ENGINEERING TEST REPORT

Vehicle Mount Computer
Model: 8516
FCC ID: GM38516

Applicant:

Psion Inc.
2100 Meadowvale Boulevard
Mississauga Ontario, L5N 7J9, Canada

In Accordance With

Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.247 and Subpart E - U-NII

UltraTech's File No.: TEK-702FCC15C

This Test report is Issued under the Authority of Tri M. Luu Vice President of Engineering UltraTech Group of Labs Date: December 11, 2012	
Report Prepared by: Dan Huynh Issued Date: December 11, 2012	Tested by: Mr. Hung Trinh Test Dates: November 9 – December 11, 2012

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

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FCC	VCCI	Industry Canada / Industrie Canada	NVLAP	BSMI	Korea KCC-RRL
91038	1309	46390-2049	NvLap Lab Code 200093-0	SL2-IN-E-1119R	CA2049

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.247 and Subpart E - U-NII
Title:	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15 – Radio Frequency Devices
Purpose of Test:	Equipment Certification for Bluetooth, DTS and U-NII device
Test Procedures:	▪ ANSI C63.4 ▪ ANSI C63.10 ▪ FCC, KDB Publication No. 558074 D01
Environmental Classification:	[x] Commercial, industrial or business environment [ ] Residential environment

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
47 CFR Parts 0-19	2011	Code of Federal Regulations (CFR), Title 47 – Telecommunication
ANSI C63.4	2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
ANSI C63.10	2009	American National Standard for Testing Unlicensed Wireless Devices
CISPR 22 & EN 55022	2008-09, Edition 6.0 2006	Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement
CISPR 16-1-1 +A1 +A2	2006 2006 2007	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus
CISPR 16-1-2 +A1 +A2	2003 2004 2006	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-2: Conducted disturbances
FCC, KDB Publication No. 558074 D01 DTS Meas Guidance v01	2012	Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	Psion Inc.
Address:	2100 Meadowvale Boulevard Mississauga Ontario, L5N 7J9 Canada
Contact Person:	Mr. Sada Dharwarkar Phone #: 905 812 6200 Ext. 3358 Fax #: 905 812 6301 Email Address: sada.dharwarkar@psion.com

MANUFACTURER	
Name:	Psion Inc.
Address:	2100 Meadowvale Boulevard Mississauga Ontario, L5N 7J9 Canada
Contact Person:	Mr. Sada Dharwarkar Phone #: 905 812 6200 Ext. 3358 Fax #: 905 812 6301 Email Address: sada.dharwarkar@psion.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Psion Inc.
Product Name:	Vehicle Mount Computer
Model Name or Number:	8516
Serial Number:	0025
Type of Equipment:	Digital Transmission System (DTS)
Input Power Supply Type:	12 Volts battery or AC/DC Adaptor
Primary User Functions of EUT:	Bluetooth, 2.4 GHz WLAN and 5 GHz WLAN wireless connectivity of embedded devices.

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Equipment Type:	• Mobile
Intended Operating Environment:	▪ Commercial, industrial or business environment ▪ Residential environment
Power Supply Requirement:	12 Vdc
RF Output Power Rating:	Bluetooth: 4 dBm 2412-2462 MHz LAN: 21.3 dBm 5745 – 5828 MHz WLAN: 18.8 dBm 5186 – 5240 MHz U-NII: 13.7 dBm 5260 – 5320 MHz U-NII: 19.6 dBm 5500 – 5700 MHz U-NII: 18.9 dBm
Operating Frequency Range:	Bluetooth: 2402 – 2480 MHz WLAN: 2412 – 2462 MHz & 5745 – 5825 MHz U-NII: 5180-5240 MHz, 5260-5320 MHz and 5500-5700 MHz
RF Output Impedance:	50 Ω
Channel Spacing:	5 MHz
Duty Cycle:	100%
Modulation Type:	Bluetooth: GFSK, π/4 DQPSK, 8DPSK WLAN (2412 – 2462 MHz & 5745 – 5825 MHz): 802.11b (DSSS) & 802.11g,n (OFDM) U-NII (5180-5240 MHz, 5260-5320 MHz and 5500-5700 MHz): OFDM with BPSK, QPSK, 16QAM, 64QAM
Emission designation	Bluetooth: 1M38GXD 2.4 GHz WLAN: 20M0G7D 5 GHz WLAN: 24M8G7D
Antenna Connector Types:	SMA reverse polarity

2.4. ASSOCIATED ANTENNA DESCRIPTIONS

Manufacturer	Mobile Mark
Type:	Magnet Mount
Model:	MGRM-WHF-3J-BLK-114
Frequency Range:	1.7 – 6 GHz
Impedance:	50 Ohms
Gain:	5 dBi

2.5. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	USB 1	1	USB Type A Receptacle	USB Type A plug shielded
2	USB 2	1	USB Type A Receptacle & 4-pin power socket	Special FCI USB + power shielded
3	Serial	2	DB9 Male	Shielded
4	Service Debug Console *Note: this port is for service use only*	1	Socket 2x3.2 mm	Unshielded 2 conductor
5	Speaker / Microphone	1	1/8" 4-pin Audio Receptacle	1/8" 4-pin Audiojack shielded 4 conductor cable

2.6. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

(1) Scanner,Model LS3408
(2) Speaker Microphoen, Model M1000

2.7. BLOCK DIAGRAM OF EUT

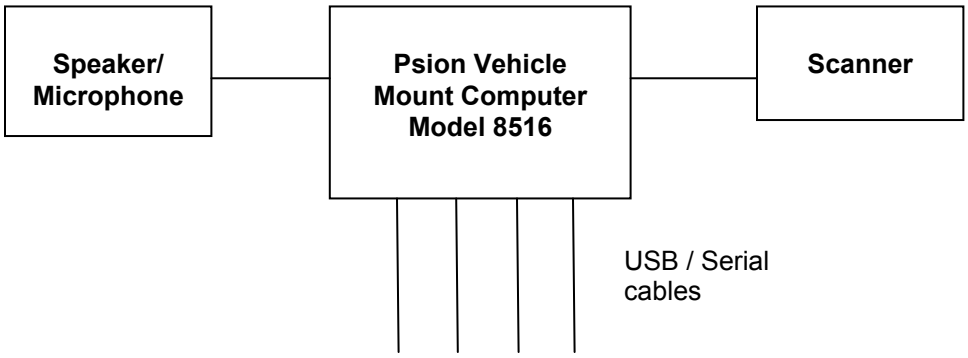


EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21 to 23 ^{o}C
Humidity:	45 to 58%
Pressure:	102 kPa
Power Input Source:	12 Vdc

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	Special software provided by the Applicant to operate the EUT at each channel frequency continuously and in the range of typical modes of operation.
Special Hardware Used:	N/A
Transmitter Test Antenna:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as integral / non-integral antenna equipment as described with the test results.

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3). Expiry Date: 2014-04-04.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

4.2.1. 2.4 GHz & 5 GHz WLAN & U-NII Devices

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15.203	Antenna requirements	See Note 1
15.207(a)	AC Power Line Conducted Emissions	Yes
15.247(a)(2)	6 dB Bandwidth	See Note 2
15.247(b)(3)	Peak Conducted Output Power - DTS	Yes
15.247(d), 15.209 & 15.205	Transmitter Spurious Radiated Emissions	Yes
15.247(e)	Power Spectral Density	See Note 2
15.407 (a)	99% And 26 dB Occupied Bandwidth	See Note 2
15.407 (a)	Maximum Conducted Output Power	Yes
15.407 (a)	Power Spectral Density	See Note 2
15.407 (a)	Peak Excursion	See Note 2
15.407 (b)	Unwanted emission	Yes
15.247(i), 15.407(f), 1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure	Yes
15.407(f)	Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS).	See Note 2

Note 1: The EUT complies with the requirements, it employs a unique (non-standard) antenna connector (reversed SMA).

Note 2: Refer to original test reports for 2.4 GHz & 5 GHz tested in Model 7545MBW, referenced File No. EMC_PSION_007_1001_15.247DSSS (dated 2011-06-17) and EMC_PSION_007_1001_15.407 (dated 2011-06-17).

Model 7545MBW and 8516 both use same radio Murata Model LBEH1Z9PFC-348, differences are: 7545 is a handheld device and 8516 is a vehicle mount device.

4.2.2. Bluetooth Module

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15.203	Antenna requirements	See Note 1
15.207(a)	AC Power Line Conducted Emissions	Yes
15.247(a)(1)	Provisions for Frequency Hopping Systems	See Note 2
15.247(b)	Peak Conducted Output Power	Yes
15.247(d)	Band-Edge and RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	See Note 2
15.247(d), 15.209 & 15.205	Transmitter Spurious Radiated Emissions	Yes
15.247(i) 1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure	Yes

Note 1: The EUT complies with the requirement, it employs a unique (non-standard) antenna connector (reversed SMA).

Note 2: Refer to original test reports for Bluetooth tested in Model 7545MBW, referenced File No.: EMC_PSION_007_1001_15.247FHSS (dated 2011-04-22).

Model 7545MBW and 8516 both use same radio Murata Model LBEH1Z9PFC-348, differences are: 7545 is a handheld device and 8516 is a vehicle mount device.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

EXHIBIT 5. TEST DATA

5.1. POWER LINE CONDUCTED EMISSIONS [§15.207(a)]

5.1.1. Limit(s)

The equipment shall meet the limits of the following table:

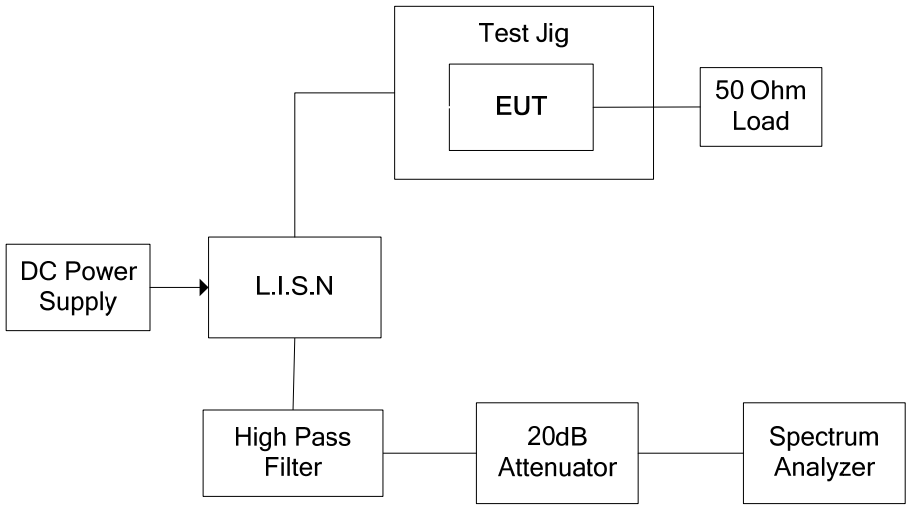
Frequency of emission (MHz)	Conducted Limits (dBμV)	
	Quasi-peak	Average
0.15–0.5 .....……..	66 to 56*	56 to 46*
0.5–5 .....……..	56	46
5-30 ……..	60 ...……..	50

*Decreases linearly with the logarithm of the frequency

5.1.2. Method of Measurements

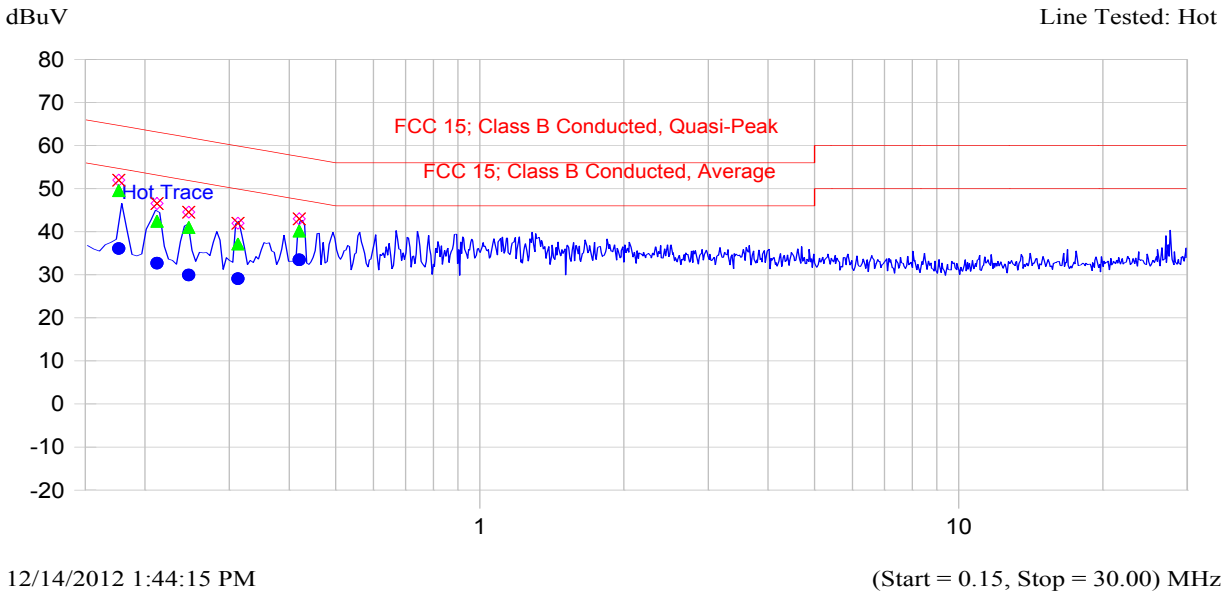
ANSI C63.4-2009

5.1.3. Test Arrangement



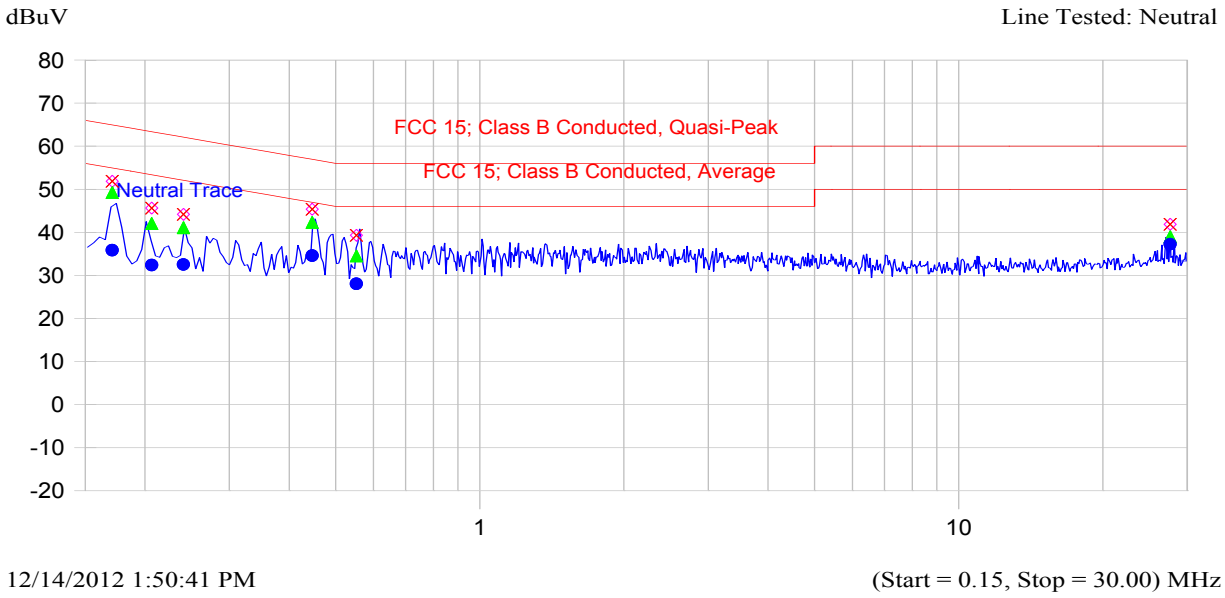
5.1.4. Test Data

Plot 5.1.4.1. Power Line Conducted Emissions; Line Voltage: 120 Vac of AC/DC Adaptor; Line Tested: Hot



Frequency MHz	Peak dBuV	QP dBuV	Delta QP-QP Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Trace Name
0.176	52.0	49.5	-15.7	36.1	-19.2	Hot Trace
0.212	46.5	42.4	-21.8	32.7	-21.5	Hot Trace
0.247	44.5	40.9	-22.2	29.9	-23.2	Hot Trace
0.313	42.0	37.1	-24.1	29.0	-22.2	Hot Trace
0.420	43.0	40.1	-18.1	33.4	-14.8	Hot Trace

Plot 5.1.4.2. Power Line Conducted Emissions; Line Voltage: 120 Vac of AC/DC Adaptor; Line Tested: Neutral



Frequency MHz	Peak dBuV	QP dBuV	Delta QP-QP Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Trace Name
0.171	51.8	49.2	-16.2	35.9	-19.5	Neutral Trace
0.206	45.6	42.0	-22.3	32.4	-21.9	Neutral Trace
0.241	44.1	41.0	-22.3	32.5	-20.8	Neutral Trace
0.447	45.3	42.2	-15.2	34.6	-12.9	Neutral Trace
0.552	39.3	34.5	-21.5	28.0	-18.0	Neutral Trace
27.623	41.8	38.9	-21.1	37.2	-12.8	Neutral Trace

5.2. PEAK CONDUCTED OUTPUT POWER [§ 15.247(b)(1) & (3), 15.407(a)(1), (2) & (3)]

5.2.1. Limit(s)

§ 15.247(b)(1): For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

§ 15.247(b)(3): For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

§15.247(b)(4): The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

See §15.407(a) Power

(a) *Power limits:*

(1) For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the of the antenna exceeds 6 dBi.

(2) For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in egahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2.2. Method of Measurements & Test Arrangement

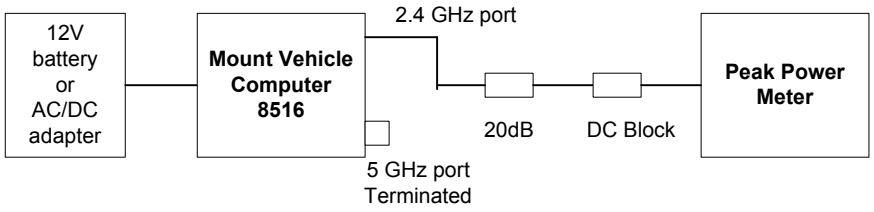
ANSI C63.10, Section 6.10.2.

5.2.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Calibration Due Date
Power Meter	Hewlett Packard	8900D	2131A01044	100 MHz–18 GHz	13 Nov 2013
Spectrum Analyzer	Rohde & Schwarz	FSEK30	100077	20Hz–40 GHz	02 Nov 2013
Attenuator	Pasternack	PE7024-20	6	DC–26.5 GHz	Cal on use
DC Block	Hewlett Packard	11742A	12460	0.045–26.5 GHz	Cal on use

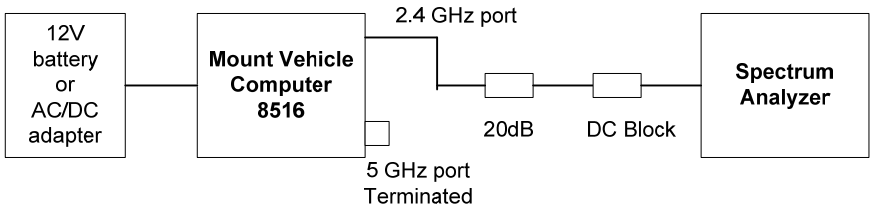
5.2.4. Test Arrangement

Test setup for 2.4 GHz & 5 GHz WLAN



AC Adapter
EDACPower Elec.
M/N: EA10721A-120
AC Input 120-240 VAC
DC Output 12 VDC

Test setup for 2.4 GHz Bluetooth



AC Adapter
EDACPower Elec.
M/N: EA10721A-120
AC Input 120-240 VAC
DC Output 12 VDC

5.2.5. Test Data

5.2.5.1. FCC Part 15, Subpart C – 15.247 DTS – Maximum Peak Power in 2412 – 2462 MHz band

Reference: KDB 558074 D01 DTS Measure Guidance V02 (Section 8.1.3 Option 3)

Power Limit: 1 Watt or 30 dBm

Channel (MHz)	Modulation	Data Rate (Mbps)	Peak PW (dBm)	Rating (dBm)	Margin (dB)	Power Set (dBm)
1						
2412(b)	DBPSK	1	17.62	17.49	0.13	18
2412(b)	CCK	11	17.79	19.24	-1.45	18
2412(g)	BPSK	6	21.04	23.85	-2.81	16
2412(g)	64QAM	54	20.63	24.51	-3.88	16
2412(n)	(MCS0) BPSK	6.5	18.62	22.87	-4.25	12
2412(n)	(MCS7) 64QAM	65	16.19	23.74	-7.55	12
6						
2437(b)	DBPSK	1	18.19	17.49	0.70	18
2437(b)	CCK	11	18.76	19.24	-0.48	18
2437(g)	BPSK	6	20.96	23.85	-2.89	16
2437(g)	64QAM	54	20.36	24.51	-4.15	16
2437(g)	(MCS0) BPSK	6.5	18.69	22.87	-4.18	12
2437(g)	(MCS7) 64QAM	65	17.53	23.74	-6.21	12
11						
2462(b)	DBPSK	1	18.26	17.49	0.77	18
2462(b)	CCK	11	17.79	19.24	-1.45	18
2412(g)	BPSK	6	21.27	23.85	-2.58	16
2462(g)	64QAM	54	19.66	24.51	-4.85	16
2462(n)	(MCS0) BPSK	6.5	17.53	22.87	-5.34	12
2462(n)	(MCS7) 64QAM	65	16.76	23.74	-6.98	12

5.2.5.2. FCC Part 15, Subpart C – 15.247 DTS – Maximum Peak Power in 5745 – 5825 MHz band

Reference: KDB 558074 D01 DTS Measure Guidance V02 (Section 8.1.3 Option 3)

Power Limit: 1 Watt or 30 dBm

Channel (MHz)	Modulation	Data Rate (Mbps)	Peak PW (dBm)	Rating (dBm)	Margin (dB)	Power Set (dBm)
149						
5745(a)	BPSK	6	18.34	23.08	-4.74	12
5745(a)	64QAM	54	17.97	23.08	-5.11	12
5745(n)	(MCS0) BPSK	6.5	18.25	23.09	-4.84	12
5745(n)	(MCS7) 64QAM	65	18.07	23.09	-5.02	12
157						
5785(a)	BPSK	6	18.52	22.91	-4.39	12
5785(a)	64QAM	54	18.34	22.91	-4.57	12
5785(n)	(MCS0) BPSK	6.5	17.87	22.87	-5.00	12
5785(n)	(MCS7) 64QAM	65	17.97	22.87	-4.90	12
165						
5825(a)	BPSK	6	18.60	22.54	-3.94	12
5825(a)	64QAM	54	18.84	22.54	-3.70	12
5825(n)	(MCS0) BPSK	6.5	18.52	22.78	-4.26	12
5825(n)	(MCS7) 64QAM	65	18.34	22.78	-4.44	12

5.2.5.3. FCC Part 15, Subpart C – 15.247(b) (Bluetooth)- Maximum Peak Power

Reference: KDB 558074 D01 DTS Meas Guidance v02 (Section 8.1.1 Option 1)

Power Limit: 1 Watt or 30 dBm

Power by battery

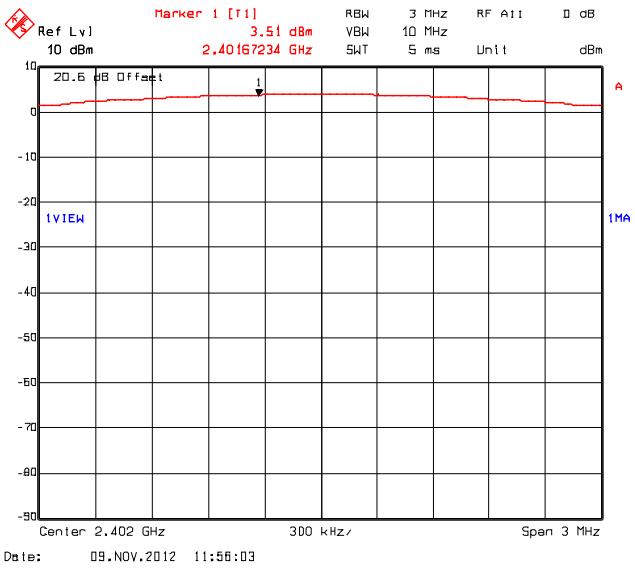
Frequency (MHz)	GFSK 1 Mbps (dBm)	π/4DPSK 2 Mbps (dBm)	8DPSK 3 Mbps (dBm)	Power Rating (dBm)	Margin (dB)
2402	3.51	2.89	3.39	4.66	-1.15
2441	3.26	2.62	3.26	4.66	-1.40
2480	2.62	2.75	3.26	4.66	-1.40

Power by AC/DC Adapter

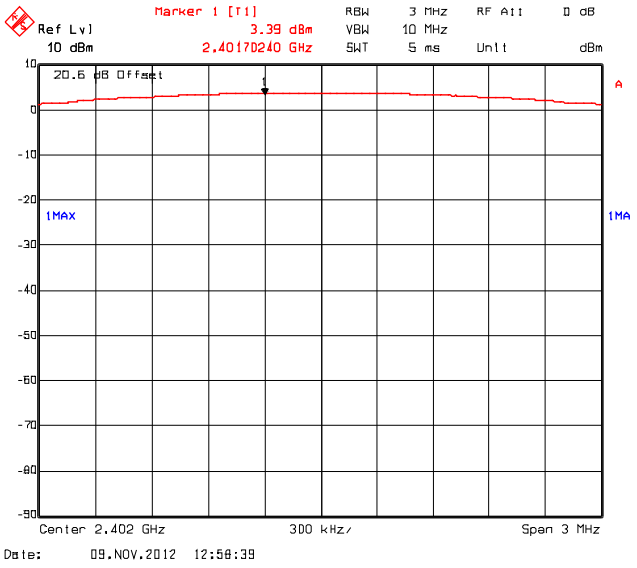
Frequency (MHz)	GFSK 1 Mbps (dBm)	π/4DPSK 2 Mbps (dBm)	8DPSK 3 Mbps (dBm)	Power Rating (dBm)	Margin (dB)
2402	3.39	3.39	3.76	4.66	-0.90
2441	3.14	3.14	3.64	4.66	-1.02
2480	3.26	3.26	3.95	4.66	-0.71

Plot 5.2.5.3.1 - Maximum Peak Power @ 2402 MHz, BT, GFSK, 1Mbps, setting 14

Powered by fully charged battery

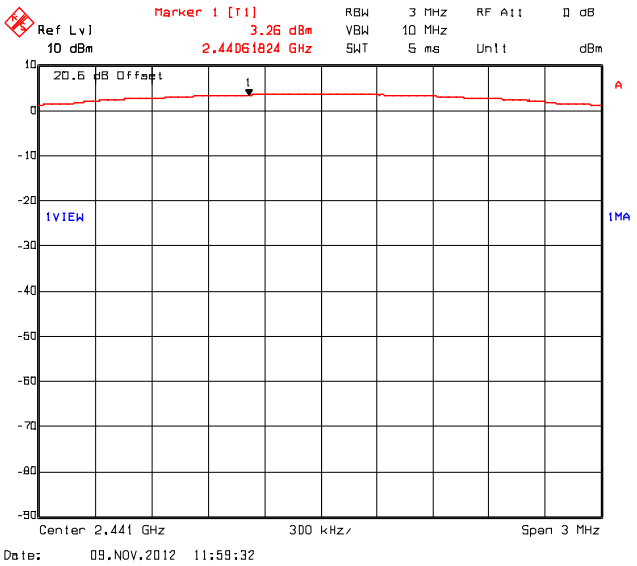


Powered by AC/DC Power Adaptor

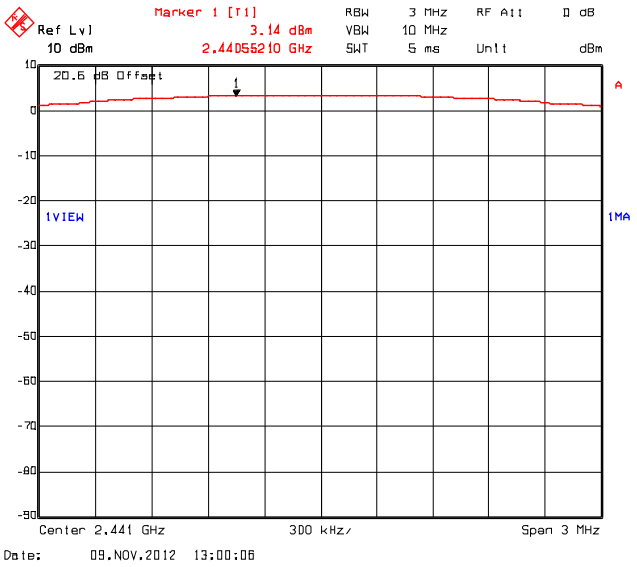


Plot 5.2.5.3.2 - Maximum Peak Power @ 2441 MHz, BT, GFSK, 1Mbps, setting 14

Powered by fully charged battery

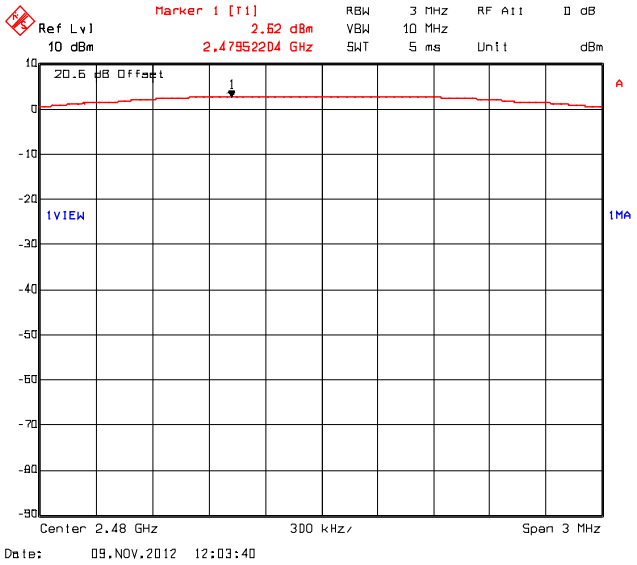


Powered by AC/DC Power Adaptor

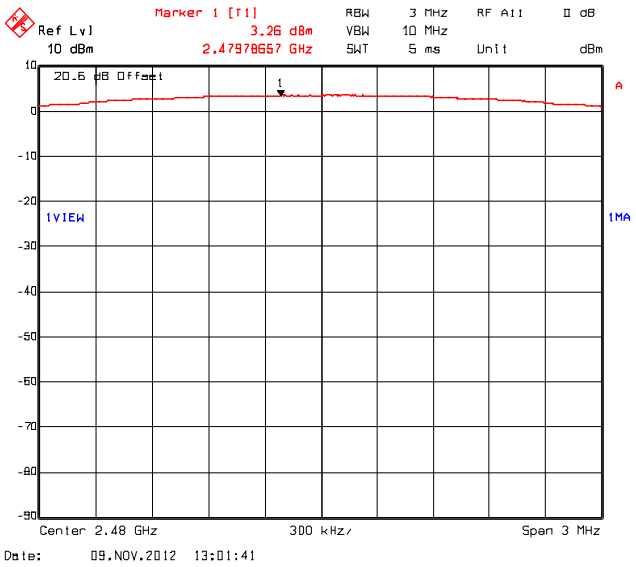


Plot 5.2.5.3.3 - Maximum Peak Power @ 2480 MHz, BT, GFSK, 1Mbps, setting 14

Powered by fully charged battery

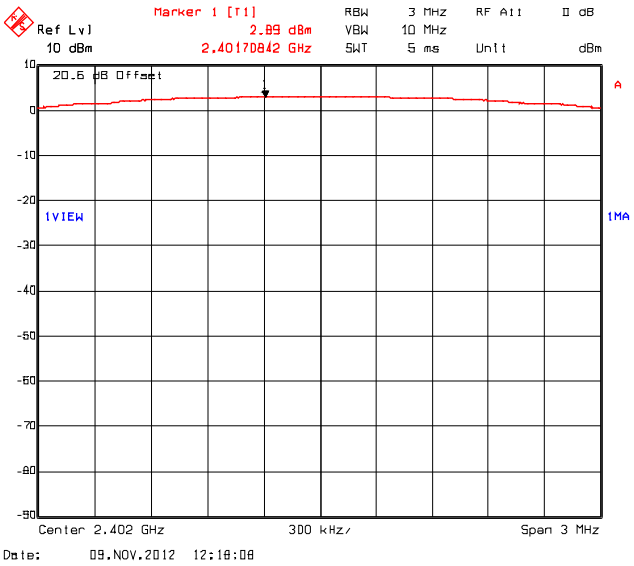


Powered by AC/DC Power Adaptor

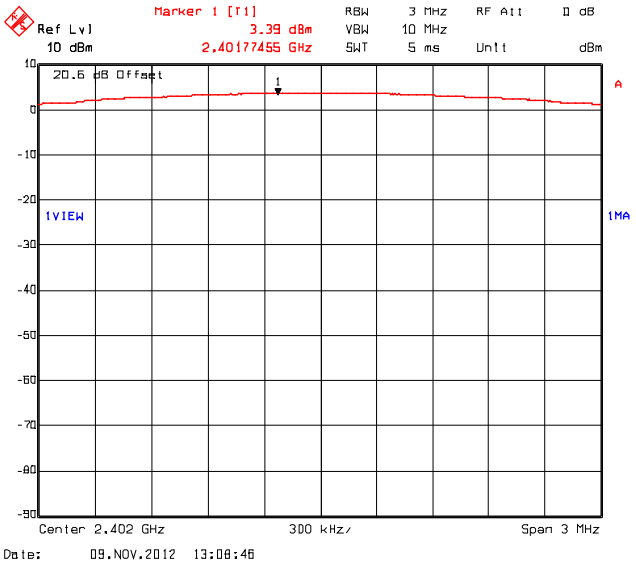


Plot 5.2.5.3.4 - Maximum Peak Power @ 2402 MHz, BT, π/4 DPSK, 2Mbps, setting 14

Powered by fully charged battery

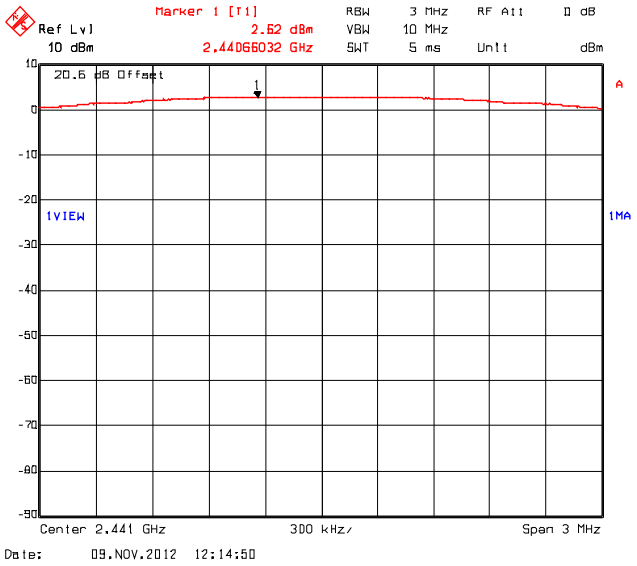


Powered by AC/DC Power Adaptor

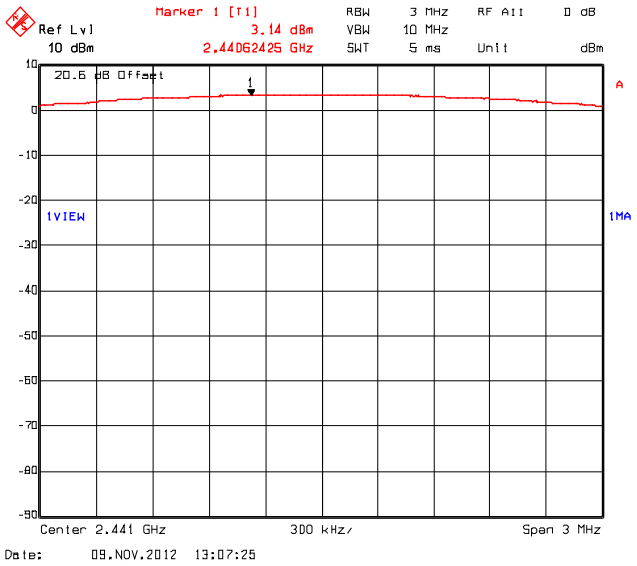


Plot 5.2.5.3.5 - Maximum Peak Power @ 2441 MHz, BT, π/4 DPSK, 2Mbps, setting 14

Powered by fully charged battery

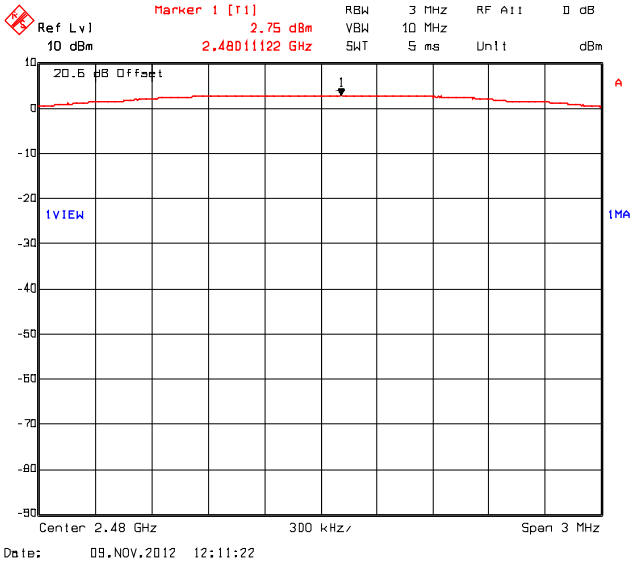


Powered by AC/DC Power Adaptor

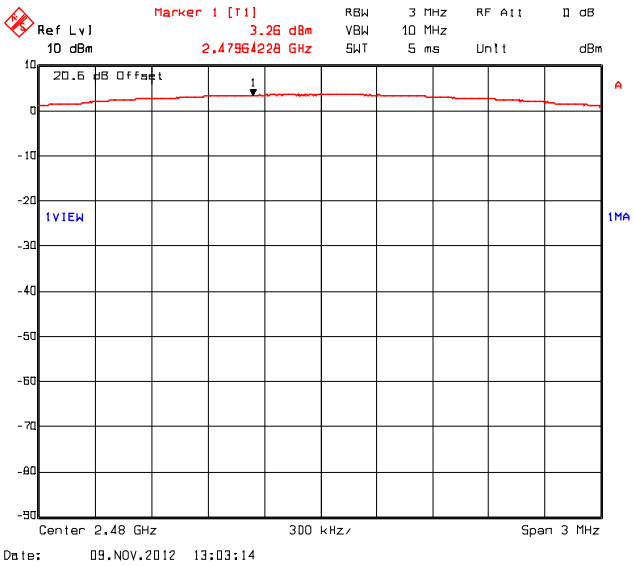


Plot 5.2.5.3.6 - Maximum Peak Power @ 2480 MHz, BT, π/4 DPSK, 2Mbps, setting 14

Powered by fully charged battery

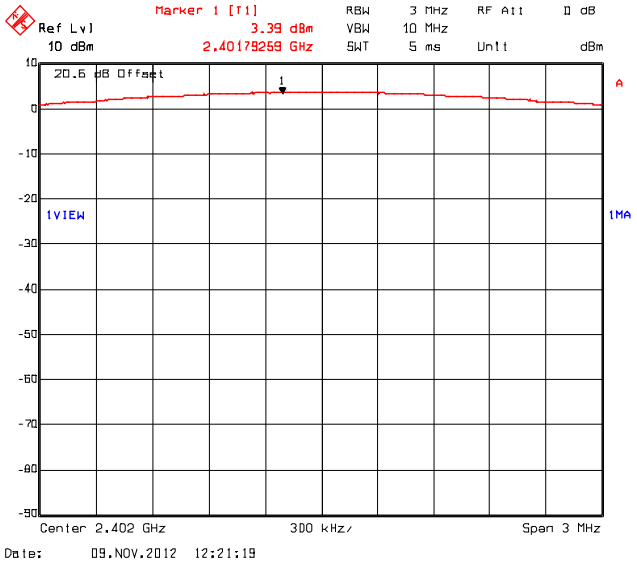


Powered by AC/DC Power Adaptor

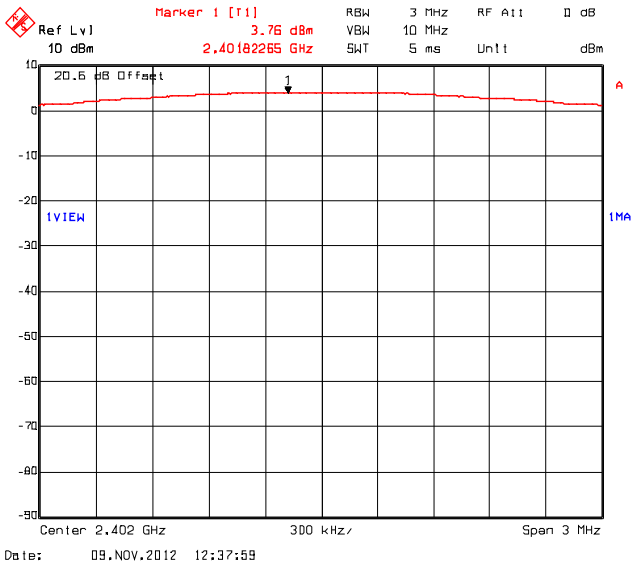


Plot 5.2.5.3.7 - Maximum Peak Power @ 2402 MHz, BT, 8DPSK, 3Mbps, setting 14

Powered by fully charged battery

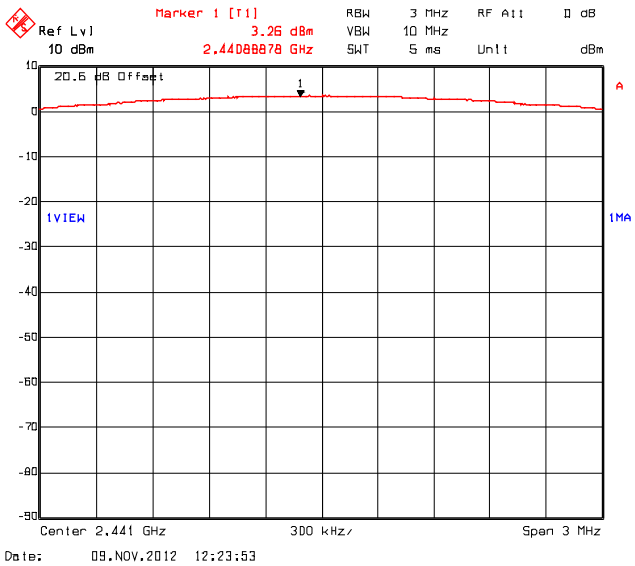


Powered by AC/DC Power Adaptor

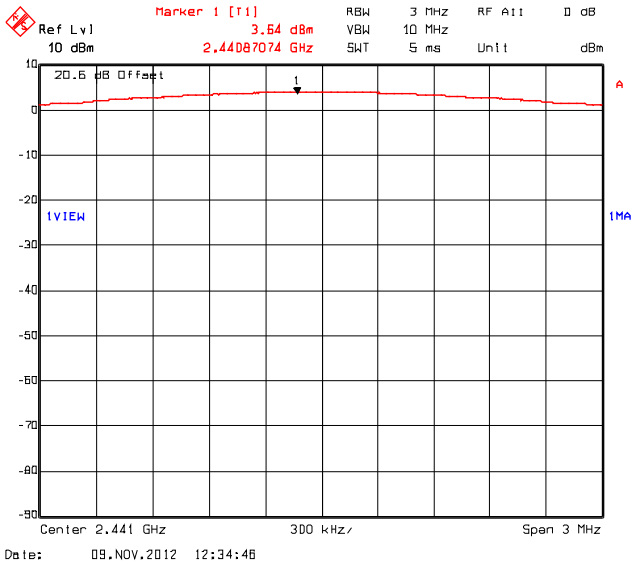


Plot 5.2.5.3.8 - Maximum Peak Power @ 2441 MHz, BT, 8DPSK, 3Mbps, setting 14

Powered by fully charged battery

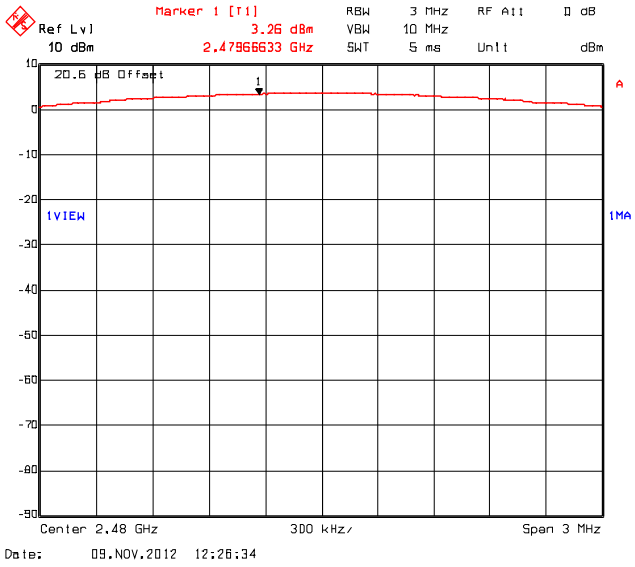


Powered by AC/DC Power Adaptor

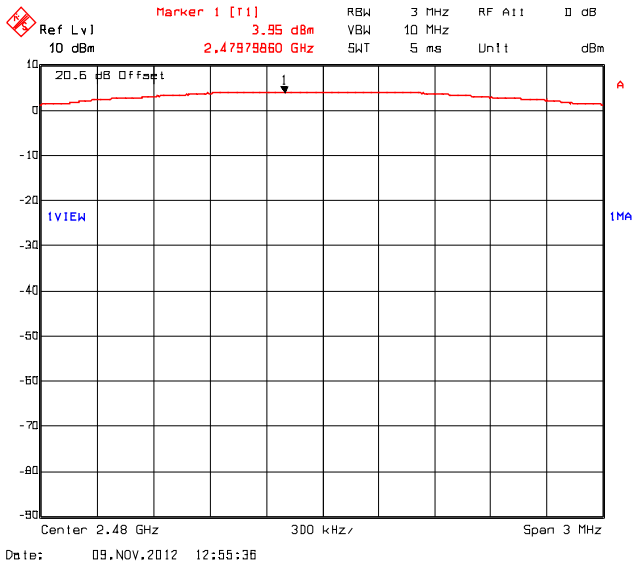


Plot 5.2.5.3.9 - Maximum Peak Power @ 2480 MHz, BT, 8DPSK, 3Mbps, setting 14

Powered by fully charged battery



Powered by AC/DC Power Adaptor



5.2.5.4. FCC Part 15, Subpart C – 15.407 U-NII – Maximum Peak Power in 5745 – 5825 MHz band

Reference: KDB 789033 D01 General U-NII Test Procedure v01r02 (Section C2)

Operating Frequency Band 5180 - 5240MHz

Power Limit: 50 mWatt or 17 dBm

Channel (MHz)	Modulation	Data Rate (Mbps)	Peak PW (dBm)	Rating (dBm)	Margin (dB)	Power Set (dBm)
36						
5180(a)	BPSK	6	12.90	12.77	0.13	6
5180(a)	64QAM	54	12.58	12.77	-0.19	6
5180(n)	(MCS0) BPSK	6.5	13.20	12.53	0.67	6
5180(n)	(MCS7) 64QAM	65	12.90	12.53	0.37	6
44						
5220(a)	BPSK	6	13.20	12.83	0.37	6
5220(a)	64QAM	54	13.74	12.83	0.91	6
5220(n)	(MCS0) BPSK	6.5	13.48	12.75	0.73	6
5220(n)	(MCS7) 64QAM	65	13.74	12.75	0.99	6
48						
5240(a)	BPSK	6	13.74	12.86	0.88	6
5240(a)	64QAM	54	13.48	12.86	0.62	6
5240(n)	(MCS0) BPSK	6.5	13.74	12.55	1.19	6
5240(n)	(MCS7) 64QAM	65	12.58	12.55	0.03	6

Operating Frequency Band 5260 - 5320 MHz

Power Limit: 250 mWatt or 24 dBm

Channel (MHz)	Modulation	Data Rate (Mbps)	Peak PW (dBm)	Rating (dBm)	Margin (dB)	Power Set (dBm)
52						
5260(a)	BPSK	6	19.15	22.69	-3.54	12
5260(a)	64QAM	54	18.52	22.69	-4.17	12
5260(n)	(MCS0) BPSK	6.5	19.07	22.68	-3.61	12
5260(n)	(MCS7) 64QAM	65	18.43	22.68	-4.25	12
60						
5300(a)	BPSK	6	19.22	22.70	-3.48	12
5300(a)	64QAM	54	19.57	22.70	-3.13	12
5300(n)	(MCS0) BPSK	6.5	19.00	22.74	-3.74	12
5300(n)	(MCS7) 64QAM	65	19.50	22.74	-3.24	12
64						
5320(a)	BPSK	6	19.15	22.76	-3.61	12
5320(a)	64QAM	54	17.35	22.76	-5.41	12
5320(n)	(MCS0) BPSK	6.5	17.77	22.80	-5.03	12
5320(n)	(MCS7) 64QAM	65	18.43	22.80	-4.37	12

Operating Frequency Band 5500 - 5700 MHz

Channel (MHz)	Modulation	Data Rate (Mbps)	Peak PW (dBm)	Rating (dBm)	Margin (dB)	Power Set (dBm)
100						
5500(a)	BPSK	6	19.00	23.18	-4.18	12
5500(a)	64QAM	54	18.34	23.18	-4.84	12
5500(n)	(MCS0) BPSK	6.5	18.76	23.20	-4.44	12
5500(n)	(MCS7) 64QAM	65	18.68	23.20	-4.52	12
120						
5600(a)	BPSK	6	18.92	23.29	-4.37	12
5600(a)	64QAM	54	18.34	23.29	-4.95	12
5600(n)	(MCS0) BPSK	6.5	18.68	23.30	-4.62	12
5600(n)	(MCS7) 64QAM	65	18.25	23.30	-5.05	12
140						
5700(a)	BPSK	6	18.43	23.28	-4.85	12
5700(a)	64QAM	54	18.52	23.28	-4.76	12
5700(n)	(MCS0) BPSK	6.5	18.76	23.33	-4.57	12
5700(n)	(MCS7) 64QAM	65	17.97	23.33	-5.36	12

3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: http://www.ultratech-labs.com

5.3. TRANSMITTER BAND-EDGE & SPURIOUS RADIATED EMISSIONS AT 3 METERS [§ 15.247(d), 15.209 & 15.205]

5.3.1. Limit(s)

§ 15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

§ 15.407 (b) (1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz.

(2) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz. Devices operating in the 5.25–5.35 GHz band that generate emissions in the 5.15–5.25 GHz band must meet all applicable technical requirements for operation in the 5.15–5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of –27 dBm/MHz in the 5.15–5.25 GHz band.

(3) For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.

(4) For transmitters operating in the 5.725–5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of –17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of –27 dBm/MHz.

Section 15.205(a) - Restricted Bands of Operation

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	[2]
13.36–13.41.			

[1] Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2] Above 38.6

Section 15.209(a)
-- Field Strength Limits within Restricted Frequency Bands --

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400 / F (kHz)	300
0.490 - 1.705	24,000 / F (kHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

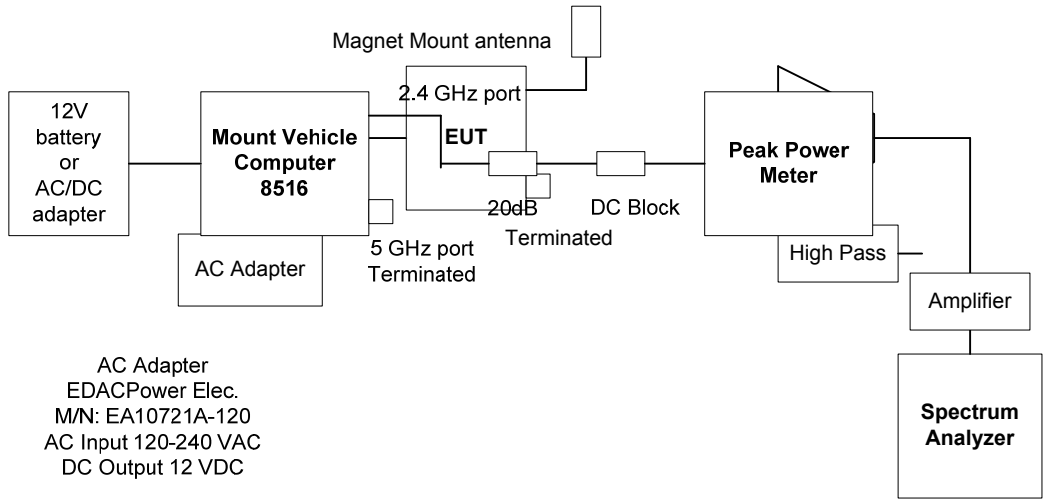
5.3.2. Method of Measurements

ANSI C63.10.

5.3.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSEK30	100077	20Hz–40 GHz	02 Nov 2013
Spectrum Analyzer	Rohde & Schwarz	ESU40	100033	20 Hz – 40 GHz	19 Mar 2013
RF Amplifier	Hewlett Packard	84498	3008A00769	1 – 26.5 GHz	6 Aug 2013
RF Amplifier	AH System	PAM-0118	225	20 MHz – 18 GHz	16 Mar 2013
High Pass Filter	K & L	11SH10-4000/T12000	4	Cut off 2.4 GHz	Cal on use
High Pass Filter	K & L	11SH10-8000/T18000	3	Cut off 5 GHz	Cal on use
Biconi-Log Antenna	ETS Lindgren	3142B	1575	26 – 3000 MHz	4 May 2013
Horn Antenna	Emco	3155	6570	1 – 18 GHz	2 Apr 2013
Horn Antenna	Emco	3160-09	118385	18 – 26.5 GHz	30 July 2014
Horn Antenna	Emco	3160-10	102686	26– 40 GHz	30 July 2014

5.3.4. Test Arrangement



5.3.5. Test Data

Remarks:

- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- The following test results are the worst-case measurements.

5.3.5.1. Spurious Radiated Emissions from WLAN Module @ FCC15.247 (DTS)

5.3.5.1.1. 2412 – 2462 MHz Band, 802.11b, Transmitter 5 dBi Magnet Mount Antenna, Power setting 18

Note: Spurious emissions with CCK 1 Mbps operation were found to be the worst case, and chosen to be tested.

Fundamental Frequency: 2412 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2412	111.1	--	V	--	--	--	--
2412	114.2	--	H	--	--	--	--
4824	47.9	36.9	V	54.0	94.2	-17.1	Pass*
4824	47.0	33.7	H	54.0	94.2	-20.3	Pass*
9648	55.5	43.0	V	54.0	94.2	-51.2	Pass
9648	54.6	41.1	H	54.0	94.2	-53.1	Pass

Fundamental Frequency: 2437 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2437	111.2	--	V	--	--	--	--
2437	112.2	--	H	--	--	--	--
4874	47.9	36.0	V	54.0	92.2	-18.0	Pass*
4874	46.3	33.5	H	54.0	92.2	-20.5	Pass*
9748	55.5	42.7	V	54.0	92.2	-49.5	Pass
9748	54.3	41.2	H	54.0	92.2	-51.0	Pass

Fundamental Frequency: 2462 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2462	111.3	--	V	--	--	--	--
2462	112.3	--	H	--	--	--	--
4924	48.4	37.3	V	54.0	92.3	-16.7	Pass*
4924	46.8	33.7	H	54.0	92.3	-20.3	Pass*
9848	55.7	41.6	V	54.0	92.3	-50.7	Pass
9848	54.7	41.0	H	54.0	92.3	-51.3	Pass

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.3.5.1.2. 2412 – 2462 MHz Band, 802.11g, Transmitter 5 dBi Magnet Mount Antenna, Power setting 16

Fundamental Frequency: 2412 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2412	112.0	--	V	--	--	--	--
2412	111.8	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 25 GHz

Fundamental Frequency: 2437 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2437	111.1	--	V	--	--	--	--
2437	112.3	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 25 GHz

Fundamental Frequency: 2462 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2462	110.7	--	V	--	--	--	--
2462	113.5	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 25 GHz

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.3.5.1.3. 2412 – 2462 MHz Band, 802.11n, Transmitter 5 dBi Magnet Mount Antenna, Power setting 12

Fundamental Frequency: 2412 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2412	106.3	--	V	--	--	--	--
2412	107.9	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 25 GHz

Fundamental Frequency: 2437 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2437	106.5	--	V	--	--	--	--
2437	107.8	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 25 GHz

Fundamental Frequency: 2462 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2462	108.0	--	V	--	--	--	--
2462	107.8	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 25 GHz

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.3.5.1.4. 2402 – 2480 MHz Band, Bluetooth, Transmitter 5 dBi Magnet Mount Antenna

Note: Spurious emissions with GFSK operation were found to be the worst case, and chosen to be tested.

Fundamental Frequency: 2402 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2402	101.5	--	V	--	--	--	--
2402	99.8	--	H	--	--	--	--
4804	49.1	35.3	V	54.0	81.5	-18.7	Pass*
4804	49.4	38.9	H	54.0	81.5	-15.1	Pass*

Fundamental Frequency: 2441 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2441	99.7	--	V	--	--	--	--
2441	99.5	--	H	--	--	--	--
4882	48.8	34.8	V	54.0	79.5	-19.2	Pass*
4882	48.4	34.7	H	54.0	79.5	-19.3	Pass*

Fundamental Frequency: 2480 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2480	99.2	--	V	--	--	--	--
2480	100.1	--	H	--	--	--	--
4960	48.3	34.3	V	54.0	80.1	-19.7	Pass*
4960	49.5	35.2	H	54.0	80.1	-18.8	Pass*

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.3.5.1.5. 5745 – 5825 MHz Band, 802.11a, Transmitter 5 dBi Magnet Mount Antenna, Power setting 12

Fundamental Frequency: 5745 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
5745	106.0	--	V	--	--	--	--
5745	106.5	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5785 MHz
Test Frequency Range: 30 MHz –40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
5785	105.1	--	V	--	--	--	--
5785	106.8	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5825 MHz
Test Frequency Range: 30 MHz –40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
5825	105.8	--	V	--	--	--	--
5825	109.6	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.3.5.1.6. 5745 – 5825 MHz Band, 802.11n, Transmitter 5 dBi Magnet Mount Antenna, Power setting 12

Fundamental Frequency: 5745 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
5745	106.7	--	V	--	--	--	--
5745	107.9	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5785 MHz
Test Frequency Range: 30 MHz –40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
5785	106.0	--	V	--	--	--	--
5785	106.8	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5825 MHz
Test Frequency Range: 30 MHz –40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
5825	106.0	--	V	--	--	--	--
5825	106.8	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.3.5.2. Spurious Radiated Emissions from WLAN Module @ FCC15.407 (U-NII)

5.3.5.2.1. 5180 – 5240 MHz Band, 802.11n, Transmitter 5 dBi Magnet Mount Antenna, Power setting 6

Fundamental Frequency: 5180 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5180	99.3	--	--	V	--	--	--	--
5180	101.2	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5220 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5220	99.3	--	--	V	--	--	--	--
5220	100.8	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5240 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5240	99.6	--	--	V	--	--	--	--
5240	100.9	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.3.5.2.2. 5260 – 5320 MHz Band, 802.11n, Transmitter 5 dBi Magnet Mount Antenna, Power setting 12

Fundamental Frequency: 5260 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5260	104.4	--	--	V	--	--	--	--
5260	107.1	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5300 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5300	104.5	--	--	V	--	--	--	--
5300	106.8	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5320 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5320	103.9	--	--	V	--	--	--	--
5320	105.3	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.3.5.2.3. 5500 – 5700 MHz Band, 802.11n, Transmitter 5 dBi Magnet Mount Antenna, Power setting 12

Fundamental Frequency: 5500 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5500	104.8	--	--	V	--	--	--	--
5500	104.7	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5600 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5600	104.3	--	--	V	--	--	--	--
5600	105.7	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5700 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5700	104.0	--	--	V	--	--	--	--
5700	106.1	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.3.5.2.4. 5180 – 5240 MHz Band, 802.11a, Transmitter 5 dBi Magnet Mount Antenna, Power setting 6

Fundamental Frequency: 5180 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5180	98.9	--	--	V	--	--	--	--
5180	101.0	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5220 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5220	99.3	--	--	V	--	--	--	--
5220	102.4	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5240 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5240	99.8	--	--	V	--	--	--	--
5240	103.0	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.3.5.2.5. 5260 – 5320 MHz Band, 802.11a, Transmitter 5 dBi Magnet Mount Antenna, Power setting 12

Fundamental Frequency: 5260 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5260	105.4	--	--	V	--	--	--	--
5260	106.2	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5300 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5300	104.6	--	--	V	--	--	--	--
5300	106.4	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5320 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5320	104.0	--	--	V	--	--	--	--
5320	106.2	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.3.5.2.6. 5500 – 5700 MHz Band, 802.11a, Transmitter 5 dBi Magnet Mount Antenna, Power setting 12

Fundamental Frequency: 5500 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5500	105.0	--	--	V	--	--	--	--
5500	105.6	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5600 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5600	104.9	--	--	V	--	--	--	--
5600	105.9	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

Fundamental Frequency: 5700 MHz
Test Frequency Range: 30 MHz – 40 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	EIRP (dBm)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit EIRP 15.407(b) (dBm/MHz)	Margin (dB)	Pass/ Fail
5700	103.9	--	--	V	--	--	--	--
5700	106.2	--	--	H	--	--	--	--

No significant radiated spurious & harmonic emissions were found from the transmitter in the frequency range 30 MHz to 40 GHz

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.3.5.3. Spurious Radiated Emissions from Bluetooth Module, 2402 – 2480 MHz Band

Fundamental Frequency: 2402 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2402	109.38	--	V	--	--	--	--
2402	101.28	--	H	--	--	--	--
4804	65.01	33.70	V	54.0	89.4	-20.3	Pass*
4804	64.37	33.85	H	54.0	89.4	-20.2	Pass*

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency: 2441 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2441	109.85	--	V	--	--	--	--
2441	110.76	--	H	--	--	--	--
4882	69.14	34.08	V	54.0	90.8	-19.9	Pass*
4882	69.40	34.34	H	54.0	90.8	-19.7	Pass*
7323	59.89	38.53	V	54.0	90.8	-15.5	Pass*
7323	61.67	39.01	H	54.0	90.8	-15.0	Pass*

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency: 2480 MHz
Test Frequency Range: 30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2480	110.14	--	V	--	--	--	--
2480	112.21	--	H	--	--	--	--
4960	69.06	34.08	V	54.0	92.2	-19.9	Pass*
4960	72.11	34.38	H	54.0	92.2	-19.6	Pass*
7440	54.90	38.14	V	54.0	92.2	-15.9	Pass*
7440	59.03	39.49	H	54.0	92.2	-14.5	Pass*

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.3.5.4. Spurious Radiated Emissions from Co-location of Bluetooth Module and WLAN Module

The middle frequency of the Bluetooth module and WLAN module were set to transmit continuously, no new spurious radiated emissions were detected. Below is a table of test results summary.

Test Configuration			Observations
	Bluetooth Module	WLAN Module	
1	2441 MHz at max. data rate	2437 MHz, 802.11b mode	No new spurious emissions.
2	2441 MHz at max. data rate	2437 MHz, 802.11g mode	No new spurious emissions.
3	2441 MHz at max. data rate	2437 MHz, 802.11n mode	No new spurious emissions.
4	2441 MHz at max. data rate	5785 MHz, 802.11a mode	No new spurious emissions.
5	2441 MHz at max. data rate	5785 MHz, 802.11n mode	No new spurious emissions.
6	2441 MHz at max. data rate	5300 MHz, 802.11a mode	No new spurious emissions.
7	2441 MHz at max. data rate	5300 MHz, 802.11n mode	No new spurious emissions.

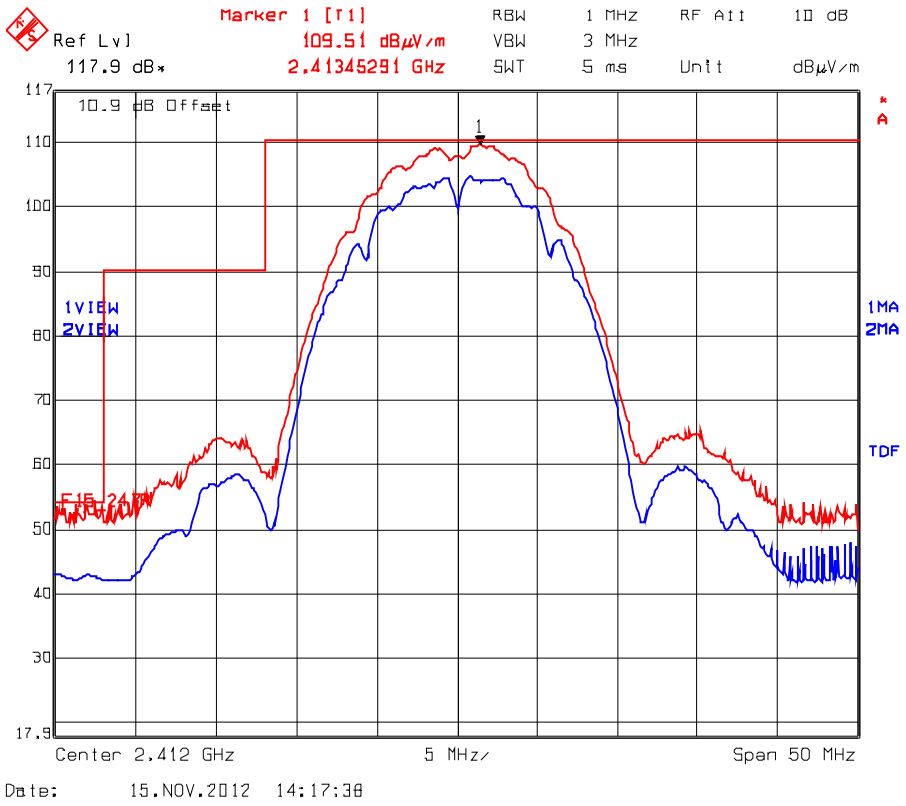
5.3.5.5. FCC 15.247 Radiated Band-edge Emissions of 2412-2462 MHz- Magnet Mount Antenna, 5dBi Gain, Power setting 18, 802.11b DBPSK 1 Mbps

Receiving Antenna in Vertical Polarization

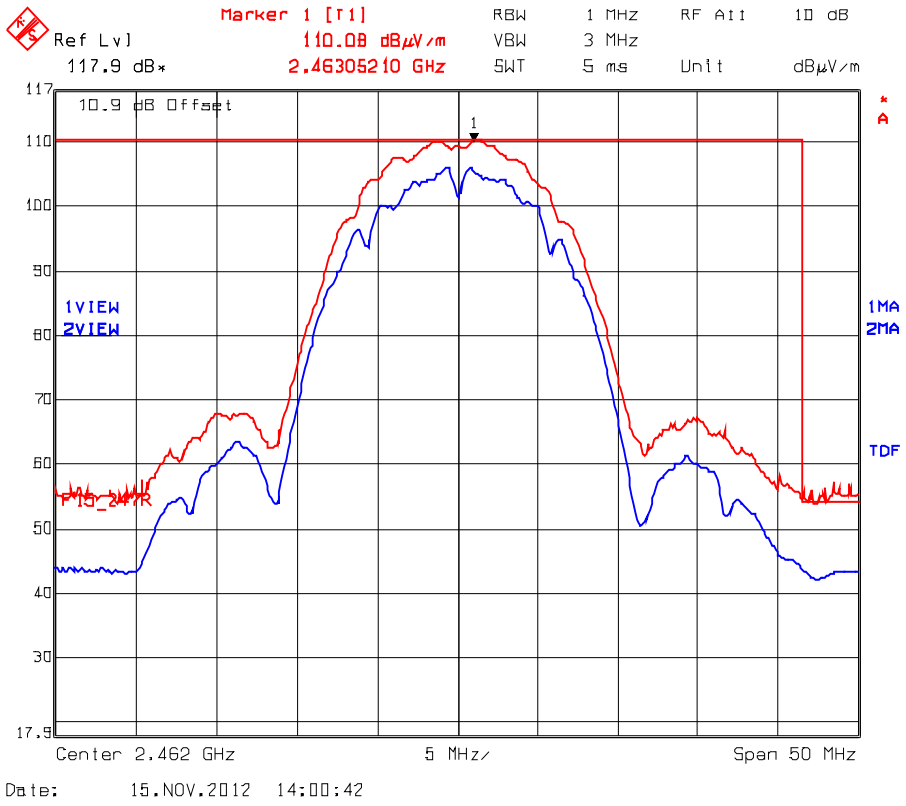
Notes:

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 1 MHz, VBW= 10 Hz

Lower Band-edge



Upper Band-edge

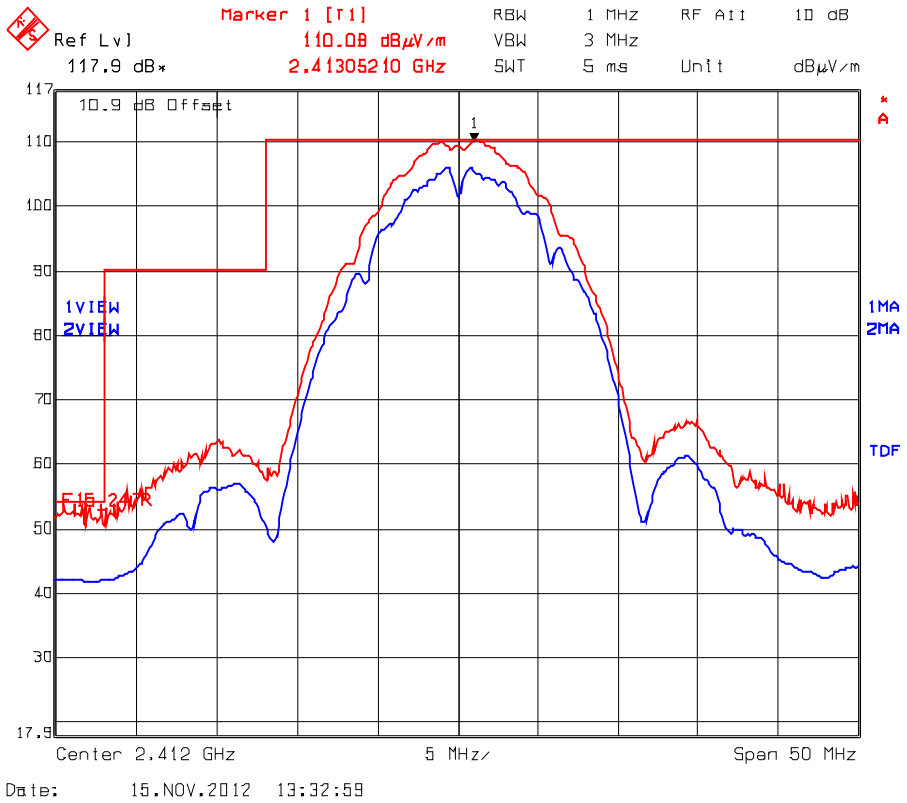


Receiving Antenna in Horiztal Polarization

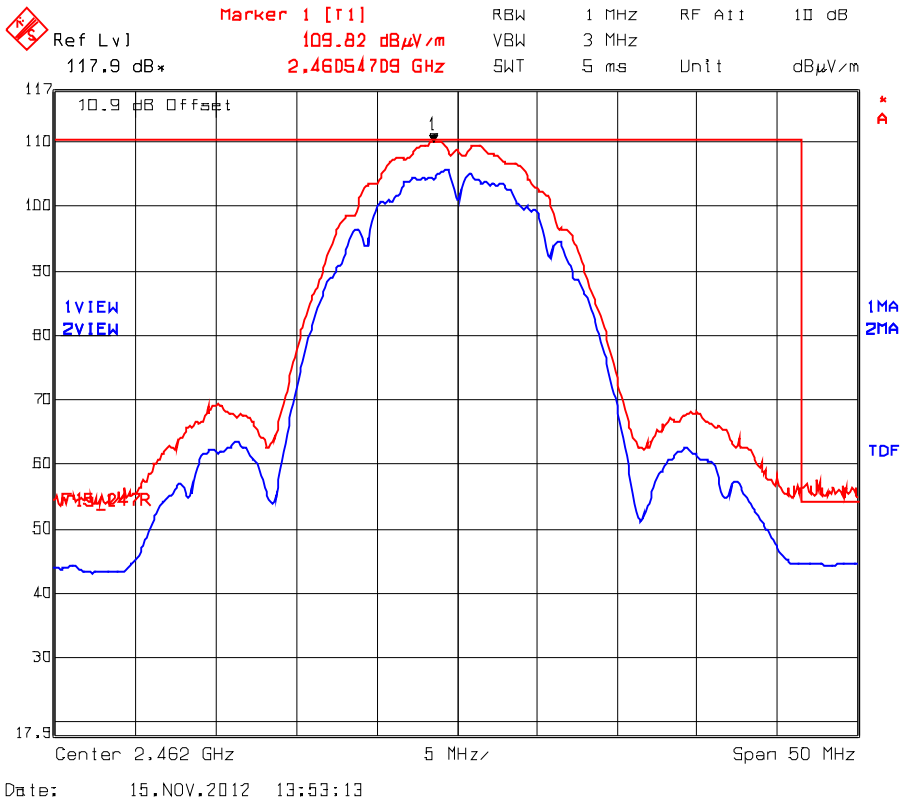
Notes:

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 1 MHz, VBW= 10 Hz

Lower Band-edge



Upper Band-edge



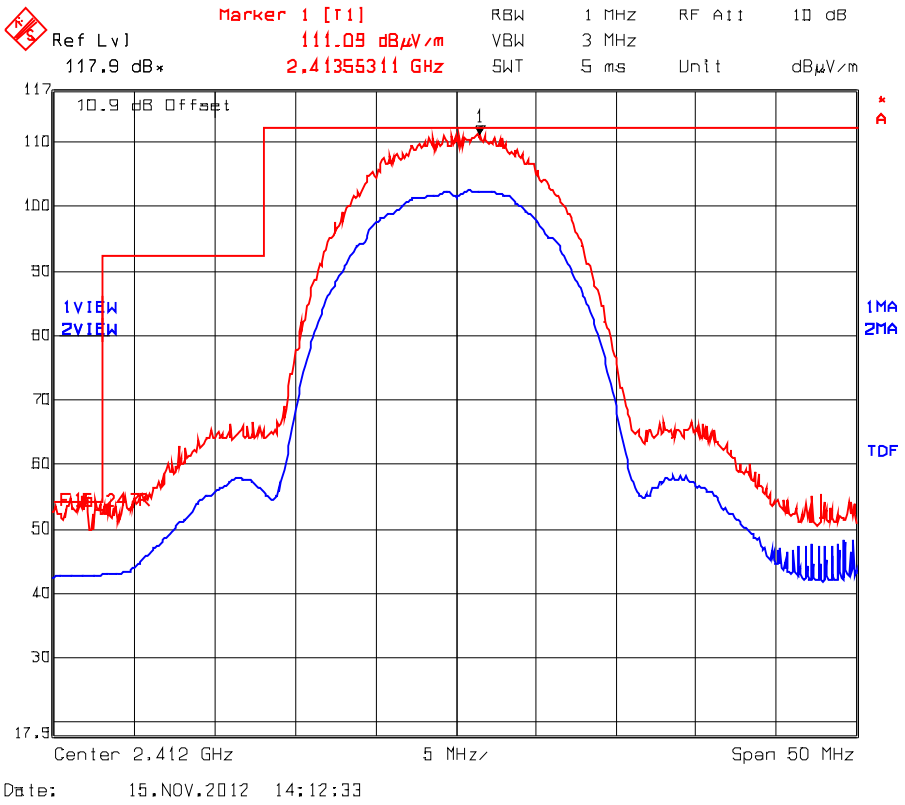
5.3.5.6. FCC 15.247 Radiated Band-edge Emissions of 2412-2462 MHz - Magnet Mount Antenna, 5dBi Gain, Power setting 18, 802.11b CCK 11 Mbps

Receiving Antenna in Vertical Polarization

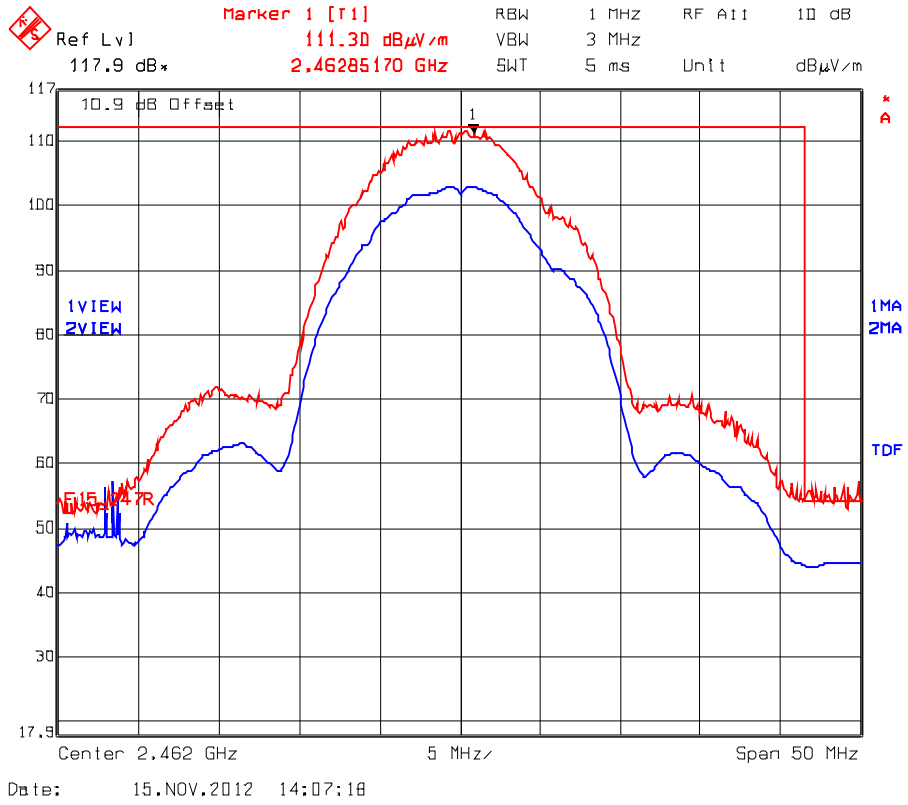
Notes:

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 1 MHz, VBW= 10 Hz

Lower Band-edge



Upper Band-edge

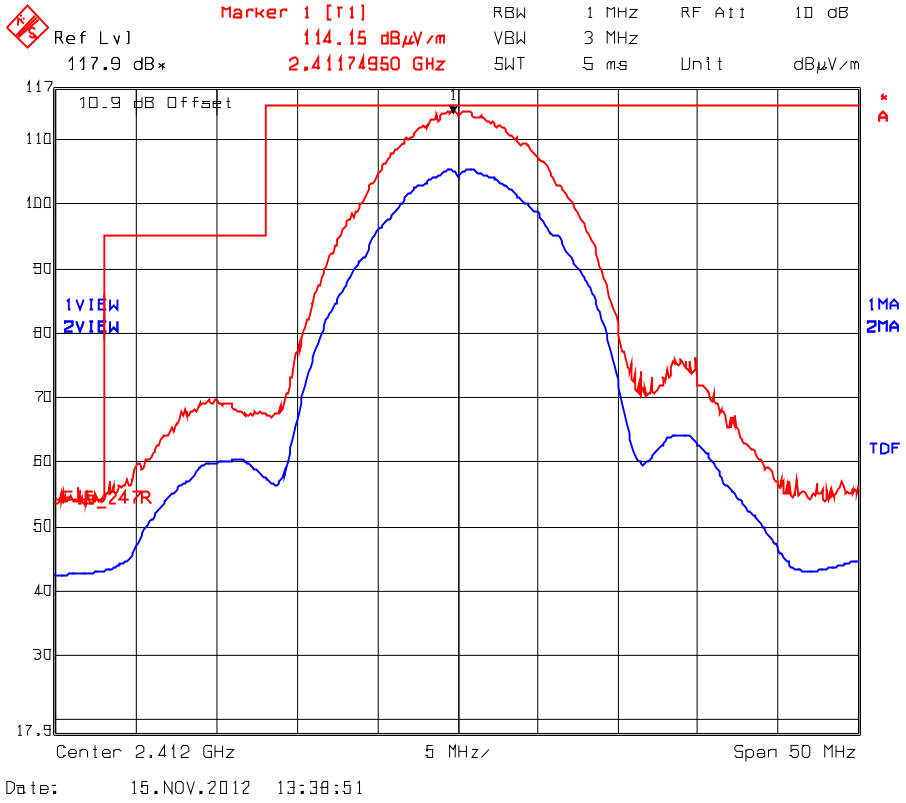


Receiving Antenna in Horiztal Polarization

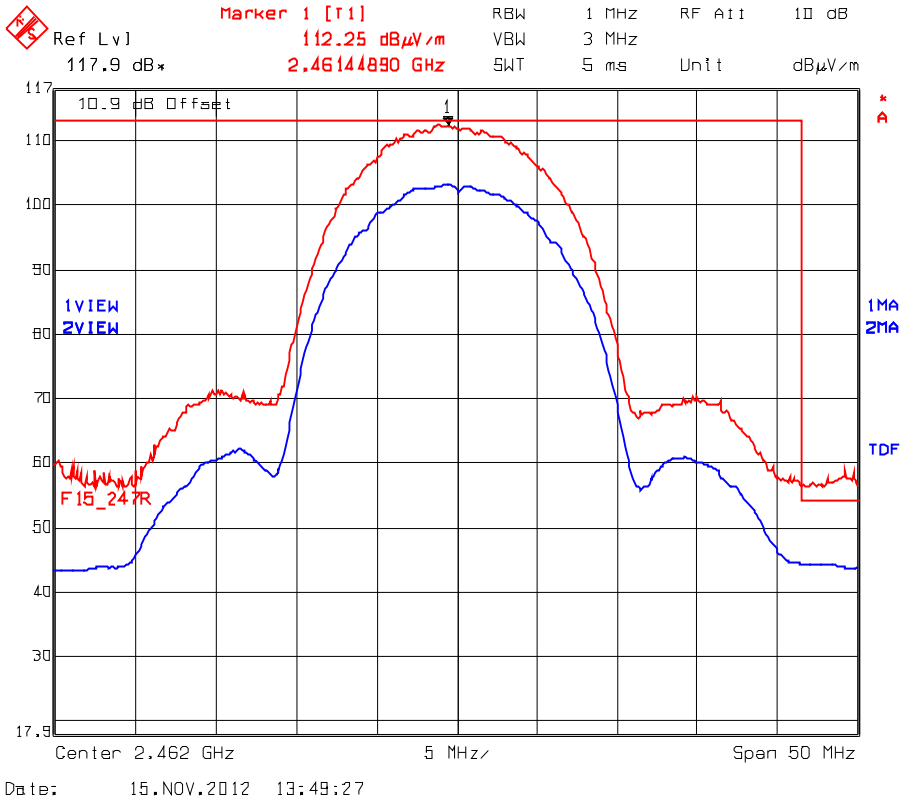
Notes:

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 1 MHz, VBW= 10 Hz

Lower Band-edge



Upper Band-edge

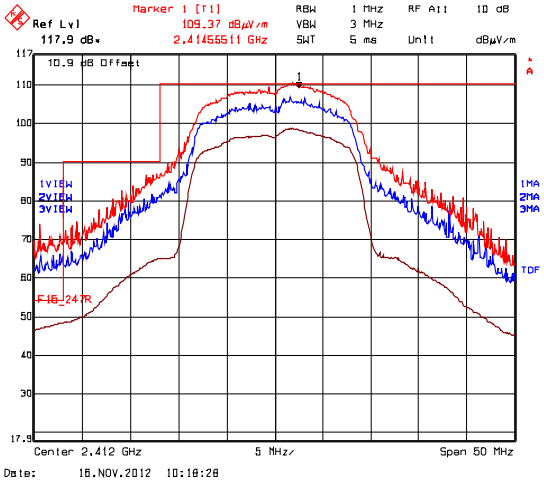


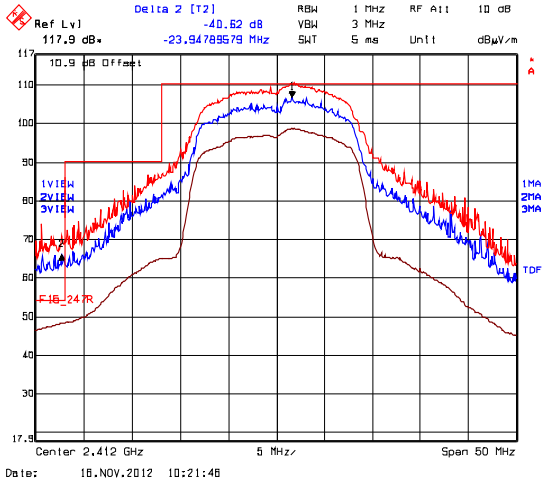
5.3.5.7. FCC 15.247 Radiated Band-edge Emissions of 2412-2462 MHz - Magnet Mount Antenna, 5dBi Gain, Power setting 16, 802.11g BPSK 6 Mbps

Receiving Antenna in Vertical Polarization

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 500 kHz, VBW= 1 MHz, Delta (Peak to Band-Edge): 40.62dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz
Peak Band-Edge at 2390 MHz: Peak= 109.37dBuV/m – 40.62dB= 68.74dBuV/m (limit 74dBuV/m)

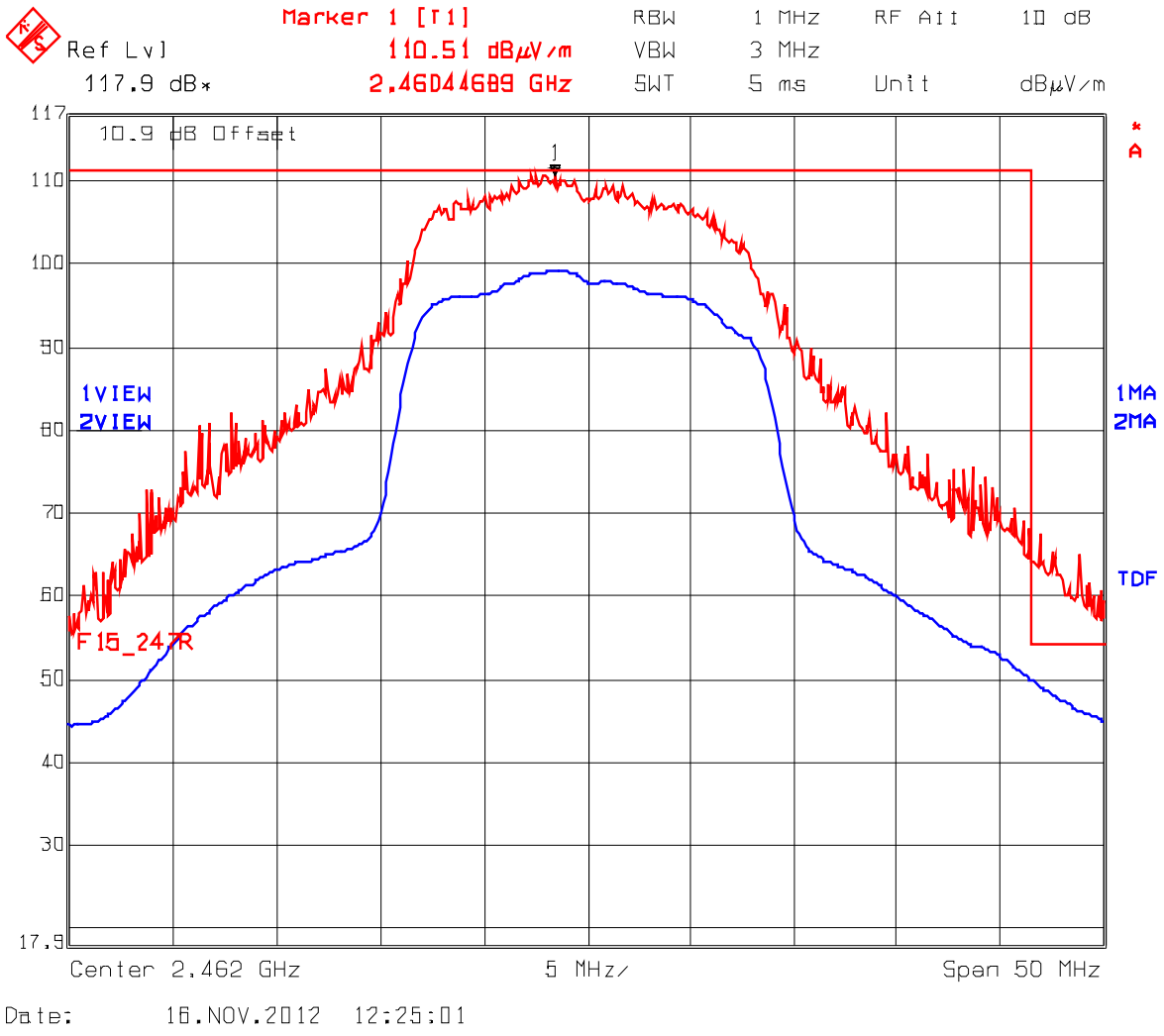
Lower Band-edge





Upper Band-edge

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 1 MHz, VBW= 10 Hz

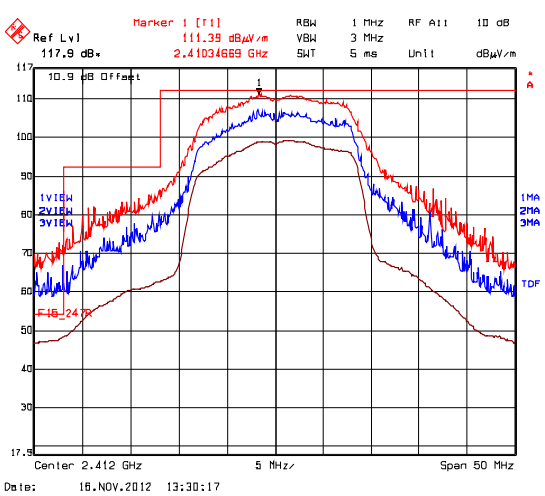


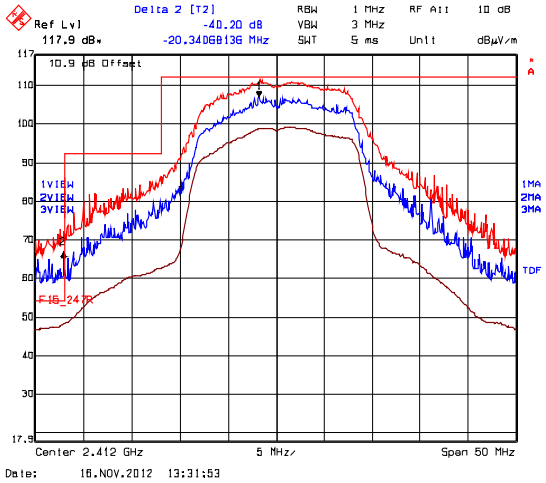
All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Receiving Antenna in Horizontal Polarization

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 500 kHz, VBW= 1 MHz, Delta (Peak to Band-Edge): 40.20dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz
Peak Band-Edge at 2390 MHz: Peak= 111.39dBuV/m – 40.20dB= 71.19dBuV/m (limit 74dBuV/m)

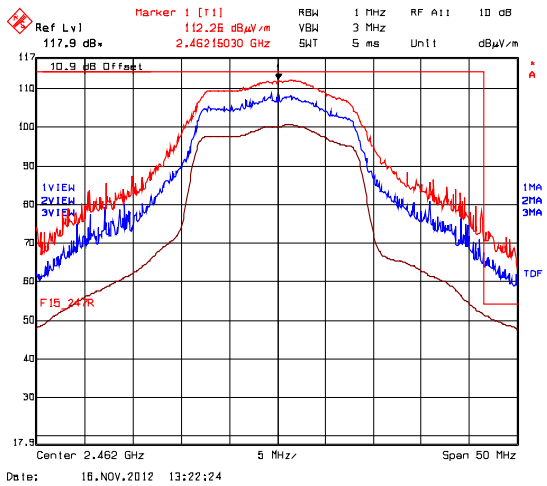
Lower Band-edge

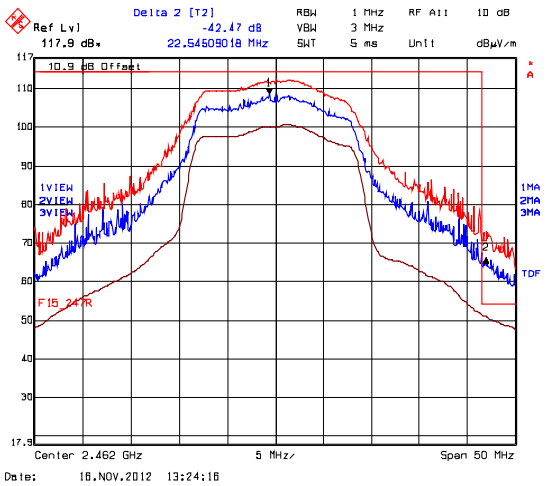




Upper Band-edge

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 500 kHz, VBW= 1 MHz, Delta (Peak to Band-Edge): 42.47dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz
Peak Band-Edge at 2483.5 MHz: Peak= 112.26dBuV/m – 42.47dB= 69.79dBuV/m (limit 74dBuV/m)



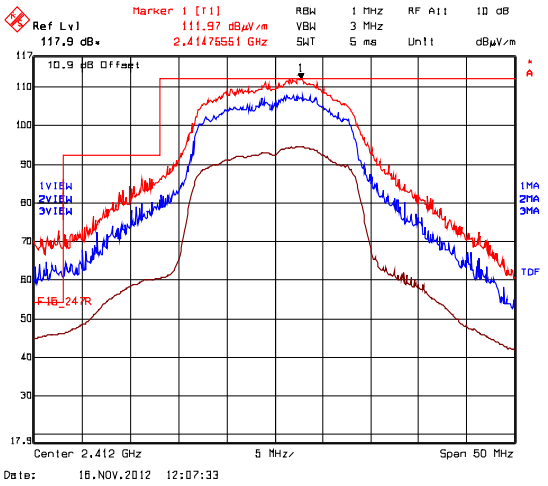


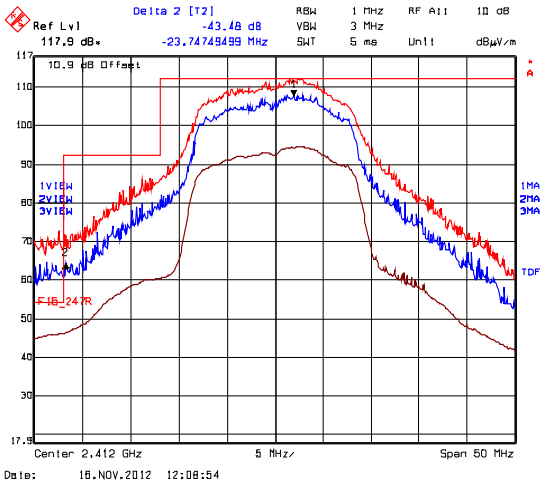
5.3.5.8. FCC 15.247 Radiated Band-edge Emissions of 2412-2462 MHz - Magnet Mount Antenna, 5dBi Gain, Power setting 16, 802.11g 64-QAM 54 Mbps

Receiving Antenna in Vertical Polarization

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 500 kHz, VBW= 1 MHz, Delta (Peak to Band-Edge): 43.48dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz
Peak Band-Edge at 2390 MHz: Peak= 111.97dBuV/m – 43.48dB= 68.49dBuV/m (limit 74dBuV/m)

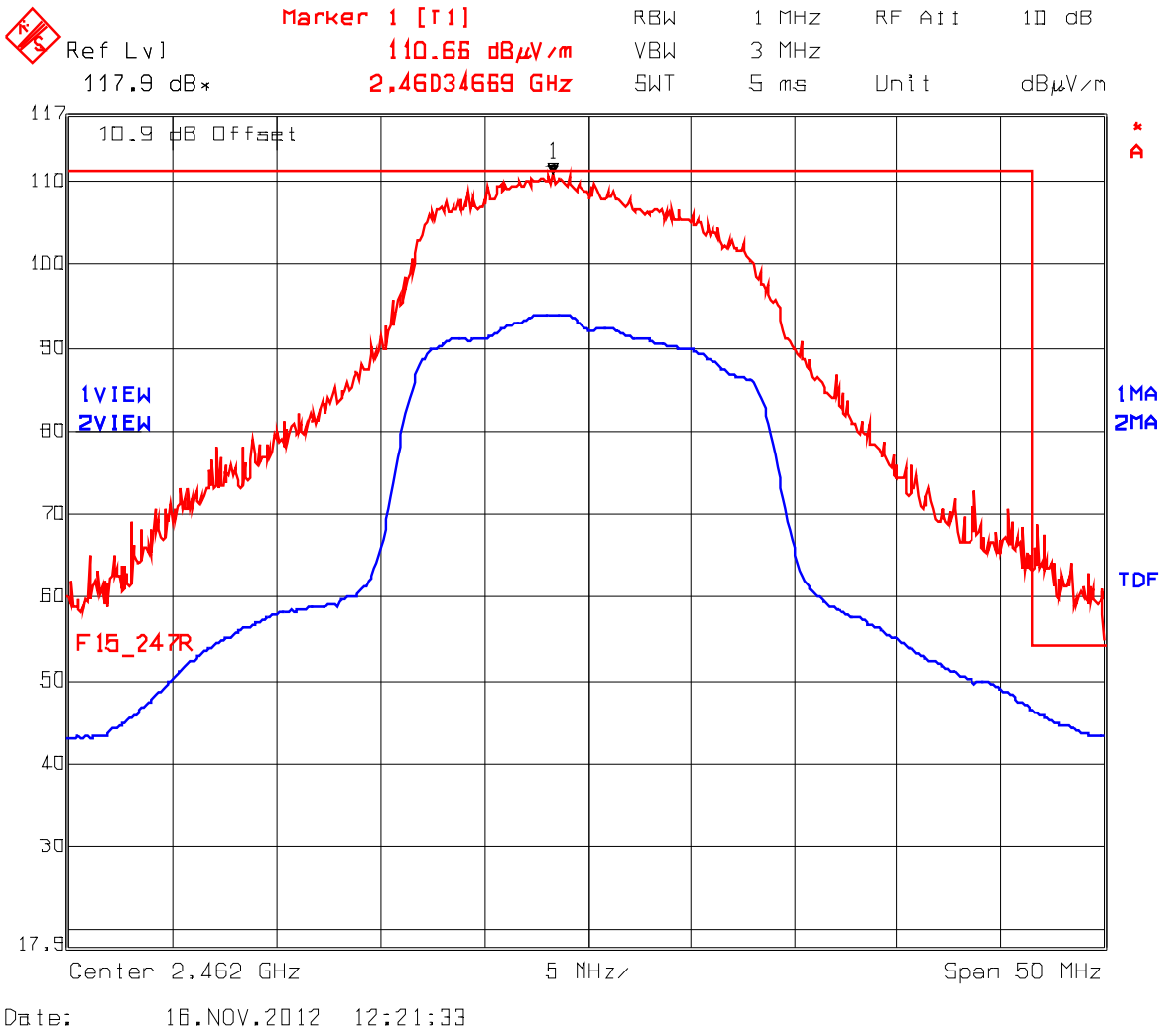
Lower Band-edge





Upper Band-edge

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 1 MHz, VBW= 10 Hz

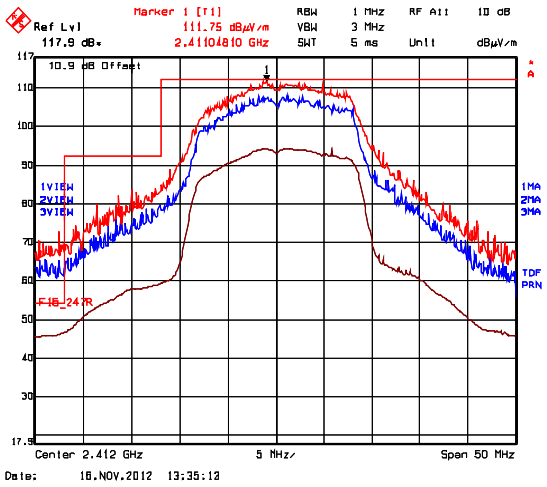


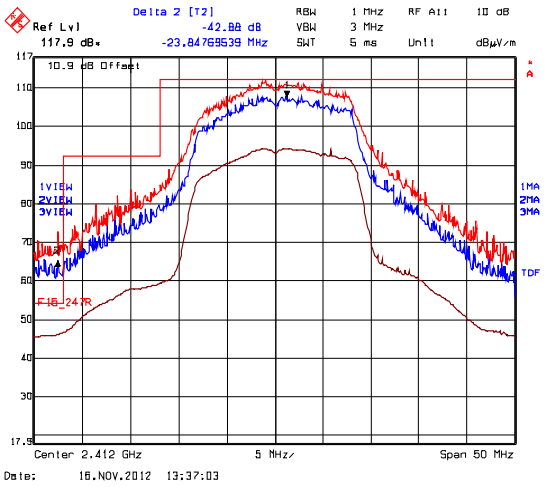
All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Receiving Antenna in Horizontal Polarization

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 500 kHz, VBW= 1 MHz, Delta (Peak to Band-Edge): 42.88dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz
Peak Band-Edge at 2390 MHz: Peak= 111.75dBuV/m – 42.88dB= 68.87dBuV/m (limit 74dBuV/m)

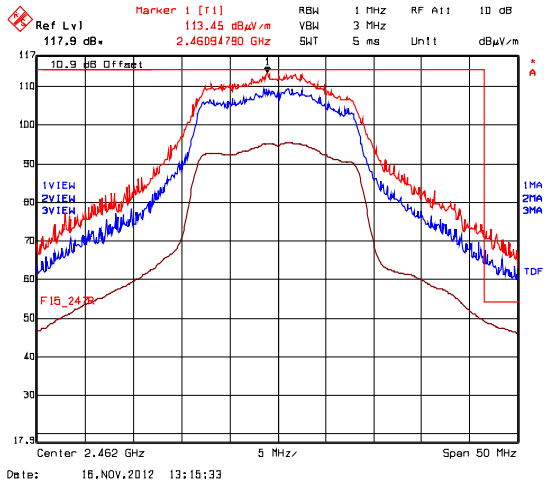
Lower Band-edge

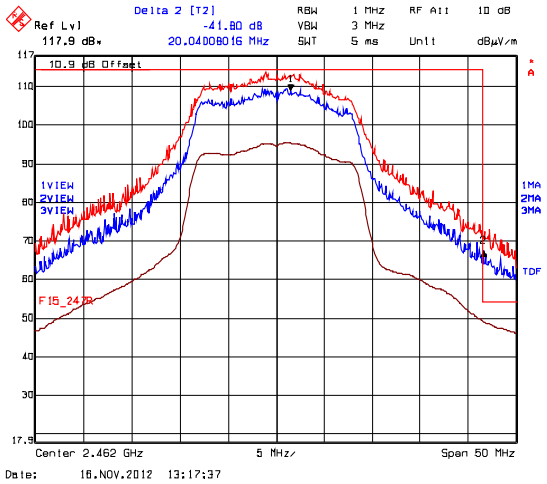




Upper Band-edge

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 500 kHz, VBW= 1 MHz, Delta (Peak to Band-Edge): 41.80dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz
Peak Band-Edge at 2483.5 MHz: Peak= 113.45dBuV/m – 41.80dB= 71.65dBuV/m (limit 74dBuV/m)



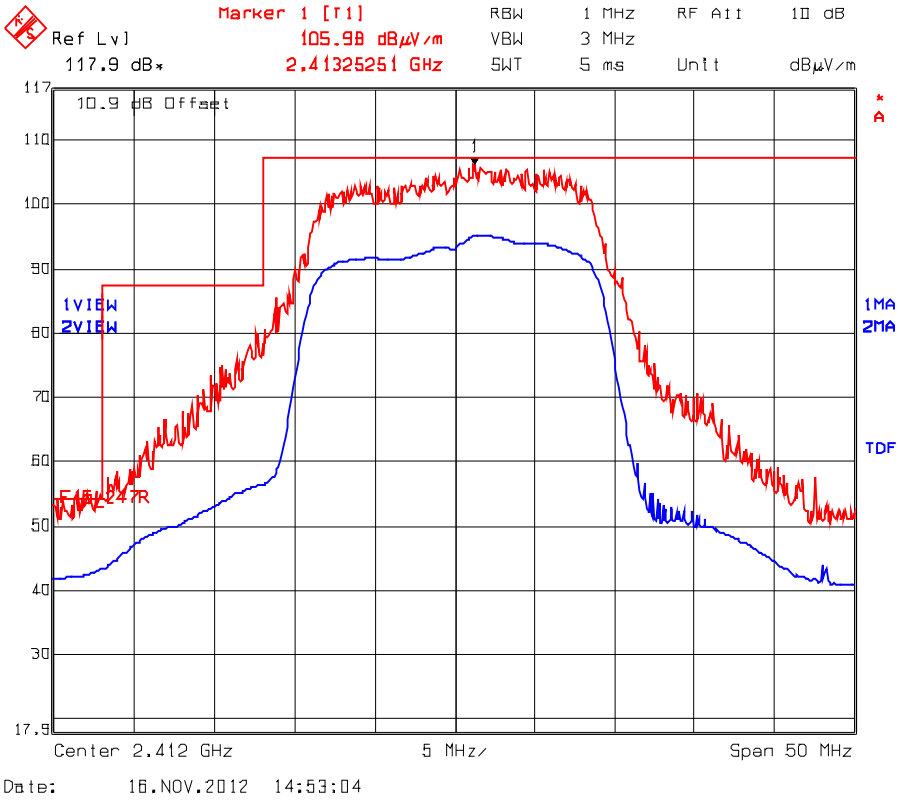


5.3.5.9. FCC 15.247 Radiated Band-edge Emissions of 2412-2462 MHz - Magnet Mount Antenna, 5dBi Gain, 802.11n BPSK 6.5 Mbps, Power setting 12

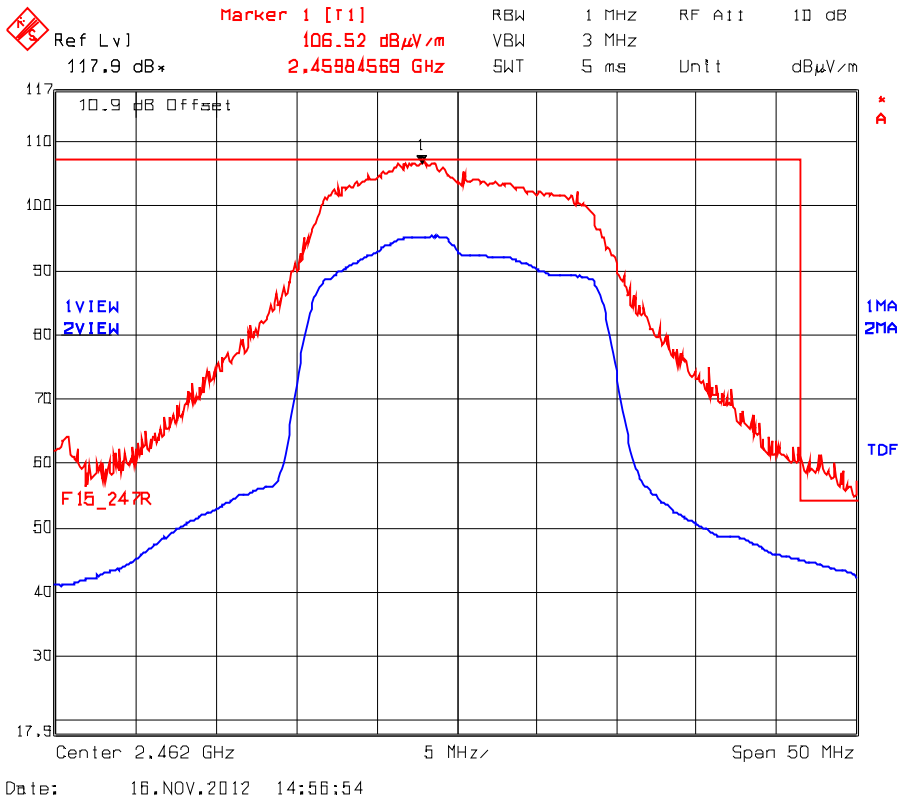
Receiving Antenna in Vertical Polarization

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 1 MHz, VBW= 10 Hz

Lower Band-edge



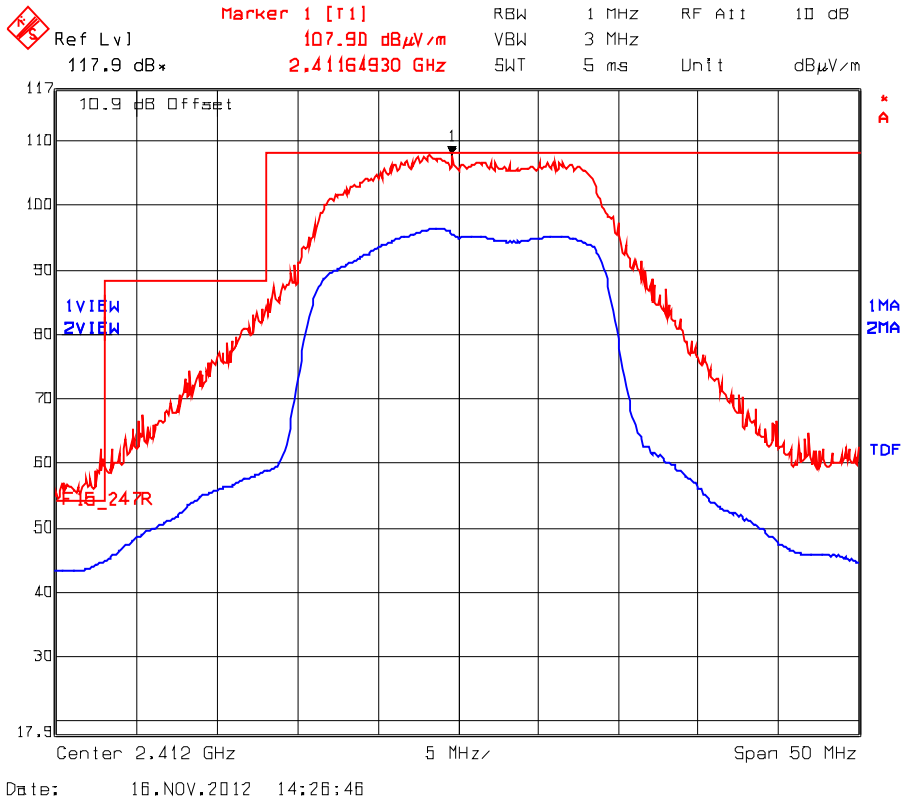
Upper Band-edge



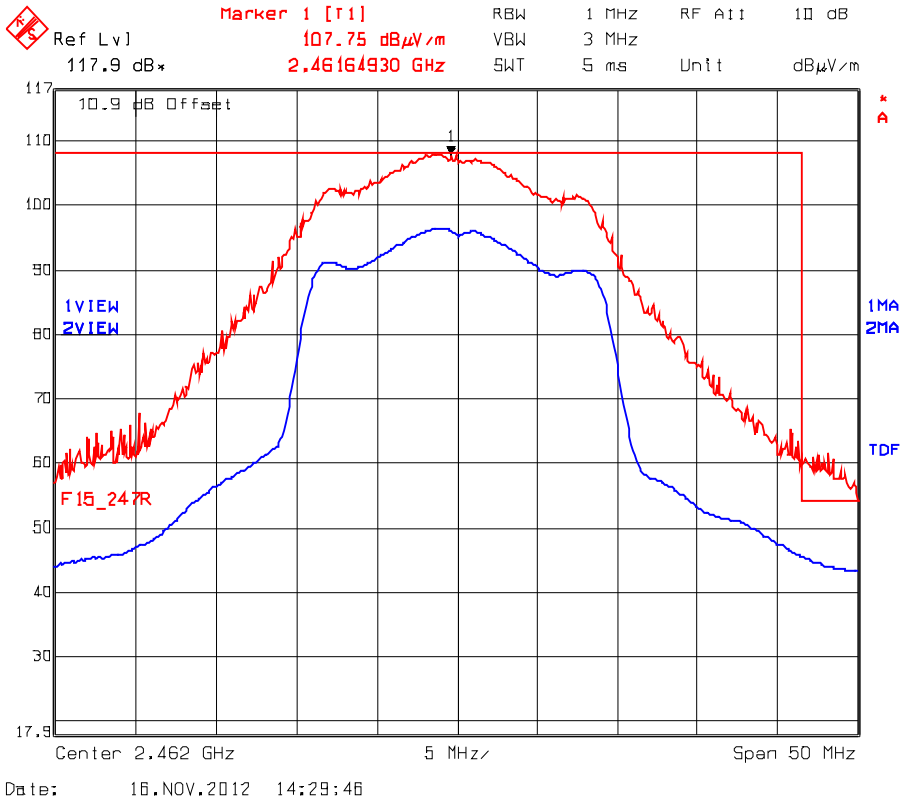
Receiving Antenna in Horizontal Polarization

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 1 MHz, VBW= 10 Hz

Lower Band-edge



Upper Band-edge

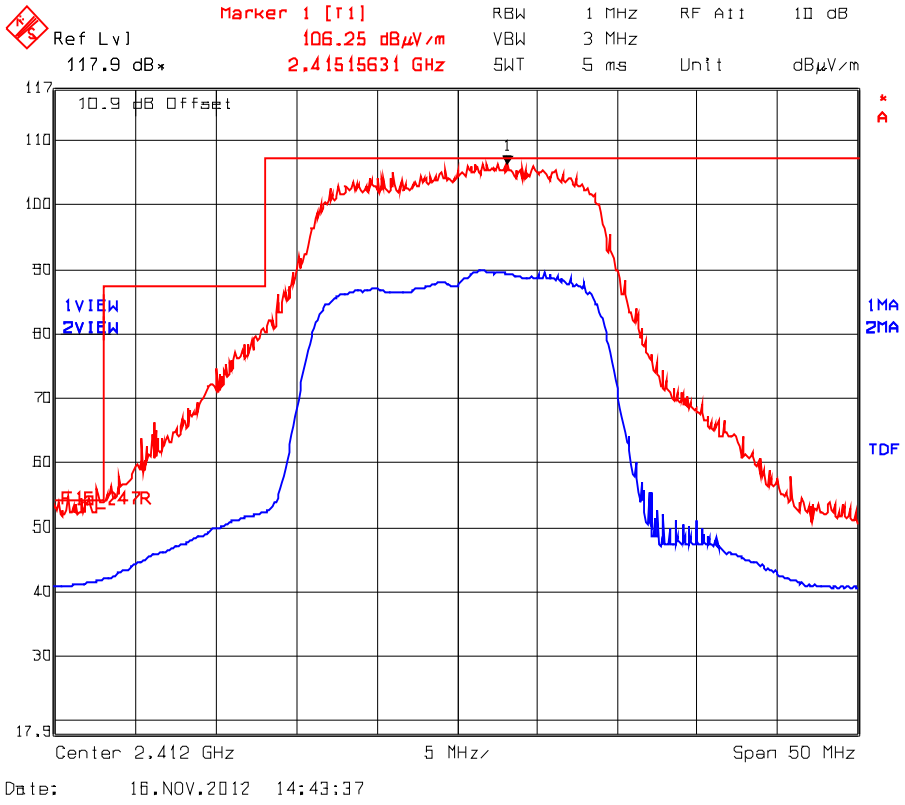


5.3.5.10. FCC 15.247 Radiated Band-edge Emissions of 2412-2462 MHz - Magnet Mount Antenna, 5dBi Gain, 802.11n 64-QAM 65 Mbps, Power setting 12

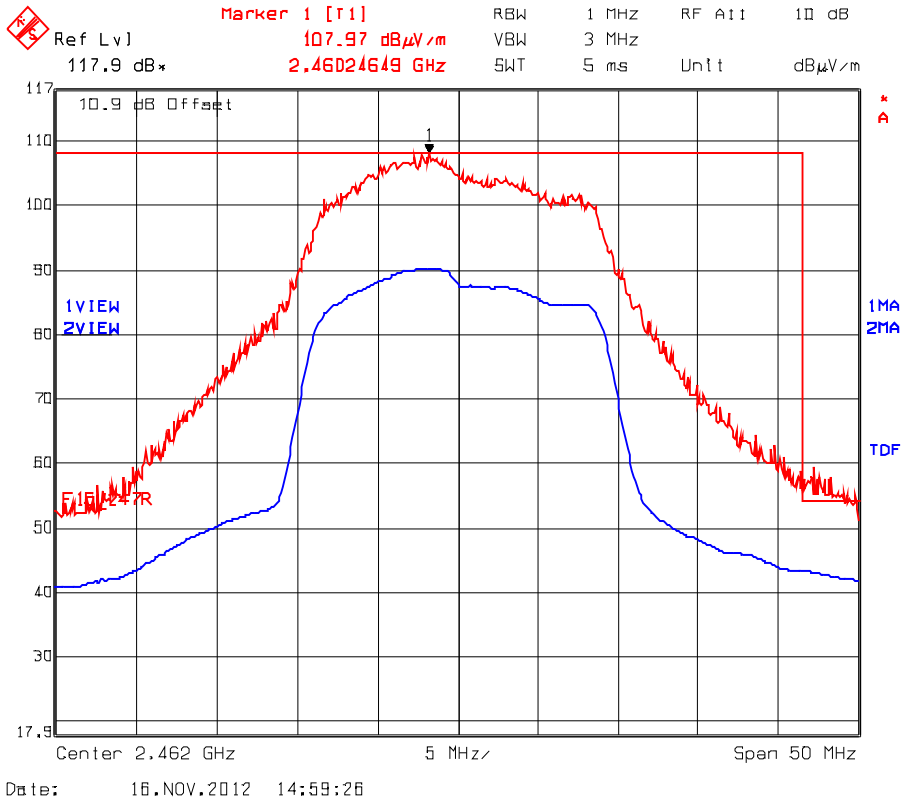
Receiving Antenna in Vertical Polarization

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 1 MHz, VBW= 10 Hz

Lower Band-edge



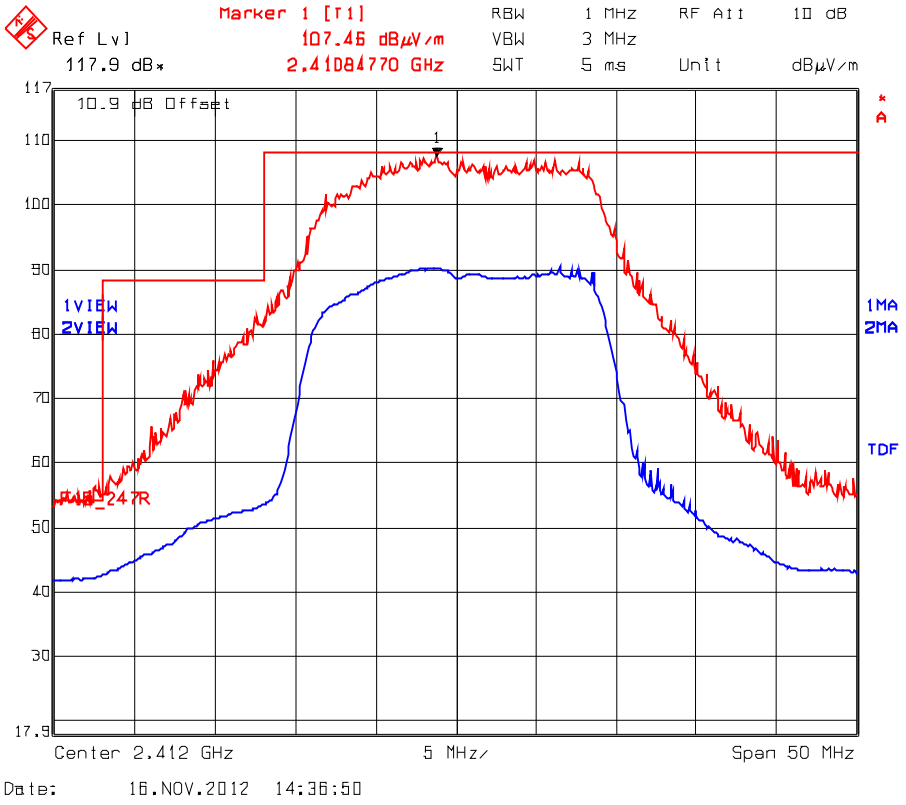
Upper Band-edge



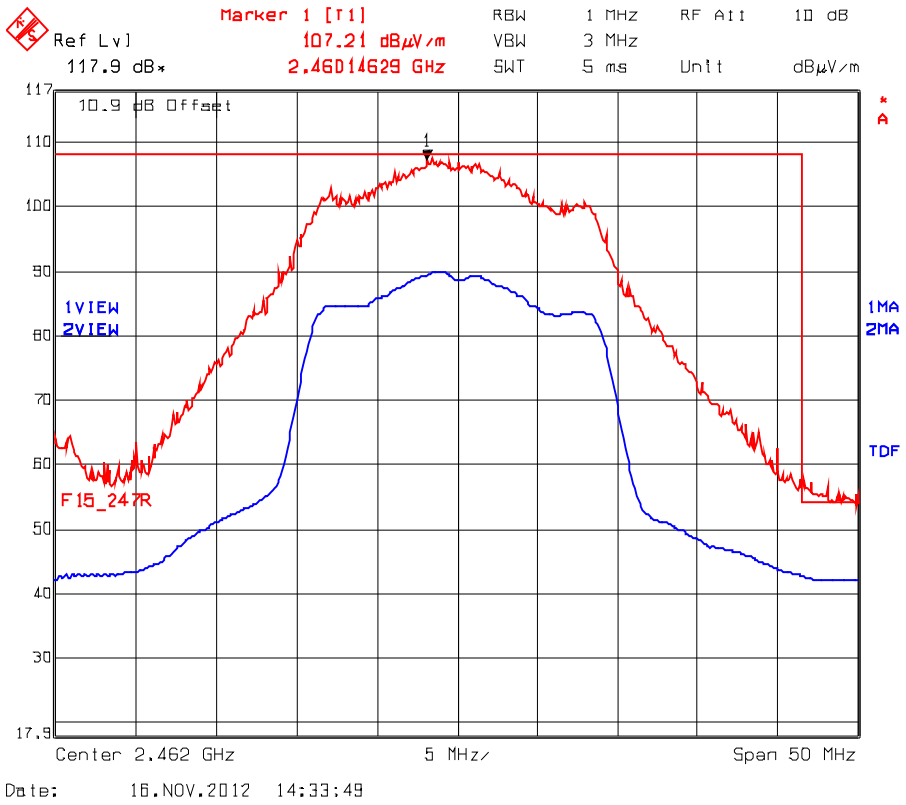
Receiving Antenna in Horizontal Polarization

Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 1 MHz, VBW= 10 Hz

Lower Band-edge



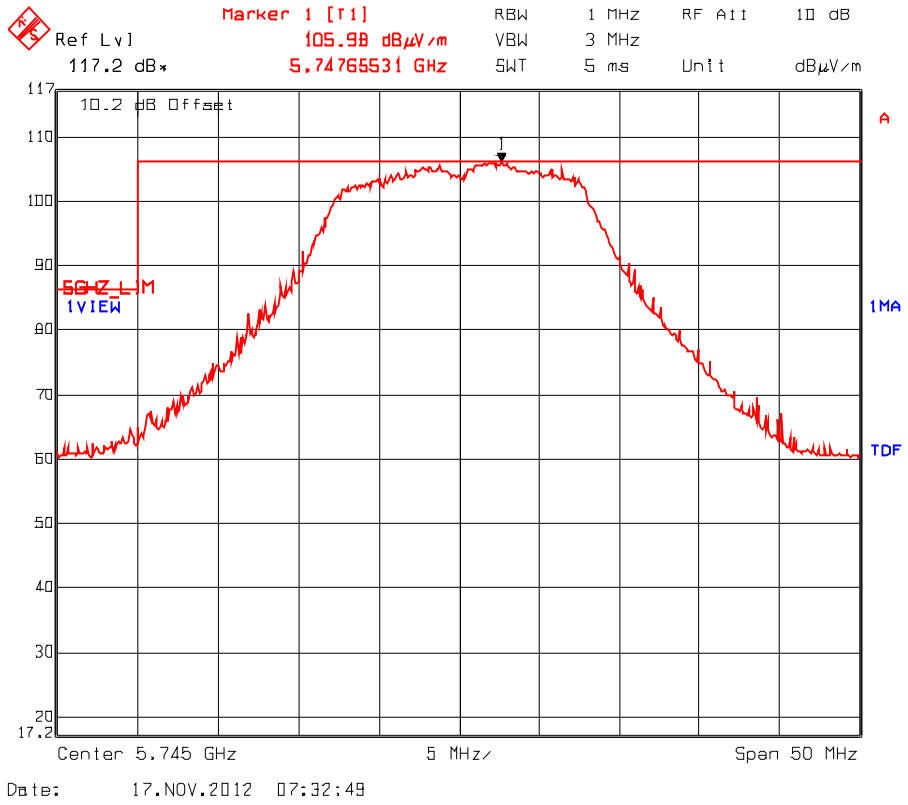
Upper Band-edge



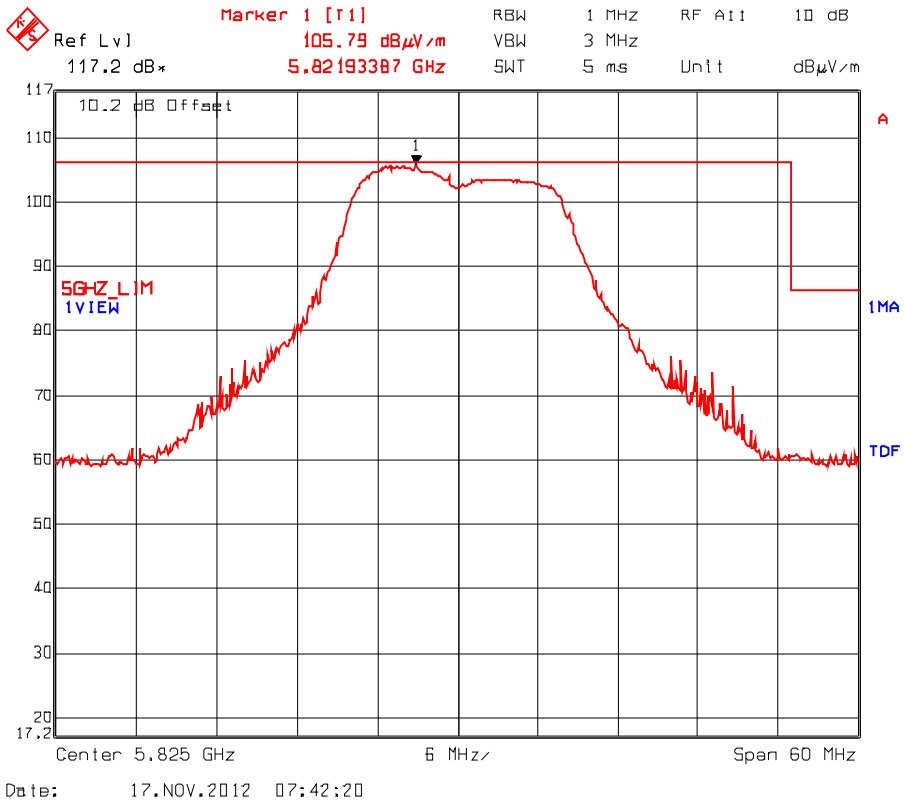
5.3.5.11. FCC 15.247 Radiated Band-edge Emissions of 5745-5825 MHz band - Magnet Mount Antenna, 5dBi Gain, Power setting 12, 802.11a BPSK 6 Mbps

Receiving Antenna in Vertical Polarization

Lower Band-edge

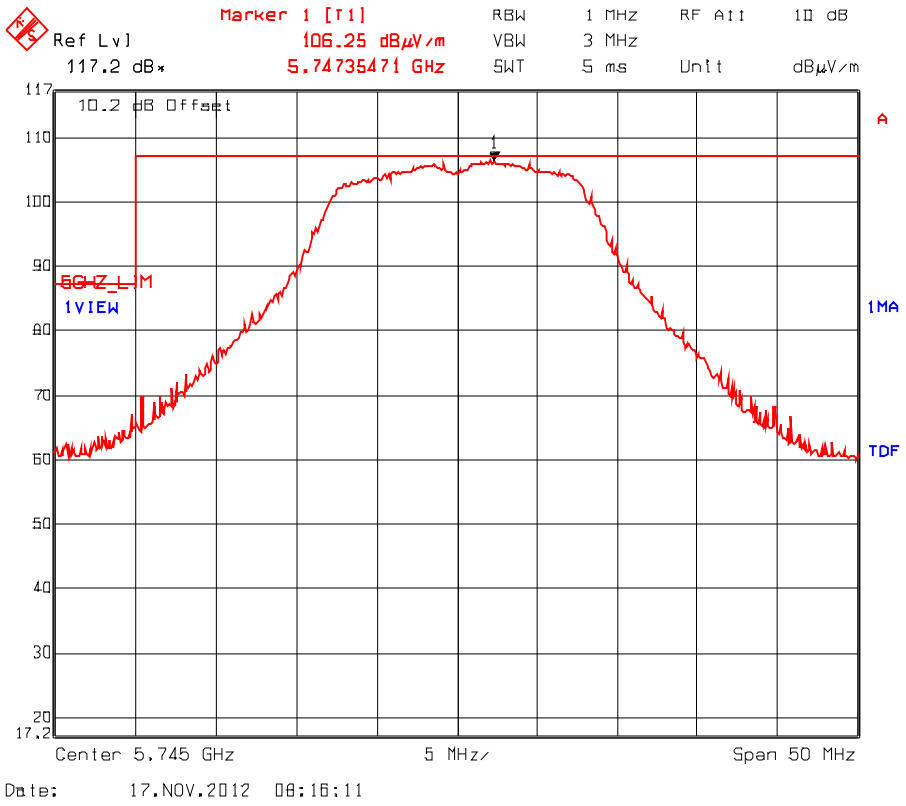


Upper Band-edge

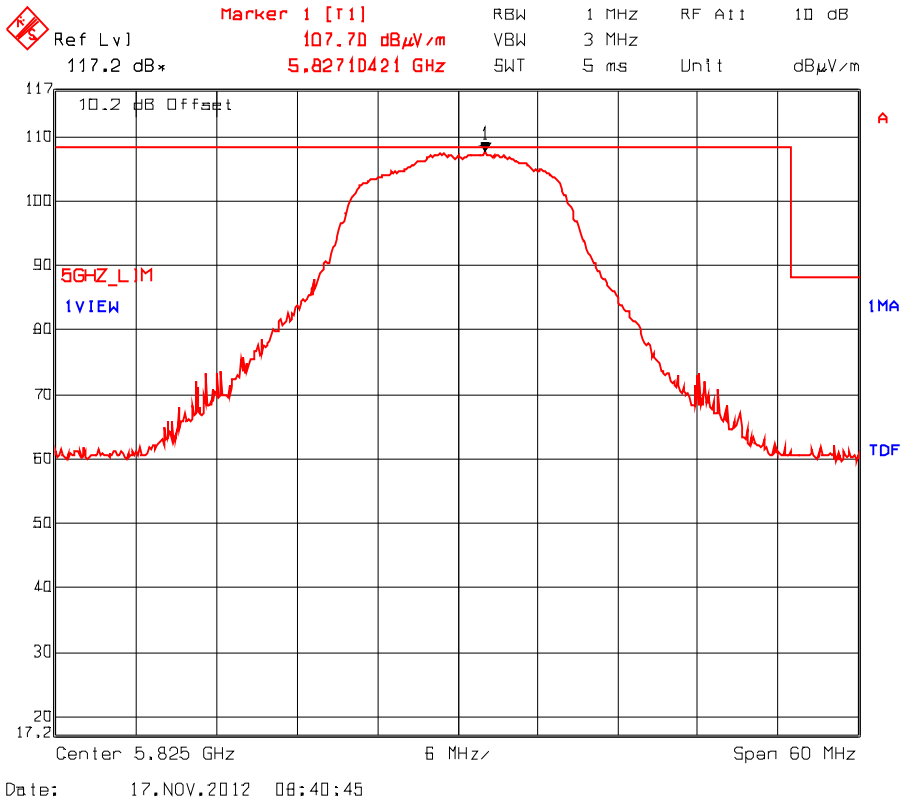


Receiving Antenna in Horizontal Polarization

Lower Band-edge



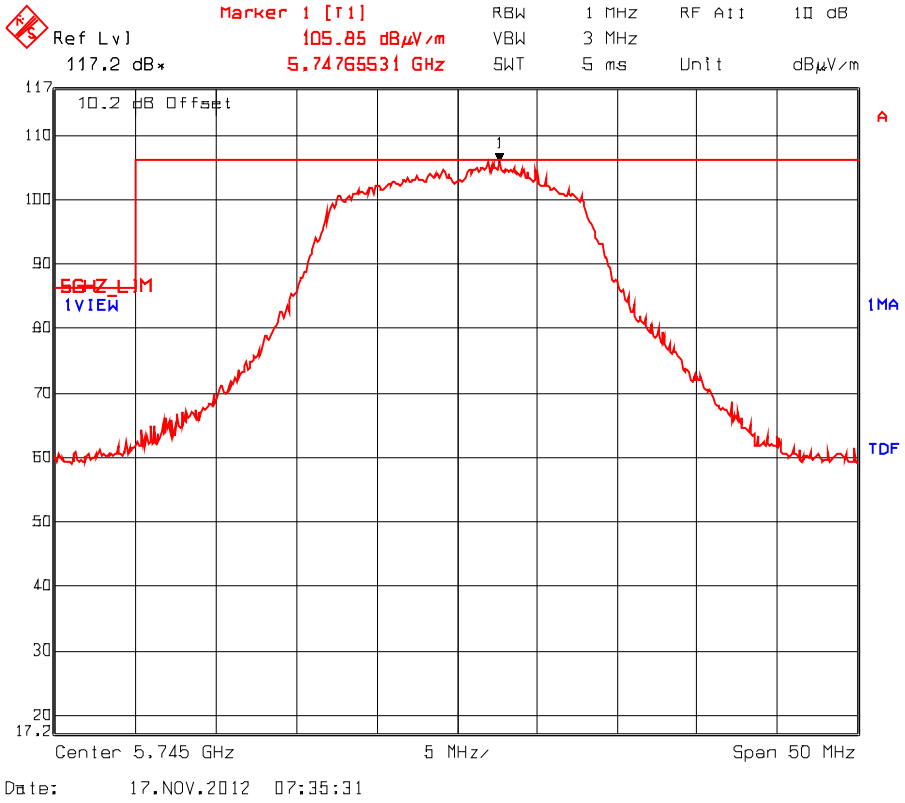
Upper Band-edge



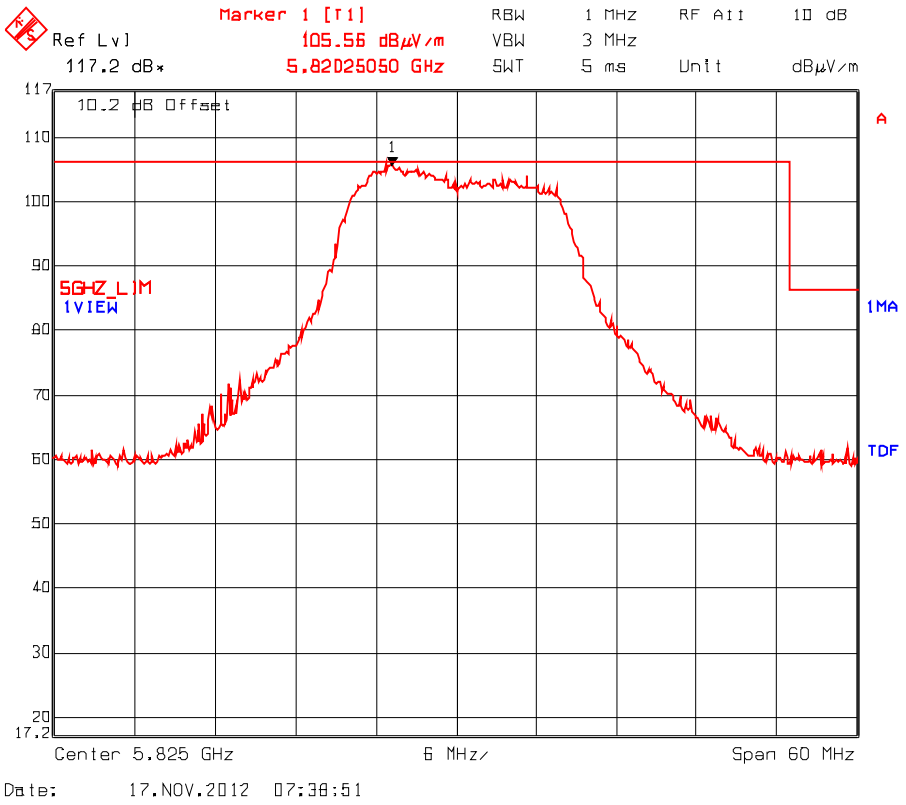
5.3.5.12. FCC 15.247 Radiated Band-edge Emissions of 5745-5825 MHz band - Magnet Mount Antenna, 5dBi Gain, Power setting 12, 802.11a 64-QAM 54 Mbps

Receiving Antenna in Vertical Polarization

Lower Band-edge

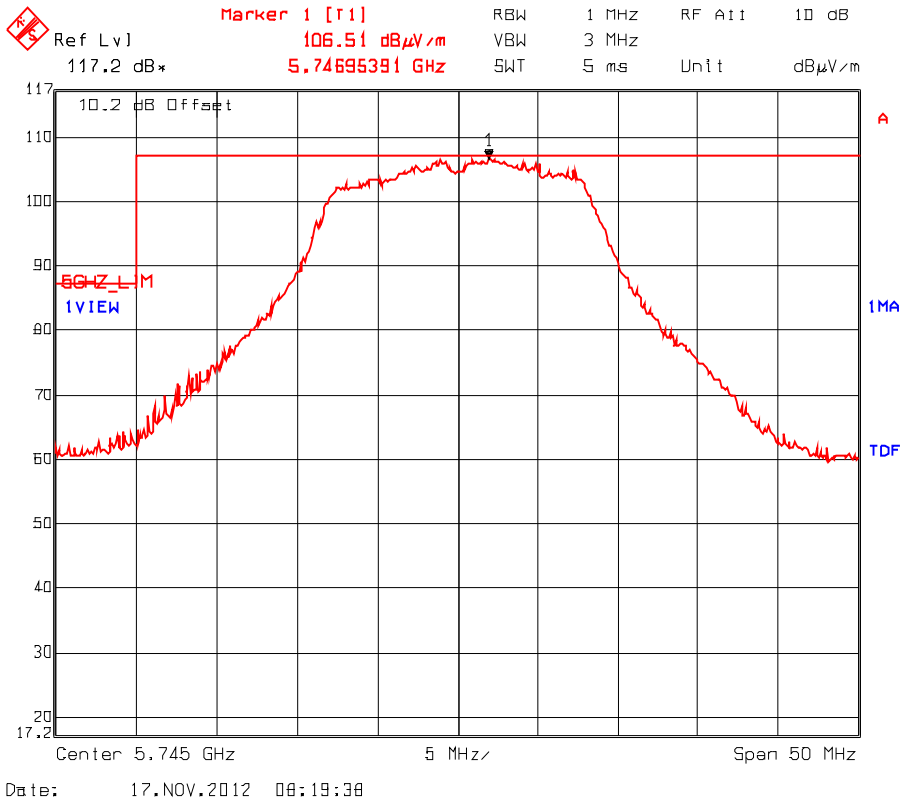


Upper Band-edge



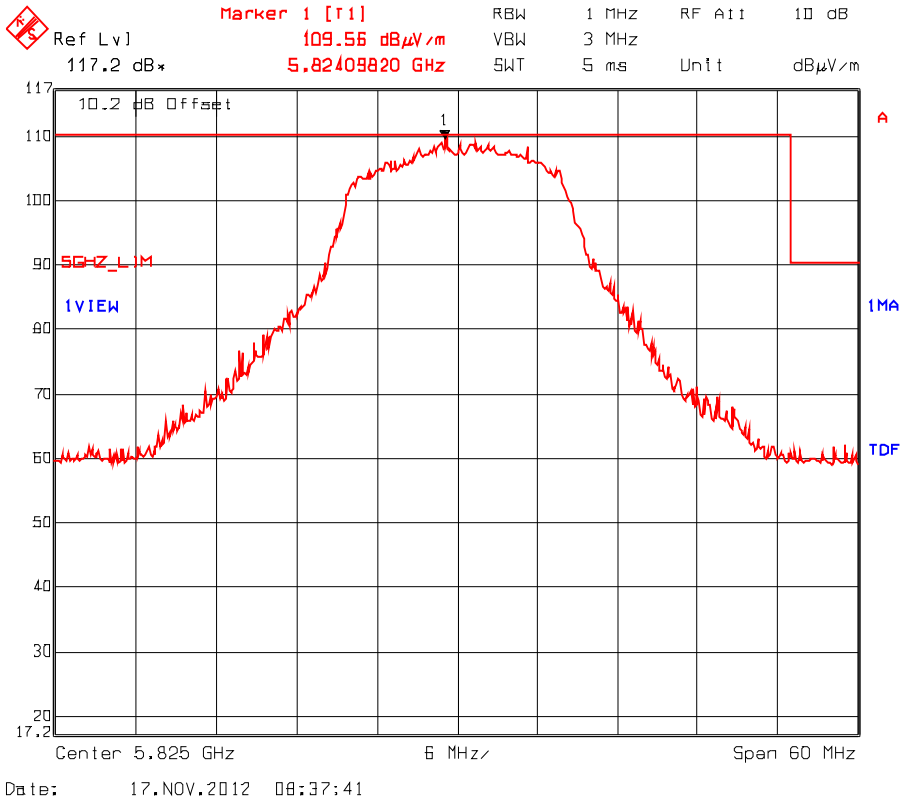
Receiving Antenna in Horizontal Polarization

Lower Band-edge



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

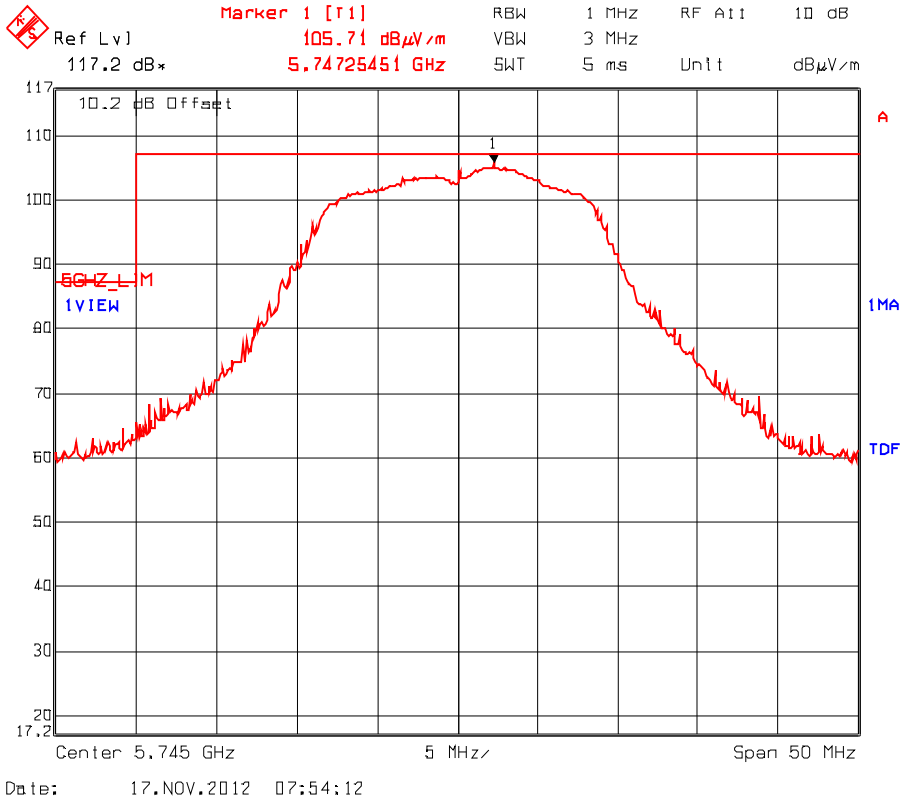
Upper Band-edge



5.3.5.13. FCC 15.247 Radiated Band-edge Emissions of 5745 – 5825 MNHz band - Magnet Mount Antenna, 5dBi Gain, Power setting 12, 802.11n BPSK 6.5 Mbps

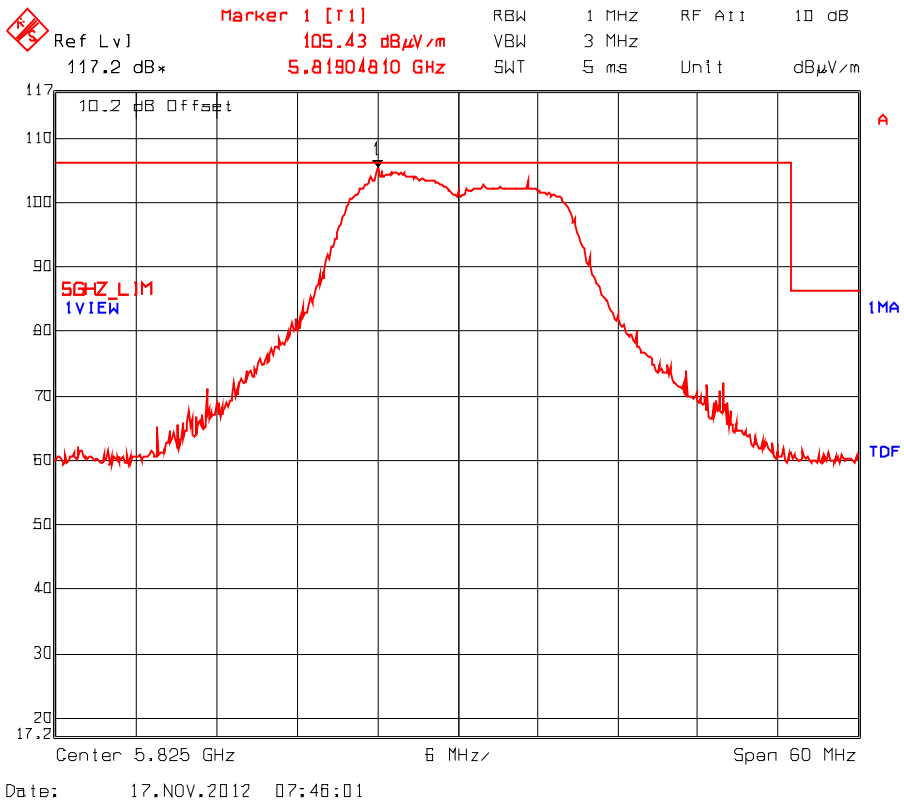
Receiving Antenna in Vertical Polarization

Lower Band-edge



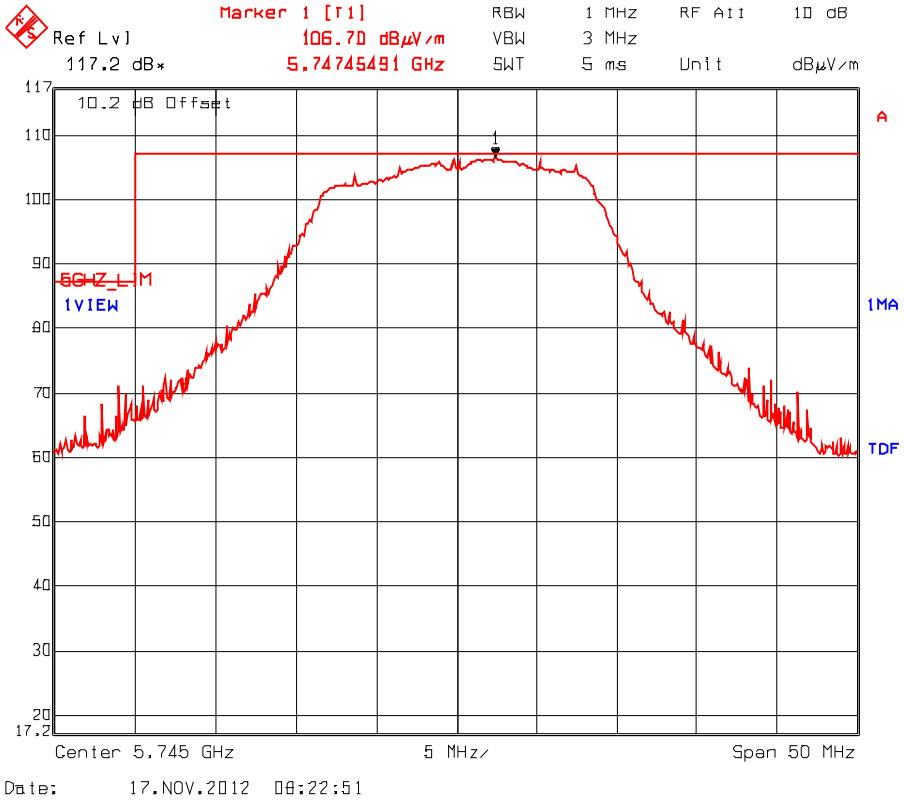
All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Upper Band-edge

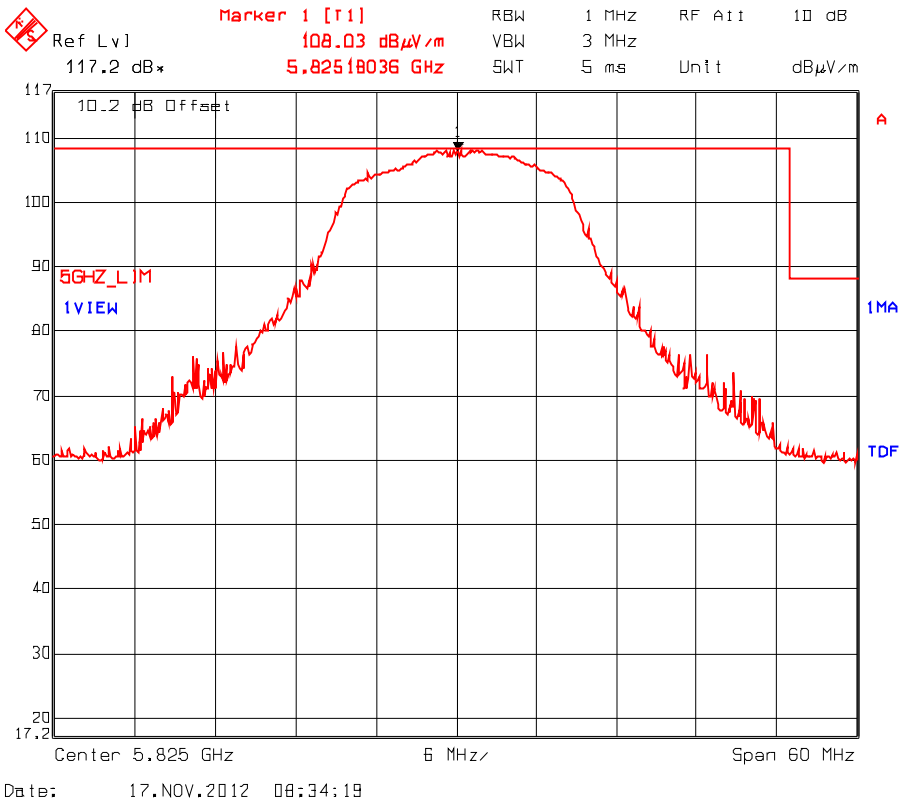


Receiving Antenna in Horizontal Polarization

Lower Band-edge



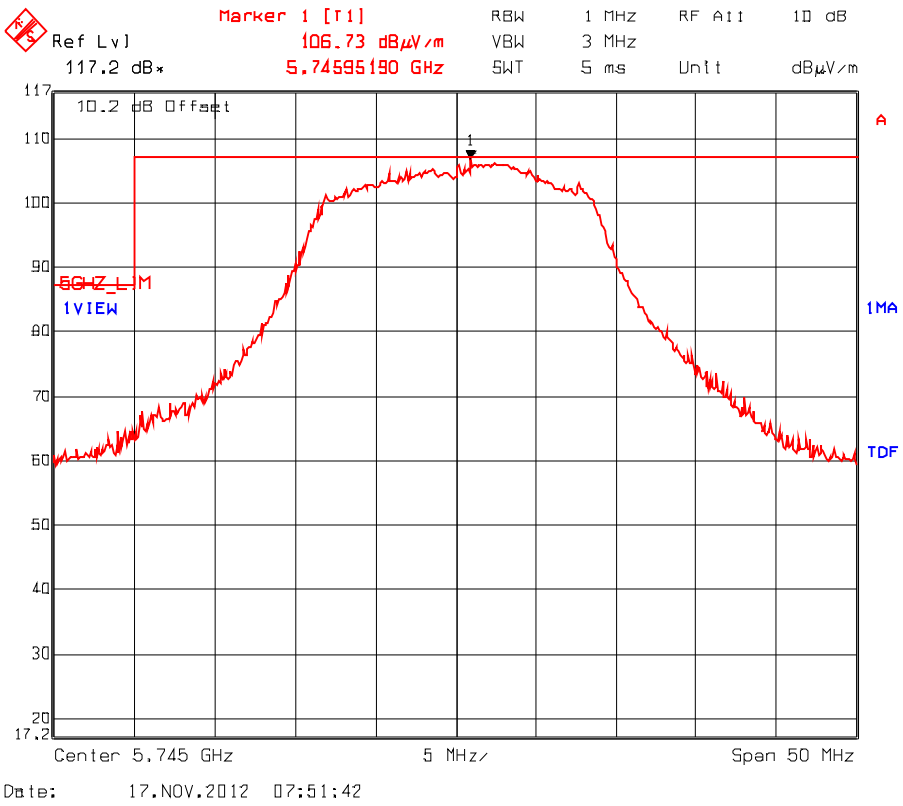
Upper Band-edge



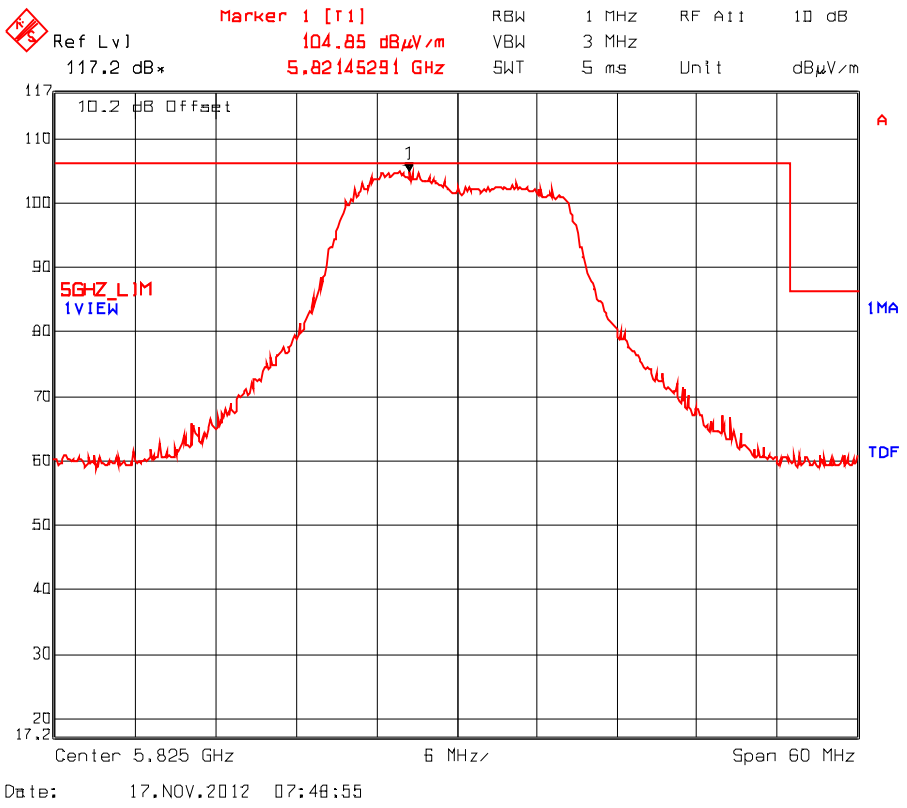
5.3.5.14. FCC 15.247 Radiated Band-edge Emissionsof 5745-5825 Mhz band - Magnet Mount Antenna, 5dBi Gain, Power setting 12, 802.11n 64-QAM 65 Mbps

Receiving Antenna in Vertical Polarization

Lower Band-edge



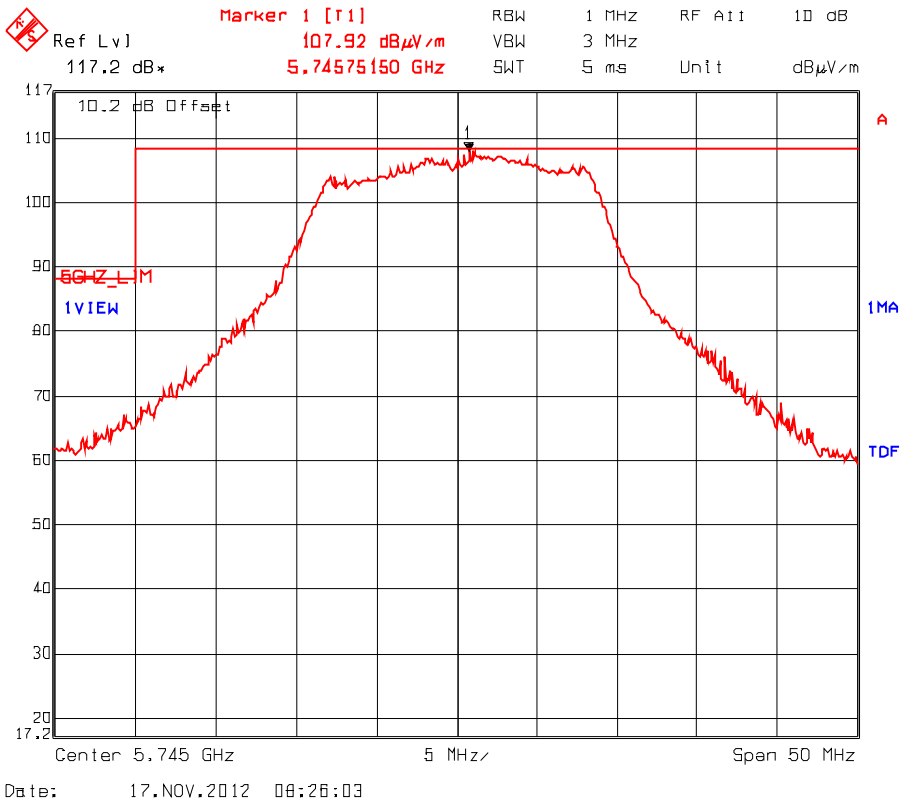
Upper Band-edge



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

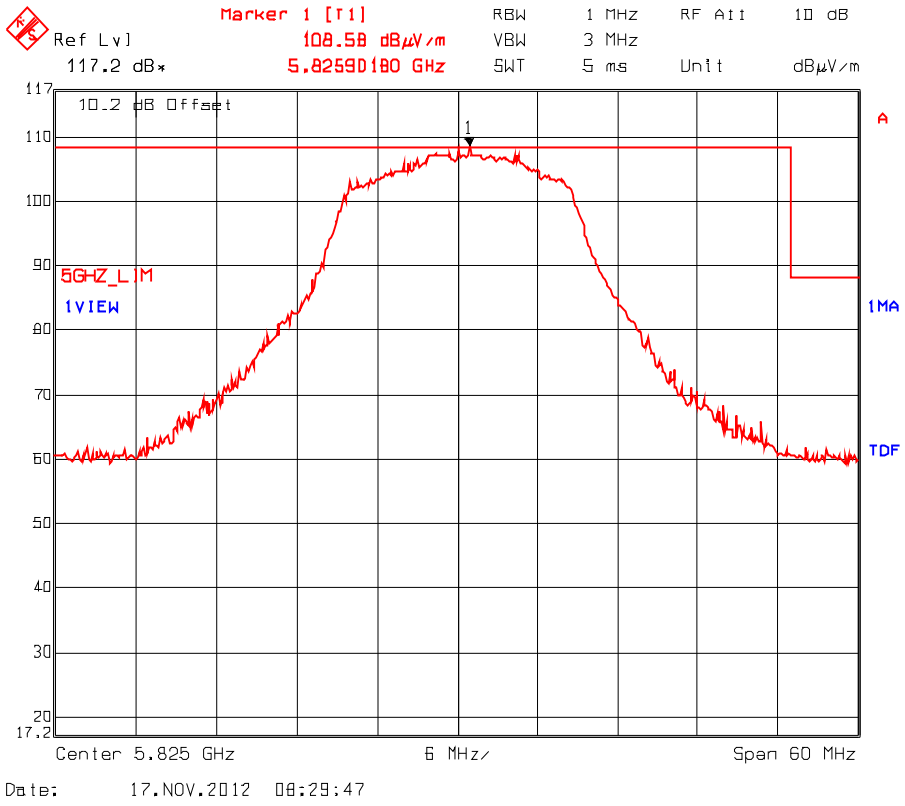
Receiving Antenna in Horizontal Polarization

Lower Band-edge



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Upper Band-edge



5.3.5.15. FCC 15.247 Radiated Band-edge Emissions of Bluetooth 2402-2480 MHz -

Receiving Antenna in Vertical Polarization

Lower Band-edge

Upper Band-edge

Receiving Antenna in Horizontal Polarization

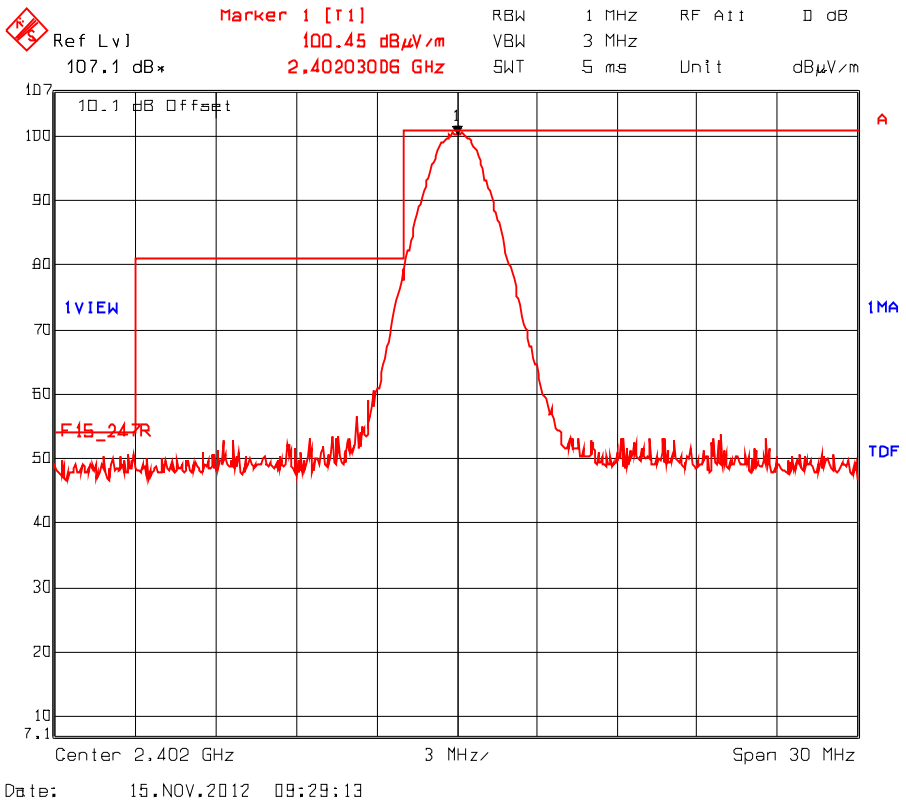
Lower Band-edge

Upper Band-edge

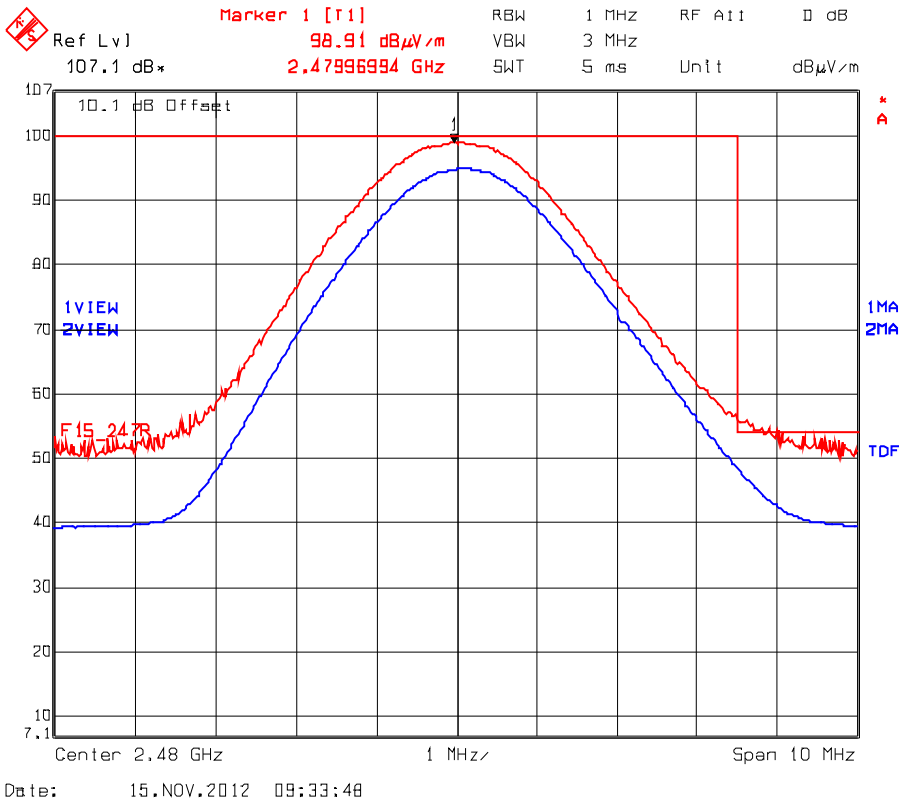
5.3.5.16. FCC 15.247 Radiated Band-edge Emissions of Bluetooth 2402-2480 MHz - Magnet Mount WiMAX Antenna, 5dBi Gain, Power setting 14, BT 8DPSK 3 Mbps

Receiving Antenna in Vertical Polarization

Lower Band-edge

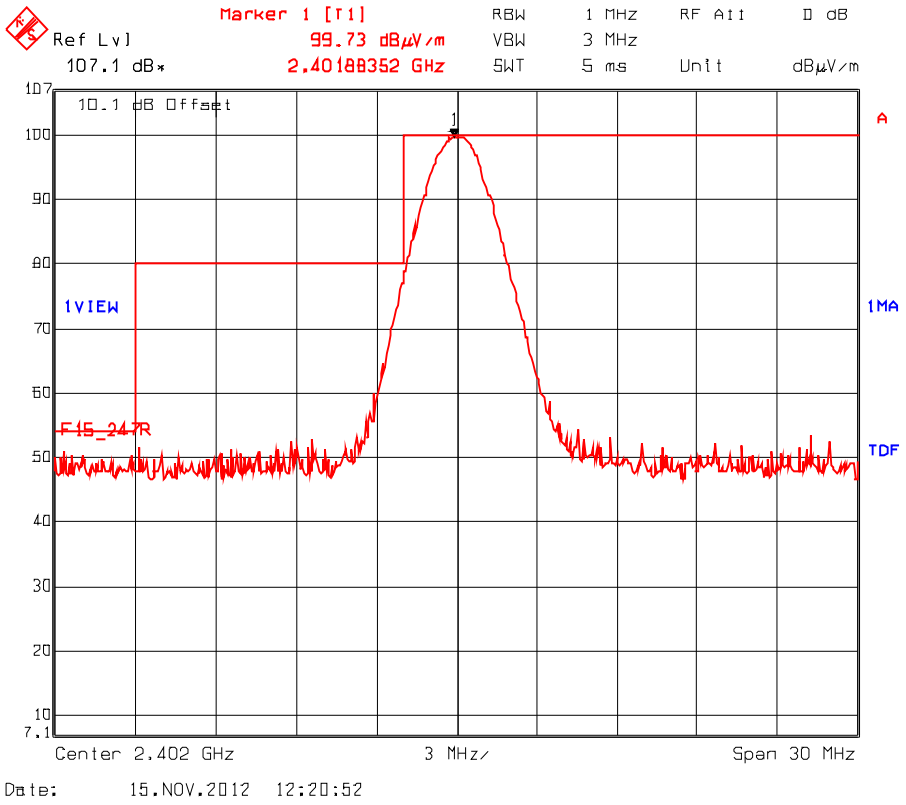


Upper Band-edge

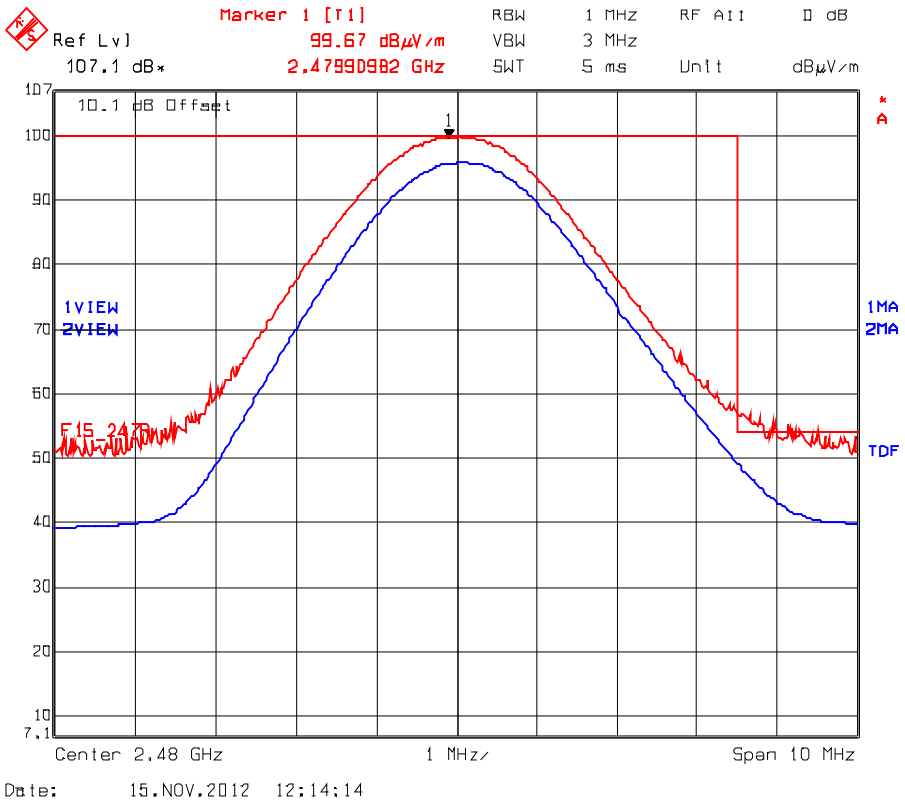


Receiving Antenna in Horizontal Polarization

Lower Band-edge



Upper Band-edge

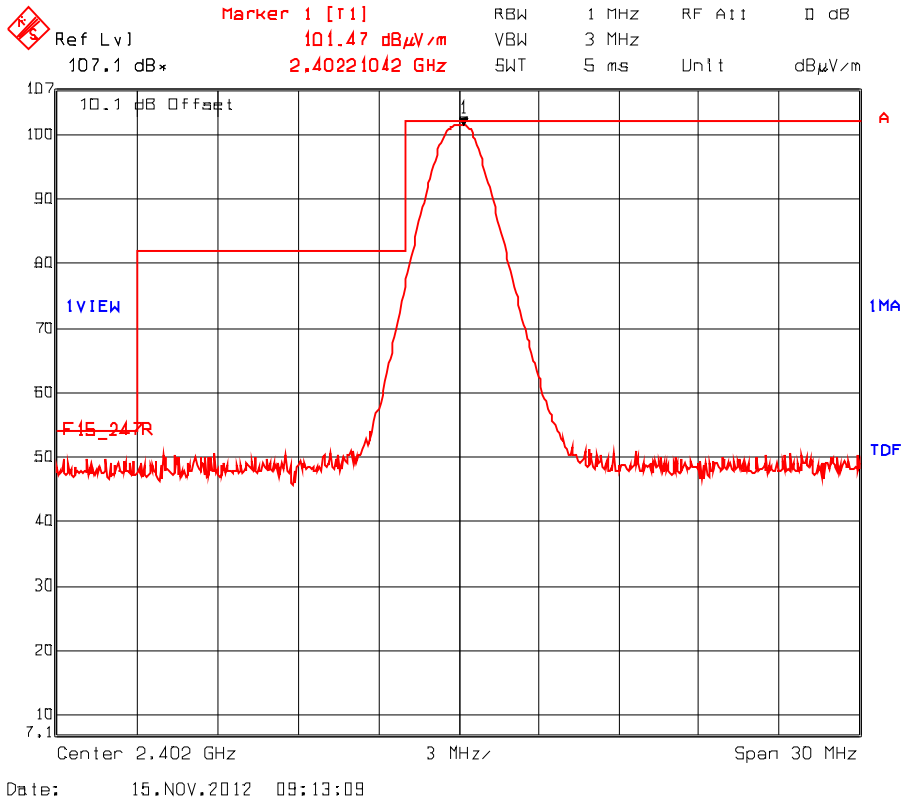


All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

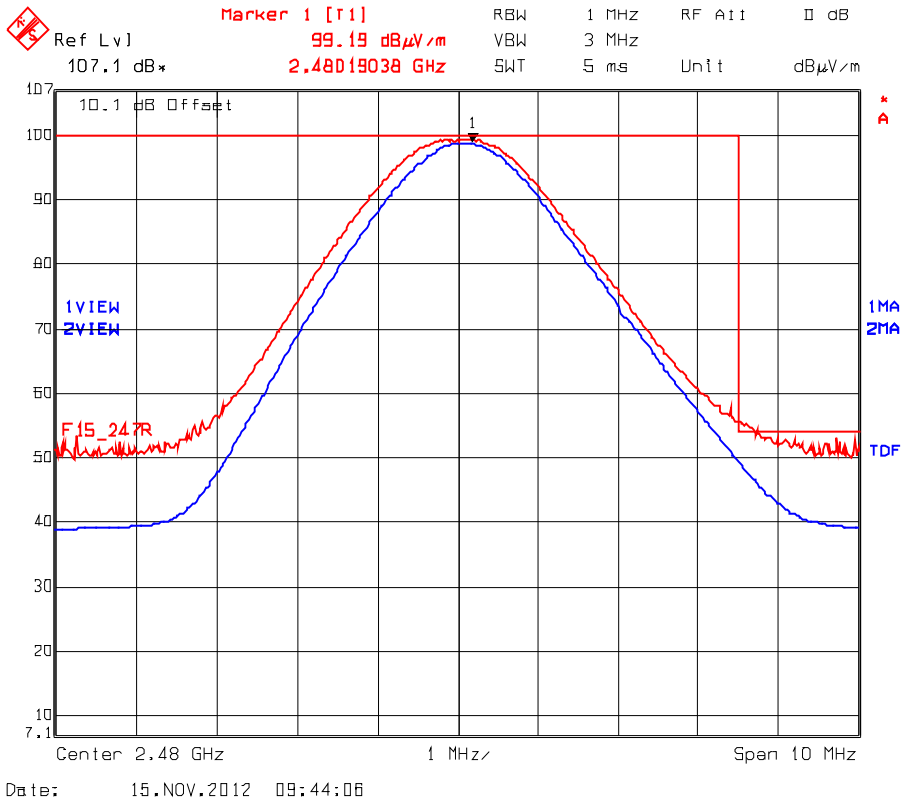
5.3.5.17. FCC 15.247 Radiated Band-edge Emissions of Bluetooth 2402-2480 MHz - Magnet Mount WiMAX Antenna, 5dBi Gain, Power setting 14, GFSK 1 Mbps

Receiving Antenna in Vertical Polarization

Lower Band-edge

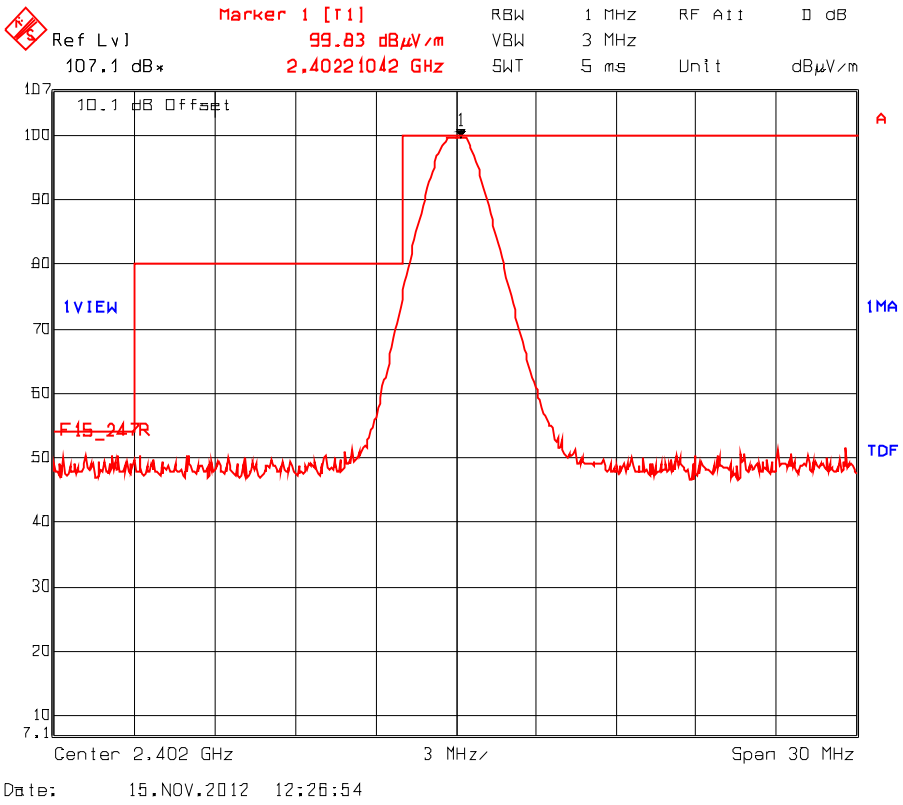


Upper Band-edge

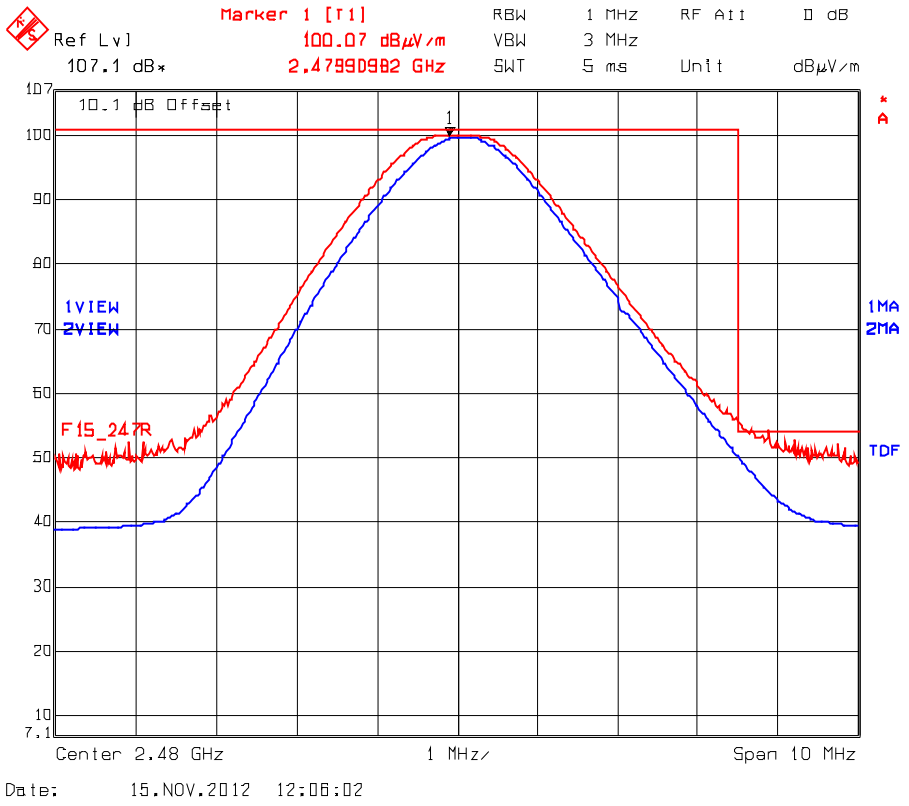


Receiving Antenna in Horizontal Polarization

Lower Band-edge



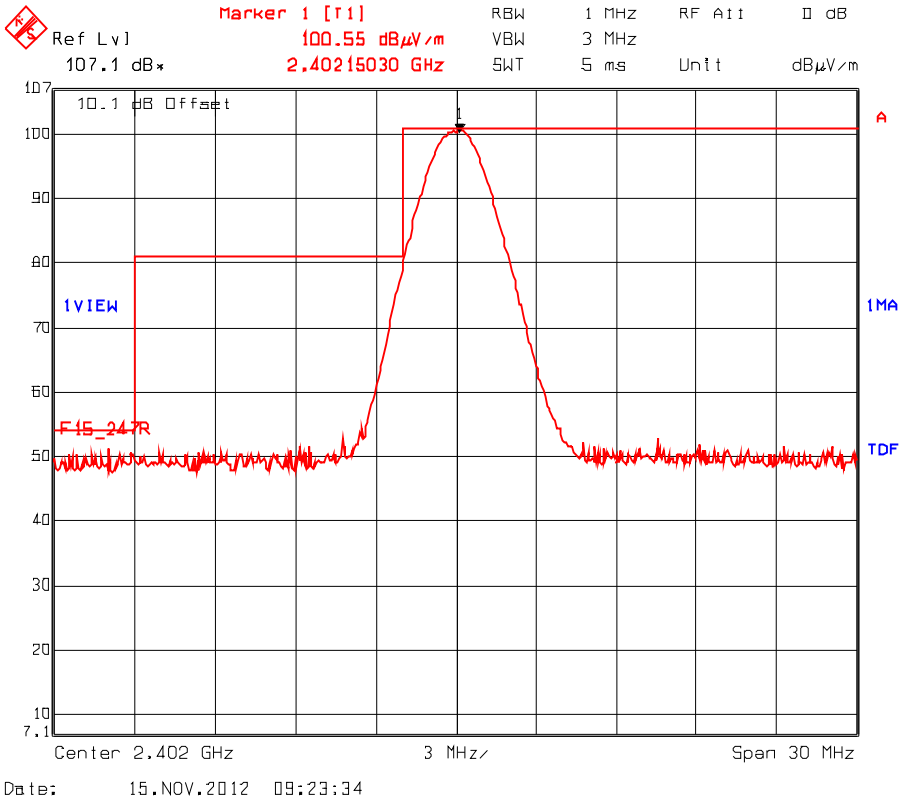
Upper Band-edge



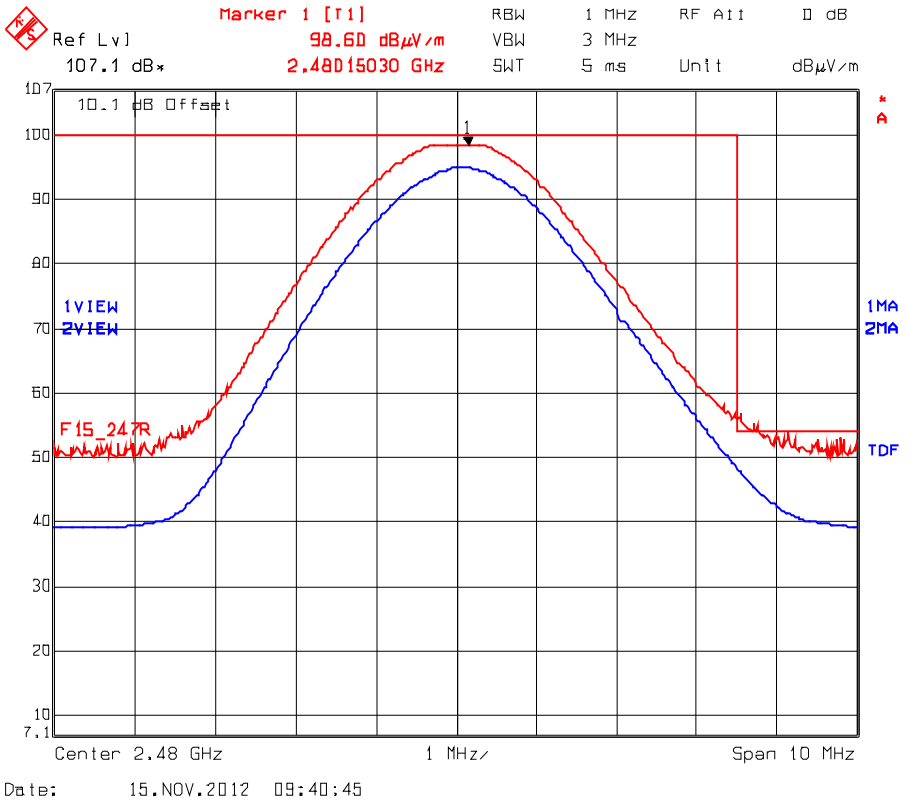
5.3.5.18. FCC 15.247 Radiated Band-edge Emissions of Bluetooth 2402-2480 MHz - Magnet Mount WiMAX Antenna, 5dBi Gain, Power setting 14, BT π4DPSK 2 Mbps

Receiving Antenna in Vertical Polarization

Lower Band-edge

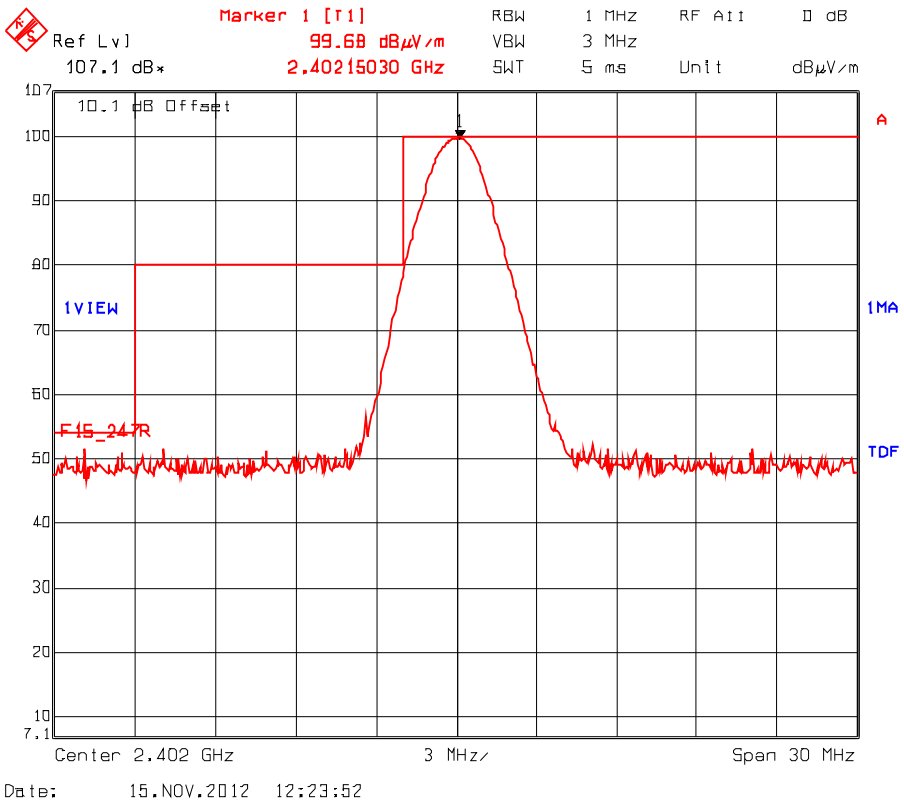


Upper Band-edge

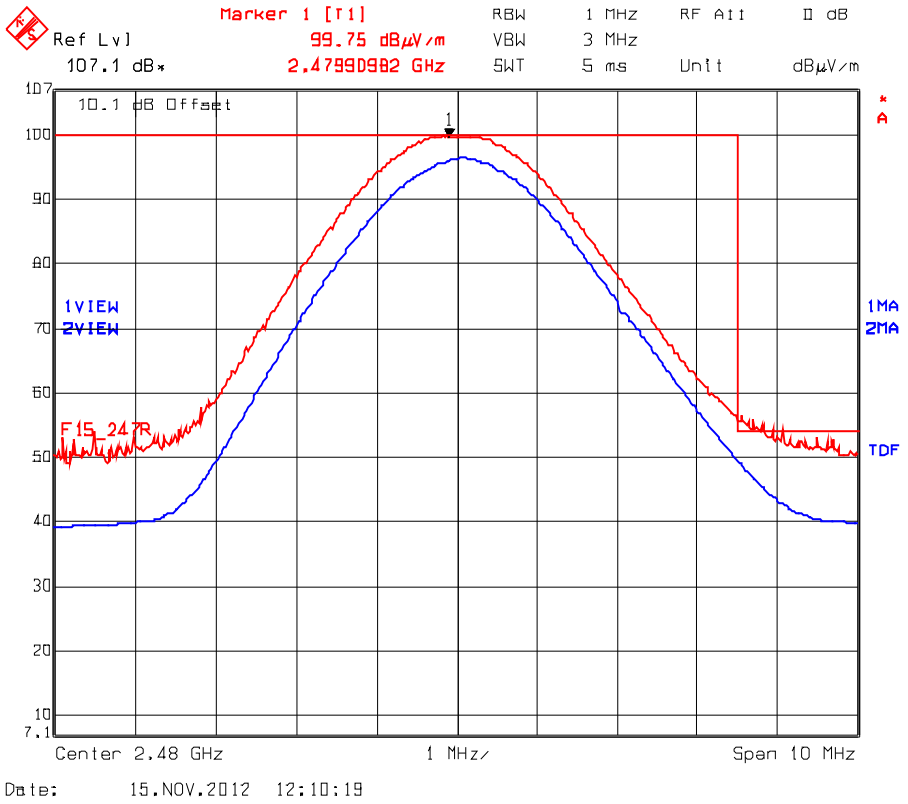


Receiving Antenna in Horizontal Polarization

Lower Band-edge



Upper Band-edge

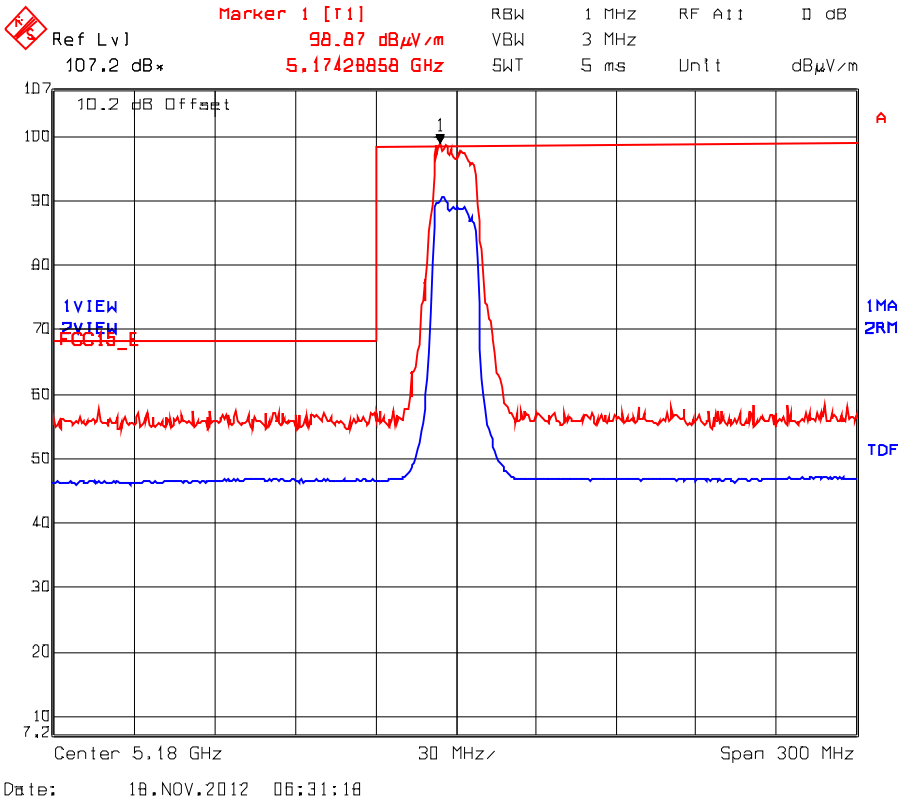


5.3.5.19. FCC 15.407 Radiated Band-edge Emissions of 5180 – 5240 MHz Band, Magnet Mount WiMAX Antenna, 5dBi Gain, 802.11a, 6 Mbps BPSK, Power Setting 6

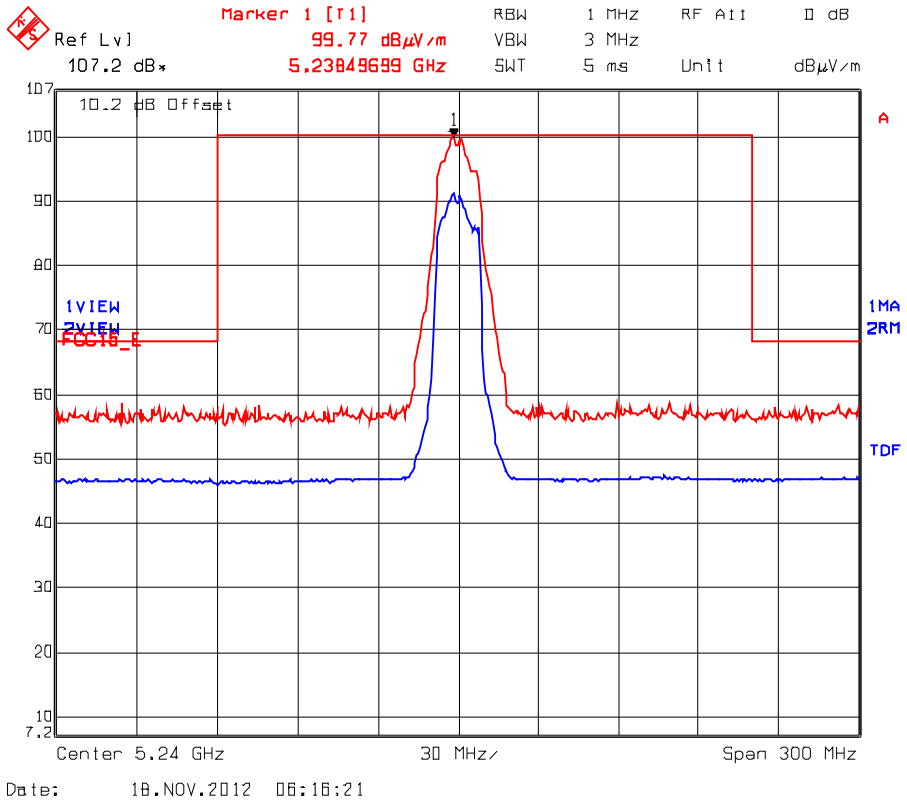
Receiving Antenna in Vertical Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



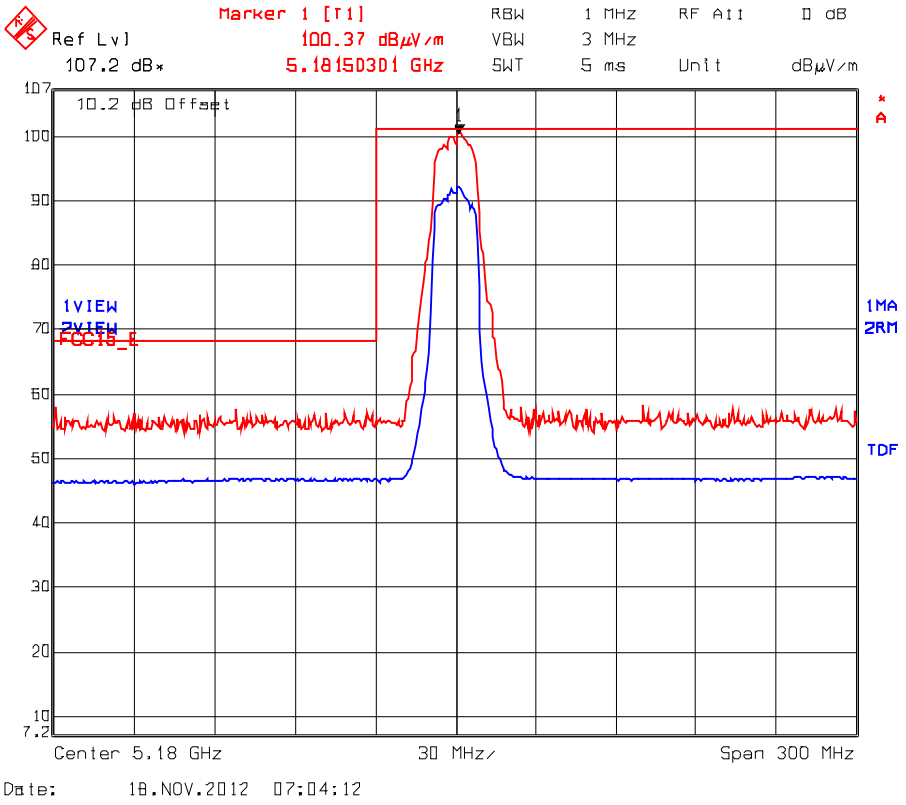
Upper Band-edge



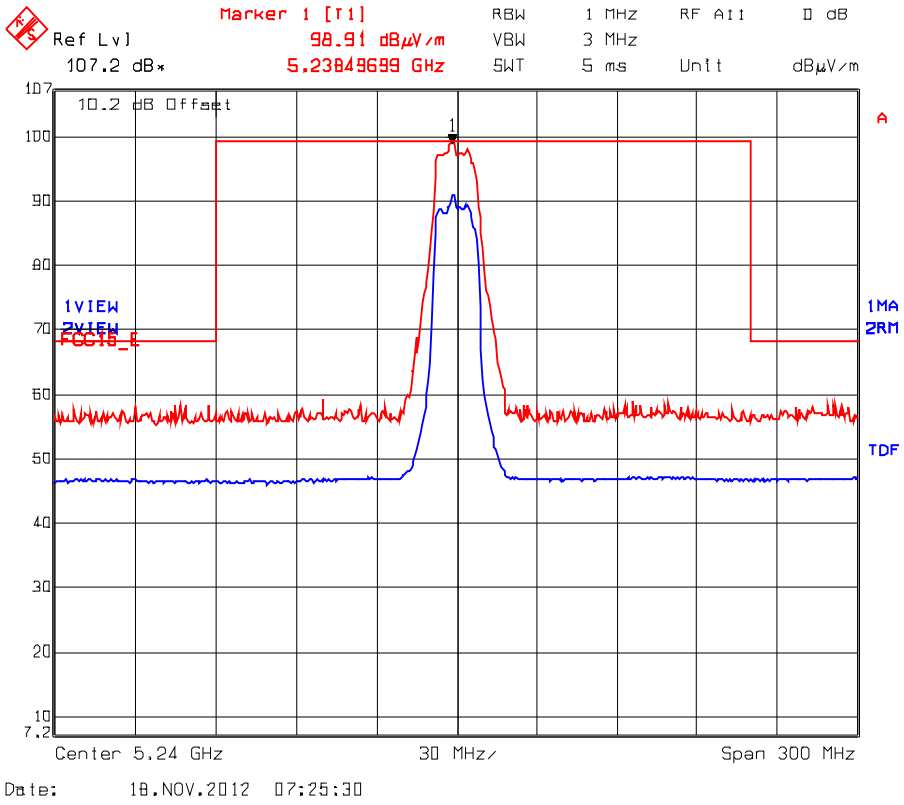
Receiving Antenna in Horizontal Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



Upper Band-edge

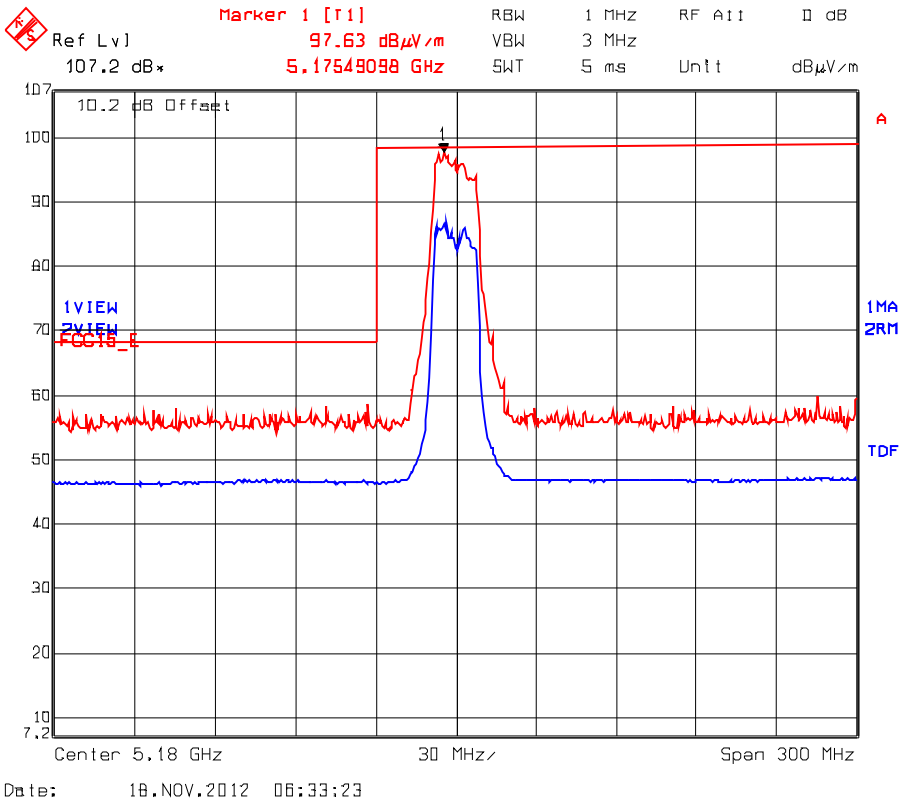


5.3.5.20. FCC 15.407 Radiated Band-edge Emissions of 5180 – 5240 MHz Band Magnet Mount WiMAX Antenna, 5dBi Gain - 802.11a, 54 Mbps 64-QAM, Power Setting 6

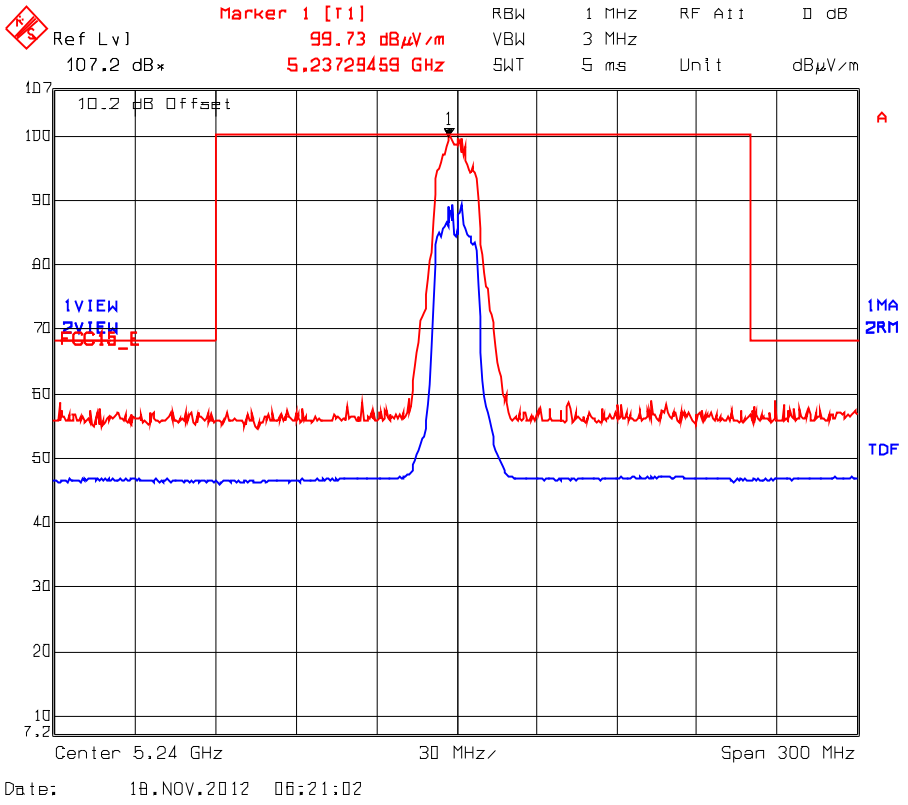
Receiving Antenna in Vertical Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



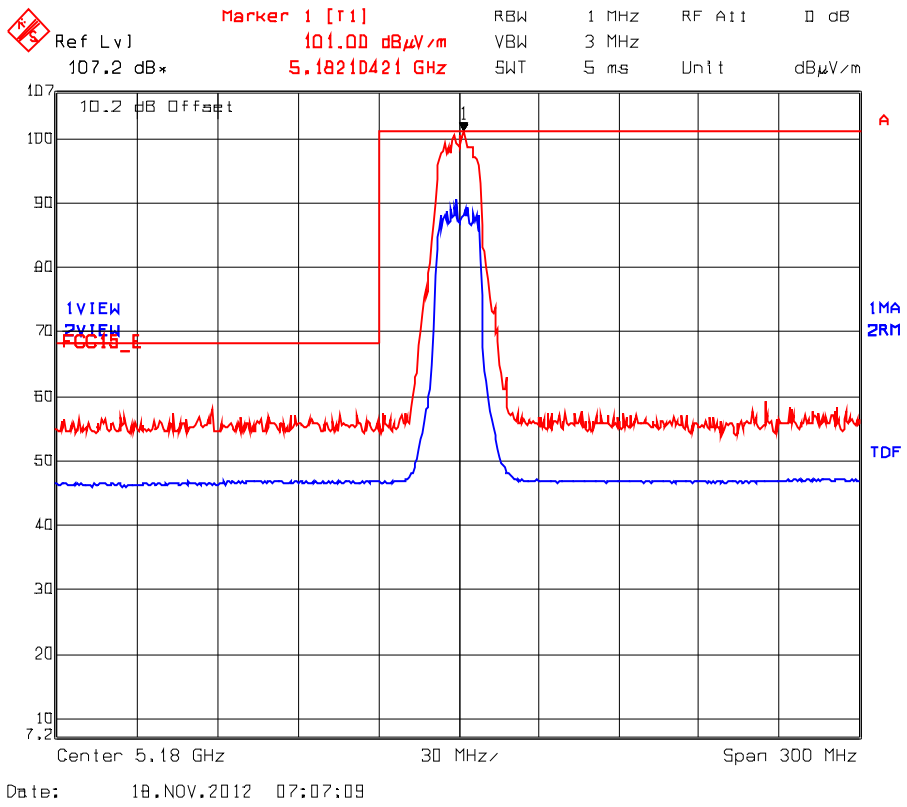
Upper Band-edge



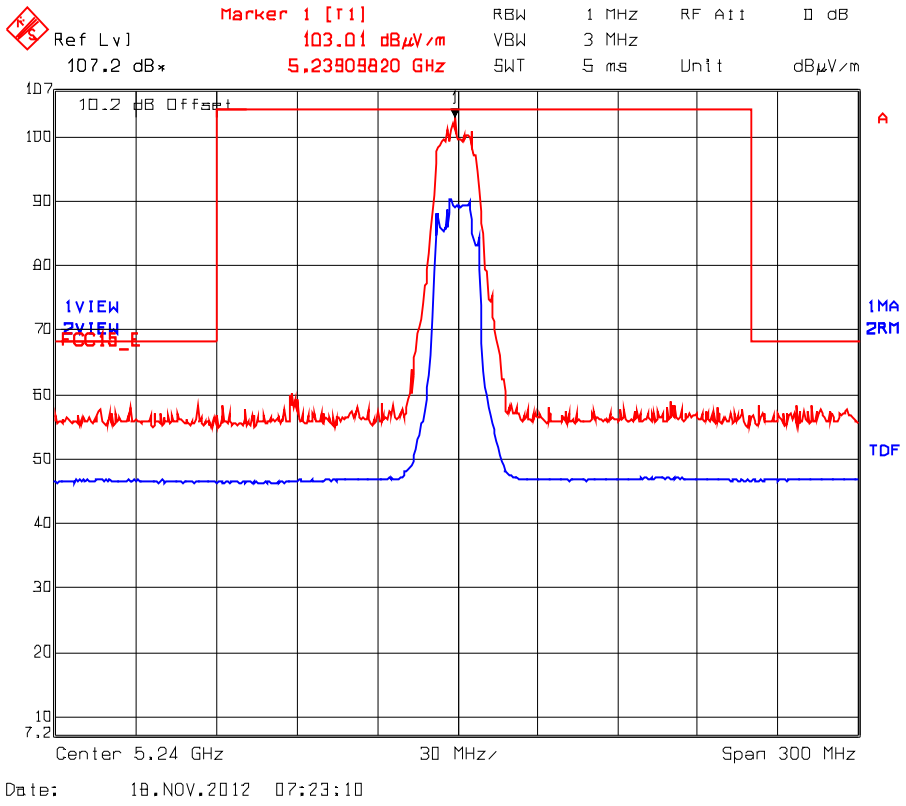
Receiving Antenna in Horizontal Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



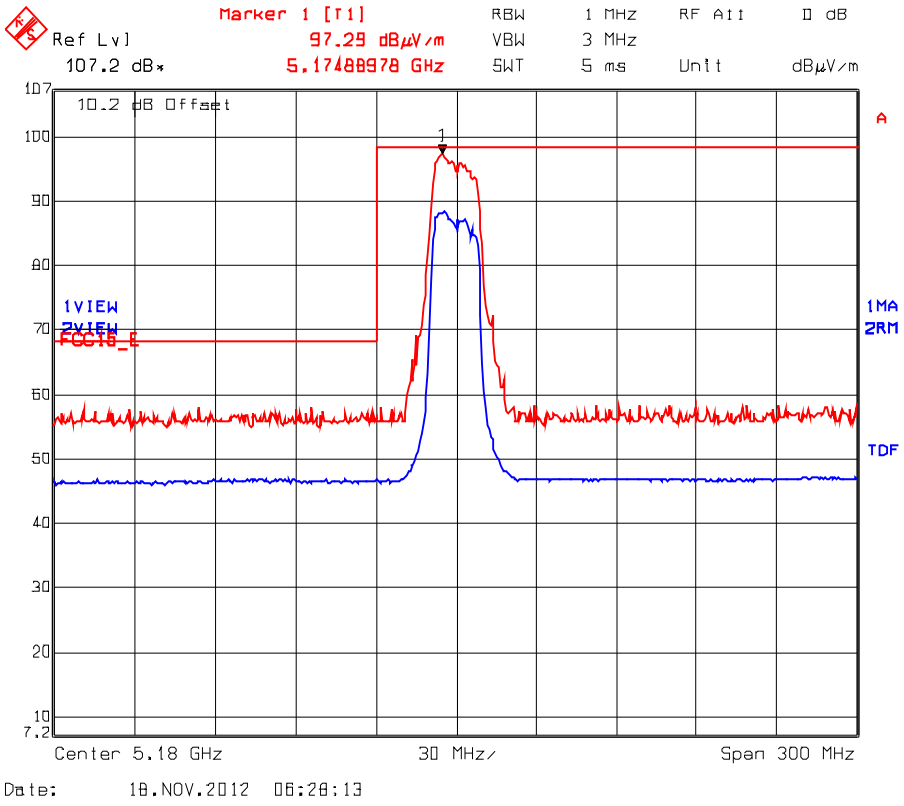
Upper Band-edge



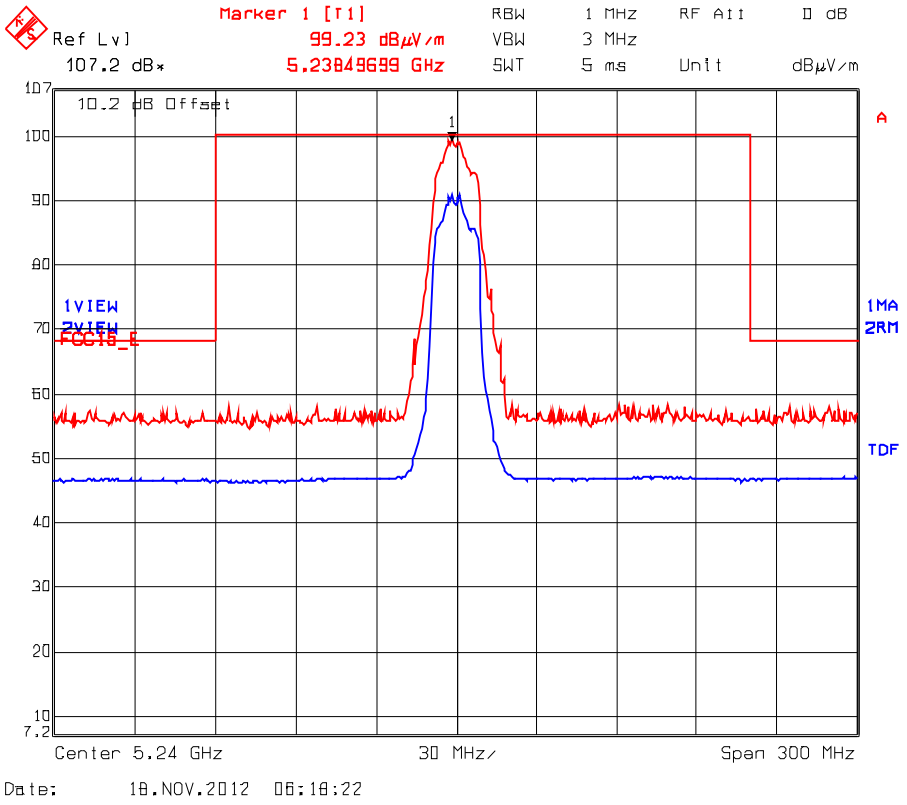
5.3.5.21. FCC 15.407 Radiated Band-edge Emissions of 5180 – 5240 MHz Band Magnet Mount WiMAX Antenna, 5dBi Gain, 802.11n, 6.5 Mbps BPSK, Power Setting 6

Receiving Antenna in Vertical Polarization

Lower Band-edge



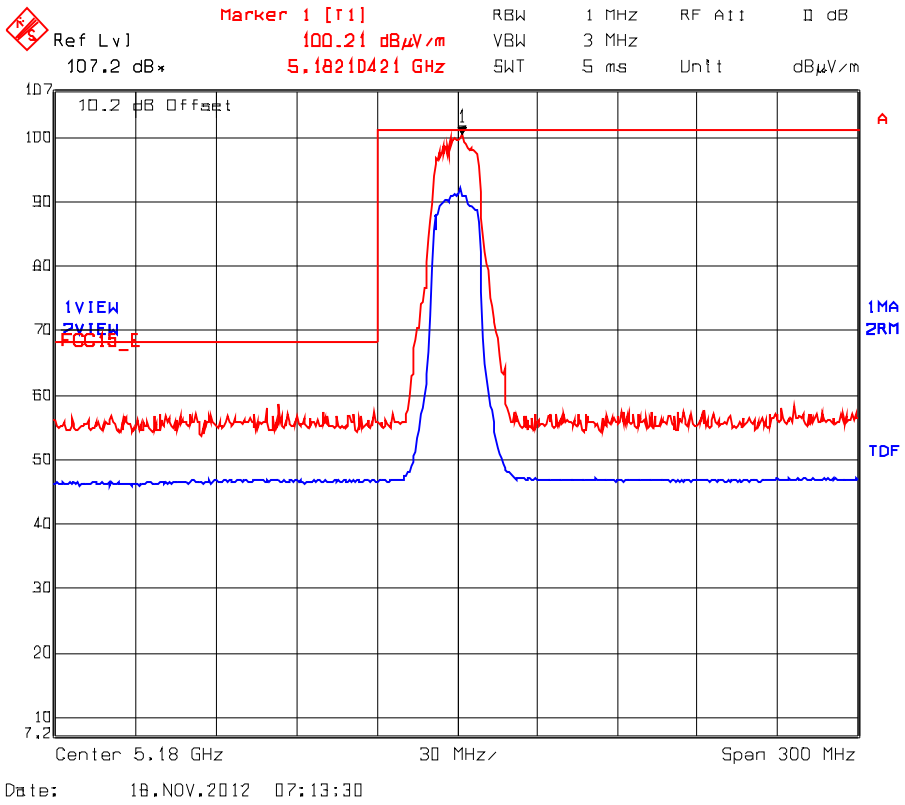
Upper Band-edge



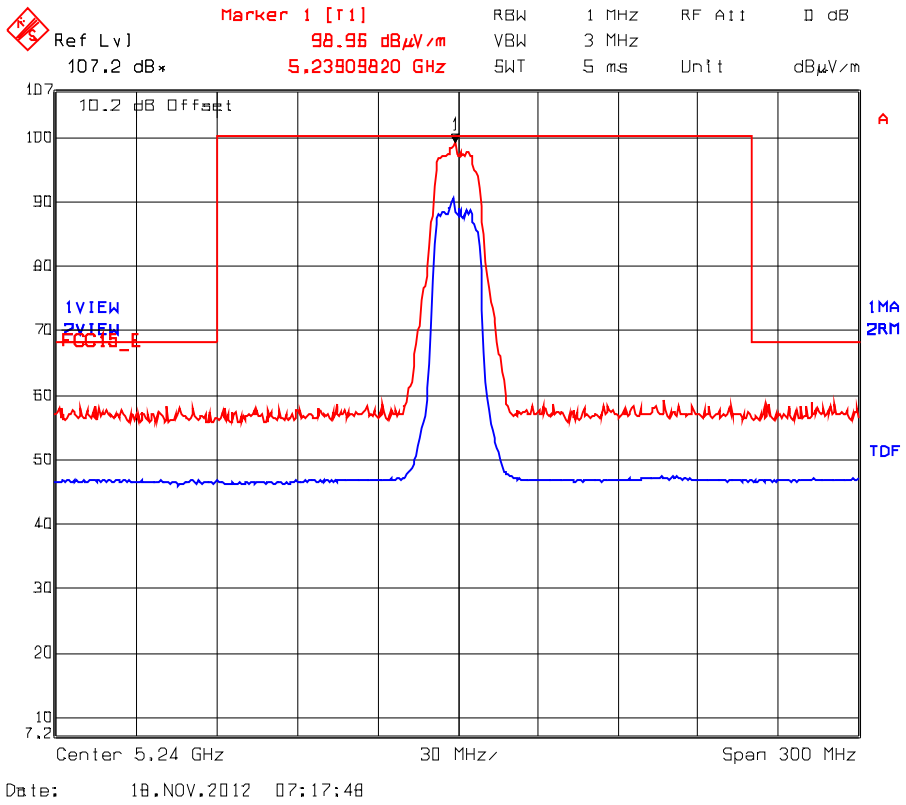
Receiving Antenna in Horizontal Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



Upper Band-edge

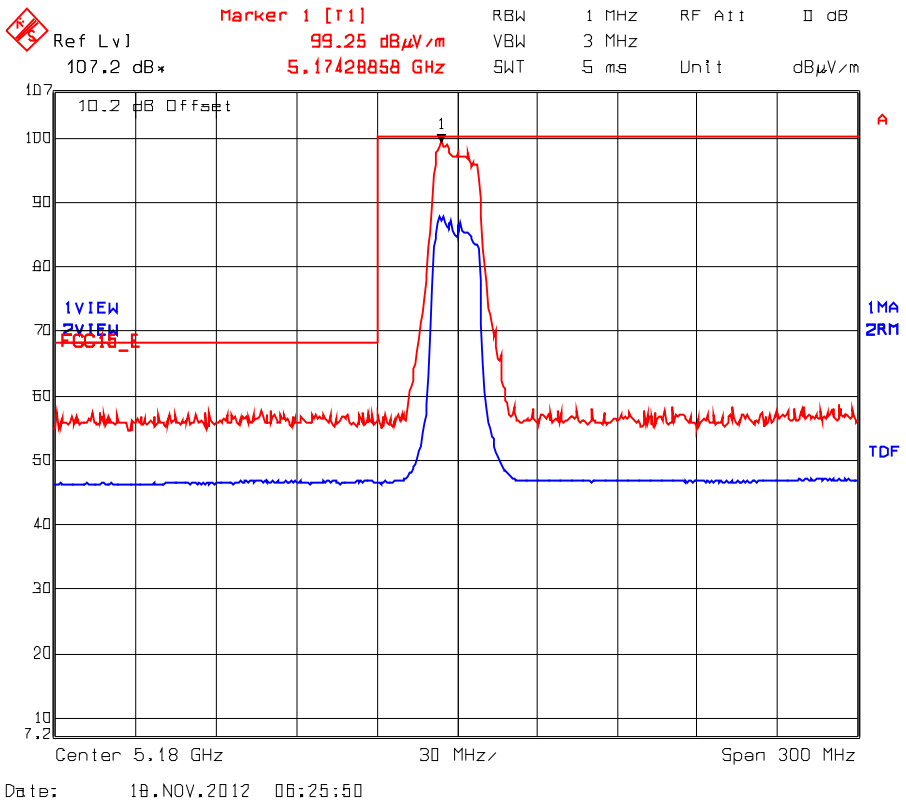


5.3.5.22. FCC 15.407 Radiated Band-edge Emissions of 5180 – 5240 MHz Band Magnet Mount WiMAX Antenna, 5dBi Gain, 802.11n, 65 Mbps 64-QAM, Power Setting 6

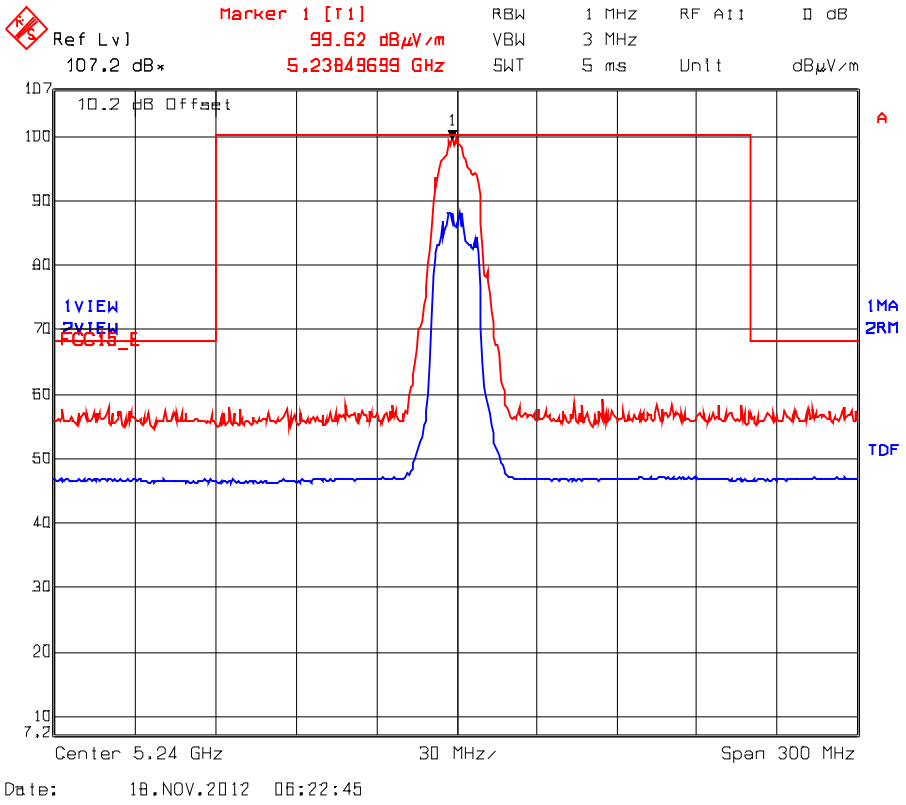
Receiving Antenna in Vertical Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



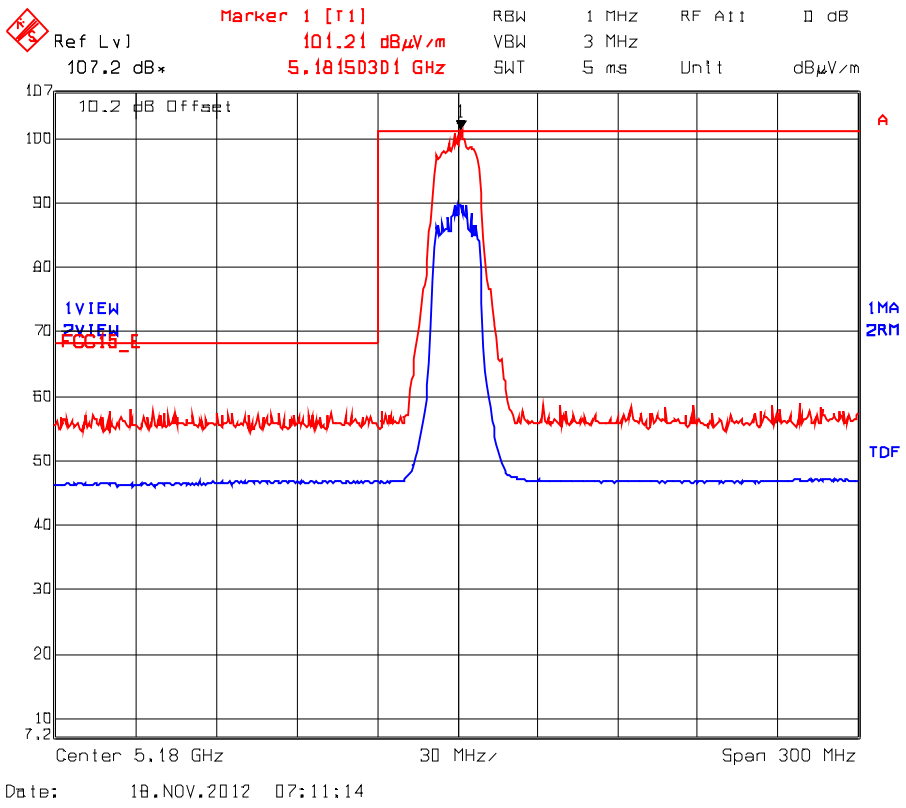
Upper Band-edge



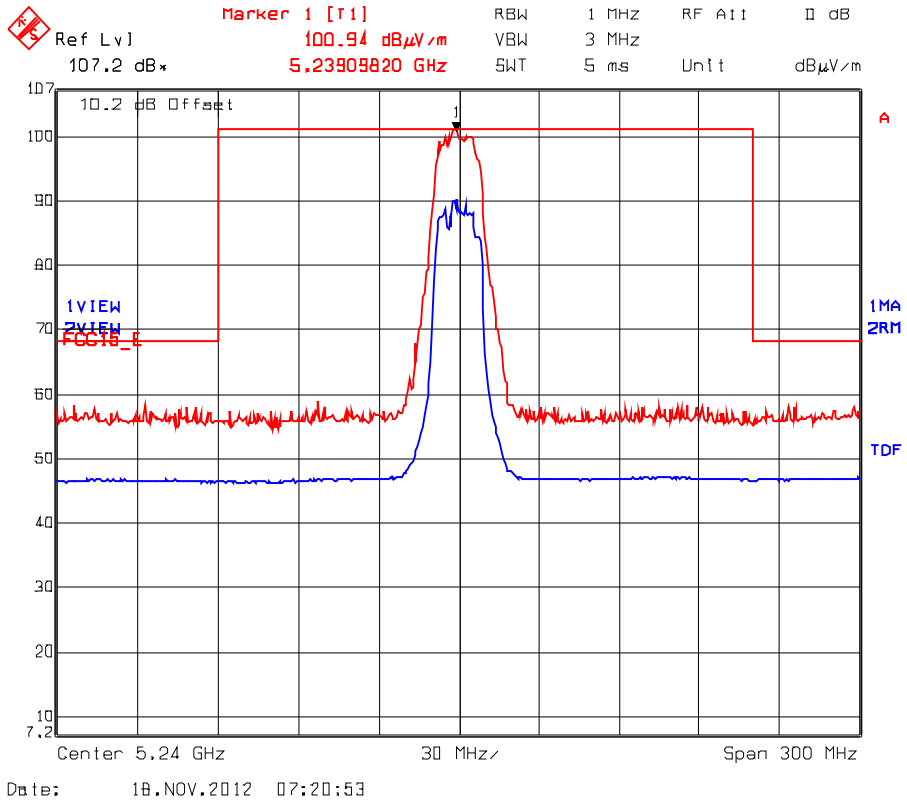
Receiving Antenna in Horizontal Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



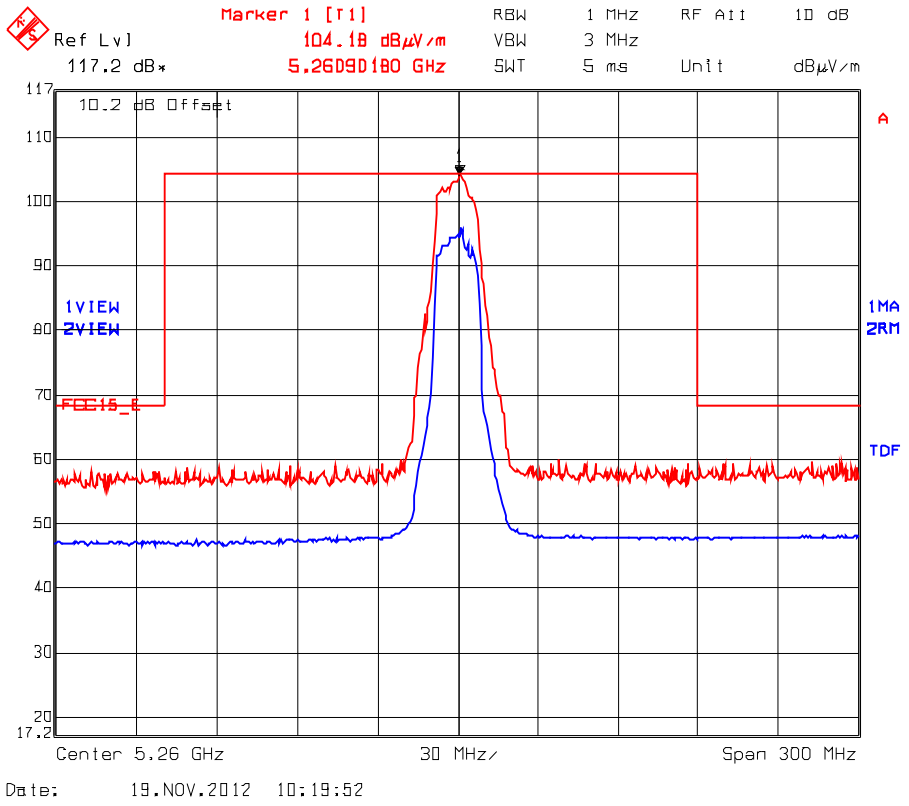
Upper Band-edge



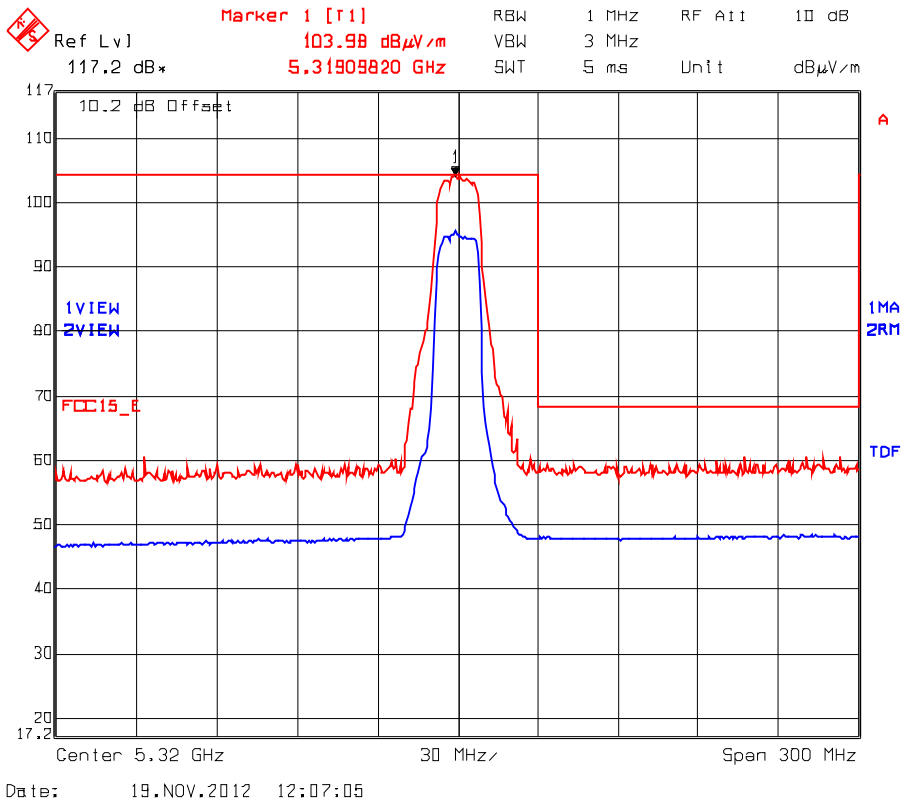
5.3.5.23. FCC 15.407 Radiated Band-edge Emissions of 5260 – 5320 MHz Band Magnet Mount WiMAX Antenna, 5dBi Gain, 802.11a, 6 Mbps BPSK, Power Setting 12

Receiving Antenna in Vertical Polarization

Lower Band-edge

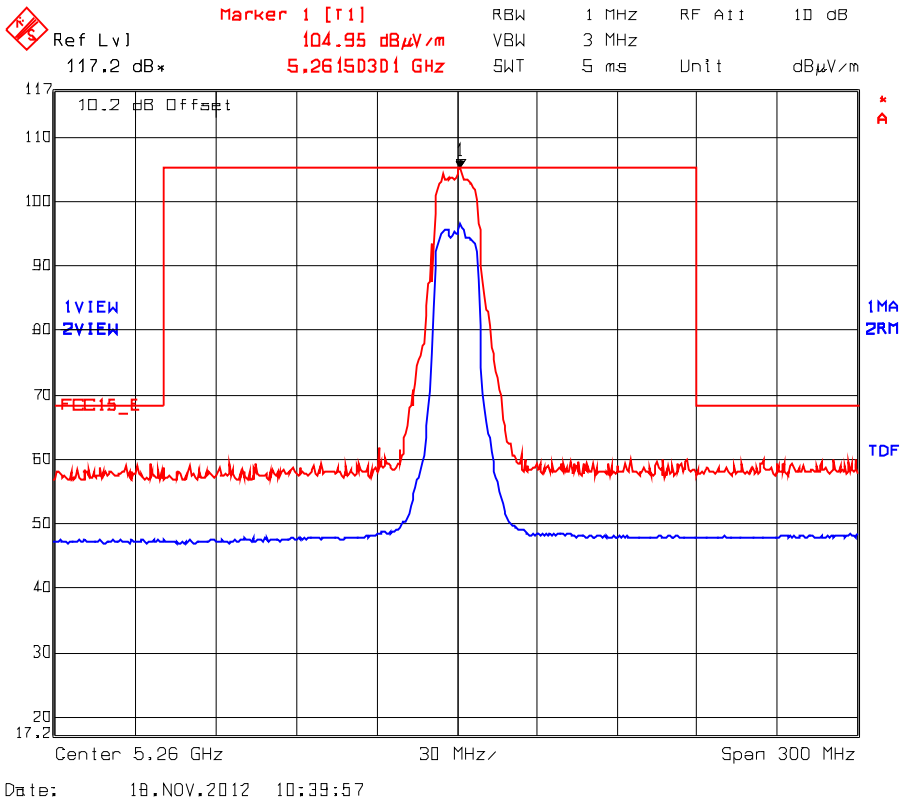


Upper Band-edge

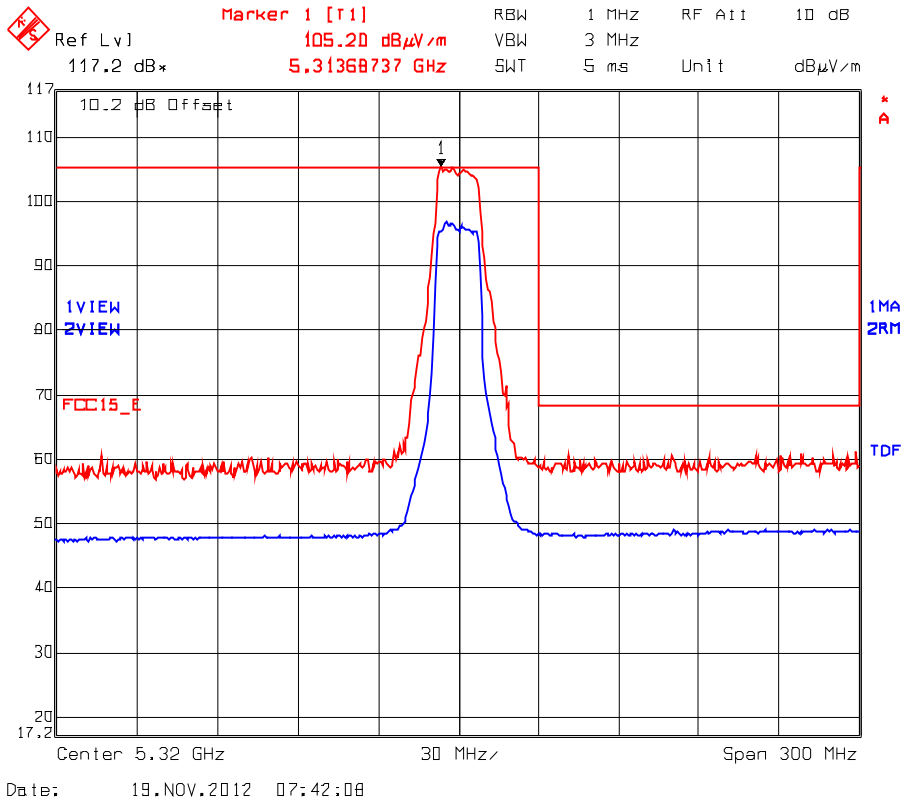


Receiving Antenna in Horizontal Polarization

Lower Band-edge



Upper Band-edge

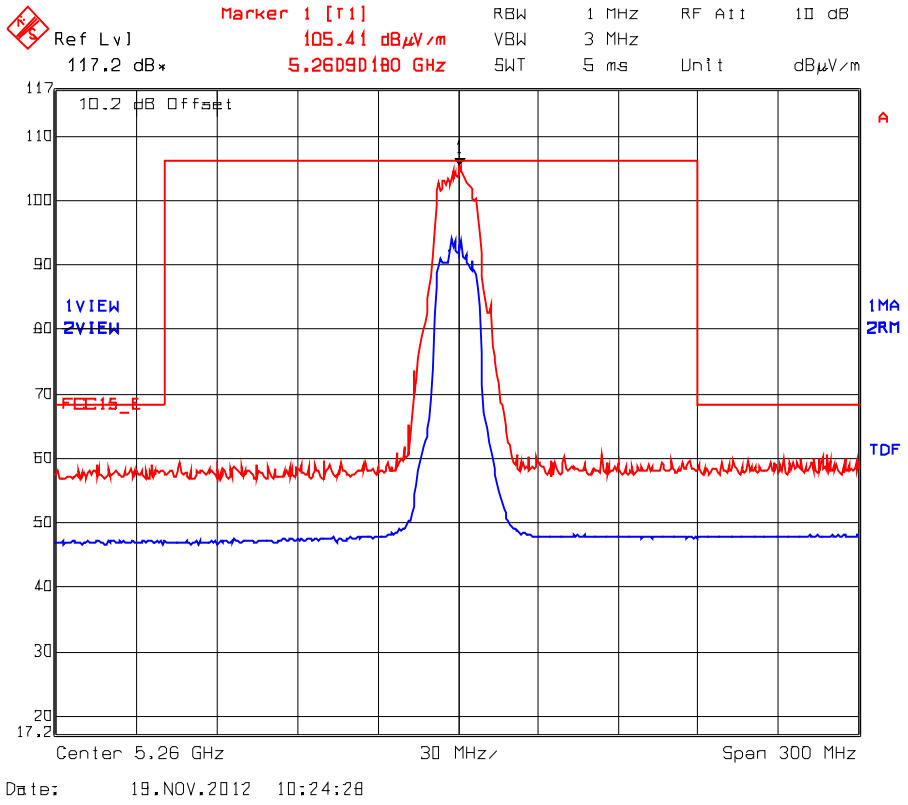


5.3.5.24. FCC 15.407 Radiated Band-edge Emissions of 5260 – 5320 MHz Band, Magnet Mount WiMAX Antenna, 5dBi Gain, 802.11a, 54 Mbps 64-QAM, Power Setting 12

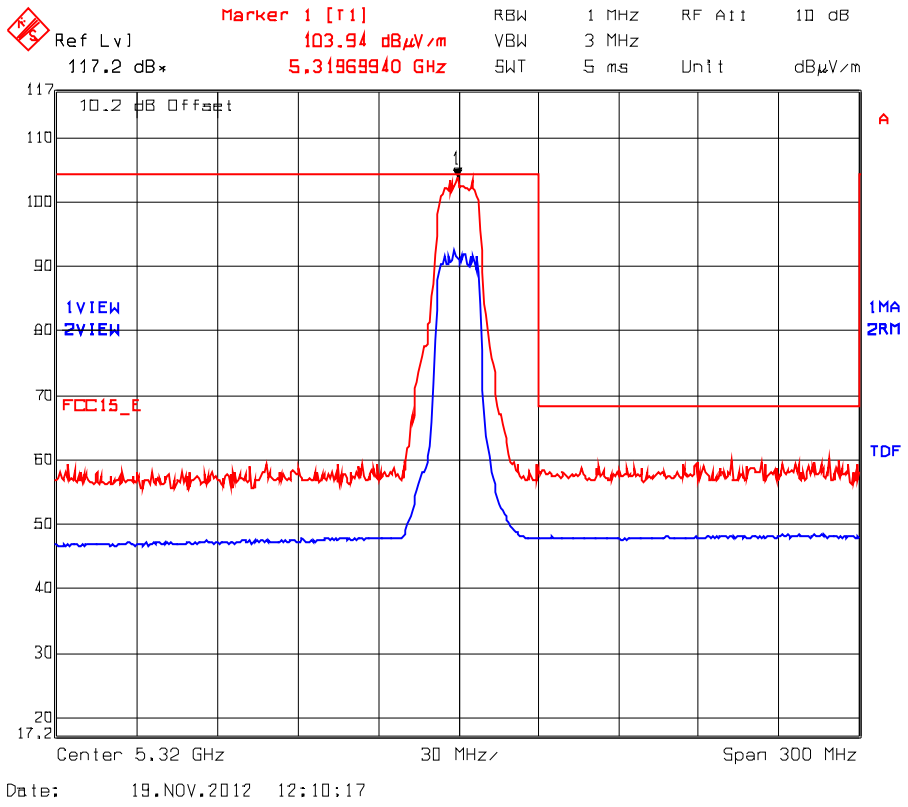
Receiving Antenna in Vertical Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



Upper Band-edge

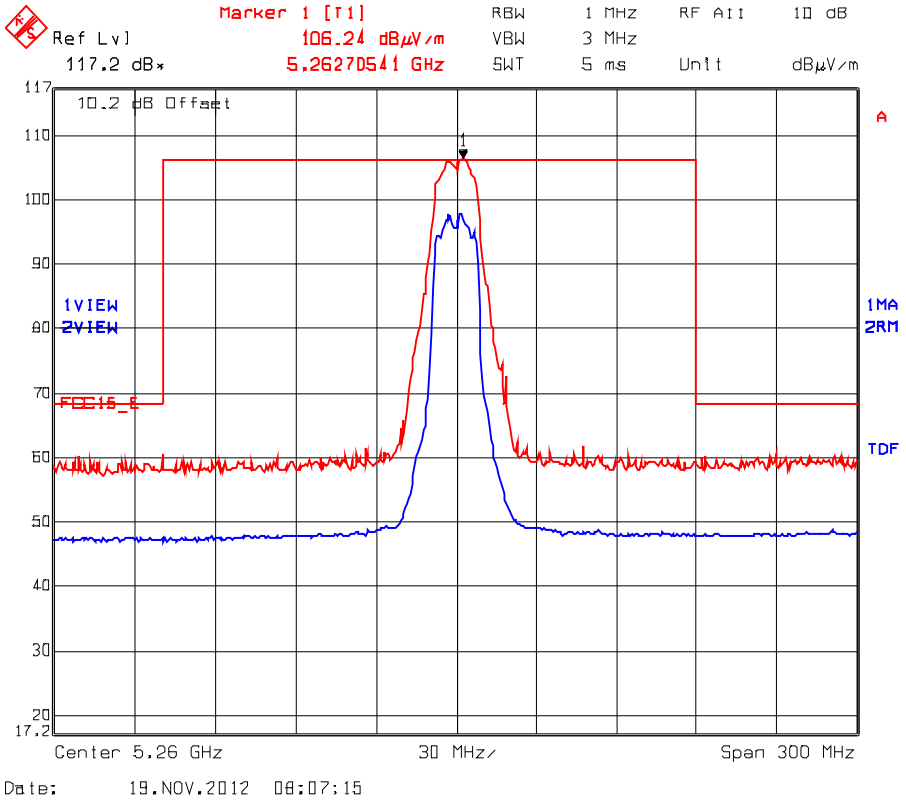


All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

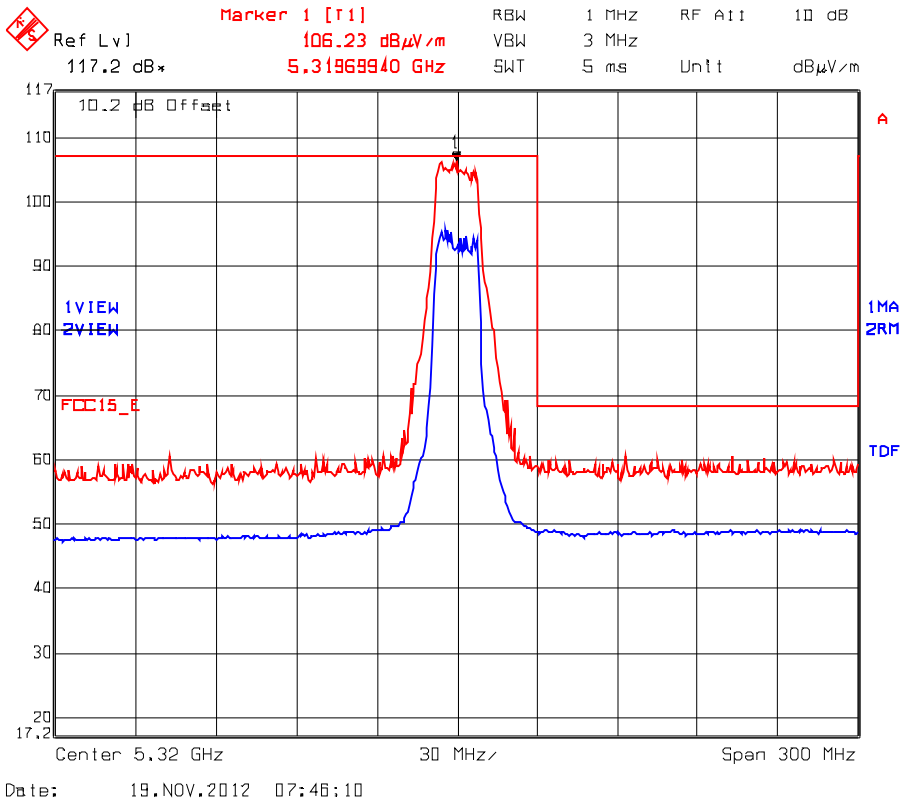
Receiving Antenna in Horizontal Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



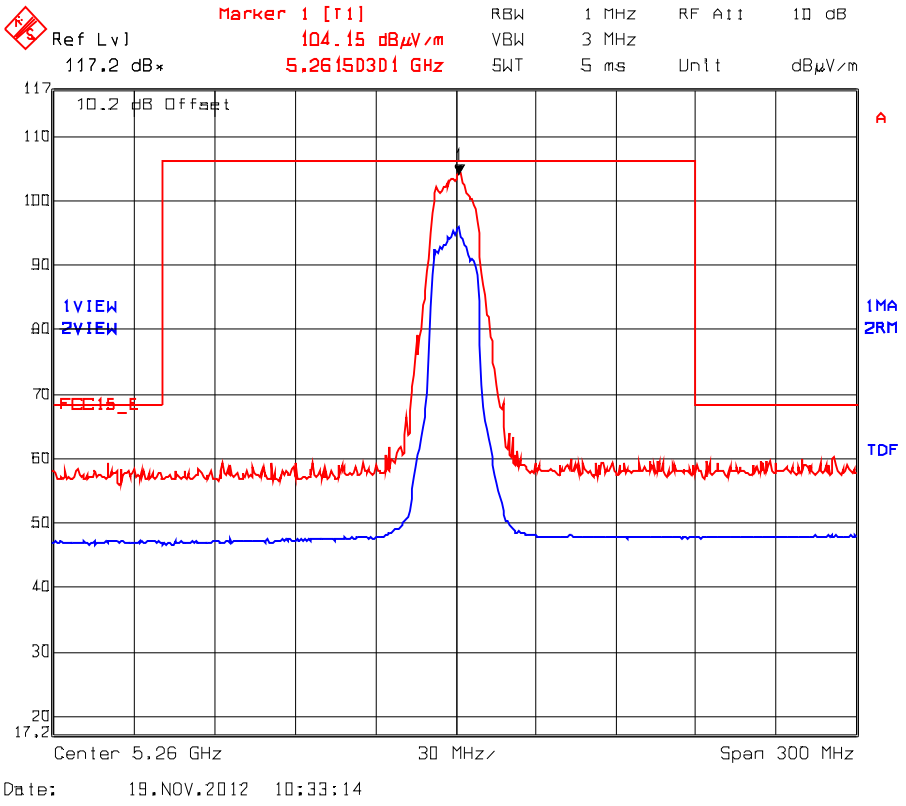
Upper Band-edge



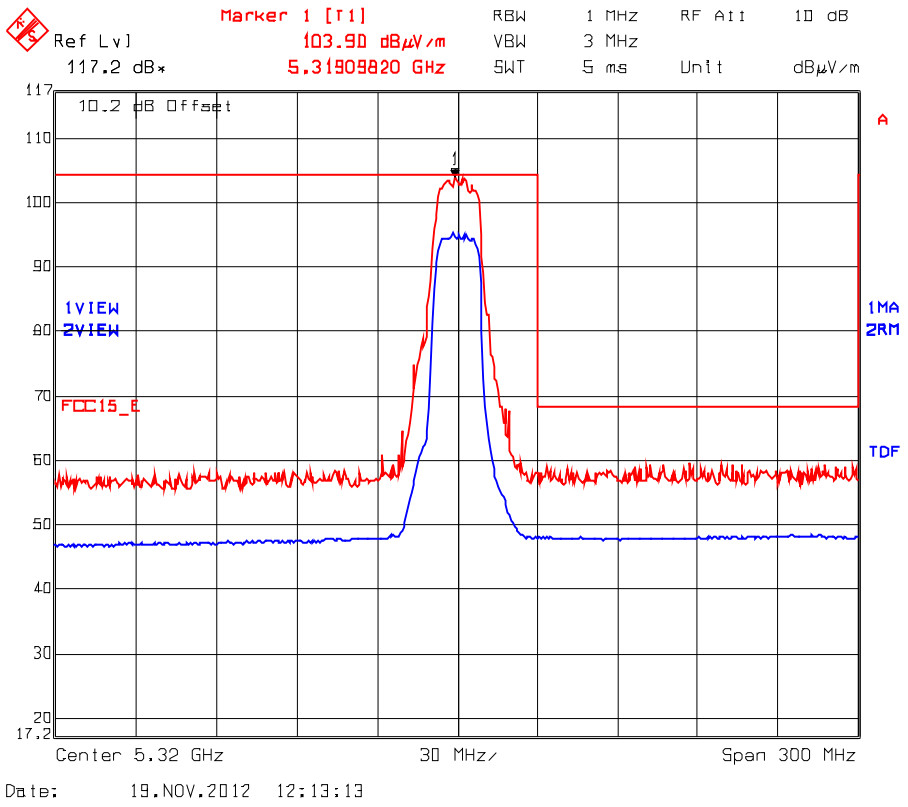
5.3.5.25. FCC 15.407 Radiated Band-edge Emissions of 5260 – 5320 MHz Band Magnet Mount WiMAX Antenna, 5dBi Gain, 802.11n, 6.5 Mbps BPSK, Power Setting 12

Receiving Antenna in Vertical Polarization

Lower Band-edge



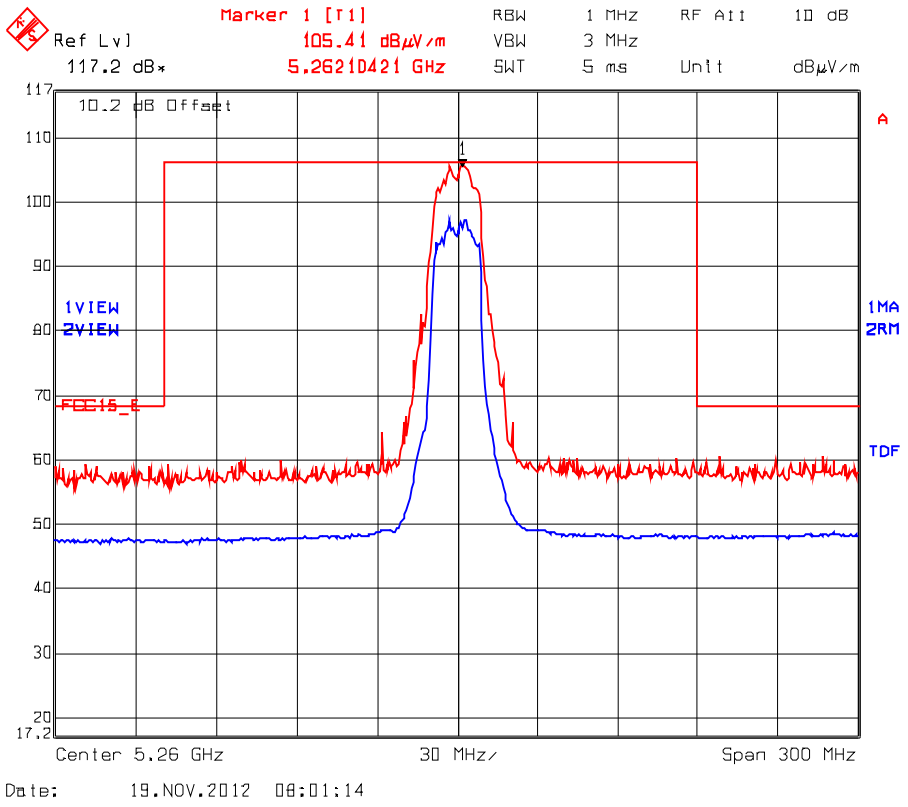
Upper Band-edge



Receiving Antenna in Horizontal Polarization

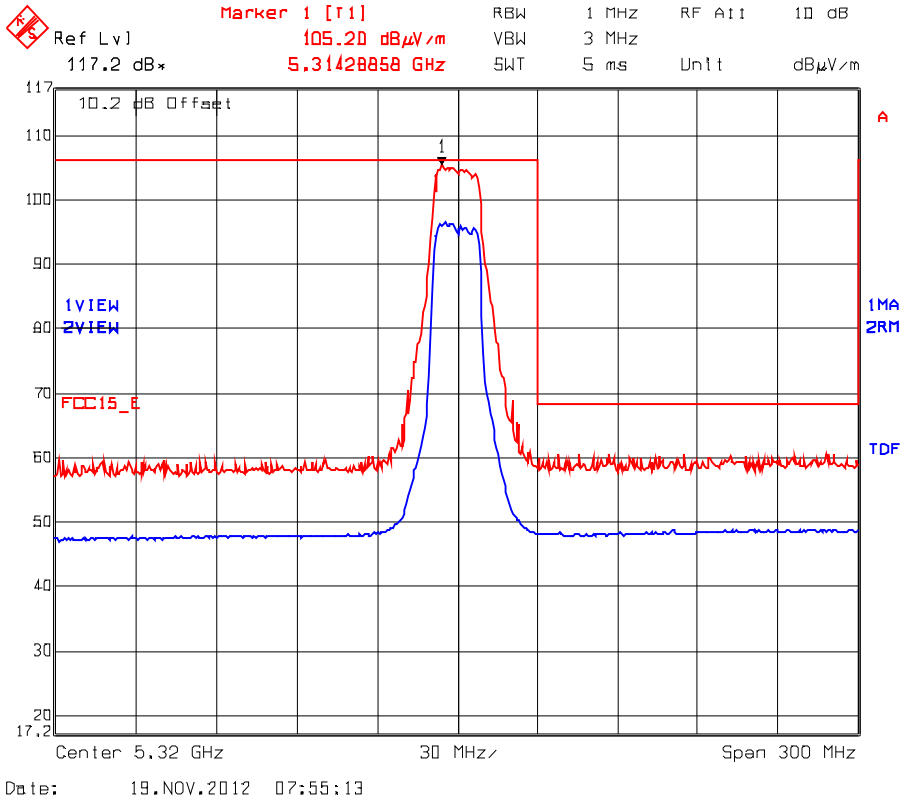
Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Upper Band-edge

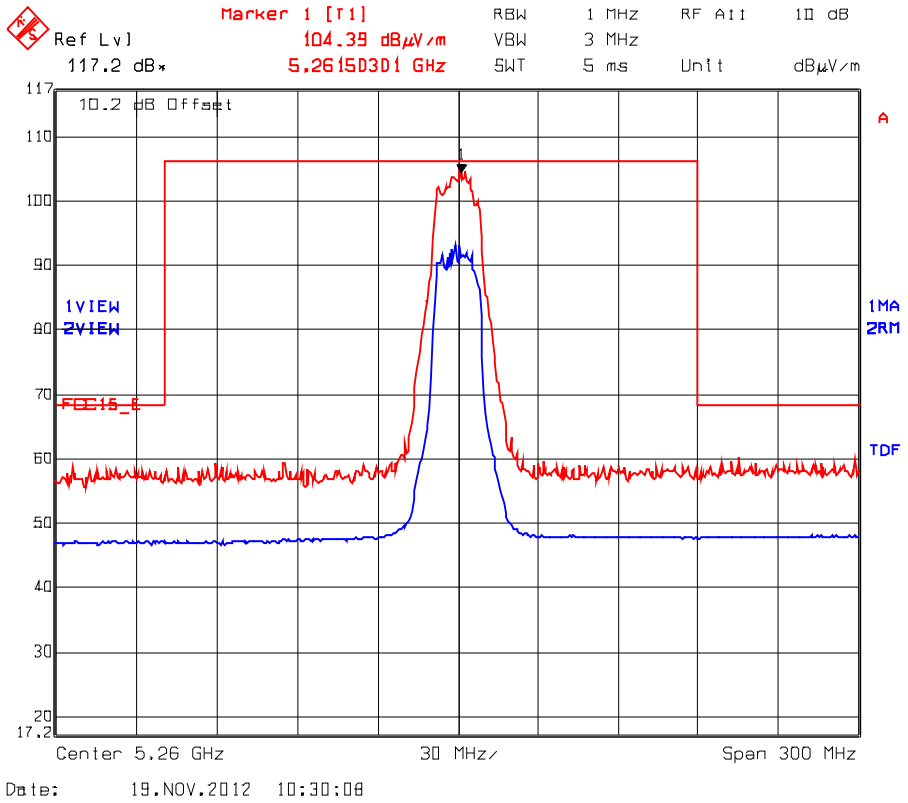


5.3.5.26. FCC 15.407 Radiated Band-edge Emissions of 5260 – 5320 MHz Band Magnet Mount WiMAX Antenna, 5dBi Gain - 802.11n, 65 Mbps 64-QAM, Power Setting

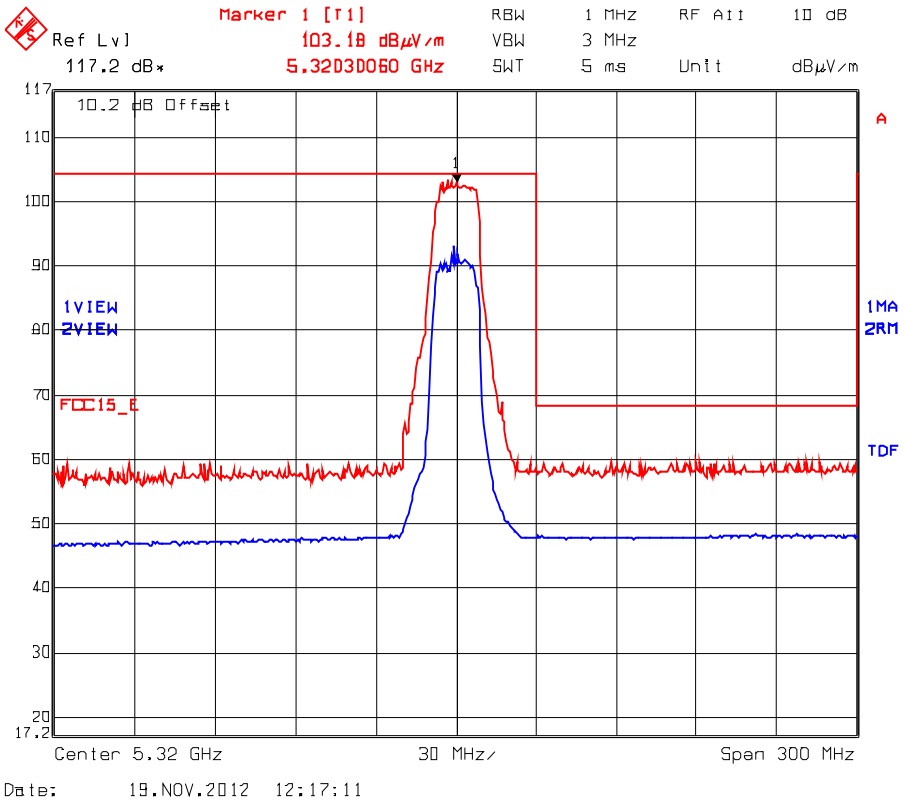
Receiving Antenna in Vertical Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



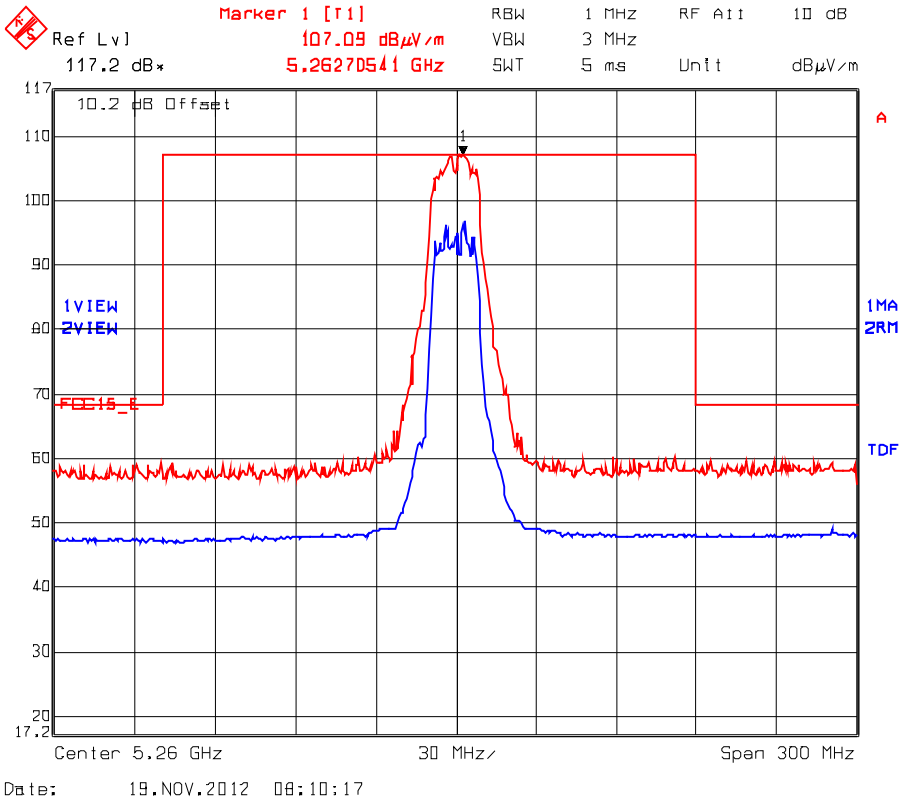
Upper Band-edge



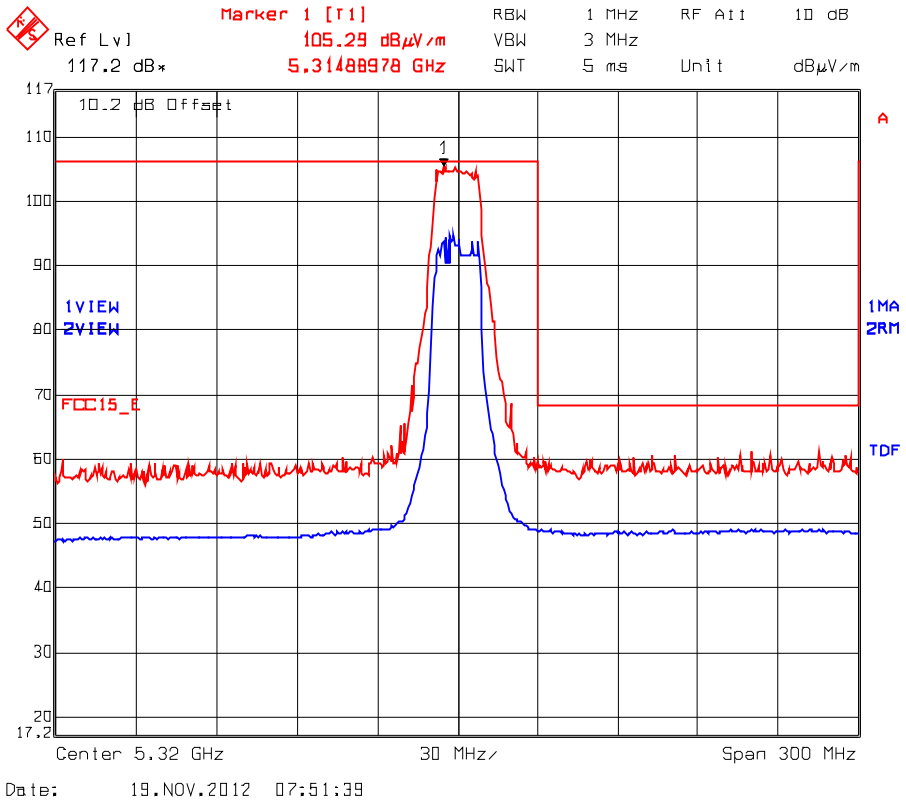
Receiving Antenna in Horizontal Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



Upper Band-edge

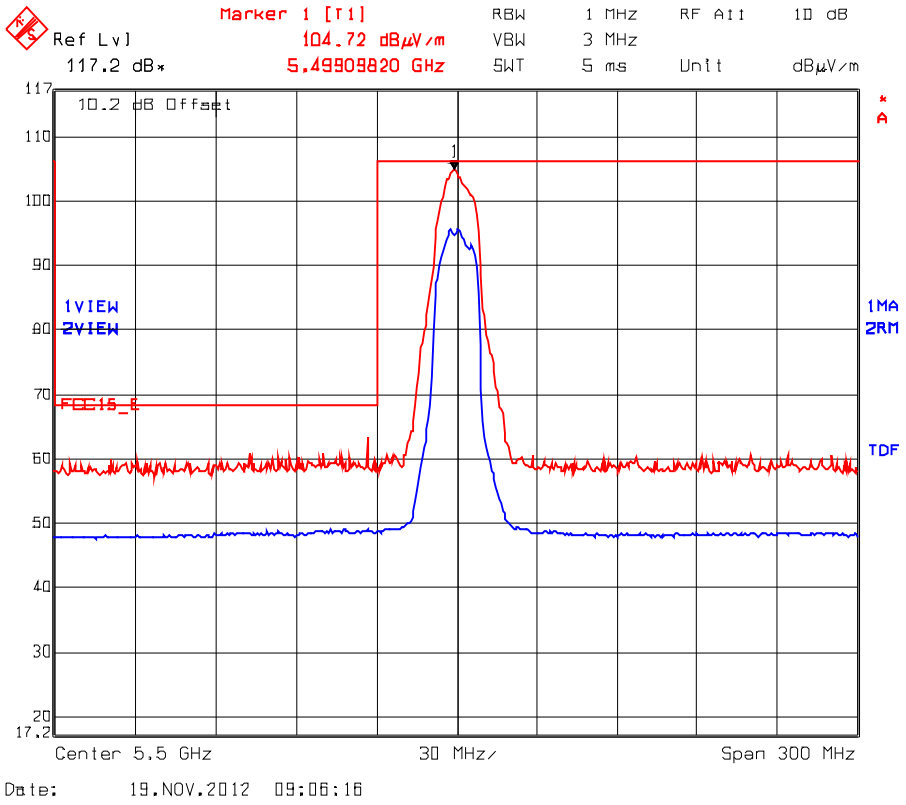


5.3.5.27. FCC 15.407 Radiated Band-edge Emissions of 5500 – 5700 MHz Band Magnet Mount WiMAX Antenna, 5dBi Gain - 802.11a, 6 Mbps BPSK, Power Setting 12

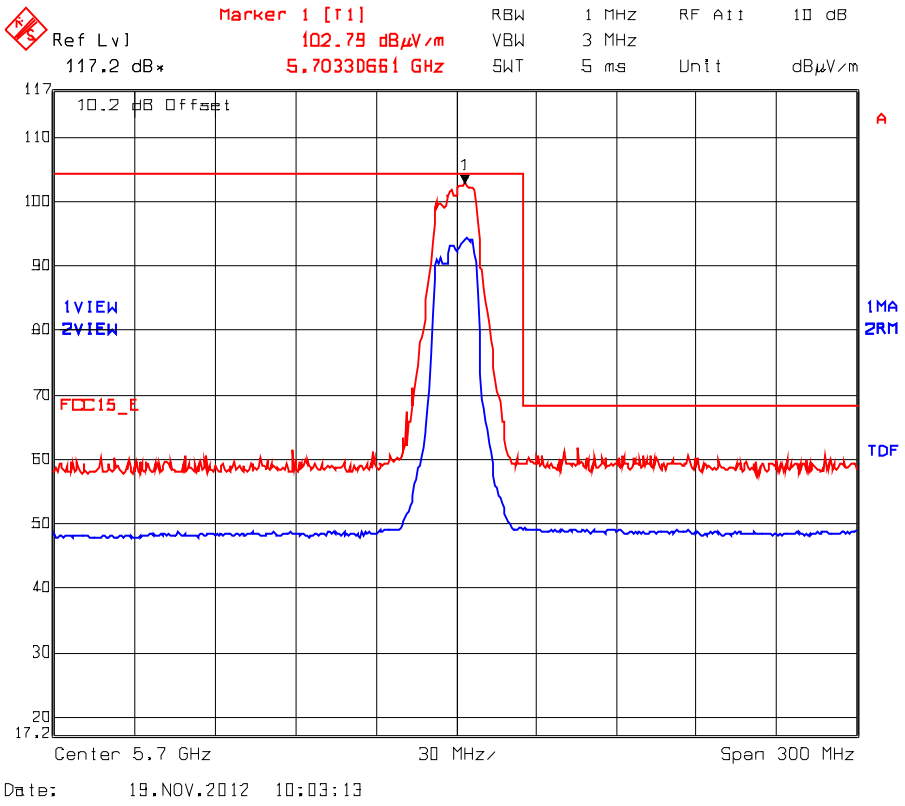
Receiving Antenna in Vertical Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



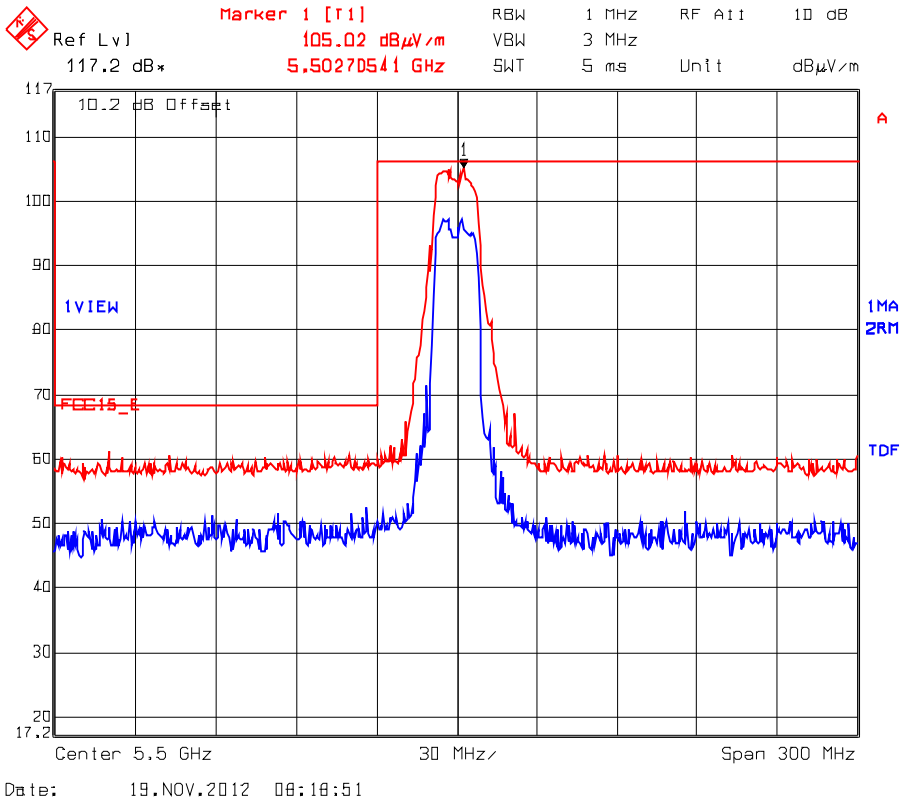
Upper Band-edge



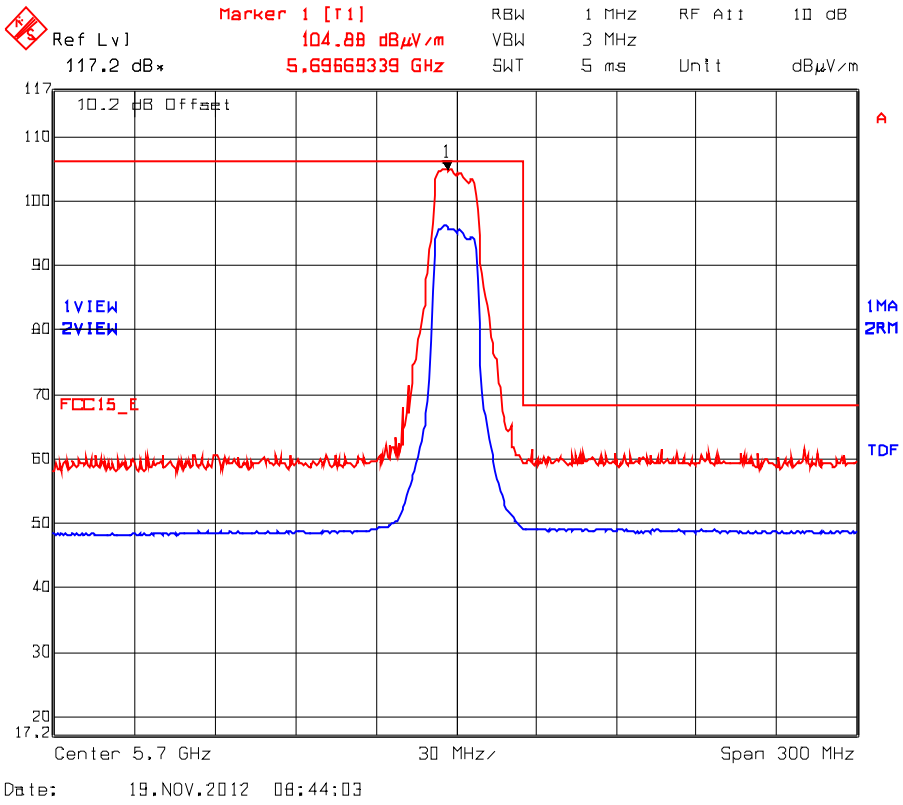
Receiving Antenna in Horizontal Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



Upper Band-edge

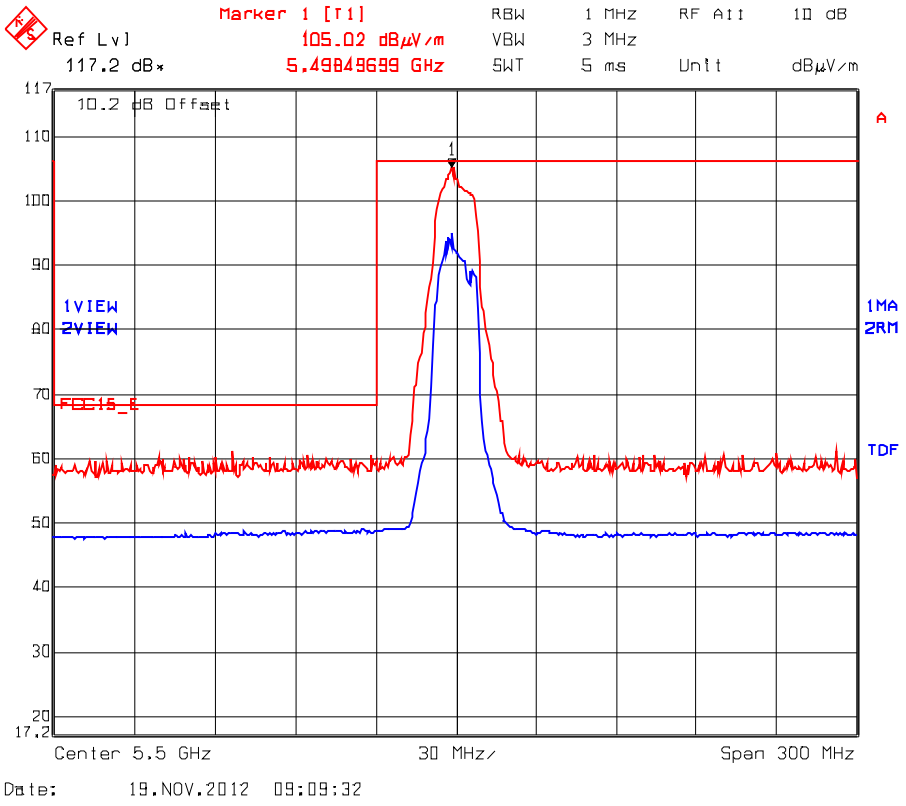


5.3.5.28. FCC 15.407 Radiated Band-edge Emissions of 5500 – 5700 MHz Band Magnet Mount WiMAX Antenna, 5dBi Gain - 802.11a, 54 Mbps 64-QAM, Power Setting 12

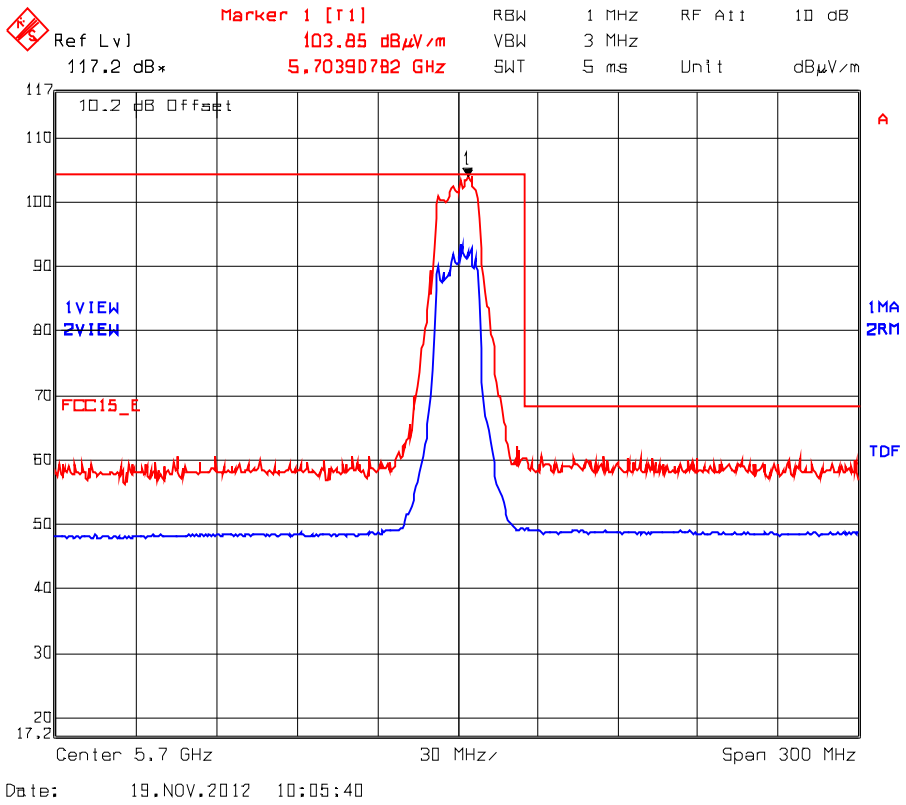
Receiving Antenna in Vertical Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



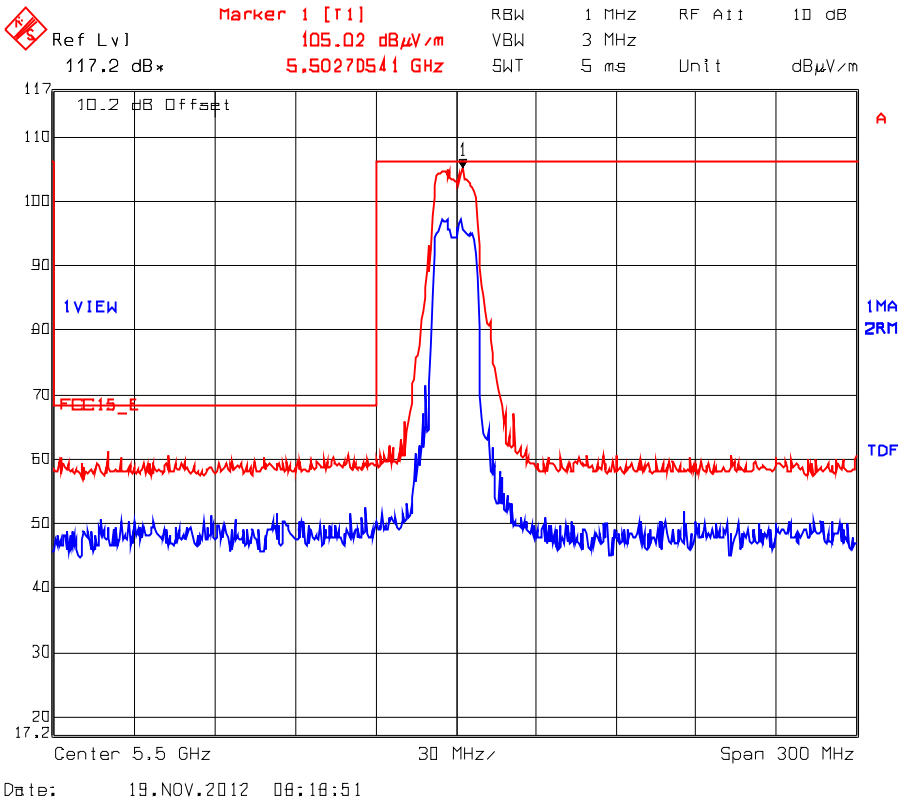
Upper Band-edge



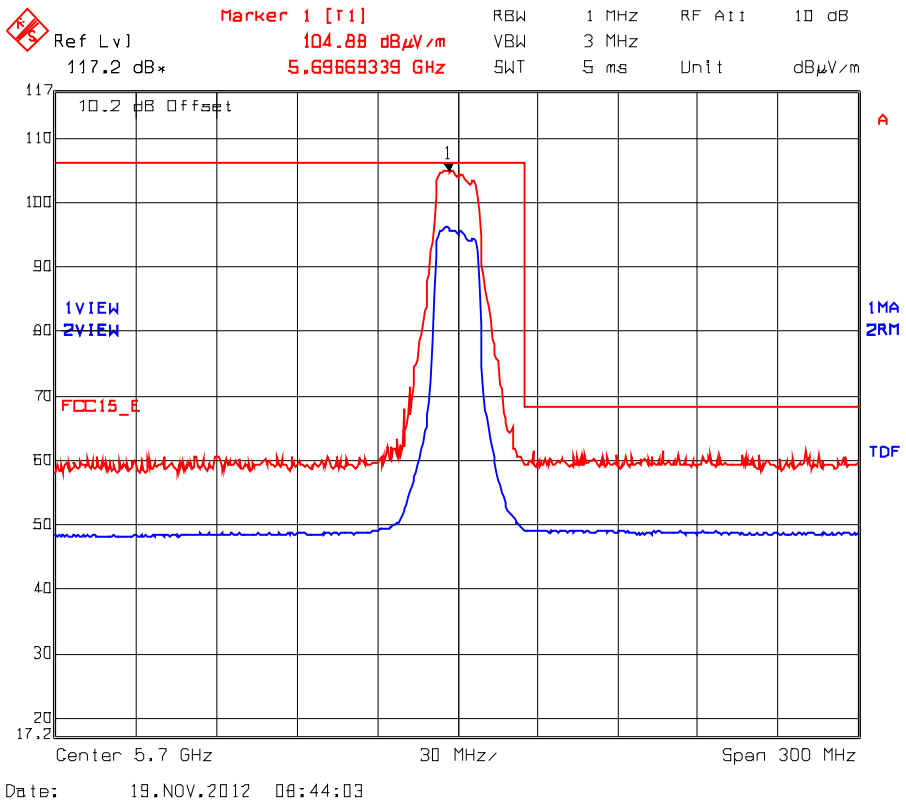
Receiving Antenna in Horizontal Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



Upper Band-edge

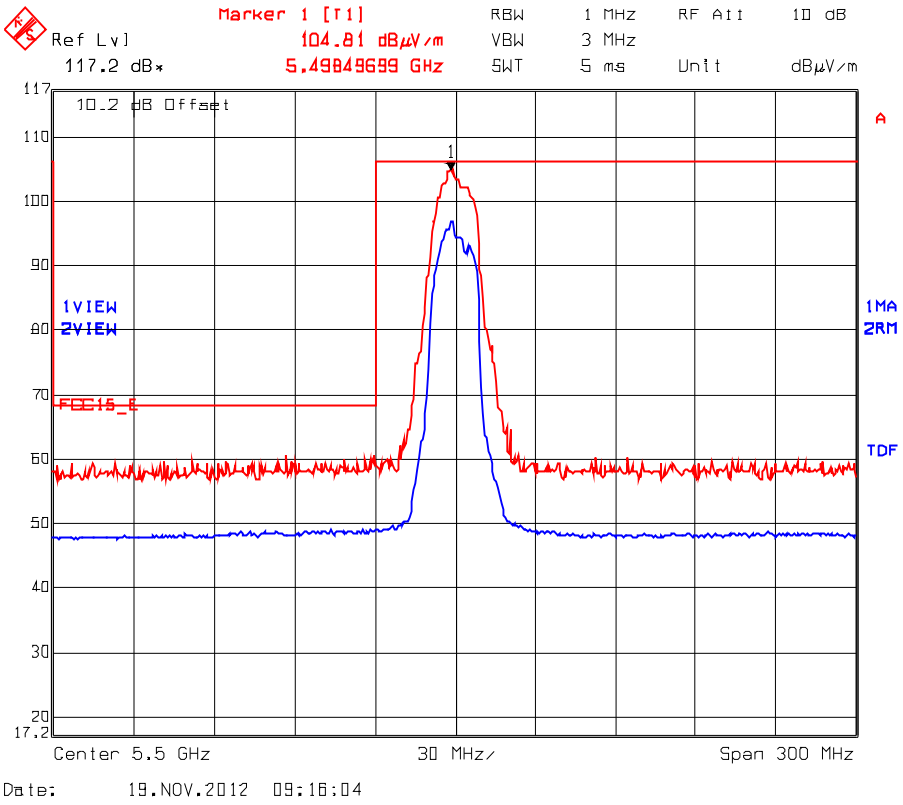


5.3.5.29. FCC 15.407 Radiated Band-edge Emissions of 5500 – 5700 MHz Band Magnet Mount WiMAX Antenna, 5dBi Gain - 802.11n, 6.5 Mbps BPSC, Power Setting 12

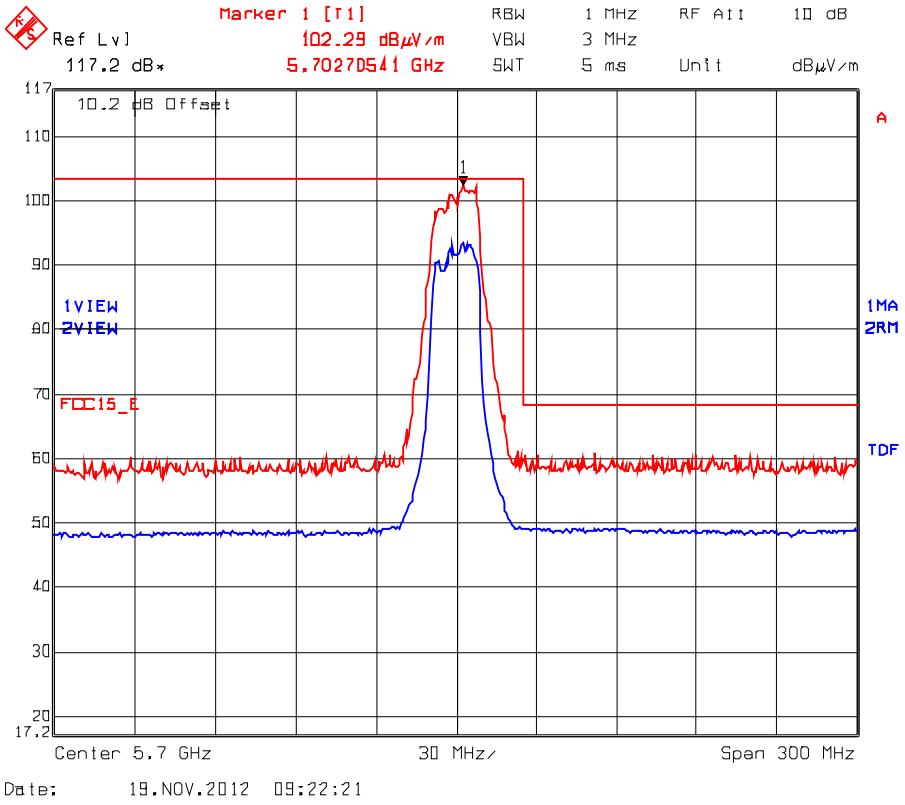
Receiving Antenna in Vertical Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



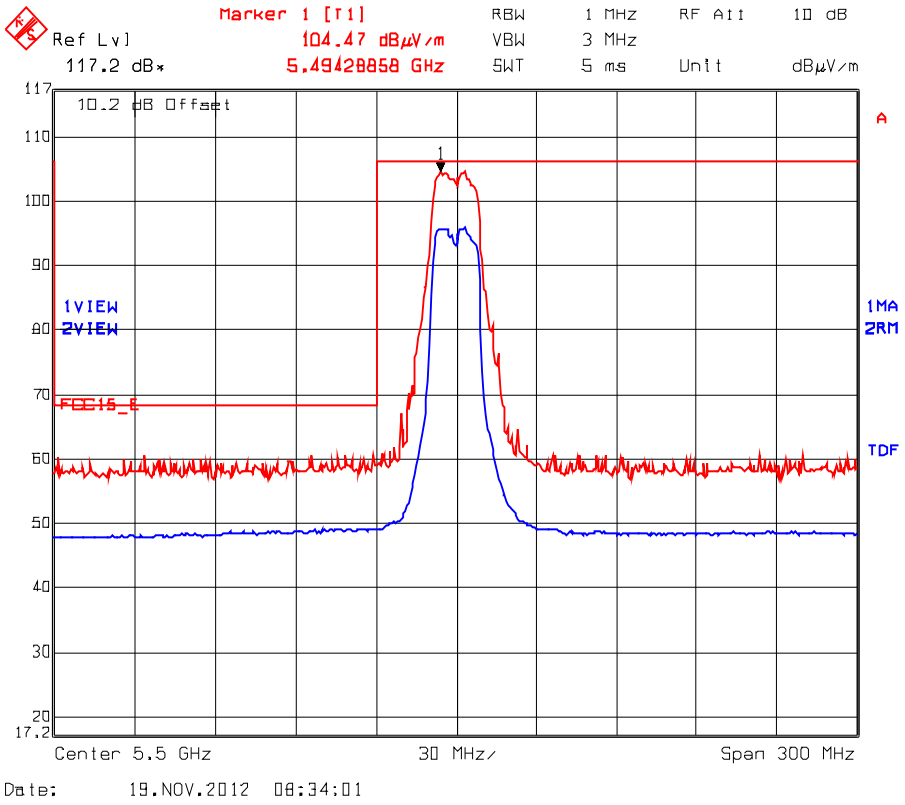
Upper Band-edge



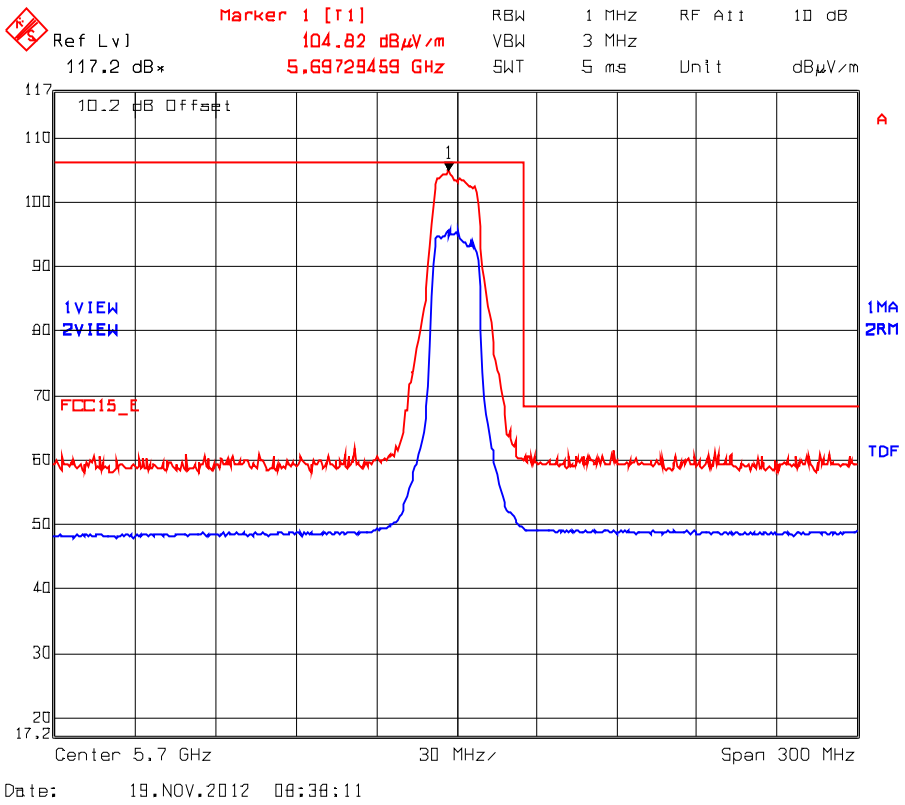
Receiving Antenna in Horizontal Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



Upper Band-edge

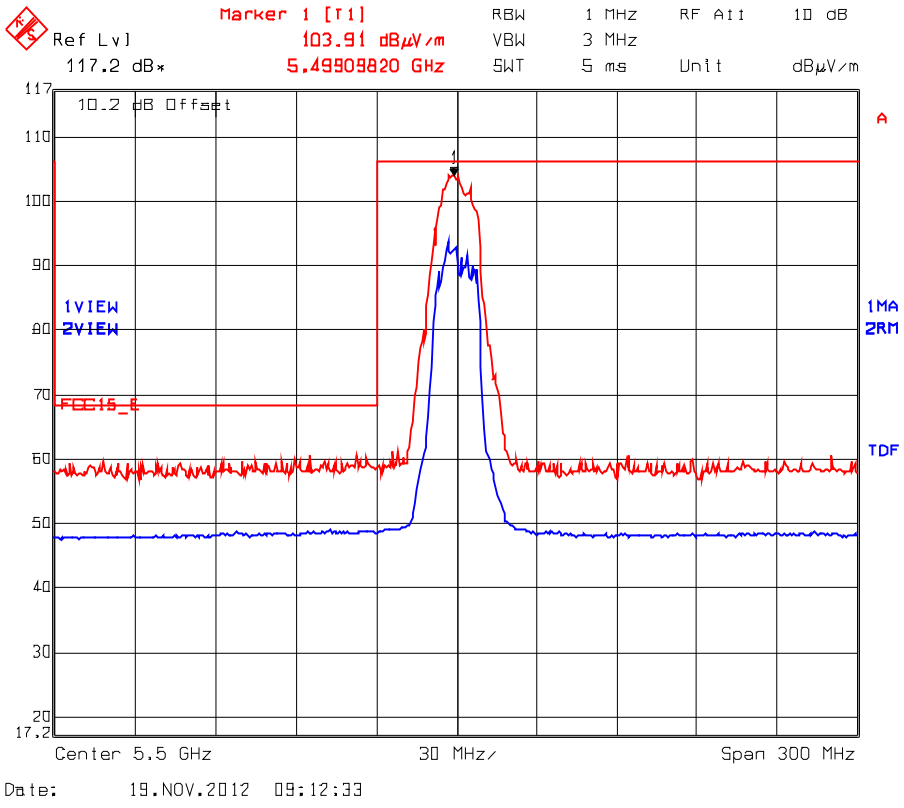


5.3.5.30. FCC 15.407 Radiated Band-edge Emissions of 5500 – 5700 MHz Band Magnet Mount WiMAX Antenna, 5dBi Gain - 802.11n, 65 Mbps 64-QAM, Power Setting 12

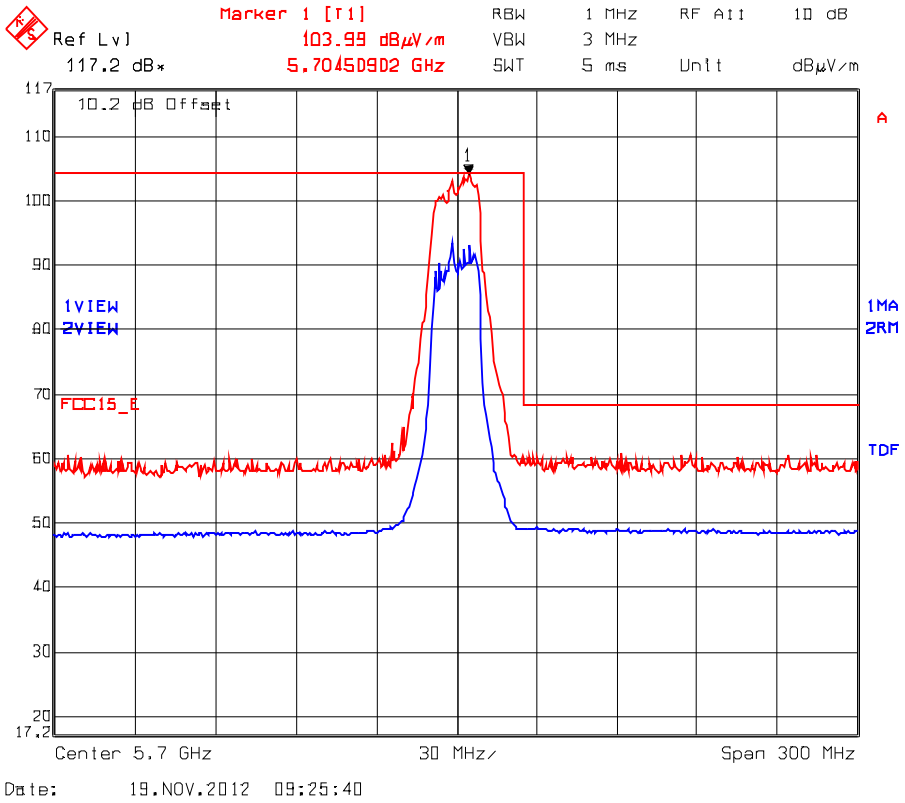
Receiving Antenna in Vertical Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



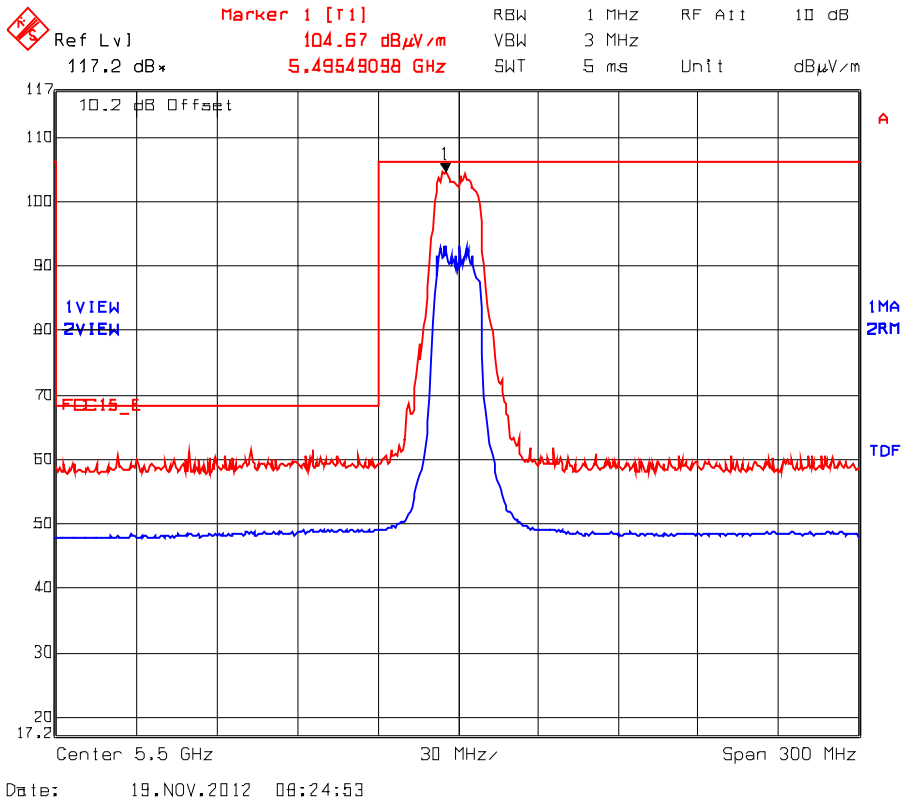
Upper Band-edge



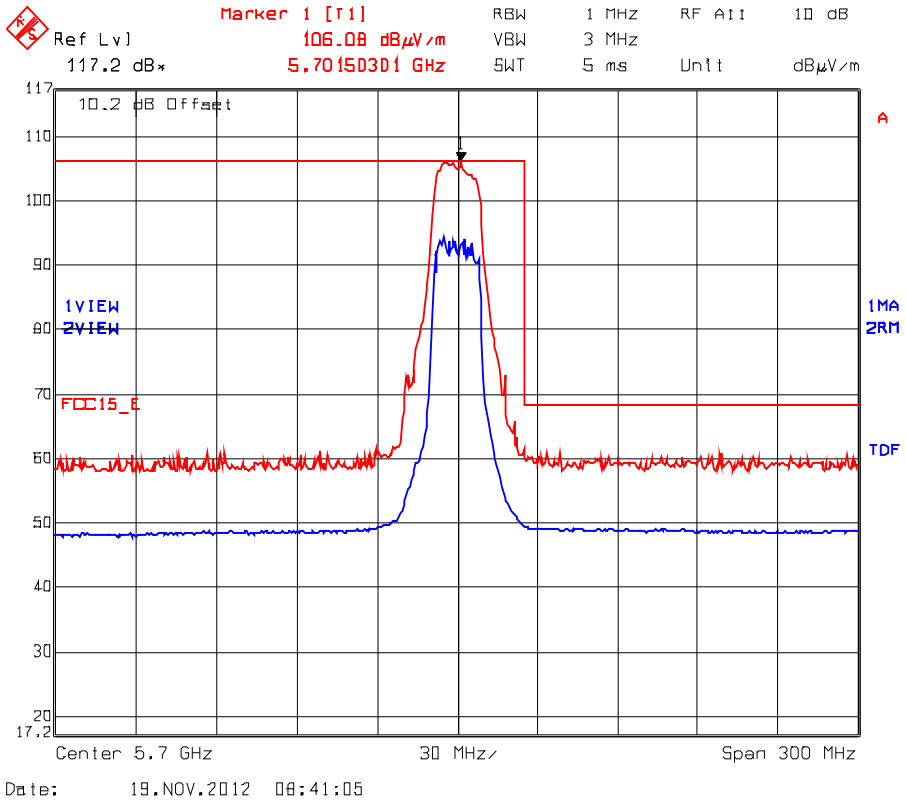
Receiving Antenna in Horizontal Polarization

Peak Trace 1: RBW= 1 MHz, VBW= 3 MHz
Average Trace 2: RBW= 1 MHz, VBW= 3 MHz
Trace average 100 traces in power averaging mode, detector RMS

Lower Band-edge



Upper Band-edge



5.4. RF EXPOSURE REQUIRMENTS [§ 15.247(e)(i), 1.1310 & 2.1091]

The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation.

FCC 47 CFR § 1.1310:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.4.1. Method of Measurements

Refer to Sections 1.1310, 2.1091

In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

(1) Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.
(2) Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement
(3) Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits
(4) Any other RF exposure related issues that may affect MPE compliance

Calculation Method of RF Safety Distance:

$$S = \frac{P \cdot G}{4 \cdot \pi \cdot r^2} = \frac{EIRP}{4 \cdot \pi \cdot r^2}$$

Where: P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

5.4.2. RF Evaluation

Evaluation of RF Exposure Compliance Requirements	
RF Exposure Requirements	**Compliance with FCC Rules**
Minimum calculated separation distance between antenna and persons required: **5.8 cm**	Manufacturer' instruction for separation distance between antenna and persons required: **20 cm minimum**
Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement	Antenna installation and device operating instructions shall be provided to installers to maintain and ensure compliance with RF exposure requirements.
Caution statements and/or warning labels that are necessary in order to comply with the exposure limits	Refer to user's manual for RF exposure Information.
Any other RF exposure related issues that may affect MPE compliance	None.

*The minimum separation distance between the antenna and bodies of users are calculated using the following formula:

$$r = \sqrt{\frac{P \cdot G}{4 \cdot \pi \cdot S}} = \sqrt{\frac{EIRP}{4 \cdot \pi \cdot S}}$$

S = 1.0 mW/cm^2
The wrost case: EIRP of 2.4 GHz WLAN = 26.3 dBm = $10^{(26.3/10)}$ mW = 427 mW (The worst Case)

EIRP = 26.3 dBm = $10^{(26.3/10)}$ mW = 427 mW (Worst Case)

(Minimum Safe Distance, r) = $\sqrt{\frac{EIRP}{4 \cdot \pi \cdot S}} = \sqrt{\frac{427}{4 \cdot \pi \cdot (1.0)}} \approx 5.8cm$

Note:

- When 5 GHz WLAN is transmitting 2.4 GHz WLAN can not transmit.
- When 5 GHz WLAN is transmitting BT can transmit
- When 2.4 GHz WLAN is transmitting BT can not transmit.

The worst case of simultaneous power transmission is 5 GHz WLAN and BT transmit at the same time.

Bluetooth: IEPR = 4 dBm + 5 dBi = 9 dBm = 7.94 mWatts
5 GHz WLAN: = 19.6 dBm + 5 dBi = 24.6 dBm = 288.40 mWatts

Total EIRP = 296.35 mwatts < 427 mWatts

EXHIBIT 6. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

6.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

	Line Conducted Emission Measurement Uncertainty (150 kHz – 30 MHz):	**Measured**	**Limit**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{i=1}^{m} u_i^2(y)}$	**± 1.57**	**± 1.8**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 3.14**	**± 3.6**

6.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	**Measured**	**Limit**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{i=1}^{m} u_i^2(y)}$	**± 2.15**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.30**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	**Measured**	**Limit**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{i=1}^{m} u_i^2(y)}$	**± 2.39**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.78**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	**Measured**	**Limit**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{i=1}^{m} u_i^2(y)}$	**± 1.87**	Under consideration
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 3.75**	Under consideration

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)