

CETECOM™

CETECOM ICT Services
consulting - testing - certification >>>

TEST REPORT

Test report no.: 1-8141/14-01-10



Deutsche
Akkreditierungsstelle
D-PL-12076-01-00

Testing laboratory

CETECOM ICT Services GmbH

Untertuerkheimer Strasse 6 – 10

66117 Saarbruecken / Germany

Phone: + 49 681 5 98 - 0

Fax: + 49 681 5 98 - 9075

Internet: <http://www.cetecom.com>

e-mail: ict@cetecom.com

Accredited Testing Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-00

Applicant

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 - 210 Issue 8

Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

RSS - 210 Issue 8

RSS-210, Amendment 1 — Licence-Exempt, Low-Power Radio Apparatus

Amendment 1

Operating in the Television Bands (February 2015)

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

FCC ID: OSDQUINTATH

IC: 3628A-QUINTATH

Frequency: DTS band 2400 MHz to 2483.5 MHz

Technology tested: Proprietary DSSS

Antenna: 2 Integrated antennas

Power supply: 3.0 V DC by 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 authorised:

Marco Bertolino
Radio Communications & EMC

Test performed:

Christoph Schneider
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/s3

 3.1 Measurement guidance.....3

4 Test environment.....4

5 Test item4

 5.1 Additional information4

6 Test laboratories sub-contracted4

7 Description of the test setup5

 7.1 Radiated measurements chamber F.....5

 7.2 Radiated measurements chamber C6

 7.3 Radiated measurements 12.75 GHz to 26 GHz7

 7.4 Conducted measurements8

8 Summary of measurement results9

9 Additional comments10

10 Measurement results11

 10.1 Antenna gain11

 10.2 Maximum output power.....17

 10.3 Power spectral density.....19

 10.4 DTS bandwidth – 6 dB27

 10.5 Occupied bandwidth – 99% emission bandwidth.....29

 10.6 Detailed spurious emissions @ the band edge - conducted37

 10.7 Band edge compliance radiated.....42

 10.8 TX spurious emissions conducted48

 10.9 TX spurious emissions radiated.....59

 10.10 RX spurious emissions radiated86

 10.11 Spurious emissions radiated < 30 MHz90

11 Test equipment and ancillaries used for tests92

12 Observations93

Annex A Document history94

Annex B Further information.....94

Annex C Accreditation Certificate95

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:	2014-12-08
Date of receipt of test item:	2015-04-07
Start of test:	2015-04-07
End of test:	2015-04-17
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	-/-	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 8	01.12.2010	Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
RSS - 210 Issue 8 Amendment 1	05.02.2015	RSS-210, Amendment 1 — Licence-Exempt, Low-Power Radio Apparatus Operating in the Television Bands (February 2015)

3.1 Measurement guidance

DTS : KDB 558074	2014-06	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
------------------	---------	---

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	+40 °C during high temperature tests
	T_{min}	0 °C during low temperature tests
Relative humidity content:		42 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	3.0 V DC by battery
	V_{max}	3.2 V
	V_{min}	2.0 V

5 Test item

Kind of test item	:	Wireless Microphone System
Type identification	:	Quinta
S/N serial number	:	Conducted: QPSK 20965 / BPSK 20964 Radiated QPSK / BPSK 20957 & 20963
HW hardware status	:	Rev. 2
SW software status	:	RF test software
Frequency band	:	DTS band 2400 MHz to 2483.5 MHz (lowest channel 2412 MHz; highest channel 2464 MHz)
Type of radio transmission	:	DSSS
Use of frequency spectrum	:	
Type of modulation	:	BPSK & QPSK
Number of channels	:	3 (test software)
Antenna	:	2 Integrated antennas
Power supply	:	3.0 V DC by battery
Temperature range	:	0°C to +40°C

5.1 Additional information

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

Test setup- and EUT-photos are included in test report: 1-8141/14-01-01_AnnexA
1-8141/14-01-01_AnnexB
1-8141/14-01-01_AnnexD

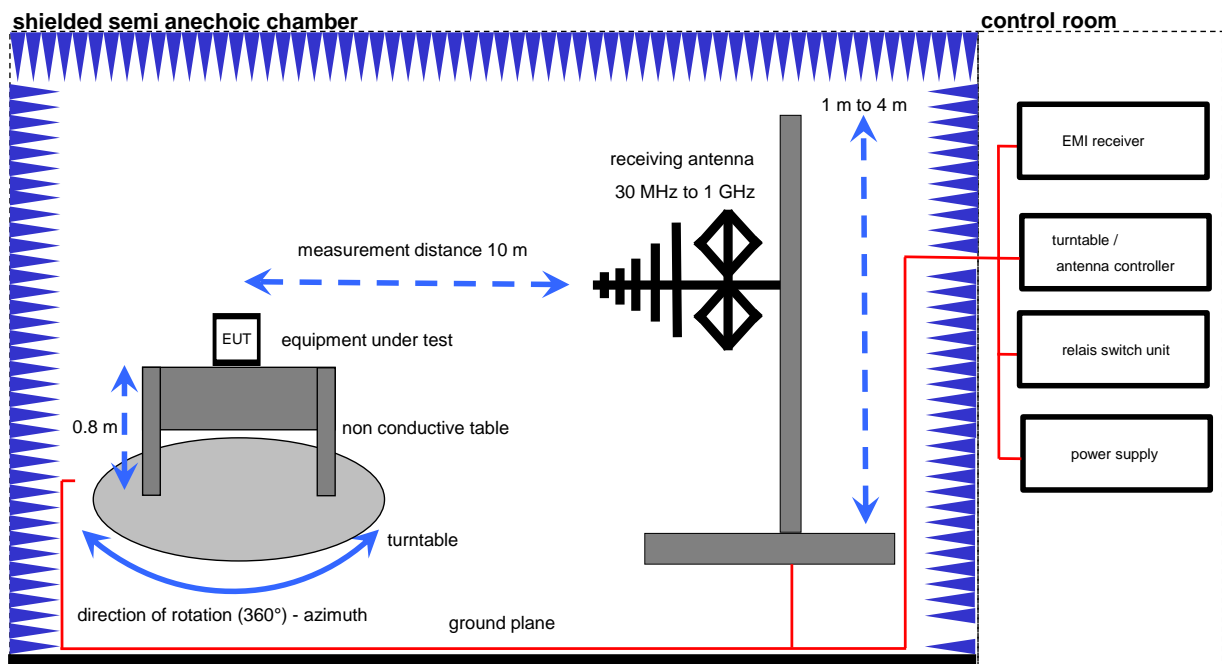
6 Test laboratories sub-contracted

None

7 Description of the test setup

7.1 Radiated measurements chamber F

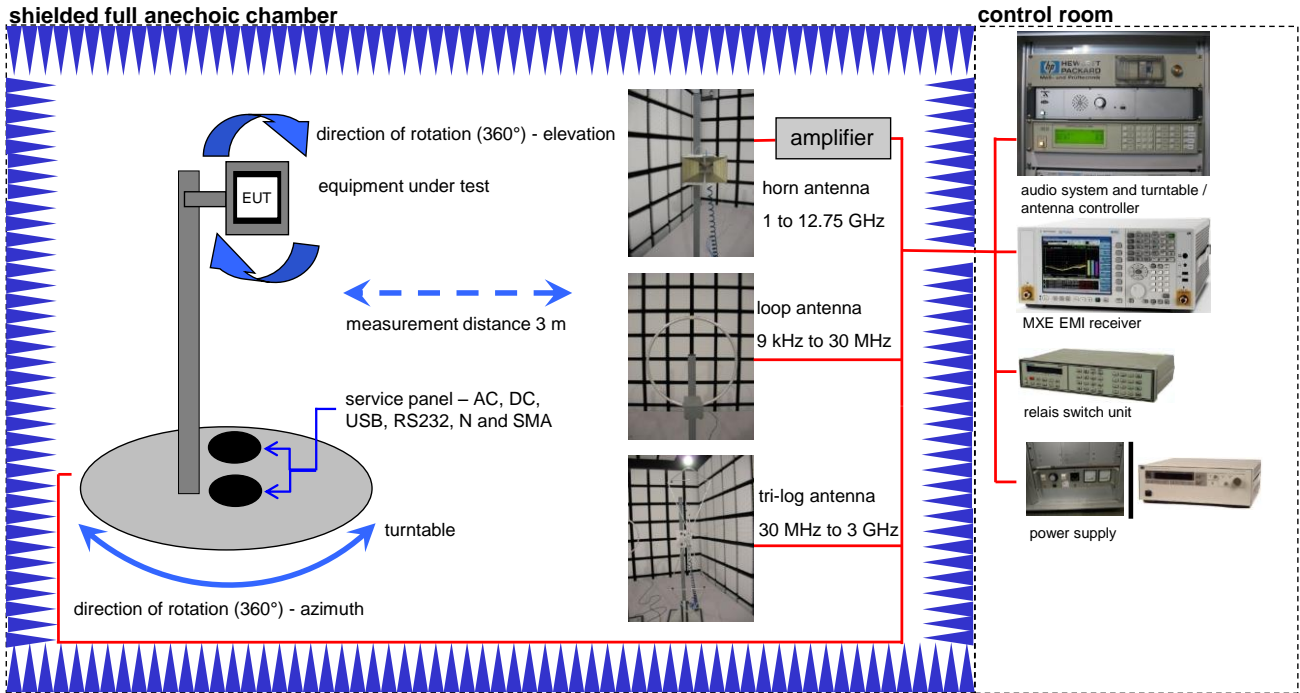
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas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



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Software	EMC32 V. 9.12.05	R&S	-/-	-/-
Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368
DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580
EMI Test Receiver	ESCI 3	R&S	100083	300003312
Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379
Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745
Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746
Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747
TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787

7.2 Radiated measurements chamber C



Equipment table:

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

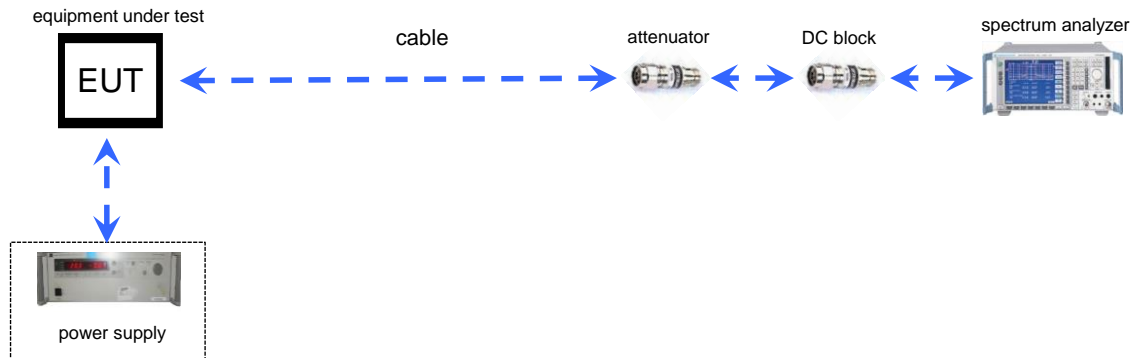
7.3 Radiated measurements 12.75 GHz to 26 GHz



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787
Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442
Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP Meßtechnik	00419	300002268
Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517

7.4 Conducted measurements



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517
Power Supply 0-20V, 0-5A	6632B	Agilent Technologies	GB42110541	400000562

8 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 210, Issue 8	See table!	2015-04-14	-/-

Test specification clause	Test case	Guideline	Temperature conditions	Power source voltages	Mode	Pass	Fail	NA	NP	Remark
§15.247(b)(4) RSS 210 / A8.4(2)	Antenna gain	-/-	Nominal	Nominal	DSSS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(e) RSS 210 / A8.2(b)	Power spectral density	KDB 558074 DTS clause: 10.6	Nominal	Nominal	DSSS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(a)(2) RSS 210 / A8.2(a)	DTS bandwidth – 6 dB bandwidth	KDB 558074 DTS clause: 8.1	Nominal	Nominal	DSSS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
RSS Gen clause 4.6.1	Occupied bandwidth	-/-	Nominal	Nominal	DSSS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(b)(3) RSS-210 / A8.4(4)	Maximum output power	KDB 558074 DTS clause: 9.2.2.5	Nominal	Nominal	DSSS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d) RSS-210 / A8.5	Detailed spurious emissions @ the band edge - conducted	-/-	Nominal	Nominal	DSSS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.205 RSS-210 / A8.5	Band edge compliance radiated	KDB 558074 DTS clause: 13.3.2	Nominal	Nominal	DSSS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions conducted	KDB 558074 DTS clause: 11.1 & 11.2 11.3	Nominal	Nominal	DSSS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions radiated	-/-	Nominal	Nominal	DSSS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.109 RSS-Gen	RX spurious emissions radiated	-/-	Nominal	Nominal	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.209(a) RSS-Gen	TX spurious emissions radiated < 30 MHz	-/-	Nominal	Nominal	DSSS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.107(a) §15.207	Conducted emissions < 30 MHz	-/-	Nominal	Nominal	-/-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Battery powered only

Note: NA = Not Applicable; NP = Not Performed

9 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: Power setting: d2 B0 00 05 04

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.

10 Measurement results

10.1 Antenna gain

Measurement:

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.

Measurement parameters:

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

Limits:

FCC	IC
Antenna Gain	
6 dBi	

Results: Antenna A

T _{nom}	V _{nom}	lowest channel 2412 MHz	middle channel 2438 MHz	highest channel 2464 MHz
Conducted power [dBm] Measured with DSSS modulation		13.75	13.40	13.01
Radiated power [dBm] Measured with DSSS modulation		13.70	13.87	13.66
Gain [dBi] Calculated		-0.05	+0.47	+0.65
Measurement uncertainty			± 1.5 dB (cond.) / ± 3 dB (rad.)	

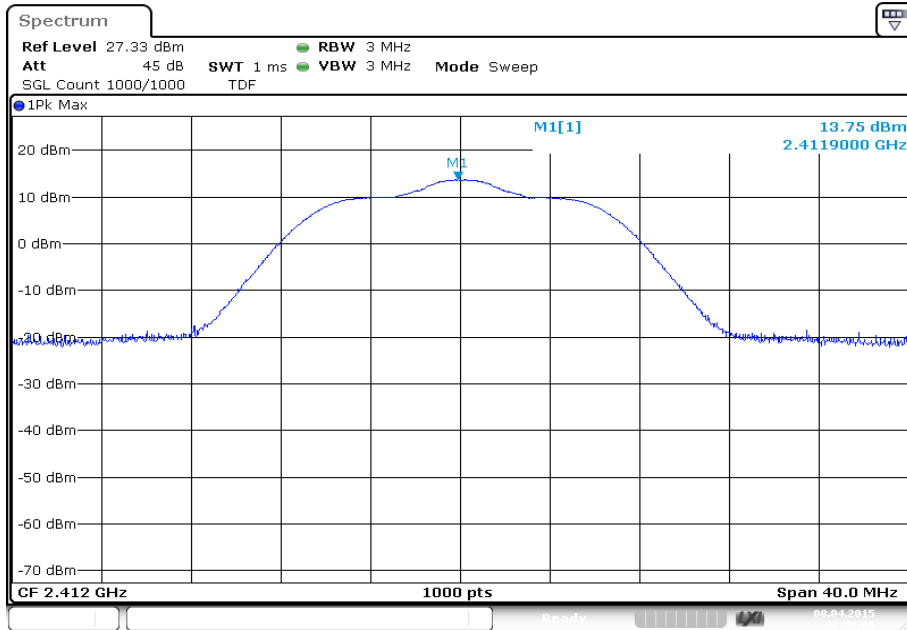
Verdict: **complies****Results:** Antenna B

T _{nom}	V _{nom}	lowest channel 2412 MHz	middle channel 2438 MHz	highest channel 2464 MHz
Conducted power [dBm] Measured with DSSS modulation		15.31	15.10	14.87
Radiated power [dBm] Measured with DSSS modulation		17.86	16.10	15.03
Gain [dBi] Calculated		+2.55	+1.00	+0.16
Measurement uncertainty			± 1.5 dB (cond.) / ± 3 dB (rad.)	

Verdict: **complies**

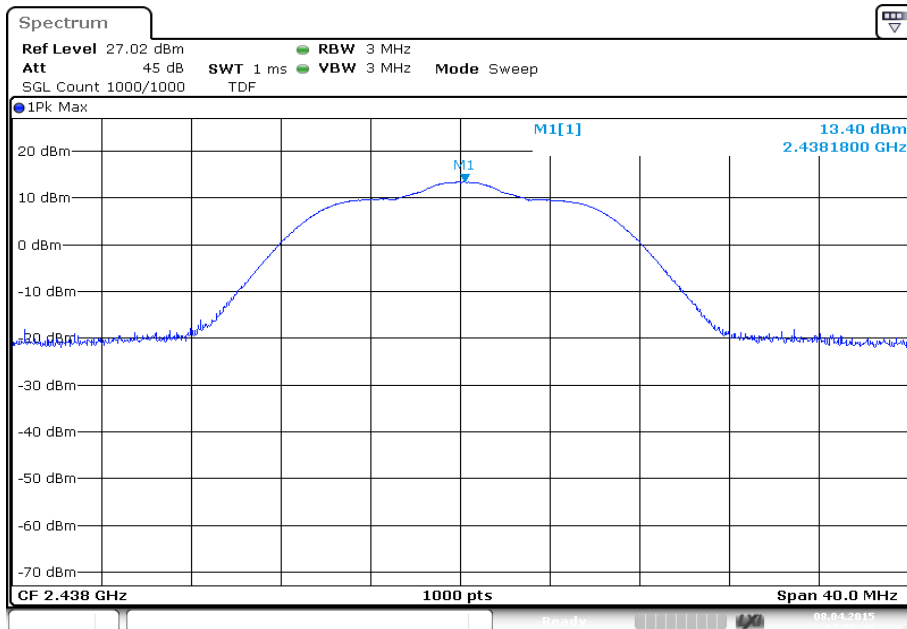
Plots: Antenna A

Plot 1: TX mode, lowest channel



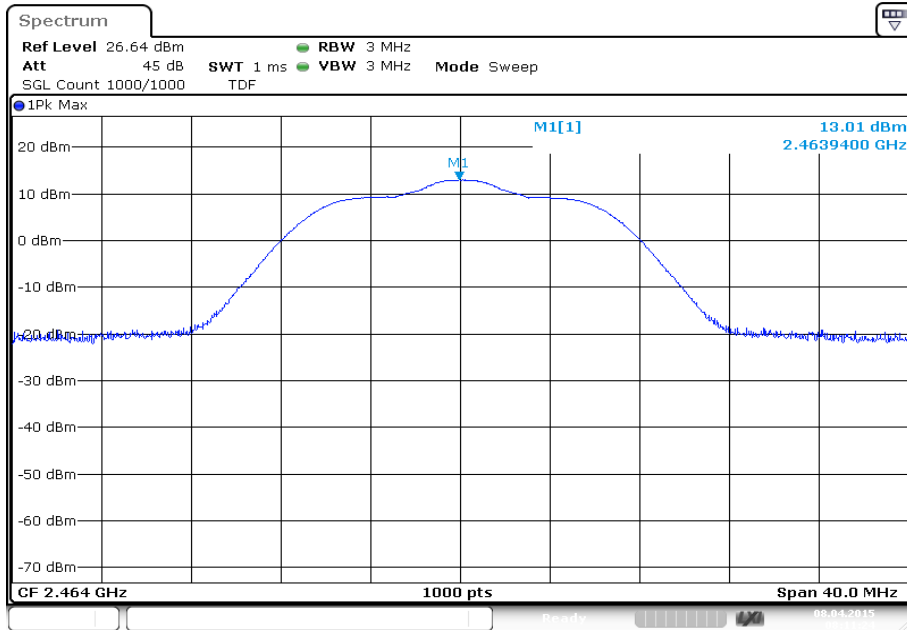
Date: 8.APR.2015 07:48:06

Plot 2: TX mode, middle channel



Date: 8.APR.2015 07:56:27

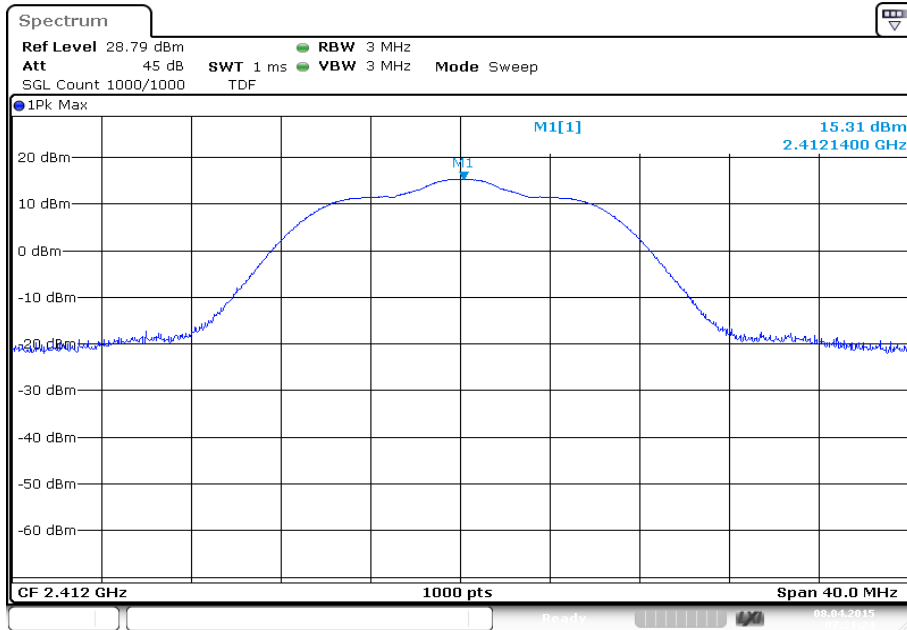
Plot 3: TX mode, highest channel



Date: 8.APR.2015 08:11:24

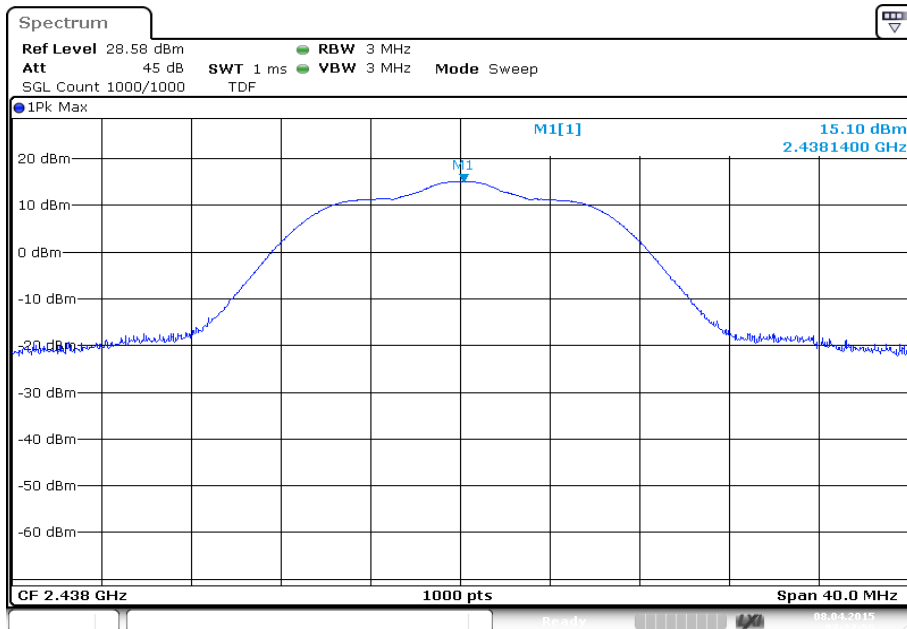
Plots: Antenna B

Plot 1: TX mode, lowest channel



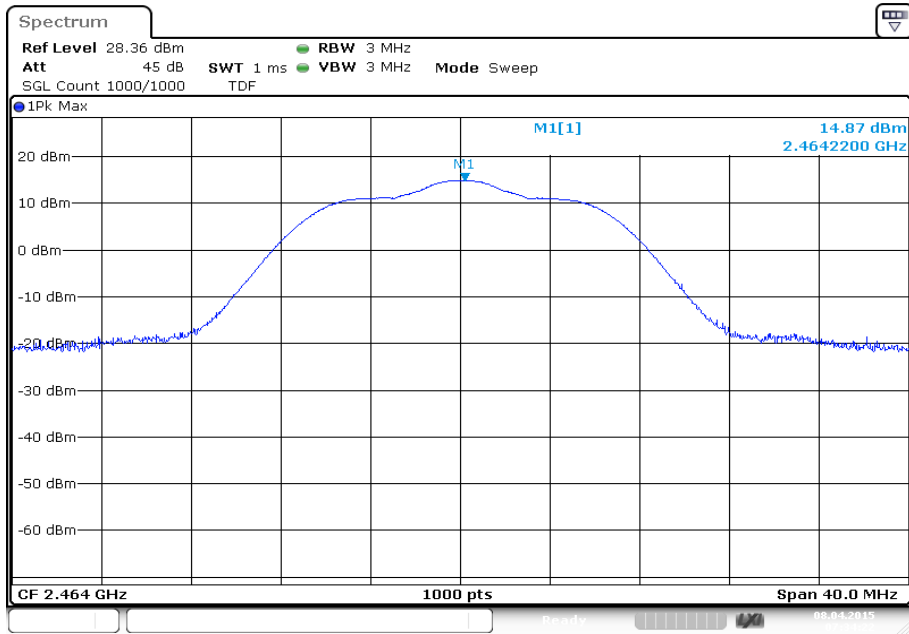
Date: 8.APR.2015 07:21:24

Plot 2: TX mode, middle channel



Date: 8.APR.2015 07:27:56

Plot 3: TX mode, highest channel



10.2 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: 9.2.2.5	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 – 5 % of the OBW
Video bandwidth:	≥3x RBW
Span:	40 MHz
Integration bandwidth:	99 % power - bandwidth (OBW)
Trace-Mode:	Max hold (allow trace to fully stabilize)
Measurement function:	Channel power with OBW

Limits:

FCC	IC
Maximum Output Power	
Conducted: 1.0 W – Antenna Gain max. 6 dBi	

Results: Antenna A

Frequency	Maximum Output Power [dBm]		
	2412 MHz	2438 MHz	2464 MHz
Output power conducted QPSK	13.53	13.26	13.23
Output power conducted BPSK	9.18	8.77	8.83
Measurement uncertainty	± 1.5 dB (cond.)		

Verdict: [complies](#)**Results:** Antenna B

Frequency	Maximum Output Power [dBm]		
	2412 MHz	2438 MHz	2464 MHz
Output power conducted QPSK	15.07	14.95	14.76
Output power conducted BPSK	9.92	9.69	9.40
Measurement uncertainty	± 1.5 dB (cond.)		

Verdict: [complies](#)

10.3 Power spectral density

Description:

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

Measurement:

Measurement parameter	
According to DTS clause: 10.6	
Detector:	RMS
Sweep time:	3s
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	40 MHz
Trace-Mode:	Max hold (allow trace to fully stabilize)

Limits:

FCC	IC
Power Spectral Density	
8 dBm / 3kHz (conducted)	

Results: Antenna A

Modulation	Power Spectral density [dBm]		
	2412 MHz	2438 MHz	2464 MHz
Frequency			
Power density QPSK	-3.02	-3.31	-3.31
Power density BPSK	-8.67	-9.05	-8.98
Measurement uncertainty	± 1.5 dB (cond.)		

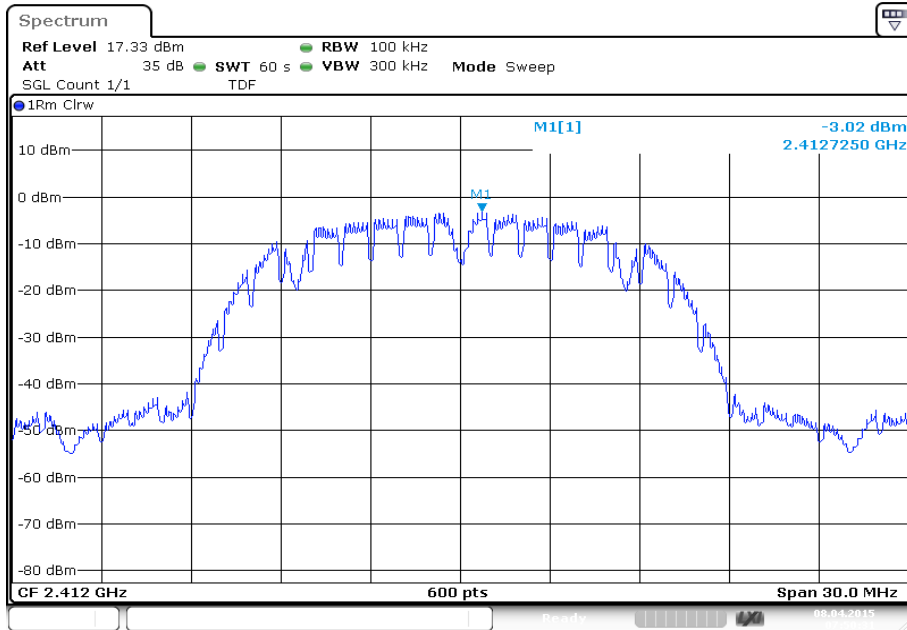
Verdict: [complies](#)**Results:** Antenna B

Modulation	Power Spectral density [dBm]		
	2412 MHz	2438 MHz	2464 MHz
Frequency			
Power density QPSK	-1.52	-1.73	-1.79
Power density BPSK	-7.83	-8.14	-8.36
Measurement uncertainty	± 1.5 dB (cond.)		

Verdict: [complies](#)

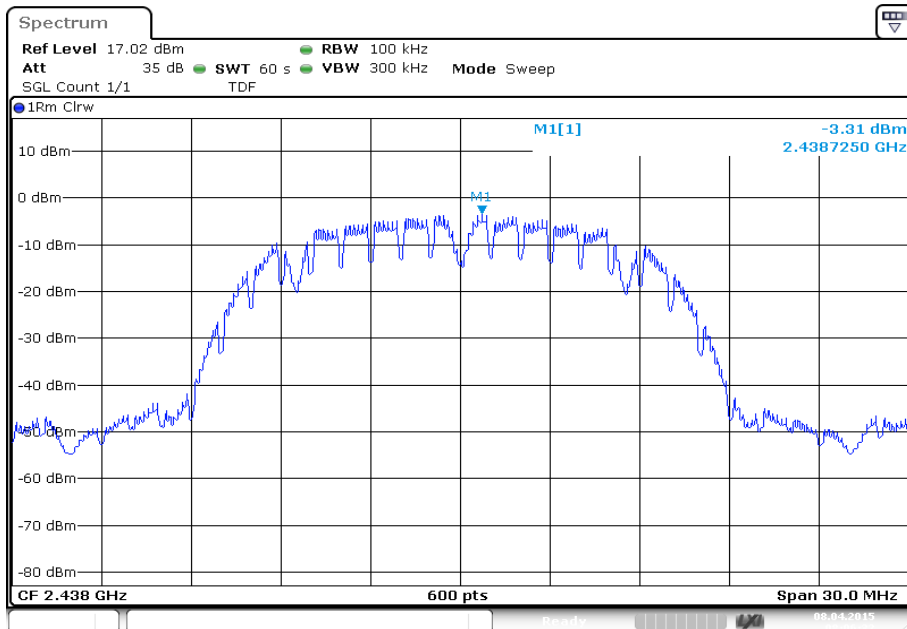
Plots: Antenna A

Plot 1: TX mode, lowest channel, QPSK



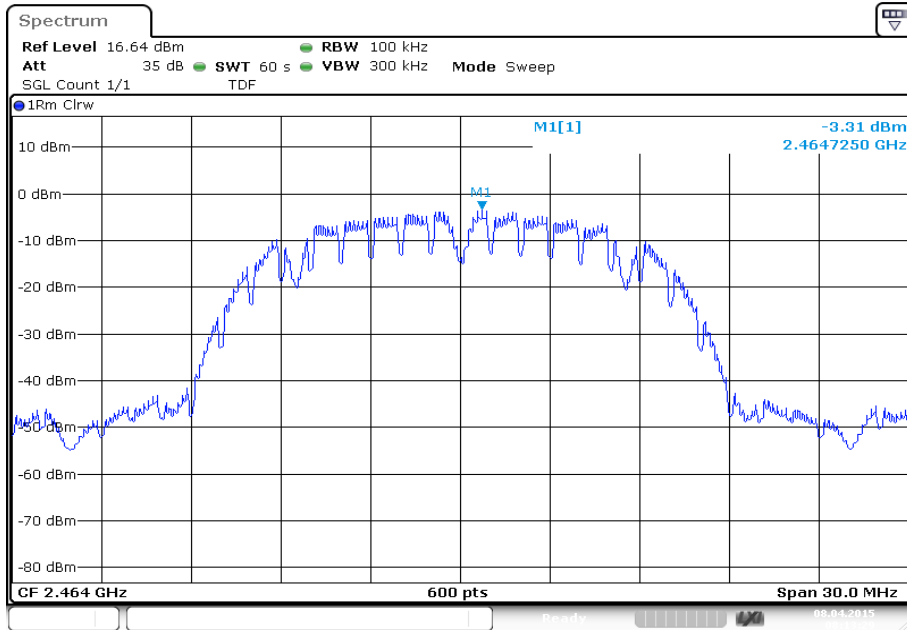
Date: 8.APR.2015 07:50:31

Plot 2: TX mode, middle channel, QPSK

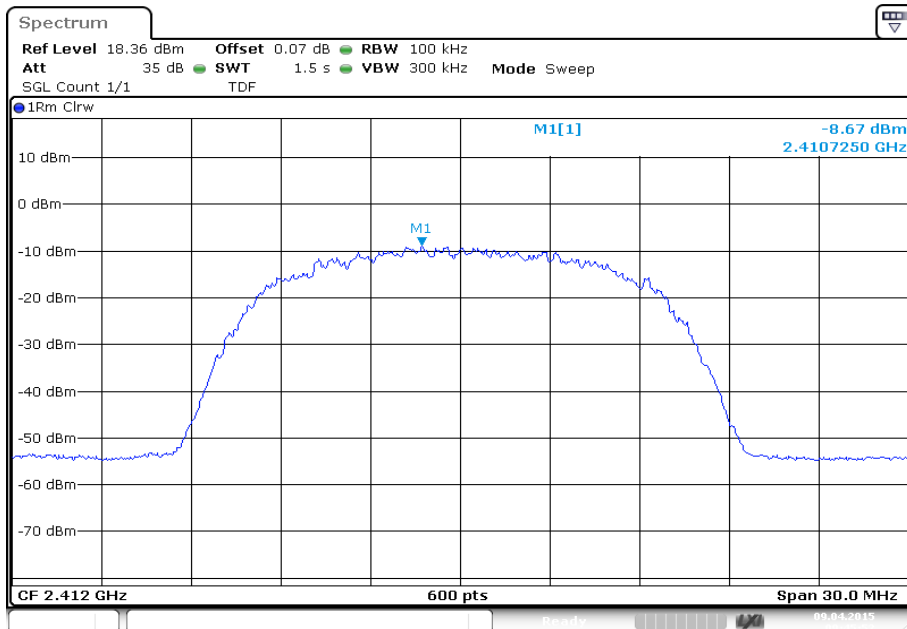


Date: 8.APR.2015 08:06:32

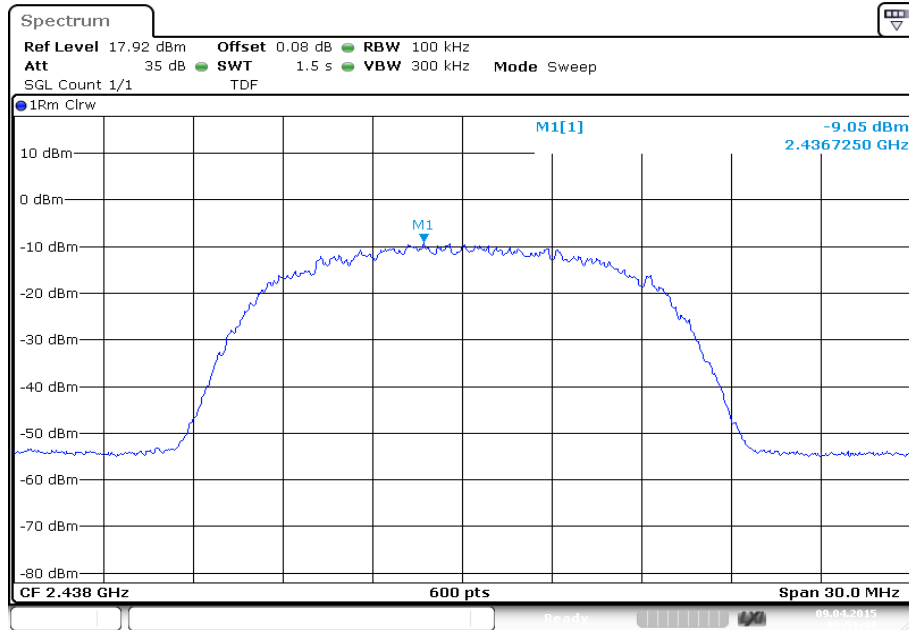
Plot 3: TX mode, highest channel, QPSK



Plot 4: TX mode, lowest channel, BPSK

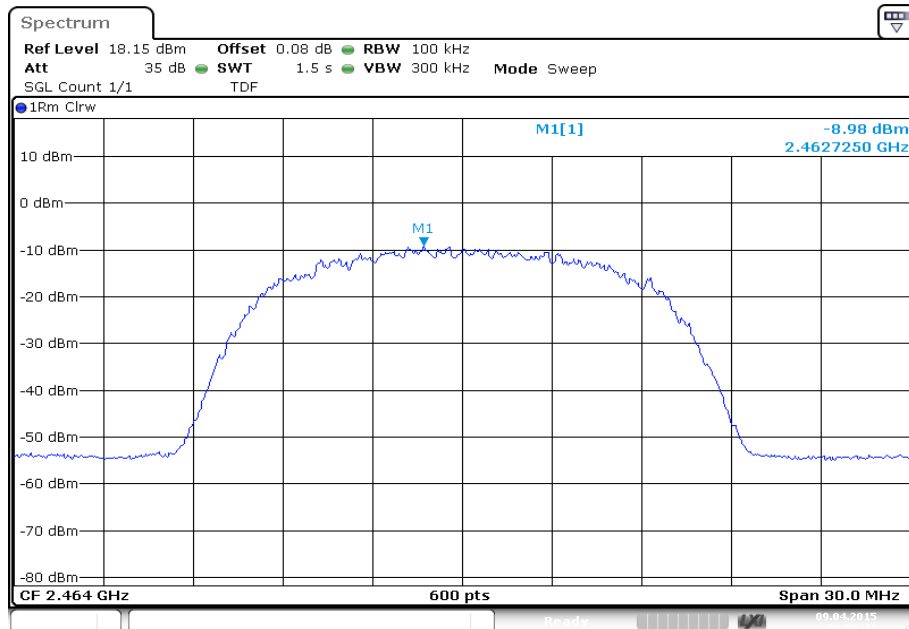


Plot 5: TX mode, middle channel, BPSK



Date: 9.APR.2015 09:51:41

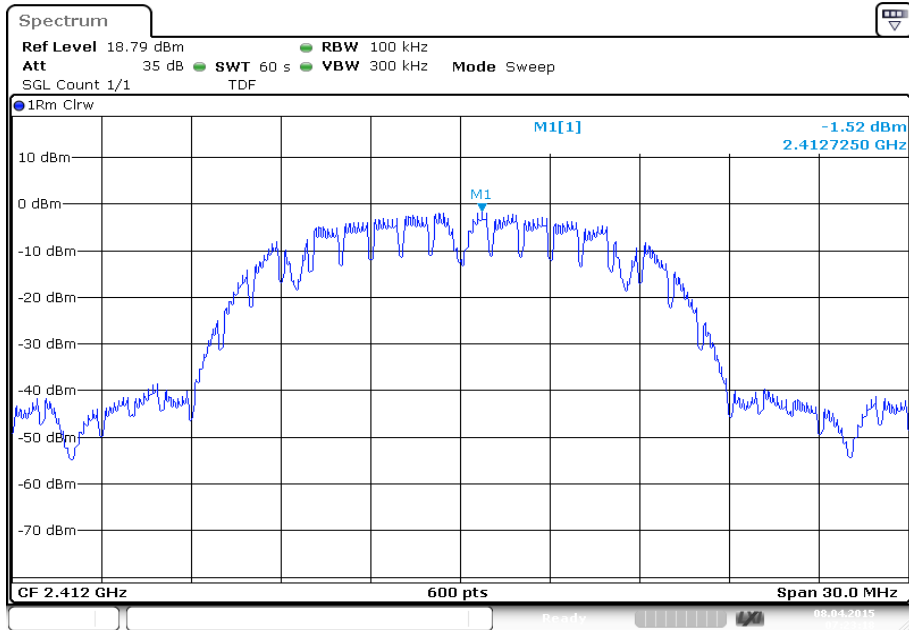
Plot 6: TX mode, highest channel, BPSK



Date: 9.APR.2015 09:55:41

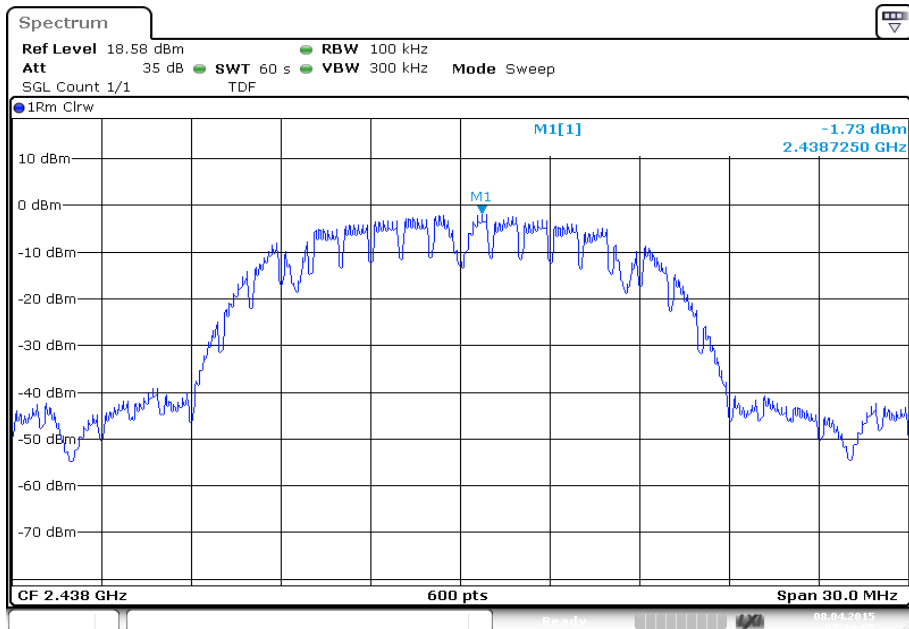
Plots: Antenna B

Plot 1: TX mode, lowest channel, QPSK



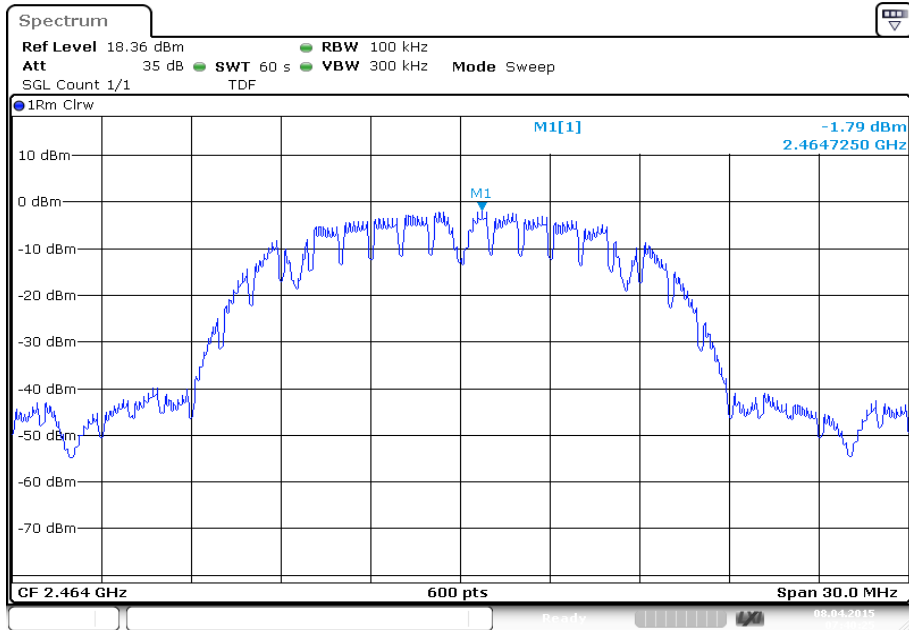
Date: 8.APR.2015 07:23:18

Plot 2: TX mode, middle channel, QPSK



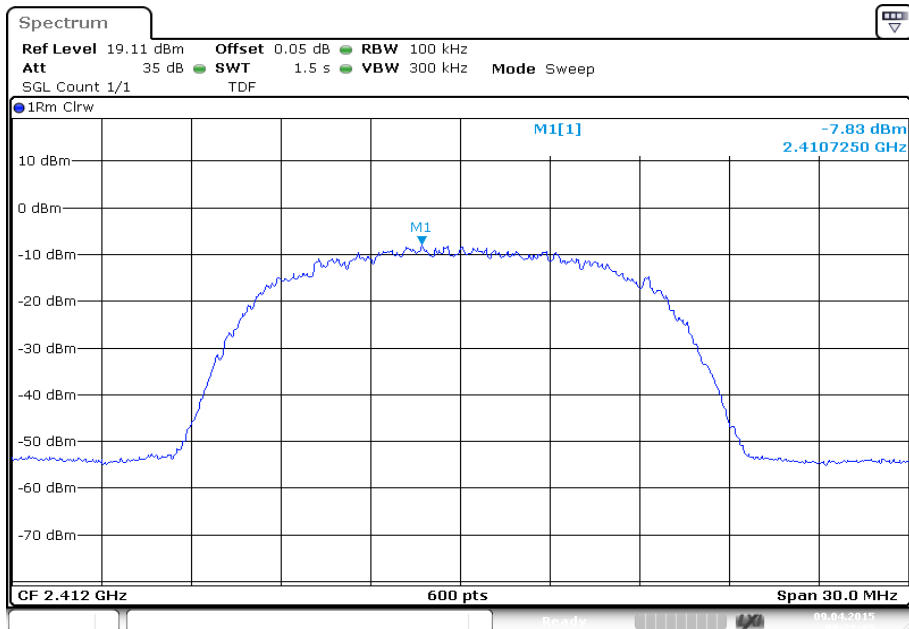
Date: 8.APR.2015 07:29:55

Plot 3: TX mode, highest channel, QPSK



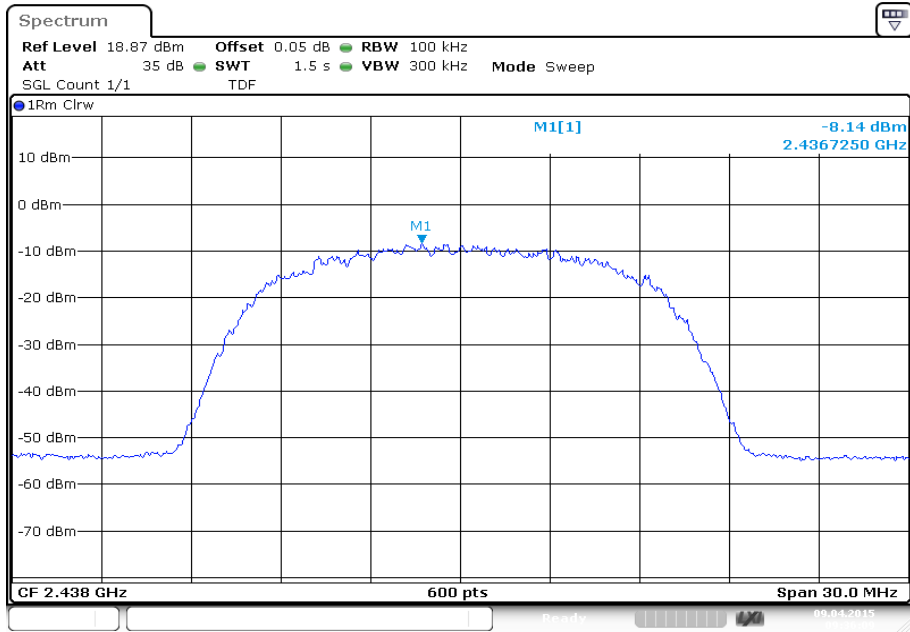
Date: 8.APR.2015 07:40:26

Plot 4: TX mode, lowest channel, BPSK

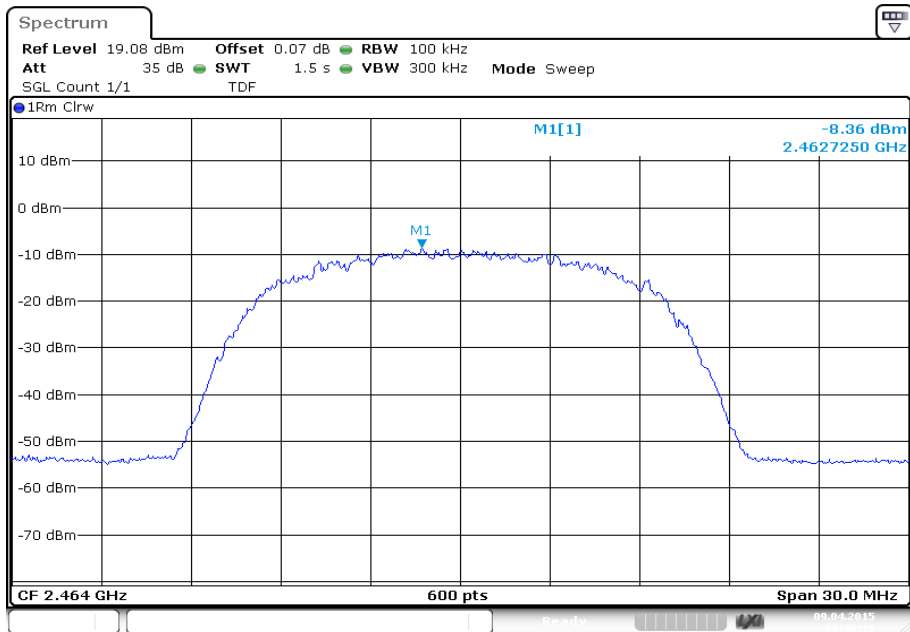


Date: 9.APR.2015 09:28:34

Plot 5: TX mode, middle channel, BPSK



Plot 6: TX mode, highest channel, BPSK



10.4 DTS bandwidth – 6 dB

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:	300 kHz
Span:	40 MHz
Measurement procedure:	Measurement of the 75% bandwidth using the integration function of the analyzer
Trace-Mode:	Max hold (allow trace to stabilize)

Limits:

FCC	IC
DTS Bandwidth – 6 dB	
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: Antenna A

Frequency	6 dB bandwidth [MHz]		
	2412 MHz	2438 MHz	2464 MHz
6 dB bandwidth QPSK	9.82	9.82	9.83
6 dB bandwidth BPSK	9.77	9.81	9.81
Measurement uncertainty	± RBW		

Verdict: [complies](#)

Results: Antenna B

Frequency	6 dB bandwidth [MHz]		
	2412 MHz	2438 MHz	2464 MHz
6 dB bandwidth QPSK	9.82	9.82	9.83
6 dB bandwidth BPSK	9.24	9.44	9.82
Measurement uncertainty	± RBW		

Verdict: [complies](#)

10.5 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
Measurement procedure:	Measurement of the 99% bandwidth using the integration function of the analyzer
Trace-Mode:	Max hold (allow trace to stabilize)

Usage:

-/-	IC
Occupied Bandwidth – 99% emission bandwidth	
OBW is necessary for Emission Designator	

Results: Antenna A

Frequency	99 % bandwidth [MHz]		
	2412 MHz	2438 MHz	2464 MHz
99 % bandwidth QPSK	13.94	13.95	13.98
99 % bandwidth BPSK	13.89	13.89	13.88
Measurement uncertainty	± RBW		

Verdict: [complies](#)

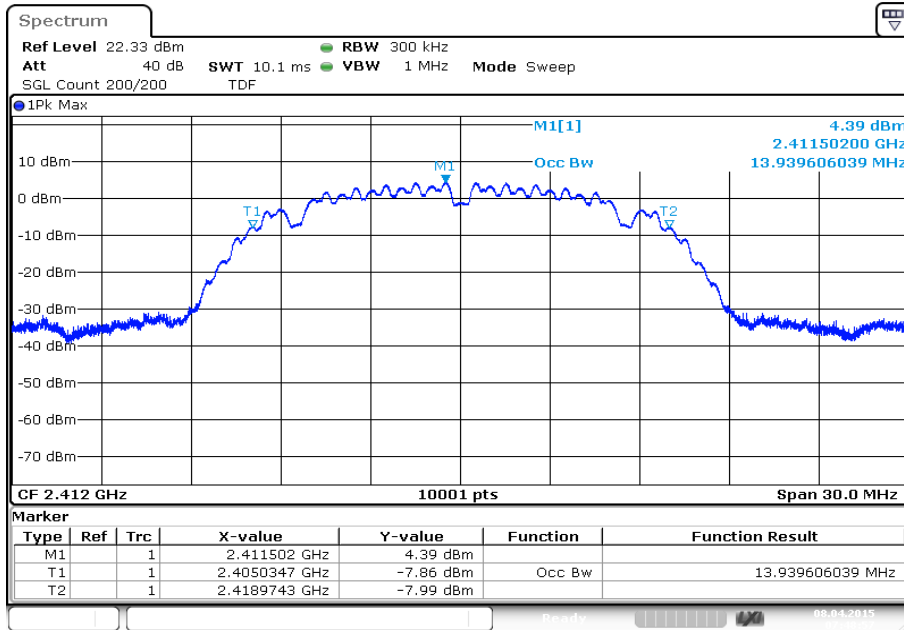
Results: Antenna B

Frequency	99 % bandwidth [MHz]		
	2412 MHz	2438 MHz	2464 MHz
99 % bandwidth QPSK	13.94	13.96	13.95
99 % bandwidth BPSK	13.89	13.88	13.87
Measurement uncertainty	± RBW		

Verdict: [complies](#)

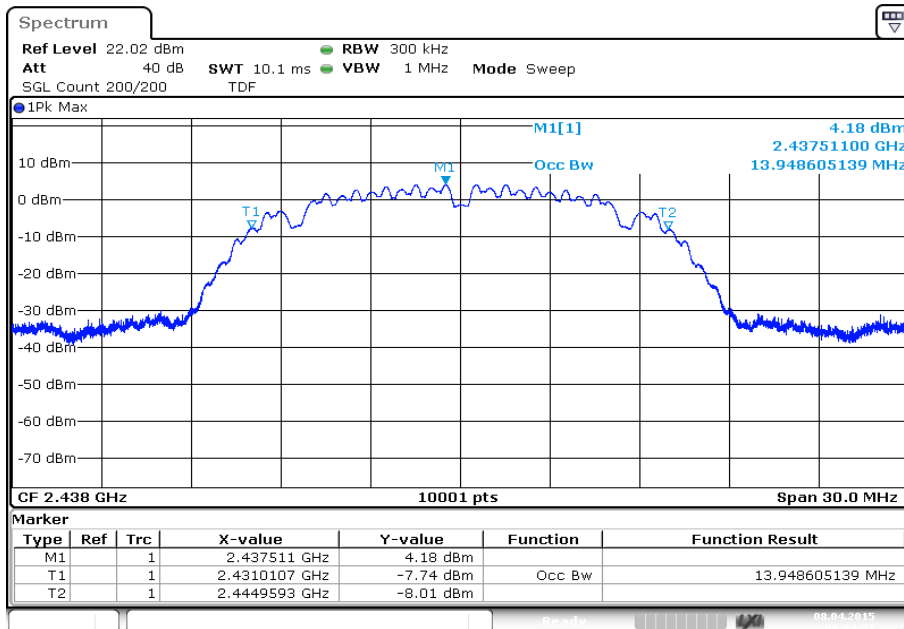
Plots: Antenna A

Plot 1: TX mode, lowest channel, QPSK



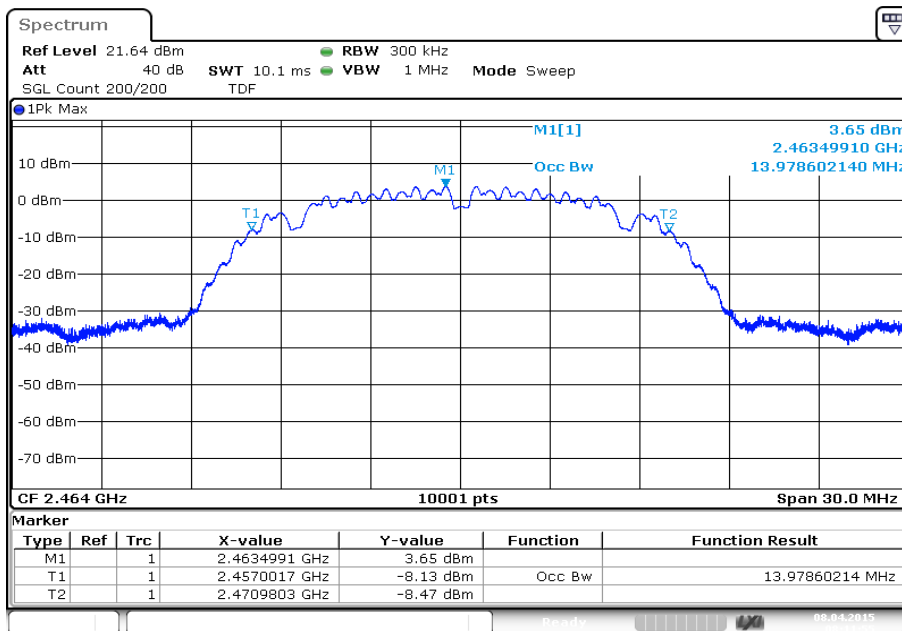
Date: 8.APR.2015 07:48:57

Plot 2: TX mode, middle channel, QPSK



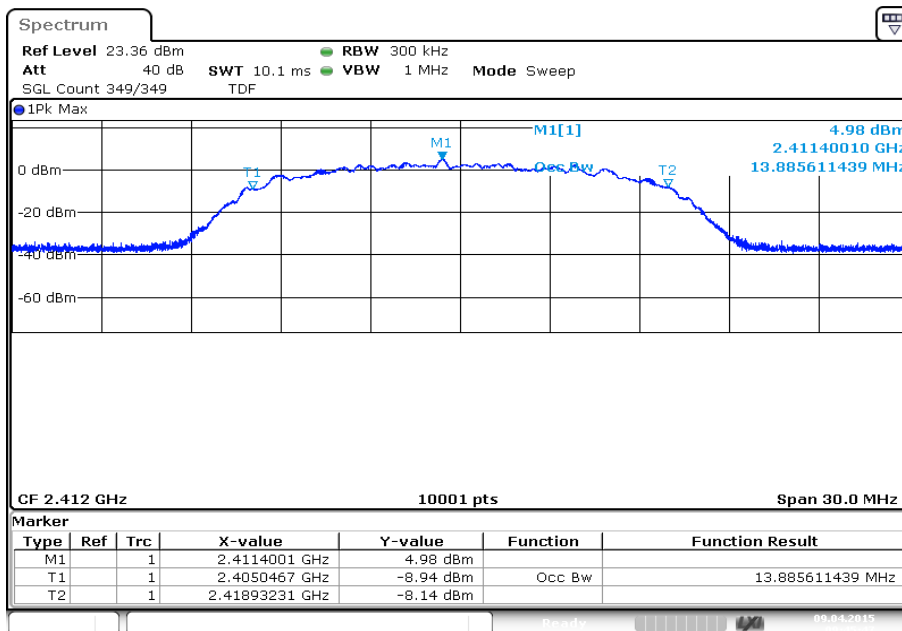
Date: 8.APR.2015 08:04:58

Plot 3: TX mode, highest channel, QPSK



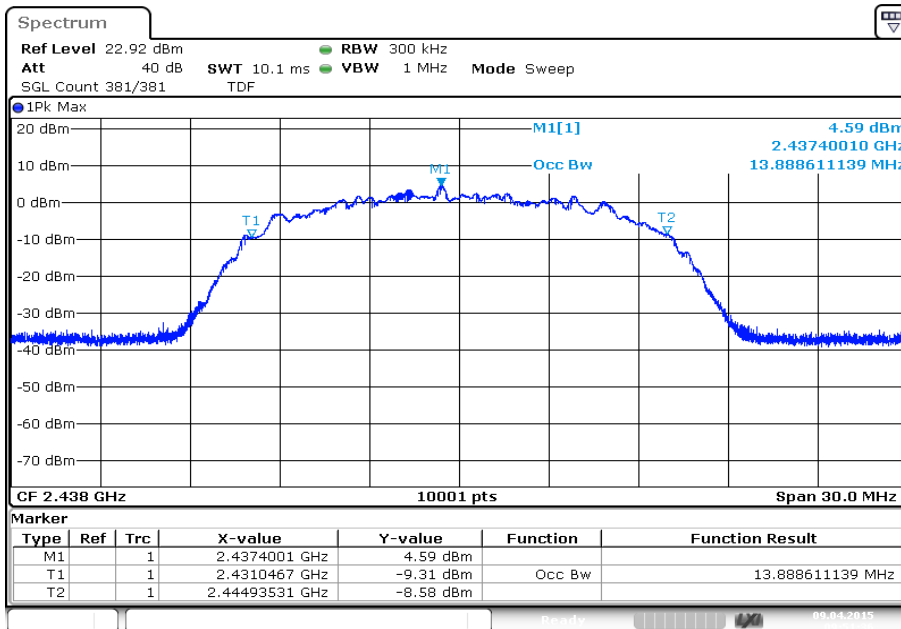
Date: 8.APR.2015 08:11:55

Plot 4: TX mode, lowest channel, BPSK

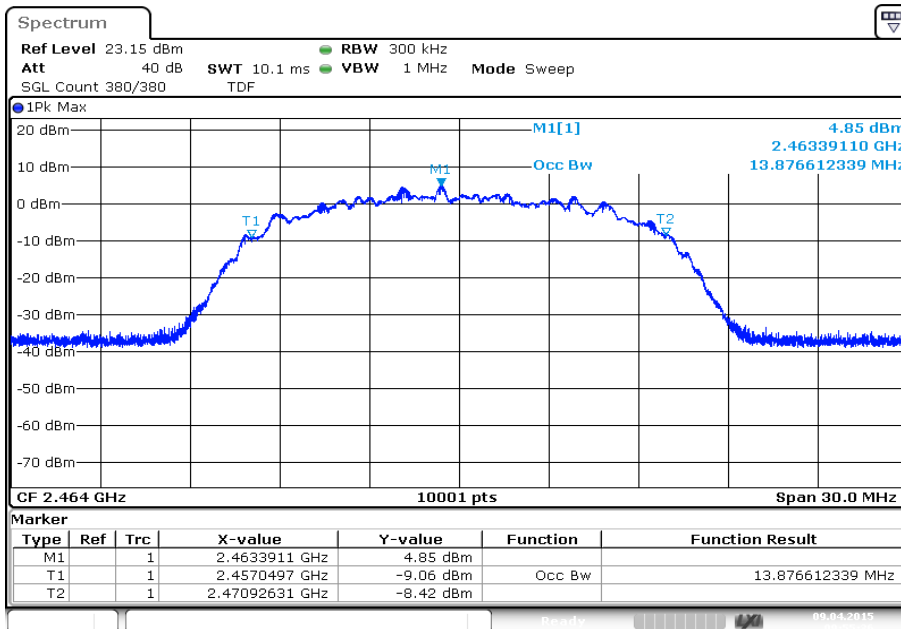


Date: 9.APR.2015 09:45:46

Plot 5: TX mode, middle channel, BPSK

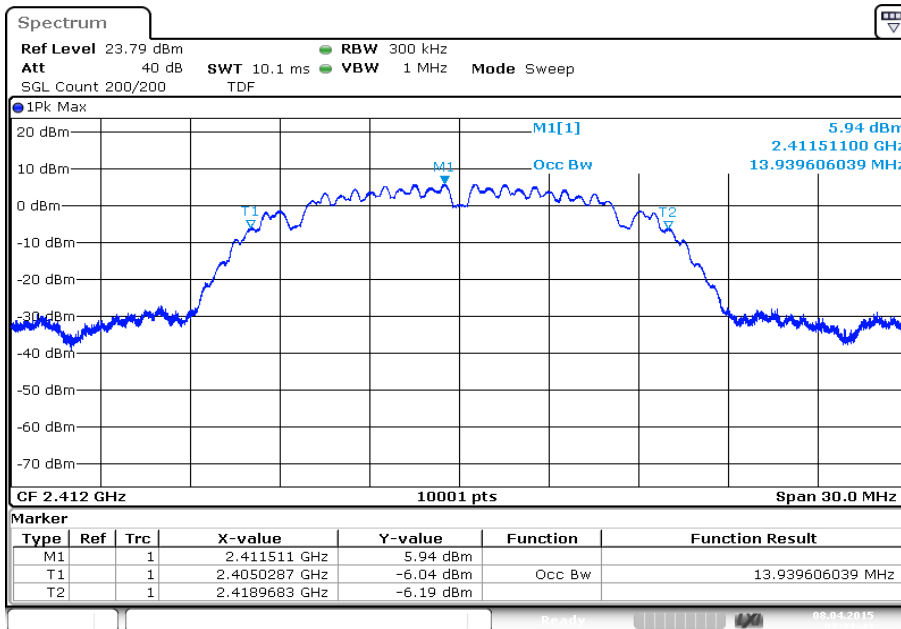


Plot 6: TX mode, highest channel, BPSK



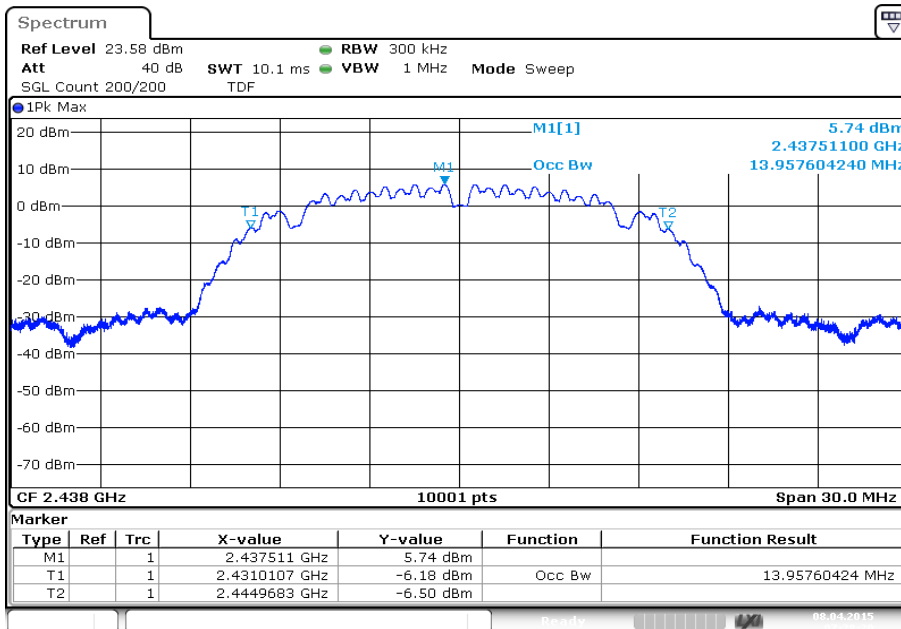
Plots: Antenna B

Plot 1: TX mode, lowest channel, QPSK



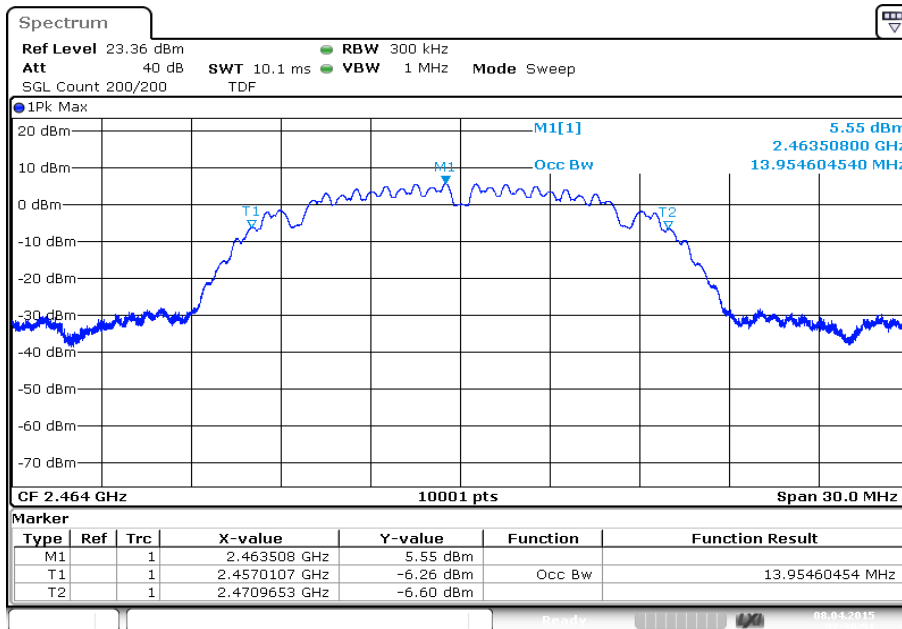
Date: 8.APR.2015 07:21:44

Plot 2: TX mode, middle channel, QPSK



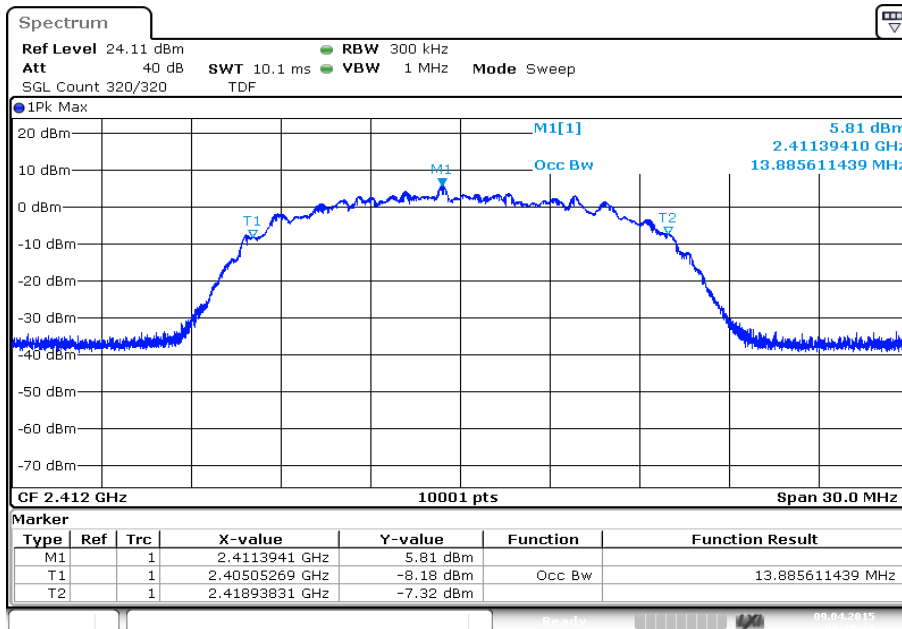
Date: 8.APR.2015 07:28:21

Plot 3: TX mode, highest channel, QPSK



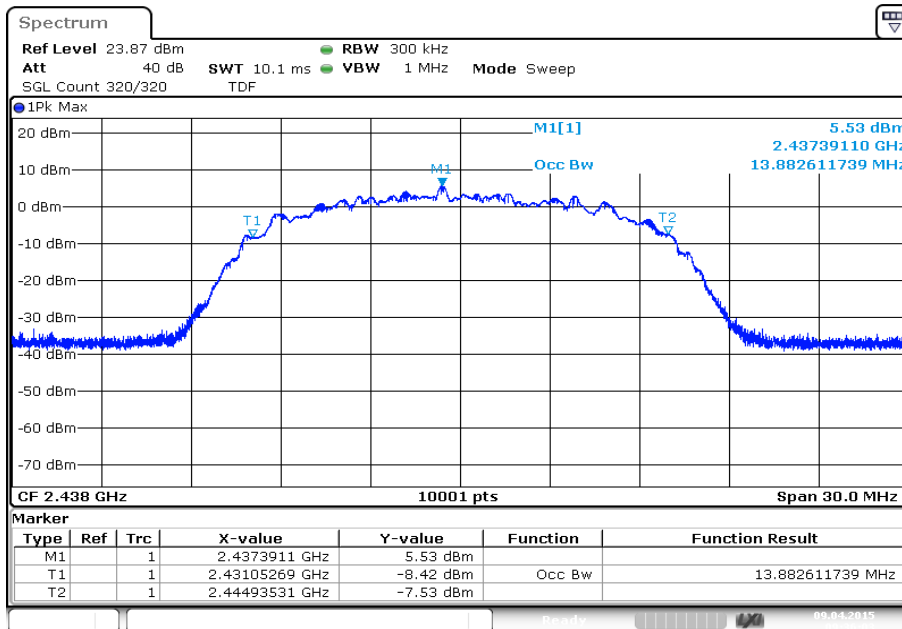
Date: 8.APR.2015 07:38:52

Plot 4: TX mode, lowest channel, BPSK

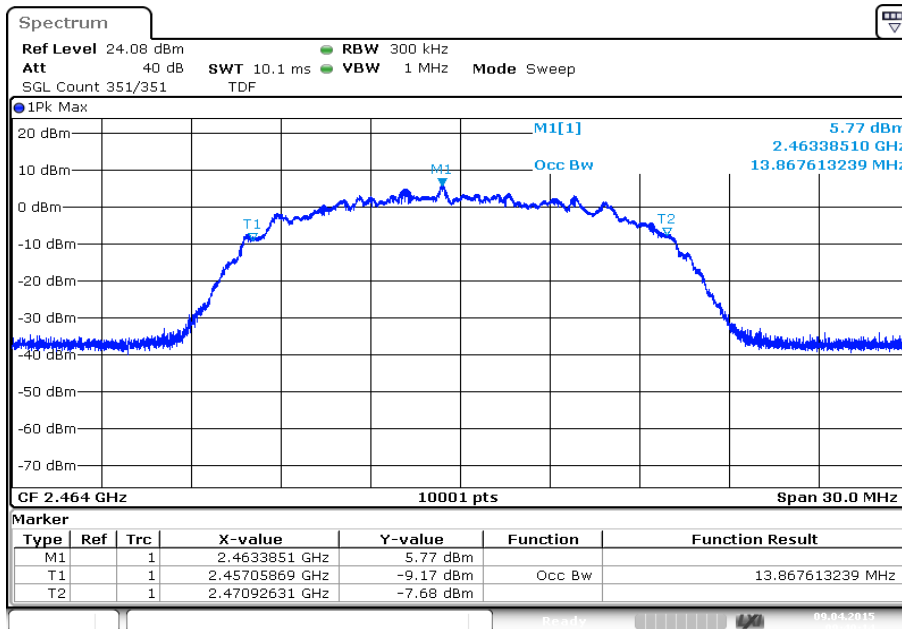


Date: 9.APR.2015 09:28:29

Plot 5: TX mode, middle channel, BPSK



Plot 6: TX mode, highest channel, BPSK



10.6 Detailed spurious emissions @ the band edge - conducted

Description:

Measurement of the conducted band edge compliance. EUT is measured at the lower and upper band edge in both modes.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	500 kHz
Span:	Lower Band Edge: 2300 – 2425 MHz Upper Band Edge: 2450 – 2550 MHz
Trace-Mode:	Max hold

Limits:

FCC	IC
Band Edge Compliance Conducted	
<p>In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 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>	

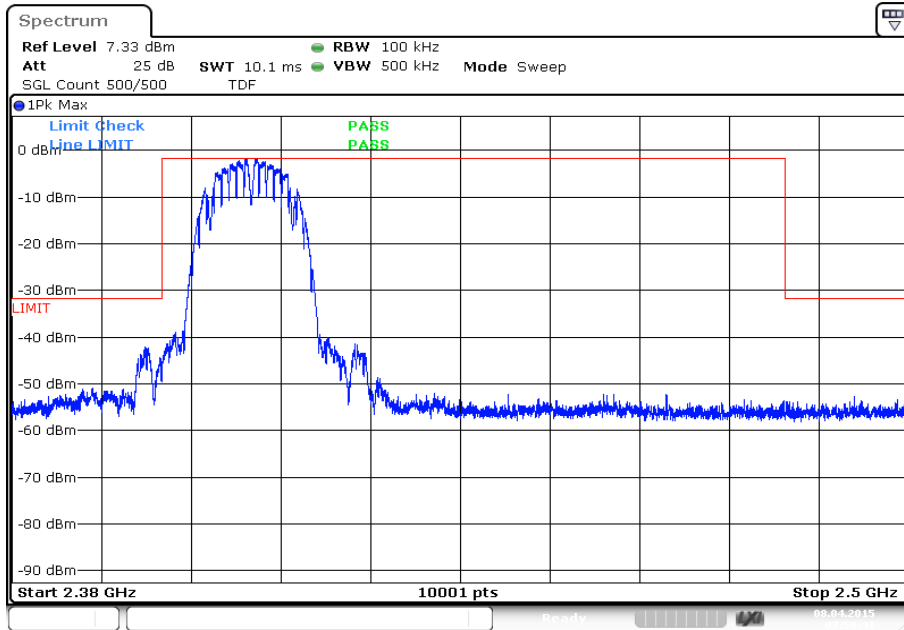
Results:

Scenario	Compliance Conducted [dB]			
	Antenna A QPSK	Antenna A BPSK	Antenna B QPSK	Antenna B BPSK
Modulation				
Lower band edge	> 30 dB	> 30 dB	> 30 dB	> 30 dB
Upper band edge	> 30 dB	> 30 dB	> 30 dB	> 30 dB
Measurement uncertainty	± 1.5 dB			

Verdict: complies

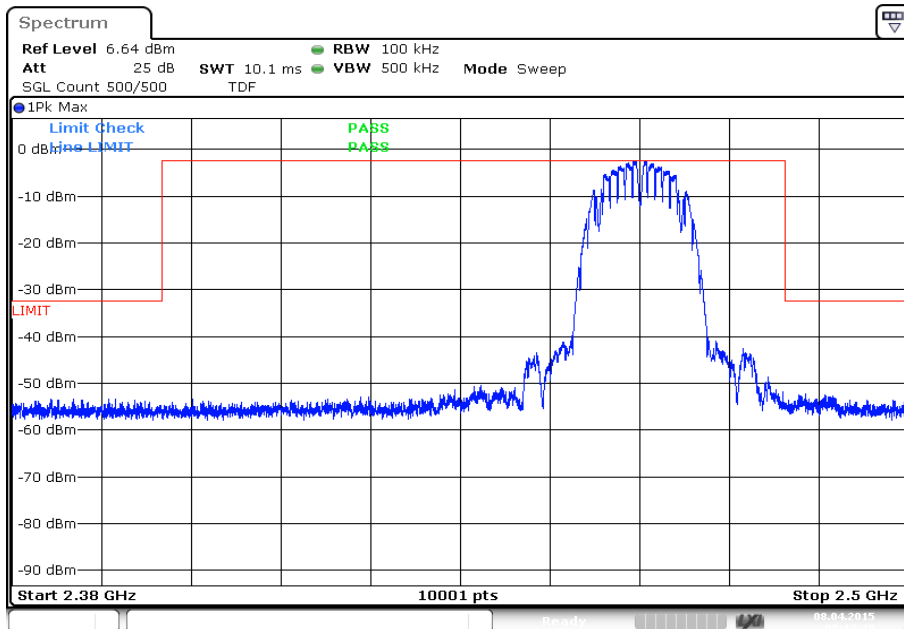
Plots: Antenna A

Plot 1: TX mode, lower band edge, QPSK



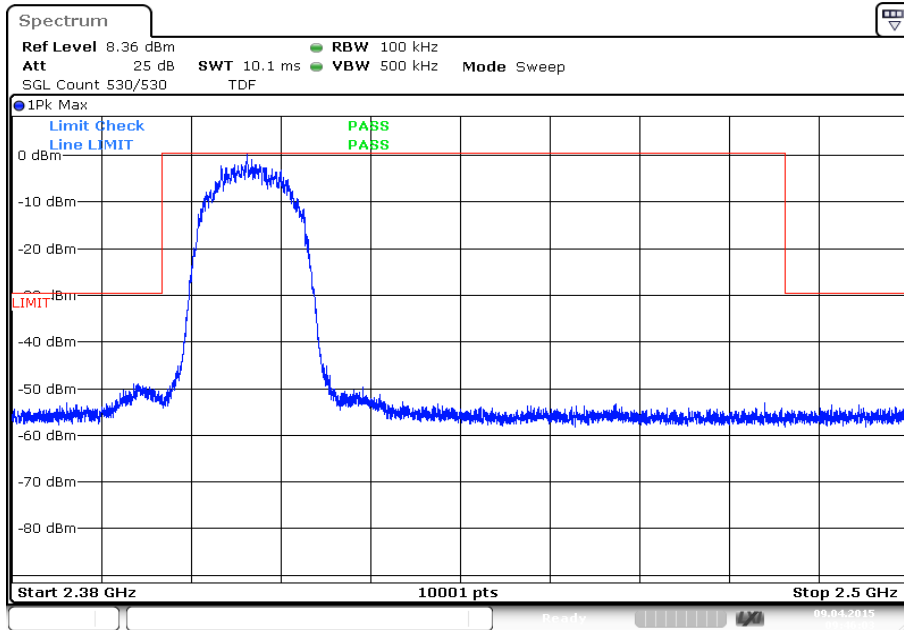
Date: 8.APR.2015 07:50:41

Plot 2: TX mode, upper band edge, QPSK



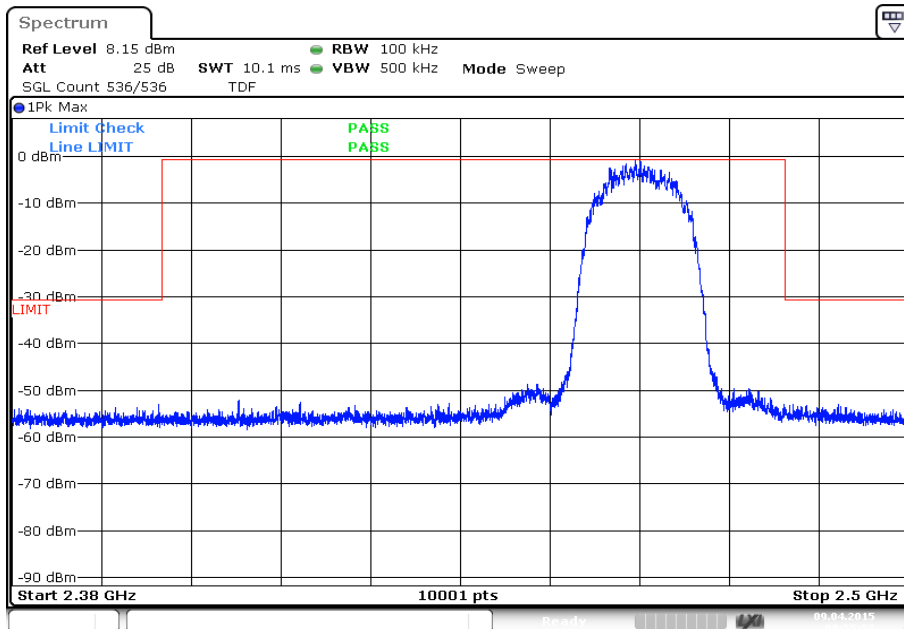
Date: 8.APR.2015 08:13:39

Plot 3: TX mode, lower band edge, BPSK



Date: 9.APR.2015 09:46:03

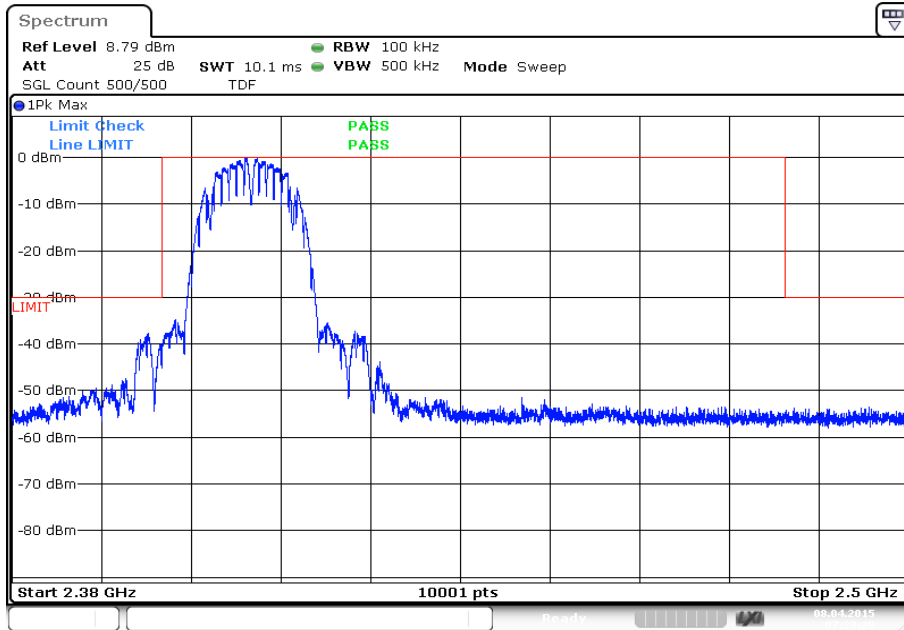
Plot 4: TX mode, upper band edge, BPSK



Date: 9.APR.2015 09:55:52

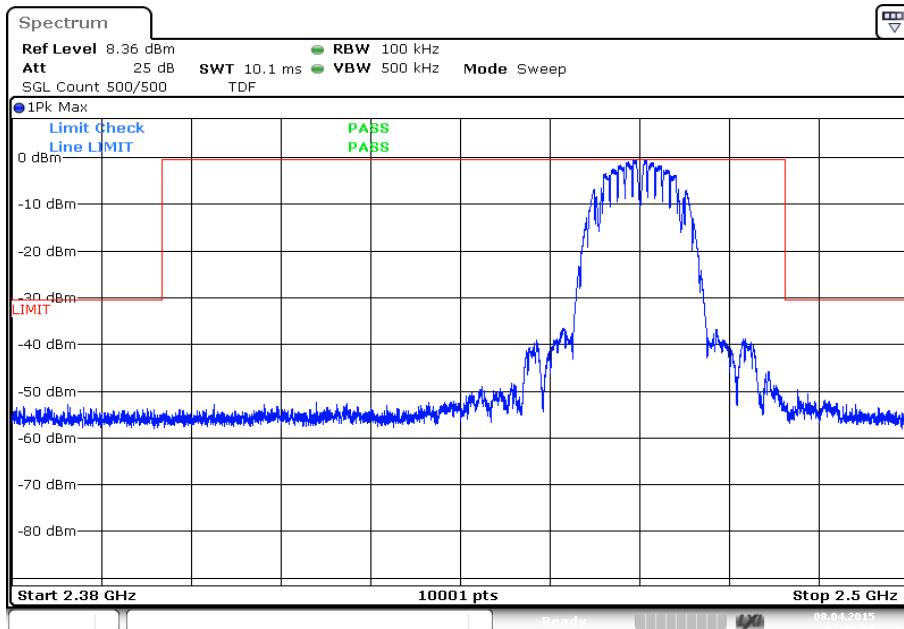
Plots: Antenna B

Plot 1: TX mode, lower band edge, QPSK



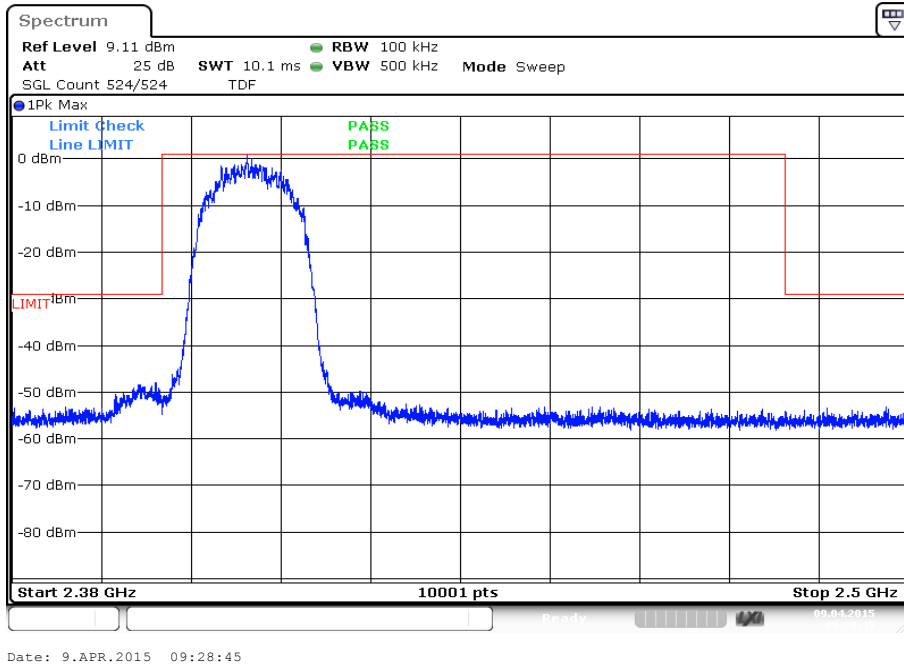
Date: 8.APR.2015 07:23:28

Plot 2: TX mode, upper band edge, QPSK

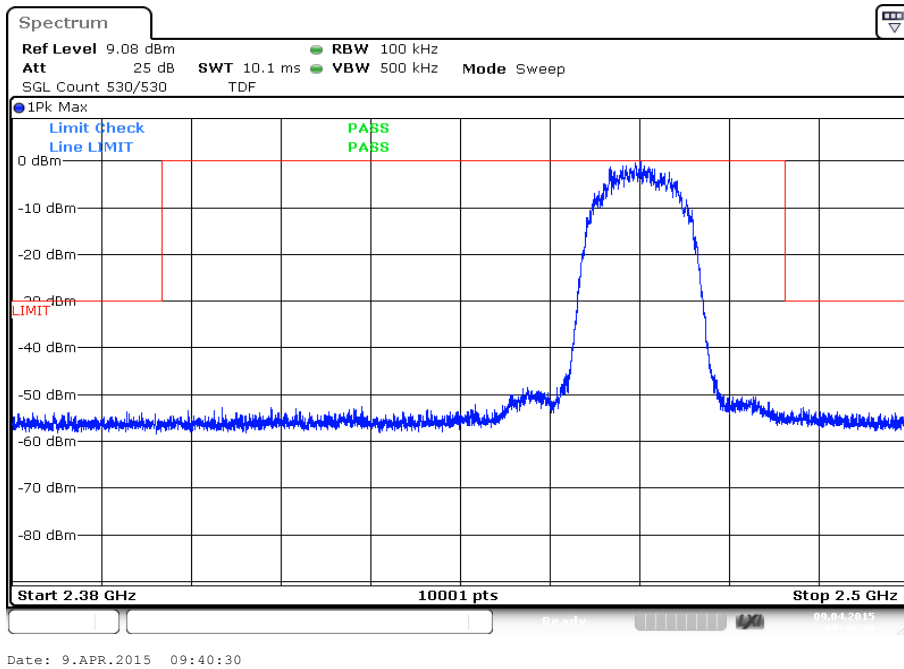


Date: 8.APR.2015 07:40:36

Plot 3: TX mode, lower band edge, BPSK



Plot 4: TX mode, upper band edge, BPSK



10.7 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 measurement is repeated for all modulations. Measurement distance is 3m.

Measurement:

Measurement parameter for peak measurements	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	1 MHz
Span:	See plot!
Trace-Mode:	Max Hold

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

Limits:

FCC	IC
Band Edge Compliance Radiated	
<p>In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).</p>	
74 dBµV/m Peak 54 dBµV/m AVG	

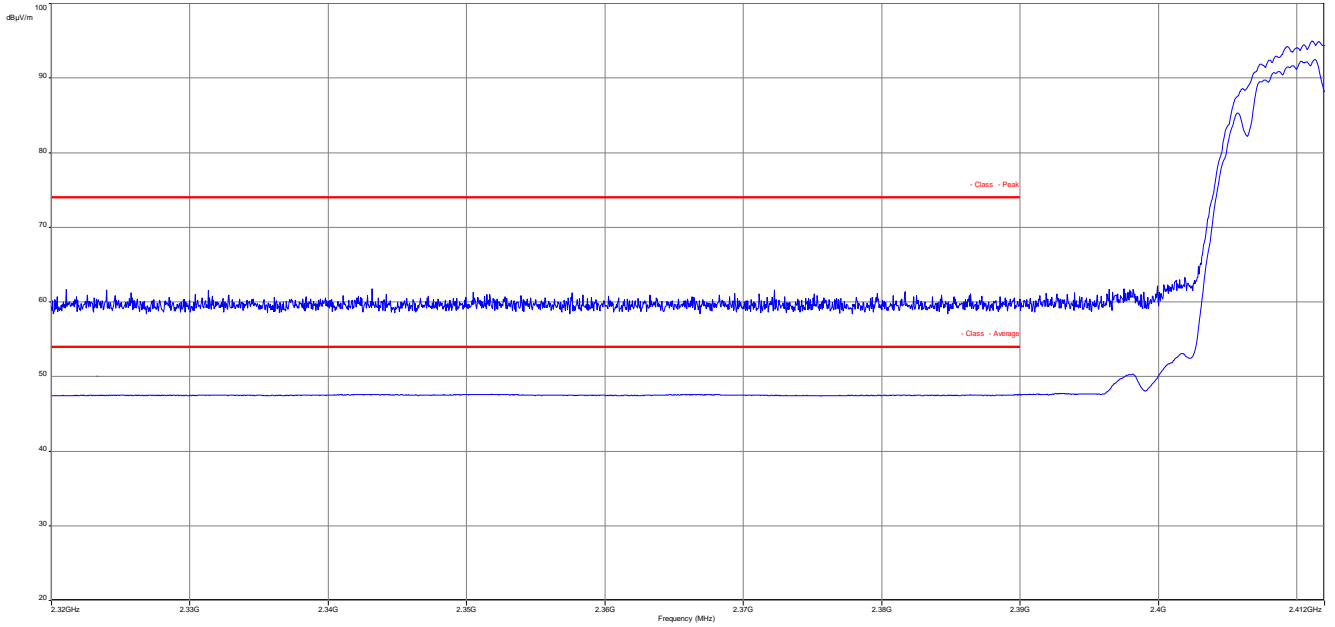
Results:

Scenario Modulation	Band Edge Compliance Conducted [dB]			
	Antenna A QPSK	Antenna A BPSK	Antenna B QPSK	Antenna B BPSK
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)
Measurement uncertainty	± 3 dB			

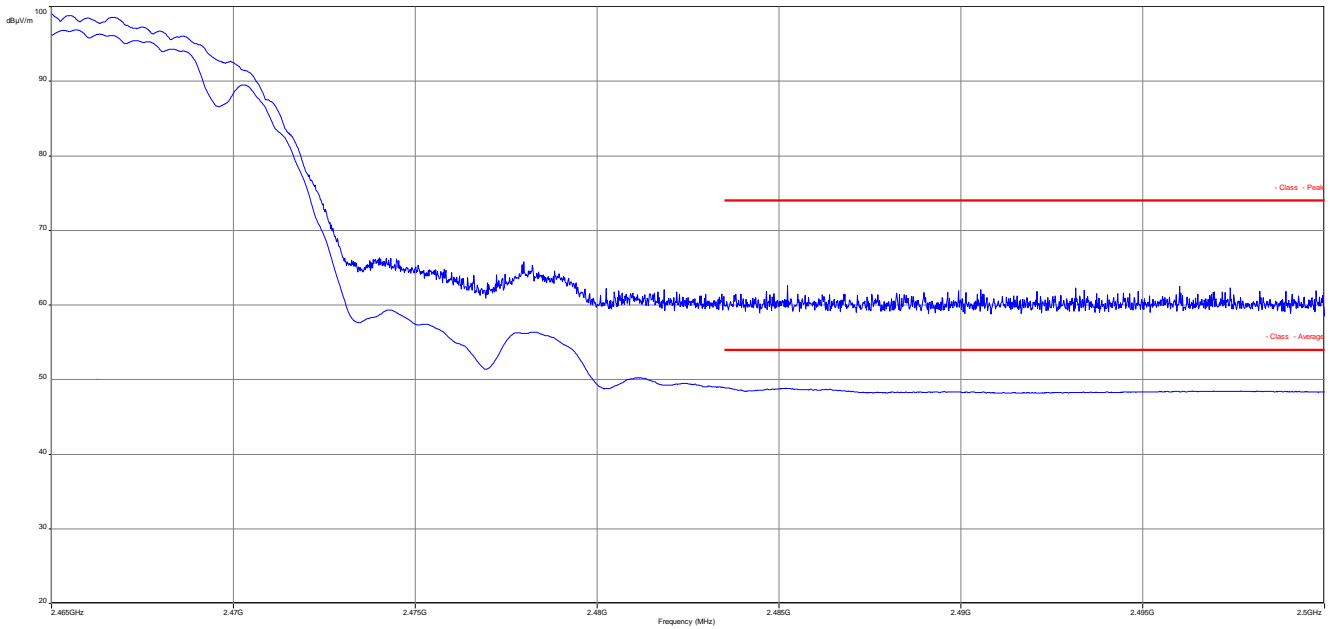
Verdict: [complies](#)

Plots: Antenna A – QPSK – mode peak / average

Plot 1: TX mode, lower band edge, vertical & horizontal polarization

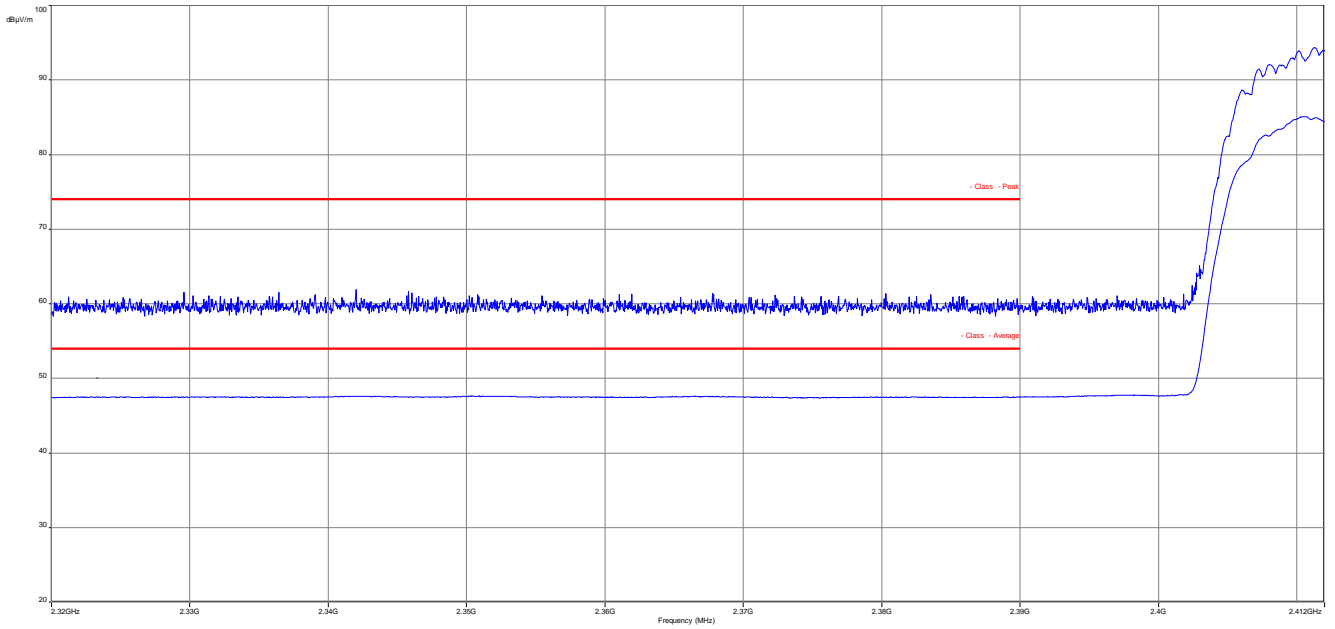


Plot 2: TX mode, upper band edge, vertical & horizontal polarization

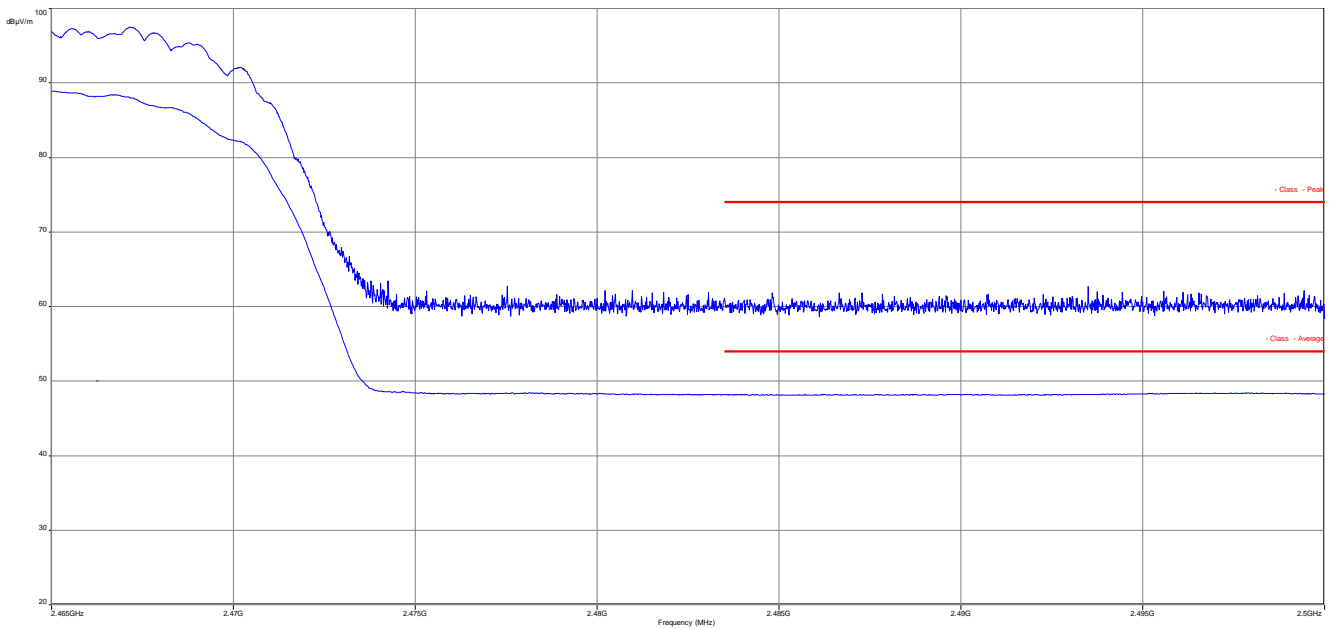


Plots: Antenna A – BPSK – mode peak / average

Plot 1: TX mode, lower band edge, vertical & horizontal polarization

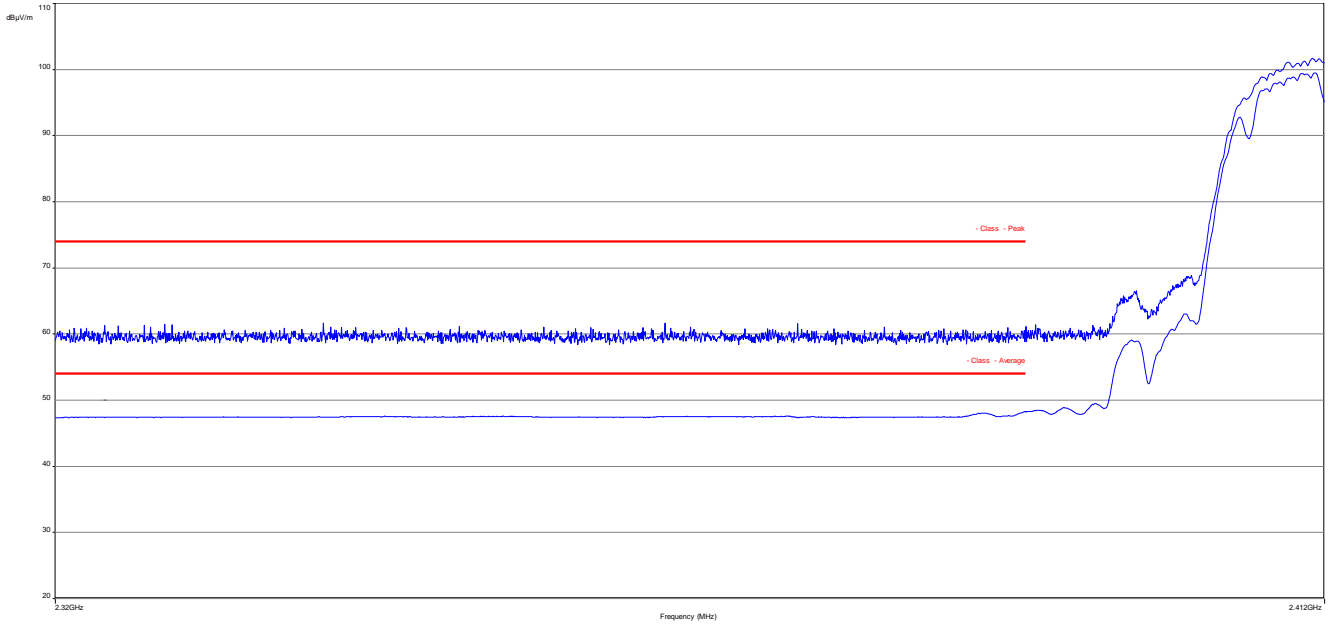


Plot 2: TX mode, upper band edge, vertical & horizontal polarization

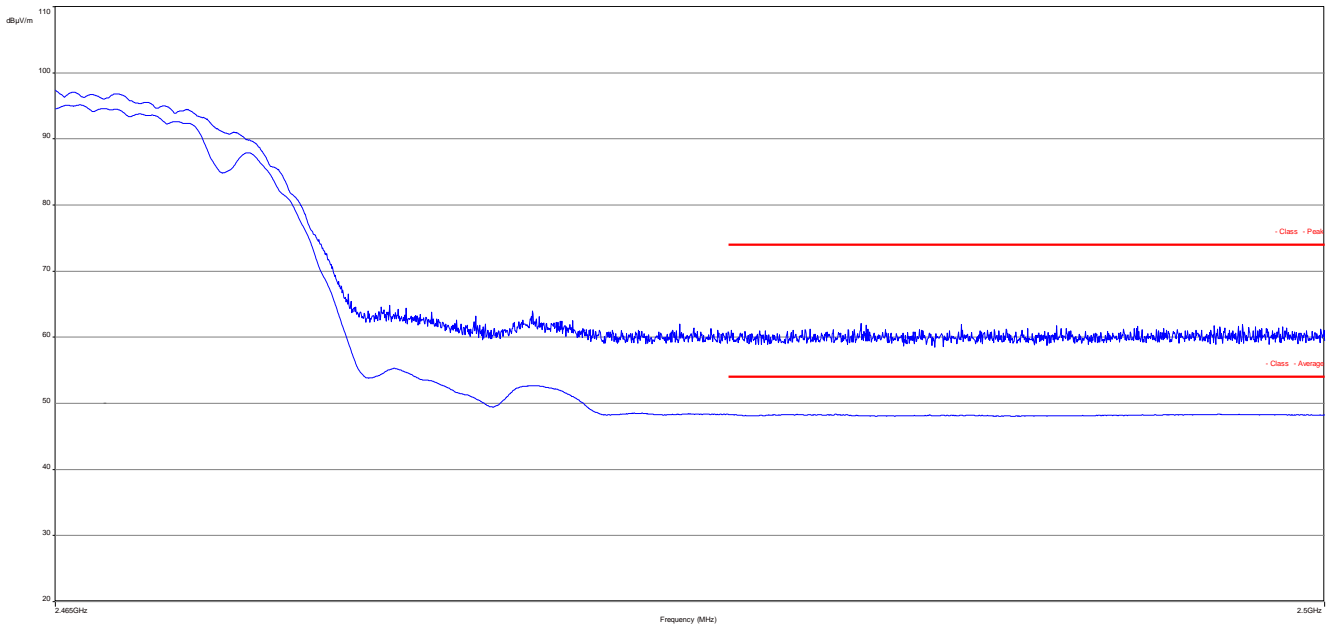


Plots: Antenna B – QPSK – mode peak / average

Plot 1: TX mode, lower band edge, vertical & horizontal polarization

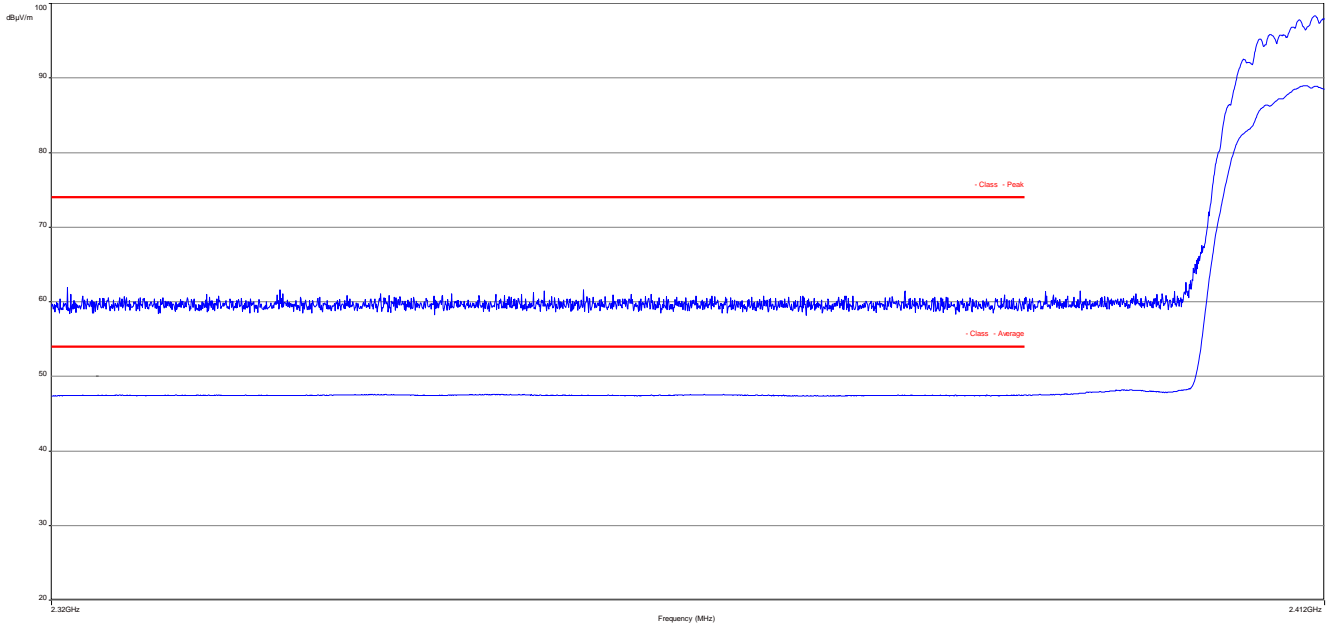


Plot 2: TX mode, upper band edge, vertical & horizontal polarization

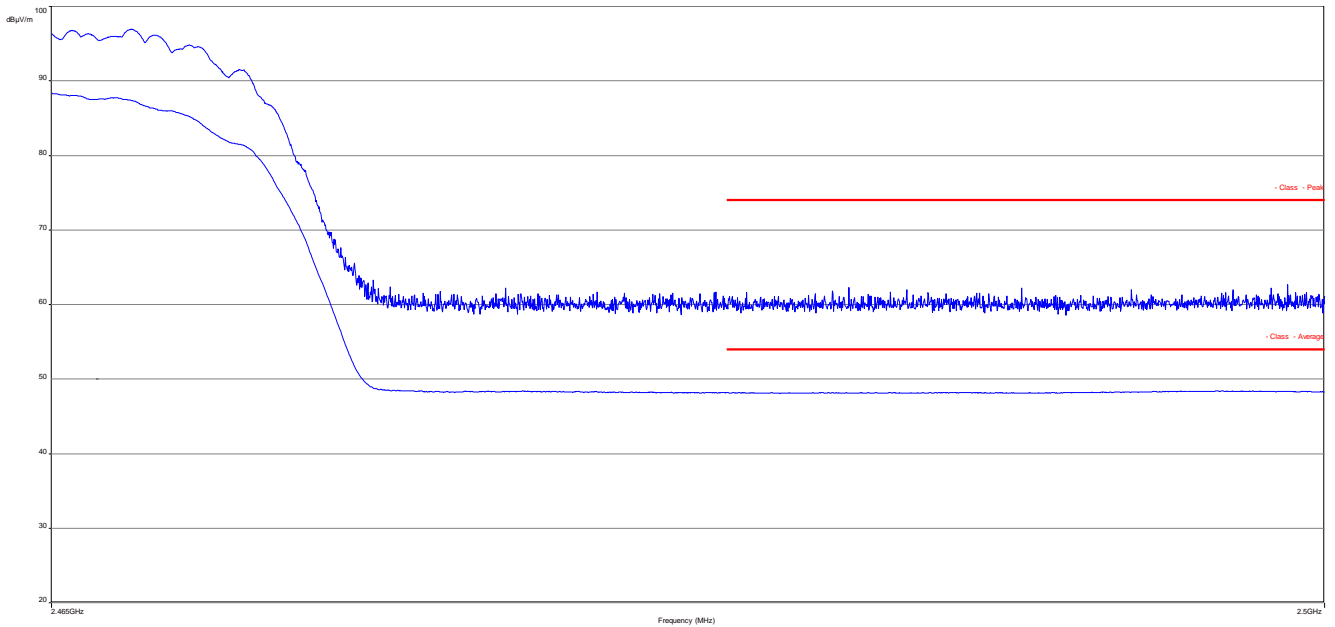


Plots: Antenna B – BPSK – mode peak / average

Plot 1: TX mode, lower band edge, vertical & horizontal polarization



Plot 2: TX mode, upper band edge, vertical & horizontal polarization



10.8 TX spurious emissions conducted

Description:

Measurement of the conducted spurious emissions in transmit mode.

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

Limits:

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

Results: Antenna A – QPSK

TX Spurious Emissions Conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		-1.55	30 dBm		Operating frequency
No peaks detected.			-20 dBc (peak) -30 dBc (average)		complies
2438		-1.81	30 dBm		Operating frequency
No peaks detected			-20 dBc (peak) -30 dBc (average)		complies
2464		-2.26	30 dBm		Operating frequency
No peaks detected			-20 dBc (peak) -30 dBc (average)		complies
Measurement uncertainty			± 3 dB		

Verdict: [complies](#)

Results: Antenna A – BPSK

TX Spurious Emissions Conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		-1.52	30 dBm		Operating frequency
No peaks detected			-20 dBc (peak) -30 dBc (average)		complies
2438		-1.30	30 dBm		Operating frequency
No peaks detected			-20 dBc (peak) -30 dBc (average)		complies
2464		-1.11	30 dBm		Operating frequency
No peaks detected			-20 dBc (peak) -30 dBc (average)		complies
Measurement uncertainty			± 3 dB		

Verdict: [complies](#)

Results: Antenna B – QPSK

TX Spurious Emissions Conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		-0.01	30 dBm		Operating frequency
No peaks detected			-20 dBc (peak) -30 dBc (average)		complies
2438		-0.64	30 dBm		Operating frequency
No peaks detected			-20 dBc (peak) -30 dBc (average)		complies
2464		-0.36	30 dBm		Operating frequency
No peaks detected			-20 dBc (peak) -30 dBc (average)		complies
Measurement uncertainty			± 3 dB		

Verdict: [complies](#)

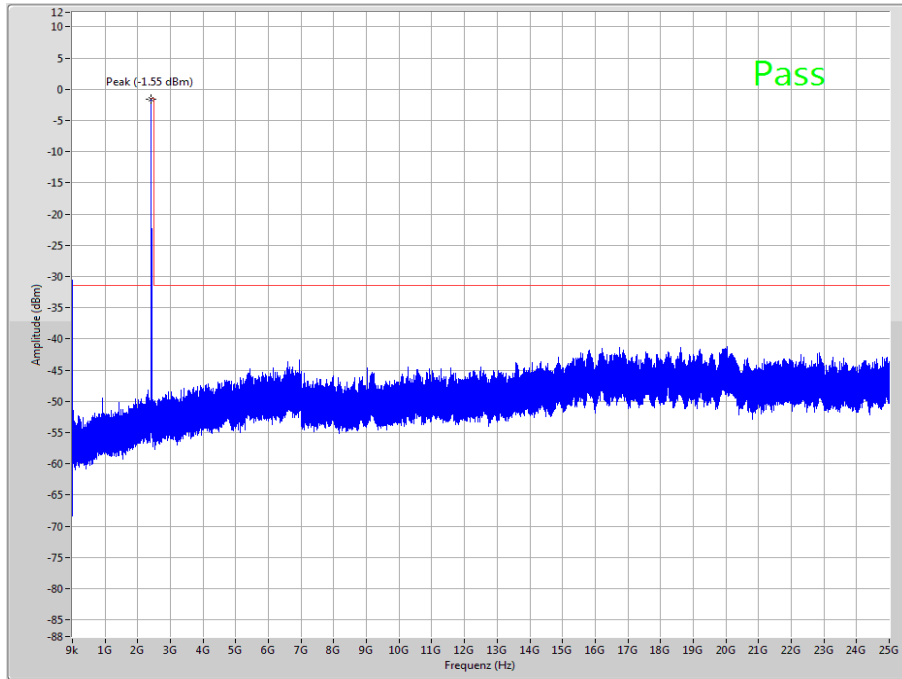
Results: Antenna B – BPSK

TX Spurious Emissions Conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		-0.67	30 dBm		Operating frequency
No peaks detected			-20 dBc (peak) -30 dBc (average)		complies
2438		-0.35	30 dBm		Operating frequency
No peaks detected			-20 dBc (peak) -30 dBc (average)		complies
2464		-1.37	30 dBm		Operating frequency
No peaks detected			-20 dBc (peak) -30 dBc (average)		complies
Measurement uncertainty			± 3 dB		

Verdict: [complies](#)

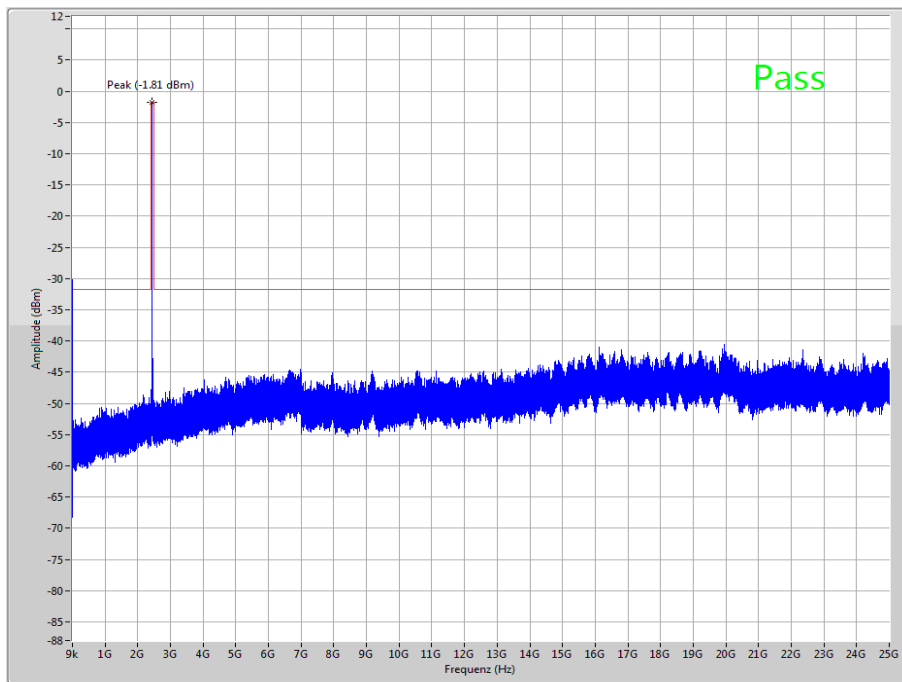
Plots: Antenna A – QPSK

Plot 1: TX mode, lowest channel, up to 25 GHz



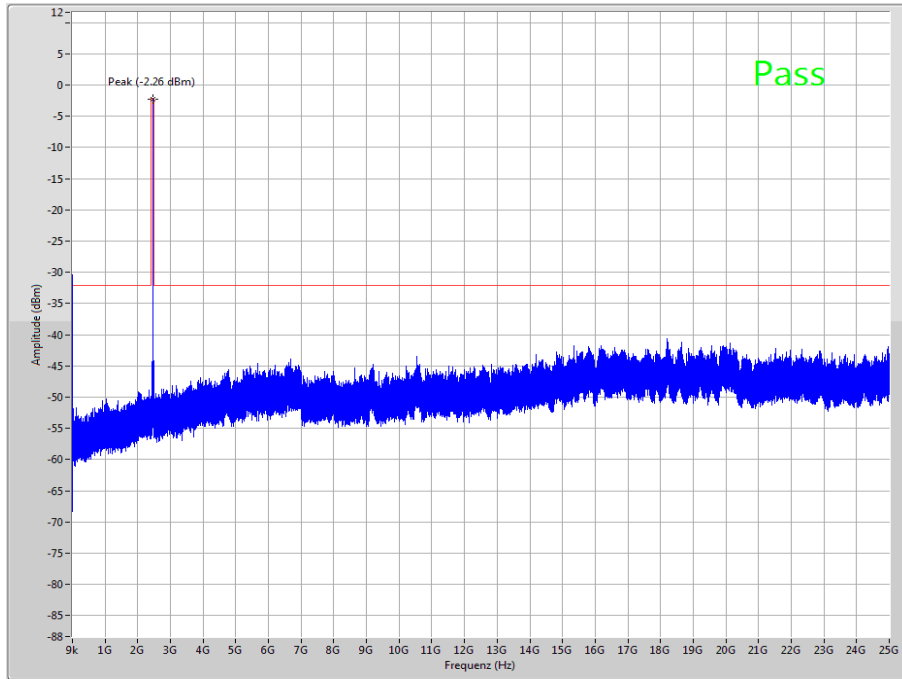
The peak at the beginning of the plot is the LO from the SA.

Plot 2: TX mode, middle channel, up to 25 GHz



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

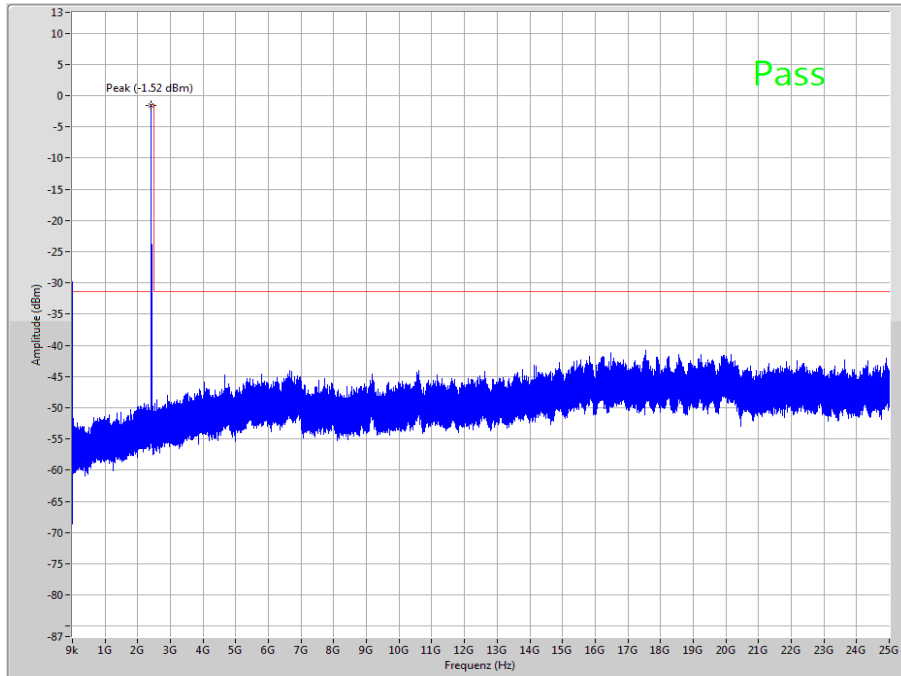
Plot 3: TX mode, highest channel, up to 25 GHz



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

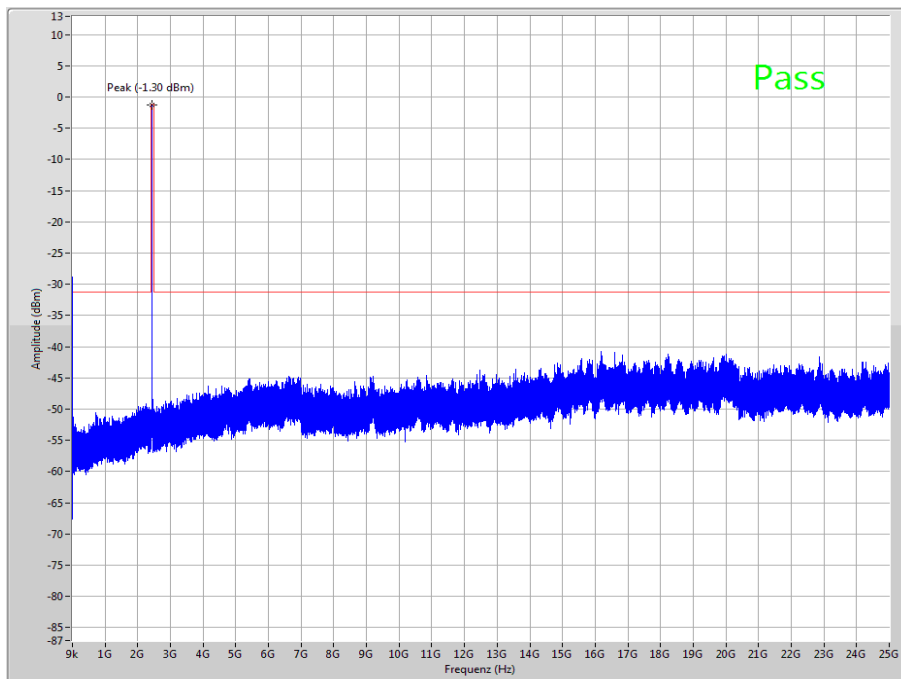
Plots: Antenna A – BPSK

Plot 1: TX mode, lowest channel, up to 25 GHz



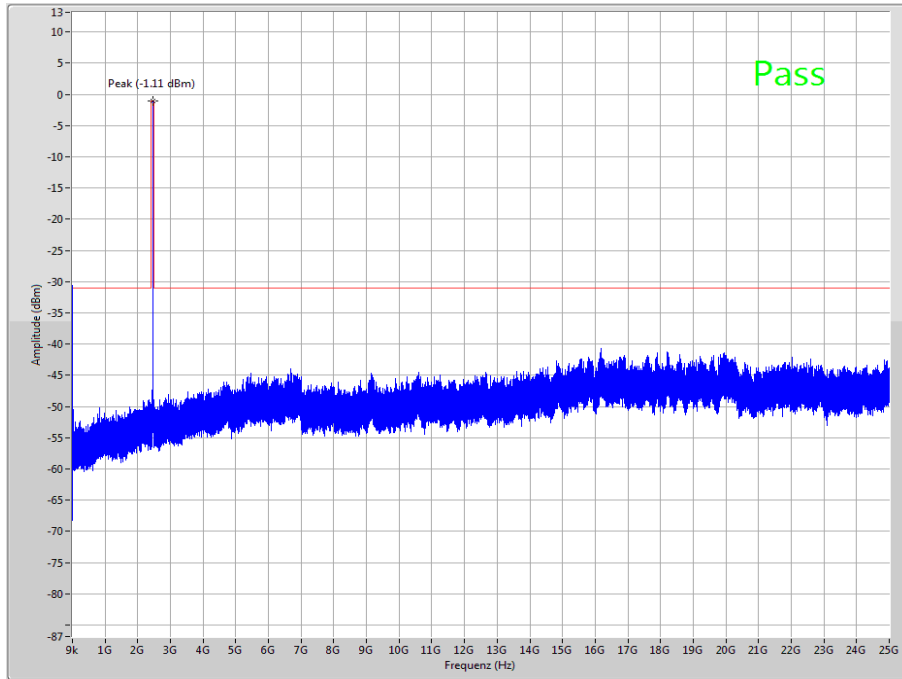
The peak at the beginning of the plot is the LO from the SA.

Plot 2: TX mode, middle channel, up to 25 GHz



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

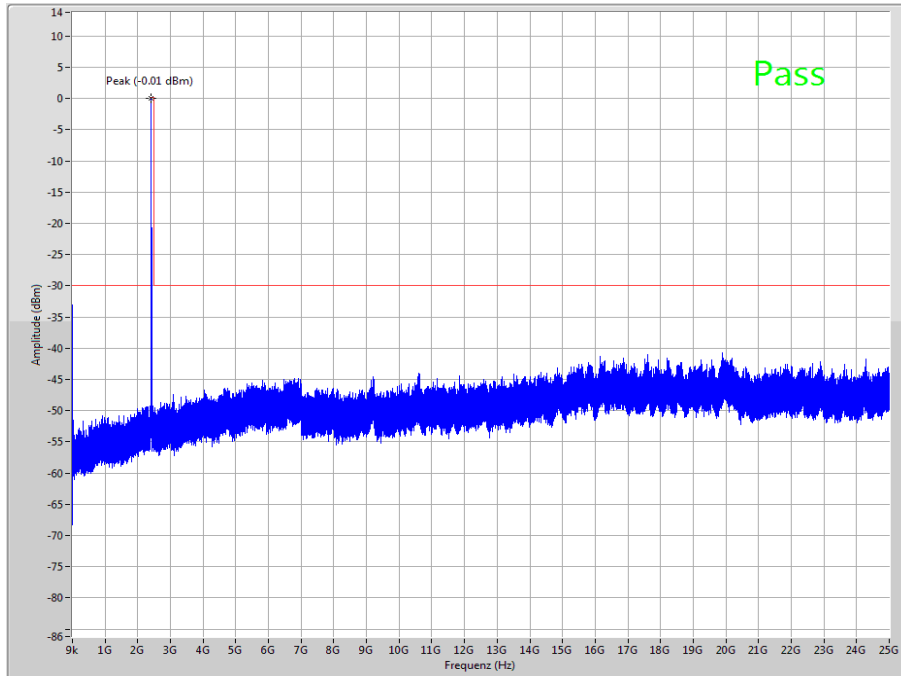
Plot 3: TX mode, highest channel, up to 25 GHz



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

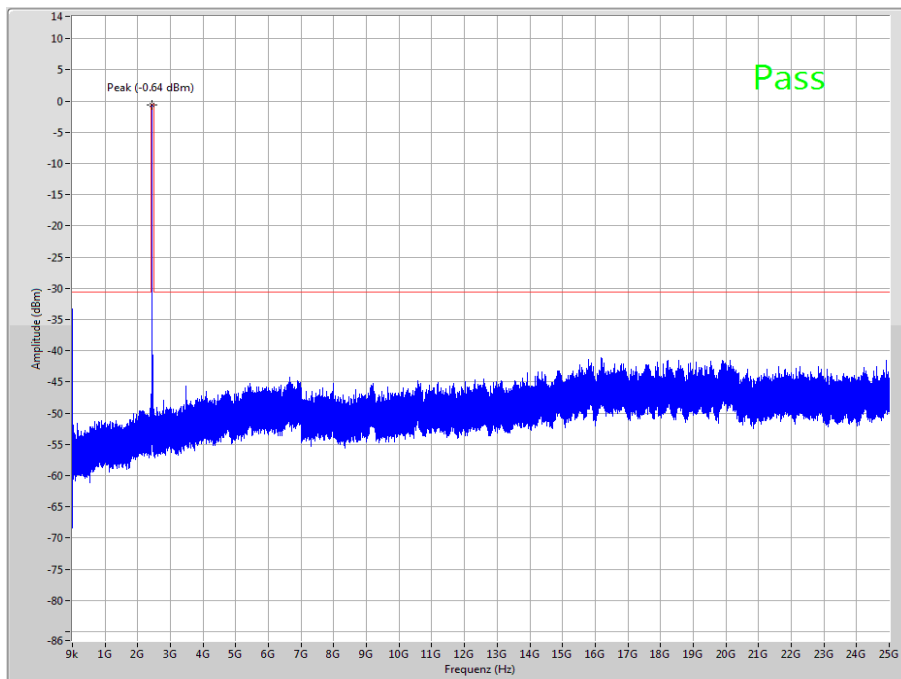
Plots: Antenna B – QPSK

Plot 1: TX mode, lowest channel, up to 25 GHz



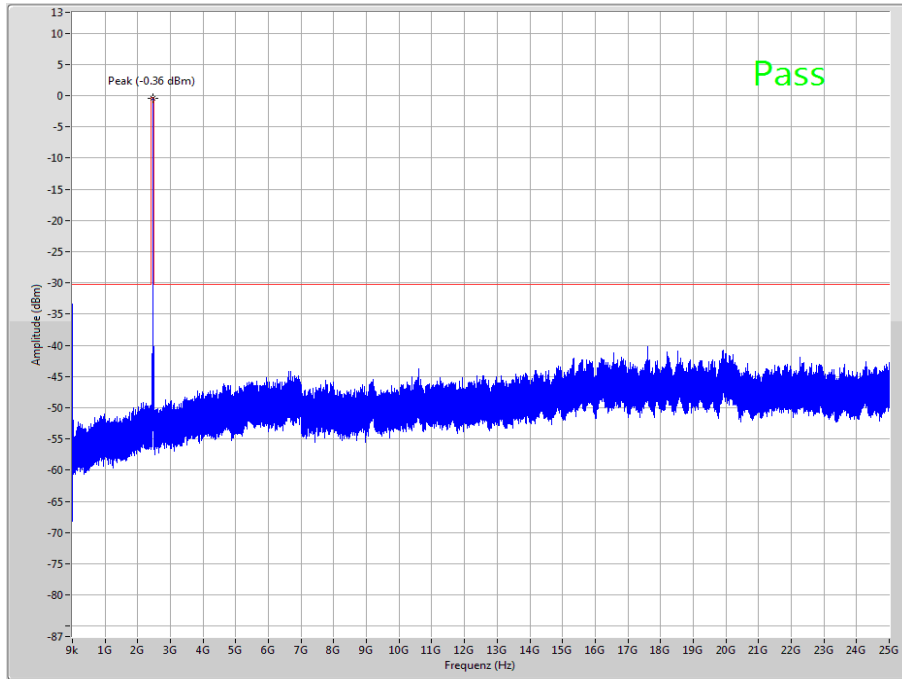
The peak at the beginning of the plot is the LO from the SA.

Plot 2: TX mode, middle channel, up to 25 GHz



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

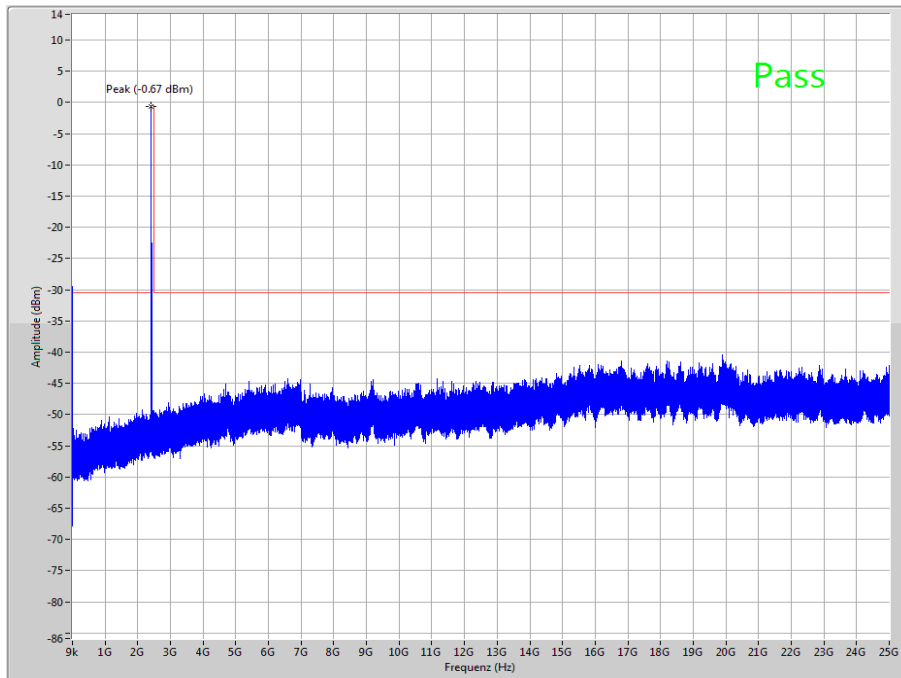
Plot 3: TX mode, highest channel, up to 25 GHz



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

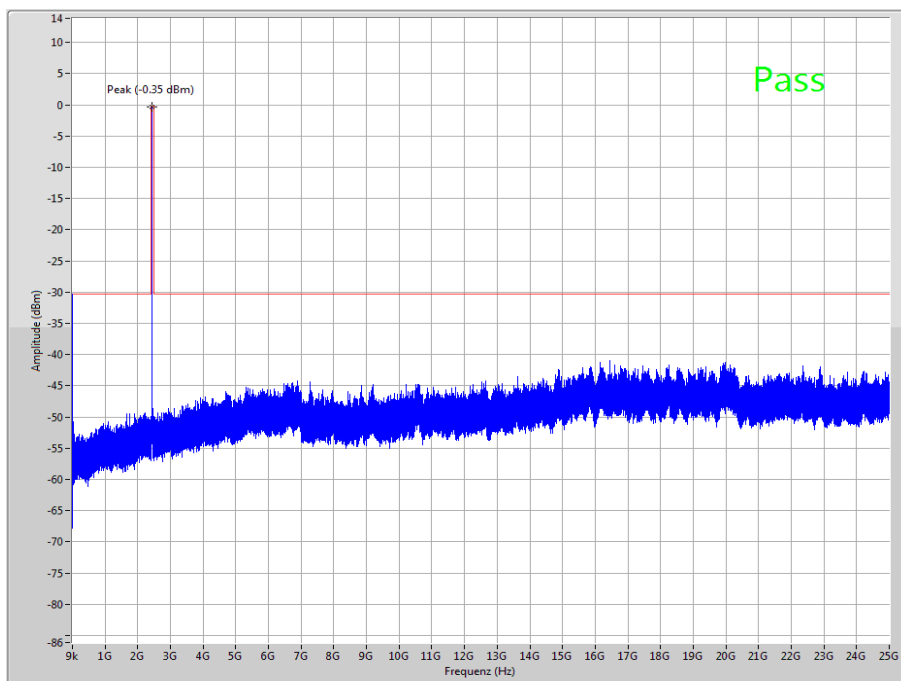
Plots: Antenna B – BPSK

Plot 1: TX mode, lowest channel, up to 25 GHz



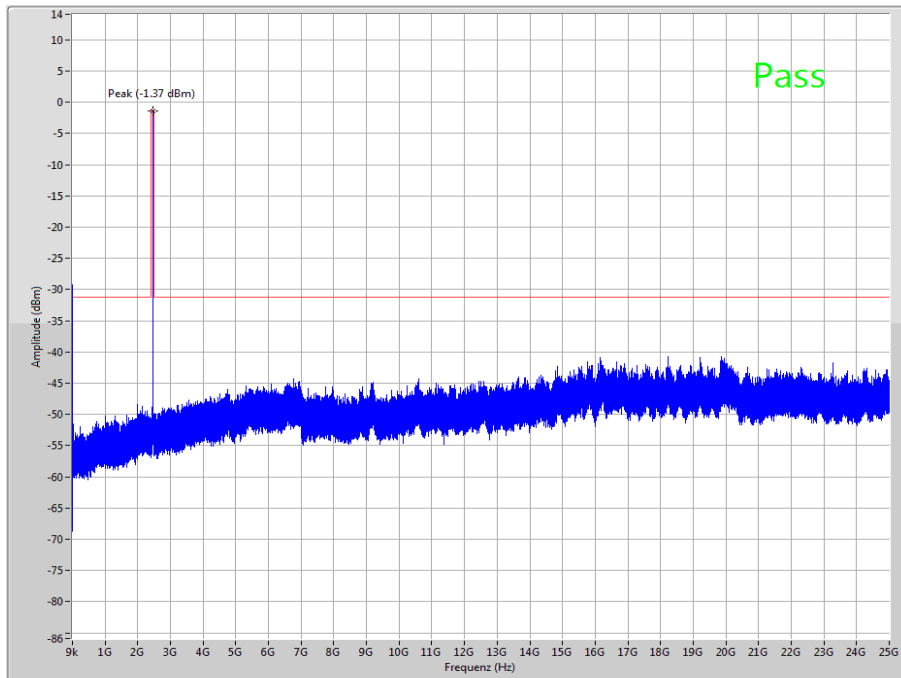
The peak at the beginning of the plot is the LO from the SA.

Plot 2: TX mode, middle channel, up to 25 GHz



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

Plot 3: TX mode, highest channel, up to 25 GHz



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

10.9 TX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in transmit mode.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	F > 1 GHz: 1 MHz F < 1 GHz: 100 kHz
Video bandwidth:	3 x RBW Remeasurement: 10 Hz / 3 MHz
Span:	30 MHz to 26 GHz
Trace-Mode:	Max Hold
Measured Modulation	<input checked="" type="checkbox"/> DSSS <input type="checkbox"/> OFDM

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

Limits:

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

Results: Antenna A – QPSK

TX Spurious Emissions Radiated [dB μ V/m]								
DSSS / b – mode								
2412 MHz			2437 MHz			2462 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]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions are more than 6 dB below the average limit.			All detected peak emissions are more than 6 dB below the average limit.			All detected peak emissions are more than 6 dB below the average limit.		
Measurement uncertainty			± 3 dB					

Verdict: [complies](#)

Results: Antenna A – BPSK

TX Spurious Emissions Radiated [dB μ V/m]								
DSSS / b – mode								
2412 MHz			2437 MHz			2462 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]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions are more than 6 dB below the average limit.			All detected peak emissions are more than 6 dB below the average limit.			All detected peak emissions are more than 6 dB below the average limit.		
Measurement uncertainty			± 3 dB					

Verdict: [complies](#)

Results: Antenna B – QPSK

TX Spurious Emissions Radiated [dB μ V/m]								
DSSS / b – mode								
2412 MHz			2437 MHz			2462 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]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions are more than 6 dB below the average limit.			All detected peak emissions are more than 6 dB below the average limit.			All detected peak emissions are more than 6 dB below the average limit.		
Measurement uncertainty			± 3 dB					

Verdict: [complies](#)

Results: Antenna B – BPSK

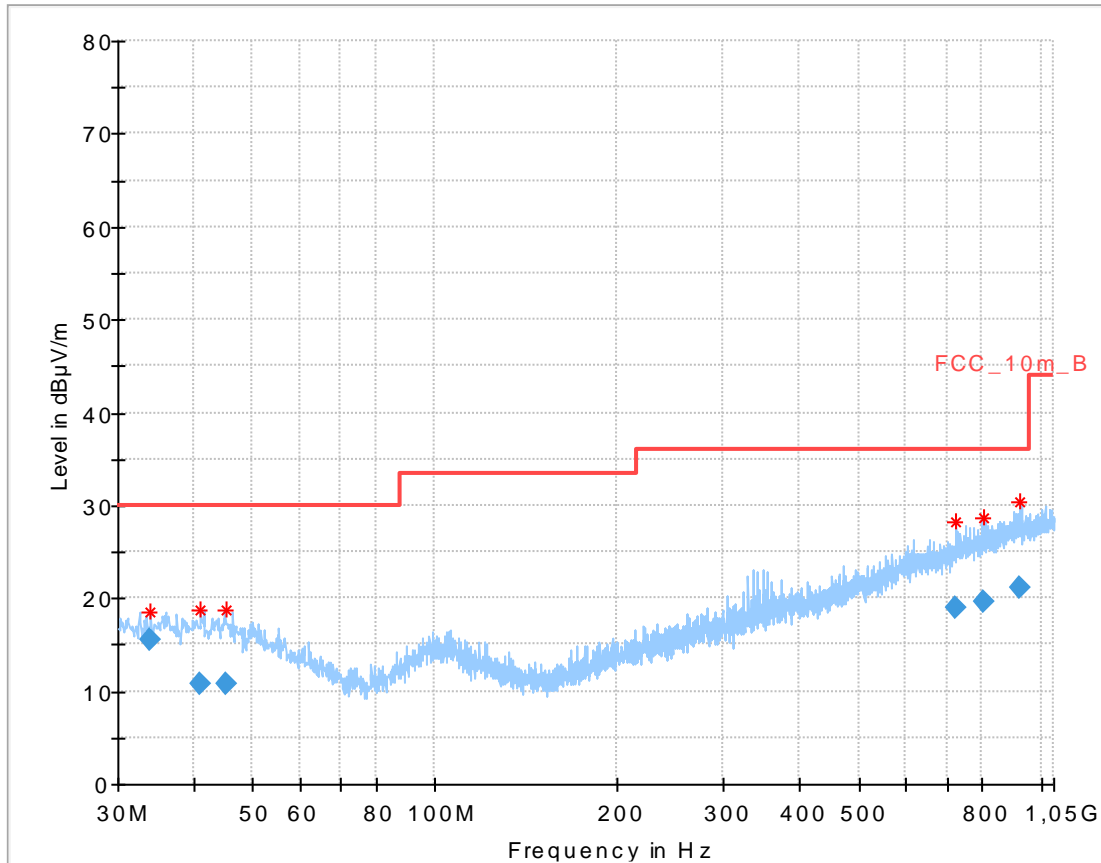
TX Spurious Emissions Radiated [dB μ V/m]								
DSSS / b – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions are more than 6 dB below the average limit.			All detected peak emissions are more than 6 dB below the average limit.			All detected peak emissions are more than 6 dB below the average limit.		
Measurement uncertainty			± 3 dB					

Verdict: [complies](#)

Note: Only the mid channel in BPSK is added to show the compliance.

Plots: Antenna A – QPSK

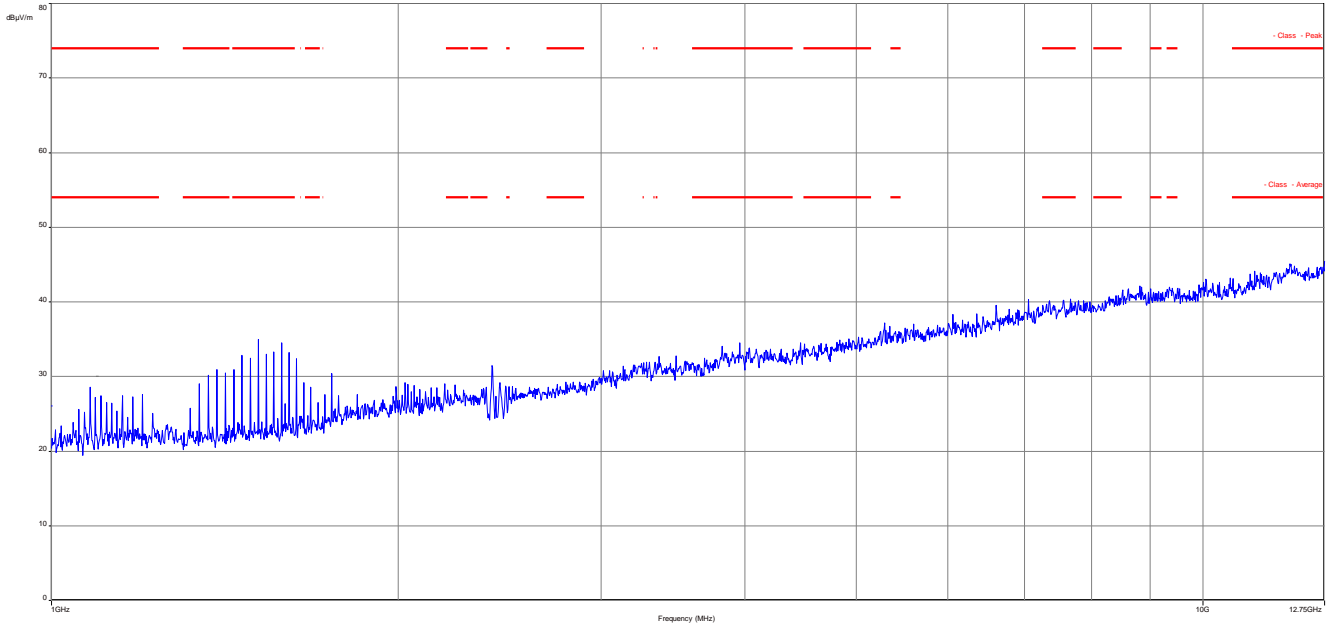
Plot 1: Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization



Final_Result

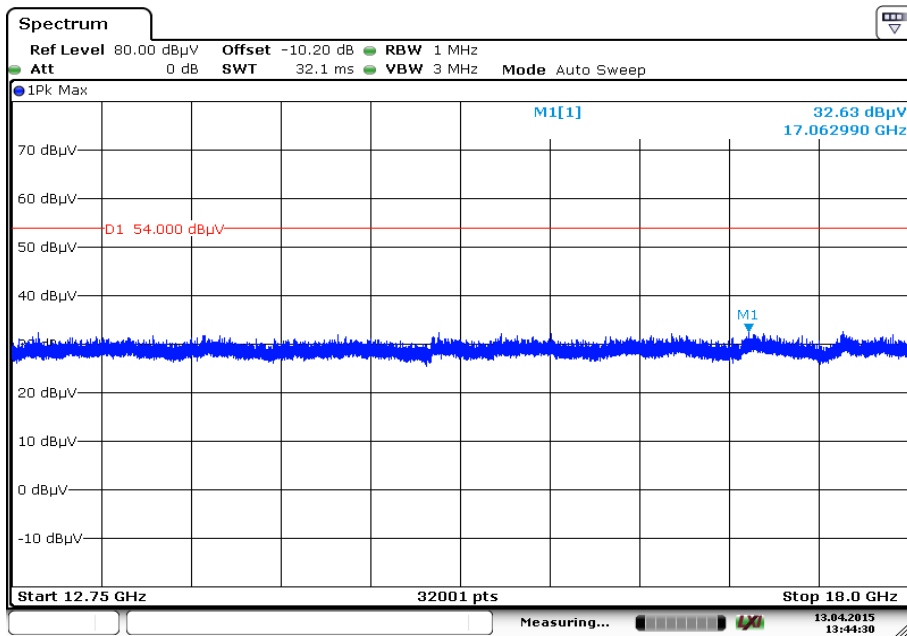
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)
33.986250	15.48	30.00	14.52	1000.0	120.000	100.0	V	-25	13.7
41.084850	10.77	30.00	19.23	1000.0	120.000	170.0	V	25	14.0
45.201900	10.69	30.00	19.31	1000.0	120.000	101.0	V	263	13.8
725.615550	19.02	36.00	16.98	1000.0	120.000	98.0	V	16	22.1
803.414550	19.53	36.00	16.47	1000.0	120.000	170.0	H	263	22.8
923.644650	21.07	36.00	14.93	1000.0	120.000	170.0	H	155	24.2

Plot 2: Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



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

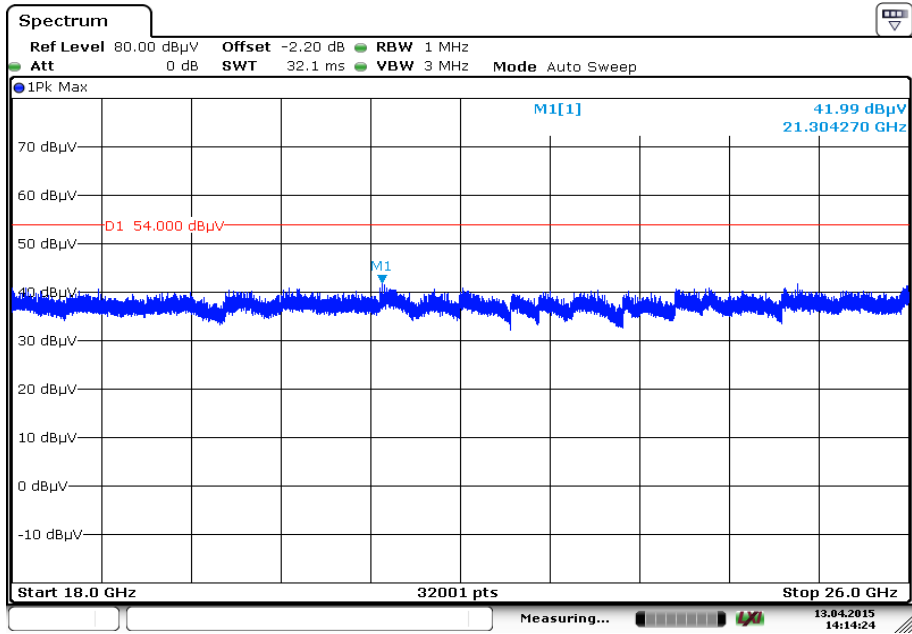
Plot 3: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Date: 13.APR.2015 13:44:30

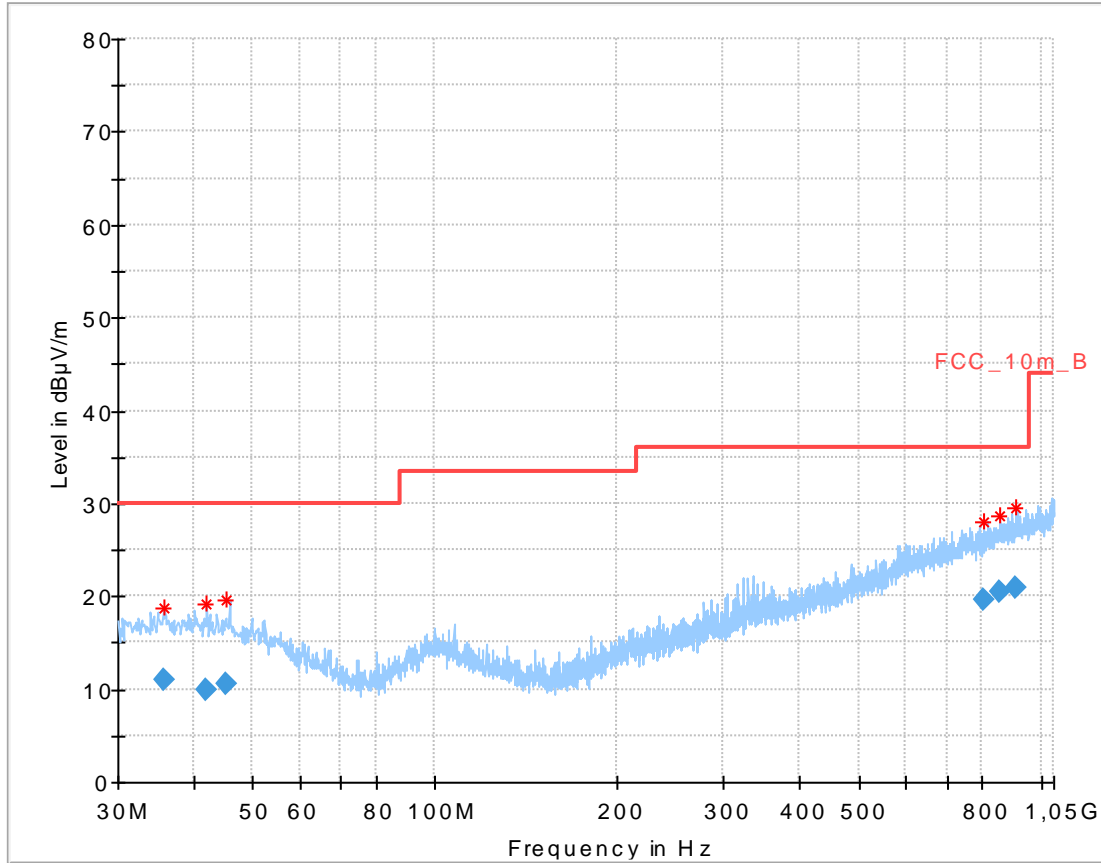
13.04.2015
13:44:30

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



Date: 13.APR.2015 14:14:23

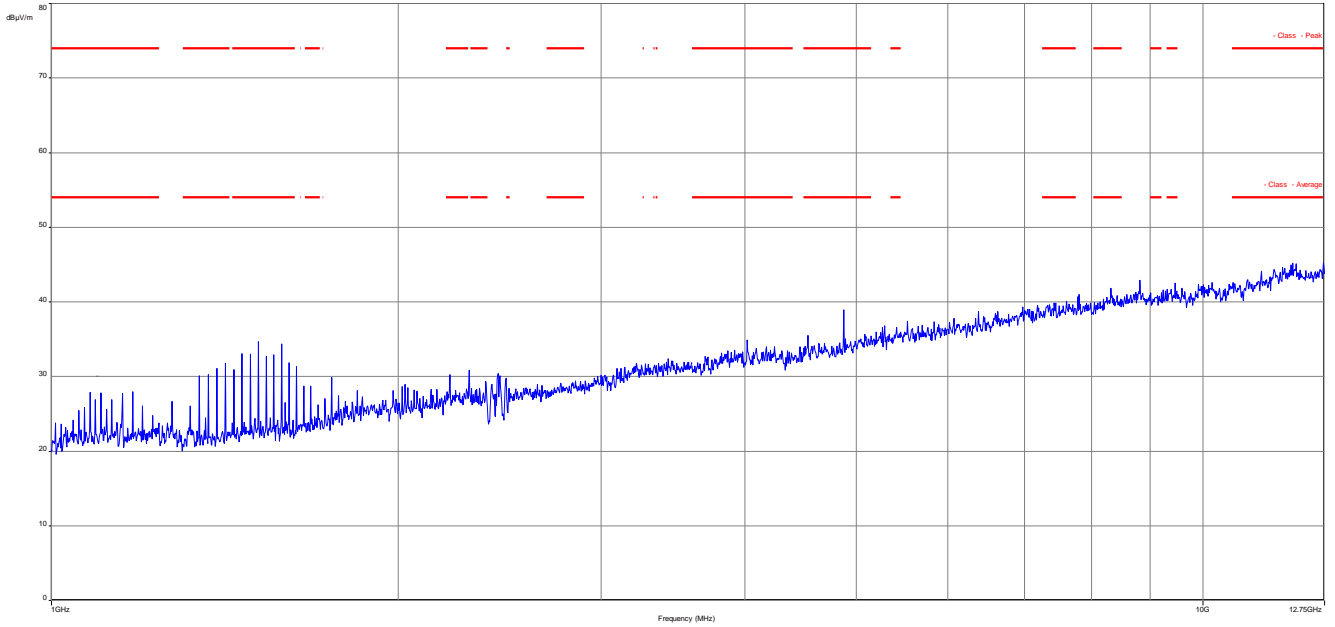
Plot 5: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization



Final_Result:

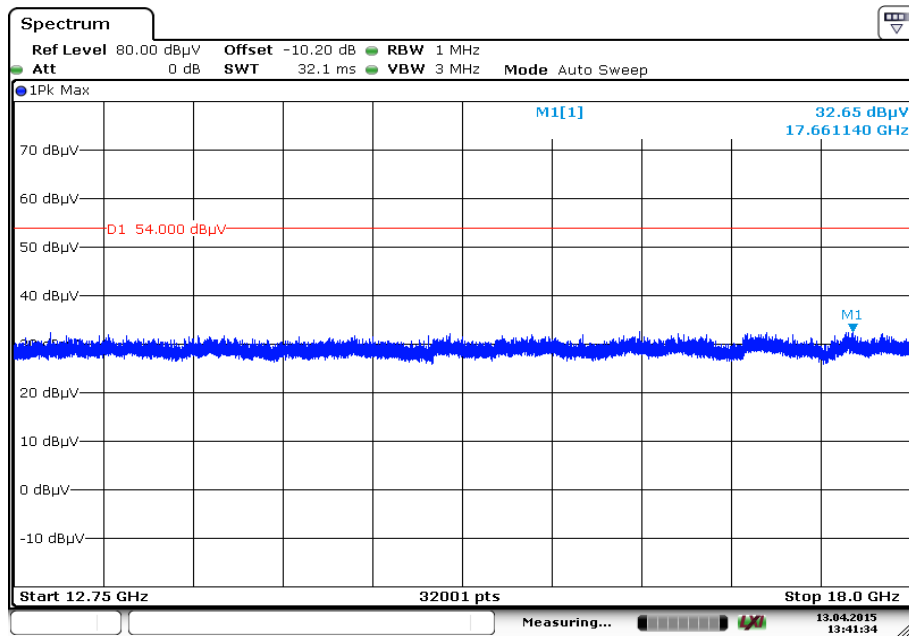
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)
35.767200	10.89	30.00	19.11	1000.0	120.000	101.0	H	83	13.8
41.920350	9.98	30.00	20.02	1000.0	120.000	170.0	V	263	14.0
45.292650	10.46	30.00	19.54	1000.0	120.000	101.0	H	263	13.8
805.942500	19.61	36.00	16.39	1000.0	120.000	170.0	H	65	22.8
857.724900	20.51	36.00	15.49	1000.0	120.000	170.0	V	107	23.6
907.885500	20.96	36.00	15.04	1000.0	120.000	170.0	H	265	24.1

Plot 6: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



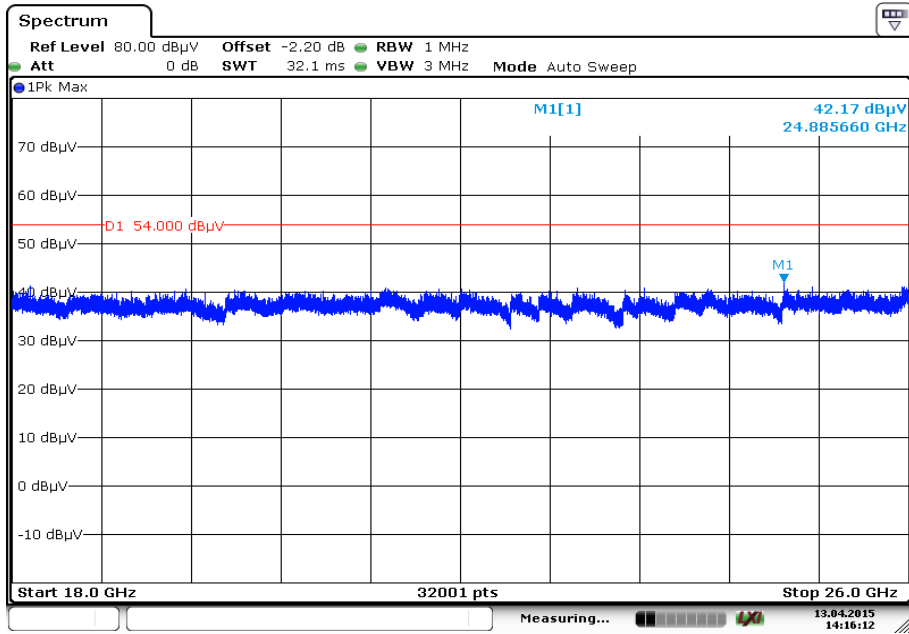
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 7: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



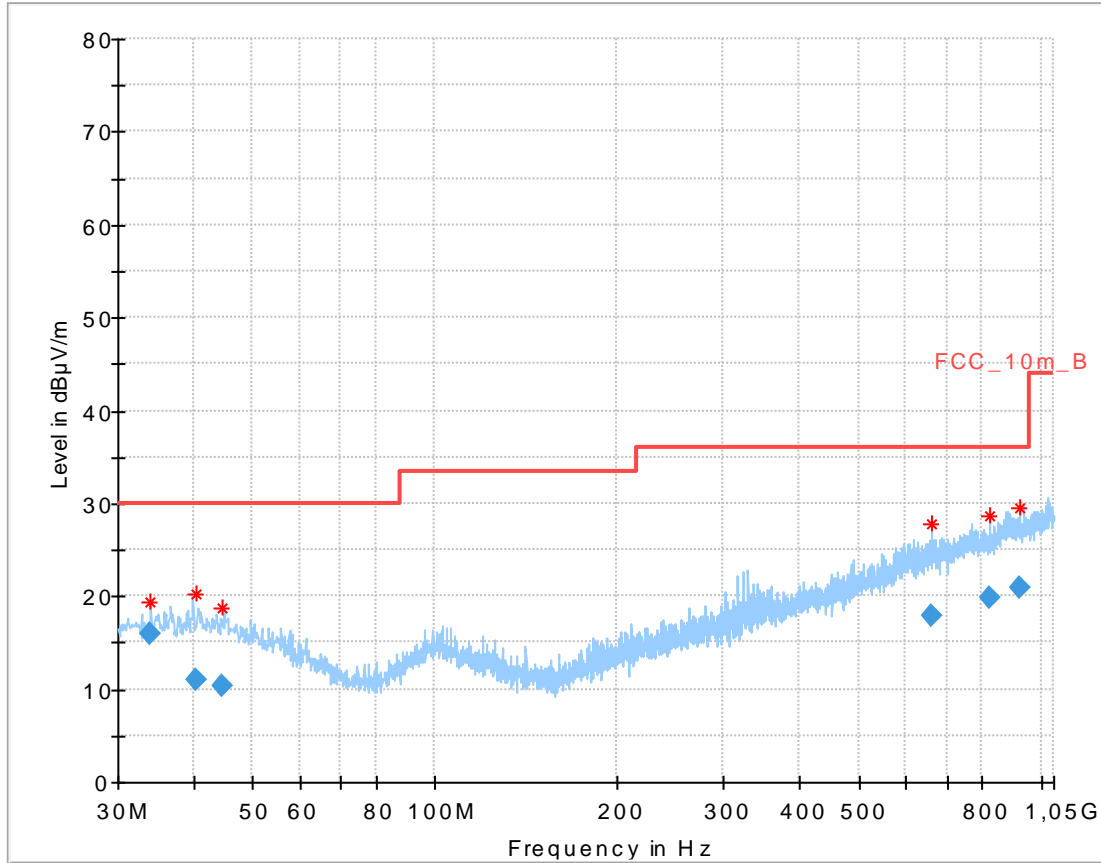
Date: 13.APR.2015 13:41:34

Plot 8: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 13.APR.2015 14:16:13

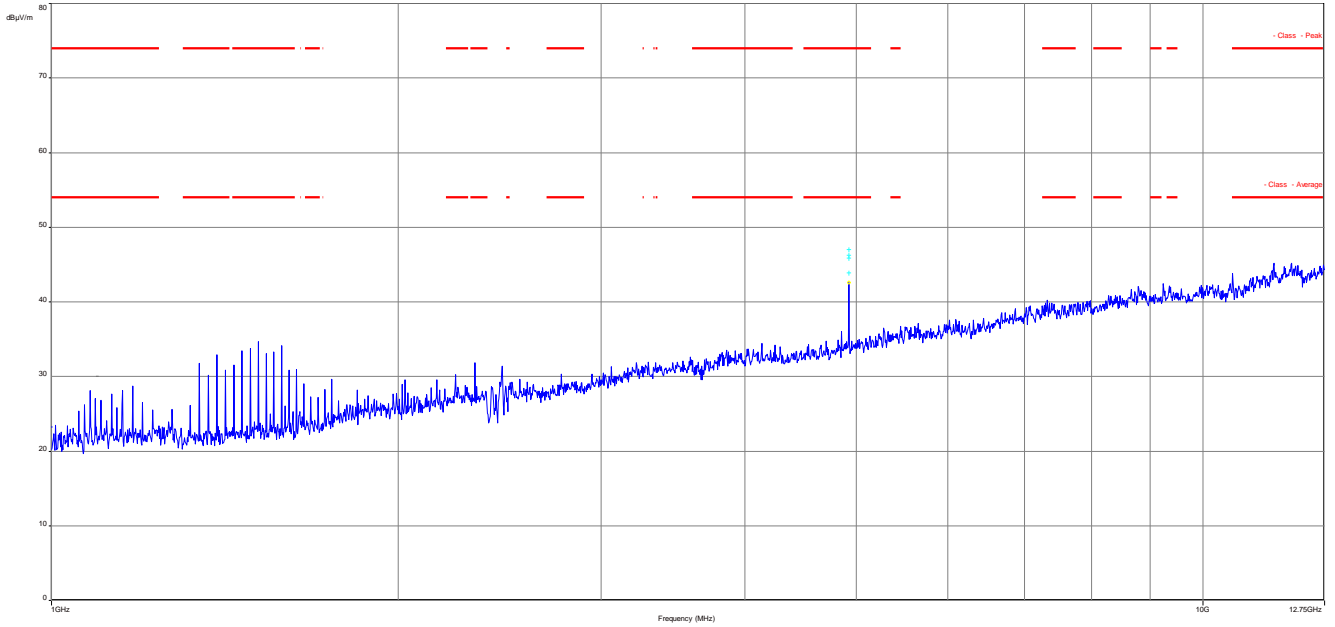
Plot 9: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization



Final_Result:

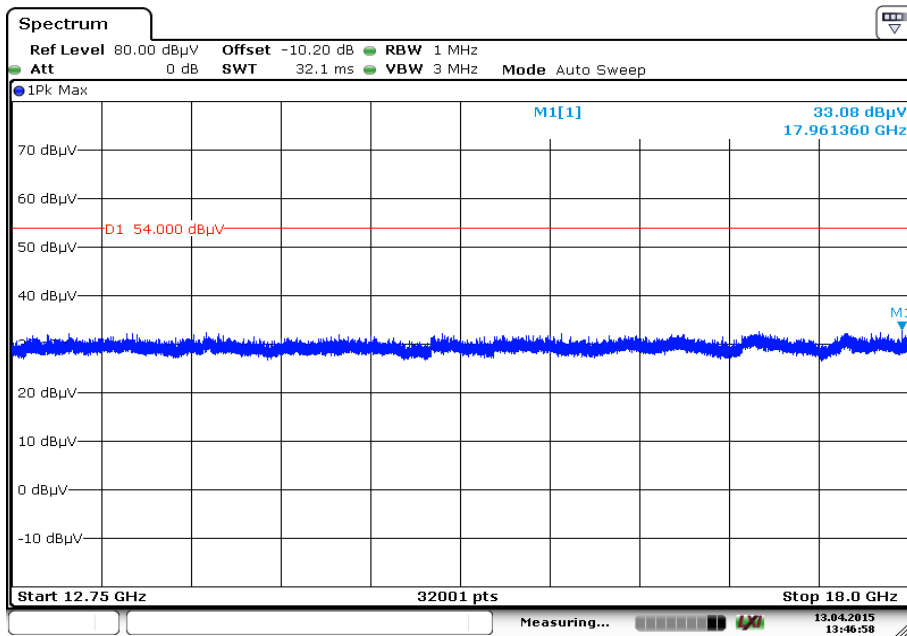
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
33.999750	15.85	30.00	14.15	1000.0	120.000	100.0	V	-6	13.7
40.352700	10.89	30.00	19.11	1000.0	120.000	101.0	H	17	14.0
44.423850	10.35	30.00	19.65	1000.0	120.000	100.0	V	106	13.9
658.629450	18.00	36.00	18.00	1000.0	120.000	170.0	V	174	21.2
820.611000	19.87	36.00	16.13	1000.0	120.000	98.0	H	205	23.0
921.017400	20.95	36.00	15.05	1000.0	120.000	170.0	V	17	24.2

Plot 10: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



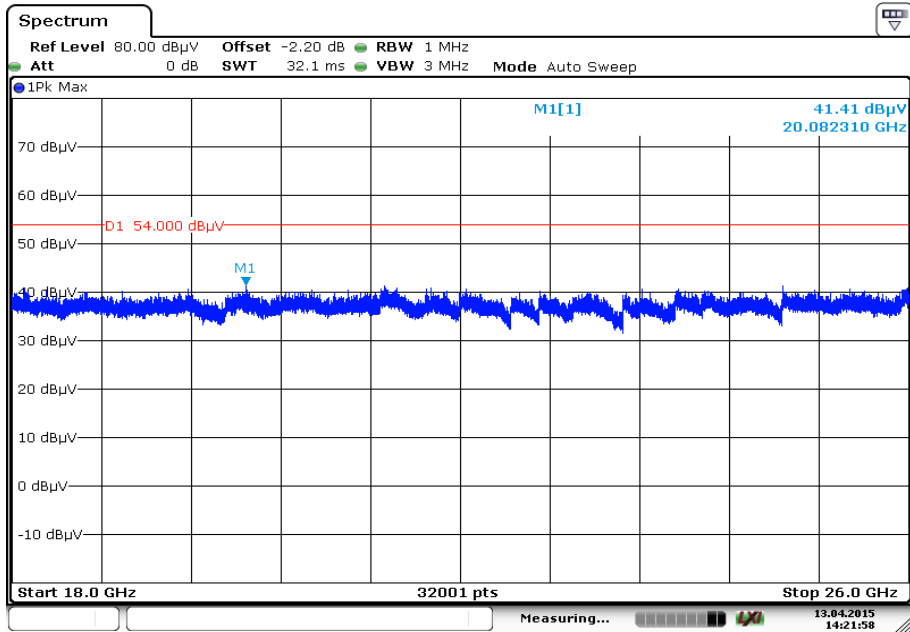
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 11: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Date: 13.APR.2015 13:46:59

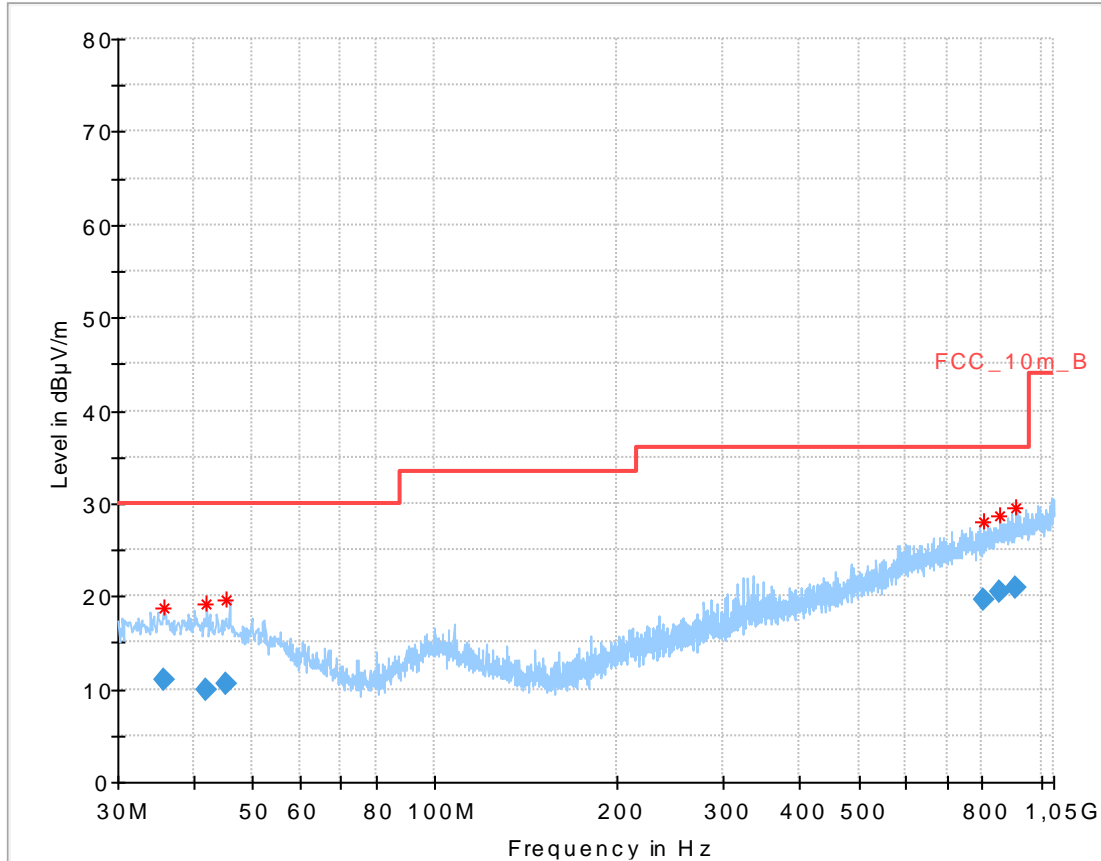
Plot 12: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 13.APR.2015 14:21:59

Plots: Antenna A – BPSK

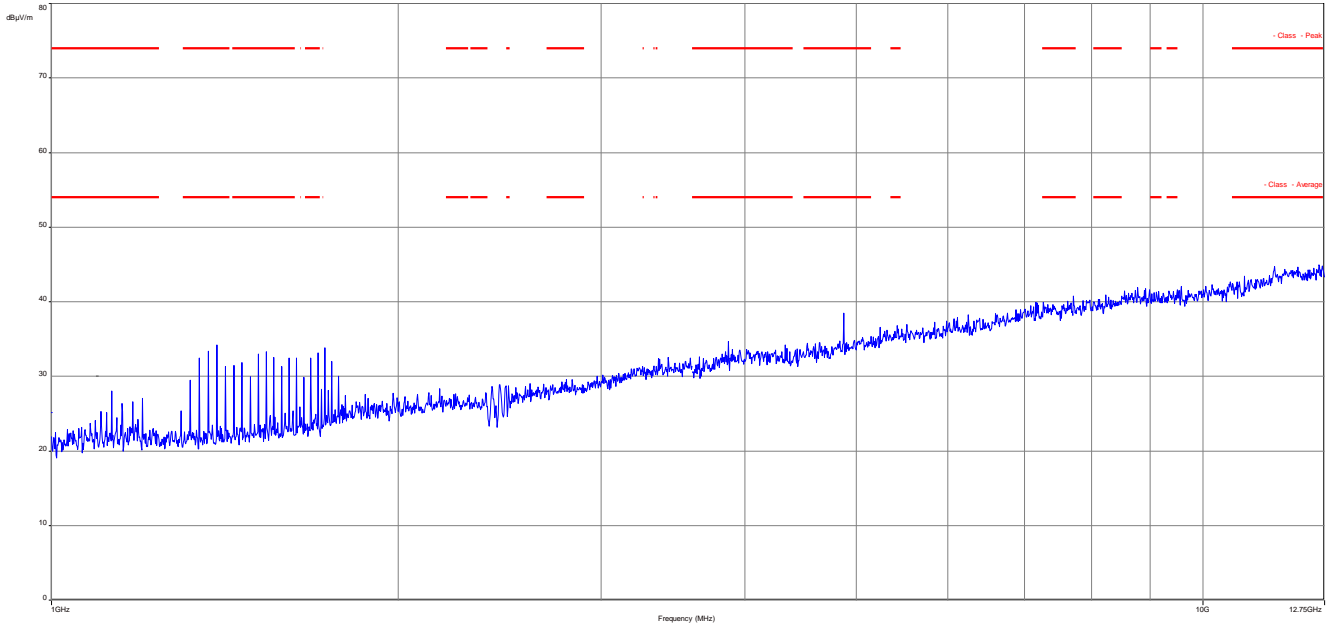
Plot 1: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization



Final_Result:

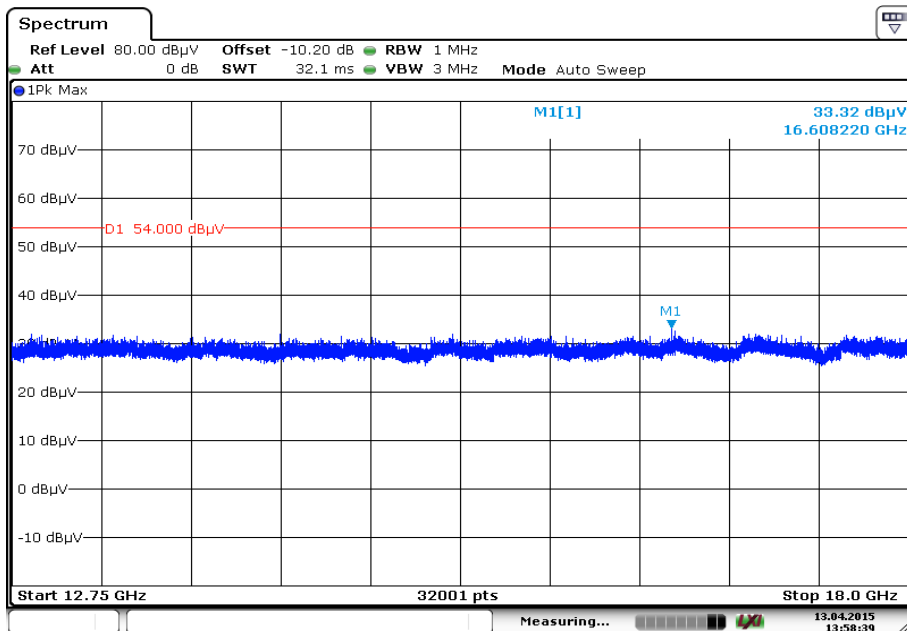
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)
35.767200	10.89	30.00	19.11	1000.0	120.000	101.0	H	83	13.8
41.920350	9.98	30.00	20.02	1000.0	120.000	170.0	V	263	14.0
45.292650	10.46	30.00	19.54	1000.0	120.000	101.0	H	263	13.8
805.942500	19.61	36.00	16.39	1000.0	120.000	170.0	H	65	22.8
857.724900	20.51	36.00	15.49	1000.0	120.000	170.0	V	107	23.6
907.885500	20.96	36.00	15.04	1000.0	120.000	170.0	H	265	24.1

Plot 2: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

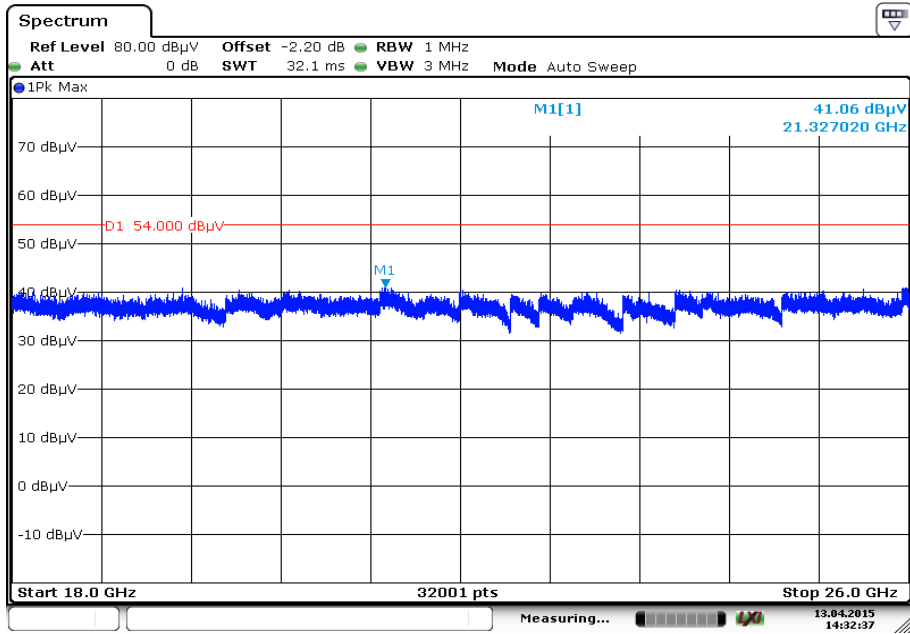


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 3: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



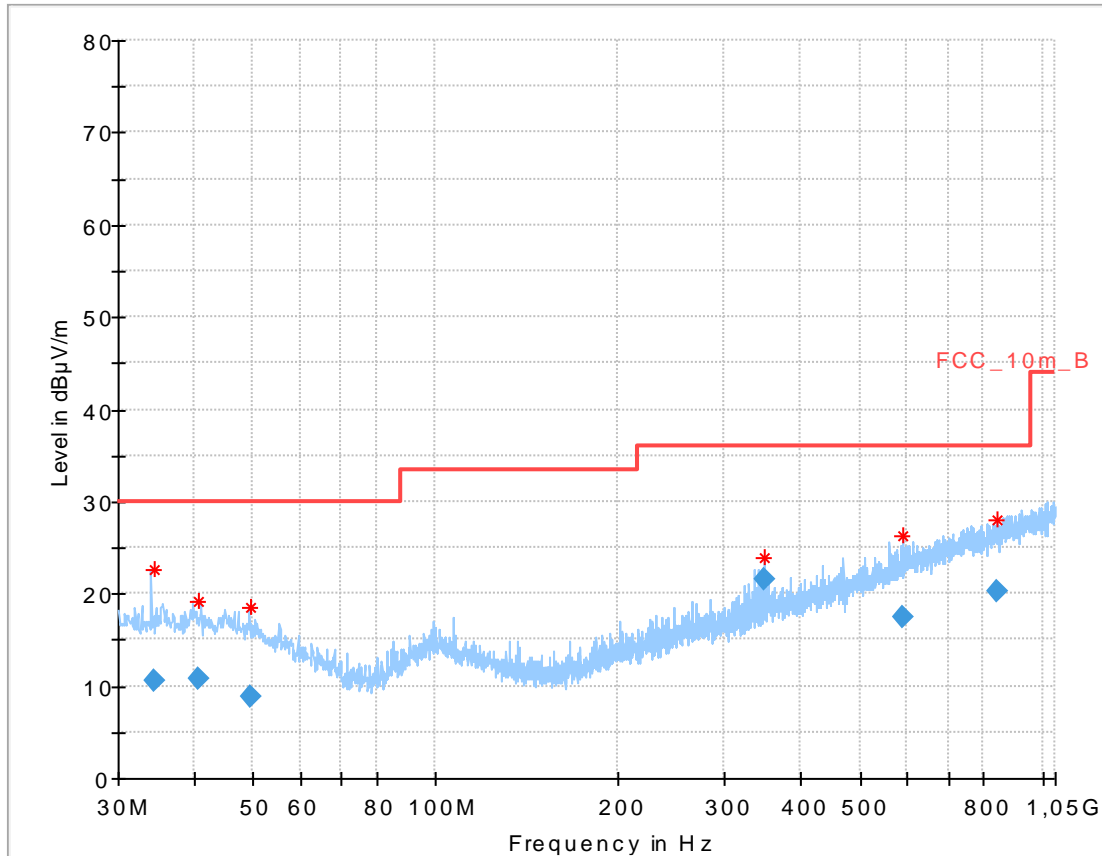
Plot 4: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 13.APR.2015 14:32:37

Plots: Antenna B – QPSK

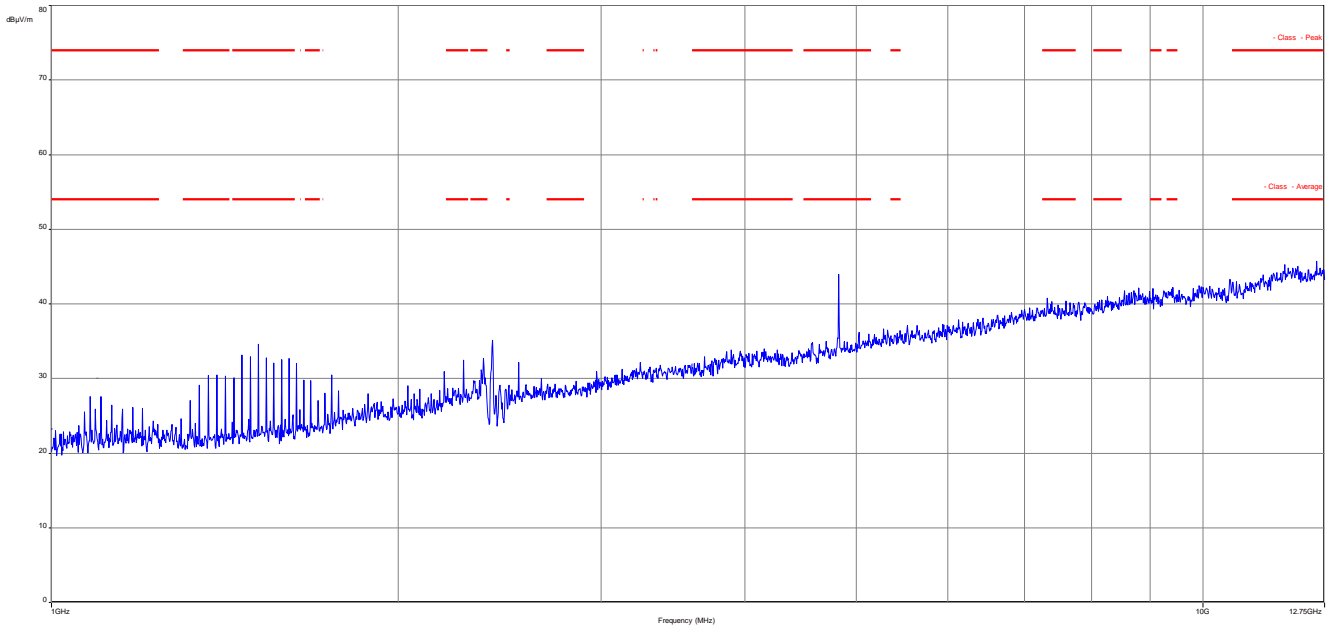
Plot 1: Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization



Final_Result:

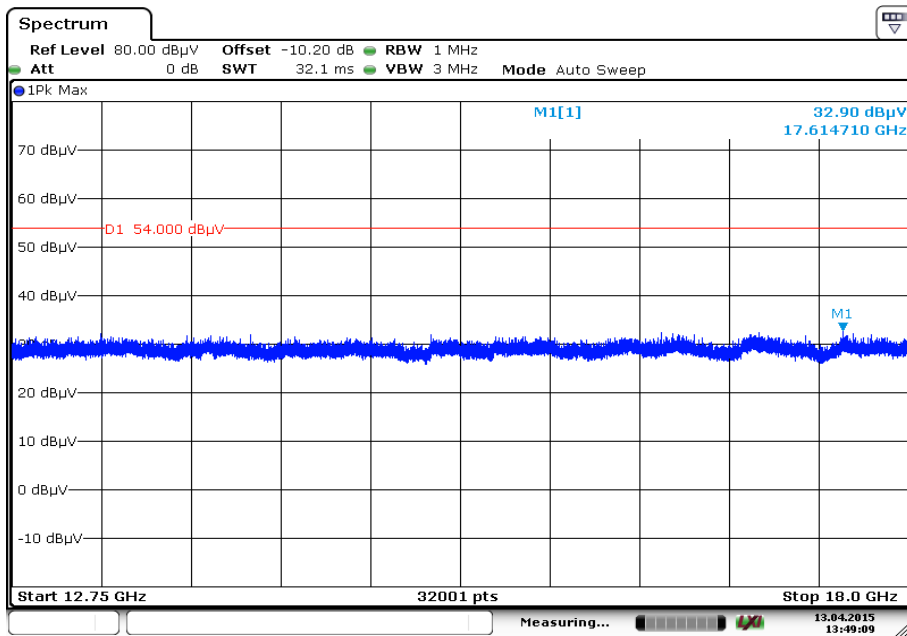
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.424550	10.59	30.00	19.41	1000.0	120.000	101.0	V	287	13.7
40.657800	10.85	30.00	19.15	1000.0	120.000	101.0	H	287	14.0
49.509300	8.83	30.00	21.17	1000.0	120.000	170.0	H	-25	12.8
347.143350	21.54	36.00	14.46	1000.0	120.000	98.0	V	108	15.9
589.744050	17.57	36.00	18.43	1000.0	120.000	170.0	H	295	20.4
843.310050	20.29	36.00	15.71	1000.0	120.000	170.0	V	205	23.4

Plot 2: Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



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

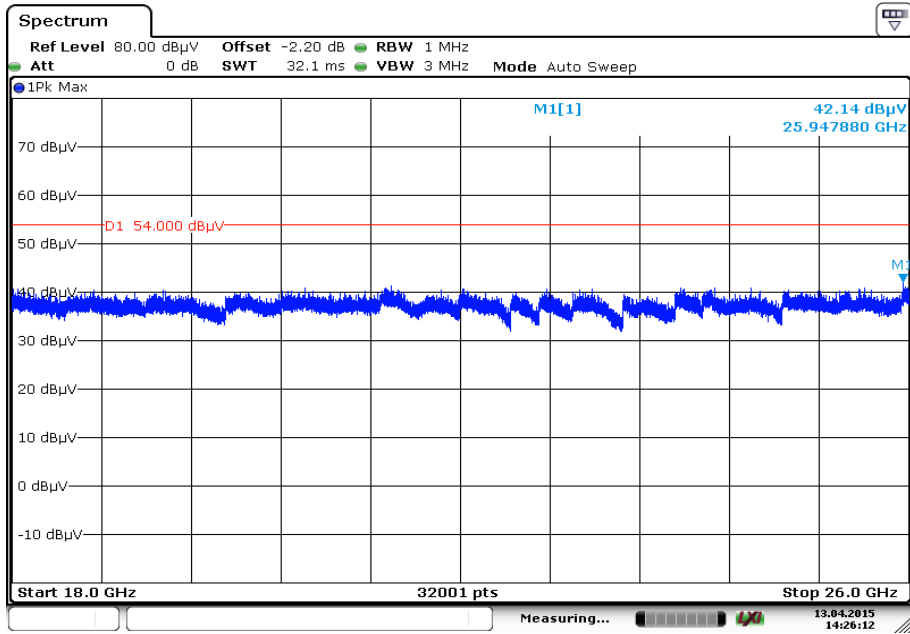
Plot 3: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Date: 13.APR.2015 13:49:09

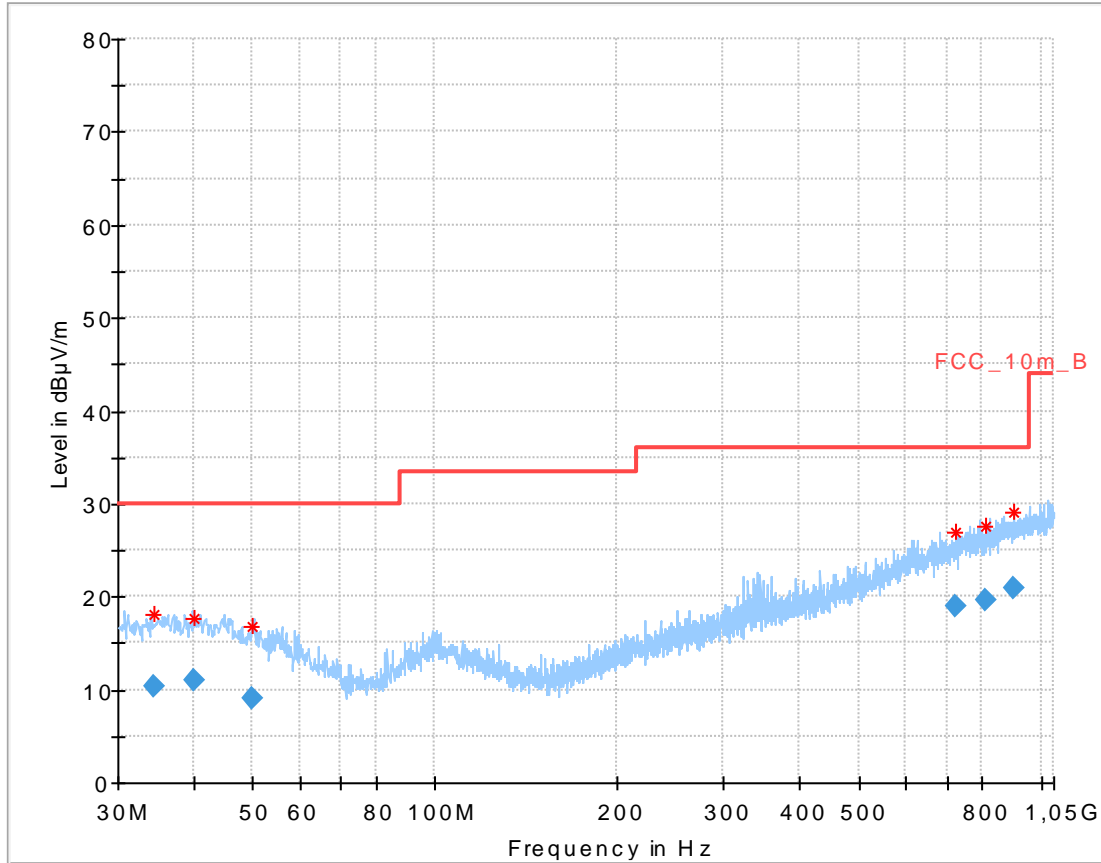
13.04.2015
13:49:09

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



Date: 13.APR.2015 14:26:11

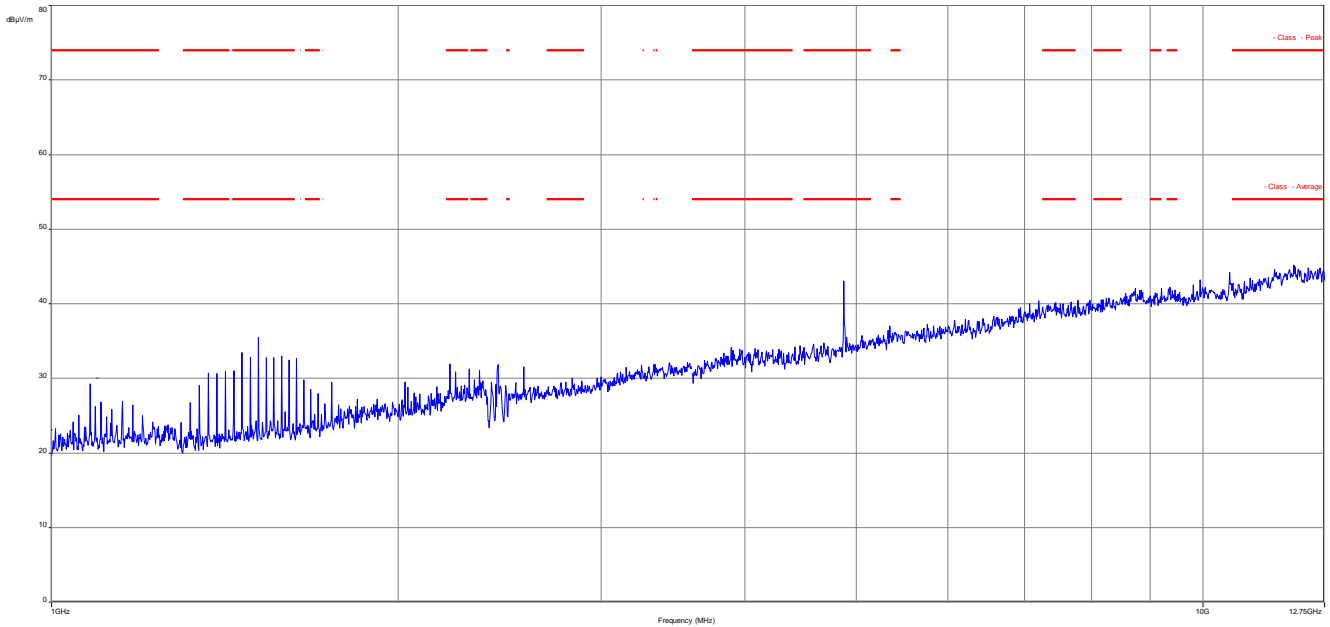
Plot 5: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization



Final_Result

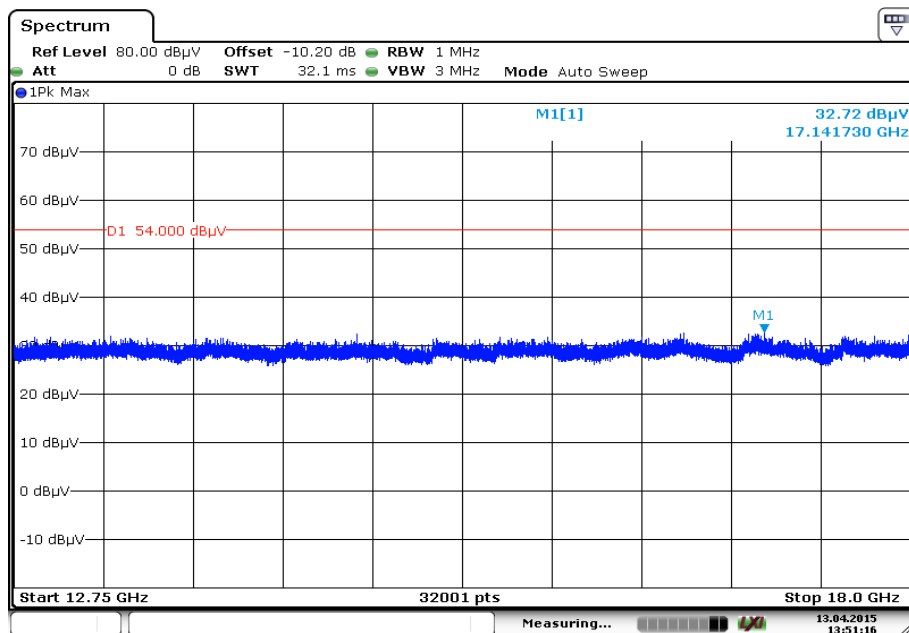
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.483500	10.43	30.00	19.57	1000.0	120.000	101.0	V	115	13.7
39.934500	10.94	30.00	19.06	1000.0	120.000	101.0	V	205	14.0
49.831050	9.03	30.00	20.97	1000.0	120.000	101.0	V	173	12.7
721.278000	18.96	36.00	17.04	1000.0	120.000	170.0	V	295	22.0
809.884050	19.67	36.00	16.33	1000.0	120.000	170.0	V	263	22.9
903.699600	20.99	36.00	15.01	1000.0	120.000	101.0	V	-6	24.1

Plot 6: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



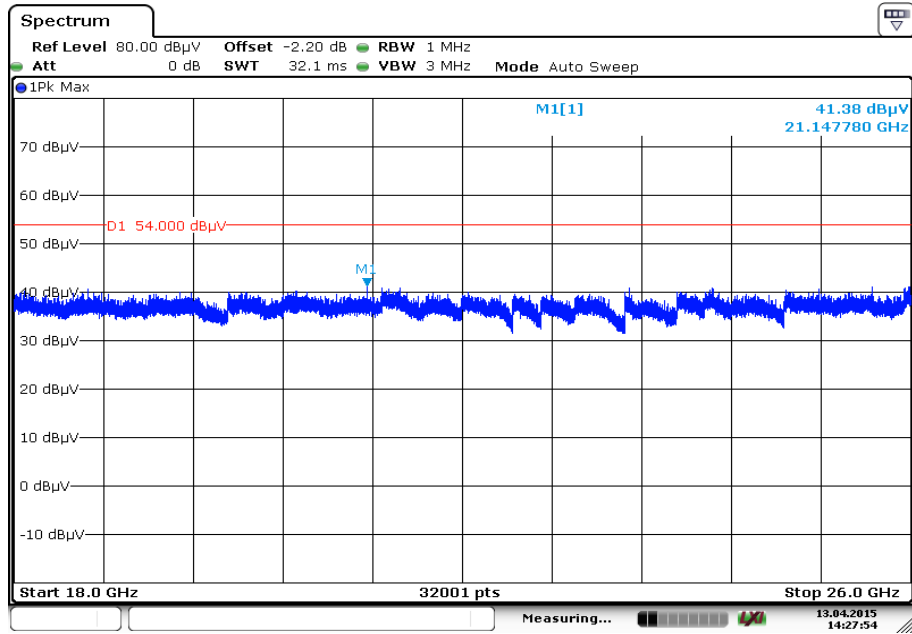
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 7: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



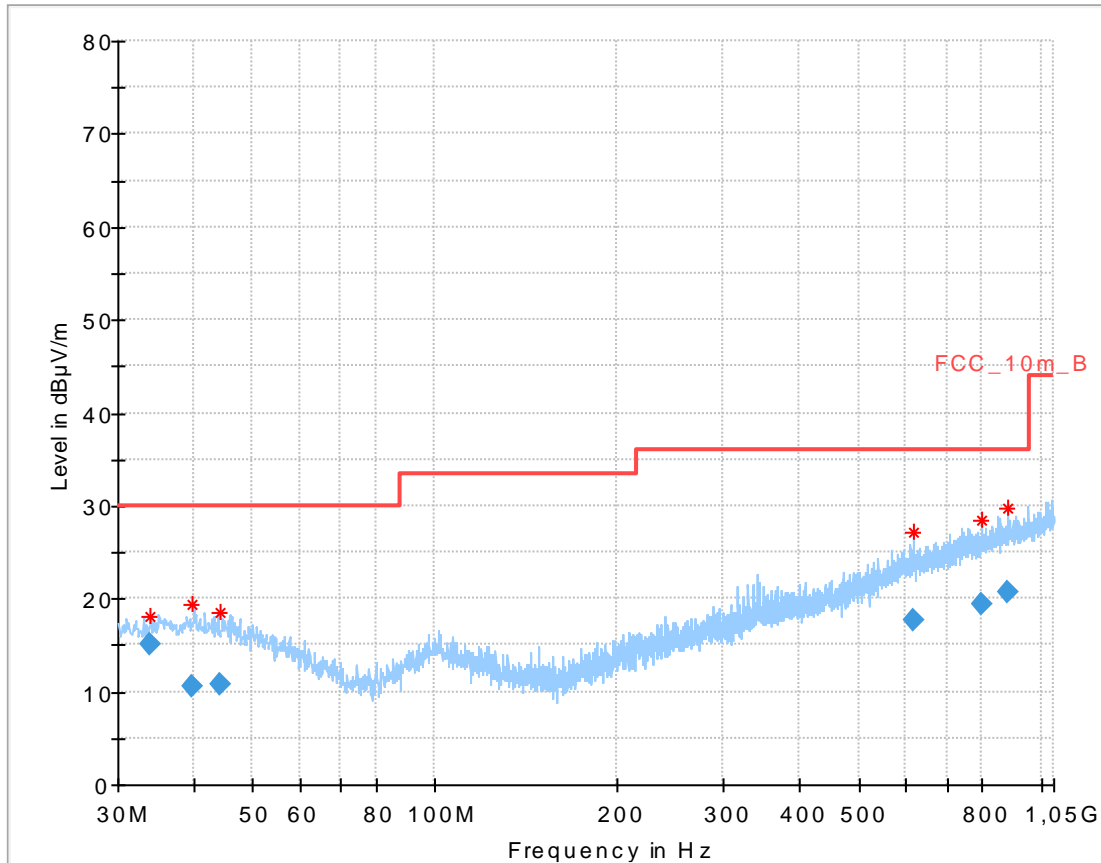
Date: 13.APR.2015 13:51:16

Plot 8: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 13.APR.2015 14:27:54

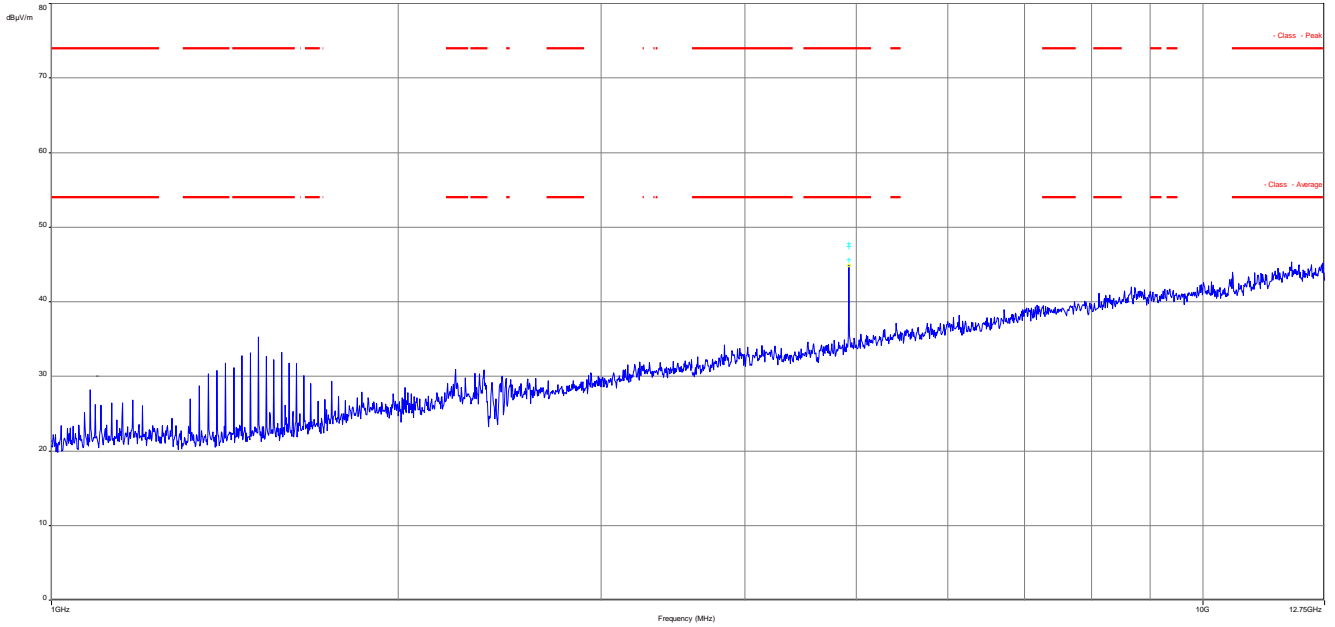
Plot 9: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization



Final_Result

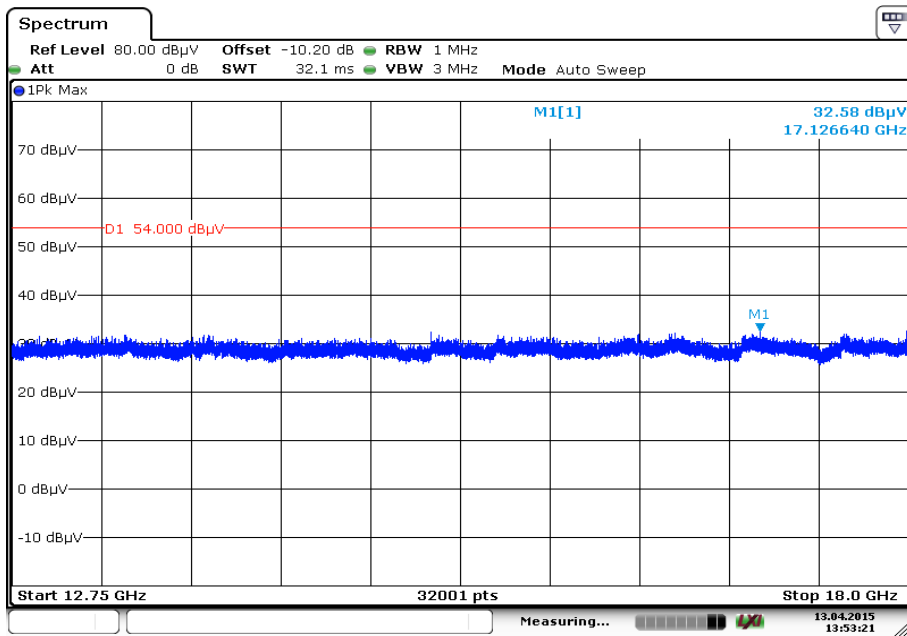
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)
34.000050	15.20	30.00	14.80	1000.0	120.000	101.0	V	205	13.7
39.619500	10.49	30.00	19.51	1000.0	120.000	101.0	H	197	14.0
44.170950	10.68	30.00	19.32	1000.0	120.000	101.0	V	106	13.9
617.305800	17.63	36.00	18.37	1000.0	120.000	170.0	H	-6	20.9
800.185500	19.49	36.00	16.51	1000.0	120.000	170.0	V	106	22.7
880.084200	20.79	36.00	15.21	1000.0	120.000	98.0	V	83	23.9

Plot 10: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



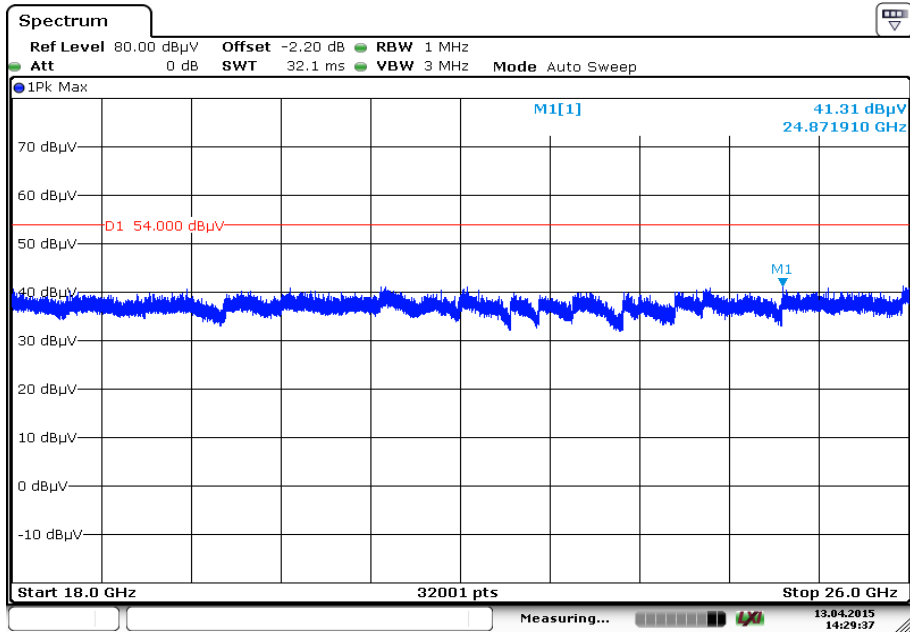
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 11: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Date: 13.APR.2015 13:53:20

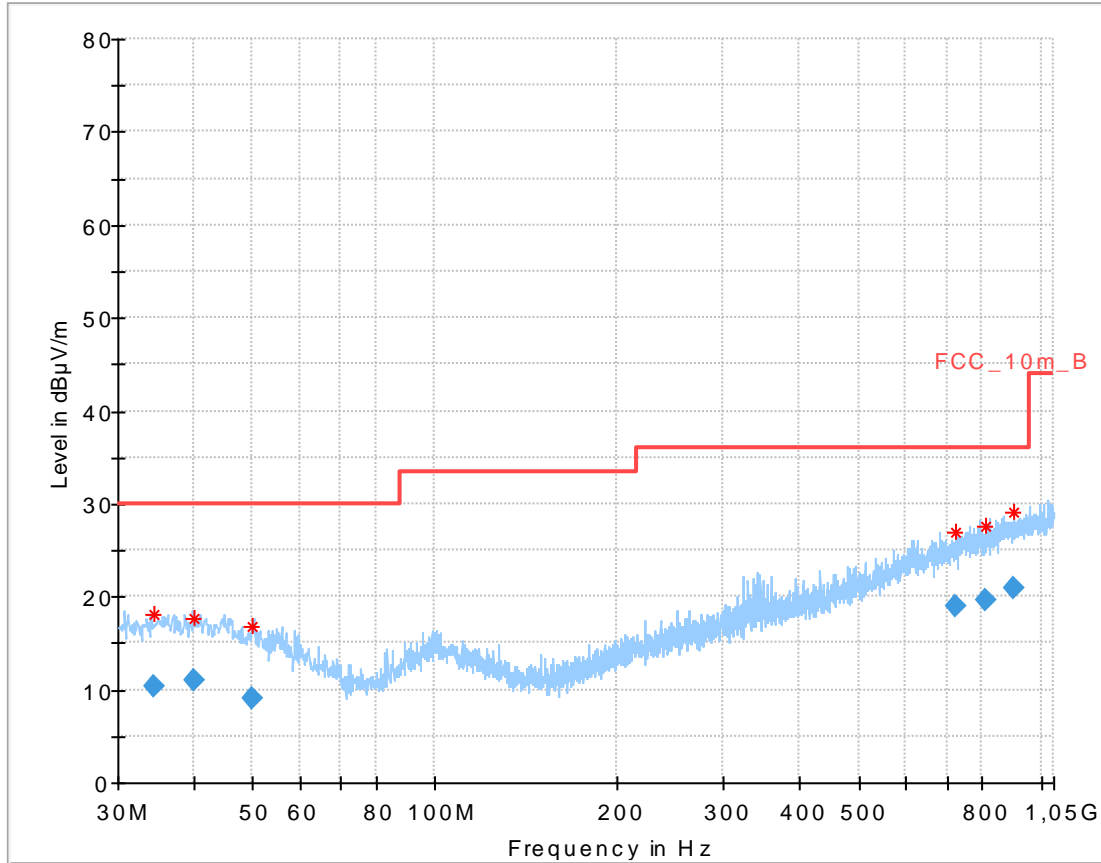
Plot 12: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 13.APR.2015 14:29:37

Plots: Antenna B – BPSK

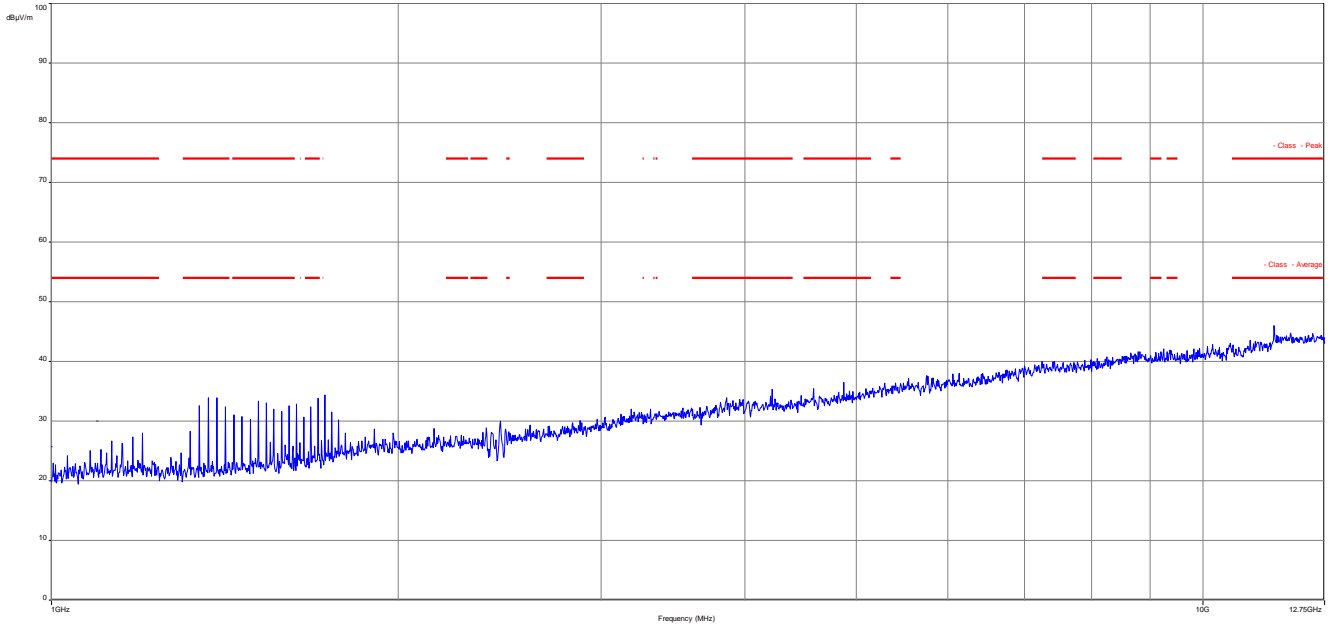
Plot 1: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization



Final_Result:

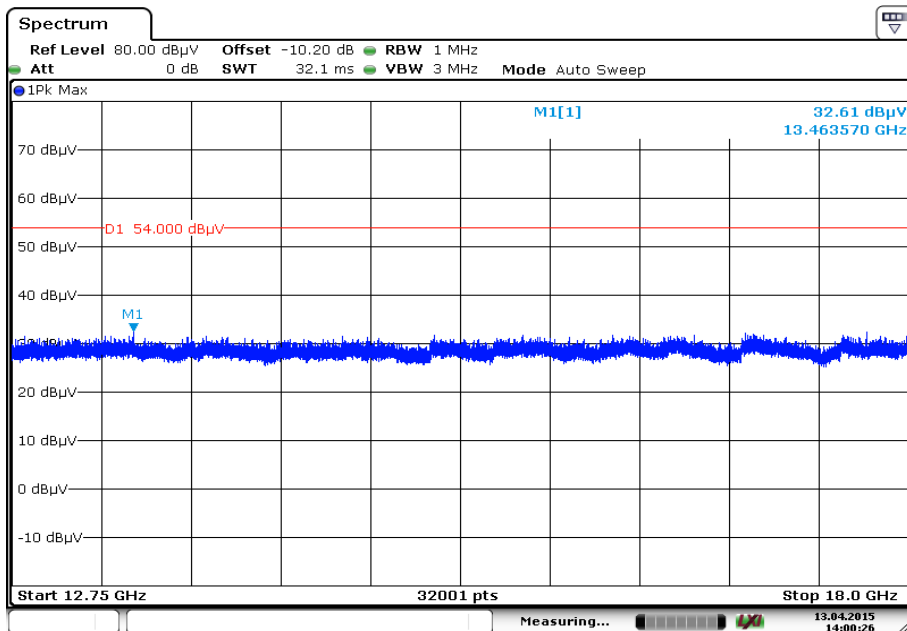
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.483500	10.43	30.00	19.57	1000.0	120.000	101.0	V	115	13.7
39.934500	10.94	30.00	19.06	1000.0	120.000	101.0	V	205	14.0
49.831050	9.03	30.00	20.97	1000.0	120.000	101.0	V	173	12.7
721.278000	18.96	36.00	17.04	1000.0	120.000	170.0	V	295	22.0
809.884050	19.67	36.00	16.33	1000.0	120.000	170.0	V	263	22.9
903.699600	20.99	36.00	15.01	1000.0	120.000	101.0	V	-6	24.1

Plot 2: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



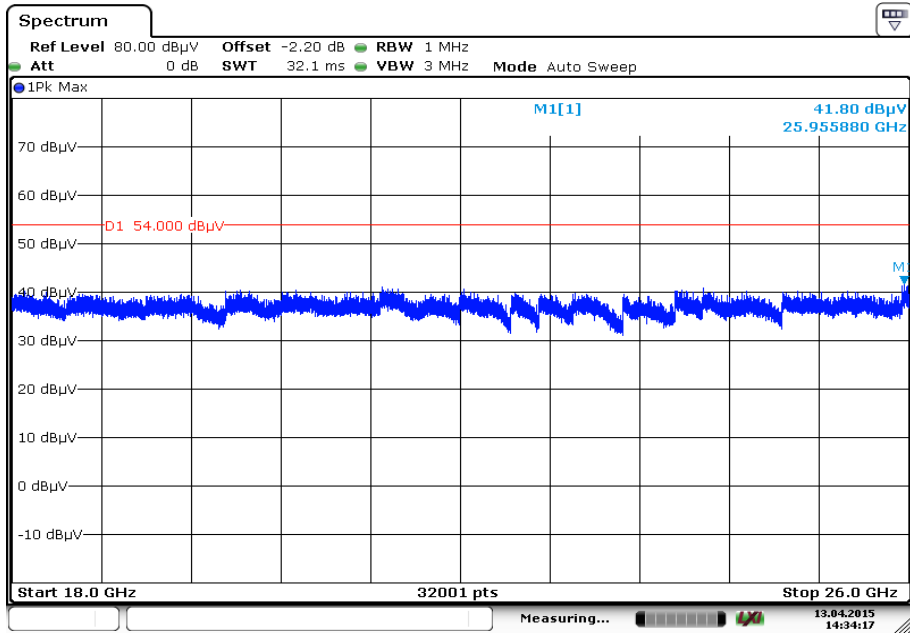
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 3: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Date: 13.APR.2015 14:00:26

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



Date: 13.APR.2015 14:34:18

10.10 RX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in idle/receive mode. The results are valid for both modes.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	F > 1 GHz: 1 MHz F < 1 GHz: 100 kHz
Video bandwidth:	3 x RBW Remeasurement: 10 Hz / 3 MHz
Span:	30 MHz to 26 GHz
Trace-Mode:	Max Hold

Limits:

FCC		IC	
RX Spurious Emissions Radiated			
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance	
30 - 88	30.0	10	
88 – 216	33.5	10	
216 – 960	36.0	10	
Above 960	54.0	3	

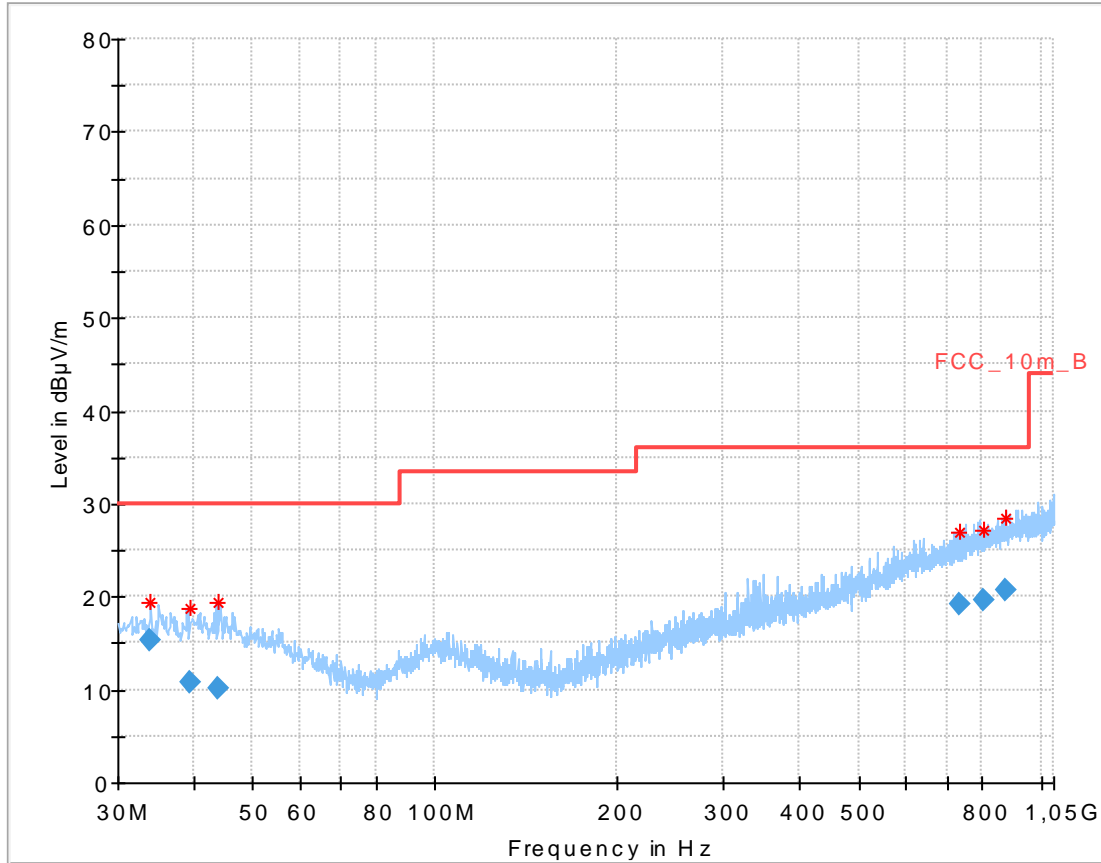
Results:

RX Spurious Emissions Radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions are below the average limit.		
Measurement uncertainty	± 3 dB	

Verdict: complies

Plots:

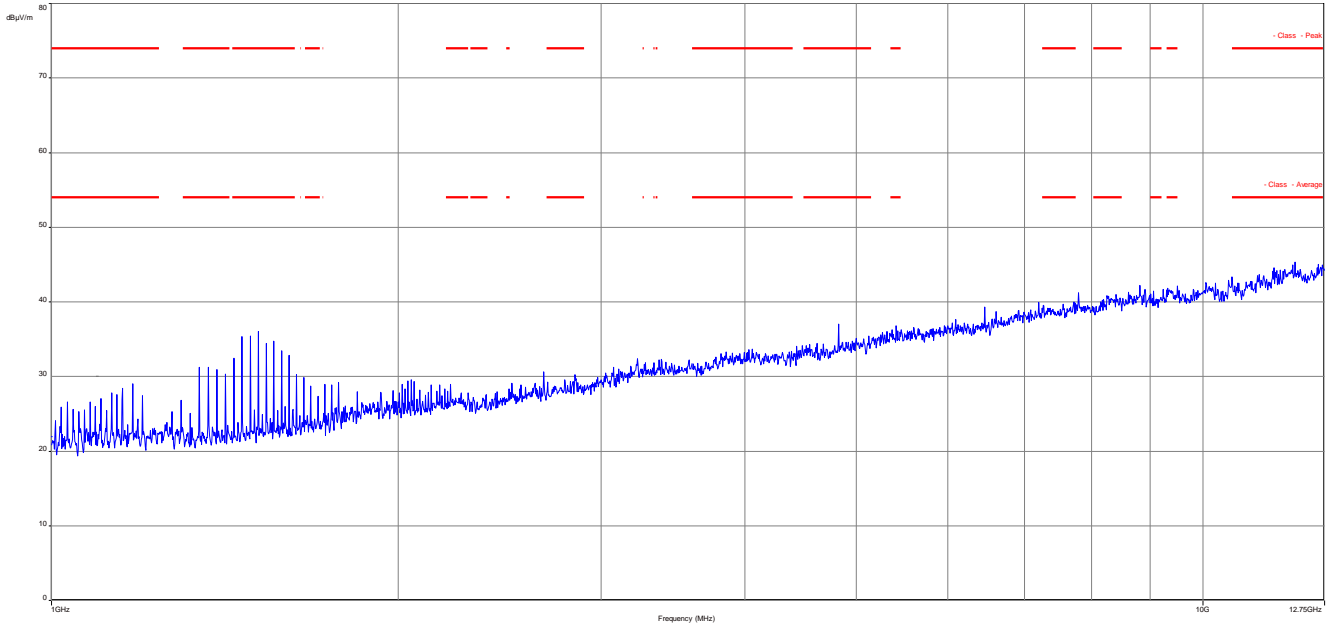
Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization



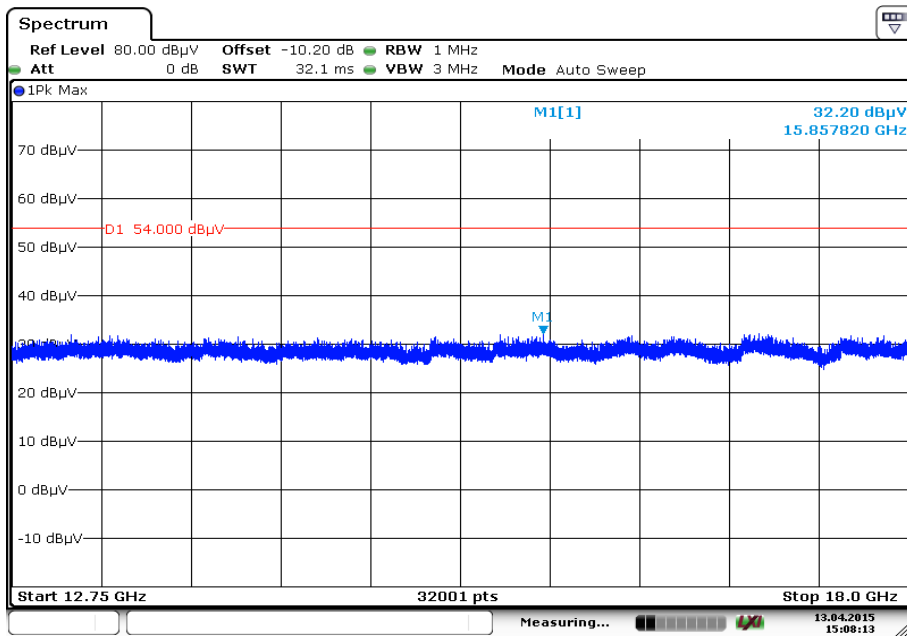
Final_Result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)
33.989850	15.31	30.00	14.69	1000.0	120.000	101.0	V	196	13.7
39.455700	10.70	30.00	19.30	1000.0	120.000	101.0	V	25	14.0
43.753650	10.04	30.00	19.96	1000.0	120.000	101.0	V	295	13.9
734.682750	19.17	36.00	16.83	1000.0	120.000	170.0	V	295	22.3
803.368050	19.54	36.00	16.46	1000.0	120.000	170.0	H	205	22.8
874.185150	20.80	36.00	15.20	1000.0	120.000	170.0	V	-25	23.8

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

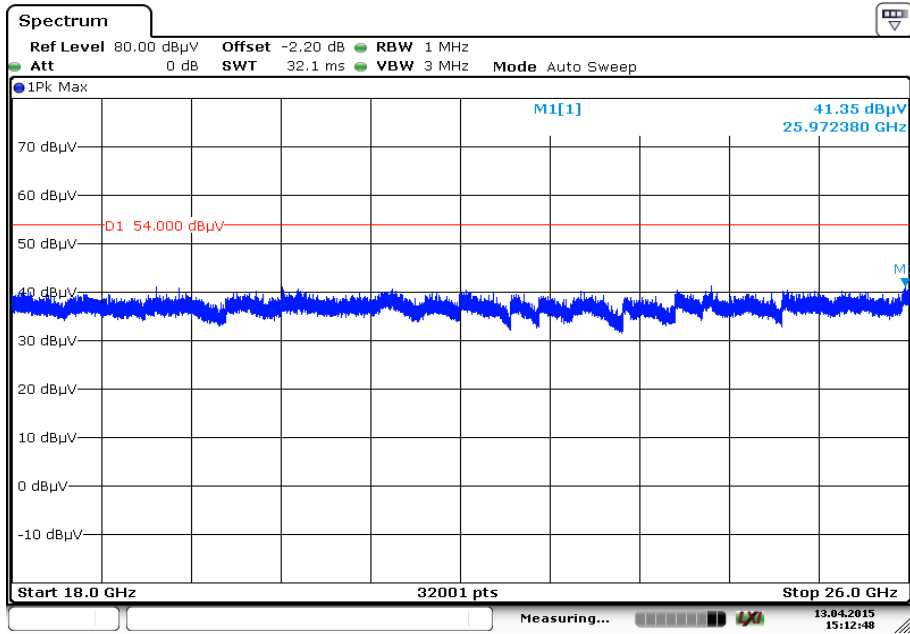


Plot 3: 12.75 GHz to 18 GHz, vertical & horizontal polarization



Date: 13.APR.2015 15:08:14

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



Date: 13.APR.2015 15:12:47

10.11 Spurious emissions radiated < 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. 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
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Limits:

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

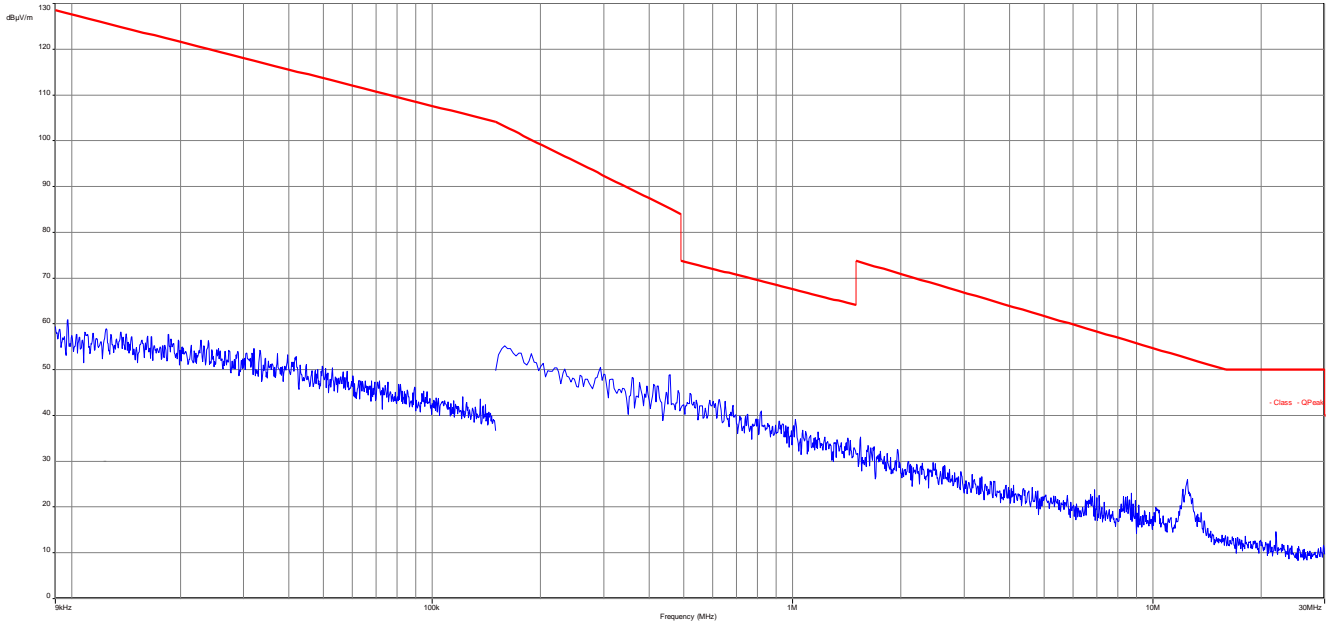
Results:

TX Spurious Emissions Radiated < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
No peaks detected.		
Measurement uncertainty	± 3 dB	

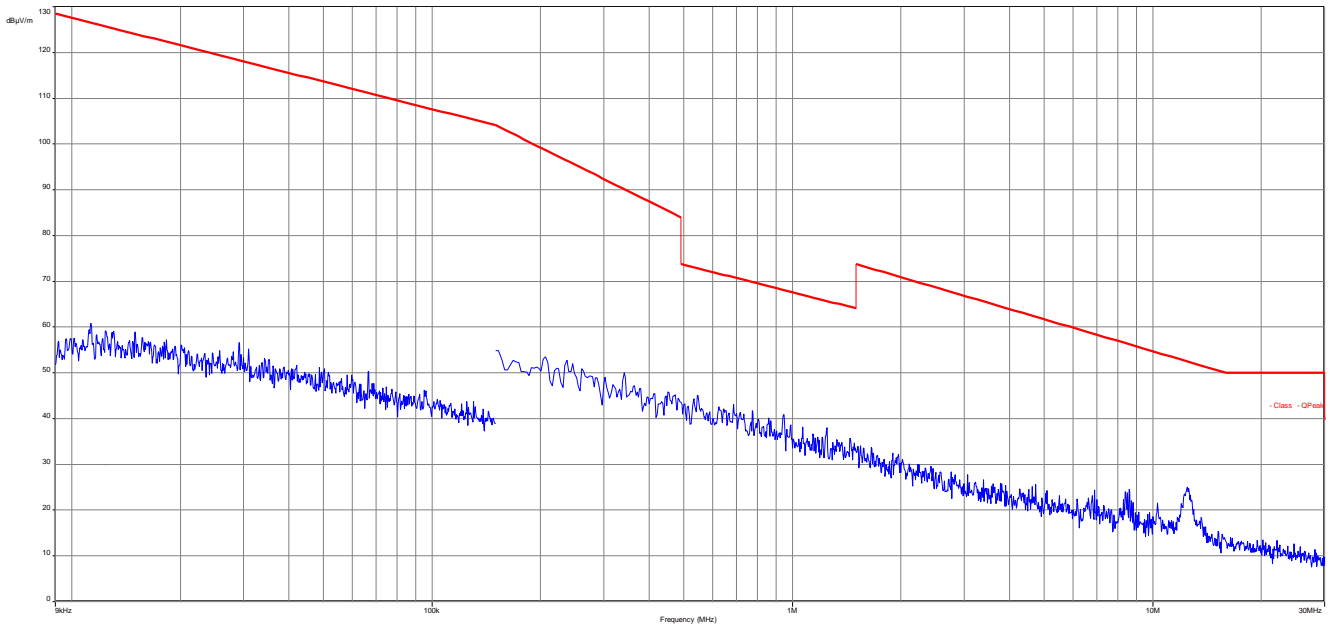
Verdict: complies

Plots:

Plot 1: 9 kHz to 30 MHz, antenna A (QPSK & BPSK)



Plot 2: 9 kHz to 30 MHz, antenna B (QPSK & BPSK)



11 Test equipment and ancillaries used for tests

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

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

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
11	45	Switch-Unit	3488A	HP	2719A14505	300000368	g		
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04466	300000580	ne		
3	50	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	26.01.2015	26.01.2016
4	50	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw		
5	50	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw		
6	50	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw		
7	50	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	22.04.2014	22.04.2016
8	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2818A03450	300001040	Ve	20.01.2015	20.01.2018
9	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	08.05.2013	08.05.2015
10	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
11	n. a.	Switch / Control Unit	3488A	HP	*	300000199	ne		
12	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
13	90	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
14	90	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
15	90	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vIKI!	29.10.2014	29.10.2017
16	90	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	06.03.2015	06.03.2016
17	11b	Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP	00419	300002268	ev		
18	A026	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787	k	22.07.2013	22.07.2015
19	A029	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442	k	19.07.2013	19.07.2015
20	A029	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	22.01.2015	22.01.2016
21	n. a.	Power Supply 0-20V, 0-5A	6632B	Agilent Technologies	GB42110541	400000562	vIKI!	10.01.2013	10.01.2016

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

12 Observations

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

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2015-04-14

Annex B Further information**Glossary**

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

Annex C Accreditation Certificate

Front side of certificate

Back side of certificate



Deutsche Akkreditierungsstelle GmbH

Beliehene 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:

- Drahtgebundene Kommunikation einschließlich xDSL
- VoIP und DECT
- Akustik
- Funk einschließlich WLAN
- Short Range Devices (SRD)
- RFID
- WiFiMax und Richtfunk
- Mobilfunk (GSM / GPRS / UTRAN / LTE) Performance
- Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive
- Produktsicherheit
- SAR und Hearing Aid Compatibility (HAC)
- Umweltsimulation
- Smart Card, Terminals
- Bluetooth
- Wi-Fi Services

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 07.03.2014 mit der Akkreditierungsnummer D-PL-12676-01 und ist gültig bis 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 77 Seiten.

Registrierungsnummer der Urkunde: D-PL-12676-01-00

Frankfurt am Main, 07.03.2014

Deutsche Akkreditierungsstelle

In Auftrag: D-PL-12676-01-00, 07.03.2014
 Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Standort Berlin
 Spittelmarkt 10
 10117 Berlin

Standort Frankfurt am Main
 Gartenstraße 6
 60594 Frankfurt am Main

Standort Braunschweig
 Bundesallee 100
 38116 Braunschweig

Die auszugsweise Veröffentlichung der Akkreditierungsurkunde bedarf der vorherigen schriftlichen Zustimmung der Deutschen Akkreditierungsstelle GmbH (DAkkS). Ausgenommen davon ist die separate Weiterverbreitung des Deckblattes durch die umseitig genannte Kurformuliersabfertigungsstelle 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 dem Gesetz 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 (Abl. L 218 vom 9. Juli 2008, S. 30). Die DAkkS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der Kompetenz von Organisationen für Akkreditierung (EA), des Internationalen Akkreditationsforums (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
 IAF: www.iaf.org
 ILAC: www.ilac.org

Note:

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

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