

Test report no. : 193682-4

Item tested : D3580

Type of equipment : BT inside UPCS Base Unit

FCC ID : AMWUN405

Client : Uniden America Corporation

FCC Part 15.247

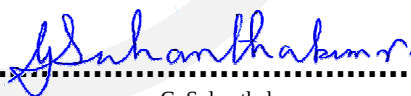
Frequency Hopping Transmitters /
Digital Transmission System

RSS-210, Issue 8

Low Power Licence-Exempt
Radiocommunication Devices

19 April 2012

Authorized by :



G. Suhanthakumar
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: 44

1.2 Client Information

Name : Uniden America Corporation
Address : 4700 Amon Carter Blvd., Fort Worth, Texas 76155, U.S.A.

Contact:

Name : Jon Suehiro
E-mail : JSuehiro@uniden.com

1.3 Manufacturer (if other than client)

Same as client.

2 Test Information

2.1 Test Item

Name :	Uniden
FCC ID :	AMWUN405
Industry Canada ID :	513C-UN405
Model/version :	D3580
Serial number :	/
Hardware identity and/or version:	1.0
Software identity and/or version :	0.08
Frequency Range :	2402 – 2480 MHz
Number of Channels :	79 RF Channels
Operating Modes :	FHSS
Type of Modulation :	Digital (GFSK)
User Frequency Adjustment :	None
Conducted Output Power :	0.0024 Watts (Peak)
Type of Power Supply :	AC Adaptor
Antenna Connector :	None
Antenna Diversity Supported :	No
Number of Antennas :	1

Description of Test Item

The EUT is a Bluetooth transceiver integrated into a UPCS Base station.

Exposure Evaluation

The Peak Output Power from the Bluetooth transmitter is below the exemption level for routine SAR evaluation.

The EUT is exempted from RF Exposure Evaluation to Industry Canada requirements since the output power complies with the power levels of section 2.5.2 of RSS-102 Issue 4.

2.2 Test Environment

2.2.1 Normal test condition

Temperature: 20 - 21 °C

Relative humidity: 37 - 44 %

Normal test voltage: 120 V AC

The values are the limit registered during the test period.

2.3 Test Period

Item received date: 2011-12-07

Test period : 2011-12-12 and from 2012-01-23 to 2012-01-24

2.4 Test Engineer(s)

Frode Sveinsen / Bjørn Nordset

2.5 Test Equipment

See list of test equipment in clause 6.

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: Uniden
Model No.: D3580
Serial No.: /

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 C63.4-2009 and ANSI C63.10-2009. 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.

☒ New Submission

☒ Production Unit

☐ Class II Permissive Change

☐ Pre-production Unit

DSS 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".



TEST REPORT #: 193682-4

TESTED BY:



Frode Sveinsen, Test engineer

DATE: 1 February 2012

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3.2 Test Summary

Name of test	FCC Part 15 reference	RSS-210 Issue 8 reference	Result
Supply Voltage Variations	15.31(e)	8 (RSS-GEN)	Complies
Number of Operating Frequencies	15.31(m)	A8.1	Complies
Antenna Requirement	15.203	7.1.4 (RSS-GEN)	Complies
Power Line Conducted Emission	15.107(a) 15.207(a)	7.2.2 (RSS-GEN)	Complies
Channel Separation and 20 dB Bandwidth	15.247(a)(1)	A8.1	Complies
Pseudorandom Hopping Algorithm	15.247(a)(1)	A8.1	Complies
Time of Occupancy	15.247(a)(1)(iii)	A8.1	Complies
Occupied Bandwidth	15.247(a)(1)	A8.1	Complies
Minimum 6 dB Bandwidth	15.247(a)(2)	A8.2	Complies ²
Peak Power Output	15.247(b)	A8.4	Complies
Power Spectral Density	15.247(d)	A8.2	N/A
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 ²

¹ The tested equipment has integrated antennas only.

² Only applicable for EUT with Equipment Code DTS, no requirement for DSS.
Bluetooth equipment may be submitted as either DTS or DSS.

3.3 Description of modification for Modification Filing

Not applicable.

3.4 Comments

The measurements were done with the EUT powered by 120 V AC. 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.

3.5 Family List Rational

Not Applicable.

4 TEST RESULTS

4.1 Power Line Conducted Emissions

Para. No.: 15.207 (a)

Test Performed By: Bjørn Nordset

Date of Test: 12 Dec 2011

Measurement procedure: ANSI C63.4-2009 using 50 μ H/50 ohms LISN.

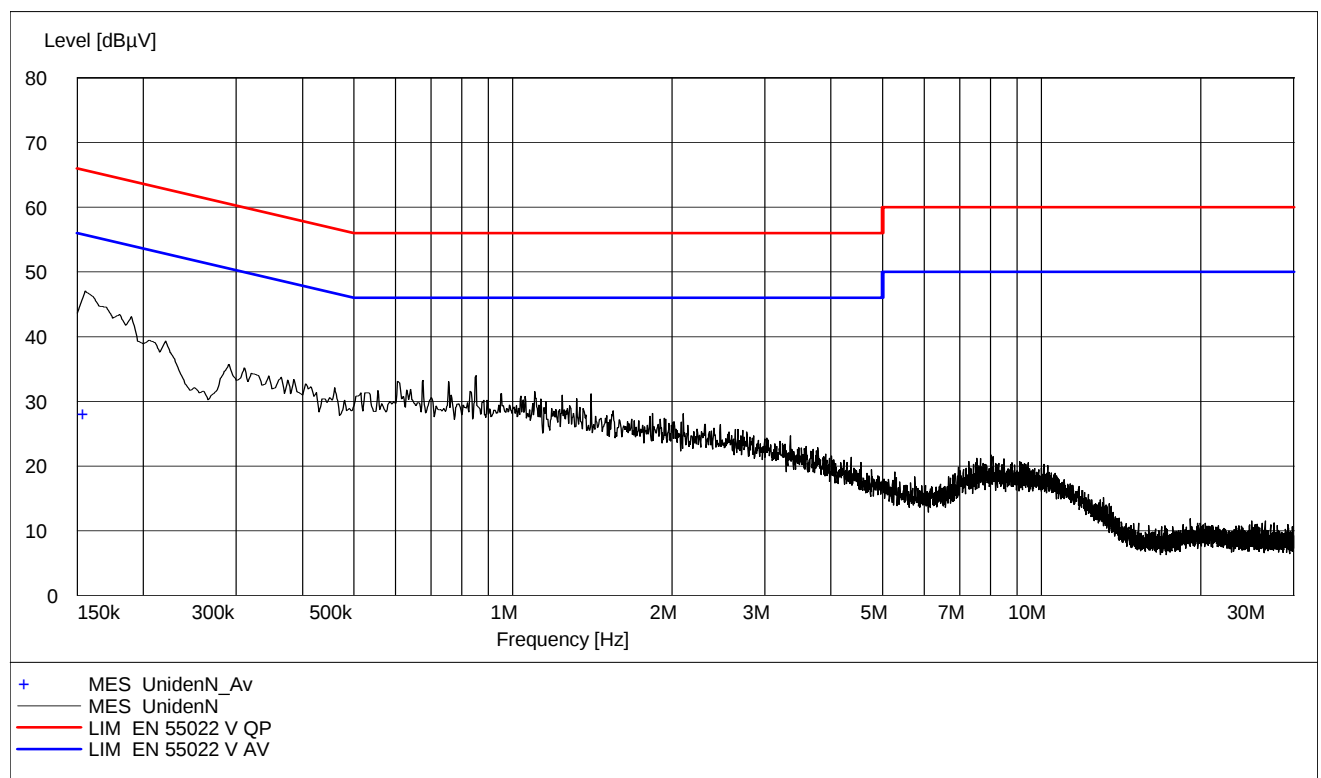
Test Results: Complies.

Measurement Data: See plot, (Peak detector).

Highest measured value (L1 and N):

Frequency [MHz]	Level [dBuV]	Af [dB]	Limit [dBuV]	Margin [dB]	Det	Position	Verdict [Pass/Fail]
0.155000	28.00	10.10	55.70	27.70	AV	N	Pass

All other values are more than 10 dB below the Average limit even when measured with Peak Detector.



Phase L1 and N, 120V 60Hz (Plot shows maximum of Phase L1 and N)

4.2 Channel Separation and 20dB Bandwidth

Para. No.: 15.247 (a)(1)

Test Performed By: Frode Sveinsen

Date of Test: 24 Jan 2012

Test Results: **Complies**

Measurement Data: Channel Separation: 1.000 MHz
20 dB Bandwidth of hopping channel: 0.918 MHz

RF channel has no influence on 20 dB bandwidth.

See attached plots

Channel Separation nominal value: 1.000 MHz.

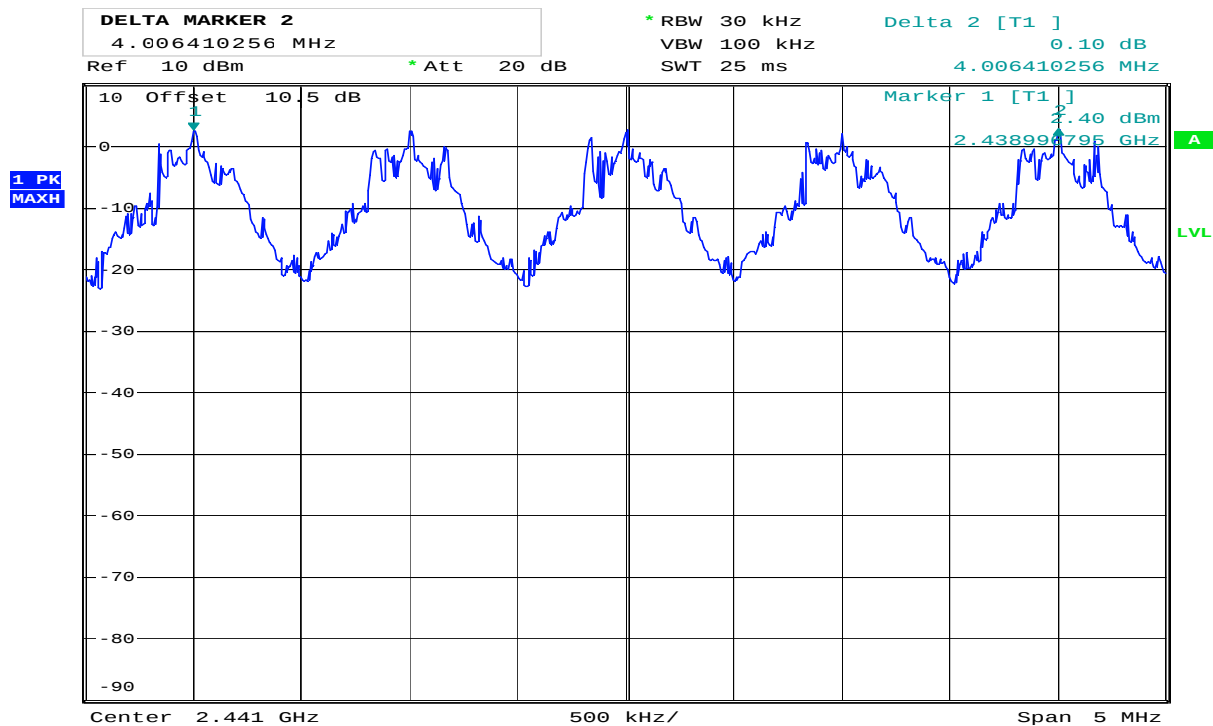
Requirement:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

or:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the system operates with an output power no greater than 125 mW.

No requirements for Digital Transmission Systems.



Date: 24.JAN.2012 10:56:51

Channel Separation



Date: 24.JAN.2012 10:02:48

20 dB Bandwidth

4.3 Pseudorandom Hopping Algorithm

Para. No.: 15.247 (a)(1)

Test Performed By: Frode Sveinsen	Date of Test: 24 Jan 2012
-----------------------------------	---------------------------

Test Results: Complies

Measurement Data: /

Requirements:

The channel frequencies shall be selected from a pseudorandom ordered list of hopping frequencies. Each frequency must be used equally by the transmitter.

No requirements for Digital Transmission Systems.

Base Table Hopping Sequence

To be described in manufacturer documentation.

4.4 Occupancy Time

Para. No.: 15.247 (a)(1)(iii)

Test Performed By: Frode Sveinsen

Date of Test: 24 Jan 2012

Test Results: **Complies**

Measurement Data:

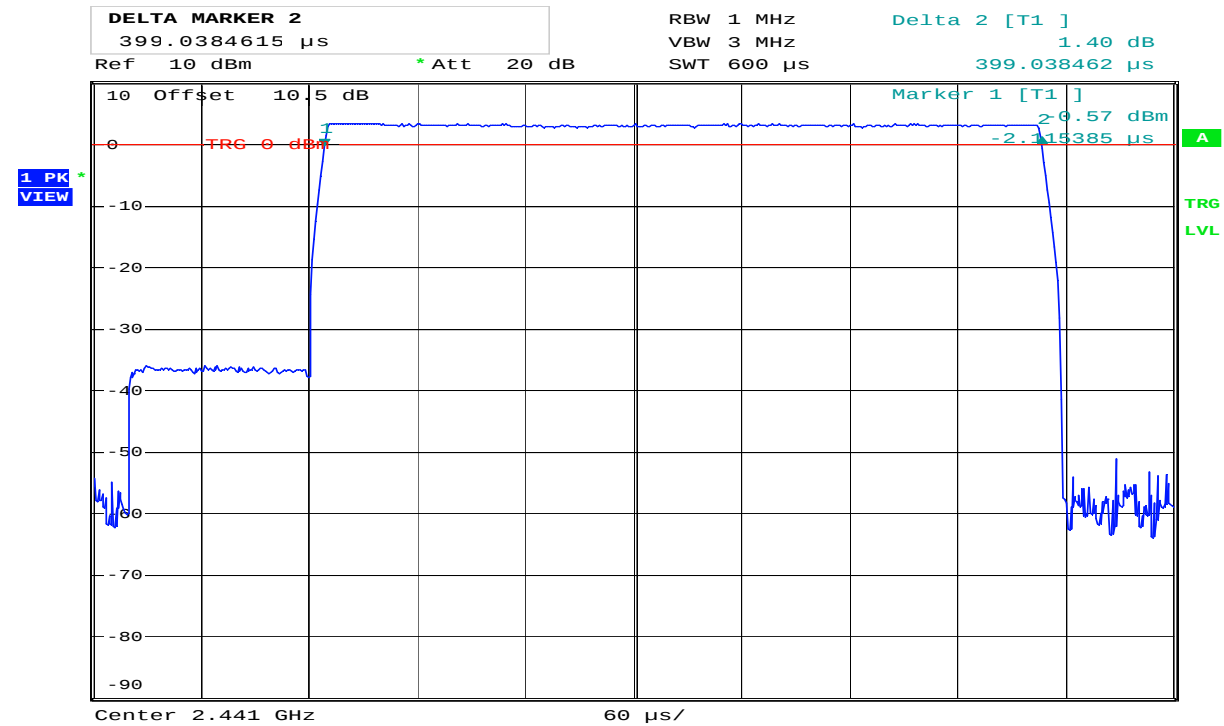
Number of RF channel:	79
RF burst pr channel:	0.4 ms
Time between each RF burst on same RF channel:	$3.725 \times 79 = 294.275$ ms
Time of occupancy: $(0.4 \times 400 \times 79) / 294.275 = 42.95$ ms	

See plot.

Requirements:

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

No requirements for Digital Transmission Systems.



Date: 24.JAN.2012 11:01:12

Occupancy Time

4.5 Occupied Bandwidth

Para. No.: 15.247 (a)(1)(iii)

Test Performed By: Frode Sveinsen

Date of Test: 23 Jan 2012

Test Results: Complies

Measurement Data: 79 RF channels in use

Channel Centre Frequencies:

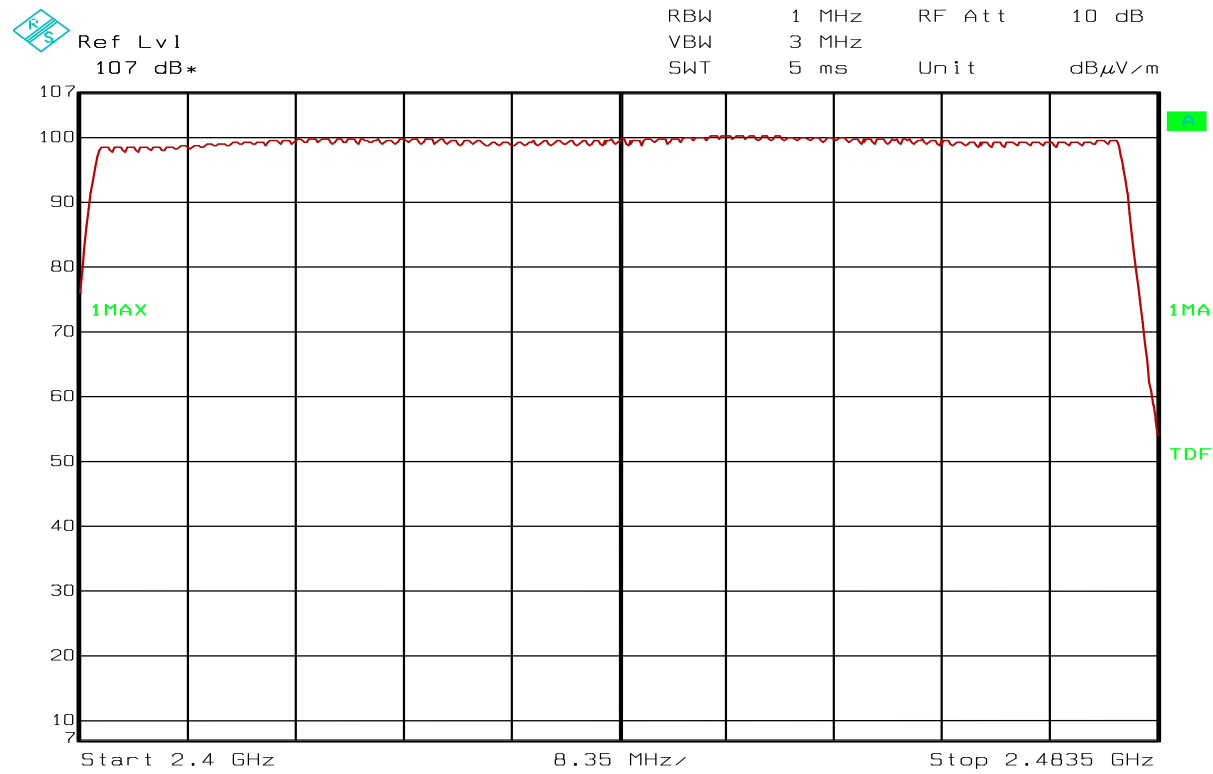
The 79 channels are centered at each full MHz from 2402 to 2480 MHz.

See plot.

Requirements:

Frequency hopping systems in the 2400 - 2483.5 MHz band shall use at least 15 non-overlapping channels. No requirements for bandwidth for this frequency band.

No requirements for Digital Transmission Systems.



Date: 23.JAN.2012 13:46:50

RF Channels in use

4.6 Minimum 6 dB Bandwidth

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

Test Performed By: Frode Sveinsen

Date of Test: 24 Jan 2012

Test Results: Complies

Measurement Data:

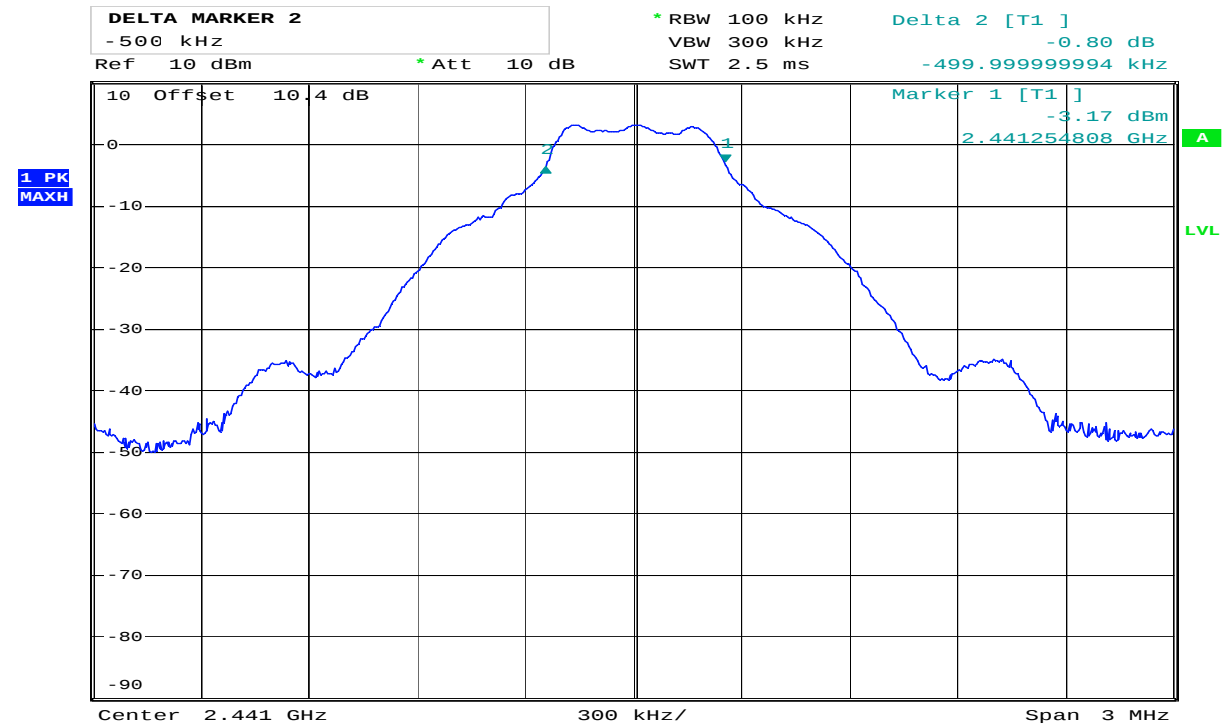
Measured 6 dB Bandwidth (MHz)		
/	2441 MHz	/
/	0.500	/

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: 24.JAN.2012 10:05:40

6dB Bandwidth

4.7 Peak Power Output

Para. No.: 15.247 (b)

Test Performed By: Frode Sveinsen

Date of Test: 23-24 Jan 2012

Test Results: Complies

Measurement Data:

	2402 MHz	2441 MHz	2480 MHz
Peak Power (dBm)	1.9	3.1	3.8
Peak Power (Watts)	0.0015	0.0020	0.0024
Field Strength (dBµV/m)	98.5	99.7	99.6
EIRP, Calculated (Watts)	0.0021	0.0028	0.0027
Antenna gain (dBi)	1.4	1.4	0.6

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

EIRP is calculated from measured field strength by the formula in DA 00-705 (See Alternative Test Procedure).

See attached graph.

Detachable antenna?

☐ Yes

☒ No

If detachable, is the antenna connector non-standard?

☐ Yes

☐ No

Type of antenna connector: N/A

Requirements:

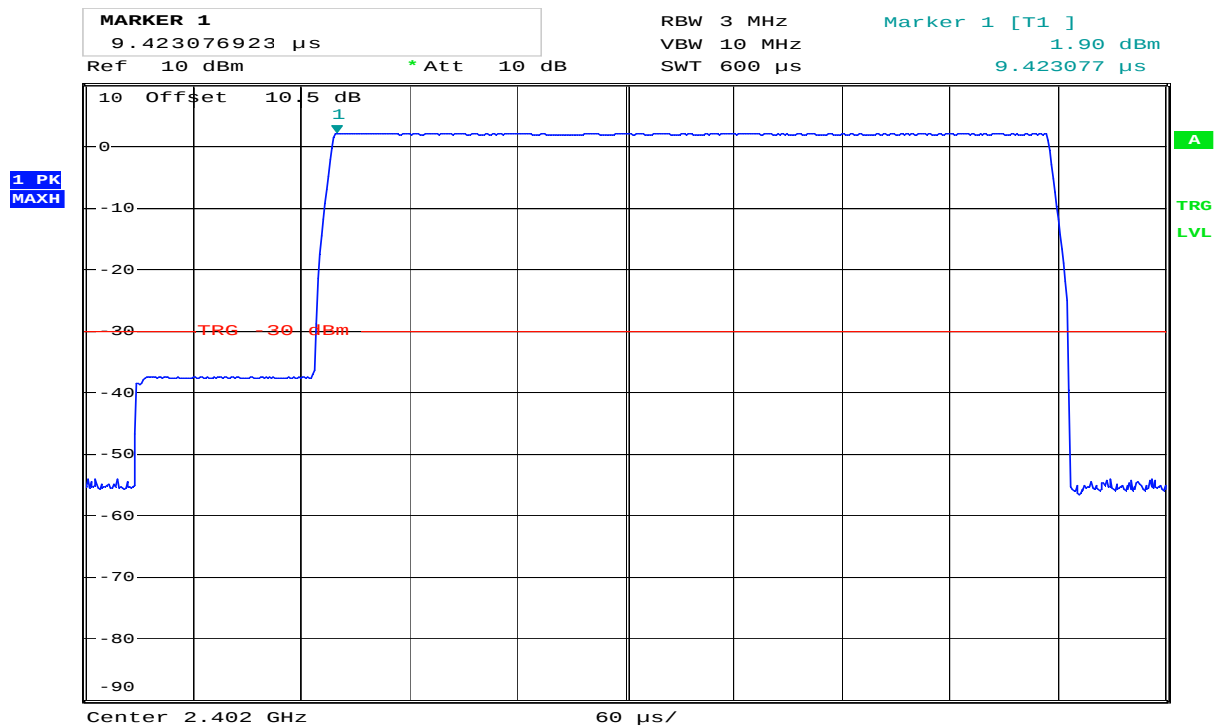
The maximum peak output power shall not exceed the following limits:

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

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

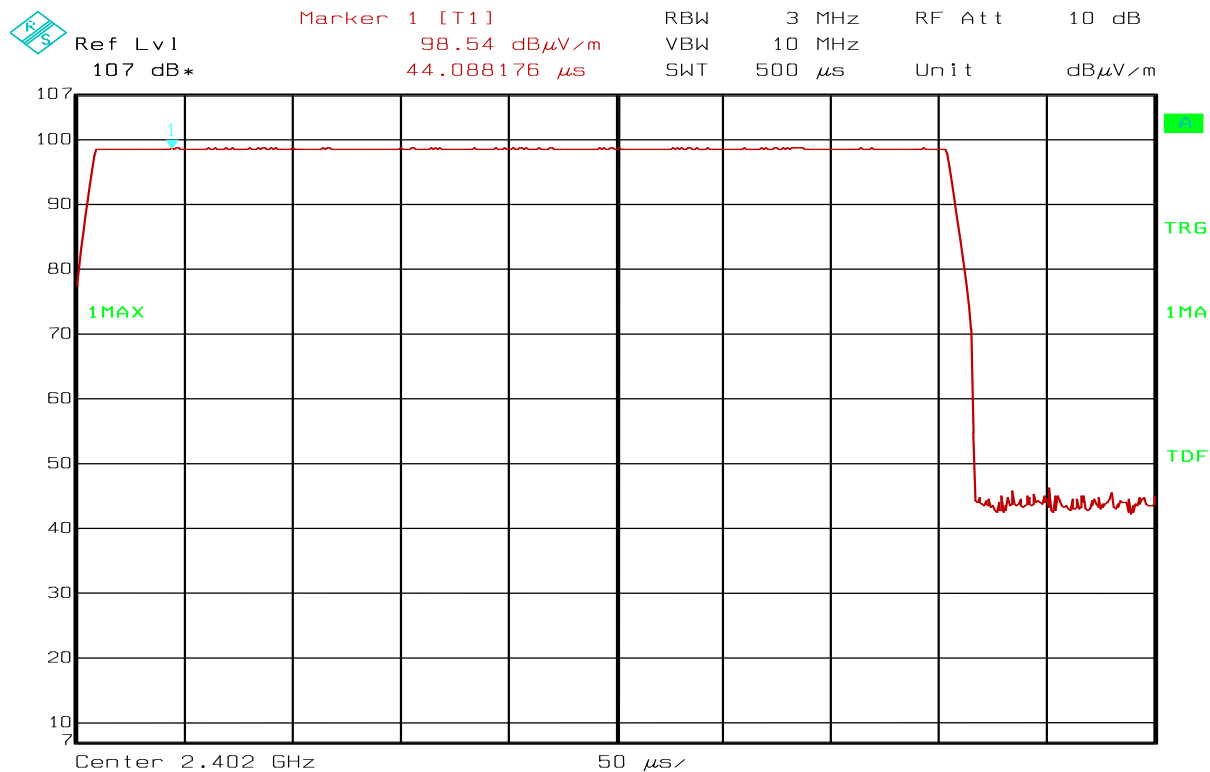
For Digital Transmission Systems in the 2400 - 2483.5 MHz band: 1 Watt

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



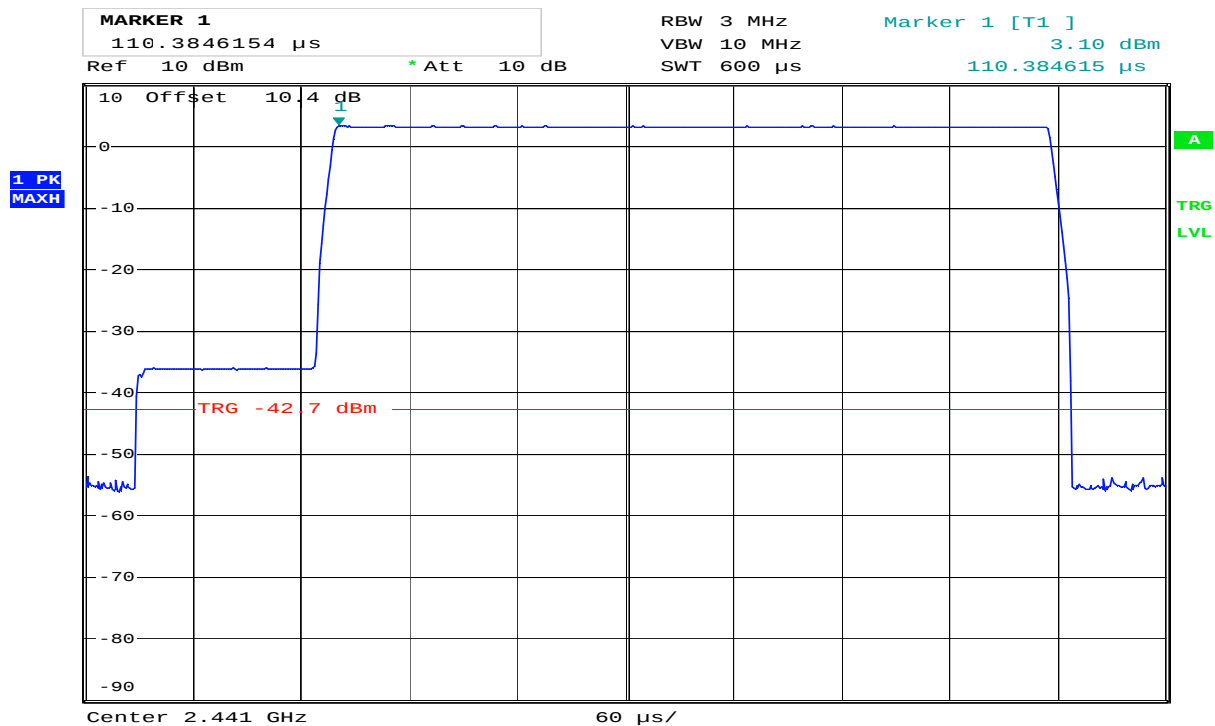
Date: 24.JAN.2012 10:35:26

Conducted Output Power, 2402MHz



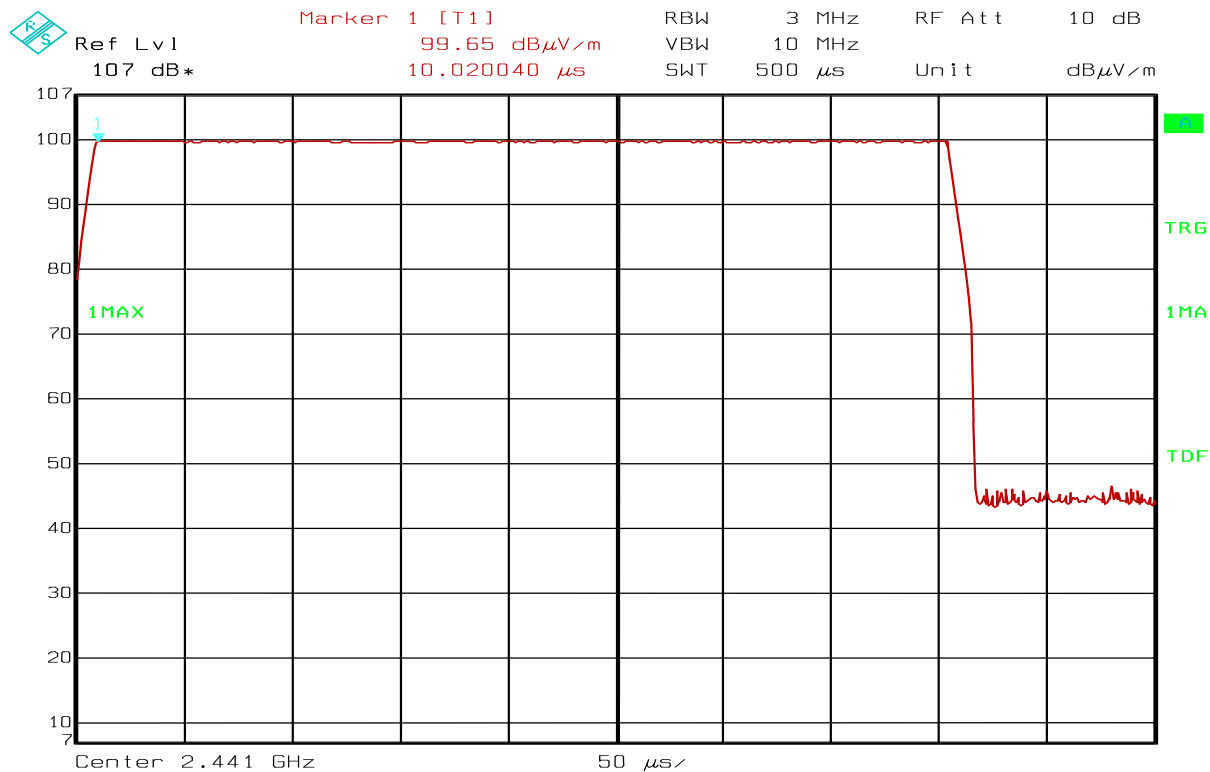
Date: 23.JAN.2012 13:28:32

Maximum Field Strength, 2402MHz (Max: EUT V, VP)



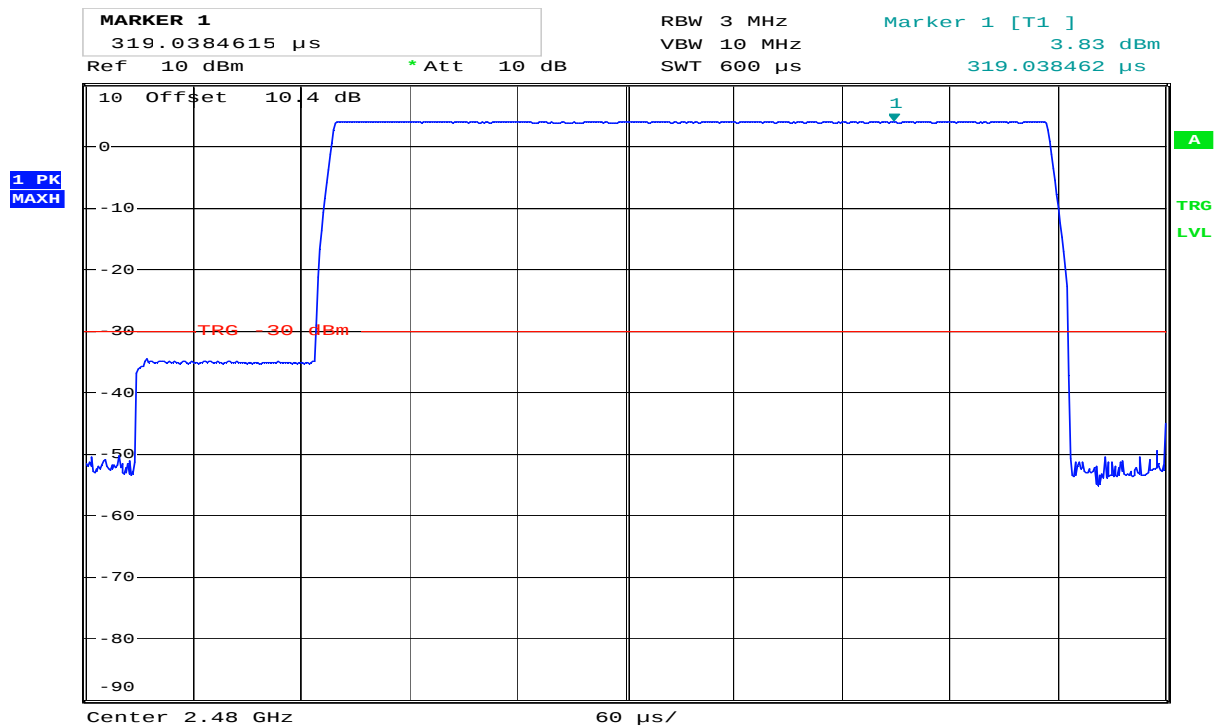
Date: 24.JAN.2012 09:50:24

Conducted Output Power, 2441MHz



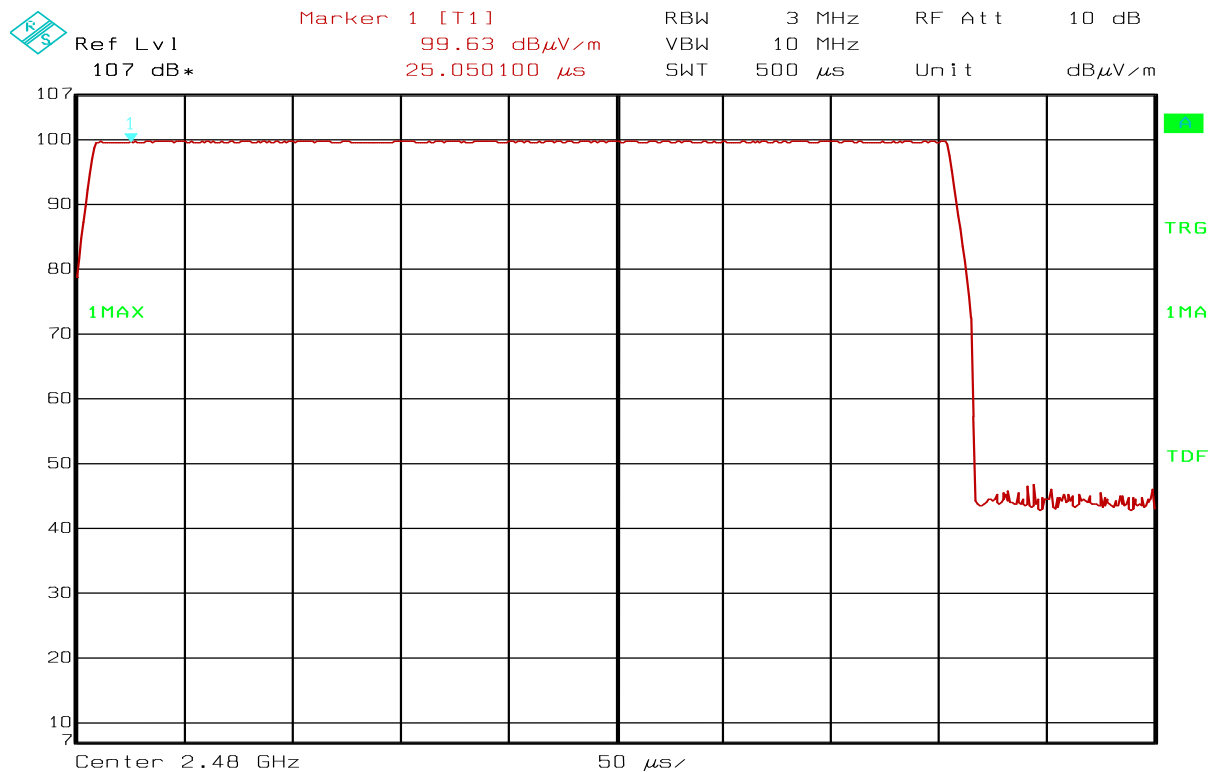
Date: 23.JAN.2012 13:25:45

Maximum Field Strength, 2441MHz (Max: EUT V, VP)



Date: 24.JAN.2012 09:54:49

Conducted Output Power, 2480MHz



Date: 23.JAN.2012 13:27:24

Maximum Field Strength, 2480MHz (Max: EUT V, VP)

4.8 Spurious Emissions (Radiated)

Para. No.: 15.247 (c)

Test Performed By: Frode Sveinsen

Date of Test: 23 Jan 2012

Test Results: Complies

Measurement Data:

Band-edge, Peak Detector

Frequency	Field Strength, dB μ V/m		Limit	Margin
GHz	Hopping Off	Hopping On	dB	dB
2.39	44.7	43.4	74	29.3
2.4835	55.5	55.0	74	18.5

Band-edge, Average Detector

Frequency	Field Strength, dB μ V/m		Limit	Margin
GHz	Hopping Off	Hopping On	dB	dB
2.39	24.7	23.4	54	29.3
2.4835	35.5	35.0	54	18.5

See plots.

Maximum Duty Cycle Correction Factor according to Para 15.35 (b): 20 dB

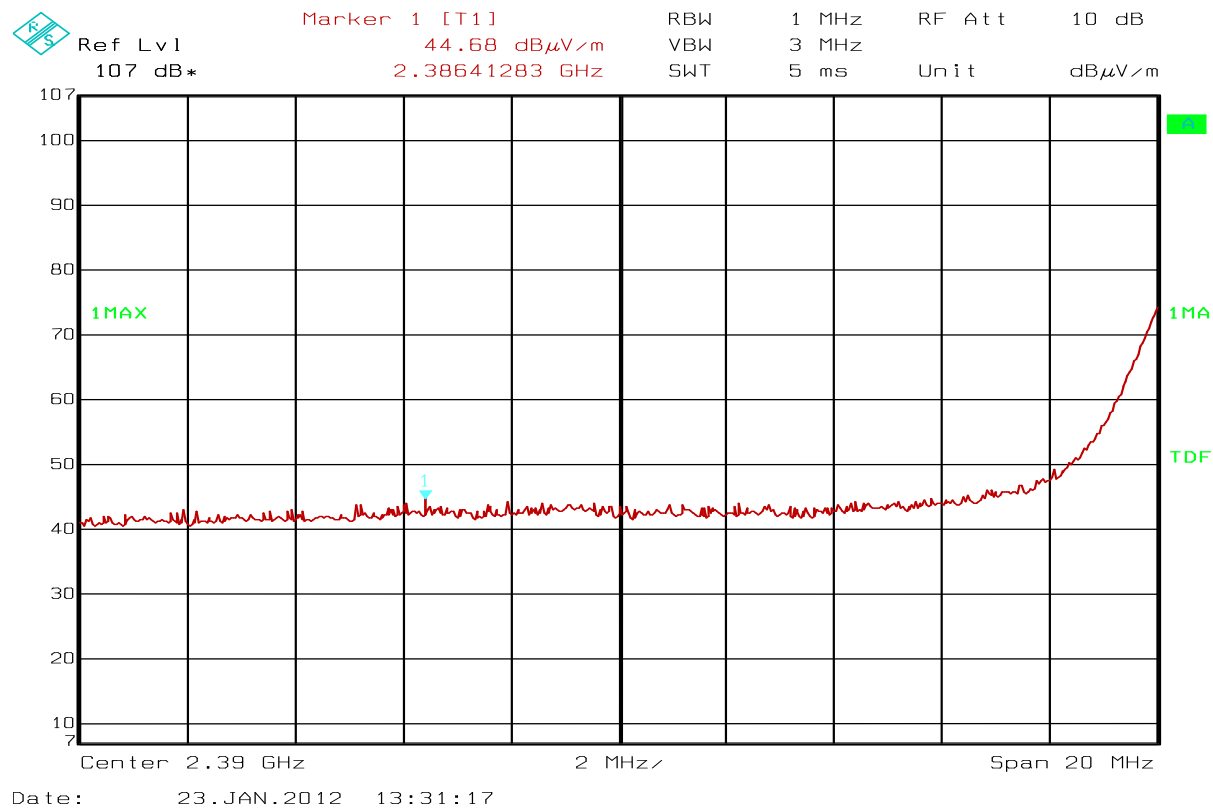
RF conducted power to 25 GHz see plots.

Maximum RF level outside operating band:

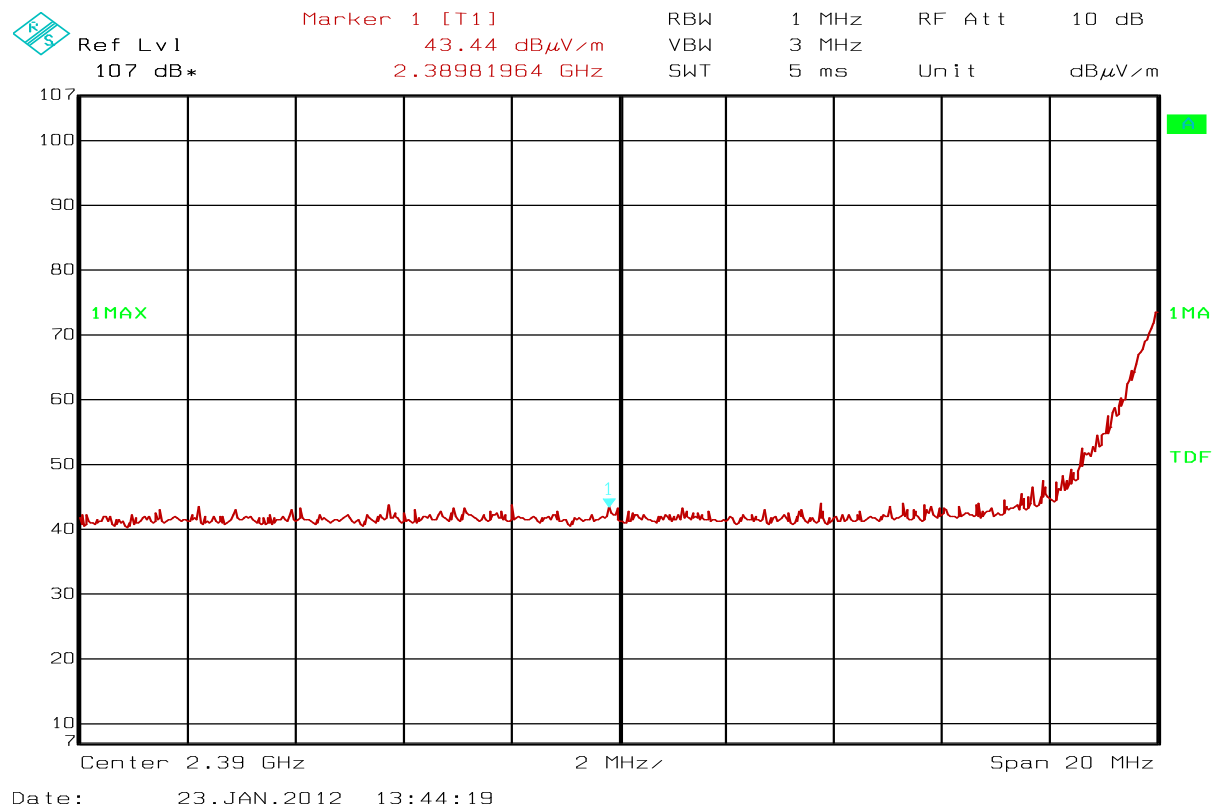
2402MHz: >40 dB/C, margin >20 dB

2441MHz: >40 dB/C, margin >20 dB

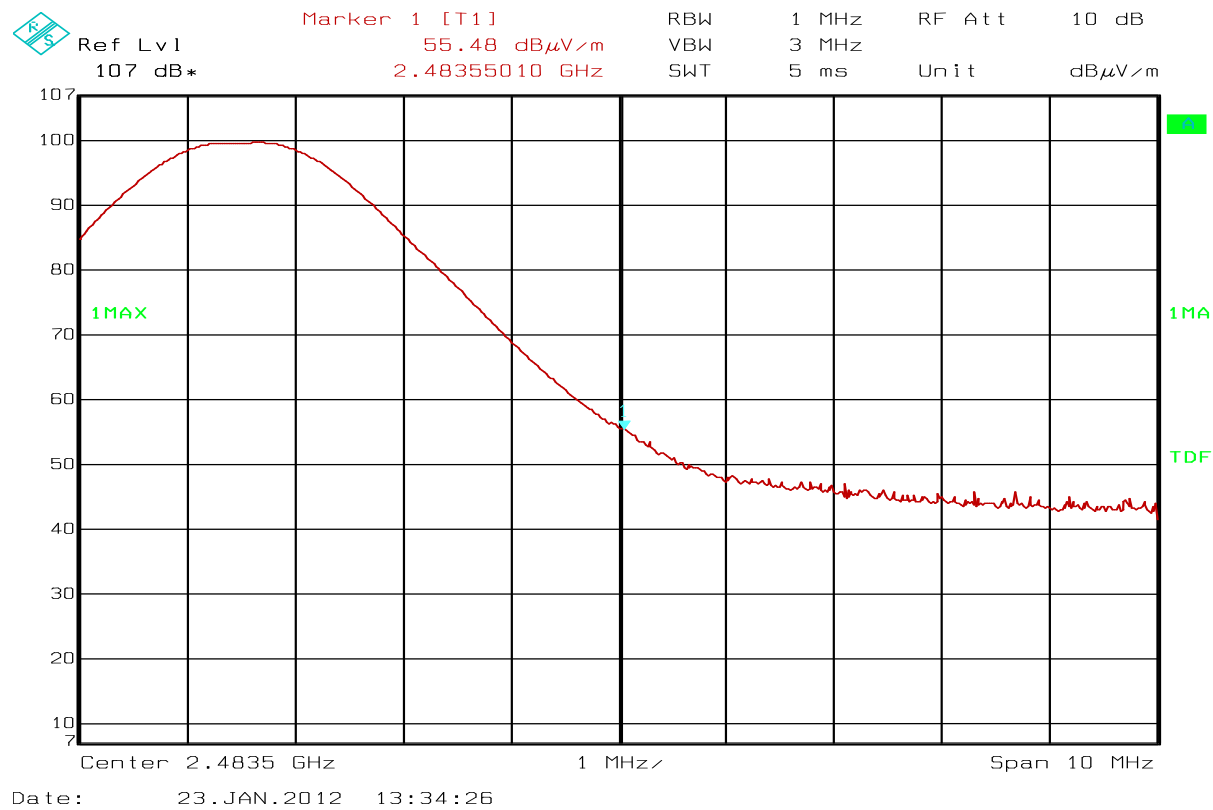
2480MHz: >40 dB/C, margin >20 dB



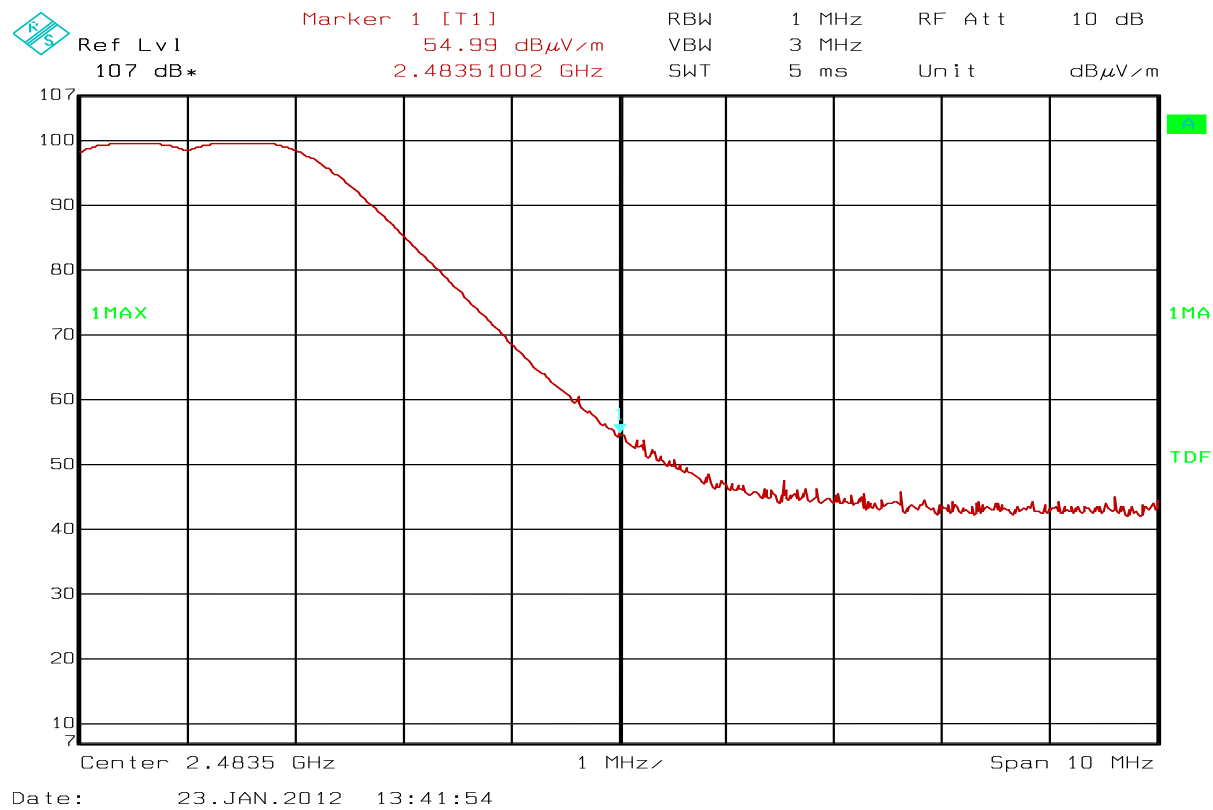
Band Edge, Lower Channel, Hopping OFF



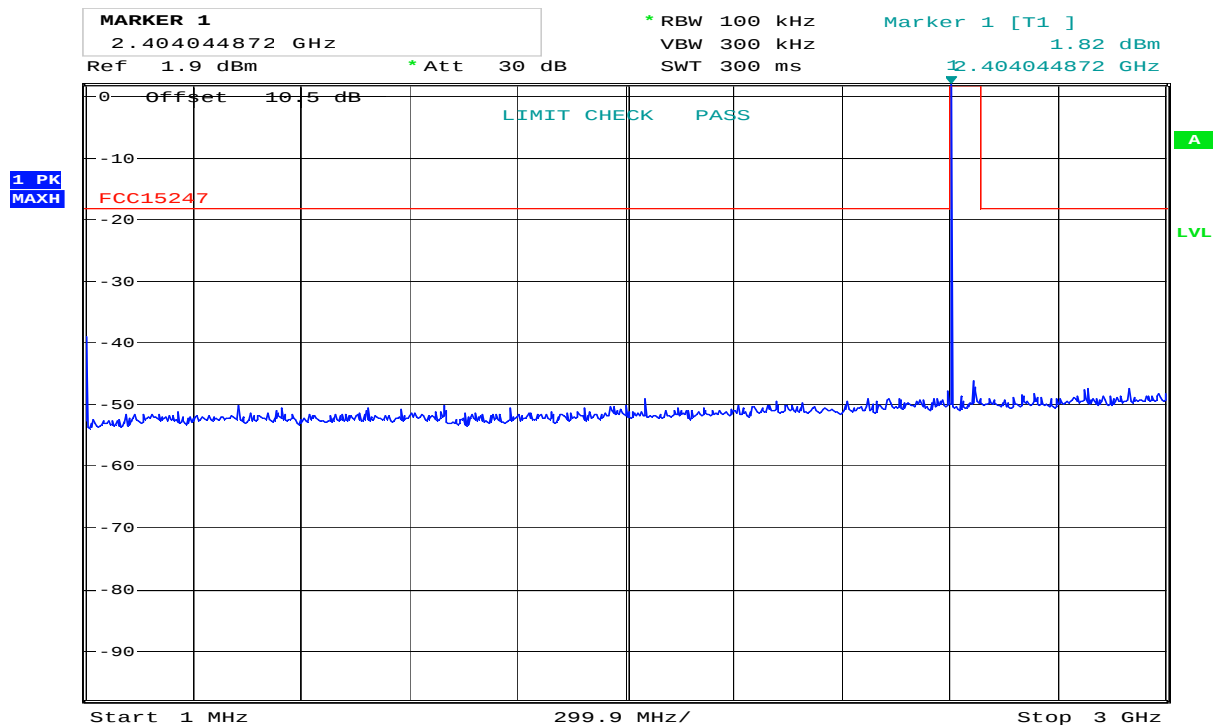
Band Edge, Lower Channel, Hopping ON



Band Edge, Upper Channel, Hopping OFF

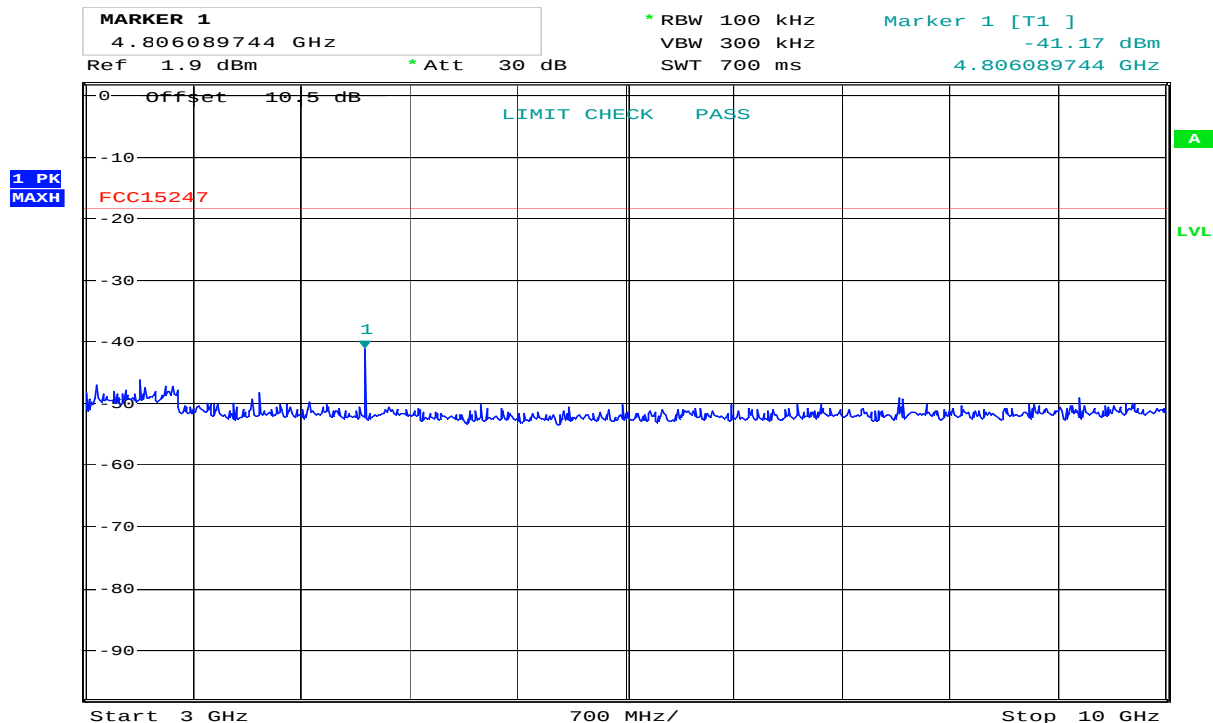


Band Edge, Upper Channel, Hopping ON



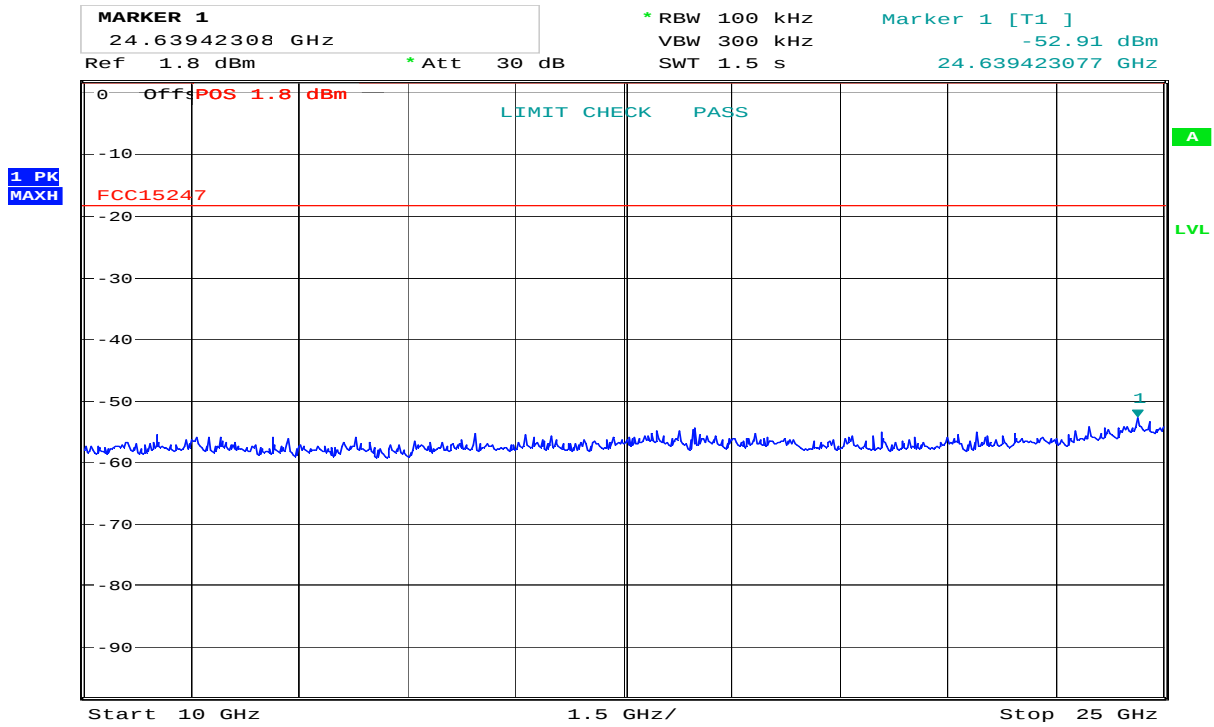
Date: 24.JAN.2012 10:38:40

Conducted Emissions, 2402MHz, 1 -3000 MHz



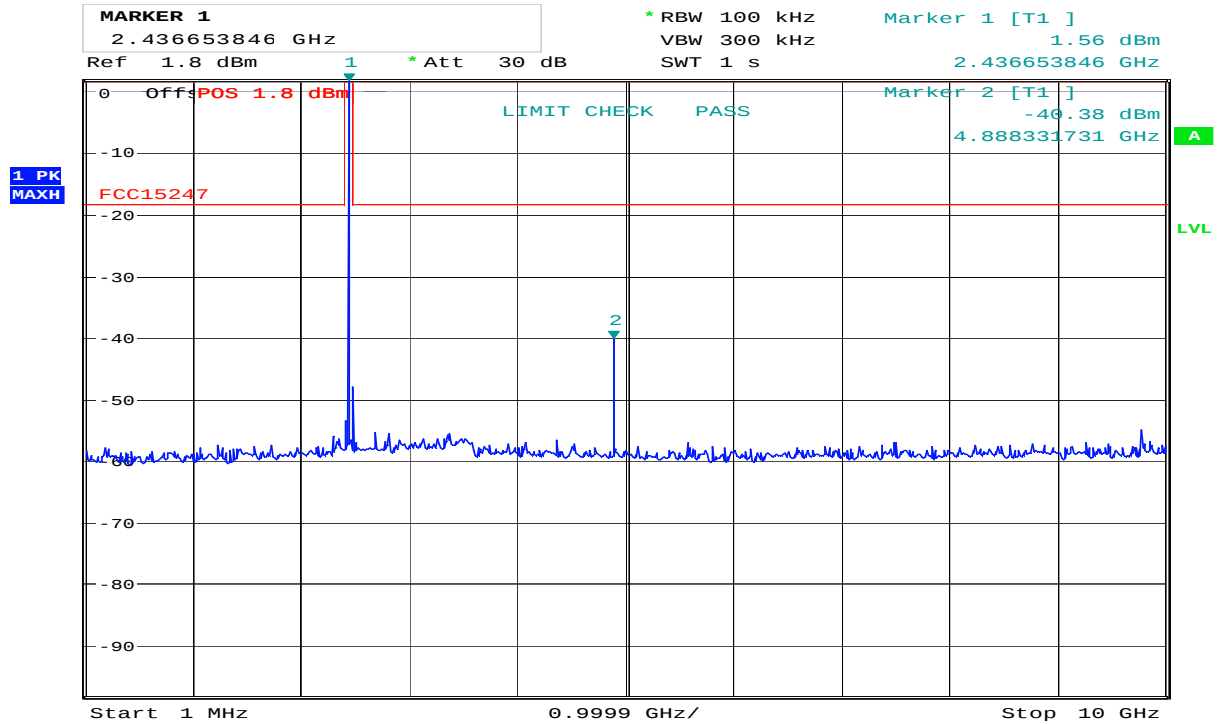
Date: 24.JAN.2012 10:39:21

Conducted Emissions, 2402MHz, 3000 -10000 MHz



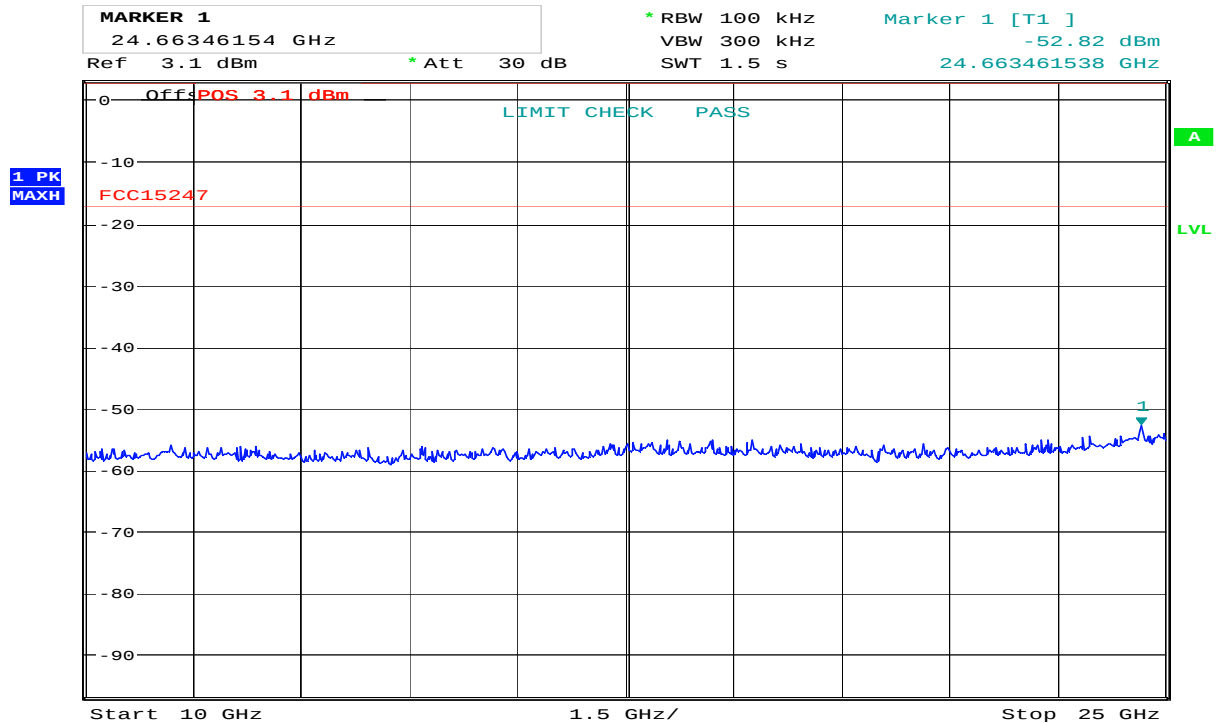
Date: 24.JAN.2012 10:26:14

Conducted Emissions, 2402MHz, 10000 -25000 MHz



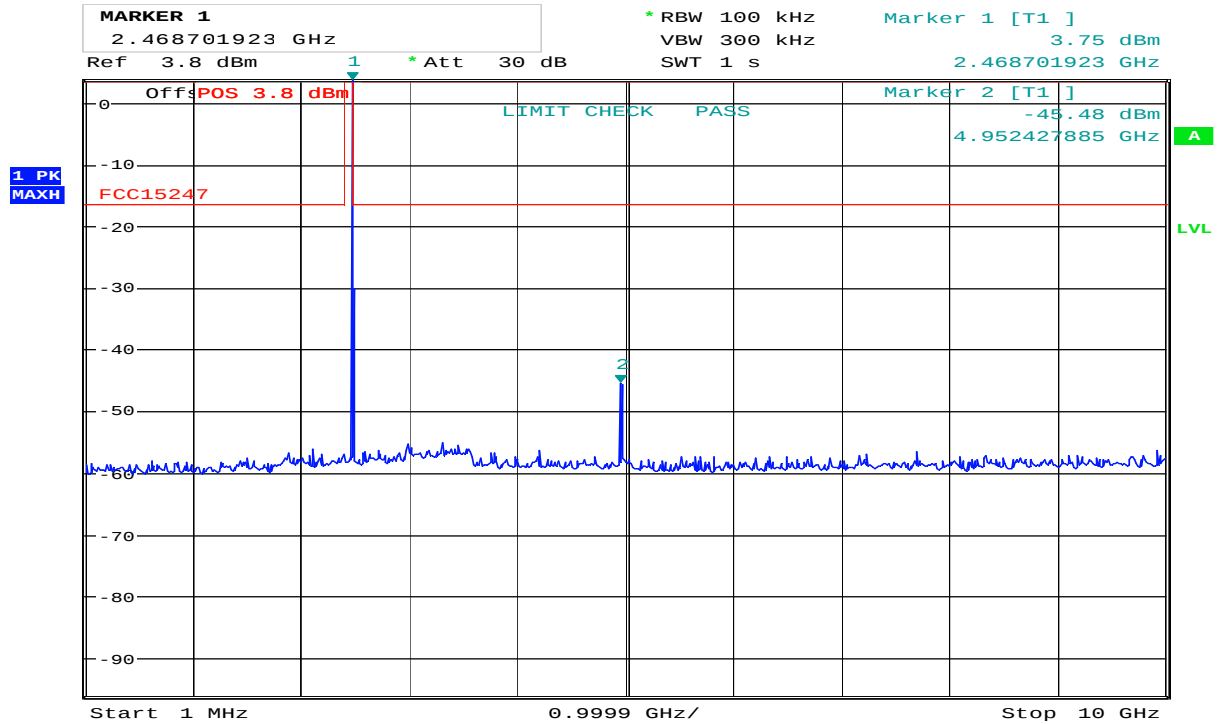
Date: 24.JAN.2012 10:22:38

Conducted Emissions, 2441MHz, 1 -10000 MHz



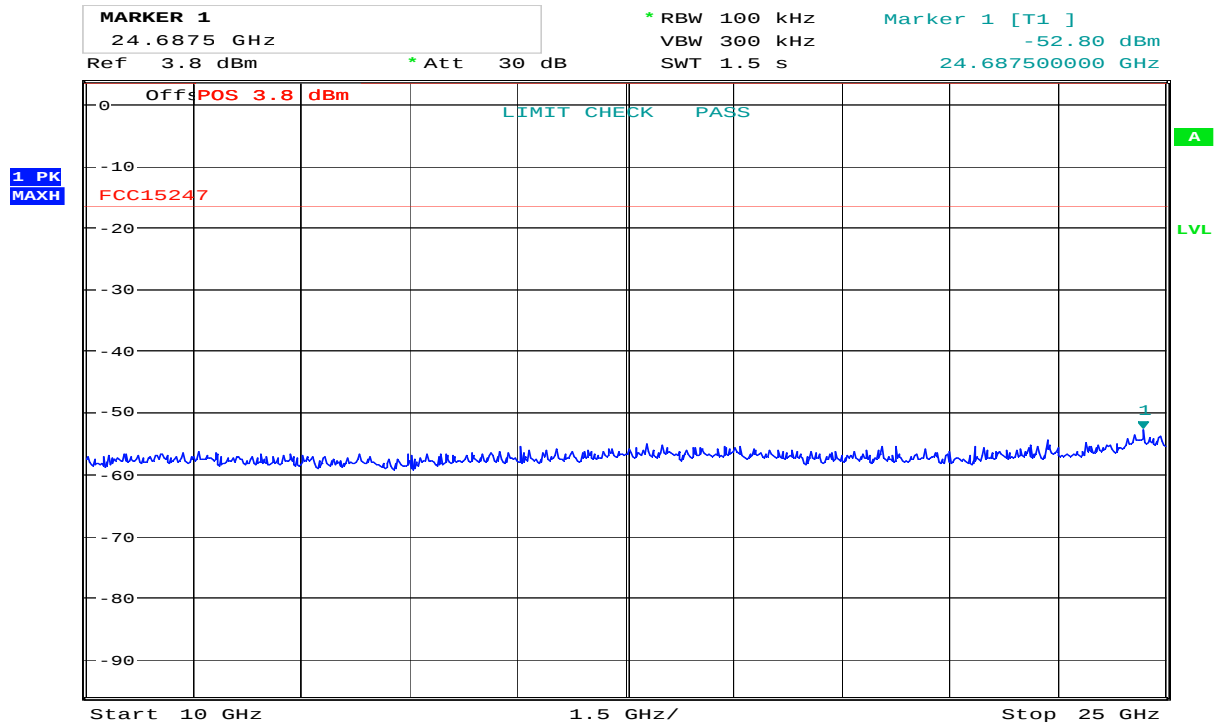
Date: 24.JAN.2012 10:29:59

Conducted Emissions, 2441MHz, 10000 -25000 MHz



Date: 24.JAN.2012 10:24:04

Conducted Emissions, 2480MHz, 1 -10000 MHz



Date: 24.JAN.2012 10:30:42

Conducted Emissions, 2480MHz, 10000 -25000 MHz

Radiated emissions 10 kHz-30 MHz.

Measuring distance 10 m, measured with Peak detector.

No component detected, see plot.

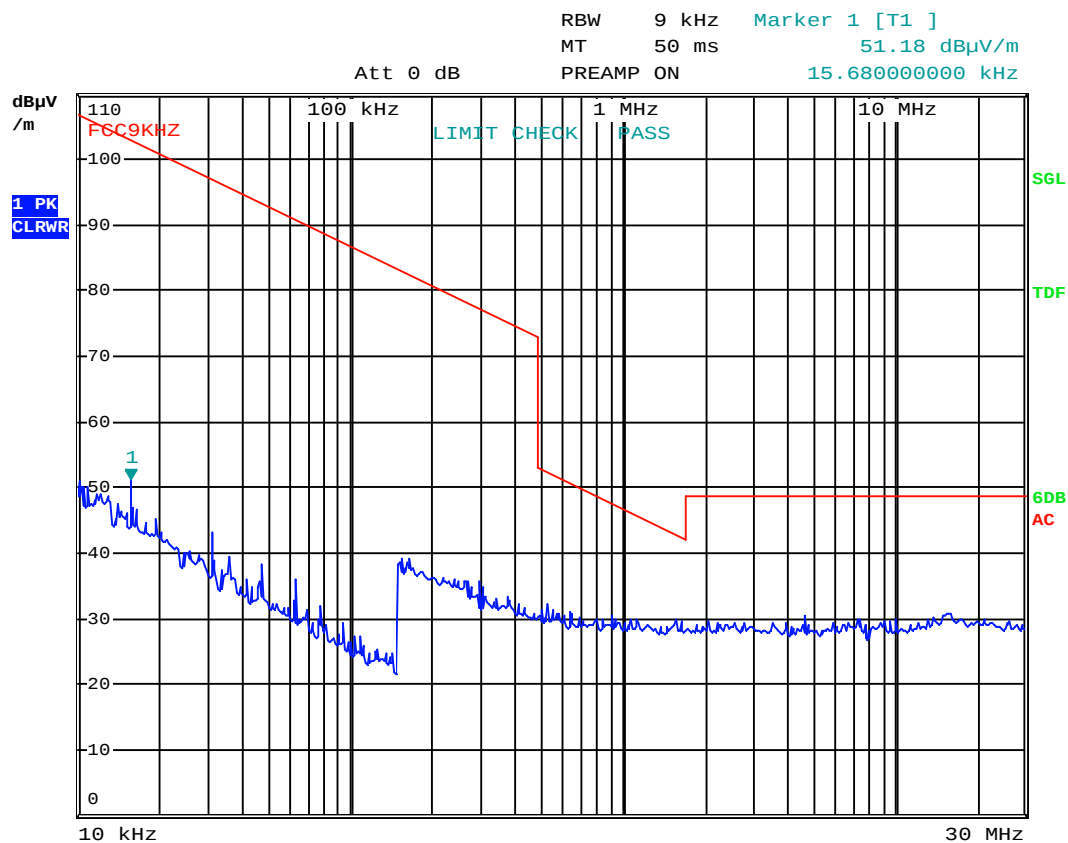
Limit is converted to 10 m using 40 dB/decade according to 15.31 (f) (2).

Radiated emission 30 – 1000 MHz.

Detector: Peak

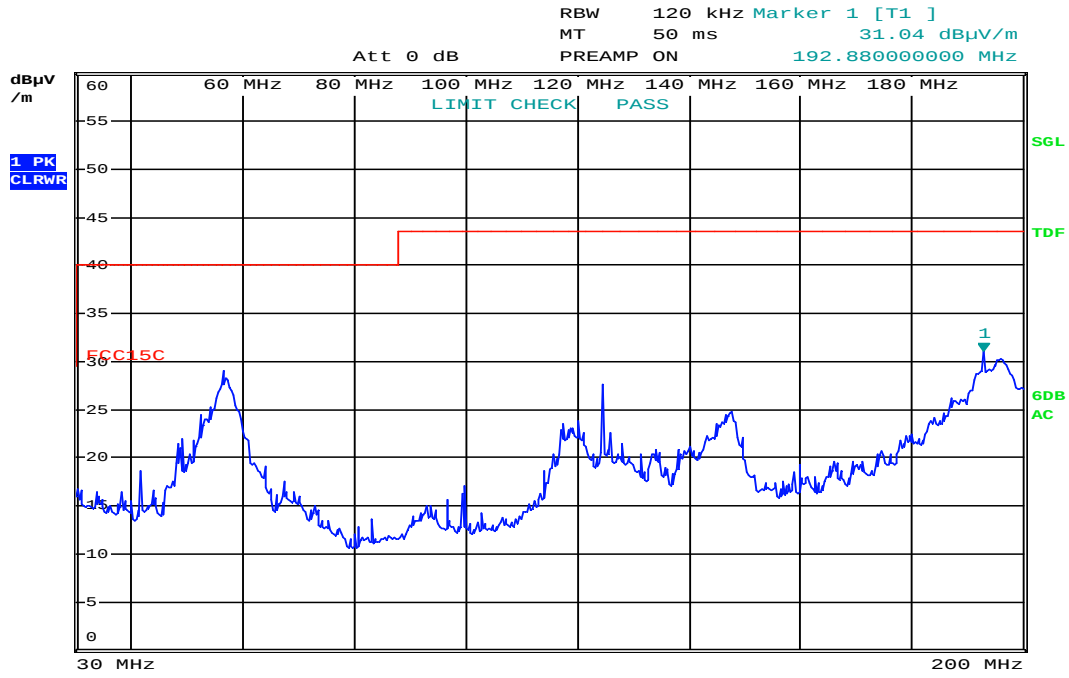
Measuring distance 3m.

No component detected, see plot.



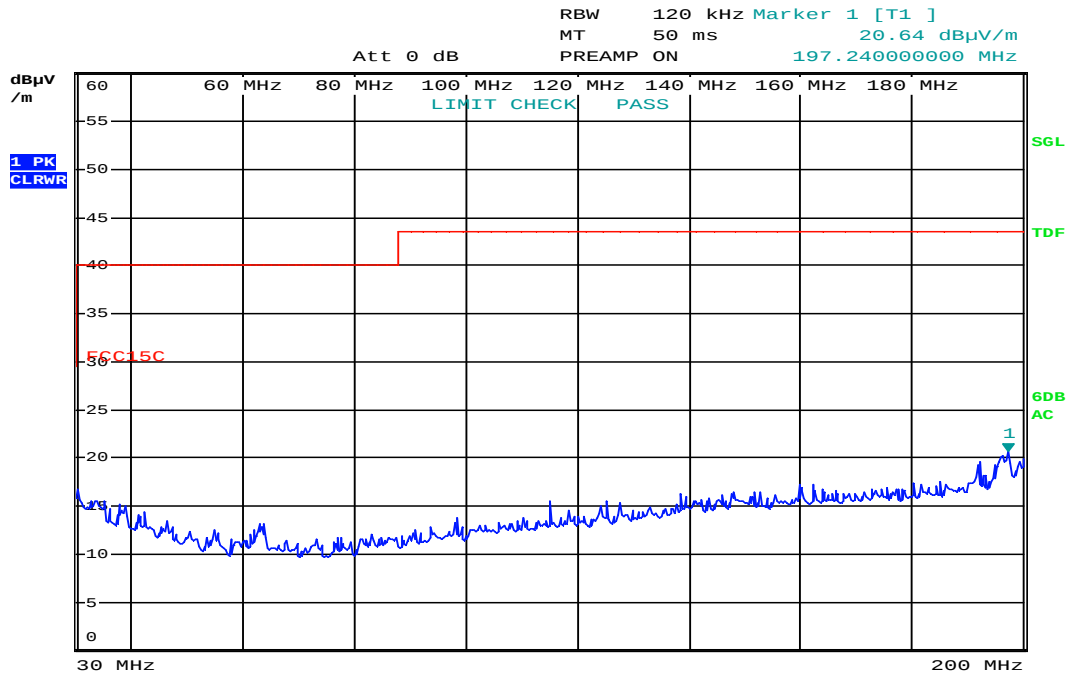
Date: 23.JAN.2012 16:58:42

Radiated Emissions, 0.010 -30MHz



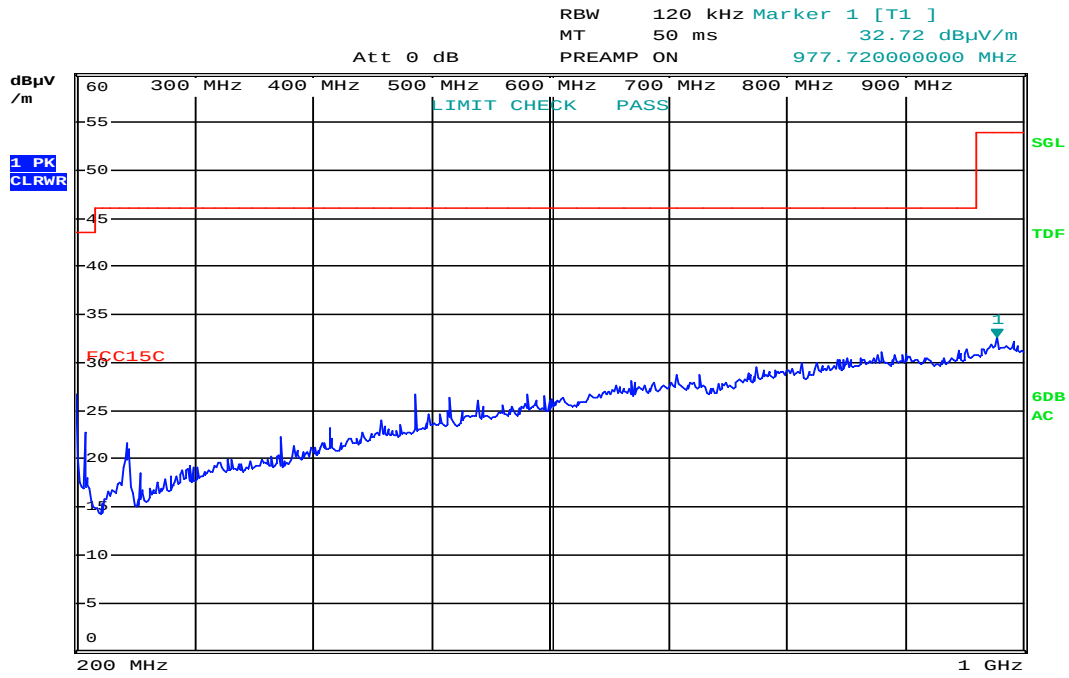
Date: 23.JAN.2012 15:35:43

Radiated Emissions, 30 -200MHz, VP



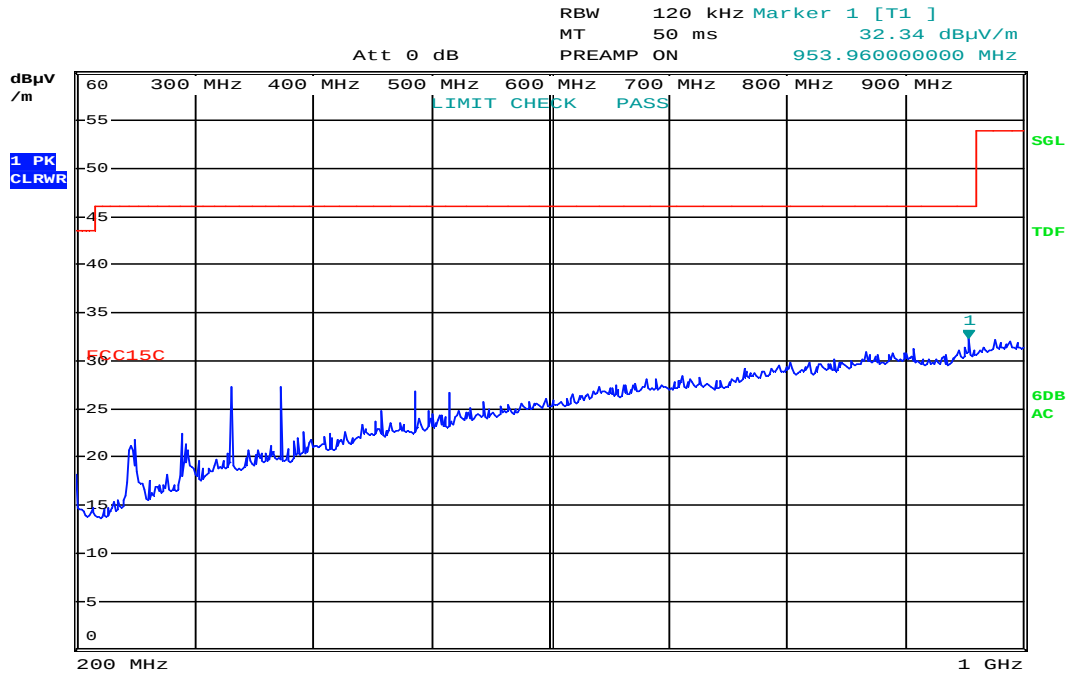
Date: 23.JAN.2012 15:39:55

Radiated Emissions, 30 -200MHz, HP



Date: 23.JAN.2012 15:06:39

Radiated Emissions, 200 -1000MHz, VP



Date: 23.JAN.2012 15:25:04

Radiated Emissions, 200 -1000MHz, HP

Radiated Emissions, 1-25 GHz

Measuring distance: 3m (1 – 8.5 GHz)
1m (8.5 – 18 GHz)

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

Peak Detector:

Frequency	RF channel	Field strength, Peak Detector, 3m	Limit	Margin
GHz	L,M,H	dB μ V/m	dB μ V/m	dB
4804	L	62.9	74	11.1
4882	M	64.1	74	9.9
4960	H	63.6	74	10.4
Other freqs	L,M,H	None detected	74	>20

Average Detector:

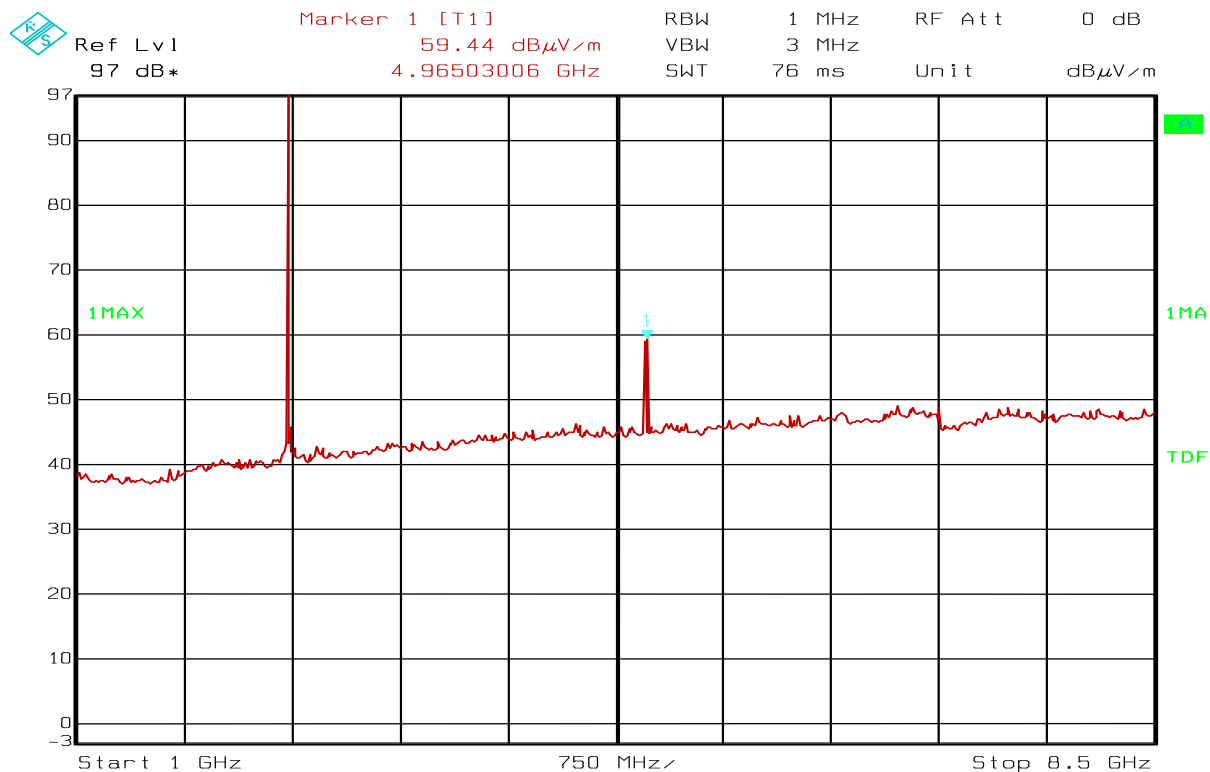
Frequency	RF channel	Field strength, Average Detector, 3m	Limit	Margin
GHz	L,M,H	dB μ V/m	dB μ V/m	dB
4804	L	42.9	54	11.1
4882	M	44.1	54	9.9
4960	H	43.6	54	10.4
Other freqs	L,M,H	None detected	54	>20

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

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

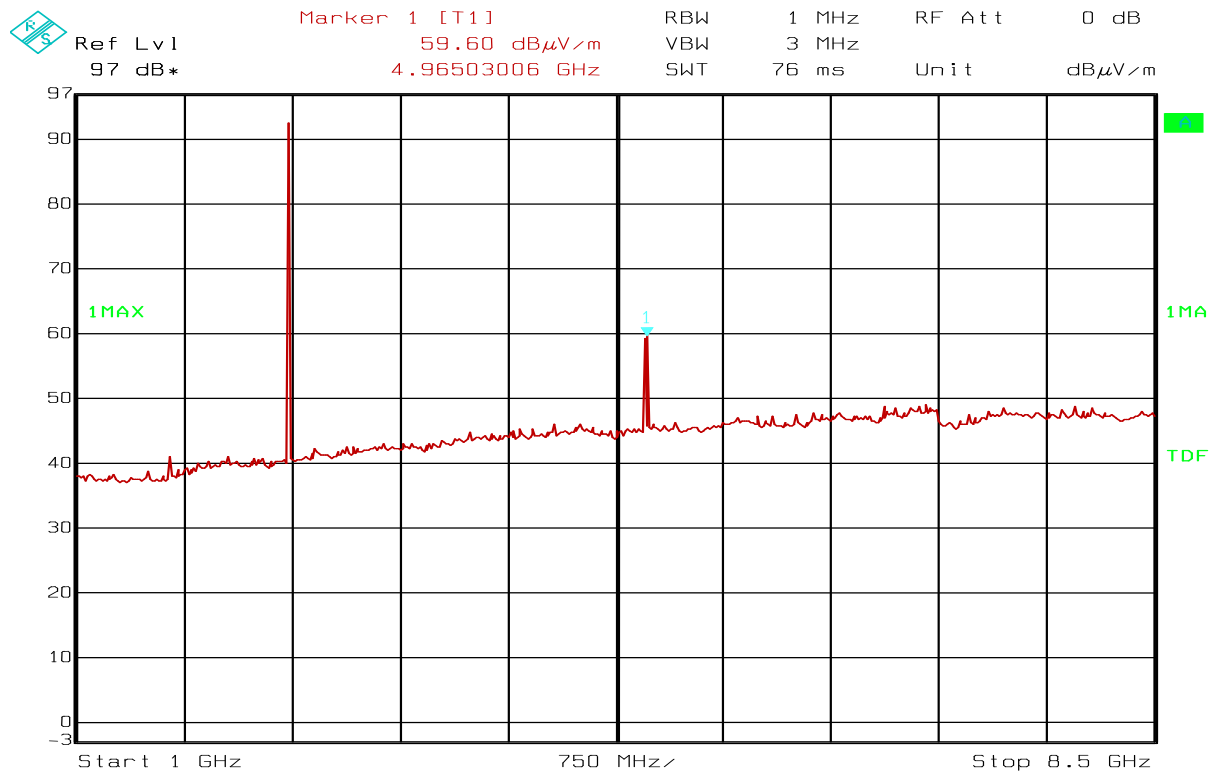
Distance correction factor is included in the plots at 1m.

See plots.



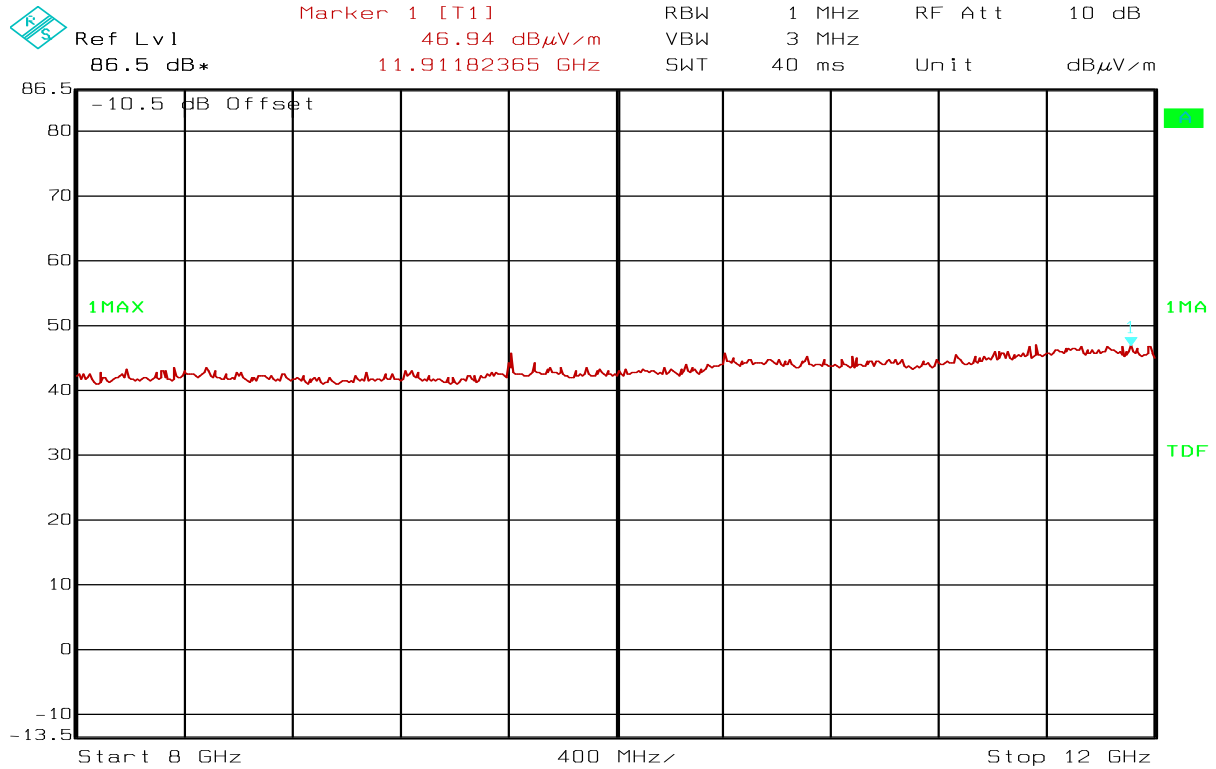
Date: 23.JAN.2012 14:13:17

Radiated Emissions, 1000 -8500MHz, VP



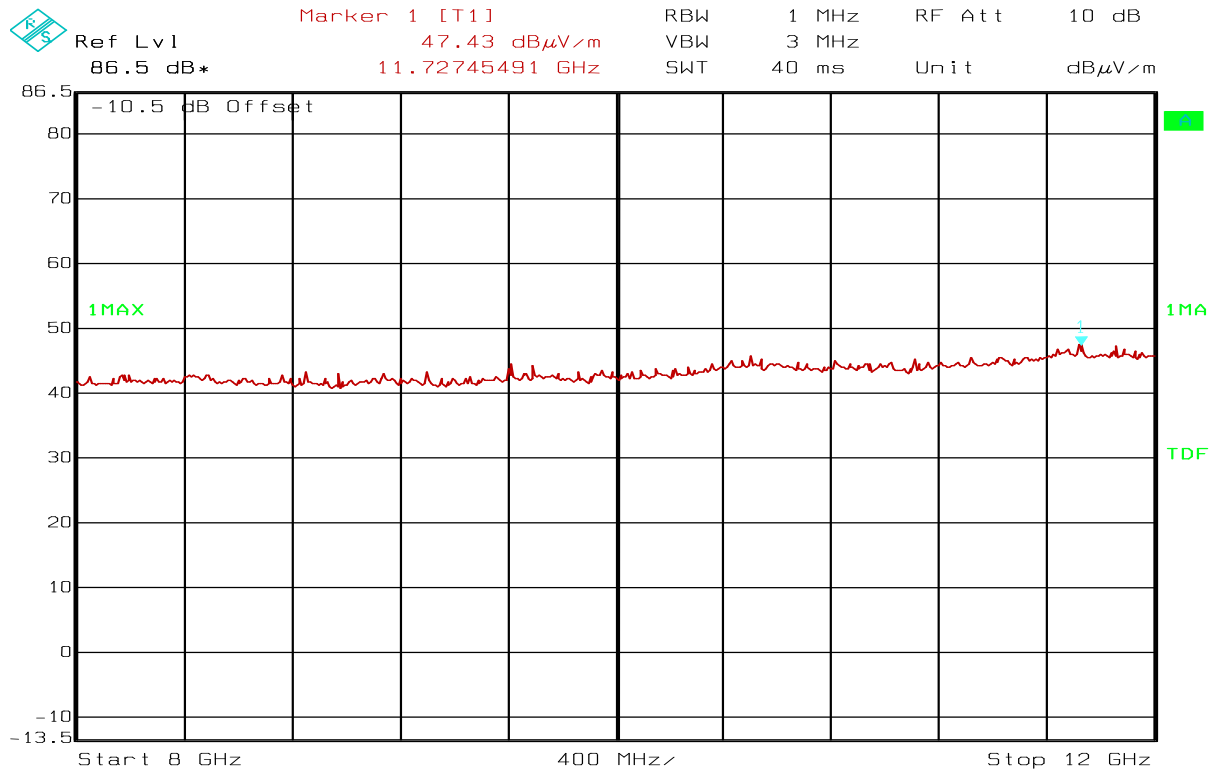
Date: 23.JAN.2012 14:16:17

Radiated Emissions, 1000 -8500MHz, HP



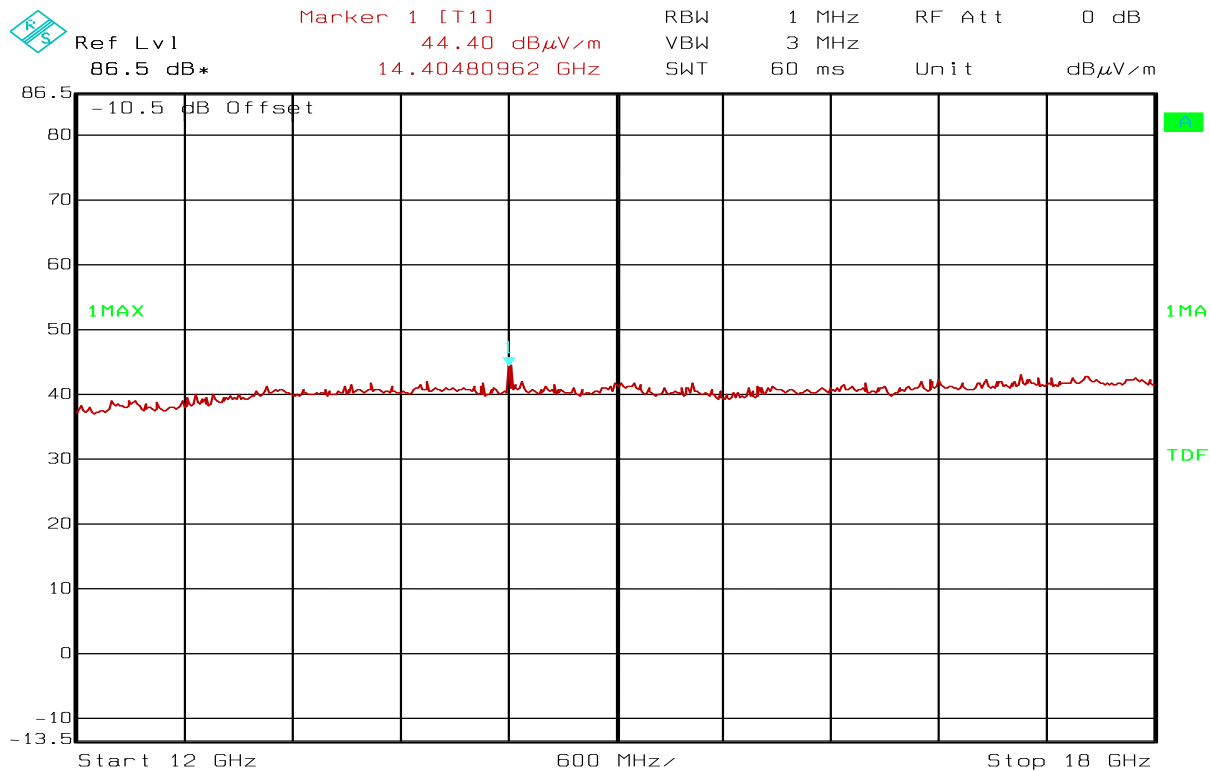
Date: 23.JAN.2012 15:16:15

Radiated Emissions, 8000 -12000MHz, VP



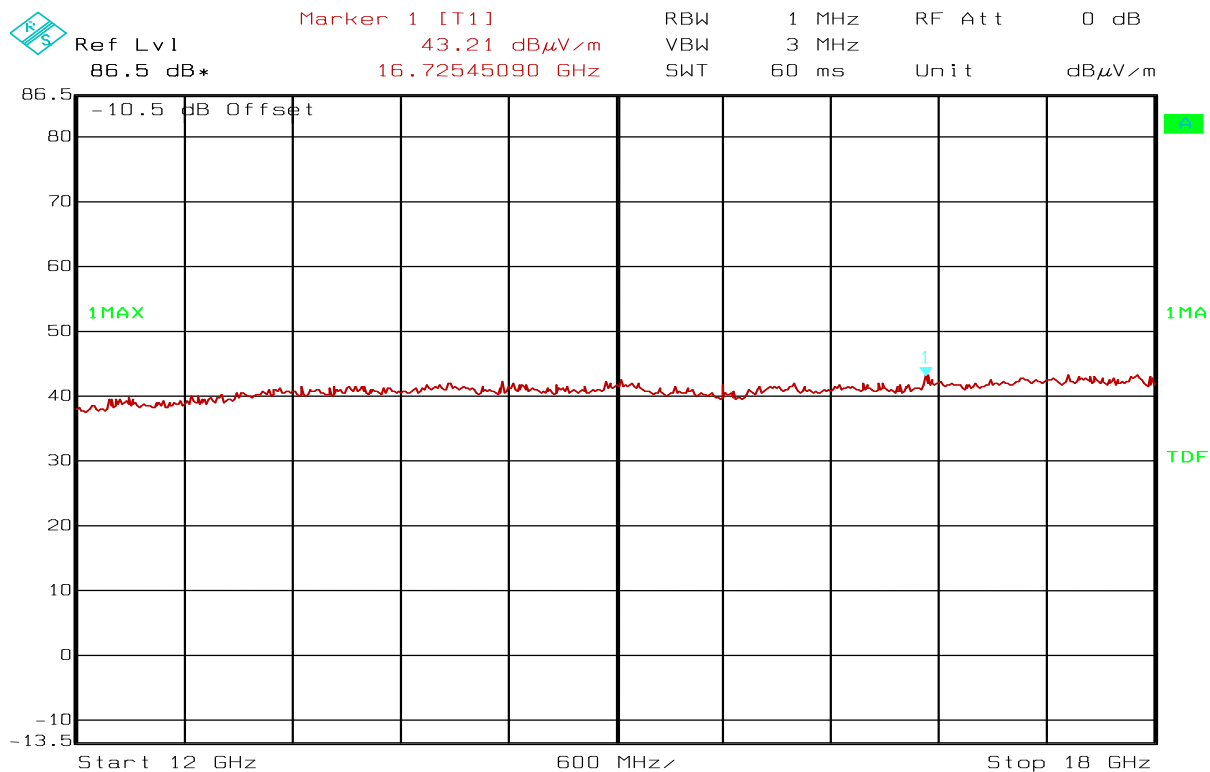
Date: 23.JAN.2012 15:19:12

Radiated Emissions, 8000 -12000MHz, HP



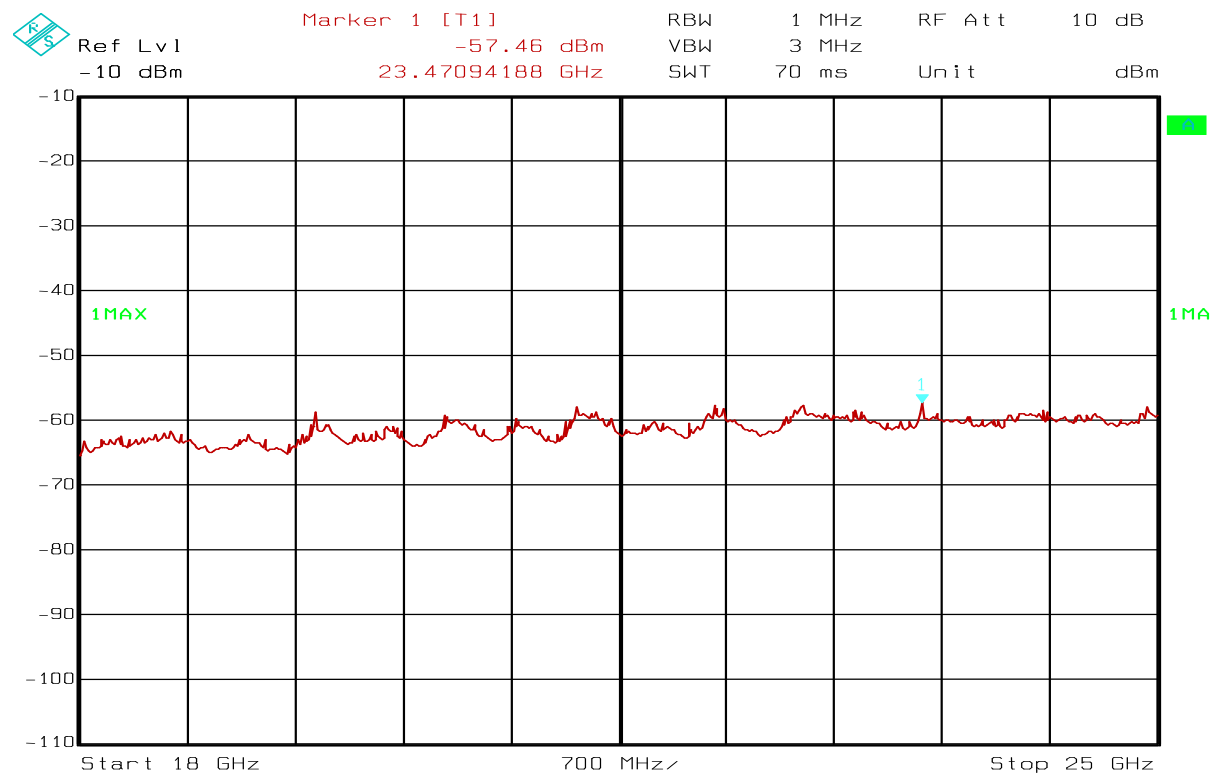
Date: 23.JAN.2012 15:37:02

Radiated Emissions, 12000 -18000MHz, VP



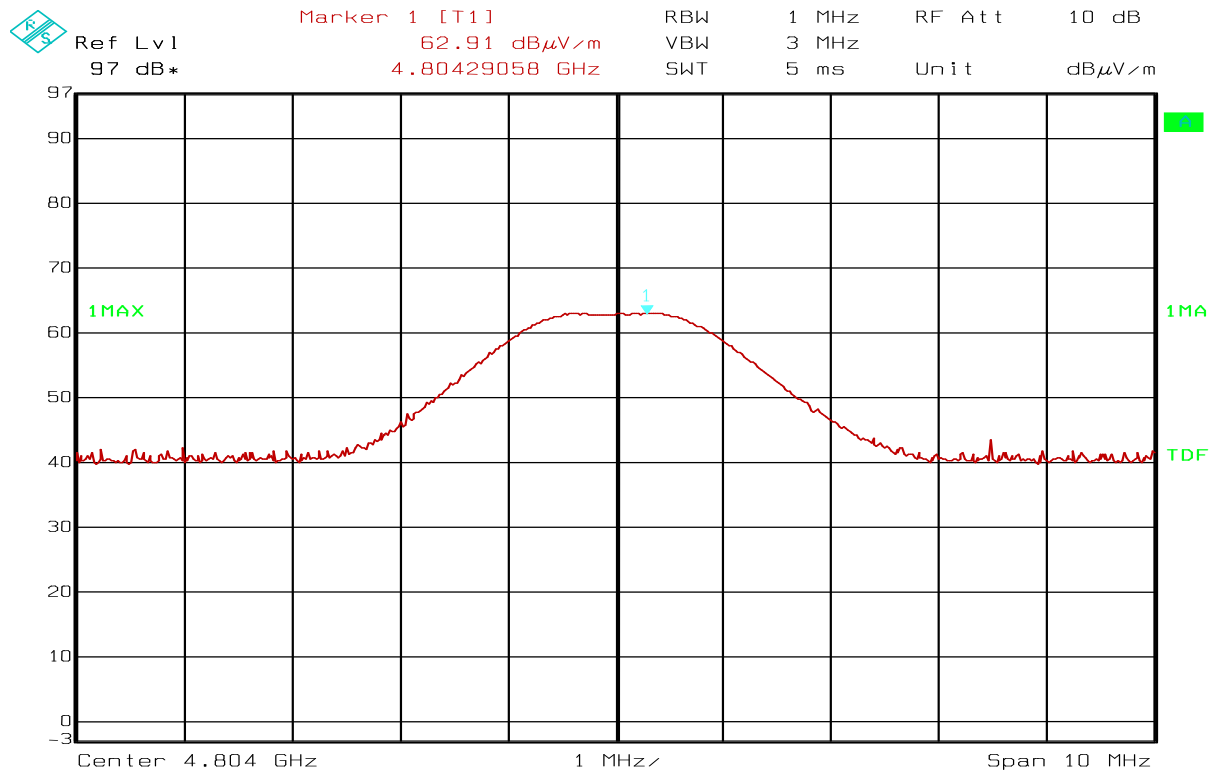
Date: 23.JAN.2012 15:33:56

Radiated Emissions, 12000 -18000MHz, HP



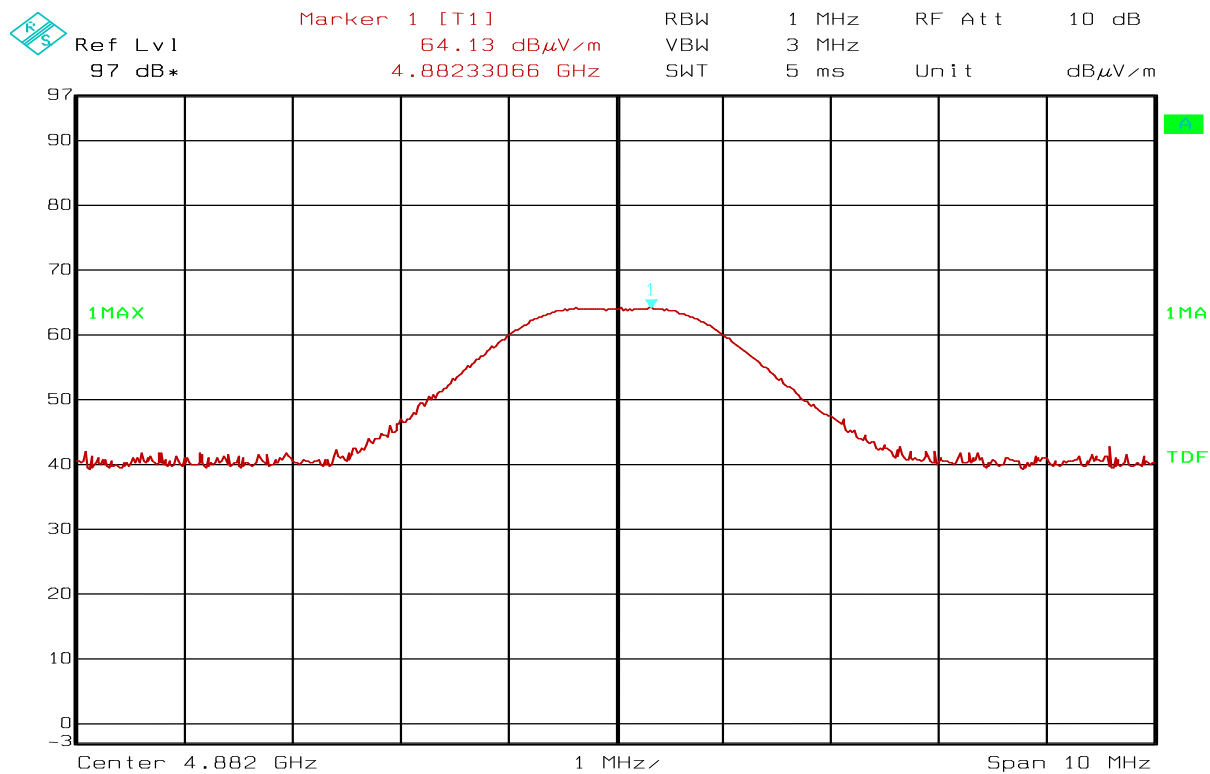
Date: 23.JAN.2012 18:28:25

Pre-scan, 18000 -25000MHz



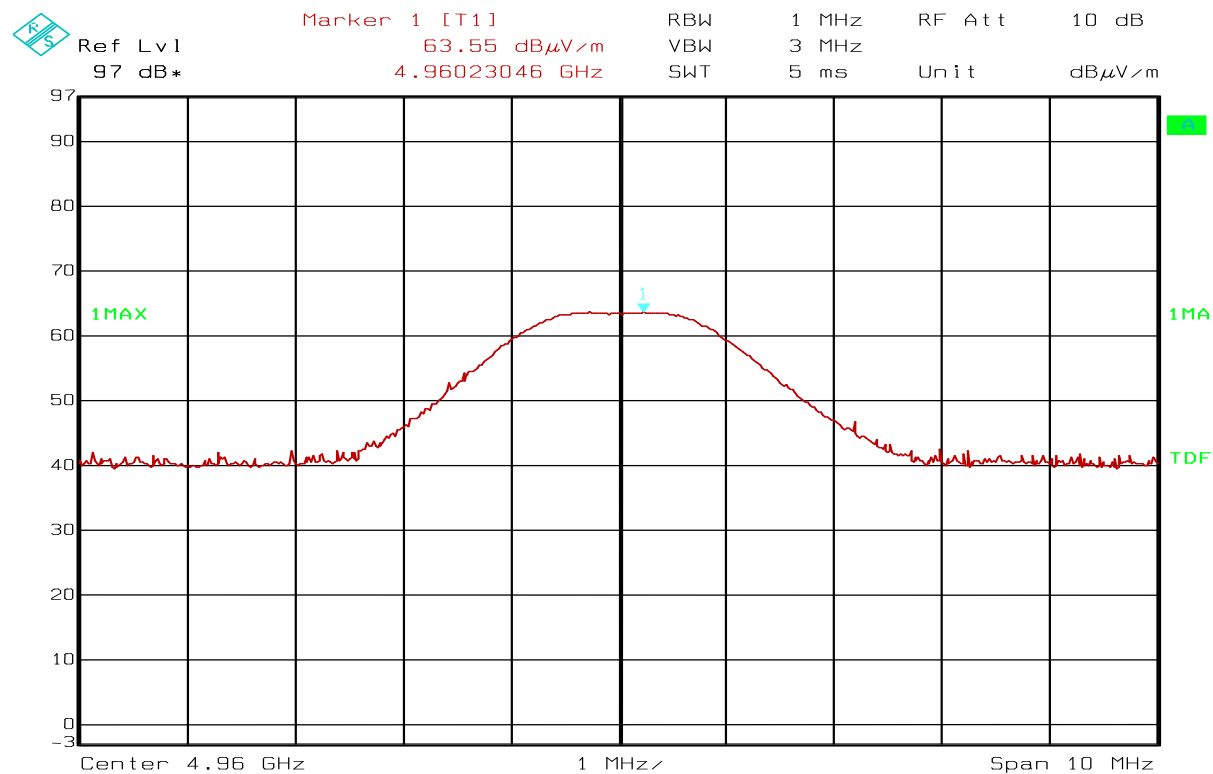
Date: 23.JAN.2012 14:58:37

Radiated Emissions, 4804MHz, HP



Date: 23.JAN.2012 14:52:49

Radiated Emissions, 4882MHz, HP



Date: 23.JAN.2012 14:40:19

Radiated Emissions, 4960MHz, VP

4.9 Power Spectral Density (PSD)

Para. No.: 15.247 (d)

Test Performed By: Frode Sveinsen

Date of Test: 24 Jan 2012

Test Results: Passed

Measured and Calculated Data:

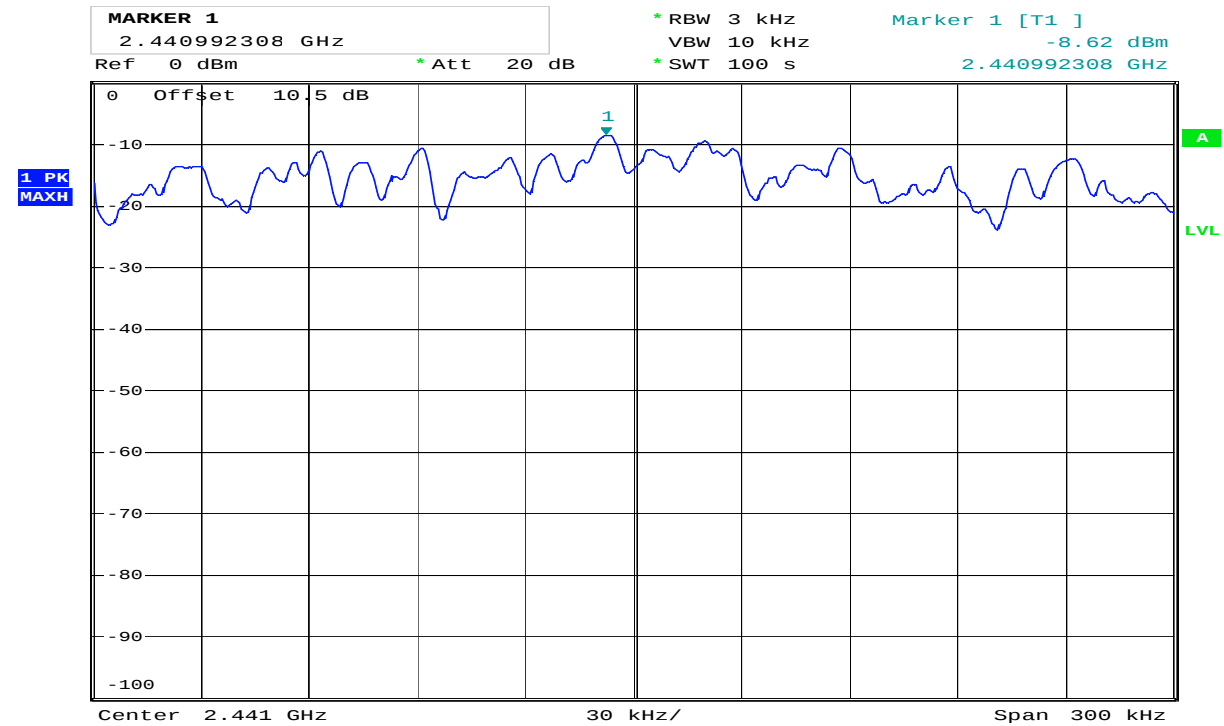
The alternative test procedures in point 2) A , B and formula 1 described in guidance on measurements for Digital Transmission Systems is used.

	2402 MHz	2441 MHz	2480 Mhz
Measured value (dBm)	/	-8.6	/

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: 24.JAN.2012 10:50:27

Power Spectral Density, 2441MHz

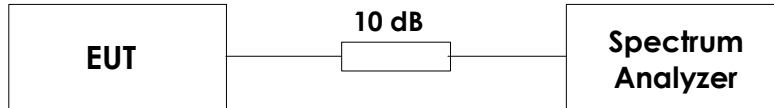
5 LIST OF TEST EQUIPMENT

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

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSEK30	Spectrum Analyzer	Rohde & Schwarz	LR 1337	2010.12.15	2012.12.15
2	ESHS10	Measuring Receiver	Rohde & Schwarz	N- 3528	2011-06	2012-06
3	6810.17B	Attenuator	Suhner	LR1212	2010.09.15	2012.09.15
4	ESH3-Z5	Two Line V-Network	Rohde & Schwarz	LR 1076	2011.11.03	2013.11.03
5	80S	Signal Generator	Powertron	LT 502	Cal b4 use	
6	6812B	AC Power Source	Agilent	LR 1515	2011.04.13	2012.04.13
7	ESH3-Z2	Pulse Limiter	Rohde & Schwarz	LR 1074	2010.03.03	2012.03.03
8	ESCI	Measuring Receiver	Rohde & Schwarz	N-4259	2011.12.21	2012.12.21
9	HK116	Biconical Antenna	Rohde & Schwarz	LR 1260	2010.05.12	2013.05.12
10	HL223	Log Period Antenna	Rohde & Schwarz	LR 1261	2010.05.12	2013.05.12
11	3115	Horn Antenna	EMCO	LR 1330	2010.08.05	2013.08.05
12	8449B	Pre-amplifier	Hewlett Packard	LR 1322	2011-09-27	2012-09-27
14	HFH2-Z2	Loop Antenna	Rohde & Schwarz	LR 285	2010-10-08	2013-10-08
15	PM7320X	Antenna horn	Siverts lab	LR 103	2009.01.26	2012.01.26
16	DBF-520-20	Antenna horn	Systron Donner	LR 101	2009.01.26	2012.01.26
17	638	Antenna horn	Narda	LR 098	2010.06.17	2015.06.17
18	FSU26	Spectrum Analyzer	Rohde & Schwarz	LR 1504	2011.11.03	2013.11.03
19	Model 87 V	Multimeter	Fluke	LR 1600	2010.12.15	2012.12.15

6 BLOCK DIAGRAM

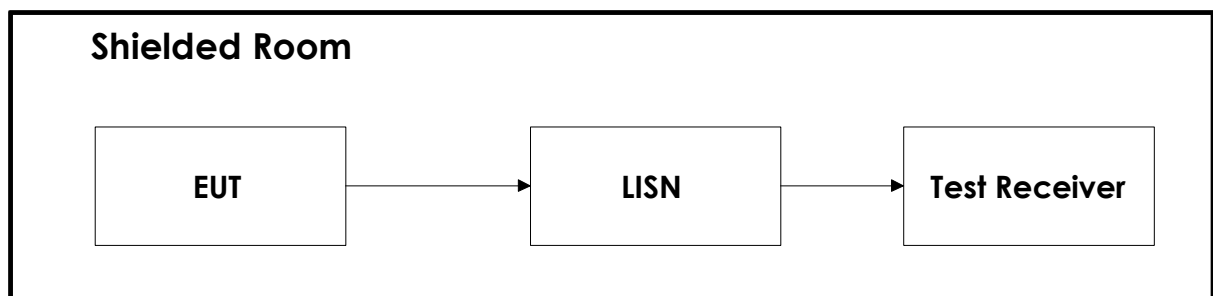
6.1 Conducted Tests



Test equipment included: 3, 6, 18

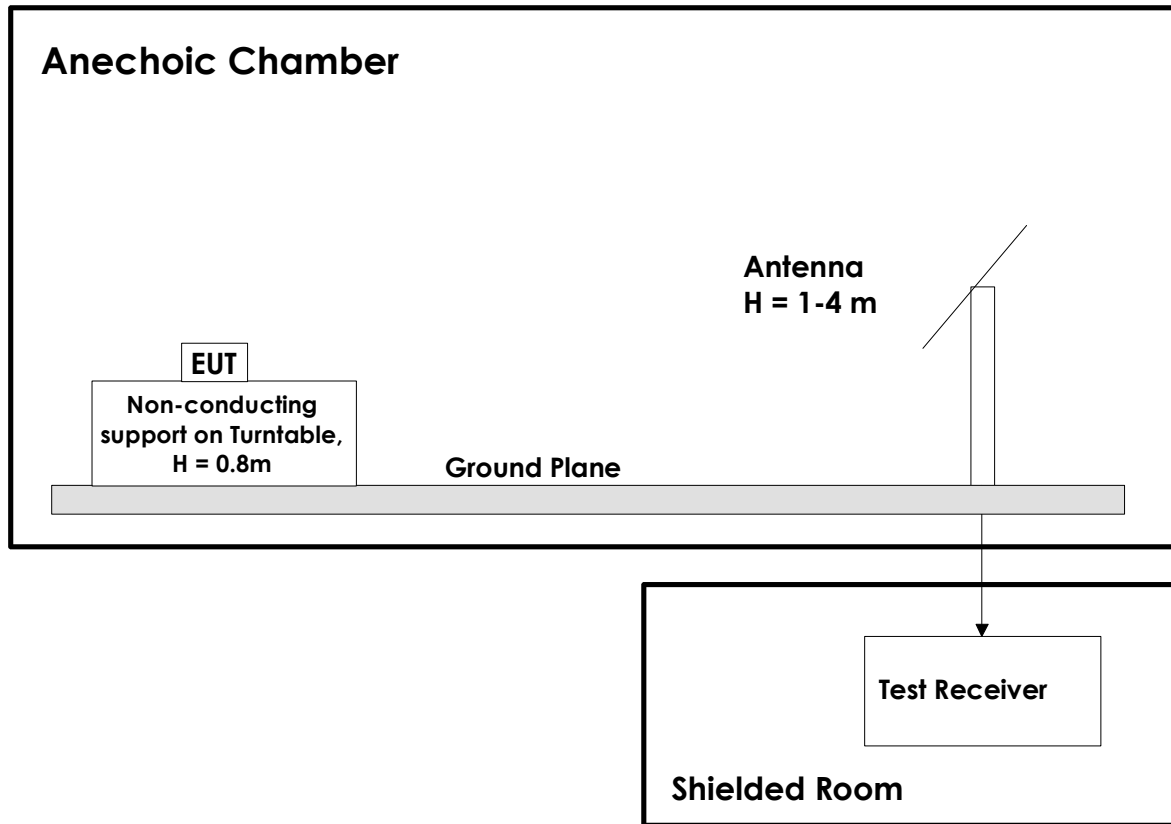
This setup is used for all measurements on 50 ohm antenna connector.

6.2 Power Line Conducted Emission



Test equipment: 2, 4, 5, 7, 19

6.3 Test Site Radiated Emission



Test equipment: 1, 6, 8, 9, 10, 11, 12, 14, 15, 16, 17, 19

This test setup is used for all radiated emissions tests. For frequencies below 30 MHz the measuring distance is 10 m, for all other frequencies it is 3m or 1m. Emissions above 1 GHz were measured with a Spectrum Analyzer and Horn Antenna and with the preamplifier after the antenna. For measurements above 18 GHz the test receiver is moved inside the anechoic chamber and located next to the antenna to minimize the cable loss.