

Test Report

Product	Wireless Audio XLR Transceiver
Name and address of the applicant	RØDE Microphones 107 Carnarvon Street Silverwater NSW 2128 Australia
Name and address of the manufacturer	RØDE Microphones 107 Carnarvon Street Silverwater NSW 2128 Australia
Model	TX-XLR
Rating	3.0 V DC
Trademark	RØDELink
Serial number	Not stated
Additional information	/
Tested according to	FCC Part 15.247 Digital Transmission Systems Industry Canada RSS-247, Issue 1 Low Power Licence-Exempt Radiocommunications Devices
Order number	297302
Tested in period	2015.12.10 to 2015.12.18 and 2016.01.21
Issue date	2016.01.20
Name and address of the testing laboratory	 Instituttveien 6 Kjeller, Norway FCC No: 994405 IC OATS: 2040D-1 TEL: +47 22 96 03 30 FAX: +47 22 96 05 50
 Prepared by [Frode Sveinsen]  Approved by [G.Suhanthakumar]	
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1 INFORMATION

1.1 Test Item

Name :	RØDELink
FCC ID :	2AEAN405001
Industry Canada ID :	20091-405001
Model/version :	TX-XLR
Serial number :	/
Hardware identity and/or version:	15a
Software identity and/or version :	V0006
Frequency Range :	2403 – 2481 MHz
Number of Channels :	40
Operating Modes :	TDMA
Type of Modulation :	GFSK
User Frequency Adjustment :	None
Rated Output Power :	7.0 mW
Type of Power Supply :	Primary Batteries (2xAA Alkaline Batteries) USB Power
Antenna Connector :	None (Integral Antennas)
Number of Antennas :	2
Antenna Diversity Supported :	Yes
Desktop Charger :	N/A

Description of Test Item

The EUT is a Wireless Audio XLR Transmitter using 2.4 GHz digital transmission. The unit covered by this report is the audio transmitter part. Both the audio transmitter and receiver are capable of transmitting and receiving on 2.4 GHz.

Exposure Evaluation

The EUT is a portable device and is designed to be used held to face when used, however the EUT is exempted from SAR evaluation since the output power is below the exemption limit.

The EUT is exempted from RF Exposure Evaluation to Industry Canada requirements since the output power complies with the power levels of section 2.5.1 of RSS-102 Issue 5.

1.2 Test Environment

1.2.1 Normal test condition

Temperature:	20.1 – 23.6 °C
Relative humidity:	20 – 43 %
Normal test voltage:	5.0 V DC (Powered from USB)

The values are the limit registered during the test period.

1.3 Test Engineer(s)

Frode Sveinsen / Thomas Dangle

1.4 Test Equipment

See list of test equipment in clause 5.

2 TEST REPORT SUMMARY

2.1 General

All measurements are traceable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.247 and Industry Canada RSS-247 Issue 1.

Tests were performed in accordance with ANSI C63.4-2014 and ANSI C63.10-2013.

Radiated tests were made in a semi-anechoic chamber at measuring distances of 3m and 10m.

A description of the test facility is on file with the FCC and Industry Canada.

☒ New Submission

☒ Production Unit

☐ Class II Permissive Change

☐ Pre-production Unit

DTS Equipment Code

☐ Family Listing



THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

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2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-247 Issue 1, RSS-GEN Issue 4 reference	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	Complies
Antenna Requirement	15.203	8.3 (RSS-GEN)	Complies
Power Line Conducted Emission	15.107(a) 15.207(a)	8.8 (RSS-GEN)	Complies
Occupied Bandwidth	N/A	6.6 (RSS-GEN)	Complies
Minimum 6 dB Bandwidth	15.247(a)(2)	5.2 (1) (RSS-247)	Complies
Peak Power Output	15.247(b)	5.4 (RSS-247)	Complies
Power Spectral Density	15.247(d)	5.2 (2) (RSS-247)	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	5.5 (RSS-247)	Complies
Spurious Emissions (Radiated)	15.247(c) 15.109(a) 15.209(a)	5.5 (RSS-247) 6.13 (RSS-GEN) 8.9 (RSS-GEN)	Complies

2.3 Description of modification for Modification Filing

Not applicable.

2.4 Comments

All ports were populated during spurious emission measurements.

2.5 Family List Rational

Not Applicable.

3 TEST RESULTS

3.1 Power Line Conducted Emissions

Para. No.: 15.207 (a)

Test Performed By: Thomas Dangle	Date of Test: 19-Jan-2016
----------------------------------	---------------------------

Measurement procedure: ANSI C63.4-2014 using 50 μ H/50 ohms LISN

Test Results: Complies

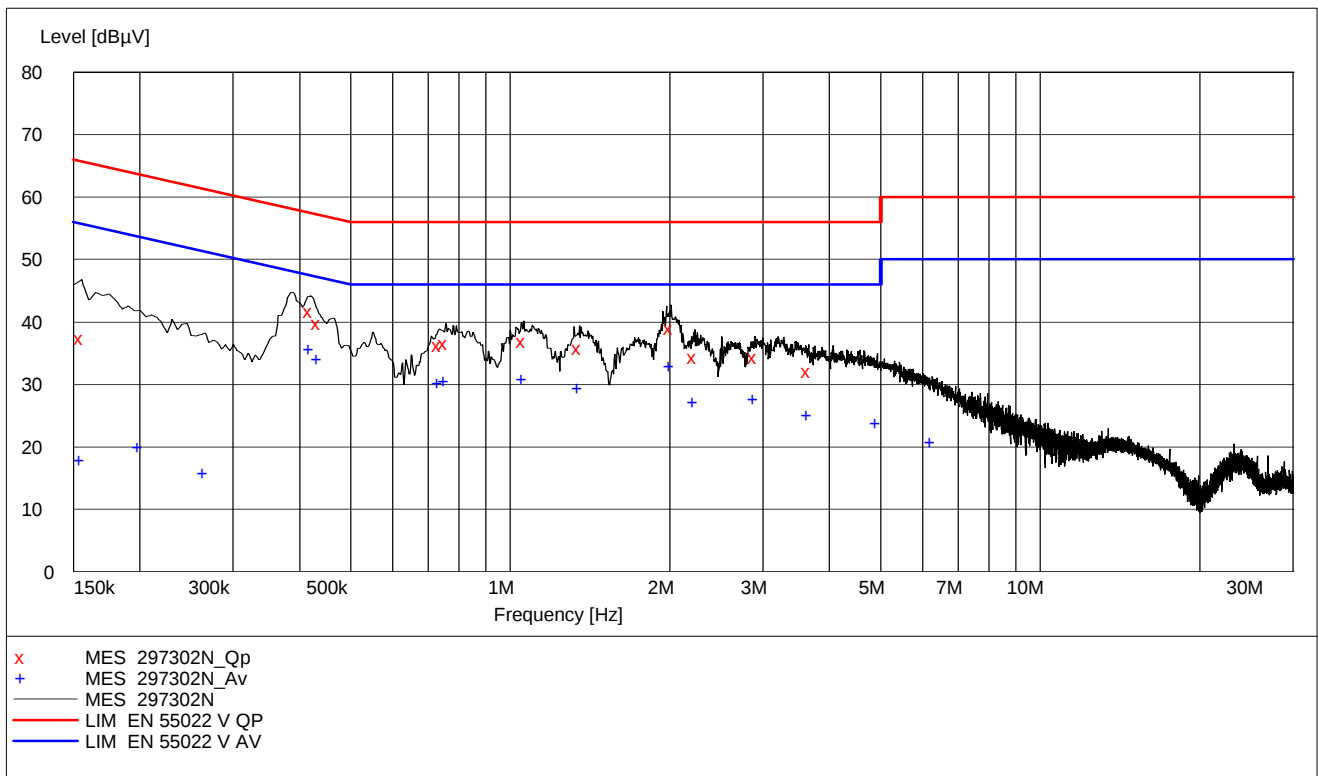
Measurement Data: See attached graph, (Peak detector)

The test was performed with the EUT transmitting and powered from a 5W USB adaptor. The power into the USB adaptor was 120V 60Hz AC. The USB adaptor used for this test was a Trust 19160 Mfd. 2015-08-07.

Highest measured value (L1 and N):

Powered from USB:

Frequency [MHz]	Level [dBuV]	Af [dB]	Limit [dBuV]	Margin [dB]	Det	Position	Verdict [Pass/Fail]
0.155000	37.40	10.70	65.70	28.30	QP	N	Pass
0.420000	41.70	10.30	57.40	15.70	QP	L1	Pass
0.435000	39.90	10.30	57.20	17.30	QP	L1	Pass
0.735000	36.30	10.20	56.00	19.70	QP	L1	Pass
0.755000	36.60	10.20	56.00	19.40	QP	L1	Pass
1.060000	36.90	10.40	56.00	19.10	QP	L1	Pass
1.350000	35.80	10.40	56.00	20.20	QP	L1	Pass
2.015000	39.00	10.40	56.00	17.00	QP	L1	Pass
2.230000	34.50	10.40	56.00	21.50	QP	L1	Pass
2.900000	34.40	10.40	56.00	21.60	QP	L1	Pass
3.655000	32.20	10.40	56.00	23.80	QP	L1	Pass
0.155000	18.00	10.70	55.70	37.70	AV	N	Pass
0.200000	20.00	10.70	53.60	33.60	AV	N	Pass
0.265000	15.80	10.60	51.30	35.50	AV	N	Pass
0.420000	35.60	10.30	47.40	11.80	AV	L1	Pass
0.435000	34.00	10.30	47.20	13.20	AV	L1	Pass
0.735000	30.20	10.20	46.00	15.80	AV	L1	Pass
0.755000	30.50	10.20	46.00	15.50	AV	L1	Pass
1.060000	30.90	10.40	46.00	15.10	AV	L1	Pass
1.350000	29.50	10.40	46.00	16.50	AV	L1	Pass
2.015000	32.90	10.40	46.00	13.10	AV	L1	Pass
2.230000	27.20	10.40	46.00	18.80	AV	L1	Pass
2.900000	27.60	10.40	46.00	18.40	AV	L1	Pass
3.655000	25.00	10.40	46.00	21.00	AV	L1	Pass
4.940000	23.80	10.50	46.00	22.20	AV	L1	Pass
6.250000	20.80	10.60	50.00	29.20	AV	L1	Pass



Powered from USB

3.2 Minimum 6 dB Bandwidth

Para. No.: 15.247 (a)(2)

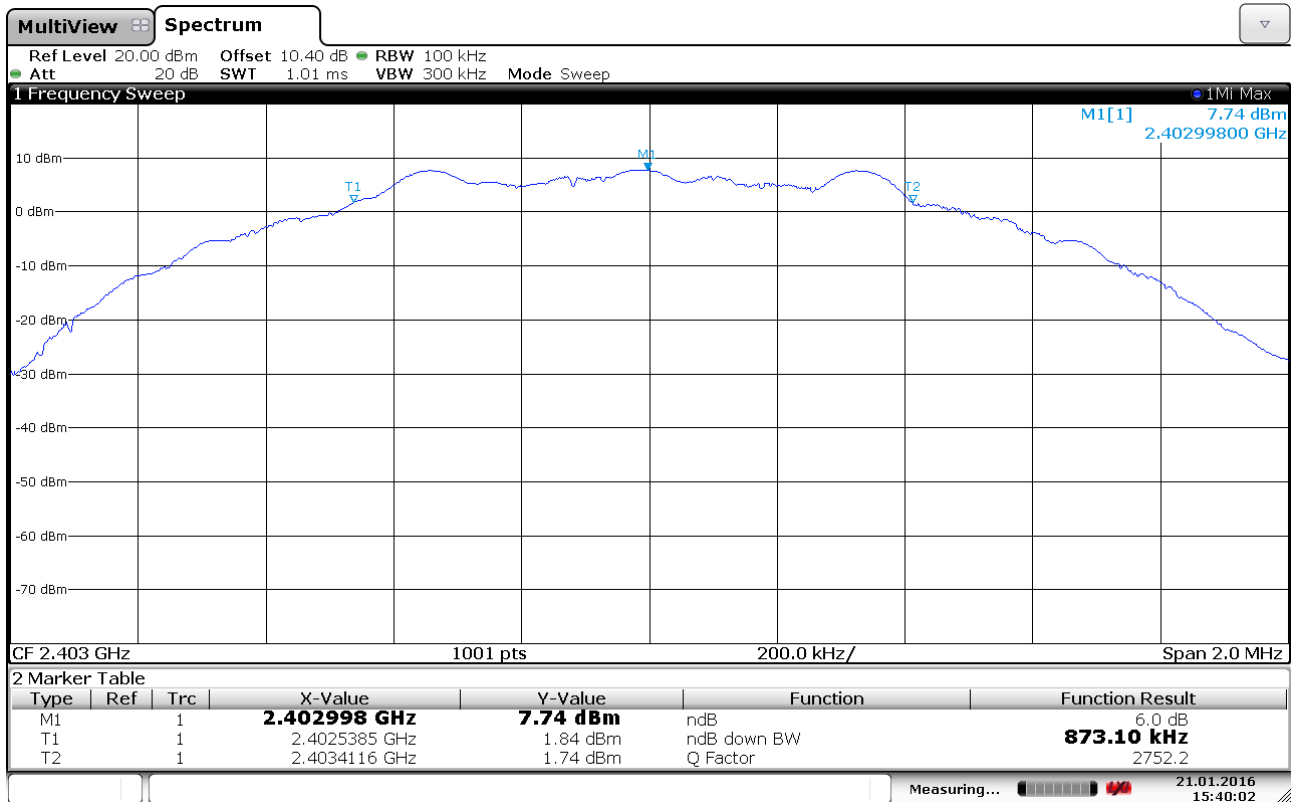
Test Results: Complies

Measurement Data:

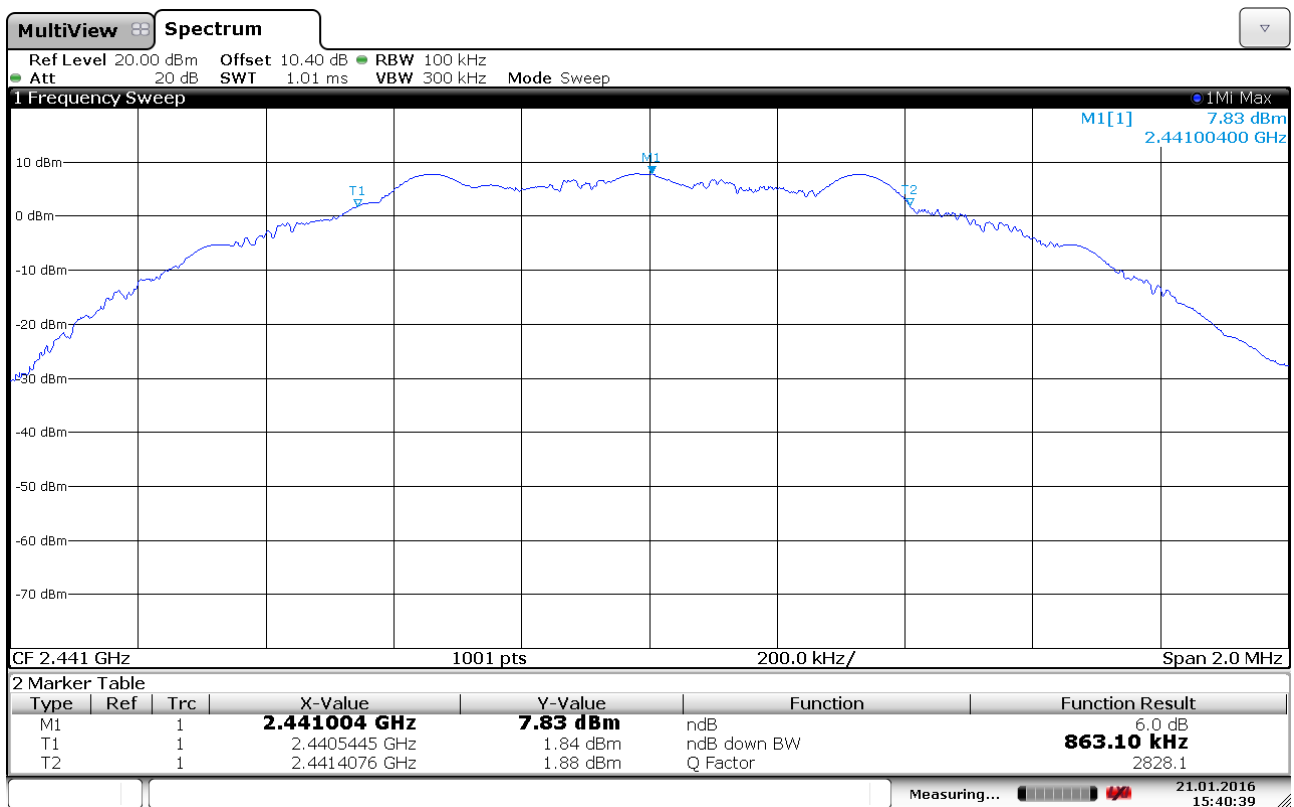
Measured 6 dB Bandwidth (kHz)		
2403 MHz	2441 MHz	2481 MHz
873	863	859

Requirements:

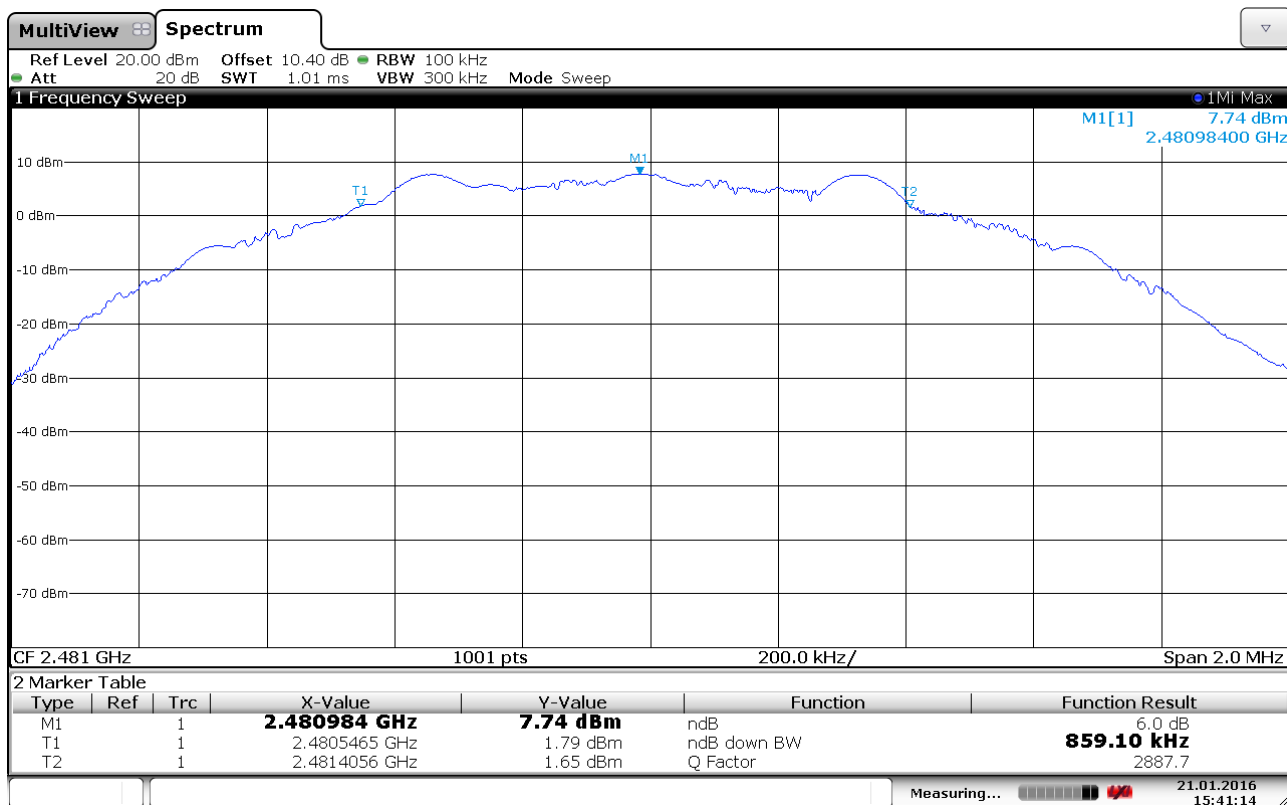
For Digital Transmission Systems in the 2400-2483.5 MHz band the minimum 6 dB bandwidth shall be at least 500 KHz.



6 dB Bandwidth at 2403 MHz



6 dB Bandwidth at 2441 MHz



6 dB Bandwidth at 2481 MHz

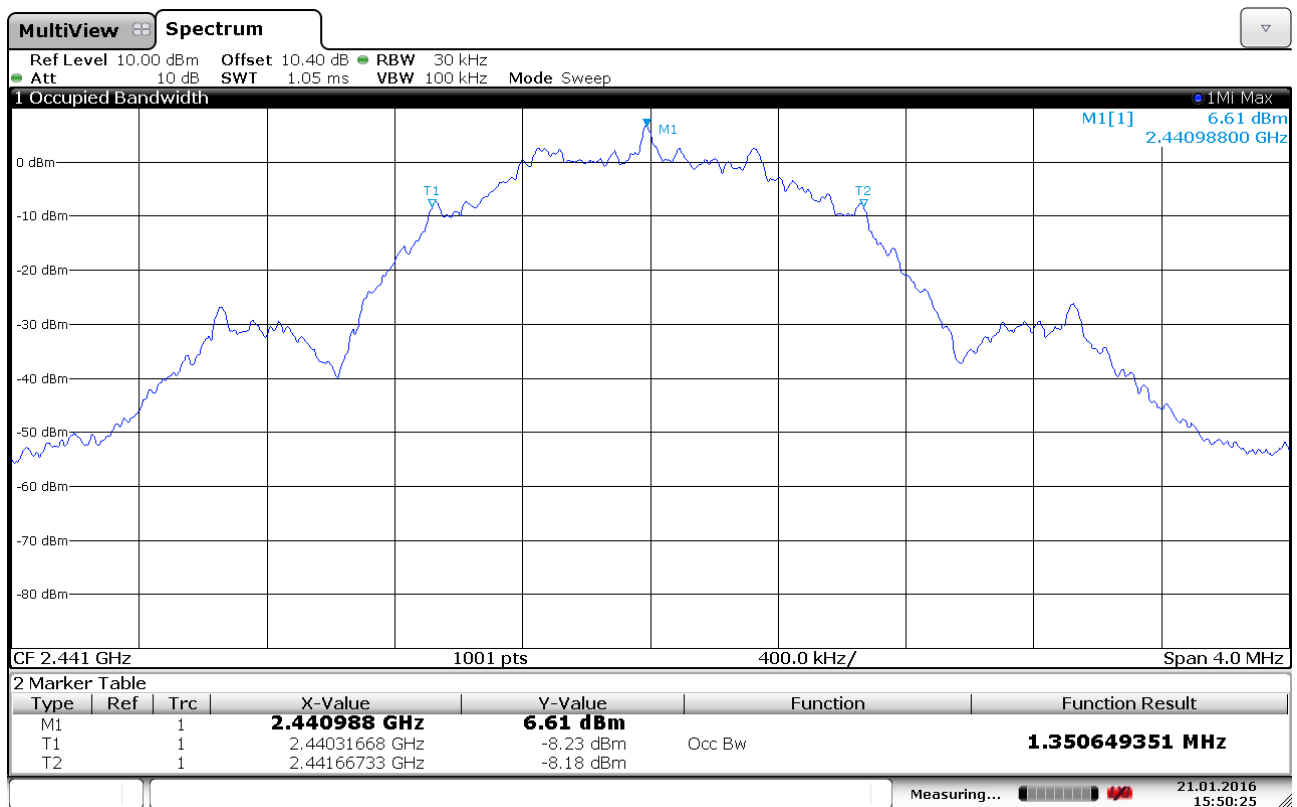
3.3 Occupied Bandwidth

Measurement Data:

Measured 99% Bandwidth (MHz)
2441 MHz
1.35

Requirements:

No requirements. Reported for information only.



99% Bandwidth

3.4 Power Spectral Density (PSD)

Para. No.: 15.247 (d)

Test Results: Passed

Measured and Calculated Data:

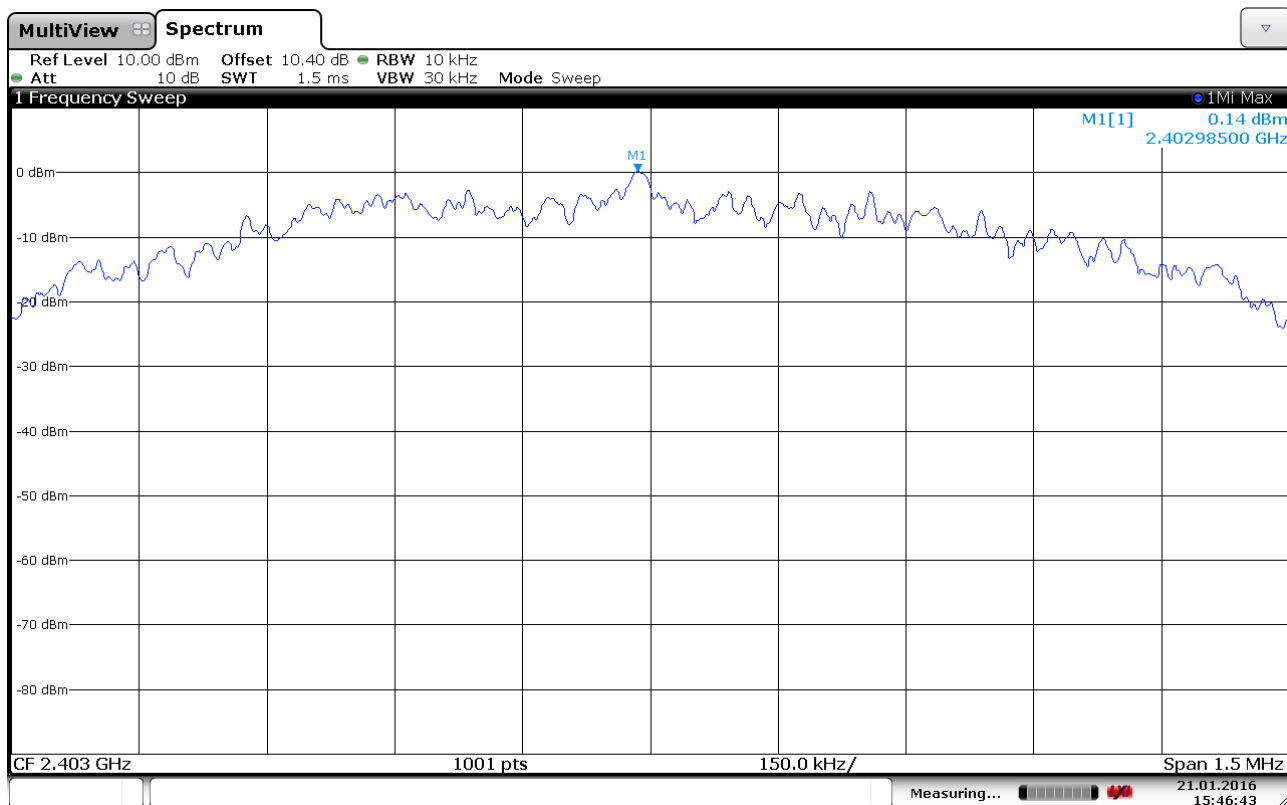
	2403 MHz	2441 MHz	2481 Mhz
Measured value (dBm)	-5.1	-4.9	-5.0

The measured values with 10kHz RBW are corrected by a Bandwidth Correction Factor of -5.2 dB.

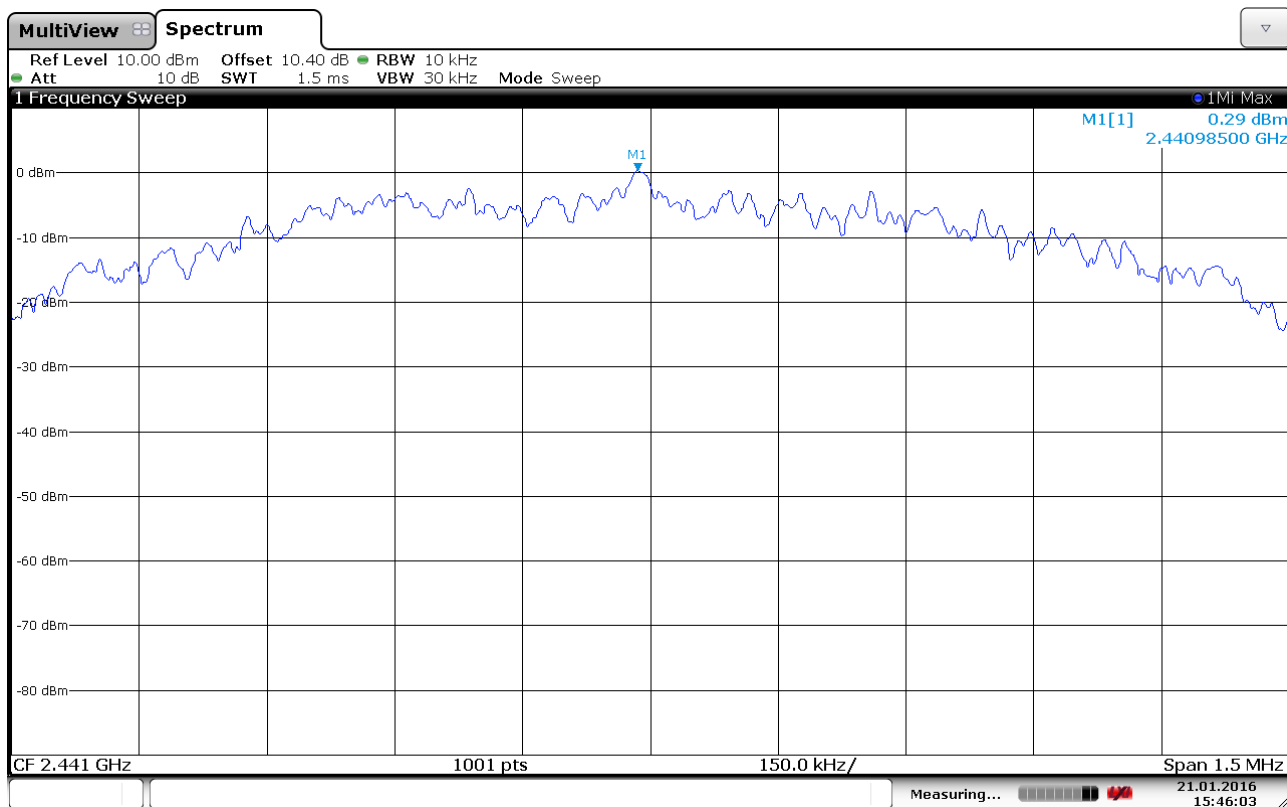
Requirements:

The Power Spectral Density of a Digital Transmission System shall be no greater than +8 dBm in any 3 kHz band

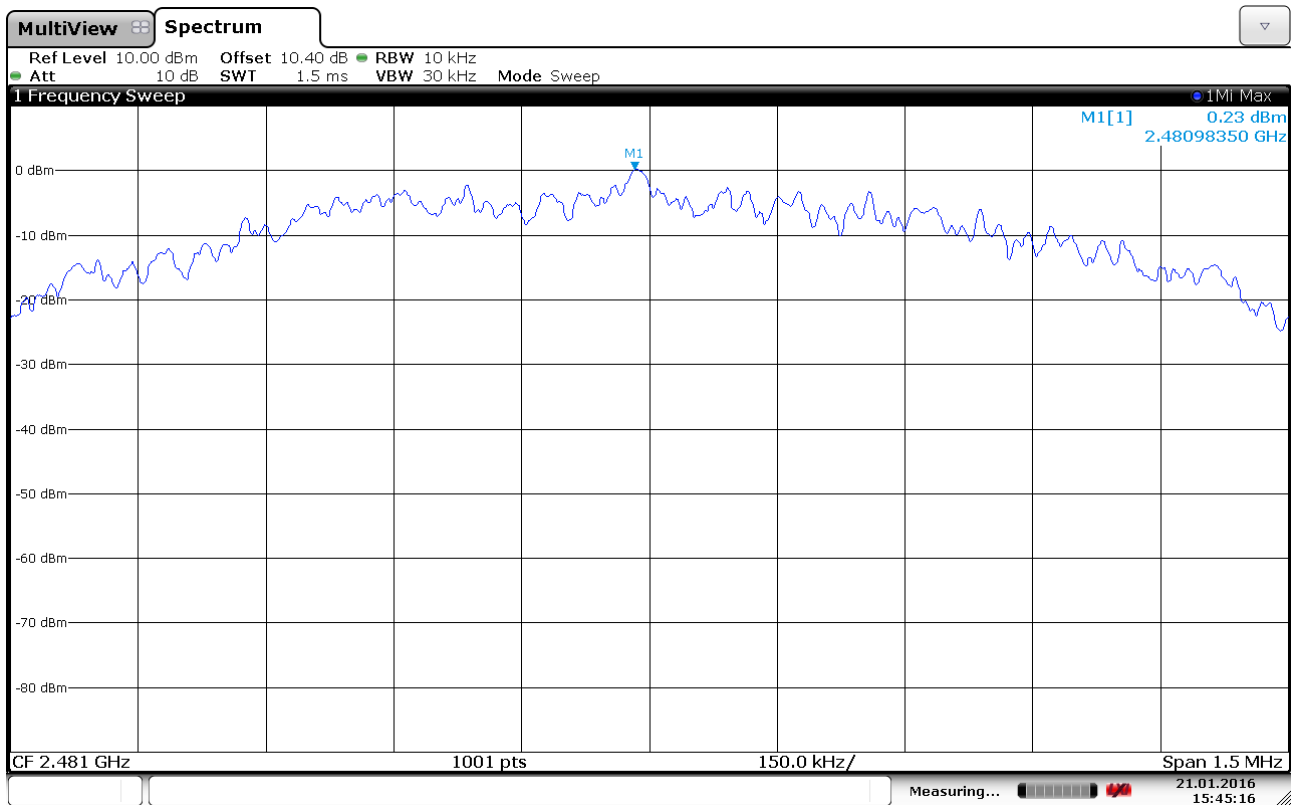
No requirements for Frequency Hopping Systems.



Power Spectral Density 10 kHz, 2403 MHz



Power Spectral Density 10 kHz, 2441 MHz



Power Spectral Density 10 kHz, 2481 MHz

3.5 Peak Power Output

Para. No.: 15.247 (b)

Test Results: Complies

Measurement Data:

RF channel	2403 MHz	2441 MHz	2481 MHz
Measured Maximum Field strength (dBμV/m) –VP	104.3	104.6	102.4
Calc. Radiated Power (dBm)	9.1	9.4	7.1
Calc. Radiated Power (mW)	8.1	8.7	6.7
Measured Conducted Power (dBm)	8.3	8.4	8.4
Measured Conducted Power (mW)	6.8	7.0	6.9
Calculated Antenna Gain (dBi)	0.8	1.0	-1.3

EIRP is calculated from measured field strength by the formulas in KDB 412172 D01 Determining ERP and EIRP v01.

See attached graph.

Detachable antenna?

☐ Yes ☒ No

If detachable, is the antenna connector non-standard?

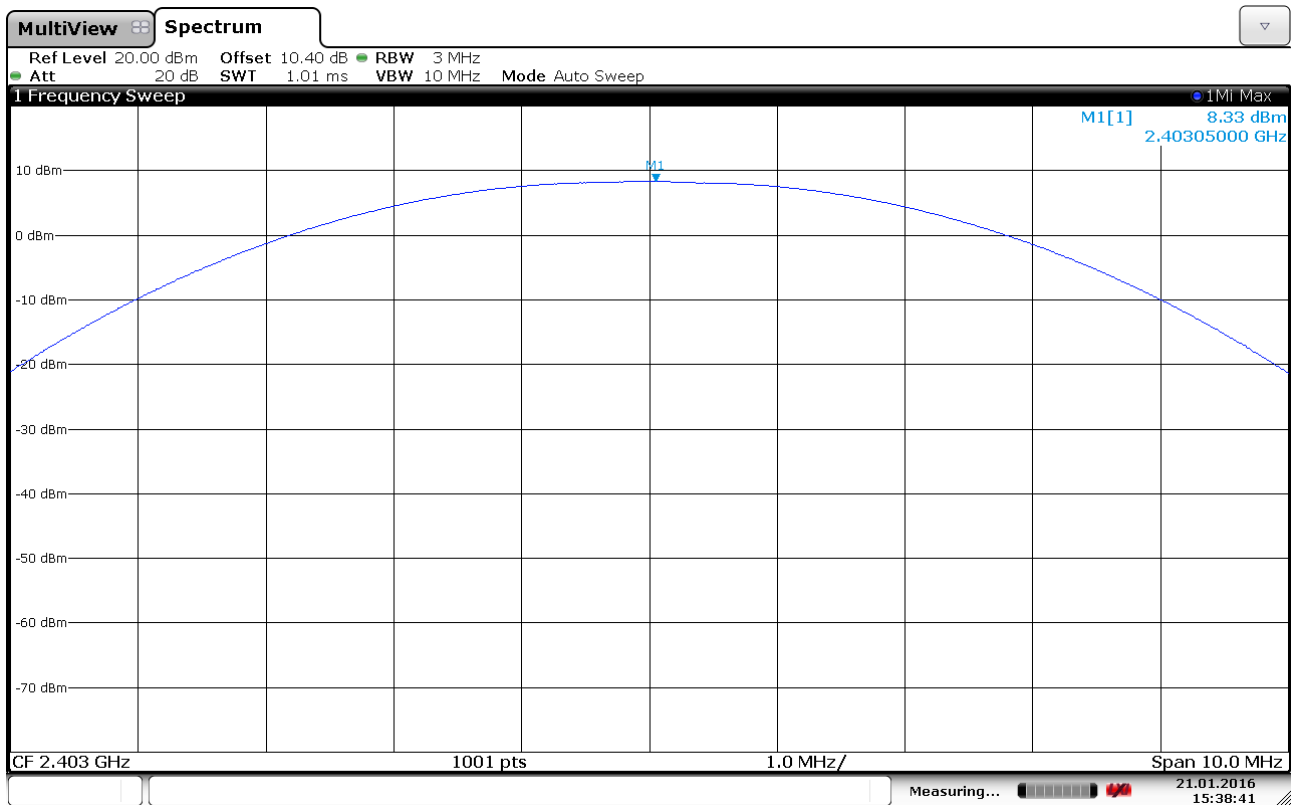
☐ Yes ☐ No

Requirements:

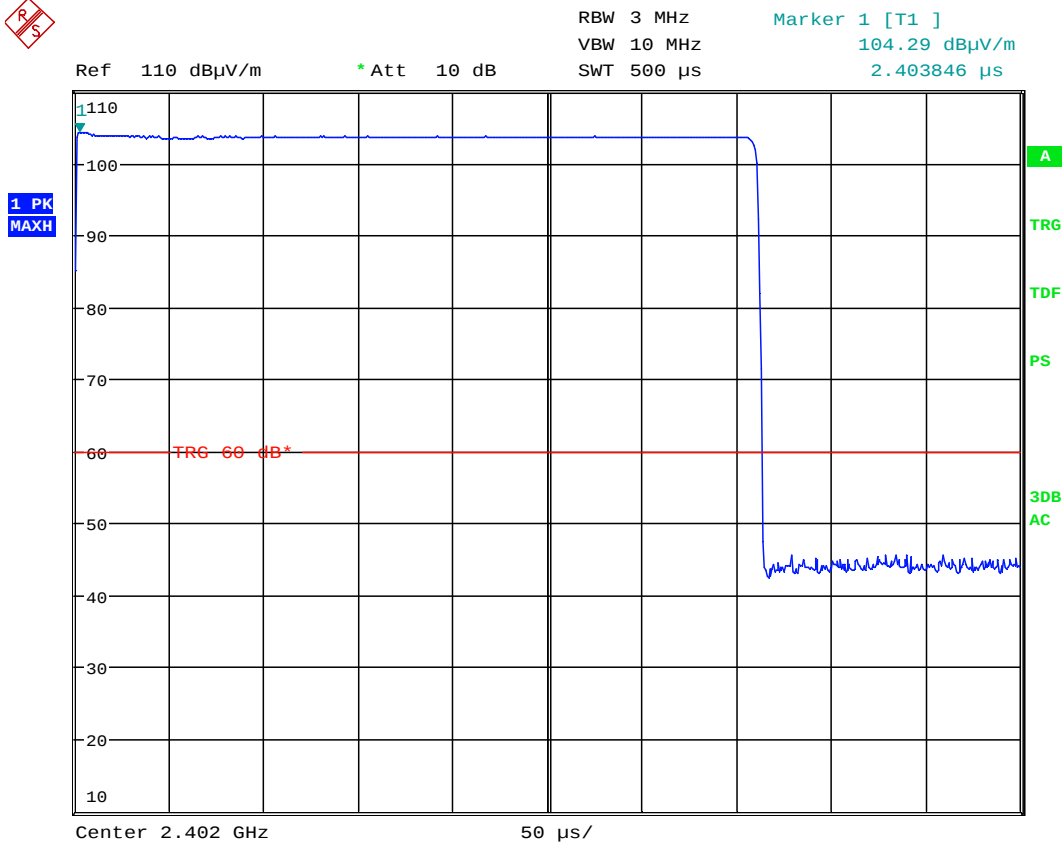
The maximum peak output power shall not exceed the following limits:

For Digital Transmission Systems in the 2400 - 2483.5 MHz band: 1 Watt

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced below the stated value above by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

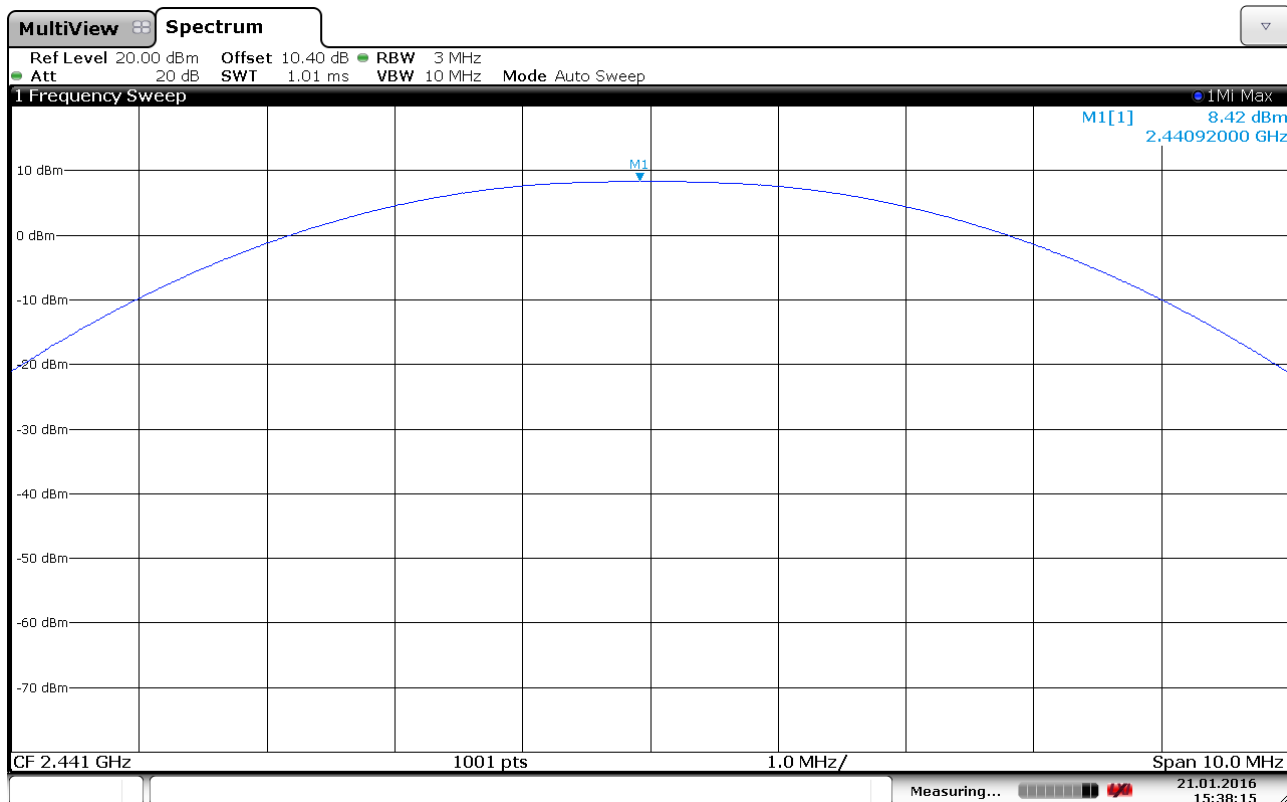


Conducted Power, 2403 MHz



Date: 17.DEC.2015 16:02:51

Radiated Power, 2402 MHz (EUT V, VP, Ant 2)



Conducted Power, 2441 MHz

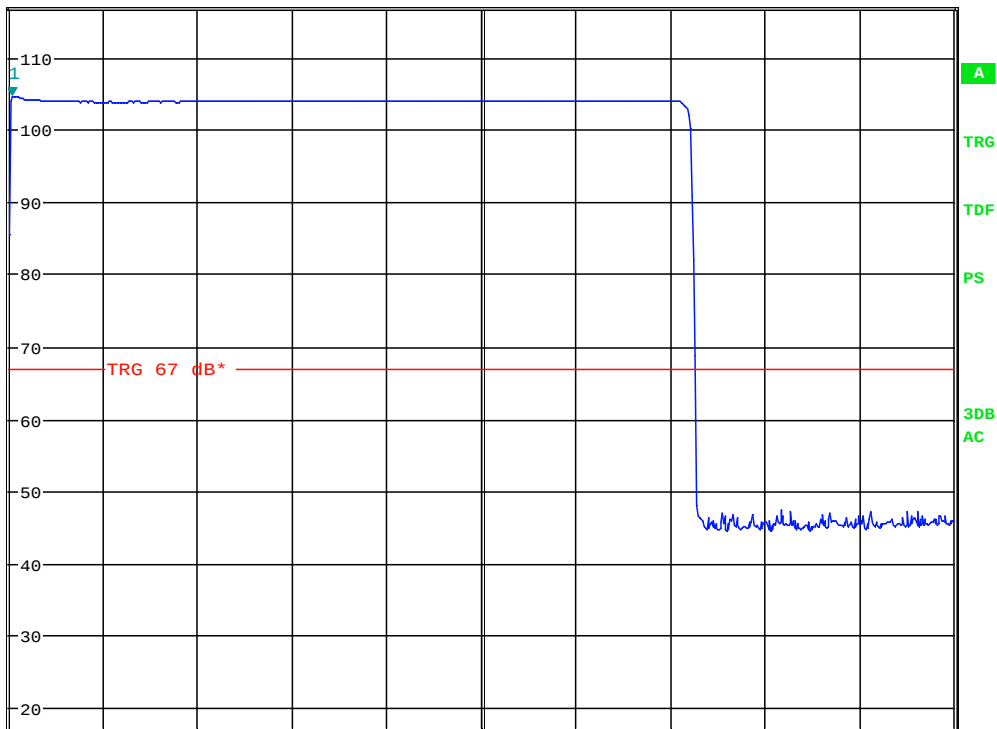


RBW 3 MHz Marker 1 [T1]
VBW 10 MHz 104.62 dBμV/m
SWT 500 μs 1.602564 μs

Ref 117 dBμV/m

* Att 10 dB

1 PK
MAXH

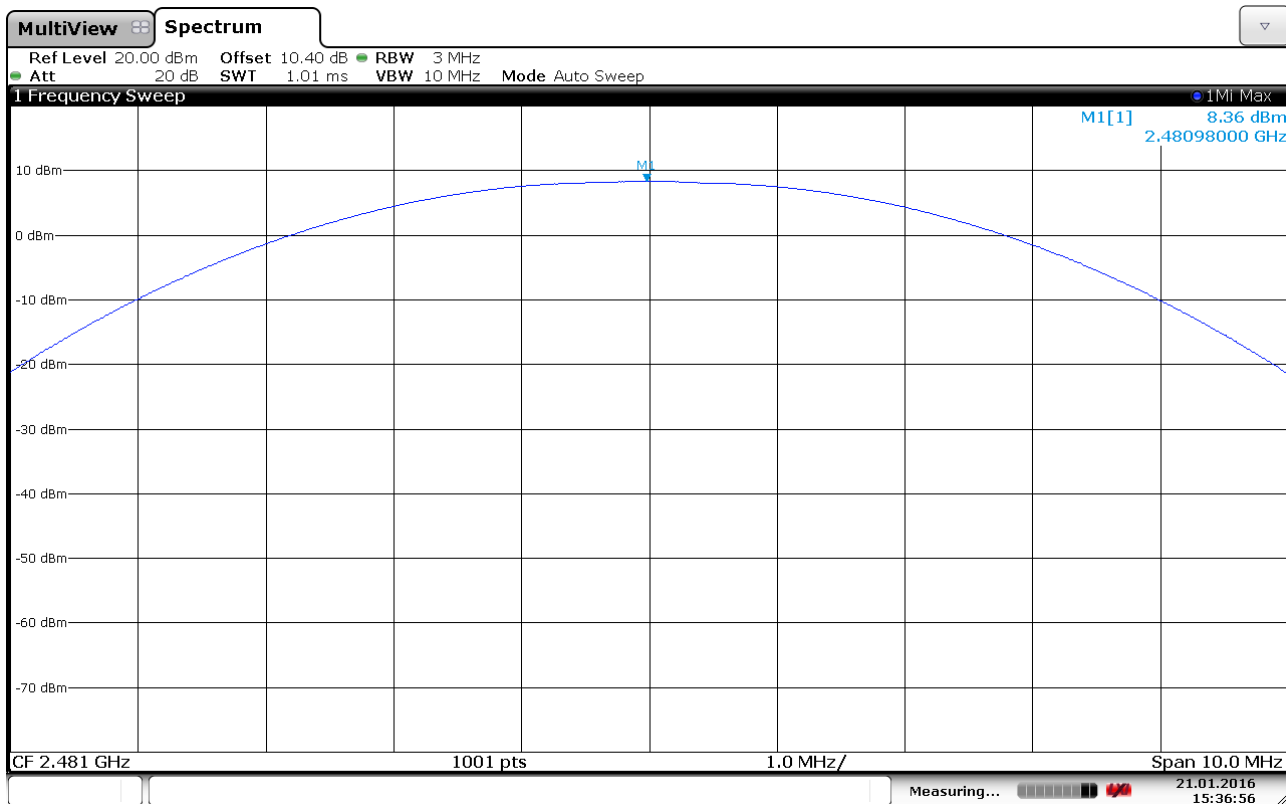


Center 2.44 GHz

50 μs/

Date: 17.DEC.2015 16:22:38

Radiated Power, 2440 MHz (EUT V, VP, Ant 2)



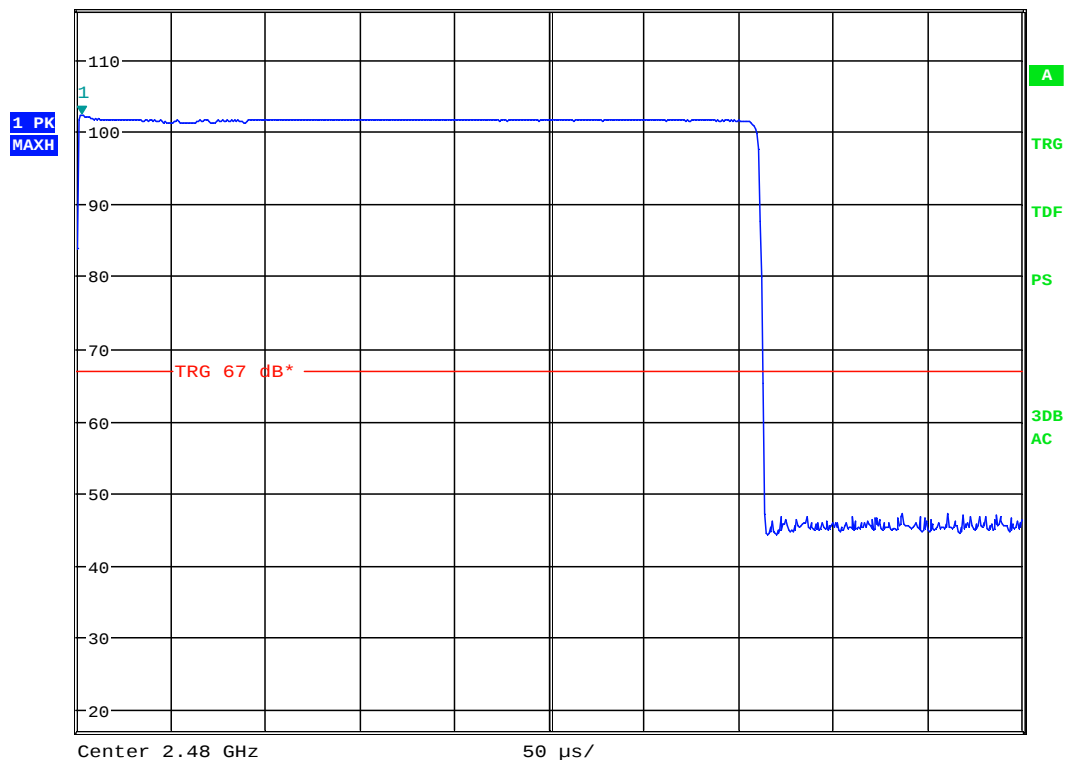
Conducted Power, 2481 MHz



MARKER 1
2.403846154 μ s
Ref 117 dB μ V/m * Att 10 dB

RBW 3 MHz
VBW 10 MHz
SWT 500 μ s

Marker 1 [T1]
102.35 dB μ V/m
2.403846 μ s



Date: 17.DEC.2015 16:24:52

Radiated Power, 2480 MHz (EUT V, VP, Ant 2)

3.6 Spurious Emissions (Radiated)

Para. No.: 15.247 (c)

Test Results: Complies

Measurement Data:

Band-edge conducted power

	Measured field strength (dB μ V/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dB μ V/m	dB	
Peak Detector	42.3	53.1	74	28.9	13.7
Average Detector	35.2	46.0	54	16.0	0.8

Average Detector values are measured with Peak Detector and corrected for Duty Cycle.
See attached plots.

Duty Cycle Correction Factor Calculation:

Maximum Duty Cycle declared by manufacturer: 44.4 %

Duty Cycle Correction factor = $-20 \times \log(\text{Duty Cycle}) = 7.1 \text{ dB}$

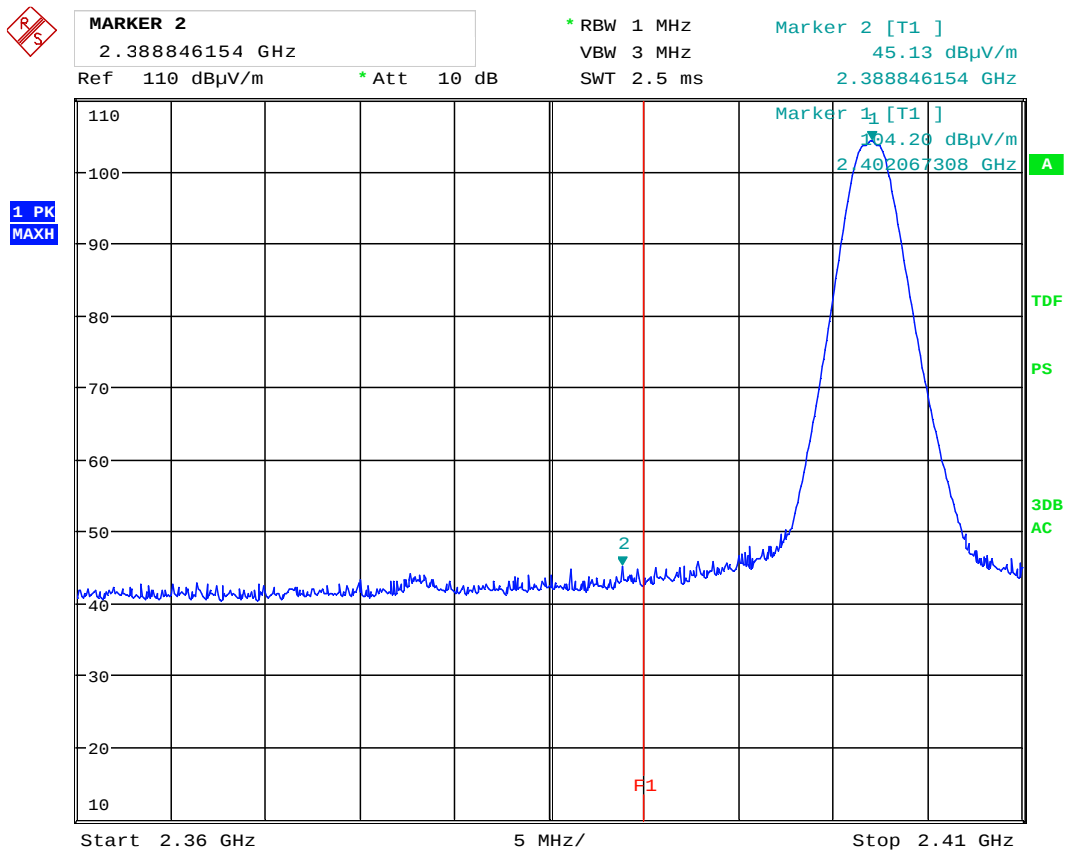
RF conducted power to 25 GHz see attached graph.

Maximum RF level outside operating band:

RF 2403 MHz: >50 dB/C, margin >30 dB

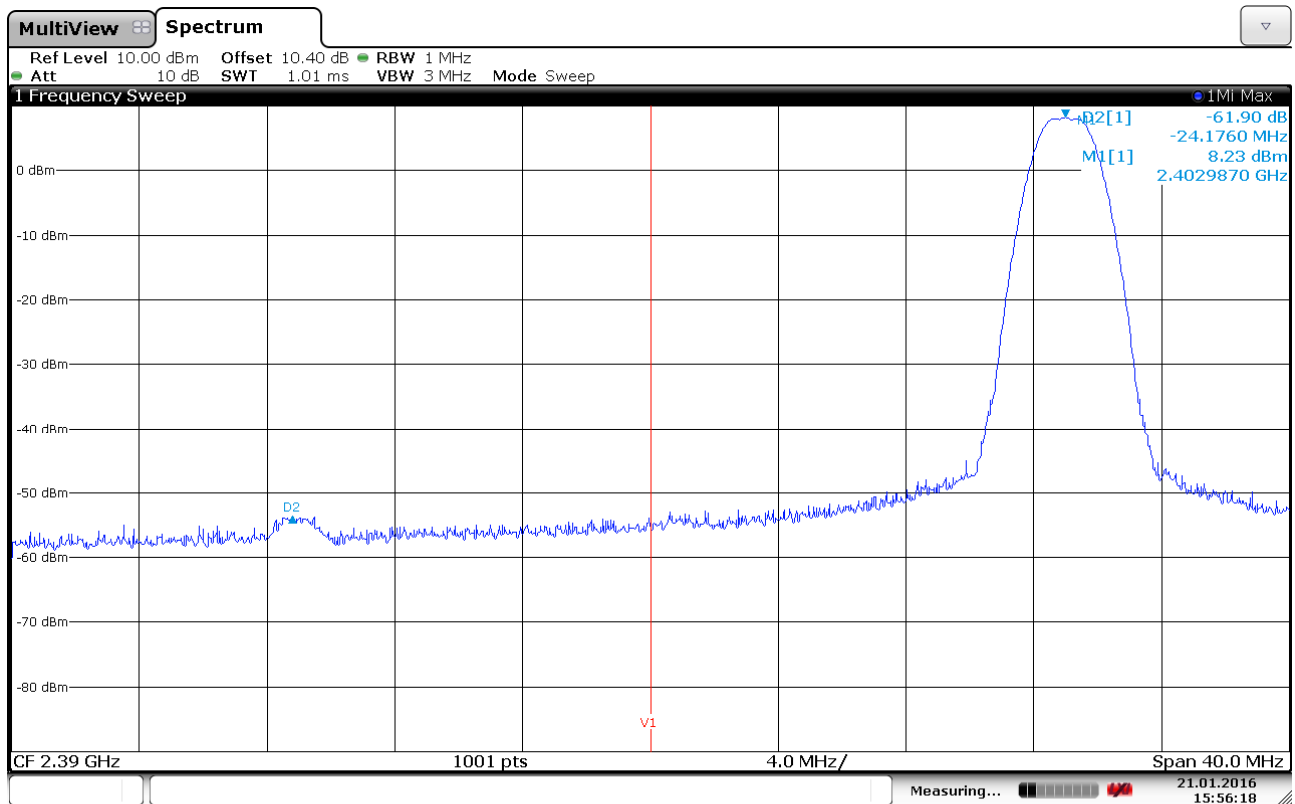
RF 2441 MHz: >50 dB/C, margin >30 dB

RF 2481 MHz: >50 dB/C, margin >30 dB



Date: 17.DEC.2015 16:06:35

Lower Band Edge, Radiated, 2402 MHz



Date: 21.JAN.2016 15:56:18

Lower Band Edge, Delta, Conducted, 2403 MHz

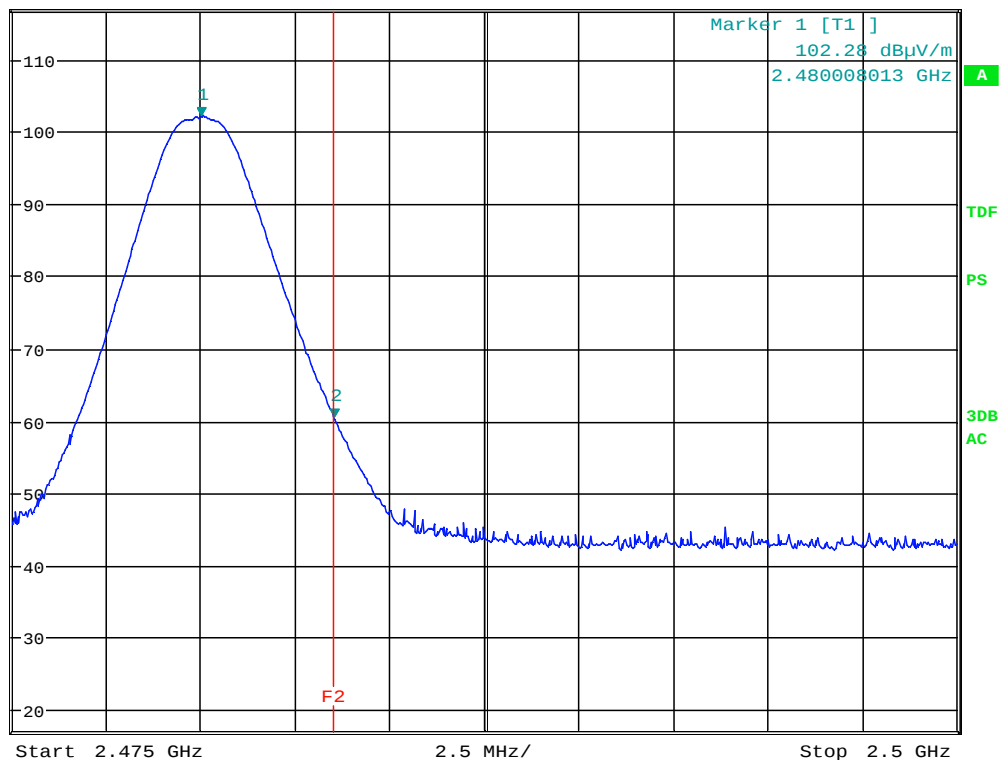


MARKER 2
2.483533654 GHz
Ref 117 dBμV/m * Att 10 dB

* RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms

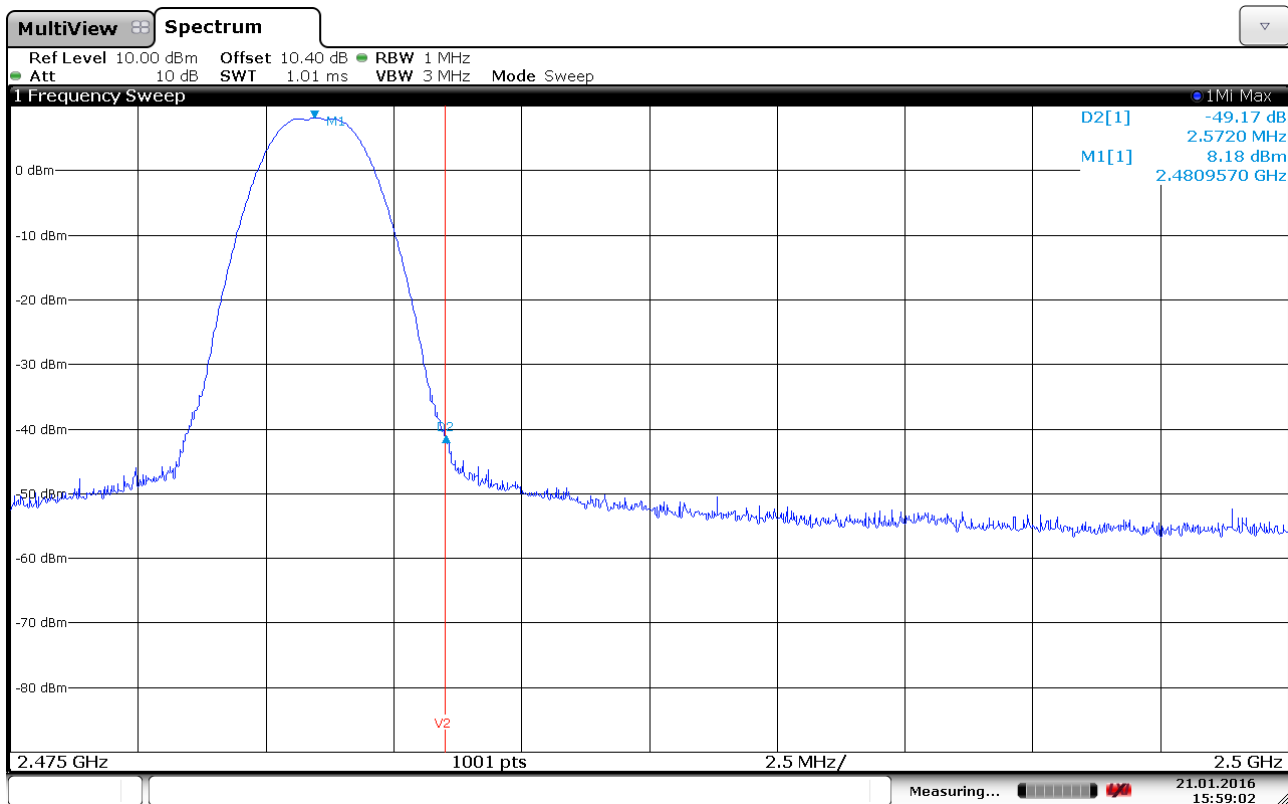
Marker 2 [T1]
60.29 dBμV/m
2.483533654 GHz

1 PK
MAXH

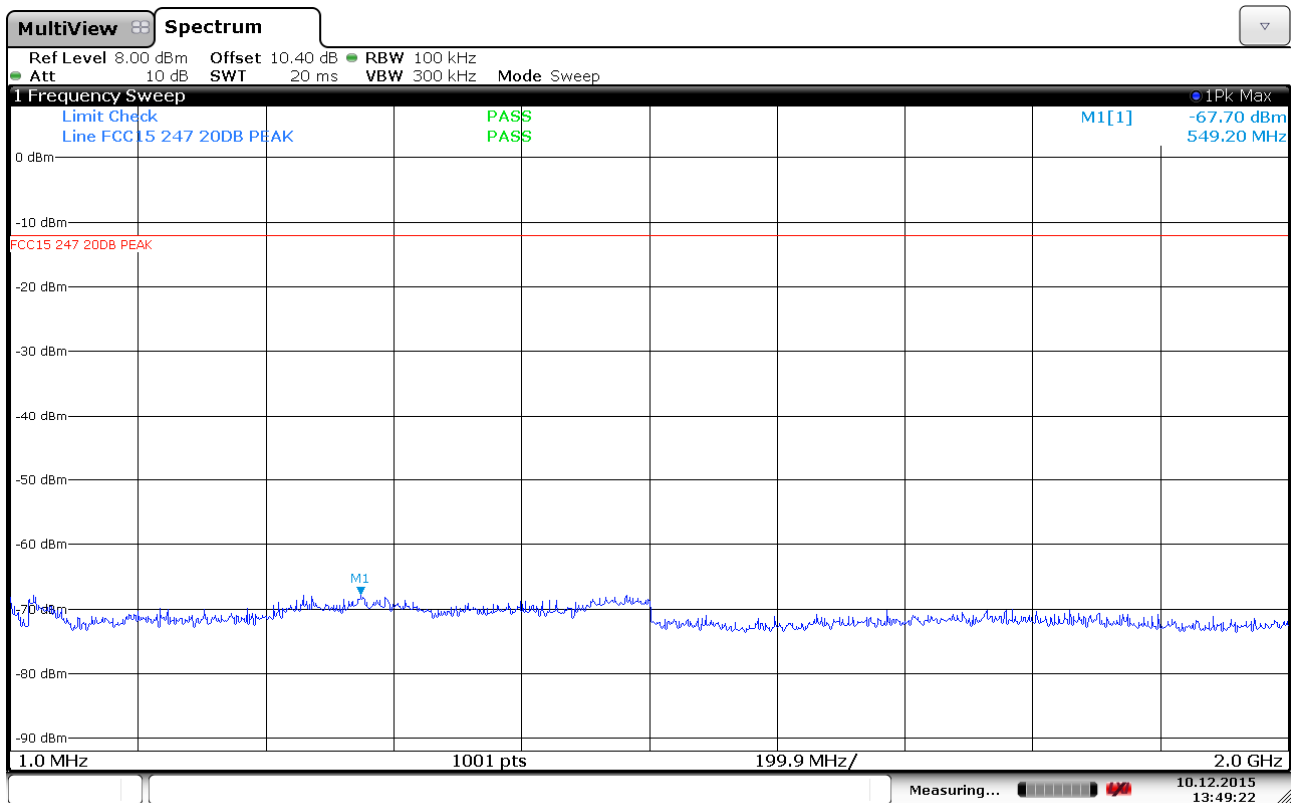


Date: 17.DEC.2015 16:26:22

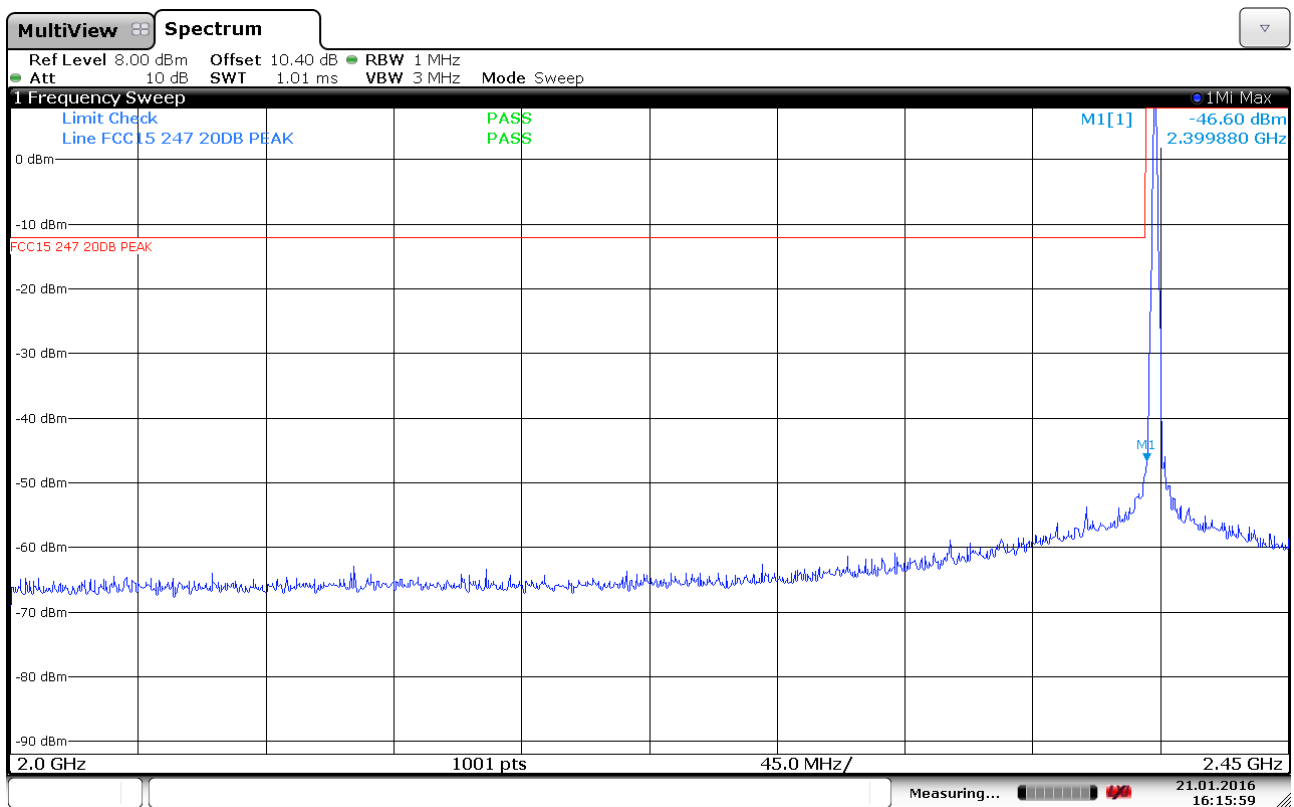
Upper Band Edge, Radiated, 2480 MHz



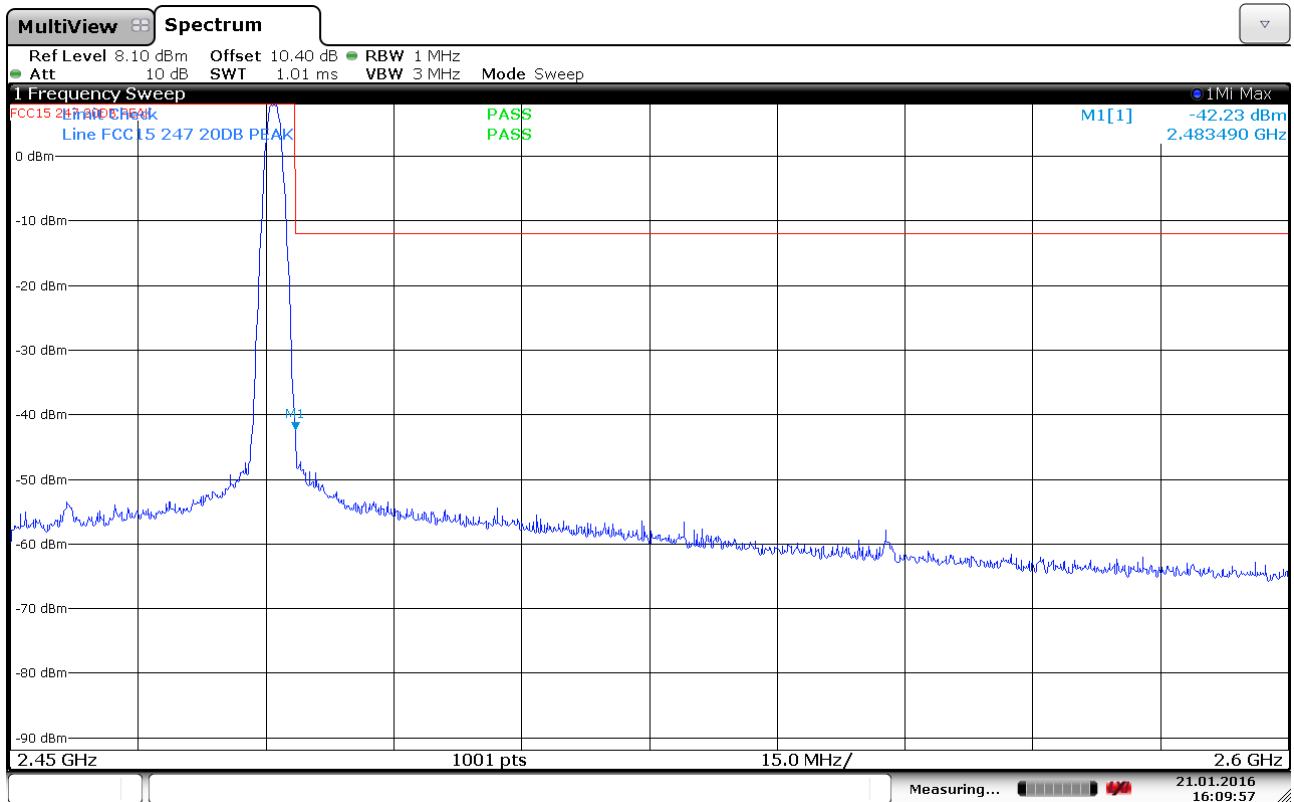
Upper Band Edge, Delta, Conducted, 2481 MHz



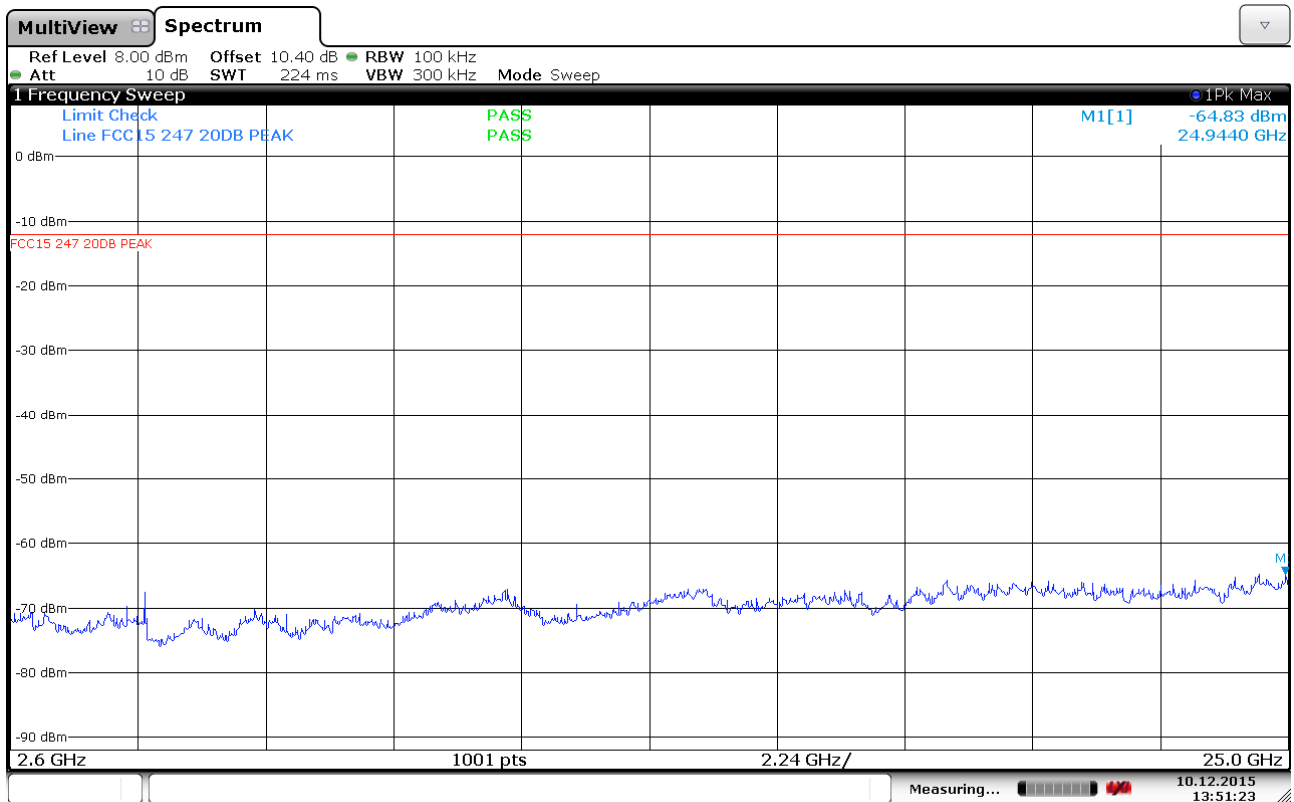
Conducted Emissions, 1 -2000 MHz, 2402 MHz



Conducted Emissions, 2000 -2450 MHz, 2403 MHz



Conducted Emissions, 2450 -2600 MHz, 2481 MHz



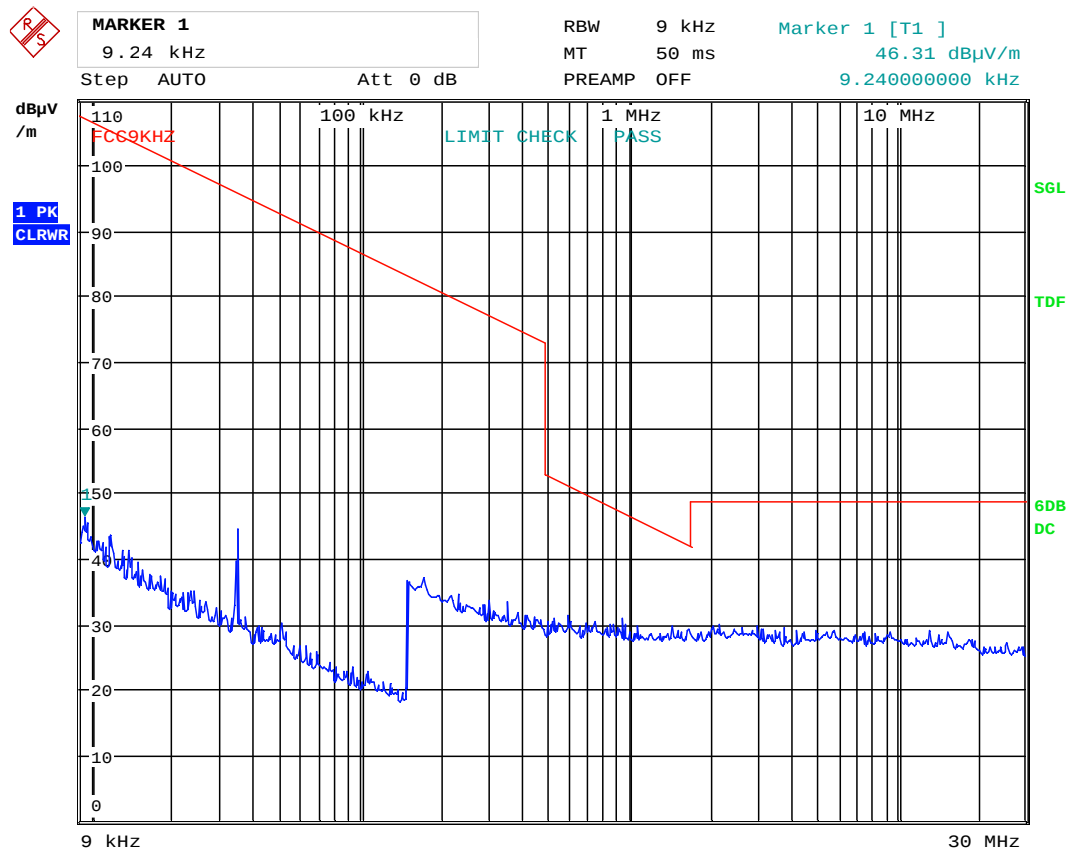
Conducted Emissions, 2600 -25000 MHz, 2440 MHz

Radiated emissions 9 kHz-30 MHz.

Measuring distance 10 m, measured with Peak detector.

No component detected, see attached graph.

Limit is converted to 10 m using 40 dB/decade according to 15.31 (f) (2).



Date: 18.DEC.2015 11:32:46

Radiated emission 30 – 1000 MHz.

Detector: Quasi-Peak

Measuring distance 3 m.

Tested with active connection.

Frequency	Operational condition	Field strength	Measuring distance	Limit FCC15.209	Margin
MHz		dB μ V/m	metres	dB μ V/m	dB
All freqs	TX on	/	3	/	>10

Tested only with Peak Detector.

See attached graphs.



MARKER 1

48.25320513 MHz

Ref 80 dBμV/m

* Att 10 dB

* RBW 100 kHz

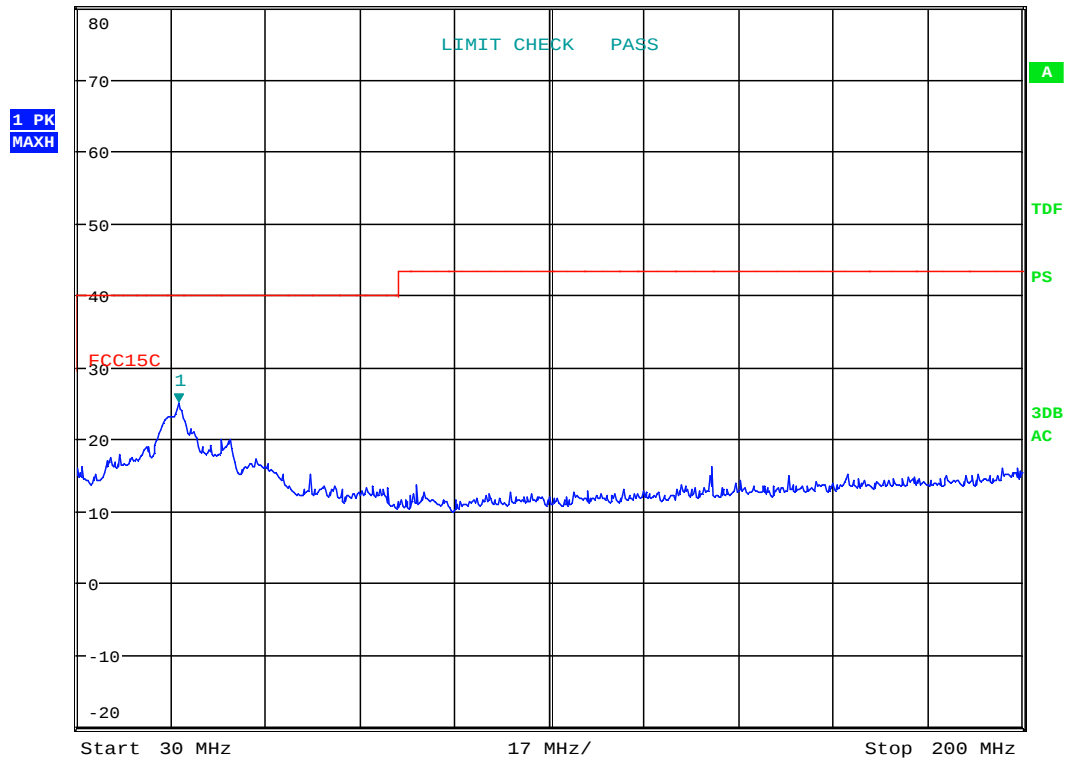
VBW 300 kHz

SWT 20 ms

Marker 1 [T1]

25.06 dBμV/m

48.253205128 MHz



Date: 18.DEC.2015 10:48:39

Radiated Emissions, 30 -200MHz, VP



MARKER 1

197.8205128 MHz

Ref 80 dBμV/m

* Att 10 dB

* RBW 100 kHz

VBW 300 kHz

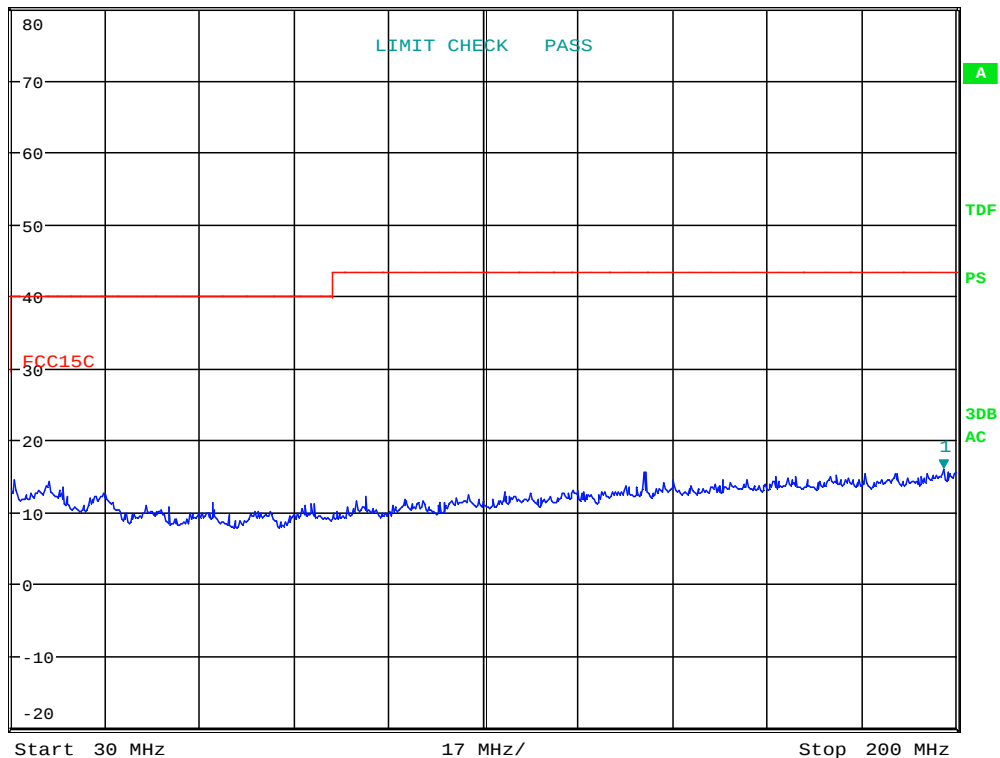
SWT 20 ms

Marker 1 [T1]

15.93 dBμV/m

197.820512821 MHz

1 PK
MAXH

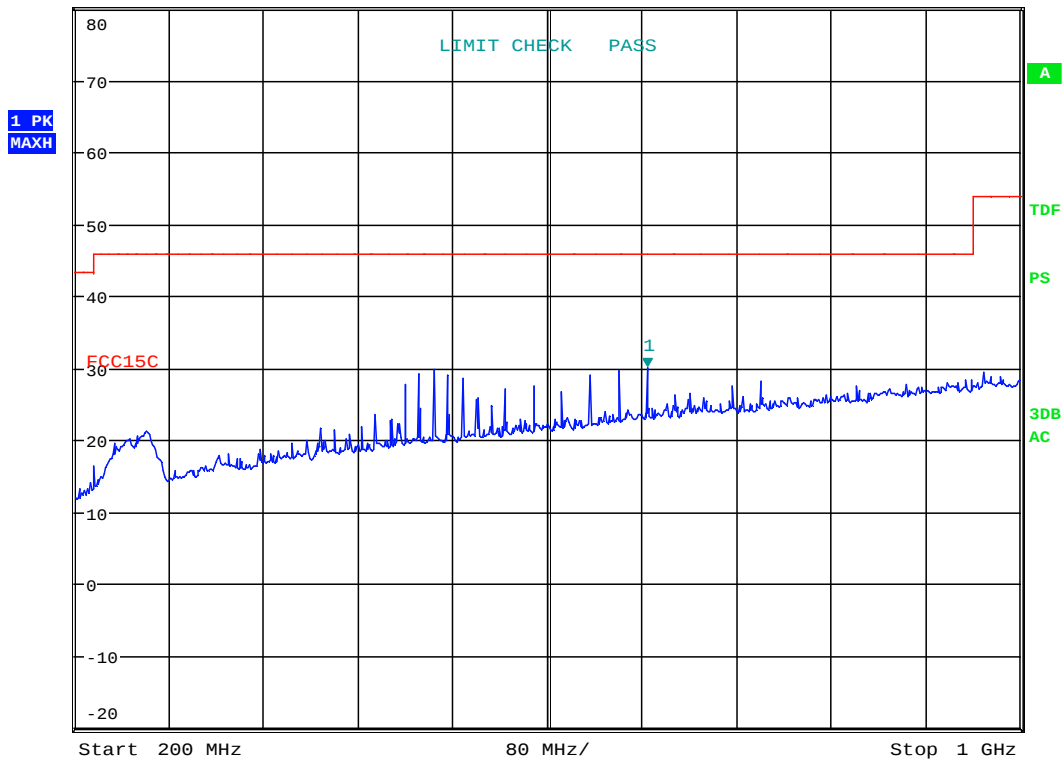


Date: 18.DEC.2015 10:53:13

Radiated Emissions, 30 -200MHz, HP



MARKER 1
684.6153846 MHz
Ref 80 dBμV/m * Att 10 dB * RBW 100 kHz Marker 1 [T1]
VBW 300 kHz 30.16 dBμV/m
SWT 80 ms 684.615384615 MHz



Date: 18.DEC.2015 11:10:22

Radiated Emissions, 200 -1000MHz, VP



MARKER 1

985.8974359 MHz

Ref 80 dB μ V/m

* Att 10 dB

* RBW 100 kHz

VBW 300 kHz

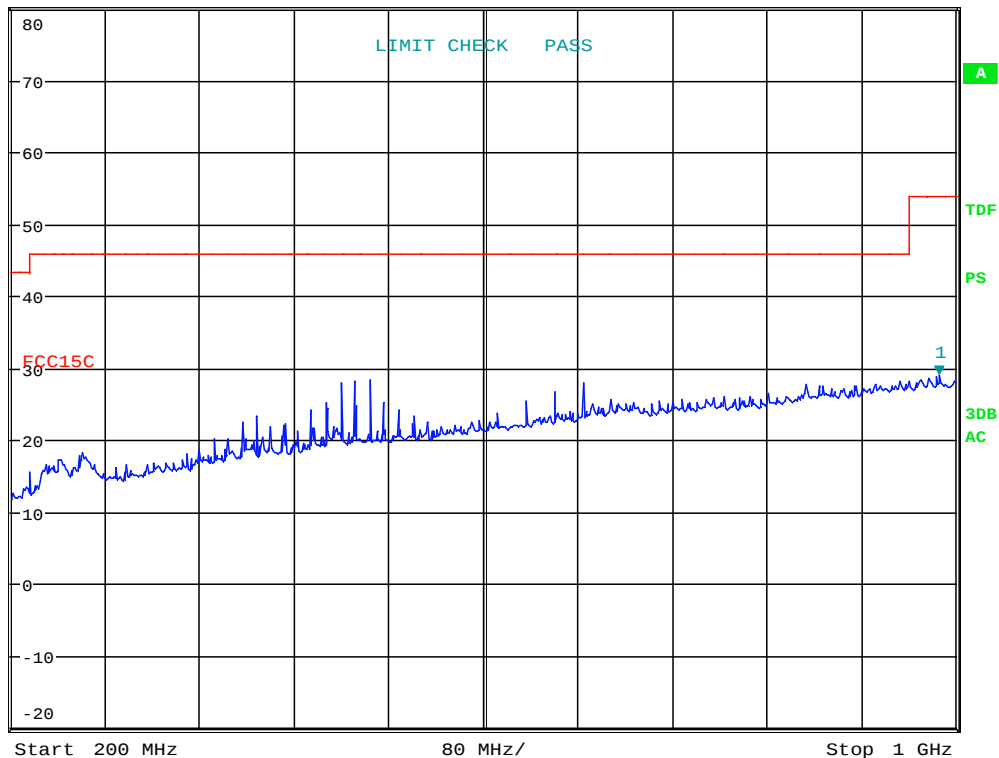
SWT 80 ms

Marker 1 [T1]

29.04 dB μ V/m

985.897435897 MHz

1 PK
MAXH



Date: 18.DEC.2015 11:16:12

Radiated Emissions, 200 -1000MHz, HP

Radiated Emissions, 1-25 GHz

Measuring distance: 3m (1 – 8.5 GHz)
1m (5.5 – 25 GHz)

Peak Detector:

Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector, 3m	Duty cycle corr. factor	Limit	Margin
GHz	L,M,H	dB	dB μ V/m	dB	dB μ V/m	dB
All freqs	M	/	None detected	7.1	74	>20

Average Detector:

Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector, 3m	Duty cycle corr. factor	Limit	Margin
GHz	L,M,H	dB	dB μ V/m	dB	dB μ V/m	dB
All freqs	M	/	None detected	7.1	54	>20

Average Detector values are calculated from Peak values by Duty Cycle Correction Factor.

Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor".

See plots.



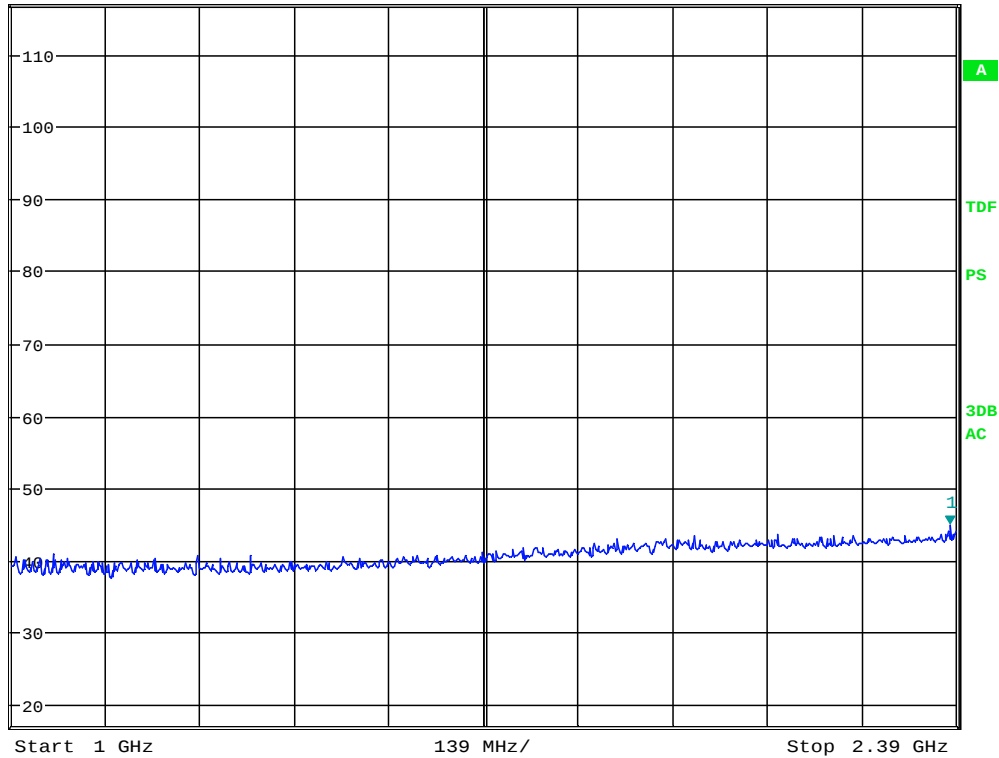
* RBW 1 MHz
* VBW 3 MHz
SWT 5 ms

Marker 1 [T1]
44.83 dBμV/m
2.381089744 GHz

Ref 117 dBμV/m

* Att 10 dB

1 PK
MAXH



Date: 17.DEC.2015 16:10:02

Radiated Emissions, 1000 -2390MHz, EUT H1, VP



* RBW 1 MHz
* VBW 3 MHz
SWT 5 ms

Marker 1 [T1]
43.99 dBμV/m
2.113782051 GHz

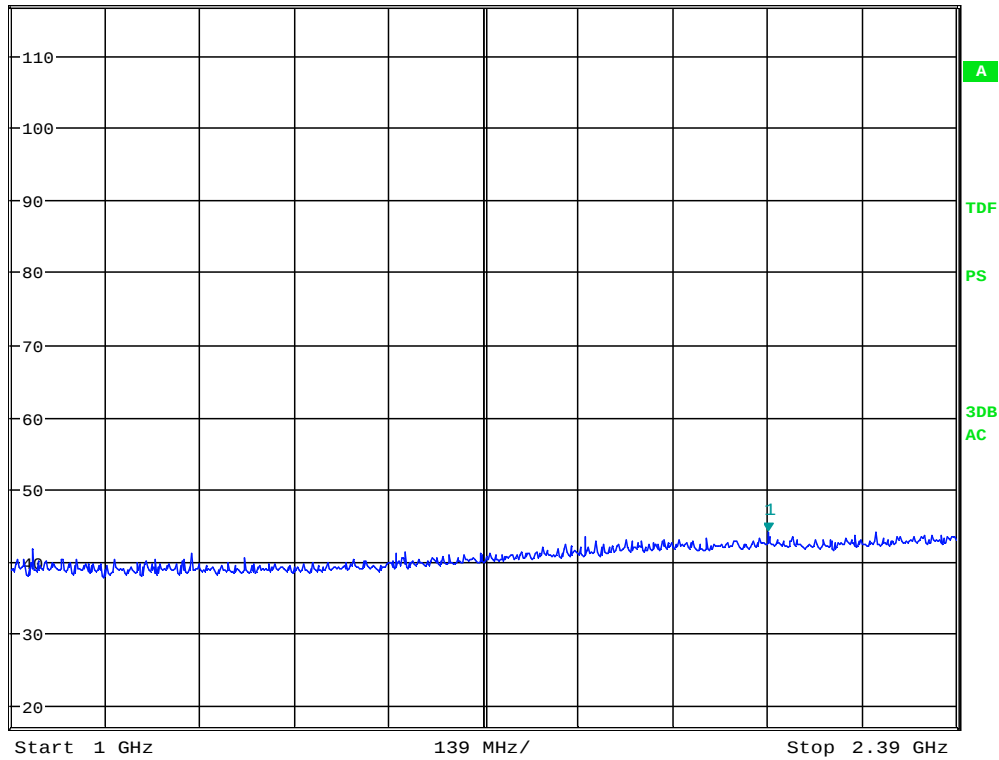
Ref 117 dBμV/m

* Att 10 dB

SWT 5 ms

2.113782051 GHz

1 PK
MAXH



Date: 17.DEC.2015 16:11:53

Radiated Emissions, 1000 -2390MHz, EUT H1, HP



* RBW 1 MHz Marker 1 [T1]
* VBW 3 MHz 48.26 dBμV/m
SWT 2.5 ms 3.137179487 GHz

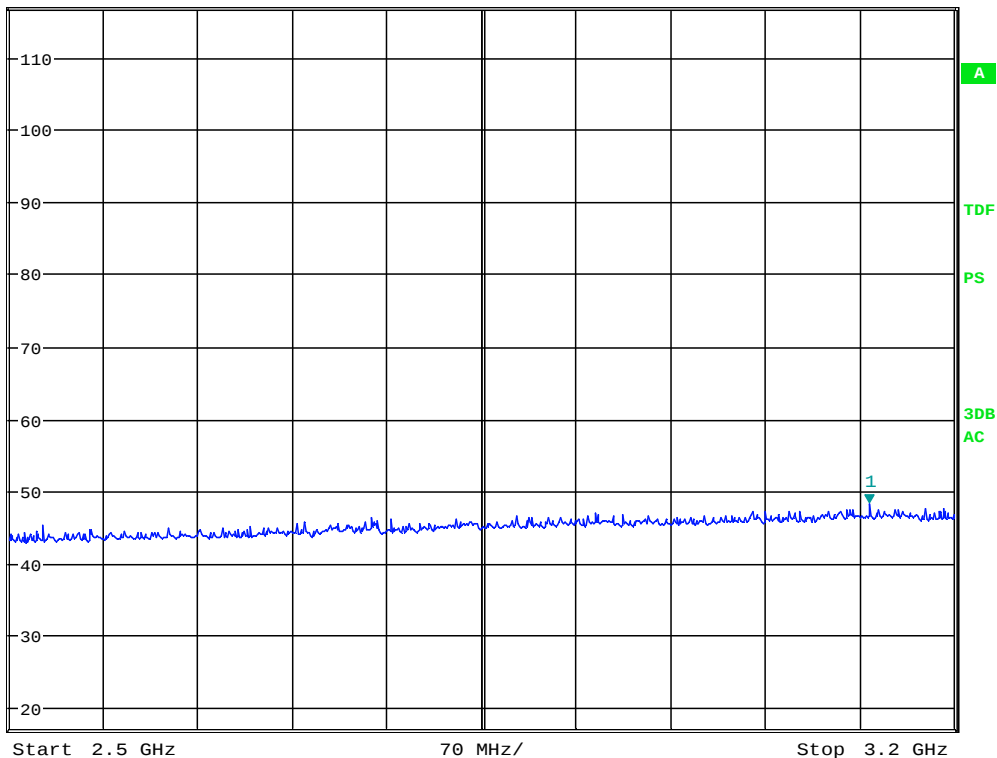
Ref 117 dBμV/m

* Att 10 dB

SWT 2.5 ms

3.137179487 GHz

1 PK
MAXH



Date: 17.DEC.2015 16:29:27

Radiated Emissions, 2500 -3200MHz, EUT H1, VP



* RBW 1 MHz Marker 1 [T1]
* VBW 3 MHz 47.66 dBμV/m
SWT 2.5 ms 3.140544872 GHz

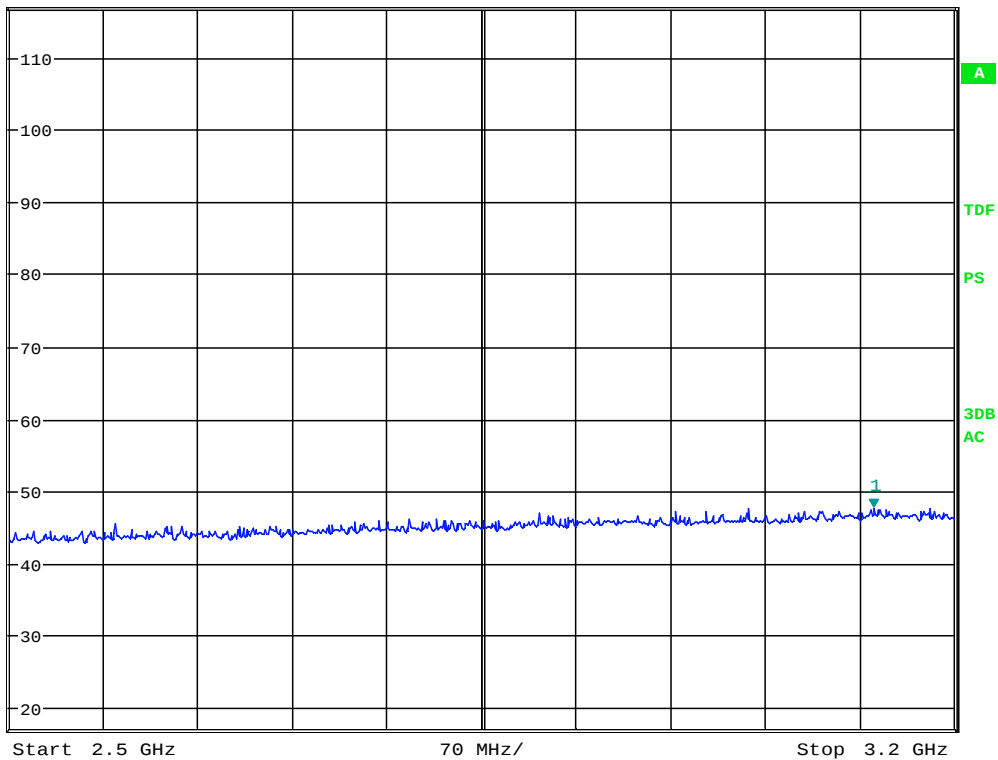
Ref 117 dBμV/m

* Att 10 dB

SWT 2.5 ms

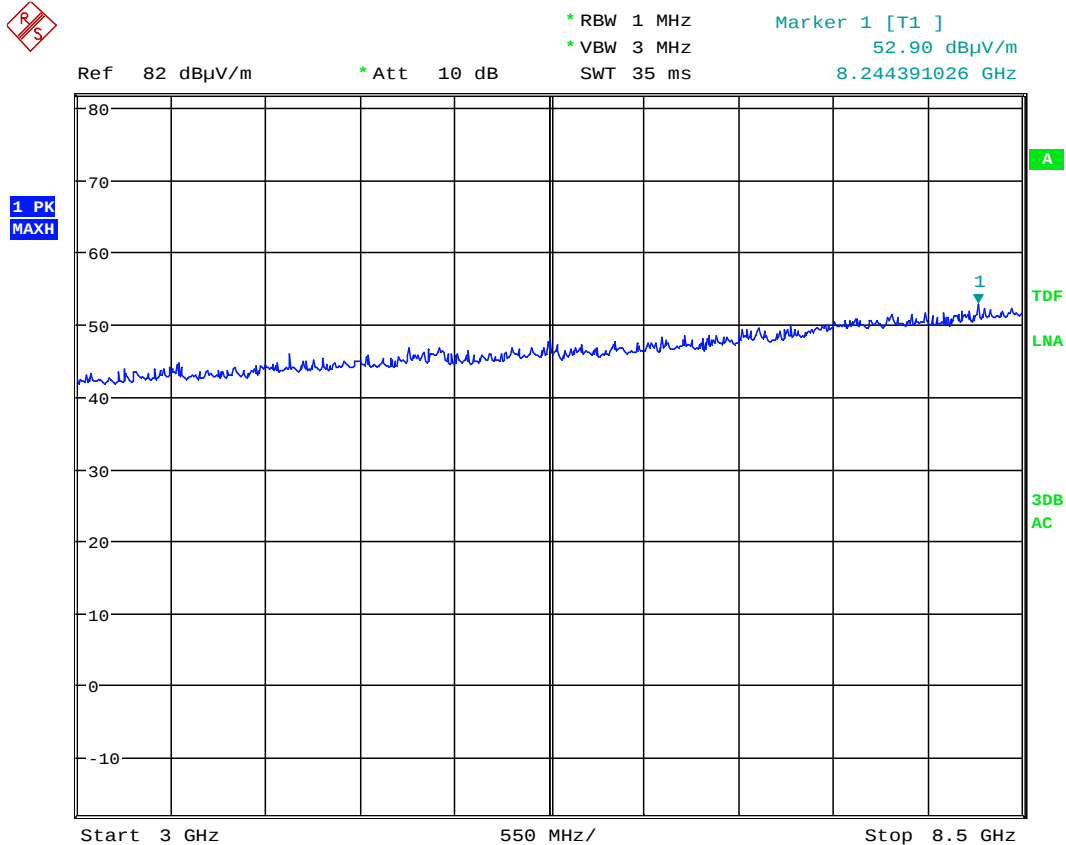
3.140544872 GHz

1 PK
MAXH



Date: 17.DEC.2015 16:31:18

Radiated Emissions, 2500 -3200MHz, EUT H1, HP

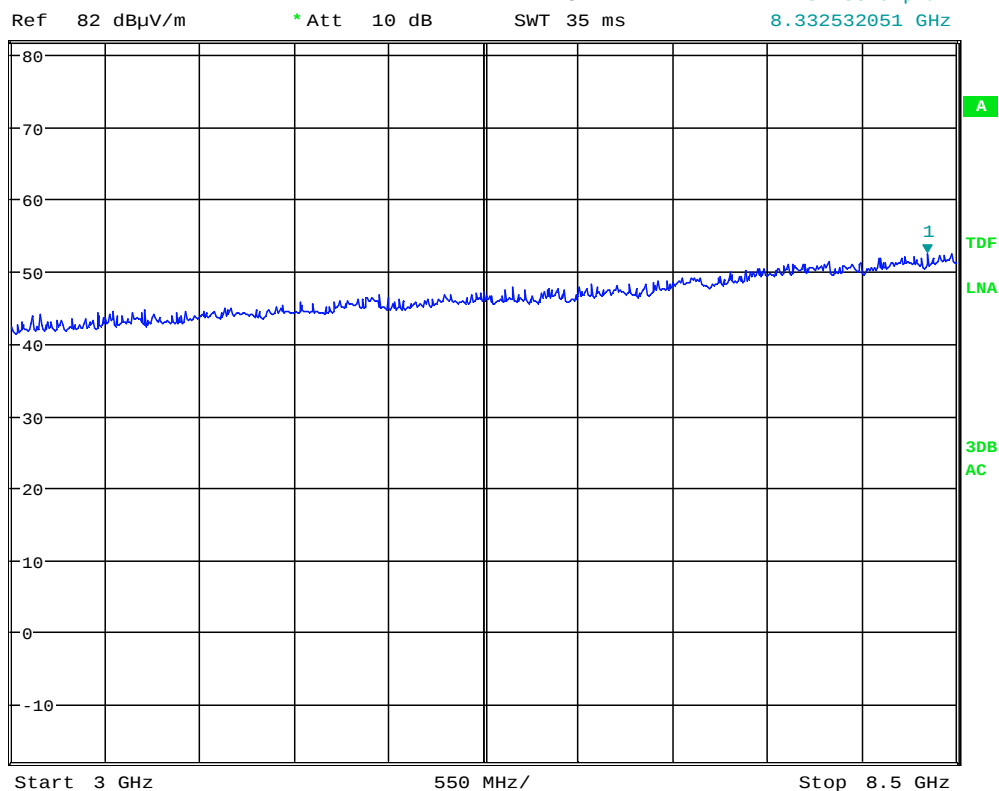


Date: 17.DEC.2015 18:33:40

Radiated Emissions, 3000 -8500MHz, VP



* RBW 1 MHz
* VBW 3 MHz
Marker 1 [T1]
52.55 dBμV/m
8.332532051 GHz



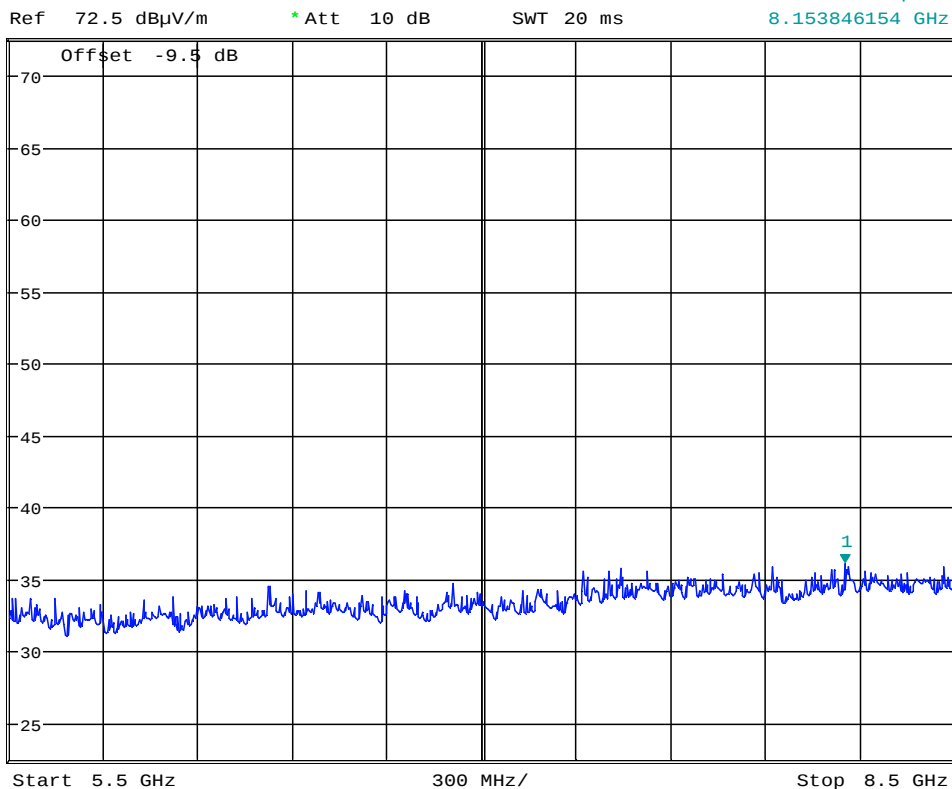
Date: 17.DEC.2015 18:35:33

Radiated Emissions, 3000 -8500MHz, HP



* RBW 1 MHz
* VBW 3 MHz
SWT 20 ms

Marker 1 [T1]
36.08 dBμV/m
8.153846154 GHz



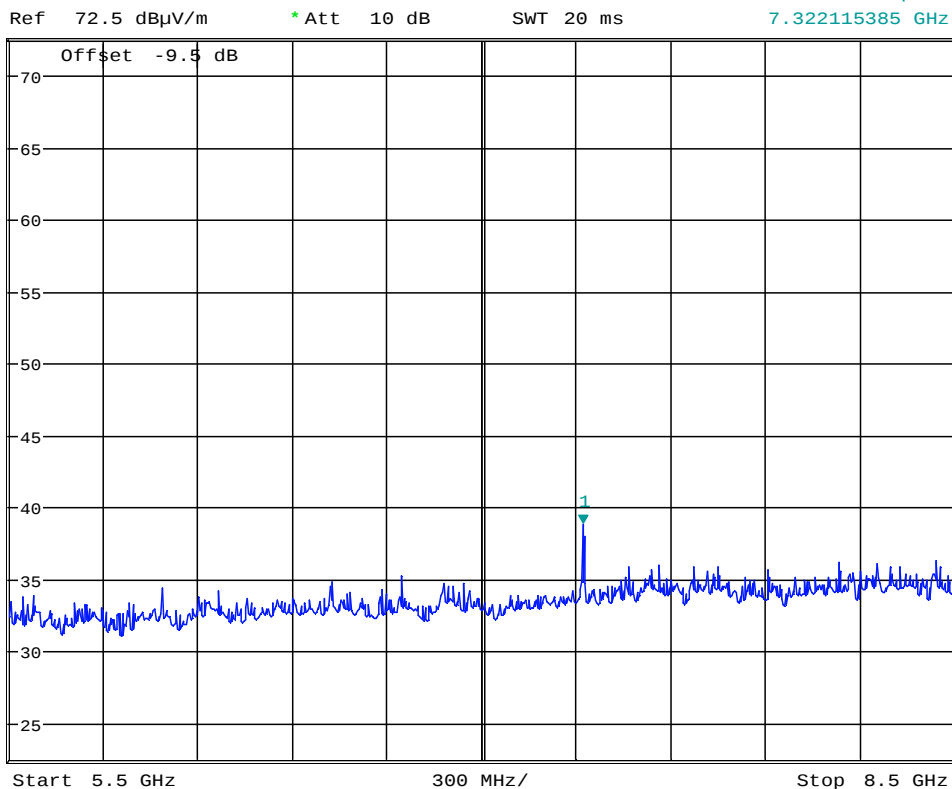
Date: 17.DEC.2015 18:46:53

Radiated Emissions, 5500 -8500MHz, VP, 1m



* RBW 1 MHz
* VBW 3 MHz
SWT 20 ms

Marker 1 [T1]
38.87 dBμV/m
7.322115385 GHz



Date: 17.DEC.2015 18:48:45

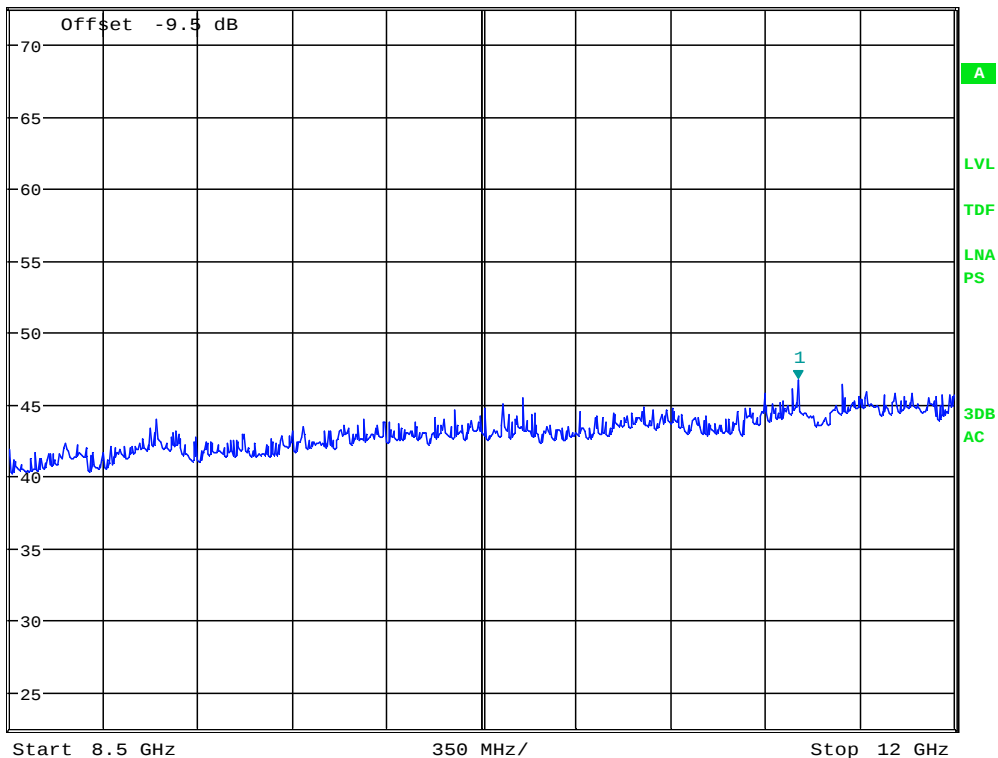
Radiated Emissions, 5500 -8500MHz, HP, 1m



* RBW 1 MHz Marker 1 [T1]
* VBW 3 MHz 46.73 dBμV/m
SWT 25 ms 11.422275641 GHz

Ref 72.5 dBμV/m * Att 10 dB

1 PK
MAXH



Date: 17.DEC.2015 18:54:20

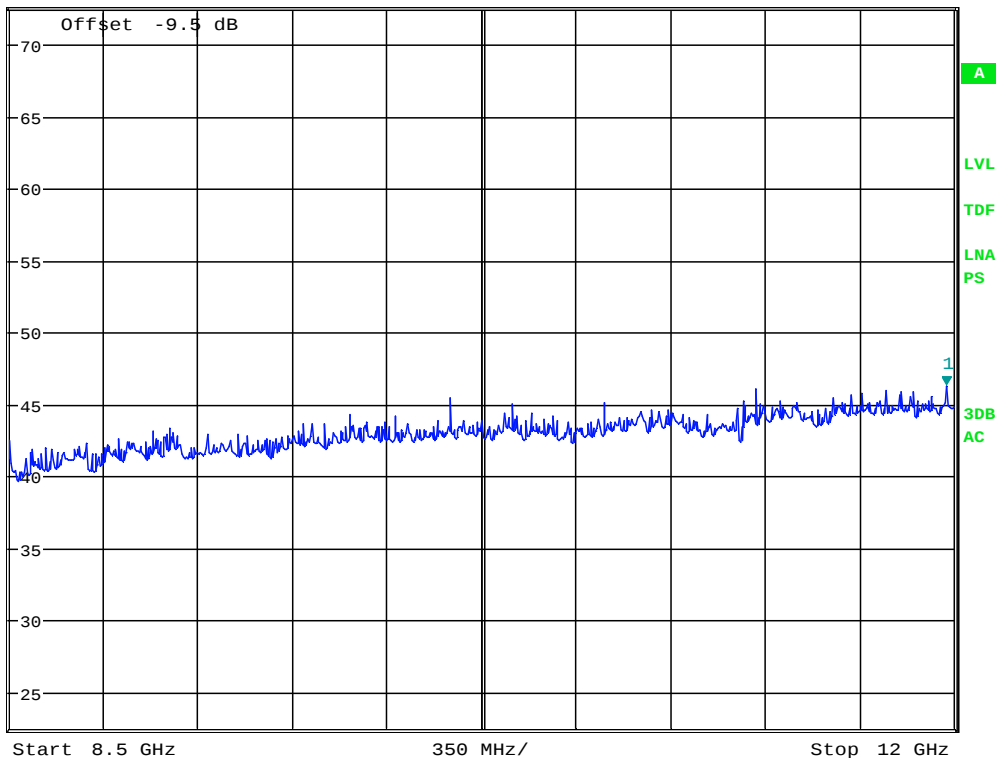
Radiated Emissions, 8500 -12000MHz, VP, 1m



* RBW 1 MHz
* VBW 3 MHz
Marker 1 [T1]
46.30 dBμV/m
11.971955128 GHz

Ref 72.5 dBμV/m * Att 10 dB SWT 25 ms

1 PK
MAXH



Date: 17.DEC.2015 18:56:12

Radiated Emissions, 8500 -12000MHz, HP, 1m

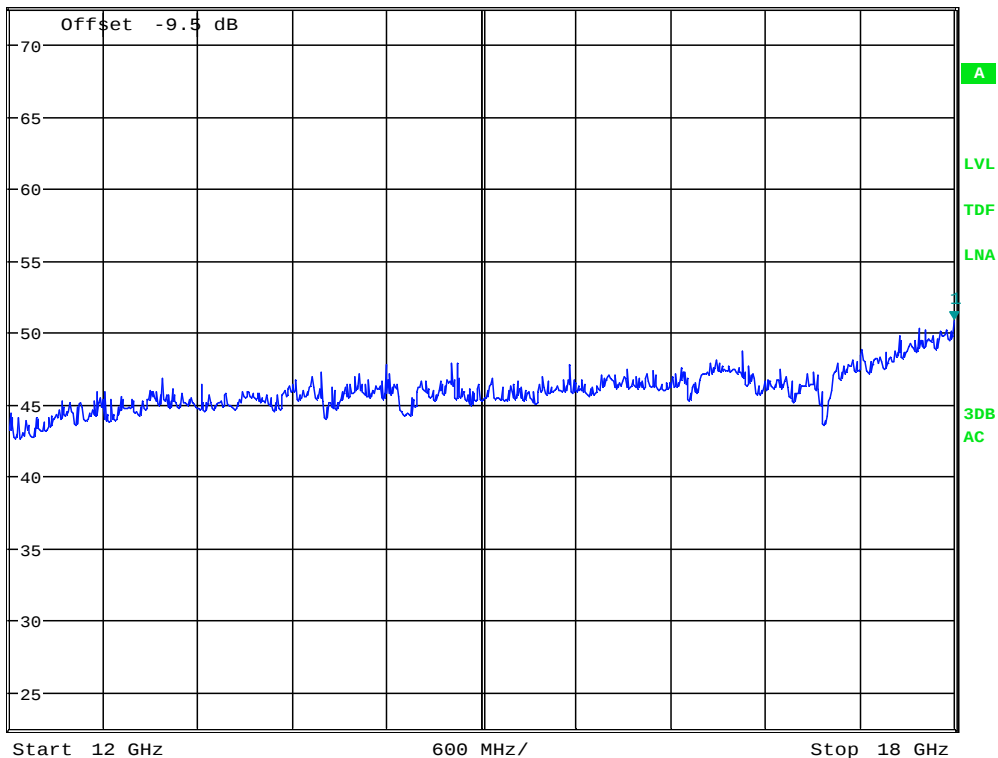


* RBW 1 MHz
* VBW 3 MHz
SWT 35 ms

Marker 1 [T1]
50.79 dBμV/m
18.000000000 GHz

Ref 72.5 dBμV/m * Att 10 dB

1 PK
MAXH



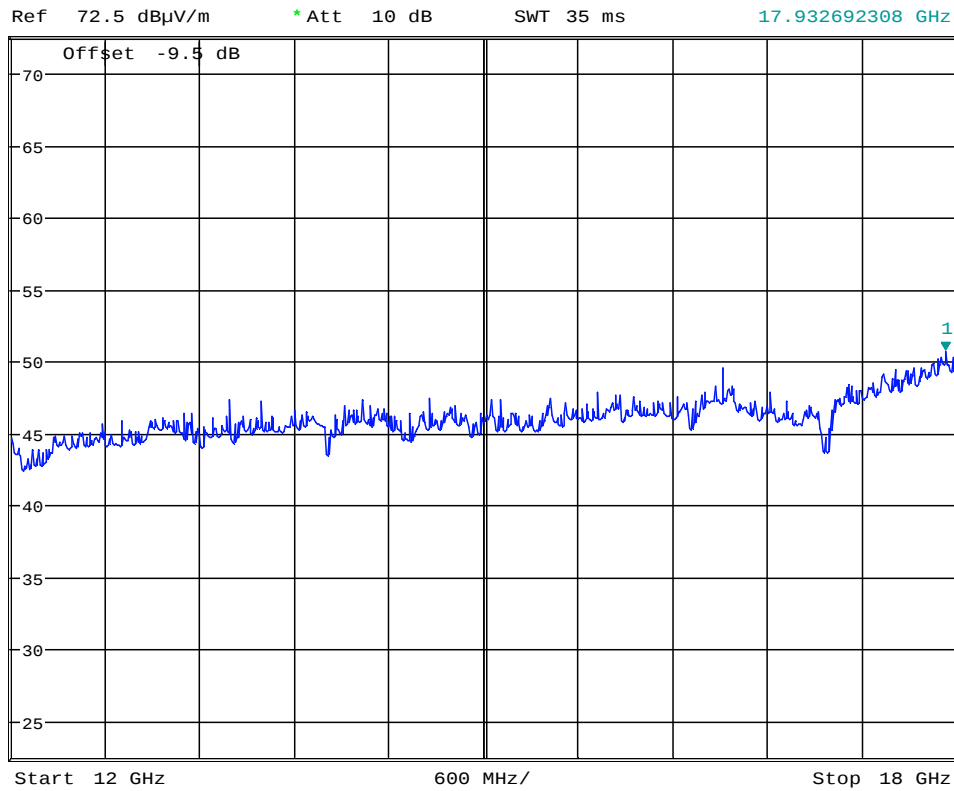
Date: 17.DEC.2015 18:59:57

Radiated Emissions, 12000 -18000MHz, VP, 1m



* RBW 1 MHz
* VBW 3 MHz
SWT 35 ms

Marker 1 [T1]
50.71 dBμV/m
17.932692308 GHz



Date: 17.DEC.2015 19:01:50

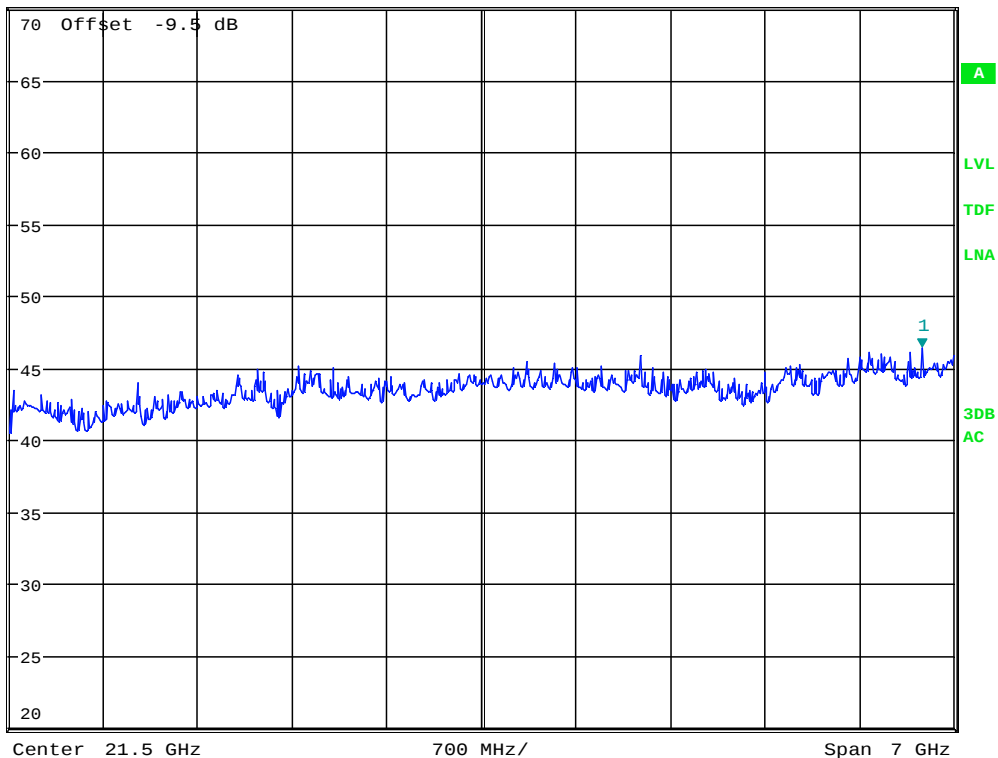
Radiated Emissions, 12000 -18000MHz, HP, 1m



* RBW 1 MHz
* VBW 3 MHz
Marker 1 [T1]
46.42 dBμV/m
24.764423077 GHz

Ref 70 dBμV/m * Att 10 dB SWT 45 ms

1 PK
MAXH



Date: 17.DEC.2015 19:15:59

Prescan, 18000 -25000MHz, VP, approx. 10cm

4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		Uncertainty
Output Power		±0.5 dB
Power Spectral Density		±0.5 dB
Out of Band Emissions, Conducted	< 3.6 GHz	±0.6 dB
	> 3.6 GHz	±0.9 dB
Spurious Emissions, Radiated	< 1 GHz	±2.5 dB
	> 1 GHz	±2.2 dB
Emission Bandwidth		±4 %
Power Line Conducted Emissions		+2.9 / -4.1 dB
Spectrum Mask Measurements	Frequency	±5 %
	Amplitude	±1.0 dB
Frequency Error		±0.6 ppm
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

5 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSW26	Spectrum Analyzer	Rohde & Schwarz	LR 1640	2015.10	2016.10
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2015.11	2016.11
3	6810.17B	Attenuator	Suhner	LR 1669	Cal b4 use	
4	6HC3000/18000	Highpass Filter	Trilithic	LR 1614	Cal b4 use	
5	HK116	Biconical Antenna	Rohde & Schwarz	LR 1260	2013.12	2017.12
6	HL223	LPDA antenna	Rohde & Schwarz	LR 1261	2013.12	2017.12
7	3115	Horn Antenna	EMCO	LR 1226	2013.12	2018.12
8	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2015.10	2016.10
9	HP 10855A	Pre-amplifier	Hewlett Packard	LR 1445	2015.10	2016.10
10	PM7320X	Antenna horn	Siverts lab	LR 103	2009.01.26	2017.01.26
11	DBF-520-20	Antenna horn	Systron Donner	LR 101	2009.01.26	2017.01.26
12	638	Antenna Horn	Narda	LR 1480	2010.06	2020.06
14	642	Antenna Horn	Narda	LR 220	2009.01	2017.01
15	HFH2-Z2	Loop Antenna	Rohde & Schwarz	LR 1660	2014.10	2016.10
16	Model 87V	Multimeter	Fluke	N-4669	2015.10	2016.10
17	ESHS10	EMI	Rohde & Schwarz	N-3528	2015.08	2016.08
18	ESH3-Z5	Two-line V-Network	Rohde & Schwarz	LR 1076	2014.04.23	2016.04.23
19	ESH3-Z2	Pulse limiter	Rohde & Schwarz	LR 1074	2015.03.05	2017.03.05
20	6812B	AC power Source	Agilent	LR 1515	2015.12	2016.12

USB Power Adaptors Used during testing:

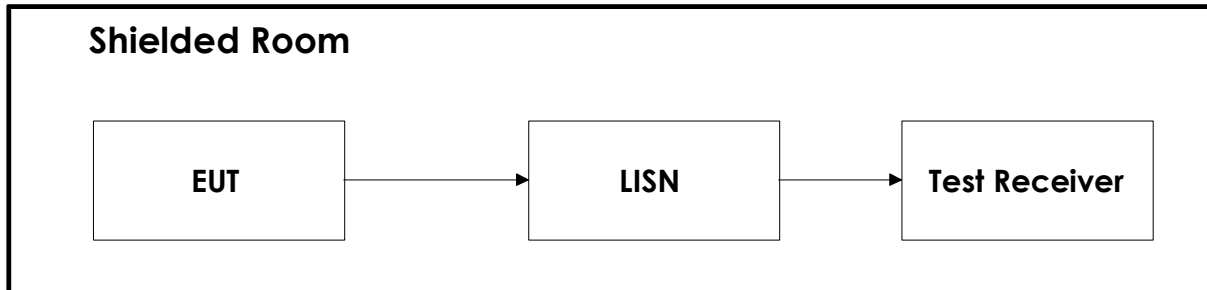
Power Line Conducted tests: Trust 19160, Mfd. 2015-08-07

Radiated Emissions tests: Apple A1400 (iPad Mini adaptor)

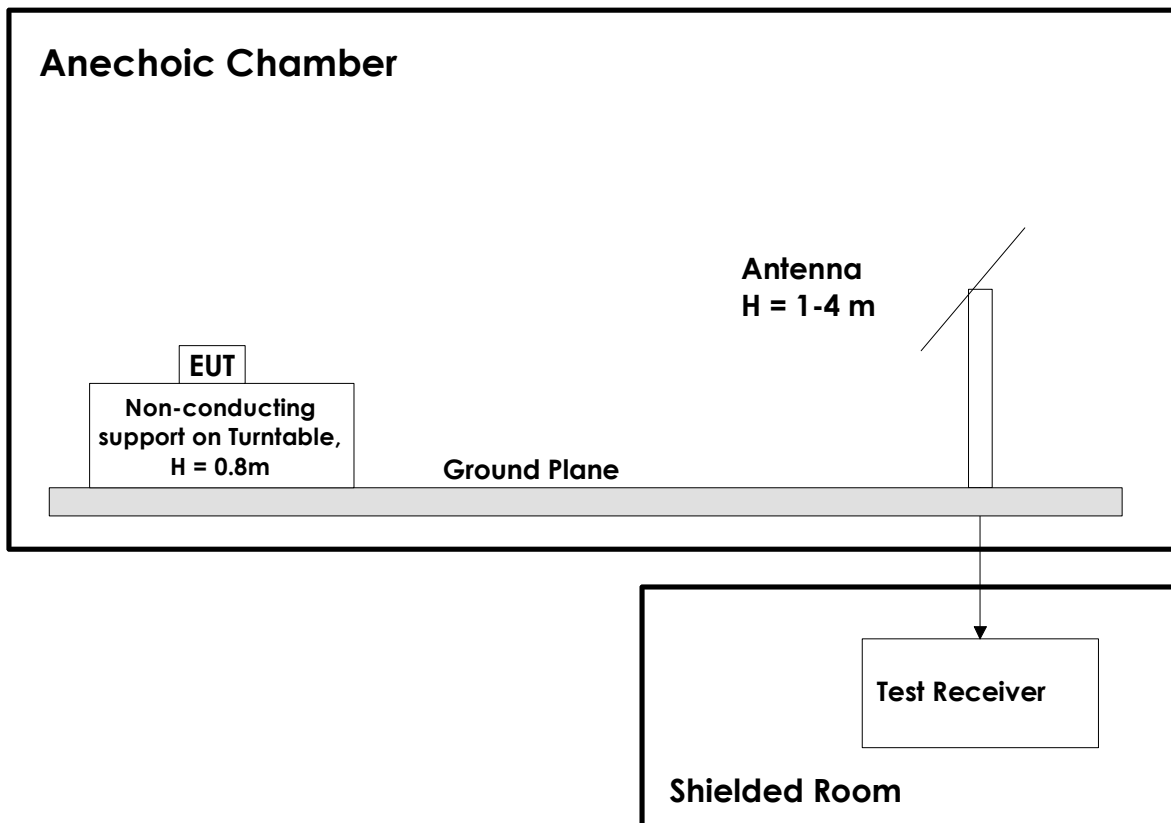
Both adaptor are property of Nemko and has EU plugs, but all tests were performed with 120V 60Hz AC.

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission



6.2 Test Site Radiated Emission



Revision history

Version	Date	Comment	Sign
1.0	2016.01.19	Version for TCB review	FS