

Test Report

Product	Zigbee Radio Module
Name and address of the applicant	ASSA ABLOY Hospitality AS Postboks 340, Anolitveien 1-3, 1402 Ski, Norway
Name and address of the manufacturer	ASSA ABLOY Hospitality AS Postboks 340, Anolitveien 1-3, 1402 Ski, Norway
Model	683081118R0
Rating	5Vdc, 500mA
Trademark	ASSA ABLOY
Serial number	/
Additional information	IEEE 802.15.4 based 2.4GHz Zigbee radio.
Tested according to	FCC Part 15.247 Frequency Hopping Transmitters / Digital Transmission Systems Industry Canada RSS-247, Issue 2 Low Power Licence-Exempt Radiocommunications Devices
Order number	318519
Tested in period	2016.10.21 - 2016.10.25
Issue date	2017.03.28
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: center;"> <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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1 INFORMATION

1.1 Test Item

Name :	Zigbee Router RT3
FCC ID :	Y7V-683081118C1
Industry Canada ID :	9514A-683081118C1
Model/version :	683081118R0
Serial number :	/
Hardware identity and/or version:	Rev D (PCB 13 3081 117-0 Modified as 13 3081 117-2)
Software identity and/or version :	1.0.59.0
Frequency Range :	2405 - 2480MHz
Tunable Bands :	None
Number of Channels :	16
Channel BW:	5 MHz
Type of Modulation :	ZigBee uses Offset quadrature phase-shift keying (OQPSK)
User Frequency Adjustment :	N/A
Rated Output Power :	2.38mW*
Type of Power Supply :	5Vdc
Antenna Connector :	None (PCB antenna)
No of antennas:	1
Antenna Diversity Supported :	None
Desktop Charger :	None

*For channels the power setting 12 & PA(Ext power 1) is used.

Description of Test Item

The EUT is IEEE 802.15.4 based zigbee radio. And it is only powered with DC Voltage.

1.2 Normal test conditions

Temperature: 20 - 24 °C

Relative humidity: 20 - 50 %

Normal test voltage: 5Vdc

The values are the limit registered during the test period.

1.3 Test Engineer(s)

G.Suwanthakumar

1.4 Test Equipment

See list of test equipment in clause 5.

1.5 Description of modification for Modification Filing

Not applicable.

1.6 Family List Rational

Not Applicable.

1.7 Additional Comments

The measurements were done with the EUT powered by 5VdC. It was checked that power variations between 85% and 115% did not have any influence on the measurements.

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 2.

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 2, RSS-GEN Issue 4 reference	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	Complies
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)	Complies
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.

3 TEST RESULTS

3.1 Power Line Conducted Emissions

Para. No.: 15.207 (a)

Test Performed By: G.Suwanthakumar

Date of Test: 2016.10.21

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

Test Results: Complies.

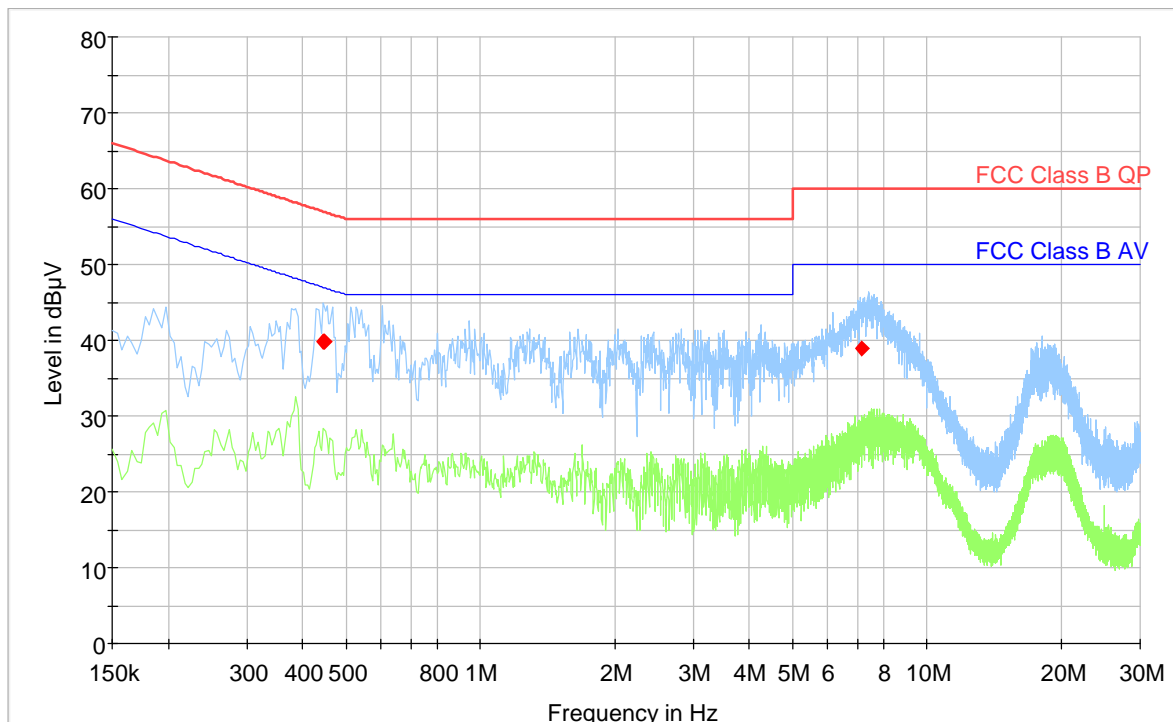
Measurement Data: See attached graph, (Peak detector).

AC/DC adapter type CMP:S008CM0500120

Input voltage to AC/DD adapter: 120Vac/60Hz

Highest measured value (L1 and N):

Full Spectrum



Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.444	39.74	---	56.99	17.24	1000.0	9.000	L1	GND	10.1
0.448	39.76	---	56.91	17.16	1000.0	9.000	L1	GND	10.1
7.148	38.98	---	60.00	21.02	1000.0	9.000	L1	GND	10.2

3.2 Minimum 6 dB Bandwidth

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

Test Performed By: G.Suwanthakumar

Date of Test: 2016.10.27

Test Results: Complies

Measurement Data:

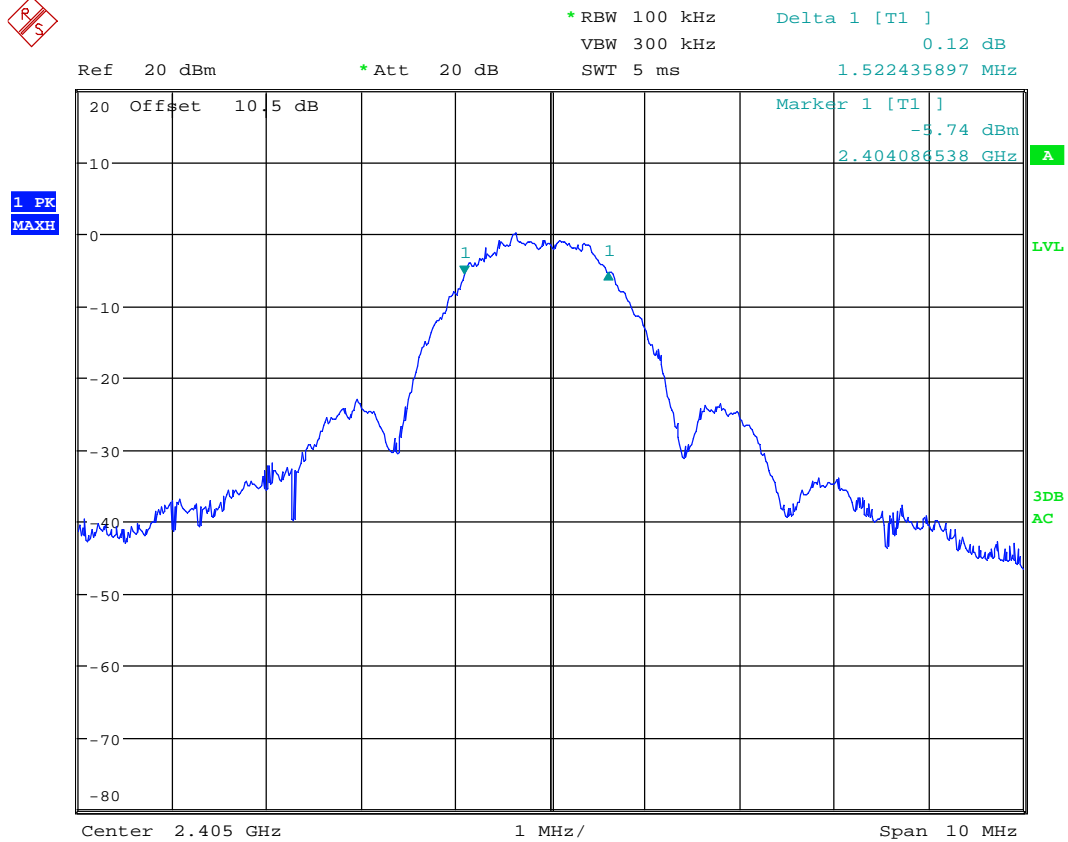
Measured 6 dB Bandwidth (MHz)		
2405MHz	2440 MHz	2480MHz
1.52	1.50	1.52

Power supply variation within 85 % to 115% of nominal value has no influence on measured value.

Requirements:

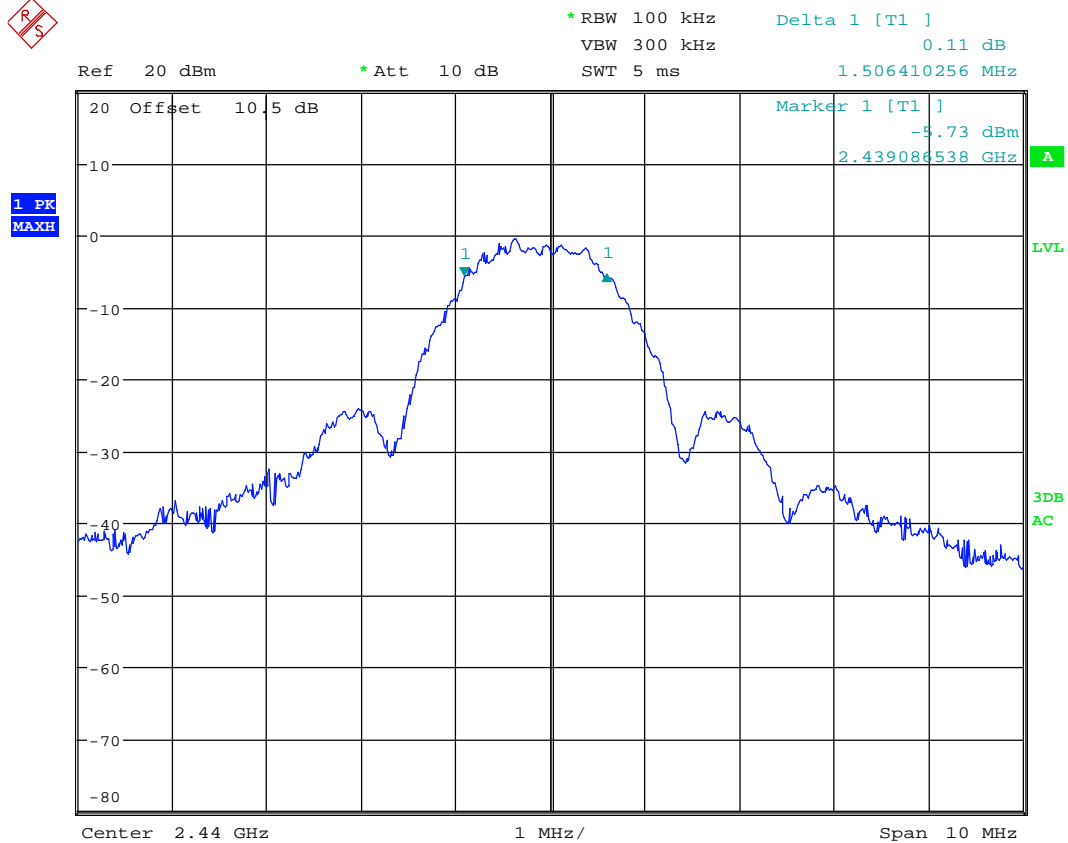
For Digital Transmission Systems in the 2400-2483.5 MHz band the minimum 6 dB bandwidth shall be at least 500 KHz.

No requirements for Frequency Hopping Systems.



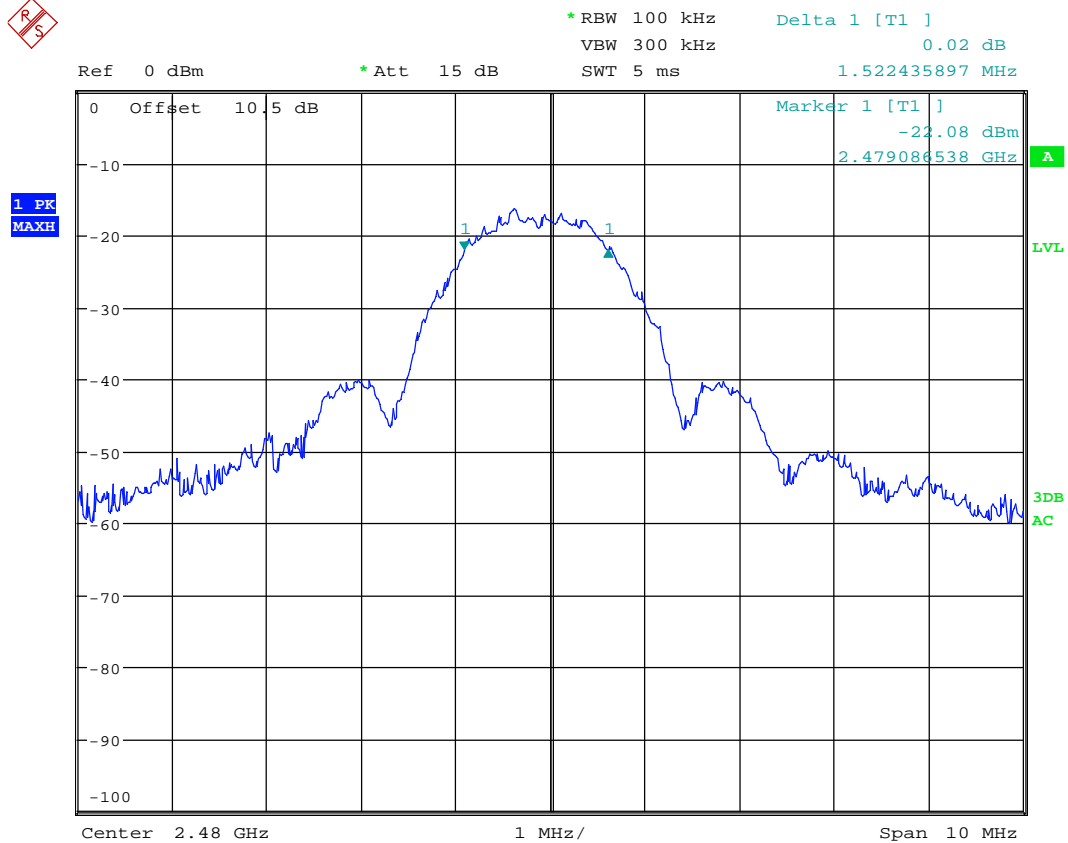
Date: 27.OCT.2016 15:47:25

6 dB Bandwidth at 2405 MHz



Date: 27.OCT.2016 15:57:38

6 dB Bandwidth at 2440 MHz



Date: 27.OCT.2016 15:52:49

6 dB Bandwidth at 2480 MHz

3.3 20 dB Bandwidth

Test Performed By: G.Suwanthakumar

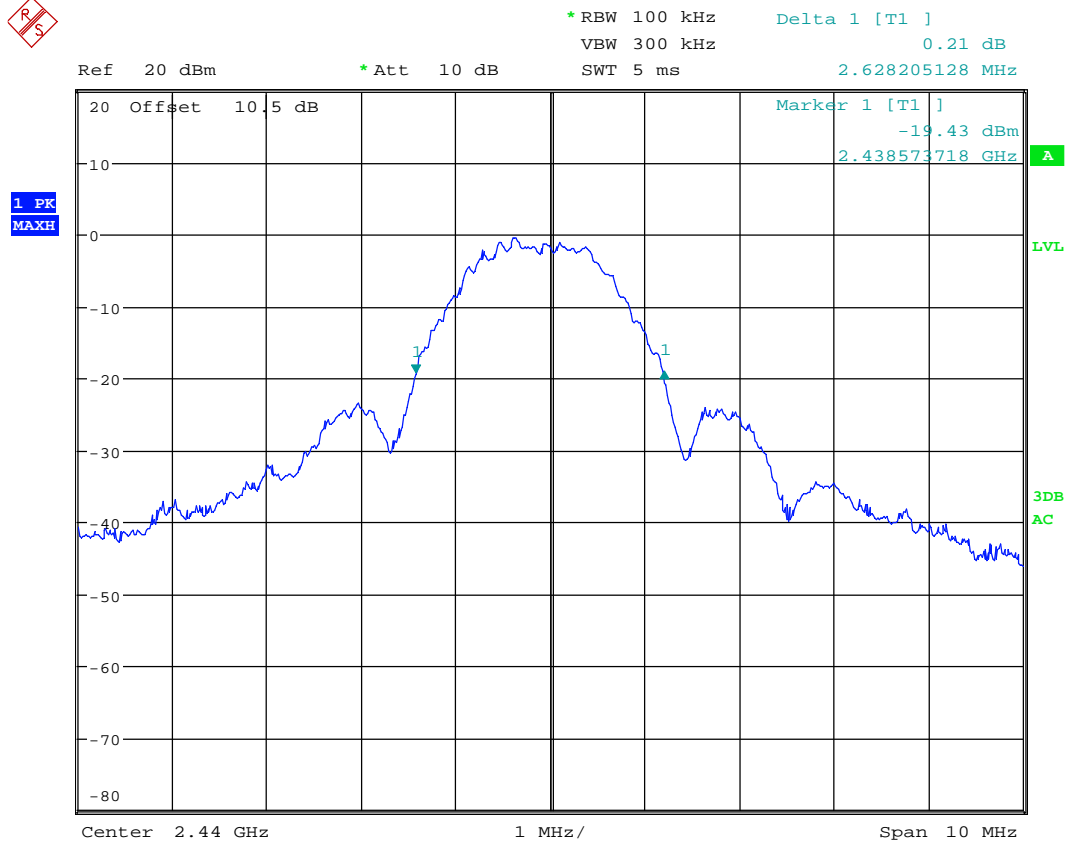
Date of Test: 2016.10.28

Measurement Data:

20 dB Bandwidth (MHz)
2440 MHz
2.628

Requirements:

No requirements. Reported for information only.



Date: 27.OCT.2016 15:58:07

20dB Bandwidth at 2440 MHz

3.4 Peak Power Output

Para. No.: 15.247 (b)

Test Performed By: G.Suwanthakumar	Date of Test: 2016.10.27
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Test Results: Complies

Measurement Data:

RF channel	2405 MHz	2440 MHz	2480 MHz
Measured Maxium Field strength (dB μ V/m) –VP	104.69	103.58	87.34
Calc. Radiated Power (dBm)	9.46	8.35	-7.89
Calc. Radiated Power (mW)	8.83	6.84	0.16
Measured Conducted Power (dBm)	3.77	3.19	-12.65
Measured Conducted Power (mW)	2.38	2.08	0.05
Calculated Antenna Gain (dBi)	5.7	5.2	4.8

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 YZ plane and Vertical polarization.

See attached graph.

Detachable antenna?

☐ Yes ☒ No

If detachable, is the antenna connector non-standard?

☐ Yes ☐ No

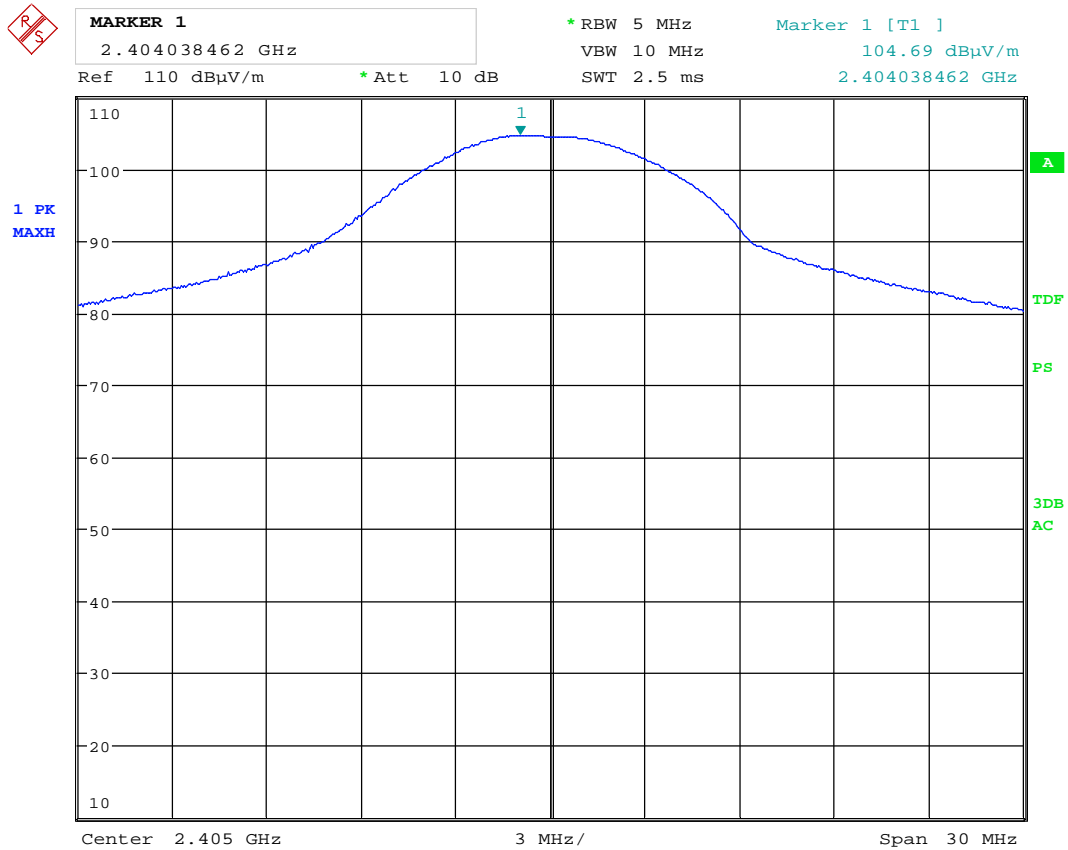
Type of antenna connector: N/A

Requirements:

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

For 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.



Date: 27.OCT.2016 07:11:54

Radiated Field strength, VP , 2405 MHz



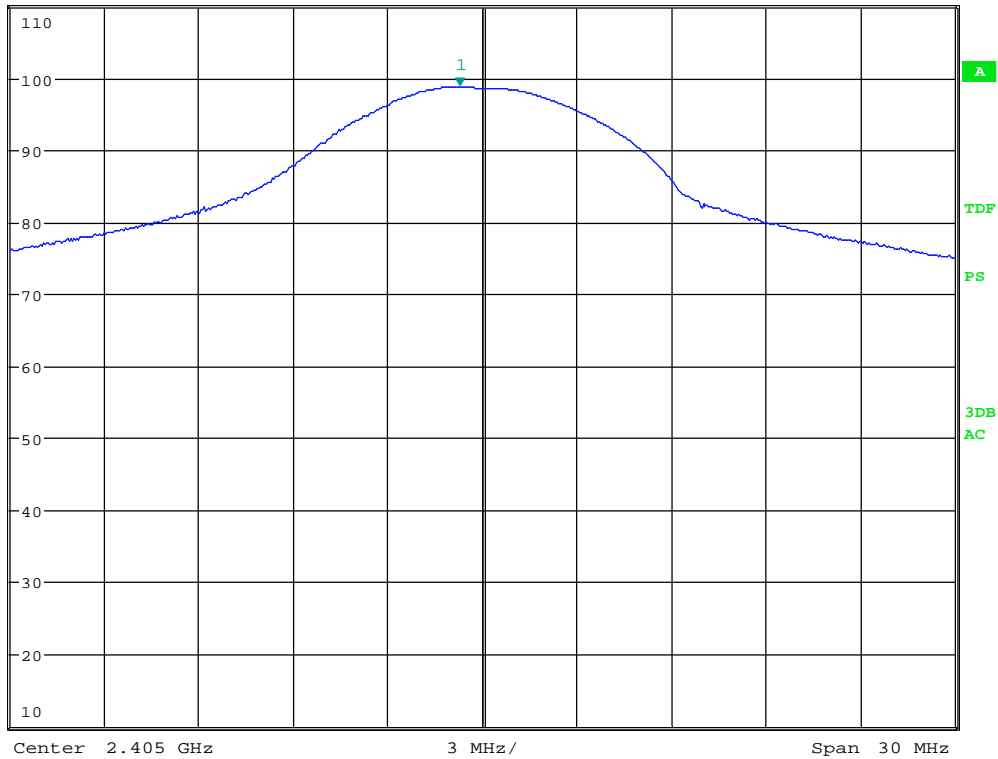
MARKER 1
2.404278846 GHz

* RBW 5 MHz
VBW 10 MHz
SWT 2.5 ms

Marker 1 [T1]
98.81 dBμV/m
2.404278846 GHz

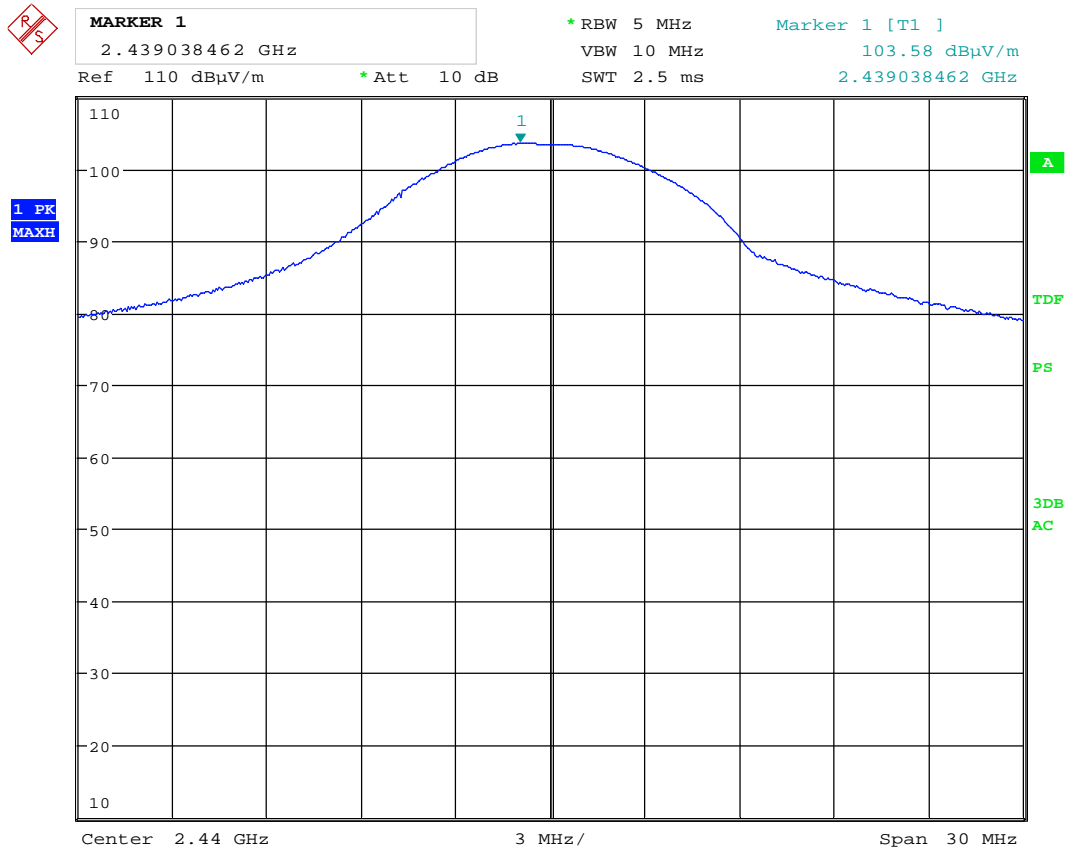
Ref 110 dBμV/m * Att 10 dB

1 PK
MAXH



Date: 27.OCT.2016 07:16:42

Radiated field strength, HP, 2405 MHz



Date: 27.OCT.2016 08:37:34

Radiated field strength, VP, 2440 MHz



MARKER 1

2.439375 GHz

Ref 110 dBμV/m

* Att 10 dB

* RBW 5 MHz

VBW 10 MHz

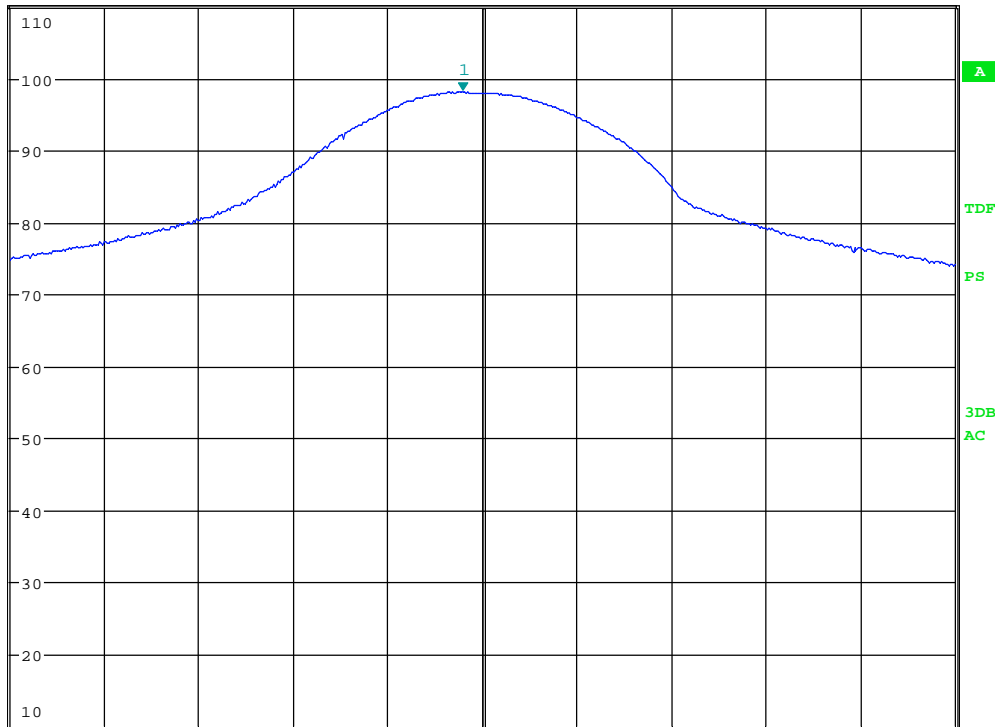
SWT 2.5 ms

Marker 1 [T1]

98.13 dBμV/m

2.439375000 GHz

1 PK
MAXH



Center 2.44 GHz

3 MHz/

Span 30 MHz

Date: 27.OCT.2016 08:42:02

Radiated field strength, HP, 2440 MHz



MARKER 1

2.479086538 GHz

Ref 110 dBuV/m

* Att 10 dB

* RBW 5 MHz

VBW 10 MHz

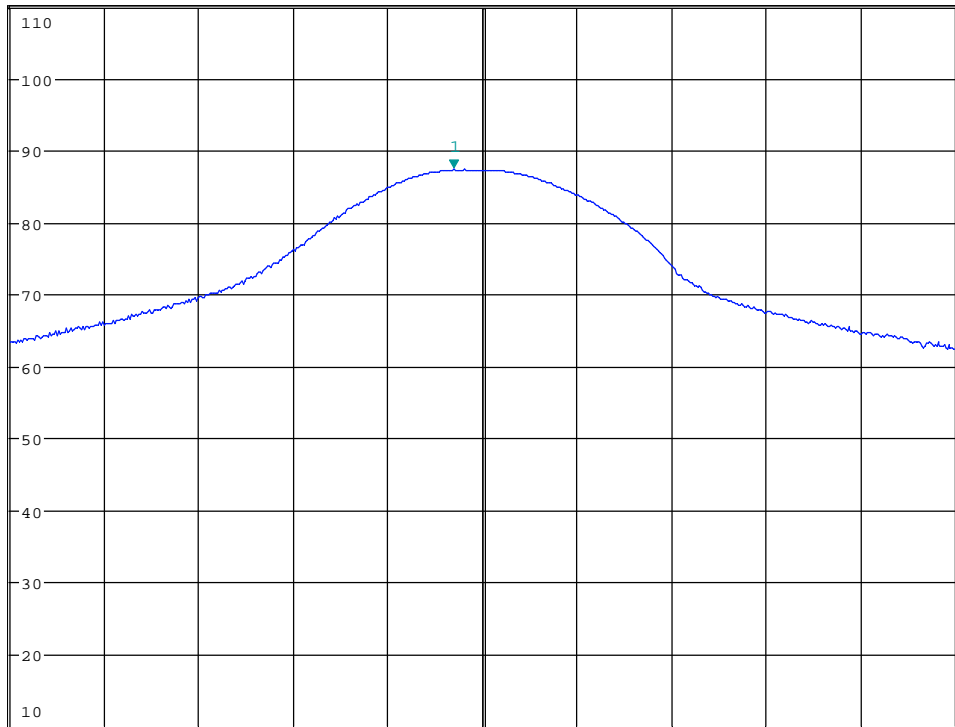
SWT 2.5 ms

Marker 1 [T1]

87.34 dBuV/m

2.479086538 GHz

1 PK
MAXH



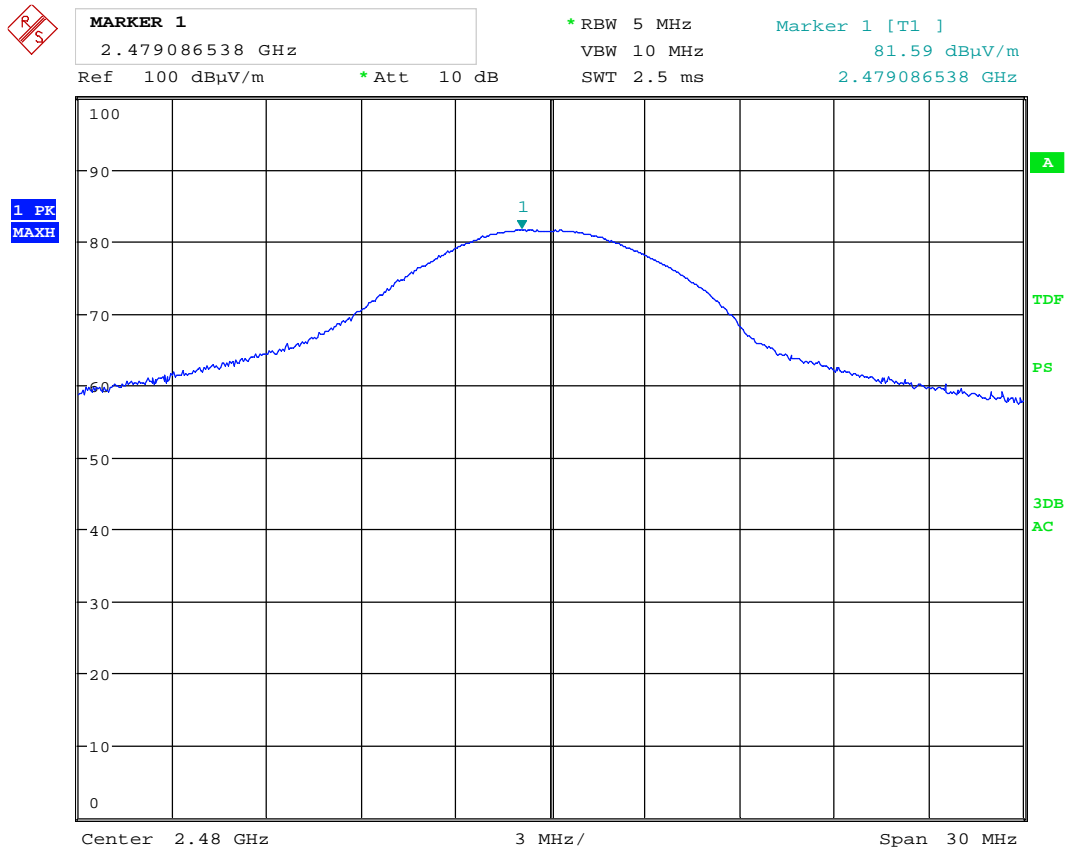
Center 2.48 GHz

3 MHz/

Span 30 MHz

Date: 27.OCT.2016 10:14:20

Radiated field strength, VP, 2480 MHz



Date: 27.OCT.2016 10:18:37

Radiated field strength, HP, 2480 MHz



MARKER 1

2.404375 GHz

* RBW 5 MHz

VBW 10 MHz

SWT 2.5 ms

Marker 1 [T1]

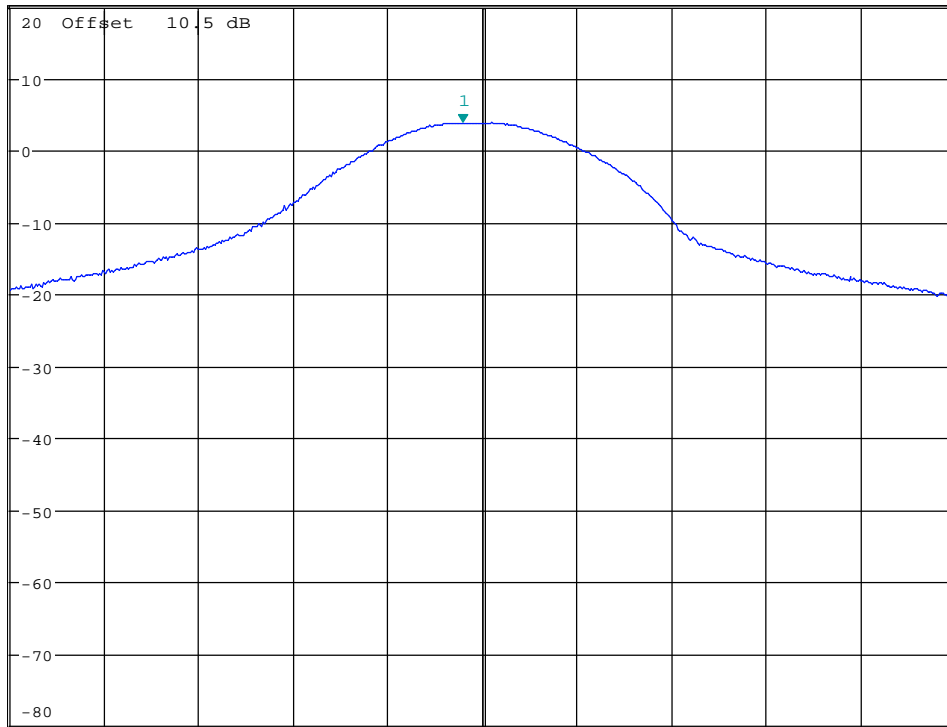
3.77 dBm

2.404375000 GHz

Ref 20 dBm

* Att 20 dB

1 PK
MAXH



Center 2.405 GHz

3 MHz/

Span 30 MHz

Date: 27.OCT.2016 15:46:13

Conducted power – 2405MHz



MARKER 1

2.438990385 GHz

Ref 20 dBm

* Att 10 dB

* RBW 5 MHz

VBW 10 MHz

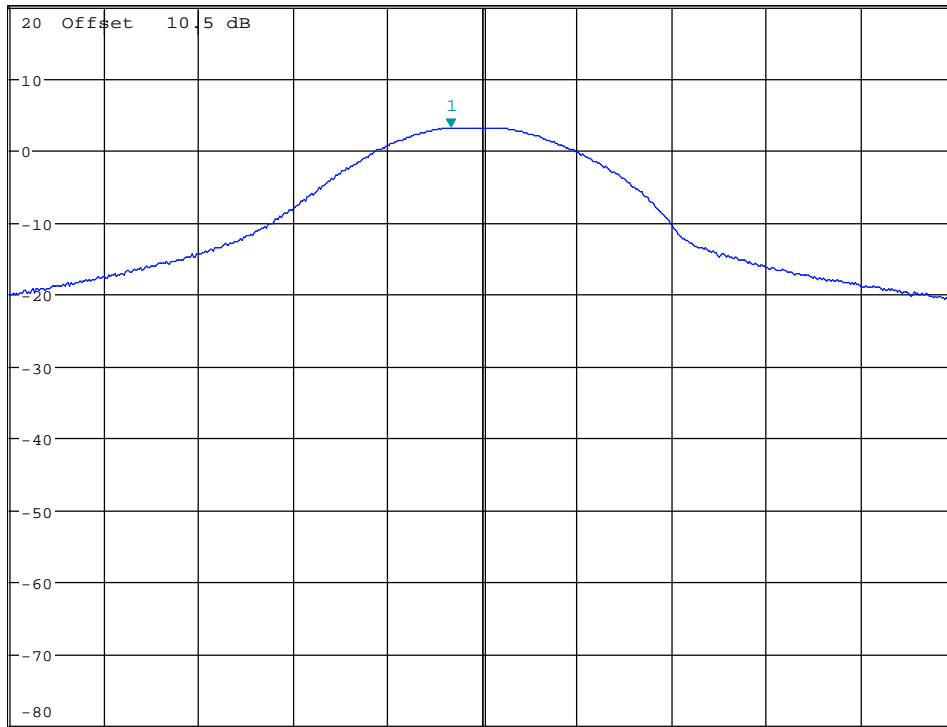
SWT 2.5 ms

Marker 1 [T1]

3.19 dBm

2.438990385 GHz

1 PK
MAXH



Center 2.44 GHz

3 MHz/

Span 30 MHz

Date: 27.OCT.2016 15:56:43

Conducted power – 2440MHz



MARKER 1

2.479182692 GHz

Ref 0 dBm

* Att 10 dB

* RBW 5 MHz

VBW 10 MHz

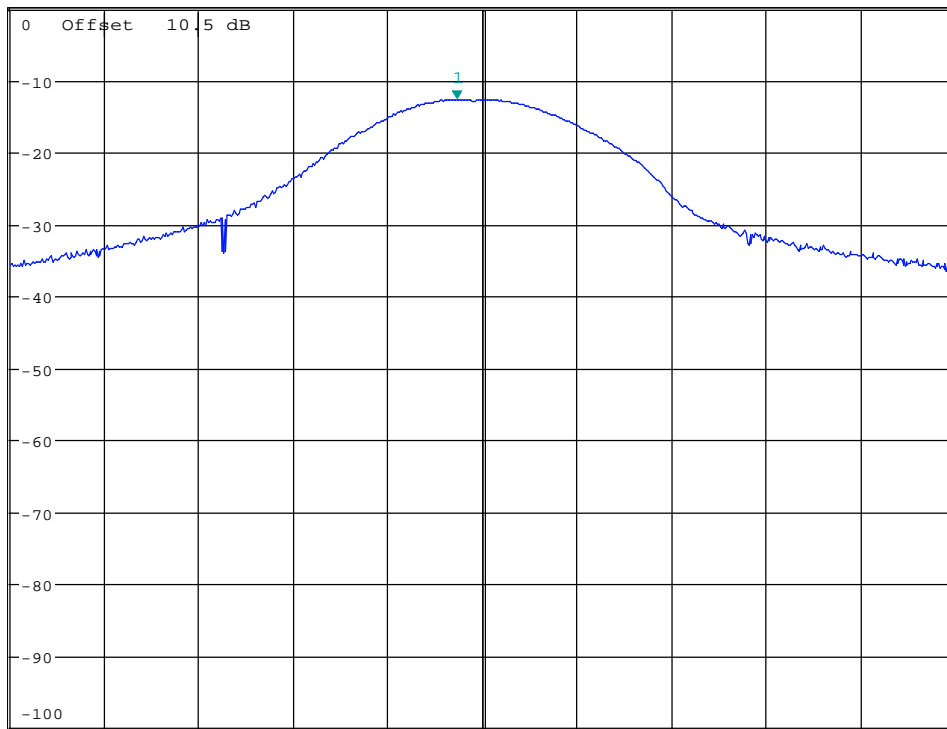
SWT 2.5 ms

Marker 1 [T1]

-12.65 dBm

2.479182692 GHz

1 PK
MAXH



Center 2.48 GHz

3 MHz/

Span 30 MHz

Date: 27.OCT.2016 15:55:07

Conducted power – 2480MHz

3.5 Spurious Emissions (Radiated)

Para. No.: 15.247 (c)

Test Performed By: G.Suwanthakumar	Date of Test: 2016.10.27
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Test Results: Complies

Measurement Data:

Band-edge, @3m

Frequency	Measured Field Strength @3m, dBμV/m	Detector	Duty Cycle Correction (dB)	Limit dBμV/m	Margin dB
2.39 GHz	69.12	PK	-	74	4.88
	49.12	AV	20	54	4.88
2.4835 GHz	63.78	PK	-	74	10.22
	43.78	AV	20	54	10.22

See attached plots.

Duty Cycle Calculation:

Pollperiod: 20s

CSMA/CA frame transmission 2.368 ms (default random back-off exponent of 3)

Data Frame transmission 4.256 ms (full frame)

Maximum transmission is one CSMA/CA and one Data Frame per poll period.

Duty Cycle Calculation: $(2.368\text{ms} + 4.256\text{ms}) / 100\text{ms} = 6.624\%$

Duty Cycle Correction Factor Calculation: $-20 \times \log_{10}(0.06624) \text{ dB} = 23.6 \text{ dB}$

Duty Cycle Correction Factor is 20 dB

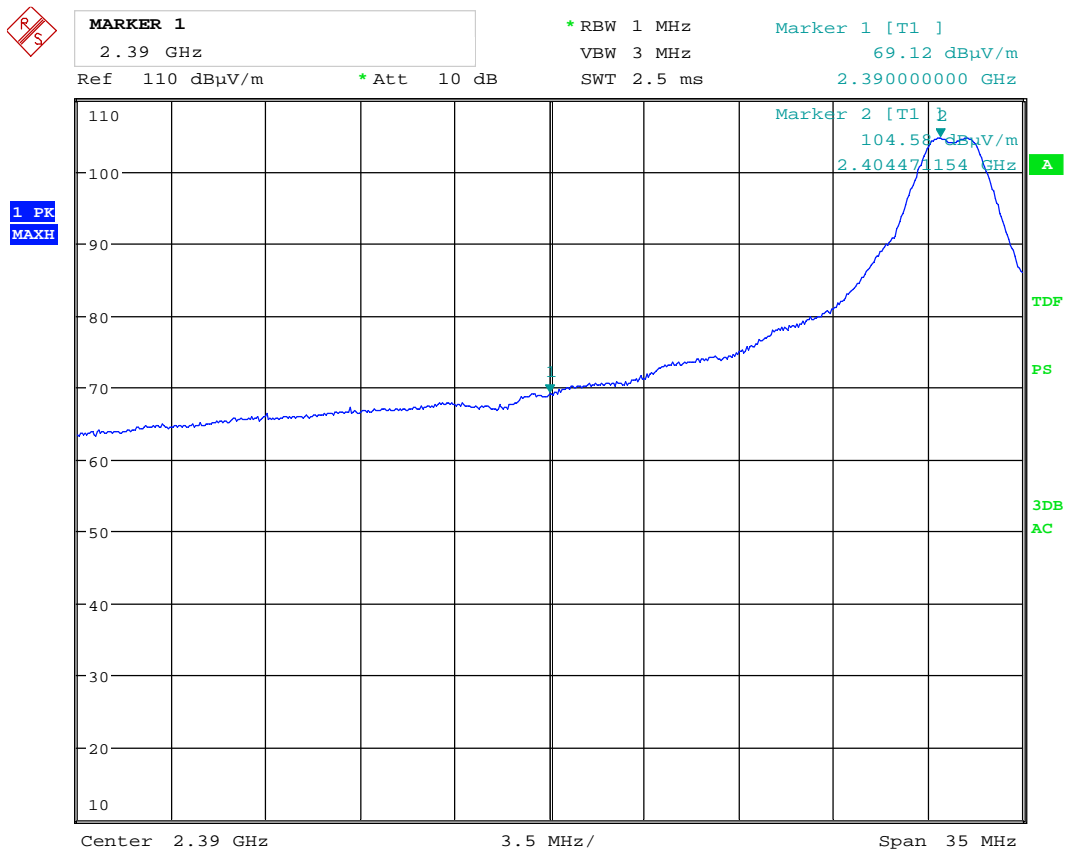
RF conducted power to 25 GHz see attached graph.

Maximum RF level outside operating band:

RF ch 1: 47.89 dB/C, margin >30 dB

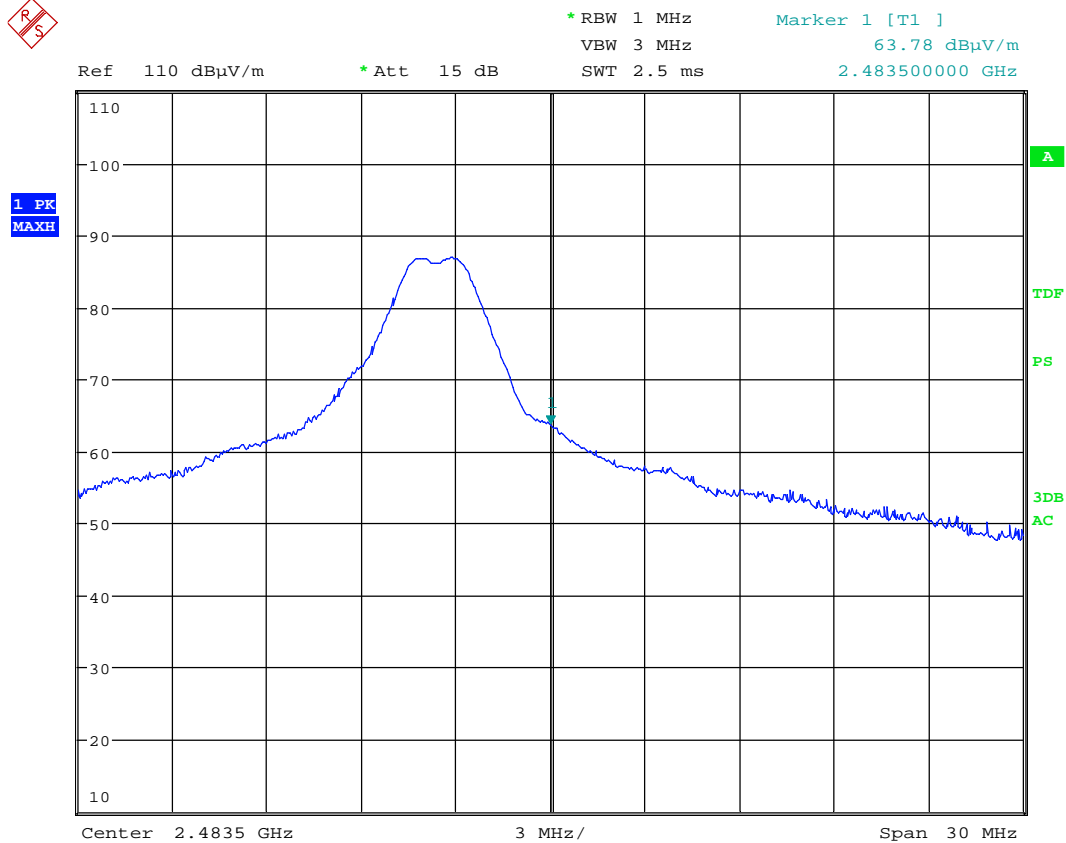
RF ch 8: 47.41 dB/C, margin >30 dB

RF ch 16: 47.01 dB/C, margin >30 dB



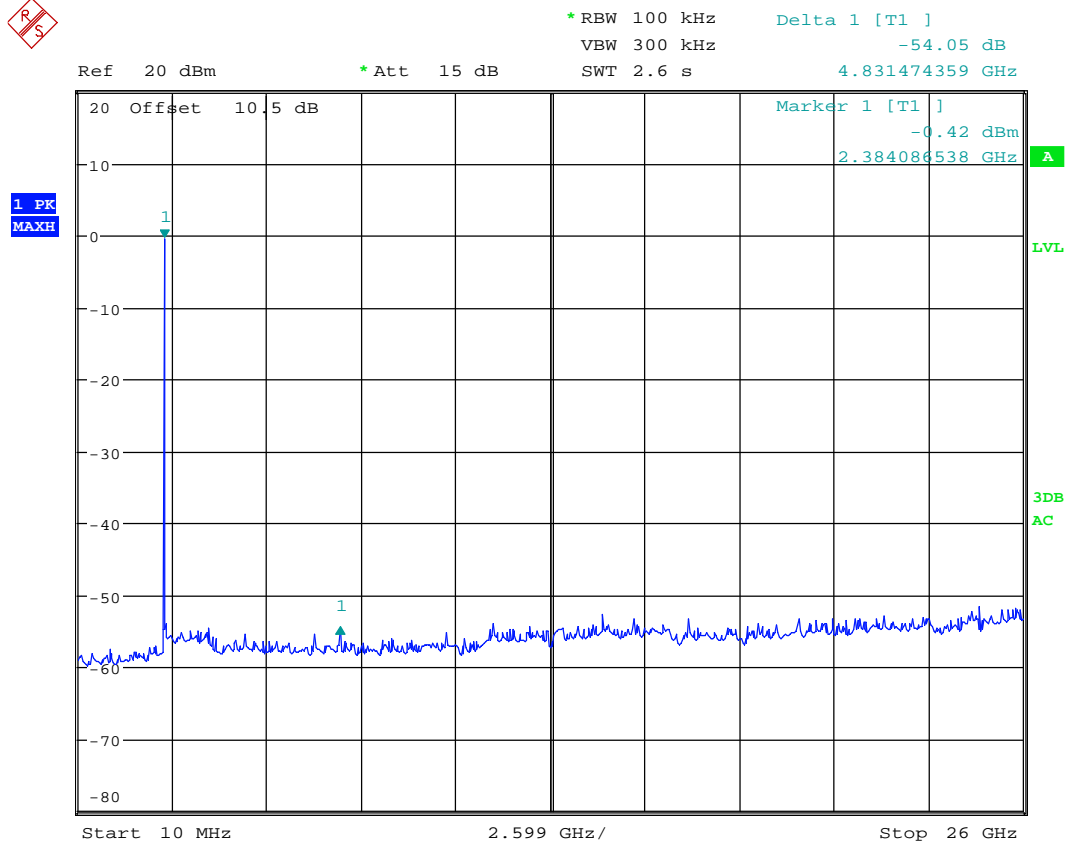
Date: 27.OCT.2016 07:19:15

Band Edge, 2390 MHz, Peak Detector



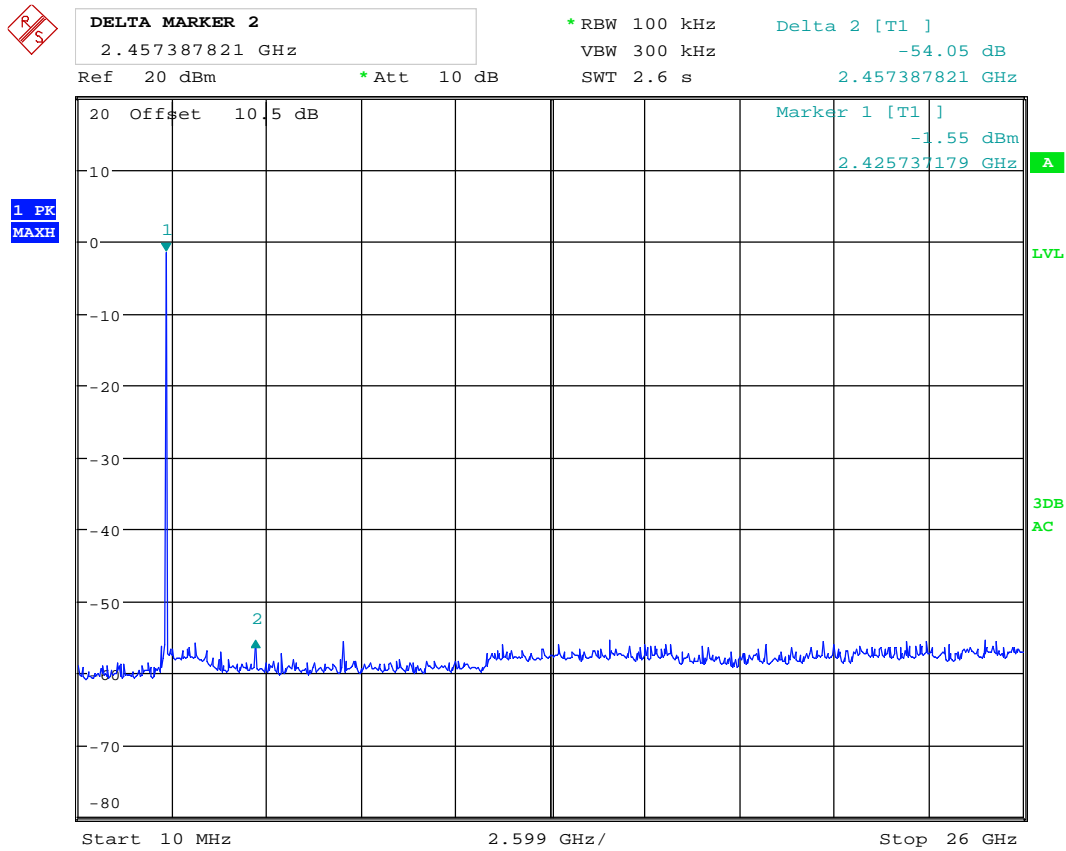
Date: 27.OCT.2016 14:20:13

Band Edge, 2483.5 MHz, Peak Detector



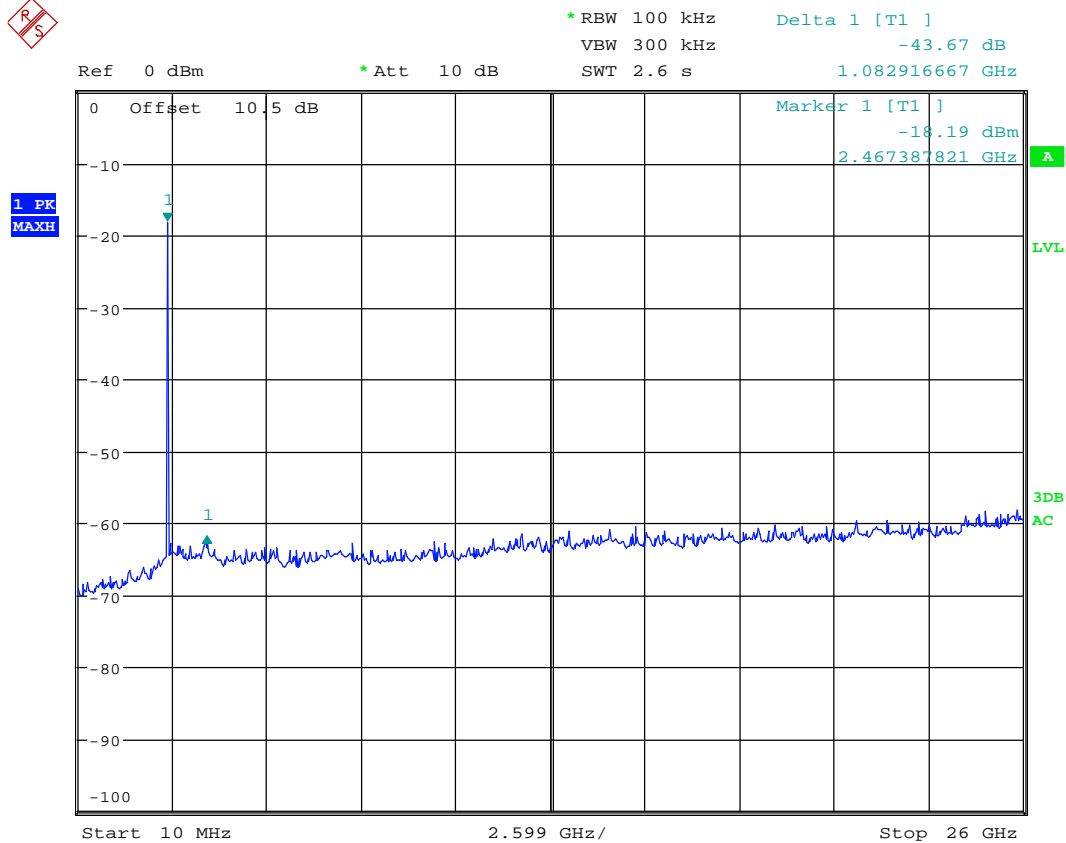
Date: 27.OCT.2016 15:49:06

Conductd spurious emission 10MHz – 25GHz - ch2405MHz



Date: 27.OCT.2016 15:58:46

Conductd spurious emission 10MHz – 25GHz - ch2440MHz



Date: 27.OCT.2016 15:53:47

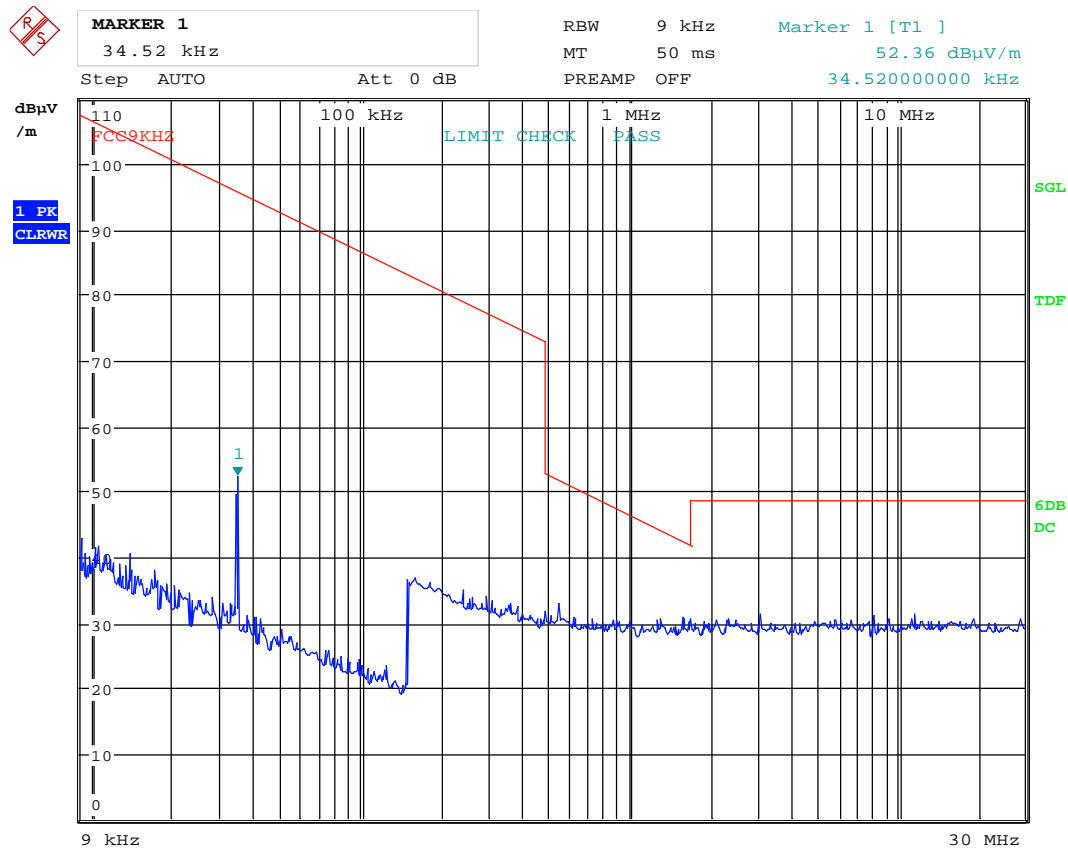
Conducted spurious emission 10MHz – 25GHz - ch2480MHz

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: 27.OCT.2016 15:17:57

Radiated Emissions, 9 kHz – 30 MHz @10m

Radiated emission 30 – 1000 MHz.

Detector: Quasi-Peak

Measuring distance 3 m.

Frequency	Operational condition	Detector	Field strength	Measuring distance	Limit FCC15.209	Margin
MHz			dB μ V/m	metres	dB μ V/m	dB
192.82	TX on	QP	36.63	3	43.5	6.87
240.1	TX ON	QP	32.74	3	46.0	13.26

See attached graphs.

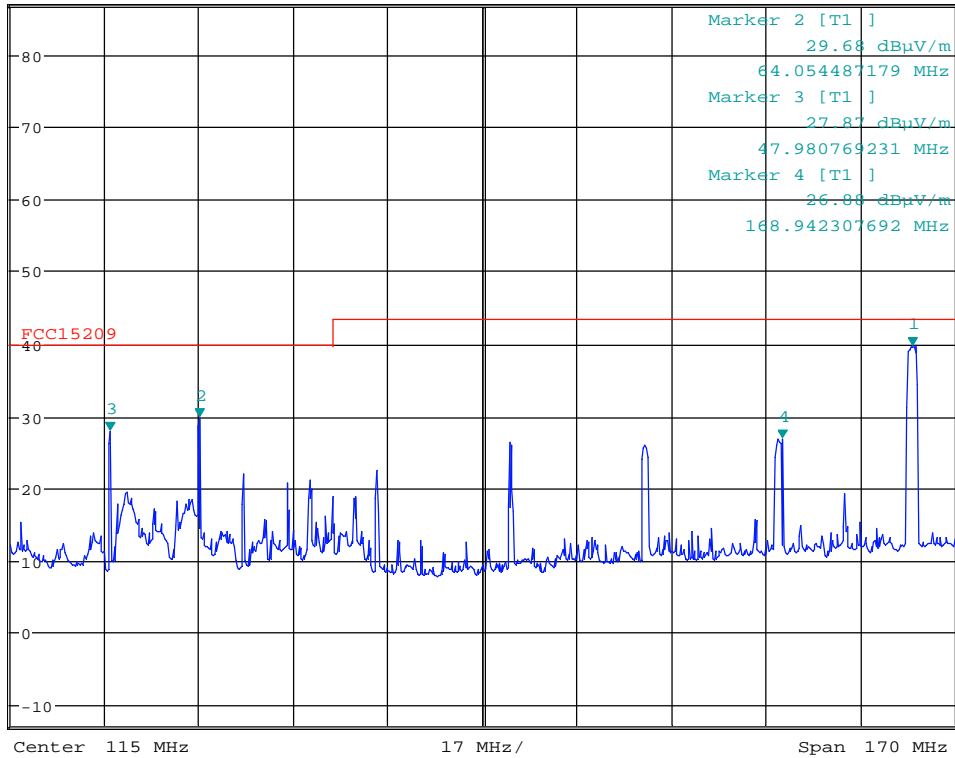


MARKER 1
192.3717949 MHz
Ref 87 dBμV/m * Att 10 dB

* RBW 100 kHz
VBW 300 kHz
SWT 20 ms

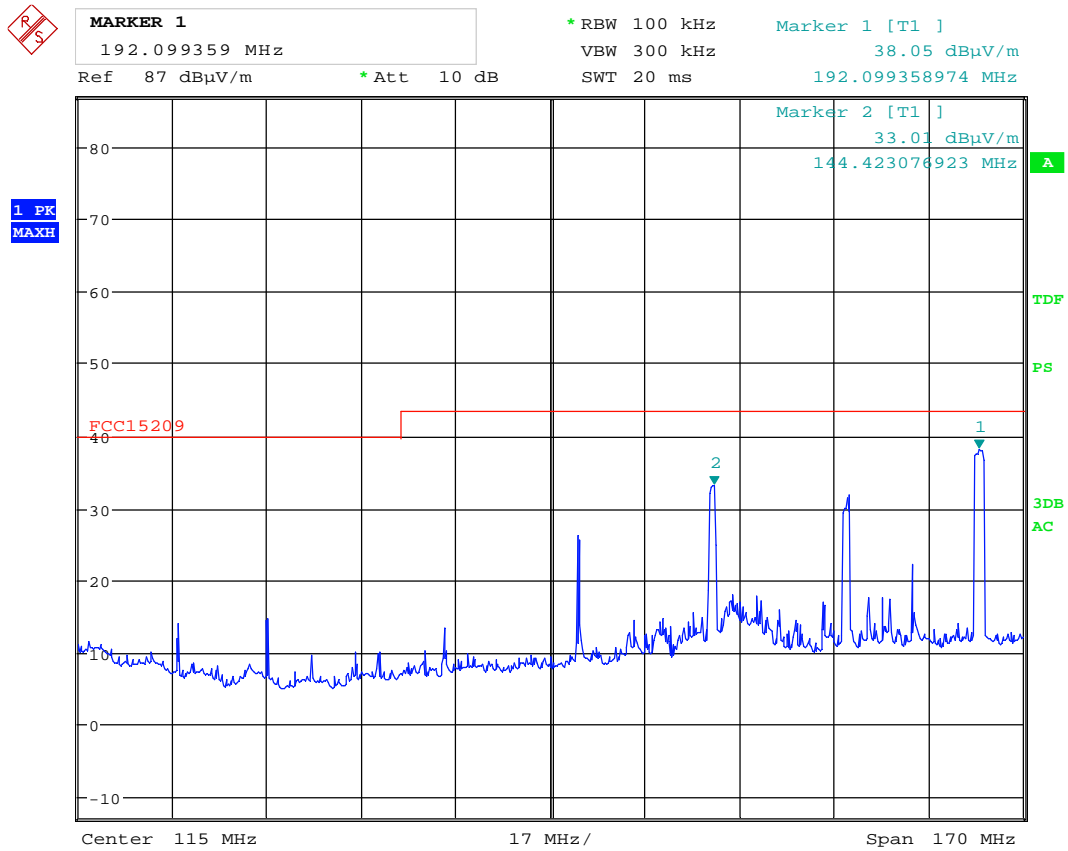
Marker 1 [T1]
39.73 dBμV/m
192.371794872 MHz

1 PK
MAXH



Date: 27.OCT.2016 05:59:10

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



Date: 27.OCT.2016 06:01:33

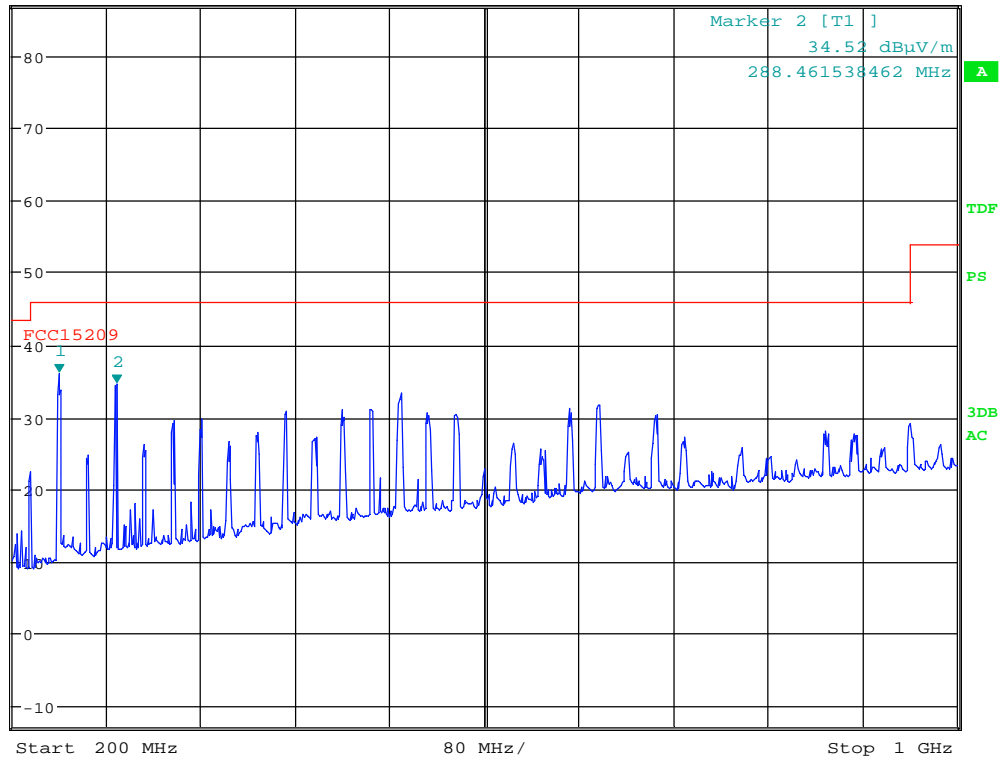
Radiated Emissions, 30 – 200 MHz, HP, @3m, PK scan



MARKER 1
 239.7435897 MHz
 Ref 87 dBμV/m *Att 10 dB

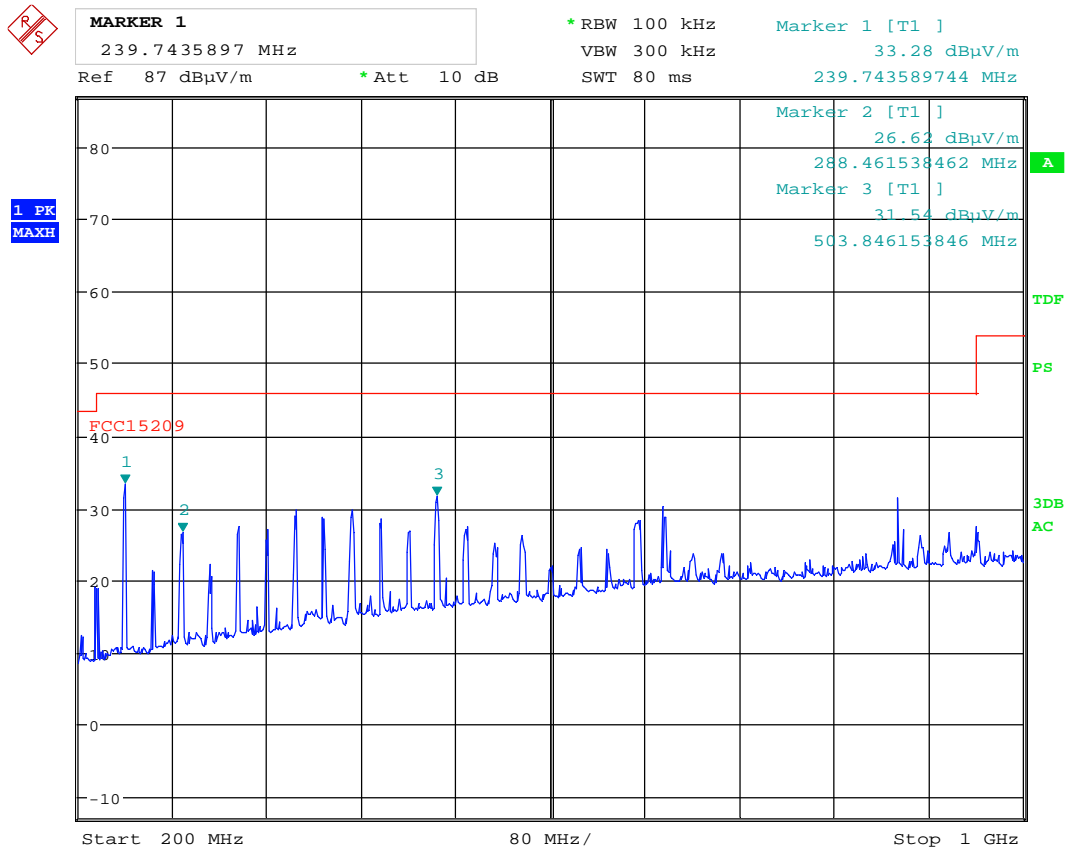
*RBW 100 kHz Marker 1 [T1]
 VBW 300 kHz 36.04 dBμV/m
 SWT 80 ms 239.743589744 MHz

1 PK
 MAXH



Date: 27.OCT.2016 06:10:12

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



Date: 27.OCT.2016 06:12:07

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	58.42	0	74	15.58
4.88	M	0	57.35	0	74	16.65
4.96	H	0	63.57	0	74	10.43
7.215	L	*	70.05	0	74	3.95
7.320	M	*	69.35	0	74	4.65
7.440	H	*	67.23	0	74	6.77
9.62	L	*	60.66	0	74	13.34
9.76	M	*	57.43	0	74	16.57
Other freqs	L,M,H	*	< 74	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	38.42	20	54	15.58
4.88	M	0	37.35	20	54	16.65
4.96	H	0	43.57	20	54	10.43
7.215	L	*	50.05	20	54	3.95
7.320	M	*	49.35	20	54	4.65
7.440	H	*	47.23	20	54	6.77
9.62	L	*	40.66	20	54	13.34
9.76	M	*	37.43	20	54	16.57
Other freqs	L,M,H	/	< 54	-	54	>20

*Distance correction of -9.5 dB for 1m is included in the plot.

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

4.810625 GHz

Ref 82 dBμV/m

* Att 15 dB

* RBW 1 MHz

VBW 3 MHz

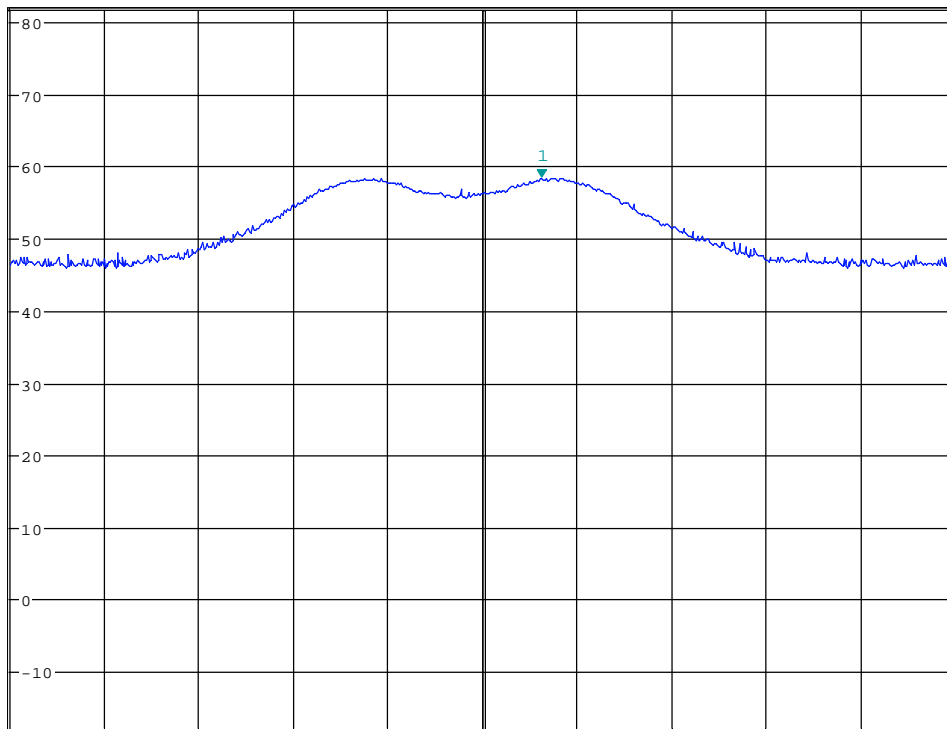
SWT 20 ms

Marker 1 [T1]

58.42 dBμV/m

4.810625000 GHz

1 PK
MAXH



Center 4.81 GHz

1 MHz/

Span 10 MHz

Date: 27.OCT.2016 13:23:33

2nd Harm, 2405MHz , VP @3m , PK detector



MARKER 1

4.880705128 GHz

Ref 82 dB μ V/m

* Att 15 dB

* RBW 1 MHz

VBW 3 MHz

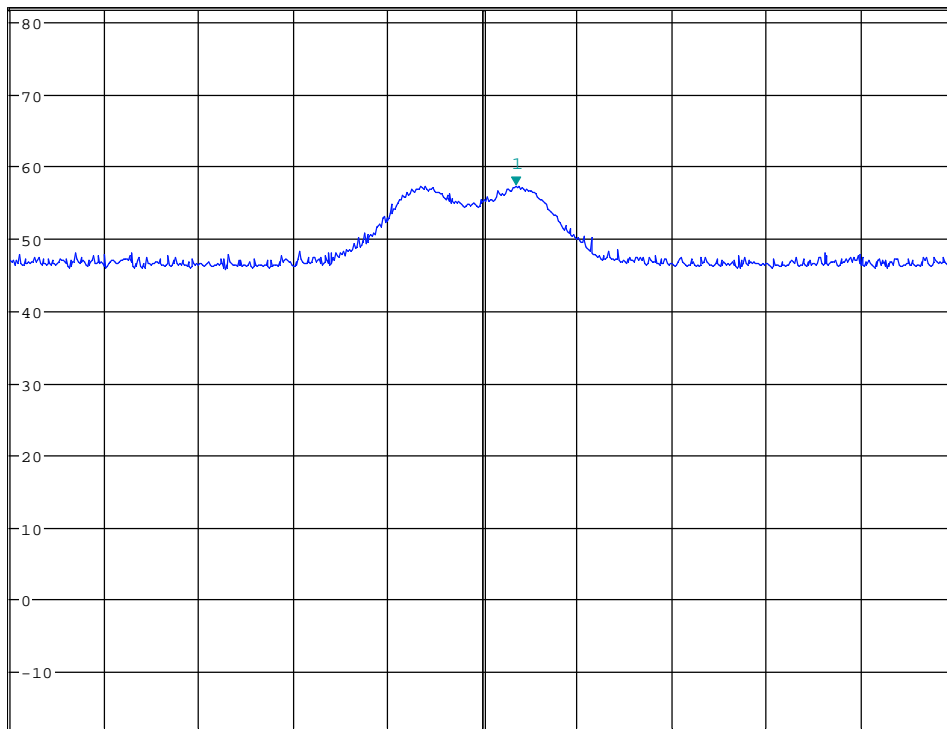
SWT 20 ms

Marker 1 [T1]

57.35 dB μ V/m

4.880705128 GHz

1 PK
MAXH



Center 4.88 GHz

2 MHz/

Span 20 MHz

Date: 27.OCT.2016 13:33:03

2nd Harm, 2440MHz , VP @3m , PK detector



MARKER 1

4.960737179 GHz

Ref 82 dBμV/m

* Att 15 dB

* RBW 1 MHz

VBW 3 MHz

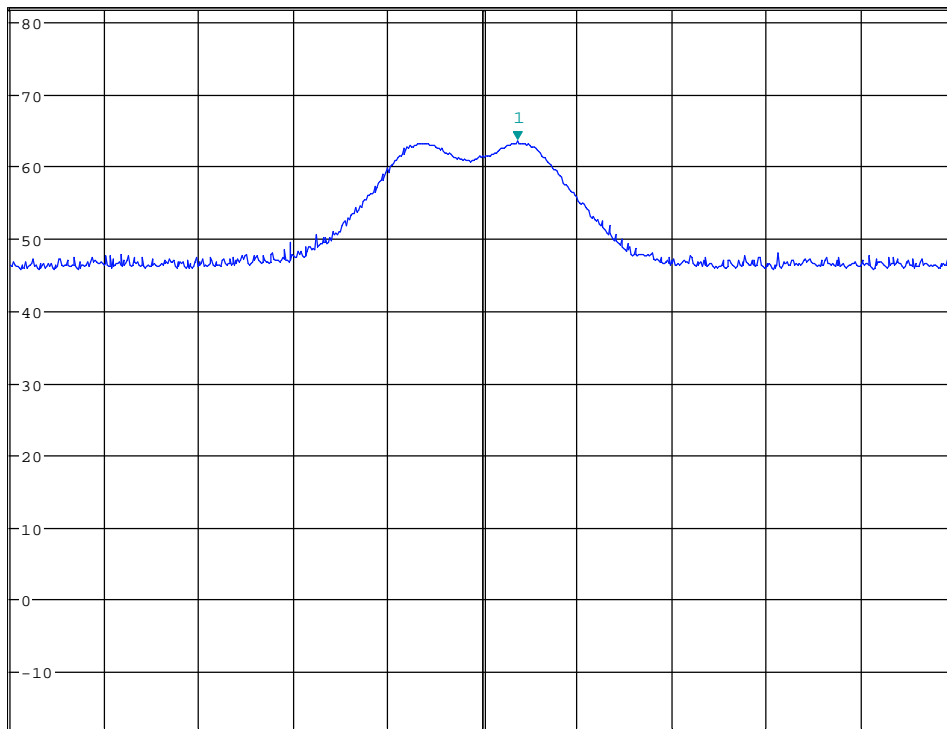
SWT 20 ms

Marker 1 [T1]

63.57 dBμV/m

4.960737179 GHz

1 PK
MAXH



Center 4.96 GHz

2 MHz/

Span 20 MHz

A

TDF

LNA

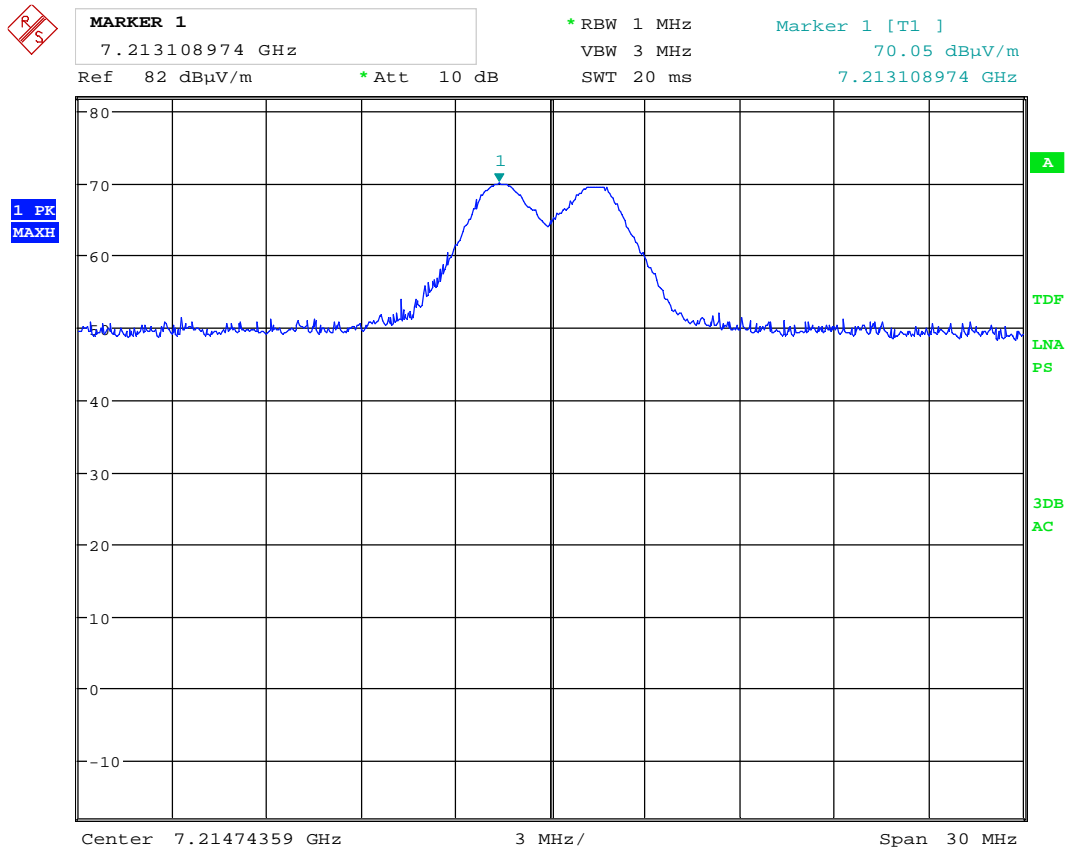
PS

3DB

AC

Date: 27.OCT.2016 13:48:45

2nd Harm, 2480MHz , VP @3m , PK detector



Date: 27.OCT.2016 10:35:37

3rd Harm, 2405MHz , VP @3m , PK detector



MARKER 1

7.318044872 GHz

Ref 82 dBμV/m

* Att 15 dB

* RBW 1 MHz

VBW 3 MHz

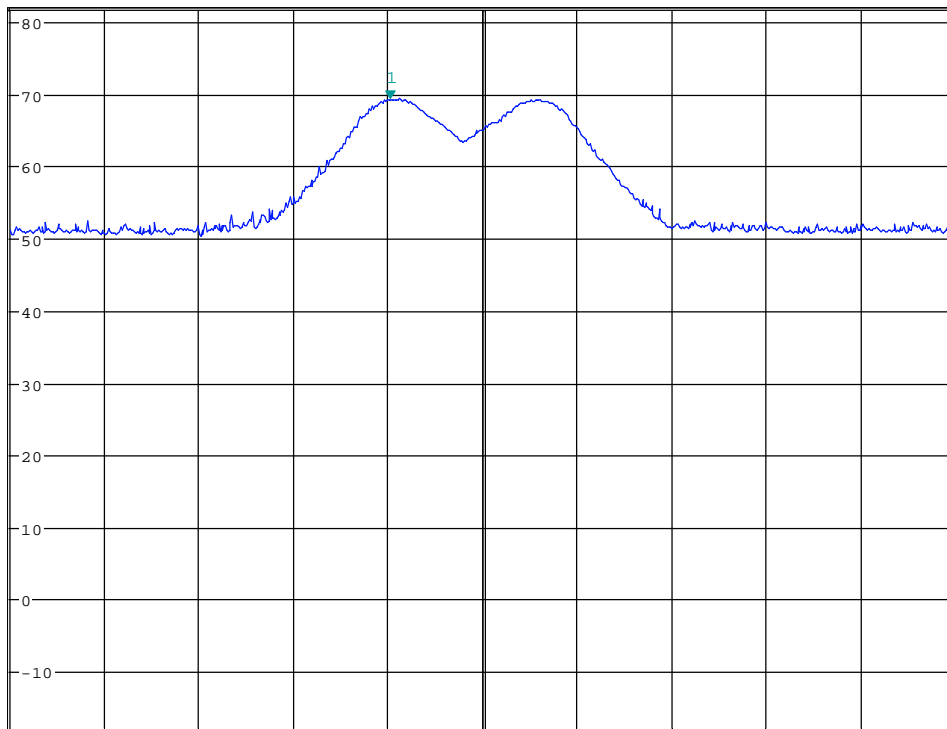
SWT 20 ms

Marker 1 [T1]

69.35 dBμV/m

7.318044872 GHz

1 PK
MAXH



Center 7.32 GHz

2 MHz/

Span 20 MHz

A

TDF

LNA

PS

3DB

AC

Date: 27.OCT.2016 13:36:56

3rd Harm, 2440MHz , VP @3m , PK detector



MARKER 1

7.438173077 GHz

Ref 82 dBμV/m

* Att 15 dB

* RBW 1 MHz

VBW 3 MHz

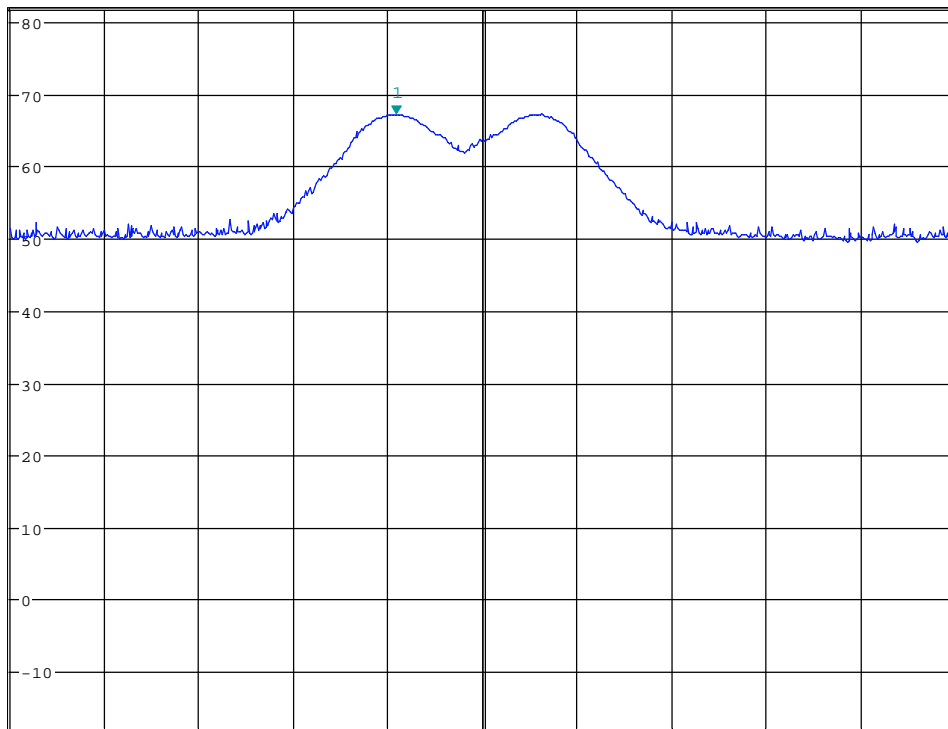
SWT 20 ms

Marker 1 [T1]

67.23 dBμV/m

7.438173077 GHz

1 PK
MAXH



Center 7.44 GHz

2 MHz/

Span 20 MHz

A

TDF

LNA

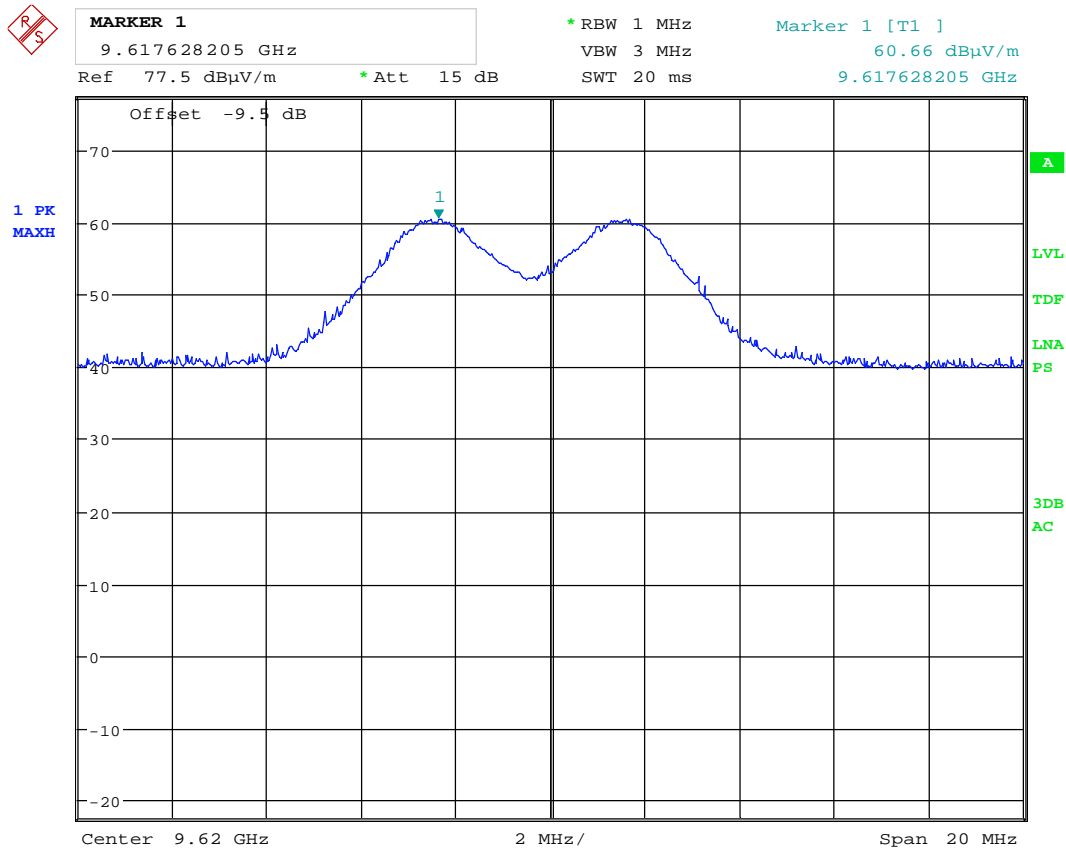
PS

3DB

AC

Date: 27.OCT.2016 13:49:15

3rd Harm, 2480MHz , VP @3m , PK detector



Date: 27.OCT.2016 14:46:07

4th Harm, 2405MHz , HP @1m , PK detector, Distance Correction factor of -9.5 dB is included in the plot



MARKER 1

9.757724359 GHz

Ref 77.5 dBμV/m

* Att 15 dB

* RBW 1 MHz

VBW 3 MHz

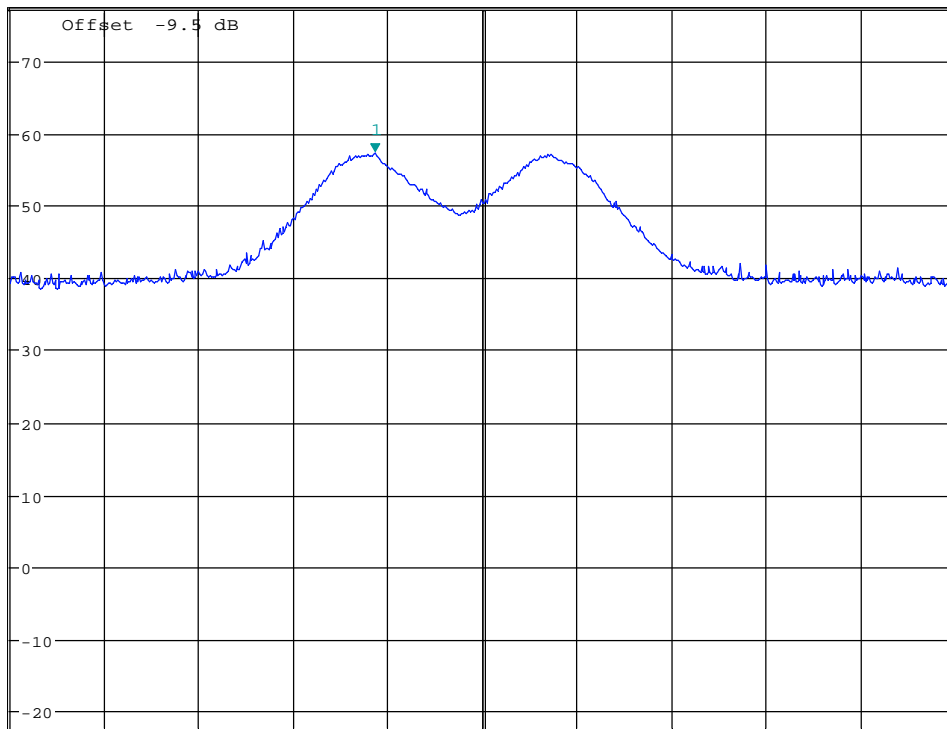
SWT 20 ms

Marker 1 [T1]

57.43 dBμV/m

9.757724359 GHz

1 PK
MAXH



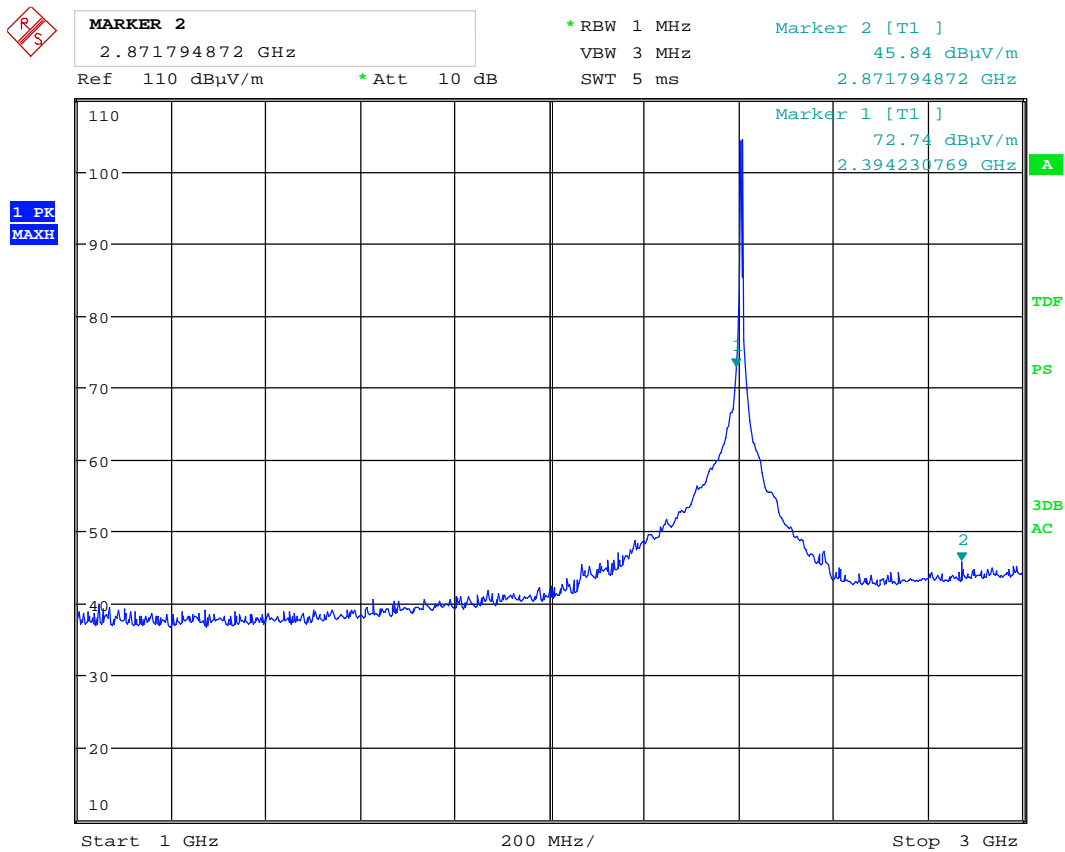
Center 9.76 GHz

2 MHz/

Span 20 MHz

Date: 27.OCT.2016 14:48:19

4th Harm, 2440MHz , HP @1m , PK detector, Distance Correction factor of -9.5 dB is included in the plot



Date: 27.OCT.2016 08:24:25

Radiated Emissions, 2405MHz, 1 – 3 GHz, VP, @3m – Pre-scan with Peak detector

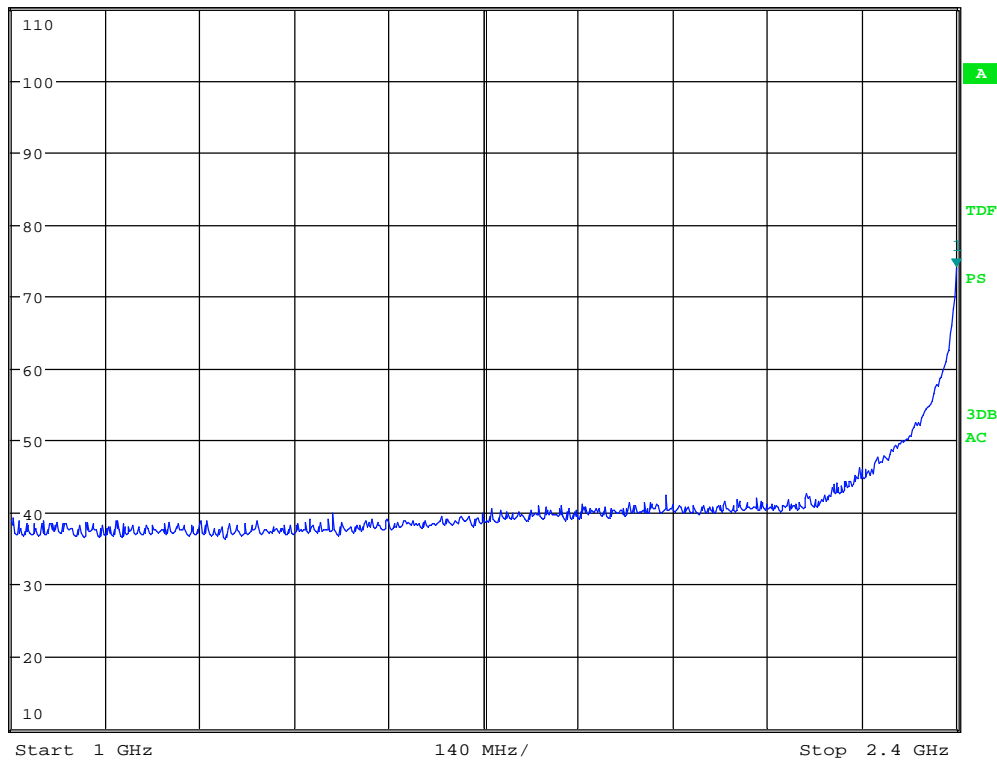


MARKER 1
2.4 GHz
Ref 110 dBμV/m * Att 10 dB

* RBW 1 MHz
VBW 3 MHz
SWT 5 ms

Marker 1 [T1]
74.07 dBμV/m
2.400000000 GHz

1 PK
MAXH



Date: 27.OCT.2016 08:27:03

Radiated Emissions, 2405 MHz, 1 – 2.4 GHz, HP, @3m – Pre-scan with Peak detector



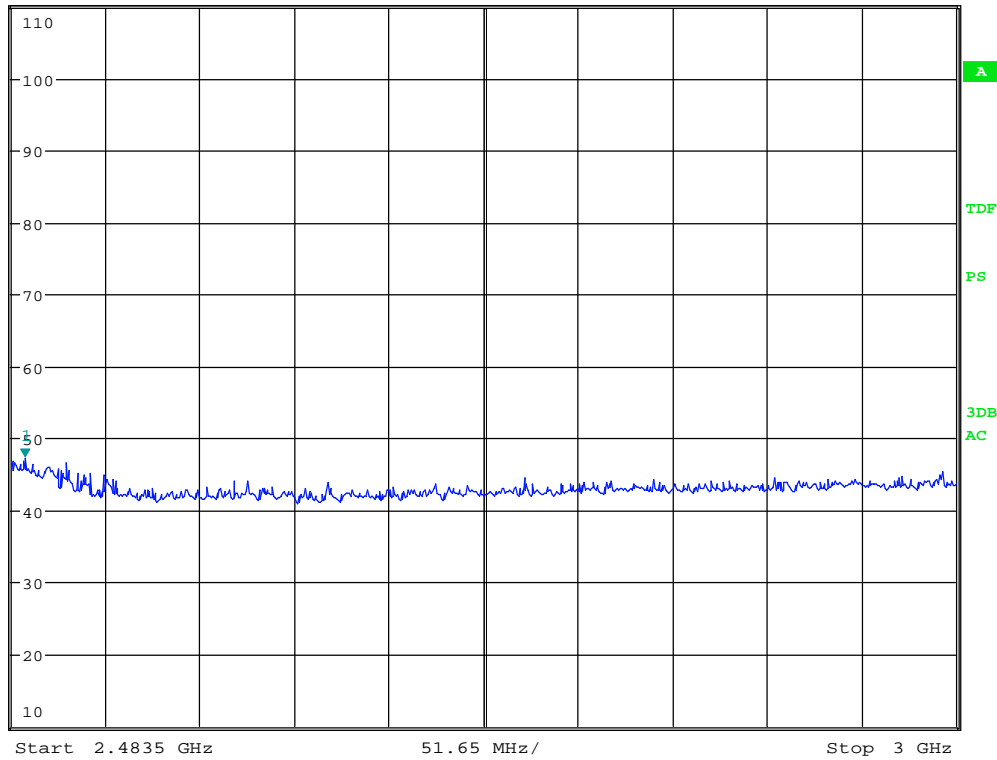
MARKER 1
2.490949519 GHz

*RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms

Marker 1 [T1]
47.31 dBμV/m
2.490949519 GHz

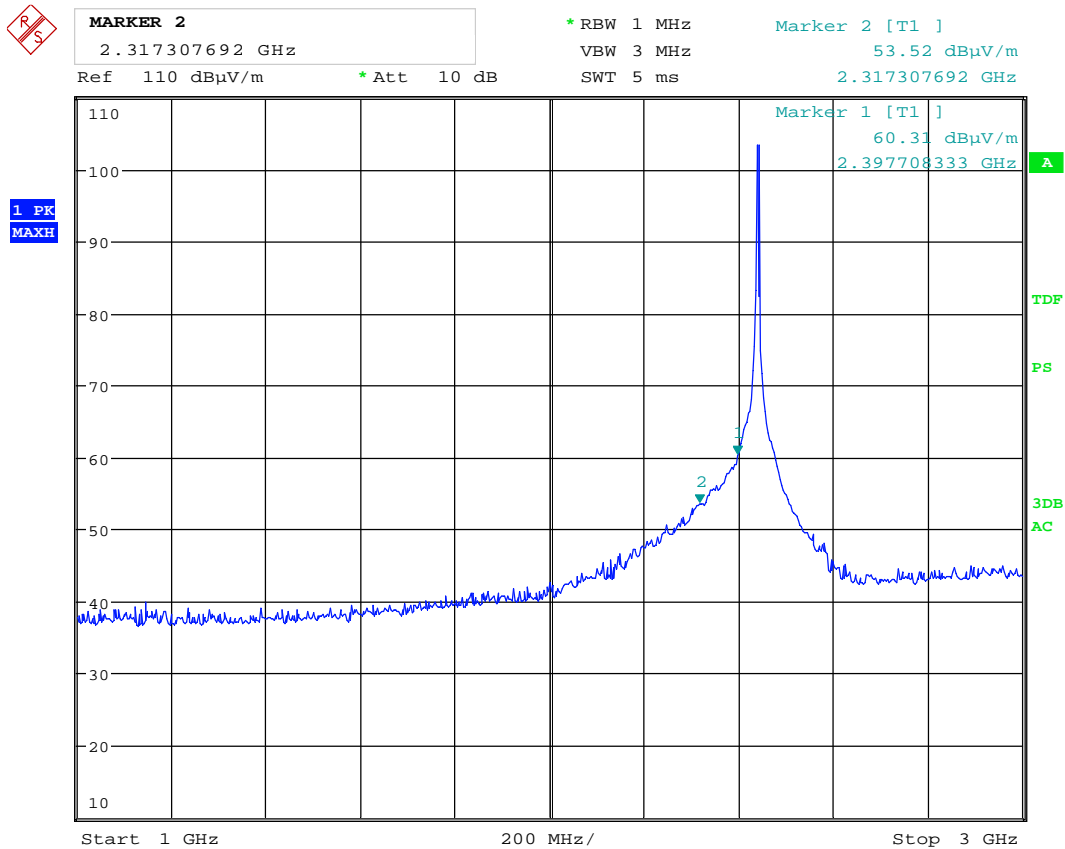
Ref 110 dBμV/m *Att 10 dB

1 PK
MAXH



Date: 27.OCT.2016 08:28:02

Radiated Emissions, 2405 MHz, 2.4835 - 3 GHz, HP, @3m – Pre-scan with Peak detector



Date: 27.OCT.2016 08:44:08

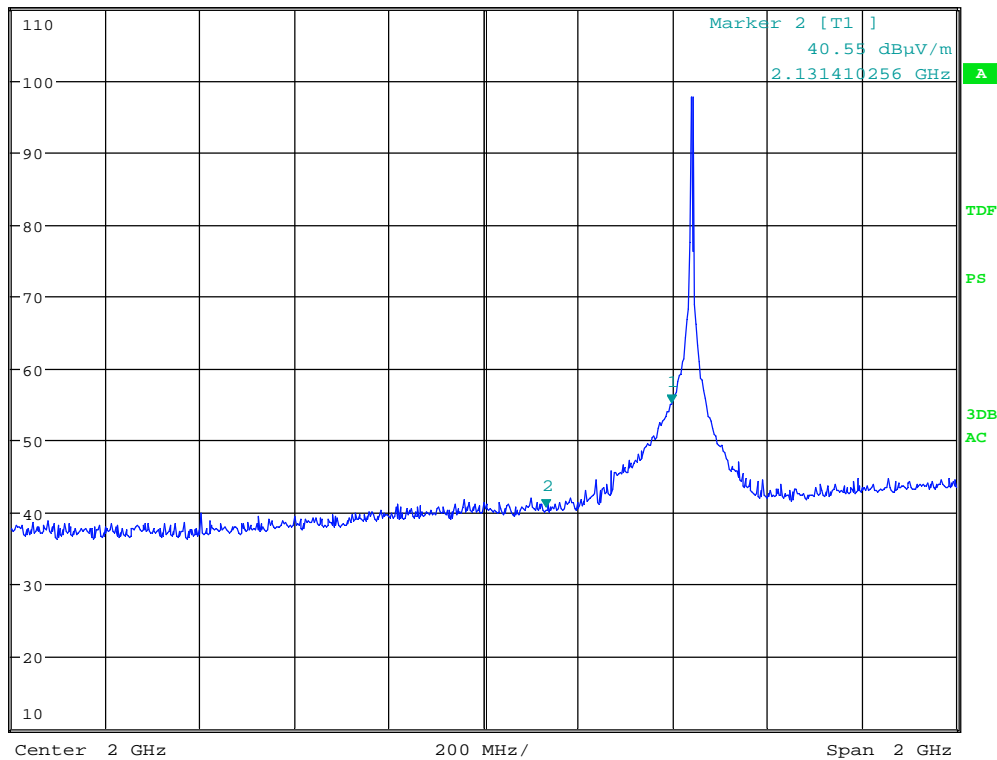
Radiated Emissions ch. 2440 MHz, 1 – 3 GHz, VP, @3m – Pre-scan with Peak detector



MARKER 1
2.397435897 GHz
Ref 110 dBμV/m * Att 10 dB

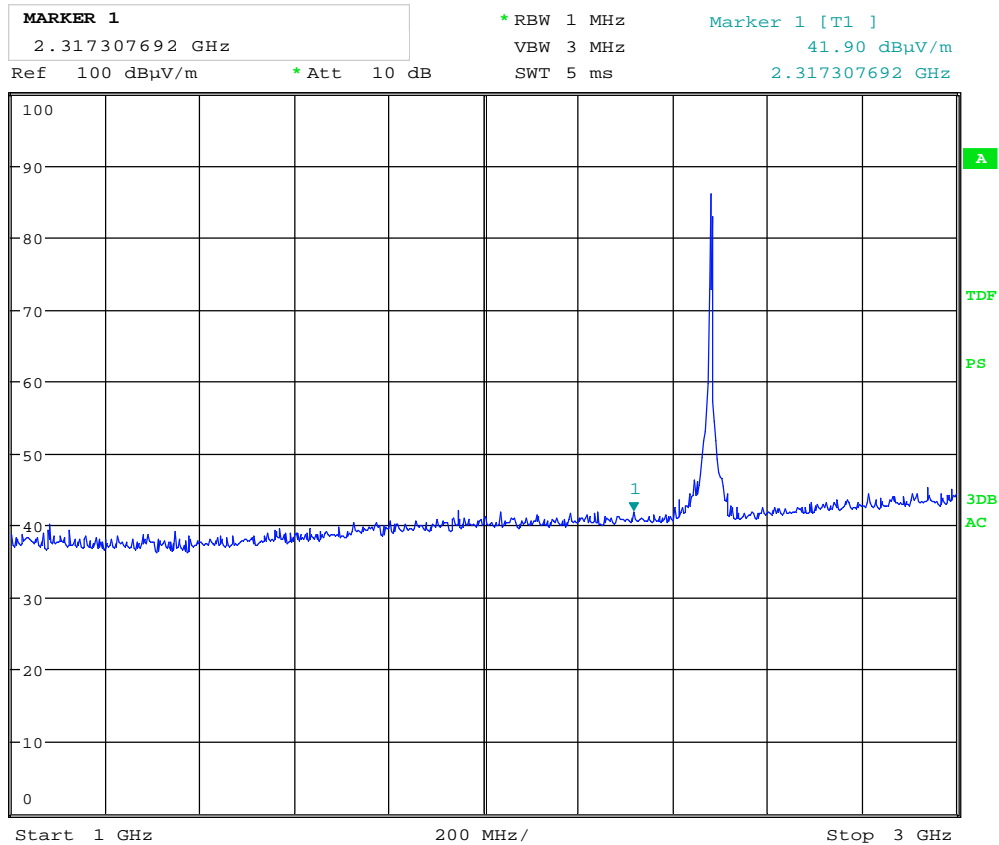
* RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 55.05 dBμV/m
SWT 5 ms 2.397435897 GHz

1 PK
MAXH



Date: 27.OCT.2016 08:40:56

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

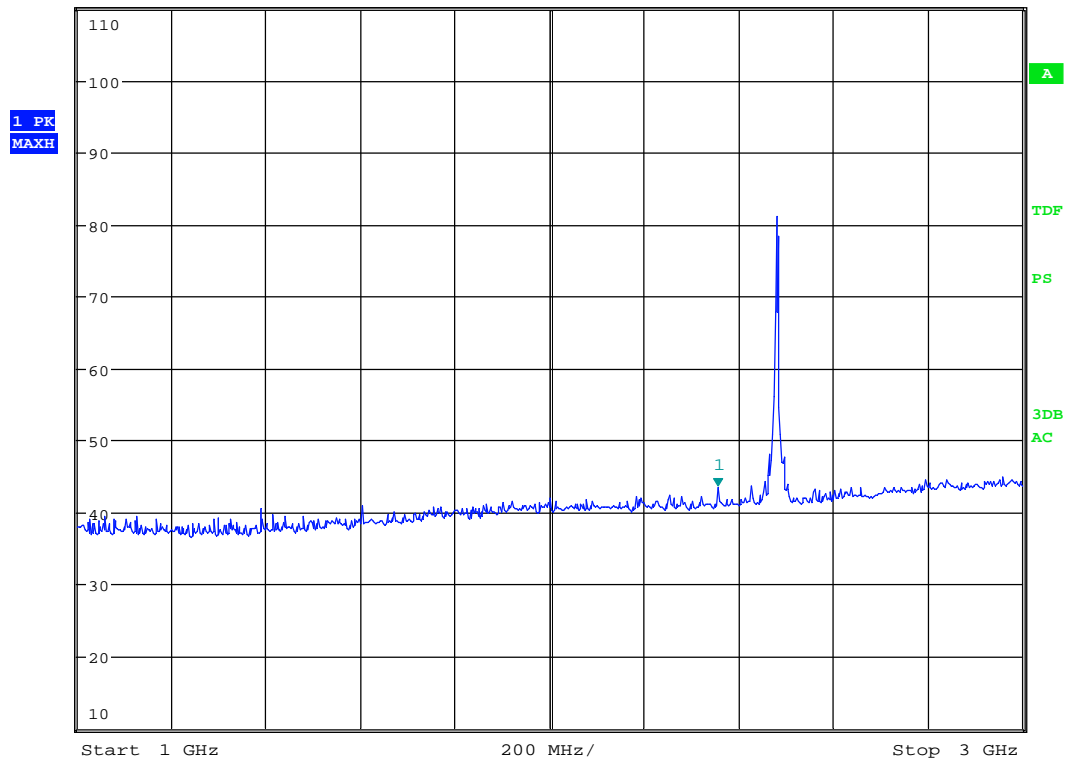


Date: 27.OCT.2016 10:20:45

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



MARKER 1
2.355769231 GHz
Ref 110 dBμV/m * Att 10 dB * RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 43.41 dBμV/m
SWT 5 ms 2.355769231 GHz



Date: 27.OCT.2016 10:17:29

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

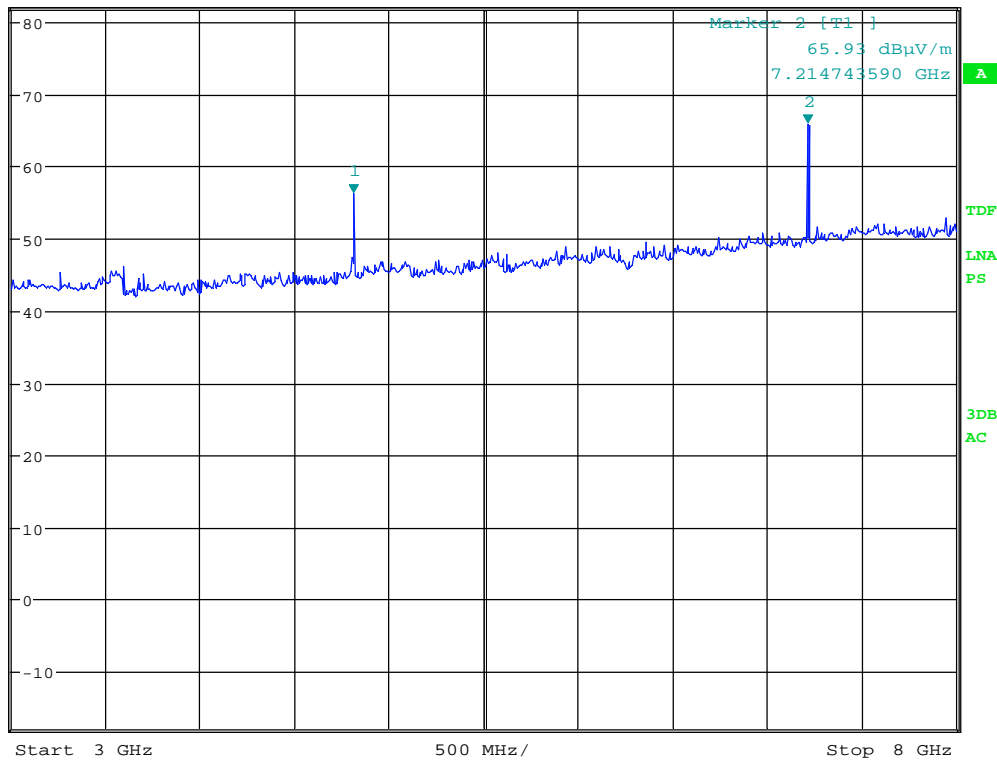


MARKER 1
4.809278846 GHz
Ref 82 dBμV/m * Att 15 dB

* RBW 1 MHz
VBW 3 MHz
SWT 30 ms

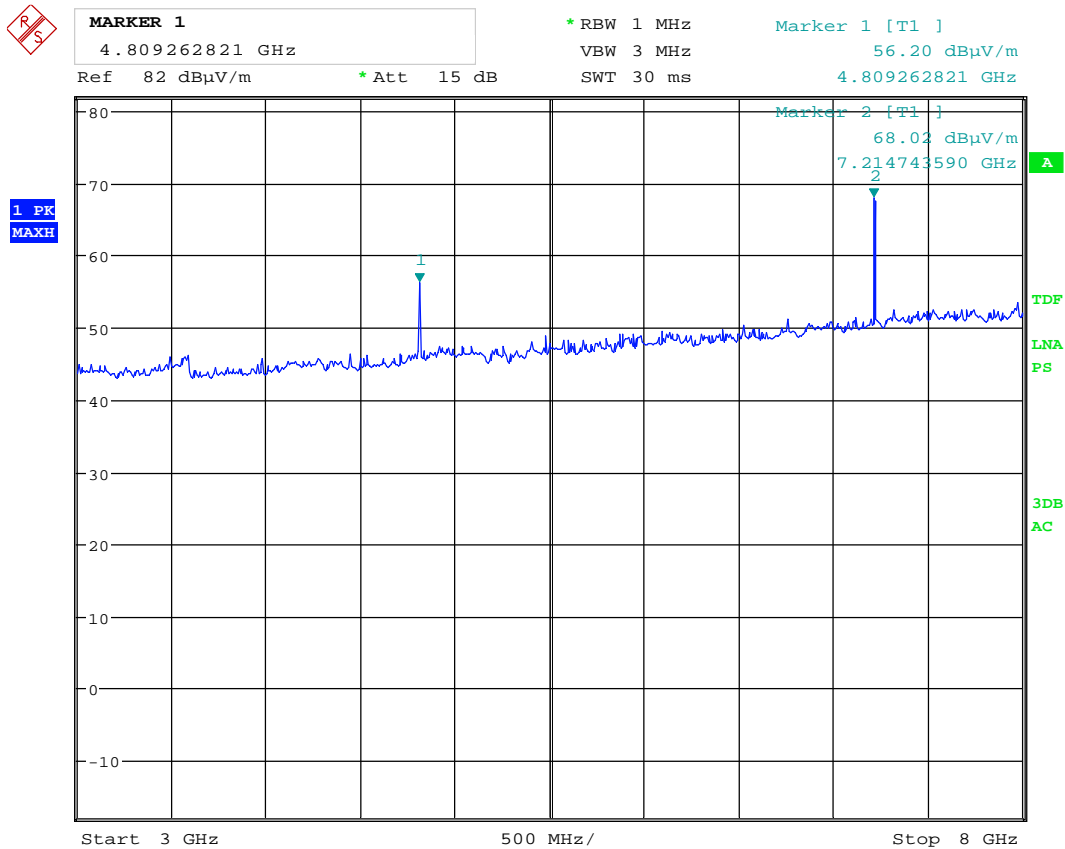
Marker 1 [T1]
56.30 dBμV/m
4.809278846 GHz

1 PK
MAXH



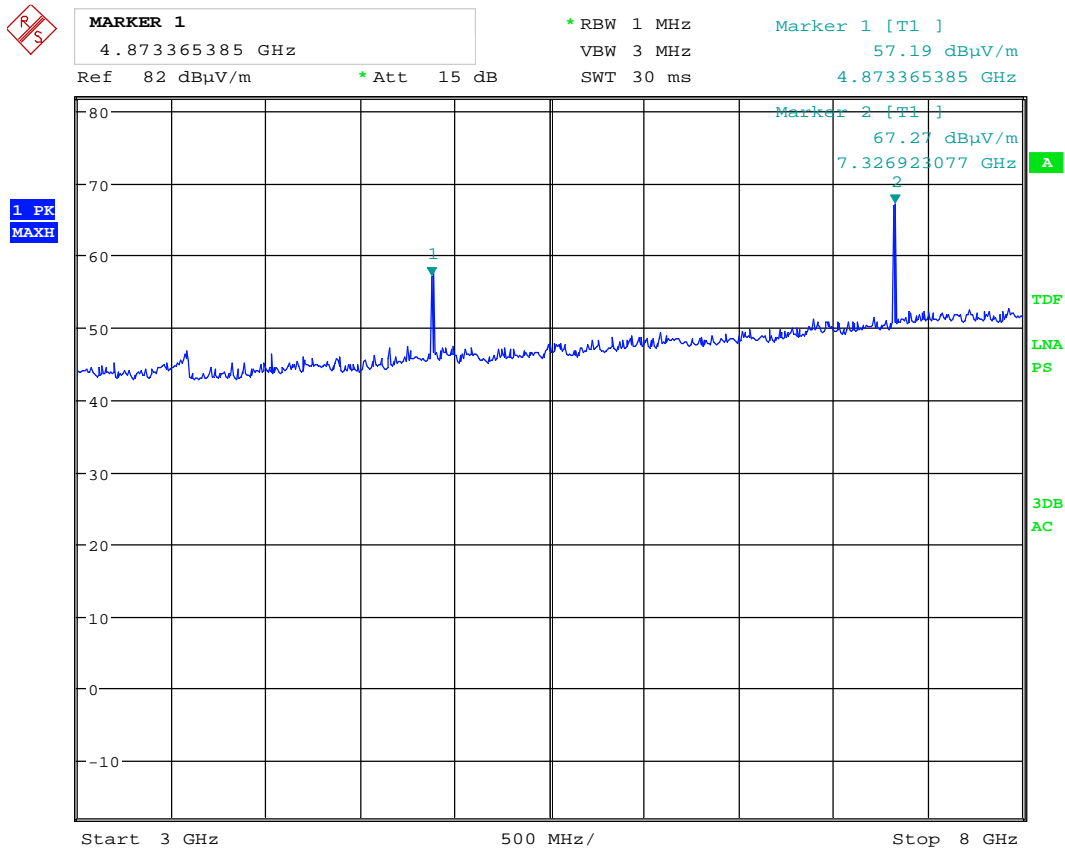
Date: 27.OCT.2016 13:20:56

Radiated Emissions ch. 2405 MHz, 3 – 8 GHz, VP, @3m – Pre-scan with Peak detector



Date: 27.OCT.2016 13:27:01

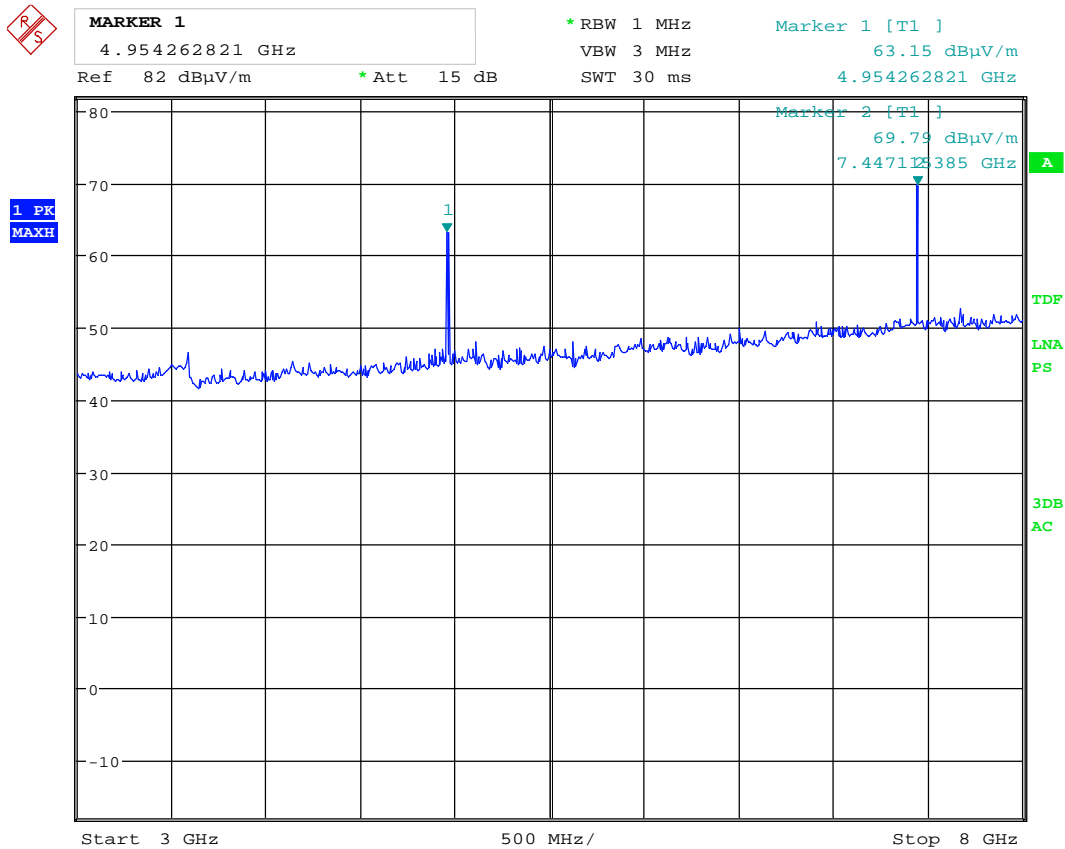
Radiated Emissions ch. 2405 MHz, 3 – 8 GHz, HP, @3m – Pre-scan with Peak detector



Date: 27.OCT.2016 13:30:10

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

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



Date: 27.OCT.2016 13:46:37

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

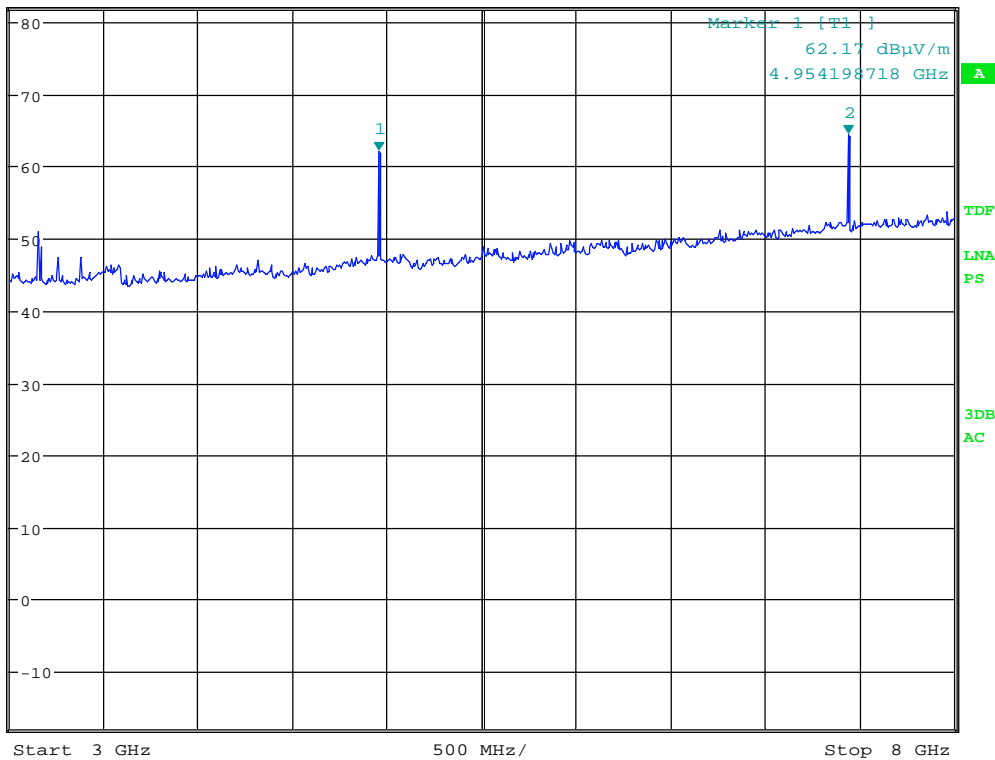


MARKER 2
7.439102564 GHz
Ref 82 dBμV/m * Att 15 dB

* RBW 1 MHz
VBW 3 MHz
SWT 30 ms

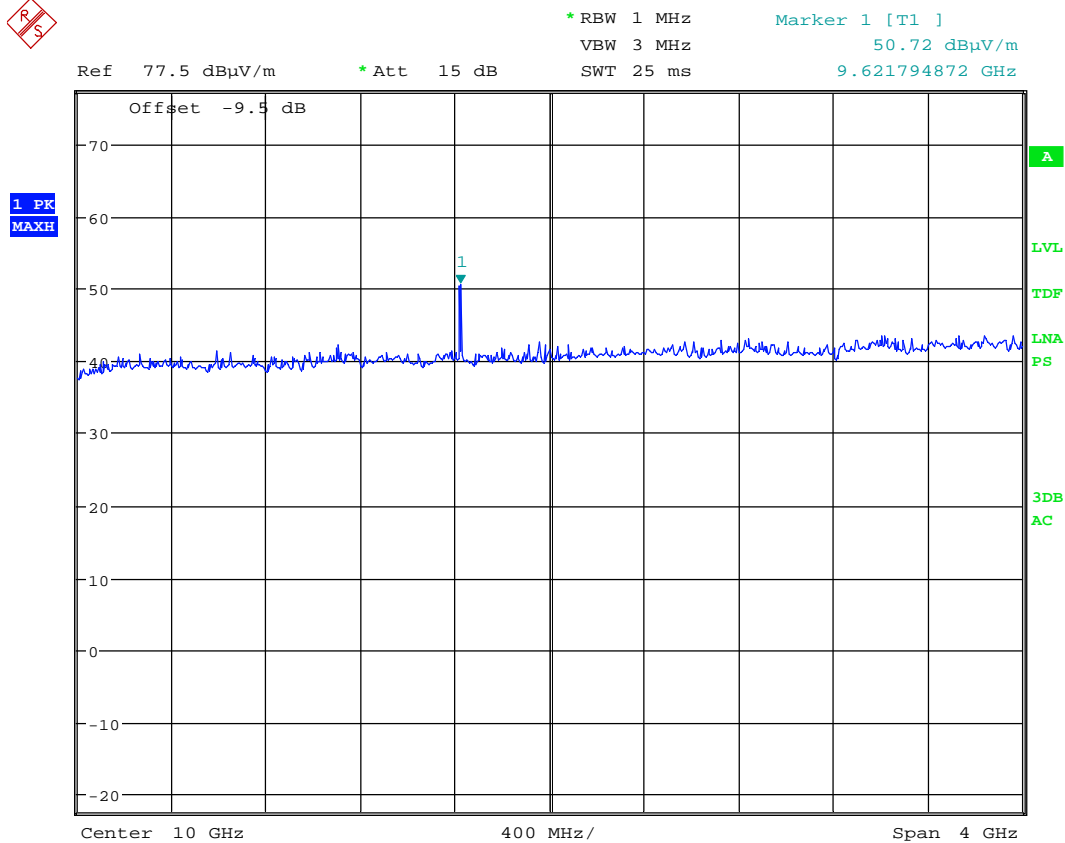
Marker 2 [T1]
64.56 dBμV/m
7.439102564 GHz

1 PK
MAXH



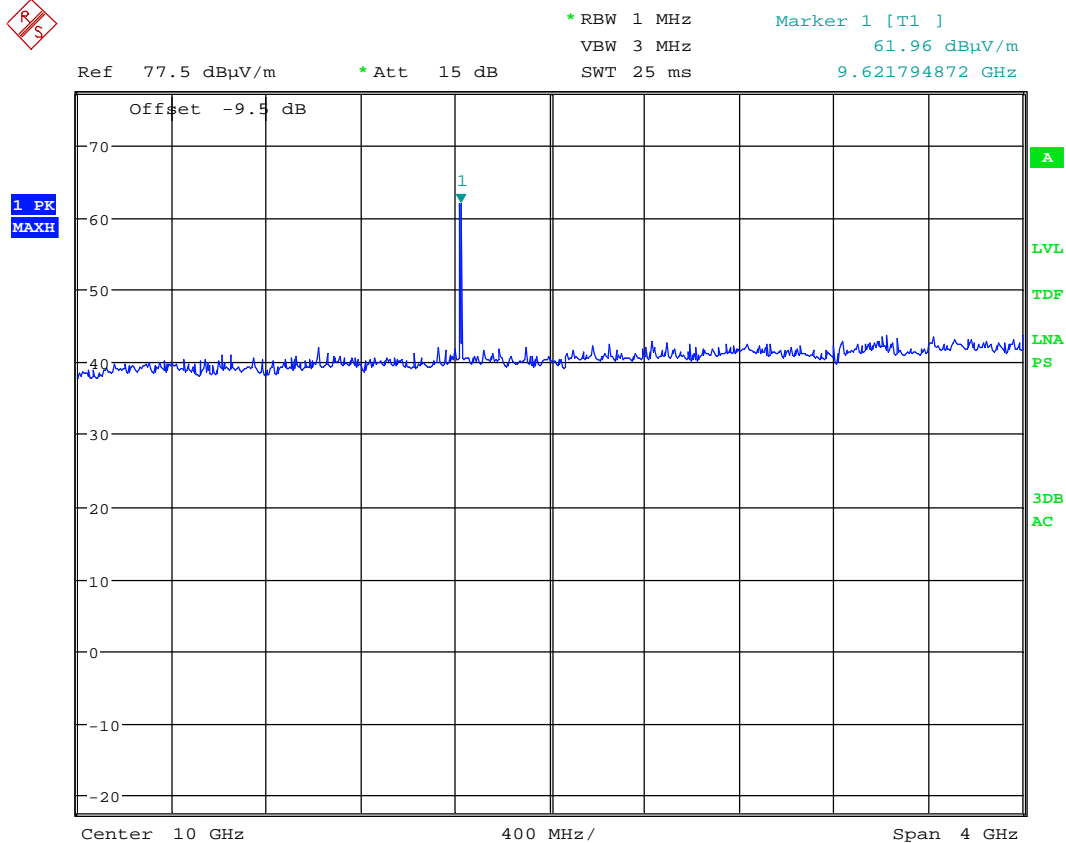
Date: 27.OCT.2016 13:57:49

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



Date: 27.OCT.2016 14:39:14

**Radiated Emissions ch. 2405 MHz, 8 – 12 GHz, VP, @1m – Pre-scan with Peak detector ,
Distance Correction factor of -9.5 dB is included in the plot**

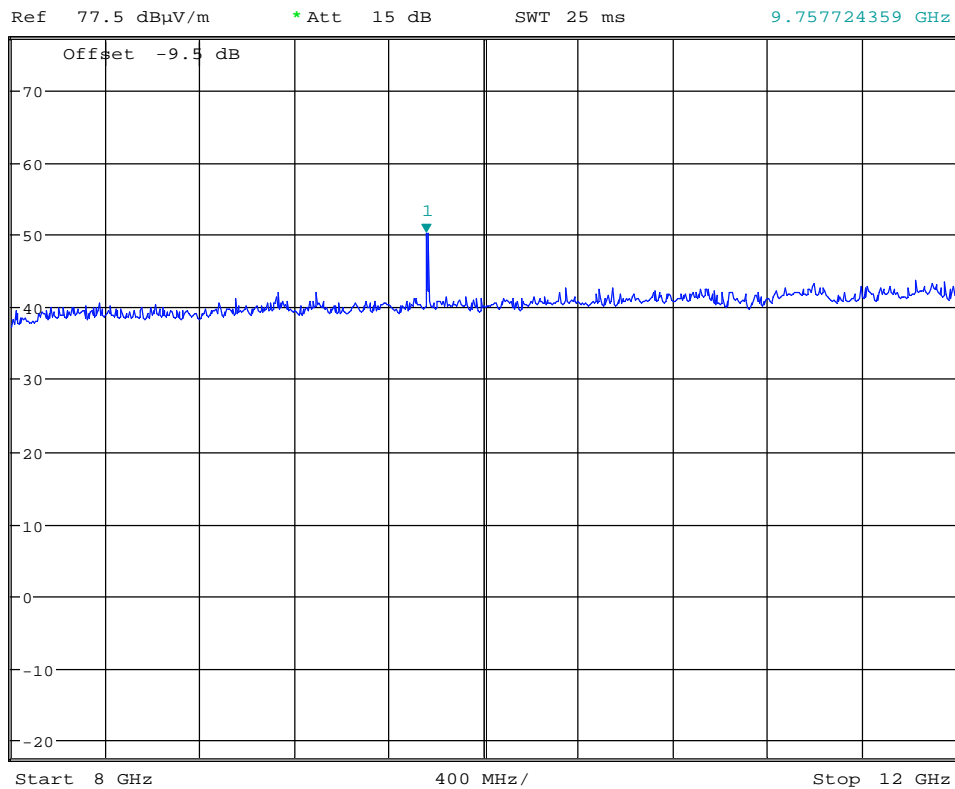


Date: 27.OCT.2016 14:38:29

**Radiated Emissions ch. 2405 MHz, 8 – 12 GHz, HP, @1m – Pre-scan with Peak detector,
Distance Correction factor of -9.5 dB is included in the plot**



*RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 50.34 dBμV/m
SWT 25 ms 9.757724359 GHz

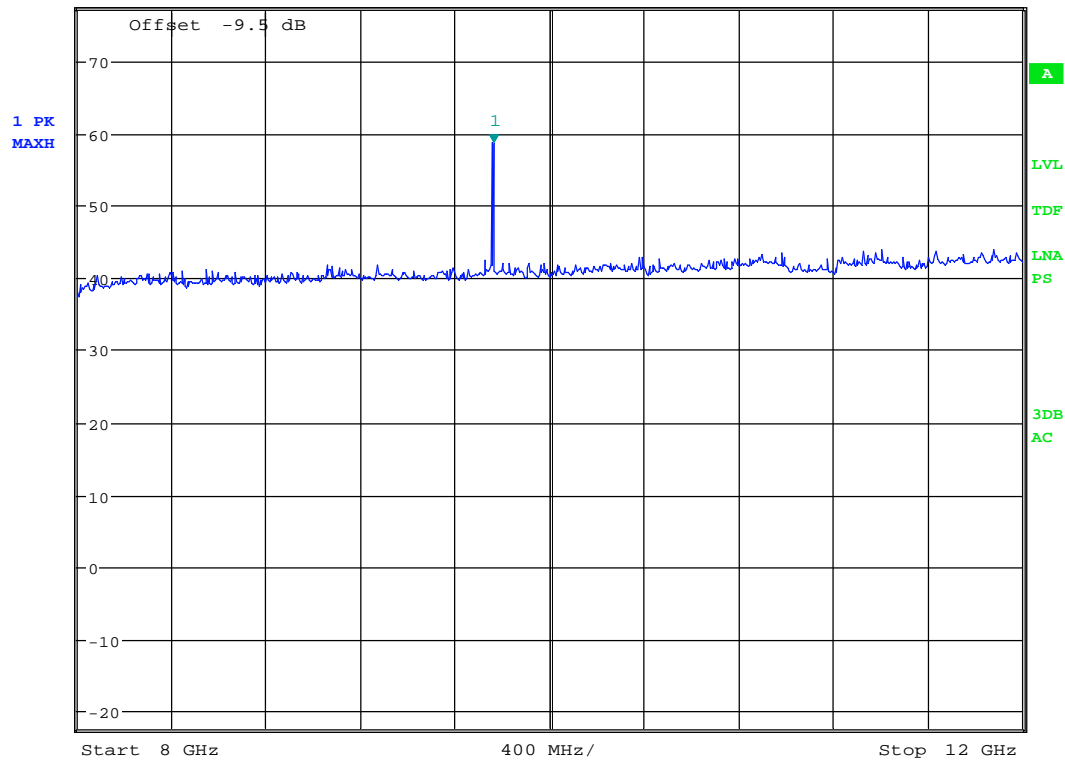


Date: 27.OCT.2016 14:49:00

**Radiated Emissions ch. 2440 MHz, 8 – 12 GHz, VP, @1m – Pre-scan with Peak detector,
Distance Correction factor of -9.5 dB is included in the plot**



MARKER 1
9.762820513 GHz
Ref 77.5 dBμV/m * Att 15 dB * RBW 1 MHz VBW 3 MHz SWT 25 ms
Marker 1 [T1]
58.74 dBμV/m
9.762820513 GHz



Date: 27.OCT.2016 14:47:26

**Radiated Emissions ch. 2440 MHz, 8 – 12 GHz, HP, @1m – Pre-scan with Peak detector,
Distance Correction factor of -9.5 dB is included in the plot**



MARKER 1

11.44871795 GHz

Ref 77.5 dB μ V/m

* Att 15 dB

* RBW 1 MHz

VBW 3 MHz

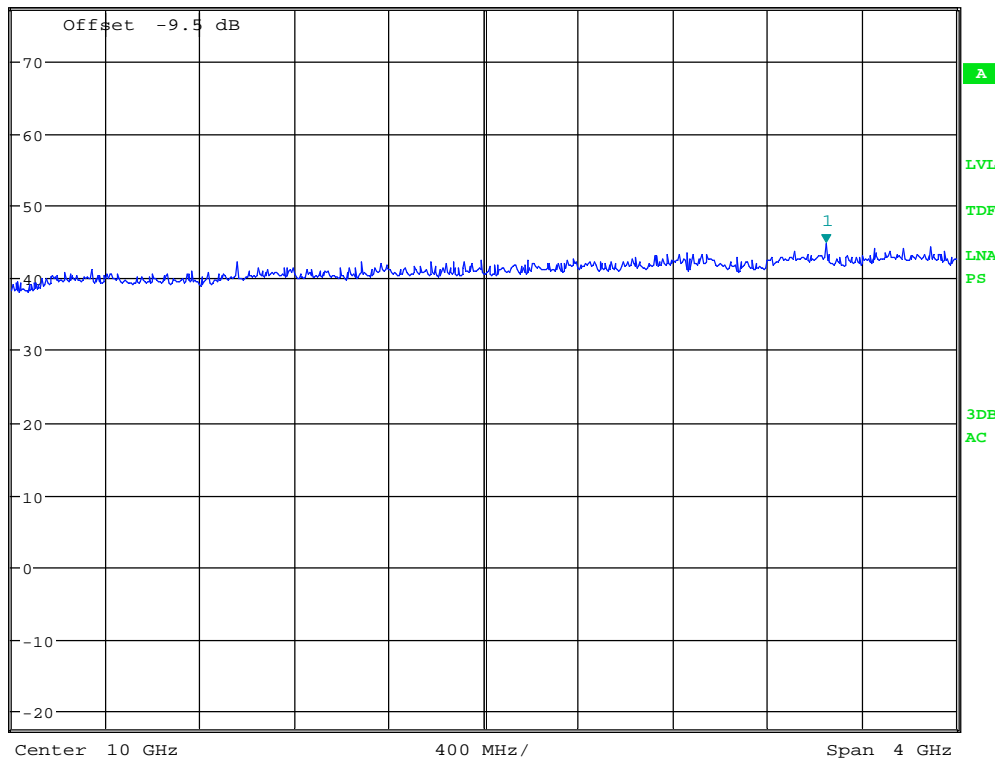
SWT 25 ms

Marker 1 [T1]

44.76 dB μ V/m

11.448717949 GHz

1 PK
MAXH



Date: 27.OCT.2016 14:36:21

**Radiated Emissions ch. 2480 MHz, 8 – 12 GHz, VP, @1m – Pre-scan with Peak detector,
Distance Correction factor of -9.5 dB is included in the plot**



MARKER 1

11.92948718 GHz

Ref 77.5 dBμV/m

* Att 15 dB

* RBW 1 MHz

VBW 3 MHz

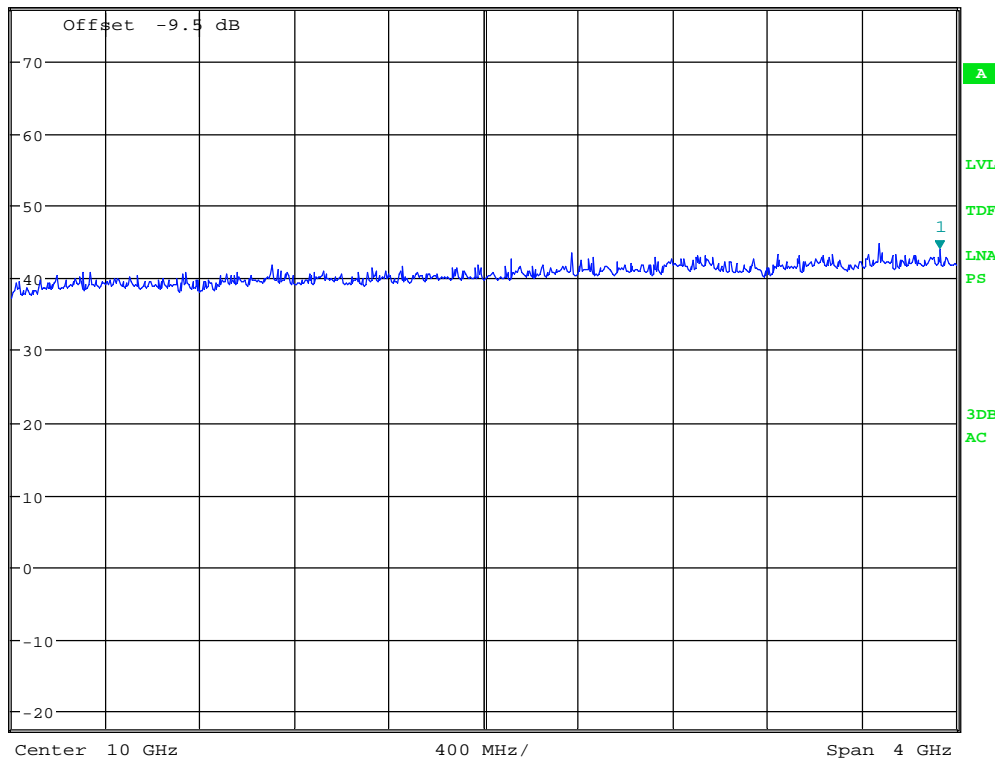
SWT 25 ms

Marker 1 [T1]

43.90 dBμV/m

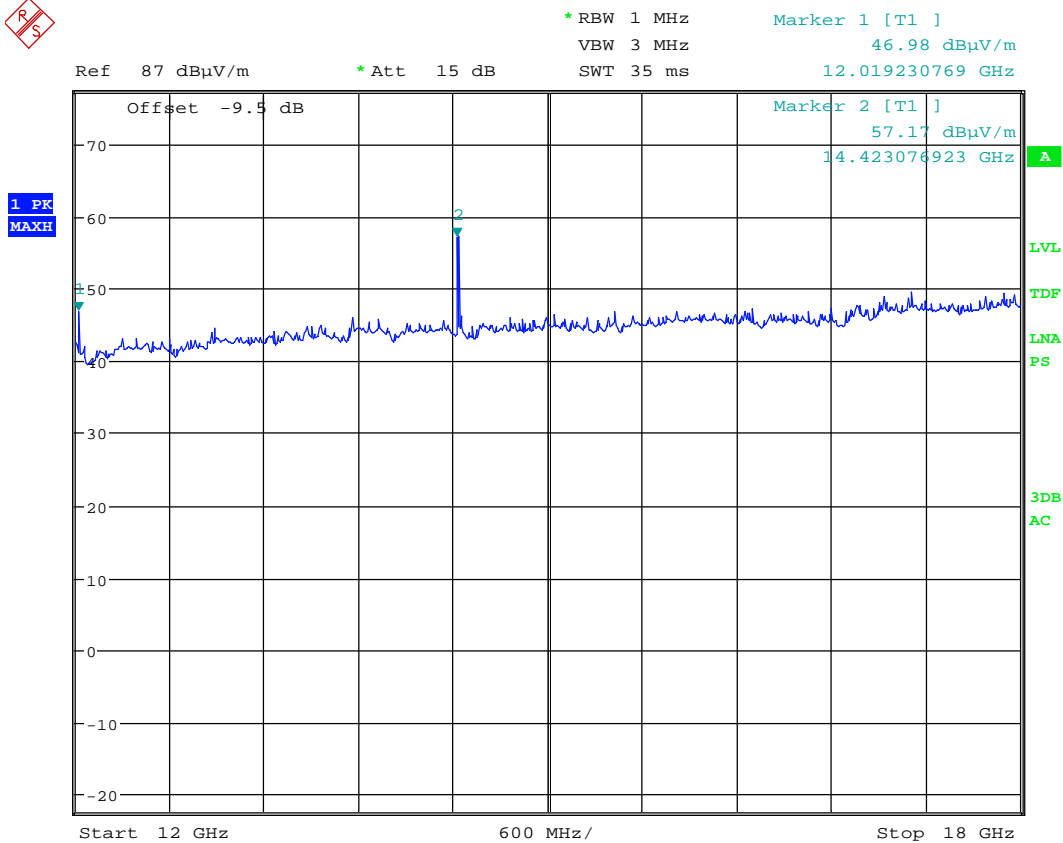
11.929487179 GHz

1 PK
MAXH



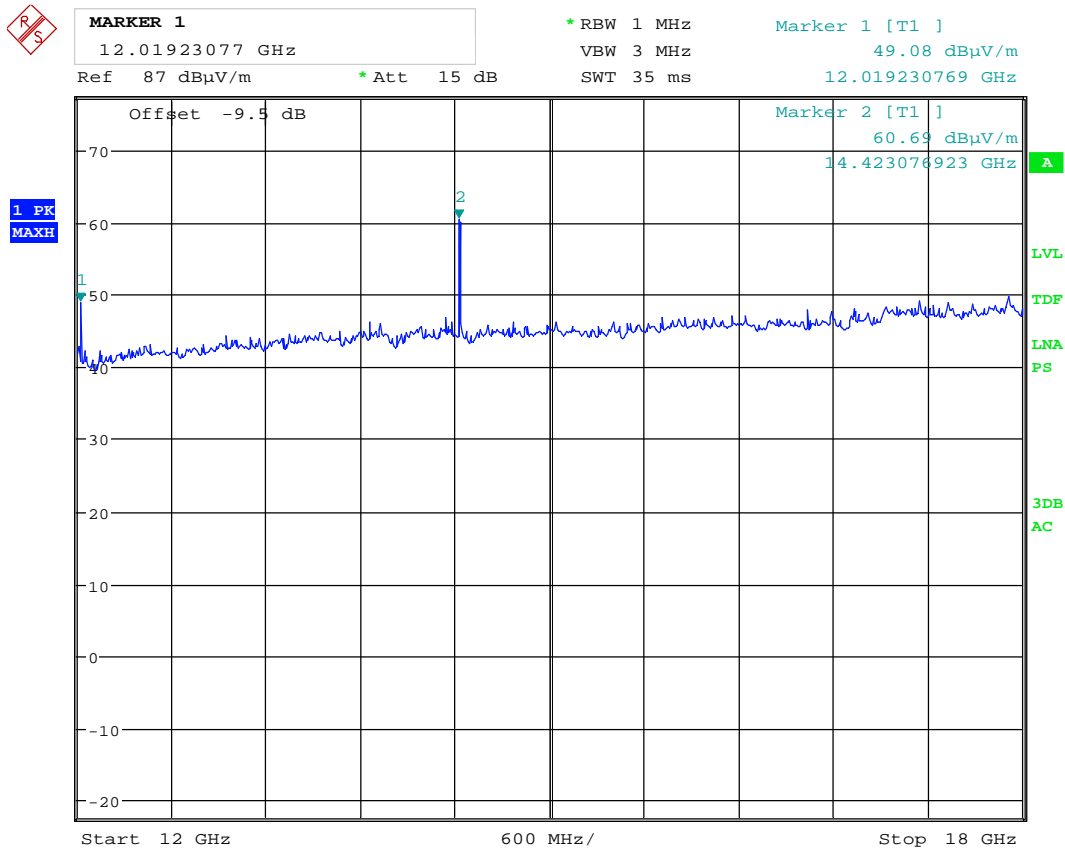
Date: 27.OCT.2016 14:36:59

**Radiated Emissions ch. 2480 MHz, 8 – 12 GHz, HP, @1m – Pre-scan with Peak detector,
Distance Correction factor of -9.5 dB is included in the plot**



Date: 27.OCT.2016 14:54:26

**Radiated Emissions ch. 2405 MHz, 12 – 18 GHz, VP, @1m – Pre-scan with Peak detector,
Distance Correction factor of -9.5 dB is included in the plot**



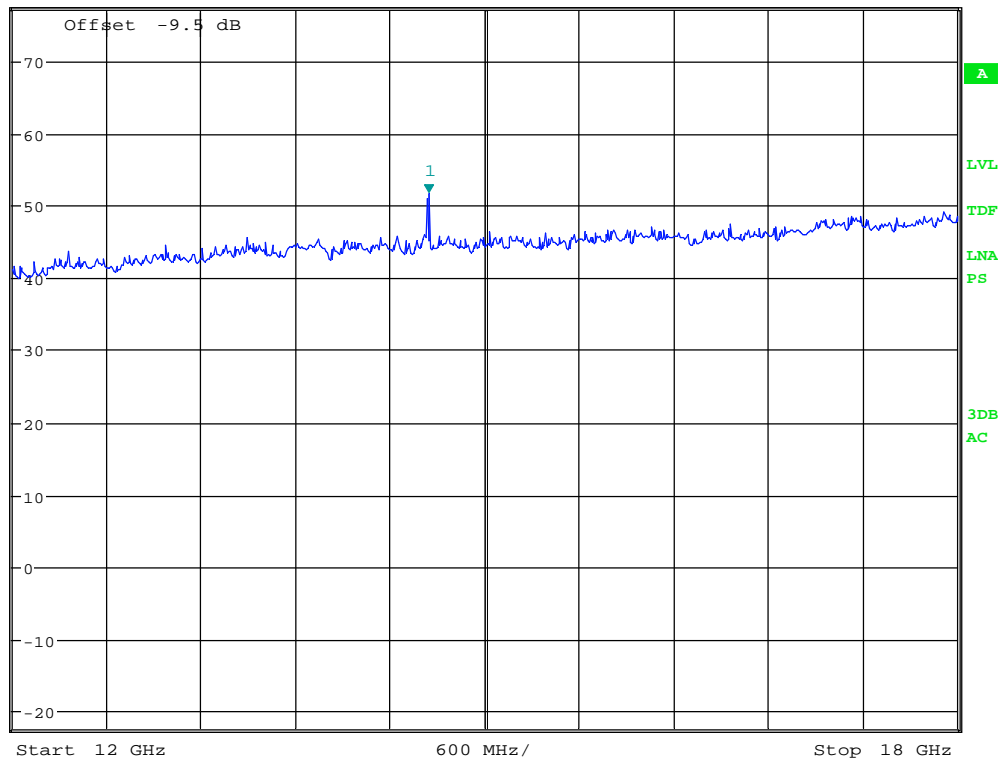
Date: 27.OCT.2016 14:53:31

**Radiated Emissions ch. 2405 MHz, 12 – 18 GHz, HP, @1m – Pre-scan with Peak detector,
Distance Correction factor of -9.5dB is included in the plot**



MARKER 1
14.64423077 GHz
Ref 87 dBμV/m * Att 15 dB
* RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 51.71 dBμV/m
SWT 35 ms 14.644230769 GHz

1 PK
MAXH



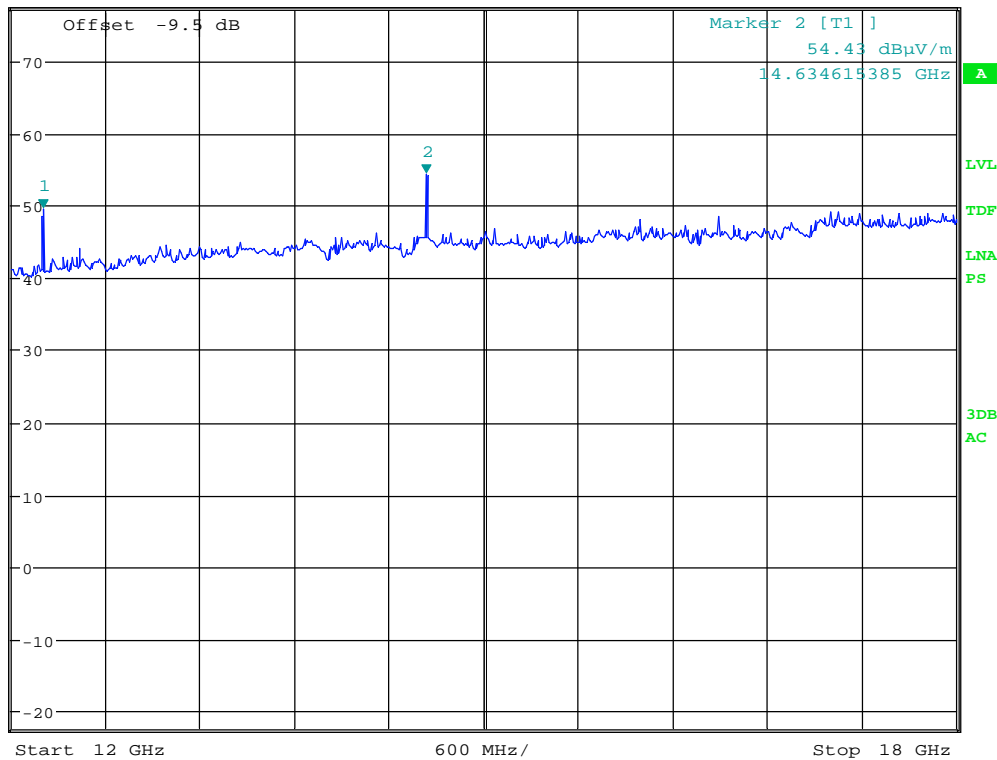
Date: 27.OCT.2016 14:51:10

**Radiated Emissions ch. 2440 MHz, 12 – 18 GHz, VP, @1m – Pre-scan with Peak detector,
Distance Correction factor of -9.5 dB is included in the plot**



MARKER 1
12.20192308 GHz
Ref 87 dBμV/m * Att 15 dB
* RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 49.62 dBμV/m
SWT 35 ms 12.201923077 GHz

1 PK
MAXH



Date: 27.OCT.2016 14:52:16

**Radiated Emissions ch. 2440 MHz, 12 – 18 GHz, HP, @1m – Pre-scan with Peak detector,
Distance Correction factor of -9.5dB is not included in the plot**



MARKER 1

17.93269231 GHz

Ref 87 dBμV/m

* Att 15 dB

* RBW 1 MHz

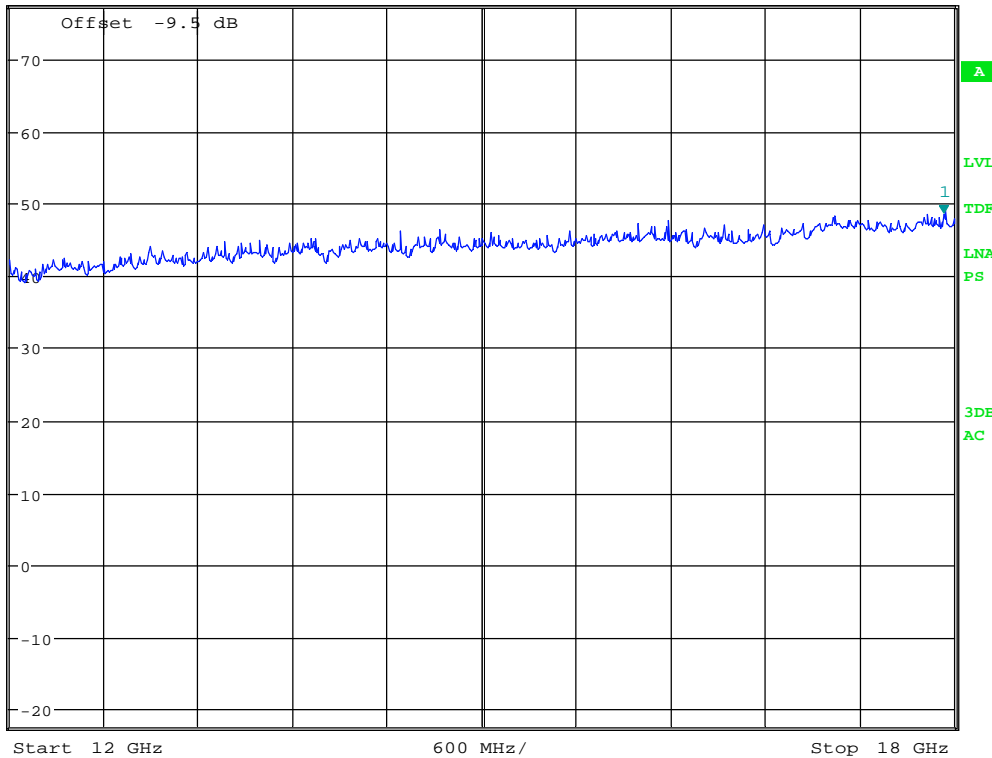
VBW 3 MHz

SWT 35 ms

Marker 1 [T1]

48.70 dBμV/m

17.932692308 GHz



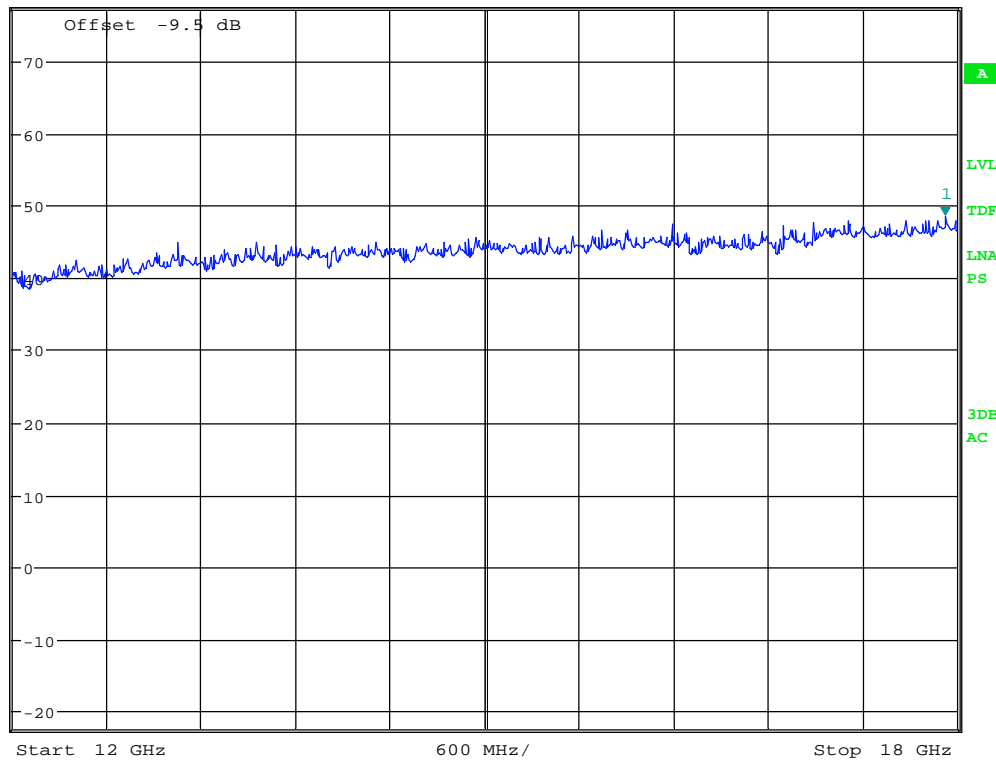
Date: 27.OCT.2016 14:55:14

**Radiated Emissions ch. 2480 MHz, 12 – 18 GHz, VP, @1m – Pre-scan with Peak detector,
Distance Correction factor of -9.5 dB is not included in the plot**



MARKER 1
17.92307692 GHz
Ref 87 dBμV/m * Att 15 dB
* RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 48.58 dBμV/m
SWT 35 ms 17.923076923 GHz

1 PK
MAXH

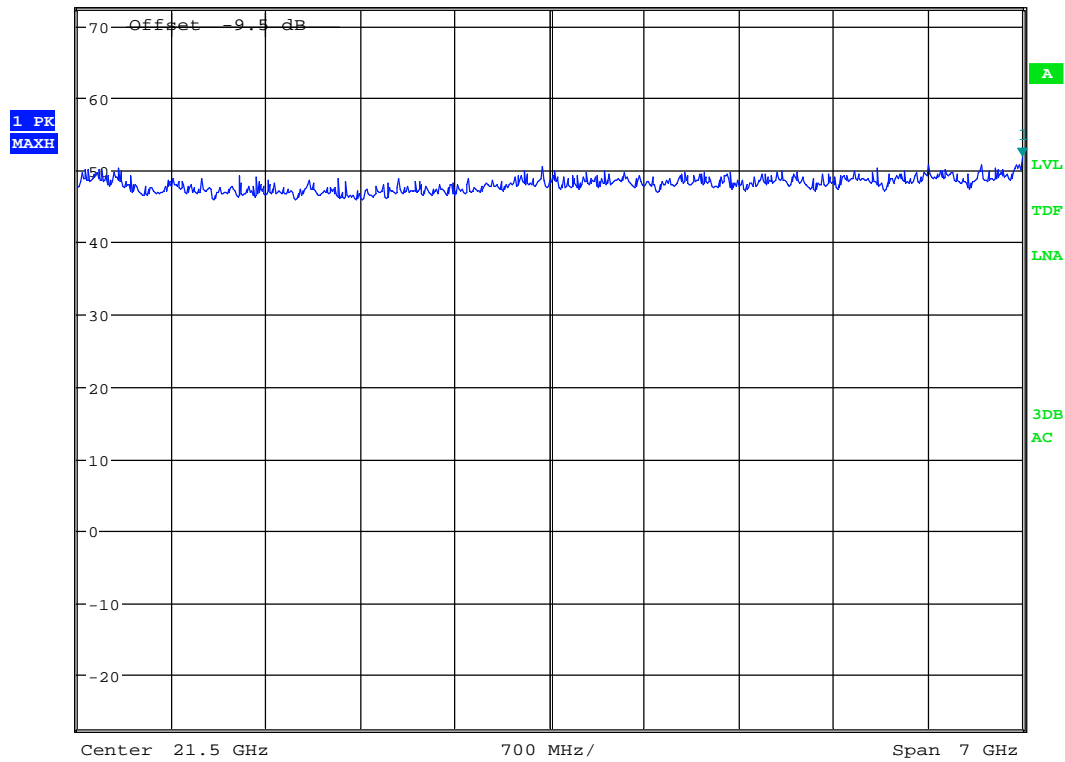


Date: 27.OCT.2016 14:55:45

**Radiated Emissions ch. 2480 MHz, 12 – 18 GHz, HP, @1m – Pre-scan with Peak detector,
Distance Correction factor of -9.5dB is not included in the plot**



MARKER 1
25 GHz
Ref 72.5 dBμV/m * Att 10 dB * RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 51.72 dBμV/m
SWT 45 ms 25.00000000 GHz



Date: 27.OCT.2016 15:34:37

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

3.6 Power Spectral Density (PSD)

Para. No.: 15.247 (d)

Test Performed By: G.Suwanthakumar

Date of Test: 2016.10.27

Test Results: Passed

Measured and Calculated Data:

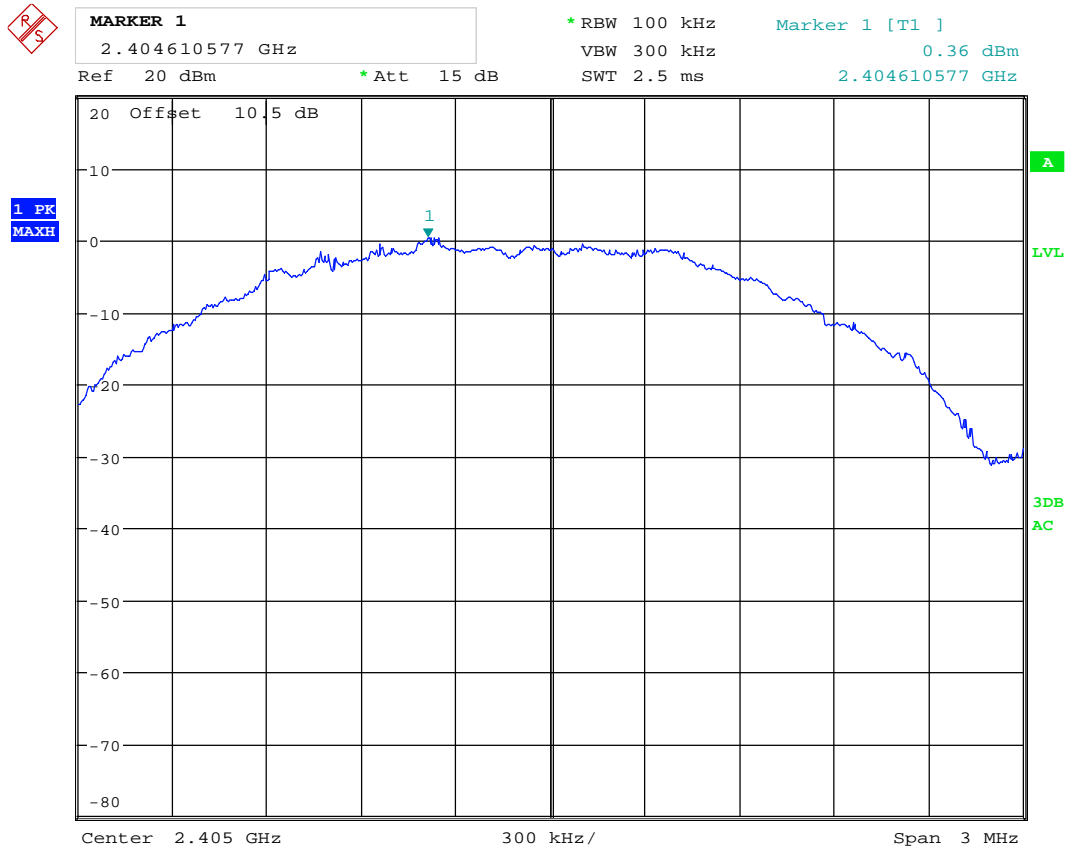
	calculated peak PSD dBm
Power Spectral Density @2405 MHz	-14.84
Power Spectral Density @2440 MHz	-15.44
Power Spectral Density @2480 MHz	-31.46

The measured values with 100 kHz RBW are corrected by a Bandwidth Correction Factor of -15.2 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.



Date: 27.OCT.2016 15:51:00

PSD Measurement - 2405MHz



MARKER 1

2.439625 GHz

*RBW 100 kHz

Marker 1 [T1]

VBW 300 kHz

-0.24 dBm

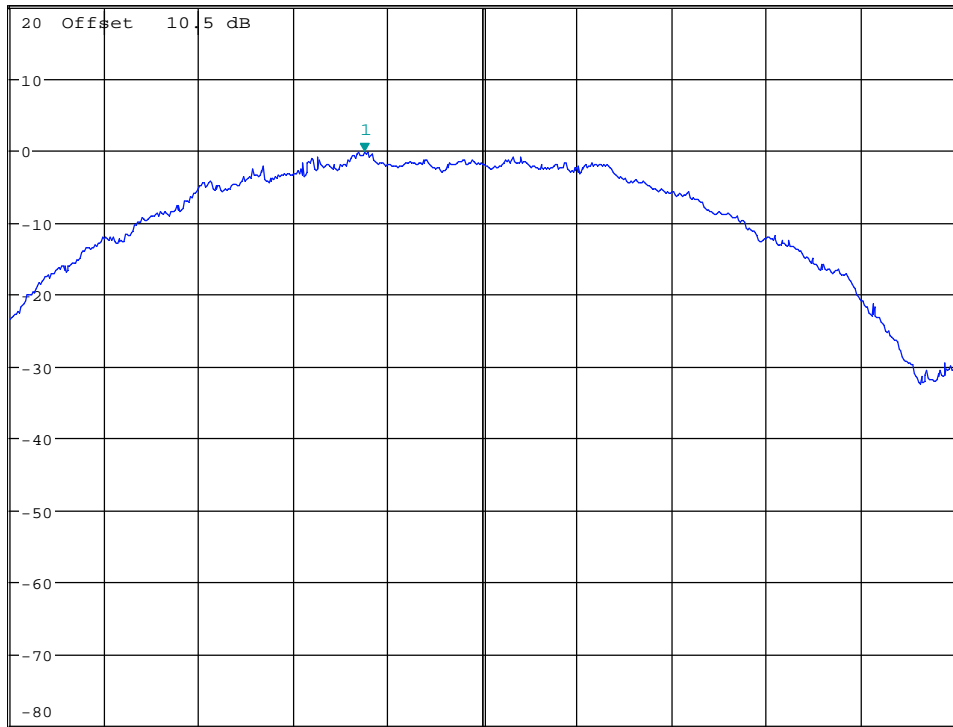
Ref 20 dBm

*Att 15 dB

SWT 2.5 ms

2.439625000 GHz

1 PK
MAXH



Center 2.44 GHz

300 kHz/

Span 3 MHz

Date: 27.OCT.2016 15:51:39

PSD Measurement – 2440MHz



MARKER 1

2.479605769 GHz

Ref 0 dBm

*Att 15 dB

*RBW 100 kHz

VBW 300 kHz

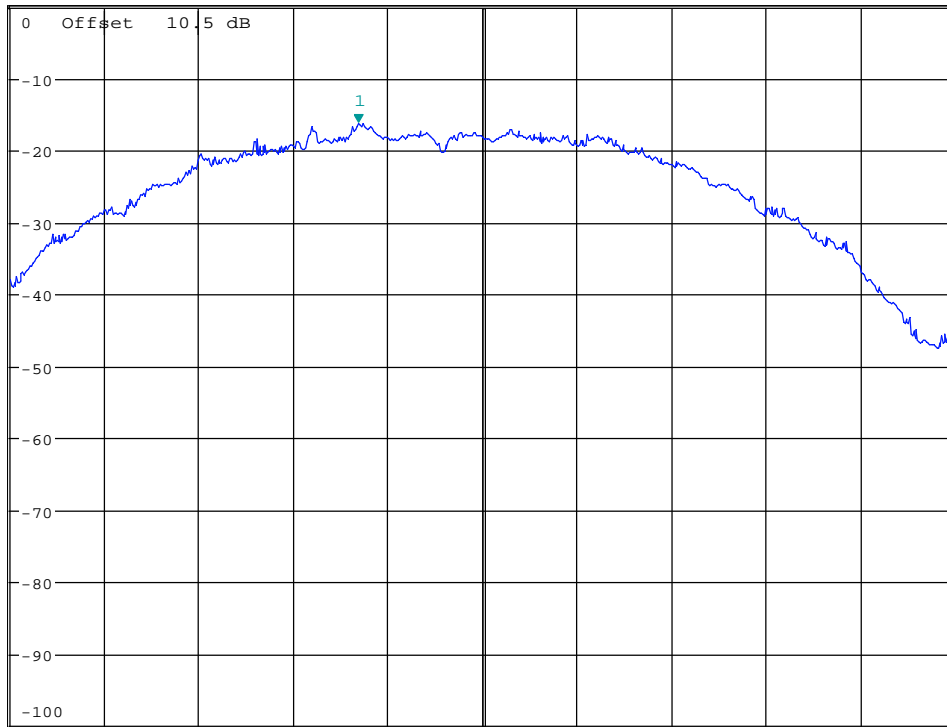
SWT 2.5 ms

Marker 1 [T1]

-16.36 dBm

2.479605769 GHz

1 PK
MAXH



Center 2.48 GHz

300 kHz/

Span 3 MHz

Date: 27.OCT.2016 15:52:11

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

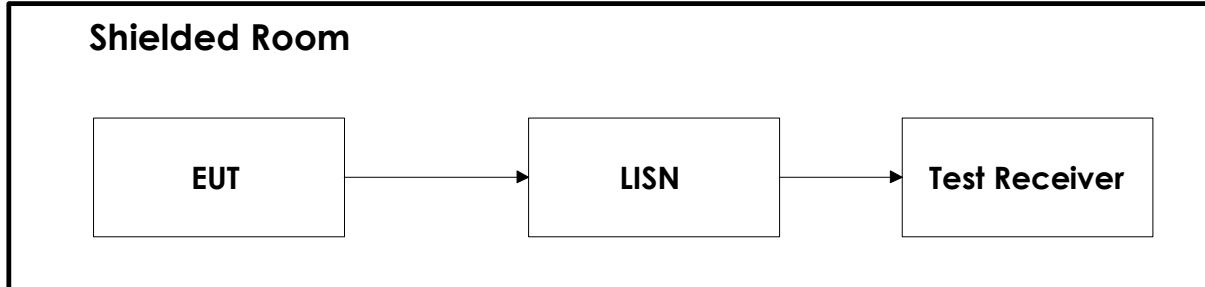
5 LIST OF TEST EQUIPMENT

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.

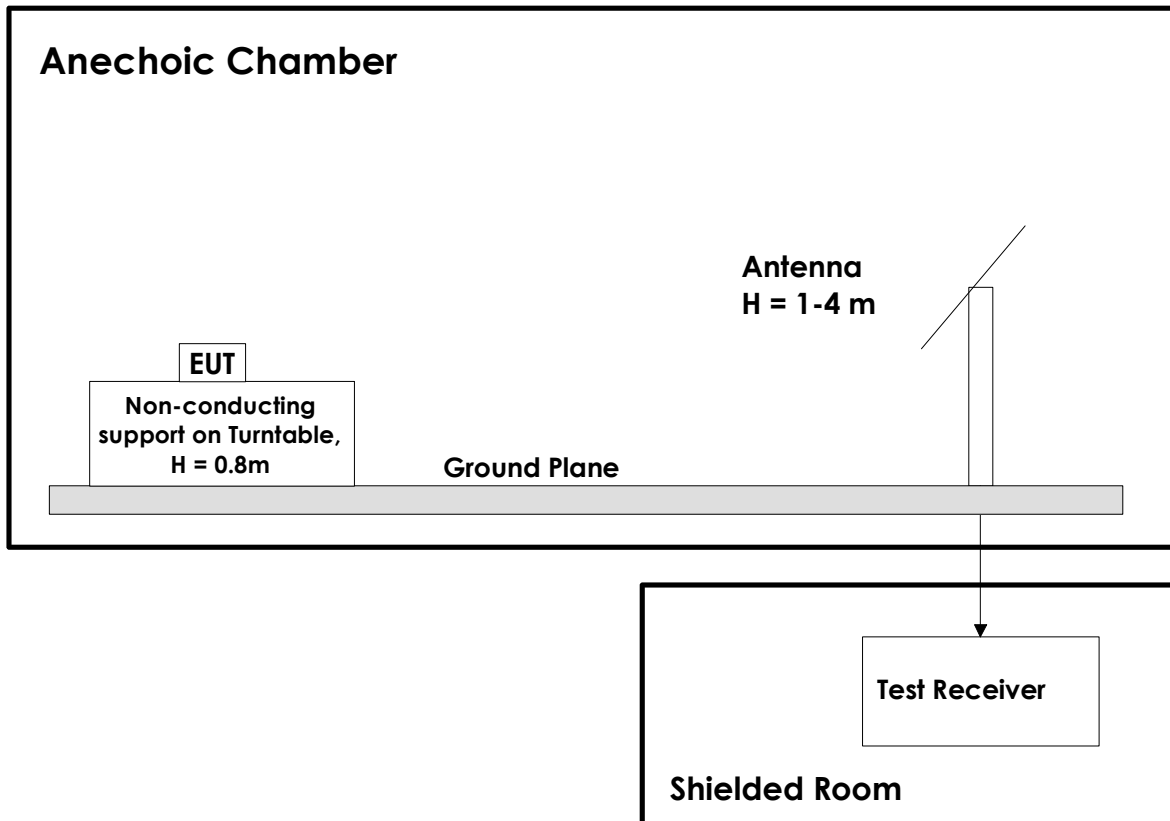
No.	Instrument/ ancillary	Type of instrument/ ancillary	Manufacturer	Ref. no.	Cal. Date	Cal. Due
1.	ESU40	EMI Receiver	Rohde & Schwarz	LR1639	2015.11	2016.11
2.	FSW26	Spectrum Analyzer	Rohde & Schwarz	LR 1640	2015.11	2017.11
3.	HFH2-Z2	Active Loop antenna	Rohde & Schwarz	LR1660	2014.10	2017.10
4.	3115	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	10.2019
8.	PM7320X	Antenna Horn	Sivers Lab	LR 102	2009.10	10.2019
9.	DBF-520-20	Antenna Horn	Systron Donner	LR 100	2009.10	10.2019
10.	638	Antenna Horn	Narda	LR 1480	2009.10	10.2019
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	2016.10	2017.10
14.	HP 10855A	Pre-amplifier	Hewlett Packard	LR 1445	2015.10	2016.10
15.	Model 87 V	Multimeter	Fluke	LR 1597	2015.10	2016.10
16.	6812B	Power source	Agilent	LR 1515	2015.12	2017.12
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	2017.03.28	First test report	gns