

Test Report

Product	Zigbee System on Chip Evaluation Board	
Name and address of the applicant	Texas Instruments Norway AS Gaustadalléen 21, NO-0349 Oslo, Norway	
Name and address of the manufacturer	Texas Instruments Norway AS Gaustadalléen 21, NO-0349 Oslo, Norway	
Model	CC2538-CC2592EM	
Rating	3.0Vdc	
Trademark	Texas Instruments	
Serial number	/	
Additional information	Zigbee System on Chip	
Tested according to	FCC Part 15.247 Digital Transmission Systems Industry Canada RSS-210, Issue 8 Low Power Licence-Exempt Radiocommunications Devices	
Order number	251857	
Tested in period	2014.01.08 to 2014.01.10	
Issue date	2014.02.05	
Name and address of the testing laboratory	 FCC No: 994405 IC OATS: 2040D-1 Instituttveien 6 Kjeller, Norway TEL: (+47) 22 96 03 30 FAX: (+47) 22 96 05 50	
	 Prepared by [G.Suhanthakumar]	 Approved by [Frode Sveinsen]
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1 INFORMATION

1.1 Test Item

Name :	Texas Instruments
FCC ID :	ZAT25382592EM
IC :	451H-25382592EM
Model/version :	CC2538-CC2592EM
Serial number :	-
Hardware identity and/or version:	-
Software identity and/or version :	-
Frequency Range :	2405 – 2480 MHz
Number of Channels :	16
Type of Modulation :	250kbps, O-QPSK (Digital)
Conducted Output Power:	0.071 Watts (Peak)
User Frequency Adjustment :	None
Type of Power Supply :	3.0V _{DC} (2xAAA Battery)
Antenna Connector :	N/A
Antenna type:	PCB antenna
Antenna Diversity Supported :	No
Desktop Charger :	None

Description of Test Item

The CC2538-CC2592EM is a 2.4 GHz RF-transceiver evaluation module containing the CC2538 IEEE 802.15.4/ZigBee System-on-Chip and the CC2592 range extender.

1.2 Test Environment

1.2.1 *Normal test condition*

Temperature:	20.2 - 21.5 °C
Relative humidity:	40 - 43 %
Normal test voltage:	3.0 V DC

The values are the limit registered during the test period.

1.3 Test Engineer(s)

G.Suhandhakumar

1.4 Test Equipment

See list of test equipment in clause 4.

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-210 Issue 8.

Radiated tests were conducted in accordance with ANSI C63.4-2003 and KDB 558074 D01 DTS Measurement Guidance v03r01. The 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.

- | | |
|---|---|
| <input checked="" type="checkbox"/> New Submission | <input type="checkbox"/> Production Unit |
| <input type="checkbox"/> Class II Permissive Change | <input checked="" type="checkbox"/> Pre-production Unit |
| DTS Equipment Code | <input type="checkbox"/> 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-210 Issue 8 & RSS-GEN Issue 3	Result
Supply Voltage Variations	15.31(e)	N/A	Complies ¹
Antenna Requirement	15.203	7.1.4 (RSS-GEN)	N/A ²
Power Line Conducted Emission	15.107(a) 15.207(a)	7.2.2 (RSS-GEN)	N/A ¹
Minimum 6 dB Bandwidth	15.247(a)(2)	A8.2	Complies
Peak Power Output	15.247(b)	A8.4	Complies
Power Spectral Density	15.247(d)	A8.2	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	A8.5	Complies
Spurious Emissions (Radiated)	15.247(c) 15.109(a) 15.209(a)	A8.5	Complies
Receiver Emissions (Radiated)	N/A	2.3	N/A

¹ EUT is battery operated only.

² PCB antenna

RSS Gen issue 3 covers section 7 & 6

RSS 210 issue 8 covers section A2.9

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)

The test is not applicable since the device is battery powered.

Test Performed By: -	Date of Test: -
----------------------	-----------------

Measurement procedure: ANSI C63.4-2003 using 50 μ H/50 ohms LISN.

Test Results: -

Measurement Data: -

3.2 Minimum 6 dB Bandwidth

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

Test Performed By: G.Suhanthakumar	Date of Test: 09 Jan 2014
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Test Results: **Complies**

Measurement Data:

Measured 6 dB Bandwidth (MHz)		
2405MHz	2440 MHz	2480MHz
1.66	1.63	1.65

Tested according to KDB 558074 D01 DTS Meas Guidance v03r01, Section 8.1.

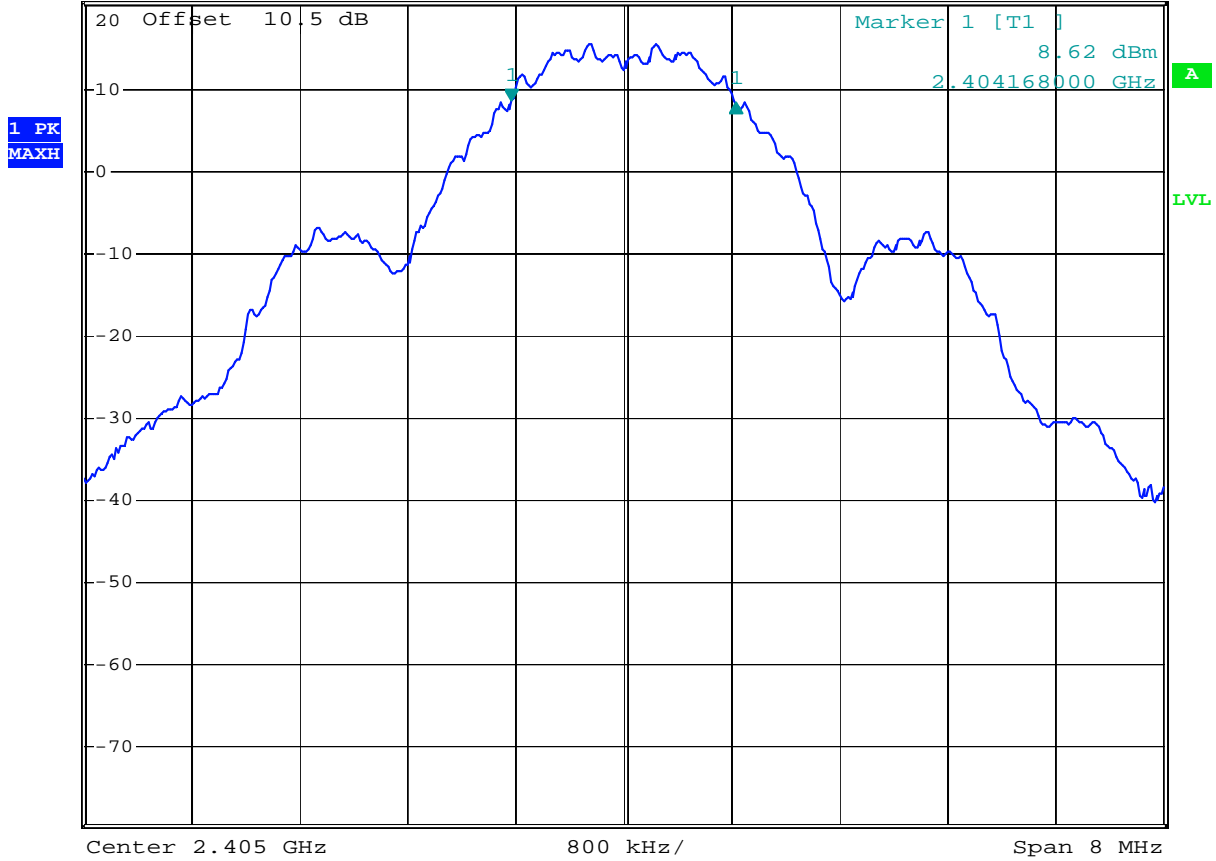
Requirements:

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



DELTA MARKER 1
 1.664 MHz
 Ref 20.5 dBm *Att 20 dB

*RBW 100 kHz Delta 1 [T1]
 VBW 300 kHz -0.22 dB
 SWT 2.5 ms 1.664000000 MHz



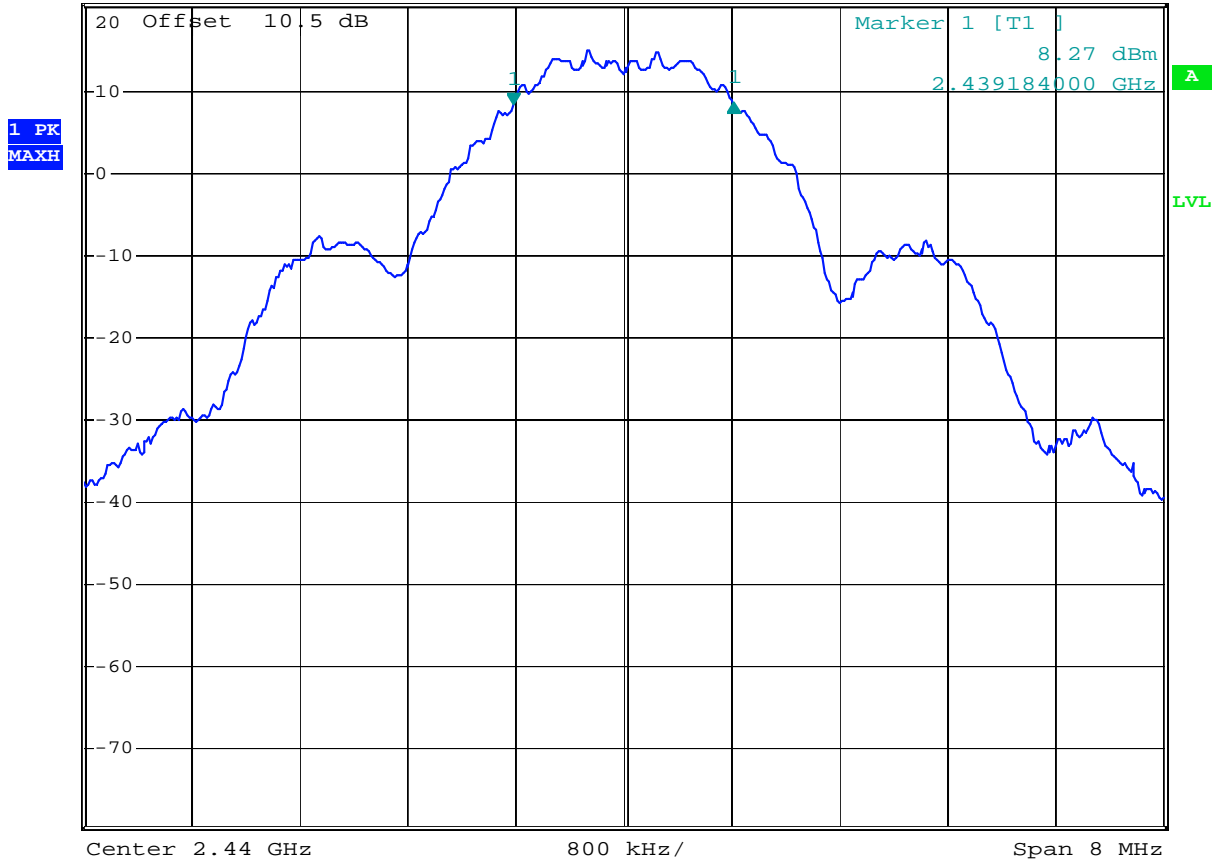
Date: 9.JAN.2014 13:20:50

6 dB Bandwidth at 2405 MHz



DELTA MARKER 1
 1.632 MHz
 Ref 20.5 dBm *Att 20 dB

*RBW 100 kHz Delta 1 [T1]
 VBW 300 kHz 0.34 dB
 SWT 2.5 ms 1.632000000 MHz



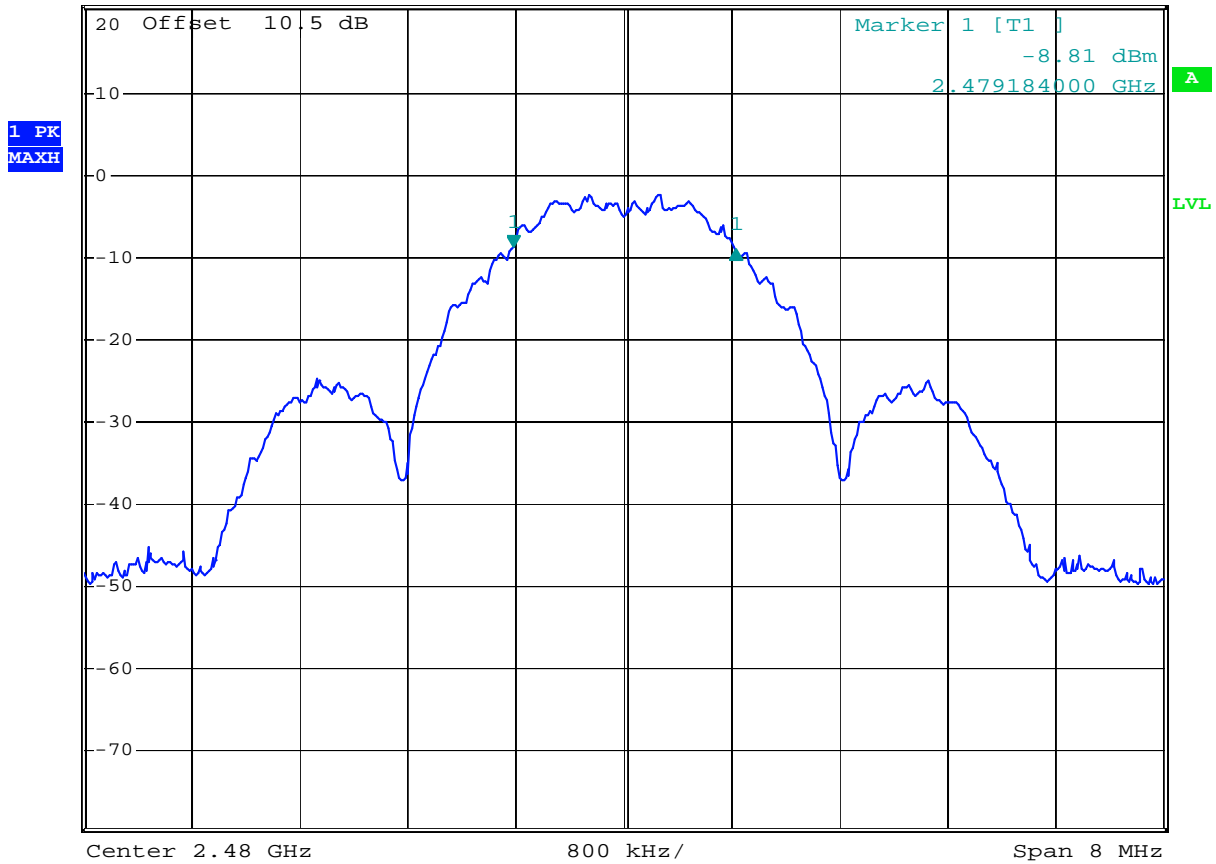
Date: 9.JAN.2014 13:22:52

6 dB Bandwidth at 2440 MHz



DELTA MARKER 1
 1.648 MHz
 Ref 20.5 dBm *Att 20 dB

*RBW 100 kHz Delta 1 [T1]
 VBW 300 kHz -0.11 dB
 SWT 2.5 ms 1.648000000 MHz



Date: 9.JAN.2014 13:24:03

6 dB Bandwidth at 2480 MHz

3.3 20 dB Bandwidth

Test Performed By: G.Suhanthakumar	Date of Test: 09 Jan 2014
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Measurement Data:

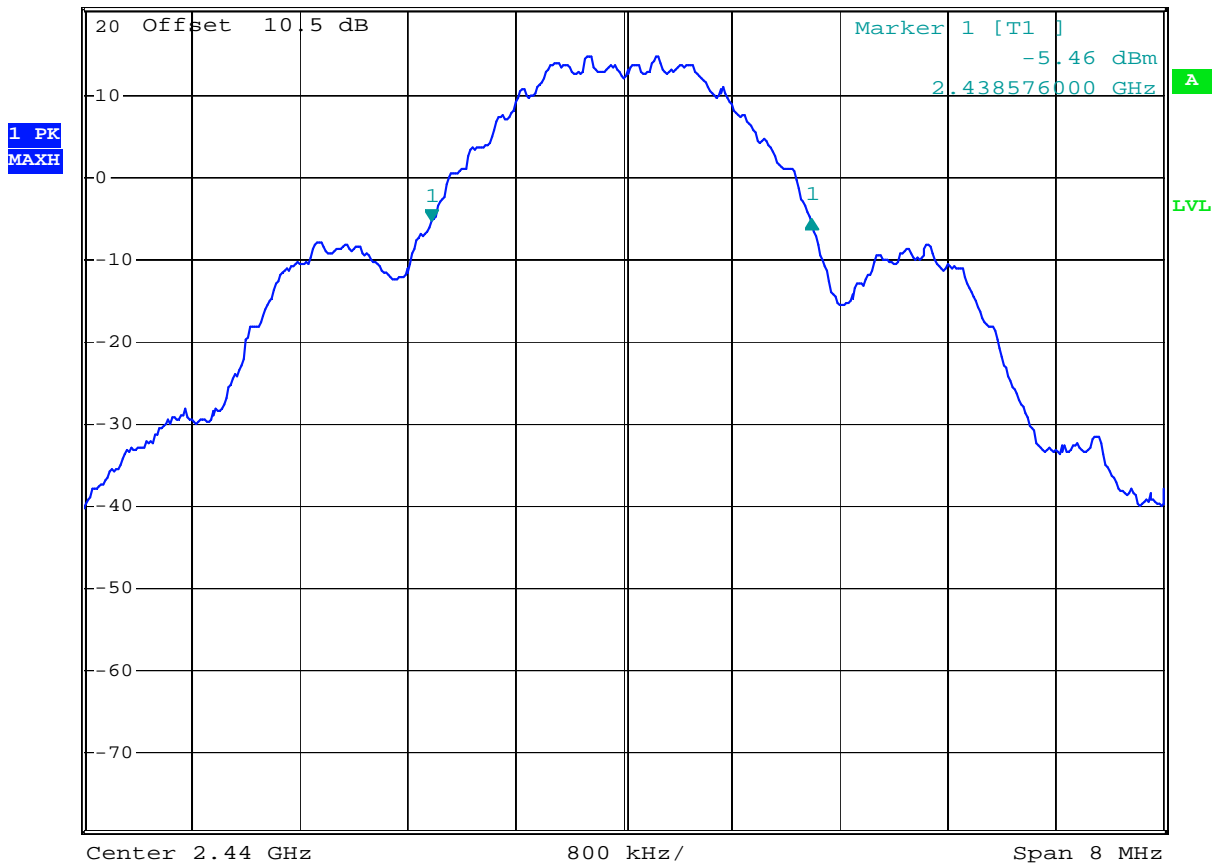
Measured 20 dB Bandwidth (MHz)
2440 MHz
2.82

Requirements:

No requirements. Reported for information only.



DELTA MARKER 1	*RBW 100 kHz	Delta 1 [T1]
2.816 MHz	VBW 300 kHz	0.43 dB
Ref 20.5 dBm	*Att 20 dB	SWT 2.5 ms
		2.816000000 MHz



Date: 9.JAN.2014 13:33:48

20 dB Bandwidth at 2440 MHz

3.4 Peak Power Output

Para. No.: 15.247 (b)

Test Performed By: G.Suhanthakumar	Date of Test: 08-13 Jan 2014
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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	116.73	116.53	98.05
Calc. Radiated Power (dBm)	21.47	21.27	2.79
Calc. Radiated Power (mW)	140.36	134.04	1.90
Measured Conducted Power (dBm)	18.53	18.09	1.78
Measured Conducted Power (mW)	71.28	64.42	1.51
Calculated Antenna Gain (dBi)	2.94	3.18	1.01

Tested according to KDB 558074 D01 DTS Meas Guidance v03r01, Section 9.1.1.

EIRP is calculated according to KDB 558074 D01 DTS Meas Guidance v03r01, Section 12.2.2. (e)

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

Requirements:

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

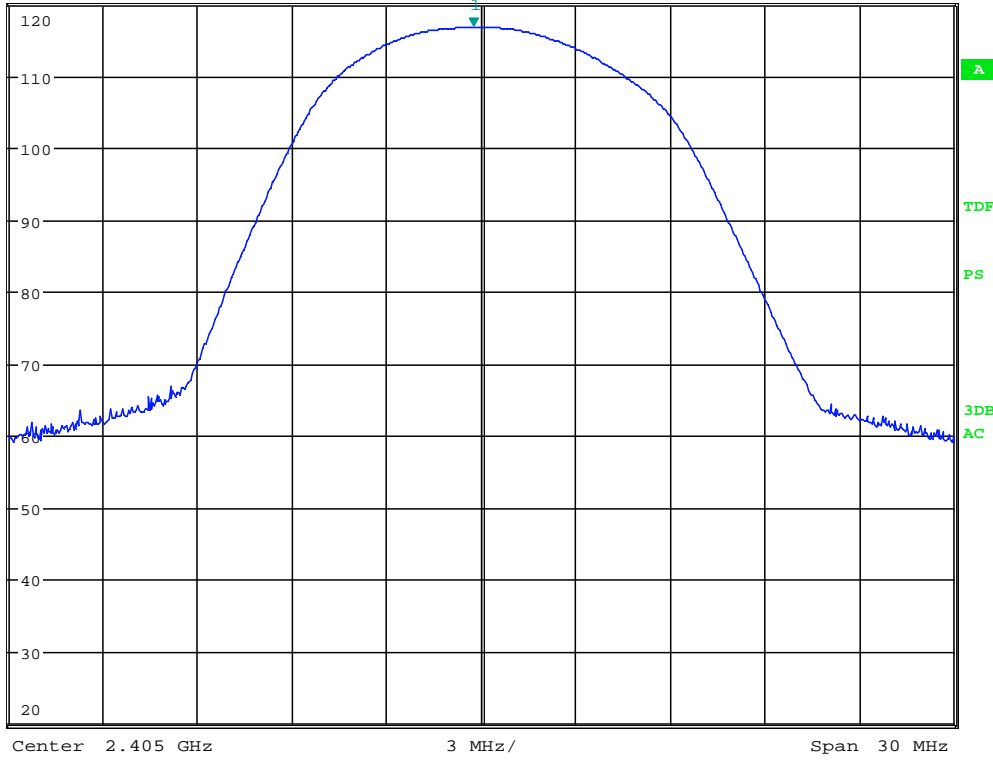
For Digital Transmission Systems in the 2400 - 2483.5 MHz band: 1 Watt

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.



Ref 120 dBµV/m *Att 15 dB *RBW 5 MHz Marker 1 [T1]
 VBW 10 MHz 116.73 dBµV/m
 SWT 5 ms 2.404737500 GHz

1 PK
 MAXH

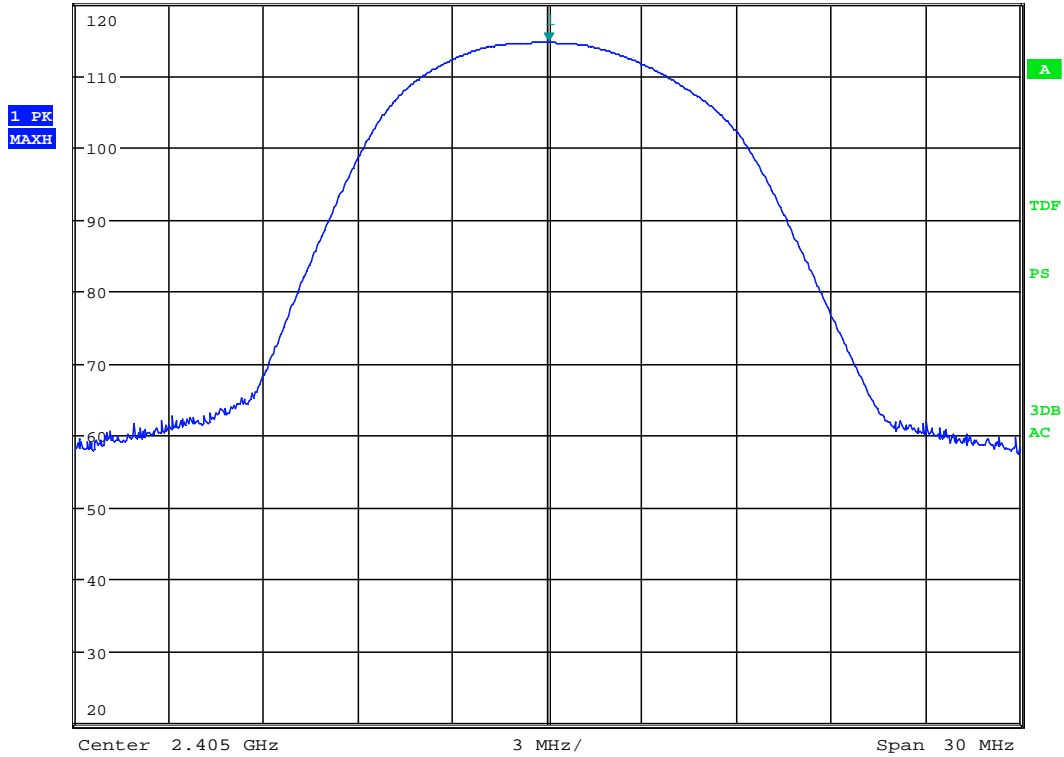


Date: 8.JAN.2014 09:19:45

Radiated Field strength, VP , 2405 MHz,PK

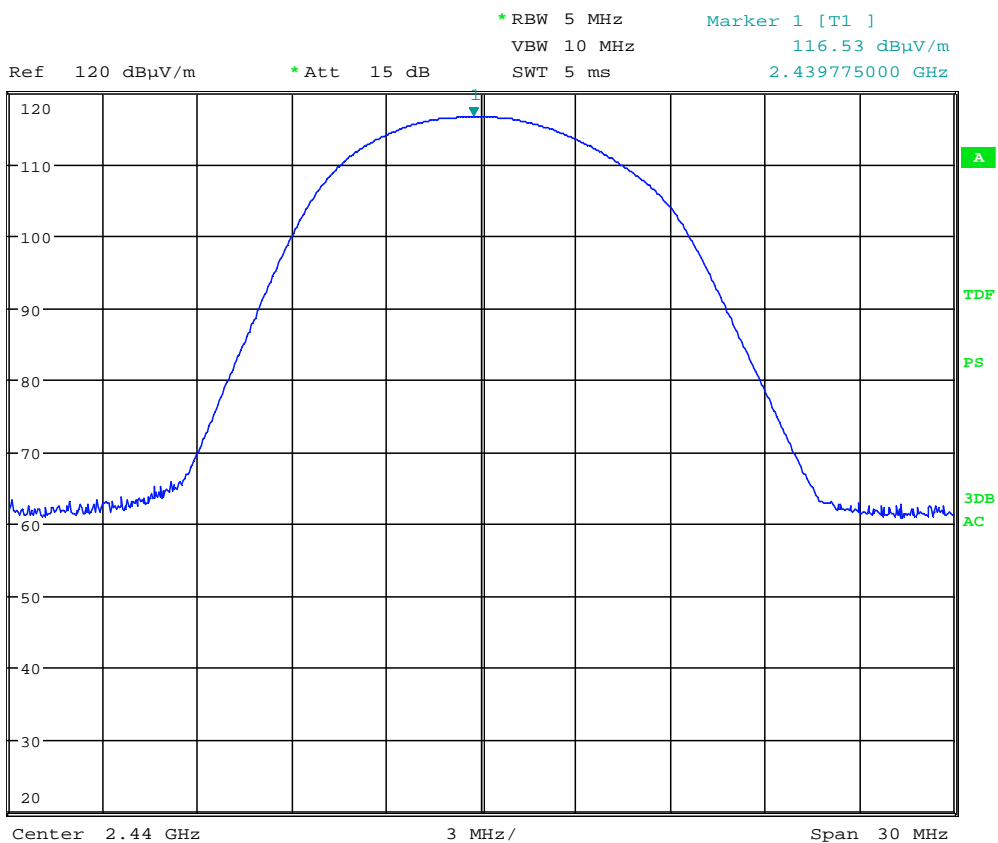


* RBW 5 MHz Marker 1 [T1]
 VBW 10 MHz 114.57 dBµV/m
 SWT 5 ms 2.405037500 GHz
 Ref 120 dBµV/m * Att 15 dB



Date: 8.JAN.2014 09:20:35

Radiated field strength, HP, 2405 MHz,PK

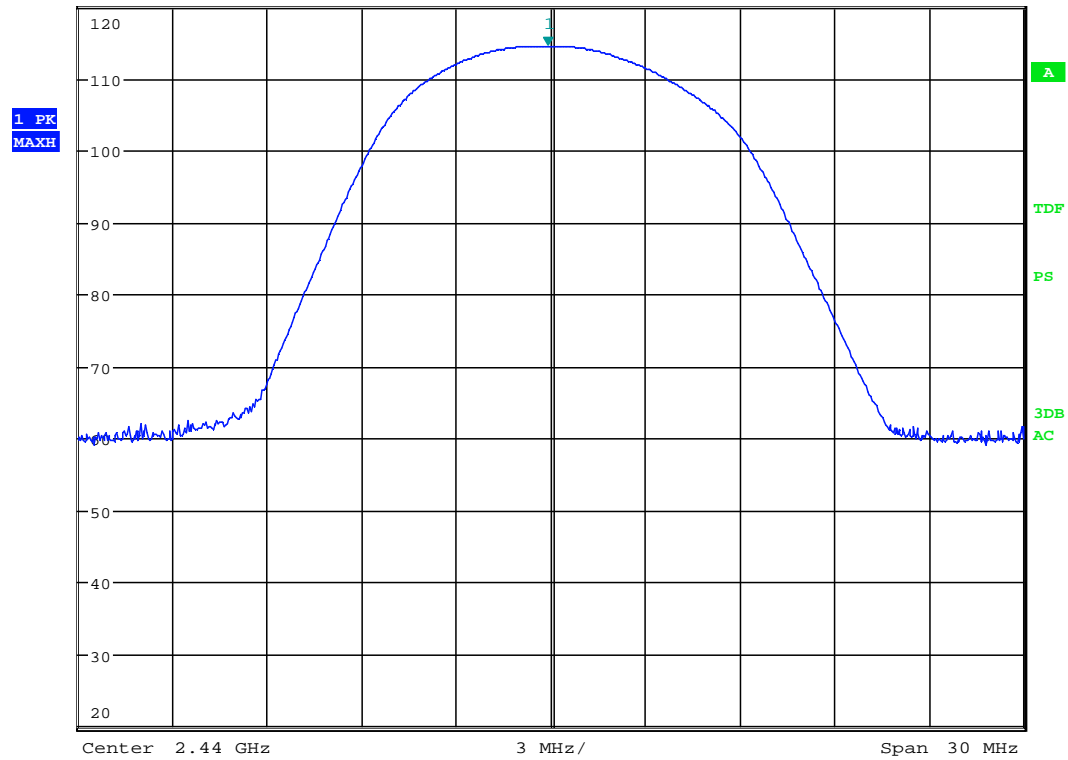


Date: 8.JAN.2014 09:45:53

Radiated field strength, VP, 2440 MHz,PK



Ref 120 dB μ V/m *Att 15 dB *RBW 5 MHz Marker 1 [T1]
 VBW 10 MHz 114.49 dB μ V/m
 SWT 5 ms 2.439925000 GHz



Date: 8.JAN.2014 09:46:45

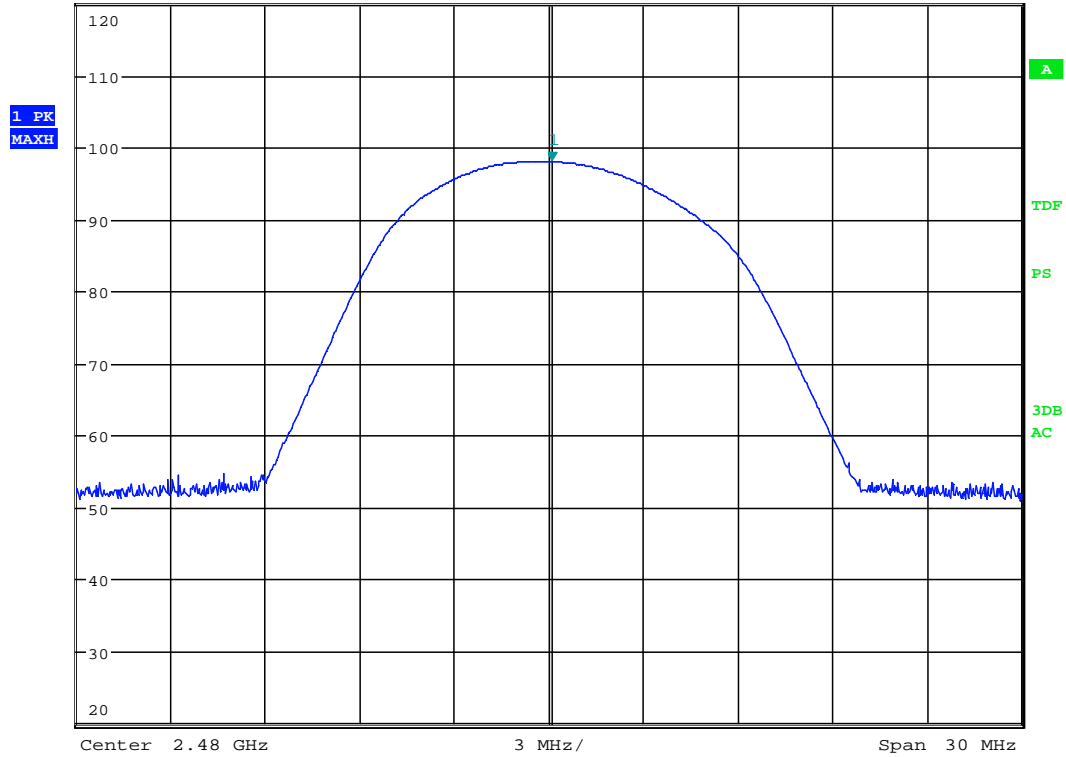
Radiated field strength, HP, 2440 MHz,PK



MARKER 1
 2.479928 GHz
 Ref 120 dBμV/m * Att 15 dB

* RBW 5 MHz
 VBW 10 MHz
 SWT 10 ms

Marker 1 [T1]
 98.05 dBμV/m
 2.480120000 GHz



Date: 8.JAN.2014 10:10:39

Radiated field strength, VP, 2480 MHz,PK



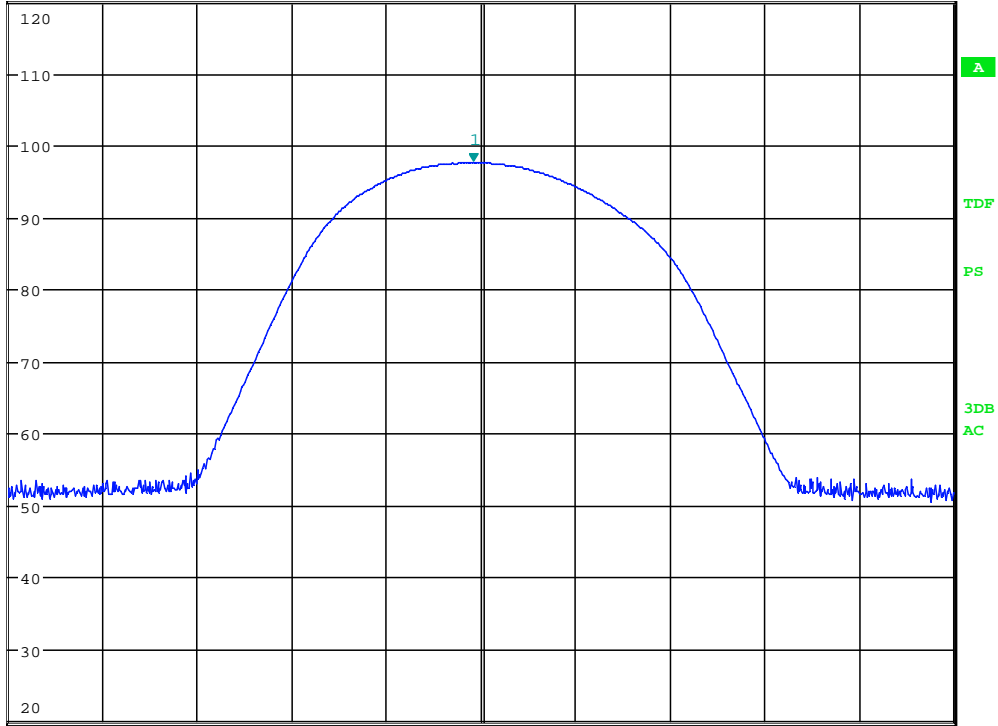
MARKER 1
 2.479928 GHz

*RBW 5 MHz
 VBW 10 MHz
 SWT 10 ms

Marker 1 [T1]
 97.60 dB μ V/m
 2.479760000 GHz

Ref 120 dB μ V/m *Att 15 dB

1 PK
 MAXH



Center 2.48 GHz 3 MHz/ Span 30 MHz

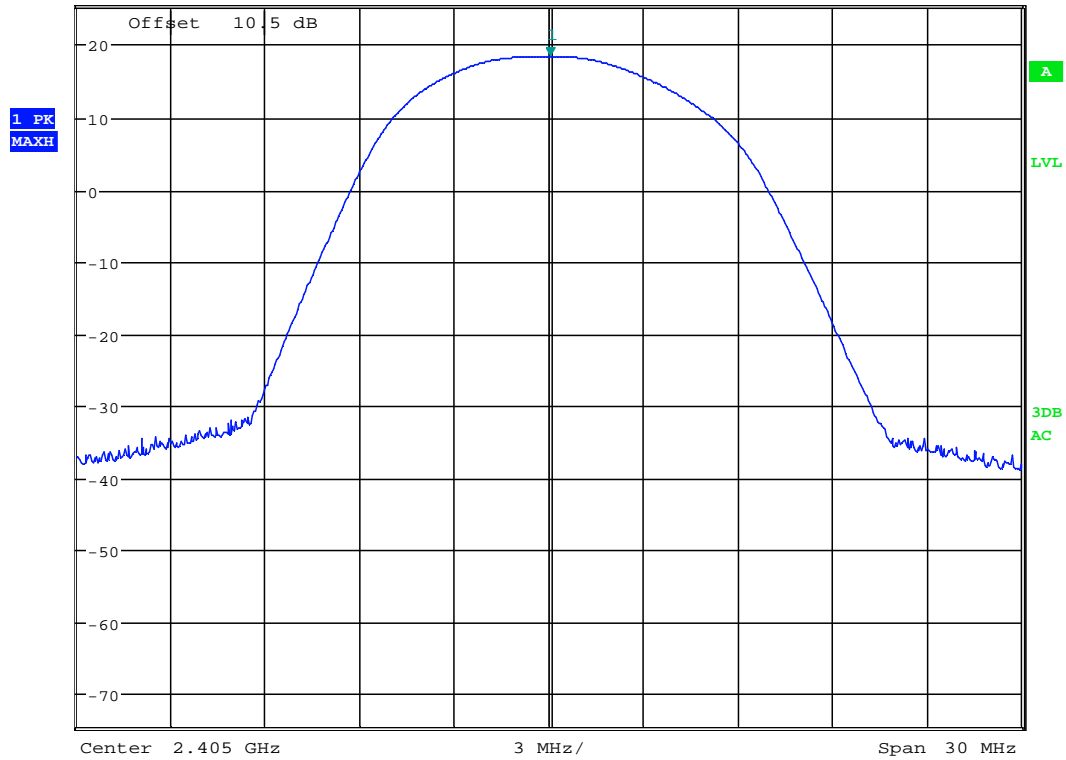
Date: 8.JAN.2014 10:11:29

Radiated field strength, HP, 2480 MHz,PK



MARKER 1
 2.405048077 GHz
 Step 25.5 dBm * Att 10 dB

* RBW 5 MHz Marker 1 [T1]
 VBW 10 MHz 18.53 dBm
 SWT 2.5 ms 2.405048077 GHz



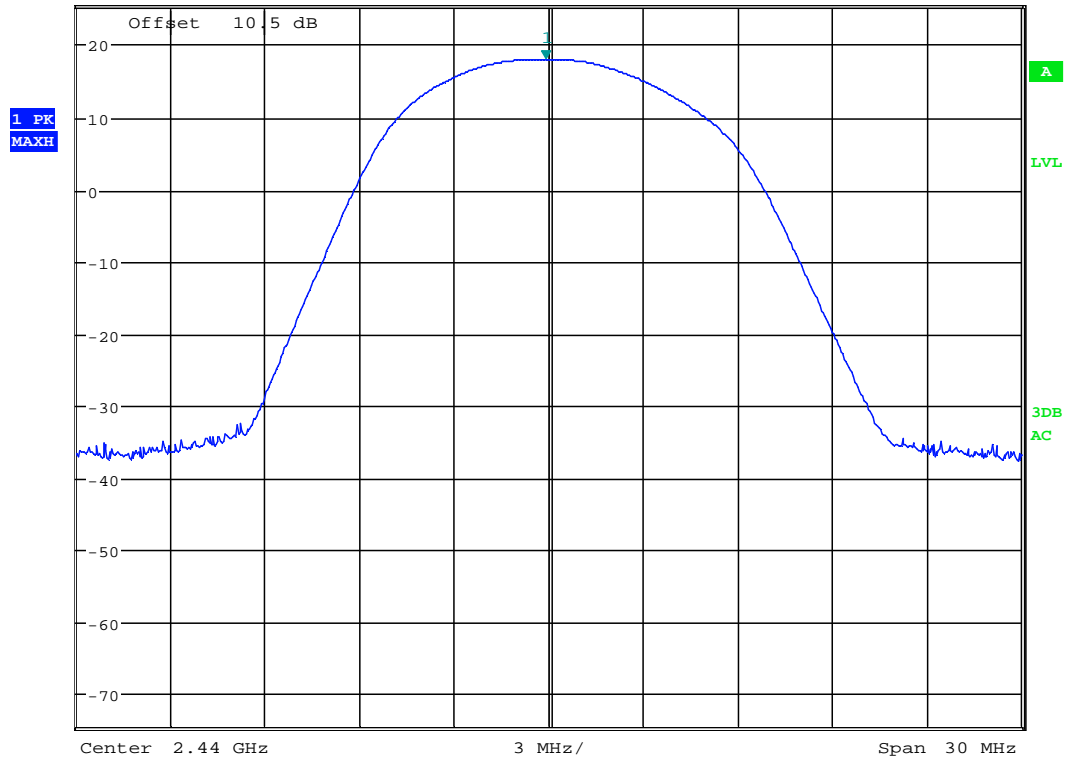
Date: 8.JAN.2014 16:28:08

Conducted power – 2405MHz,PK



MARKER 1
 2.439903846 GHz
 Step 25.5 dBm *Att 10 dB

*RBW 5 MHz Marker 1 [T1]
 VBW 10 MHz 18.09 dBm
 SWT 2.5 ms 2.439903846 GHz



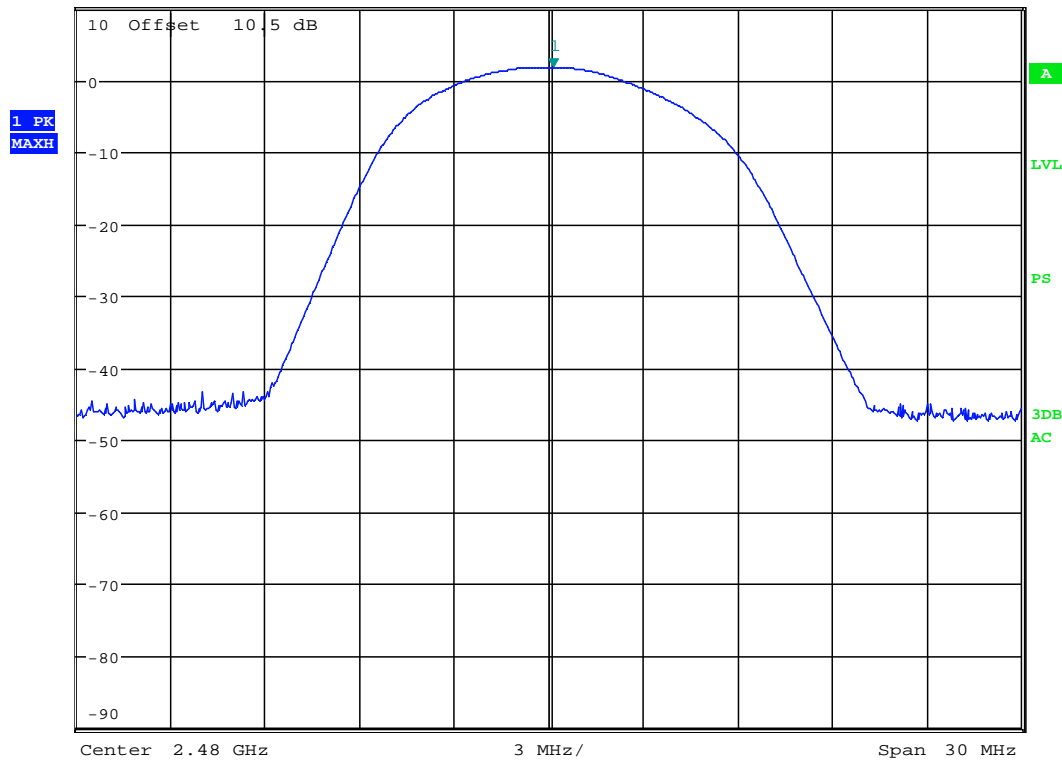
Date: 8.JAN.2014 16:27:53

Conducted power – 2440MHz,PK



MARKER 1
 2.480144231 GHz
 Ref 10 dBm * Att 15 dB

* RBW 5 MHz
 VBW 10 MHz
 SWT 2.5 ms
 Marker 1 [T1]
 1.78 dBm
 2.480144231 GHz



Date: 13.JAN.2014 07:53:41

Conducted power – 2480MHz, PK

3.5 Spurious Emissions (Radiated)

Para. No.: 15.247 (c)

Test Performed By: G.Suhanthakumar	Date of Test: 09 Jan 2014
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Test Results: Complies

Measurement Data:

Band-edge, @3m

Frequency	Measured Field Strength @3m, dB μ V/m	Detector	Limit dB μ V/m	Margin dB
2.39 GHz	53.61	PK	74	20.39
	47.01	AV	54	6.99
2.4835 GHz	66.80	PK	74	7.2
	43.52	AV	54	10.48

Tested according to KDB 558074 D01 DTS Measurement Guidance v03r01, Section 13.1 & 13.3.2.

100% duty cycle

See attached plots.

RF conducted spurious emission

Scan performed with 100 kHz Bandwidth from 0.01 to 25 GHz.

All emissions are more than 20dB below carrier.

See plots.



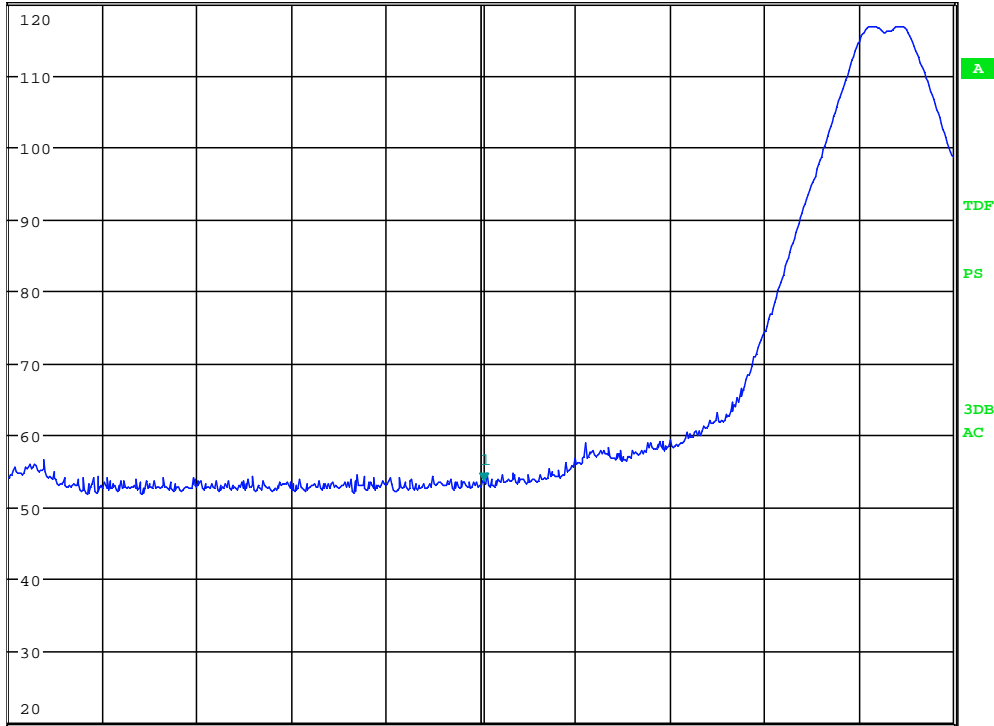
MARKER 1
 2.390112179 GHz

*RBW 1 MHz
 VBW 3 MHz
 SWT 2.5 ms

Marker 1 [T1]
 53.61 dBμV/m
 2.390112179 GHz

Ref 120 dBμV/m *Att 15 dB

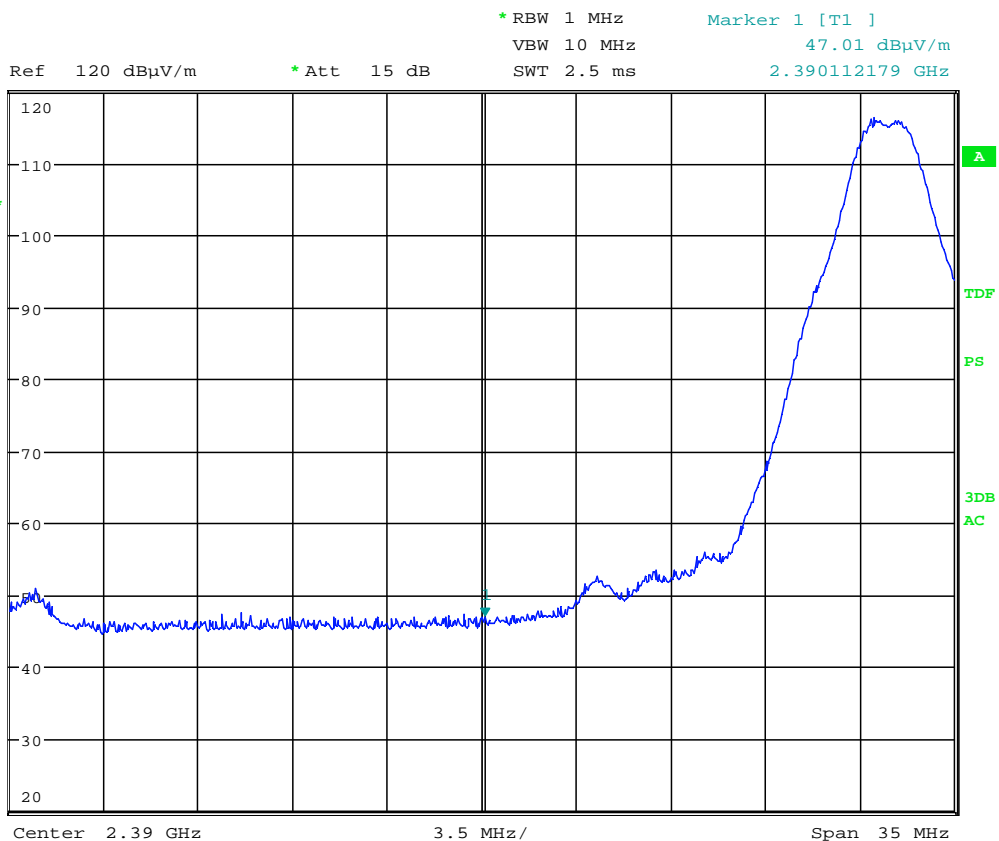
1 PK
 MAXH



Center 2.39 GHz 3.5 MHz / Span 35 MHz

Date: 8.JAN.2014 08:59:13

Band Edge, 2390 MHz, Peak Detector



Date: 8.JAN.2014 09:00:06

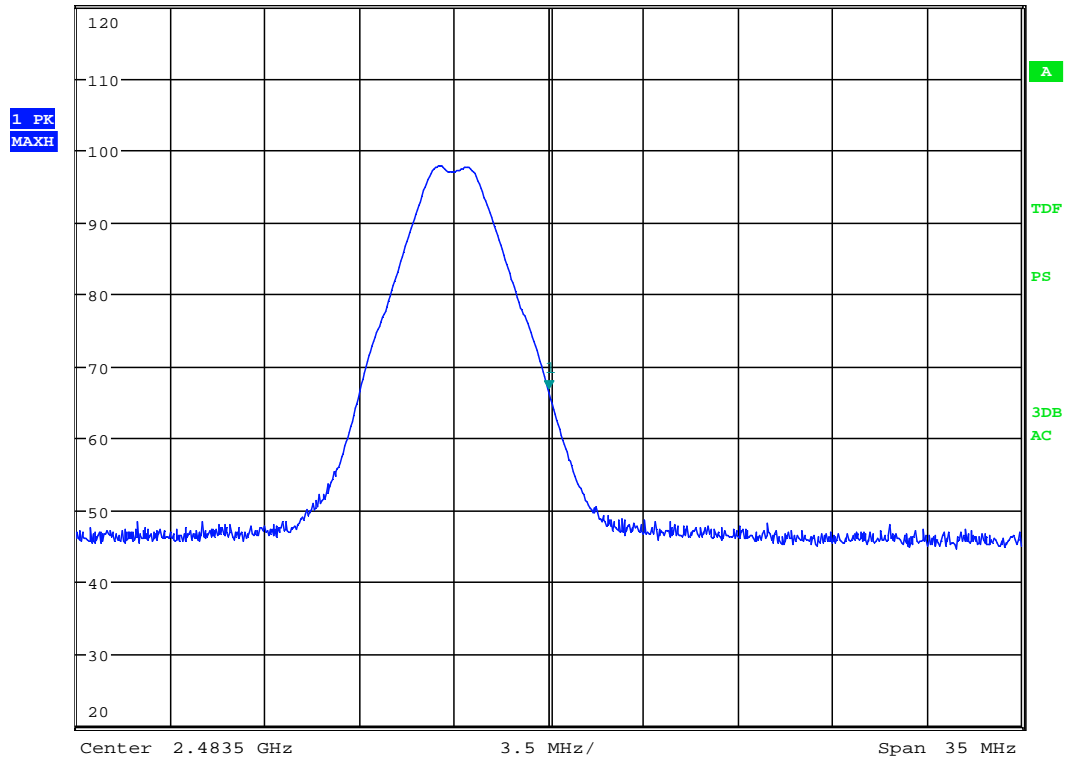
Band Edge, 2390 MHz, Average Detector



MARKER 1
 2.4835 GHz
 Ref 120 dBμV/m * Att 15 dB

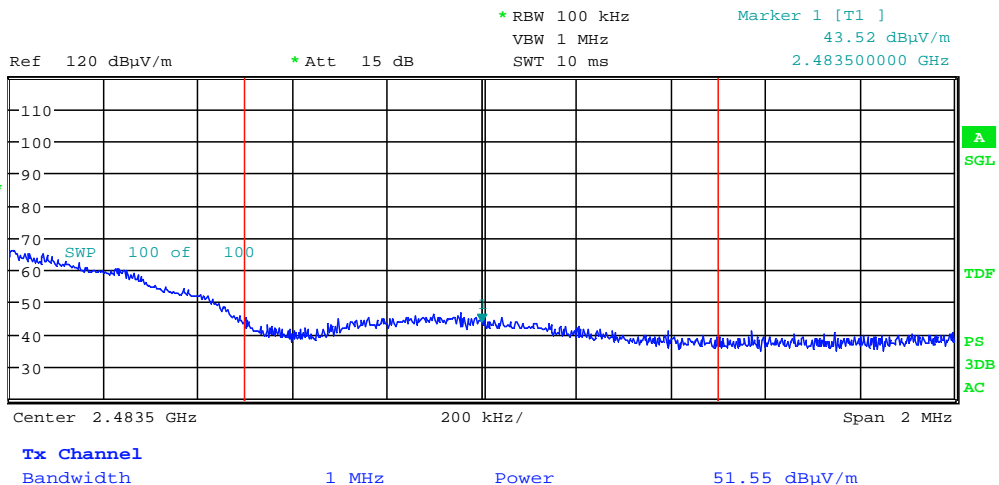
* RBW 1 MHz
 VBW 3 MHz
 SWT 10 ms

Marker 1 [T1]
 66.80 dBμV/m
 2.483500000 GHz



Date: 8.JAN.2014 10:14:50

Upper Band Edge, 2483.5 MHz, Peak Detector



Date: 8.JAN.2014 10:19:28

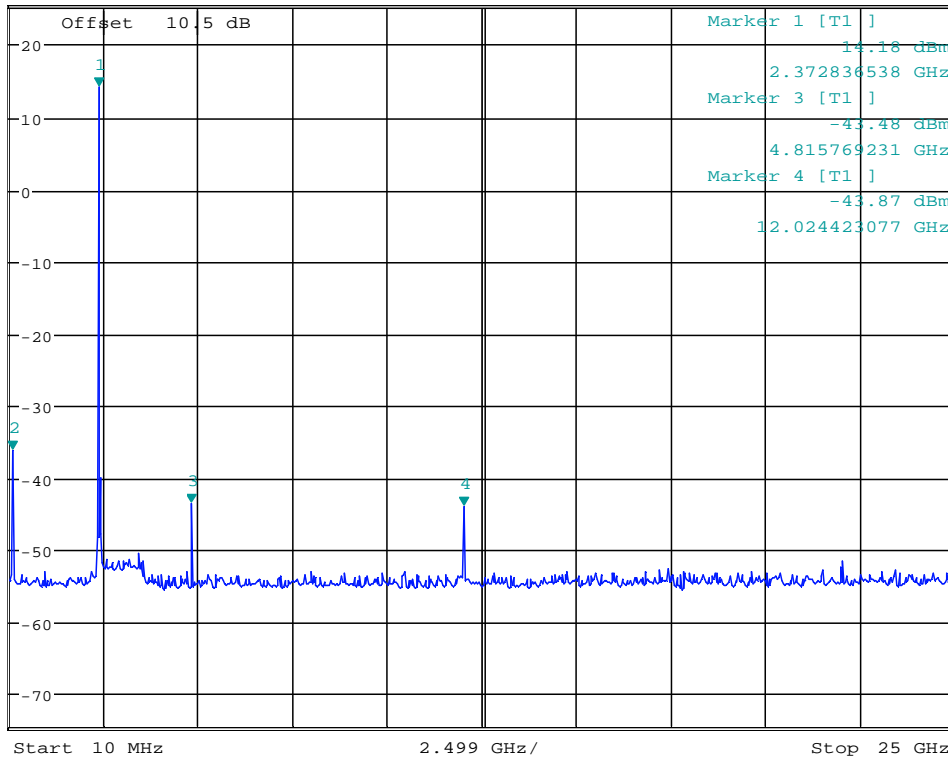
Upper Band edge power, 2483.5MHz, AV detector



MARKER 2
 90.09615385 MHz
 Step 25.5 dBm

*RBW 100 kHz Marker 2 [T1]
 VBW 300 kHz -36.17 dBm
 *Att 10 dB 90.096153846 MHz
 SWT 2.5 s

1 PK
 MAXH



Date: 8.JAN.2014 16:30:06

Conducted spurious emission 10MHz – 25GHz - ch2402MHz

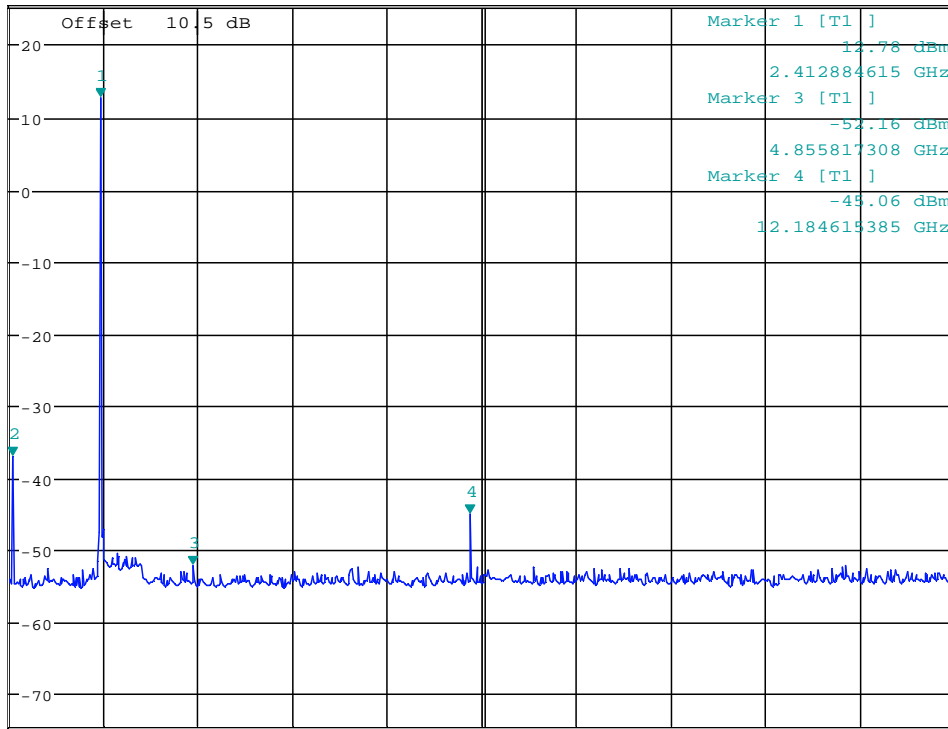


MARKER 2
 90.09615385 MHz

*RBW 100 kHz Marker 2 [T1]
 VBW 300 kHz -37.02 dBm
 SWT 2.5 s 90.096153846 MHz

Step 25.5 dBm *Att 10 dB

1 PK
 MAXH



Start 10 MHz 2.499 GHz/ Stop 25 GHz

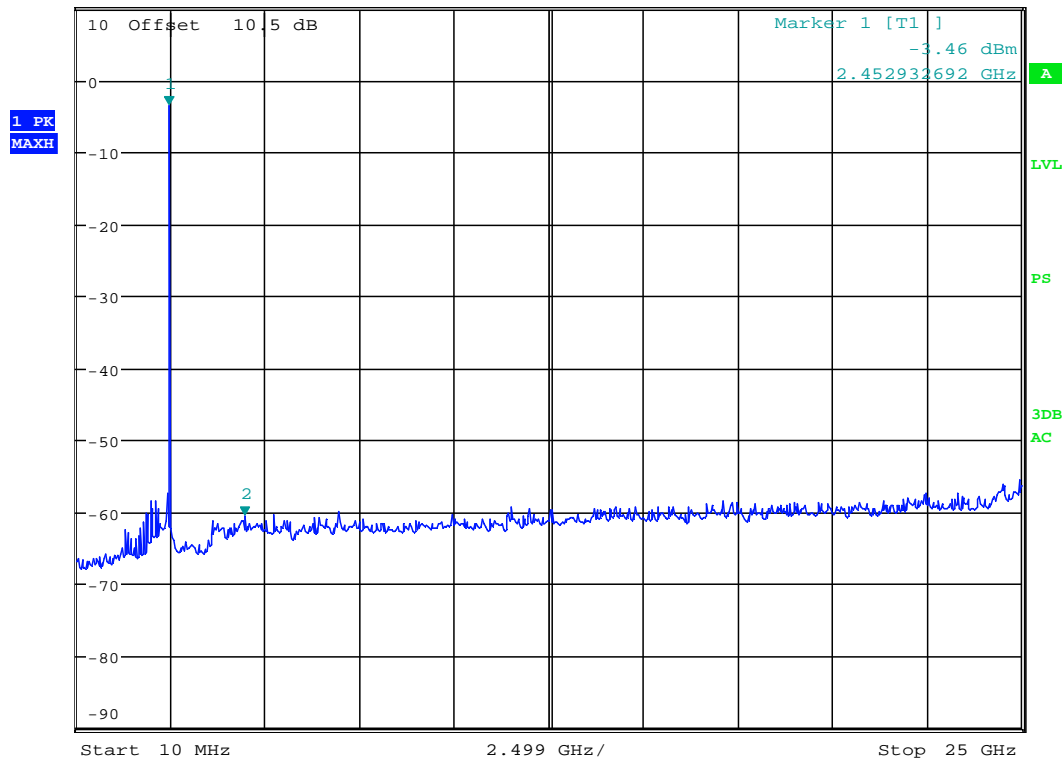
Date: 8.JAN.2014 16:31:03

Conducted spurious emission 10MHz – 25GHz - ch2440MHz



MARKER 2
 4.455336538 GHz
 Ref 10 dBm *Att 15 dB

*RBW 100 kHz Marker 2 [T1]
 VBW 300 kHz -60.41 dBm
 SWT 2.5 s 4.455336538 GHz



Date: 13.JAN.2014 07:54:36

Conducted spurious emission 10MHz – 25GHz - ch2480MHz

Radiated emissions 9kHz - 30 MHz.

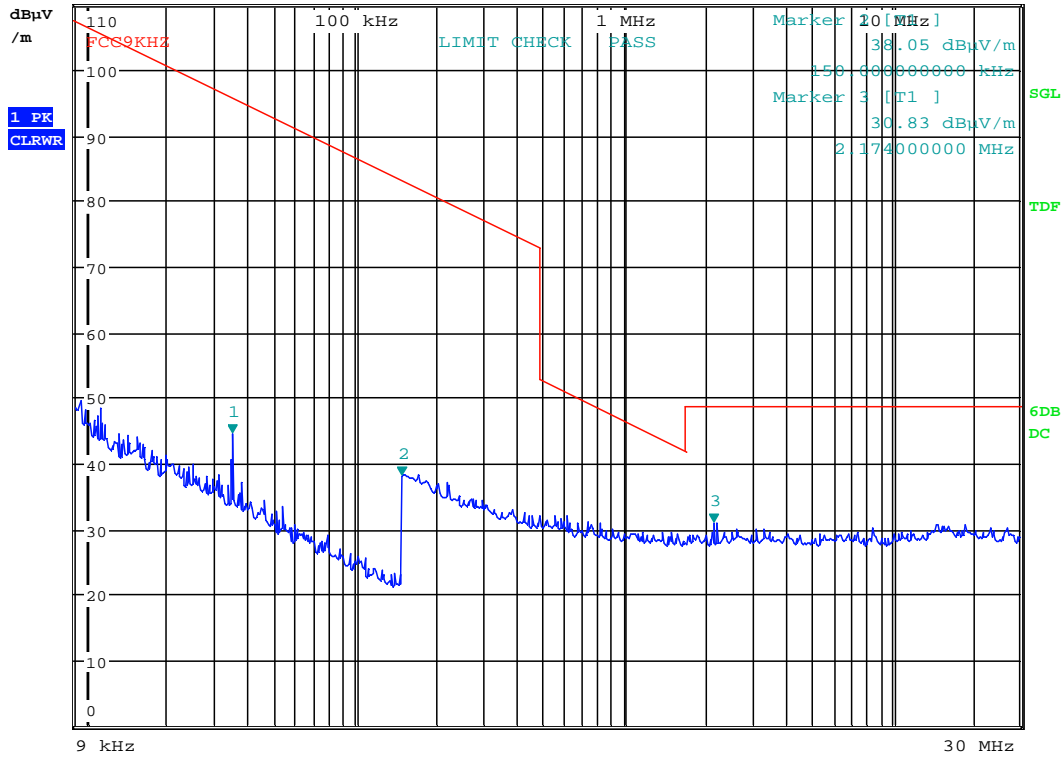
Detector: Quasi-Peak

Measuring distance 10 m.



MARKER 1
 34.6 kHz

RBW 9 kHz Marker 1 [T1]
 MT 50 ms 44.38 dBµV/m
 Step AUTO Att 0 dB PREAMP OFF 34.600000000 kHz



Date: 8.JAN.2014 14:04:29

Radiated Emissions, 9 kHz – 30 MHz @10m

Radiated emission 30 – 1000 MHz.

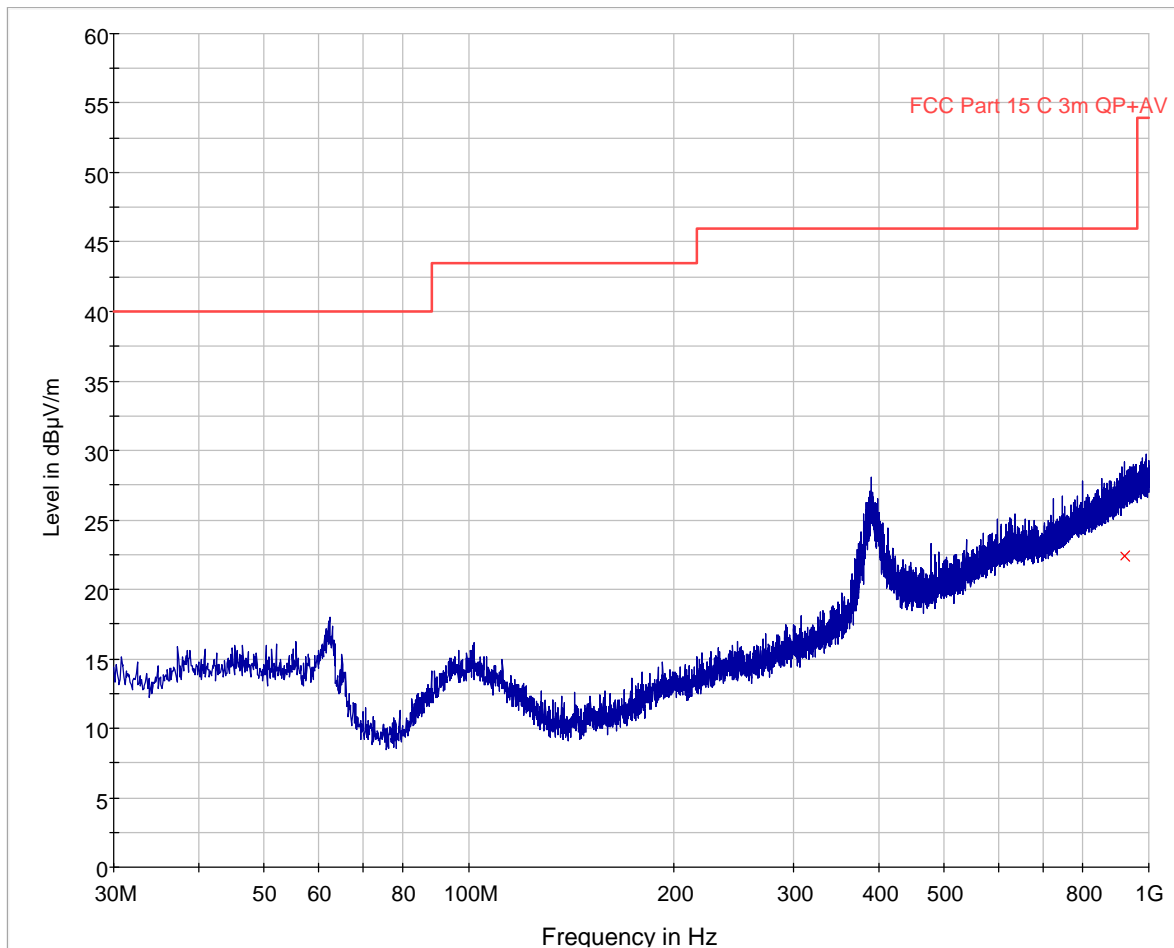
Detector: Peak

Measuring distance at 3m.

All values are below the limit even when measured with Peak Detector, RBW=100kHz, VBW=300kHz.

See attached plot.

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
920.472600	22.4	1000.0	120.000	277.0	V	100.0	2.6	23.6	46.0	



Radiated Emissions, 30 – 1000 MHz, VP and HP, @3m

Radiated Emissions, 1-25 GHz

1-8 GHz measured at a distance of 3 m

8 - 25 GHz measured at 1m distance

Peak detector

Frequency MHz	Field Strength dB μ V/m	Detector	Limit dB μ V/m	Margin dB
2342	59.12	Pk	74	14.88
2376	58.59	Pk	74	15.41
4811	49.96	Pk	74	24.04
4881	50.05	Pk	74	23.95
7217	58.31	Pk	74	15.69
7321	58.98	Pk	74	15.02
9618	44.15	Pk	74	29.85
9758	43.25	Pk	74	30.75
12027	58.27	Pk	74	15.73
12197	59.27	Pk	74	14.73
14433	58.09	Pk	74	15.91
14643	57.91	Pk	74	16.09
16831	50.54	Pk	74	23.46
17076	51.00	Pk	74	23.00

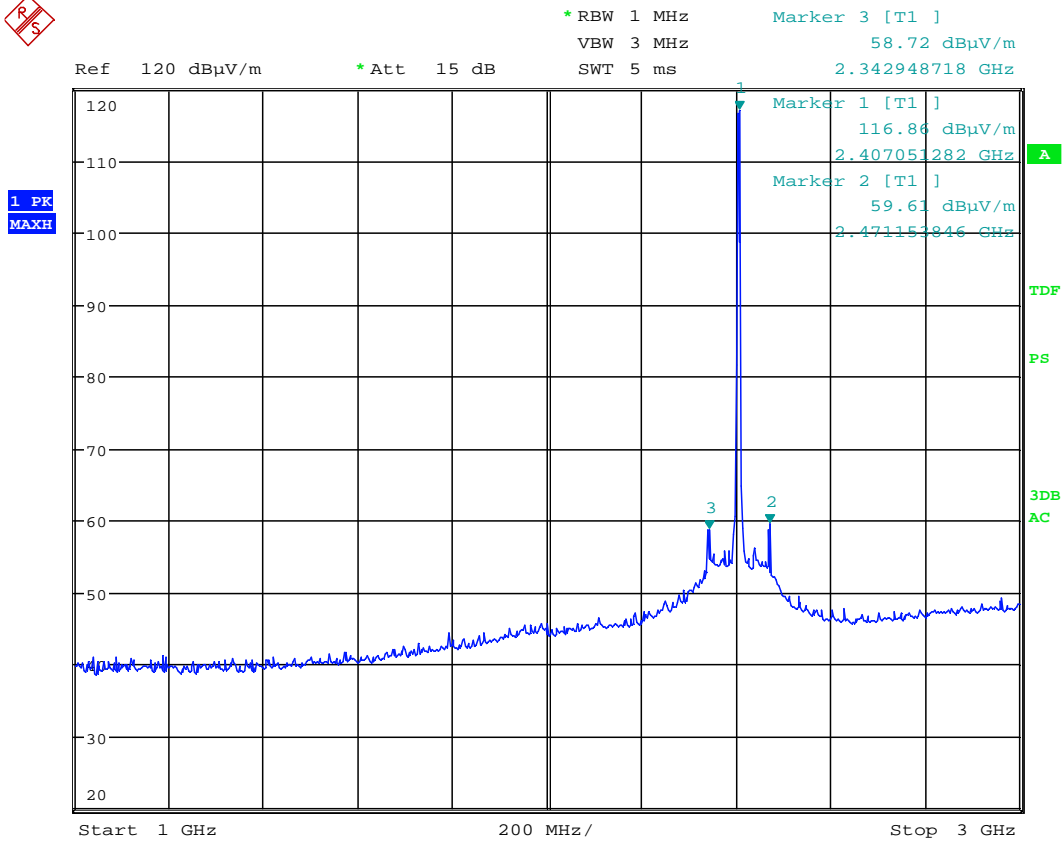
Antenna factor, amplifier gain and cable loss are included in Spectrum Analyzer "Transducer factor".

See attached graphs.

Average detector

Frequency MHz	Field Strength dB μ V/m	Detector	Limit dB μ V/m	Margin dB
2341	51.93	AV	54	2.07
2376	52.27	AV	54	1.73
4811	41.33	AV	54	12.67
4879	40.57	AV	54	13.43
7216	52.24	AV	54	1.76
7321	52.51	AV	54	1.49
9618	36.00	AV	54	18.00
9762	34.74	AV	54	19.26
12027	53.17	AV	54	0.83
12202	53.78	AV	54	0.22
14433	53.00	AV	54	1.00
14643	53.04	AV	54	0.96
16838	43.22	AV	54	10.78
17083	43.00	AV	54	11.00

Antenna factor, amplifier gain and cable loss are included in Spectrum Analyzer "Transducer factor".
 See attached graphs.

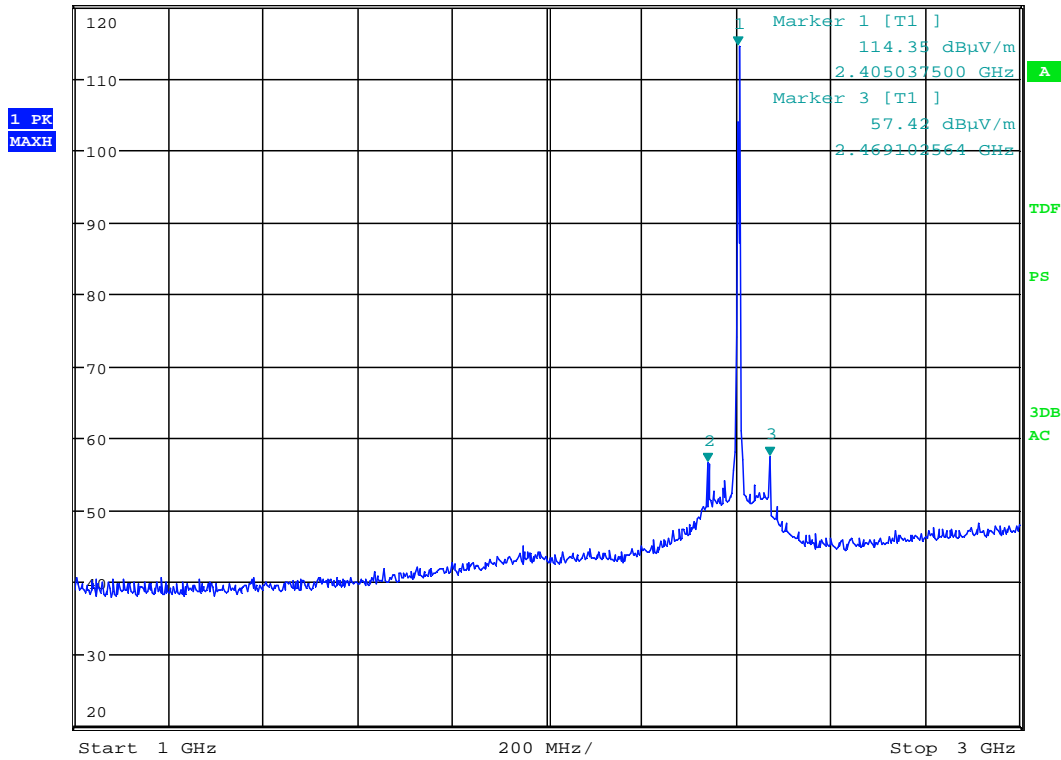


Date: 8.JAN.2014 09:02:25

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



MARKER 2	* RBW 1 MHz	Marker 2 [T1]
2.340897436 GHz	VBW 3 MHz	56.69 dBuV/m
Ref 120 dBuV/m	SWT 5 ms	2.340897436 GHz
* Att 15 dB		

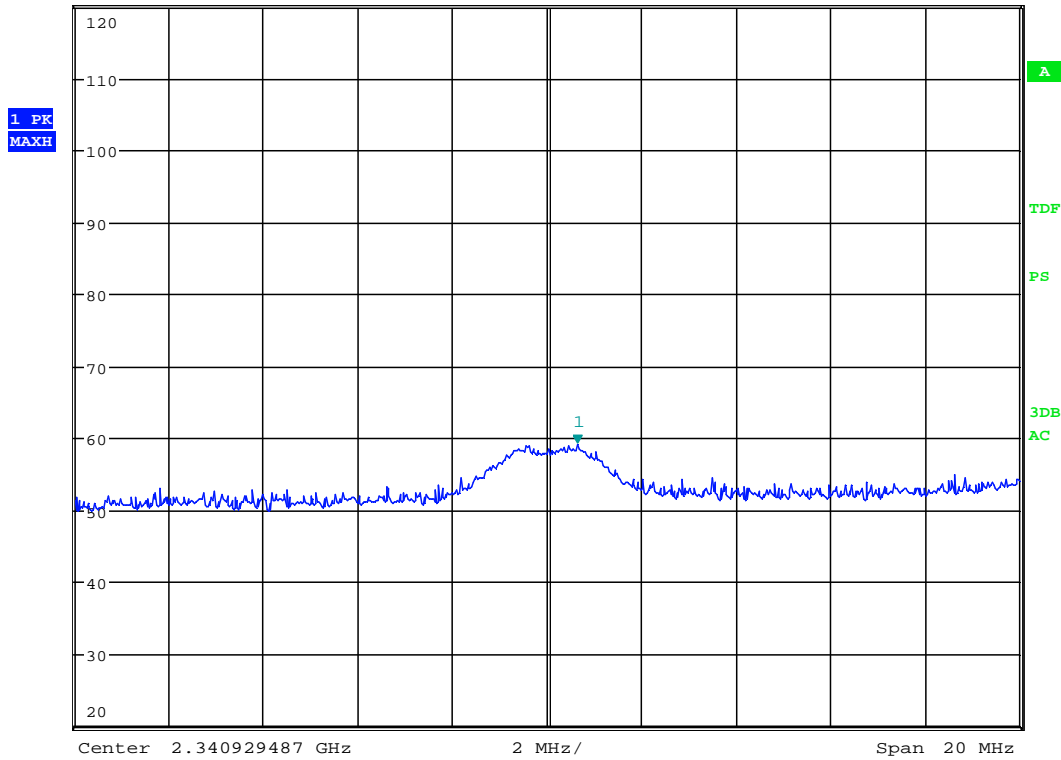


Date: 8.JAN.2014 09:38:35

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



MARKER 1
 2.341570513 GHz
 Ref 120 dBµV/m *Att 15 dB *RBW 1 MHz Marker 1 [T1] 59.12 dBµV/m
 VBW 3 MHz SWT 2.5 ms 2.341570513 GHz

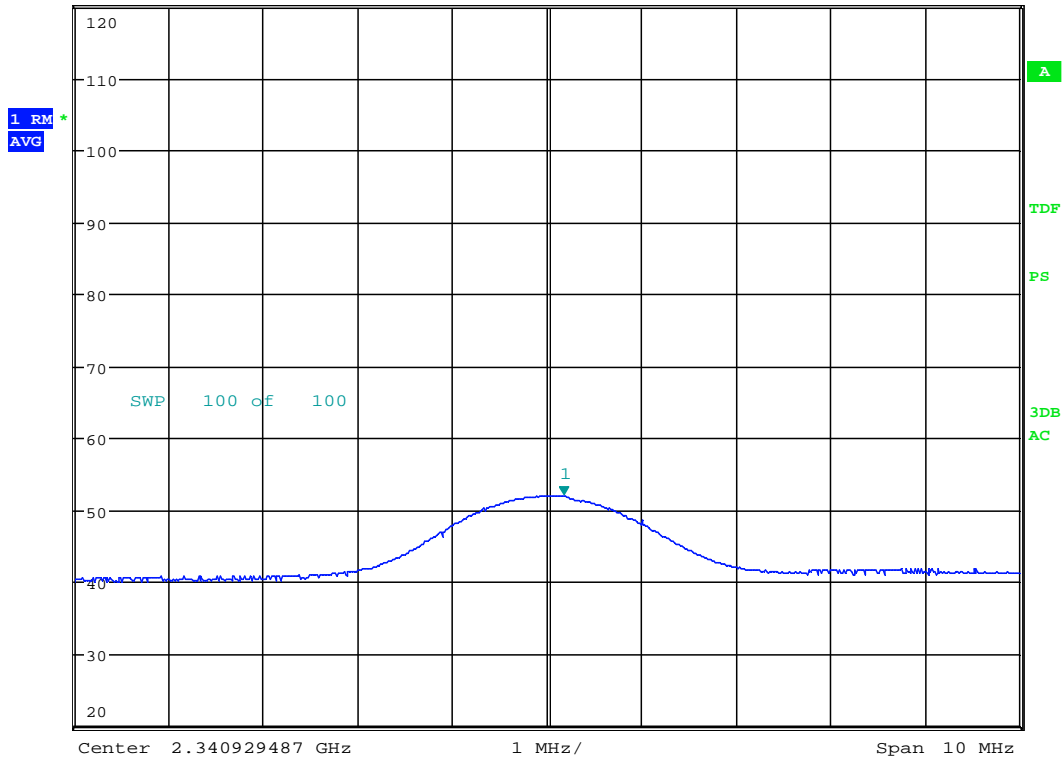


Date: 8.JAN.2014 09:04:27

Spurious emission at 2.34 GHz , ch2405MHz, VP- Peak Detector



MARKER 1
 2.341113487 GHz
 Ref 120 dBµV/m *Att 15 dB
 *RBW 1 MHz Marker 1 [T1]
 VBW 10 MHz 51.93 dBµV/m
 SWT 25 ms 2.341113487 GHz

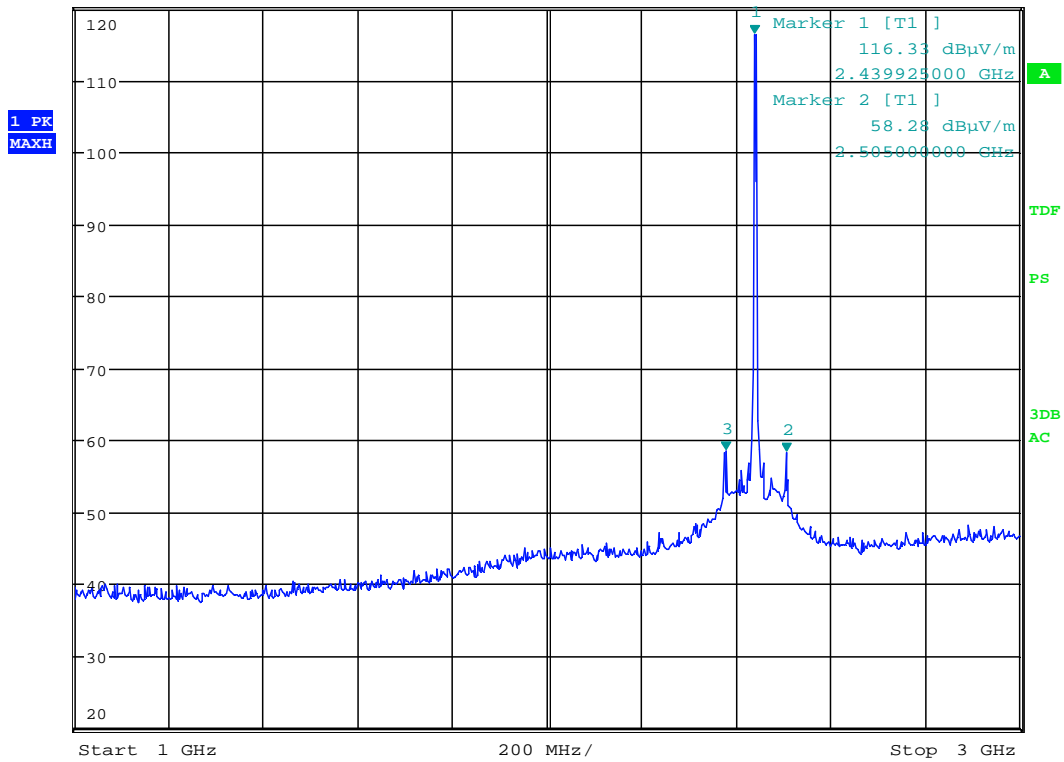


Date: 8.JAN.2014 10:03:19

Spurious emission at 2.34 GHz , ch2405MHz, VP- Average Detector



*RBW 1 MHz Marker 3 [T1]
 VBW 3 MHz 58.65 dBuV/m
 Ref 120 dBuV/m *Att 15 dB SWT 5 ms 2.376794872 GHz

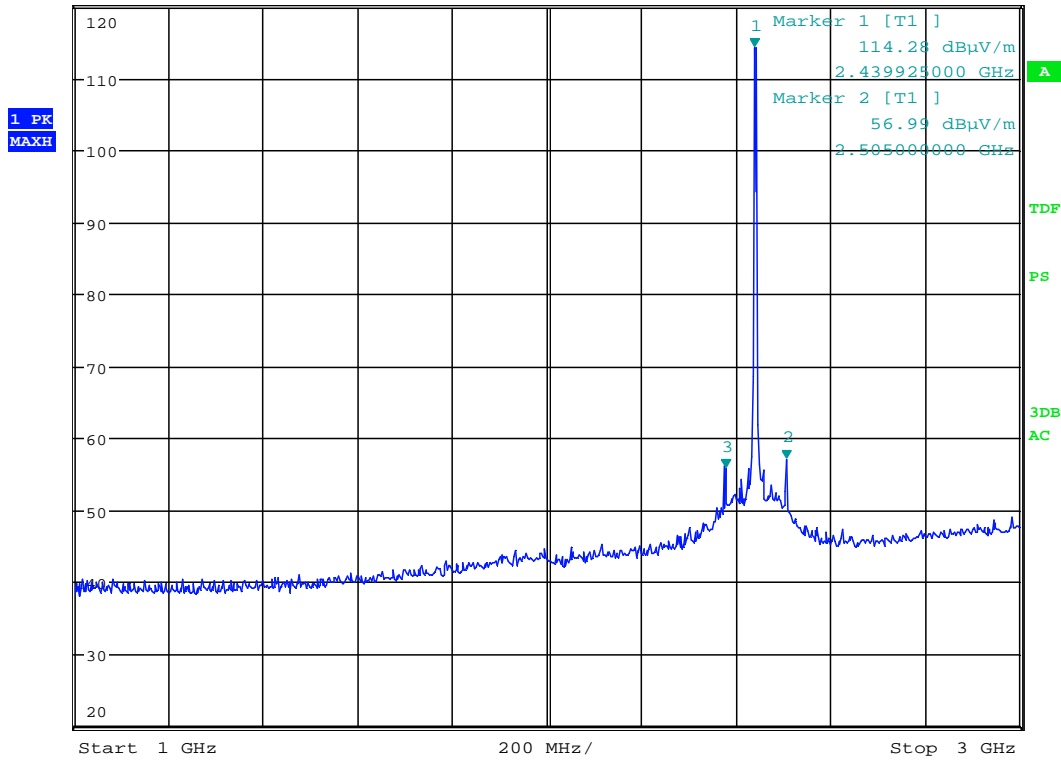


Date: 8.JAN.2014 09:50:39

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



MARKER 3
 2.376794872 GHz
 Ref 120 dBuV/m * Att 15 dB
 * RBW 1 MHz Marker 3 [T1]
 VBW 3 MHz 55.88 dBuV/m
 SWT 5 ms 2.376794872 GHz

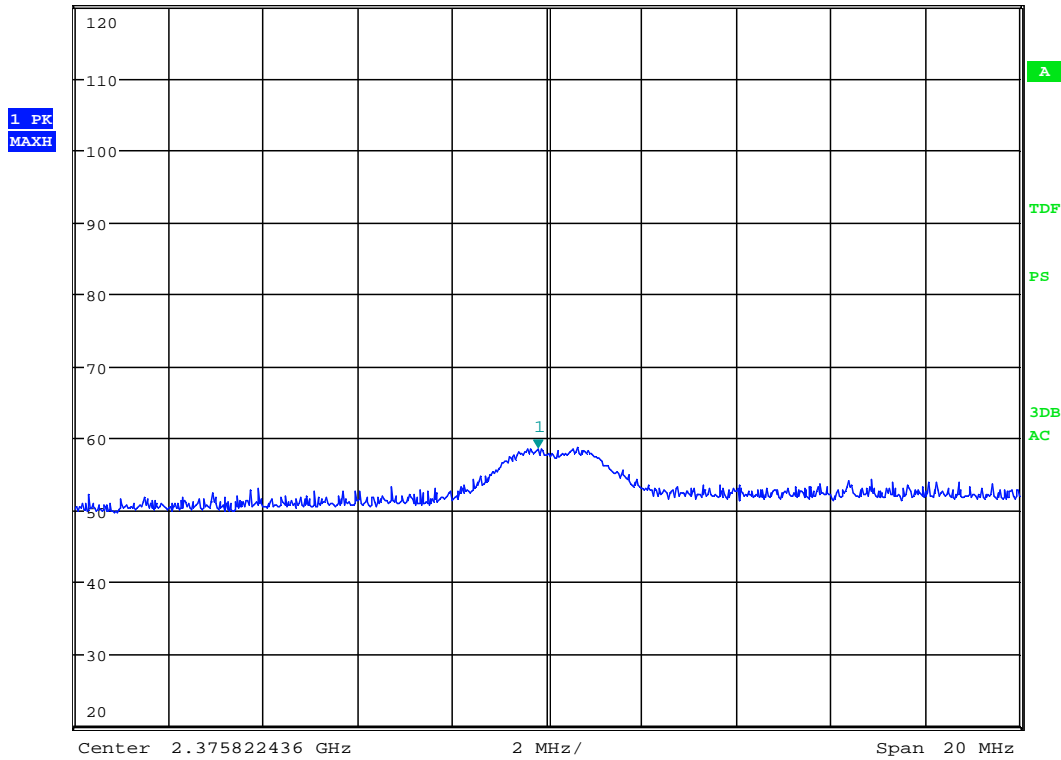


Date: 8.JAN.2014 09:49:47

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



MARKER 1	* RBW 1 MHz	Marker 1 [T1]
2.375622436 GHz	VBW 3 MHz	58.59 dBµV/m
Ref 120 dBµV/m	SWT 5 ms	2.375622436 GHz
* Att 15 dB		

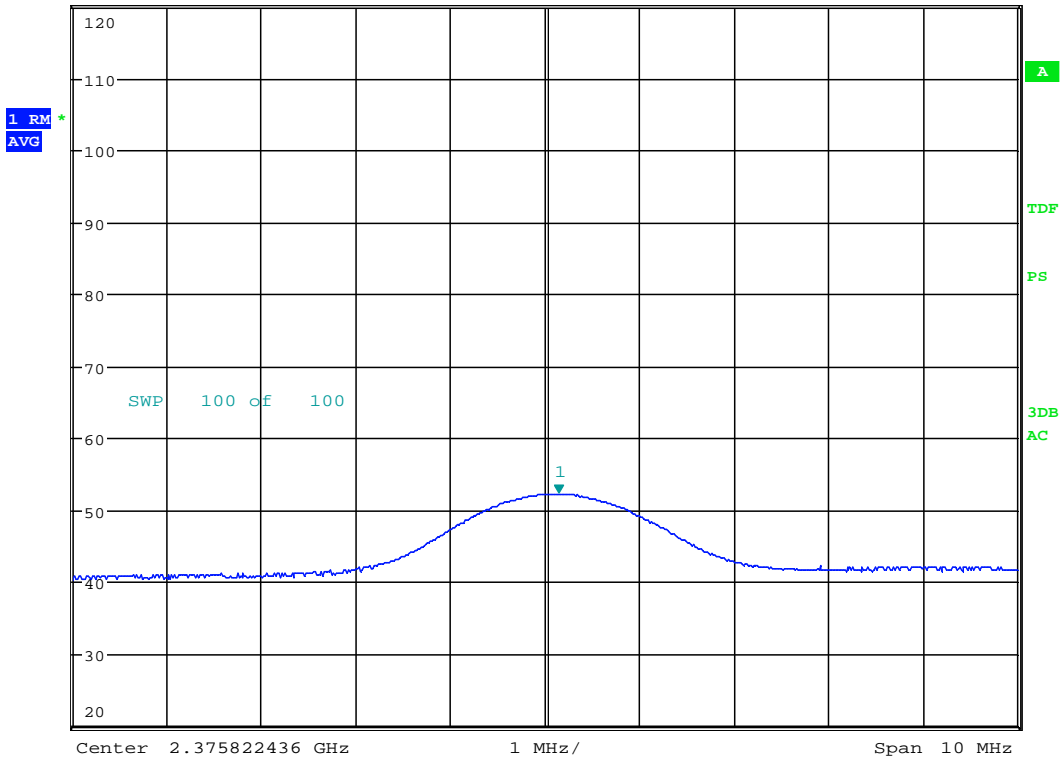


Date: 8.JAN.2014 09:51:32

Spurious emission at 2.37GHz , ch2440MHz, VP- Peak Detector



* RBW 1 MHz Marker 1 [T1]
 VBW 10 MHz 52.27 dBµV/m
 SWT 25 ms 2.375972436 GHz
 Ref 120 dBµV/m * Att 15 dB



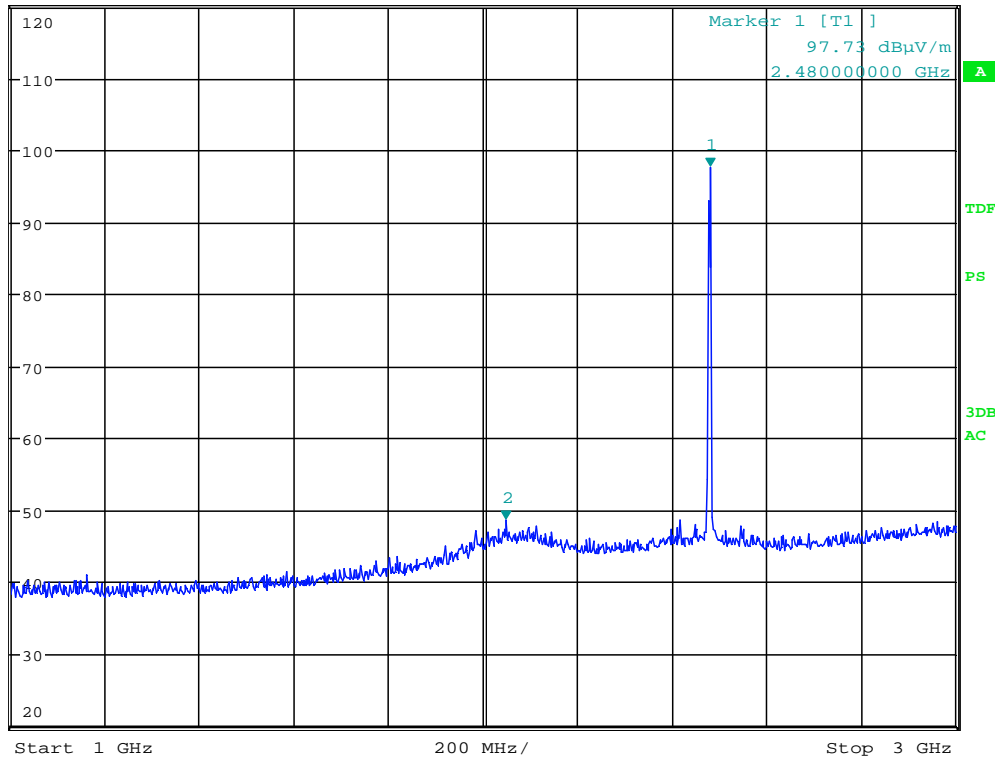
Date: 8.JAN.2014 09:57:53

Spurious emission at 2.37GHz , ch2440MHz, VP- Average Detector



MARKER 2
 2.047307692 GHz
 Ref 120 dBuV/m * Att 15 dB * RBW 1 MHz
 VBW 3 MHz Marker 2 [T1]
 SWT 10 ms 48.62 dBuV/m
 2.047307692 GHz

1 PK
MAXH

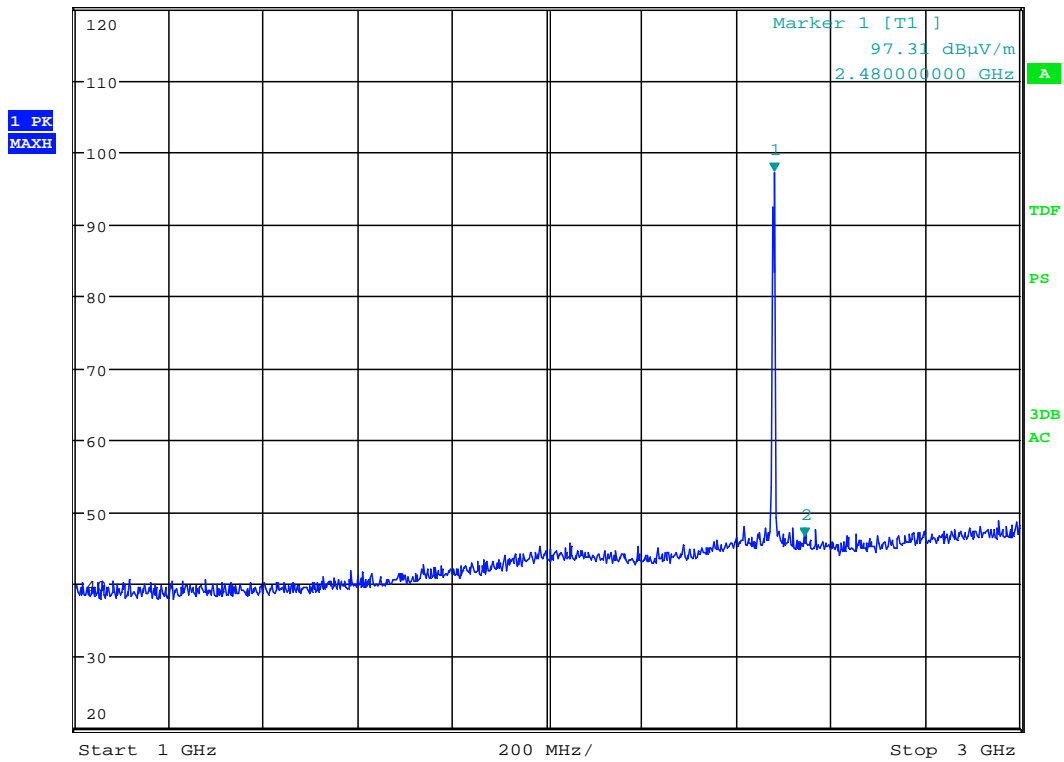


Date: 8.JAN.2014 10:13:47

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



MARKER 2
 2.544102564 GHz
 Ref 120 dBuV/m * Att 15 dB * RBW 1 MHz
 VBW 3 MHz Marker 2 [T1]
 SWT 10 ms 46.57 dBuV/m
 2.544102564 GHz



Date: 8.JAN.2014 10:12:28

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

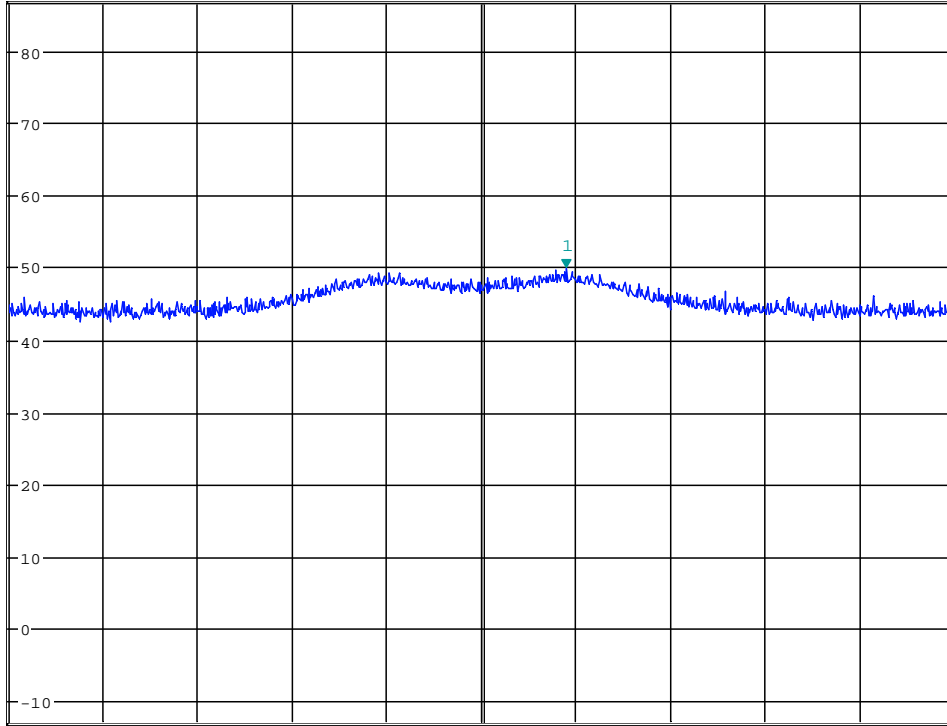


* RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 49.96 dBμV/m
 SWT 20 ms 4.810904000 GHz

Ref 87 dBμV/m

* Att 10 dB

1 PK
 MAXH



Center 4.81 GHz

1 MHz/

Span 10 MHz

A

TDF

LNA

3DB

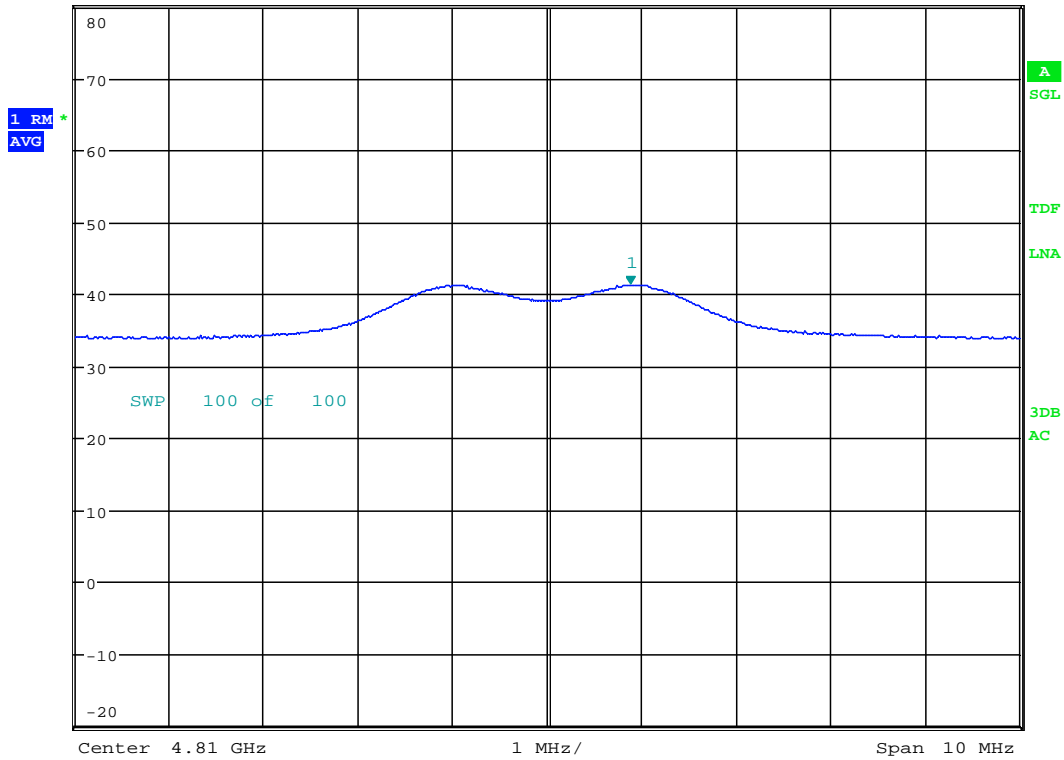
AC

Date: 8.JAN.2014 10:44:44

2nd harmonic , ch2402MHz – HP, PK detector



MARKER 1
 4.810888 GHz
 Ref 80 dBµV/m * Att 10 dB * RBW 1 MHz Marker 1 [T1]
 VBW 10 MHz 41.33 dBµV/m
 SWT 20 ms 4.810888000 GHz



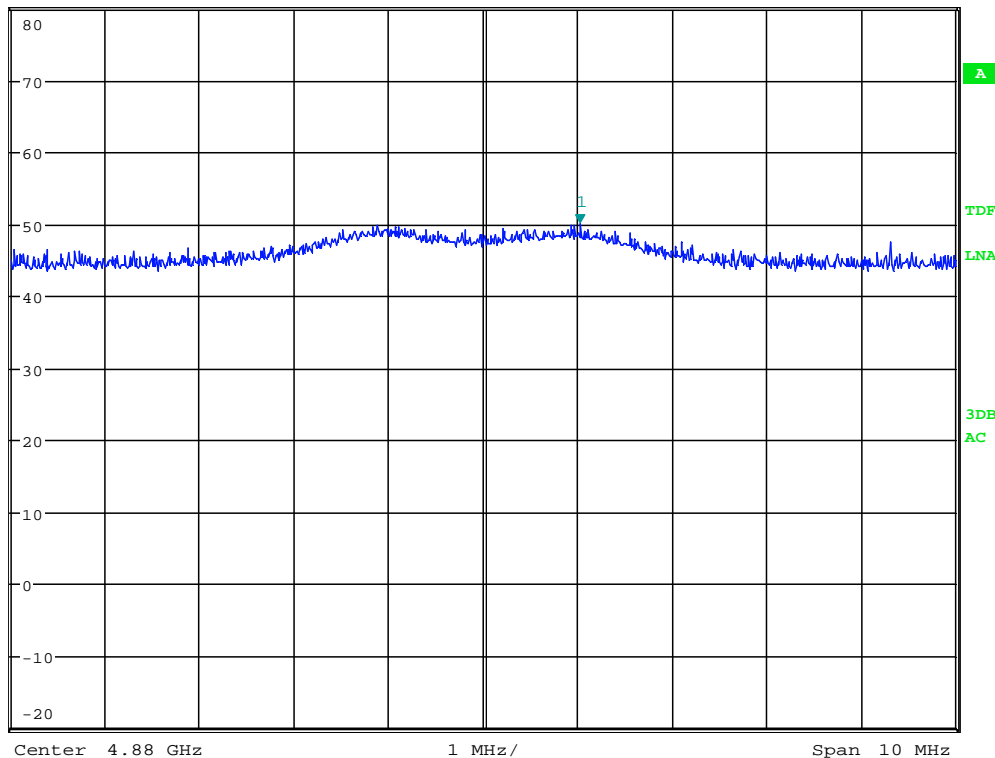
Date: 8.JAN.2014 12:13:07

2nd harmonic , ch2402MHz – HP, AV detector



MARKER 1	* RBW 1 MHz	Marker 1 [T1]
4.881032 GHz	VBW 3 MHz	50.05 dBµV/m
Ref 80 dBµV/m	* Att 10 dB	SWT 20 ms
		4.881032000 GHz

1 PK
MAXH

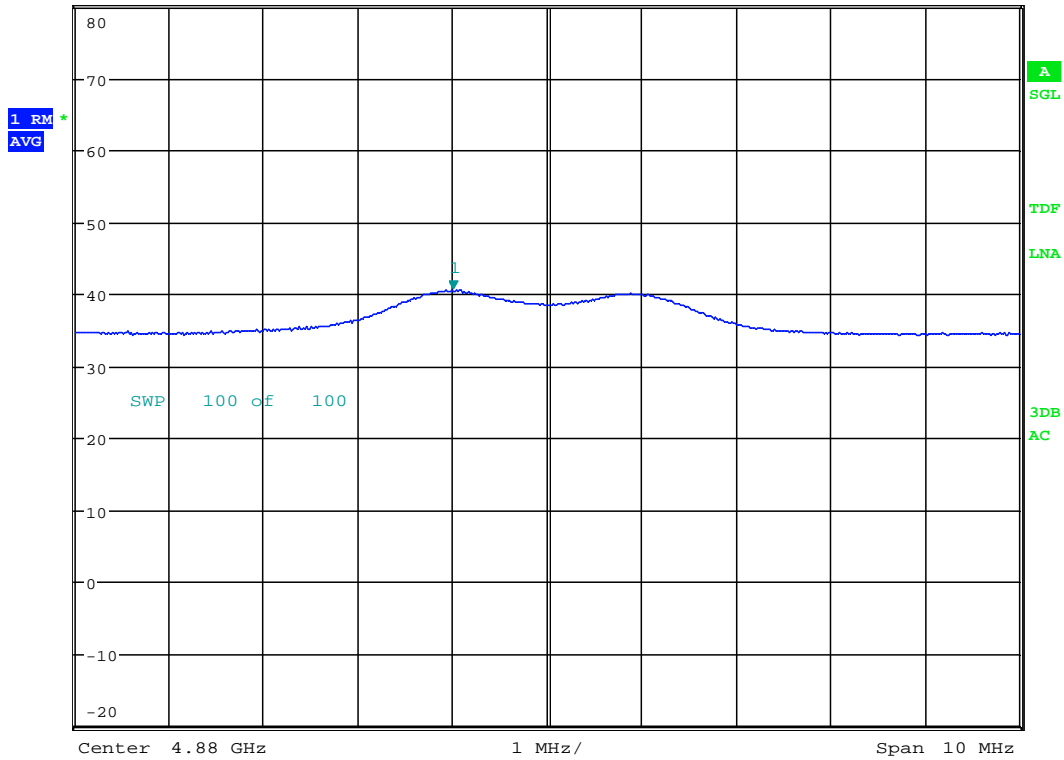


Date: 8.JAN.2014 11:31:36

2nd harmonic , ch2440MHz – HP, PK detector



MARKER 1
 4.879 GHz
 Ref 80 dBµV/m * Att 10 dB
 * RBW 1 MHz Marker 1 [T1]
 VBW 10 MHz 40.57 dBµV/m
 SWT 20 ms 4.879000000 GHz

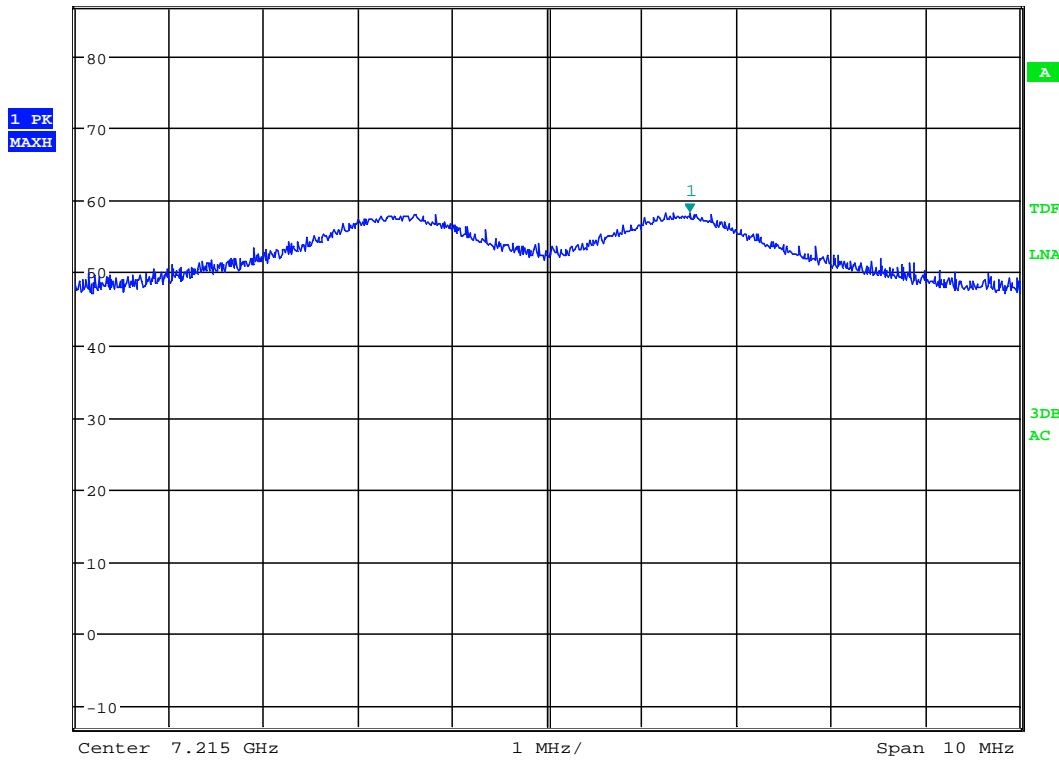


Date: 8.JAN.2014 11:30:50

2nd harmonic , ch2440MHz – HP, AV detector



MARKER 1	* RBW 1 MHz	Marker 1 [T1]
7.213264 GHz	VBW 3 MHz	58.31 dBμV/m
Ref 87 dBμV/m	* Att 10 dB	SWT 20 ms
		7.216504000 GHz



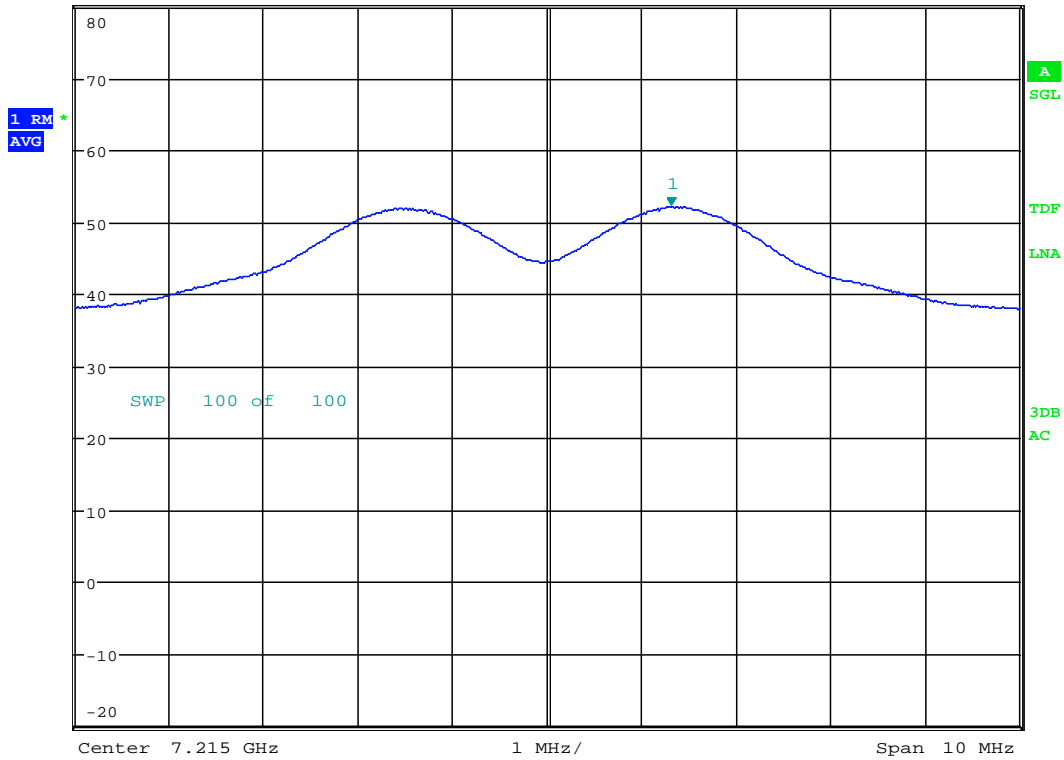
Date: 8.JAN.2014 10:54:52

3rd harmonic , ch2405MHz – VP, PK detector



MARKER 1
 7.21632 GHz
 Ref 80 dBµV/m * Att 10 dB

* RBW 1 MHz Marker 1 [T1]
 VBW 10 MHz 52.24 dBµV/m
 SWT 20 ms 7.216320000 GHz

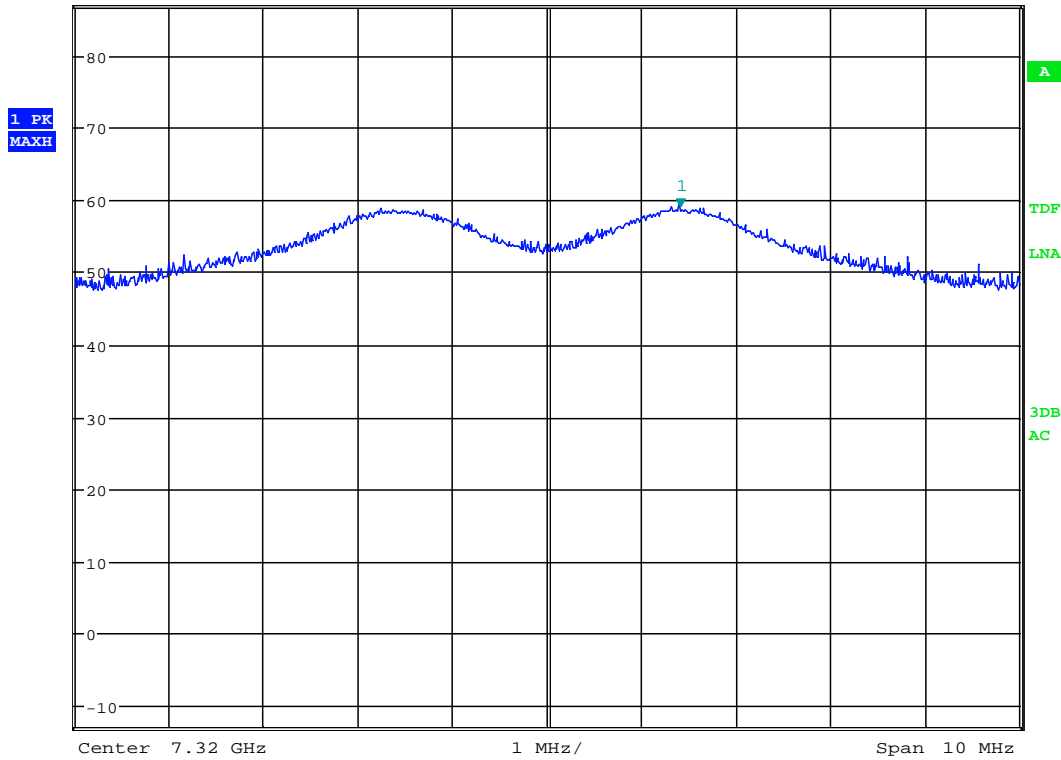


Date: 8.JAN.2014 12:14:33

3rd harmonic , ch2405MHz – VP, AV detector



MARKER 1	* RBW 1 MHz	Marker 1 [T1]
7.321416 GHz	VBW 3 MHz	58.98 dBμV/m
Ref 87 dBμV/m	* Att 10 dB	SWT 20 ms
		7.321416000 GHz



Date: 8.JAN.2014 11:08:12

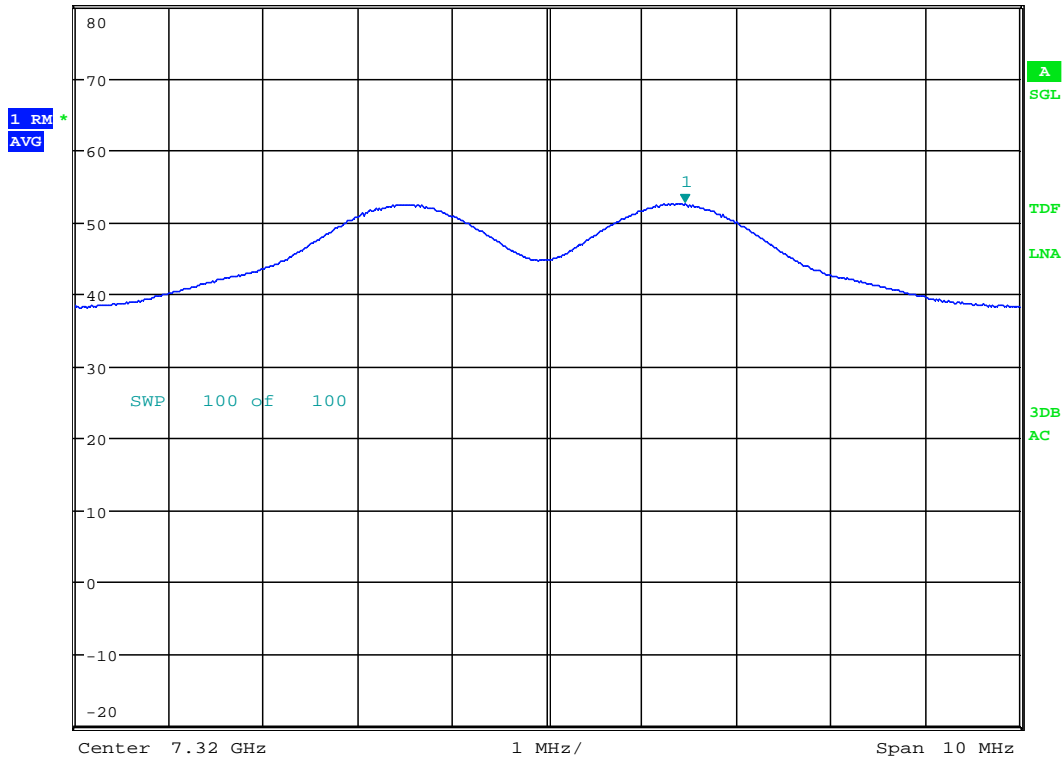
3rd harmonic , ch2440MHz – VP, PK detector



MARKER 1
 7.321464 GHz
 Ref 80 dB μ V/m * Att 10 dB

* RBW 1 MHz
 VBW 10 MHz
 SWT 20 ms

Marker 1 [T1]
 52.51 dB μ V/m
 7.321464000 GHz

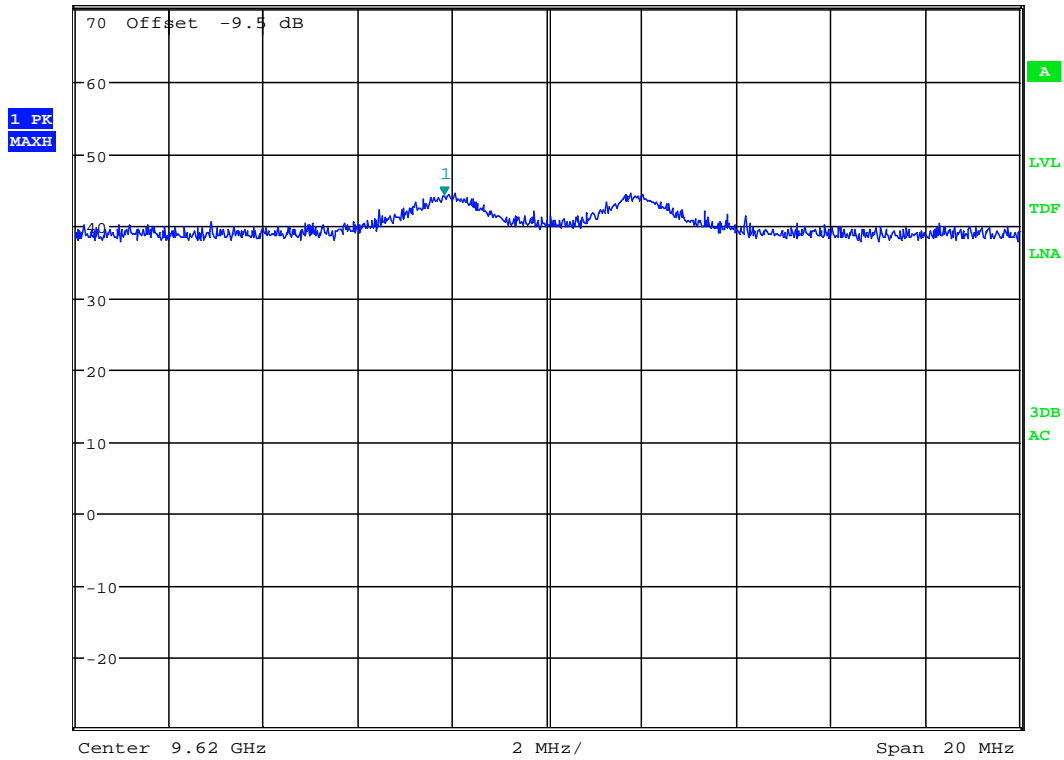


Date: 8.JAN.2014 11:29:21

3rd harmonic , ch2440MHz – VP, AV detector



MARKER 1
 9.617808 GHz
 Ref 70.5 dBµV/m * Att 10 dB * RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 44.15 dBµV/m
 SWT 20 ms 9.617808000 GHz



Date: 8.JAN.2014 13:35:54

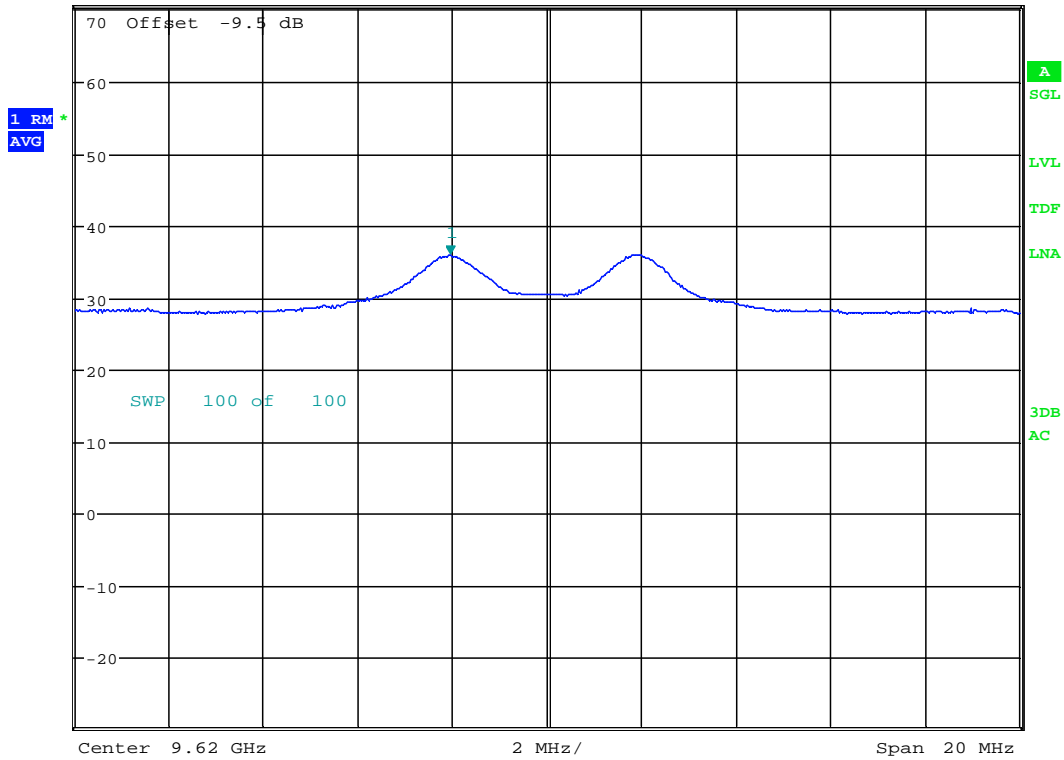
4th harmonic , ch2405MHz – VP, PK detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1
 9.617952 GHz
 Ref 70.5 dBµV/m *Att 10 dB

*RBW 1 MHz
 VBW 10 MHz
 SWT 20 ms

Marker 1 [T1]
 36.00 dBµV/m
 9.617952000 GHz

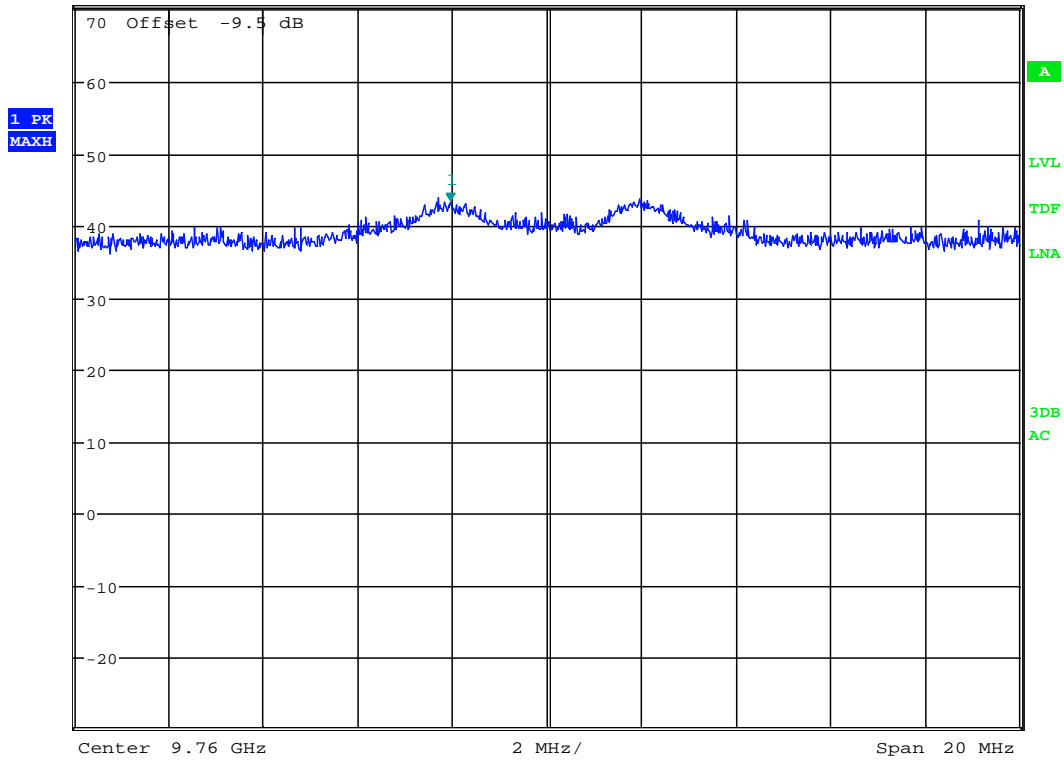


Date: 8.JAN.2014 13:36:37

4th harmonic , ch2405MHz – VP, AV detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1
 9.757952 GHz
 Ref 70.5 dBµV/m * Att 10 dB * RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 43.25 dBµV/m
 SWT 20 ms 9.757952000 GHz

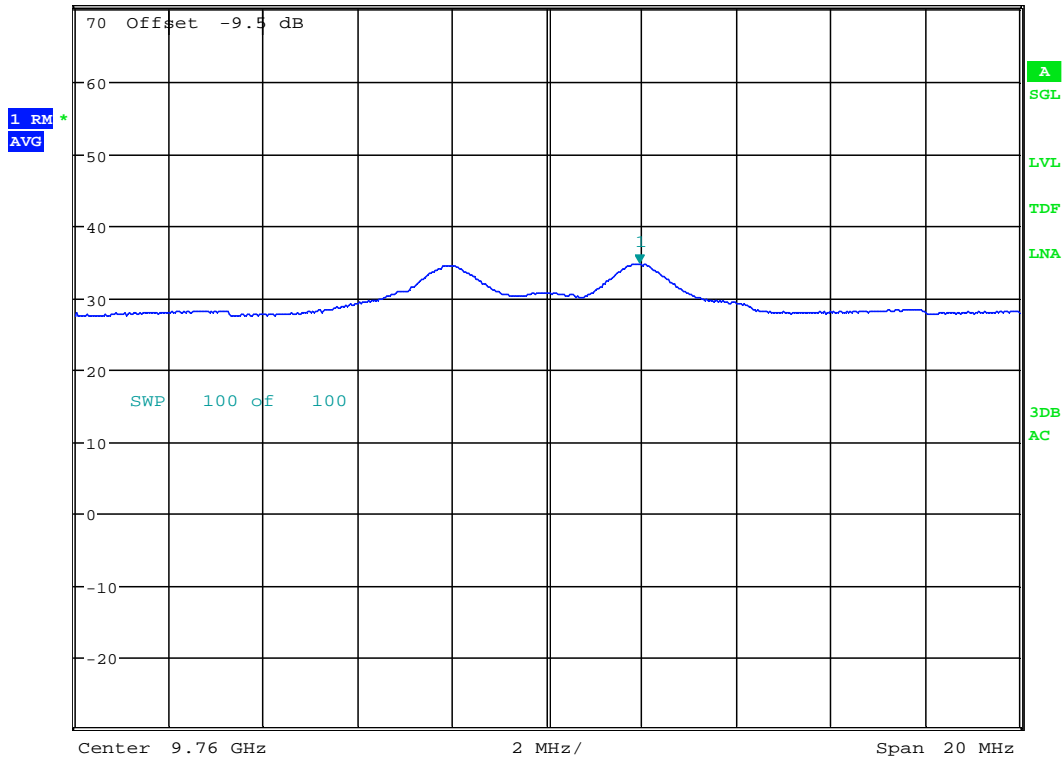


Date: 8.JAN.2014 13:32:27

4th harmonic , ch2440MHz – VP, PK detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1
 9.761968 GHz
 Ref 70.5 dBµV/m *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 10 MHz 34.74 dBµV/m
 SWT 20 ms 9.761968000 GHz

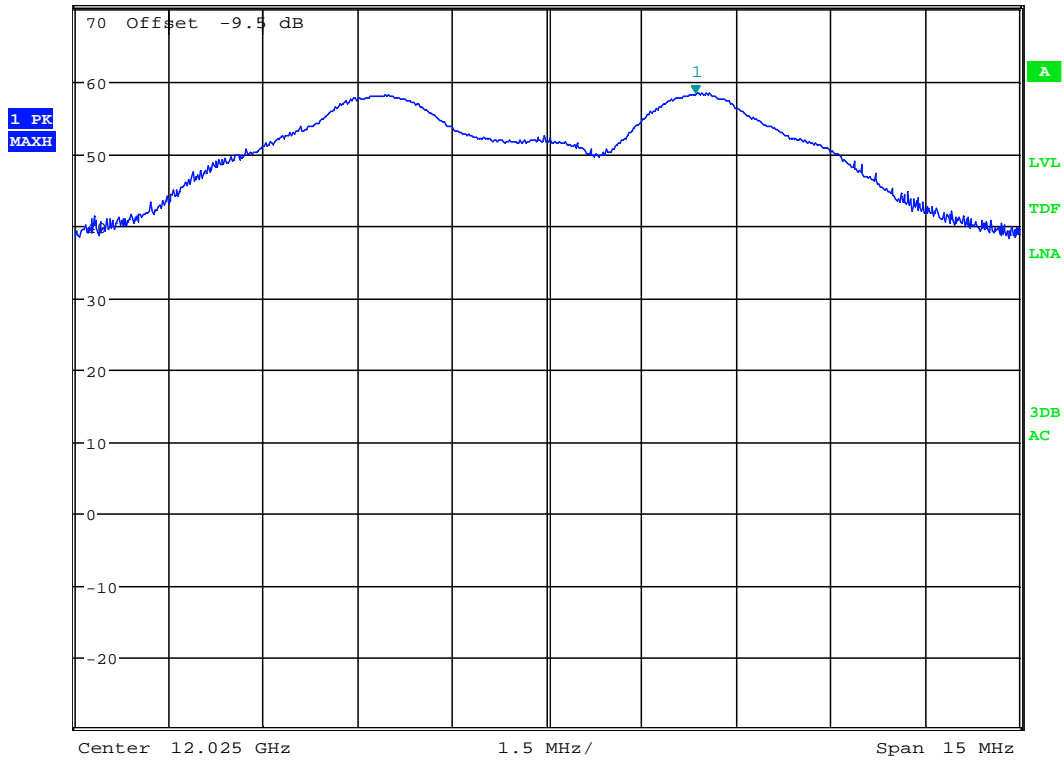


Date: 8.JAN.2014 13:33:18

4th harmonic , ch2440MHz – VP, AV detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1	* RBW 1 MHz	Marker 1 [T1]
12.027352 GHz	VBW 3 MHz	58.27 dBµV/m
Ref 70.5 dBµV/m	* Att 10 dB	SWT 20 ms
		12.027352000 GHz

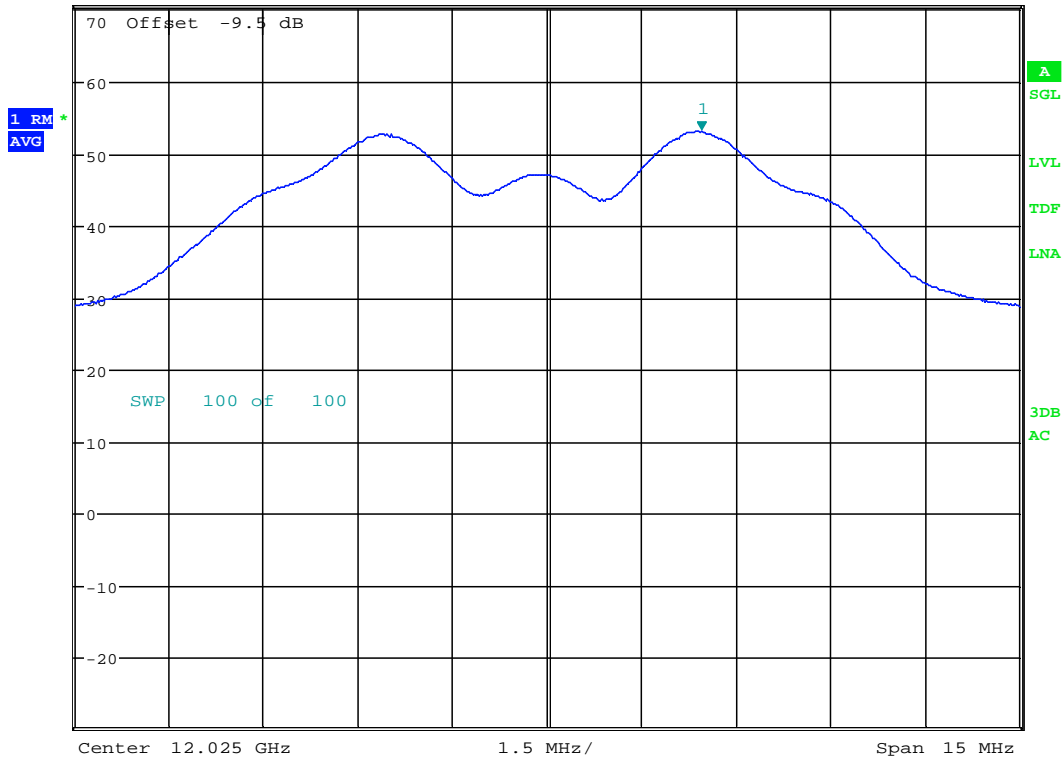


Date: 8.JAN.2014 12:49:14

5th harmonic , ch2405MHz – HP, PK detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1
 12.02746 GHz
 Ref 70.5 dBµV/m *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 10 MHz 53.17 dBµV/m
 SWT 20 ms 12.027460000 GHz

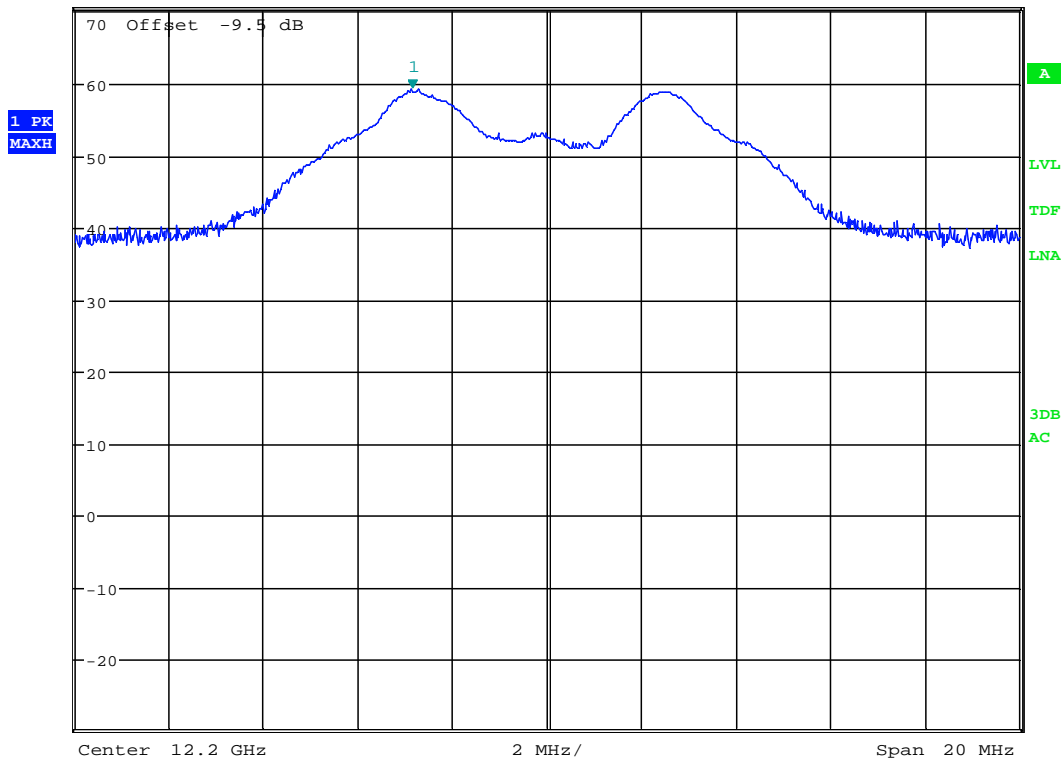


Date: 8.JAN.2014 12:51:20

5th harmonic , ch2405MHz – HP, AV detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1	* RBW 1 MHz	Marker 1 [T1]
12.197136 GHz	VBW 3 MHz	59.27 dBµV/m
Ref 70.5 dBµV/m	* Att 10 dB	12.197136000 GHz
	SWT 20 ms	

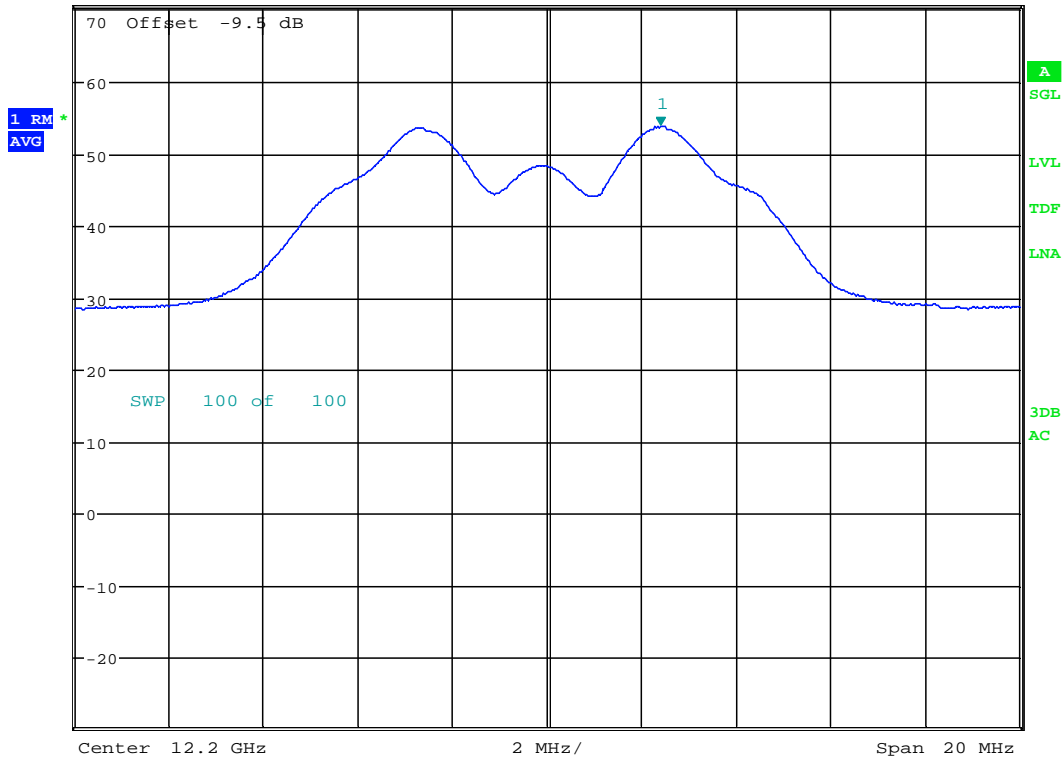


Date: 8.JAN.2014 13:02:50

5th harmonic , ch2440MHz – HP, PK detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1	* RBW 1 MHz	Marker 1 [T1]
12.202416 GHz	VBW 10 MHz	53.78 dBµV/m
Ref 70.5 dBµV/m	* Att 10 dB	SWT 20 ms
		12.202416000 GHz

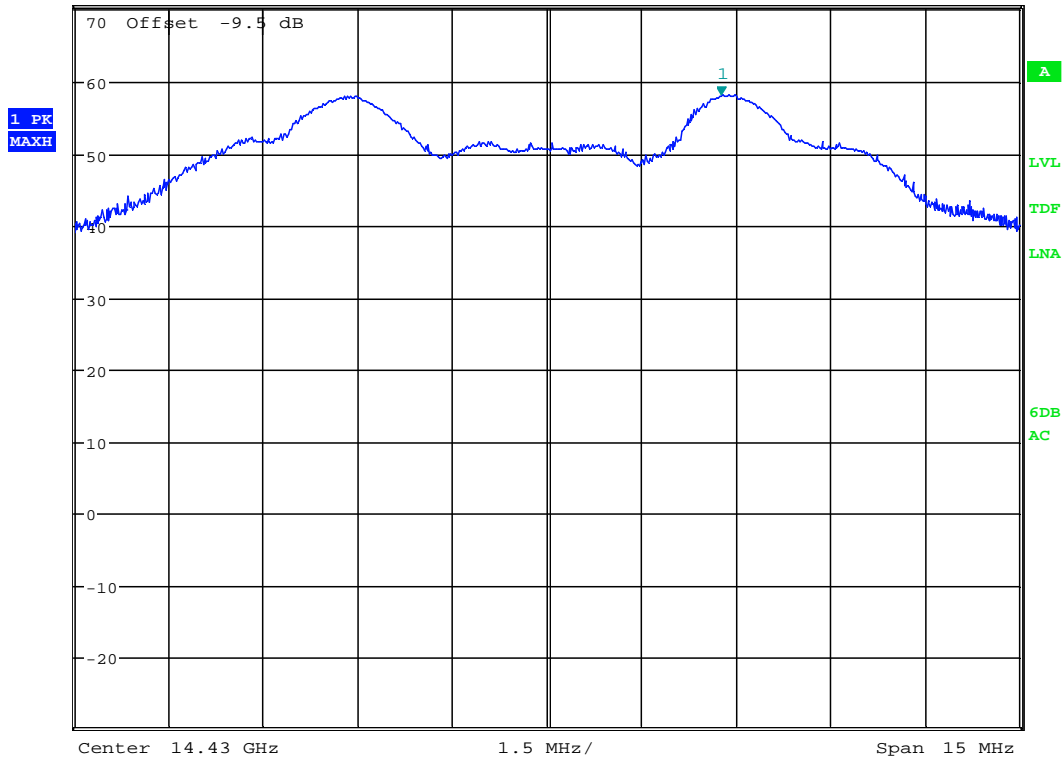


Date: 8.JAN.2014 13:03:43

5th harmonic , ch2440MHz – HP, AV detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1
 14.432772 GHz
 Ref 70.5 dBµV/m *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 58.09 dBµV/m
 SWT 20 ms 14.432772000 GHz

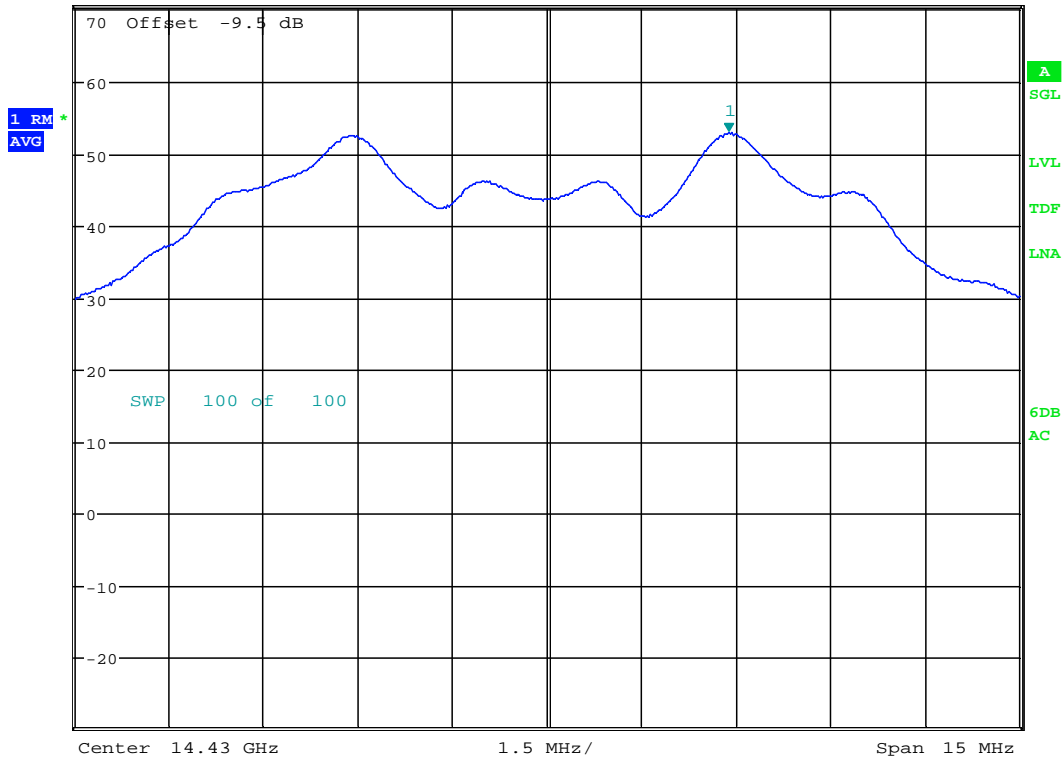


Date: 8.JAN.2014 12:53:07

6th harmonic , ch2405MHz – HP, PK detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1
 14.43288 GHz
 Ref 70.5 dBµV/m *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 10 MHz 53.00 dBµV/m
 SWT 20 ms 14.432880000 GHz

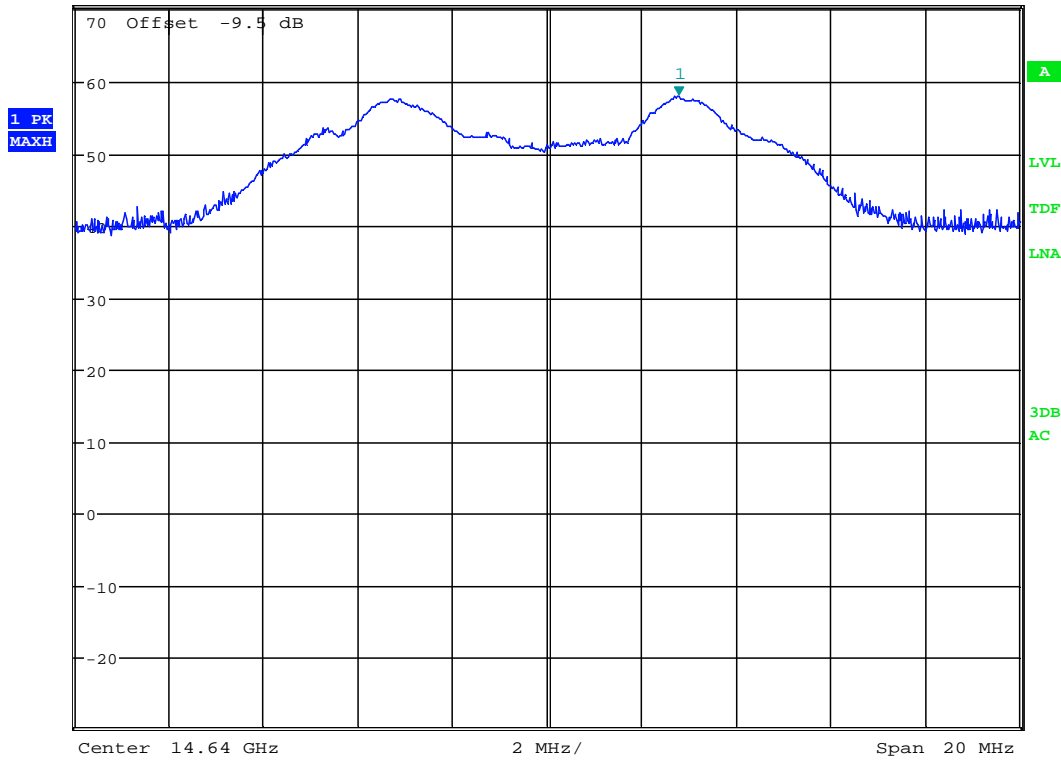


Date: 8.JAN.2014 12:54:01

6th harmonic , ch2405MHz – HP, AV detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1
 14.642784 GHz
 Ref 70.5 dBµV/m *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 57.91 dBµV/m
 SWT 20 ms 14.642784000 GHz

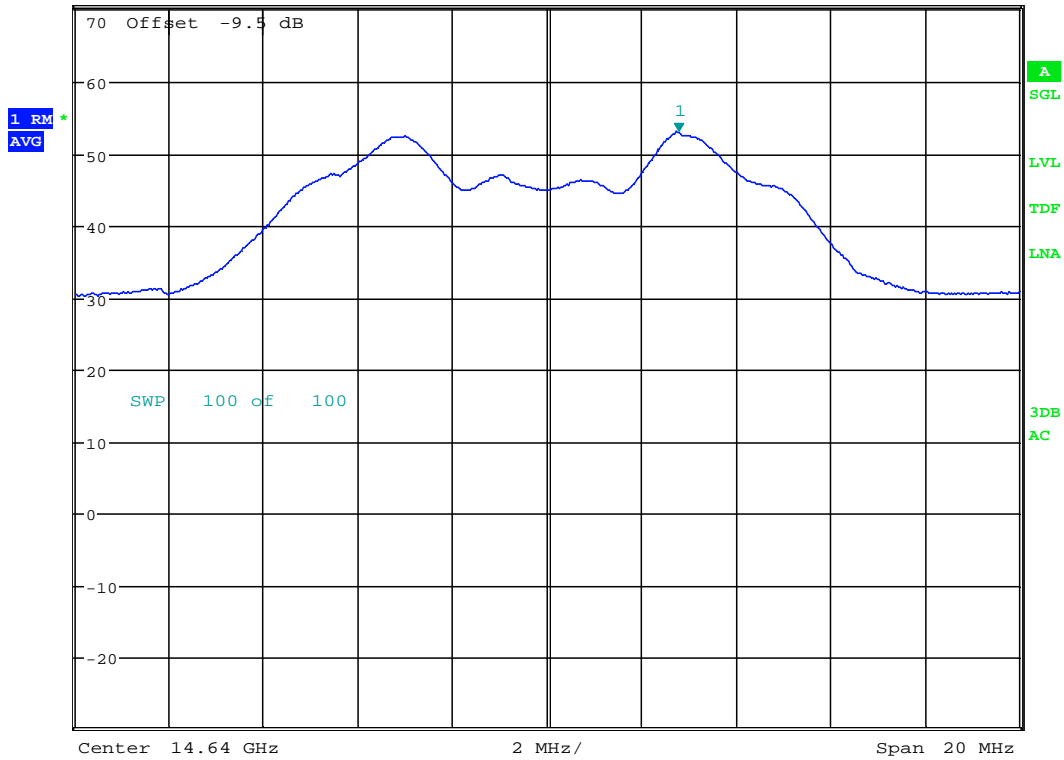


Date: 8.JAN.2014 13:05:28

6th harmonic , ch2440MHz – HP, PK detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1
 14.6428 GHz
 Ref 70.5 dBµV/m *Att 10 dB
 *RBW 1 MHz Marker 1 [T1]
 VBW 10 MHz 53.04 dBµV/m
 SWT 20 ms 14.64280000 GHz

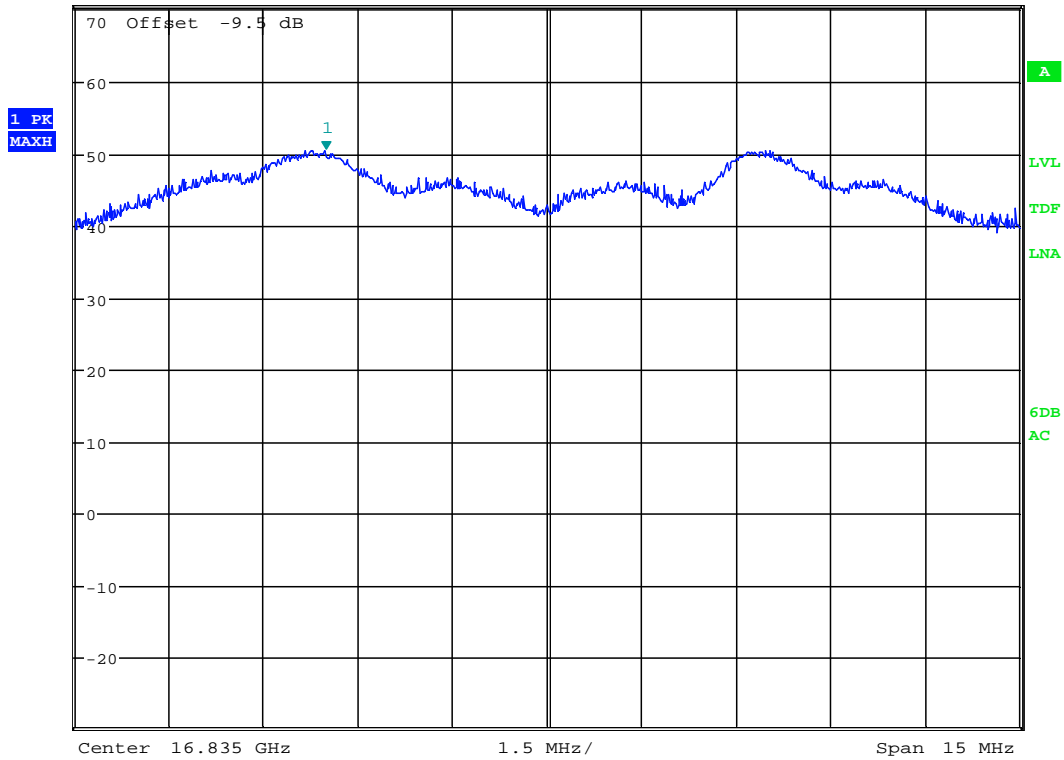


Date: 8.JAN.2014 13:04:19

6th harmonic , ch2440MHz – HP, AV detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1	* RBW 1 MHz	Marker 1 [T1]
16.831484 GHz	VBW 3 MHz	50.54 dBµV/m
Ref 70.5 dBµV/m	SWT 20 ms	16.831484000 GHz
* Att 10 dB		

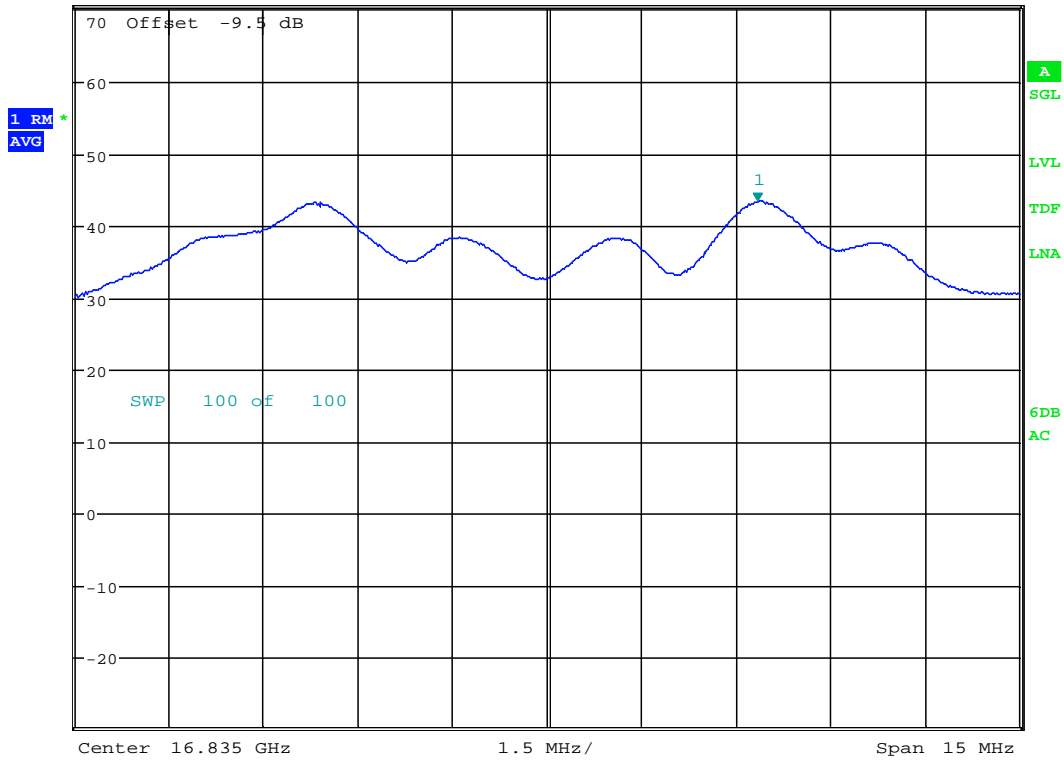


Date: 8.JAN.2014 12:55:29

7th harmonic , ch2405MHz – HP, PK detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



*RBW 1 MHz Marker 1 [T1]
 VBW 10 MHz 43.22 dBµV/m
 Ref 70.5 dBµV/m *Att 10 dB SWT 20 ms 16.838348000 GHz

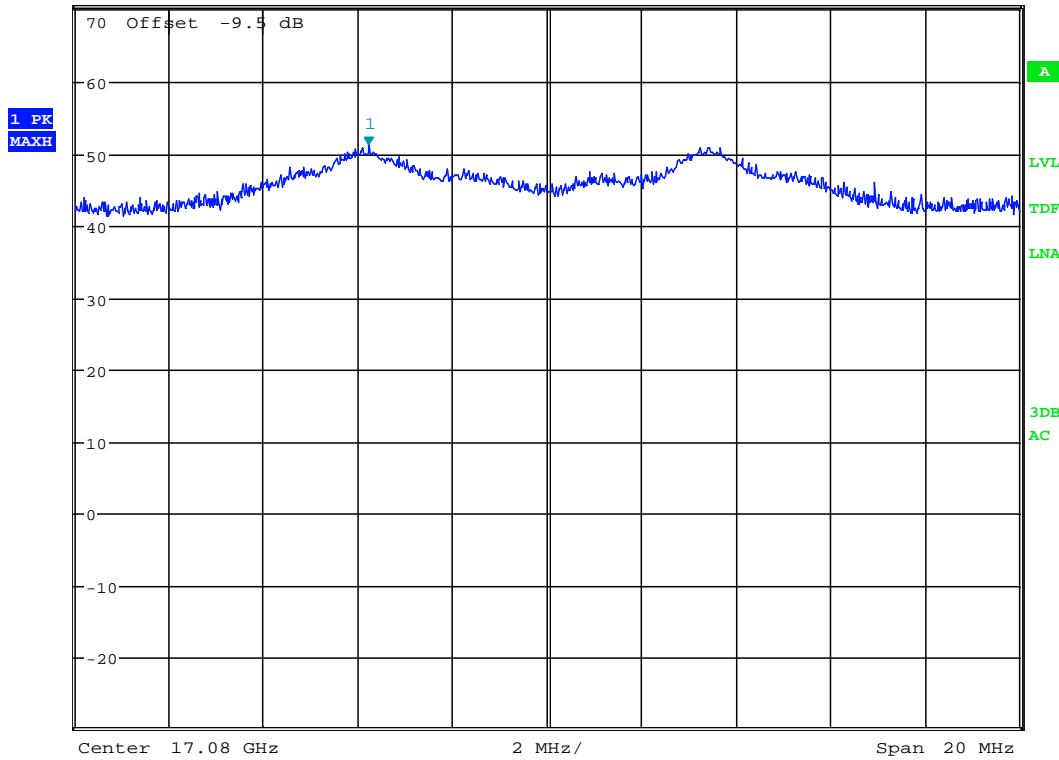


Date: 8.JAN.2014 12:56:12

7th harmonic , ch2405MHz – HP, AV detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1	* RBW 1 MHz	Marker 1 [T1]
17.076224 GHz	VBW 3 MHz	51.00 dBµV/m
Ref 70.5 dBµV/m	SWT 20 ms	17.076224000 GHz
* Att 10 dB		

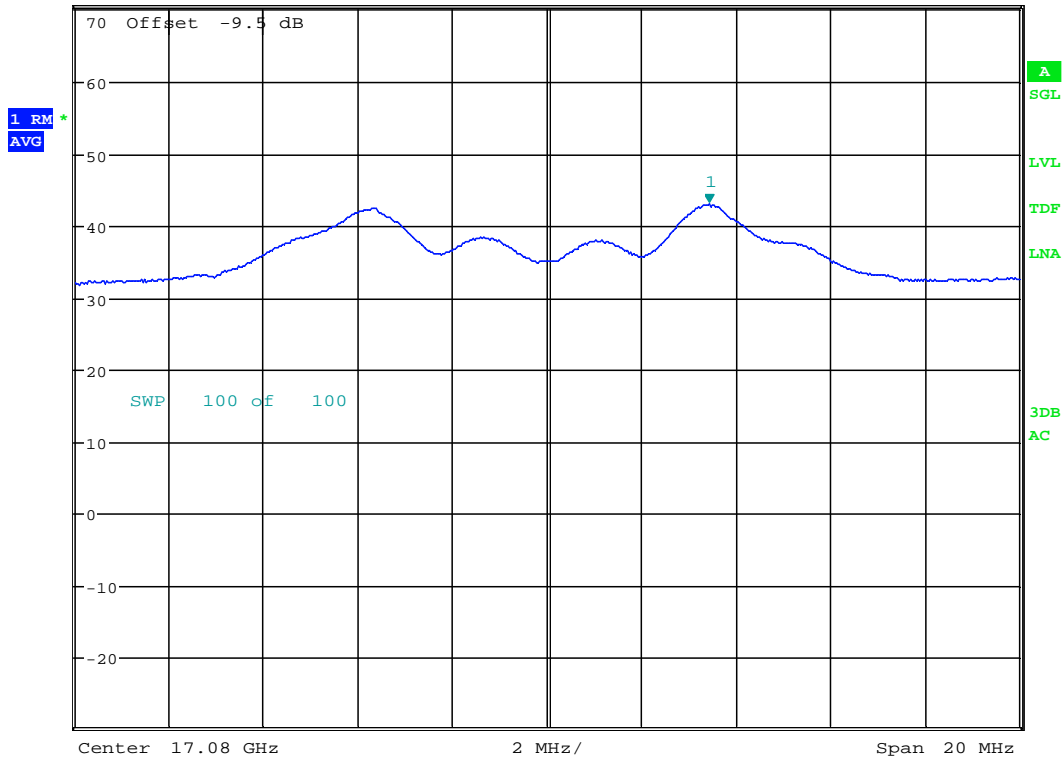


Date: 8.JAN.2014 13:05:12

7th harmonic , ch2440MHz – HP, PK detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1
 17.083424 GHz
 Ref 70.5 dBµV/m *Att 10 dB
 *RBW 1 MHz Marker 1 [T1]
 VBW 10 MHz 43.00 dBµV/m
 SWT 20 ms 17.083424000 GHz

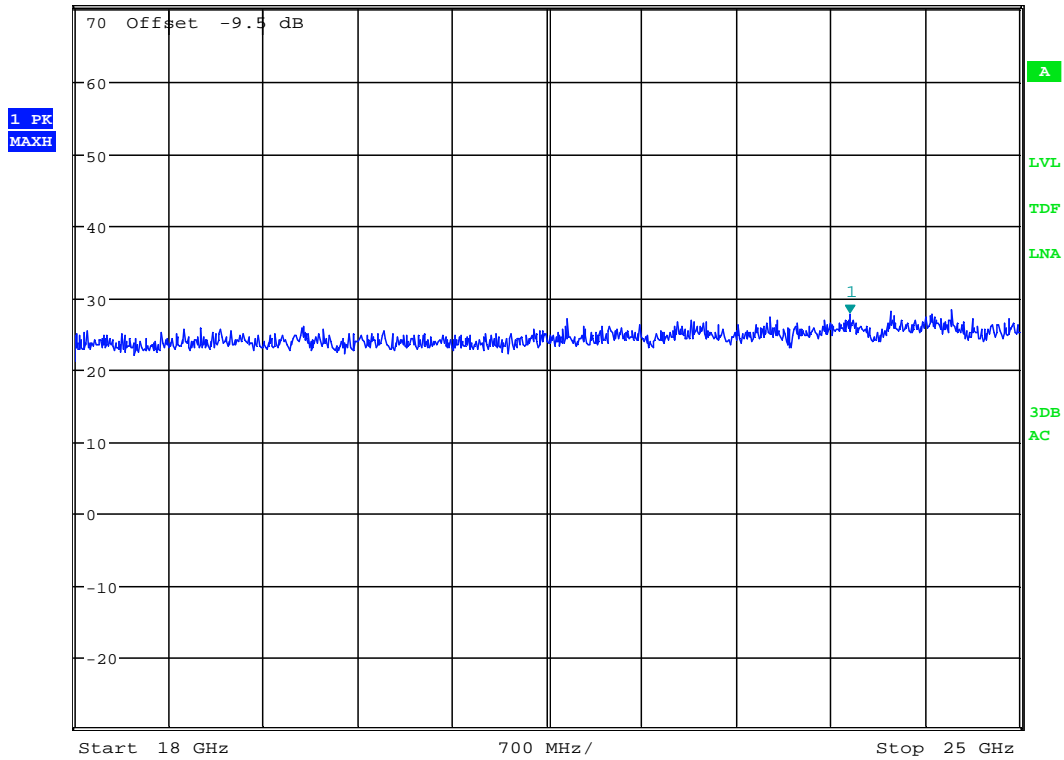


Date: 8.JAN.2014 13:04:44

7th harmonic , ch2440MHz – HP, AV detector, @ 1m distance, Distance Correction factor of -9.5 dB is included in the graph.



MARKER 1
 23.74 GHz
 Ref 70.5 dB μ V/m * Att 10 dB
 * RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 27.75 dB μ V/m
 SWT 45 ms 23.74000000 GHz

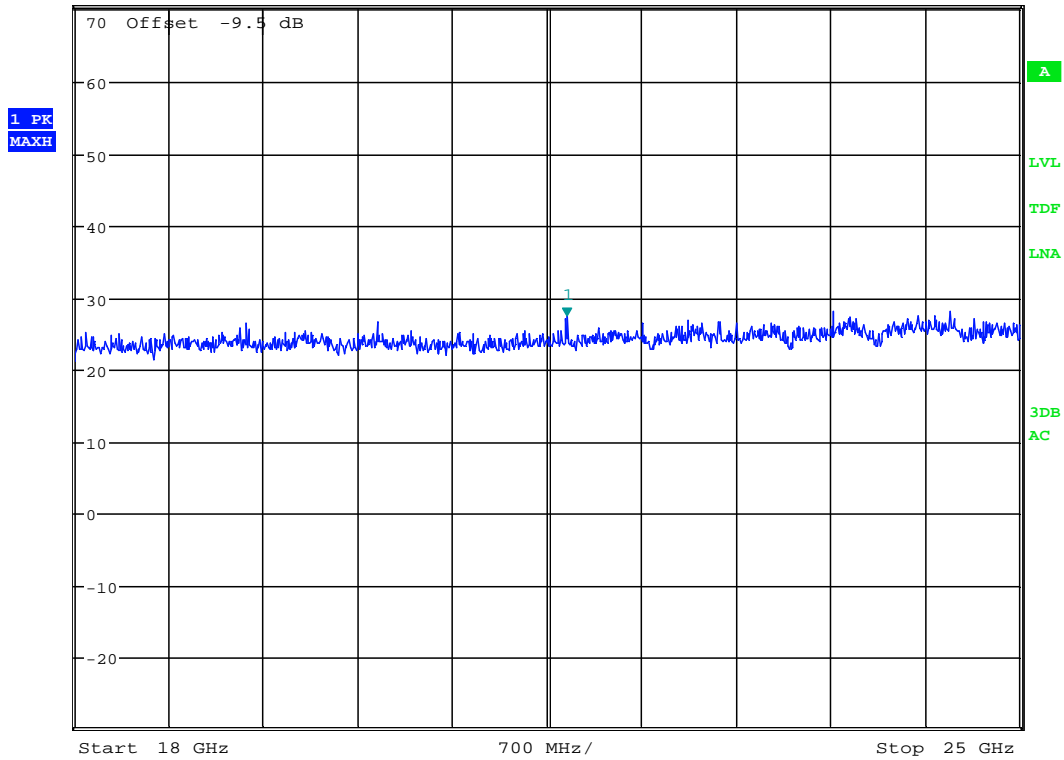


Date: 8.JAN.2014 13:38:30

Radiated Emissions ch. 2405 MHz, 18 – 25 GHz, VP, Pre-scan with Peak detector, Distance Correction factor -9.5dB is included in the graph.



* RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 27.40 dBµV/m
 Ref 70.5 dBµV/m * Att 10 dB SWT 45 ms 21.651200000 GHz
 Offset -9.5 dB



Date: 8.JAN.2014 13:39:34

Radiated Emissions ch. 2405 MHz, 18 – 25 GHz, HP, Pre-scan with Peak detector, Distance Correction factor -9.5dB is included in the graph.

3.6 Power Spectral Density (PSD)

Para. No.: 15.247 (e)

Test Performed By: G.Suhanthakumar	Date of Test: 09 Jan 2014
------------------------------------	---------------------------

Test Results: Complies

Measured and Calculated Data:

	calculated peak PSD dBm
Power Spectral Density @2405 MHz	3.2
Power Spectral Density @2440 MHz	4.2
Power Spectral Density @2480 MHz	-14.5

Tested according to KDB 558074 D01 DTS Meas Guidance v03r01, Section 10.2.

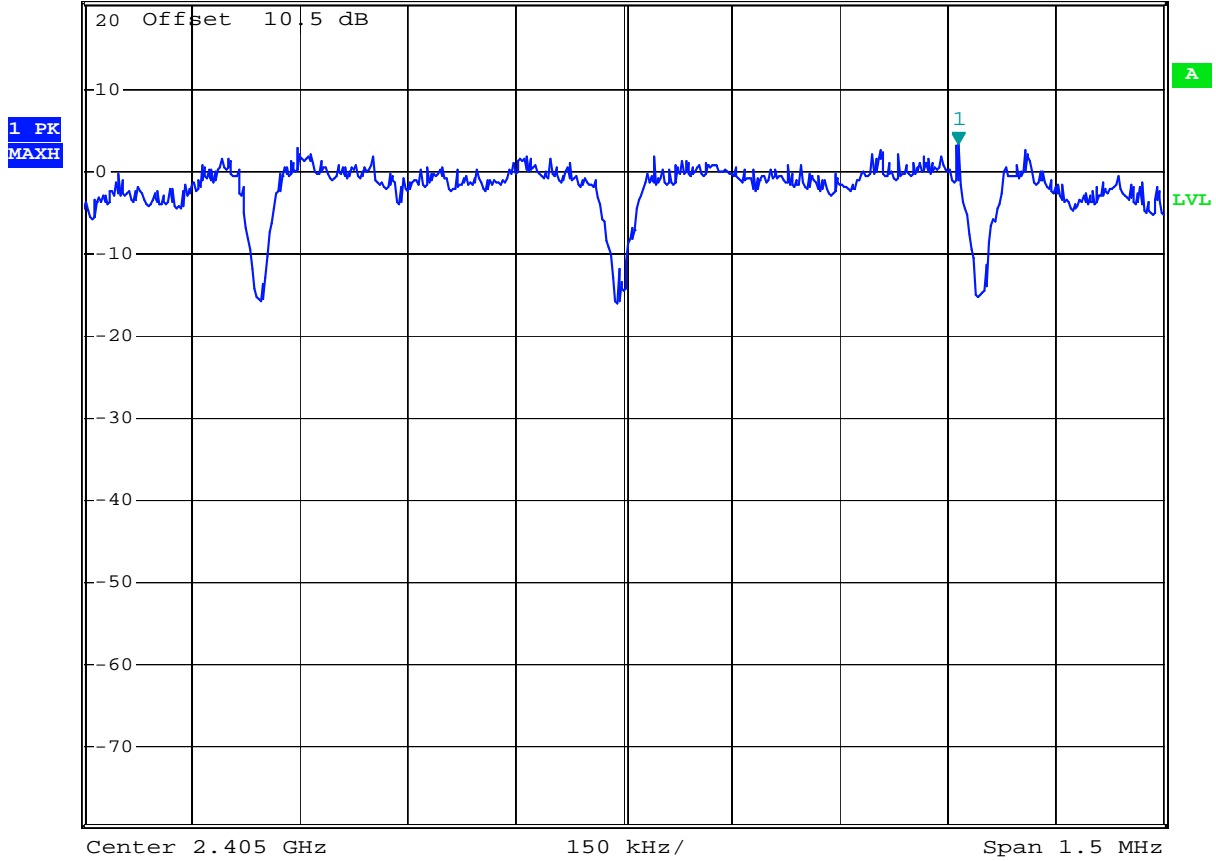
Requirements:

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



MARKER 1
 2.405465 GHz

*RBW 3 kHz Marker 1 [T1]
 VBW 10 kHz 3.18 dBm
 Ref 20.5 dBm *Att 20 dB SWT 170 ms 2.405465000 GHz



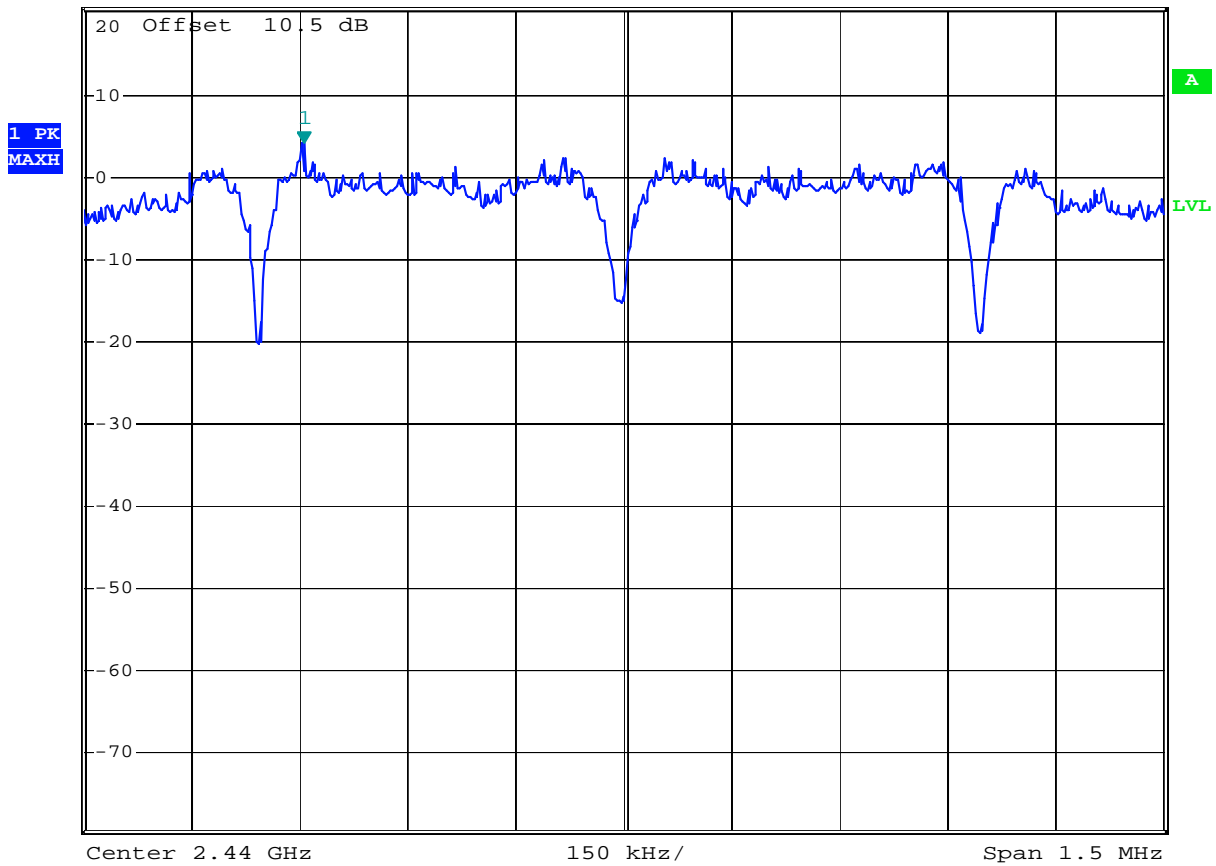
Date: 9.JAN.2014 13:38:10

PSD Measurement - 2405MHz



MARKER 1
 2.439556 GHz
 Ref 20.5 dBm *Att 20 dB

*RBW 3 kHz Marker 1 [T1]
 VBW 10 kHz 4.18 dBm
 SWT 170 ms 2.439556000 GHz



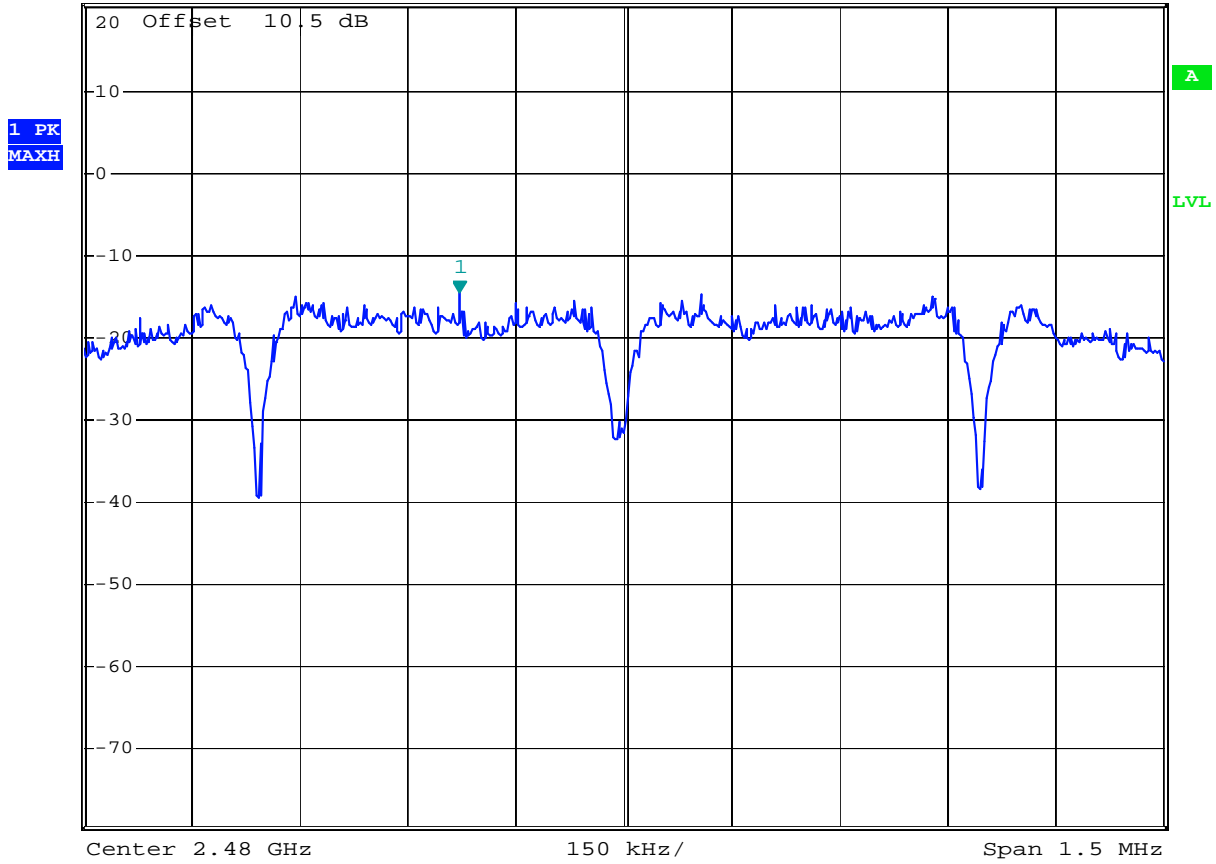
Date: 9.JAN.2014 13:35:22

PSD Measurement – 2440MHz



MARKER 1
 2.479772 GHz
 Ref 20.5 dBm *Att 20 dB

*RBW 3 kHz Marker 1 [T1]
 VBW 10 kHz -14.50 dBm
 SWT 170 ms 2.479772000 GHz



Date: 9.JAN.2014 13:37:16

PSD Measurement - 2480MHz

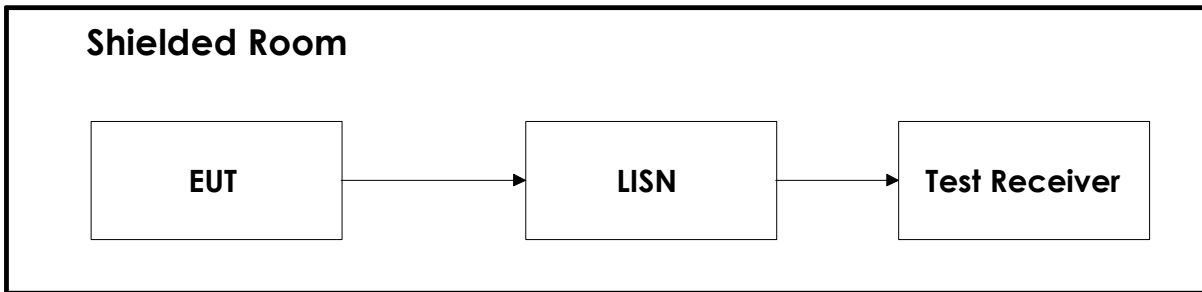
4 LIST OF TEST EQUIPMENT

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	FSU26	Spectrum Analyzer	Rohde & Schwarz	LR 1504	2013.11	2015.11
2	ESU40	EMI Receiver	Rohde & Schwarz	LR1639	2013.09.24	2014.09.24
3	3115	Antenna horn	EMCO	LR 1330	2010.08.05	2015.08.05
4	643	Antenna horn	Narda	LR 093	2009.01.26	2014.01.26
5	642	Antenna horn	Narda	LR 220	2009.01.26	2014.01.26
6	PM7320X	Antenna horn	Siverts lab	LR 103	2009.01.26	2014.01.26
7	DBF-520-20	Antenna horn	Systron Donner	LR 101	2009.01.26	2014.01.26
8	638	Antenna horn	Narda	LR 098	2010.06.17	2015.06.17
9	JB3	BiLog Antenna	Sunol Sciences	N-4525	2011.09.07	2014.09.07
10	8449B	Pre-amplifier	Hewlett Packard	LR 1322	2013.09.27	2014.09.27
11	LNA6900	Pre-amplifier	Teseq	LR 1593	2013.11	2014.11
14	80S	Signal Generator	Powertron	LT 502	Cal b4 use	
15	Model 87 V	Multimeter	Fluke	LR 1598	2012-12-14	2014-12-14
17	6810.17A	10 attenuator	Suhner	LR 1143	2012.09.15	2014.09.15
18	FA210A1010003030	Microwave cable	Rosenberger	LR1566	Cal b4 use	
19	6HC 3000-18000	HP Filter	Trithlic	LR1614	Cal b4 use	
20	6HC 2500-18000	HP Filter	Trithlic	LR1615	Cal b4 use	
21	FSW	Spectrum Analyzer	Rohde & Schwarz	LR1640	2012.06	2014.06

5 BLOCK DIAGRAM

5.1 Power Line Conducted Emission



5.2 Test Site Radiated Emission

