

Test report no. : 208041-3

Item tested : RTX4100

Type of equipment : WLAN Module

FCC ID : S9J4100

Client : RTX A/S

FCC Part 15.247

Frequency Hopping Transmitters /
Digital Transmission System

RSS-210, Issue 8

Low Power Licence-Exempt
Radiocommunication Devices

2012-09-14

Authorized by :

Geir Antonsen
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: 89

1.2 Client Information

Name : RTX A/S
Address : Strømmen 6,
DK-9400 Nørresundby, Denmark

Contact:

Name : Peer Wolfsen
E-mail : pew@rtx.dk
Telephone : +45 9632 2376

1.3 Manufacturer

Same as client.

2 Test Information

2.1 Test Item

Name :	RTX
FCC ID :	S9J4100
Industry Canada ID :	4979A-4100
Model/version :	RTX4100-IN (PCB antenna) RTX4100-EX (External antenna, U.FL connector) RTX4100-EC (External antenna, Edge connector)
Serial number :	/
Hardware identity and/or version:	/
Software identity and/or version :	/
Frequency Range :	2412 - 2462 MHz
Number of Channels :	11
Operating Modes :	802.11b 802.11g 802.11n (20 MHz mode only)
Type of Modulation :	DSSS (802.11b) OFDM (802.11g, 802.11n)
User Frequency Adjustment :	None
Rated Output Power :	0.062 Watts
Type of Power Supply :	Powered from host device
Antenna Connector :	U.FL (RTX4100-EX) Edge connector (RTX4100-EC)
Number of Antennas :	1
Antenna Diversity Supported :	No
MIMO Mode :	Not supported
External Antennas included in the report :	TE Connectivity 2118059-1, 2300 -3800 MHz Single Band Antenna Taoglas GW.17.07.0250E, 2.4GHz Click-in Terminal Dipole Antenna Taoglas PC17.07.0070A, Miniature 2.4GHz PCB antenna

Description of Test Item

The tested item is a 2.4GHz WLAN transceiver module.

Exposure Evaluation

The EUT is a module and the user manual contains text that it shall be mounted with a separation distance of at least 20 cm from any persons. For the purposes of exposure evaluation this EUT is a mobile or fixed device. MPE Calculation at 20 cm satisfying FCC requirements is submitted as a separate document.

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:	21.1 - 23.2 °C
Relative humidity:	41 - 46 %
Normal test voltage:	2xAAA Primary Batteries (3.0 V DC)

The EUT was powered from 2xAAA new primary batteries during all tests. The module has a voltage regulator.

The values are the limit registered during the test period.

2.3 Test Period

Item received date: 2012-08-14

Test period : from 2012-08-14 to 2012-08-16 and 2012-08-27

2.4 Test Engineer(s)

Frode Sveinsen

2.5 Test Equipment

See list of test equipment in clause 6.

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: RTX A/S
Model No.: RTX4100-IN / RTX4100-EX / RTX4100-EC

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.

All tests were conducted in accordance with ANSI C63.4-2003 and KDB 558074 D01 DTS Measurement Guidance v01. 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
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".



TEST REPORT #: 208041-3

TESTED BY:



Frode Sveinsen, Chief Engineer

DATE: 30 August 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)	Pass
Number of Operating Frequencies	15.31(m)	A8.1	Pass
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 ¹
Occupied Bandwidth	N/A	A8.1	No requirement
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

¹ The EUT is powered from primary batteries or from a host

3.3 Description of modification for Modification Filing

Not applicable.

3.4 Comments

All ports were populated during spurious emission measurements.

All radiated tests were performed on the version with PCB antenna.

Calculations of Radiated Output Power and Band Edge Conducted Emissions are included for the 3 antenna types included in the certification.

3.5 Family List Rational

Not Applicable.

4 TEST RESULTS

4.1 Occupied Bandwidth

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

Test Performed By: Frode Sveinsen

Date of Test: 27 Aug 2012

Test Results: Complies

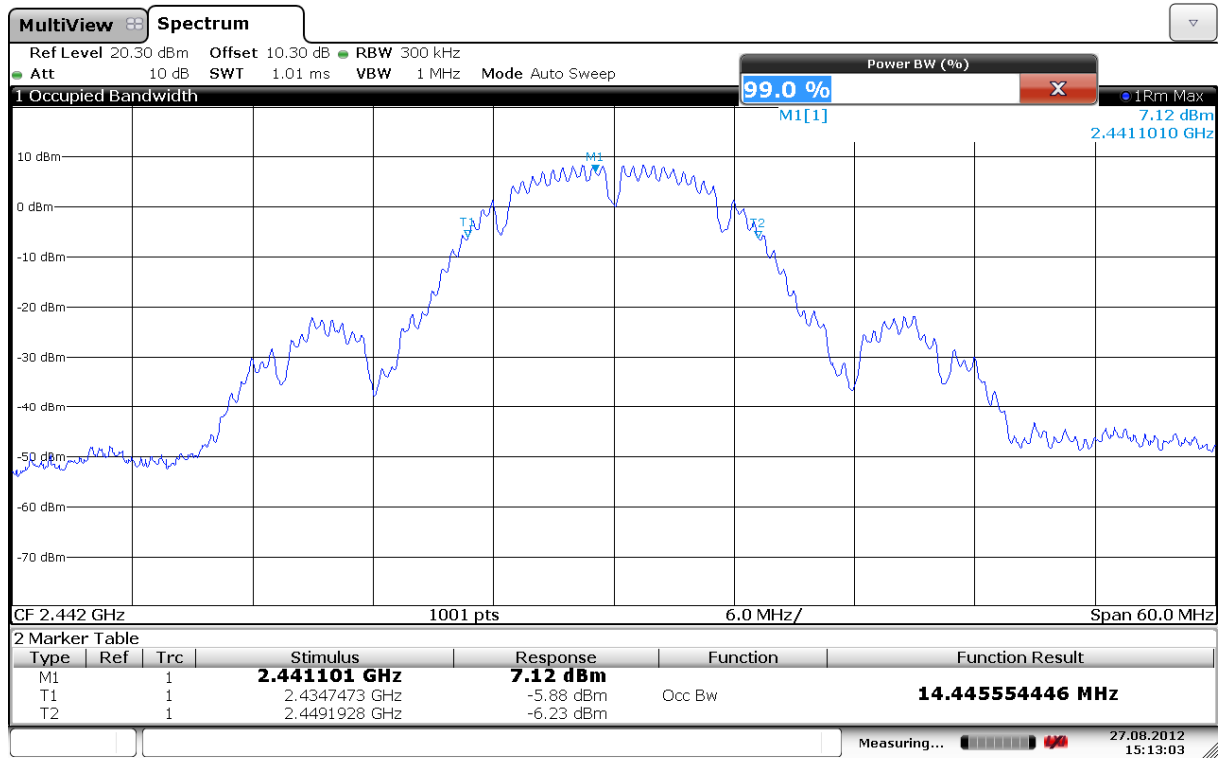
Measurement Data:

Modulation type and bitrate	Occupied Bandwidth (MHz)
	Ch 07, 2442 MHz
802.11b, 1 Mbps	14.4
802.11g, 6 Mbps	19.2
802.11n, MCS0	22.1

See attached plots.

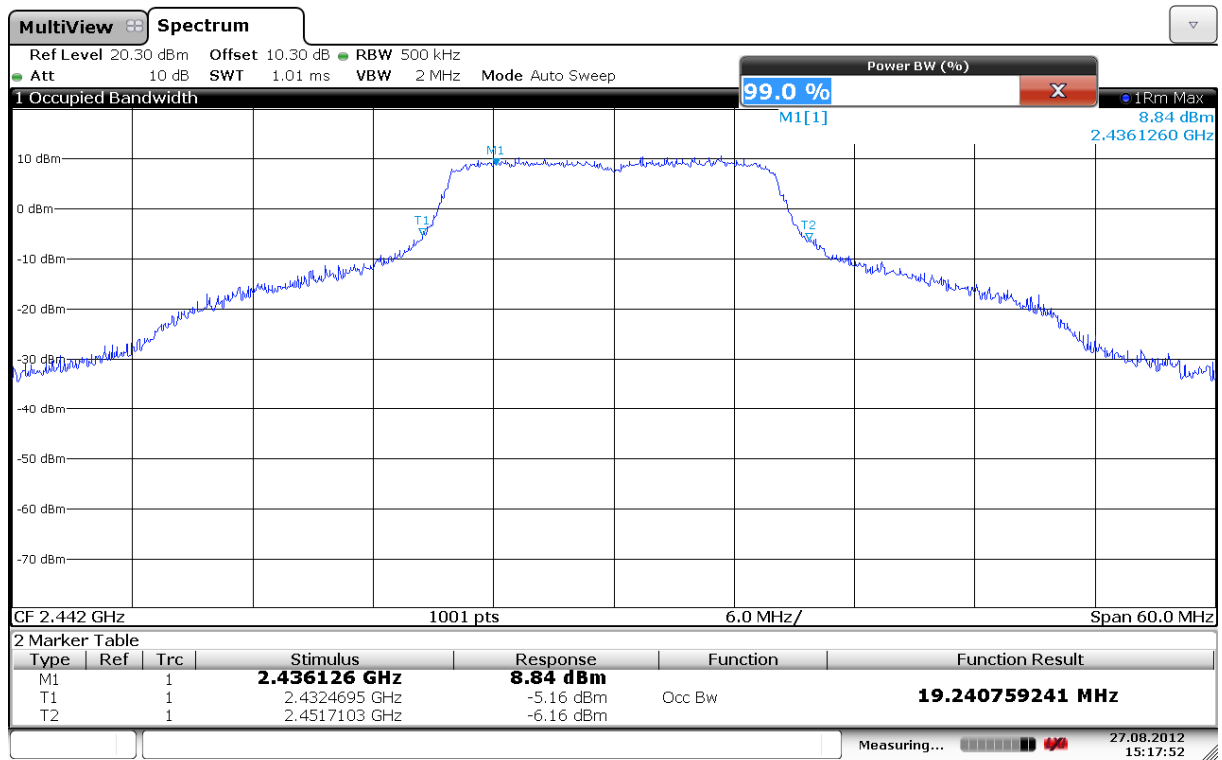
Requirements:

No requirements for Digital Transmission Systems, reported for information only.



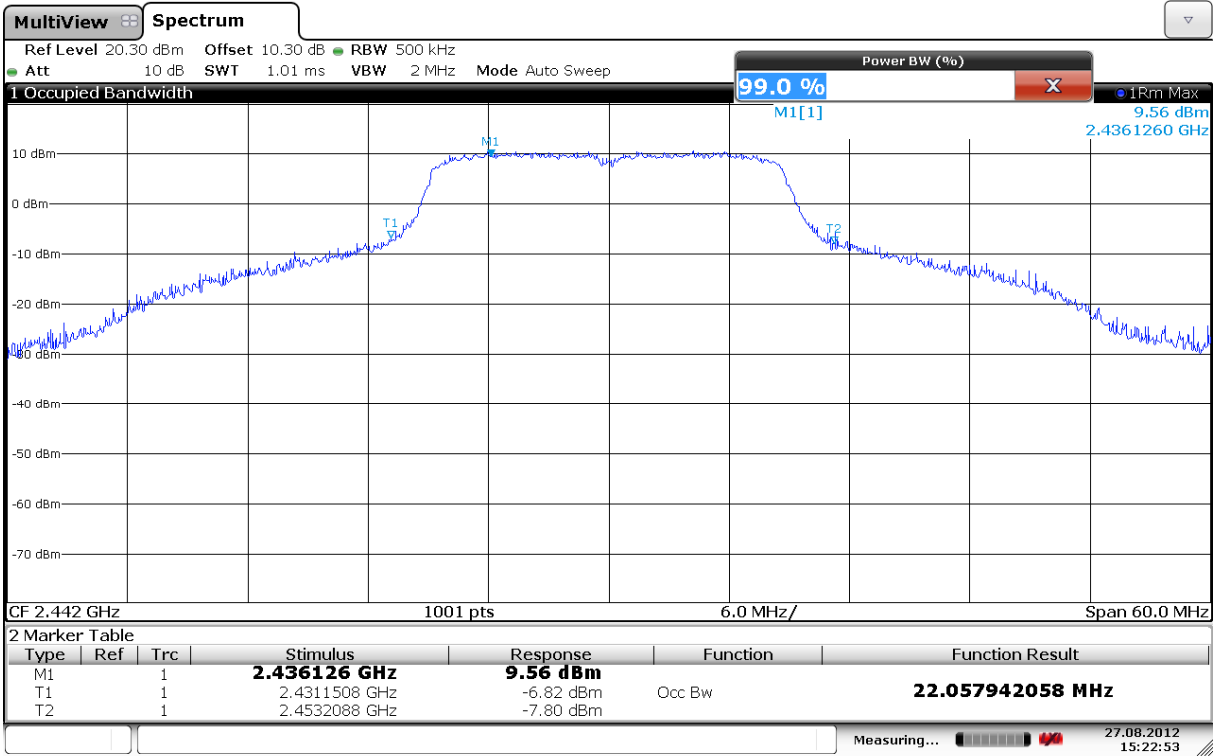
Date: 27.AUG.2012 15:13:03

Occupied Bandwidth, 2442 MHz, 802.11b, 1Mbps



Date: 27.AUG.2012 15:17:51

Occupied Bandwidth, 2442 MHz, 802.11g, 6Mbps



Date: 27.AUG.2012 15:22:52

Occupied Bandwidth, 2442 MHz, 802.11n, MCS0

4.2 Minimum 6 dB Bandwidth

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

Test Performed By: Frode Sveinsen

Date of Test: 14 Aug 2012

Test Results: Complies

Measurement Data:

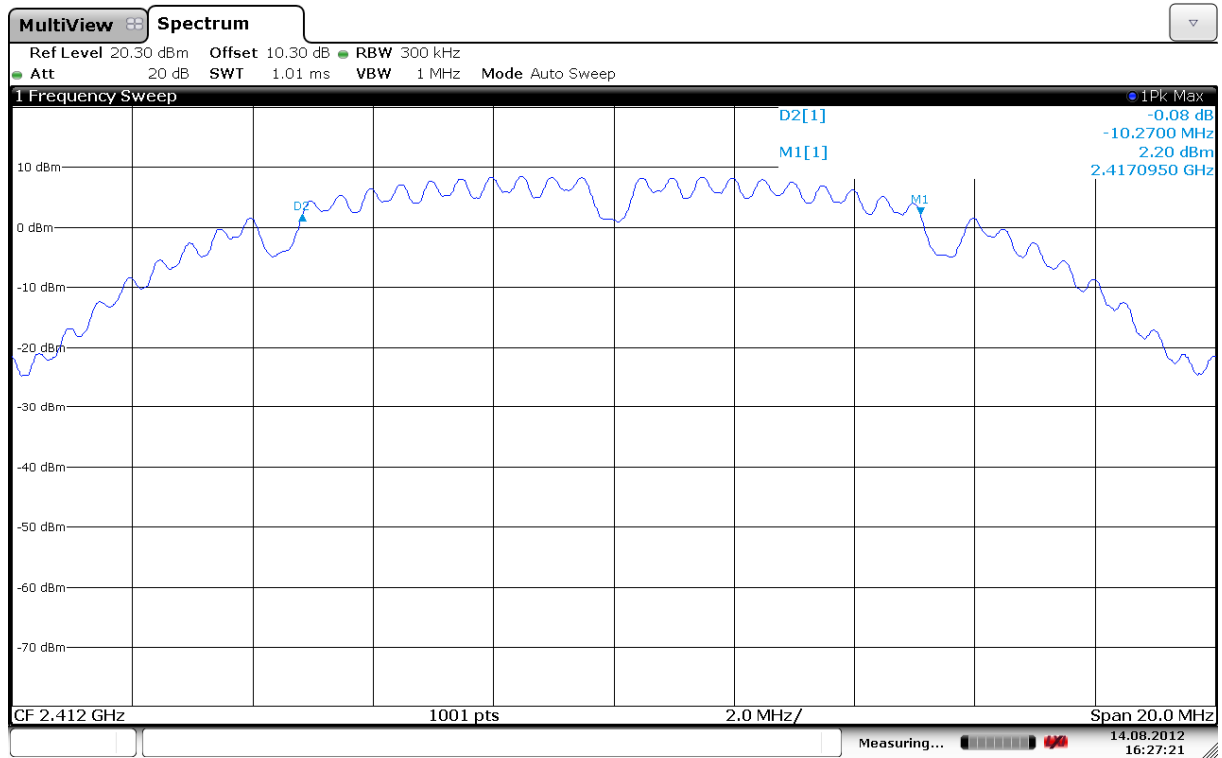
Modulation type and bitrate	Measured 6 dB Bandwidth (MHz)		
	Ch 1, 2412 MHz	Ch 7, 2442 MHz	Ch 11, 2462 MHz
802.11b, 1 Mbps	10.3	10.1	10.3
802.11g, 6 Mbps	16.4	16.5	16.4
802.11n, MCS0	17.7	17.7	17.6

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

Requirements:

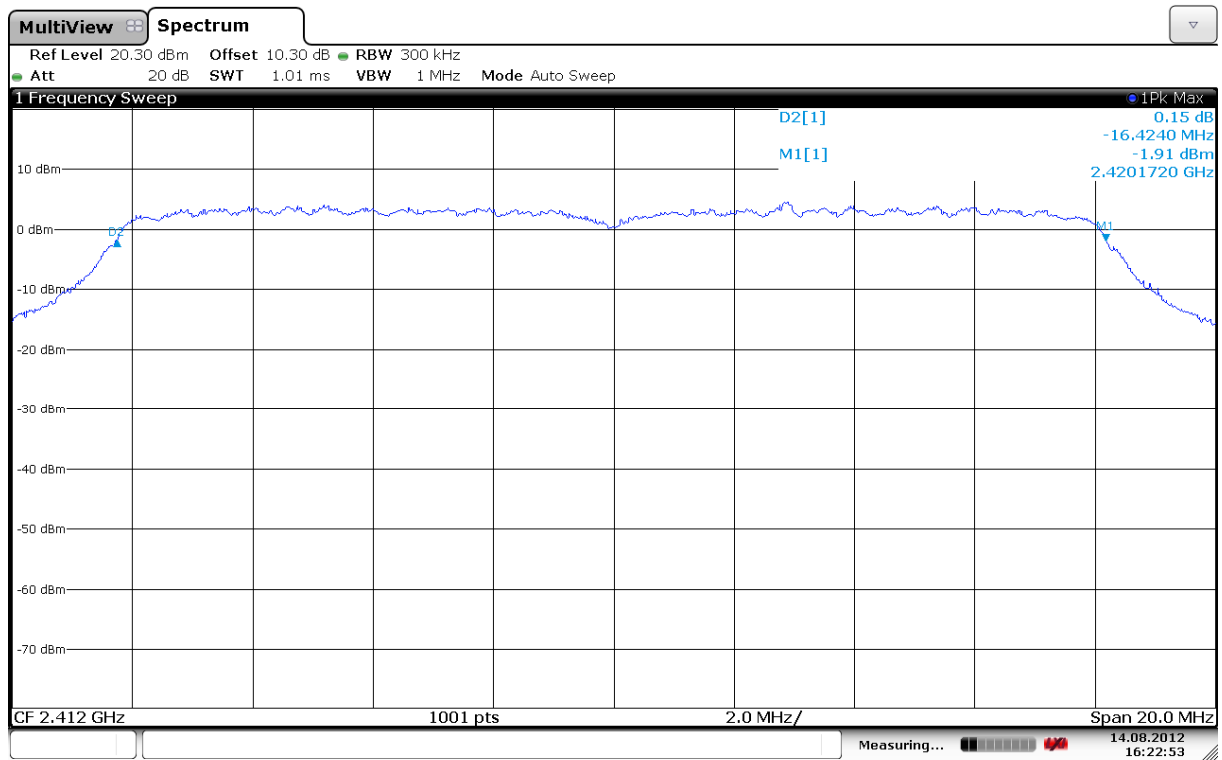
For Digital Transmission Systems in the 2400-2483.5 MHz band the minimum 6 dB bandwidth shall be at least 500 KHz.

No requirements for Frequency Hopping Systems.



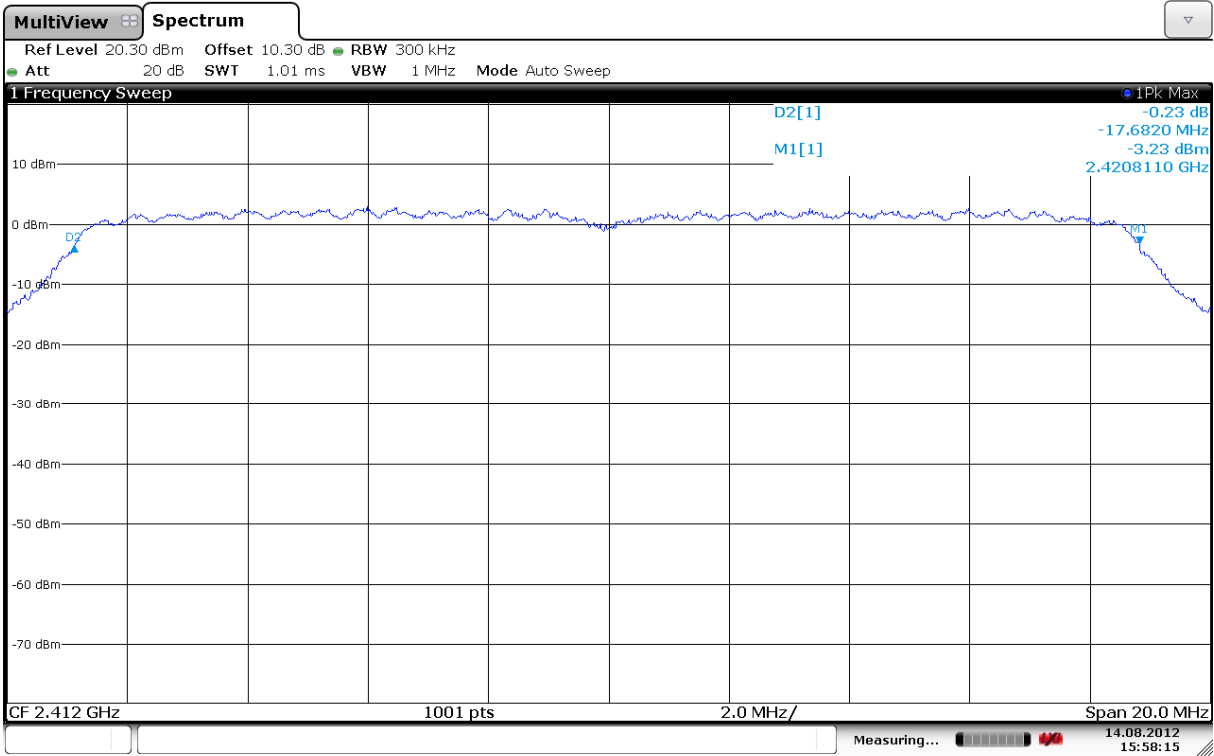
Date: 14.AUG.2012 16:27:20

6 dB Bandwidth, 2412 MHz, 802.11b, 1Mbps



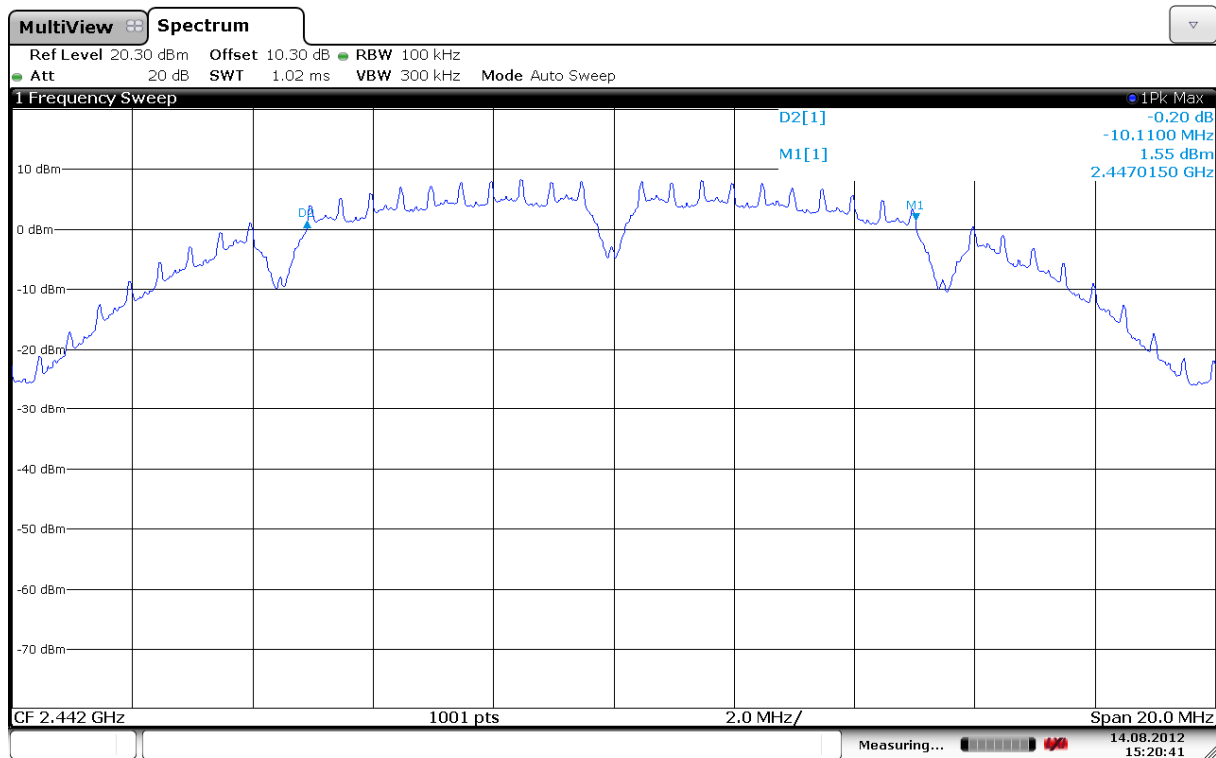
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6 dB Bandwidth, 2412 MHz, 802.11g, 6Mbps



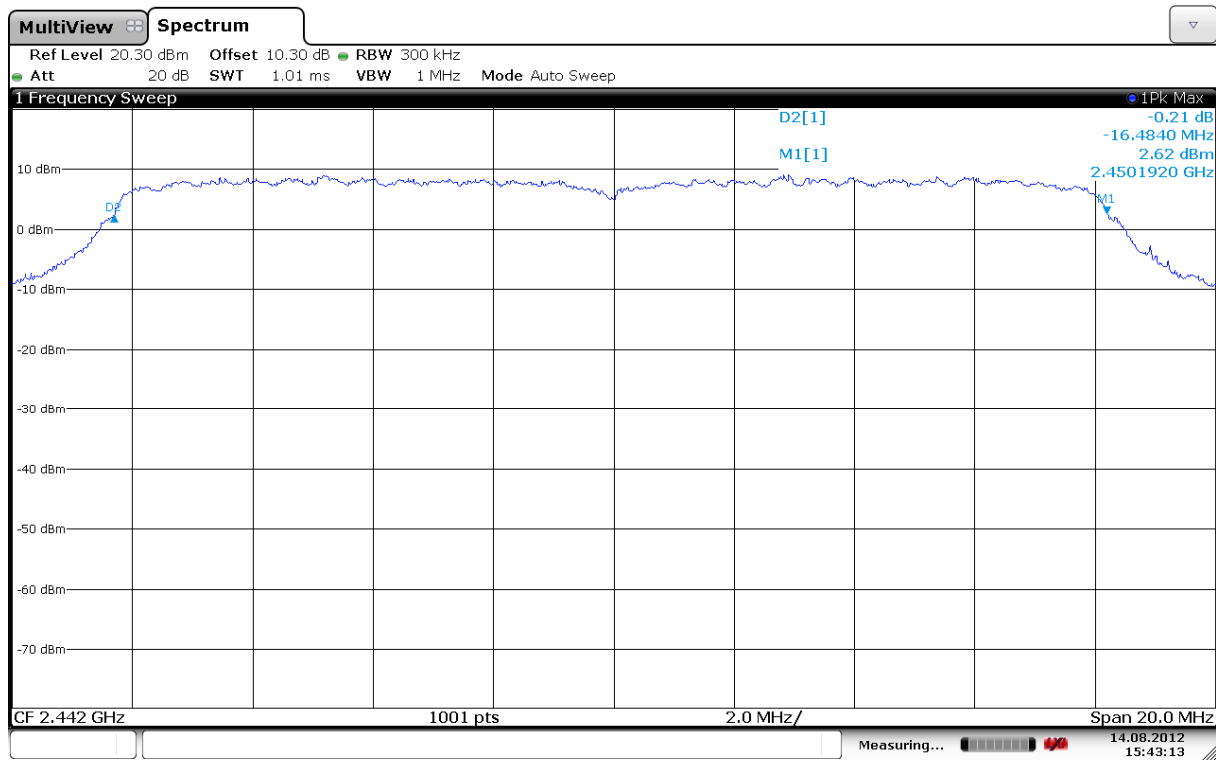
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6 dB Bandwidth, 2412 MHz, 802.11n, MCS0



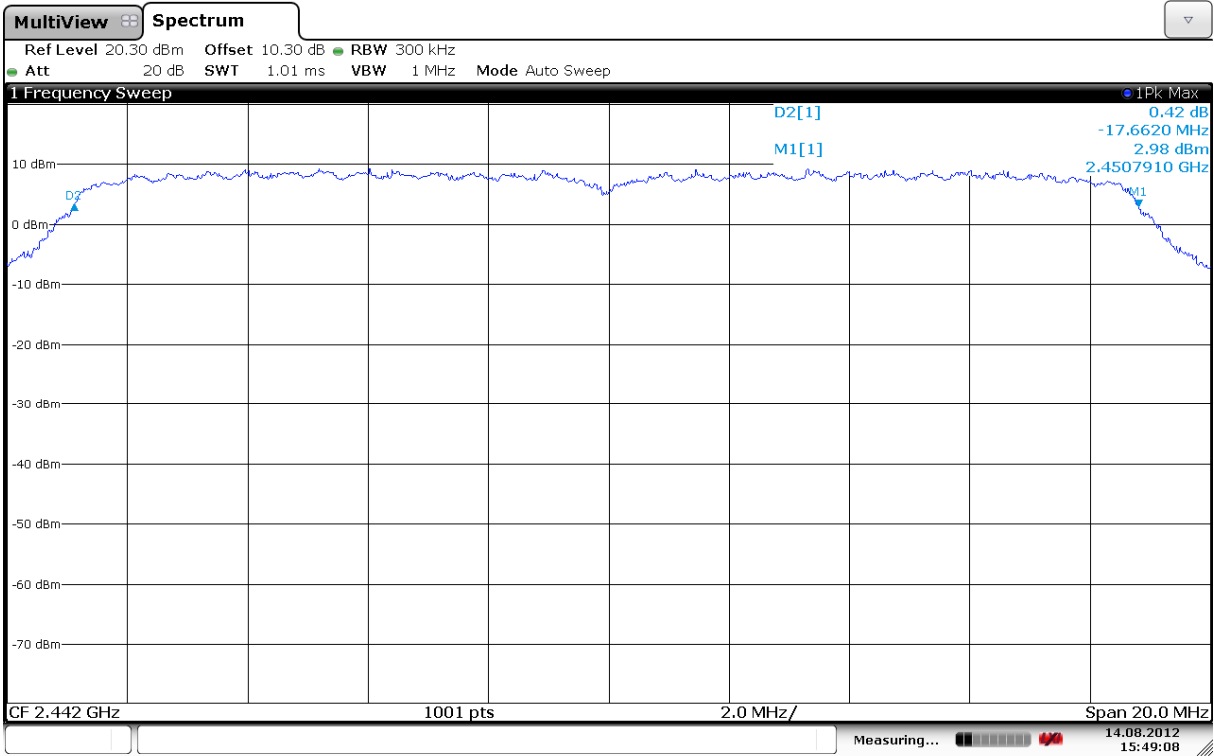
Date: 14.AUG.2012 15:20:41

6 dB Bandwidth, 2442 MHz, 802.11b, 1Mbps



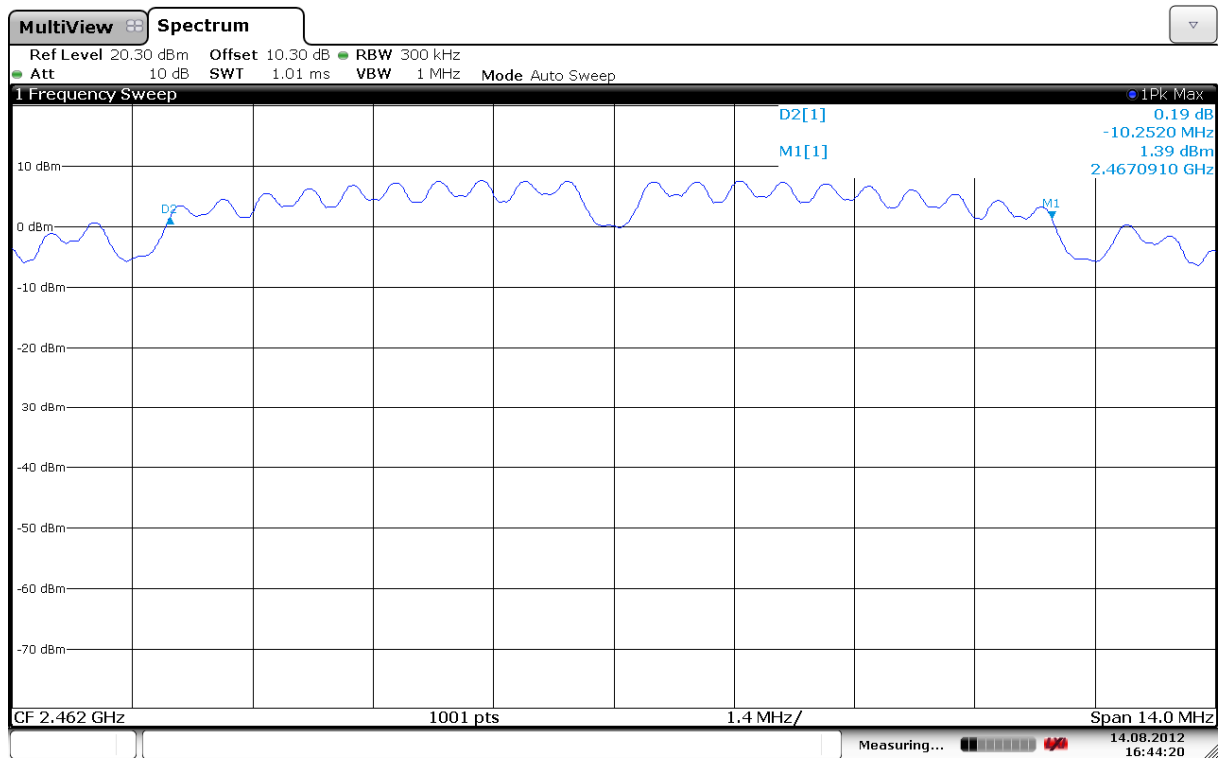
Date: 14.AUG.2012 15:43:13

6 dB Bandwidth, 2442 MHz, 802.11g, 6Mbps



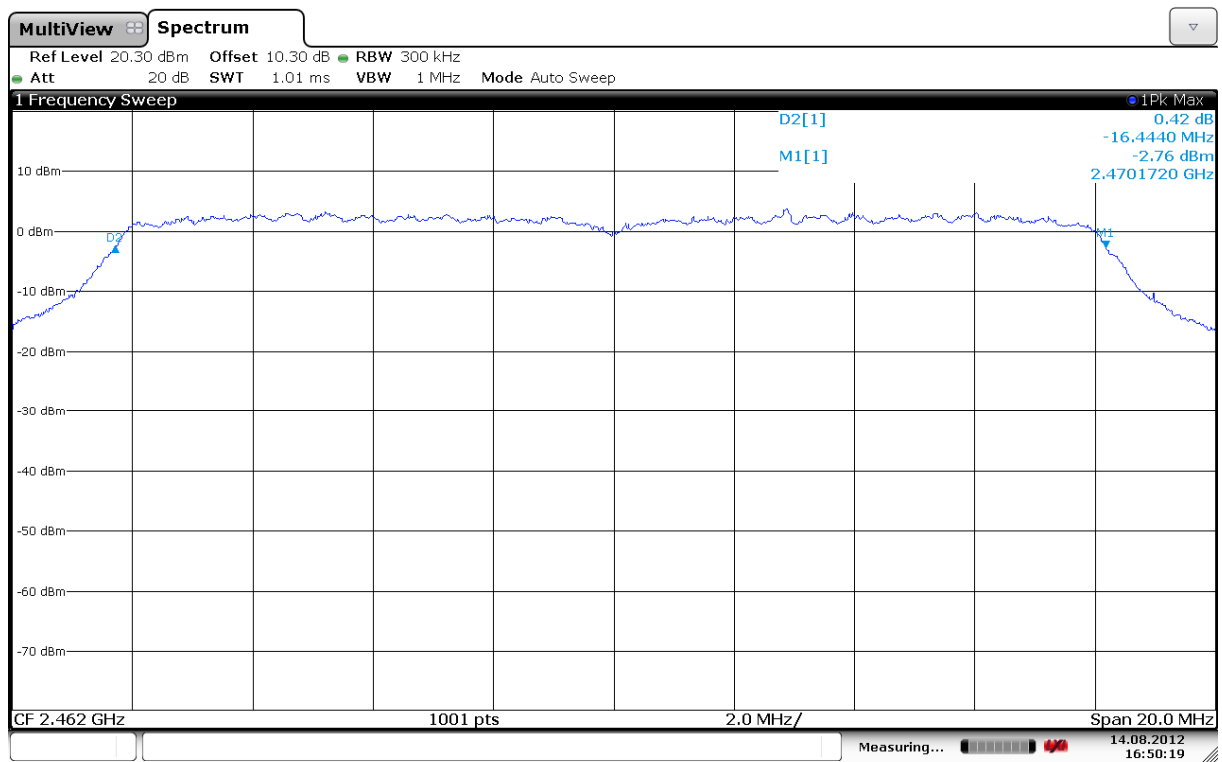
Date: 14.AUG.2012 15:49:08

6 dB Bandwidth, 2442 MHz, 802.11n, MCS0



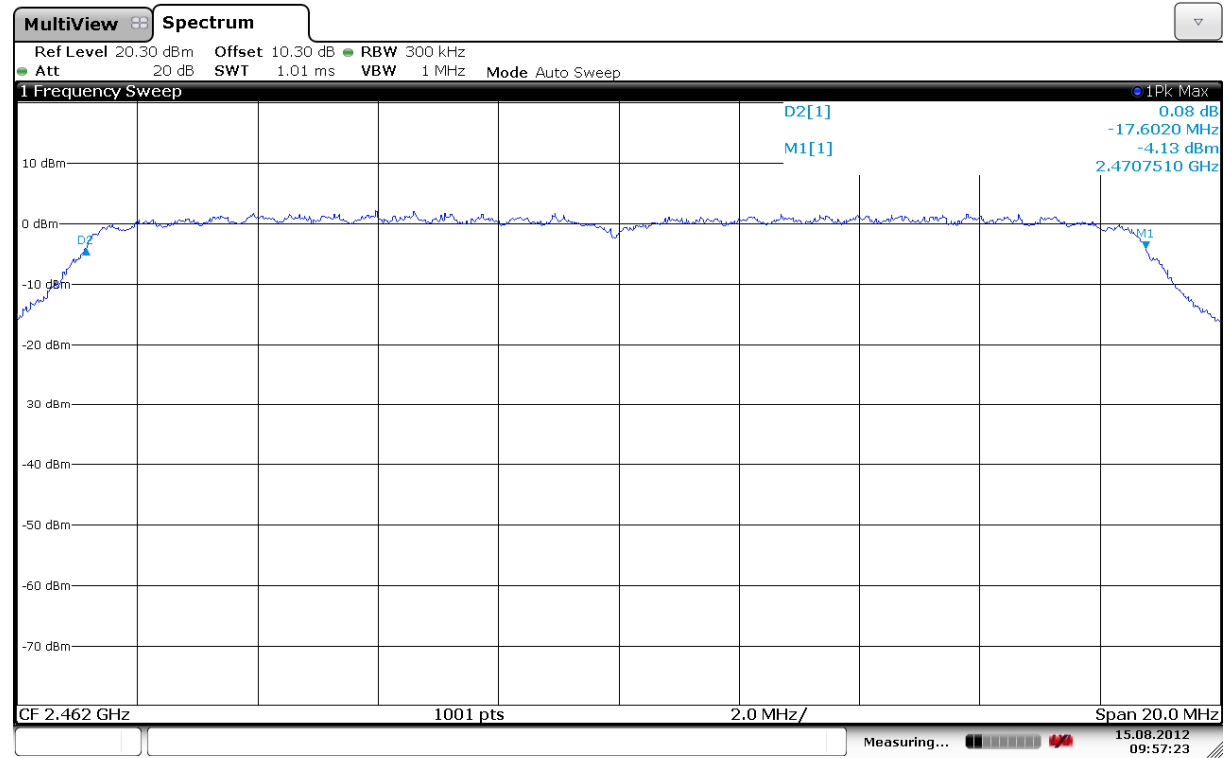
Date: 14.AUG.2012 16:44:20

6 dB Bandwidth, 2462 MHz, 802.11b, 1Mbps



Date: 14.AUG.2012 16:50:18

6 dB Bandwidth, 2462 MHz, 802.11g, 6Mbps



Date: 15.AUG.2012 09:57:23

6 dB Bandwidth, 2462 MHz, 802.11n, MCS0

4.3 Peak Power Output

Para. No.: 15.247 (b)

Test Performed By: Frode Sveinsen

Date of Test: 16 Aug 2012

Test Results: Complies

Measurement Data:

Carrier Frequency	Maximum Measured Conducted Output Power, Watts		
	802.11b, 1 Mbps	802.11g, 6 Mbps	802.11n, MCS0
2412 MHz	0.062	0.016	0.013
2442 MHz	0.051	0.056	0.047
2462 MHz	0.050	0.014	0.011

Carrier Frequency	Maximum EIRP, Watts (PCB Antenna)		
	802.11b, 1 Mbps	802.11g, 6 Mbps	802.11n, MCS0
2412 MHz	0.054	0.014	0.011
2442 MHz	0.033	0.032	0.030
2462 MHz	0.018	0.005	0.004

Carrier Frequency	Maximum Antenna Gain, dBi (PCB Antenna)		
	802.11b, 1 Mbps	802.11g, 6 Mbps	802.11n, MCS0
2412 MHz	-0.6	-0.7	-0.7
2442 MHz	-1.9	-2.4	-2.0
2462 MHz	-4.4	-4.6	-3.7

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

The EIRP is calculated from measured field strength by the formula in KDB 558074 D01.

See attached plots.

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.

Calculated EIRP for External Antennas

Calculated values for TE Connectivity 2118059-1, 2300 -3800 MHz Single Band Antenna

Carrier Frequency	Maximum EIRP, Watts		
	802.11b, 1 Mbps	802.11g, 6 Mbps	802.11n, MCS0
2412 MHz	0.156	0.041	0.032
2442 MHz	0.128	0.140	0.119
2462 MHz	0.125	0.036	0.024

Max Gain value from data sheet (4.0 dBi) has been used for calculations above

Calculated values for Taoglas GW.17.07.0250E, 2.4GHz 2dBi Click-in Terminal Dipole Antenna

Carrier Frequency	Maximum EIRP, Watts		
	802.11b, 1 Mbps	802.11g, 6 Mbps	802.11n, MCS0
2412 MHz	0.115	0.031	0.024
2442 MHz	0.095	0.104	0.089
2462 MHz	0.092	0.027	0.017

Max Gain value from data sheet (2.7 dBi) has been used for calculations above

Calculated values for Taoglas PC.17.07.0070A, Miniature 2.4GHz PCB antenna with cable and connector

Carrier Frequency	Maximum EIRP, Watts		
	802.11b, 1 Mbps	802.11g, 6 Mbps	802.11n, MCS0
2412 MHz	0.076	0.020	0.016
2442 MHz	0.063	0.068	0.059
2462 MHz	0.061	0.018	0.012

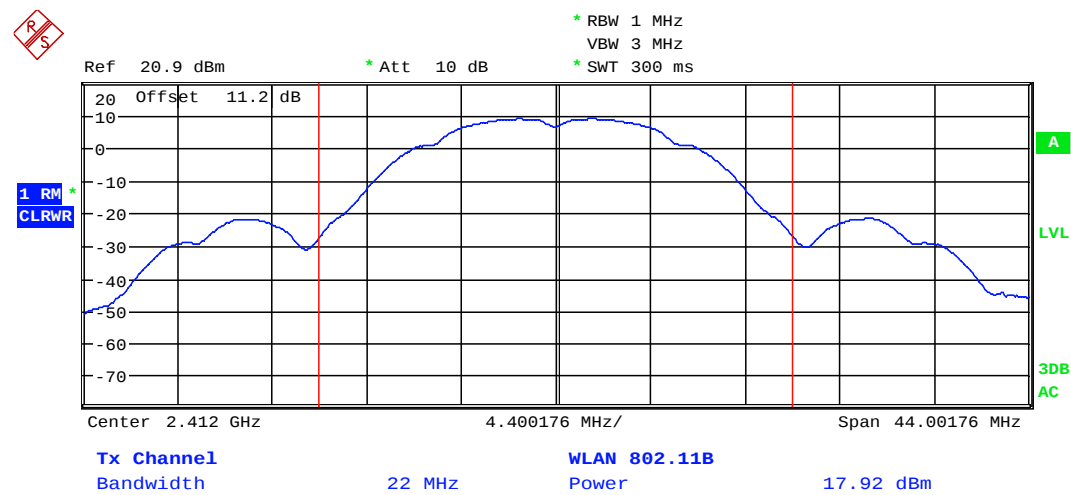
Max Gain value from data sheet (0.9 dBi) has been used for calculations above

Requirements:

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

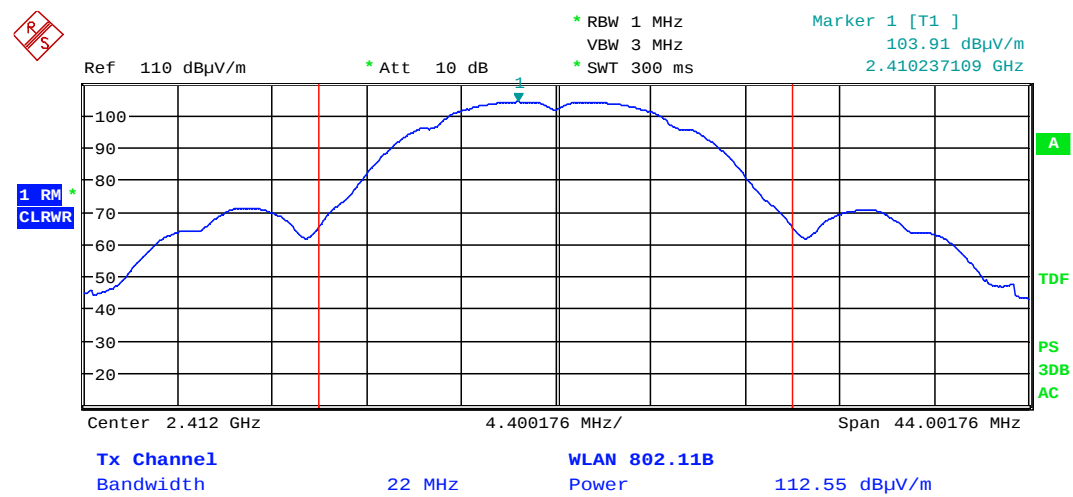
For Digital Transmission Systems in the 2400 - 2483.5 MHz band: 1 Watt

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.



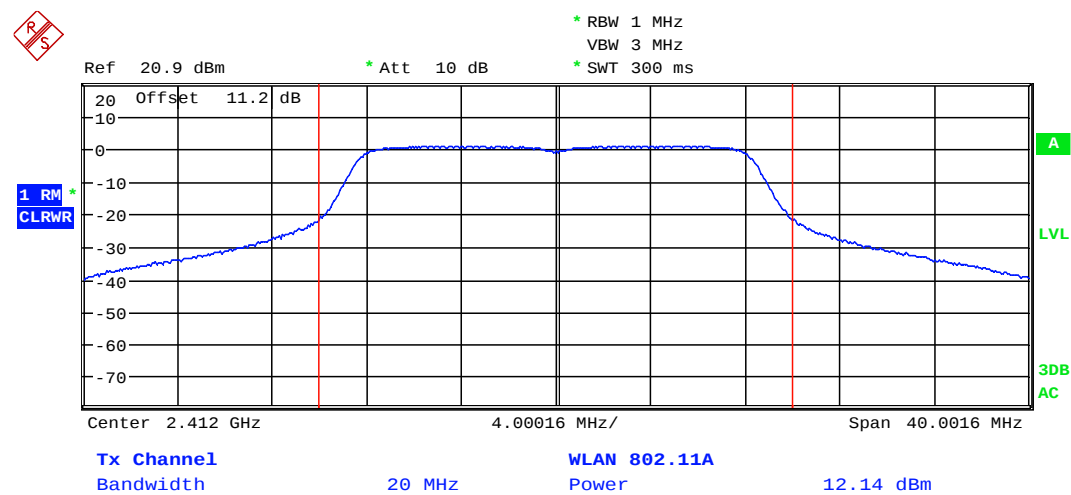
Date: 16.AUG.2012 13:57:48

Conducted Output Power, 2412 MHz, 802.11b, 1Mbps



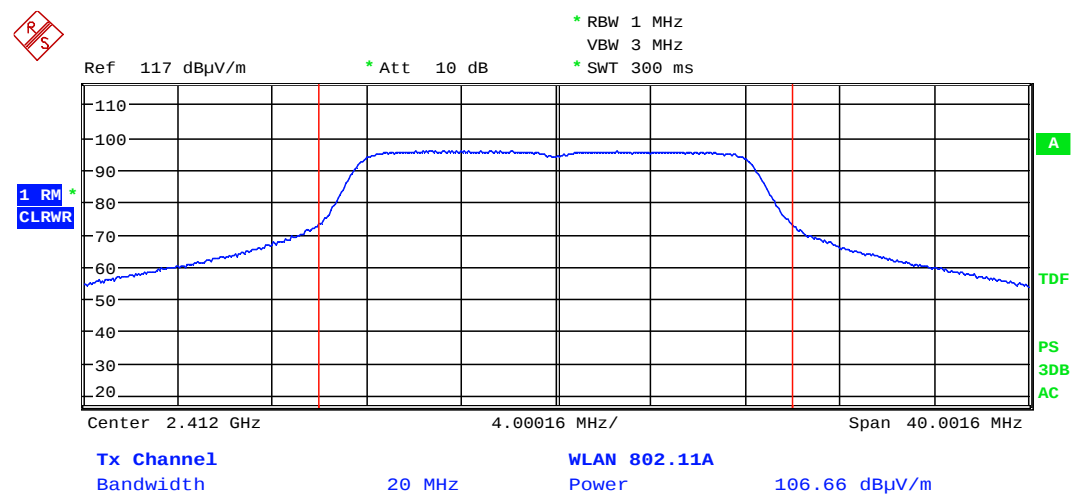
Date: 16.AUG.2012 09:17:38

Radiated Output Power, 2412 MHz, 802.11b, 11Mbps (Max: EUT V, VP), PCB Antenna



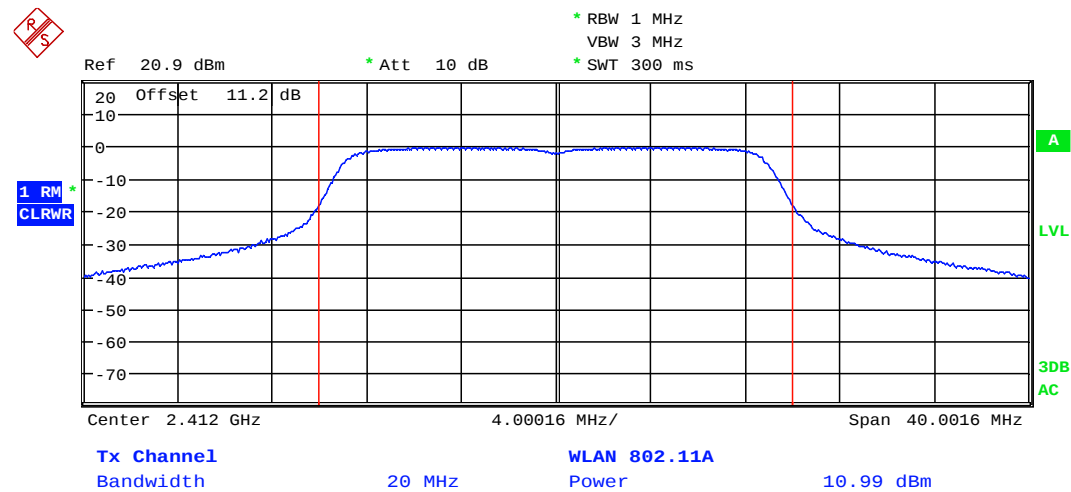
Date: 16.AUG.2012 14:06:20

Conducted Output Power, 2412 MHz, 802.11g, 6Mbps



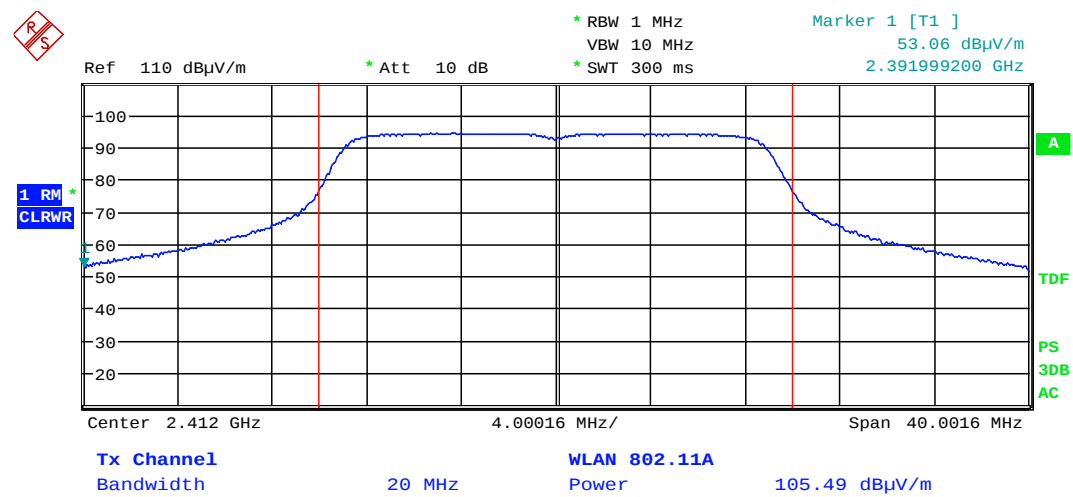
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Radiated Output Power, 2412 MHz, 802.11g, 6Mbps (Max: EUT V, VP) , PCB Antenna



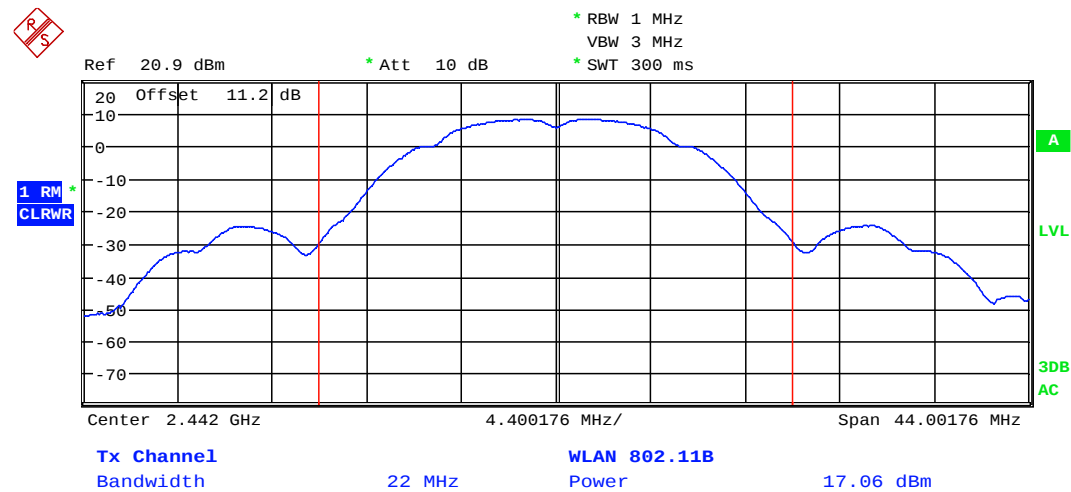
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Conducted Output Power, 2412 MHz, 802.11n, MCS0



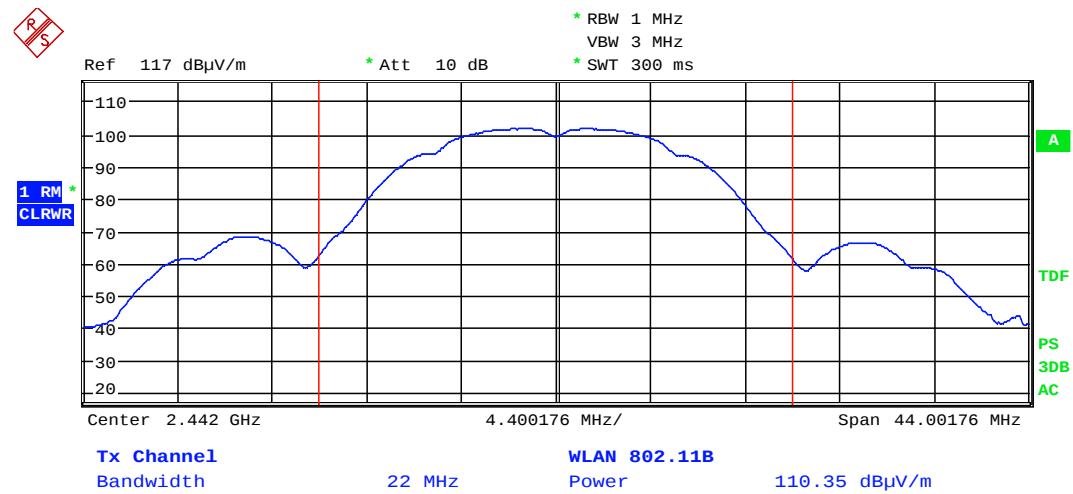
Date: 16.AUG.2012 09:44:06

Radiated Output Power, 2412 MHz, 802.11n, MCS0 (Max: EUT V, VP) , PCB Antenna



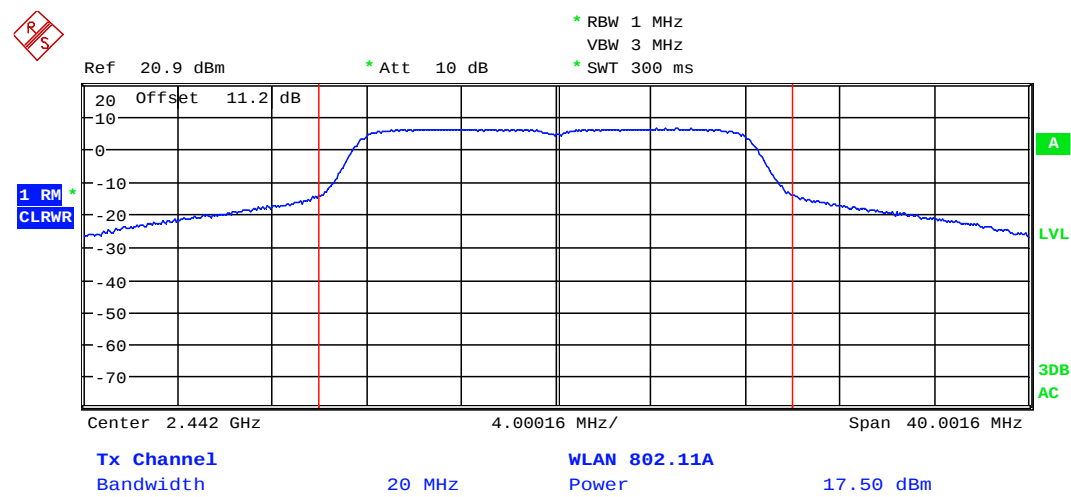
Date: 16.AUG.2012 13:59:22

Conducted Output Power, 2442 MHz, 802.11b, 11Mbps



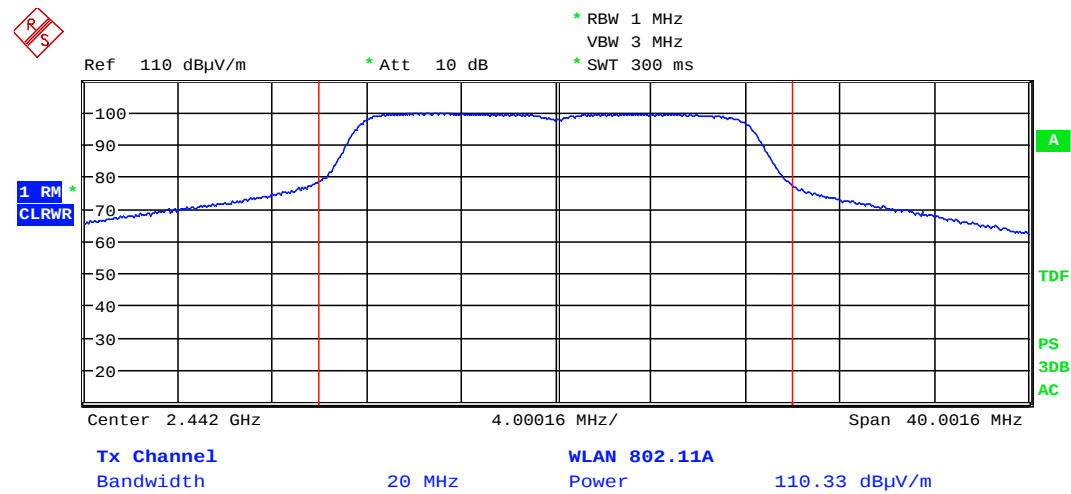
Date: 16.AUG.2012 10:06:01

Radiated Output Power, 2442 MHz, 802.11b, 11Mbps (Max: EUT V, VP) , PCB Antenna



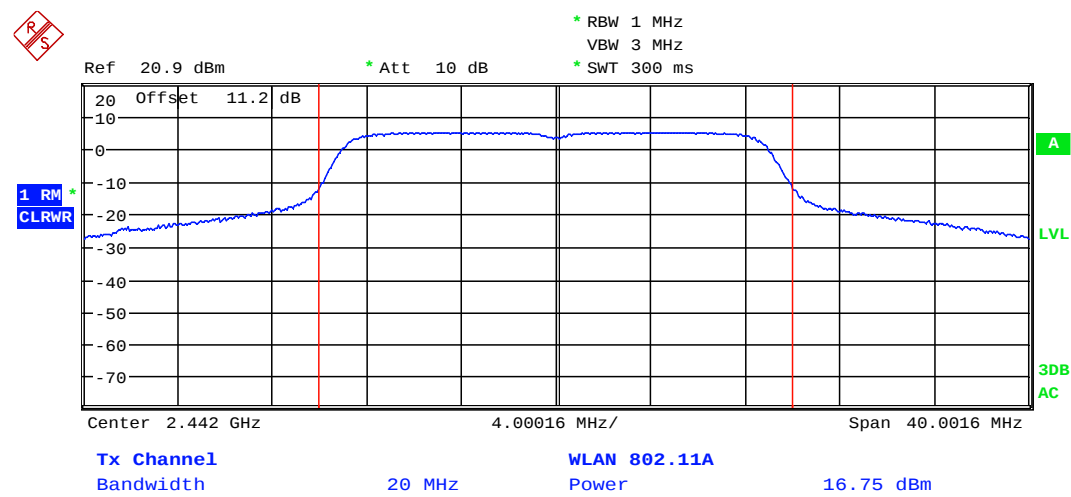
Date: 16.AUG.2012 14:04:21

Conducted Output Power, 2442 MHz, 802.11g, 6Mbps



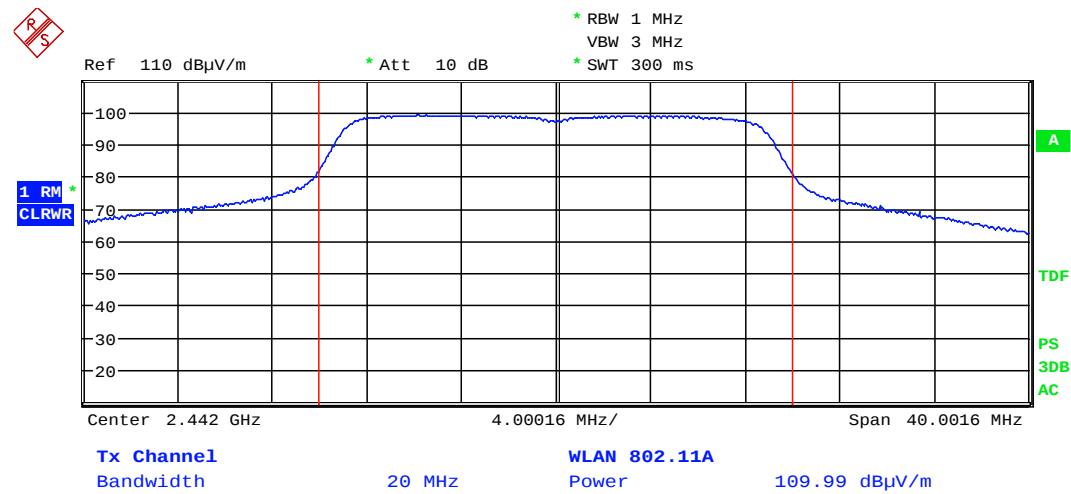
Date: 16.AUG.2012 10:12:32

Radiated Output Power, 2442 MHz, 802.11g, 6Mbps (Max: EUT V, VP) , PCB Antenna



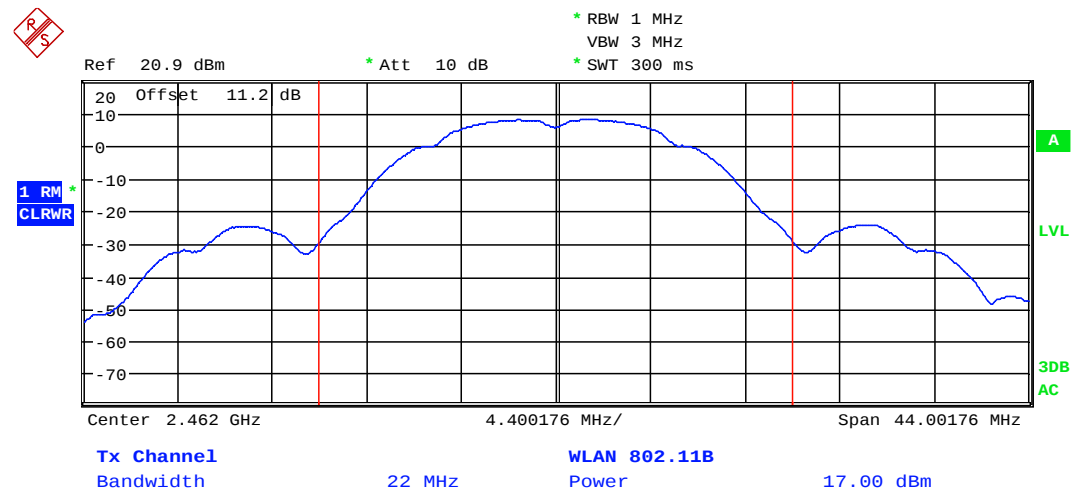
Date: 16.AUG.2012 14:11:04

Conducted Output Power, 2442 MHz, 802.11n, MCS0



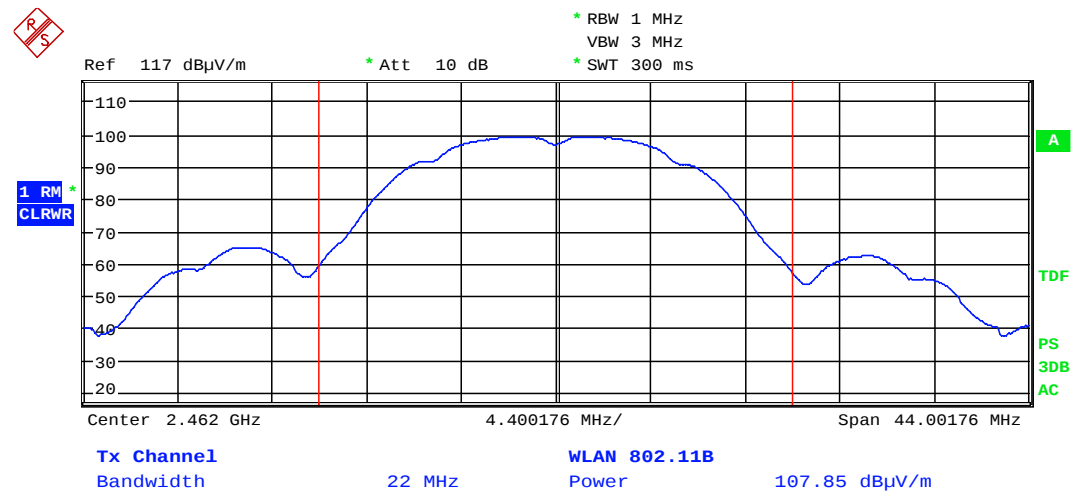
Date: 16.AUG.2012 10:18:09

Radiated Output Power, 2442 MHz, 802.11n, MCS0 (Max: EUT V, VP) , PCB Antenna



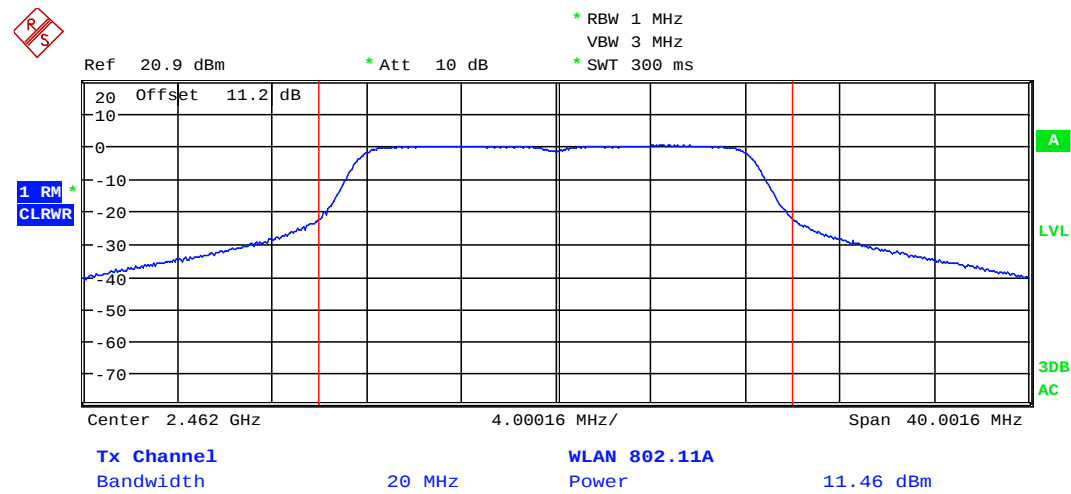
Date: 16.AUG.2012 14:00:43

Conducted Output Power, 2462 MHz, 802.11b, 11Mbps



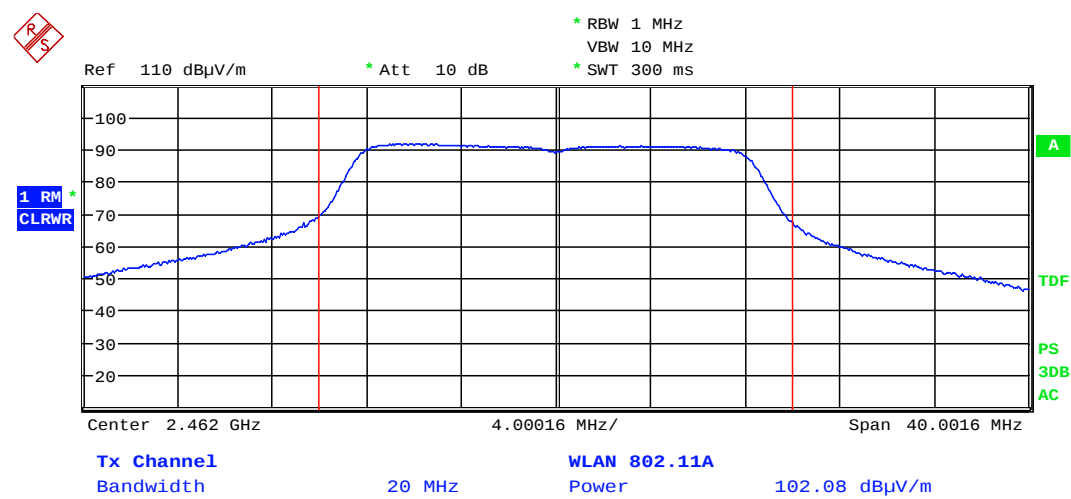
Date: 16.AUG.2012 10:24:03

Radiated Output Power, 2462 MHz, 802.11b, 11Mbps (Max: EUT V, VP) , PCB Antenna



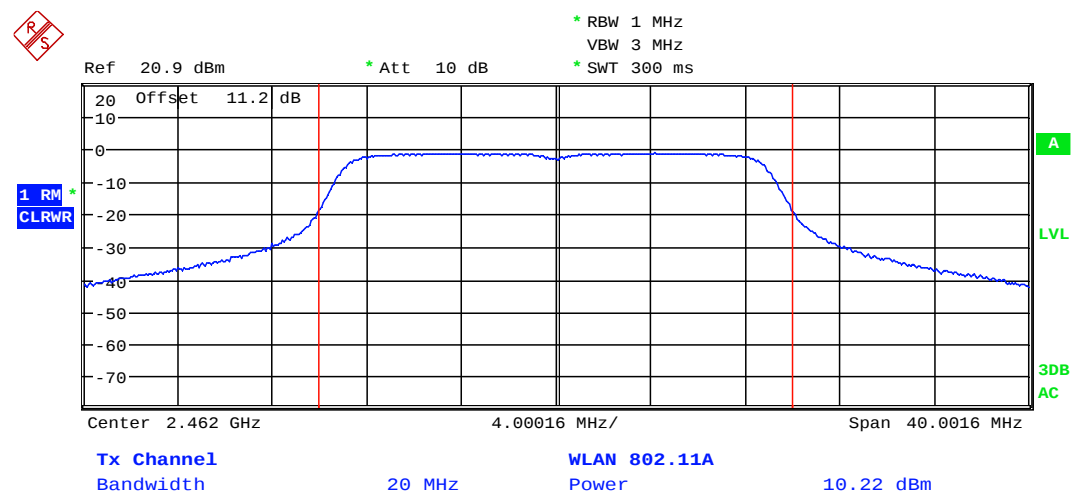
Date: 16.AUG.2012 14:02:18

Conducted Output Power, 2462 MHz, 802.11g, 6Mbps



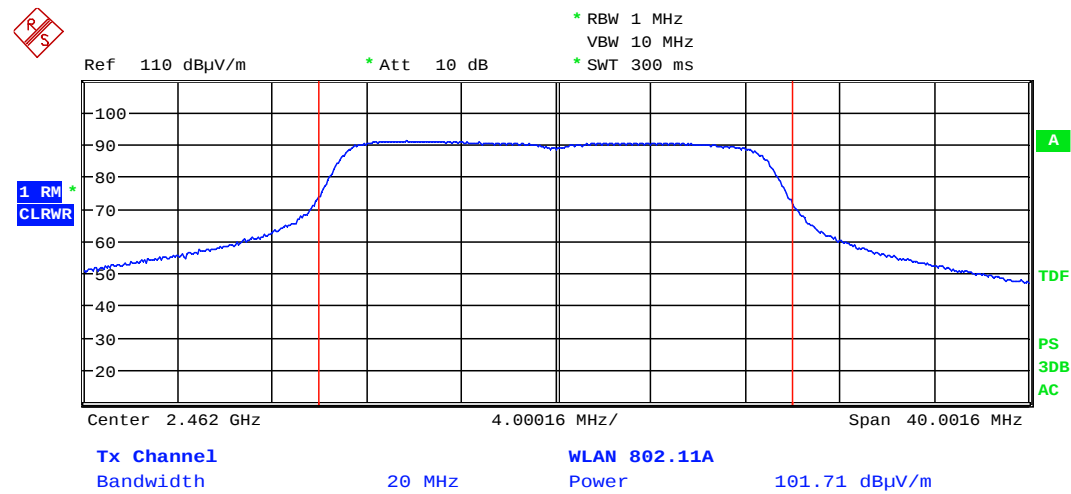
Date: 16.AUG.2012 10:39:58

Radiated Output Power, 2462 MHz, 802.11g, 6Mbps (Max: EUT V, VP) , PCB Antenna



Date: 16.AUG.2012 14:13:42

Conducted Output Power, 2462 MHz, 802.11n, MCS0



Date: 16.AUG.2012 10:47:13

Radiated Output Power, 2462 MHz, 802.11n, MCS0 (Max: EUT V, VP) , PCB Antenna

4.4 Spurious Emissions

Para. No.: 15.247 (c)

Test Performed By: Frode Sveinsen

Date of Test: 16 Aug 2012

Band Edge Emissions, Radiated

Test Results: Complies

Measurement Data:

Peak Detector:

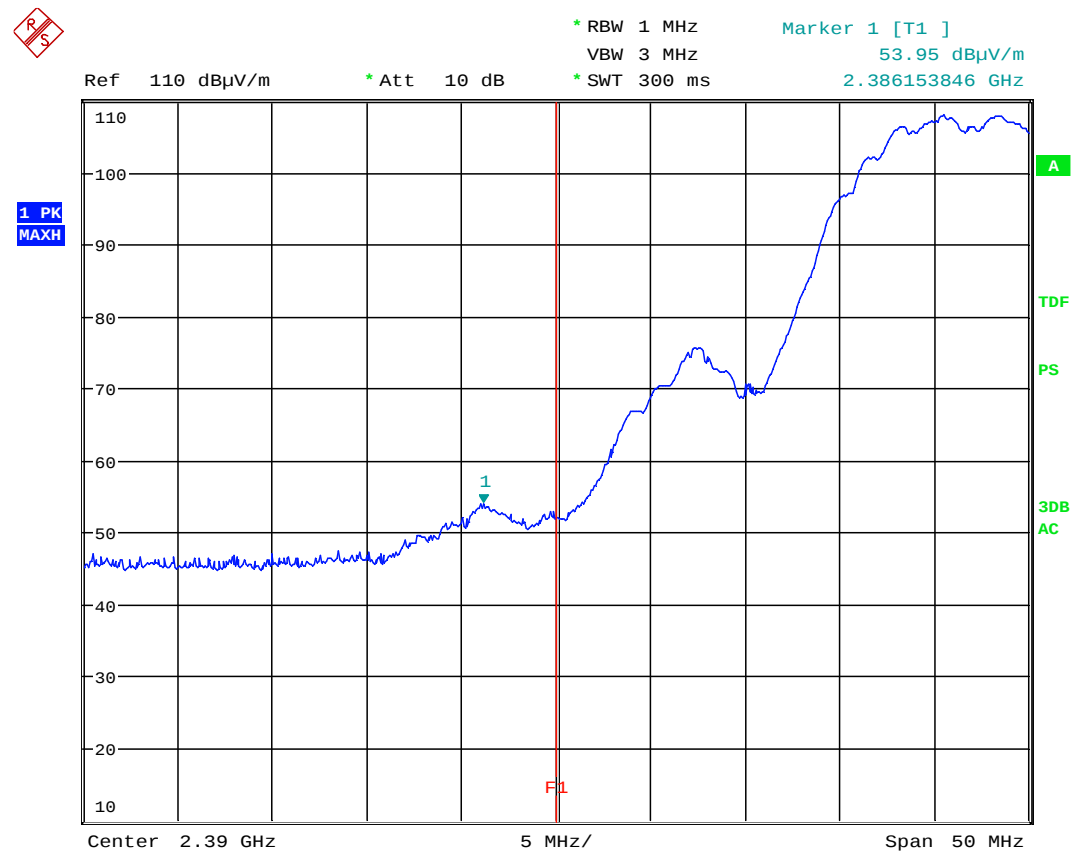
Modulation and Bitrate	Measured field strength (dBμV/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dBμV/m	dB	
802.11b, 1 Mbps	54.0	50.4	74	20.0	23.6
802.11g, 6 Mbps	68.3	61.6	74	5.7	12.4
802.11n, MCS0	68.1	62.6	74	5.9	11.4

Average Detector:

Modulation and Bitrate	Measured field strength (dBμV/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dBμV/m	dB	
802.11b, 1 Mbps	46.7	43.5	54	7.3	10.5
802.11g, 6 Mbps	50.1	43.2	54	3.9	10.8
802.11n, MCS0	50.5	44.1	54	3.5	9.9

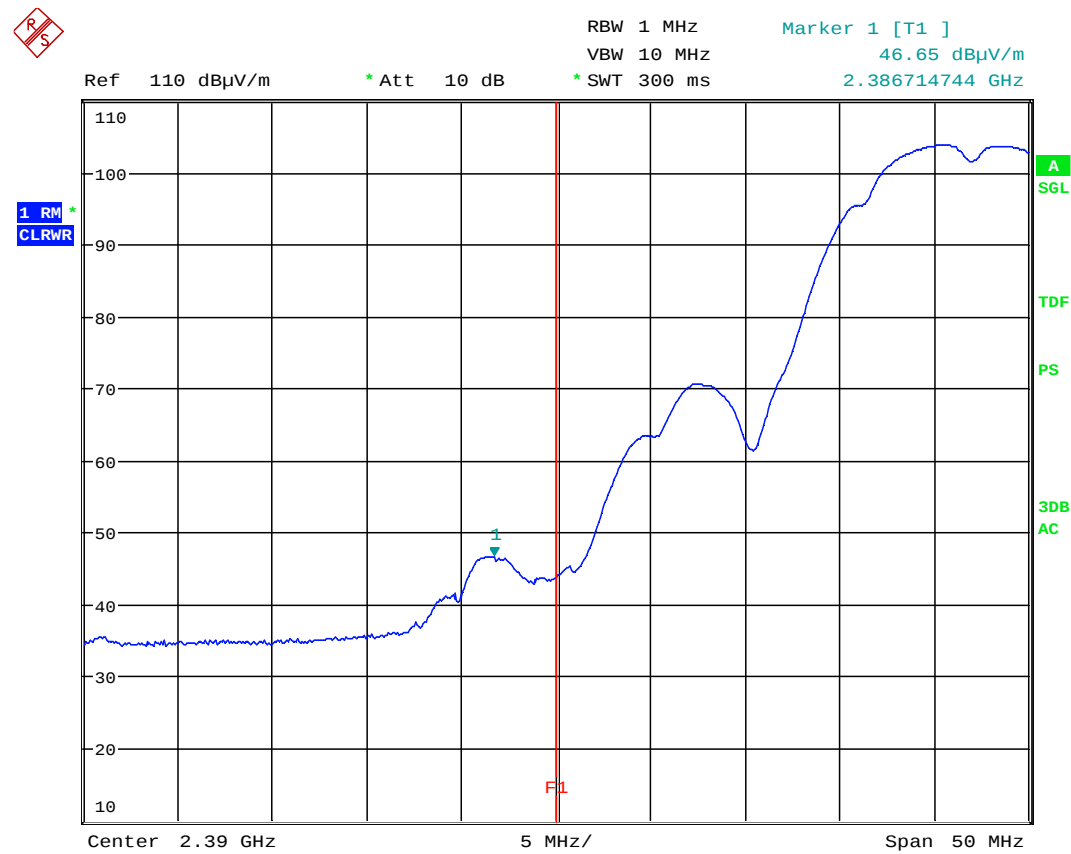
All results above are measured with PCB Antenna.

See attached plots



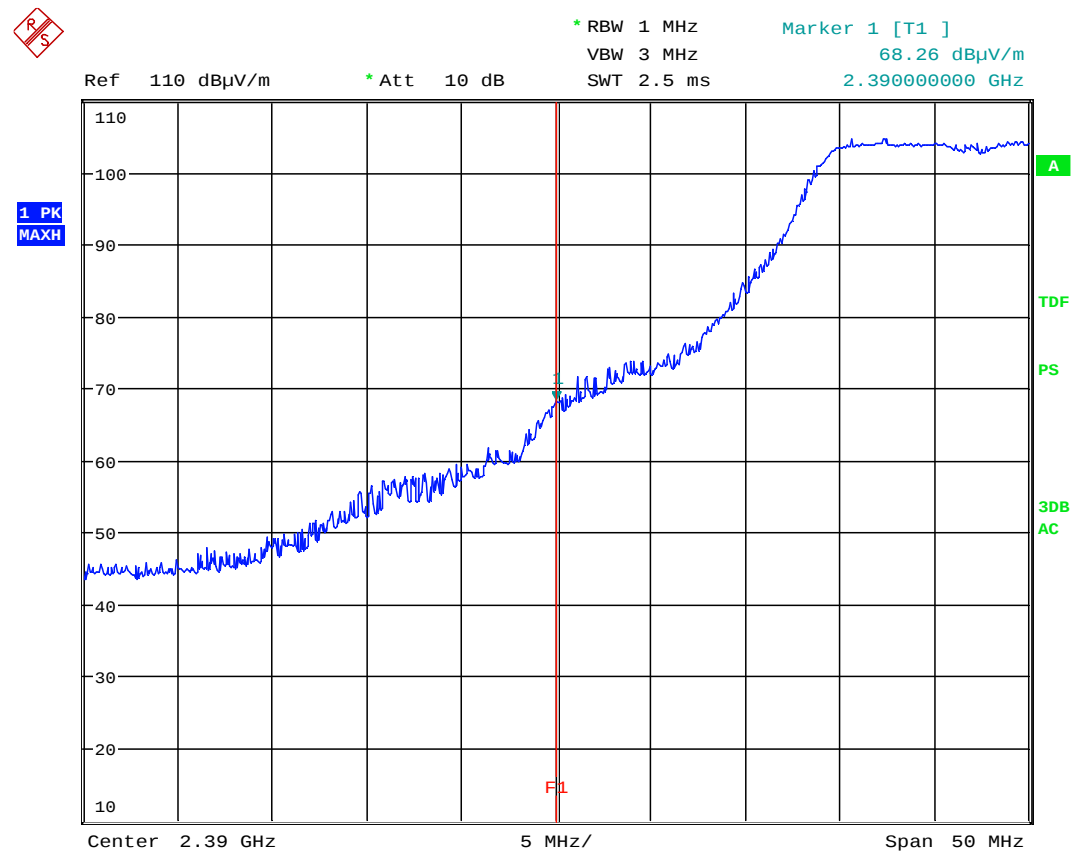
Date: 16.AUG.2012 09:23:58

Band Edge, Lower, Peak, 2412 MHz, 802.11b, 1Mbps



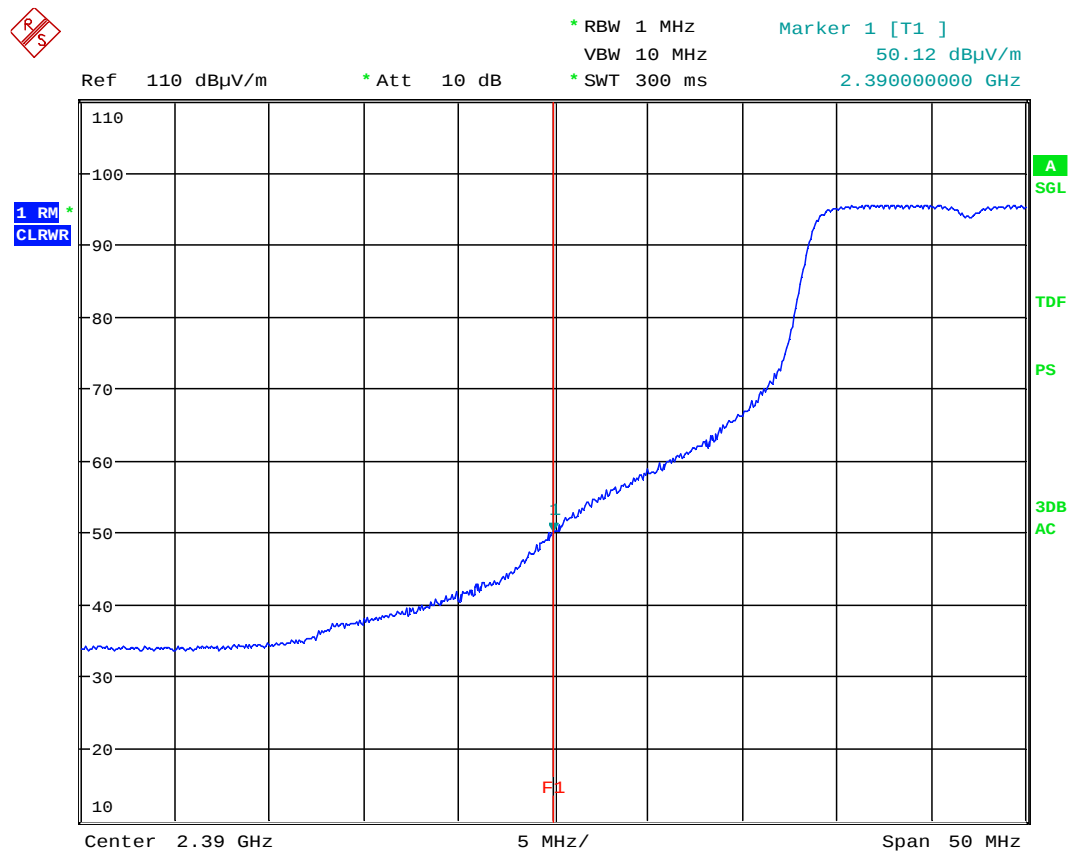
Date: 16.AUG.2012 09:25:30

Band Edge, Lower, Average, 2412 MHz, 802.11b, 1Mbps



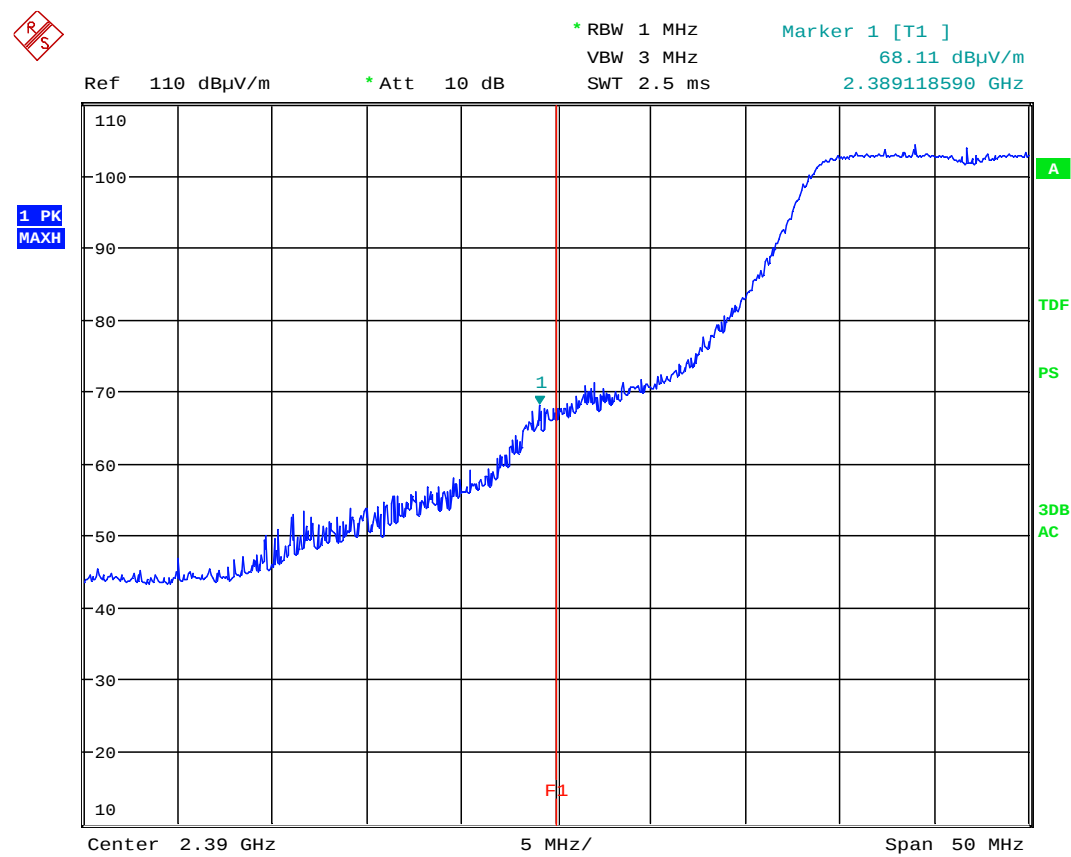
Date: 16.AUG.2012 09:34:49

Band Edge, Lower, Peak, 2412 MHz, 802.11g, 6Mbps



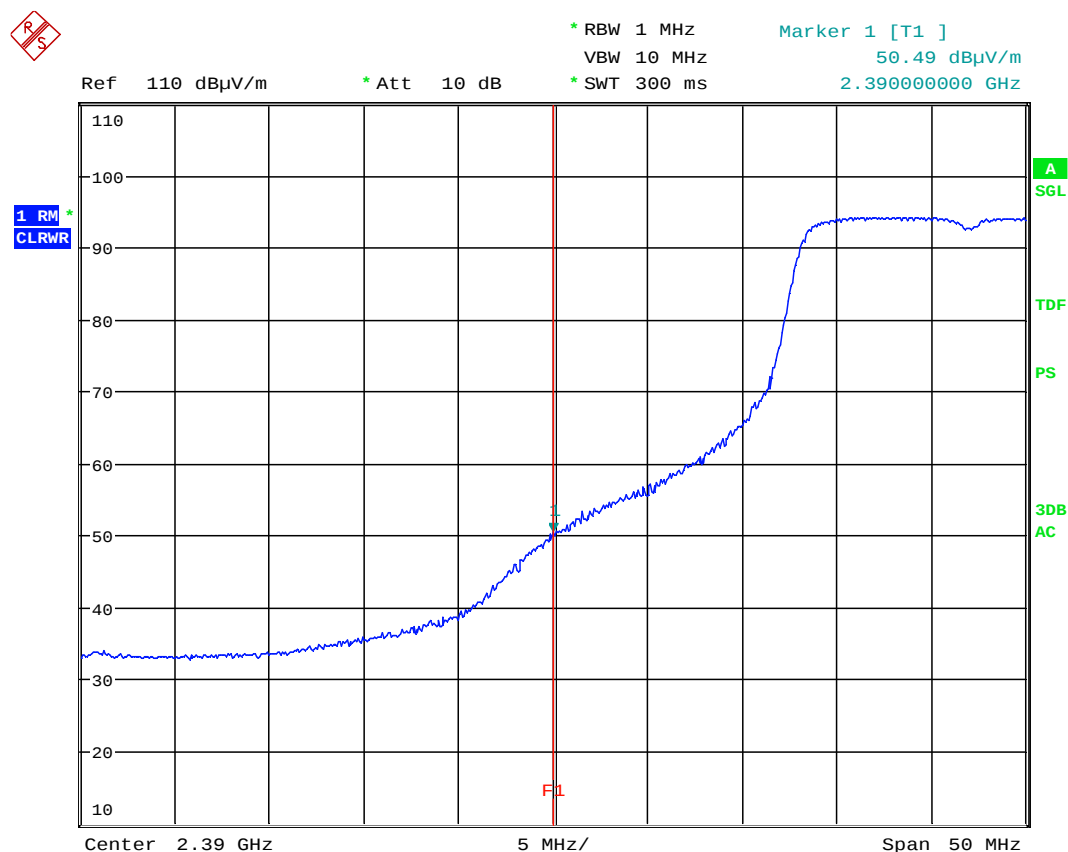
Date: 16.AUG.2012 09:33:38

Band Edge, Lower, Average, 2412 MHz, 802.11g, 6Mbps



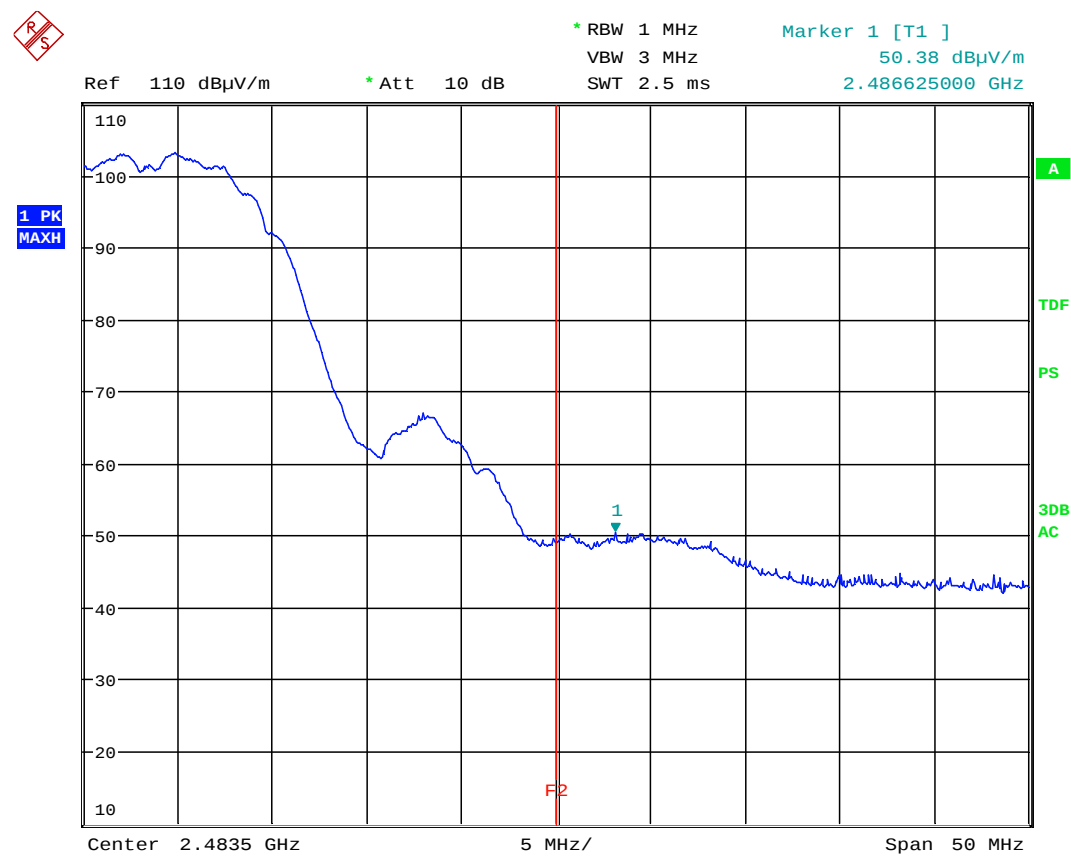
Date: 16.AUG.2012 09:39:06

Band Edge, Lower, Peak, 2412 MHz, 802.11n, MCS0



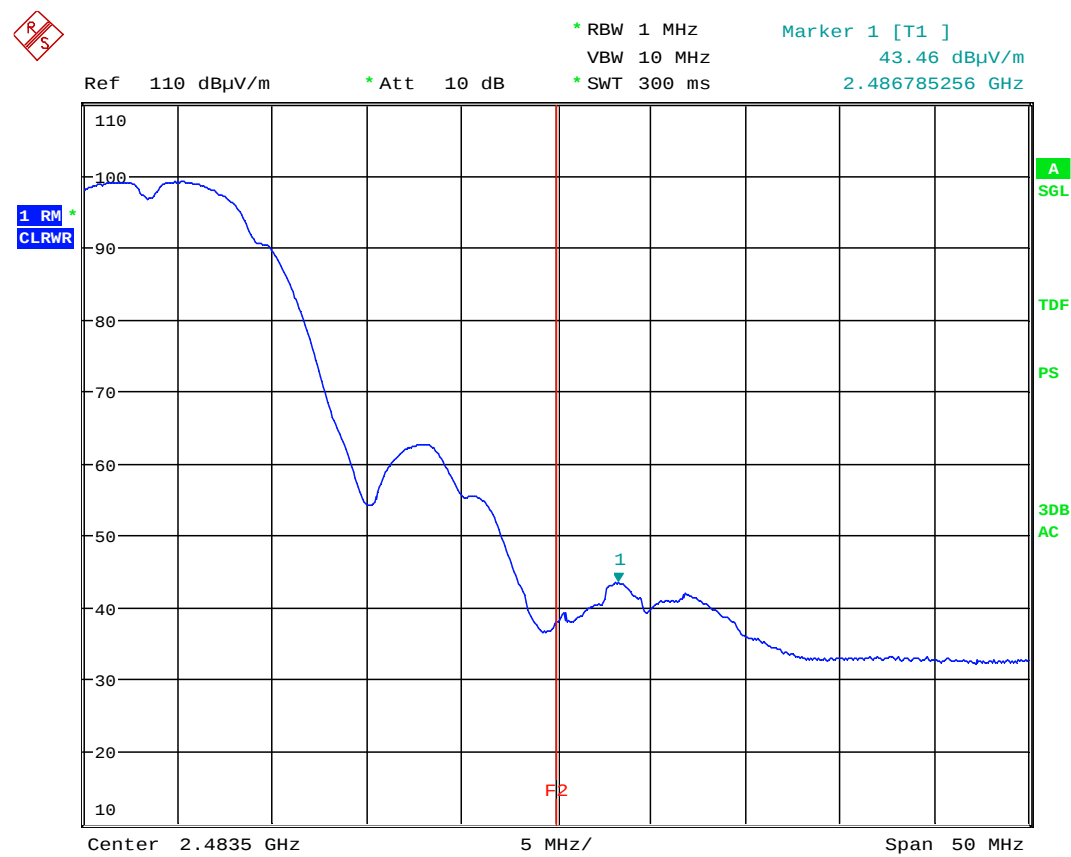
Date: 16.AUG.2012 09:41:43

Band Edge, Lower, Average, 2412 MHz, 802.11n, MCS0



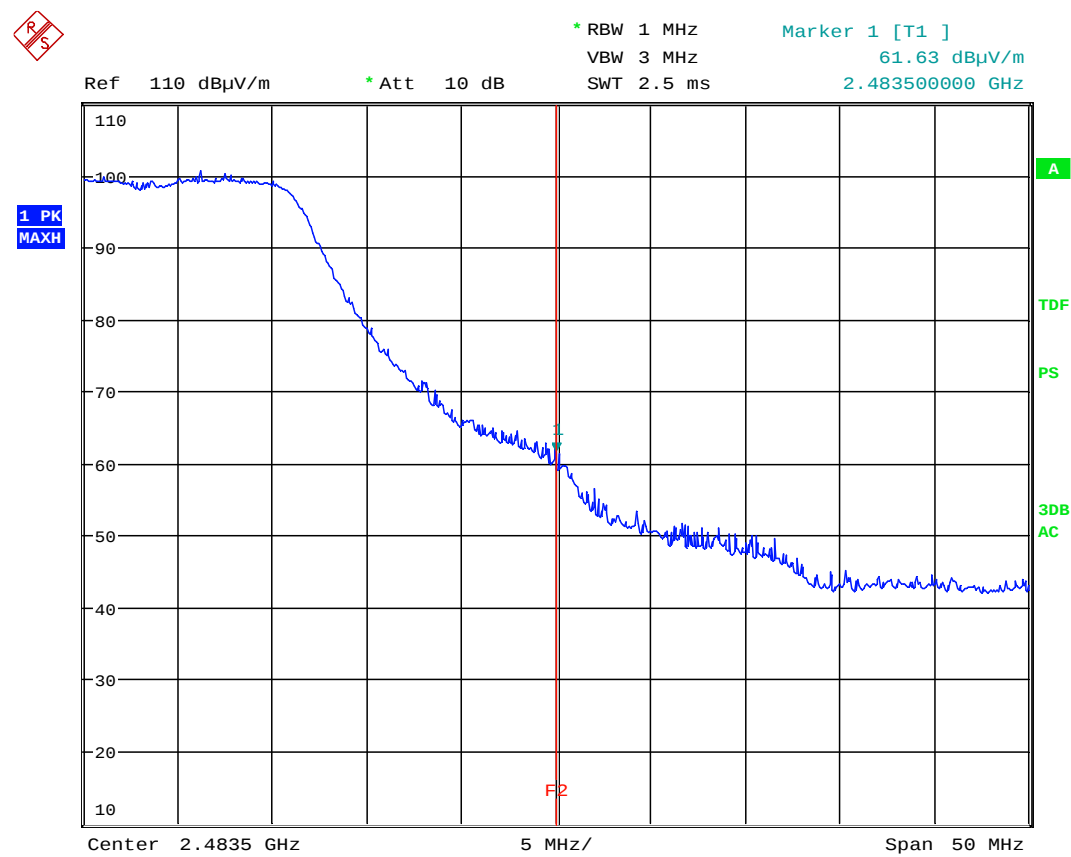
Date: 16.AUG.2012 10:27:50

Band Edge, Upper, Peak, 2462 MHz, 802.11b, 1Mbps



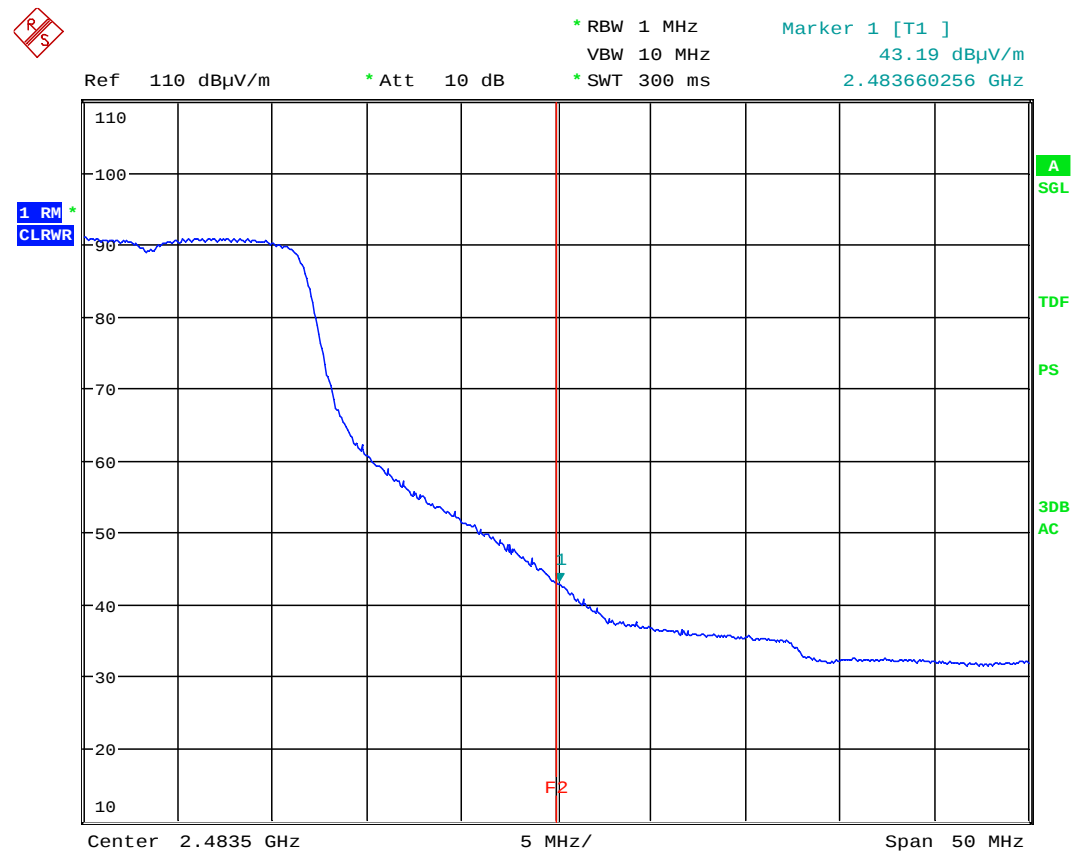
Date: 16.AUG.2012 10:26:35

Band Edge, Upper, Average, 2462 MHz, 802.11b, 1Mbps



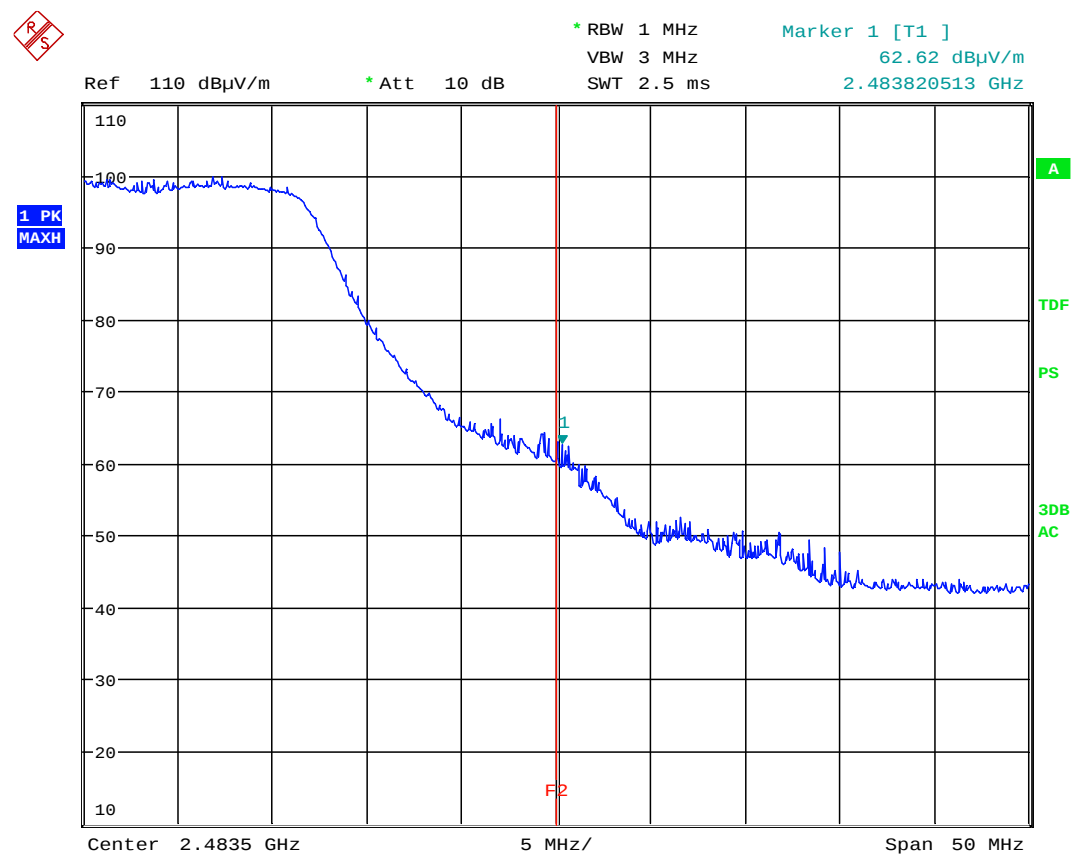
Date: 16.AUG.2012 10:34:13

Band Edge, Upper, Peak, 2462 MHz, 802.11g, 6Mbps



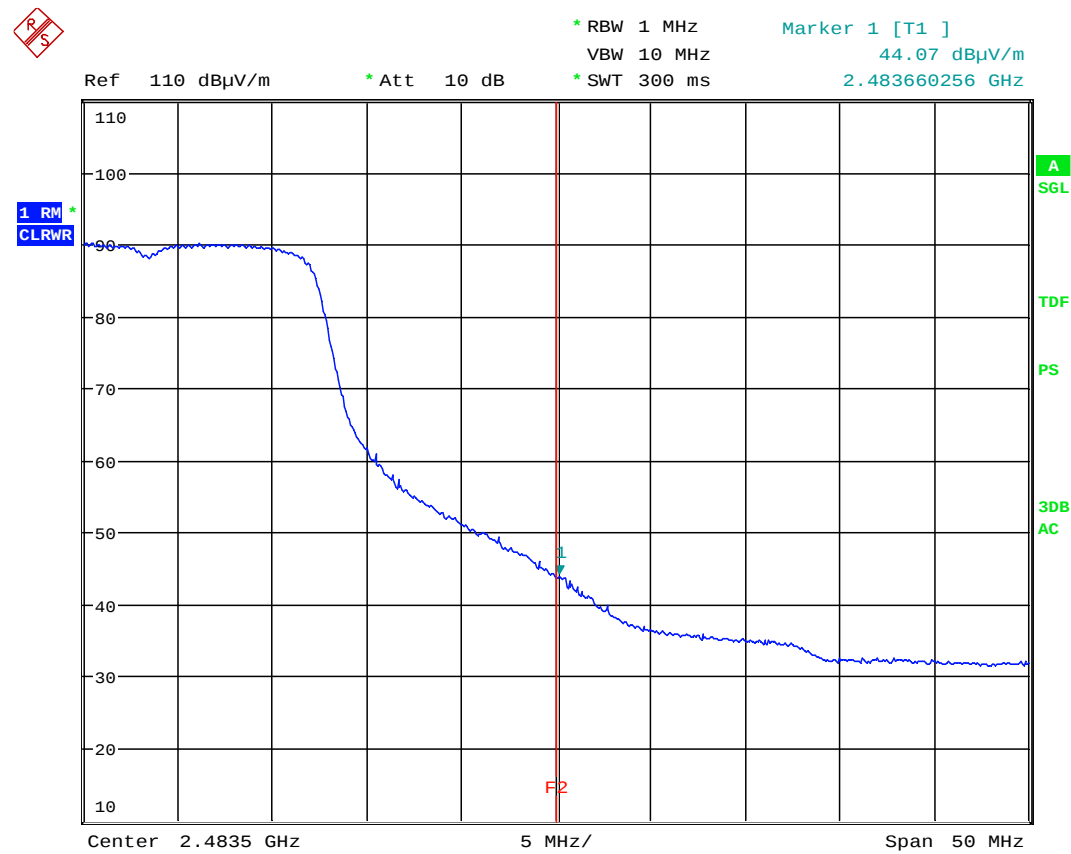
Date: 16.AUG.2012 10:37:19

Band Edge, Upper, Average, 2462 MHz, 802.11g, 6Mbps



Date: 16.AUG.2012 10:50:30

Band Edge, Upper, Peak, 2462 MHz, 802.11n, MCS0



Date: 16.AUG.2012 10:49:00

Band Edge, Upper, Average, 2462 MHz, 802.11n, MCS0

Band Edge Emissions, Conducted
Test Results: Complies
Measurement Data:
Peak Detector:

Modulation and Bitrate	Measured Emissions (dBm)		Limit	Margin	
	2390 MHz	2483.5 MHz	dBm	dB	
802.11b, 11 Mbps	-43.0	-40.5	-21.3	21.7	19.2
802.11g, 6 Mbps	-38.4	-25.3	-21.3	17.1	4.0
802.11n, MCS0	-26.6	-25.8	-21.3	5.3	4.5

Average Detector:

Modulation and Bitrate	Measured Emissions (dBm)		Limit	Margin	
	2390 MHz	2483.5 MHz	dBm	dB	
802.11b, 11 Mbps	-49.6	-47.6	-41.3	8.3	6.3
802.11g, 6 Mbps	-49.6	-50.5	-41.3	8.3	9.2
802.11n, MCS0	-48.9	-51.0	-41.3	7.6	9.7

All Average Detector values include Duty Cycle Correction Factor.

See attached plots.

Duty Cycle Correction Factor:

	Max. Duty Cycle	Max DC Correction Factor
802.11b	93.3%	0.6 dB
802.11g	41.9%	7.6 dB
802.11n	38.5%	8.3 dB

DC Correction Factor = $-20 \cdot \log(\text{Duty Cycle})$ dB

Duty Cycle values used are the values declared by the applicant.

Band Edge Emissions, Calculated

Calculated values for TE Connectivity 2118059-1, 2300 -3800 MHz Single Band Antenna (Gain: 4.0 dBi):

Peak Detector:

Modulation and Bitrate	Maximum Emissions (dBµV/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dBµV/m	dB	
802.11b, 11 Mbps	56.2	58.7	74	17.8	15.3
802.11g, 6 Mbps	60.8	73.9	74	13.2	0.1
802.11n, MCS0	72.6	73.4	74	1.4	0.6

Average Detector:

Modulation and Bitrate	Maximum Emissions (dBµV/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dBµV/m	dB	
802.11b, 11 Mbps	49.0	51.0	54	5.0	3.0
802.11g, 6 Mbps	49.3	48.4	54	4.7	5.6
802.11n, MCS0	49.3	47.2	54	4.7	6.8

Calculated values for Taoglas GW.17.07.0250E, 2.4GHz Click-in Terminal Dipole Antenna (Gain: 2.7 dBi):

Peak Detector:

Modulation and Bitrate	Maximum Emissions (dBµV/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dBµV/m	dB	
802.11b, 11 Mbps	54.9	57.4	74	19.1	16.6
802.11g, 6 Mbps	59.5	72.6	74	14.5	1.4
802.11n, MCS0	71.3	72.1	74	2.7	1.9

Average Detector:

Modulation and Bitrate	Maximum Emissions (dBµV/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dBµV/m	dB	
802.11b, 11 Mbps	47.7	49.7	54	6.3	4.3
802.11g, 6 Mbps	48.0	47.1	54	6.0	6.9
802.11n, MCS0	48.0	45.9	54	6.0	8.1

Band Edge Emissions, Calculated

Calculated values for Taoglas PC.17.07.0070A, Miniature 2.4GHz PCB antenna (Gain: 0.9 dBi):

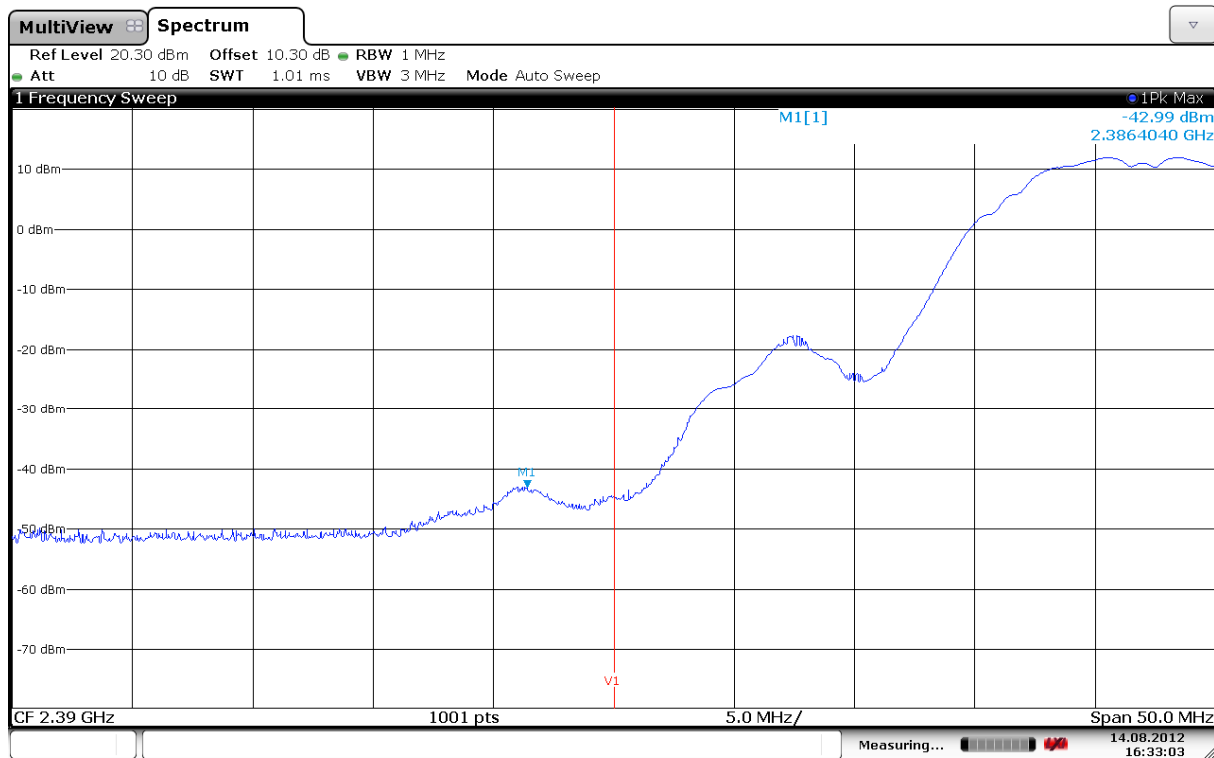
Peak Detector:

Modulation and Bitrate	Maximum Emissions (dBμV/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dBμV/m	dB	
802.11b, 11 Mbps	53.1	55.6	74	20.9	18.4
802.11g, 6 Mbps	57.7	70.8	74	16.3	3.2
802.11n, MCS0	69.5	70.3	74	4.5	3.7

Average Detector:

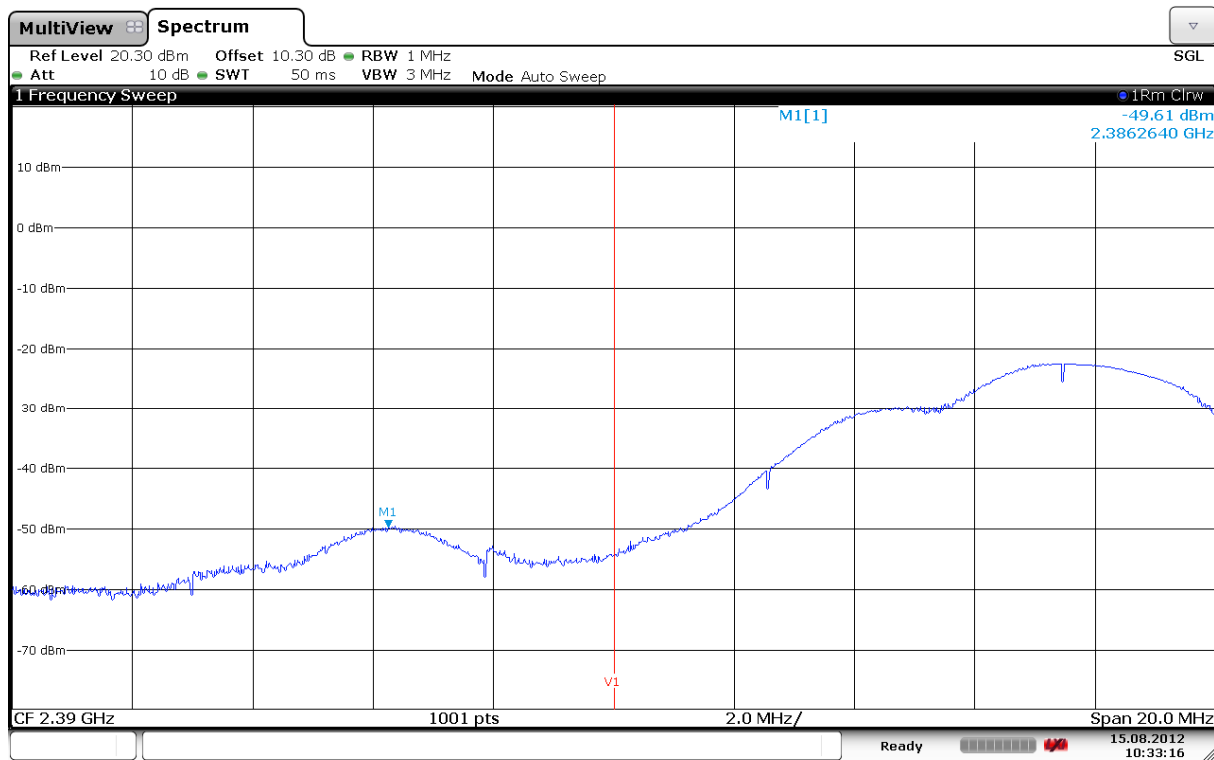
Modulation and Bitrate	Maximum Emissions (dBμV/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dBμV/m	dB	
802.11b, 11 Mbps	45.9	47.9	54	8.1	6.1
802.11g, 6 Mbps	46.2	45.3	54	7.8	8.7
802.11n, MCS0	46.2	44.1	54	7.8	9.9

All Band Edge values are calculated from conducted values using the formulas in KDB 412172 D01 v01.



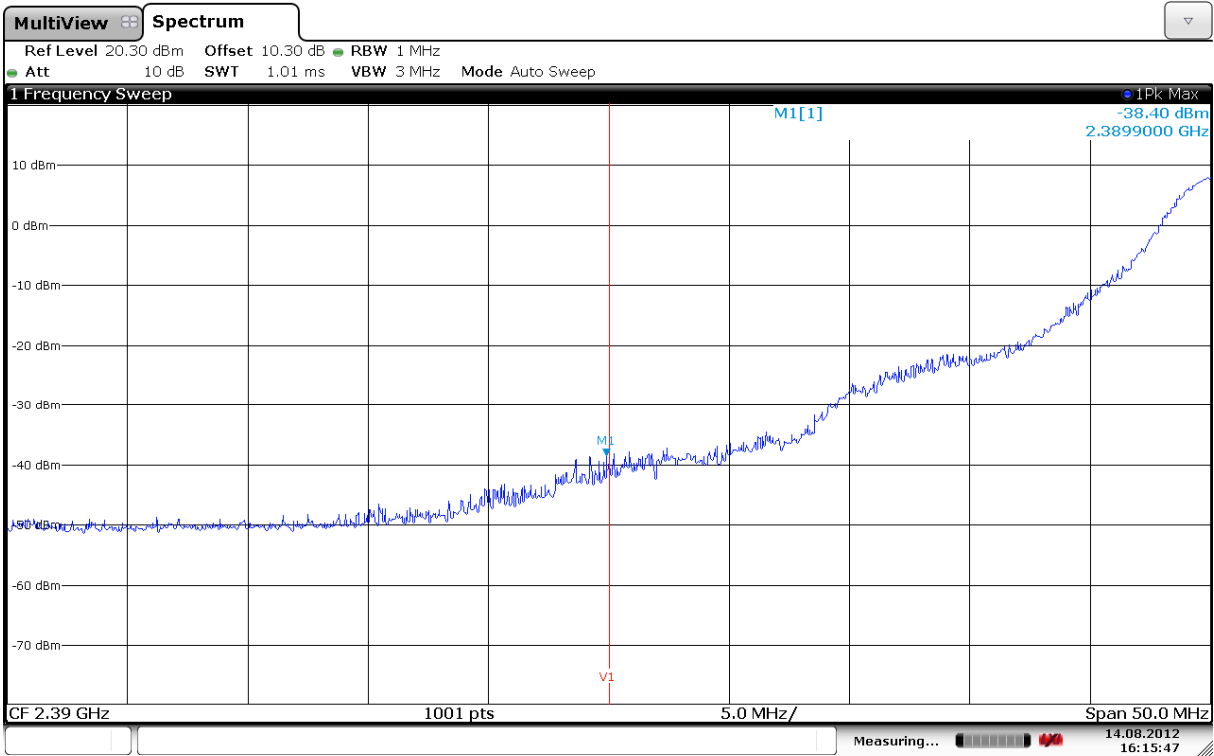
Date: 14.AUG.2012 16:33:03

Lower Band Edge, Peak, Conducted, 2412 MHz, 802.11b, 1Mbps



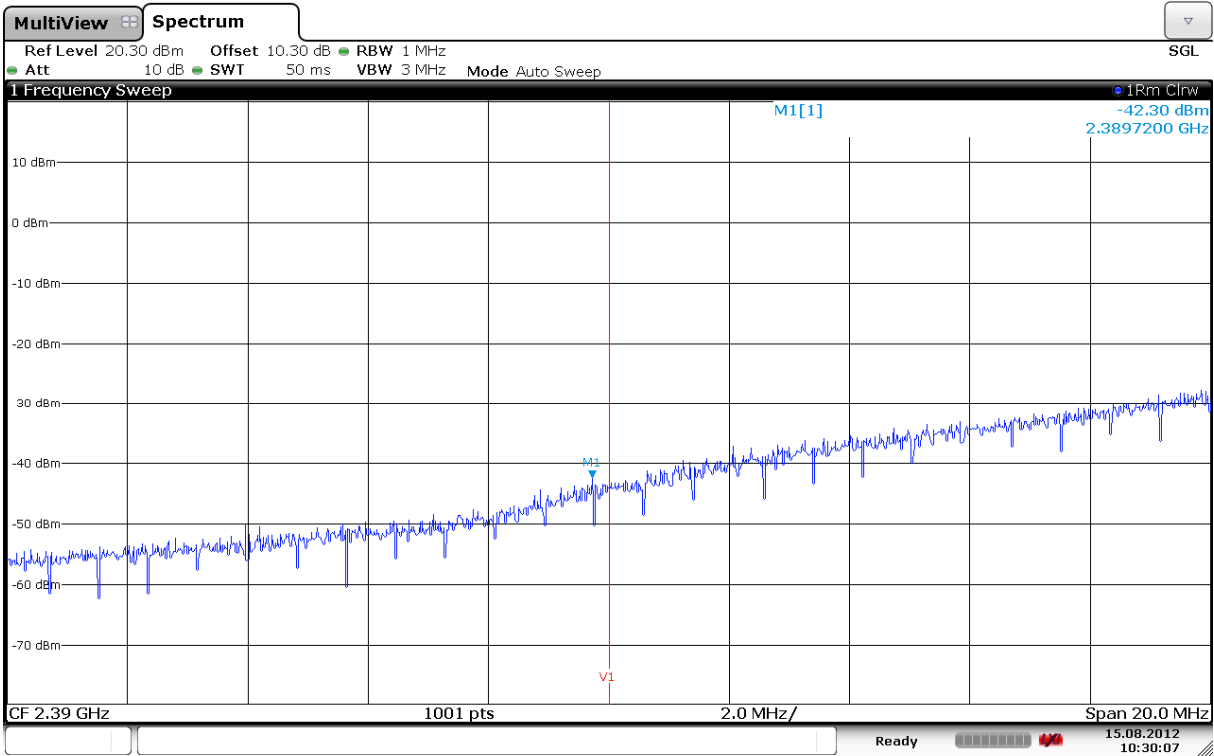
Date: 15.AUG.2012 10:33:16

Lower Band Edge, Average, Conducted, 2412 MHz, 802.11b, 1Mbps



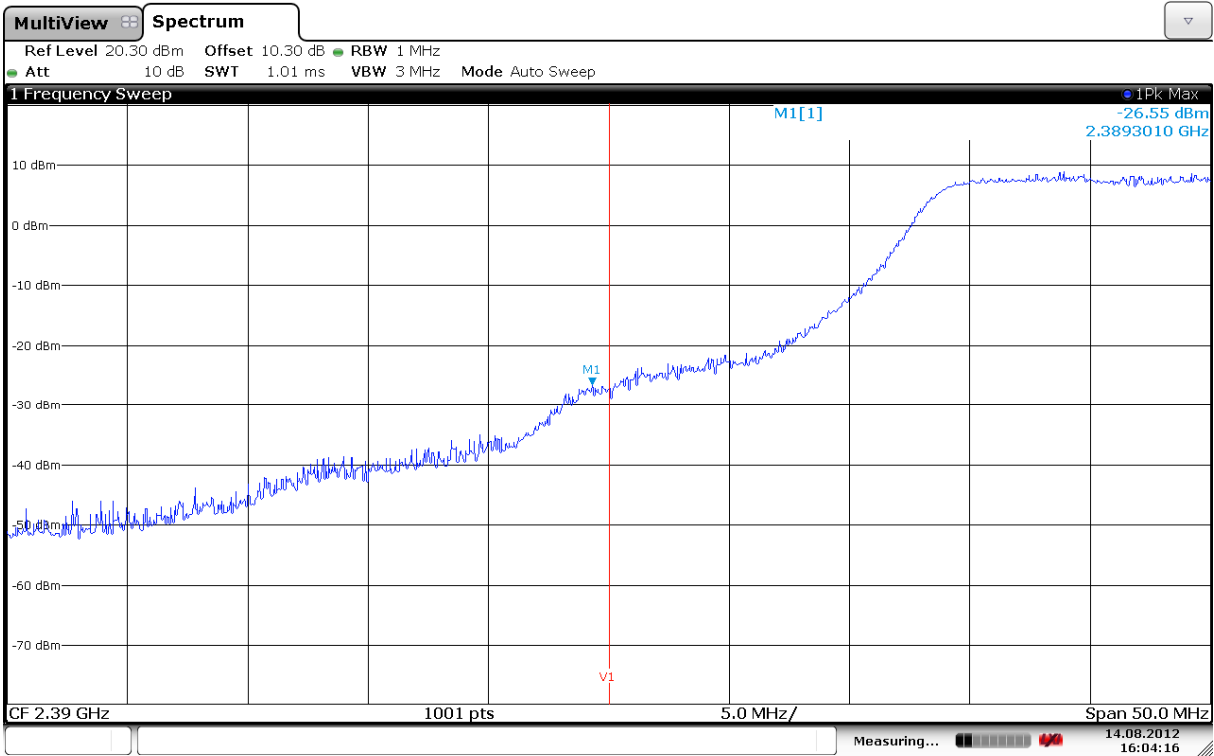
Date: 14.AUG.2012 16:15:47

Lower Band Edge, Peak, Conducted, 2412 MHz, 802.11g, 6Mbps



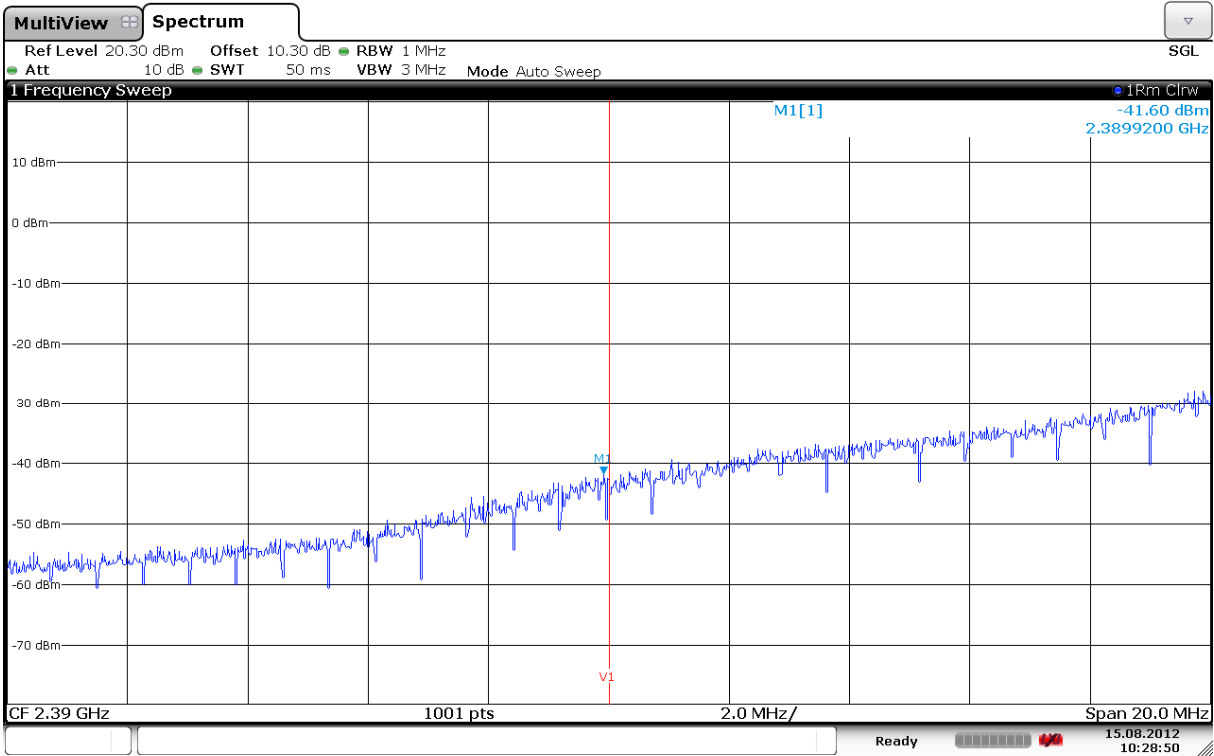
Date: 15.AUG.2012 10:30:07

Lower Band Edge, Average, Conducted, 2412 MHz, 802.11g, 6Mbps



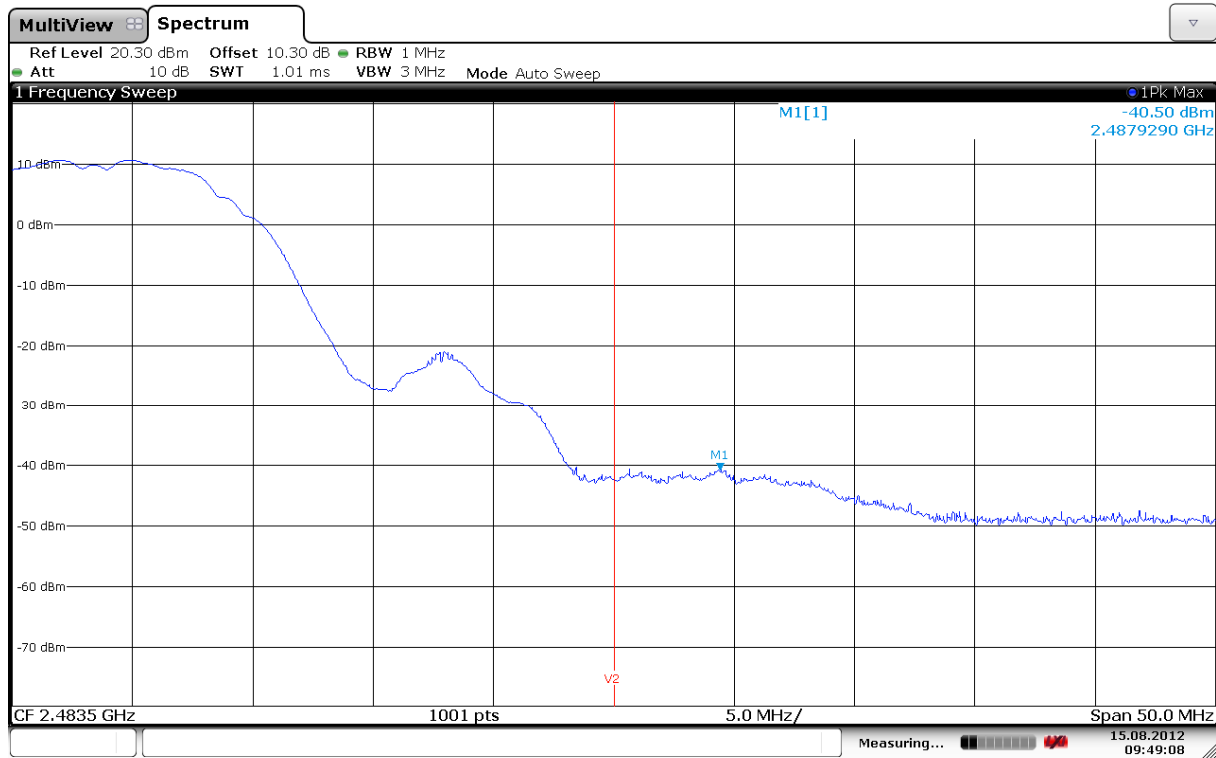
Date: 14.AUG.2012 16:04:17

Lower Band Edge, Peak, Conducted, 2412 MHz, 802.11n, MCS0



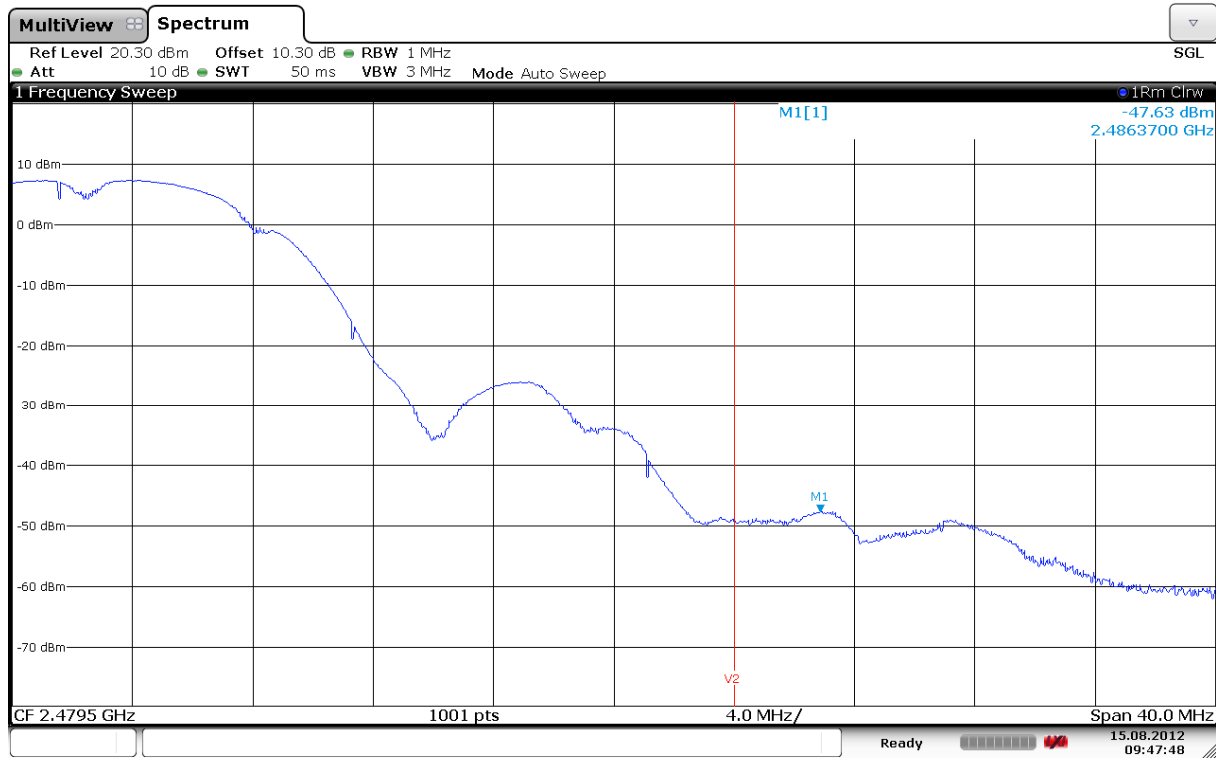
Date: 15.AUG.2012 10:28:50

Lower Band Edge, Average, Conducted, 2412 MHz, 802.11n, MCS0



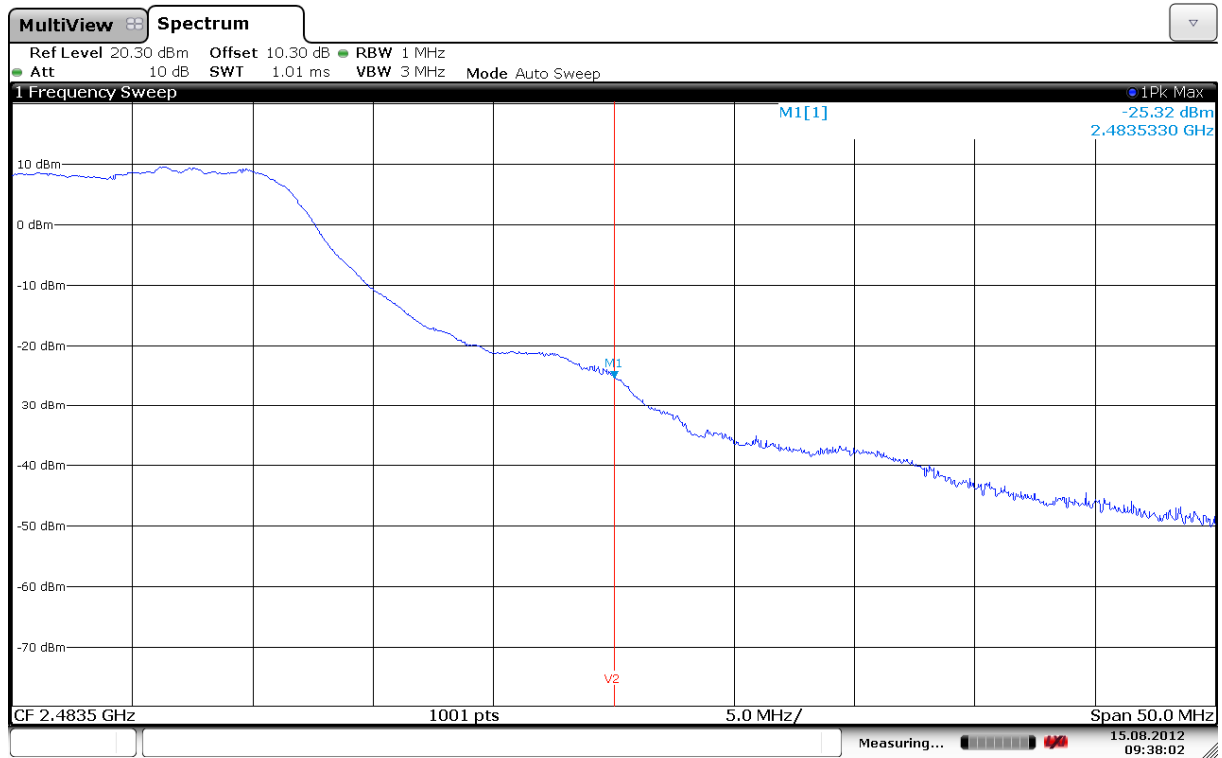
Date: 15.AUG.2012 09:49:09

Upper Band Edge, Peak, Conducted, 2462 MHz, 802.11b, 1Mbps



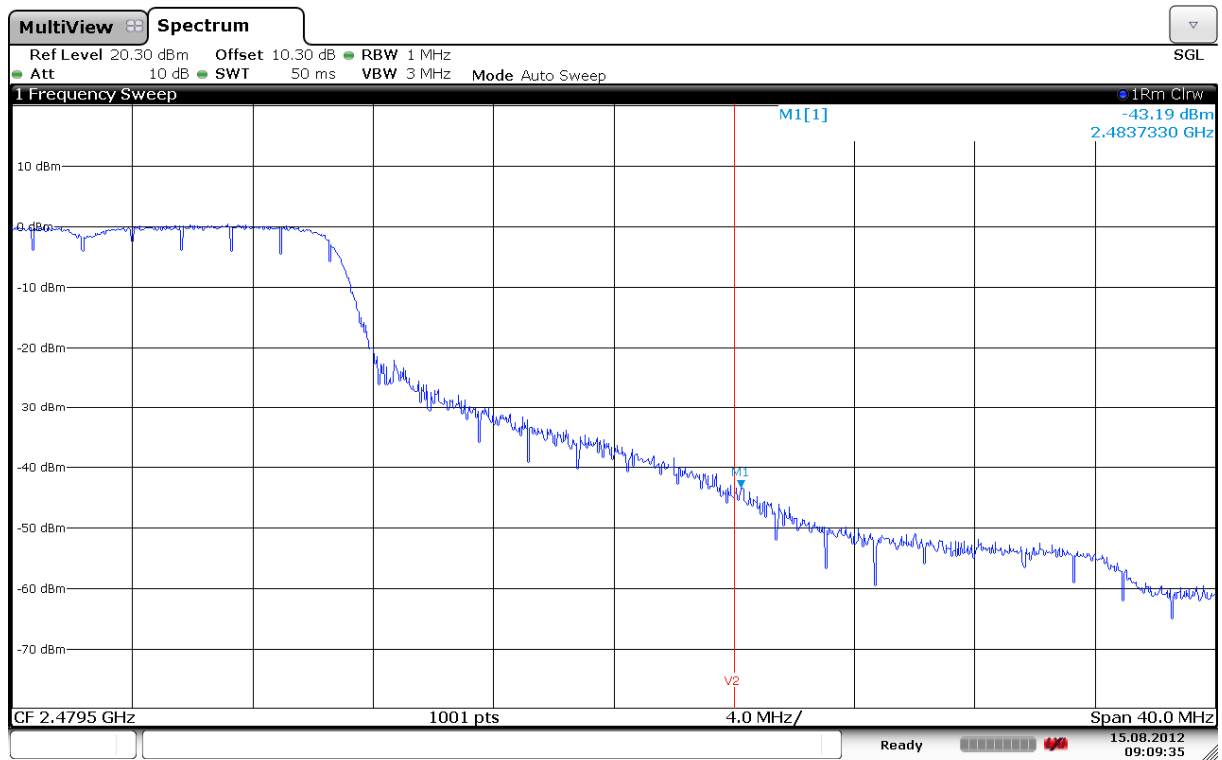
Date: 15.AUG.2012 09:47:48

Upper Band Edge, Average, Conducted, 2462 MHz, 802.11b, 1Mbps



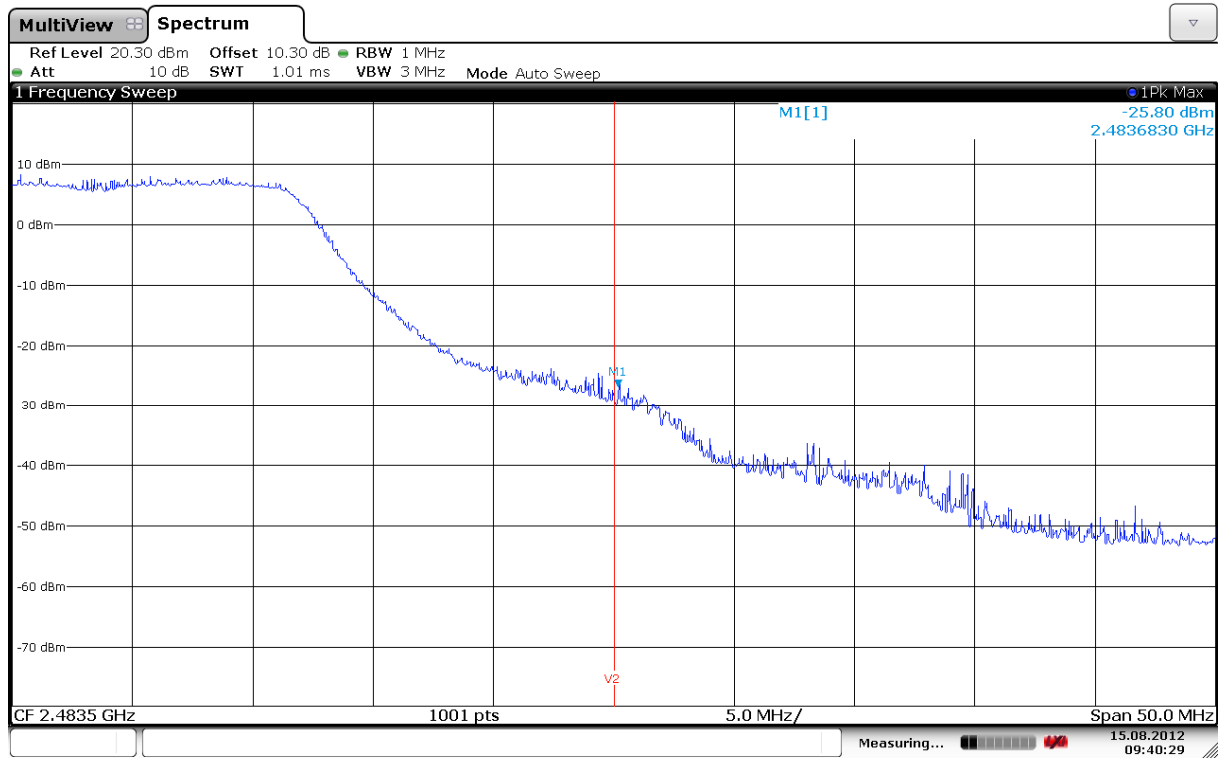
Date: 15.AUG.2012 09:38:02

Upper Band Edge, Peak, Conducted, 2462 MHz, 802.11g, 6Mbps



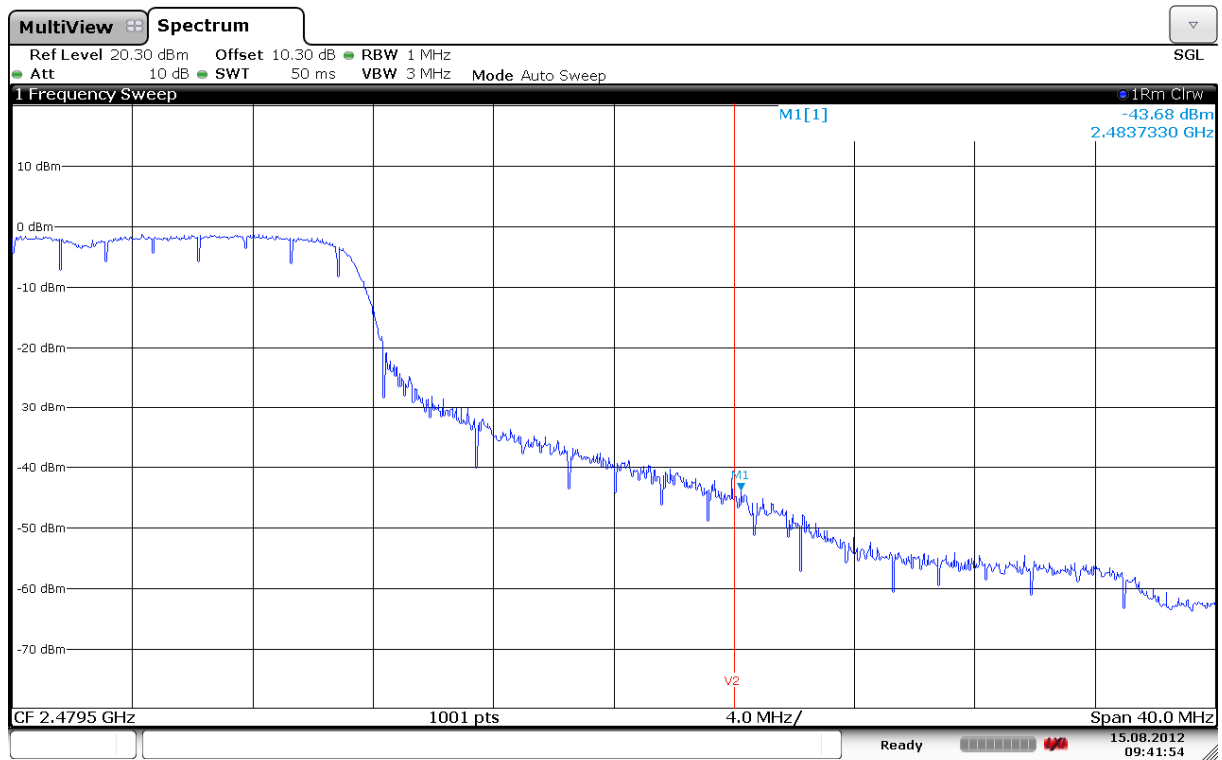
Date: 15.AUG.2012 09:09:34

Upper Band Edge, Average, Conducted, 2462 MHz, 802.11g, 6Mbps



Date: 15.AUG.2012 09:40:30

Upper Band Edge, Peak, Conducted, 2462 MHz, 802.11n, MCS0



Date: 15.AUG.2012 09:41:54

Upper Band Edge, Average, Conducted, 2462 MHz, 802.11n, MCS0

Spurious Emissions, Conducted

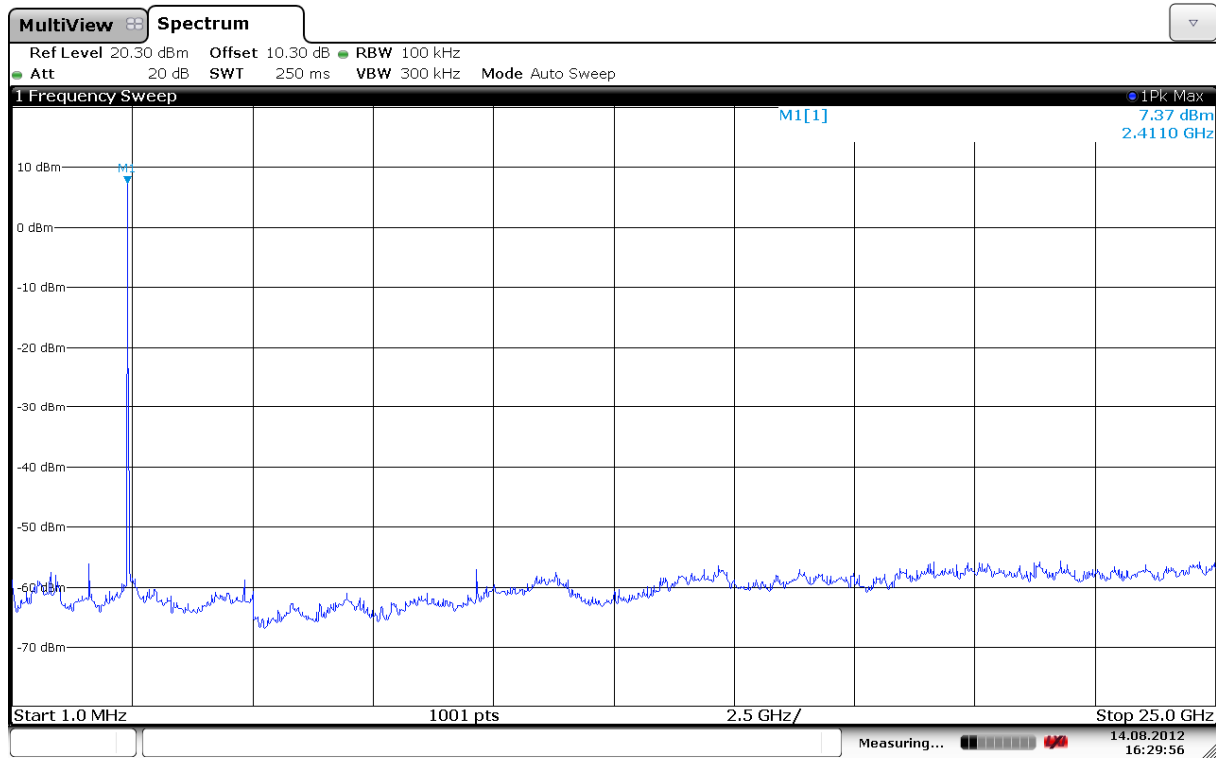
1 - 25 GHz, see attached plots.

Maximum RF level outside operating band:

RF ch 01: >50 dB/C, margin >20 dB

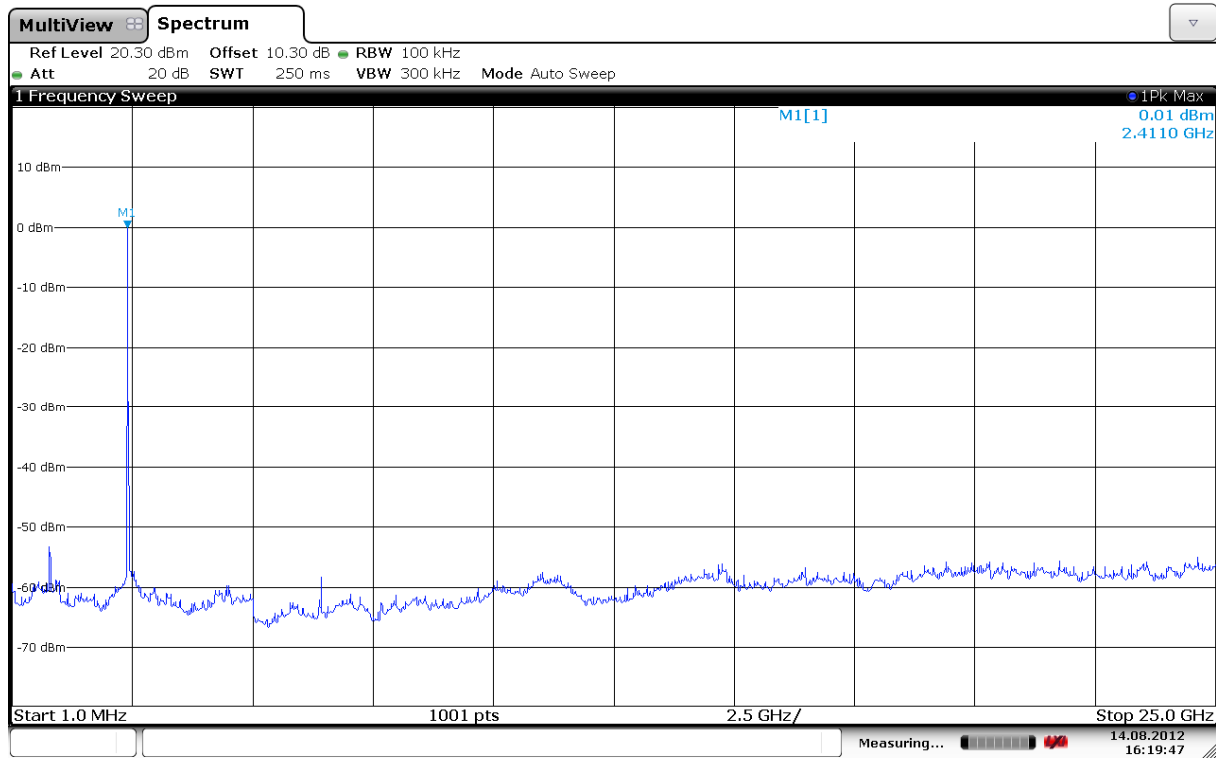
RF ch 07: >50 dB/C, margin >20 dB

RF ch 11: >50 dB/C, margin >20 dB



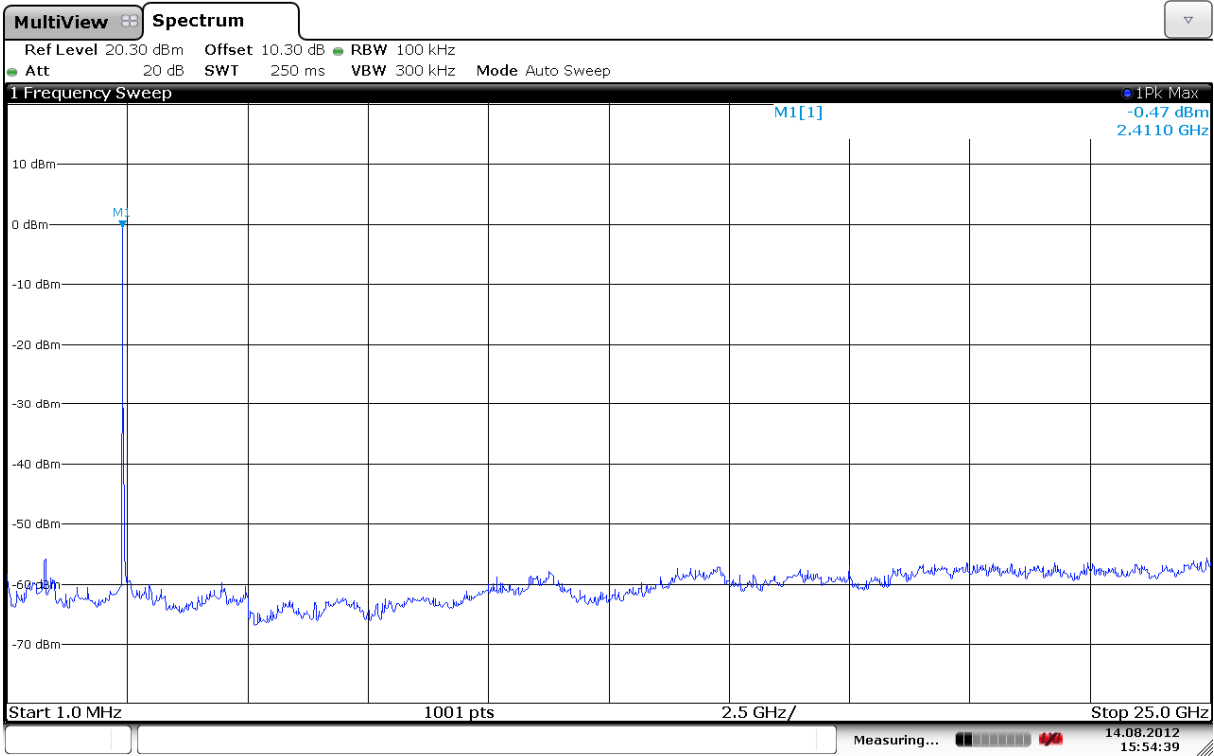
Date: 14.AUG.2012 16:29:55

Conducted Emissions 1 MHz – 25 GHz, 2412 MHz, 802.11b, 11Mbps



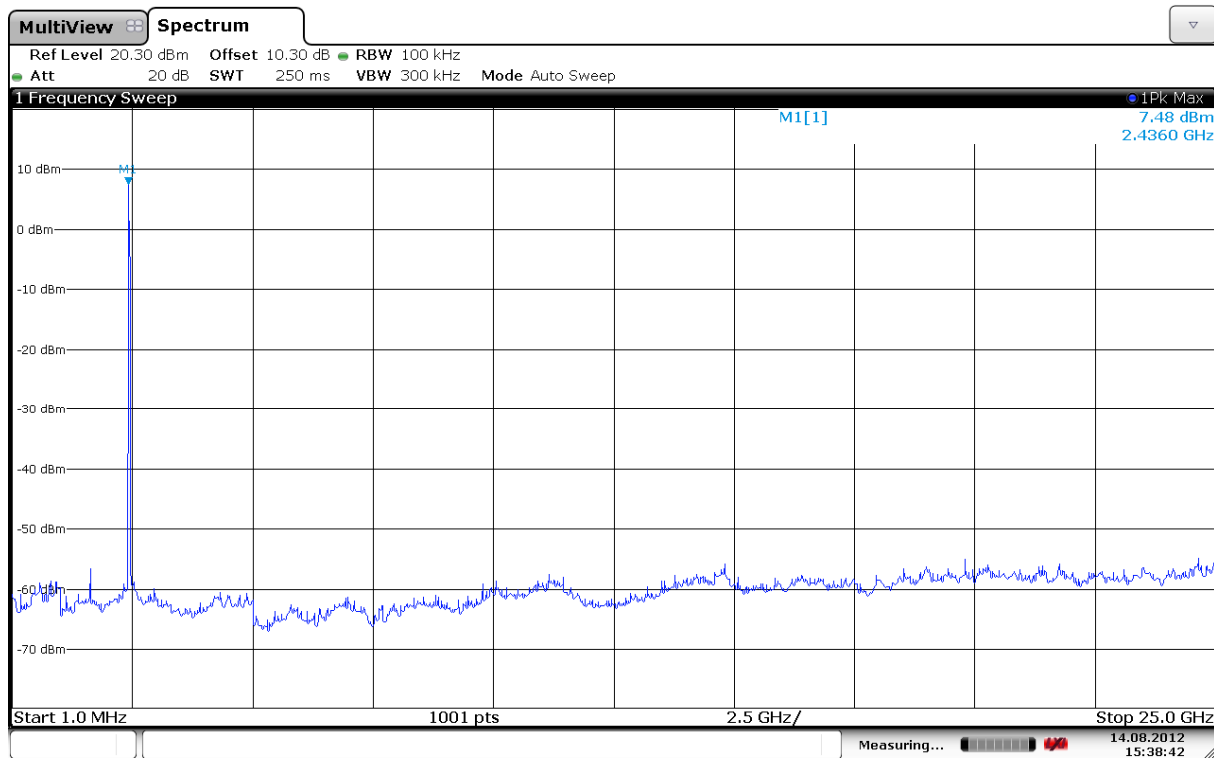
Date: 14.AUG.2012 16:19:47

Conducted Emissions 1 MHz – 25 GHz, 2442 MHz, 802.11b, 11Mbps



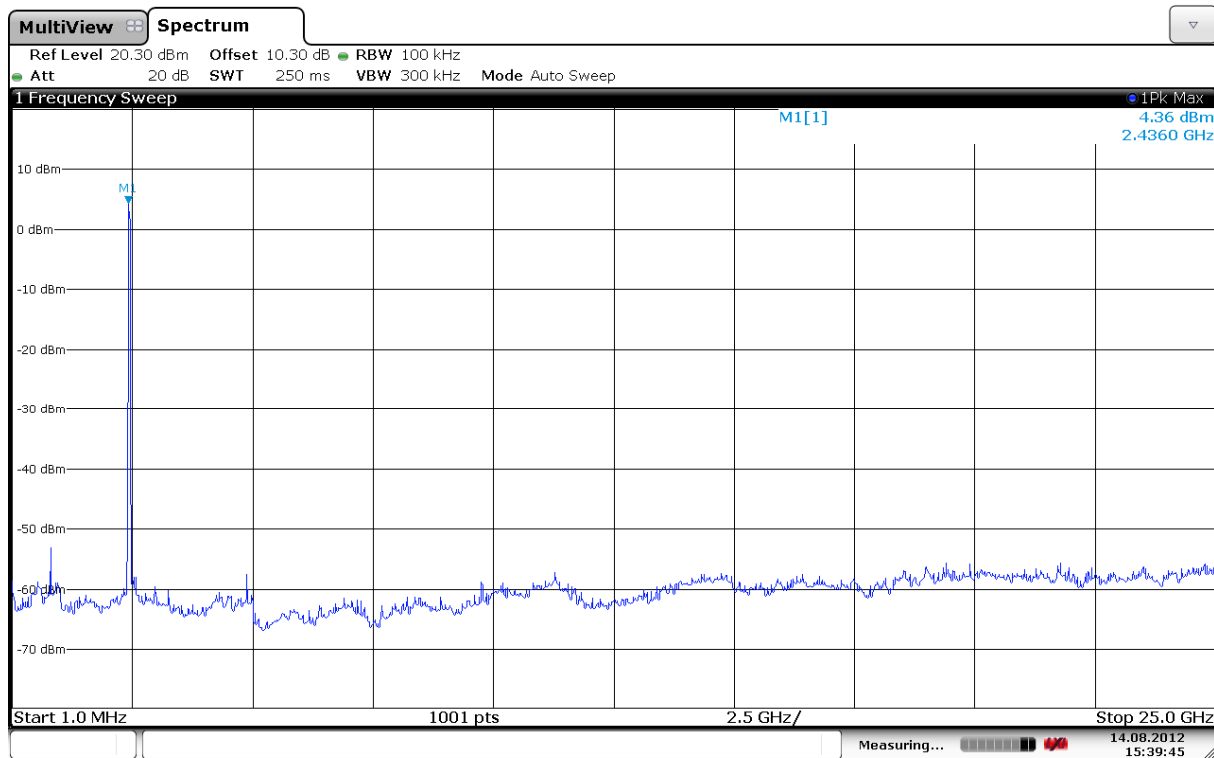
Date: 14.AUG.2012 15:54:40

Conducted Emissions 1 MHz – 25 GHz, 2472 MHz, 802.11b, 11Mbps



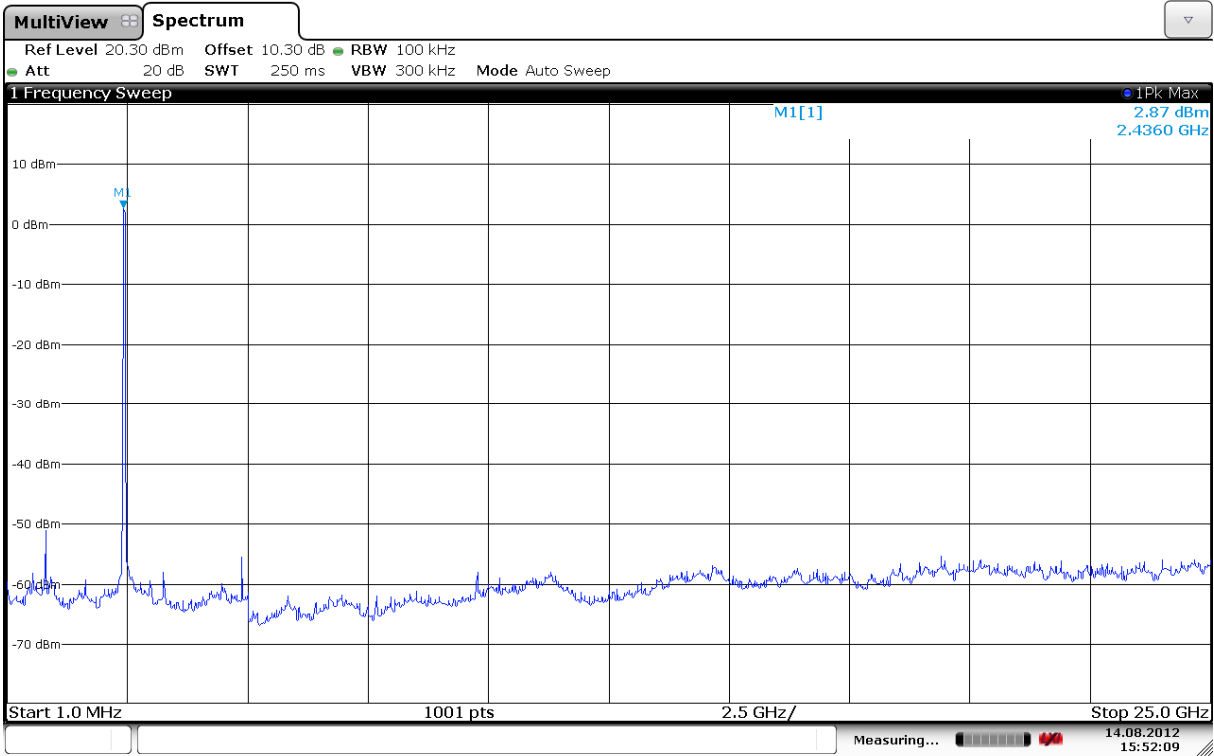
Date: 14.AUG.2012 15:38:43

Conducted Emissions 1 MHz – 25 GHz, 2412 MHz, 802.11g, 6Mbps



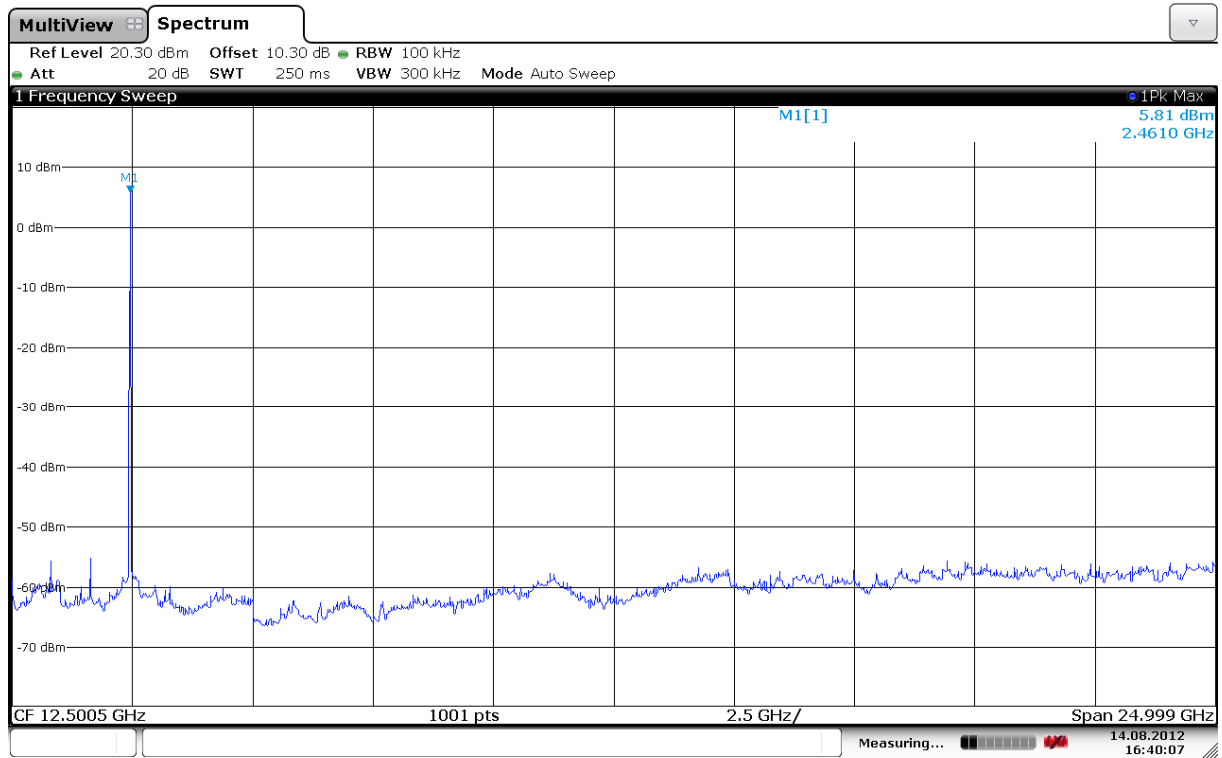
Date: 14.AUG.2012 15:39:45

Conducted Emissions 1 MHz – 25 GHz, 2442 MHz, 802.11g, 6Mbps



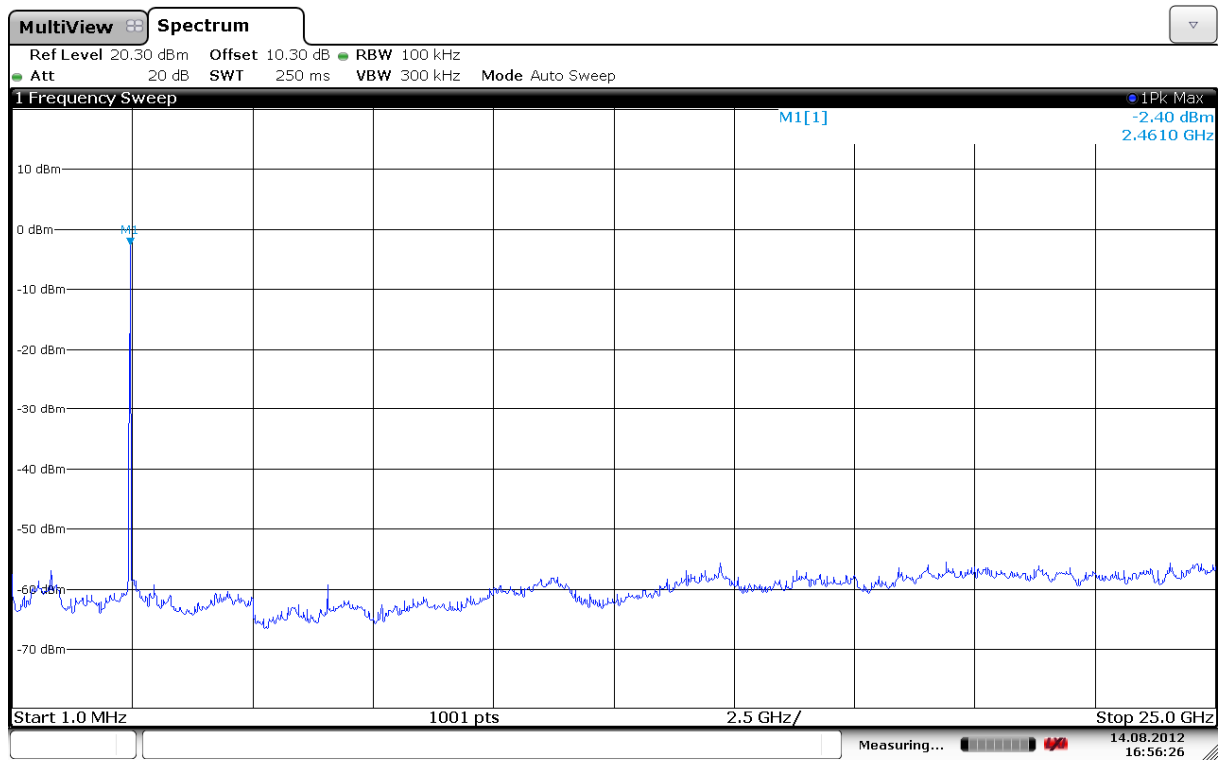
Date: 14.AUG.2012 15:52:10

Conducted Emissions 1 MHz – 25 GHz, 2472 MHz, 802.11g, 6Mbps



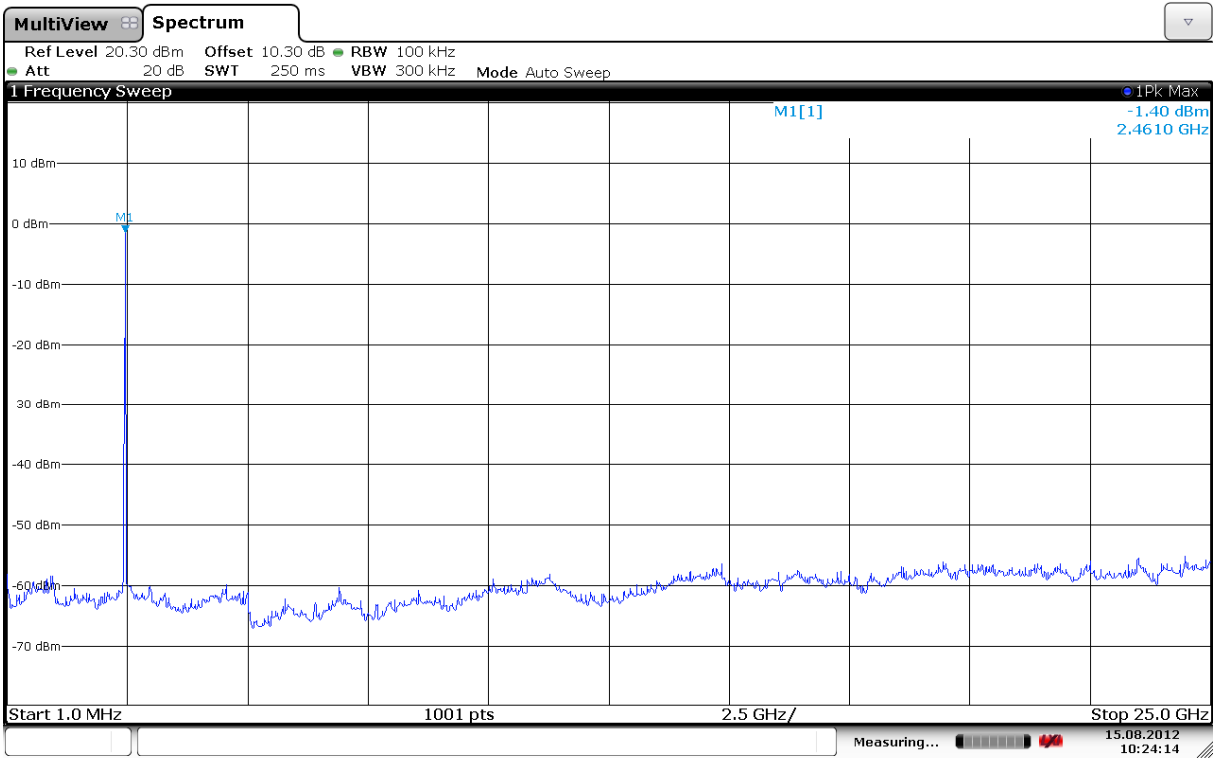
Date: 14.AUG.2012 16:40:07

Conducted Emissions 1 MHz – 25 GHz, 2412 MHz, 802.11n, MCS0



Date: 14.AUG.2012 16:56:26

Conducted Emissions 1 MHz – 25 GHz, 2442 MHz, 802.11n, MCS0



Date: 15.AUG.2012 10:24:14

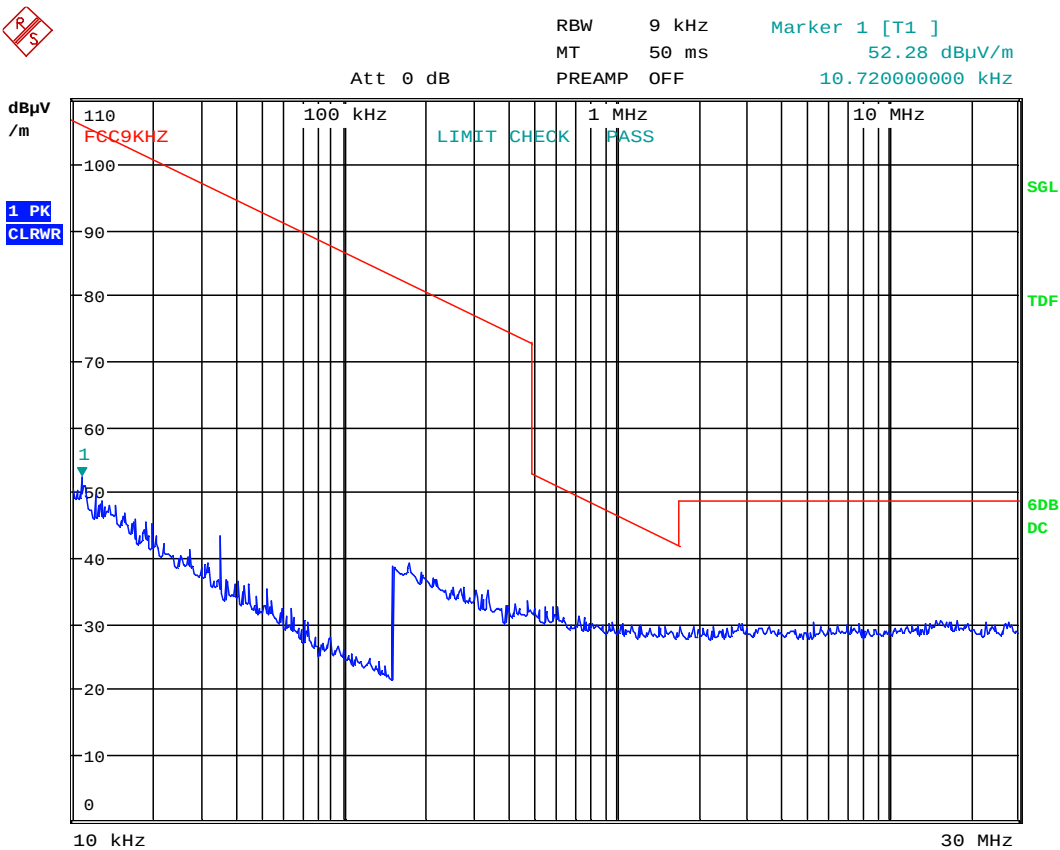
Conducted Emissions 1 MHz – 25 GHz, 2472 MHz, 802.11n, MCS0

Spurious Emissions, Radiated, 10 kHz-30 MHz.

Measuring distance 10 m, measured with Peak detector.

No component detected, see attached plot.

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



Date: 16.AUG.2012 15:50:56

Radiated Emissions, 10 kHz – 30 MHz

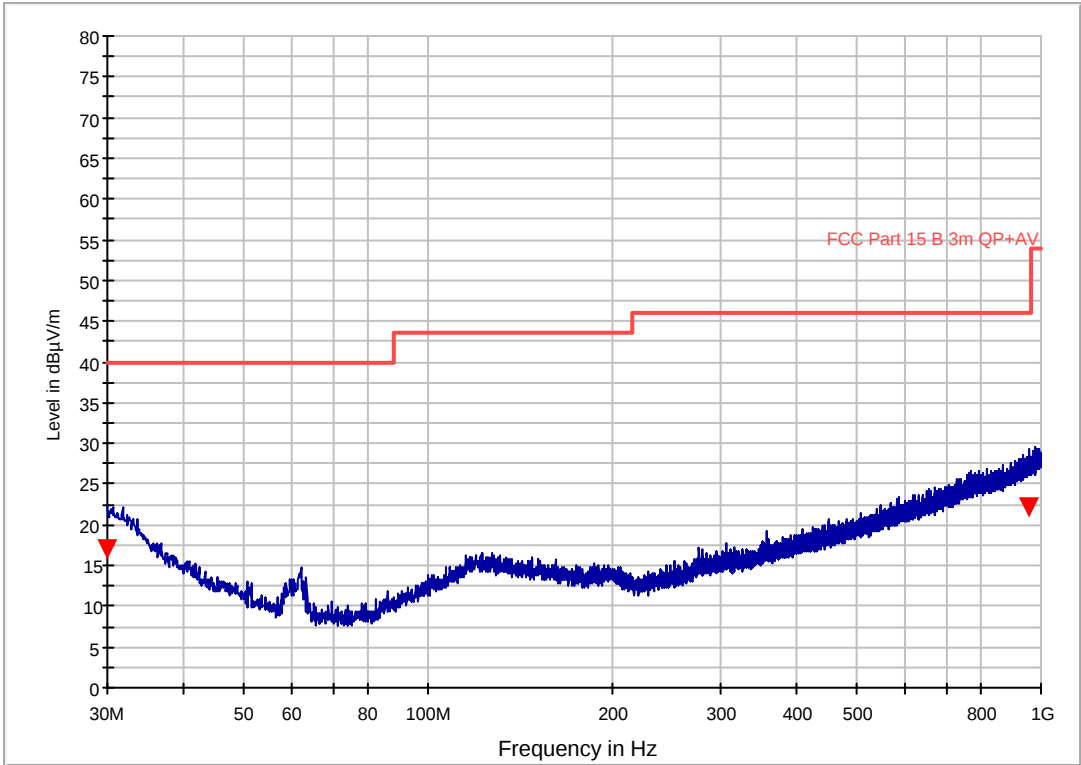
Spurious Emissions, Radiated, 30 – 1000 MHz.

Detector: Quasi-Peak
Measuring distance: 3 m.

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
30.007299	17.1	1000.0	120.000	250.0	H	13.0	-2.3	23.0	40.0	
953.950209	22.2	1000.0	120.000	340.0	V	204.0	2.5	23.8	46.0	

See attached plot.

FCC Pt15 Class B 30-1000M 3m



Radiated Emissions, 1-25 GHz

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

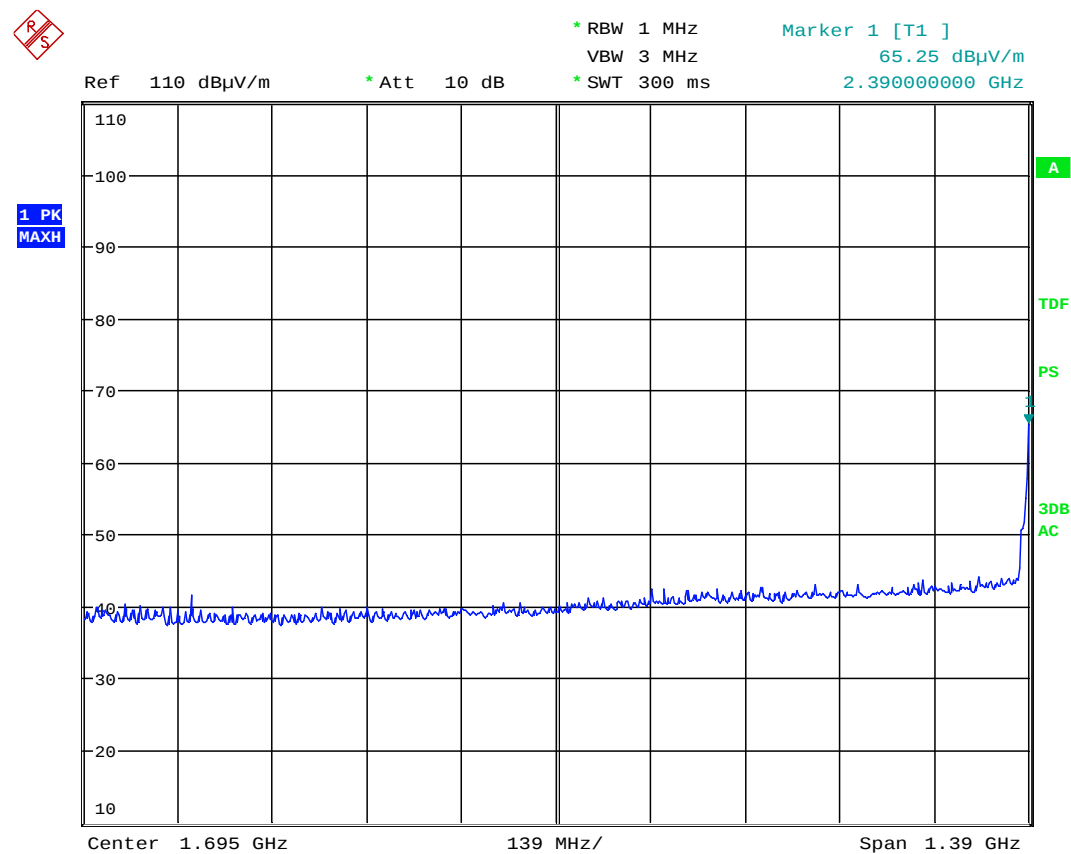
A pre-scan was performed above 18 GHz and no spurious emissions were detected.

All radiated emission measurements were performed with PCB antenna.

No spurious emissions were found.

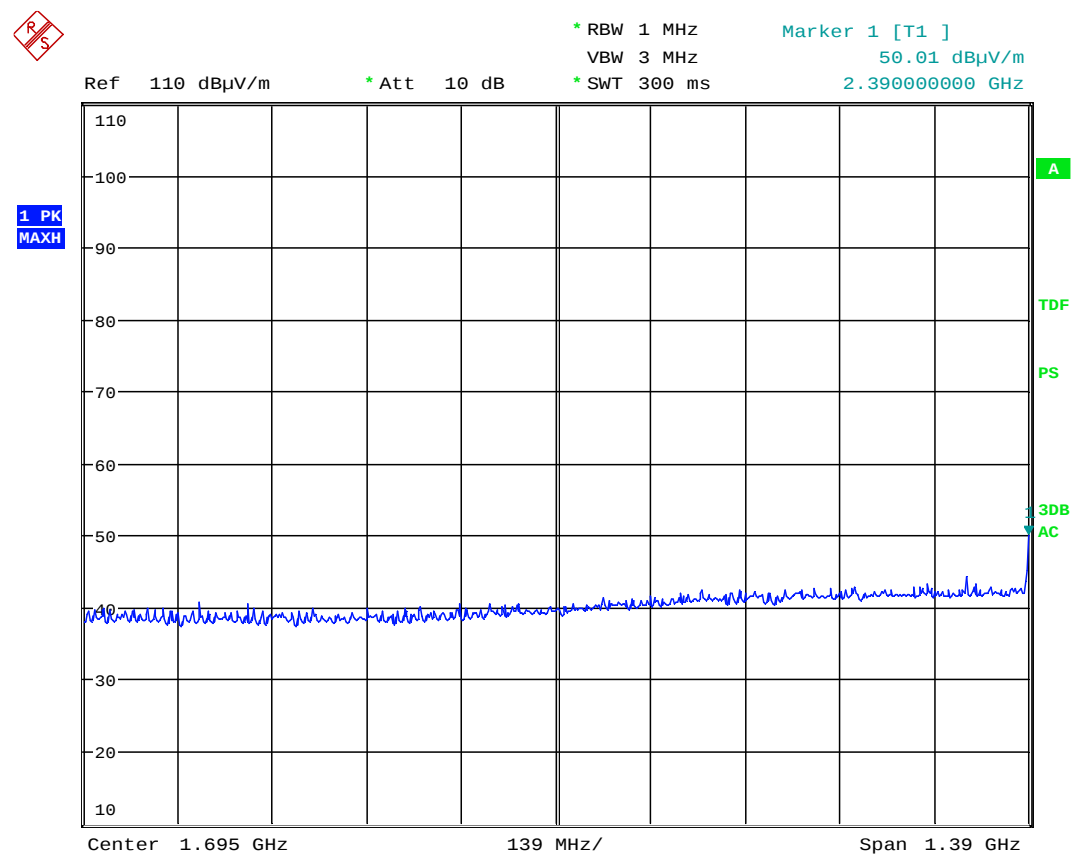
Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor".

See plots.



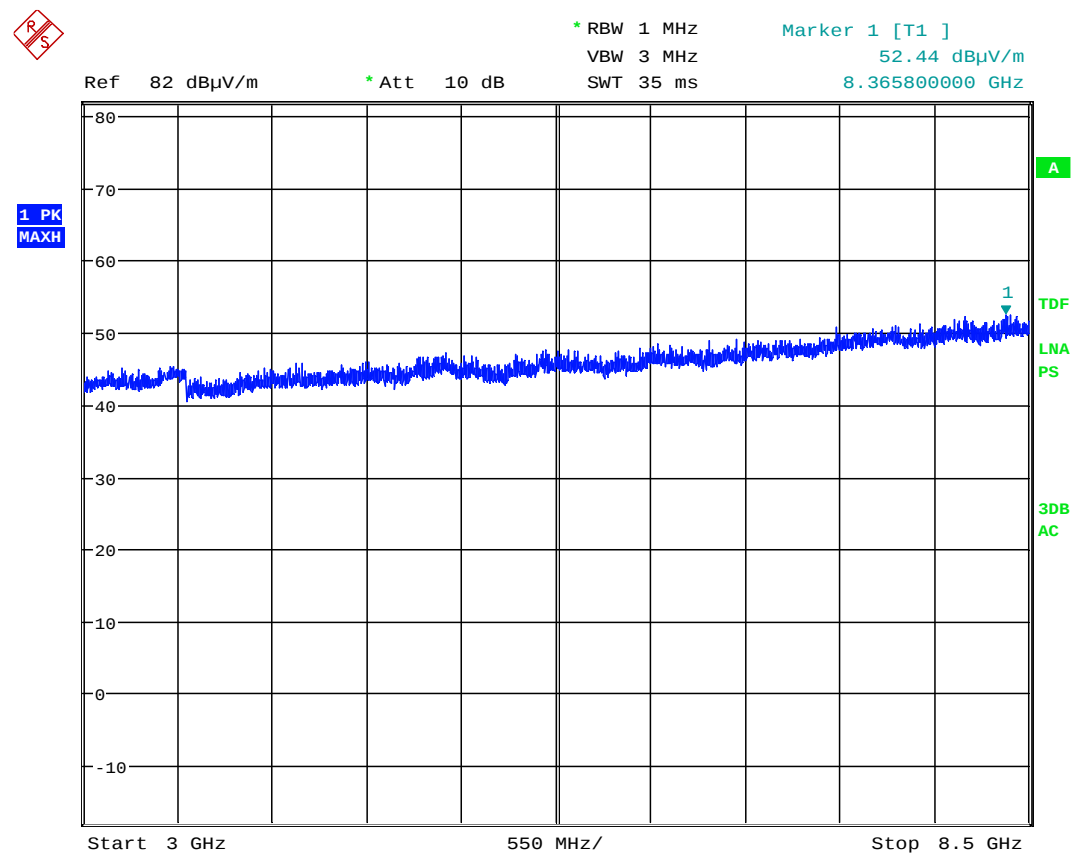
Date: 16.AUG.2012 09:50:33

Radiated Emissions, 1000 -2390 MHz, VP, 802.11b, 1Mbps



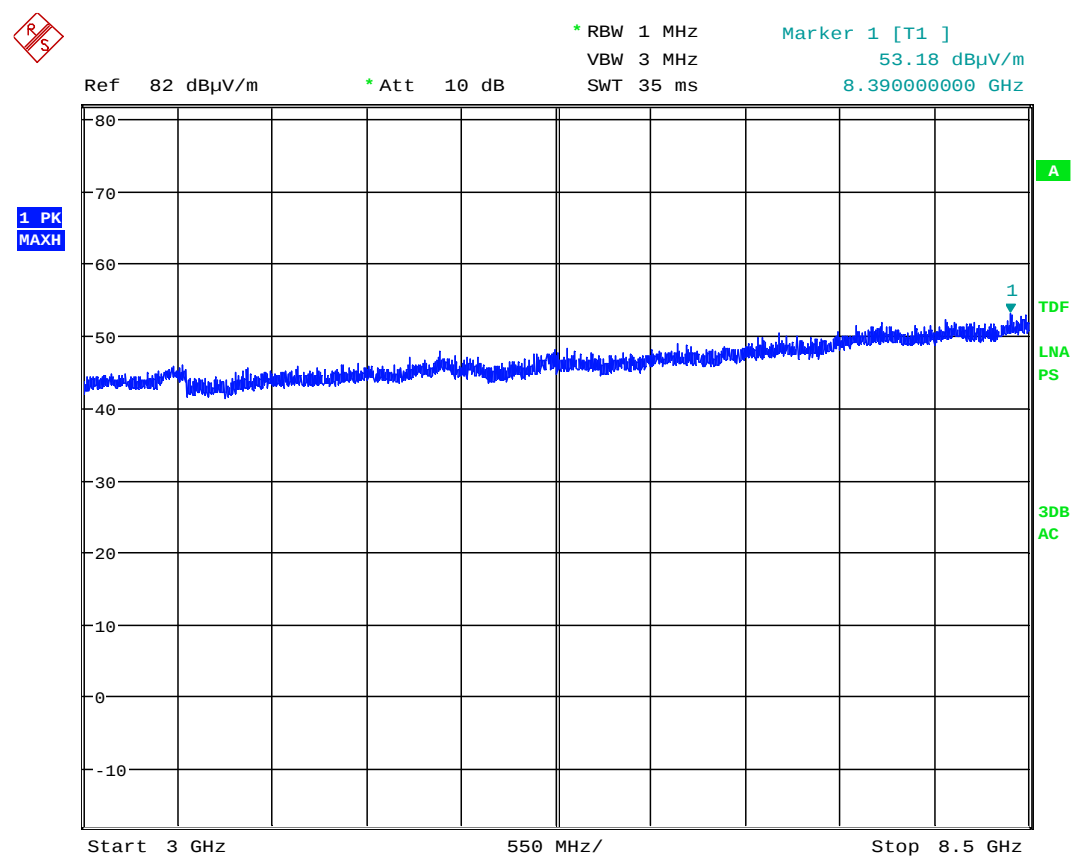
Date: 16.AUG.2012 09:53:15

Radiated Emissions, 1000 -2390 MHz, HP, 802.11b, 1Mbps



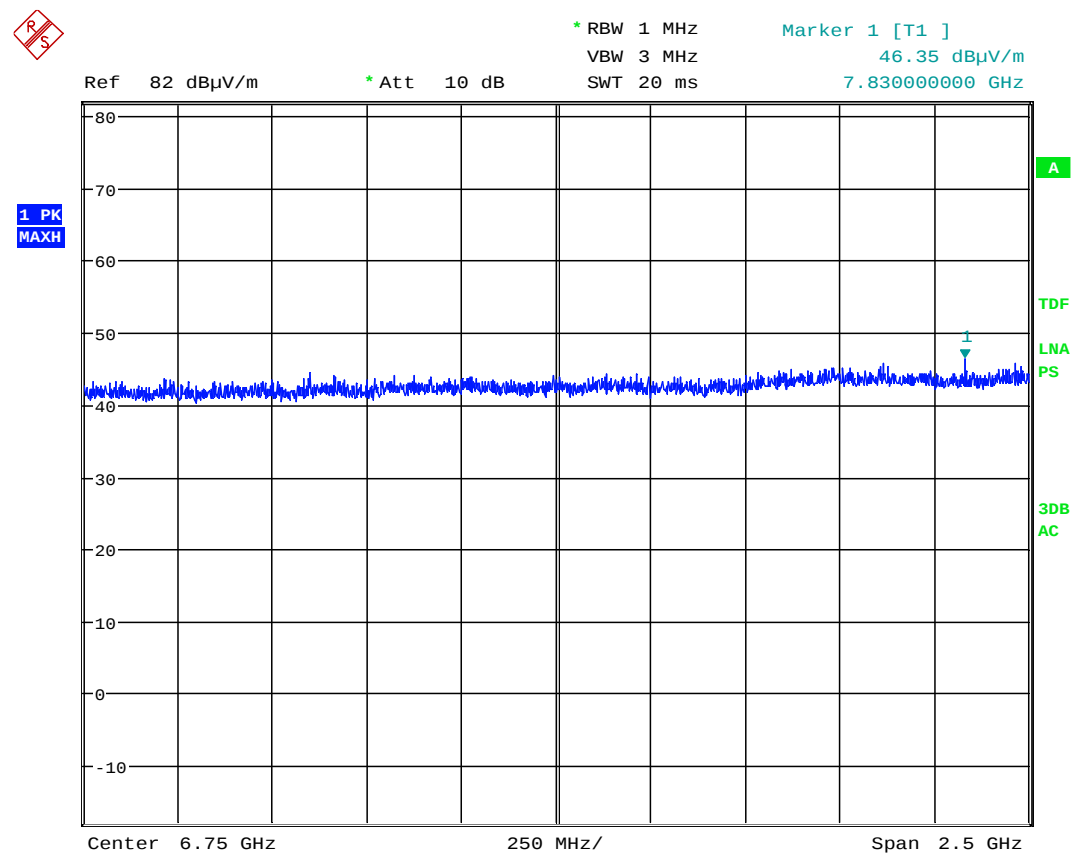
Date: 16.AUG.2012 11:19:11

Radiated Emissions, 3000 -8500 MHz, VP, 802.11b, 1Mbps



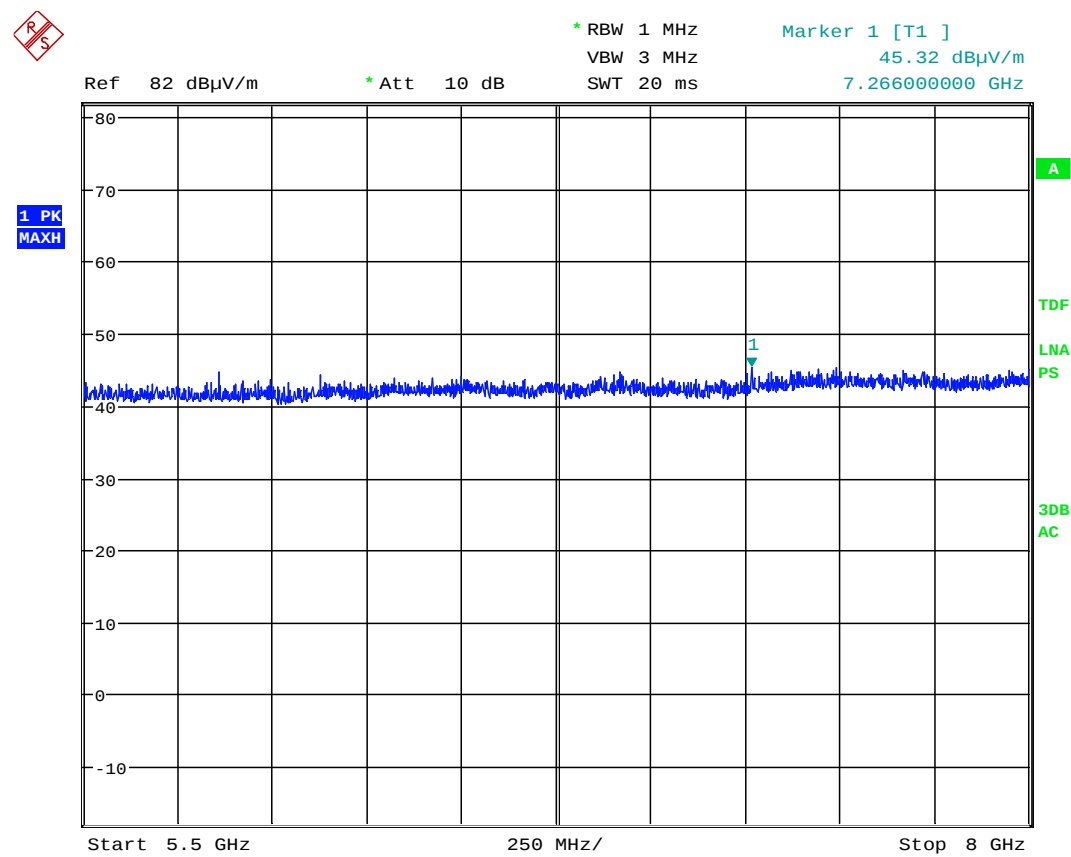
Date: 16.AUG.2012 11:17:02

Radiated Emissions, 3000 -8500 MHz, HP, 802.11b, 1Mbps



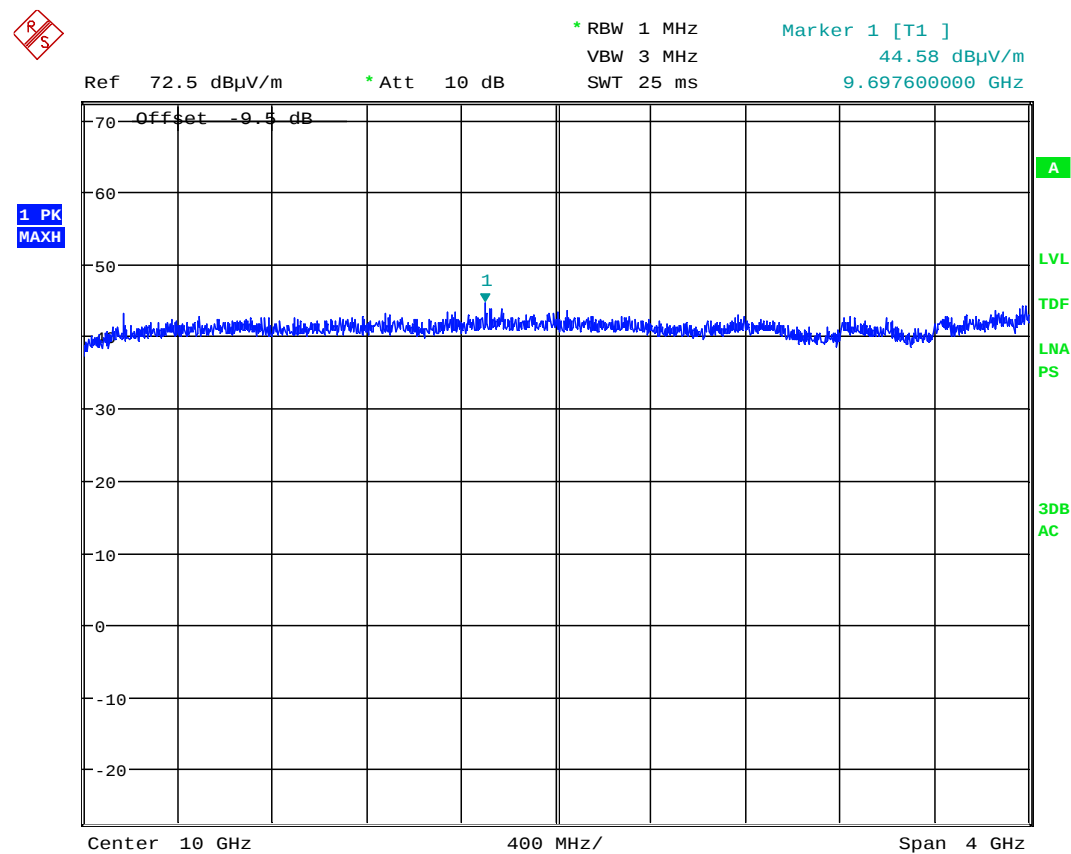
Date: 16.AUG.2012 11:50:59

Radiated Emissions, 5500 -8000 MHz, VP, 802.11b, 1Mbps



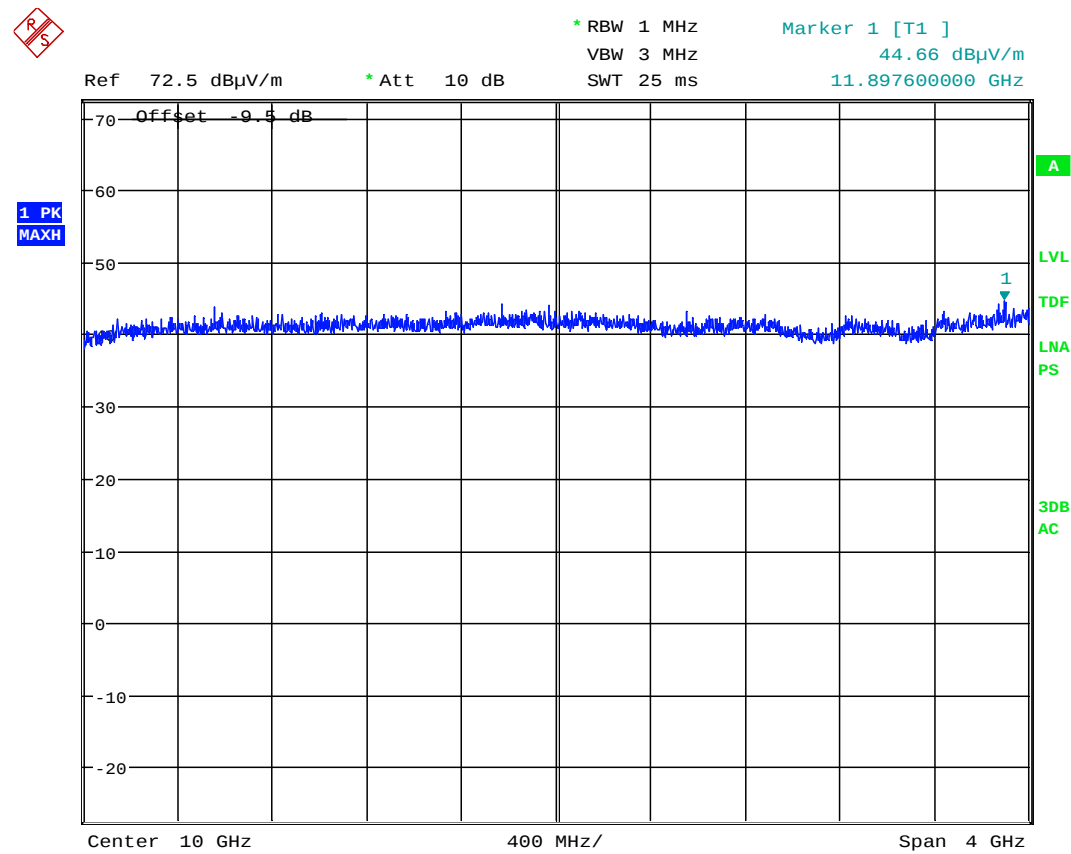
Date: 16.AUG.2012 11:53:29

Radiated Emissions, 5500 -8000 MHz, HP, 802.11b, 1Mbps



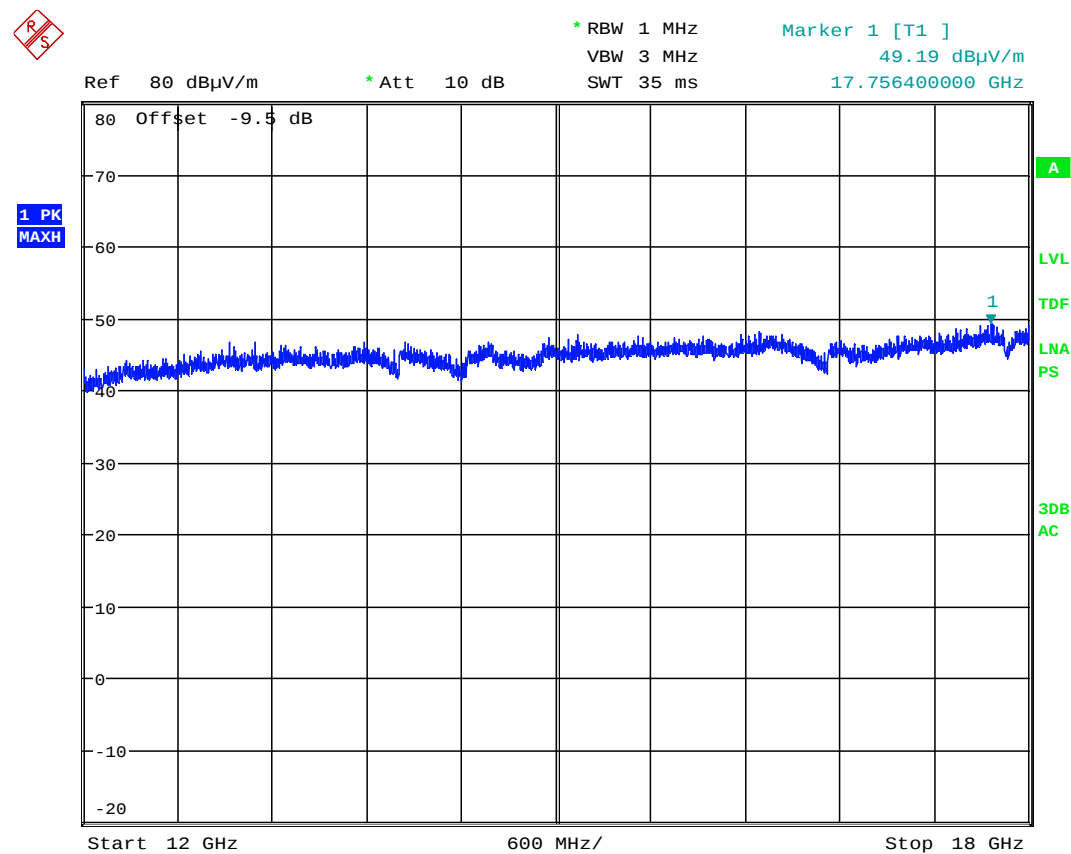
Date: 16.AUG.2012 12:32:30

Radiated Emissions, 8000 -12000 MHz, VP, 802.11b, 1Mbps, @1m



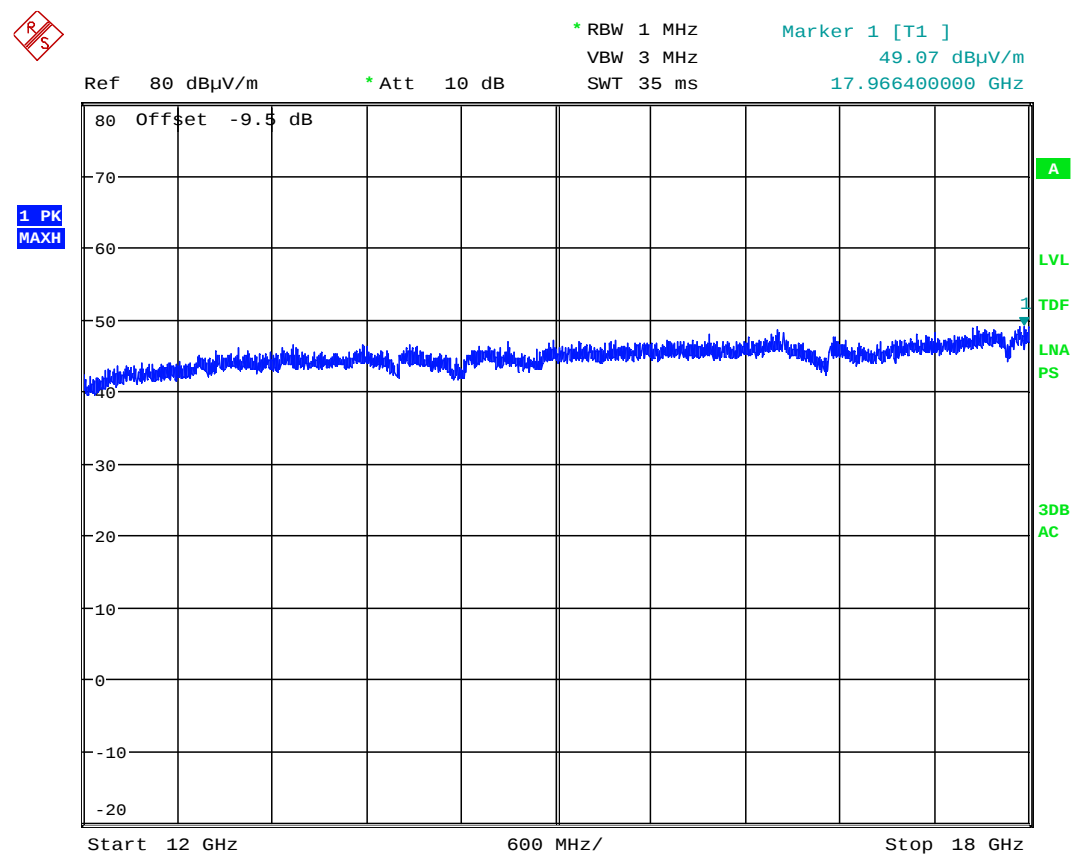
Date: 16.AUG.2012 12:35:09

Radiated Emissions, 8000 -12000 MHz, HP, 802.11b, 1Mbps, @1m



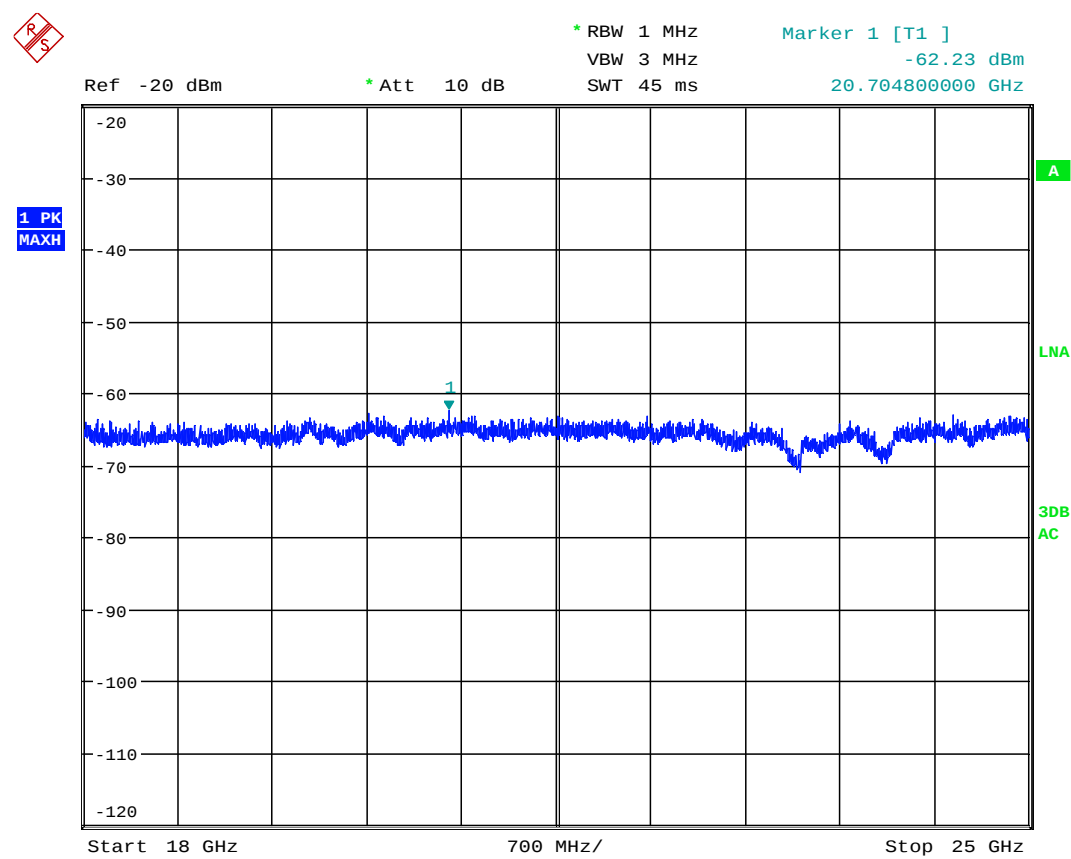
Date: 16.AUG.2012 12:46:08

Radiated Emissions, 12000 -18000 MHz, VP, 802.11b, 1Mbps, @1m



Date: 16.AUG.2012 12:43:19

Radiated Emissions, 12000 -18000 MHz, HP, 802.11b, 1Mbps, @1m



Date: 16.AUG.2012 13:42:56

Pre-scan, 18000 -25000 MHz, 802.11b, 1Mbps

4.5 Power Spectral Density (PSD)

Para. No.: 15.247 (d)

Test Performed By: Frode Sveinsen

Date of Test: 14 Aug 2012

Test Results: Passed

Measured and Calculated Data:

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

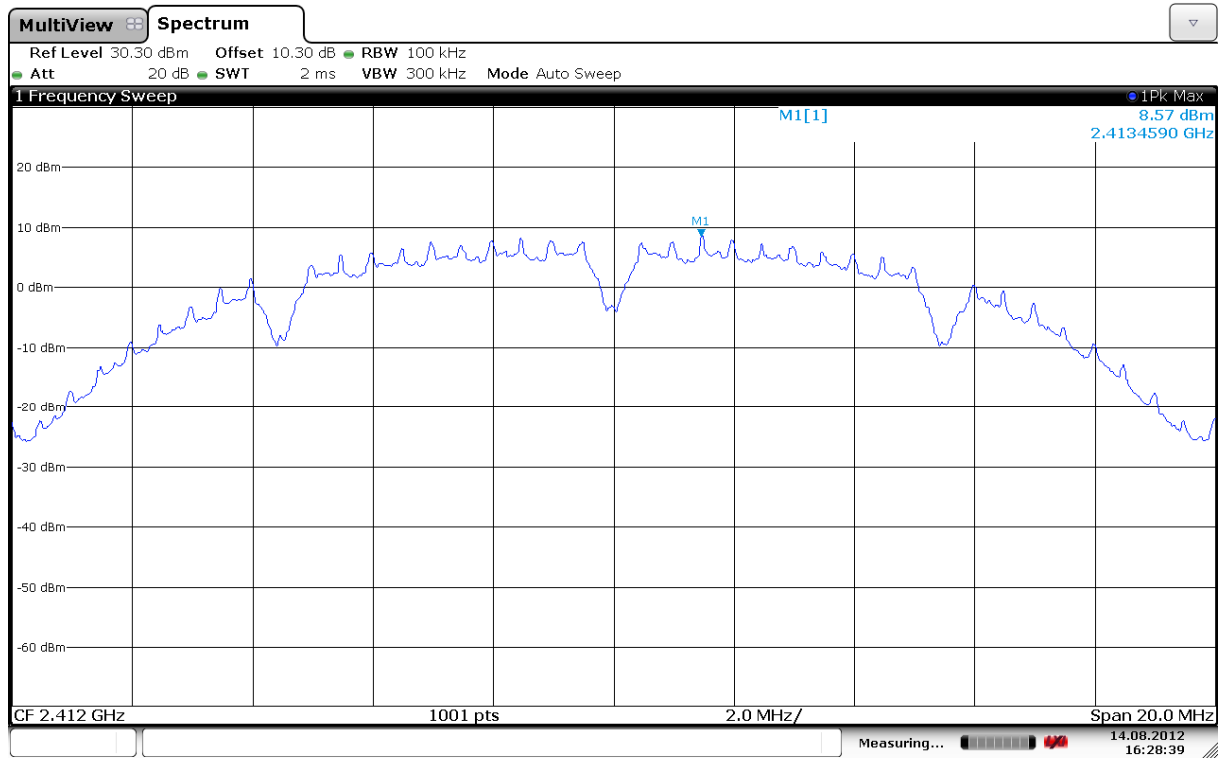
Carrier Frequency (MHz)	Power Spectral Density (dBm)		
	802.11b, 11 Mbps	802.11g, 6 Mbps	802.11n, MCS0
2412	-6.3	-14.1	-15.4
2442	-6.8	-9.4	-8.4
2462	-8.2	-14.9	-16.2

Note: The measured value has been scaled by -15.2 dB to get a 3 kHz equivalent value.

Requirements:

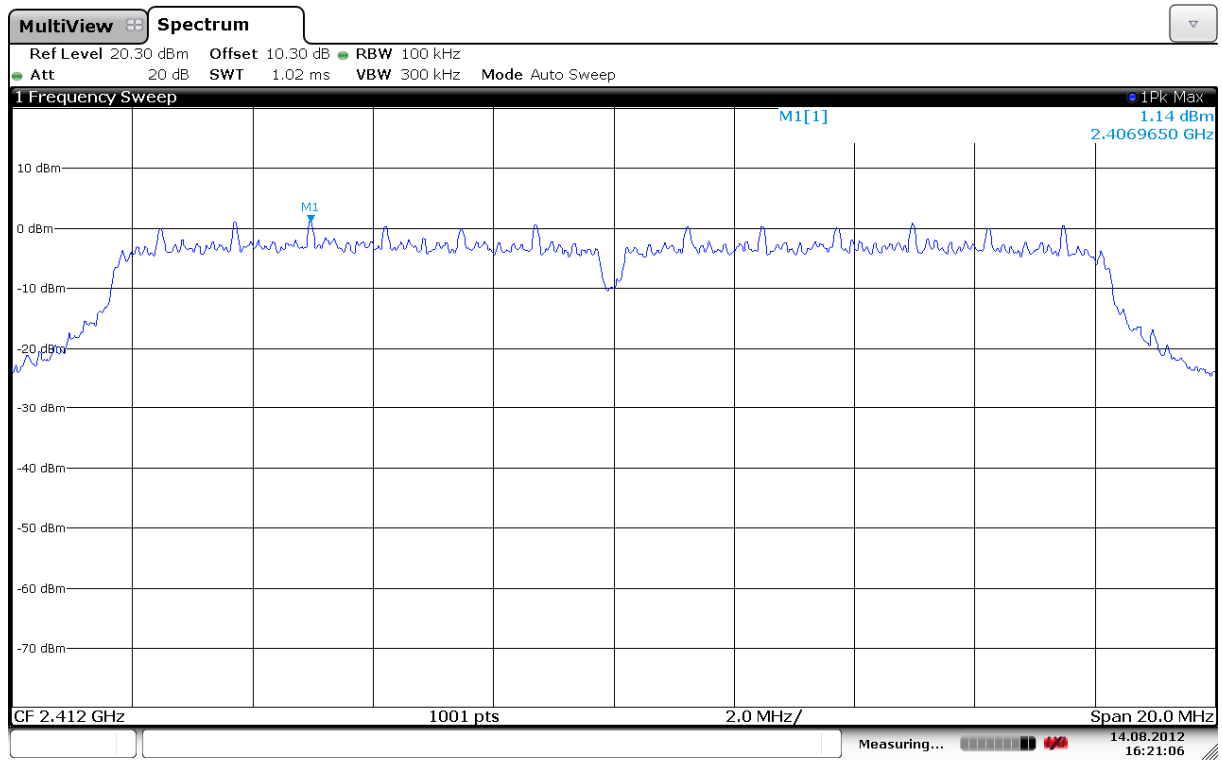
The Power Spectral Density of a Digital Transmission System shall be no greater than +8 dBm in any 3 kHz band

No requirements for Frequency Hopping Systems.



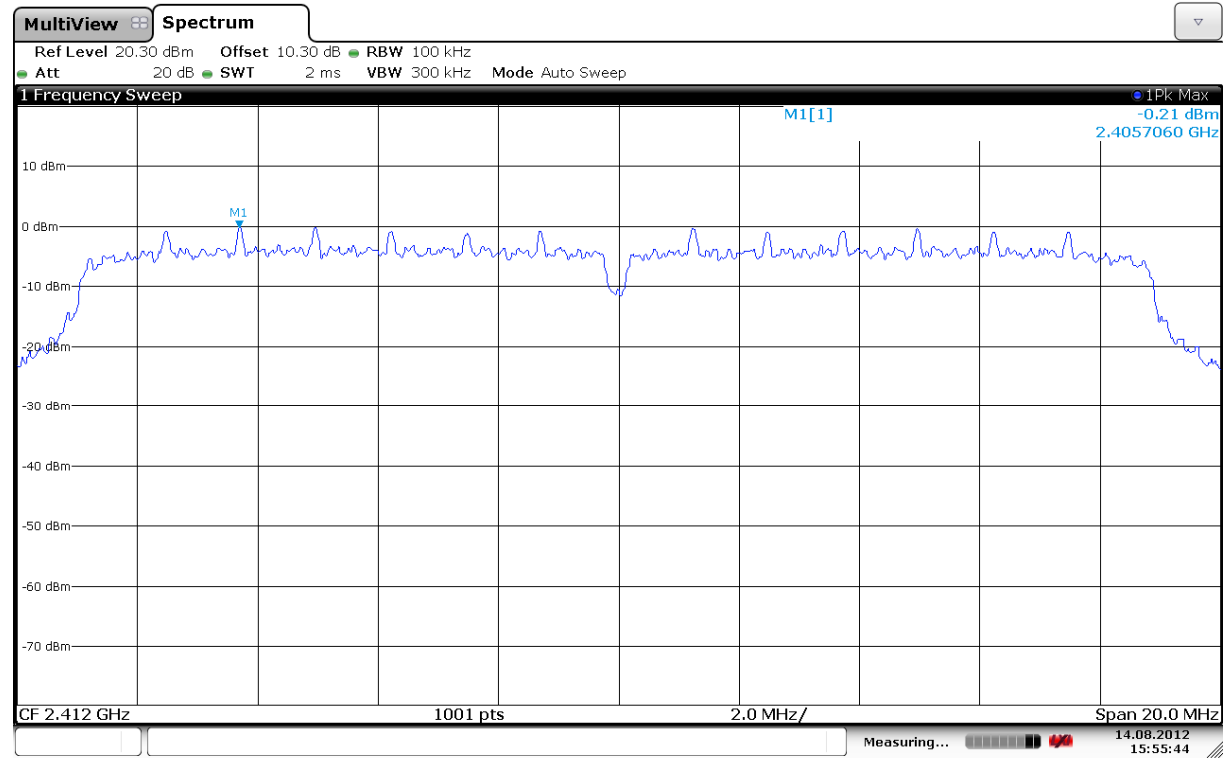
Date: 14.AUG.2012 16:28:39

PSD, 2412 MHz, 802.11b, 11 Mbps



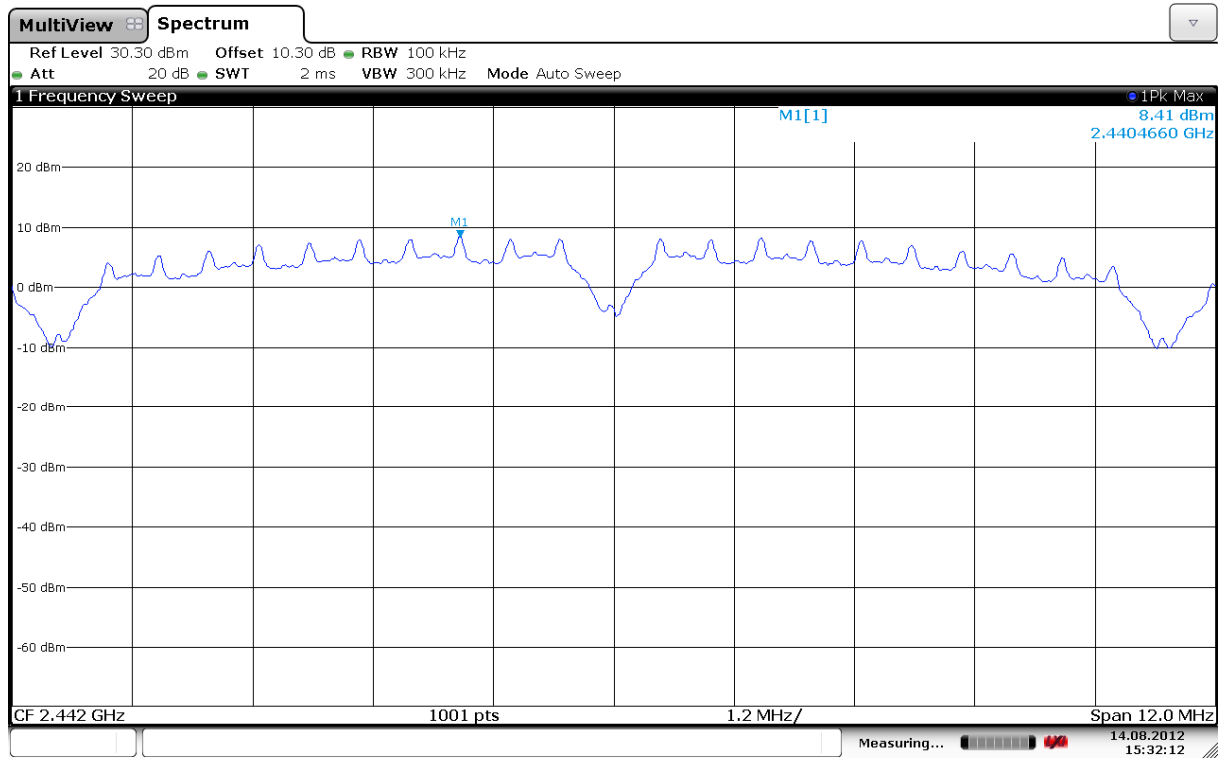
Date: 14.AUG.2012 16:21:07

PSD, 2412 MHz, 802.11g, 6 Mbps



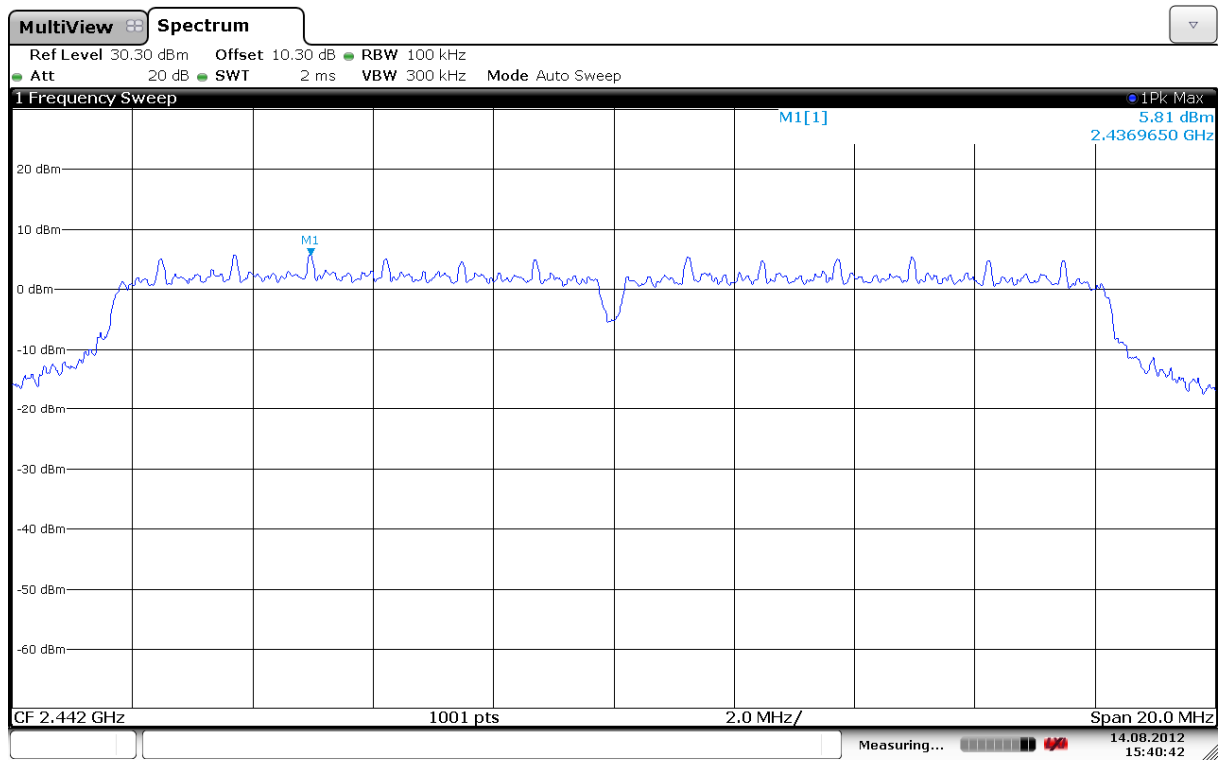
Date: 14.AUG.2012 15:55:44

PSD, 2412 MHz, 802.11n, MCS0



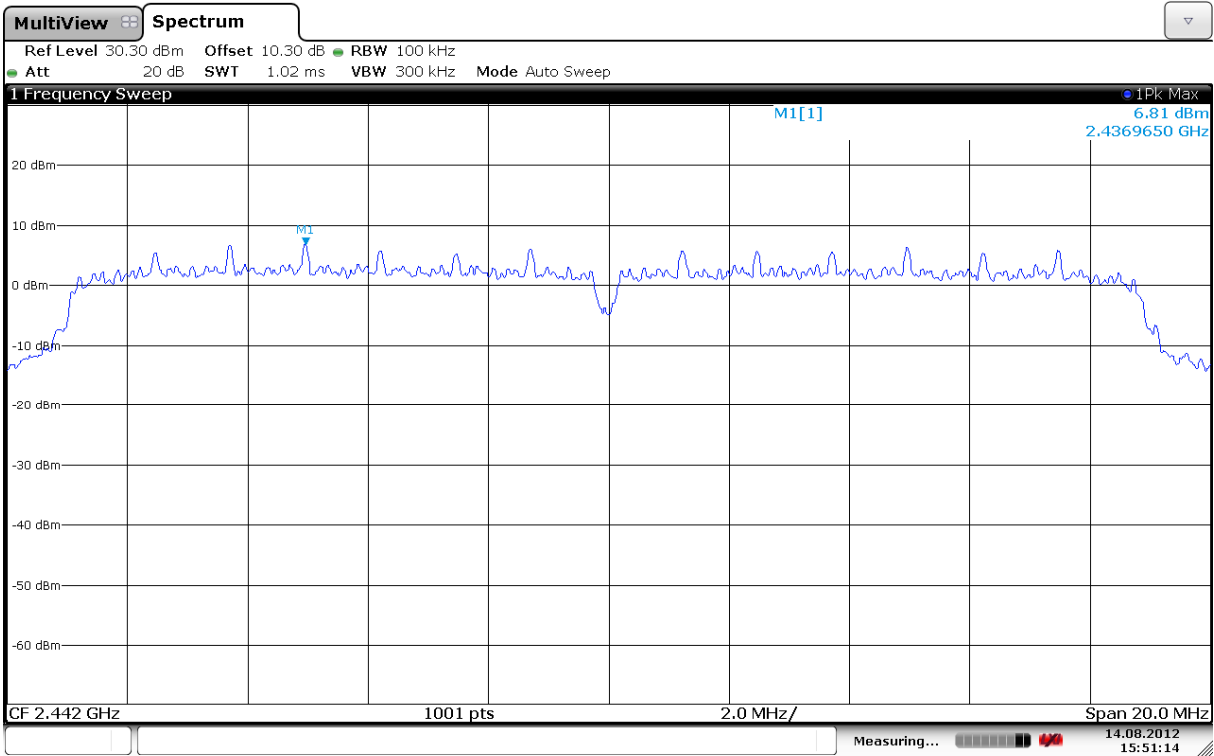
Date: 14.AUG.2012 15:32:12

PSD, 2442 MHz, 802.11b, 11 Mbps



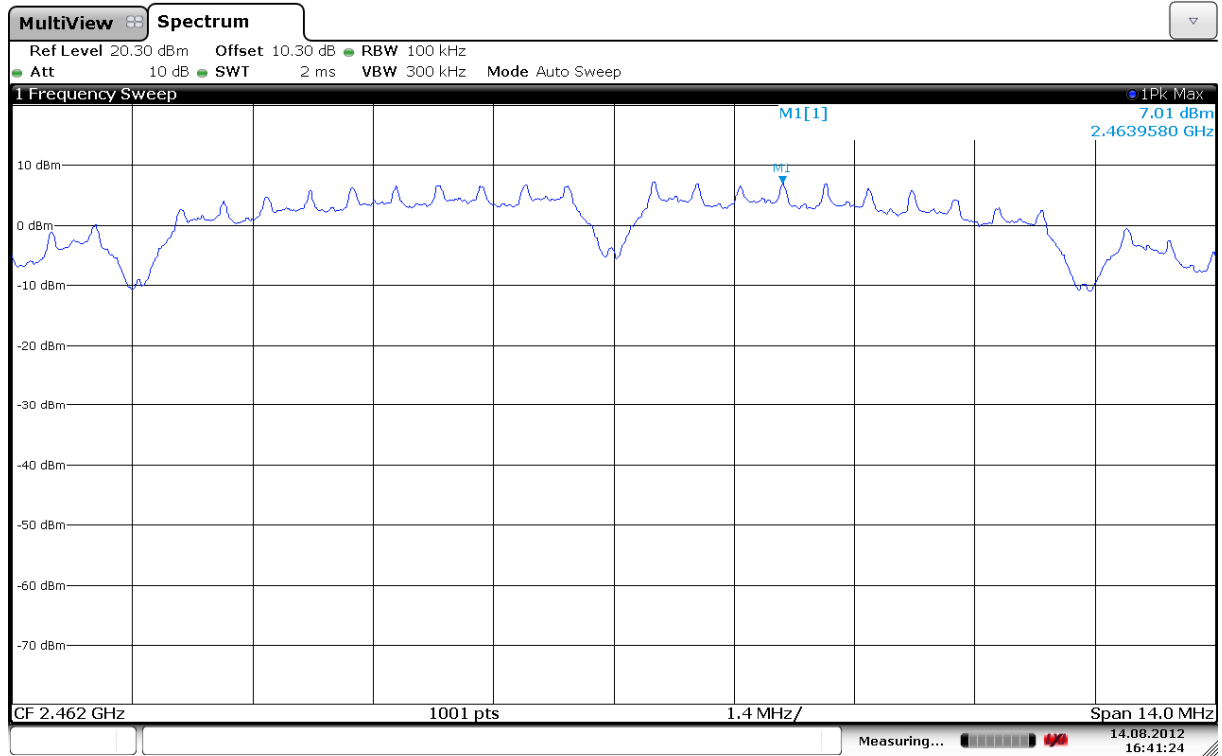
Date: 14.AUG.2012 15:40:42

PSD, 2442 MHz, 802.11g, 6 Mbps



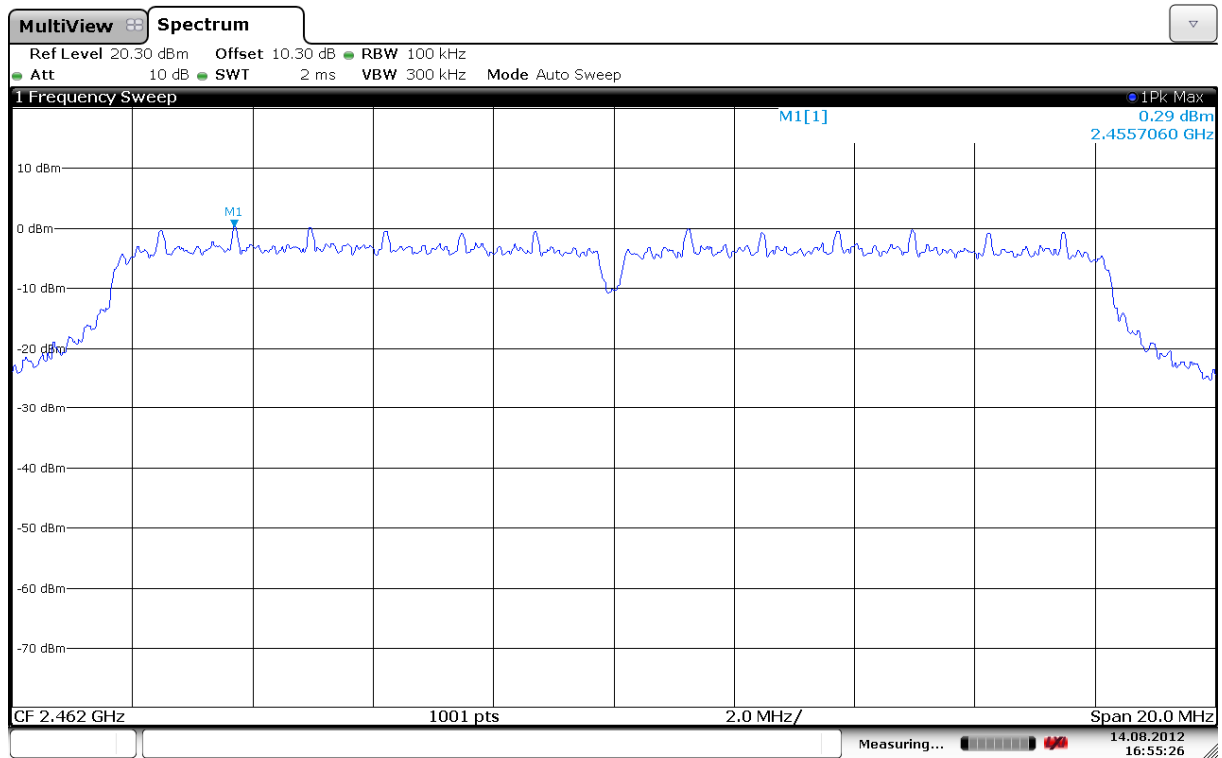
Date: 14.AUG.2012 15:51:14

PSD, 2442 MHz, 802.11n, MCS0



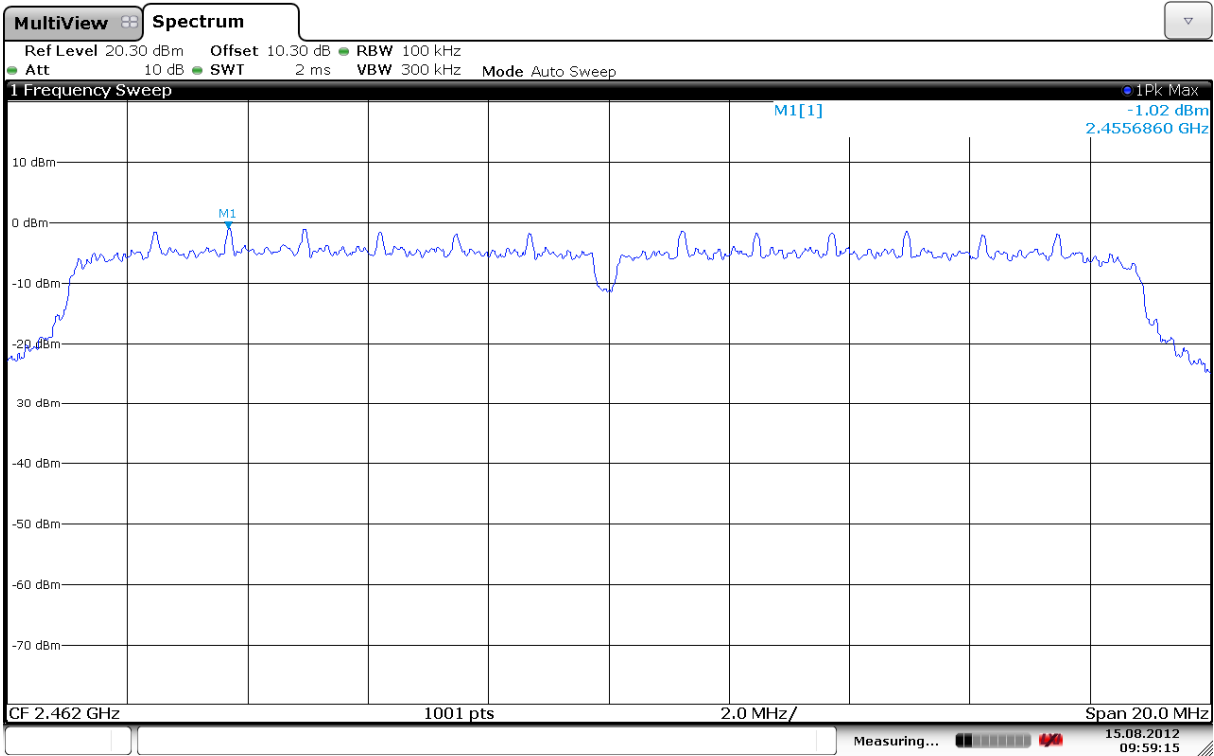
Date: 14.AUG.2012 16:41:25

PSD, 2462 MHz, 802.11b, 11 Mbps



Date: 14.AUG.2012 16:55:26

PSD, 2462 MHz, 802.11g, 6 Mbps



Date: 15.AUG.2012 09:59:15

PSD, 2462 MHz, 802.11n, MCS0

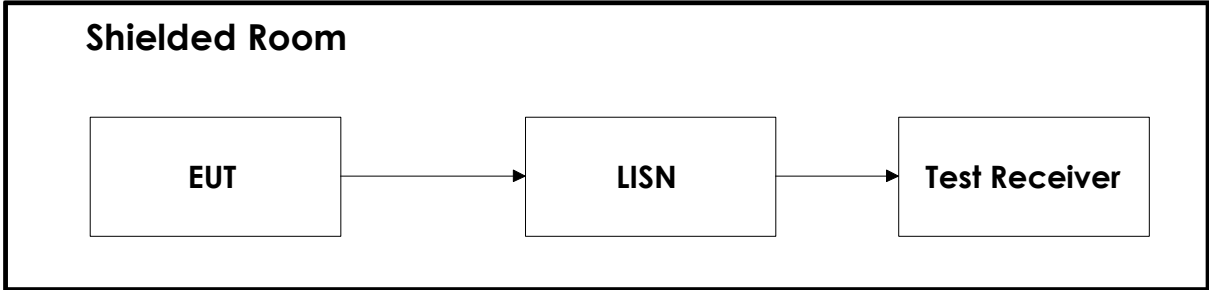
5 LIST OF TEST EQUIPMENT

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.

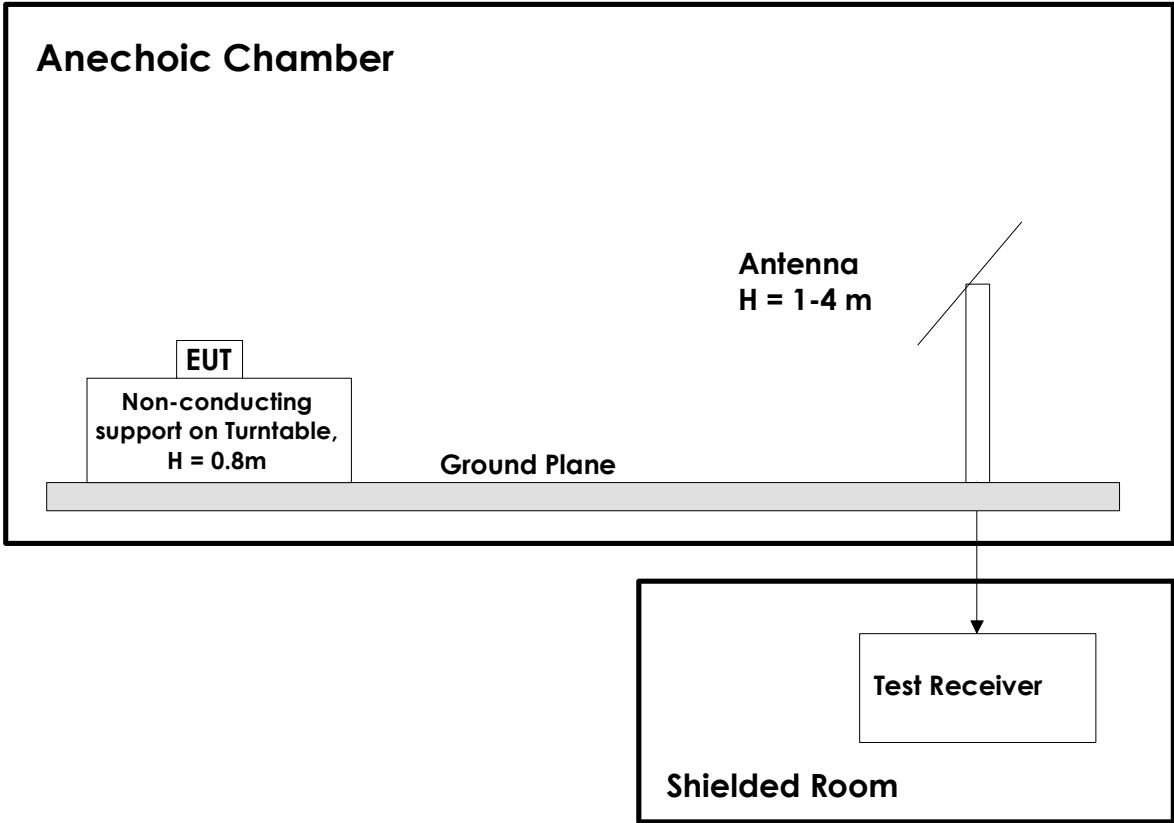
No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSW26	Spectrum Analyzer	Rohde & Schwarz	LR 1640	2012-06	2013-06
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2012-06	2013-06
3	4768-10	Attenuator	Narda	LR 1356	Cal b4 use	
4	6HC3000/18000	Highpass Filter	Trilithic	LR 1614	Cal b4 use	
5	JB3	BiLog Antenna	Sunol Sciences	N-4525	2011.09.07	2014.09.07
6	LNA6900	Preamplifier	Teseq	LR 1593	2010.11.16	2012.11.16
7	3115	Horn Antenna	EMCO	LR 1330	2010.08.05	2013.08.05
8	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2011.09.27	2012.09.27
9	643	Antenna Horn	Narda	LR 093	2009.01.26	2014.01.26
10	PM7320X	Antenna Horn	Sivers Lab	LR 102	2009.01.26	2014.01.26
11	DBF-520-20	Antenna Horn	Systron Donner	LR 100	2009.01.26	2014.01.26
12	638	Antenna Horn	Narda	LR 1480	2010.06.17	2013.06.17
14	HFH2-Z2	Loop Antenna	Rohde & Schwarz	LR 285	2010.10.08	2013.10.08

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission



6.2 Test Site Radiated Emission



6.3 Conducted Tests

