{MID}	1925	600	36.90	ver	pk	46.00	-09.10
F_{MID}	1925	600	39.31	hor	pk	46.00	-06.69

Comments:

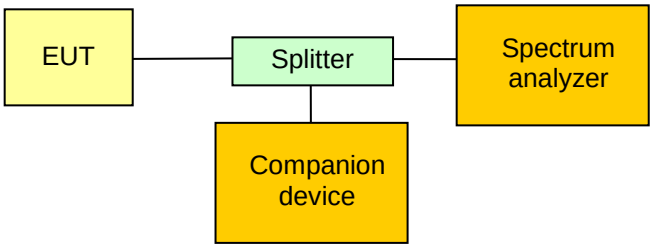
3.13 Test Conditions and Results – Automatic discontinuation of Transmission

Automatic discontinuation of transmission acc. to FCC 15D / RSS-213	**Verdict: PASS**
EUT requirement rule parts and clause	Reference
	FCC 15.319(f) / IC RSS-213 5.2
Test according to measurement reference	Reference Method
	Manual evaluation
EUT equipment type	Portable part

Requirements

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. This is not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

Test setup



Test procedure

The following situations were simulated to test the reaction of the EUT:

- EUT power removed
- EUT switched –off
- Companion device switched off
- Hook-on by companion device
- Hook-on by EUT
- Power removed from companion device

The reaction of the EUT is recorded by the following results:

A – Connection breakdown, cease of all transmissions
B – Connection breakdown, EUT transmits control and signalling information
C – Connection breakdown, Companion device transmits control and signalling information
N/A – Not applicable (the EUT or companion device does not have an on/off switch or cannot perform hook on

Result

Test	Reaction	Verdict
Power removed : EUT	C	PASS
Power removed : Companion device	A	PASS
Switch –off : EUT	C	PASS
Switch –off : Companion device	A	PASS
Hook-on : EUT	C	PASS
Hook-on : Companion device	C	PASS

3.14 Test Conditions and Results – LIC Procedure Test

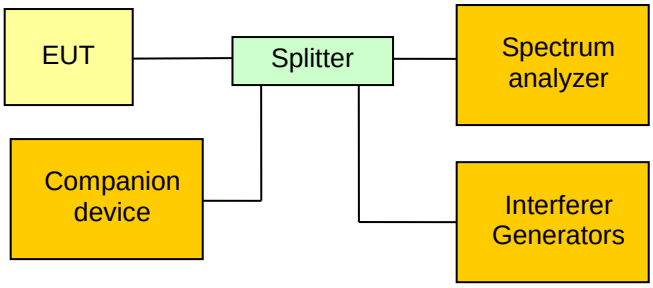
LIC Procedure Test acc. to FCC 47 CFR 15D / IC RSS-213	Verdict: PASS
EUT requirement rule parts and clause	Reference
	FCC 15.323(c)(5) / IC RSS-213 5.2
Test according referenced standards	Reference Method
	ANSI C63.17 7.3.2

Requirements

FCC: If access to spectrum is not available as determined by the above, and a minimum of 20 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level may be accessed.

IC: If access to spectrum is not available as determined by the above, and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with a power level below a monitoring threshold of 50 dB above the thermal noise power determined for the occupied bandwidth may be accessed.

Test setup



Test procedure

1. The EUT is forced to two carrier frequencies f_1 and f_2 only be the use of interferer generators with power levels higher than the threshold T_L plus the measurement uncertainty U_M of 6 dB
2. Additional interferer signals are applied to the channels f_1 and f_2 according to the result table below
3. A communication session with the companion device is initiated
4. Transmission on the least interfered channel is verified
5. The communication session is terminated
6. The communications session is established another 4 times

Test results

Interferer Level f_1	Interferer Level f_2	Communication channel	Verdict
$T_L + U_M + 7$ dB	$T_L + U_M$	f_2	PASS
$T_L + U_M$	$T_L + U_M + 7$ dB	f_1	PASS
$T_L + U_M + 1$ dB	$T_L + U_M - 6$ dB	f_2	PASS
$T_L + U_M - 6$ dB	$T_L + U_M + 1$ dB	f_1	PASS

Comments:

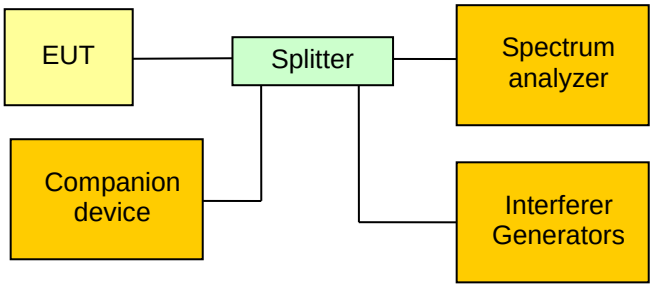
3.15 Test Conditions and Results – LIC Selected Channel Confirmation

LIC Selected Channel Confirmation acc. to FCC 47 CFR 15D / IC RSS-213	**Verdict: PASS**
EUT requirement rule parts and clause	Reference
	FCC 15.323(c)(1) / IC RSS-213 5.2
Test according referenced standards	Reference Method
	ANSI C63.17 7.3.3

Requirements

Immediately prior to initiating transmission, devices must monitor the combined time and spectrum windows in which they intend to transmit for a period of at least 10 milliseconds for systems designed to use a 10 milliseconds or shorter frame period or at least 20 milliseconds for systems designed to use a 20 milliseconds frame period.

Test setup



Test procedure

1. The EUT is forced to two carrier frequencies f_1 and f_2 only be the use of interferer generators with power levels 20 dB higher than the threshold T_L plus the measurement uncertainty U_M of 6 dB
2. The interferer level on channel frequency f_1 is also set to $T_L + U_M$ + 20dB and channel f_2 has no interferer
3. A communication session is initiated on f_2 and transmission on f_2 is verified
4. An interferer level of $T_L + U_M$ + 20 dB is applied to f_2 and the interferer on channel f_1 is removed 20ms after the interferer on f_2 is applied
5. Transmission on f_1 and f_2 is monitored with the spectrum analyzer and it is verified that the EUT does not transmit on f_2.

Test results

Initial transmit channel	Interferer level	Final transmit channel	Verdict
f_2	0	f_2	PASS
f_2	$T_L + U_M$ + 20 dB	f_1	PASS

Comments:

3.16 Test Conditions and Results – Monitoring antenna

Monitoring antenna acc. to FCC 47 CFR 15D / IC RSS-213	**Verdict: PASS**
EUT requirement rule parts and clause	Reference
	FCC 15.323(c)(8) / IC RSS-213 5.2
Test according to measurement reference	Reference Method
	ANSI C63.17 4
Monitoring antenna	The same as transmitting antenna
Requirements	
The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.	
Results	
Connection status	Verdict
N/A (monitoring antenna identical to transmitting antenna)	PASS

3.17 Test Conditions and Results – Monitoring Bandwidth

Monitoring Bandwidth acc. to FCC 47 CFR 15D / IC RSS-213	**Verdict: PASS**
EUT requirement rule parts and clause	Reference
	FCC 15.323(c)(7) / IC RSS-213 5.2
Test according to measurement reference	Reference Method
	ANSI C63.17 7.4
Requirements	
The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission	
Results	
Monitoring receiver	Verdict
The same as used for communication	PASS

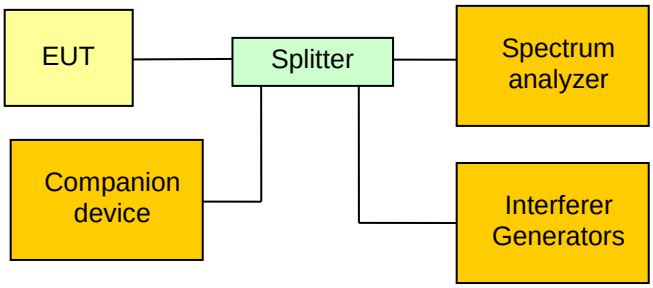
3.18 Test Conditions and Results – Monitoring reaction time and monitoring interval

Monitoring reaction time and monitoring interval acc. to FCC 47 CFR 15D / IC RSS-213	**Verdict: PASS**
EUT requirement rule parts and clause	Reference
	FCC 15.323(c)(7) / IC RSS-213 5.2
Test according referenced standards	Reference Method
	ANSI C63.17 7.5

Requirements

The monitor shall have a maximum reaction time less than 50xSQRT (1.25/emission(occupied) bandwidth in MHz) microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds. If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be 35xSQRT (1.25/emission (occupied) bandwidth in MHz) microseconds but shall not be required to be less than 35 microseconds.

Test setup



Test procedure

1. Using interferer signals operation is restricted to channel f_1
2. A time-synchronized, pulsed interference is applied to f_1 with a power level of $T_L + U_M$
3. For systems with a 10 ms frame time and N timeslots per frame, a channel interferer with N pulses in a 10 ms repetition period is applied
4. On f_2 a CW interferer with level equal to T_L is activated
5. The pulse width of the interferer pulses on f_1 is set to the largest of 50 µs and $50 \cdot \sqrt{1.25/Bandwidh[MHz]}$ µs
6. It is verified that the connection to the companion device is established on f_2 only
7. The level of the interferer pulses on f_1 is set to 6 dB above $T_L + U_M$
8. The pulse width on f_1 is set to the largest of 35 µs and $35 \cdot \sqrt{1.25/Bandwidh[MHz]}$ µs
9. It is verified that the connection to the companion device is established on f_2 only

Test results - FCC					
Channel	Emission bandwidth [MHz]	Pulse width from Bandwidth [µs]	Pulse width for test [µs]	Connection on channel f_2	Verdict
F_{LOW}	1.406	$50 \cdot \sqrt{1.25/B[MHz]}$ = 47.1	50	Yes	PASS
F_{LOW}	1.406	$35 \cdot \sqrt{1.25/B[MHz]}$ =33.0	35	Yes	PASS
F_{HIGH}	1.408	$50 \cdot \sqrt{1.25/B[MHz]}$ = 47.1	50	Yes	PASS
F_{HIGH}	1.408	$35 \cdot \sqrt{1.25/B[MHz]}$ = 33.0	35	Yes	PASS
Test results - IC					
Channel	Emission bandwidth [MHz]	Pulse width from Bandwidth [µs]	Pulse width for test [µs]	Connection possible	Verdict
F_{LOW}	1.208	$50 \cdot \sqrt{1.25/B[MHz]}$ = 50.9	50	Yes	PASS
F_{LOW}	1.208	$35 \cdot \sqrt{1.25/B[MHz]}$ = 35.6	35	Yes	PASS
F_{HIGH}	1.216	$50 \cdot \sqrt{1.25/B[MHz]}$ = 50.7	50	Yes	PASS
F_{HIGH}	1.216	$35 \cdot \sqrt{1.25/B[MHz]}$ = 35.5	35	Yes	PASS
Comments:					

3.19 Test Conditions and Results – Acknowledgements

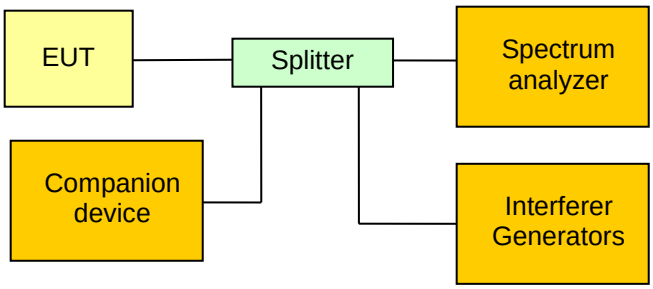
Acknowledgements acc. to FCC 47 CFR 15D / IC RSS-213	**Verdict: PASS**
EUT requirement rule parts and clause	Reference
	FCC 15.323(c)(4) / IC RSS-213 5.2
Test according referenced standards	Reference Method
	ANSI C63.17 8.2.1
EUT can initiate a communication session	Yes

Requirements

Once access to specific combined time and spectrum windows is obtained, an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease.

Periodic acknowledgements must be received at least every 30 seconds or transmission must cease.

Test setup



Test procedure

1. (Applies to EUTs that can initiate a communication session (e.g. portable parts)) The acknowledgement timeslots are blocked by interferer signals
2. An attempt to establish communication session is started from the EUT
3. The emissions from the EUT are monitored to verify that the EUT does not transmit for more than 1s
4. Next the acknowledgements are unblocked and another communication session is established between the EUT and the companion device
5. It is verified that the communication session is successful
6. (Applies to all EUTs) With all acknowledges unblocked, an communication session is initiated between the EUT and the companion device
7. The acknowledgements were blocked and the time the EUT continues to transmit is recorded

Test results

Maximum initial transmission [s]	Transmission time limit [s]	Verdict
0.402	1	PASS
Maximum transmission time [s]	Transmission time limit [s]	Verdict
1.09	30	PASS

Comments:

3.20 Test Conditions and Results – Transmission duration

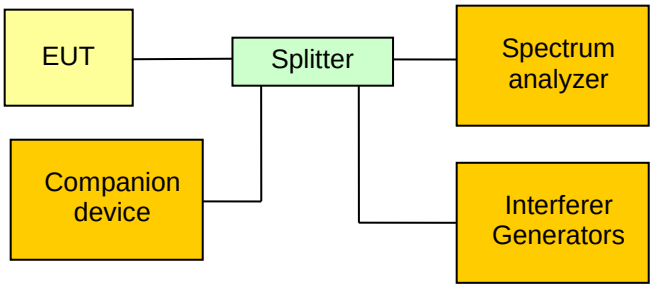
Transmission duration acc. to FCC 47 CFR 15D / IC RSS-213	**Verdict: N/A**
EUT requirement rule parts and clause	Reference
	FCC 15.323(c)(3) / IC RSS-213 5.2
Test according referenced standards	Reference Method
	ANSI C63.17 8.2.2

Requirements

If no signal above the threshold level is detected, transmission may commence and continue with the same emission bandwidth in the monitored time and spectrum windows without further monitoring.

However, occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.

Test setup



Test procedure

1. A communication session is established between the EUT and the companion device.
2. With the beginning of the communication session a counter is stared
3. An interferer is introduced on the communication channel to force the EUT to select a different communication channel if the communications has to be reestablished
4. As soon as the communication session switches to a different channel the time measurement is stopped

Test results

Total transmission time [h]	Transmission time limit	Verdict
1.0	8 hours	PASS

Comments:

For the DECT system the communication session is established by the portable part and the fixed part simply follows the portable part. Hence it's the responsibility of the portable part to control the maximum transmit period.

3.21 Test Conditions and Results – Duplex connections

Duplex connections acc. to FCC 47 CFR 15D / IC RSS-213	Verdict: PASS
EUT requirement rule parts and clause	Reference
	FCC 15.323(c)(10) / IC RSS-213 5.2
Test according referenced standards	Reference Method
	ANSI C63.17 8.3
EUT implements LIC algorithm	Yes
Number of duplex channels	> 20

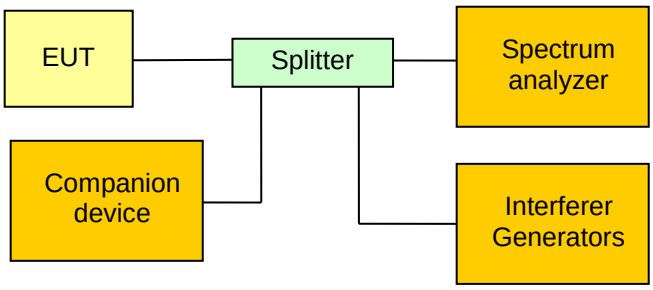
Requirements

An initiating device may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows.

If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window.

If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.

Test setup



Test procedure (EUT implements LIC algorithm and offer at least 20 duplex channels)
1. The path loss between the EUT and the companion device is adjusted such that the received signal to the EUT is at least 40 dB above $T_L + U_M$ 2. By the use of interference signals the EUT is restricted to channel f_1 3. An interference of level $T_L + U_M$ is applied per carrier on the enabled carriers on all its transmit time/spectrum windows except one, which has interference at least 10 dB below T_L 4. An interference of level $T_L + U_M$ + 7dB is applied per carrier on the enabled carriers on all its receive time/spectrum windows except one, which has interference at least 10 dB below T_L. The interference free receive time/spectrum window must not be the duplex mate of the interference-free transmit time/spectrum window 5. It is verified that the interference levels at the companion device are at least 10 dB below T_L for all time/spectrum windows 6. An attempt is made to establish a connection and it is verified that the connection is established on the interference-free receive time/spectrum window and its duplex mate 7. Next an interference of level $T_L + U_M$ + 7dB is applied per carrier on the enabled carriers on all its transmit time/spectrum windows except one, which has interference at least 10 dB below T_L 8. An interference of level $T_L + U_M$ is applied per carrier on the enabled carriers on all its receive time/spectrum windows except one, which has interference at least 10 dB below T_L. The interference free receive time/spectrum window must not be the duplex mate of the interference-free transmit time/spectrum window 9. It is verified that the interference levels at the companion device are at least 10 dB below T_L for all time/spectrum windows 10. An attempt is made to establish a connection and it is verified that the connection is established on the interference-free transmit time/spectrum window and its duplex mate

Test results			
Transmit time/spectrum windows	Receive time/spectrum windows	Connection time/spectrum window	Verdict
$T_L + U_M$	$T_L + U_M$ + 7dB	Receive	PASS
$T_L + U_M$ + 7dB	$T_L + U_M$	Transmit	PASS
Comments:			

3.22 Test Conditions and Results – Fair access

Fair access acc. to FCC 47 CFR 15D / IC RSS-213	Verdict: PASS
EUT requirement rule parts and clause	Reference
	FCC 15.323(c)(12) / IC RSS-213 5.2
Test according to measurement reference	Reference Method
	Customer declaration
Requirements	
The provisions of FCC 47 CRF 15.323(c)(10), IC RSS-213(b)(10) or FCC 47 CRF 15.323(c)(11), IC RSS-213(b)(11) shall not be used to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.	
Declaration	
The manufacturer declares that is device does not work in a mode which denies fair access to spectrum for other participants	

3.23 Test Conditions and Results – Frame period and Jitter

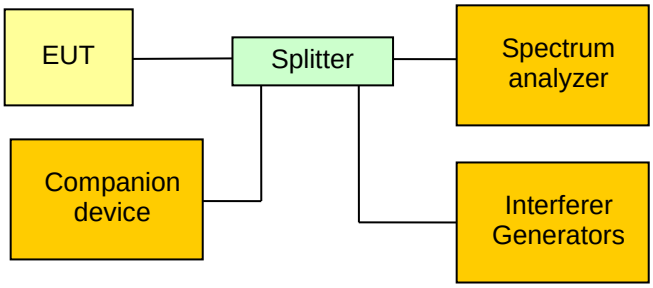
Frame period and Jitter acc. to FCC 47 CFR 15D / IC RSS-213	**Verdict: PASS**
EUT requirement rule parts and clause	Reference
	FCC 15.323(e) / IC RSS-213 5.2
Test according referenced standards	Reference Method
	ANSI C63.17 6.2.3

Requirements

The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in this sub-band shall be 20 milliseconds/X where X is a positive whole number.

The jitter (time-related, abrupt, spurious variations in the duration of the frame interval) introduced at the two ends of such a communication link shall not exceed 25 microseconds for any two consecutive transmissions.

Test setup



Test procedure

1. With a spectrum analyzer the frame periods are measured over time
2. 100 000 frames are measured
3. The peak-to-peak, mean and standard deviation values are computed

Test results – Frame period

Mean value [ms]	Divider X (10ms/X)	Verdict
9.999853 = 10.00 – 0.000147	1	PASS

Test results – Jitter

Maximum difference between frames [µs]	Limit [µs]	Verdict
0.091000	25 – 0.000147 = 24.999853	PASS

Comments:

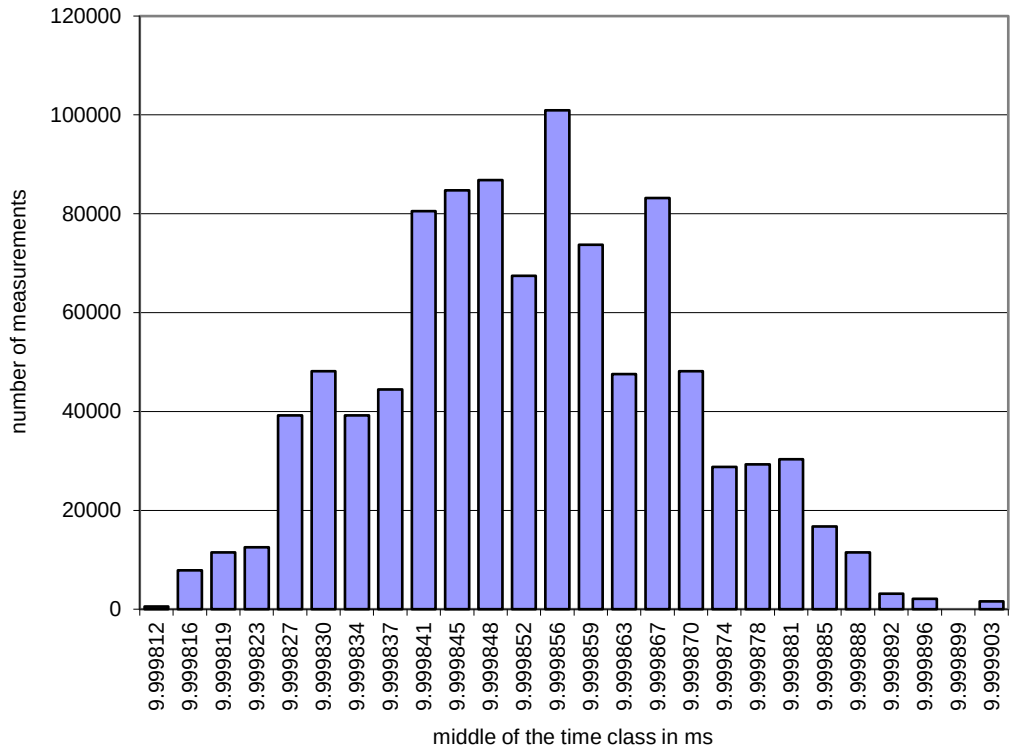
Frame period and Jitter

FCC Part 15.323 Frame Period and jitter

Testprocedure ANSI 63.17
UPCS

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	23°C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Frame Period and jitter
Width of the time class	0,003640 µs
Mean	9,999853 ms
Deviation	0,000016
Max-Min	0,091000 µs
Test result	Verdict = PASS

Histogram



3.24 Test Conditions and Results – Frame repetition stability

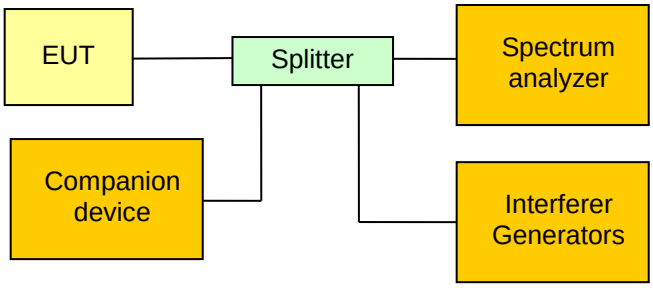
Frame repetition stability acc. to FCC 47 CFR 15D / IC RSS-213	**Verdict: PASS**
EUT requirement rule parts and clause	Reference
	FCC 15.323(e) / IC RSS-213 5.2
Test according referenced standards	Reference Method
	ANSI C63.17 6.2.2
Access scheme used	Time Division Multiple Access

Requirements

Each device that implements time division for the purpose of maintaining a duplex connection on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 50 parts per millions (ppm).

Each device which further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 10 ppm.

Test setup



Test procedure

1. With a spectrum analyzer the frame repetition periods are measured over time
2. 1 000 frame repetitions are measured
3. The mean and standard deviation values are computed

Test results

Access scheme	Error [ppm]	Limit [ppm]	Verdict
Time Division Access	N/A	50	N/A
Time Division Multiple Access	1.035705	10	PASS

Comments:

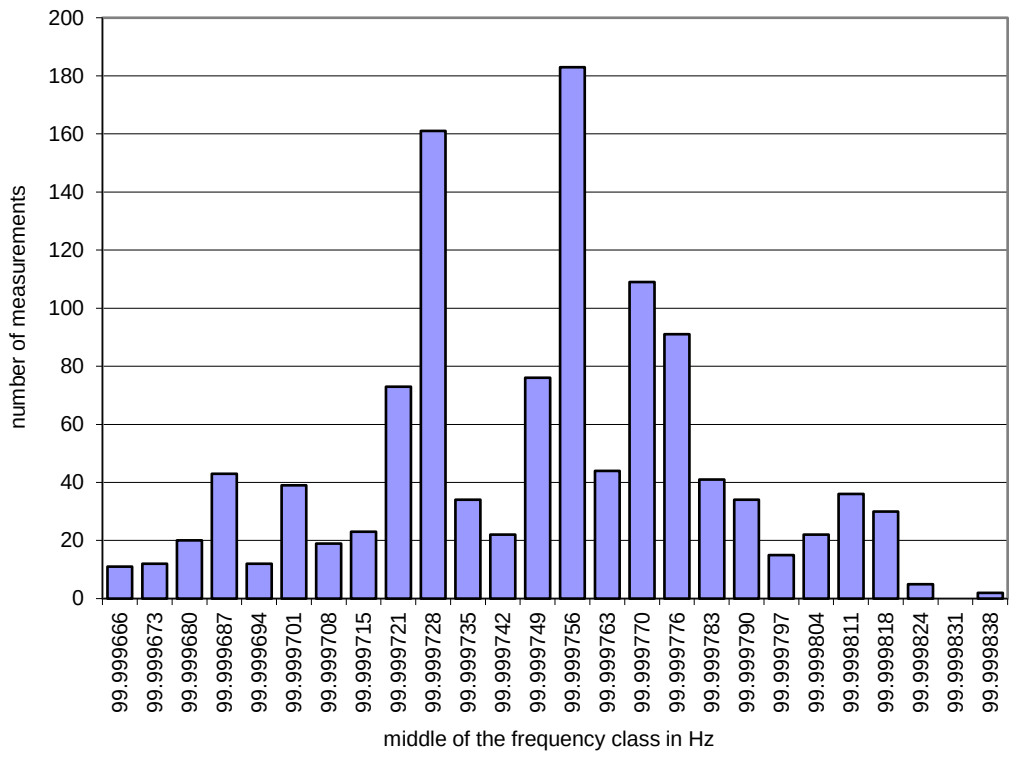
Frame repetition stability

FCC Part 15.323 Frame repetition

Testprocedure ANSI 63.17
UPCS

EUT	DECT / UPCS Module
Model	CT-DECT M7
Applicant	CeoTronics AG
Temperature	23°C
Test Site / Operator	Eurofins Product Service GmbH
Test Specification	Frame repetition
Width of the frequency class	0,000007 Hz
Mean	99,999749 Hz
Deviation	0,000035
Stability in ppm	1,035705 ppm
Test result	Verdict = PASS

Histogram



3.25 Test Conditions and Results – Maximum spectral occupancy

Maximum spectral occupancy acc. to FCC 47 CFR 15D / IC RSS-213	**Verdict: PASS**
EUT requirement rule parts and clause	Reference
	FCC 15.323(c)(5) / IC RSS-213 5.2
Test according referenced standards	Reference Method
	Customer declaration
Requirements	
No device or group of co-operating devices located within 1 meter of each other shall during any frame period occupy more than 6 MHz of aggregate bandwidth, or alternatively, more than one third of the time and spectrum windows defined by the system.	
Test result	
Evaluation	Verdict
According to the technical documentation the total number of time and spectrum windows is: 5 x 12 = 60 According to customer declaration the total number of concurrent time and spectrum windows is: 12 The number of concurrent allocated time and spectrum windows is less than one third of the total time and spectrum windows of the EUT	PASS
Comments:	