

TEST REPORT

Test report no.: 1-7988/14-02-05-A



Testing Laboratory

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Accredited Testing Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-01
Area of Testing:
Radio Communications & EMC (RCE)

Applicant

SBO Hearing A/S
Kongebakken 9
2765 Smørum/DENMARK
Phone: +45 39 13 85 38
Contact: Jørgen Peter Hanuscheck
e-mail: jnp@oticon.dk

Manufacturer

SBO Hearing A/S
Kongebakken 9
2765 Smørum/DENMARK

Test Standard/s

47 CFR Part 15 Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 8 Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item: Programming device for hearing aids
Model name: WLP Multi (e.g. FittingLINK WP-2)
FCC ID: 2ACAHWLP020
IC: 11936A-WLP020
Frequency [MHz]: ISM band 2400 MHz to 2483.5 MHz
(lowest channel 00 – 2402, highest channel 78 – 2480 MHz)
Technology tested: Bluetooth®+EDR
Antenna: Integrated PCB antenna
Power Supply: 3.70V DC by Li - Po battery
Temperature Range: 0°C to +40°C

Test report authorised:

p.o.

Jörg Warken
Professional

Test performed:

p.o.

Tobias Wittenmeier
Experienced

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2 General Information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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In no case this test report can be considered as a Letter of Approval.

2.2 Application details

Date of receipt of order:	2014-05-13
Date of receipt of test item:	2014-06-16
Start of test:	2014-06-23
End of test:	2014-06-27
Person(s) present during the test:	-/-

3 Test standard/s

Test Standard	Date	Test Standard Description
47 CFR Part 15	12.2010	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 8	12.2010	Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

4 Test Environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	+40 °C during high temperature tests
	T_{min}	0 °C during low temperature tests
Relative humidity:		55 %
Air pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	3.70 V DC by Li - Po battery
	V_{max}	4.10 V
	V_{min}	3.45 V

5 Test item

Kind of test item	:	Programming device for hearing aids
Type identification	:	WLP Multi (e.g. FittingLINK WP-2)
S/N serial number	:	Rad. 01901289 *) Cond. 01901271 (BTADDR: 00198E3005F6) *)
HW hardware status	:	assembly rev 00 - PCB rev 03
SW software status	:	1.4.2 + Power table fix (limited to 4dBm; 8dBm line removed in PSKEY_LC_ENHANCED_POWER_TABLE)
Frequency Band [MHz]	:	ISM band 2400 MHz to 2483.5 MHz (lowest channel 00 – 2402, highest channel 78 – 2480 MHz)
Type of Modulation	:	GFSK, Pi/4 DQPSK
Number of channels	:	79
Antenna	:	Integrated PCB antenna
Power Supply	:	3.70 V DC by Li - Po battery
Temperature Range	:	0°C to +40 °C

*) for multiple measurements, the used S/N's are explicitly mentioned in the test case.

5.1 Referenced documents

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup- and EUT-photos are included in test report:

1-7988/14-02-01_AnnexA
1-7988/14-02-01_AnnexB
1-7988/14-02-01_AnnexD

6 Test laboratories sub-contracted

None

7 Summary of measurement results

- No deviations from the technical specifications were ascertained
- There were deviations from the technical specifications ascertained

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 210, Issue 8, Annex 8	Passed	2014-07-21	-/-

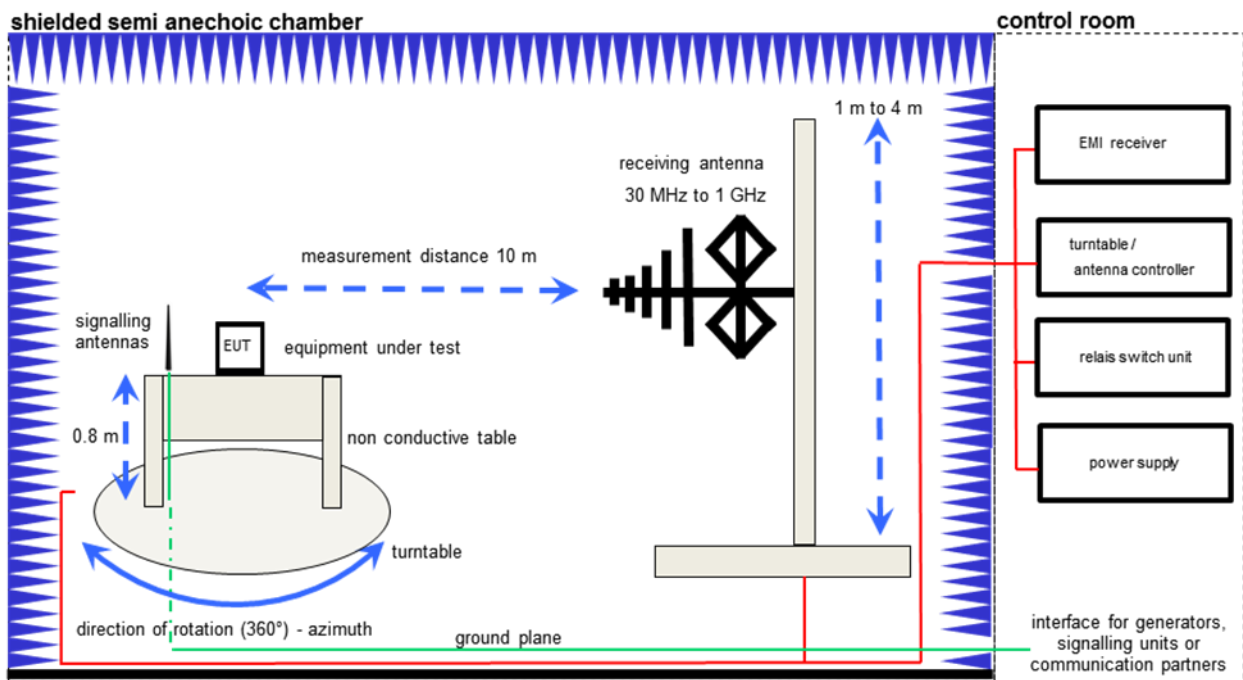
Test specification clause	Test case	Temperature conditions	Power source voltages	Mode	Pass	Fail	NA	NP	Remark
§15.247(b)(4) RSS 210 / A8.4(2)	Antenna gain	Nominal	Nominal	GFSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(e) RSS 210 / A8.2(b)	Power spectral density	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not applicable for FHSS!
§15.247(a)(1) RSS 210 / A8.1(b)	Carrier frequency separation	Nominal	Nominal	GFSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(a)(1) RSS 210 / A8.1(d)	Number of hopping channels	Nominal	Nominal	GFSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(a)(1) (iii) RSS 210 / A8.3(1)	Time of occupancy (dwell time)	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(a)(1) RSS 210 / A8.2(a)	Spectrum bandwidth of a FHSS system 20dB bandwidth	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	complies
§15.247(b)(1) RSS-210 / A8.4(2)	Maximum output power	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	complies
§15.247(d) RSS-210 / A8.5	Near band spurious emissions	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	complies
§15.205 RSS-210 / A8.5	Band edge compliance radiated	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions conducted	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions radiated	Nominal	Nominal	GFSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.109 RSS-Gen	RX spurious emissions radiated	Nominal	Nominal	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.209(a) RSS-Gen	TX spurious emissions radiated < 30 MHz	Nominal	Nominal	GFSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.107(a) §15.207	Conducted emissions < 30 MHz	Nominal	Nominal	GFSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

Note: NA = Not Applicable; NP = Not Performed

8 Description of the test setup

8.1 Radiated measurements chamber F

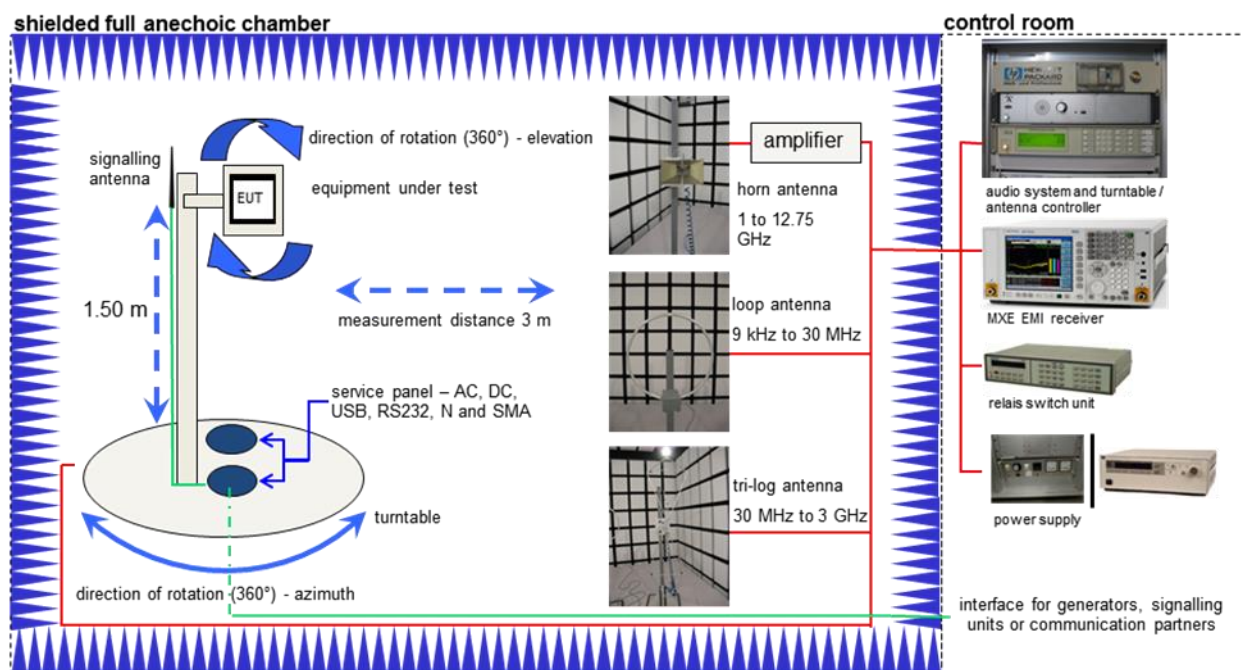
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Software	EMC32 V. 9.12.05	R&S	-/-	-/-
Switch-Unit	3488A	HP Meßtechnik	2719A14505	30000368
DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580
EMI Test Receiver	ESCI 3	R&S	100083	300003312
Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379
Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745
Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746
Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747
TRILOG Broadband Test- Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787
CBT (Bluetooth Tester + EDR Signalling)	CBT 1153.9000K35, CBT- B55, CBT-K55	R&S	100313	300003516

8.2 Radiated measurements chamber C



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405
TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854
Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351
Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789
Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032
Active Loop Antenna	6502	EMCO	8905-2342	300000256
Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156
Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erfi	91350	300001155
Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997
Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143
CBT (Bluetooth Tester + EDR Signalling)	CBT 1153.9000K35, CBT-B55, CBT-K55	R&S	100313	300003516

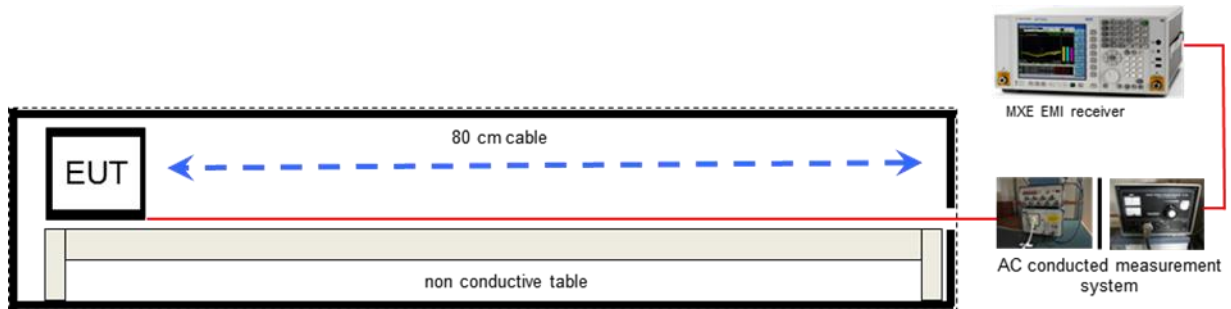
8.3 Radiated measurements 12.75 GHz to 26 GHz



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787
Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442
Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP Meßtechnik	00419	300002268
Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517
CBT (Bluetooth Tester + EDR Signalling)	CBT 1153.9000K35, CBT- B55, CBT-K55	R&S	100313	300003516

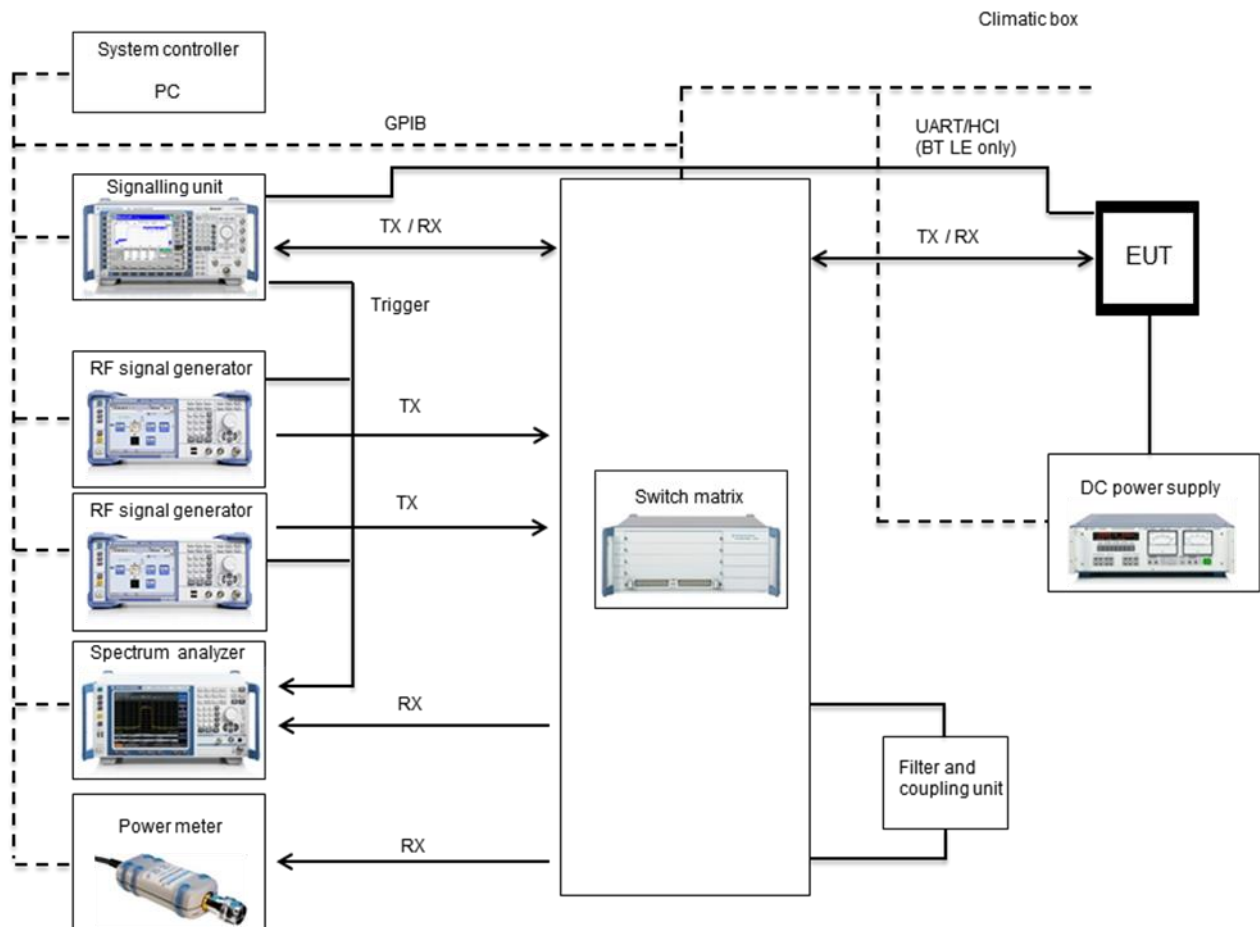
8.4 AC conducted



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405
Isolating Transformer	MPL IEC625 Bus Regeltrentravo	Erfi	91350	300001155
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001168
Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210
CBT (Bluetooth Tester + EDR Signalling)	CBT 1153.9000K35, CBT-B55, CBT-K55	R&S	100313	300003516

8.5 Conducted Bluetooth test system



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Power Supply DC	NGPE 40/40	R&S	388	400000078
Switch / Control Unit	SSCU	R&S	338864/003	300002681-0006
Precision Step Attenuator 50 Ohms, 0 - 2700MHz	RSP	R&S	834500/010	300002681-0007
Frequency Standard (Rubidium Frequency Standard)	MFS (Rubidium)	R&S (Datum)	002	300002681-0009
Directional Coupler	101020010	Krytar	70215	300002840
DC-Blocker	8143	Inmet Corp.	none	300002842
Powersplitter	6005-3	Inmet Corp.		300002841
Temperature Test Chamber	VT 4002	Heraeus Voetsch	58566046820010	300003019
CBT (Bluetooth Tester + EDR Signalling)	CBT 1153.9000K35	R&S	100185	300003416
Spectrum Analyzer 9kHz to 30GHz -140..+30dBm	FSP30	R&S	100886	300003575

8.6 Additional comments

The Bluetooth® word mark and logos are owned by the Bluetooth SIG Inc. and any use of such marks by Cetecom ICT Services GmbH is under license.

Reference documents: None

Special test descriptions: None

Configuration descriptions: TX tests: were performed with x-DH5 packets and static PRBS pattern payload.
RX/Standby tests: BT test mode enabled, scan enabled, TX Idle

Test mode:

- Bluetooth Test mode loop back enabled (EUT is controlled over CBT/CMU)
- Special software is used. EUT is transmitting pseudo random data by itself

9 Measurement results

9.1 Antenna gain

Measurement:

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal Bluetooth® devices, the GFSK modulation is used.

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3 MHz
Resolution bandwidth:	3 MHz
Span:	5 MHz
Trace-Mode:	Max hold

Limits:

FCC	IC
Antenna Gain	
6 dBi	

Results:

Note: For the purpose of additional information the average antenna gain was calculated based on the EIRP of three similar devices.

	<i>lowest channel 2402 MHz</i>	<i>mid channel 2441 MHz</i>	<i>highest channel 2480 MHz</i>
<i>Conducted peak power [dBm] GFSK (measured)*</i>	2.9	3.1	3.1
<i>Radiated peak power [dBm] GFSK EIRP (measured)¹⁾</i>	5.2	4.5	3.5
<i>Radiated peak power [dBm] GFSK EIRP (measured)²⁾</i>	3.3	5.0	4.9
<i>Radiated peak power [dBm] GFSK EIRP (measured)³⁾</i>	6.3	5.4	5.4
<i>Max. Gain [dBi] calculated</i>	3.4	2.3	2.3
<i>Average. Gain [dBi] calculated</i>	2.0	2.0	1.5

¹⁾Test sample 1 (SN:01901263)

²⁾Test sample 2 (SN:01901266)

³⁾Test sample 3 (SN:01901289)

Result: Passed

9.2 Power spectral density

Description:

Measurement of the power spectral density of a digital modulated system. This requirement is only valid for digitally modulated systems without hopping functionality.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	500 s
Video bandwidth:	3 kHz
Resolution bandwidth:	3 kHz
Span:	150 kHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Power Spectral Density	
For digitally modulated systems the transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0-second duration.	

Results:

Modulation	Power spectral density [dBm/3kHz]		
	2412 MHz	2437 MHz	2462 MHz
Frequency			
GFSK	Not required for hopping systems!		
Pi/4 DQPSK			
8DPSK			
Measurement uncertainty	± 1.5 dB		

9.3 Carrier frequency separation

Description:

Measurement of the carrier frequency separation of a hopping system. The carrier frequency separation is constant for all modulation-modes. We use GFSK-modulation to show compliance. EUT in hopping mode.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	4 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Carrier Frequency Separation	
Minimum 25 kHz or two-thirds of the 20 dB bandwidth of the hopping system whichever is greater.	

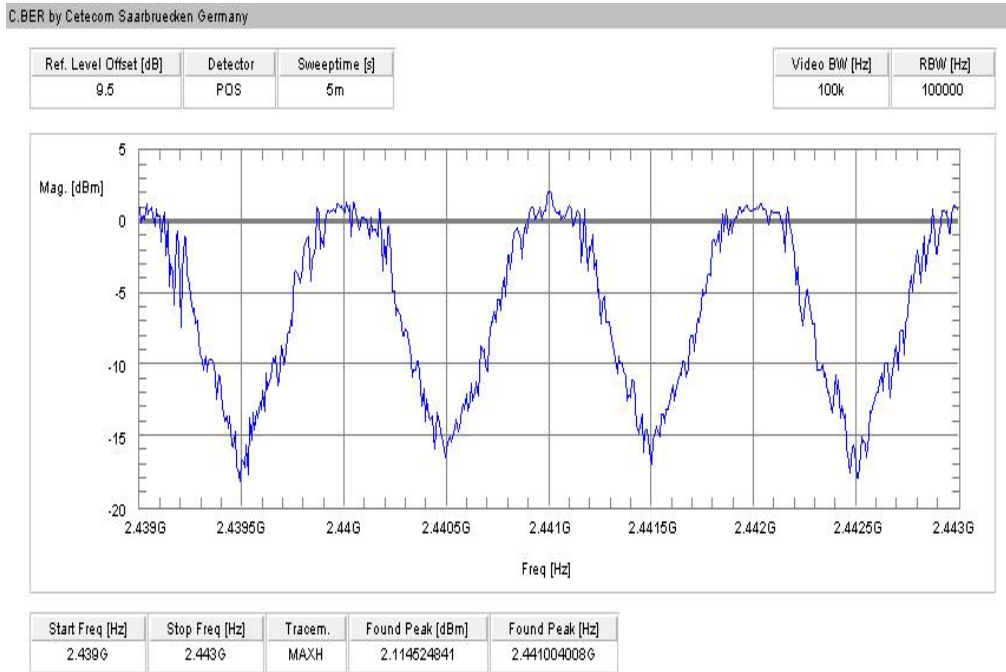
Result:

Carrier frequency separation	~ 1 MHz
------------------------------	---------

Result: Passed

Plot:

Plot 1: Carrier frequency separation (GFSK modulation)



9.4 Number of hopping channels

Description:

Measurement of the total number of used hopping channels. The number of hopping channels is constant for all modulation-modes. We use GFSK-modulation to show compliance. EUT in hopping mode.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	500 kHz
Resolution bandwidth:	500 kHz
Span:	Plot 1: 2400 – 2445 MHz Plot 2: 2445 – 2485 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Number of hopping channels	
At least 15 non overlapping hopping channels	

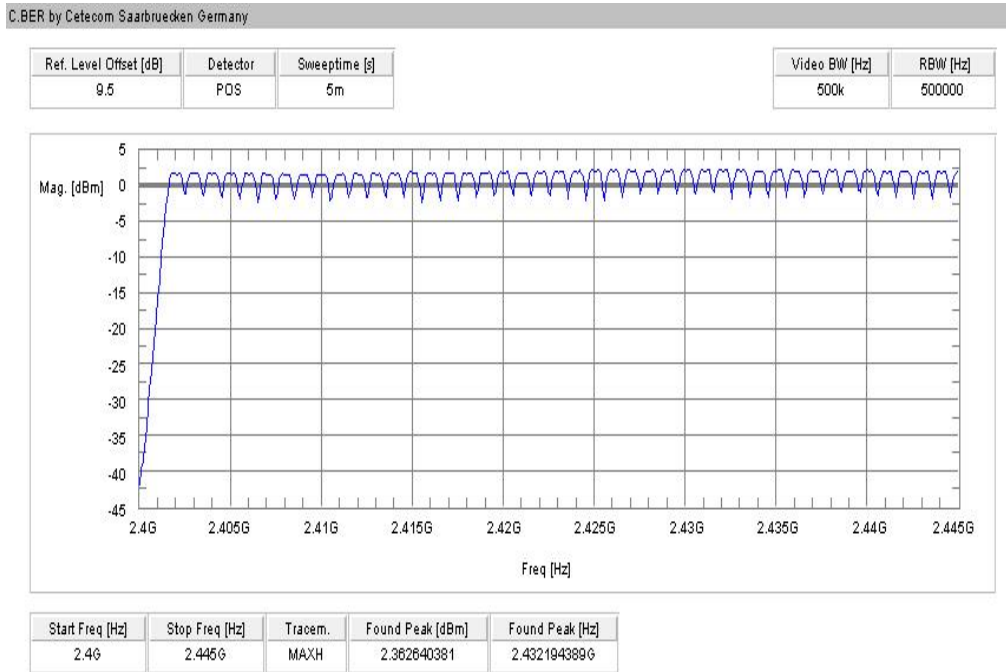
Result:

Number of hopping channels	79
----------------------------	----

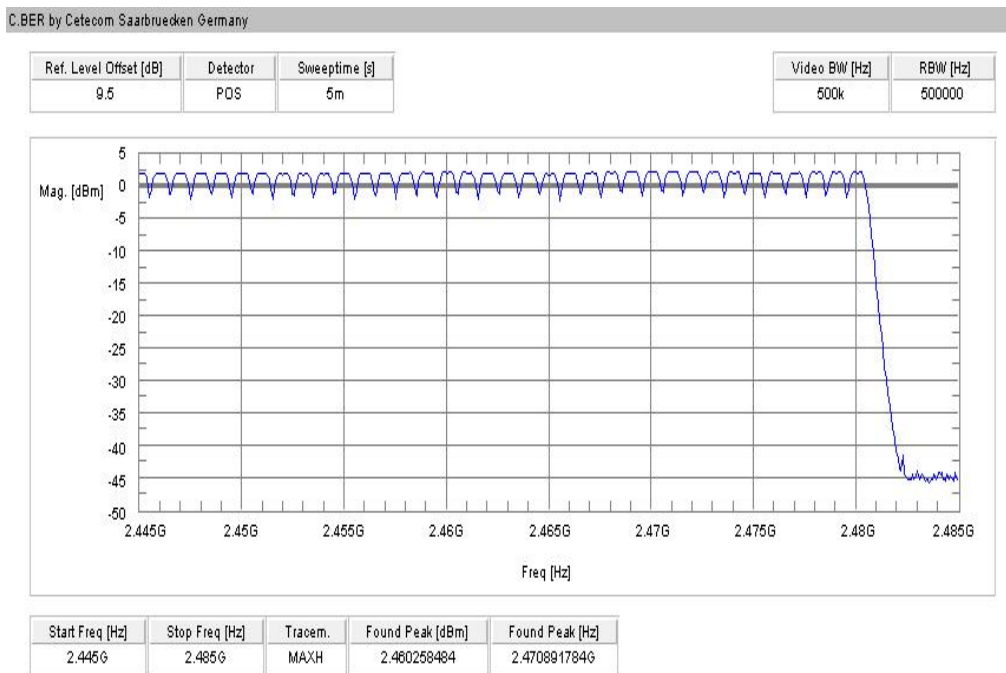
Result: Passed

Plots:

Plot 1: Number of hopping channels (GFSK modulation)



Plot 2: Number of hopping channels (GFSK modulation)



9.5 Time of occupancy (dwell time)

Measurement:

For Bluetooth® devices no measurements mandatory depending on the fixed requirements according to the Bluetooth® Core Specifications!

For Bluetooth® devices:

The channel staying time of 0.4 s within a 31.6 second period in data mode is constant for Bluetooth® devices and independent from the packet type (packet length). The calculation for a 31.6 second period is as follows:

Channel staying time = time slot length * hop rate / number of hopping channels * 31.6 s

Example for a DH1 packet (with a maximum length of one time slot)
 Channel staying time = $625 \mu\text{s} * 1600 * 1/\text{s} / 79 * 31.6 \text{ s} = 0.4 \text{ s}$ (in a 31.6 s period)

For multi-slot packets the hopping is reduced according to the length of the packet.

Example for a DH3 packet (with a maximum length of three time slots)
 Channel staying time = $3 * 625 \mu\text{s} * 1600/3 * 1/\text{s} / 79 * 31.6 \text{ s} = 0.4 \text{ s}$ (in a 31.6 s period)

Example for a DH5 packet (with a maximum length of five time slots)
 Channel staying time = $5 * 625 \mu\text{s} * 1600/5 * 1/\text{s} / 79 * 31.6 \text{ s} = 0.4 \text{ s}$ (in a 31.6 s period)

This is according to the Bluetooth® Core Specification V2.1 & V3.0 & V4.0 & V4.1 for all Bluetooth® devices and all modulations.

The following table shows the relations:

Packet Size	Pulse Width [ms] *	Max. number of transmissions per channel in 31.6 sec
DH1	0.366	640
DH3	1.622	214
DH5	2.870	128

* according to Bluetooth® specification

Results:

Packet Size	Pulse Width [ms]*	Max. number of transmissions in 31.6 sec	Dwell time [Pulse width * Number of transmissions]
DH1	0.366	640	234.2 ms
DH3	1.622	214	347.1 ms
DH5	2.870	128	367.4 ms

Limits:

FCC	IC
Time of occupancy (dwell time)	
The frequency hopping operation shall have an average time of occupancy on any frequency not exceeding 0.4 seconds within a duration in seconds equal to the number of hopping frequencies multiplied by 0.4.	

Result: Passed

9.6 Spectrum bandwidth of a FHSS system – 99 % bandwidth

Description:

Measurement of the 20dB bandwidth of the modulated signal. The measurement is performed according to the “Measurement Guidelines” (DA 00-705, March 30, 2000). EUT in single channel mode.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	30 kHz
Resolution bandwidth:	10 kHz
Span:	6 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Spectrum bandwidth of a FHSS system – 99% bandwidth	
GFSK < 1500 kHz Pi/4 DQPSK < 1500 kHz 8DPSK < 1500 kHz	

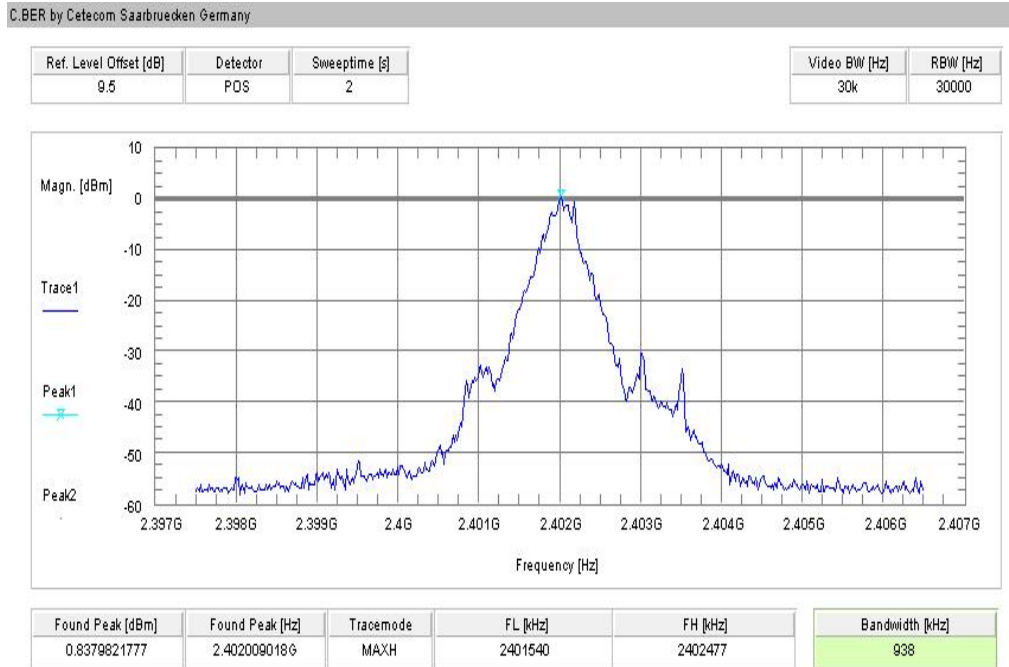
Results:

Modulation Frequency	99 % bandwidth [kHz]		
	2402 MHz	2441 MHz	2480 MHz
GFSK	938	920	938
Pi/4 DQPSK	1244	1263	1263
Measurement uncertainty	± 10 kHz		

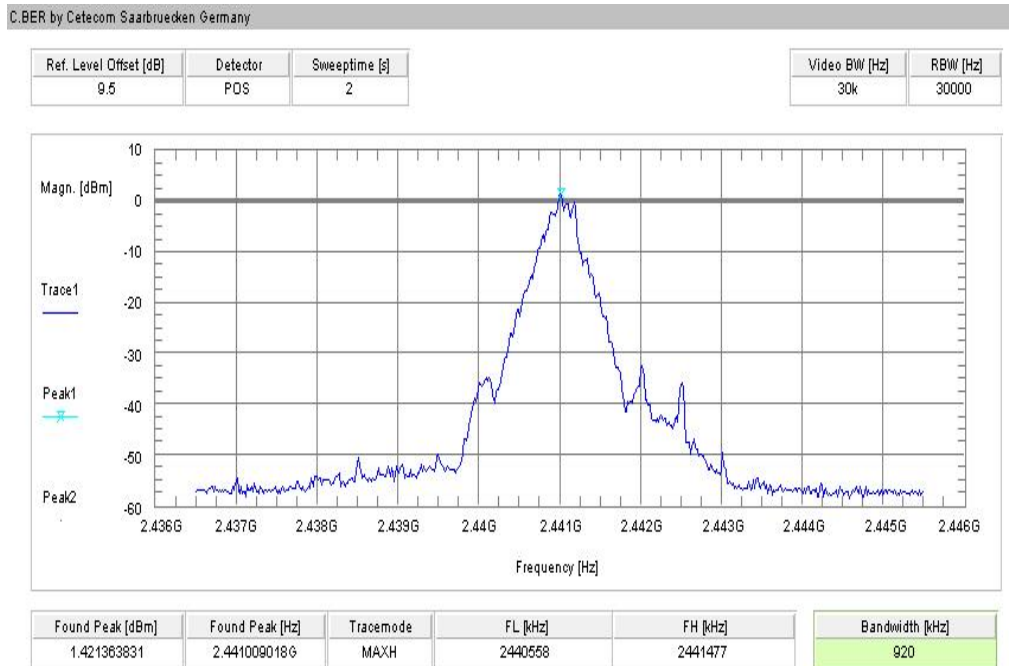
Result: Passed

Plots:

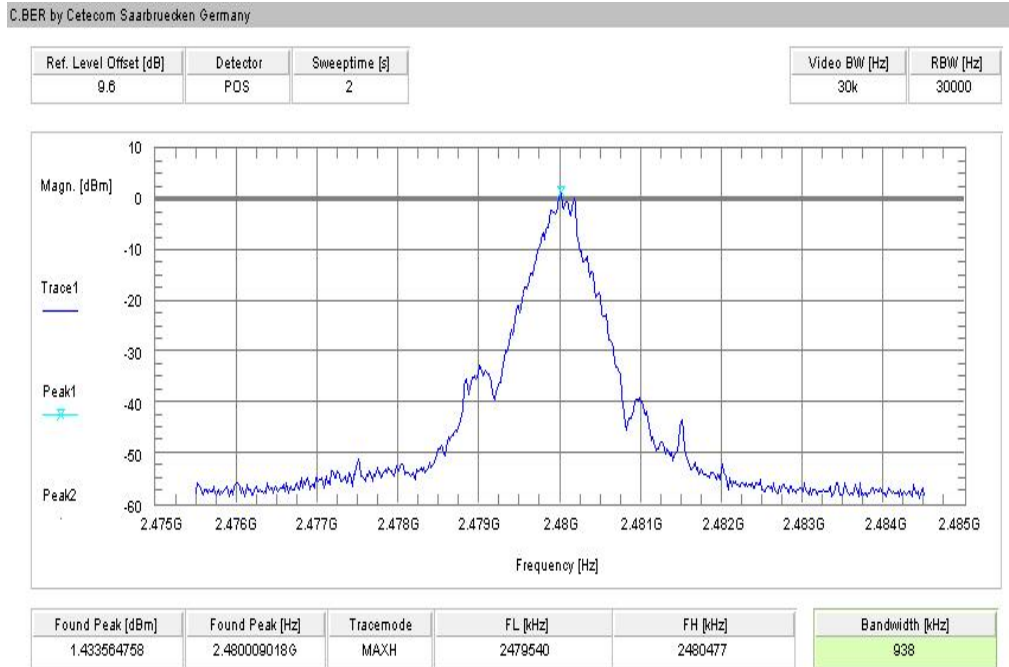
Plot 1: lowest channel – 2402 MHz, GFSK modulation



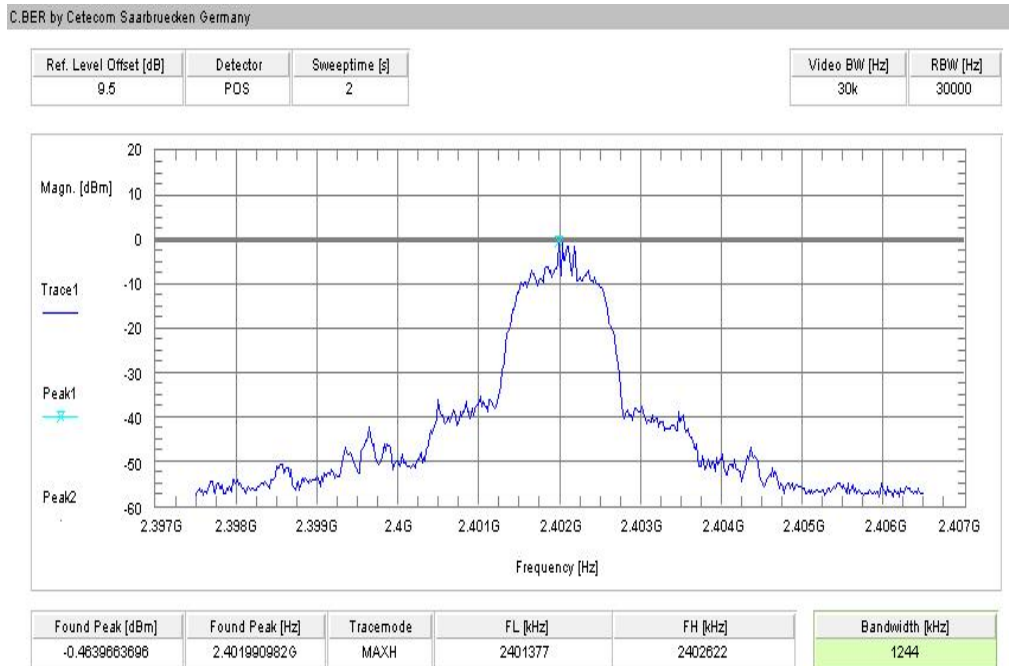
Plot 2: middle channel – 2441 MHz, GFSK modulation



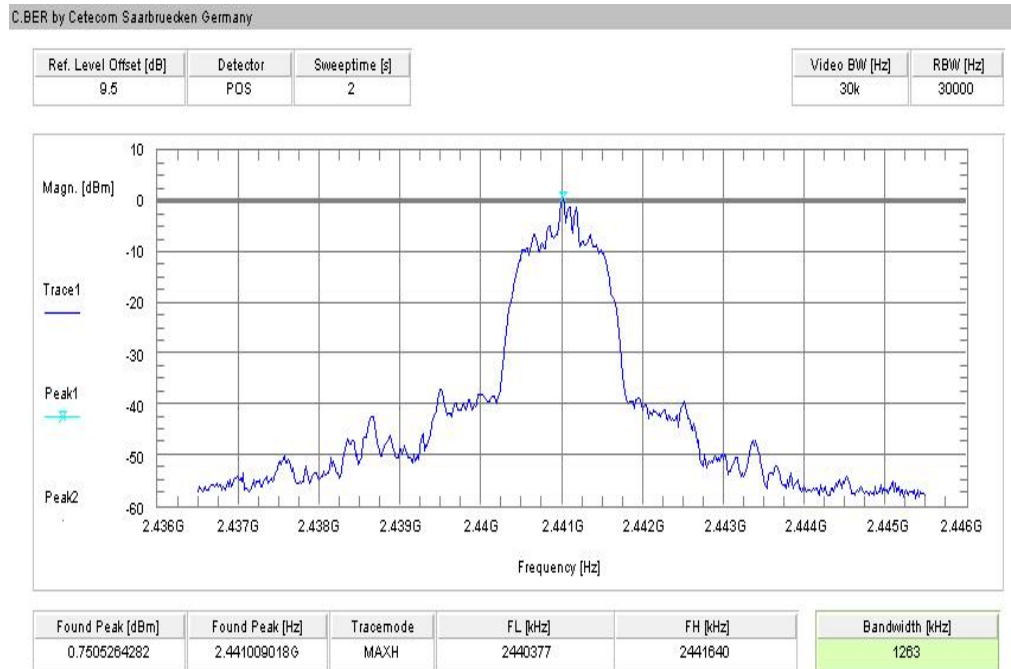
Plot 3: highest channel – 2480 MHz, GFSK modulation



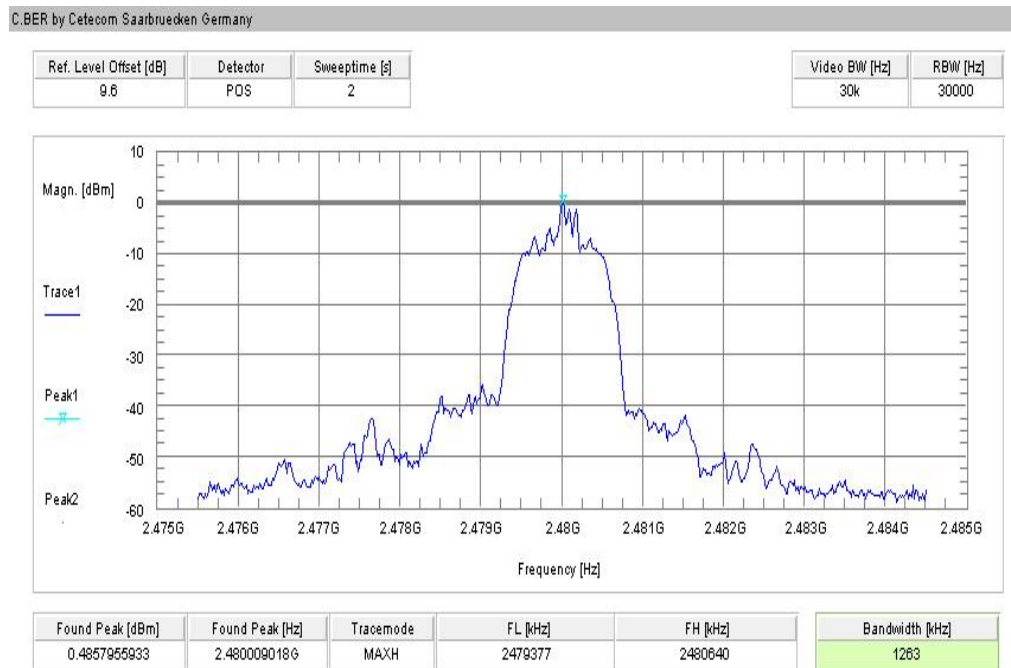
Plot 4: lowest channel – 2402 MHz, Pi / DQPSK modulation



Plot 5: middle channel – 2441 MHz, Pi / DQPSK modulation



Plot 6: highest channel – 2480 MHz, Pi / DQPSK modulation



9.7 Maximum output power

Description:

Measurement of the maximum output power conducted and radiated. EUT in single channel mode.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3 MHz
Resolution bandwidth:	3 MHz
Span:	5 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Maximum output power	
[Conducted: 0.125 W – antenna gain max. 6 dBi] Systems using more than 75 hopping channels: Conducted: 1.0 W – antenna gain max. 6 dBi	

Results:

Modulation Frequency	Maximum output power conducted [dBm]		
	2402 MHz	2441 MHz	2480 MHz
GFSK	2.9	3.1	3.1
Pi/4 DQPSK	2.1	2.4	2.2
Measurement uncertainty	± 1 dB		

Result: Passed**Results:**

Modulation Frequency	Maximum output power radiated - EIRP [dBm]		
	2402 MHz	2441 MHz	2480 MHz
GFSK *)	4.9	5.1	4.6
Pi/4 DQPSK *)	4.1	4.4	3.7
Measurement uncertainty	± 3 dB		

*) - Values calculated with antenna gain

Result: Passed

9.8 Near band spurious emissions conducted

Description:

EUT is measured at the lower and upper band edge in single channel and hopping mode. The measurement is repeated for all modulations.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	Lower Band Edge: 2395 – 2405 MHz higher Band Edge: 2478 – 2489 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Near band spurious emissions conducted	
<p>In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.</p>	

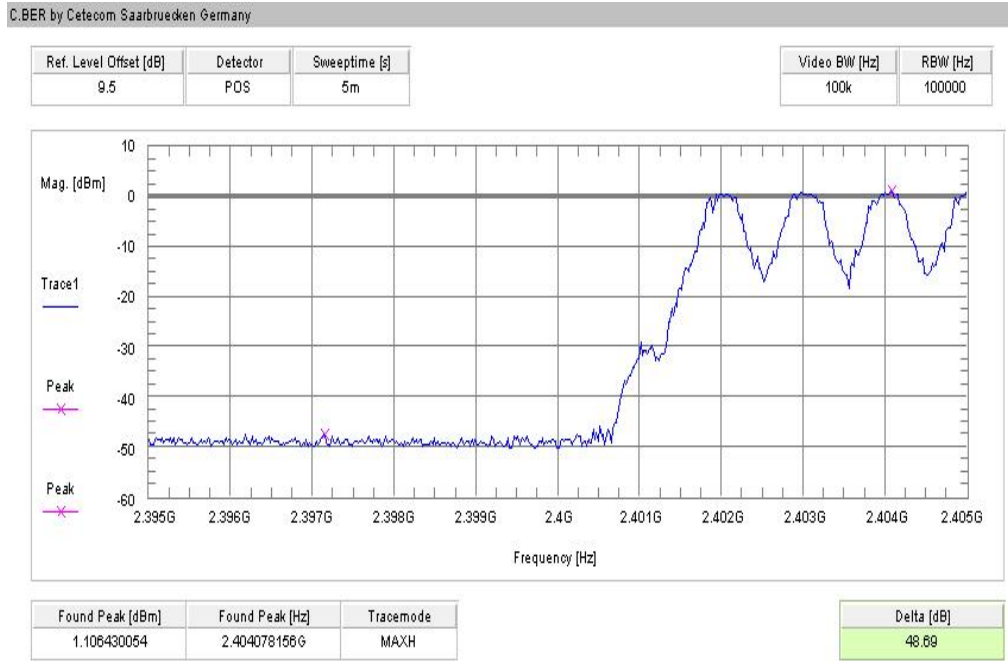
Results:

Scenario Modulation	Near band spurious emissions conducted [dB]		
	GFSK	Pi/4 DQPSK	8DPSK
Lower band edge – hopping off	> 20 dB	> 20 dB	-/-
Lower band edge – hopping on	> 20 dB	> 20 dB	-/-
Upper band edge – hopping off	> 20 dB	> 20 dB	-/-
Upper band edge – hopping on	> 20 dB	> 20 dB	-/-
Measurement uncertainty	± 1.5 dB		

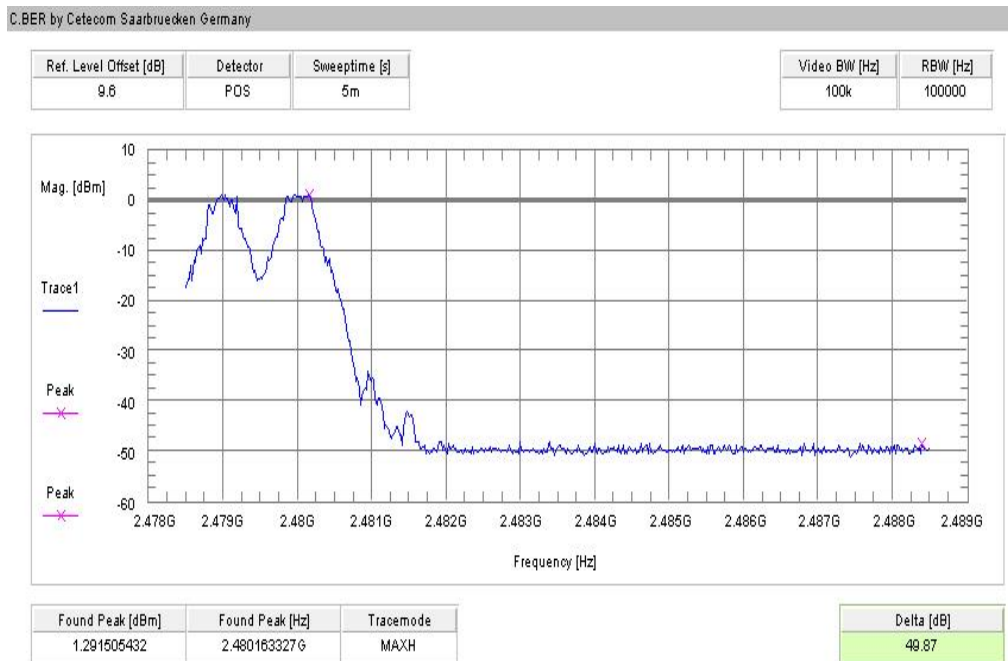
Result: Passed

Plots:

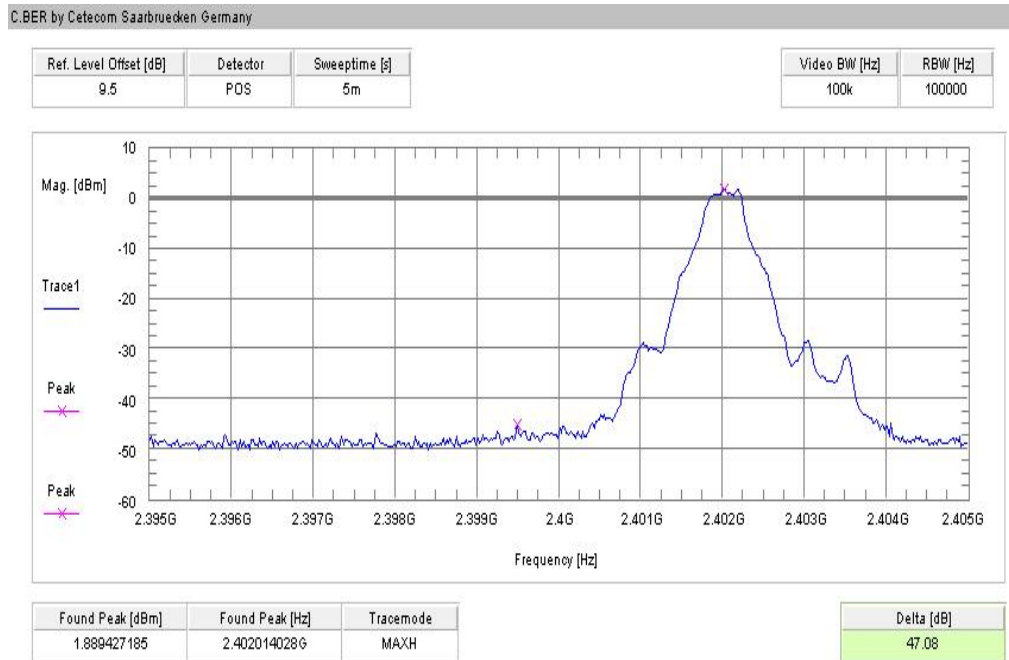
Plot 1: Lower band edge – hopping on, GFSK modulation



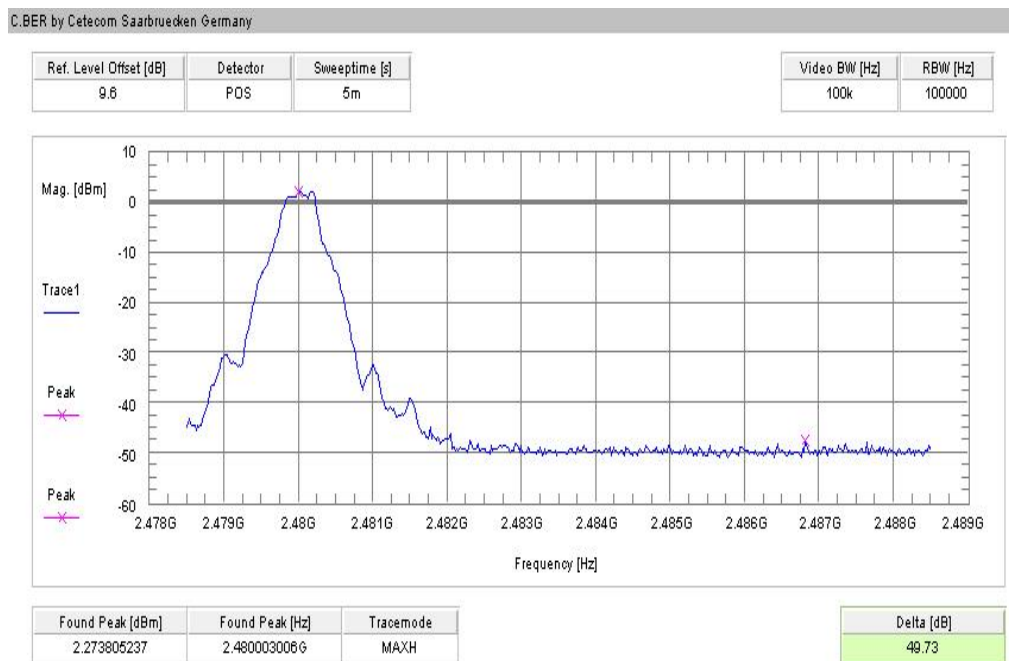
Plot 2: Upper band edge – hopping on, GFSK modulation



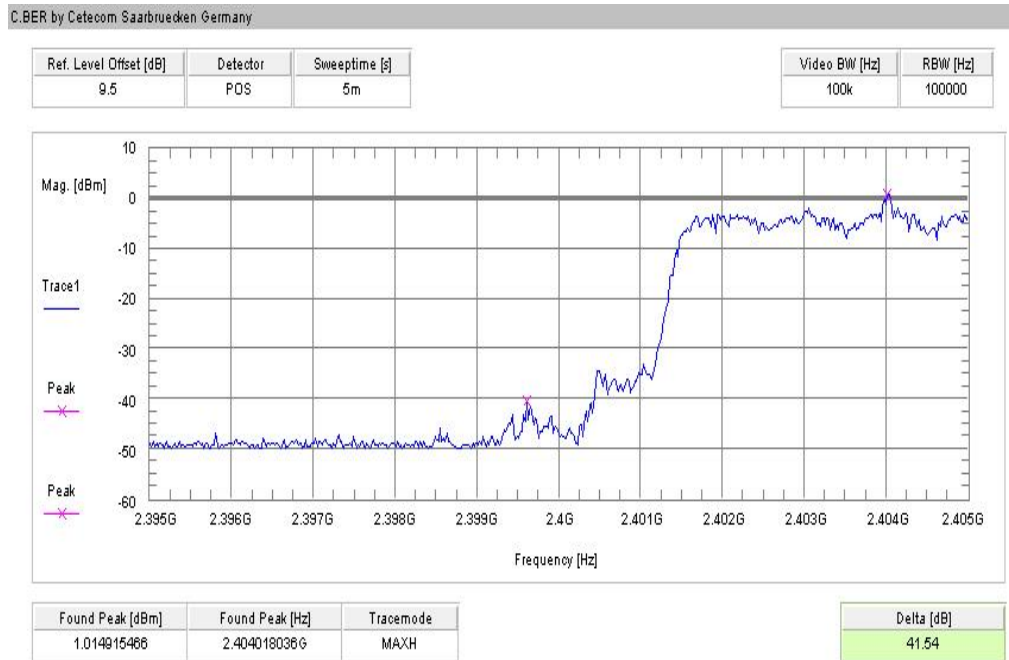
Plot 3: Lower band edge – hopping off, GFSK modulation



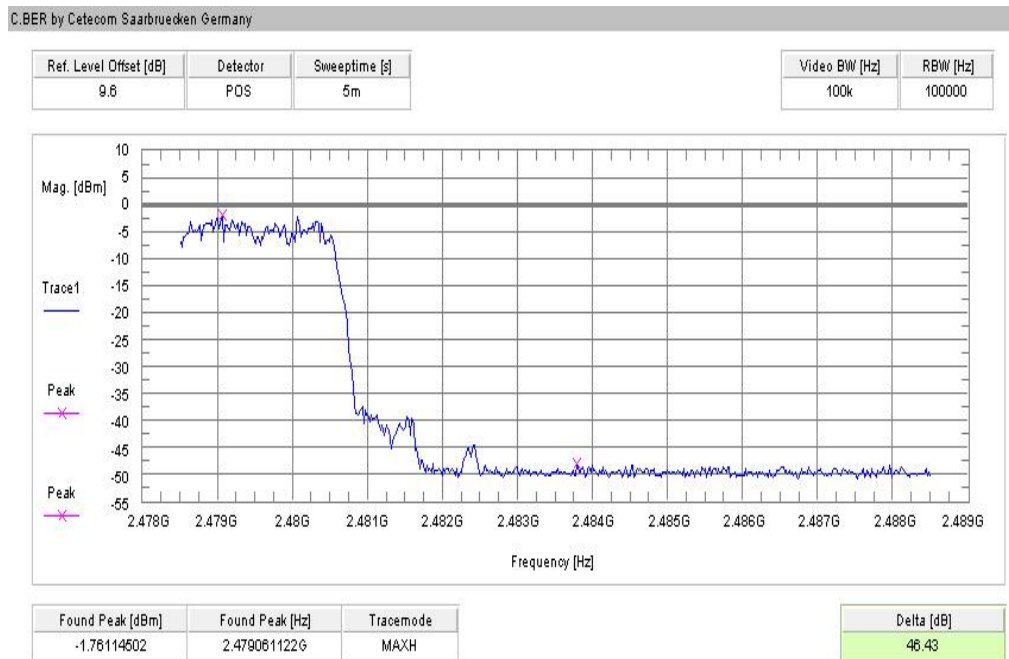
Plot 4: Upper band edge – hopping off, GFSK modulation



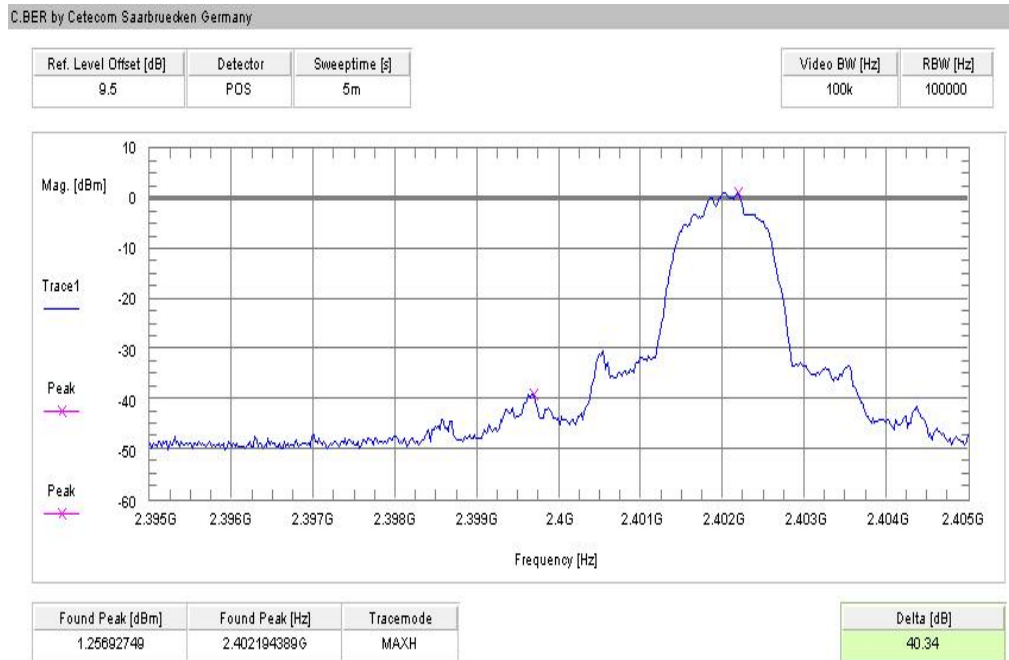
Plot 5: Lower band edge – hopping on, Pi/4 DQPSK modulation



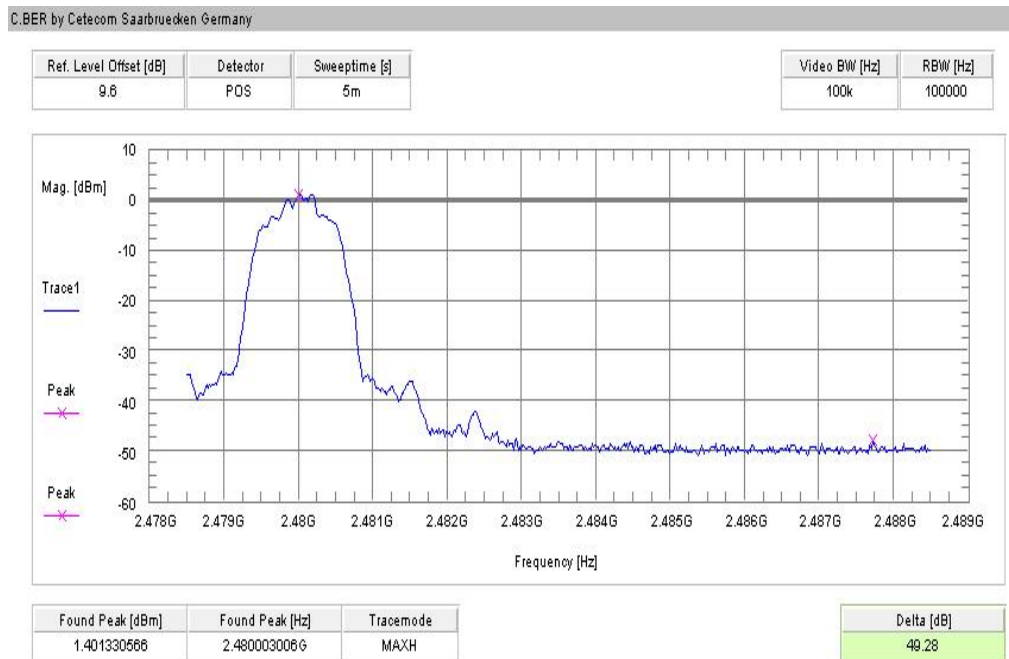
Plot 6: Upper band edge – hopping on, Pi/4 DQPSK modulation



Plot 7: Lower band edge – hopping off, Pi/4 DQPSK modulation



Plot 8: Upper band edge – hopping off, Pi/4 DQPSK modulation



9.9 Band edge compliance radiated

Description:

Measurement of the radiated band edge compliance. The EUT is turned in the position that results in the maximum level at the band edge. Then a sweep over the corresponding restricted band is performed. The EUT is set to single channel mode and the transmit channel is channel 00 for the lower restricted band and channel 78 for the upper restricted band. The measurement is repeated for all modulations. Measurement distance is 3m.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	1 MHz Peak / 10 Hz AVG
Resolution bandwidth:	1 MHz
Span:	Lower Band: 2370 – 2400 MHz higher Band: 2480 – 2500 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Band edge compliance radiated	
<p>In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, 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 5.205(c)).</p>	
54 dB μ V/m AVG 74 dB μ V/m Peak	

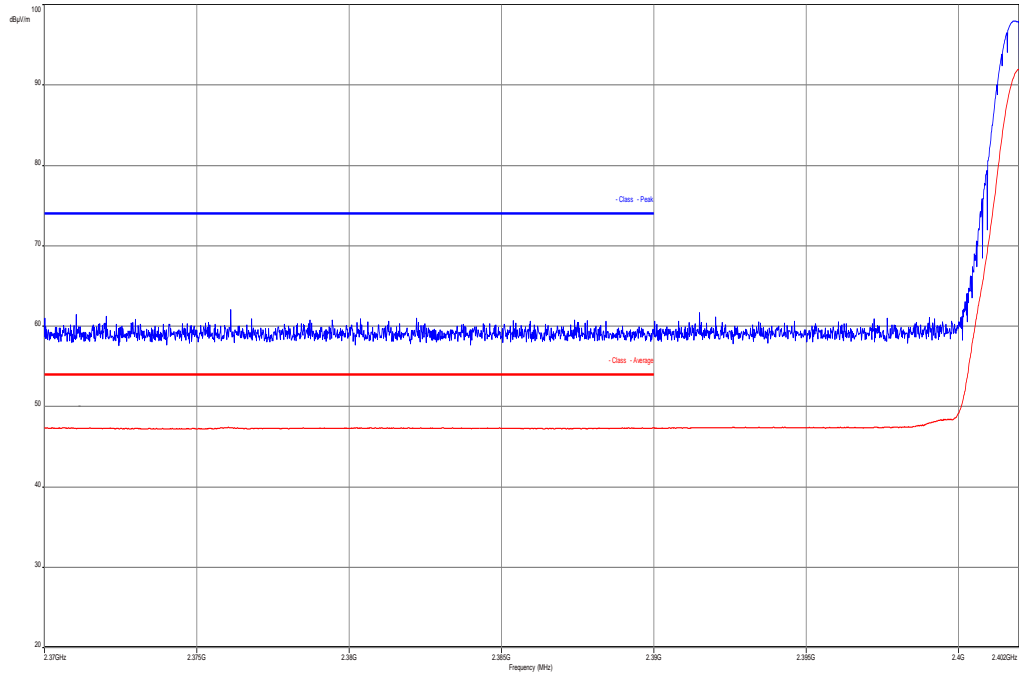
Results:

Scenario Modulation	Band edge compliance radiated [dB μ V/m]		
	GFSK	Pi/4 DQPSK	8DPSK
Lower restricted band	< 54 AVG / < 74 PP	< 54 AVG / < 74 PP	-/-
Upper restricted band	< 54 AVG / < 74 PP	< 54 AVG / < 74 PP	-/-
Measurement uncertainty	± 3 dB		

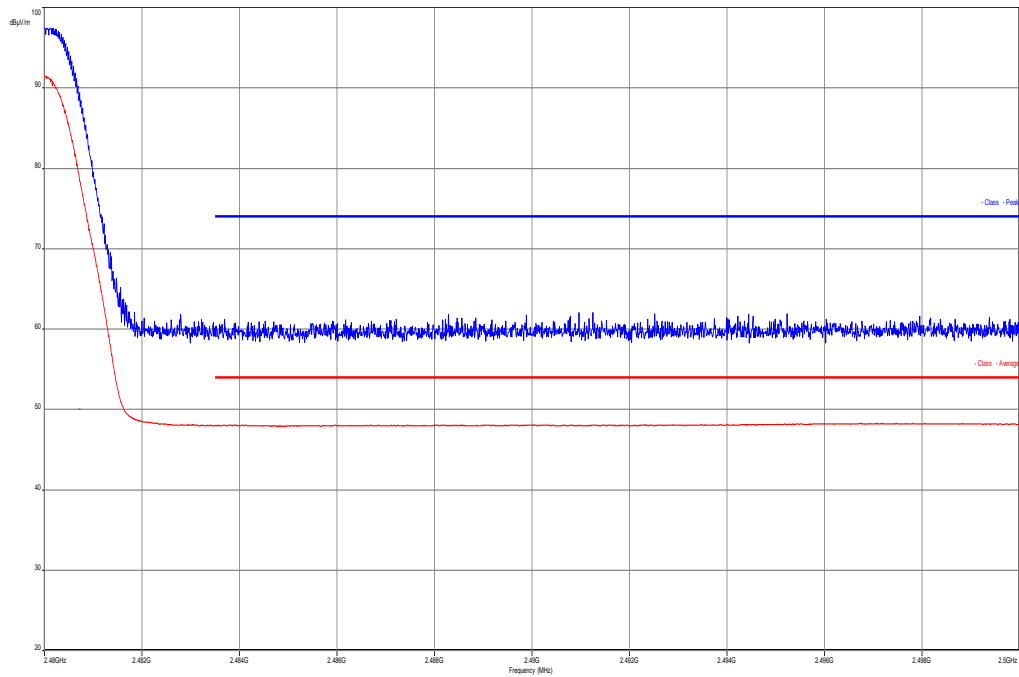
Result: Passed

Plots:

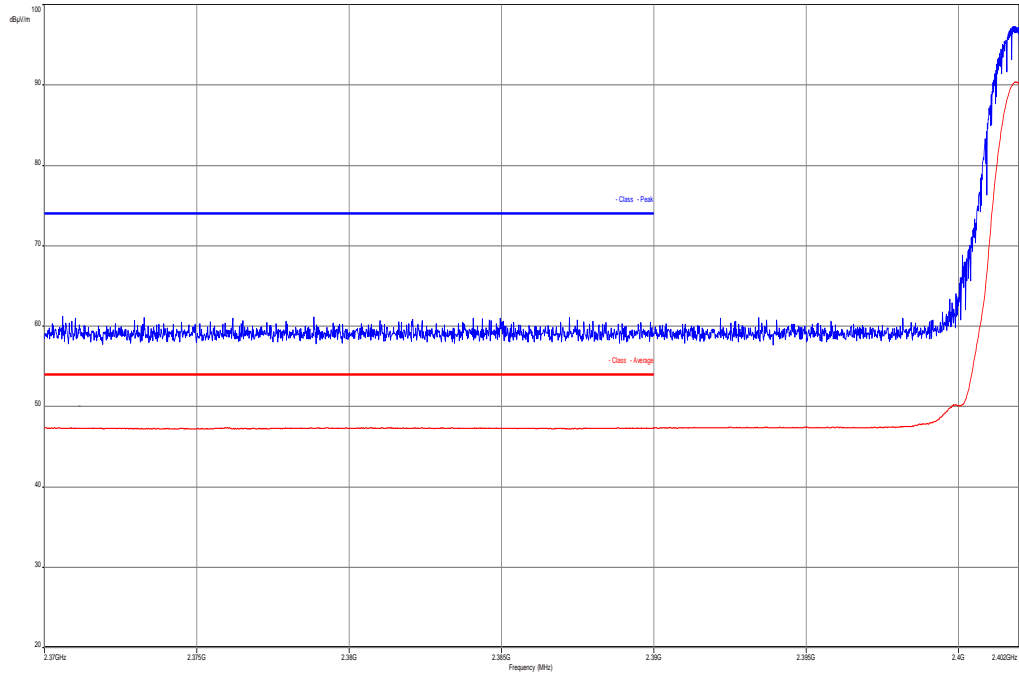
Plot 1: Lower band edge, GFSK modulation, vertical & horizontal polarization



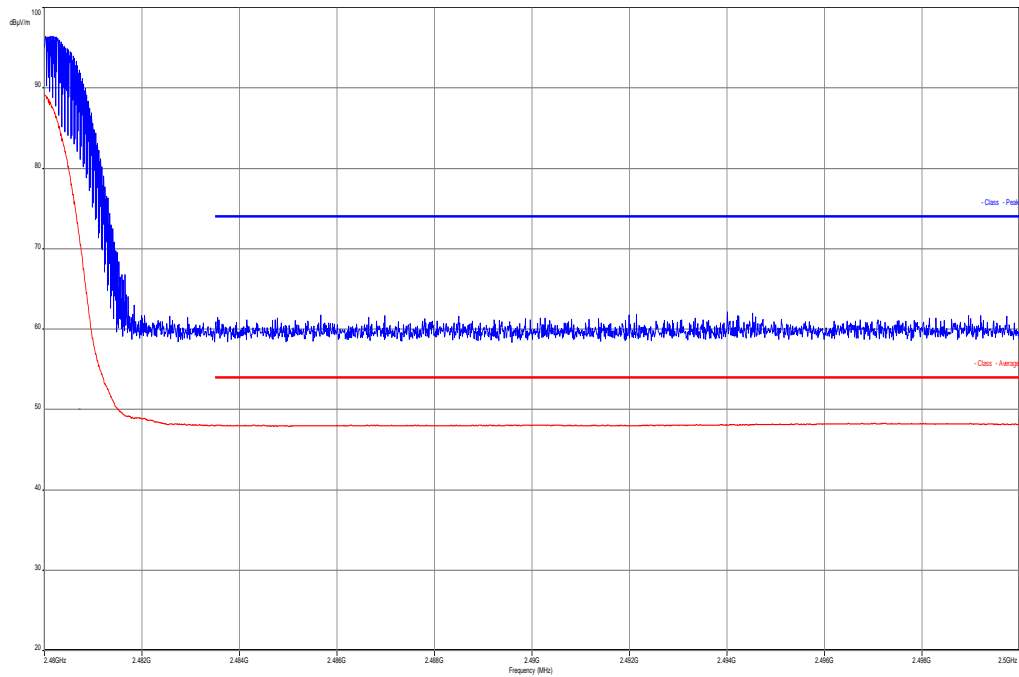
Plot 2: Upper band edge, GFSK modulation, vertical & horizontal polarization



Plot 3: Lower band edge, Pi/4 DQPSK modulation, vertical & horizontal polarization



Plot 4: Upper band edge, Pi/4 DQPSK modulation, vertical & horizontal polarization



9.10 TX spurious emissions conducted

Description:

Measurement of the conducted spurious emissions in transmit mode. The EUT is set to single channel mode and the transmit channel is channel 00, channel 39 and channel 78. The measurement is repeated for all modulations.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	F < 1 GHz: 500 kHz F > 1 GHz: 500 kHz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 100 kHz
Span:	9 kHz to 25 GHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
TX spurious emissions conducted	
<p>In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required</p>	

Results:

TX spurious emissions conducted					
GFSK - mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2402		See plot	30 dBm		Operating frequency
<i>No traceable peaks detected</i>			-20 dBc		complies
2441		See plot	30 dBm		Operating frequency
<i>No traceable peaks detected</i>			-20 dBc		complies
2480		See plot	30 dBm		Operating frequency
<i>No traceable peaks detected</i>			-20 dBc		complies
Measurement uncertainty		± 3 dB			

Result: Passed

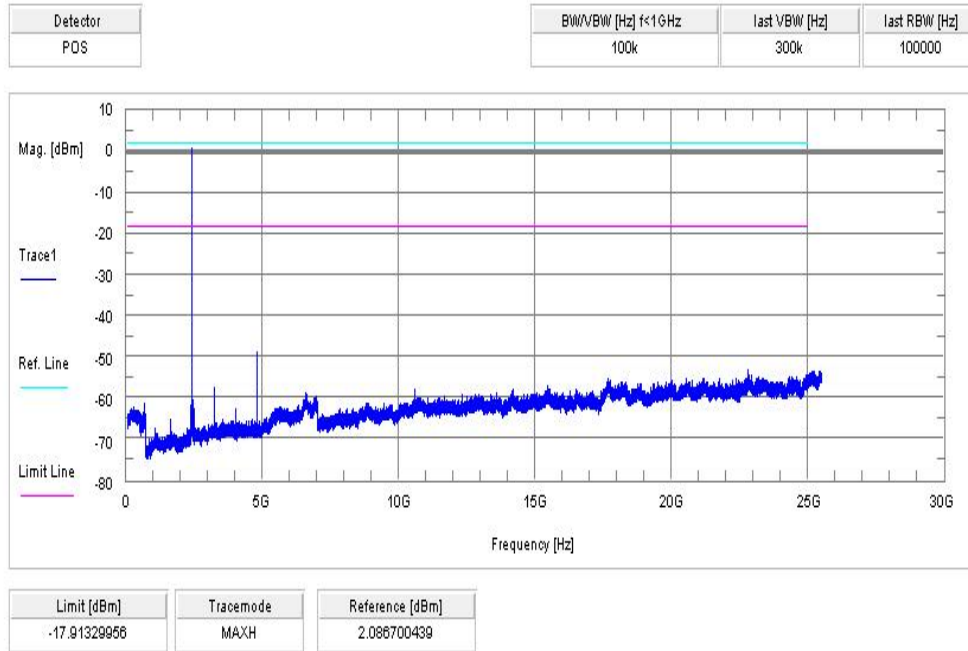
Results:

TX spurious emissions conducted					
Pi/4-DQPSK - mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2402		See plot	30 dBm		Operating frequency
<i>No traceable peaks detected</i>			-20 dBc		complies
2441		See plot	30 dBm		Operating frequency
<i>No traceable peaks detected</i>			-20 dBc		complies
2480		See plot	30 dBm		Operating frequency
<i>No traceable peaks detected</i>			-20 dBc		complies
Measurement uncertainty		± 3dB			

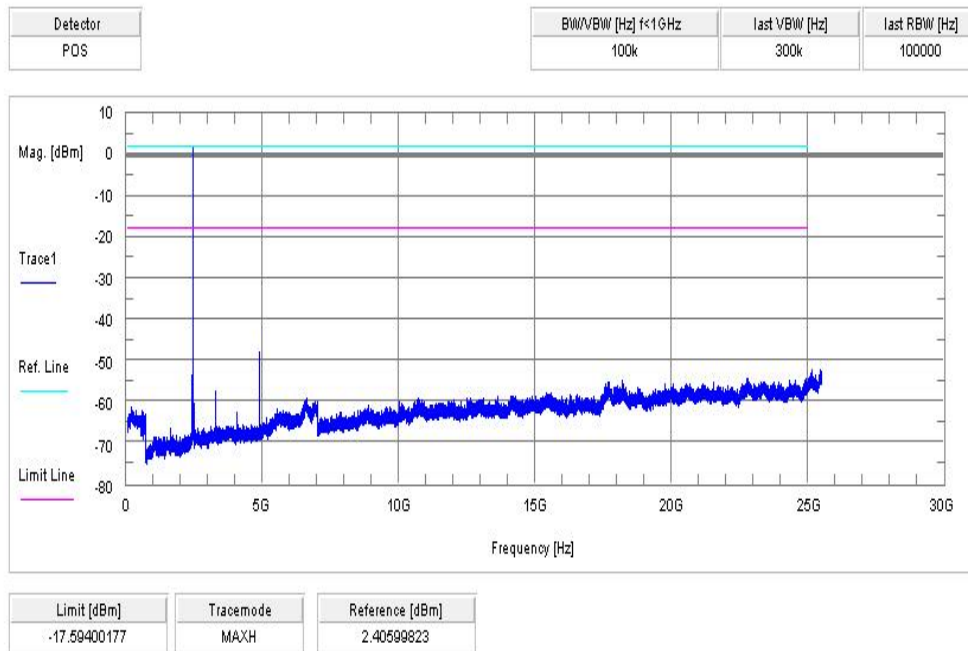
Result: Passed

Plots:

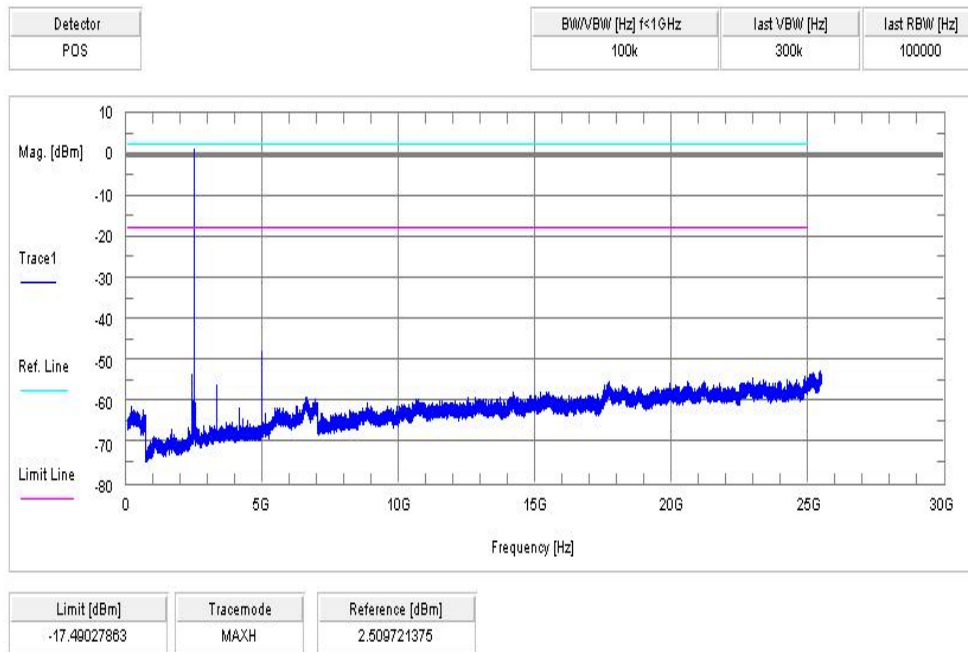
Plot 1: lowest channel – 2402 MHz, GFSK modulation



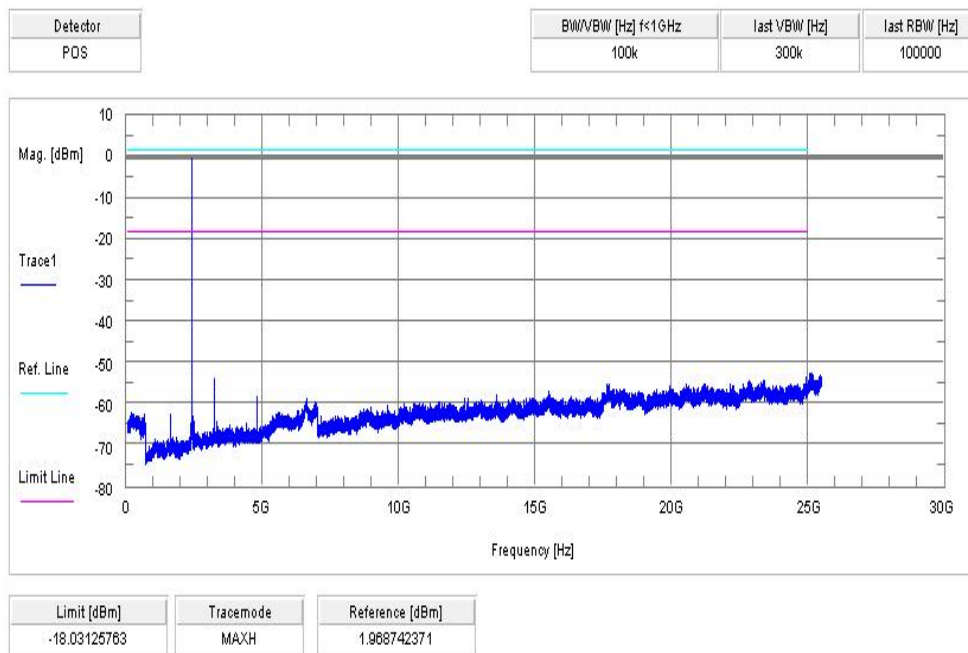
Plot 2: middle channel – 2441 MHz, GFSK modulation



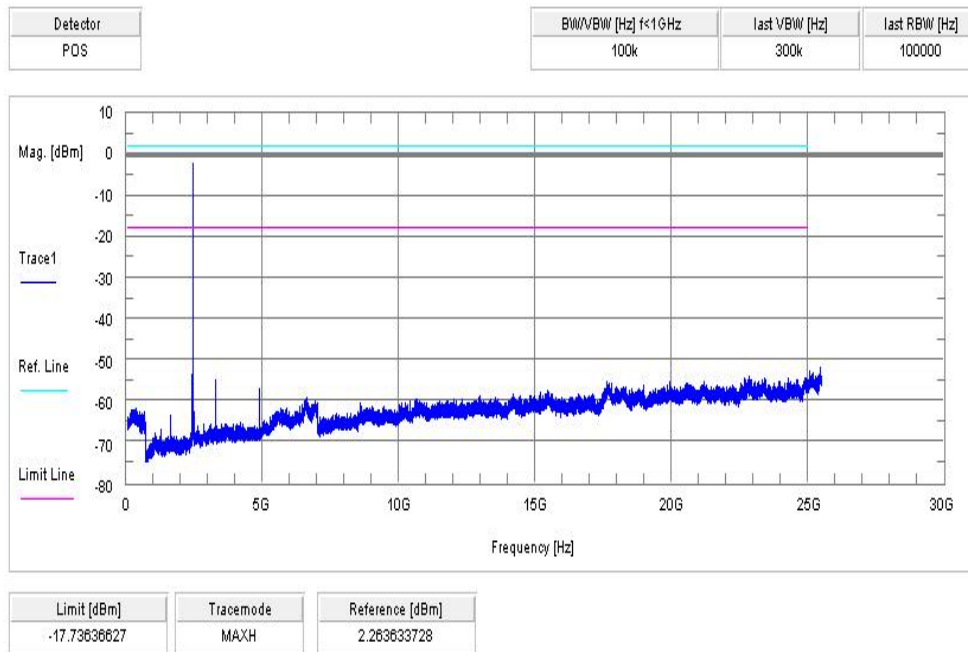
Plot 3: highest channel – 2480 MHz, GFSK modulation



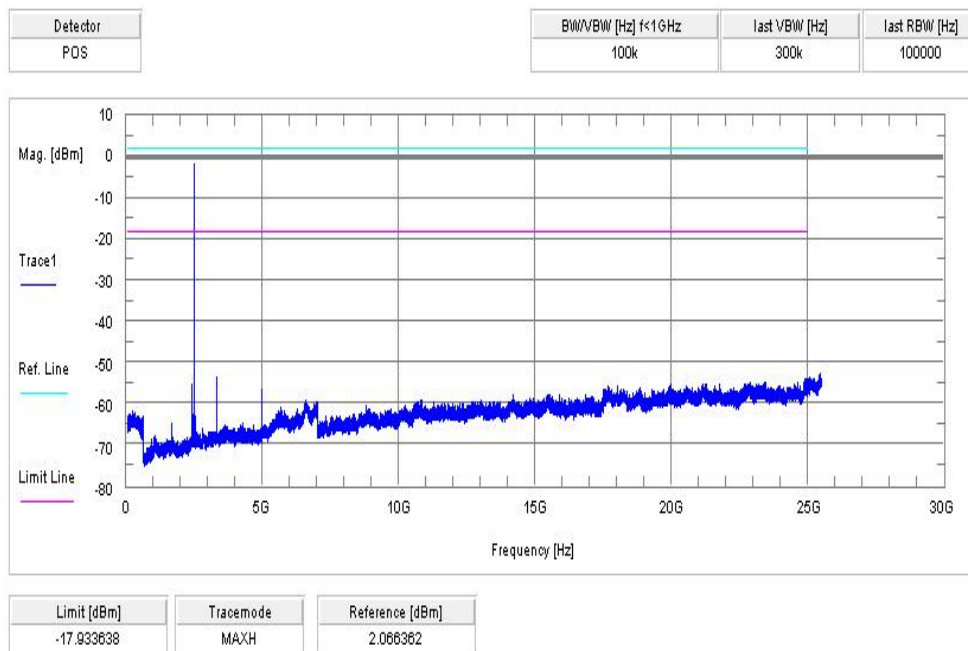
Plot 4: lowest channel – 2402 MHz, Pi / DQPSK modulation



Plot 5: middle channel – 2441 MHz, Pi / DQPSK modulation



Plot 6: highest channel – 2480 MHz, Pi / DQPSK modulation



9.11 TX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in transmit mode. The EUT is set to single channel mode and the transmit channel is channel 00, channel 39 and channel 78. The measurement is performed in the mode with the highest output power.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	3 x RBW Remeasurement: 10 Hz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Span:	30 MHz to 25 GHz
Trace-Mode:	Max Hold
Measured Modulation:	<input checked="" type="checkbox"/> GFSK <input type="checkbox"/> Pi/4 DQPSK <input type="checkbox"/> 8DPSK

The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

Limits:

FCC	IC	
TX spurious emissions radiated		
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
§15.209		
Frequency (MHz)	Field strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results:

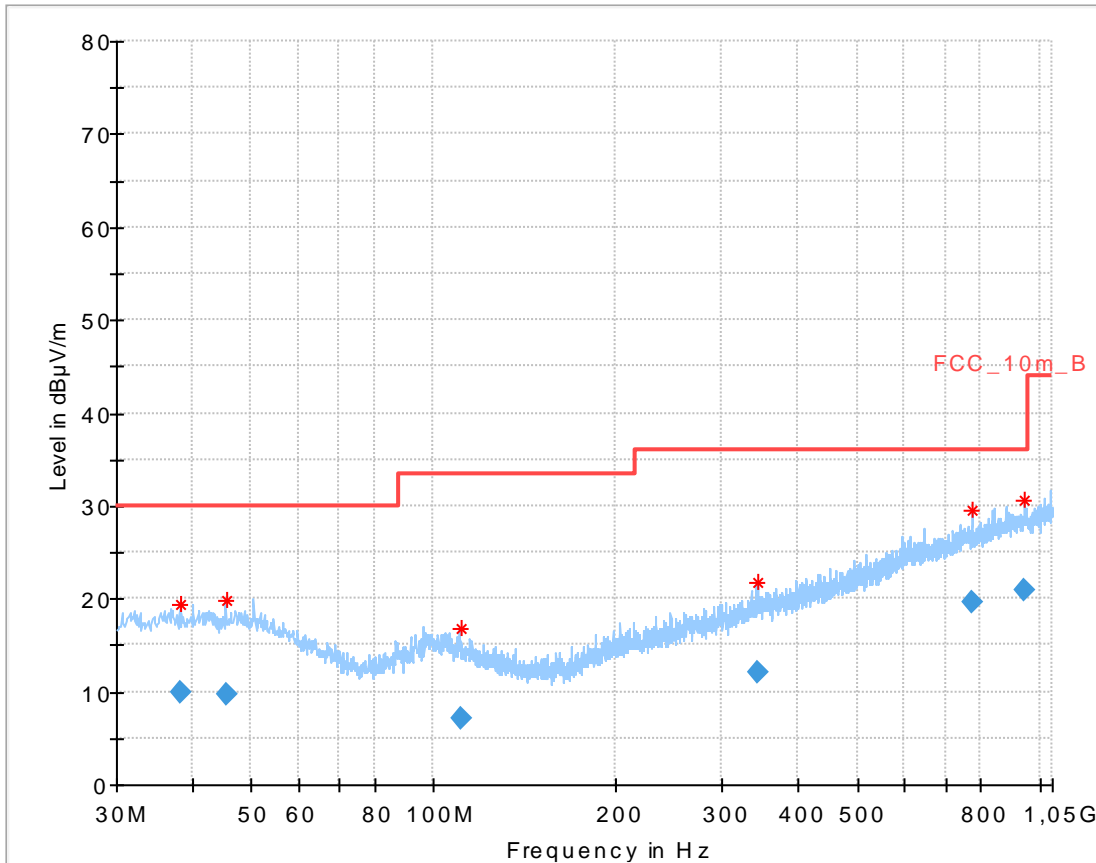
TX spurious emissions radiated [dBµV/m]								
2402 MHz			2441 MHz			2480 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions above 1 GHz are below the average limit!			All detected peak emissions above 1 GHz are below the average limit!			All detected peak emissions above 1 GHz are below the average limit!		
Measurement uncertainty			± 3 dB					

Result: Passed

Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

Plots:

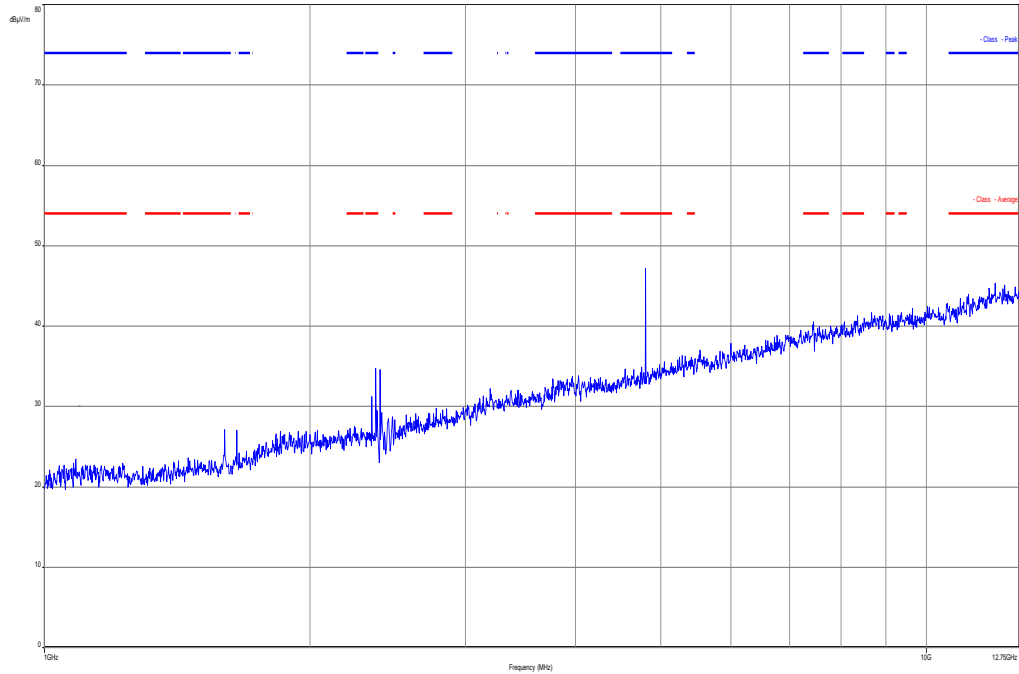
Plot 1: 30 MHz to 1 GHz, TX mode, channel 00, vertical & horizontal polarization



Final_Result

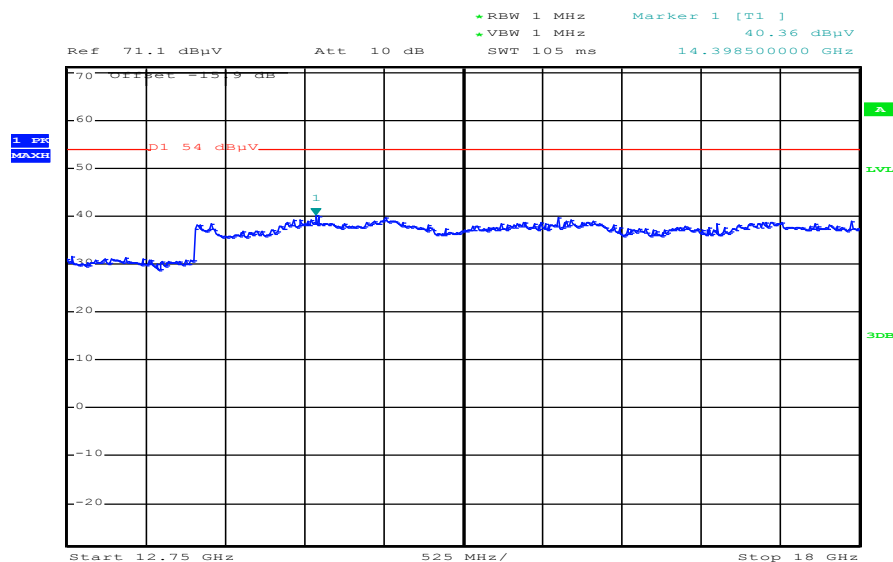
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
38.189400	9.90	30.00	20.10	1000.0	120.000	400.0	V	222	14.0
45.433500	9.79	30.00	20.21	1000.0	120.000	400.0	V	-7	13.8
110.883600	7.02	33.50	26.48	1000.0	120.000	200.0	V	110	11.0
342.025200	12.15	36.00	23.85	1000.0	120.000	193.0	V	266	15.8
771.692100	19.54	36.00	16.46	1000.0	120.000	200.0	H	262	22.7
944.293500	21.02	36.00	14.98	1000.0	120.000	400.0	H	72	24.2

Plot 2: 1 GHz to 12.75 GHz, TX mode, channel 00, vertical & horizontal polarization



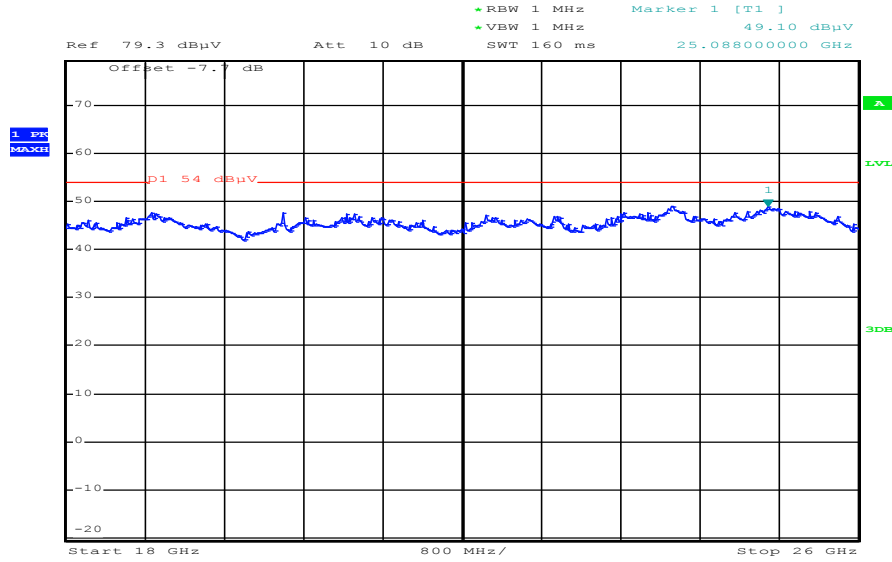
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 3: 12.75 GHz to 18 GHz, TX mode, channel 00, vertical & horizontal polarization



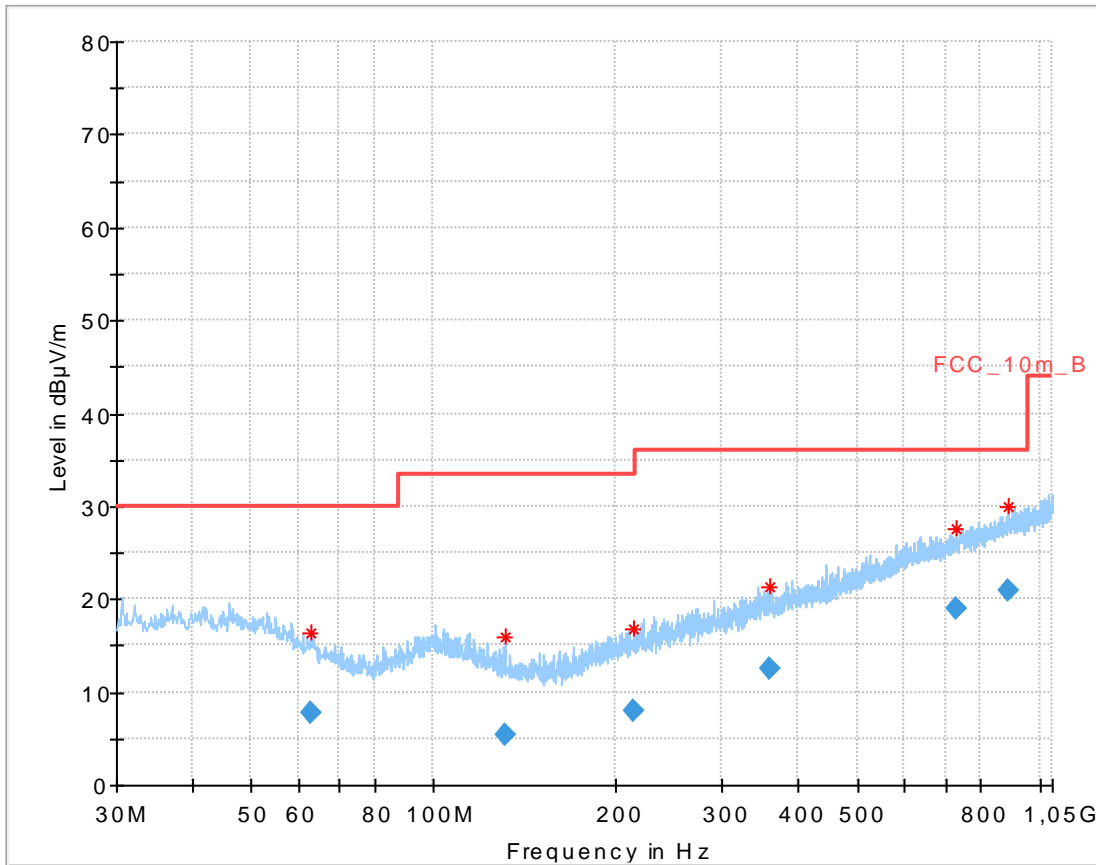
Date: 17.JUN.2014 13:51:20

Plot 4: 18 GHz to 26 GHz, TX mode, channel 00, vertical & horizontal polarization



Date: 17.JUN.2014 13:58:40

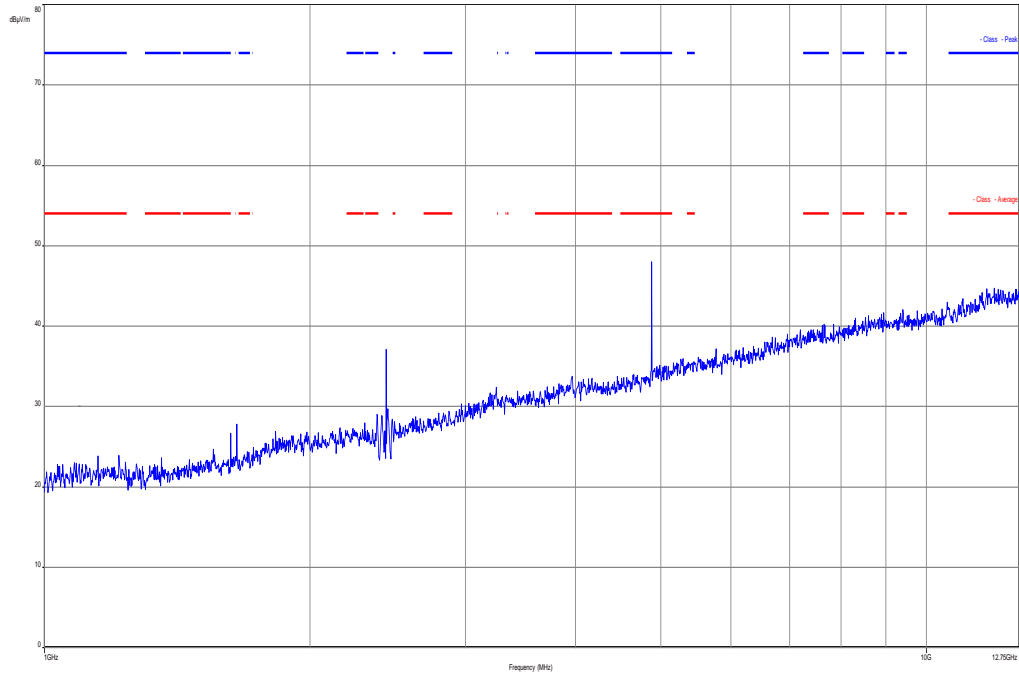
Plot 5: 30 MHz to 1 GHz, TX mode, channel 39, vertical & horizontal polarization



Final_Result:

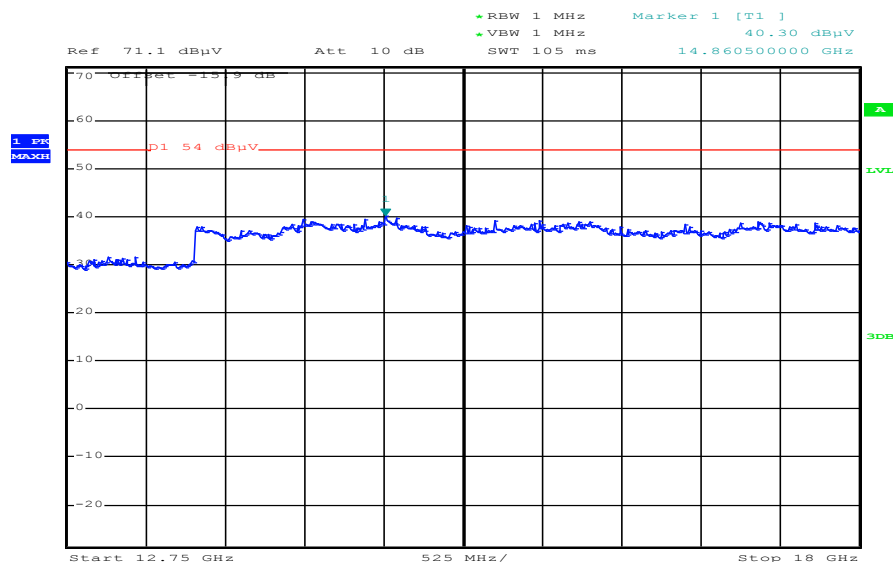
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
62.990400	7.77	30.00	22.23	1000.0	120.000	400.0	V	174	10.9
131.238000	5.31	33.50	28.19	1000.0	120.000	200.0	V	131	9.3
213.414450	7.89	33.50	25.61	1000.0	120.000	200.0	V	145	12.2
357.754350	12.40	36.00	23.60	1000.0	120.000	200.0	H	-50	16.2
727.052850	19.05	36.00	16.95	1000.0	120.000	171.0	H	304	22.2
887.345850	20.92	36.00	15.08	1000.0	120.000	200.0	V	24	23.9

Plot 6: 1 GHz to 12.75 GHz, TX mode, channel 39, vertical & horizontal polarization



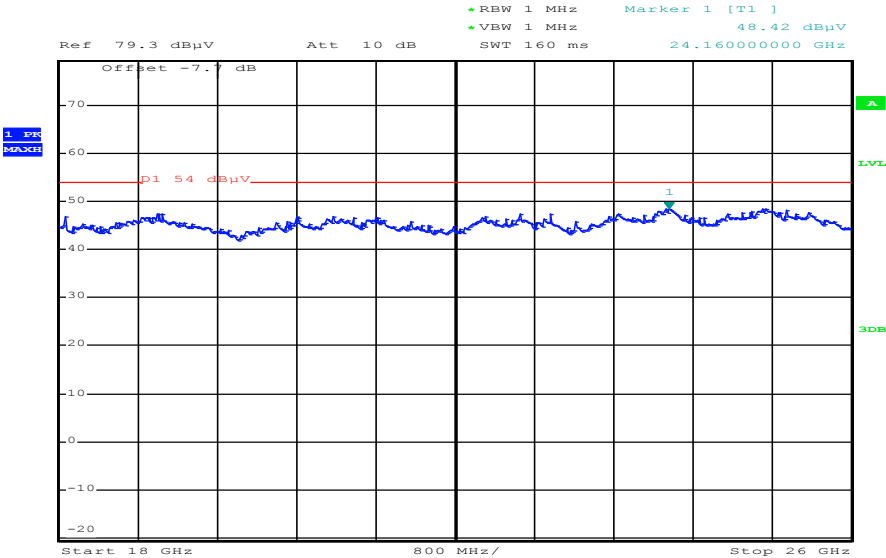
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 7: 12.75 GHz to 18 GHz, TX mode, channel 39, vertical & horizontal polarization



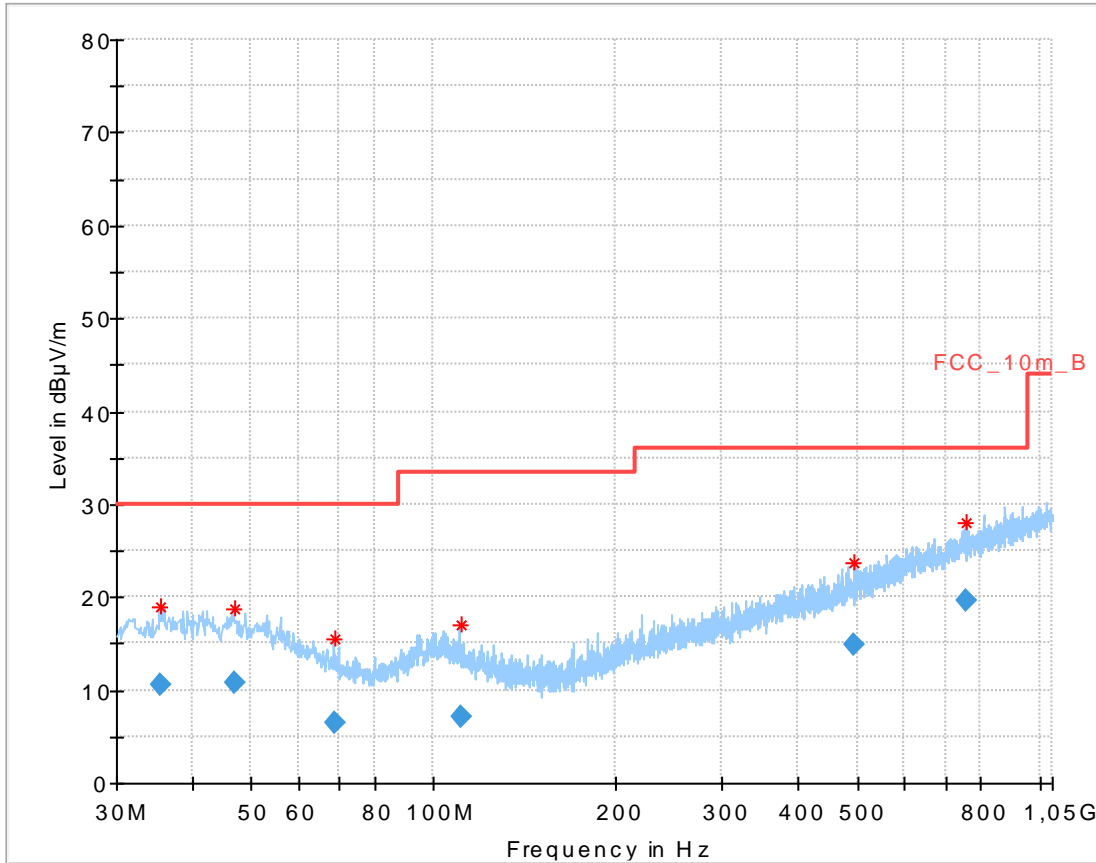
Date: 17.JUN.2014 13:52:20

Plot 8: 18 GHz to 26 GHz, TX mode, channel 39, vertical & horizontal polarization



Date: 17.JUN.2014 13:59:25

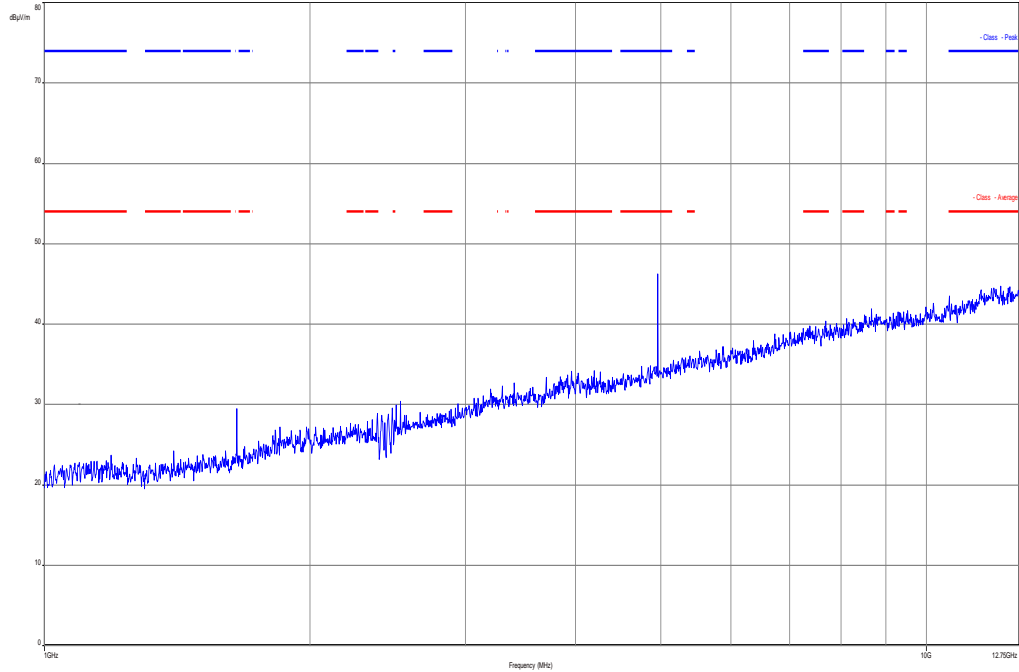
Plot 9: 30 MHz to 1 GHz, TX mode, channel 78, vertical & horizontal polarization



Final Result:

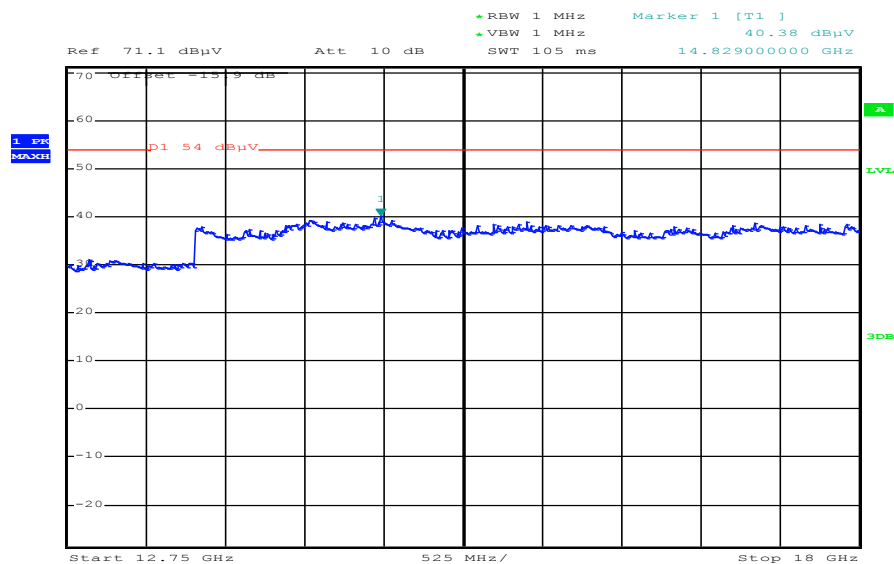
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
35.490000	10.48	30.00	19.52	1000.0	120.000	220.0	V	101	13.8
47.018400	10.84	30.00	19.16	1000.0	120.000	152.0	V	195	13.8
68.854650	6.44	30.00	23.56	1000.0	120.000	141.0	V	320	9.7
110.731650	7.12	33.50	26.38	1000.0	120.000	148.0	H	121	11.0
495.159150	14.95	36.00	21.05	1000.0	120.000	136.0	V	188	18.6
757.977750	19.52	36.00	16.48	1000.0	120.000	210.0	H	105	22.7

Plot 10: 1 GHz to 12.75 GHz, TX mode, channel 78, vertical & horizontal polarization



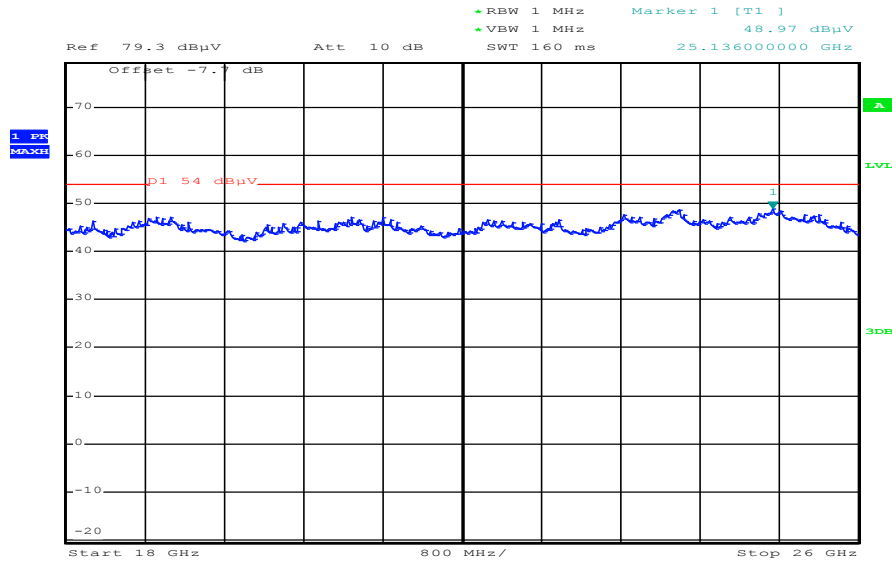
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 11: 12.75 GHz to 18 GHz, TX mode, channel 78, vertical & horizontal polarization



Date: 17.JUN.2014 13:53:21

Plot 12: 18 GHz to 26 GHz, TX mode, channel 78, vertical & horizontal polarization



Date: 17.JUN.2014 14:00:42

9.12 RX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in idle/receive mode. The EUT is detached so all oscillators are active.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi peak
Sweep time:	Auto
Video bandwidth:	3 x RBW Remeasurement: 10 Hz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Span:	30 MHz to 25 GHz
Trace-Mode:	Max Hold

Limits:

FCC		IC
RX Spurious Emissions Radiated		
Frequency (MHz)	Field strength (dB μ V/m)	Measurement distance
30 - 88	30.0	10
88 - 216	33.5	10
216 - 960	36.0	10
Above 960	54.0	3

Results:

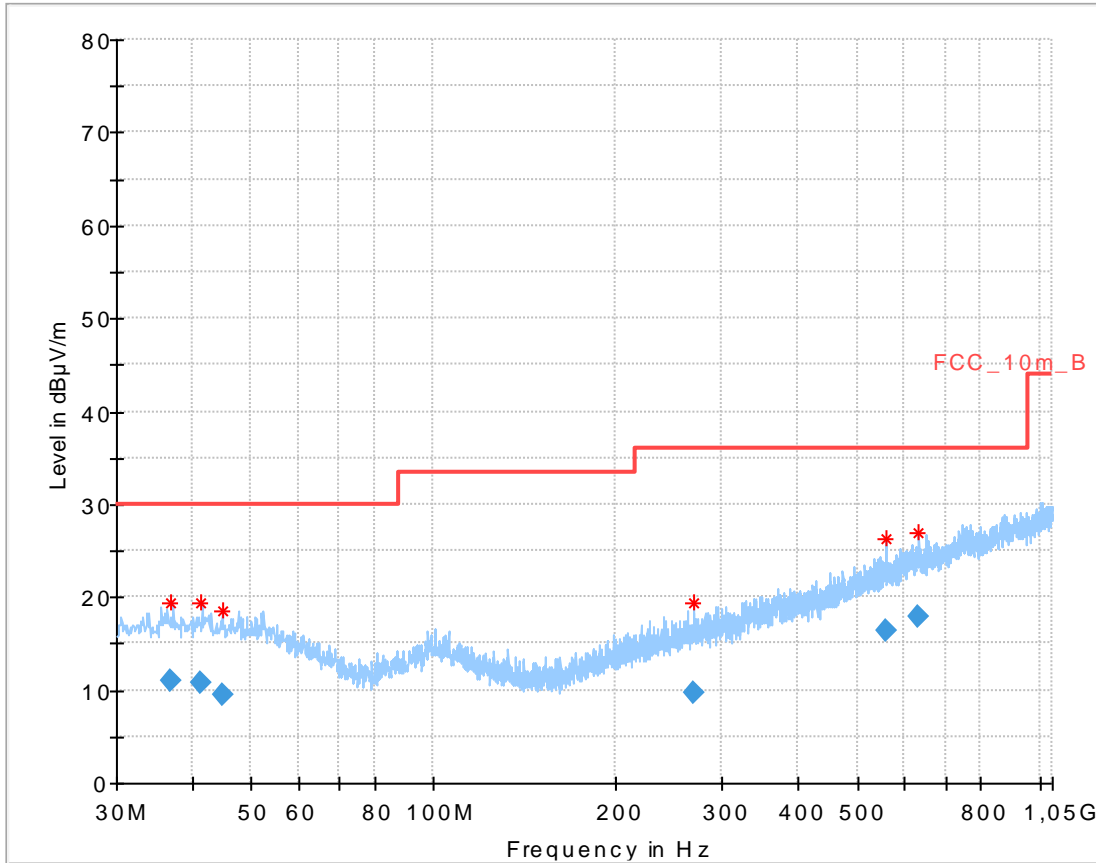
RX spurious emissions radiated [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions above 1 GHz are below the average limit!		
Measurement uncertainty	± 3 dB	

Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

Result: **Passed**

Plots:

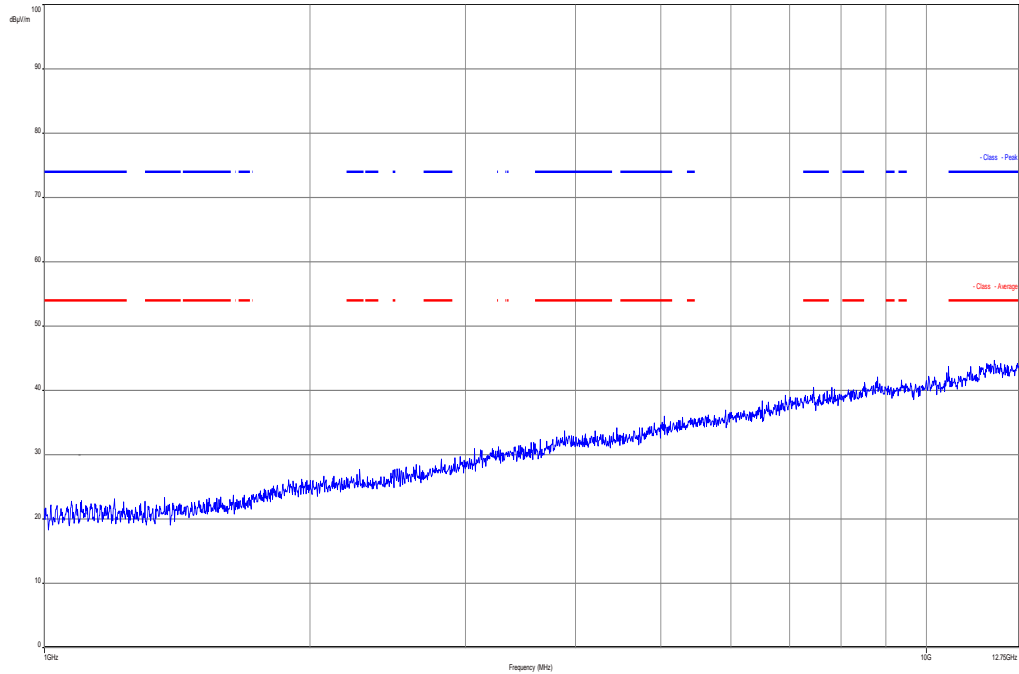
Plot 1: 30 MHz to 1 GHz, RX mode, vertical & horizontal polarization



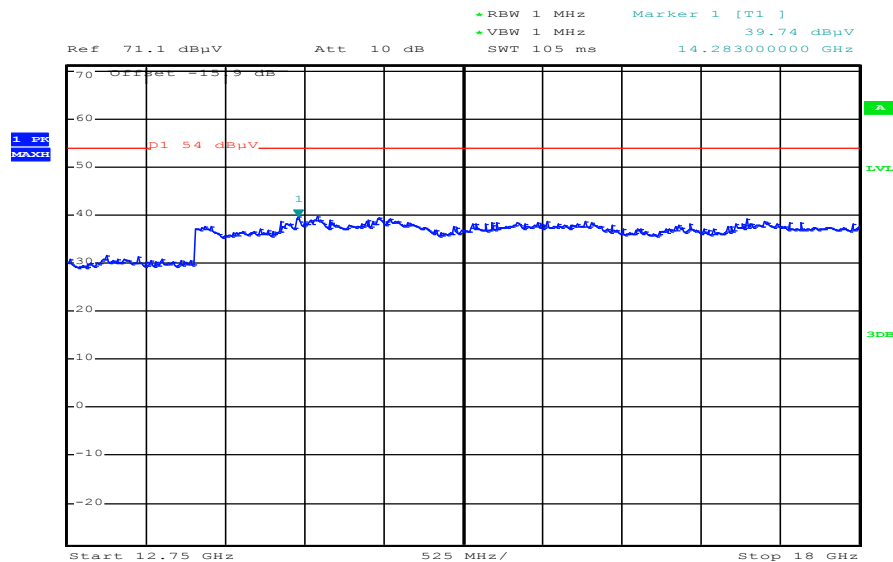
Final_Result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)
36.780450	11.04	30.00	18.96	1000.0	120.000	140.0	V	269	13.9
41.367150	10.74	30.00	19.26	1000.0	120.000	220.0	H	10	14.0
44.835150	9.47	30.00	20.53	1000.0	120.000	158.0	H	294	13.9
267.989700	9.62	36.00	26.38	1000.0	120.000	215.0	H	320	13.8
557.942550	16.35	36.00	19.65	1000.0	120.000	220.0	H	196	19.5
632.393700	17.87	36.00	18.13	1000.0	120.000	194.0	V	213	21.0

Plot 2: 1 GHz to 12.75 GHz, RX mode, vertical & horizontal polarization

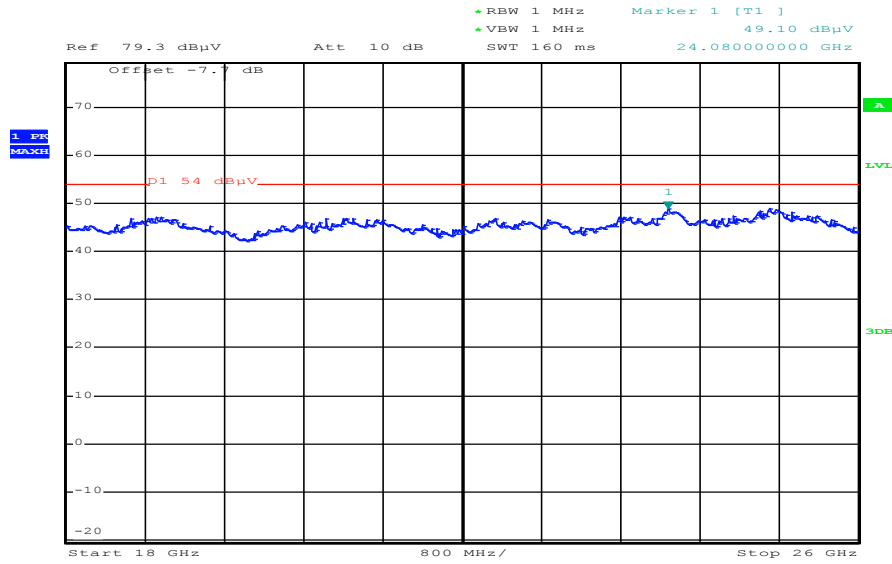


Plot 3: 12.75 GHz to 18 GHz, RX mode, vertical & horizontal polarization



Date: 17 JUN 2014 13:54:40

Plot 4: 18 GHz to 26 GHz, RX mode, vertical & horizontal polarization



Date: 17.JUN.2014 13:57:38

9.13 TX and RX spurious emissions radiated < 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The EUT is set to single channel mode and the transmit channel is channel 39. This measurement is representative for all channels and modes. If critical peaks are found channel 00 and channel 78 will be measured too. The measurement is performed in the mode with the highest output power. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi peak
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Limits:

FCC		IC
TX spurious emissions radiated < 30 MHz		
Frequency (MHz)	Field strength (dBµV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

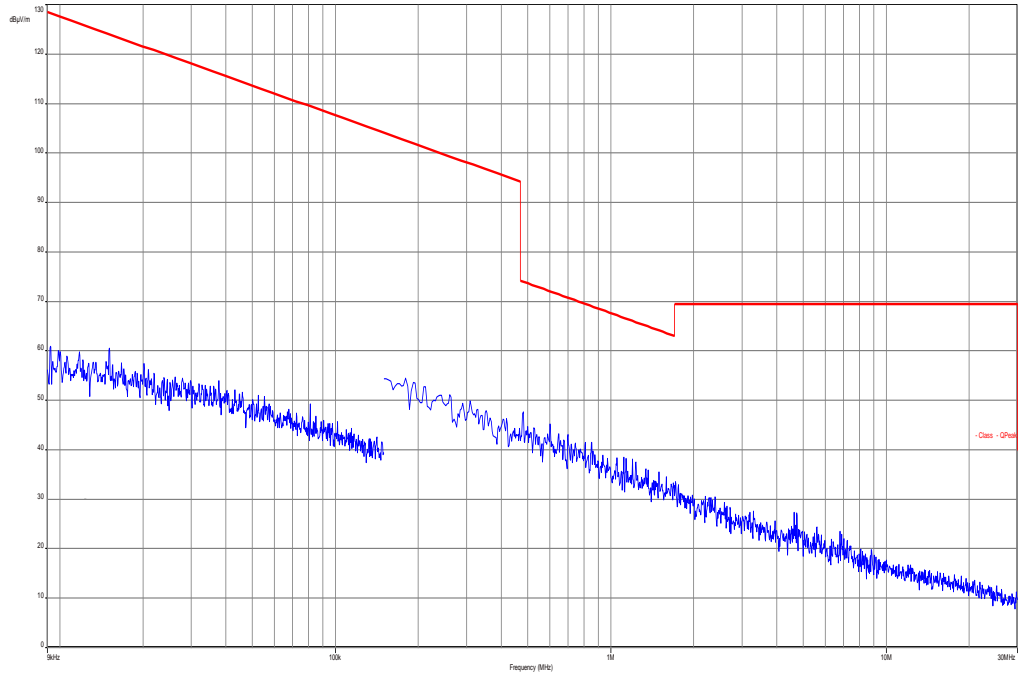
Results:

TX spurious emissions radiated < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
No peaks detected.		
Measurement uncertainty	± 3 dB	

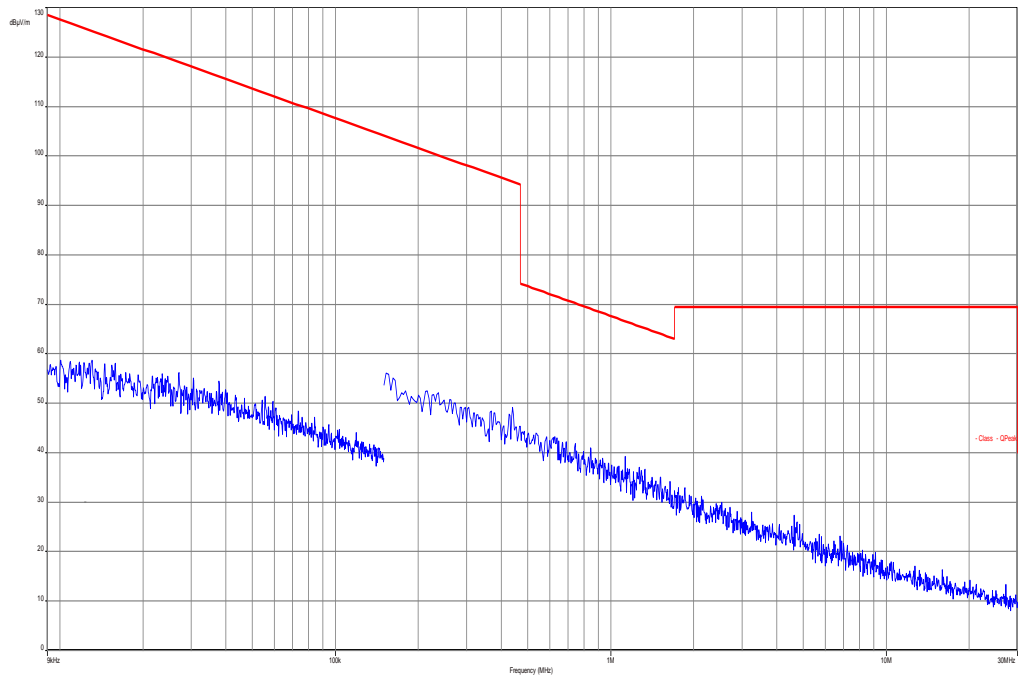
Result: Passed

Plots:

Plot 1: 9 kHz to 30 MHz, TX mode



Plot 4: 9 kHz to 30 MHz, RX mode



9.14 TX and RX spurious emissions conducted < 30 MHz

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to single channel mode and the transmit channel is channel 39. This measurement is representative for all channels and modes. If critical peaks are found channel 00 and channel 78 will be measured too. The measurement is performed in the mode with the highest output power. Both power lines, phase and neutral line, are measured. Found peaks are remeasured with average and quasi peak detection to show compliance to the limits.

Measurement:

Measurement parameter	
Detector:	Peak - Quasi peak / average
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Limits:

FCC		IC
TX spurious emissions conducted < 30 MHz		
Frequency (MHz)	Quasi-peak (dBµV/m)	Average (dBµV/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

*Decreases with the logarithm of the frequency

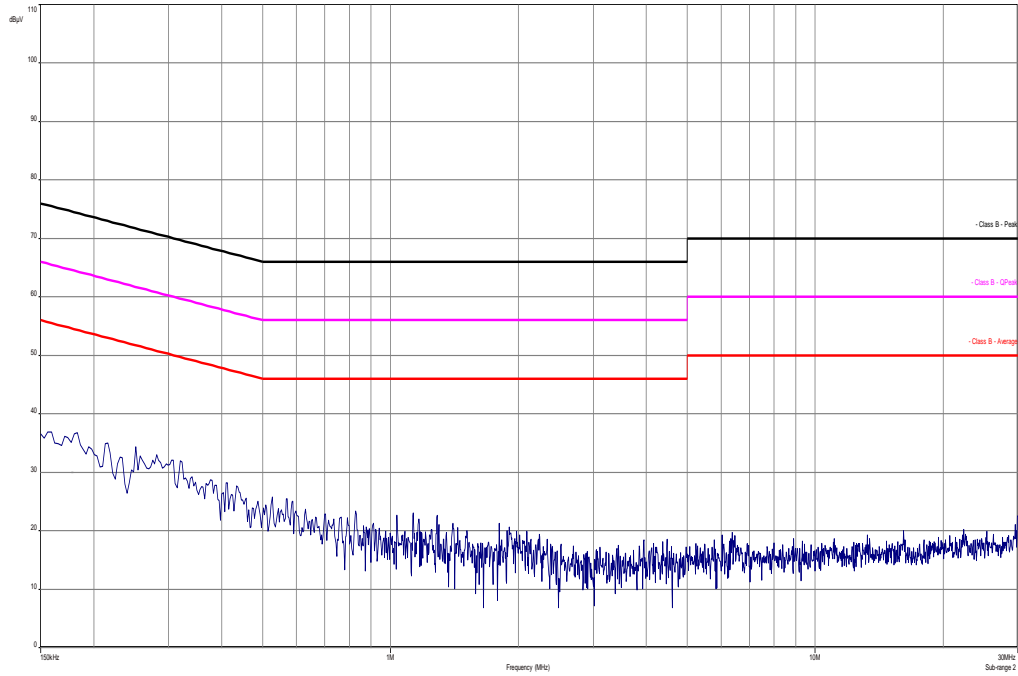
Results:

TX spurious emissions conducted < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
No peaks detected.		
Measurement uncertainty	± 3 dB	

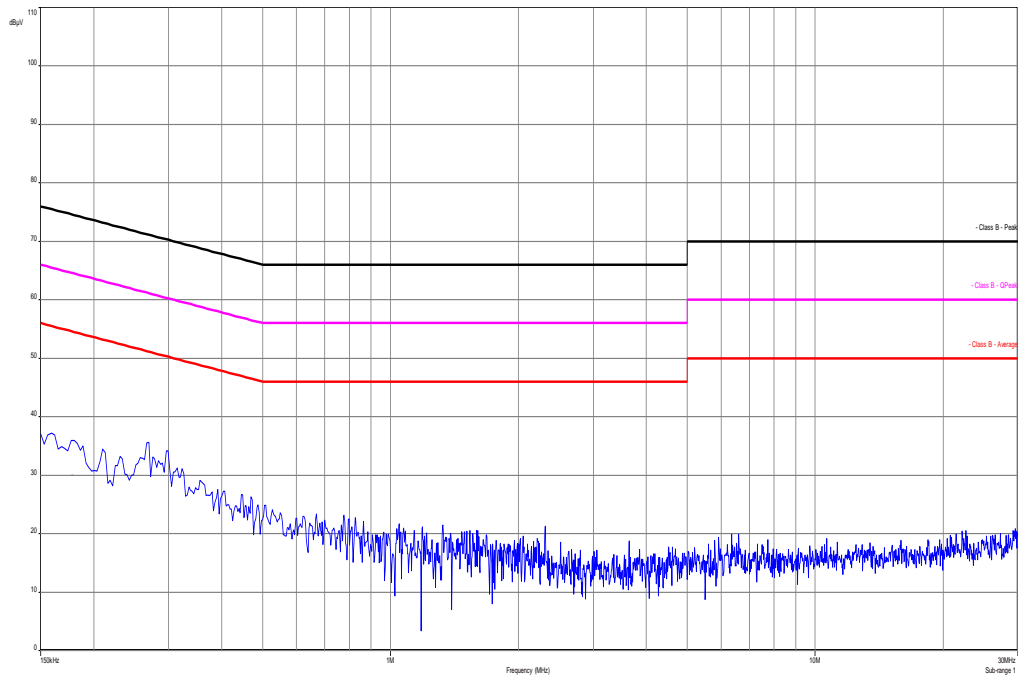
Result: Passed

Plots:

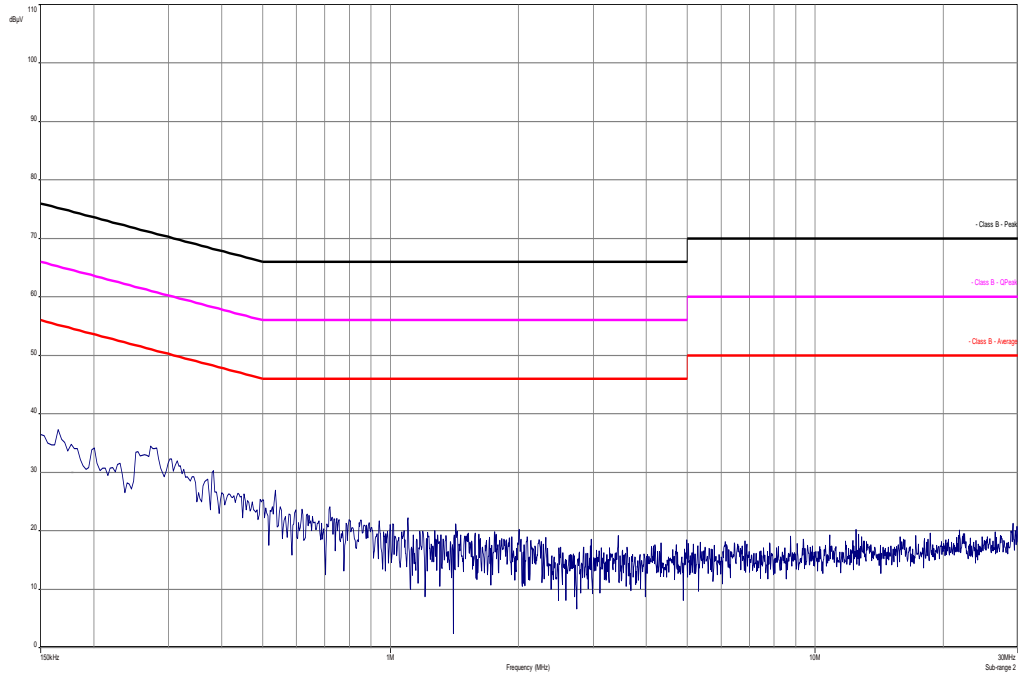
Plot 1: 150 kHz to 30 MHz, TX mode, phase line



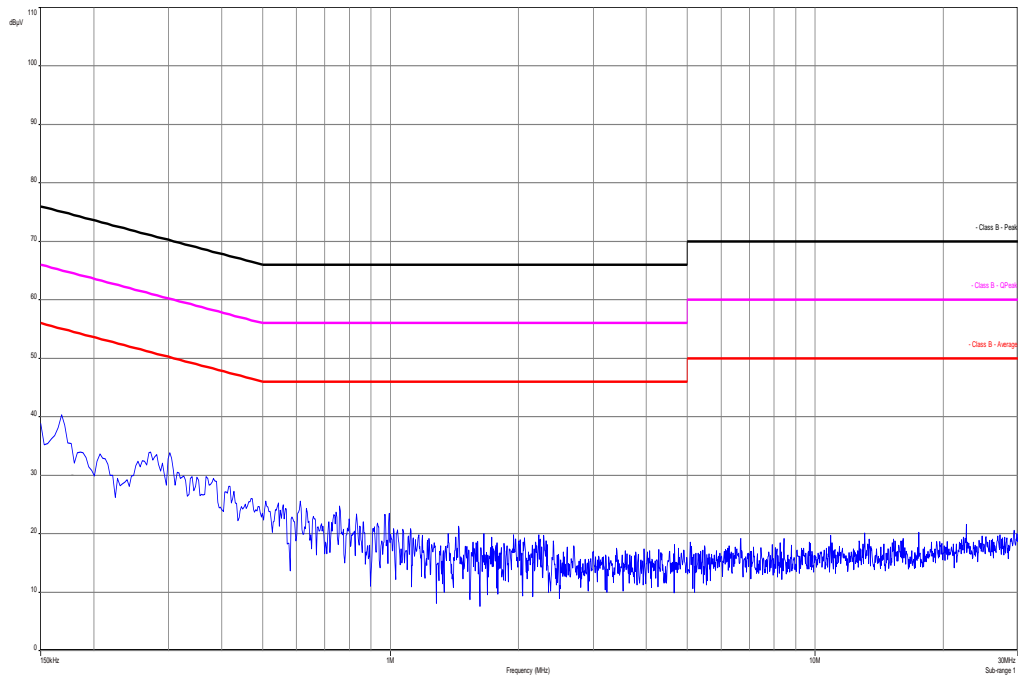
Plot 2: 150 kHz to 30 MHz, TX mode, neutral line



Plot 3: 150 kHz to 30 MHz, RX mode, phase line



Plot 4: 150 kHz to 30 MHz, RX mode, neutral line



9.15 Statistical measurements

Radiated peak power: GFSK

	<i>lowest channel 2402 MHz</i>	<i>mid channel 2441 MHz</i>	<i>highest channel 2480 MHz</i>
<i>Sample SN:01901263 [dbm]</i>	5.2	4.5	3.5
<i>Sample SN:01901266 [dbm]</i>	3.3	5.0	4.9
<i>Sample SN:01901289 [dbm]</i>	6.3	5.4	5.4

Conducted peak power: GFSK

	<i>lowest channel 2402 MHz</i>	<i>mid channel 2441 MHz</i>	<i>highest channel 2480 MHz</i>
<i>Sample SN:01901271 [dbm]</i>	2.9	3.1	3.1
<i>Sample SN:01901275 [dbm]</i>	2.4	2.0	1.6
<i>Sample SN:01901279 [dbm]</i>	0.7	1.5	2.1

Conducted 20dB bandwidth: GFSK

	<i>lowest channel 2402 MHz</i>	<i>mid channel 2441 MHz</i>	<i>highest channel 2480 MHz</i>
<i>Sample SN:01901271 [kHz]</i>	938	920	938
<i>Sample SN:01901275 [kHz]</i>	938	938	938
<i>Sample SN:01901279 [kHz]</i>	938	938	938

Conducted 20dB bandwidth: Pi/4 DQPSK

	<i>lowest channel 2402 MHz</i>	<i>mid channel 2441 MHz</i>	<i>highest channel 2480 MHz</i>
<i>Sample SN:01901271 [kHz]</i>	1244	1263	1263
<i>Sample SN:01901275 [kHz]</i>	1263	1244	1244
<i>Sample SN:01901279 [kHz]</i>	1263	1263	1244

10 Test equipment and ancillaries used for tests

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and signalling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Switch / Control Unit	3488A	HP Meßtechnik		300001691	ne		
2	n. a.	Power Supply DC	NGPE 40/40	R&S	388	400000078	vIKI!	21.08.2012	21.08.2014
3	n. a.	Power Sensor 50 Ohms, 10 MHz - 18 GHz, 1 nW - 20 mW	NRV-Z1	R&S	833894/011	300002681-0010	k	22.08.2012	22.08.2014
4	n. a.	Hygro-Thermometer	-/, 5-45°C, 20-100%rF	Thies Clima	-/	400000080	izw	29.10.2013	29.10.2015
5	n. a.	Vector Signal Generator, 300 kHz to 2.2 GHz	SMIQ03B	R&S	835541/055	300002681-0001	k	18.08.2011	18.08.2014
7	n. a.	Signal Generator 0.01/2 - 20 GHz, Frequ. Resol. 0.1Hz	SMP02	R&S	835133/011	300002681-0003	k	12.08.2011	12.08.2014
8	n. a.	Dual Channel Power Meter	NRVD	R&S	835430/044	300002681-0004	k	22.08.2012	22.08.2014
9	n. a.	Switch / Control Unit	SSCU	R&S	338864/003	300002681-0006	ne		
10	n. a.	Precision Step Attenuator 50 Ohms, 0 - 2700MHz	RSP	R&S	834500/010	300002681-0007	NK!	26.08.2008	
11	n. a.	Frequency Standard (Rubidium Frequency Standard)	MFS (Rubidium)	R&S (Datum)	002	300002681-0009	Ve	21.08.2012	21.08.2014
12	n. a.	Power Sensor 50 Ohms, 10 MHz - 18 GHz, 1 nW - 20 mW	NRV-Z1	R&S	833894/012	300002681-0013	NK!	26.08.2008	
13	n. a.	Directional Coupler	101020010	Krytar	70215	300002840	ev		
14	n. a.	DC-Blocker	8143	Inmet Corp.	none	300002842	ne		
15	n. a.	Powersplitter	6005-3	Inmet Corp.		300002841	ev		
16	n. a.	Temperature Test Chamber	VT 4002	Heraeus Voetsch	58566046820 010	300003019	Ve	26.09.2013	26.09.2015
17	n. a.	CBT (Bluetooth Tester + EDR Signalling)	CBT 1153.9000 K35	R&S	100185	300003416	vIKI!	21.08.2012	21.08.2014
18	n. a.	Spectrum Analyzer 9kHz to 30GHz - 140...+30dBm	FSP30	R&S	100886	300003575	k	22.08.2012	22.08.2014
19	n. a.	CBT-K57 Software-Option for CBT/CBT32	CBT-K57	R&S	101051	300003910	ne		
20	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
21	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081;B597 9	300000210	ne		
22	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	27.01.2014	27.01.2015
23	n. a.	Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379	ev		
24	n. a.	Antenna Tower	Model 2175	ETS- LINDGREN	64762	300003745	izw		

25	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
26	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		
27	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	22.04.2014	22.04.2016
28	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	22.01.2014	22.01.2015
29	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIK!	08.05.2013	08.05.2015
30	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
31	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
32	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
33	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
34	n. a.	Band Reject filter	WRCG185 5/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
35	n. a.	Band Reject filter	WRCG240 0/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
36	n. a.	Highpass Filter	WHKX7.0/1 8G-8SS	Wainwright	18	300003789	ne		
37	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vIK!	14.10.2011	14.10.2014
38	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	13.03.2014	13.03.2015
39	n. a.	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne		

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vIK!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

11 Observations

No observations exceeding those reported with the single test cases have been made.

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2014-07-17
A	Editorial changes (product name) Corrected output power calculation	2014-07-21

Annex B Further information**Glossary**

AVG	-	Average
DUT	-	Device under test
EMC	-	Electromagnetic Compatibility
EN	-	European Standard
EUT	-	Equipment under test
ETSI	-	European Telecommunications Standard Institute
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	Not applicable
PP	-	Positive peak
QP	-	Quasi peak
S/N	-	Serial number
SW	-	Software

Annex C Accreditation Certificate

Front side of certificate

Back side of certificate



Deutsche Akkreditierungsstelle GmbH

Befehlene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleG8V
 Unterzeichnerin der Multilateralen Abkommen
 von EA, ILAC und IAF zur gegenseitigen Anerkennung

Akkreditierung



Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

CETECOM ICT Services GmbH
 Untertürkheimer Straße 6-10, 66117 Saarbrücken

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

- Drahtgebundene Kommunikation einschließlich xDSL
- VoIP und DECT
- Akustik
- Funk einschließlich WLAN
- Short Range Devices (SRD)
- RFID
- WiMax und Richtfunk
- Mobilfunk (GSM / DCS, Over the Air (OTA) Performance)
- Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive
- Produktsicherheit
- SAR and Hearing Aid Compatibility (HAC)
- Umweltsimulation
- Smart Card Terminals
- Bluetooth
- Wi-Fi Services

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 07.03.2014 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 77 Seiten.

Registrierungsnummer der Urkunde: D-PL-12076-01-00

Frankfurt am Main, 07.03.2014

Im Auftrag D-PL-12076-01/01/01/01
 Albrecht Jäger
 Leiter der Stelle

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 EA: www.european-accreditation.org
 IAF: www.iaf.org
 ILAC: www.ilac.org

Note:

The current certificate including annex is published on our website (see link below) or may be received from CETECOM ICT Services on request.

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