



Test report no. : 182243-3

Item tested : CC85XXEM

Type of equipment : 2.4GHz wireless audio transceiver

FCC ID : ZAT85XXEM

IC-ID: 451H-85XXEM

Client : Texas Instruments Norway AS

FCC Part 15.247

Digital Transmission System

RSS-210, Issue 8

Low Power Licence-Exempt
Radiocommunication Devices

2012-10-02

Authorized by :



Frode Sveinsen
Technical Verificator

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1 GENERAL INFORMATION

1.1 Testhouse Info

Name : Nemko AS
Address : Nemko Kjeller
Instituttveien 6, Box 96
NO-2027 Kjeller, NORWAY
Telephone : +47 64 84 57 00
Fax : +47 64 84 57 05
E-mail: comlab@nemko.com
FCC test firm : 994405
IC OATS : 2040D-1
Total Number of Pages: 39

1.2 Client Information

Name : Texas Instruments Norway AS
Address : Gaustadalléen 21,
NO-0349 Oslo, Norway
Telephone : +47 22 95 85 44
Fax : +47 22 95 85 46

Contact:

Name : Fredrik Kervel
Telephone : +47 22 95 83 62
E-mail : f.kervel@ti.com

1.3 Responsible Manufacturer (If other than client)

Name : /
Address : /

2 Test Information

2.1 Test Item

Name :	Texas Instruments
Model/version :	CC85XXEM
Serial number :	-
Hardware identity and/or version:	-
Software identity and/or version :	-
Frequency Range :	2406 – 2474 MHz
Type of Modulation :	Shaped 8GFSK (DSSS)
Data rate:	5000 kbit/s
User Frequency Adjustment :	None
Conducted Output Power :	0.004 Watt
Type of Power Supply :	Battery 9.0V DC
Antenna Connector :	SMA
Antenna type:	Whip antenna - Pulse W1010
Antenna Diversity Supported :	None

Theory of Operation

The CC85XXEM with Purepath Wireless Audio Evaluation Board is powered from a 9V battery (preferred choice) or USB. The CC85XXEM uses 4 out of 18 2MHz channels. The 4 channels used are based on what channels achieve the best RSSI performance in an initial scan of the band at start-up. A channel will be kept until influenced by interference at which time it will be exchanged with the 5th best channel from a receiver perspective to continue keeping optimum communication performance. This system is considered an adaptive frequency hopping system, i.e. a kind of frequency agile system.

Exposure Evaluation

Output power is below the low threshold, the EUT is therefore exempted from RF Exposure Evaluation.

2.2 Test Environment

2.2.1 Normal test condition

Temperature:	20 – 25 °C
Relative humidity:	30 – 45 %
Normal test voltage:	9.0 V DC

The radiated emissions tests were performed with the EUT powered from a test-jig with 9V primary batteries.

The values are the limit registered during the test period.

2.3 Test Period

Item received date:	2011-10-04
Test period :	from 2011-10-24 and 2012-02-07

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: Texas Instruments
Model No.: CC85XXEM

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

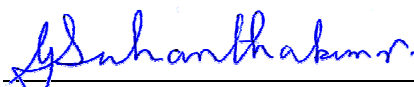
<input checked="" type="checkbox"/> New Submission	<input checked="" type="checkbox"/> Production Unit
<input type="checkbox"/> Class II Permissive Change	<input type="checkbox"/> Pre-production Unit
DTS Equipment Code	<input type="checkbox"/> Family Listing

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".



TEST REPORT #: 182243-3

TESTED BY: 
G. Suhanthakumar, Test engineer

DATE: 2012-02-22

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3.2 Test Summary

Name of test	FCC Part 15 reference	RSS-210 Issue 8 reference	Result
Antenna Requirement	15.203	7.1.4 (RSS-GEN)	Pass
Power Line Conducted Emission	15.107(a) 15.207(a)	7.2.2 (RSS-GEN)	N/A*
Minimum 6 dB Bandwidth	15.247(a)(2)	A8.2	Pass
Peak Power Output	15.247(b)	A8.4	Pass
Power Spectral Density	15.247(d)	A8.2	Pass
Spurious Emissions (Antenna Conducted)	15.247(c)	A8.5	Pass
Spurious Emissions (Radiated)	15.247(c) 15.109(a) 15.209(a)	A8.5	Pass
Receiver Emissions (Radiated)	N/A	2.3	Pass

*EUT is battery operated only.

3.3 Description of modification for Modification Filing

Not applicable.

3.4 Comments

All ports were populated during spurious emission measurements.

3.5 Family List Rational

Not Applicable.

3.6 Test Engineer(s)

G.Suwanthakumar / Thomas Dangle

4 TEST RESULTS

4.1 Minimum 6 dB Bandwidth

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

Test Performed By: G.Suwanthakumar

Date of Test: 24 Oct 2011

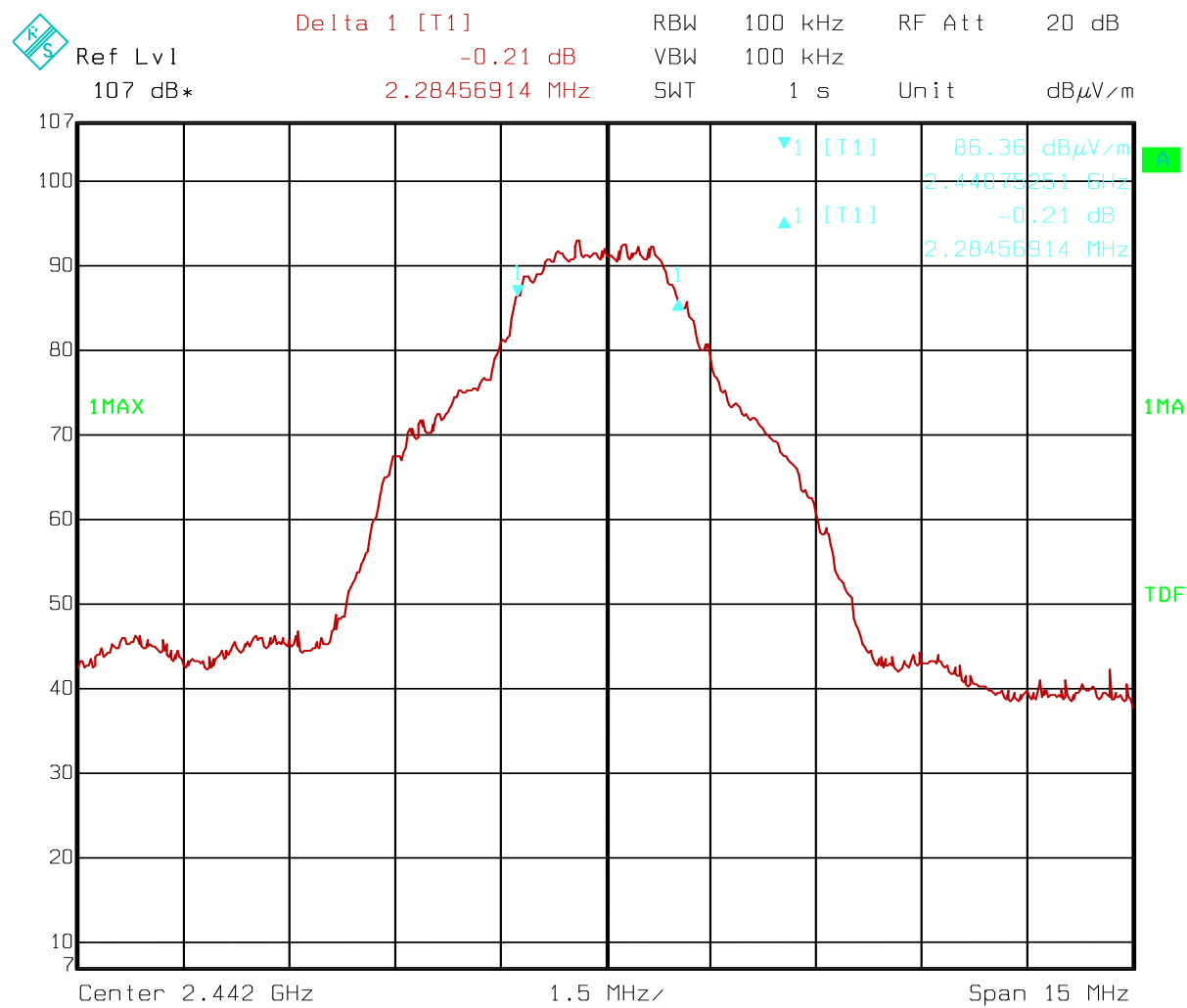
Test Results: Complies

Measurement Data:

Measured 6 dB Bandwidth (MHz)		
2406 MHz	2442 MHz	2474 MHz
2.24	2.28	2.19

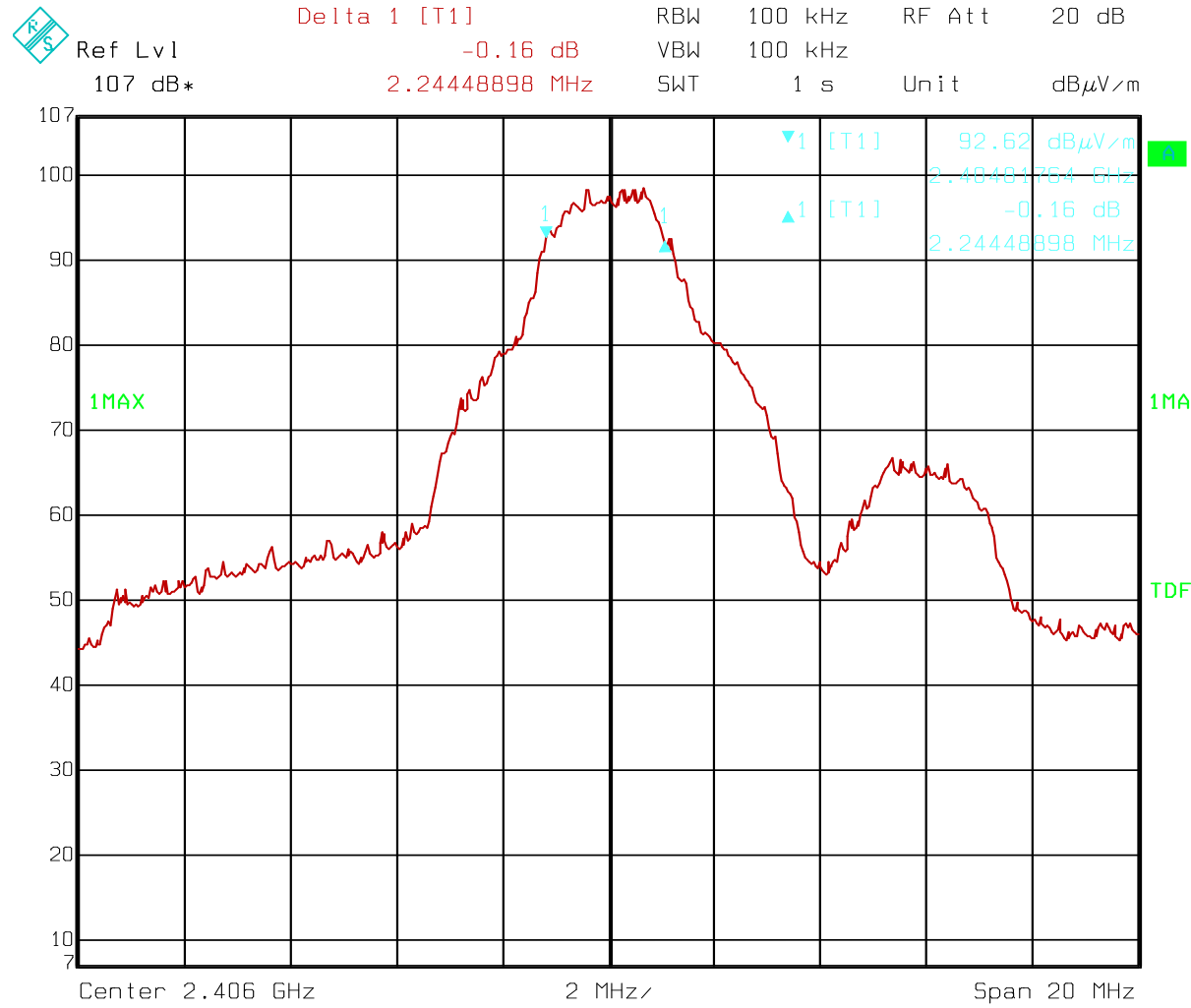
Requirements:

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



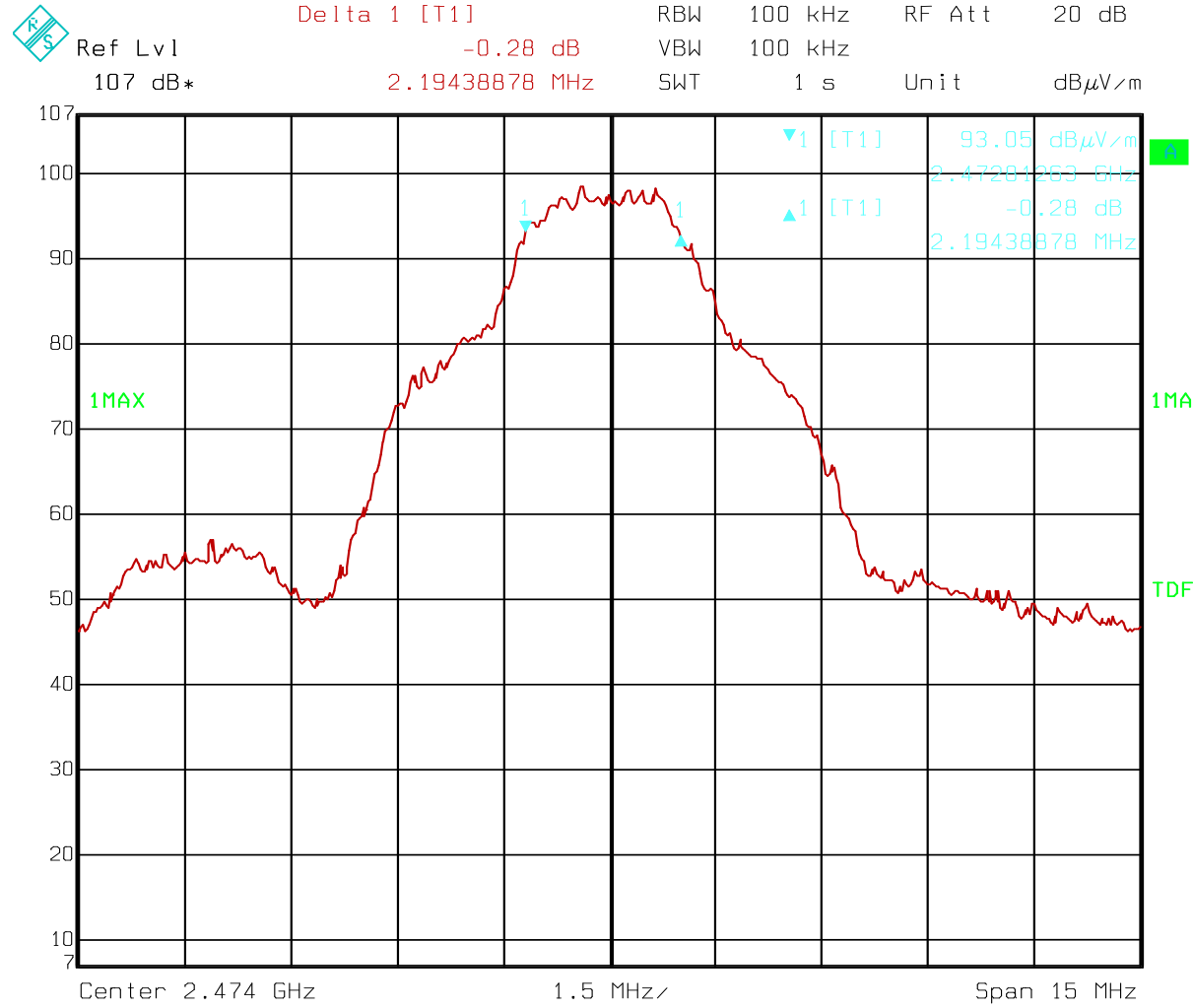
Date: 24.OCT.2011 14:31:10

6 dB Bandwidth at 2442 MHz



Date: 24.OCT.2011 14:03:51

6 dB Bandwidth at 2406 MHz



Date: 24.OCT.2011 14:39:51

6 dB Bandwidth at 2474 MHz

4.2 20 dB Bandwidth

Test Performed By: G.Suwanthakumar

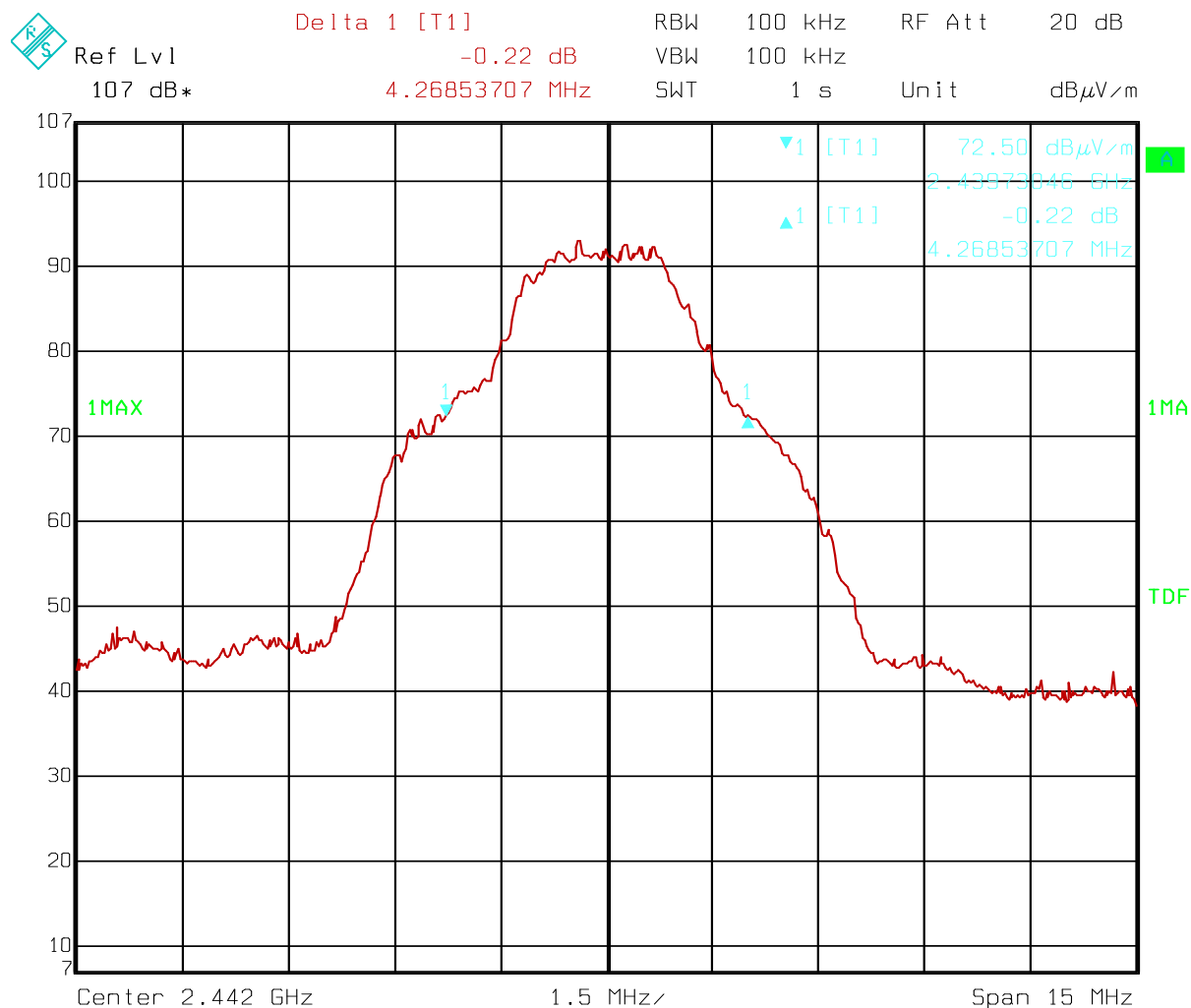
Date of Test: 24 Oct 2011

Measurement Data:

Measured 20 dB Bandwidth (MHz)
2442 MHz
4.27

Requirements:

No requirements. Reported for information only.



Date: 24.OCT.2011 14:31:53

20 dB Bandwidth at 2442 MHz

4.3 Peak Power Output

Para. No.: 15.247 (b)

Test Performed By: G.Suwanthakumar

Date of Test: 24 Oct 2011

Test Results: Complies

Measurement Data:

RF channel	2406 MHz	2442 MHz	2474 MHz
Conducted Power (dBm)	6.0	5.9	5.9
Conducted Power (Watt)	0.0040	0.0039	0.0039
Measured field strength (dB μ V/m)	102.2	96.4	101.8
Radiated Power EIRP (dBm)	6.1	6.7	7.0
Antenna Gain (dB)	0.1	0.8	1.1

Radiated Power is calculated from measured field strength by the formulas from "**KDB 412172 D01 Determining ERP and EIRP v01**".

See plots.

Detachable antenna?

☒ Yes ☐ No

If detachable, is the antenna connector non-standard?

☐ Yes ☒ No

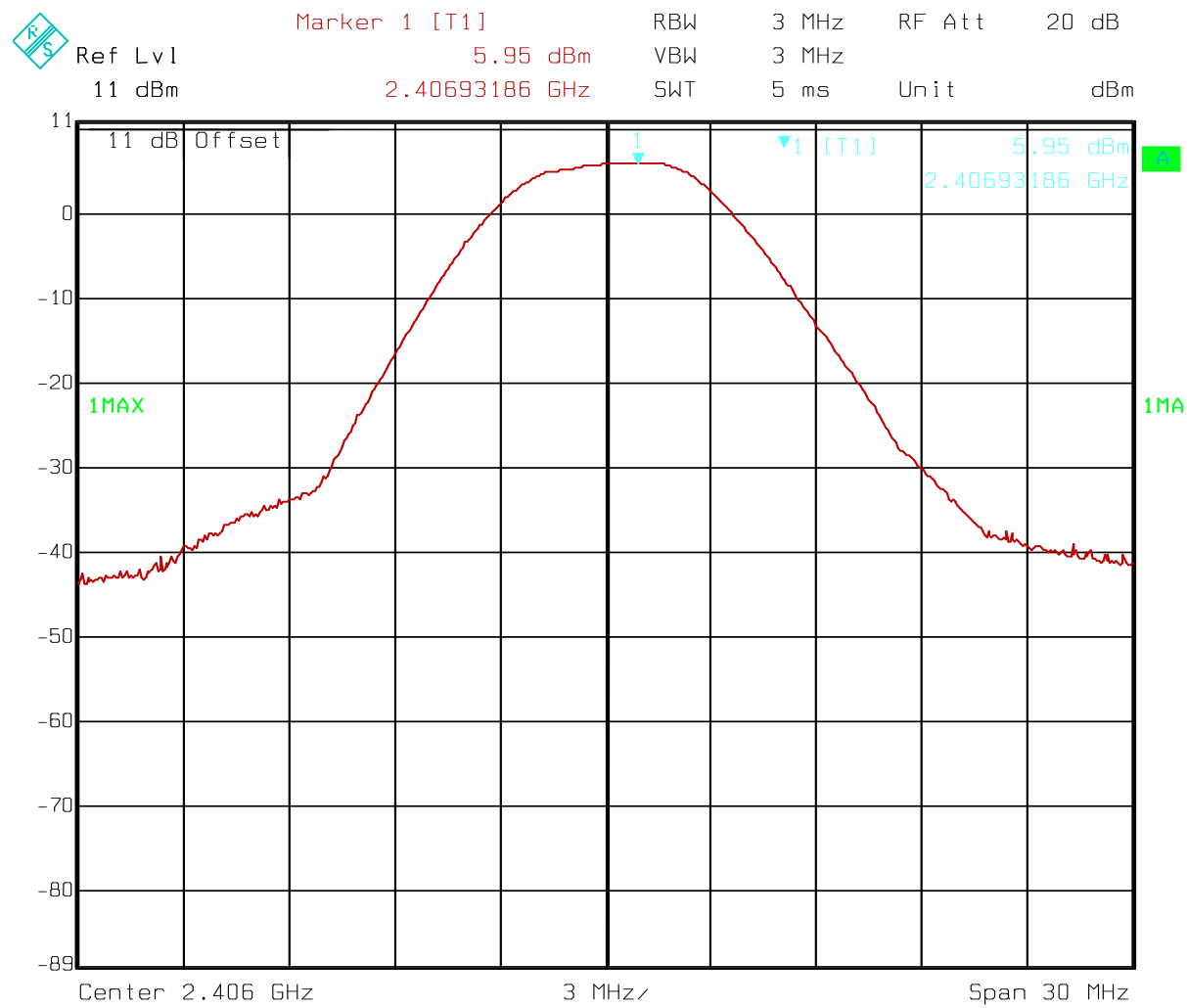
Type of antenna connector: SMA.

Requirements:

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

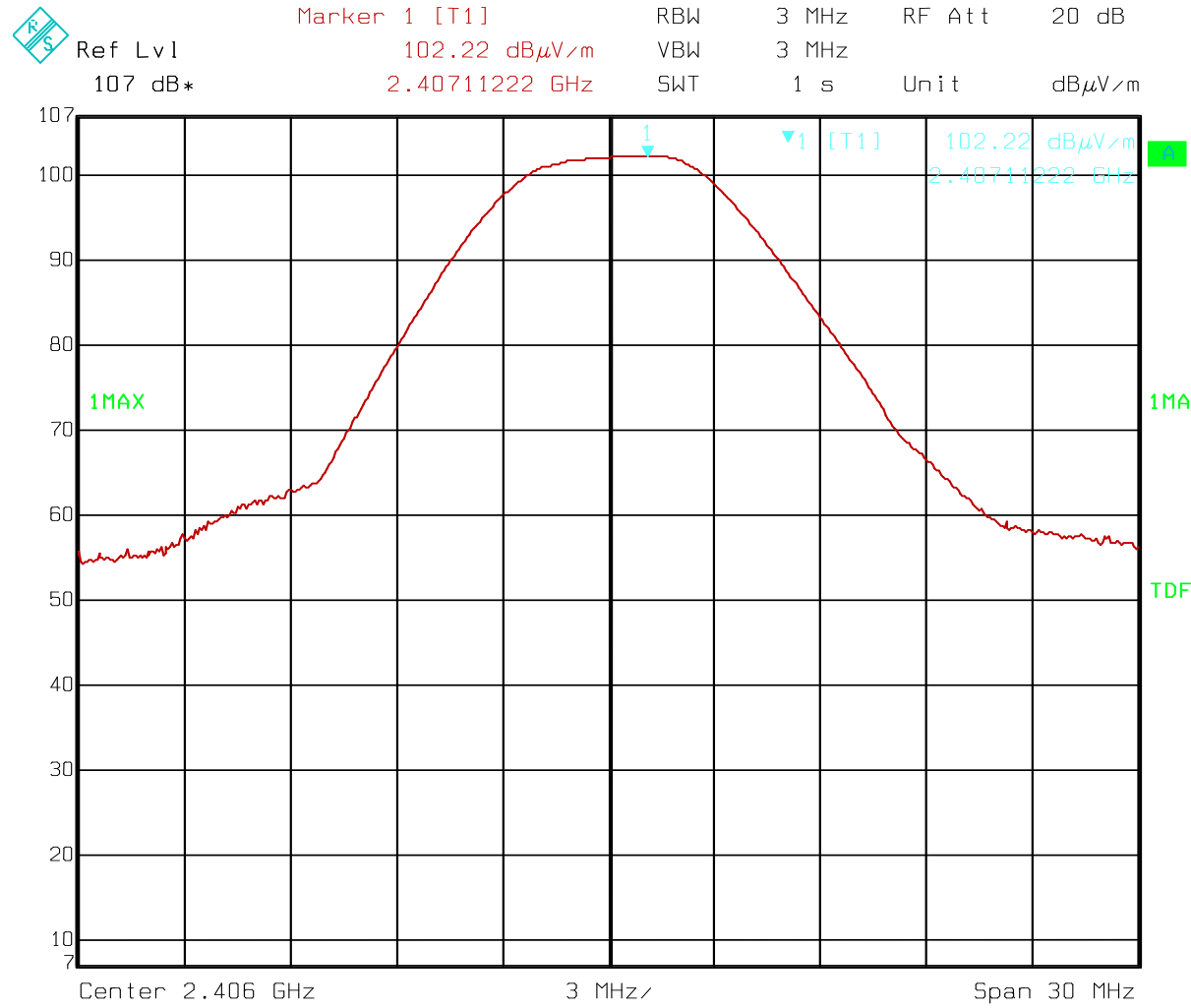
For Digital Transmission Systems in the 2400 - 2483.5 MHz band: 1 Watt

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.



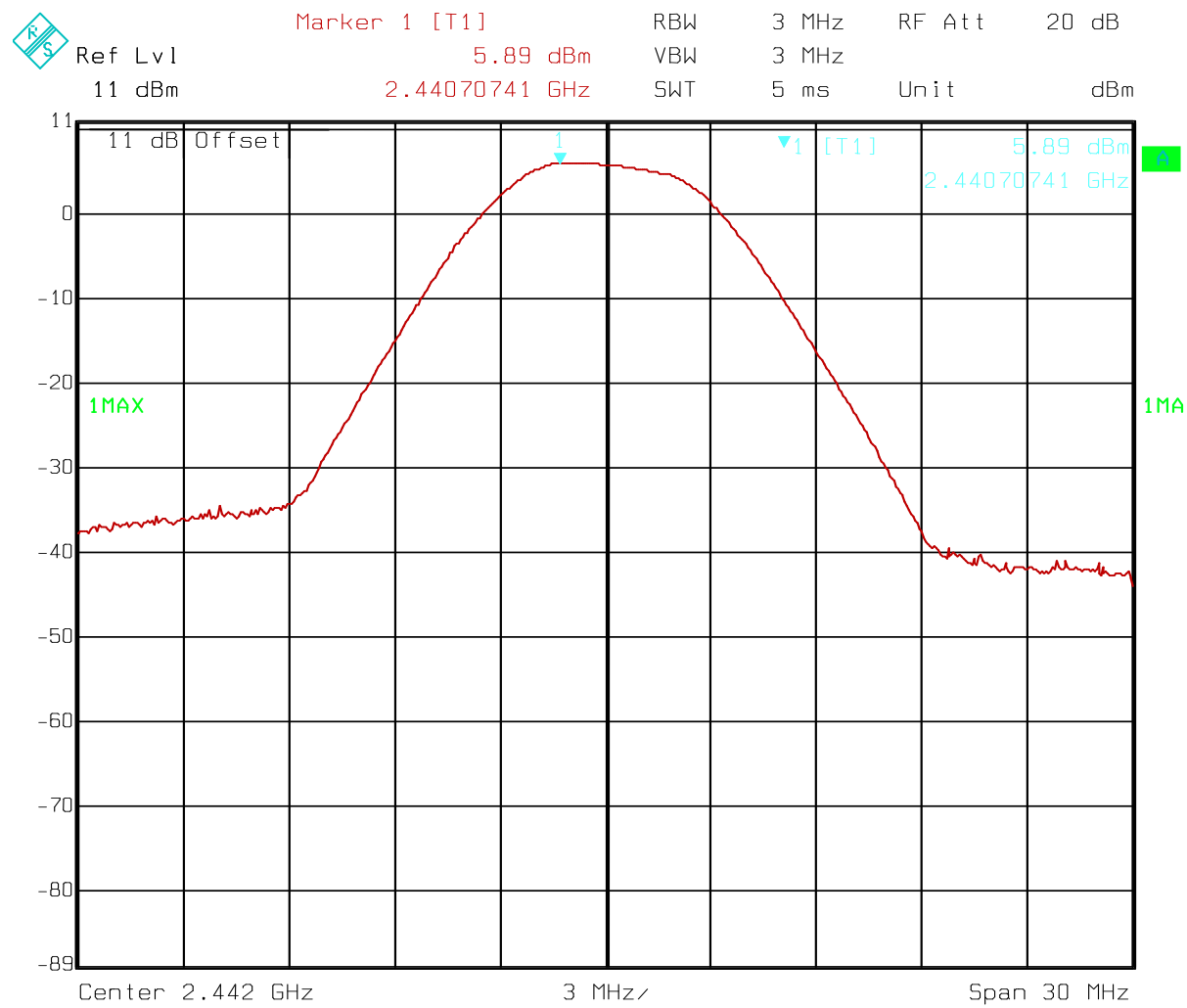
Date: 24.OCT.2011 15:33:41

Conducted Power, 2406 MHz



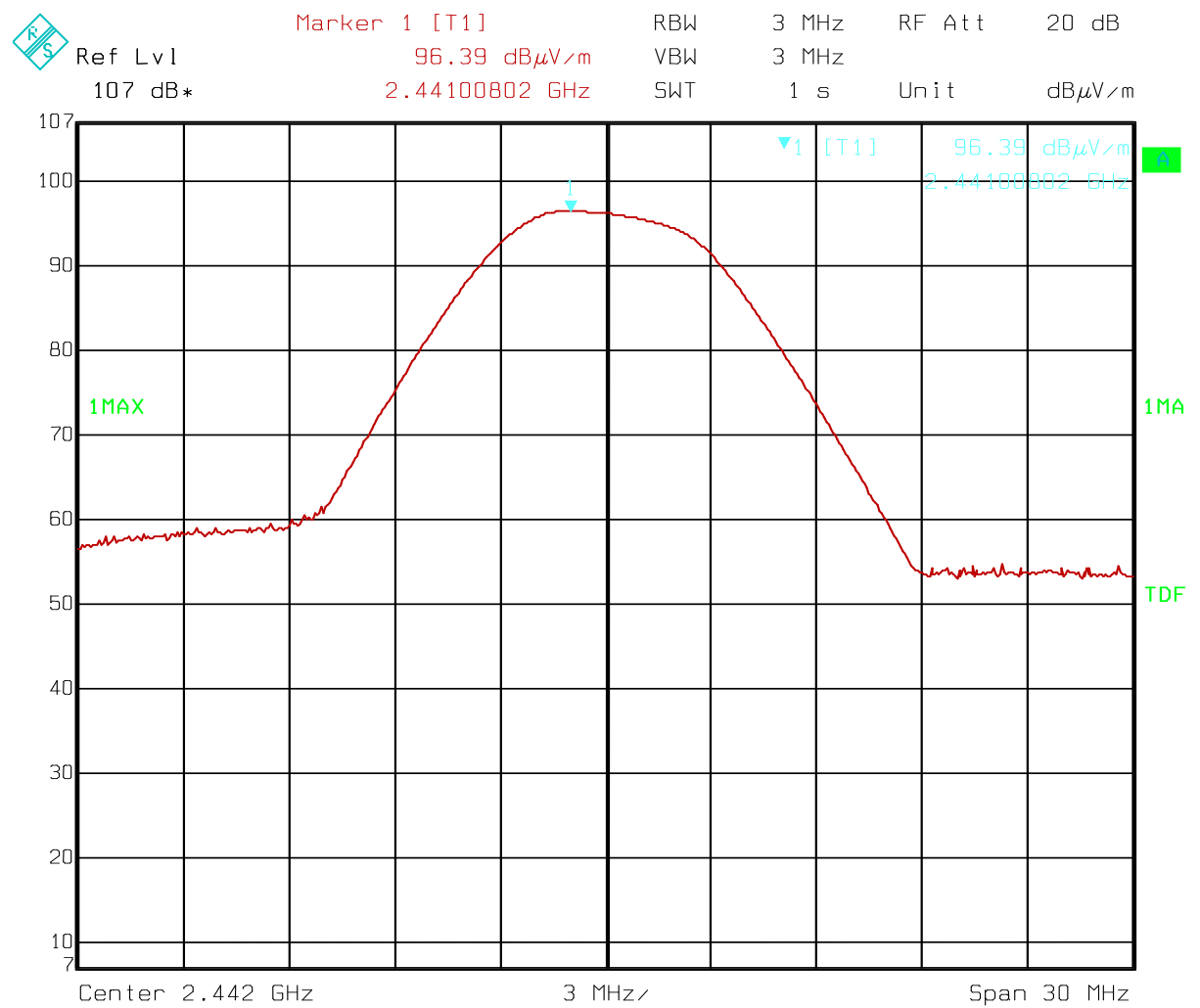
Date: 24.OCT.2011 14:01:50

Radiated Field strength, 2406 MHz



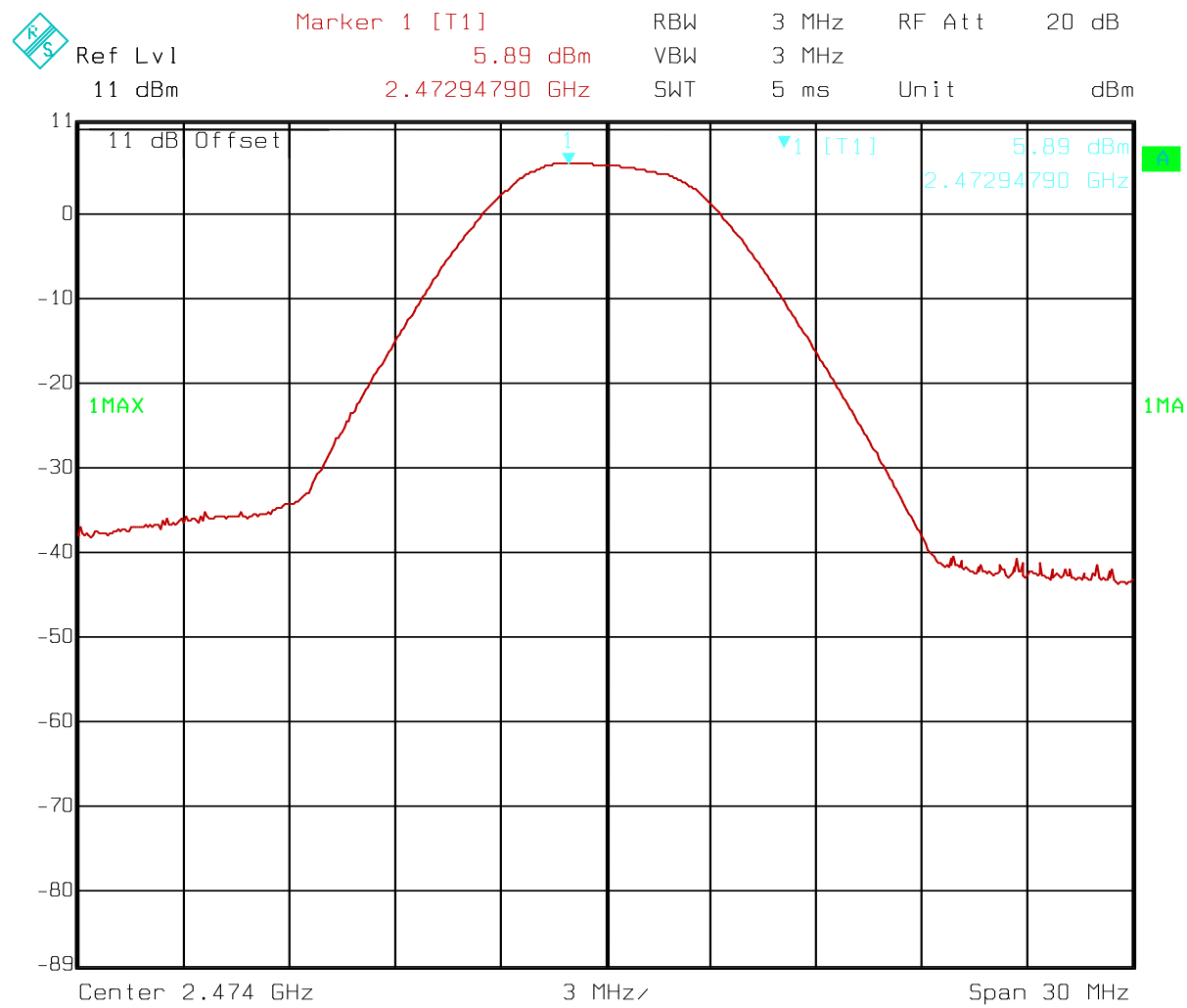
Date: 24.OCT.2011 15:43:58

Conducted Power, 2442 MHz



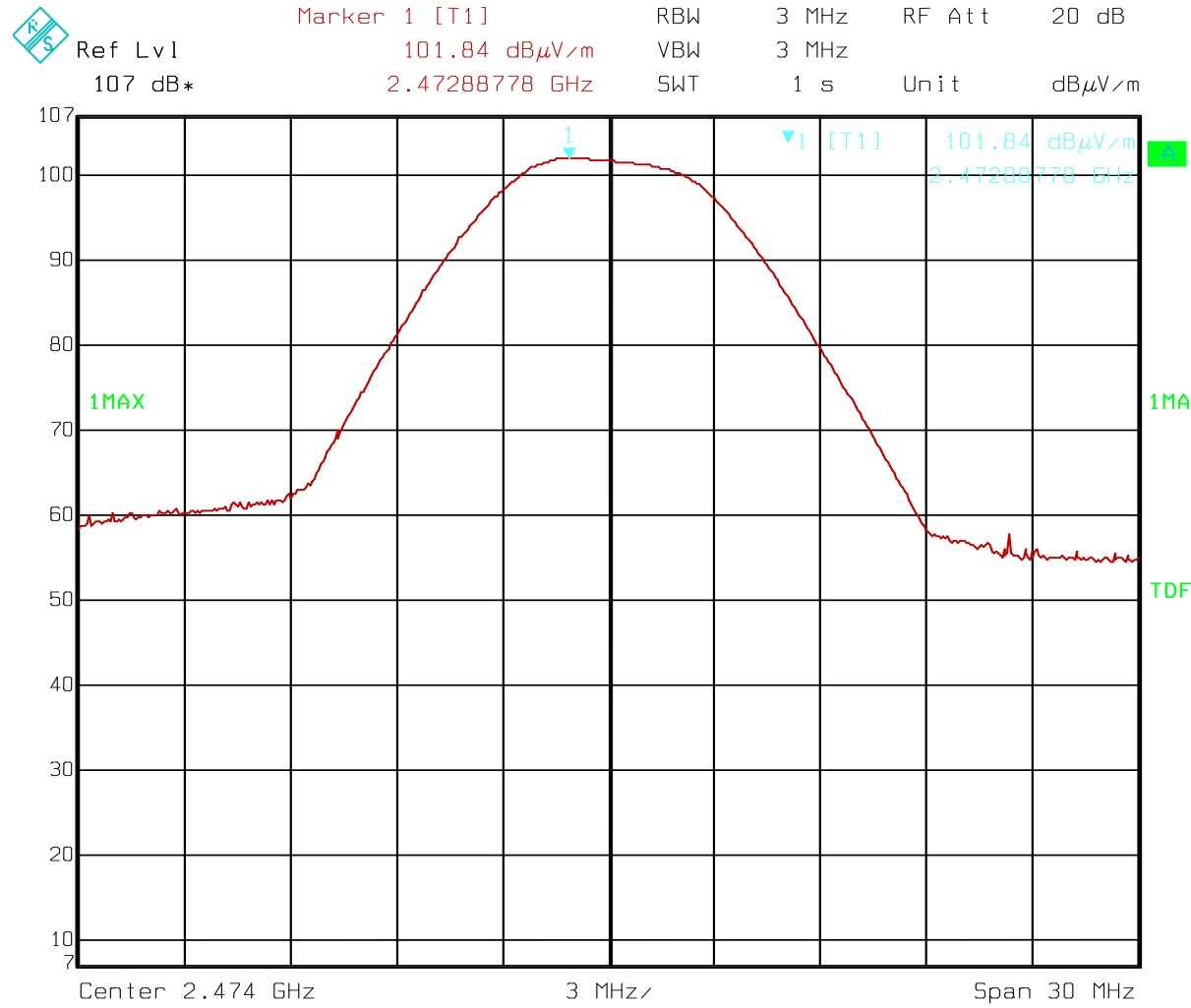
Date: 24.OCT.2011 14:29:51

Radiated Field strength, 2442 MHz



Date: 24.OCT.2011 15:44:40

Conducted Power, 2474 MHz



Date: 24.OCT.2011 14:38:55

Radiated Field strength, 2474 MHz

4.4 Spurious Emissions (Radiated)

Para. No.: 15.247 (c)

Test Performed By: G.Suinthakumar

Date of Test: 24 Oct 2011

Test Results: Complies

Measurement Data:

Band-edge, @3m

Frequency	Measured Field Strength @3m, dBμV/m	Detector	Limit dBμV/m	Margin dB
2.39 GHz	38.6	AV	54	15.4
	38.6	PK	74	35.4
2.4835 GHz	44.1	AV	54	9.9
	44.1	PK	74	29.9

See attached plots.

Marker Delta Calculation for Lower Band Edge:

Measured Max: 101.7 dBμV/m

Delta: 63.1 dB

Band Edge Field Strength, Peak: $101.7 - 63.1 \text{ dB}\mu\text{V/m} = 38.6 \text{ dB}\mu\text{V/m}$

Marker Delta Calculation for Upper Band Edge:

Measured Max: 101.7 dBμV/m

Delta: 57.6 dB

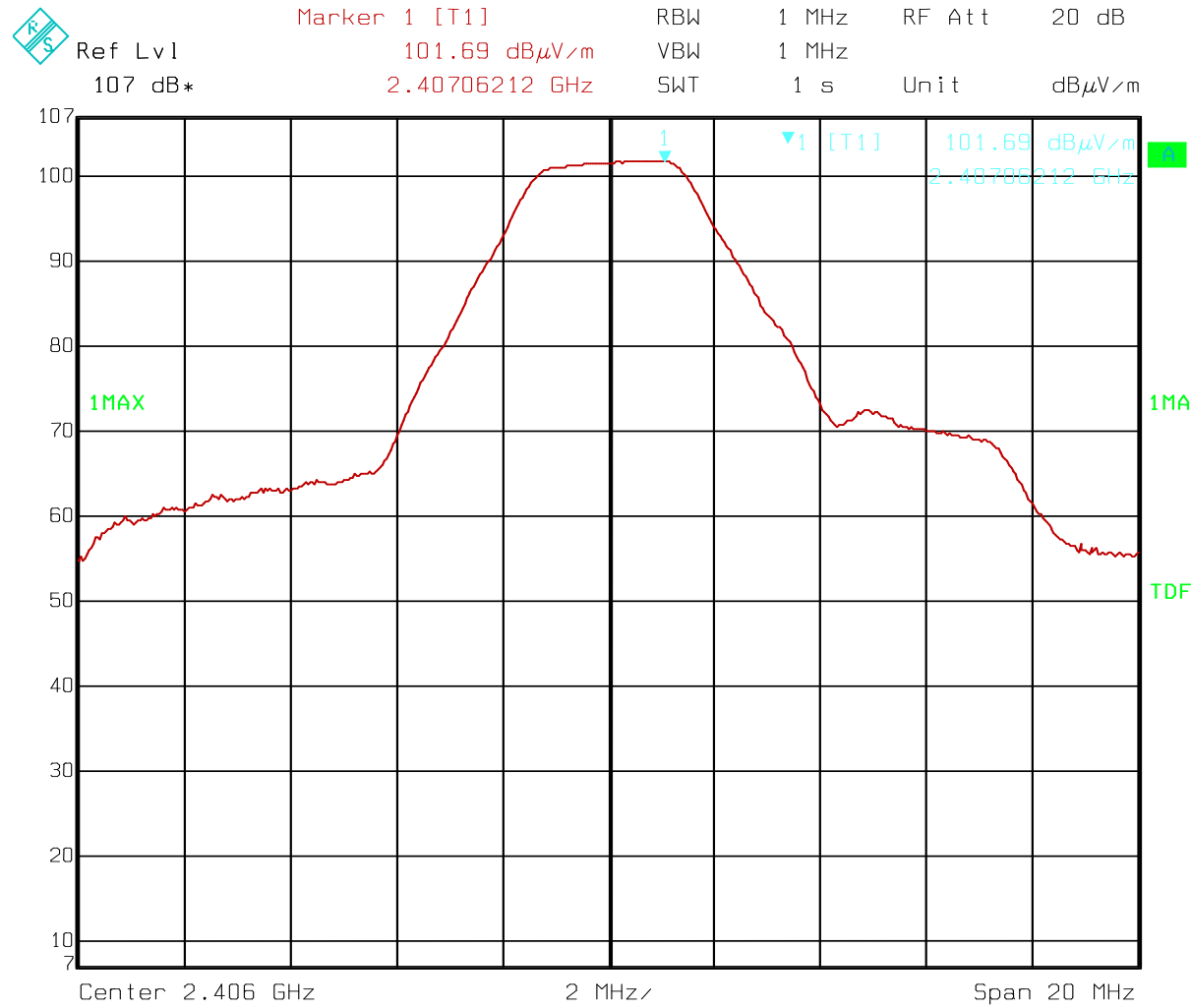
Band Edge Field Strength, Peak: $101.7 - 57.6 \text{ dB}\mu\text{V/m} = 44.1 \text{ dB}\mu\text{V/m}$

RF conducted power

Scan performed radiated with 100 kHz Bandwidth from 10kHz to 25 GHz.

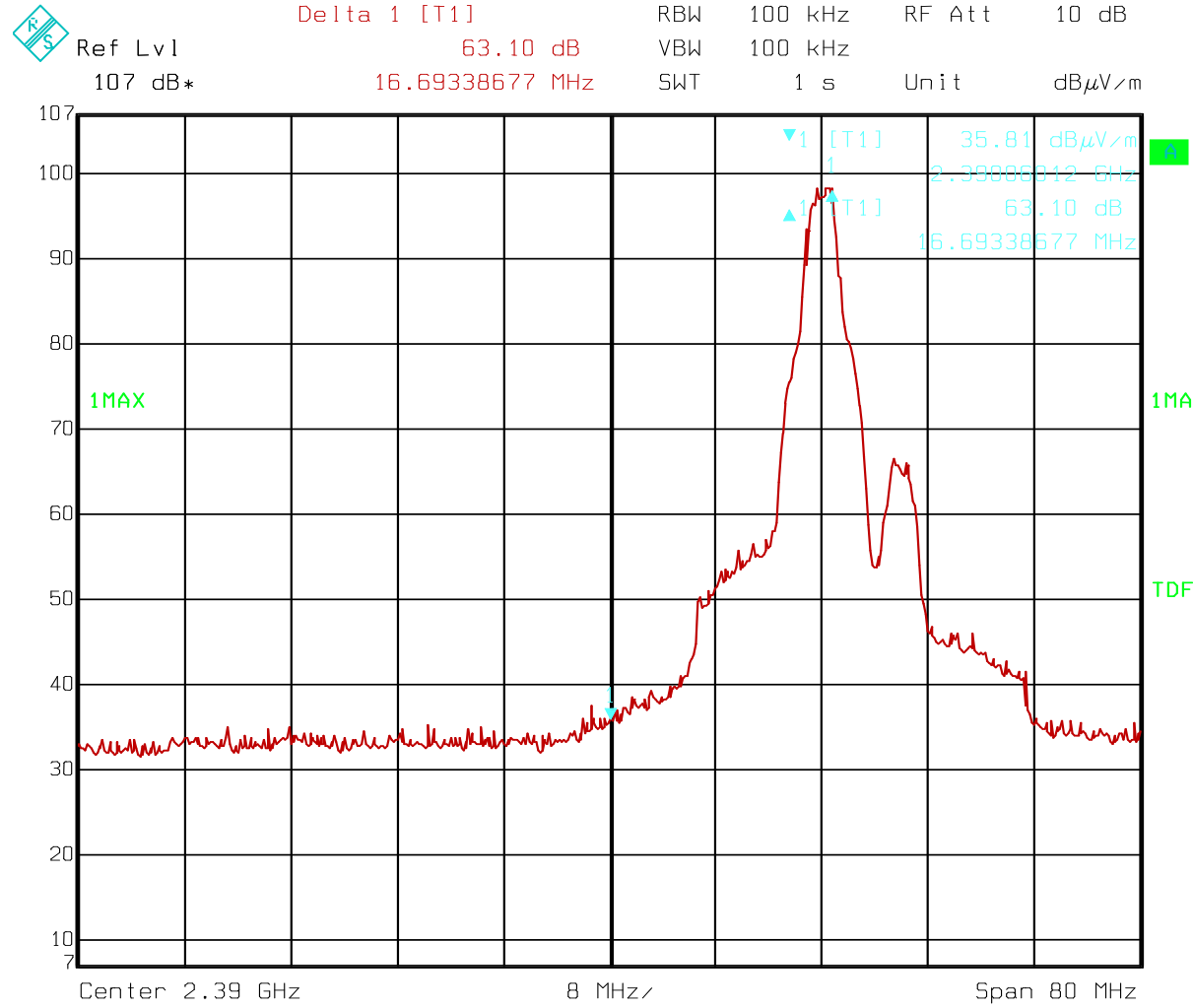
All emissions are more than 20dB below carrier.

See plots.



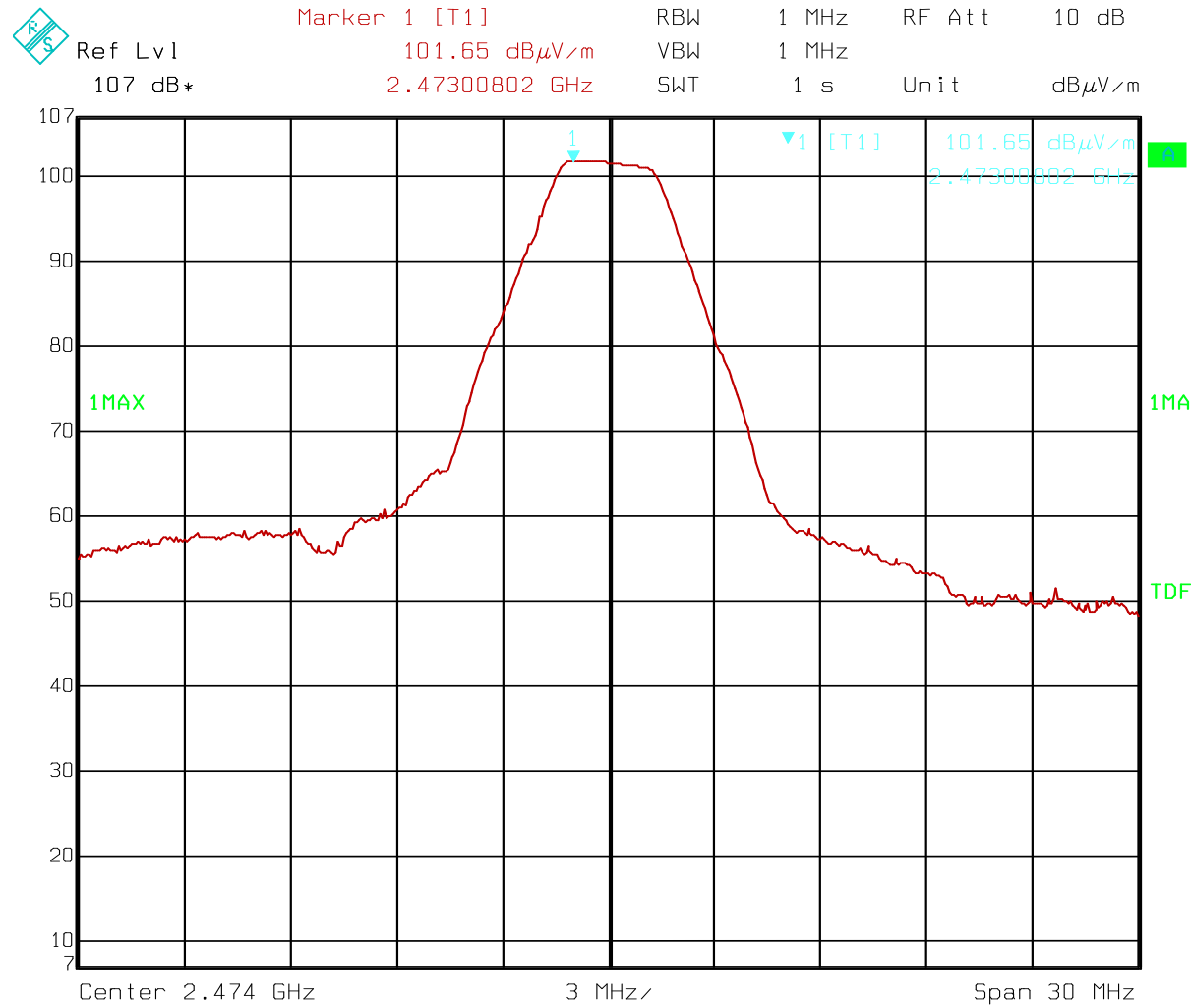
Date: 24.OCT.2011 14:02:39

Band Edge, 2390 MHz, Max



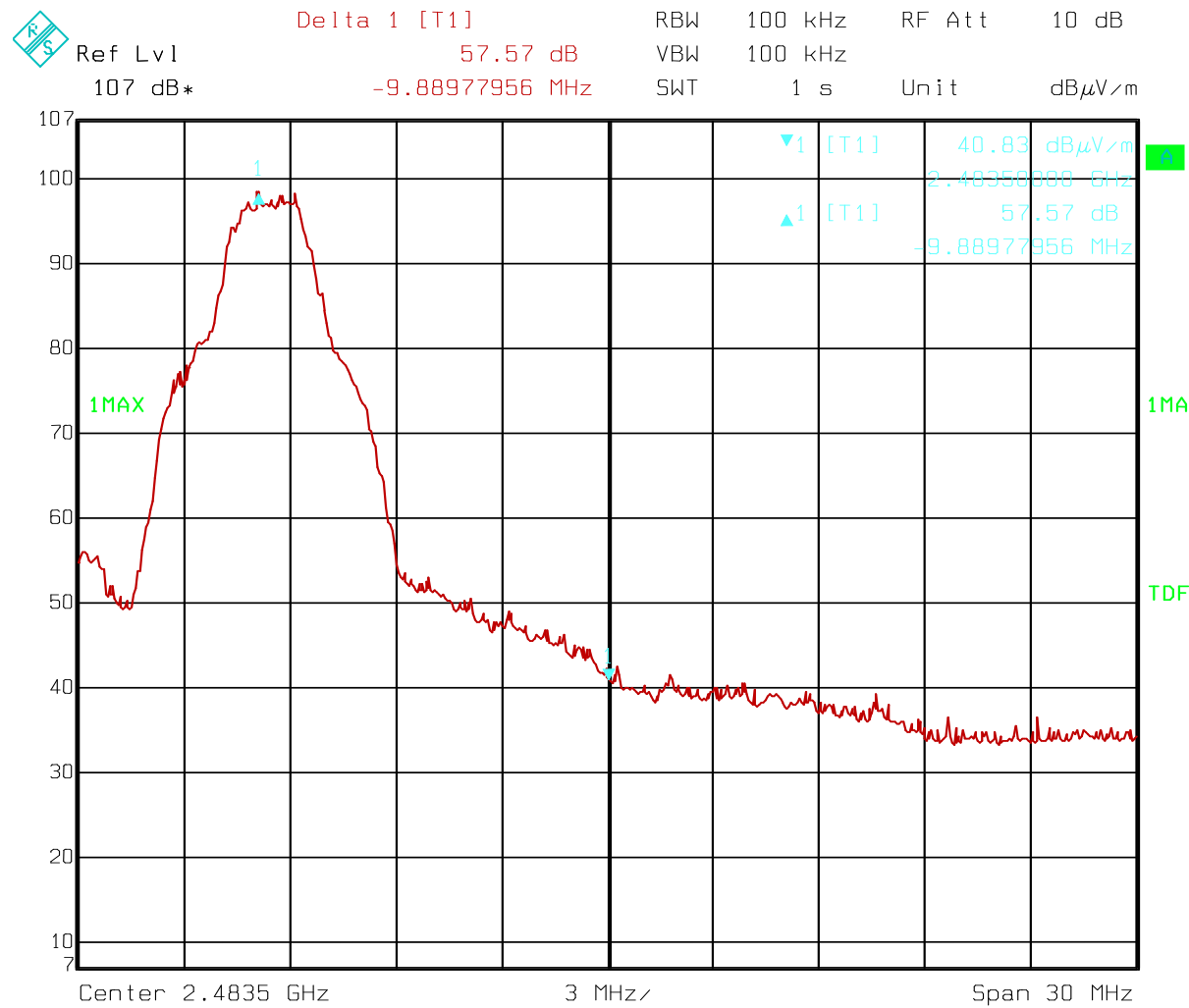
Date: 24.OCT.2011 14:05:41

Band Edge, 2390 MHz, Marker Delta



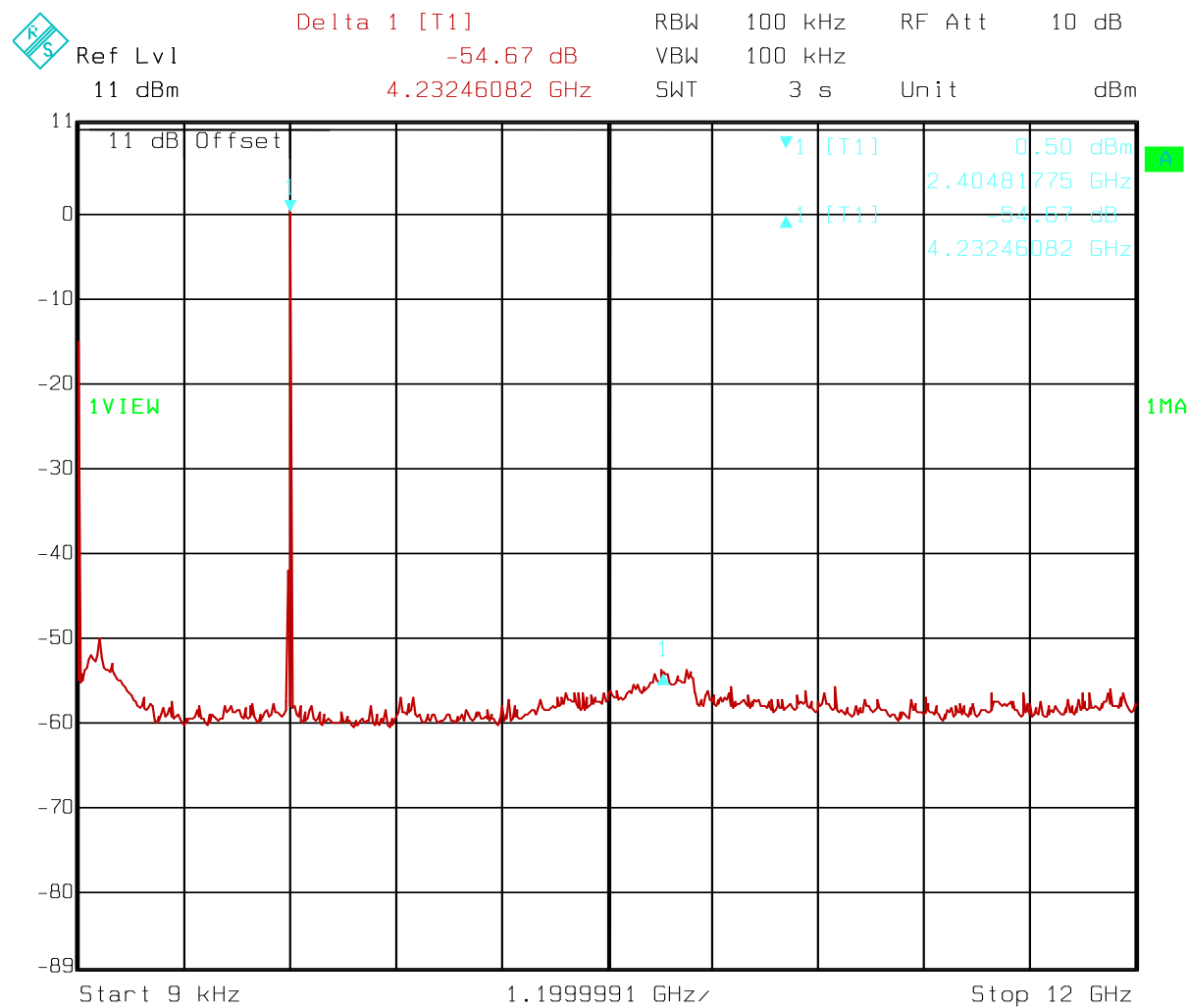
Date: 24.OCT.2011 14:42:29

Band Edge, 2483.5 MHz, Max



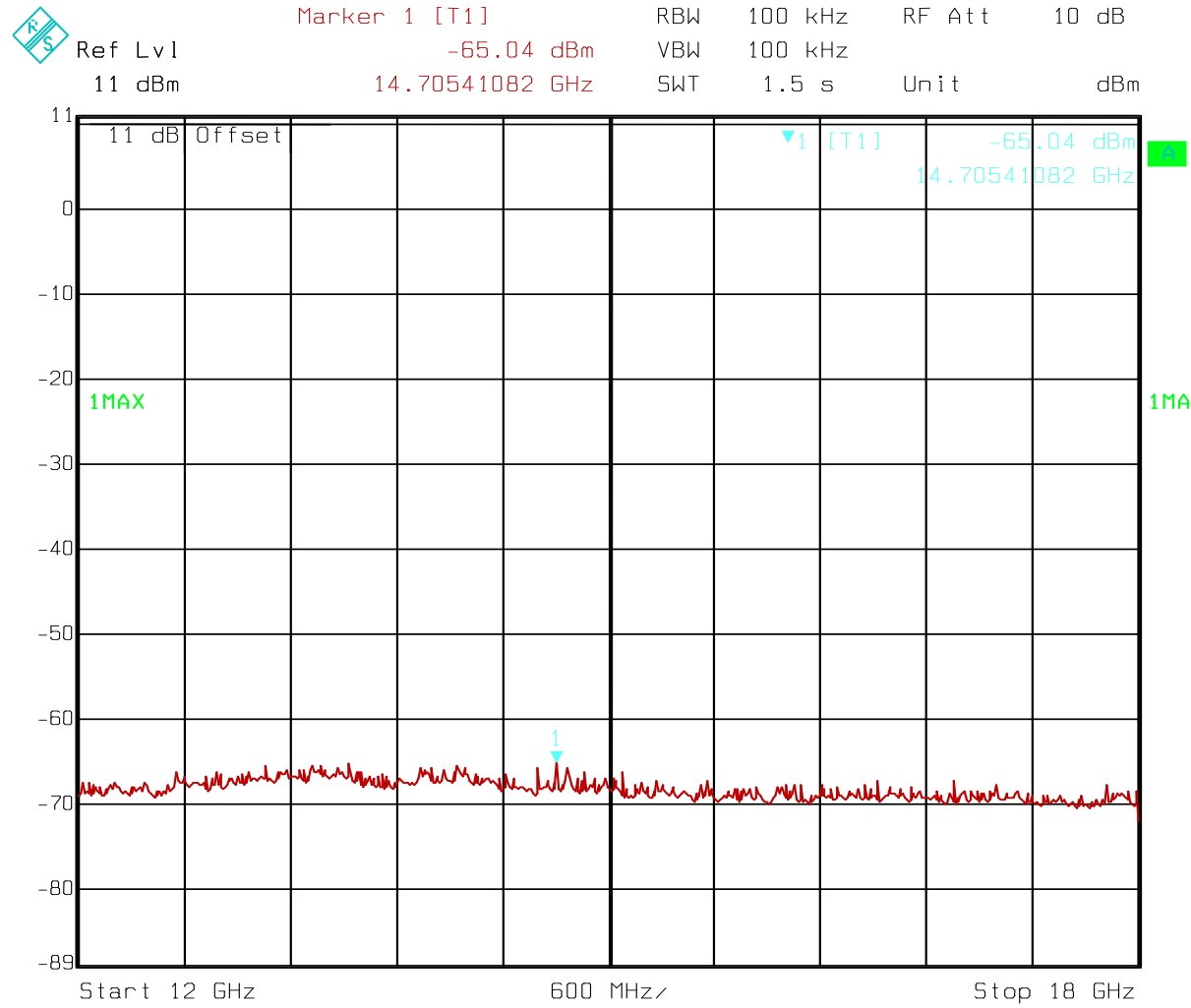
Date: 24.OCT.2011 14:41:39

Band Edge, 2483.5 MHz, Marker Delta



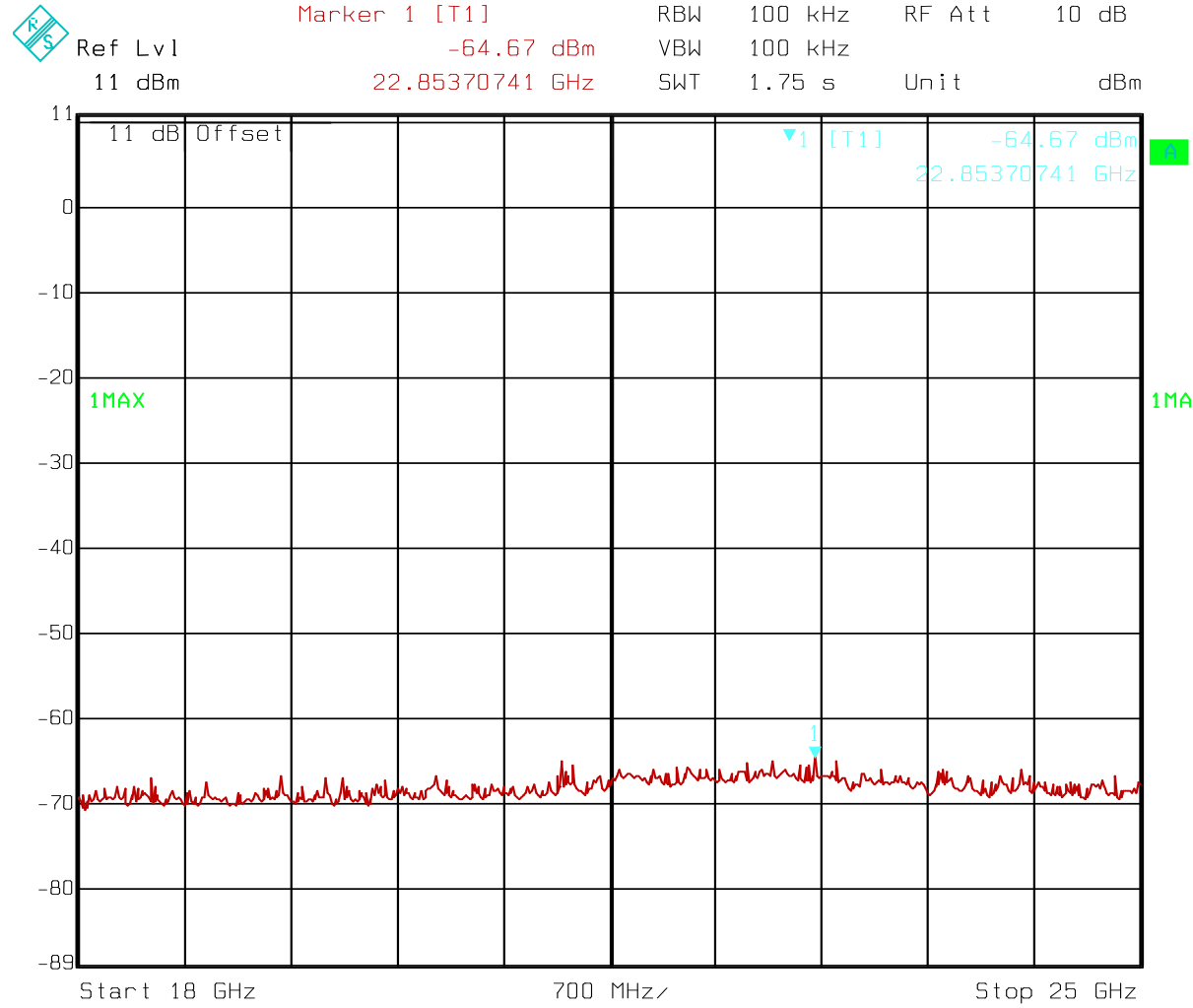
Date: 24.OCT.2011 15:30:25

Conducted Emissions, 10kHz – 12GHz



Date: 24.OCT.2011 15:31:47

Conducted Emissions, 12 – 18 GHz



Date: 24.OCT.2011 15:32:24

Conducted Emissions, 18 – 25 GHz

Test Performed By: Thomas Dangle

Date of Test: 07.Feb 2012

Test Results: Passed

Radiated emission 30 – 1000 MHz.

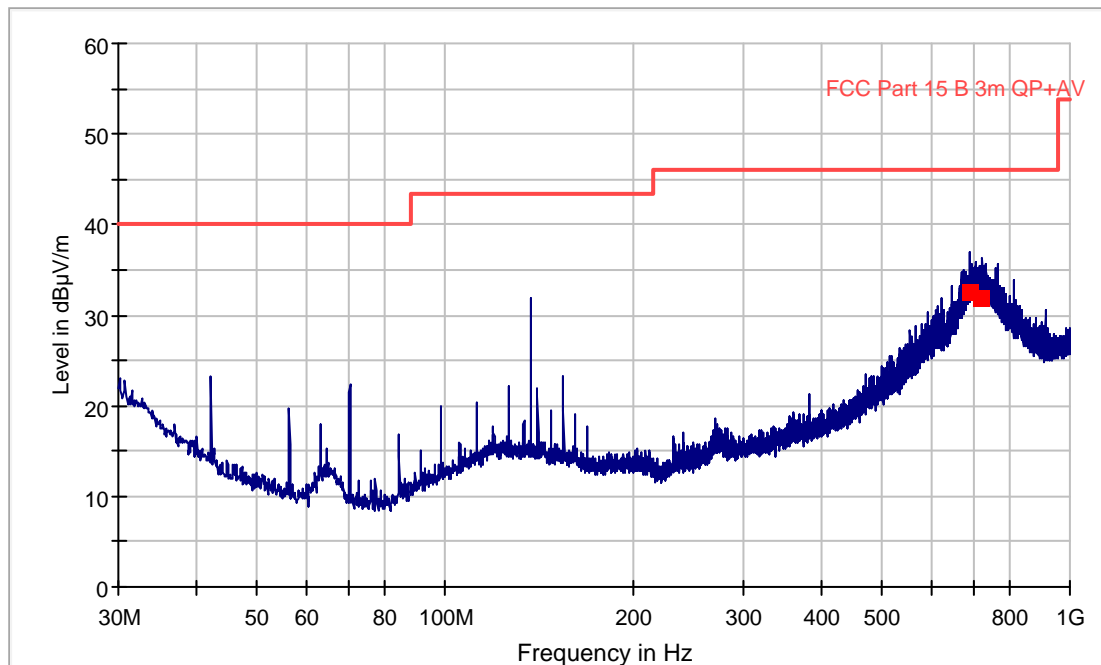
Detector: Peak

Measuring distance 3m.

All values are below the limit even when measured with Peak Detector.

See attached plot.

FCC Pt15 Class B 30-1000M 3m



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

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
692.003468	32.6	1000.0	120.000	100.0	V	123.0	-1.0	13.4	46.0	
725.243529	32.0	1000.0	120.000	115.0	H	240.0	-0.5	14.0	46.0	

Radiated Emissions, 1-25 GHz

1-12 GHz measured at a distance of 3m

12 - 18 GHz measured at 1m

Prescan performed from 18 to 25 GHz.

Frequency MHz	Field strength @3m dBμV/m	Detector	Limit dBμV/m	Margin dB
4812	None detected	Pk	74	-
4884	None detected	Pk	74	-
4948	None detected	Pk	74	-

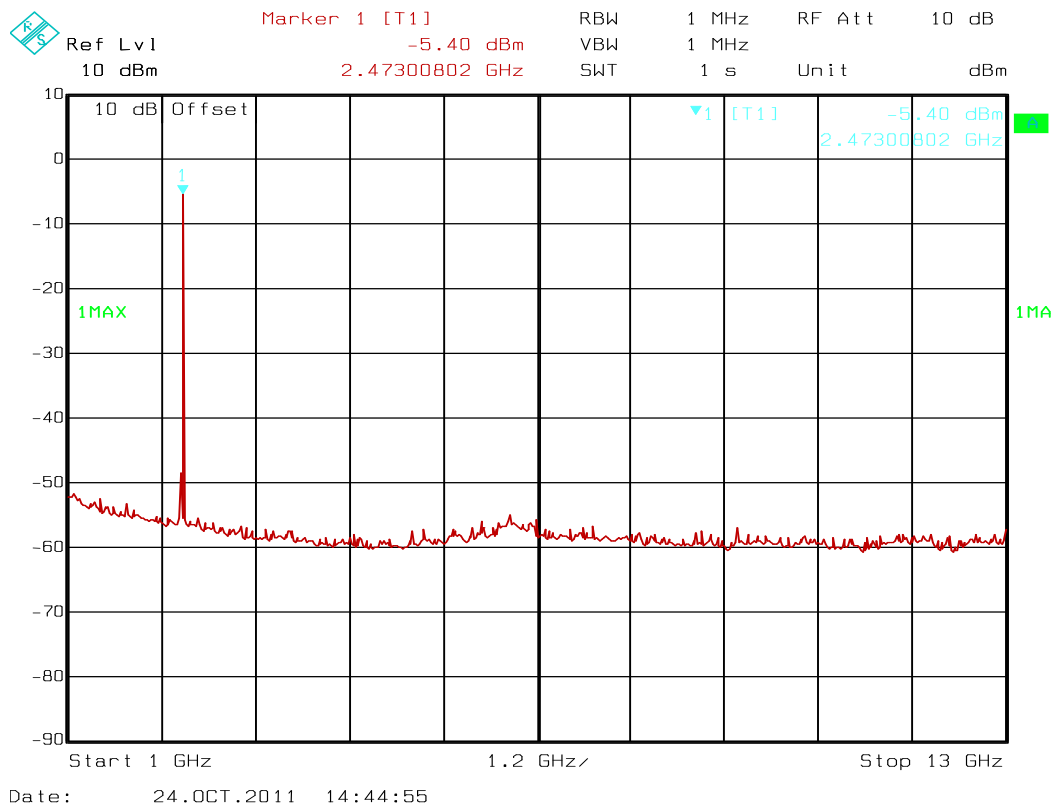
All emissions are below the Average Limit, even when measured with Peak Detector.

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

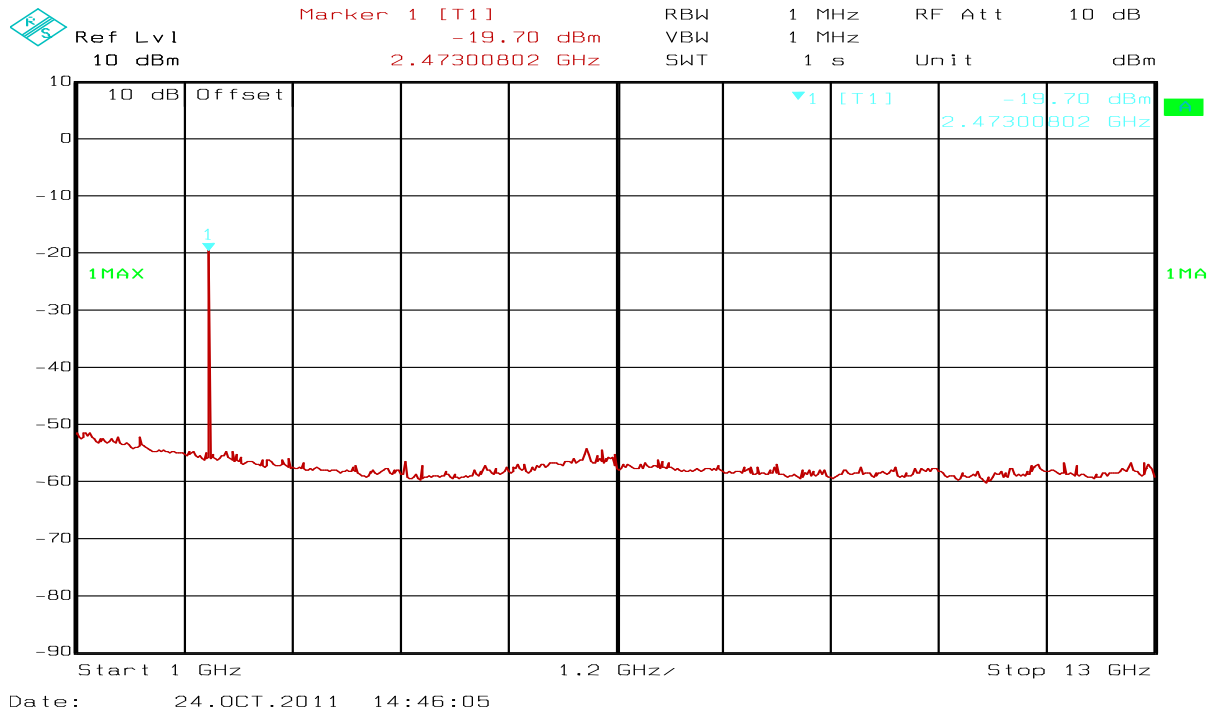
Distance Correction factor of 9.5 dB for measurements at 1m is included in above values

See attached graphs.

Radiated Emissions, 1 – 13 GHz, VP, @3m – pre-scan only



Radiated Emissions, 1 – 13 GHz, HP, @3m pre-scan only



Radiated Emissions, 1 – 13 GHz, VP, @3m pre-scan only

4.5 Receiver Spurious Emissions

Test Performed By: G.Suwanthakumar/Thmoas Dangle**Date of Test: 24 Oct 2011 and
07.Feb 2012****Test Results: Passed****Measurement Procedure:**

Industry Canada RSS-210 paragraph 2.3 and RSS-GEN paragraphs 4.10 and 6.

Test results:

Frequency MHz	Carrier Freq. MHz	Measured Value Radiated dBuV/m @3m	Limit dBuV/m @3m	Margin dB
30 – 1000	all	Under the limit	40 - 47	/
2406	4810	48.67	54	10.3
2442	4882	48.85	54	9.4
2474	4946	47.73	54	8.8
> 1000 (all others)	all	None found	54	/

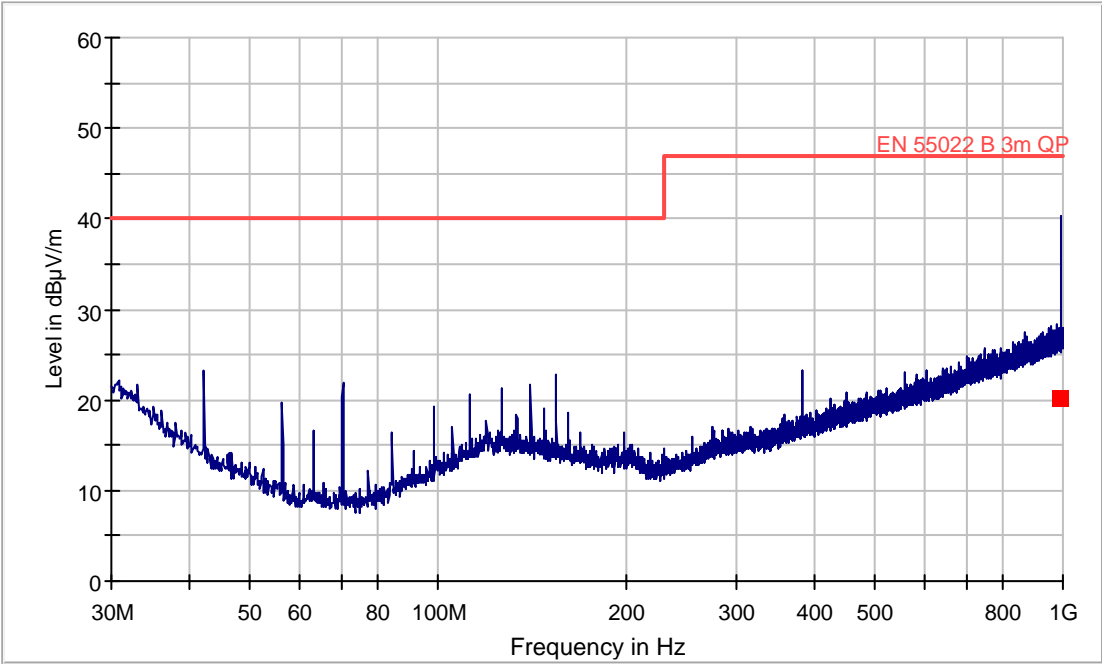
The measurement was performed radiated with the EUT in receive-only mode.

Requirements, RSS-GEN Issue 3, clause 6

The measurement can be performed either radiated or conducted.

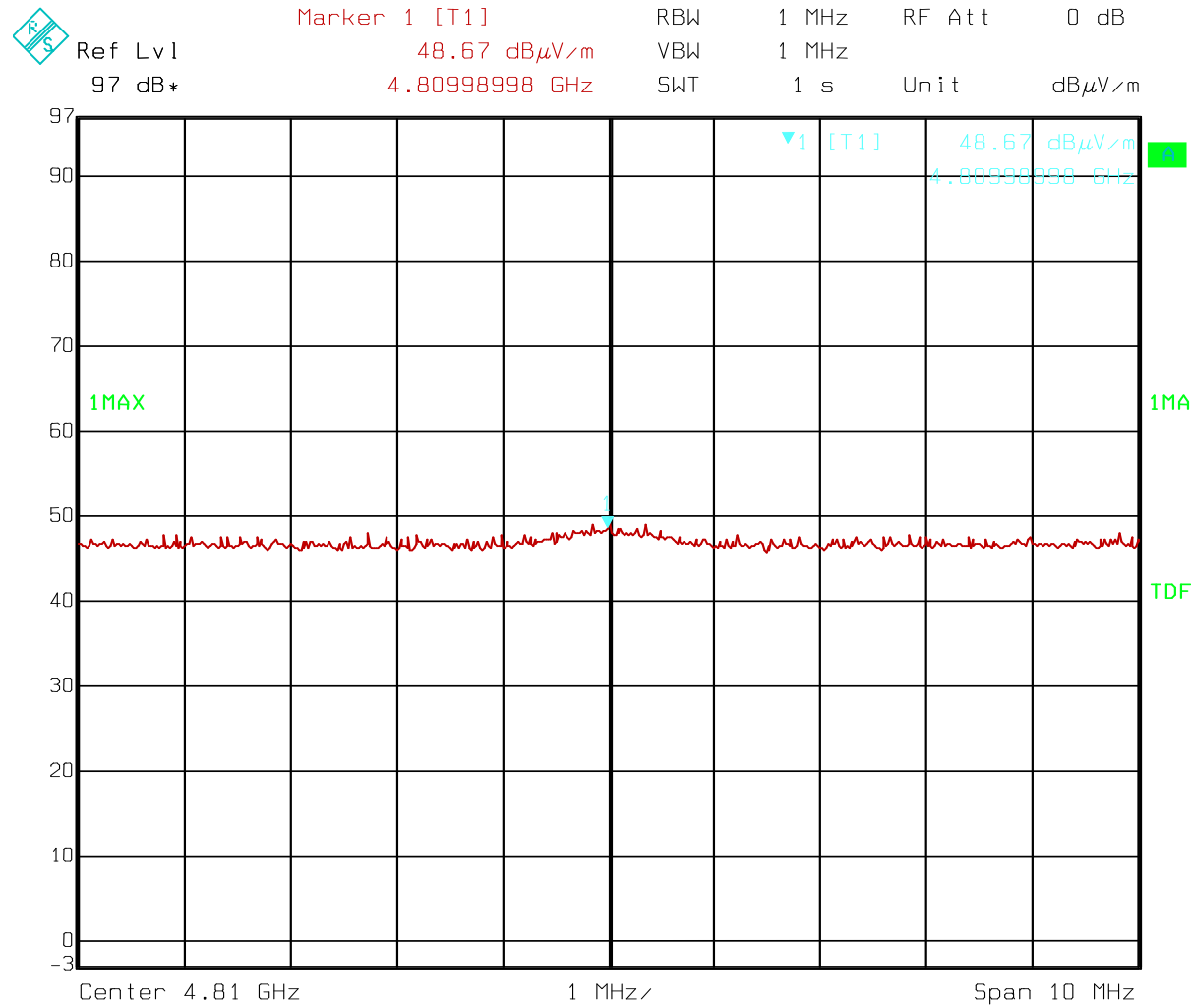
When measured Conducted: no spurious signals appearing at the antenna terminals shall exceed 2 nW per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nW above 1 GHz.**When measured Radiated:** See Table 2 in RSS-GEN Issue 3, clause 6.

EN 55022 Class B 0-1G 3m



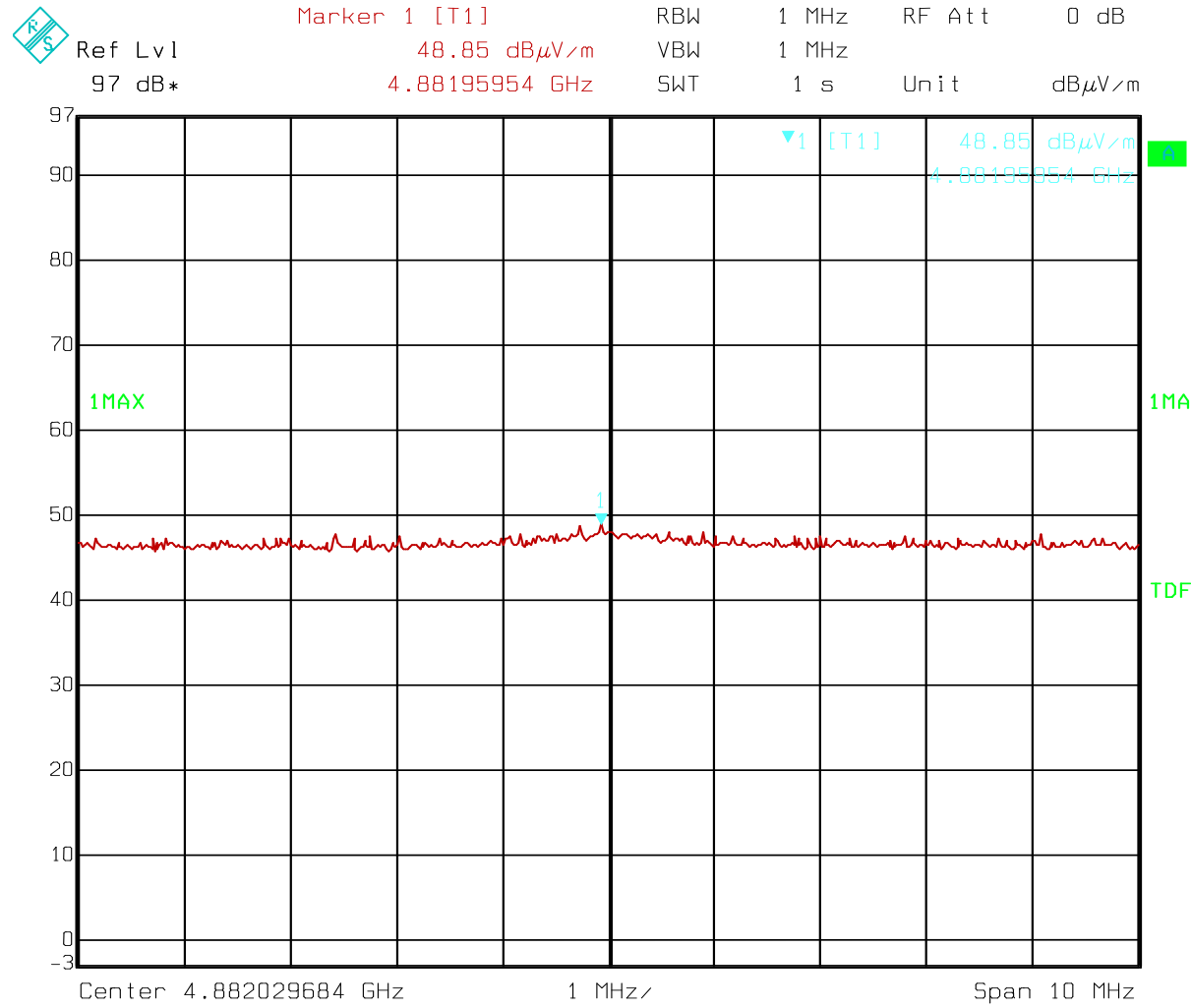
Radiated Emissions, 30 – 1000 MHz, VP and HP, @3m

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
994.768576	20.2	1000.0	120.000	200.0	H	141.0	3.1	26.8	47.0	



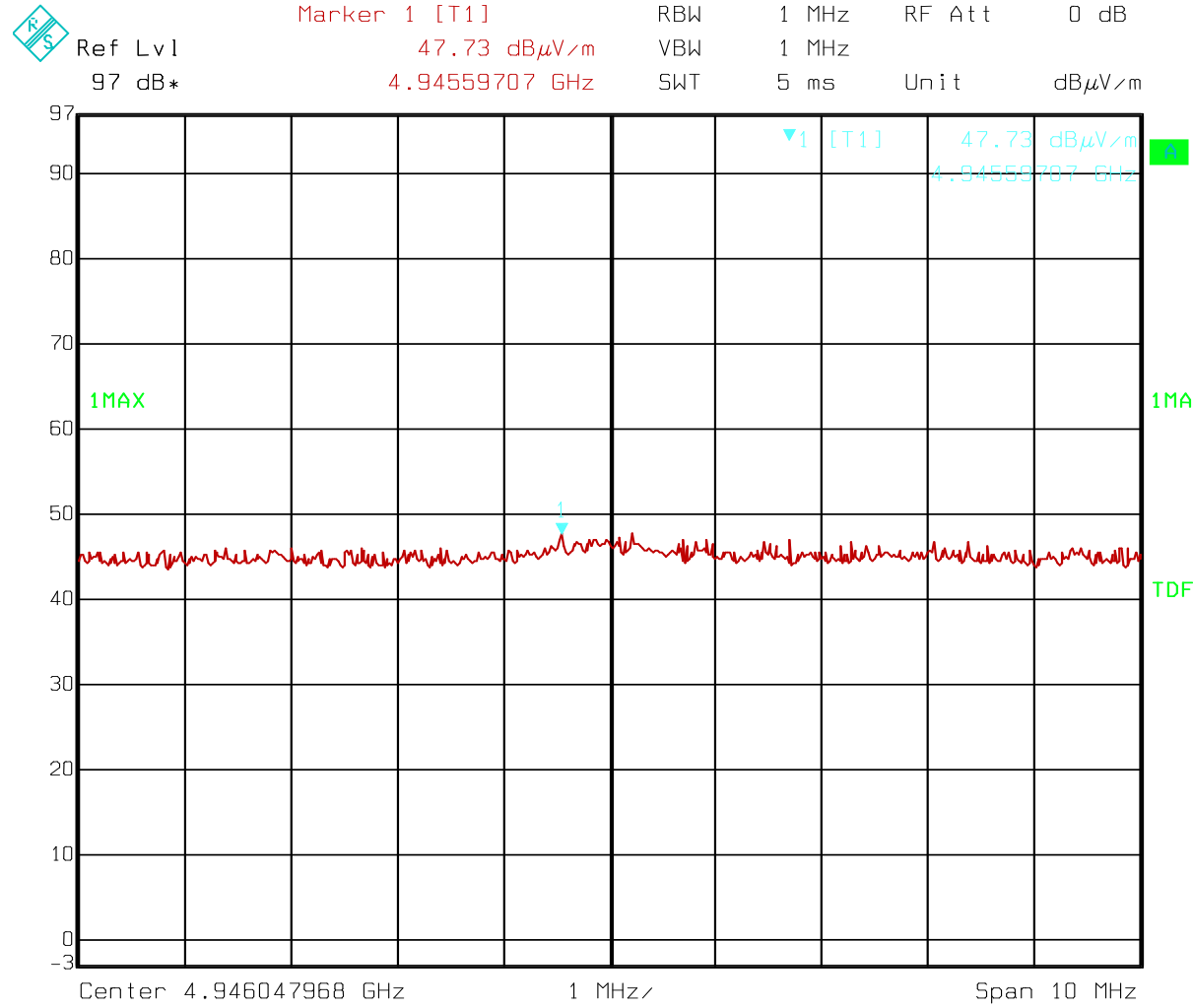
Date: 24.OCT.2011 14:55:53

Receiver Radiated Emissions, 4810 MHz



Date: 24.OCT.2011 15:00:03

Receiver Radiated Emissions, 4882 MHz



Date: 24.OCT.2011 15:03:57

Receiver Radiated Emissions, 4946 MHz

4.6 Power Spectral Density (PSD)

Para. No.: 15.247 (d)

Test Performed By: G.Suwanthakumar

Date of Test: 24 Oct 2011

Test Results: Passed

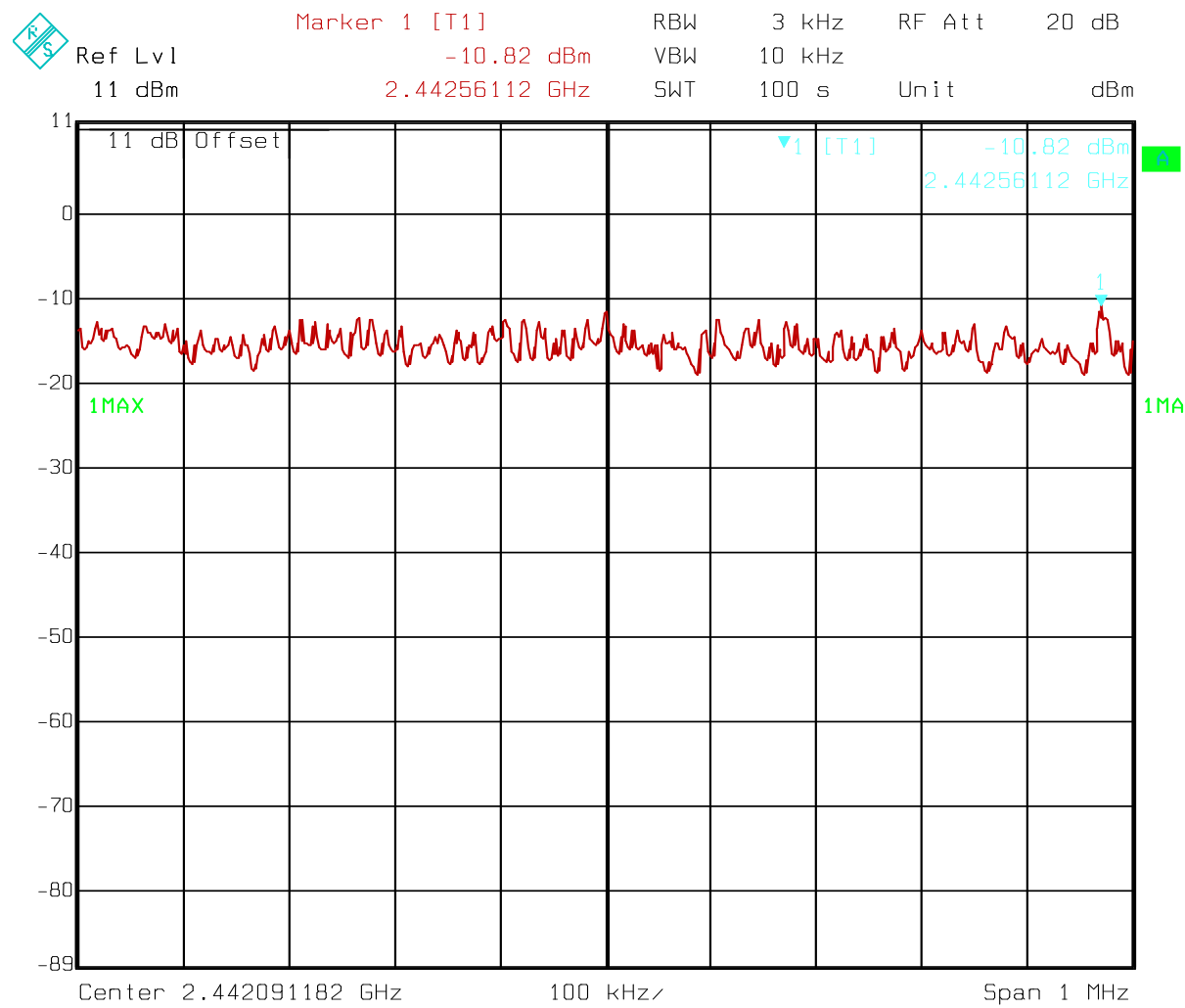
Measured and Calculated Data:

The alternative test procedures in point 2) A , B and formula 1 described in guidance on measurements for Digital Transmission Systems is used.

	Measured PSD
Power Spectral Density @2442 MHz	-10.82 dBm

Requirements:

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



Date: 24.OCT.2011 15:42:51

PSD Measurement

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.

Date: 2011-10-24

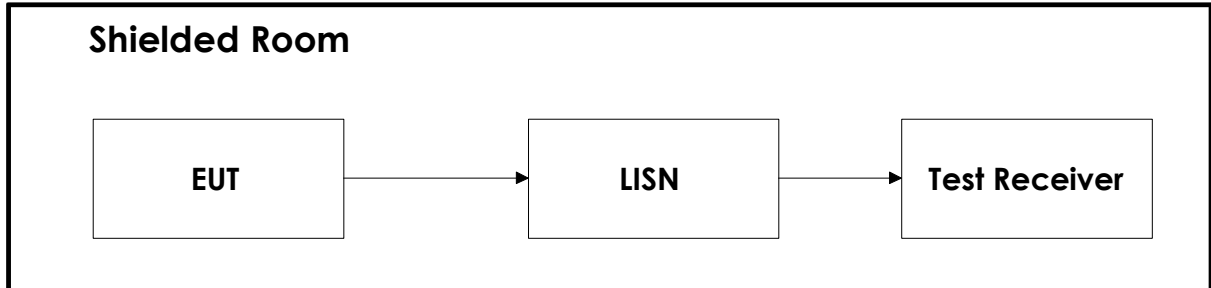
No.	Instrument/ ancillary	Type of instrument/ ancillary	Manufacturer	Ref. no.	Cal. Date	Cal. Due
1	FSEK	Spectrum Analyzer	Rohde & Schwarz	LR 1337	2010.12.15	2012.12.15
2	ESHS10	Spectrum Analyzer	Rohde & Schwarz	LR 1090	2011.06.21	2012.06.21
3	3115	Antenna horn	EMCO	LR 1330	2010.08.05	2013.08.05
4	643	Antenna horn	Narda	LR 093	2009.01.26	2012.01.26
5	642	Antenna horn	Narda	LR 220	2009.01.26	2012.01.26
6	PM7320X	Antenna horn	Siverts lab	LR 103	2009.01.26	2012.01.26
7	DBF-520-20	Antenna horn	Syston Donner	LR 101	2009.01.26	2012.01.26
8	638	Antenna horn	Narda	LR 098	2010.06.17	2015.06.17
9	JB3	Antenna BiLog	Sunol Sciences	N-4525	2010-09	2012-09
10	8449B	Pre-amplifier	Hewlett Packard	LR 1322	2011-09-27	2012-09-27
11	LNA6900	Pre-amplifier	Teseq	LR 1593	2010-11	2011-11
12	ESCI	Test Receiver	Rohde & Schwarz	N-4529	2010.11.08	2011.11.02
13	ESH3-Z3	LISN	Rohde & Schwarz	LR 1076	2009-10-22	2011-10-22
14	80S	Signal Generator	Powertron	LT 502	Cal b4 use	
15	Model 87 V	Multimeter	Fluke	LR 1598	2010-12-14	2011-12-14
16	FSU26	Spectrum Analyzer	Rohde & Schwarz	LR 1504	2010.09.28	2012.09.28

Date: 2012-02-07

No.	Instrument/ ancillary	Type of instrument/ ancillary	Manufacturer	Ref. no.	Cal. Date	Cal. Due
1	JB3	Antenna BiLog	Sunol Sciences	N-4525	2010-09	2012-09
2	LNA6900	Pre-amplifier	Teseq	LR 1593	2011-11-24	2013-11-24
3	ESCI	Test Receiver	Rohde & Schwarz	N-4259	2011.12.21	2012.11.03
4	Model 87 V	Multimeter	Fluke	LR 1598	2011-03-11	2012-11-03

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission



6.2 Test Site Radiated Emission

