
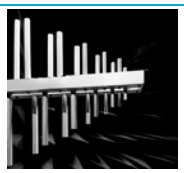
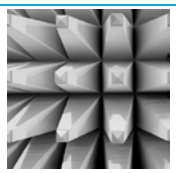

CTC advanced
member of RWTÜV group

TEST REPORT

Test report no.: 1-3558/17-01-04-B

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

Testing laboratory

CTC advanced GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
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Internet: http://www.ctcadvanced.com
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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

Applicant

Philips Medizin Systeme Böblingen GmbH
Hewlett-Packard-Strasse 2
71034 Böblingen / GERMANY
Phone: -/-
Fax: +49 7031 463-2944
Contact: Hansjörg Geywitz
e-mail: hansjoerg.geywitz@philips.com
Phone: +49 7031 463-1879

Manufacturer

Philips Medizin Systeme Böblingen GmbH
Hewlett-Packard-Strasse 2
71034 Böblingen / GERMANY

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 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices
RSS - Gen Issue 4	Spectrum Management and Telecommunications Radio Standards Specifications - General Requirements and Information for the Certification of Radio Apparatus

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

Test Item

Kind of test item:	**CTG Base Station PQC-OBBSBV1 including 2x 2.4GHz Transceiver**
Model name:	**866074**
FCC ID:	**PQC-OBBSBV1**
IC:	**-/-**
Frequency:	DTS band 2400.0 MHz to 2483.5 MHz
Technology tested:	Short range radio
Antenna:	Chip antenna
Power supply:	7.5 V DC by power supply
Temperature range:	-20°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 authorized:

p.o.

cn=Marco Bertolino, o=CTC advanced GmbH, ou=BTL-161128, email=Marco.Bertolino@ctcadvanced.com, c=DE
2018.02.22 15:14:25 +01'00'

Stefan Bös
Lab Manager
Radio Communications & EMC

Test performed:

cn=Mihail Dorongovskij, o=CTC advanced GmbH, ou=DOR-281116, email=Mihail.Dorongovskij@ctcadvanced.com, c=DE
2018.02.22 12:06:00 +01'00'

Mihail Dorongovskij
Lab Manager
Radio Communications & EMC

1 Table of contents

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. CTC advanced 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.

This test report replaces the test report with the number 1-3558/17-01-04-A and dated 2018-02-21

2.2 Application details

Date of receipt of order:	2017-04-10
Date of receipt of test item:	2017-04-18
Start of test:	2017-04-20
End of test:	2017-04-28
Person(s) present during the test:	-/-

2.3 Test laboratories sub-contracted

None

3 Test standard/s and references

Test standard	Date	Description
47 CFR Part 15		Title 47 of the Code of Federal Regulations; Chapter I; Part 15 – Radio frequency devices
RSS – 247 Issue 2	February 2017	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence – Exempt Local Area Network (LE-LAN) Devices
RSS – Gen Issue 4	November 2014	Spectrum Management and Telecommunications Radio Standards Specifications – General Requirements and Information for the Certification of Radio Apparatus

Guidance	Version	Description
DTS: KDB 558074 D01	v03r05	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
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} T_{max} T_{min}	+22 °C during room temperature tests No tests under extreme conditions performed. No tests under extreme conditions performed.
Relative humidity content	:		55 %
Barometric pressure	:		1021 hpa
Power supply	:	V_{nom} V_{max} V_{min}	7.5 V DC by power supply No tests under extreme conditions performed. No tests under extreme conditions performed.

5 Test item

5.1 General description

Kind of test item	:	CTG Base Station PQC-OBBSBV1 including 2x 2.4GHz Transceiver
Type identification	:	866074
HMN	:	-/-
PMN	:	866074
HVIN	:	866074
FVIN	:	-/-
S/N serial number	:	Rad. DE32000515
HW hardware status	:	1
SW software status	:	B.00.39 / B.02.60
Frequency band	:	DTS band 2400.0 MHz to 2483.5 MHz (lowest channel 2405 MHz; highest channel 2480 MHz)
Type of radio transmission Use of frequency spectrum	: :	DSSS
Type of modulation	:	OQPSK
Number of channels	:	16
Antenna	:	Chip antenna
Power supply	:	7.5 V DC by power supply
Temperature range	:	-20°C to +55°C

5.2 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: 1-3558/17-01-01_AnnexA
1-3558/17-01-01_AnnexB
1-3558/17-01-01_AnnexD

6 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 signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

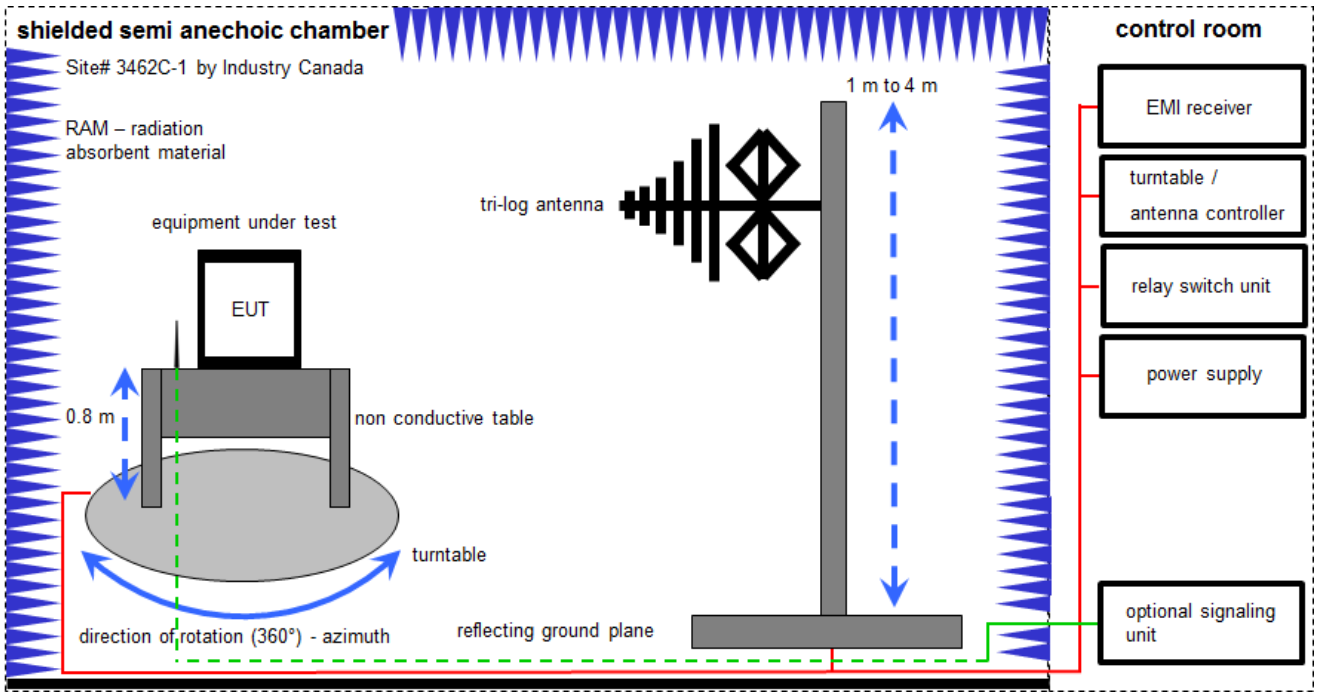
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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

6.1 Shielded semi anechoic chamber

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 conform to 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 analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Measurement distance: tri-log antenna 10 meter

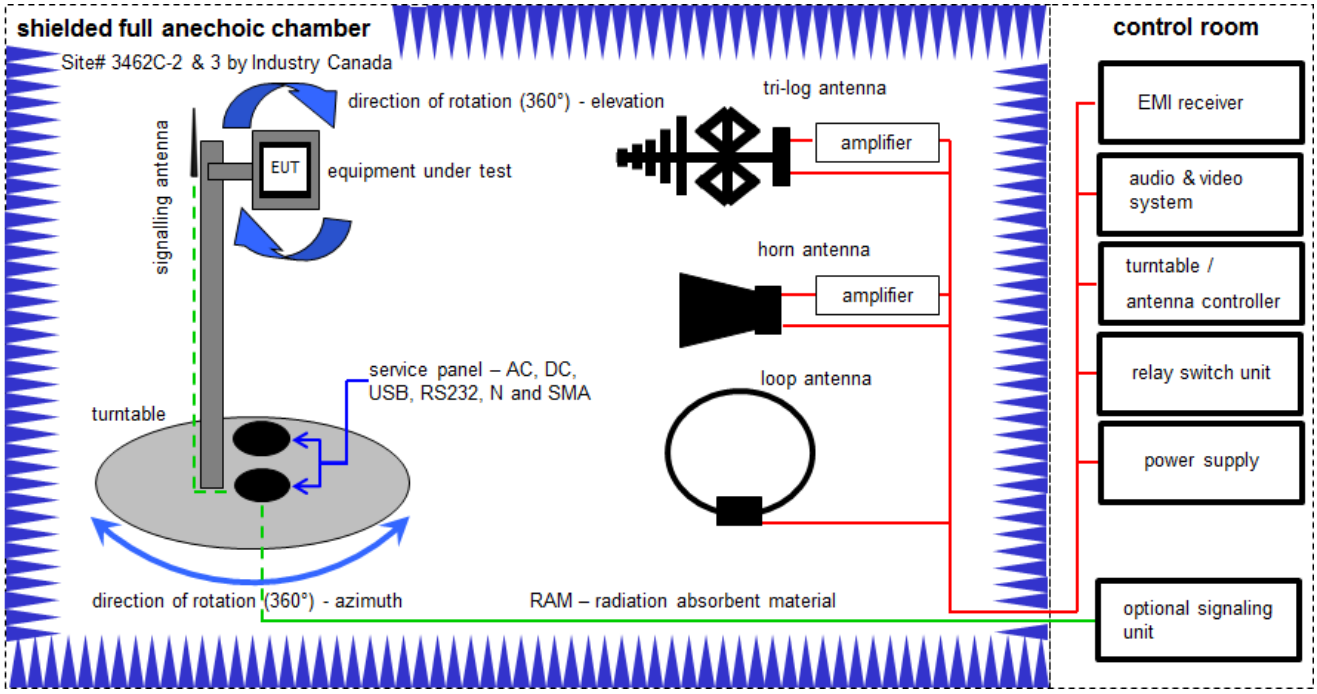
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dBµV/m] (35.69 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	A	Meßkabine 1	HF-Absorberhalle	MWB AG 300023	101042	300000551	ne	-/-	-/-
3	A	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	01.02.2017	31.01.2018
4	A	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	Ve	02.02.2016	02.02.2018
5	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
6	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
7	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
8	A	TRILOG Broadband Test-Antenna 30 MHz – 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	25.04.2016	25.04.2018

6.2 Shielded fully anechoic chamber



Measurement distance: tri-log antenna and horn antenna 3 meter; loop antenna 3 meter

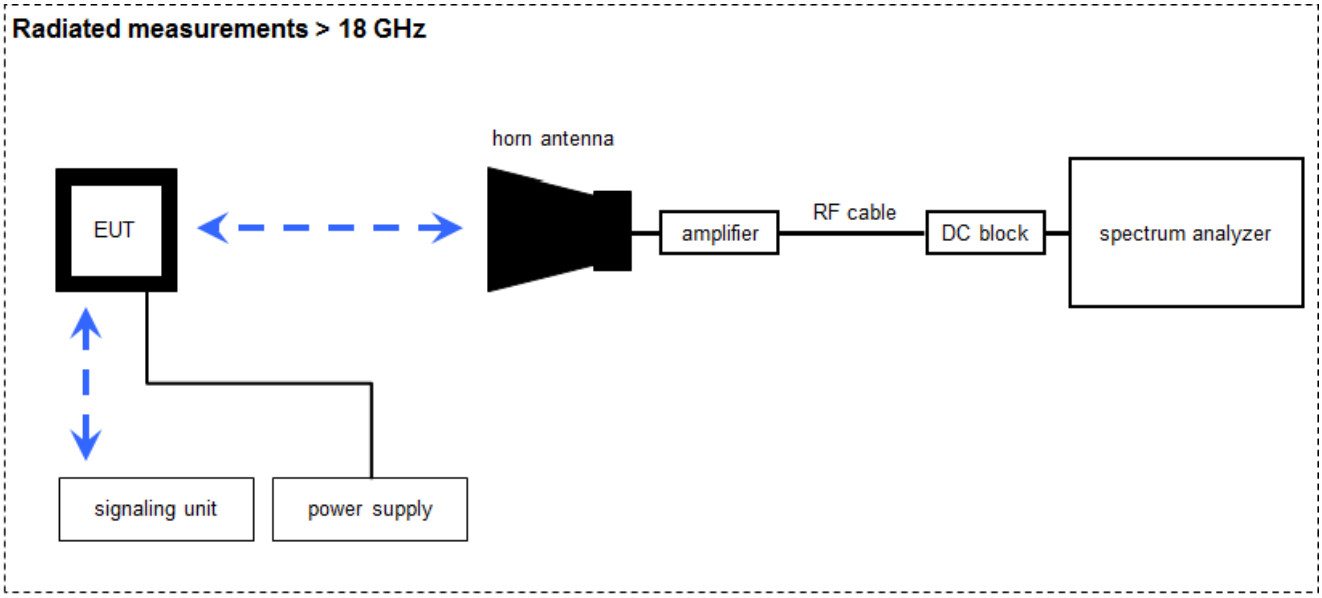
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dBµV/m] (71.61 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	C	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO	2210	300001015	k	20.05.2015	20.05.2017
2	A	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9709-5290	300000212	k	13.08.2015	13.08.2017
3	A	Highpass Filter	WHK1.1/15G-10SS	Wainwright	37	400000148	ne	-/-	-/-
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	B	TRILOG Broadband Test-Antenna 30 MHz – 3 GHz	VULB9163	Schwarzbeck	371	300003854	vlKl!	29.10.2014	29.10.2017
7	A, B	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22051	300004483	ev	-/-	-/-
8	A, B, C	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000032	300004510	ne	-/-	-/-
9	A, B, C	Messrechner und Monitor	Intel Core i3 3220/3,3 GHz, Prozessor	Huber & Suhner	2V2403033A5421	300004591	ne	-/-	-/-
10	A, B, C	NEXIO EMV-Software	BAT EMC V3.16.0.49	EMCO	Batch no. 14844	300004682	ne	-/-	-/-
11	A, B, C	Anechoic chamber	ESH3-Z5	TDK	893045/004	300003726	ne	-/-	-/-
12	A, B, C	EMI Test Receiver 9kHz-26,5GHz	ESR26	R&S	101376	300005063	vlKl!	13.09.2016	13.03.2018

6.3 Radiated measurements > 18 GHz



Measurement distance: horn antenna 50 cm

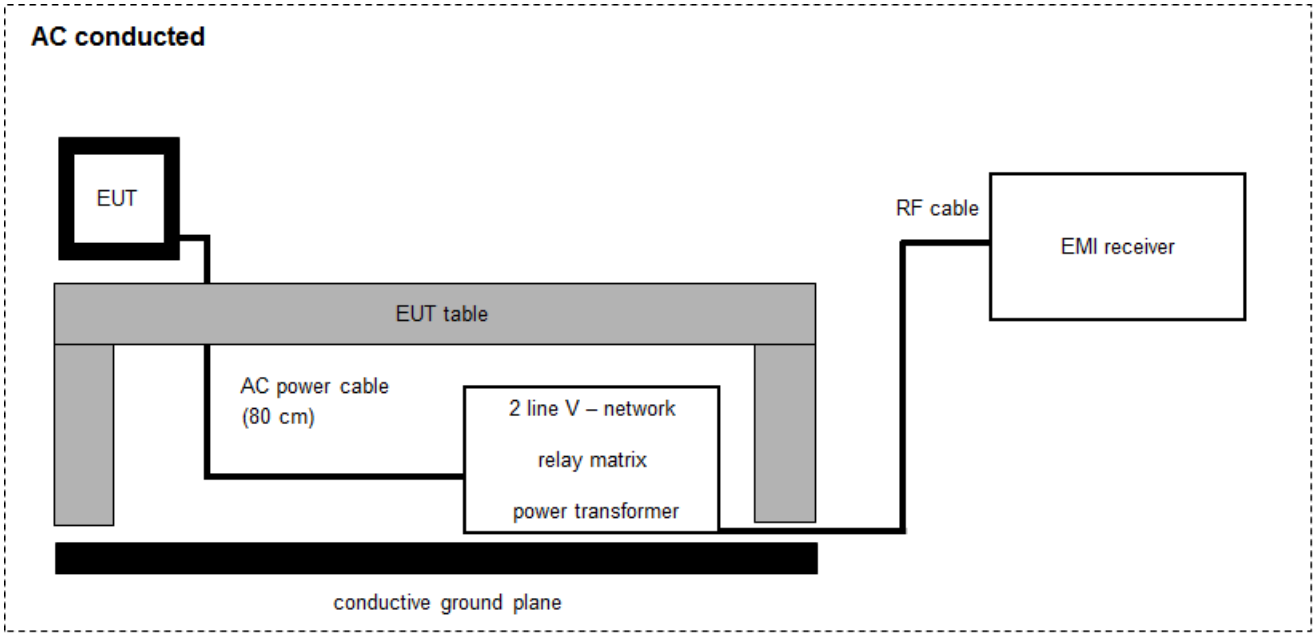
FS = U_R + CA + AF
(FS-field strength; U_R-voltage at the receiver; CA-loss signal path & distance correction; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dBµV/m] (6.79 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	-/-	300000486	k	10.09.2015	10.09.2017
2	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	27.01.2017	26.01.2018
3	A	Amplifier 2-40 GHz	JS32-02004000-57-5P	MITEQ	1777200	300004541	ev	-/-	-/-
4	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 600918	400001182	ev	-/-	-/-
5	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 127377	400001183	ev	-/-	-/-
6	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	-/-	400001185	ev	-/-	-/-

6.4 AC conducted



FS = UR + CF + VC
(FS-field strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

Example calculation:
FS [dBµV/m] = 37.62 [dBµV/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dBµV/m] (244.06 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Two-line V-Network (LISN) 9 kHz to 30 MHz	ESH3-Z5	R&S	893045/004	300000584	k	31.01.2017	30.01.2018
2	A	RF-Filter-section	85420E	HP	3427A00162	300002214	k	27.11.2006	-/-
3	A	EM-Injection Clamp	FCC-203i	emv	232	300000626	ev	18.05.2001	-/-
4	A	AC-Spannungsquelle variabel	MV2616-V	EM-Test	0397-12	300003259	k	11.12.2015	11.12.2017
5	A	Hochpass 150 kHz	EZ-25	R&S	100010	300003798	ev	08.04.2008	-/-
6	A	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	16.08.2016	16.08.2017

7 Sequence of testing

7.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are 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.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

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

Final measurement

- Identified emissions during the premeasurement are maximized by the software by rotating the turntable from 0° to 360°. In case of the 2-axis positioner is used the elevation axis is also rotated from 0° to 360°.
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

7.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the 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 are 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.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- 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 is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position ± 45° and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

7.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are 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.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

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

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

7.4 Sequence of testing radiated spurious above 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- Auxiliary equipment and cables are 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.
- The measurement distance is as appropriate (e.g. 0.5 m).
- The EUT is set into operation.

Premeasurement

- The test antenna is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.

Final measurement

- The final measurement is performed at the position and antenna orientation causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement and the limit is stored.

8 Measurement uncertainty

Measurement uncertainty	
Test case	**Uncertainty**
Antenna gain	± 3 dB
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 Summary of measurement results

☐	No deviations from the technical specifications were ascertained
☐	There were deviations from the technical specifications ascertained
☒	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 2	See table!	2018-02-22	Tests according to customer's demand

Test specification clause	Test case	Guideline	Temperature conditions	Power source voltages	Mode	C	NC	NA	NP	Remark
§15.247(b)(4) RSS – 247 / 5.4 (f)(ii)	System gain	-/-	Nominal	Nominal	OQPSK	☐	☐	☐	☒	-/-
§15.247© RSS – 247 / 5.2 (b)	Power spectral density	KDB 558074 DTS clause: 10.6	Nominal	Nominal	OQPSK	☐	☐	☐	☒	*1
§15.247(a)(2) RSS – 247 / 5.2 (a)	DTS bandwidth – 6 dB bandwidth	KDB 558074 DTS clause: 8.1	Nominal	Nominal	OQPSK	☐	☐	☐	☒	*1
RSS Gen clause 4.6.1	Occupied bandwidth	-/-	Nominal	Nominal	OQPSK	☐	☐	☐	☒	*1
§15.247(b)(3) RSS – 247 / 5.4 (d)	Maximum output power	KDB 558074 DTS clause: 9.1.1	Nominal	Nominal	OQPSK	☒	☐	☐	☐	-/-
§15.247(d) RSS – 247 / 5.5	Detailed spurious emissions @ the band edge – conducted	-/-	Nominal	Nominal	OQPSK	☐	☐	☐	☒	*1
§15.205 RSS – 247 / 5.5 RSS – Gen	Band edge compliance radiated	KDB 558074 DTS clause: 13.3.2	Nominal	Nominal	OQPSK	☒	☐	☐	☐	-/-
§15.247(d) RSS – 247 / 5.5	TX spurious emissions conducted	KDB 558074 DTS clause: 11.1 & 11.2 11.3	Nominal	Nominal	OQPSK	☐	☐	☐	☒	*1
§15.209(a) RSS – Gen	Spurious emissions radiated below 30 MHz	-/-	Nominal	Nominal	OQPSK	☒	☐	☐	☐	-/-
15.247(d) RSS – 247 / 5.5 §15.109 RSS – Gen	Spurious emissions radiated 30 MHz to 1 GHz	-/-	Nominal	Nominal	-/-	☒	☐	☐	☐	-/-
§15.247(d) RSS – 247 / 5.5 §15.109 RSS – Gen	Spurious emissions radiated above 1 GHz	-/-	Nominal	Nominal	OQPSK	☒	☐	☐	☐	-/-
§15.107(a) §15.207	Conducted emissions below 30 MHz (AC conducted)	-/-	Nominal	Nominal	OQPSK	☒	☐	☐	☐	-/-

*1: For conducted results please see main report 1-5420/12-01-11-A

Note: C = Compliant; NC = Not compliant; NA = Not applicable; NP = Not performed

10 Additional comments

Reference documents : Customer_Questionnaire_1-3558_17-01_Base.docx

Project Note – SRR Duty Cycle Determination for FCC Approval

Main test report 1-5420/12-01-11-A

Special test descriptions: The EUT contains two radio modules (left and right). The tests were performed on both modules.

Configuration descriptions: Used power settings: 0 dBm (lowest channel)
0 dBm (middle channel)
-5 dBm (highest channel)

Test mode: ☒ Special software is used.
EUT is transmitting pseudo random data by itself

Antennas and transmit operating modes:

☒ 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)*

☐ Operating mode 2 (multiple antennas, no beamforming)

- *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without beamforming.*

☐ Operating mode 3 (multiple antennas, with beamforming)

- *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously with beamforming.*
  In addition to the antenna assembly gain (G), the beamforming gain (Y) may have to be taken into account when performing the measurements.

11 Measurement results

11.1 Maximum output power

Description:

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

Measurement parameters	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	3 MHz
Video bandwidth	10 MHz
Span	10 MHz
Trace mode	Max hold
Test setup	See sub clause 6.2 A
Measurement uncertainty	See sub clause 8

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:

	Frequency		
	2405 MHz	2440 MHz	2480 MHz
Maximum output power radiated (left module) [dBm]	3.3	2.1	-3.7
Maximum output power radiated (right module) [dBm]	4.5	4.2	-0.9
Maximum output power radiated [dBm] Added from main report: 1-5420/12-01-11-A	2.20	3.19	-2.73

11.2 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 frequency 2402 MHz for the lower restricted band and 2480 MHz for the upper restricted band. Measurement distance is 3m.

Measurement parameters	
Detector	Peak / RMS
Sweep time	Auto
Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Span	Lower Band: 2300 – 2400 MHz Upper Band: 2480 – 2500 MHz
Trace mode	Max hold
Test setup	See sub clause 6.2 B
Measurement uncertainty	See sub clause 8

Limits:

FCC	IC
Band edge compliance 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 Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).	
54 dBµV/m AVG 74 dBµV/m Peak	

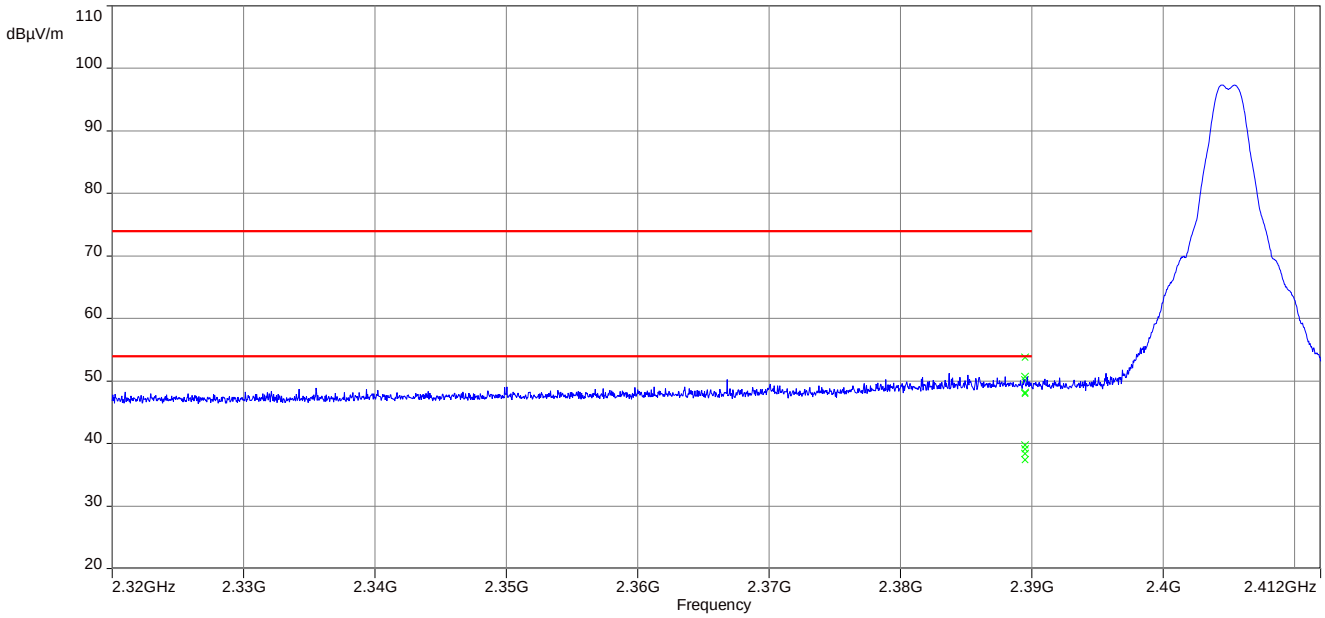
Result:

Scenario Modulation	Band edge compliance radiated [dBµV/m] OQPSK
Lower restricted band (left module)	53.7 dBµV/m @ 3 m (Peak – measured) 38.3 dBµV/m @ 3 m (Average – calculated)
Upper restricted band (left module)	60.4 dBµV/m @ 3 m (Peak – measured) 45.0 dBµV/m @ 3 m (Average – calculated)
Lower restricted band (left module)	53.5 dBµV/m @ 3 m (Peak – measured) 38.1 dBµV/m @ 3 m (Average – calculated)
Upper restricted band (left module)	64.2 dBµV/m @ 3 m (Peak – measured) 48.8 dBµV/m @ 3 m (Average – calculated)

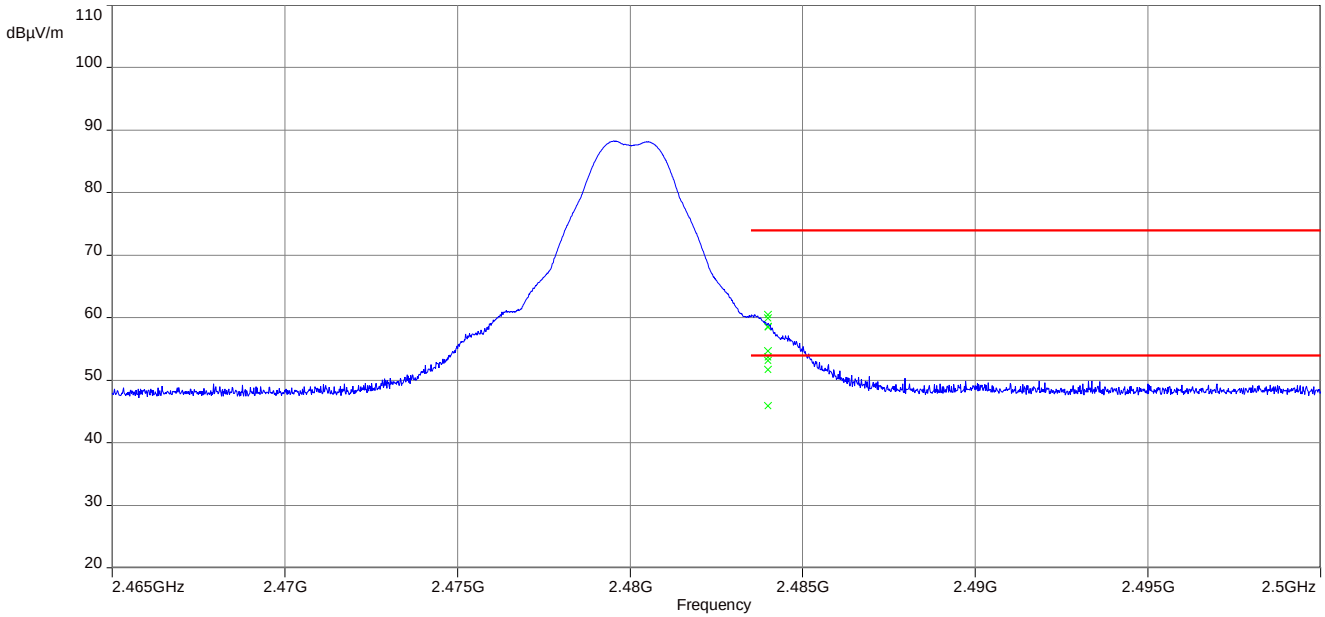
Note: The average value is recalculated with the stated duty cycle of 17.024 % = 15.38 dB (correction factor)

Plots:

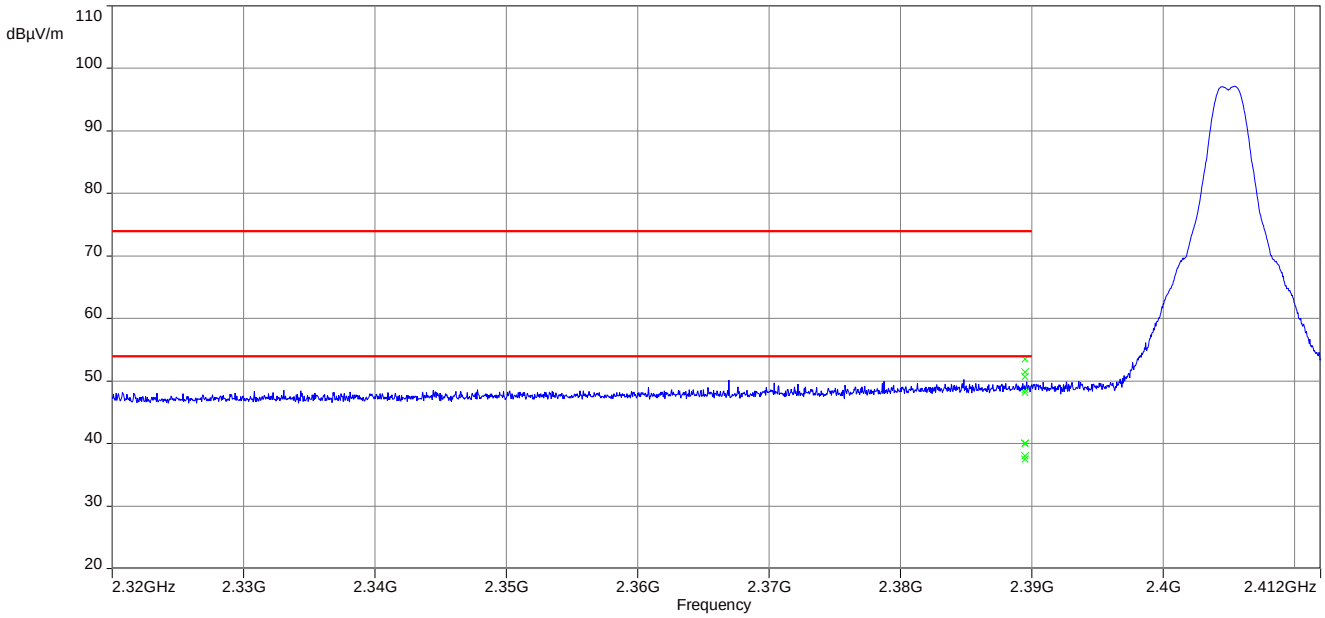
Plot 1: Lower restricted band, left module



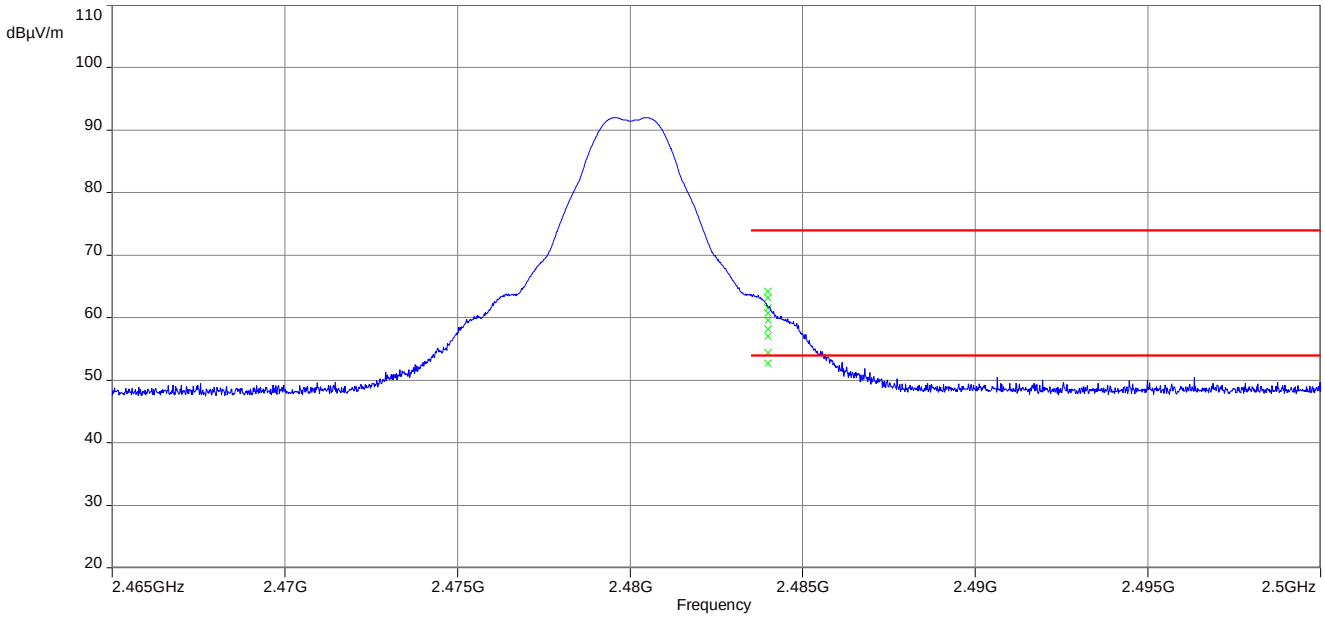
Plot 2: Upper restricted band, left module



Plot 3: Lower restricted band, right module



Plot 4: Upper restricted band, right module



11.3 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 frequencies are 2402 MHz, 2440 MHz and 2480 MHz. 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 parameters	
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: 30 kHz
Span	9 kHz to 30 MHz
Trace mode	Max hold
Test setup	See sub clause 6.2 C
Measurement uncertainty	See sub clause 8

Limits:

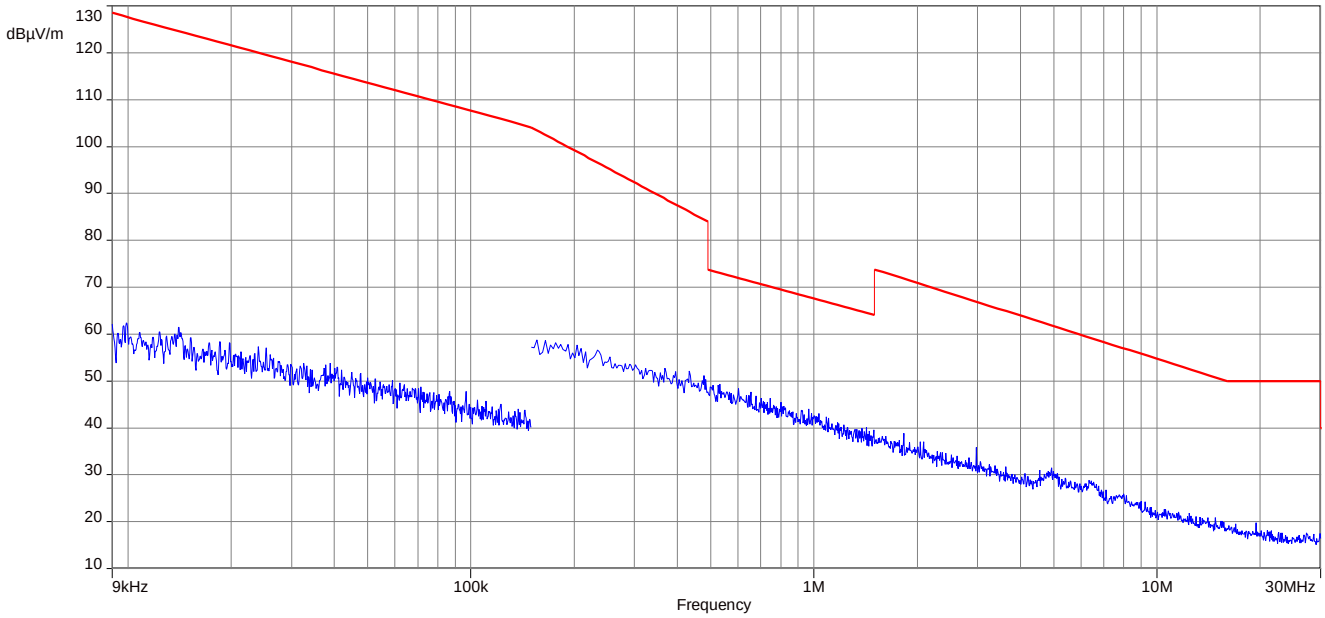
FCC		IC
TX spurious emissions radiated below 30 MHz		
Frequency (MHz)	Field strength (dBµV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Results: both modules

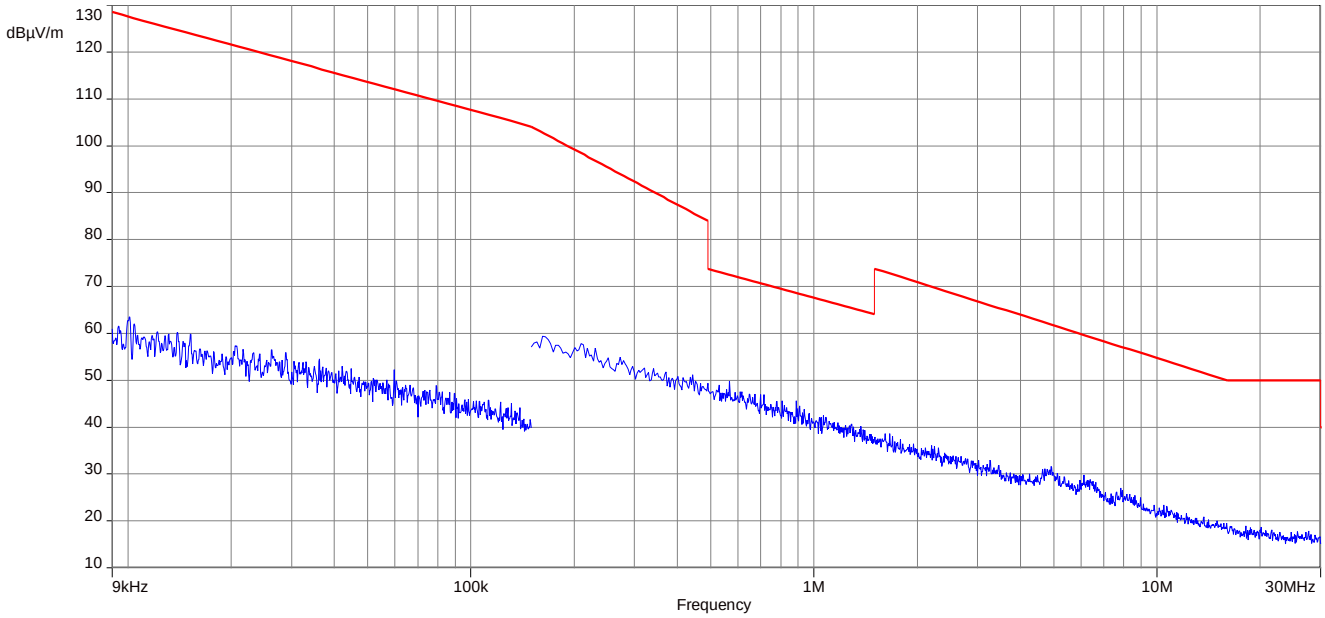
TX spurious emissions radiated below 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 20 dB below the limit.		

Plots:

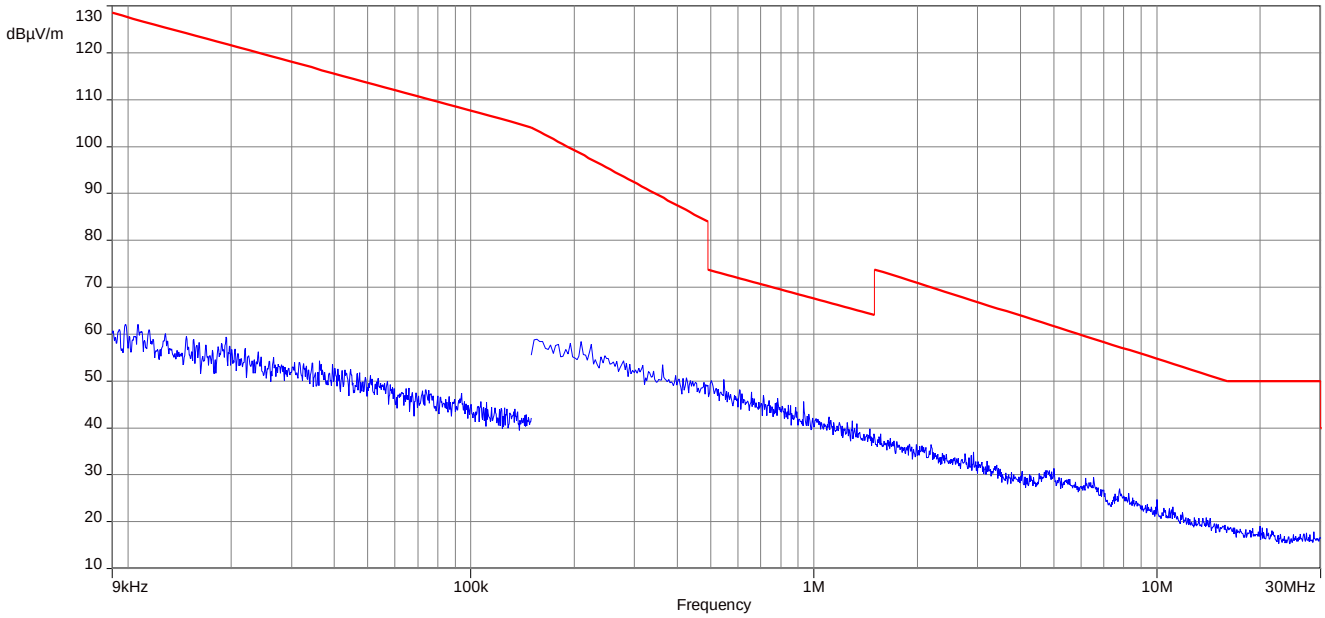
Plot 1: 9 kHz to 30 MHz, 2402 MHz, transmit mode, left module



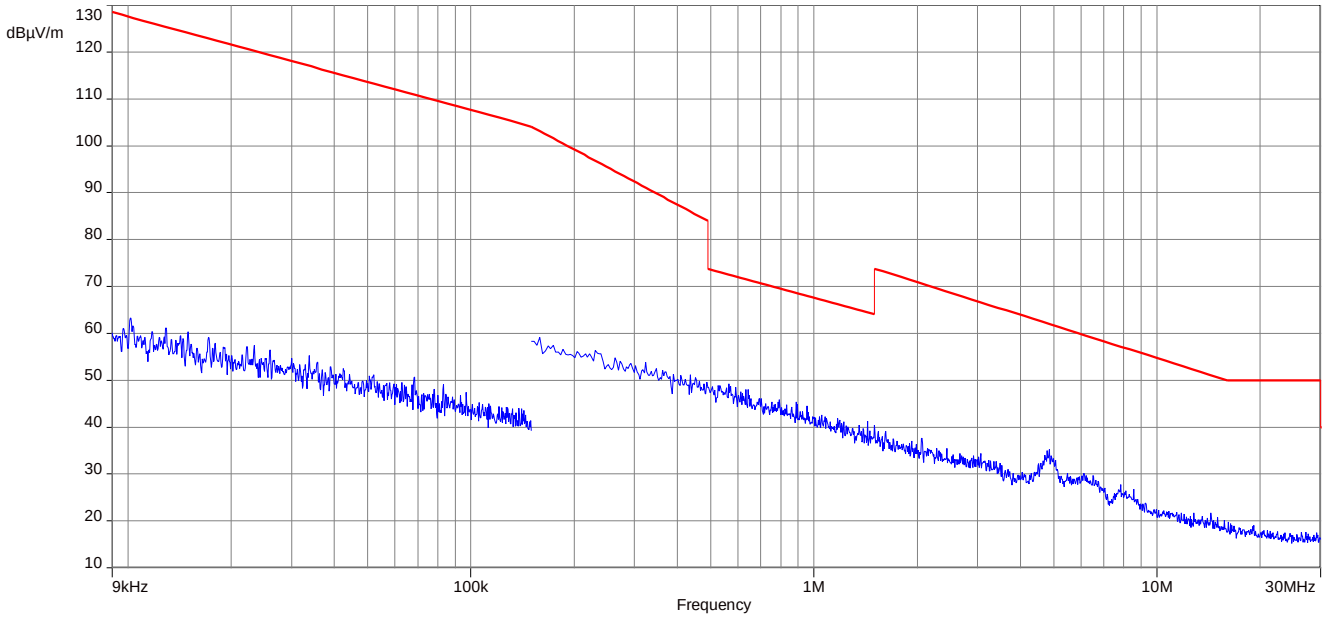
Plot 2: 9 kHz to 30 MHz, 2440 MHz, transmit mode, left module



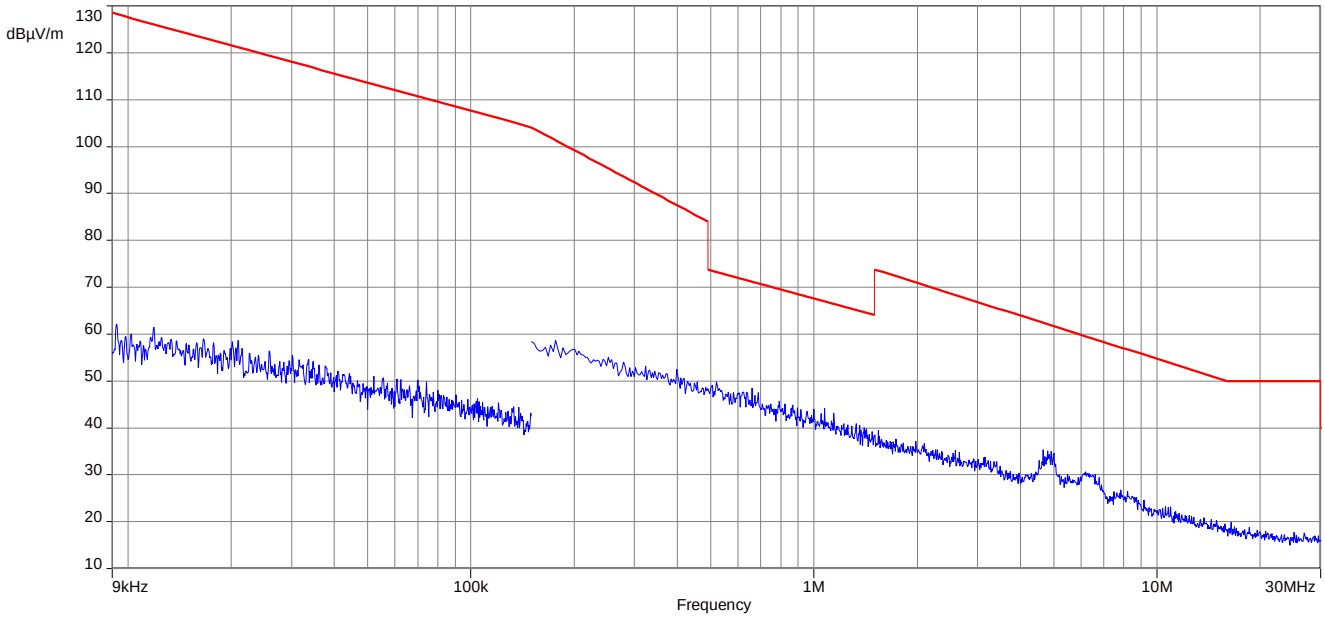
Plot 3: 9 kHz to 30 MHz, 2480 MHz, transmit mode, left module



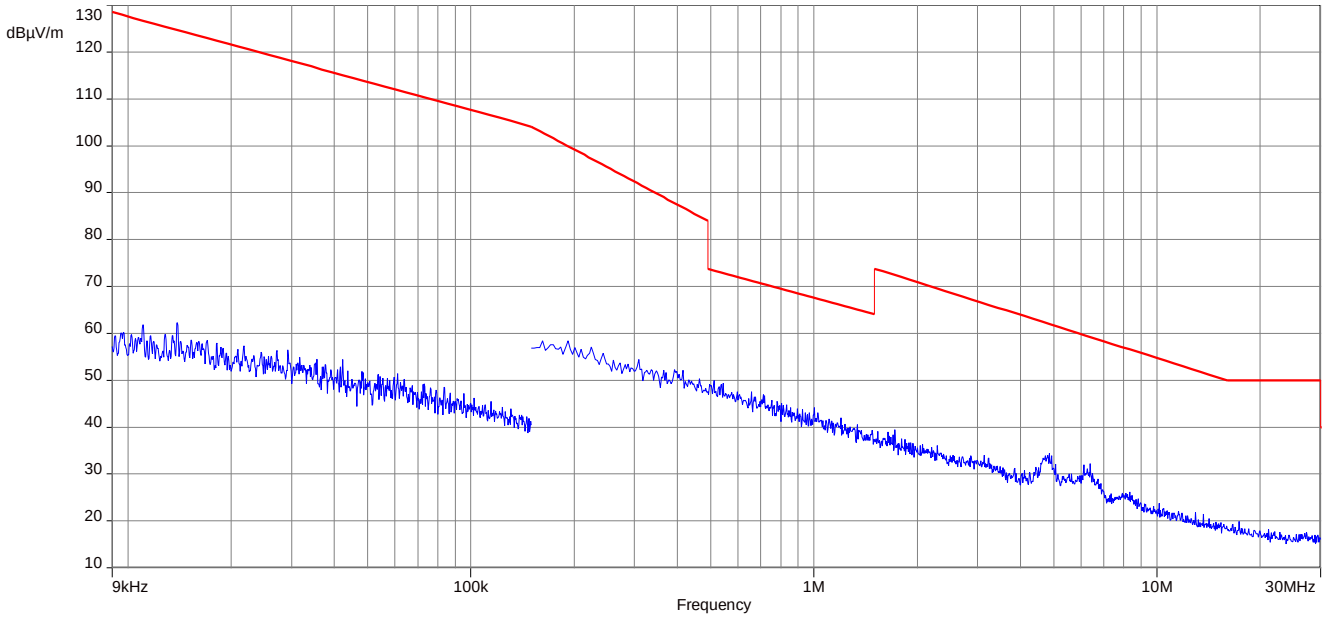
Plot 4: 9 kHz to 30 MHz, 2402 MHz, transmit mode, right module



Plot 5: 9 kHz to 30 MHz, 2440 MHz, transmit mode, right module



Plot 6: 9 kHz to 30 MHz, 2480 MHz, transmit mode, right module



11.4 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 frequencies are 2402 MHz, 2440 MHz and 2480 MHz. The measurement is performed in the mode with the highest output power.

Measurement parameters	
Detector	Peak / Quasi Peak
Sweep time	Auto
Resolution bandwidth	120 kHz
Video bandwidth	3 x RBW
Span	30 MHz to 1 GHz
Trace mode	Max hold
Measured modulation	OQPSK
Test setup	See sub clause 6.1 A
Measurement uncertainty	See sub clause 8

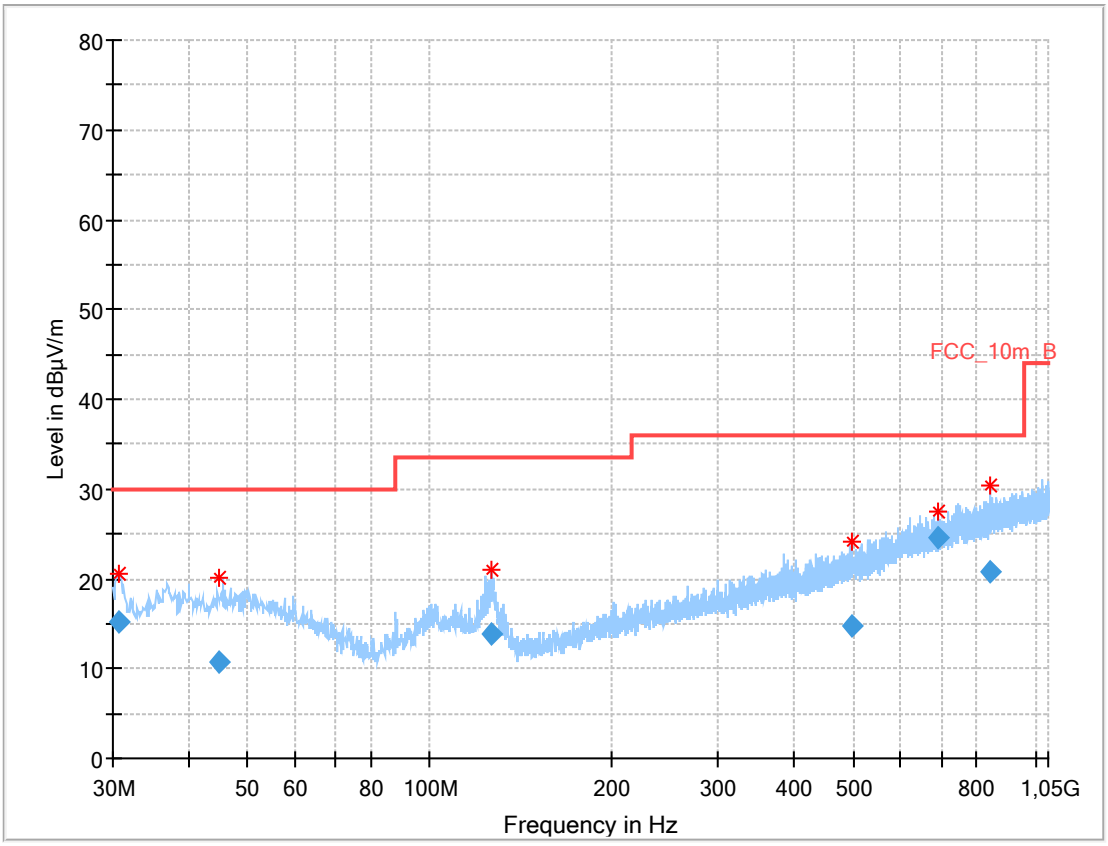
The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

Limits:

FCC		IC
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

Plots: Transmit mode

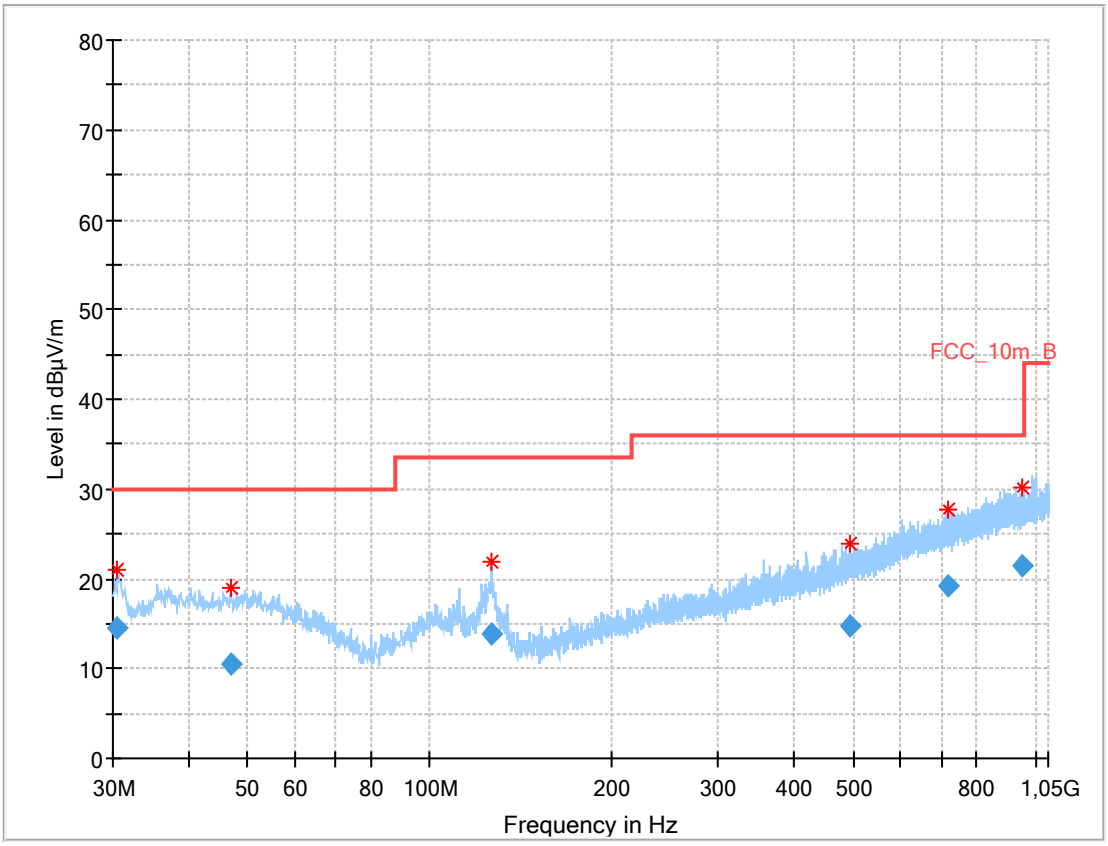
Plot 1: 30 MHz to 1 GHz, TX mode, 2402 MHz, vertical & horizontal polarization, left module



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.782438	15.28	30.00	14.72	1000.0	120.000	100.0	V	313.0	12.0
45.022800	10.78	30.00	19.22	1000.0	120.000	101.0	V	74.0	13.6
126.017550	13.75	33.50	19.75	1000.0	120.000	101.0	V	90.0	9.8
497.095350	14.75	36.00	21.25	1000.0	120.000	178.0	H	0.0	18.7
689.994450	24.62	36.00	11.38	1000.0	120.000	98.0	H	132.0	21.5
843.634200	20.70	36.00	15.30	1000.0	120.000	185.0	H	0.0	23.4

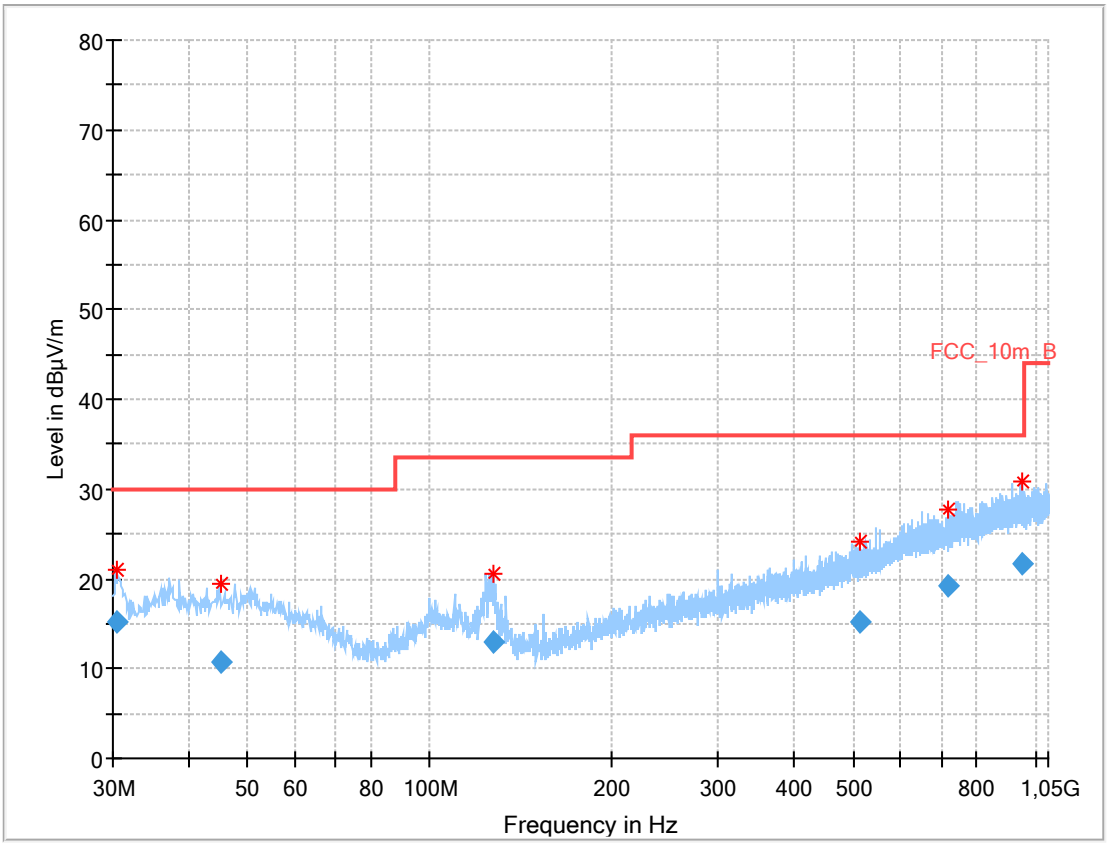
Plot 2: 30 MHz to 1 GHz, TX mode, 2440 MHz, vertical & horizontal polarization, left module



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.398250	14.46	30.00	15.54	1000.0	120.000	101.0	V	225.0	11.9
46.870650	10.48	30.00	19.52	1000.0	120.000	101.0	V	69.0	13.7
126.442200	13.85	33.50	19.65	1000.0	120.000	98.0	V	55.0	9.8
494.736600	14.69	36.00	21.31	1000.0	120.000	179.0	V	343.0	18.6
716.341200	19.18	36.00	16.82	1000.0	120.000	101.0	V	225.0	21.9
951.451800	21.37	36.00	14.63	1000.0	120.000	185.0	H	0.0	24.4

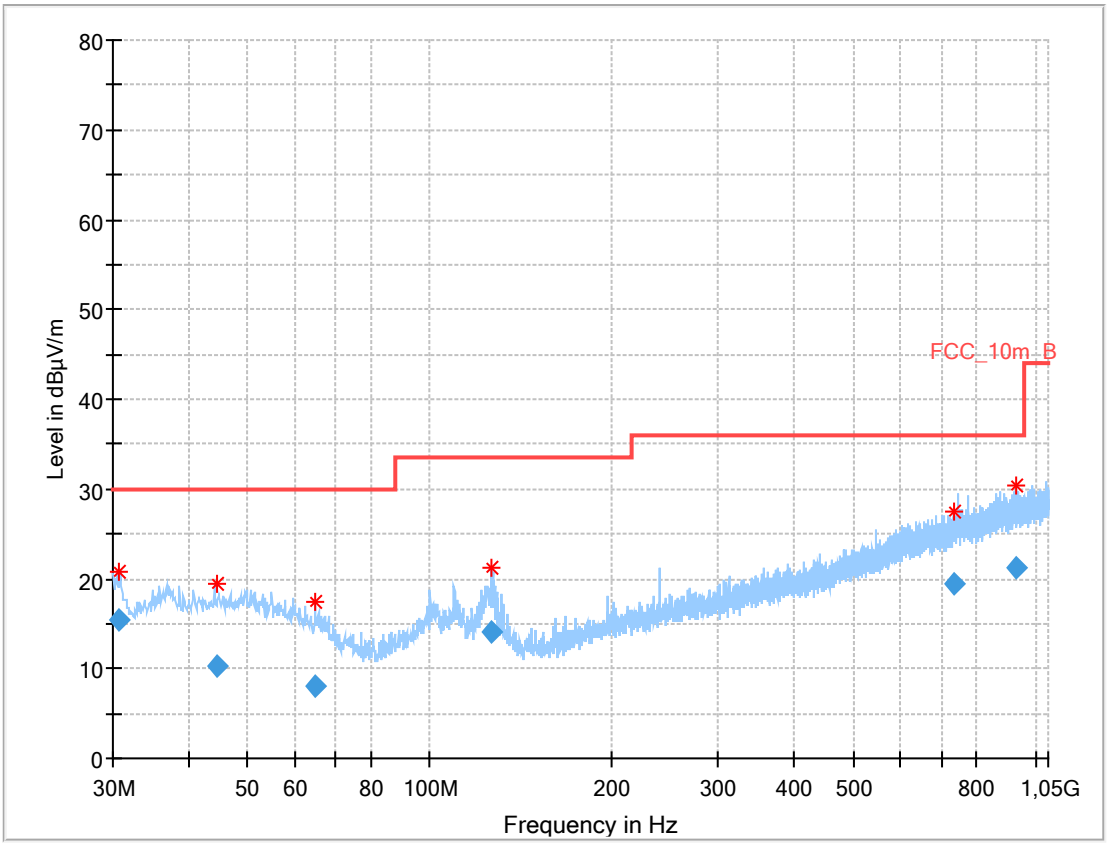
Plot 3: 30 MHz to 1 GHz, TX mode, 2480 MHz, vertical & horizontal polarization, left module



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.470678	15.10	30.00	14.90	1000.0	120.000	101.0	V	315.0	11.9
45.256200	10.66	30.00	19.34	1000.0	120.000	179.0	V	25.0	13.6
127.143750	13.02	33.50	20.48	1000.0	120.000	98.0	V	174.0	9.7
512.668200	15.14	36.00	20.86	1000.0	120.000	98.0	V	199.0	18.9
718.593300	19.32	36.00	16.68	1000.0	120.000	98.0	H	199.0	22.0
950.283450	21.74	36.00	14.26	1000.0	120.000	98.0	V	153.0	24.3

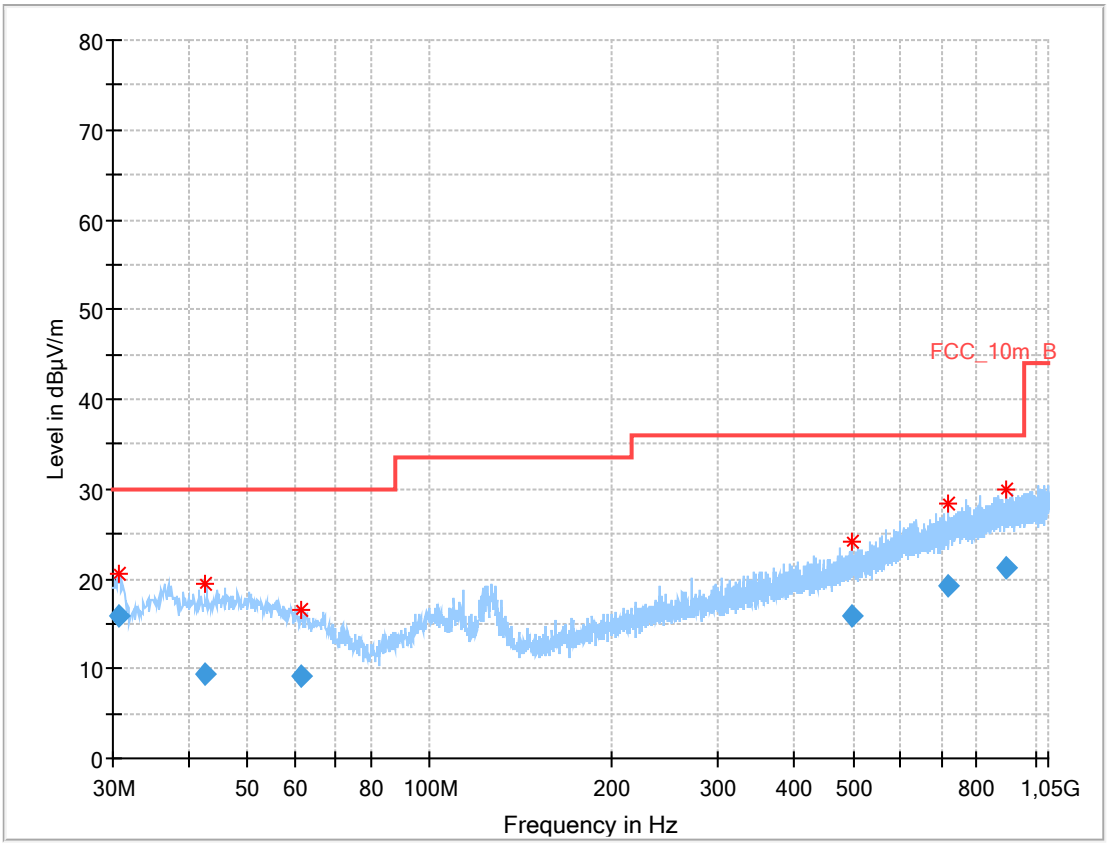
Plot 4: 30 MHz to 1 GHz, TX mode, 2402 MHz, vertical & horizontal polarization, right module



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.798784	15.46	30.00	14.54	1000.0	120.000	101.0	V	27.0	12.0
44.502600	10.32	30.00	19.68	1000.0	120.000	101.0	V	77.0	13.6
64.534950	8.03	30.00	21.97	1000.0	120.000	178.0	V	327.0	10.9
126.261450	14.04	33.50	19.46	1000.0	120.000	101.0	V	88.0	9.8
731.524950	19.51	36.00	16.49	1000.0	120.000	185.0	V	15.0	22.3
931.039200	21.28	36.00	14.72	1000.0	120.000	185.0	V	286.0	24.3

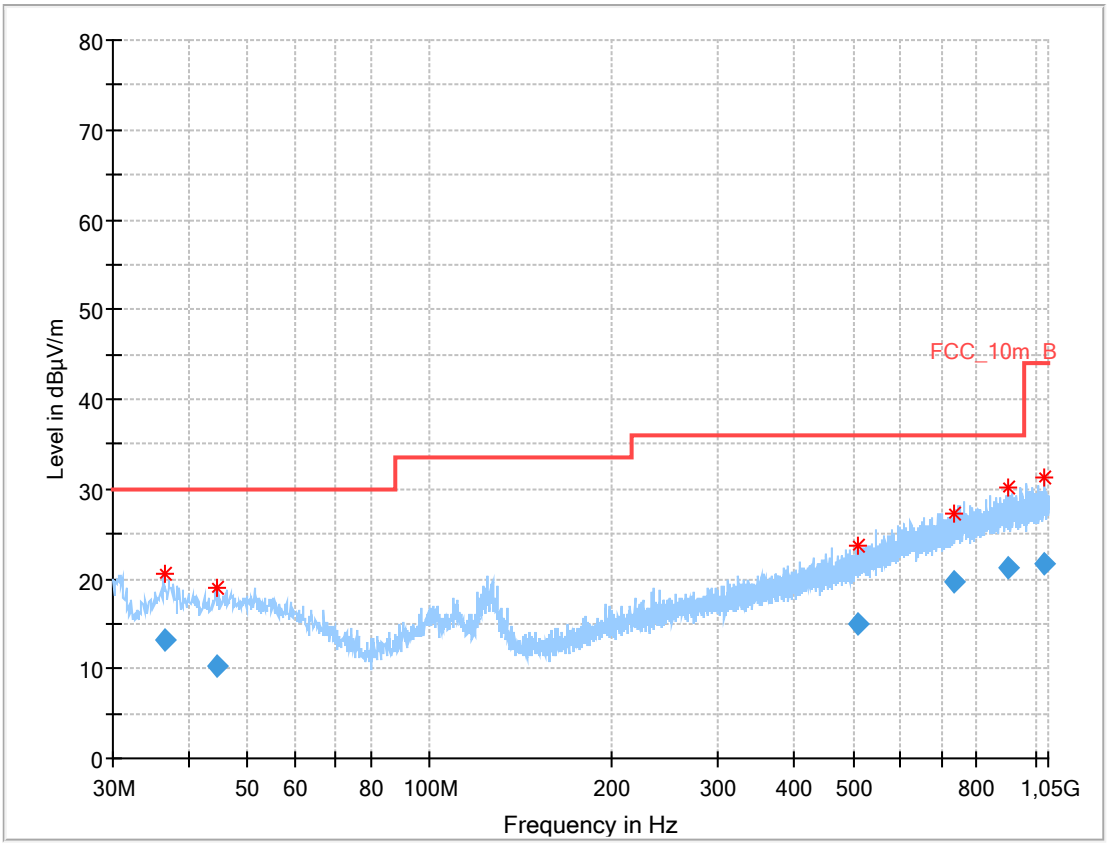
Plot 5: 30 MHz to 1 GHz, TX mode, 2440 MHz, vertical & horizontal polarization, right module



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.682650	15.86	30.00	14.14	1000.0	120.000	101.0	V	265.0	12.0
42.599850	9.47	30.00	20.53	1000.0	120.000	101.0	V	54.0	13.4
61.208250	9.13	30.00	20.87	1000.0	120.000	101.0	V	138.0	11.6
498.384150	15.84	36.00	20.16	1000.0	120.000	185.0	V	152.0	18.7
719.150550	19.27	36.00	16.73	1000.0	120.000	185.0	V	353.0	22.0
895.761750	21.25	36.00	14.75	1000.0	120.000	185.0	H	297.0	24.1

Plot 6: 30 MHz to 1 GHz, TX mode, 2480 MHz, vertical & horizontal polarization, right module

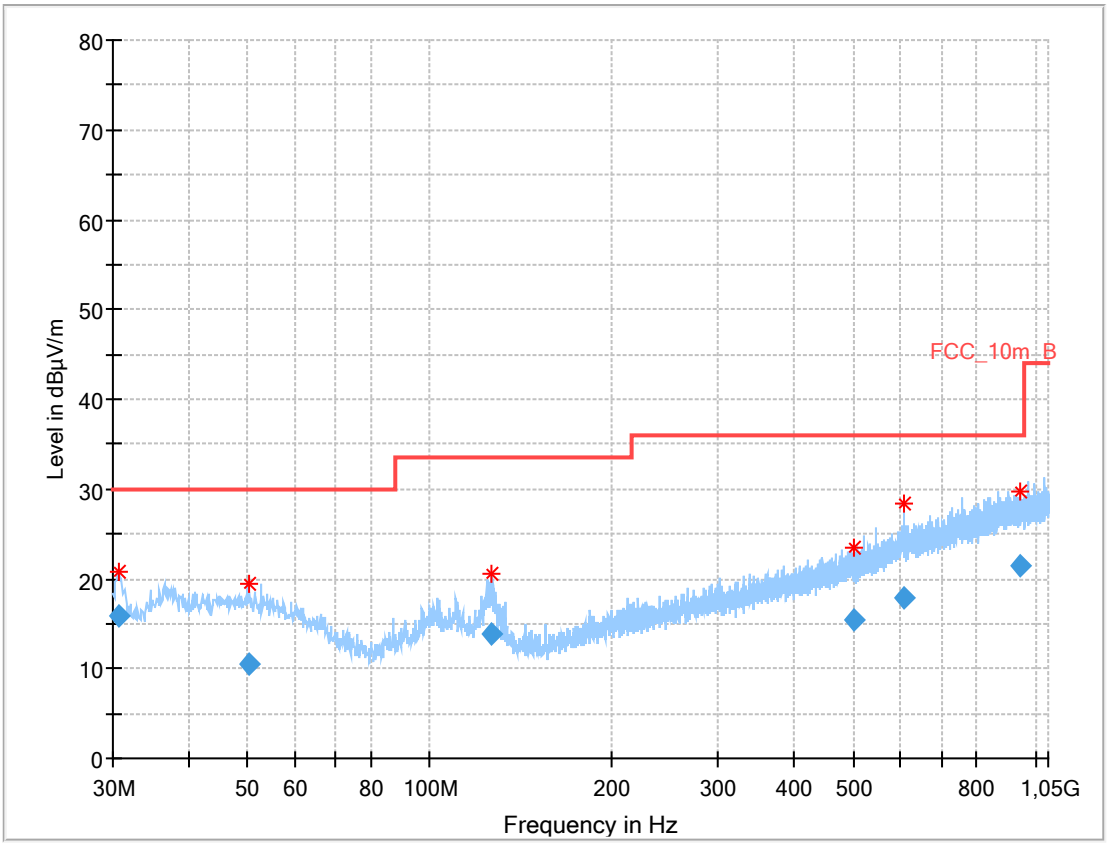


Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.626850	13.18	30.00	16.82	1000.0	120.000	101.0	V	351.0	12.8
44.666250	10.30	30.00	19.70	1000.0	120.000	101.0	V	48.0	13.6
511.100250	15.00	36.00	21.00	1000.0	120.000	185.0	V	215.0	18.9
734.371800	19.58	36.00	16.42	1000.0	120.000	98.0	V	317.0	22.4
903.880800	21.23	36.00	14.77	1000.0	120.000	178.0	V	103.0	24.2
1032.855600	21.66	44.00	22.34	1000.0	120.000	185.0	H	237.0	25.5

Plots: Receiver mode

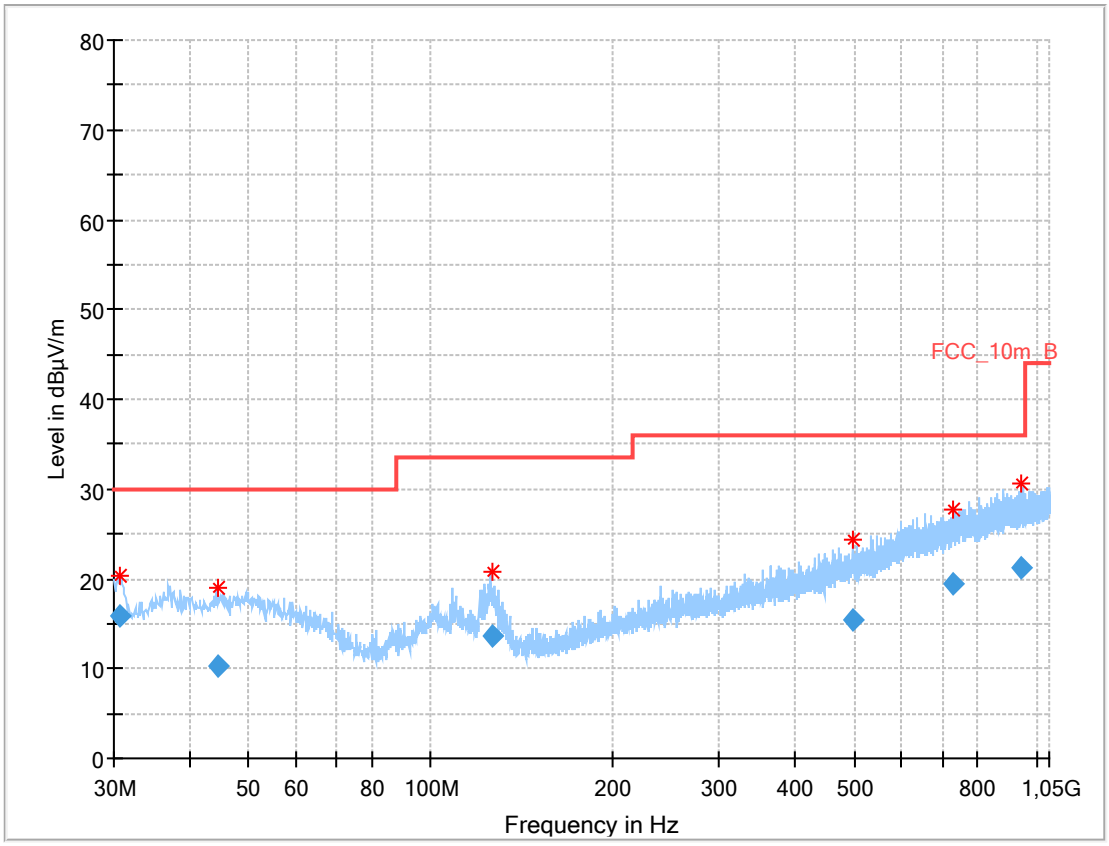
Plot 1: 30 MHz to 1 GHz, RX / idle – mode, vertical & horizontal polarization, left module



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.716100	15.88	30.00	14.12	1000.0	120.000	101.0	V	282.0	12.0
50.197800	10.43	30.00	19.57	1000.0	120.000	100.0	V	113.0	13.7
126.488550	13.87	33.50	19.63	1000.0	120.000	98.0	V	48.0	9.8
501.032100	15.50	36.00	20.50	1000.0	120.000	185.0	H	33.0	18.7
609.072000	17.98	36.00	18.02	1000.0	120.000	185.0	V	147.0	20.8
944.043900	21.38	36.00	14.62	1000.0	120.000	185.0	H	0.0	24.3

Plot 2: 30 MHz to 1 GHz, RX / idle – mode, vertical & horizontal polarization, right module



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.751981	15.76	30.00	14.24	1000.0	120.000	100.0	V	33.0	12.0
44.507250	10.26	30.00	19.74	1000.0	120.000	101.0	V	124.0	13.6
126.131100	13.74	33.50	19.76	1000.0	120.000	101.0	V	104.0	9.8
498.209100	15.49	36.00	20.51	1000.0	120.000	98.0	H	75.0	18.7
730.885950	19.52	36.00	16.48	1000.0	120.000	101.0	V	18.0	22.3
946.876800	21.30	36.00	14.70	1000.0	120.000	185.0	H	0.0	24.3

11.5 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 frequencies are 2402 MHz, 2440 MHz and 2480 MHz. The measurement is performed in the mode with the highest output power.

Measurement parameters	
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	OQPSK
Test setup	See sub clause 6.2 A (1 GHz – 18 GHz) See sub clause 6.3 A (18 GHz – 26 GHz)
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
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
Above 960	54.0 (Average)	3
Above 960	74.0 (Peak)	3

Results: Transmitter mode, left module

TX spurious emissions radiated [dBµV/m]								
2402 MHz			2440 MHz			2480 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
1619	Peak	43.9	4881	Peak	50.9	2475	Peak	*
	AVG	40.9		AVG	41.6		AVG	
4810	Peak	51.6	7317	Peak	48.9		Peak	
	AVG	43.7		AVG	39.7		AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

* Not rated (inband notch filter emission)

Results: Transmitter mode, right module

TX spurious emissions radiated [dBµV/m]								
2402 MHz			2440 MHz			2480 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
1619	Peak	44.1	4879	Peak	55.2	2420	Peak	*
	AVG	40.8		AVG	47.6		AVG	
4810	Peak	53.2	7118	Peak	56.1		Peak	
	AVG	46.1		AVG	47.0		AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

* Not rated (inband notch filter emission)

Results: Receiver mode, left module

RX spurious emissions radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
1619	Peak	44.3
	AVG	41.1

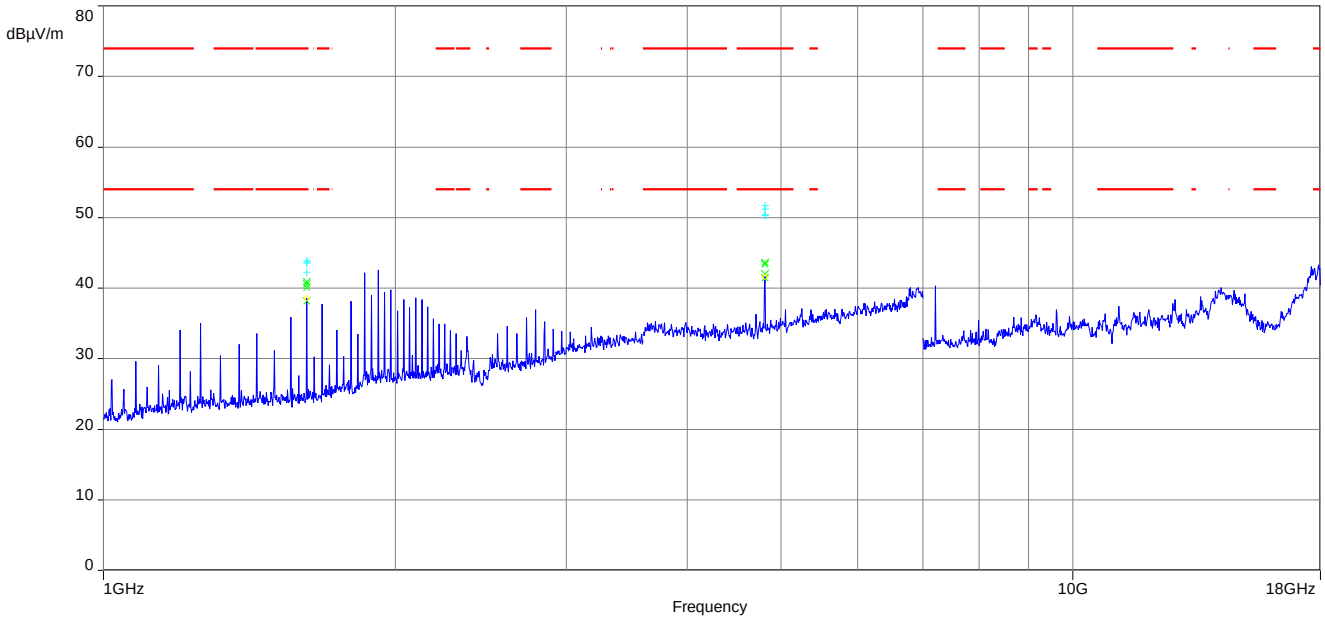
Results: Receiver mode, right module

RX spurious emissions radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
1619	Peak	44.3
	AVG	41.1

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)

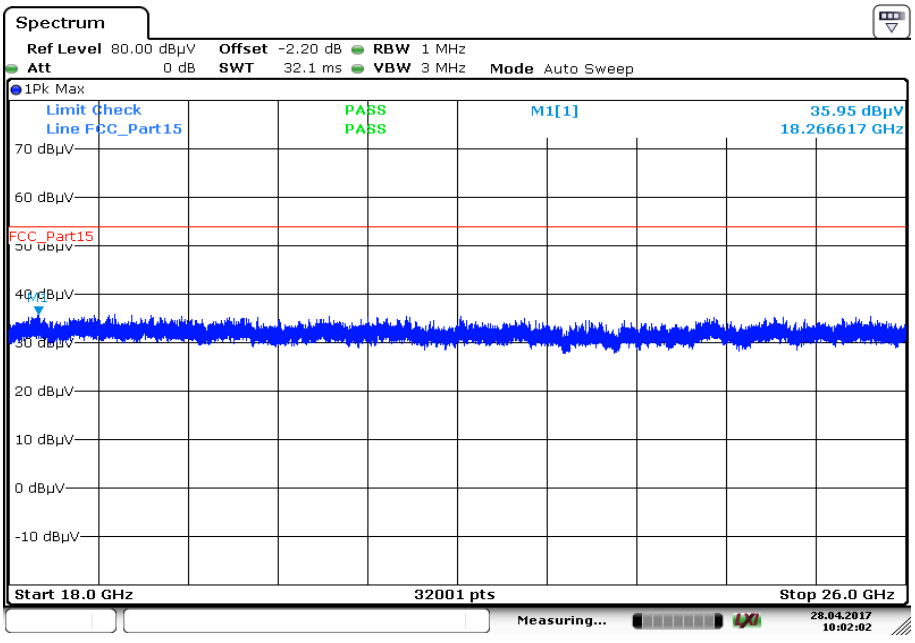
Plots: Transmitter mode, left module

Plot 1: 1 GHz to 18 GHz, TX mode, 2402 MHz, vertical & horizontal polarization



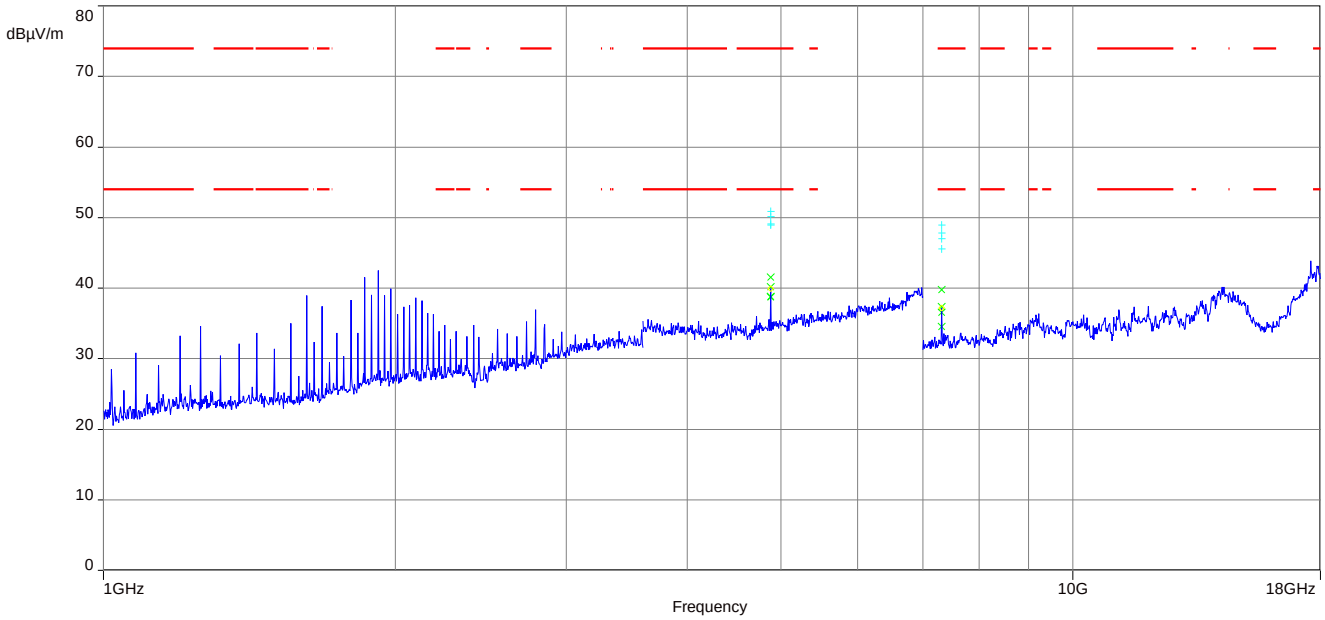
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: 18 GHz to 26 GHz, TX mode, 2402 MHz, vertical & horizontal polarization



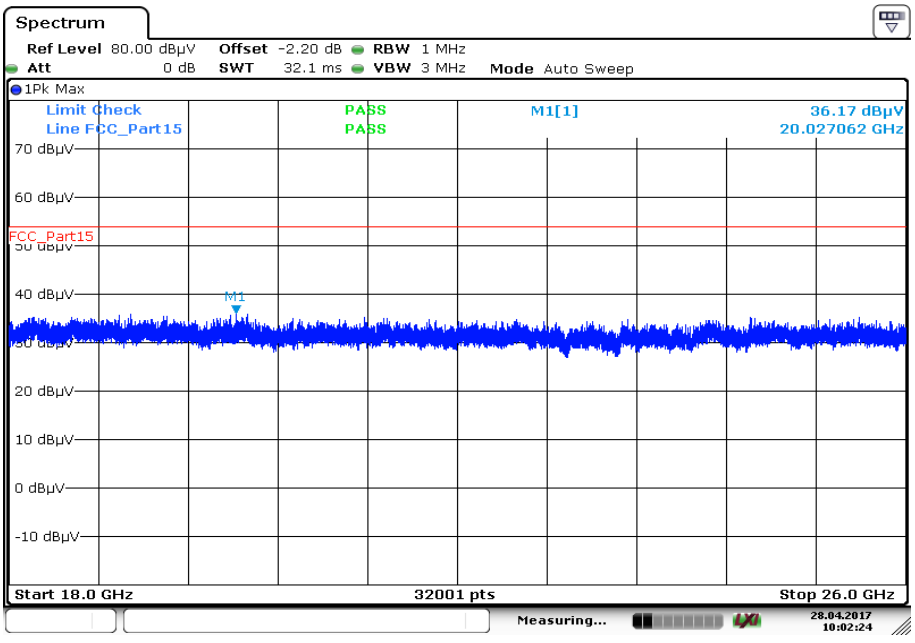
Date: 28.APR.2017 10:02:02

Plot 3: 1 GHz to 18 GHz, TX mode, 2440 MHz, vertical & horizontal polarization



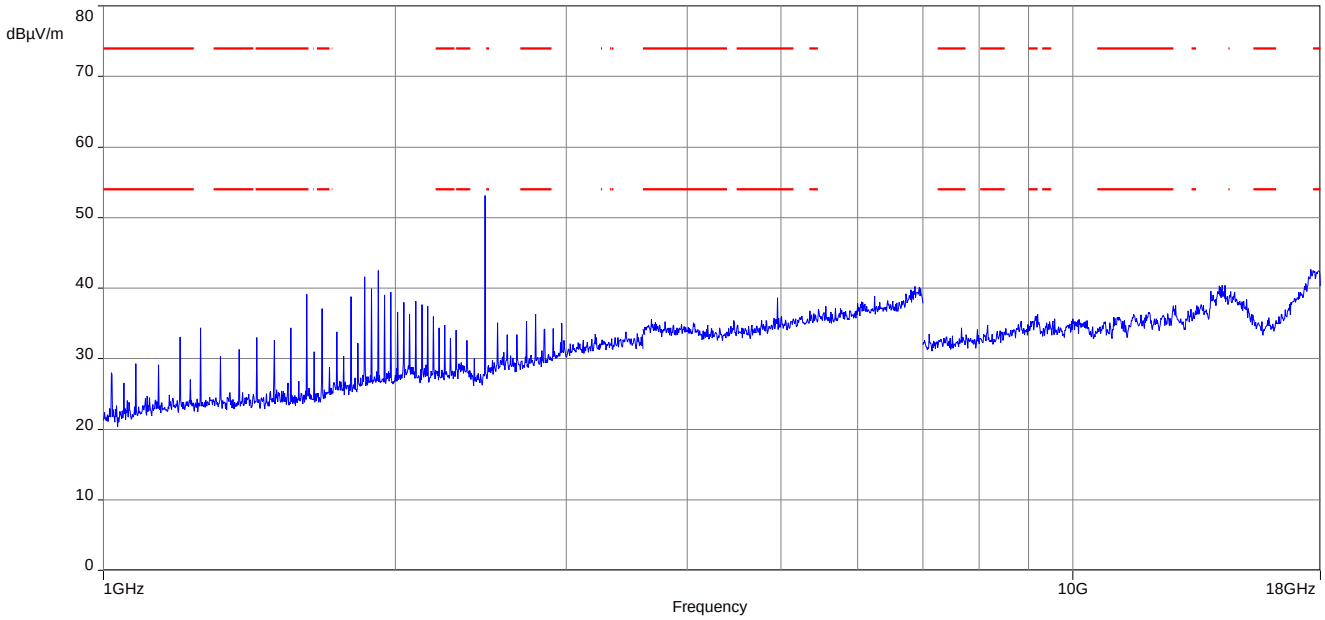
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 4: 18 GHz to 26 GHz, TX mode, 2440 MHz, vertical & horizontal polarization



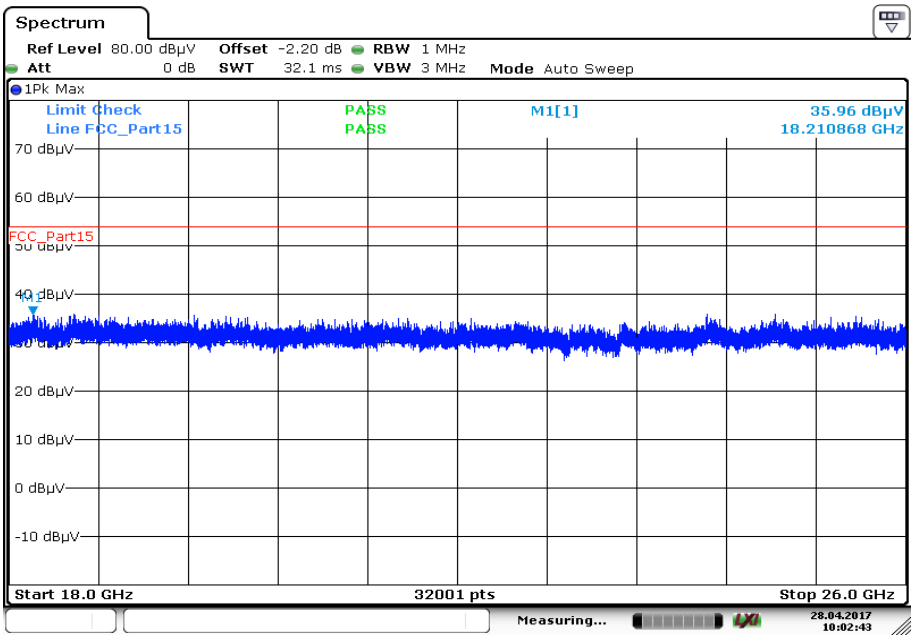
Date: 28.APR.2017 10:02:24

Plot 5: 1 GHz to 18 GHz, TX mode, 2480 MHz, vertical & horizontal polarization



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

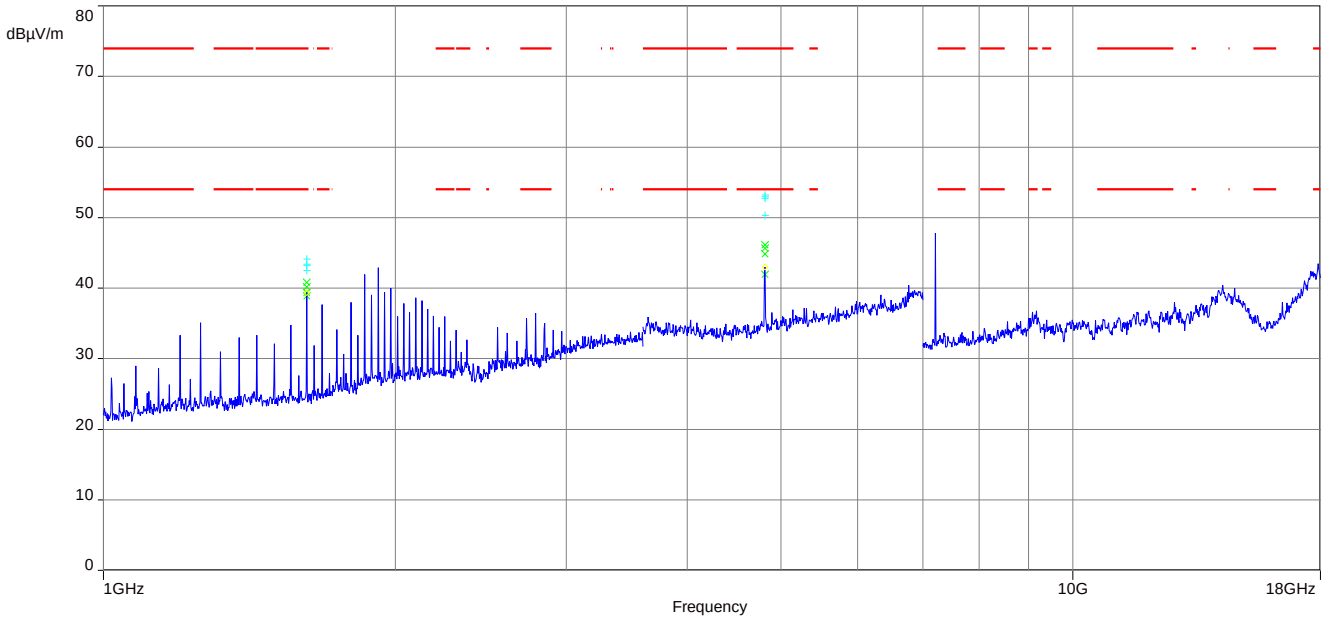
Plot 6: 18 GHz to 26 GHz, TX mode, 2480 MHz, vertical & horizontal polarization



Date: 28.APR.2017 10:02:43

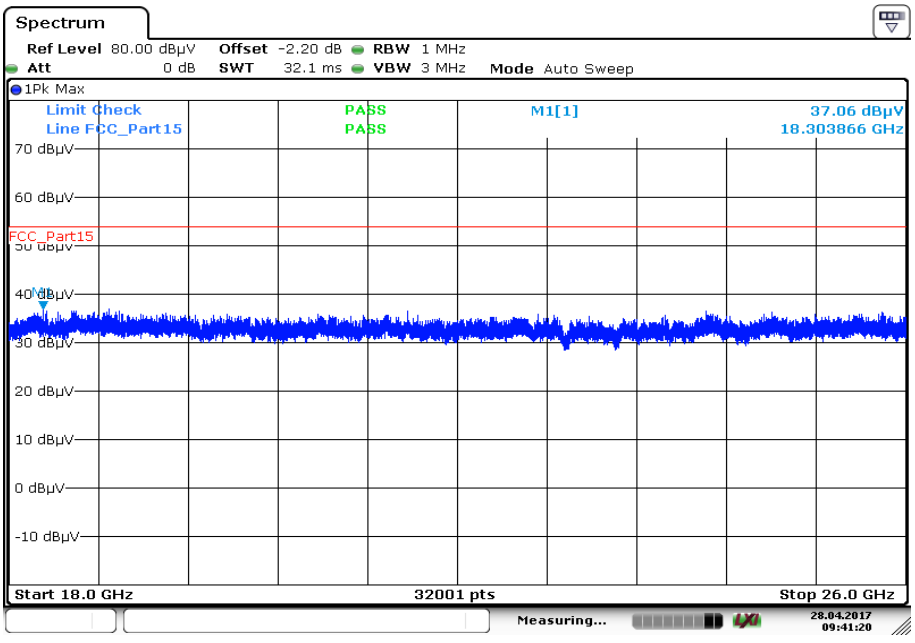
Plots: Transmitter mode, right module

Plot 1: 1 GHz to 18 GHz, TX mode, 2402 MHz, vertical & horizontal polarization



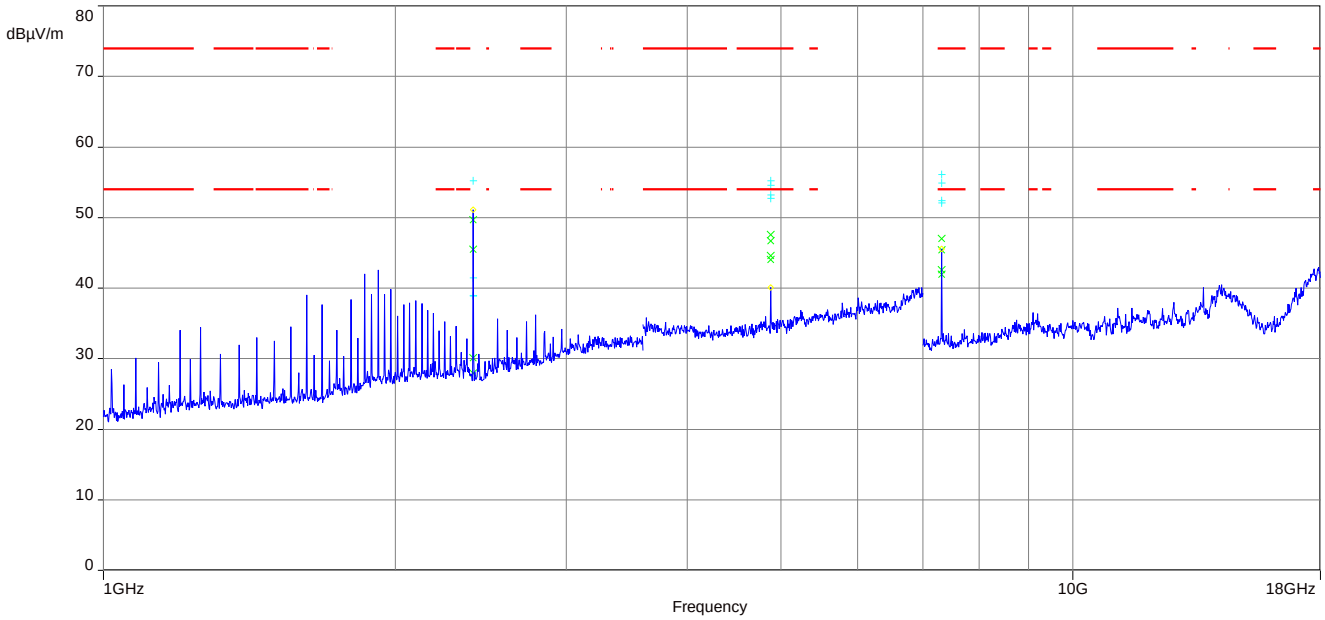
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: 18 GHz to 26 GHz, TX mode, 2402 MHz, vertical & horizontal polarization



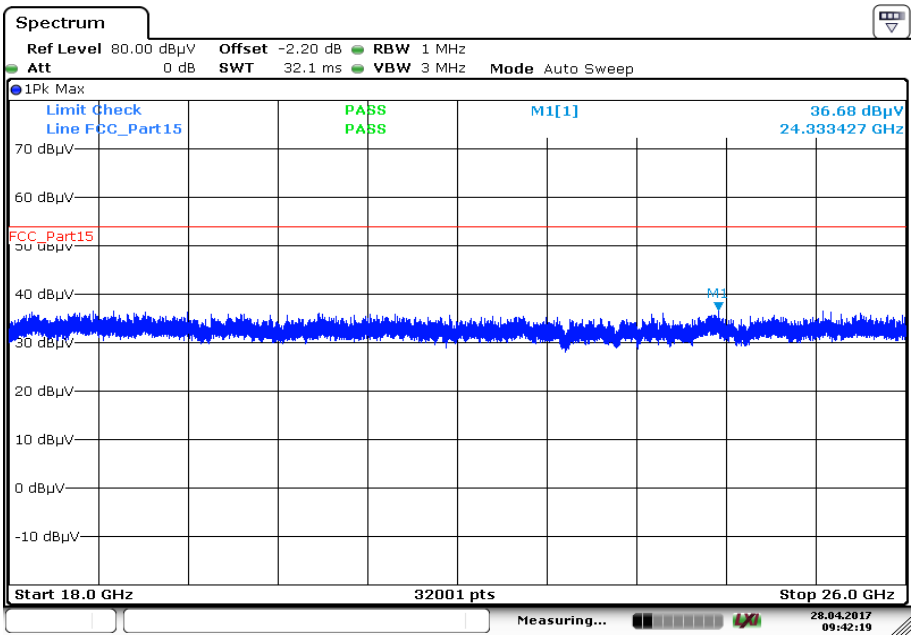
Date: 28.APR.2017 09:41:20

Plot 3: 1 GHz to 18 GHz, TX mode, 2440 MHz, vertical & horizontal polarization



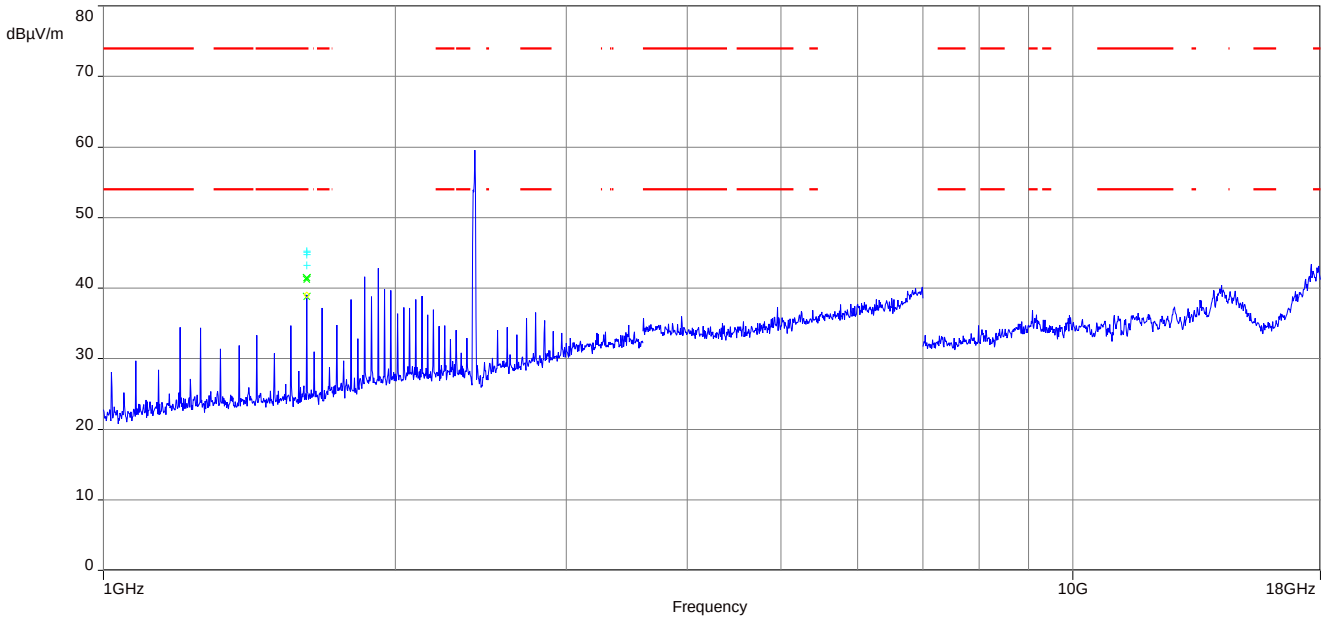
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 4: 18 GHz to 26 GHz, TX mode, 2440 MHz, vertical & horizontal polarization



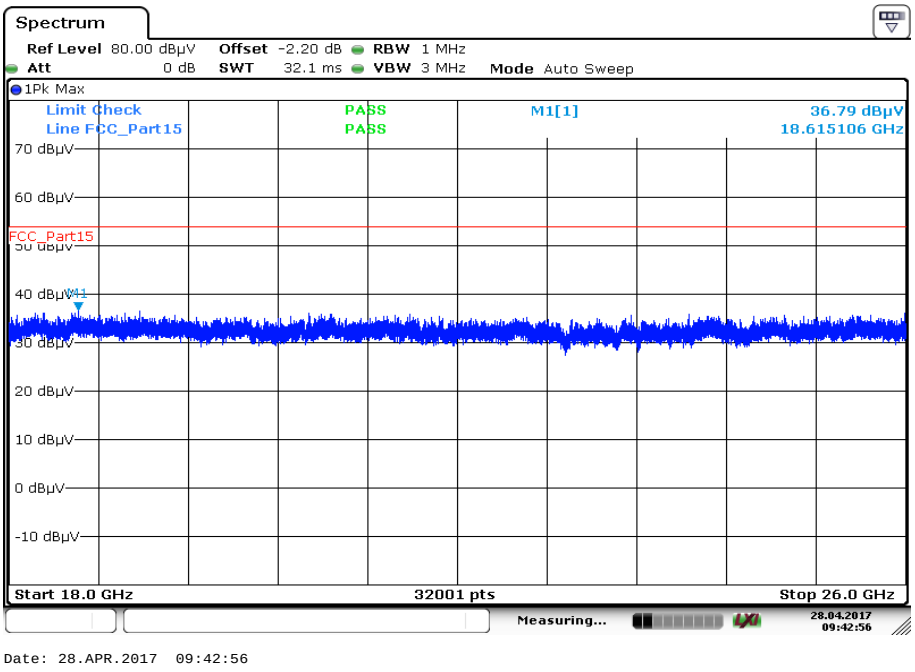
Date: 28.APR.2017 09:42:19

Plot 5: 1 GHz to 18 GHz, TX mode, 2480 MHz, vertical & horizontal polarization



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

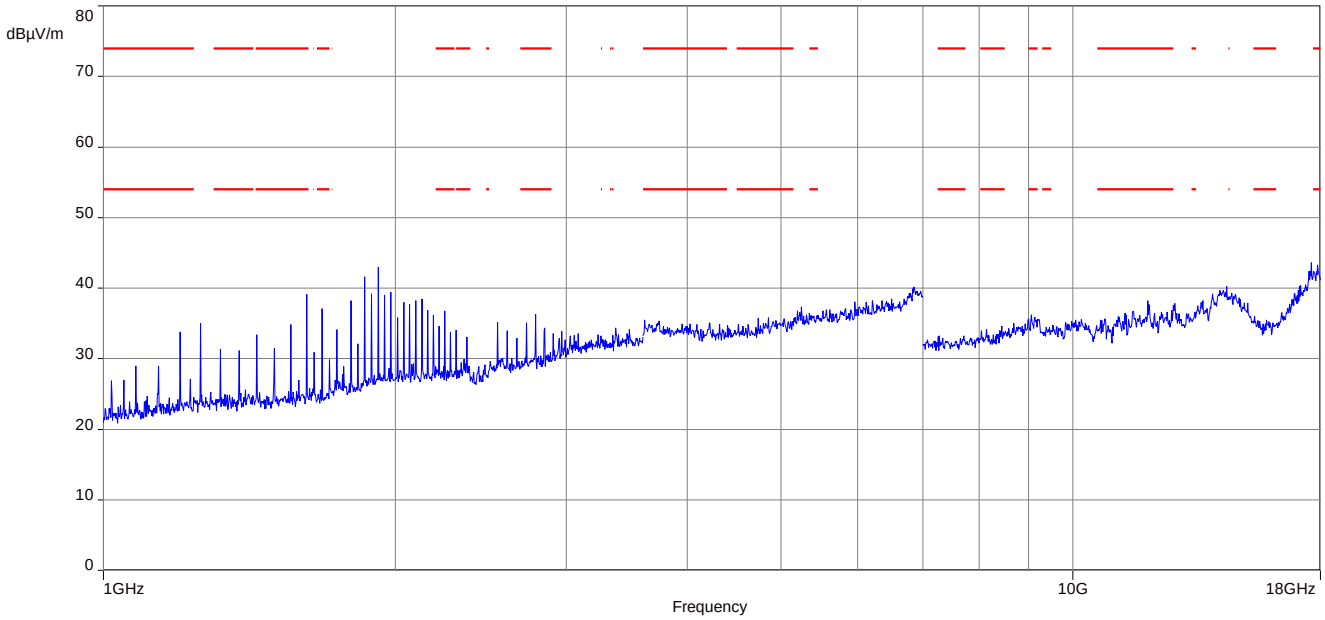
Plot 6: 18 GHz to 26 GHz, TX mode, 2480 MHz, vertical & horizontal polarization



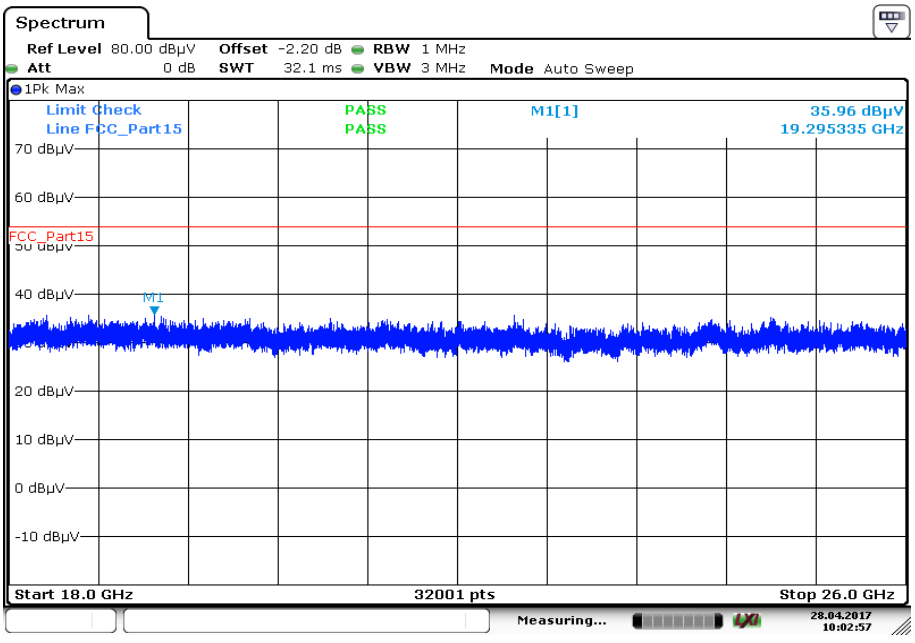
Date: 28.APR.2017 09:42:56

Plots: Receiver mode, left module

Plot 1: 1 GHz to 18 GHz, RX / idle – mode, vertical & horizontal polarization



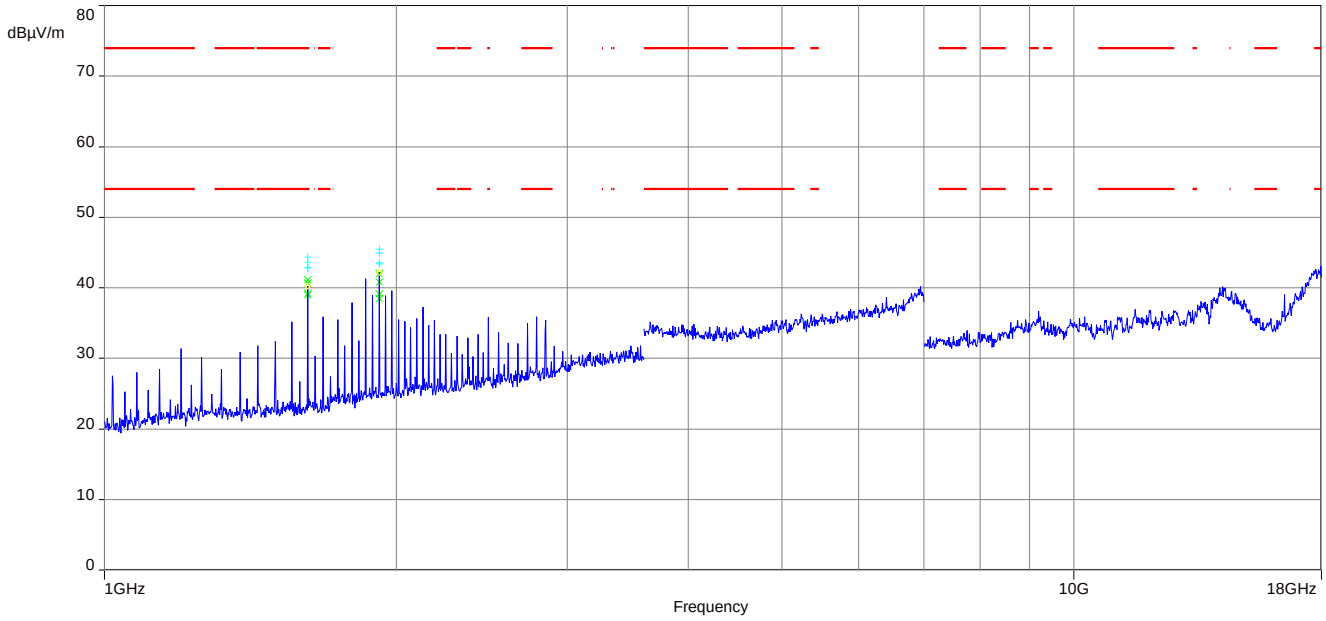
Plot 2: 18 GHz to 26 GHz, RX / idle – mode, vertical & horizontal polarization



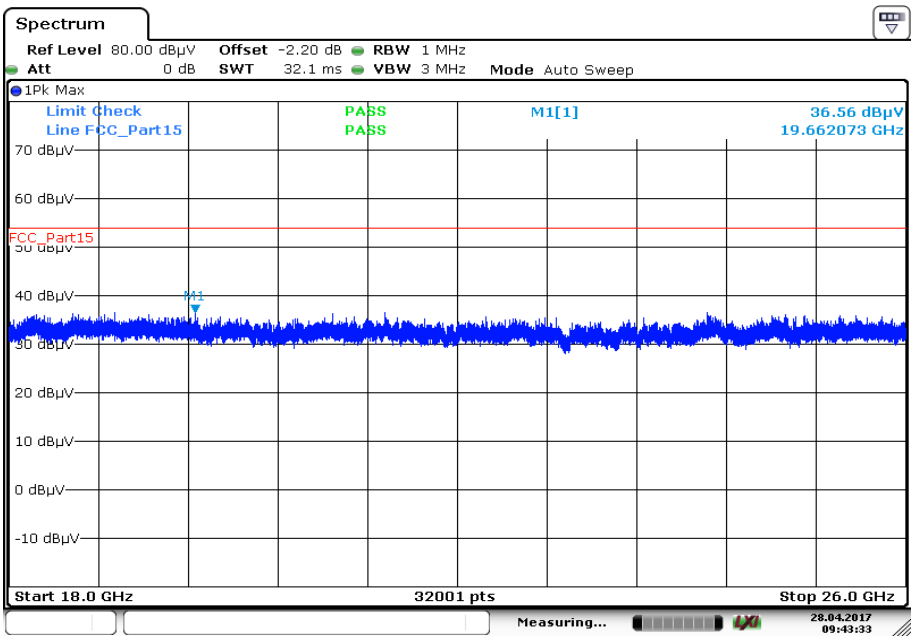
Date: 28.APR.2017 10:02:57

Plots: Receiver mode, right module

Plot 1: 1 GHz to 18 GHz, RX / idle – mode, vertical & horizontal polarization



Plot 2: 18 GHz to 26 GHz, RX / idle – mode, vertical & horizontal polarization



Date: 28.APR.2017 09:43:33

11.6 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 frequency is 2440 MHz. This measurement is representative for all channels and modes. If critical peaks are found frequency 2402 MHz and 2480 MHz 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 parameters	
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 6.4. A
Measurement uncertainty	See sub clause 8

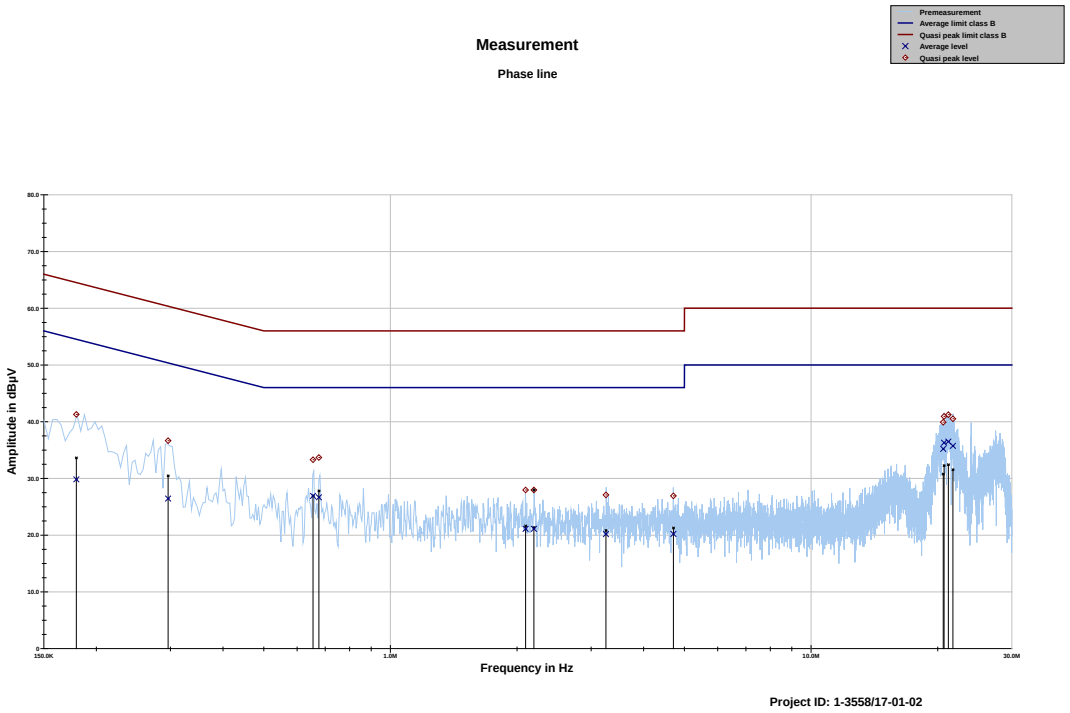
Limits:

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

Plots: left module

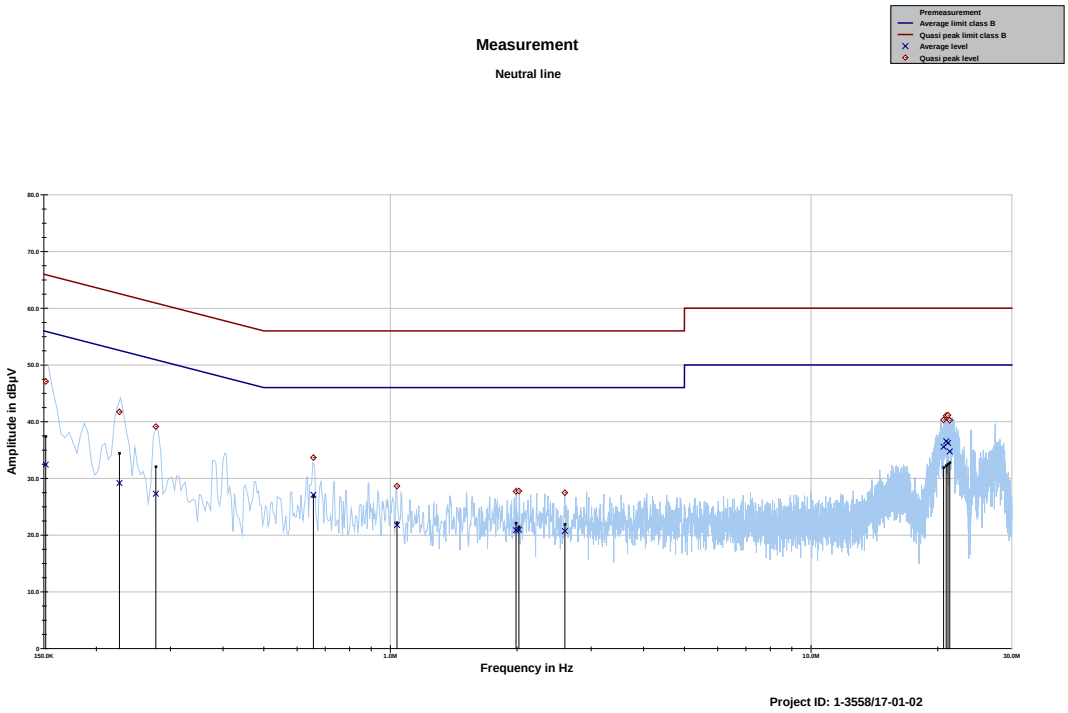
Plot 1: 150 kHz to 30 MHz, phase line



Final results:

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.179197	41.27	23.25	64.523	29.83	25.34	55.166
0.296135	36.65	23.70	60.351	26.44	25.38	51.825
0.654616	33.28	22.72	56.000	26.91	19.09	46.000
0.676246	33.69	22.31	56.000	26.67	19.33	46.000
2.096125	27.96	28.04	56.000	21.11	24.89	46.000
2.193256	27.96	28.04	56.000	21.10	24.90	46.000
3.253453	27.08	28.92	56.000	20.17	25.83	46.000
4.706644	26.92	29.08	56.000	20.20	25.80	46.000
20.613410	39.91	20.09	60.000	35.20	14.80	50.000
20.707189	40.94	19.06	60.000	36.30	13.70	50.000
21.204471	41.23	18.77	60.000	36.48	13.52	50.000
21.730895	40.51	19.49	60.000	35.73	14.27	50.000

Plot 2: 150 kHz to 30 MHz, neutral line

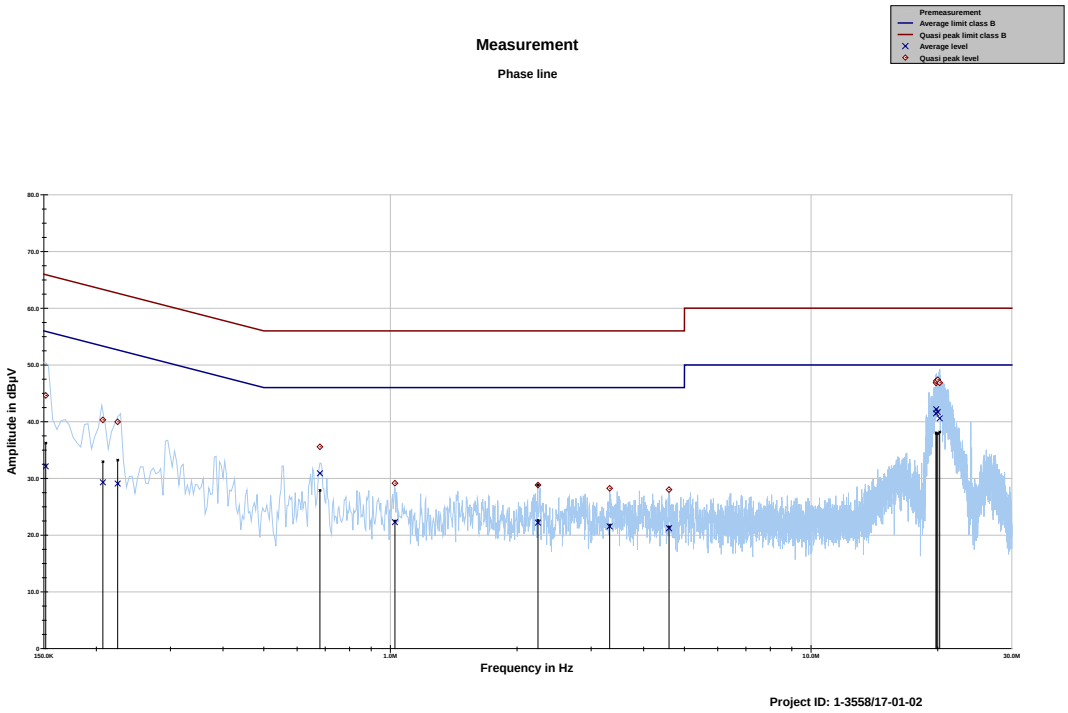


Final results:

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.151578	47.10	18.82	65.913	32.43	23.52	55.955
0.226901	41.75	20.82	62.562	29.19	24.61	53.803
0.276997	39.13	21.78	60.905	27.30	25.07	52.372
0.655971	33.67	22.33	56.000	27.13	18.87	46.000
1.036921	28.64	27.36	56.000	21.78	24.22	46.000
1.988720	27.70	28.30	56.000	20.86	25.14	46.000
2.020734	27.78	28.22	56.000	20.95	25.05	46.000
2.598842	27.48	28.52	56.000	20.71	25.29	46.000
20.657269	40.32	19.68	60.000	35.56	14.44	50.000
20.955294	41.06	18.94	60.000	36.54	13.46	50.000
21.159801	41.15	18.85	60.000	36.26	13.74	50.000
21.360624	40.24	19.76	60.000	34.75	15.25	50.000

Plots: right module

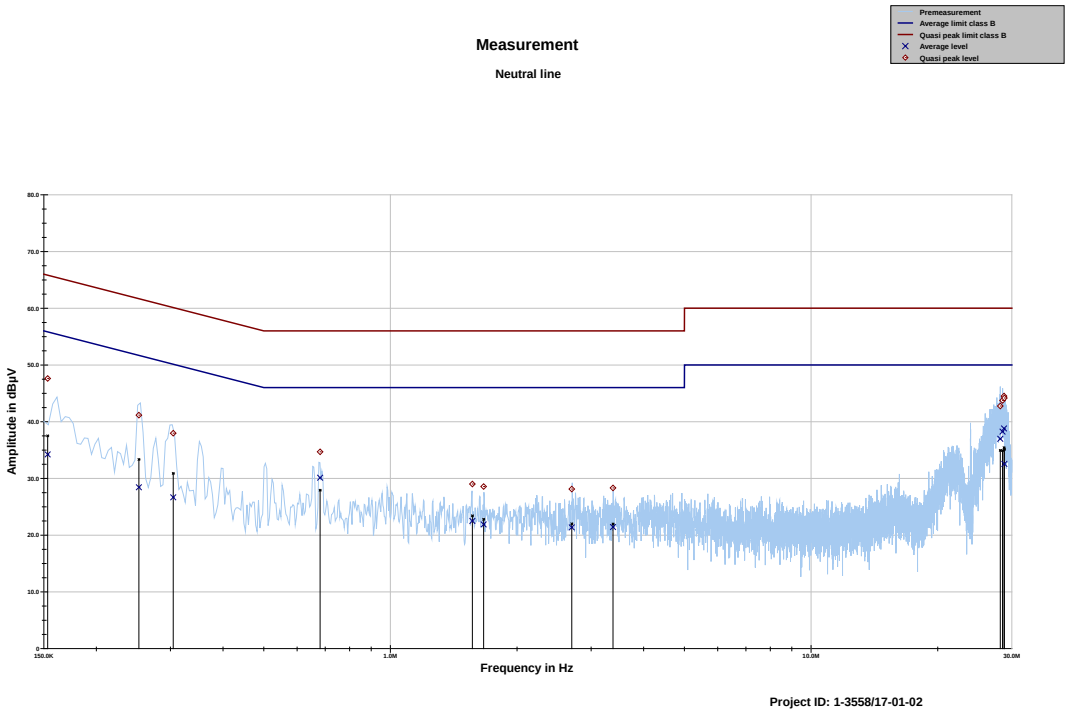
Plot 1: 150 kHz to 30 MHz, phase line



Final results:

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.151592	44.63	21.28	65.912	32.12	23.83	55.955
0.207237	40.30	23.01	63.315	29.29	25.07	54.365
0.224703	39.97	22.68	62.643	29.09	24.78	53.866
0.680029	35.57	20.43	56.000	30.89	15.11	46.000
1.025047	29.16	26.84	56.000	22.28	23.72	46.000
2.243176	28.83	27.17	56.000	22.20	23.80	46.000
3.320899	28.26	27.74	56.000	21.54	24.46	46.000
4.594920	28.02	27.98	56.000	21.21	24.79	46.000
19.817912	46.85	13.15	60.000	41.46	8.54	50.000
19.842781	47.19	12.81	60.000	42.18	7.82	50.000
20.000256	47.38	12.62	60.000	41.69	8.31	50.000
20.221435	46.86	13.14	60.000	40.59	9.41	50.000

Plot 2: 150 kHz to 30 MHz, neutral line



Final results:

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.153217	47.61	18.22	65.824	34.22	21.68	55.908
0.252430	41.15	20.52	61.677	28.43	24.65	53.073
0.304668	37.97	22.14	60.115	26.65	24.93	51.581
0.680513	34.68	21.32	56.000	30.12	15.88	46.000
1.565904	29.01	26.99	56.000	22.50	23.50	46.000
1.665534	28.57	27.43	56.000	21.88	24.12	46.000
2.699182	28.12	27.88	56.000	21.35	24.65	46.000
3.382506	28.32	27.68	56.000	21.42	24.58	46.000
28.176701	42.76	17.24	60.000	36.98	13.02	50.000
28.521265	43.74	16.26	60.000	38.24	11.76	50.000
28.756896	44.52	15.48	60.000	38.80	11.20	50.000
28.802505	44.17	15.83	60.000	32.56	17.44	50.000

12 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	2017-05-18
-A	Editorial Changes (FCC ID)	2018-02-21
-B	Wrong reference for conducted results (page 16)	2018-02-22

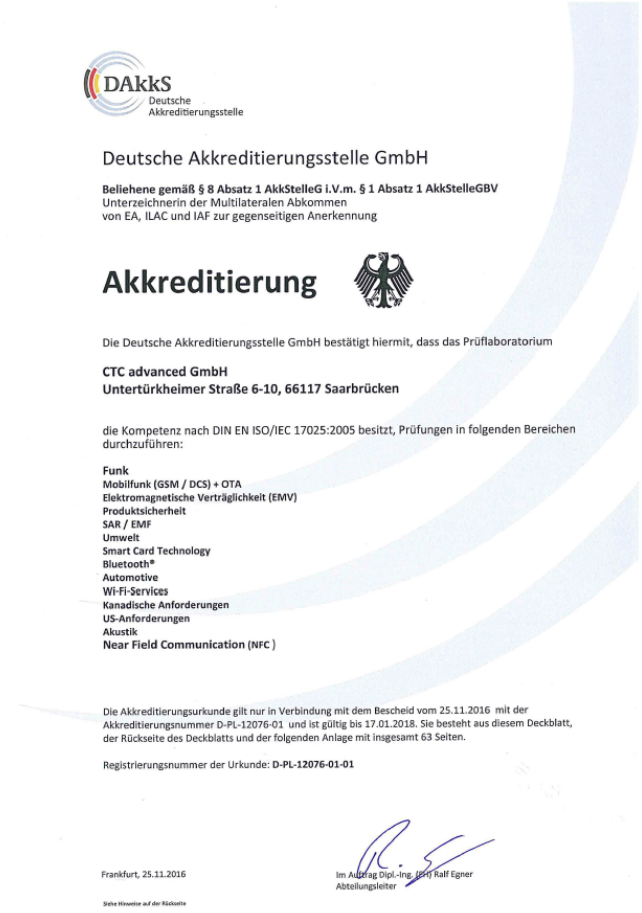
Annex B Further information

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
OBW		Occupied Bandwidth
OC		Operating Channel
OCW		Operating Channel Bandwidth
OOB		Out Of Band

Annex C Accreditation Certificate

first page



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Akkreditierung

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CTC advanced GmbH
Untertürkheimer Straße 6-10, 66117 Saarbrücken

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SAR / EMF
Umwelt
Smart Card Technology
Bluetooth®
Automotive
Wi-Fi-Services
Kanadische Anforderungen
US-Anforderungen
Akustik
Near Field Communication (NFC)

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Frankfurt, 25.11.2016

Im Auftrag Dipl.-Ing. (FH) Ralf Egner
Abteilungsleiter

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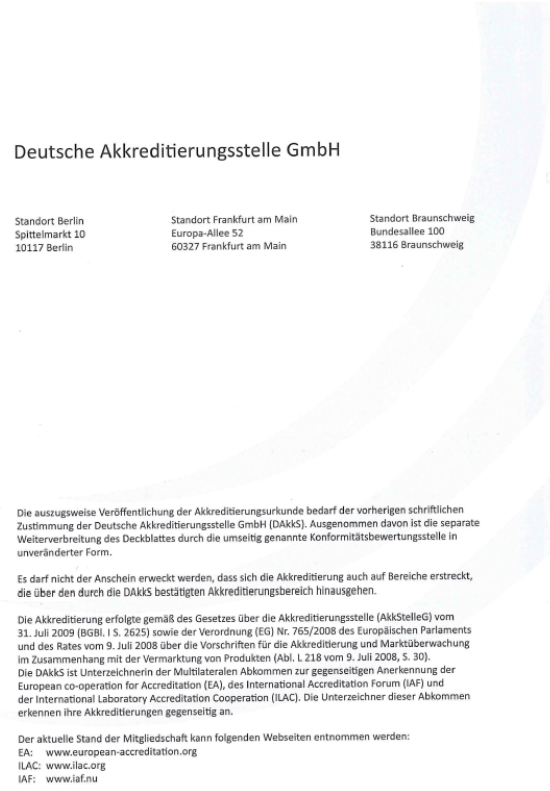
last page



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