

CETECOM™

CETECOM ICT Services
consulting - testing - certification >>>

TEST REPORT

Test report no.: 1-0905/15-01-07



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-12076-01-01

Applicant

beyerdynamic GmbH & Co. KG

Theresienstraße 8

74072 Heilbronn / GERMANY

Phone: +49 7131 617-0

Fax: +49 7131 617-215

Contact: Ulrich Roth

e-mail: roth@beyerdynamic.de

Phone: +49 7131 617-155

Manufacturer

beyerdynamic GmbH & Co. KG

Theresienstraße 8

74072 Heilbronn / 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 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: Wireless microphone system

Model name: Quinta TB

FCC ID: OSDSTEGOSTB

IC: 3628A-STEGOSTB

Frequency: 2400.0 MHz to 2483.5 MHz DTS Band

Technology tested: Proprietary

Antenna: 2 Integrated antennas

Power supply: 100 V to 240 V AC-Main / 4.8V NiMH battery

Temperature range: 0°C to +40°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:

Stefan BöS
Lab Manager
Radio Communications & EMC

Test performed:

David Lang
Lab Manager
Radio Communications & EMC

1 Table of contents

1 Table of contents2

2 General information3

 2.1 Notes and disclaimer3

 2.2 Application details.....3

3 Test standard/s and references3

4 Test environment.....5

5 Test item5

 5.1 General description5

 5.2 Additional information5

6 Test laboratories sub-contracted5

7 Description of the test setup6

 7.1 Shielded semi anechoic chamber.....7

 7.2 Shielded fully anechoic chamber8

 7.3 Radiated measurements > 18 GHz.....9

 7.4 AC conducted10

 7.5 Conducted measurements11

8 Sequence of testing12

 8.1 Sequence of testing radiated spurious 9 kHz to 30 MHz.....12

 8.2 Sequence of testing radiated spurious 30 MHz to 1 GHz.....13

 8.3 Sequence of testing radiated spurious 1 GHz to 18 GHz14

 8.4 Sequence of testing radiated spurious above 18 GHz15

9 Measurement uncertainty16

10 Summary of measurement results.....17

11 Additional comments18

12 Measurement results19

 12.1 Duty cycle19

 12.2 Antenna gain22

 12.3 Maximum output power.....23

 12.4 Peak power spectral density.....24

 12.5 6 dB DTS bandwidth32

 12.6 Occupied bandwidth – 99% emission bandwidth.....39

 12.7 Occupied bandwidth – 20 dB bandwidth.....46

 12.8 Band edge compliance radiated.....53

 12.9 Band edge compliance conducted59

 12.10 Spurious emissions conducted.....65

 12.11 Spurious emissions radiated below 30 MHz80

 12.12 Spurious emissions radiated 30 MHz to 1 GHz.....87

 12.13 Spurious emissions radiated above 1 GHz102

 12.14 Spurious emissions conducted below 30 MHz (AC conducted).....132

13 Observations139

Annex A Document history139

Annex B Further information.....139

Annex C Accreditation Certificate140

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.

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM ICT Services GmbH.

The testing service provided by CETECOM ICT Services GmbH has been rendered under the current "General Terms and Conditions for CETECOM ICT Services GmbH".

CETECOM ICT Services GmbH will not be liable for any loss or damage resulting from false, inaccurate, inappropriate or incomplete product information provided by the customer.

Under no circumstances does the CETECOM ICT Services GmbH test report include any endorsement or warranty regarding the functionality, quality or performance of any other product or service provided.

Under no circumstances does the CETECOM ICT Services GmbH test report include or imply any product or service warranties from CETECOM ICT Services GmbH, including, without limitation, any implied warranties of merchantability, fitness for purpose, or non-infringement, all of which are expressly disclaimed by CETECOM ICT Services GmbH.

All rights and remedies regarding vendor's products and services for which CETECOM ICT Services GmbH has prepared this test report shall be provided by the party offering such products or services and not by CETECOM ICT Services GmbH.

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

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:	2016-04-07
Date of receipt of test item:	2016-07-11
Start of test:	2016-07-12
End of test:	2016-07-29
Person(s) present during the test:	-/-

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 1	May 2015	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} +24 °C during room temperature tests T_{max} +40 °C during high temperature tests T_{min} 0 °C during low temperature tests
Relative humidity content	:	55 %
Barometric pressure	:	not relevant for this kind of testing
Power supply	:	V_{nom} 115 V AC-Main / 4.8V NiMH battery V_{max} -/- V (no extreme condition tests performed) V_{min} -/- V (no extreme condition tests performed)

5 Test item

5.1 General description

Kind of test item	:	Wireless microphone system
Type identification	:	Quinta TB
HMN	:	-/-
PMN	:	Quinta TB
HVIN	:	Quinta TB
FVIN	:	-/-
S/N serial number	:	Rad. 000005 (QPSK Sample), 000001 (BPSK Sample) Cond. 000007 (QPSK Sample), 000008 (BPSK Sample)
HW hardware status	:	Release 1
SW software status	:	Release 1
Frequency band	:	2400.0 MHz to 2483.5 MHz DTS Band
Type of radio transmission	:	DSSS
Use of frequency spectrum	:	
Type of modulation	:	BPSK, QPSK
Number of channels	:	3
Antenna	:	2 Integrated antennas Max. Gain for both antennas does not exceed 3.2 dBi. Only one antenna is active at the time.
Power supply	:	100 V to 240 V AC-Main / 4.8V NiMH battery
Temperature range	:	0°C to +40°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: 1-0905/15-01-02_AnnexA
1-0905/15-01-02_AnnexB
1-0905/15-01-02_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 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).

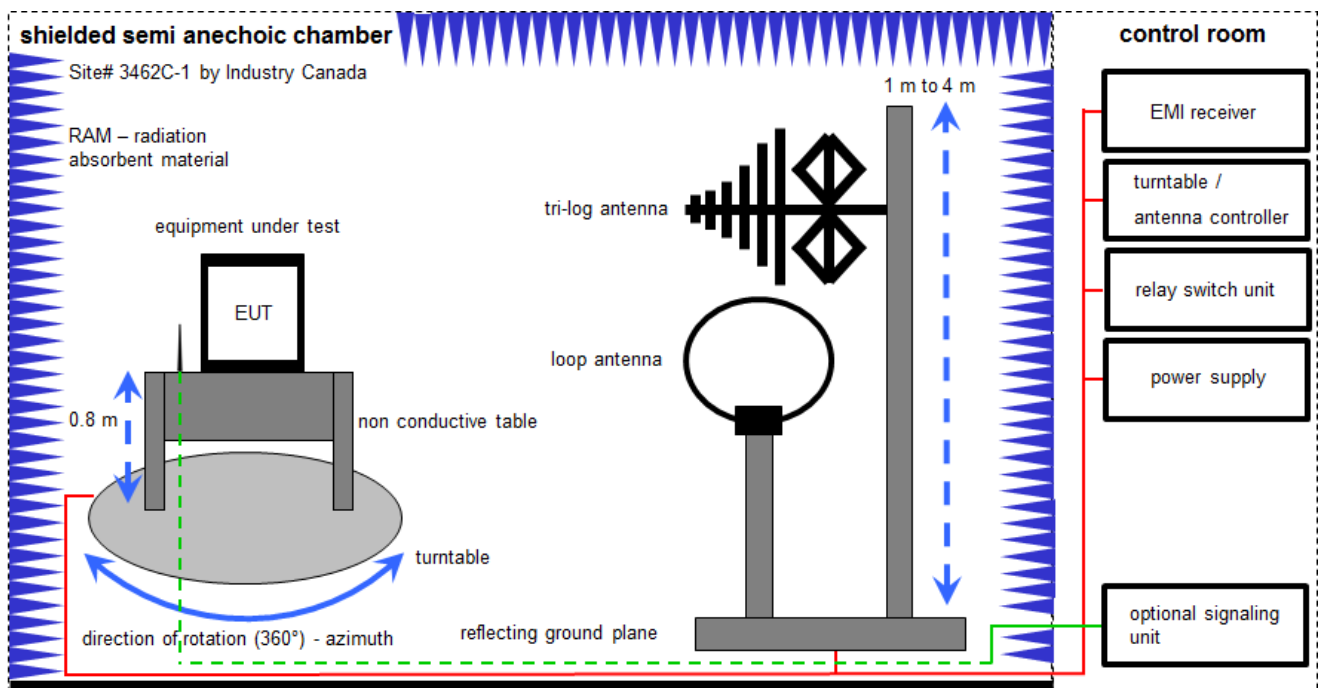
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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
v/k!	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 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices. 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; loop antenna 10 meter

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

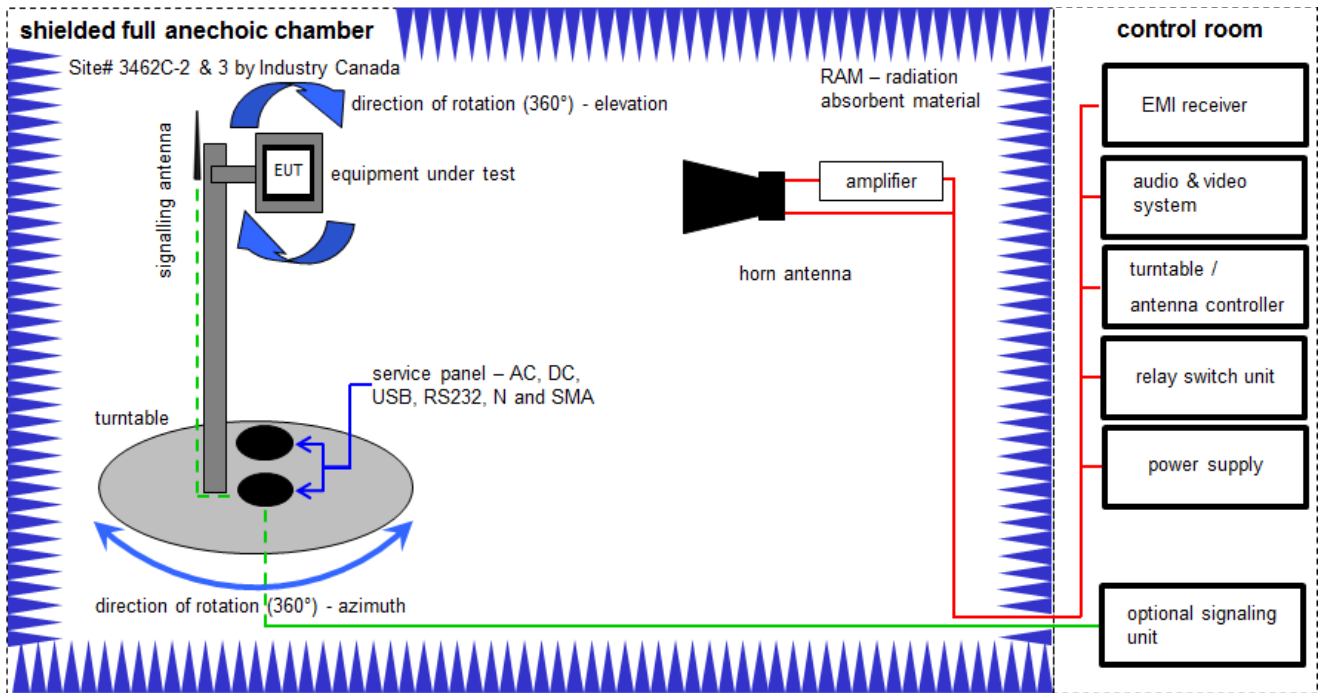
Example calculation:

$$FS [dB\mu V/m] = 12.35 [dB\mu V/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dB\mu V/m] (35.69 \mu V/m)$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	B	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO/2	8905-2342	300000256	k	24.06.2015	24.06.2017
2	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
3	A+B	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	08.03.2016	08.03.2017
4	A+B	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+B	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

7.2 Shielded fully anechoic chamber



Measurement distance: tri-log antenna and horn antenna 3 meter; loop antenna 3 meter / 1 meter

$$FS = UR + CA + AF$$

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

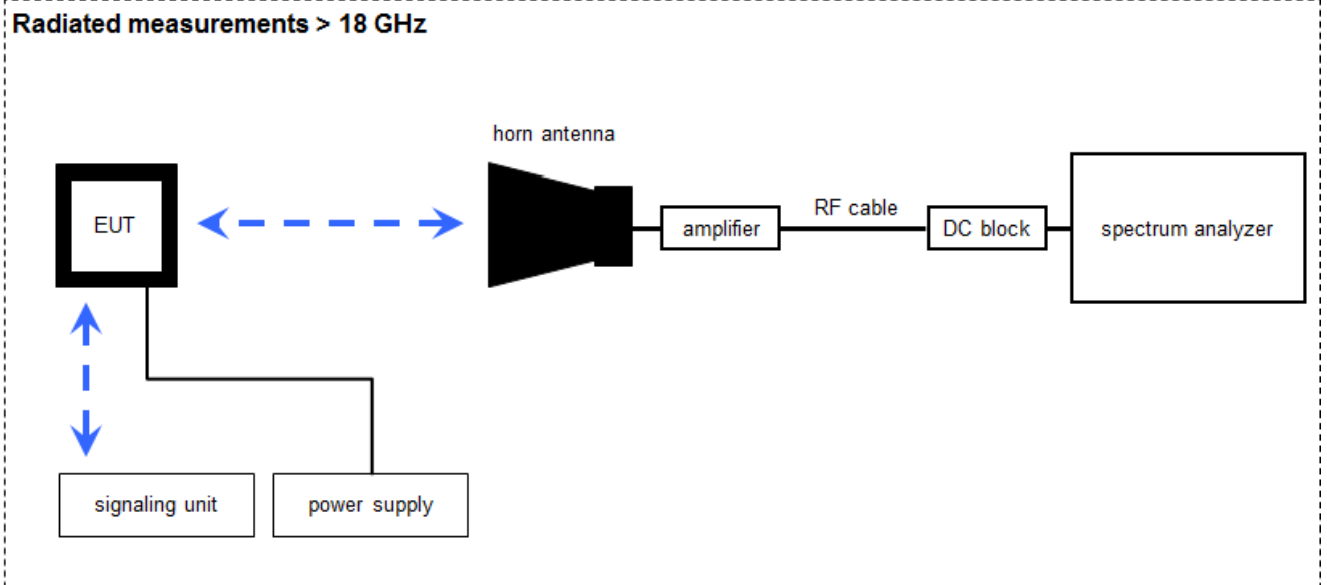
Example calculation:

$$FS [dB\mu V/m] = 40.0 [dB\mu V/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dB\mu V/m] (71.61 \mu V/m)$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	20.05.2015	20.05.2017
2	A	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
3	A	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
4	A	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne	-/-	-/-
5	A	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne	-/-	-/-
6	A	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
7	A	EMI Test Receiver 9kHz-26.5GHz	ESR26	R&S	101376	300005063	k	04.09.2015	04.09.2016

7.3 Radiated measurements > 18 GHz



Measurement distance: horn antenna 25 cm

$$FS = UR + CA + AF$$

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

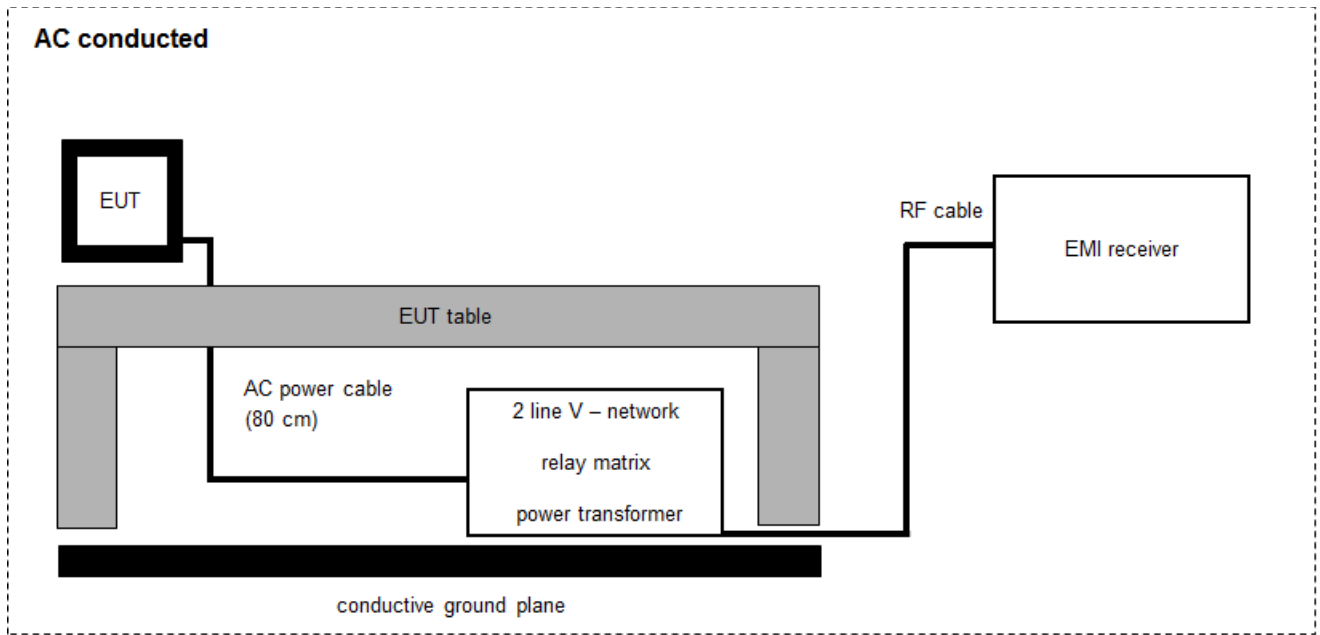
Example calculation:

$$FS [dB\mu V/m] = 40.0 [dB\mu V/m] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dB\mu V/m] (6.79 \mu V/m)$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	21.01.2016	21.01.2017
2	A	Amplifier 2-40 GHz	JS32-02004000-57-5P	MITEQ	1777200	300004541	ev	-/-	-/-
3	A	RF-Cable	ST18/SMAm/SMAm/60	Huber & Suhner	Batch no. 606844	400001181	ev	-/-	-/-
4	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	Batch no. 606844	400001185	ev	-/-	-/-
5	A	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787	k	14.08.2015	14.08.2017
6	A	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8402	300000486	k	10.09.2015	10.09.2017
7	A	Std. Gain Horn Antenna 26.5 to 40.0 GHz	V637	Narda	82-16	300000510	k	14.08.2015	14.08.2017

7.4 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)

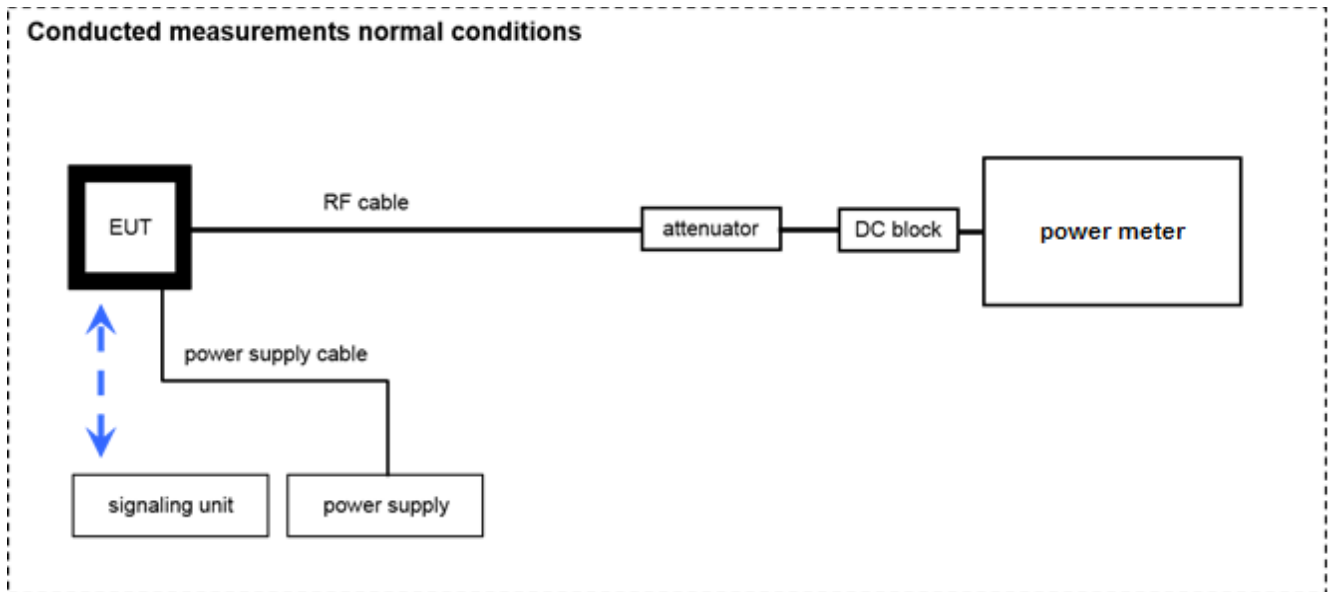
Example calculation:

$$FS [dB\mu V/m] = 37.62 [dB\mu V/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dB\mu V/m] (244.06 \mu V/m)$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	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	02.02.2016	02.02.2017
2	A	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	04.02.2016	04.02.2017
3	A	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	Ve	02.02.2016	02.02.2018

7.5 Conducted measurements



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

Example calculation:

OP [dBm] = 6.0 [dBm] + 11.7 [dB] = 17.7 [dBm] (58.88 mW)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	PC-WLAN Tester	Intel Core i3 3220/3,3 GHz, Prozessor	MITEQ	2V2403033A45 23	300004589	ne	-/-	-/-
2	A	Teststand	Teststand Custom Sequence Editor	National Instruments GmbH	2V2403033A45 23	300004590	ne	-/-	-/-
3	A	RF-Cable	ST18/SMAm/SMAm/60	Huber & Suhner	Batch no. 606844	400001181	ev	-/-	-/-
4	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	Batch no. 606844	400001185	ev	-/-	-/-
5	A	Power Sensor	NRP-Z81	R&S	100010	300003780	k	25.01.2016	25.01.2017

8 Sequence of testing

8.1 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.

8.2 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 $\pm 45^\circ$ 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.

8.3 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.

8.4 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.

9 Measurement uncertainty

Measurement uncertainty	
Test case	Uncertainty
Antenna gain	± 3 dB
Power spectral density	± 1.5 dB
DTS bandwidth	± 100 kHz (depends on the used RBW)
Occupied bandwidth	± 100 kHz (depends on the used RBW)
Maximum output power	± 1.5 dB
Detailed spurious emissions @ the band edge - conducted	± 1.5 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

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!	2016-08-02	-/-

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 (4)	Antenna gain	-/-	Nominal	Nominal	-/-					Declared
RSS - 247 / 6.0	Duty cycle	-/-	Nominal	Nominal						-/-
§15.247(e) RSS - 247 / 5.2 (2)	Power spectral density	KDB 558074 DTS clause: 10.2	Nominal	Nominal	BPSK, QPSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(a)(2) RSS - 247 / 5.2 (1)	DTS bandwidth	KDB 558074 DTS clause: 8.1	Nominal	Nominal	BPSK, QPSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
RSS Gen clause 4.6.1	Occupied bandwidth	-/-	Nominal	Nominal	BPSK, QPSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(b)(3) RSS - 247 / 5.4 (4)	Maximum output power	KDB 558074 DTS clause: 9.1.2	Nominal	Nominal	BPSK, QPSK	<input checked="" 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	BPSK, QPSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.205 RSS - 247 / 5.5 RSS - Gen	Band edge compliance conducted and radiated	KDB 558074 DTS clause: 13.3.2 and clause 12.2.2	Nominal	Nominal	BPSK, QPSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(d) RSS - 247 / 5.5	TX spurious emissions conducted	KDB 558074 DTS clause: 11.1 & 11.2 11.3	Nominal	Nominal	BPSK, QPSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.209(a) RSS-Gen	TX spurious emissions radiated below 30 MHz	-/-	Nominal	Nominal	BPSK, QPSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(d) RSS - 247 / 5.5 RSS-Gen	TX spurious emissions radiated 30 MHz to 1 GHz	-/-	Nominal	Nominal	BPSK, QPSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(d) RSS - 247 / 5.5 RSS-Gen	TX spurious emissions radiated above 1 GHz	-/-	Nominal	Nominal	BPSK, QPSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.109 RSS-Gen	RX spurious emissions radiated 30 MHz to 1 GHz	-/-	Nominal	Nominal	RX / idle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.109 RSS-Gen	RX spurious emissions radiated above 1 GHz	-/-	Nominal	Nominal	RX / idle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.107(a) §15.207	Conducted emissions < 30 MHz	-/-	Nominal	Nominal	BPSK, QPSK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-

*1 According antenna specification

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

11 Additional comments

- Reference documents: Antenna specification: Application Note W3006 DualBand WiFi Antenna by Pulse Finland Oy (Version 1.0.3).
- Special test descriptions: None
- Configuration descriptions: Power Setting:
QPSK: d 2 B0 00061F 000000
BPSK: d 2 B0 938326 000000
- Test mode:
- No test mode available.
Iperf was used to ping another device with the largest support packet size
 - 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.

12 Measurement results

12.1 Duty cycle

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Depends on the signal see plot
Resolution bandwidth:	10 MHz
Video bandwidth:	10 MHz
Trace mode:	Max hold
Test setup:	See sub clause 7.5 - A
Measurement uncertainty:	See sub clause 9

Limits:

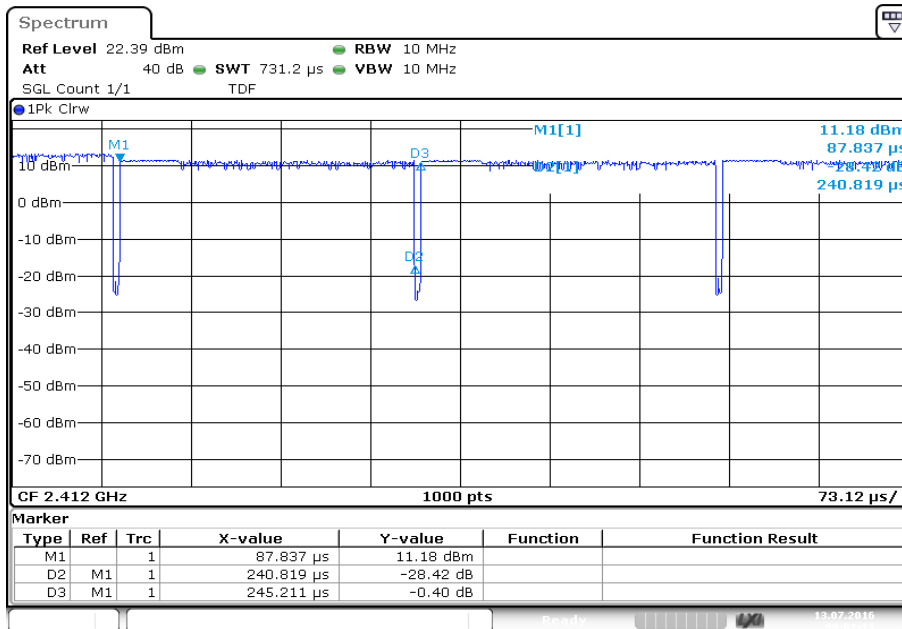
FCC	IC
-/-	

Results:

T _{nom}	V _{nom}	lowest channel 2412 MHz	middle channel 2438 MHz	highest channel 2464 MHz
BPSK – mode		98.2	98.2	98.8
QPSK – mode		100%	100%	100%

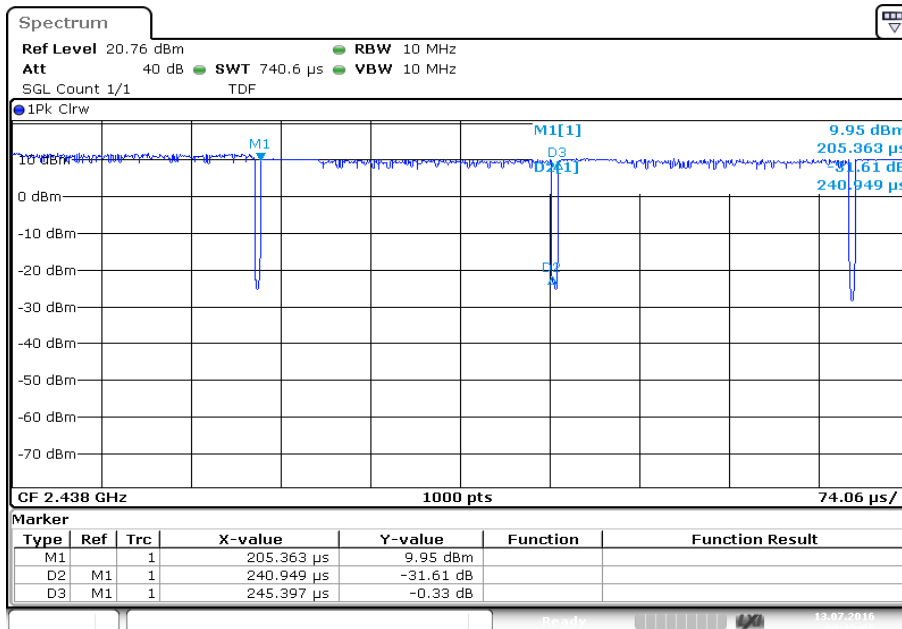
Plots: BPSK - mode

Plot 1: Lowest channel



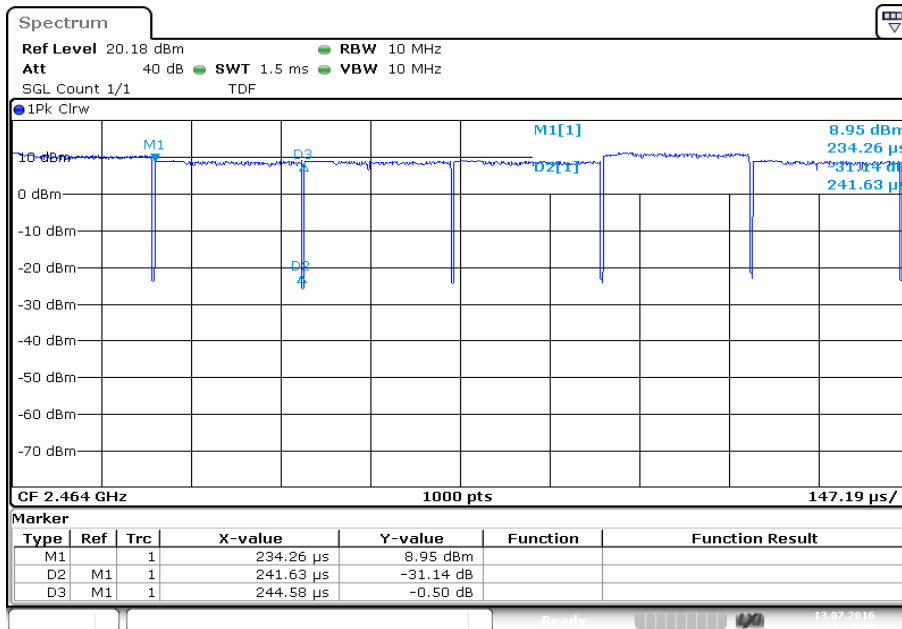
Date: 13.JUL.2016 09:01:12

Plot 2: Middle channel



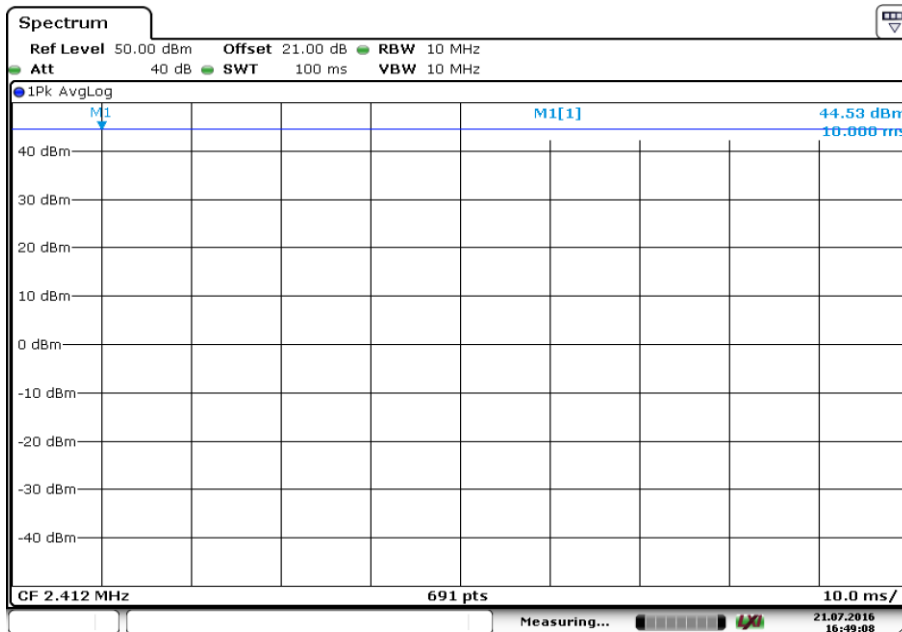
Date: 13.JUL.2016 09:15:05

Plot 3: Highest channel



Plot: BPSK - mode

Plot 1: Lowest channel



Note: Only one plot showing 100% duty cycle reported

12.2 Antenna gain

Antenna Gain as specified in antenna documentation: 3.2 dBi (Peak)

12.3 Maximum output power

Description:

Measurement of the maximum output power conducted and radiated. The measurements are performed using the data rate producing the highest conducted output power.

Measurement:

Measurement parameter	
According to DTS clause: 9.1.2	
Peak power meter	
Test setup:	See sub clause 7.5 – A
Measurement uncertainty	See sub clause 9

Limits:

FCC	IC
Conducted: 1.0 W – Antenna gain with max. 6 dBi	

Results: BPSK - mode

Frequency	Maximum Output Power [dBm]		
	2412 MHz	2438 MHz	2464 MHz
Antenna A	16.0	15.3	14.1
Antenna B	7.1	7.8	9.0

Results: QPSK - mode

Frequency	Maximum Output Power [dBm]		
	2412 MHz	2438 MHz	2464 MHz
Antenna A	19.0	18.5	17.6
Antenna B	11.5	12.2	12.9

12.4 Peak power spectral density

Description:

Measurement of the power spectral density of a digital modulated system. The measurement is repeated for all modulations at the lowest, middle and highest channel.

Measurement:

Measurement parameter	
According to DTS clause: 10.2	
Detector:	Positive Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	30 MHz
Trace mode:	Max hold (allow trace to fully stabilize)
Test setup:	See sub clause 7.5 – A
Measurement uncertainty	See sub clause 9

Limits:

FCC	IC
8 dBm / 3kHz (conducted)	

Results: BPSK - mode

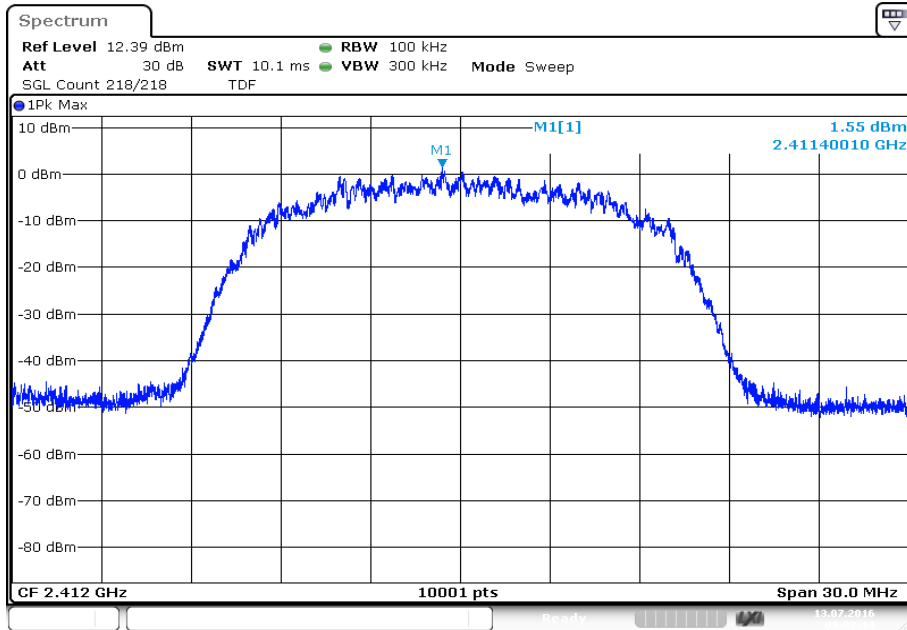
Frequency	Peak power spectral density [dBm]		
	2412 MHz	2438 MHz	2464 MHz
Antenna A	1.6	-0.6	-1.0
Antenna B	-6.8	-7.1	-5.9

Results: QPSK - mode

Frequency	Peak power spectral density [dBm]		
	2412 MHz	2438 MHz	2464 MHz
Antenna A	-0.8	-1.9	-2.8
Antenna B	-8.9	-8.6	-7.6

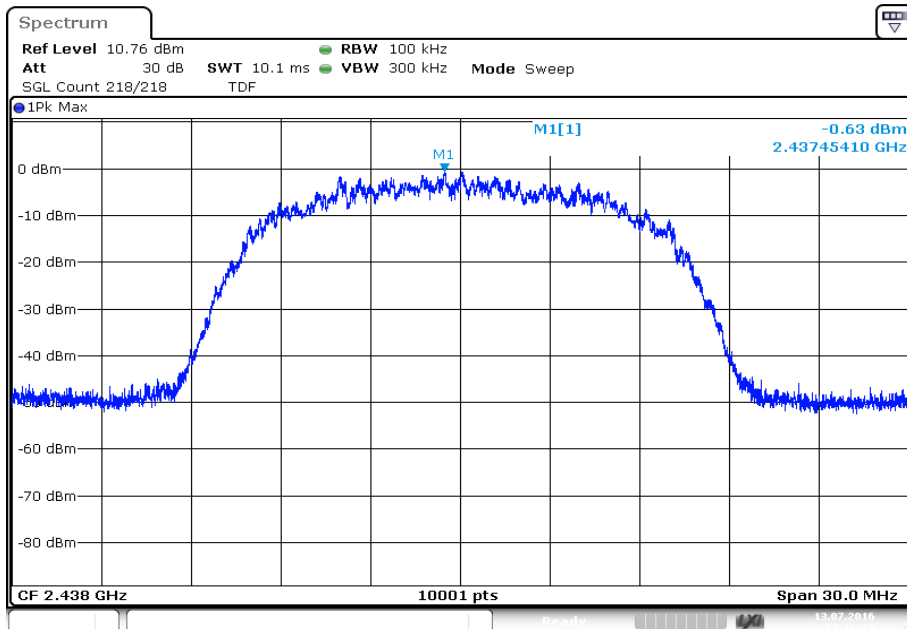
Plots: BPSK – mode / Antenna A

Plot 1: Lowest channel



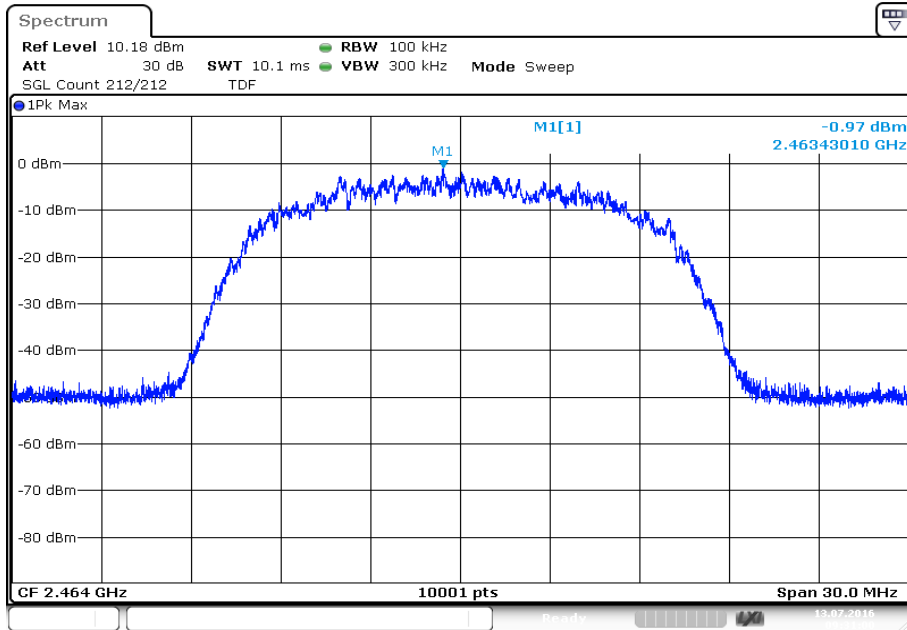
Date: 13.JUL.2016 09:02:14

Plot 2: Middle channel



Date: 13.JUL.2016 09:16:09

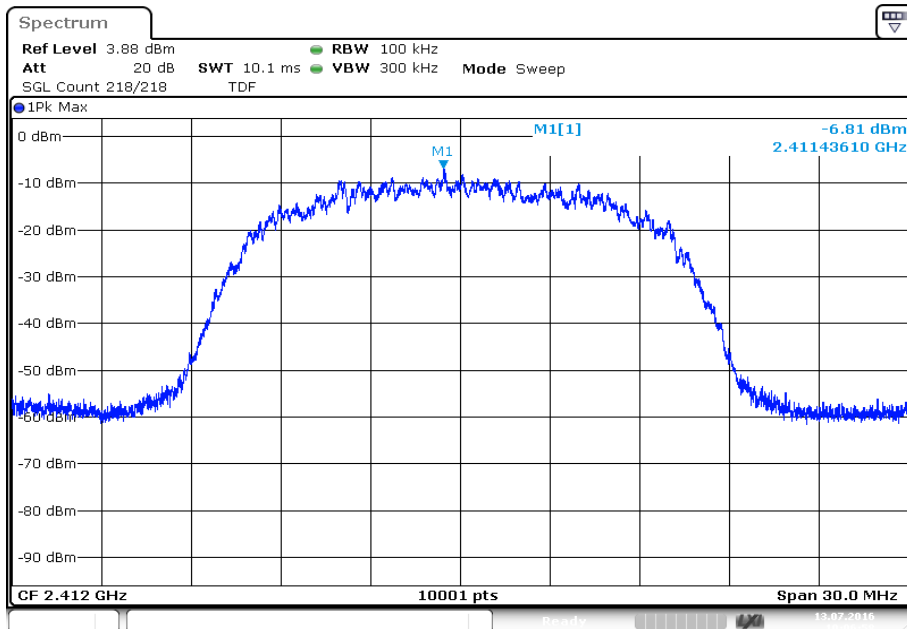
Plot 3: Highest channel



Date: 13.JUL.2016 09:31:00

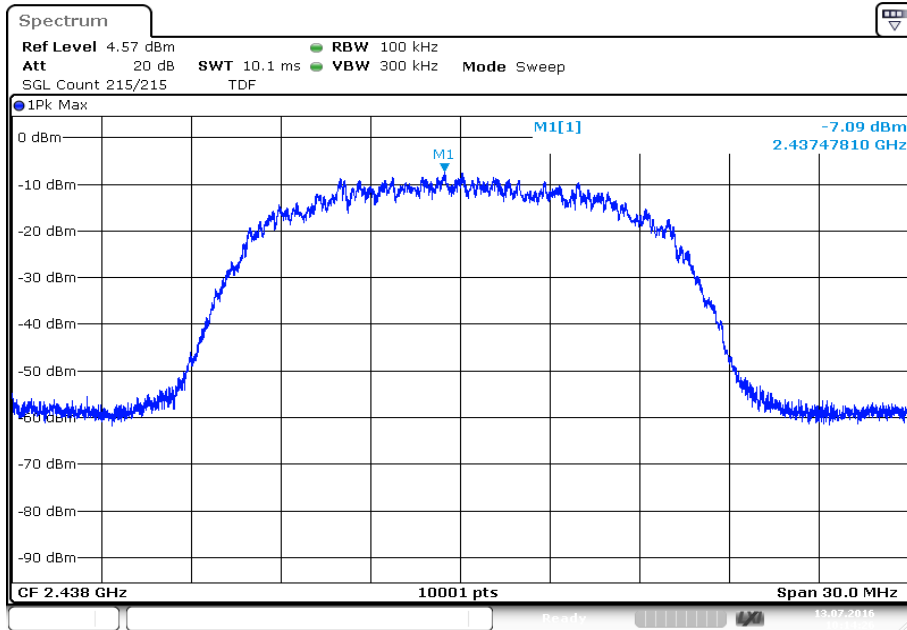
Plots: BPSK – mode / Antenna B

Plot 1: Lowest channel



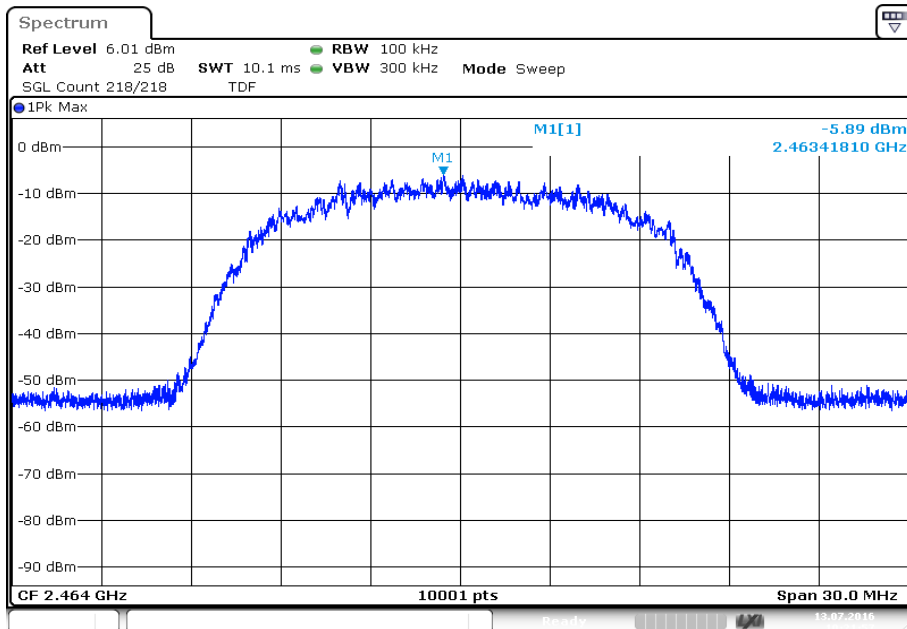
Date: 13.JUL.2016 10:06:59

Plot 2: Middle channel



Date: 13.JUL.2016 10:14:25

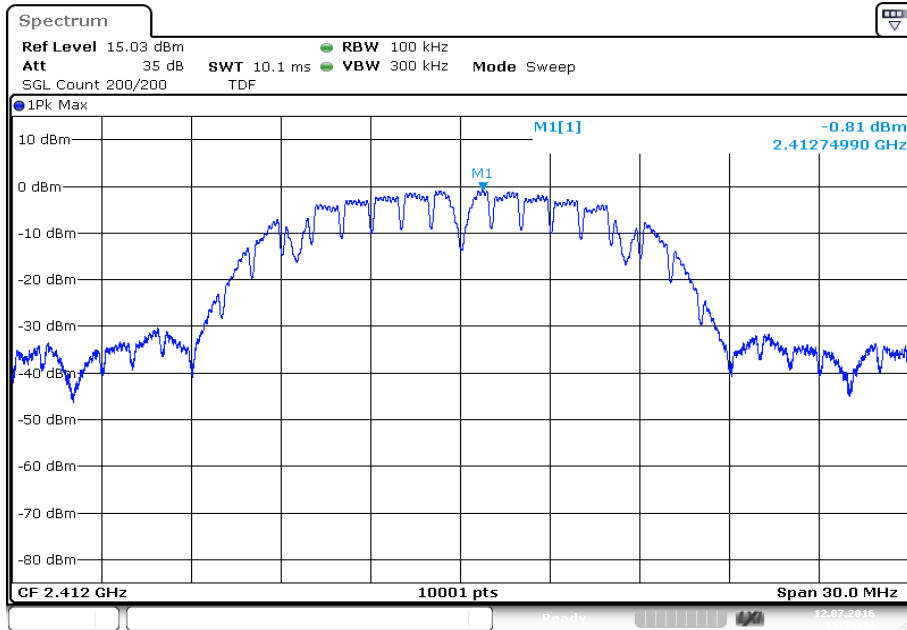
Plot 3: Highest channel



Date: 13.JUL.2016 10:21:57

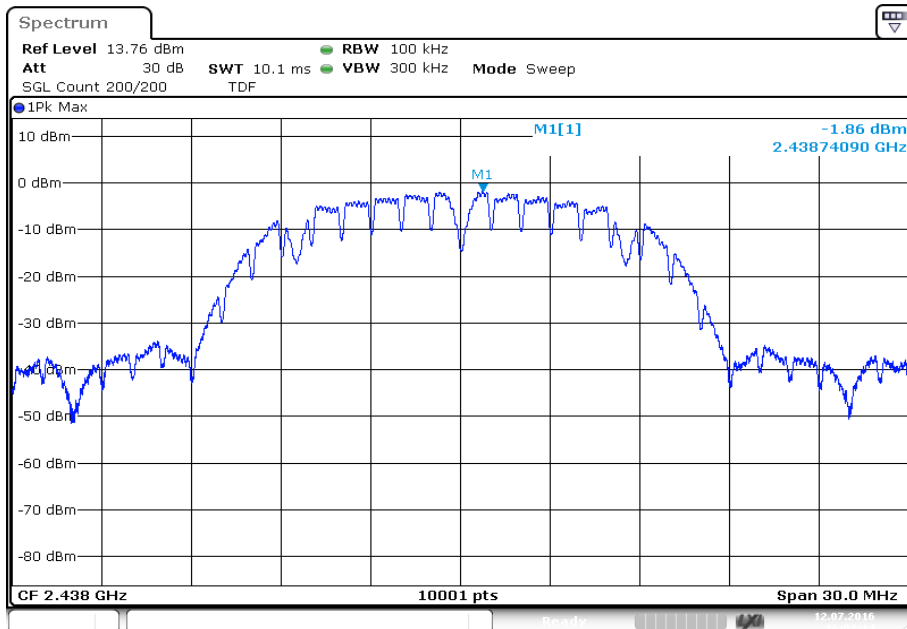
Plots: QPSK – mode / Antenna A

Plot 1: Lowest channel



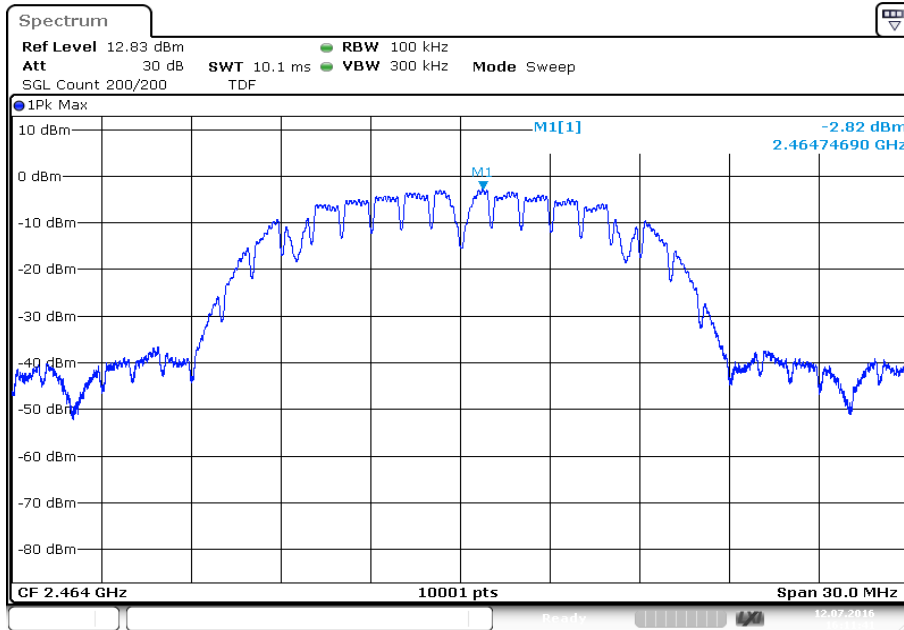
Date: 12.JUL.2016 15:53:32

Plot 2: Middle channel



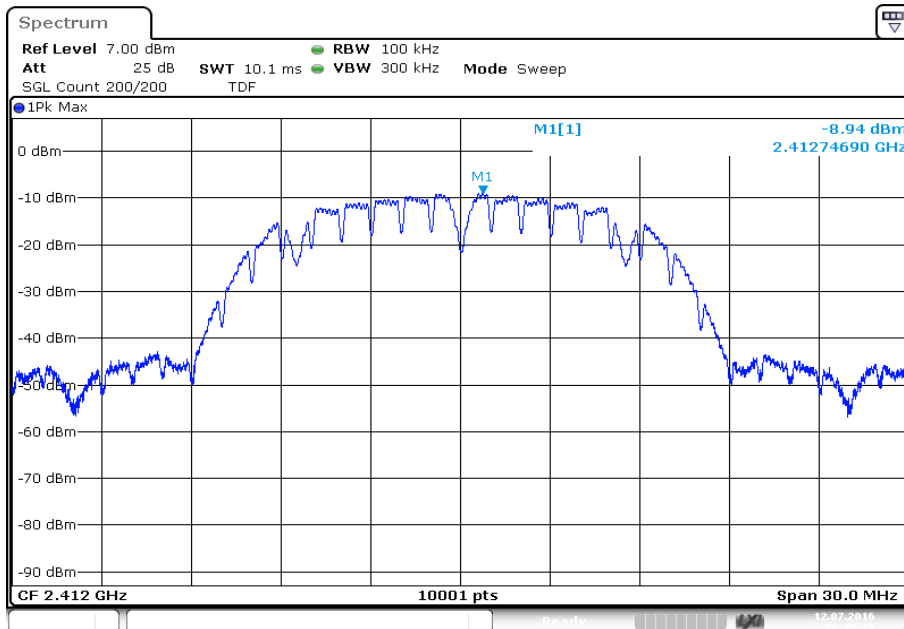
Date: 12.JUL.2016 16:02:14

Plot 3: Highest channel

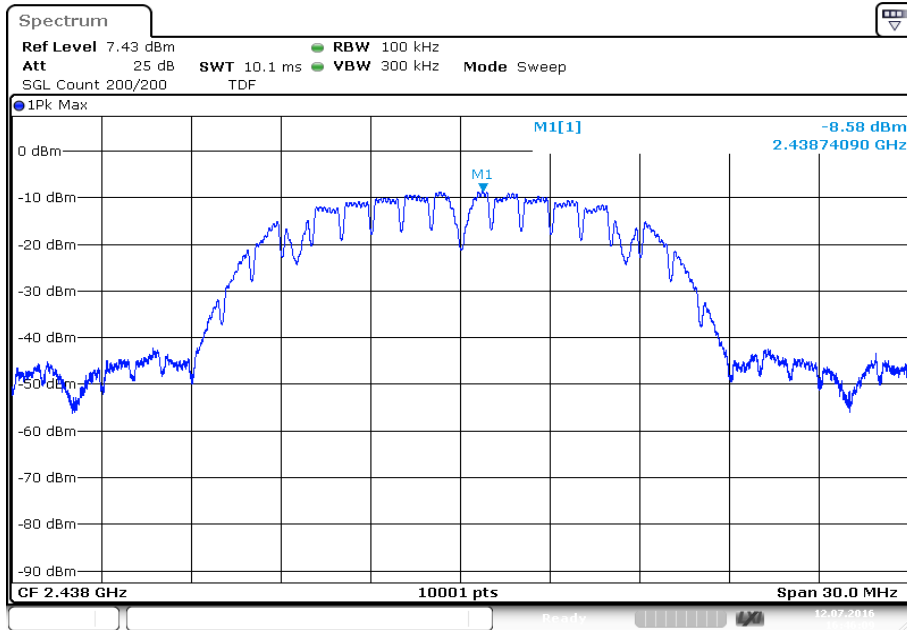


Plots: QPSK – mode / Antenna B

Plot 1: Lowest channel

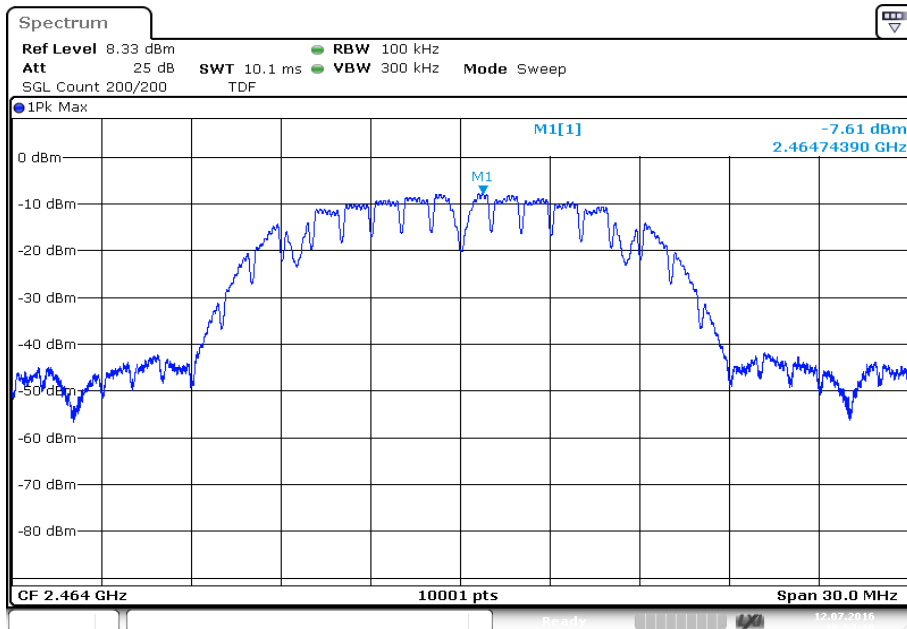


Plot 2: Middle channel



Date: 12.JUL.2016 16:46:09

Plot 3: Highest channel



Date: 12.JUL.2016 16:54:39

12.5 6 dB DTS bandwidth

Description:

Measurement of the 6 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
According to DTS clause: 8.1	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	500 kHz
Span:	30 MHz / 50 MHz
Measurement procedure:	Measurement of the 75% bandwidth using the integration function of the analyzer
Trace mode:	Single count with 200 counts
Test setup:	See sub clause 7.5 – A
Measurement uncertainty	See sub clause 9

Limits:

FCC	IC
Systems using digital modulation techniques may operate in the 2400–2483.5 MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.	

Results: BPSK - mode

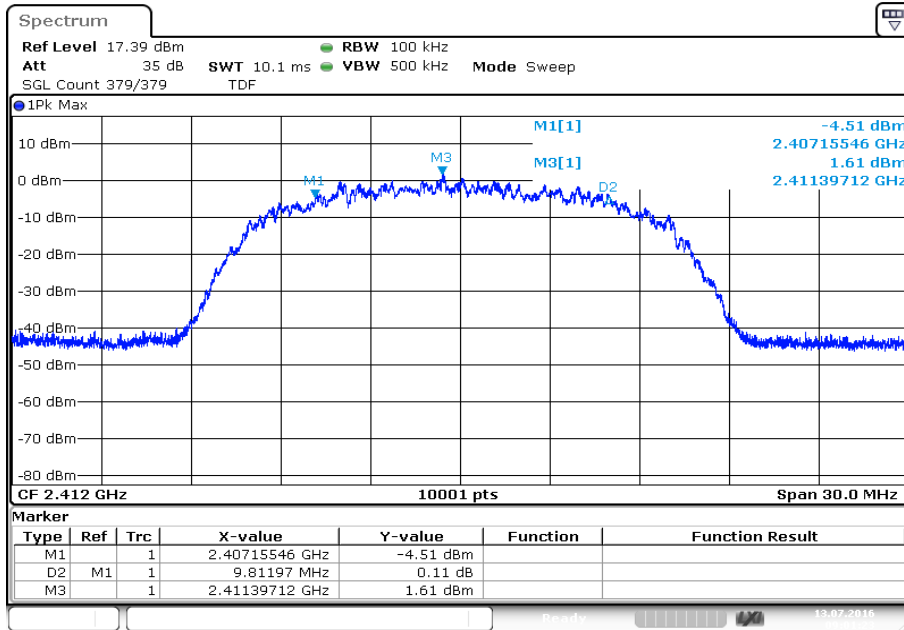
Frequency	6 dB DTS bandwidth [kHz]		
	2412 MHz	2438 MHz	2464 MHz
Antenna A	9812	9821	9818
Antenna B	9113	9806	9869

Results: QPSK - mode

Frequency	6 dB DTS bandwidth [kHz]		
	2412 MHz	2438 MHz	2464 MHz
Antenna A	10580	9824	9827
Antenna B	9824	9824	9821

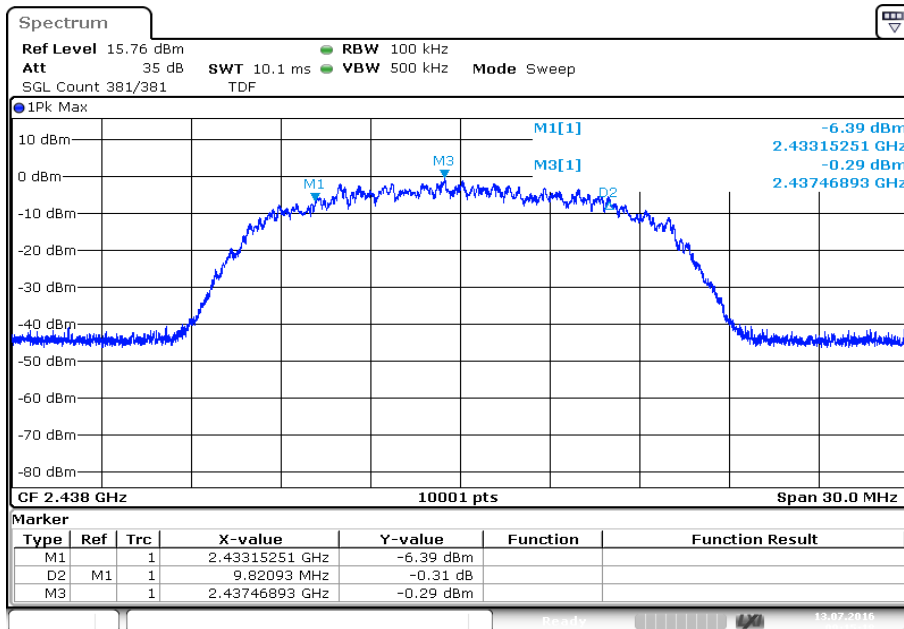
Plots: BPSK – mode / Antenna A

Plot 1: Lowest channel



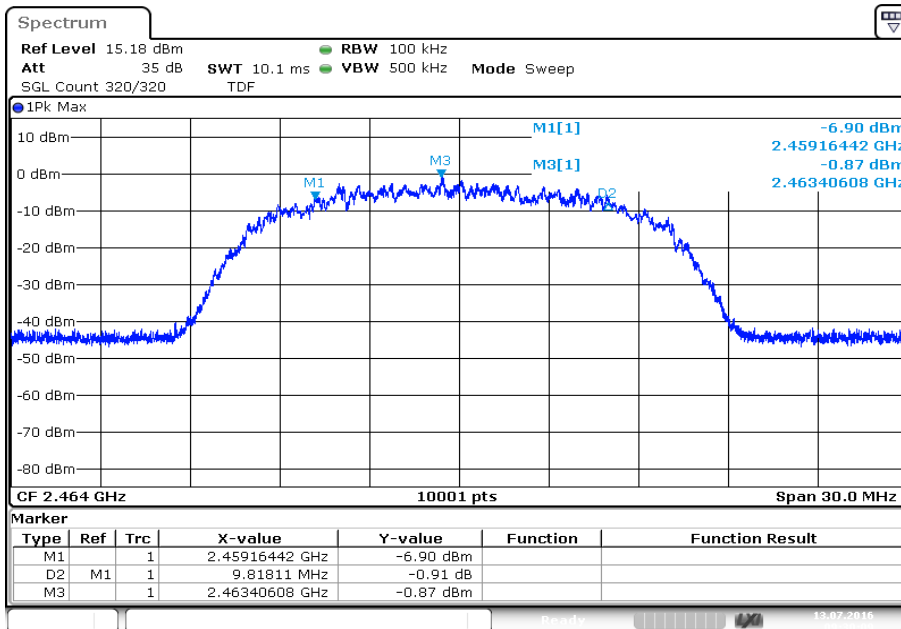
Date: 13.JUL.2016 09:01:24

Plot 2: Middle channel



Date: 13.JUL.2016 09:15:18

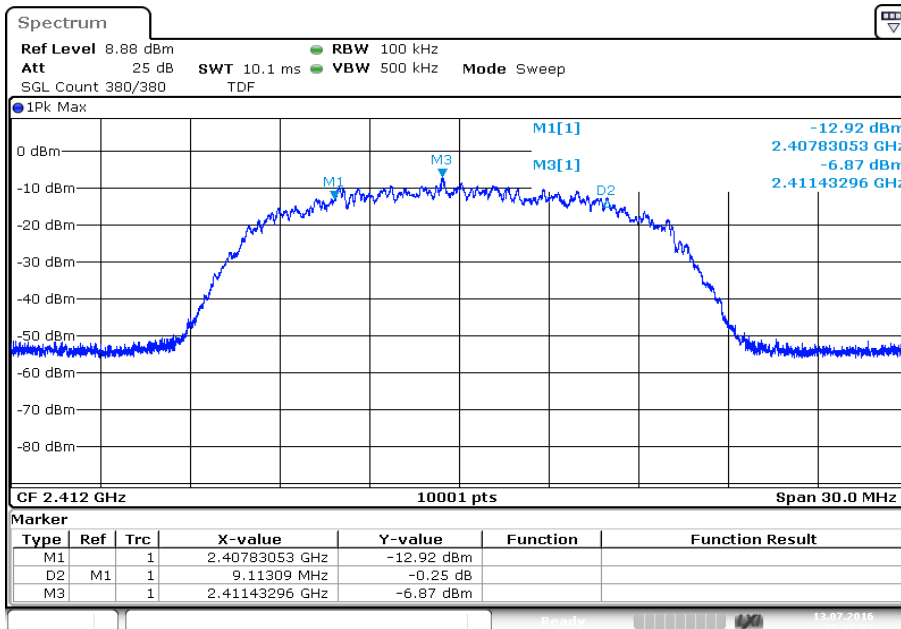
Plot 3: Highest channel



Date: 13.JUL.2016 09:30:10

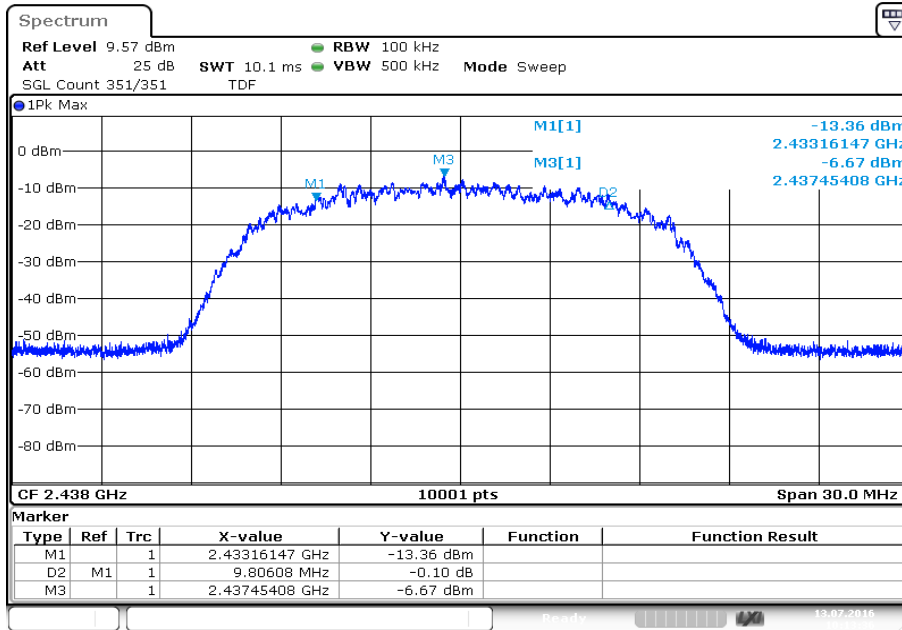
Plots: BPSK – mode / Antenna B

Plot 1: Lowest channel



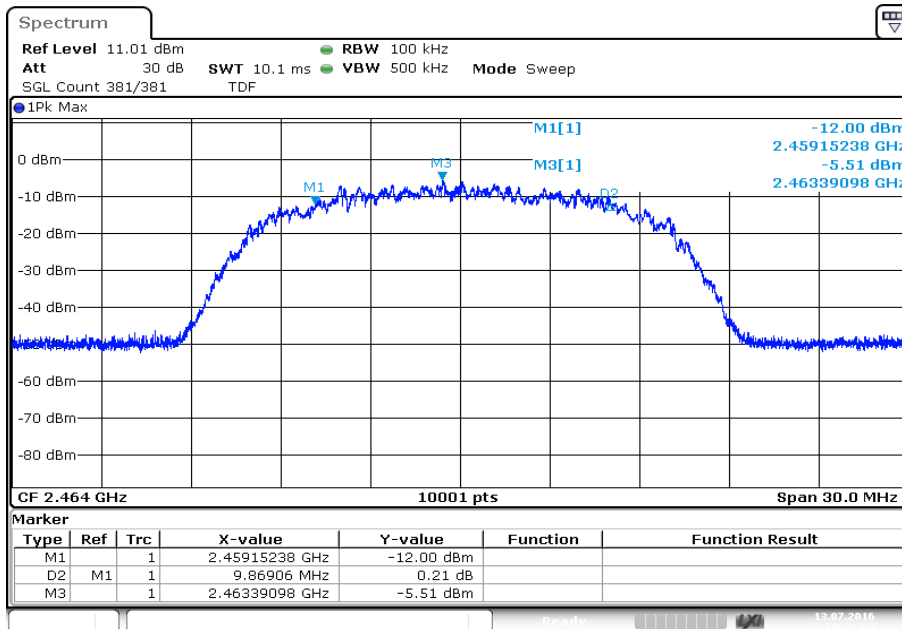
Date: 13.JUL.2016 10:06:08

Plot 2: Middle channel



Date: 13.JUL.2016 10:13:35

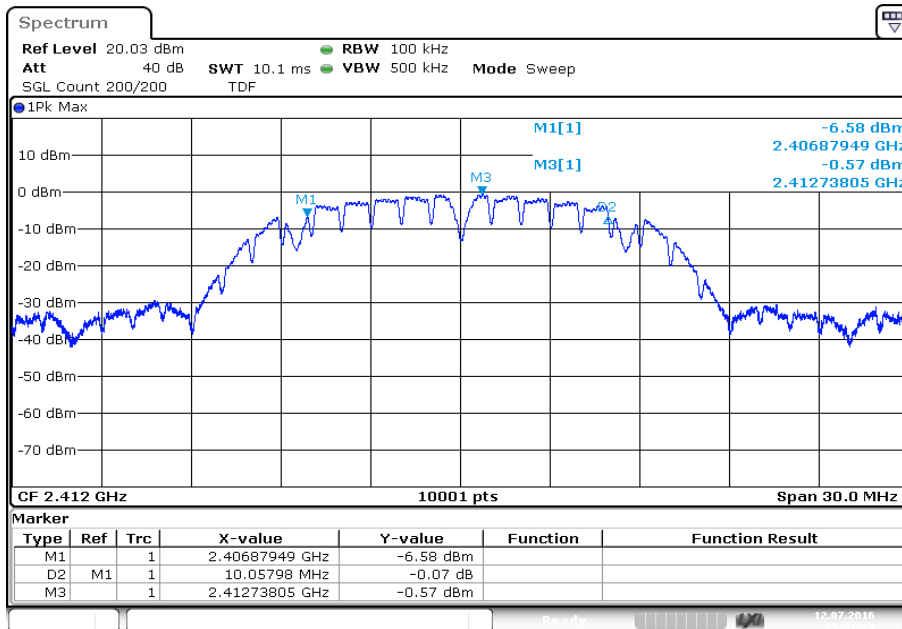
Plot 3: Highest channel



Date: 13.JUL.2016 10:21:04

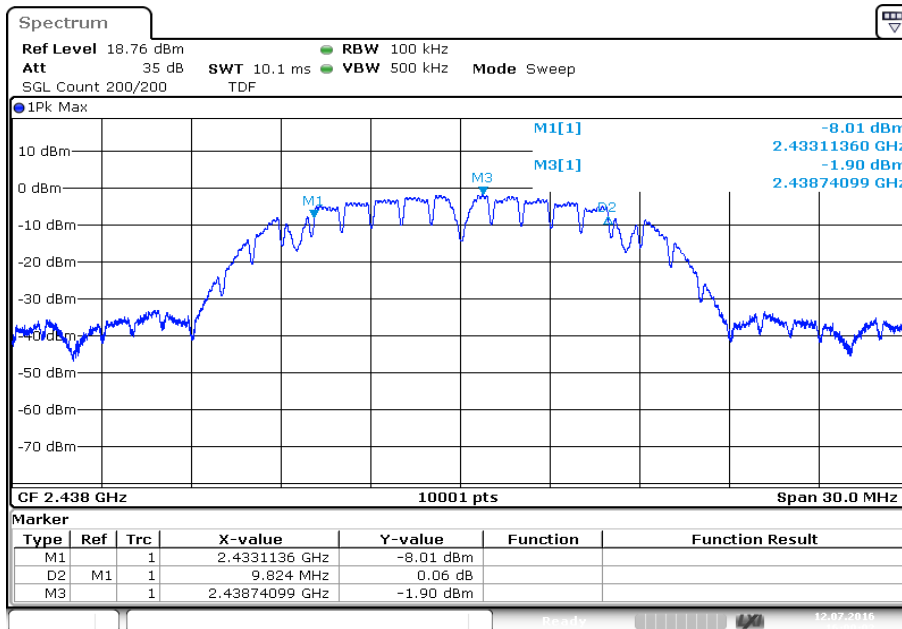
Plots: QPSK – mode / Antenna A

Plot 1: Lowest channel



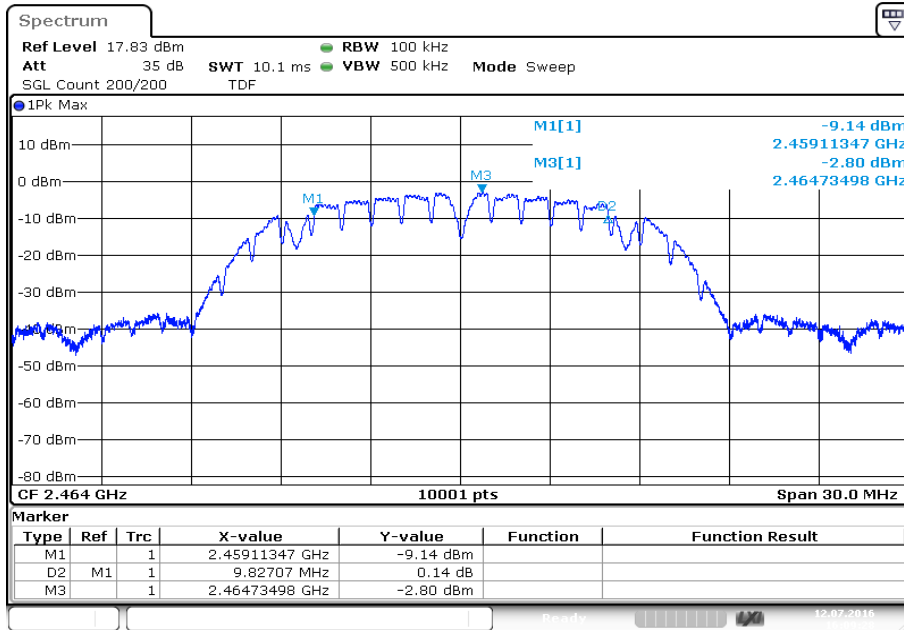
Date: 12.JUL.2016 15:51:21

Plot 2: Middle channel



Date: 12.JUL.2016 16:00:02

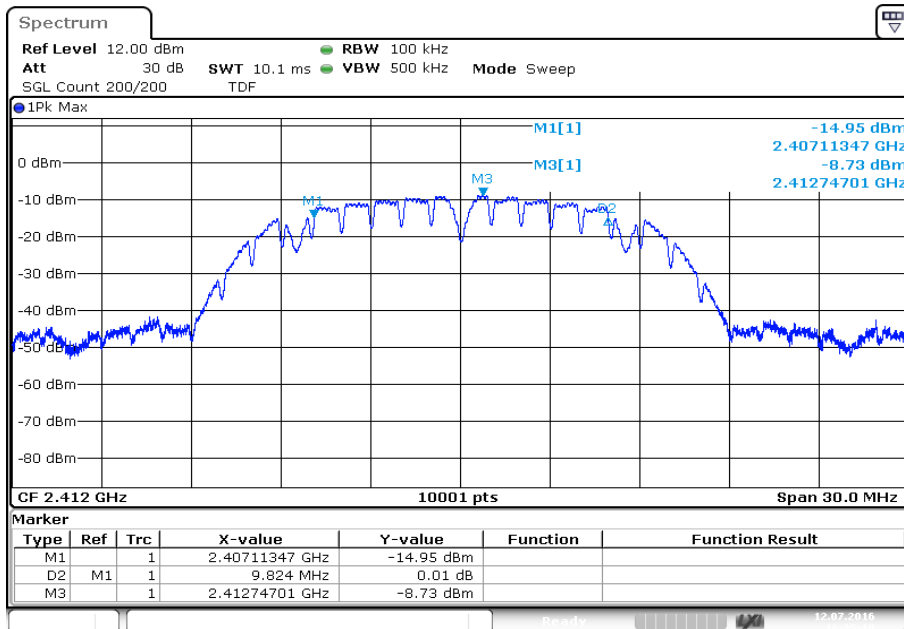
Plot 3: Highest channel



Date: 12.JUL.2016 16:09:28

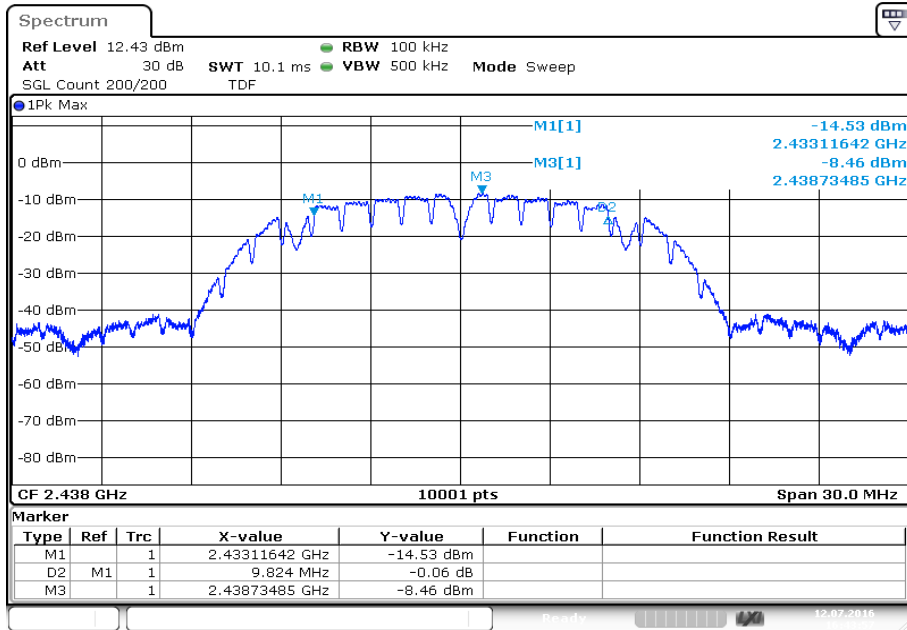
Plots: QPSK – mode / Antenna B

Plot 1: Lowest channel



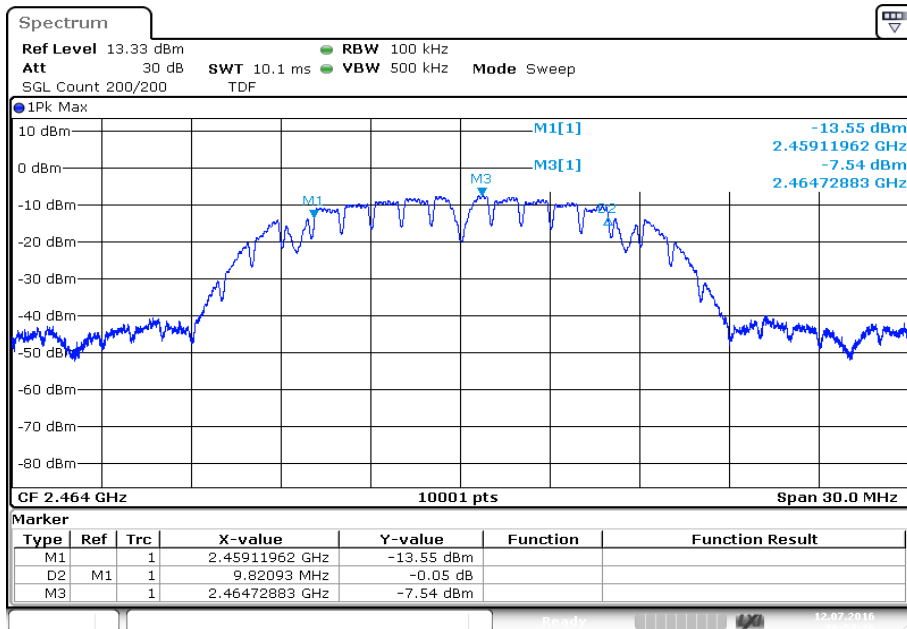
Date: 12.JUL.2016 16:35:10

Plot 2: Middle channel



Date: 12.JUL.2016 16:43:57

Plot 3: Highest channel



Date: 12.JUL.2016 16:52:26

12.6 Occupied bandwidth – 99% emission bandwidth

Description:

Measurement of the 99% bandwidth of the modulated signal acc. RSS-GEN.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	300 kHz
Video bandwidth:	1 MHz
Span:	30 MHz / 50 MHz
Measurement procedure:	Measurement of the 99% bandwidth using the integration function of the analyzer
Trace mode:	Single count with 200 counts
Test setup:	See sub clause 7.5 – A
Measurement uncertainty	See sub clause 9

Usage:

-/-	IC
OBW is necessary for Emission Designator	

Results: BPSK - mode

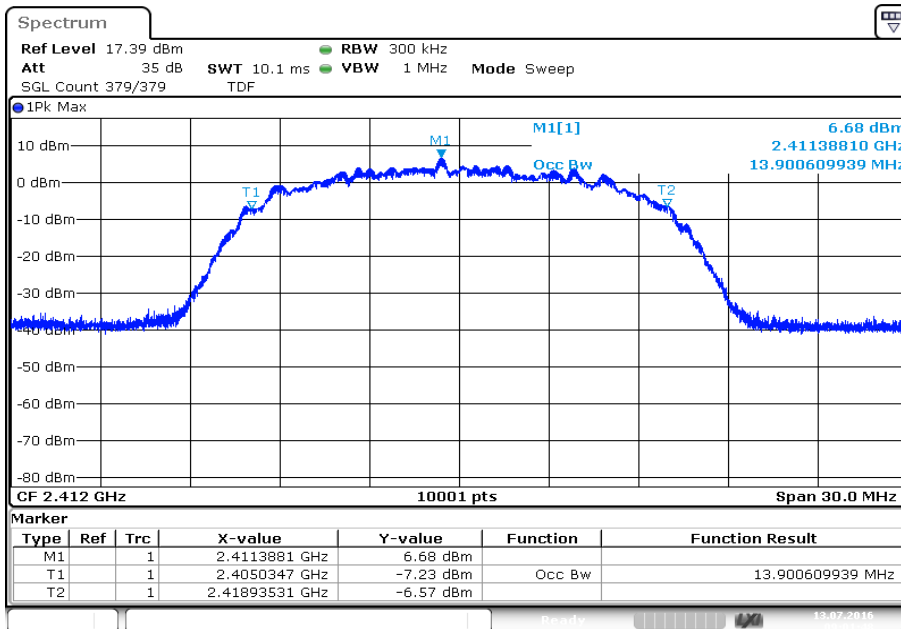
Frequency	99% bandwidth [kHz]		
	2412 MHz	2438 MHz	2464 MHz
Antenna A	13901	13895	13886
Antenna B	13919	13907	13865

Results: QPSK - mode

Frequency	99% bandwidth [kHz]		
	2412 MHz	2438 MHz	2464 MHz
Antenna A	13934	13922	13913
Antenna B	13889	13922	13904

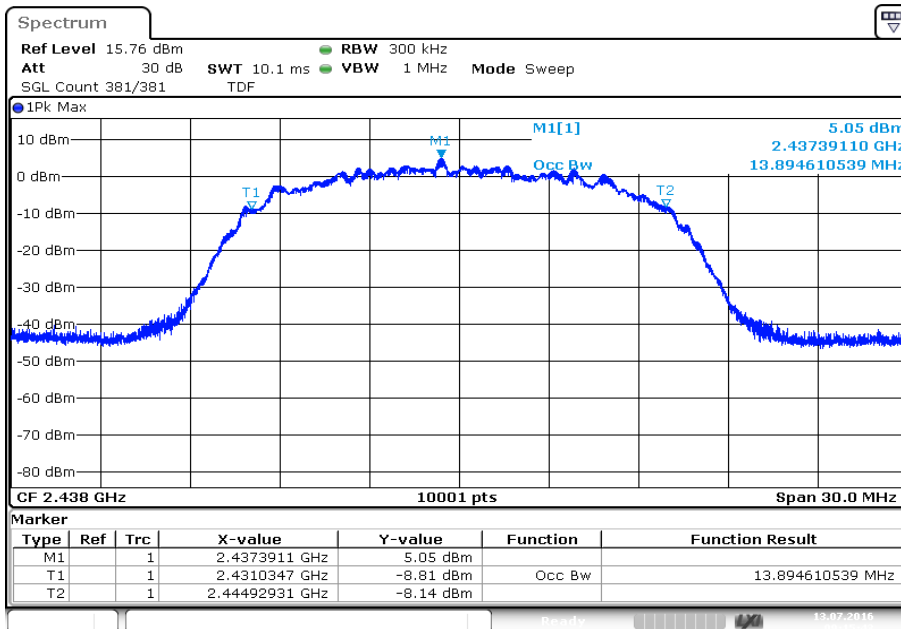
Plots: BPSK – mode / Antenna A

Plot 1: Lowest channel



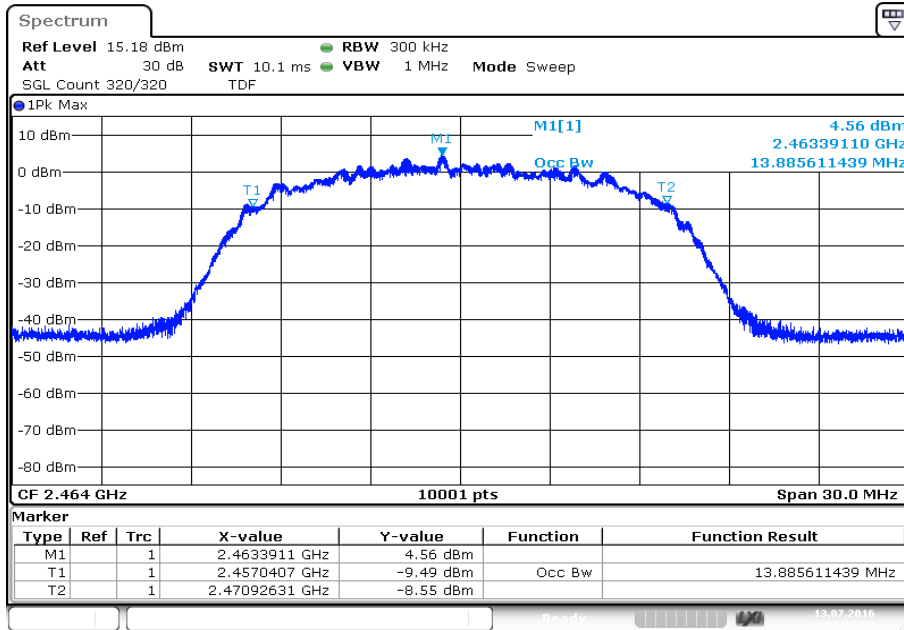
Date: 13.JUL.2016 09:01:48

Plot 2: Middle channel



Date: 13.JUL.2016 09:15:43

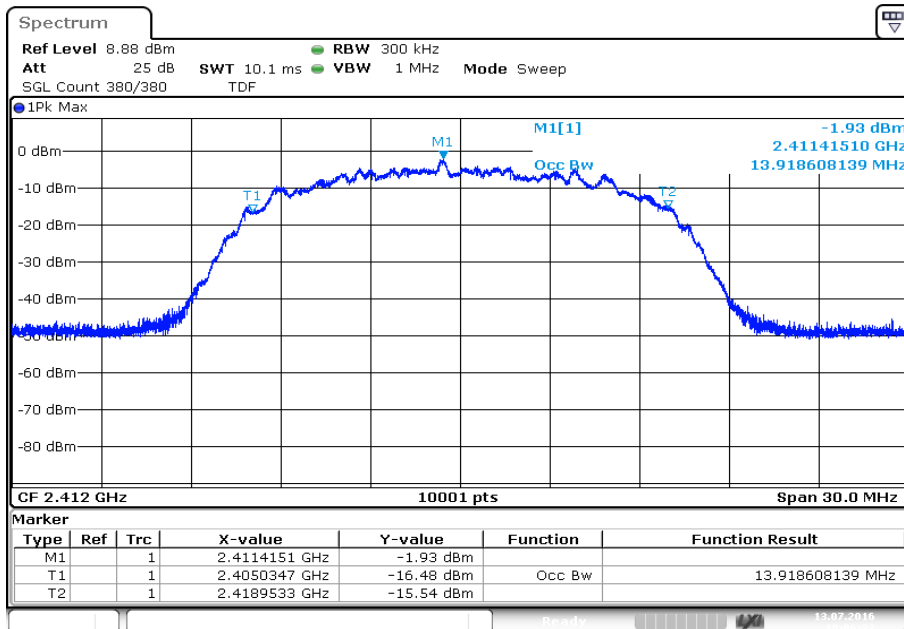
Plot 3: Highest channel



Date: 13.JUL.2016 09:30:33

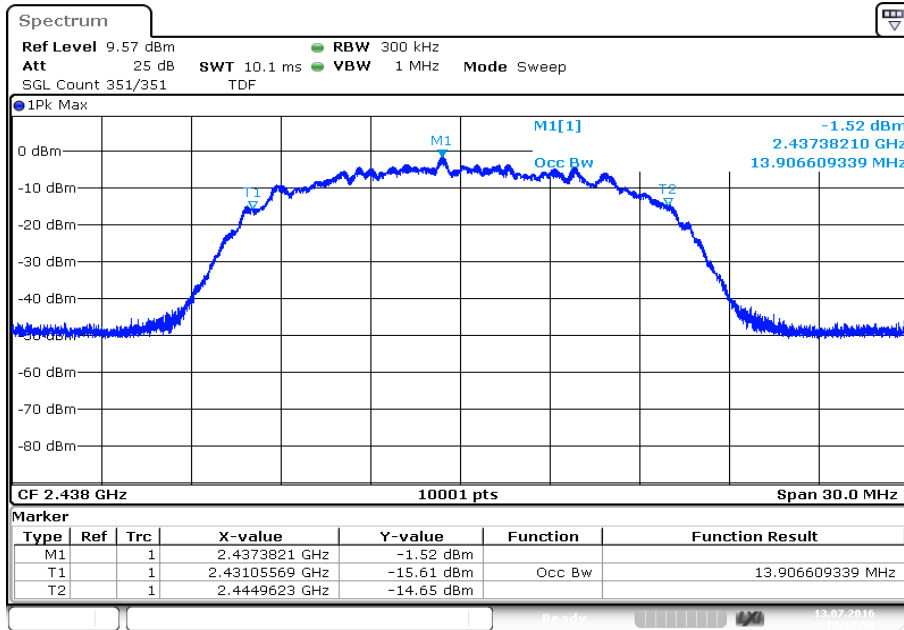
Plots: BPSK – mode / Antenna B

Plot 1: Lowest channel



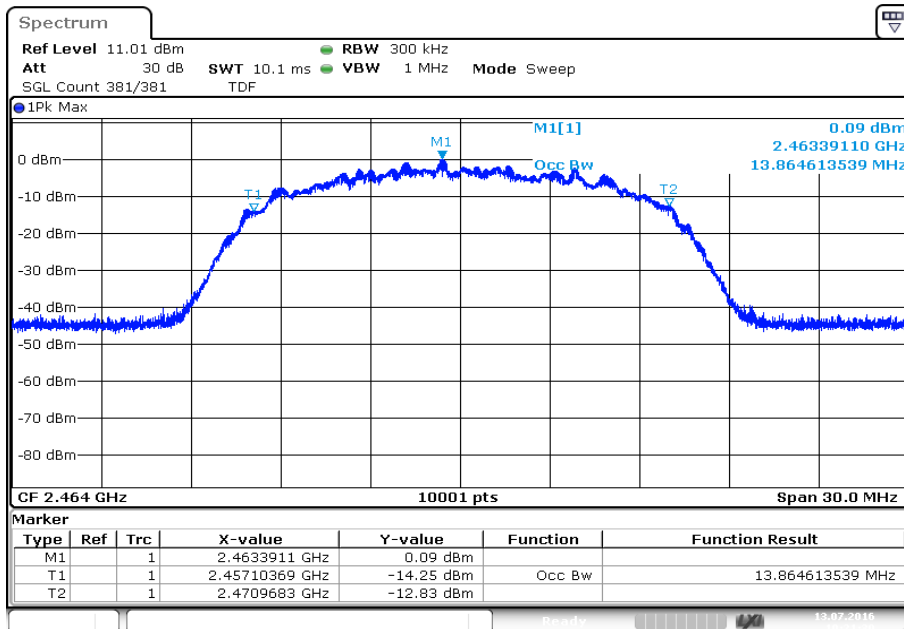
Date: 13.JUL.2016 10:06:33

Plot 2: Middle channel



Date: 13.JUL.2016 10:13:59

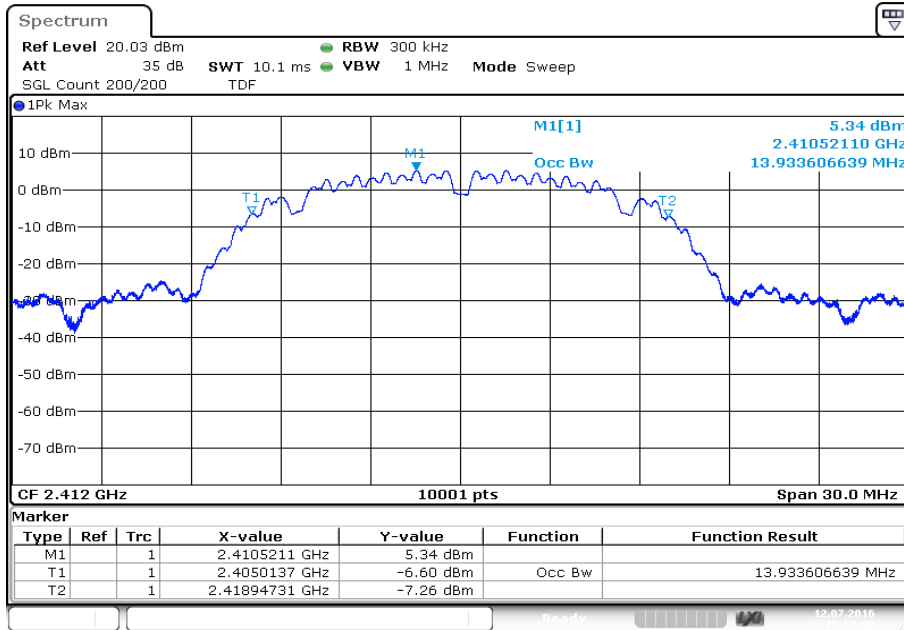
Plot 3: Highest channel



Date: 13.JUL.2016 10:21:30

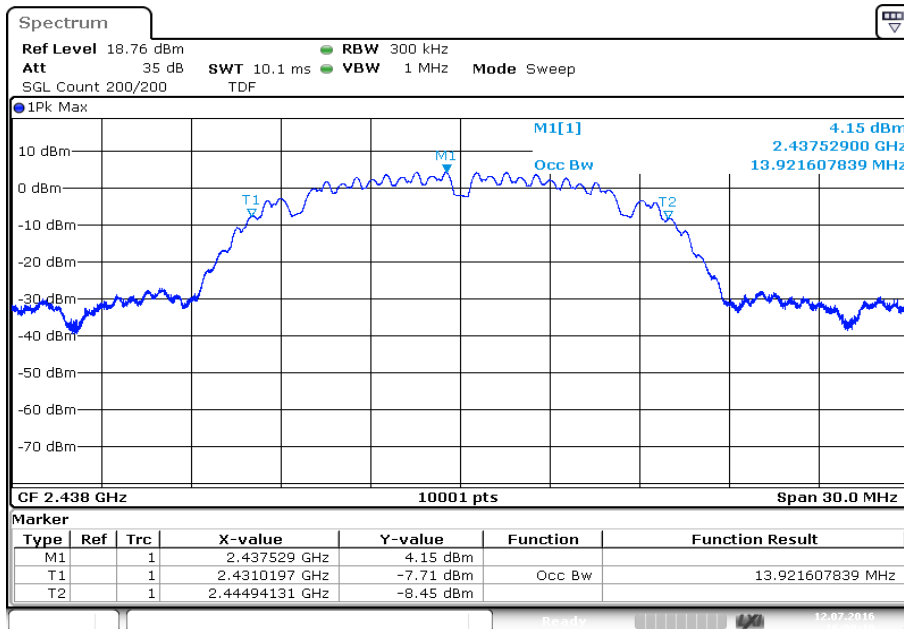
Plots: QPSK – mode / Antenna A

Plot 1: Lowest channel



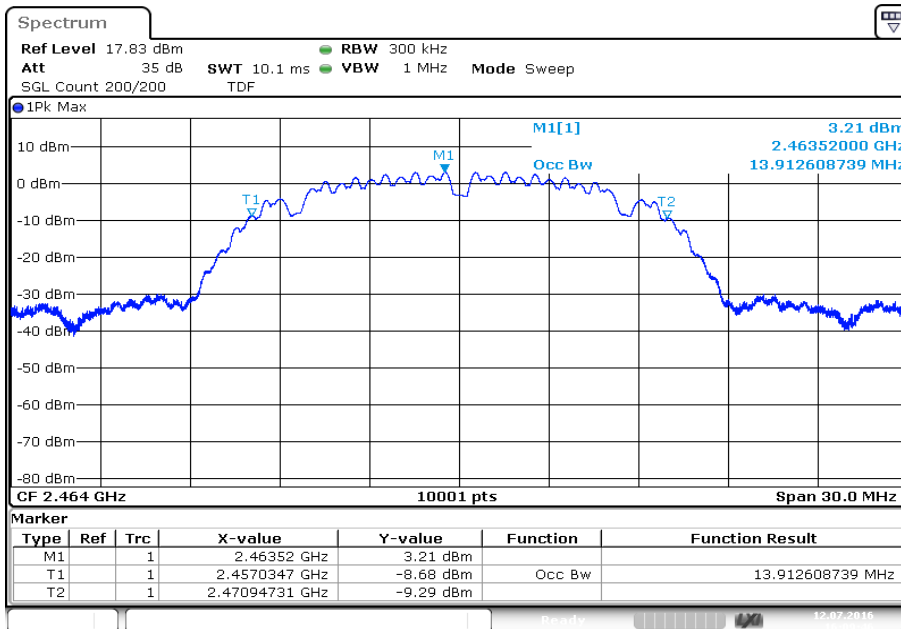
Date: 12.JUL.2016 15:51:38

Plot 2: Middle channel



Date: 12.JUL.2016 16:00:19

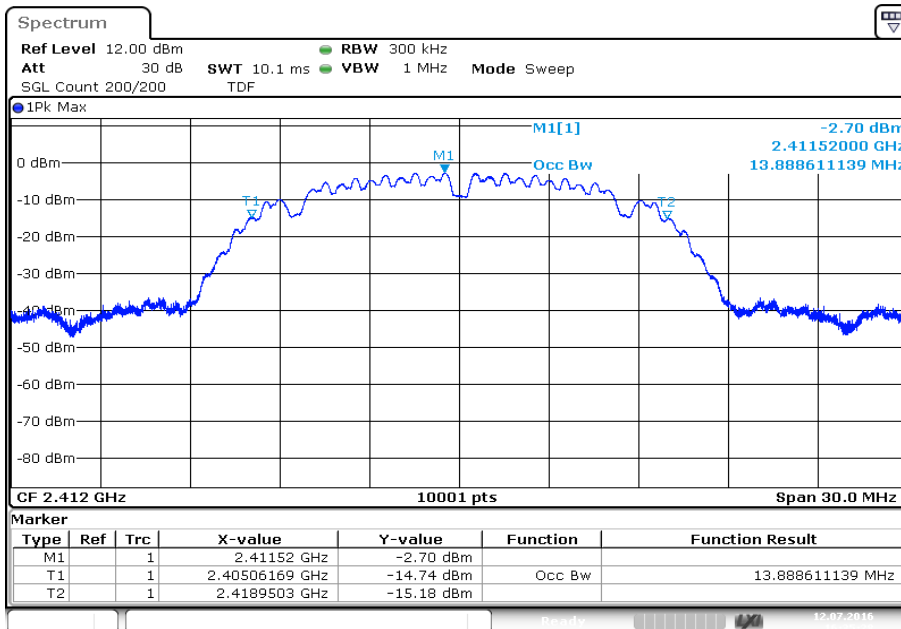
Plot 3: Highest channel



Date: 12.JUL.2016 16:09:46

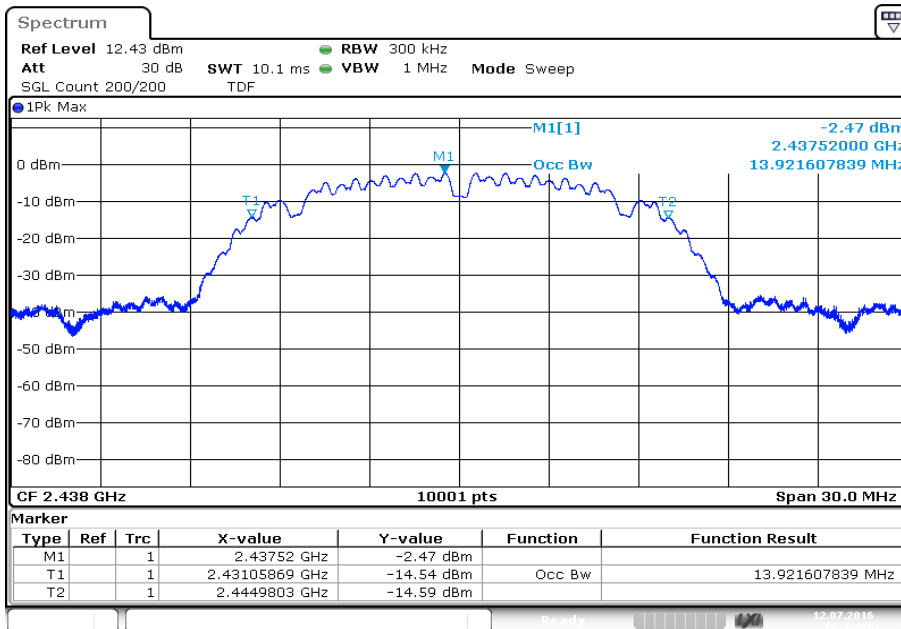
Plots: QPSK – mode / Antenna B

Plot 1: Lowest channel



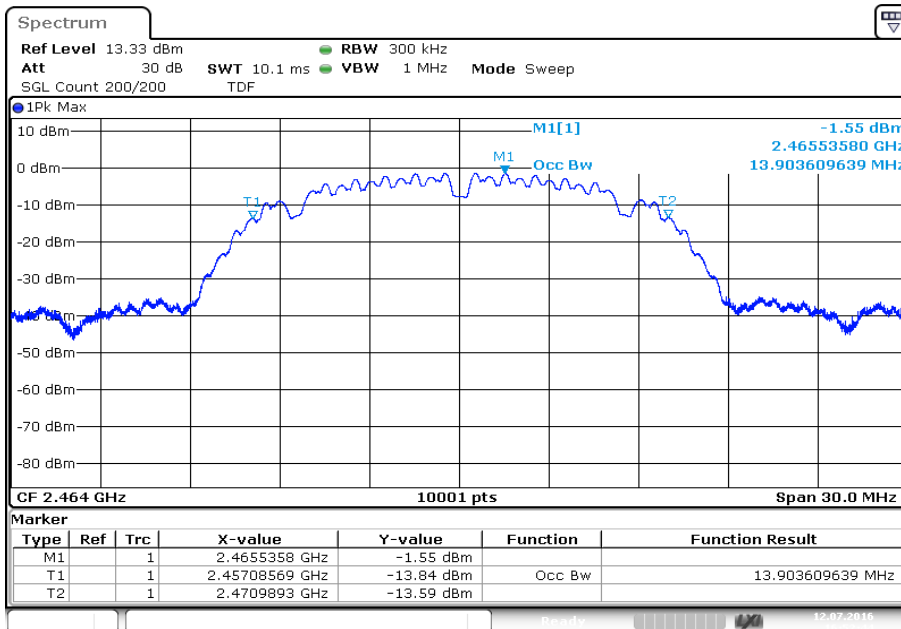
Date: 12.JUL.2016 16:35:28

Plot 2: Middle channel



Date: 12.JUL.2016 16:44:15

Plot 3: Highest channel



Date: 12.JUL.2016 16:52:44

12.7 Occupied bandwidth – 20 dB bandwidth

Description:

Measurement of the 20 dB bandwidth of the modulated carrier.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	500 kHz
Span:	30 MHz / 50 MHz
Trace mode:	Single count with min. 200 counts
Test setup:	See sub clause 7.5 – A
Measurement uncertainty	See sub clause 9

Usage:

-/-	IC
Within the used band!	

Results: BPSK - mode

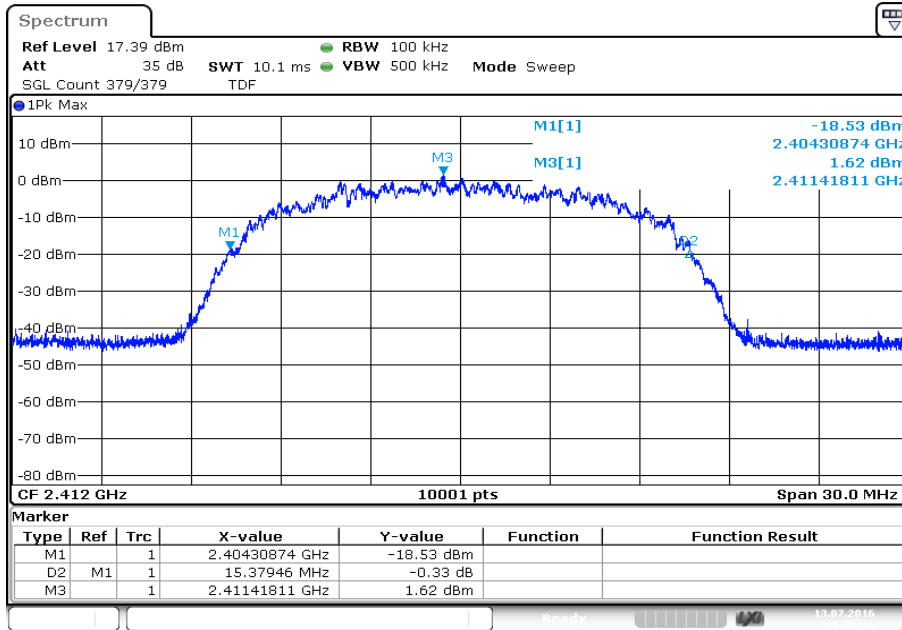
Frequency	20 dB bandwidth [MHz]		
	2412 MHz	2438 MHz	2464 MHz
Antenna A	15.4	15.4	15.4
Antenna B	15.0	15.4	15.5

Results: QPSK - mode

Frequency	20 dB bandwidth [MHz]		
	2412 MHz	2438 MHz	2464 MHz
Antenna A	15.6	15.6	15.6
Antenna B	15.5	15.5	15.5

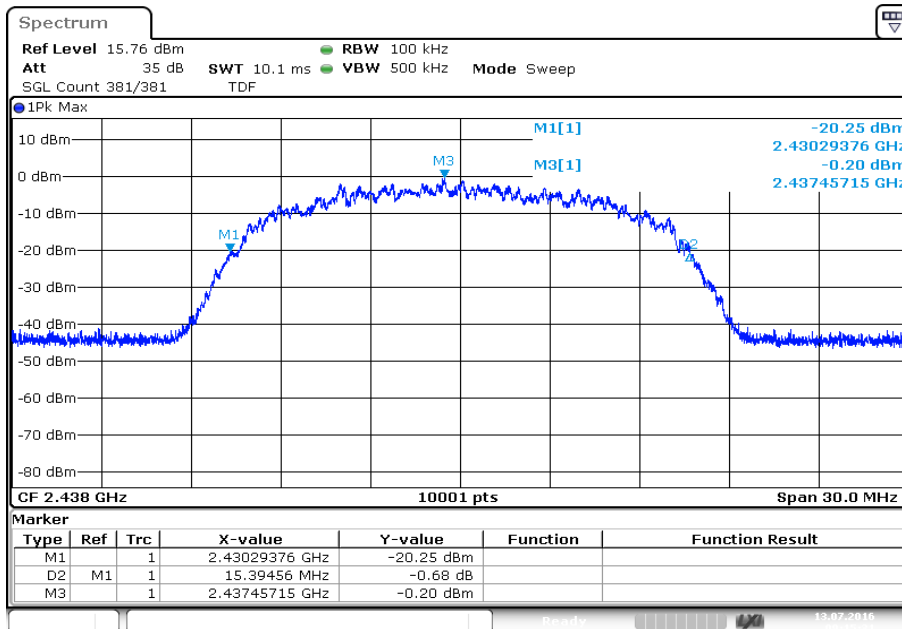
Plots: BPSK – mode / Antenna A

Plot 1: Lowest channel



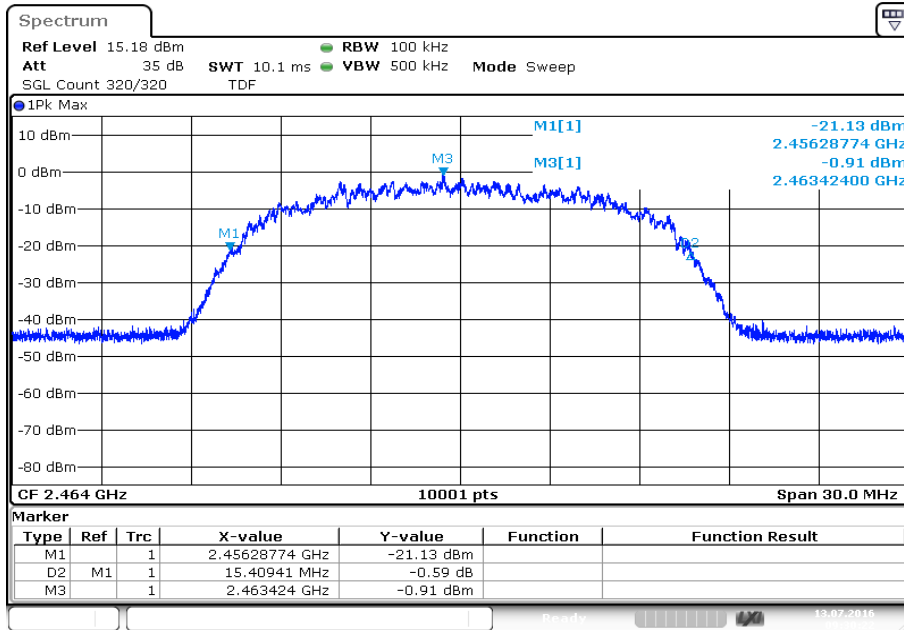
Date: 13.JUL.2016 09:01:37

Plot 2: Middle channel



Date: 13.JUL.2016 09:15:31

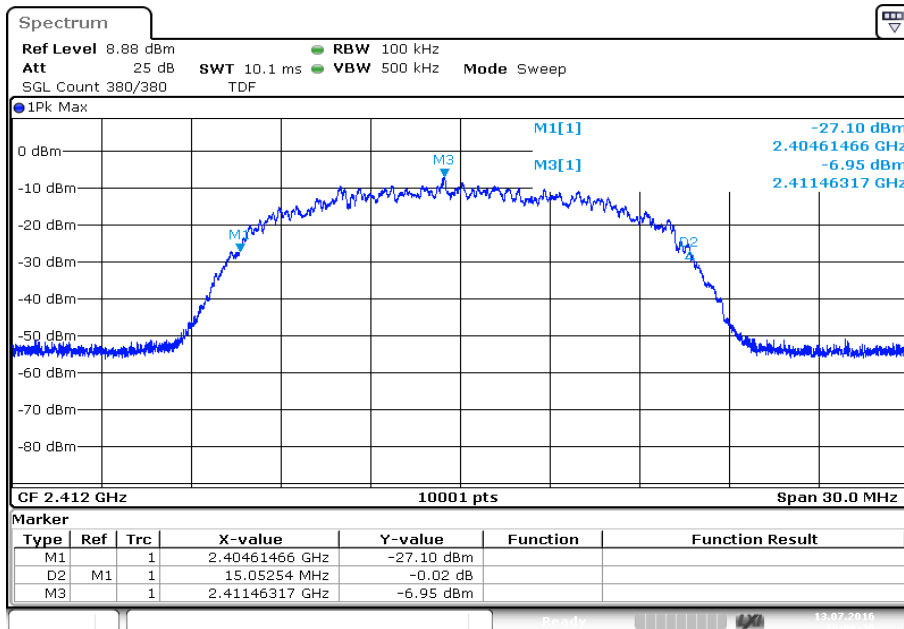
Plot 3: Highest channel



Date: 13.JUL.2016 09:30:22

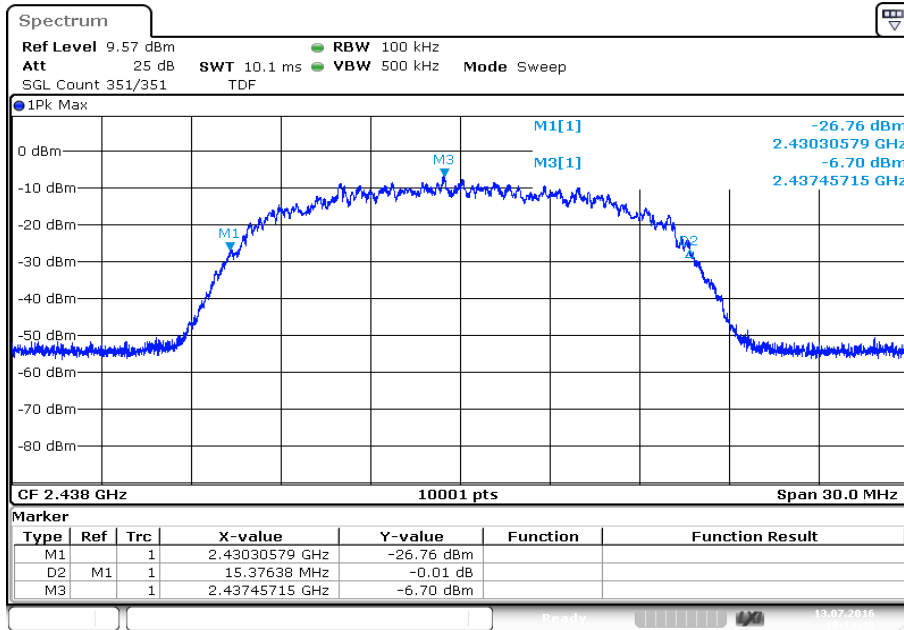
Plots: BPSK – mode / Antenna B

Plot 1: Lowest channel



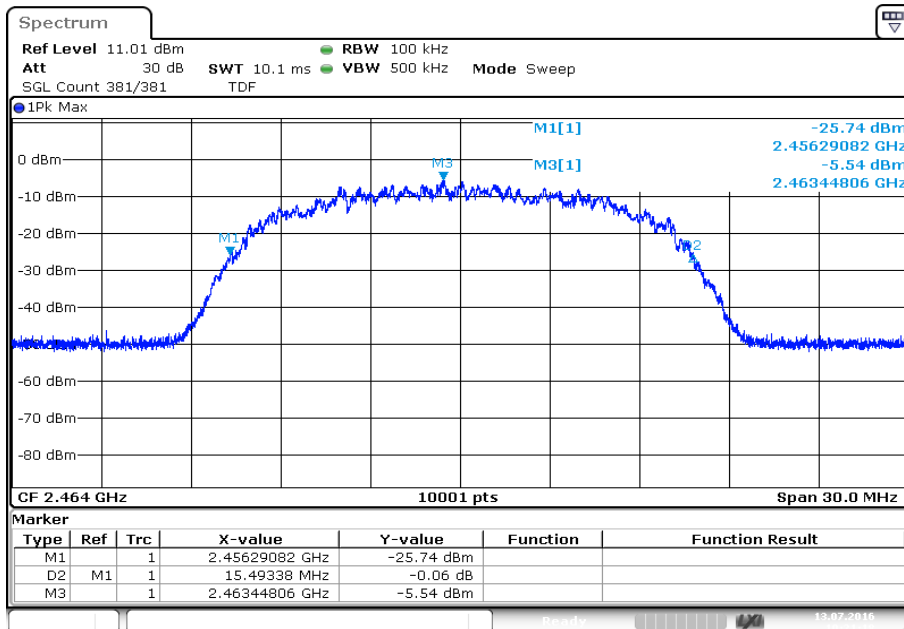
Date: 13.JUL.2016 10:06:21

Plot 2: Middle channel



Date: 13.JUL.2016 10:13:48

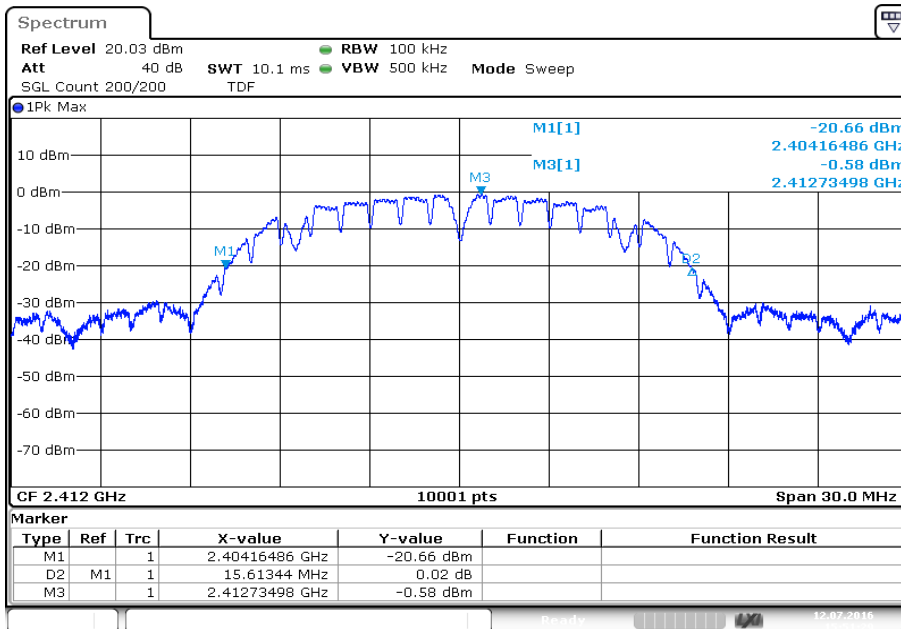
Plot 3: Highest channel



Date: 13.JUL.2016 10:21:18

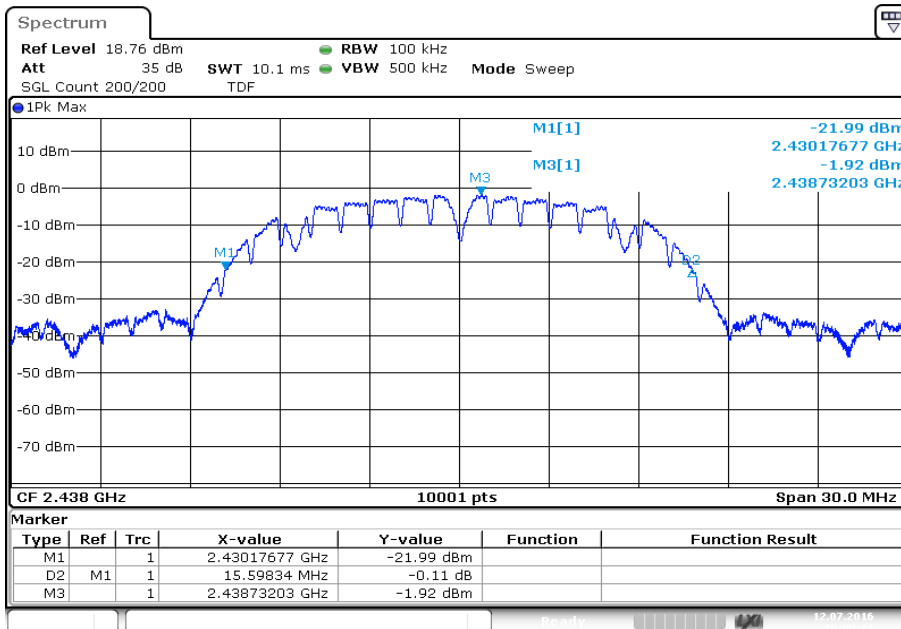
Plots: QPSK – mode / Antenna A

Plot 1: Lowest channel



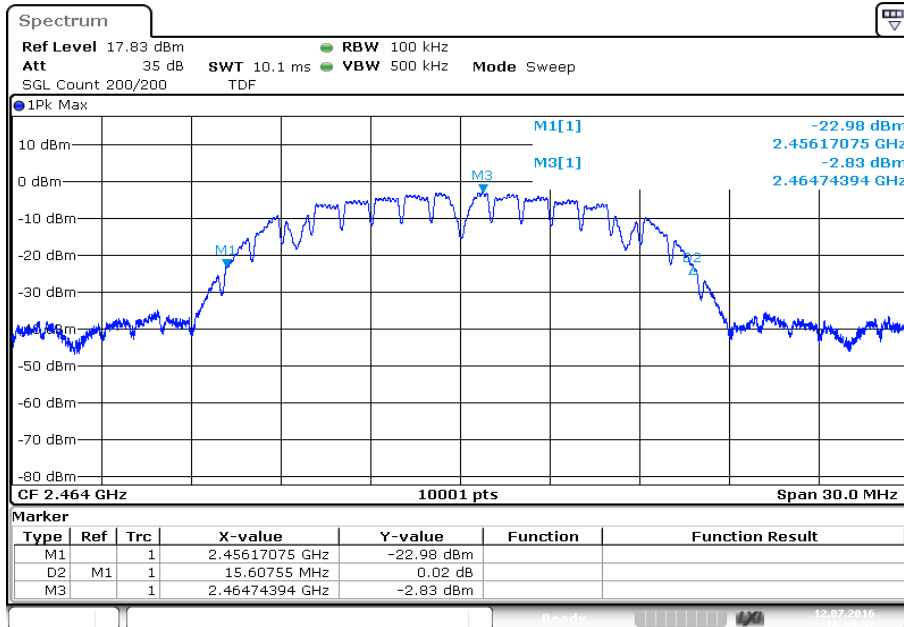
Date: 12.JUL.2016 15:51:29

Plot 2: Middle channel



Date: 12.JUL.2016 16:00:11

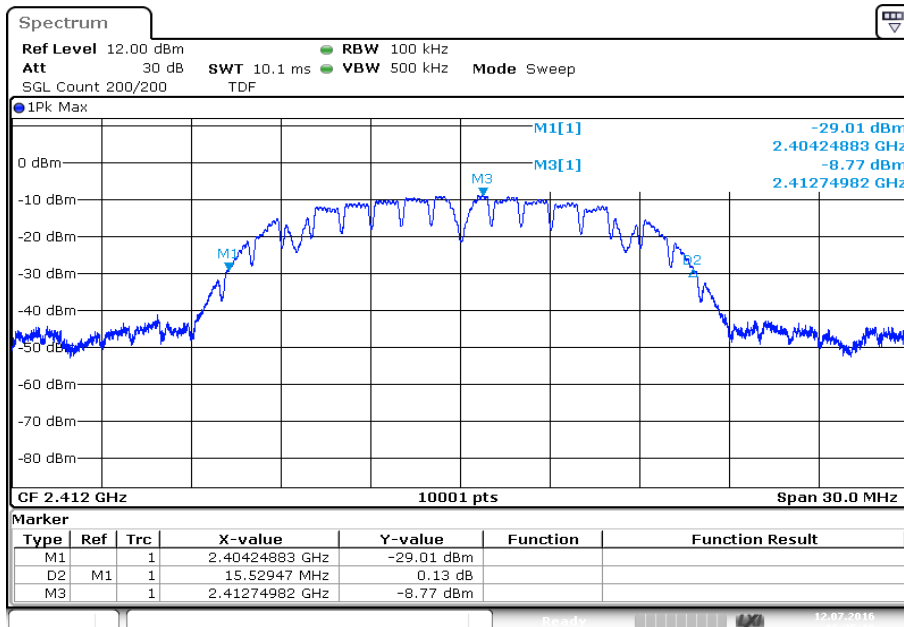
Plot 3: Highest channel



Date: 12.JUL.2016 16:09:37

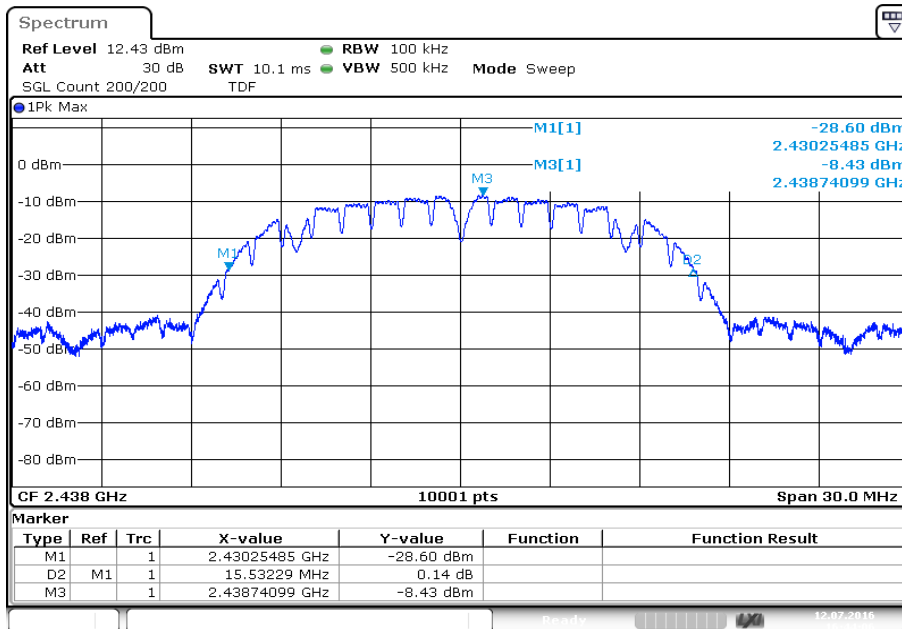
Plots: QPSK – mode / Antenna B

Plot 1: Lowest channel



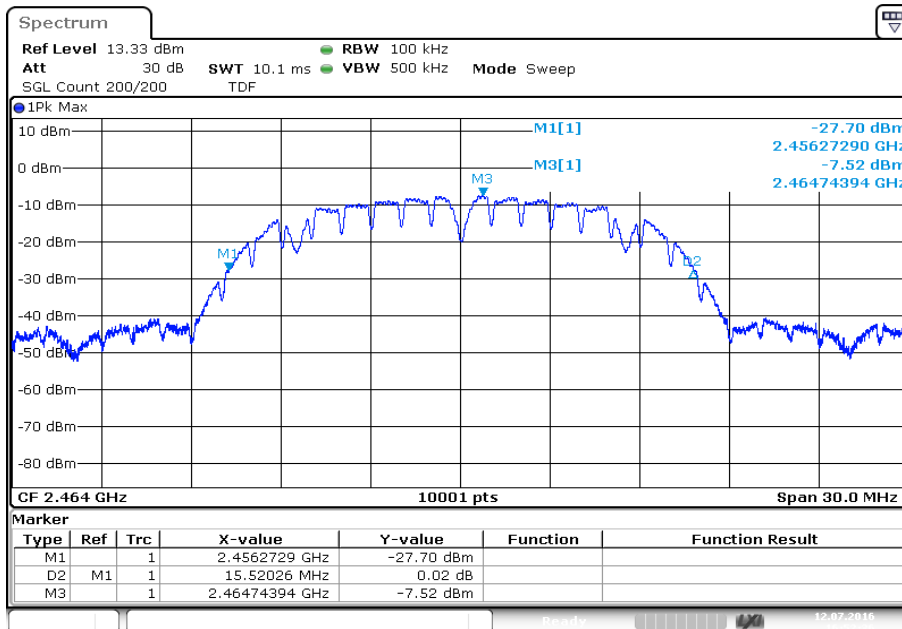
Date: 12.JUL.2016 16:35:19

Plot 2: Middle channel



Date: 12.JUL.2016 16:44:06

Plot 3: Highest channel



Date: 12.JUL.2016 16:52:36

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 channel 1 for the lower restricted band and to channel 11 for the upper restricted band. The measurement is repeated for all modulations. Measurement distance is 3 m.

Measurement:

Measurement parameter for peak measurements	
Detector:	Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	1 MHz
Span:	See plot!
Trace mode:	Max Hold
Test setup:	See sub clause 7.2
Measurement uncertainty	See sub clause 9

Measurement parameter for average measurements	
According to DTS clause: 13.3.2	
Detector:	RMS
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	2 MHz
Trace mode:	RMS Average over 101 sweeps
Test setup:	See sub clause 7.2
Measurement uncertainty	See sub clause 9

Limits:

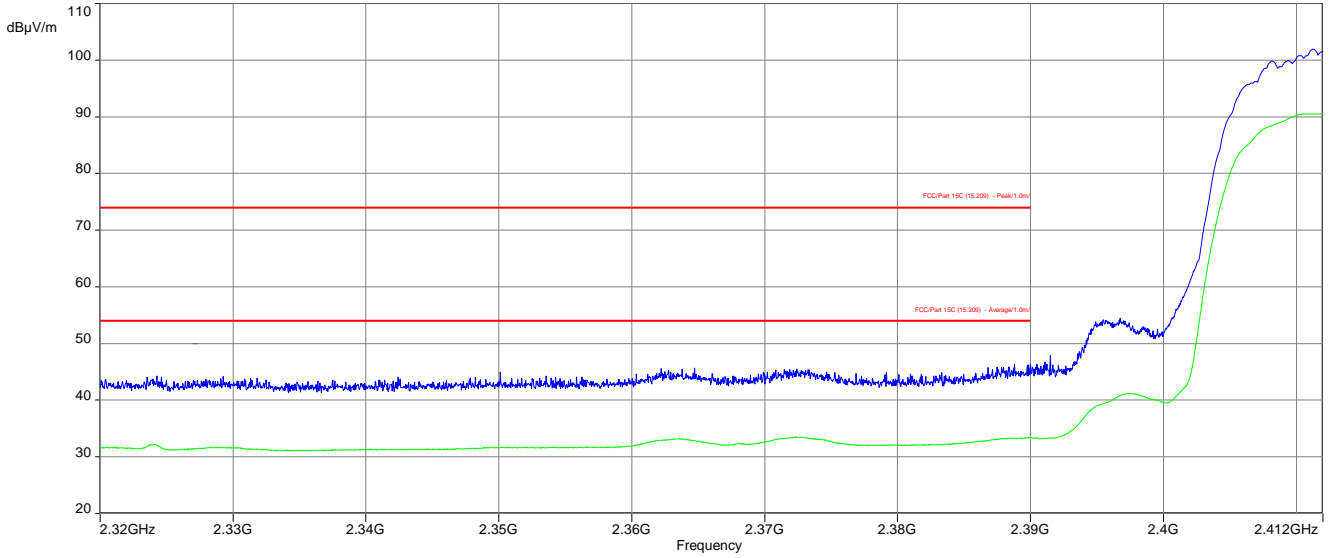
FCC	IC
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains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

Results:

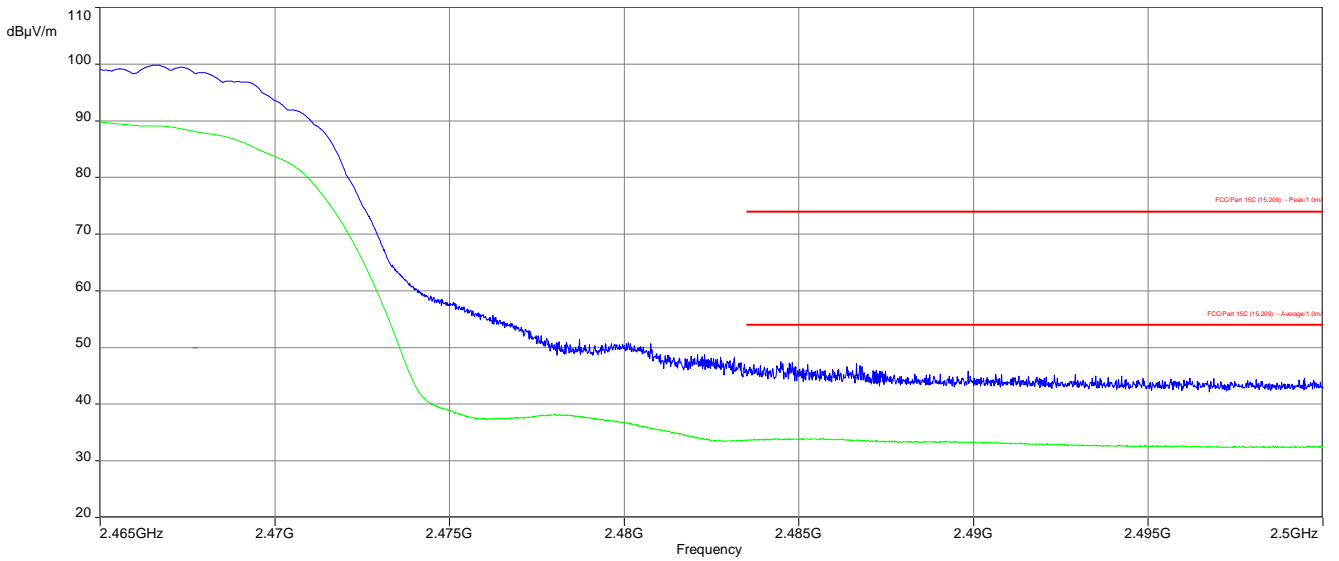
Scenario Modulation Antenna	Band edge compliance radiated [dB]			
	BPSK		QPSK	
	A	B	A	B
Lower band edge	> 20 dB (Peak) > 20 dB (AVG)	> 20 dB (Peak) > 20 dB (AVG)	> 20 dB (Peak) > 20 dB (AVG)	> 20 dB (Peak) > 20 dB (AVG)
Upper band edge	> 20 dB (Peak) > 20 dB (AVG)	> 20 dB (Peak) > 20 dB (AVG)	> 20 dB (Peak) > 20 dB (AVG)	> 20 dB (Peak) > 20 dB (AVG)

Plots: BPSK – mode / Antenna A

Plot 1: lower band edge, vertical & horizontal polarization, 2412 MHz

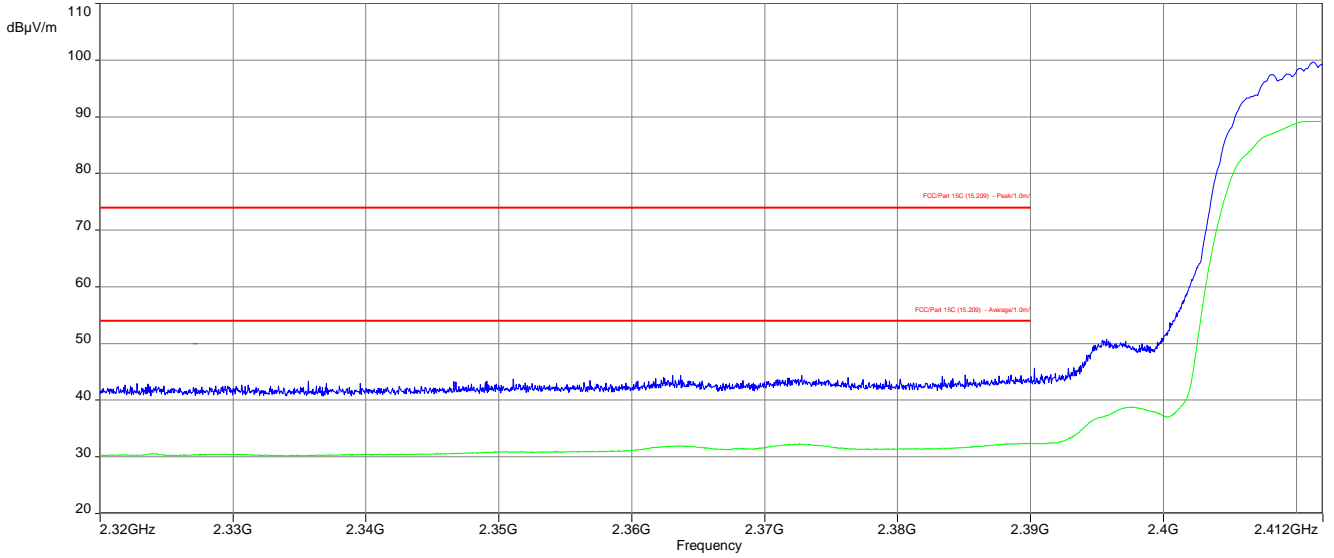


Plot 2: upper band edge, vertical & horizontal polarization, 2464 MHz

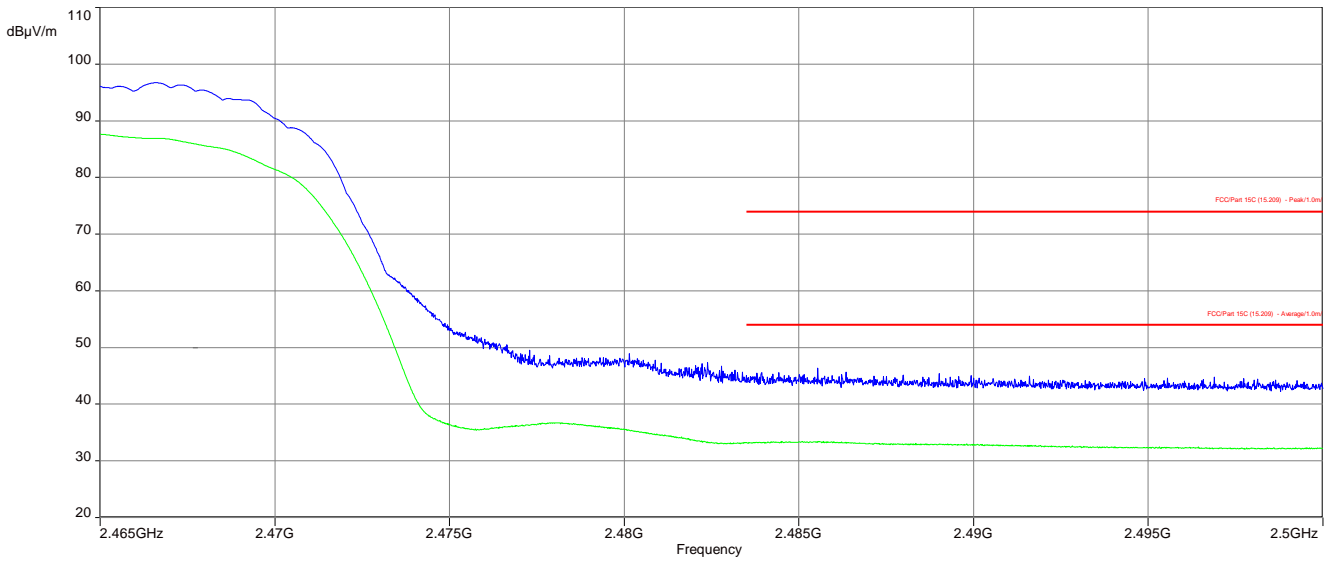


Plots: BPSK – mode / Antenna B

Plot 1: lower band edge, vertical & horizontal polarization, 2412 MHz

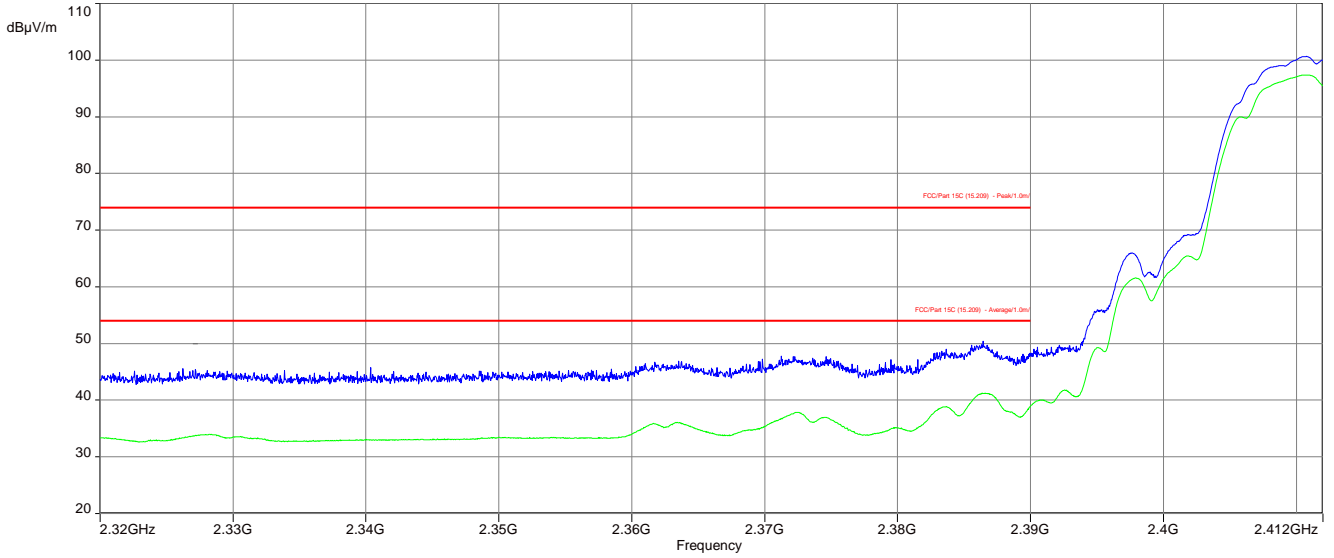


Plot 2: upper band edge, vertical & horizontal polarization, 2464 MHz

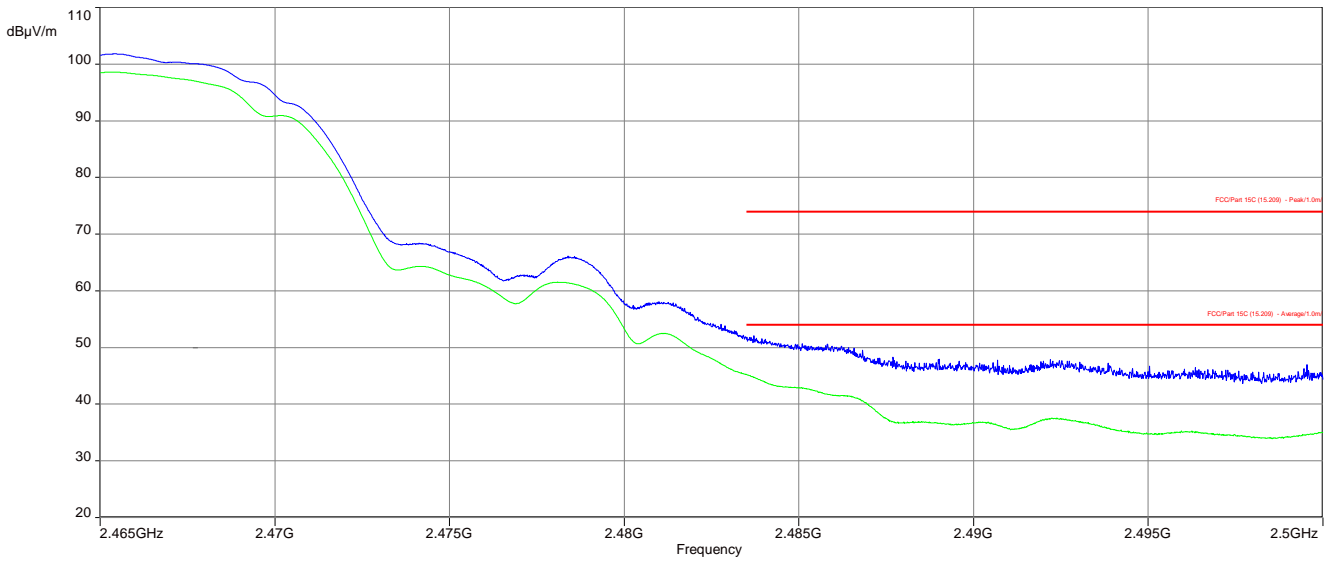


Plots: QPSK – mode / Antenna A

Plot 1: lower band edge, vertical & horizontal polarization, 2412 MHz

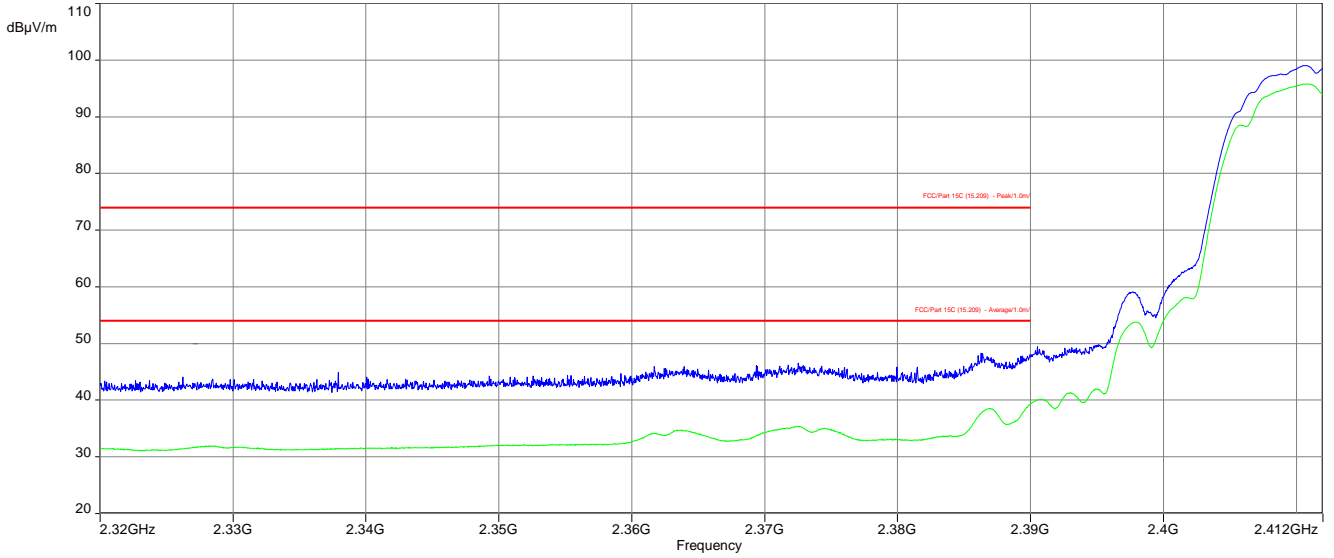


Plot 2: upper band edge, vertical & horizontal polarization, 2464 MHz

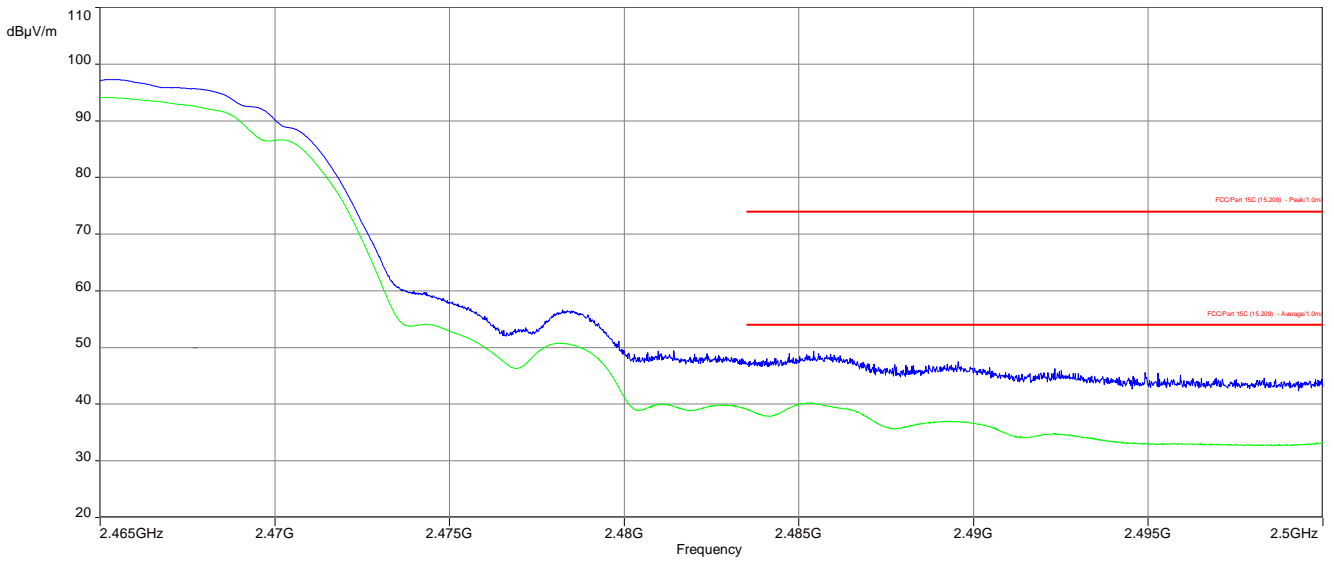


Plots: QPSK – mode / Antenna B

Plot 1: lower band edge, vertical & horizontal polarization, 2412 MHz



Plot 2: upper band edge, vertical & horizontal polarization, 2464 MHz



12.9 Band edge compliance conducted

Description:

Measurement of the radiated band edge compliance with a conducted test setup.

Measurement:

Measurement parameter for measurements	
According to DTS clause: 13.3.2 and clause 12.2.2	
Detector:	RMS
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	Lower band edge: 2388 MHz to 2390 MHz (2 MHz) Upper band edge: 2483.5 MHz to 2485.5 MHz (2 MHz)
Trace mode:	Trace average with 200 counts
Test setup:	See sub clause 7.5 – A
Measurement uncertainty	See sub clause 9

Limits:

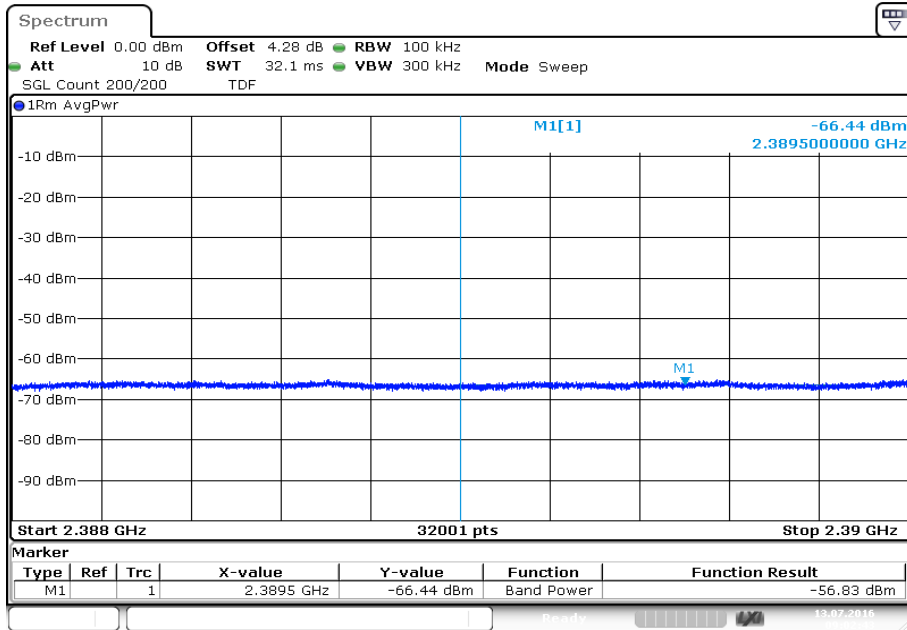
FCC	IC
-41.26 dBm	

Results:

Scenario Modulation	Band edge compliance [dBm] (including 3.2 dBi antenna gain)			
	BPSK – mode	QPSK – mode	-/-	-/-
Max. lower band edge power / Antenna A	-56.8	-62.7	-/-	-/-
Max. upper band edge power / Antenna A	-57.7	-65.5	-/-	-/-
Max. lower band edge power / Antenna B	-62.0	-56.2	-/-	-/-
Max. upper band edge power / Antenna B	-70.0	-52.7	-/-	-/-

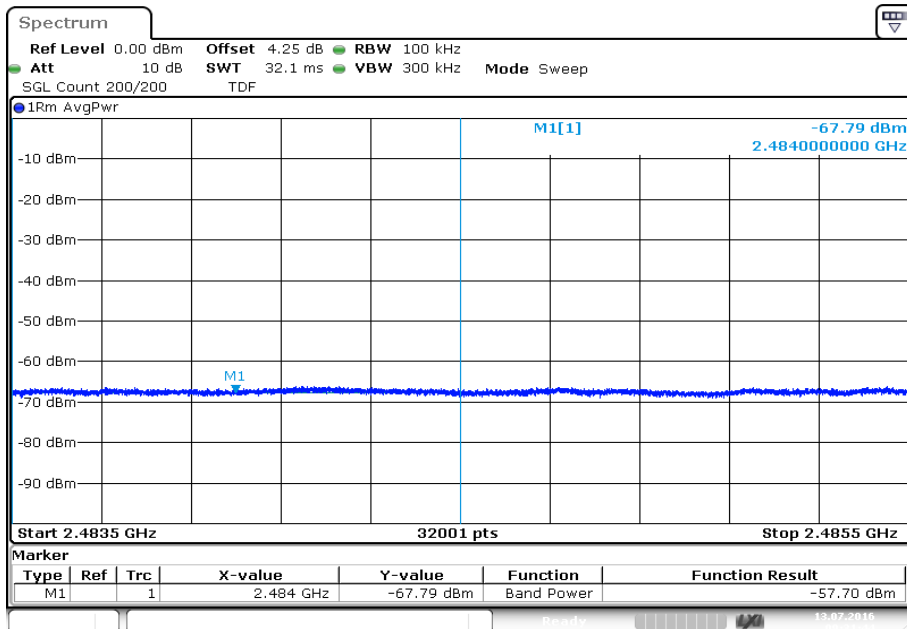
Plots: BPSK – mode / Antenna A

Plot 1: Lower band edge



Date: 13.JUL.2016 09:02:43

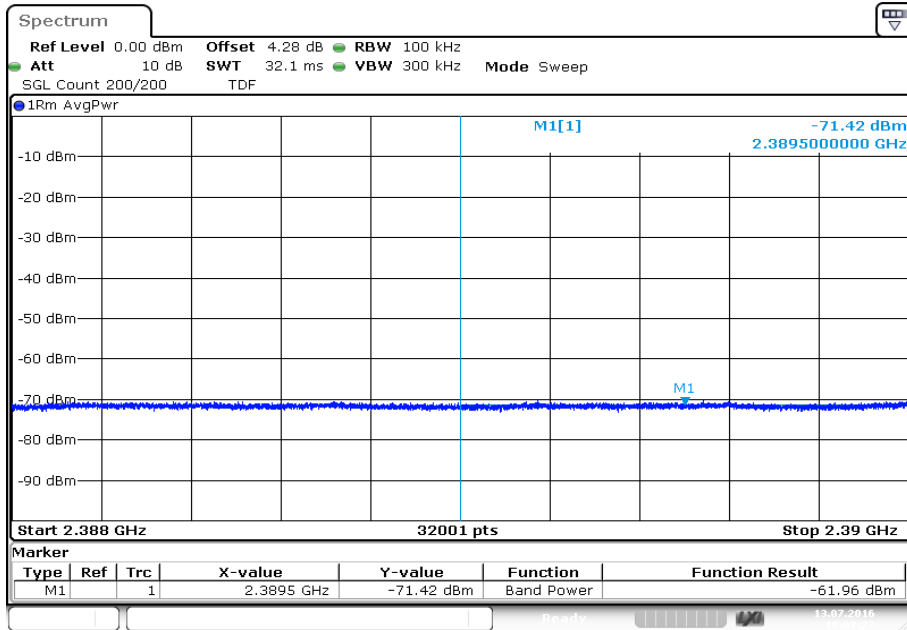
Plot 2: Upper band edge



Date: 13.JUL.2016 09:31:44

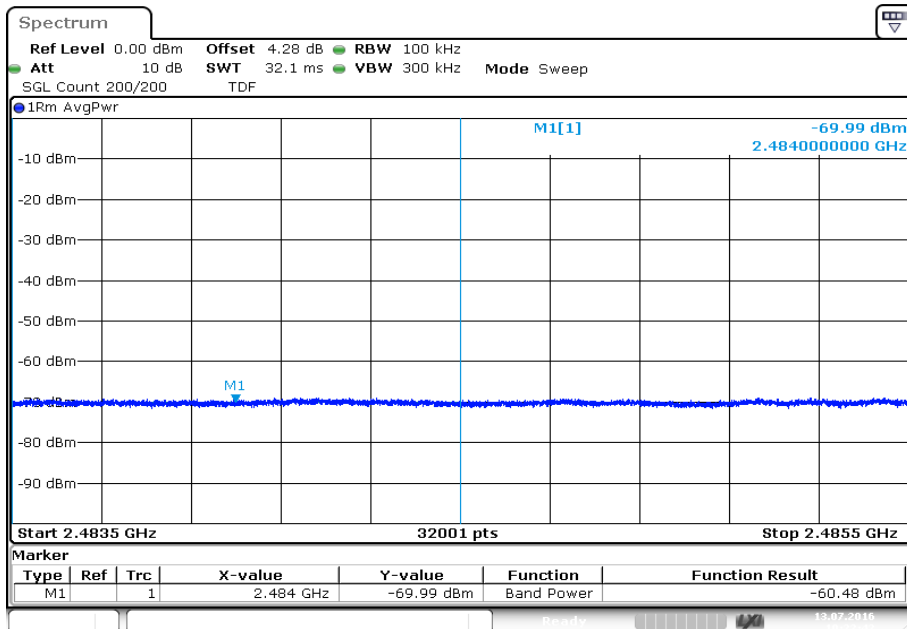
Plots: BPSK – mode / Antenna B

Plot 1: Lower band edge



Date: 13.JUL.2016 10:07:28

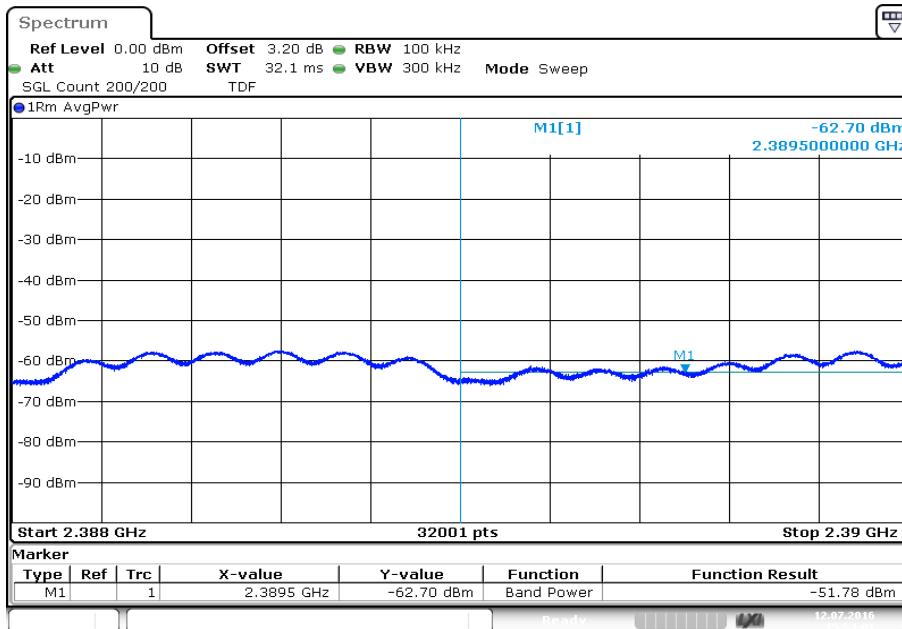
Plot 2: Upper band edge



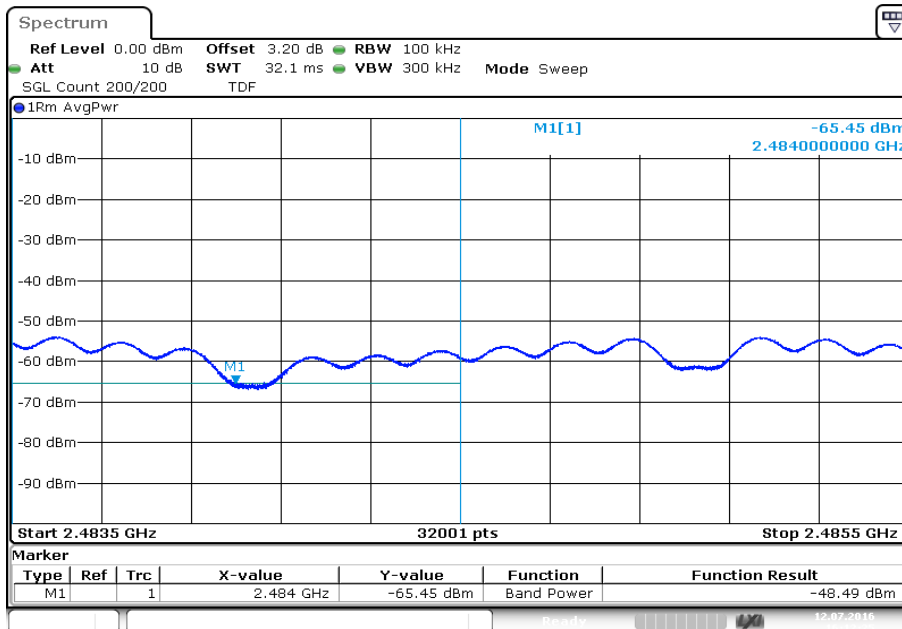
Date: 13.JUL.2016 10:22:42

Plots: QPSK – mode / Antenna A

Plot 1: Lower band edge

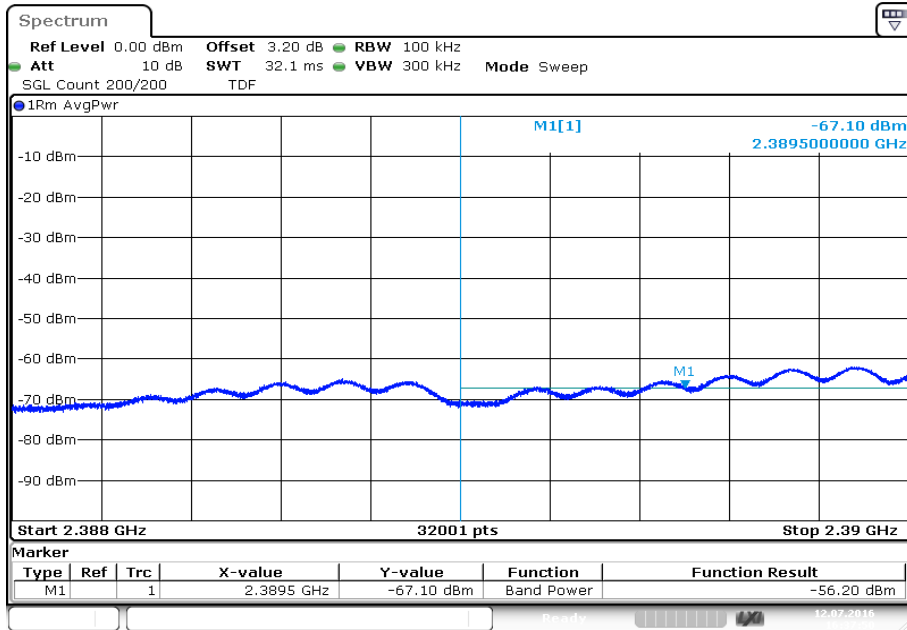


Plot 2: Upper band edge



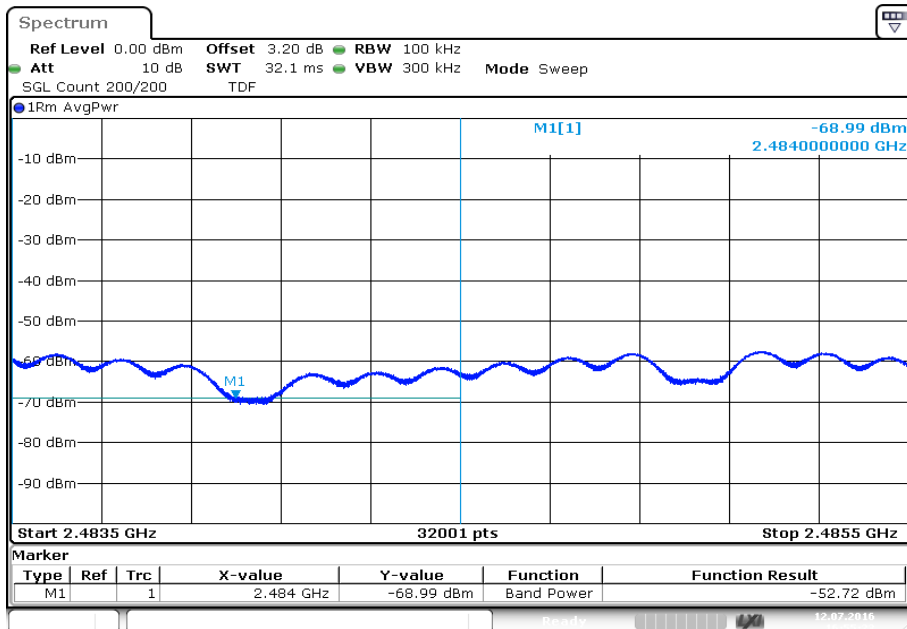
Plots: QPSK – mode / Antenna B

Plot 1: Lower band edge



Date: 12.JUL.2016 16:37:50

Plot 2: Upper band edge



Date: 12.JUL.2016 16:55:23

12.10 Spurious emissions conducted

Description:

Measurement of the conducted spurious emissions in transmit mode. The measurement is performed at channel 1, 6 and 11. The measurement is repeated for all modulations.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	500 kHz
Span:	9 kHz to 25 GHz
Trace mode:	Max Hold
Test setup:	See sub clause 7.5 – A
Measurement uncertainty	See sub clause 9

Limits:

FCC	IC
<p>In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required</p>	

Results: BPSK – mode / Antenna A

TX Spurious Emissions Conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		-0.7	30 dBm	-/-	Operating frequency
No peaks detected. All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2438		-1.8	30 dBm	-/-	Operating frequency
No peaks detected. All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2464		-2.5	30 dBm	-/-	Operating frequency
No peaks detected. All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

Results: BPSK – mode / Antenna B

TX Spurious Emissions Conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		-7.6	30 dBm	-/-	Operating frequency
No peaks detected. All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2438		-7.0	30 dBm	-/-	Operating frequency
No peaks detected. All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2464		-6.9	30 dBm	-/-	Operating frequency
No peaks detected. All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

Results: QPSK – mode / Antenna A

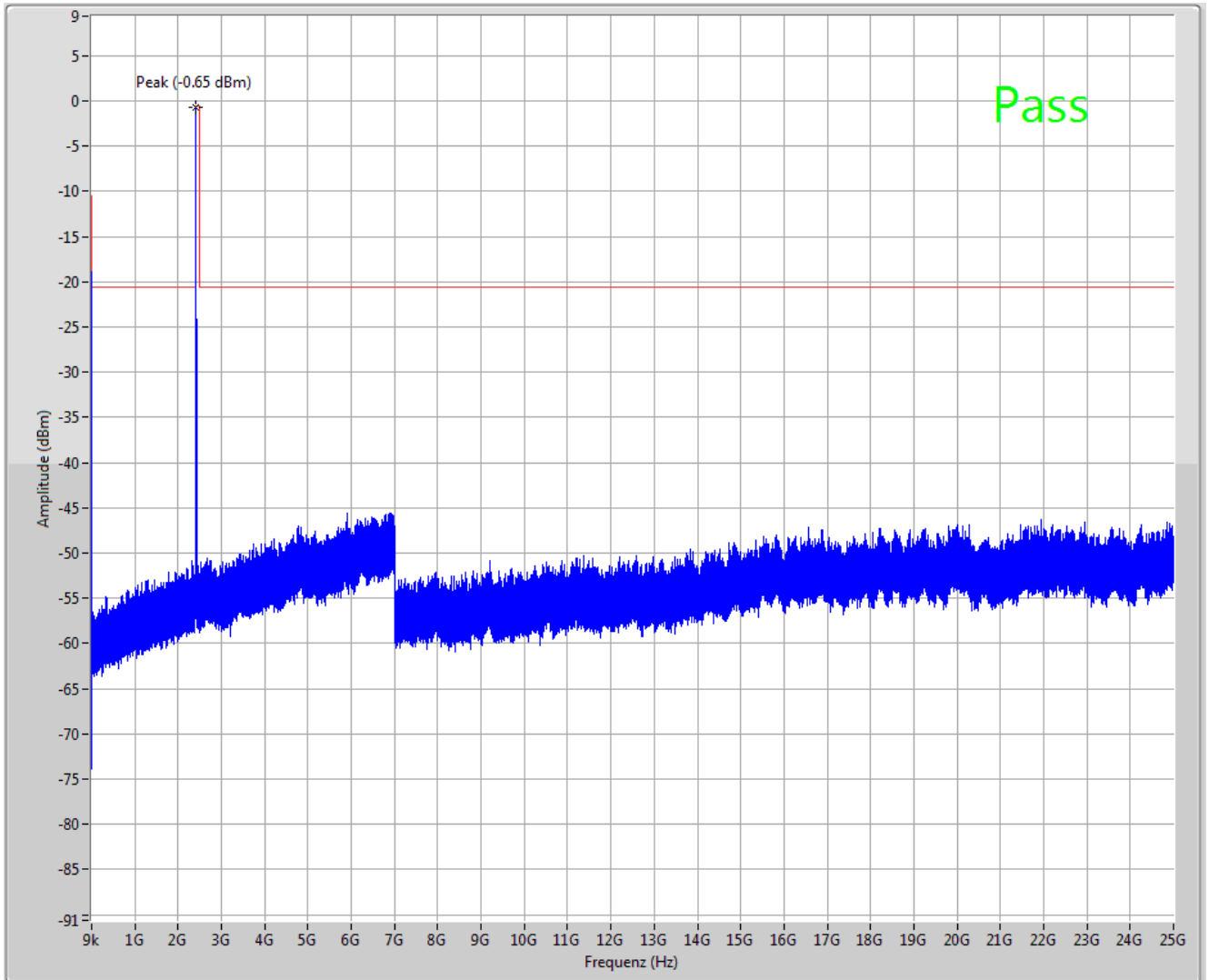
TX Spurious Emissions Conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		-0.5	30 dBm	-/-	Operating frequency
No peaks detected. All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2438		-1.6	30 dBm	-/-	Operating frequency
No peaks detected. All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2464		-2.7	30 dBm	-/-	Operating frequency
No peaks detected. All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

Results: QPSK – mode / Antenna B

TX Spurious Emissions Conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		-8.6	30 dBm	-/-	Operating frequency
No peaks detected. All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2438		-8.4	30 dBm	-/-	Operating frequency
No peaks detected. All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2464		-7.2	30 dBm	-/-	Operating frequency
No peaks detected. All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

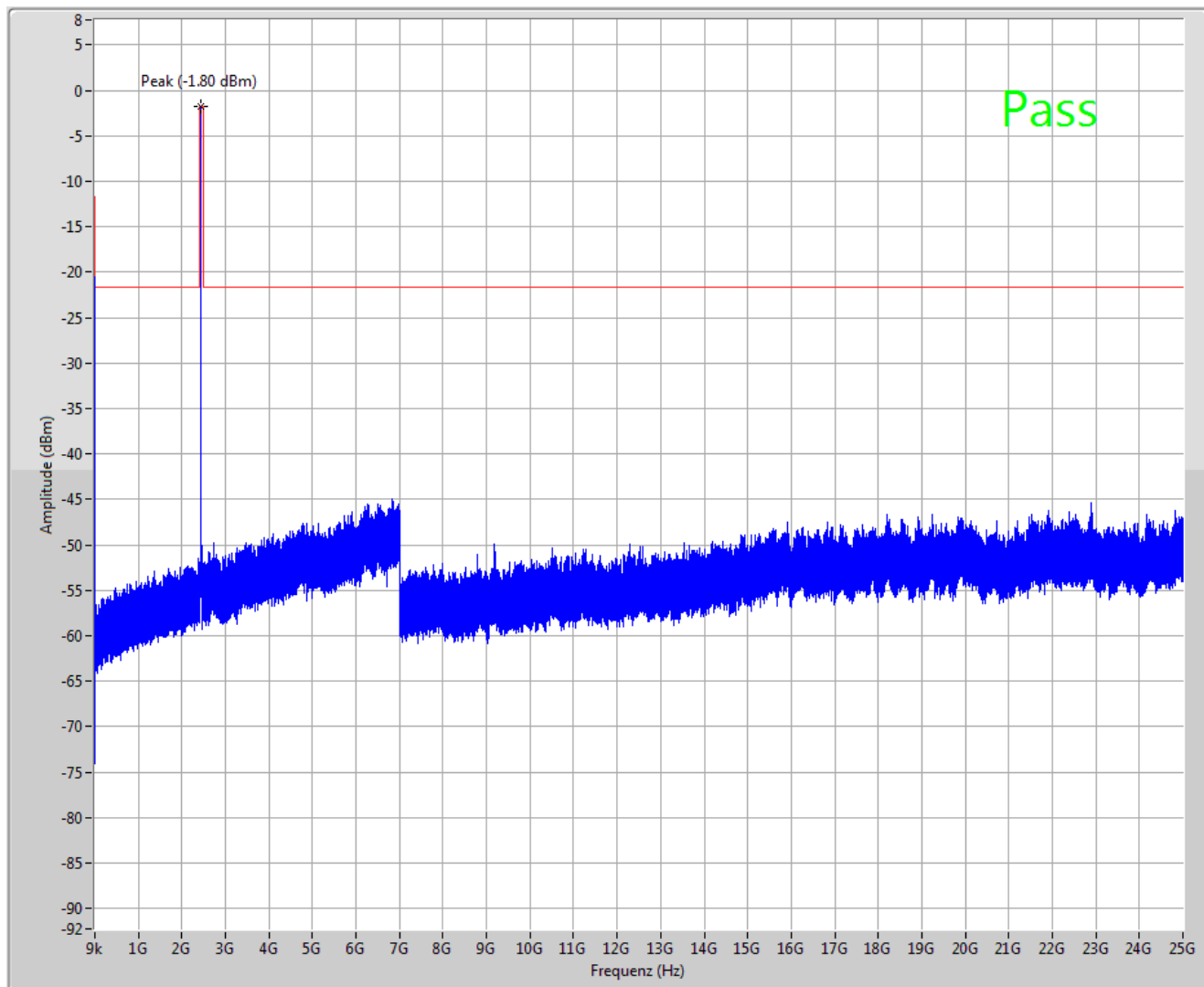
Plots: BPSK – mode / Antenna A

Plot 1: Lowest channel, up to 25 GHz



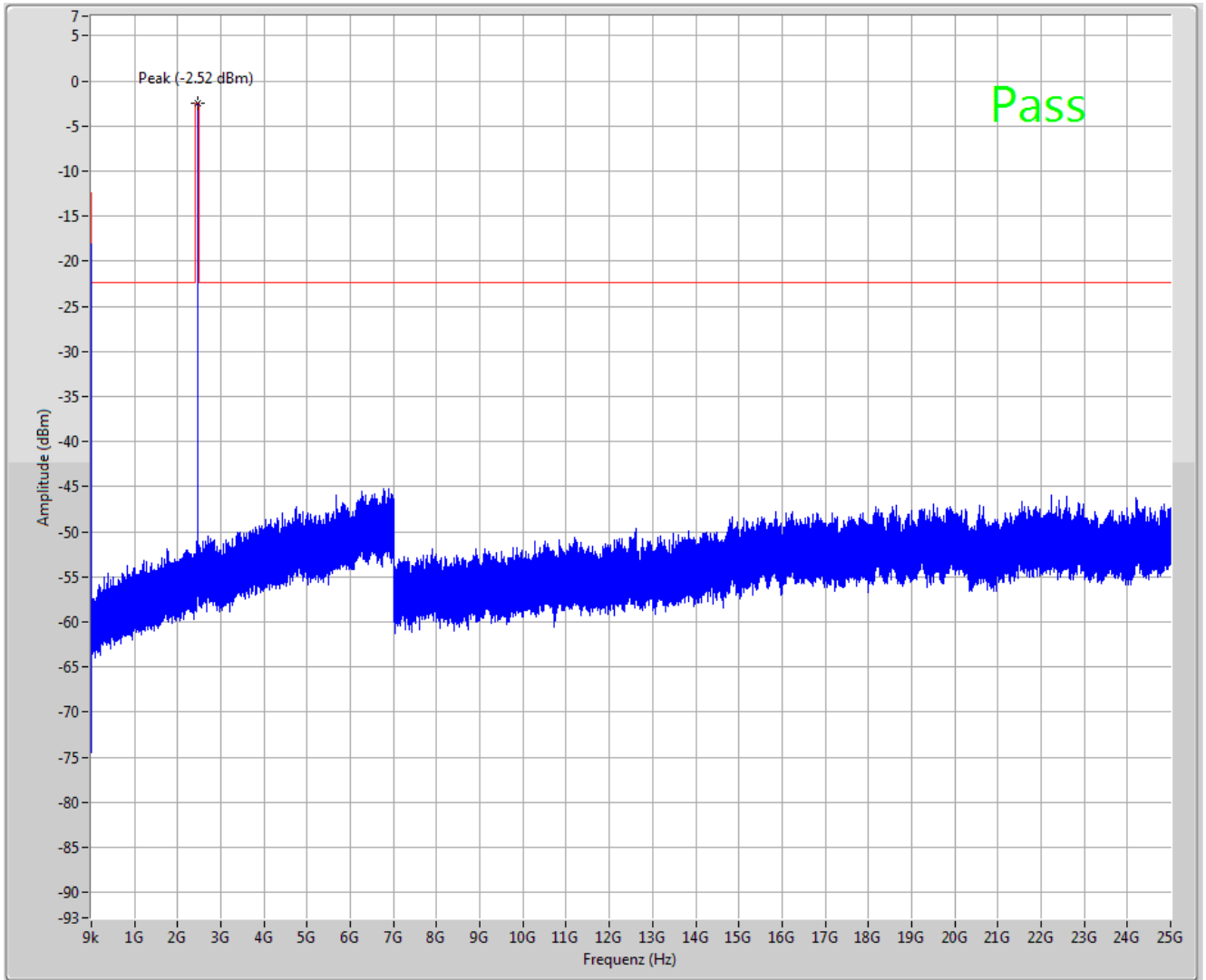
The peak at the beginning of the plot is the LO from the SA.

Plot 2: Middle channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

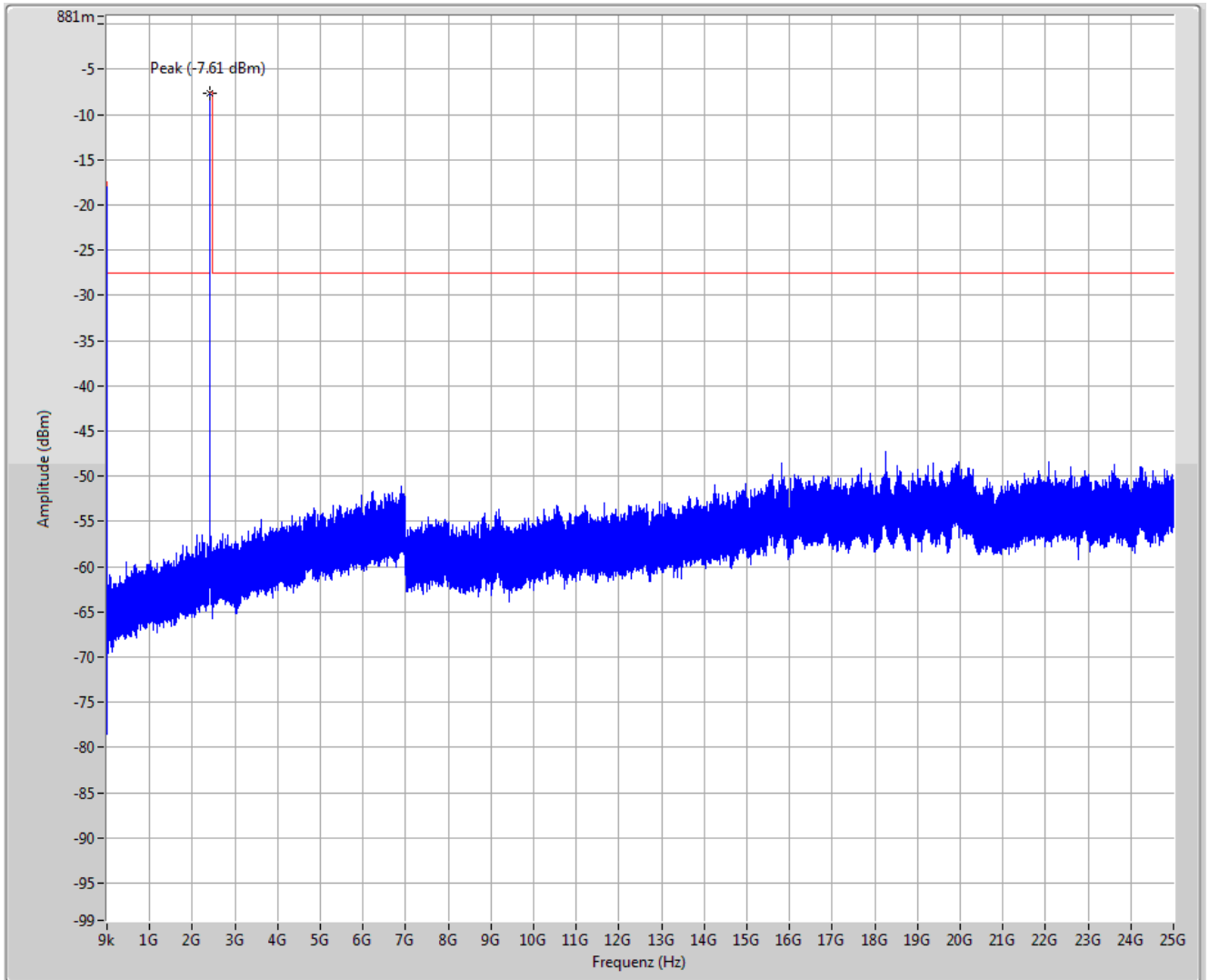
Plot 5: Highest channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

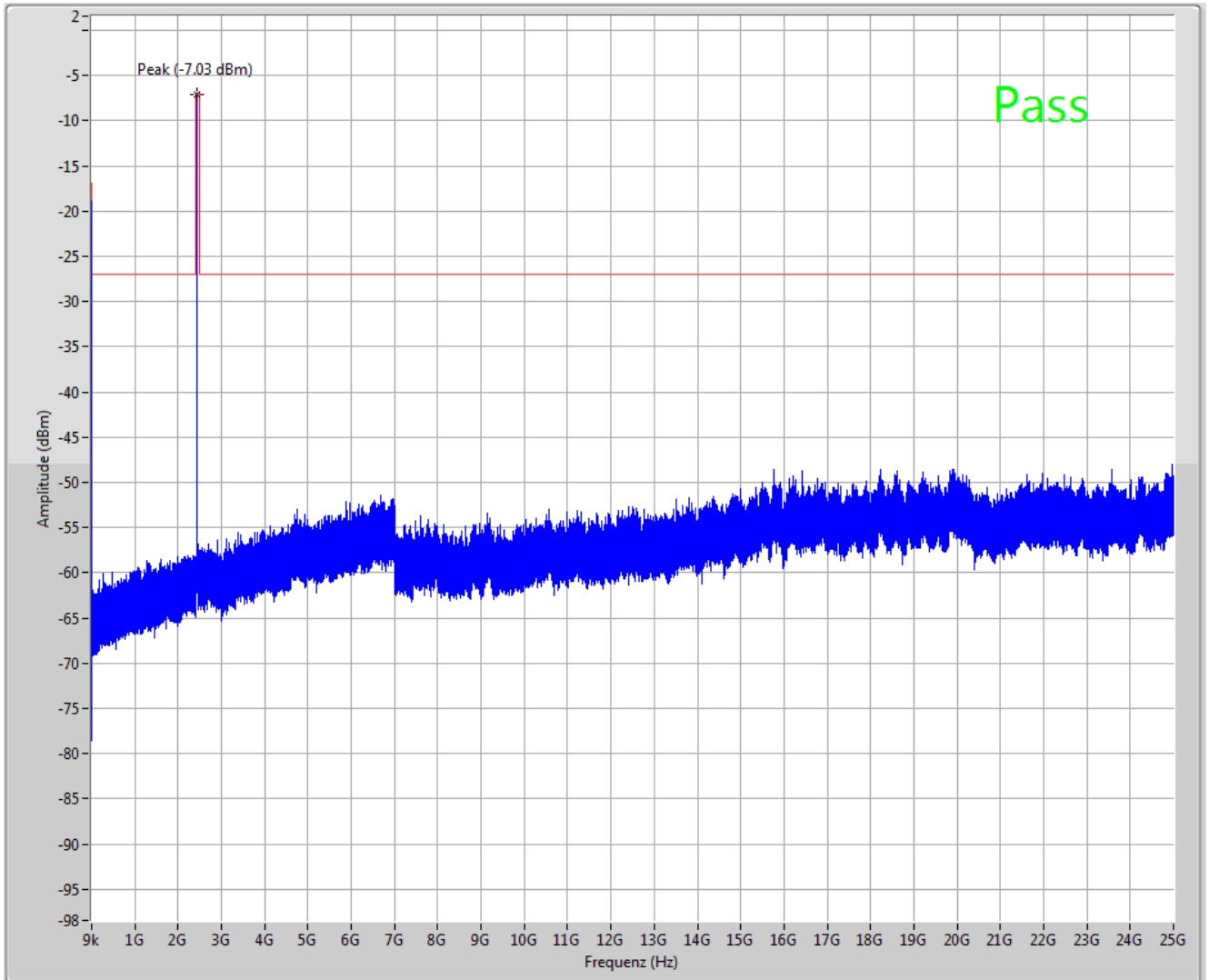
Plots: BPSK – mode / Antenna B

Plot 1: Lowest channel, up to 25 GHz



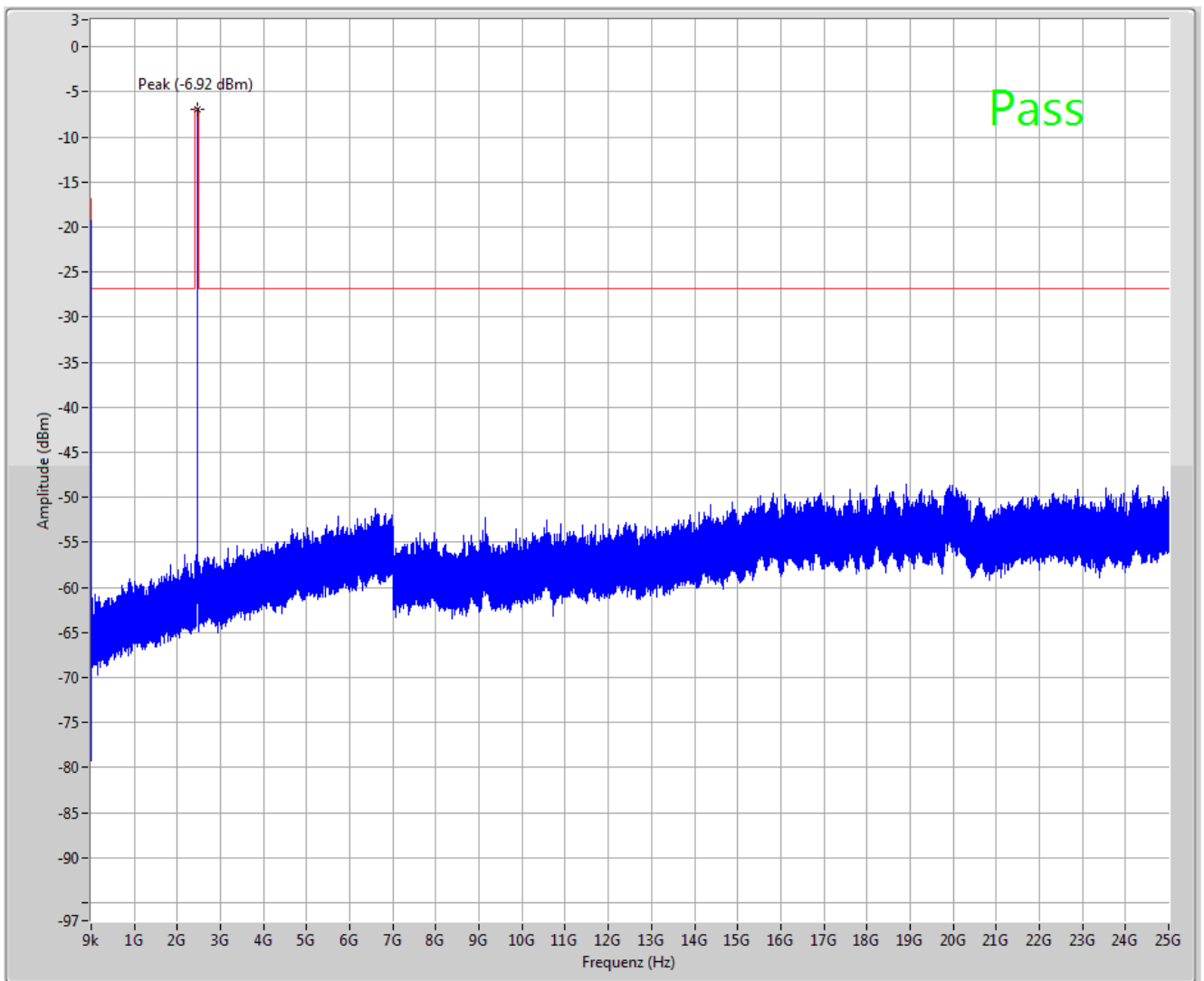
The peak at the beginning of the plot is the LO from the SA.

Plot 2: Middle channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

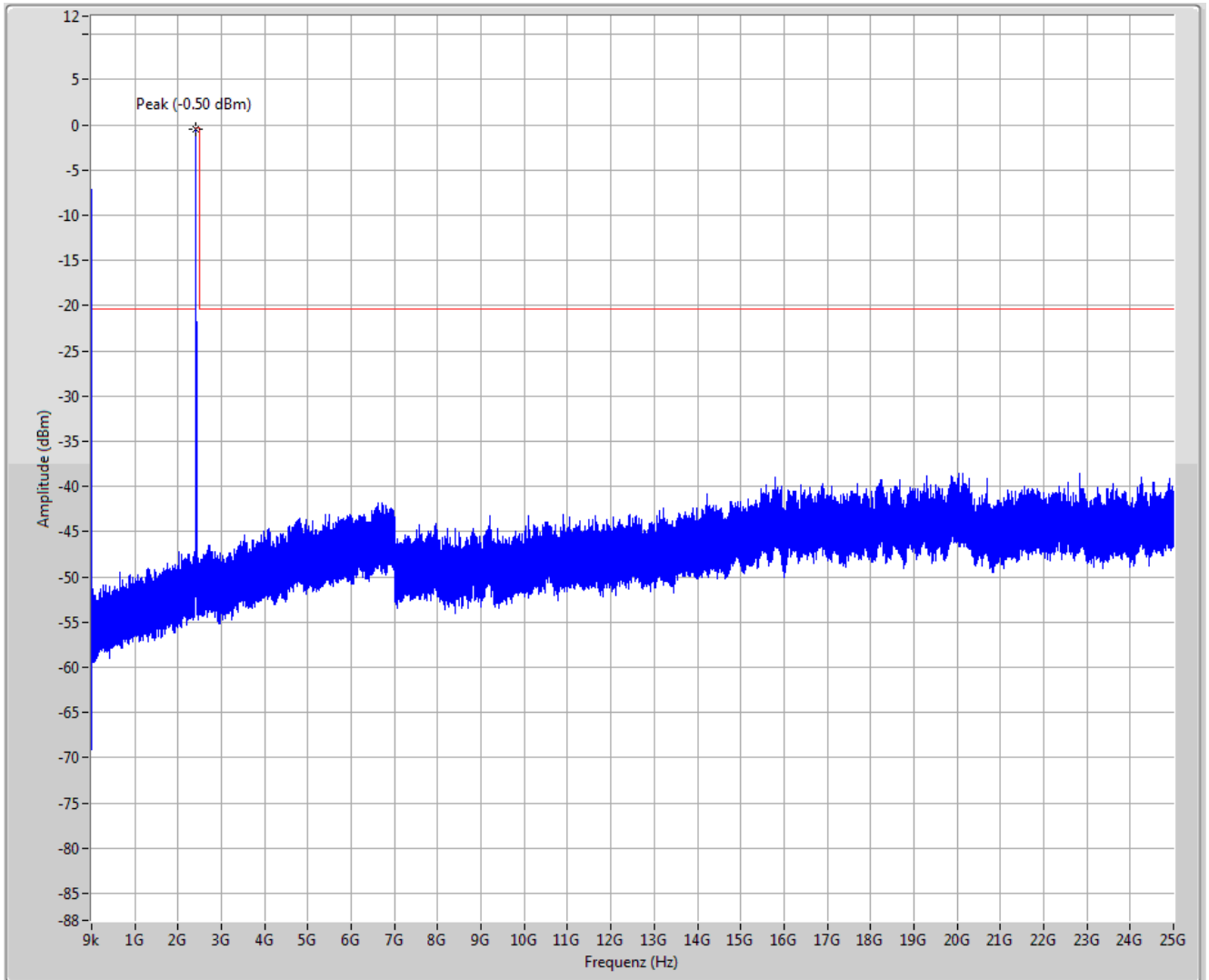
Plot 3: Highest channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

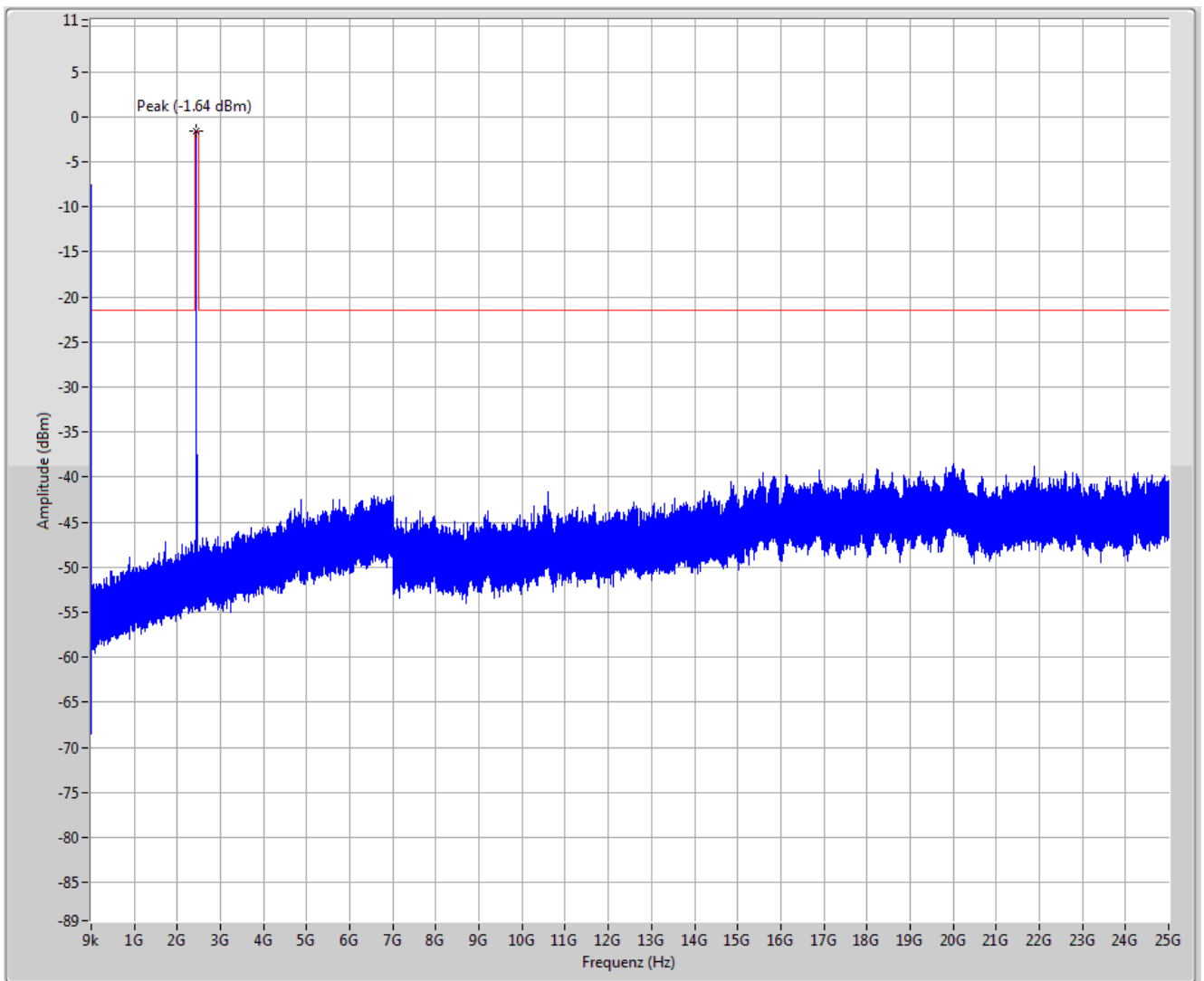
Plots: QPSK – mode / Antenna A

Plot 1: Lowest channel, up to 25 GHz



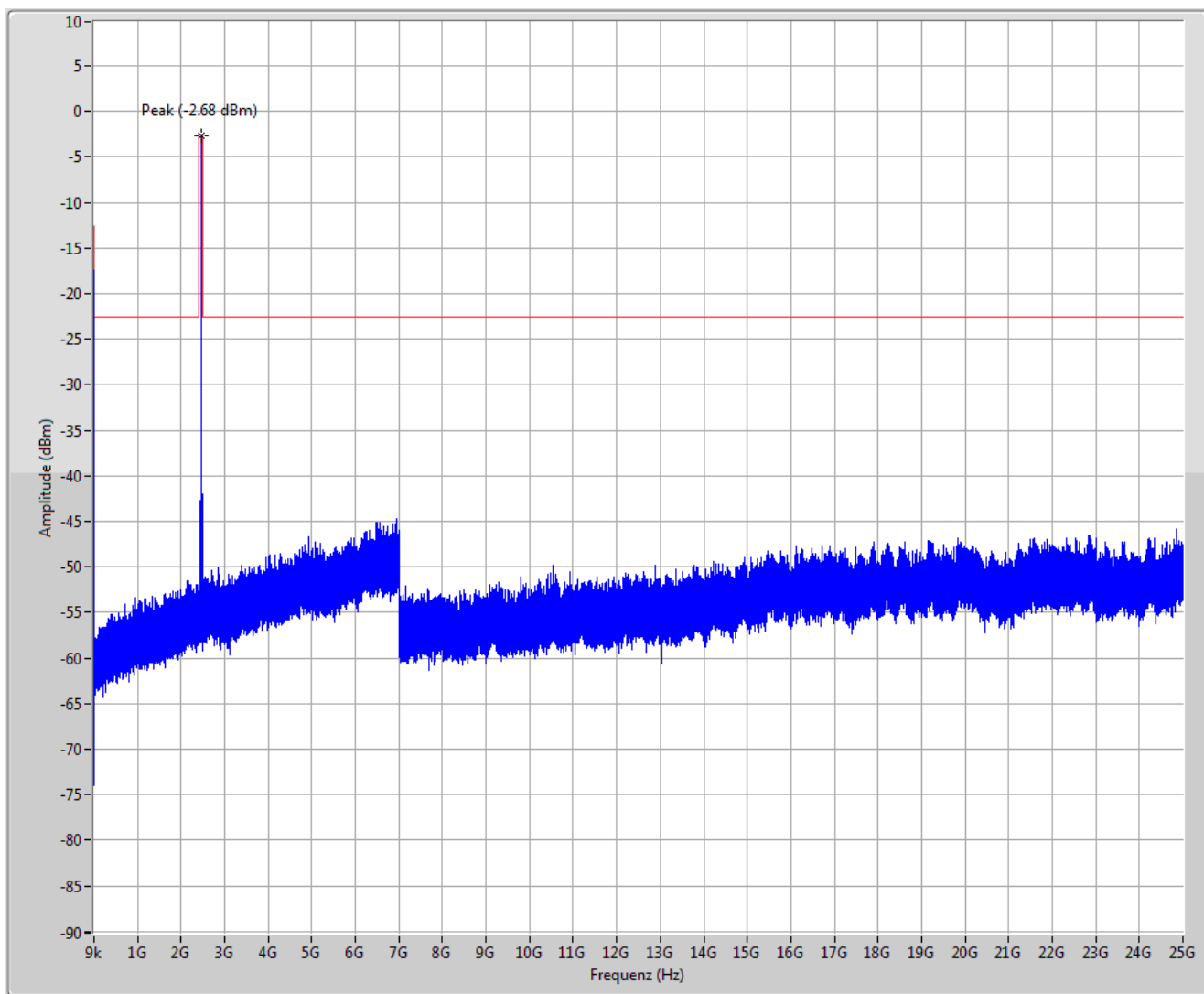
The peak at the beginning of the plot is the LO from the SA.

Plot 2: Middle channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

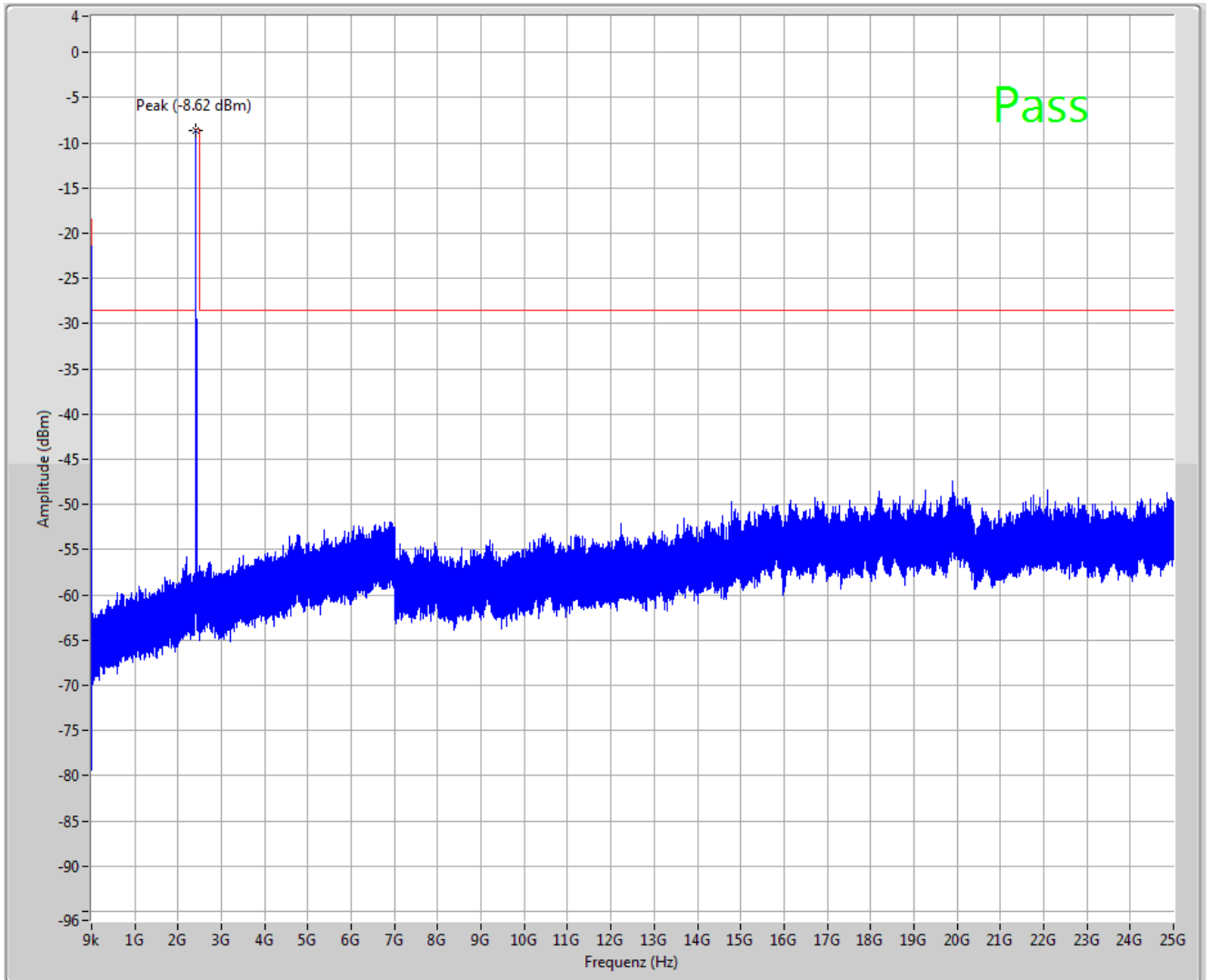
Plot 5: Highest channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

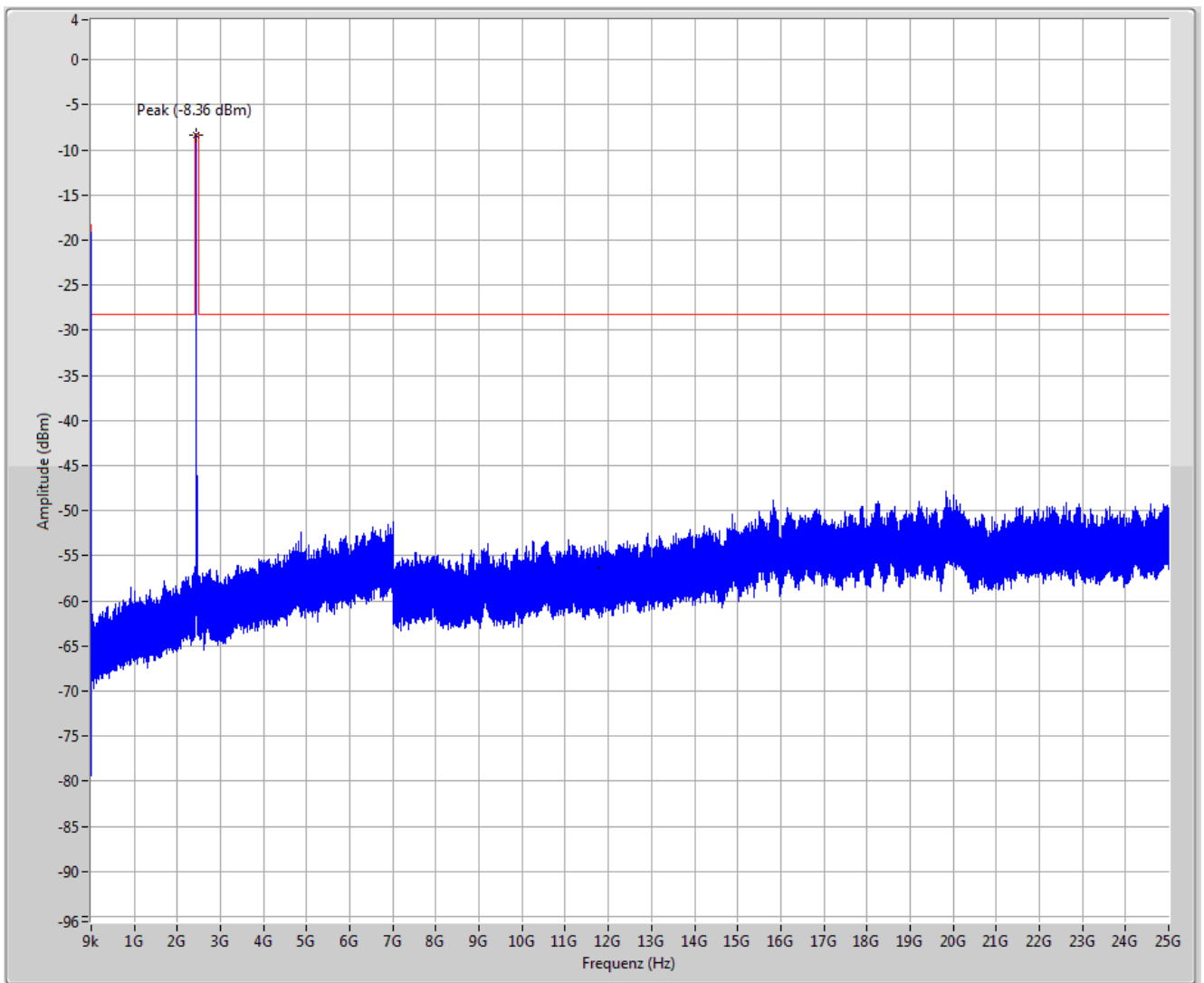
Plots: QPSK – mode / Antenna B

Plot 1: Lowest channel, up to 25 GHz



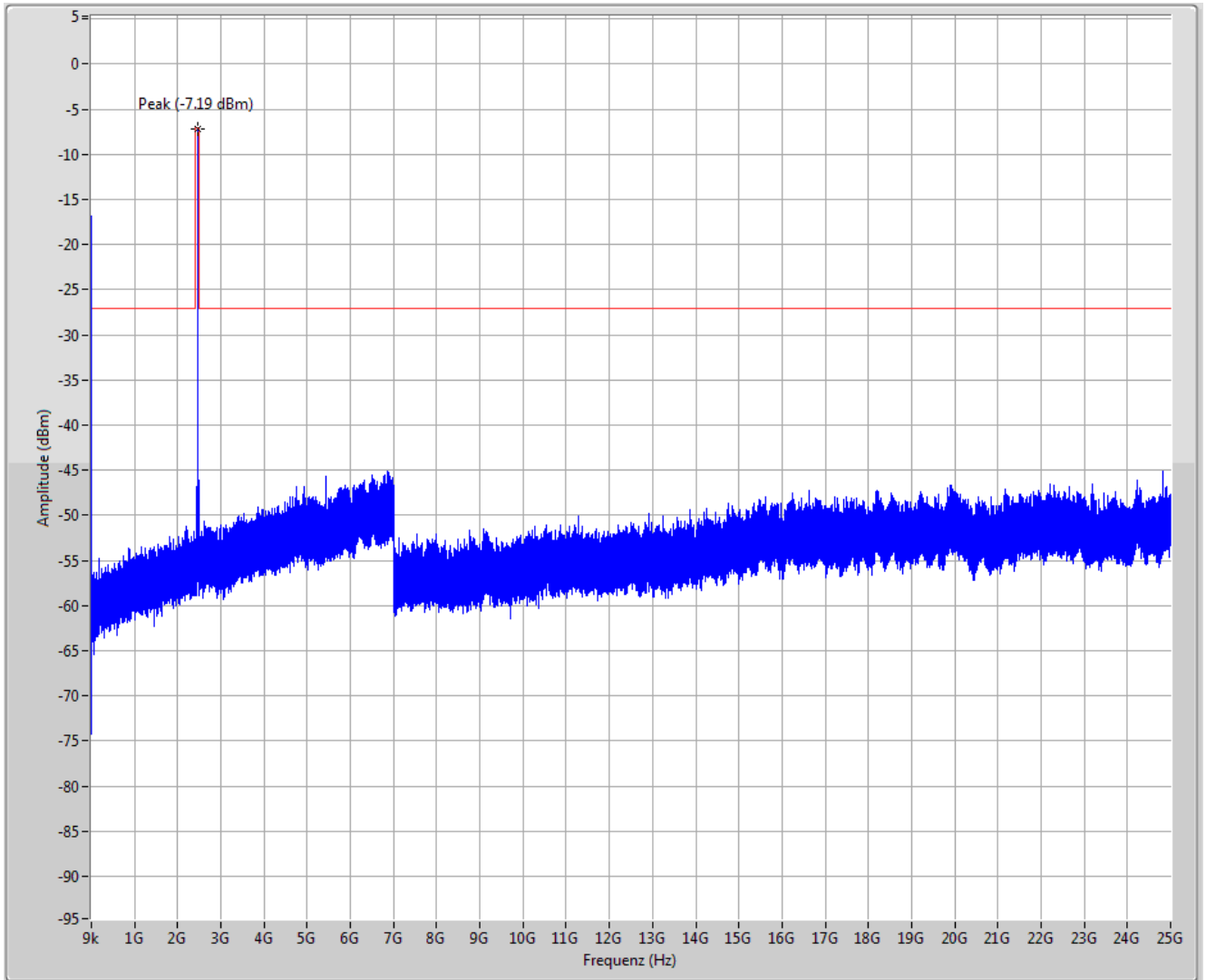
The peak at the beginning of the plot is the LO from the SA.

Plot 2: Middle channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

Plot 5: Highest channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

12.11 Spurious emissions radiated below 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 6. This measurement is representative for all channels and modes. If peaks are found channel 1 and channel 11 will be measured too. The measurement is performed with the data rate producing the highest output power. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
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
Measured modulation	<input checked="" type="checkbox"/> QPSK <input checked="" type="checkbox"/> BPSK
Test setup:	See sub clause 7.1 - B
Measurement uncertainty	See sub clause 9

Limits:

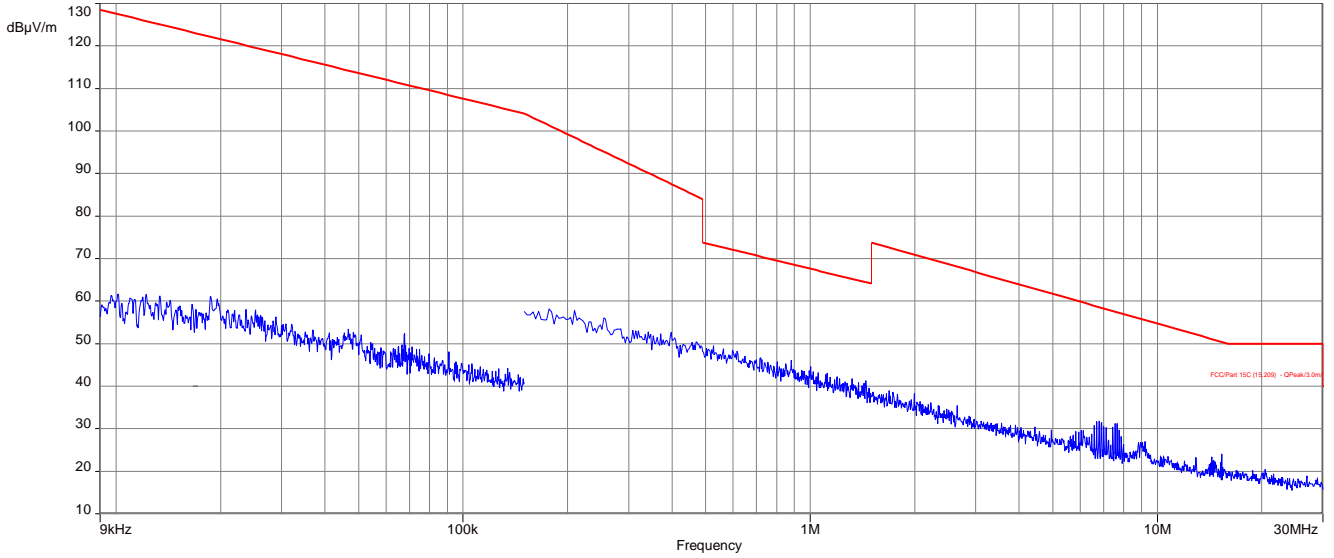
FCC		IC
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Results:

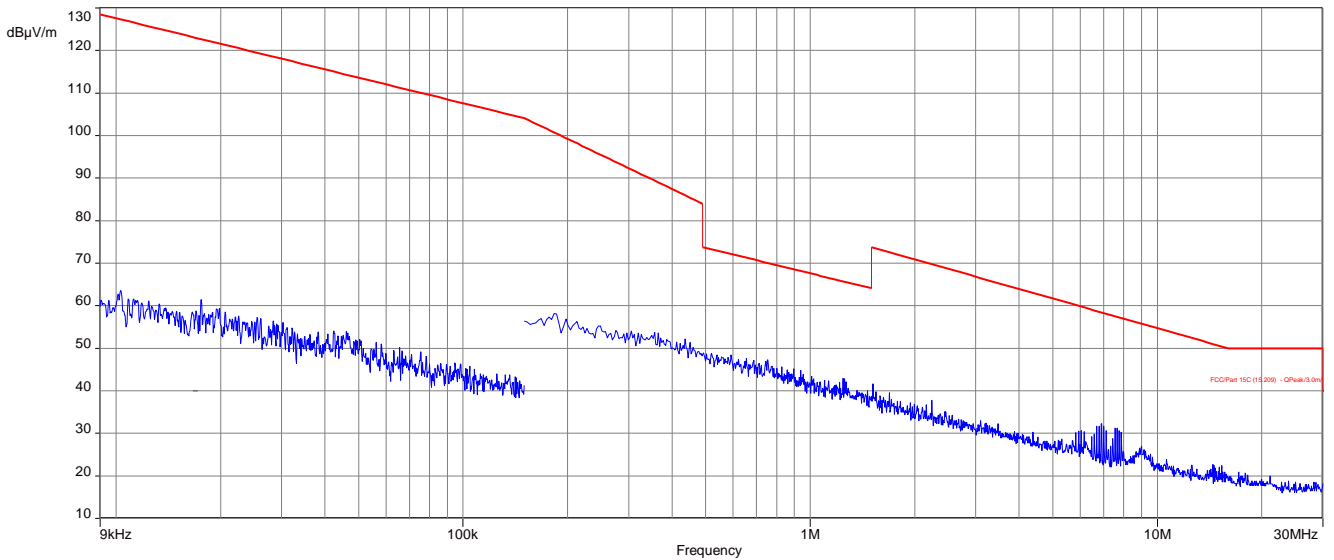
TX Spurious Emissions Radiated < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected peaks are more than 20 dB below the limit.		

Plots: BPSK – mode / Antenne A

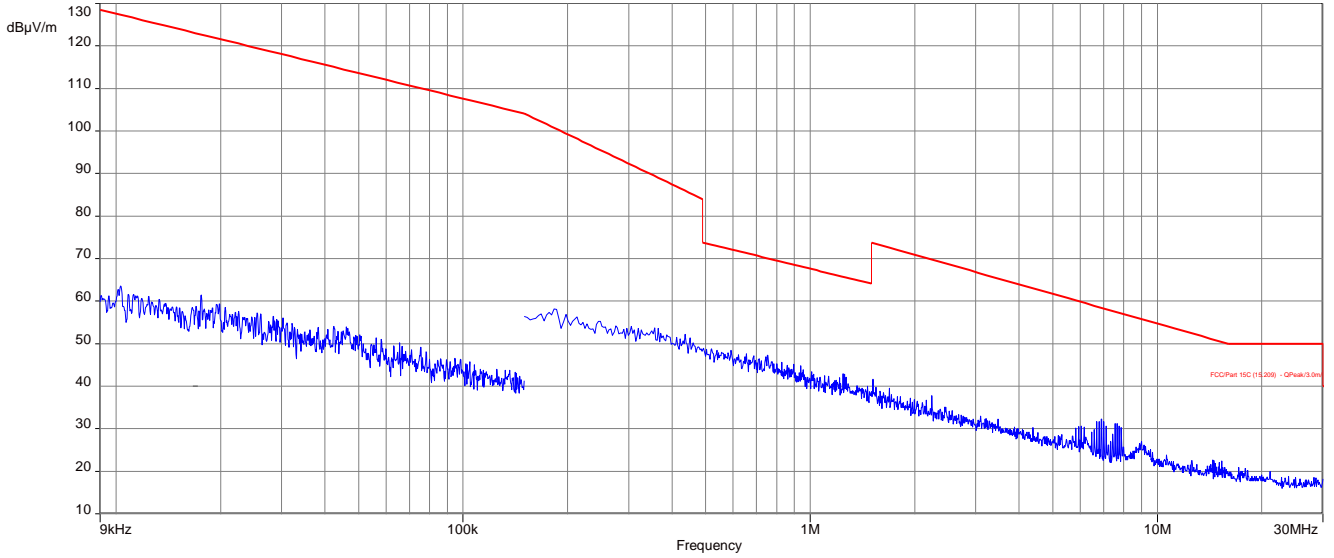
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel

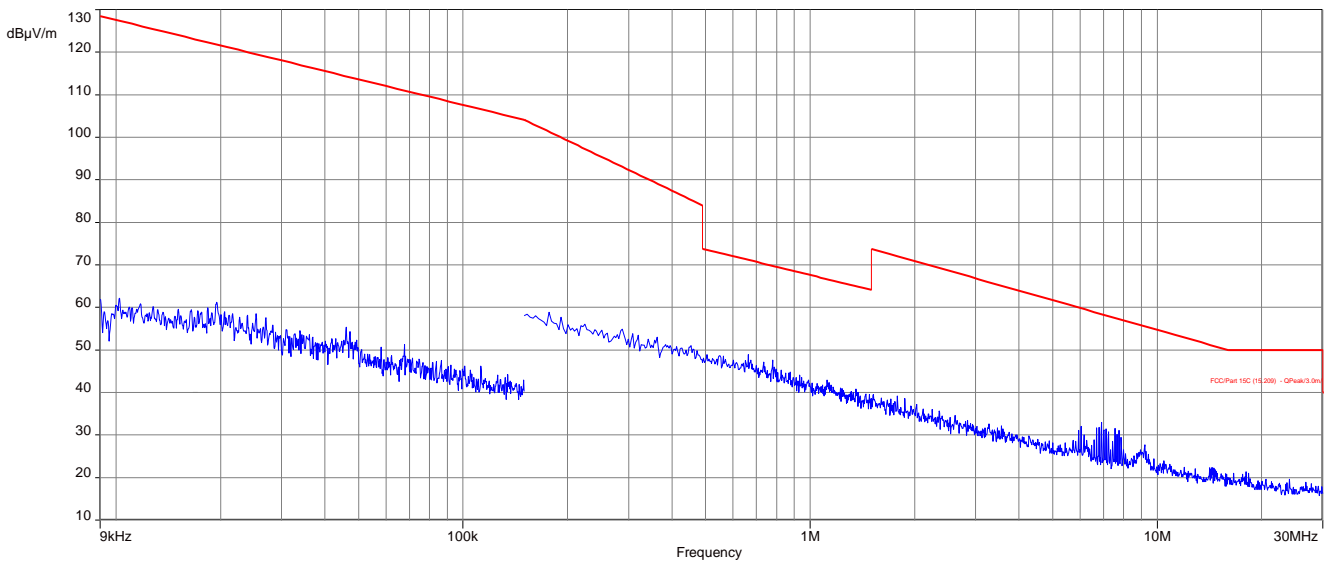


Plot 3: 9 kHz to 30 MHz, high channel

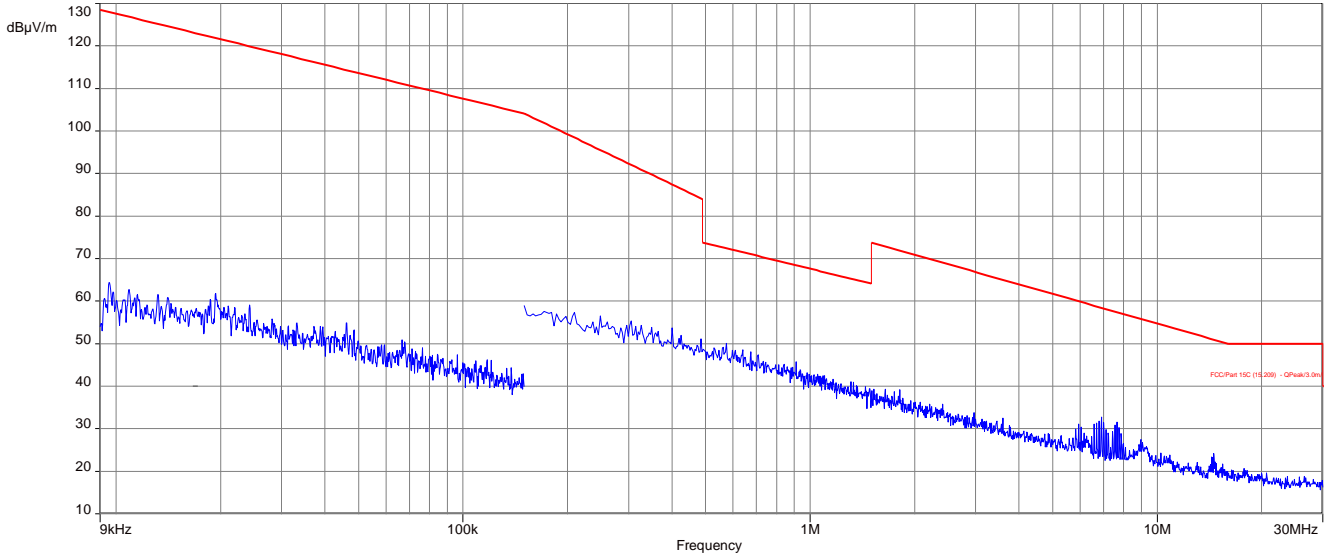


Plots: BPSK – mode / Antenne B

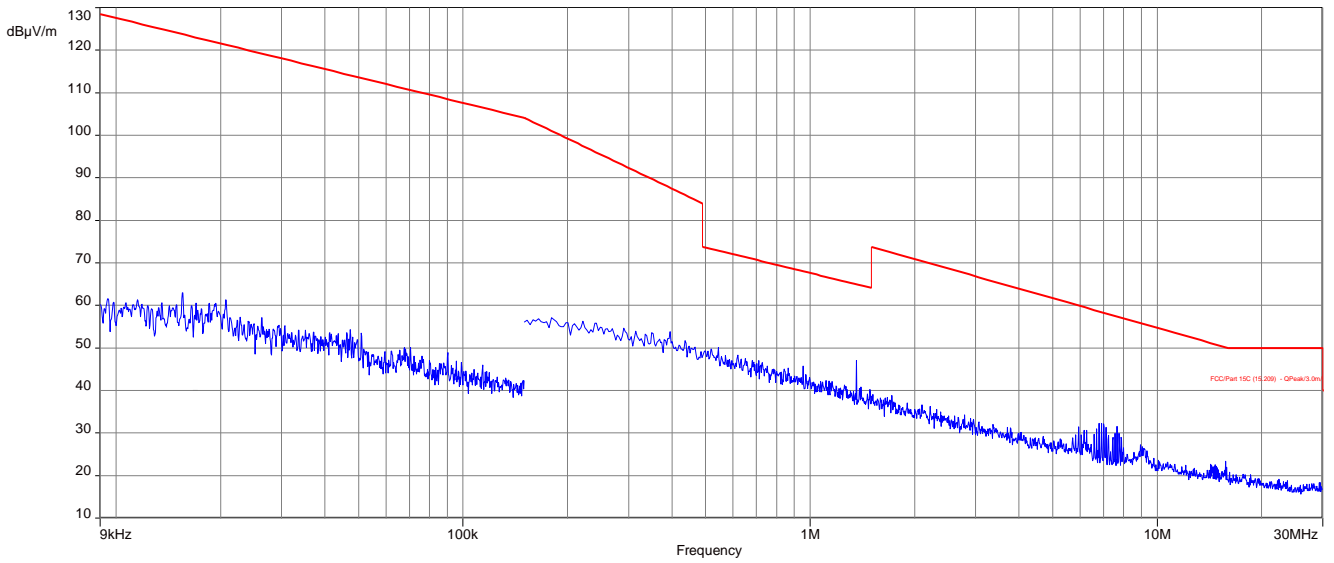
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel

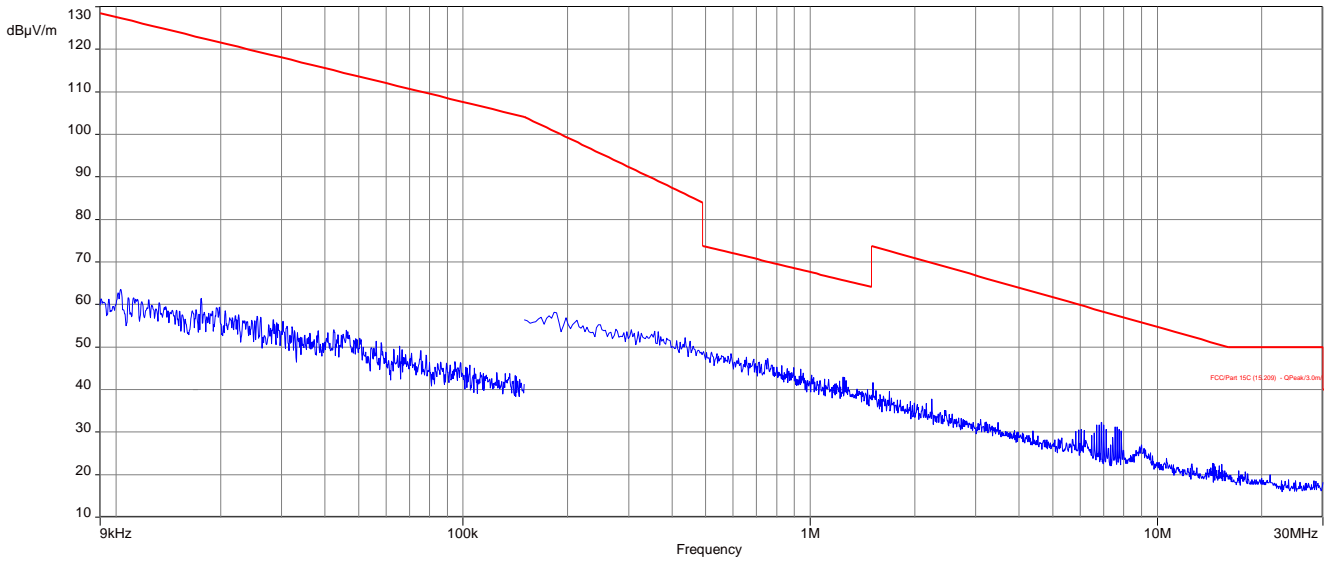


Plot 3: 9 kHz to 30 MHz, high channel

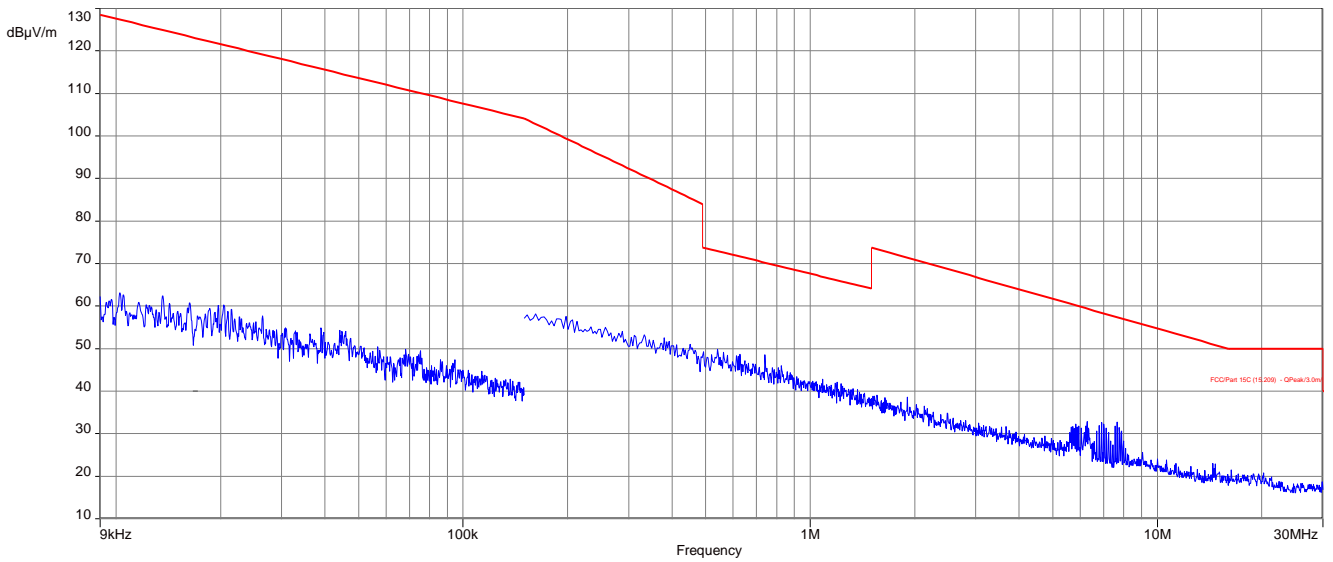


Plots: QPSK – mode / Antenna A

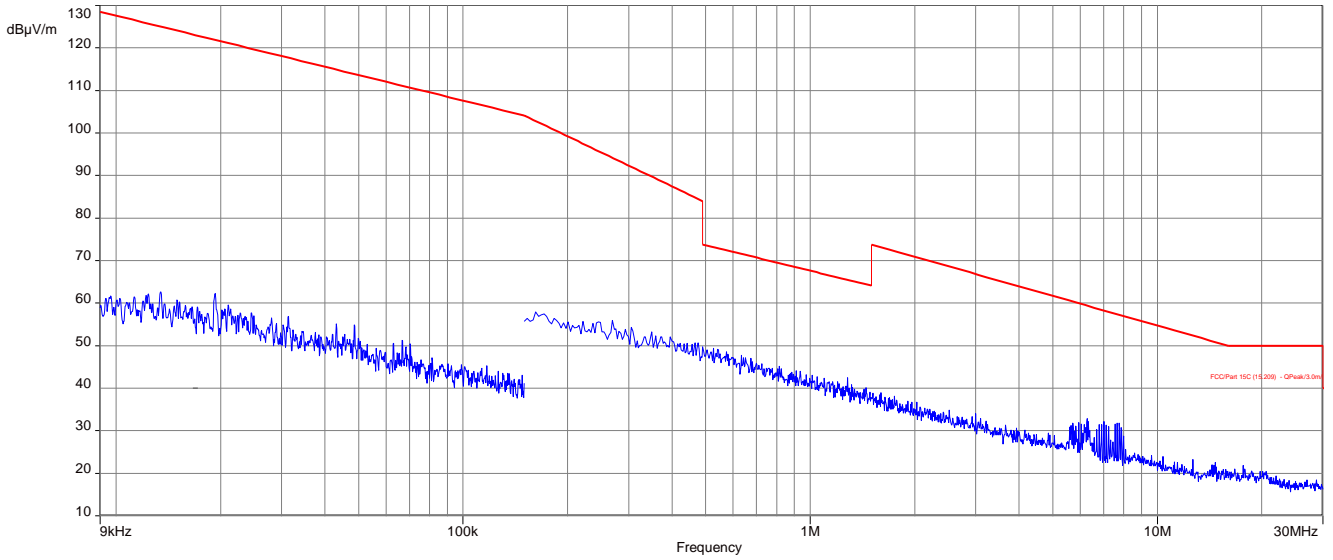
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel

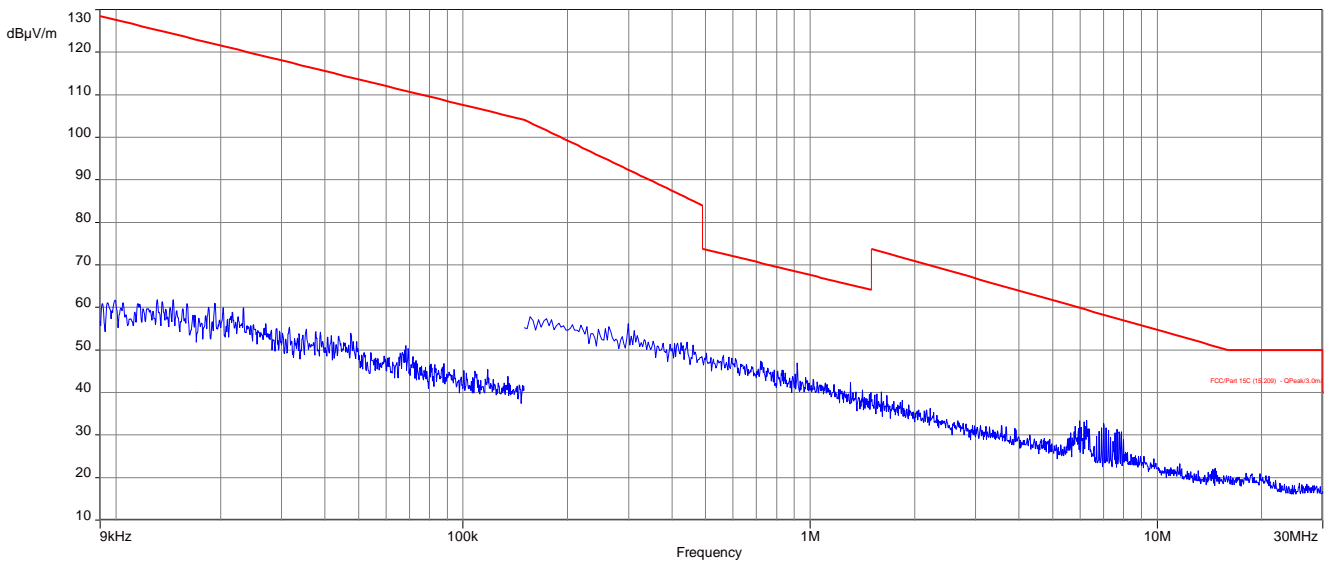


Plot 3: 9 kHz to 30 MHz, high channel

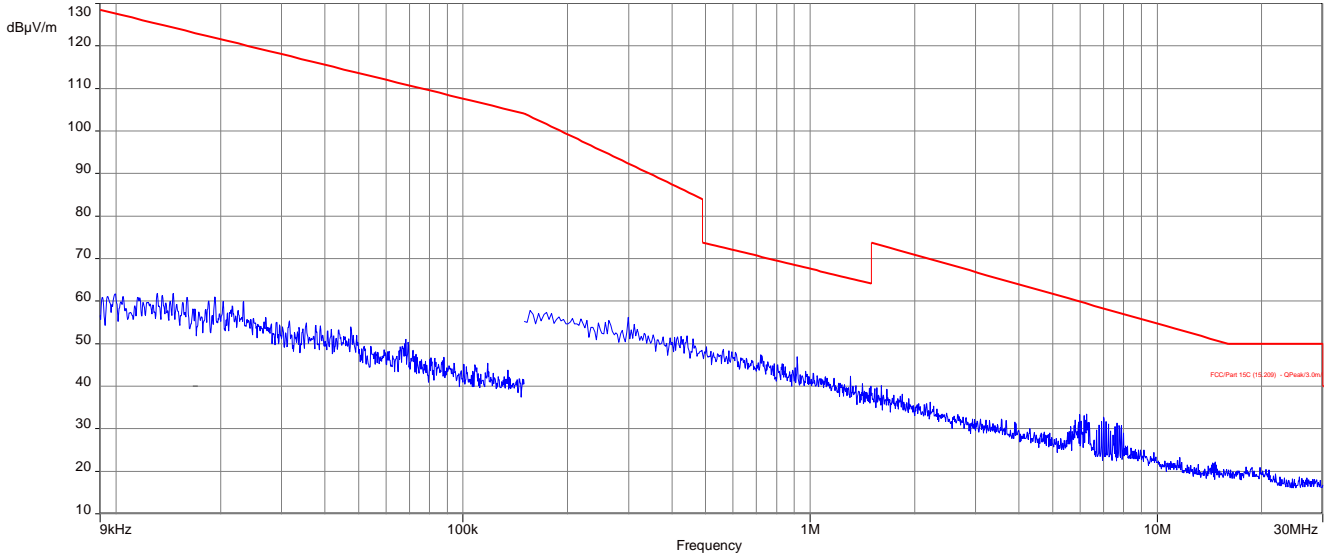


Plots: QPSK – mode / Antenna B

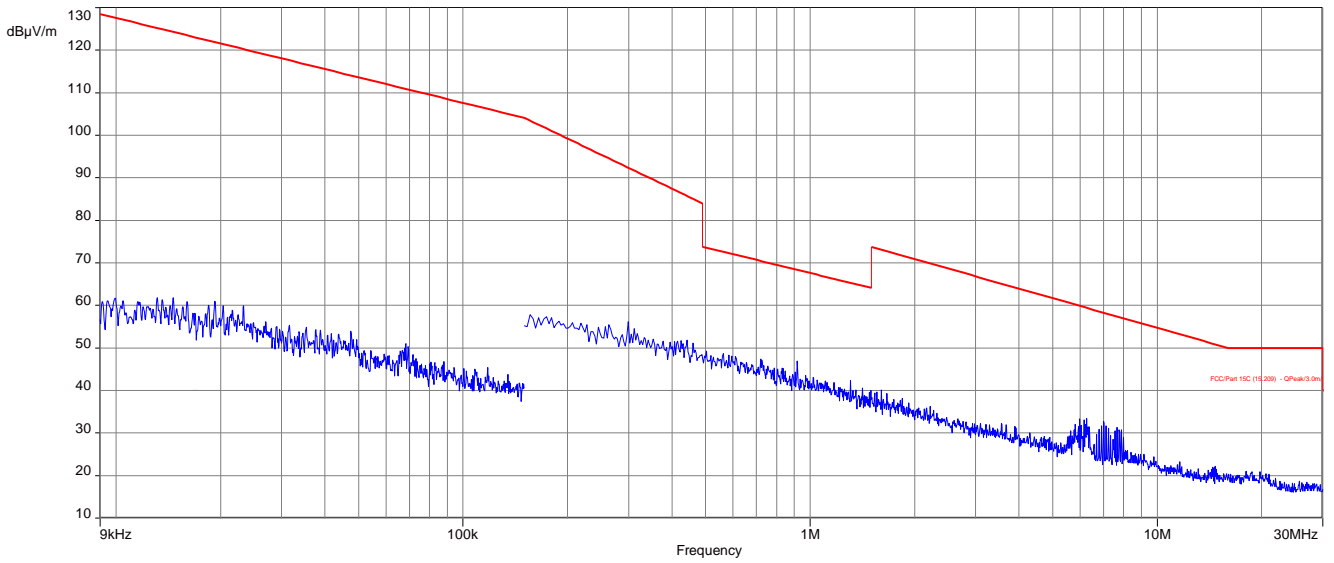
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel



Plot 3: 9 kHz to 30 MHz, high channel



12.12 Spurious emissions radiated 30 MHz to 1 GHz

Description:

Measurement of the radiated spurious emissions and cabinet radiations below 1 GHz.

Measurement:

Measurement parameter	
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	<input checked="" type="checkbox"/> QPSK <input checked="" type="checkbox"/> BPSK
Test setup:	See sub clause 7.1 - A
Measurement uncertainty	See sub clause 9

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:

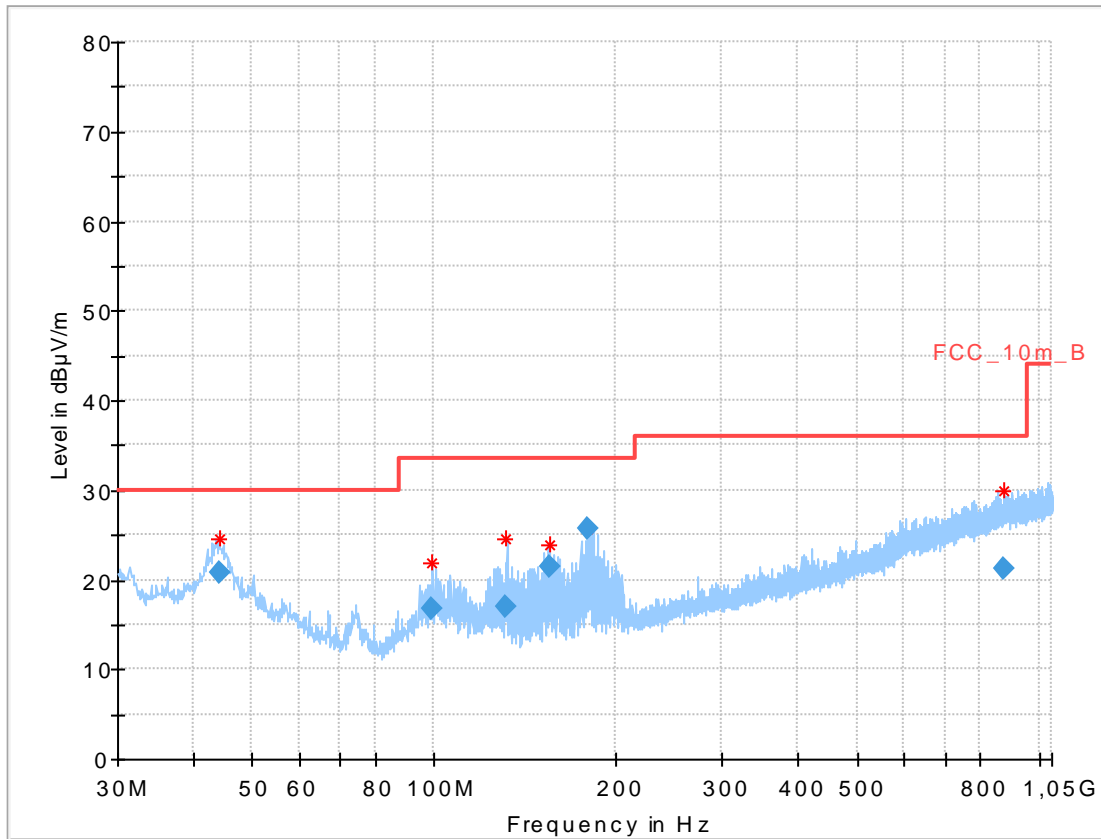
FCC		IC
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains 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)).		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10

Limits:

See result tables below plots.

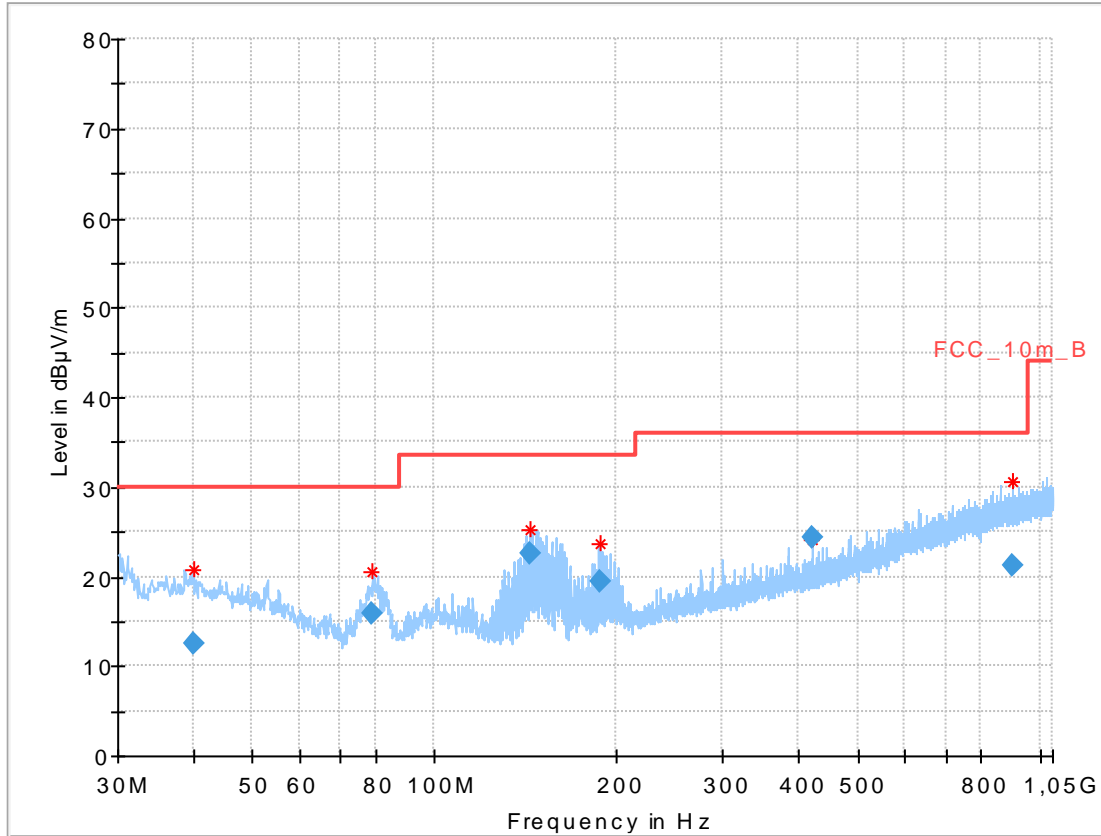
Plot: QPSK-mode / Antenna A

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, low channel



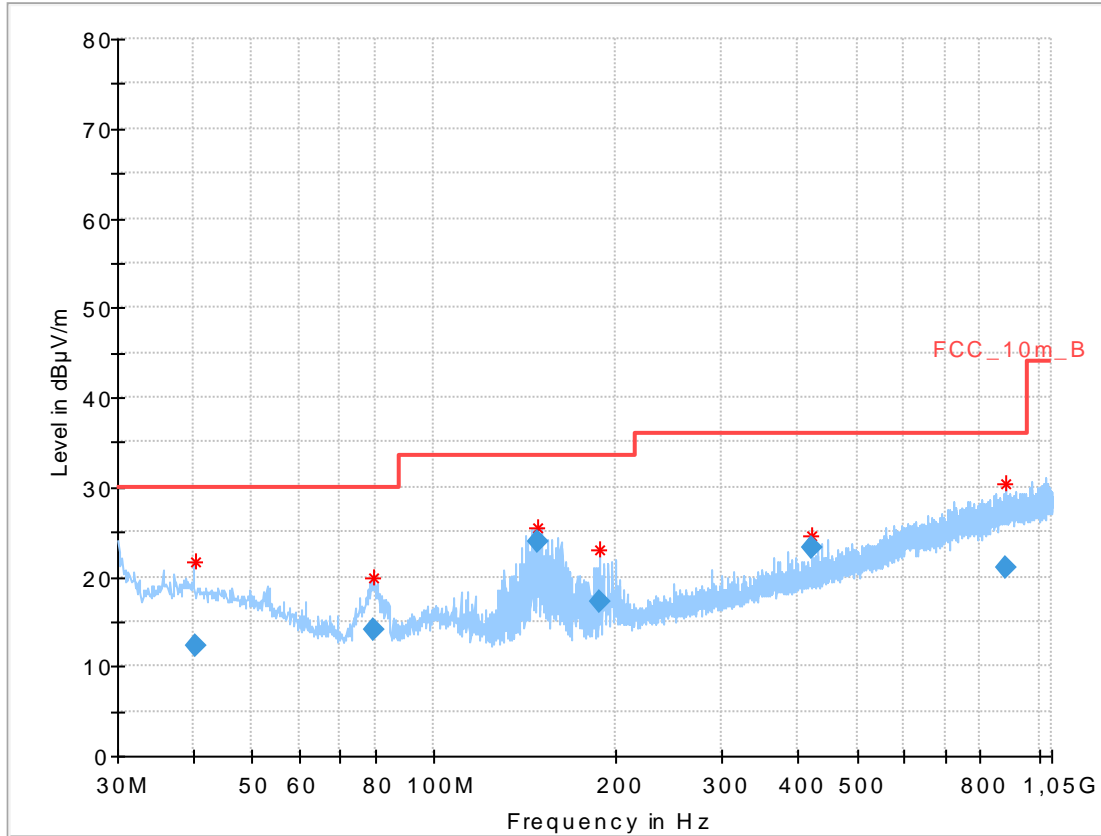
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
44.227050	20.89	30.00	9.11	1000.0	120.000	98.0	V	260.0	13.9
99.500100	16.77	33.50	16.73	1000.0	120.000	101.0	V	260.0	12.1
131.668800	17.04	33.50	16.46	1000.0	120.000	98.0	V	10.0	9.3
154.838400	21.36	33.50	12.14	1000.0	120.000	98.0	V	-9.0	9.0
180.005700	25.63	33.50	7.87	1000.0	120.000	98.0	V	10.0	10.4
875.851050	21.21	36.00	14.79	1000.0	120.000	98.0	V	100.0	23.8

Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, mid channel



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.143150	12.47	30.00	17.53	1000.0	120.000	180.0	V	0.0	14.0
78.803850	15.95	30.00	14.05	1000.0	120.000	98.0	V	70.0	8.1
143.965350	22.58	33.50	10.92	1000.0	120.000	101.0	V	233.0	8.8
187.264050	19.54	33.50	13.96	1000.0	120.000	98.0	V	349.0	10.9
419.988750	24.33	36.00	11.67	1000.0	120.000	98.0	V	87.0	17.2
900.040050	21.21	36.00	14.79	1000.0	120.000	185.0	V	0.0	24.1

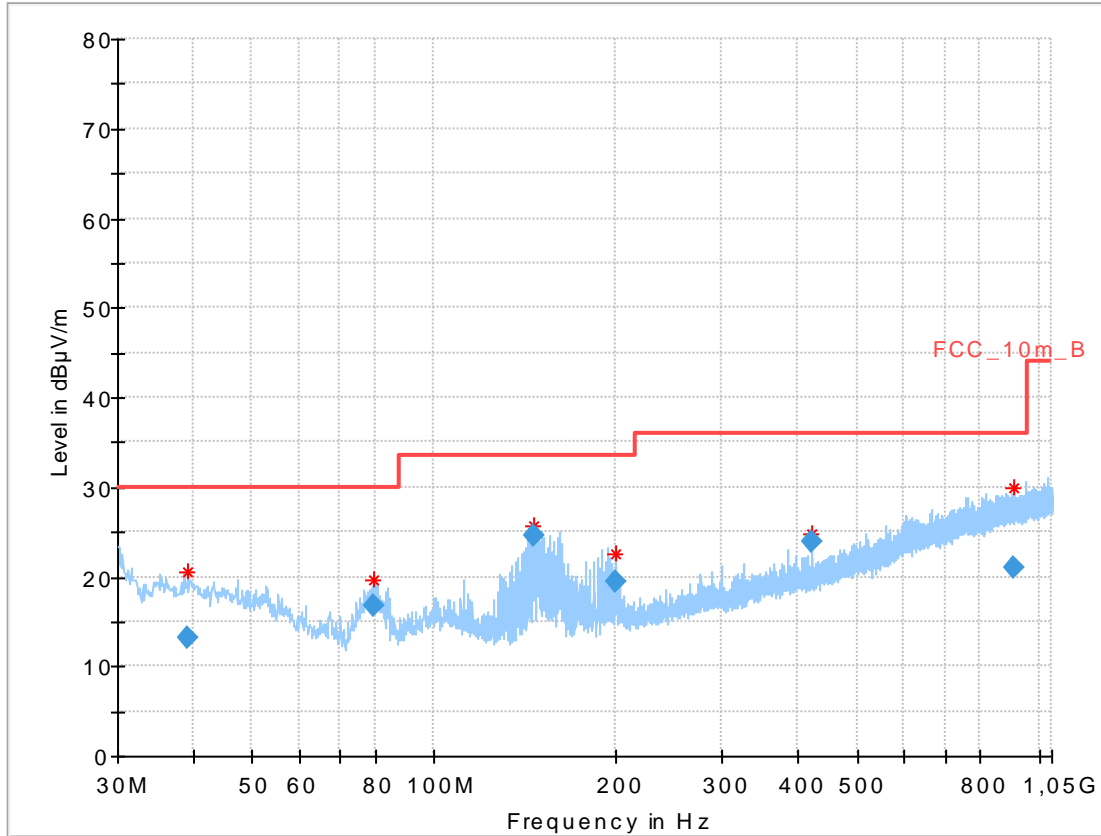
Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, high channel



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.320450	12.24	30.00	17.76	1000.0	120.000	180.0	V	0.0	14.0
79.239000	14.06	30.00	15.94	1000.0	120.000	101.0	V	111.0	8.1
148.035750	23.92	33.50	9.58	1000.0	120.000	98.0	V	190.0	8.9
188.286450	17.31	33.50	16.19	1000.0	120.000	98.0	V	302.0	10.9
420.021150	23.13	36.00	12.87	1000.0	120.000	98.0	V	72.0	17.2
882.620700	21.07	36.00	14.93	1000.0	120.000	185.0	V	123.0	23.9

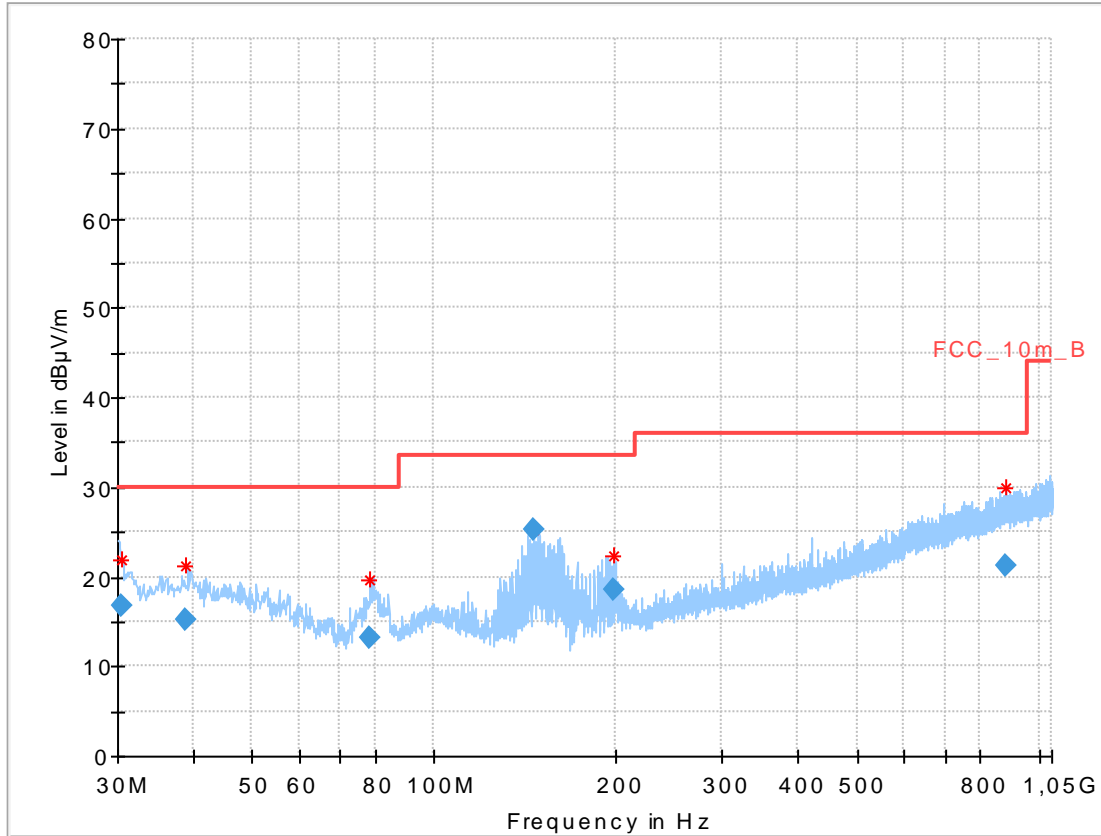
Plot: QPSK-mode / Antenna B

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, low channel



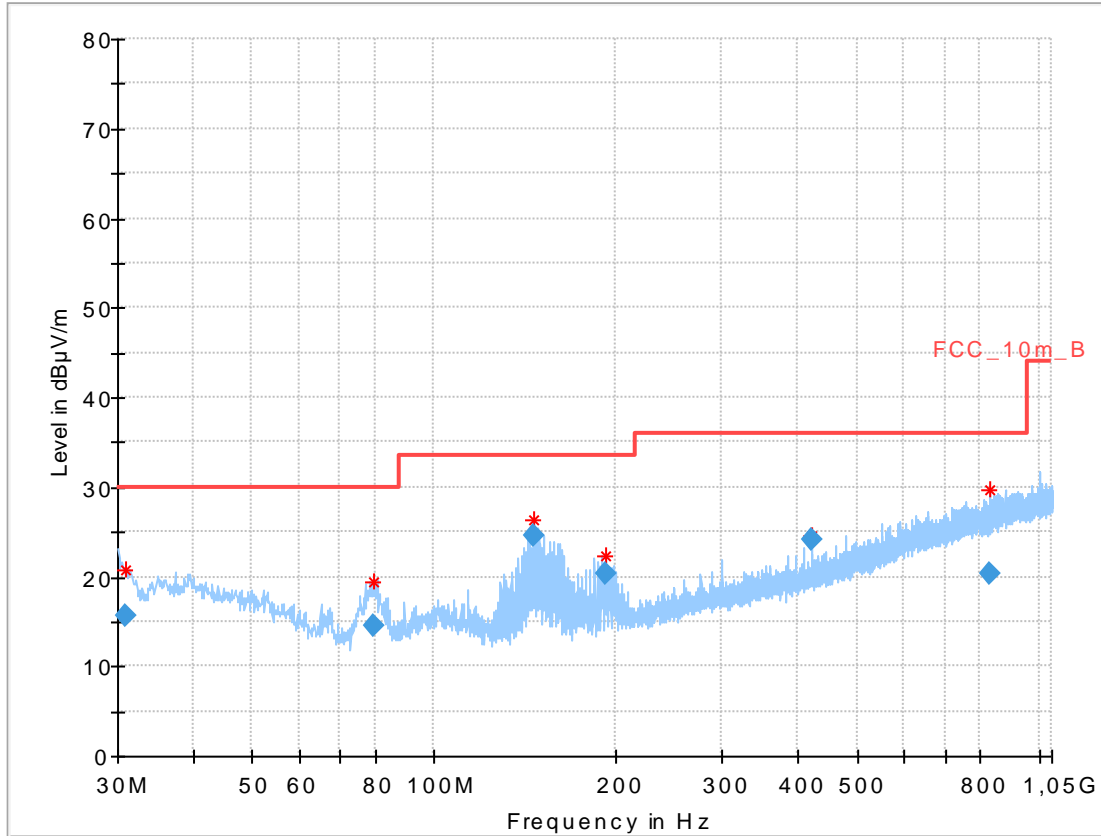
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
39.175650	13.19	30.00	16.81	1000.0	120.000	98.0	V	23.0	14.0
79.502850	16.68	30.00	13.32	1000.0	120.000	178.0	V	66.0	8.1
145.971150	24.67	33.50	8.83	1000.0	120.000	98.0	V	188.0	8.8
200.313600	19.38	33.50	14.12	1000.0	120.000	101.0	V	0.0	11.7
419.996550	24.02	36.00	11.98	1000.0	120.000	98.0	V	78.0	17.2
910.736250	21.07	36.00	14.93	1000.0	120.000	179.0	V	66.0	24.1

Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, mid channel



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.473250	16.73	30.00	13.27	1000.0	120.000	101.0	V	294.0	13.4
38.729100	15.29	30.00	14.71	1000.0	120.000	101.0	V	31.0	14.0
78.418500	13.09	30.00	16.91	1000.0	120.000	101.0	V	16.0	8.1
145.961550	25.18	33.50	8.32	1000.0	120.000	98.0	V	197.0	8.8
198.327000	18.60	33.50	14.90	1000.0	120.000	98.0	V	336.0	11.6
880.016100	21.12	36.00	14.88	1000.0	120.000	101.0	H	313.0	23.9

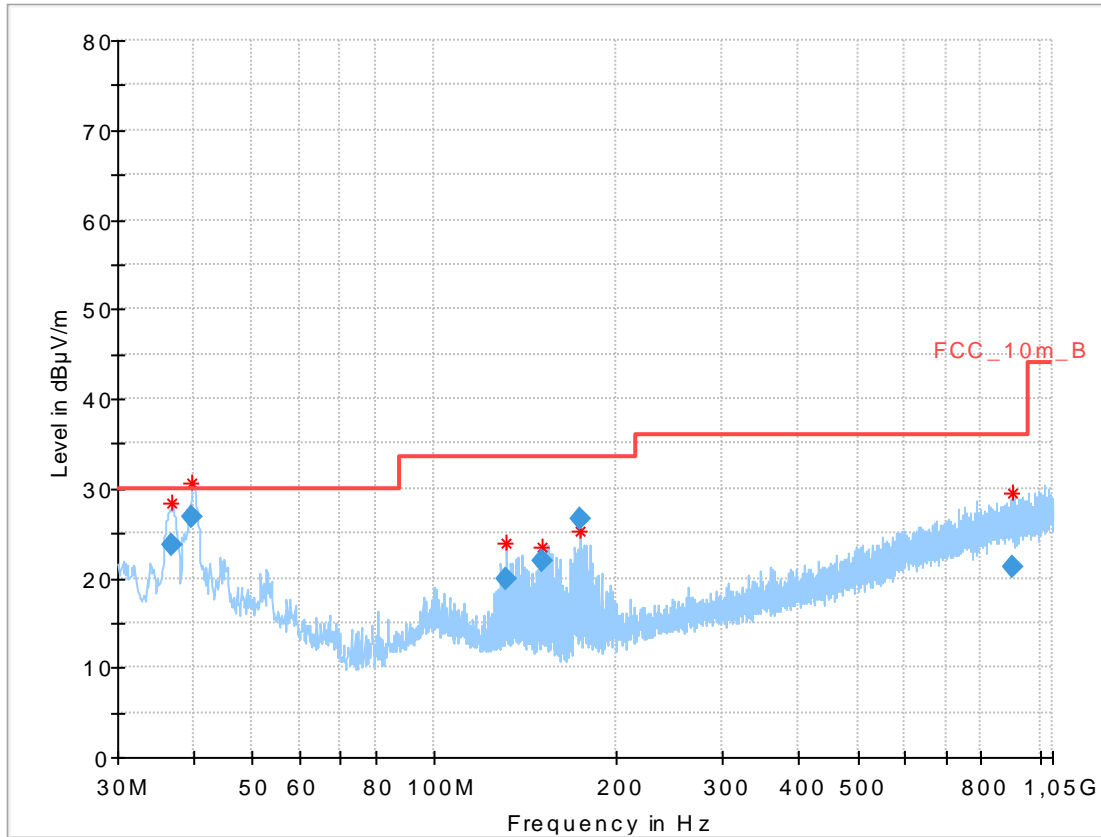
Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, high channel



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.998550	15.59	30.00	14.41	1000.0	120.000	101.0	V	43.0	13.4
79.207650	14.63	30.00	15.37	1000.0	120.000	101.0	V	43.0	8.1
146.005050	24.54	33.50	8.96	1000.0	120.000	98.0	V	213.0	8.8
192.231000	20.34	33.50	13.16	1000.0	120.000	98.0	V	253.0	11.2
419.991900	24.13	36.00	11.87	1000.0	120.000	98.0	V	82.0	17.2
829.097100	20.26	36.00	15.74	1000.0	120.000	101.0	H	0.0	23.2

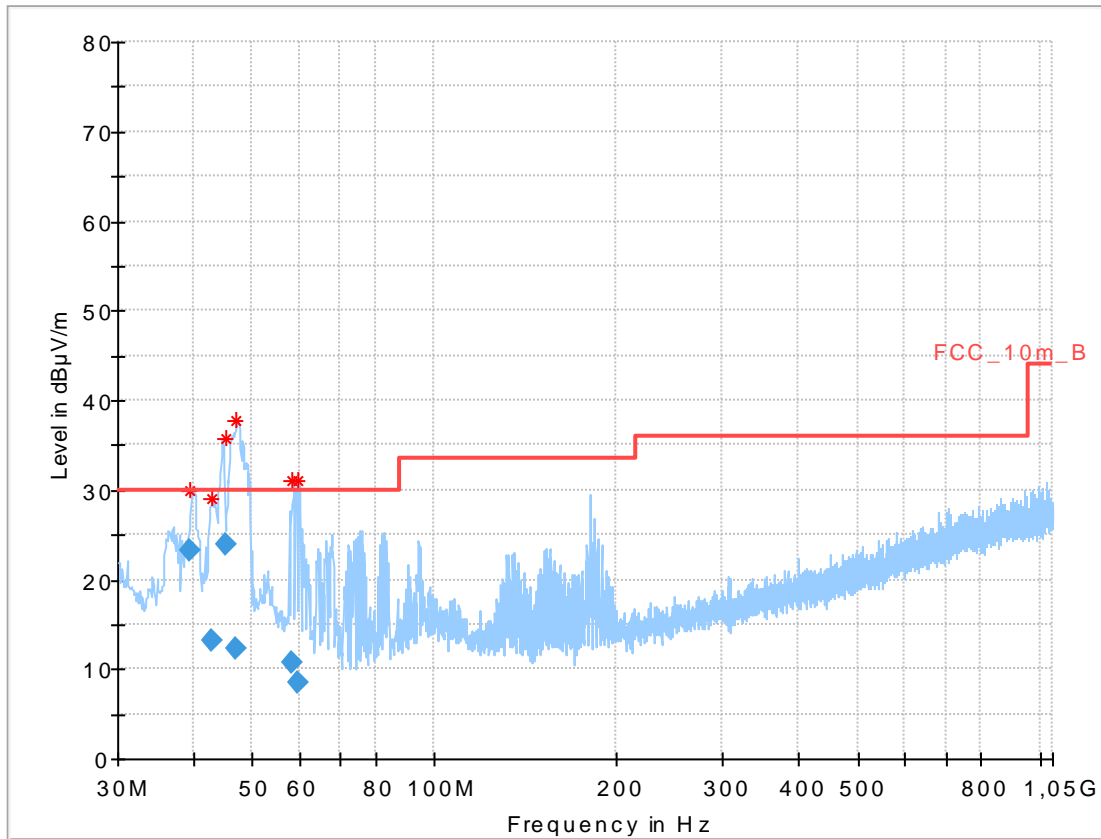
Plot: BPSK-mode / Antenna A

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, low channel



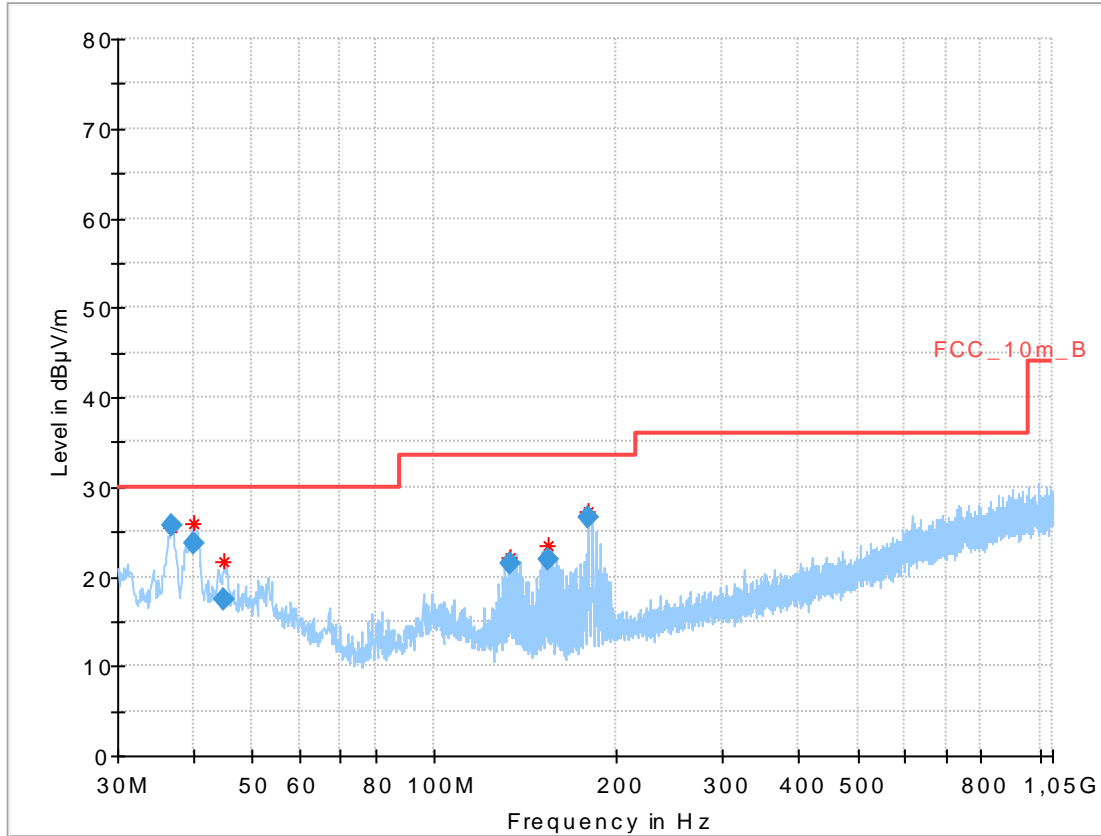
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.892950	23.69	30.00	6.31	1000.0	120.000	98.0	V	100.0	13.9
39.905100	26.73	30.00	3.27	1000.0	120.000	98.0	V	10.0	14.0
131.841000	19.89	33.50	13.61	1000.0	120.000	101.0	V	280.0	9.3
150.885750	21.89	33.50	11.61	1000.0	120.000	98.0	V	190.0	8.9
173.830050	26.55	33.50	6.95	1000.0	120.000	101.0	V	260.0	10.0
900.650250	21.15	36.00	14.85	1000.0	120.000	170.0	H	261.0	24.1

Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, mid channel



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
39.598050	23.22	30.00	6.78	1000.0	120.000	100.0	V	81.0	14.0
42.783450	13.16	30.00	16.84	1000.0	120.000	101.0	V	190.0	13.9
45.176700	23.84	30.00	6.16	1000.0	120.000	101.0	V	190.0	13.8
47.108400	12.39	30.00	17.61	1000.0	120.000	100.0	V	280.0	13.3
58.188150	10.71	30.00	19.29	1000.0	120.000	101.0	V	170.0	11.0
59.562450	8.42	30.00	21.58	1000.0	120.000	98.0	V	190.0	10.7

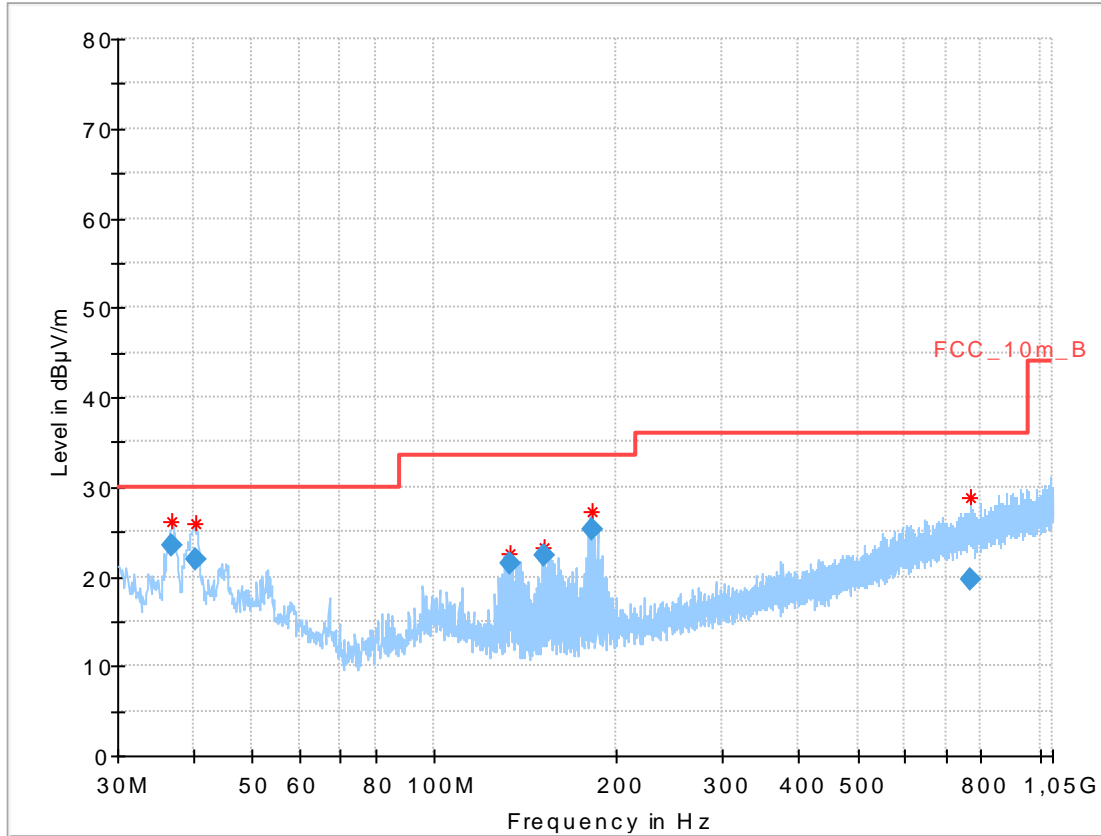
Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, high channel



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.937050	25.79	30.00	4.21	1000.0	120.000	101.0	V	10.0	13.9
40.039350	23.60	30.00	6.40	1000.0	120.000	101.0	V	10.0	14.0
45.079050	17.54	30.00	12.46	1000.0	120.000	101.0	V	10.0	13.8
133.888650	21.53	33.50	11.97	1000.0	120.000	101.0	V	190.0	9.1
153.877350	21.95	33.50	11.55	1000.0	120.000	98.0	V	171.0	9.0
179.859150	26.67	33.50	6.83	1000.0	120.000	98.0	V	260.0	10.4

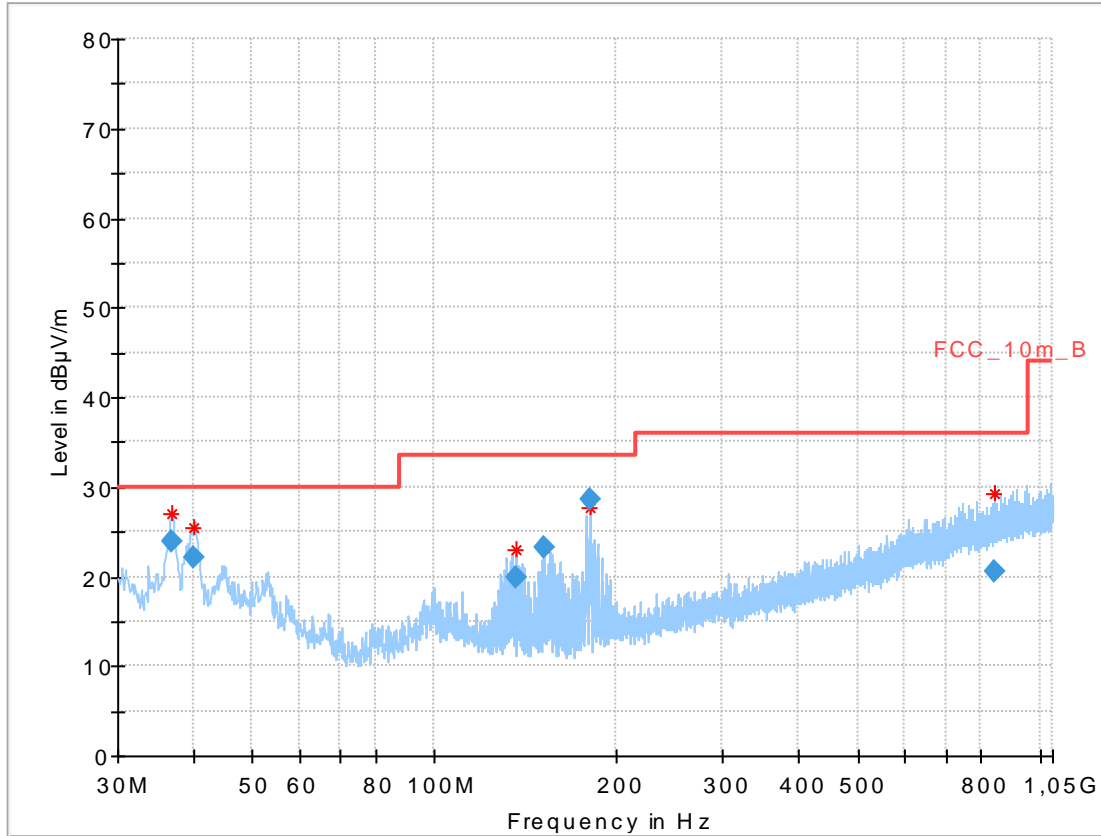
Plot: BPSK-mode / Antenna B

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, low channel



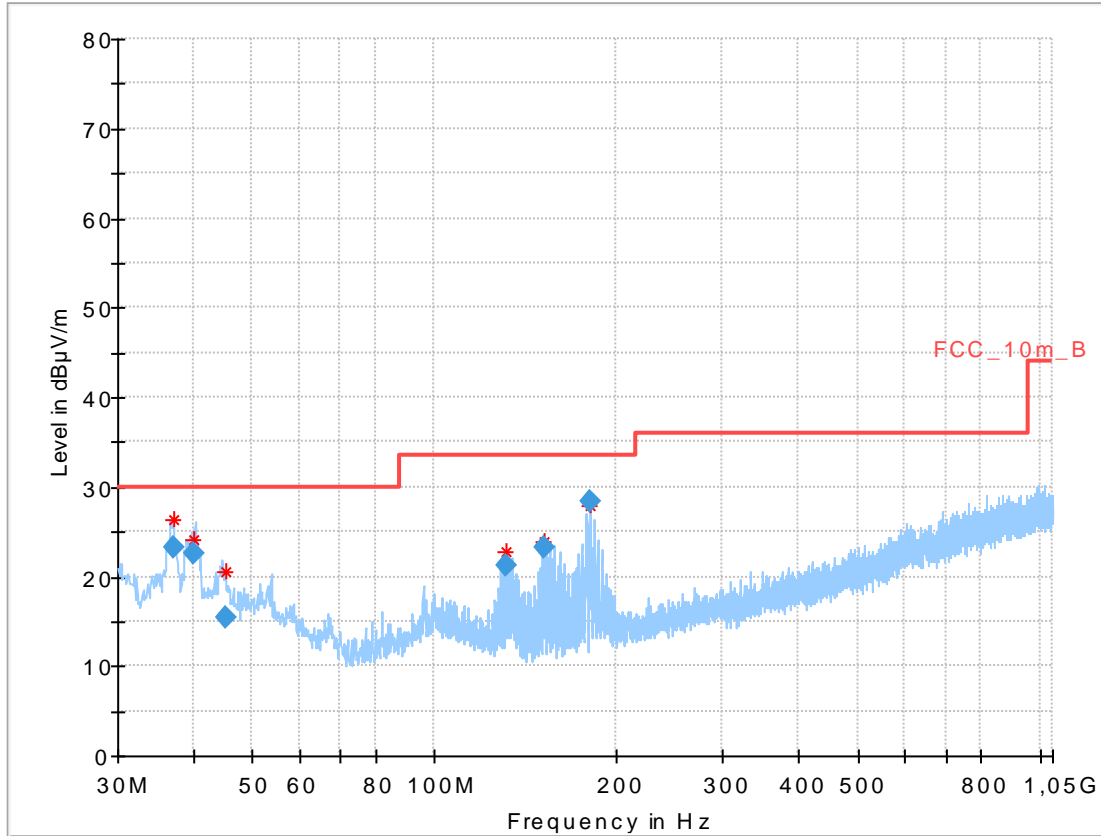
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.765600	23.36	30.00	6.64	1000.0	120.000	98.0	V	10.0	13.9
40.223700	21.88	30.00	8.12	1000.0	120.000	170.0	V	261.0	14.0
133.893150	21.39	33.50	12.11	1000.0	120.000	98.0	V	260.0	9.1
151.896300	22.44	33.50	11.06	1000.0	120.000	98.0	V	190.0	8.9
182.872500	25.30	33.50	8.20	1000.0	120.000	98.0	V	280.0	10.6
769.862250	19.62	36.00	16.38	1000.0	120.000	101.0	H	81.0	22.7

Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, mid channel



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.849000	23.97	30.00	6.03	1000.0	120.000	98.0	V	10.0	13.9
40.042650	22.04	30.00	7.96	1000.0	120.000	98.0	V	81.0	14.0
136.870200	19.95	33.50	13.55	1000.0	120.000	98.0	V	280.0	8.9
151.874100	23.14	33.50	10.36	1000.0	120.000	98.0	V	190.0	8.9
180.870300	28.52	33.50	4.98	1000.0	120.000	98.0	V	280.0	10.4
844.607100	20.45	36.00	15.55	1000.0	120.000	170.0	H	10.0	23.4

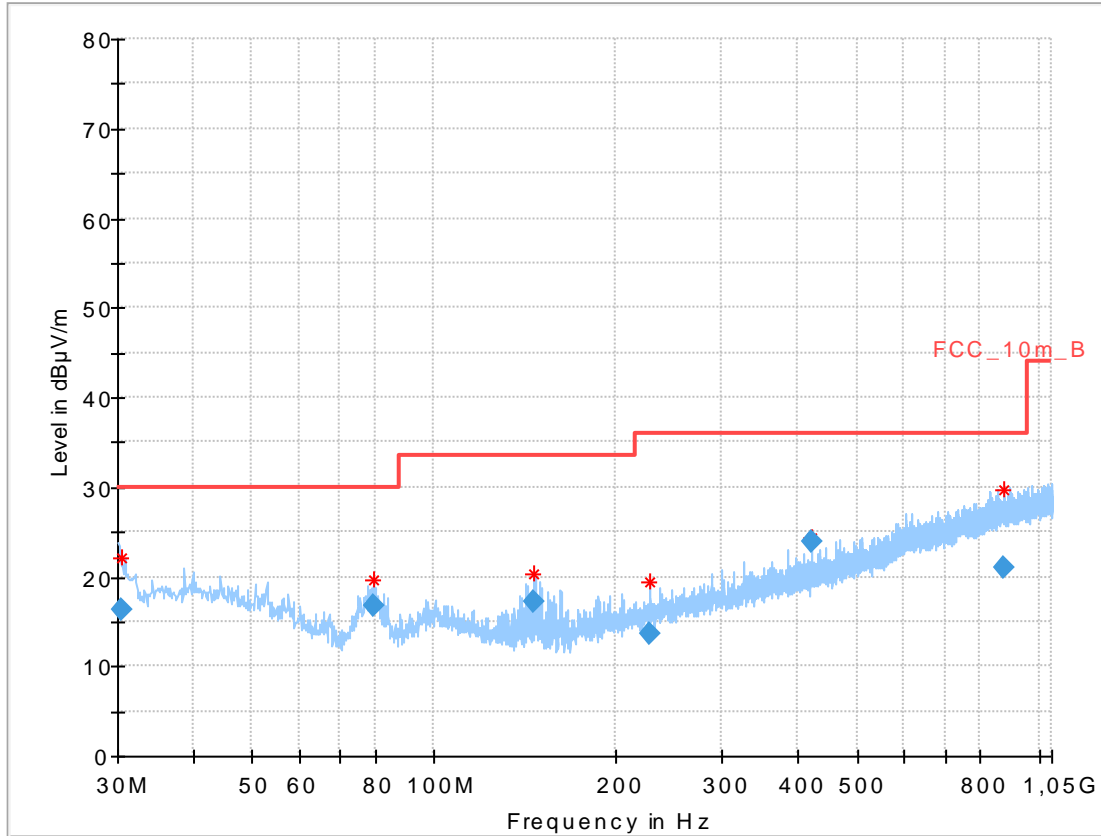
Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, high channel



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
37.165500	23.31	30.00	6.69	1000.0	120.000	101.0	V	10.0	13.9
40.141350	22.64	30.00	7.36	1000.0	120.000	101.0	V	10.0	14.0
45.325500	15.53	30.00	14.47	1000.0	120.000	98.0	V	-10.0	13.8
131.871600	21.27	33.50	12.23	1000.0	120.000	103.0	V	261.0	9.3
151.860750	23.13	33.50	10.37	1000.0	120.000	98.0	V	190.0	8.9
180.831750	28.31	33.50	5.19	1000.0	120.000	98.0	V	280.0	10.4

Plot: Idle mode / Antenna A

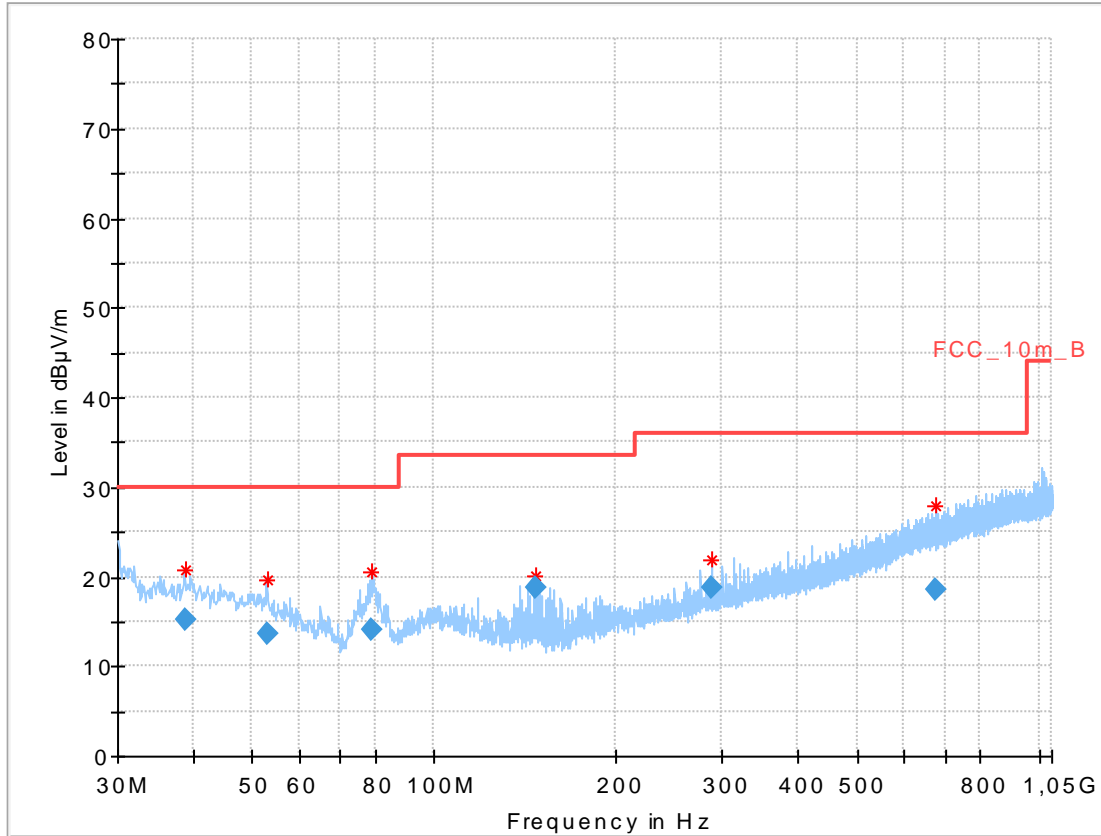
Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.484650	16.25	30.00	13.75	1000.0	120.000	101.0	V	135.0	13.4
79.215600	16.78	30.00	13.22	1000.0	120.000	185.0	V	81.0	8.1
145.900050	17.25	33.50	16.25	1000.0	120.000	101.0	V	237.0	8.8
227.988150	13.60	36.00	22.40	1000.0	120.000	98.0	V	332.0	12.7
419.974050	23.86	36.00	12.14	1000.0	120.000	98.0	V	81.0	17.2
876.354000	21.10	36.00	14.90	1000.0	120.000	185.0	V	112.0	23.8

Idle mode / Antenna B

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



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
38.725500	15.24	30.00	14.76	1000.0	120.000	101.0	V	323.0	14.0
53.053200	13.71	30.00	16.29	1000.0	120.000	100.0	V	277.0	12.1
78.809250	14.18	30.00	15.82	1000.0	120.000	101.0	V	83.0	8.1
146.852700	18.74	33.50	14.76	1000.0	120.000	98.0	V	244.0	8.8
287.988900	18.78	36.00	17.22	1000.0	120.000	98.0	V	288.0	14.2
675.069900	18.48	36.00	17.52	1000.0	120.000	101.0	H	170.0	21.3

12.13 Spurious emissions radiated above 1 GHz

Description:

Measurement of the radiated spurious emissions above 1 GHz in transmit mode and receiver / idle mode.

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 checked="" type="checkbox"/> QPSK <input checked="" type="checkbox"/> BPSK
Test setup:	See sub clause 7.2 - A
Measurement uncertainty	See sub clause 9

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 30 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)).		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
Above 960	54.0	3

Results: BPSK – mode / Antenna A

TX Spurious Emissions Radiated [dB μ V/m]								
2412 MHz			2438 MHz			2464 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 at least more than 10 dB below the dedicated limit.			All detected emissions are at least more than 10 dB below the dedicated limit.			All detected emissions are at least more than 10 dB below the dedicated limit.		
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Results: BPSK – mode / Antenna B

TX Spurious Emissions Radiated [dB μ V/m]								
2412 MHz			2438 MHz			2464 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 at least more than 10 dB below the dedicated limit.			All detected emissions are at least more than 10 dB below the dedicated limit.			All detected emissions are at least more than 10 dB below the dedicated limit.		
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Results: QPSK – mode / Antenna A

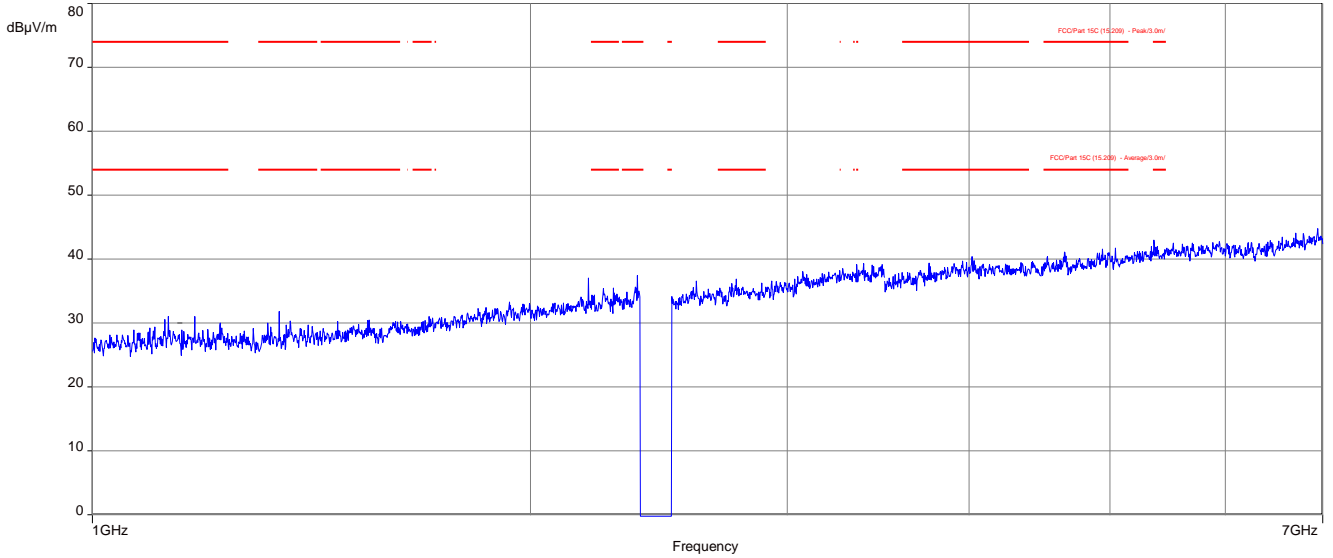
TX Spurious Emissions Radiated [dB μ V/m]								
2412 MHz			2438 MHz			2464 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
All detected emissions are at least more than 10 dB below the dedicated limit.			All detected emissions are at least more than 10 dB below the dedicated limit.			All detected emissions are at least more than 10 dB below the dedicated limit.		
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Results: QPSK – mode / Antenna B

TX Spurious Emissions Radiated [dB μ V/m]								
2412 MHz			2438 MHz			2464 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 at least more than 10 dB below the dedicated limit.			All detected emissions are at least more than 10 dB below the dedicated limit.			All detected emissions are at least more than 10 dB below the dedicated limit.		
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

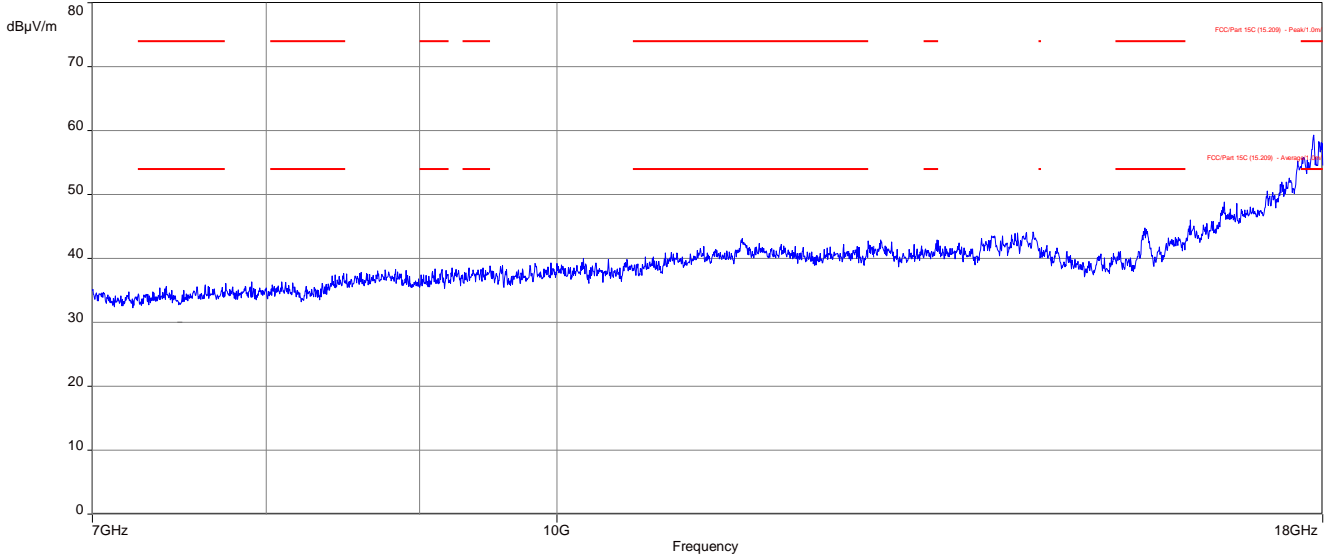
Plots: BPSK – mode / Antenna A

Plot 1: 2412 MHz, 1 GHz to 7 GHz, vertical & horizontal polarization

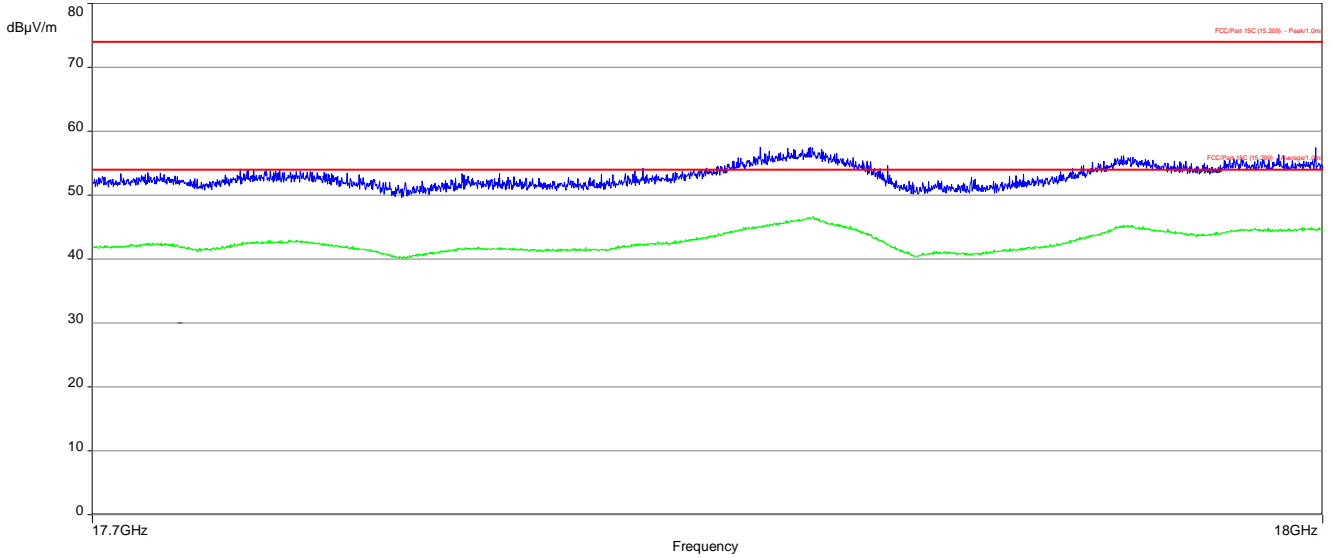


The carrier signal is notched with a 2.4 GHz band rejection filter.

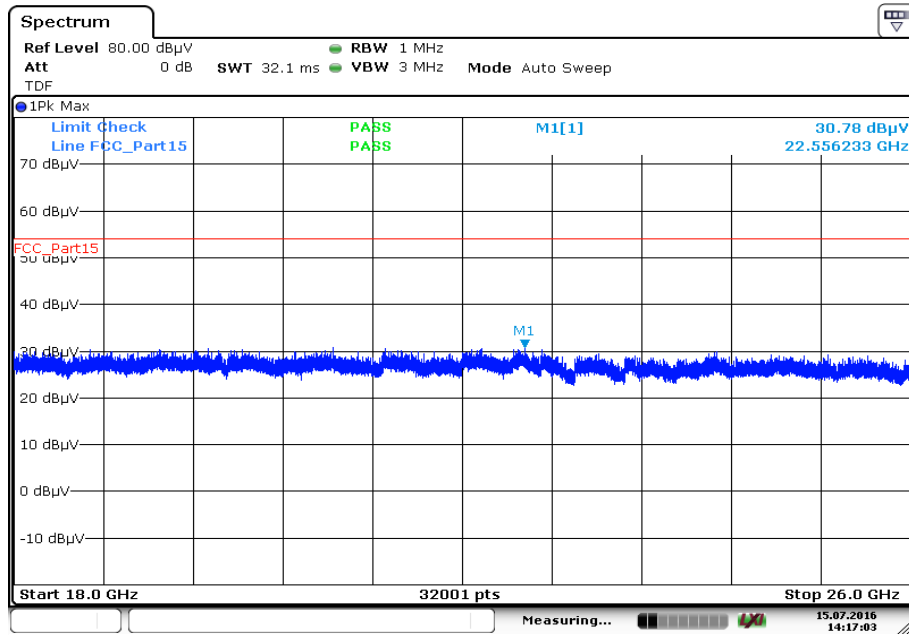
Plot 2: 2412 MHz, 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 3: 2412 MHz, 17.7 GHz to 18 GHz, vertical & horizontal polarization, peak & average

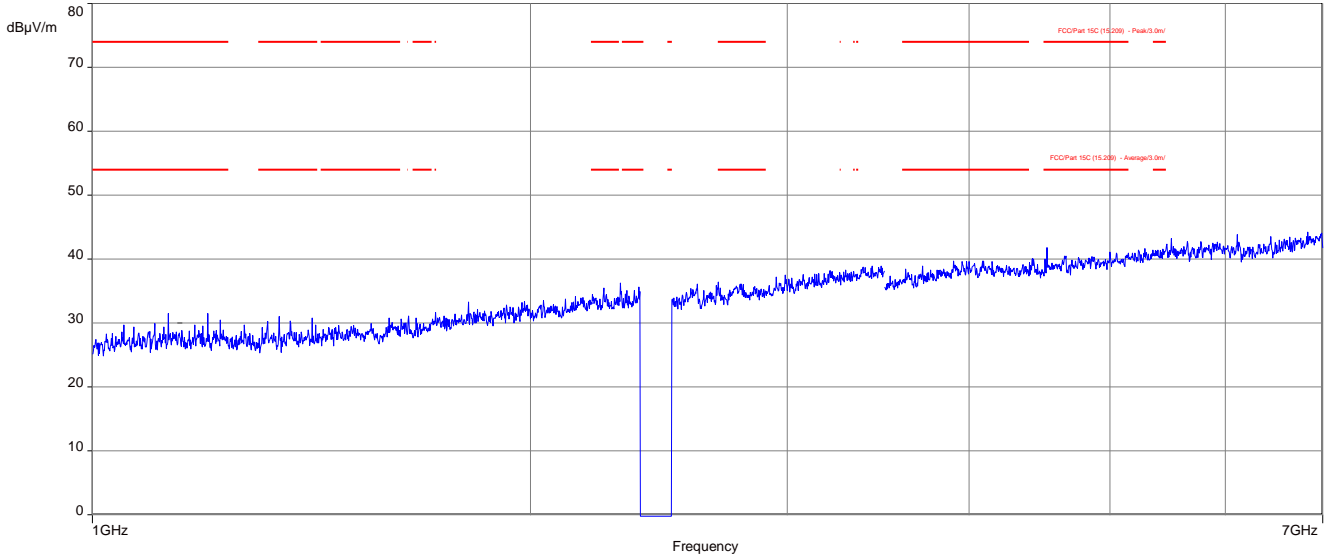


Plot 3: 2412 MHz, 18 GHz to 26 GHz, vertical & horizontal polarization



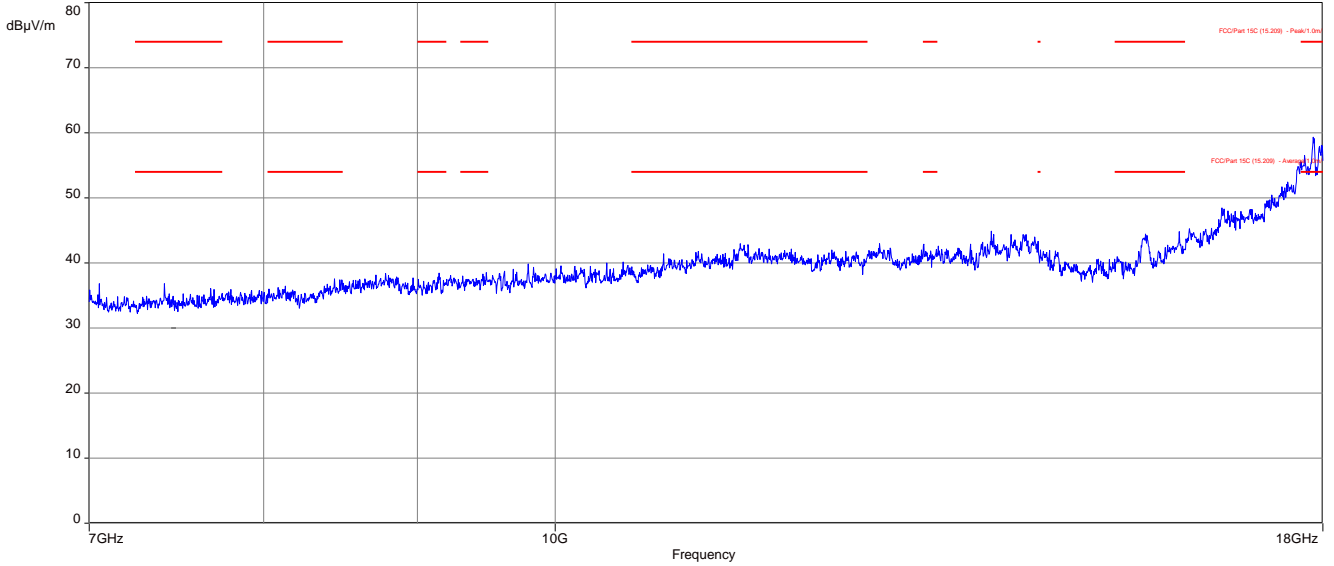
Date: 15.JUL.2016 14:17:03

Plot 4: 2438 MHz, 1 GHz to 7 GHz, vertical & horizontal polarization

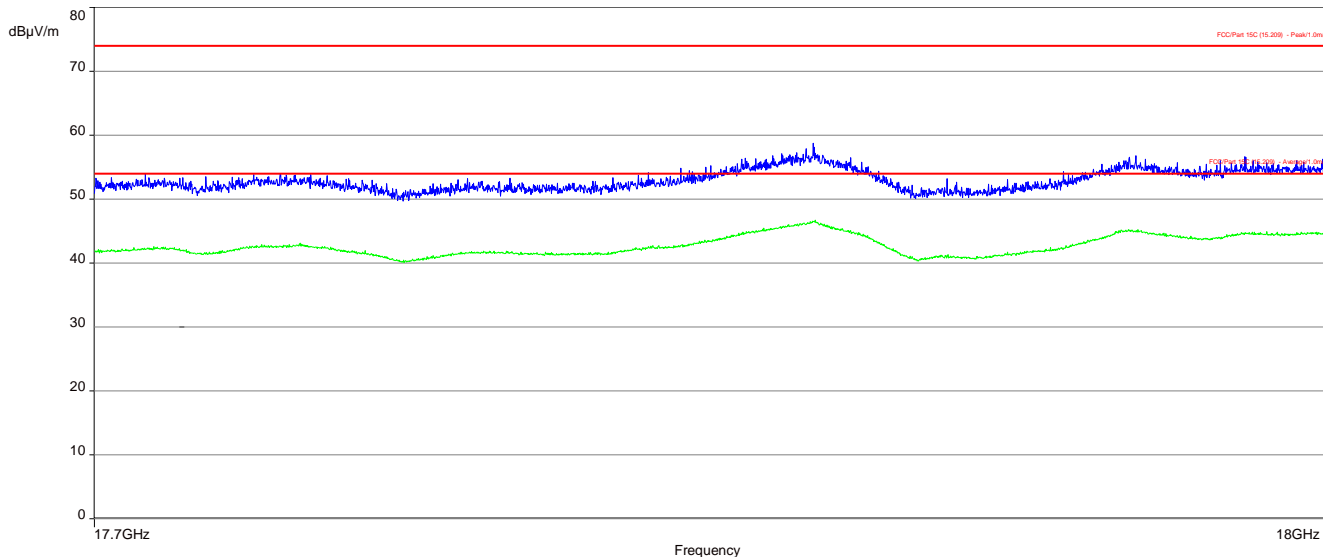


The carrier signal is notched with a 2.4 GHz band rejection filter.

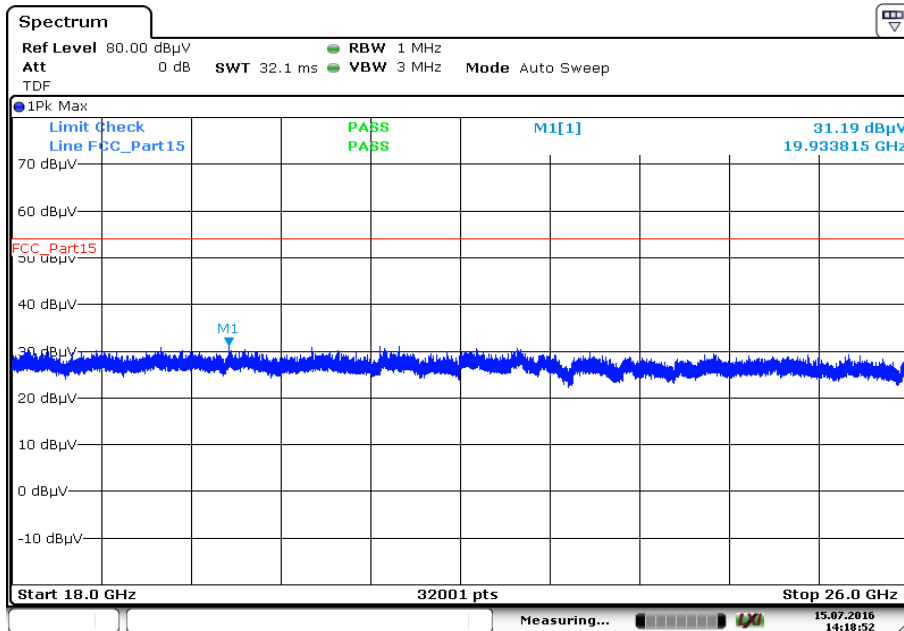
Plot 5: 2438 MHz, 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 6: 2438 MHz, 17.7 GHz to 18 GHz, vertical & horizontal polarization, peak & average

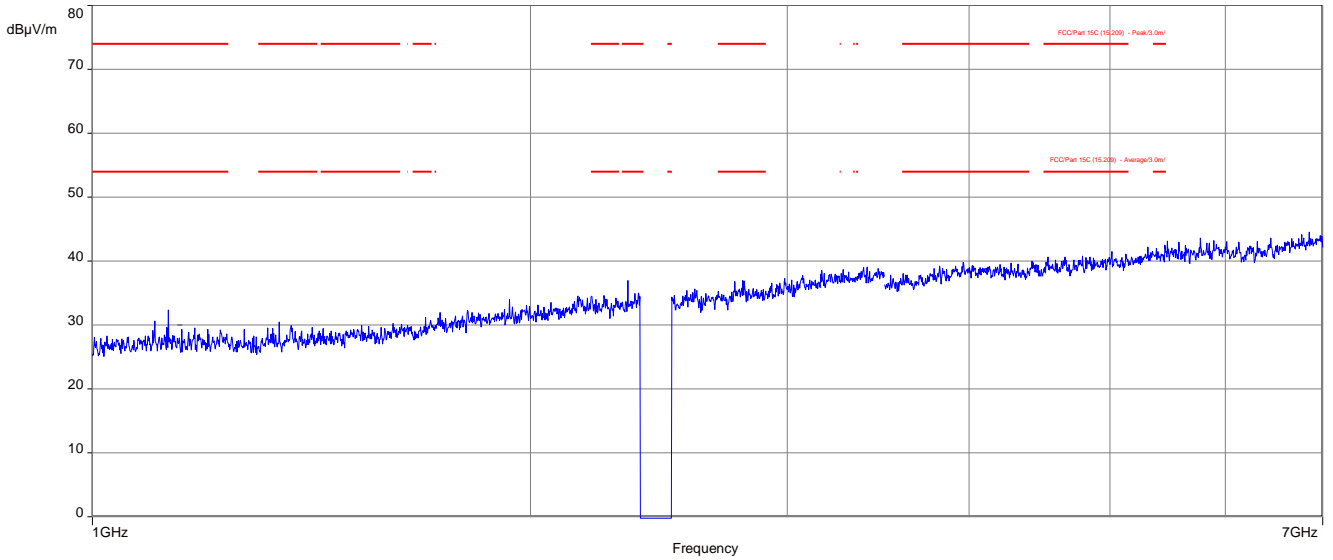


Plot 7: 2438 MHz, 18 GHz to 26 GHz, vertical & horizontal polarization



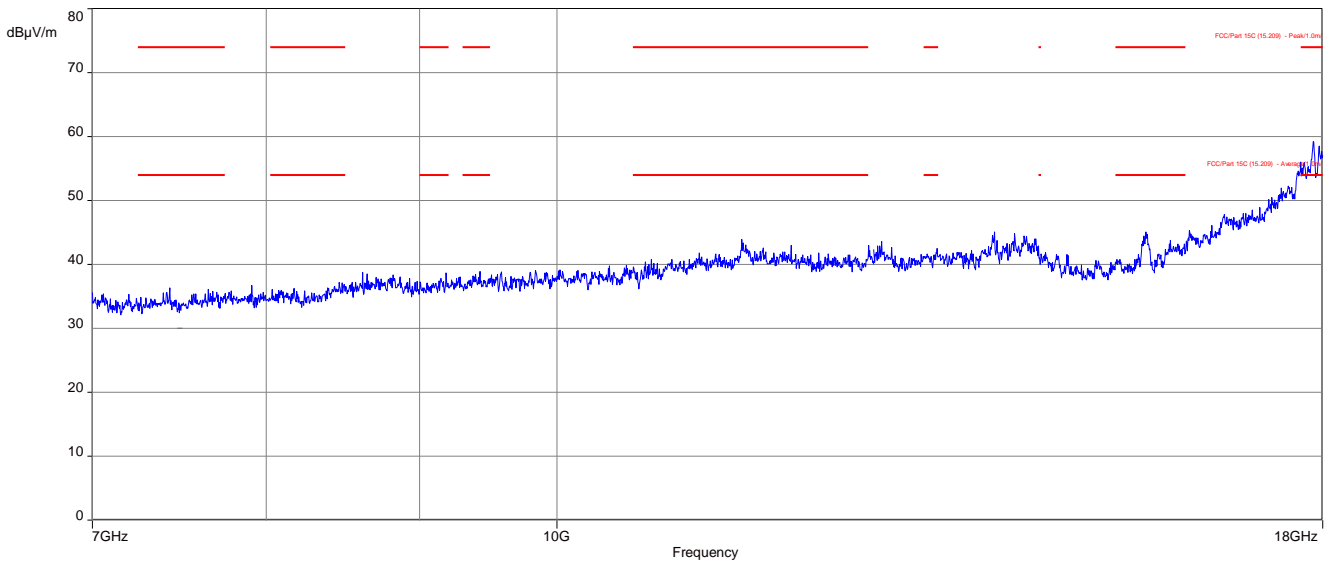
Date: 15.JUL.2016 14:18:52

Plot 8: 2464 MHz, 1 GHz to 7 GHz, vertical & horizontal polarization

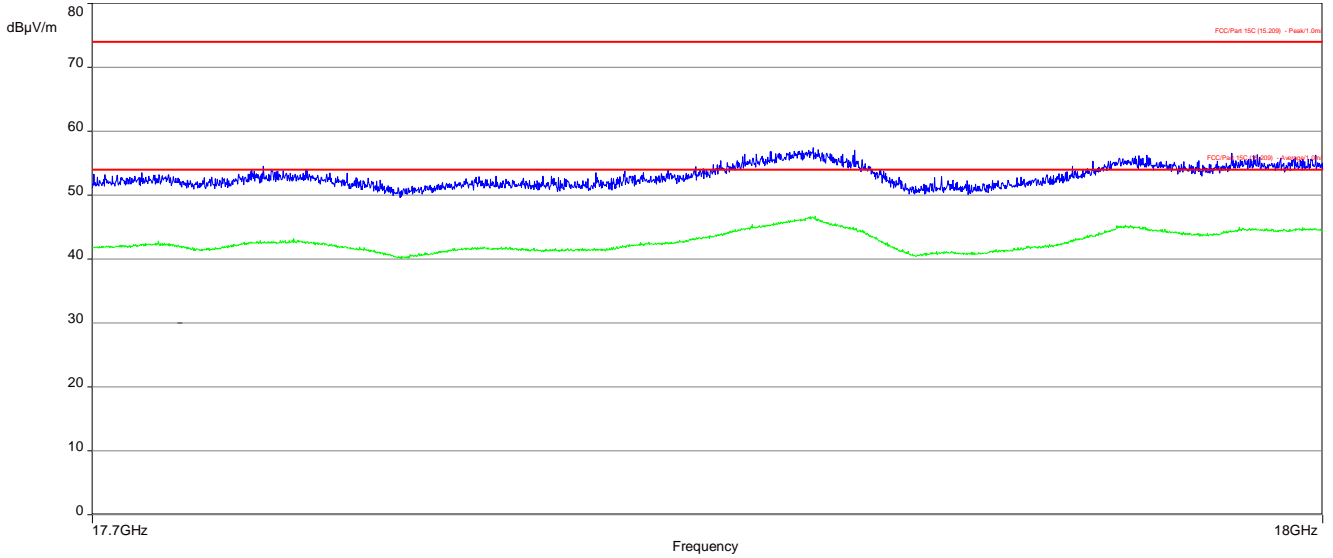


The carrier signal is notched with a 2.4 GHz band rejection filter.

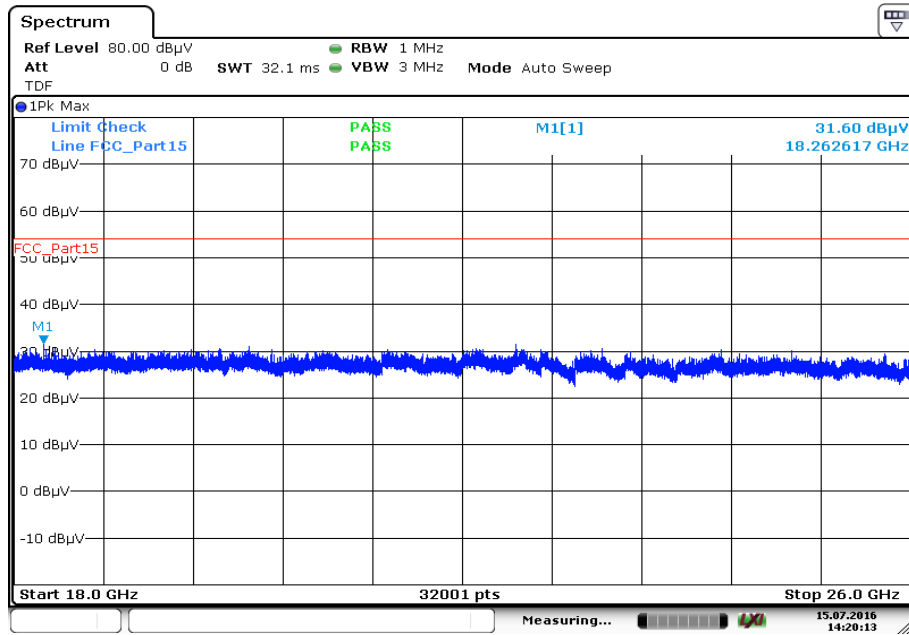
Plot 9: 2464 MHz, 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 10: 2464 MHz, 17.7 GHz to 18 GHz, vertical & horizontal polarization, peak & average



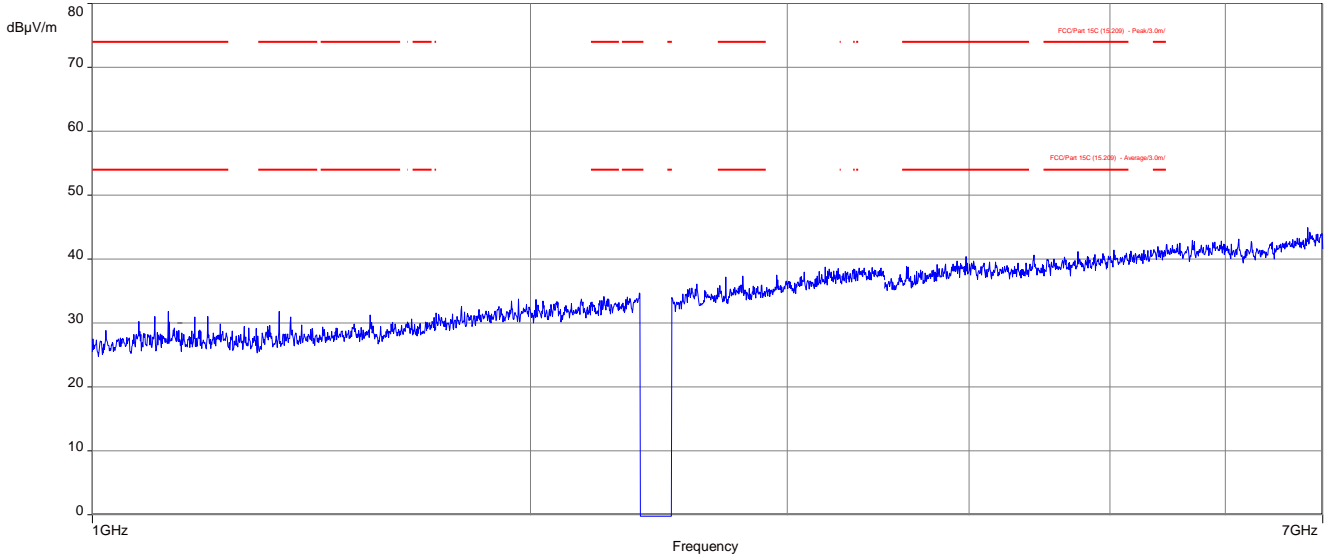
Plot 11: 2464 MHz, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 15.JUL.2016 14:20:13

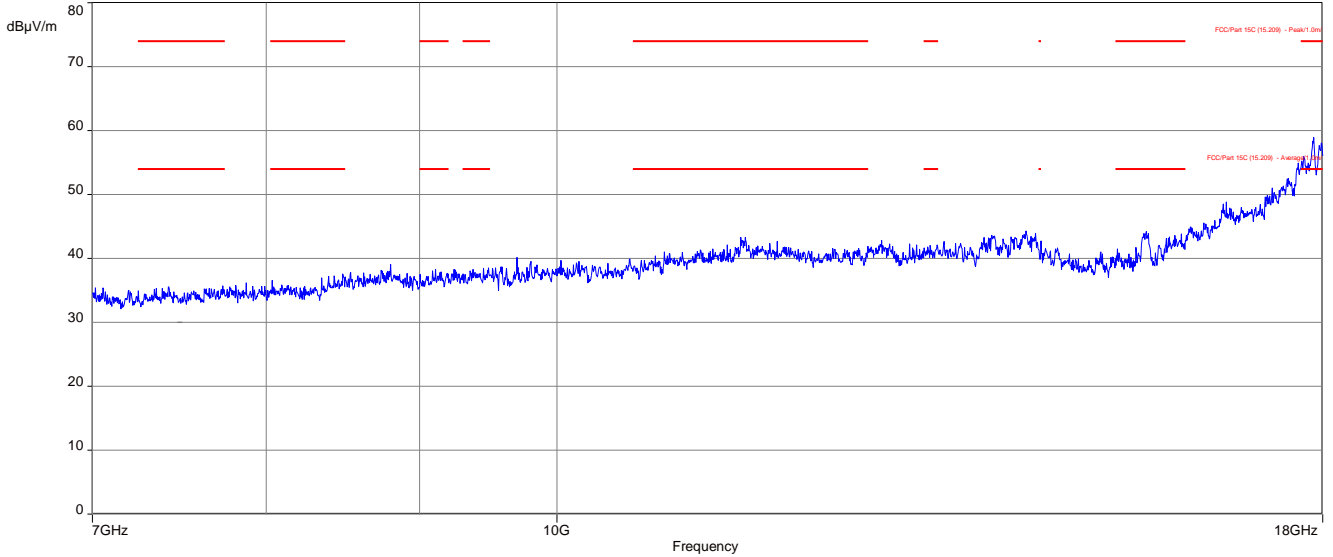
Plots: BPSK – mode / Antenna B

Plot 1: 2412 MHz, 1 GHz to 7 GHz, vertical & horizontal polarization

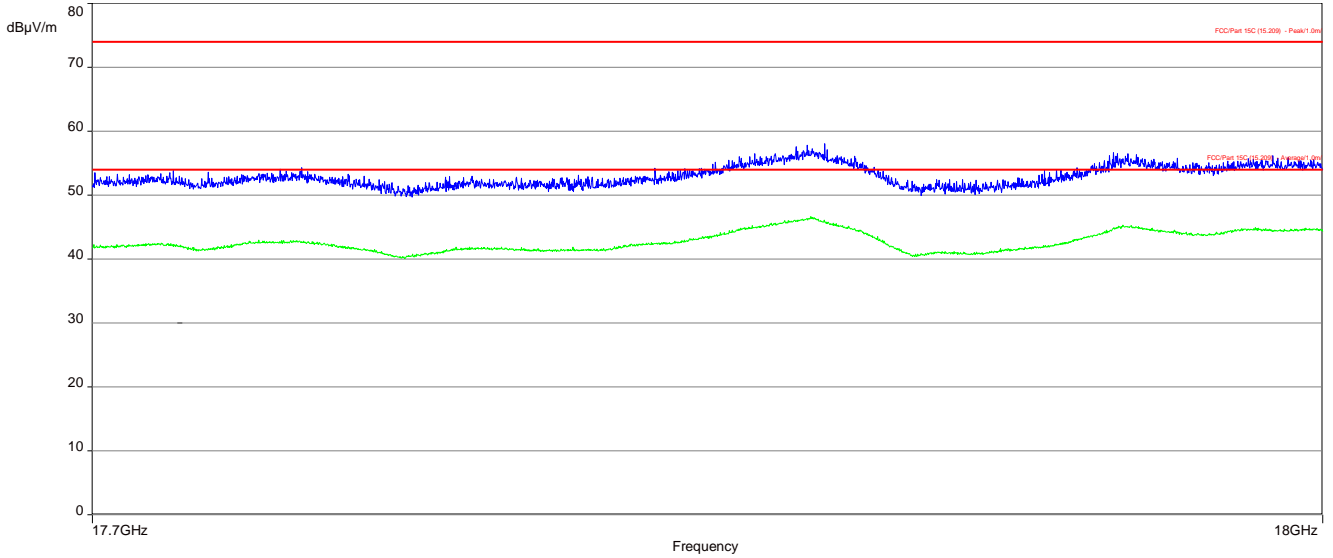


The carrier signal is notched with a 2.4 GHz band rejection filter.

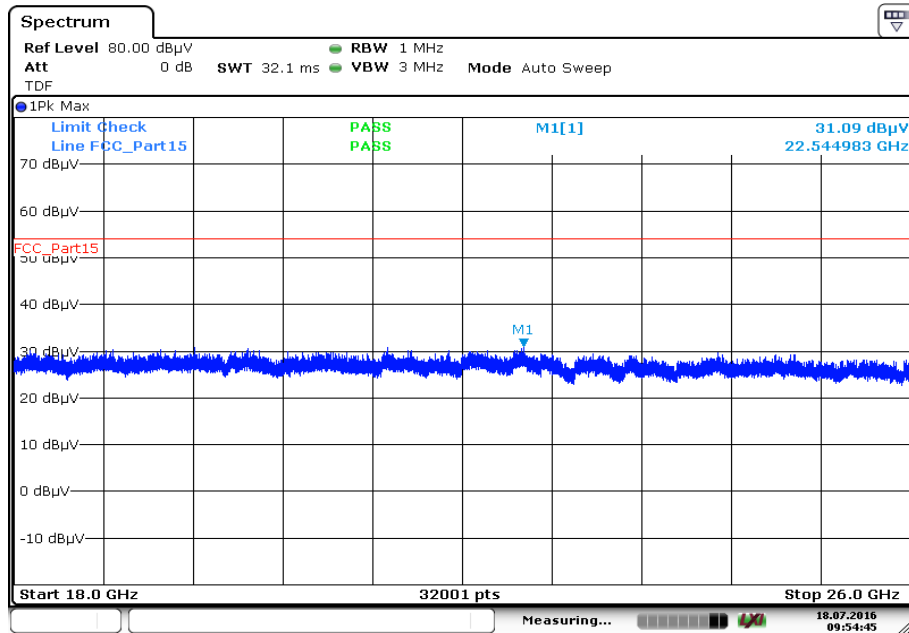
Plot 2: 2412 MHz, 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 3: 2412 MHz, 17.7 GHz to 18 GHz, vertical & horizontal polarization, peak & average

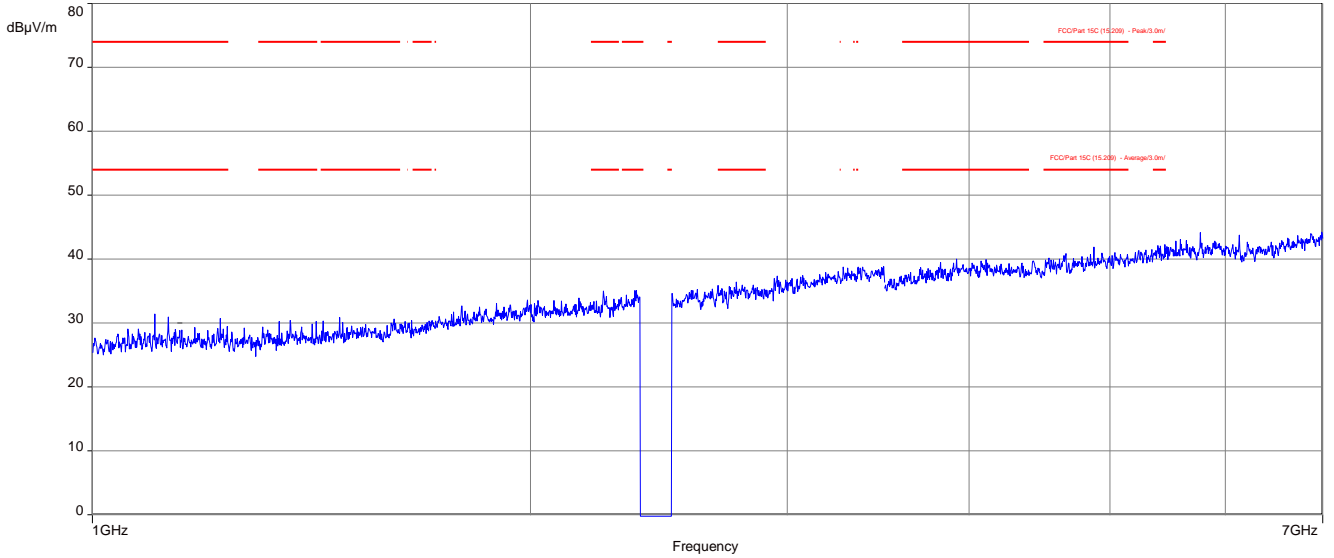


Plot 3: 2412 MHz, 18 GHz to 26 GHz, vertical & horizontal polarization



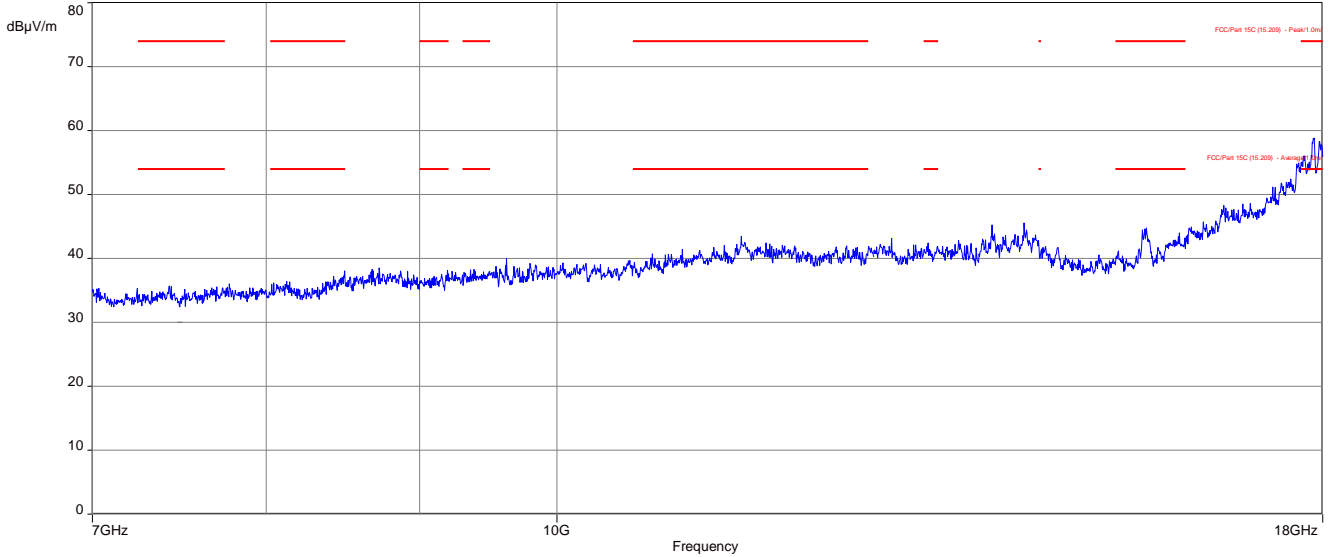
Date: 18.JUL.2016 09:54:45

Plot 4: 2438 MHz, 1 GHz to 7 GHz, vertical & horizontal polarization

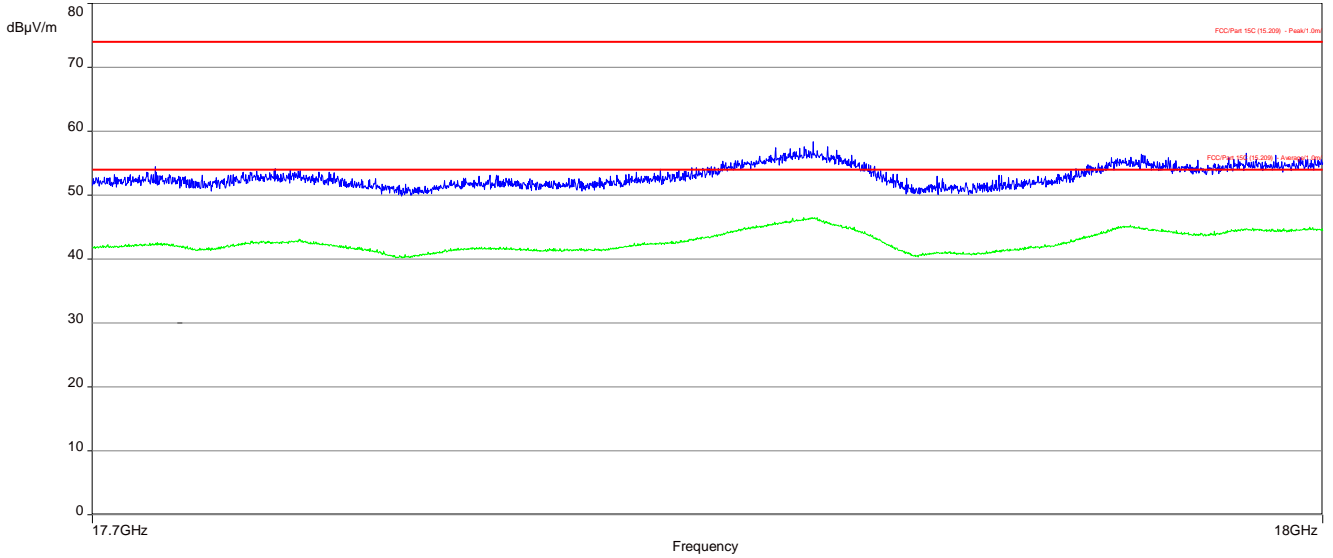


The carrier signal is notched with a 2.4 GHz band rejection filter.

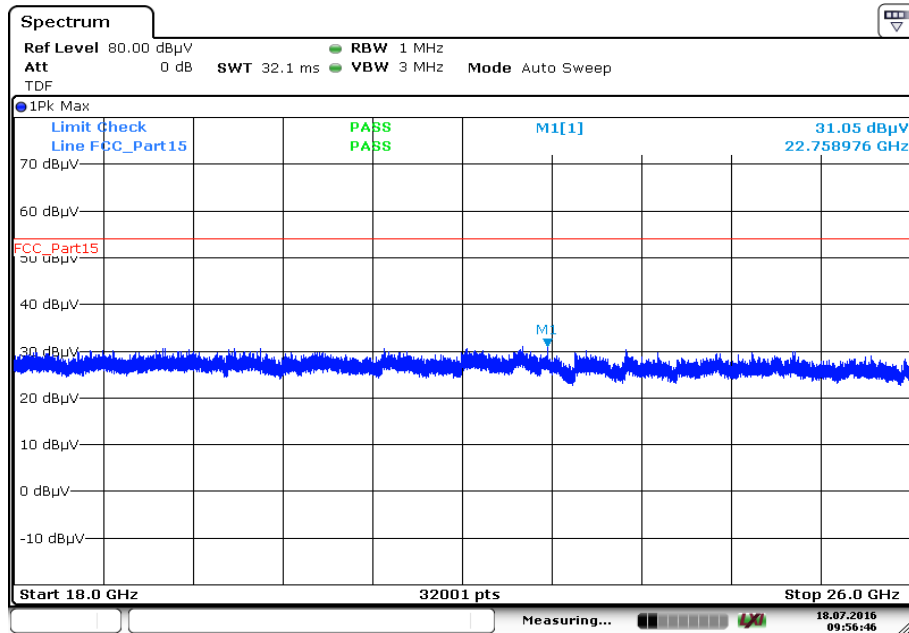
Plot 5: 2438 MHz, 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 6: 2438 MHz, 17.7 GHz to 18 GHz, vertical & horizontal polarization, peak & average

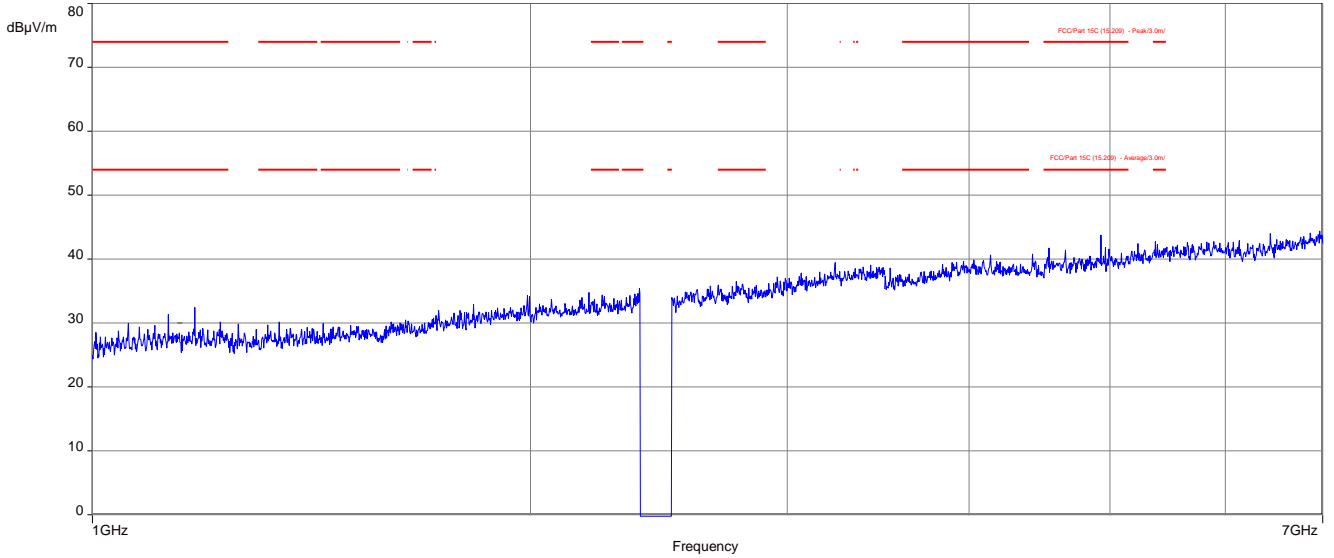


Plot 7: 2438 MHz, 18 GHz to 26 GHz, vertical & horizontal polarization



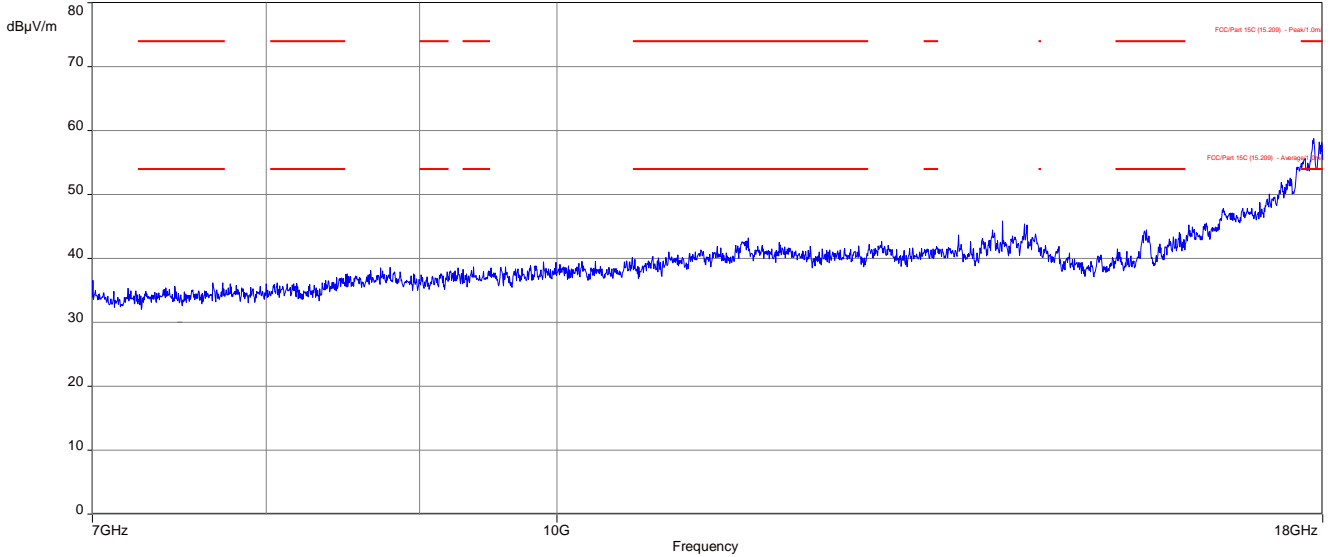
Date: 18.JUL.2016 09:56:46

Plot 8: 2464 MHz, 1 GHz to 7 GHz, vertical & horizontal polarization

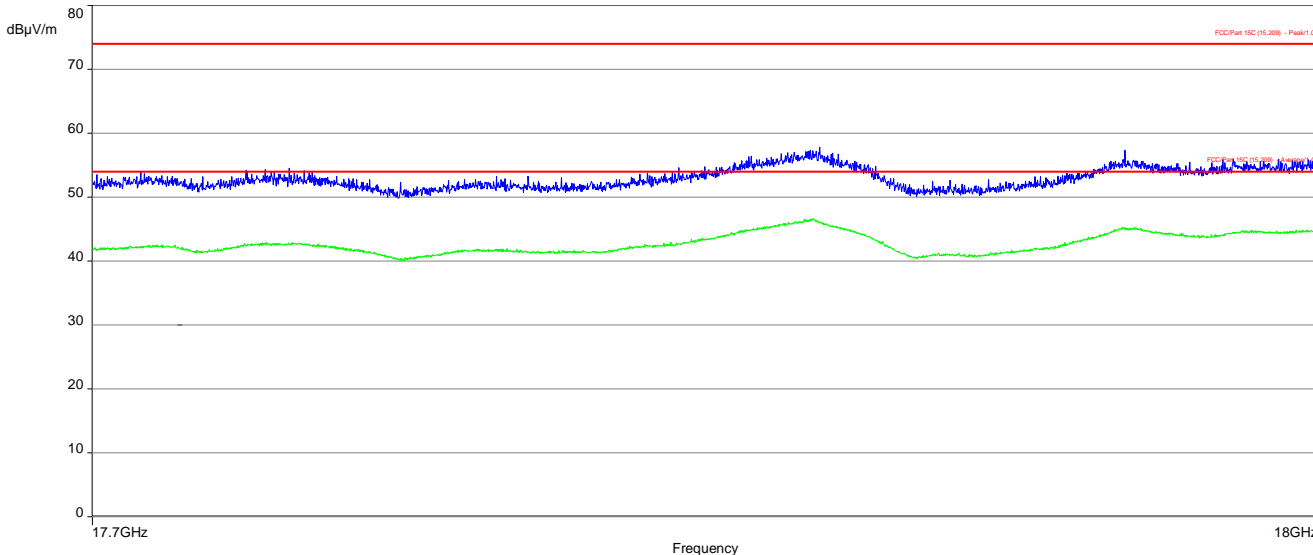


The carrier signal is notched with a 2.4 GHz band rejection filter.

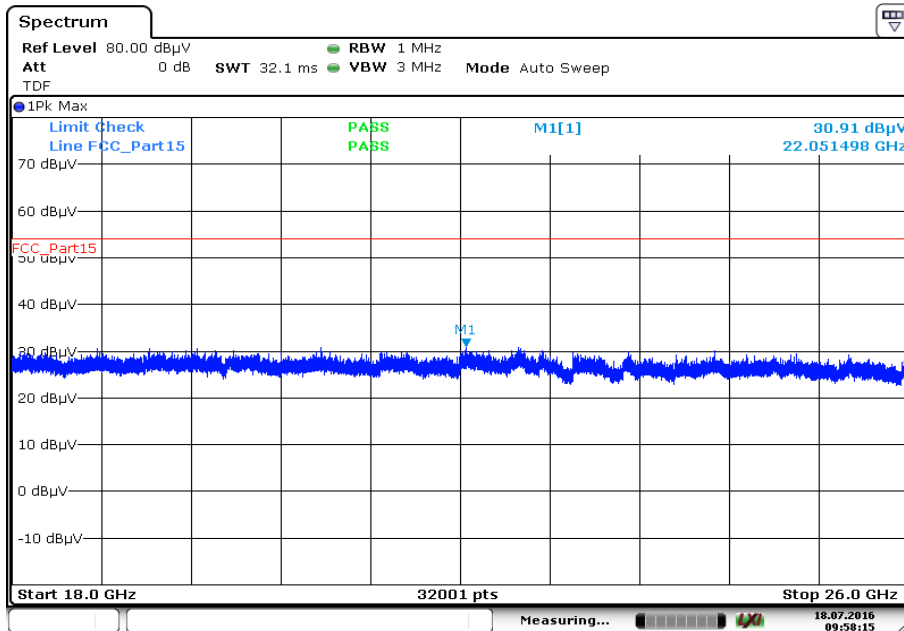
Plot 9: 2464 MHz, 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 10: 2464 MHz, 17.7 GHz to 18 GHz, vertical & horizontal polarization, peak & average

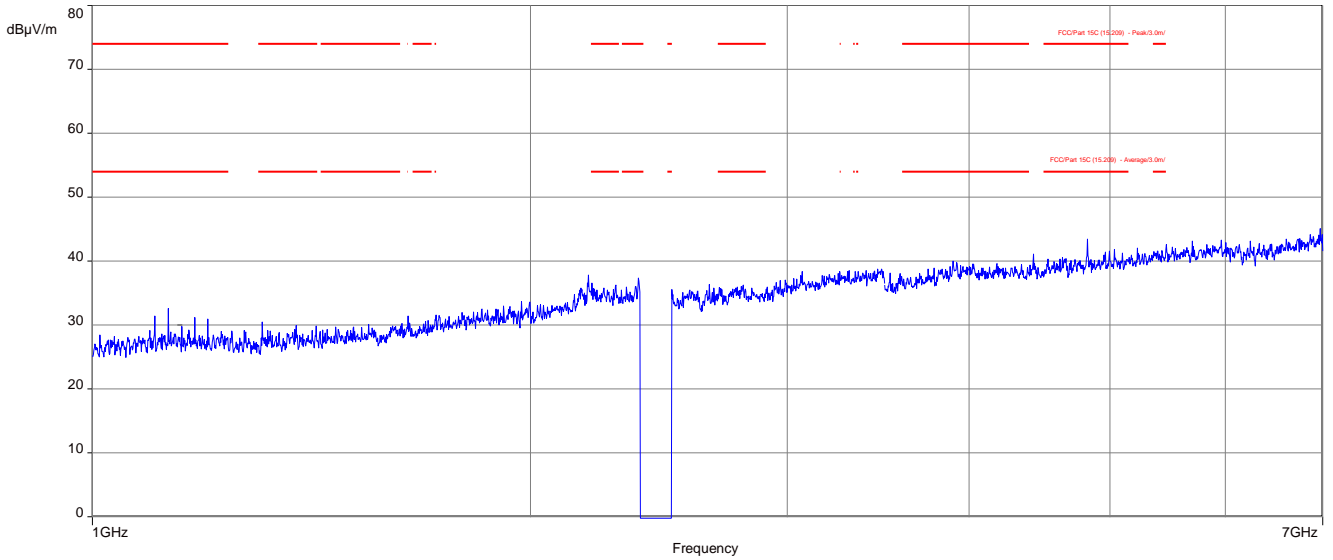


Plot 11: 2464 MHz, 18 GHz to 26 GHz, vertical & horizontal polarization



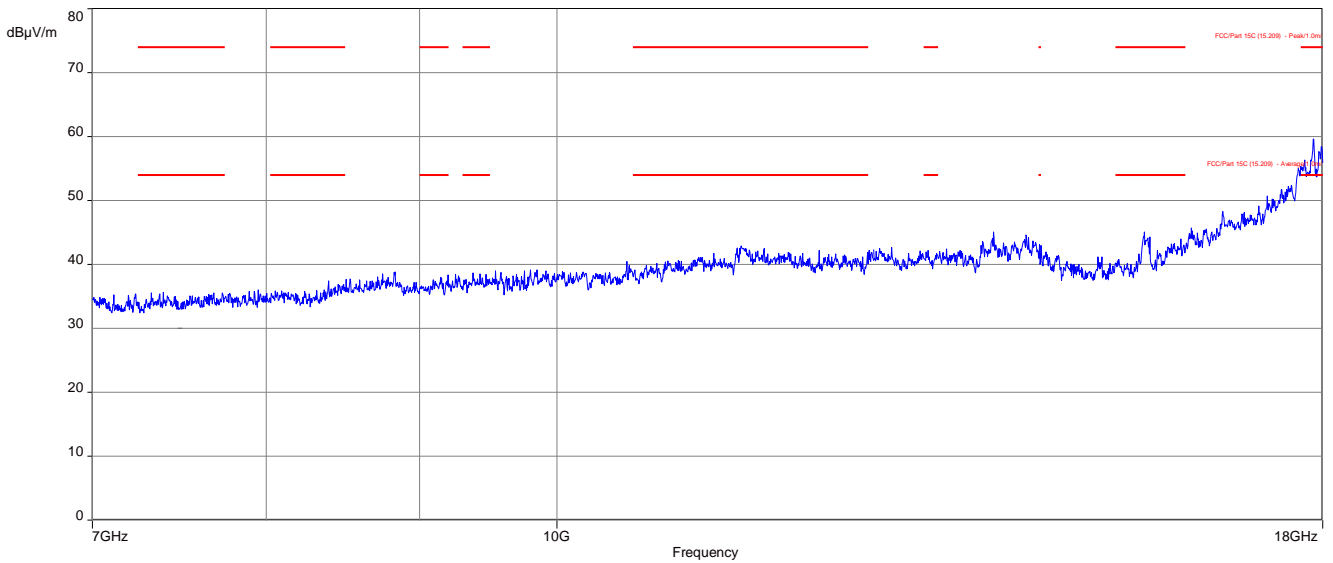
Plots: QPSK – mode / Antenna A

Plot 1: 2412 MHz, 1 GHz to 7 GHz, vertical & horizontal polarization

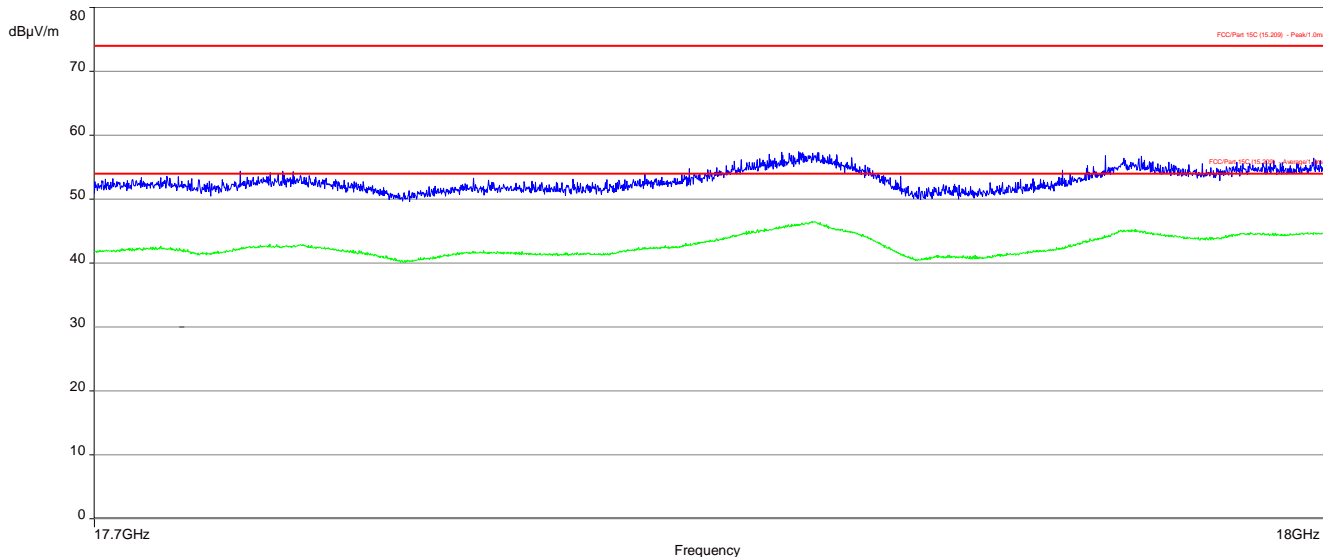


The carrier signal is notched with a 2.4 GHz band rejection filter.

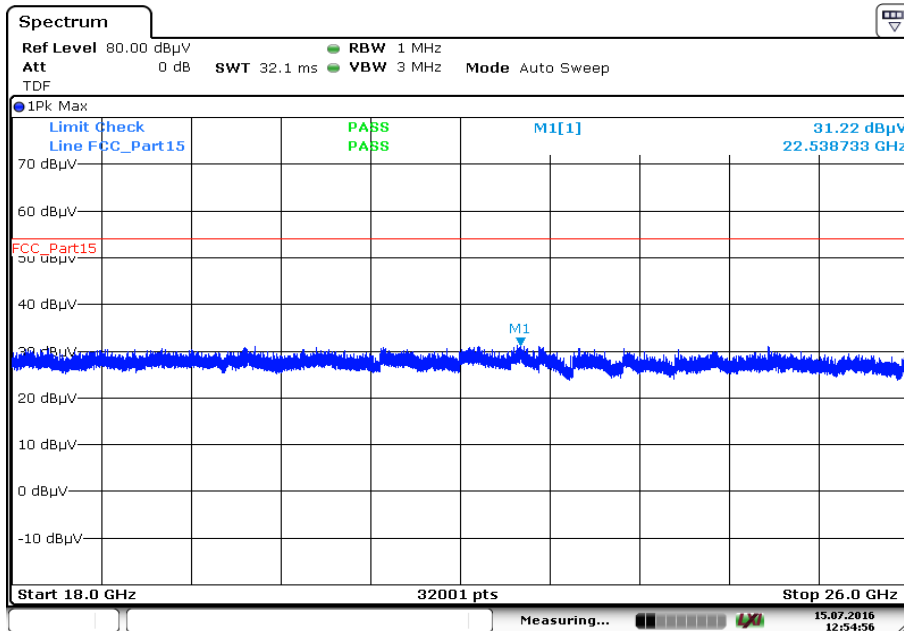
Plot 2: 2412 MHz, 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 3: 2412 MHz, 17.7 GHz to 18 GHz, vertical & horizontal polarization, peak & average

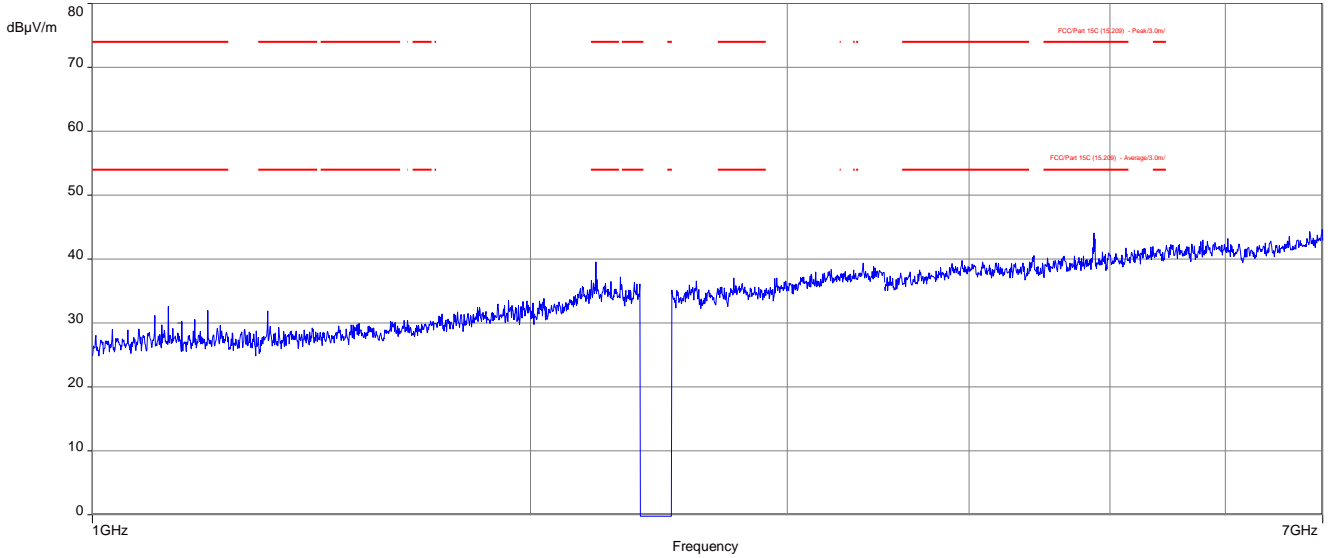


Plot 3: 2412 MHz, 18 GHz to 26 GHz, vertical & horizontal polarization



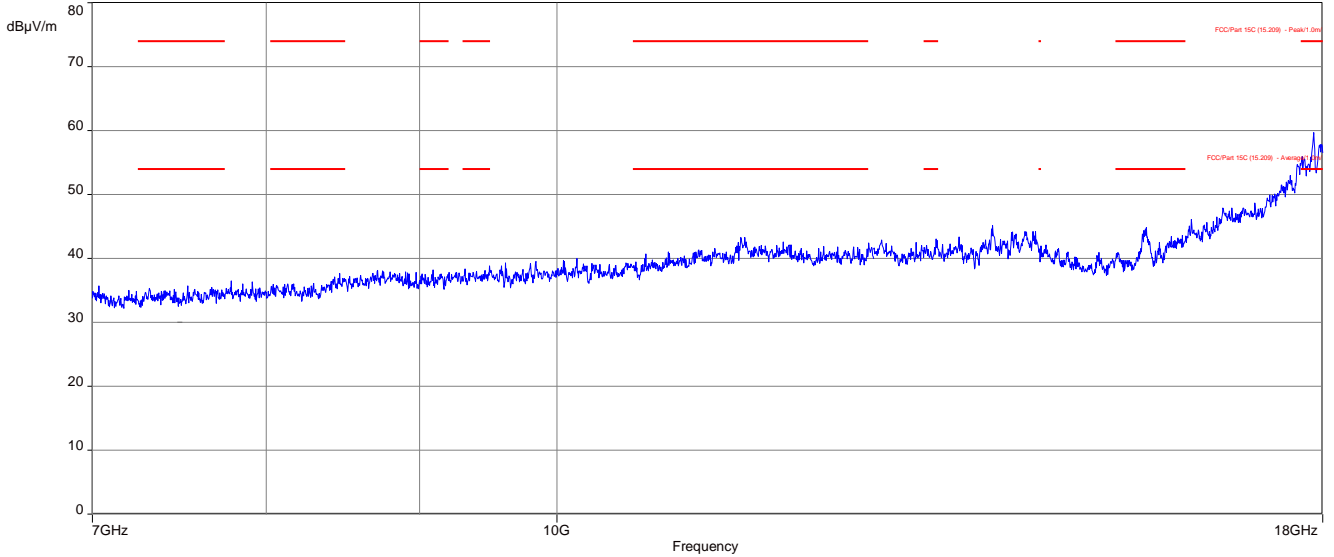
Date: 15.JUL.2016 12:54:56

Plot 4: 2438 MHz, 1 GHz to 7 GHz, vertical & horizontal polarization

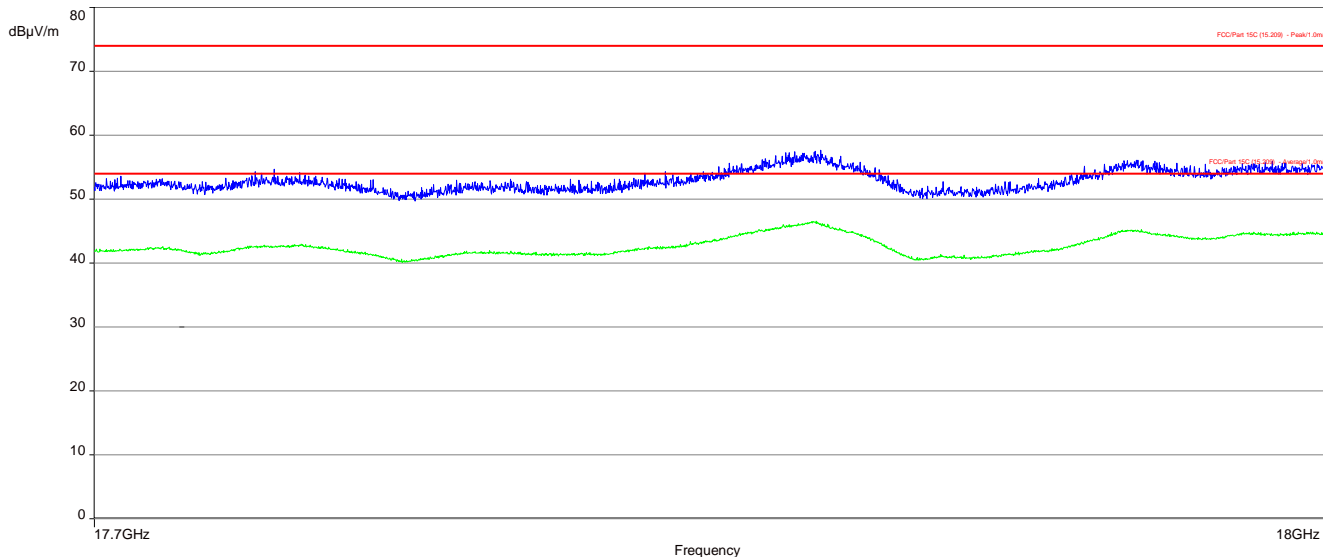


The carrier signal is notched with a 2.4 GHz band rejection filter.

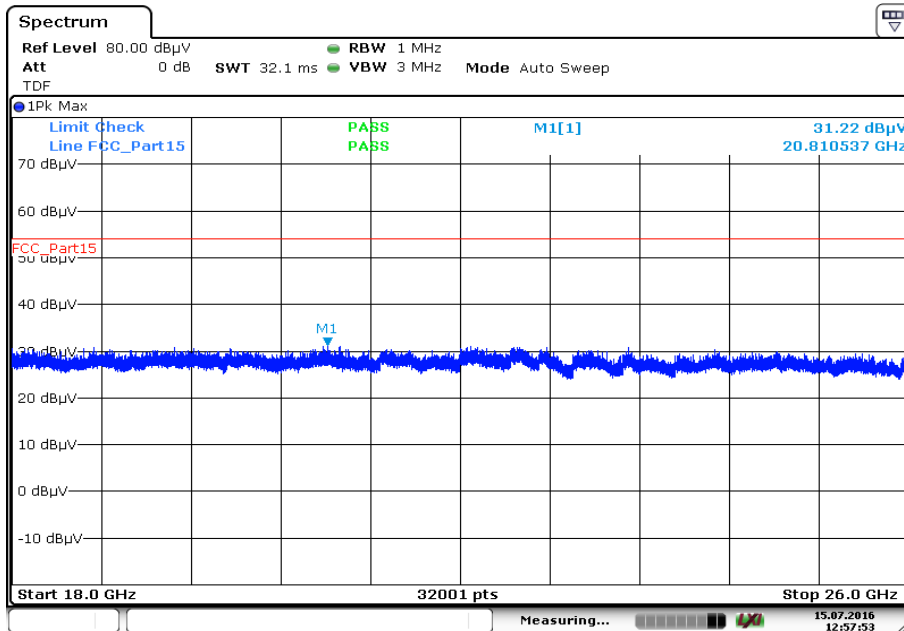
Plot 5: 2438 MHz, 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 6: 2438 MHz, 17.7 GHz to 18 GHz, vertical & horizontal polarization, peak & average

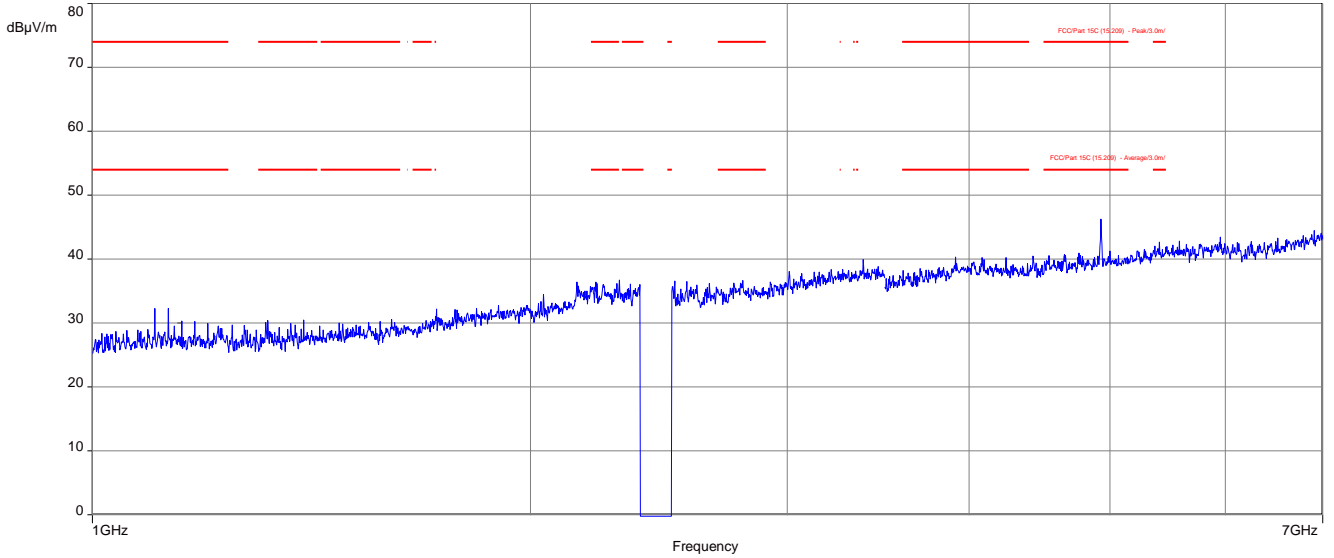


Plot 7: 2438 MHz, 18 GHz to 26 GHz, vertical & horizontal polarization



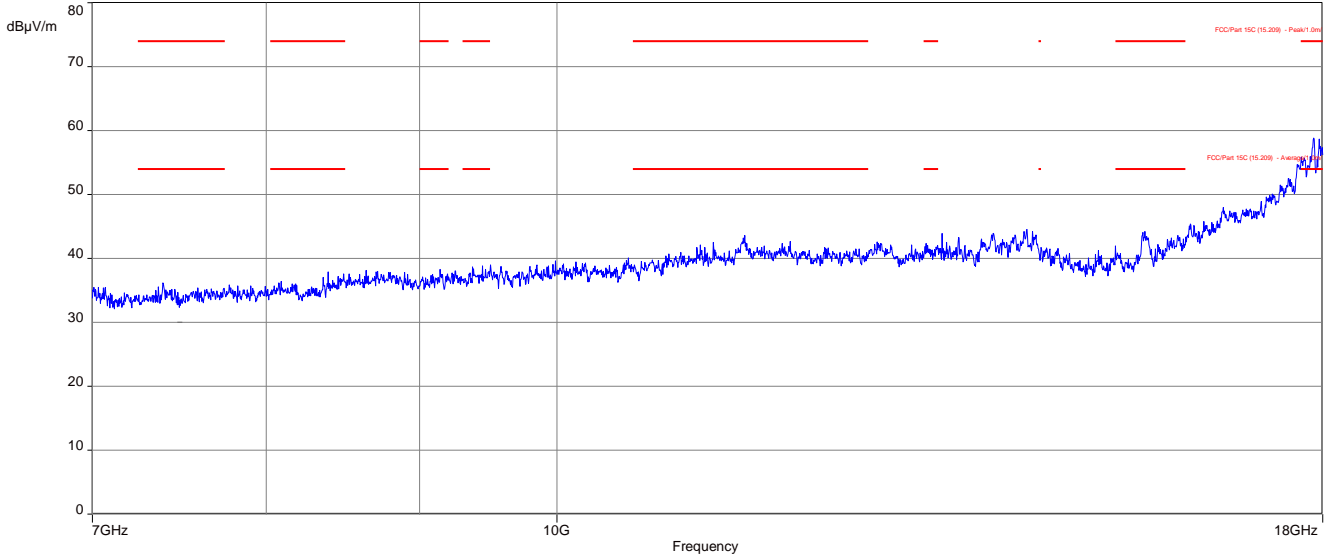
Date: 15.JUL.2016 12:57:53

Plot 8: 2464 MHz, 1 GHz to 7 GHz, vertical & horizontal polarization

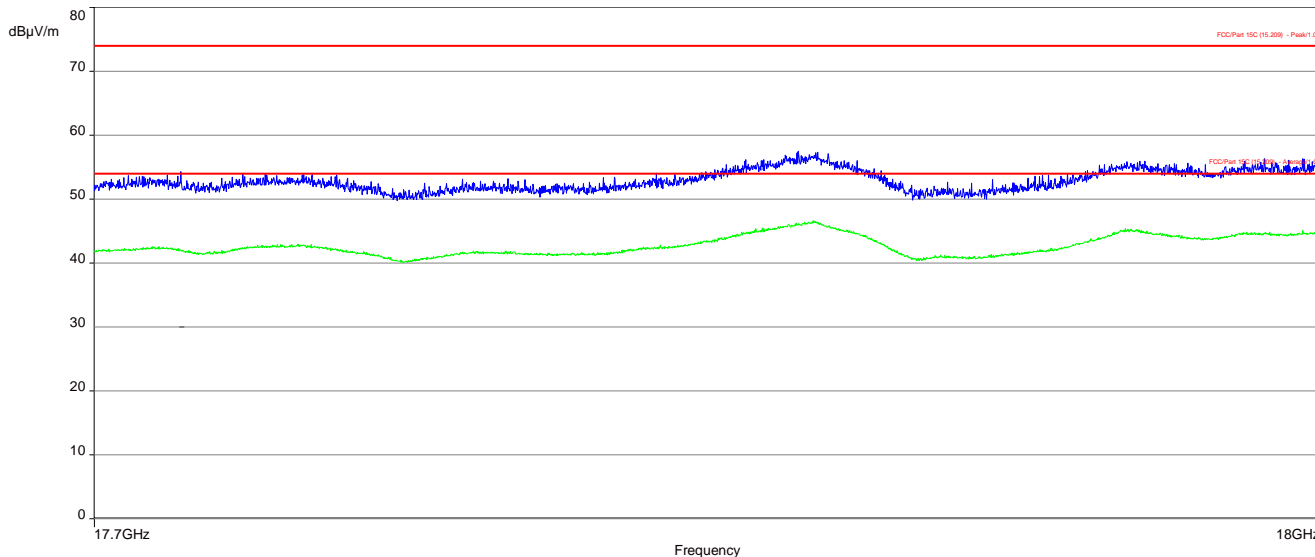


The carrier signal is notched with a 2.4 GHz band rejection filter.

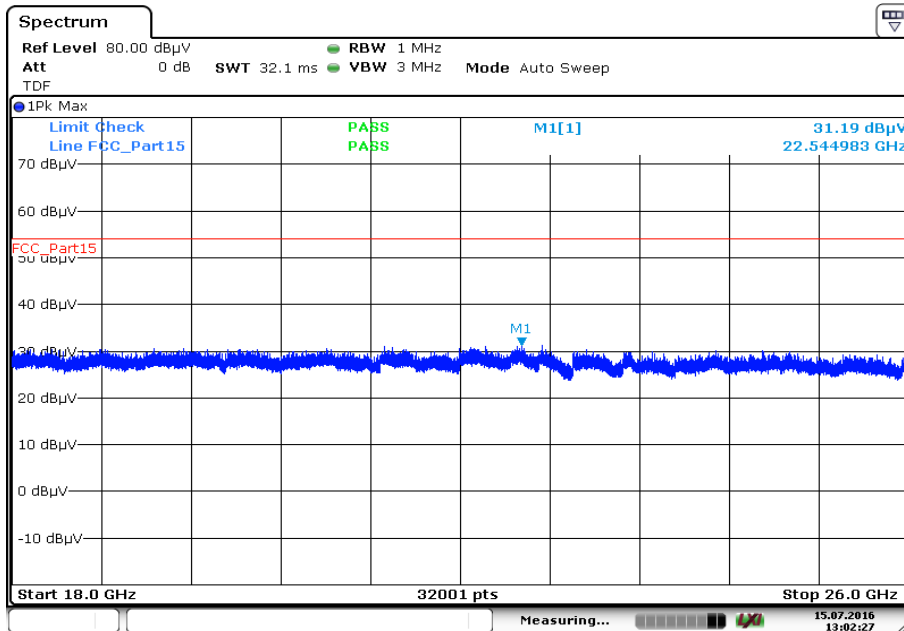
Plot 9: 2464 MHz, 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 10: 2464 MHz, 17.7 GHz to 18 GHz, vertical & horizontal polarization, peak & average



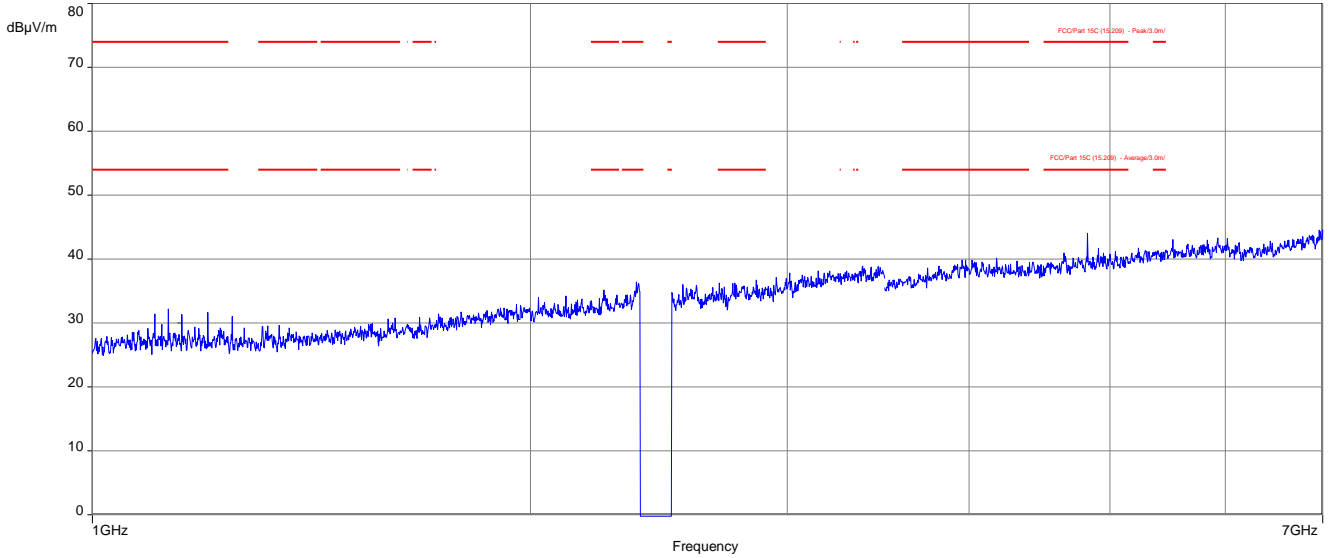
Plot 11: 2464 MHz, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 15.JUL.2016 13:02:27

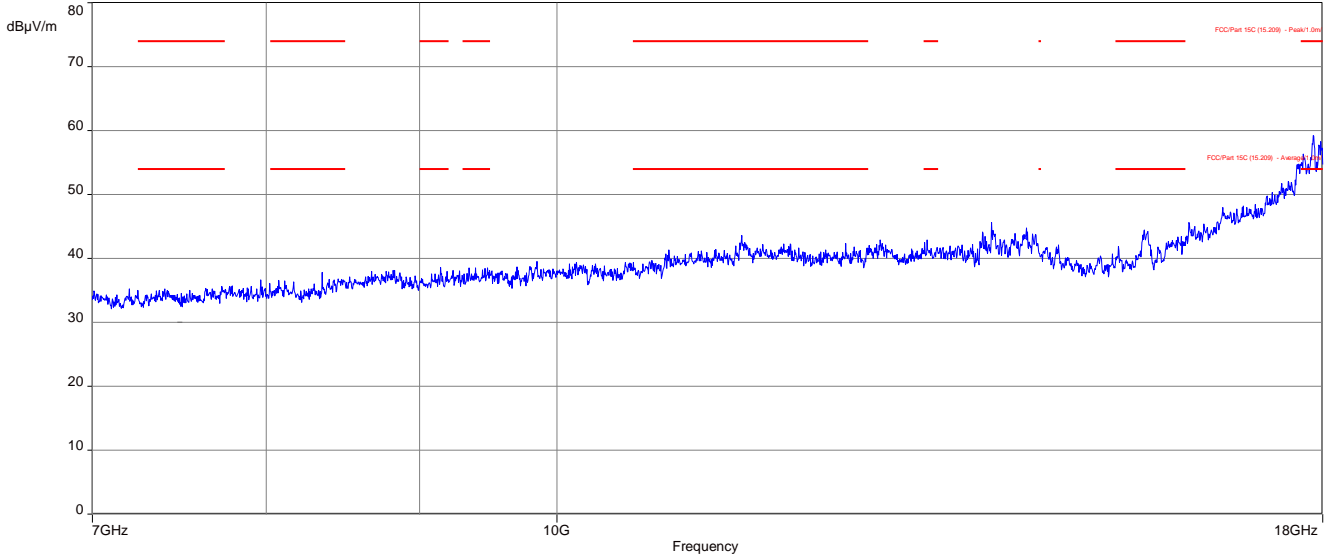
Plots: QPSK – mode / Antenna B

Plot 1: 2412 MHz, 1 GHz to 7 GHz, vertical & horizontal polarization

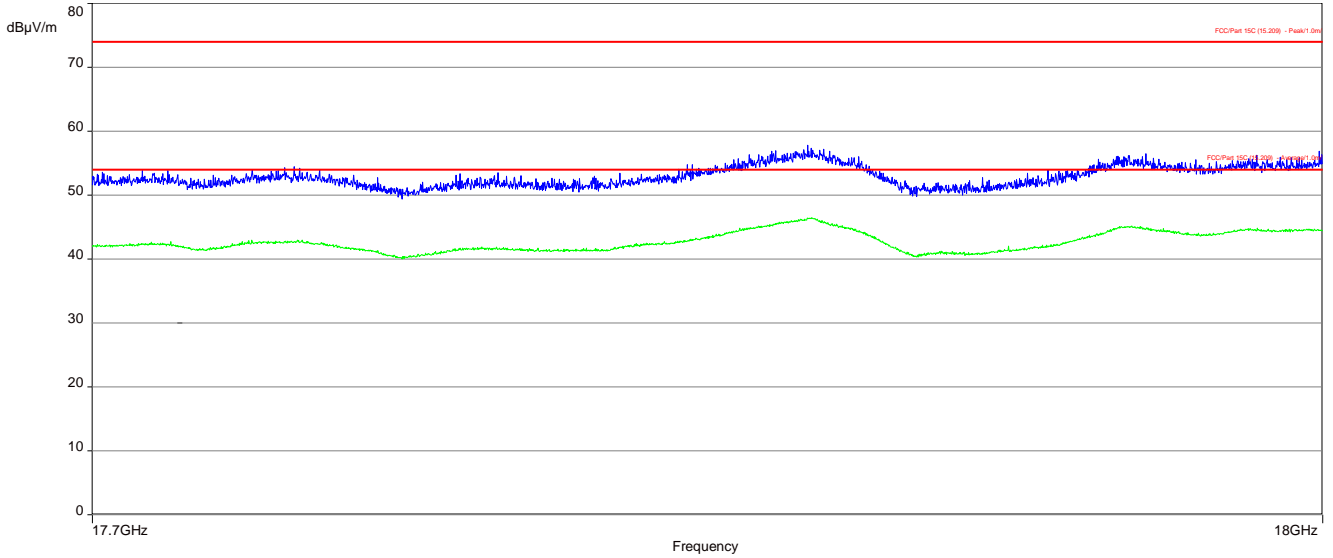


The carrier signal is notched with a 2.4 GHz band rejection filter.

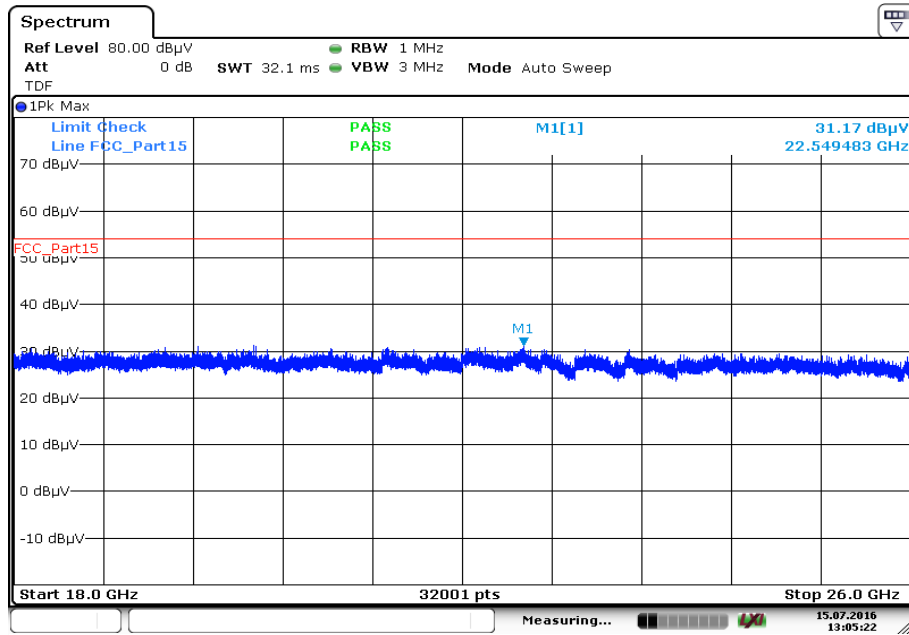
Plot 2: 2412 MHz, 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 3: 2412 MHz, 17.7 GHz to 18 GHz, vertical & horizontal polarization, peak & average

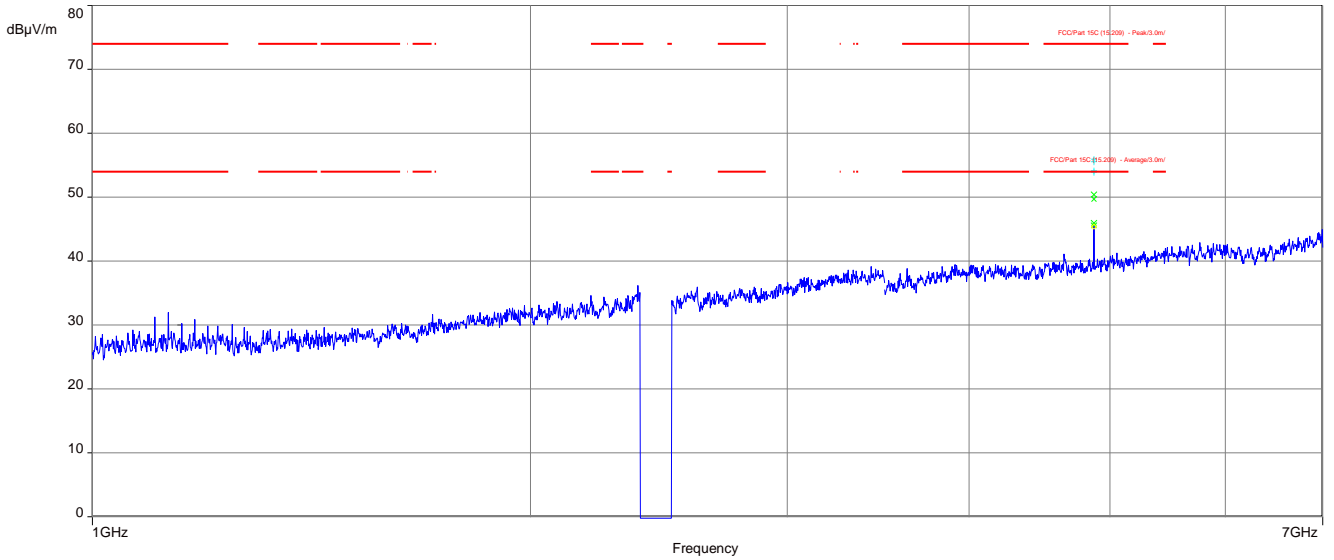


Plot 3: 2412 MHz, 18 GHz to 26 GHz, vertical & horizontal polarization



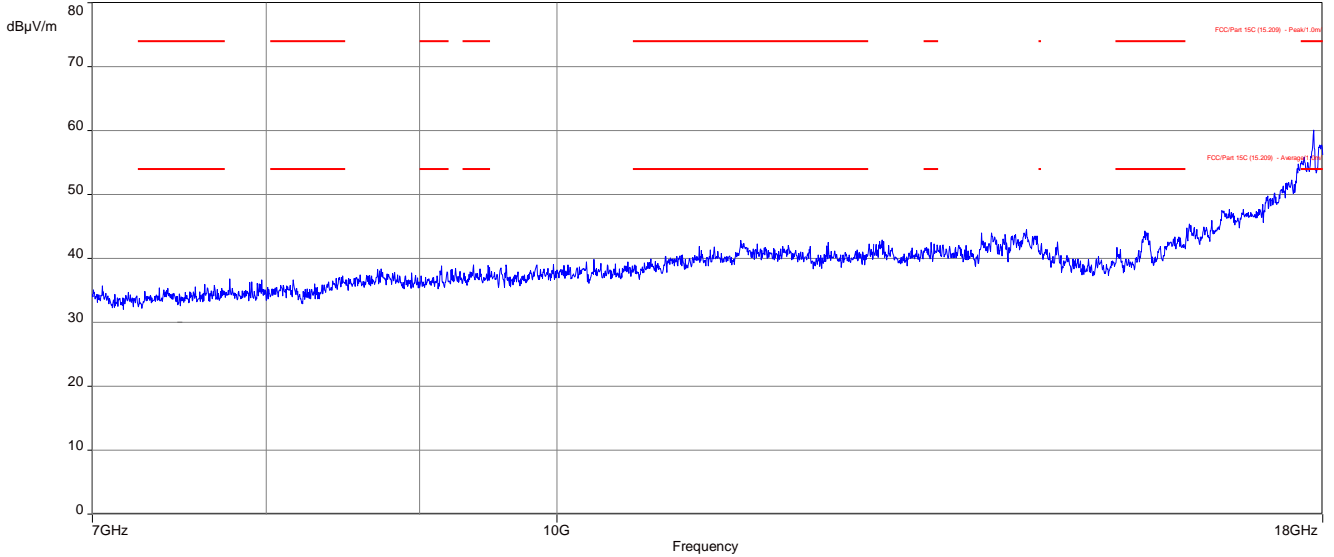
Date: 15.JUL.2016 13:05:22

Plot 4: 2438 MHz, 1 GHz to 7 GHz, vertical & horizontal polarization

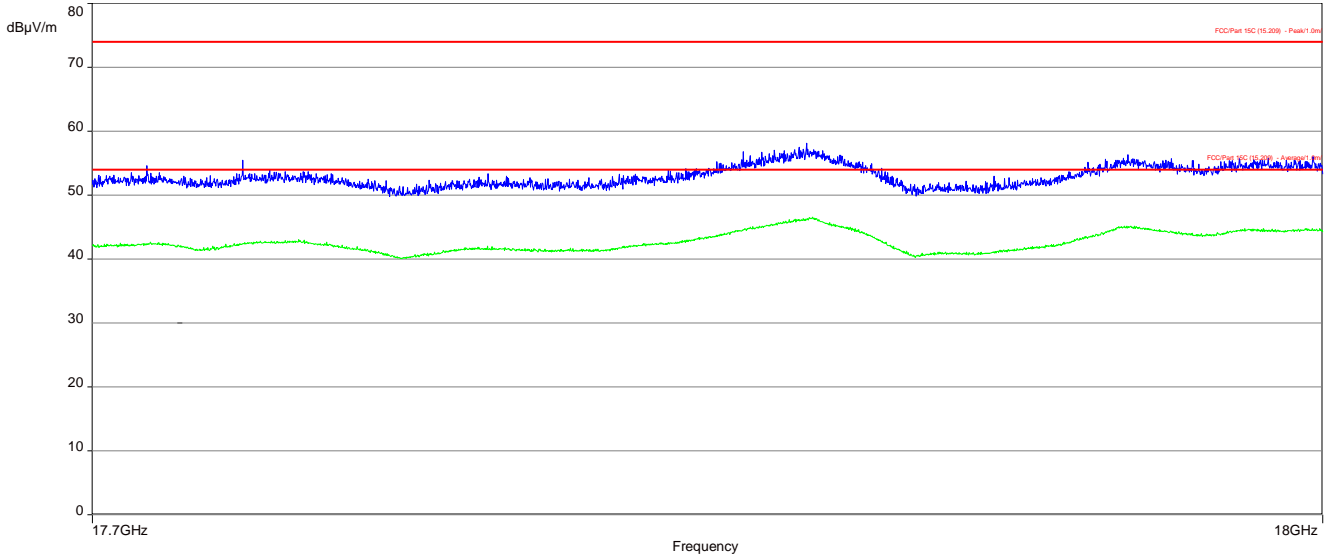


The carrier signal is notched with a 2.4 GHz band rejection filter.

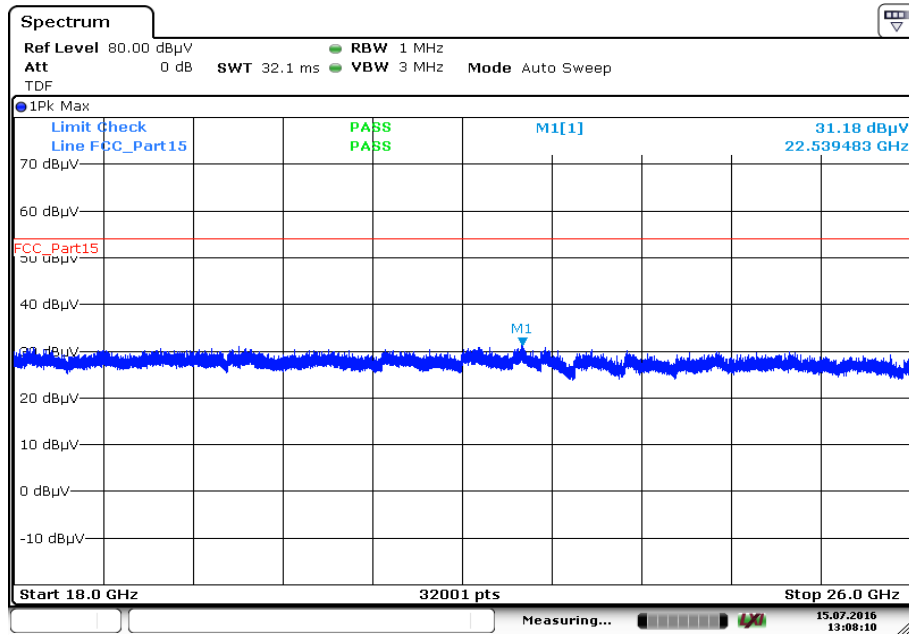
Plot 5: 2438 MHz, 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 6: 2438 MHz, 17.7 GHz to 18 GHz, vertical & horizontal polarization, peak & average

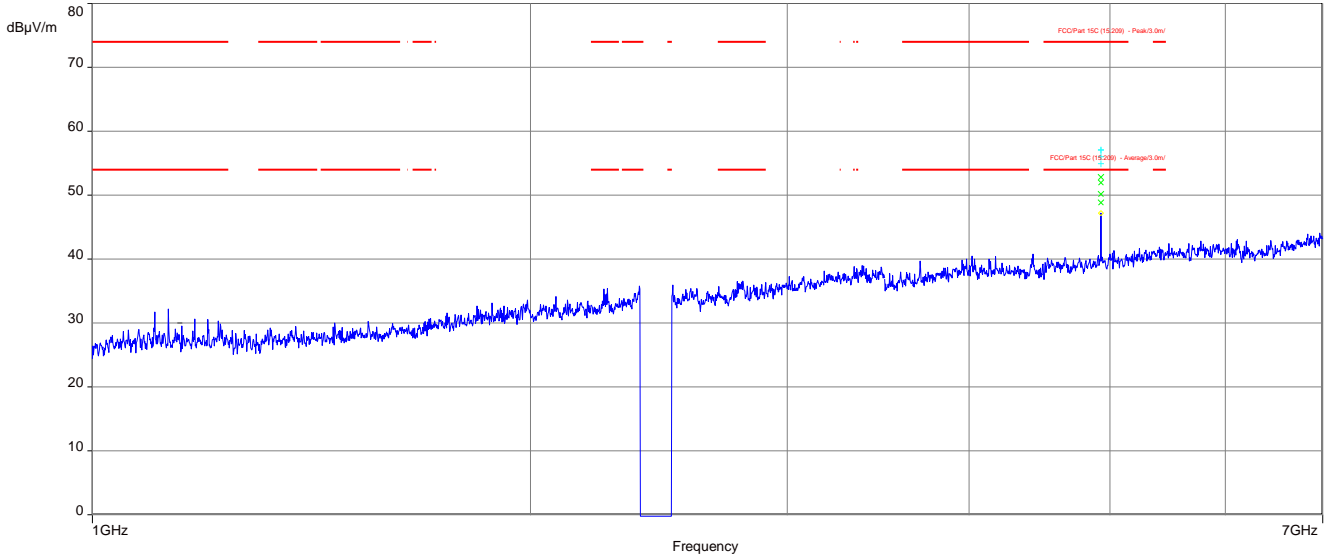


Plot 7: 2438 MHz, 18 GHz to 26 GHz, vertical & horizontal polarization



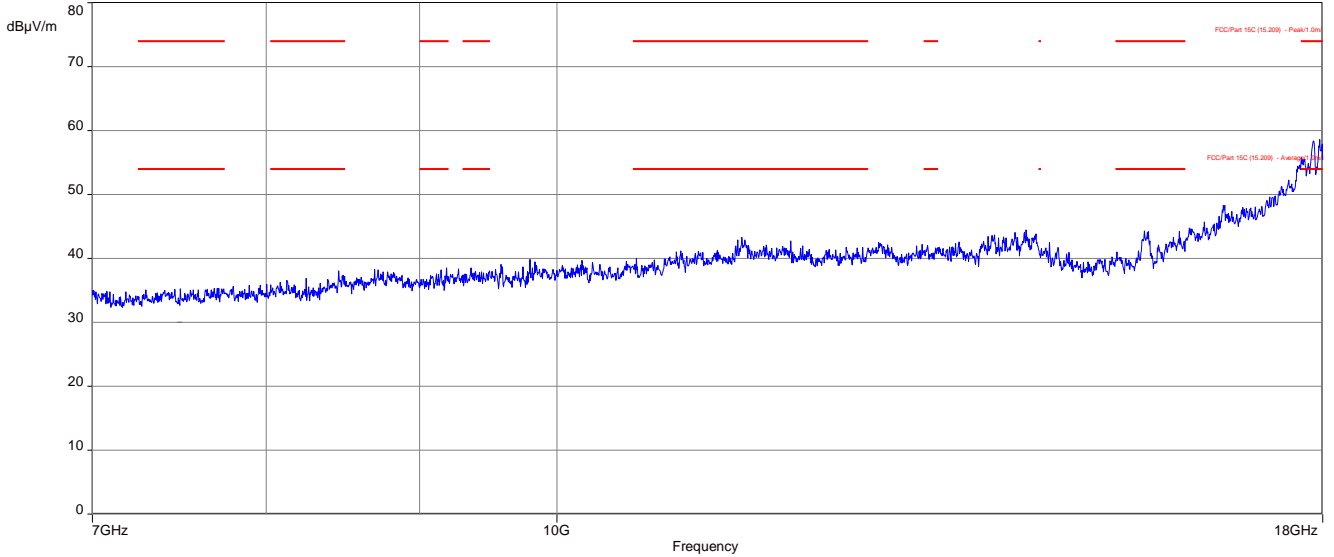
Date: 15.JUL.2016 13:08:10

Plot 8: 2464 MHz, 1 GHz to 7 GHz, vertical & horizontal polarization

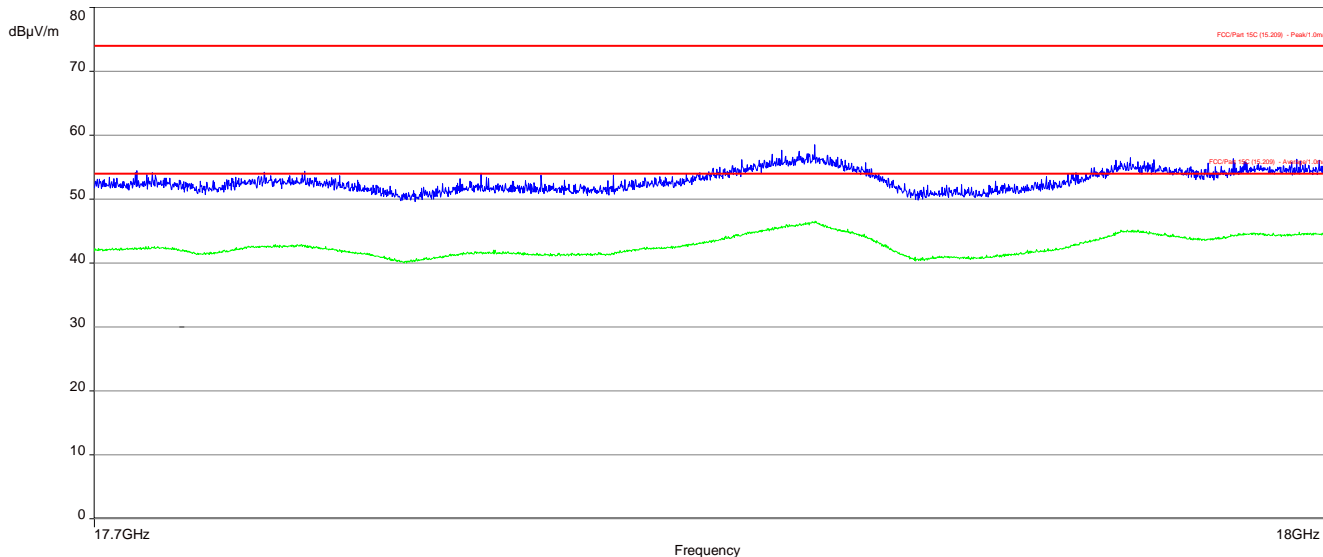


The carrier signal is notched with a 2.4 GHz band rejection filter.

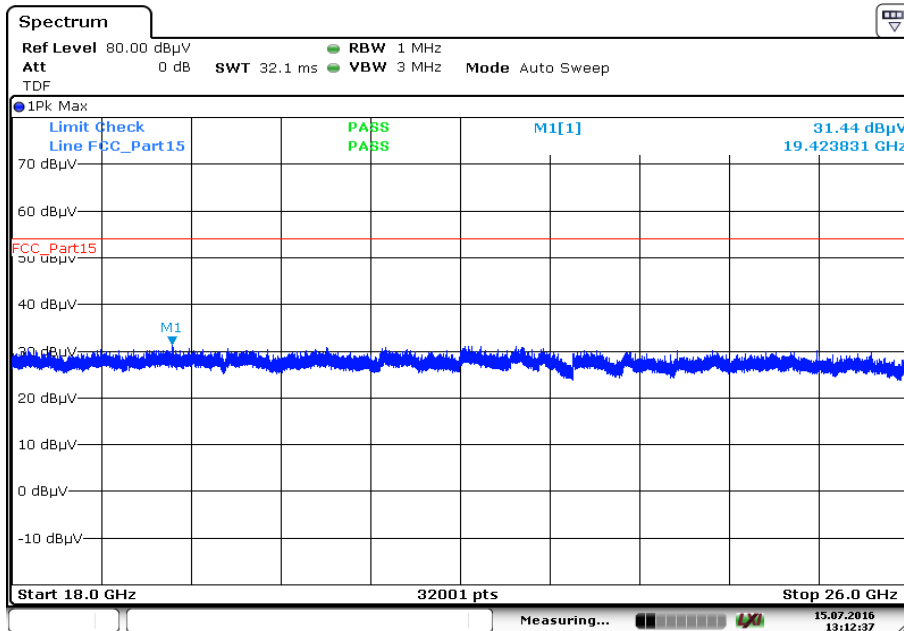
Plot 9: 2464 MHz, 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 10: 2464 MHz, 17.7 GHz to 18 GHz, vertical & horizontal polarization, peak & average



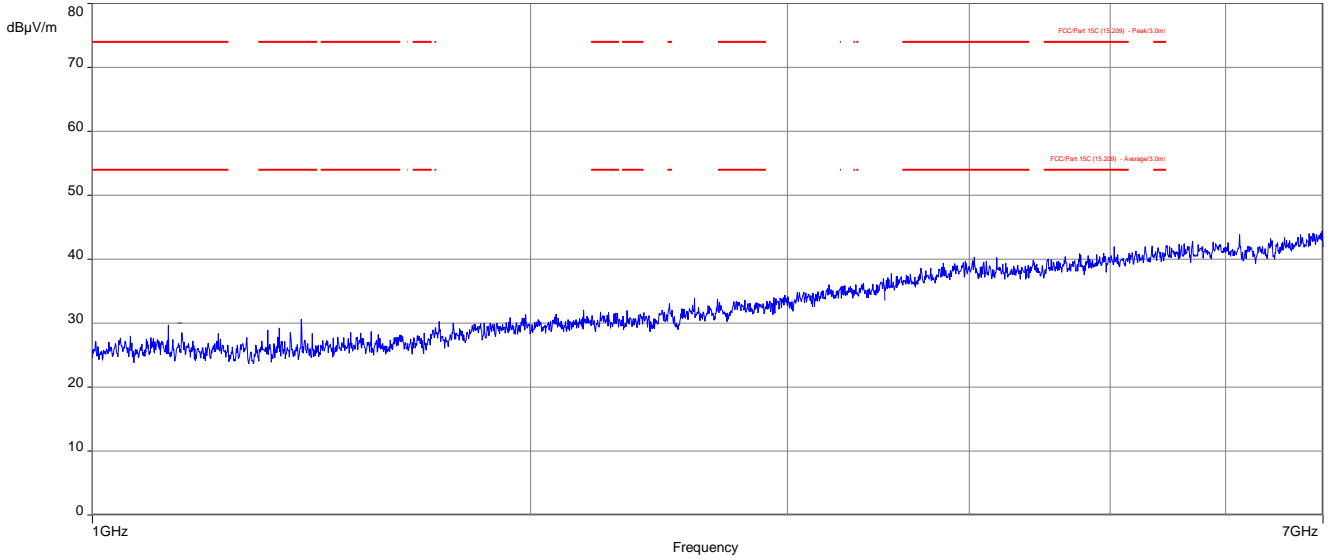
Plot 11: 2464 MHz, 18 GHz to 26 GHz, vertical & horizontal polarization



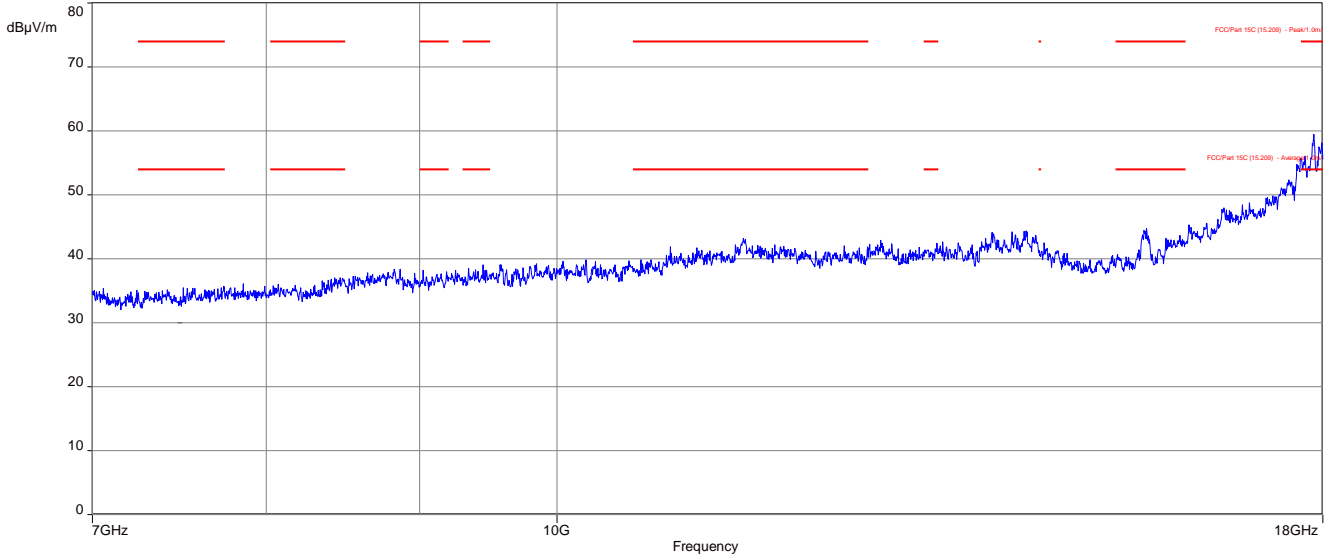
Date: 15.JUL.2016 13:12:37

Plots: Idle mode / Antenna A

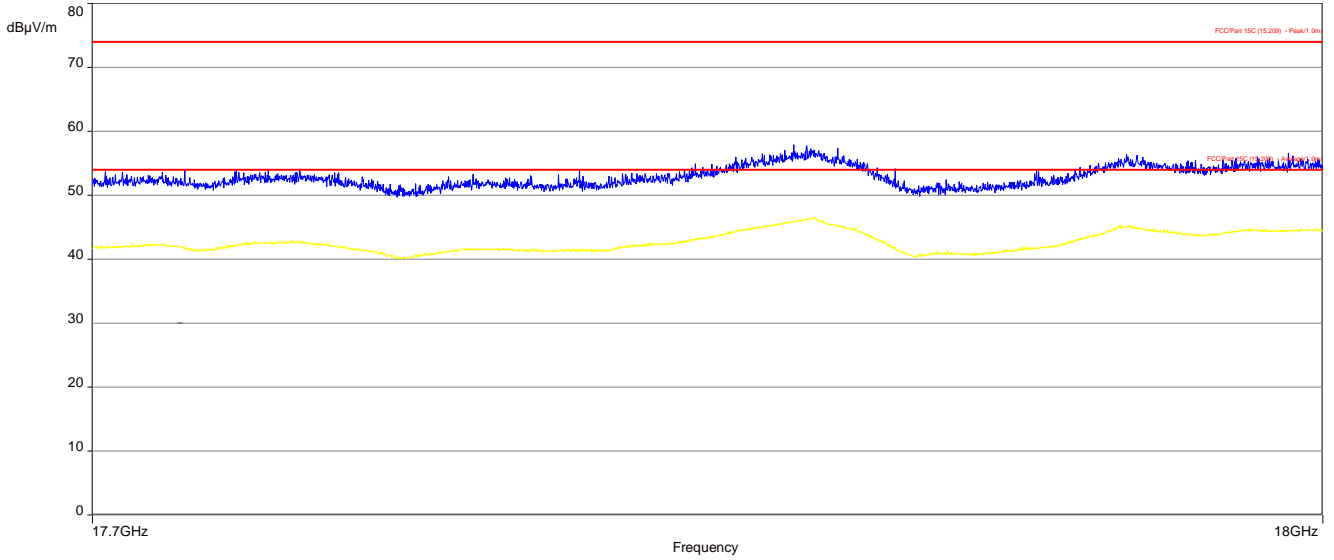
Plot 1: 1 GHz to 7 GHz, vertical & horizontal polarization



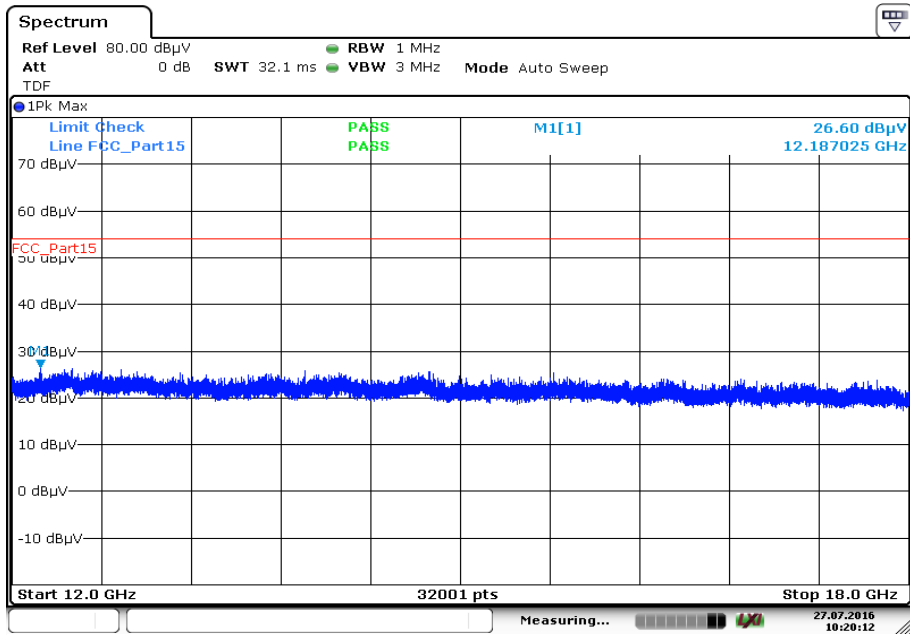
Plot 2: 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 3: 17.7 GHz to 18 GHz, vertical & horizontal polarization



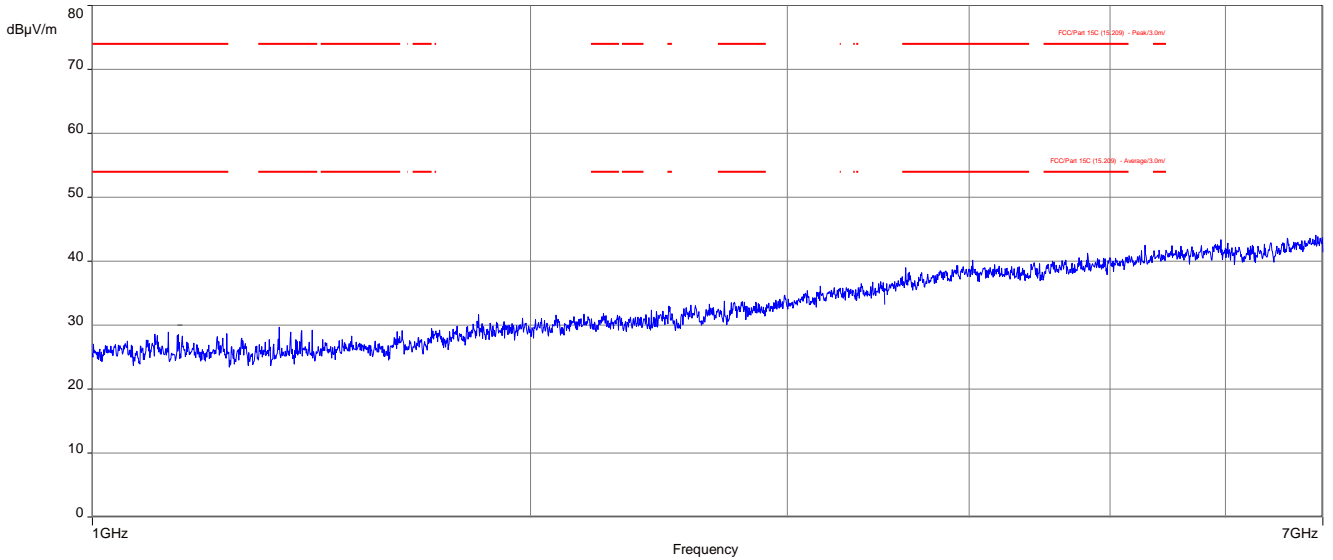
Plot 4: 18 GHz to 26 GHz, vertical & horizontal polarization



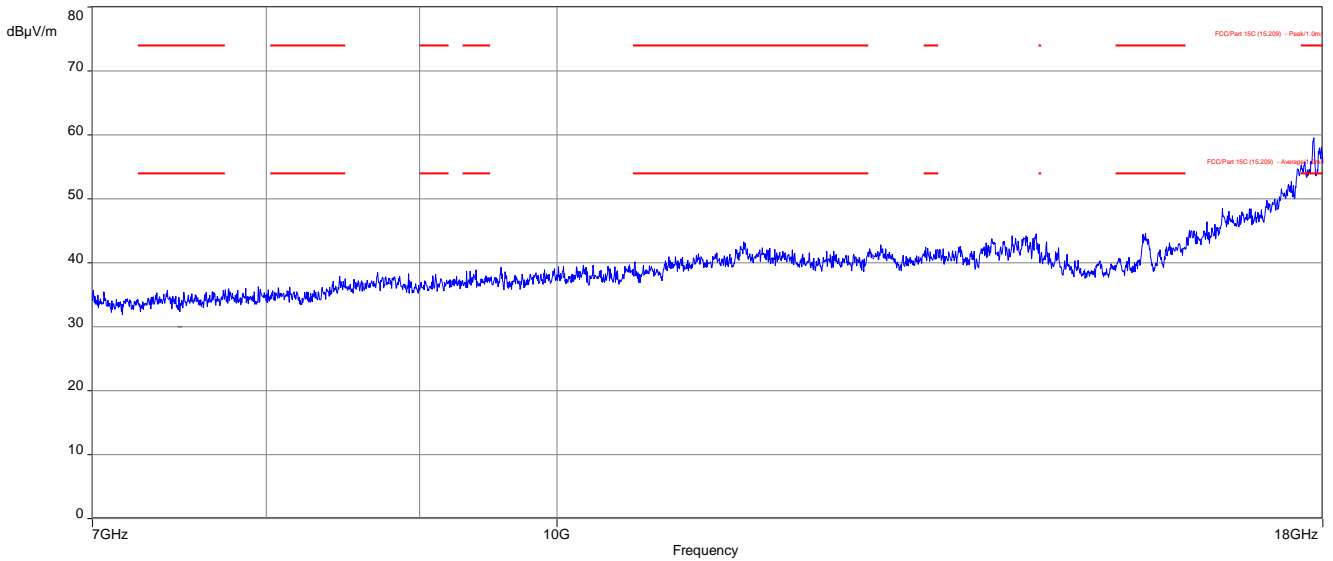
Date: 27.JUL.2016 10:20:12

Plots: Idle mode / Antenna B

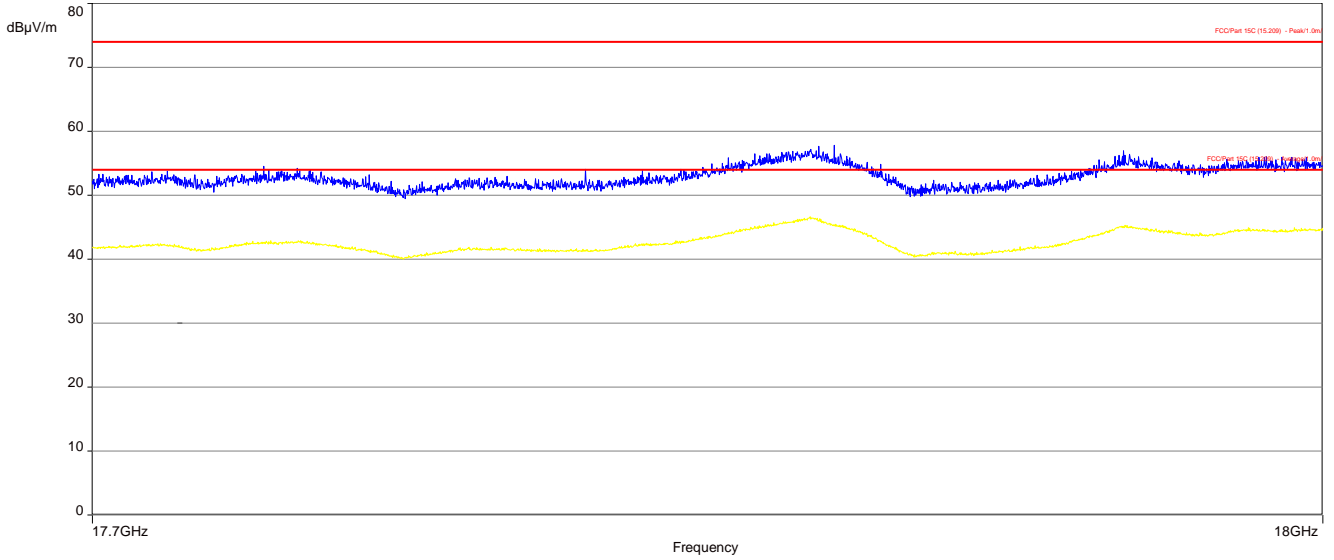
Plot 1: 1 GHz to 7 GHz, vertical & horizontal polarization



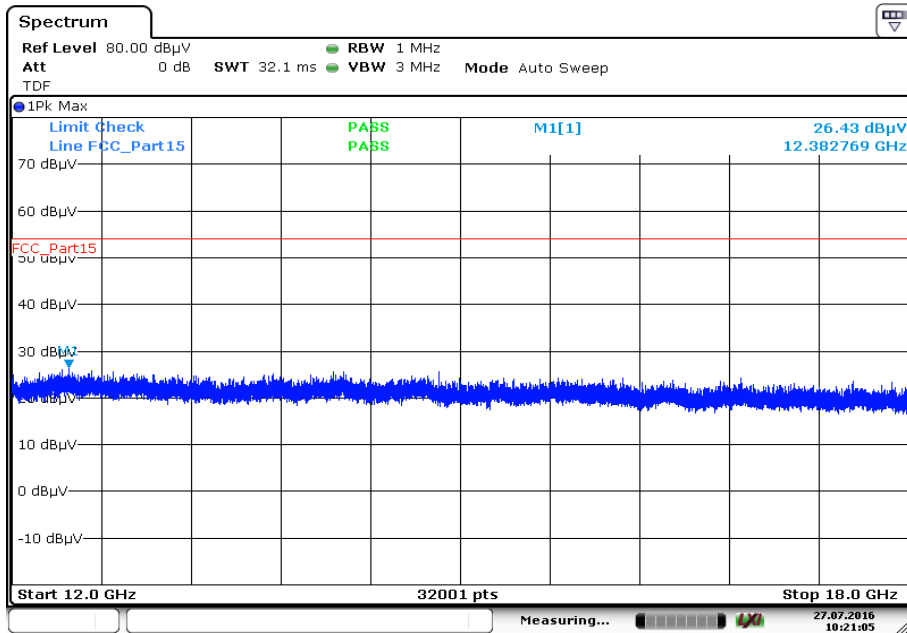
Plot 2: 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 3: 17.7 GHz to 18 GHz, vertical & horizontal polarization



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



Date: 27.JUL.2016 10:21:05

12.14 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 channel 6. This measurement is repeated for DSSS and OFDM modulation. If peaks are found channel 1 and channel 11 will be measured too. The measurement is performed with the data rate producing the highest output power. Both power lines, phase and neutral line, are measured. Found peaks are re-measured 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 7.4 - A
Measurement uncertainty:	See sub clause 9

Limits:

FCC		IC
Frequency (MHz)	Quasi-Peak (dBµV/m)	Average (dBµV/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

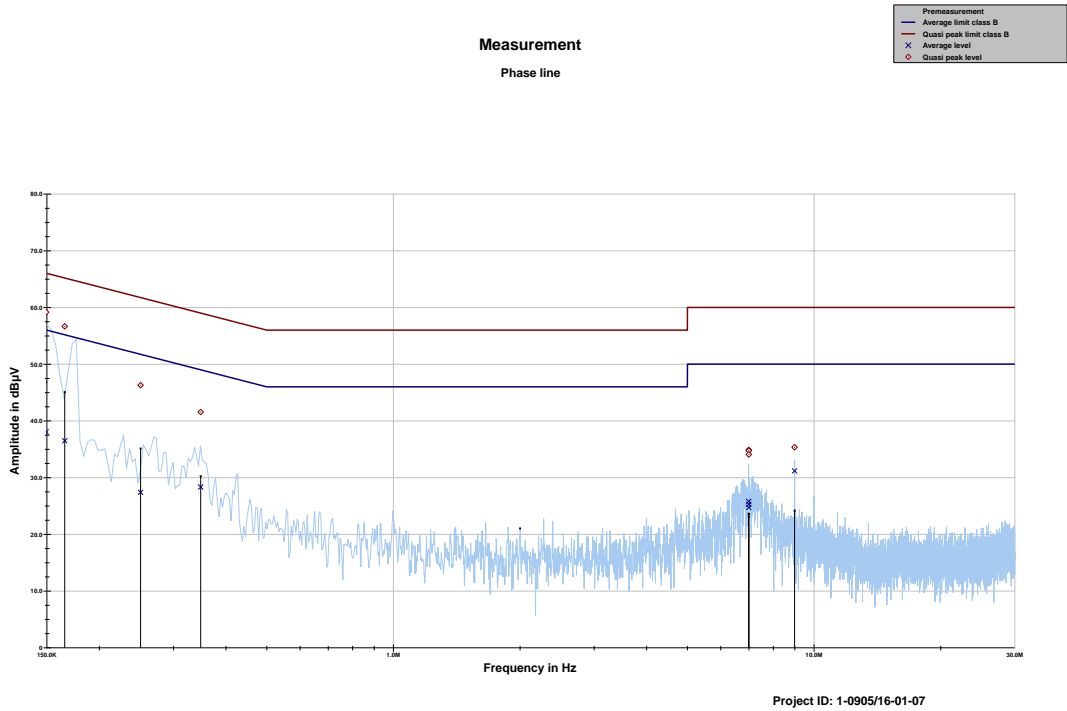
*Decreases with the logarithm of the frequency

Results:

TX Spurious Emissions Conducted < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
Result tables below plots.		

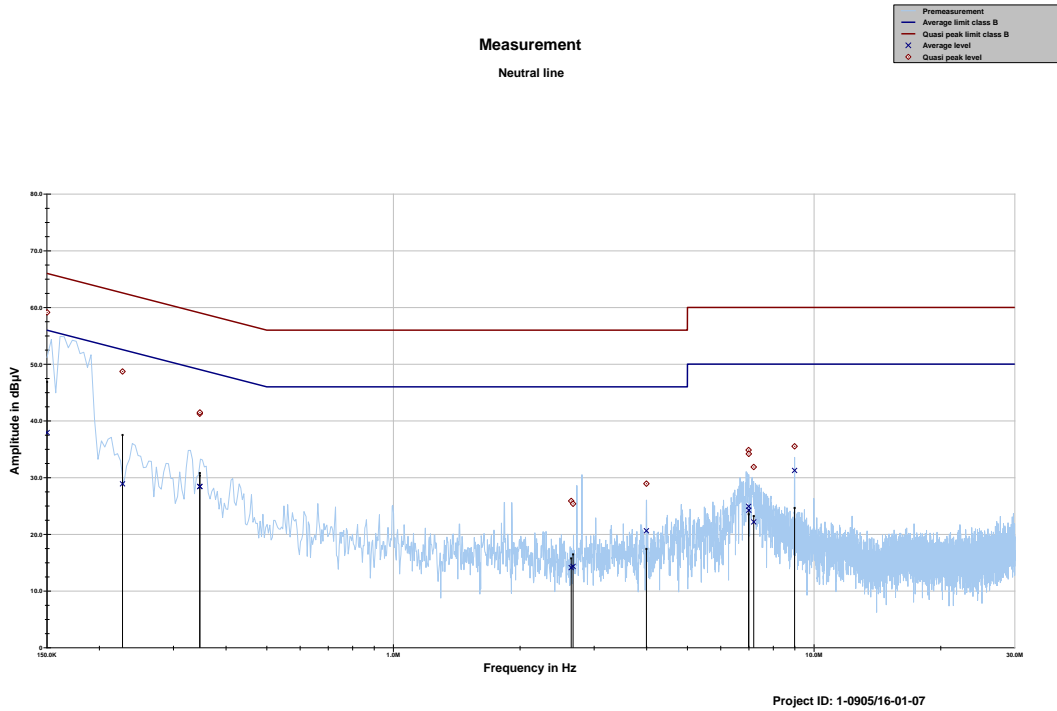
Plots: TX – mode / Antenna A

Plot 1: 150 kHz to 30 MHz, phase line



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.149322	59.16			38.05		
0.165478	56.67	8.51	65.184	36.50	19.06	55.558
0.250599	46.29	15.44	61.737	27.40	25.73	53.126
0.348306	41.55	17.45	59.003	28.33	22.00	50.334
6.991580	34.89	25.11	60.000	25.80	24.20	50.000
6.995078	34.73	25.27	60.000	25.29	24.71	50.000
6.995780	34.09	25.91	60.000	24.75	25.25	50.000
8.989734	35.35	24.65	60.000	31.17	18.83	50.000

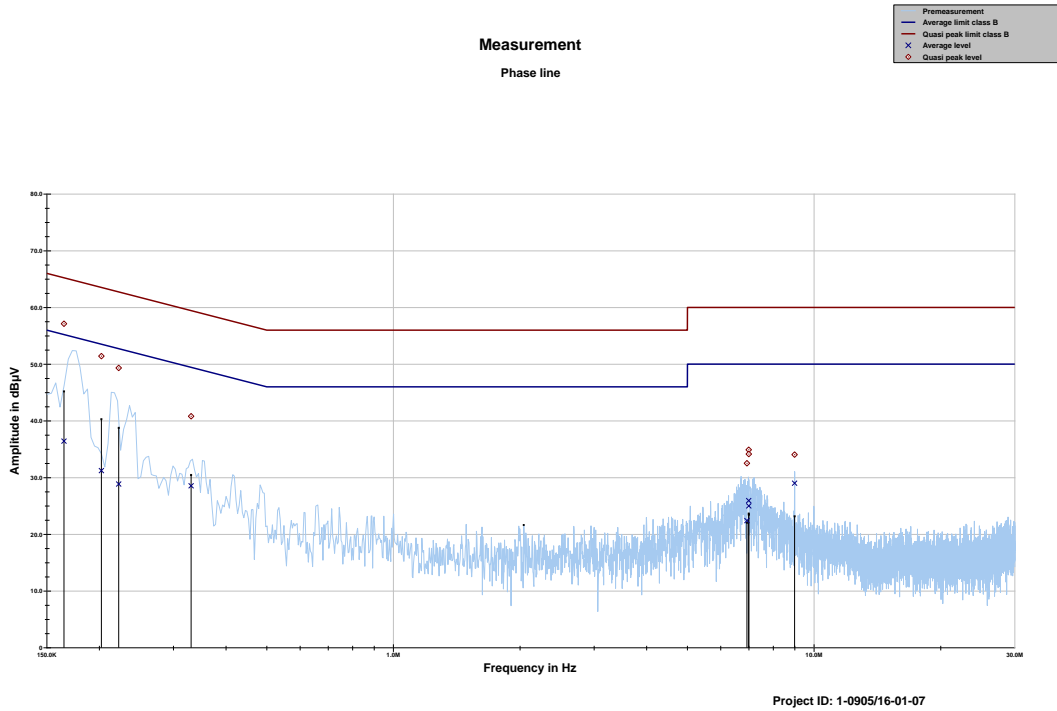
Plot 2: 150 kHz to 30 MHz, neutral line



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.150263	59.12	6.86	65.985	37.94	18.06	55.992
0.226978	48.70	13.86	62.560	28.90	24.90	53.801
0.346453	41.26	17.79	59.047	28.43	21.96	50.387
0.346612	41.48	17.56	59.043	28.43	21.95	50.383
2.647124	25.87	30.13	56.000	14.12	31.88	46.000
2.673437	25.39	30.61	56.000	14.34	31.66	46.000
3.994864	28.92	27.08	56.000	20.62	25.38	46.000
6.988012	34.86	25.14	60.000	24.92	25.08	50.000
6.996703	34.18	25.82	60.000	24.25	25.75	50.000
7.186449	31.86	28.14	60.000	22.18	27.82	50.000
8.990678	35.52	24.48	60.000	31.26	18.74	50.000

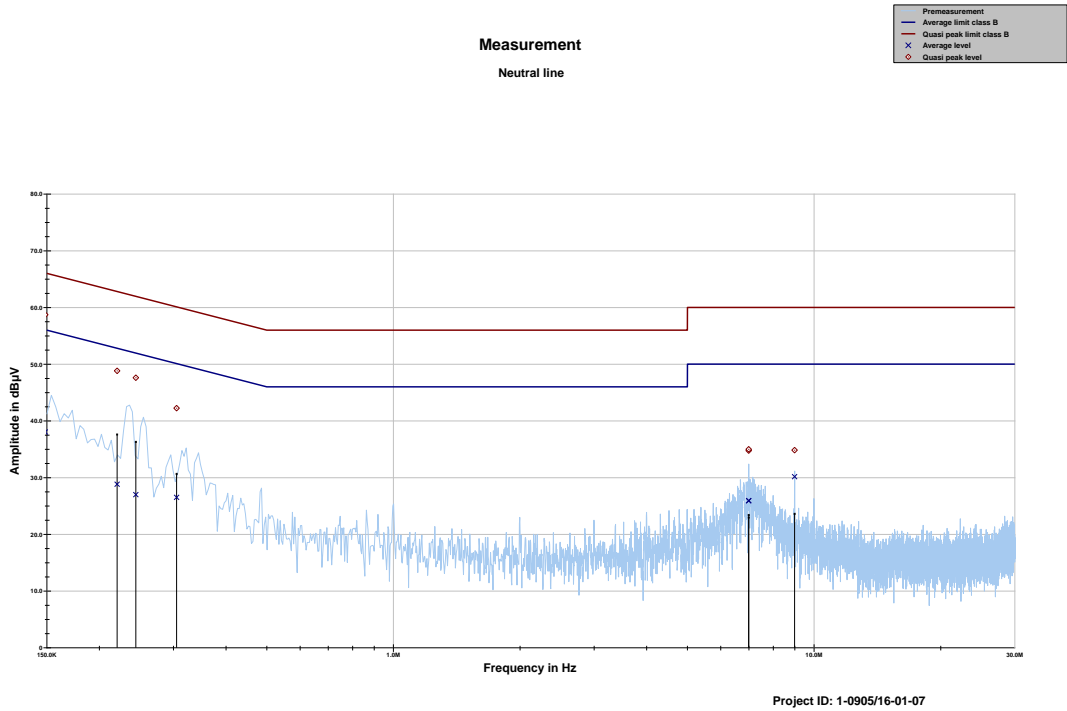
Plots: TX – mode / Antenna B

Plot 1: 150 kHz to 30 MHz, phase line



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.164746	57.13	8.09	65.221	36.43	19.15	55.579
0.202266	51.42	12.09	63.517	31.22	23.29	54.507
0.222381	49.32	13.41	62.730	28.86	25.07	53.932
0.330406	40.80	18.64	59.441	28.56	22.29	50.846
6.924979	32.52	27.48	60.000	22.41	27.59	50.000
6.993262	34.90	25.10	60.000	25.94	24.06	50.000
6.996587	34.15	25.85	60.000	25.00	25.00	50.000
8.987532	34.05	25.95	60.000	29.01	20.99	50.000

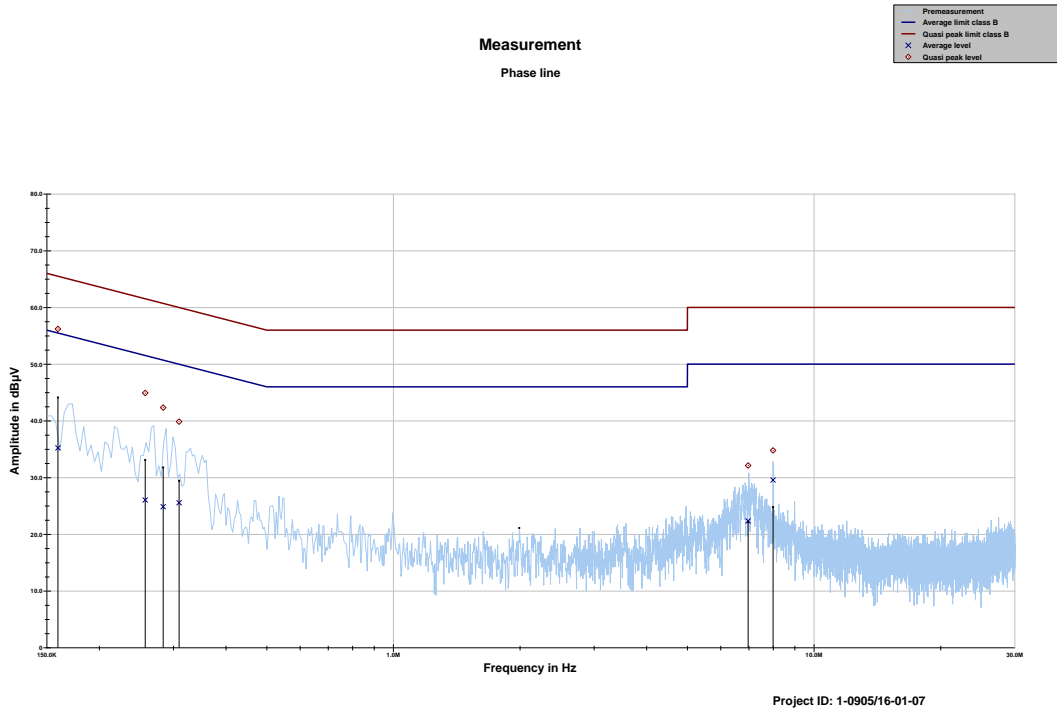
Plot 2: 150 kHz to 30 MHz, neutral line



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.148649	58.71			38.04		
0.220453	48.82	13.98	62.802	28.83	25.16	53.987
0.244224	47.60	14.35	61.951	27.00	26.31	53.308
0.305261	42.24	17.86	60.098	26.51	25.05	51.564
6.991503	34.76	25.24	60.000	25.90	24.10	50.000
6.992454	34.98	25.02	60.000	25.93	24.07	50.000
8.989105	34.84	25.16	60.000	30.17	19.83	50.000

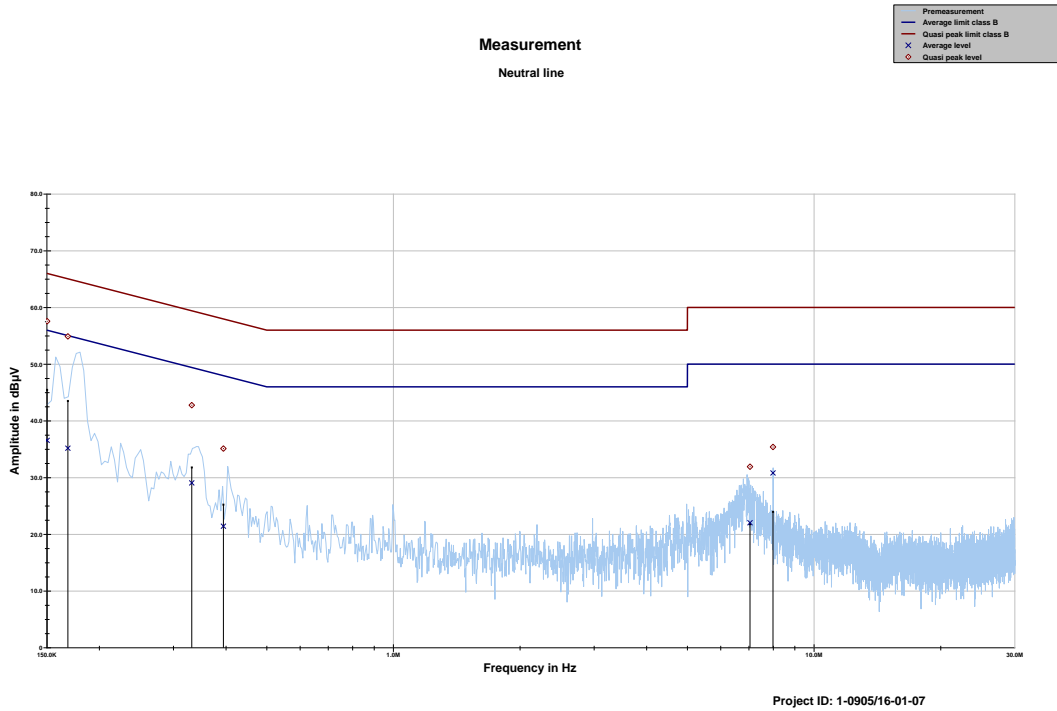
Plots: RX – mode

Plot 1: 150 kHz to 30 MHz, phase line



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.159433	56.21	9.28	65.493	35.24	20.49	55.730
0.257136	44.91	16.61	61.523	26.05	26.89	52.939
0.283625	42.34	18.37	60.709	24.86	27.33	52.182
0.309436	39.86	20.13	59.986	25.57	25.87	51.445
6.973422	32.13	27.87	60.000	22.36	27.64	50.000
7.993326	34.79	25.21	60.000	29.57	20.43	50.000

Plot 2: 150 kHz to 30 MHz, neutral line



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.150291	57.58	8.41	65.984	36.57	19.42	55.992
0.168360	54.89	10.15	65.041	35.18	20.30	55.475
0.331678	42.77	16.64	59.409	29.06	21.75	50.809
0.394384	35.12	22.85	57.971	21.42	27.59	49.018
7.043932	31.91	28.09	60.000	22.04	27.96	50.000
7.989330	35.39	24.61	60.000	30.81	19.19	50.000

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	2016-08-02

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

Back side of certificate



Deutsche Akkreditierungsstelle GmbH

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

Akkreditierung



Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

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

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

- Funk
- Mobilfunk (GSM / DCS) + OTA
- Elektromagnetische Verträglichkeit (EMV)
- Produktsicherheit
- SAR / EMF
- Umwelt
- Smart Card Technology
- Bluetooth®
- Automotive
- Wi-Fi-Services
- Kanadische Anforderungen
- US-Anforderungen
- Akustik
- Near Field Communication (NFC)

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 04.05.2016 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig bis 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 63 Seiten.

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

Frankfurt, 04.05.2016

RSE
 Im Auftrag Dir.-Ing. (FH) Ralf Eigner
 Abteilungsleiter

Siehe Hinweise auf der Rückseite

Deutsche Akkreditierungsstelle GmbH

Standort Berlin
 Spittelmarkt 10
 10117 Berlin

Standort Frankfurt am Main
 Europa-Allee 52
 60327 Frankfurt am Main

Standort Braunschweig
 Bundesallee 100
 38116 Braunschweig

Die auszugsweise Veröffentlichung der Akkreditierungsurkunde bedarf der vorherigen schriftlichen Zustimmung der Deutsche Akkreditierungsstelle GmbH (DAkkS). Ausgenommen davon ist die separate Weiterverbreitung des Deckblattes durch die unseitig genannte Konformitätsbewertungsstelle in unveränderter Form.

Es darf nicht der Anschein erweckt werden, dass sich die Akkreditierung auch auf Bereiche erstreckt, die über den durch die DAkkS bestätigten Akkreditierungsbereich hinausgehen.

Die Akkreditierung erfolgte gemäß des 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 (Abt. L 218 vom 9. Juli 2008, S. 30). Die DAkkS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der European co-operation for Accreditation (EA), des International Accreditation Forum (IAF) und 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
 IAF: www.iaf.nu

Note:

The current certificate including annex can be received from CETECOM ICT Services GmbH on request.