FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

HD Multimedia Home Server

Model: CE-HE130S4 Series

Trade Name: ABLECOM

Issued to

Ablecom Technology Inc.
5F, No. 228, Lian-Cheng Rd., Chung-Ho City, Taipei Hsien, Taiwan

Issued by

Compliance Certification Services Inc.
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
http://www.ccsrf.com
service@ccsrf.com

Testing Laboratory
0363

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		December 29, 2009		Initial Issue	All	Sabrina Wang

TABLE OF CONTENTS

1 TEST RESULT CERTIFICATION

Applicant:	**Ablecom Technology Inc.** 5F, No. 228, Lian-Cheng Rd., Chung-Ho City, Taipei Hsien, Taiwan
Manufacturer:	**Ablecom Technology Inc.** 5F, No. 228, Lian-Cheng Rd., Chung-Ho City, Taipei Hsien, Taiwan
Equipment Under Test:	HD Multimedia Home Server
Trade Name:	ABLECOM
Model:	CE-HE130S4 Series
Date of Test:	November 24 ~ December 23, 2009

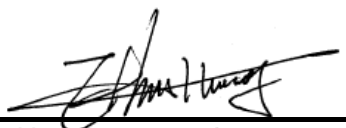
APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 15 Subpart C	No non-compliance noted

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:



Ethan Huang
Section Manager

Reviewed by:

Stan Lin
Supervisor

2 EUT DESCRIPTION

Product	HD MULTIMEDIA HOME SERVER		
Trade Name	ABLECOM		
Model Number	CE-HE130S4 SERIES		
Model Discrepancy	N/A		
EUT Power Rating	100~240VAC, 50~60HZ, 1.5~3.5A		
Power Supply	Enhance	**Model**	ENP-7025B
Power Supply Power Rating	I/P: 100~240VAC, 50~60HZ, 1.5~3.5A O/P: +3.3VDC, 13A; +5VDC, 14A; +12V1DC, 18A; +12V2DC, 18A; -12VDC, 0.3A; +5VSB 2A		
RF Module	AZUREWAVE	**Model**	AW-NU706H
Operating Frequency Range	2412 ~ 2462 MHz		
Transmit Power	IEEE 802.11b mode: 18.61 dBm IEEE 802.11g mode: 24.17 dBm draft 802.11n 20 MHz Channel mode: 24.49 dBm draft 802.11n 40 MHz Channel mode: 23.90 dBm		
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	PIFA Antenna / 0.32 dBi		

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: **XXT-HE1304S** 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, 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 (model: PCG-4T1L) had been tested under operating condition.

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 and cyclic delay diversity were chosen for full testing.

IEEE 802.11g mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6Mbps data rate and cyclic delay diversity 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	10/28/2010
Spectrum Analyzer	R&S	FSEB	825829/011	10/29/2010

3M Chamber Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY48250064	10/28/2010
Spectrum Analyzer	R&S	FSEB	825829/011	10/29/2010
Pre-Amplifier	HP	8447D	2944A06530	12/31/2009
Pre-Amplifier	HP	8449B	3008A01738	04/17/2010
EMI Test Receiver	SCHAFFNER	SCR 3501	436	01/21/2010
Loop Antenna	EMCO	6502	2356	05/28/2010
Bilog Antenna	SCHWAZBECK	VULB9160	3084	09/08/2010
Horn Antenna	EMCO	3115	00022250	05/08/2010
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)			

Remark: *The measurement uncertainty is less than +/-4.0235dB (30MHz ~ 1GHz), +/-3.0958dB (Above 1GHz) which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.*

Powerline Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI Test Receiver	R&S	ESCS30	845552/030	05/18/2010
LISN	R&S	ENV216	100074	12/09/2010
LISN	FCC	FCC-LISN-50/ 250-16-2-07	06013	10/12/2010
Test S/W	CCS-3A1-CE-Luchu			

Remark: *The measurement uncertainty is less than +/- 1.7806dB, which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.*

4.3. MEASUREMENT UNCERTAINTY

Parameter	Uncertainty
Powerline Conducted Emission	±1.7983
3M Semi Anechoic Chamber / 30MHz ~ 1GHz	±3.8856
3M Semi Anechoic Chamber / Above 1GHz	±3.8721

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-321/325
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	RSS212, Issue 1	Canada IC 2324C-3 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 Radiated Emission Above 1GHz & Conductected Measurement

No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
	N/A**						

***No any support equipment during the test.*

For Radiated Emission Below 1GHz & Powerline Measurement

No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1	LCD Monitor	2407WFPb	CN-0FC255-46633-675-23TLS	FCC DoC	DELL	DVI Cable: Unshielded, 1.8m with two cores HDMI Cable: Unshielded, 1.8m	Unshielded, 1.8m
2	LCD Monitor	2407WFPb	CN-0FC255-46633-675-24TKS	FCC DoC	DELL	D-SUB Cable: Unshielded, 1.8m with two cores	Unshielded, 1.8m
3	PS/2 Keyboard	Y-SJ17	SY528UK	FCC DoC	Logitech	Unshielded, 1.8m	N/A
4	USB Mouse	MO19UCA	020440943	FCC DoC	HP	Unshielded, 1.8m	N/A
5	Traveling Disk	U172	C072001303348	FCC DoC	CJC	Unshielded, 1.8m	N/A
6	Traveling Disk	U172	C072001303385	FCC DoC	PQI	Unshielded, 1.8m	N/A
7	Traveling Disk	U172	C072001301690	FCC DoC	PQI	Unshielded, 1.8m	N/A
8	Traveling Disk	U172	C072001301788	FCC DoC	PQI	Unshielded, 1.8m	N/A
9	Traveling Disk	U172	C072001303234	FCC DoC	PQI	Unshielded, 1.8m	N/A
10	Traveling Disk	U172	C072001301712	FCC DoC	PQI	Unshielded, 1.8m	N/A
11	Traveling Disk	U172	C072001301599	FCC DoC	PQI	Unshielded, 1.8m	N/A
12	e-SATA External HDD	ST-M10	A01869-E48-0004	FCC DoC	Onnto	Unshielded, 1.8m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m
13	5.1CH Amp.	Z-5400	S-0180B	FCC DoC	Logitech	Unshielded, 1.8m Shielded, 0.5m*2	Unshielded, 1.8m
14	Multimedia Headset	ClearChat	N/A	FCC DoC	Logitech	Unshielded, 1.8m*2	N/A
15	Multimedia Headset	ClearChat	N/A	FCC DoC	Logitech	Unshielded, 1.8m*2	N/A
16	Walkman	RQ-L11	CD008487	FCC DoC	Panasonic	Unshielded, 1.8m	N/A
17	Notebook PC (Remote)	COMPAQ NC 4010	CNU441F8LV	FCC DoC	HP	LAN Cable: Unshielded, 3.5m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core

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

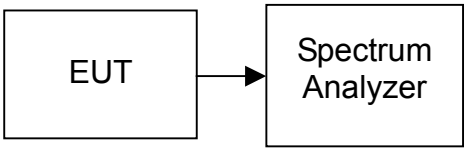
7 FCC PART 15.247 REQUIREMENTS

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 = 20MHz, 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	12.240	>500	PASS
Mid	2437	12.240		PASS
High	2462	12.271		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	16.467	>500	PASS
Mid	2437	16.467		PASS
High	2462	16.527		PASS

Test mode: draft 802.11n 20 MHz Channel mode

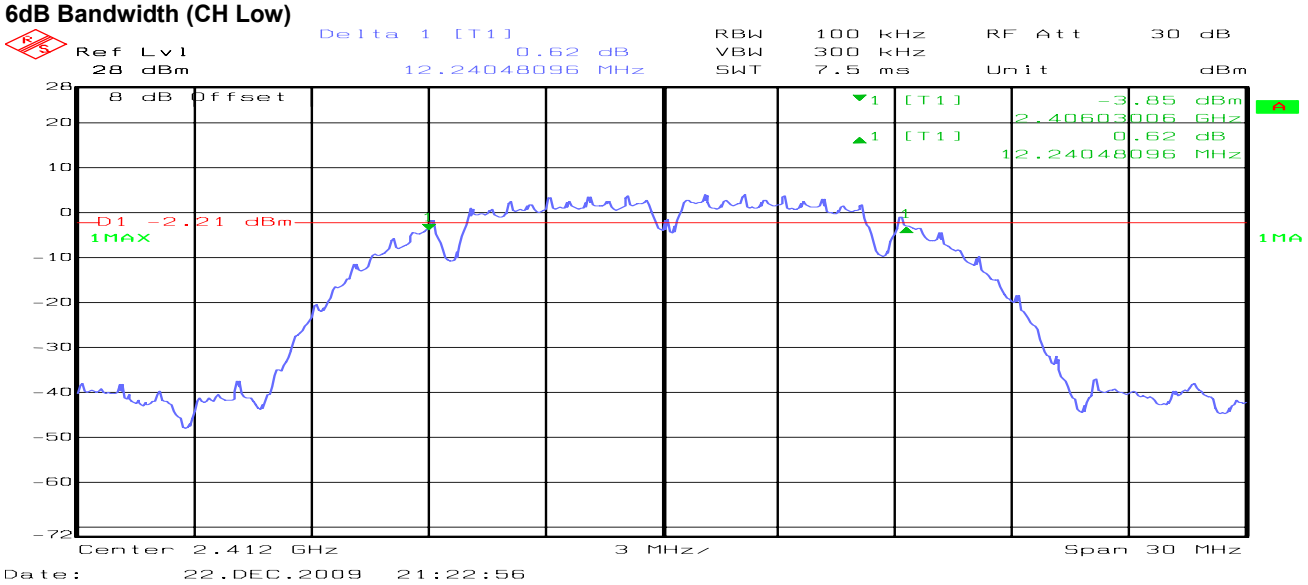
Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	17.723	>500	PASS
Mid	2437	17.699		PASS
High	2462	17.645		PASS

Test mode: draft 802.11n 40 MHz Channel mode

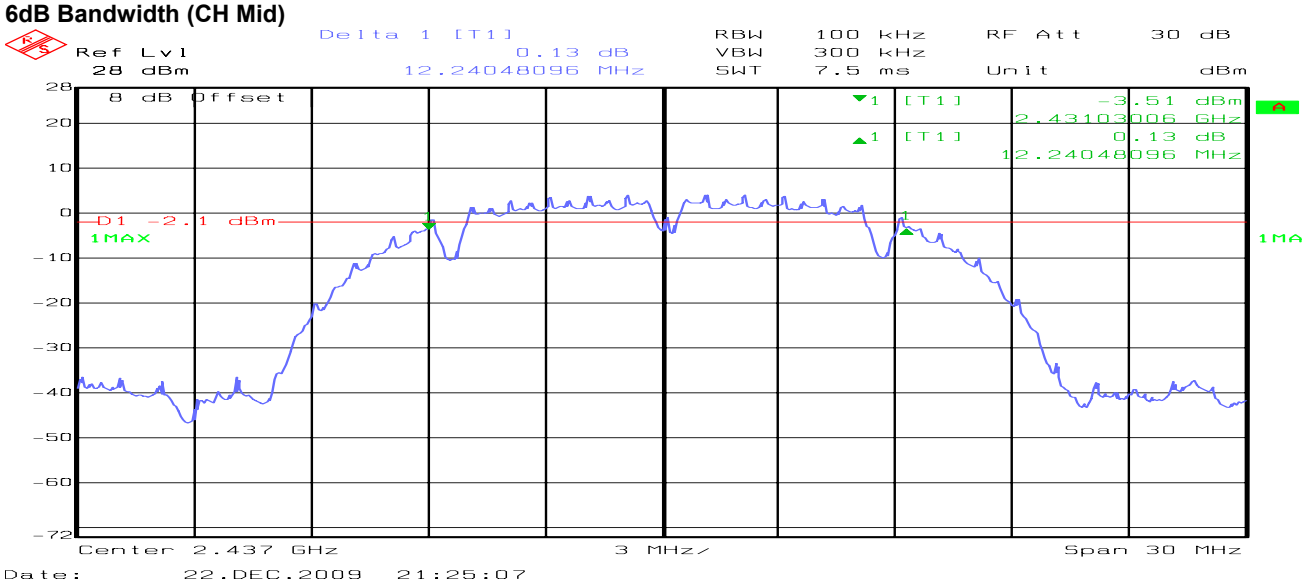
Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	2422	36.152	>500	PASS
Mid	2437	36.052		PASS
High	2452	36.114		PASS

Test Plot
IEEE 802.11b mode

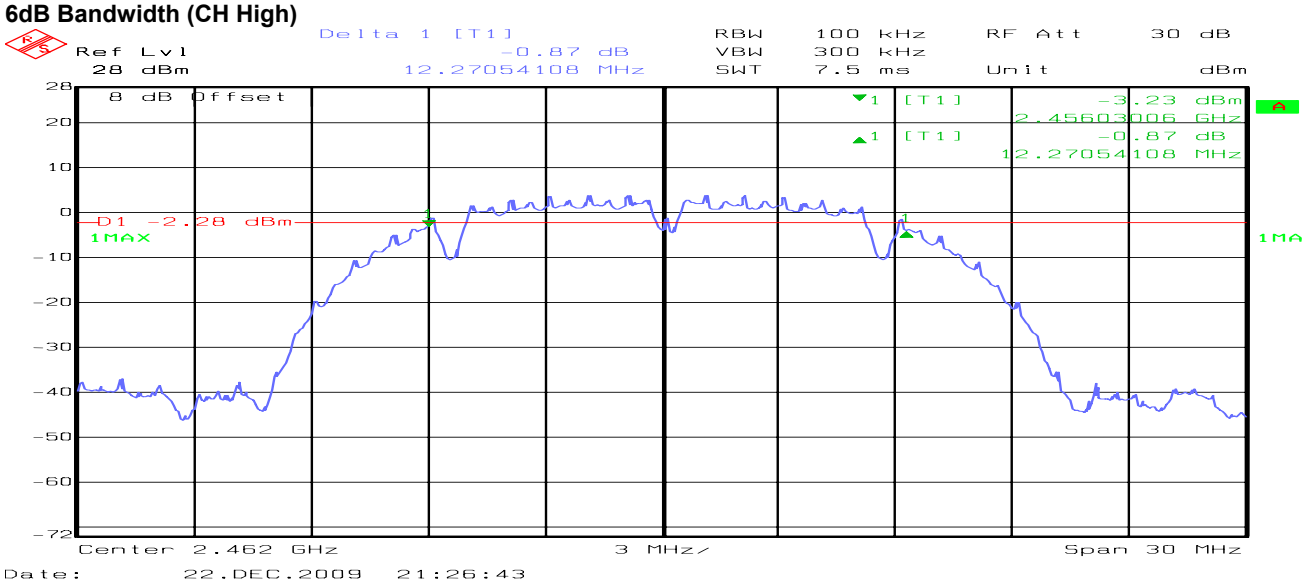
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

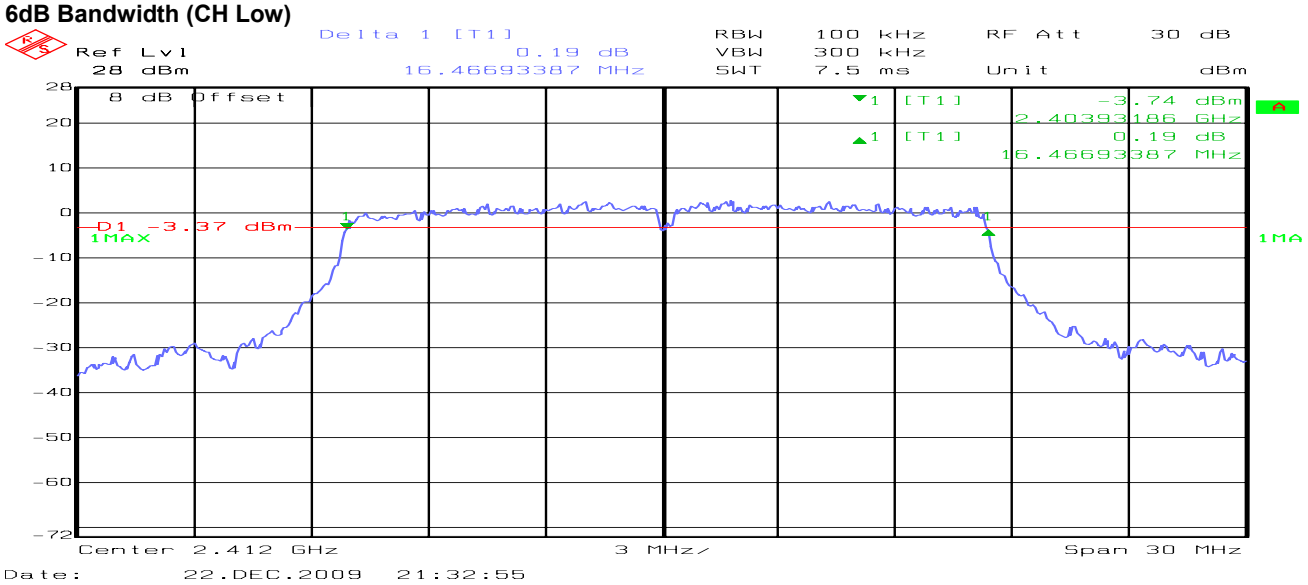


6dB Bandwidth (CH High)

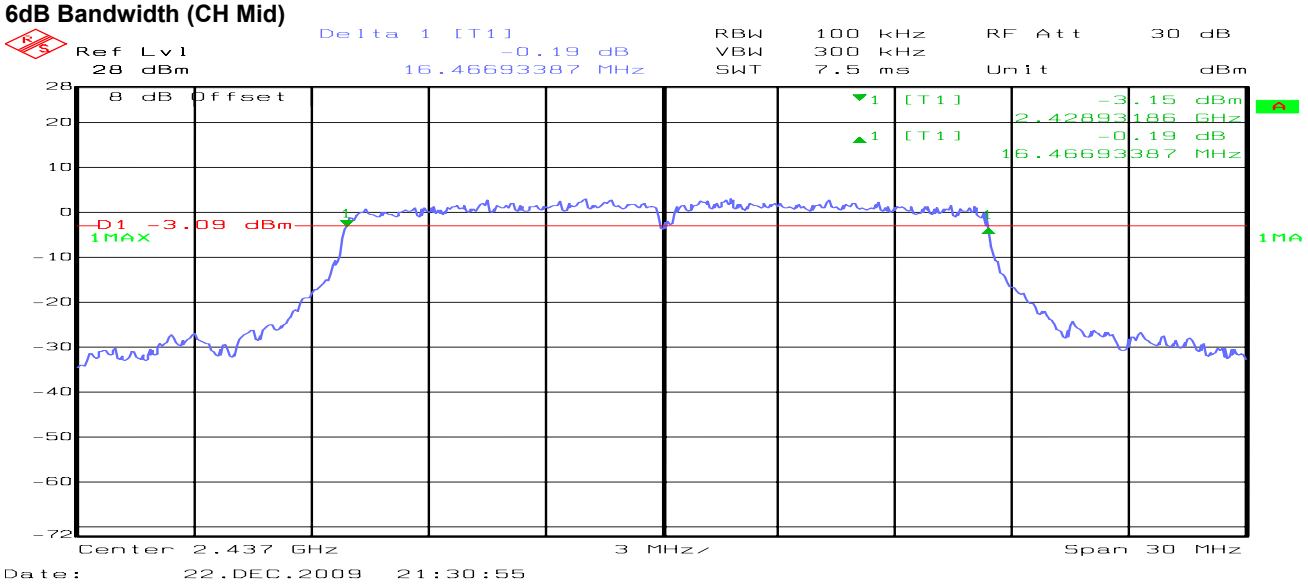


IEEE 802.11g mode

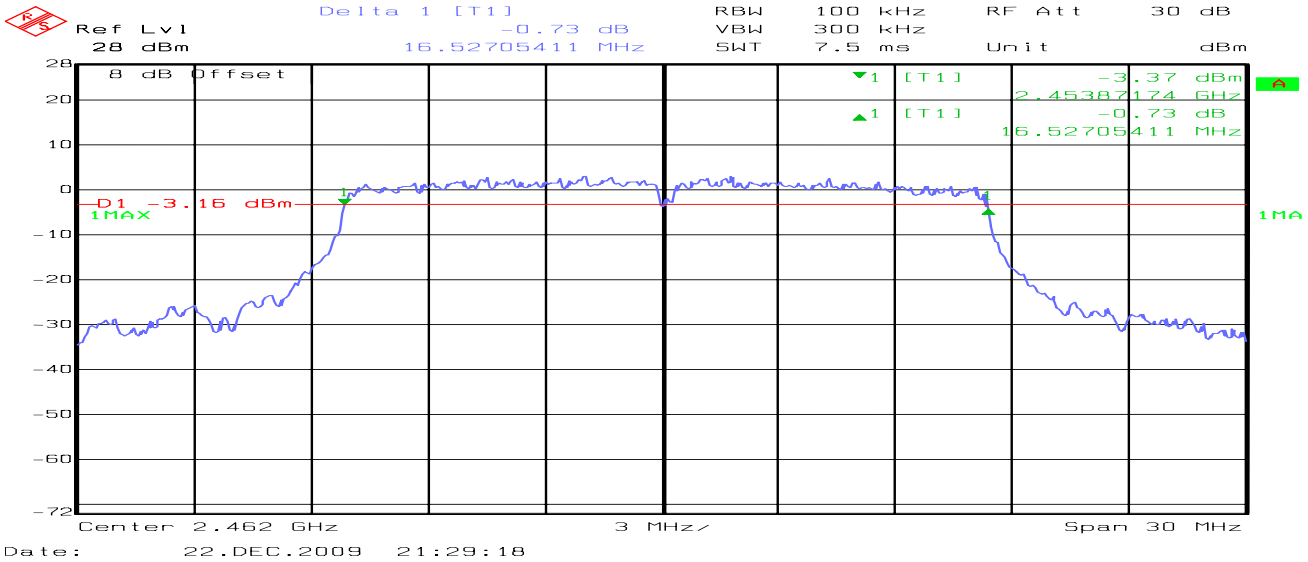
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

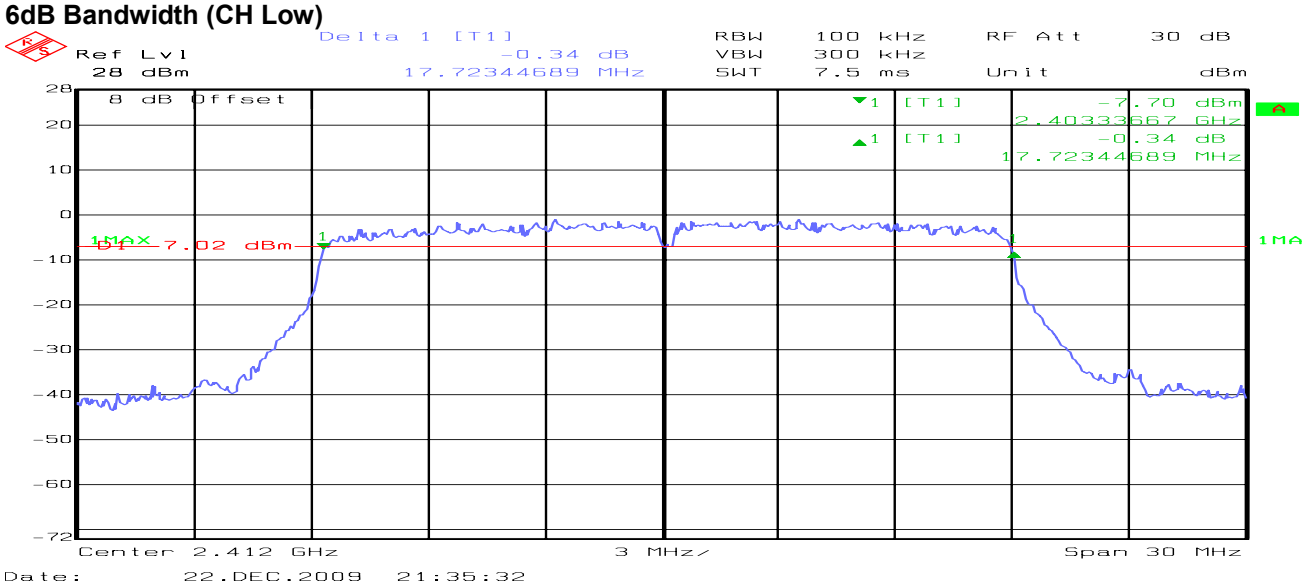


6dB Bandwidth (CH High)

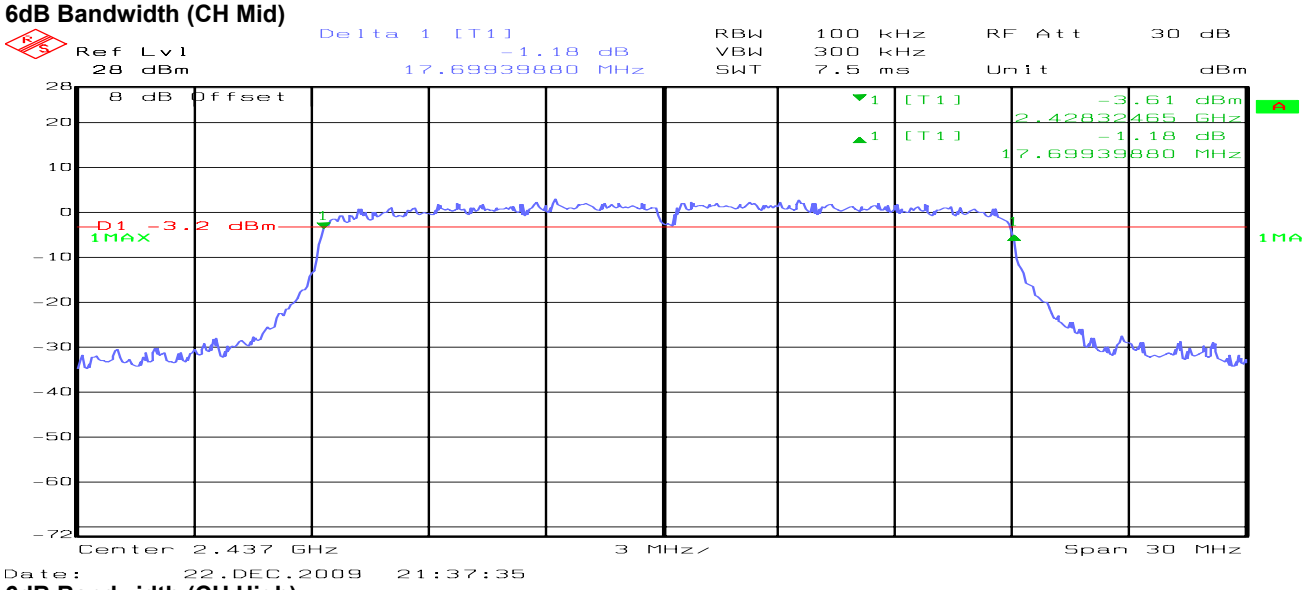


draft 802.11n 20 MHz Channel mode

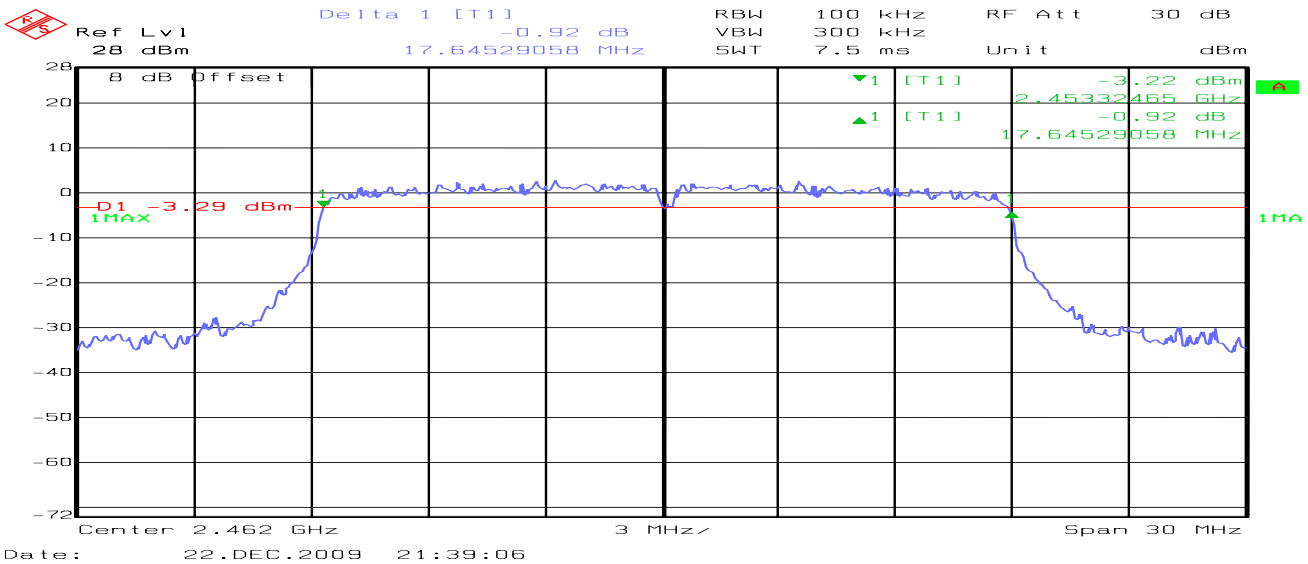
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

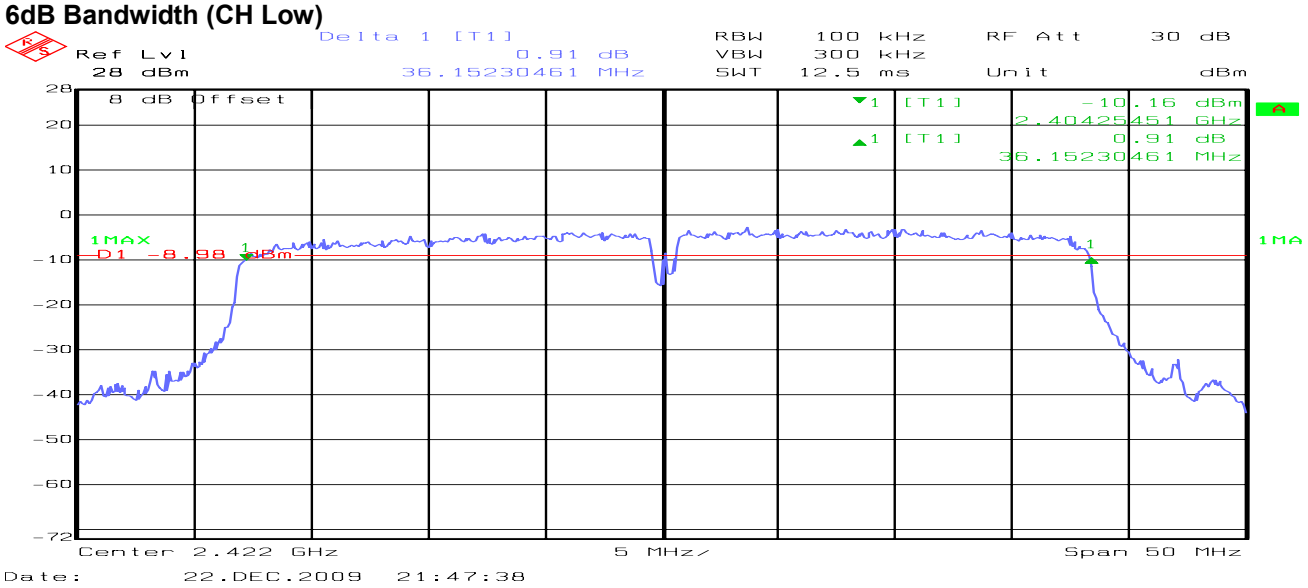


6dB Bandwidth (CH High)

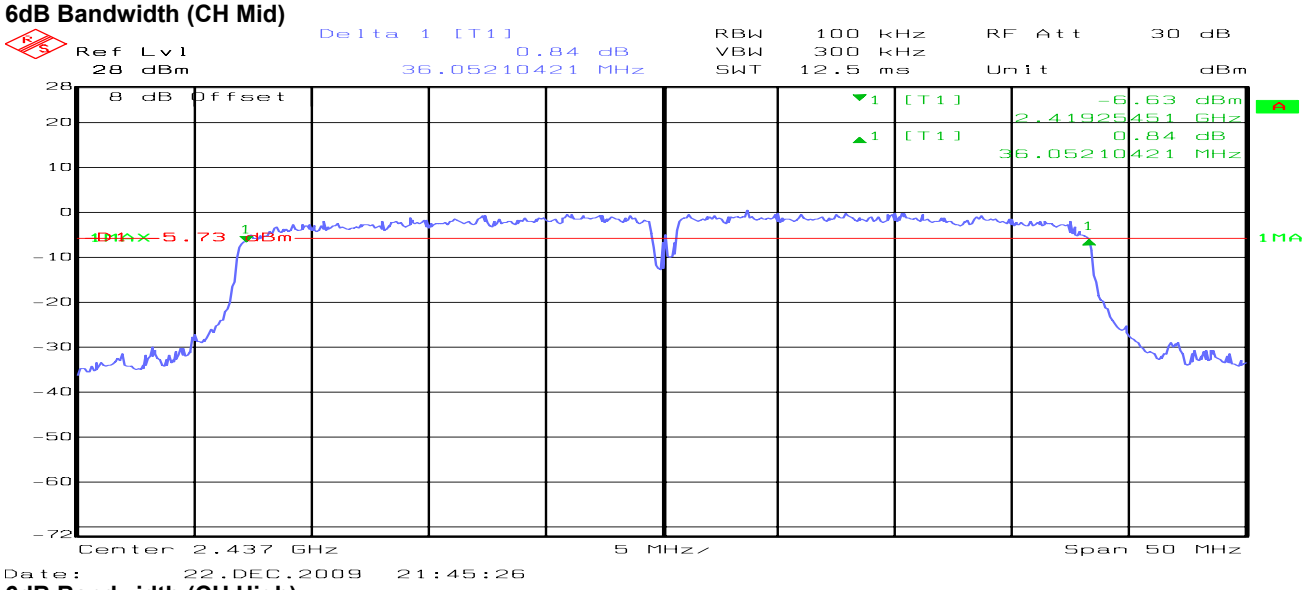


draft 802.11n 40 MHz Channel mode

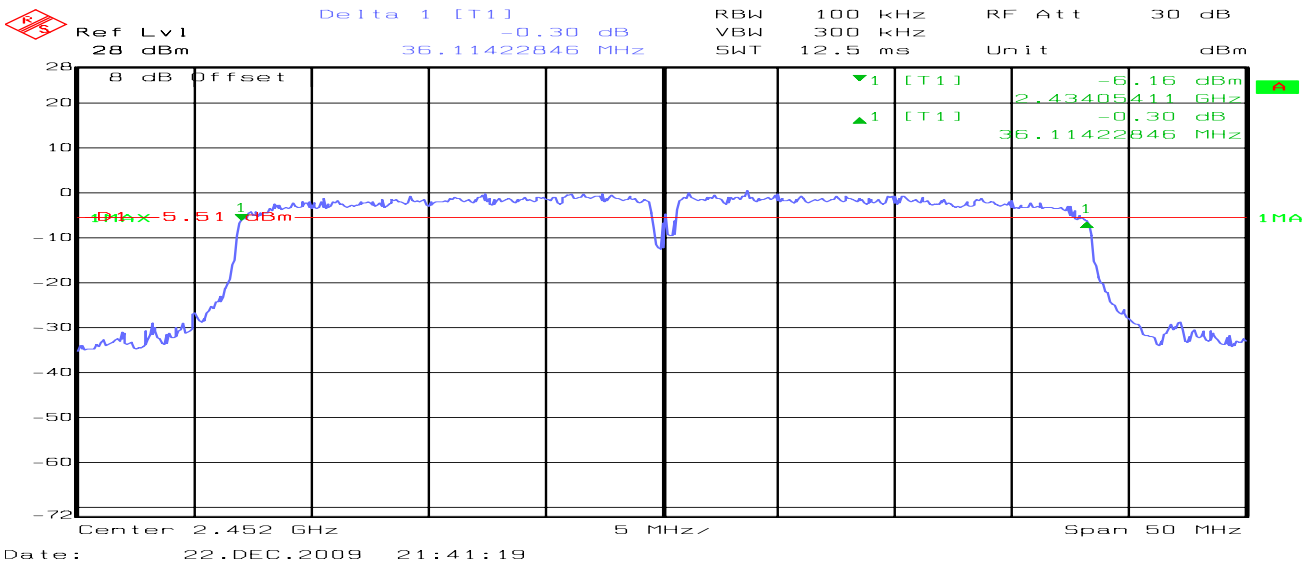
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



6dB Bandwidth (CH High)



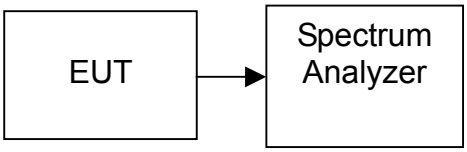
7.2. PEAK POWER

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 Spectrum analyzer. The Spectrum analyzer 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	18.61	0.07261	1.00	PASS
Mid	2437	18.41	0.06934		PASS
High	2462	18.53	0.07129		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	20.14	0.10328	1.00	PASS
Mid	2437	24.17	0.26122		PASS
High	2462	23.75	0.23714		PASS

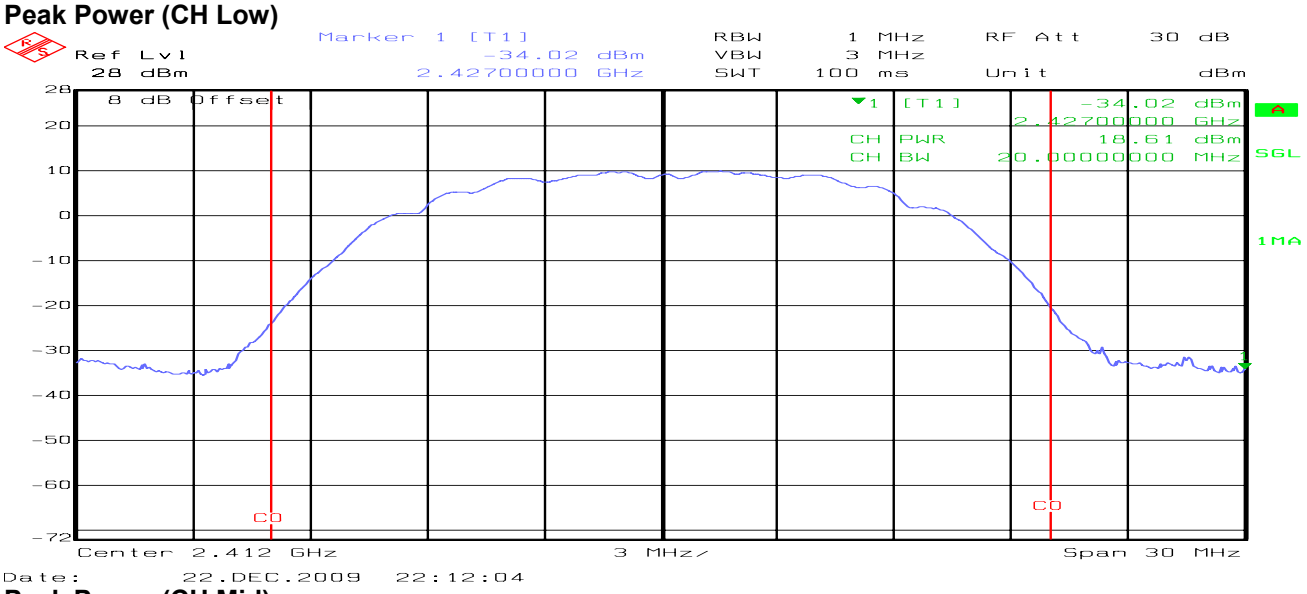
Test mode: draft 802.11n 20 MHz Channel mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	20.50	0.11220	1.00	PASS
Mid	2437	24.35	0.27227		PASS
High	2462	24.49	0.28119		PASS

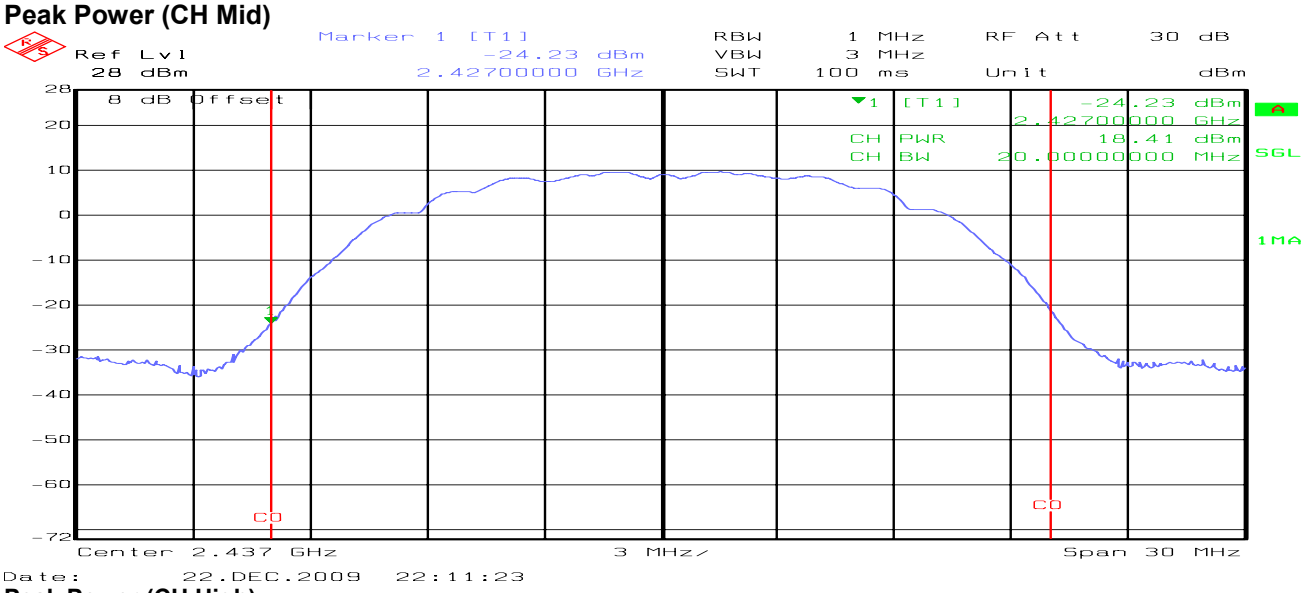
Test mode: draft 802.11n 40 MHz Channel mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2422	20.93	0.12388	1.00	PASS
Mid	2437	23.87	0.24378		PASS
High	2452	23.90	0.24547		PASS

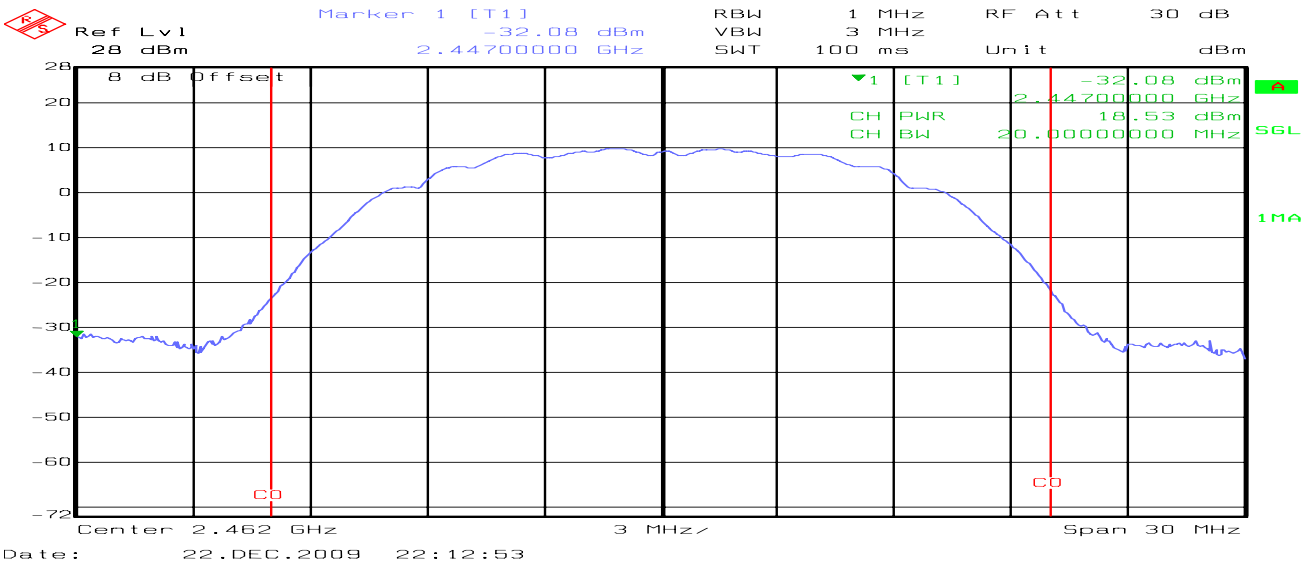
Test Plot
IEEE 802.11b mode
Peak Power (CH Low)



Peak Power (CH Mid)

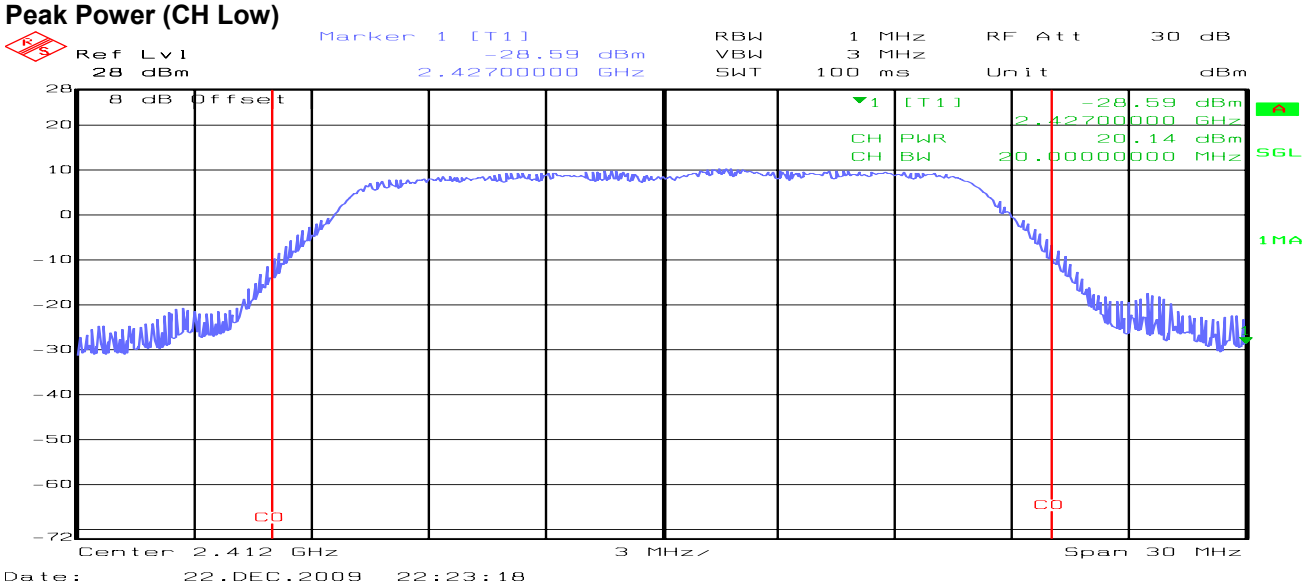


Peak Power (CH High)

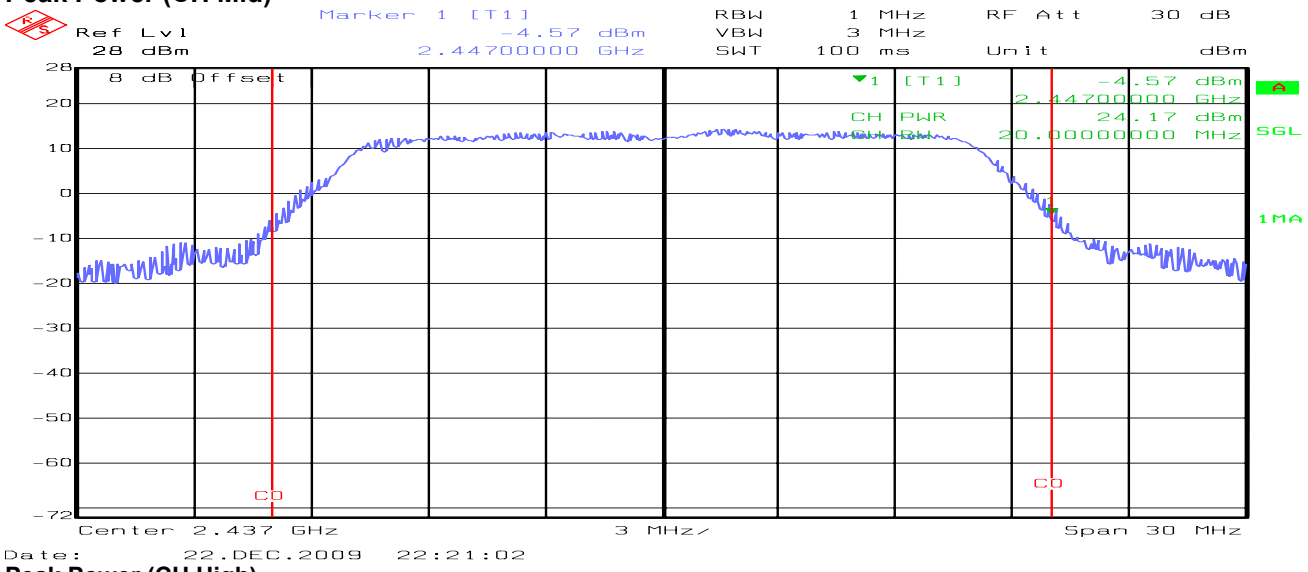


IEEE 802.11g mode

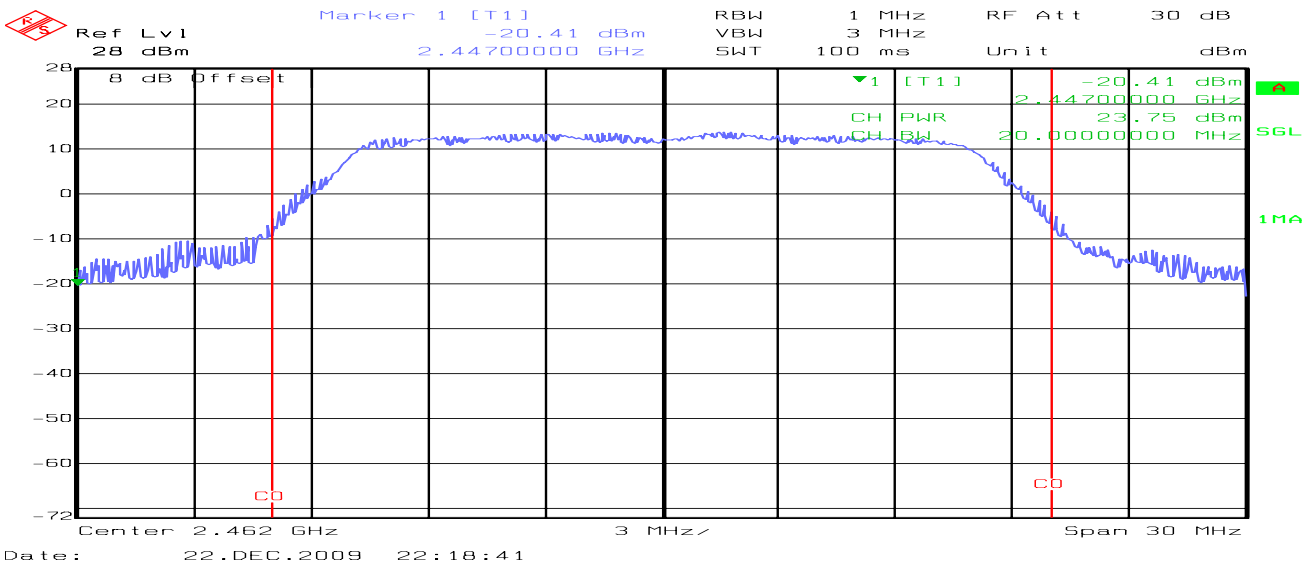
Peak Power (CH Low)



Peak Power (CH Mid)

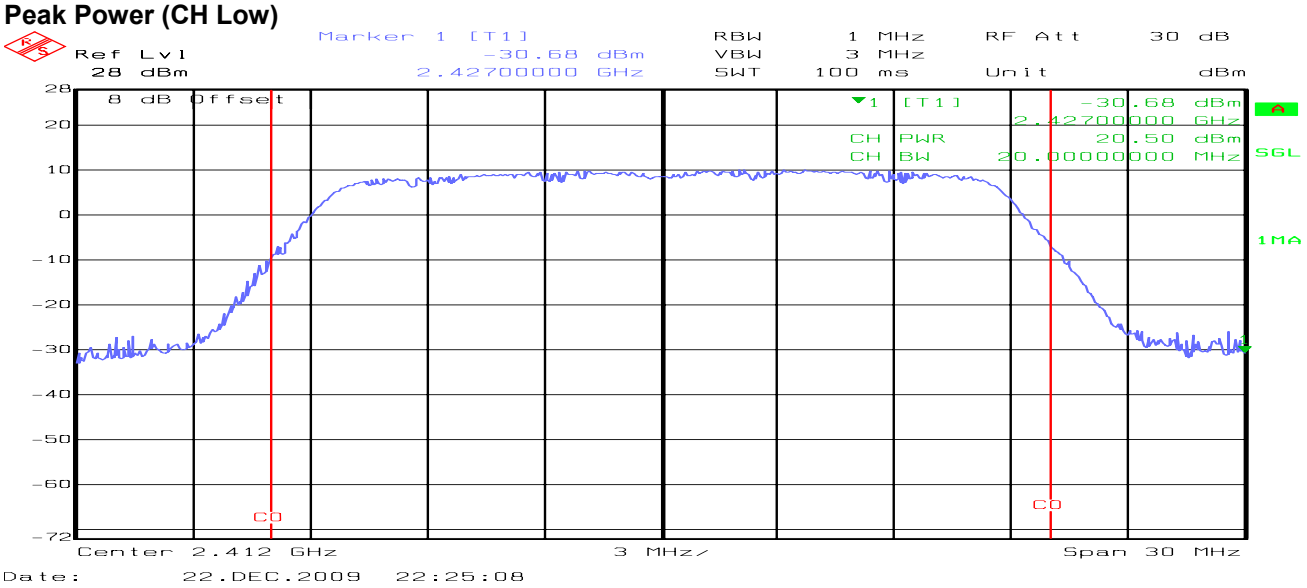


Peak Power (CH High)

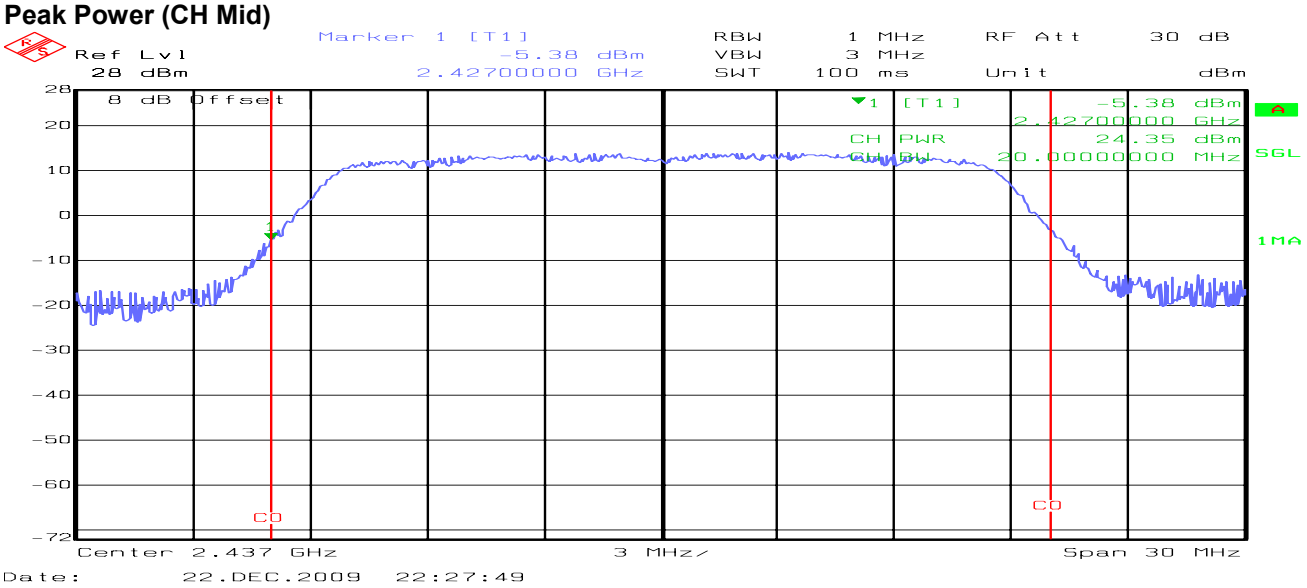


draft 802.11n 20 MHz Channel mode

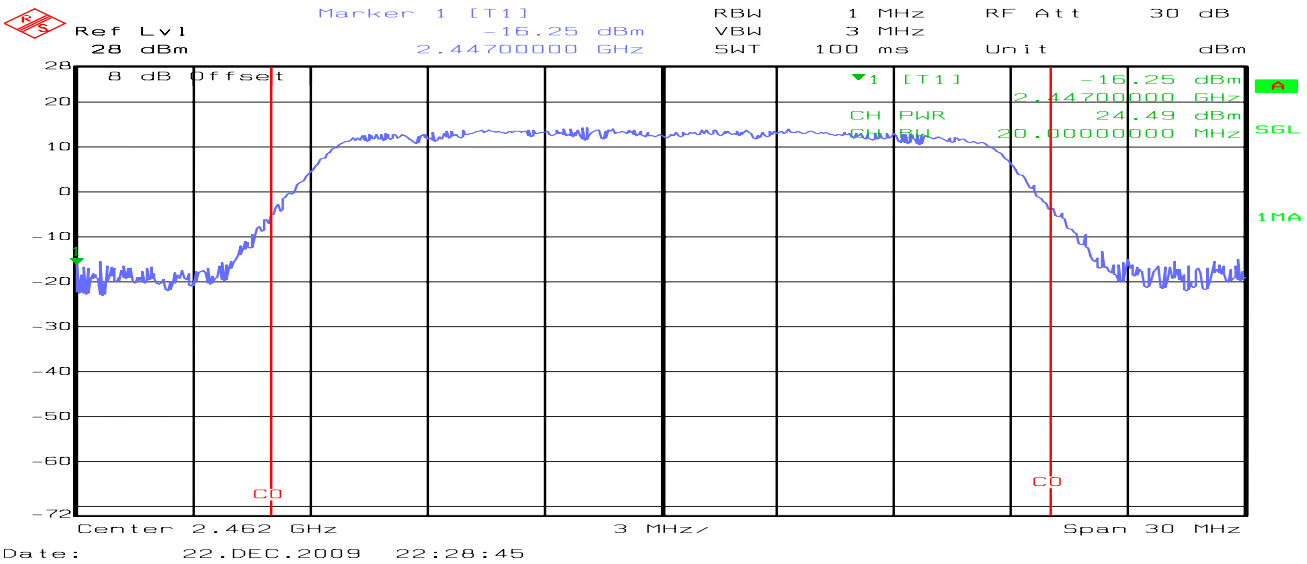
Peak Power (CH Low)



Peak Power (CH Mid)

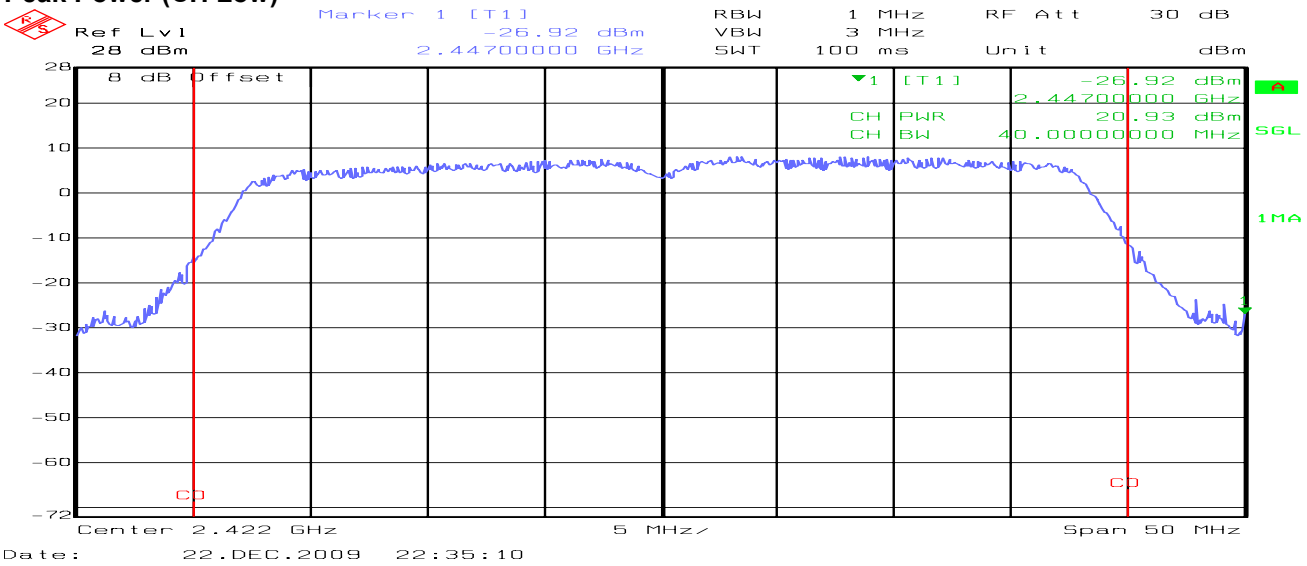


Peak Power (CH High)

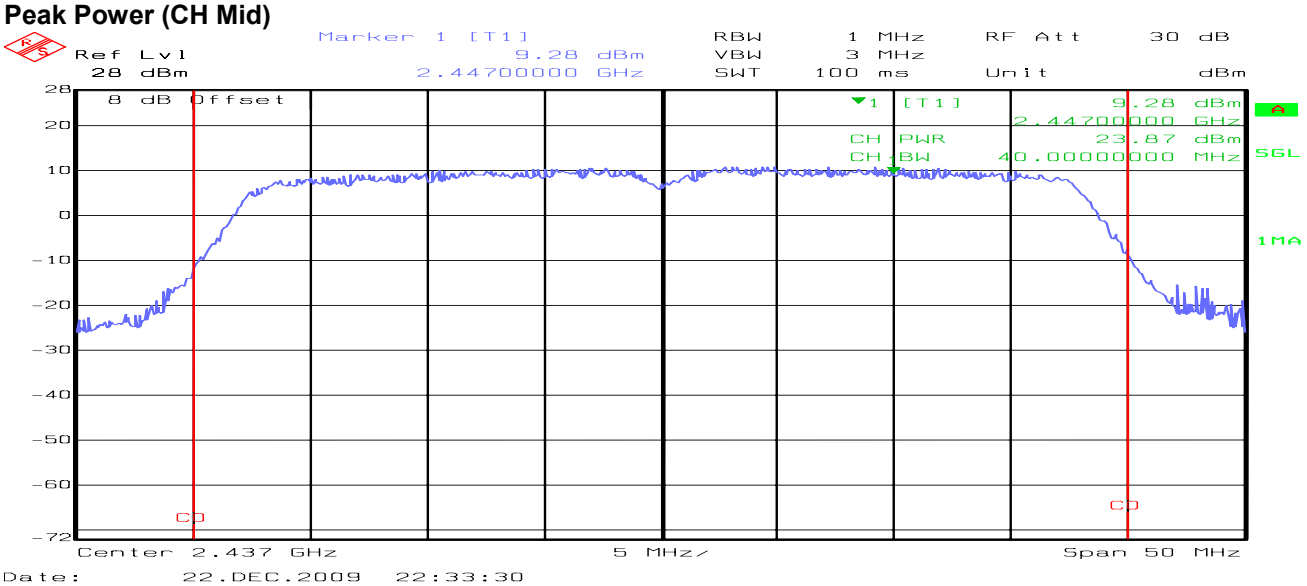


draft 802.11n 40 MHz Channel mode

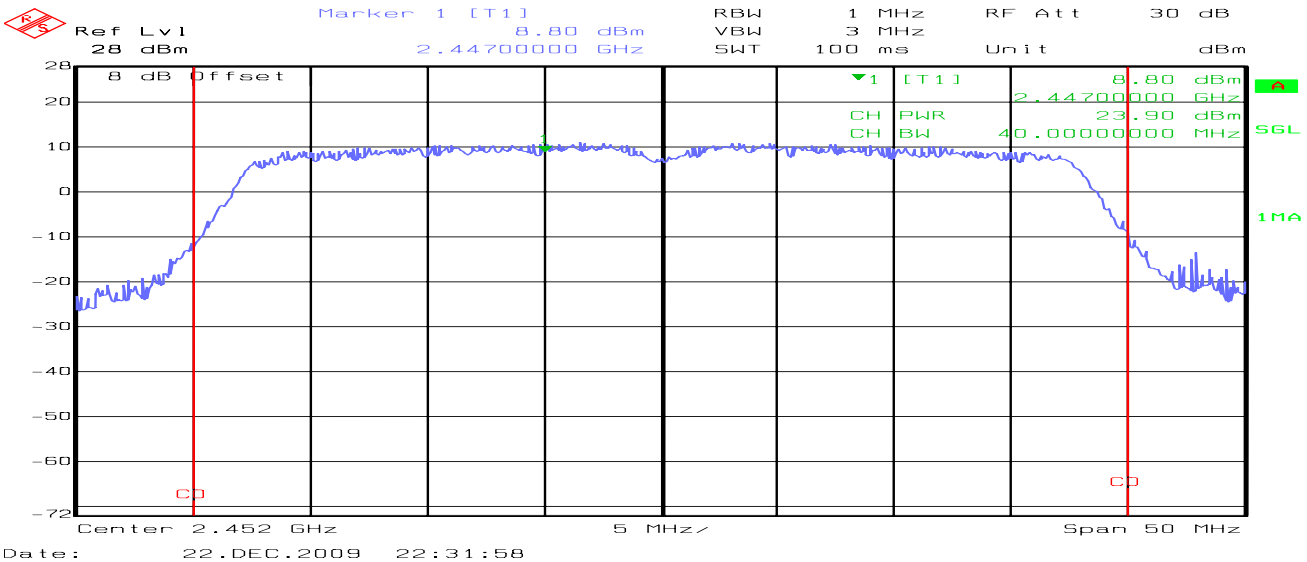
Peak Power (CH Low)



Peak Power (CH Mid)



Peak Power (CH High)

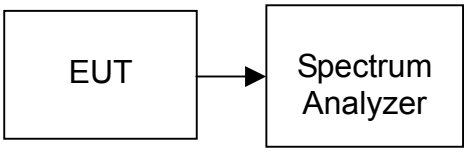


7.3. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. The Spectrum Analyzer is set to the average power detection.

TEST RESULTS

No non-compliance noted

TEST DATA

IEEE 802.11b

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	15.64	0.03664
Mid	2437	15.64	0.03664
High	2462	15.76	0.03767

IEEE 802.11g

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	13.04	0.02014
Mid	2437	16.41	0.04375
High	2462	16.52	0.04487

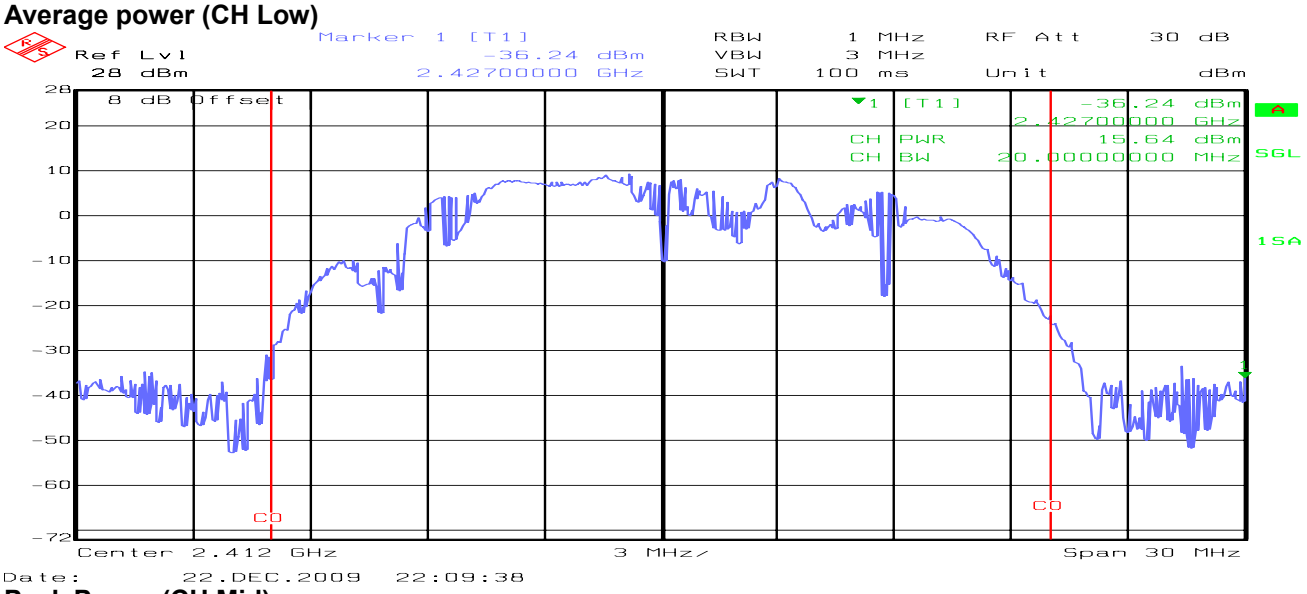
draft 802.11n 20 MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	12.81	0.01910
Mid	2437	16.59	0.04560
High	2462	16.70	0.04677

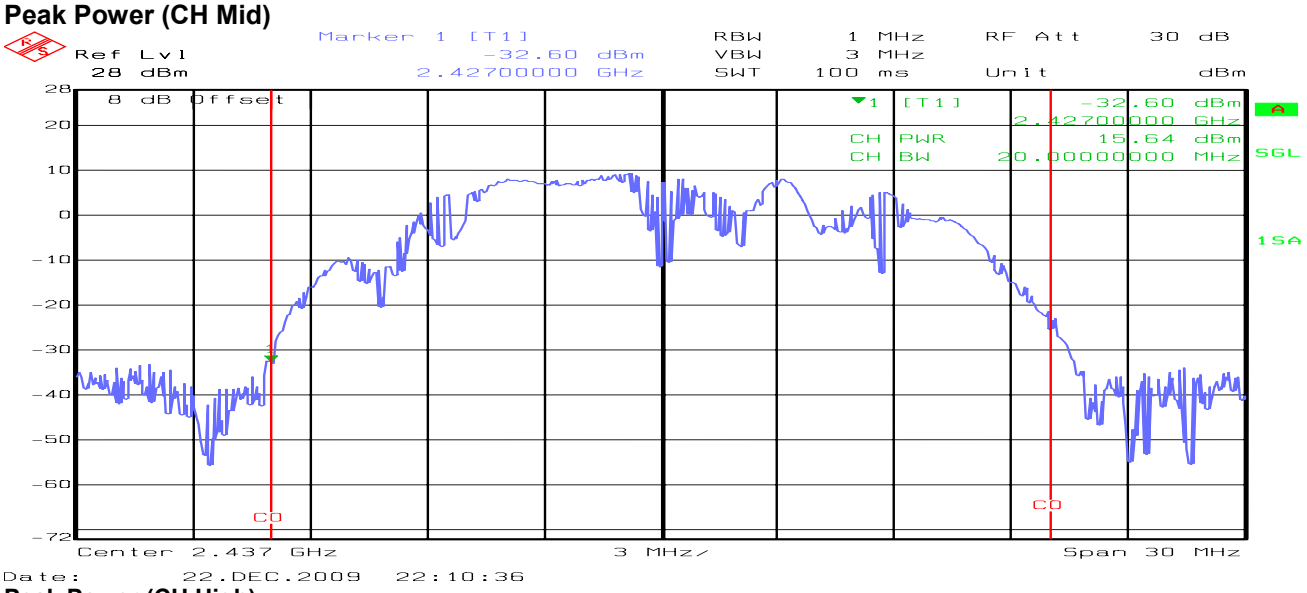
draft 802.11n 40 MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2422	13.47	0.02223
Mid	2437	16.32	0.04285
High	2452	16.57	0.04539

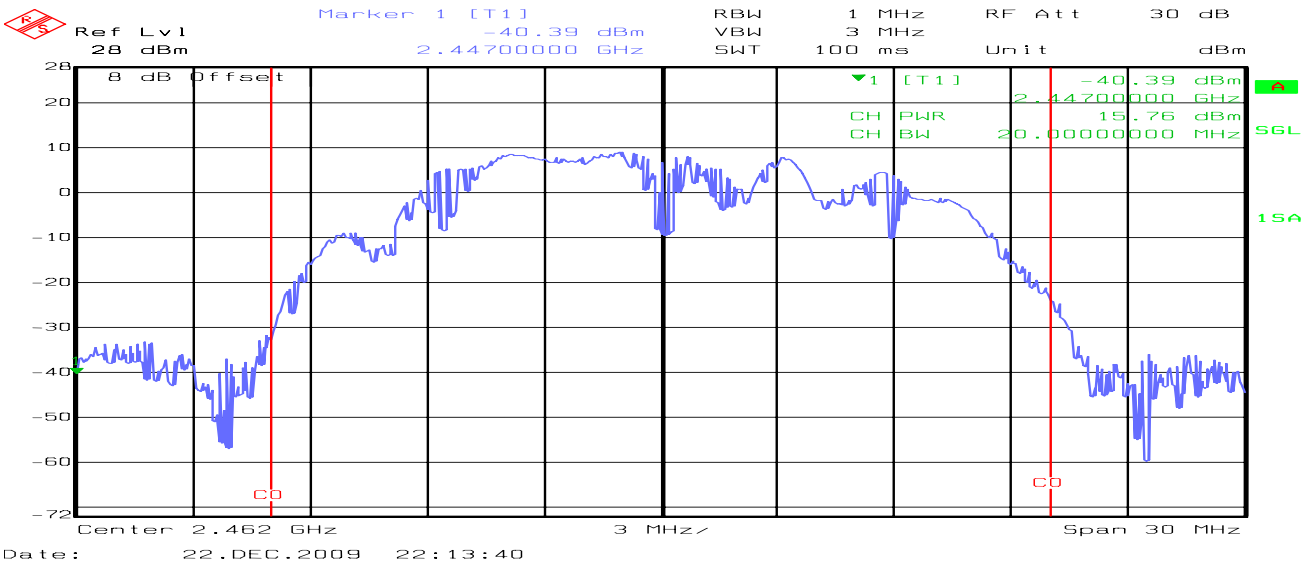
Test Plot
IEEE 802.11b mode
Average power (CH Low)



Peak Power (CH Mid)

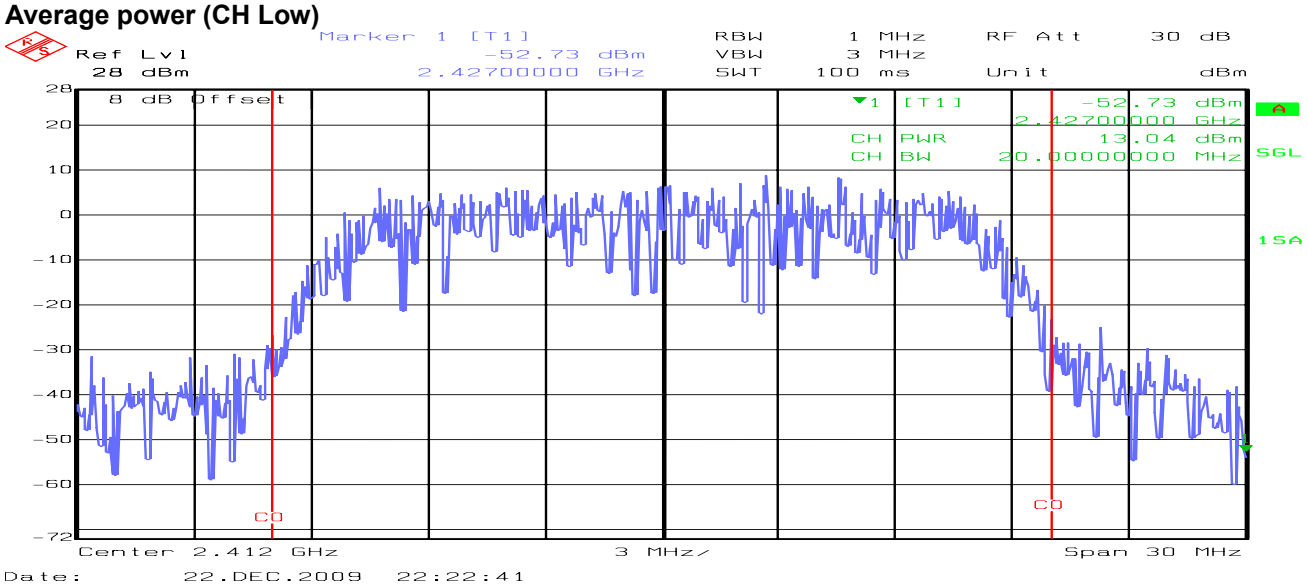


Peak Power (CH High)

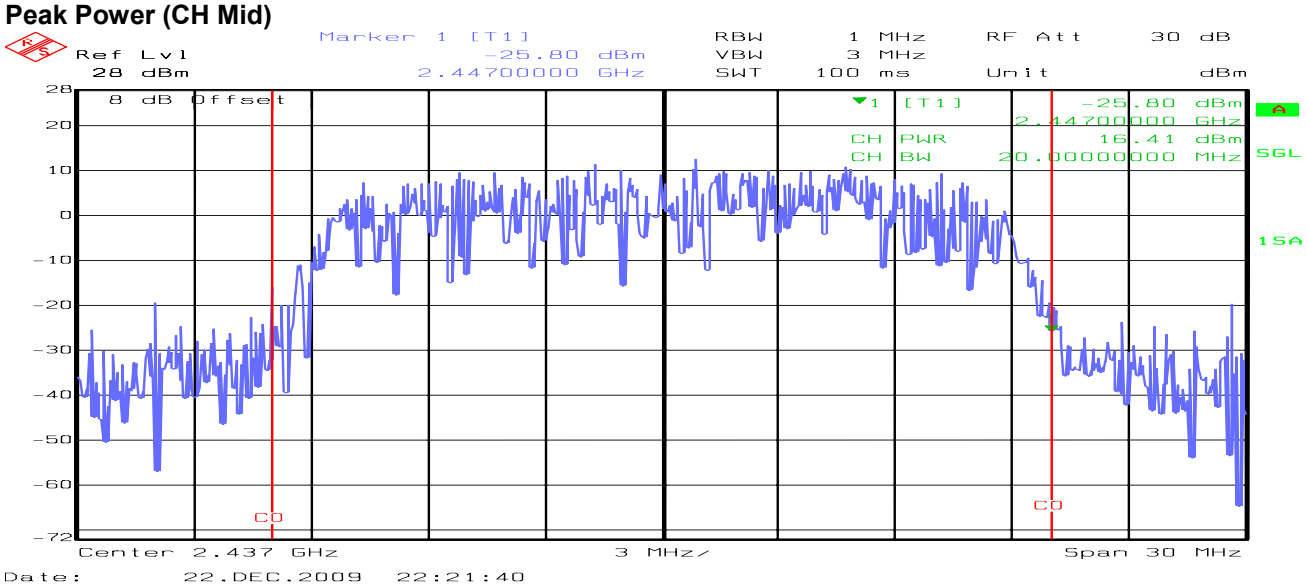


IEEE 802.11g mode

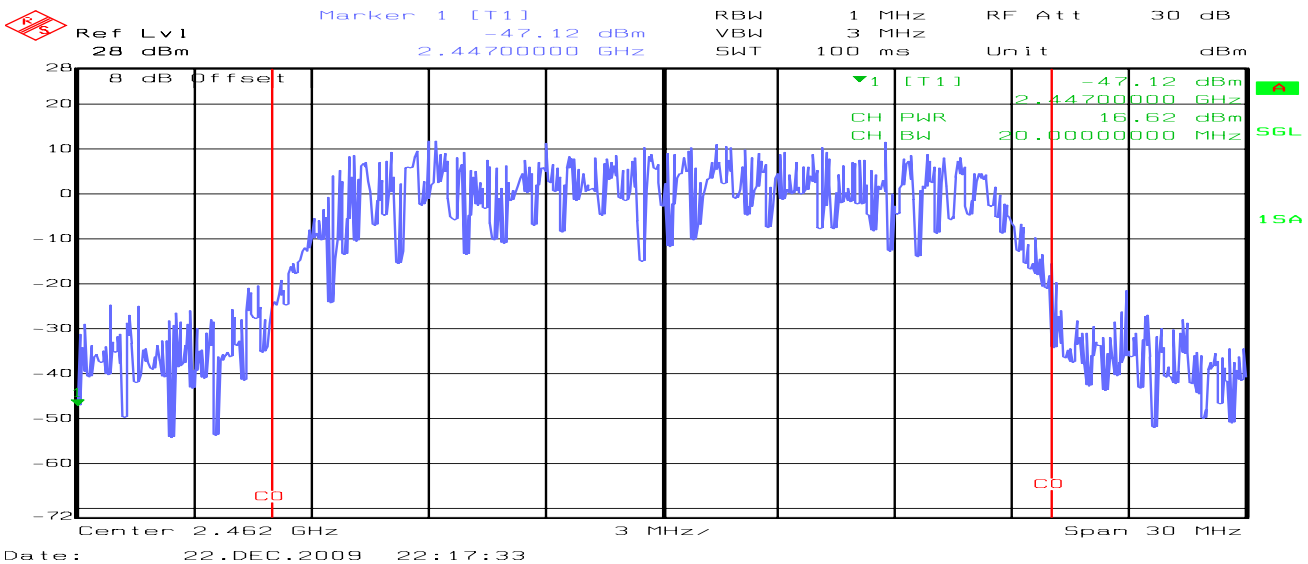
Average power (CH Low)



Peak Power (CH Mid)

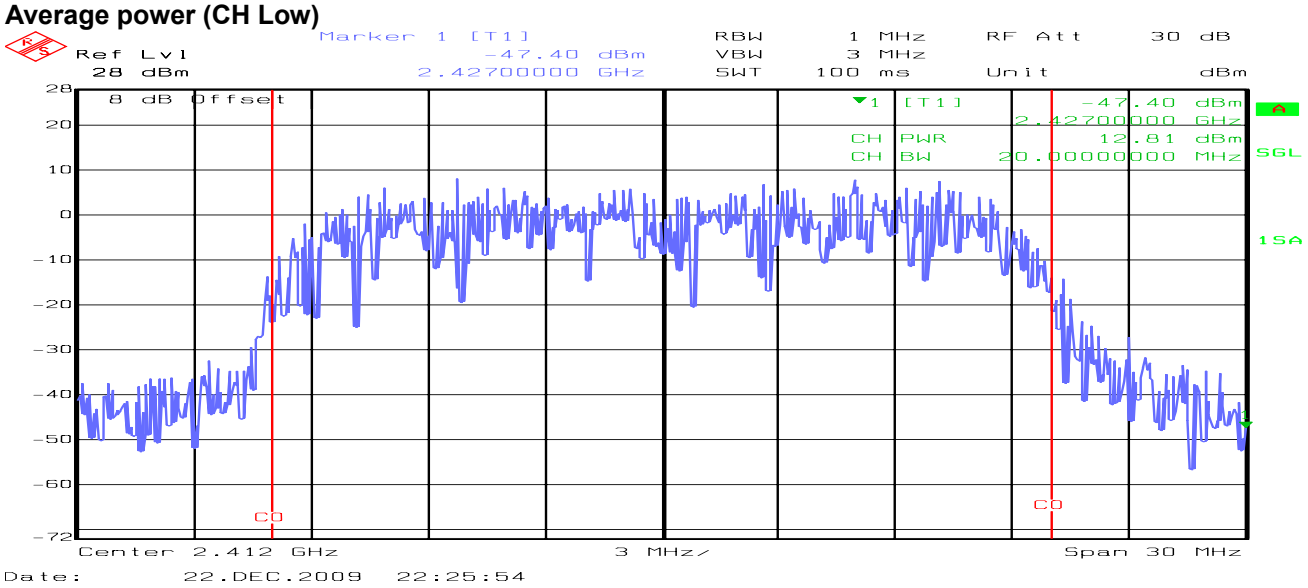


Peak Power (CH High)

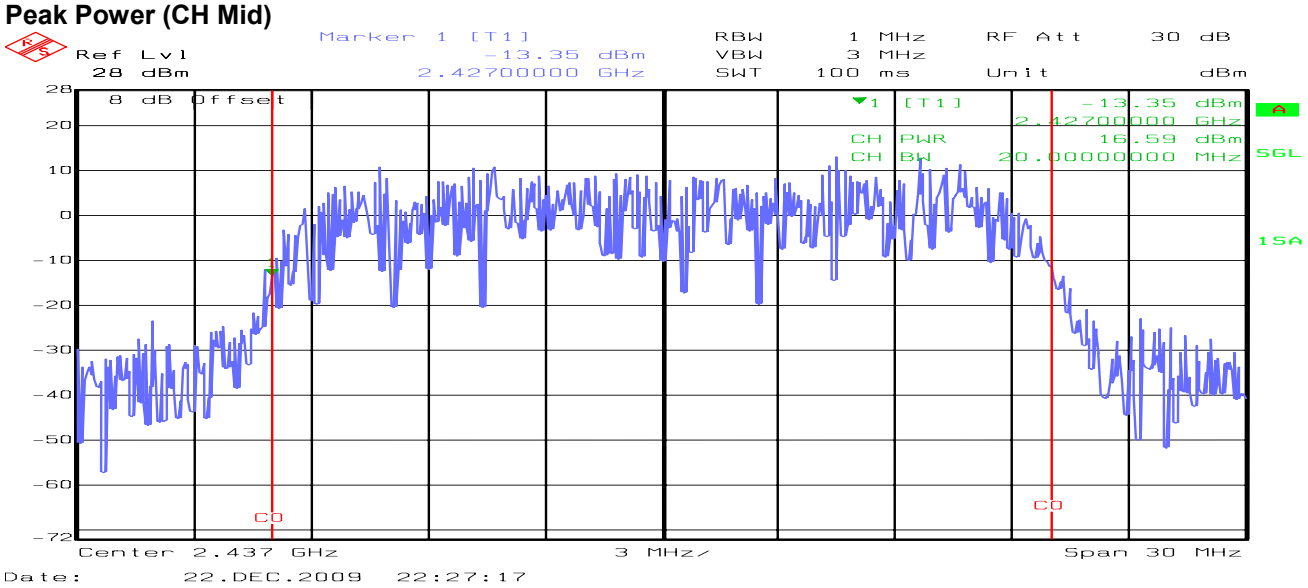


draft 802.11n 20 MHz Channel mode

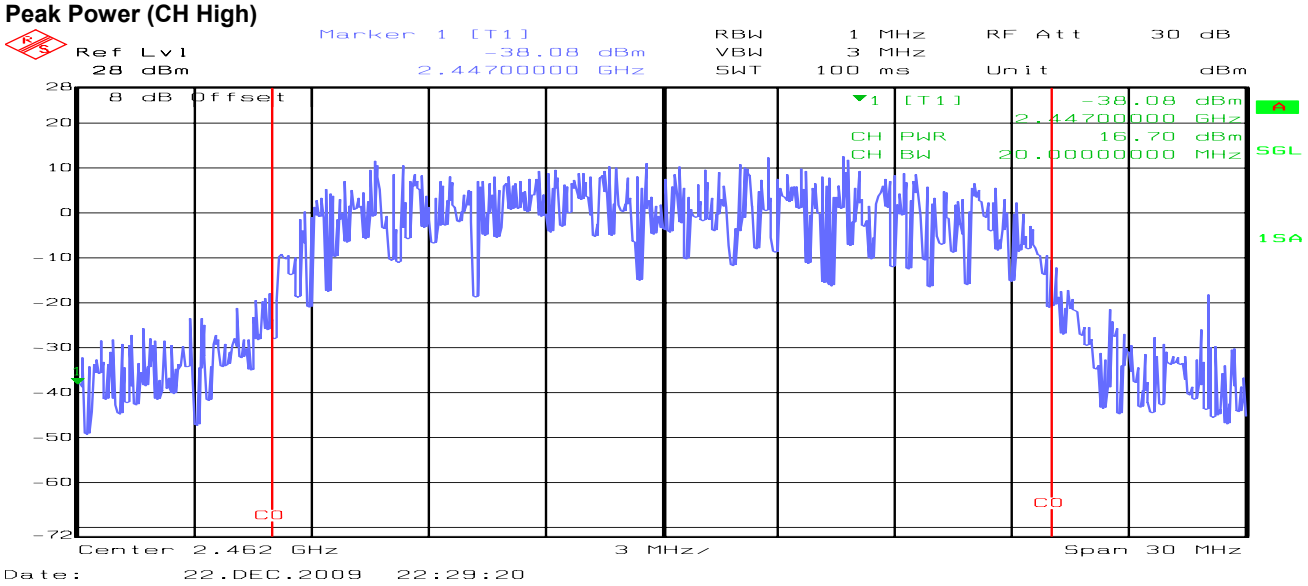
Average power (CH Low)



Peak Power (CH Mid)

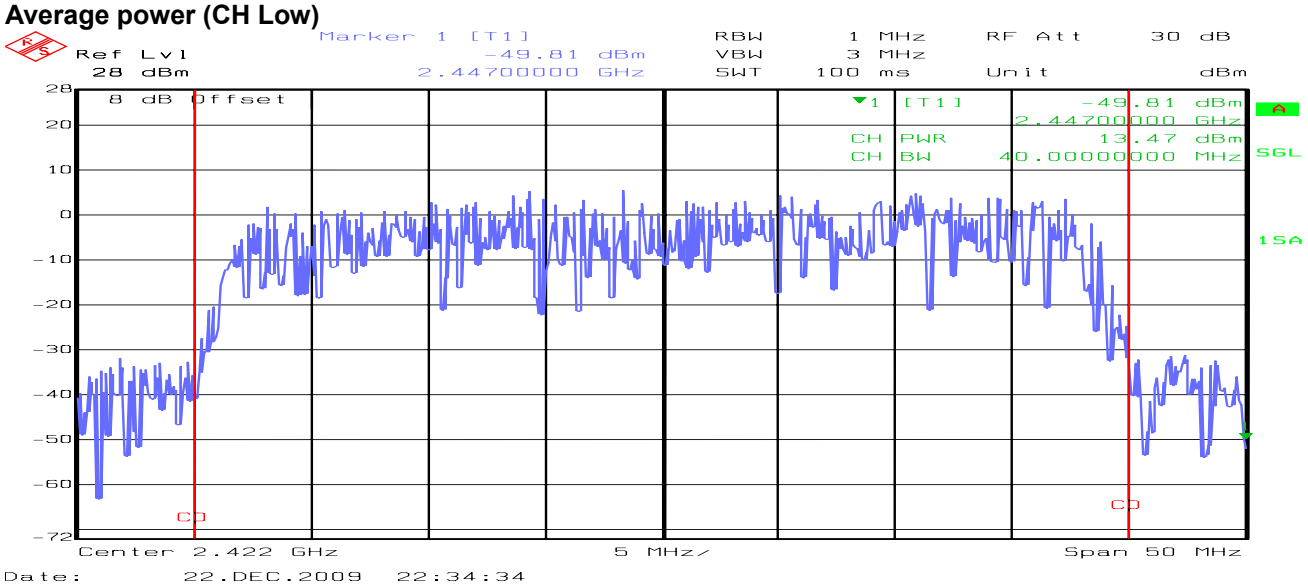


Peak Power (CH High)

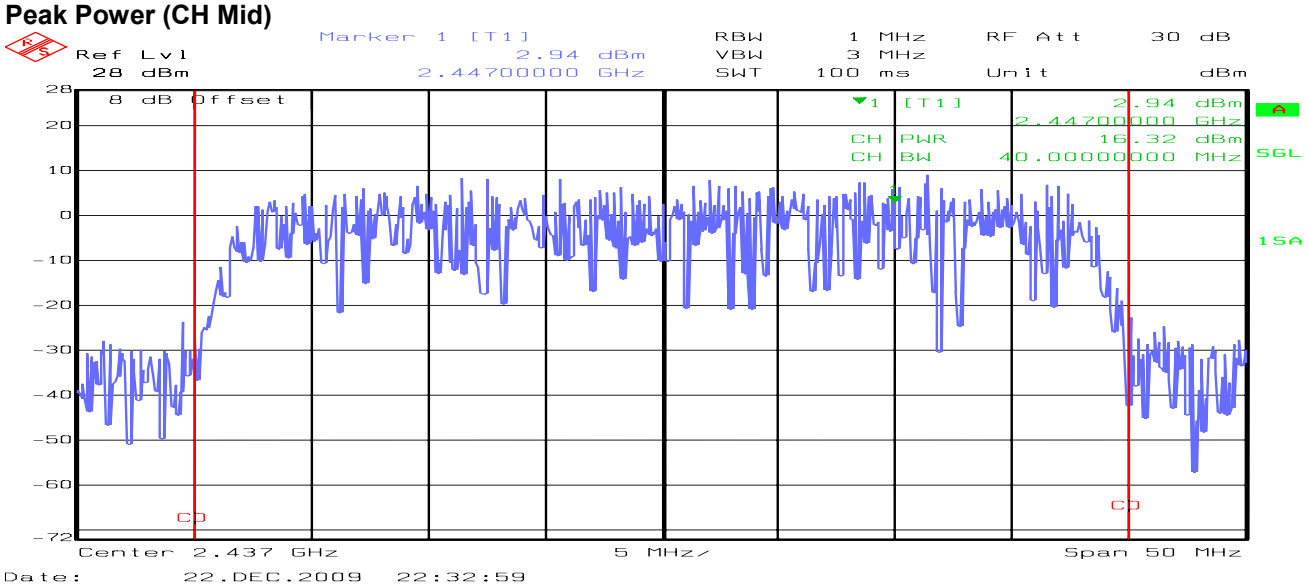


draft 802.11n 40 MHz Channel mode

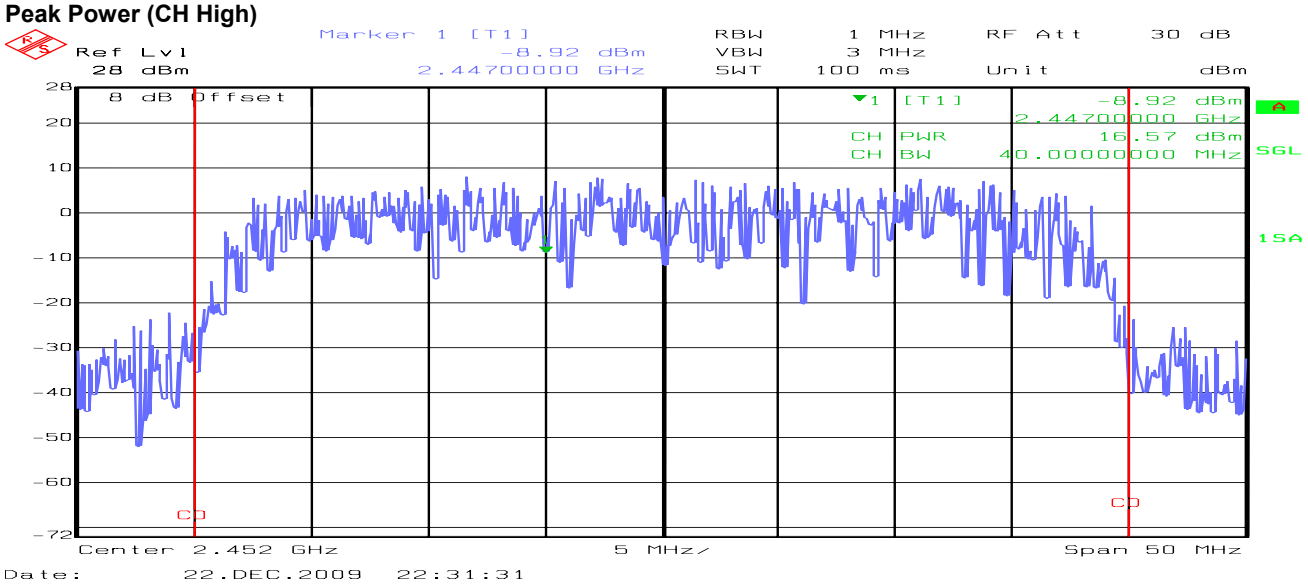
Average power (CH Low)



Peak Power (CH Mid)



Peak Power (CH High)

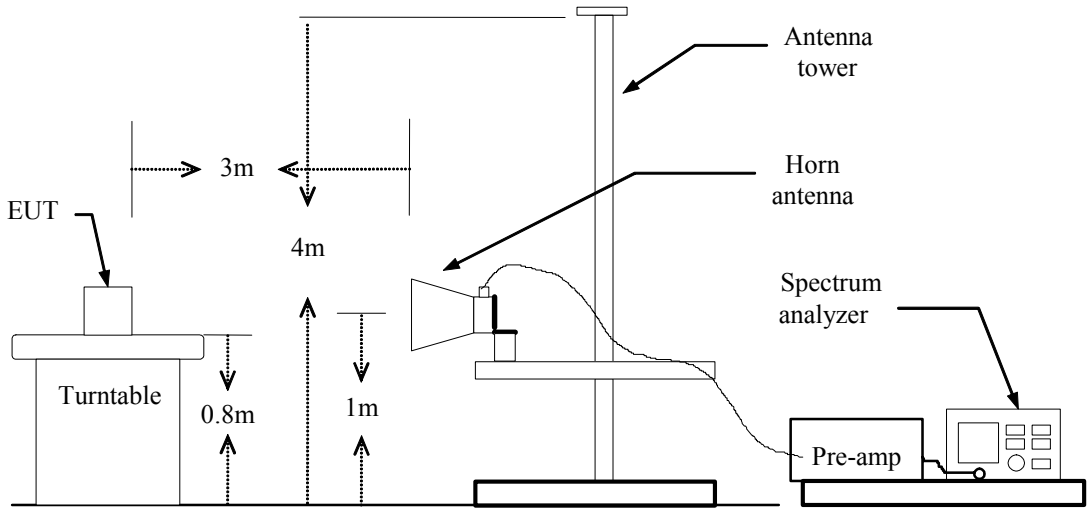


7.4. BAND EDGES MEASUREMENT

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=AUTO
   (b) AVERAGE: RBW=1MHz / VBW=1MHz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

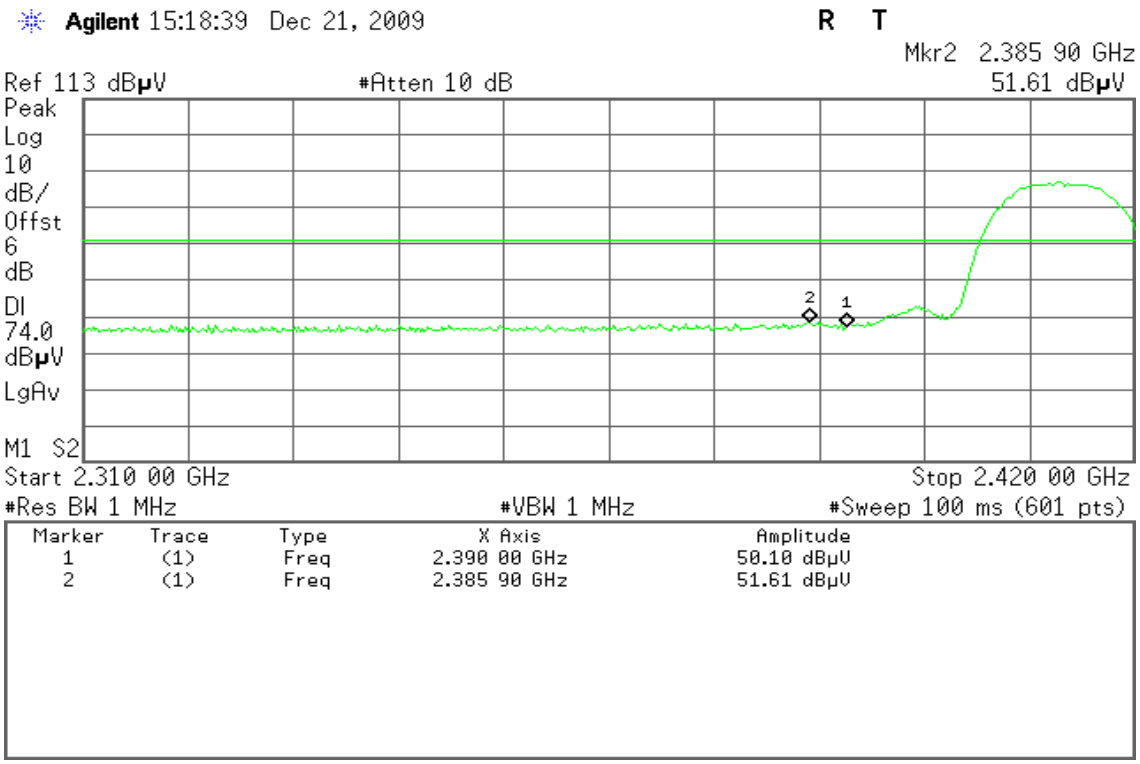
TEST RESULTS

Refer to attach spectrum analyzer data chart.

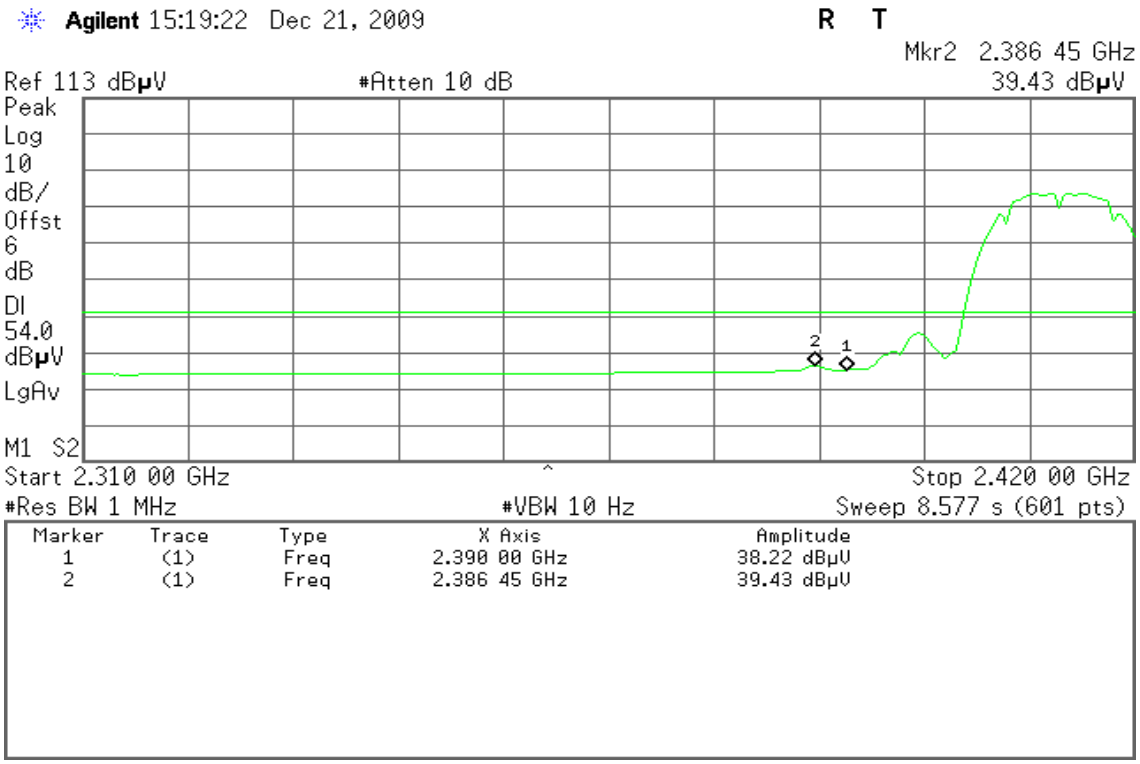
Test Plot

Band Edges (IEEE 802.11b mode / CH Low)

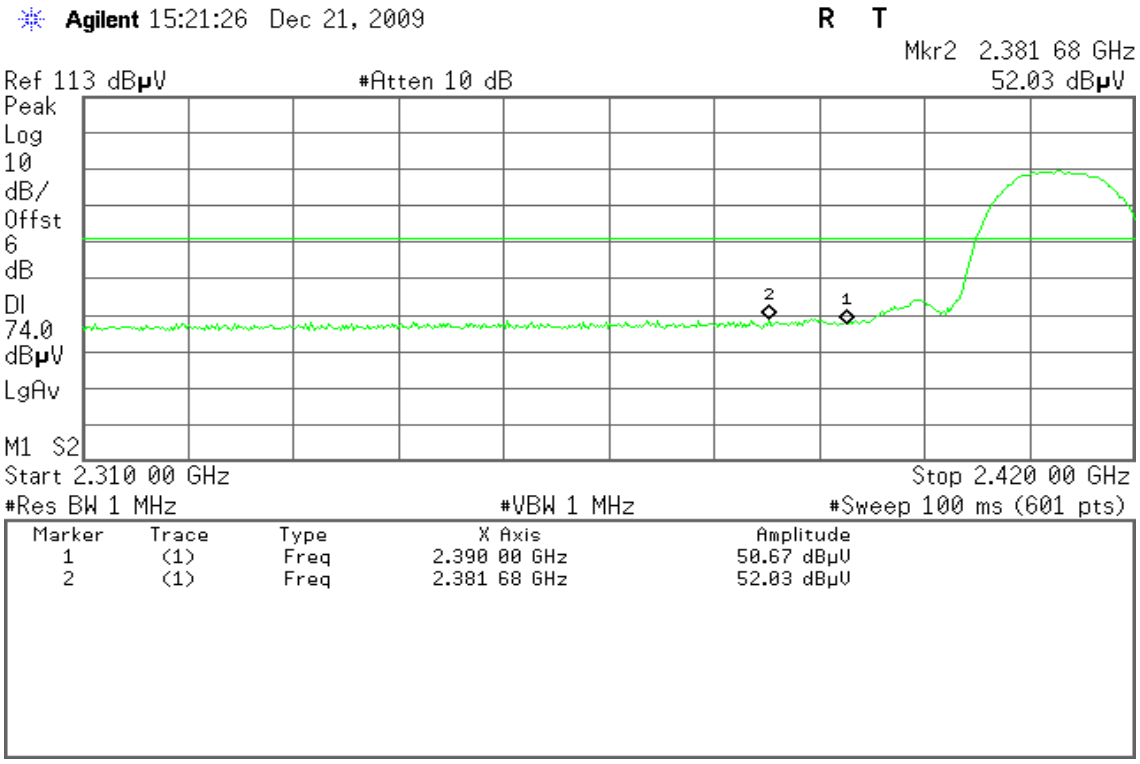
Detector mode: Peak **Polarity: Vertical**



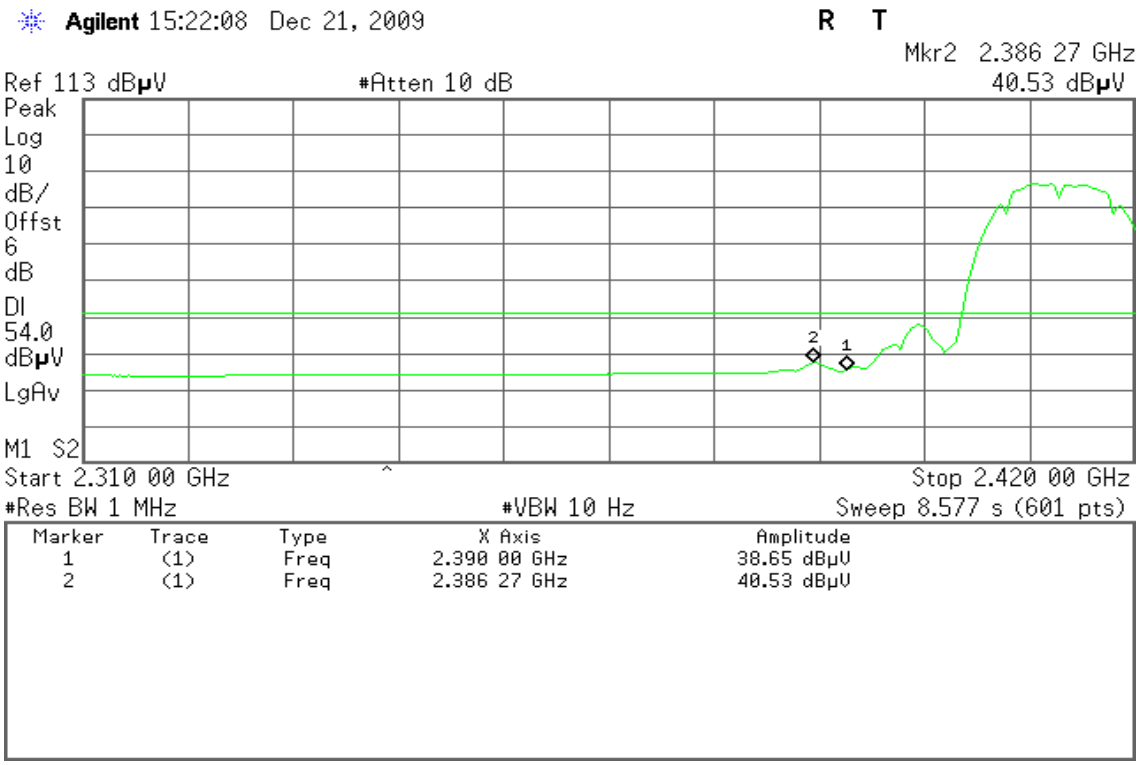
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

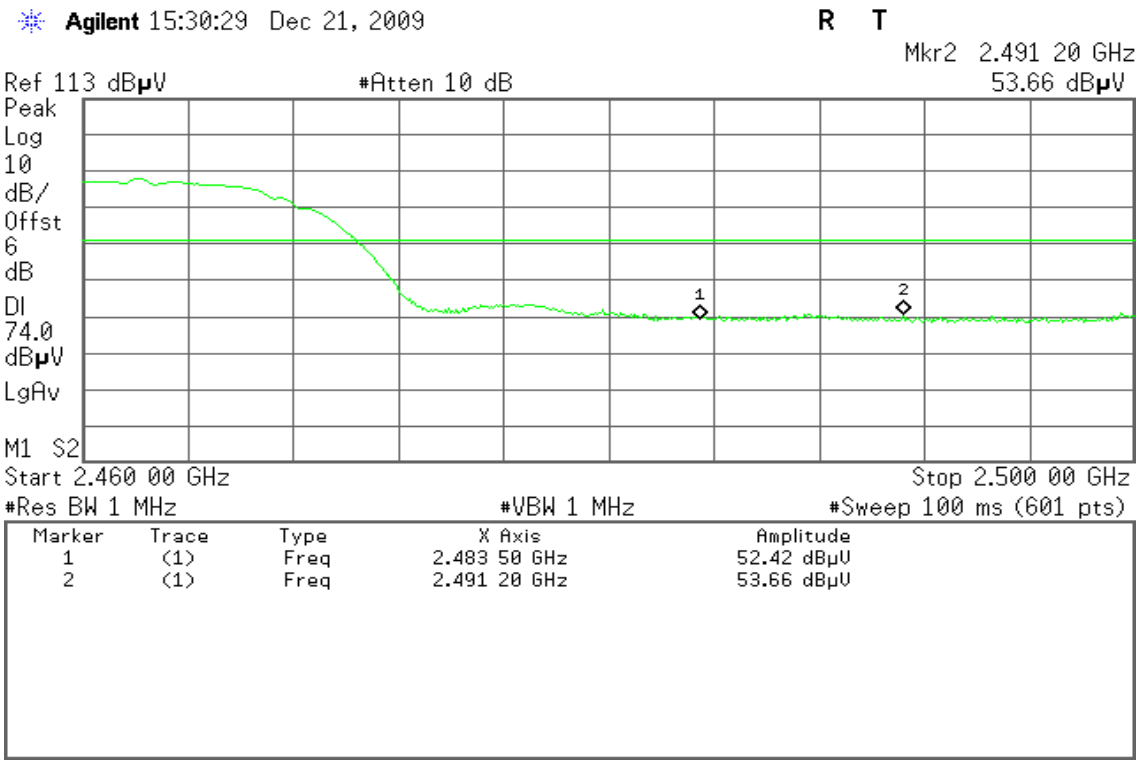


Detector mode: Average **Polarity: Horizontal**

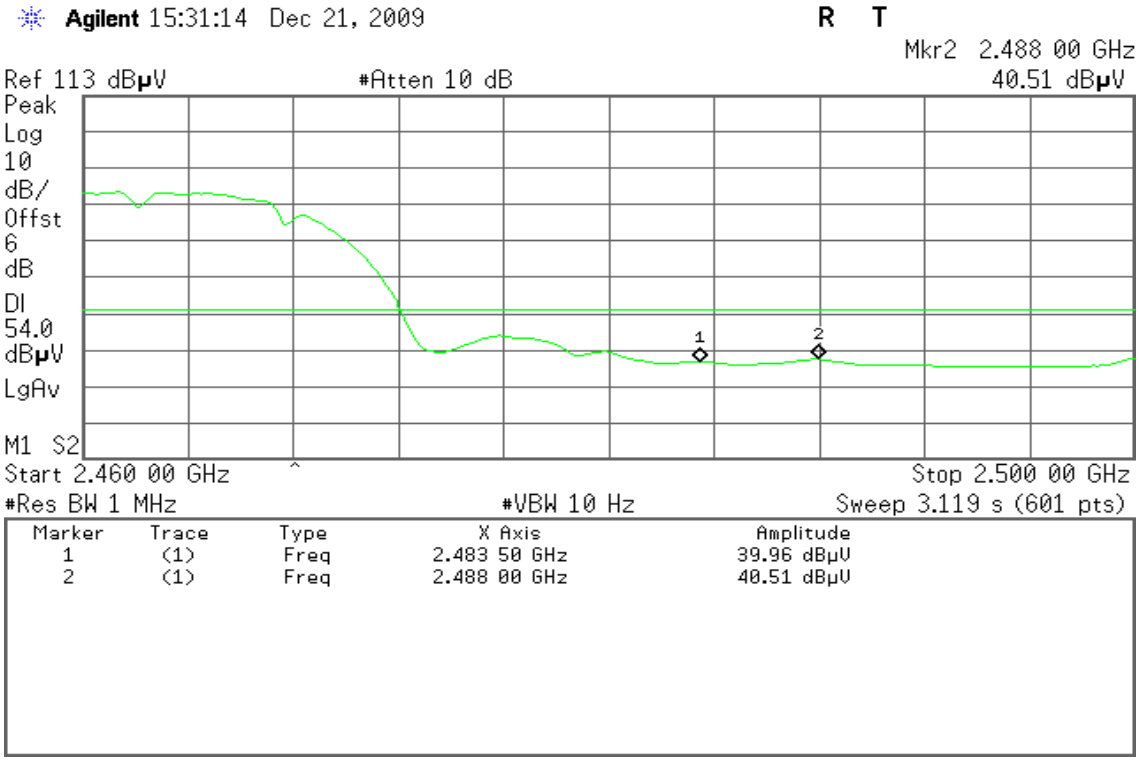


Band Edges (IEEE 802.11b mode / CH High)

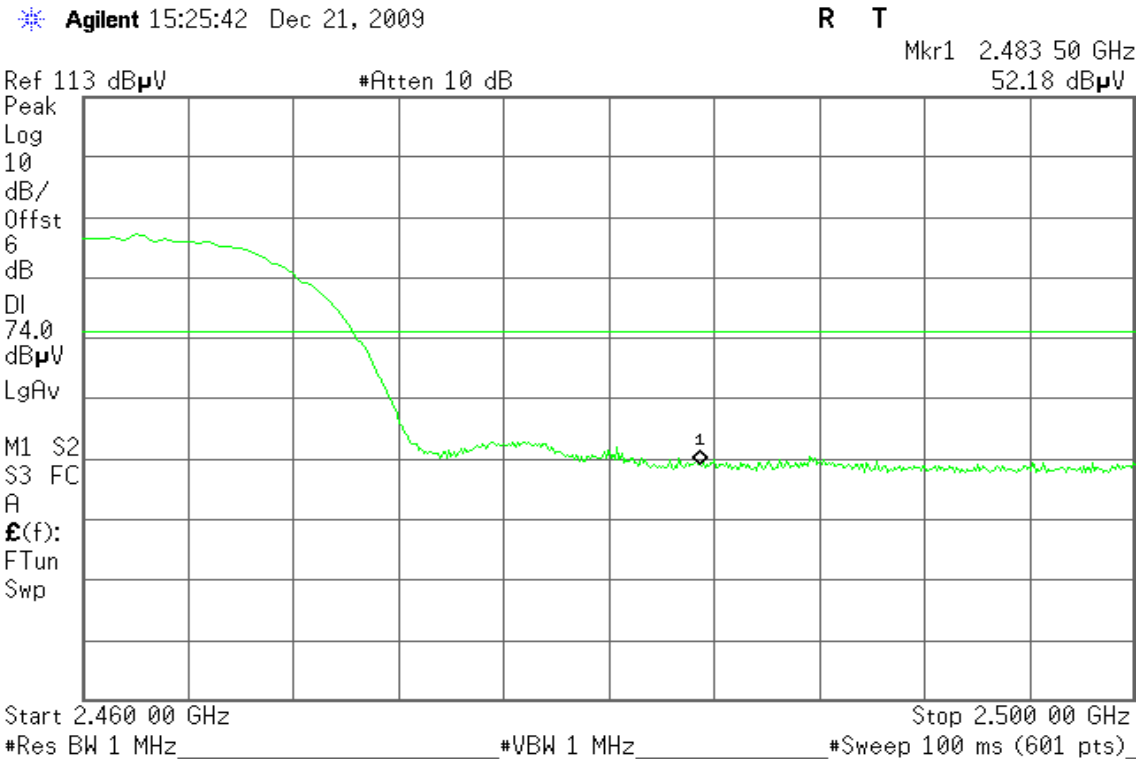
Detector mode: Peak **Polarity: Vertical**



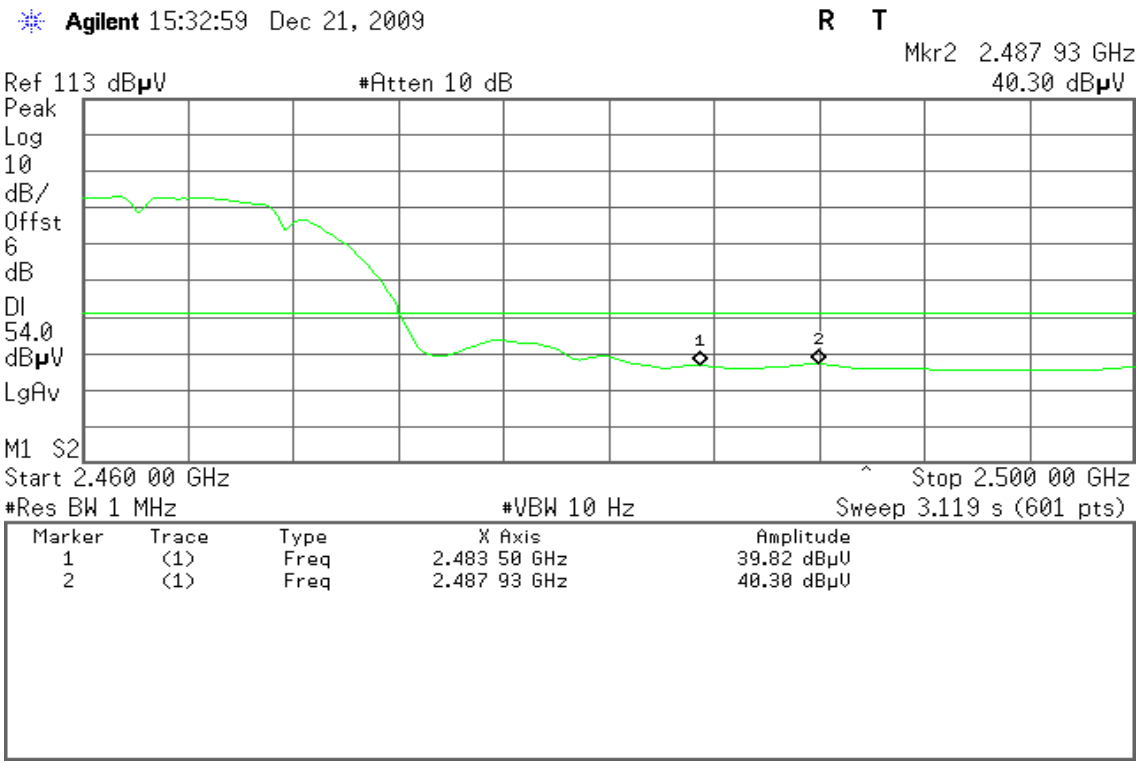
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

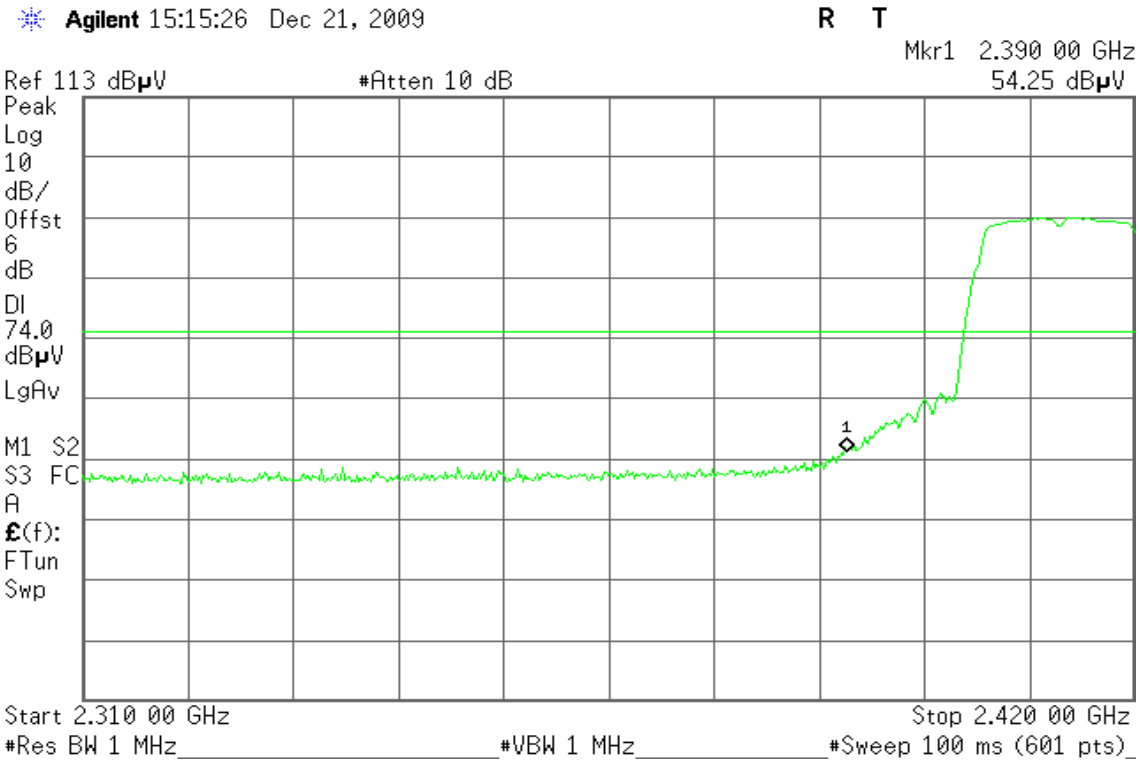


Detector mode: Average **Polarity: Horizontal**

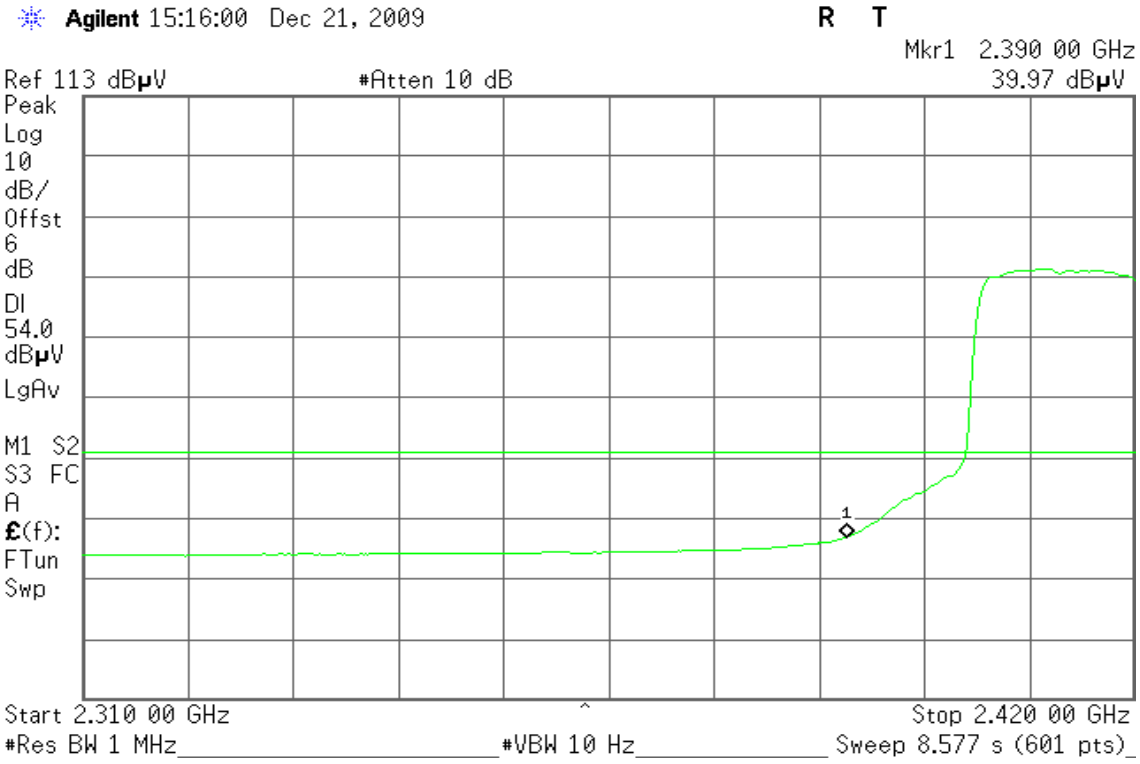


Band Edges (IEEE 802.11g mode / CH Low)

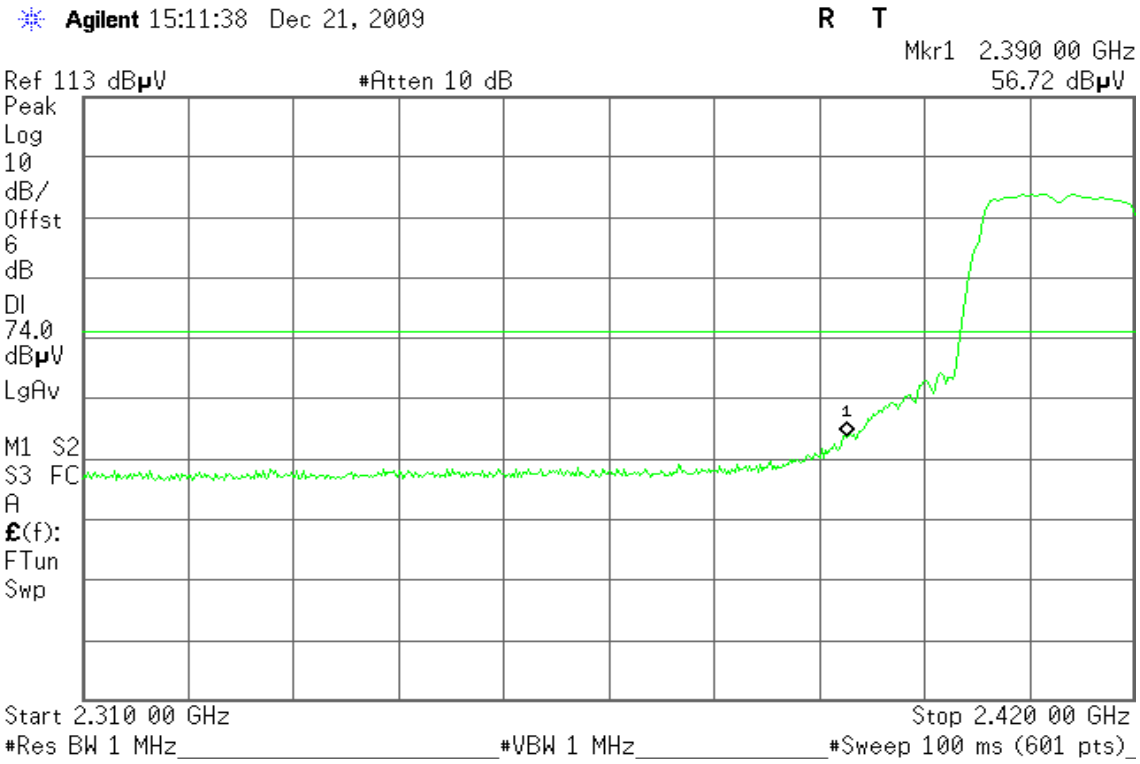
Detector mode: Peak **Polarity: Vertical**



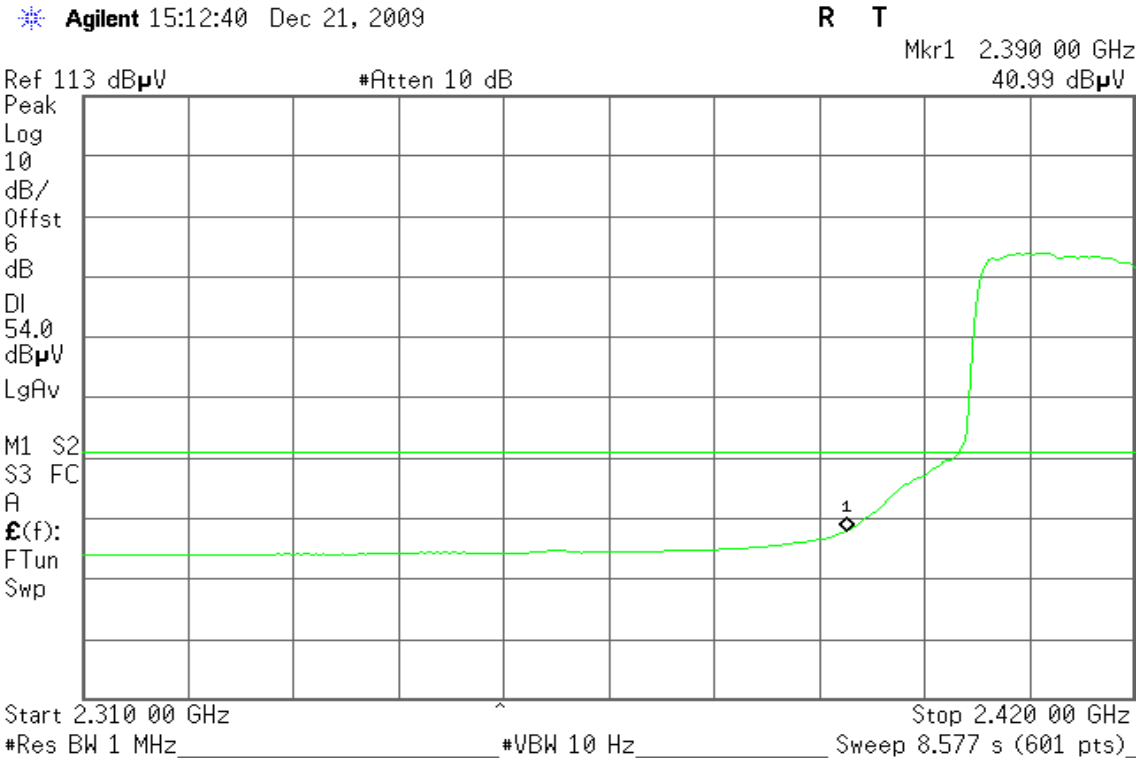
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

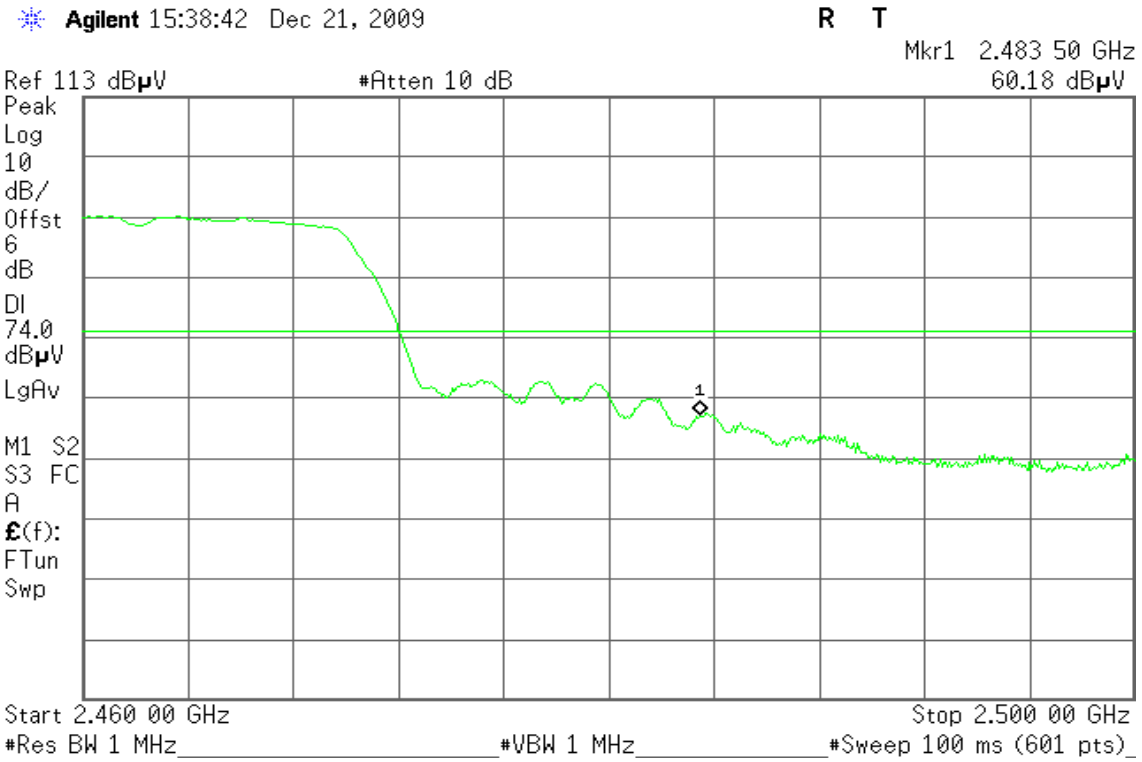


Detector mode: Average **Polarity: Horizontal**

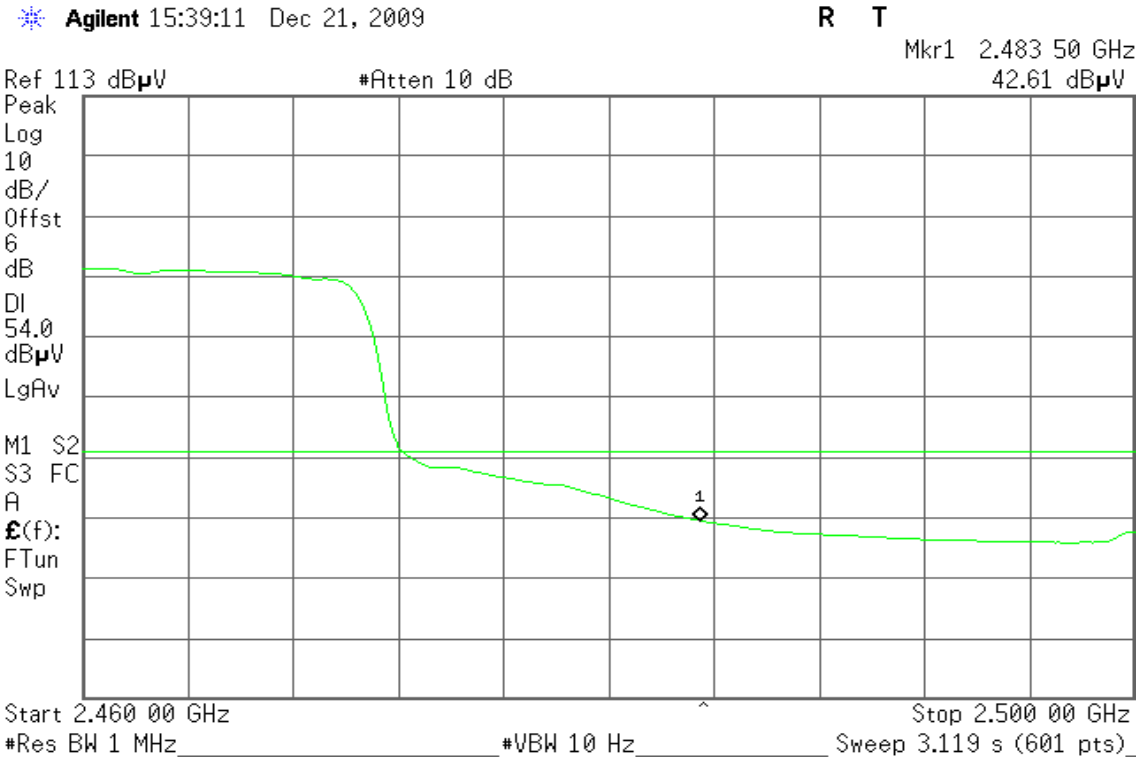


Band Edges (IEEE 802.11g mode / CH High)

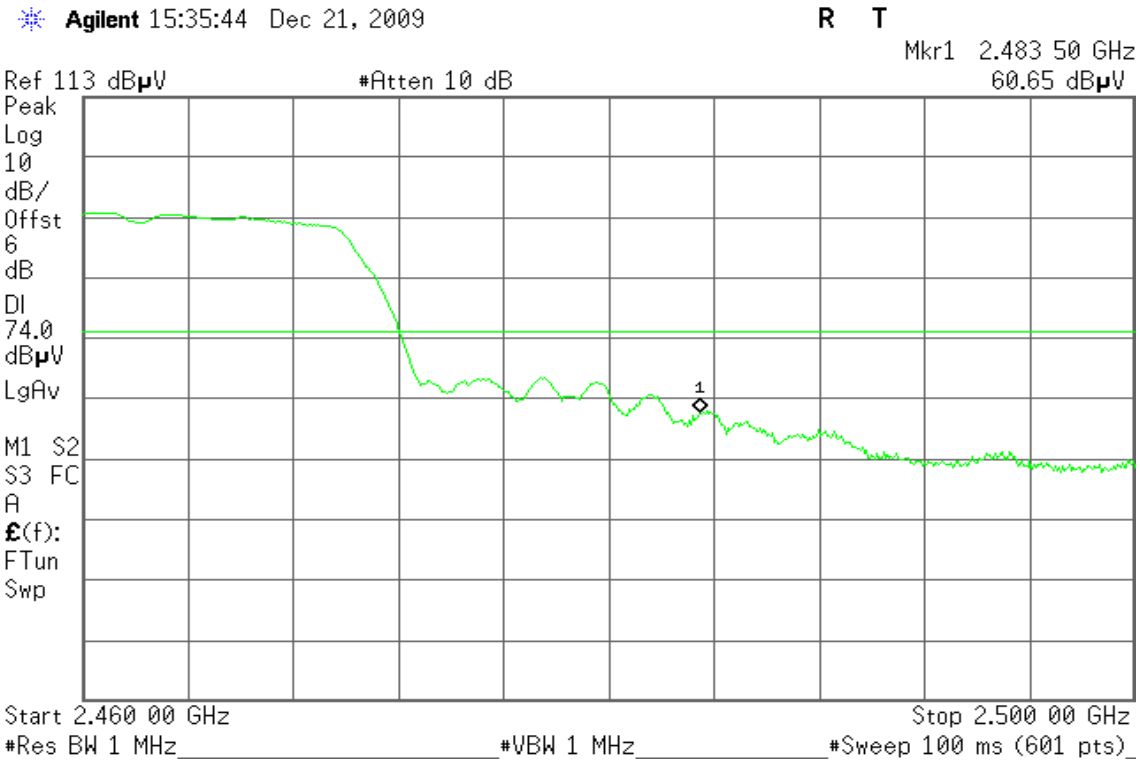
Detector mode: Peak **Polarity: Vertical**



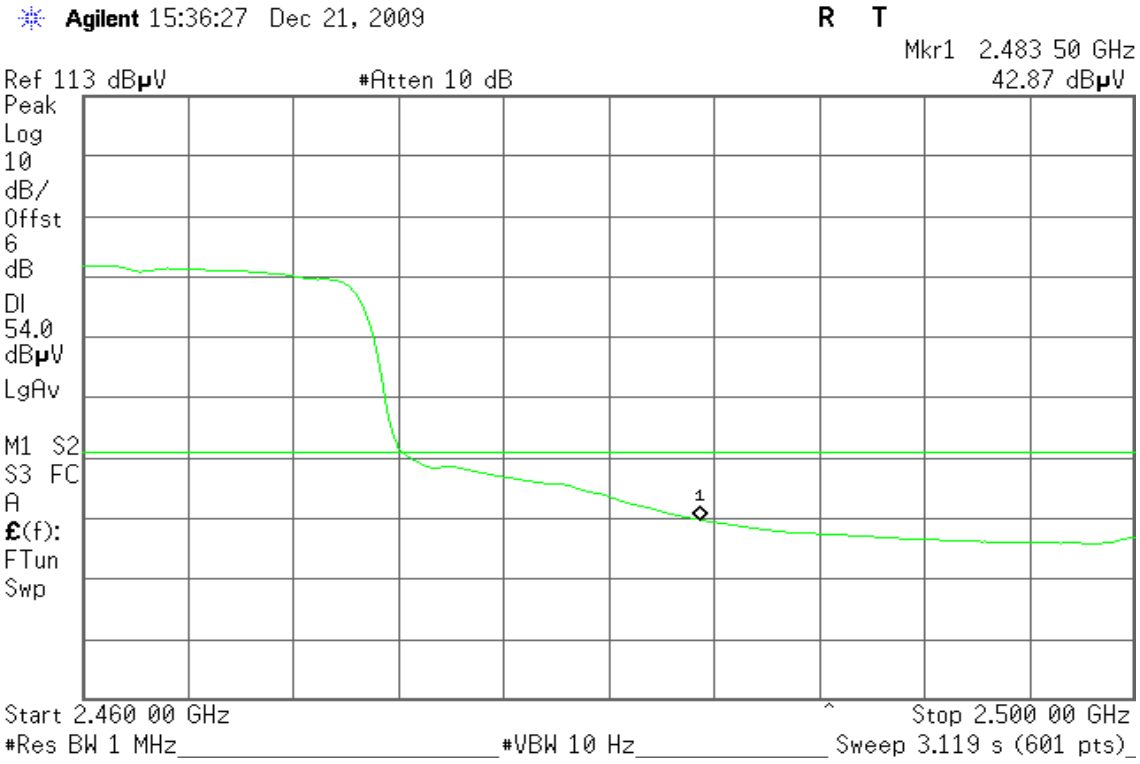
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

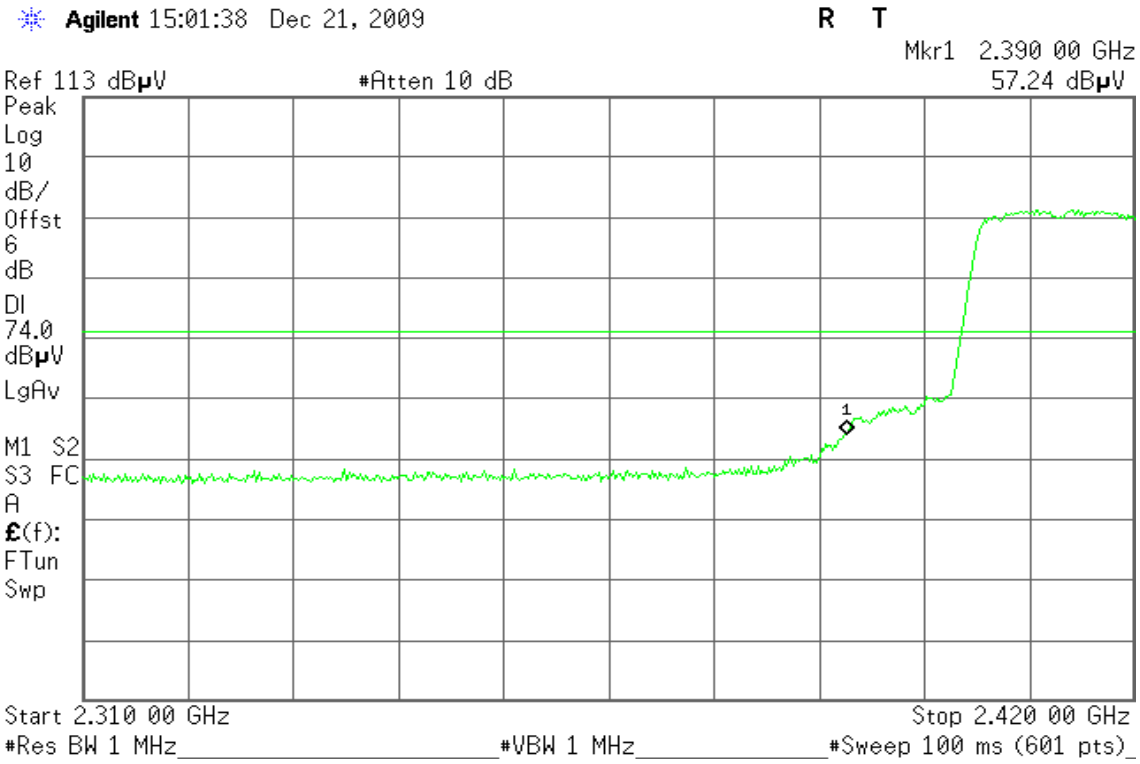


Detector mode: Average **Polarity: Horizontal**

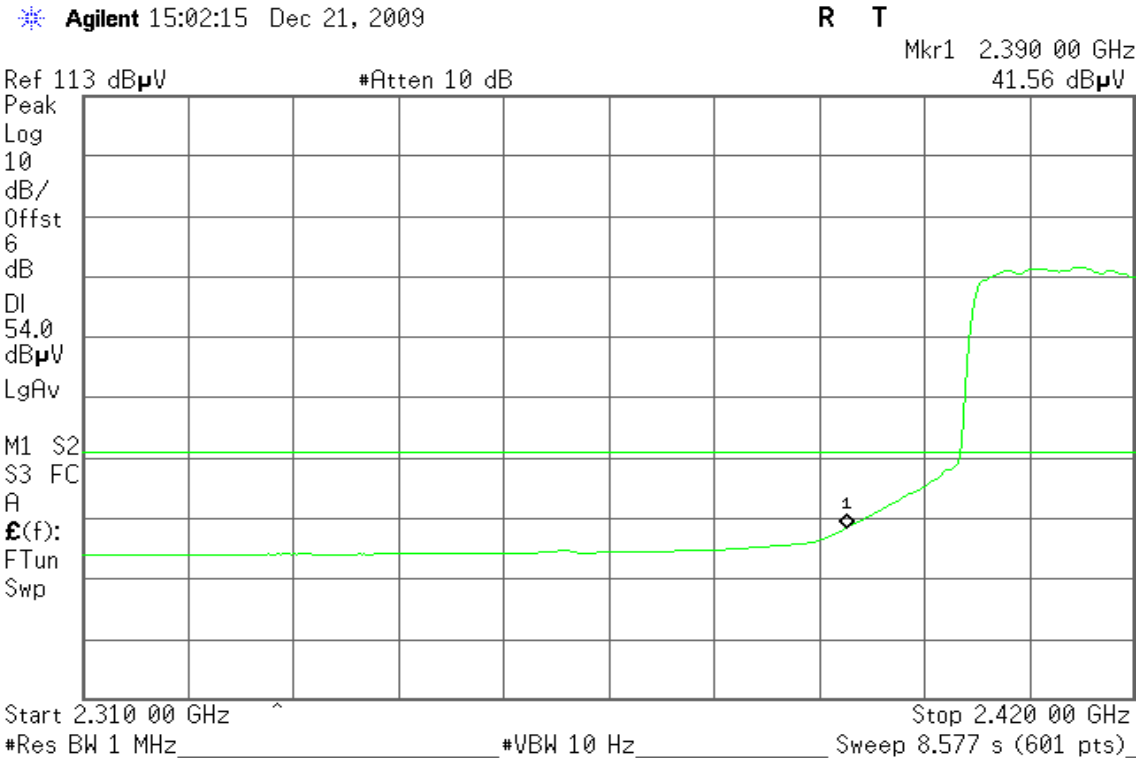


Band Edges (draft 802.11n 20 MHz Channel mode / CH Low)

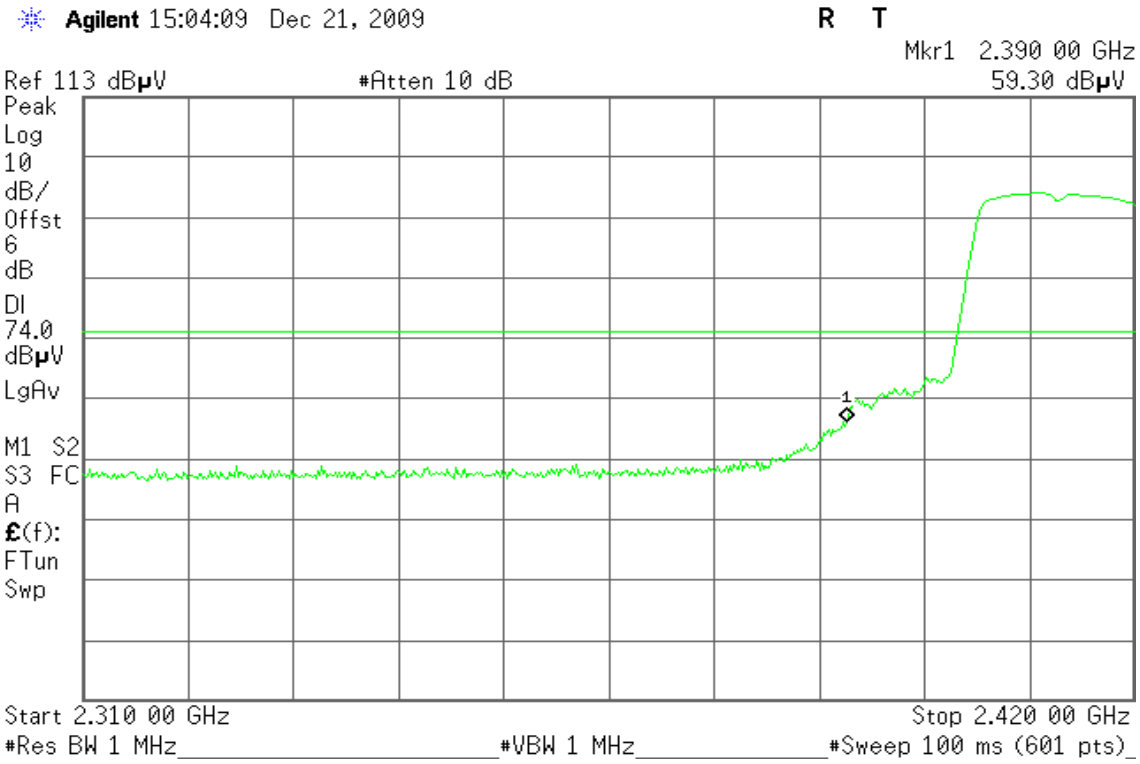
Detector mode: Peak **Polarity: Vertical**



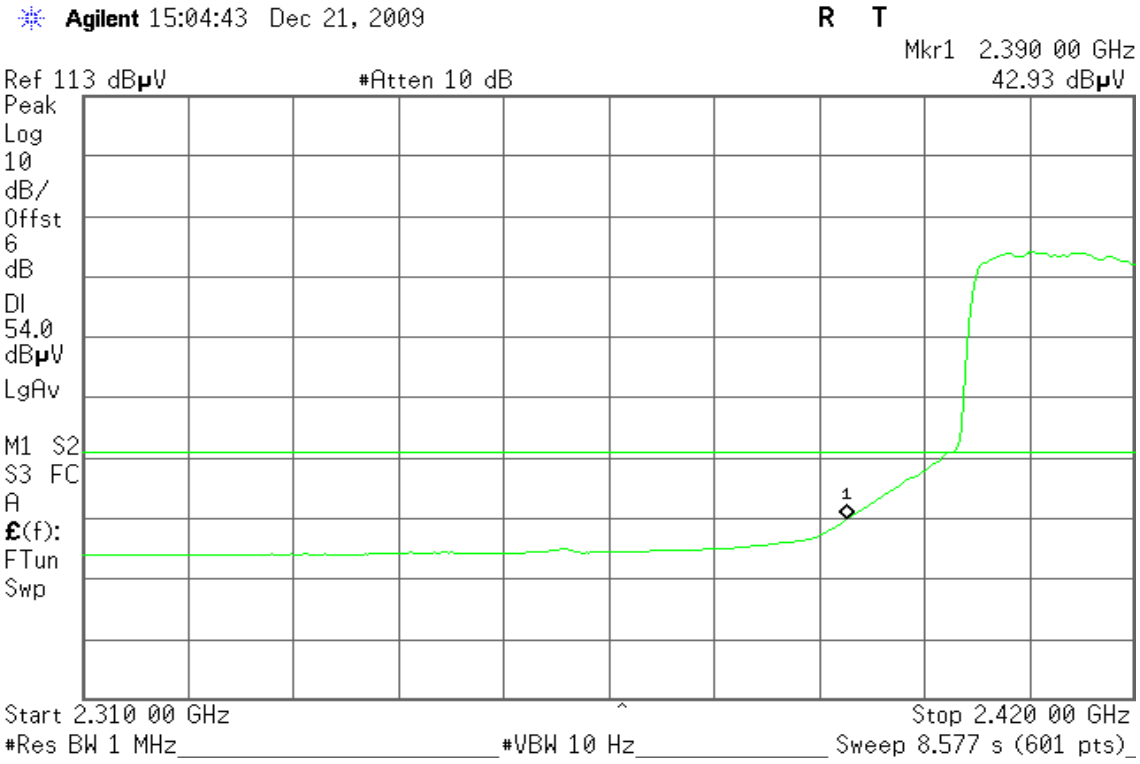
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

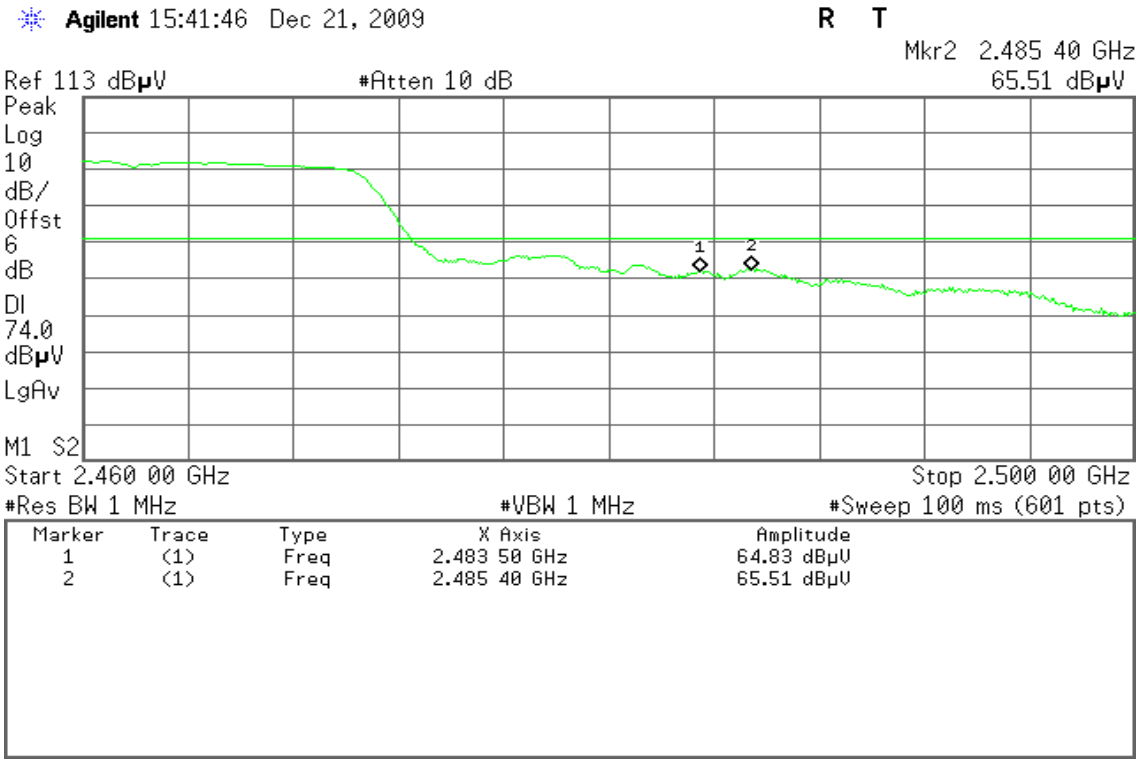


Detector mode: Average **Polarity: Horizontal**

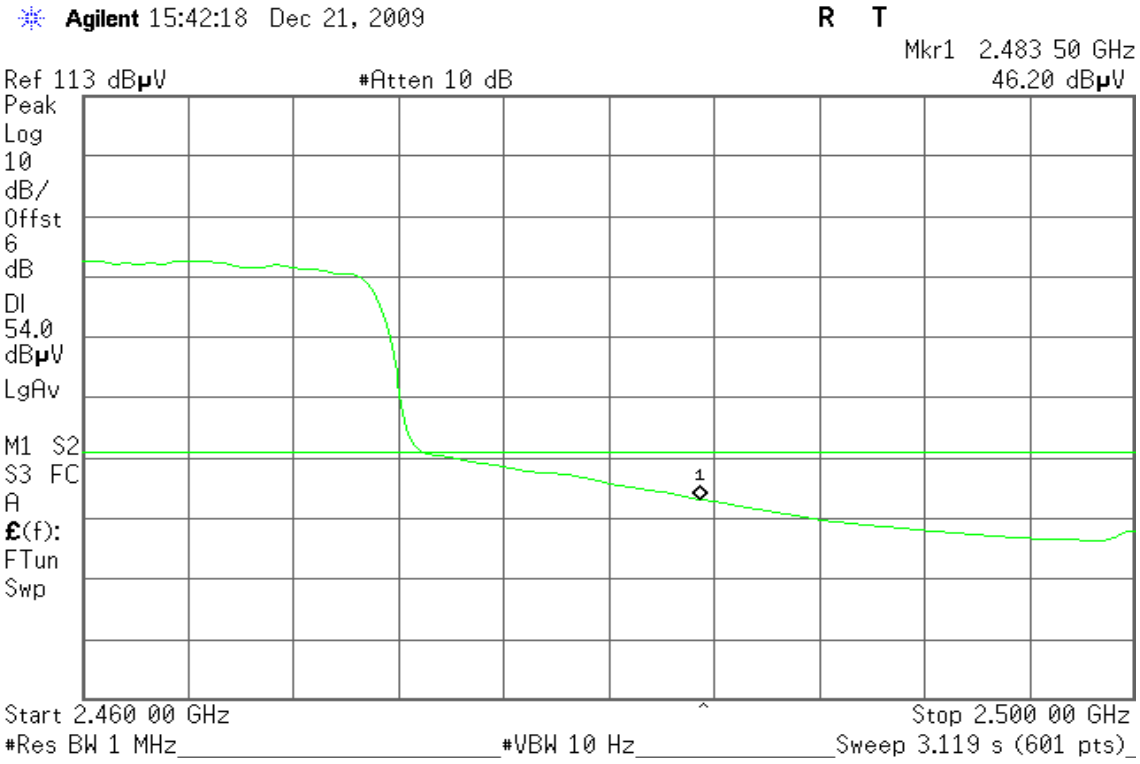


Band Edges (draft 802.11n 20 MHz Channel mode / CH High)

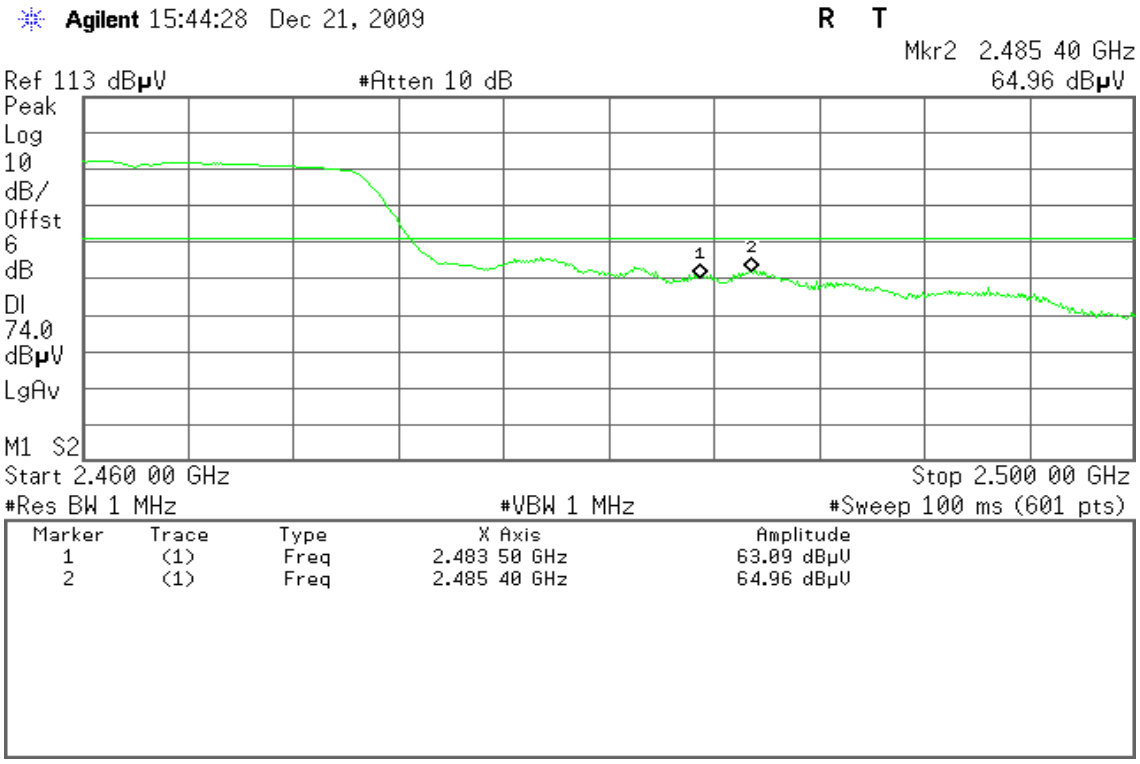
Detector mode: Peak **Polarity: Vertical**



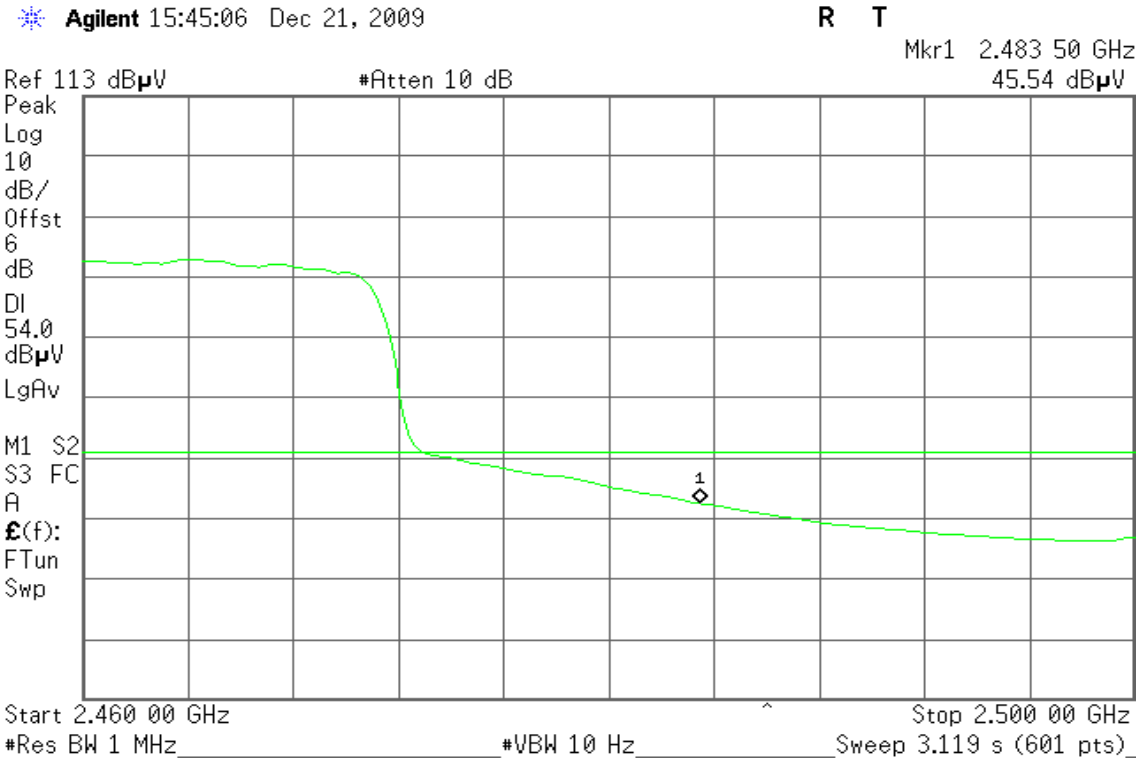
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

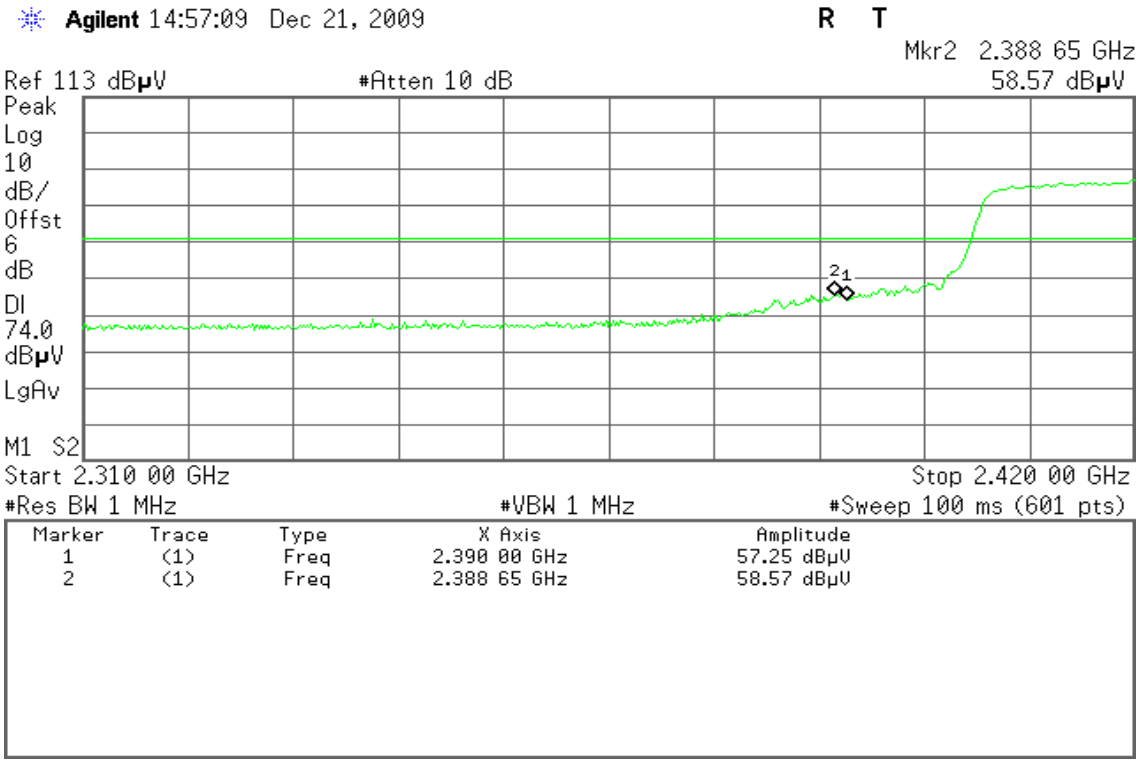


Detector mode: Average **Polarity: Horizontal**

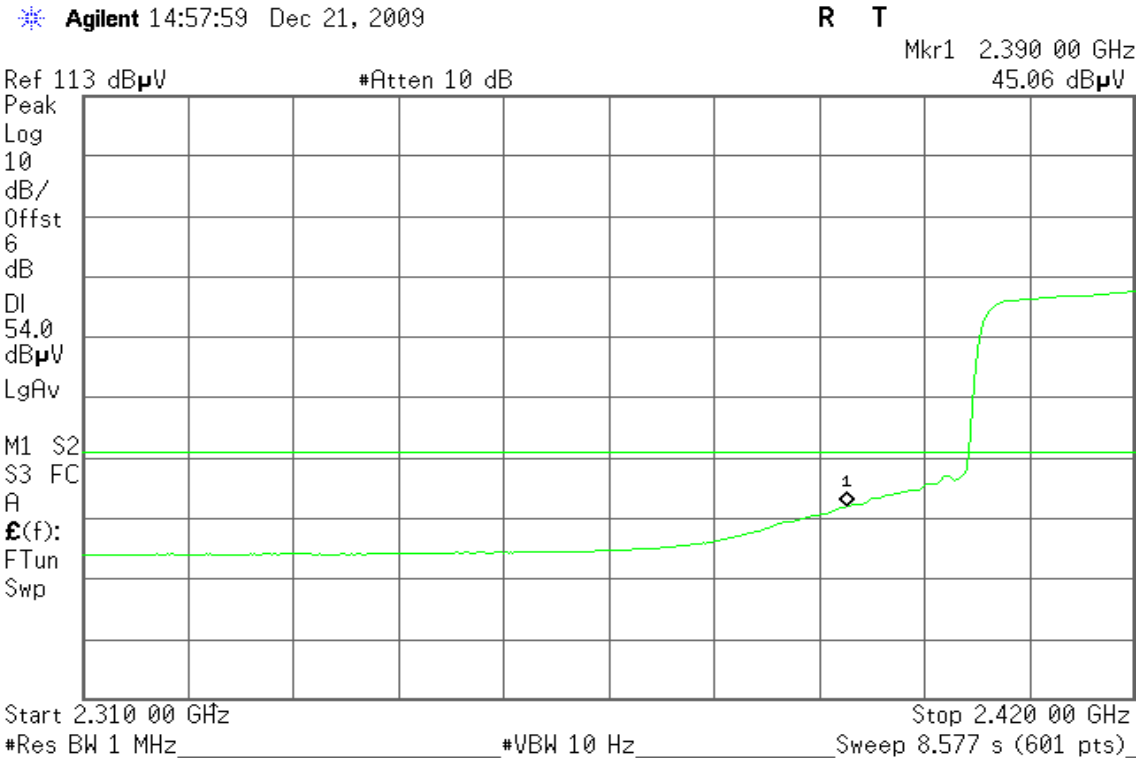


Band Edges (draft 802.11n 40 MHz Channel mode / CH Low)

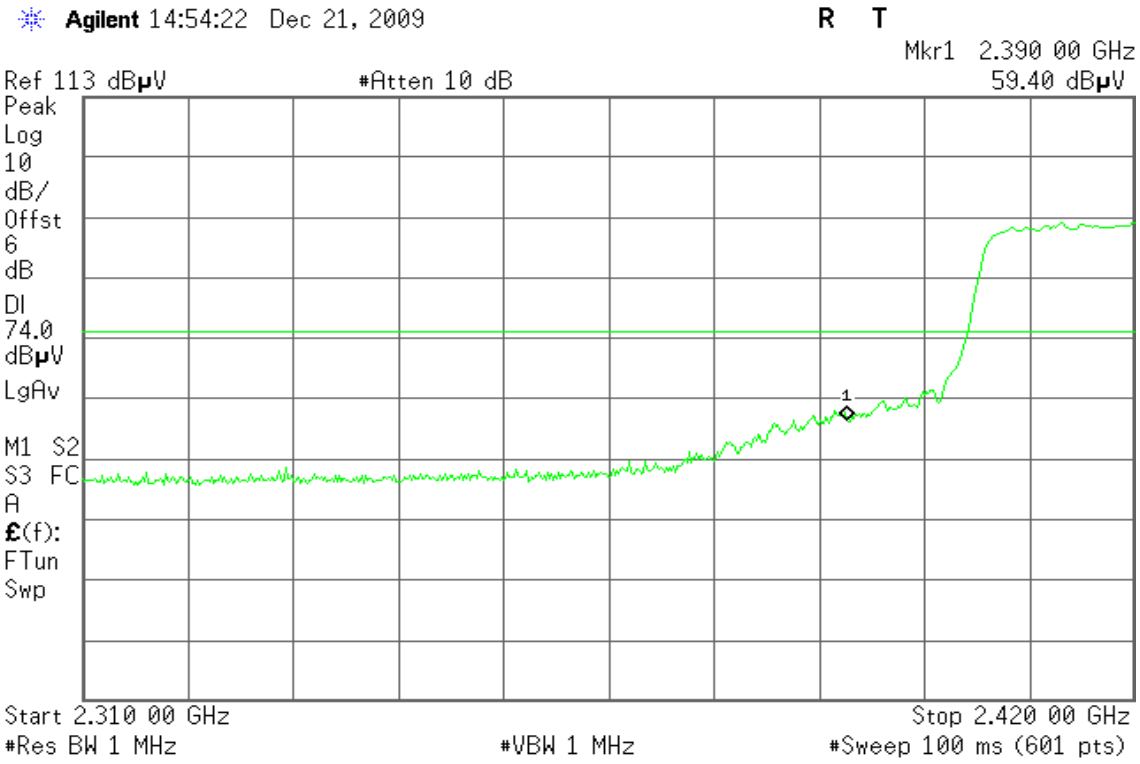
Detector mode: Peak **Polarity: Vertical**



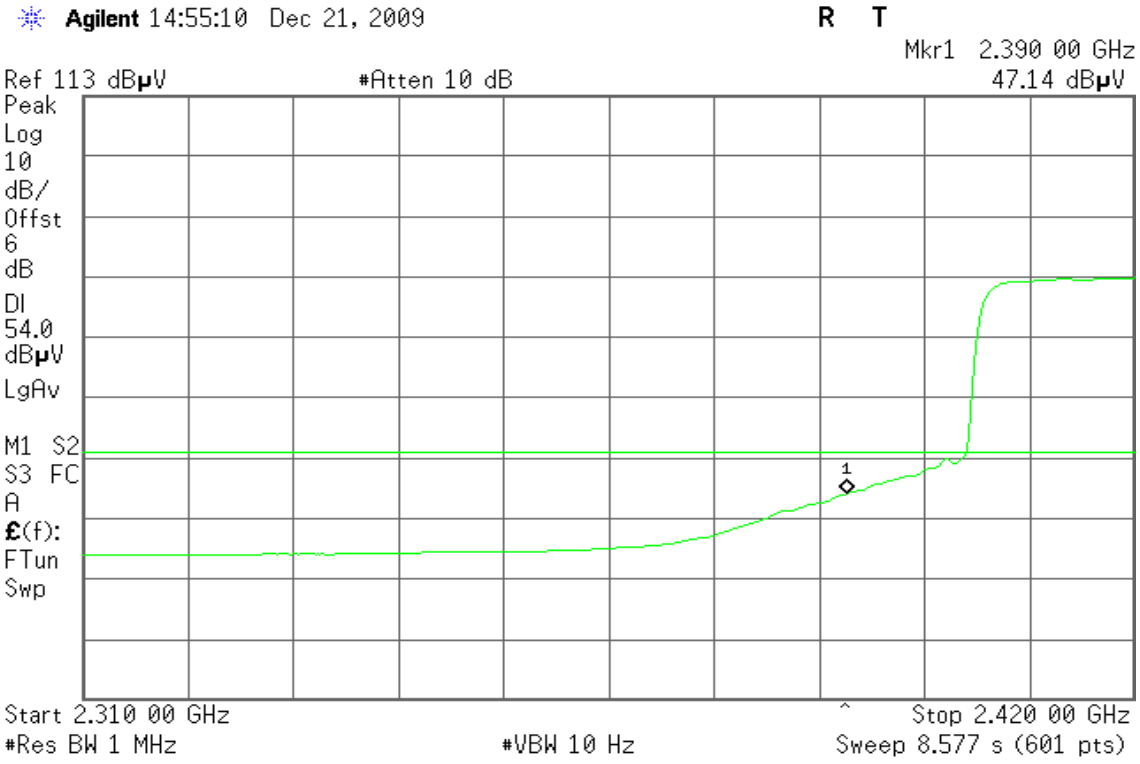
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

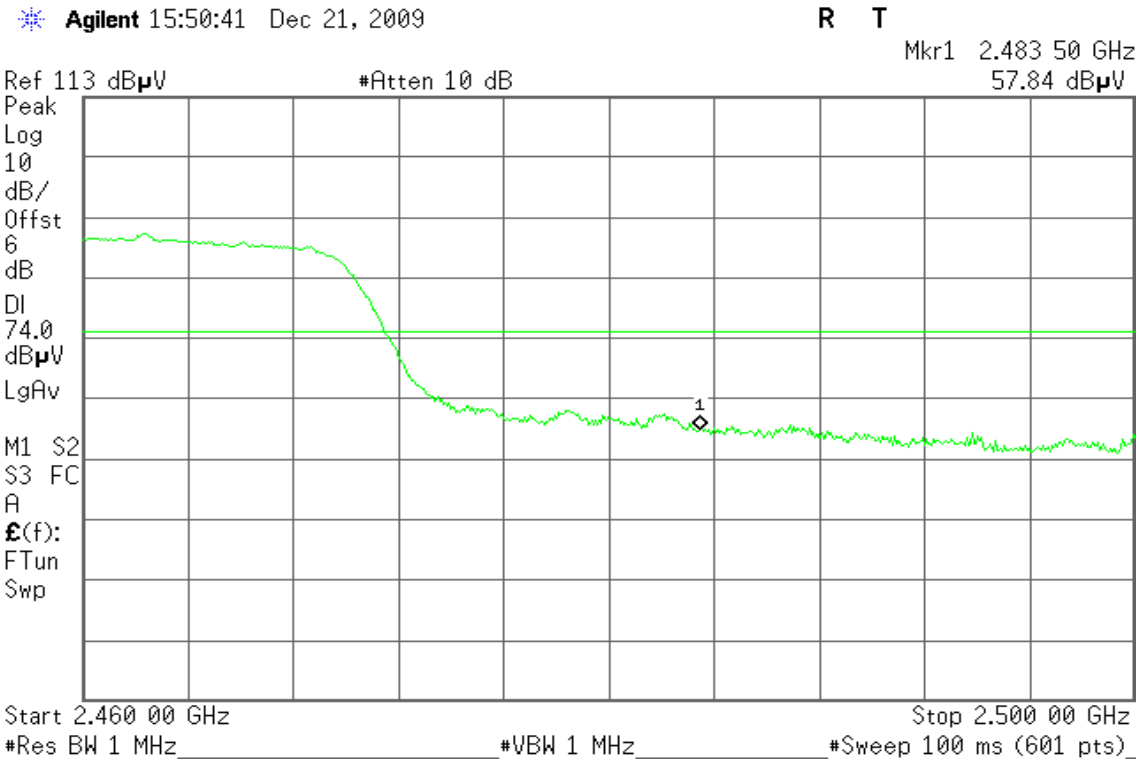


Detector mode: Average **Polarity: Horizontal**

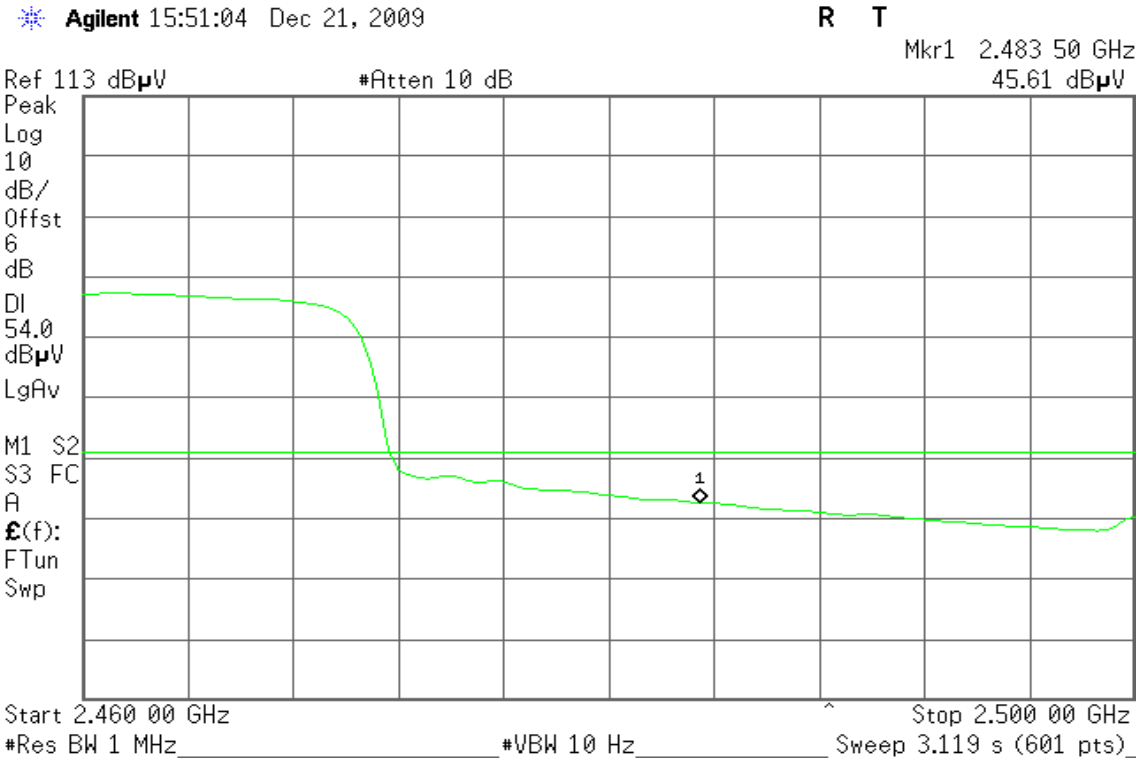


Band Edges (draft 802.11n 40 MHz Channel mode / CH High)

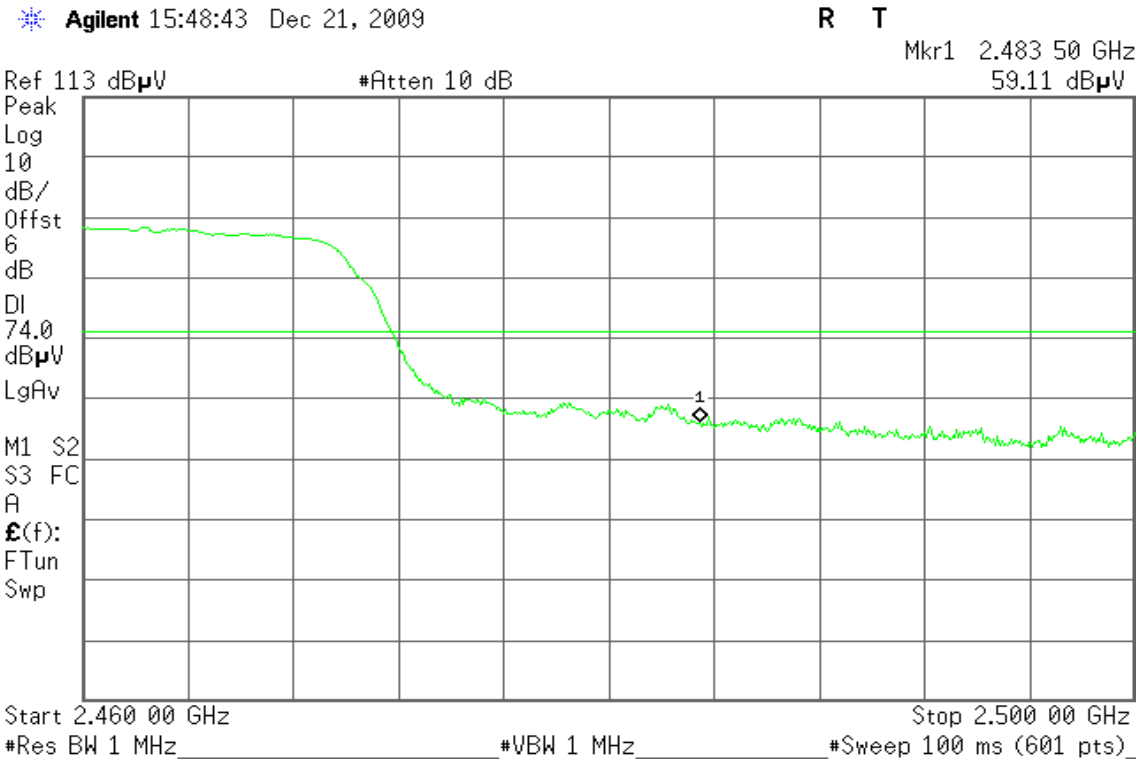
Detector mode: Peak **Polarity: Vertical**



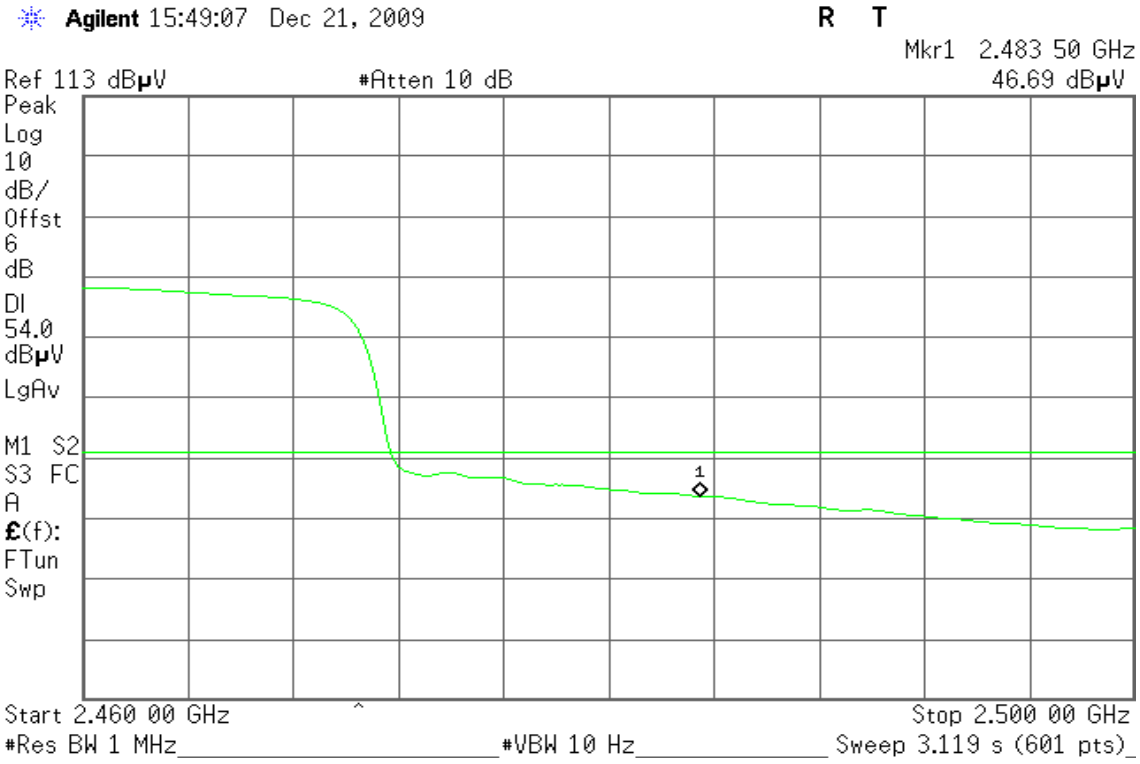
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**

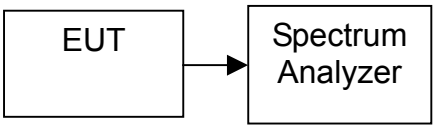


7.5. PEAK POWER SPECTRAL DENSITY

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	-9.08	8.00	PASS
Mid	2437	-8.45		PASS
High	2462	-8.60		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-13.36	8.00	PASS
Mid	2437	-8.74		PASS
High	2462	-8.65		PASS

Test mode: draft 802.11n 20 MHz Channel mode

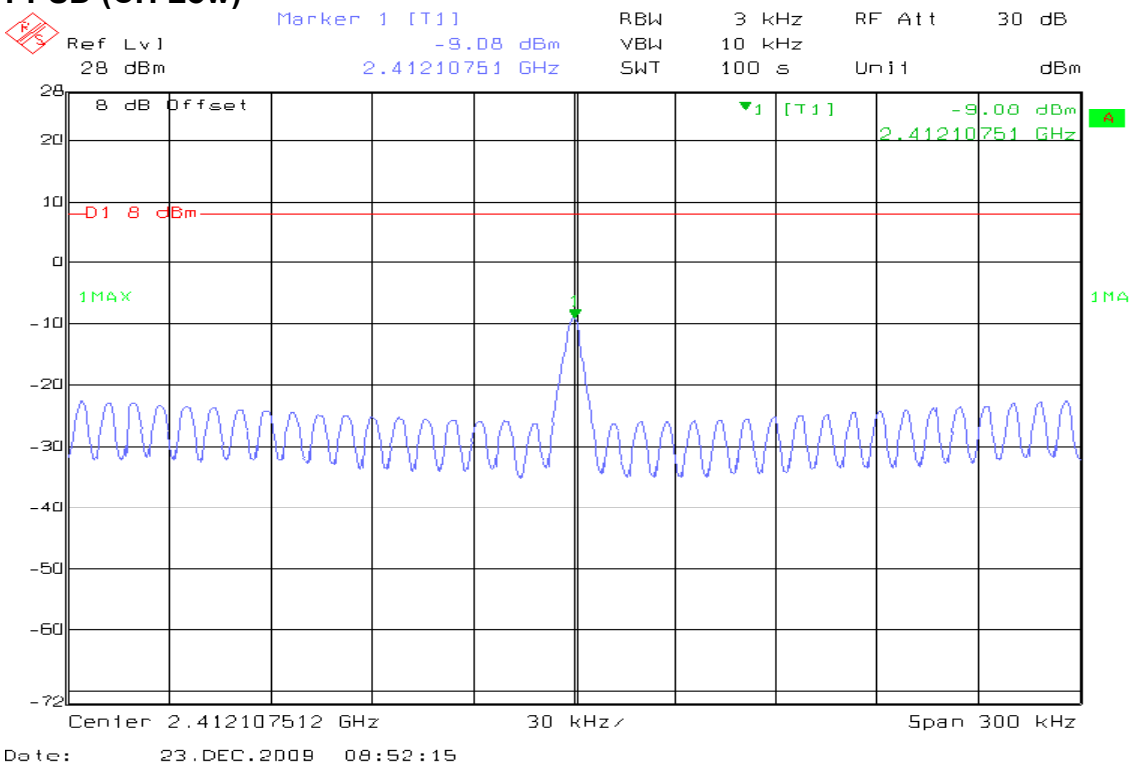
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-13.14	8.00	PASS
Mid	2437	-8.85		PASS
High	2462	-8.85		PASS

Test mode: draft 802.11n 40 MHz Channel mode

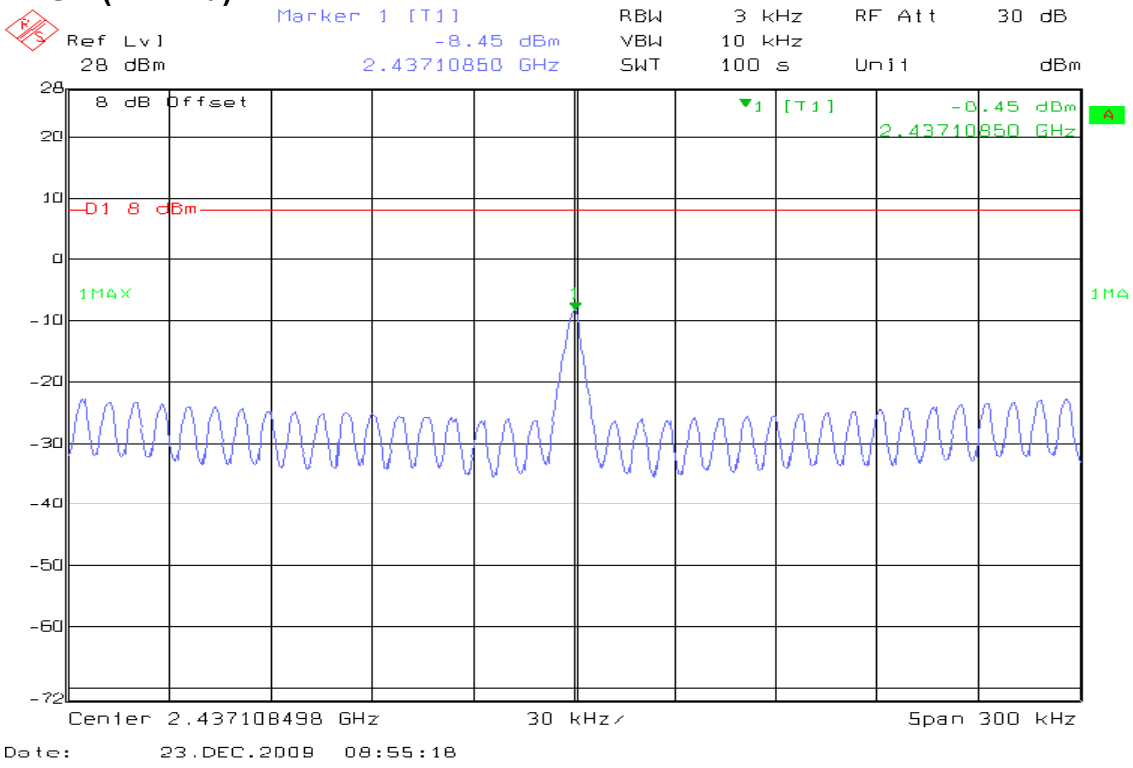
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2422	-12.95	8.00	PASS
Mid	2437	-9.35		PASS
High	2452	-9.12		PASS

Test Plot
IEEE 802.11b mode

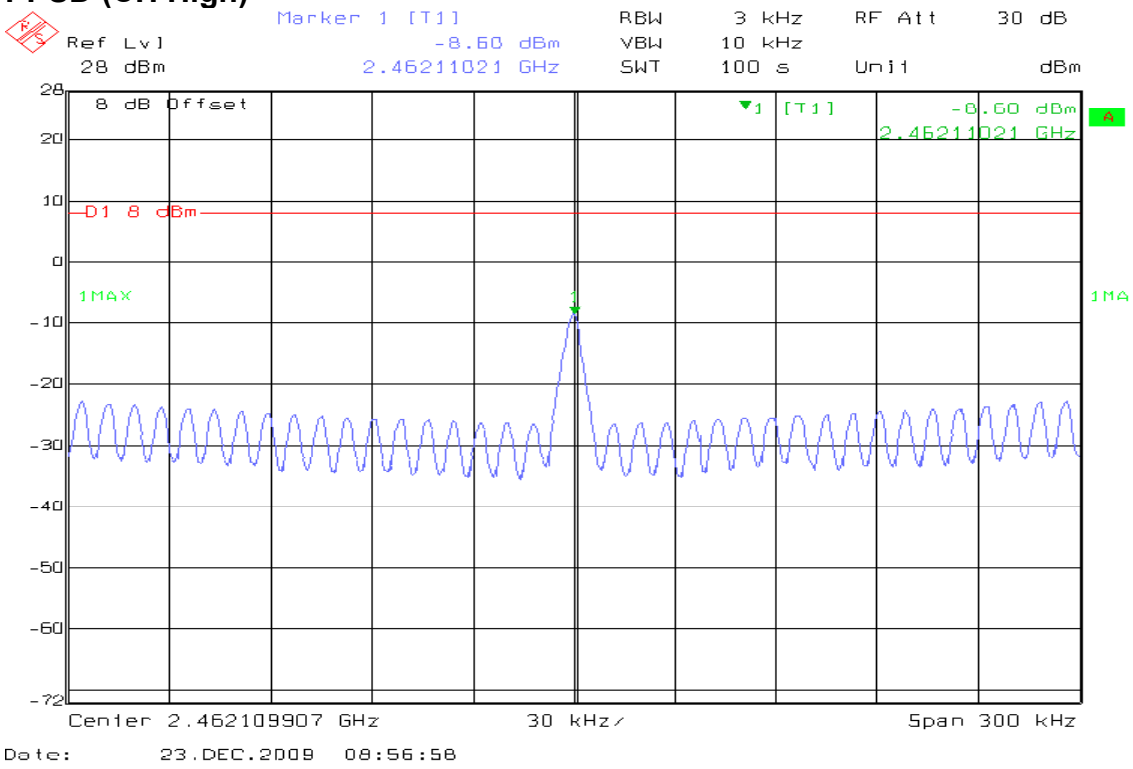
PPSD (CH Low)



PPSD (CH Mid)

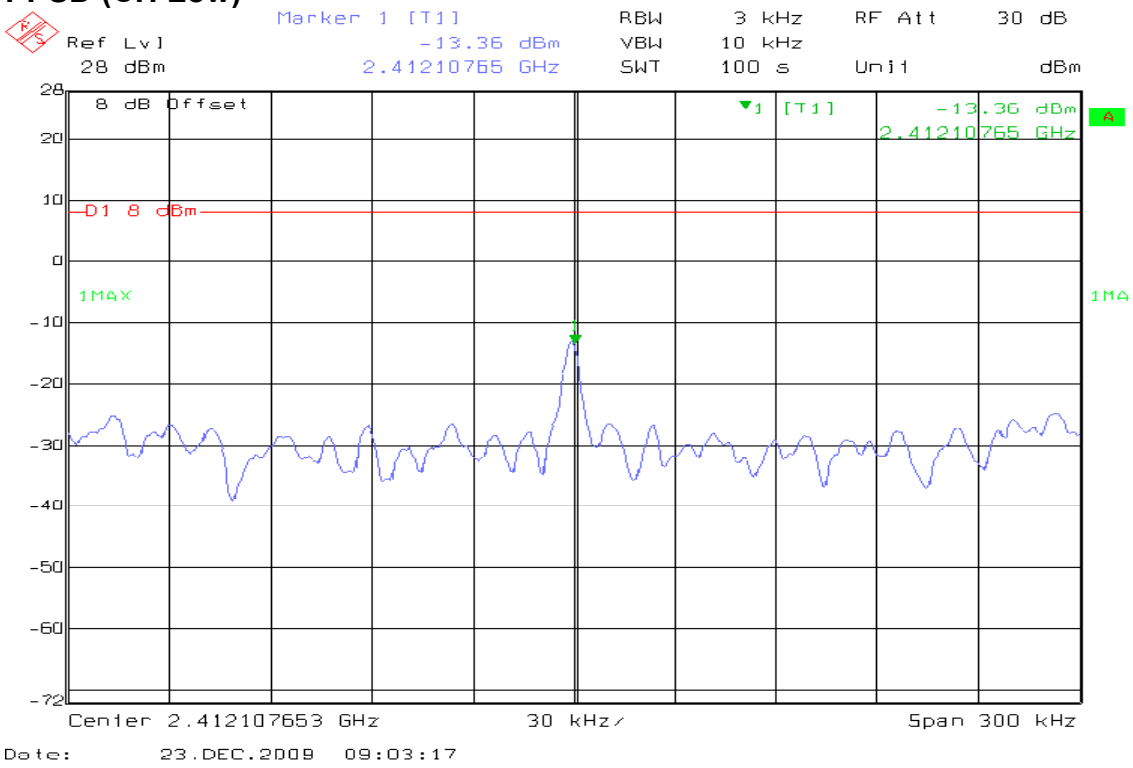


PPSD (CH High)

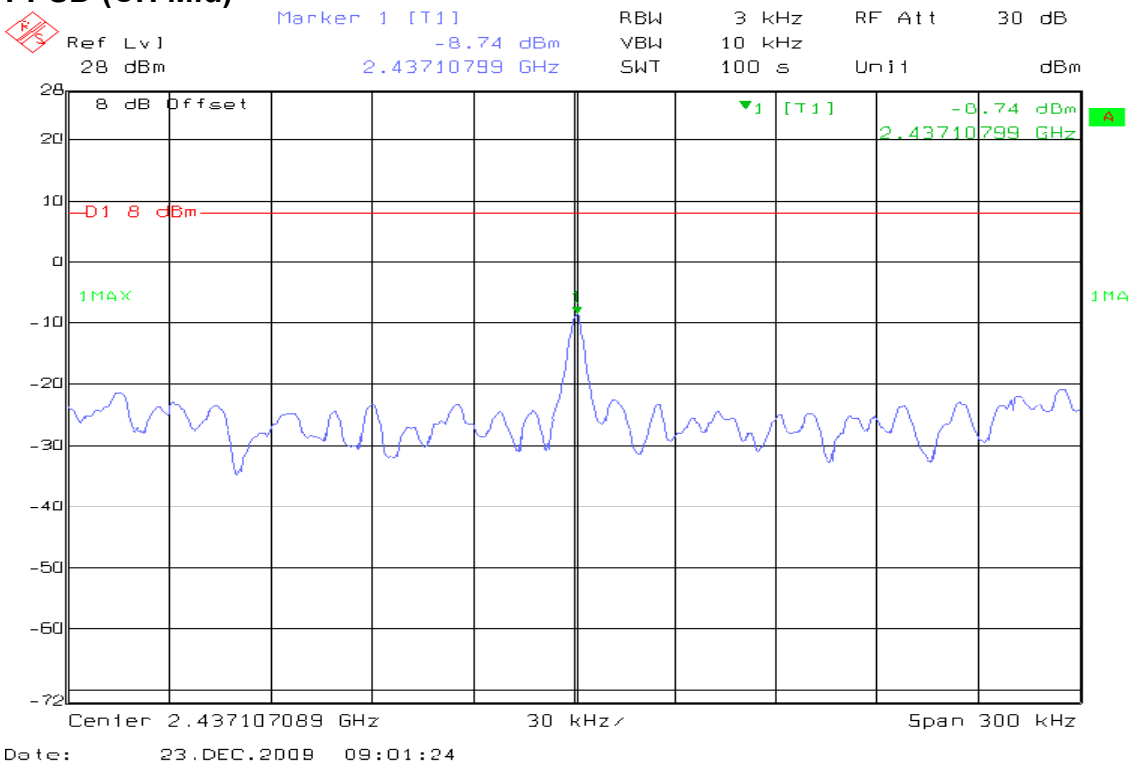


IEEE 802.11g mode

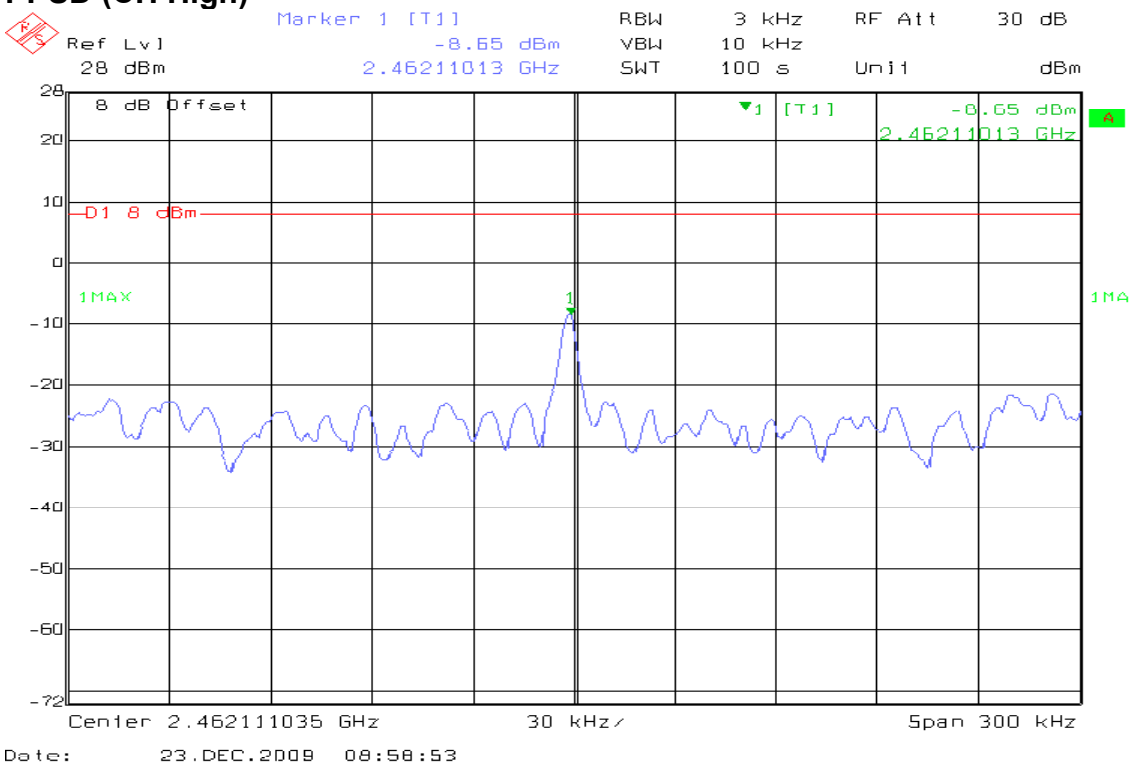
PPSD (CH Low)



PPSD (CH Mid)

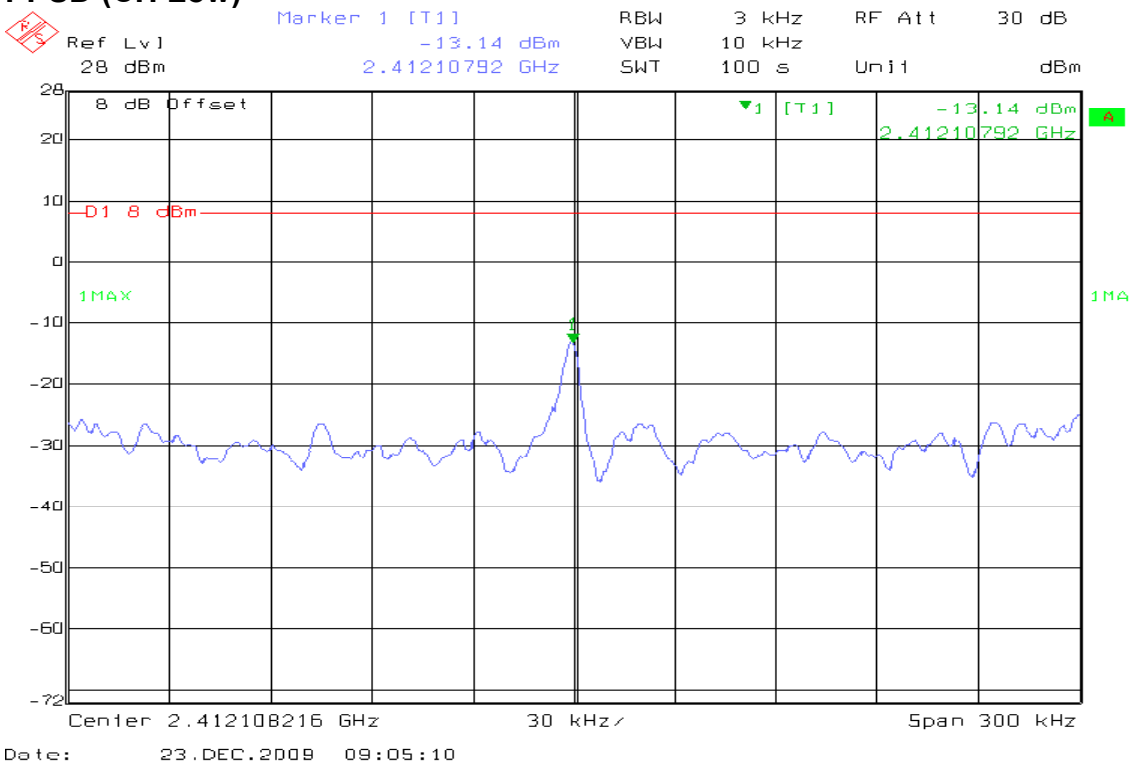


PPSD (CH High)

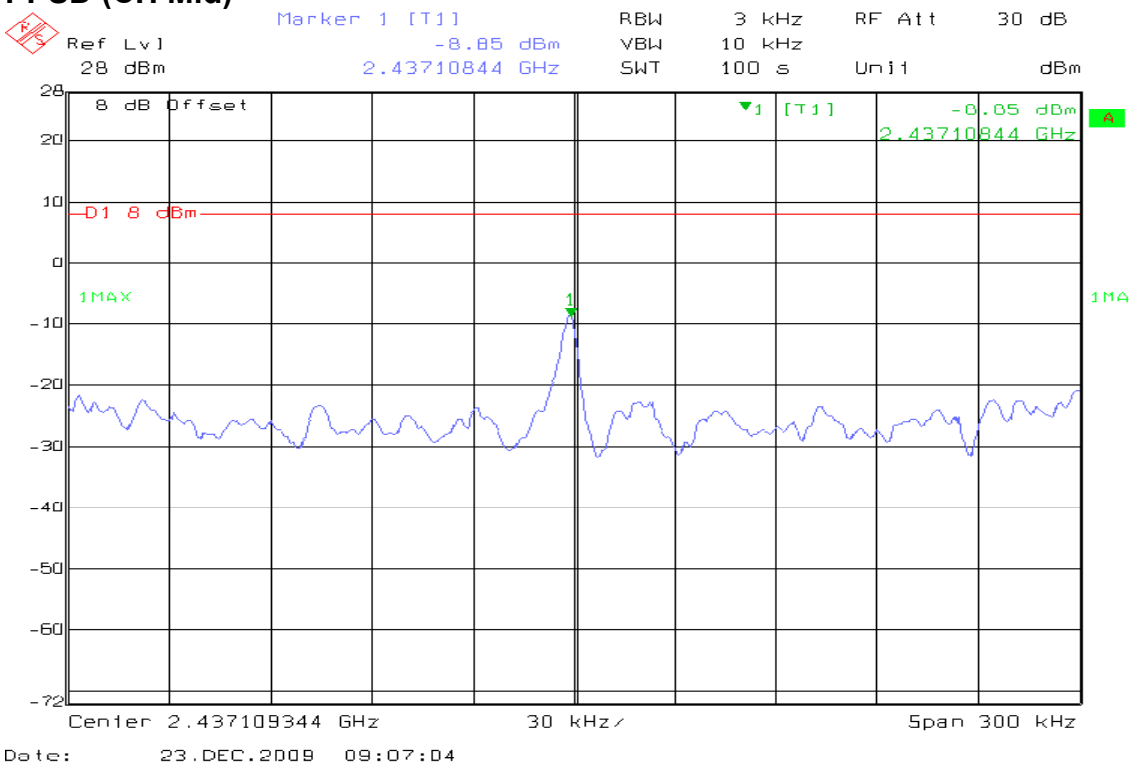


draft 802.11n 20 MHz Channel mode

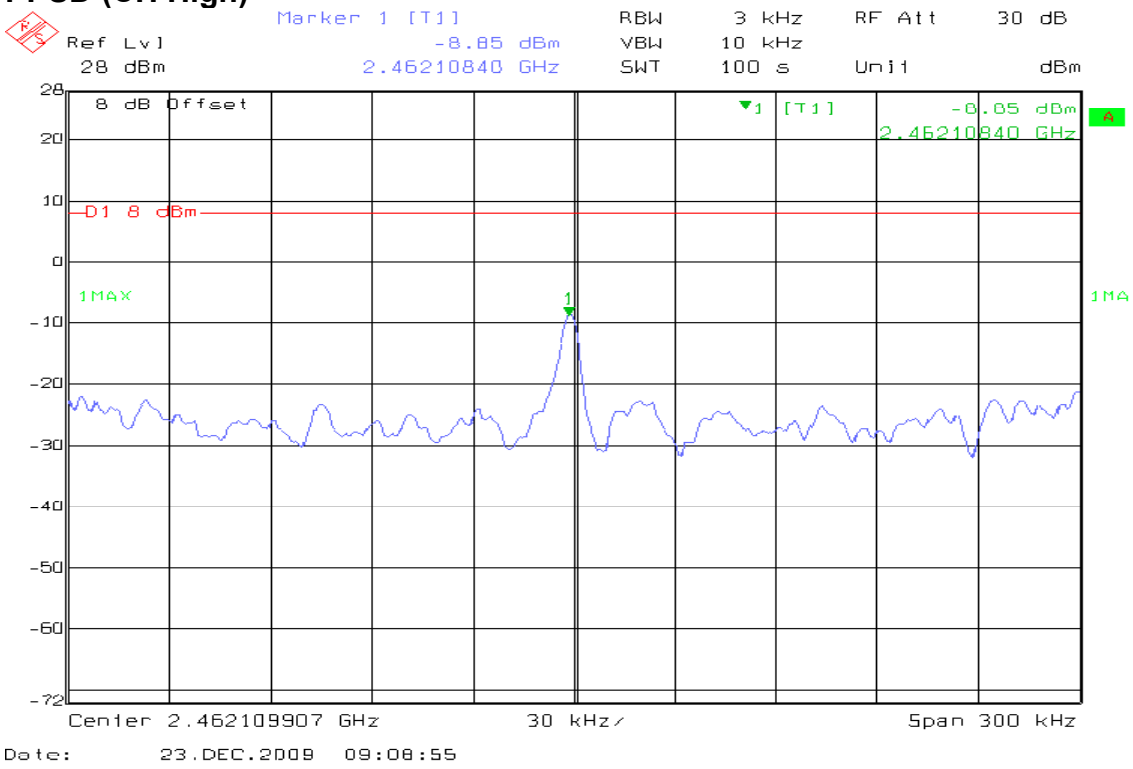
PPSD (CH Low)



PPSD (CH Mid)

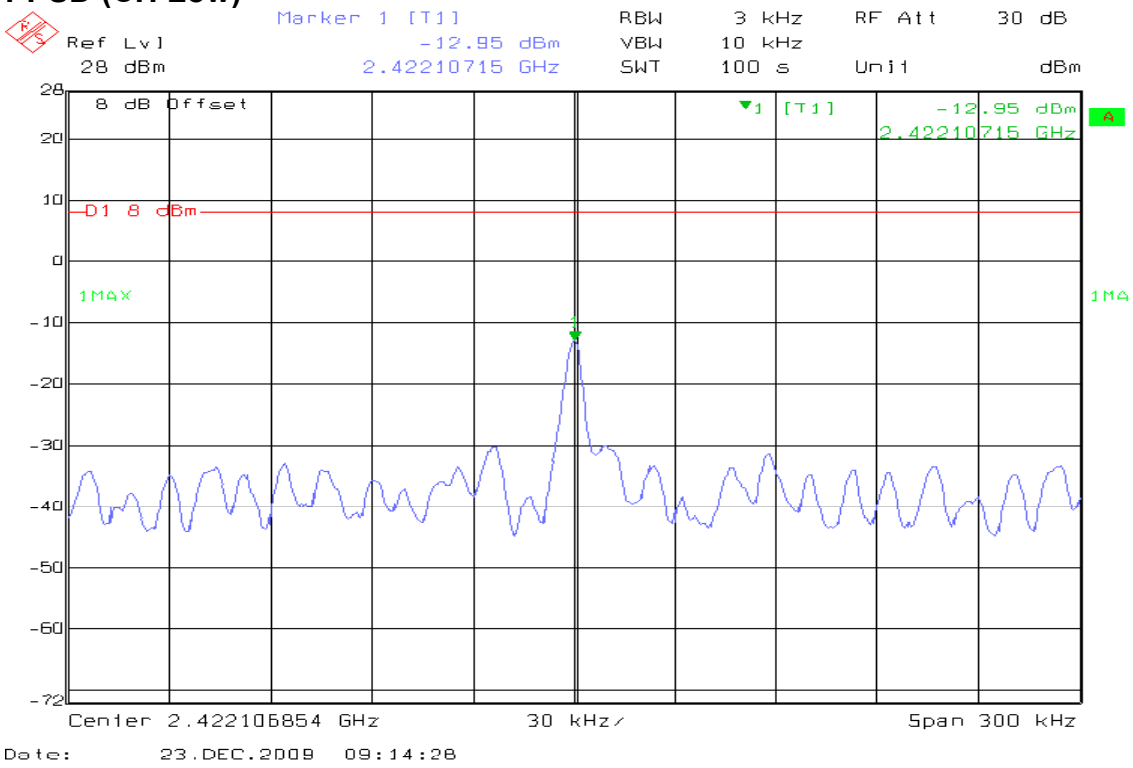


PPSD (CH High)

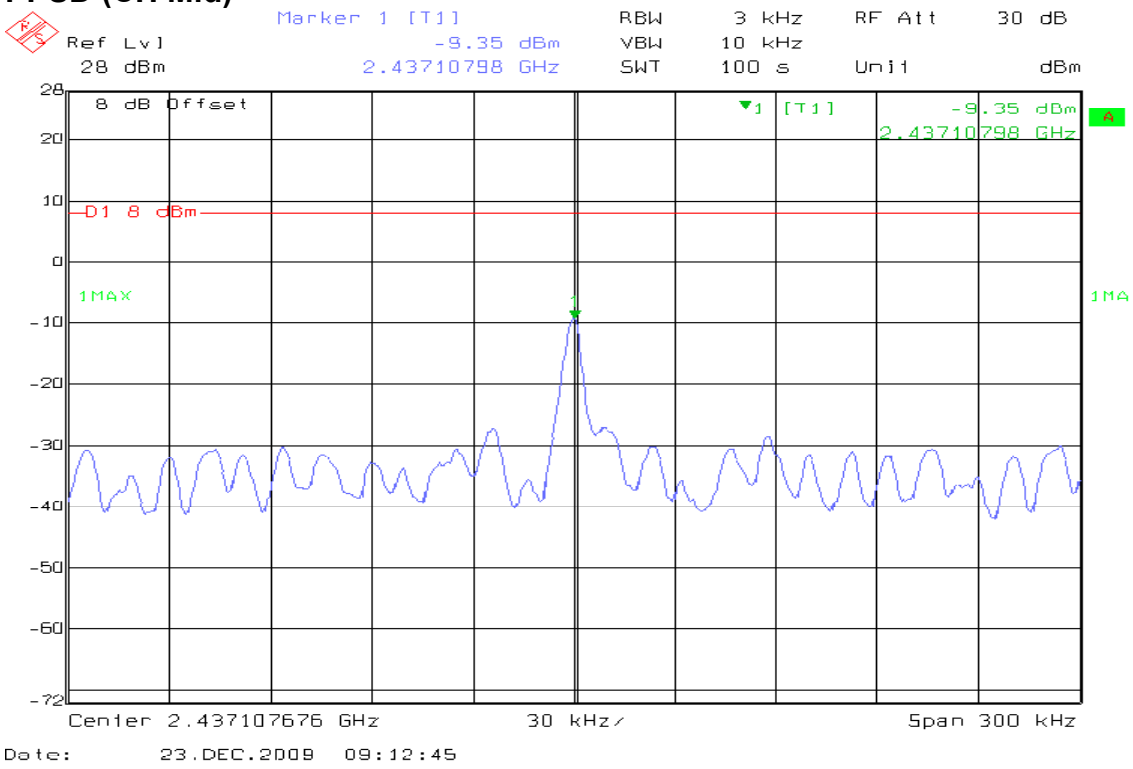


draft 802.11n 40 MHz Channel mode

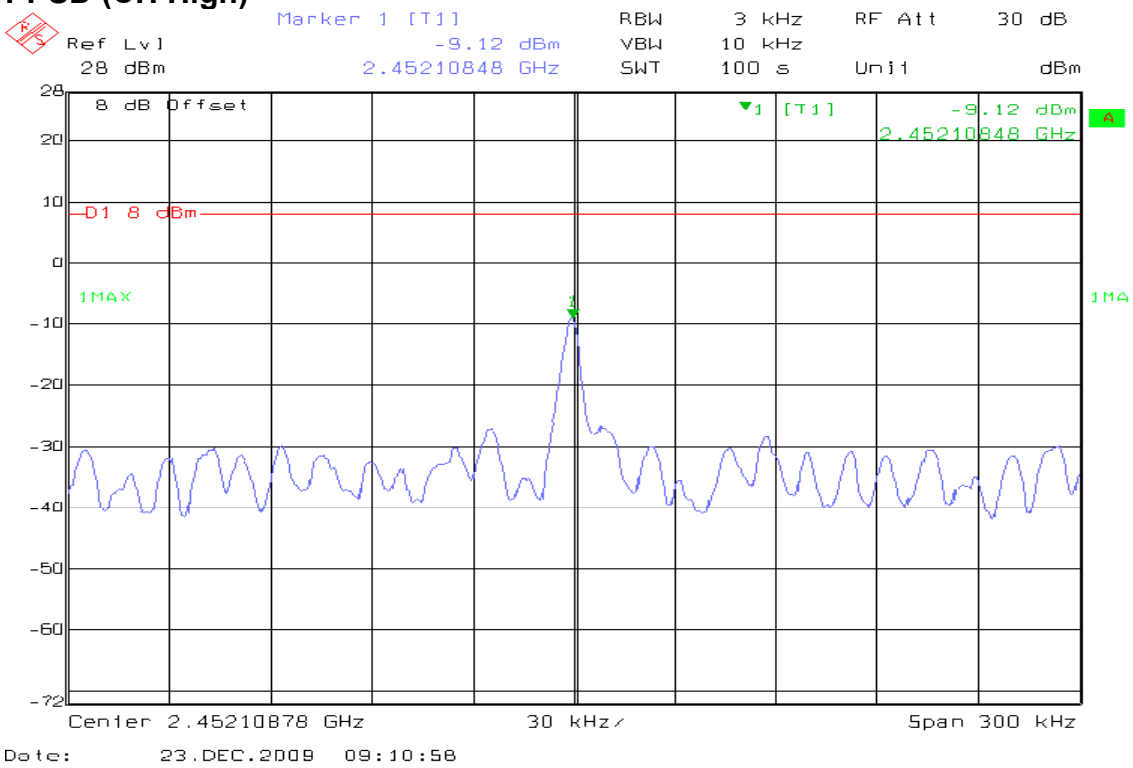
PPSD (CH Low)



PPSD (CH Mid)



PPSD (CH High)



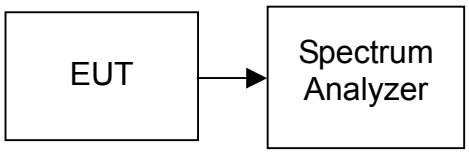
7.6. SPURIOUS EMISSIONS

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.

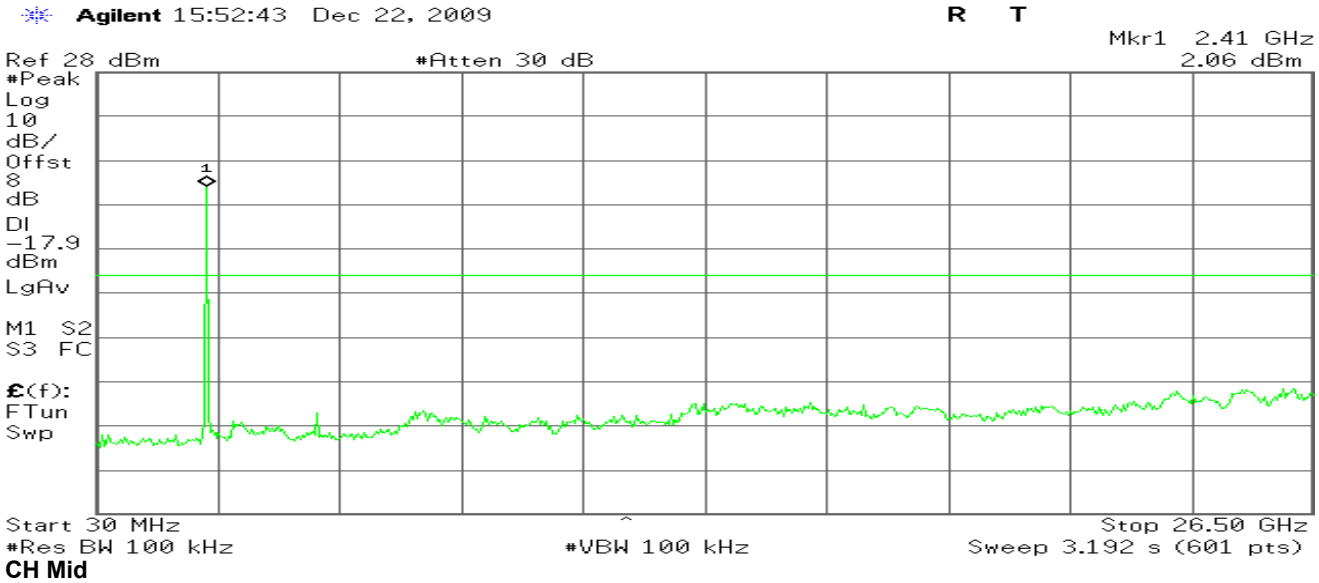
TEST RESULTS

No non-compliance noted.

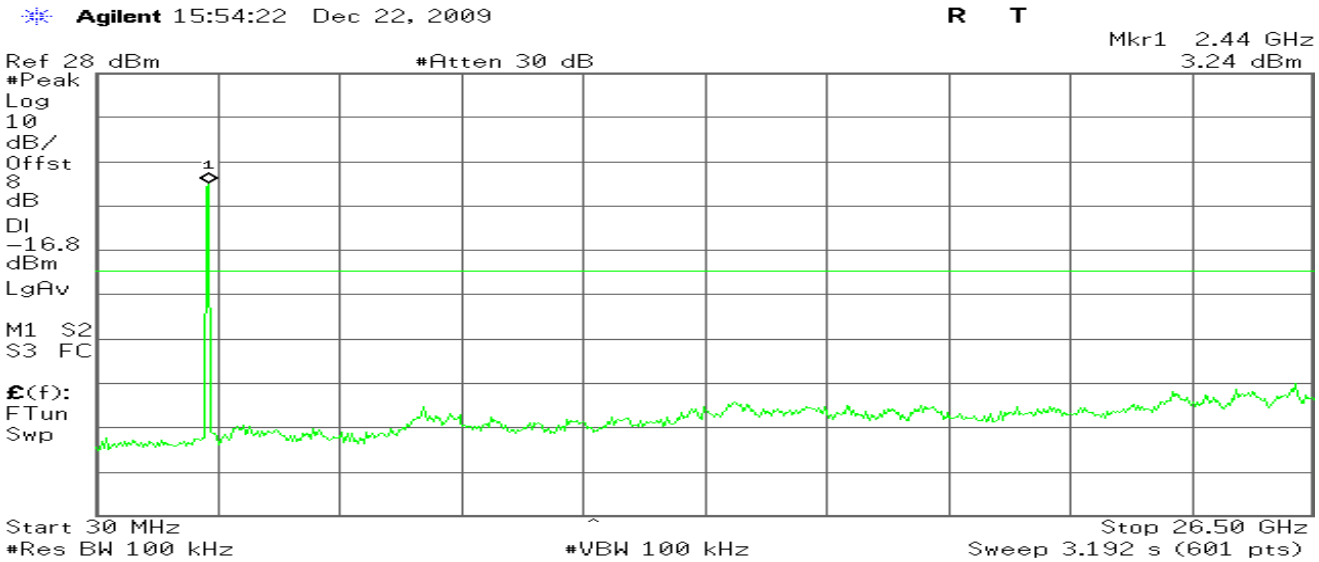
Test Plot

IEEE 802.11b mode

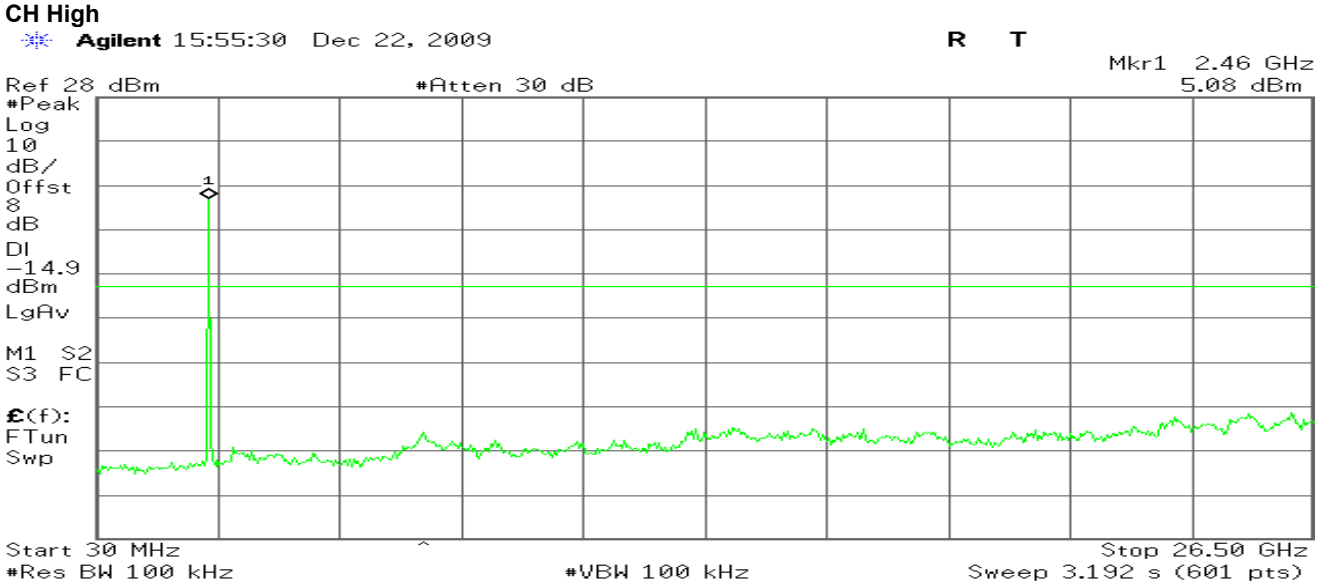
CH Low



CH Mid

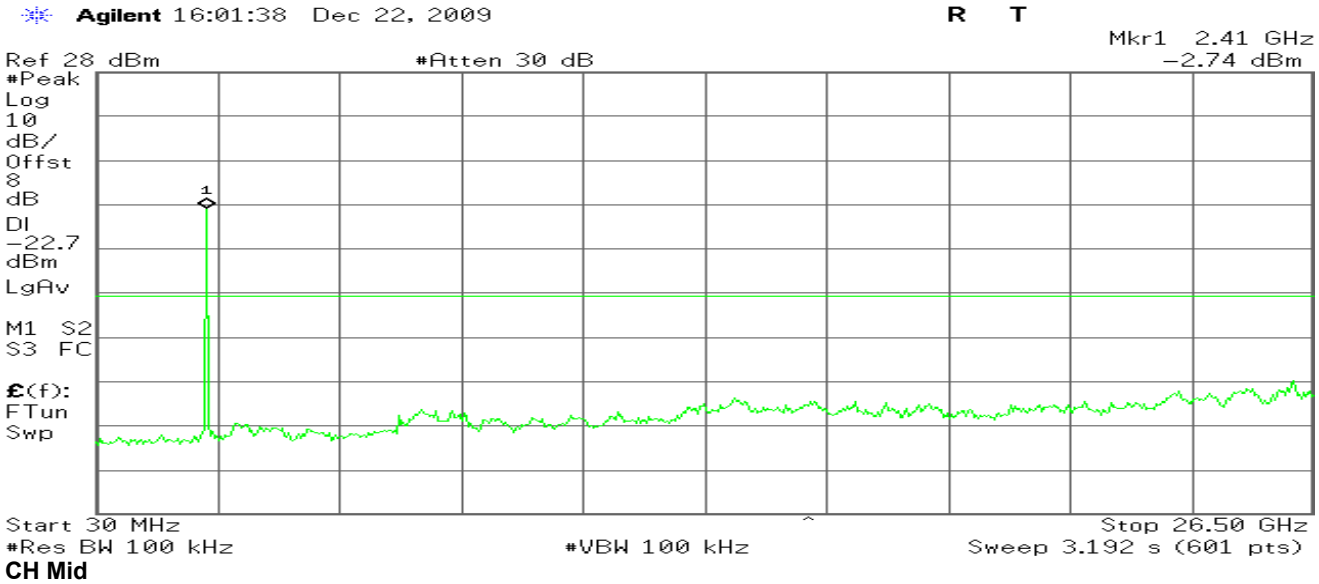


CH High

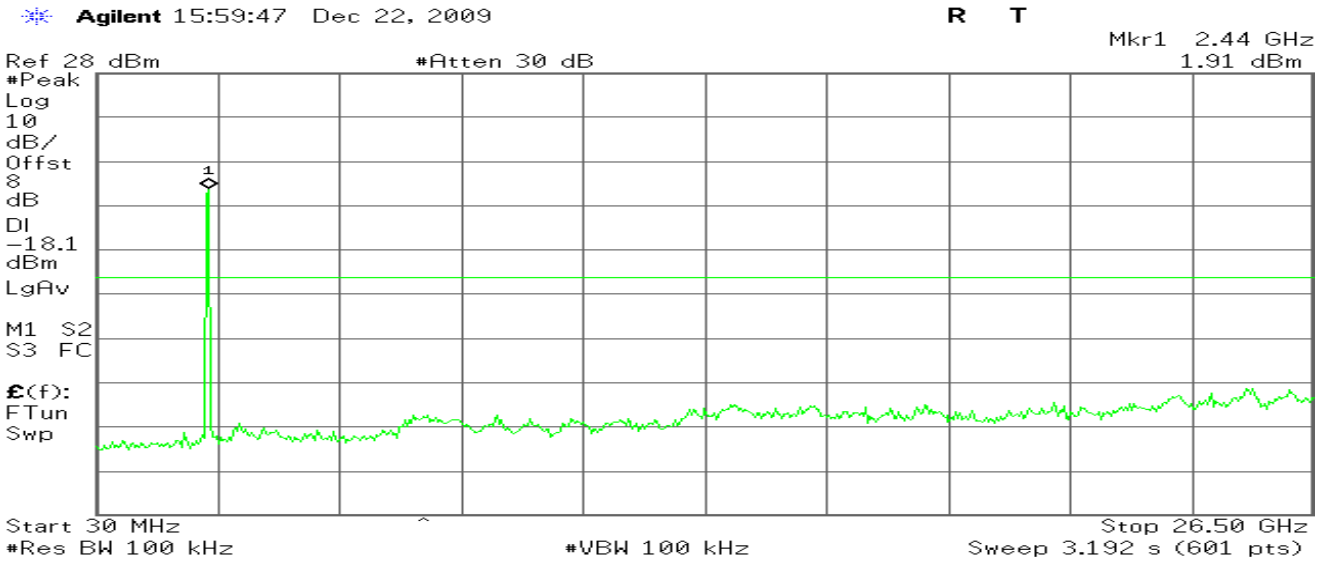


IEEE 802.11g mode

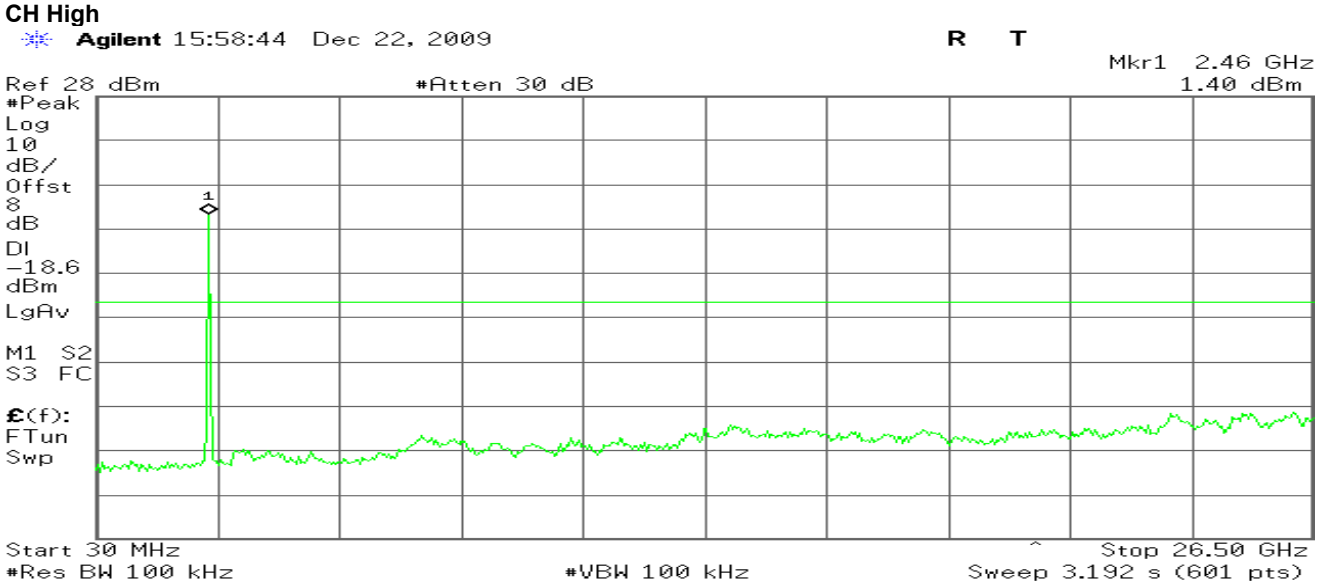
CH Low



CH Mid

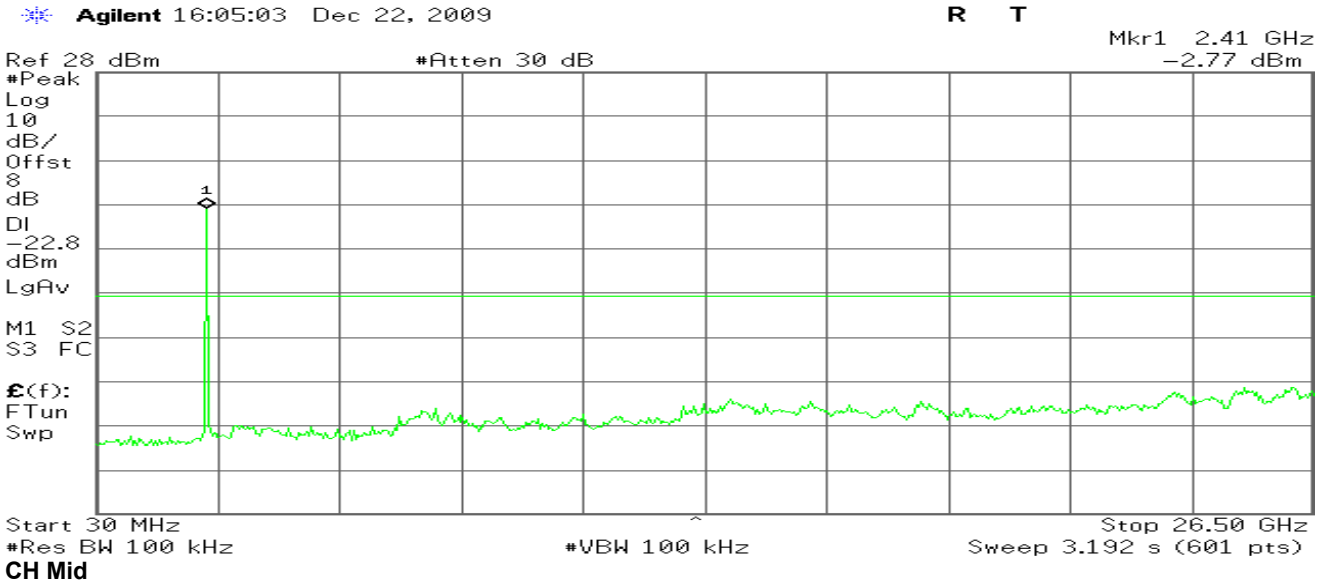


CH High

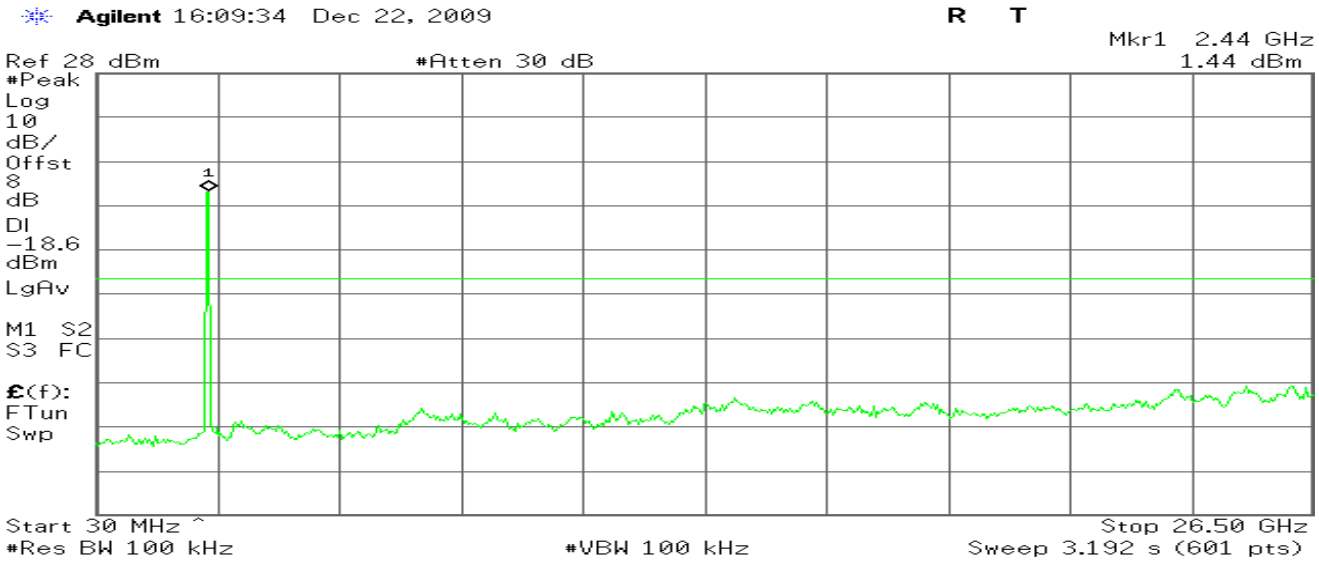


draft 802.11n 20 MHz Channel mode

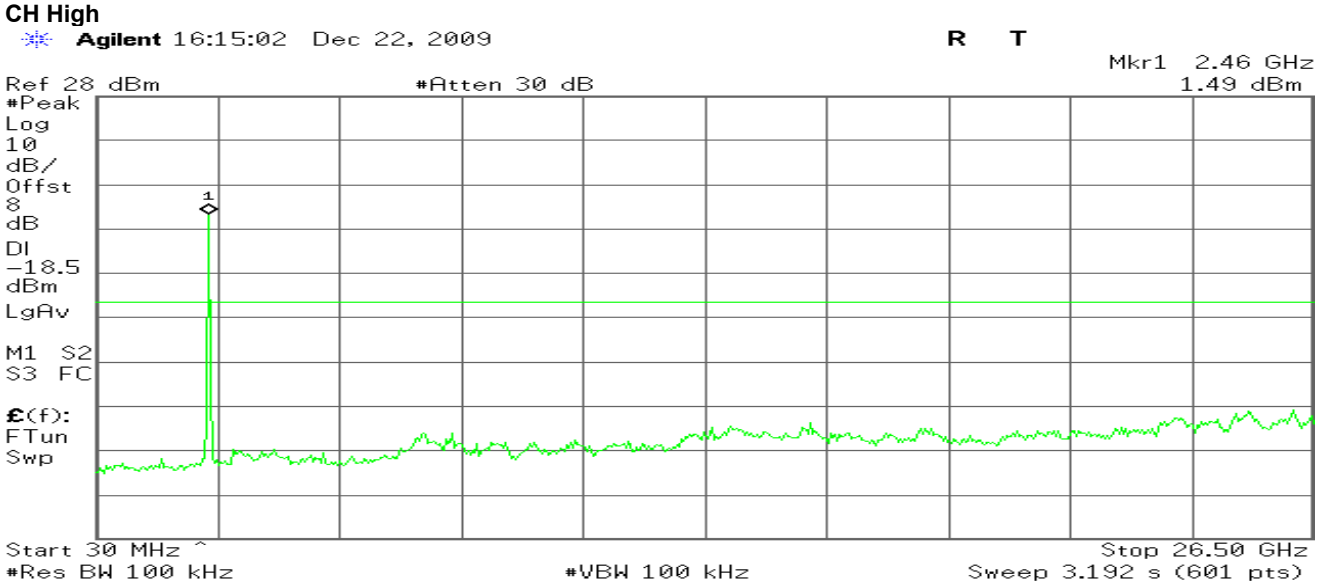
CH Low



CH Mid

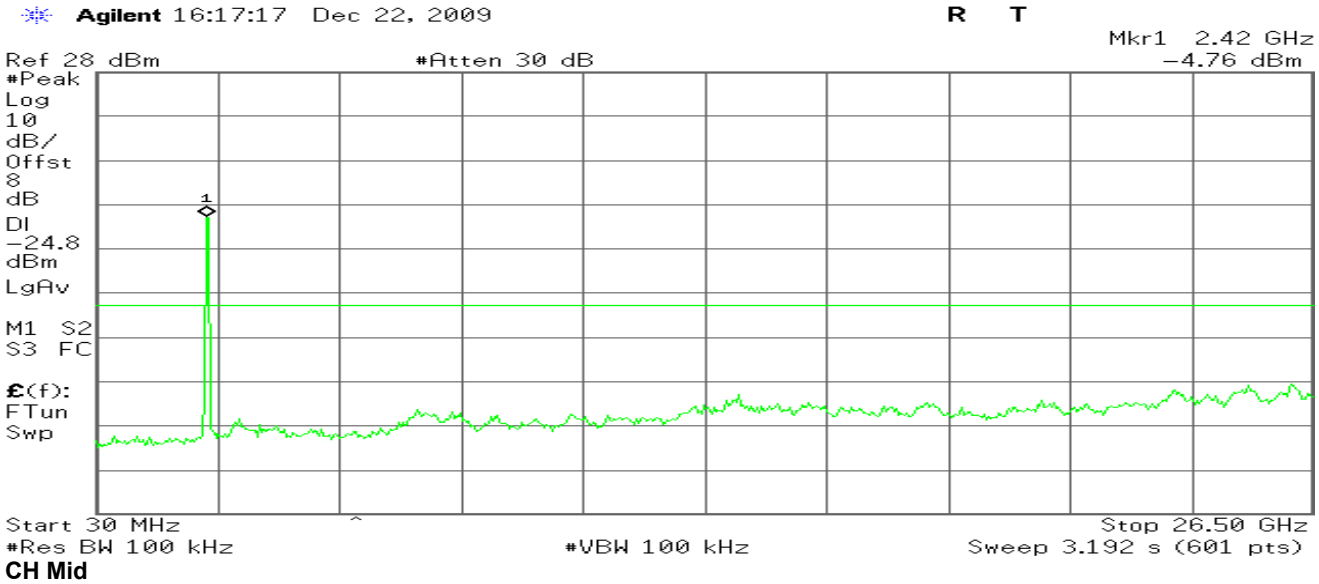


CH High

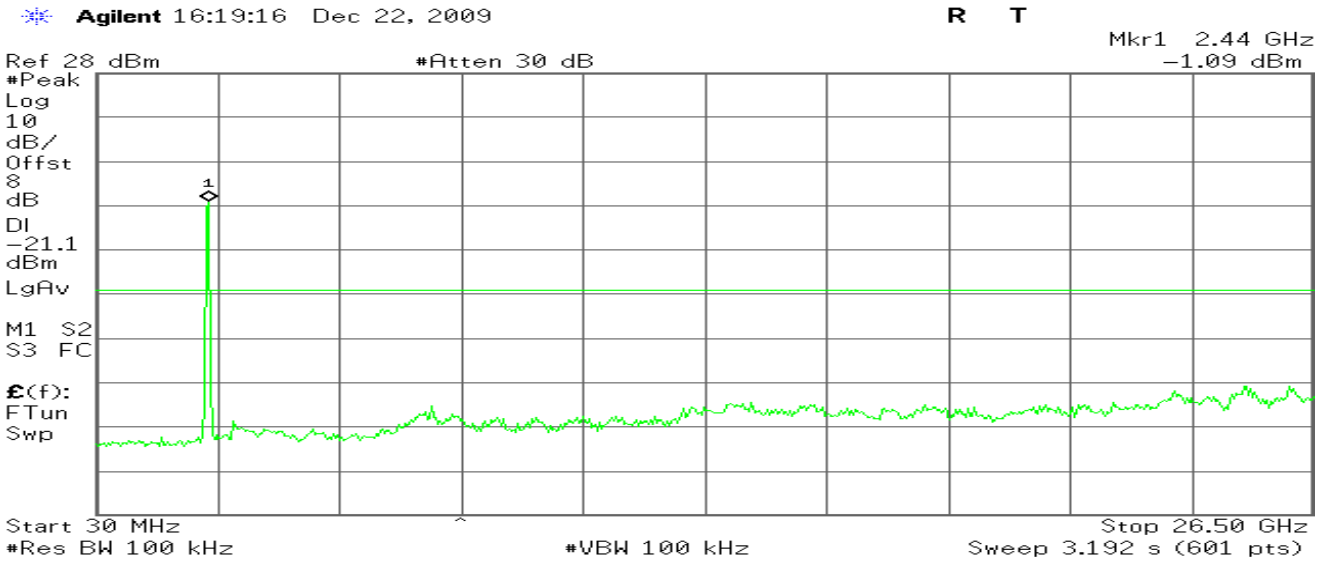


draft 802.11n 40 MHz Channel mode

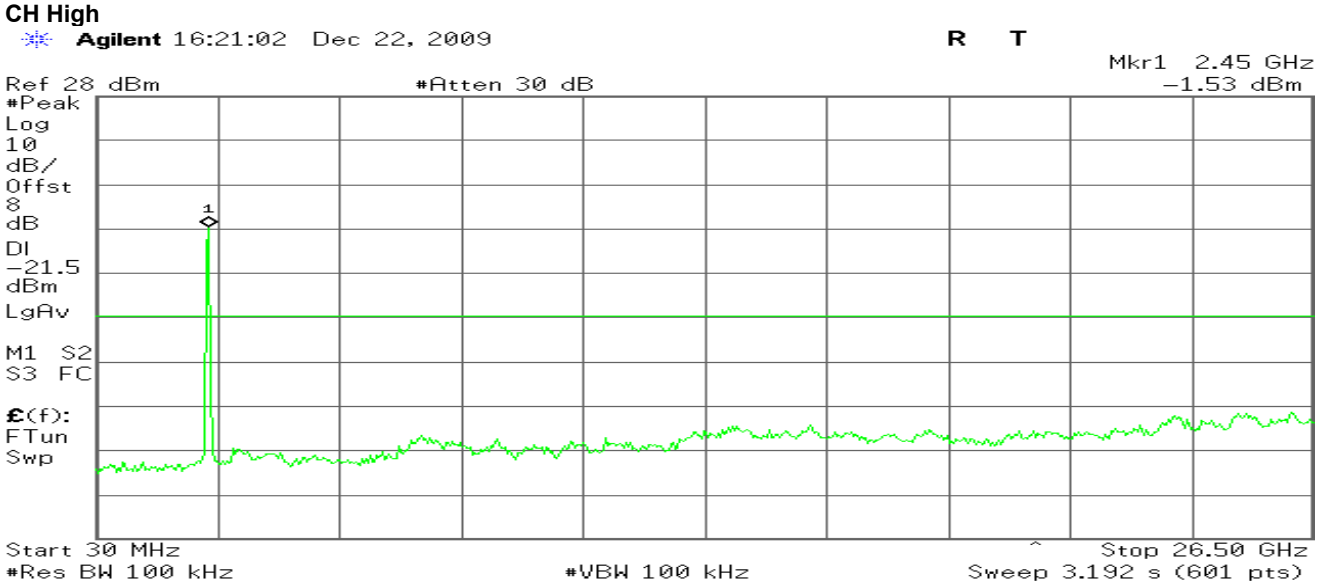
CH Low



CH Mid



CH High



7.7. 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

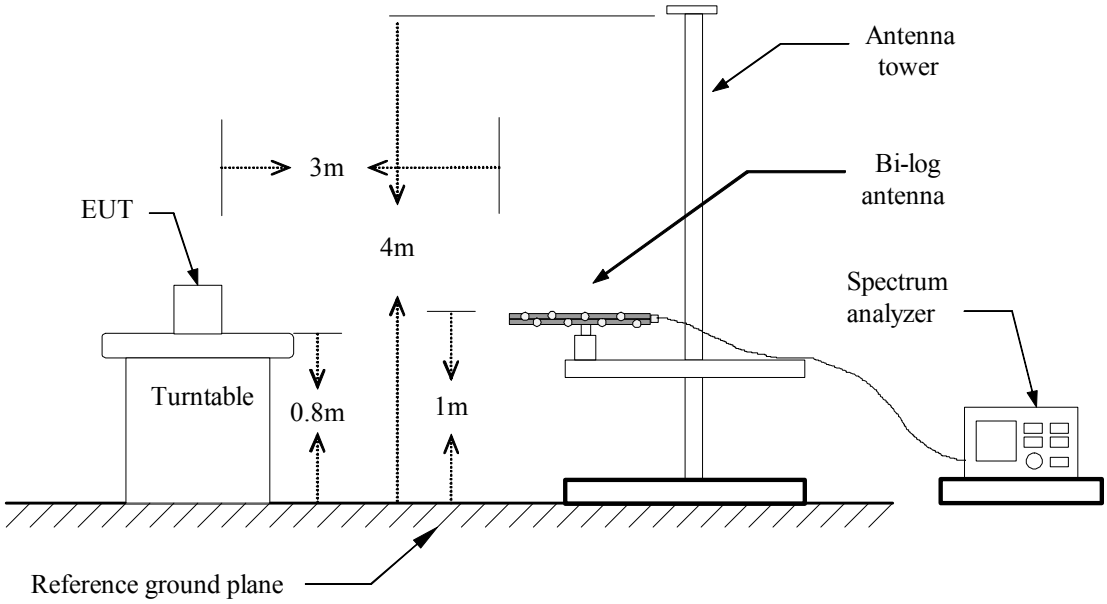
Remark: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

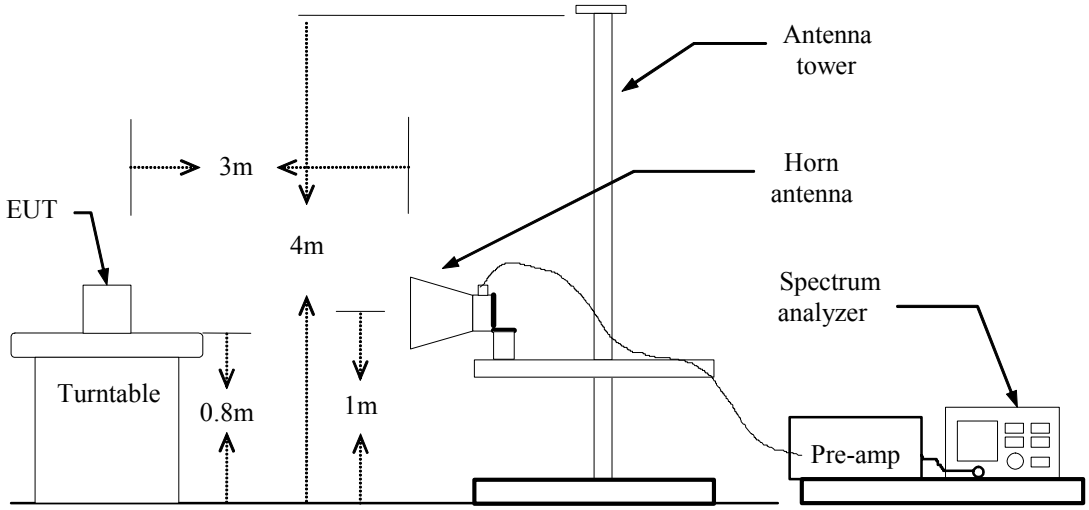
Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

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 1GHz:

   RBW=100kHz / 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: Normal Link **Test Date:** 2009/12/21

Temperature: 18°C **Tested by:** Alonso Lu

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
51.8250	V	47.50	-14.16	33.34	40.00	-6.66	Peak
93.0500	V	57.19	-17.99	39.20	43.50	-4.30	Peak
124.5750	V	54.71	-15.48	39.23	43.50	-4.27	Peak
148.8250	V	49.10	-12.56	36.54	43.50	-6.96	Peak
599.8750	V	39.27	-3.99	35.28	46.00	-10.72	Peak
750.2250	V	41.57	-2.15	39.42	46.00	-6.58	Peak
900.5750	V	42.40	0.30	42.70	46.00	-3.30	Peak
1000.0000	V	42.61	2.23	44.84	53.90	-9.06	Peak
124.5750	H	42.41	-15.48	26.93	43.50	-16.57	Peak
148.8250	H	53.22	-12.56	40.66	43.50	-2.84	Peak
294.3250	H	42.76	-11.31	31.45	46.00	-14.55	Peak
301.6000	H	43.18	-11.08	32.10	46.00	-13.90	Peak
359.8000	H	42.36	-9.63	32.73	46.00	-13.27	Peak
599.8750	H	41.14	-3.99	37.15	46.00	-8.85	Peak
747.8000	H	39.31	-2.19	37.12	46.00	-8.88	Peak
839.9500	H	41.09	-0.64	40.45	46.00	-5.55	Peak

Remark:

1. *No emission found between lowest internal used / generated frequency to 30 MHz. (9kHz ~ 30MHz)*
2. *Measuring frequencies from 30 MHz to the 1GHz.*
3. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.*
4. *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.*
5. *Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).*

Above 1 GHz

Operation Mode: TX / IEEE 802.11b / CH Low **Test Date:** 2009/12/21

Temperature: 16°C **Tested by:** Alonso Lu

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
1043.33	V	56.49	---	-6.71	49.77	---	74.00	54.00	-4.23	Peak
1080.00	V	58.65	---	-6.88	51.77	---	74.00	54.00	-2.23	Peak
1833.33	V	52.76	---	-0.96	51.81	---	74.00	54.00	-2.19	Peak
2240.00	V	50.89	---	0.65	51.54	---	74.00	54.00	-2.46	Peak
4825.00	V	46.76	45.59	6.51	53.27	52.10	74.00	54.00	-1.90	AVG
5000.00	V	46.60	40.57	6.43	53.03	47.00	74.00	54.00	-7.00	AVG
7000.00	V	41.25	34.99	11.81	53.06	46.80	74.00	54.00	-7.20	AVG
2096.67	H	49.31	---	-1.63	47.68	---	74.00	54.00	-6.32	Peak
2746.67	H	49.52	---	-0.63	48.90	---	74.00	54.00	-5.10	Peak
4825.00	H	43.90	---	7.74	51.64	---	74.00	54.00	-2.36	Peak
5000.00	H	41.67	---	9.47	51.14	---	74.00	54.00	-2.86	Peak

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:** 2009/12/21

Temperature: 16°C **Tested by:** Alonso Lu

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
1000.00	V	56.96	---	-6.52	50.44	---	74.00	54.00	-3.56	Peak
1043.33	V	56.21	---	-6.71	49.50	---	74.00	54.00	-4.50	Peak
1080.00	V	59.06	39.03	-6.88	52.18	32.15	74.00	54.00	-21.85	AVB
1100.00	V	58.64	---	-6.97	51.67	---	74.00	54.00	-2.33	Peak
1833.33	V	53.37	37.15	-0.96	52.41	36.19	74.00	54.00	-17.81	AVG
2240.00	V	50.92	---	0.65	51.58	---	74.00	54.00	-2.42	Peak
4875.00	V	47.73	44.87	7.30	55.03	52.17	74.00	54.00	-1.83	AVG
5000.00	V	44.30	---	6.43	50.73	---	74.00	54.00	-3.27	Peak
1080.00	H	55.15	---	-7.41	47.74	---	74.00	54.00	-2.12	Peak
2930.00	H	49.06	---	1.57	50.63	---	74.00	54.00	-2.95	Peak
4875.00	H	44.14	---	7.74	51.88	---	74.00	54.00	-2.12	Peak
5000.00	H	41.58	---	9.47	51.05	---	74.00	54.00	-2.95	Peak

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:** 2009/12/21

Temperature: 16°C **Tested by:** Alonso Lu

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
1000.00	V	56.61	---	-6.52	50.09	---	74.00	54.00	-3.91	Peak
1046.67	V	55.36	---	-6.73	48.63	---	74.00	54.00	-5.37	Peak
1080.00	V	59.28	39.12	-6.88	52.40	32.24	74.00	54.00	-21.76	AVG
1833.33	V	52.52	---	-0.96	51.57	---	74.00	54.00	-2.43	Peak
2200.00	V	51.20	---	0.80	52.00	---	74.00	54.00	-2.00	Peak
4925.00	V	47.55	45.31	7.38	54.93	52.69	74.00	54.00	-1.31	AVG
5000.00	V	45.12	---	6.43	51.55	---	74.00	54.00	-2.45	Peak
7000.00	V	41.88	35.13	11.81	53.69	46.94	74.00	54.00	-7.06	AVG
2153.33	H	49.85	---	-1.90	47.95	---	74.00	54.00	-6.05	Peak
2596.67	H	48.22	---	0.17	48.39	---	74.00	54.00	-5.61	Peak
4925.00	H	46.40	44.26	8.18	54.58	52.44	74.00	54.00	-1.56	AVG

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:** 2009/12/21

Temperature: 16°C **Tested by:** Alonso Lu

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
1000.00	V	55.14	---	-7.97	47.17	---	74.00	54.00	-6.83	Peak
1080.00	V	51.29	---	-7.41	43.88	---	74.00	54.00	-10.12	Peak
1100.00	V	50.71	---	-7.27	43.44	---	74.00	54.00	-10.56	Peak
1250.00	V	50.16	---	-7.91	42.25	---	74.00	54.00	-11.75	Peak
1726.67	V	47.68	---	-3.87	43.81	---	74.00	54.00	-10.19	Peak
2736.67	V	46.49	---	-0.60	45.89	---	74.00	54.00	-8.11	Peak
4825.00	V	41.49	---	7.74	49.22	---	74.00	54.00	-4.78	Peak
5000.00	V	41.39	---	9.47	50.86	---	74.00	54.00	-3.14	Peak
1080.00	H	58.81	---	-6.88	51.93	---	74.00	54.00	-2.07	Peak
1833.33	H	52.00	---	-0.96	51.04	---	74.00	54.00	-2.96	Peak
1943.33	H	49.41	---	-1.68	47.73	---	74.00	54.00	-6.27	Peak
2243.33	H	49.79	---	0.64	50.43	---	74.00	54.00	-3.57	Peak
2500.00	H	47.62	---	2.43	50.05	---	74.00	54.00	-3.95	Peak
4825.00	H	43.53	---	6.51	50.04	---	74.00	54.00	-3.96	Peak
5000.00	H	45.79	40.52	6.43	52.22	46.95	74.00	54.00	-7.05	AVG
7000.00	H	40.94	34.93	11.81	52.75	46.74	74.00	54.00	-7.26	AVG

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:** 2009/12/21

Temperature: 16°C **Tested by:** Alonso Lu

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
1080.00	V	57.98	---	-6.88	51.10	---	74.00	54.00	-2.90	Peak
1833.33	V	52.71	---	-0.96	51.75	---	74.00	54.00	-2.25	Peak
2250.00	V	50.44	---	0.62	51.06	---	74.00	54.00	-2.94	Peak
4866.67	V	43.02	---	7.17	50.20	---	74.00	54.00	-3.80	Peak
5000.00	V	45.51	---	6.43	51.94	---	74.00	54.00	-2.06	Peak
7000.00	V	42.10	34.86	11.81	53.91	46.67	74.00	54.00	-7.33	AVG
1080.00	H	54.57	---	-7.41	47.16	---	74.00	54.00	-6.84	Peak
2146.67	H	49.87	---	-1.85	48.02	---	74.00	54.00	-5.98	Peak
4275.00	H	41.00	---	9.14	50.14	---	74.00	54.00	-3.86	Peak
4875.00	H	43.17	---	7.74	50.92	---	74.00	54.00	-3.08	Peak
5000.00	H	41.99	---	9.47	51.46	---	74.00	54.00	-2.54	Peak

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:** 2009/12/21

Temperature: 16°C **Tested by:** Alonso Lu

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
1080.00	V	59.05	39.10	-6.88	52.17	32.22	74.00	54.00	-21.78	AVG
1100.00	V	58.63	---	-6.97	51.66	---	74.00	54.00	-2.34	Peak
1833.33	V	52.13	---	-0.96	51.18	---	74.00	54.00	-2.82	Peak
2200.00	V	51.70	38.42	0.80	52.50	39.22	74.00	54.00	-14.78	AVG
2246.67	V	50.96	---	0.63	51.59	---	74.00	54.00	-2.41	Peak
4925.00	V	47.89	36.81	7.38	55.28	44.19	74.00	54.00	-9.81	AVG
5000.00	V	45.77	40.58	6.43	52.20	47.01	74.00	54.00	-6.99	AVG
7000.00	V	42.24	35.11	11.81	54.05	46.92	74.00	54.00	-7.08	AVG
1713.33	H	51.29	---	-3.78	47.51	---	74.00	54.00	-6.49	Peak
1833.33	H	51.27	---	-4.58	46.69	---	74.00	54.00	-7.31	Peak
4925.00	H	47.59	34.15	8.18	55.77	42.33	74.00	54.00	-11.67	AVG

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:** 2009/12/21

Temperature: 16°C **Tested by:** Alonso Lu

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
1043.33	V	53.75	---	-6.71	47.04	---	74.00	54.00	-6.96	Peak
1080.00	V	57.80	---	-6.88	50.92	---	74.00	54.00	-3.08	Peak
1833.33	V	51.97	---	-0.96	51.02	---	74.00	54.00	-2.98	Peak
2200.00	V	50.60	---	0.80	51.40	---	74.00	54.00	-2.60	Peak
2246.67	V	49.41	---	0.63	50.04	---	74.00	54.00	-3.96	Peak
4816.67	V	45.88	34.58	6.38	52.26	40.96	74.00	54.00	-13.04	AVG
5000.00	V	46.75	40.51	6.43	53.18	46.94	74.00	54.00	-7.06	AVG
1000.00	H	52.71	---	-7.97	44.74	---	74.00	54.00	-9.26	Peak
1080.00	H	52.03	---	-7.41	44.62	---	74.00	54.00	-9.38	Peak
1833.33	H	48.70	---	-4.58	44.12	---	74.00	54.00	-9.88	Peak
2243.33	H	47.92	---	-1.82	46.10	---	74.00	54.00	-7.90	Peak
5933.33	H	40.38	---	10.28	50.66	---	74.00	54.00	-3.34	Peak

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:** 2009/12/21

Temperature: 16°C **Tested by:** Alonso Lu

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
1040.00	V	54.15	---	-6.70	47.45	---	74.00	54.00	-6.55	Peak
1080.00	V	58.31	---	-6.88	51.43	---	74.00	54.00	-2.57	Peak
1833.33	V	52.20	---	-0.96	51.24	---	74.00	54.00	-2.76	Peak
2200.00	V	49.93	---	0.80	50.73	---	74.00	54.00	-3.27	Peak
2246.67	V	49.58	---	0.63	50.20	---	74.00	54.00	-3.80	Peak
4883.33	V	44.65	33.64	7.44	52.09	41.08	74.00	54.00	-12.92	AVG
5000.00	V	45.34	---	6.43	51.77	---	74.00	54.00	-2.23	Peak
7000.00	V	41.13	34.59	11.81	52.94	46.40	74.00	54.00	-7.60	AVG
1080.00	H	52.52	---	-7.41	45.11	---	74.00	54.00	-8.89	Peak
1523.33	H	49.00	---	-6.12	42.87	---	74.00	54.00	-11.13	Peak
1833.33	H	48.18	---	-4.58	43.60	---	74.00	54.00	-10.40	Peak
2563.33	H	47.65	---	-0.41	47.24	---	74.00	54.00	-6.76	Peak
4266.67	H	40.62	---	9.07	49.70	---	74.00	54.00	-4.30	Peak
4883.33	H	42.06	---	7.75	49.81	---	74.00	54.00	-4.19	Peak

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:** 2009/12/21

Temperature: 16°C **Tested by:** Alonso Lu

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
1043.33	V	55.81	---	-6.71	49.10	---	74.00	54.00	-4.90	Peak
1080.00	V	58.56	---	-6.88	51.68	---	74.00	54.00	-2.32	Peak
1833.33	V	51.86	---	-0.96	50.90	---	74.00	54.00	-3.10	Peak
2200.00	V	50.01	---	0.80	50.81	---	74.00	54.00	-3.19	Peak
2243.33	V	49.46	---	0.64	50.10	---	74.00	54.00	-3.90	Peak
2930.00	V	46.80	---	0.90	47.70	---	74.00	54.00	-6.30	Peak
4916.67	V	47.69	35.80	7.49	55.18	43.29	74.00	54.00	-10.71	AVG
5000.00	V	45.44	---	6.43	51.87	---	74.00	54.00	-2.13	Peak
7000.00	V	42.66	35.02	11.81	54.47	46.83	74.00	54.00	-7.17	AVG
1080.00	H	51.88	---	-7.41	44.47	---	74.00	54.00	-9.53	Peak
1100.00	H	52.84	---	-7.27	45.57	---	74.00	54.00	-8.43	Peak
1833.33	H	48.78	---	-4.58	44.20	---	74.00	54.00	-9.80	Peak
2683.33	H	46.55	---	-0.38	46.17	---	74.00	54.00	-7.83	Peak
3933.33	H	41.61	---	7.78	49.39	---	74.00	54.00	-4.61	Peak
4925.00	H	45.68	34.51	8.18	53.86	42.69	74.00	54.00	-11.31	AVG
5000.00	H	41.68	---	9.47	51.15	---	74.00	54.00	-2.85	Peak

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:**	2009/12/21
Temperature:	16°C	**Tested by:**	Alonso Lu
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
1043.33	V	54.51	---	-6.71	47.79	---	74.00	54.00	-6.21	Peak
1080.00	V	57.86	---	-6.88	50.98	---	74.00	54.00	-3.02	Peak
1833.33	V	51.69	---	-0.96	50.73	---	74.00	54.00	-3.27	Peak
2200.00	V	50.35	---	0.80	51.15	---	74.00	54.00	-2.85	Peak
2240.00	V	49.72	---	0.65	50.38	---	74.00	54.00	-3.62	Peak
4850.00	V	42.33	---	6.91	49.24	---	74.00	54.00	-4.76	Peak
5000.00	V	46.55	40.55	6.43	52.98	46.98	74.00	54.00	-7.02	AVG
7000.00	V	41.64	34.69	11.81	53.45	46.50	74.00	54.00	-7.50	AVG
1000.00	H	54.97	---	-7.97	47.00	---	74.00	54.00	-7.00	Peak
1043.33	H	51.98	---	-7.67	44.32	---	74.00	54.00	-9.68	Peak
1250.00	H	49.82	---	-7.91	41.91	---	74.00	54.00	-12.09	Peak
1833.33	H	48.80	---	-4.58	44.23	---	74.00	54.00	-9.77	Peak
2250.00	H	47.23	---	-1.76	45.47	---	74.00	54.00	-8.53	Peak
4283.33	H	40.66	---	9.21	49.86	---	74.00	54.00	-4.14	Peak
5425.00	H	39.78	---	10.72	50.49	---	74.00	54.00	-3.51	Peak

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:** 2009/12/21

Temperature: 16°C **Tested by:** Alonso Lu

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
1080.00	V	58.24	---	-6.88	51.36	---	74.00	54.00	-2.64	Peak
1833.33	V	51.34	---	-0.96	50.38	---	74.00	54.00	-3.62	Peak
2200.00	V	49.75	---	0.80	50.55	---	74.00	54.00	-3.45	Peak
2246.67	V	49.48	---	0.63	50.11	---	74.00	54.00	-3.89	Peak
4400.00	V	42.81	---	3.88	46.69	---	74.00	54.00	-7.31	Peak
4891.67	V	42.29	---	7.57	49.86	---	74.00	54.00	-4.14	Peak
5000.00	V	44.89	---	6.43	51.32	---	74.00	54.00	-2.68	Peak
7000.00	V	41.80	34.67	11.81	53.61	46.48	74.00	54.00	-7.52	AVG
1080.00	H	51.78	---	-7.41	44.37	---	74.00	54.00	-9.63	Peak
1100.00	H	53.67	---	-7.27	46.40	---	74.00	54.00	-7.60	Peak
2100.00	H	46.81	---	-1.55	45.26	---	74.00	54.00	-8.74	Peak
5000.00	H	41.91	---	9.47	51.38	---	74.00	54.00	-2.62	Peak
5600.00	H	39.73	---	10.00	49.73	---	74.00	54.00	-4.27	Peak
11600.00	H	39.08	---	10.63	49.71	---	74.00	54.00	-4.29	Peak

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:** 2009/12/21

Temperature: 16°C **Tested by:** Alonso Lu

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
1043.33	V	56.14	---	-6.71	49.43	---	74.00	54.00	-4.57	Peak
1080.00	V	58.68	---	-6.88	51.80	---	74.00	54.00	-2.20	Peak
1100.00	V	56.85	---	-6.97	49.88	---	74.00	54.00	-4.12	Peak
1833.33	V	52.04	---	-0.96	51.08	---	74.00	54.00	-2.92	Peak
2200.00	V	50.32	---	0.80	51.12	---	74.00	54.00	-2.88	Peak
2250.00	V	48.95	---	0.62	49.56	---	74.00	54.00	-4.44	Peak
4900.00	V	43.58	---	7.70	51.28	---	74.00	54.00	-2.72	Peak
5000.00	V	46.10	40.57	6.43	52.53	47.00	74.00	54.00	-7.00	AVG
7000.00	V	42.41	34.98	11.81	54.22	46.79	74.00	54.00	-7.21	AVG
1000.00	H	55.66	---	-7.97	47.69	---	74.00	54.00	-6.31	Peak
1046.67	H	53.78	---	-7.64	46.14	---	74.00	54.00	-7.86	Peak
2243.33	H	47.80	---	-1.82	45.98	---	74.00	54.00	-8.02	Peak
2623.33	H	46.27	---	0.06	46.33	---	74.00	54.00	-7.67	Peak
4616.67	H	39.93	---	9.41	49.34	---	74.00	54.00	-4.66	Peak
6925.00	H	39.90	---	9.56	49.45	---	74.00	54.00	-4.55	Peak

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).*

7.8. 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:	Normal Link	**Test Date:**	2009/11/24
Temperature:	25°C	**Tested by:**	Han Chaic
Humidity:	57% RH		

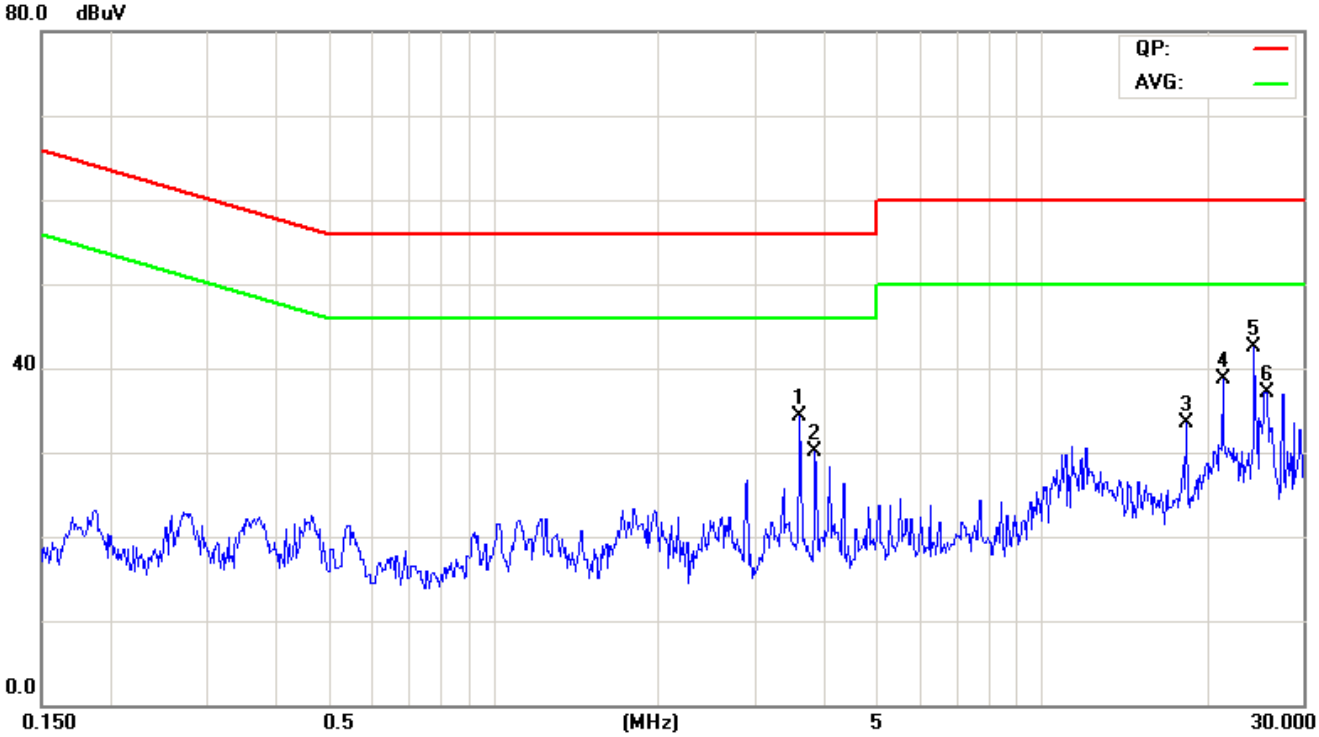
Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB)	QP Result (dBuV)	AV Result (dBuV)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
3.6118	23.34	22.40	9.76	33.10	32.16	56.00	46.00	-22.90	-13.84	L1
3.8526	19.06	18.17	9.76	28.82	27.93	56.00	46.00	-27.18	-18.07	L1
18.2731	20.95	20.17	10.40	31.35	30.57	60.00	50.00	-28.65	-19.43	L1
21.3173	26.31	26.00	10.49	36.80	36.49	60.00	50.00	-23.20	-13.51	L1
24.3612	31.54	30.62	10.63	42.17	41.25	60.00	50.00	-17.83	-8.75	L1
25.6146	22.53	18.15	10.66	33.19	28.81	60.00	50.00	-26.81	-21.19	L1
2.8883	16.34	15.26	9.74	26.08	25.00	56.00	46.00	-29.92	-21.00	L2
3.6112	23.47	22.50	9.75	33.22	32.25	56.00	46.00	-22.78	-13.75	L2
3.8517	19.14	18.15	9.75	28.89	27.90	56.00	46.00	-27.11	-18.10	L2
21.3169	26.44	26.14	10.62	37.06	36.76	60.00	50.00	-22.94	-13.24	L2
24.3608	31.39	30.50	10.77	42.16	41.27	60.00	50.00	-17.84	-8.73	L2
27.4049	24.97	23.84	10.82	35.79	34.66	60.00	50.00	-24.21	-15.34	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)