SFCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

Wireless N Service Router

Model: DSR-250N

Trade Name: D-Link

Issued to

D Link Corporation
17595 Mt. Herrmann , Fountain Valley, California 92708, United States

Issued by

Compliance Certification Services Inc.
No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township,
Taoyuan County 33841,Taiwan, R.O.C.
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Testing Laboratory
0363

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		June 22, 2011		Initial Issue	ALL	Jill Shiau

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1. TEST RESULT CERTIFICATION

Applicant:	**D Link Corporation** 17595 Mt. Herrmann , Fountain Valley, California 92708, United States
Manufacturer:	**CAMEO Communications, Inc.** No. 276, Sinhu 1st Rd., Neihu District, Taipei City 114 Taiwan, R.O.C.
Equipment Under Test:	Wireless N Service Router
Trade Name:	D-Link
Model:	DSR-250N
Date of Test:	March 23 ~ June 22, 2011

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 15 Subpart C	No non-compliance noted

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2003 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by: ***Reviewed by:***

Stan Lin
Supervisor

Chieh Cheng
Engineer

2. EUT DESCRIPTION

Product	Wireless N Service Router		
Trade Name	D-Link		
Model Number	DSR-250N		
Model Discrepancy	N/A		
EUT Power Rating	12VDC, 1.5A		
Power Adapter	CWT	**Model**	SAF018F4 US
RF Module Manufacturer	Ralink	**Model**	RT3092L
Operating Frequency Range	IEEE 802.11 b/g/HT 20MHz: 2412 ~ 2462 MHz IEEE 802.11 HT 40MHz: 2422 ~ 2452 MHz		
Transmit Power	IEEE 802.11b mode: 20.05 dBm (101.16mW) IEEE 802.11g mode: 24.45 dBm (278.61mW) draft 802.11n 20 MHz Channel mode: 25.92 dBm (390.84mW) draft 802.11n 40 MHz Channel mode: 25.49 dBm (354.00mW)		
Modulation Technique	IEEE 802.11b mode: DSSS (1, 2, 5.5 and 11 Mpbs) IEEE 802.11g mode: OFDM (6, 9, 12, 18, 24, 36, 48 and 54 Mpbs) draft 802.11n 20 MHz Channel mode: OFDM (6.5, 7.2, 13, 14.4, 14.44, 19.5, 21.7, 26, 28.89, 28.9, 39, 43.3, 43.33 52, 57.78, 57.8, 58.5, 65.0, 72.2, 78, 86.67, 104, 115.56, 117, 130, 144.44 Mbps) draft 802.11n 40 MHz Channel mode: OFDM (13.5, 15, 27, 30, 40.5, 45, 54, 60, 81, 90, 108, 120, 121.5, 135, 150, 162, 180, 216, 240, 243, 270, 300 Mbps)		
Number of Channels	IEEE 802.11b/g mode: 11 Channels draft 802.11n 20 MHz Channel mode: 11 Channels draft 802.11n 40 MHz Channel mode: 7 Channels		
Antenna Specification	Dipole Antenna / Gain: 2.0dBi		

Remark:

1. The sample selected for test was production product and was provided by manufacturer.

*2. This submittal(s) (test report) is intended for FCC ID: **KA2SR250NA1** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.*

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4: 2003 and FCC CFR 47 Part 2, Part 15.207, 15.209 and 15.247.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4: 2003 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4: 2003.

3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

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 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 - 13.41	322 - 335.4		

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3.5 DESCRIPTION OF TEST MODES

The EUT is a 2Tx2R MIMO transmitter.

Software used to control the EUT for staying in continuous transmitting mode was programmed.
The worst case data rate is determined as the data rate with highest output power.
After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only.

IEEE 802.11b mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 1Mbps data rate was chosen for full testing.

IEEE 802.11g mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6Mbps data rate was chosen for full testing.

draft 802.11n 20 MHz Channel mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 13.5Mbps data rate were chosen for full testing.

draft 802.11n 40 MHz Channel mode:

Channel Low (2422MHz), Channel Mid (2437MHz) and Channel High (2452MHz) with 13.5Mbps data rate were chosen for full testing.

4. INSTRUMENT CALIBRATION

4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Remark: *Each piece of equipment is scheduled for calibration once a year.*

Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY48250064	12/29/2011
Spectrum Analyzer	R&S	FSEB	825829/011	11/01/2011
Power meter	Anritsu	MA2411B	917221	08/24/2011

3M Semi Anechoic Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY48250064	12/29/2011
Pre-Amplifier	HP	8447D	2944A06530	01/02/2012
Pre-Amplifier	HP	8449B	3008A01738	04/17/2012
EMI Test Receiver	SCHAFFNER	SCR 3501	430	01/18/2012
Loop Antenna	EMCO	6502	2356	06/11/2013
Bilog Antenna	SCHWAZBECK	VULB9160	3084	10/07/2011
Horn Antenna	EMCO	3115	00022250	05/09/2011
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Test S/W	LabVIEW 6.1 (Wugu Chamber EMI Teat V1_4.5.3)			

Powerline Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TEST RECEIVER	R&S	ESCI	100234	06/13/2011
LISN (EUT)	FCC	FCC-LISN-50-32-2	08009	03/27/2012
LISN	SCHWARZBECK	NSLK 8127	8127382	01/02/2012
BNC CABLE	MIYAZAKI	5D-FB	BNC B3	08/10/2011
Pulse Limiter	R&S	ESH3-Z2	100374	01/09/2012
THERMO-HYGRO METER	TOP	HA-202	9303-3	01/25/2012
Test S/W	EZ-EMC			

4.3 MEASUREMENT UNCERTAINTY

Parameter	Uncertainty
Powerline Conducted Emission	±2.0878
3M Semi Anechoic Chamber / 30MHz ~ 1GHz	±3.7046
3M Semi Anechoic Chamber / Above 1GHz	±3.0958

Remark: *This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.*

5. FACILITIES AND ACCREDITATIONS

5.1 FACILTIES

All measurement facilities used to collect the measurement data are located at

☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☐ No.11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☒ No. 81-1, Lane 210, Pa-De 2nd Rd., Luchu Hsiang, Taoyuan Shien, (338) Taiwan, R.O.C.
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4: 2003 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	A2LA	CFR 47, FCC Part15/18, CISPR 22, EN 55022, ICES-003, AS/NZS CISPR 22, VCCI V-3, EN 55011, CISPR 11, IEC/EN 61000-4-2/3/4/5/6/8/11, EN 61000-6-1/2/3/4, EN 55024, CISPR 24, AS/NZS CISPR 24, AS/NZS 61000.6.2, EN 55014-1/-2, ETSI EN 300 386 v1.3.2/v1.3.3, IEC/EN 61000-3-2, AS/NZS 61000.3.2, IEC/EN 61000-3-3, AS/NZS 61000.3.3	ACCREDITED No. 0824-01
USA	FCC MRA	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	TW1026
Japan	VCCI	3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements	VCCI R-2882/2541/2798/725/1868 C-402/747/912 T-1930/1646
Taiwan	TAF	EN 55014-1, CISPR 14, CNS 13781-1, EN 55013, CISPR 13, CNS 13439, EN 55011, CISPR 11, CNS 13803, PLMN09, IS2045-0, LP0002 FCC Part 27/90, Part 15B/C/D/E, RSS-192/193/210/310 ETSI EN 300 328/ 300 220-1/ 300 220-2/ 301 893/ 301 489-01/ 301 489-03/ 301 489-07 / 301 489-17/ 300 440-1/ 300 440-2 AS/NZS 4268, AS/NZS 4771 CISPR 22, EN 55022, CNS 13438, AS/NZS CISPR 22, VCCI, IEC/EN 61000-4-2/3/4/5/6/8/11, CNS 14676-2/3/4/5/6/8, CNS 14934-2/3, CNS 13783-1, CNS 13439, CNS 13803	ilac-MRA TAF Testing Laboratory 0363
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	SL2-IS-E-0014 / IN-E-0014 /A1-E-0014 /R1-E-0014 /R2-E-0014 /L1-E-0014
Canada	Industry Canada	RSS-Gen Issue 3	Canada IC 2324C-5

Note: *No part of this report may be used to claim or imply product endorsement by A2LA, TAF or other government agency.*

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

For Conducted & Radiated Emission measurement (Above 1GHz):							
No.	**Device Type**	**Brand**	**Model**	**Series No.**	**FCC ID**	**Data Cable**	**Power Cord**
1.	Notebook PC	DELL	D400	0932RY	E2K24GBRL	LAN Cable: Unshielded, 10m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core

For Radiated Emission measurement (Below 1GHz) emission measurement:							
No.	**Device Type**	**Brand**	**Model**	**Series No.**	**FCC ID**	**Data Cable**	**Power Cord**
1.	Traveling Disk	SILICON POWER	LuxMini 720	N/A	FCC DoC	Unshielded, 1.0m	N/A
2.	HUB (Remote)	SONY	BDP-S360	1005989	FCC DoC	Unshielded, 10m *8	Unshielded, 1.8m
3.	Notebook PC (Remote)	DELL	D400	0932RY	E2K24GBRL	LAN Cable: Unshielded, 10m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core

For Power line conducted emission measurement:							
No.	**Device Type**	**Brand**	**Model**	**Series No.**	**FCC ID**	**Data Cable**	**Power Cord**
1.	USB 2.0 HDD	F12-U	N/A	N/A	FCC DoC	Shielded, 1.8m	N/A
2.	Server PC	Compaq 2210b	CNU7472KDP	1005989	N/A	Unshielded, 20m	Unshielded, 1.8m
3.	Server PC	2210B	NV7472KG5	0932RY	FCC DoC	Unshielded, 20m	Unshielded, 1.8m
4.	Load	N/A	N/A	N/A	N/A	Unshielded, 1.5m X7	N/A
5.	Cable	N/A	N/A	N/A	N/A	Unshielded, 1.5m	N/A

Remark: *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

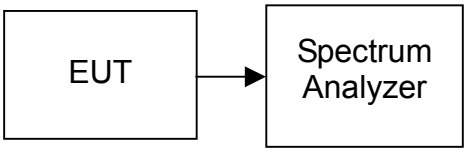
7. FCC PART 15.247 REQUIREMENTS

7.1 6dB BANDWIDTH

LIMIT

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100kHz, VBW = 300kHz, Span = 30MHz, Sweep = auto.
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

TEST RESULTS

No non-compliance noted

TEST DATA

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	12.150	>500	PASS
Mid	2437	12.150		PASS
High	2462	12.150		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	16.600	>500	PASS
Mid	2437	16.650		PASS
High	2462	16.600		PASS

Test mode: draft 802.11n 20 MHz Channel mode

Channel	Frequency (MHz)	Bandwidth (MHz)		Limit (kHz)	Result
		Chain 0	Chain 1		
Low	2412	17.700	17.700	>500	PASS
Mid	2437	17.650	17.700		PASS
High	2462	17.600	17.650		PASS

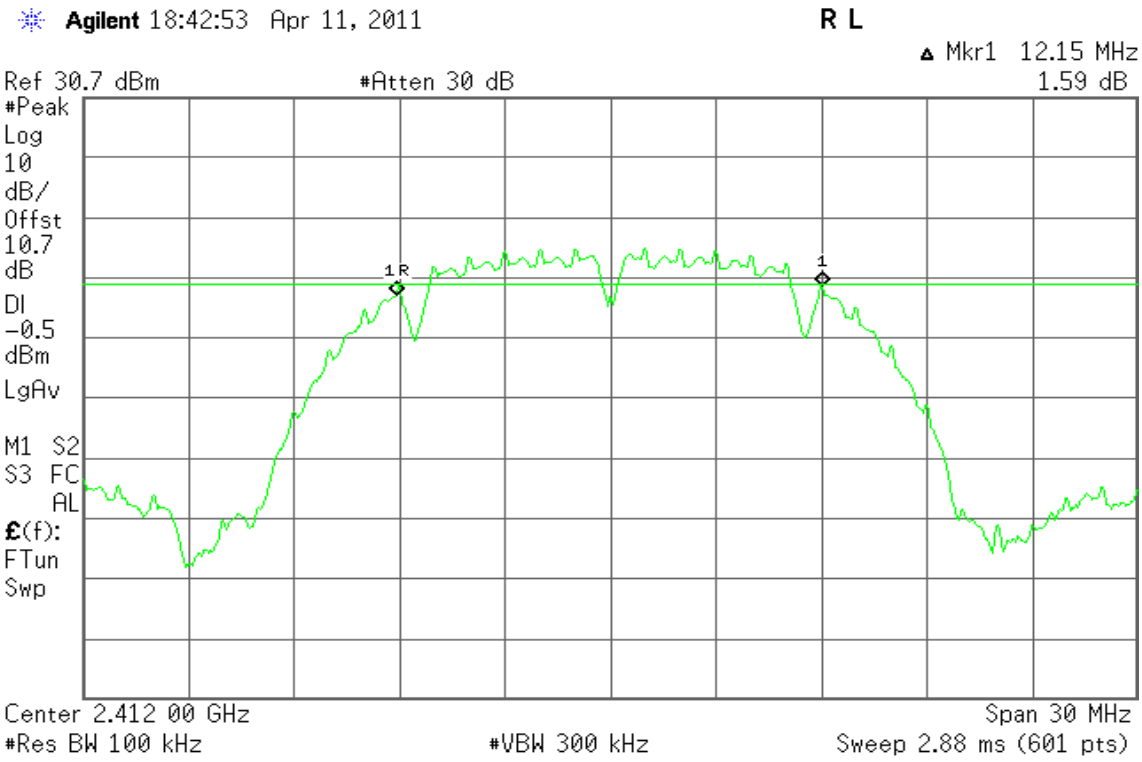
Test mode: draft 802.11n 40 MHz Channel mode

Channel	Frequency (MHz)	Bandwidth (MHz)		Limit (kHz)	Result
		Chain 0	Chain 1		
Low	2422	36.330	36.500	>500	PASS
Mid	2437	36.500	36.420		PASS
High	2452	36.420	36.420		PASS

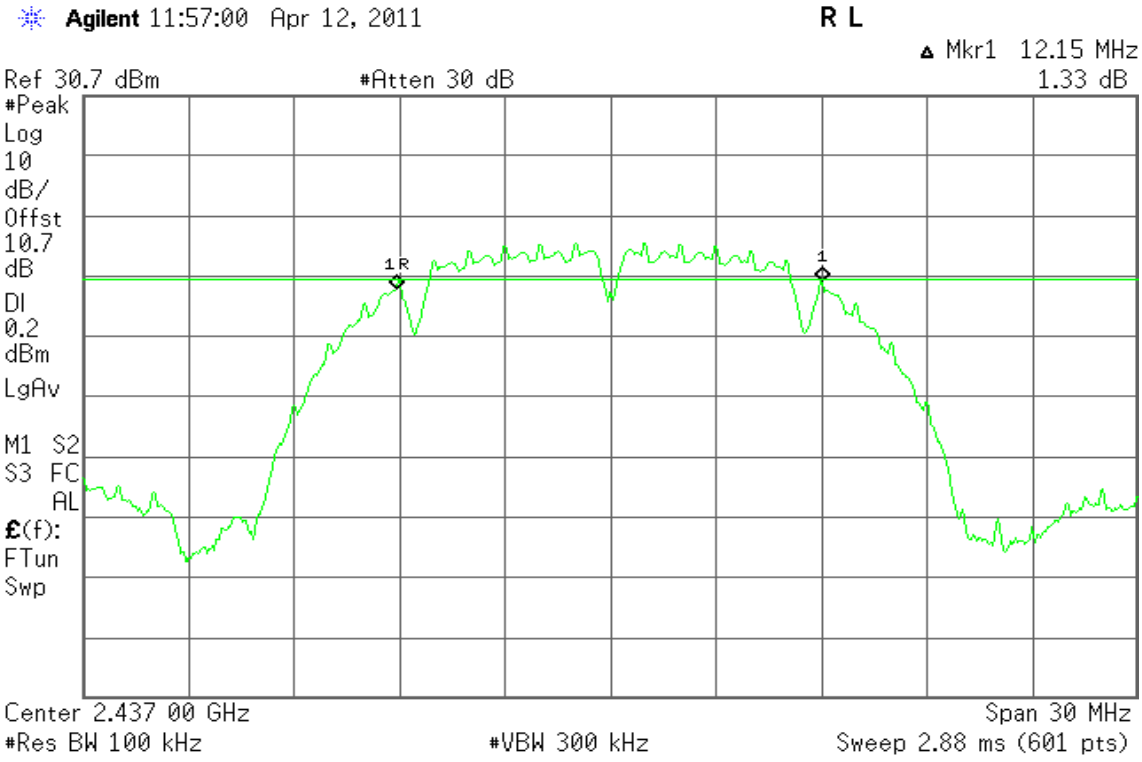
Test Plot

IEEE 802.11b mode

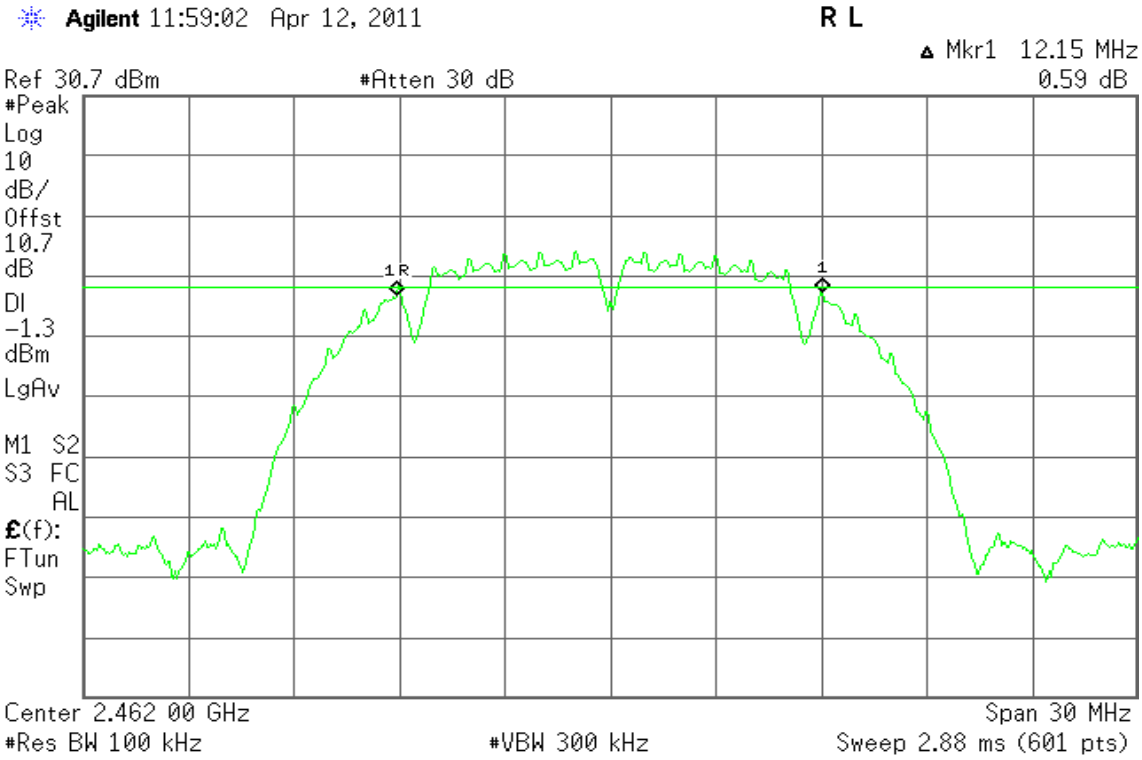
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

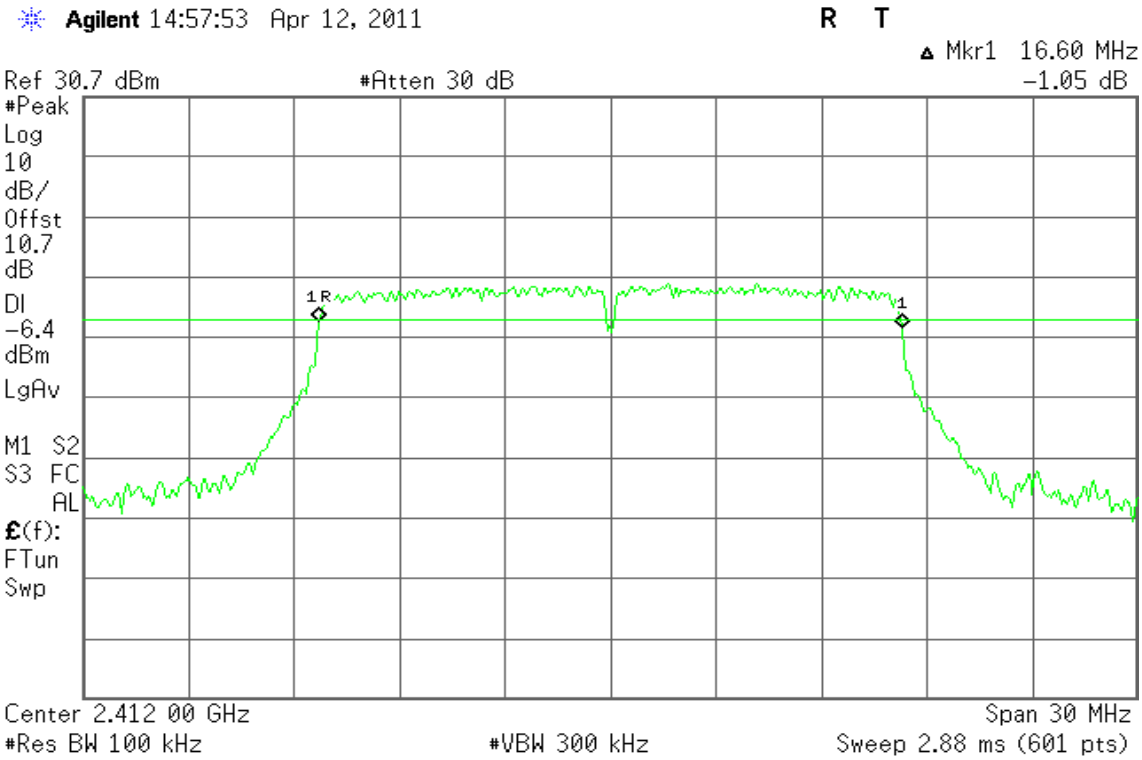


6dB Bandwidth (CH High)

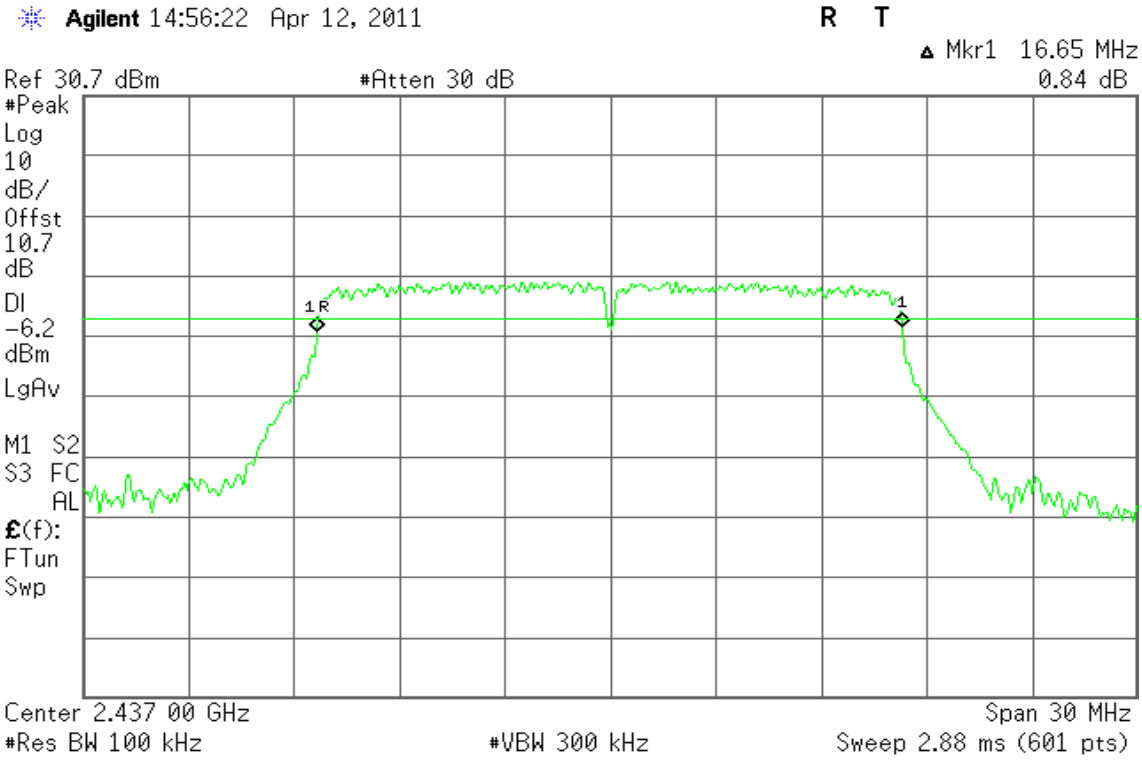


IEEE 802.11g mode

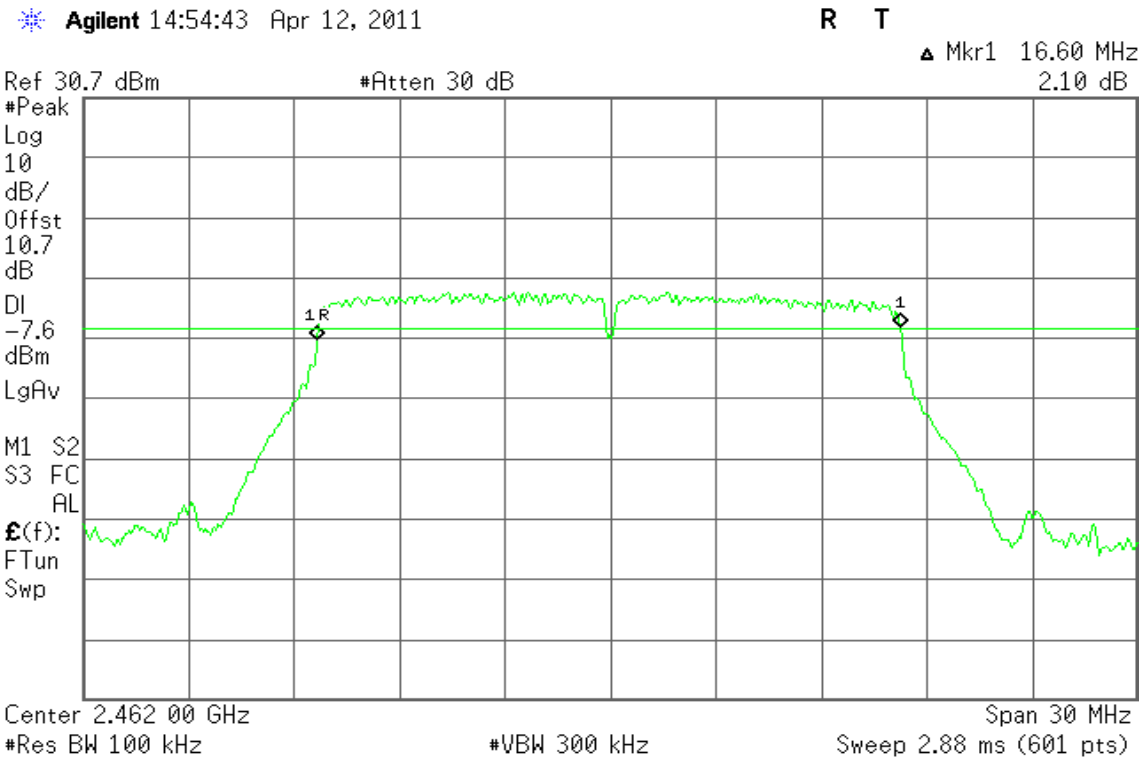
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

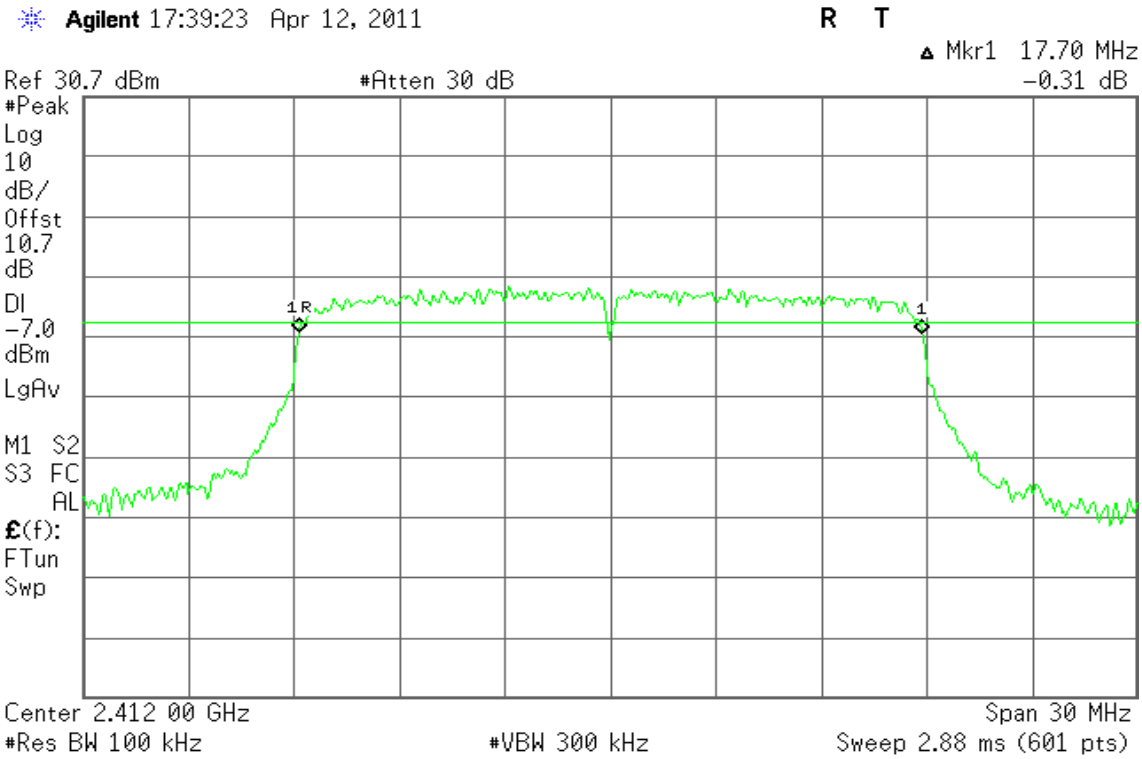


6dB Bandwidth (CH High)

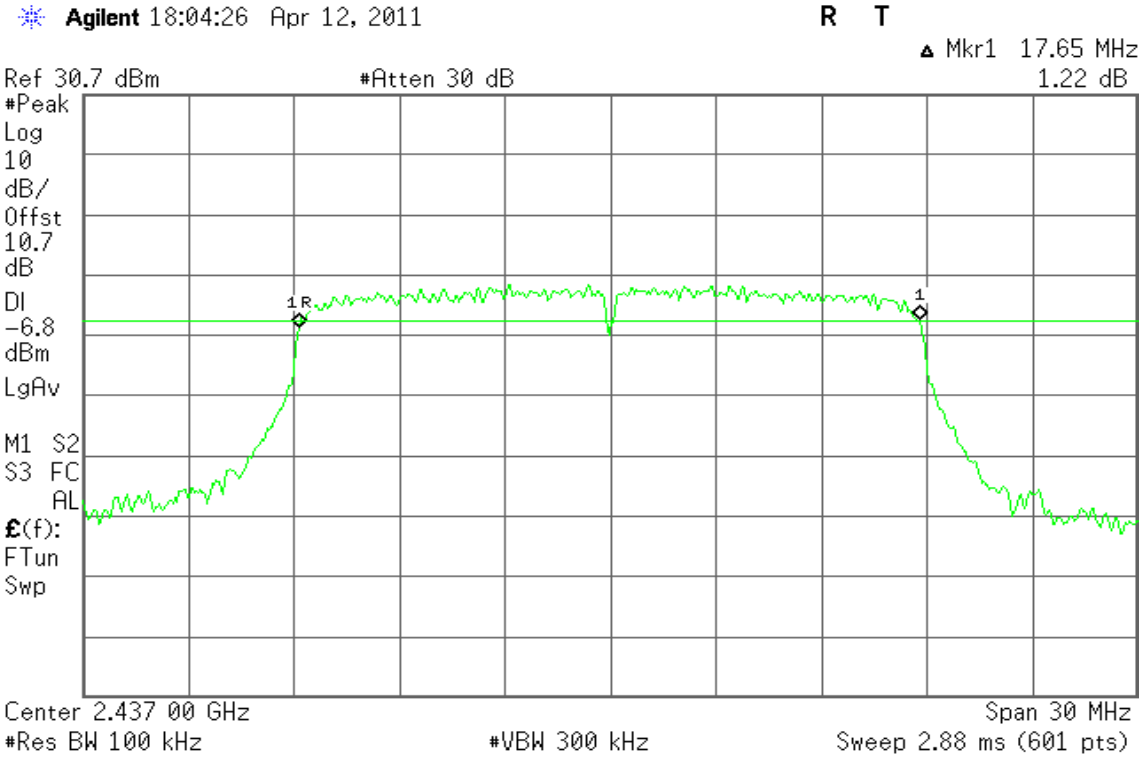


draft 802.11n 20 MHz Channel mode / Chain 0

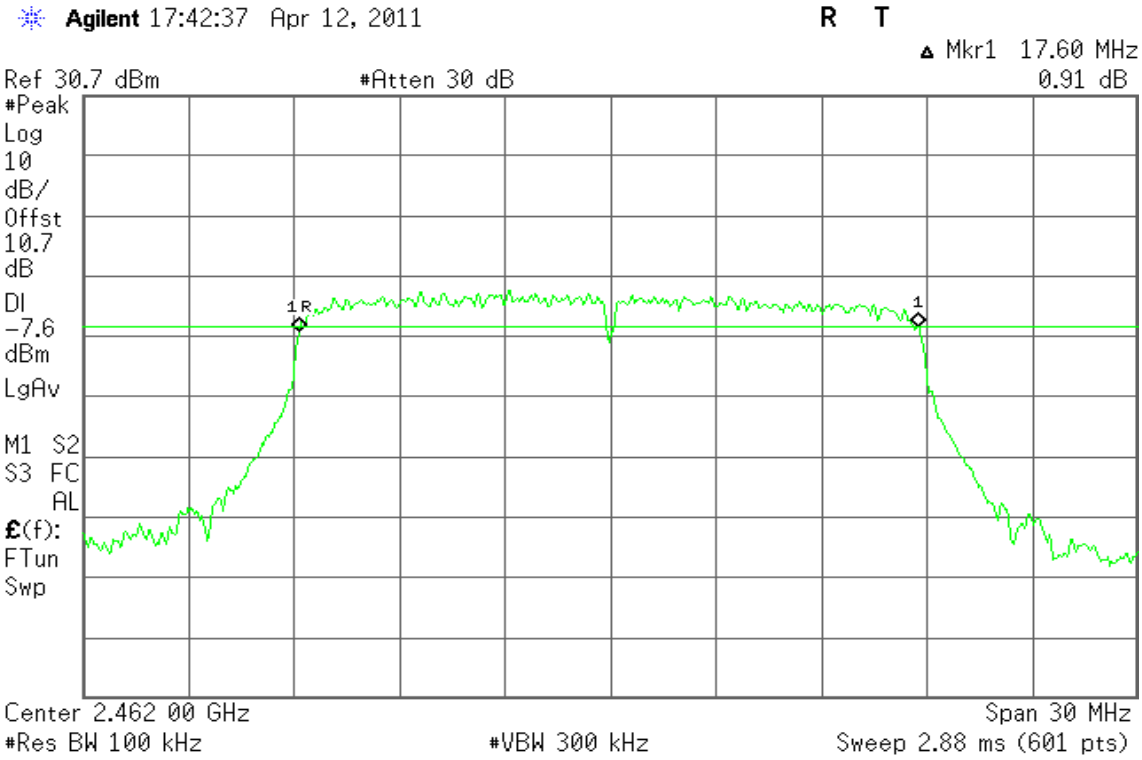
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

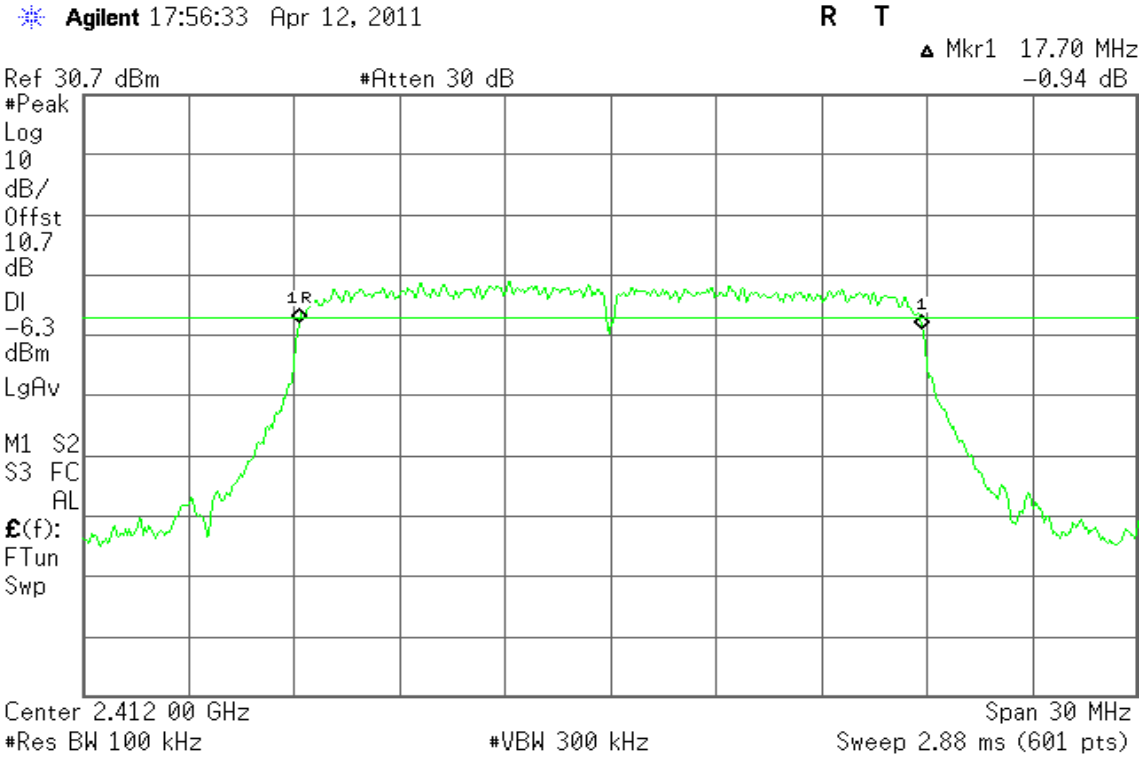


6dB Bandwidth (CH High)

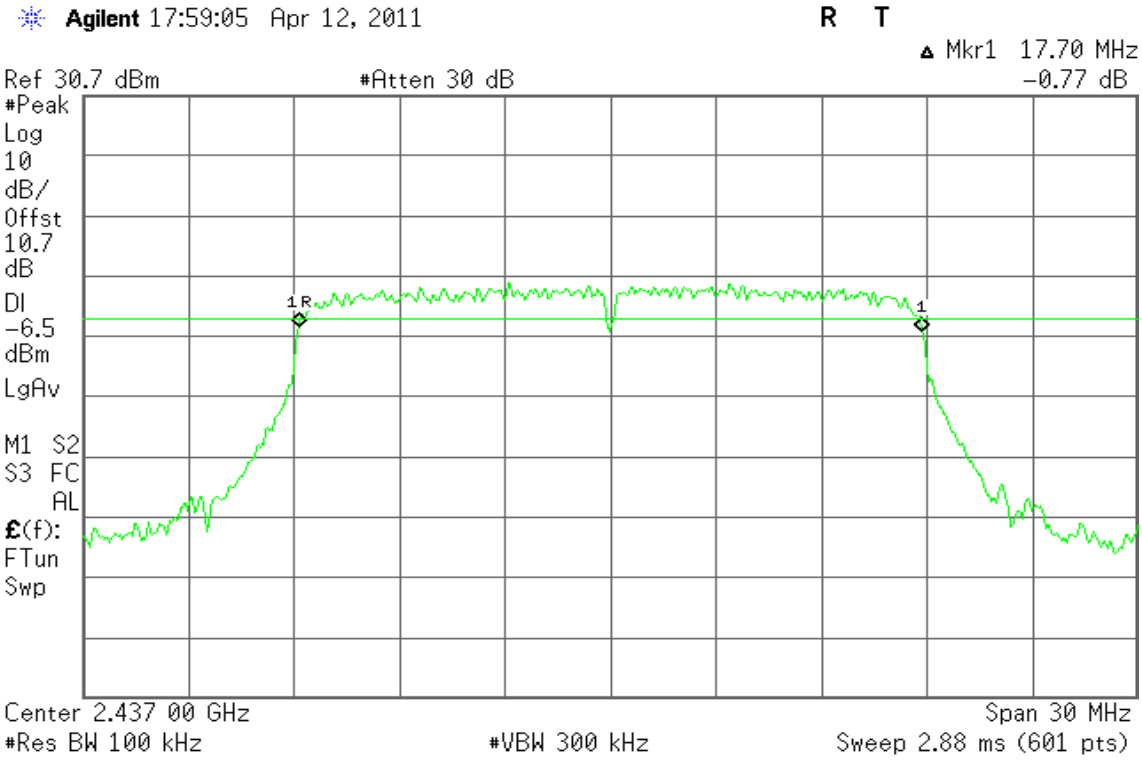


draft 802.11n 20 MHz Channel mode / Chain 1

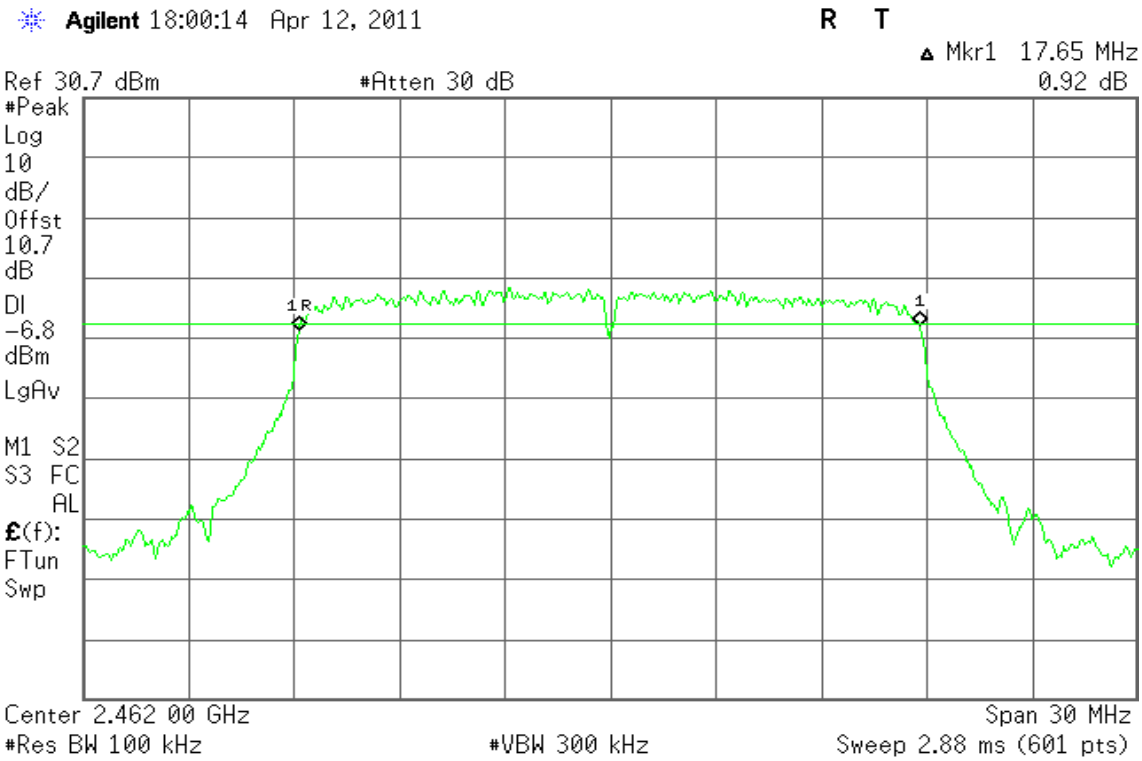
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

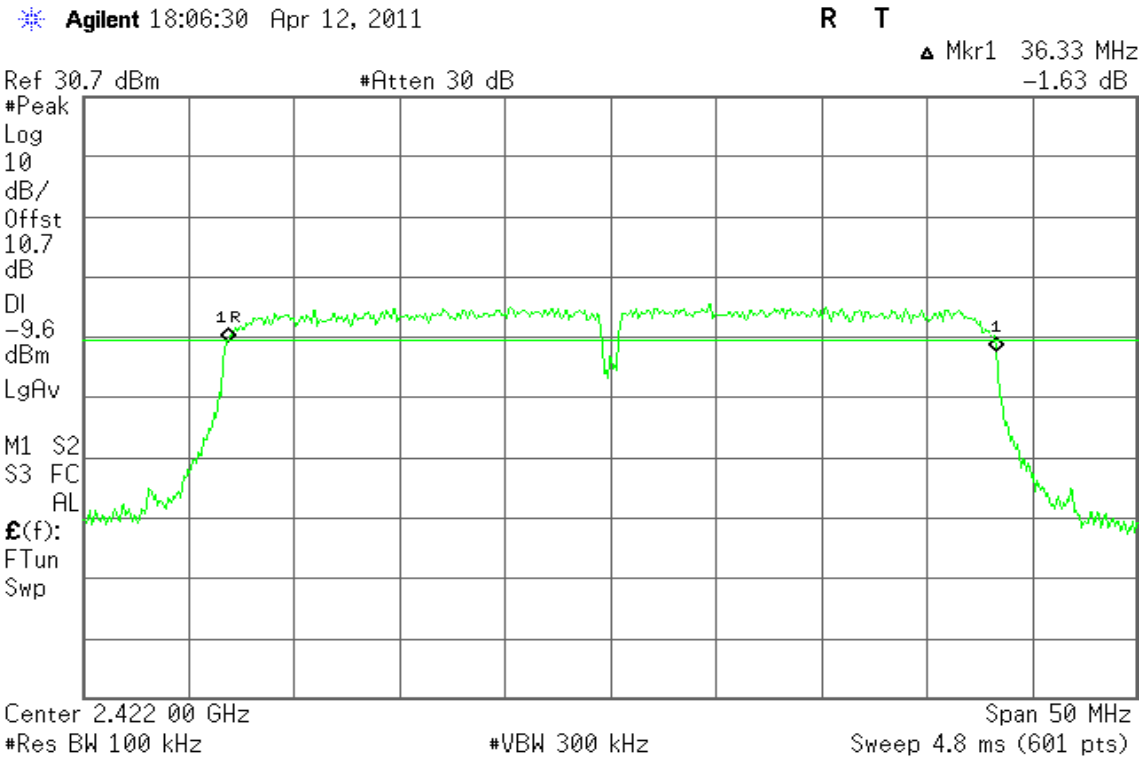


6dB Bandwidth (CH High)

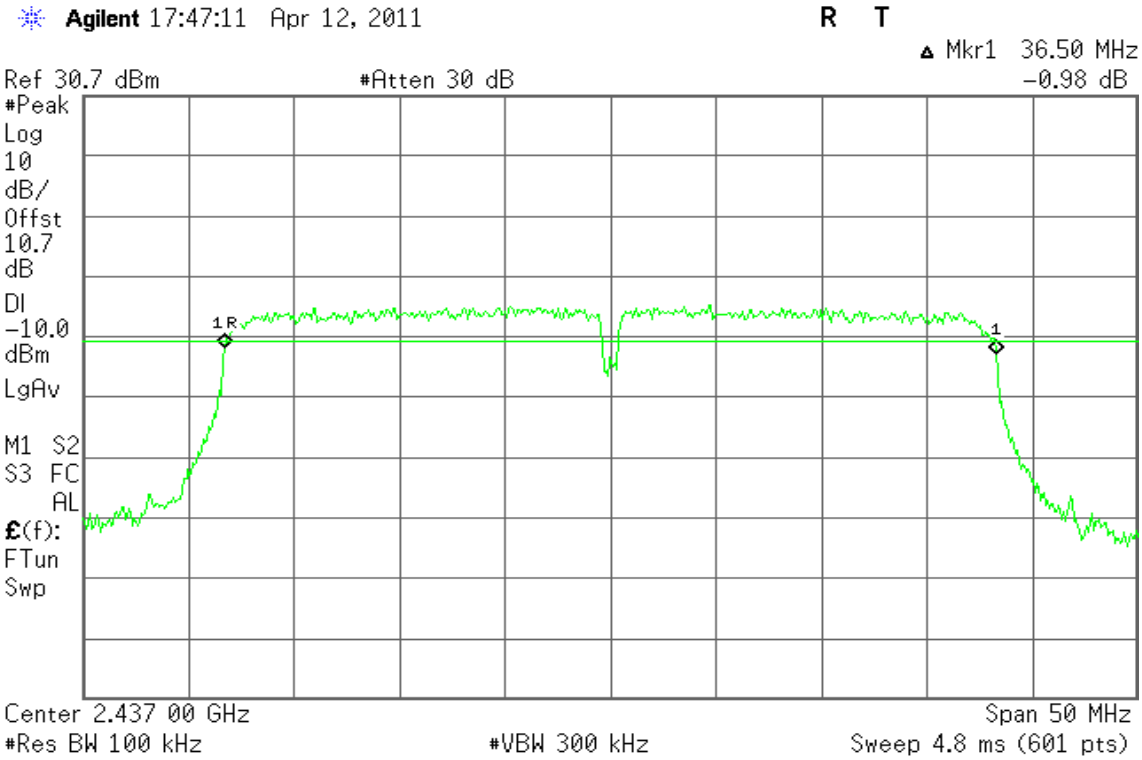


draft 802.11n 40 MHz Channel mode / Chain 0

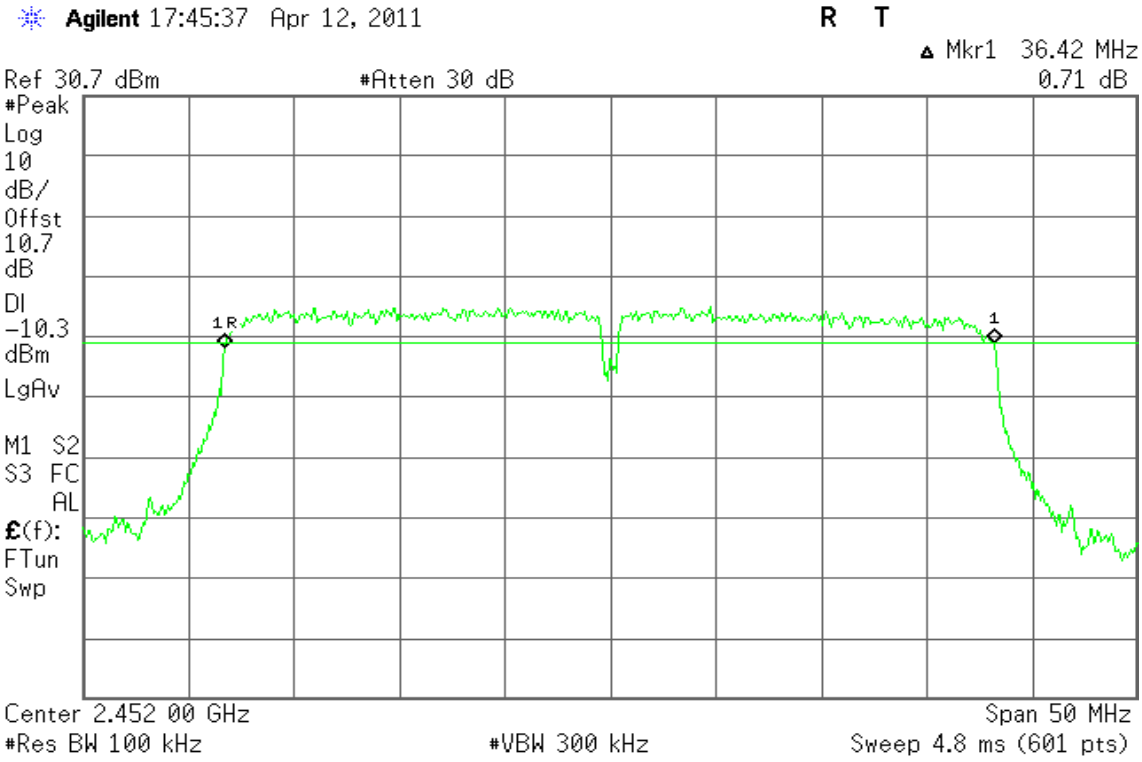
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

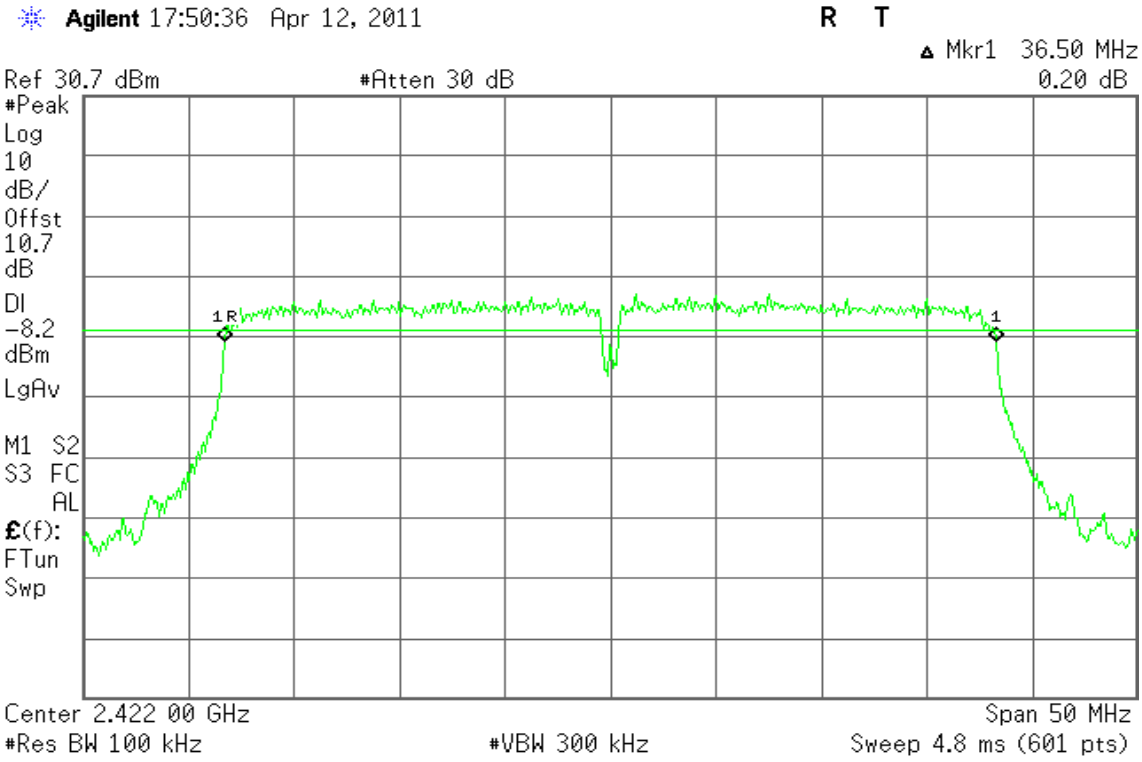


6dB Bandwidth (CH High)

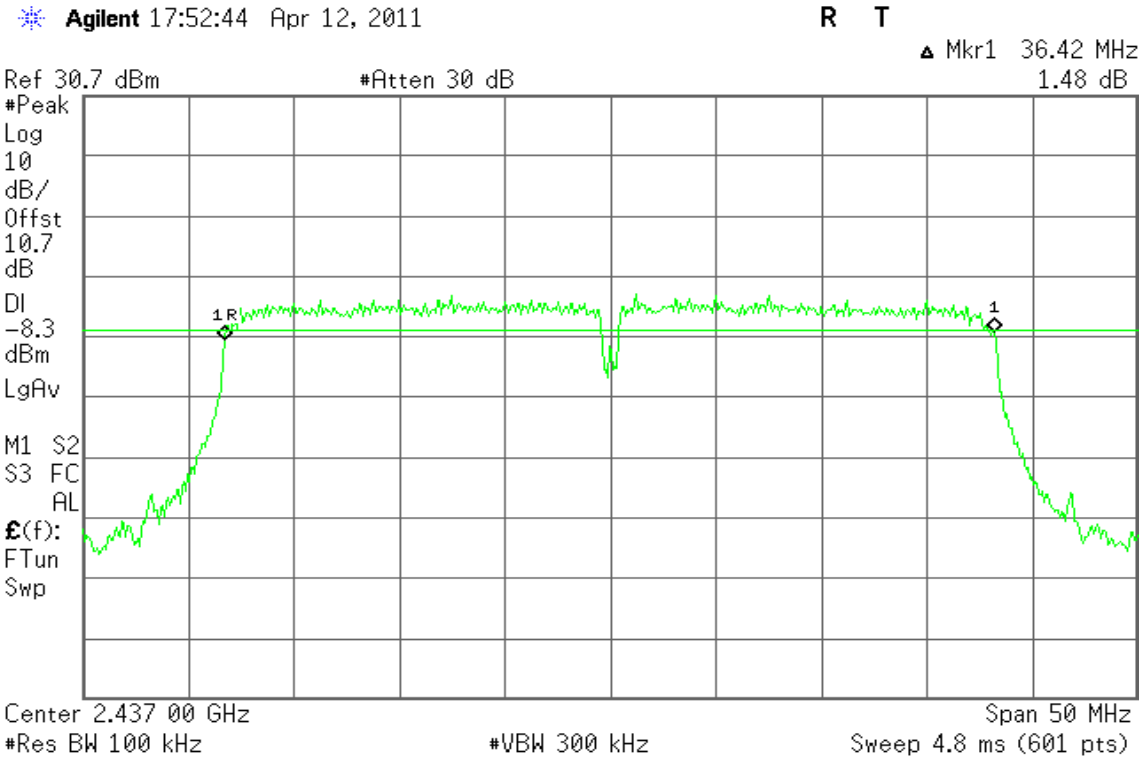


draft 802.11n 40 MHz Channel mode / Chain 1

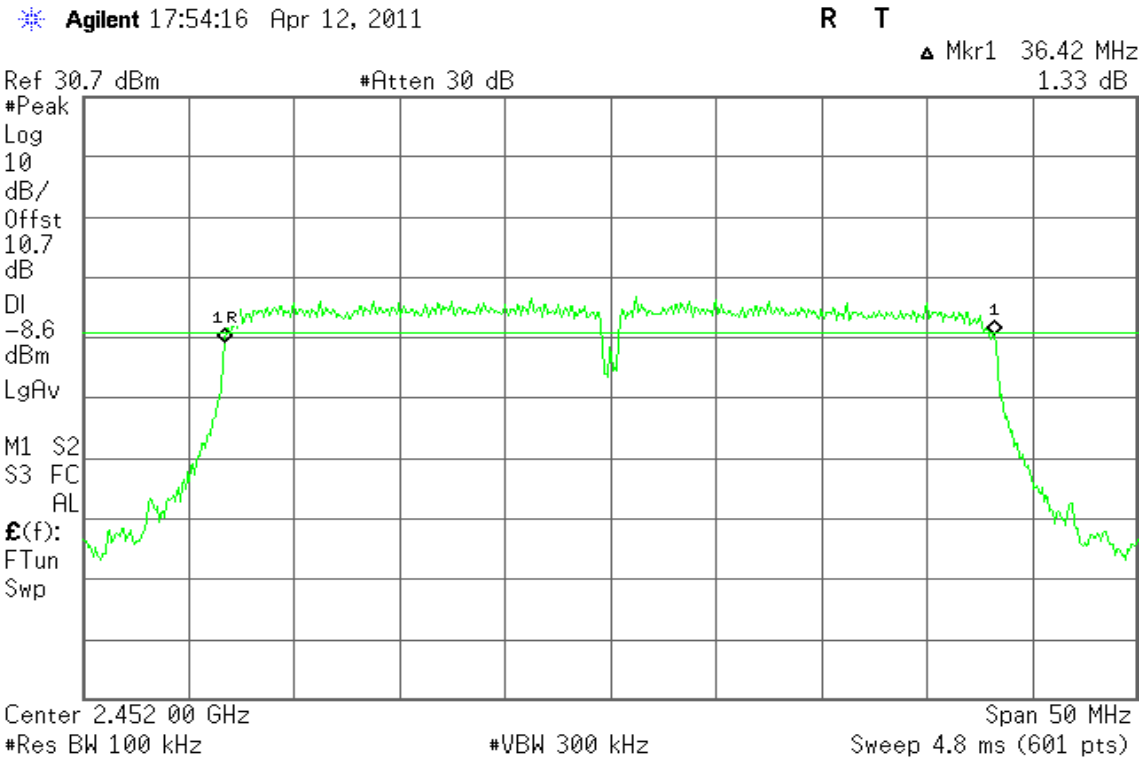
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



6dB Bandwidth (CH High)



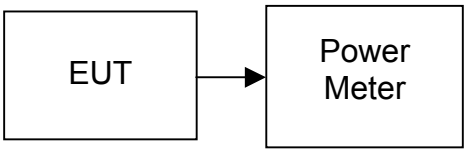
7.2 PEAK POWER

LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to §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.

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

TEST RESULTS

No non-compliance noted

TEST DATA

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	20.05	0.1012	1.00	PASS
Mid	2437	20.02	0.1005		PASS
High	2462	18.09	0.0644		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	24.45	0.2786	1.00	PASS
Mid	2437	24.09	0.2564		PASS
High	2462	22.86	0.1932		PASS

Test mode: draft 802.11n 20 MHz Channel mode

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)			Limit (W)	Result
		Chain 0	Chain 1	Combination	Chain 0	Chain 1	Combination		
Low	2412	22.89	22.92	25.92	0.1945	0.1959	0.3904	1.00	PASS
Mid	2437	22.97	22.61	25.80	0.1982	0.1824	0.3805		PASS
High	2462	21.86	22.59	25.25	0.1535	0.1816	0.3350		PASS

Test mode: draft 802.11n 40 MHz Channel mode

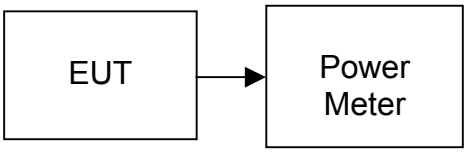
Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)			Limit (W)	Result
		Chain 0	Chain 1	Combination	Chain 0	Chain 1	Combination		
Low	2422	22.63	0.1663	25.44	0.1832	0.1722	0.3496	1.00	PASS
Mid	2437	22.72	0.1667	25.49	0.1871	0.1778	0.3540		PASS
High	2452	21.62	0.1611	24.86	0.1452	0.1730	0.3063		PASS

7.3 AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the average power detection.

TEST RESULTS

No non-compliance noted

TEST DATA

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	17.56	0.0570
Mid	2437	17.64	0.0581
High	2462	15.59	0.0362

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	14.29	0.0269
Mid	2437	14.28	0.0268
High	2462	13.25	0.0211

Test mode: draft 802.11n 20 MHz Channel mode

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)		
		Chain 0	Chain 1	Combination	Chain 0	Chain 1	Combination
Low	2412	13.79	14.18	17.00	0.0239	0.0262	0.0501
Mid	2437	13.85	14.39	17.14	0.0243	0.0275	0.0517
High	2462	12.84	13.03	15.95	0.0192	0.0201	0.0393

Test mode: draft 802.11n 40 MHz Channel mode

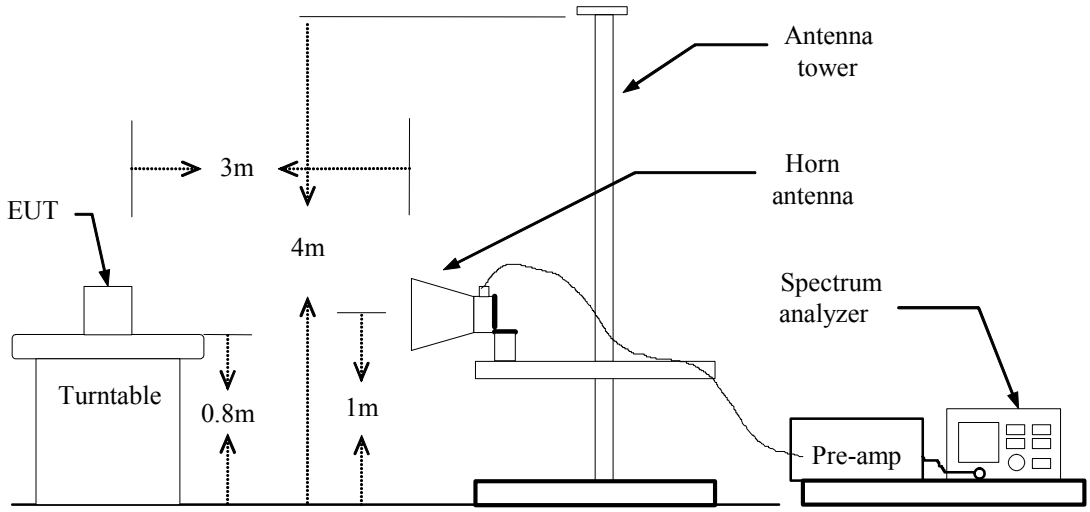
Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)		
		Chain 0	Chain 1	Combination	Chain 0	Chain 1	Combination
Low	2422	13.76	14.33	17.06	0.0238	0.0271	0.0509
Mid	2437	13.71	14.21	16.98	0.0235	0.0264	0.0499
High	2452	12.49	14.02	16.33	0.0177	0.0252	0.0430

7.4 BAND EDGES MEASUREMENT

LIMIT

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in 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. 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 Section 15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
   (a) PEAK: RBW=VBW=1MHz / Sweep=100ms
   (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

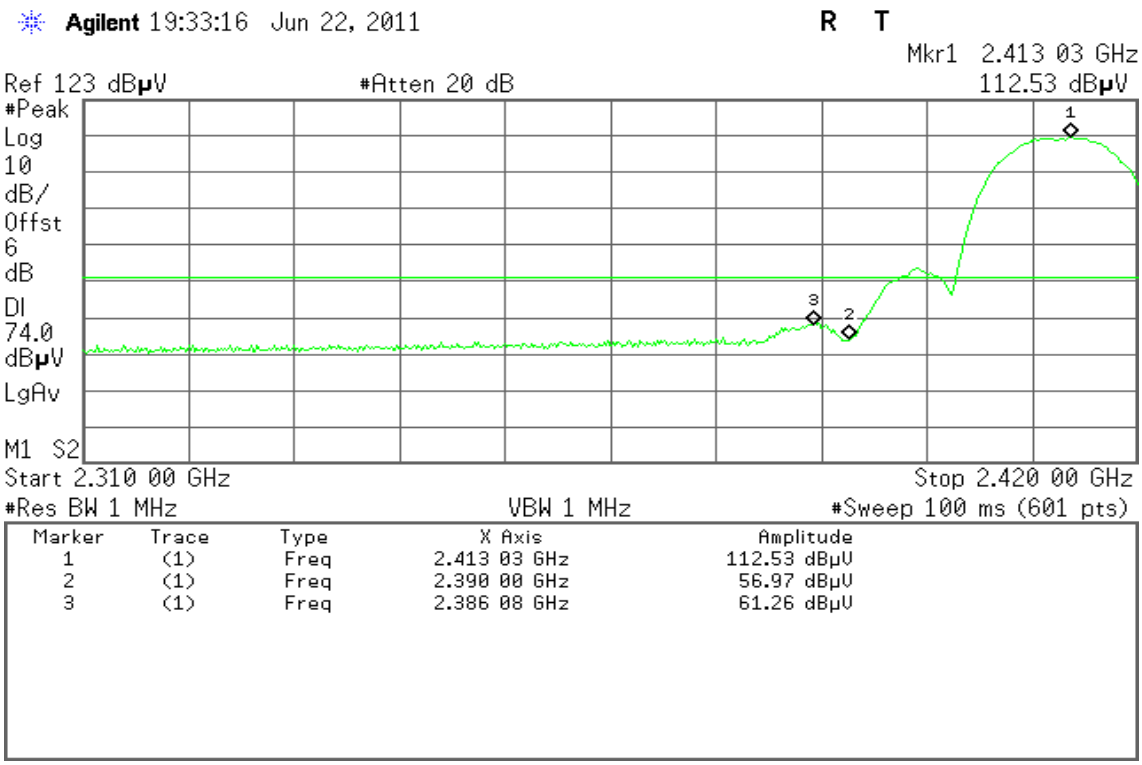
TEST RESULTS

Refer to attach spectrum analyzer data chart.

Test Plot

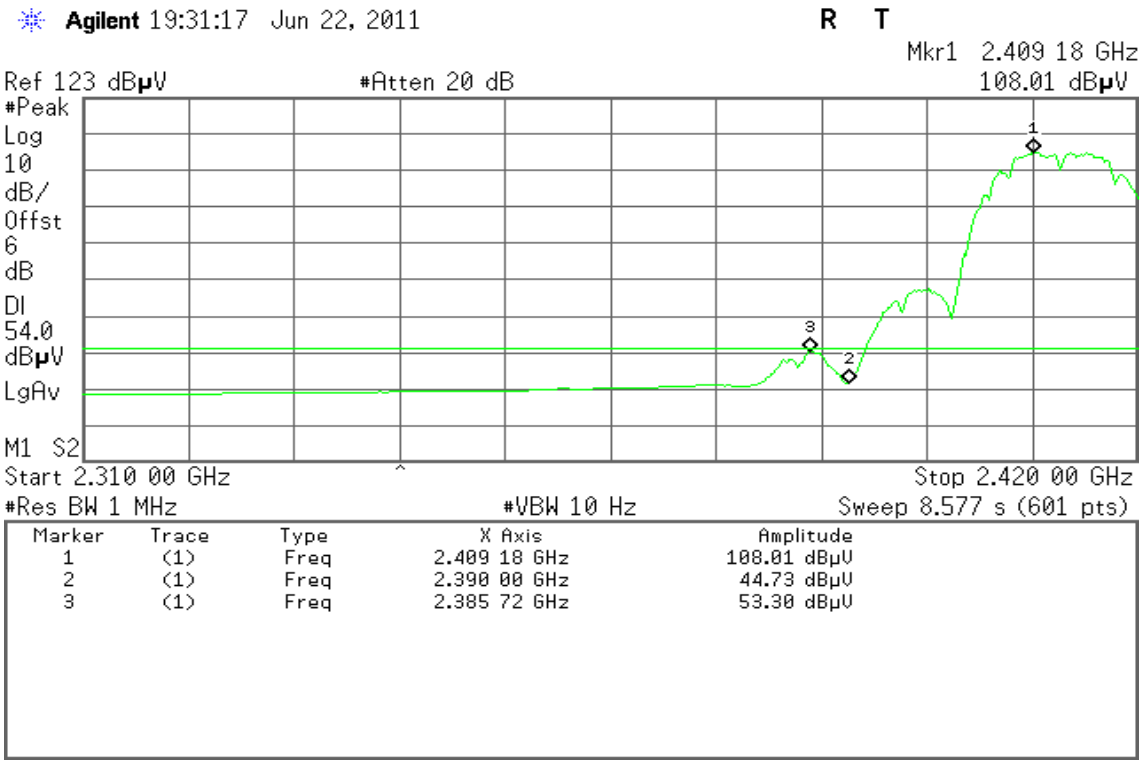
Band Edges (IEEE 802.11b mode / CH Low)

Detector mode: Peak **Polarity: Vertical**



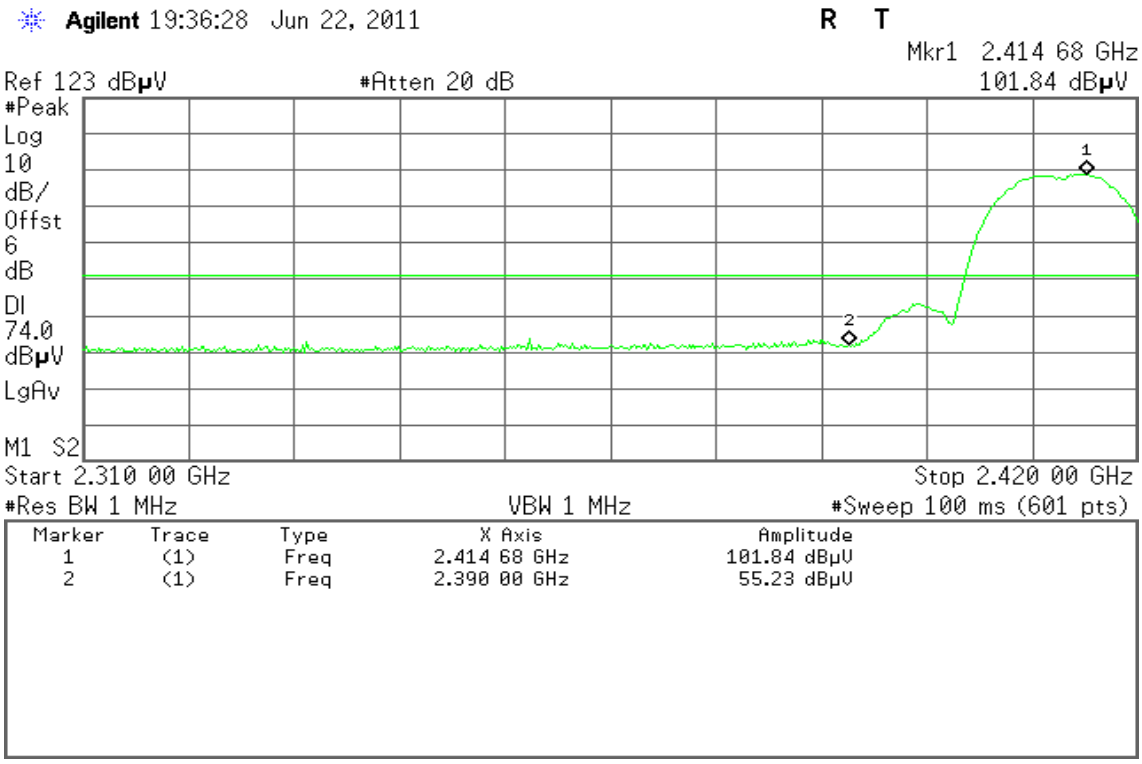
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.413 03 GHz	112.53 dBµV
2	(1)	Freq	2.390 00 GHz	56.97 dBµV
3	(1)	Freq	2.386 08 GHz	61.26 dBµV

Detector mode: Average **Polarity: Vertical**

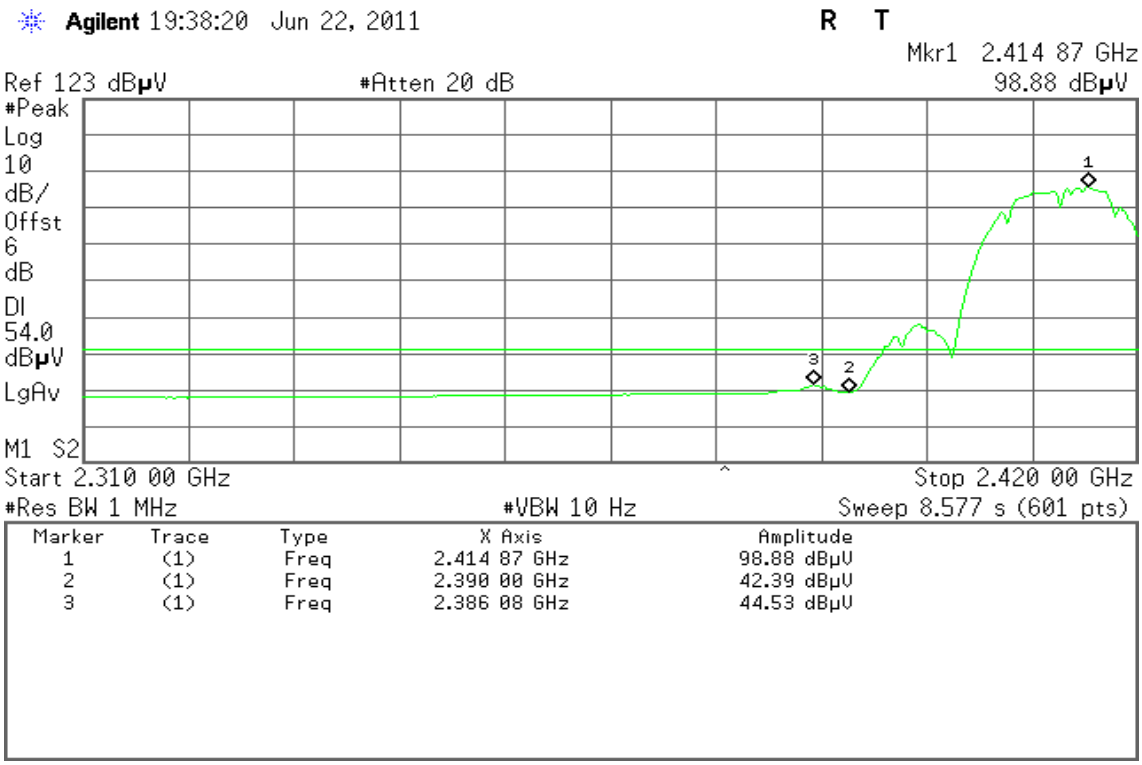


Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.409 18 GHz	108.01 dBµV
2	(1)	Freq	2.390 00 GHz	44.73 dBµV
3	(1)	Freq	2.385 72 GHz	53.30 dBµV

Detector mode: Peak Polarity: Horizontal

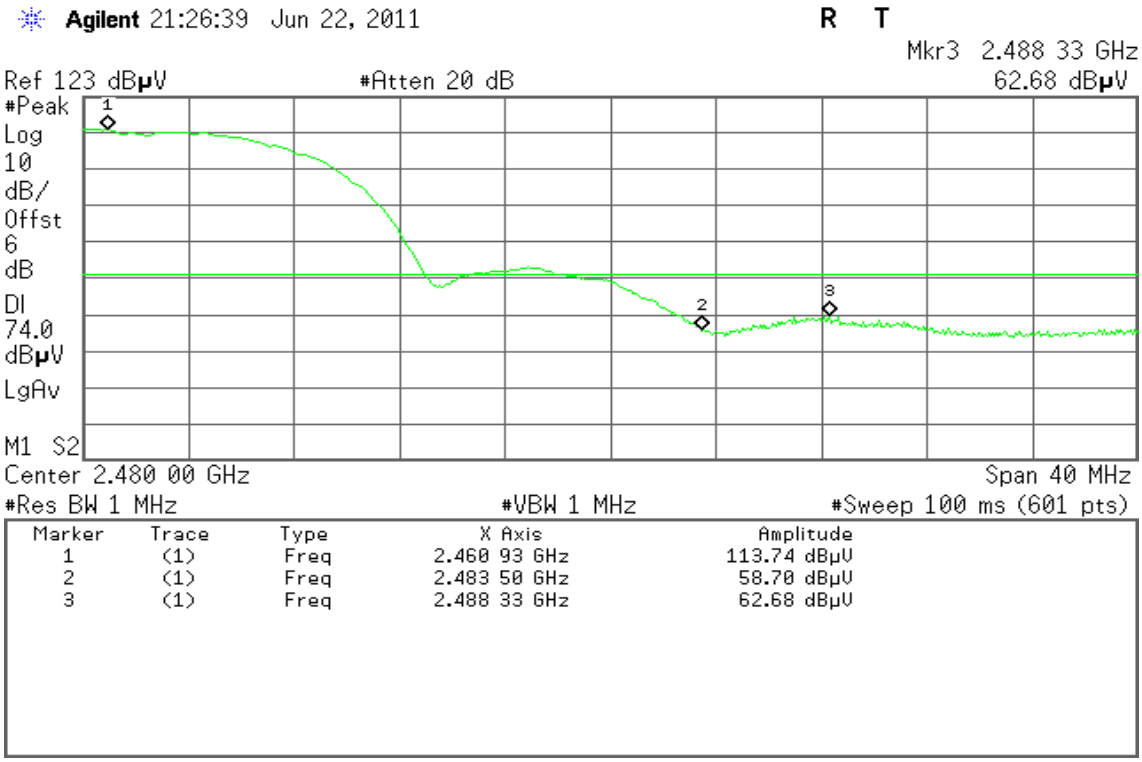


Detector mode: Average Polarity: Horizontal



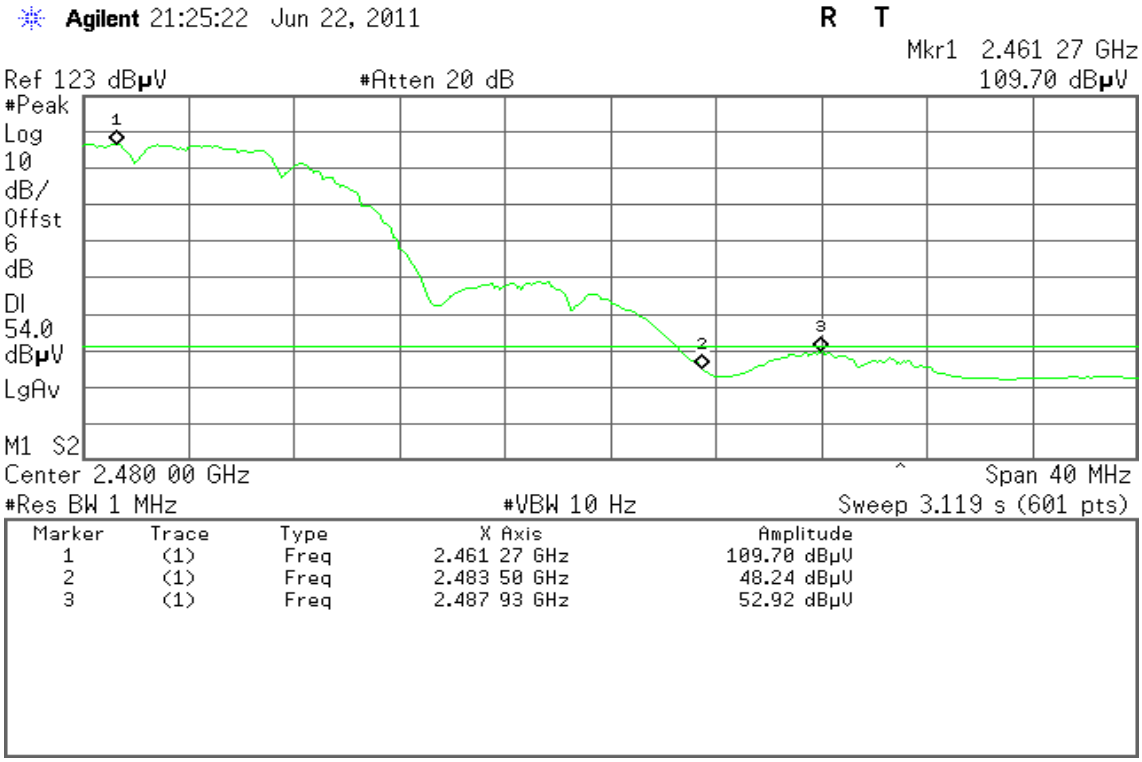
Band Edges (IEEE 802.11b mode / CH High)

Detector mode: Peak Polarity: Vertical



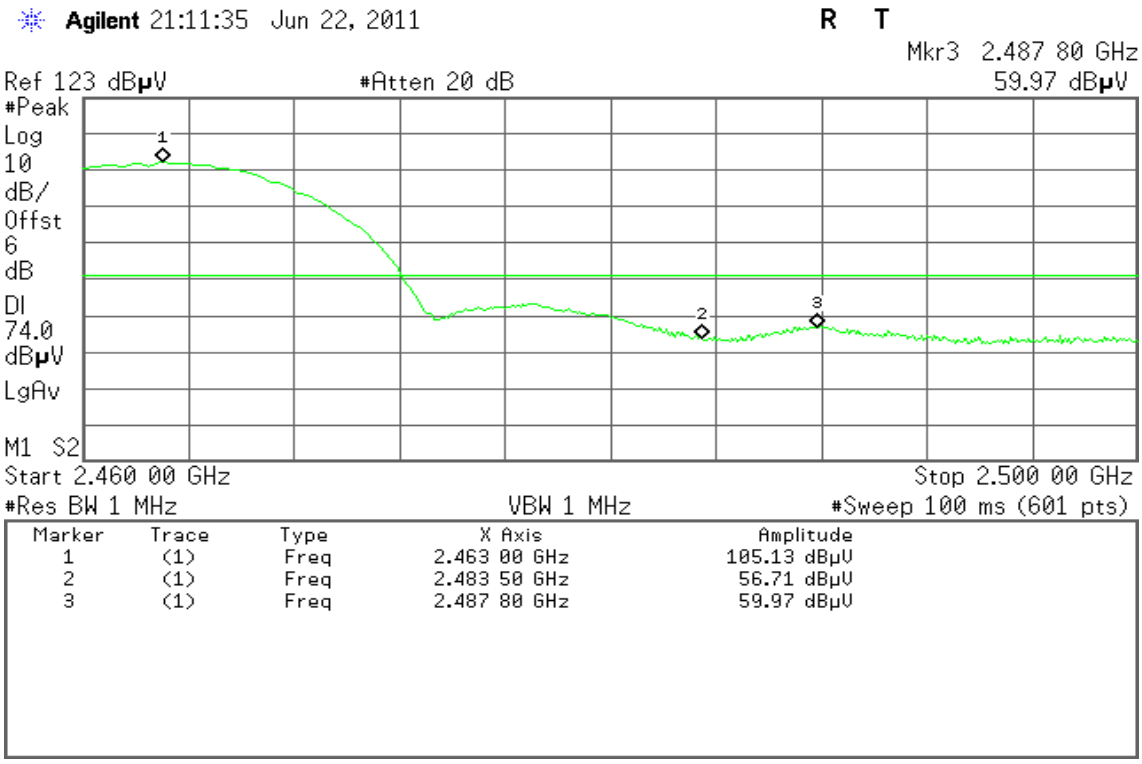
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.460 93 GHz	113.74 dBµV
2	(1)	Freq	2.483 50 GHz	58.70 dBµV
3	(1)	Freq	2.488 33 GHz	62.68 dBµV

Detector mode: Average Polarity: Vertical

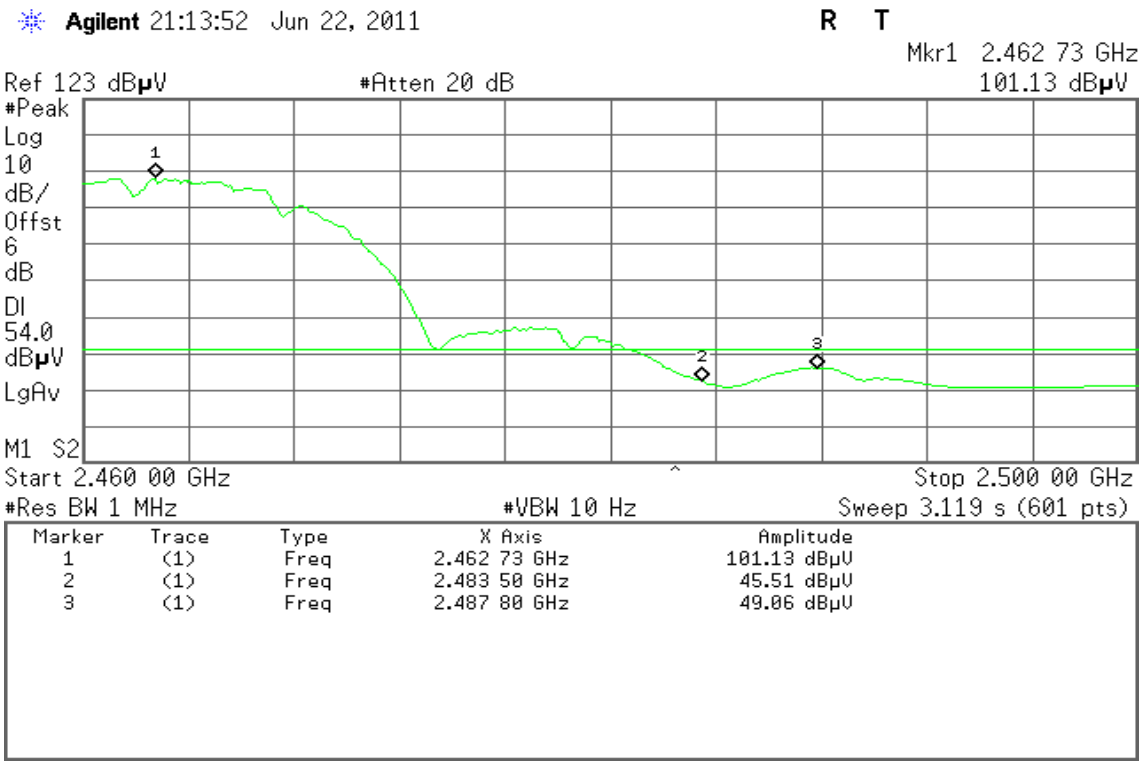


Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.461 27 GHz	109.70 dBµV
2	(1)	Freq	2.483 50 GHz	48.24 dBµV
3	(1)	Freq	2.487 93 GHz	52.92 dBµV

Detector mode: Peak Polarity: Horizontal

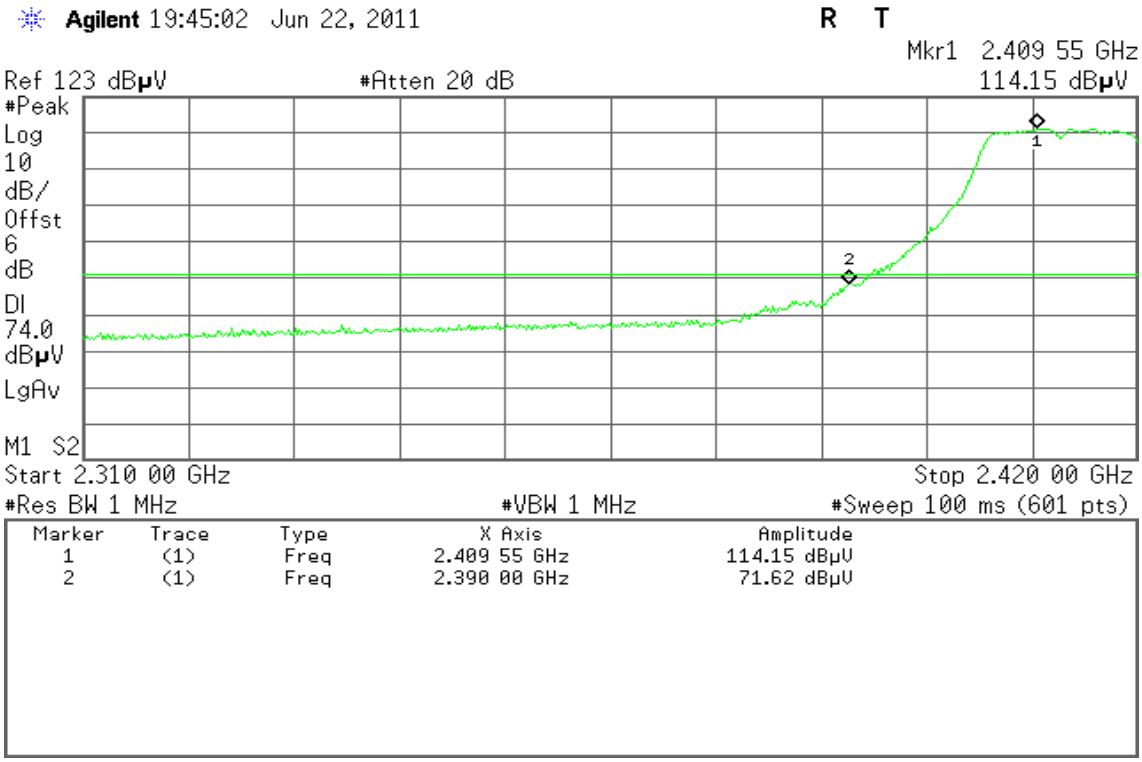


Detector mode: Average Polarity: Horizontal

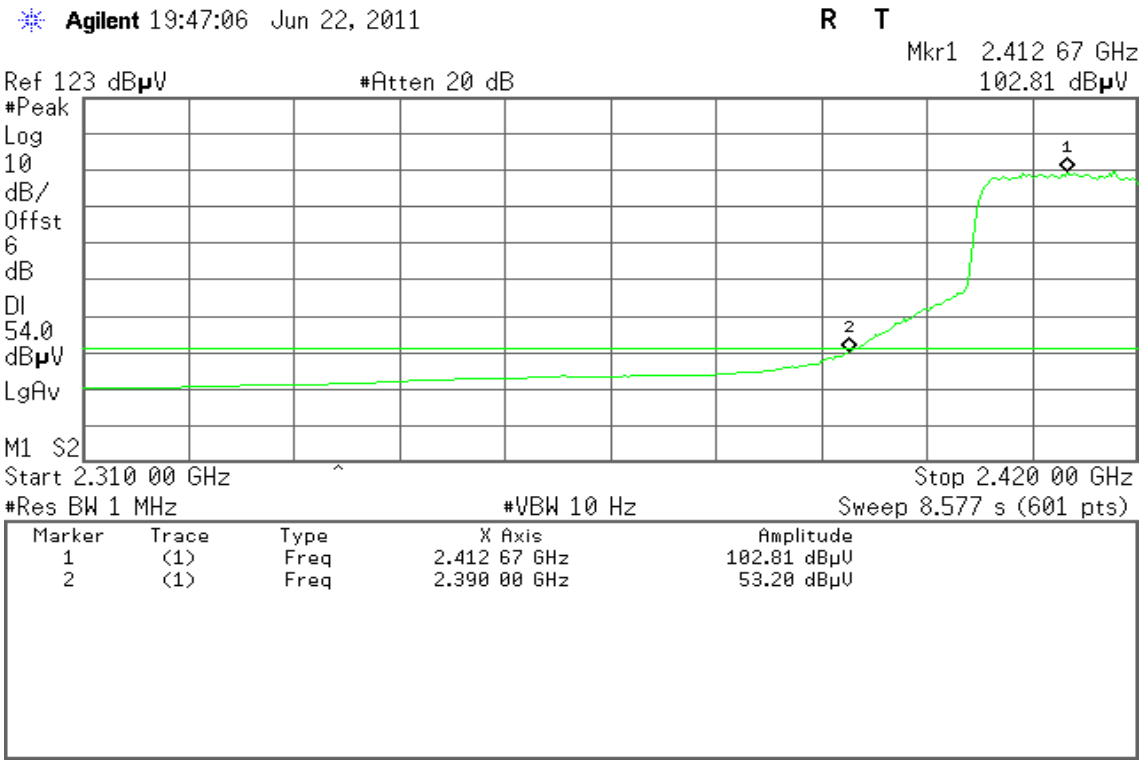


Band Edges (IEEE 802.11g mode / CH Low)

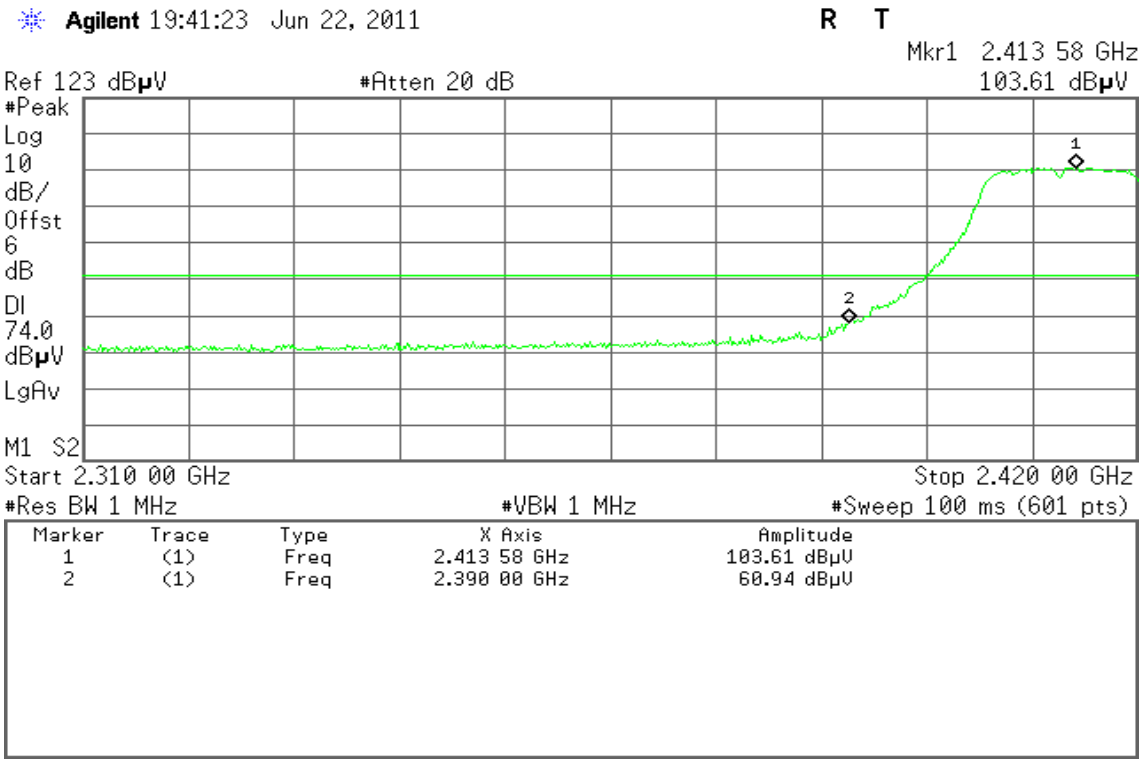
Detector mode: Peak Polarity: Vertical



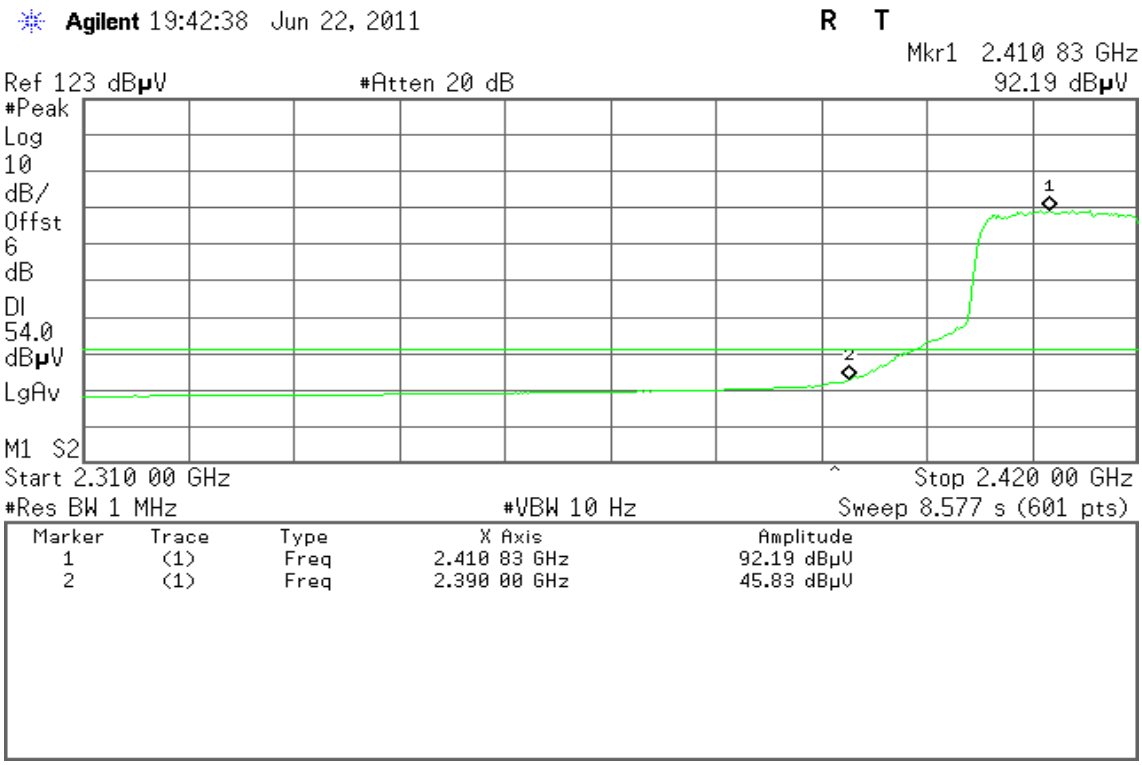
Detector mode: Average Polarity: Vertical



Detector mode: Peak Polarity: Horizontal

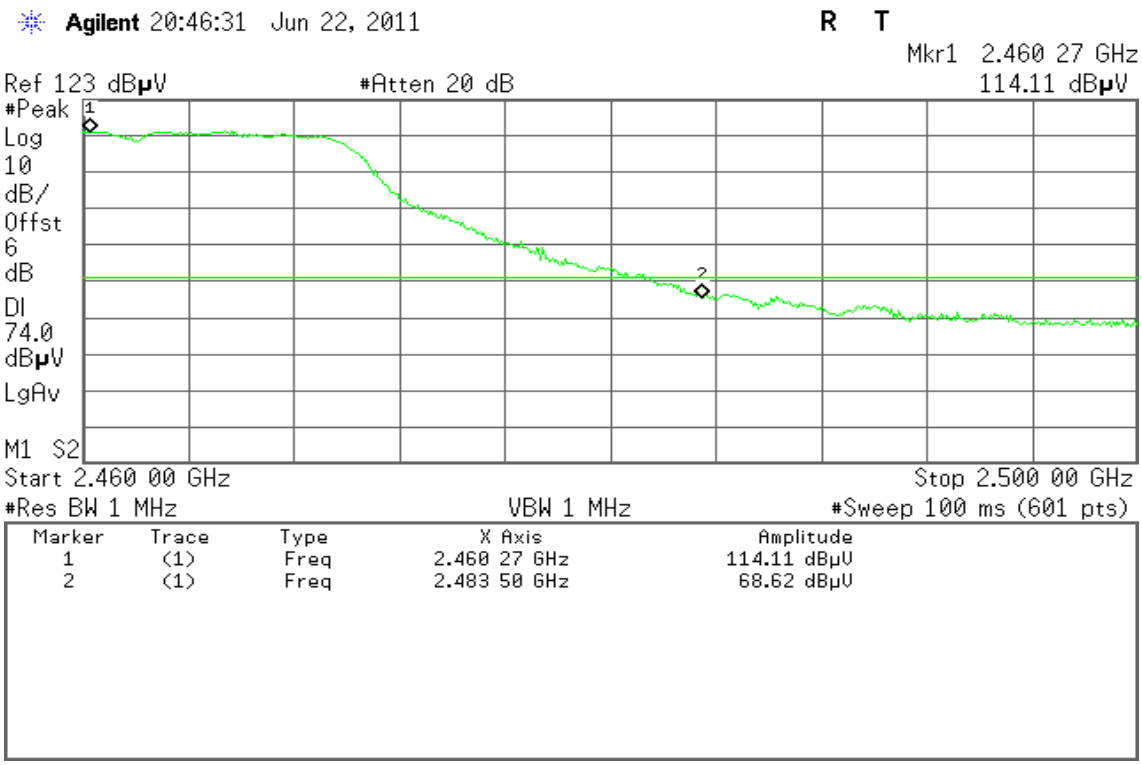


Detector mode: Average Polarity: Horizontal

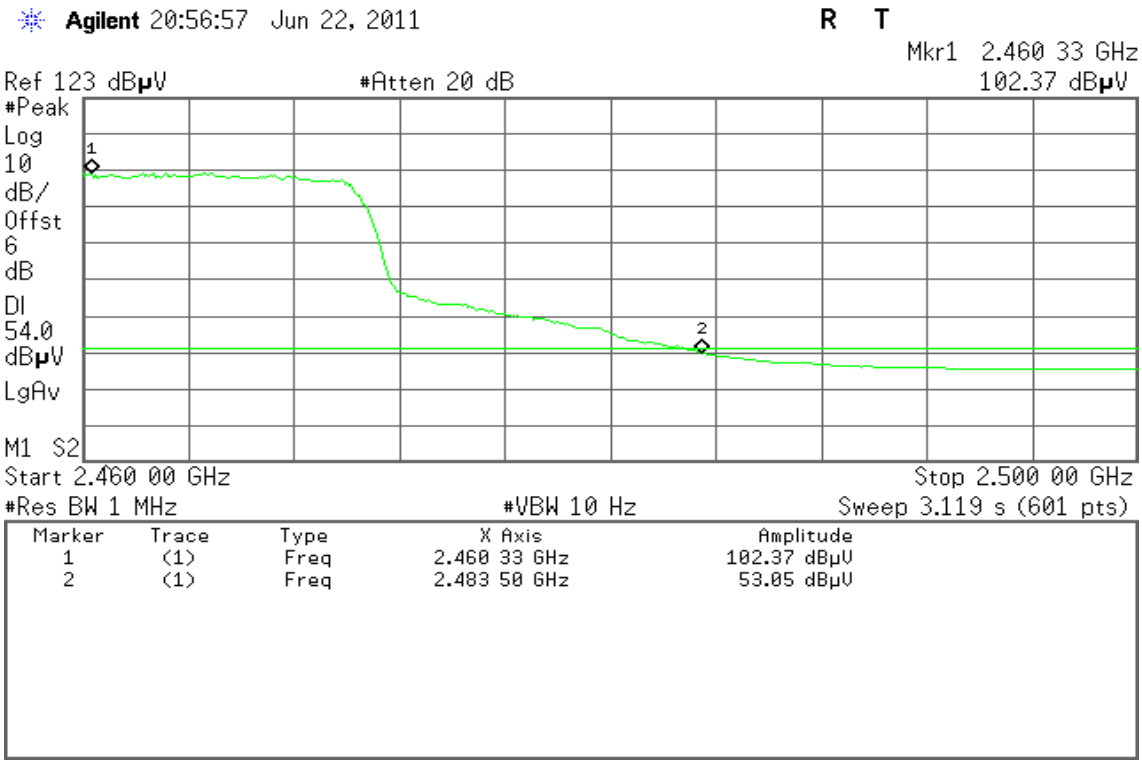


Band Edges (IEEE 802.11g mode / CH High)

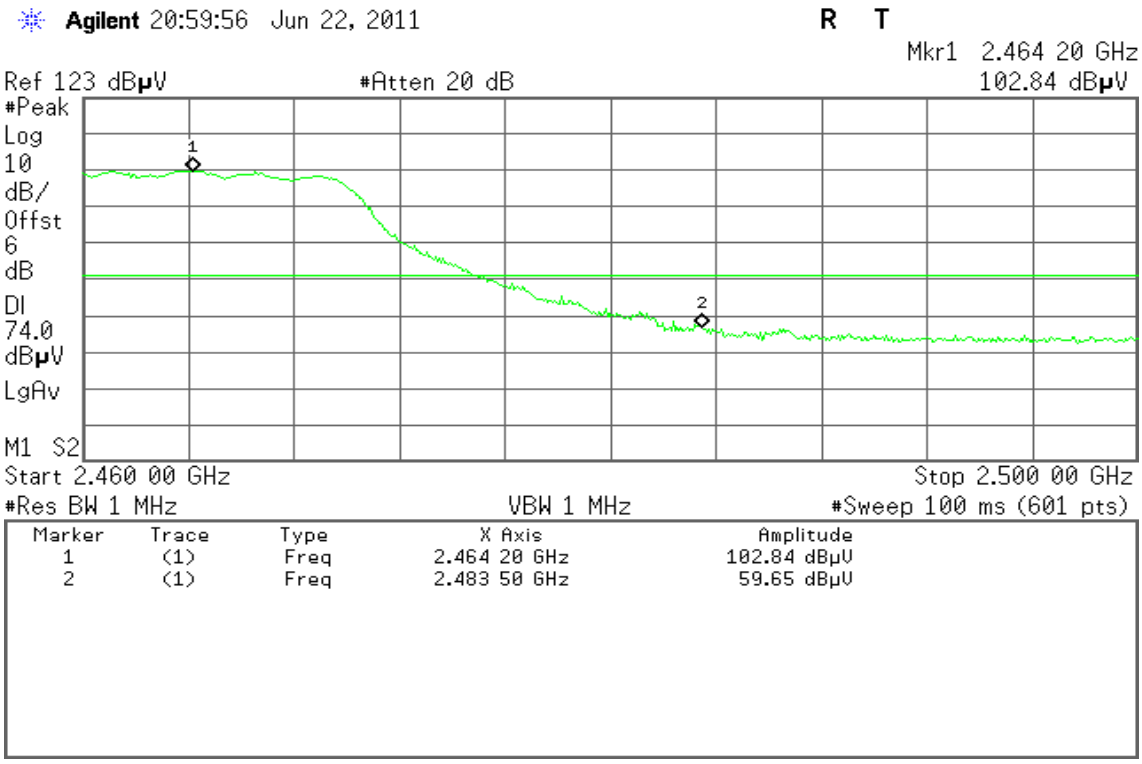
Detector mode: Peak Polarity: Vertical



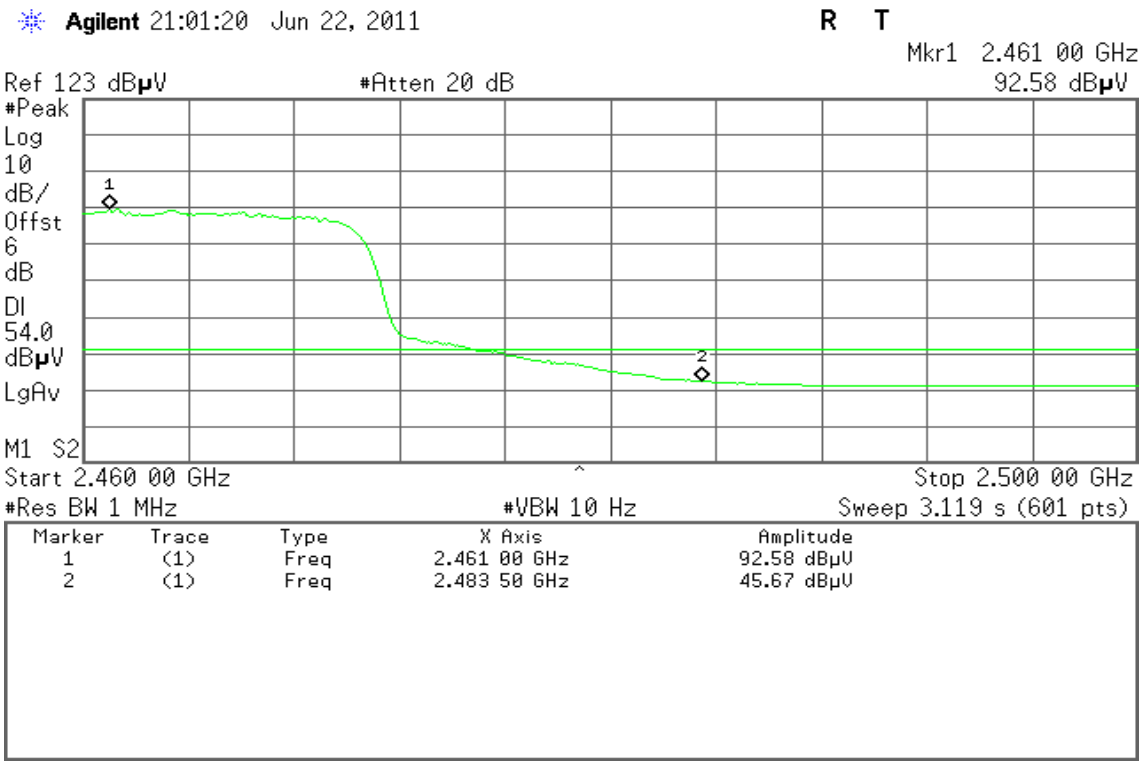
Detector mode: Average Polarity: Vertical



Detector mode: Peak Polarity: Horizontal

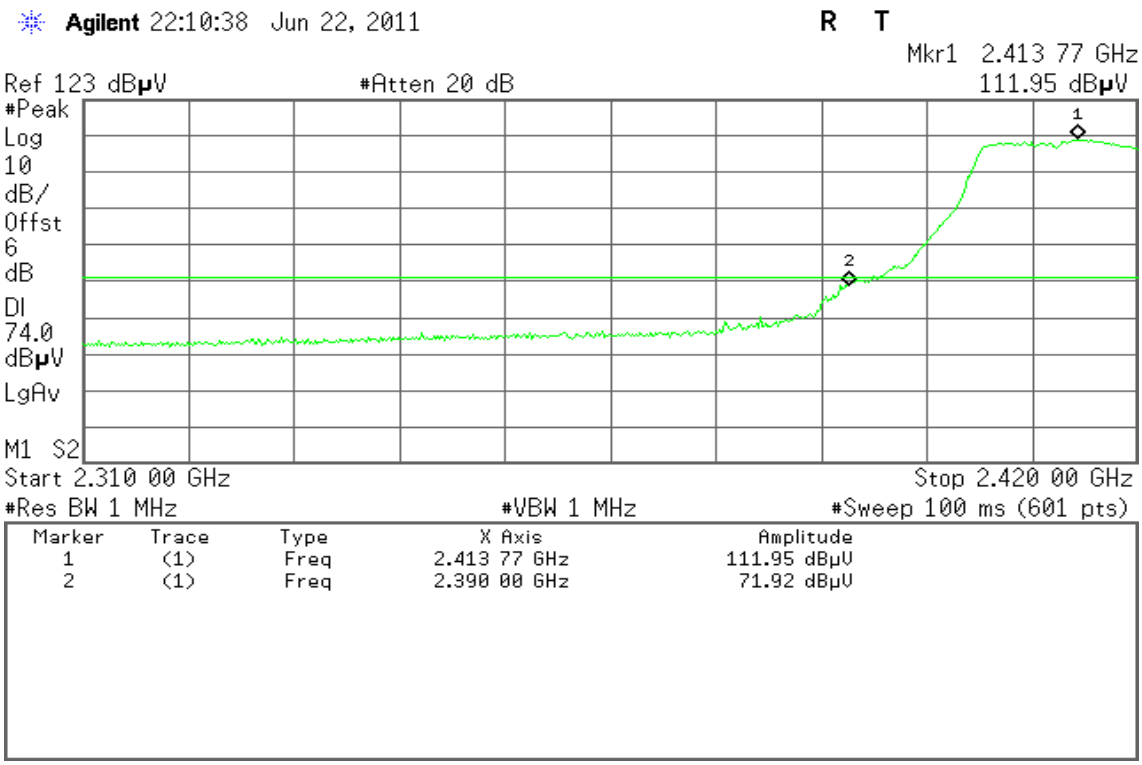


Detector mode: Average Polarity: Horizontal

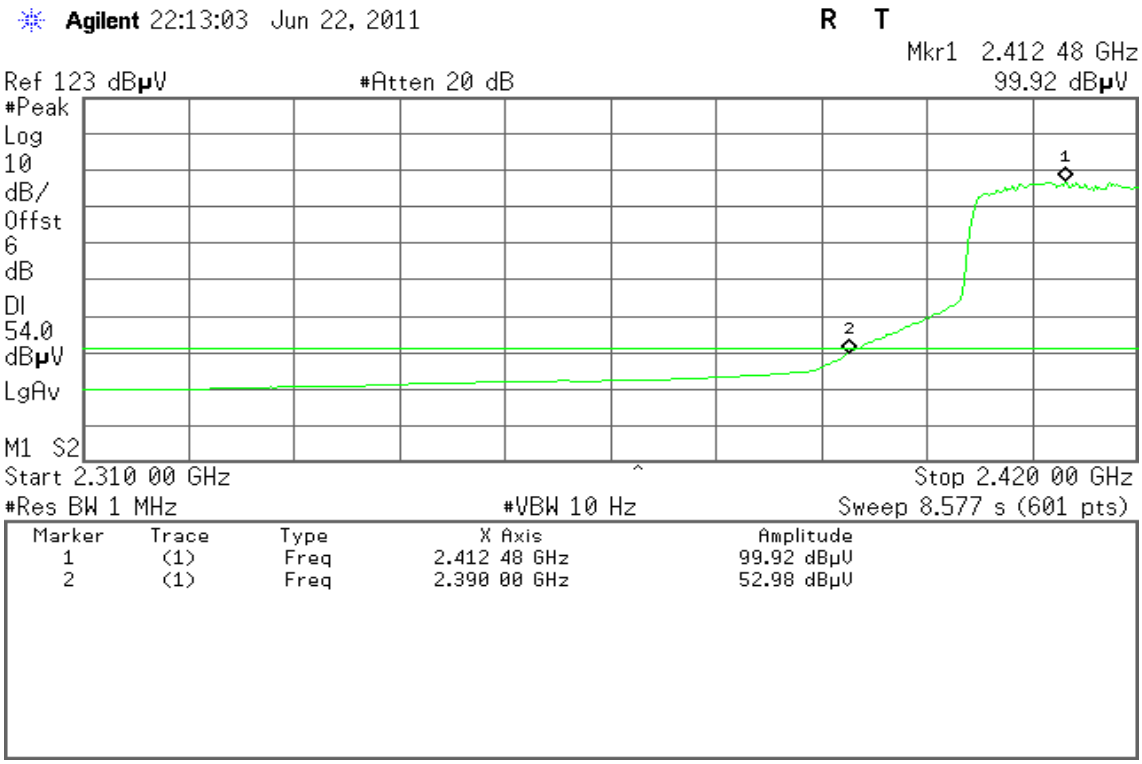


Band Edges (draft 802.11n 20 MHz Channel mode / CH Low)

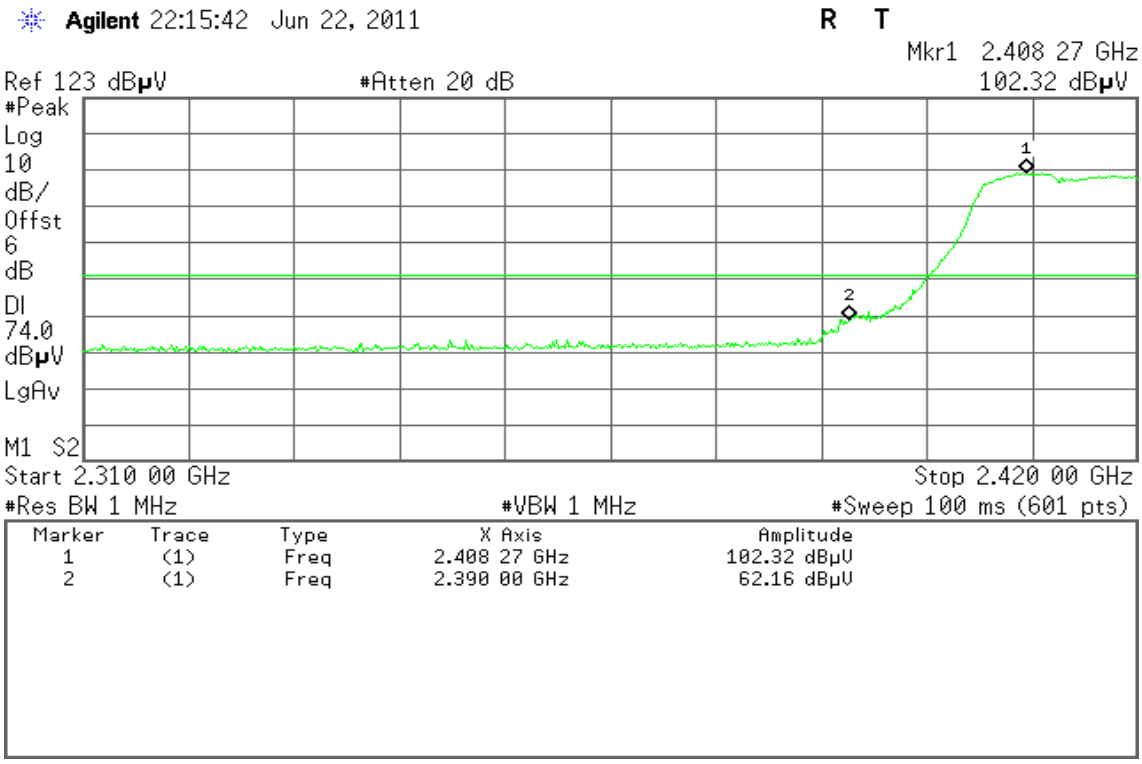
Detector mode: Peak Polarity: Vertical



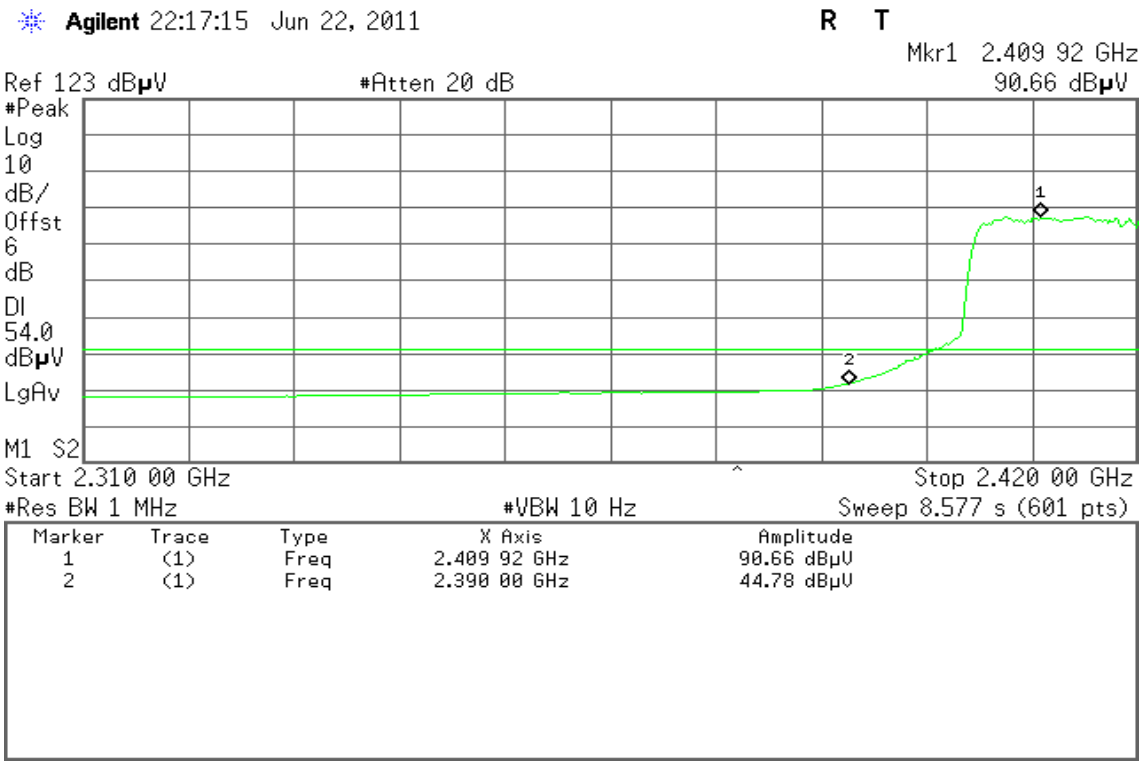
Detector mode: Average Polarity: Vertical



Detector mode: Peak Polarity: Horizontal

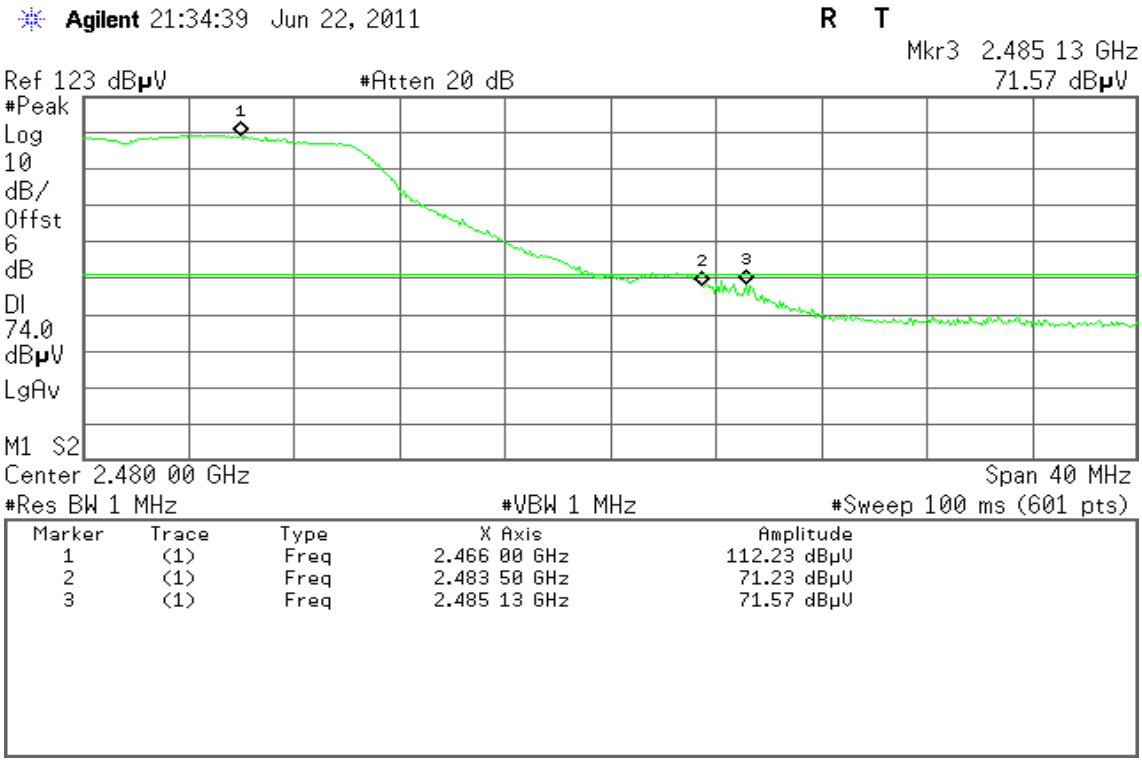


Detector mode: Average Polarity: Horizontal



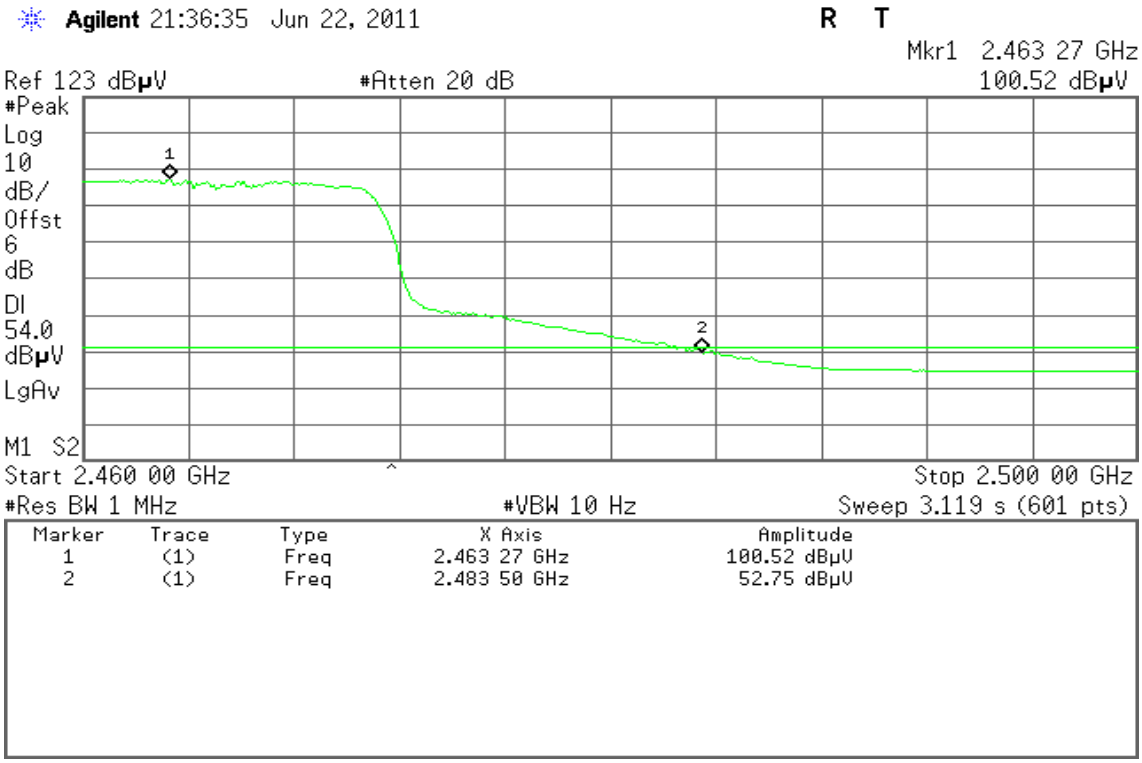
Band Edges (draft 802.11n 20 MHz Channel mode / CH High)

Detector mode: Peak Polarity: Vertical



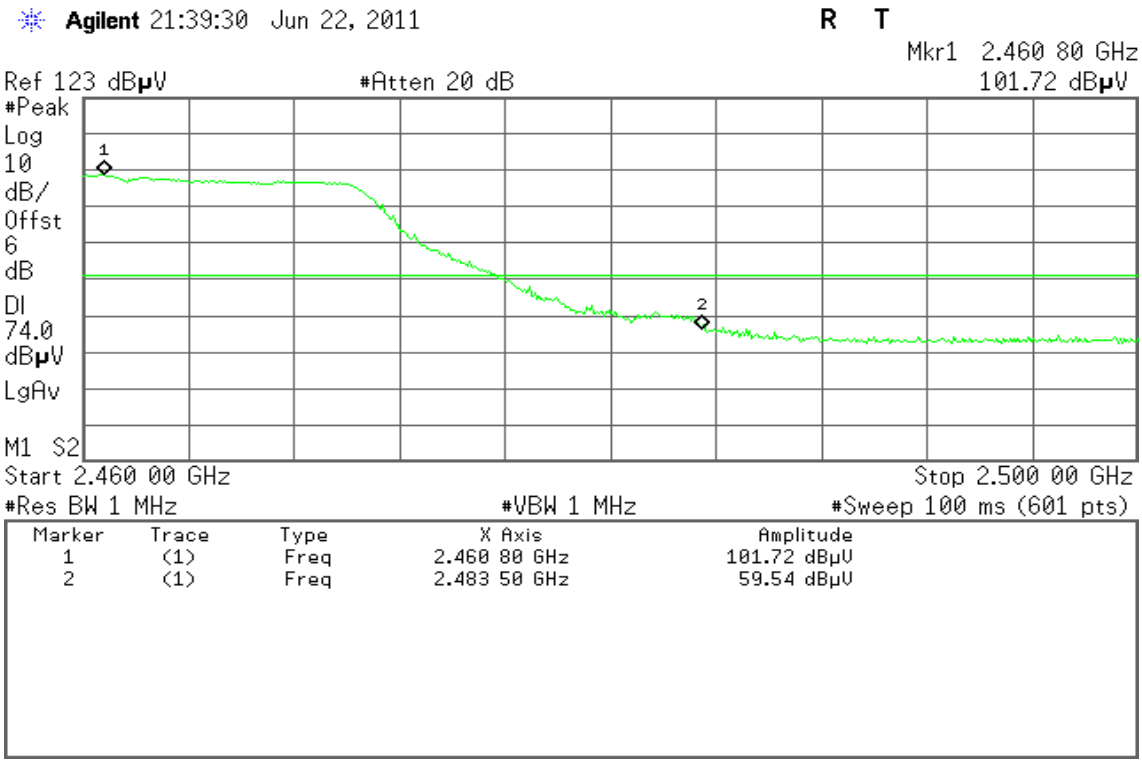
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.466 00 GHz	112.23 dBµV
2	(1)	Freq	2.483 50 GHz	71.23 dBµV
3	(1)	Freq	2.485 13 GHz	71.57 dBµV

Detector mode: Average Polarity: Vertical

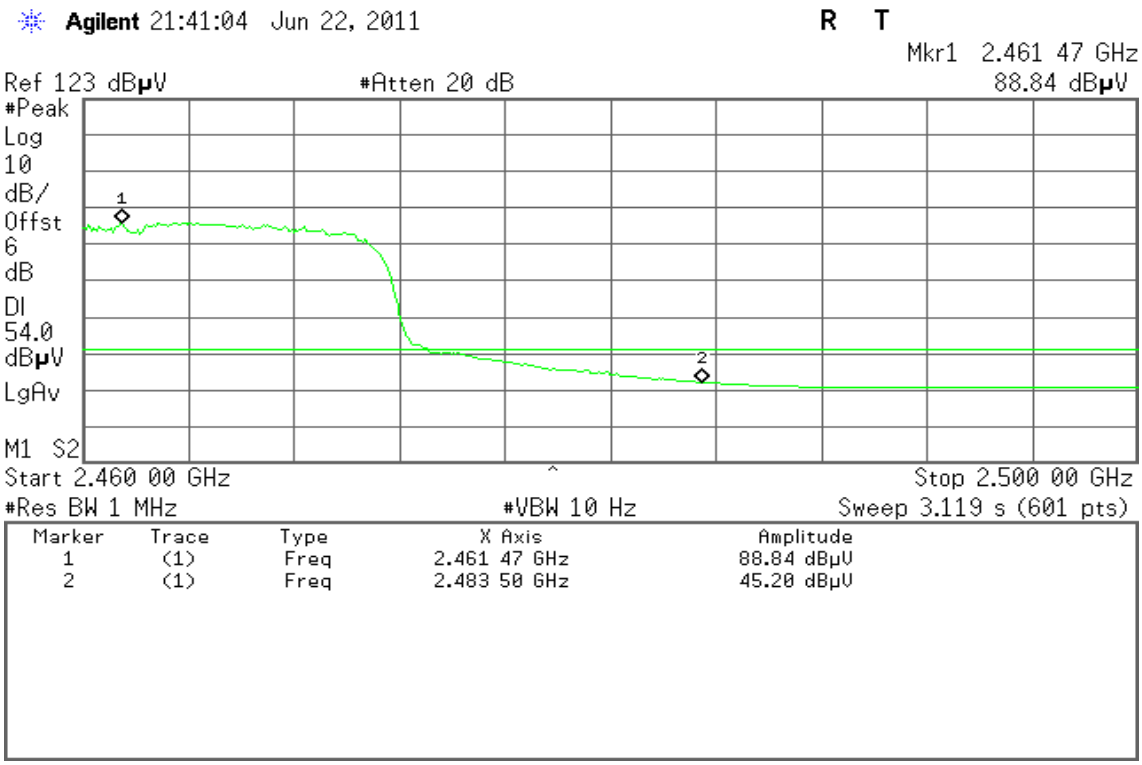


Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.463 27 GHz	100.52 dBµV
2	(1)	Freq	2.483 50 GHz	52.75 dBµV

Detector mode: Peak **Polarity: Horizontal**

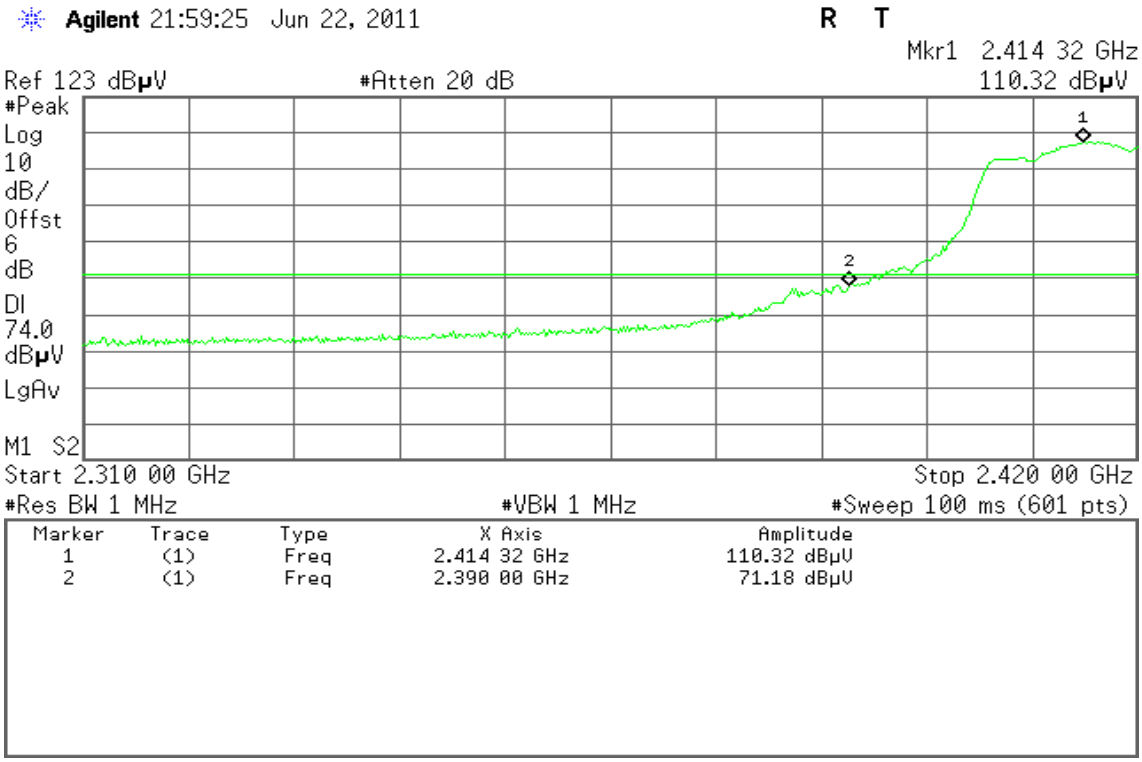


Detector mode: Average **Polarity: Horizontal**

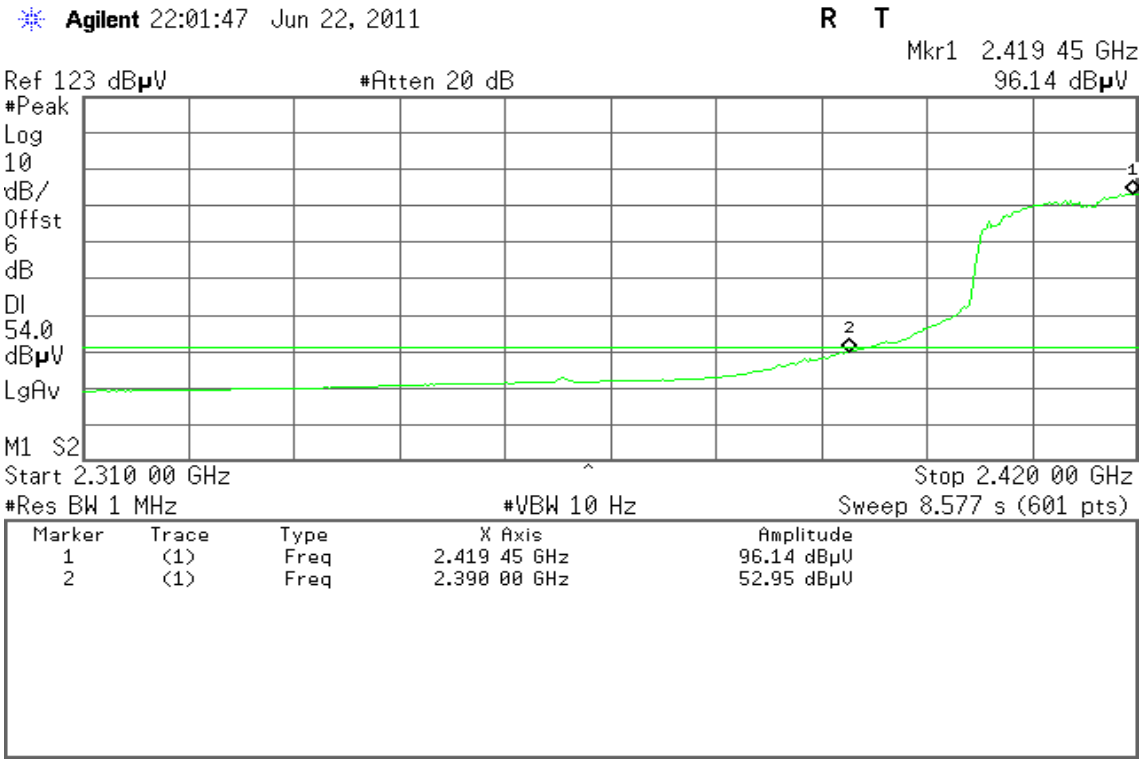


Band Edges (draft 802.11n 40 MHz Channel mode / CH Low)

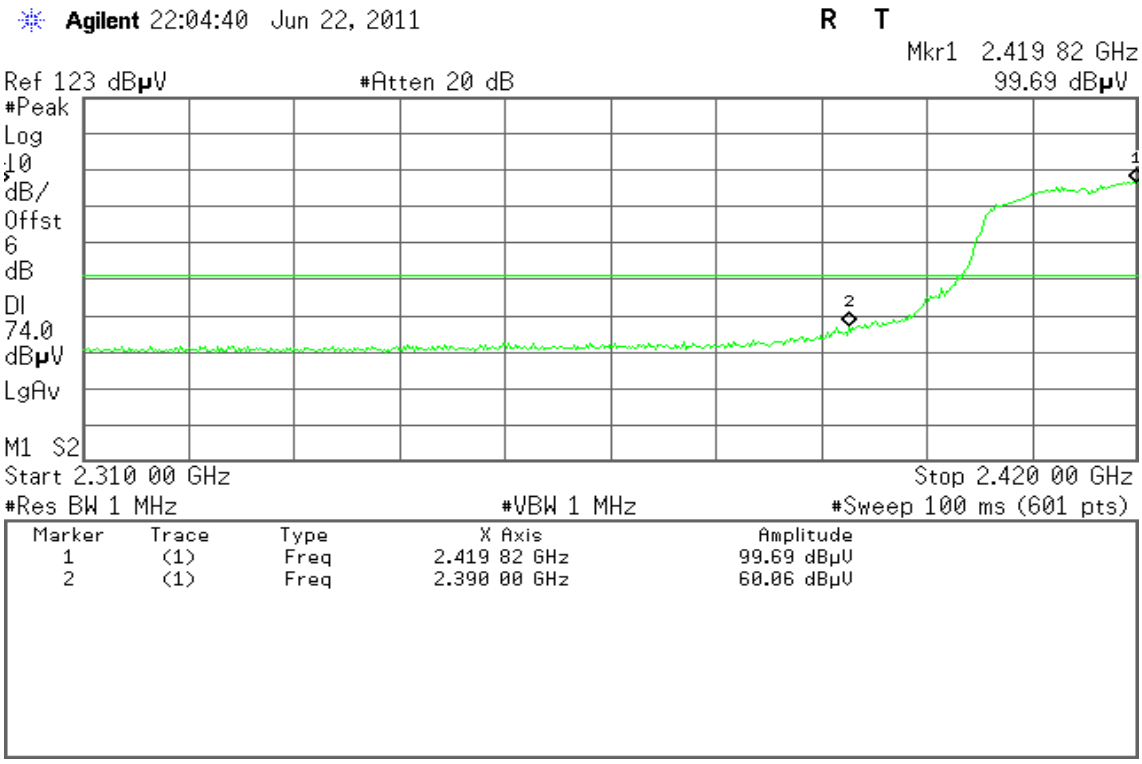
Detector mode: Peak Polarity: Vertical



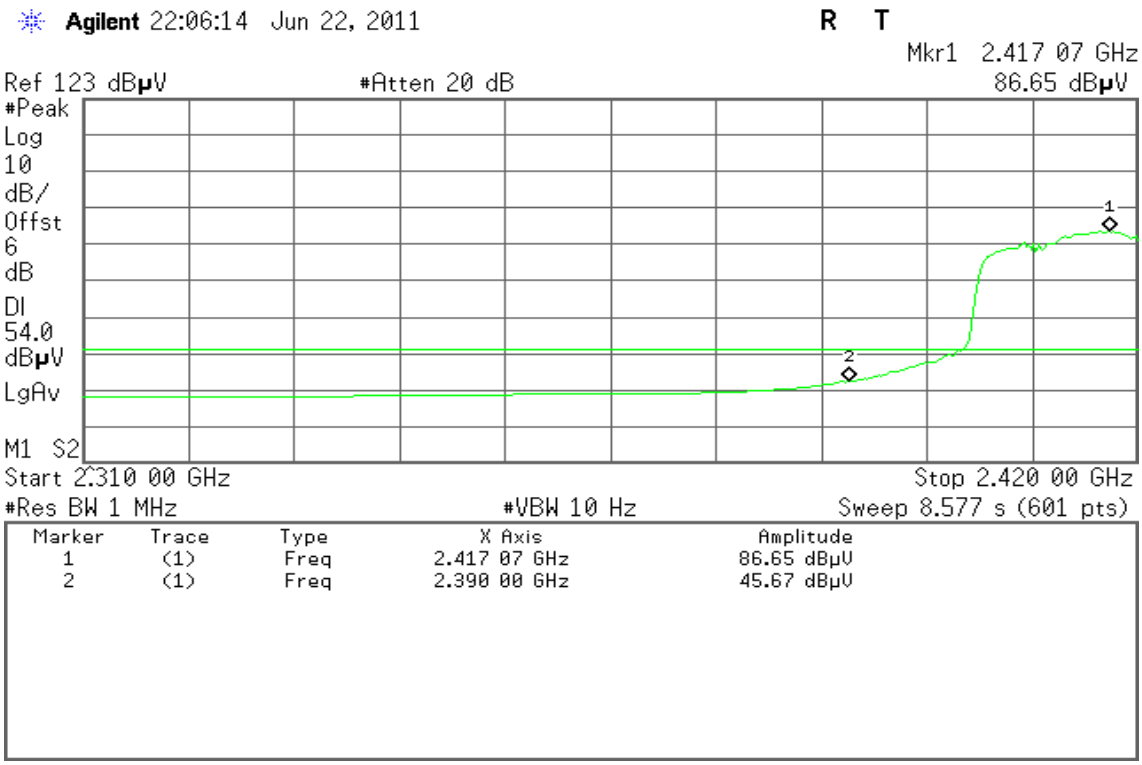
Detector mode: Average Polarity: Vertical



Detector mode: Peak Polarity: Horizontal

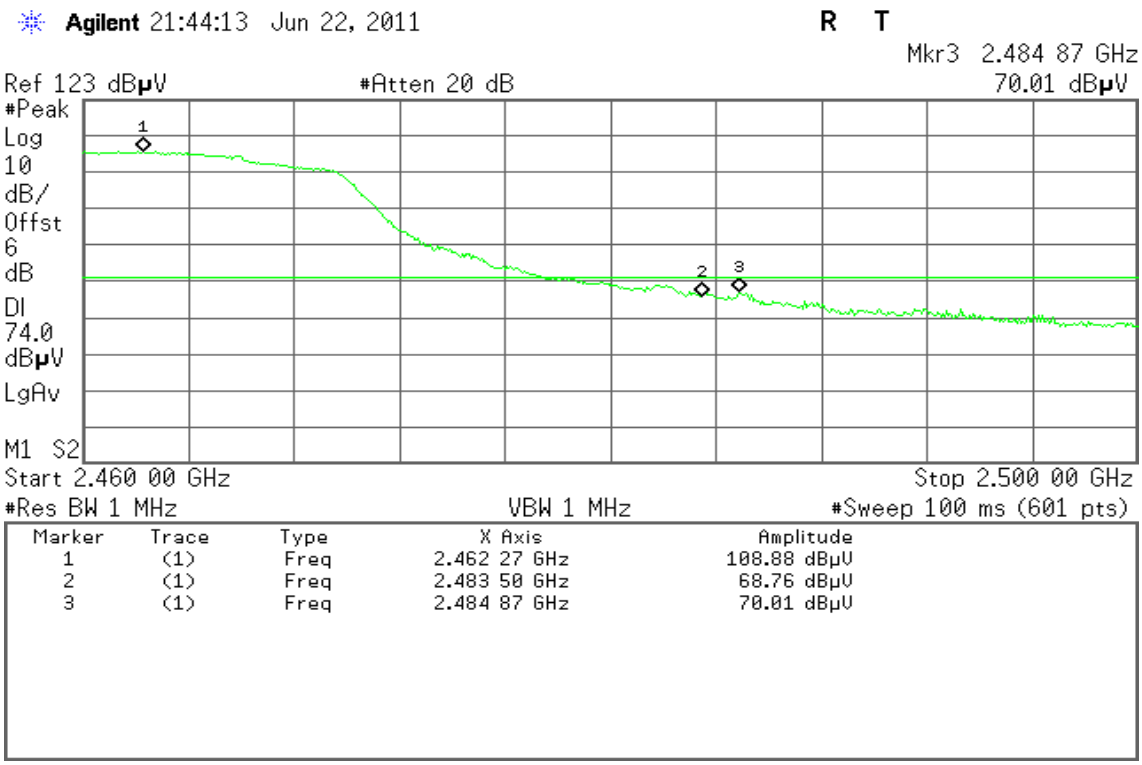


Detector mode: Average Polarity: Horizontal

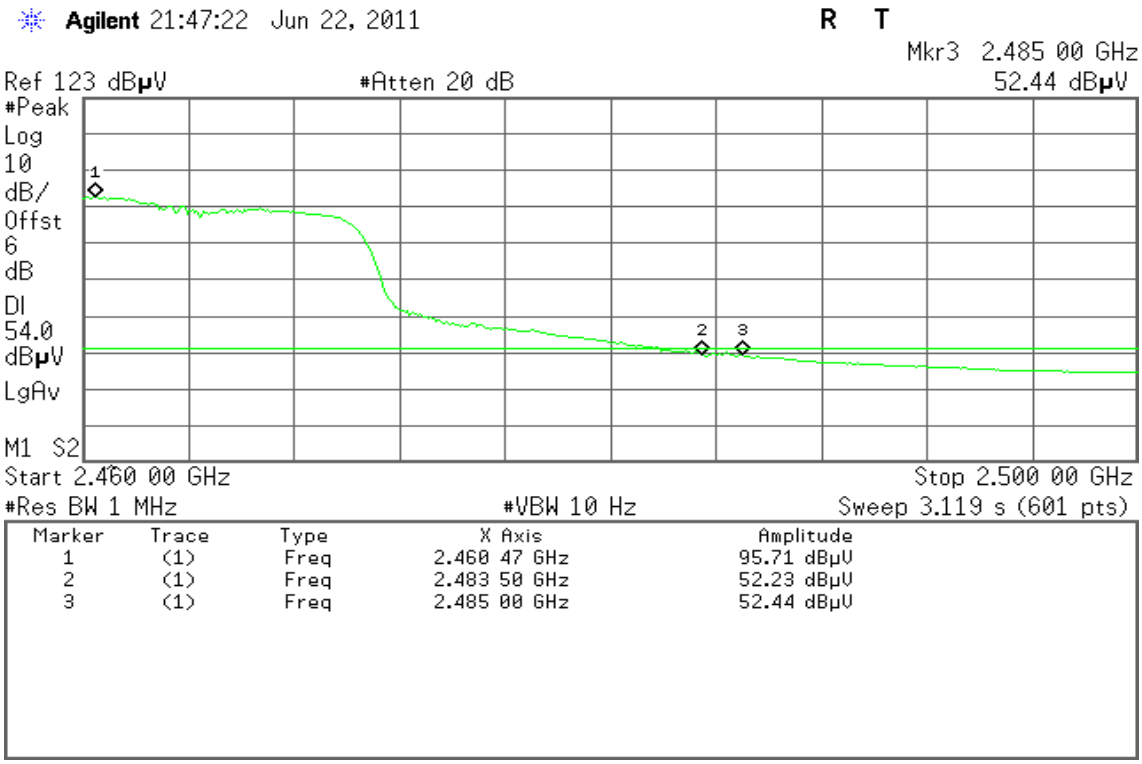


Band Edges (draft 802.11n 40 MHz Channel mode / CH High)

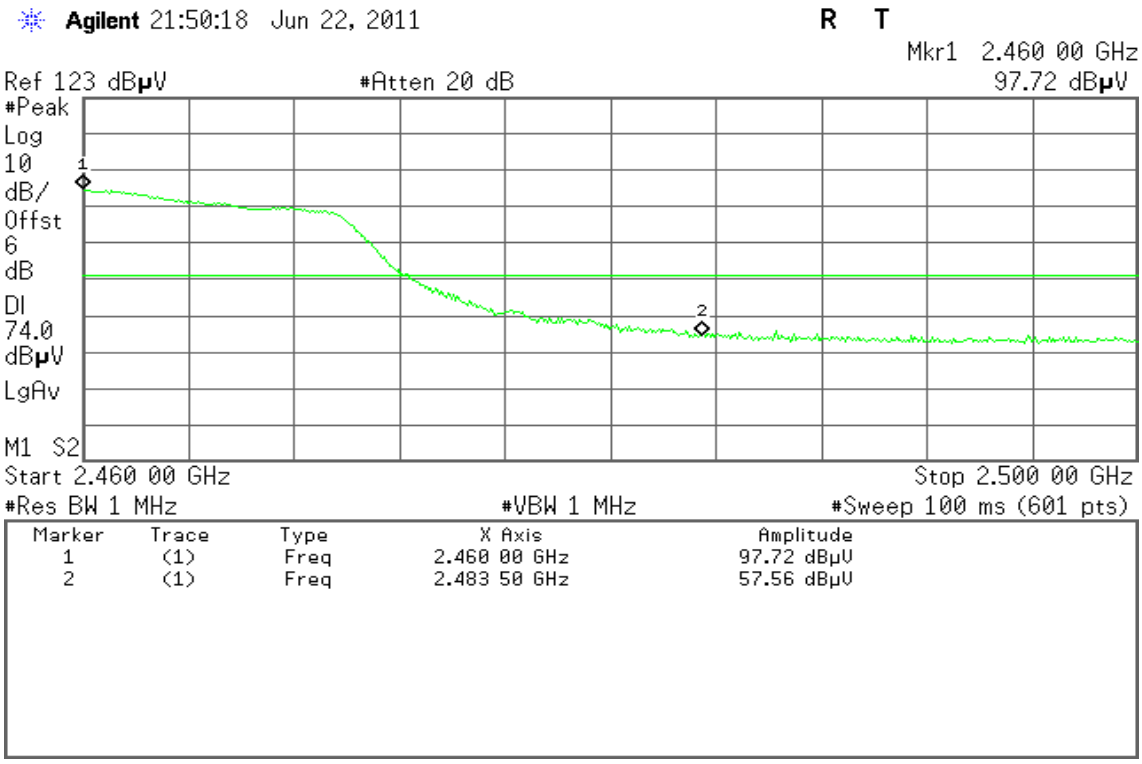
Detector mode: Peak Polarity: Vertical



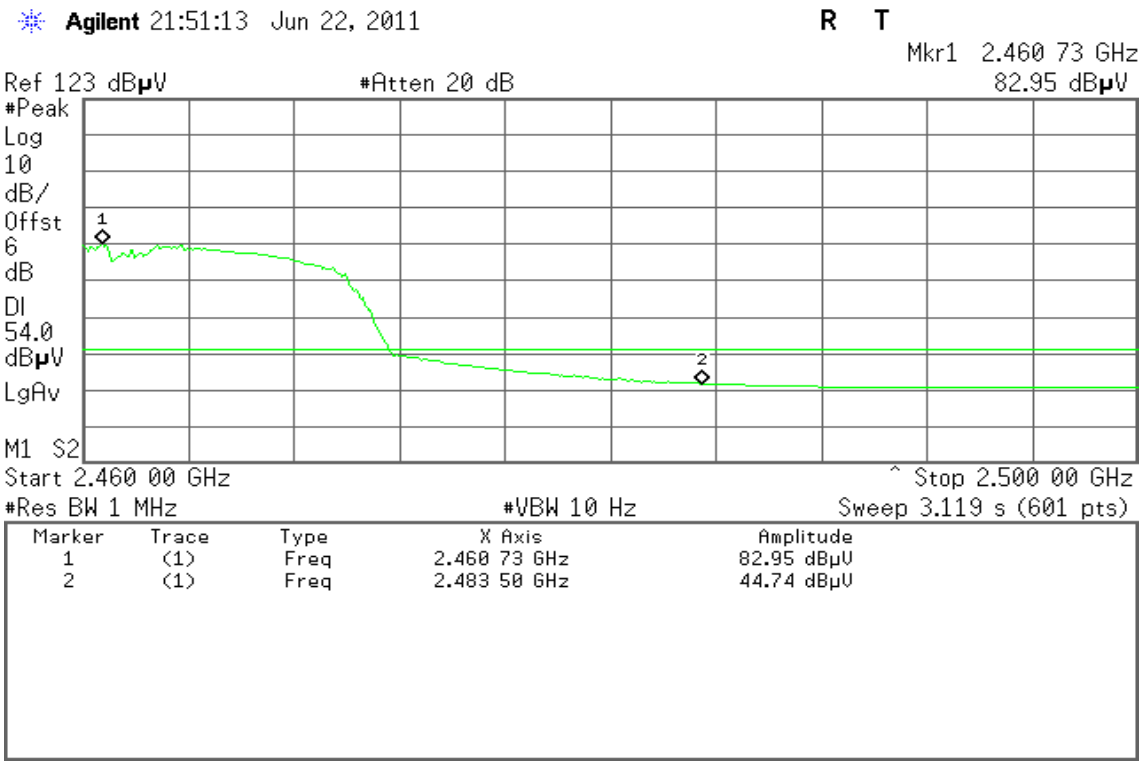
Detector mode: Average Polarity: Vertical



Detector mode: Peak Polarity: Horizontal



Detector mode: Average Polarity: Horizontal

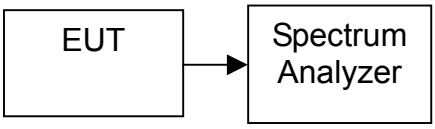


7.5 PEAK POWER SPECTRAL DENSITY

LIMIT

1. According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
2. According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
   Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 300kHz, Sweep=100s
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

TEST RESULTS

No non-compliance noted

TEST DATA

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-13.39	8.00	PASS
Mid	2437	-13.27		PASS
High	2462	-14.24		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-15.02	8.00	PASS
Mid	2437	-14.91		PASS
High	2462	-15.78		PASS

Test mode: draft 802.11n 20 MHz Channel mode

Channel	Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Result
		Chain 0	Chain 1	Max		
Low	2412	-14.24	-13.76	-10.75	8.00	PASS
Mid	2437	-14.48	-14.41	-11.40		PASS
High	2462	-15.03	-13.94	-10.93		PASS

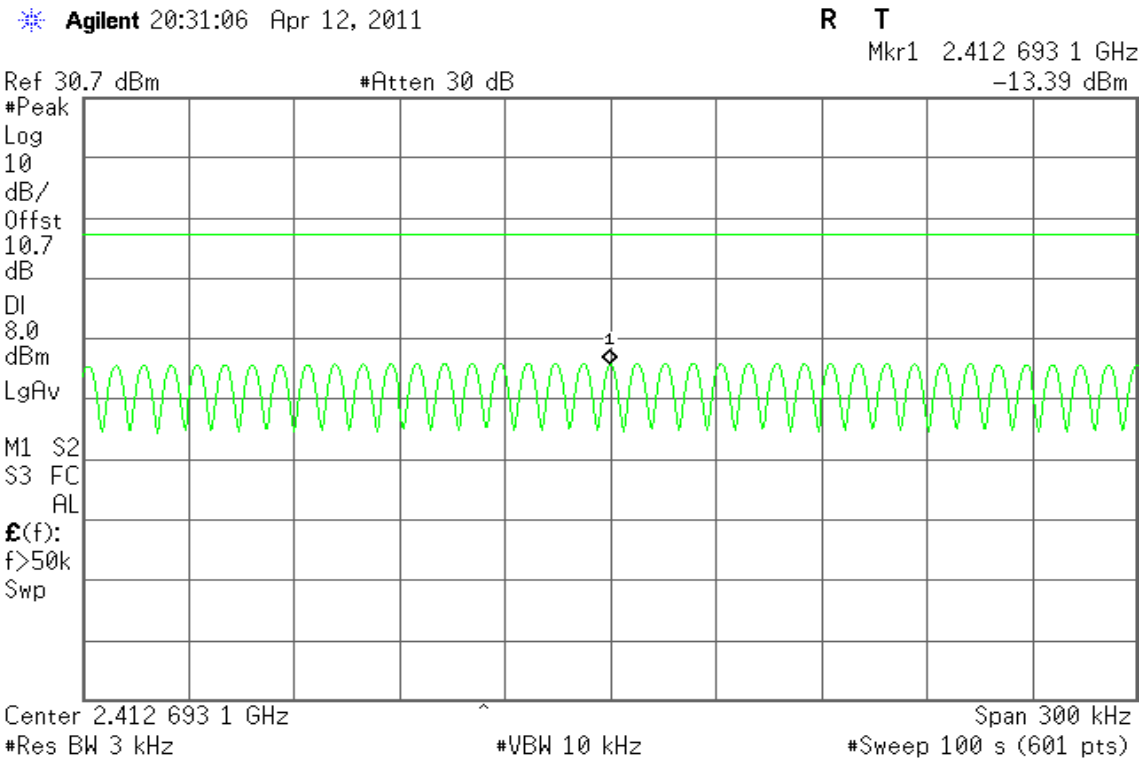
Test mode: draft 802.11n 40 MHz Channel mode

Channel	Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Result
		Chain 0	Chain 1	Max		
Low	2422	-12.73	-13.58	-9.72	8.00	PASS
Mid	2437	-12.76	-13.33	-9.75		PASS
High	2452	-12.95	-13.30	-9.94		PASS

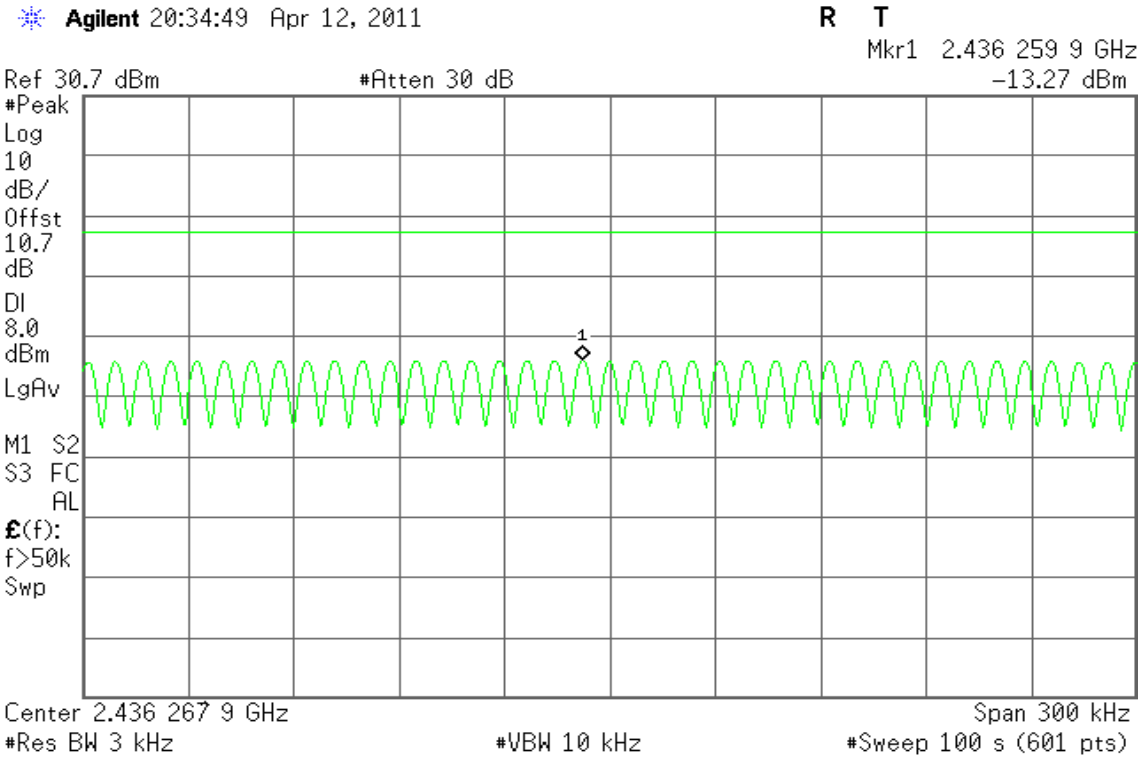
Test Plot

IEEE 802.11b mode

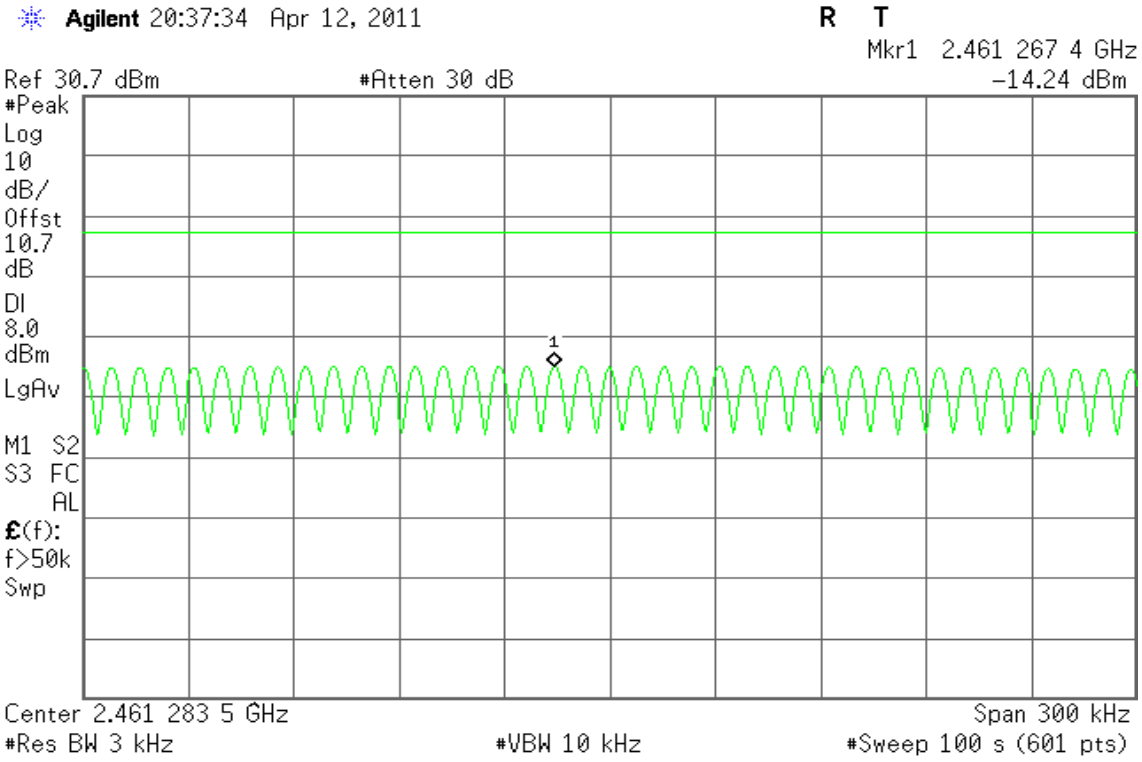
PPSD (CH Low)



PPSD (CH Mid)

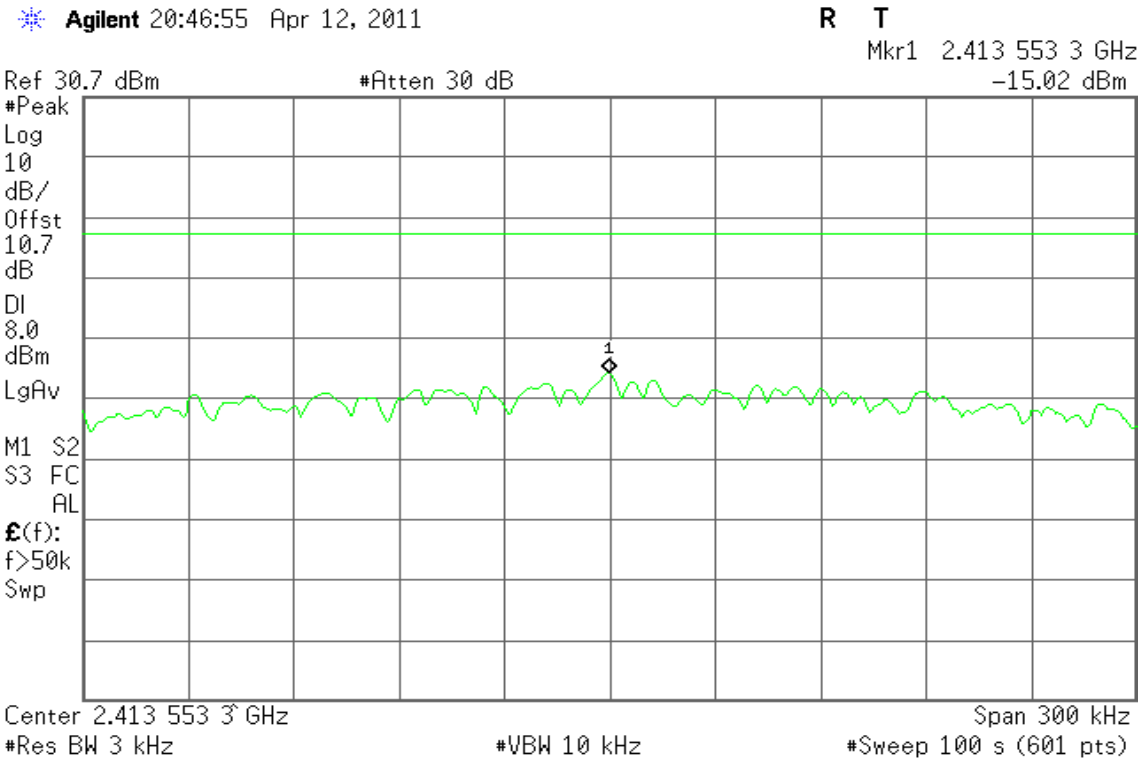


PPSD (CH High)

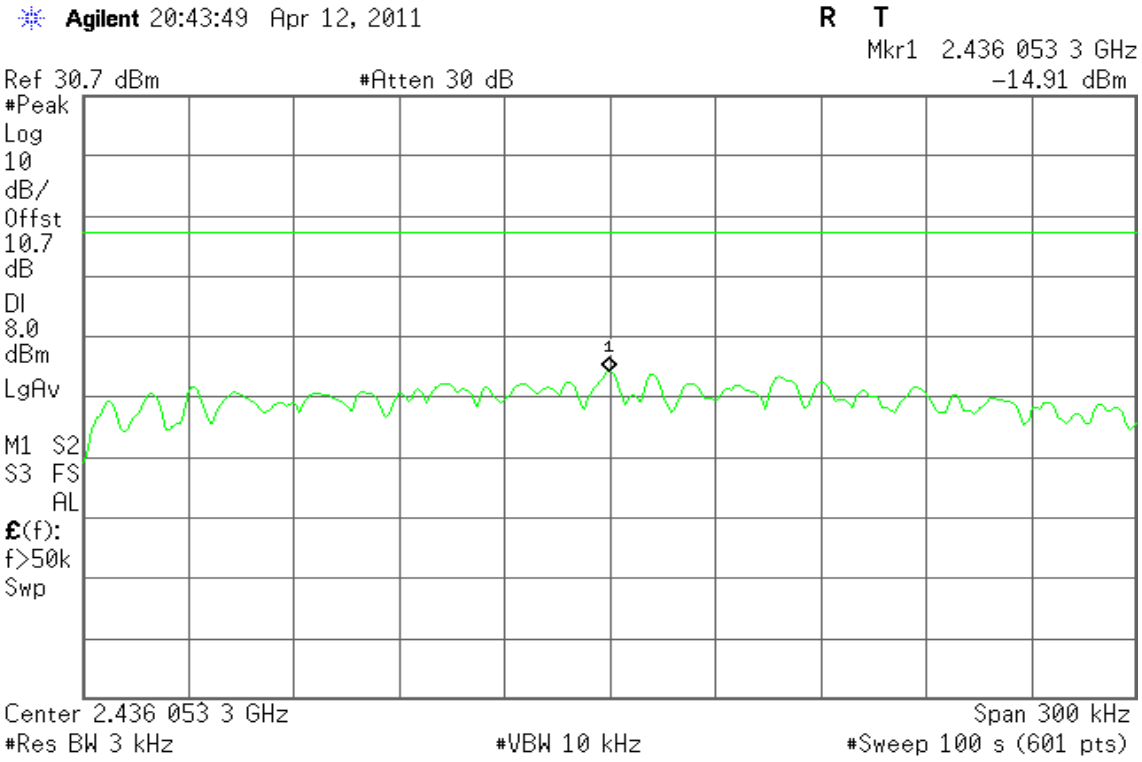


IEEE 802.11g mode

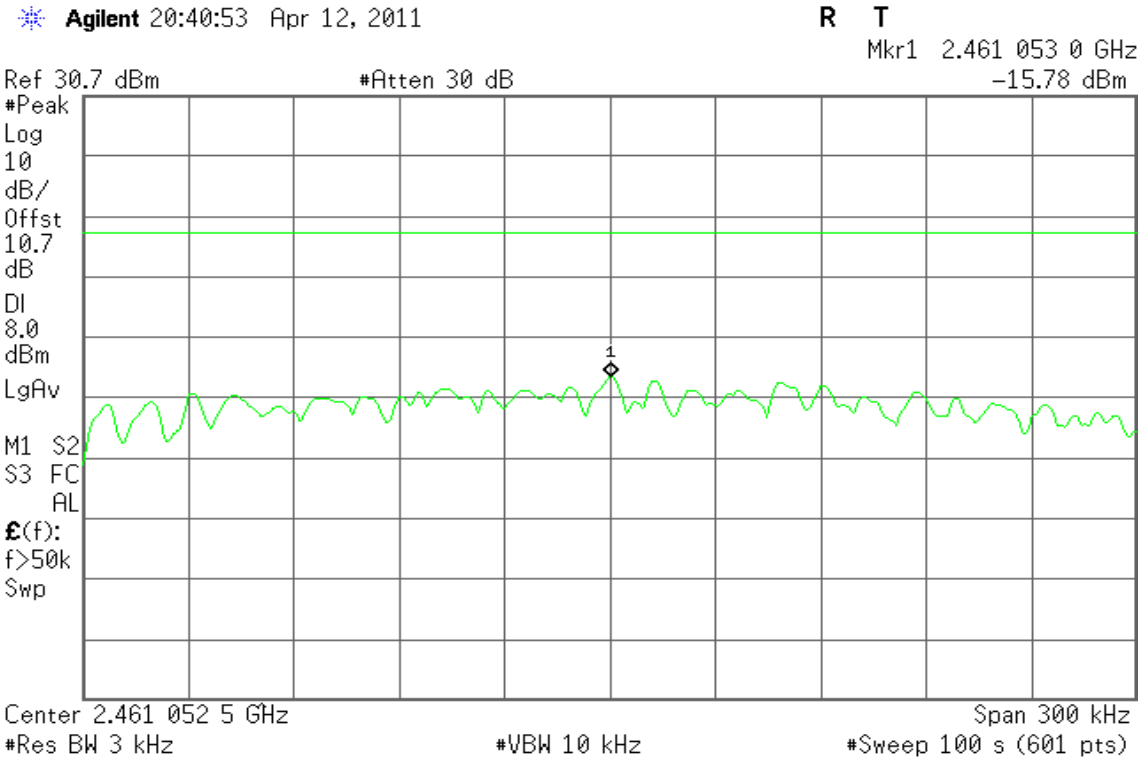
PPSD (CH Low)



PPSD (CH Mid)

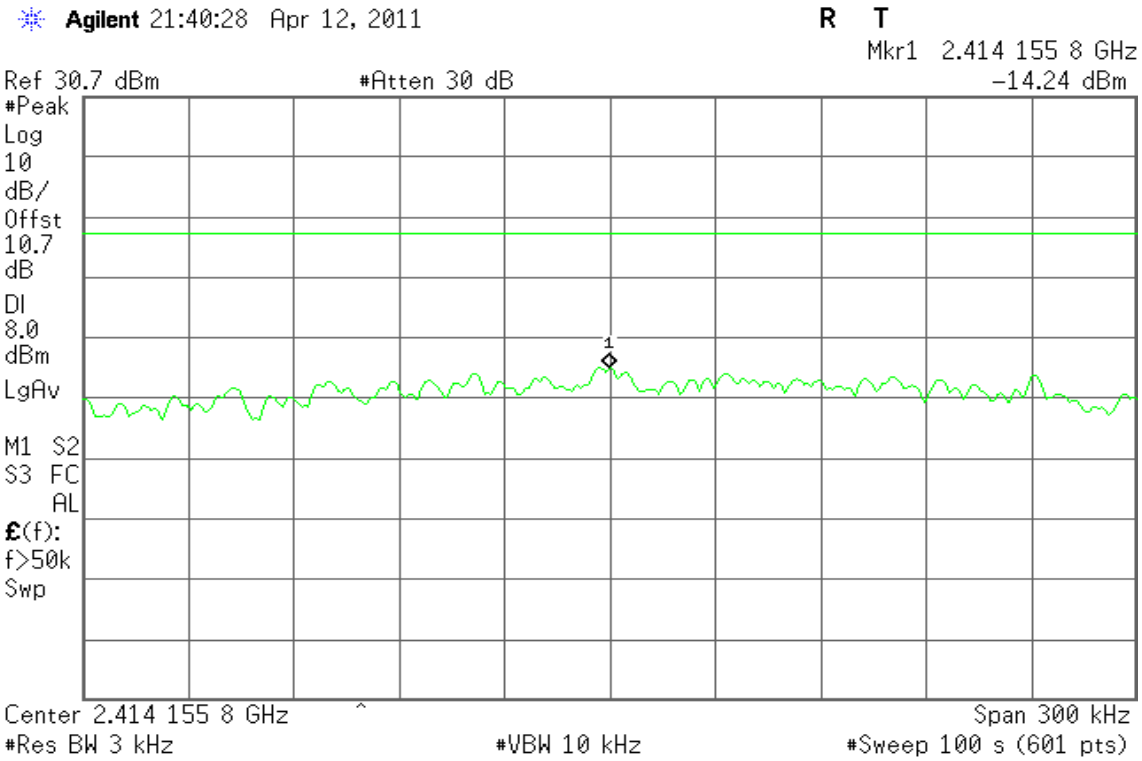


PPSD (CH High)

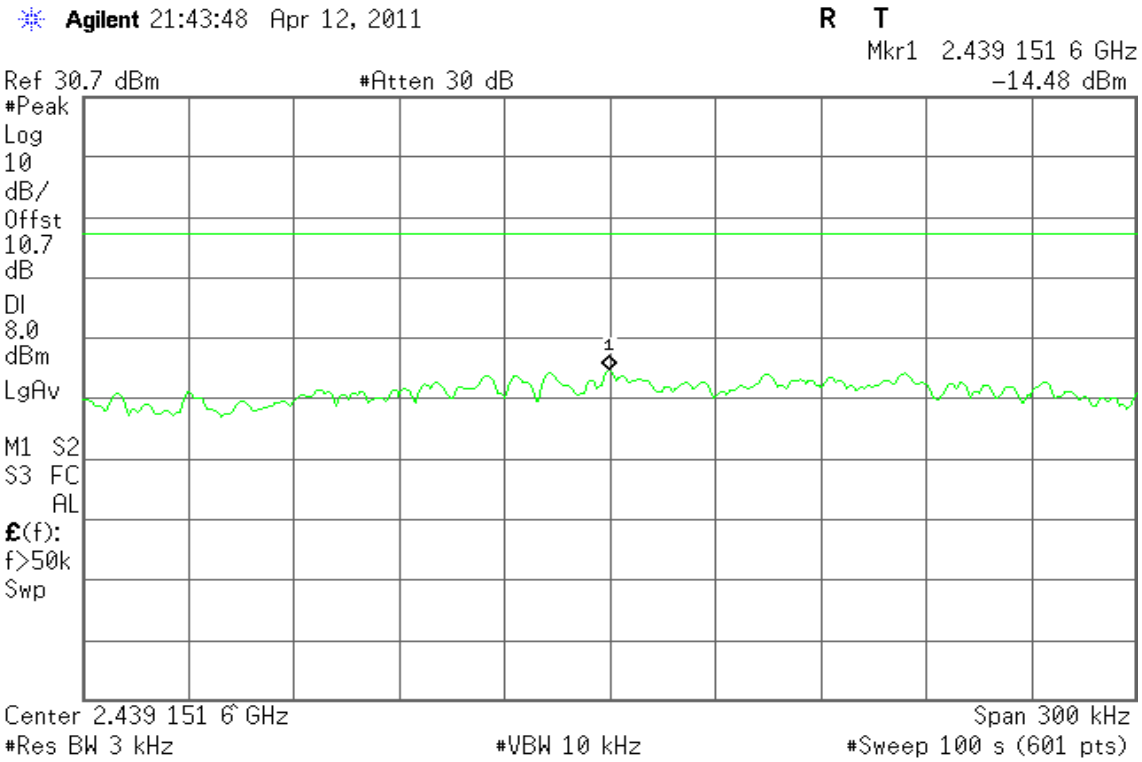


draft 802.11n 20 MHz Channel mode / Chain 0

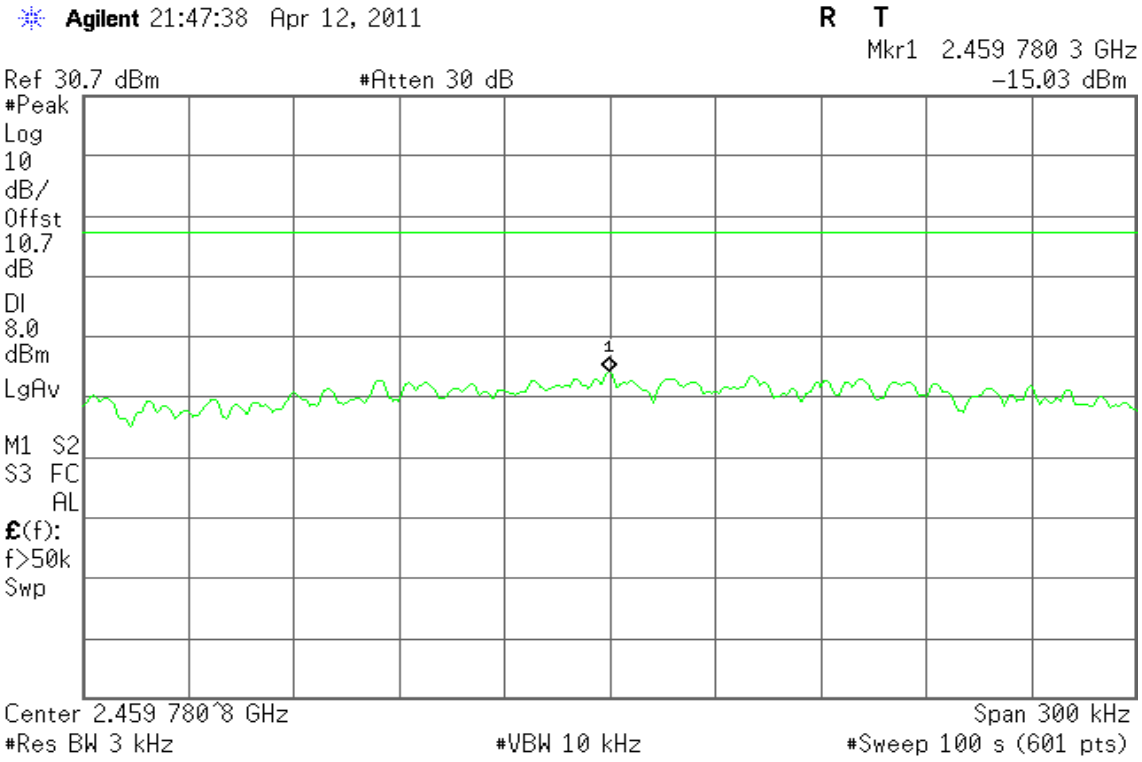
PPSD (CH Low)



PPSD (CH Mid)

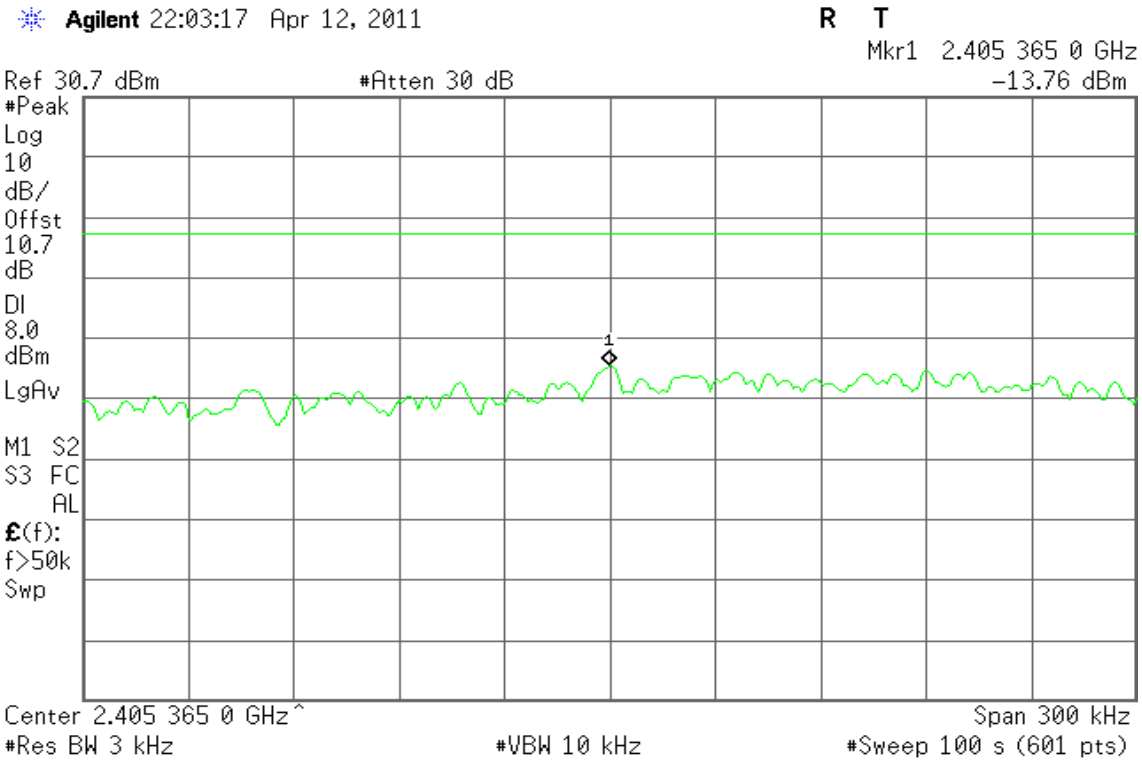


PPSD (CH High)

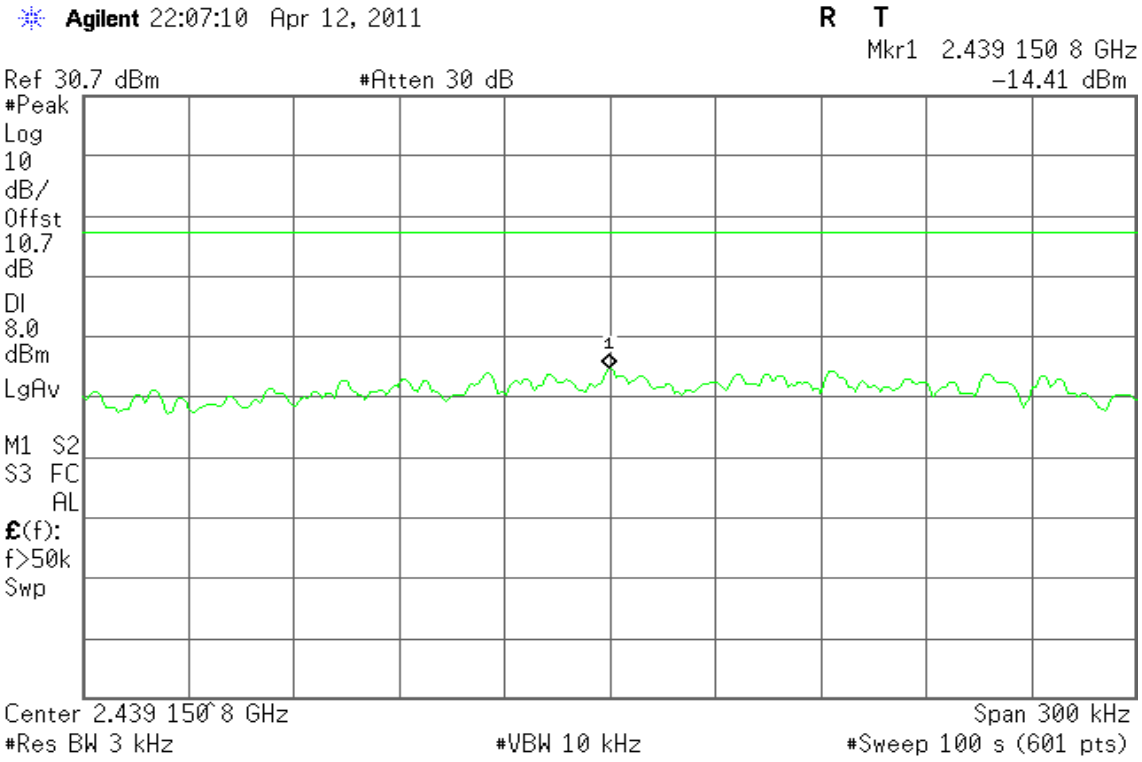


draft 802.11n 20 MHz Channel mode / Chain 1

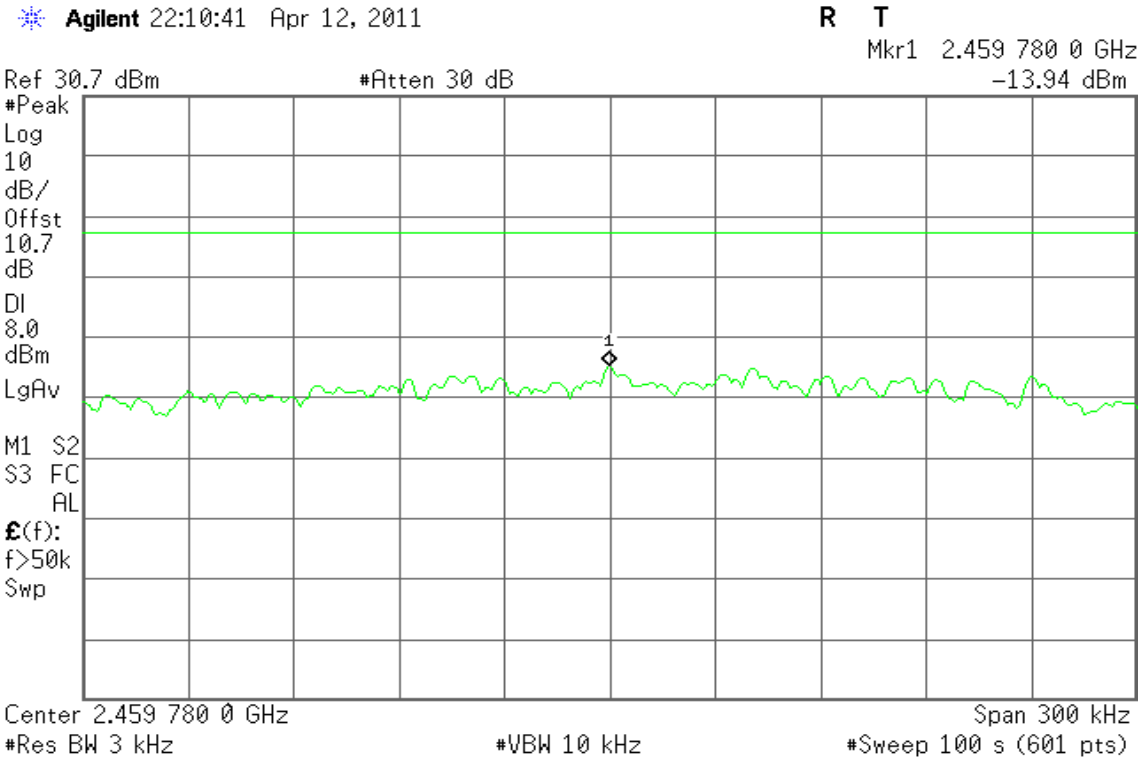
PPSD (CH Low)



PPSD (CH Mid)

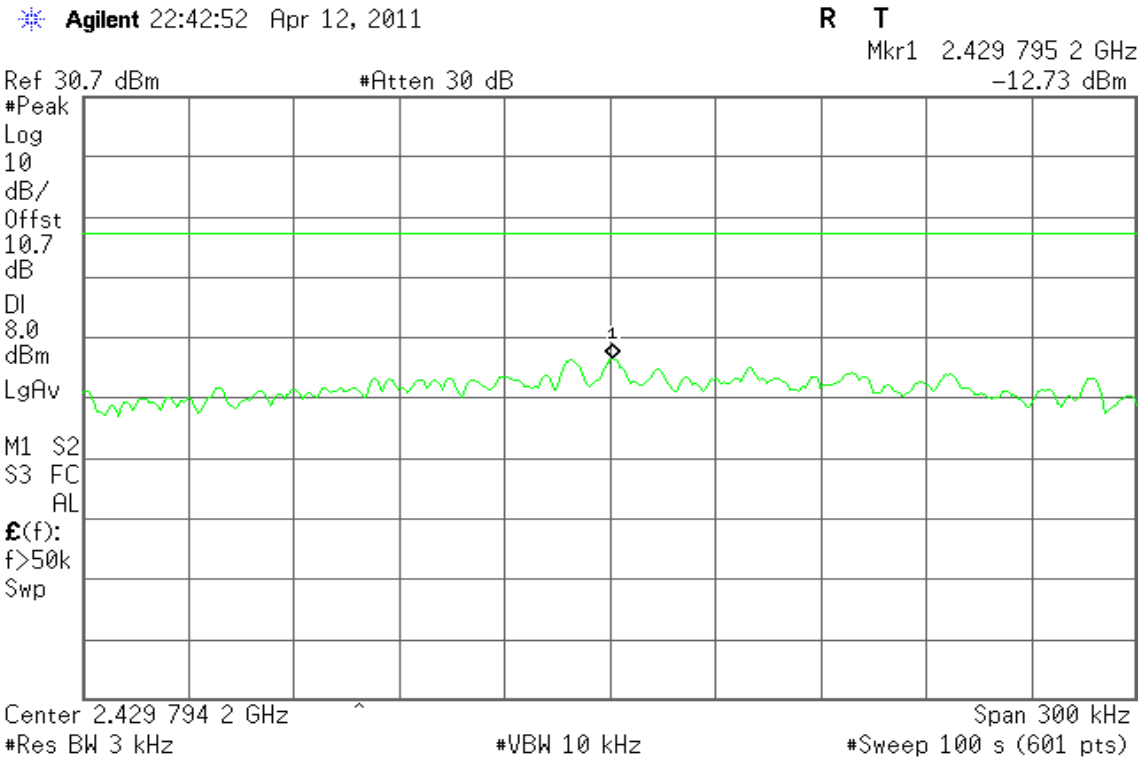


PPSD (CH High)

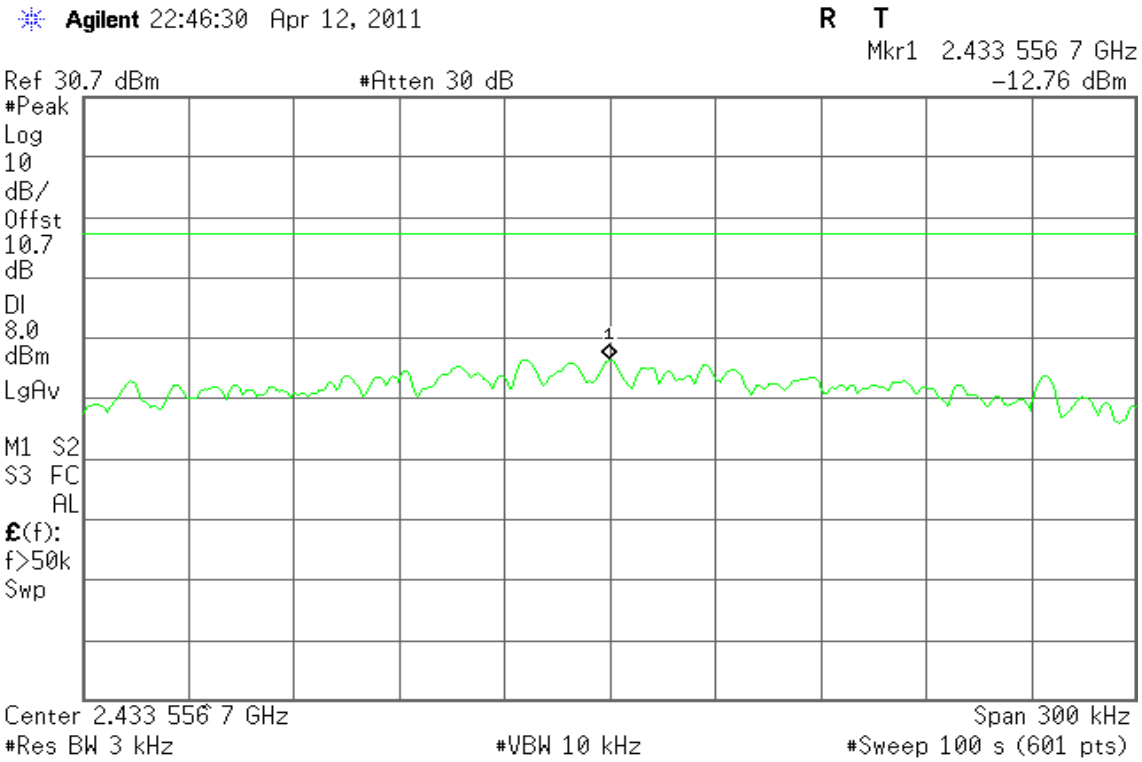


draft 802.11n 40 MHz Channel mode / Chain 0

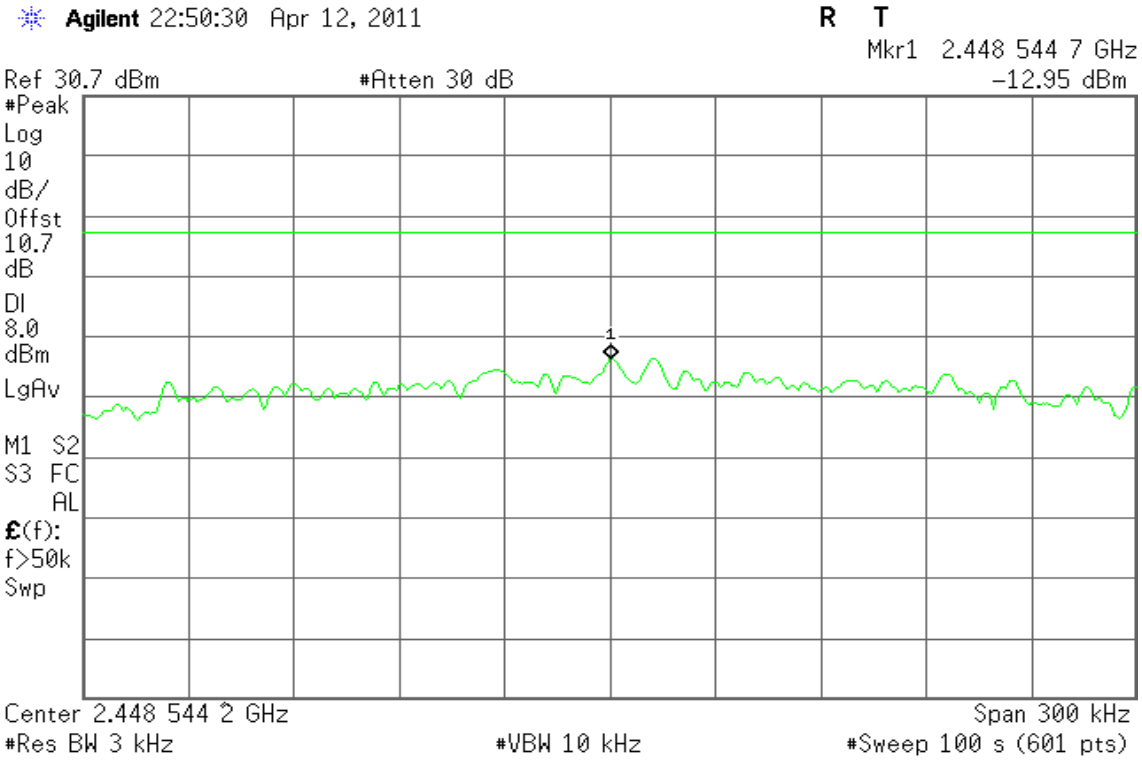
PPSD (CH Low)



PPSD (CH Mid)

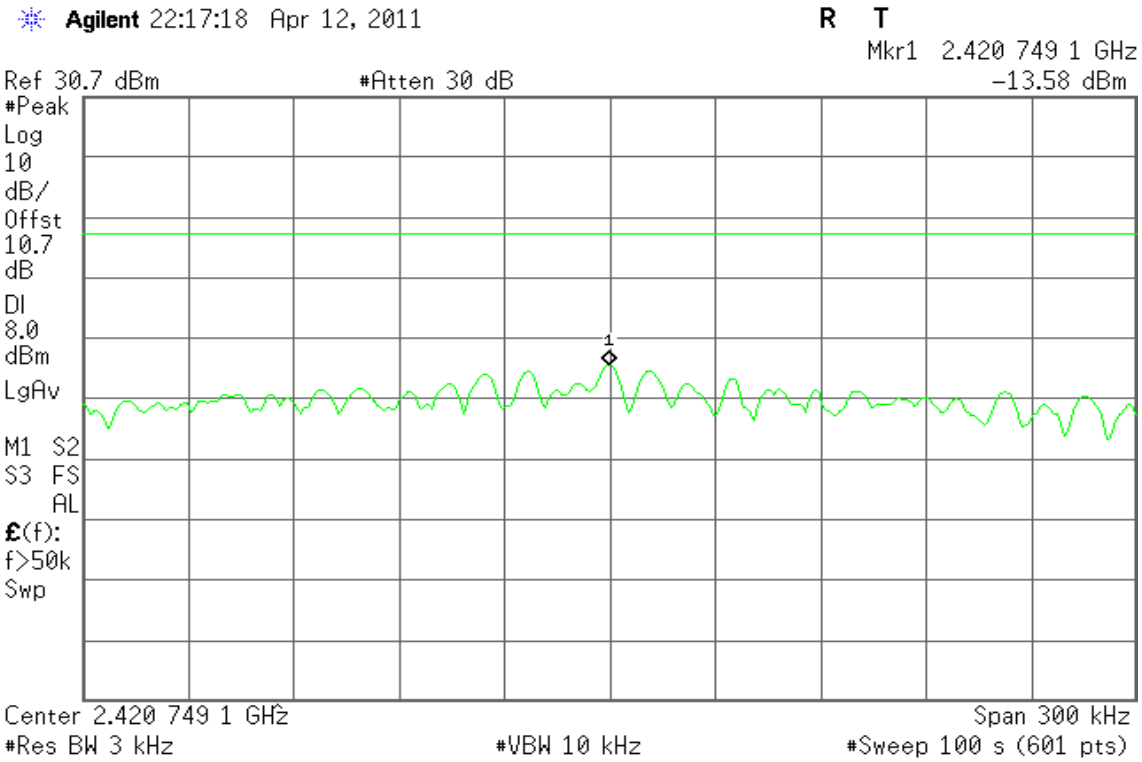


PPSD (CH High)

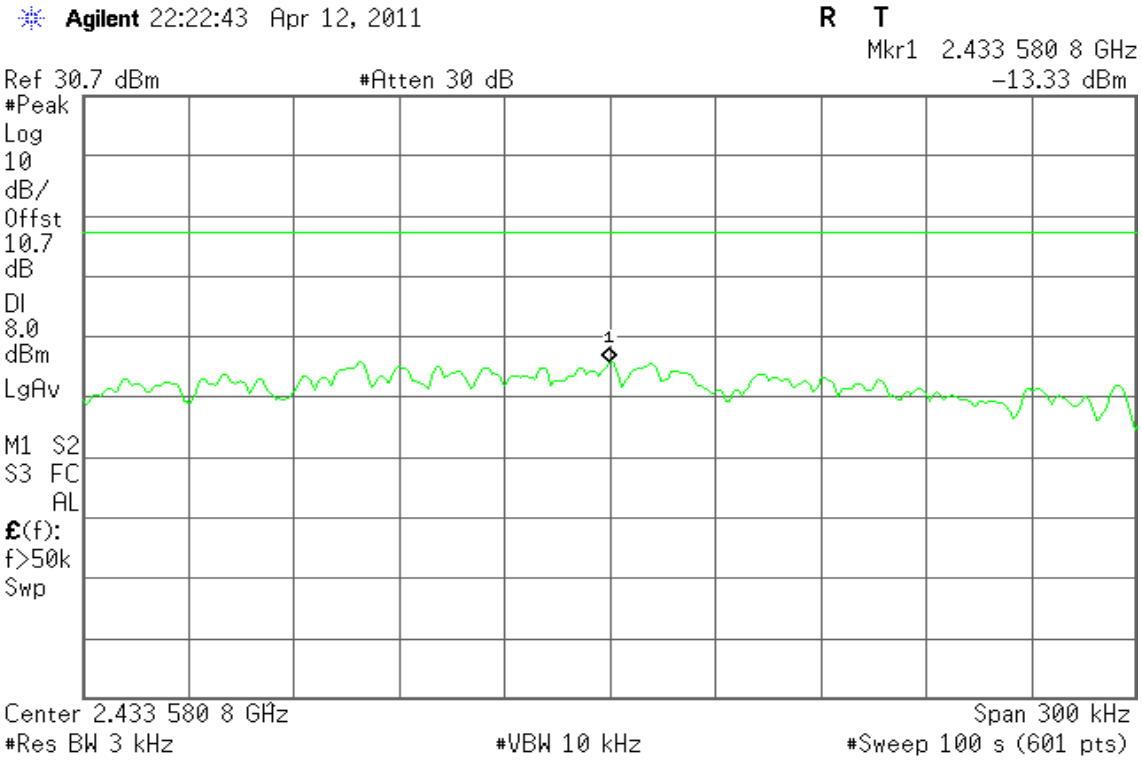


draft 802.11n 40 MHz Channel mode / Chain 1

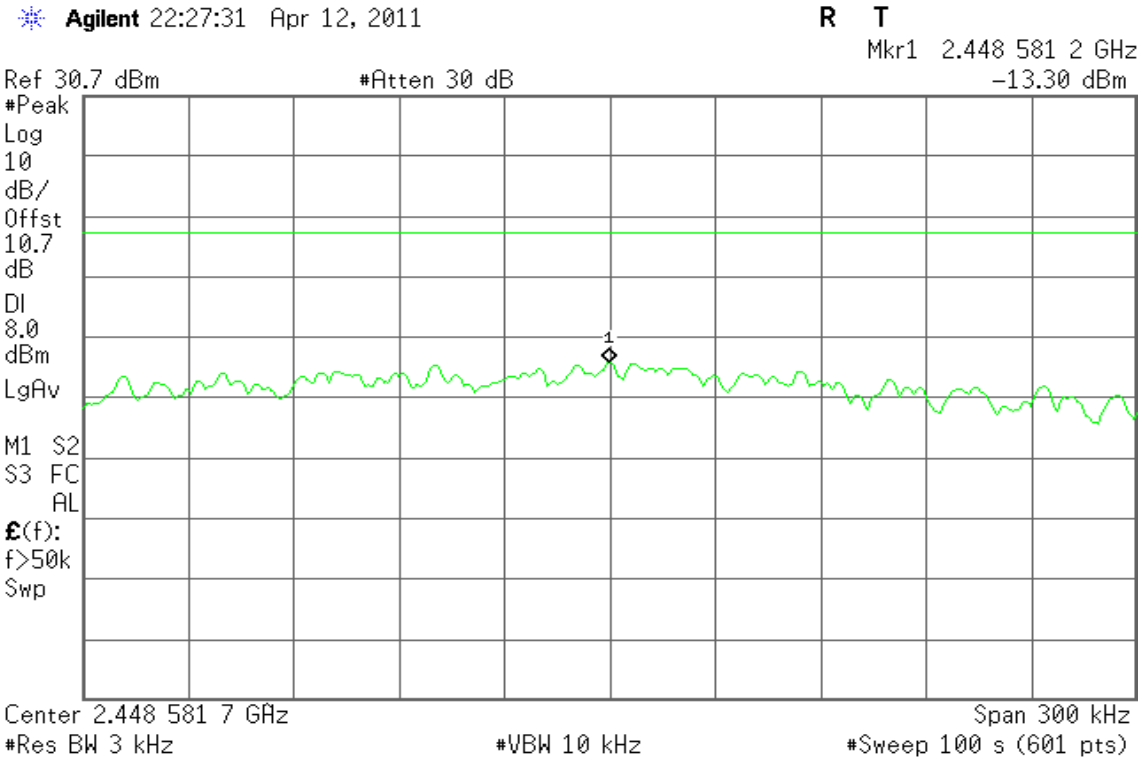
PPSD (CH Low)



PPSD (CH Mid)



PPSD (CH High)



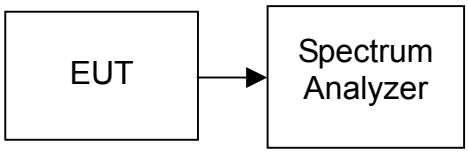
7.6 SPURIOUS EMISSIONS

7.6.1 CONDUCTED MEASUREMENT

LIMIT

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in 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. 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 Section 15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

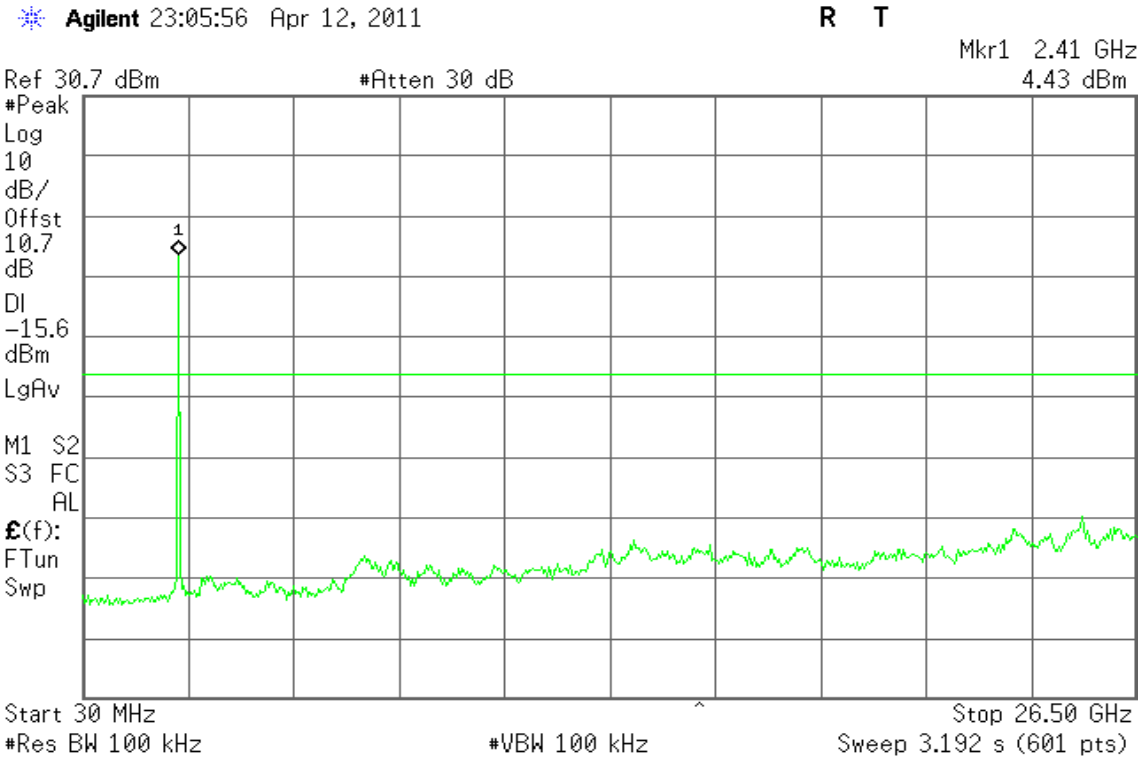
Measurements are made over the 30MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.

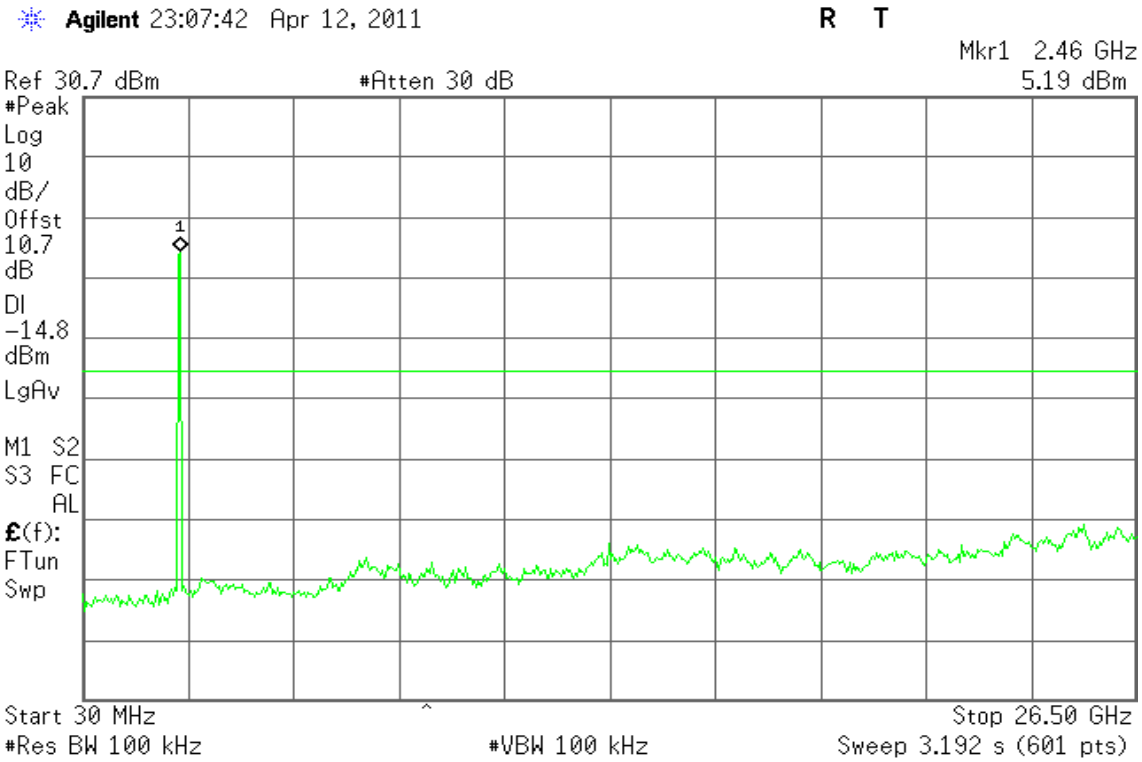
TEST RESULTS

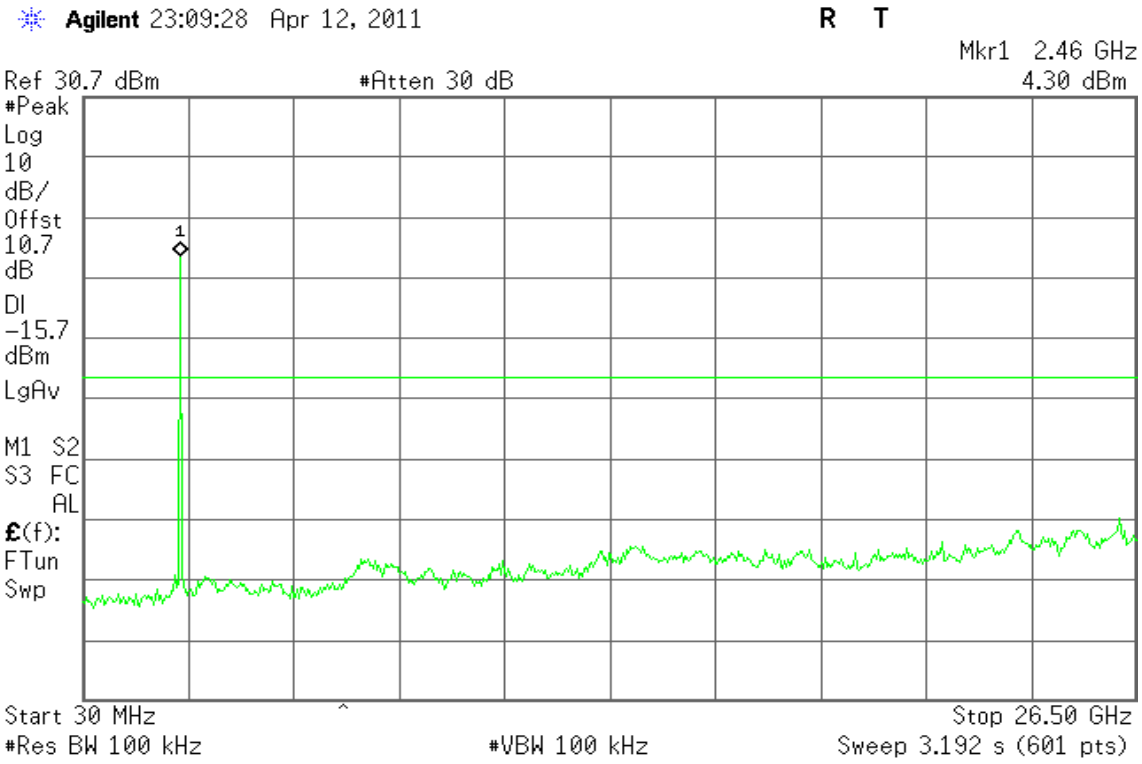
No non-compliance noted.

Test Plot

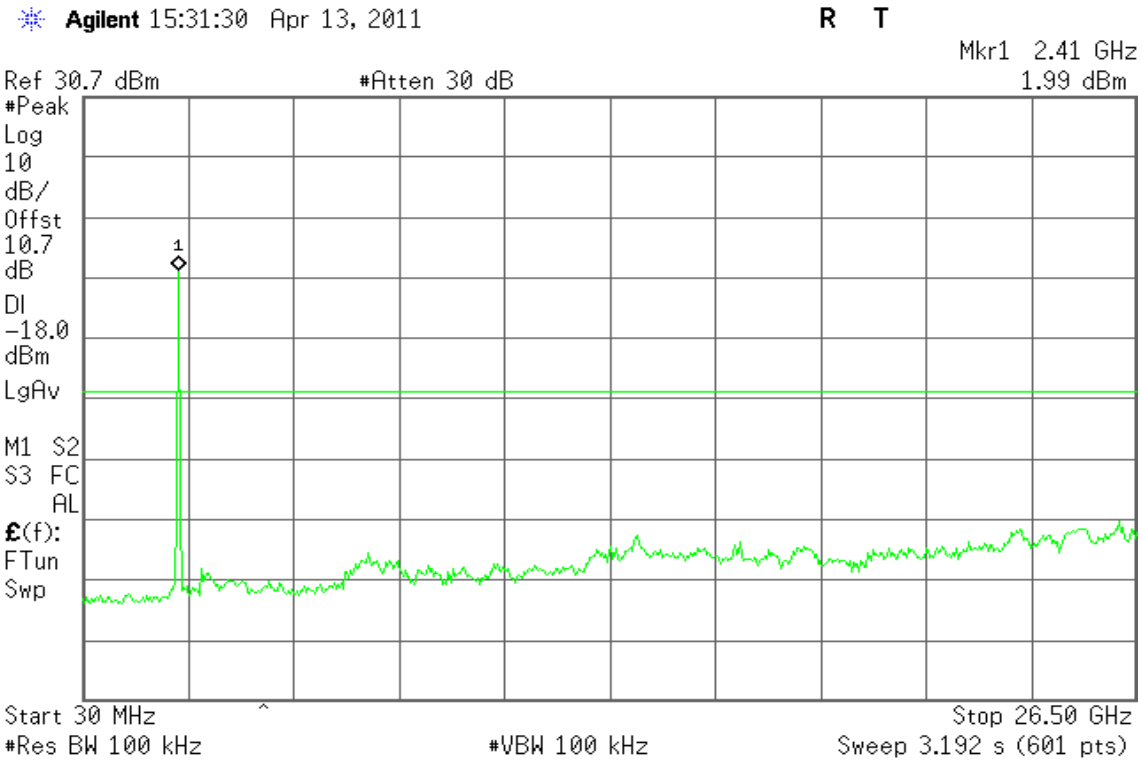
IEEE 802.11b mode

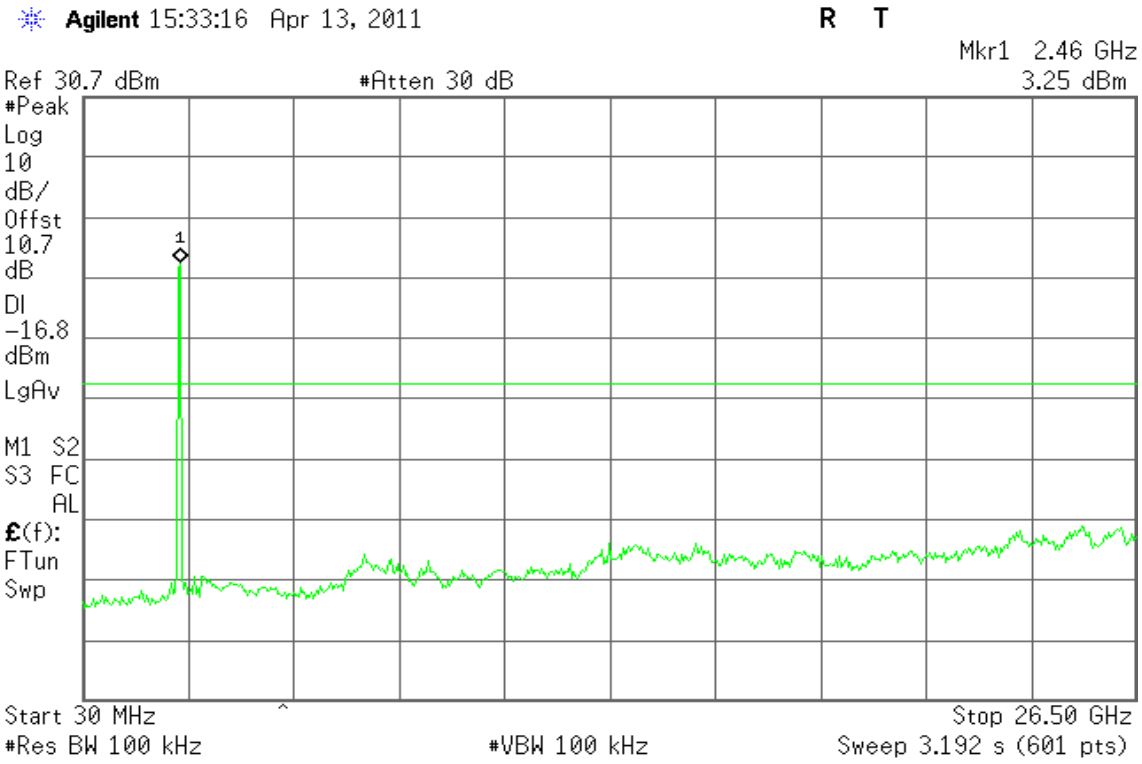


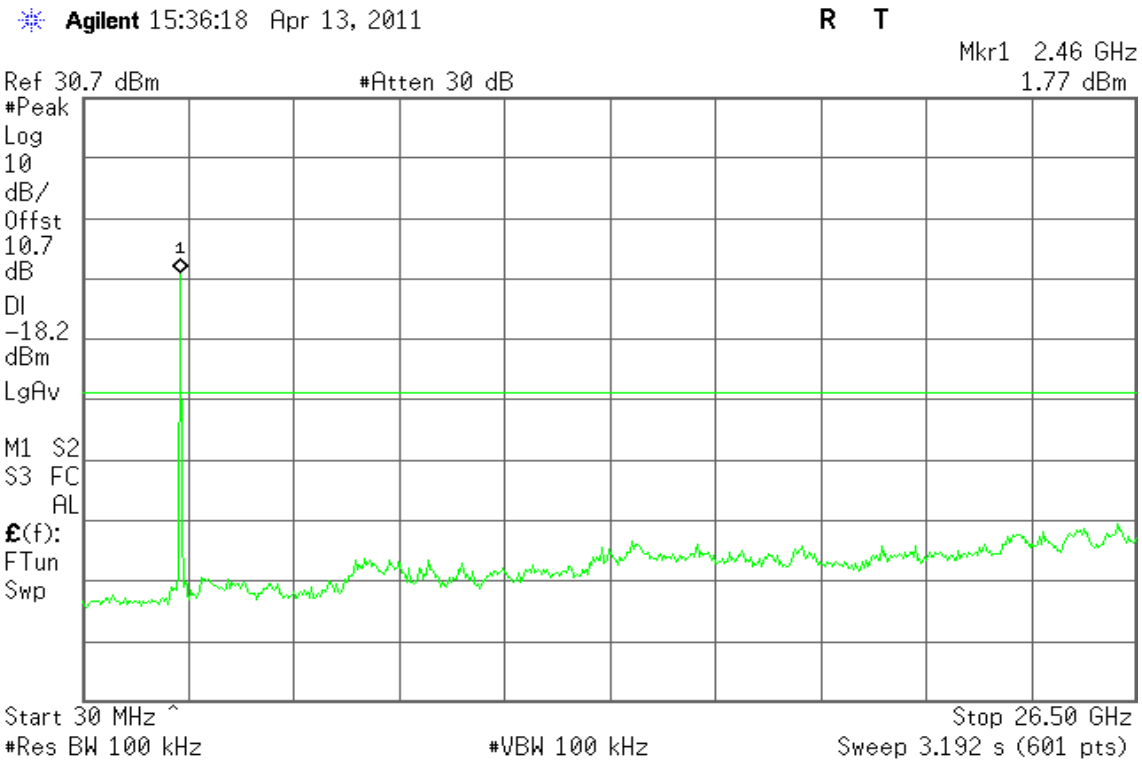




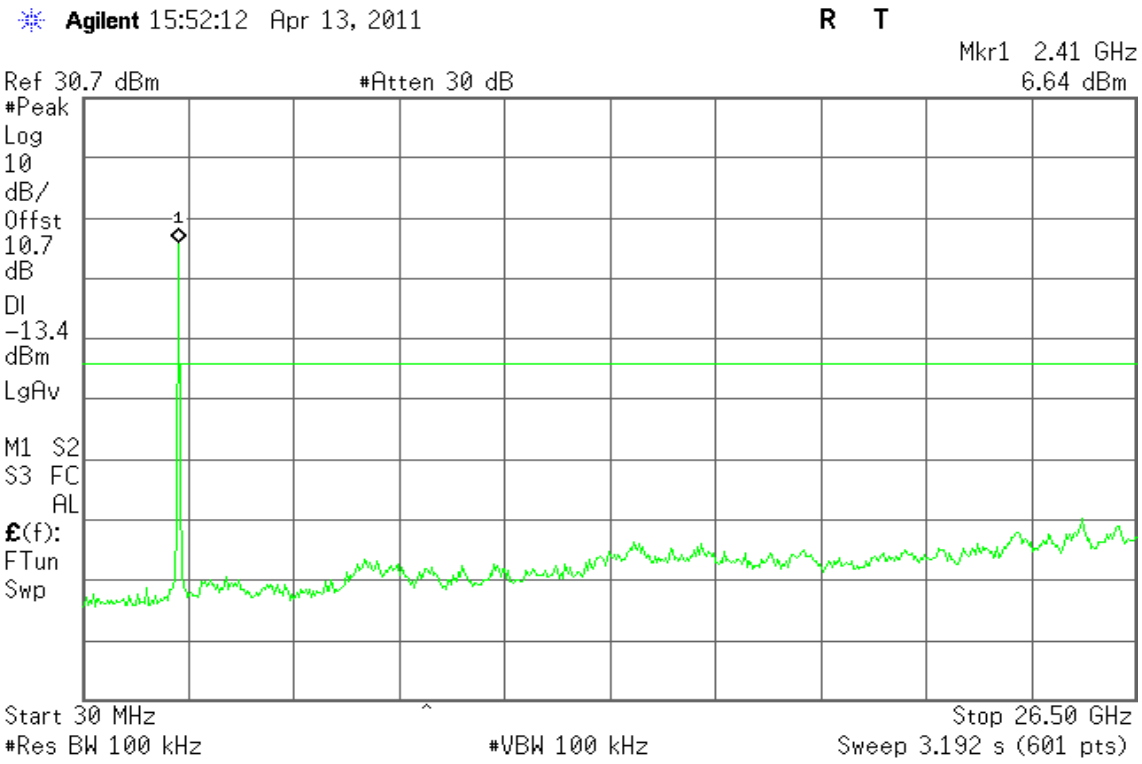
IEEE 802.11g mode

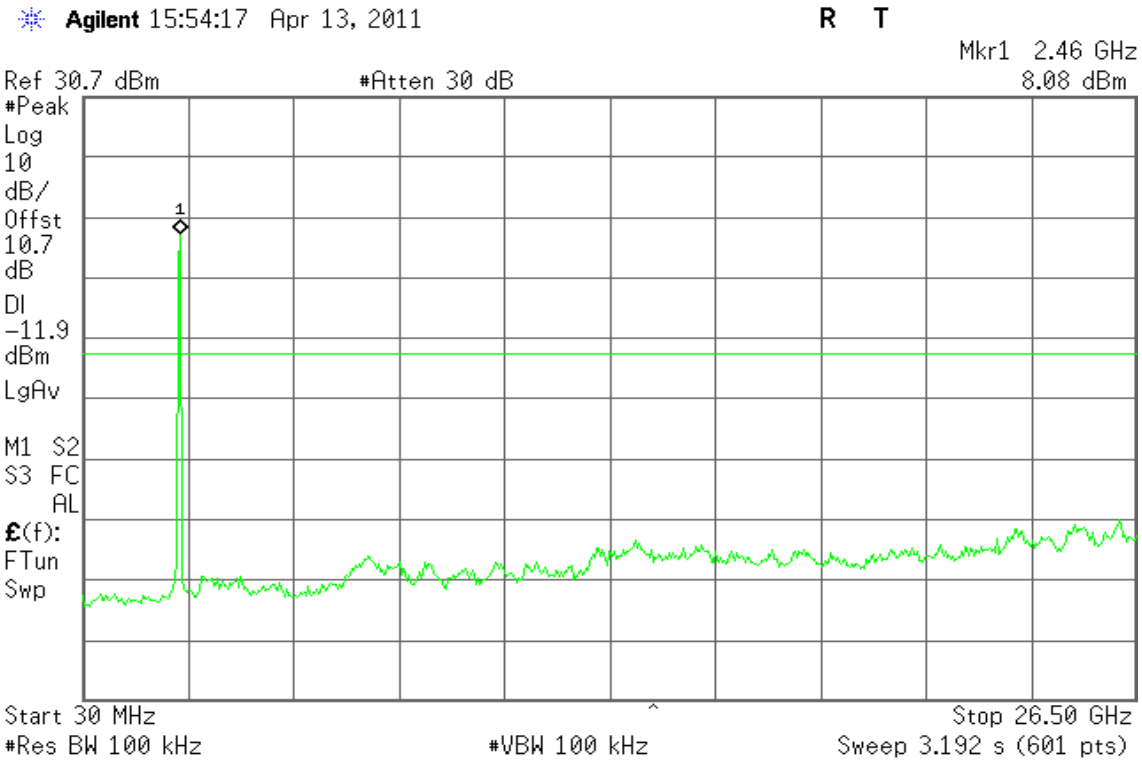


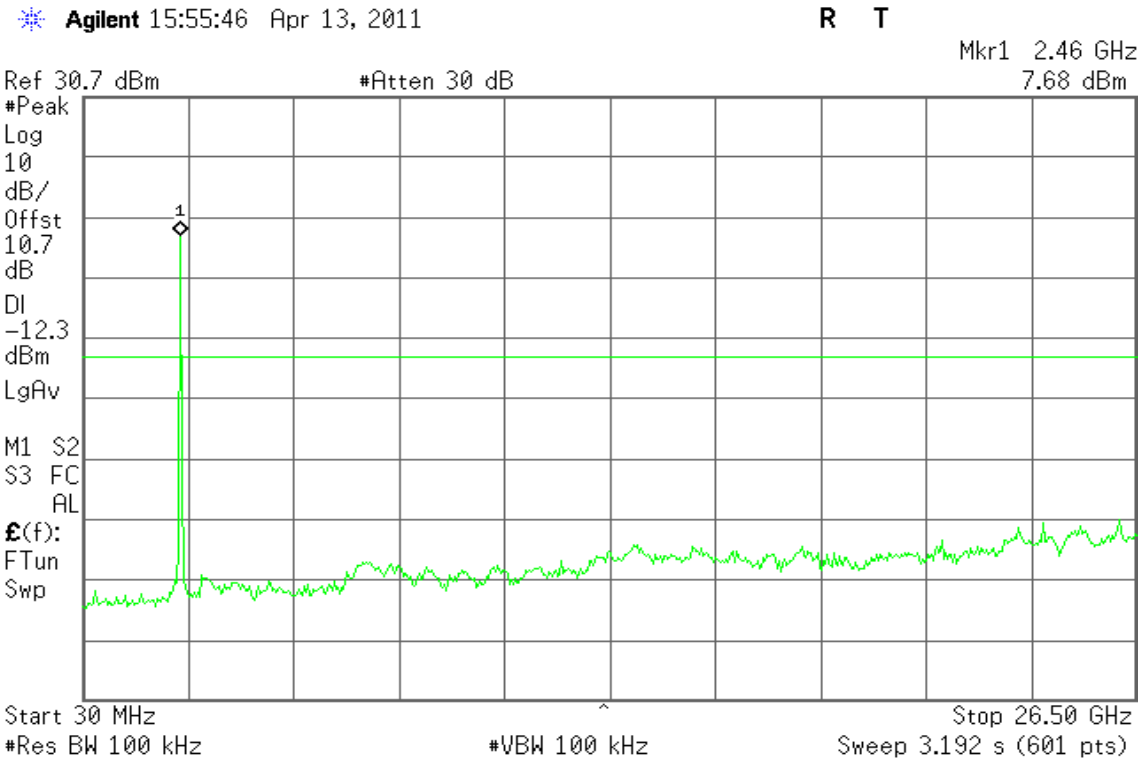




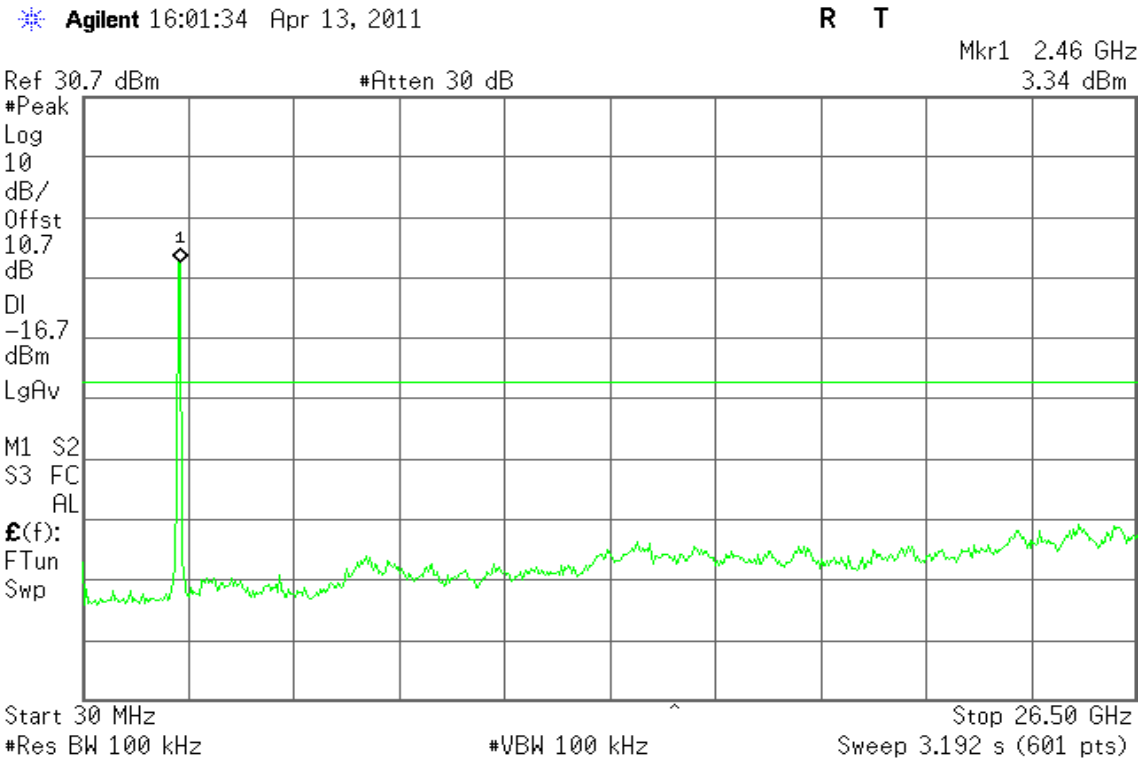
draft 802.11n 20 MHz Channel mode

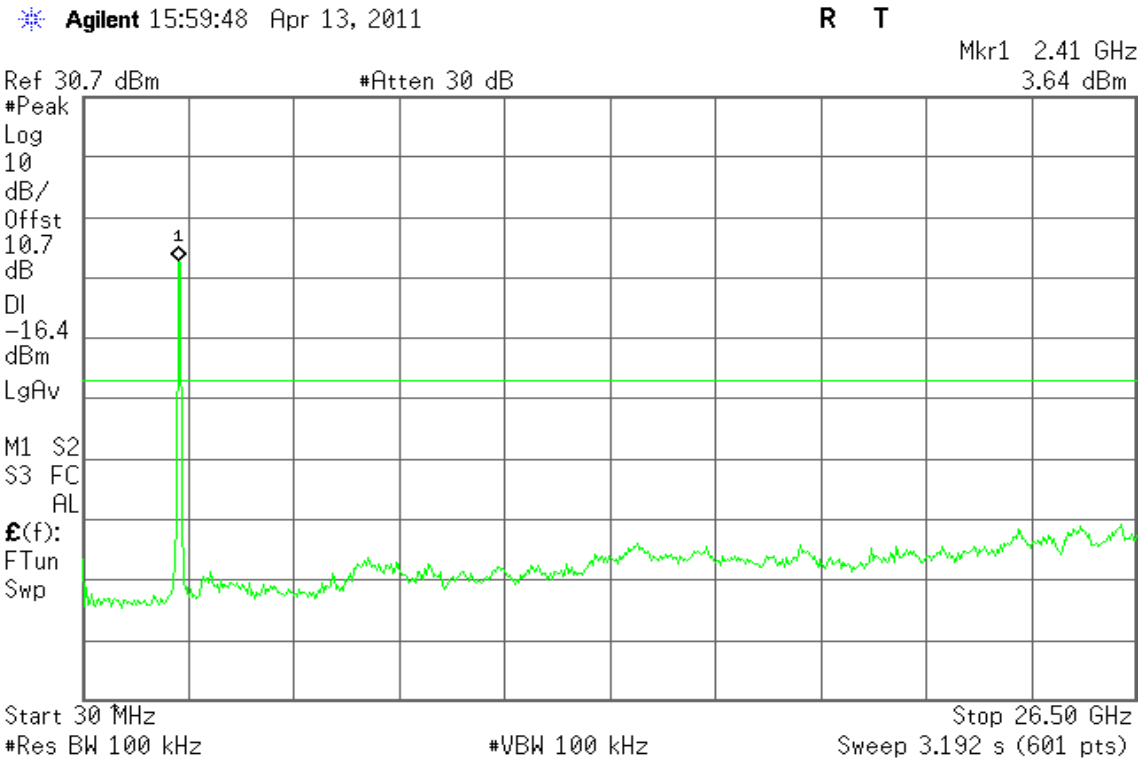


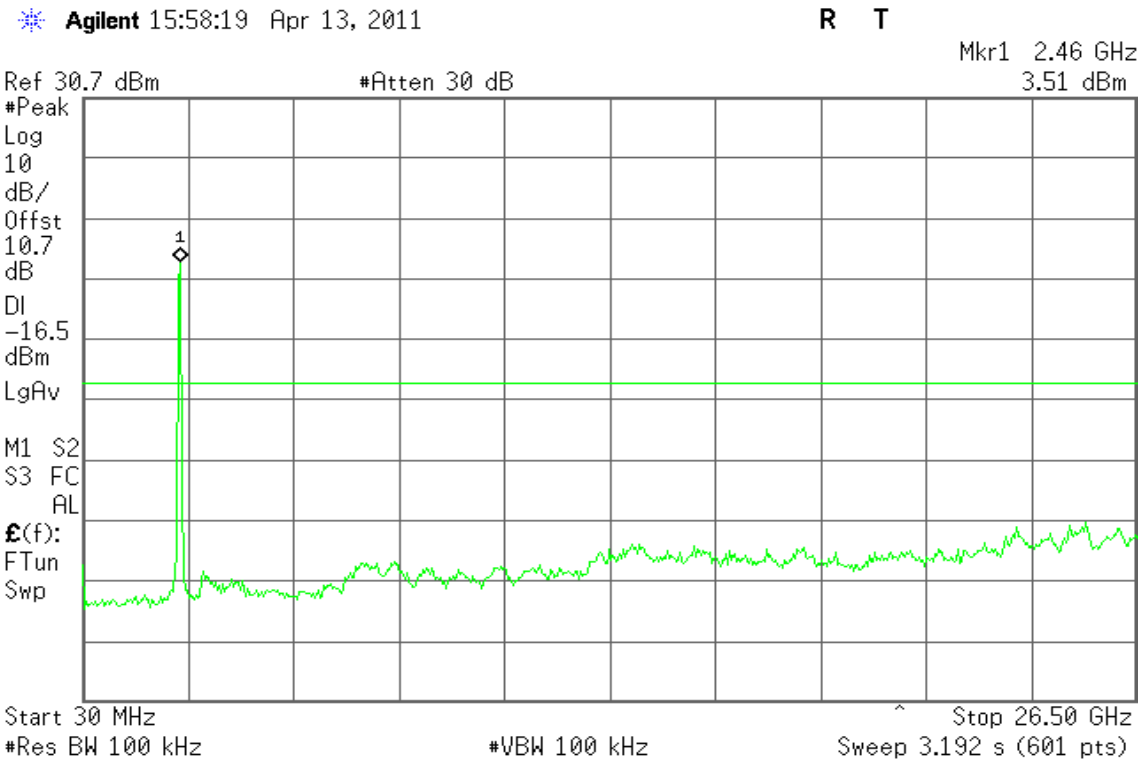




draft 802.11n 40 MHz Channel mode







7.6.2 RADIATED EMISSIONS

LIMIT

1. According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

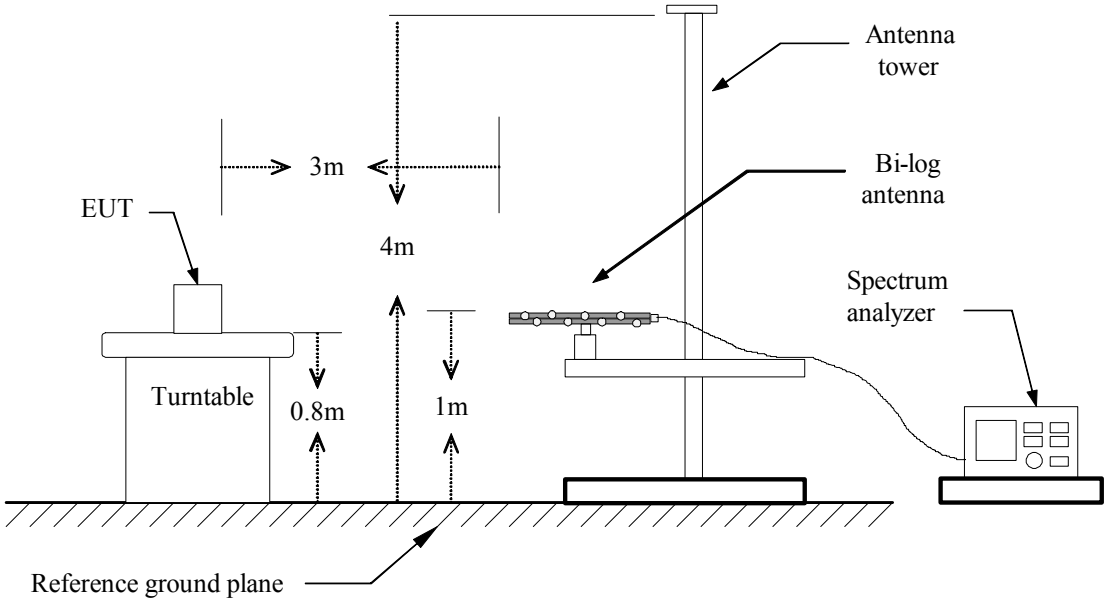
Remark: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.*

2. In the emission table above, the tighter limit applies at the band edges.

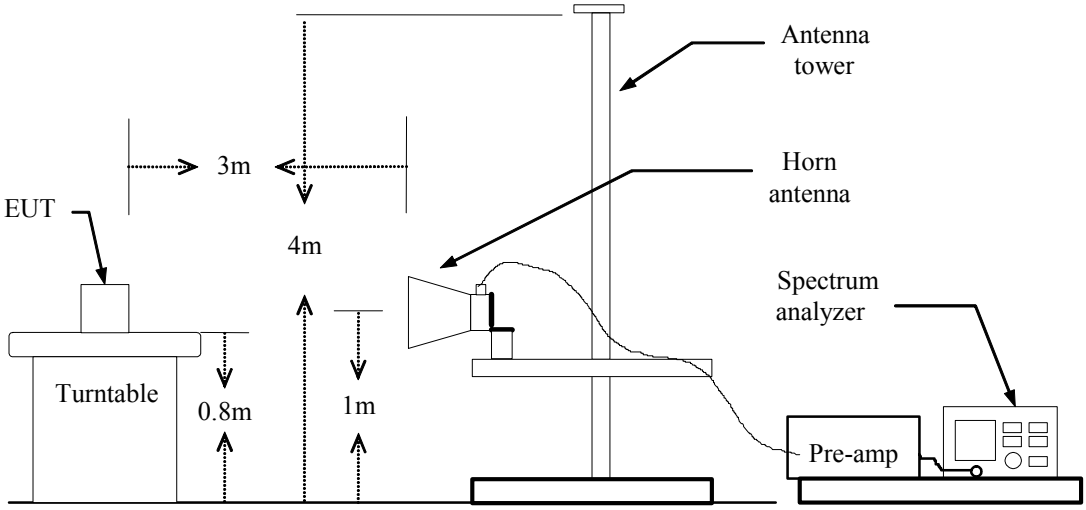
Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

TEST CONFIGURATION

Below 1 GHz



Above 1 GHz



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

   Below 30MHz

   RBW=9kHz / VBW=300kHz / Sweep=AUTO

   30 ~ 1000MHz:

   RBW=120kHz / VBW=300kHz / Sweep=AUTO

   Above 1GHz:

   (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

   (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

TEST RESULTS

No non-compliance noted.

TEST DATA

Below 1GHz

Operation Mode:	Transmitting	**Test Date:**	April 15, 2011
Temperature:	18°C	**Tested by:**	Chieh Cheng
Humidity:	60% RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
59.1000	V	51.65	-15.48	36.17	40.00	-3.83	QP
130.2333	V	53.33	-14.30	39.03	43.50	-4.47	QP
198.1333	V	54.13	-15.33	38.80	43.50	-4.70	QP
249.8667	V	51.98	-12.50	39.48	46.00	-6.52	QP
500.4500	V	47.51	-7.06	40.45	46.00	-5.55	QP
666.9667	V	43.28	-4.33	38.95	46.00	-7.05	QP
59.1000	H	52.42	-15.48	36.94	40.00	-3.06	QP
130.2333	H	54.03	-14.30	39.73	43.50	-3.77	QP
198.1333	H	56.05	-15.33	40.72	43.50	-2.78	QP
249.8667	H	51.52	-12.50	39.02	46.00	-6.98	QP
500.4500	H	49.19	-7.06	42.13	46.00	-3.87	QP
749.4167	H	40.98	-2.16	38.82	46.00	-7.18	QP
898.1500	H	39.70	0.27	39.97	46.00	-6.03	QP

Remark:

1. *No emission found between lowest internal used / generated frequency to 30 MHz. (9kHz ~ 30MHz)*
2. *Measuring frequencies from 9 kHz to the 1GHz.*
3. *Radiated emissions measured in the measured frequency range were made with an instrument using peak detector or quasi-peak detector mode.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.*

Above 1 GHz

Operation Mode: TX / IEEE 802.11b / CH Low **Test Date:** March 23, 2011

Temperature: 12°C **Tested by:** Chieh Cheng

Humidity: 50 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1126.67	V	53.46	---	-6.63	46.83	---	74.00	54.00	-7.17	Peak
1843.33	V	50.15	---	-0.95	49.20	---	74.00	54.00	-4.80	Peak
2290.00	V	53.81	44.87	0.47	54.28	45.34	74.00	54.00	-8.66	AVG
N/A										
1126.67	H	54.51	---	-7.43	47.08	---	74.00	54.00	-6.92	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: TX / IEEE 802.11b / CH Mid **Test Date:** March 23, 2011

Temperature: 12°C **Tested by:** Chieh Cheng

Humidity: 50 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1126.67	V	53.95	---	-6.63	47.32	---	74.00	54.00	-6.68	Peak
2316.67	V	55.04	45.93	0.57	55.61	46.50	74.00	54.00	-7.50	AVG
2480.00	V	56.79	47.38	2.20	58.99	49.58	74.00	54.00	-4.42	AVG
N/A										
1126.67	H	54.57	---	-7.43	47.14	---	74.00	54.00	-6.86	Peak
2950.00	H	48.95	---	1.83	50.78	---	74.00	54.00	-3.22	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: TX / IEEE 802.11b / CH High **Test Date:** March 23, 2011

Temperature: 12°C **Tested by:** Chieh Cheng

Humidity: 50 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1123.33	V	54.04	---	-6.67	47.37	---	74.00	54.00	-6.63	Peak
1840.00	V	49.93	---	-0.95	48.98	---	74.00	54.00	-5.02	Peak
2340.00	V	53.84	44.71	0.77	54.61	45.48	74.00	54.00	-8.52	AVG
N/A										
1126.67	H	54.60	---	-7.43	47.17	---	74.00	54.00	-6.83	Peak
2100.00	H	50.02	---	-1.55	48.47	---	74.00	54.00	-5.53	Peak
2546.67	H	50.38	---	-0.70	49.69	---	74.00	54.00	-4.31	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: TX / IEEE 802.11g / CH Low **Test Date:** March 23, 2011

Temperature: 12°C **Tested by:** Chieh Cheng

Humidity: 50 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1126.67	V	54.69	---	-6.63	48.06	---	74.00	54.00	-5.94	Peak
N/A										
1123.33	H	55.73	---	-7.41	48.32	---	74.00	54.00	-5.68	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: TX / IEEE 802.11g / CH Mid **Test Date:** March 23, 2011

Temperature: 12°C **Tested by:** Chieh Cheng

Humidity: 50 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1126.67	V	52.88	---	-6.63	46.25	---	74.00	54.00	-7.75	Peak
2380.00	V	56.86	47.66	1.11	57.97	48.77	74.00	54.00	-5.23	AVG
2493.33	V	57.27	47.85	2.35	59.62	50.20	74.00	54.00	-3.80	AVG
N/A										
1126.67	H	53.96	---	-7.43	46.53	---	74.00	54.00	-7.47	Peak
2086.67	H	50.31	---	-1.88	48.43	---	74.00	54.00	-5.57	Peak
2493.33	H	52.58	---	-1.51	51.07	---	74.00	54.00	-2.93	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: TX / IEEE 802.11g / CH High **Test Date:** March 23, 2011

Temperature: 12°C **Tested by:** Chieh Cheng

Humidity: 50 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1126.67	V	54.75	---	-6.63	48.12	---	74.00	54.00	-5.88	Peak
2406.67	V	58.43	48.99	1.36	59.79	50.35	74.00	54.00	-3.65	AVG
N/A										
1123.33	H	54.99	---	-7.41	47.58	---	74.00	54.00	-6.42	Peak
2406.67	H	52.53	---	-1.54	50.99	---	74.00	54.00	-3.01	Peak
2516.67	H	51.51	---	-1.22	50.29	---	74.00	54.00	-3.71	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / draft 802.11n 20 MHz Channel mode / CH Low	**Test Date:**	March 23, 2011
Temperature:	12°C	**Tested by:**	Chieh Cheng
Humidity:	50 % RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
2286.67	V	56.33	47.62	0.48	56.81	48.10	74.00	54.00	-5.90	AVG
7241.67	V	41.52	---	9.58	51.10	---	74.00	54.00	-2.90	Peak
N/A										
1126.67	H	55.33	---	-7.43	47.90	---	74.00	54.00	-6.10	Peak
2176.67	H	49.55	---	-2.05	47.50	---	74.00	54.00	-6.50	Peak
7216.67	H	44.46	32.03	12.39	56.85	44.42	74.00	54.00	-9.58	AVG
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / draft 802.11n 20 MHz Channel mode / CH Mid	**Test Date:**	March 23, 2011
Temperature:	12°C	**Tested by:**	Chieh Cheng
Humidity:	50 % RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
2383.33	V	60.55	49.81	1.14	61.69	50.95	74.00	54.00	-3.05	AVG
2493.33	V	59.71	50.34	2.35	62.06	52.69	74.00	54.00	-1.31	AVG
7325.00	V	40.05	---	9.43	49.48	---	74.00	54.00	-4.52	Peak
N/A										
1126.67	H	54.64	---	-7.43	47.21	---	74.00	54.00	-6.79	Peak
2516.67	H	52.19	---	-1.22	50.97	---	74.00	54.00	-3.03	Peak
7316.67	H	44.22	33.87	12.38	56.60	46.25	74.00	54.00	-7.75	AVG
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / draft 802.11n 20 MHz Channel mode / CH High	**Test Date:**	March 23, 2011
Temperature:	12°C	**Tested by:**	Chieh Cheng
Humidity:	50 % RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
2343.33	V	56.96	47.69	0.80	57.75	48.49	74.00	54.00	-5.51	AVG
2516.67	V	59.01	48.67	2.22	61.23	50.89	74.00	54.00	-3.11	AVG
7391.67	V	41.81	---	10.56	52.37	---	74.00	54.00	-1.63	Peak
N/A										
1126.67	H	54.71	---	-7.43	47.28	---	74.00	54.00	-6.72	Peak
2406.67	H	53.06	---	-1.54	51.53	---	74.00	54.00	-2.47	Peak
2516.67	H	52.74	---	-1.22	51.52	---	74.00	54.00	-2.48	Peak
7383.33	H	42.82	34.92	11.52	54.35	46.44	74.00	54.00	-7.56	AVG
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / draft 802.11n 40 MHz Channel mode / CH Low	**Test Date:**	March 23, 2011
Temperature:	12°C	**Tested by:**	Chieh Cheng
Humidity:	50 % RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1126.67	V	53.64	---	-6.63	47.01	---	74.00	54.00	-6.99	Peak
2523.33	V	61.98	50.83	2.14	64.12	52.97	74.00	54.00	-1.03	AVG
N/A										
1123.33	H	55.65	---	-7.41	48.24	---	74.00	54.00	-5.76	Peak
2526.67	H	53.38	---	-1.05	52.34	---	74.00	54.00	-1.66	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / draft 802.11n 40 MHz Channel mode / CH Mid	**Test Date:**	March 23, 2011
Temperature:	12°C	**Tested by:**	Chieh Cheng
Humidity:	50 % RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
2303.33	V	57.50	46.28	-1.33	56.17	44.95	74.00	54.00	-9.05	AVG
2330.00	V	59.21	50.37	-1.39	57.83	48.98	74.00	54.00	-5.02	AVG
2540.00	V	61.03	51.46	-0.81	60.21	50.65	74.00	54.00	-3.35	AVG
N/A										
1126.67	H	54.75	---	-7.43	47.32	---	74.00	54.00	-6.68	Peak
2540.00	H	53.12	---	-0.81	52.31	---	74.00	54.00	-1.69	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / draft 802.11n 40 MHz Channel mode / CH High	**Test Date:**	March 23, 2011
Temperature:	12°C	**Tested by:**	Chieh Cheng
Humidity:	50 % RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
2350.00	V	60.83	49.83	-1.43	59.40	48.40	74.00	54.00	-5.60	AVG
2556.67	V	58.77	47.19	-0.52	58.24	46.67	74.00	54.00	-7.33	AVG
N/A										
1123.33	H	55.35	---	-7.41	47.94	---	74.00	54.00	-6.06	Peak
2346.67	H	52.27	---	-1.42	50.85	---	74.00	54.00	-3.15	Peak
2556.67	H	51.35	---	-0.52	50.82	---	74.00	54.00	-3.18	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

7.7 POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

** Decreases with the logarithm of the frequency.*

TEST CONFIGURATION

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

TEST DATA

Operation Mode: Charging **Test Date:** March 29, 2011
Temperature: 24°C **Tested by:** Frank Liao
Humidity: 60% RH

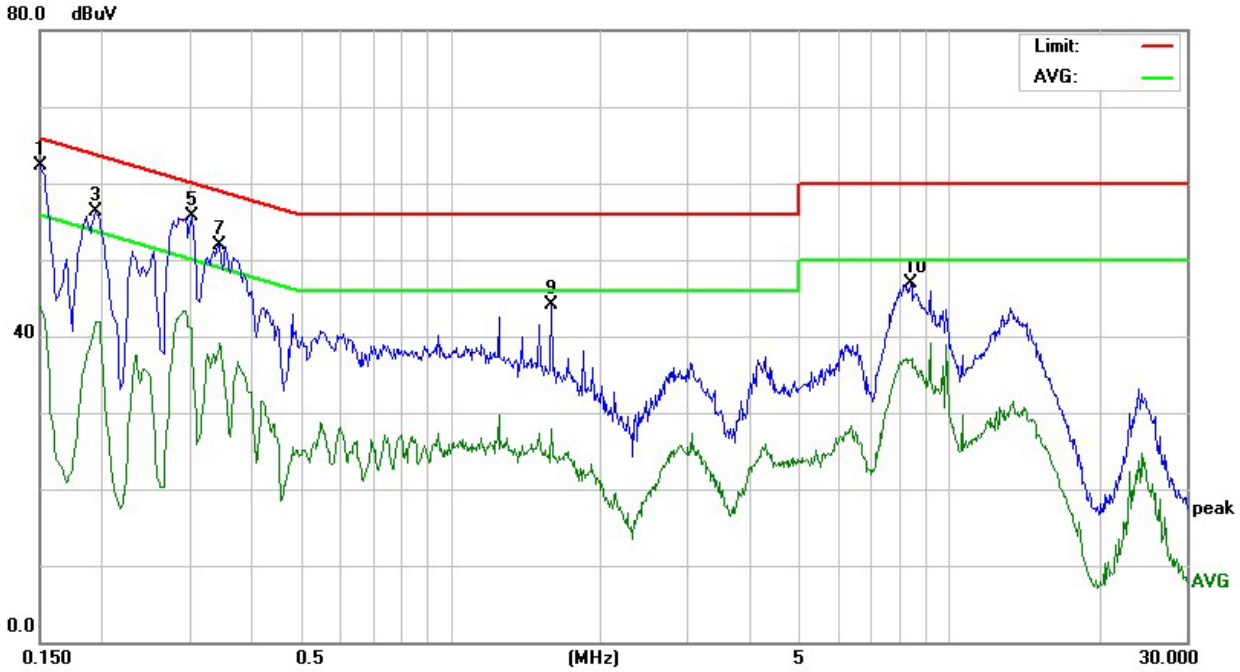
Freq. (MHz)	QP Reading	AV Reading	Corr. factor	QP Result	AV Result	QP Limit	AV Limit	QP Margin	AV Margin	Note
0.150	51.36	33.09	10.90	62.26	43.99	65.99	55.99	-3.73	-12.00	L1
0.194	45.48	31.01	10.80	56.28	41.81	63.86	53.86	-7.58	-12.05	L1
0.302	44.98	27.63	10.69	55.67	38.32	60.19	50.19	-4.52	-11.87	L1
0.346	41.33	28.42	10.65	51.98	39.07	59.06	49.06	-7.08	-9.99	L1
1.594	33.51	--	10.60	44.11	--	56.00	46.00	-11.89	--	L1
8.370	36.10	--	10.73	46.83	--	60.00	50.00	-13.17	--	L1
0.150	51.39	36.90	10.68	62.07	47.58	65.99	55.99	-3.92	-8.41	L2
0.194	45.37	30.28	10.63	56.00	40.91	63.86	53.86	-7.86	-12.95	L2
0.286	44.95	32.79	10.57	55.52	43.36	60.64	50.64	-5.12	-7.28	L2
0.342	42.16	28.14	10.53	52.69	38.67	59.15	49.15	-6.46	-10.48	L2
8.122	37.35	--	10.66	48.01	--	60.00	50.00	-11.99	--	L2
13.310	33.06	--	10.81	43.87	--	60.00	50.00	-16.13	--	L2

Remark:

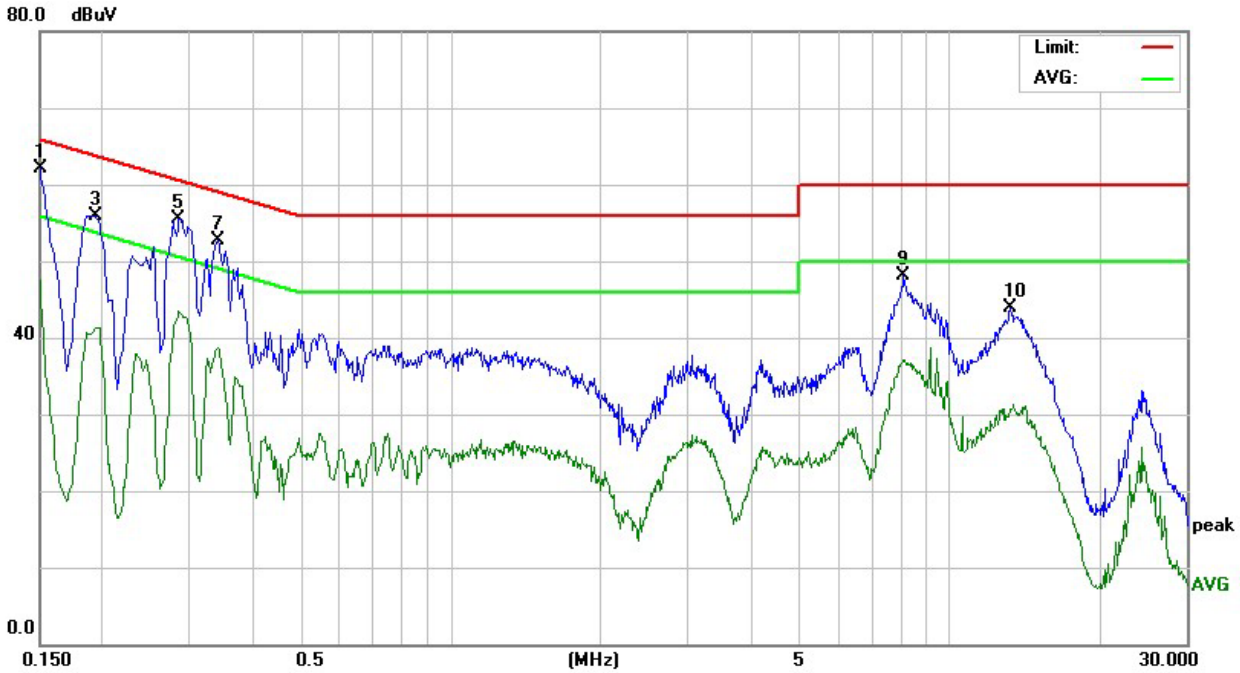
1. *The measuring frequencies range between 0.15 MHz and 30 MHz.*
2. *The emissions measured in the frequency range between 0.15 MHz and 30MHz were made with an instrument using Quasi-peak detector and Average detector.*
3. *The IF bandwidth of SPA between 0.15MHz and 30MHz was 10kHz. The IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9kHz.*
4. *L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)*

Test Plot

Conducted emissions (Line 1)



Conducted emissions (Line 2)



8. APPENDIX I
RADIO FREQUENCY EXPOSURE

LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

EUT Specification

EUT	Wireless N Service Router
Frequency band (Operating)	☒ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz ☐ WLAN: 5.745GHz ~ 5.825GHz ☐ Others
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm^2) ☒ General Population/Uncontrolled exposure (S=1mW/cm^2)
Antenna diversity	☐ Single antenna ☒ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☒ Tx/Rx diversity
Max. output power	IEEE 802.11b mode: 20.05 dBm (101.16mW) IEEE 802.11g mode: 24.45 dBm (278.61mW) draft 802.11n 20 MHz Channel mode: 25.92 dBm (390.84mW) draft 802.11n 40 MHz Channel mode: 25.49 dBm (354.00mW)
Antenna gain (Max)	2.00dBi (including cable loss) (Numeric gain: 1.58)
Evaluation applied	☒ MPE Evaluation ☐ SAR Evaluation ☐ N/A
Remark: *1. The maximum output power is 25.92dBm (390.84mW) at 2412MHz (with 1.58numeric antenna gain.)* *2. For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm^2 even if the calculation indicates that the power density would be larger.*	

TEST RESULTS

No non-compliance noted.

Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{3770}$

Where E = Field strength in Volts / meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and

d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$ ***Equation 1***

Where d = Distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm^2

Maximum Permissible Exposure

EUT output power = 390.84mW

Numeric Antenna gain = 1.58

Substituting the MPE safe distance using d = 20 cm into Equation 1:

Yields

$$S = 0.000199 \times P \times G$$

Where P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm^2

→ Power density = 0.123 mW / cm^2

(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm^2 even if the calculation indicates that the power density would be larger.)