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TEST REPORT

Test report no.: 1-9730/15-01-08



DAkkS
Deutsche
Akkreditierungsstelle
D-PL-12076-01-00

Testing laboratory

CETECOM ICT Services GmbH

Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany

Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: <http://www.cetecom.com>
e-mail: ict@cetecom.com

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-12076-01-00

Applicant

FLIR Systems AB

Antennvägen 6
18715 Täby / SWEDEN
Phone: -/-
Fax: -/-
Contact: Göran Skedung
e-mail: goran.skedung@flir.se
Phone: +46 87 53 27 59

Manufacturer

FLIR Systems AB

Antennvägen 6
18715 Täby / SWEDEN

Test standard/s

47 CFR Part 15

Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

RSS - 247 Issue 1

Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices

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

Test Item

Kind of test item: Infrared camera

Model name: FLIR-T7250

FCC ID: ZLV-FLIRT7250

IC: 5306A-FLIRT7250

Frequency: DTS band 2400 MHz to 2483.5 MHz

Technology tested: Bluetooth®, +EDR

Antenna: Integrated antenna

Power supply: 3.7 V DC by Li - Ion battery

Temperature range: -10°C to +55°C



This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorised:

Marco Bertolino
Lab Manager
Radio Communications & EMC

Test performed:

p.o.
Mihail Dorongovskij
Testing Manager
Radio Communications & EMC

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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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This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

2.2 Application details

Date of receipt of order:	2015-07-08
Date of receipt of test item:	2015-07-14
Start of test:	2015-07-14
End of test:	2015-07-14
Person(s) present during the test:	Mr. Göran Skedung

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	-/-	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 1	May 2015	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices

3.1 Measurement guidance

Guidance	Version	Description
ANSI C63.4-2014	-/-	American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz
ANSI C63.10-2013	-/-	American national standard of procedures for compliance testing of unlicensed wireless devices

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	No tests under extreme conditions required.
	T_{min}	No tests under extreme conditions required.
Relative humidity content:		53 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	3.7 V DC by Li - Ion battery
	V_{max}	No tests under extreme conditions required.
	V_{min}	No tests under extreme conditions required.

5 Test item

Kind of test item	:	Infrared camera
Type identification	:	FLIR-T7250 (FLIR T1030SC)
HMN	:	-/-
PMN	:	FLIR-T7250
HVIN	:	FLIR-T7250
FVIN	:	-/-
S/N serial number	:	Radiated units: 72500037; 72400046 Conducted unit: No information available!
HW hardware status	:	T198767-01
SW software status	:	RF test mode
Frequency band	:	DTS band 2400 MHz to 2483.5 MHz (lowest channel 2402 MHz; highest channel 2480 MHz)
Type of radio transmission	:	
Use of frequency spectrum	:	FHSS
Type of modulation	:	GFSK, Pi/4DQPSK, 8DPSK
Number of channels	:	79
Antenna	:	Integrated antenna
Power supply	:	3.7 V DC by Li - Ion battery
Temperature range	:	-10°C to +55°C

5.1 Additional information

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: 1-9730/15-01-01_AnnexA
1-9730/15-01-01_AnnexB
1-9730/15-01-01_AnnexD

6 Test laboratories sub-contracted

None

7 Description of the test setup

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 analysers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

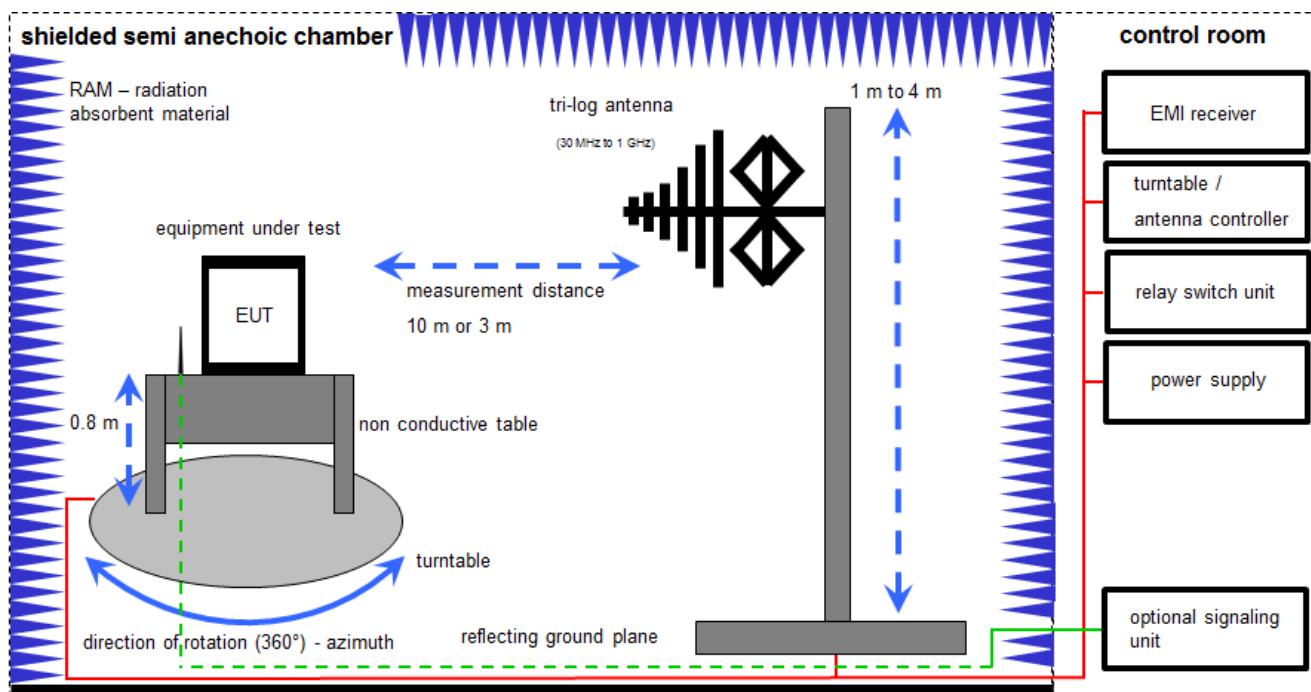
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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
vlkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

7.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 30 MHz 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 C63.4. 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. 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 C63.4 and ANSI C63.10.



$$SS = UR + CL + AF$$

(SS-signal strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

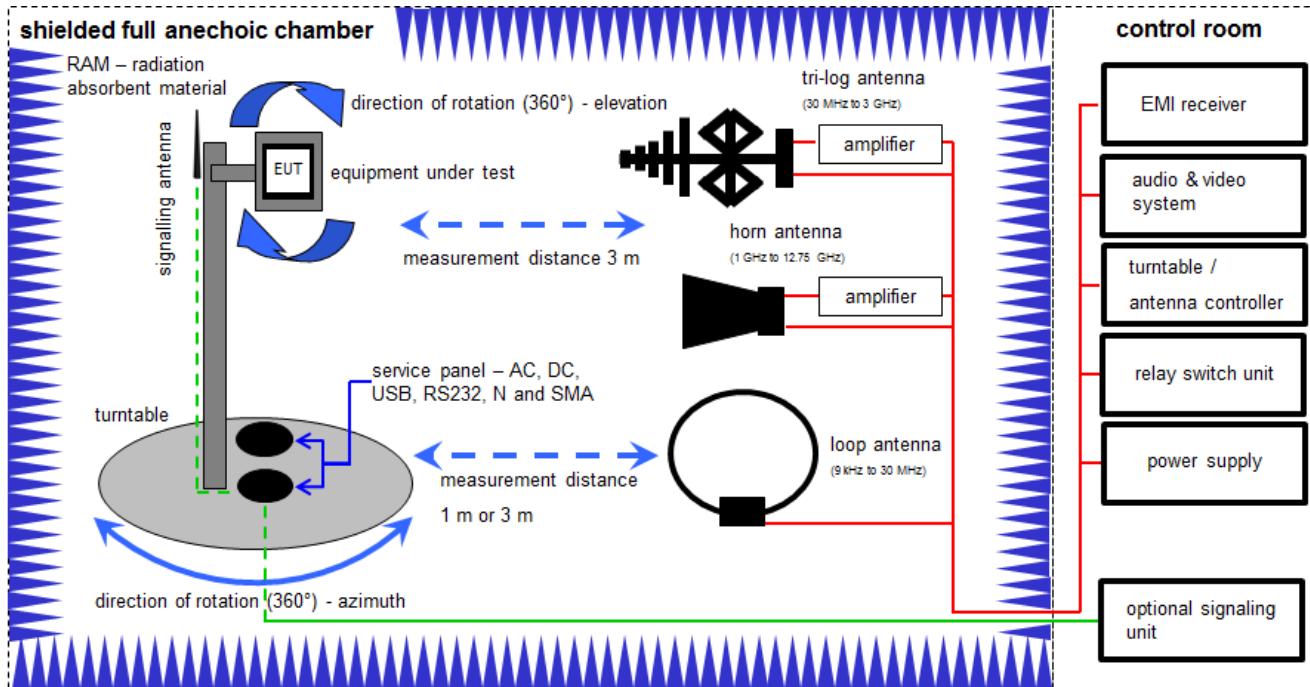
Example calculation:

$$SS [\text{dB}\mu\text{V/m}] = 12.35 [\text{dB}\mu\text{V/m}] + 1.90 [\text{dB}] + 16.80 [\text{dB}\mu\text{V/m}] = 31.05 [\text{dB}\mu\text{V/m}] (35.69 \mu\text{V/m})$$

Used equipment:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch-Unit	3488A	HP	2719A14505	30000368	ev		
2	A	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	26.01.2015	26.01.2016
3	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	30.01.2014	30.01.2016
4	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	29.01.2015	29.01.2017
5	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	26.08.2014	26.08.2016
6	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	22.04.2014	22.04.2016
7	A	Bluetooth Tester	CBT35	R&S	100635	300003907	ne signalling only	-/-	-/-

7.2 Shielded fully anechoic chamber



$$SS = U_R + CA + AF$$

(SS-signal strength; U_R -voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

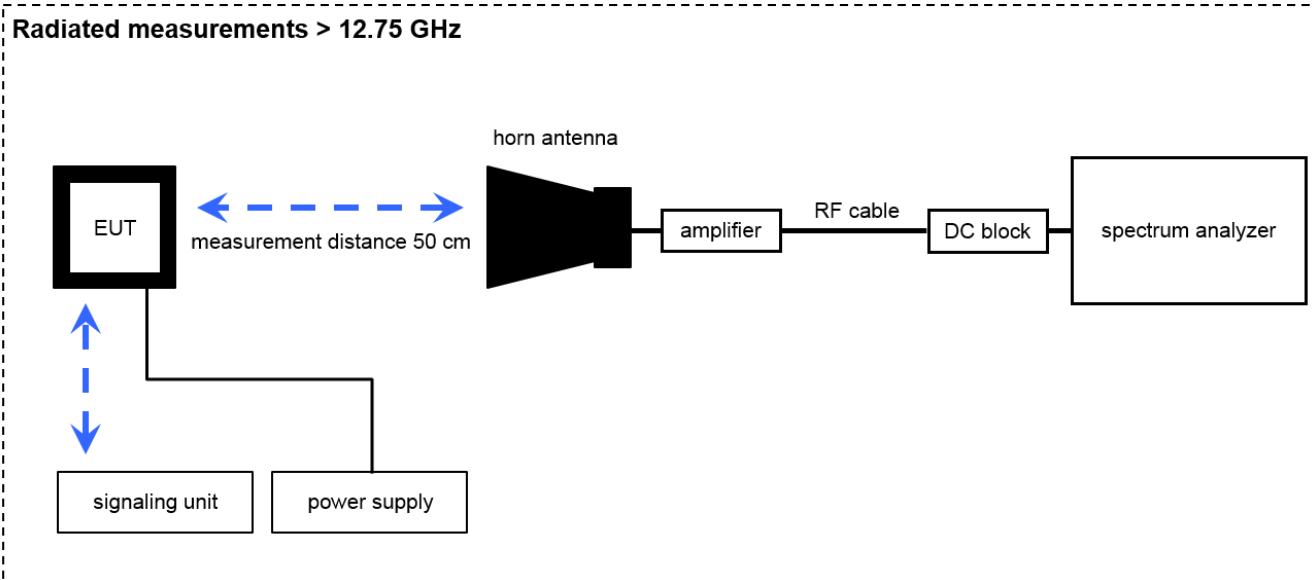
Example calculation:

$$SS [\text{dB}\mu\text{V}/\text{m}] = 40.0 [\text{dB}\mu\text{V}/\text{m}] + (-35.8) [\text{dB}] + 32.9 [\text{dB}\mu\text{V}/\text{m}] = 37.1 [\text{dB}\mu\text{V}/\text{m}] (71.61 \mu\text{V}/\text{m})$$

Used equipment:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A,C	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9709-5290	300000212	k	23.07.2013	23.07.2015
2	A,B	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	22.01.2015	22.01.2016
3	A,C	Highpass Filter WHK1.1/15G-10SS	Wainwright		37	400000148	ne	22.04.2014	22.04.2017
4	A	Highpass Filter WHKX7.0/18G-8SS	Wainwright		18	300003789	ne		
5	A	Band Reject Filter WRCG2400/2483-2375/2505-50/10SS	Wainwright		26	300003792	ne		
6	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	318	300003696	k	22.04.2014	22.04.2017
7	A,C	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22050	300004482	ev		
8	A	Broadband Amplifier CBLU5135235	CERNEX		22011	300004492	ev		
9	A,C	4U RF Switch Platform L4491A	Agilent Technologies		MY50000032	300004510	ne		
10	A,B,C	Messrechner und Monitor Intel Core i3 3220/3,3 GHz, Prozessor	Agilent Technologies		2V2403033A54 21	300004591	ne		
11	A,B,C	NEXIO EMV-Software BAT EMC	EMCO		2V2403033A54 21	300004682	ne		
12	B	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	24.06.2015	24.06.2017
13	A,B,C	Bluetooth Tester CBT35	R&S		100635	300003907	ne signalling only	-/-	-/-

7.3 Radiated measurements > 12.75 GHz



$$SS = U_R + CA + AF$$

(SS=signal strength; U_R =voltage at the receiver; CA-loss signal path & distance correction; AF=antenna factor)

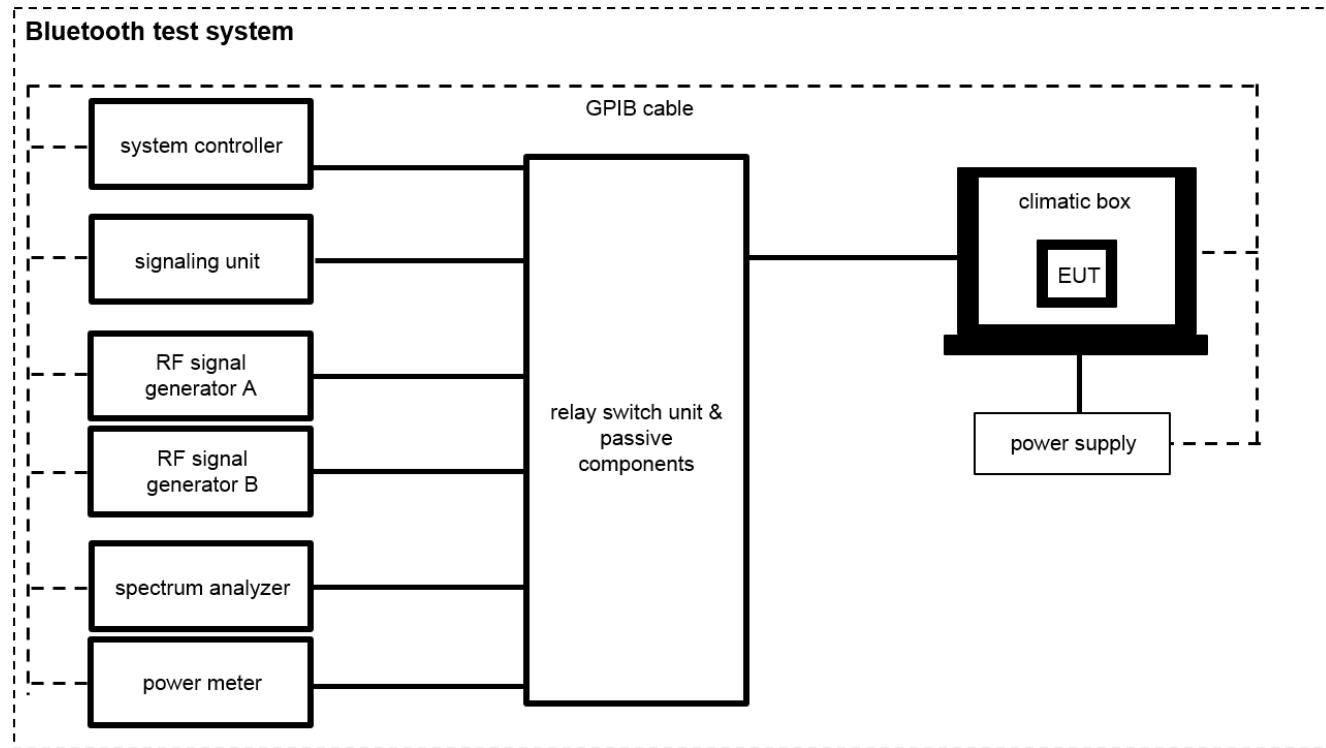
Example calculation:

$$SS \text{ [dB}\mu\text{V/m]} = 40.0 \text{ [dB}\mu\text{V/m]} + (-60.1) \text{ [dB]} + 36.74 \text{ [dB}\mu\text{V/m]} = 16.64 \text{ [dB}\mu\text{V/m]} (6.79 \mu\text{V/m})$$

Used equipment:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787	k	22.07.2013	22.07.2015
2	A	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442	k	19.07.2013	19.07.2015
3	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	22.01.2015	22.01.2016
4	A	Amplifier 2-40 GHz	JS32-02004000-57-5P	MITEQ	1777200	300004541	ev		
5	A	Bluetooth Tester	CBT35	R&S	100635	300003907	ne signalling only	-/-	-/-
6	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 600918	400001182	ev	-/-	-/-
7	A	RF-Cable	ST18/SMAm/SMm/48	Huber & Suhner	Batch no. 127377	400001183	ev	-/-	-/-
8	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	Batch no. 127377	400001185	ev	-/-	-/-

7.4 Conducted measurements BT system



OP = AV + CA
(OP-output power; AV-analyzer value; CA-loss signal path)

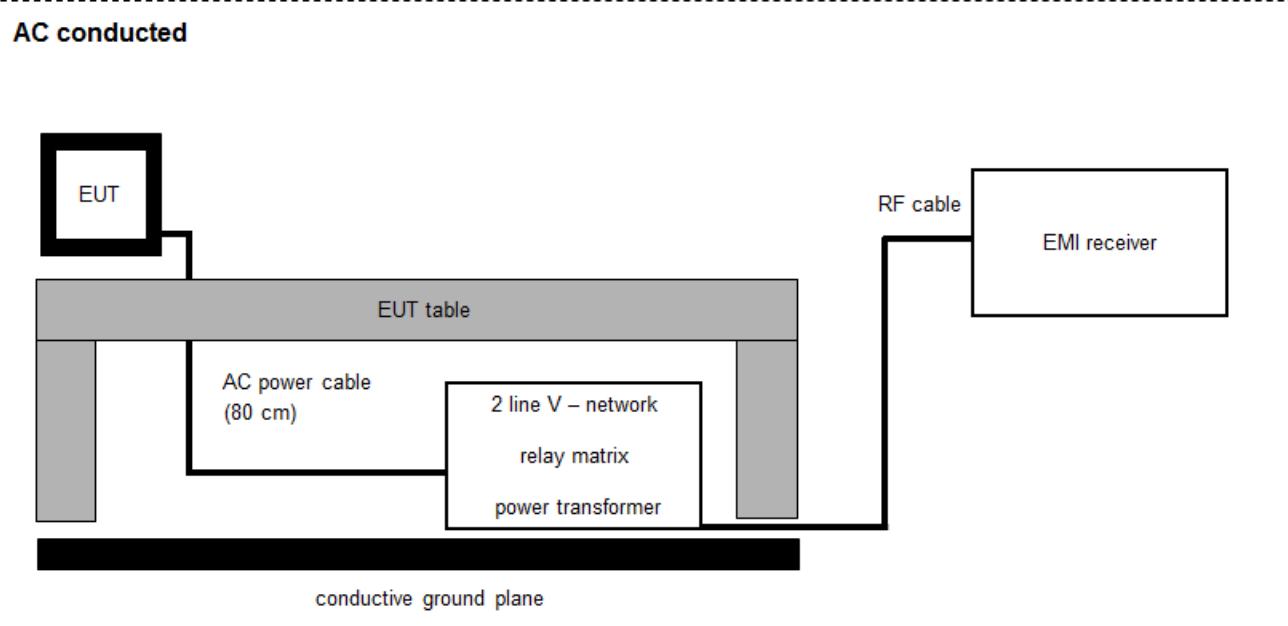
Example calculation:

$$\text{OP [dBm]} = 6.0 \text{ [dBm]} + (11.7) \text{ [dB]} = 17.7 \text{ [dBm]} (58.88 \text{ mW})$$

Used equipment:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch / Control Unit	3488A	HP		300001691	ne		
2	A	Power Supply DC	NGPE 40/40	R&S	388	400000078	vIKI!	22.01.2015	22.01.2017
3	A	Signal Analyzer 20Hz-26.5GHz-150 to + 30 dBm	FSIQ26	R&S	835540/018	300002681	k	30.01.2014	30.01.2016
4	A	Frequency Standard (Rubidium Frequency Standard)	MFS (Rubidium)	R&S (Datum)	002	300002681	Ve	29.01.2015	29.01.2017
5	A	CBT (Bluetooth Tester + EDR Signalling)	CBT 1153.9000K35, CBT-B55, CBT-K55	R&S	100313	300003516	vIKI!	26.08.2014	26.08.2016
6	A	CBT-K57 Software-Option for CBT/CBT32	CBT-K57	R&S	101051	300003910	ne		
7	A	USB/GPIB interface	82357B	Agilent Technologies	MY52103346	300004390	ne		
8	A	BT-K57 Software-Option for CBT/CBT32	CBT-K57	R&S	101483	300003910	ne		
9	A	Messplatzrechner	Tecline	F+W	101483	300003580	ne		
10	A	RF cable	-/-	Huber & Suhner	AC02-C01	-/-	-/-	-/-	-/-
11	A	RF cable	-/-	Huber & Suhner	AC02-C02	-/-	-/-	-/-	-/-
12	A	DC block	BLK-18-S	IMET	AC02-DC01	-/-	-/-	-/-	-/-
13	A	Power divider	4324.4	Narda	AC02-PD01	-/-	-/-	-/-	-/-
14	A	Coupler	8143	IMET	-/-	300002842	-/-	-/-	-/-

7.5 AC conducted



SS = UR + CF + VC

(SS-signal strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

Example calculation:

$$\text{SS [dB}\mu\text{V/m]} = 37.62 \text{ [dB}\mu\text{V/m]} + 9.90 \text{ [dB]} + 0.23 \text{ [dB]} = 47.75 \text{ [dB}\mu\text{V/m]} (244.06 \mu\text{V/m})$$

Used equipment:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A,B	Netznachbildung	ESH3-Z5	R&S	892475/017	300002209	k	17.06.2014	17.06.2016
2	A,B	RF-Filter-section	85420E	HP	3427A00162	300002214	k	27.11.2006	
3	A,B	EMI-Receiver	8542E	HP	3617A00170	300000568	k	28.01.2015	28.01.2016
4	B	Laptop (Customer)	X961D A00	Dell	CP8207030117-OLE42-OLH-AT4-C	-/-	-/-	-/-	-/-

8 Measurement uncertainty

Measurement uncertainty	
Test case	Uncertainty
System gain	± 3 dB
Carrier frequency separation	± 21.5 kHz
Number of hopping channels	-/-
Time of occupancy	-/-
Spectrum bandwidth	± 21.5 kHz absolute; ± 15.0 kHz relative
Maximum output power	± 1 dB
Detailed conducted spurious emissions @ the band edge	± 1 dB
Band edge compliance radiated	± 3 dB
Spurious emissions conducted	± 3 dB
Spurious emissions radiated below 30 MHz	± 3 dB
Spurious emissions radiated 30 MHz to 1 GHz	± 3 dB
Spurious emissions radiated 1 GHz to 12.75 GHz	± 3.7 dB
Spurious emissions radiated above 12.75 GHz	± 4.5 dB
Spurious emissions conducted below 30 MHz (AC conducted)	± 2.6 dB

9 Sequence of testing

9.1 Sequence of testing 9 kHz to 30 MHz

Setup

- The equipment was setup to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter (see ANSI C 63.4) – see each test details
- The EUT was set into operation.

Premeasurement

- The turntable rotates from 0° to 315° with 45° steps.
- The antenna height is 1.5 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement

- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axces (0° to 360°).
- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK (QPK / see ANSI C 63.4) detector
- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit, and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

9.2 Sequence of testing 30 MHz to 1 GHz

Setup

- The equipment was setup to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 10 or 3 meter (see ANSI C 63.4) – see each test details
- The EUT was set into operation.

Premasurement

- The turntable rotates from 0° to 315° with 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 to 3 meter.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions

Final measurement

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP (Quasi-Peak / see ANSI C 63.4) detector with an EMI receiver
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit, and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

9.3 Sequence of testing 1 GHz to 12.75 GHz

Setup

- The equipment was setup to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter (see ANSI C 63.4) – see each test details
- The EUT was set into operation.

Premeasurement

- The turntable rotates from 0° to 315° with 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement

- The final measurement will be performed with minimum the six highest peaks according the requirements of the ANSI C63.4.
- According to the maximum found antenna polarisation and turntable position of the premeasurement the software maximizes the peaks by rotating the turntable position (0° to 360°). This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps). This procedure is repeated for both antenna polarisations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS (RMS / see ANSI C 63.4) detector
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit, and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

9.4 Sequence of testing above 12.75 GHz

Setup

- The equipment was setup to simulate a typical usage like described in the user manual or described by manufacturer.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 0.5 meter
- The EUT was set into operation.

Premeasurement

- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement

- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and RMS (RMS / see ANSI C 63.4) detector
- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit, and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

10 Summary of measurement results

<input checked="" type="checkbox"/>	No deviations from the technical specifications were ascertained
<input type="checkbox"/>	There were deviations from the technical specifications ascertained
<input type="checkbox"/>	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS - 247, Issue 1	See table!	2015-07-23	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Mode	C	NC	NA	NP	Remark
§15.247(b)(4) RSS - 247 / 5.4 (2)	System gain	Nominal	Nominal	GFSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(a)(1) RSS - 247 / 5.1 (2)	Carrier frequency separation	Nominal	Nominal	GFSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(a)(1) RSS - 247 / 5.1 (4)	Number of hopping channels	Nominal	Nominal	GFSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(a)(1) (iii) RSS - 247 / 5.1 (4)	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"/>	-/-
§15.247(a)(1) RSS - 247 / 5.1 (1)	Spectrum bandwidth of a FHSS system bandwidth	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	<input checked="" type="checkbox"/> <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 type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	-/-
§15.247(b)(1) RSS - 247 / 5.4 (2)	Maximum output power	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	<input checked="" type="checkbox"/> <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 type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	-/-
§15.247(d) RSS - 247 / 5.5	Detailed spurious emissions @ the band edge - conducted	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	<input checked="" type="checkbox"/> <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 type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	-/-
§15.205 RSS - 247 / 5.5 RSS - Gen	Band edge compliance radiated	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	<input checked="" type="checkbox"/> <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 type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	-/-
§15.247(d) RSS - 247 / 5.5	Spurious emissions conducted	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	<input checked="" type="checkbox"/> <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 type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	-/-
§15.209(a) RSS - Gen	Spurious emissions radiated below 30 MHz	Nominal	Nominal	8 DPSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(d) RSS - 247 / 5.5 §15.109 RSS - Gen	Spurious emissions radiated 30 MHz to 1 GHz	Nominal	Nominal	8 DPSK RX mode	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(d) RSS - 247 / 5.5 §15.109 RSS - Gen	Spurious emissions radiated above 1 GHz	Nominal	Nominal	8 DPSK RX mode	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.107(a) §15.207	Conducted emissions below 30 MHz (AC conducted)	Nominal	Nominal	8 DPSK RX mode	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-

Note: C = Complies; NC = Not complies; NA = Not applicable; NP = Not performed

11 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:	Bluetooth® Core Specification Module report: Report-ETHE0018.2.pdf Antenna gain: 3-3-TECH-587 900-01 Flir T1020 - Antenna measurements_A
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:	<input checked="" type="checkbox"/> Bluetooth Test mode loop back enabled (EUT is controlled over CBT/CMU) <input type="checkbox"/> Special software is used. EUT is transmitting pseudo random data by itself
Antennas and transmit operating modes:	<input checked="" type="checkbox"/> Operating mode 1 (single antenna) - Equipment with 1 antenna, - Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used, - Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)

12 Measurement results

12.1 Antenna gain

Limits:

FCC	IC
6 dBi	

Results:

T _{nom}	V _{nom}	ISM band 2400 MHz to 2483.5 MHz
	Gain [dBi]	+ 0.9 dBi*

*Note: For detailed information, please take a look at the external document 3-3-TECH-587 900-01 Flir T1020 - Antenna measurements_A.

Verdict: **complies**

12.2 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
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	4 MHz
Trace mode:	Max Hold
Test setup:	See sub clause 7.4 - A
Measurement uncertainty	See sub clause 8

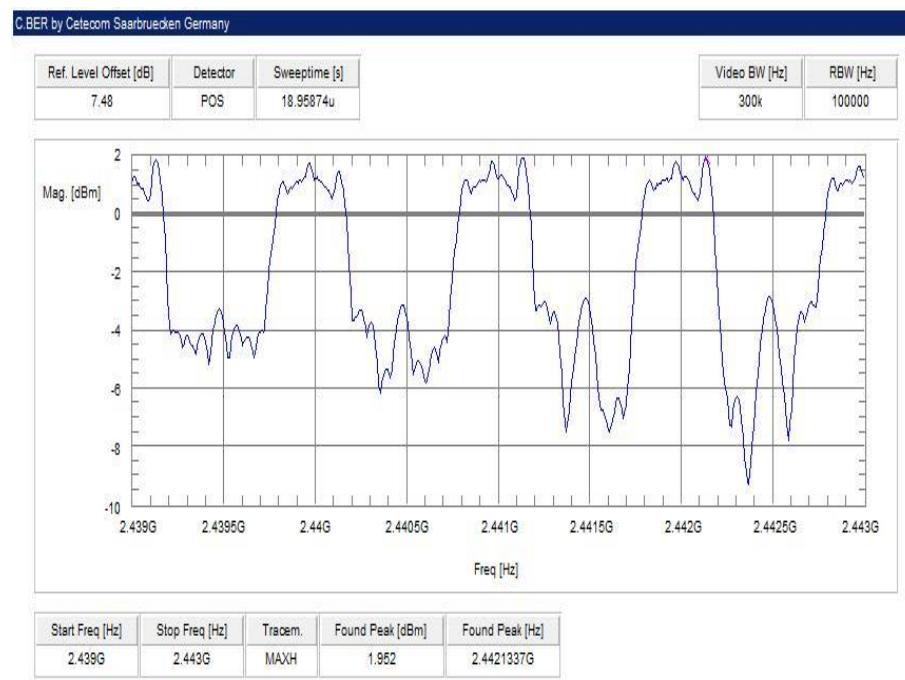
Limits:

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

Result:

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

Verdict: **complies**

Plot:**Plot 1:** Carrier frequency separation (GFSK modulation)

12.3 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
Resolution bandwidth:	500 kHz
Video bandwidth:	500 kHz
Span:	Plot 1: 2400 – 2445 MHz Plot 2: 2445 – 2485 MHz
Trace mode:	Max Hold
Test setup:	See sub clause 7.4 - A
Measurement uncertainty	See sub clause 8

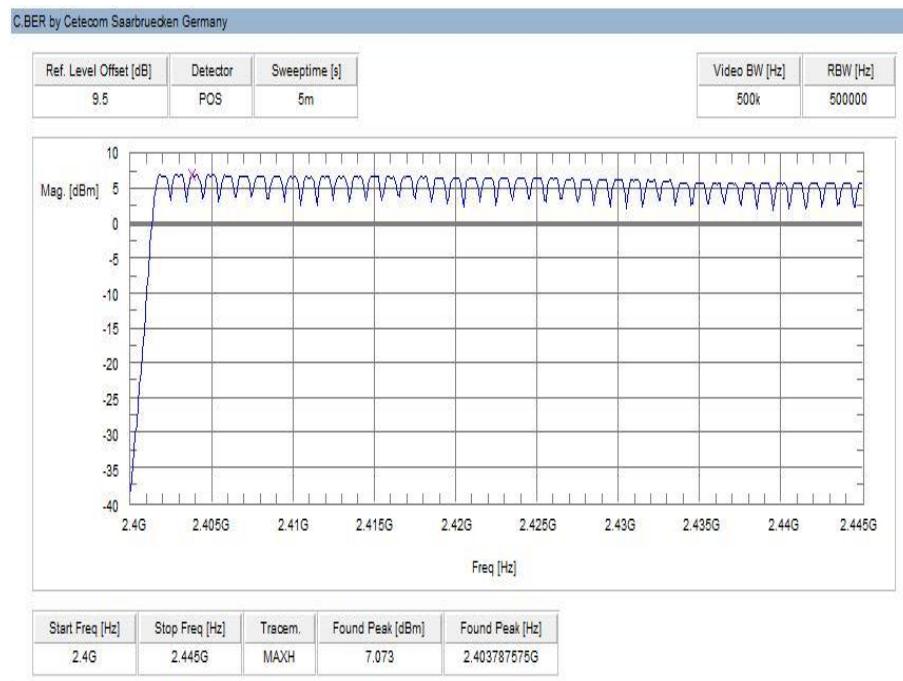
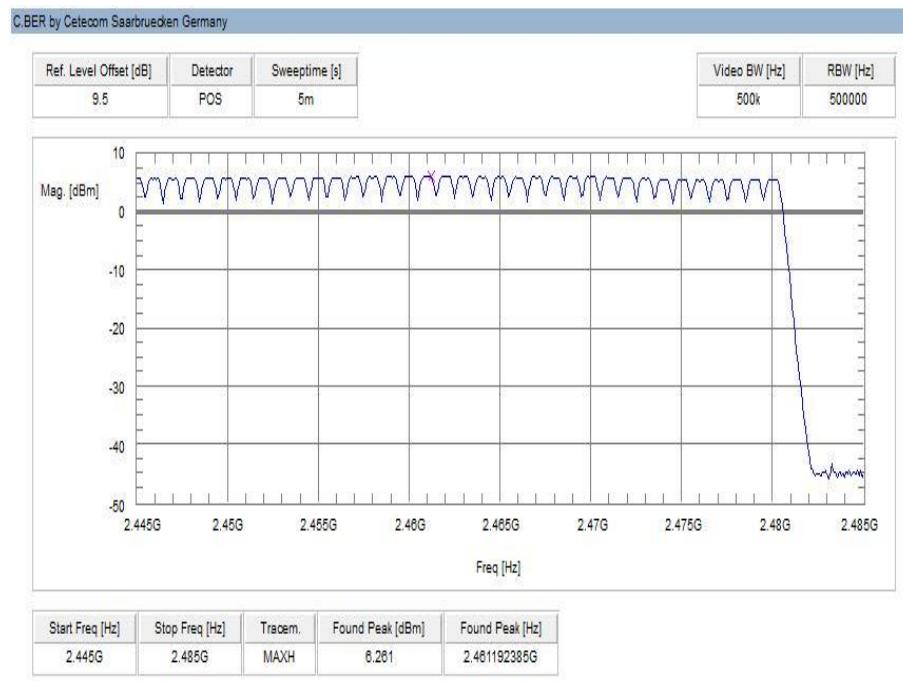
Limits:

FCC	IC
At least 15 non overlapping hopping channels	

Result:

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

Verdict: **complies**

Plots:**Plot 1:** Number of hopping channels (GFSK modulation)**Plot 2:** Number of hopping channels (GFSK modulation)

12.4 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 the Bluetooth® Core Specification V2.0 & V2.1 & V3.0 & V4.0 (+ critical errata) 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 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
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.	

Verdict: complies

12.5 Spectrum bandwidth of a FHSS system

Description:

Measurement of the 20dB bandwidth and 99% 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
Resolution bandwidth:	30 kHz
Video bandwidth:	100 kHz
Span:	3 MHz
Trace mode:	Max Hold
Test setup:	See sub clause 7.4 - A
Measurement uncertainty	See sub clause 8

Limits:

FCC	IC
GFSK < 1500 kHz Pi/4 DQPSK < 1500 kHz 8DPSK < 1500 kHz	

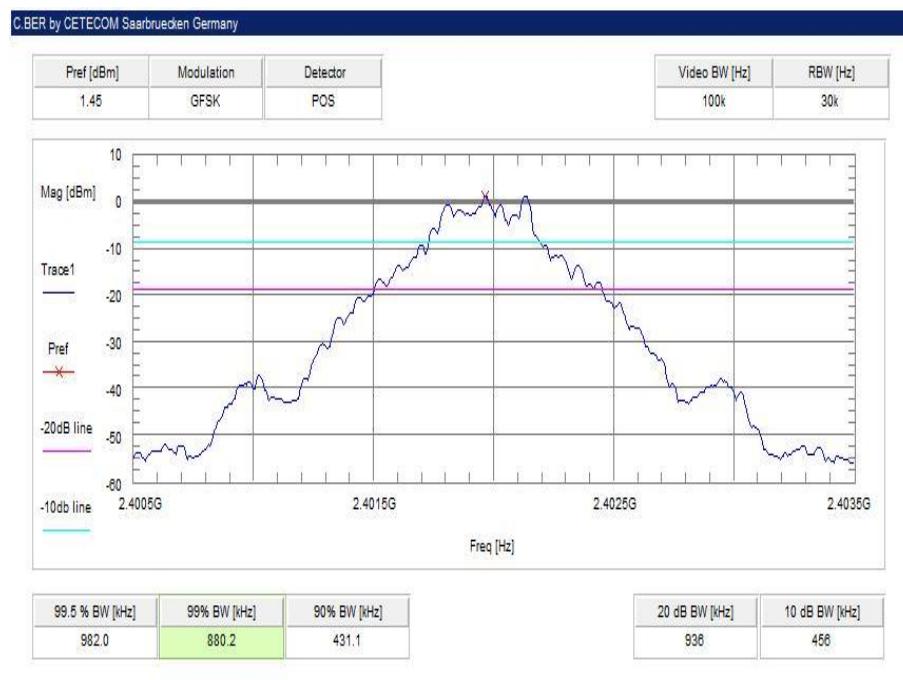
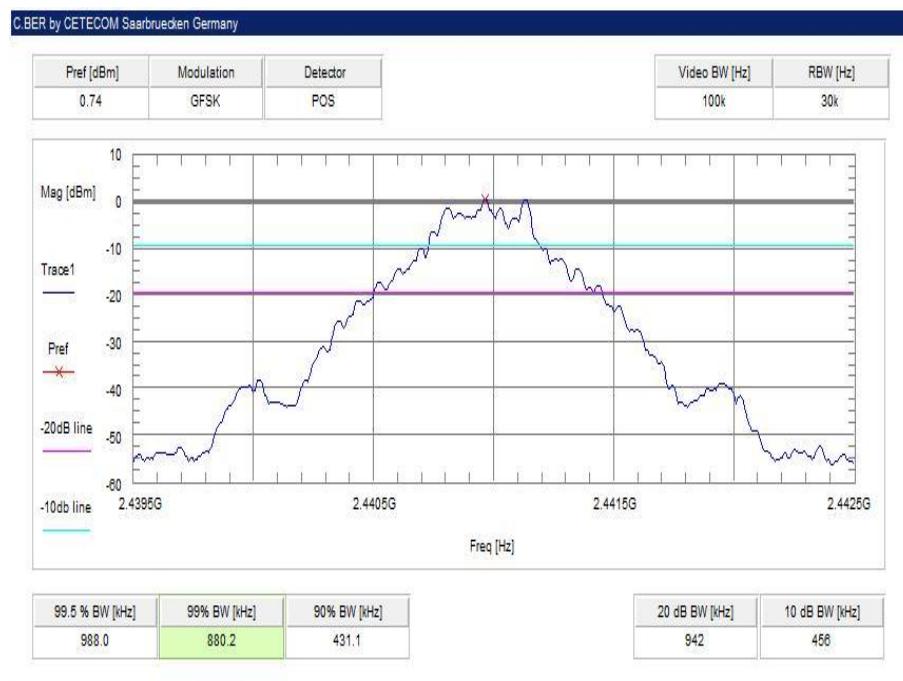
Results:

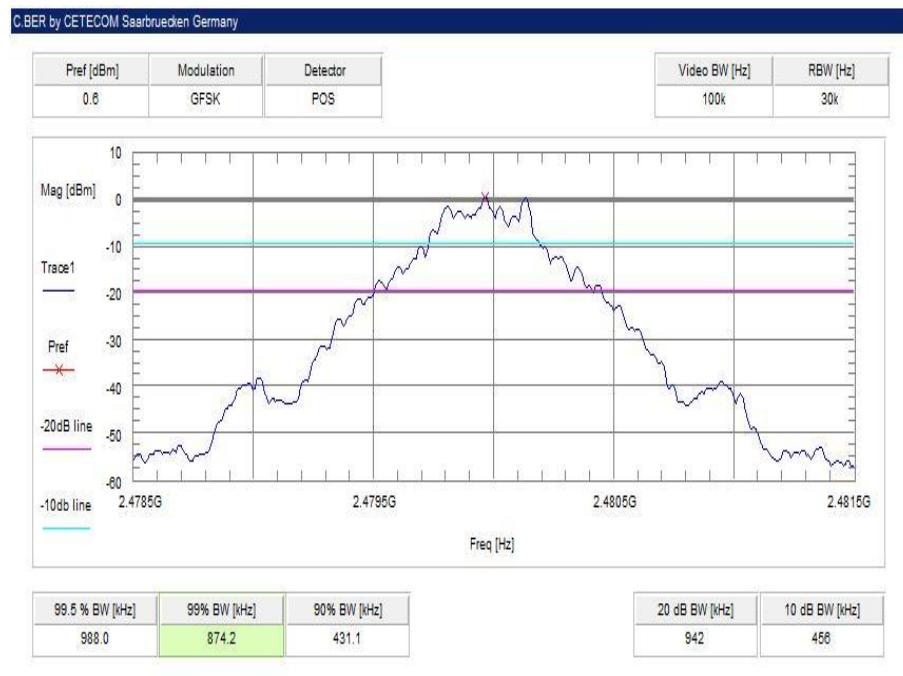
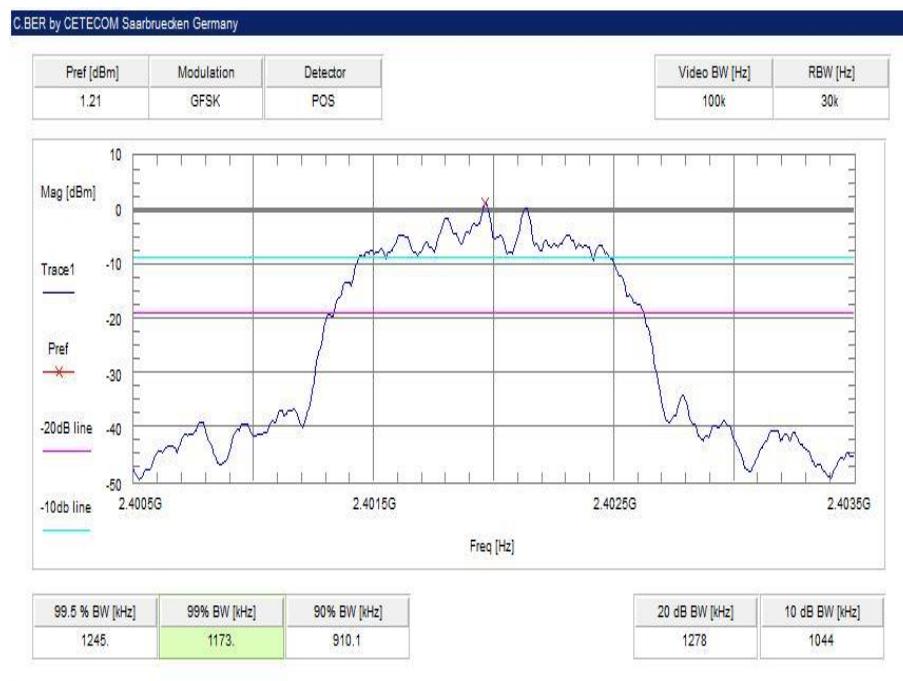
Modulation	20 dB bandwidth [kHz]		
	2402 MHz	2441 MHz	2480 MHz
Frequency			
GFSK	936	942	942
Pi/4 DQPSK	1278	1278	1284
8DPSK	1290	1296	1290

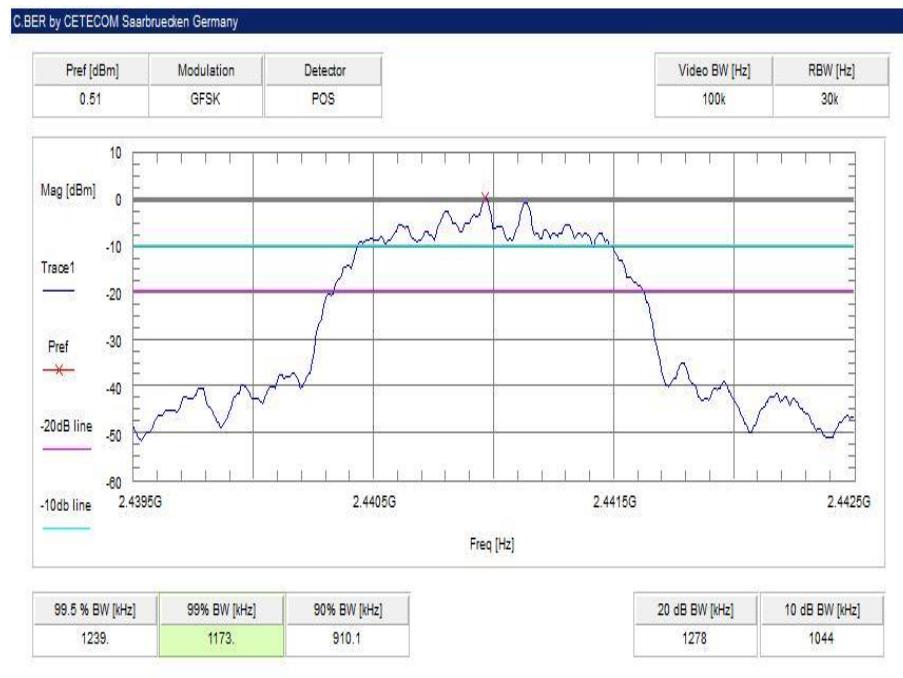
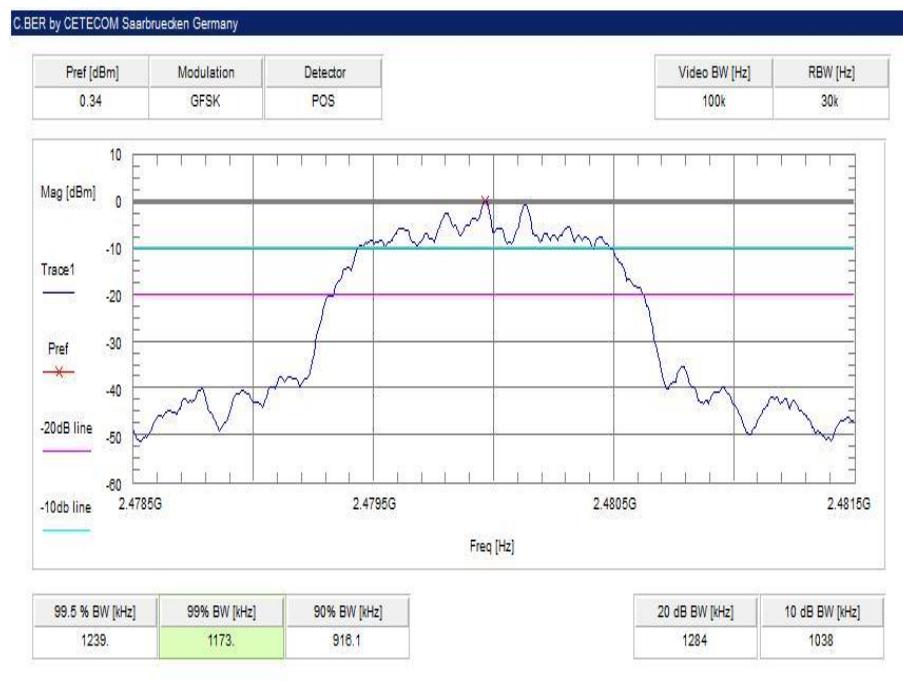
Verdict: complies**Results:**

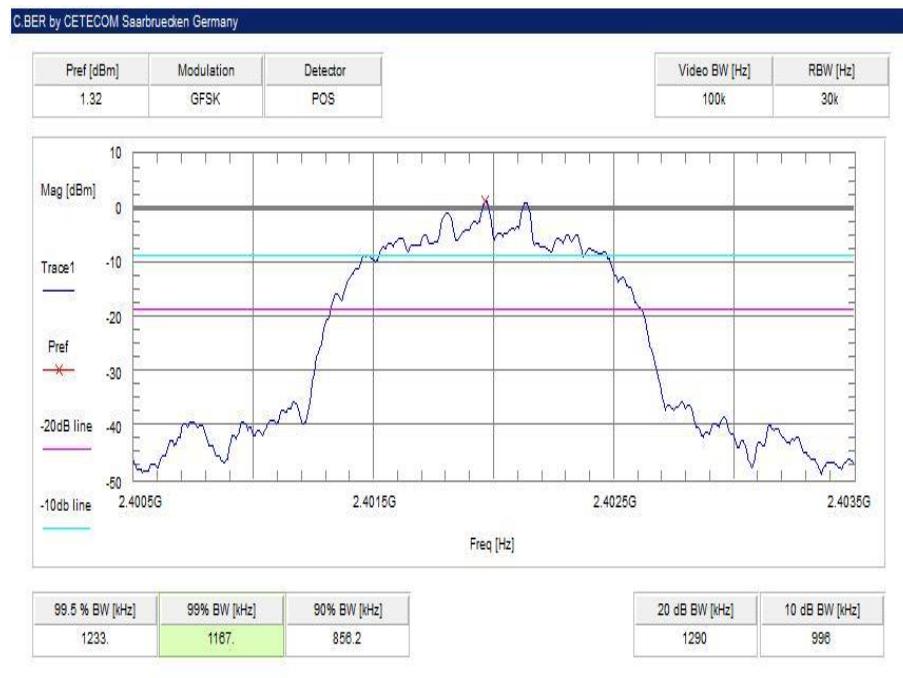
Modulation	99 % bandwidth [kHz]		
	2402 MHz	2441 MHz	2480 MHz
Frequency			
GFSK	880.2	880.2	874.2
Pi/4 DQPSK	1173	1173	1173
8DPSK	1167	1173	1173

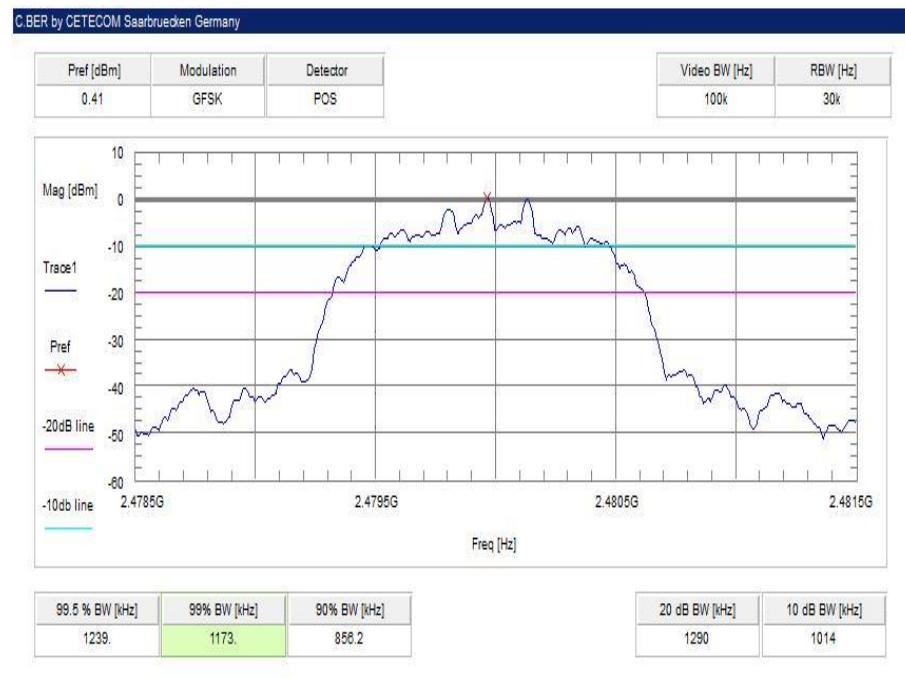
Verdict: complies

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

Plot 7: lowest channel – 2402 MHz, 8 DPSK modulation**Plot 8:** middle channel – 2441 MHz, 8 DPSK modulation

Plot 9: highest channel – 2480 MHz, 8 DPSK modulation

12.6 Maximum output power

Description:

Measurement of the maximum output power conducted. EUT in single channel mode. The measurement is performed according to the ANSI C63.10.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	3 MHz
Video bandwidth:	10 MHz
Span:	6 MHz
Trace mode:	Max Hold
Test setup:	See sub clause 7.4 - A
Measurement uncertainty	See sub clause 8

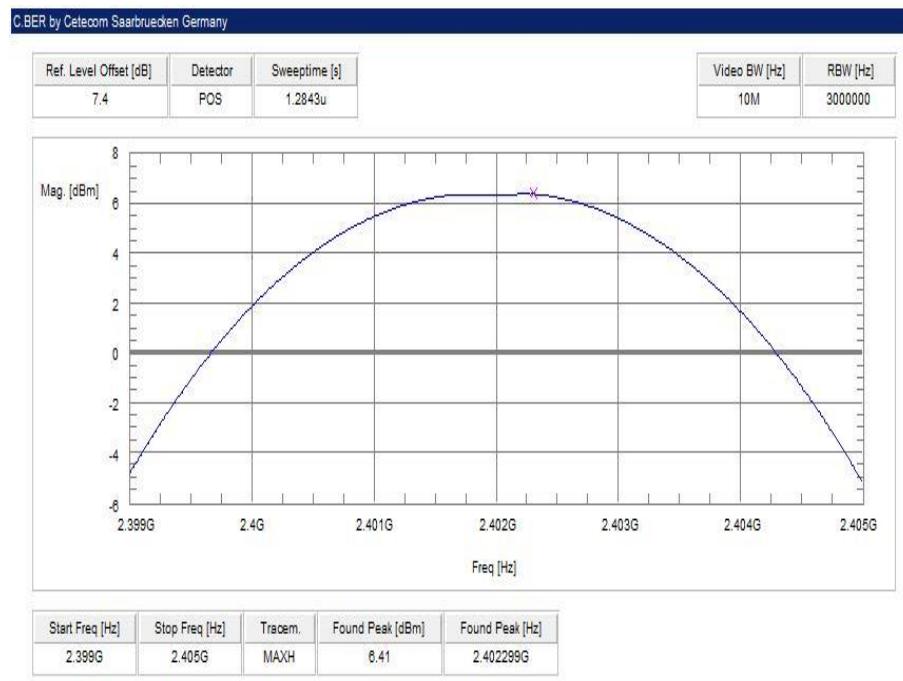
Limits:

FCC	IC
[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	6.41	5.82	5.86
Pi/4 DQPSK	8.62	8.09	8.15
8 DPSK	8.91	8.43	8.39

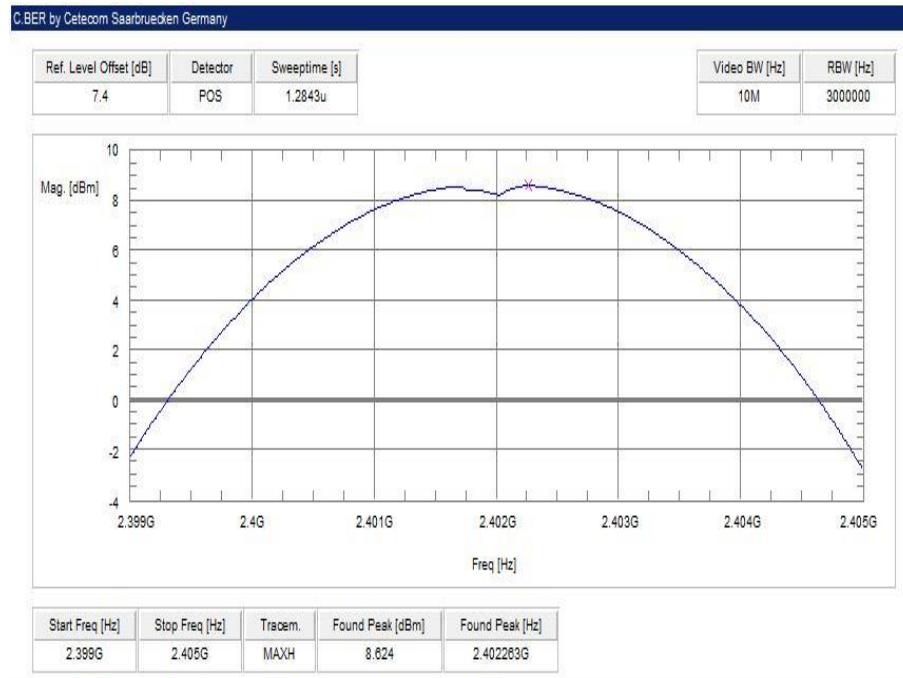
Verdict: **complies**

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

Plot 7: lowest channel – 2402 MHz, 8 DPSK modulation**Plot 8:** middle channel – 2441 MHz, 8 DPSK modulation

Plot 9: highest channel – 2480 MHz, 8 DPSK modulation

12.7 Detailed spurious emissions @ the band edge - conducted

Description:

Measurement of the conducted band edge compliance. 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
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz / 500 kHz
Span:	Lower Band Edge: 2395 – 2405 MHz Upper Band Edge: 2478 – 2489 MHz
Trace mode:	Max Hold
Test setup:	See sub clause 7.4 - A
Measurement uncertainty	See sub clause 8

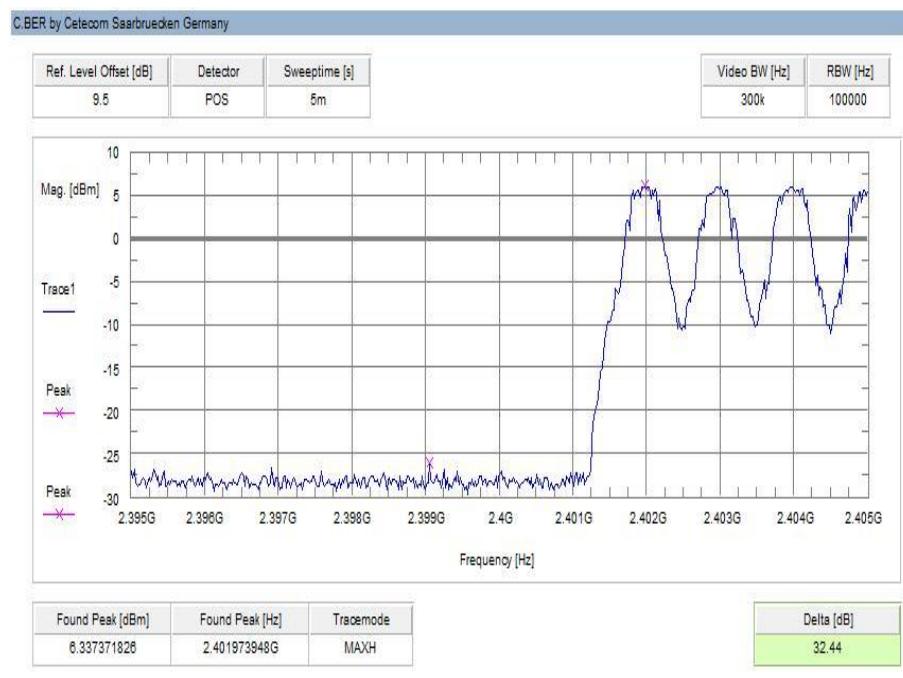
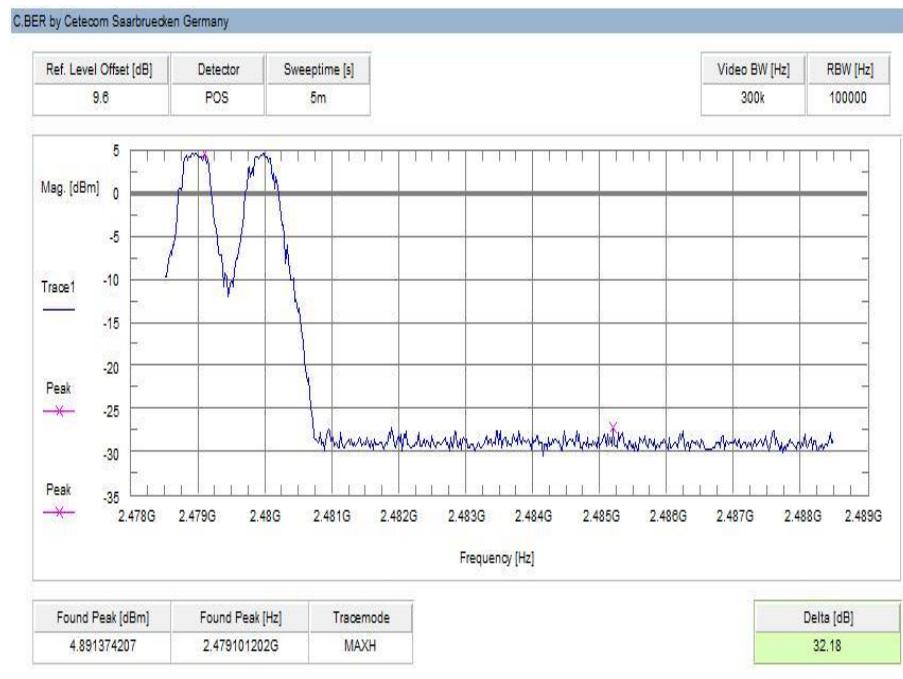
Limits:

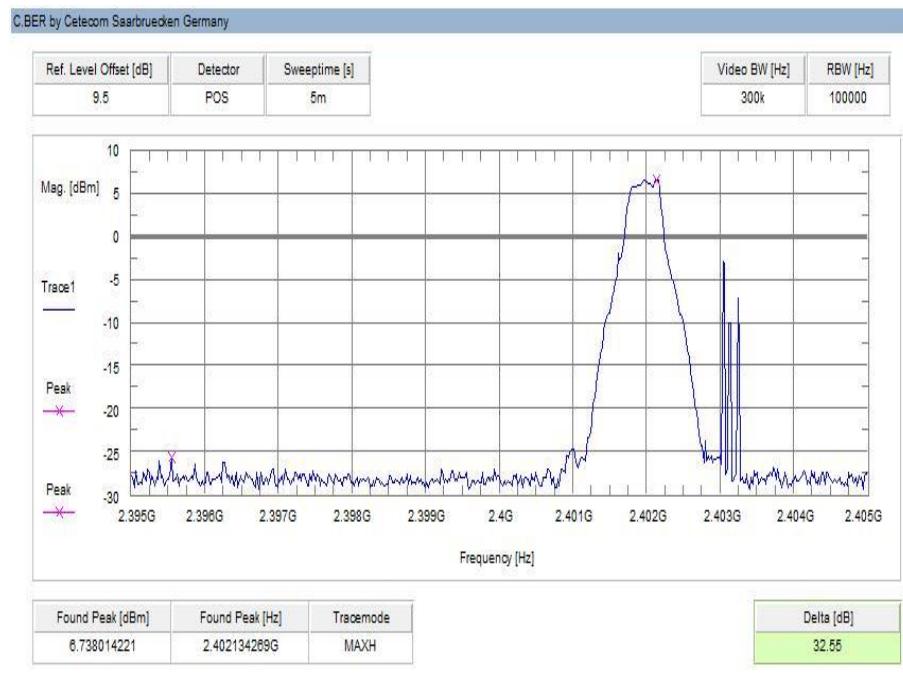
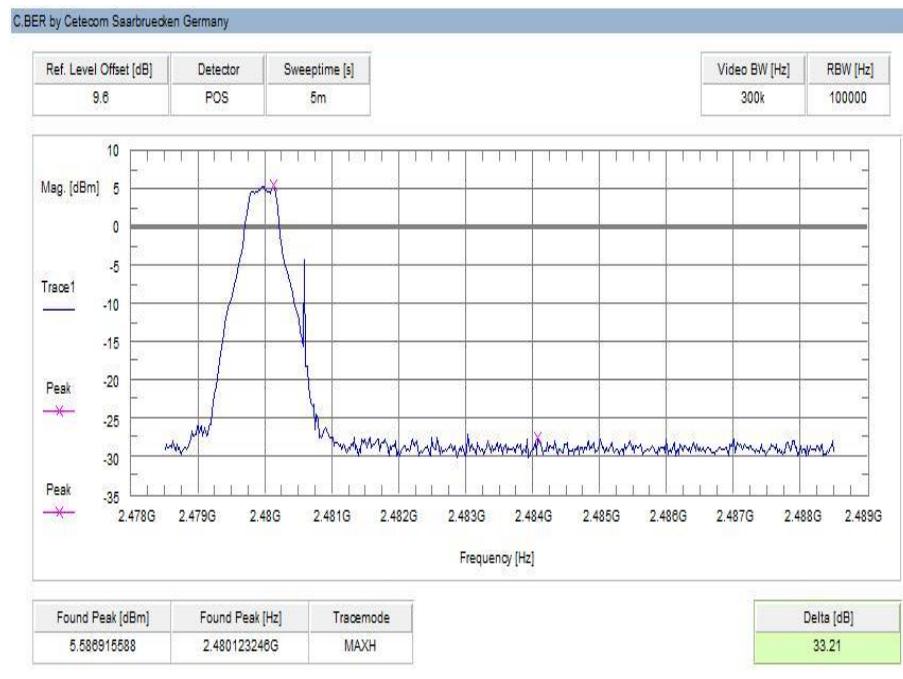
FCC	IC
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains 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.	

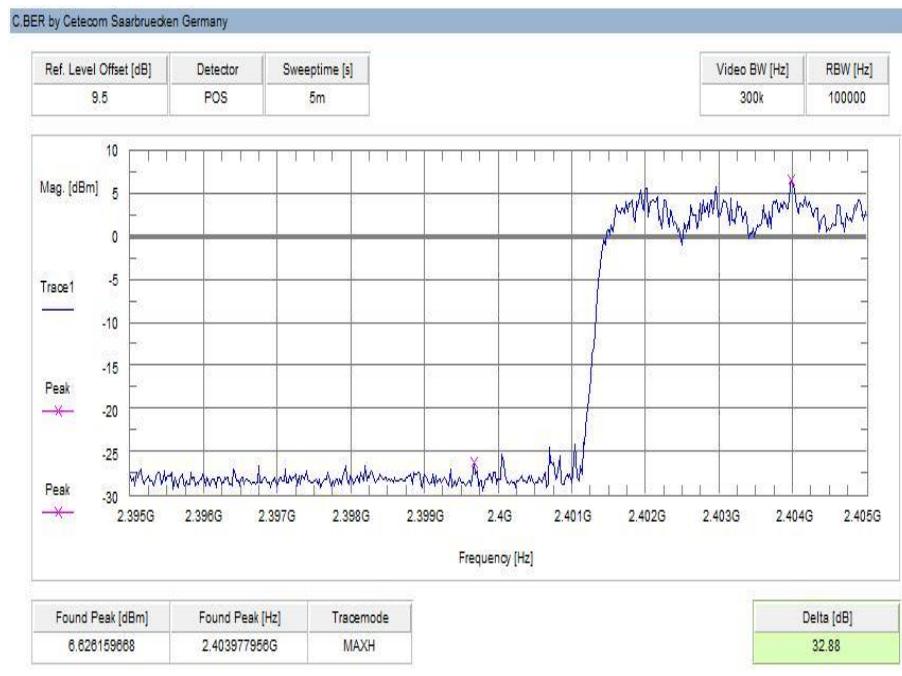
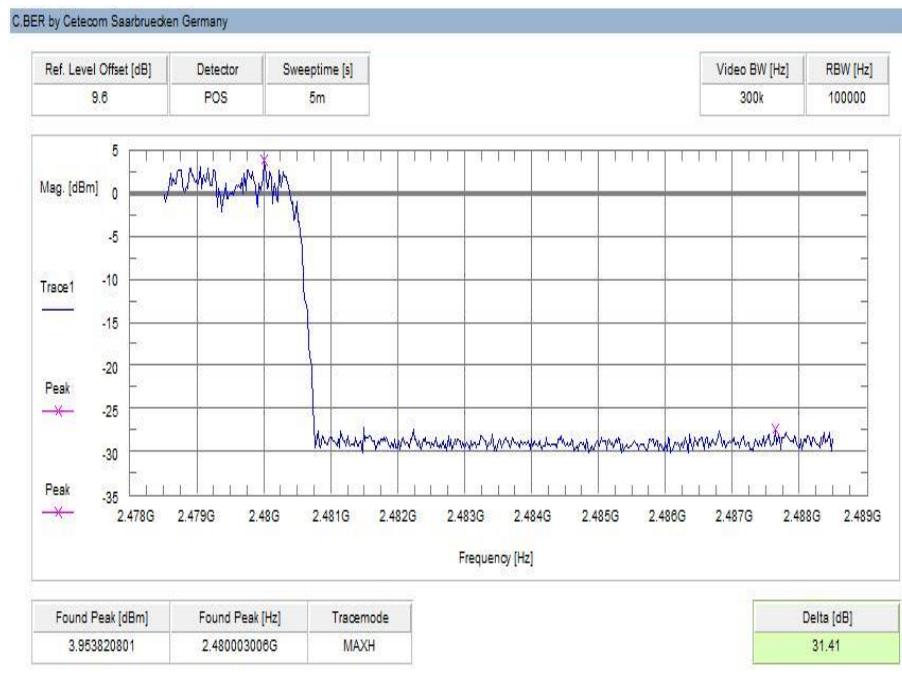
Results:

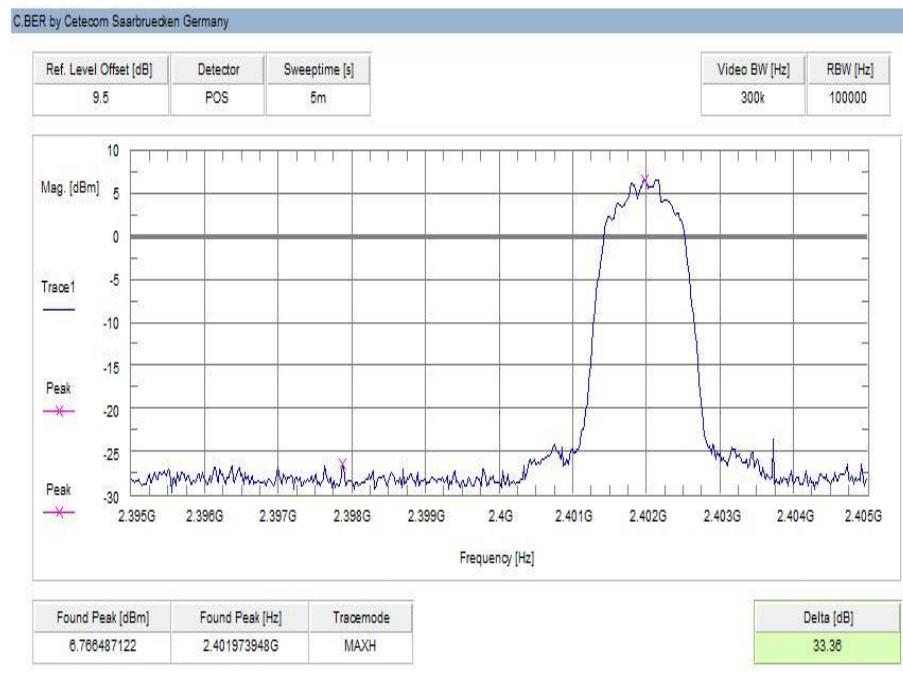
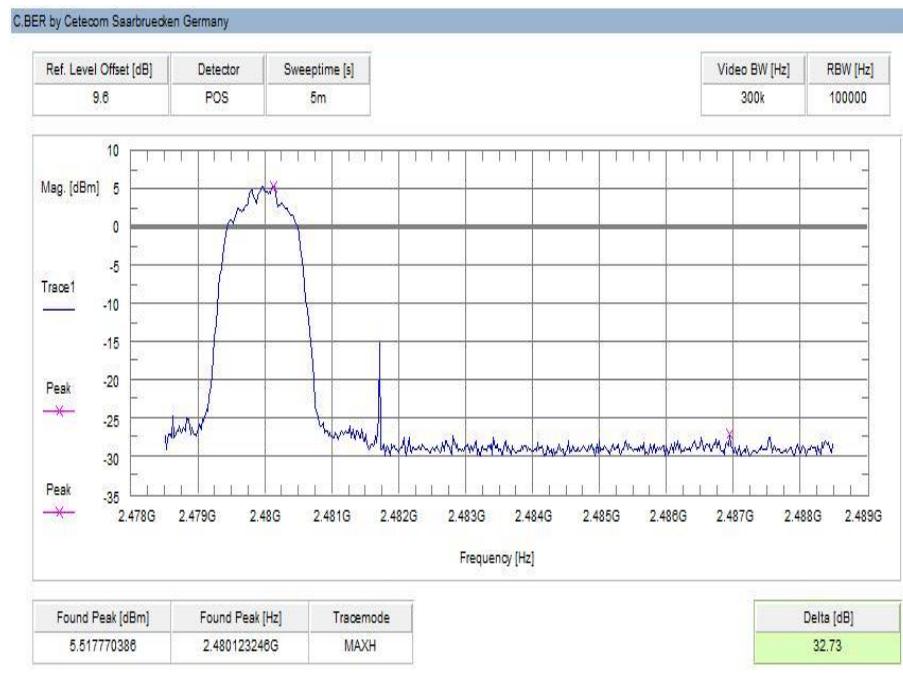
Scenario	Spurious band edge conducted [dB]		
	GFSK	Pi/4 DQPSK	8DPSK
Modulation			
Lower band edge – hopping off	> 20 dB	> 20 dB	> 20 dB
Lower band edge – hopping on	> 20 dB	> 20 dB	> 20 dB
Upper band edge – hopping off	> 20 dB	> 20 dB	> 20 dB
Upper band edge – hopping on	> 20 dB	> 20 dB	> 20 dB

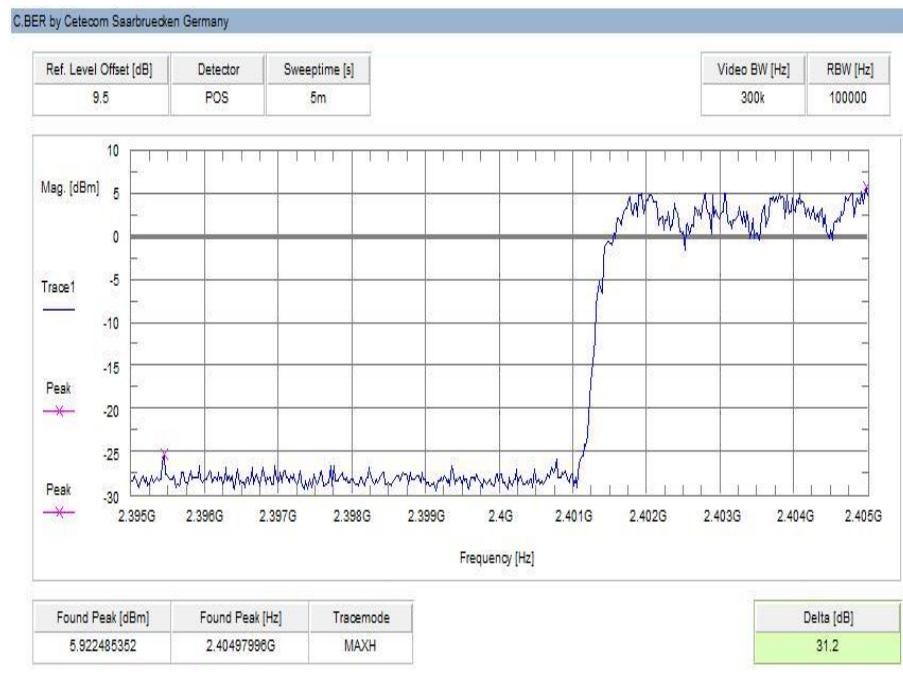
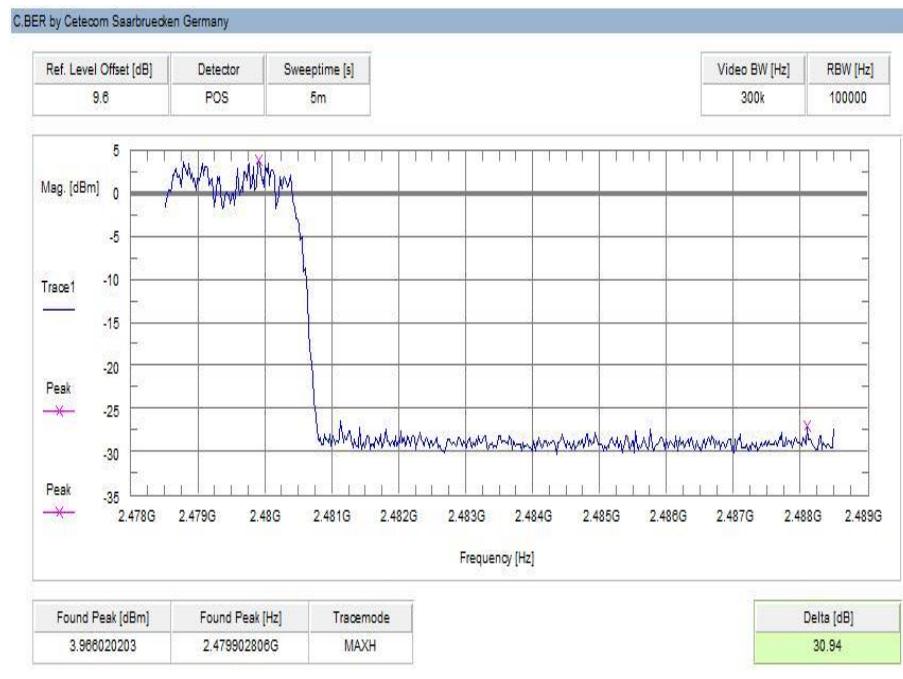
Verdict: **complies**

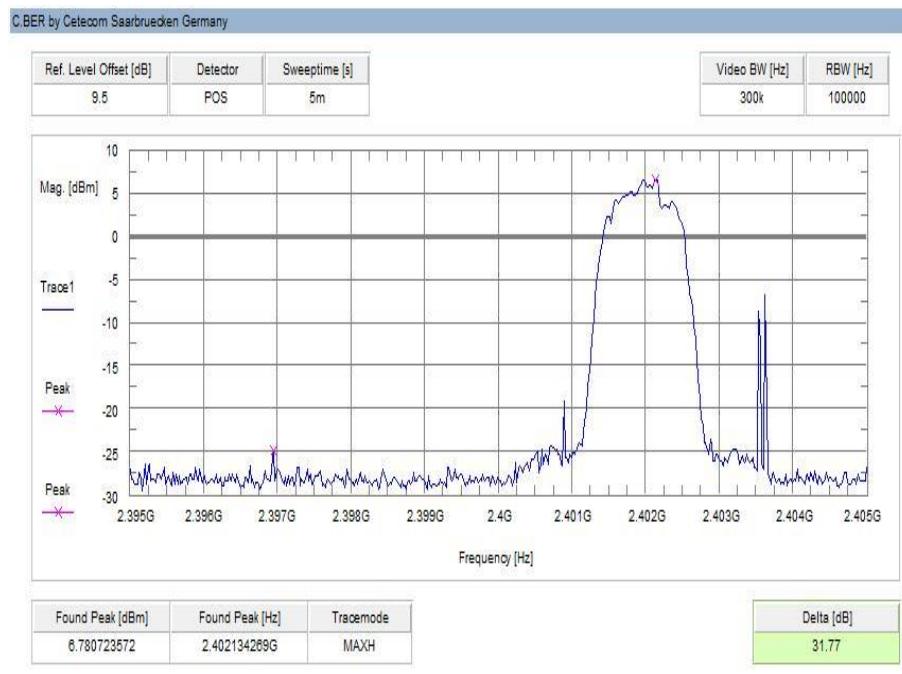
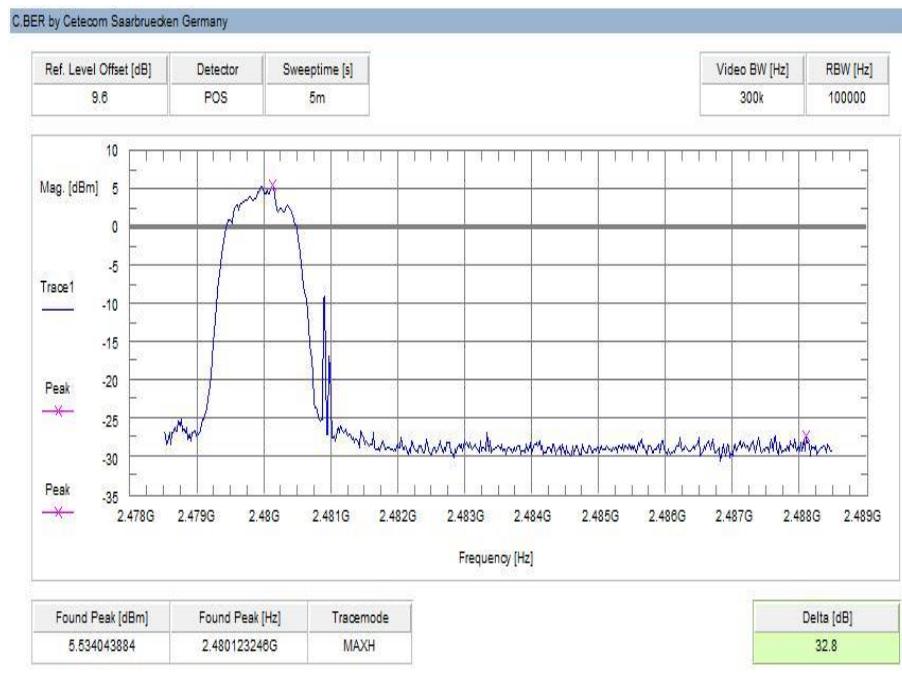
Plots:**Plot 1: Lower band edge – hopping on, GFSK modulation****Plot 2: Upper band edge – hopping on, GFSK modulation**

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

Plot 9: Lower band edge – hopping on, 8DPSK modulation**Plot 10:** Upper band edge – hopping on, 8DPSK modulation

Plot 11: Lower band edge – hopping off, 8DPSK modulation**Plot 12:** Upper band edge – hopping off, 8DPSK modulation

12.8 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 / RMS
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	Lower Band: 2370 – 2400 MHz Upper Band: 2480 – 2500 MHz
Trace mode:	Max Hold
Test setup:	See sub clause 7.2 - C
Measurement uncertainty	See sub clause 8

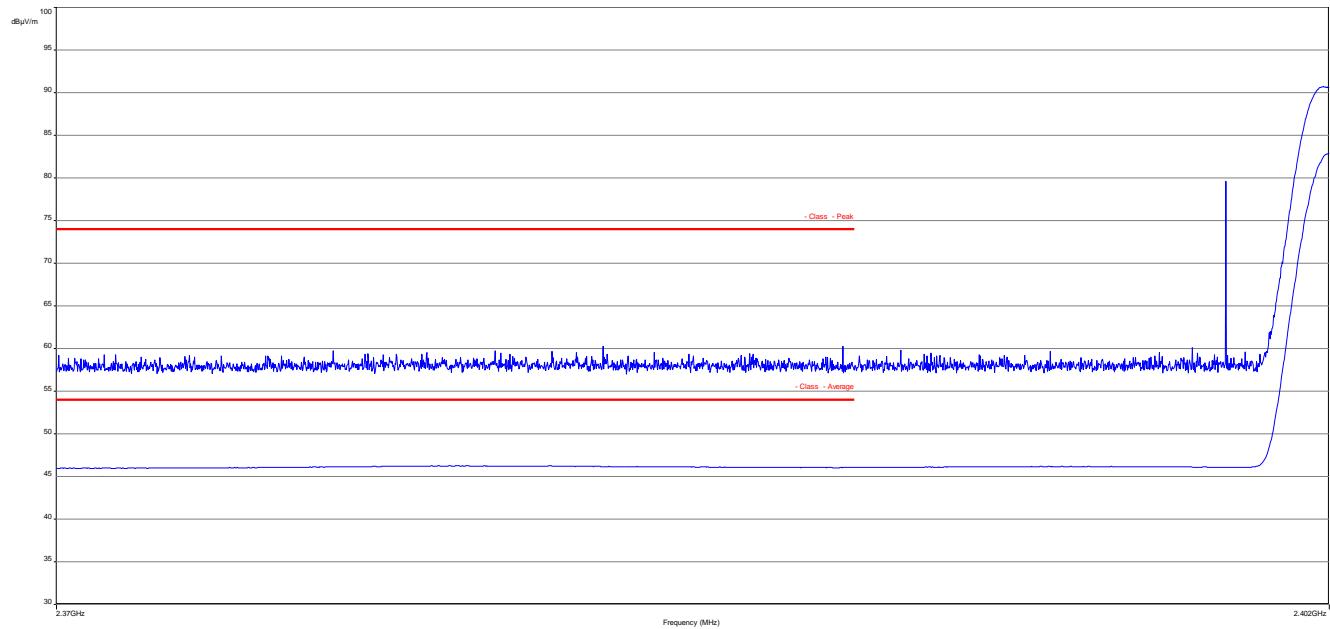
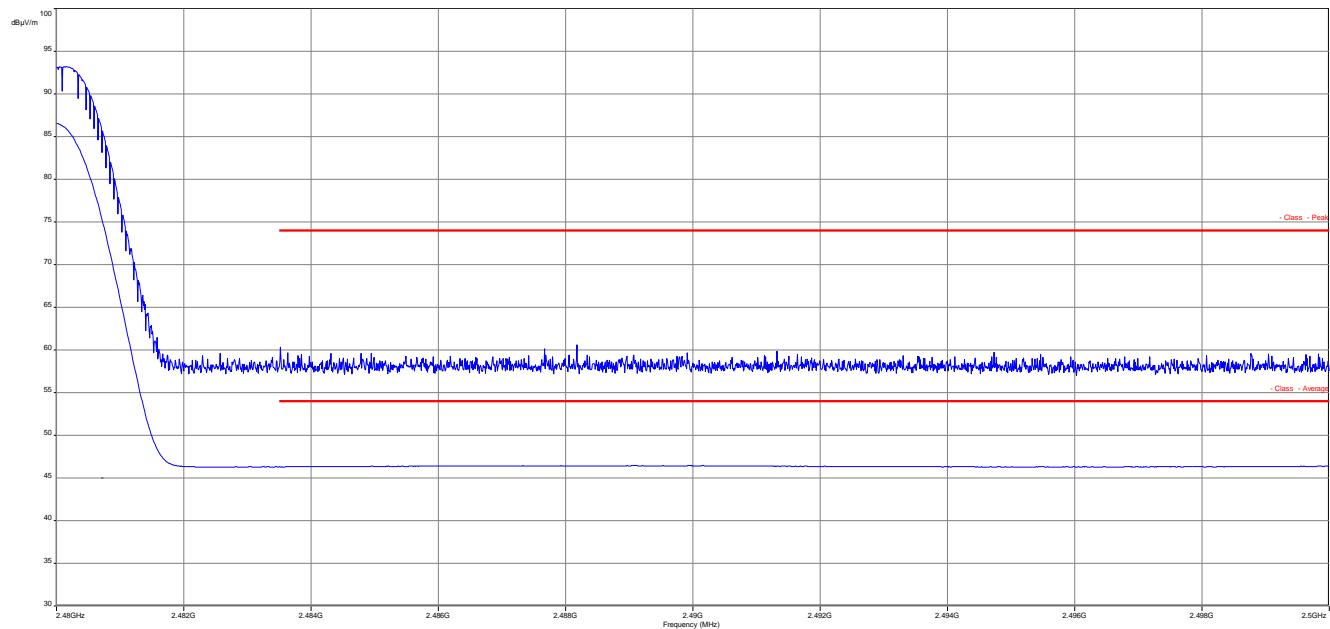
Limits:

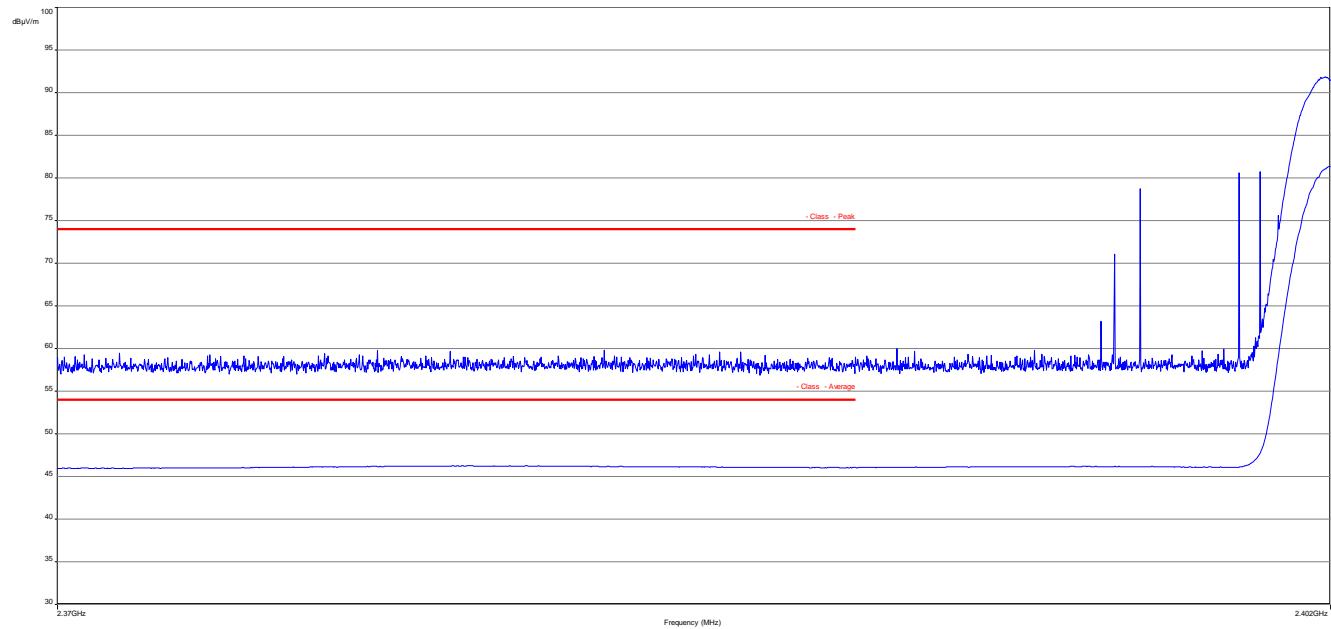
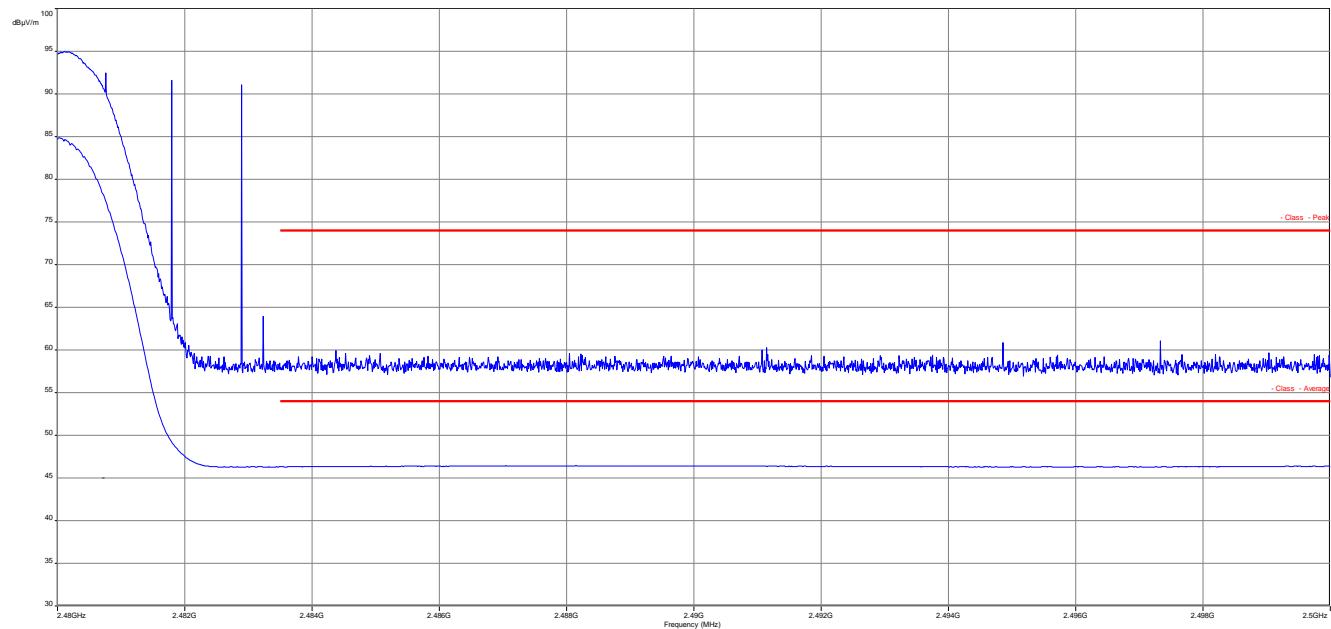
FCC	IC
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains 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)).	
54 dB μ V/m AVG 74 dB μ V/m Peak	

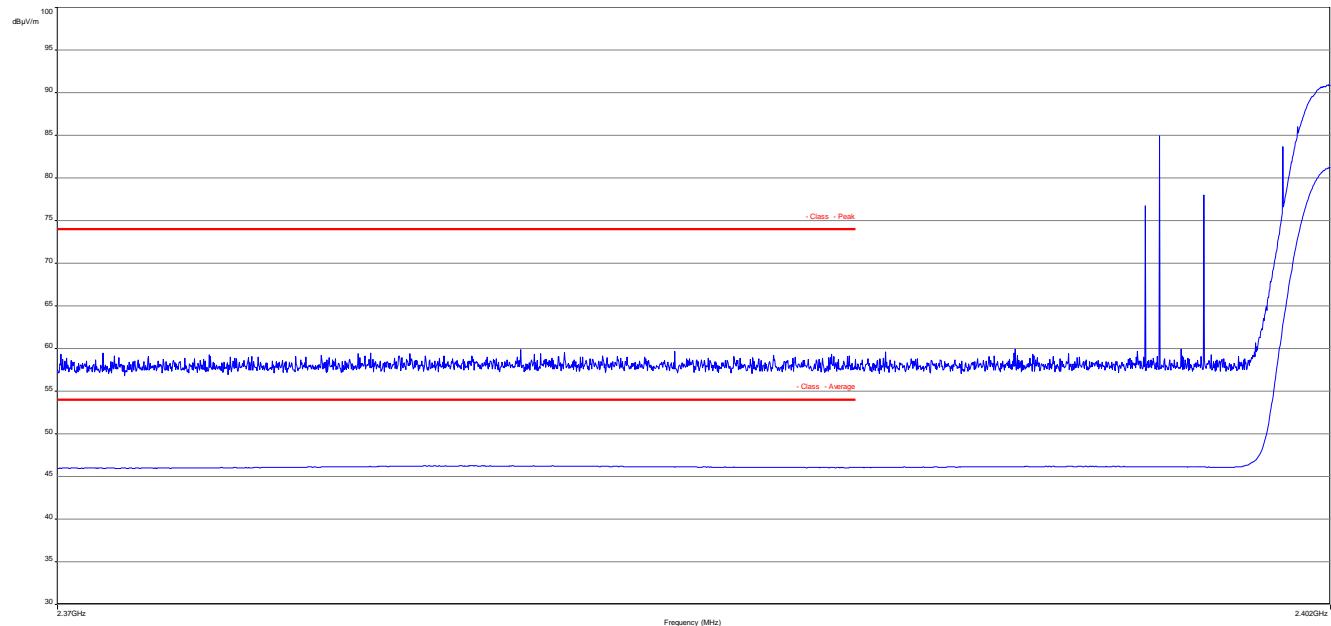
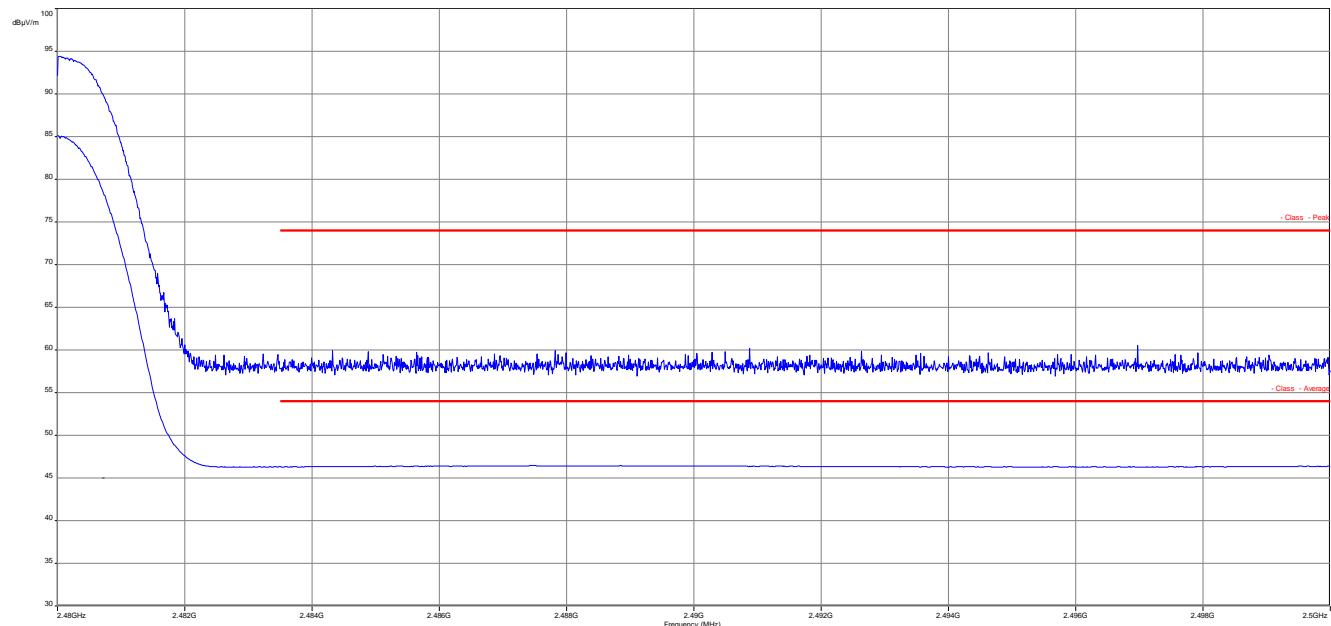
Results:

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

Verdict: complies

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

Plot 5: Lower band edge, 8 DPSK modulation, vertical & horizontal polarization**Plot 6:** Upper band edge, 8 DPSK modulation, vertical & horizontal polarization

12.9 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
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	9 kHz to 25 GHz
Trace mode:	Max Hold
Test setup:	See sub clause 7.4 - A
Measurement uncertainty	See sub clause 8

Limits:

FCC	IC
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	

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		6.7	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria. Please take a look at the plot!			-20 dBc		complies
2441		5.2	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria. Please take a look at the plot!			-20 dBc		complies
2480		5.5	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria. Please take a look at the plot!			-20 dBc		complies

Verdict: **complies****Results:**

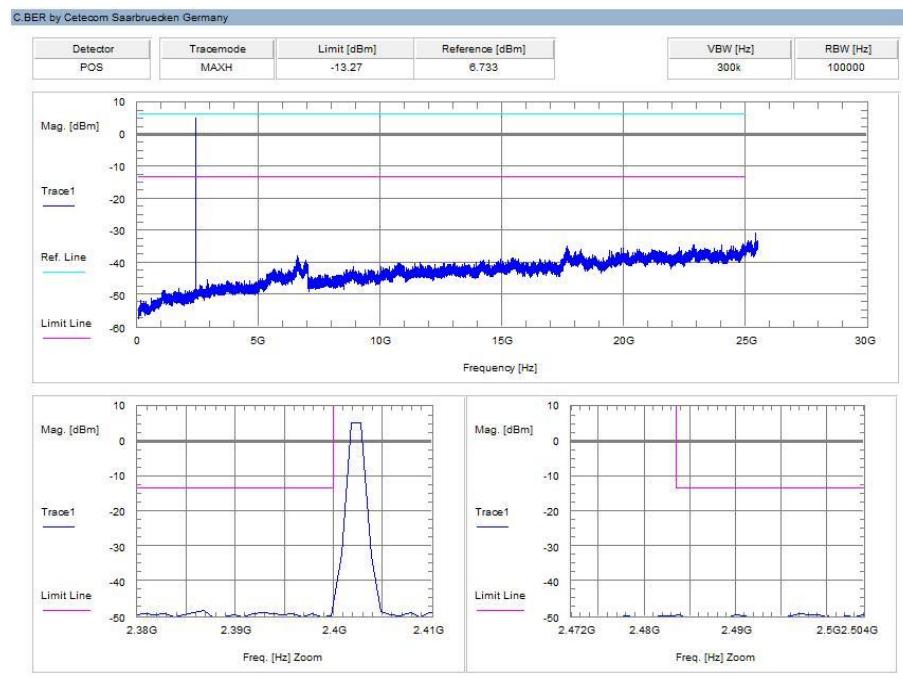
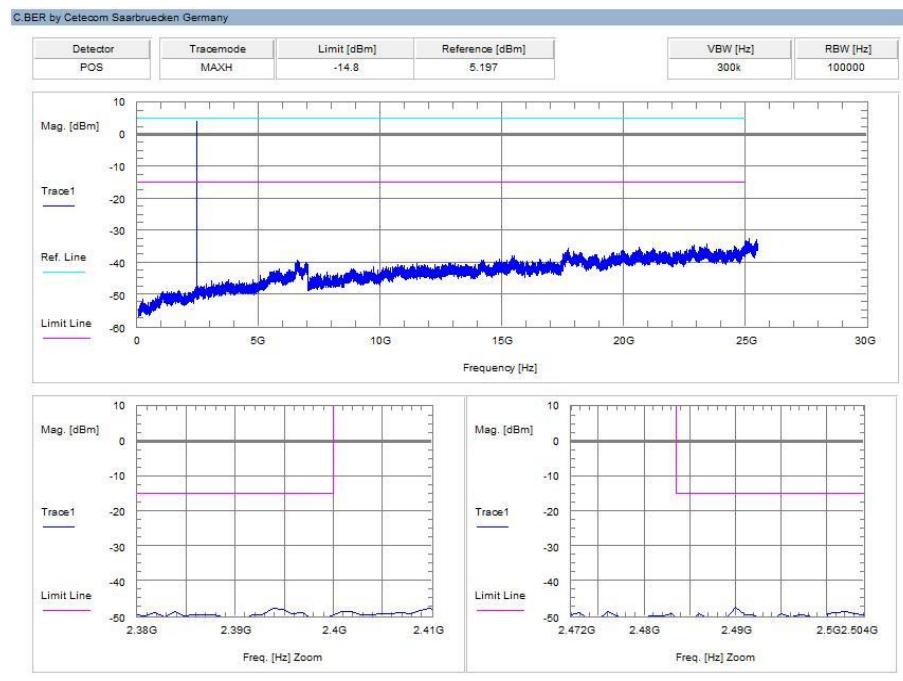
TX spurious emissions conducted					
Pi/4-DQPSK - mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2402		6.6	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria. Please take a look at the plot!			-20 dBc		complies
2441		5.3	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria. Please take a look at the plot!			-20 dBc		complies
2480		5.5	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria. Please take a look at the plot!			-20 dBc		complies

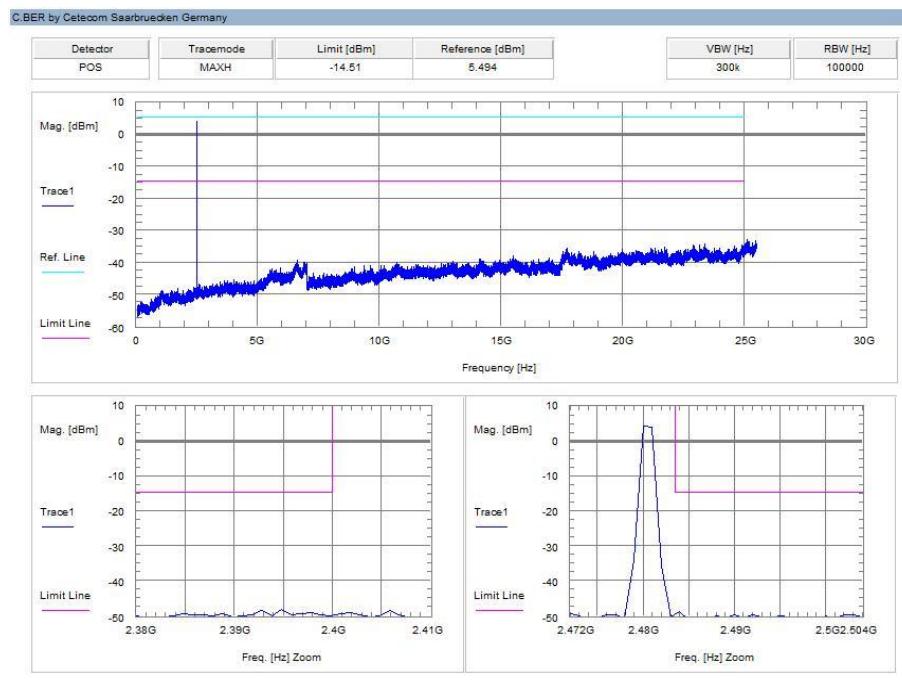
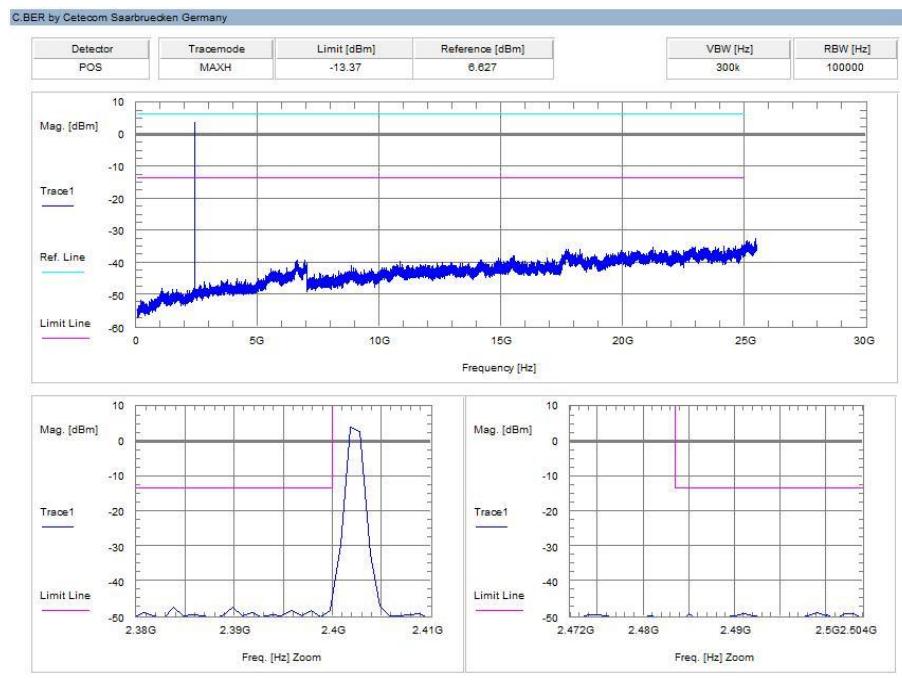
Verdict: **complies**

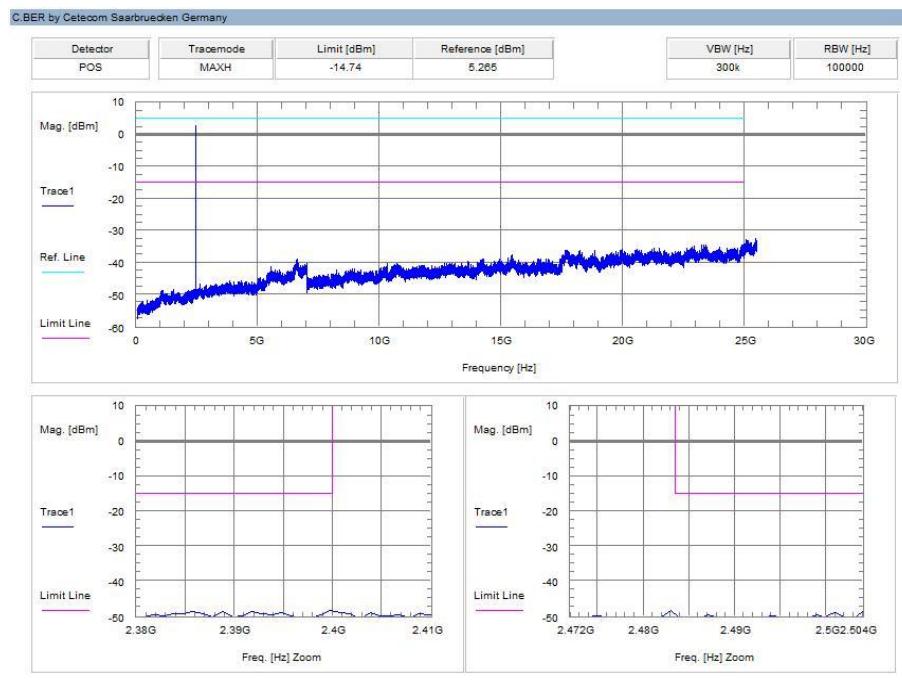
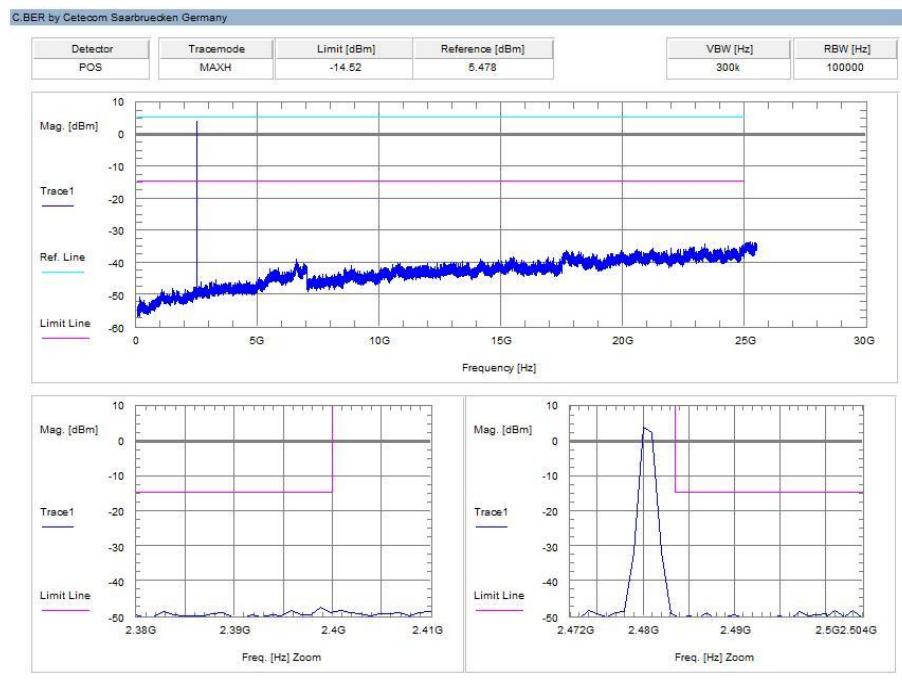
Results:

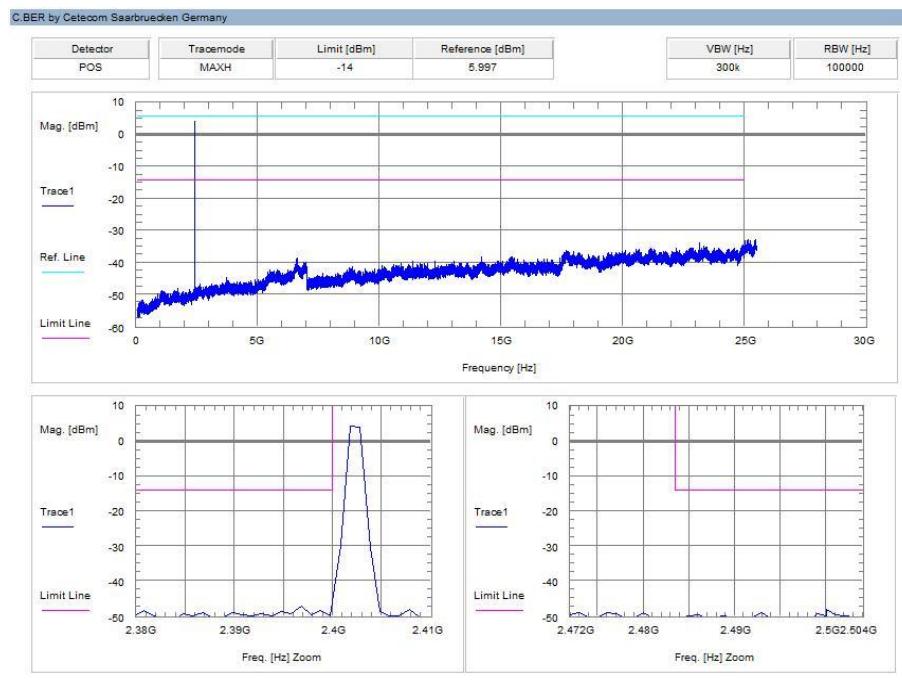
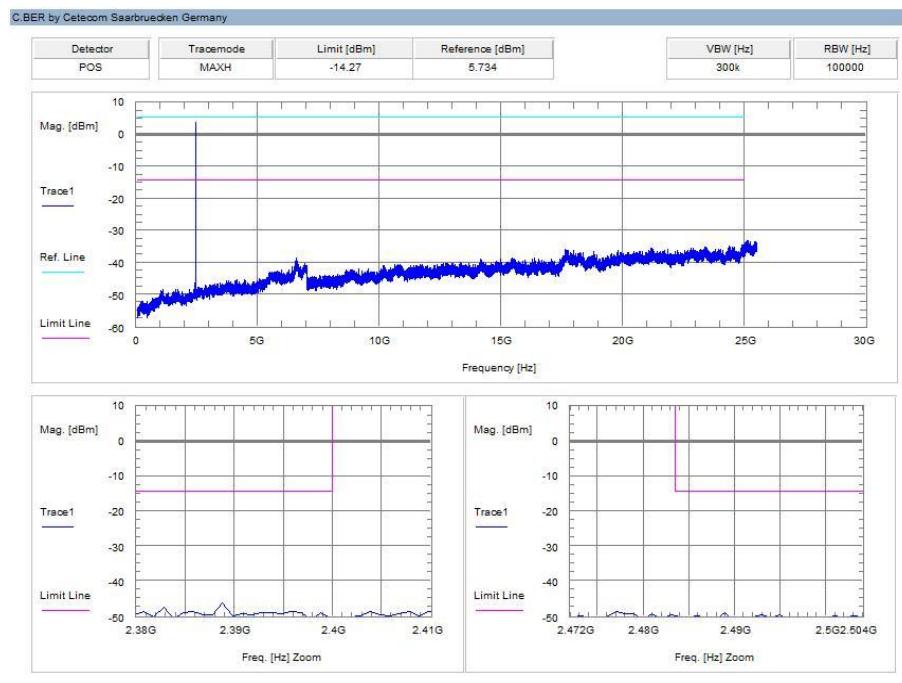
TX spurious emissions conducted 8DPSK - mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2402		6.0	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria. Please take a look at the plot!			-20 dBc		complies
2441		5.7	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria. Please take a look at the plot!			-20 dBc		complies
2480		5.4	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria. Please take a look at the plot!			-20 dBc		complies

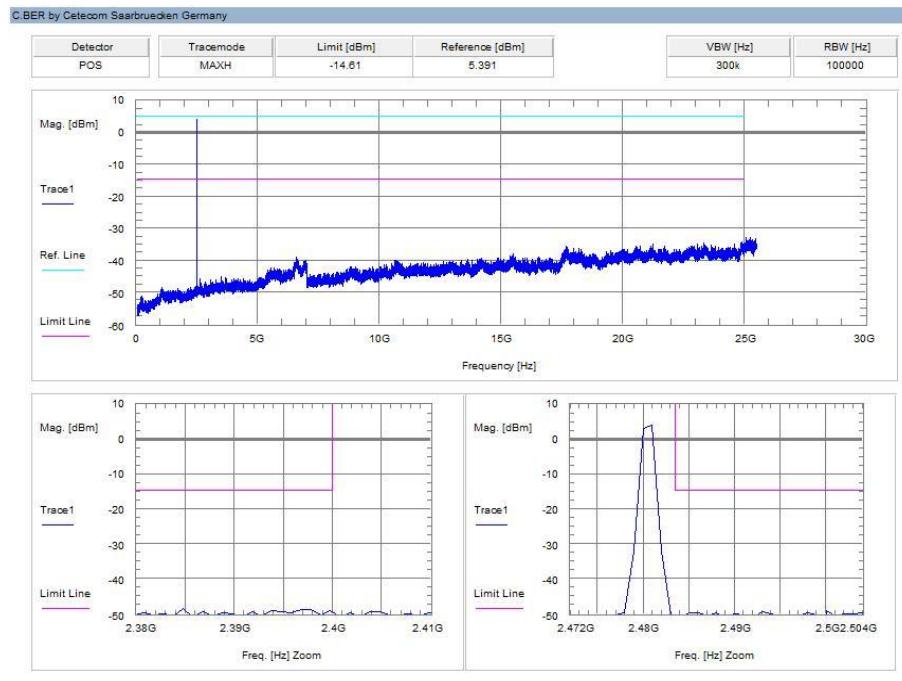
Verdict: **complies**

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

Plot 7: lowest channel – 2402 MHz, 8 DPSK modulation**Plot 8:** middle channel – 2441 MHz, 8 DPSK modulation

Plot 9: highest channel – 2480 MHz, 8 DPSK modulation

12.10 Spurious emissions radiated below 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 channels are 00; 39 and 78. The measurement is performed in the mode with the highest output power. The limits are recalculated to a measurement distance of 3 m according the ANSI C63.10.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi peak
Sweep time:	Auto
Resolution bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Video bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace mode:	Max Hold
Test setup:	See sub clause 7.2 - B
Measurement uncertainty	See sub clause 8

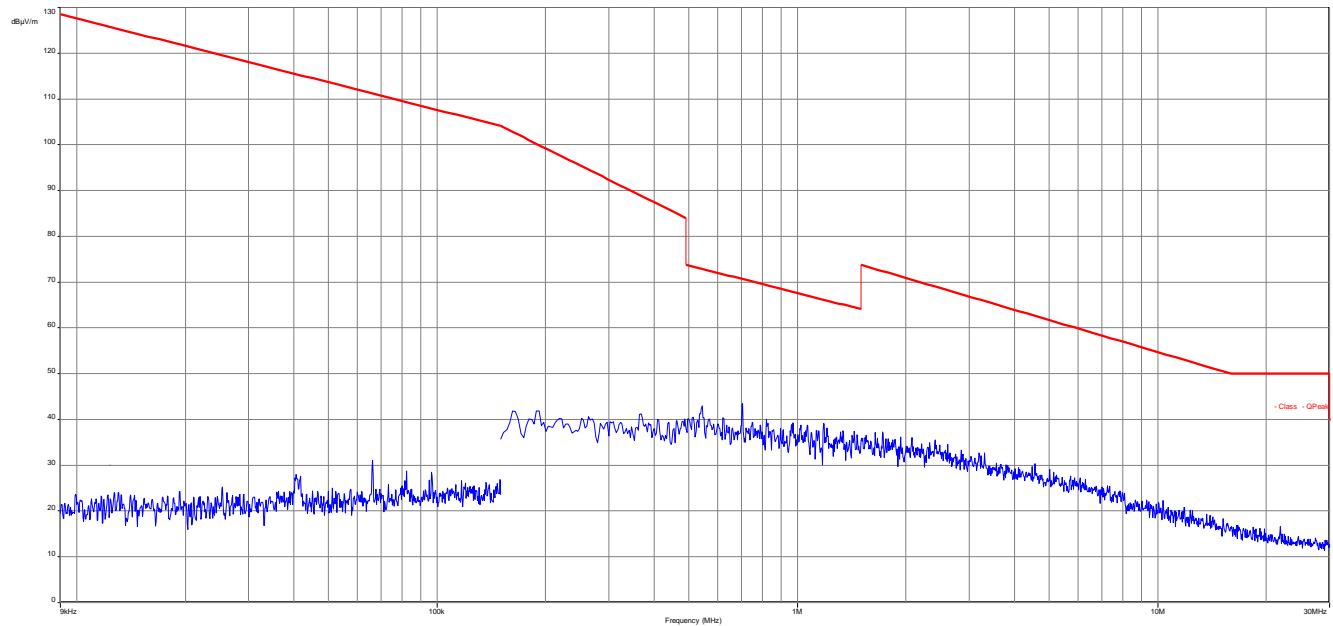
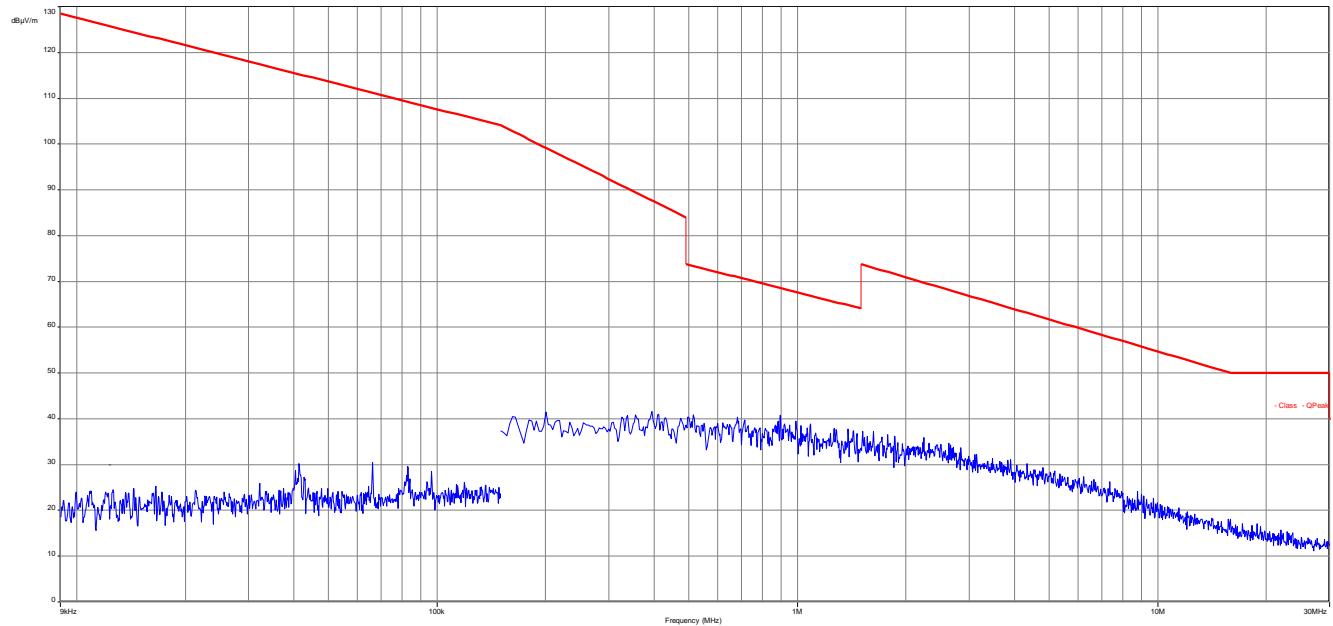
Limits:

FCC		IC
Frequency (MHz)	Field strength (dB μ V/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

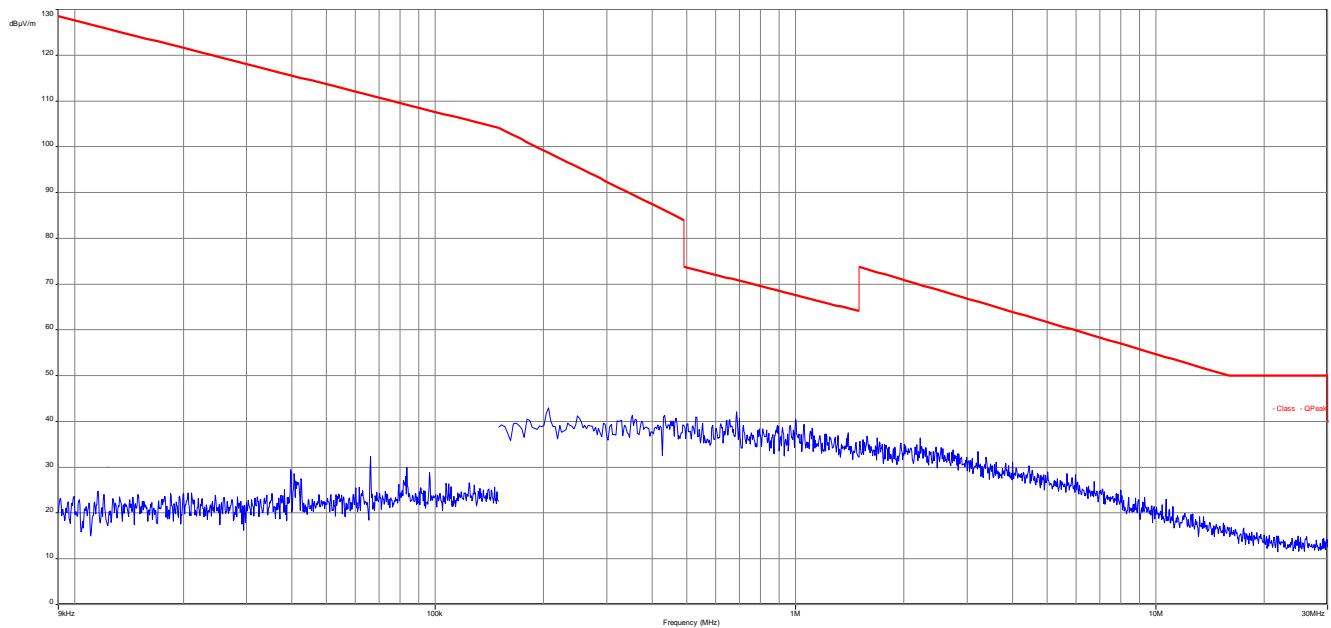
Results:

TX spurious emissions radiated below 30 MHz [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
All detected emissions are more than 20 dB below the limit.		

Verdict: complies

Plots:**Plot 1:** 9 kHz to 30 MHz, channel 00, transmit mode**Plot 2:** 9 kHz to 30 MHz, channel 39, transmit mode

Plot 2: 9 kHz to 30 MHz, channel 78, transmit mode



12.11 Spurious emissions radiated 30 MHz to 1 GHz

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
Resolution bandwidth:	3 x RBW
Video bandwidth:	120 kHz
Span:	30 MHz to 1 GHz
Trace mode:	Max Hold
Measured modulation:	<input type="checkbox"/> GFSK <input type="checkbox"/> Pi/4 DQPSK <input checked="" type="checkbox"/> 8DPSK
Test setup:	See sub clause 7.1 - A
Measurement uncertainty	See sub clause 8

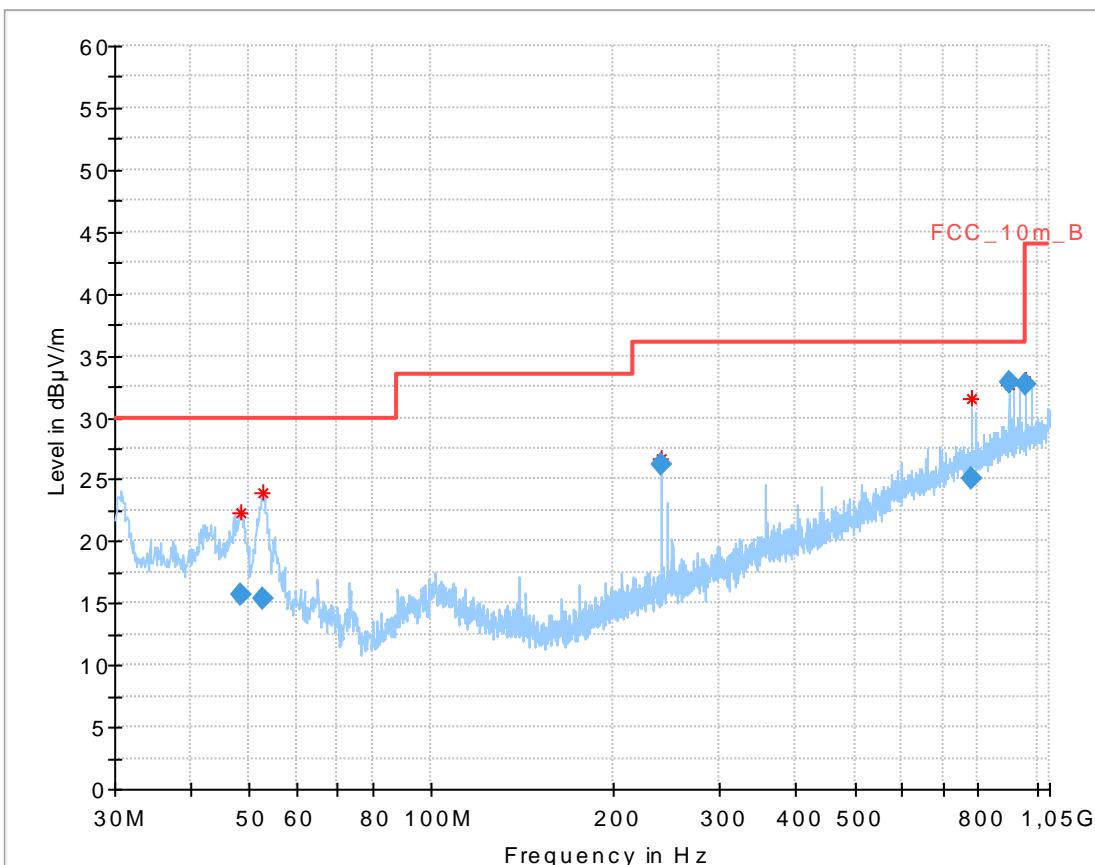
The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

Limits:

FCC	IC
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 (dB μ V/m)
30 - 88	30.0
88 - 216	33.5
216 - 960	36.0
Above 960	54.0

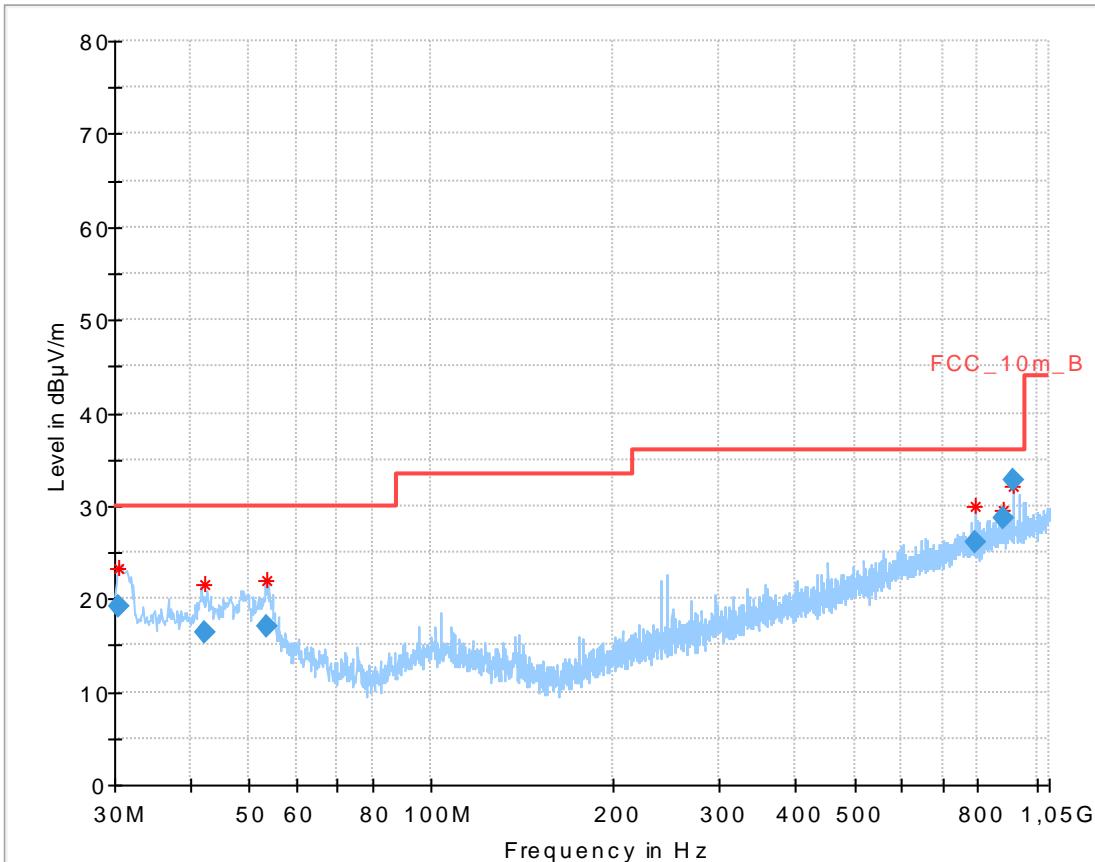
Plots: Transmit mode

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

**Final_Result:**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
48.504300	15.66	30.00	14.34	1000.0	120.000	103.0	V	185	13.0
52.822200	15.29	30.00	14.71	1000.0	120.000	200.0	V	95	12.2
239.589600	26.18	36.00	9.82	1000.0	120.000	350.0	H	7	13.0
781.952850	25.07	36.00	10.93	1000.0	120.000	272.0	H	97	22.7
898.459800	32.76	36.00	3.24	1000.0	120.000	100.0	H	252	24.1
958.342500	32.68	36.00	3.32	1000.0	120.000	100.0	H	254	24.3

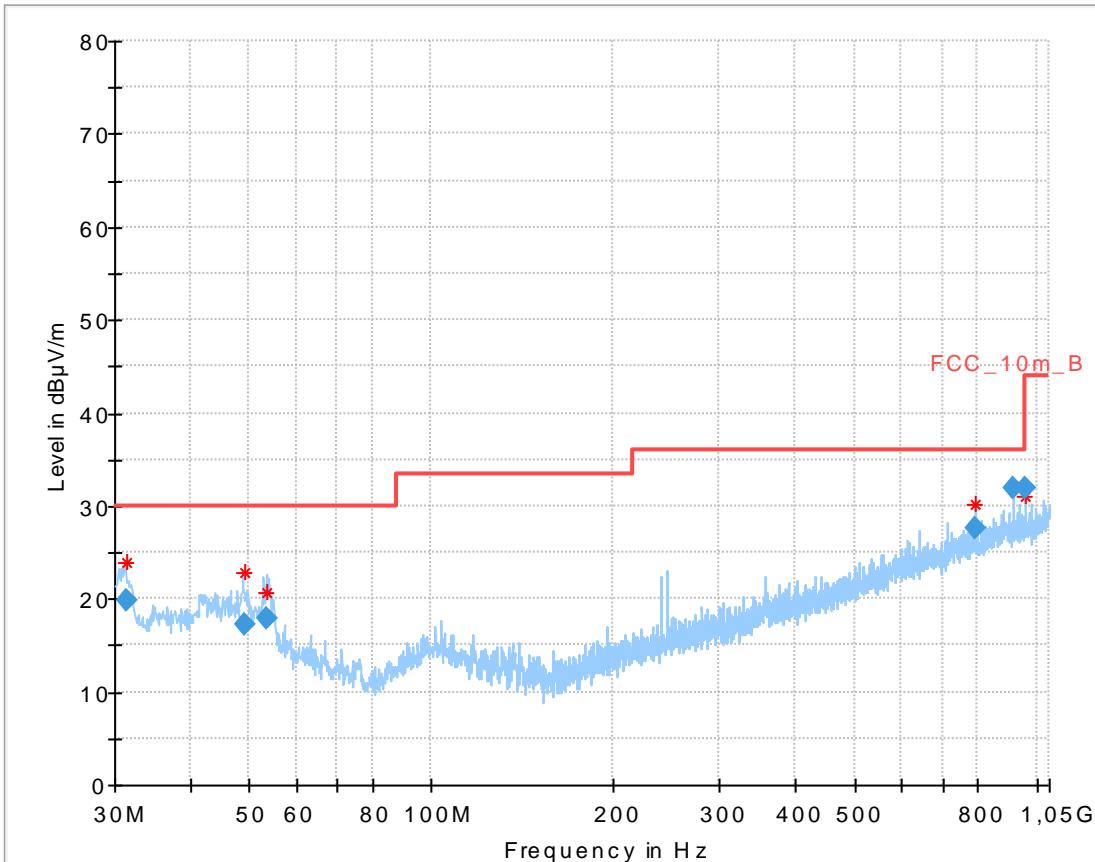
Plot 2: 30 MHz to 1 GHz, TX mode, channel 39, vertical & horizontal polarization



Final_Result:

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.371295	19.13	30.00	10.87	1000.0	120.000	101.0	V	10	13.4
42.240750	16.47	30.00	13.53	1000.0	120.000	101.0	V	280	14.0
53.455200	17.11	30.00	12.89	1000.0	120.000	98.0	V	280	12.1
791.559600	26.11	36.00	9.89	1000.0	120.000	100.0	H	261	22.7
878.490600	28.70	36.00	7.30	1000.0	120.000	98.0	H	260	23.8
918.419550	32.76	36.00	3.24	1000.0	120.000	98.0	H	260	24.2

Plot 3: 30 MHz to 1 GHz, TX mode, channel 78, vertical & horizontal polarization

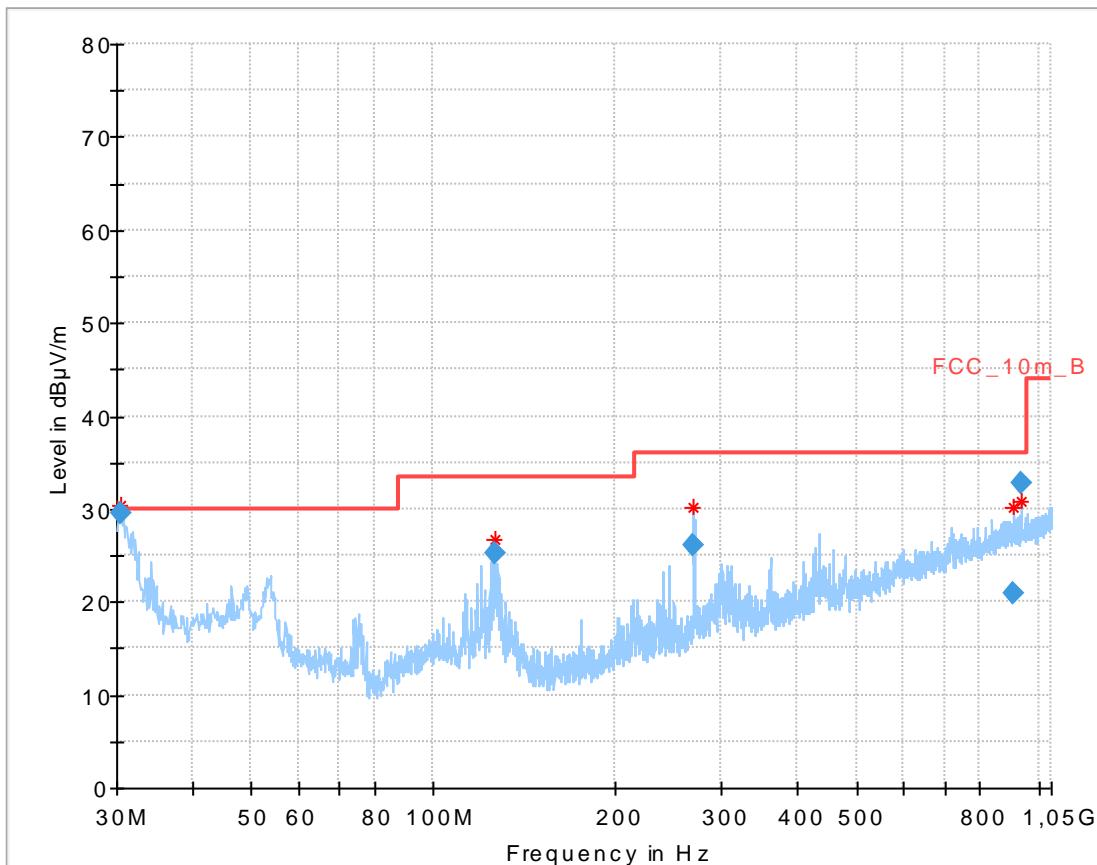


Final_Result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.466550	19.77	30.00	10.23	1000.0	120.000	170.0	V	190	13.5
49.212300	17.27	30.00	12.73	1000.0	120.000	98.0	V	190	12.8
53.465250	17.81	30.00	12.19	1000.0	120.000	98.0	V	260	12.1
791.674800	27.53	36.00	8.47	1000.0	120.000	100.0	H	260	22.7
918.403950	31.99	36.00	4.01	1000.0	120.000	98.0	H	260	24.2
958.350450	32.01	36.00	3.99	1000.0	120.000	98.0	H	260	24.3

Plots: Receiver mode

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

**Final_Result:**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.391649	29.49	30.00	0.51	1000.0	120.000	101.0	V	-10	13.4
126.080850	25.23	33.50	8.27	1000.0	120.000	101.0	V	280	9.7
268.698150	26.00	36.00	10.00	1000.0	120.000	98.0	V	81	13.8
911.765700	20.92	36.00	15.08	1000.0	120.000	170.0	H	190	24.1
938.394300	32.84	36.00	3.16	1000.0	120.000	98.0	H	260	24.2

12.12 Spurious emissions radiated above 1 GHz

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 / RMS
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	3 x RBW
Span:	1 GHz to 26 GHz
Trace mode:	Max Hold
Measured modulation:	<input type="checkbox"/> GFSK <input type="checkbox"/> Pi/4 DQPSK <input checked="" type="checkbox"/> 8DPSK
Test setup:	See sub clause 7.2 - A See sub clause 7.3 - A
Measurement uncertainty	See sub clause 8

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	
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 (dB μ V/m)	Measurement distance
Above 960	54.0	3

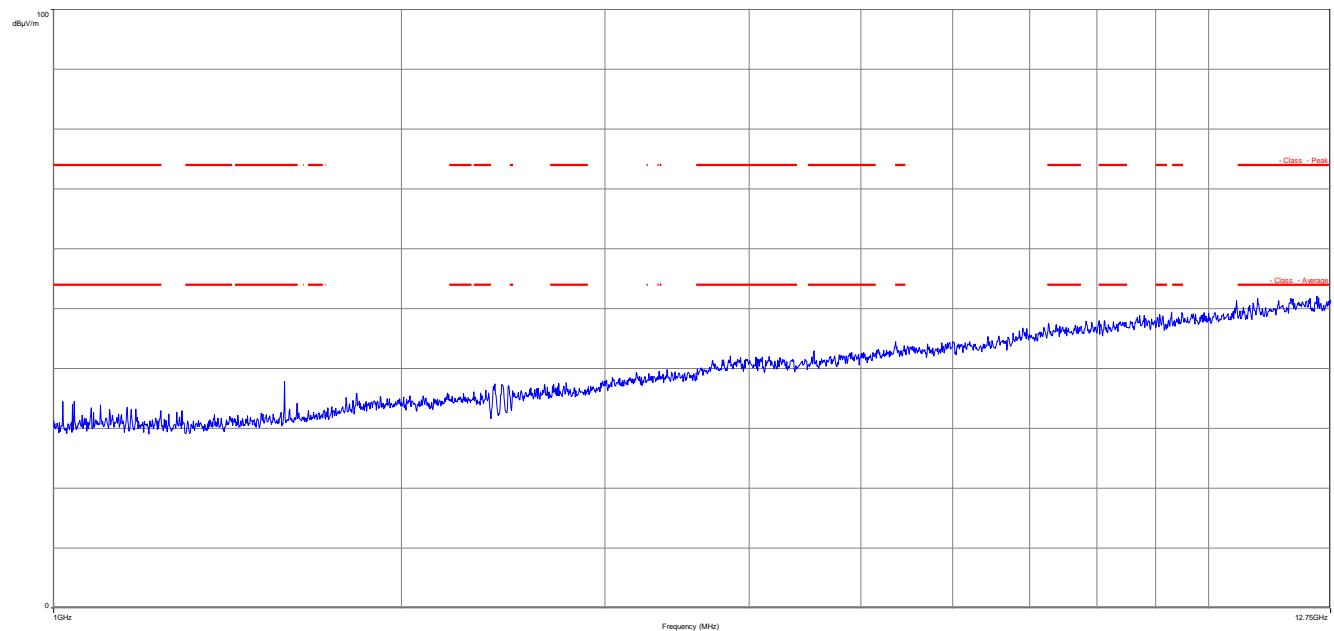
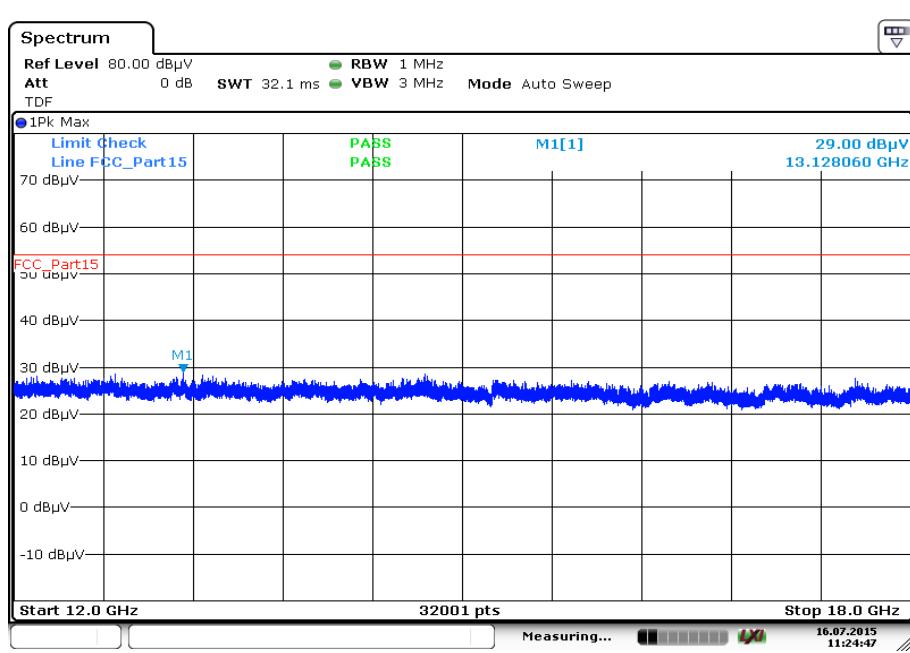
Results: Transmitter mode

TX spurious emissions radiated [dB μ V/m]								
2402 MHz			2441 MHz			2480 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
All detected emissions are more than 20 dB below the limit.								
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-

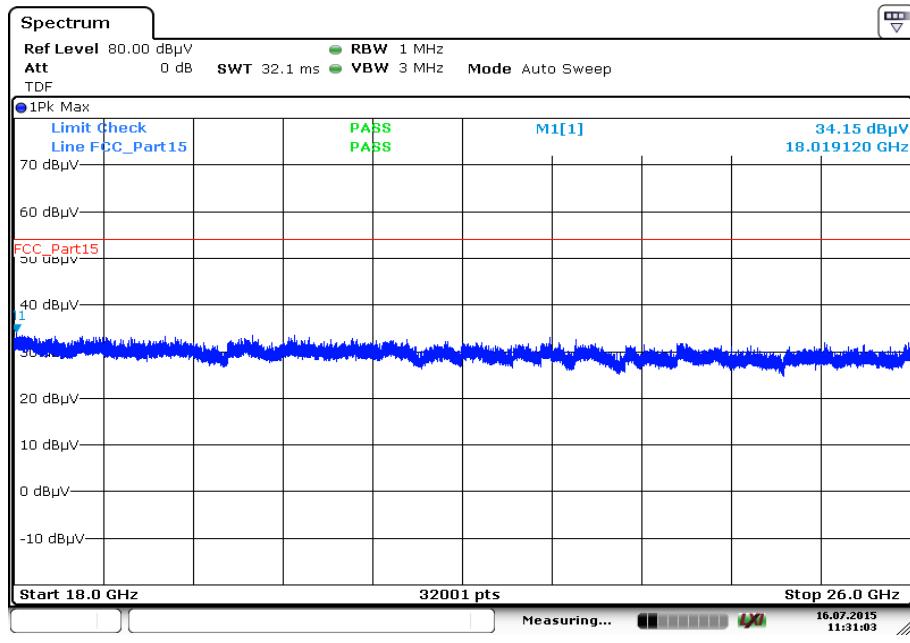
Verdict: **complies****Results:** Receiver mode

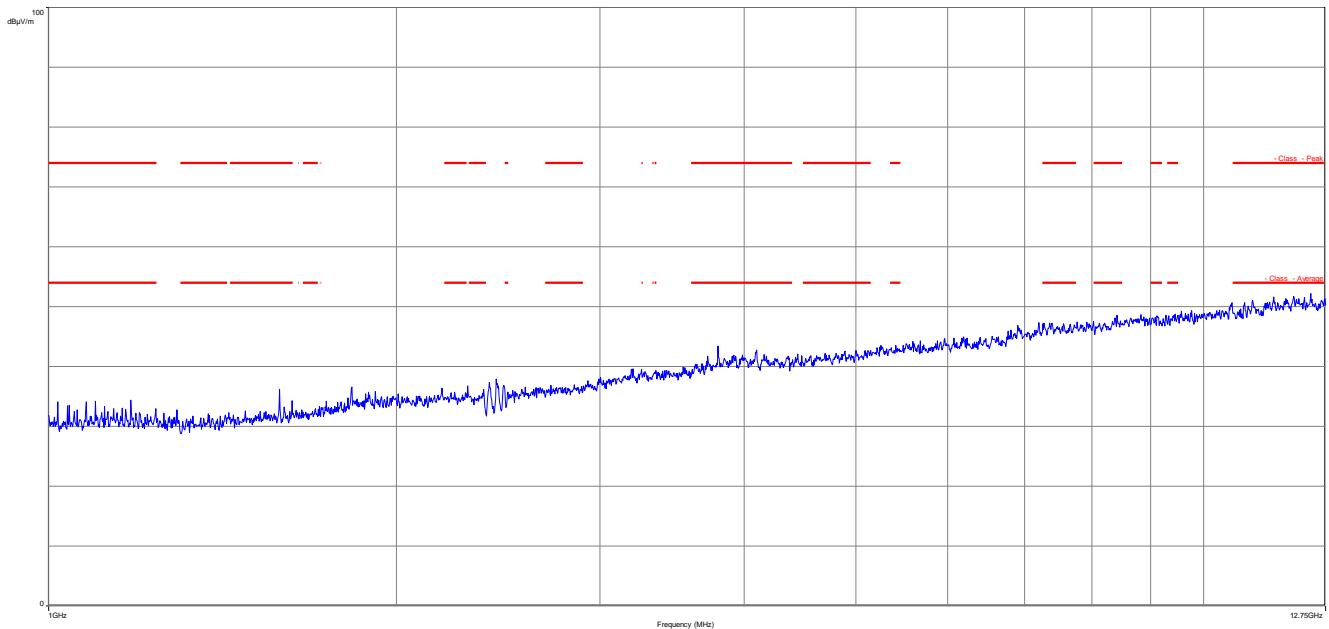
RX spurious emissions radiated [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
All detected emissions are more than 20 dB below the limit.		
-/-	Peak	-/-
	AVG	-/-

Verdict: **complies**

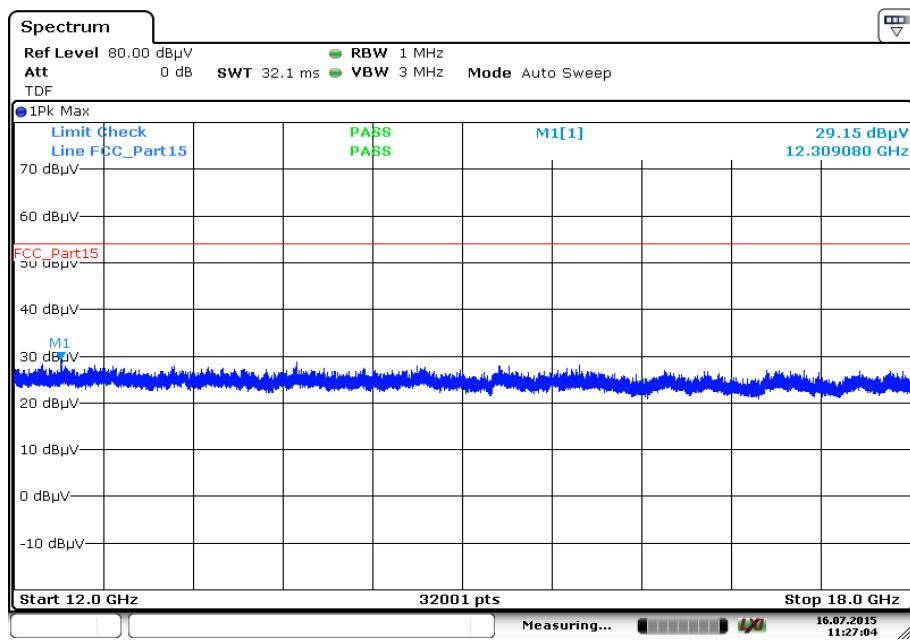
Plots: Transmitter mode**Plot 1:** 1 GHz to 12.75 GHz, TX mode, channel 00, vertical & horizontal polarization**Plot 2:** 12.75 GHz to 18 GHz, TX mode, channel 00, vertical & horizontal polarization

Date: 16.JUL.2015 11:24:47

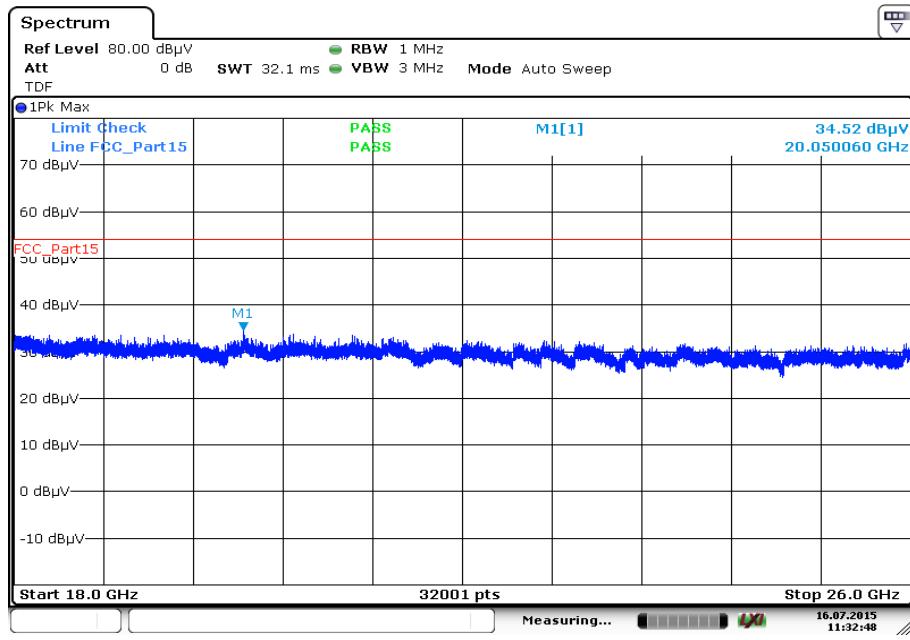
Plot 3: 18 GHz to 26 GHz, TX mode, channel 00, vertical & horizontal polarization

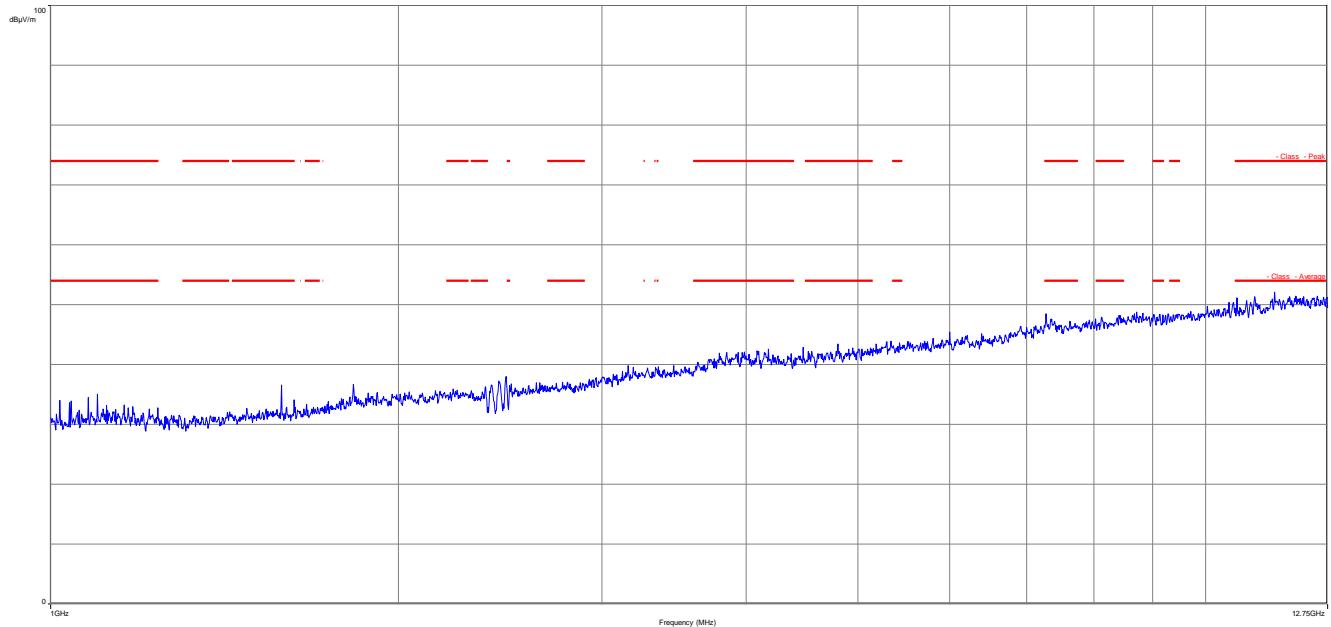
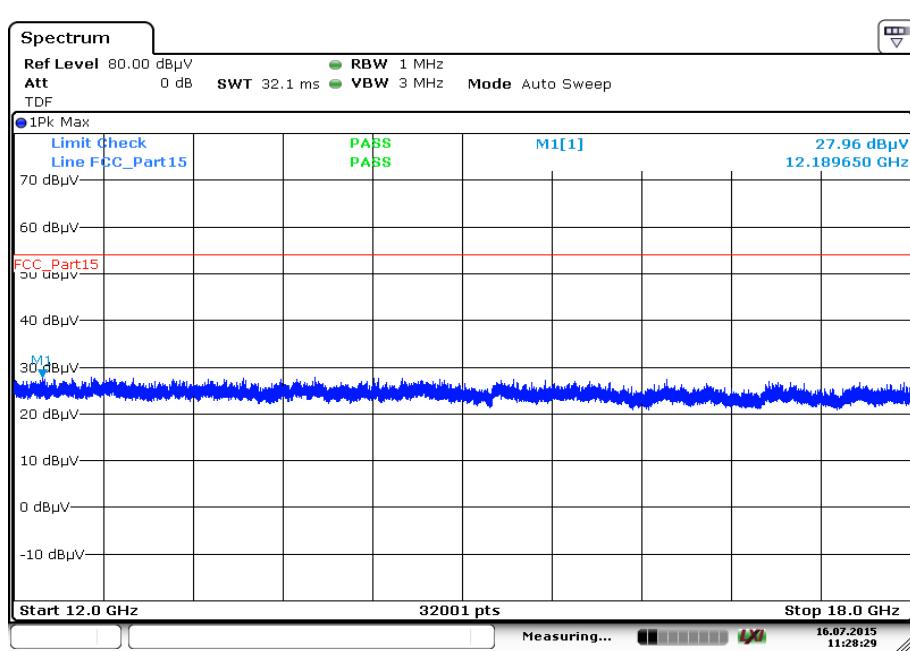
Plot 4: 1 GHz to 12.75 GHz, TX mode, channel 39, vertical & horizontal polarization

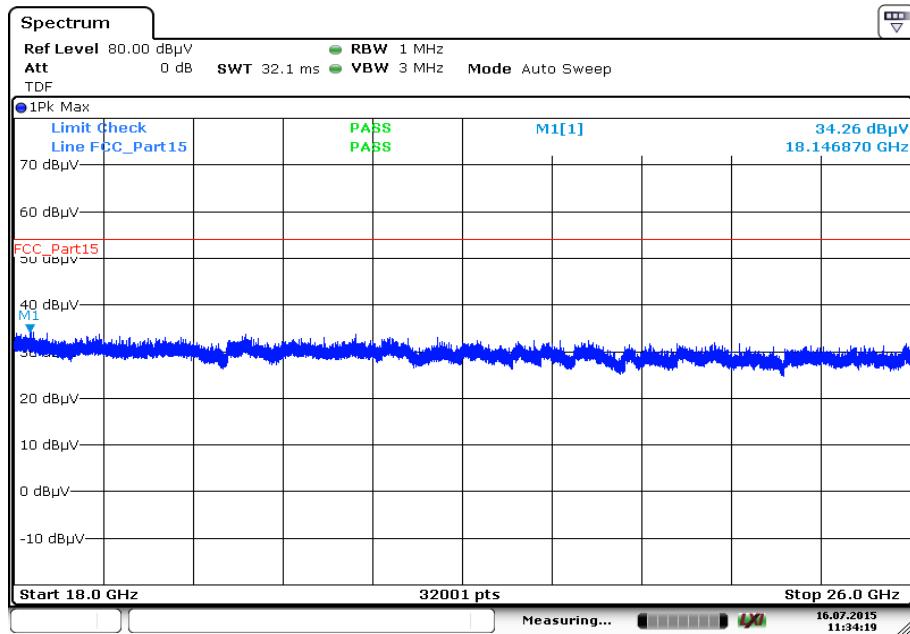
The carrier signal is notched with a 2.4 GHz band rejection filter.

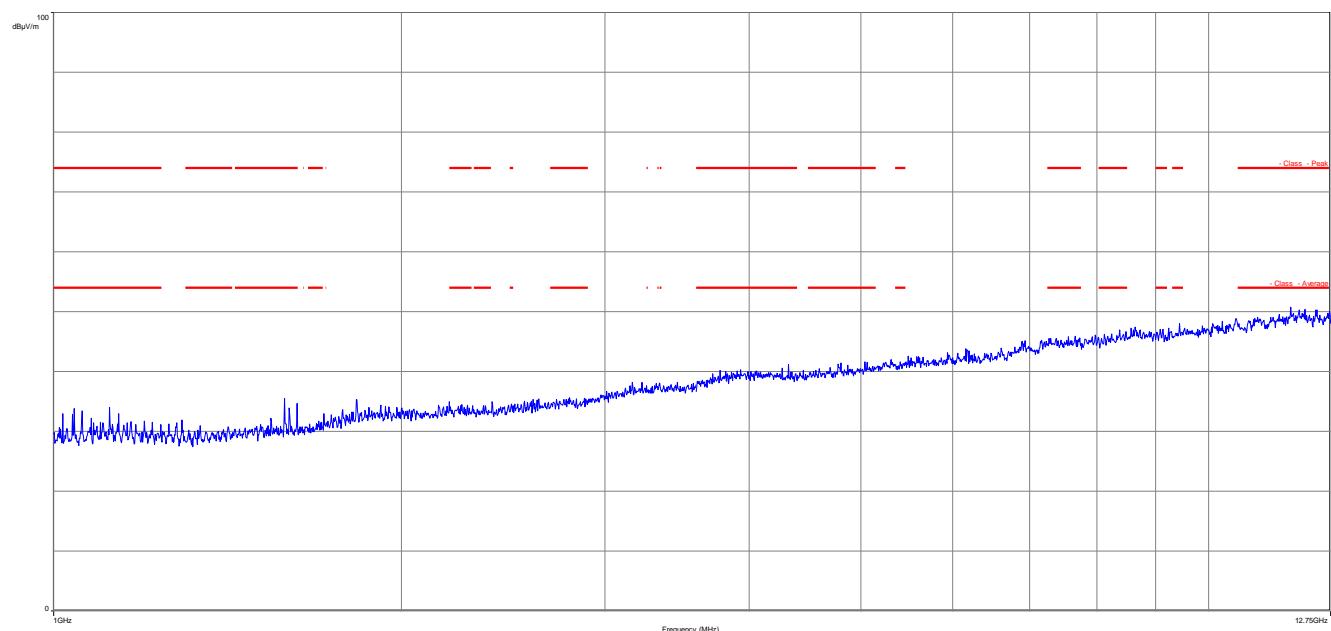
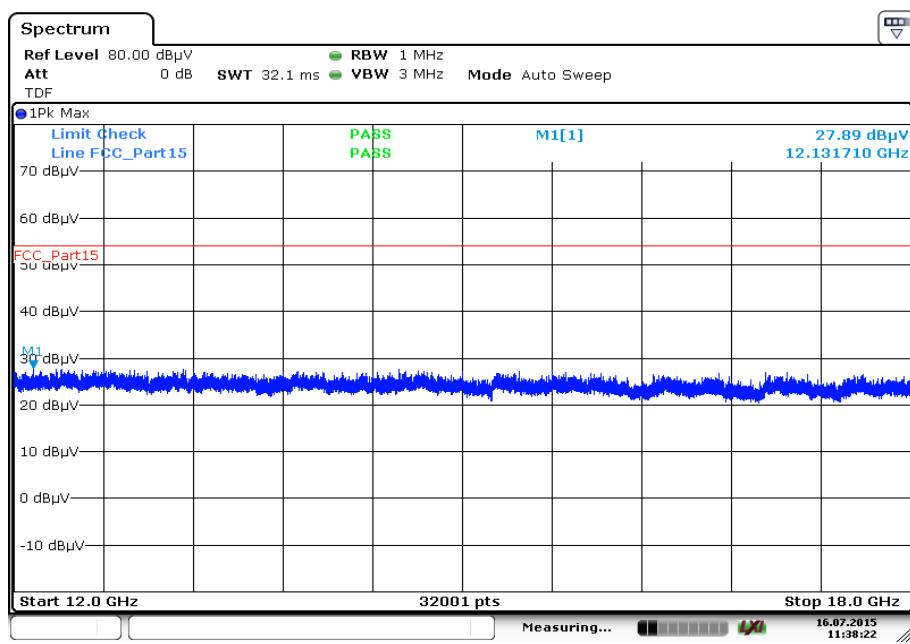
Plot 5: 12.75 GHz to 18 GHz, TX mode, channel 39, vertical & horizontal polarization

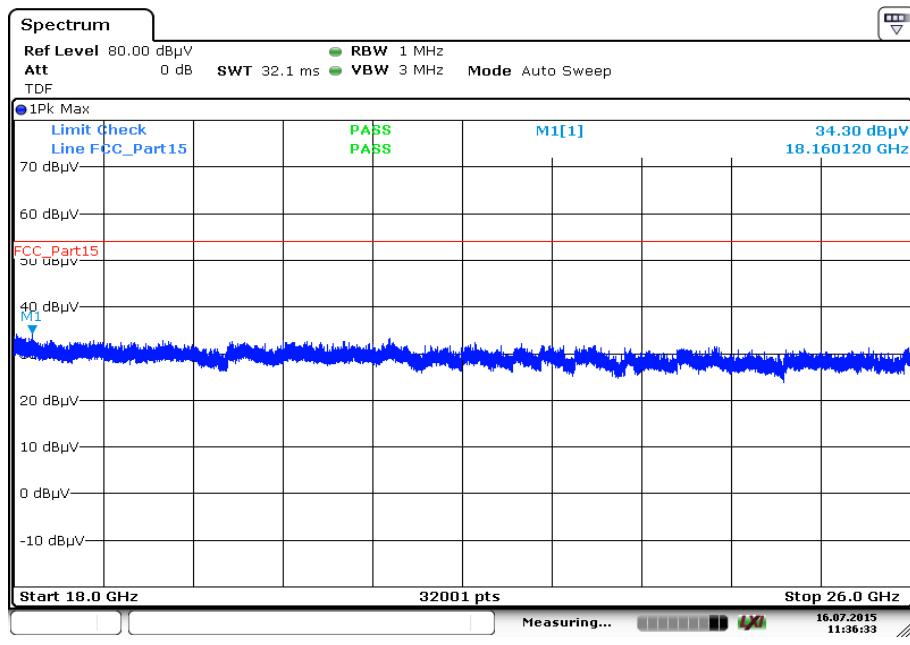
Date: 16.JUL.2015 11:27:04

Plot 6: 18 GHz to 26 GHz, TX mode, channel 39, vertical & horizontal polarization

Plot 7: 1 GHz to 12.75 GHz, TX mode, channel 78, vertical & horizontal polarization**Plot 8:** 12.75 GHz to 18 GHz, TX mode, channel 78, vertical & horizontal polarization

Plot 9: 18 GHz to 26 GHz, TX mode, channel 78, vertical & horizontal polarization

Plots: Receiver mode**Plot 1:** 1 GHz to 12.75 GHz, RX / idle – mode, vertical & horizontal polarization**Plot 2:** 12.75 GHz to 18 GHz, RX / idle – mode, vertical & horizontal polarization

Plot 3: 18 GHz to 26 GHz, RX / idle – mode, vertical & horizontal polarization

12.13 Spurious emissions conducted below 30 MHz (AC conducted)

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:

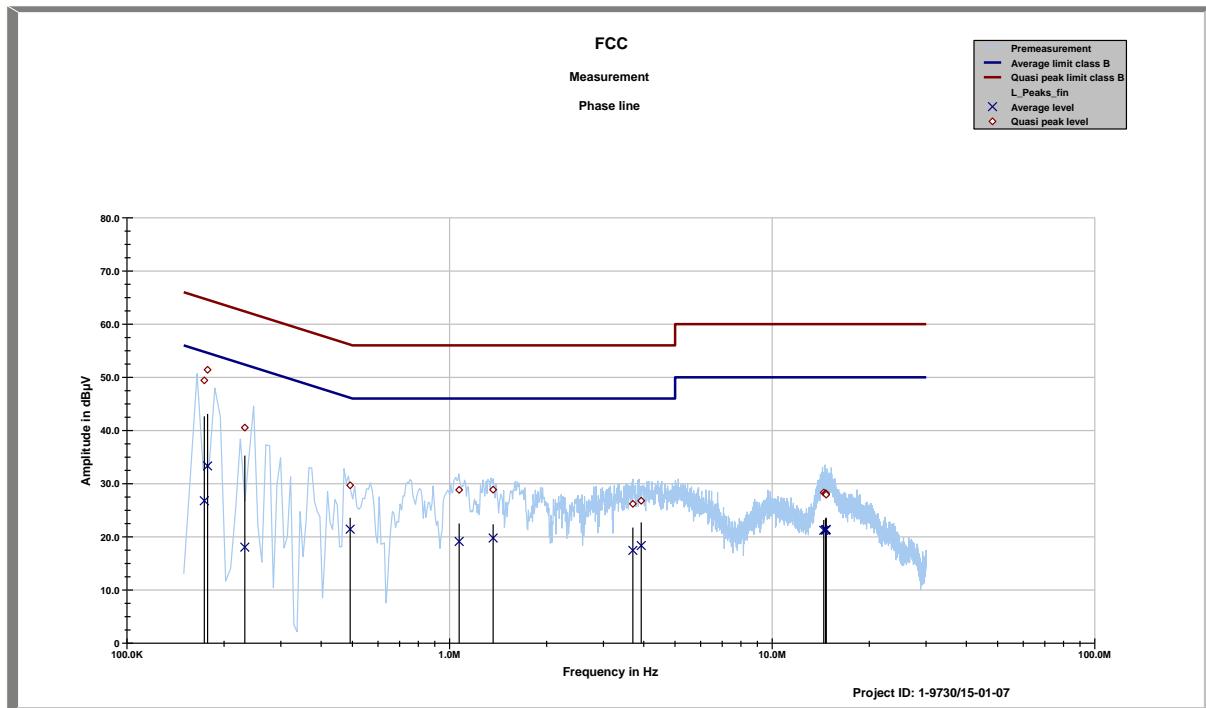
Measurement parameter	
Detector:	Peak - Quasi peak / average
Sweep time:	Auto
Resolution bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Video bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace mode:	Max Hold
Test setup:	See sub clause 7.5 – A (TX/RX) – B (JPB)
Measurement uncertainty	See sub clause 8

Limits:

FCC		IC
Frequency (MHz)	Quasi-peak (dB μ V/m)	Average (dB μ V/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

Verdict: **complies**

Plots & result tables:**Plot 1: 150 kHz to 30 MHz, phase line , TX mode**

FCC

Phase line tbl

Project ID: 1-9730/15-01-08

03:01:29 PM, Wednesday, July 15, 2015

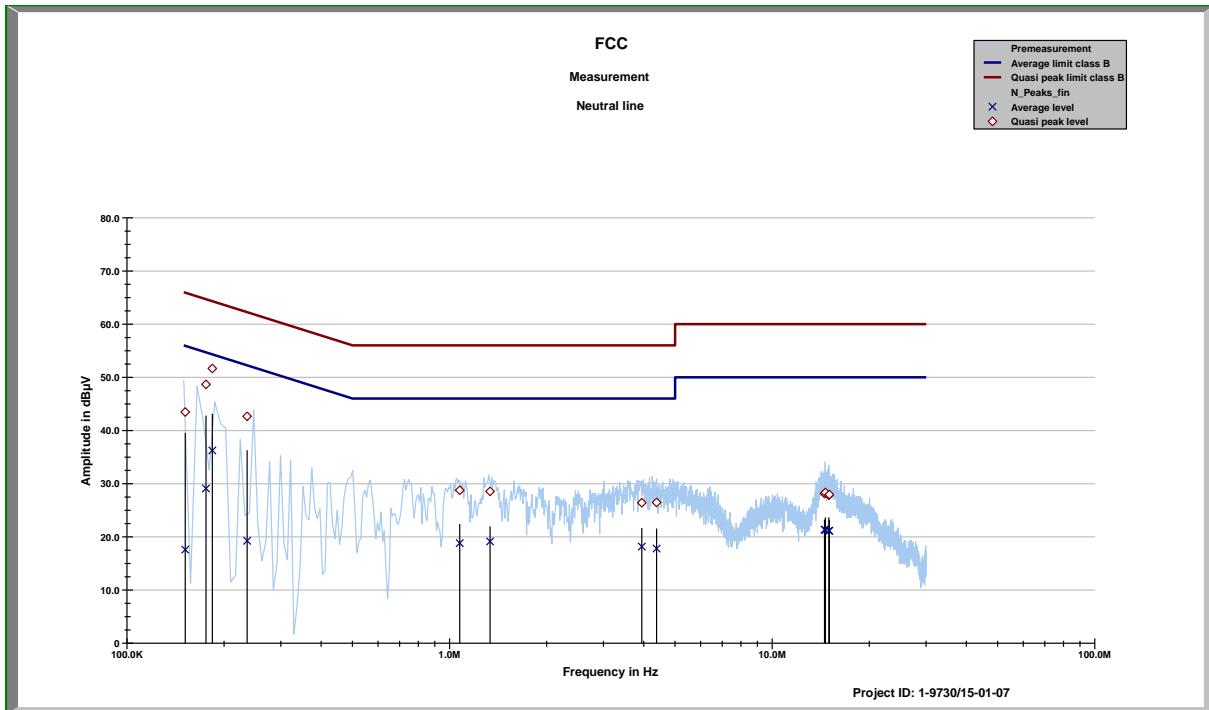
Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dB μ V	dB μ V	dB μ V	dB μ V
0.17378	49.43	15.35	26.78	28.54
0.17782	51.42	13.17	33.33	21.87
0.23198	40.54	21.84	18.07	35.59
0.49201	29.69	26.45	21.44	24.79
1.07063	28.82	27.18	19.13	26.87
1.3647	28.87	27.13	19.77	26.23
3.6981	26.21	29.79	17.45	28.55
3.9251	26.78	29.22	18.36	27.64
14.443	28.32	31.68	21.23	28.77
14.626	28.14	31.86	21.27	28.73
14.665	28.16	31.84	21.30	28.70
14.693	27.93	32.07	21.39	28.61

Project ID - 1-9730/15-01-08

EUT - FLIR-T7250

Serial Number - 72400046

Operating mode - BT TX (Ch. 39)

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


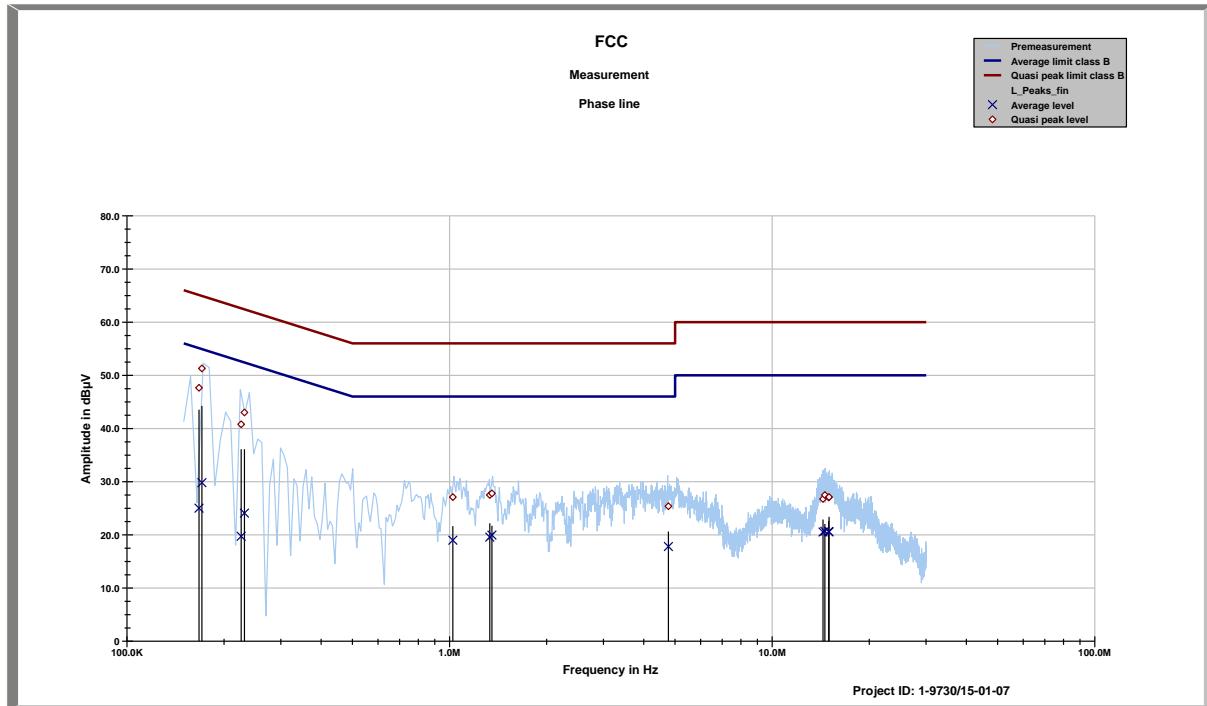
FCC
Neutral line tbl

Project ID: 1-9730/15-01-08

03:01:29 PM, Wednesday, July 15, 2015

Frequency MHz	Quasi peak level dB μ V	Margin quasi peak dB μ V	Average level dB μ V	Margin average dB μ V
0.15165	43.46	22.45	17.59	38.36
0.17585	48.68	16.00	29.10	26.17
0.18395	51.65	12.65	36.24	18.79
0.23583	42.66	19.58	19.25	34.29
1.07496	28.75	27.25	18.82	27.18
1.335	28.56	27.44	19.13	26.87
3.9421	26.41	29.59	18.16	27.84
4.3816	26.46	29.54	17.79	28.21
14.514	28.13	31.87	21.36	28.64
14.61	28.34	31.66	21.28	28.72
14.978	27.82	32.18	21.14	28.86
15.03	27.95	32.05	21.15	28.85

Project ID - 1-9730/15-01-08
EUT - FLIR-T7250
Serial Number - 72400046
Operating mode - BT TX (Ch. 39)

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

FCC

Phase line tbl

Project ID: 1-9730/15-01-08

03:18:15 PM, Wednesday, July 15, 2015

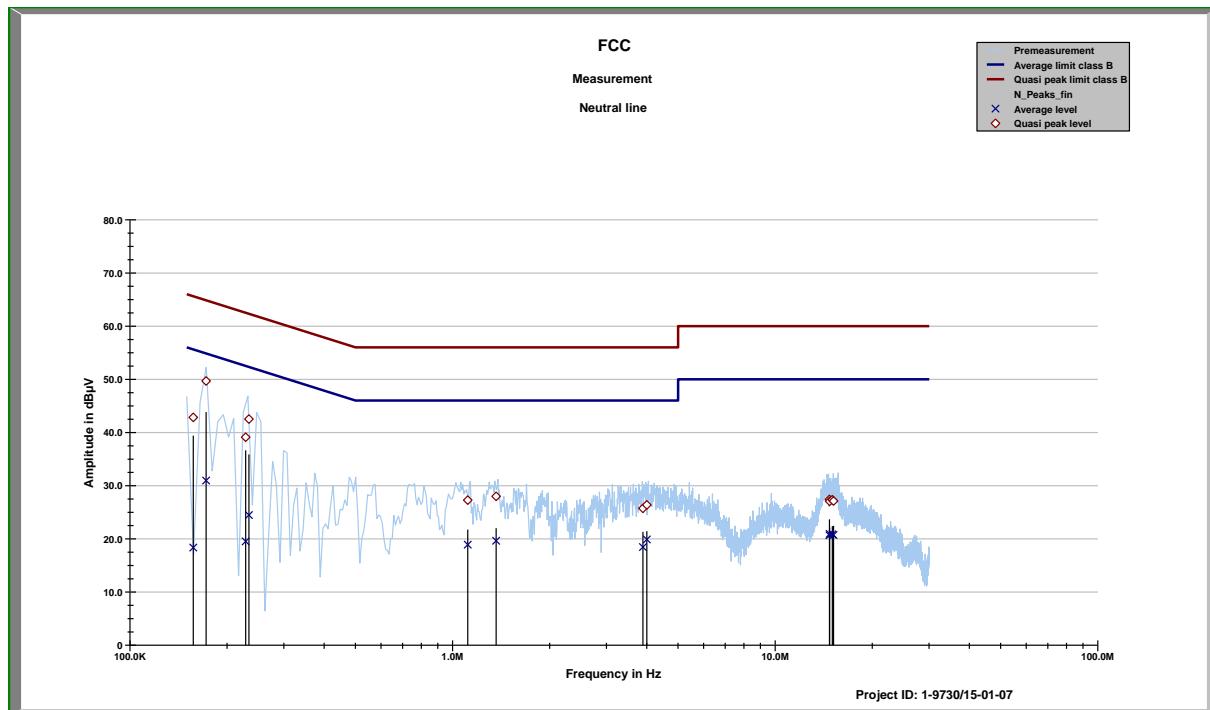
Frequency MHz	Quasi peak level dB μ V	Margin quasi peak dB μ V	Average level dB μ V	Margin average dB μ V
0.16724	47.65	17.45	25.02	30.49
0.17074	51.30	13.63	29.82	25.59
0.22601	40.79	21.81	19.73	34.10
0.23127	43.00	19.40	24.08	29.60
1.02358	27.10	28.90	19.00	27.00
1.3321	27.50	28.50	19.57	26.43
1.3526	27.80	28.20	19.96	26.04
4.7655	25.37	30.63	17.80	28.20
14.361	26.75	33.25	20.52	29.48
14.553	27.48	32.52	20.67	29.33
14.955	27.03	32.97	20.62	29.38
14.993	27.09	32.91	20.55	29.45

Project ID - 1-9730/15-01-08

EUT - FLIR-T7250

Serial Number - 72400046

Operating mode - RX

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

FCC
Neutral line tbl

Project ID: 1-9730/15-01-08

03:18:15 PM, Wednesday, July 15, 2015

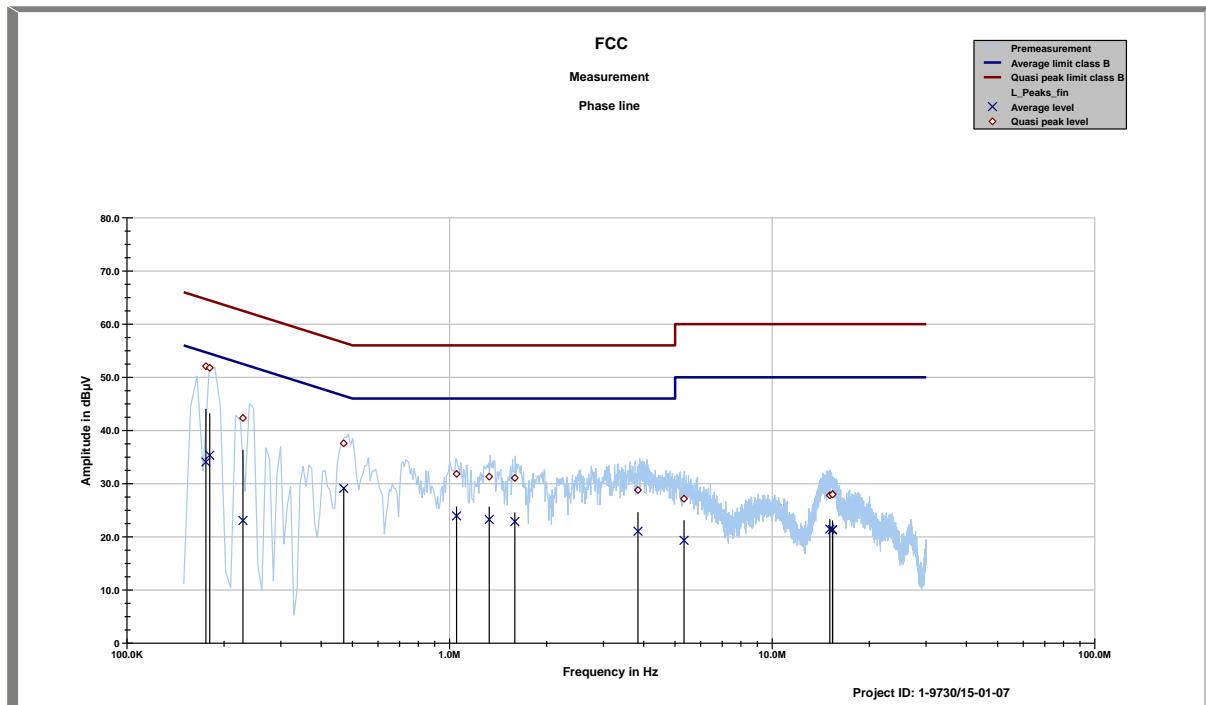
Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dB μ V	dB μ V	dB μ V	dB μ V
0.15716	42.83	22.78	18.35	37.44
0.1722	49.68	15.17	30.97	24.40
0.22838	39.11	23.40	19.52	34.25
0.23373	42.53	19.79	24.47	29.14
1.11403	27.27	28.73	18.91	27.09
1.3641	28.00	28.00	19.64	26.36
3.8887	25.73	30.27	18.44	27.56
3.9979	26.37	29.63	19.88	26.12
14.721	27.42	32.58	20.66	29.34
14.737	27.06	32.94	20.93	29.07
15.027	27.33	32.67	20.84	29.16
15.155	27.11	32.89	20.73	29.27

Project ID - 1-9730/15-01-08

EUT - FLIR-T7250

Serial Number - 72400046

Operating mode - RX

Plot 5: 150 kHz to 30 MHz, phase line, JBP

FCC

Phase line tbl

Project ID: 1-9730/15-01-08

03:36:42 PM, Wednesday, July 15, 2015

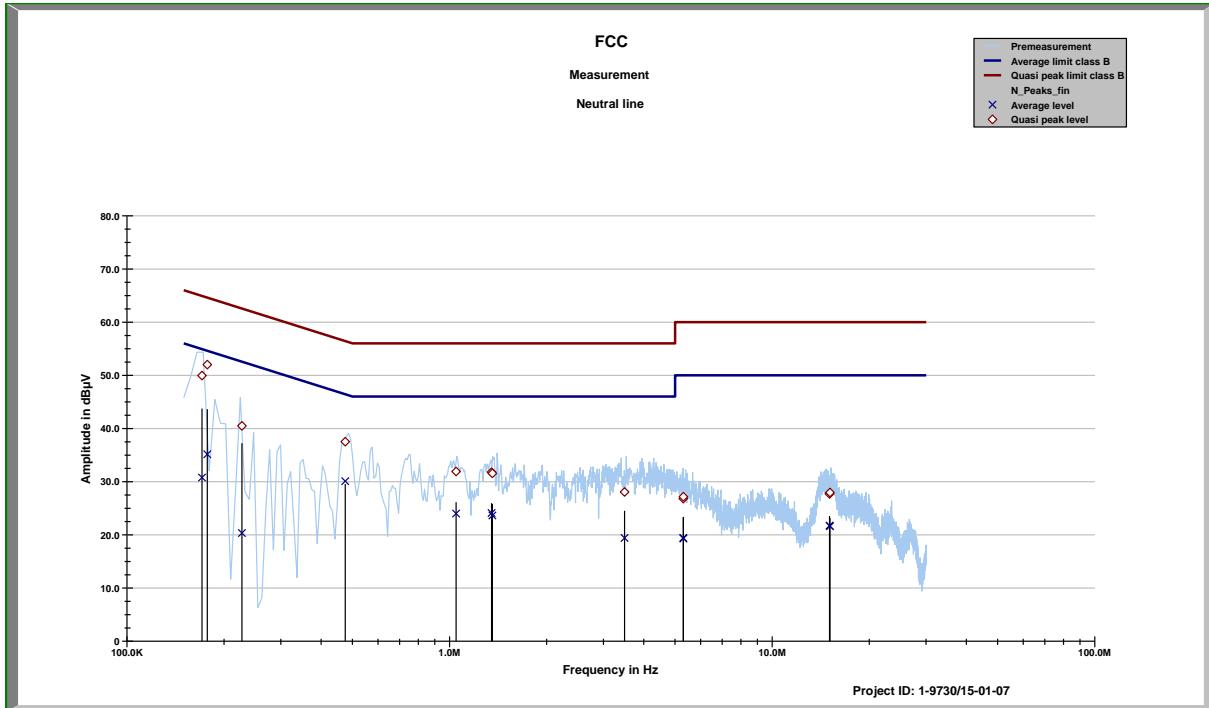
Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.17564	52.08	12.61	34.06	21.20
0.18056	51.78	12.68	35.34	19.79
0.22889	42.34	20.15	23.07	30.67
0.46991	37.58	18.94	29.13	17.73
1.05073	31.82	24.18	23.95	22.05
1.3269	31.32	24.68	23.25	22.75
1.5927	31.07	24.93	22.88	23.12
3.8357	28.79	27.21	21.05	24.95
5.3284	27.17	32.83	19.35	30.65
15.074	27.79	32.21	21.46	28.54
15.375	28.05	31.95	21.33	28.67
15.377	27.97	32.03	21.36	28.64

Project ID - 1-9730/15-01-08

EUT - FLIR-T7250

Serial Number - 72400046

Operating mode - RX + traffic on USB

Plot 6: 150 kHz to 30 MHz, neutral line, JBP

FCC
Neutral line tbl

Project ID: 1-9730/15-01-08

03:36:42 PM, Wednesday, July 15, 2015

Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dB μ V	dB μ V	dB μ V	dB μ V
0.17082	49.94	14.98	30.77	24.64
0.17746	52.01	12.59	35.15	20.06
0.22714	40.50	22.06	20.34	33.45
0.47488	37.51	18.92	30.09	16.63
1.04771	31.90	24.10	24.00	22.00
1.3493	31.79	24.21	24.10	21.90
1.3573	31.57	24.43	23.65	22.35
3.4854	28.05	27.95	19.41	26.59
5.3001	26.79	33.21	19.43	30.57
5.3046	27.17	32.83	19.31	30.69
15.044	27.69	32.31	21.73	28.27
15.099	27.96	32.04	21.62	28.38

Project ID - 1-9730/15-01-08
 EUT - FLIR-T7250
 Serial Number - 72400046
 Operating mode - RX + traffic on USB

13 Observations

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

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2015-07-23

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
PMN	Product marketing name
HMN	Host marketing name
HVIN	Hardware version identification number
FVIN	Firmware version identification number

Annex C Accreditation Certificate

Front side of certificate



Deutsche Akkreditierungsstelle GmbH

Berehne gemäß § 8 Absatz 2 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV
Unterzeichner 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 und Hearing Aid Compatibility (HAC)
Umweltimulation
Smart Card Terminals
Bluetooth
Wi-Fi-Services

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 07.03.2014 mit der
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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

In Auftrag D-PL-12076-01 Ralf Egner

Akkreditierungsleiter

Back side of certificate

Deutsche Akkreditierungsstelle GmbH

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Spittelmarkt 10
10117 Berlin

Standort Frankfurt am Main:
Gartenstraße 6
60591 Frankfurt am Main

Standort Braunschweig:
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38116 Braunschweig

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Die Akkreditierung erfolgte gemäß den Gesetzes über die Akkreditierungsstelle (AkkStelleG) vom
31. Juli 2009 (BGBl. I S. 2625) sowie der Verordnung (EG) Nr. 765/2008 des Europäischen Parlaments
und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung

im Zusammenhang mit der Vermarktung von Produkten (ML L 238 vom 1. Juli 2008).

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der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen
erkennen ihre Akkreditierungen gegenseitig an.

Der aktuelle Stand der Mitgliedschaft kann folgenden Webseiten entnommen werden:

EA: www.european-accreditation.org

ILAC: www.ilac.org

IAC: www.iac.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.

<http://www.cetecom.com/eu/de/cetecom-group/europa/deutschland-saarbruecken/akkreditierungen.html>