FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

Wireless-N ADSL2+ Gateway

Model: WAG160N

Trade Name: Linksys

Issued to

Cisco-Linksys LLC
121 Theory Drive
Irvine, CA 92617

Issued by

Compliance Certification Services Inc.
No. 81-1, Lane 210, Bade Rd. 2, Luchu Hsiang,
Taoyuan Hsien, (338) Taiwan, R.O.C.
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ACCREDITED
TESTING CERT #0824.01

TAF
Testing Laboratory
0363

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1. TEST RESULT CERTIFICATION

Applicant:	Cisco-Linksys LLC 121 Theory Drive Irvine, CA 92617
Equipment Under Test:	Wireless-N ADSL2+ Gateway
Trade Name:	Linksys
Model Number:	WAG160N
Date of Test:	November 27 ~ December 25, 2007

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:

Rex Lai
Section Manager
Compliance Certification Services Inc.

Reviewed by:

Amanda Wu
Section Manager
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	Wireless-N ADSL2+ Gateway
Trade Name	Linksys
Model Number	WAG160N
Model Discrepancy	All the above models are identical except the model designation and the difference of color for its external appearance. Please refer to the external photos for reference.
Power Adapter	1. LEADER / Model: MU12-2120100-A1 I/P: 100-240V, 50-60Hz, 0.5A O/P: 12V, 1.0A 2. SINO-AMERICAN / Mode: SA110C-12S-I I/P: 100-240V, 50-60Hz, 0.3A O/P: 12V, 1A, 12W 3. LEADER / Model: MT12-4120100-A1 I/P: 120V, 60Hz, 0.3A O/P: 12V, 1A 4. OEM / Model: AD12V/1A-SW I/P: 100-240V, 0.5A, 50-60Hz O/P: +12V, 1.0A MAX 5. EnerTronix / Model: LS120V10AE I/P: 100V-240V, 0.5A, 50-60Hz O/P: 12V, 1.0A MAX
Frequency Range	2412 ~ 2462 MHz
Transmit Power	IEEE 802.11b mode: 23.90 dBm IEEE 802.11g mode: 22.80 dBm draft 802.11n Standard-20 MHz Channel mode: 22.39 dBm draft 802.11n Wide-40 MHz Channel mode: 18.97 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 Standard-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 Wide-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 Standard-20 MHz Channel mode: 11 Channels draft 802.11n Wide-40 MHz Channel mode: 7 Channels
Antenna Specification	PIFA Antenna: Left: Wha Yu 2.9 dBi, GALTRONICS 2.1 dBi Right: Wha Yu 2.9 dBi, GALTRONICS 2.1 dBi Antenna Calculation for CDD Mode: Wha Yu: 2.9dBi + 10 log (2) = 5.91 dBi (Numeric gain: 3.89) GALTRONICS: 2.1dBi + 10 log (2) = 5.11 dBi (Numeric gain: 3.24)

Remark:

1. *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*
2. *This submittal(s) (test report) is intended for FCC ID: **Q87-WAG160N** 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 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 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 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.

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: WAG160N) comes with four types of power adapter (MU12-2120100-A1 / SA110C-12GS-I / MT12-4120100-A1 / AD12V/1A-SW / LS120V10AE) for sale. After the preliminary test, the power adapter LS120V10AE was found to emit the worst emissions and therefore had been tested under operating condition.

The EUT (model: WAG160N) comes with two different antennas (Wha Yu & GALTRONICS) for sale. After the preliminary test, the antenna with trade name Wha Yu was found to eliminate the worst emissions and therefore had been tested under operating condition.

The EUT is a 2x2 configuration spatial MIMO (2Tx & 2Rx) without beam forming function but with cyclic delay diversity function that operate in double TX chains and double RX chains. The 2x2 configuration is implemented with two outside TX & RX chains (Chain 0 and 1).

Software used to control the EUT for staying in continuous transmitting mode was programmed.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, 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 Standard-20 MHz Channel mode:
Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6.5Mbps data rate were chosen for full testing.

draft 802.11n Wide-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	MY43360131	01/30/2008

3M Semi Anechoic Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	US42510252	09/11/2008
Test Receiver	Rohde&Schwarz	ESCI	100064	11/13/2008
Switch Controller	TRC	Switch Controller	SC94050010	05/04/2008
4 Port Switch	TRC	4 Port Switch	SC94050020	05/04/2008
Horn Antenna	EMCO	3115	9903-5761	01/12/2008
Bilog- Antenna	Sunol Sciences	JB3	A030205	03/29/2008
Turn Table	Max-Full	MFT-120S	T120S940302	N.C.R.
Antenna Tower	Max-Full	MFA-430	A440940302	N.C.R.
Controller	Max-Full	MF-CM886	CC-C-1F-13	N.C.R.
Site NSA	CCS	N/A	FCC: 965860 IC: IC 6106	09/25/2008
Test S/W	LABVIEW (V 6.1)			

Remark: *The measurement uncertainty is less than +/-2.0065dB (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 9kHz-30MHz	ROHDE & SCHWARZ	ESHS30	828144/003	10/31/2008
TWO-LINE V-NETWORK 9kHz-30MHz	SCHAFFNER	NNB41	03/10013	06/12/2008
LISN 10kHz-100MHz	EMCO	3825/2	9106-1809	03/19/2008
Test S/W	LABVIEW (V 6.1)			

Remark: *The measurement uncertainty is less than +/- 2.81dB, which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.*

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

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, Bade 2nd Rd., Luchu Hsiang, Taoyuan Hsien 338, Taiwan
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 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	EN 55011, EN 55014-1/2, CISPR 11, CISPR 14-1/2, EN 55022, EN 55015, CISPR 22, CISPR 15, AS/NZS 3548, VCCI V3 (2001), CFR 47, FCC Part 15/18, CNS 13783-1, CNS 13439, CNS 13438, CNS 13803, CNS 14115, EN 55024, IEC 801-2, IEC 801-3, IEC 801-4, IEC/EN 61000-3-2, IEC/EN 61000-3-3, IEC/EN 61000-4-2/3/4/5/6/8/11, EN 50081-1/ EN 61000-6-3, EN 50081-2/EN 61000-6-4, EN 50081-2/EN 61000-6-1: 2001	ACCREDITED TESTING CERT #0824.01
USA	FCC	3/10 meter Open Area Test Sites (93105, 90471) / 3M Semi Anechoic Chamber (965860) to perform FCC Part 15/18 measurements	93105, 90471 965860
Japan	VCCI	3/10 meter Open Area Test Sites to perform conducted/radiated measurements	R-393/1066/725/879 C-402/747/912
Norway	NEMKO	EN 50081-1/2, EN 50082-1/2, IEC 61000-6-1/2, EN 50091-2, EN 50130-4, EN 55011, EN 55013, EN 55014-1/2, EN 55015, EN 55022, EN 55024, EN 61000-3-2/3, EN 61326-1, IEC 61000-4-2/3/4/5/6/8/11, EN 60601-1-2, EN 300 328, EN 300 422-2, EN 301 419-1, EN 301 489-01/03/07/08/09/17, EN 301 419-2/3, EN 300 454-2, EN 301 357-2	ELA 124a ELA 124b ELA 124c
Taiwan	TAF	EN 300 328, EN 300 220-1, EN 300 220-2, EN 300 220-3, 47 CFR FCC Part 15 Subpart C, EN 61000-3-2, EN 61000-3-3, CNS 13439, CNS 13783-1, CNS 14115, CNS 13438, AS/NZS CISPR 22, CNS 13022-1, IEC 61000-4-2/3/4/5/6/8/11, CNS 13022-2/3	Testing Laboratory 0363
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	SL2-IS-E-0014 SL2-IN-E-0014 SL2-A1-E-0014 SL2-R1-E-0014 SL2-R2-E-0014 SL2-L1-E-0014
Canada	Industry Canada	3/10 meter Open Area Test Sites (IC 2324C-3, IC 2324C-5) / 3M Semi Anechoic Chamber (IC 6106)	IC 2324C-3 IC 2324C-5 IC 6106

** No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

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

6.2 SUPPORT EQUIPMENT

No	Equipment	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1.	Notebook PC (Remote)	IBM	2672 (X31)	99KPZYN	WLAN: ANO20030400LEG Bluetooth: ANO20020100MTN	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core

Remark:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

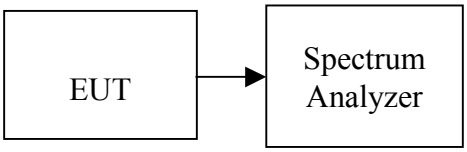
7. FCC PART 15.247 REQUIREMENTS

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 6dB 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 = 100 kHz, VBW = RBW, Span = 50 MHz, 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 / Chain 0

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Low	2412	9920	>500	PASS
Mid	2437	10080		PASS
High	2462	10170		PASS

Test mode: IEEE 802.11b mode / Chain 1

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Low	2412	10830	>500	PASS
Mid	2437	10080		PASS
High	2462	9830		PASS

Test mode: IEEE 802.11g mode / Chain 0

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Low	2412	16580	>500	PASS
Mid	2437	16330		PASS
High	2462	16500		PASS

Test mode: IEEE 802.11g mode / Chain 1

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Low	2412	16420	>500	PASS
Mid	2437	16420		PASS
High	2462	16500		PASS

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 0

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Low	2412	17500	>500	PASS
Mid	2437	17670		PASS
High	2462	17750		PASS

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 1

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Low	2412	17750	>500	PASS
Mid	2437	17750		PASS
High	2462	17750		PASS

Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 0

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Low	2422	36420	>500	PASS
Mid	2437	36420		PASS
High	2452	36420		PASS

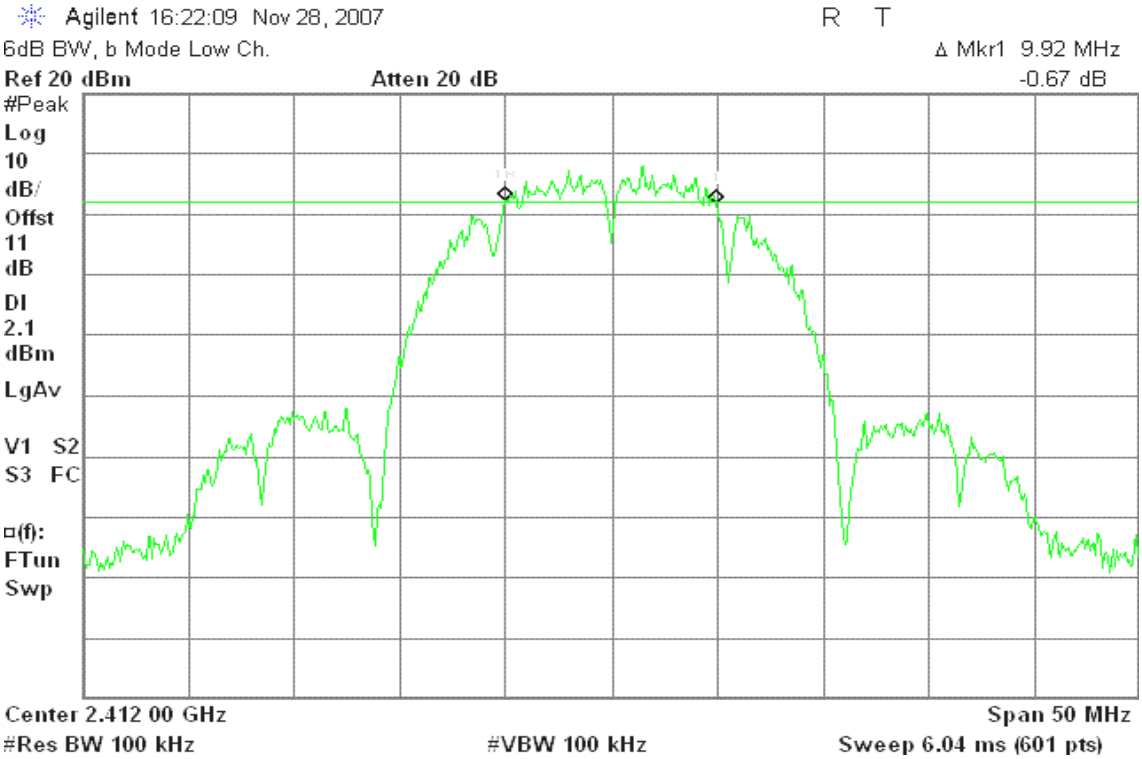
Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 1

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Low	2422	36080	>500	PASS
Mid	2437	36250		PASS
High	2452	36420		PASS

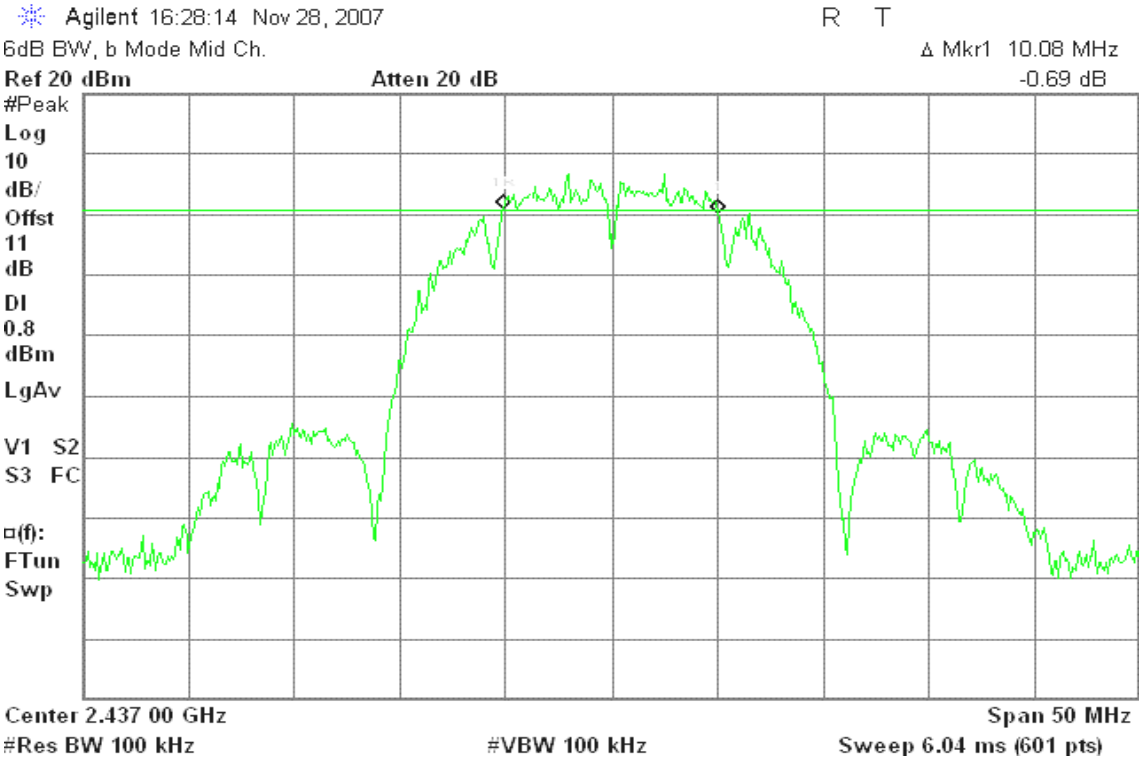
Test Plot

IEEE 802.11b mode / Chain 0

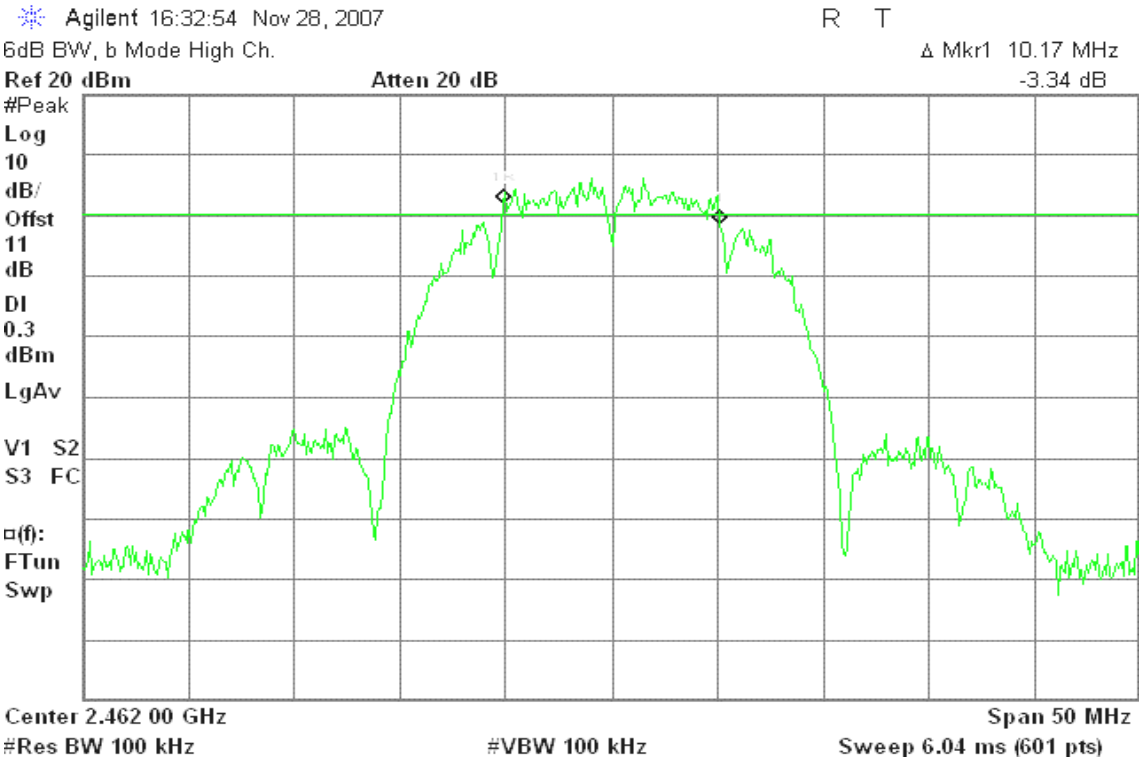
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

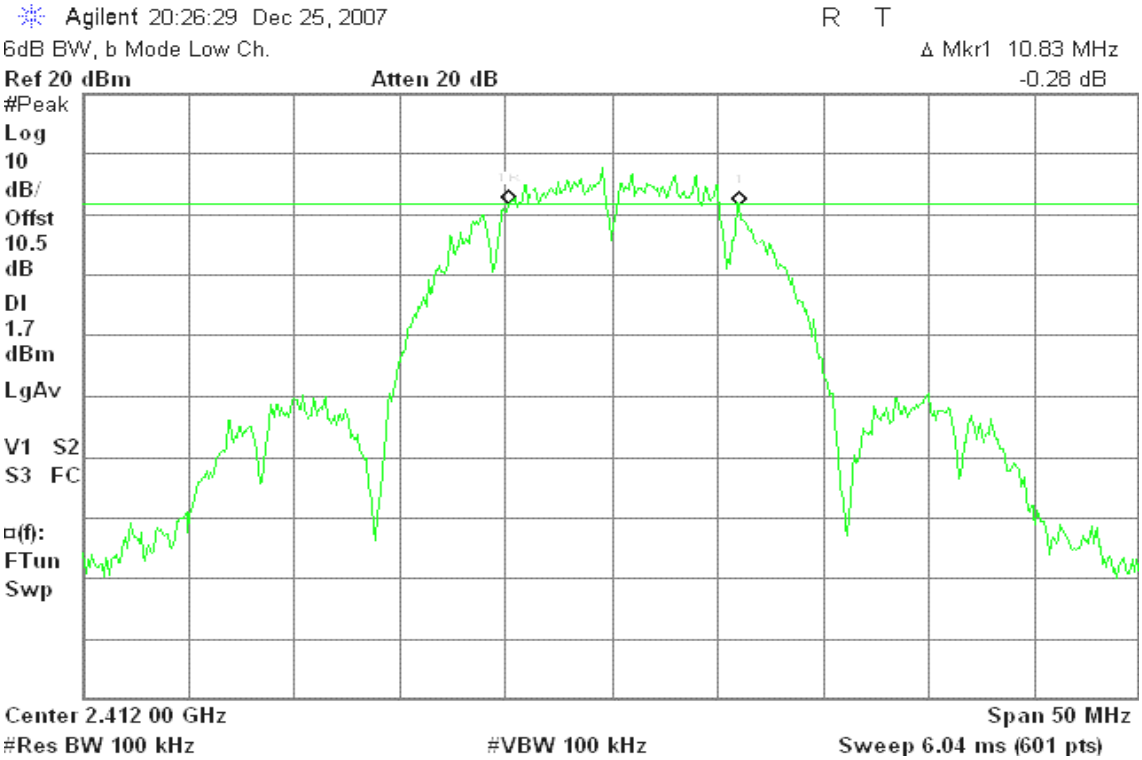


6dB Bandwidth (CH High)

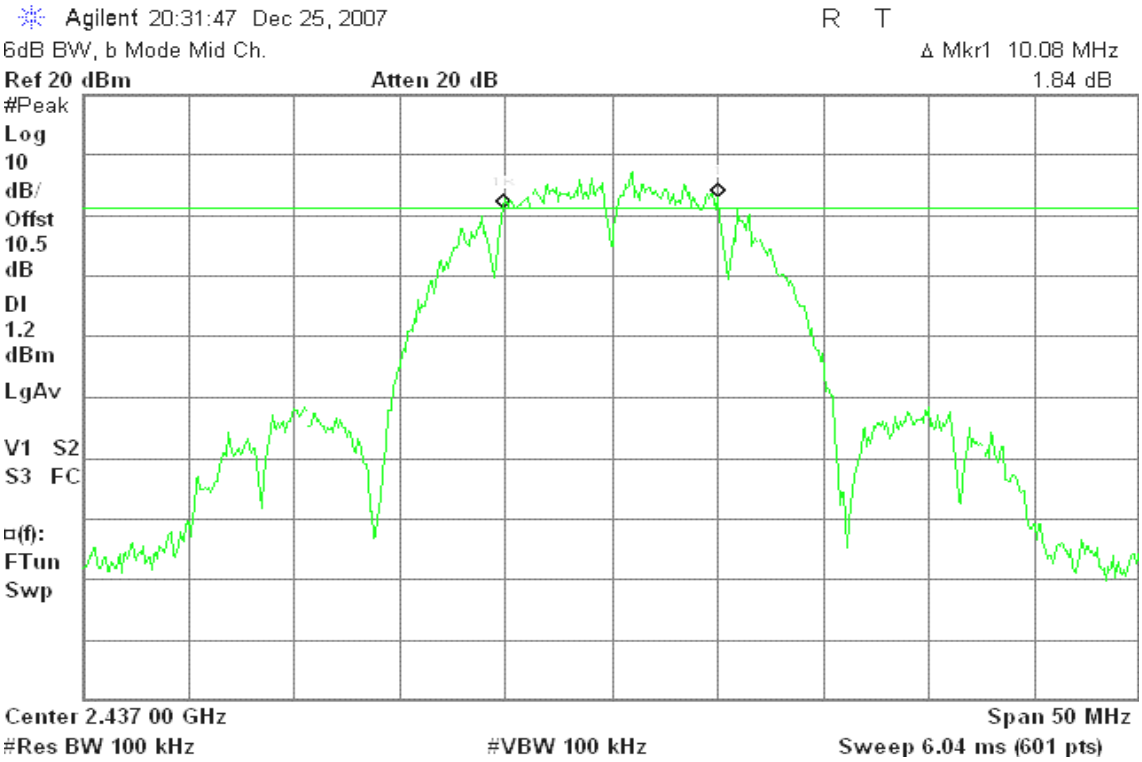


IEEE 802.11b mode / Chain 1

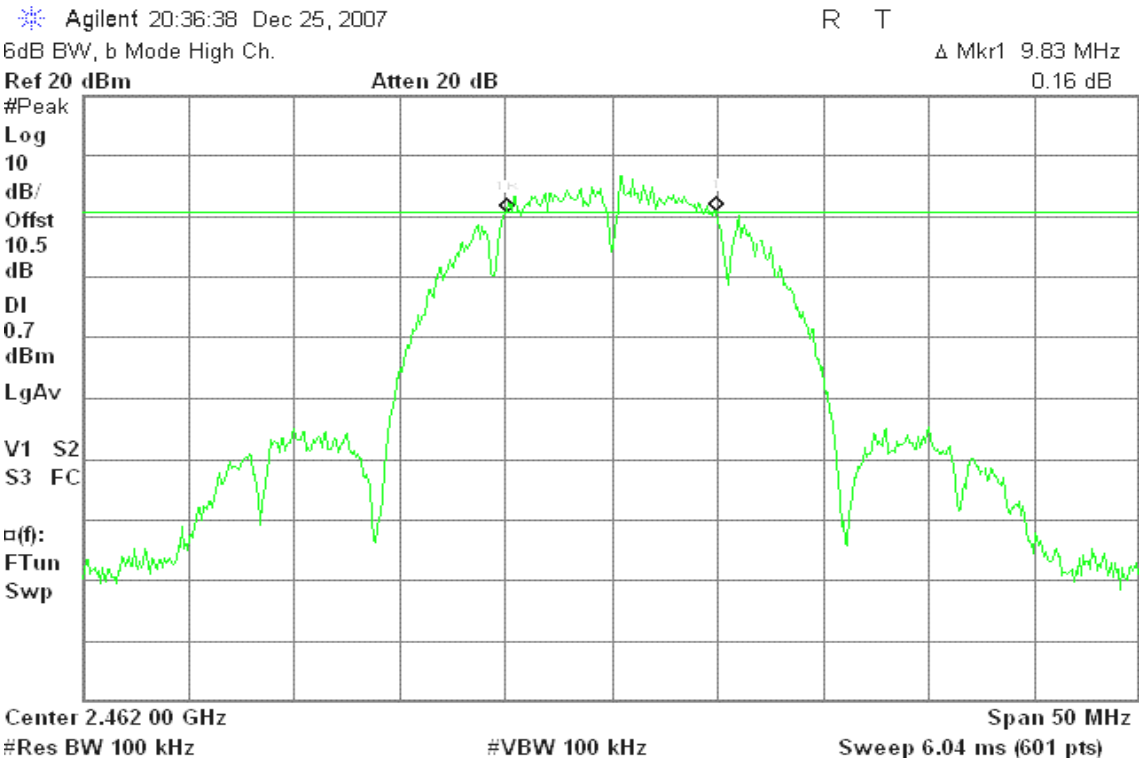
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

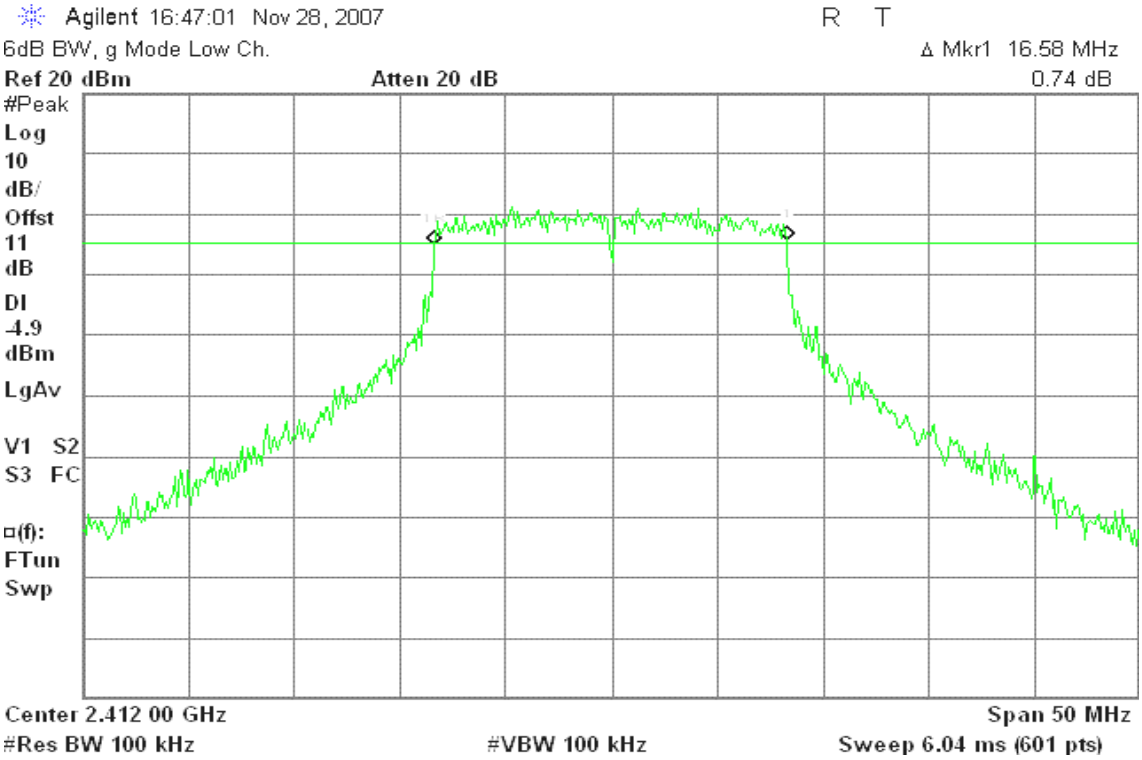


6dB Bandwidth (CH High)

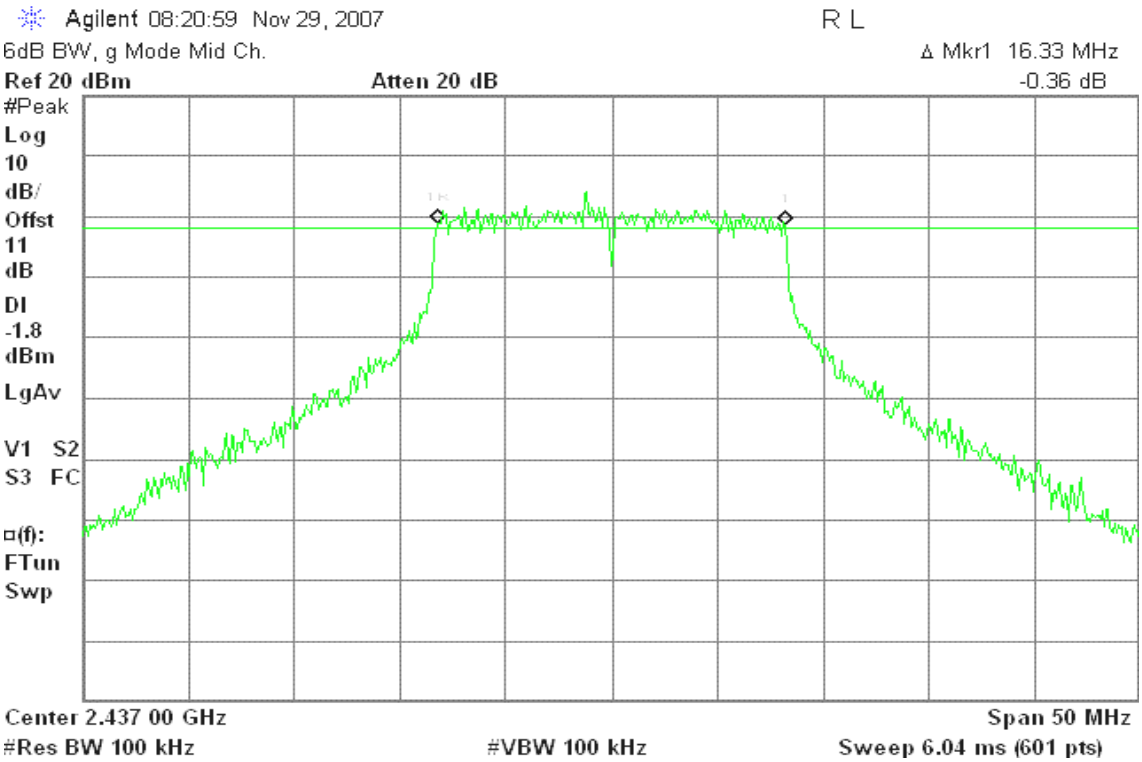


IEEE 802.11g mode / Chain 0

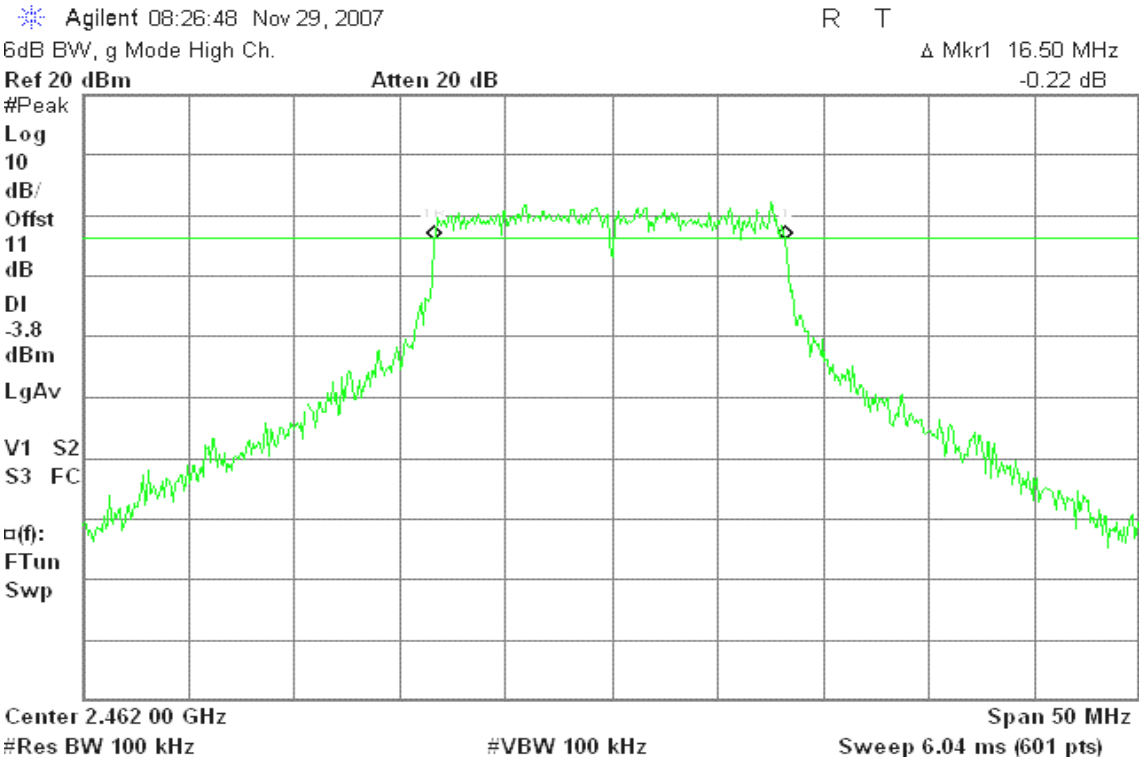
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

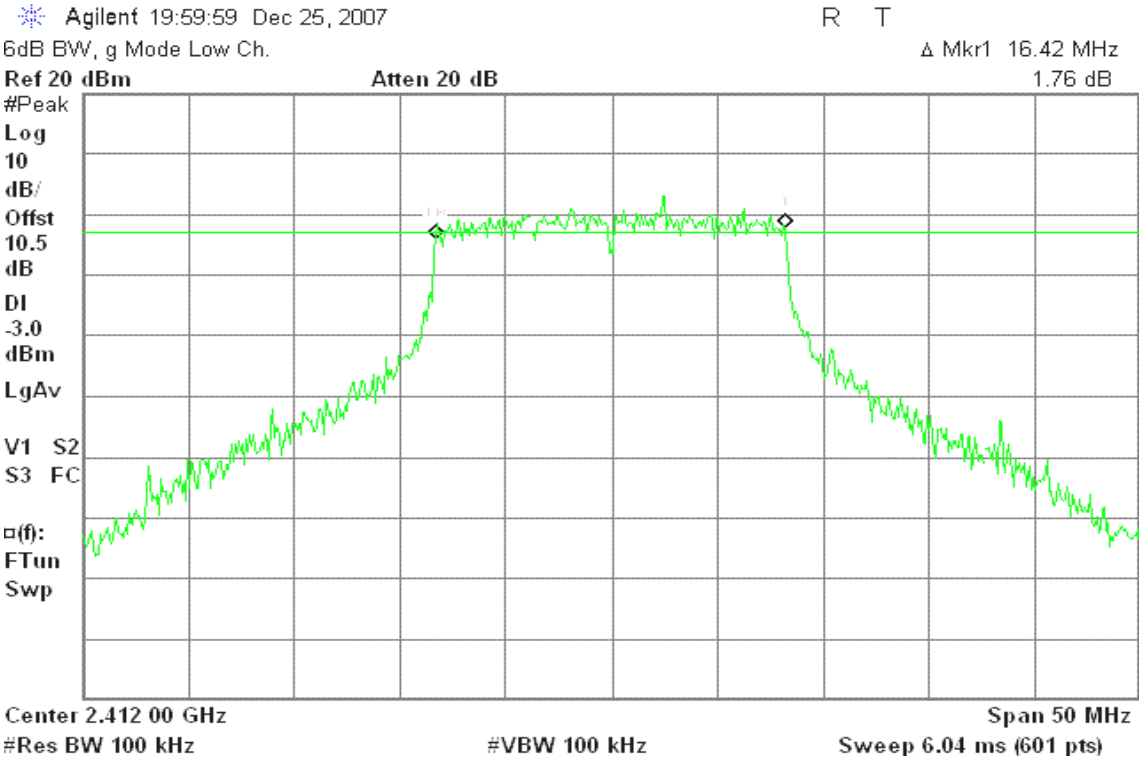


6dB Bandwidth (CH High)

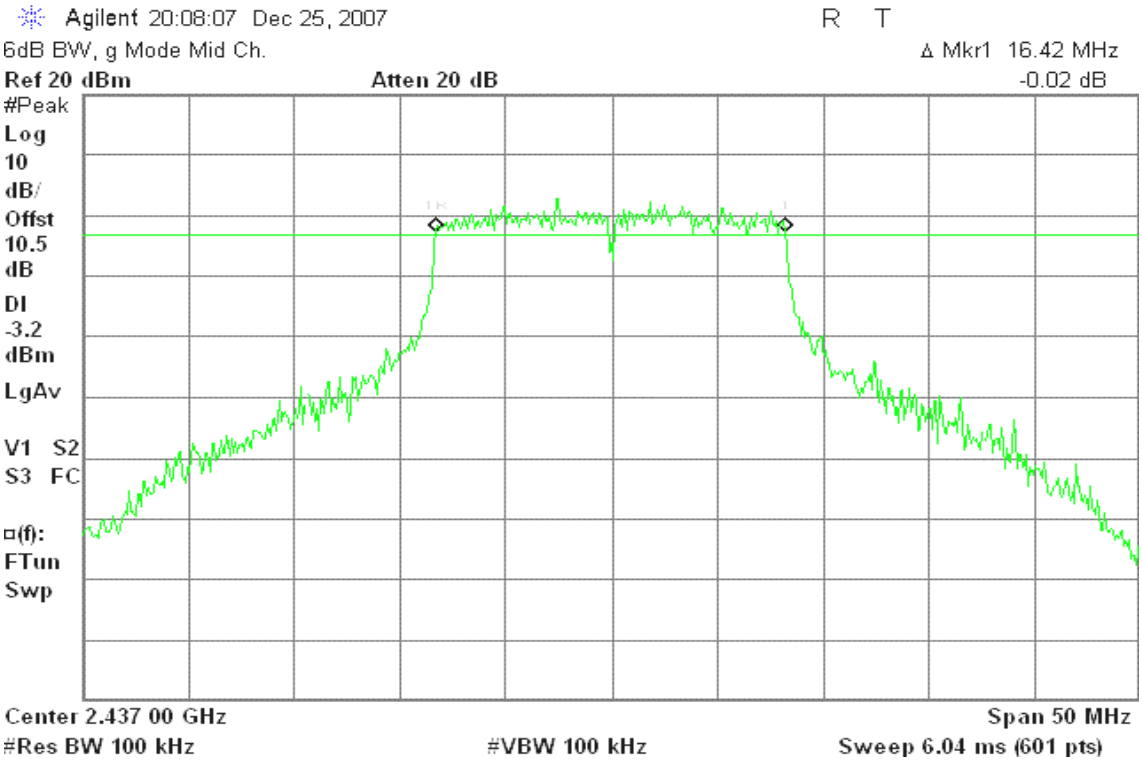


IEEE 802.11g mode / Chain 1

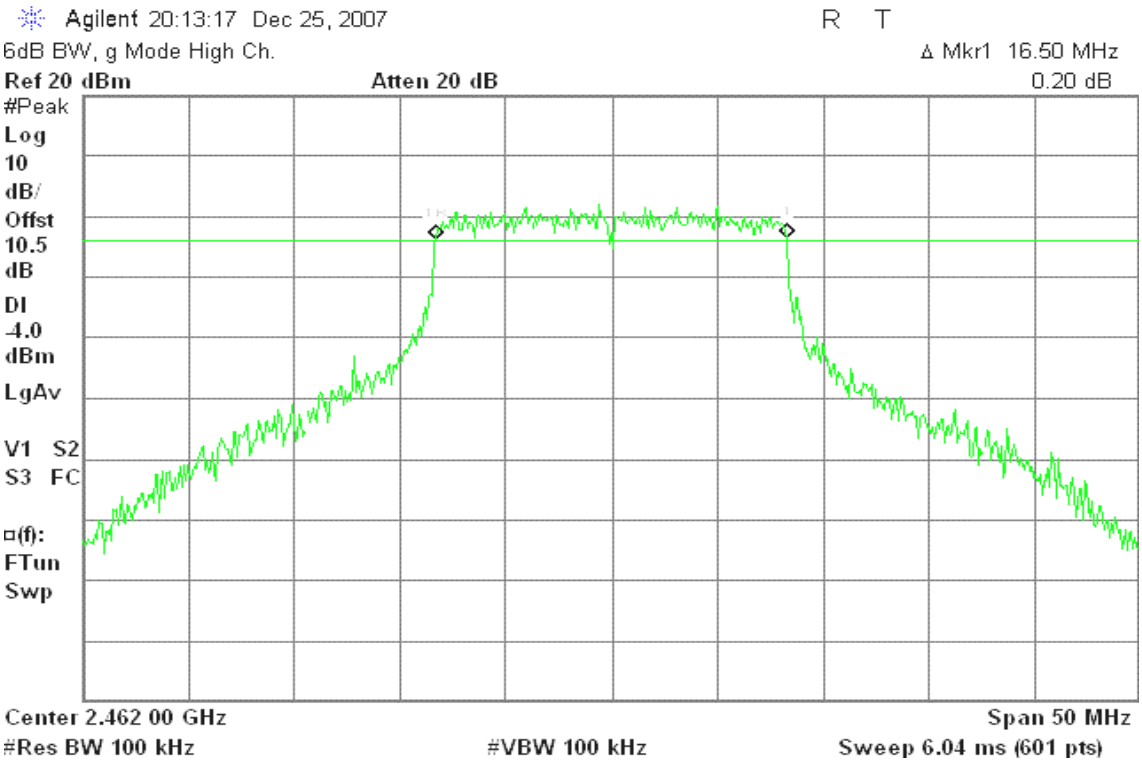
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

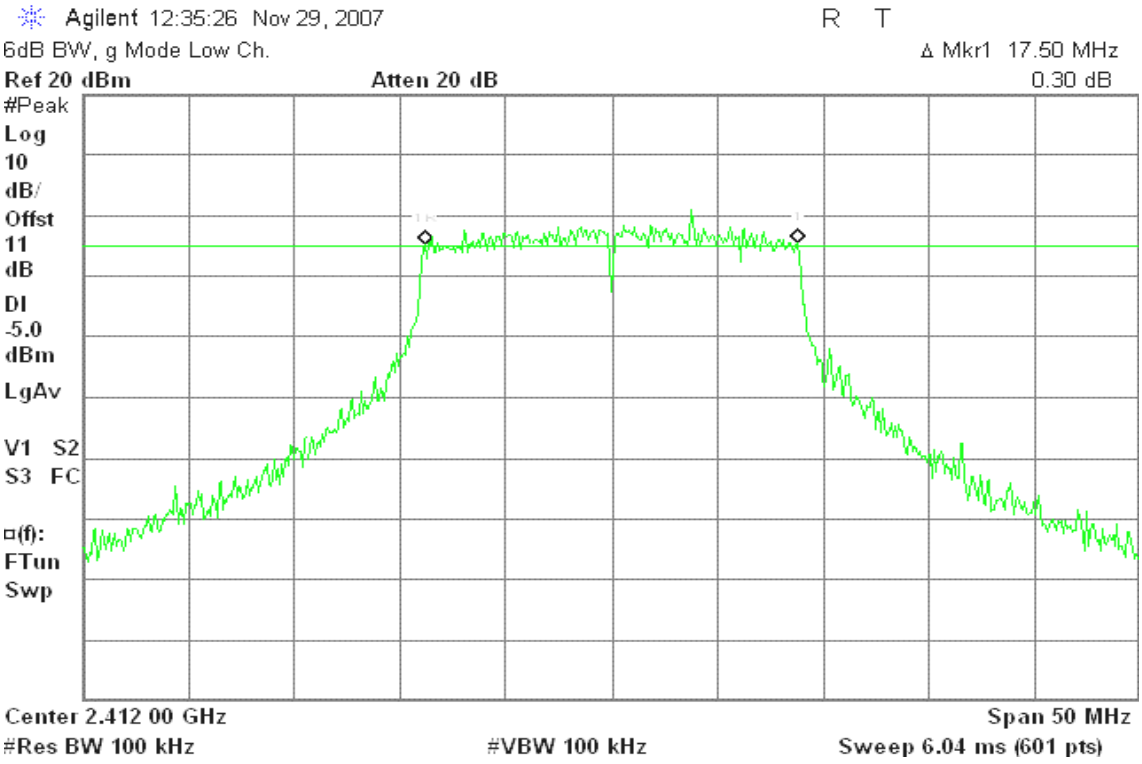


6dB Bandwidth (CH High)

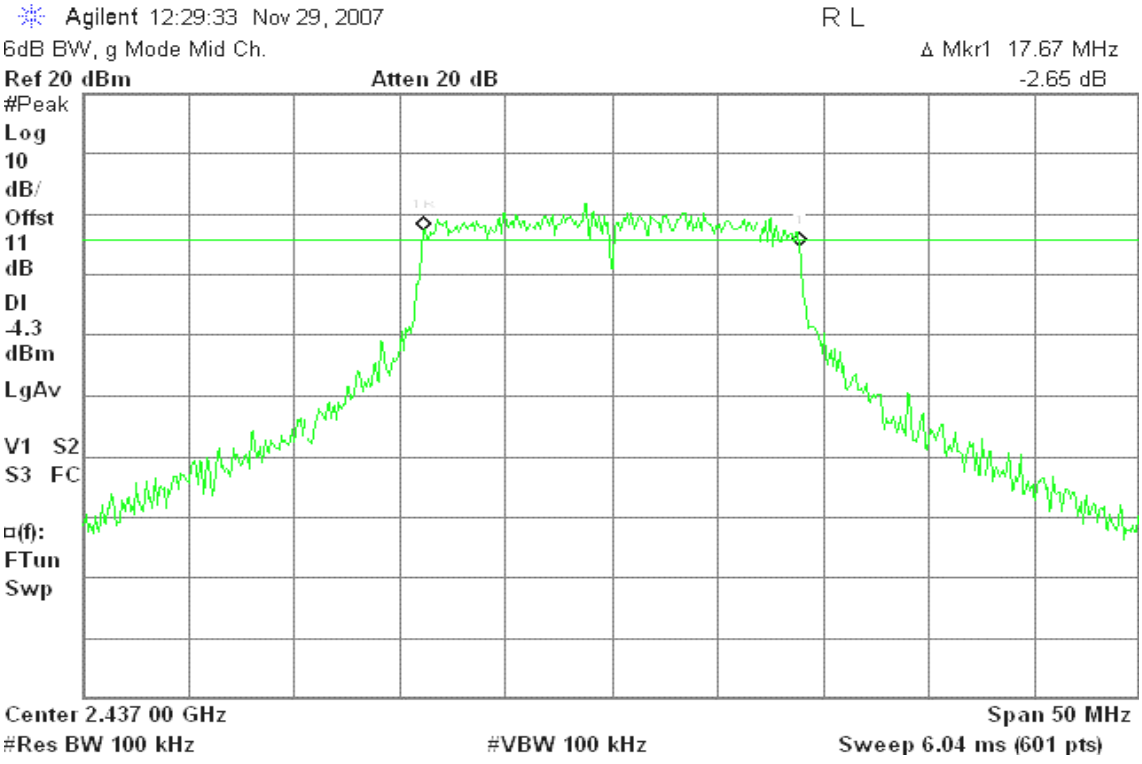


draft 802.11n Standard-20 MHz Channel mode / Chain 0

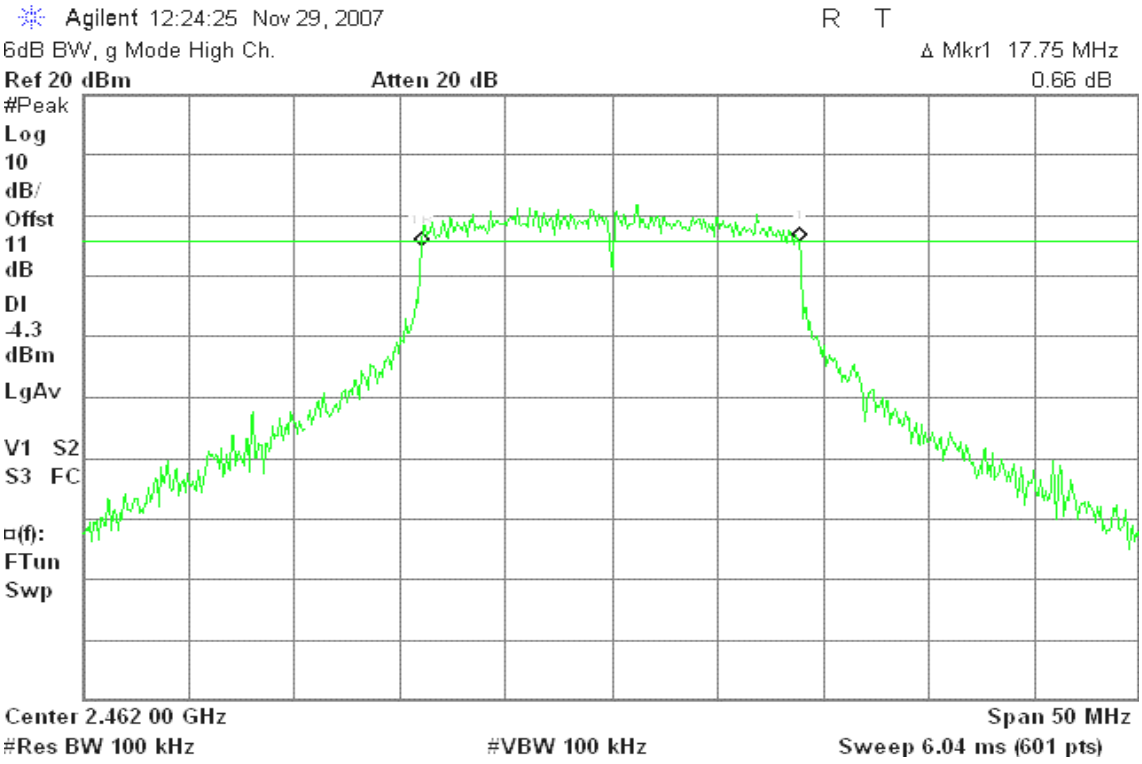
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

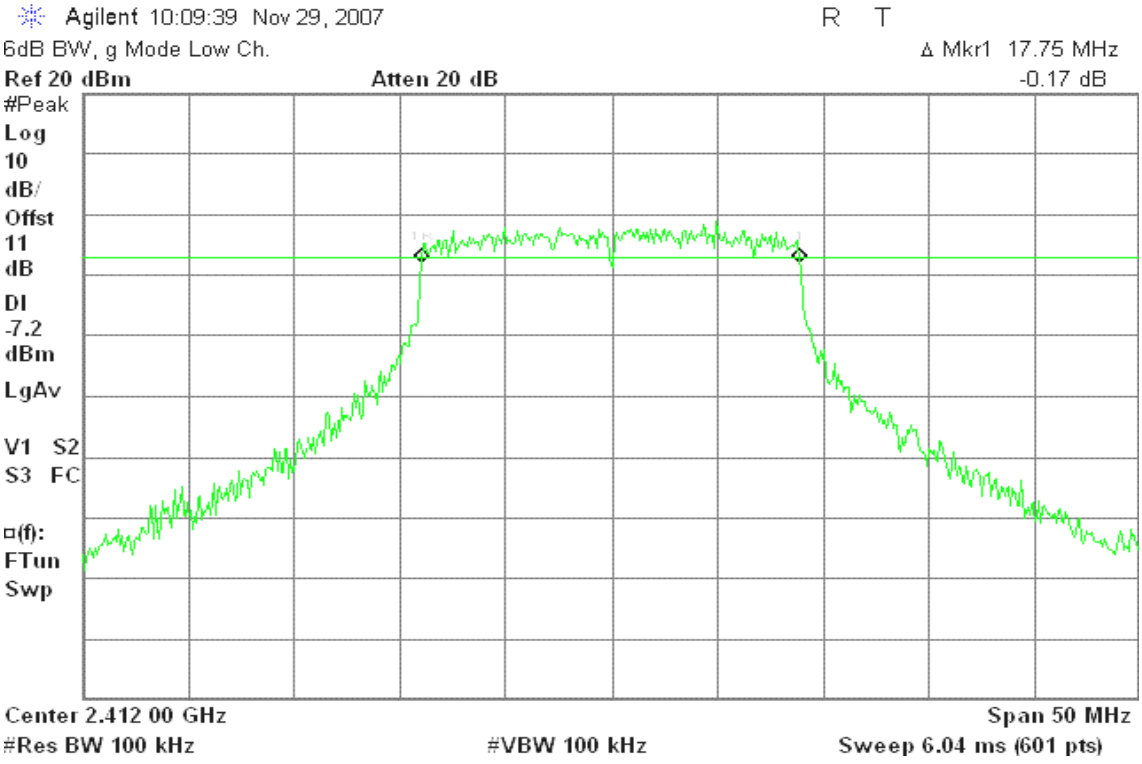


6dB Bandwidth (CH High)

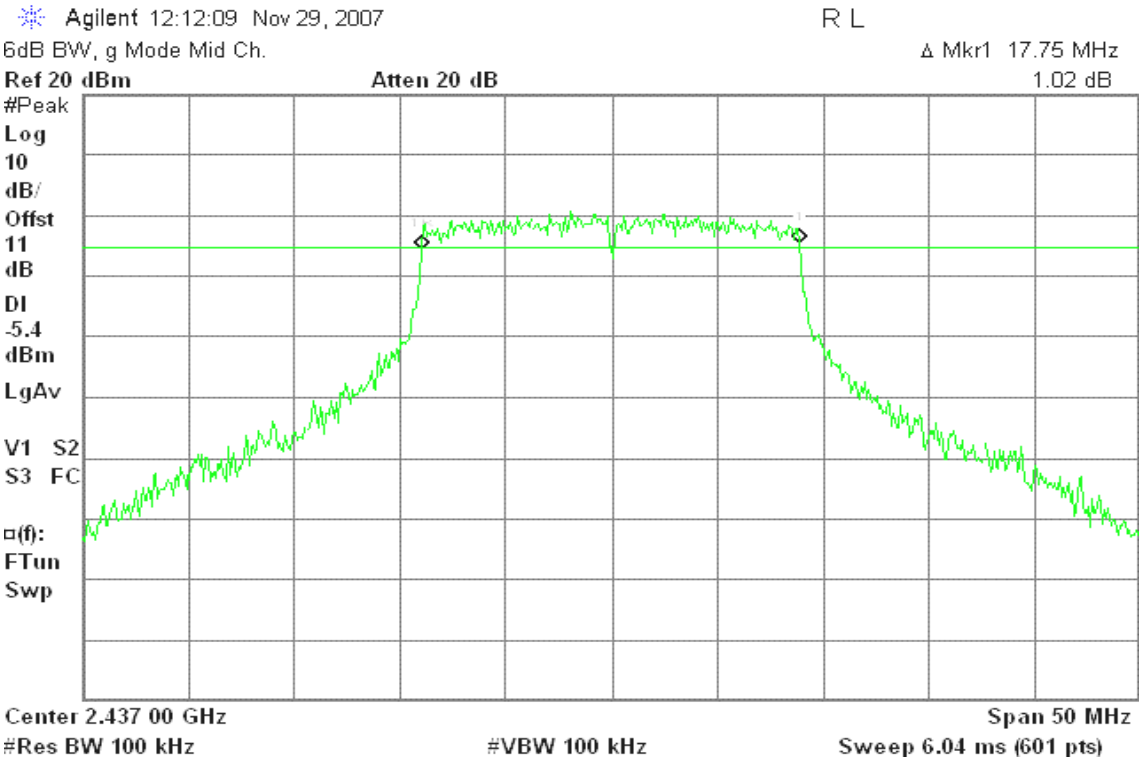


draft 802.11n Standard-20 MHz Channel mode / Chain 1

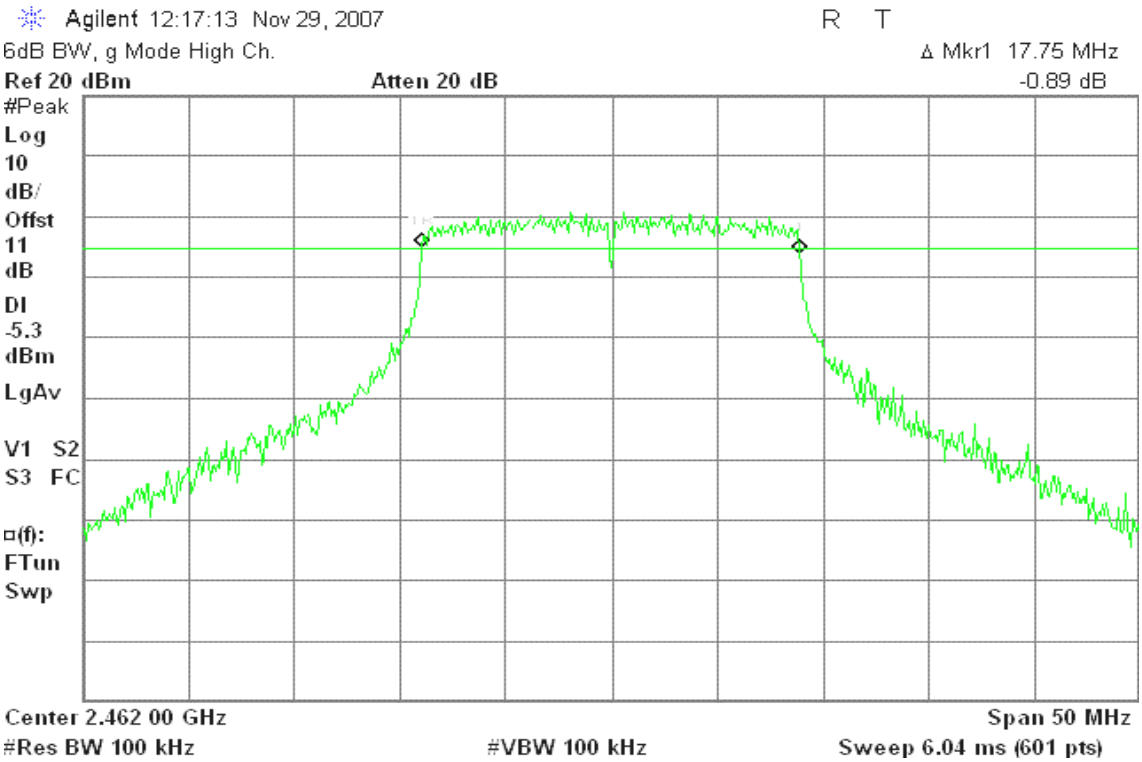
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

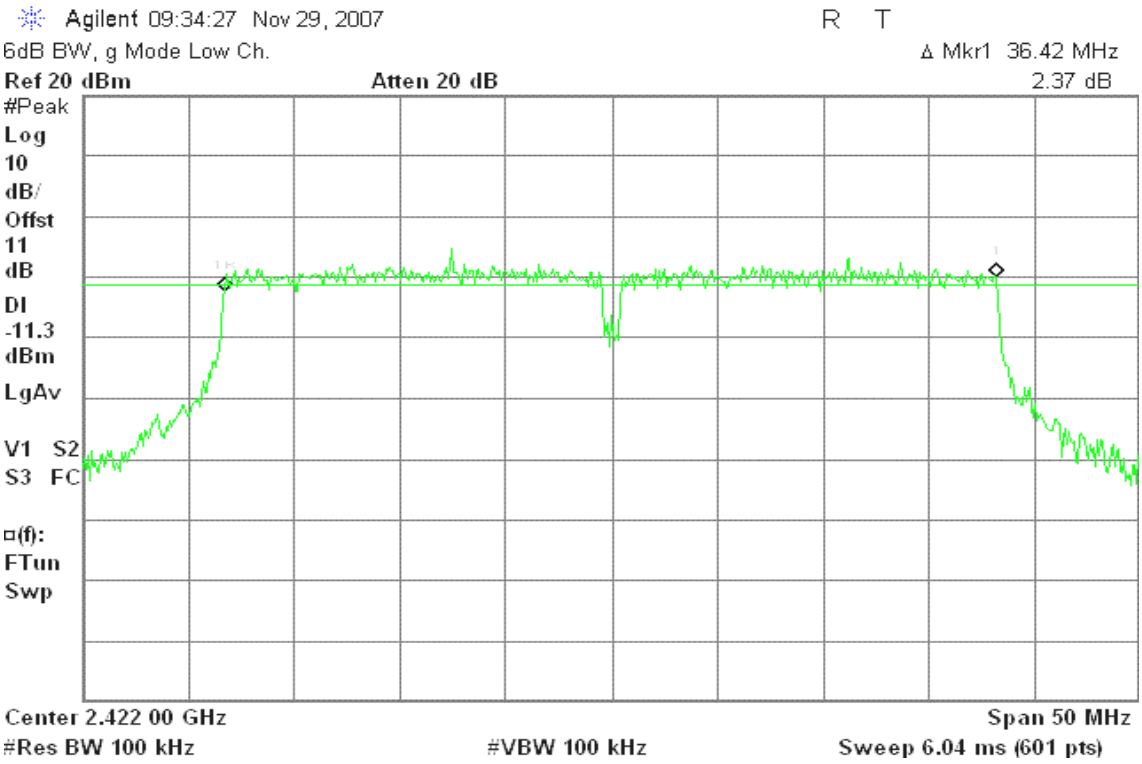


6dB Bandwidth (CH High)

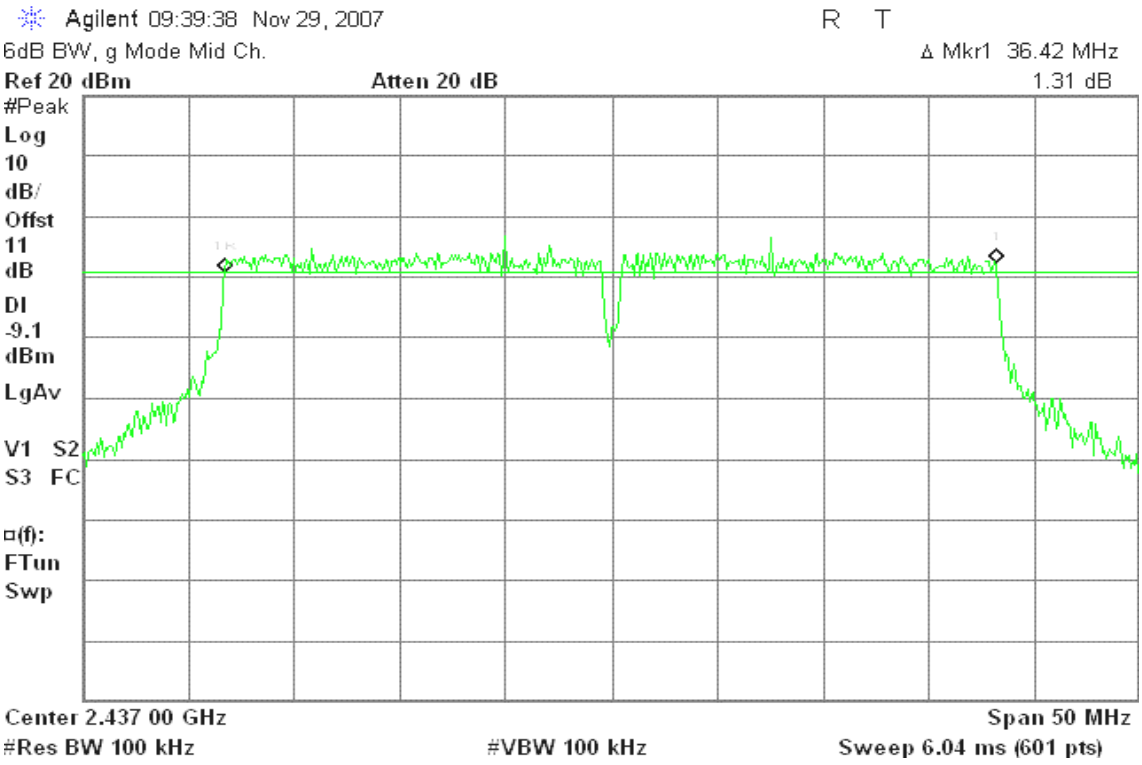


draft 802.11n Wide-40 MHz Channel mode / Chain 0

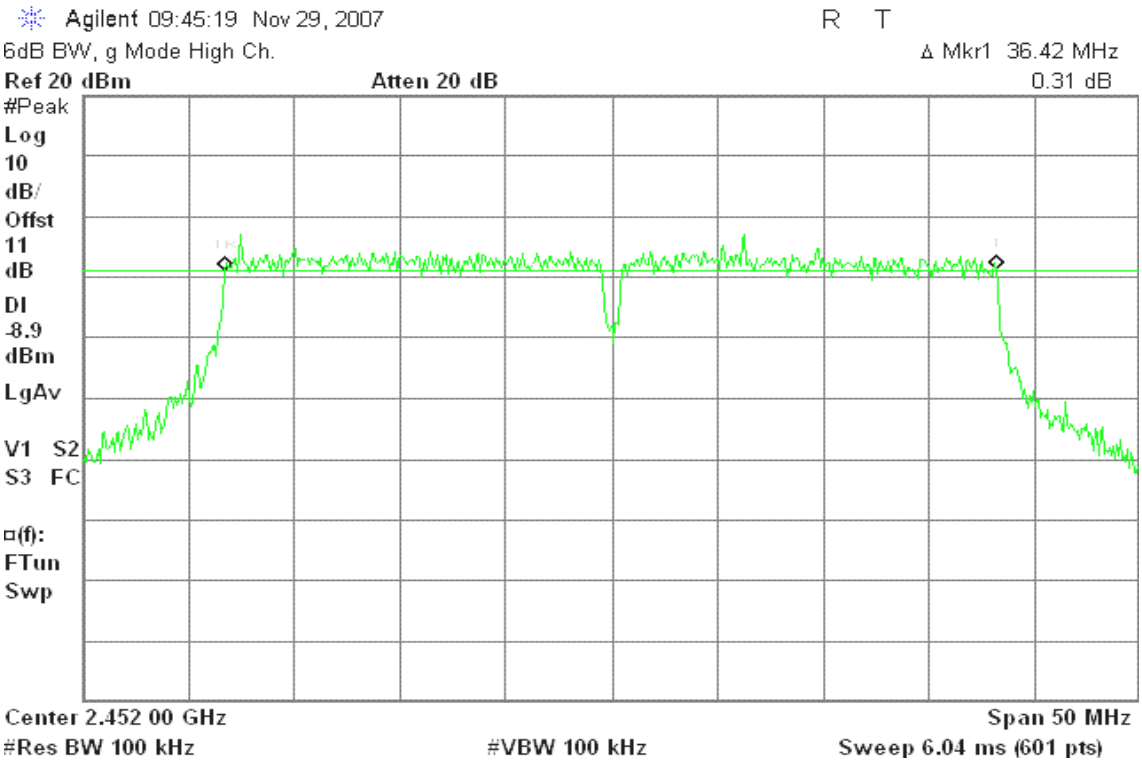
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

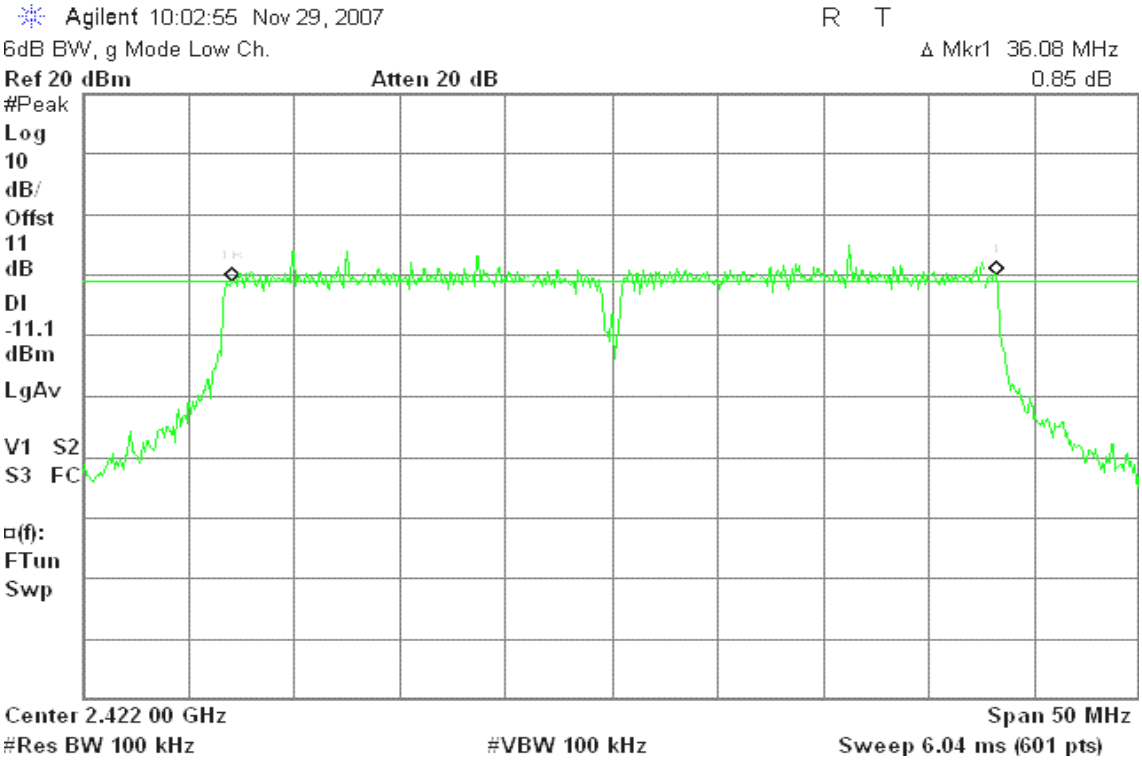


6dB Bandwidth (CH High)

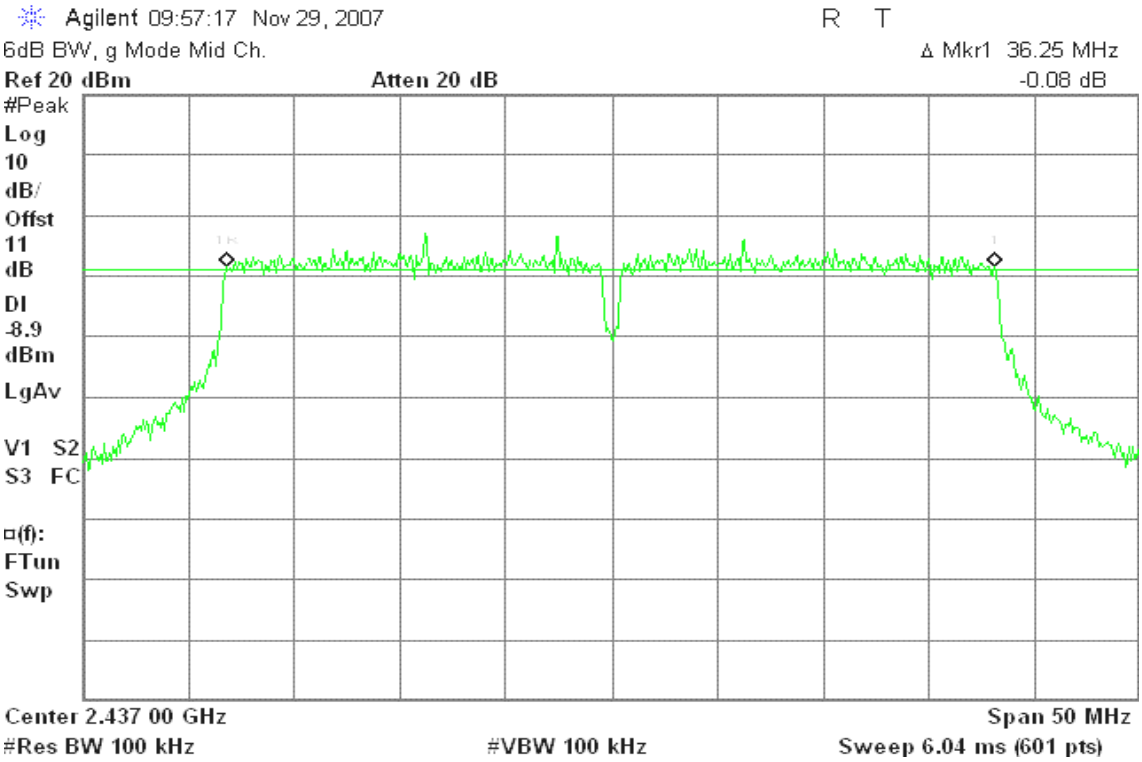


draft 802.11n Wide-40 MHz Channel mode / Chain 1

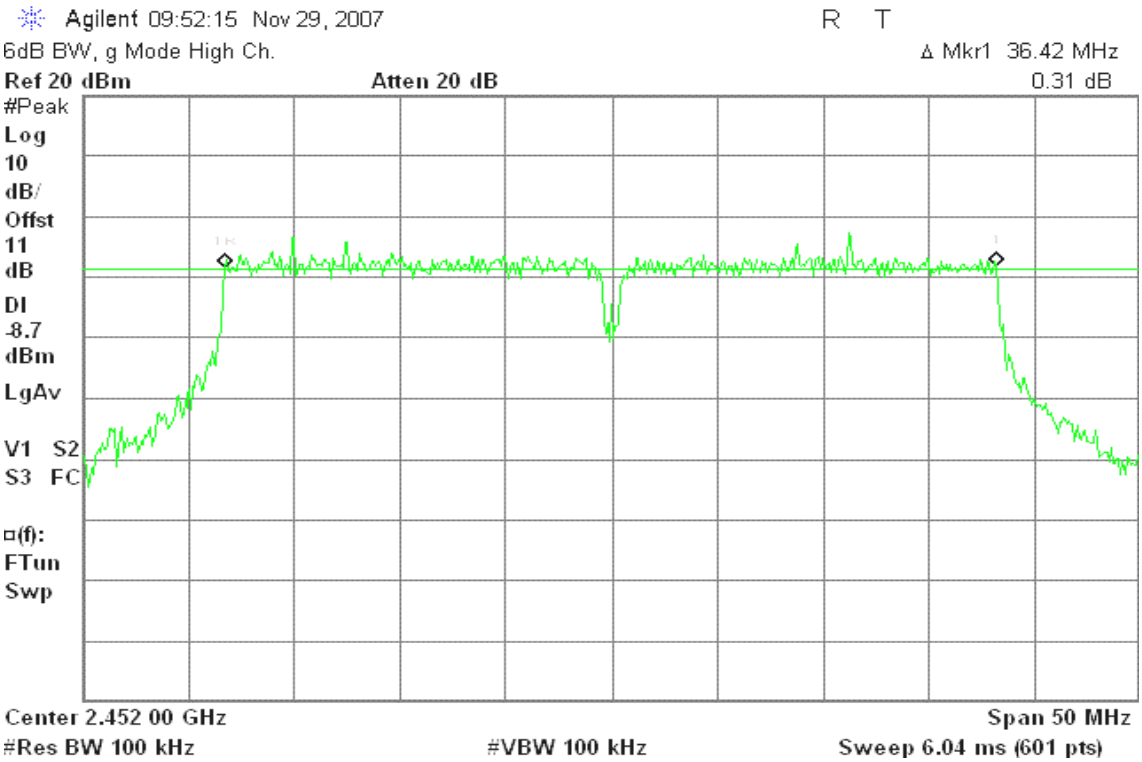
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



6dB Bandwidth (CH High)



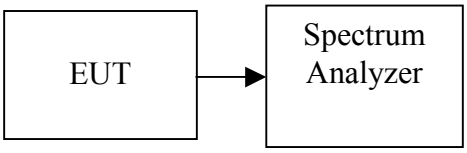
7.2 PEAK POWER

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

1. Place the EUT on the table and set it in 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 = 1 MHz, VBW >= 3 MHz. in “Channel Power ” measurement.
4. Record the max reading.
5. 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)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	20.86	20.91	23.90	0.2452	1.00	PASS
Mid	2437	20.39	20.39	23.40	0.2188		PASS
High	2462	20.01	19.37	22.71	0.1867		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	19.44	19.03	22.25	0.1679	1.00	PASS
Mid	2437	19.78	19.77	22.79	0.1899		PASS
High	2462	19.54	20.03	22.80	0.1906		PASS

Test mode: draft 802.11n Standard-20 MHz Channel mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	17.20	16.53	19.89	0.0975	1.00	PASS
Mid	2437	18.77	19.18	21.99	0.1581		PASS
High	2462	19.27	19.49	22.39	0.1734		PASS

Test mode: draft 802.11n Wide-40 MHz Channel mode

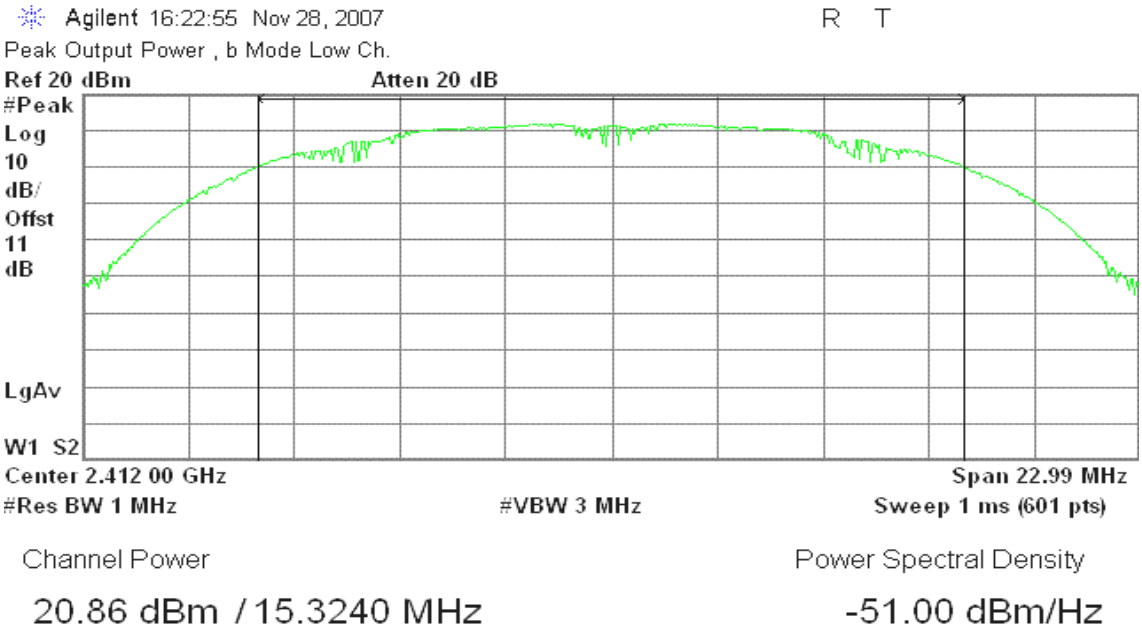
Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2422	14.06	13.06	16.60	0.0457	1.00	PASS
Mid	2437	15.84	15.64	18.75	0.0750		PASS
High	2452	16.19	15.72	18.97	0.0789		PASS

Remark: *Total Output Power (w) = Chain 0 (10^(Output Power /10)/1000)+ Chain 2 (10^(Output Power /10)/1000)*

Test Plot

IEEE 802.11b mode / Chain 0

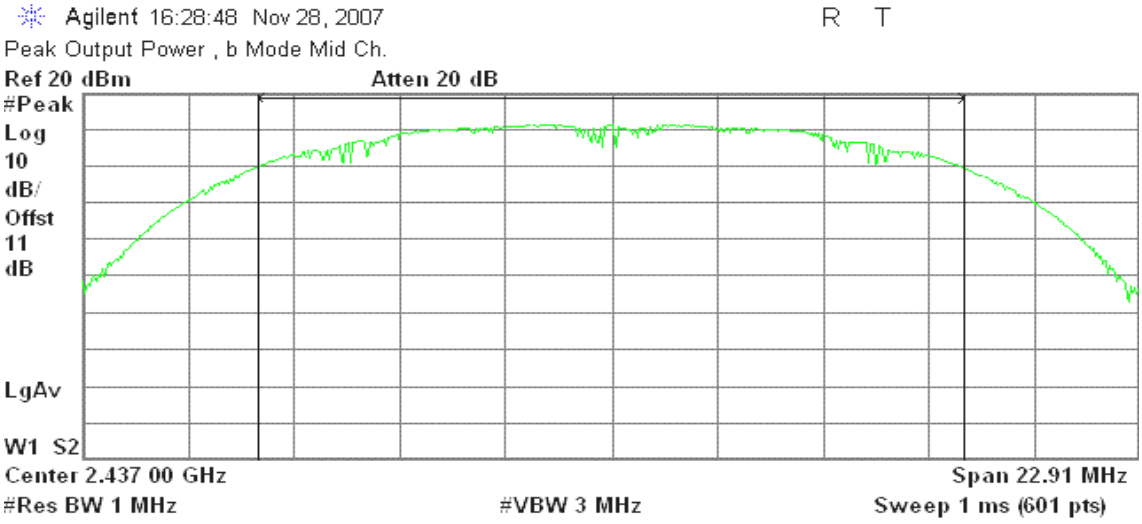
Peak Power (CH Low)



Channel Power
20.86 dBm / 15.3240 MHz

Power Spectral Density
-51.00 dBm/Hz

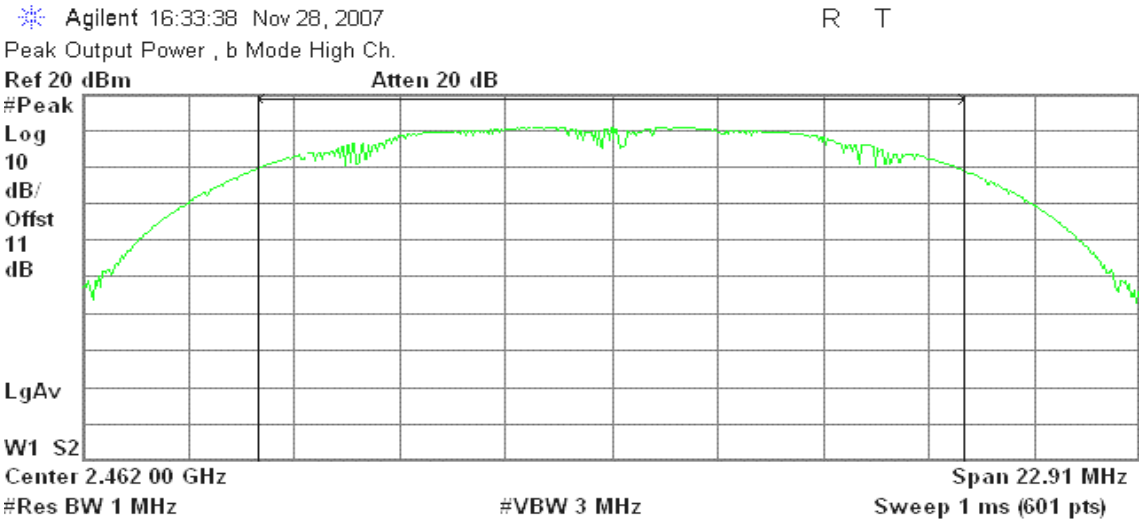
Peak Power (CH Mid)



Channel Power
20.39 dBm / 15.2720 MHz

Power Spectral Density
-51.45 dBm/Hz

Peak Power (CH High)

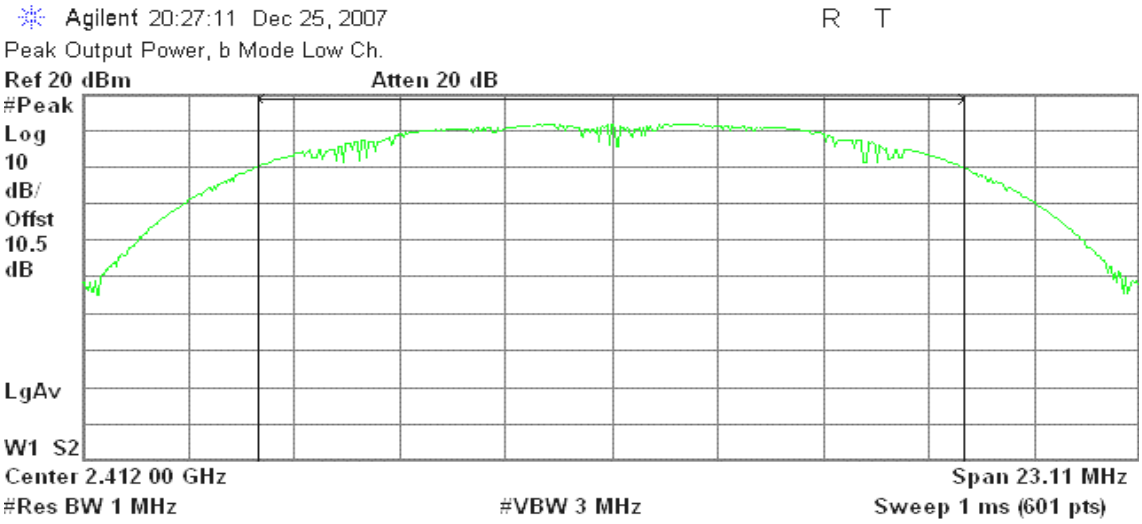


Channel Power
20.01 dBm / 15.2710 MHz

Power Spectral Density
-51.82 dBm/Hz

IEEE 802.11b mode / Chain 1

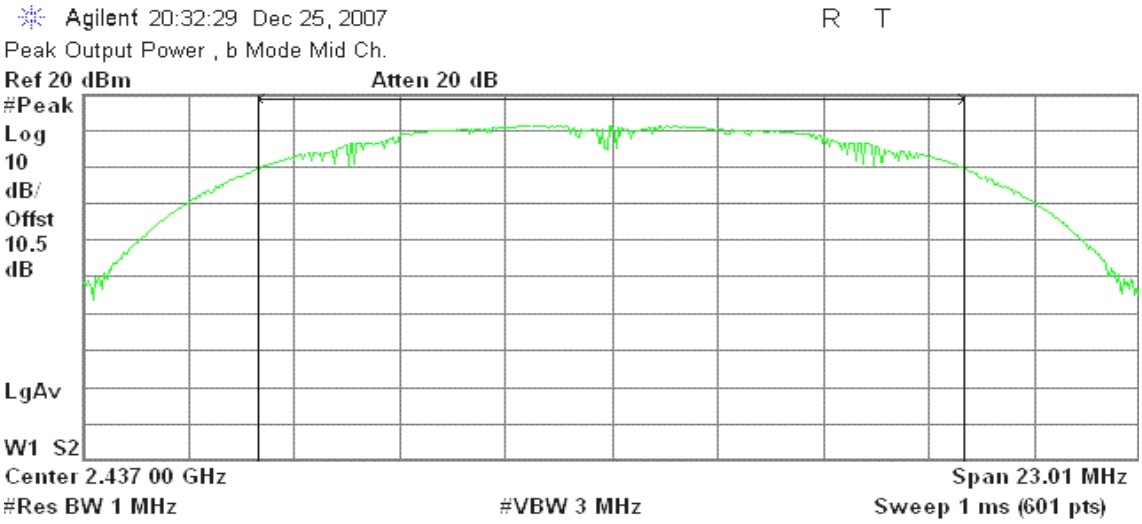
Peak Power (CH Low)



Channel Power
20.91 dBm / 15.4090 MHz

Power Spectral Density
-50.96 dBm/Hz

Peak Power (CH Mid)



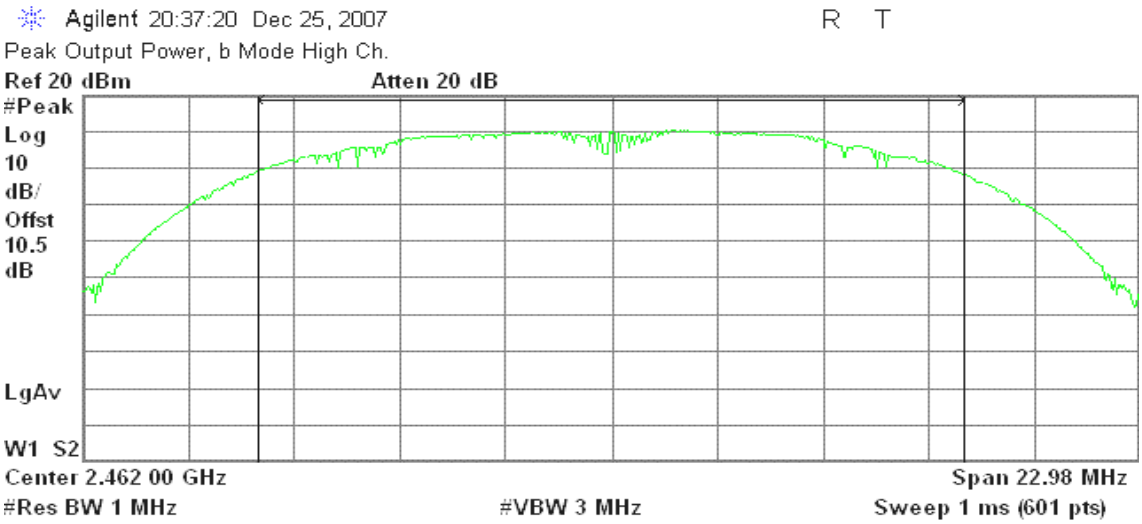
Channel Power

20.39 dBm / 15.3390 MHz

Power Spectral Density

-51.47 dBm/Hz

Peak Power (CH High)



Channel Power

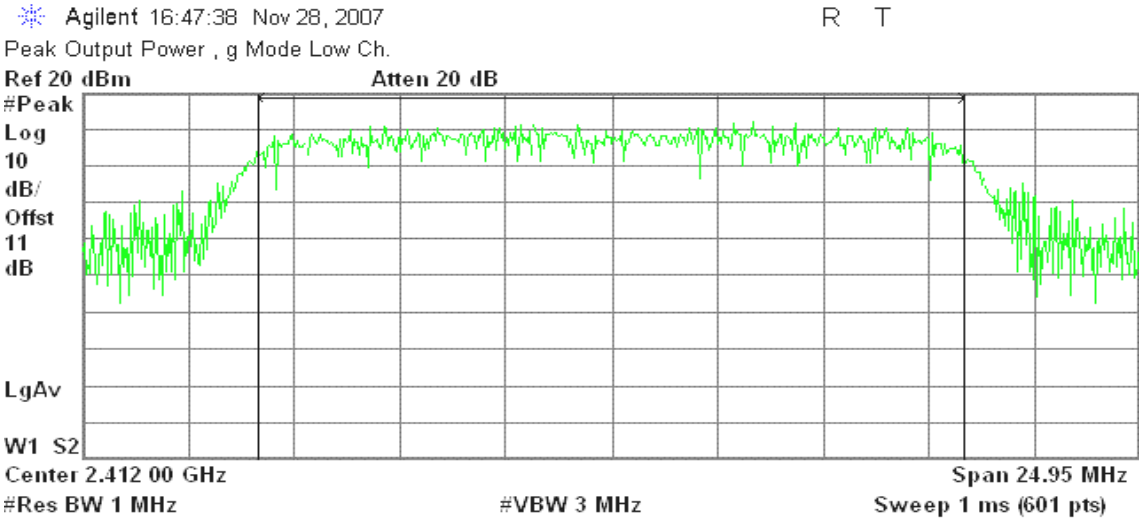
19.37 dBm / 15.3190 MHz

Power Spectral Density

-52.48 dBm/Hz

IEEE 802.11g mode / Chain 0

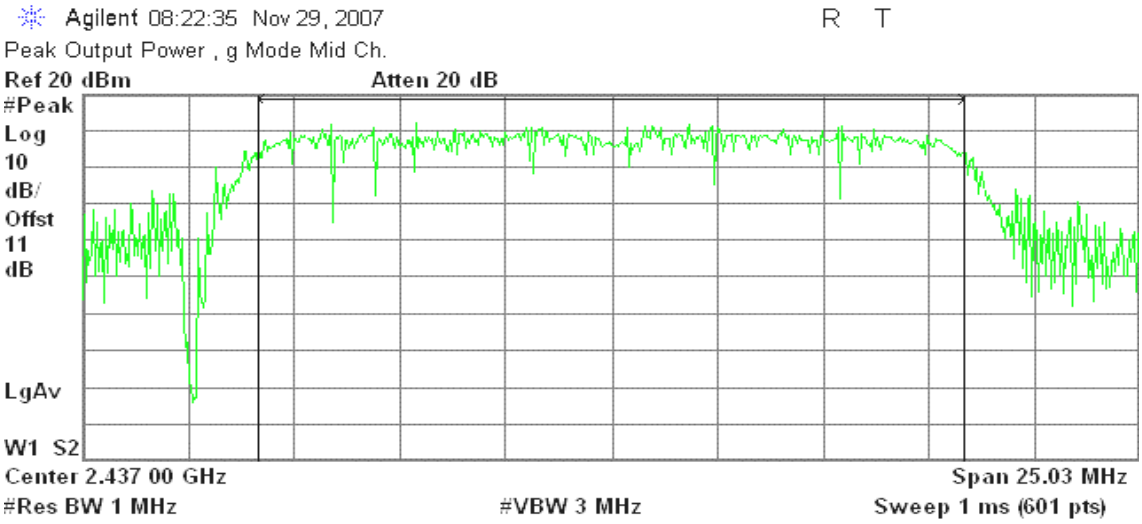
Peak Power (CH Low)



Channel Power
19.44 dBm / 16.6330 MHz

Power Spectral Density
-52.77 dBm/Hz

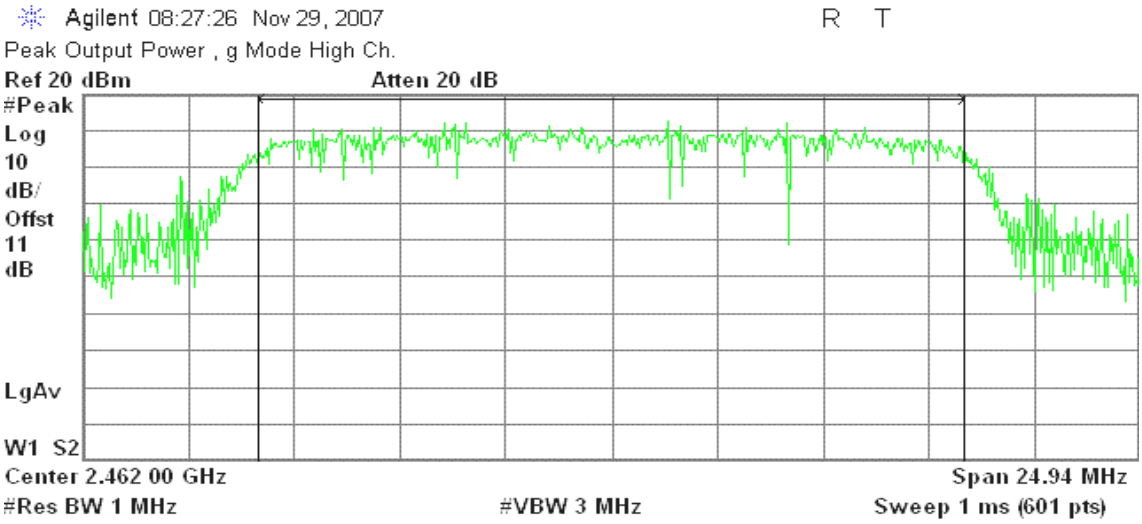
Peak Power (CH Mid)



Channel Power
19.78 dBm / 16.6890 MHz

Power Spectral Density
-52.44 dBm/Hz

Peak Power (CH High)

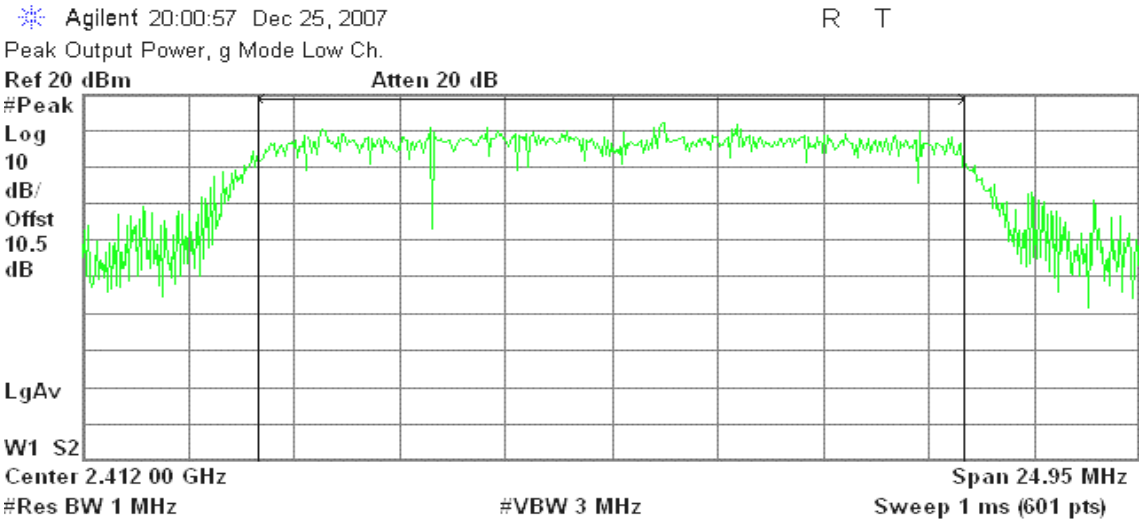


Channel Power
19.54 dBm / 16.6270 MHz

Power Spectral Density
-52.67 dBm/Hz

IEEE 802.11g mode / Chain 1

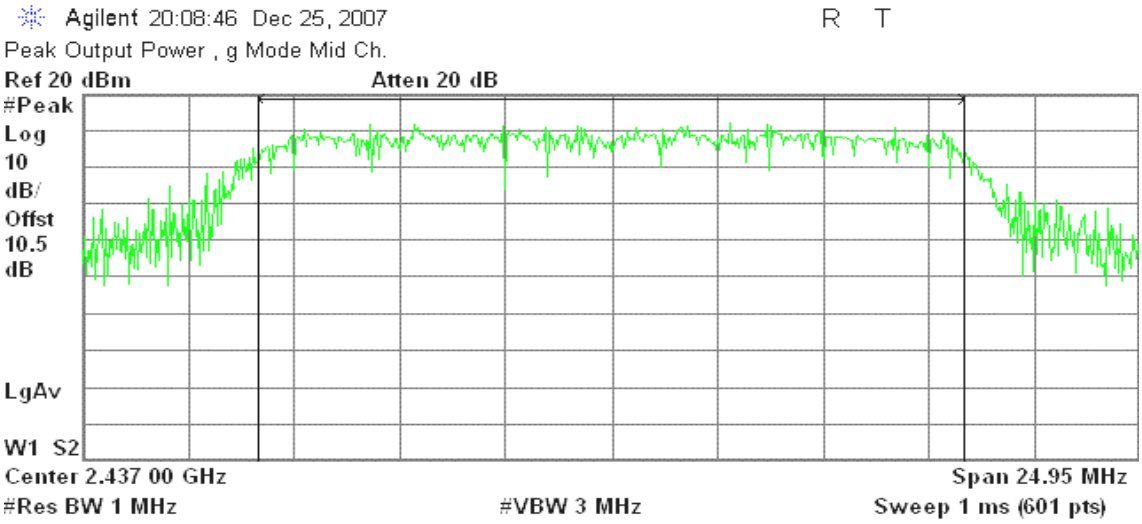
Peak Power (CH Low)



Channel Power
19.03 dBm / 16.6350 MHz

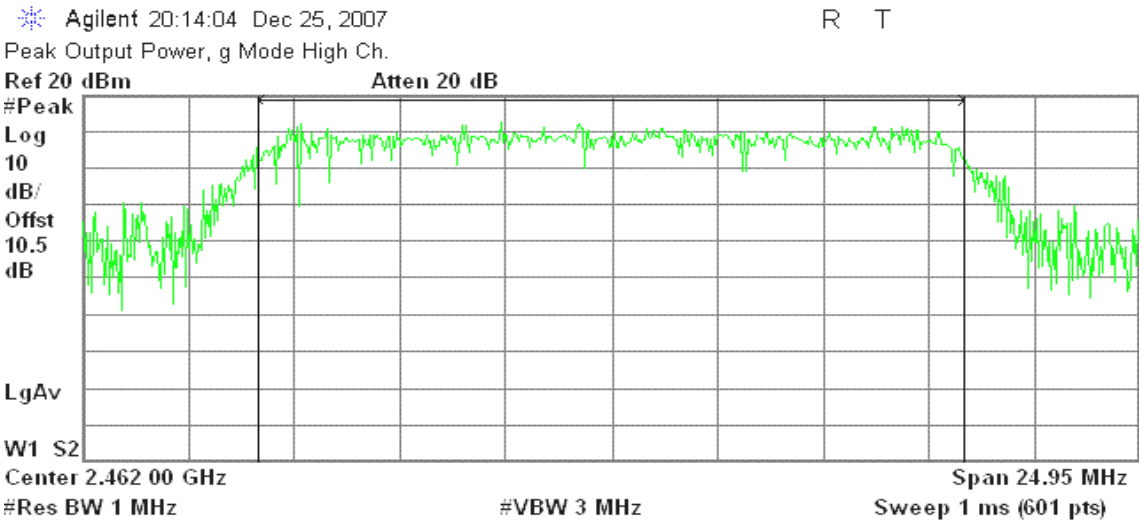
Power Spectral Density
-53.18 dBm/Hz

Peak Power (CH Mid)



Channel Power	Power Spectral Density
19.77 dBm / 16.6310 MHz	-52.44 dBm/Hz

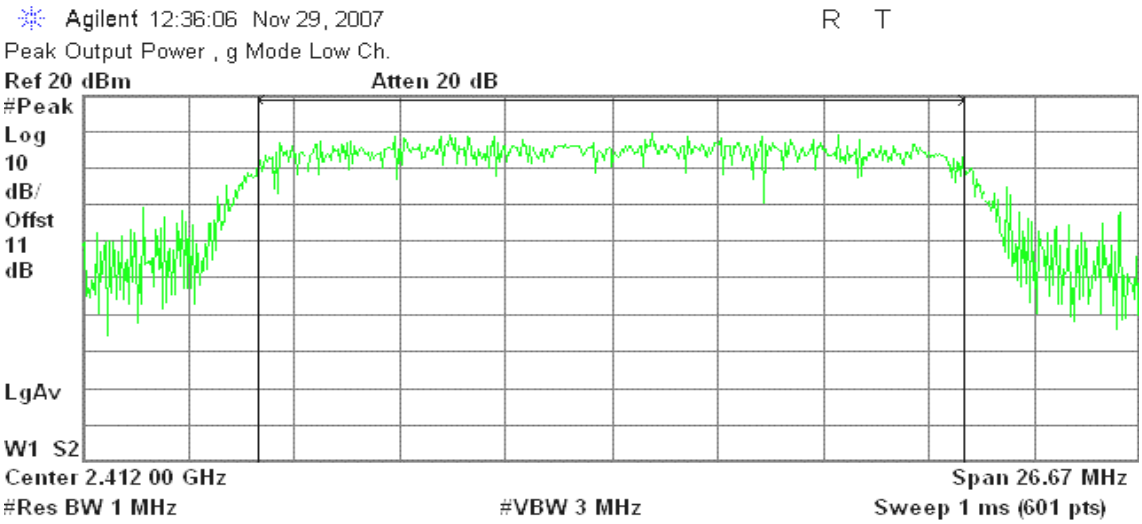
Peak Power (CH High)



Channel Power	Power Spectral Density
20.03 dBm / 16.6310 MHz	-52.18 dBm/Hz

draft 802.11n Standard-20 MHz Channel mode / Chain 0

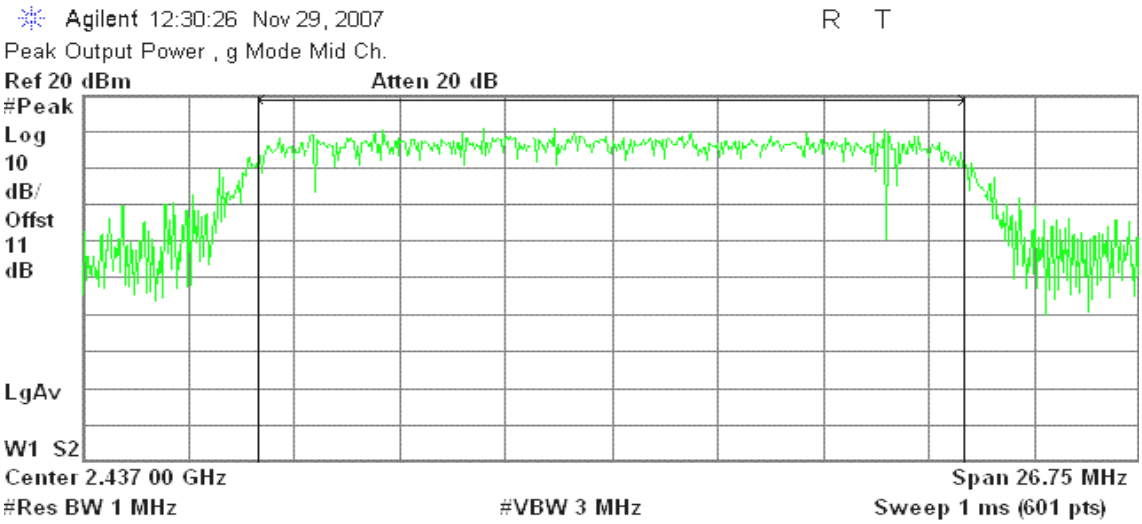
Peak Power (CH Low)



Channel Power
17.20 dBm / 17.7830 MHz

Power Spectral Density
-55.30 dBm/Hz

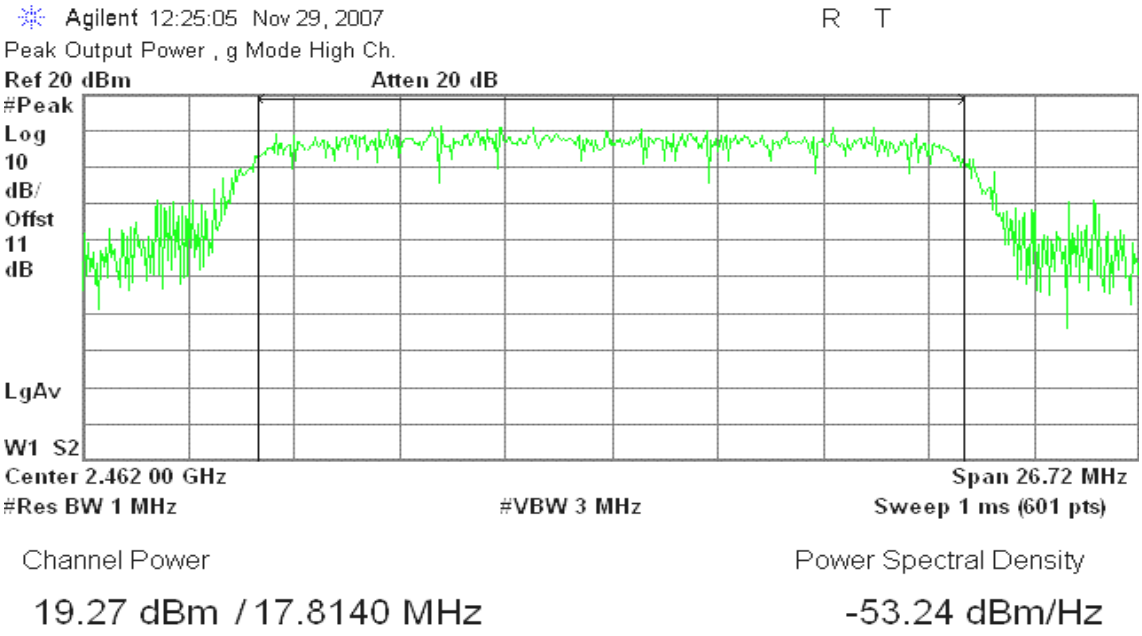
Peak Power (CH Mid)



Channel Power
18.77 dBm / 17.8350 MHz

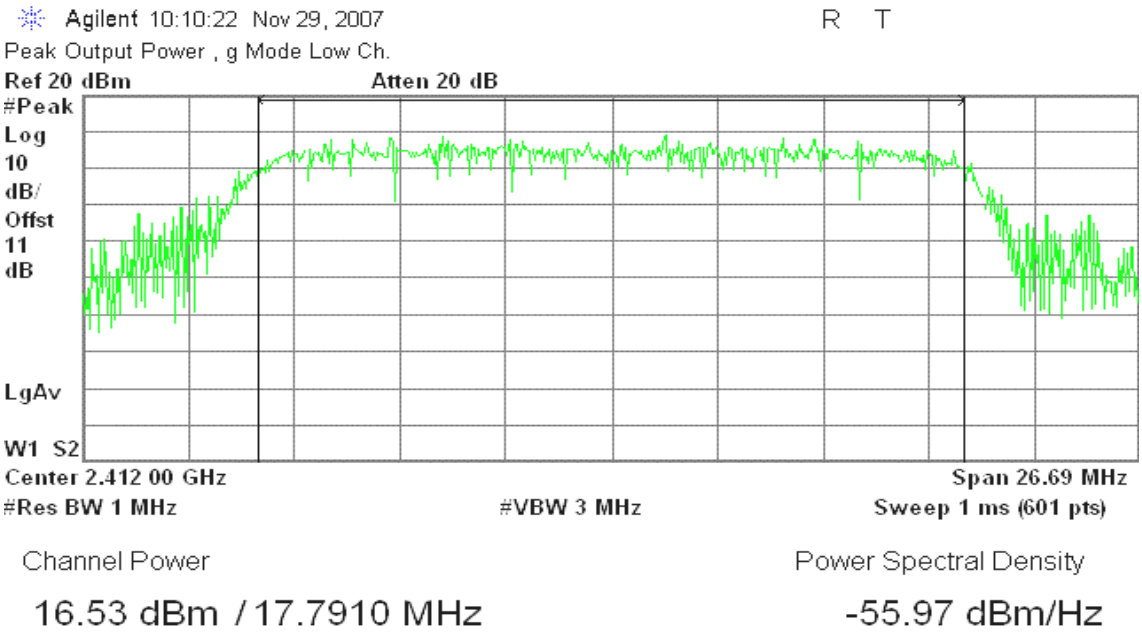
Power Spectral Density
-53.75 dBm/Hz

Peak Power (CH High)

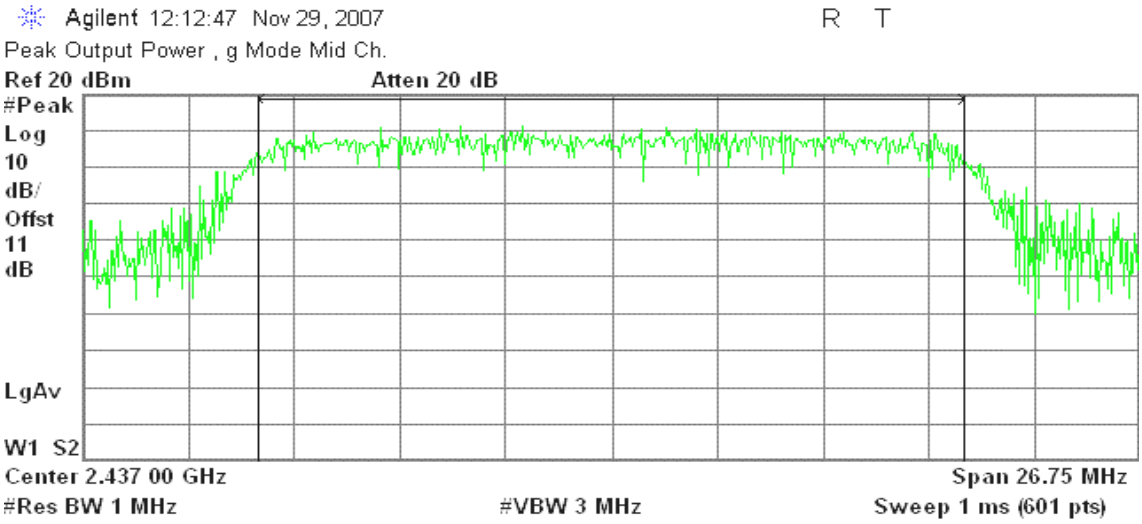


draft 802.11n Standard-20 MHz Channel mode / Chain 1

Peak Power (CH Low)



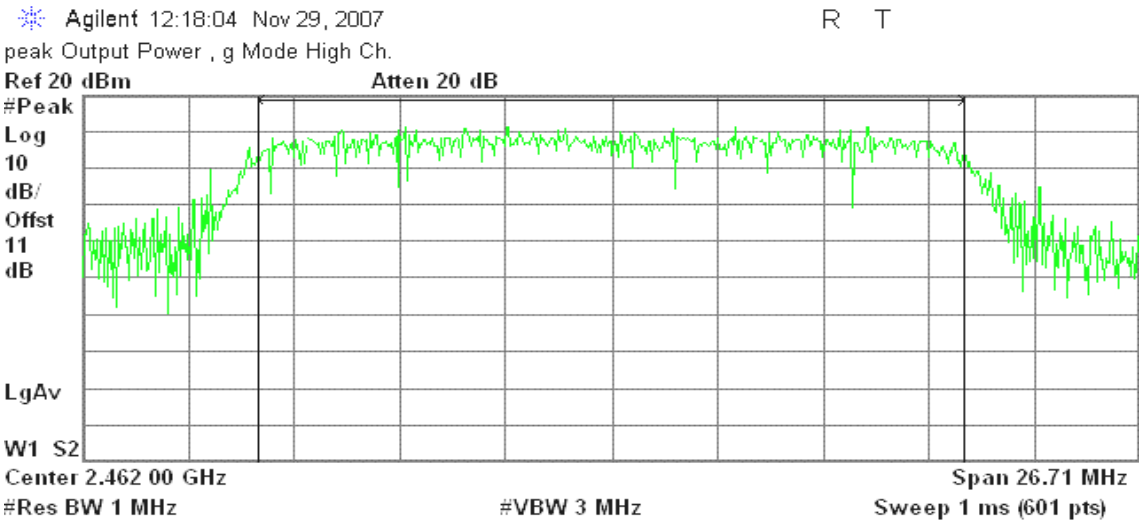
Peak Power (CH Mid)



Channel Power
19.18 dBm / 17.8330 MHz

Power Spectral Density
-53.33 dBm/Hz

Peak Power (CH High)

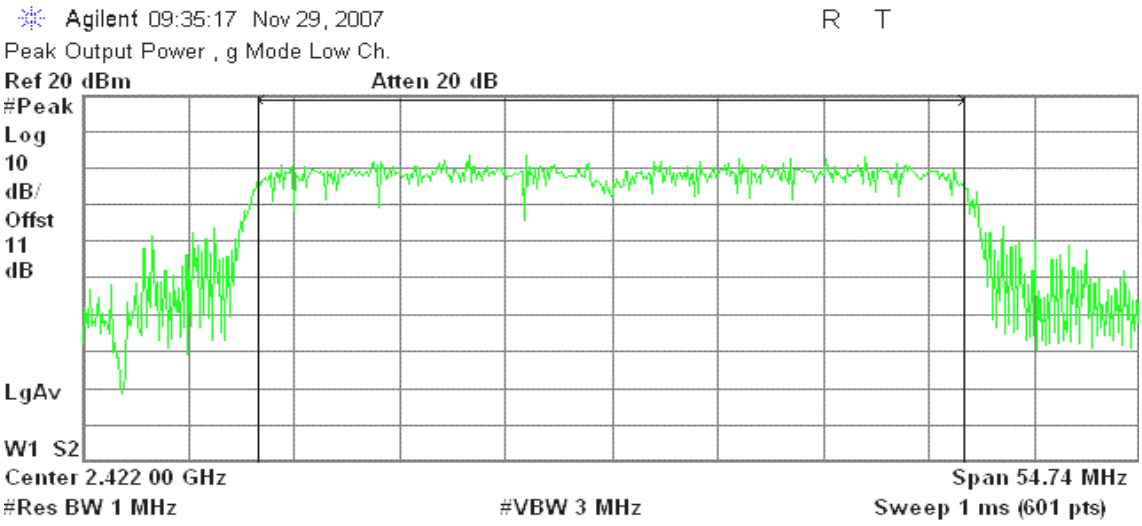


Channel Power
19.49 dBm / 17.8080 MHz

Power Spectral Density
-53.02 dBm/Hz

draft 802.11n Wide-40 MHz Channel mode / Chain 0

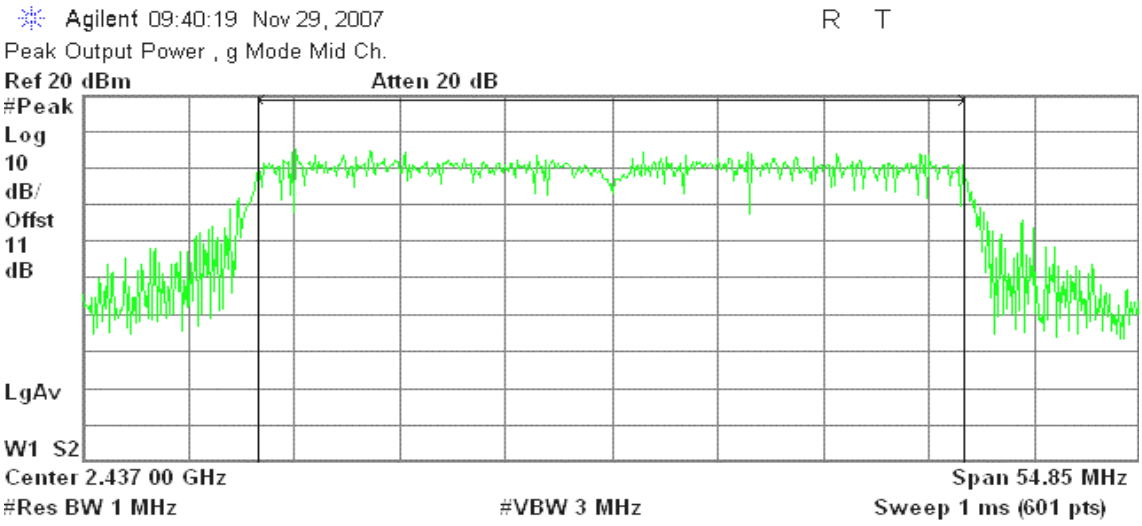
Peak Power (CH Low)



Channel Power
14.06 dBm / 36.4930 MHz

Power Spectral Density
-61.56 dBm/Hz

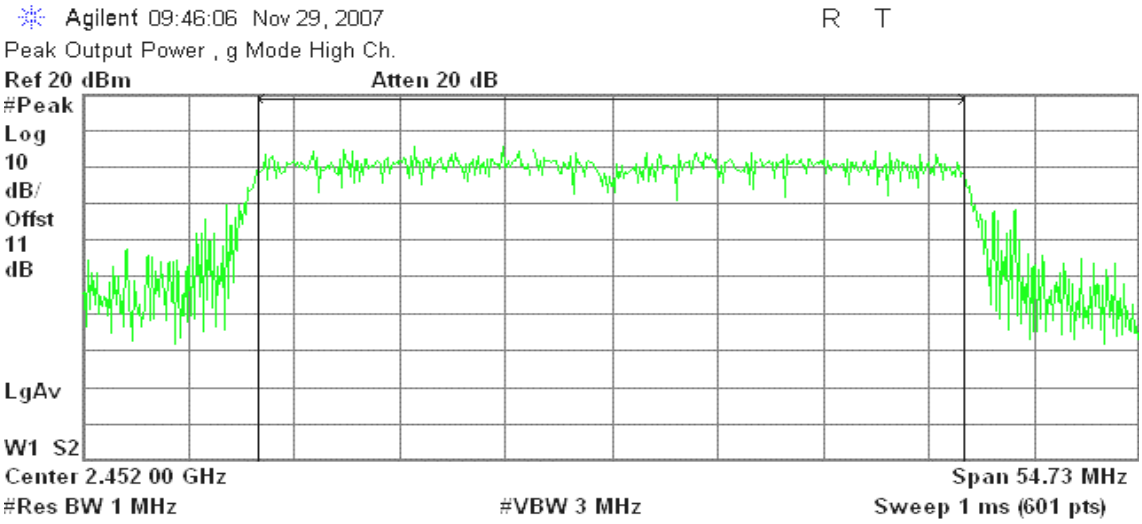
Peak Power (CH Mid)



Channel Power
15.84 dBm / 36.5660 MHz

Power Spectral Density
-59.79 dBm/Hz

Peak Power (CH High)

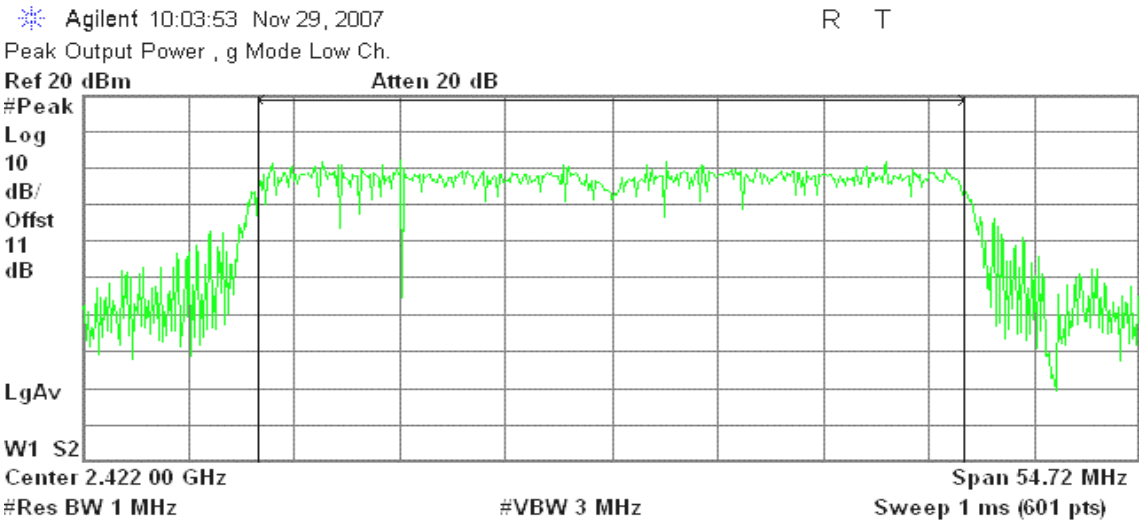


Channel Power
16.19 dBm / 36.4900 MHz

Power Spectral Density
-59.43 dBm/Hz

draft 802.11n Wide-40 MHz Channel mode / Chain 1

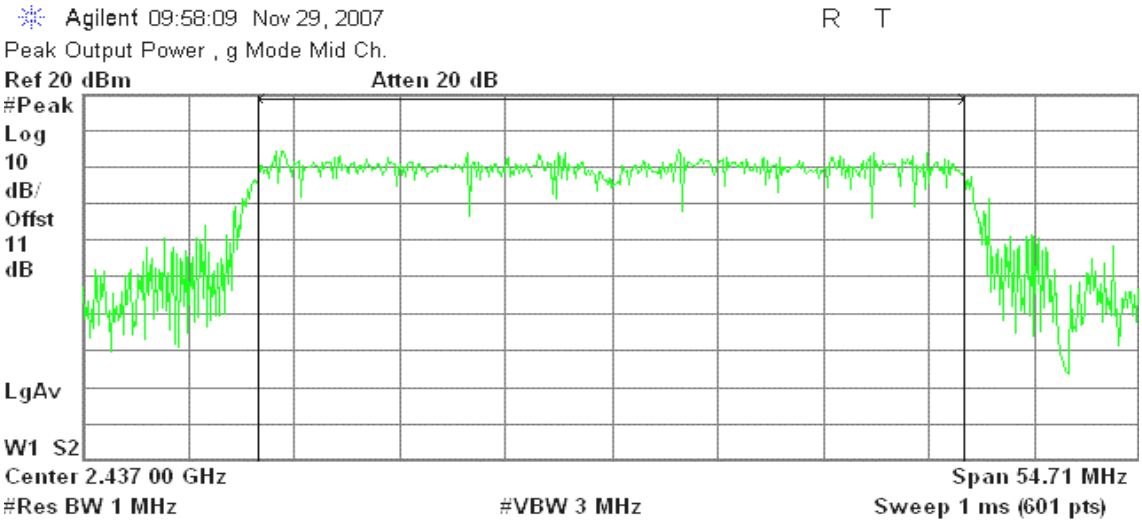
Peak Power (CH Low)



Channel Power
13.06 dBm / 36.4830 MHz

Power Spectral Density
-62.56 dBm/Hz

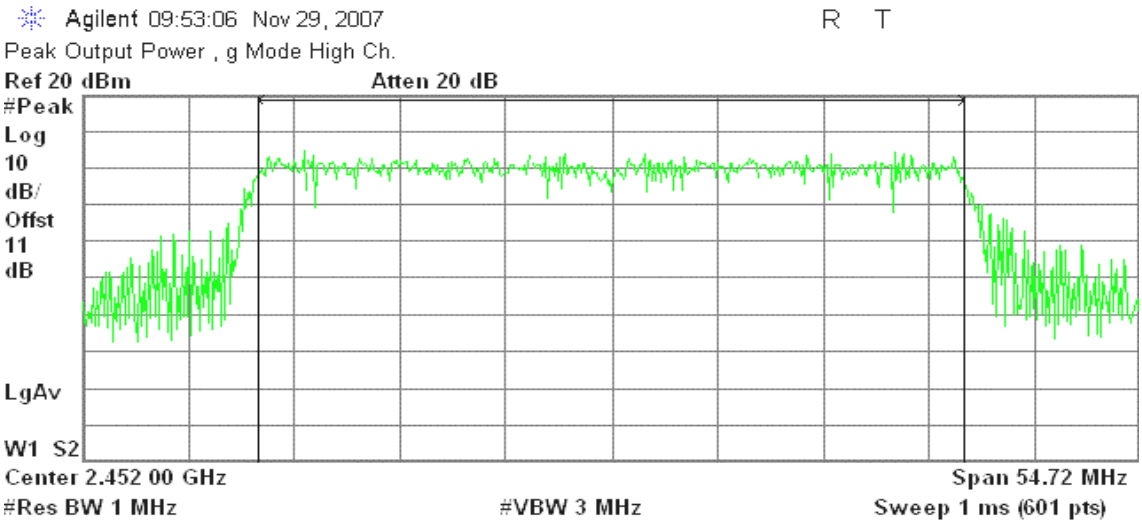
Peak Power (CH Mid)



Channel Power
15.64 dBm / 36.4710 MHz

Power Spectral Density
-59.98 dBm/Hz

Peak Power (CH High)



Channel Power
15.72 dBm / 36.4780 MHz

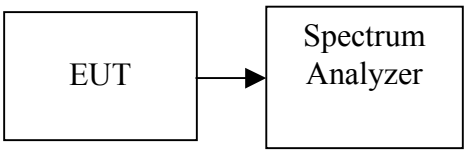
Power Spectral Density
-59.90 dBm/Hz

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

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	18.27	18.02	21.16	0.1305	1.00	PASS
Mid	2437	17.82	17.70	20.77	0.1194		PASS
High	2462	17.43	16.79	20.13	0.1031		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	15.66	15.56	18.62	0.0728	1.00	PASS
Mid	2437	16.40	16.15	19.29	0.0849		PASS
High	2462	16.40	16.46	19.44	0.0879		PASS

Test mode: draft 802.11n Standard-20 MHz Channel mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	13.37	13.29	16.34	0.0431	1.00	PASS
Mid	2437	15.70	15.77	18.75	0.0749		PASS
High	2462	15.32	15.82	18.59	0.0722		PASS

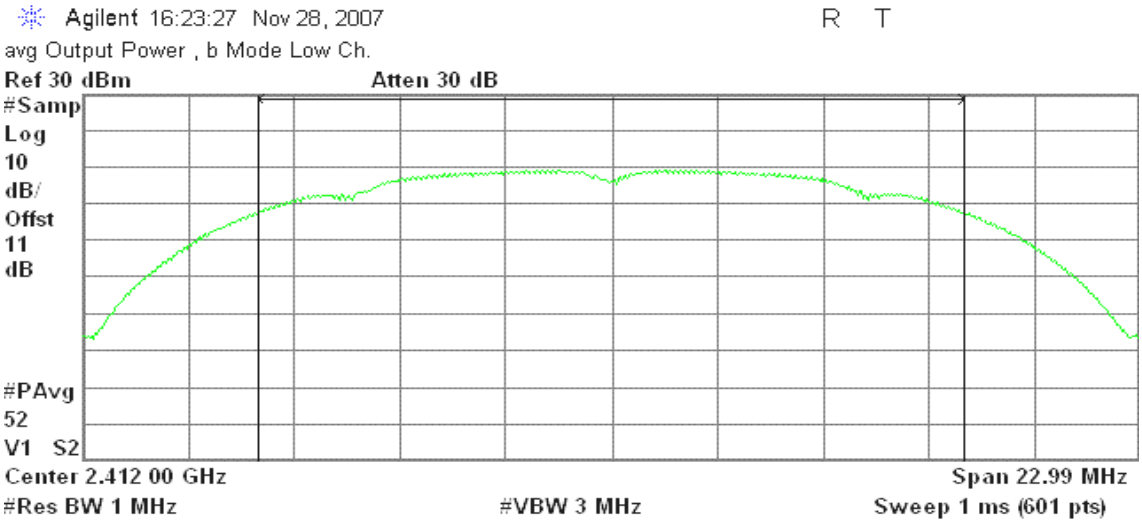
Test mode: draft 802.11n Wide-40 MHz Channel mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2422	10.33	9.67	13.02	0.0201	1.00	PASS
Mid	2437	12.18	12.26	15.23	0.0333		PASS
High	2452	12.80	12.22	15.53	0.0357		PASS

Test Plot

IEEE 802.11b mode / Chain 0

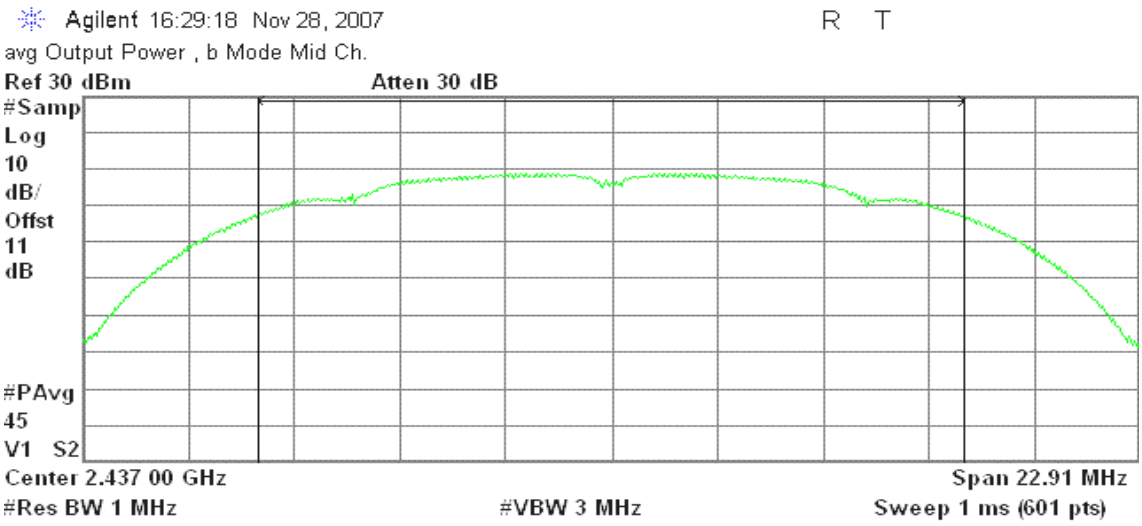
Average Power (CH Low)



Channel Power
18.27 dBm / 15.3240 MHz

Power Spectral Density
-53.58 dBm/Hz

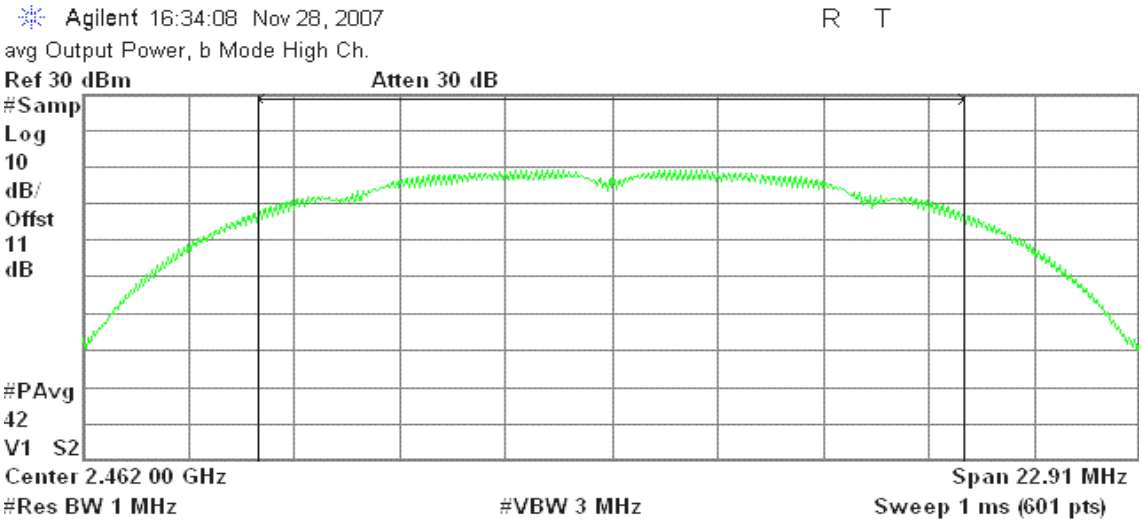
Average Power (CH Mid)



Channel Power
17.82 dBm / 15.2720 MHz

Power Spectral Density
-54.02 dBm/Hz

Average Power (CH High)

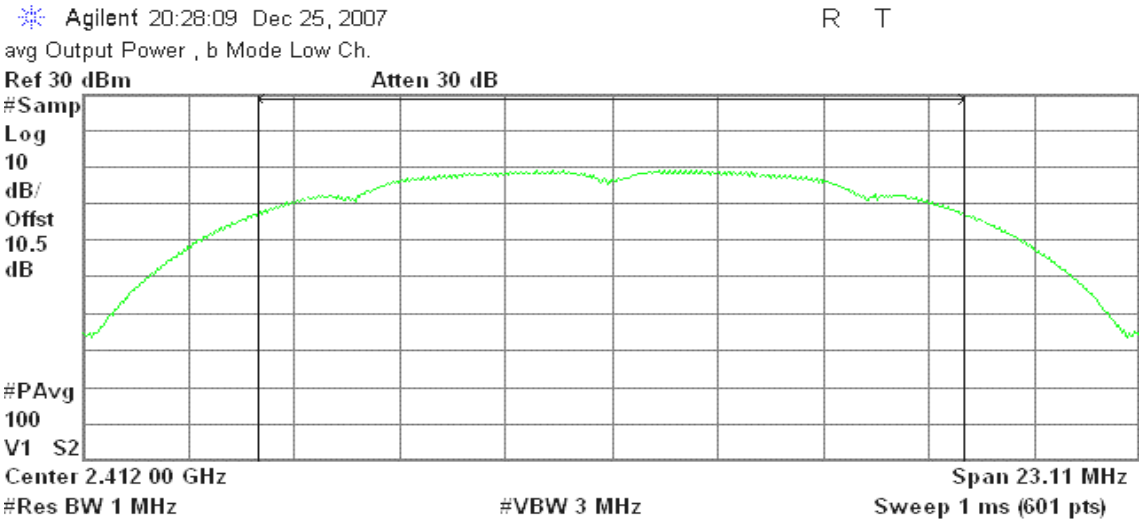


Channel Power
17.43 dBm / 15.2710 MHz

Power Spectral Density
-54.41 dBm/Hz

IEEE 802.11b mode / Chain 1

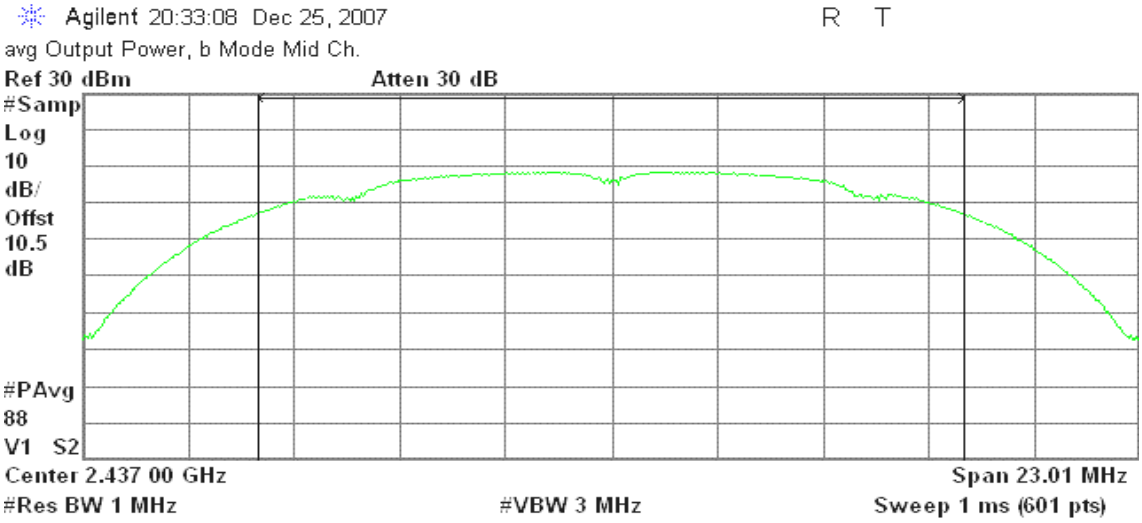
Average Power (CH Low)



Channel Power
18.02 dBm / 15.4090 MHz

Power Spectral Density
-53.86 dBm/Hz

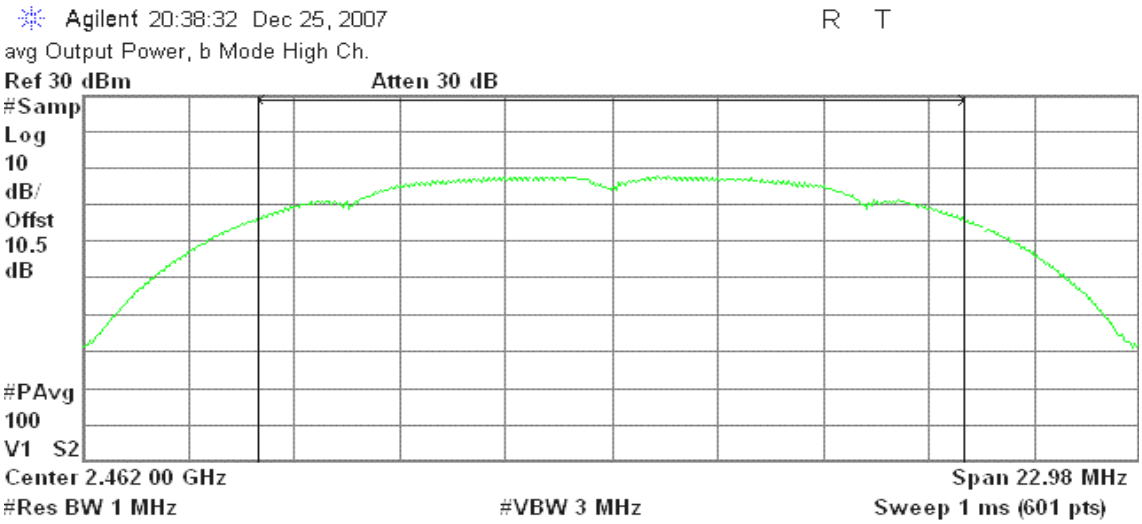
Average Power (CH Mid)



Channel Power
17.70 dBm / 15.3390 MHz

Power Spectral Density
-54.15 dBm/Hz

Average Power (CH High)

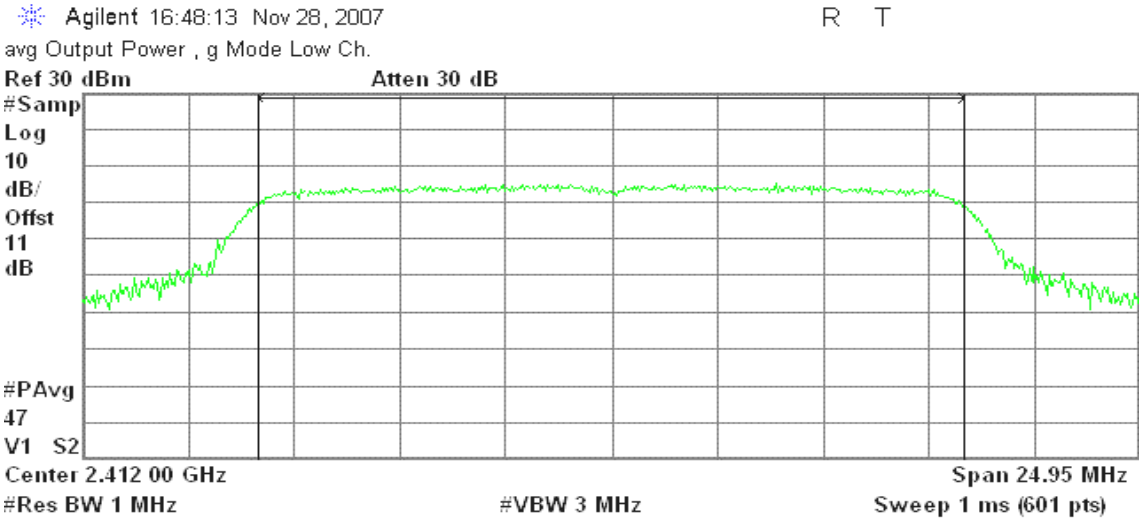


Channel Power
16.79 dBm / 15.3190 MHz

Power Spectral Density
-55.06 dBm/Hz

IEEE 802.11g mode / Chain 0

Average Power (CH Low)



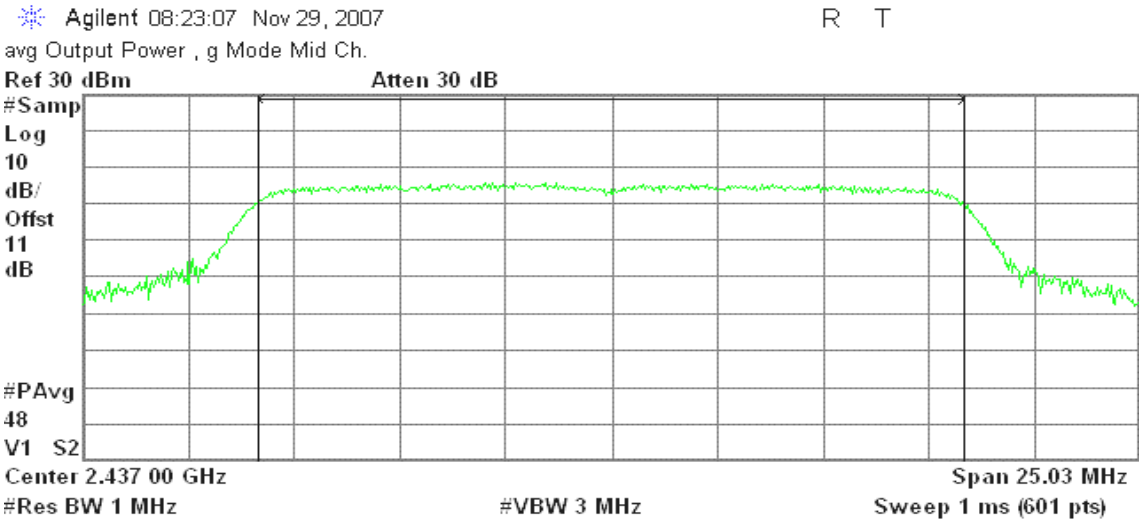
Channel Power

15.66 dBm / 16.6330 MHz

Power Spectral Density

-56.55 dBm/Hz

Average Power (CH Mid)



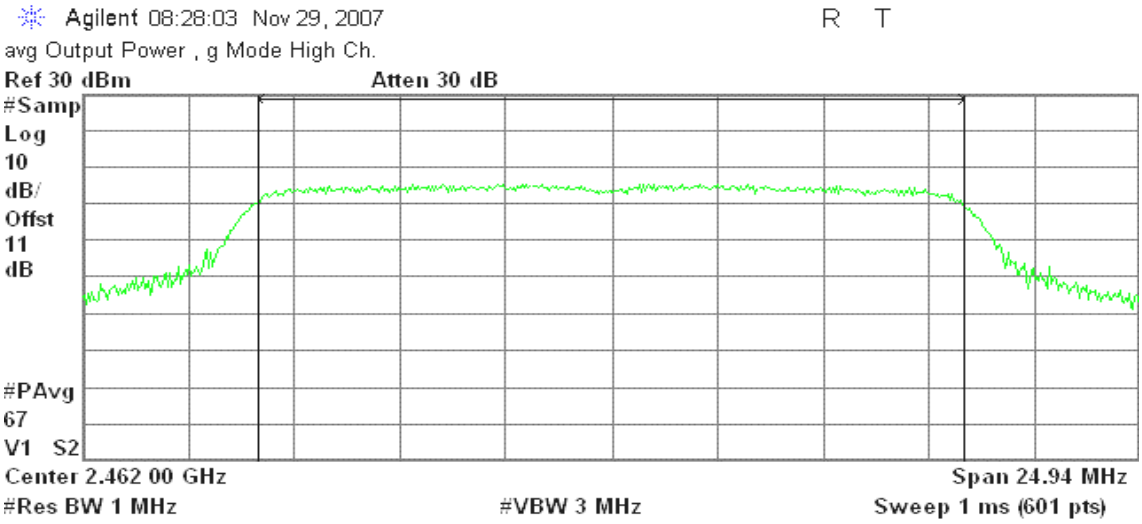
Channel Power

16.40 dBm / 16.6890 MHz

Power Spectral Density

-55.83 dBm/Hz

Average Power (CH High)

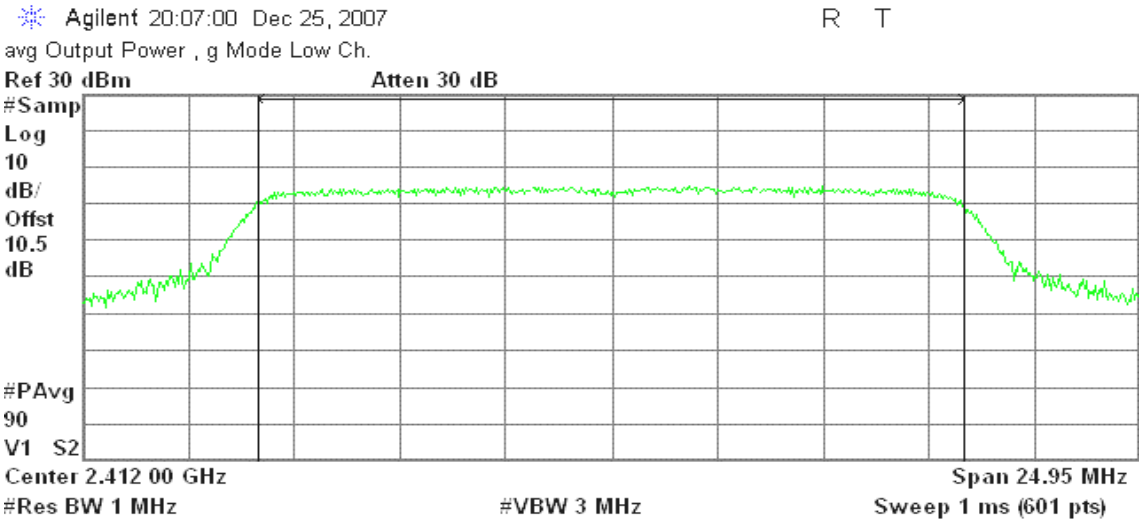


Channel Power
16.40 dBm / 16.6270 MHz

Power Spectral Density
-55.81 dBm/Hz

IEEE 802.11g mode / Chain 1

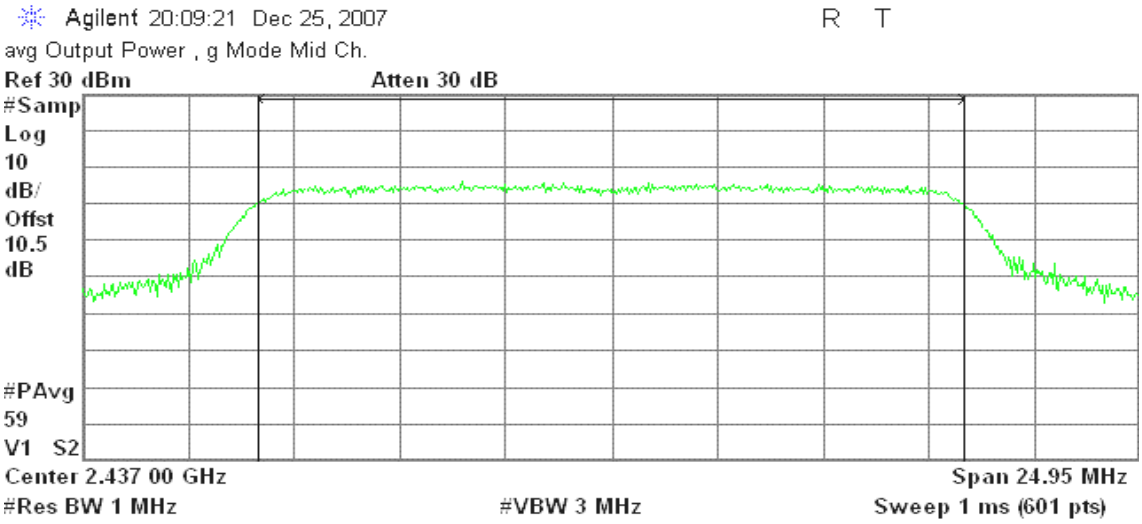
Average Power (CH Low)



Channel Power
15.56 dBm / 16.6350 MHz

Power Spectral Density
-56.65 dBm/Hz

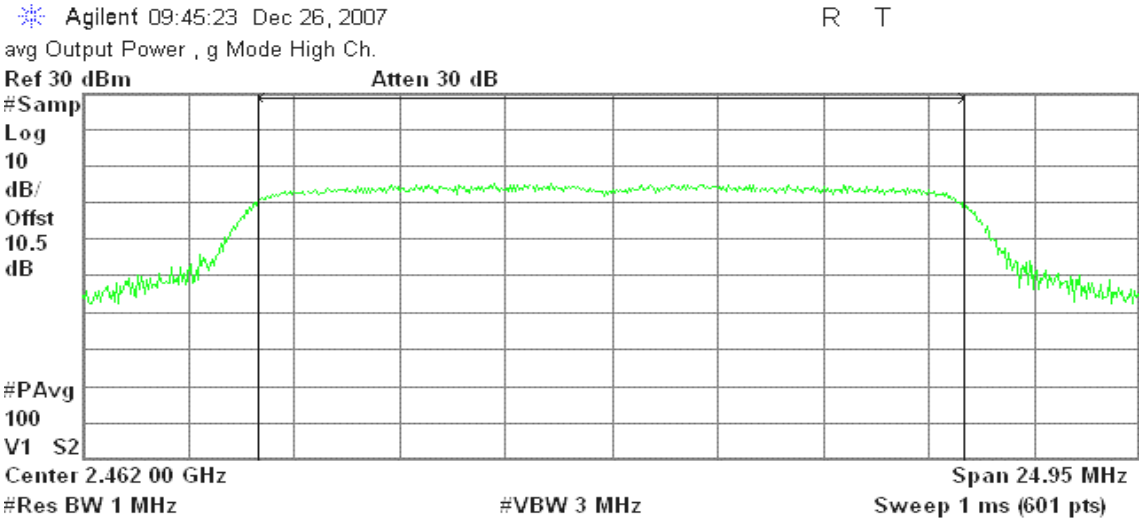
Average Power (CH Mid)



Channel Power
16.15 dBm / 16.6310 MHz

Power Spectral Density
-56.06 dBm/Hz

Average Power (CH High)

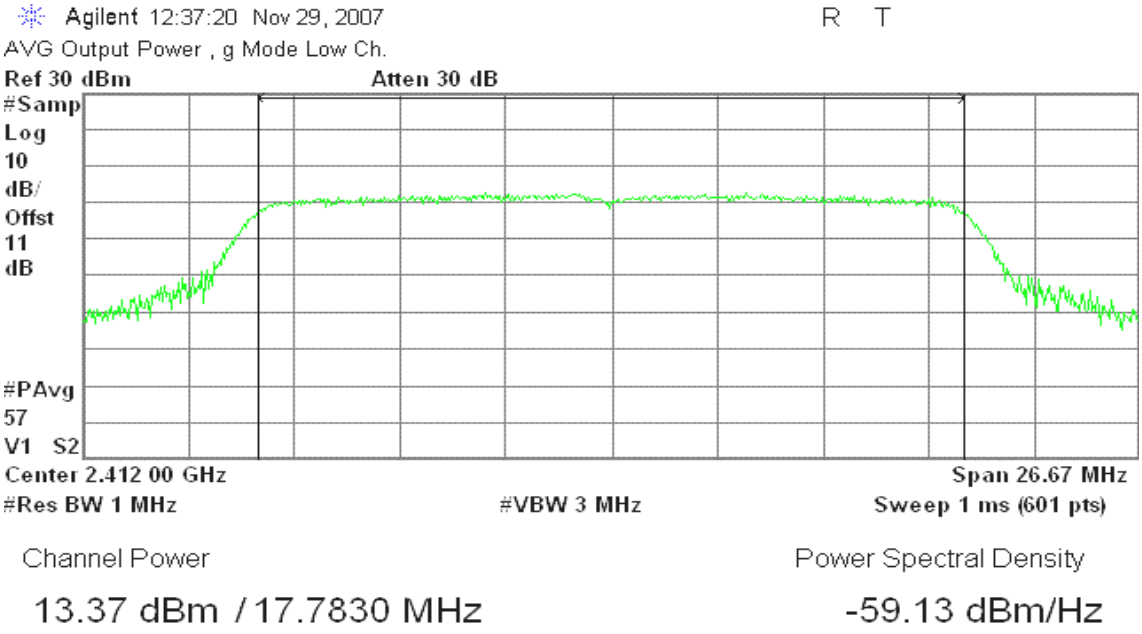


Channel Power
16.46 dBm / 16.6310 MHz

Power Spectral Density
-55.75 dBm/Hz

draft 802.11n Standard-20 MHz Channel mode / Chain 0

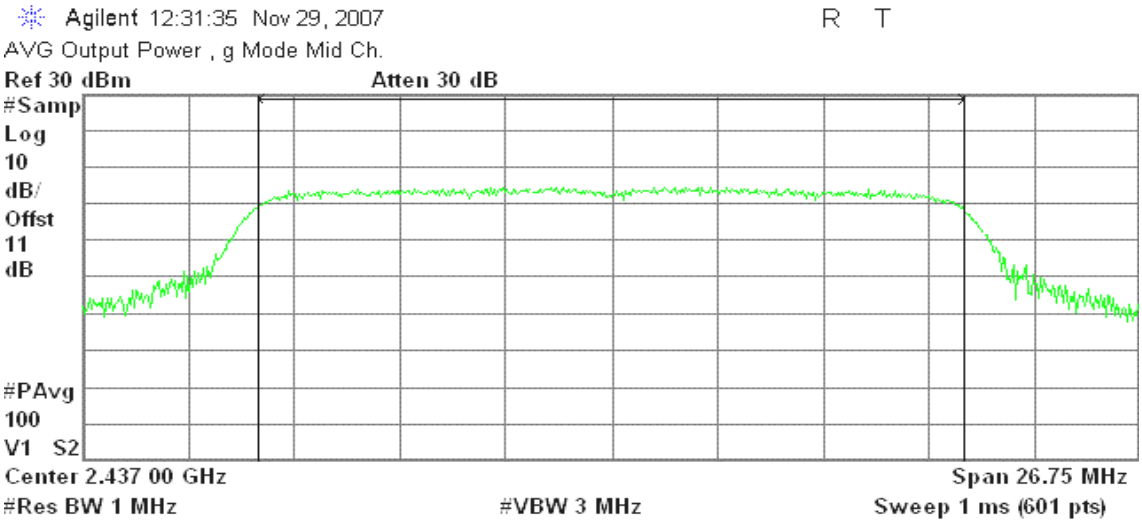
Average Power (CH Low)



Channel Power
13.37 dBm / 17.7830 MHz

Power Spectral Density
-59.13 dBm/Hz

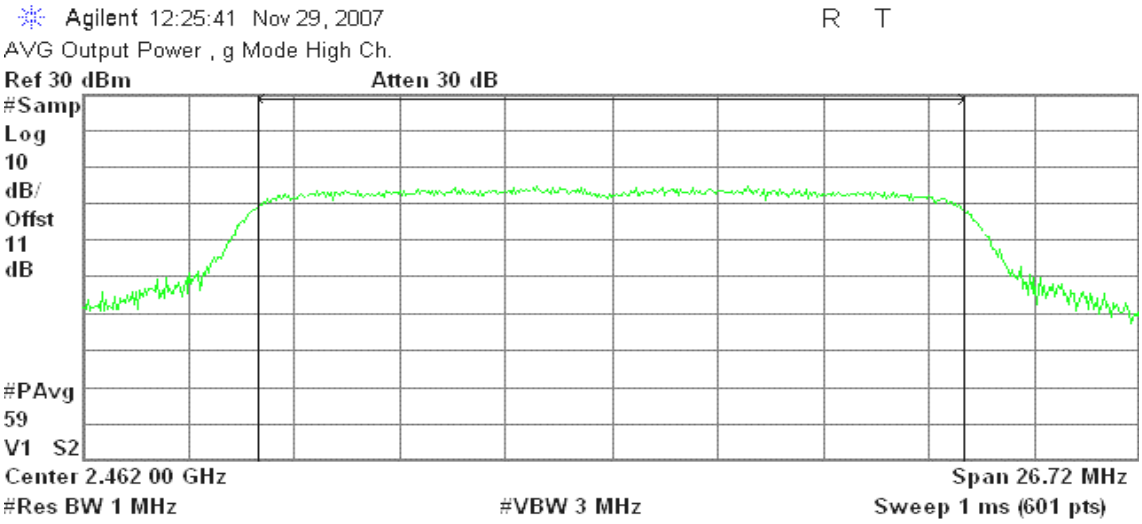
Average Power (CH Mid)



Channel Power
15.70 dBm / 17.8350 MHz

Power Spectral Density
-56.81 dBm/Hz

Average Power (CH High)

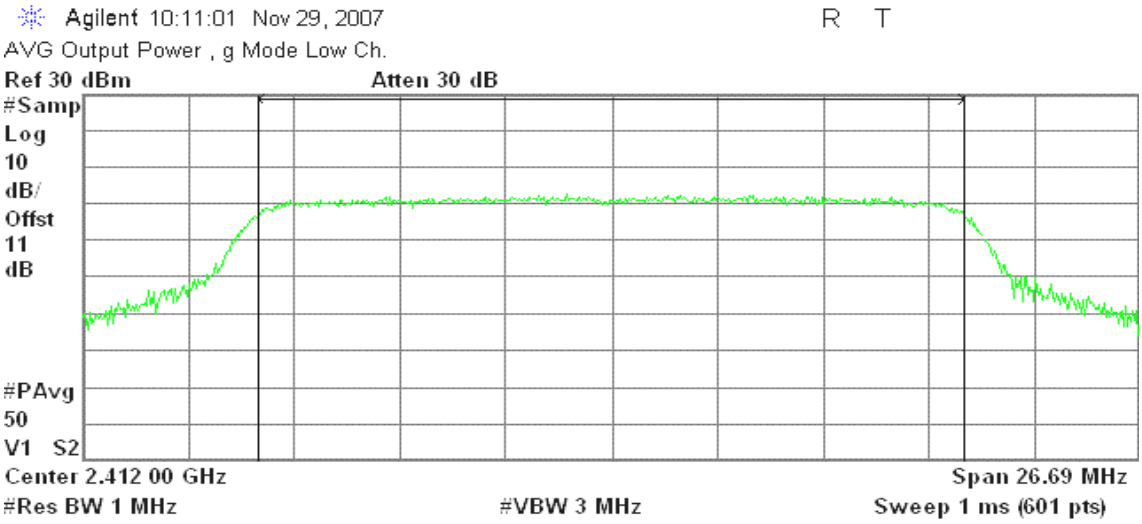


Channel Power
15.32 dBm / 17.8140 MHz

Power Spectral Density
-57.19 dBm/Hz

draft 802.11n Standard-20 MHz Channel mode / Chain 1

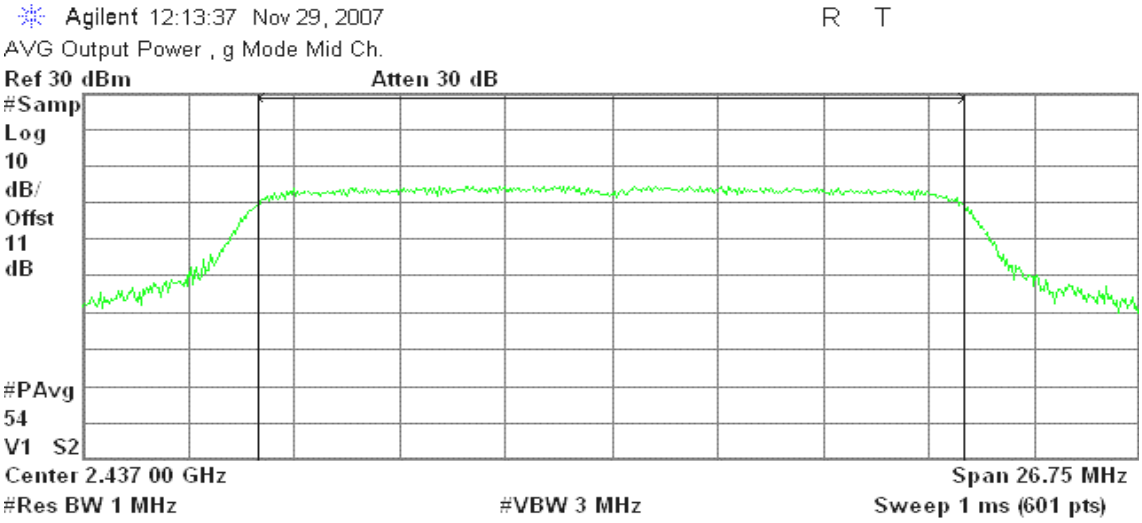
Average Power (CH Low)



Channel Power
13.29 dBm / 17.7910 MHz

Power Spectral Density
-59.21 dBm/Hz

Average Power (CH Mid)



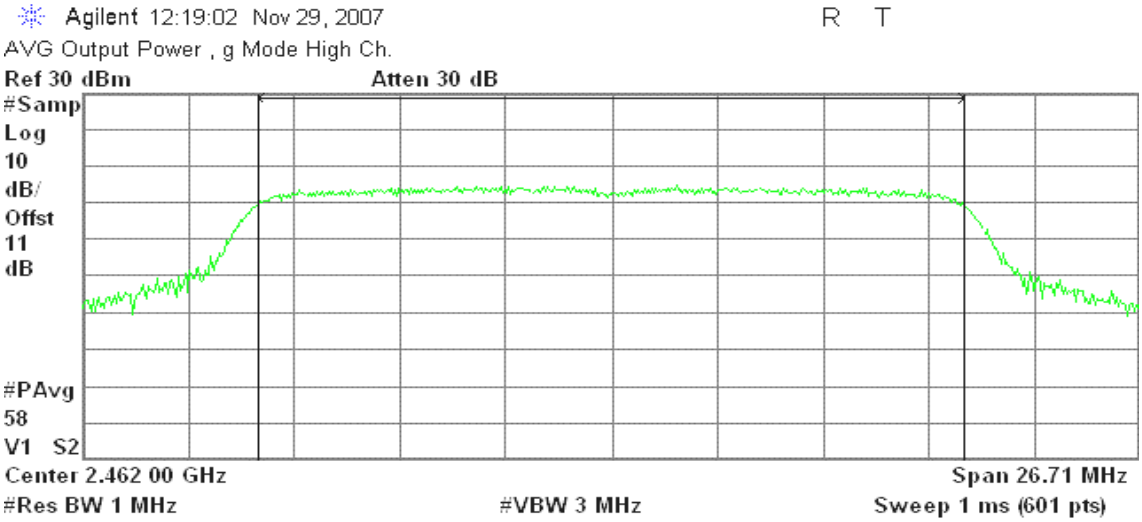
Channel Power

15.77 dBm / 17.8330 MHz

Power Spectral Density

-56.74 dBm/Hz

Average Power (CH High)



Channel Power

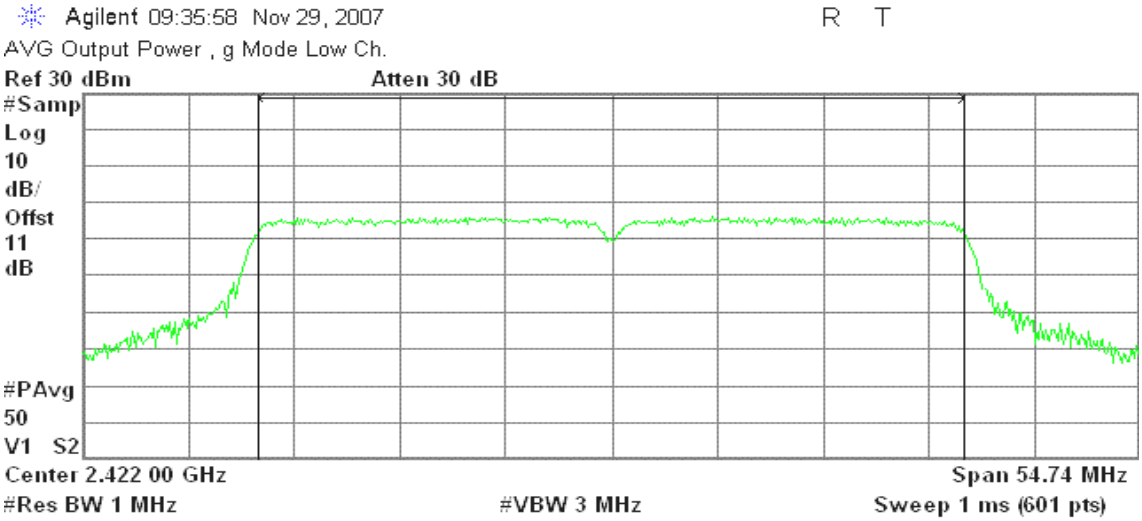
15.82 dBm / 17.8080 MHz

Power Spectral Density

-56.68 dBm/Hz

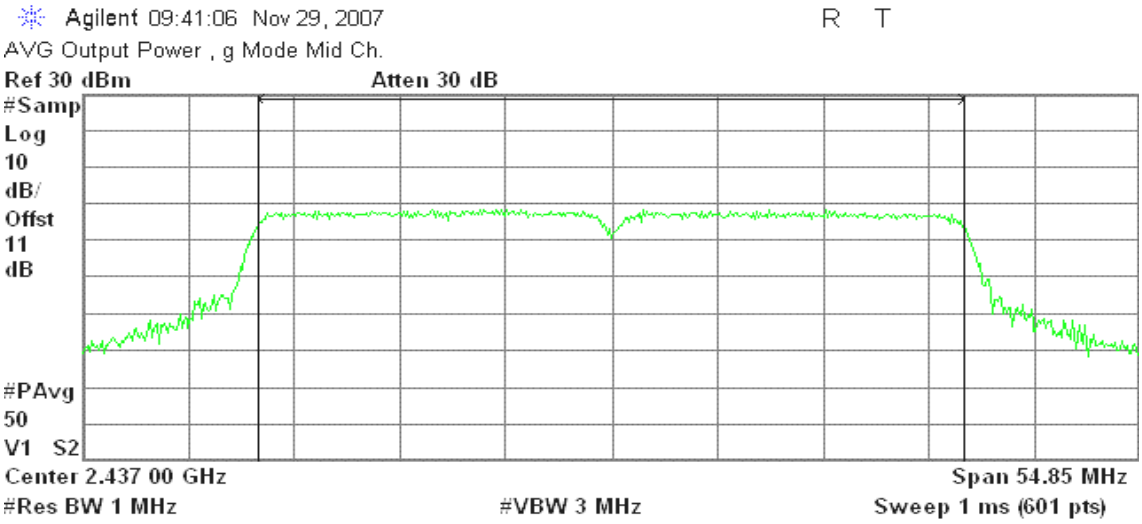
draft 802.11n Wide-40 MHz Channel mode / Chain 0

Average Power (CH Low)



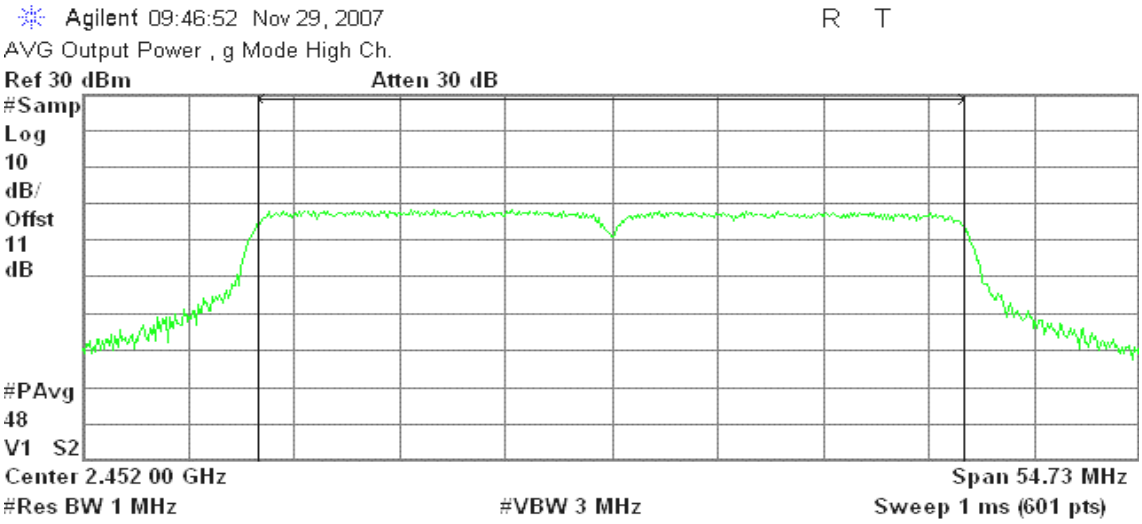
Channel Power	Power Spectral Density
10.33 dBm / 36.4930 MHz	-65.29 dBm/Hz

Average Power (CH Mid)



Channel Power	Power Spectral Density
12.18 dBm / 36.5660 MHz	-63.45 dBm/Hz

Average Power (CH High)

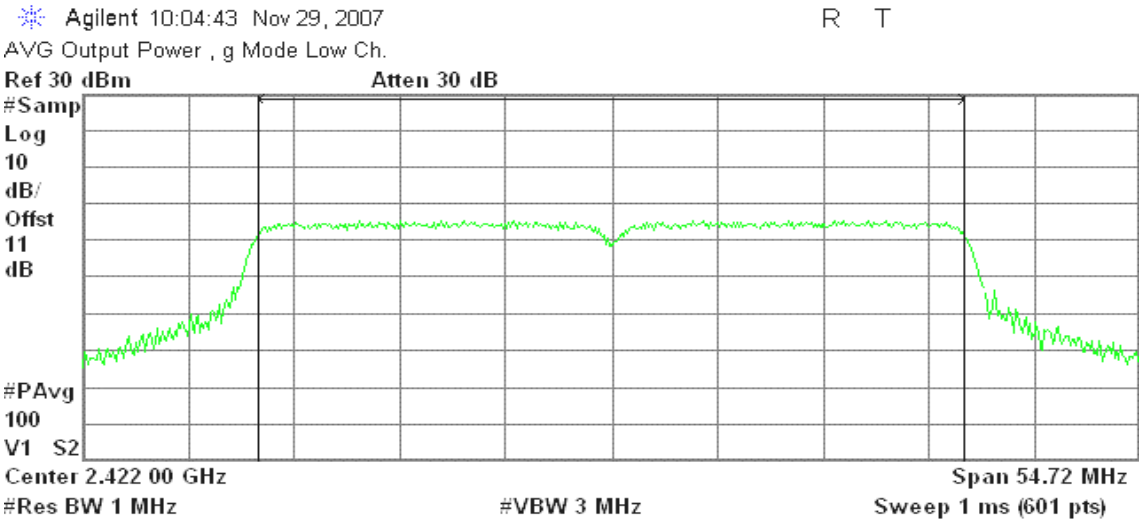


Channel Power
12.80 dBm / 36.4900 MHz

Power Spectral Density
-62.82 dBm/Hz

draft 802.11n Wide-40 MHz Channel mode / Chain 1

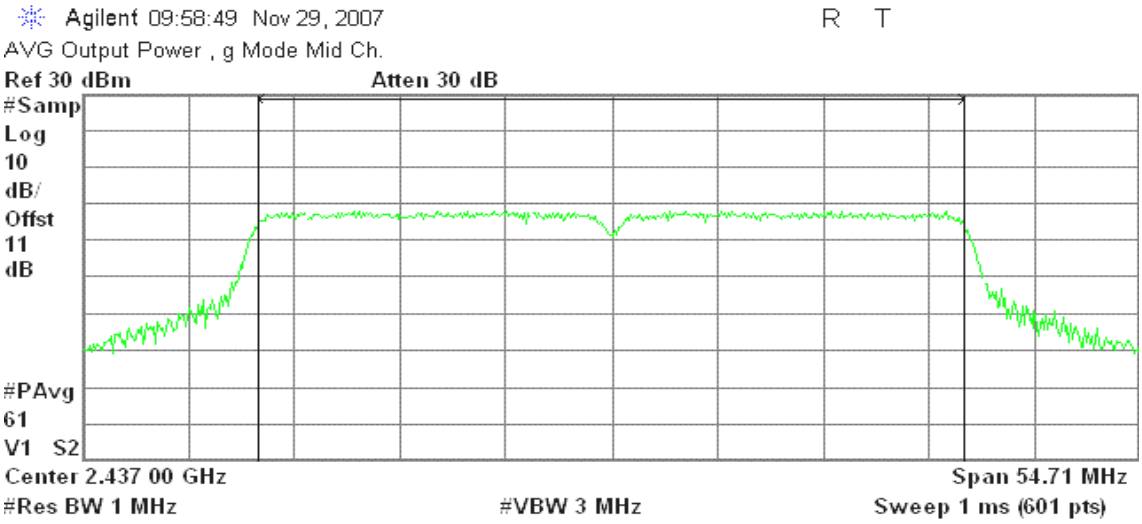
Average Power (CH Low)



Channel Power
9.67 dBm / 36.4830 MHz

Power Spectral Density
-65.95 dBm/Hz

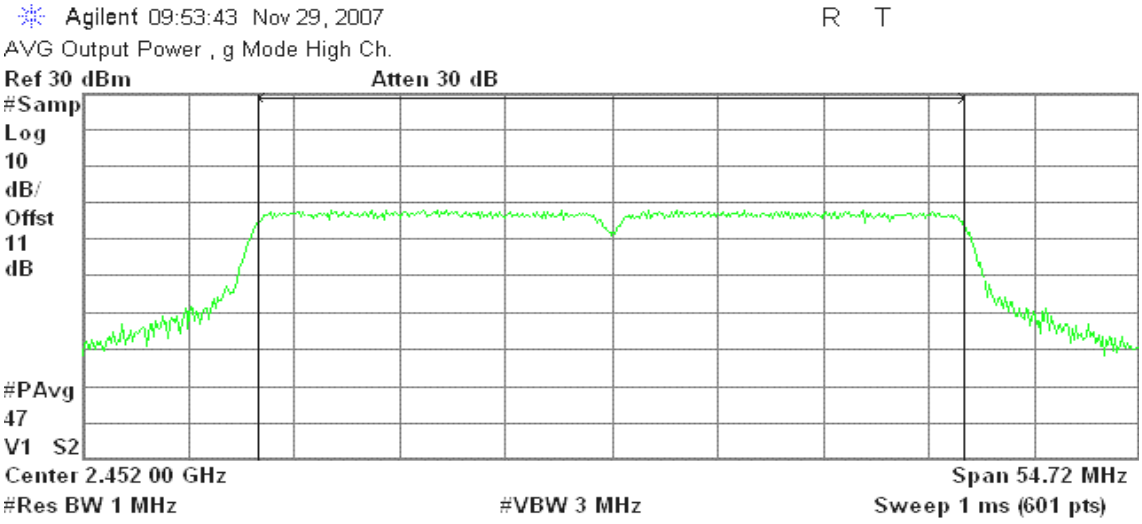
Average Power (CH Mid)



Channel Power
12.26 dBm / 36.4710 MHz

Power Spectral Density
-63.36 dBm/Hz

Average Power (CH High)



Channel Power
12.22 dBm / 36.4780 MHz

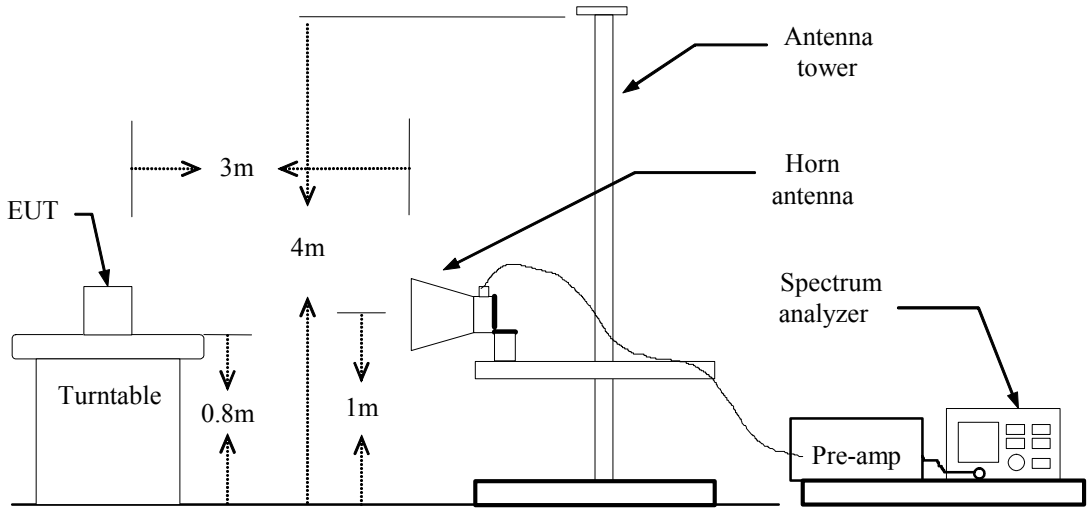
Power Spectral Density
-63.40 dBm/Hz

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

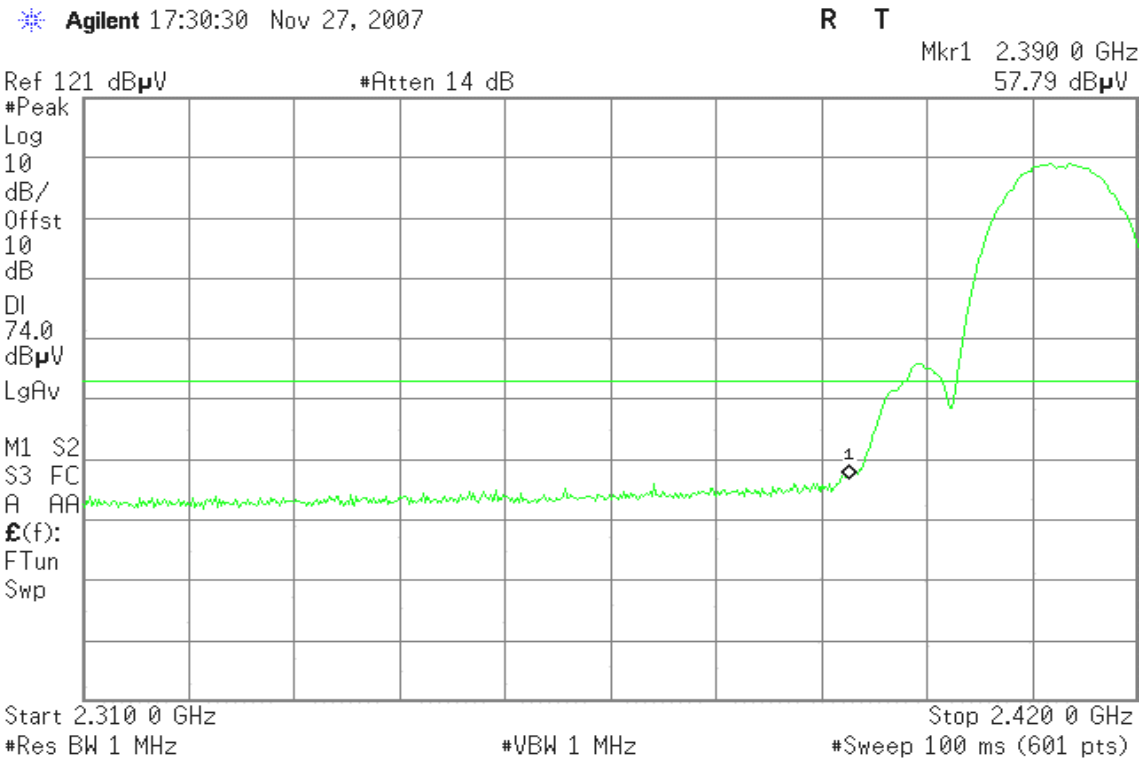
1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the 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=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

TEST RESULTS

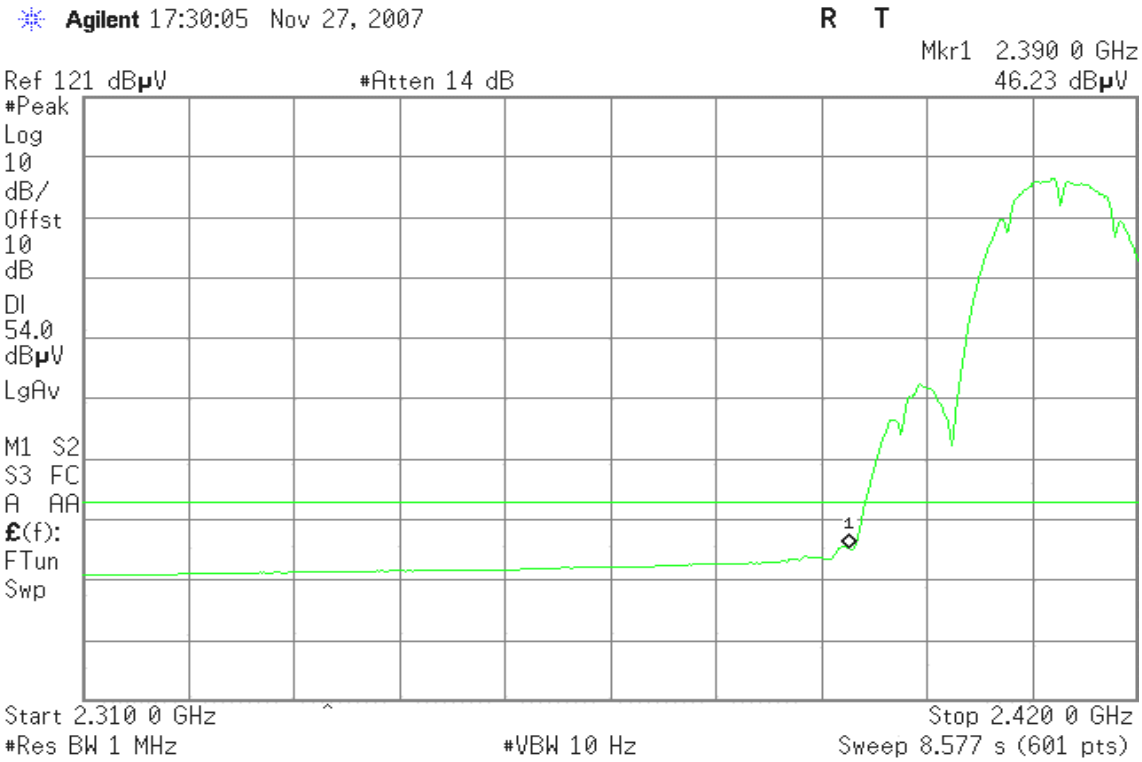
Refer to attach spectrum analyzer data chart.

Band Edges (IEEE 802.11b mode / CH Low)

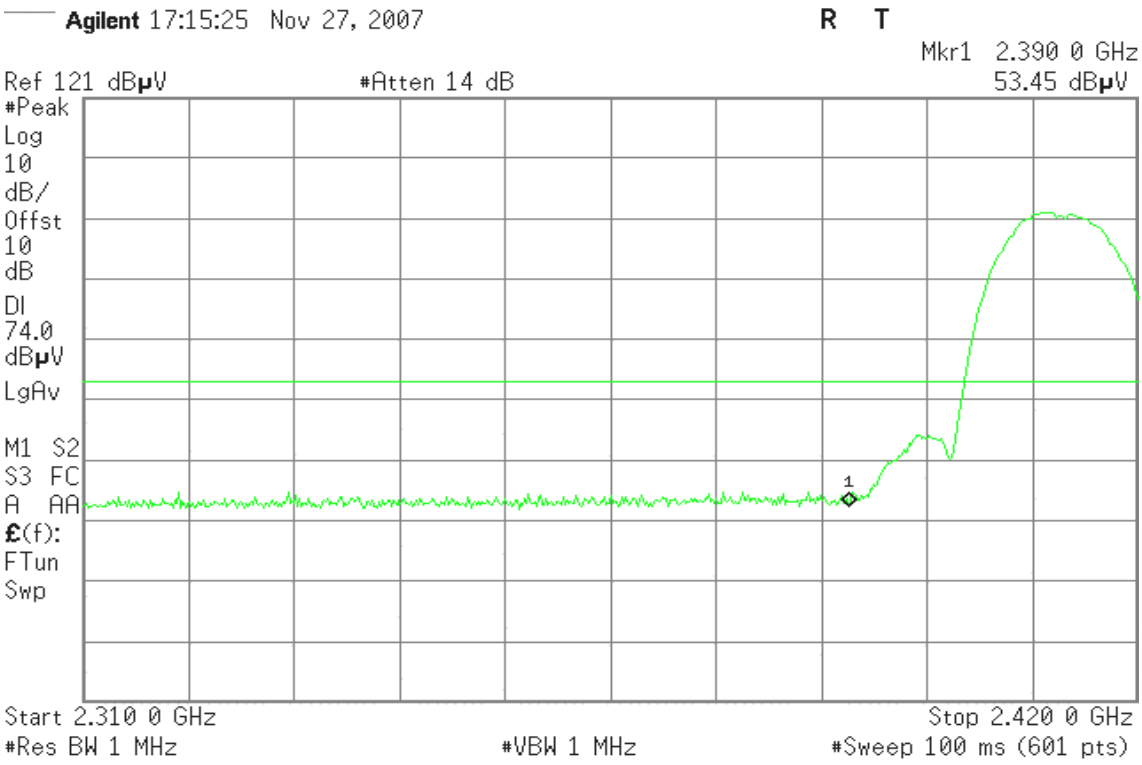
Detector mode: Peak Polarity: Vertical



Detector mode: Average Polarity: Vertical



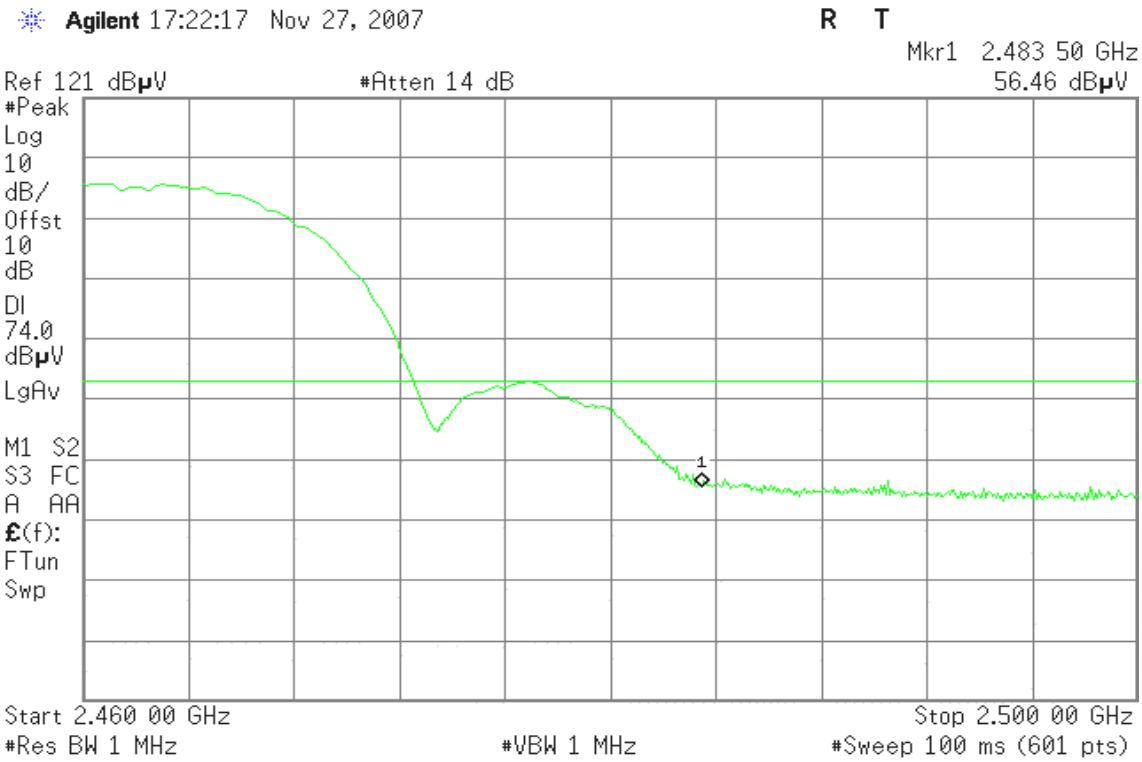
Detector mode: Peak **Polarity: Horizontal**



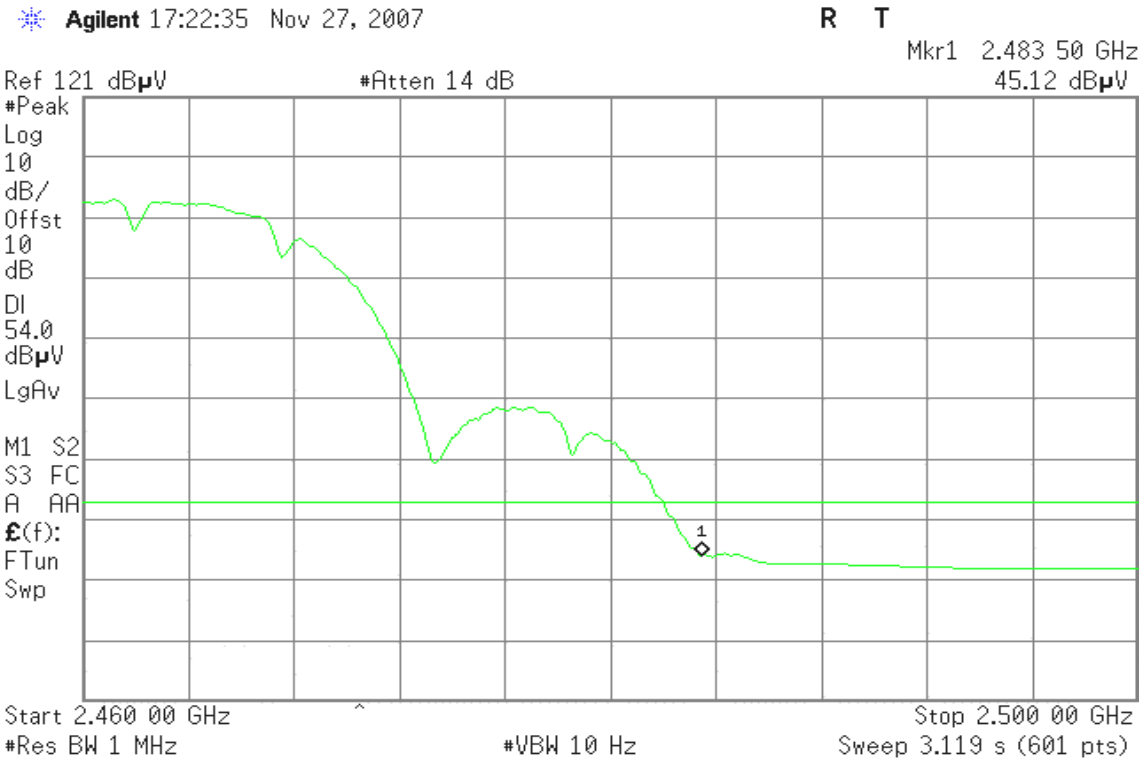
Detector mode: Average **Polarity: Horizontal**

Band Edges (IEEE 802.11b mode / CH High)

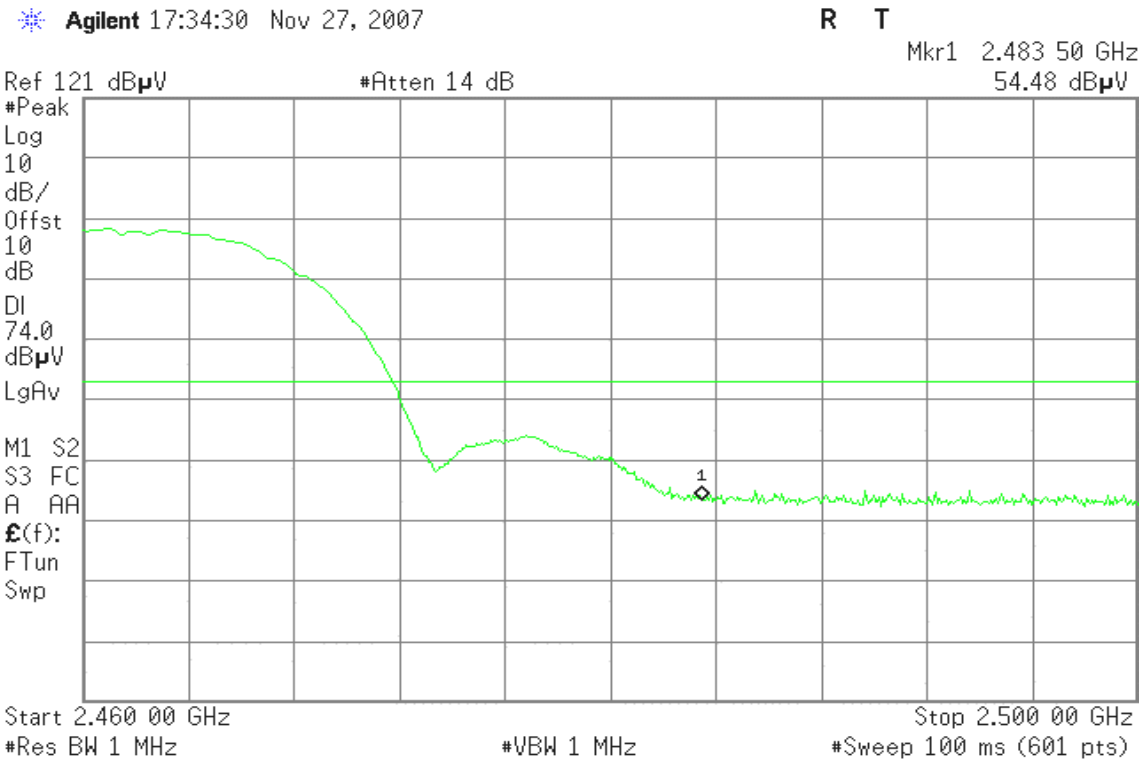
Detector mode: Peak Polarity: Vertical



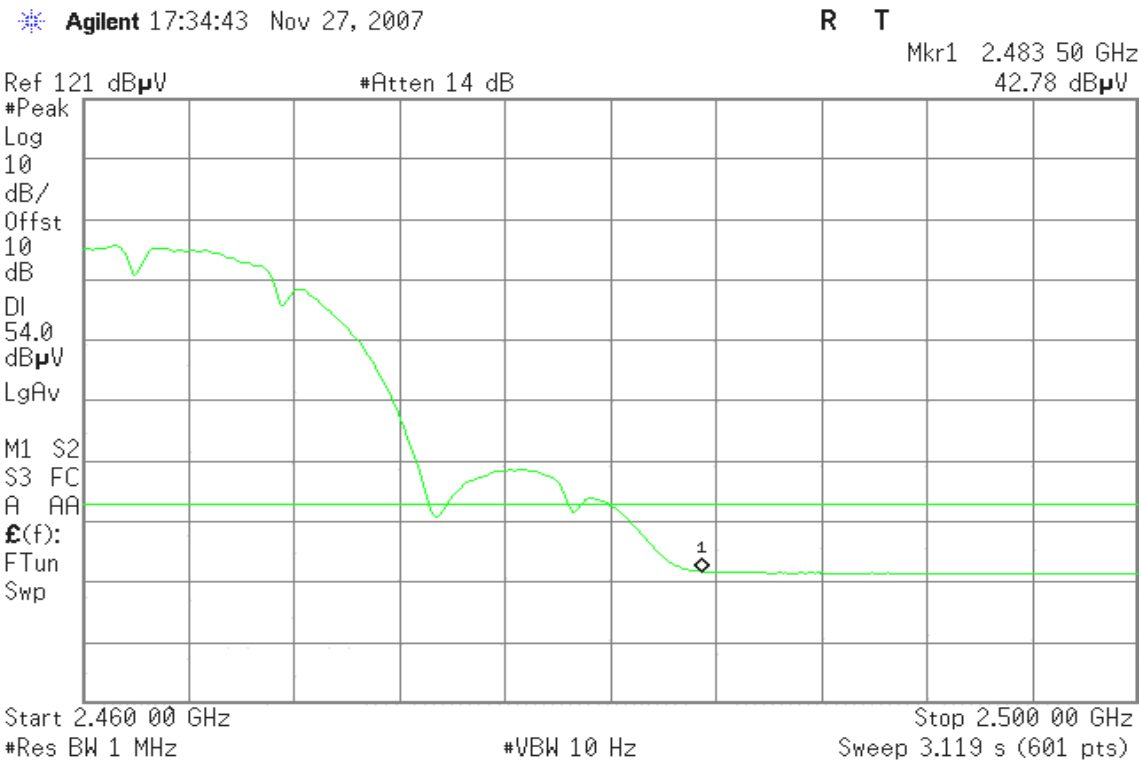
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

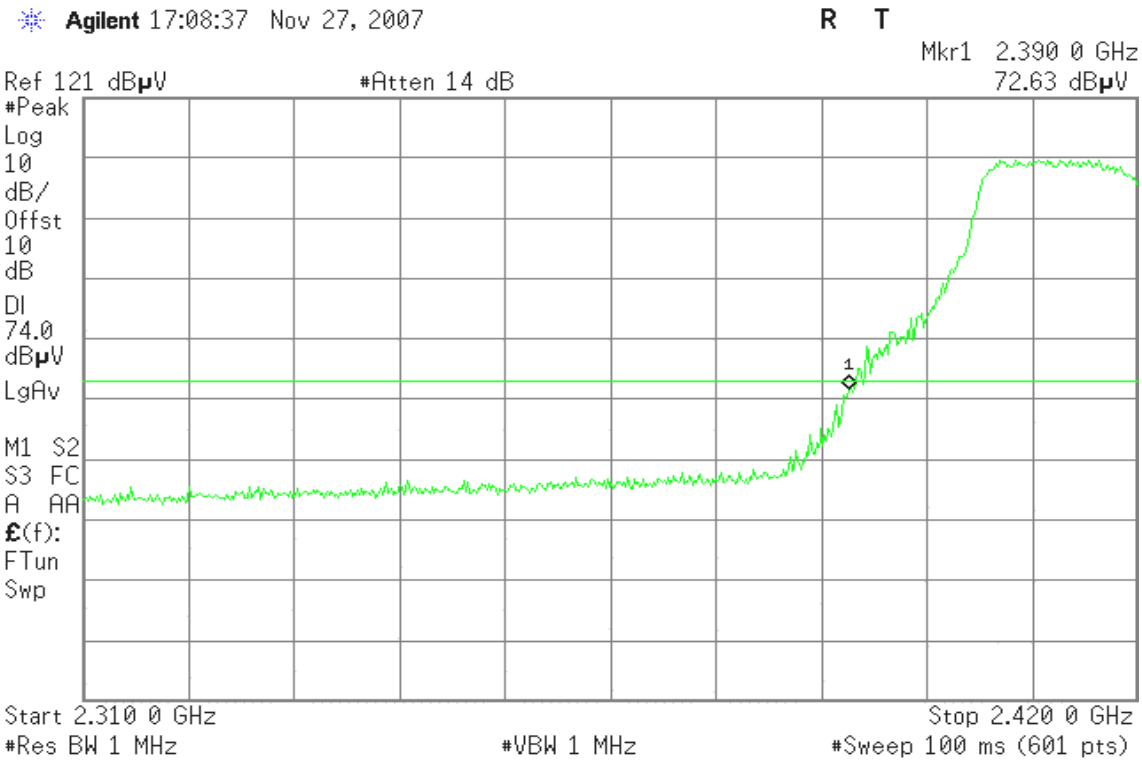


Detector mode: Average **Polarity: Horizontal**

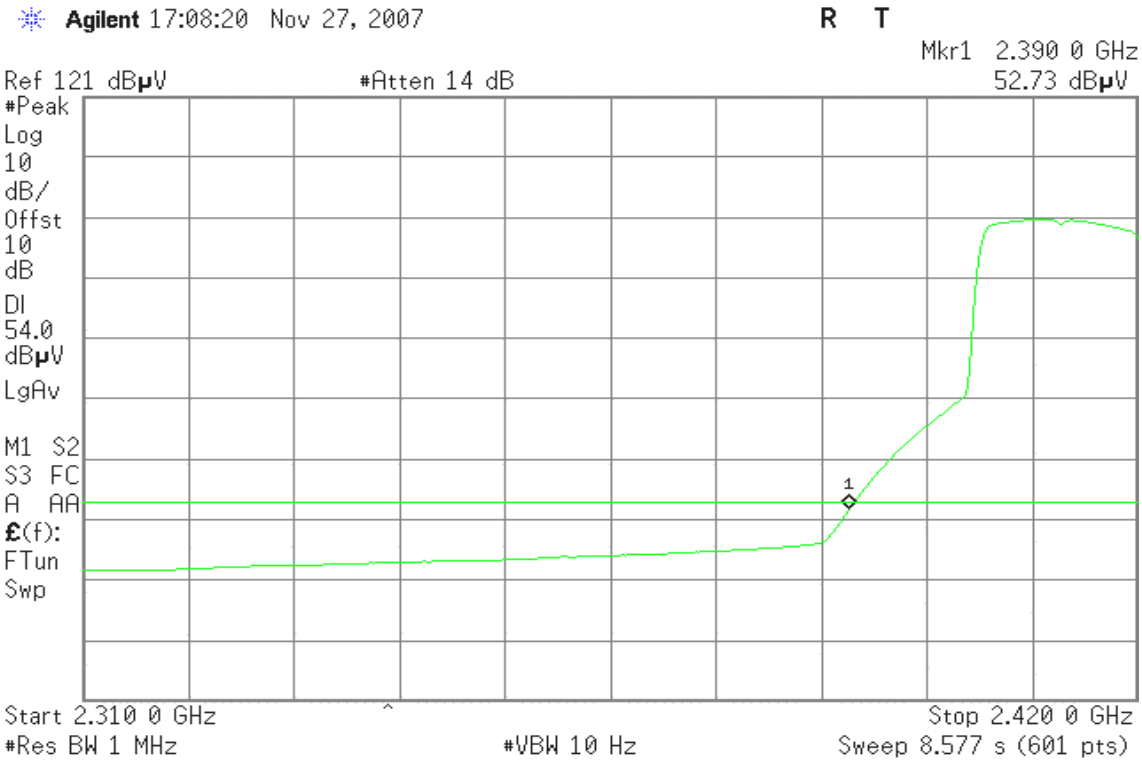


Band Edges (IEEE 802.11g mode / CH Low)

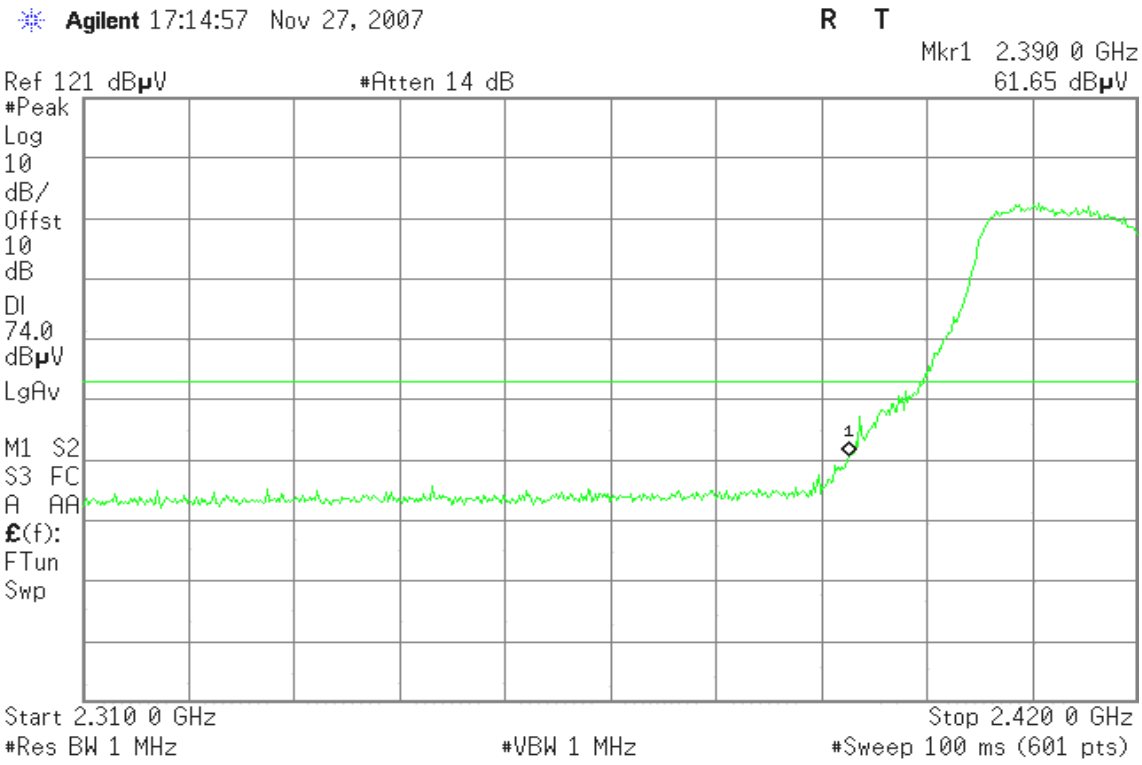
Detector mode: Peak Polarity: Vertical



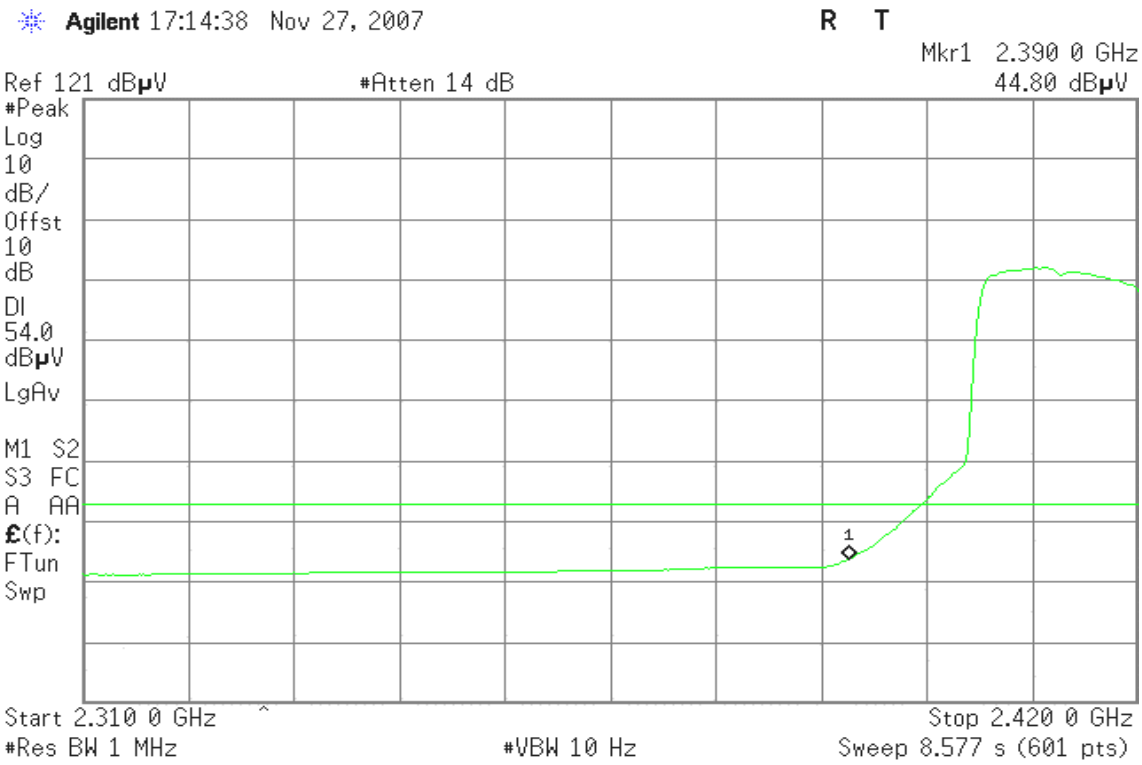
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

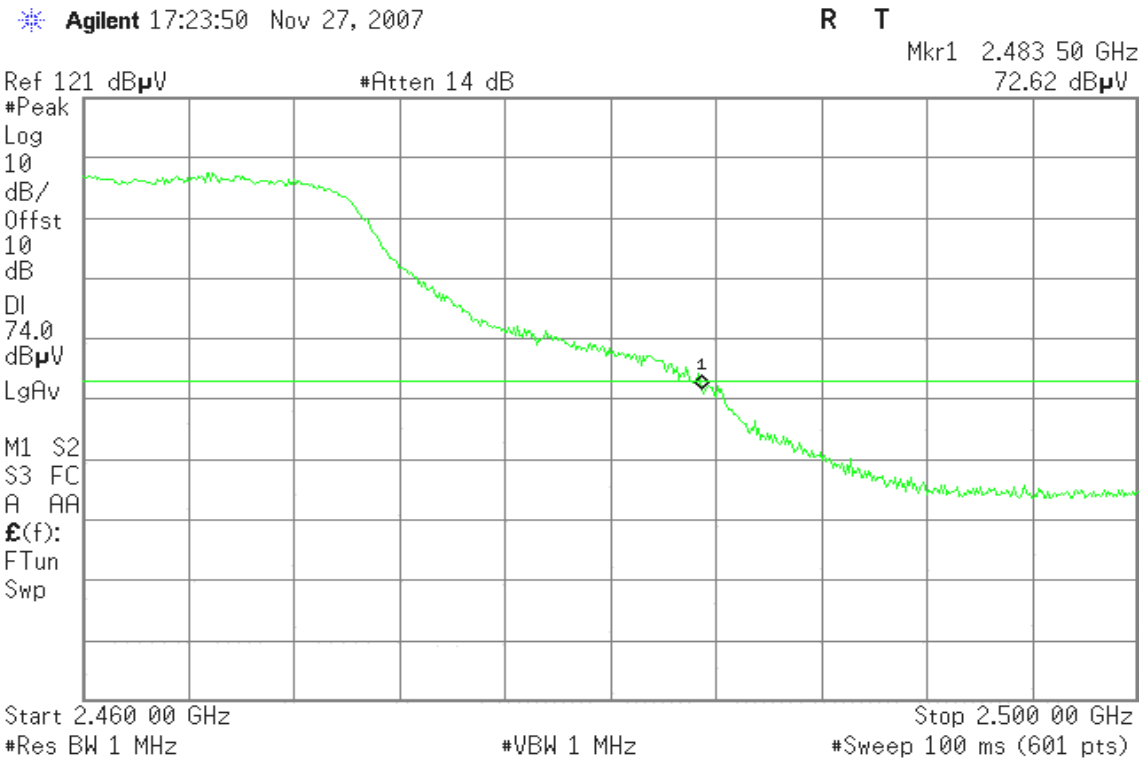


Detector mode: Average **Polarity: Horizontal**

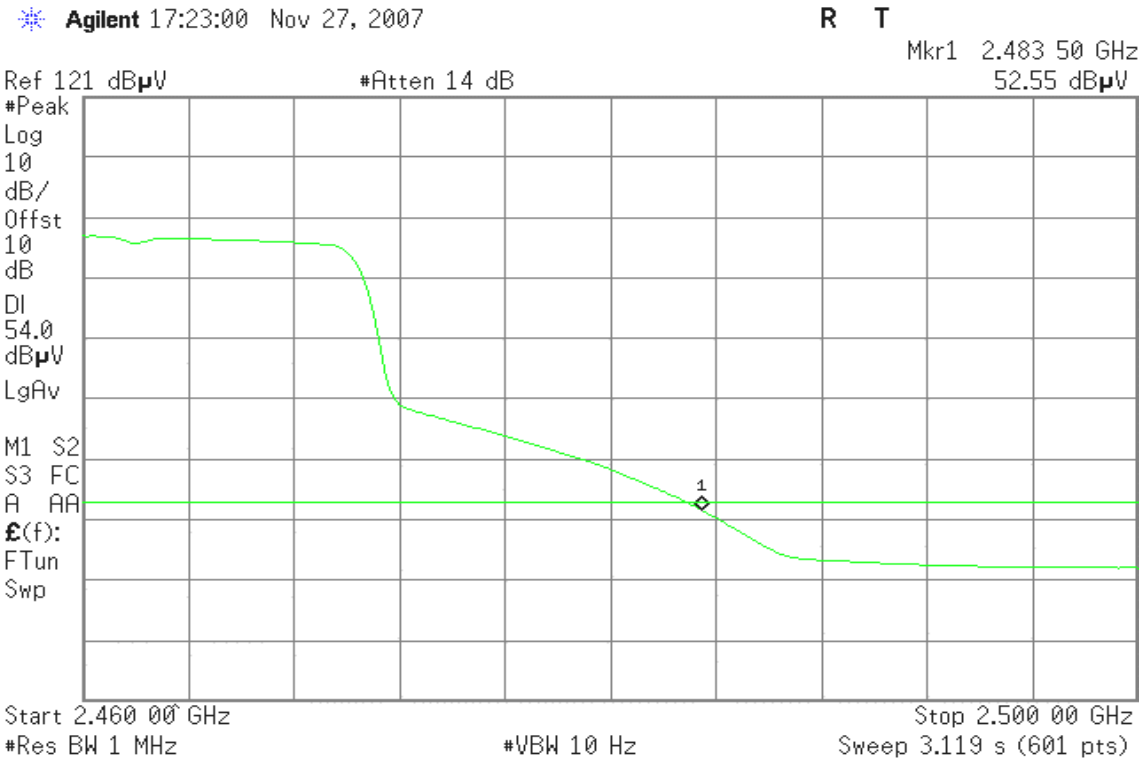


Band Edges (IEEE 802.11g mode / CH High)

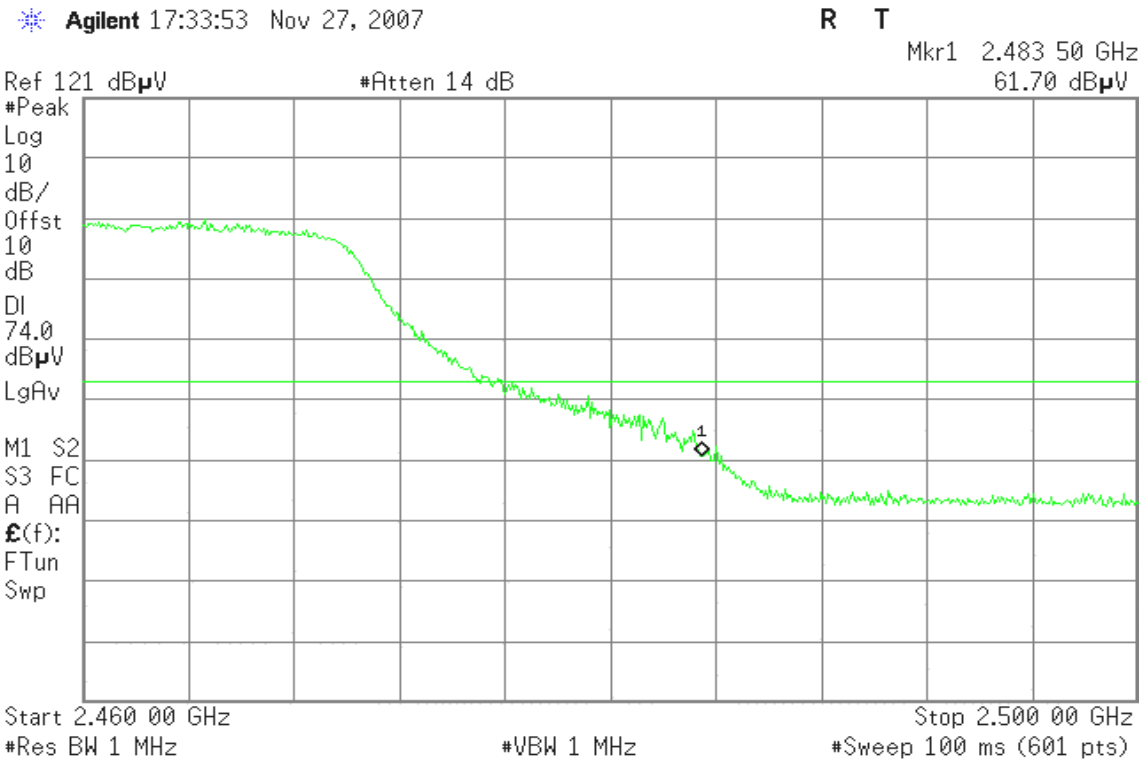
Detector mode: Peak Polarity: Vertical



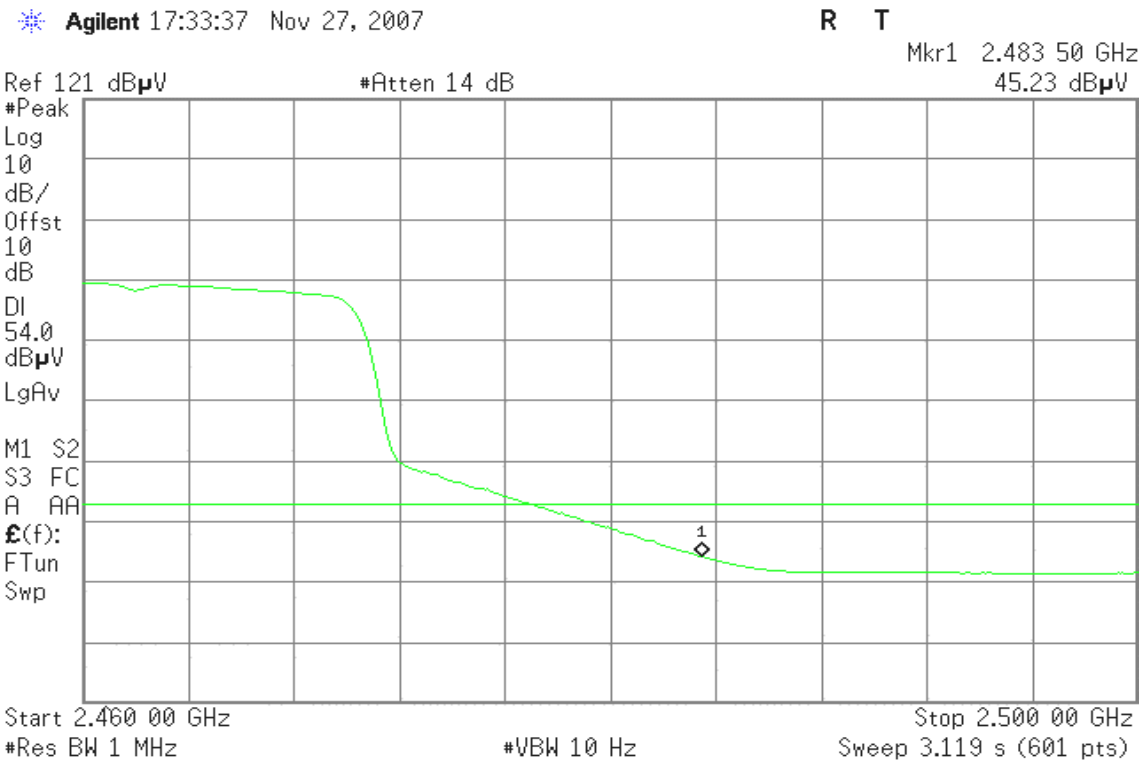
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

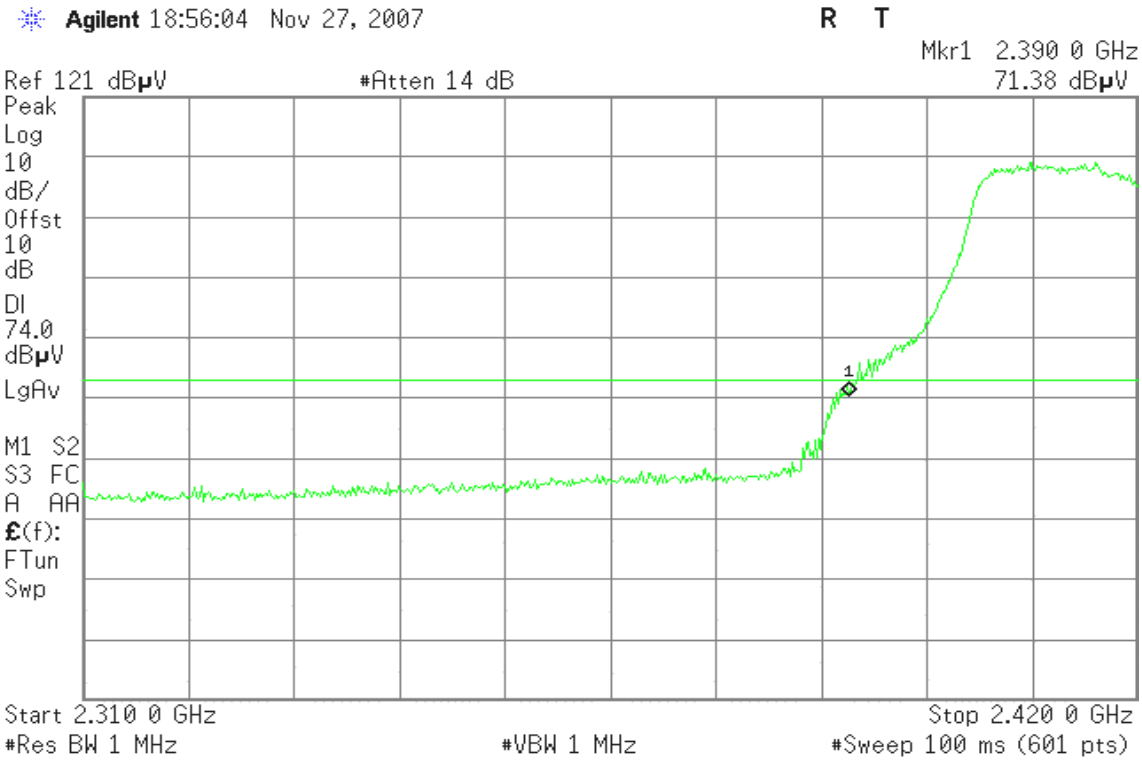


Detector mode: Average **Polarity: Horizontal**

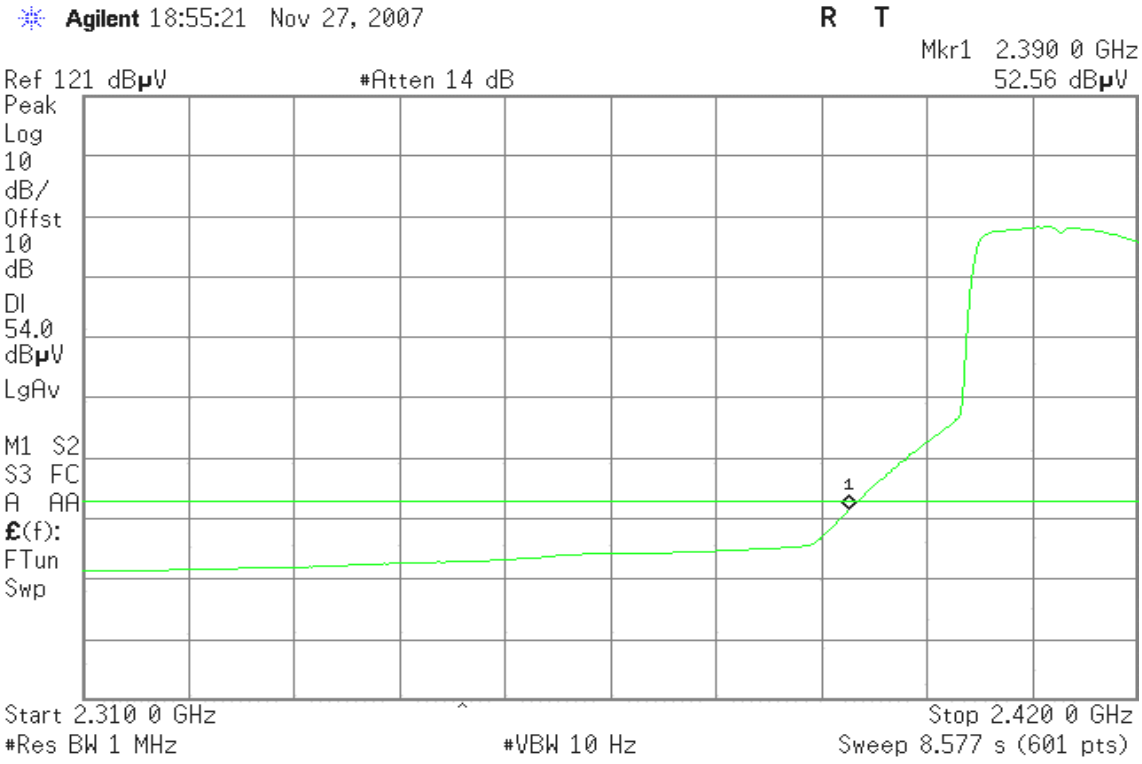


Band Edges (draft 802.11n Standard-20 MHz Channel mode / CH Low)

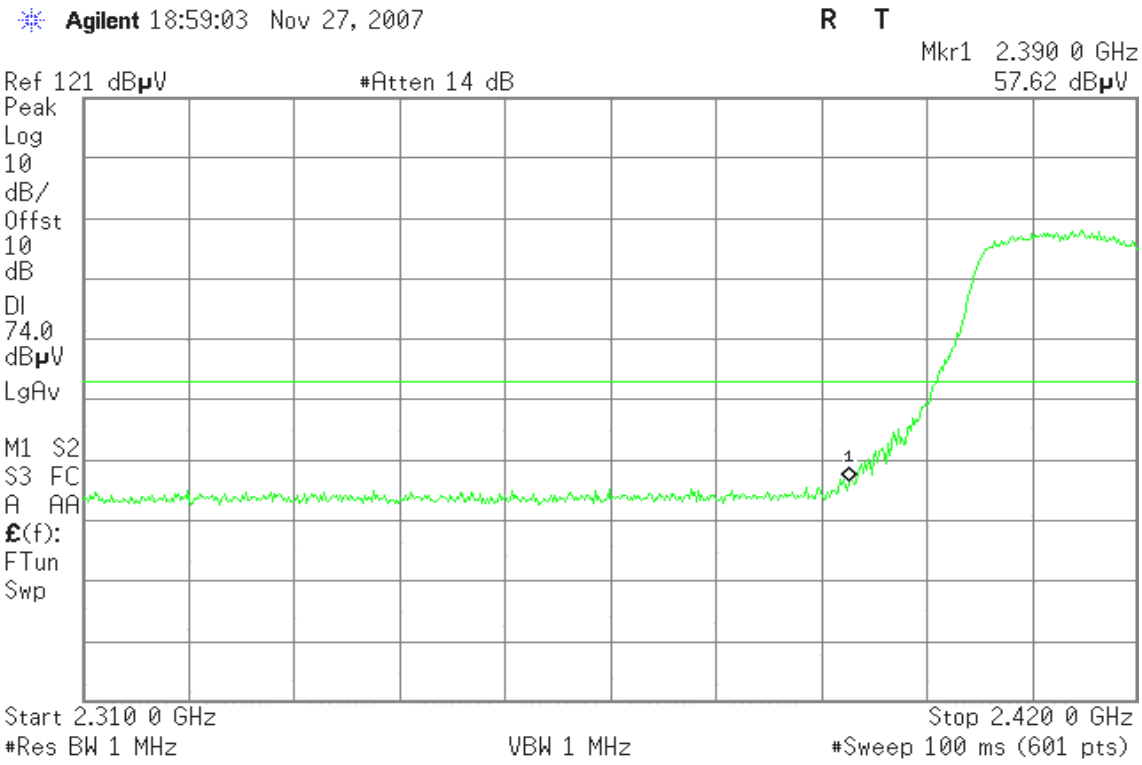
Detector mode: Peak **Polarity: Vertical**



Detector mode: Average **Polarity: Vertical**



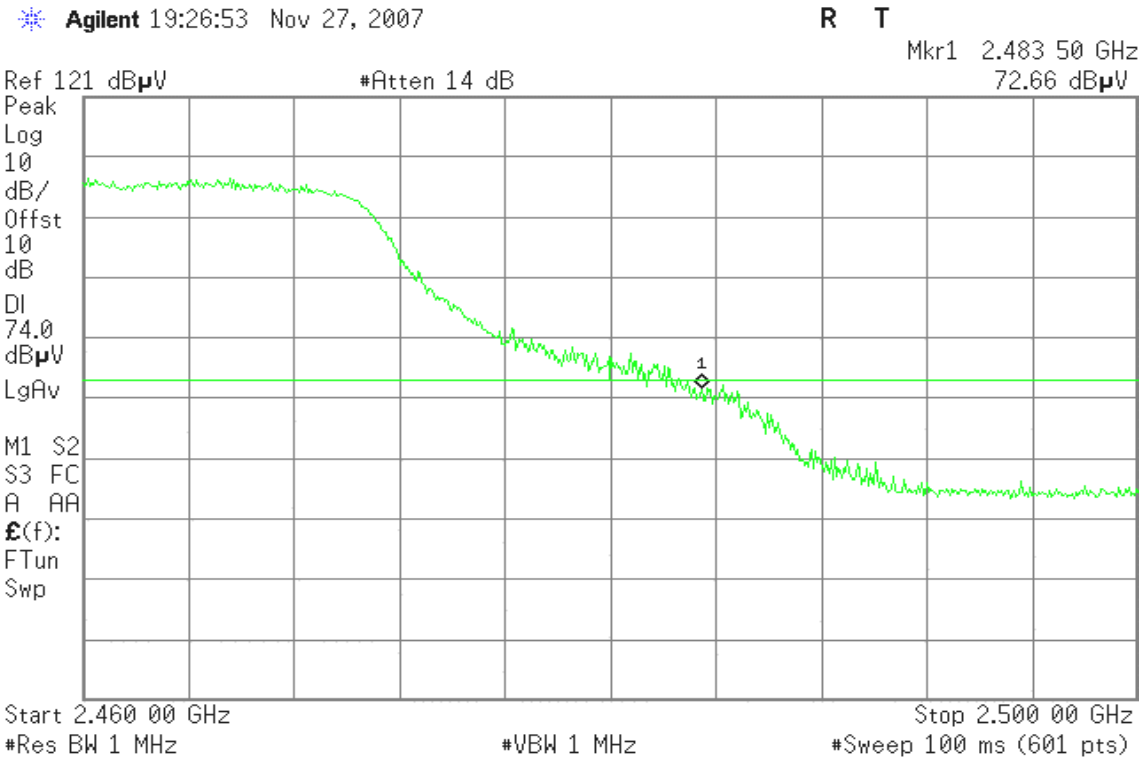
Detector mode: Peak **Polarity: Horizontal**



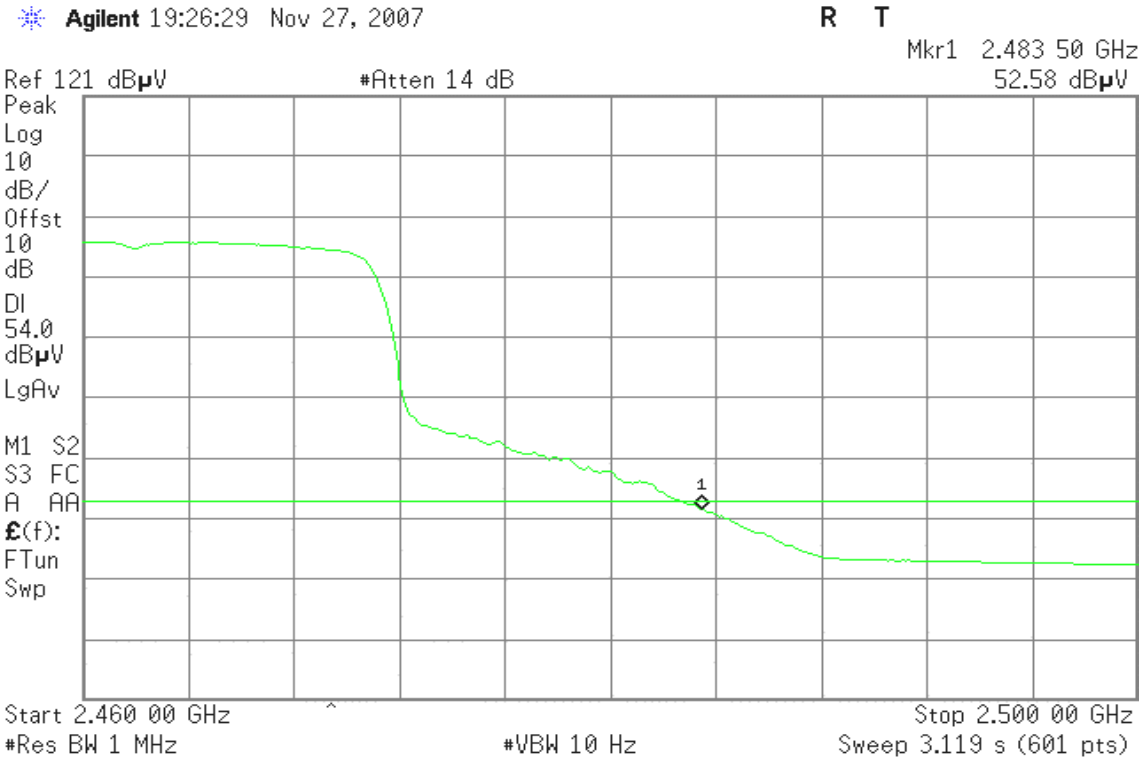
Detector mode: Average **Polarity: Horizontal**

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

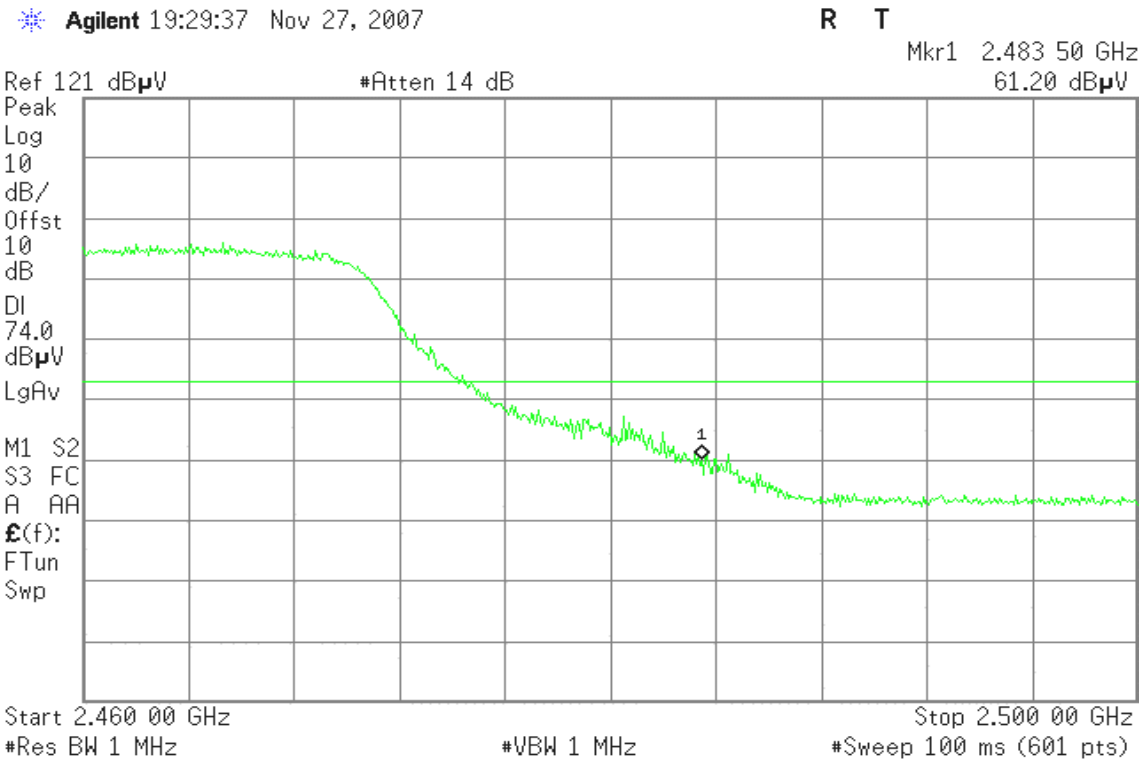
Detector mode: Peak **Polarity: Vertical**



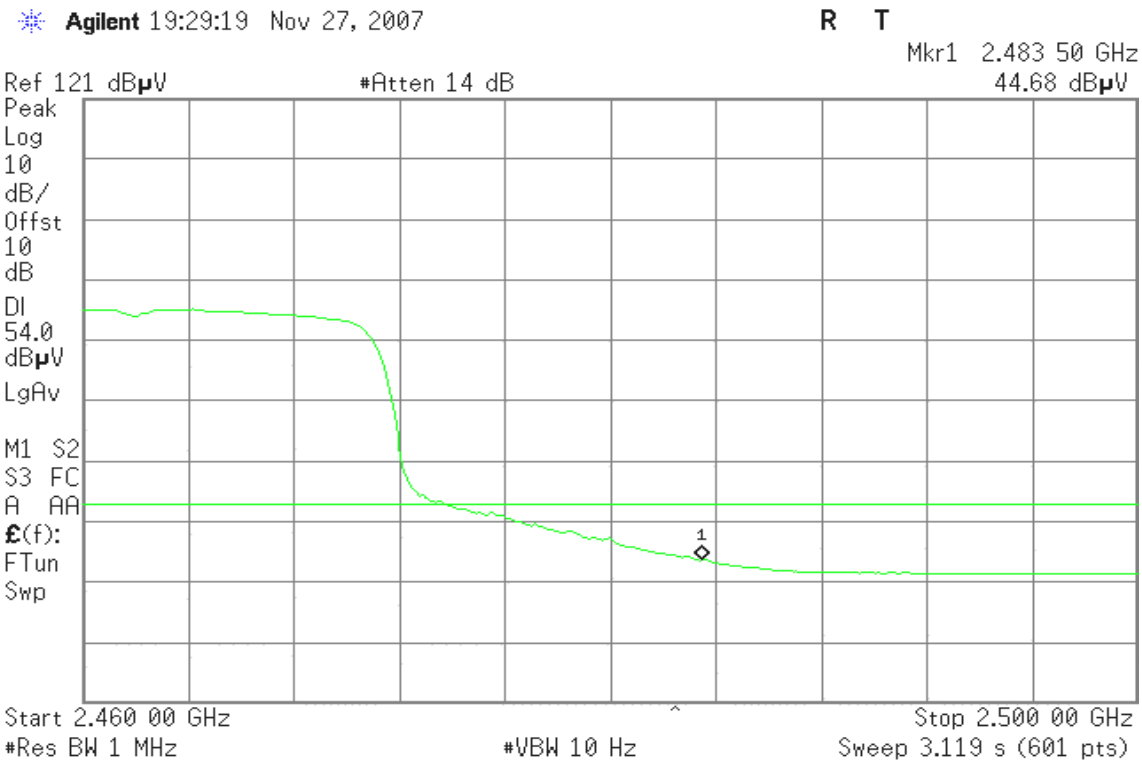
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

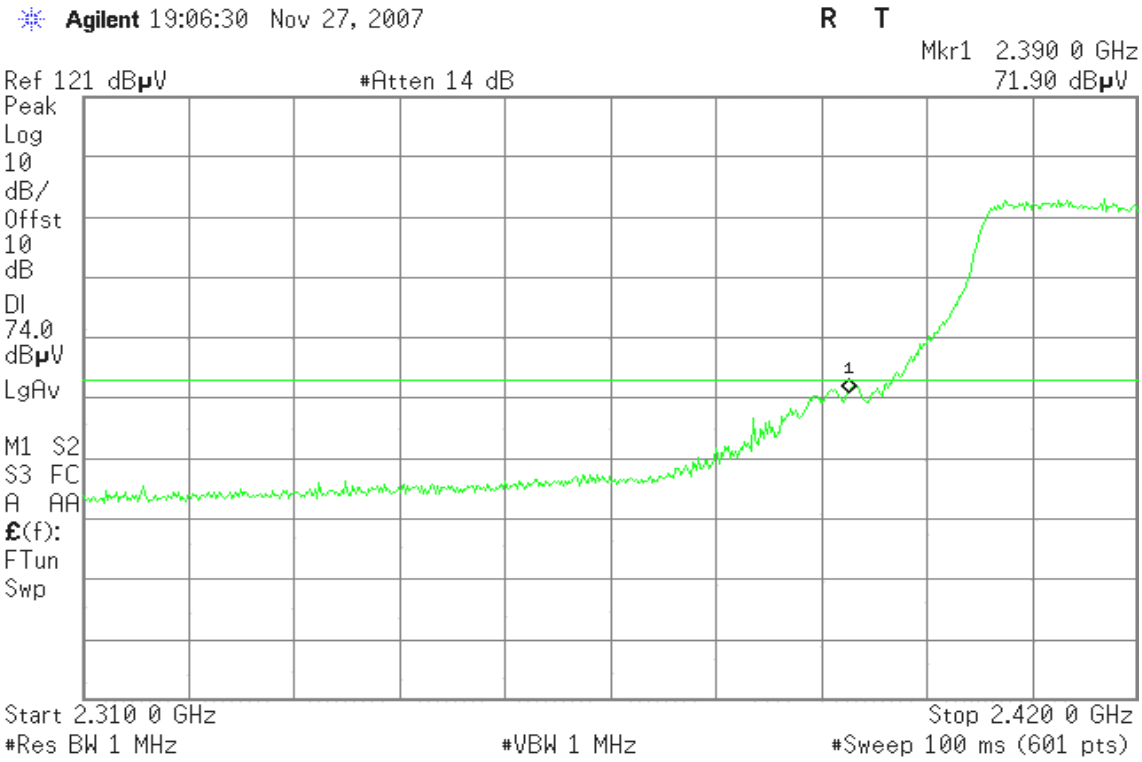


Detector mode: Average **Polarity: Horizontal**

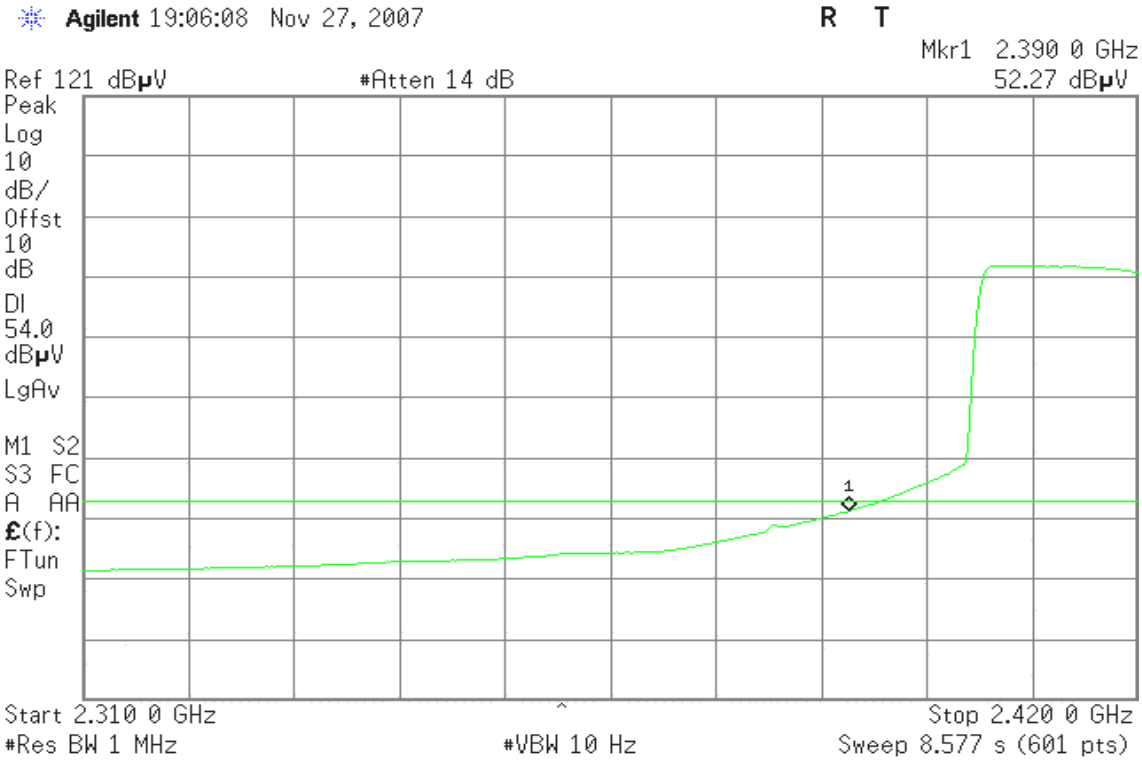


Band Edges (draft 802.11n Wide-40 MHz Channel mode / CH Low)

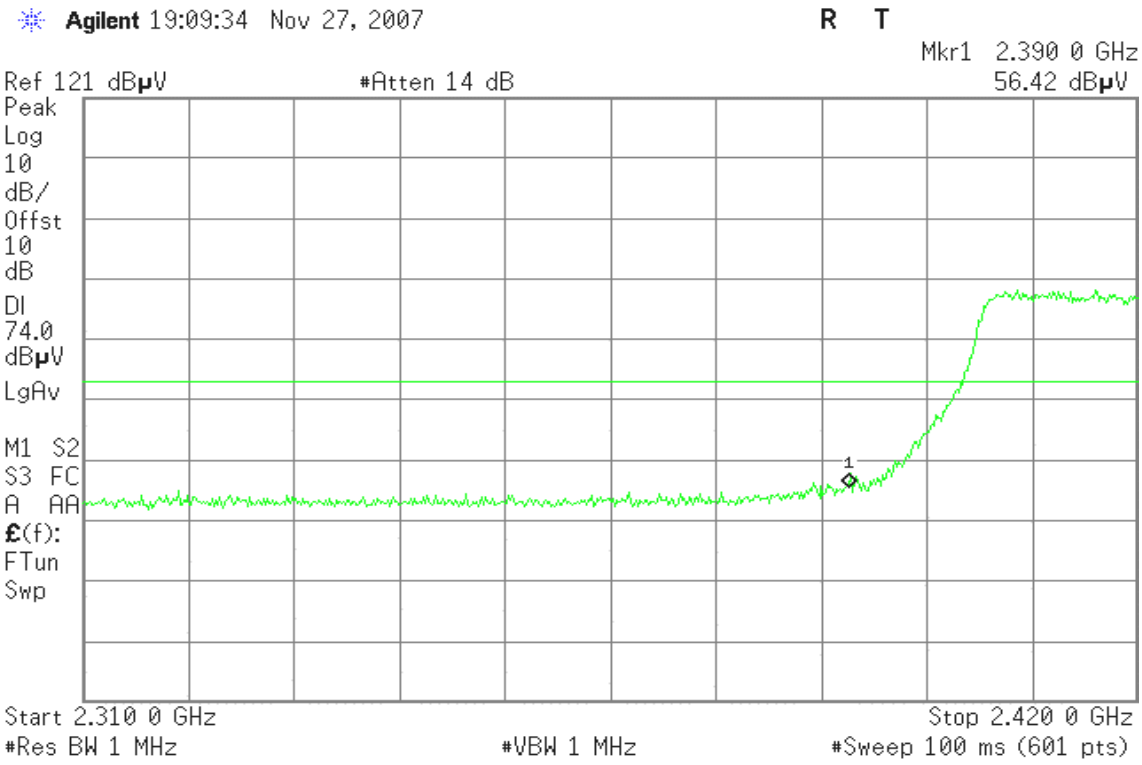
Detector mode: Peak **Polarity: Vertical**



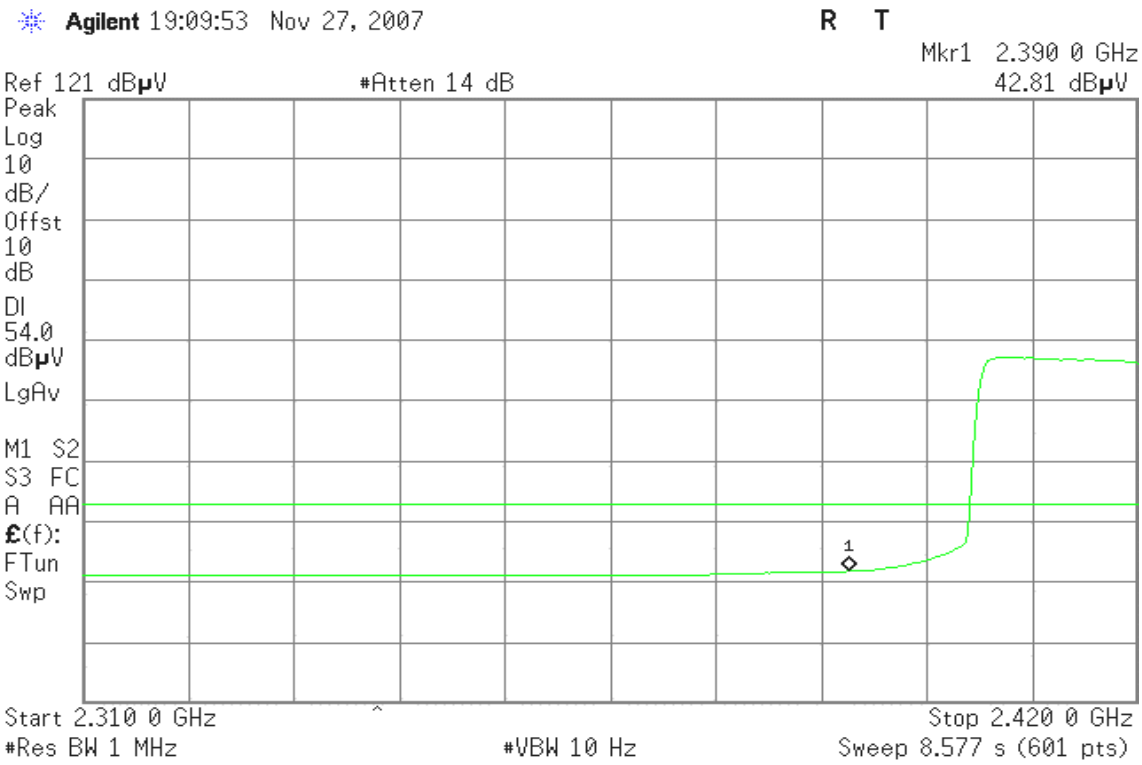
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

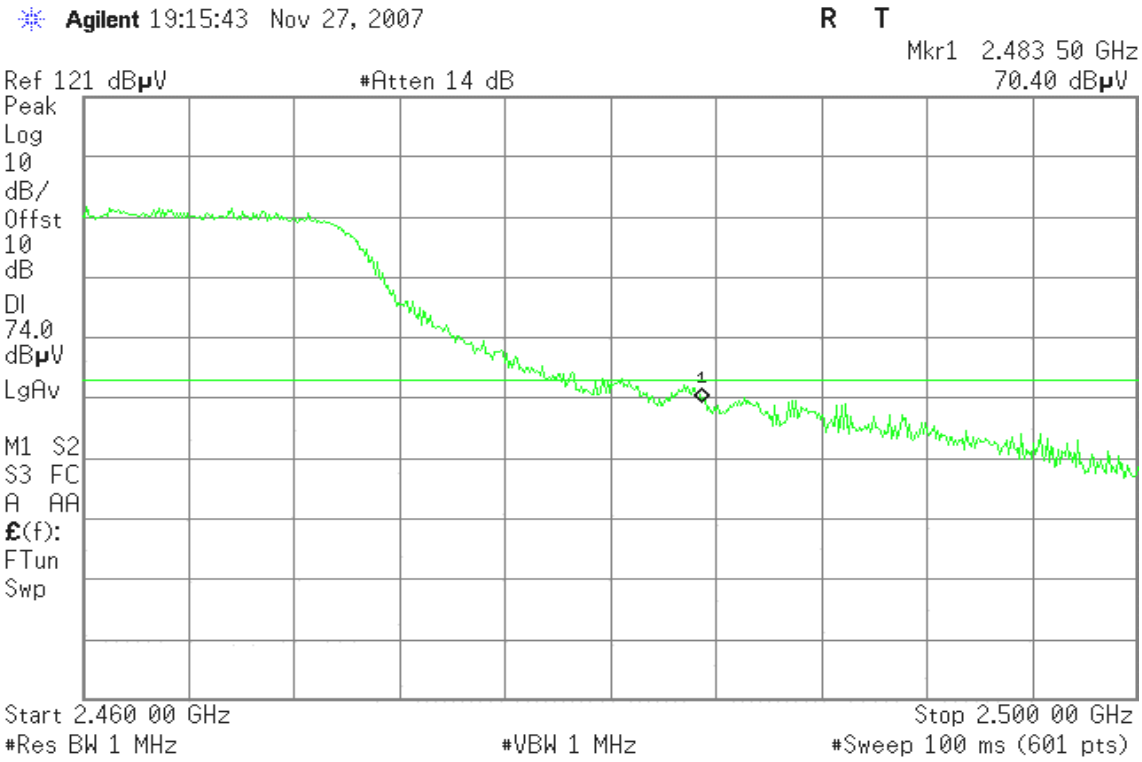


Detector mode: Average **Polarity: Horizontal**

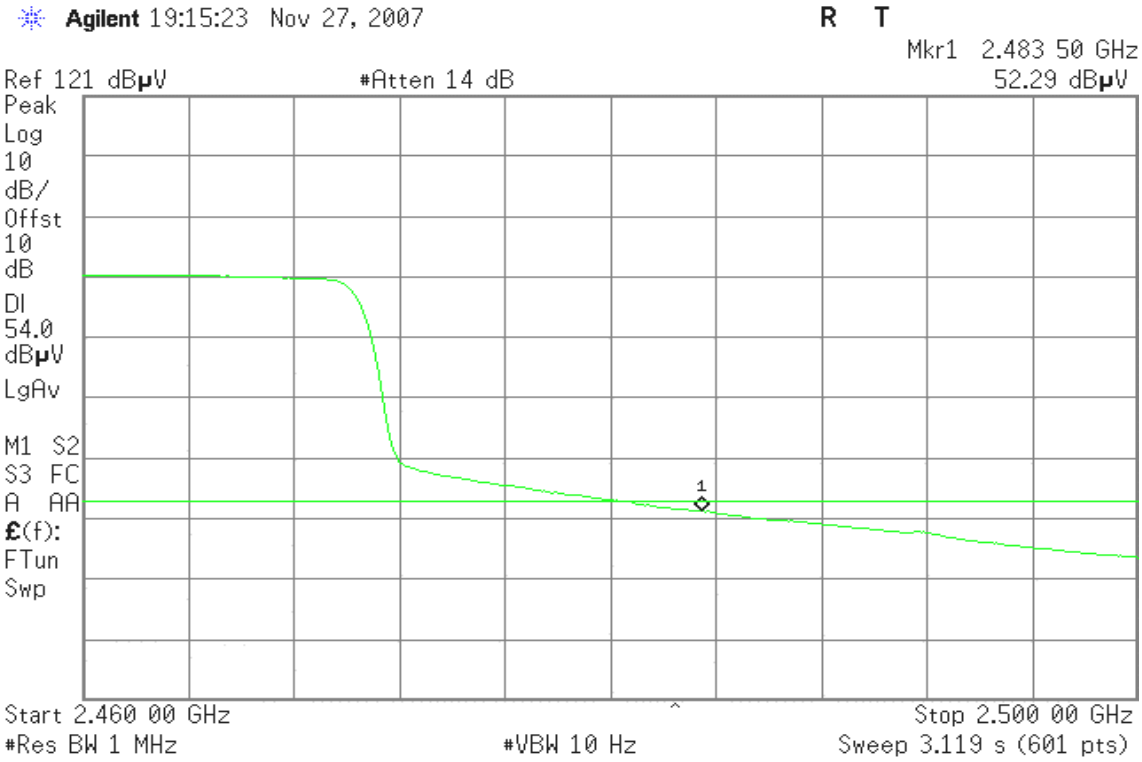


Band Edges (draft 802.11n Wide-40 MHz Channel mode / CH High)

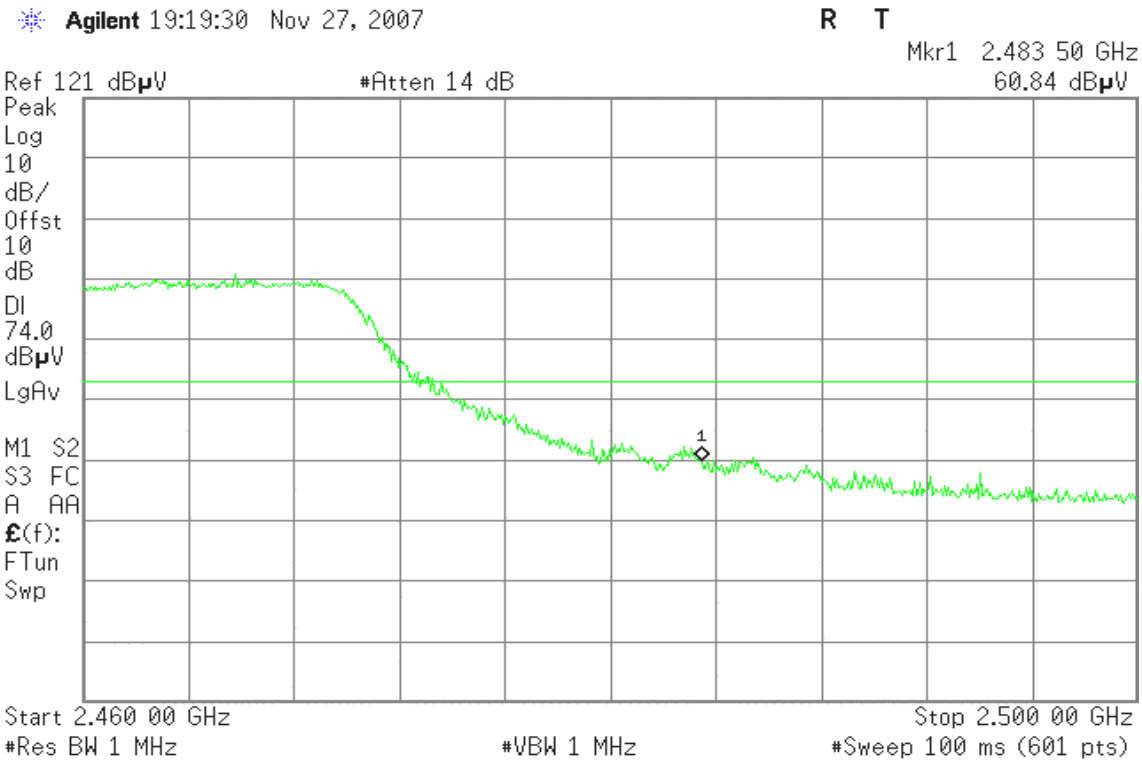
Detector mode: Peak **Polarity: Vertical**



Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**