




Test Report

Product	Bluetooth Low Energy (BLE) module
Name and address of the applicant	ASSA ABLOY Hospitality AS Anolitveien 1-3, 1400 Ski, Norway
Name and address of the manufacturer	ASSA ABLOY Hospitality AS Anolitveien 1-3, 1400 Ski, Norway
Model	4827610CC1
Rating	4.5Vdc
Trademark	ASSA ABLOY
Serial number	/
Additional information	2.4GHz, Bluetooth Low Energy (BLE). This product contains RFID transceiver with same FCC/IC ID. But never transmits simultaneously with RFID.
Tested according to	FCC Part 15.247 Frequency Hopping Transmitters / Digital Transmission Systems Industry Canada RSS-247, Issue 1 Low Power Licence-Exempt Radiocommunications Devices
Order number	311535
Tested in period	2016.06.27 – 2016.07.12 and 2017.02.08
Issue date	2017.02.09
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
<div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  Prepared by [G.Suhanthakumar] </div> <div style="text-align: center;">  Approved by [Frode Sveinsen] </div> </div>	
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CONTENTS

1	INFORMATION	3
1.1	Test Item.....	3
1.2	Normal test conditions	4
1.3	Test Engineer(s)	4
1.4	Description of modification for Modification Filing.....	4
1.5	Family List Rational	4
1.6	Comments	4
2	TEST REPORT SUMMARY	5
2.1	General.....	5
2.2	Test Summary	6
3	TEST RESULTS.....	7
3.1	Occupied Bandwidth.....	7
3.3	Minimum 6 dB Bandwidth	9
3.4	Peak Power Output.....	13
3.5	Spurious Emissions (Radiated).....	23
3.6	Power Spectral Density (PSD).....	64
4	Measurement Uncertainty.....	68
5	LIST OF TEST EQUIPMENT.....	69
6	BLOCK DIAGRAM.....	70
6.1	Power Line Conducted Emission	70
6.2	Test Site Radiated Emission.....	70

1 INFORMATION

1.1 Test Item

Name :	ASSA ABLOY
FCC ID :	Y7V-4827610CC1
Industry Canada ID :	9514A-4827610CC1
Model/version :	4827610CC1
Serial number :	/
Hardware identity and/or version:	4827610-B (PCBA: 4827644)*
Software identity and/or version :	BLE test SW 2.0
Frequency Range :	2402 - 2480MHz
Tunable Bands :	None
Number of Channels :	39
Operating Modes :	Transceiver
Type of Modulation :	GFSK, 250kHz deviation
User Frequency Adjustment :	None
Rated Output Power :	1.92 mW
Type of Power Supply :	4.5Vdc (3x LR6 batteries)
Antenna Connector :	None (PCB antenna)
Antenna Diversity Supported :	No
Desktop Charger :	No

*This PCBA 4827644 is BLE module in 4827610-B

Description of Test Item

The Bluetooth Low Energy Module is located on PCB 1104, and is controlled by the main microcontroller located on PCB 1101, both located inside the LCU 5350.

A chip antenna is also located on the PCB 1104. This module will communicate with a BLE enabled Mobile phone held in front of the unit

Theory of Operation

The module follows the Bluetooth specification 4-0, operating in the 2.4GHz band. The module is designed using the nRF51822 system on chip from Nordic Semiconductor.

This system on chip contains a microcontroller, memory and embedded 2.4GHz transceiver supporting BLE. The transceiver's oscillator is controlled by a 16MHz crystal.

1.2 Normal test conditions

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	4.5 V dc(3x1.5Vdc AA batteries)

The values are the limit registered during the test period. All tests were performed with fully charged batteries.

1.3 Test Engineer(s)

G.Suhandhakumar

1.4 Description of modification for Modification Filing

Not applicable.

1.5 Family List Rational

Not Applicable.

1.6 Comments

And the output level is set to maximum in the software.

The radiated measurements are tested on three axis.

Two fully charged primary batteries are used.

All ports were populated during spurious emission measurements.

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)	NA ²
Number of Operating Frequencies	15.31(m)	5.1 (6) (RSS-247)	N/A
Antenna Requirement	15.203	8.3 (RSS-GEN)	Complies ¹
Power Line Conducted Emission	15.107(a) 15.207(a)	8.8 (RSS-GEN)	NA ²
Channel Separation	15.247(a)(1)	5.1 (4) (RSS-247)	N/A
Pseudorandom Hopping Algorithm	15.247(a)(1)	5.1 (3) (RSS-247)	N/A
Time of Occupancy	15.247(a)(1)(iii)	5.1 (5) (RSS-247)	N/A
Occupied Bandwidth	15.247(a)(1)	5.1 (7) (RSS-247)	Complies
Occupied Bandwidth	N/A	6.6 (RSS-GEN)	
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 ¹
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

¹ The tested equipment has integrated antennas only

² EUT is battery powered

3 TEST RESULTS

3.1 Occupied Bandwidth

Para. No.: RSS-Gen

Test Performed By: G.Suhanthakumar

Date of Test: 2016-07-02

Test Results: Complies

Measurement Data:

OBW (MHz)
2440MHz
1.04

Requirements:

For information only



MARKER 1

2.439991987 GHz

Ref 10 dBm

* Att 10 dB

* RBW 100 kHz

VBW 300 kHz

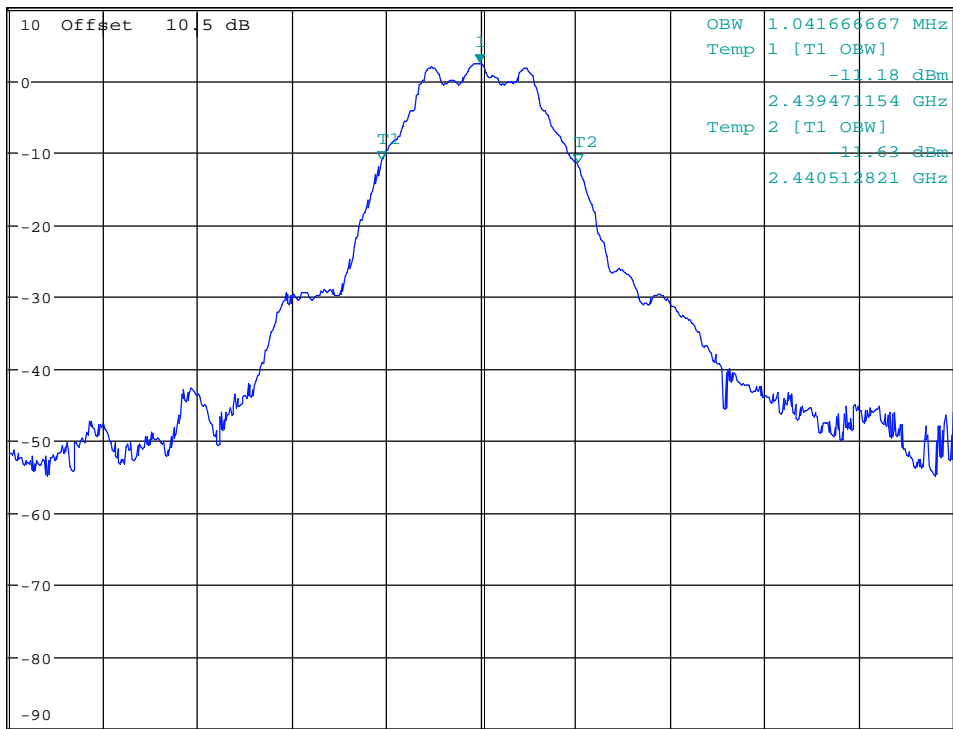
SWT 2.5 ms

Marker 1 [T1]

2.40 dBm

2.439991987 GHz

1 PK
MAXH



Center 2.44 GHz

500 kHz/

Span 5 MHz

Date: 2.JUL.2016 12:43:22

3.3 Minimum 6 dB Bandwidth

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

Test Performed By: G.Suwanthakuar

Date of Test: 2016.07.02 &
2017.02.08

Test Results: Complies

Measurement Data:

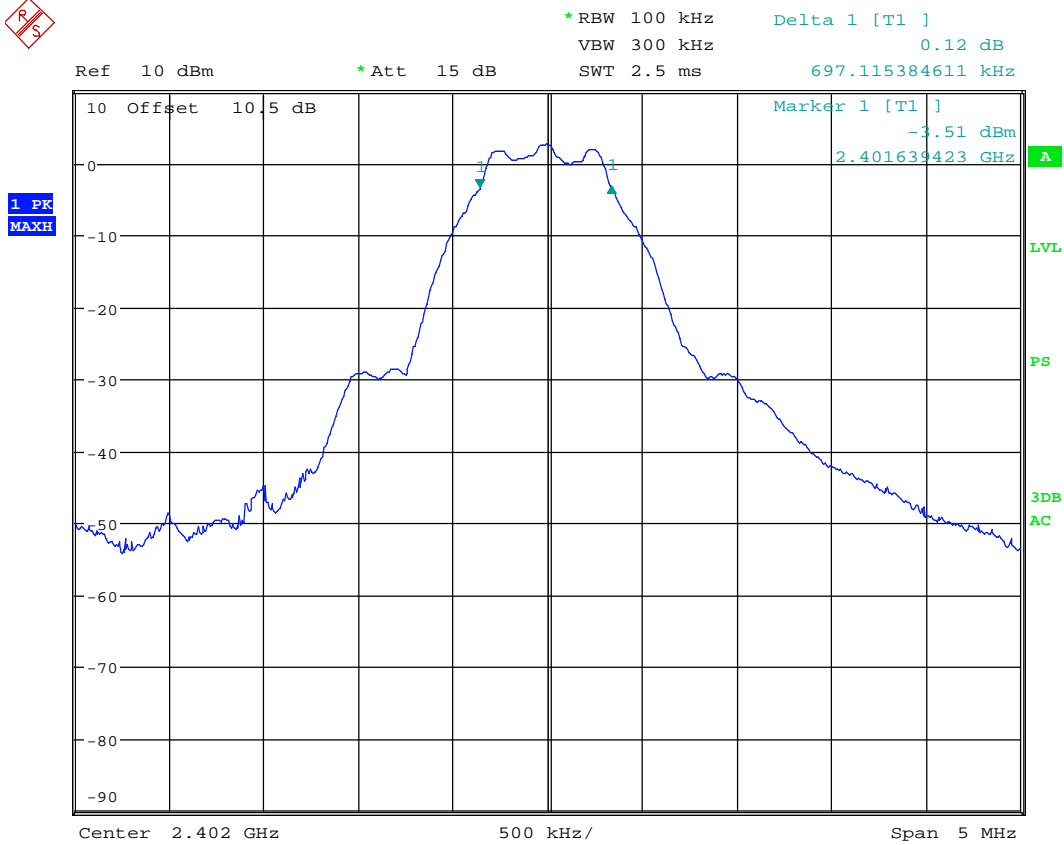
Measured 6 dB Bandwidth (kHz)		
2402 MHz, Ch 0	2440 MHz, Ch 19	2480 MHz, Ch 39
697.12	681.1	657.1

Fully charged battery is used

Requirements:

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

No requirements for Frequency Hopping Systems.



Date: 8.FEB.2017 08:42:31

Ch2402MHz, 6 dB BW



Date: 2.JUL.2016 12:44:22

Ch2440MHz, 6 dB BW



Date: 2.JUL.2016 12:45:33

Ch2480MHz, 6 dB BW

3.4 Peak Power Output

Para. No.: 15.247 (b)

Test Performed By: G.Suwanthakuar

Date of Test: 2016.06.27 – 2016.07.02
& 2017.02.08

Test Results: Complies

Measurement Data:

RF channel	2402 MHz	2440 MHz	2480 MHz
Measured Maximum Field strength (dBμV/m) –VP	88.21	88.04	87.36
Calc. Radiated Power (dBm)	-7.02	-7.19	-7.87
Calc. Radiated Power (mW)	0.20	0.19	0.16
Measured Conducted Power (dBm)	2.84	2.65	2.60
Measured Conducted Power (mW)	1.92	1.84	1.82
Calculated Antenna Gain (dBi)	-9.90	-9.86	-10.5

Antenna gain = $10 \cdot \log(\text{EIRP}/\text{Conducted power})$ dBi

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

The maximum field strength is obtained in XY plane and Vertical polarization

See attached graph.

Detachable antenna?

☐ Yes ☒ No

If detachable, is the antenna connector non-standard?

☐ Yes ☐ No

Type of antenna connector: N/A

Requirements:

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

For frequency hopping systems employing at least 75 hopping channels: 1 Watt

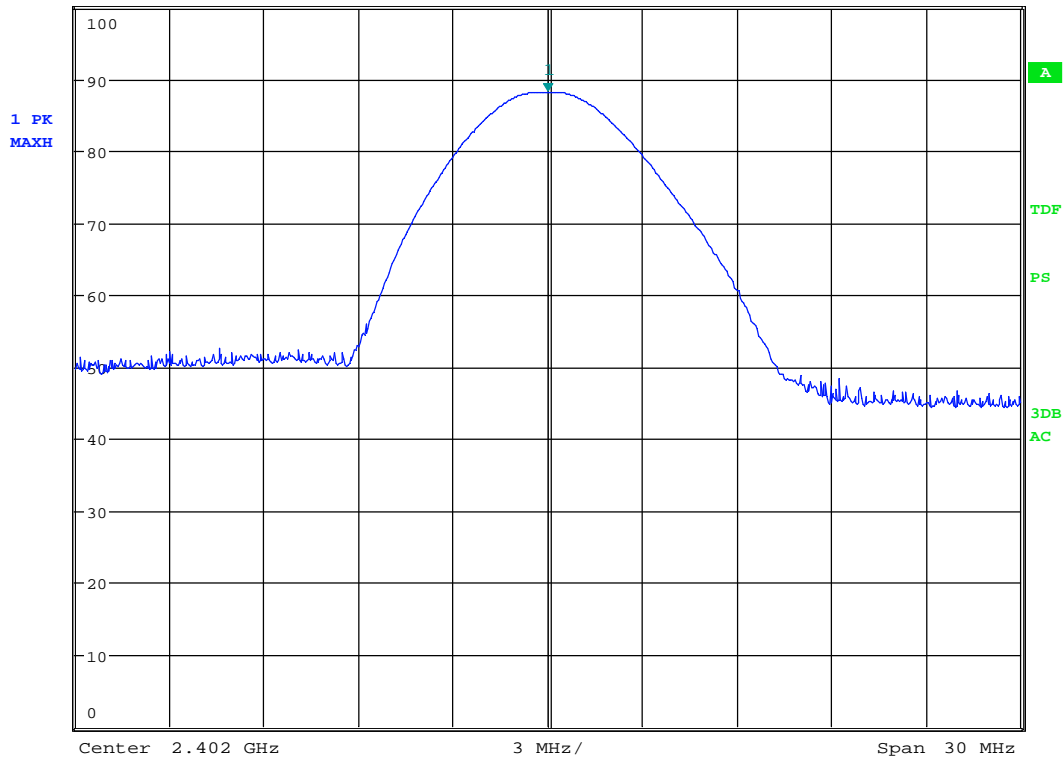
For all other frequency hopping systems in the 2400 - 2483.5 MHz band: 0.125 Watts

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.



MARKER 1
2.402 GHz
Ref 100 dBμV/m * Att 10 dB * RBW 3 MHz VBW 10 MHz SWT 2.5 ms
Marker 1 [T1] 88.21 dBμV/m 2.402000000 GHz



Date: 8.FEB.2017 07:48:28

Radiated Field strength, VP , 2402 MHz



MARKER 1

2.401951923 GHz

Ref 100 dBμV/m

* Att 10 dB

* RBW 3 MHz

VBW 10 MHz

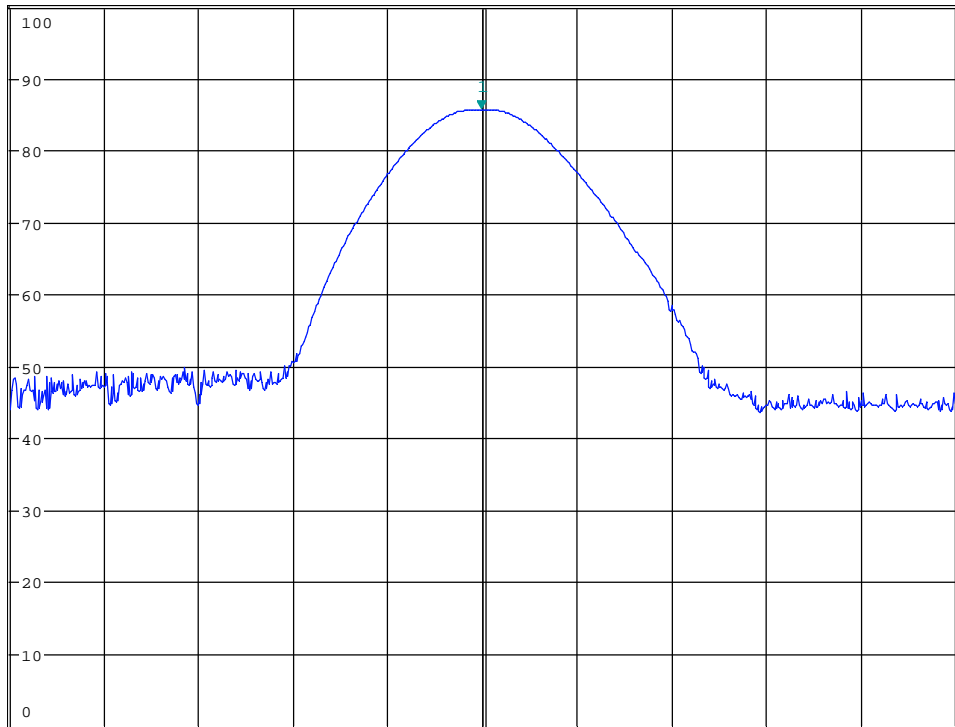
SWT 2.5 ms

Marker 1 [T1]

85.68 dBμV/m

2.401951923 GHz

1 PK
MAXH



Center 2.402 GHz

3 MHz/

Span 30 MHz

Date: 8.FEB.2017 07:51:21

Radiated field strength, HP, 2402 MHz



MARKER 1

2.439903846 GHz

* RBW 3 MHz

VBW 10 MHz

* SWT 200 ms

Marker 1 [T1]

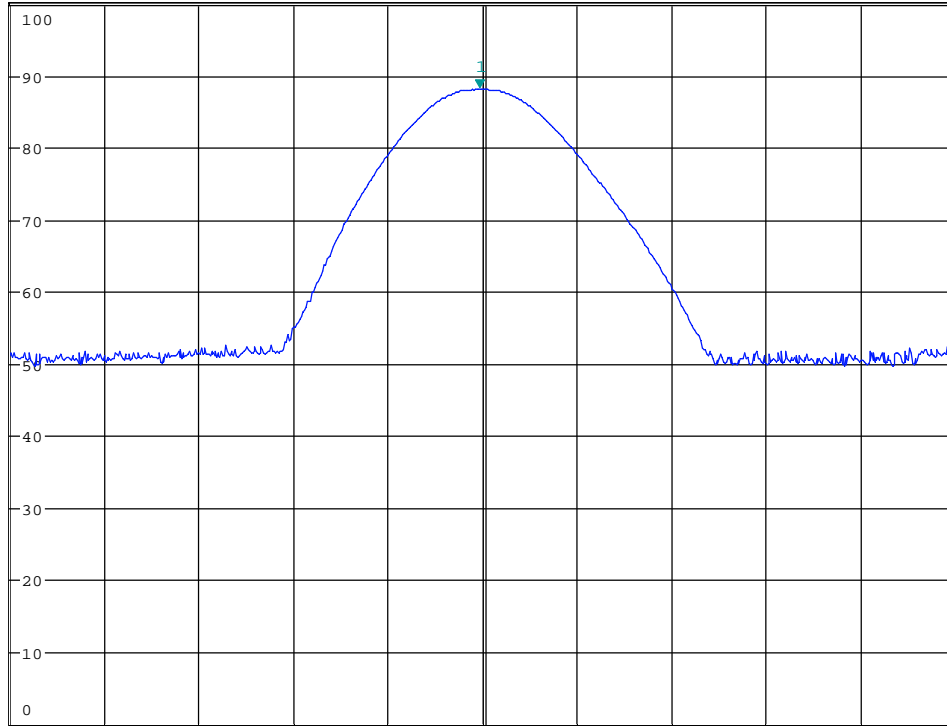
88.04 dBμV/m

2.439903846 GHz

Ref 100 dBμV/m

* Att 10 dB

1 PK
MAXH



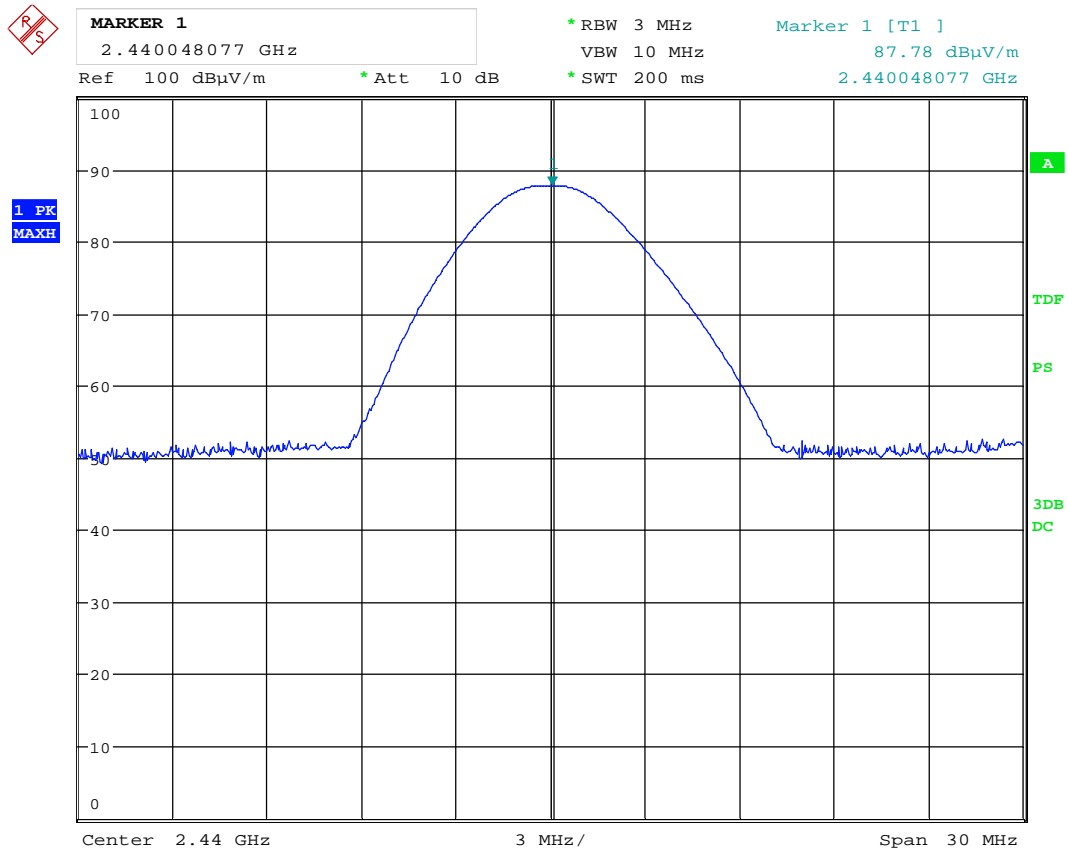
Center 2.44 GHz

3 MHz/

Span 30 MHz

Date: 27.JUN.2016 14:14:32

Radiated field strength, VP, 2440 MHz



Date: 27.JUN.2016 14:13:50

Radiated field strength, HP, 2440 MHz



MARKER 1

2.479711538 GHz

* RBW 3 MHz

VBW 10 MHz

* SWT 200 ms

Marker 1 [T1]

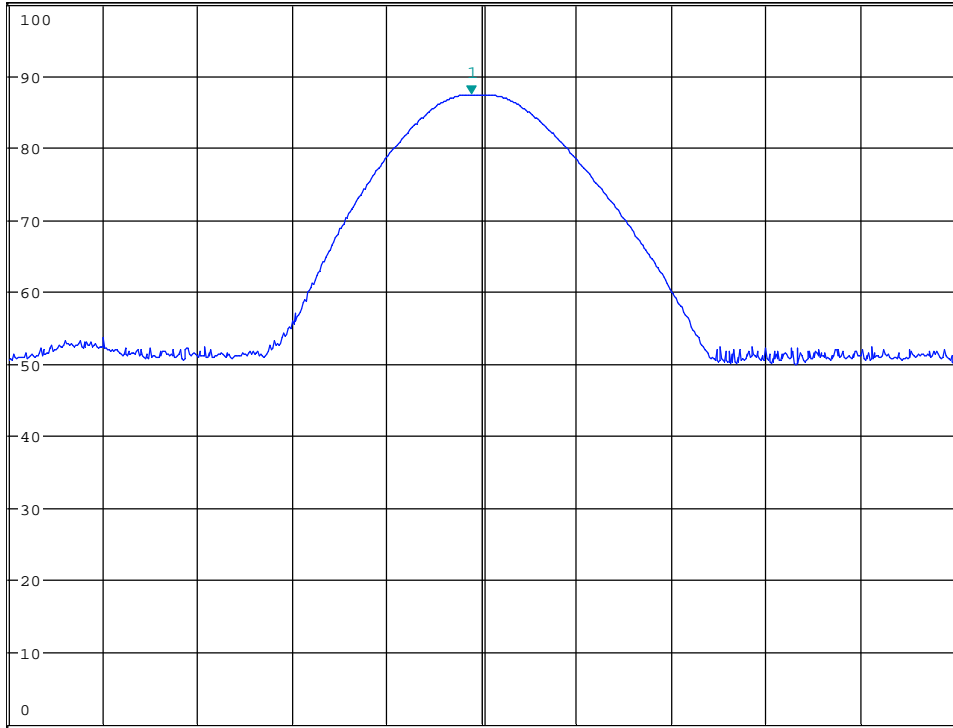
87.36 dBμV/m

2.479663462 GHz

Ref 100 dBμV/m

* Att 10 dB

1 PK
MAXH



Center 2.48 GHz

3 MHz/

Span 30 MHz

Date: 27.JUN.2016 14:06:57

Radiated field strength, VP, 2480 MHz



MARKER 1

2.479711538 GHz

*RBW 3 MHz

VBW 10 MHz

*SWT 200 ms

Marker 1 [T1]

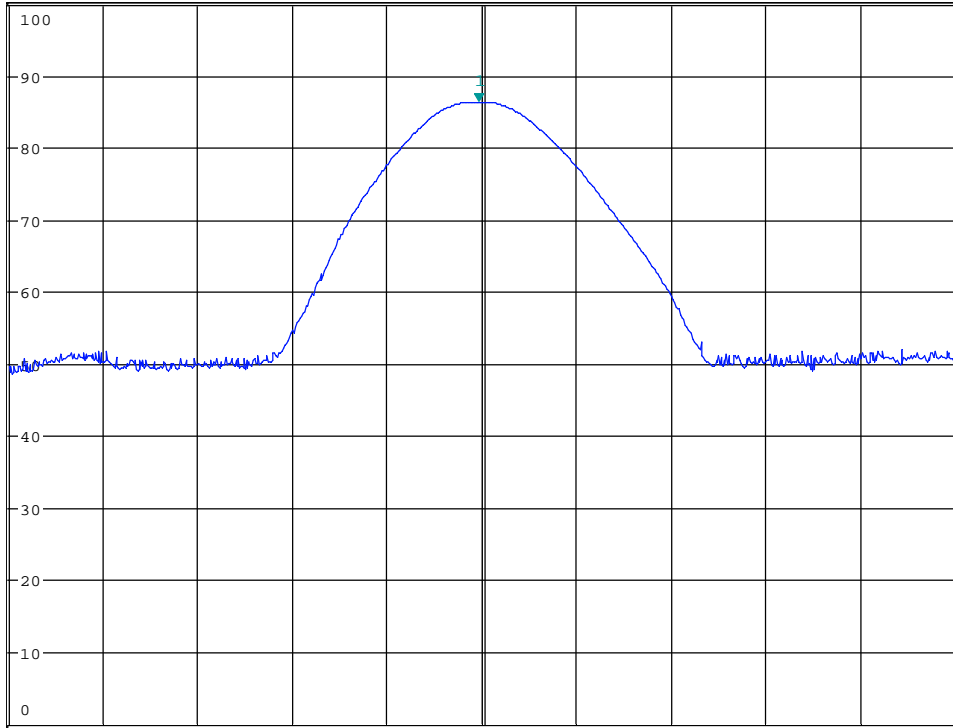
86.29 dBμV/m

2.479903846 GHz

Ref 100 dBμV/m

*Att 10 dB

1 PK
MAXH



Center 2.48 GHz

3 MHz/

Span 30 MHz

Date: 27.JUN.2016 14:06:02

Radiated field strength, HP, 2480 MHz



MARKER 1

2.401855769 GHz

*RBW 3 MHz

VBW 10 MHz

SWT 2.5 ms

Marker 1 [T1]

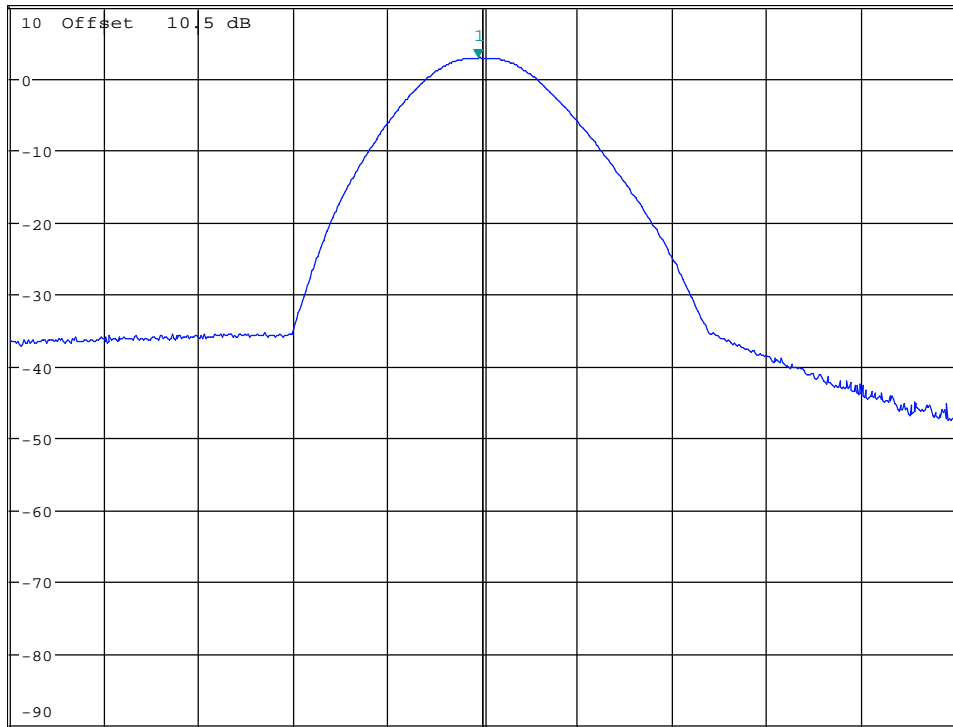
2.84 dBm

2.401855769 GHz

Ref 10 dBm

*Att 15 dB

1 PK
MAXH



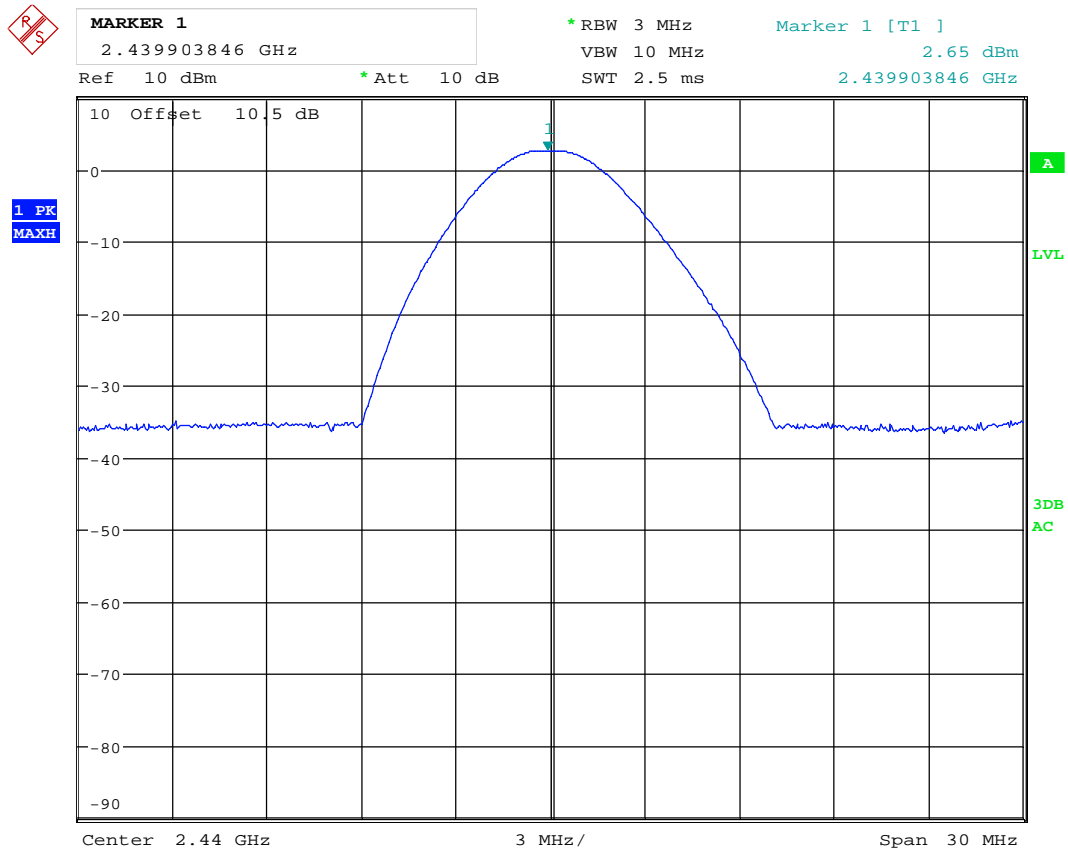
Center 2.402 GHz

3 MHz/

Span 30 MHz

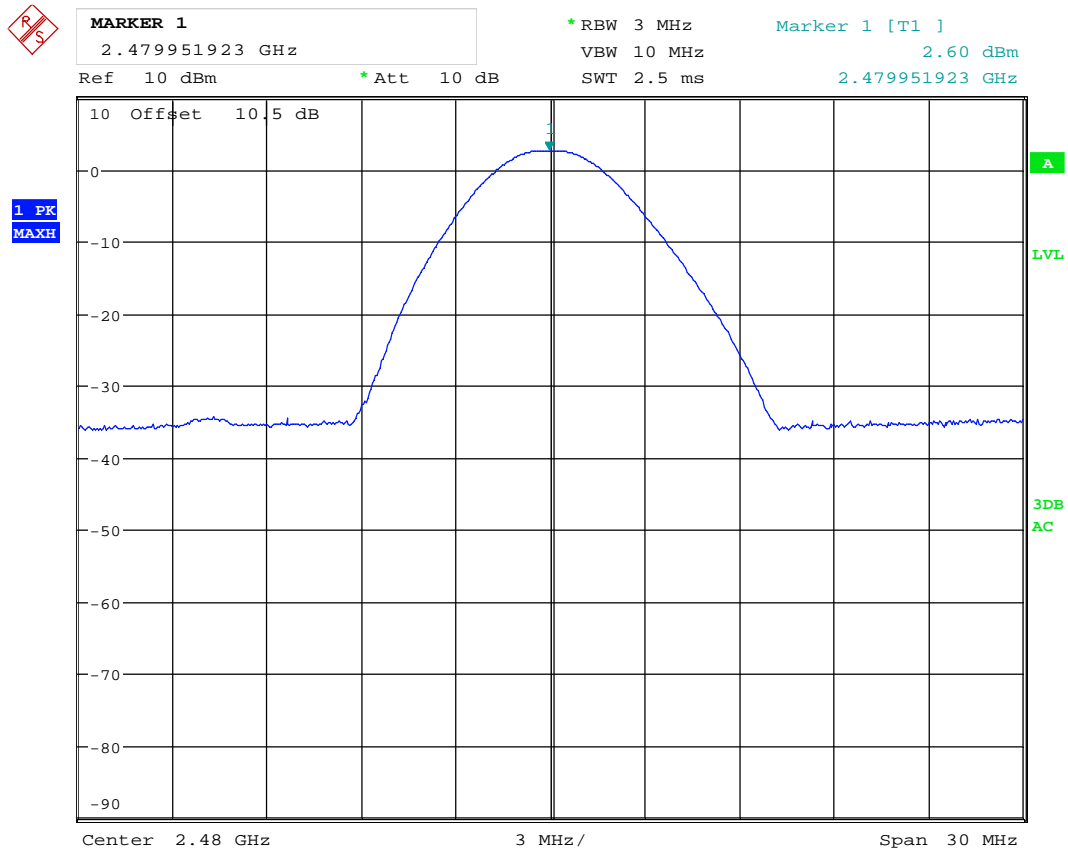
Date: 8.FEB.2017 08:36:27

Conducted power – 2402MHz



Date: 2.JUL.2016 12:42:55

Conducted power – 2440MHz



Date: 2.JUL.2016 12:46:28

Conducted power – 2480MHz

3.5 Spurious Emissions (Radiated)

Para. No.: 15.247 (c)

Test Performed By: G.Suwanthakuar

Date of Test: 2016.06.27 – 2016.07.14
and 2017.02.08

Test Results: Complies

Band-edge, @3m

Frequency	Measured Field Strength @3m, dBμV/m	Detector	Limit dBμV/m	Margin dB
2.377 GHz	50.1	PK	74	23.9
	30.1	AV	54	23.9
2.4835 GHz	50.8	PK	74	23.2
	30.8	AV	54	23.2

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

Duty Cycle Correction Factor Calculation:

Duty Cycle = On Time / (Period * Number of Channels) = 213 μs / (628 μs * 39) = 0.0087

Duty Cycle Correction factor = -20 x log (Duty Cycle) = 41.2 dB

Maximum allowed Duty Cycle Correction: 20 dB

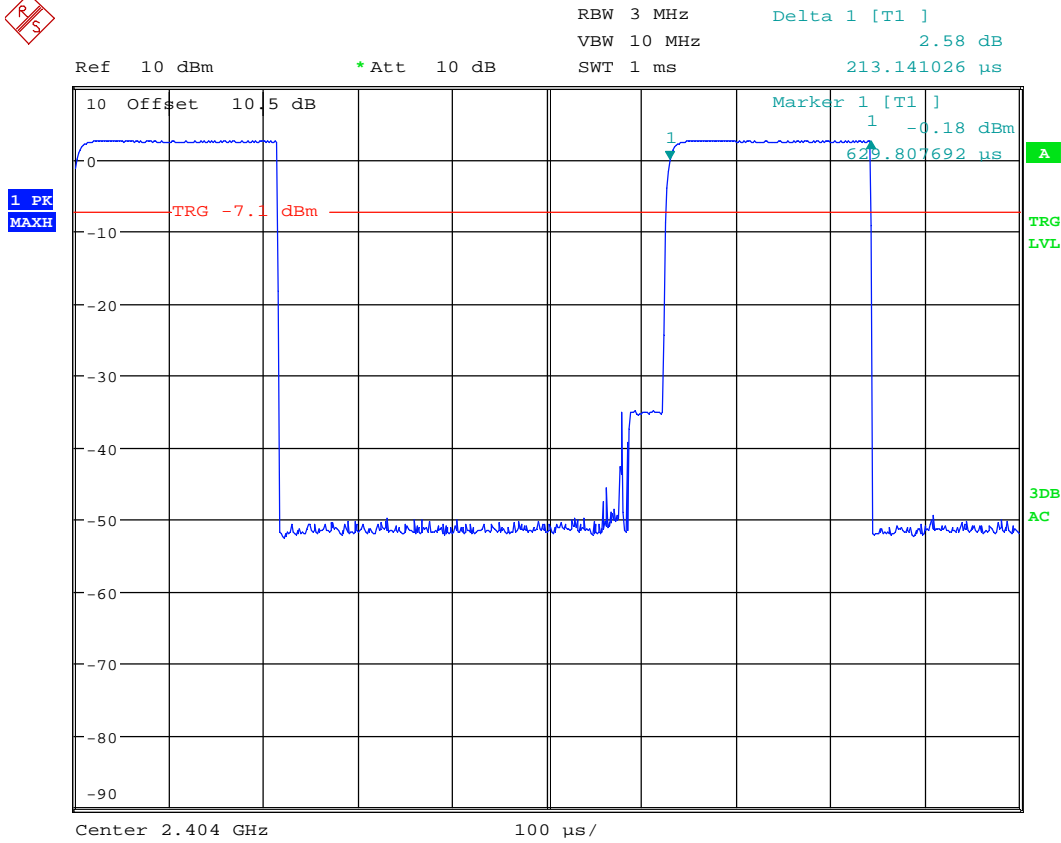
RF conducted power to 25 GHz see attached graph.

Maximum RF level outside operating band:

RF ch 01: 56 dB/C, margin >30 dB

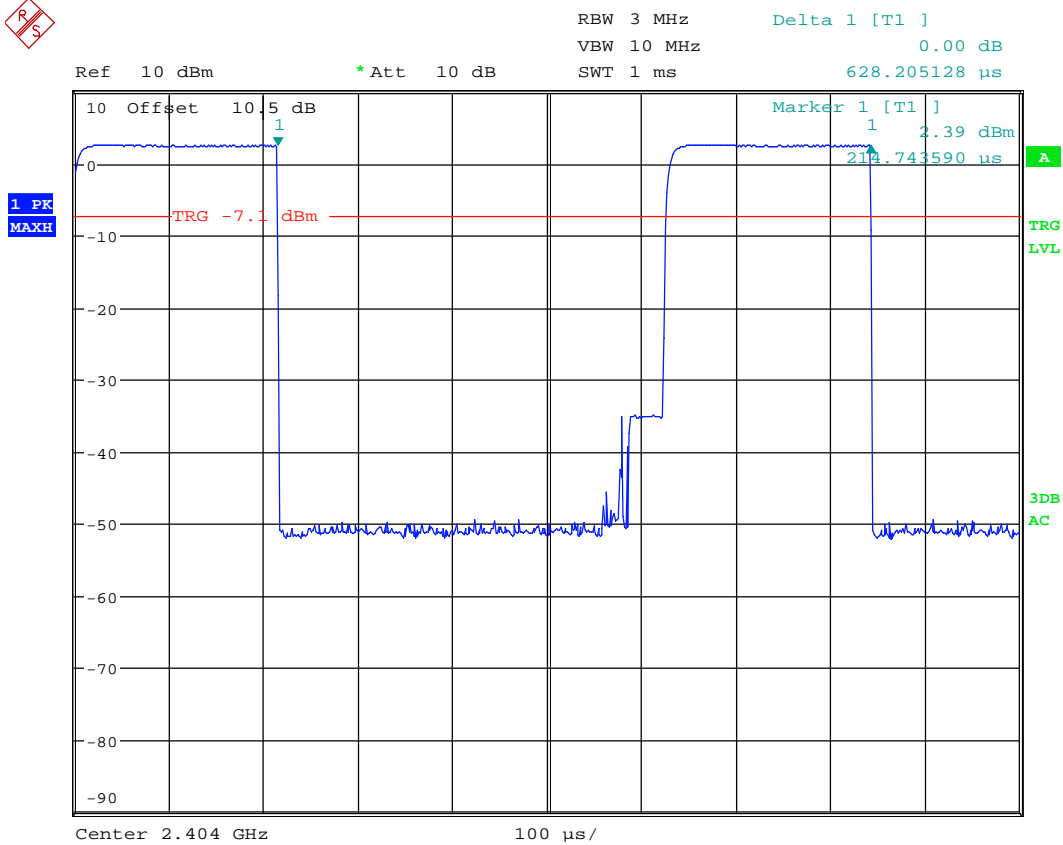
RF ch 19: 53 dB/C, margin >30 dB

RF ch 39: 55 dB/C, margin >30 dB



Date: 2.JUL.2016 12:50:30

ON time



Date: 2.JUL.2016 12:50:57

ON plus OFF time



MARKER 1

2.39 GHz

Ref 100 dBμV/m

*Att 10 dB

*RBW 1 MHz

VBW 3 MHz

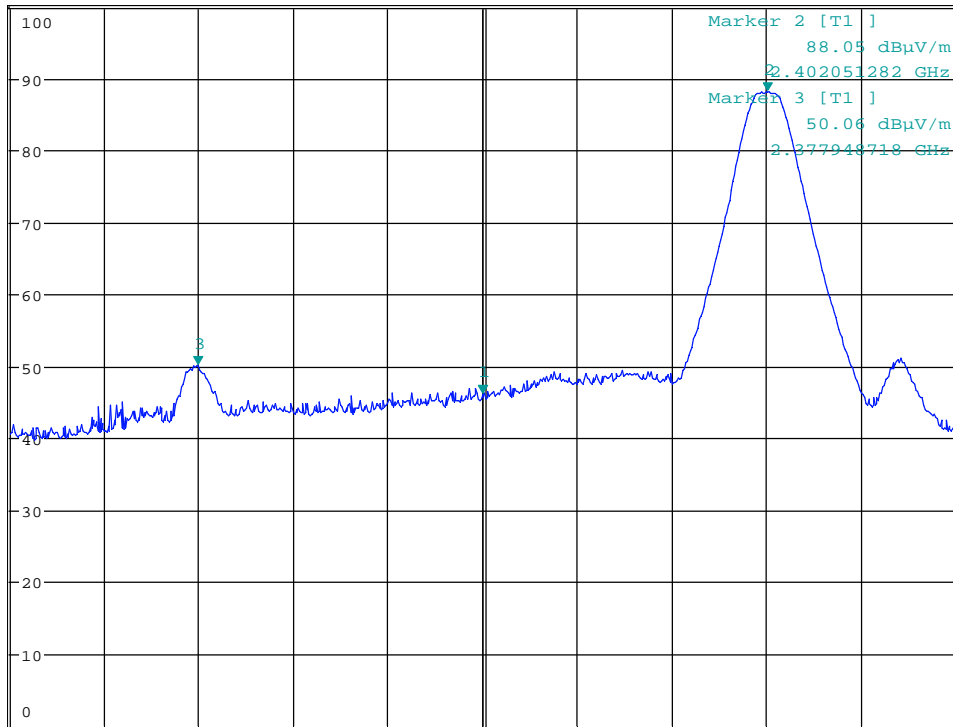
SWT 2.5 ms

Marker 1 [T1]

46.20 dBμV/m

2.390000000 GHz

1 PK
MAXH



Center 2.39 GHz

4 MHz/

Span 40 MHz

Date: 8.FEB.2017 07:56:15

Band Edge, 2390 MHz, Peak Detector



MARKER 2

2.479717949 GHz

Ref 100 dBμV/m

* Att 10 dB

* RBW 1 MHz

VBW 3 MHz

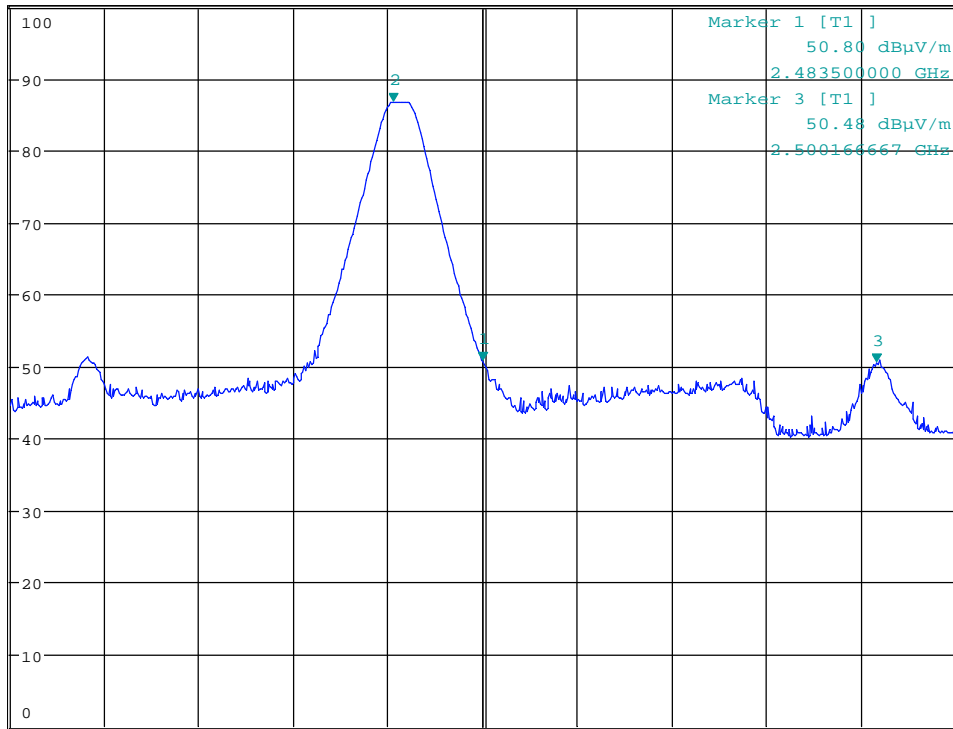
SWT 2.5 ms

Marker 2 [T1]

86.73 dBμV/m

2.479717949 GHz

1 PK
MAXH



Center 2.4835 GHz

4 MHz/

Span 40 MHz

Date: 13.JUL.2016 21:26:05

Band Edge, 2483.5 MHz, Peak Detector



MARKER 2

9.589647436 GHz

Ref 10 dBm

*Att 15 dB

*RBW 100 kHz

VBW 300 kHz

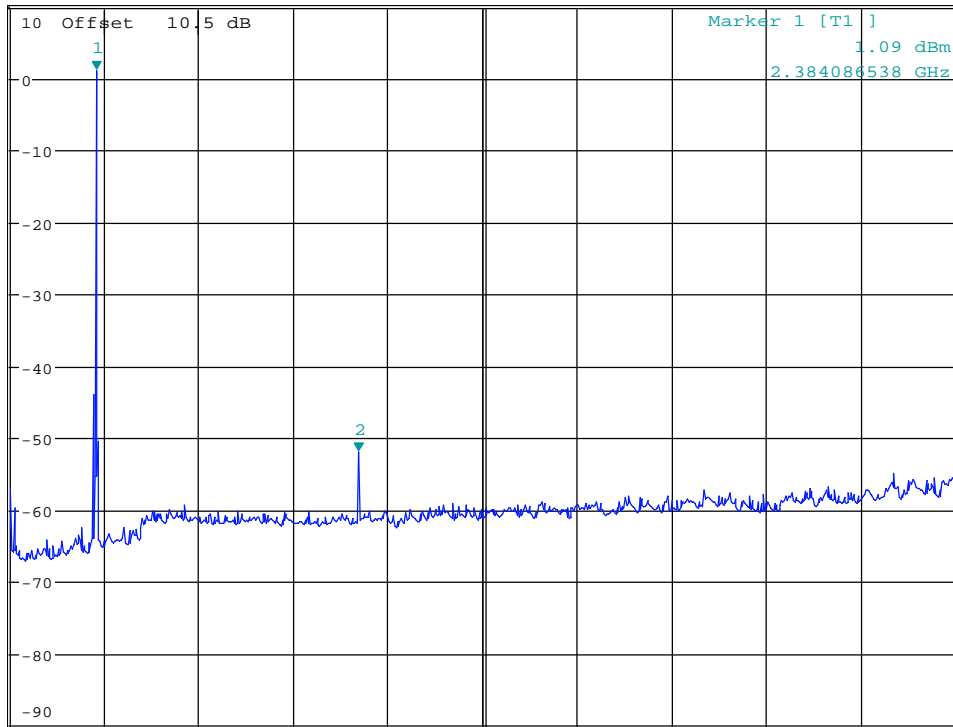
SWT 2.6 s

Marker 2 [T1]

-51.81 dBm

9.589647436 GHz

1 PK
MAXH



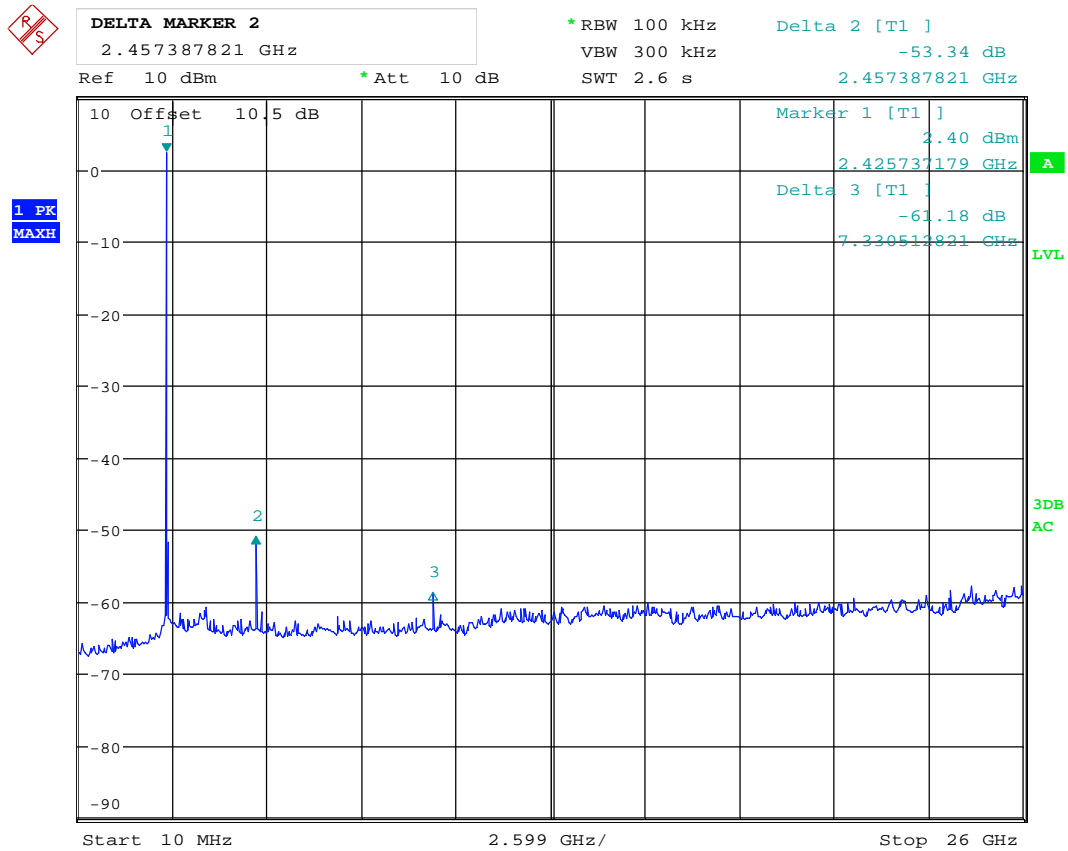
Start 10 MHz

2.599 GHz/

Stop 26 GHz

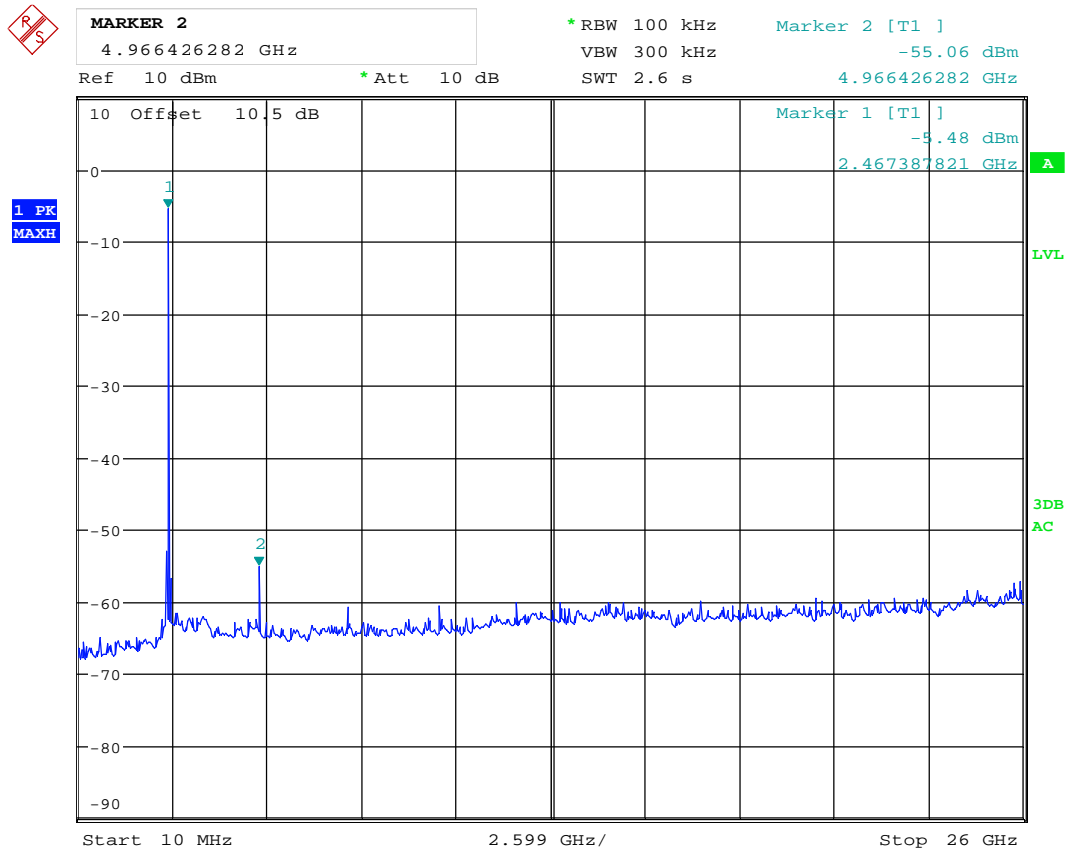
Date: 8.FEB.2017 08:40:35

Conductd spurious emission 10MHz – 25GHz - ch2402MHz



Date: 2.JUL.2016 12:42:08

Conductd spurious emission 10MHz – 25GHz - ch2440MHz



Date: 2.JUL.2016 12:47:12

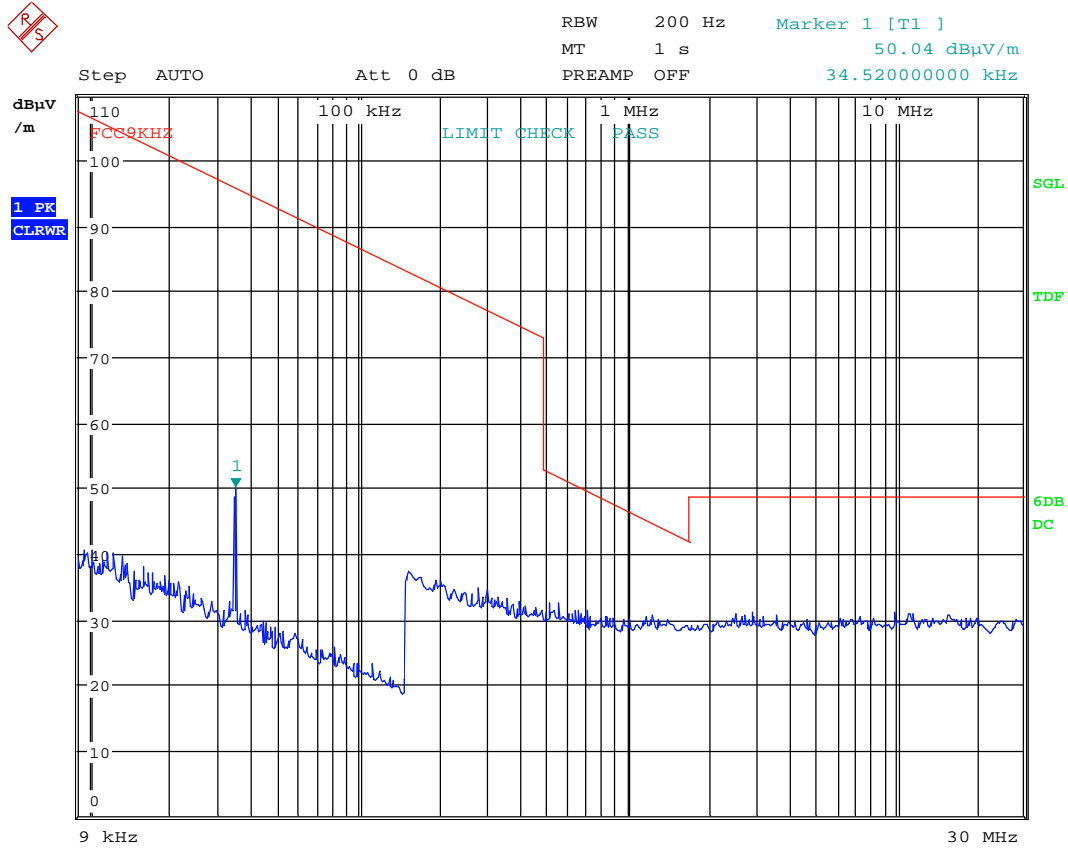
Conducted spurious emission 10MHz – 25GHz - ch2480MHz

Radiated emissions 10 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: 13.JUL.2016 21:50:28

Radiated Emissions, 9 kHz – 30 MHz @10m

Radiated emission 30 – 1000 MHz.

Detector: Quasi-Peak

Measuring distance 3 .

Frequency	Operational condition	Detector	Field strength	Measuring distance	Limit FCC15.209	Margin
MHz			dB μ V/m	metres	dB μ V/m	dB
/	TX on	PK	/	3	40.0	/

See attached graphs.



MARKER 1

198.6378205 MHz

*RBW 100 kHz

Marker 1 [T1]

VBW 300 kHz

5.98 dBμV/m

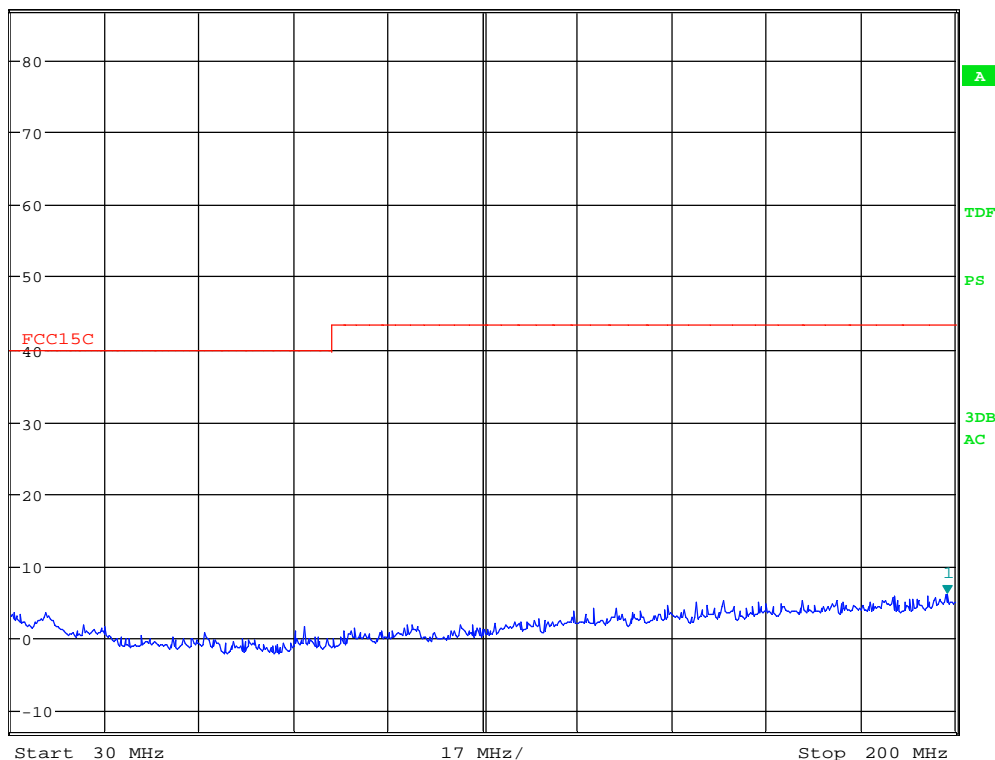
Ref 87 dBμV/m

*Att 10 dB

SWT 20 ms

198.637820513 MHz

1 PK
MAXH



Date: 27.JUN.2016 17:11:26

Radiated Emissions, 30 – 200 MHz, VP, @3m, PK scan



MARKER 1

197.5480769 MHz

*RBW 100 kHz

Marker 1 [T1]

VBW 300 kHz

6.56 dBμV/m

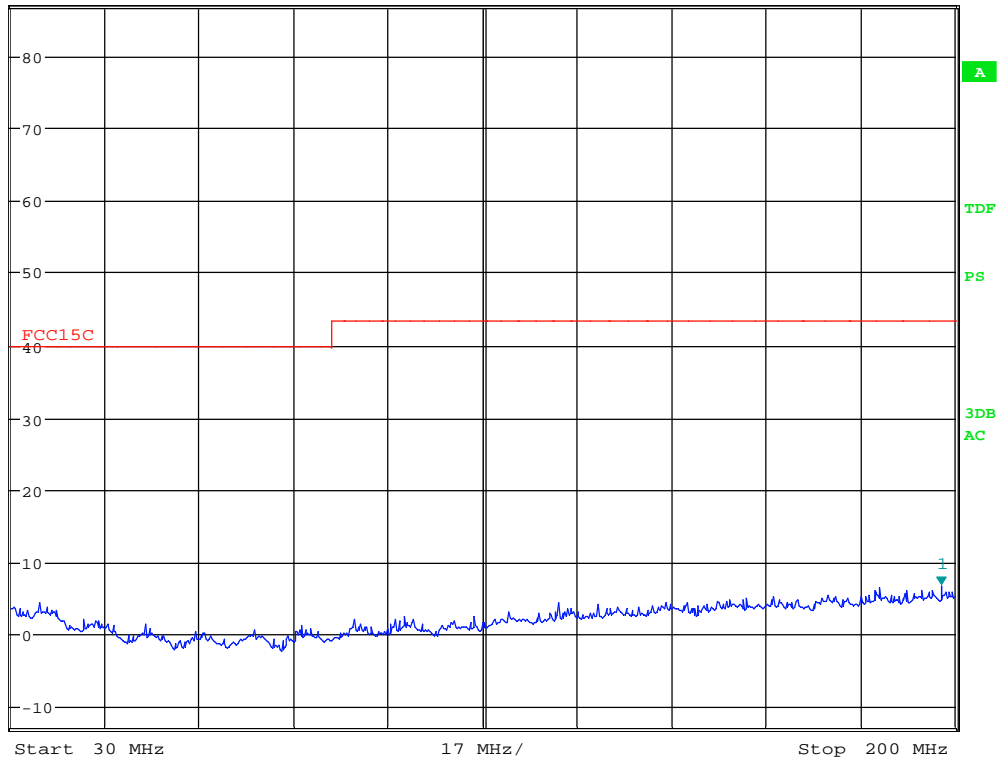
Ref 87 dBμV/m

*Att 10 dB

SWT 20 ms

197.548076923 MHz

1 PK
MAXH



Date: 27.JUN.2016 17:18:25

Radiated Emissions, 30 – 200 MHz, HP, @3m, PK scan



MARKER 1

997.4358974 MHz

*RBW 100 kHz

VBW 300 kHz

SWT 80 ms

Marker 1 [T1]

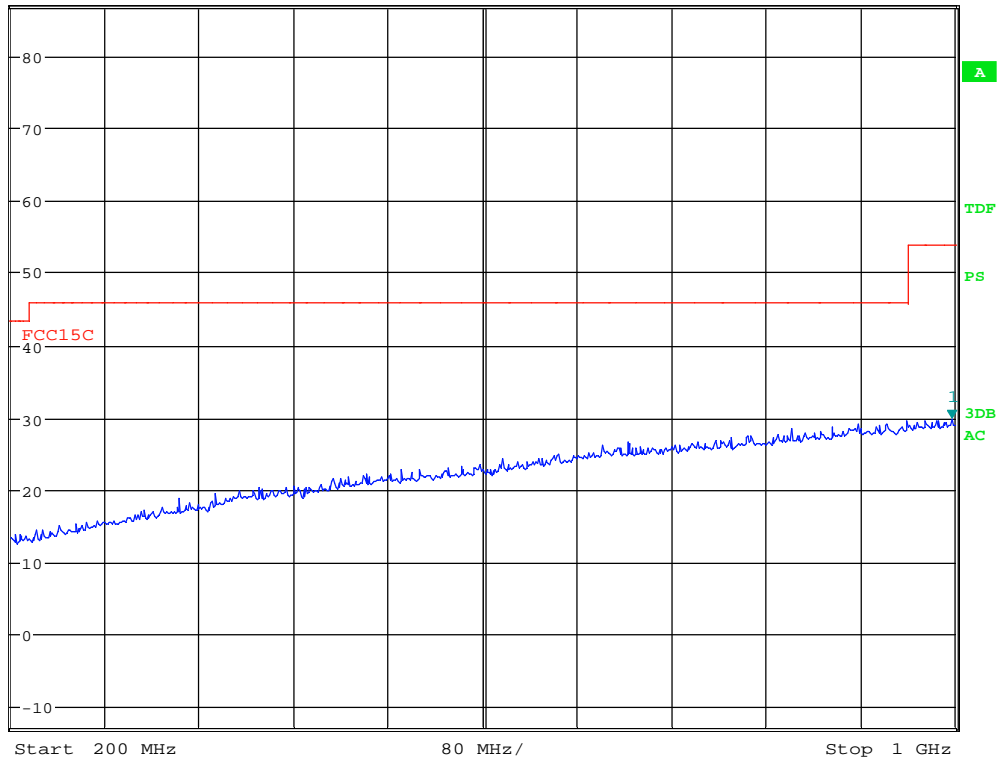
29.76 dBμV/m

997.435897436 MHz

Ref 87 dBμV/m

*Att 10 dB

1 PK
MAXH



Date: 27.JUN.2016 17:05:33

Radiated Emissions, 200 - 1000 MHz, VP , @3m, PK scan



MARKER 1

991.025641 MHz

*RBW 100 kHz

Marker 1 [T1]

VBW 300 kHz

29.03 dBμV/m

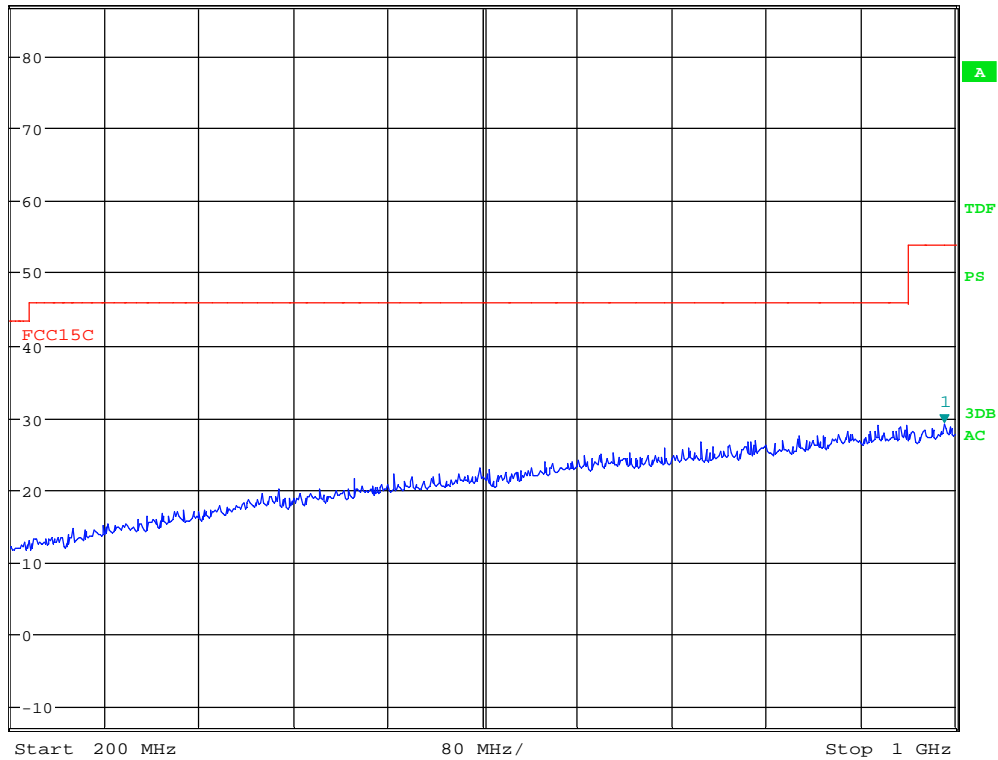
Ref 87 dBμV/m

*Att 10 dB

SWT 80 ms

991.025641026 MHz

1 PK
MAXH



Date: 27.JUN.2016 17:06:56

Radiated Emissions, 200 - 1000MHz, HP , @3m, PK scan

Radiated Emissions, 1-25 GHz

Measuring distance: 3m (1 – 8 GHz)
1m (8 – 18 GHz)

A pre-scan was performed above 18 GHz and no spurious emissions were detected.

Peak Detector:

Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector	Duty cycle corr. factor	Limit	Margin
GHz	L,M,H	dB	dB μ V/m	dB	dB μ V/m	dB
4.81	L	0	/	0	74	>20
4.88	M	0	49.3	0	74	>20
4.96	H	0	48.6	0	74	>20
7.215	L	*	/	0	74	>20
7.320	M	*	/	0	74	>20
7.440	H	*	54.89	0	74	19.11
Other freqs	L,M,H	/	< 54	0	74	>20

Average Detector:

Frequency	RF channel	Dist. corr. factor	Field strength, Average Detector	Duty cycle corr. factor	Limit	Margin
GHz	L,M,H	dB	dB μ V/m	dB	dB μ V/m	dB
4.81	L	0	/	0	54	>20
4.88	M	0	29.3	0	54	>20
4.96	H	0	28.6	0	54	>20
7.215	L	*	/	0	54	>20
7.320	M	*	/	0	54	>20
7.440	H	*	34.89	4.7	54	19.1
Other freqs	L,M,H	/	< 54	0	54	>20

*Average detector values are calculated from Peak values

Tested according to KDB 558074 D01 DTS Meas Guidance v03r04, Section 12.2.5.2

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

See plots.



MARKER 1

12.40100962 GHz

* RBW 1 MHz

Marker 1 [T1]

VBW 3 MHz

54.89 dBμV/m

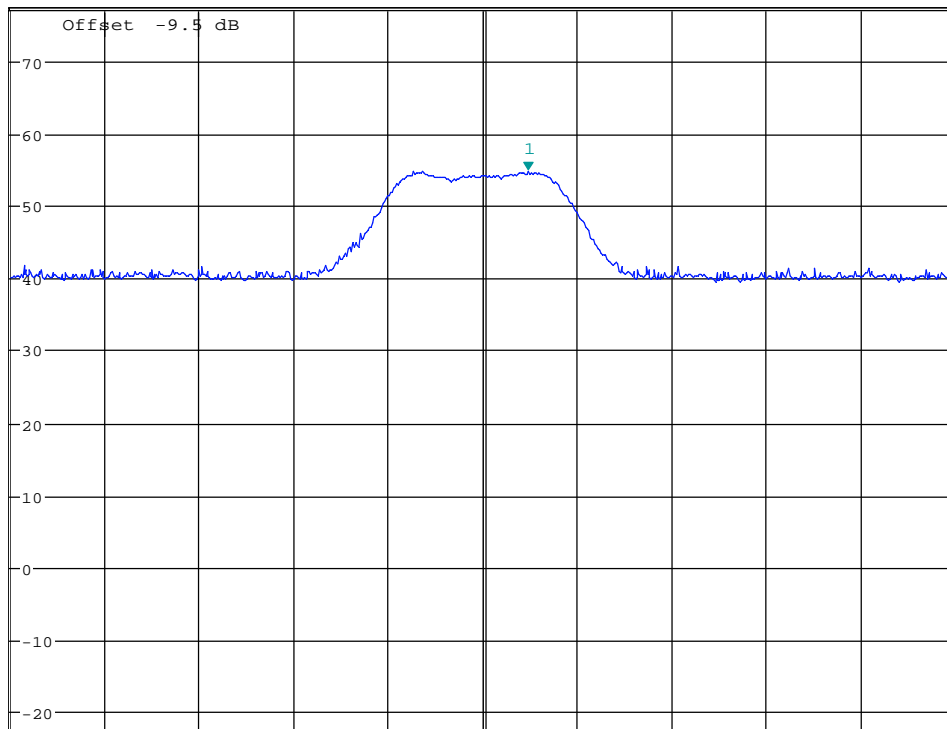
Ref 77.5 dBμV/m

* Att 10 dB

* SWT 200 ms

12.401009615 GHz

1 PK
MAXH



Center 12.40004808 GHz

2 MHz/

Span 20 MHz

Date: 2.JUL.2016 11:56:41

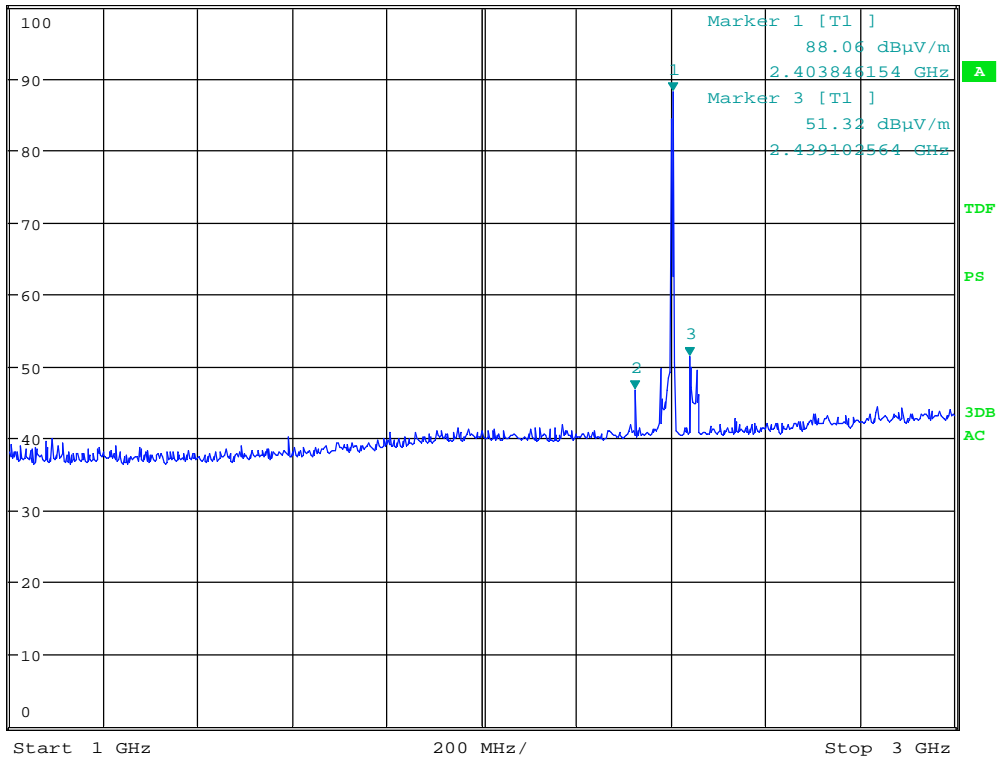
5th Harm, 2480MHz , HP @3m , PK detector



MARKER 2
2.323717949 GHz
Ref 100 dBuV/m * Att 10 dB

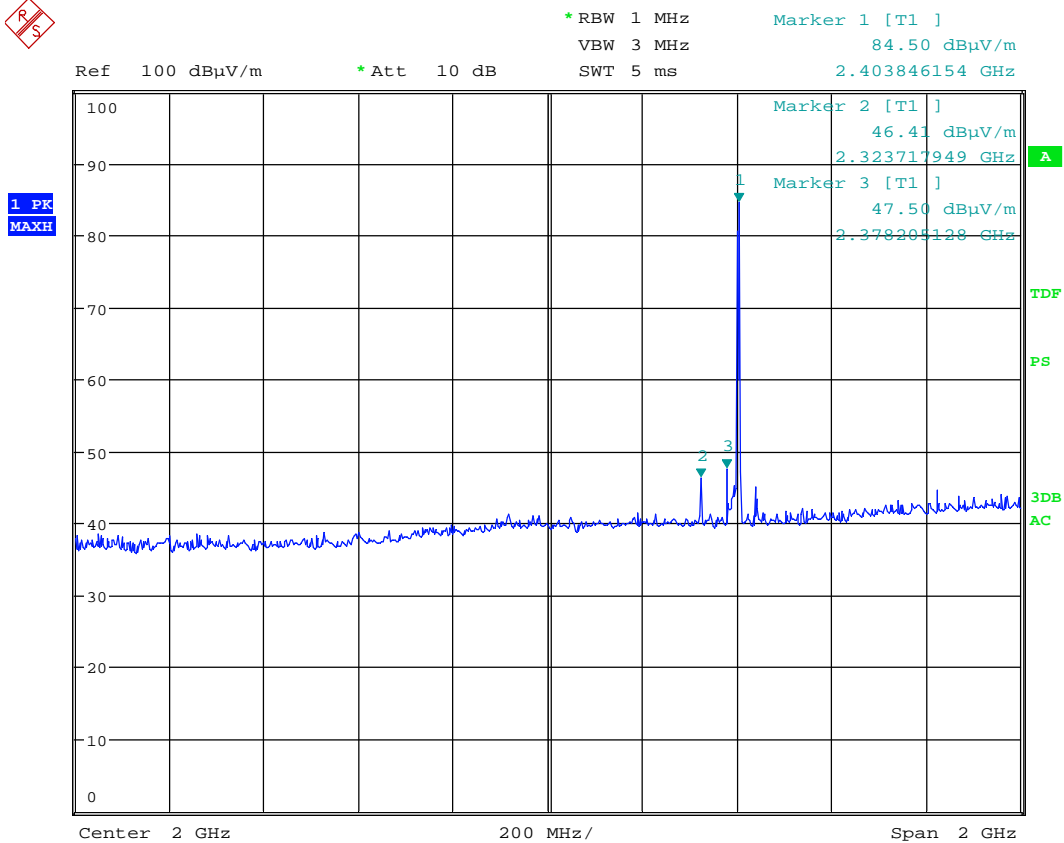
* RBW 1 MHz Marker 2 [T1]
VBW 3 MHz 46.78 dBuV/m
SWT 5 ms 2.323717949 GHz

1 PK
MAXH



Date: 8.FEB.2017 07:57:44

Radiated Emissions, 2402MHz, 1 – 3 GHz, VP, @3m – Pre-scan



Date: 8.FEB.2017 08:01:52

Radiated Emissions, 2402 MHz, 1 – 3 GHz, HP, @3m – Pre-scan



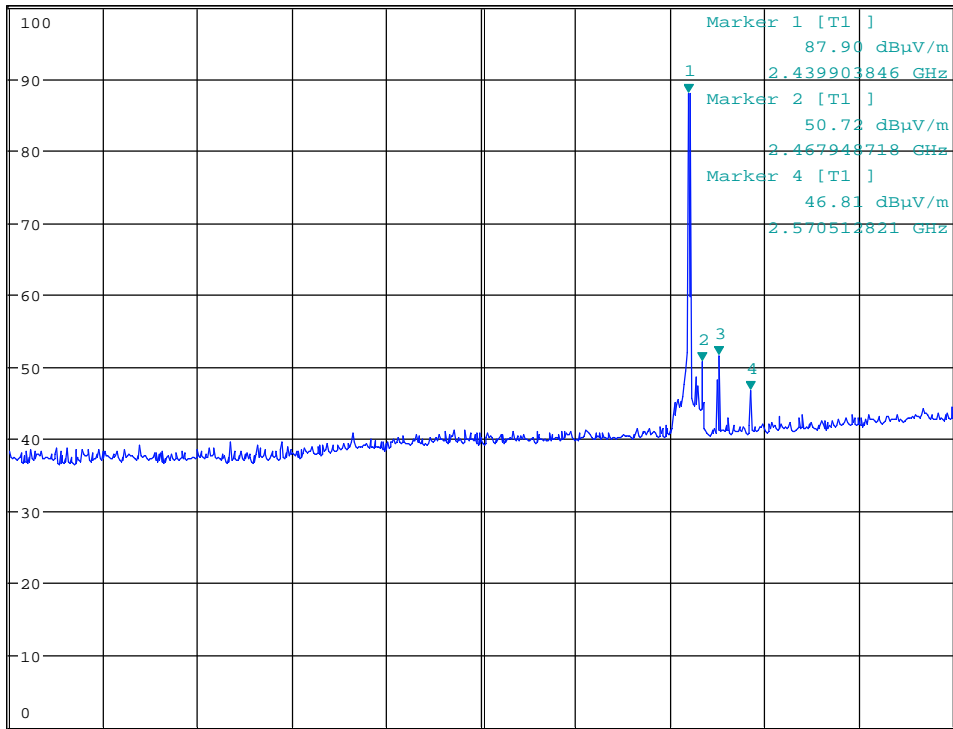
MARKER 3
2.503205128 GHz

Ref 100 dBμV/m * Att 10 dB

* RBW 1 MHz
VBW 3 MHz
* SWT 200 ms

Marker 3 [T1]
51.67 dBμV/m
2.503205128 GHz

1 PK
MAXH



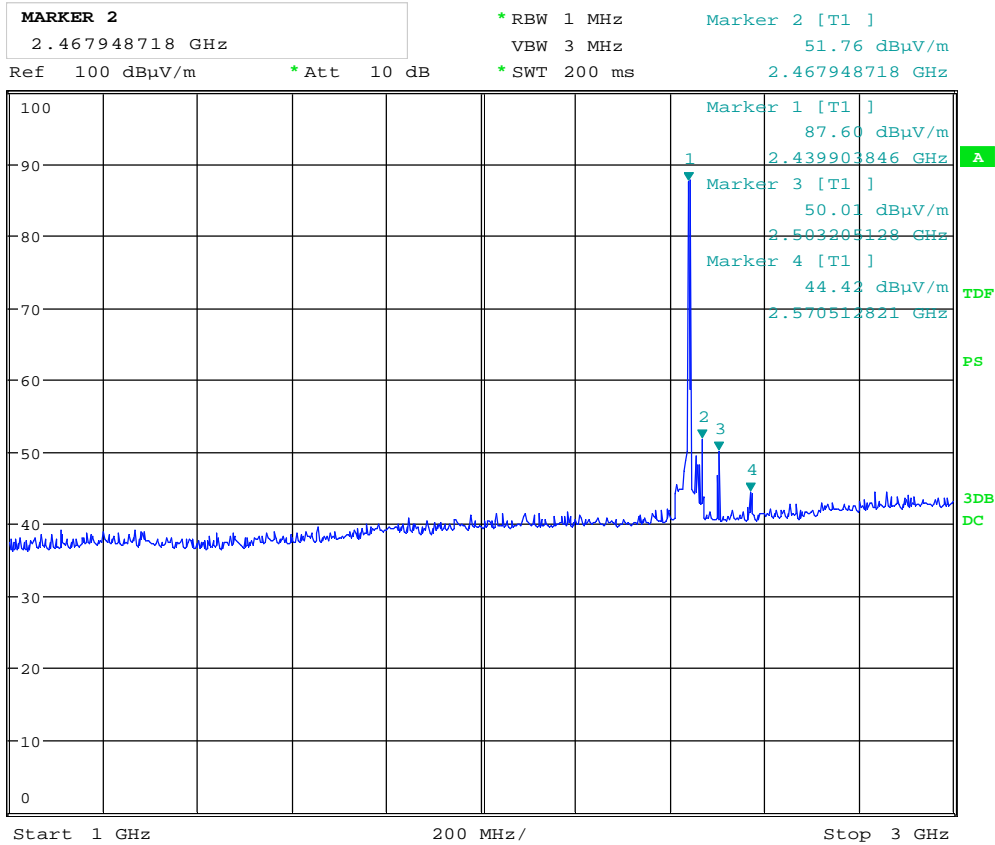
Start 1 GHz

200 MHz/

Stop 3 GHz

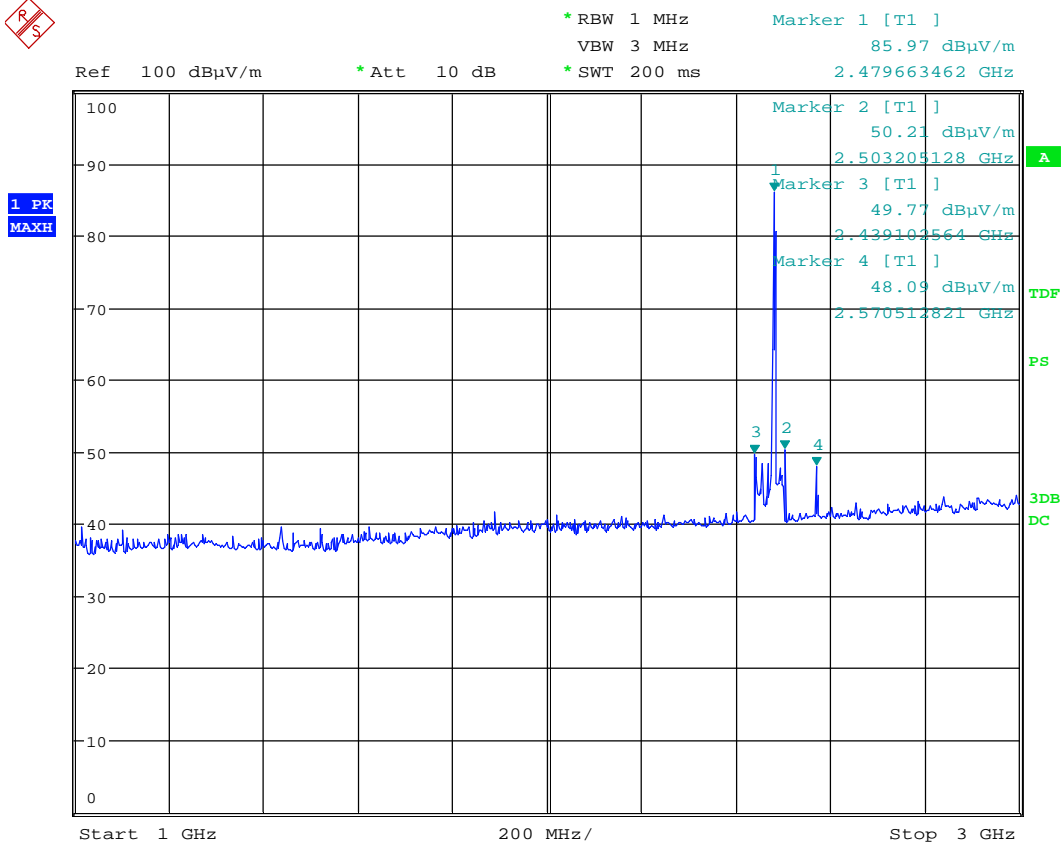
Date: 27.JUN.2016 14:15:45

Radiated Emissions ch. 2440 MHz, 1 – 3 GHz, VP, @3m – Pre-scan



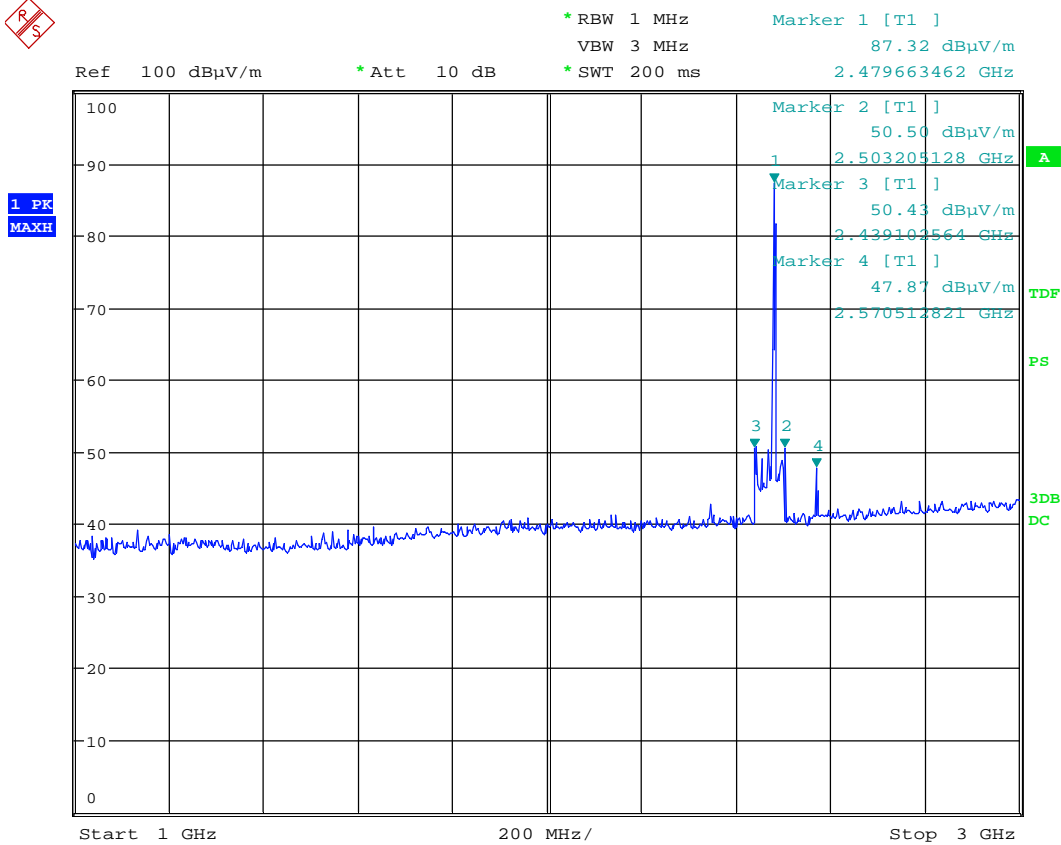
Date: 27.JUN.2016 14:16:25

Radiated Emissions ch. 2440 MHz, 1 – 3 GHz, HP, @3m – Pre-scan



Date: 27.JUN.2016 14:10:05

Radiated Emissions ch. 2480 MHz, 1 – 3 GHz, VP, @3m – Pre-scan

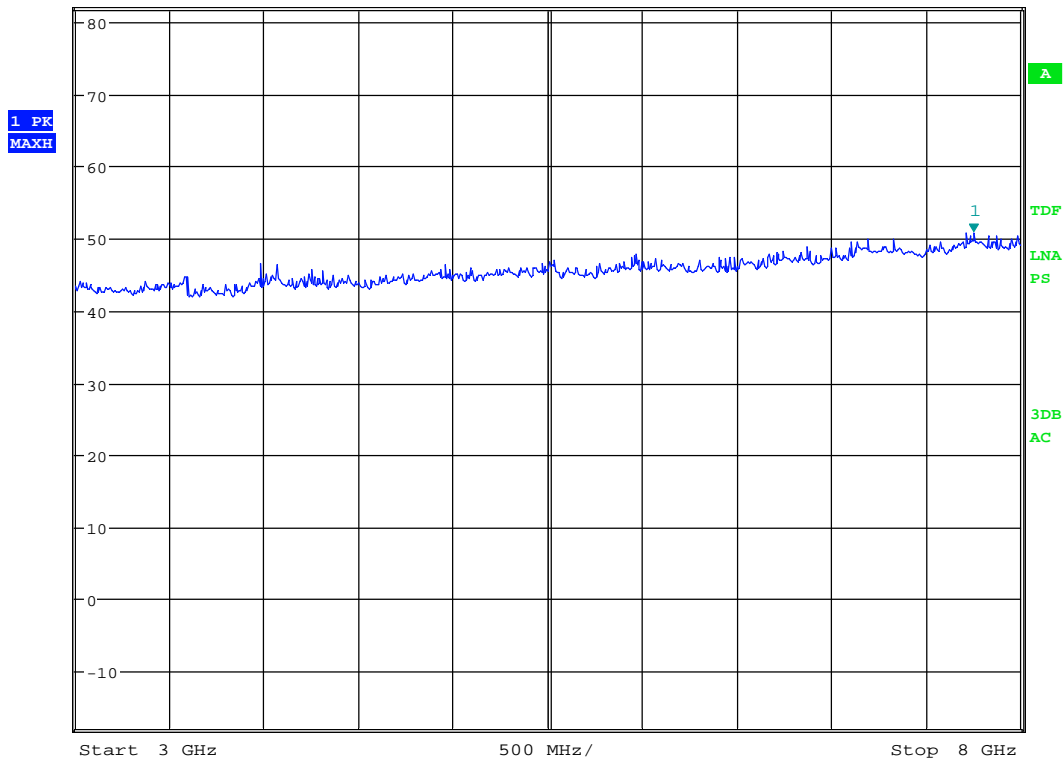


Date: 27.JUN.2016 14:09:17

Radiated Emissions ch. 2480 MHz, 1 – 3 GHz, HP, @3m – Pre-scan

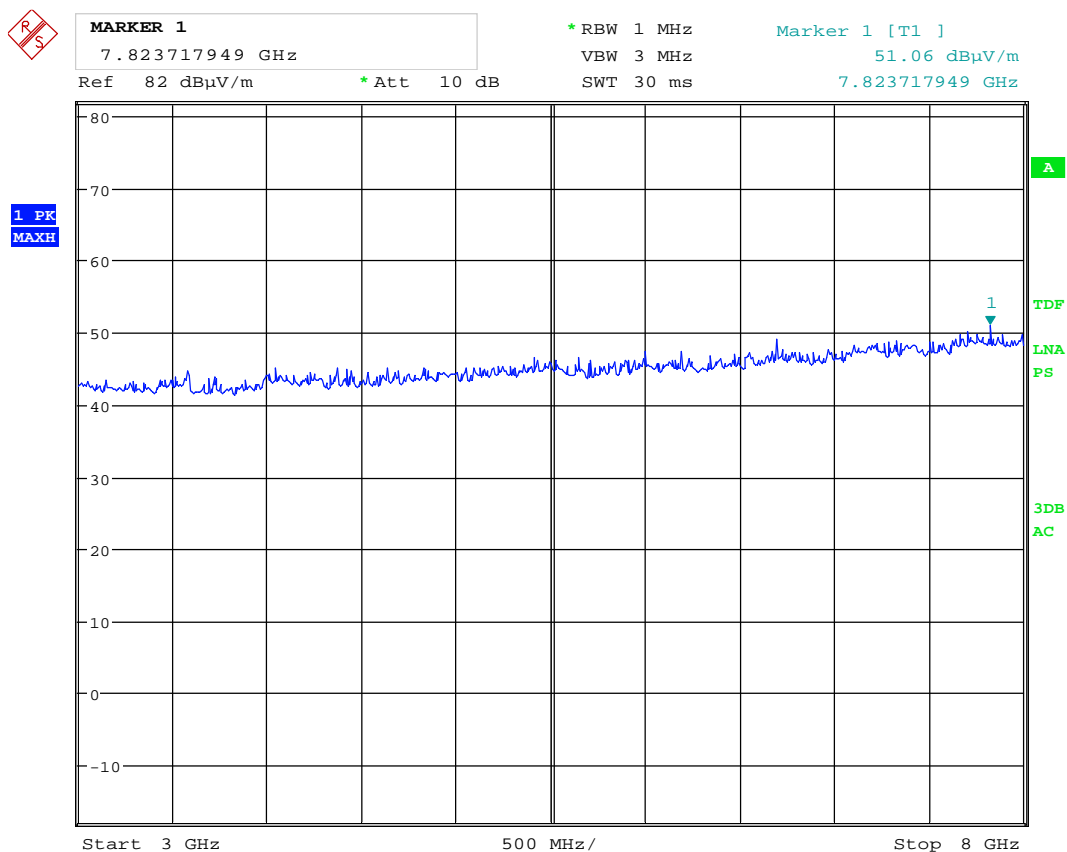


MARKER 1
7.751602564 GHz
Ref 82 dBμV/m * Att 10 dB * RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 50.76 dBμV/m
SWT 30 ms 7.751602564 GHz



Date: 8.FEB.2017 08:23:00

Radiated Emissions ch. 2402 MHz, 3 – 8 GHz, VP, @3m – Pre-scan



Date: 8.FEB.2017 08:23:44

Radiated Emissions ch. 2402 MHz, 3 – 8 GHz, HP, @3m – Pre-scan

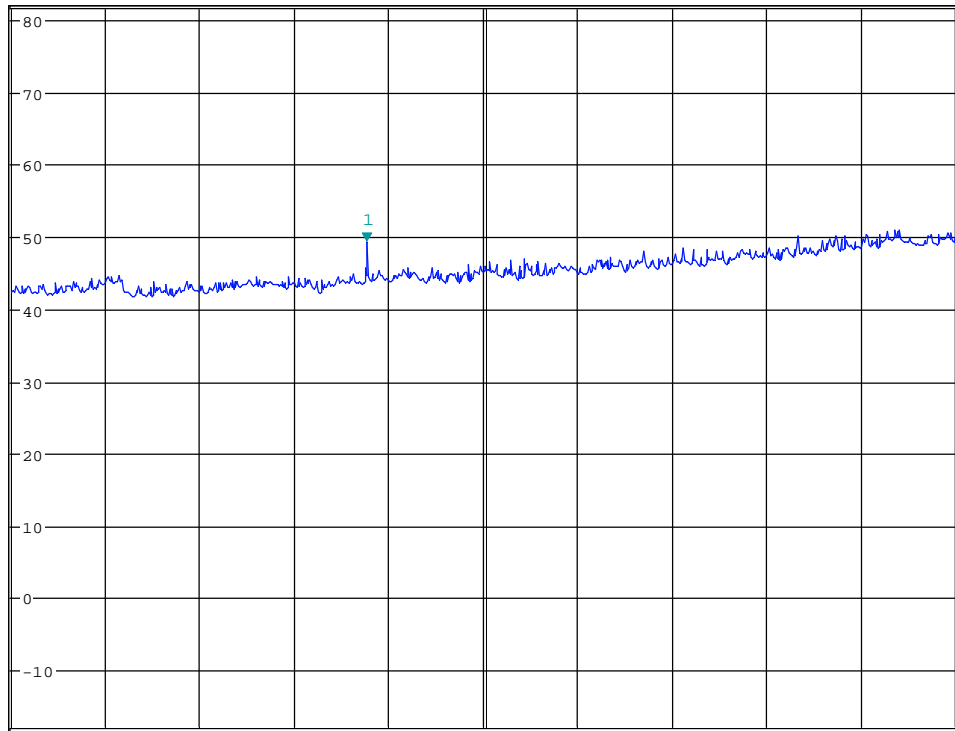


* RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 49.29 dBμV/m
SWT 30 ms 4.883012821 GHz

Ref 82 dBμV/m

* Att 10 dB

1 PK
MAXH



Start 3 GHz

500 MHz /

Stop 8 GHz

Date: 27.JUN.2016 14:18:34

Radiated Emissions ch. 2440 MHz, 3 – 8 GHz, VP, @3m – Pre-scan

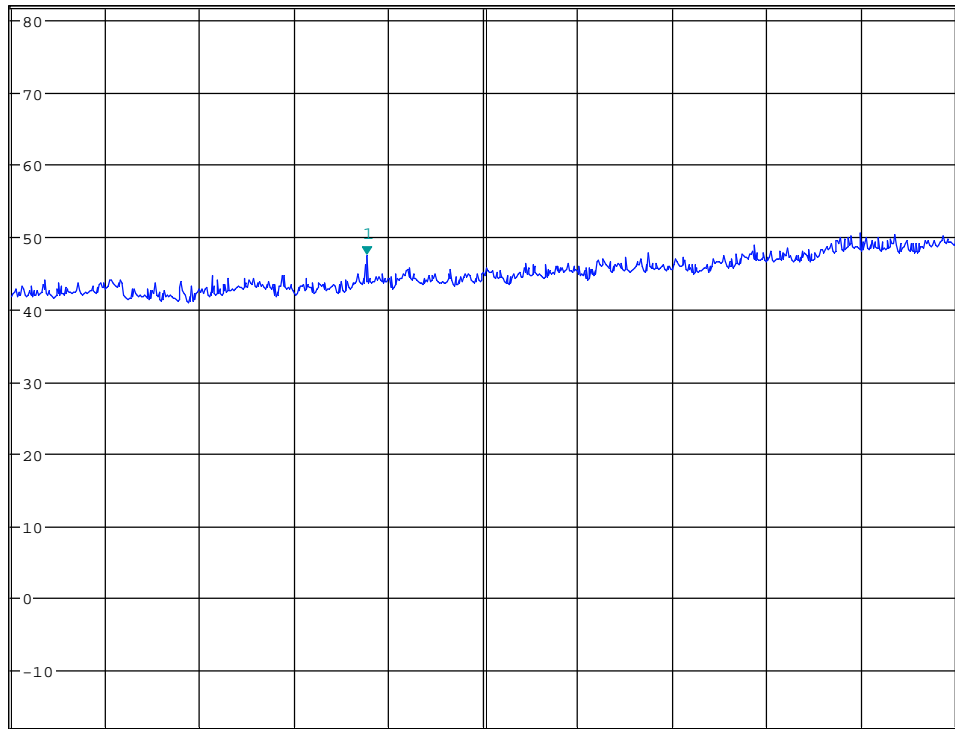


* RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 47.44 dBμV/m
SWT 30 ms 4.883012821 GHz

Ref 82 dBμV/m

* Att 10 dB

1 PK
MAXH



Start 3 GHz

500 MHz/

Stop 8 GHz

Date: 27.JUN.2016 14:17:35

Radiated Emissions ch. 2440 MHz, 3 – 8 GHz, HP, @3m – Pre-scan



MARKER 1

4.963141026 GHz

Ref 82 dBμV/m

* Att 10 dB

* RBW 1 MHz

VBW 3 MHz

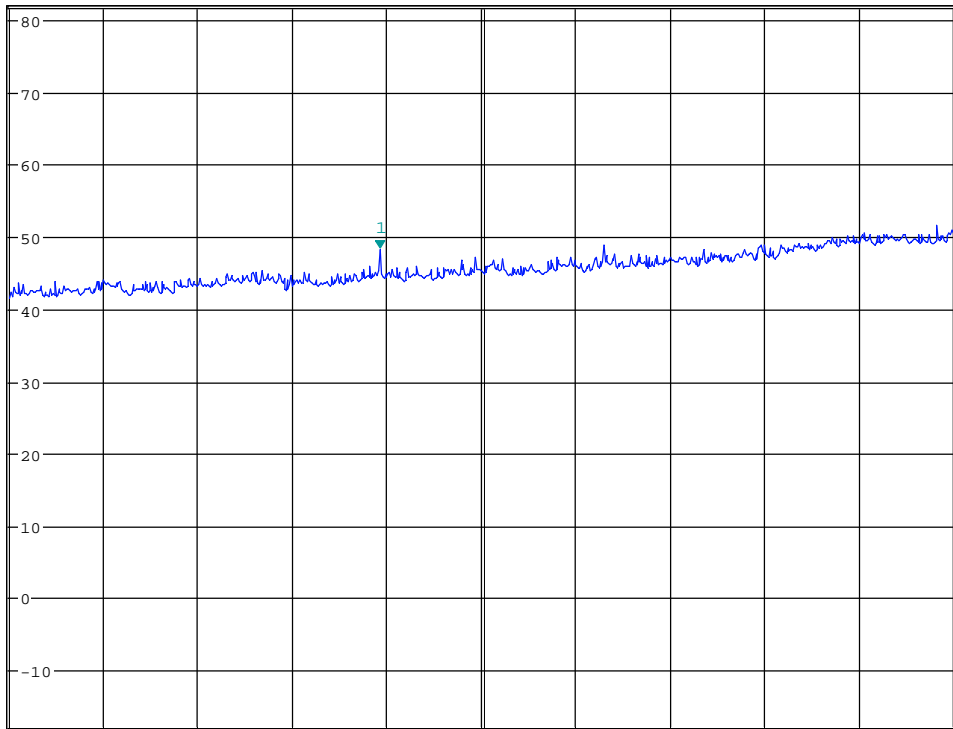
* SWT 200 ms

Marker 1 [T1]

48.19 dBμV/m

4.963141026 GHz

1 PK
MAXH



A

TDF

LNA

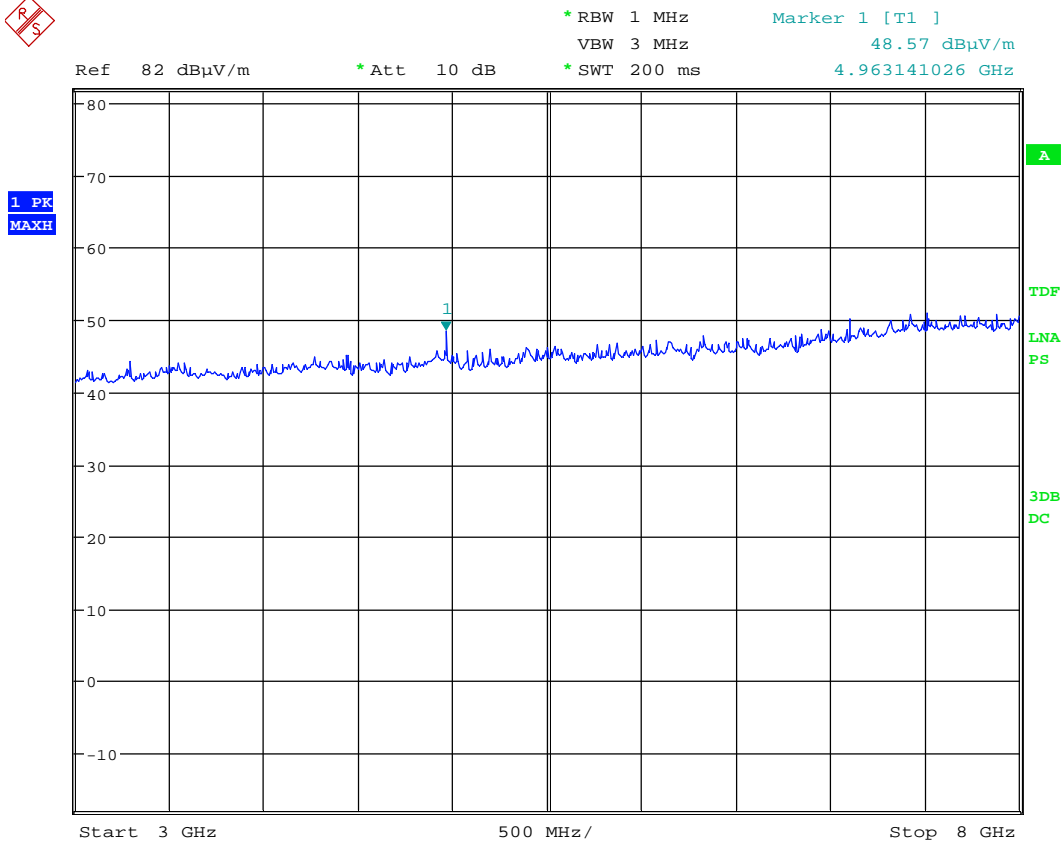
PS

3DB

DC

Date: 27.JUN.2016 14:10:53

Radiated Emissions ch. 2480 MHz, 3 – 8 GHz, VP, @3m – Pre-scan



Date: 27.JUN.2016 14:11:32

Radiated Emissions ch. 2480 MHz, 3 – 8 GHz, HP, @3m – Pre-scan



MARKER 1

10.38461538 GHz

Ref 72.5 dBμV/m

*Att 10 dB

*RBW 1 MHz

VBW 3 MHz

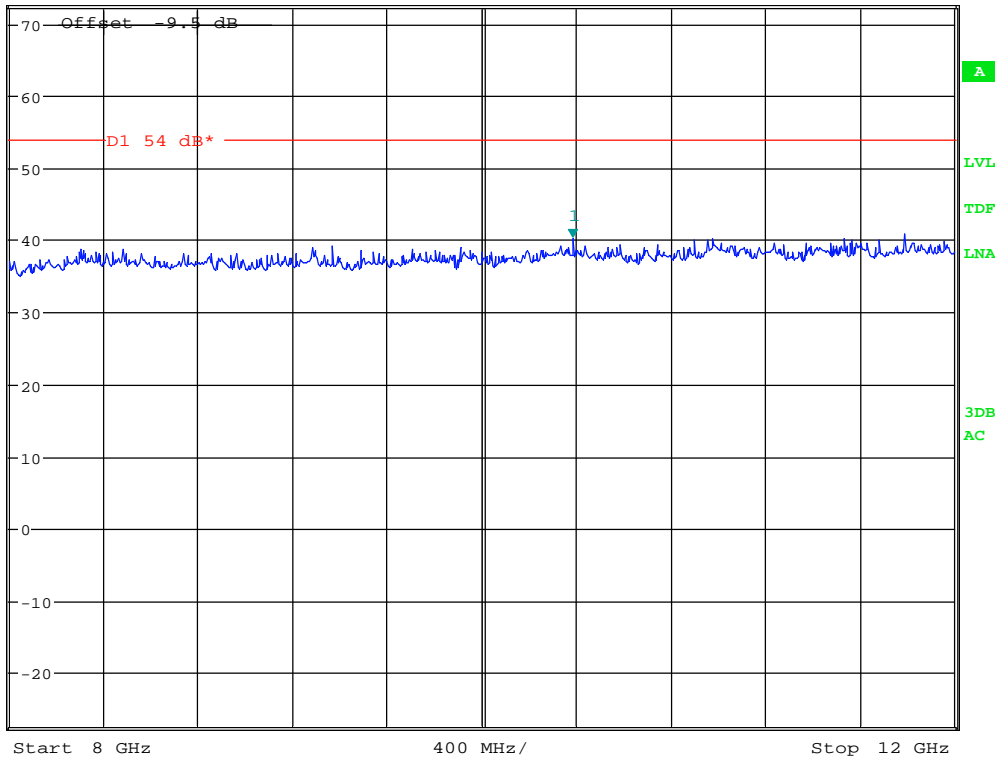
SWT 25 ms

Marker 1 [T1]

40.16 dBμV/m

10.384615385 GHz

1 PK
MAXH



Date: 8.FEB.2017 08:25:37

Radiated Emissions ch. 2402 MHz, 8 – 12 GHz, VP, @1m – Pre-scan



MARKER 1

11.58333333 GHz

Ref 72.5 dBμV/m

*Att 10 dB

*RBW 1 MHz

VBW 3 MHz

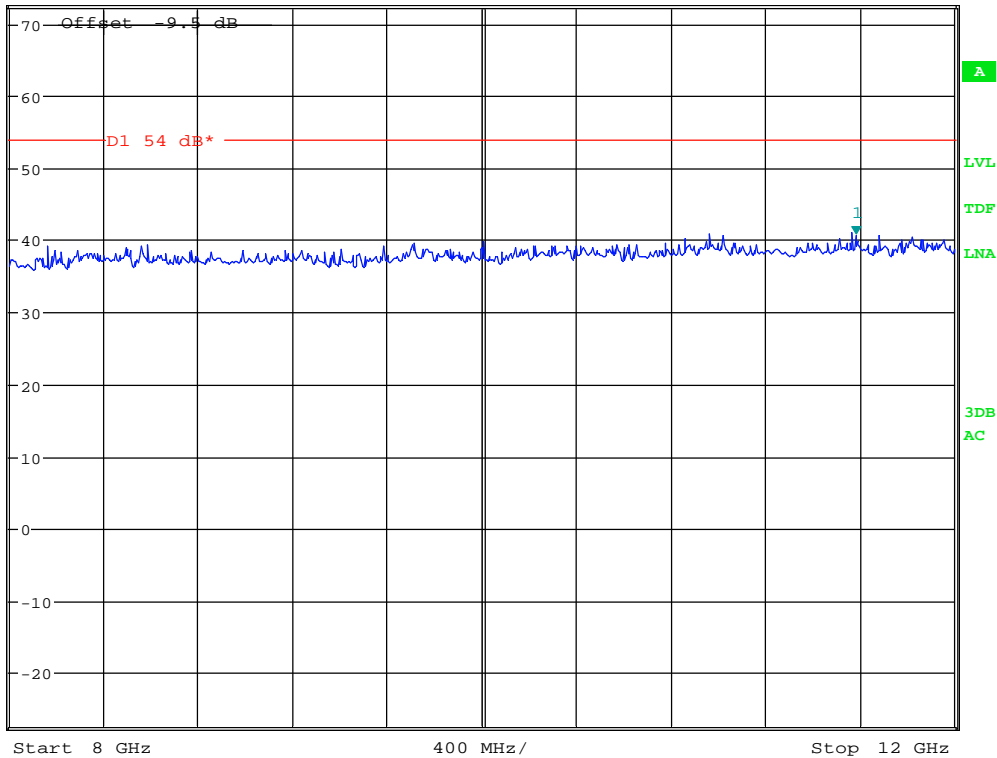
SWT 25 ms

Marker 1 [T1]

40.75 dBμV/m

11.58333333 GHz

1 PK
MAXH



Date: 8.FEB.2017 08:25:12

Radiated Emissions ch. 2402 MHz, 8 – 12 GHz, HP, @1m – Pre-scan



MARKER 1

11.19230769 GHz

Ref 77.5 dBμV/m

* Att 10 dB

* RBW 1 MHz

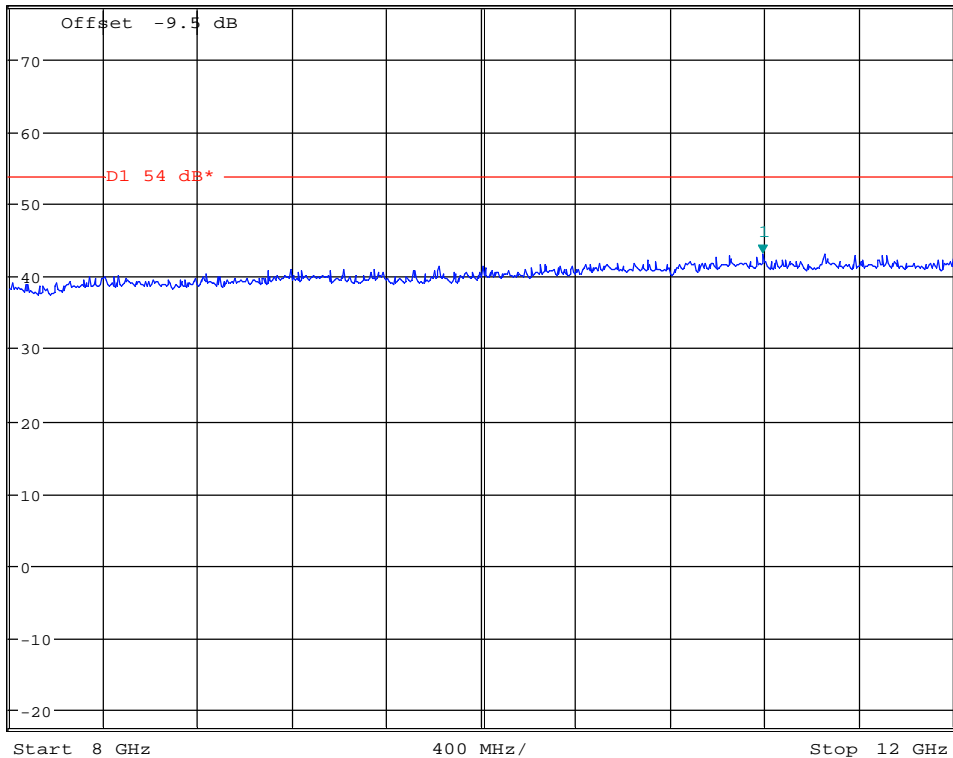
VBW 3 MHz

* SWT 200 ms

Marker 1 [T1]

43.24 dBμV/m

11.192307692 GHz



Date: 2.JUL.2016 11:38:15

Radiated Emissions ch. 2440 MHz, 8 – 12 GHz, VP, @1m – Pre-scan



MARKER 1

11.30128205 GHz

Ref 77.5 dBμV/m

* Att 10 dB

* RBW 1 MHz

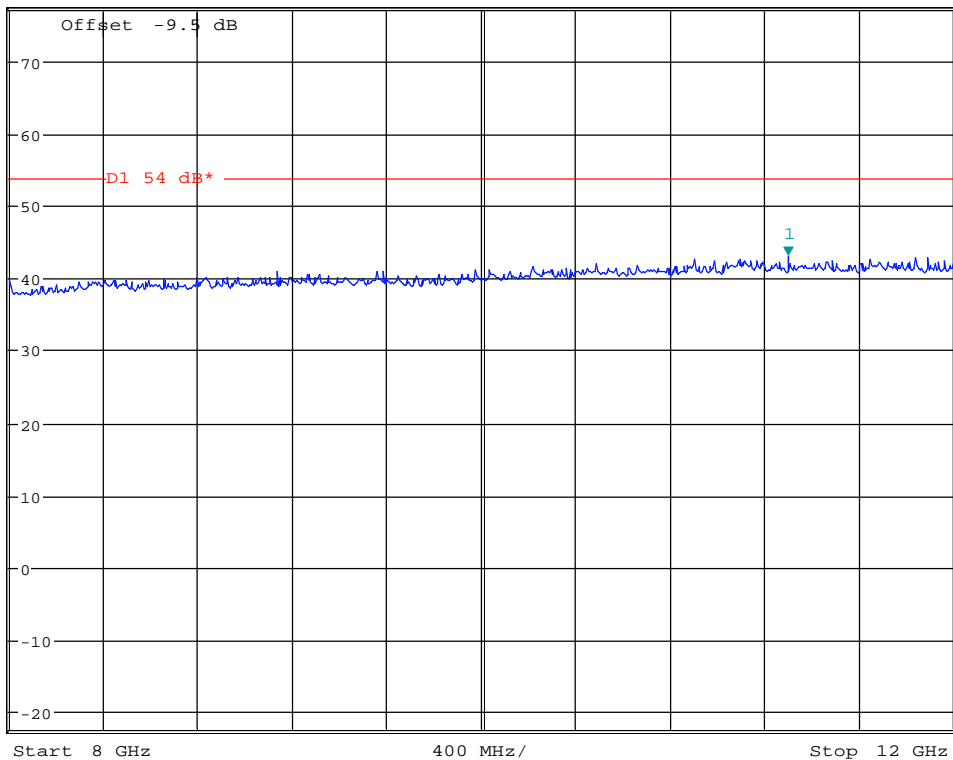
VBW 3 MHz

* SWT 200 ms

Marker 1 [T1]

43.10 dBμV/m

11.301282051 GHz



Date: 2.JUL.2016 11:35:57

Radiated Emissions ch. 2440 MHz, 8 – 12 GHz, HP, @1m – Pre-scan



MARKER 1

11.44871795 GHz

Ref 77.5 dBμV/m

* Att 10 dB

* RBW 1 MHz

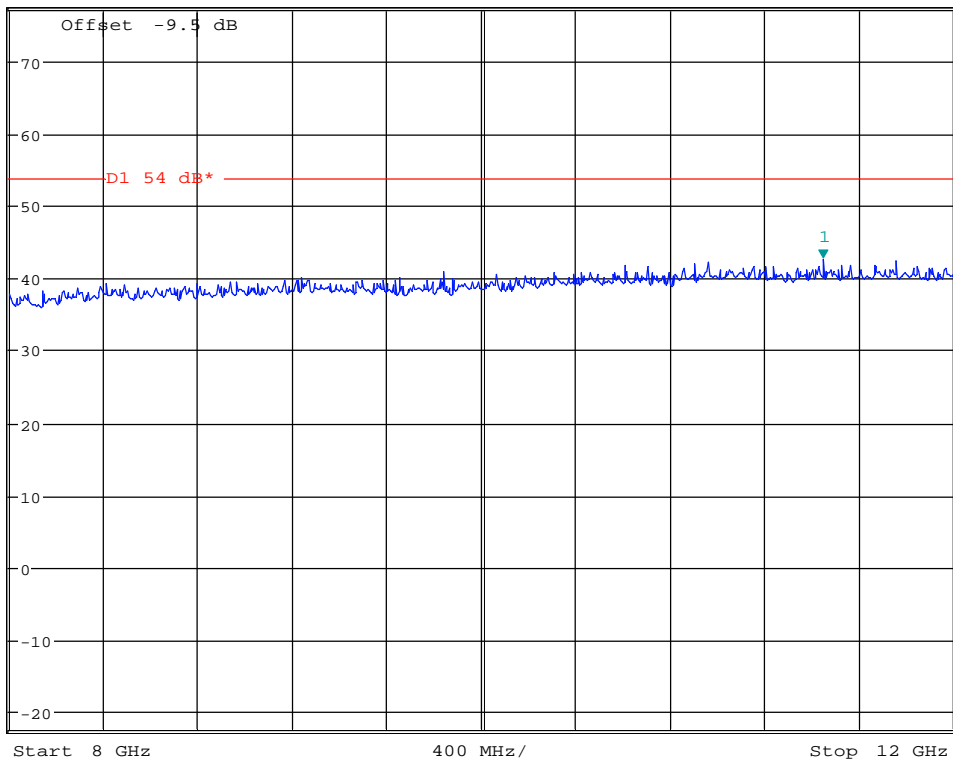
VBW 3 MHz

* SWT 200 ms

Marker 1 [T1]

42.66 dBμV/m

11.448717949 GHz



Date: 2.JUL.2016 11:44:17

Radiated Emissions ch. 2480 MHz, 8 – 12 GHz, VP, @1m – Pre-scan



MARKER 1

11.61538462 GHz

Ref 77.5 dBμV/m

* Att 10 dB

* RBW 1 MHz

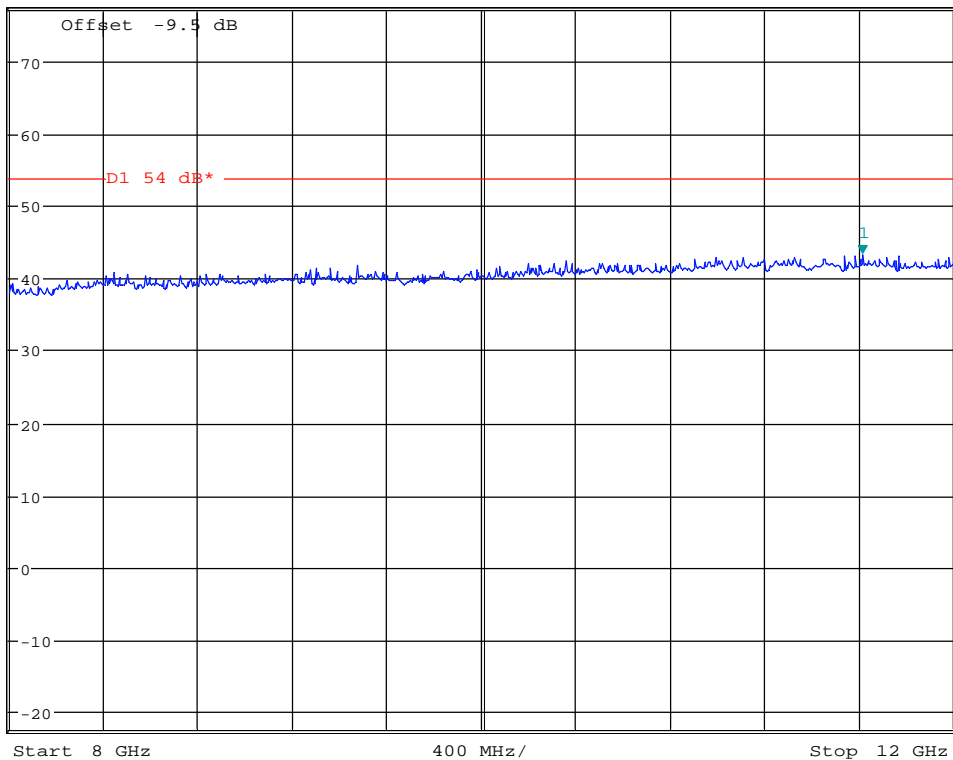
VBW 3 MHz

* SWT 200 ms

Marker 1 [T1]

43.34 dBμV/m

11.615384615 GHz

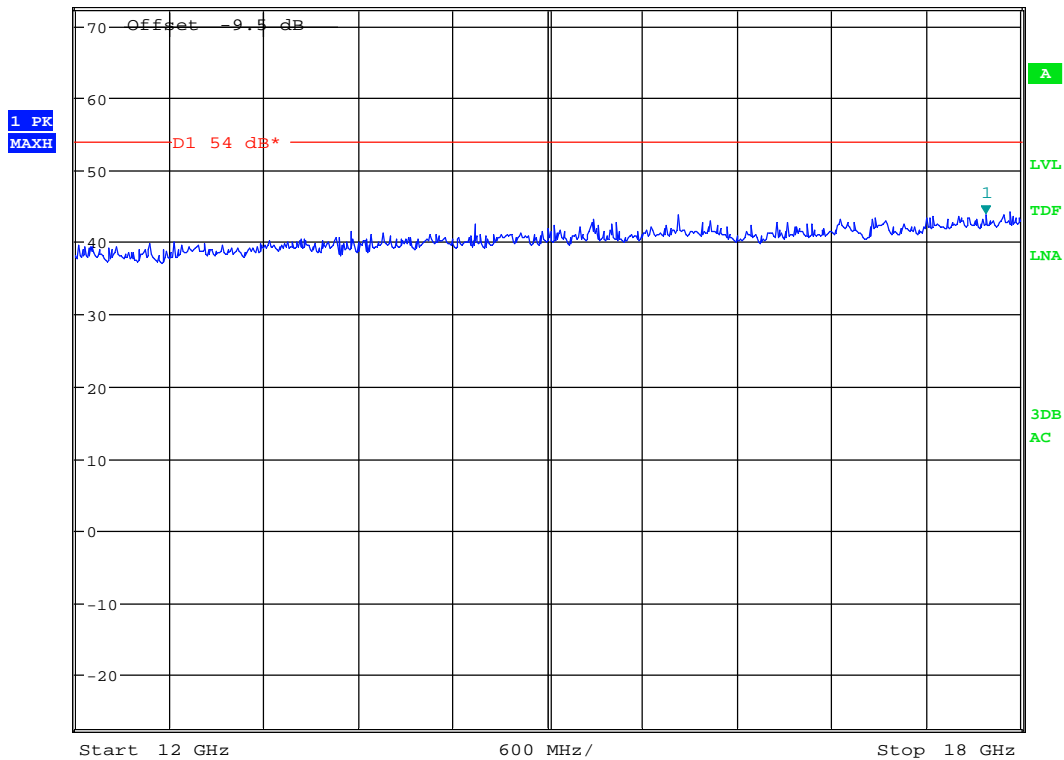


Date: 2.JUL.2016 11:46:45

Radiated Emissions ch. 2480 MHz, 8 – 12 GHz, HP, @1m – Pre-scan



MARKER 1
17.77884615 GHz
Ref 72.5 dBμV/m *Att 10 dB *RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 43.82 dBμV/m
SWT 35 ms 17.778846154 GHz

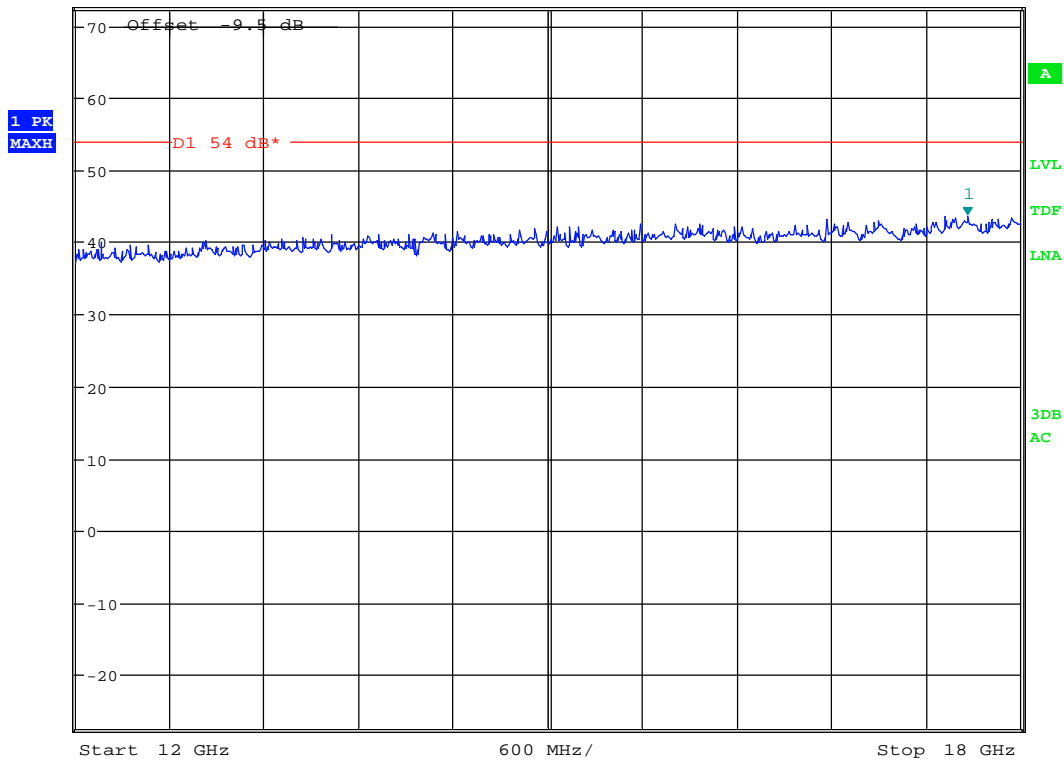


Date: 8.FEB.2017 08:26:39

Radiated Emissions ch. 2402 MHz, 12 – 18 GHz, VP, @1m – Pre-scan



MARKER 1
17.66346154 GHz
Ref 72.5 dBμV/m *Att 10 dB *RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 43.59 dBμV/m
SWT 35 ms 17.663461538 GHz



Date: 8.FEB.2017 08:27:02

Radiated Emissions ch. 2402 MHz, 12 – 18 GHz, HP, @1m – Pre-scan



MARKER 1

17.95192308 GHz

Ref 77.5 dBμV/m

* Att 10 dB

* RBW 1 MHz

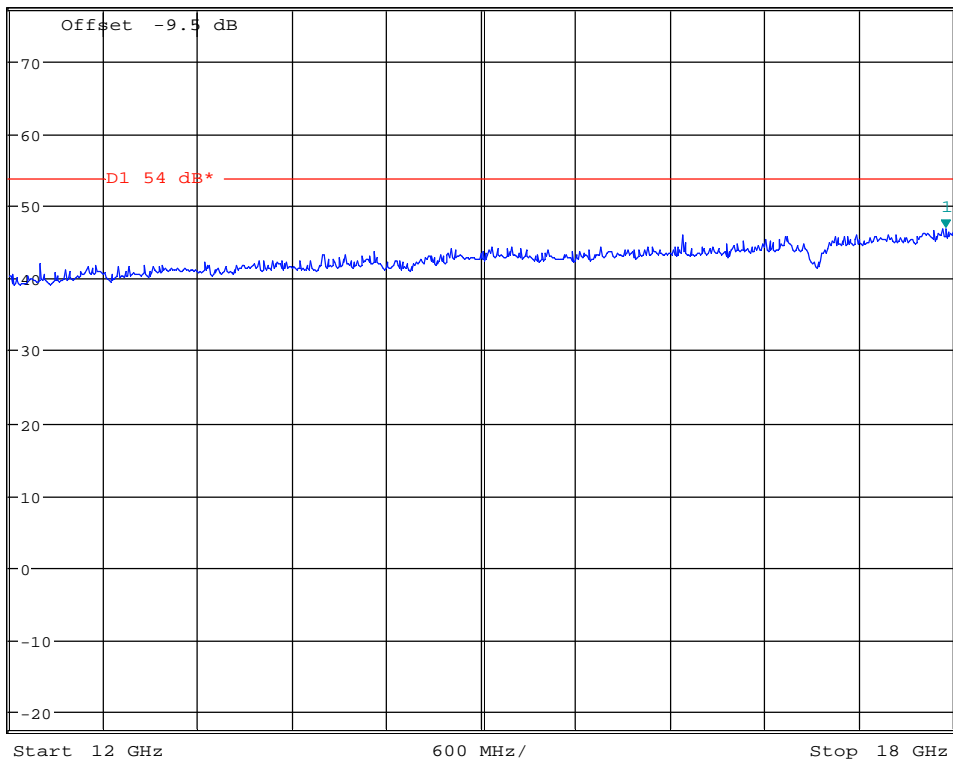
VBW 3 MHz

* SWT 200 ms

Marker 1 [T1]

46.98 dBμV/m

17.951923077 GHz



Date: 2.JUL.2016 12:04:12

Radiated Emissions ch. 2440 MHz, 12 – 18 GHz, VP, @1m – Pre-scan



MARKER 1

17.60576923 GHz

Ref 77.5 dBμV/m

* Att 10 dB

* RBW 1 MHz

VBW 3 MHz

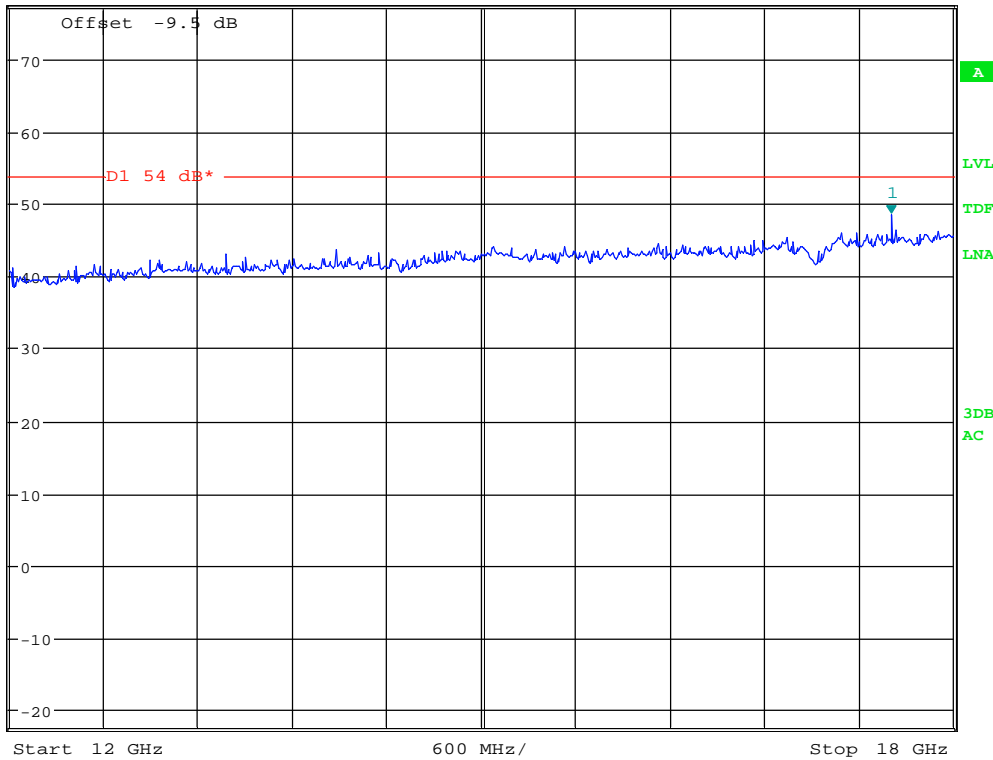
* SWT 200 ms

Marker 1 [T1]

48.58 dBμV/m

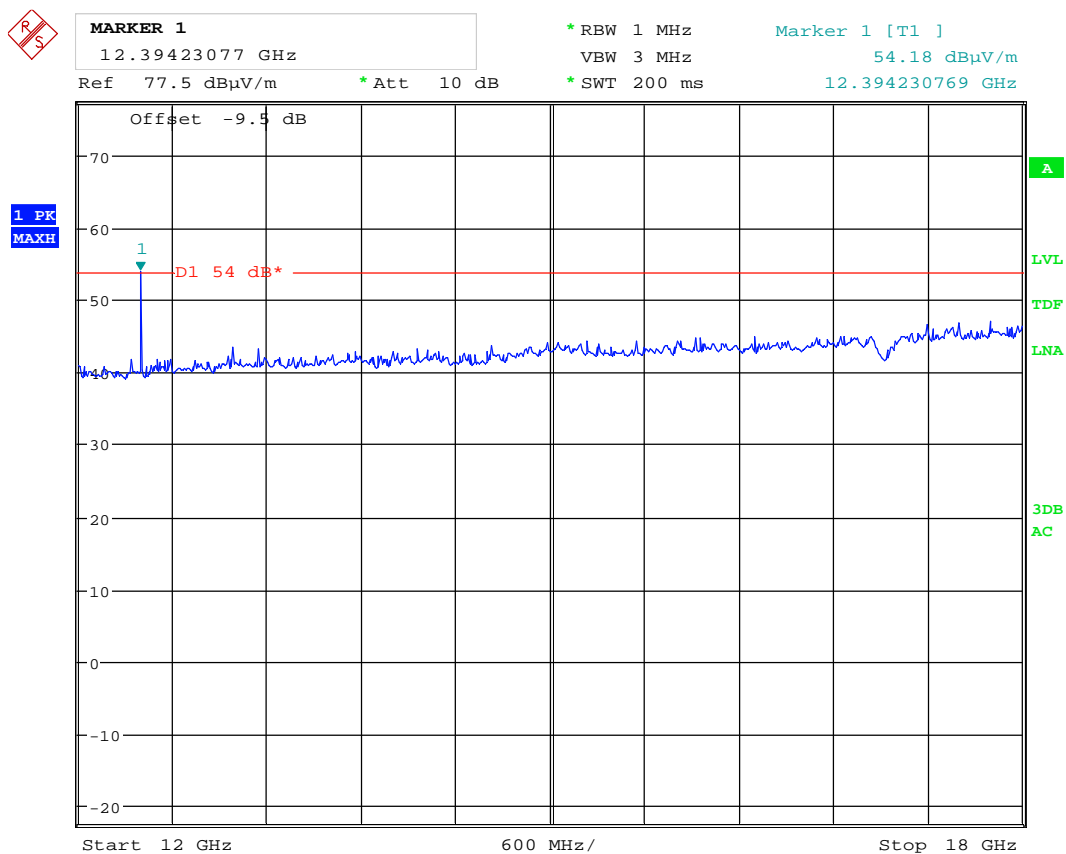
17.605769231 GHz

1 PK
MAXH



Date: 2.JUL.2016 12:05:24

Radiated Emissions ch. 2440 MHz, 12 – 18 GHz, HP, @1m – Pre-scan



Date: 2.JUL.2016 11:50:02

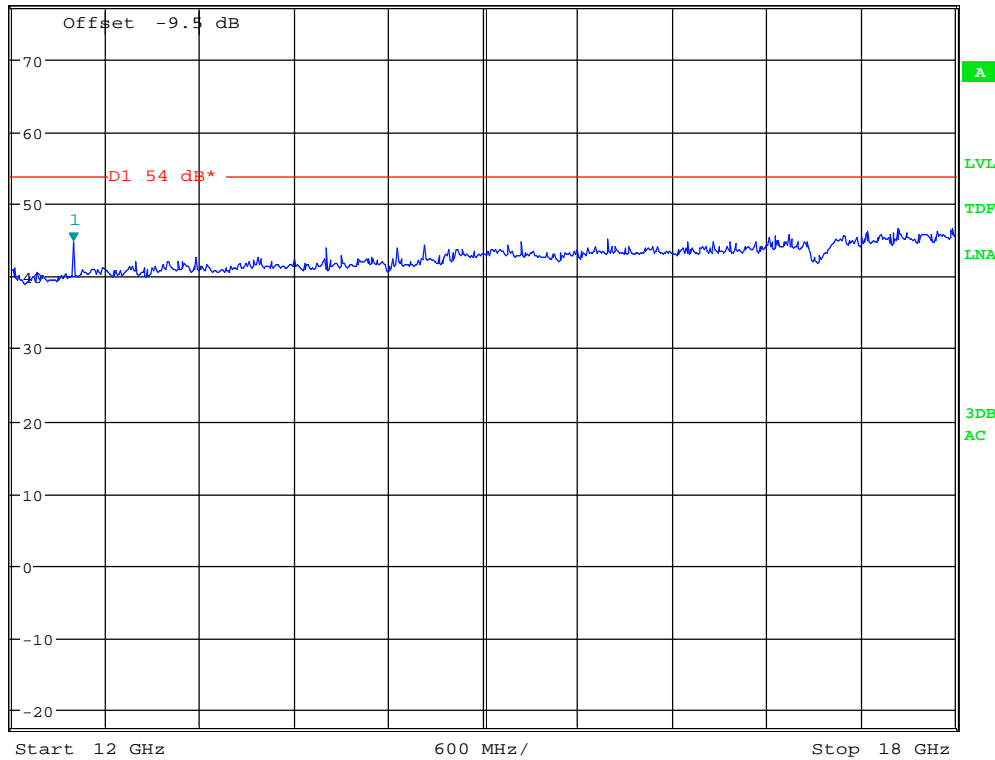
Radiated Emissions ch. 2480 MHz, 12 – 18 GHz, VP, @1m – Pre-scan



*RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 44.91 dBμV/m
*SWT 200 ms 12.394230769 GHz

Ref 77.5 dBμV/m *Att 10 dB

1 PK
MAXH

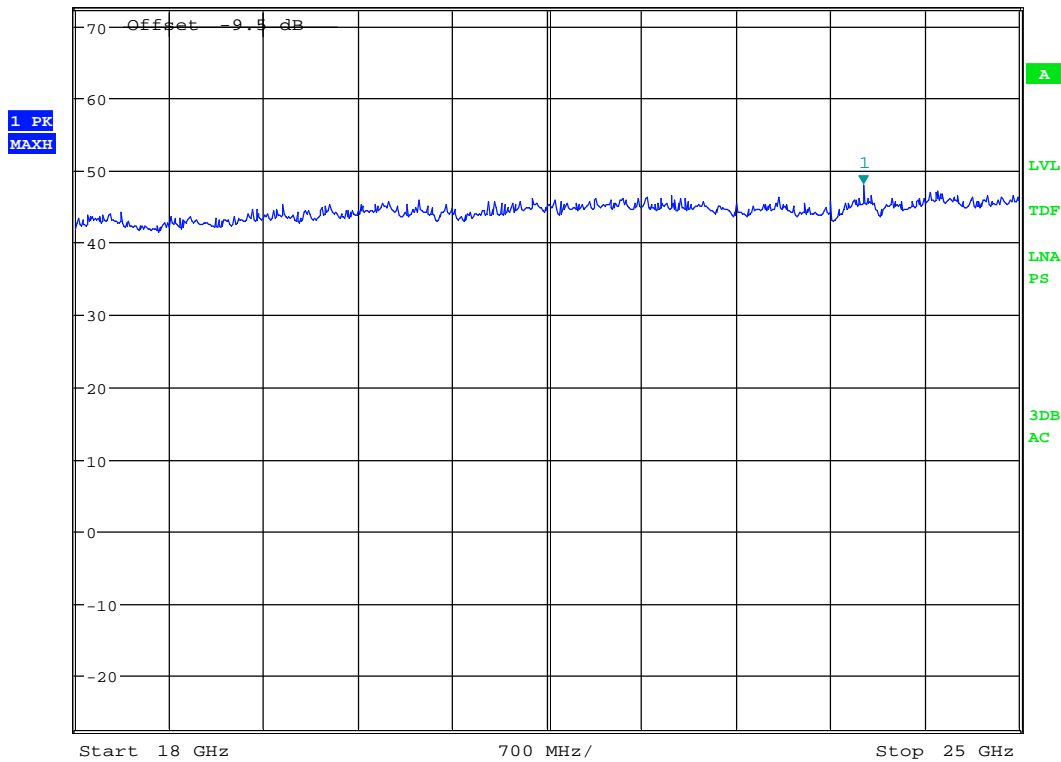


Date: 2.JUL.2016 11:52:05

Radiated Emissions ch. 2480 MHz, 12 – 18 GHz, HP, @1m – Pre-scan



MARKER 1
23.84455128 GHz
Ref 72.5 dBμV/m * Att 10 dB * RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 47.94 dBμV/m
SWT 45 ms 23.844551282 GHz



Date: 2.JUL.2016 14:38:35

Radiated Emissions ch. 2440 MHz, 18 – 25 GHz, VP/HP, Pre-scan

3.6 Power Spectral Density (PSD)

Para. No.: 15.247 (d)

Test Performed By: G.Suhanthakumar

Date of Test: 2016.07.13 &
2017.02.08

Test Results: Passed

Measured and Calculated Data:

The measurement procedures PKPSD described in KDB 558074 D01 v01 was used.

	calculated peak PSD dBm
Power Spectral Density @2402 MHz	-08.70
Power Spectral Density @2440 MHz	-10.85
Power Spectral Density @2480 MHz	-10.45

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.



MARKER 1

2.401978365 GHz

*RBW 3 kHz

VBW 10 kHz

SWT 170 ms

Marker 1 [T1]

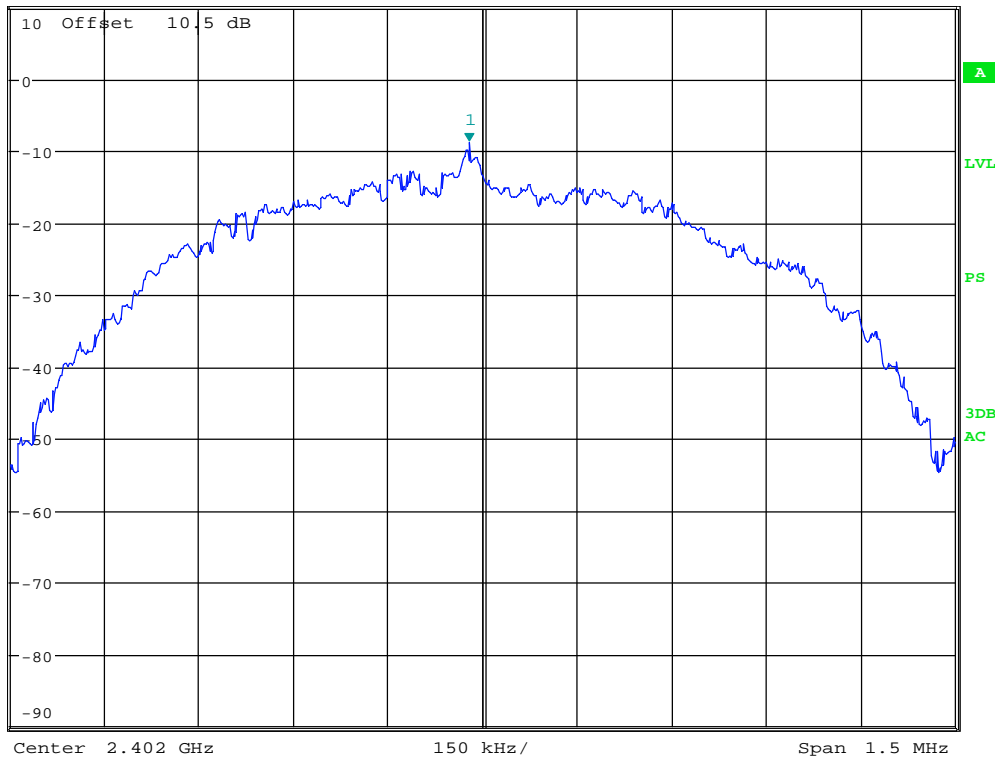
-8.70 dBm

2.401978365 GHz

Ref 10 dBm

*Att 15 dB

1 PK
MAXH



Date: 8.FEB.2017 08:43:28

PSD Measurement - 2402MHz



MARKER 1

2.439971154 GHz

*RBW 3 kHz

VBW 10 kHz

SWT 170 ms

Marker 1 [T1]

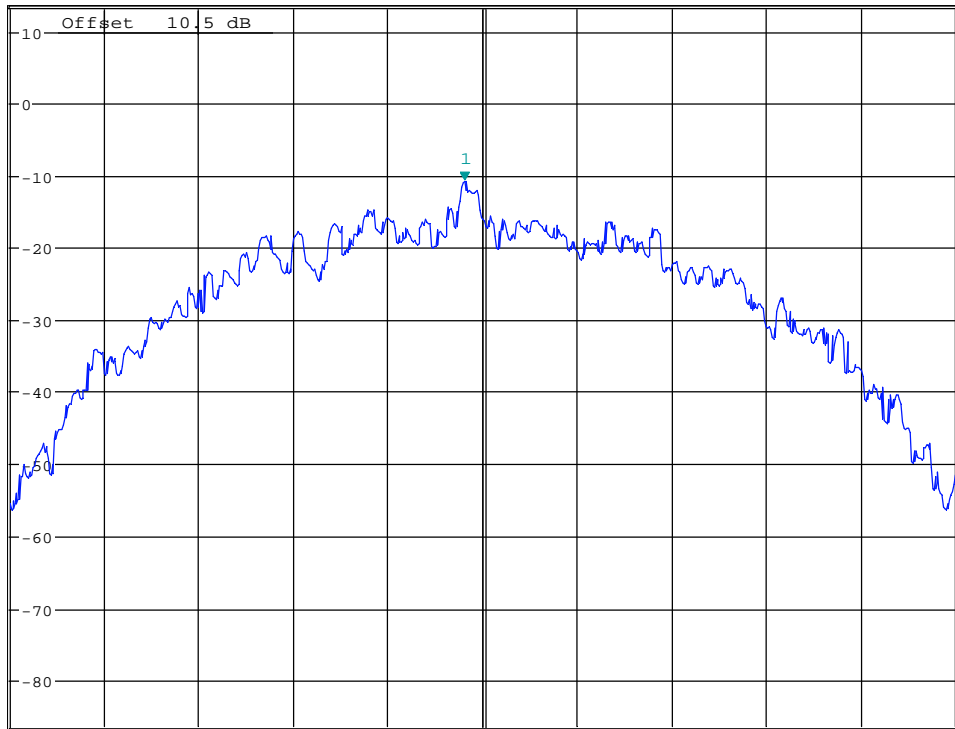
-10.85 dBm

2.439971154 GHz

Ref 13.5 dBm

*Att 10 dB

1 PK
MAXH



Center 2.44 GHz

150 kHz/

Span 1.5 MHz

Date: 13.JUL.2016 20:32:45

PSD Measurement – 2440MHz



MARKER 1

2.479978365 GHz

*RBW 3 kHz

VBW 10 kHz

SWT 170 ms

Marker 1 [T1]

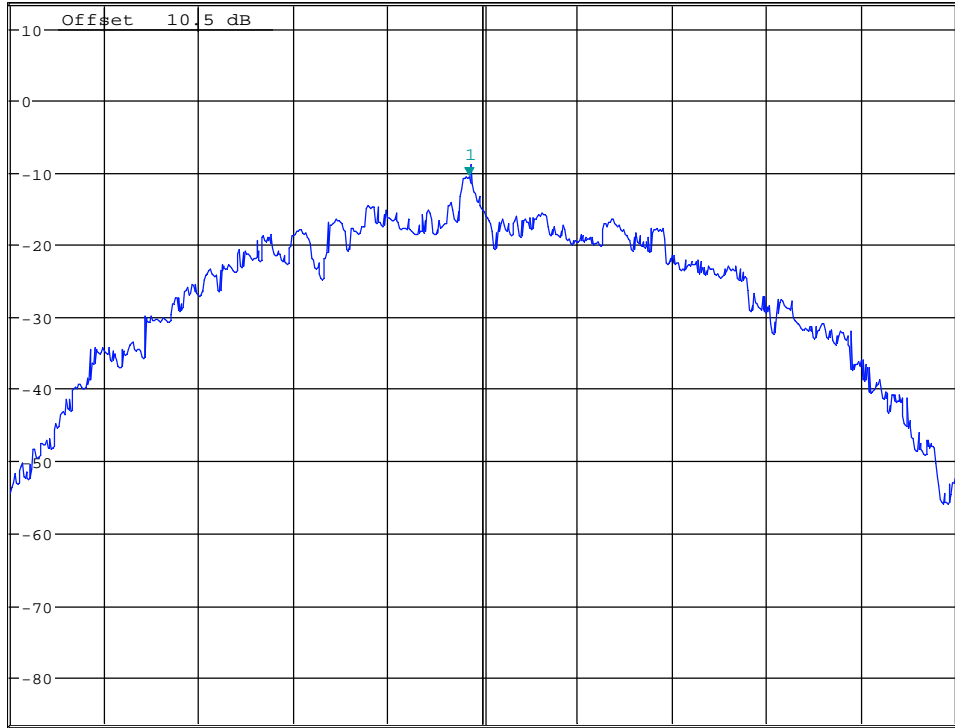
-10.45 dBm

2.479978365 GHz

Ref 13.5 dBm

*Att 10 dB

1 PK
MAXH



Center 2.48 GHz

150 kHz/

Span 1.5 MHz

Date: 13.JUL.2016 20:33:12

PSD Measurement - 2480MHz

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

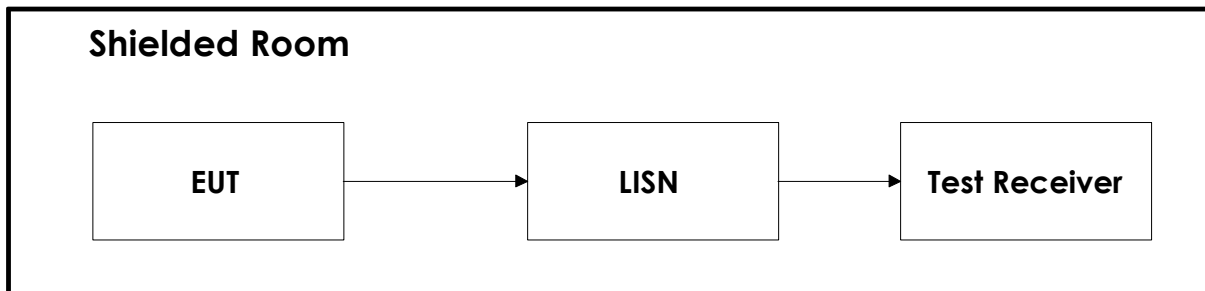
5 LIST OF TEST EQUIPMENT

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.

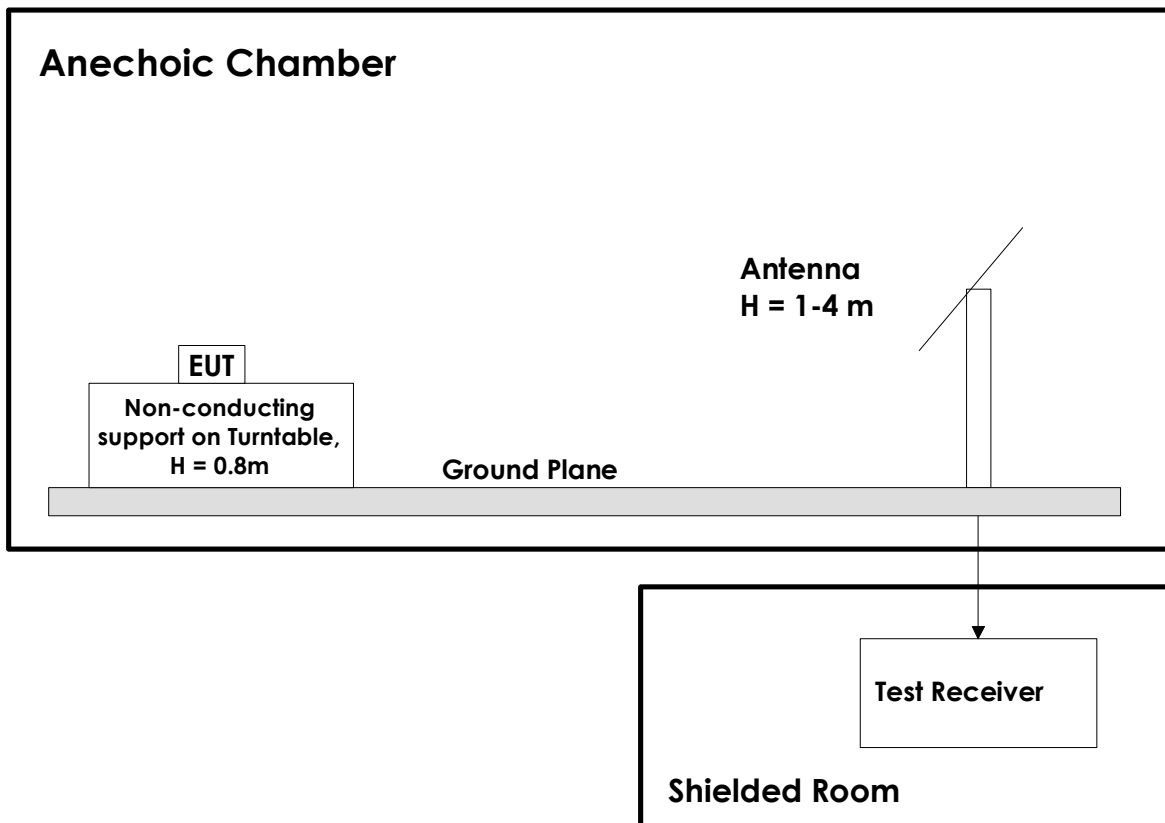
No.	Instrument/ ancillary	Type of instrument/ ancillary	Manufacturer	Ref. no.	Cal. Date	Cal. Due
1.	ESU40	EMI Receiver	Rohde & Schwarz	LR1639	2015.11	2016.11
2.	FSW26	Spectrum Analyzer	Rohde & Schwarz	LR 1640	2015.11	2016.11
3.	HFH2-Z2	Active Loop antenna	Rohde & Schwarz	LR1660	2014.10	2017.10
4.	3115	Antenna horn	EMCO	LR 1330	2010.08	2017.08
5.	HK116	Biconical Antenna	Rohde & Schwarz	LR 1260	2013.12	2016.12
6.	HL223	Log Periodic antenna	Rohde & Schwarz	LR 1261	2013.12	2016.12
7.	643	Antenna Horn	Narda	LR 093	2009.10	2019.10
8.	PM7320X	Antenna Horn	Sivers Lab	LR 102	2009.10	2019.10
9.	DBF-520-20	Antenna Horn	Systron Donner	LR 100	2009.10	2019.10
10	638	Antenna Horn	Narda	LR 1480	2009.10	2019.10
11	4768-10	Attenuator	Narda	LR 1356	Cal b4 use	
12	6HC3000/18000	Highpass Filter	Trilithic	LR 1614	Cal b4 use	
13	8449B	Pre-amplifier	Hewlett Packard	LR 1322	2015.09	2016.09
14	310N	Pre-amplifier	Sonoma	LR 1686	2016.05	2017.05
15	Model 87 V	Multimeter	Fluke	LR 1597	2015.10	2016.10
16	6812B	Power source	Agilent	LR 1515	2015.12.02	2017.12.02
17	D001	DC power supply	Farnell	LT 5150	Cal b4 use	

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission



6.2 Test Site Radiated Emission



Revision history

Version	Date	Comment	Sign
00	2016.11.10	First version	gns
01	2017.02.09	Measured on ch2402MHz	gns