FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

802.11b/g WiFi Module

Model: TYPE III

Trade Name: Airspan

Issued to

DELTA NETWORKS, INC.
252, Shang Ying Road, Kuei San Industrial Park,
Taoyuan Shien 33341,Taiwan, R.O.C.

Issued by

Compliance Certification Services Inc.
No. 81-1, Lane 210, Bade Rd. 2, Luchu Hsiang,
Taoyuan Hsien, (338) Taiwan, R.O.C.
http://www.ccsemc.com.tw
service@tw.ccsemc.com

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1. TEST RESULT CERTIFICATION

Applicant: DELTA NETWORKS, INC.
252, Shang Ying Road, Kuei San Industrial Park,
Taoyuan Shien 33341,Taiwan, R.O.C.

Equipment Under Test: 802.11b/g WiFi Module

Trade Name: Airspan

Model: TYPE III

Date of Test: November 10 ~ 17, 2005

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:

Gavin Lim
Section Manager
Compliance Certification Services Inc.

Reviewed by:

Amanda Wu
Section Manager
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	802.11b/g WiFi Module
Trade Name	Airspan
Model Number	TYPE III
Model Discrepancy	N/A
Power Supply	Model: DV-151A-1 I/P: AC 120V, 60Hz, 22W O/P: DC 12V, 1.2A
Frequency Range	2412 ~ 2462 MHz
Transmit Power	External Antenna: IEEE 802.11b: 18.31 dBm IEEE 802.11g: 18.97 dBm Internal Antenna: IEEE 802.11b: 18.99 dBm IEEE 802.11g: 20.05 dBm
Modulation Technique	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: DSSS (CCK, DQPSK, DBPSK) + OFDM (QPSK, BPSK, 16-QAM, 64-QAM)
Transmit Data Rate	IEEE 802.11b: 11, 5.5, 2, 1 Mbps IEEE 802.11g: 54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, 1 Mbps
Number of Channels	11 Channels
Antenna Specification	External Antenna: Dipole Antenna / Gain: 2 dBi Internal Antenna: PIFA Antenna / Gain: 1.77 dBi

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: PD5TYPEIII 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.

3.1EUT 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.

3.2EUT 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.

3.3GENERAL 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.

3.4FCC 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.

3.5DESCRIPTION OF TEST MODES

The EUT (model: TYPE III) had been tested under operating condition.

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, which worst case was in normal link mode only.

IEEE802.11b: Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 11Mbps data rate were chosen for full testing.

IEEE802.11g:
Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6Mbps 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	01/10/2006

Open Area Test Site # 3				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI Test Receiver	R&S	ESVS20	838804/004	01/08/2006
Spectrum Analyzer	R&S	FSP30	100112	09/23/2006
Spectrum Analyzer	Agilent	E4446A	MY43360131	01/10/2006
Pre-Amplifier	MITEC	AFS42-00102650	924206	N.C.R.
Pre-Amplifier	MITEC	AMF-6F-260400	945377	N.C.R.
Bilog Antenna	SCHWAZBECK	VULB9163	145	07/05/2006
Horn Antenna	EMCO	3115	00022250	04/18/2006
Horn Antenna	EMCO	3116	2487	12/08/2005
Turn Table	EMCO	2081-1.21	9709-1885	N.C.R.
Antenna Tower	EMCO	2075-2	9707-2060	N.C.R.
Controller	EMCO	2090	9709-1256	N.C.R.
RF Switch	ANRITSU	MP59B	M53867	N.C.R.
Site NSA	C&C	N/A	N/A	09/06/2006

Remark: *The measurement uncertainty is less than +/- 2.16dB, 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	09/24/2006
TWO-LINE V-NETWORK 9kHz-30MHz	SCHAFFNER	NNB41	03/10013	06/11/2006
LISN 10kHz-100MHz	EMCO	3825/2	9106-1809	02/17/2006
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. 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 LABORATORY ACCREDITATIONS AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200600-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (Registration no: 93105 and 90471).

5.4 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	NVLAP*	EN 55011, EN 55014-1, AS/NZS 1044, CNS 13783-1, EN 55022, CNS 13438, EN 61000-3-2, EN 61000-3-3, ANSI C63.4, FCC OST/MP-5, AS/NZS CISPR 22, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11	200600-0
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 300 328-2, 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	CNLA	EN 300 328-1/2, EN 300 220-1/2/3, EN 300 440-1/2, EN 61000-3-2, EN 61000-3-3, 47 CFR FCC Part 15 Subpart C/D/E, EN 55013, CNS 13439, EN 55014-1, CNS 13783-1, EN 55022, CNS 13438, CISPR 22, AS/NZS 3548, EN 61000-4-2/3/4/5/6/8/11, ENV 50204, IEEE Std 1528, FCC OET Bulletin, 65+Supplement C, EN50360, EN50361, EN50371, RSS102	0363 ILAC MRA
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 3991-3, IC 3991-4) / 3M Semi Anechoic Chamber (IC 6106) to perform RSS 212 Issue 1	IC 3991-3 IC 3991-4 IC 6106

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

** Australia: MRA of NVLAP AS/NZS 4771 &AS/NZS 4268.*

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

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1.	Notebook PC	IBM	2672(X31)	99PBTKB	FCC DoC	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
2.	Notebook PC	DELL	PP10L	50XP51J	FCC DoC	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
3.	Test kit	N/A	N/A	N/A	N/A	N/A	N/A
4.	Adapter	IBM	02K6807	N/A	FCC DoC	N/A	AC I/P: 100-240V, 1.2A-0.7A, 50-60Hz DC O/P: 16V, 3.5A

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.*

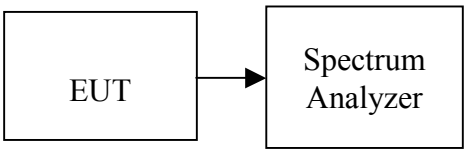
7. FCC PART 15.247 REQUIREMENTS

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

External Antenna: Dipole Antenna / Gain: 2 dBi

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Low	2412	12250	>500	PASS
Mid	2437	12420		PASS
High	2462	11250		PASS

Test mode: IEEE 802.11g

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

Internal Antenna: PIFA Antenna / Gain: 1.77 dBi

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Low	2412	12170	>500	PASS
Mid	2437	11420		PASS
High	2462	11500		PASS

Test mode: IEEE 802.11g

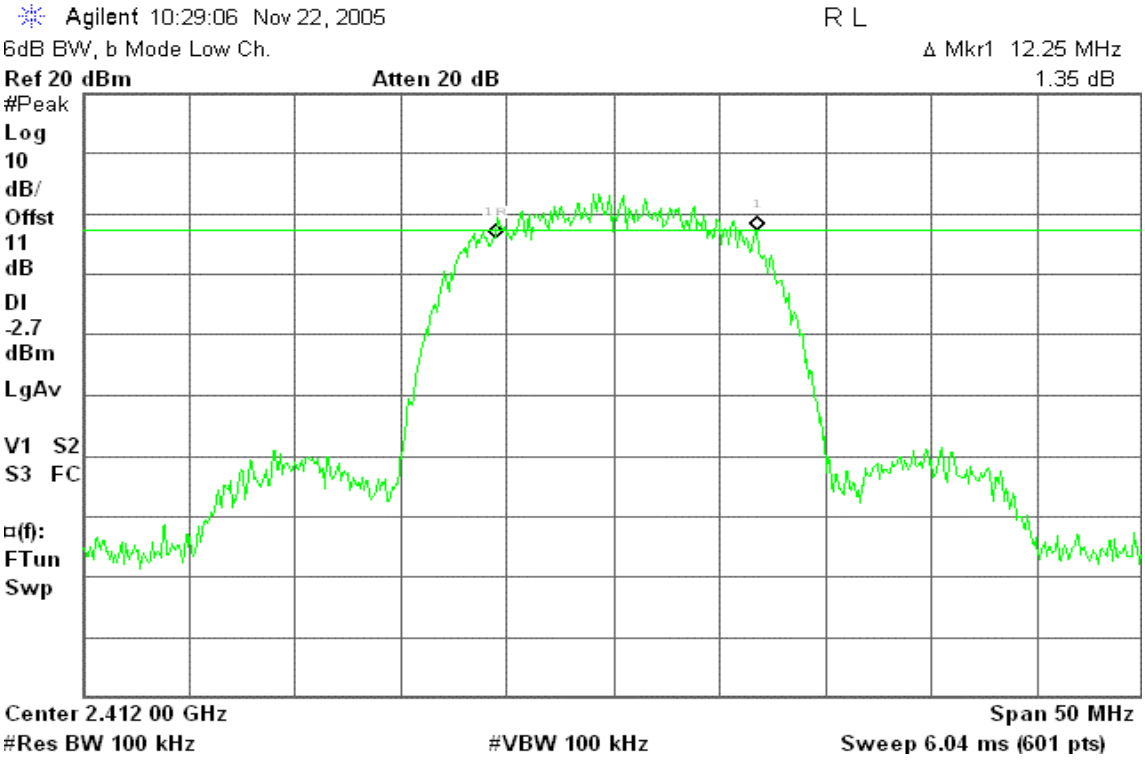
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Low	2412	16500	>500	PASS
Mid	2437	16500		PASS
High	2462	16500		PASS

Test Plot

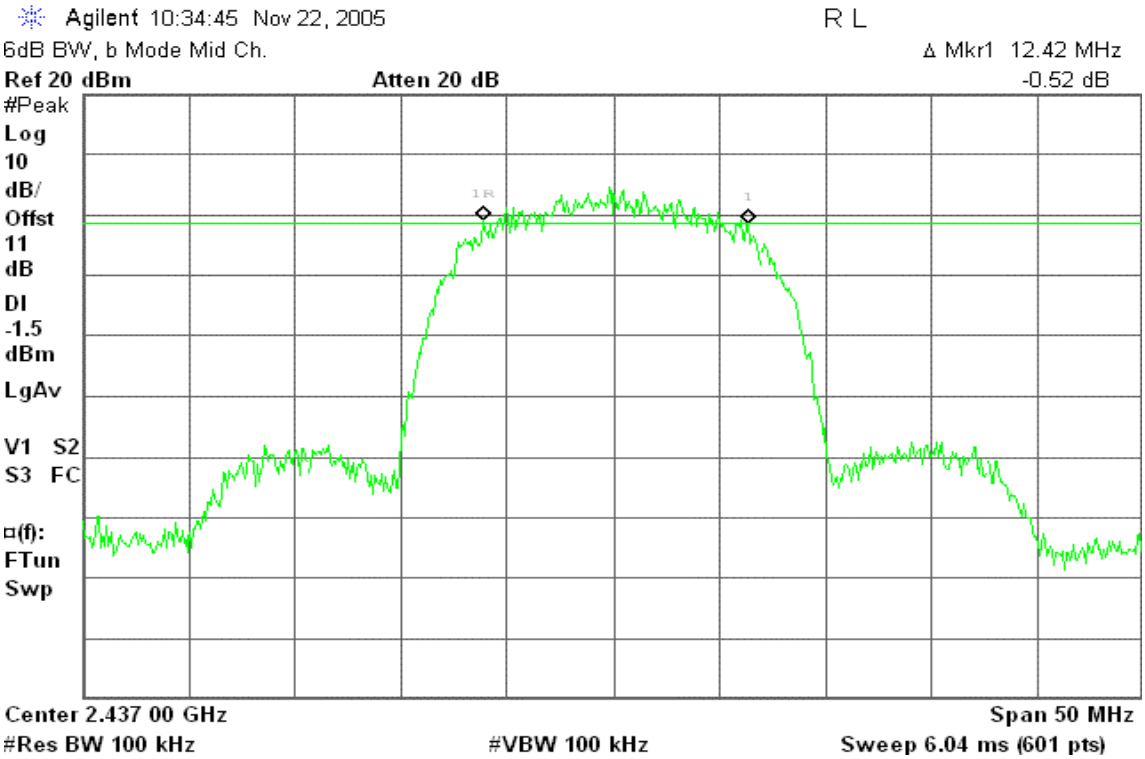
External Antenna: Dipole Antenna / Gain: 2 dBi

IEEE 802.11b

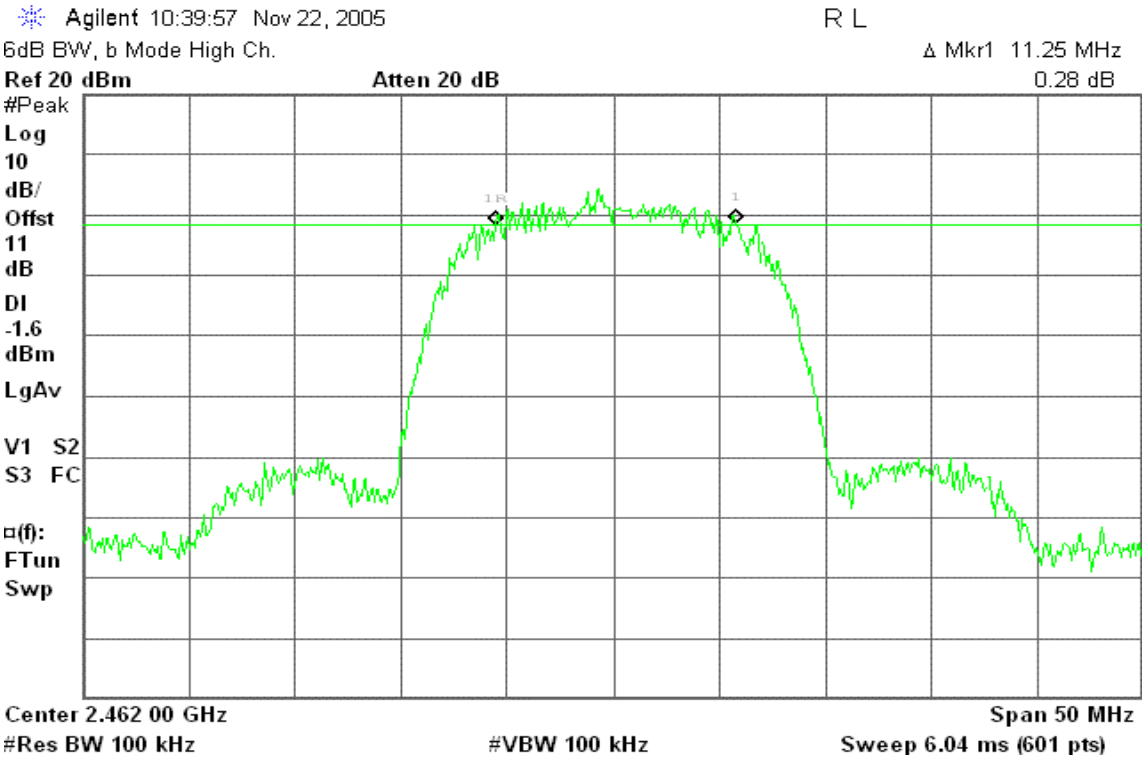
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

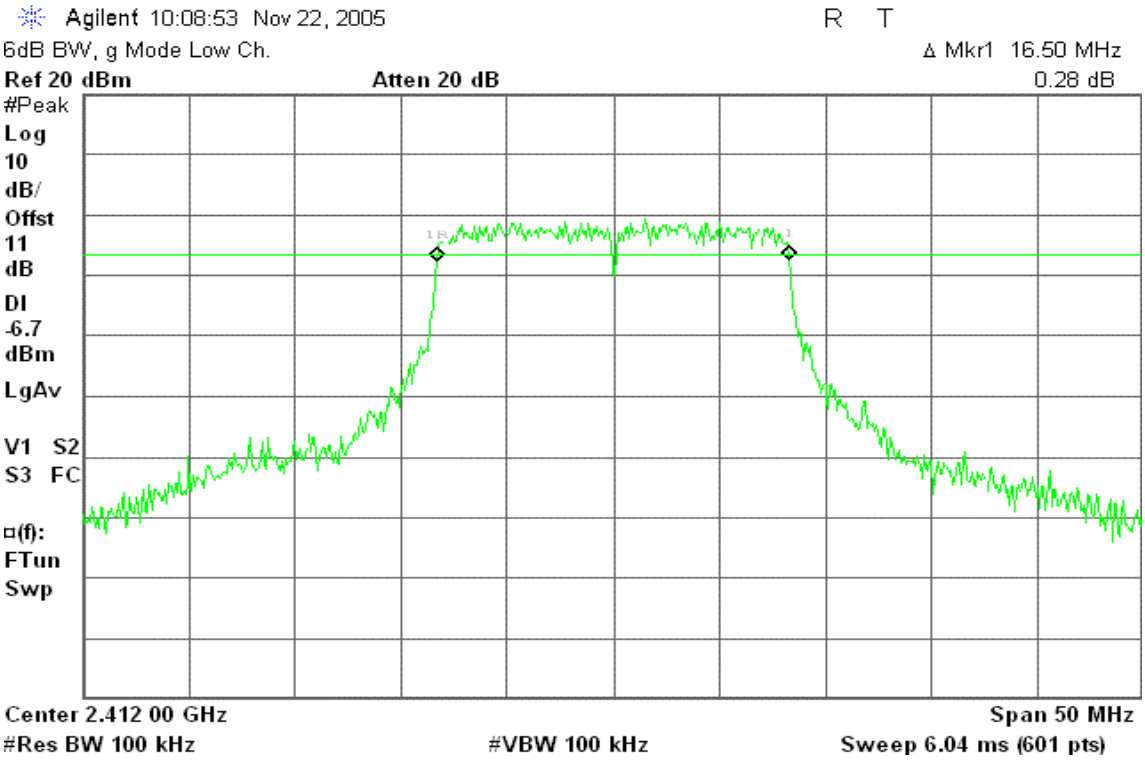


6dB Bandwidth (CH High)

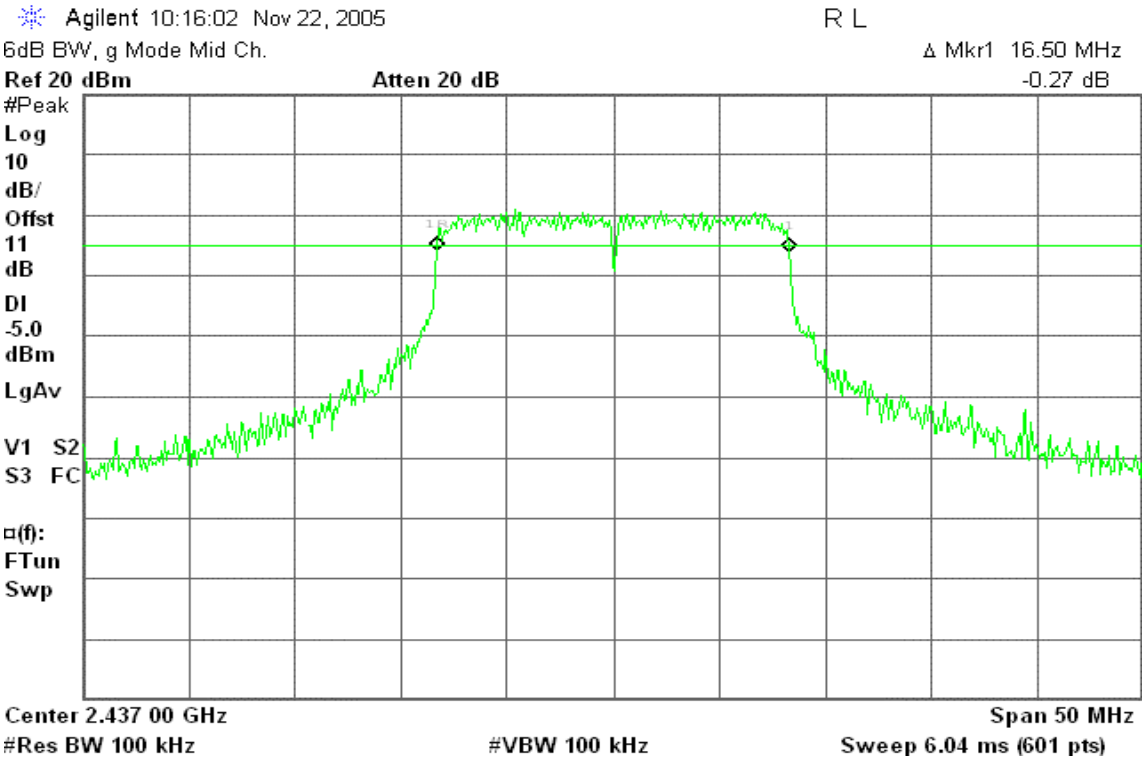


IEEE 802.11g

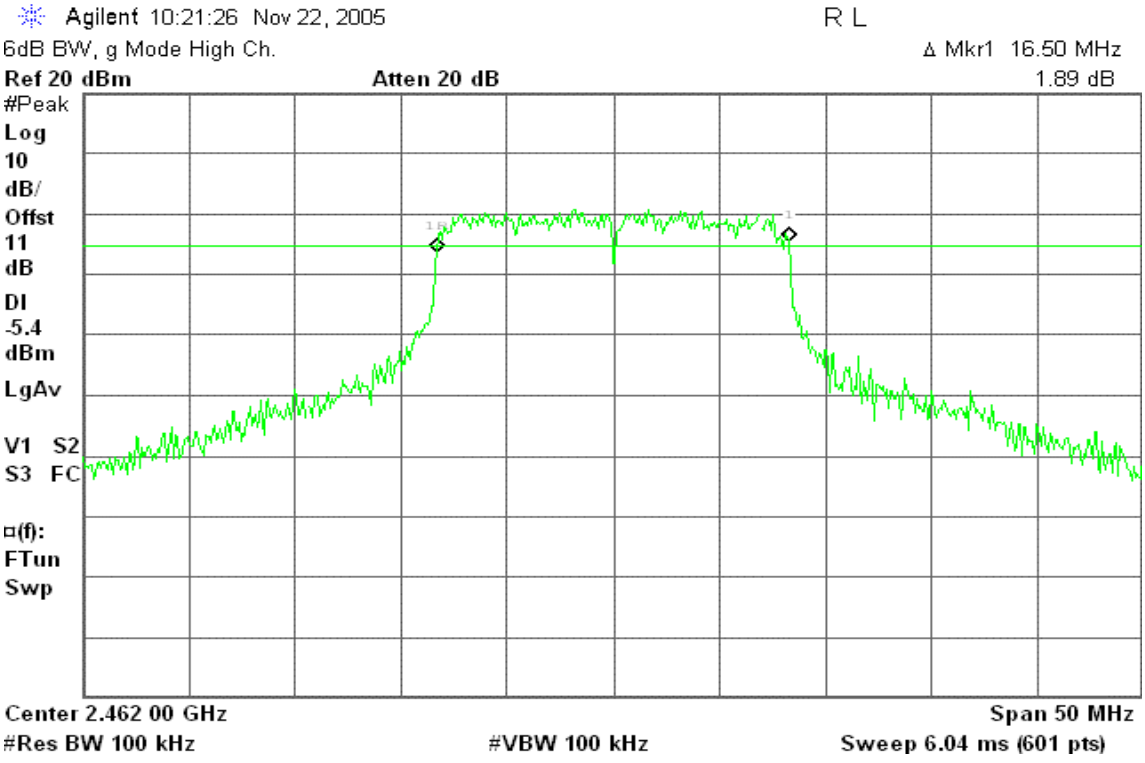
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



6dB Bandwidth (CH High)

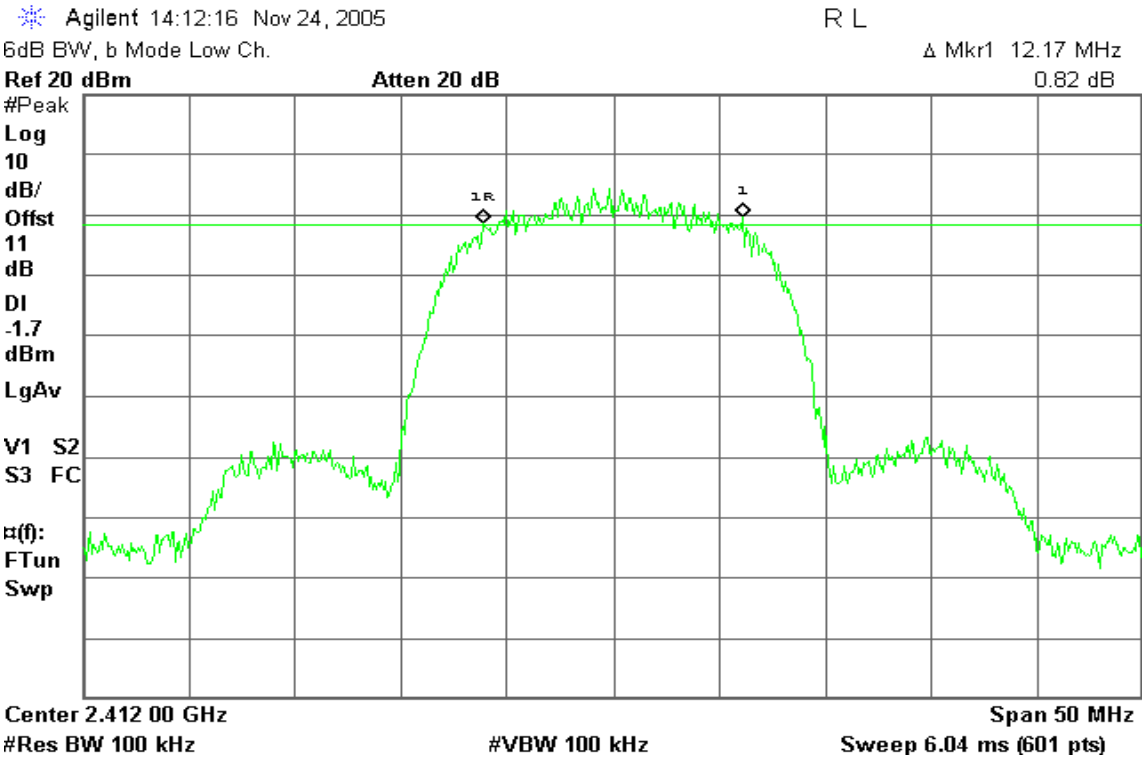


Test Plot

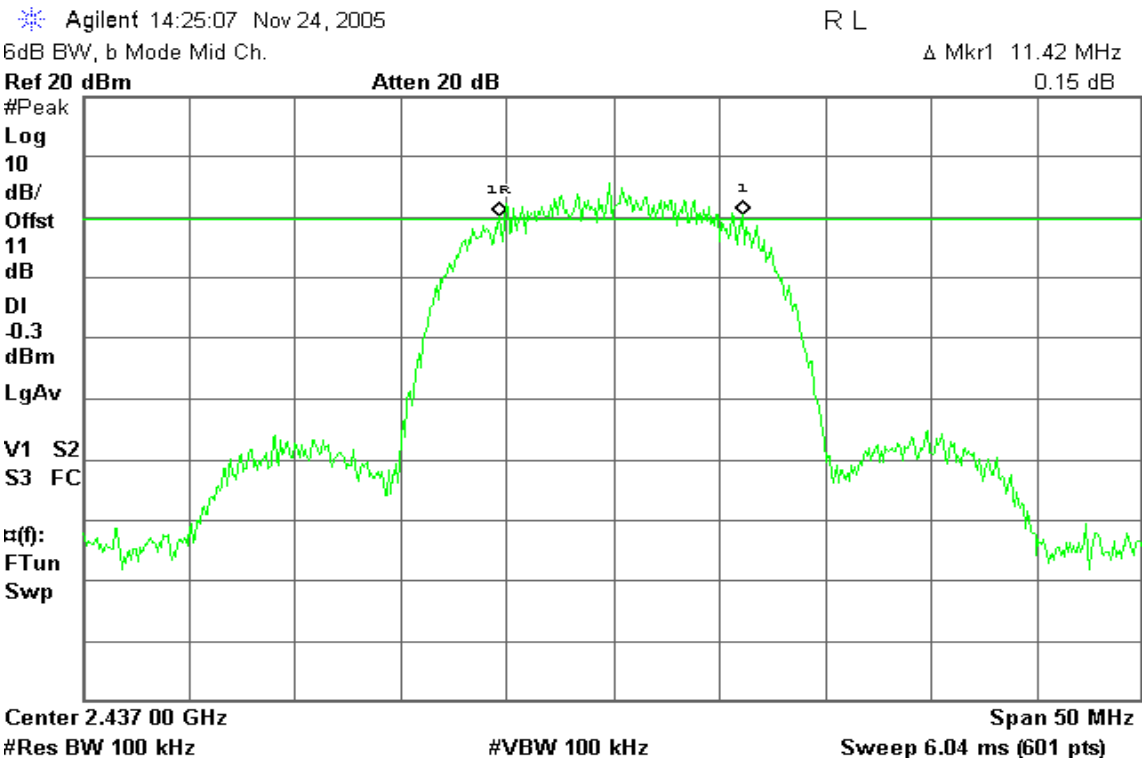
Internal Antenna: PIFA Antenna / Gain: 1.77 dBi

IEEE 802.11b

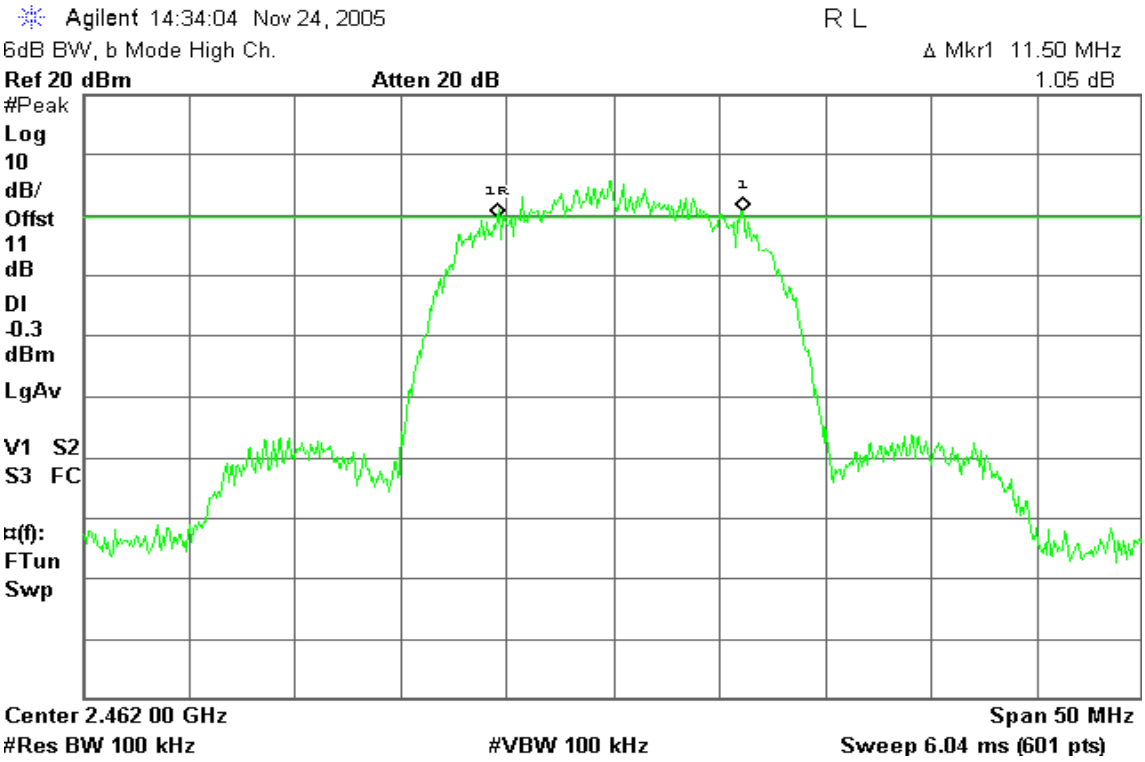
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

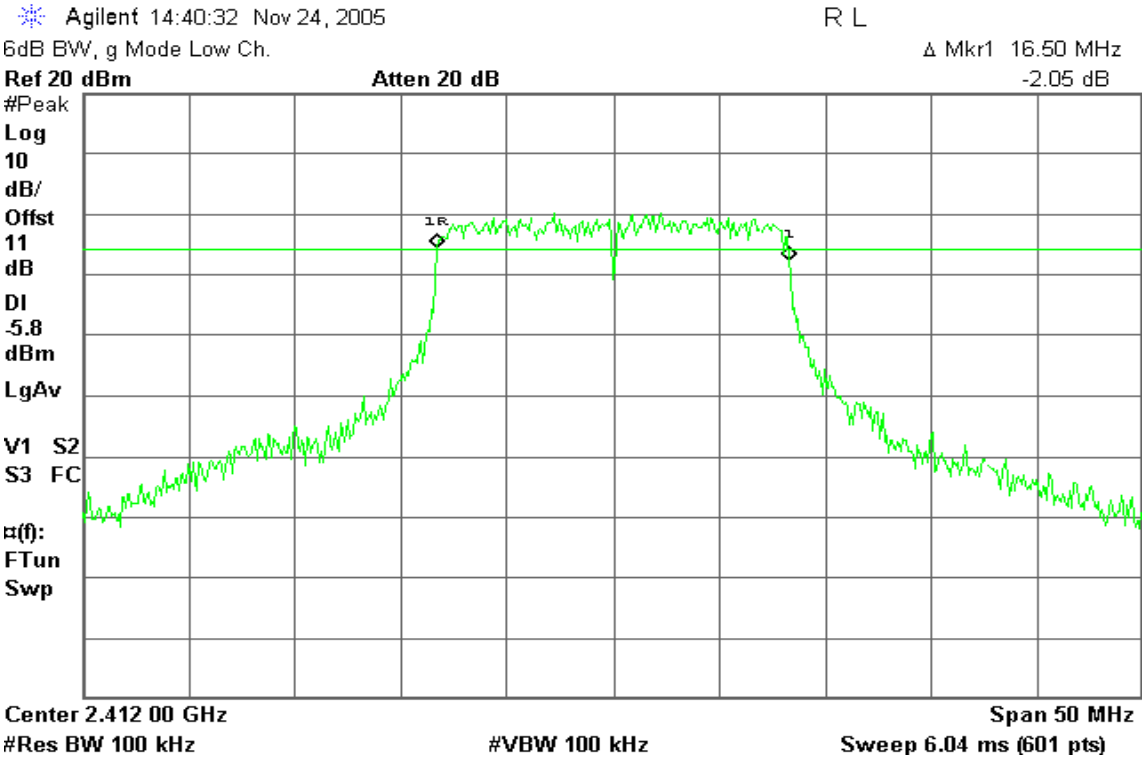


6dB Bandwidth (CH High)

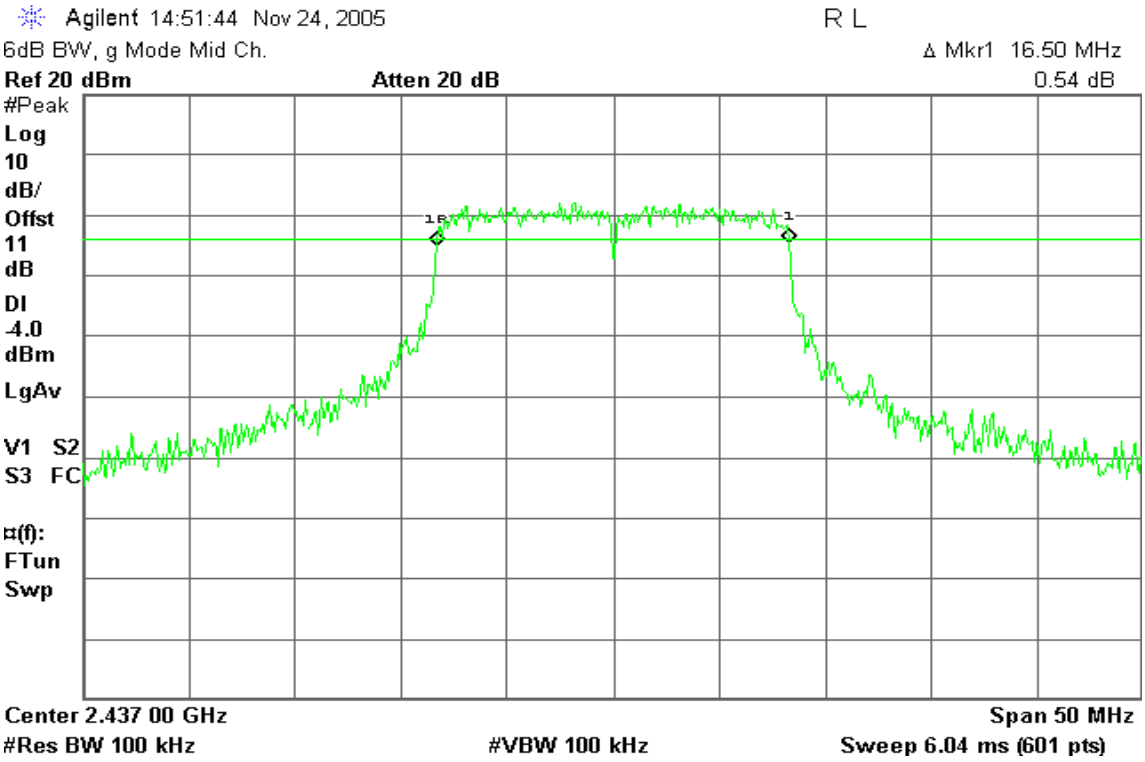


IEEE 802.11g

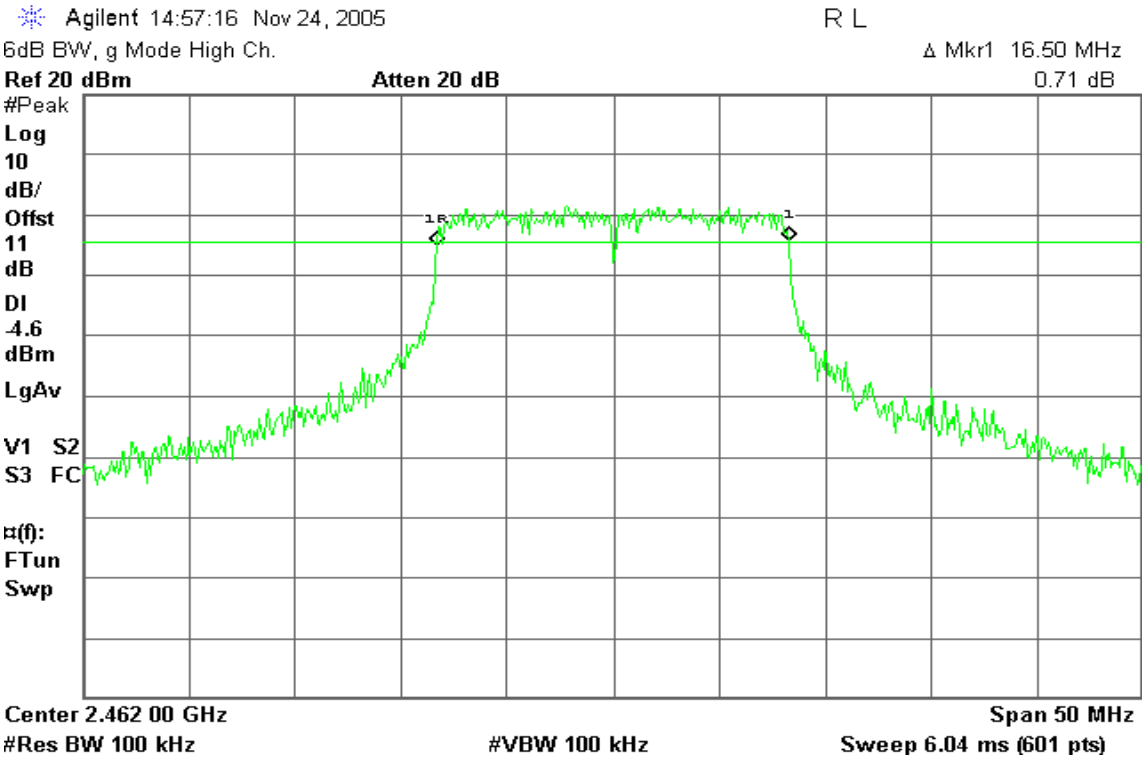
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



6dB Bandwidth (CH High)



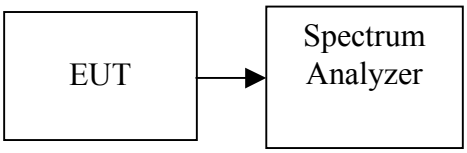
7.2 PEAK POWER

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

External Antenna: Dipole Antenna / Gain: 2 dBi

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	17.06	0.0508	1.00	PASS
Mid	2437	18.31	0.0678		PASS
High	2462	18.03	0.0635		PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	17.18	0.0522	1.00	PASS
Mid	2437	18.94	0.0783		PASS
High	2462	18.97	0.0789		PASS

Internal Antenna: PIFA Antenna / Gain: 1.77 dBi

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	17.74	0.0594	1.00	PASS
Mid	2437	18.74	0.0748		PASS
High	2462	18.99	0.0793		PASS

Test mode: IEEE 802.11g

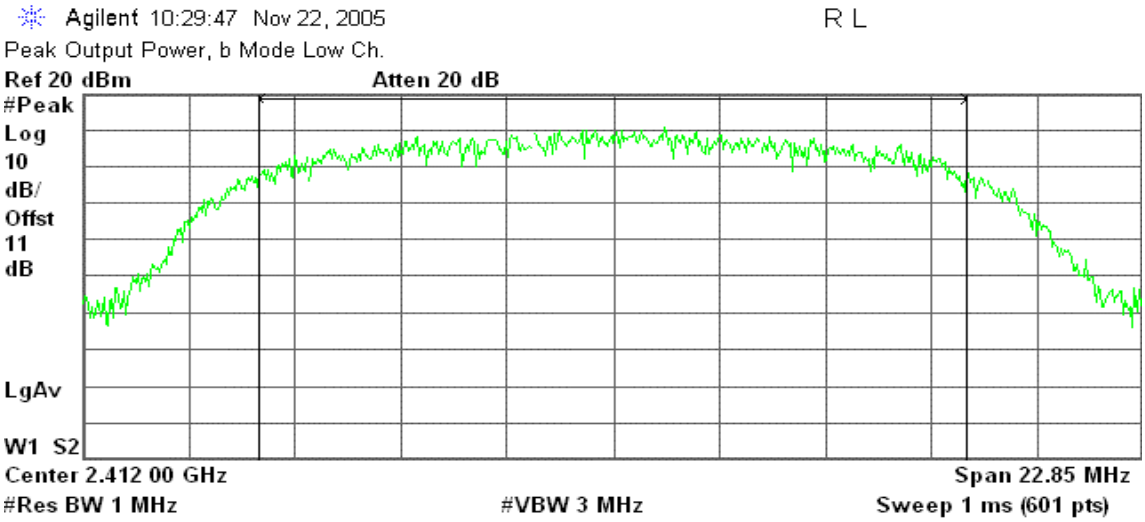
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	18.09	0.0644	1.00	PASS
Mid	2437	20.05	0.1012		PASS
High	2462	19.55	0.0902		PASS

Test Plot

External Antenna: Dipole Antenna / Gain: 2 dBi

IEEE 802.11b

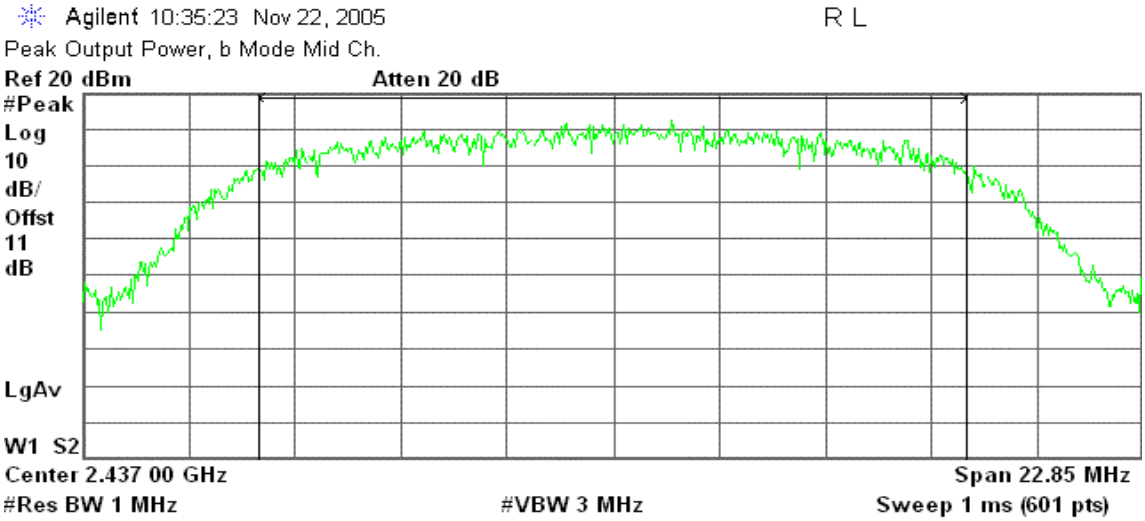
Peak Power (CH Low)



Channel Power
17.06 dBm / 15.2360 MHz

Power Spectral Density
-54.77 dBm/Hz

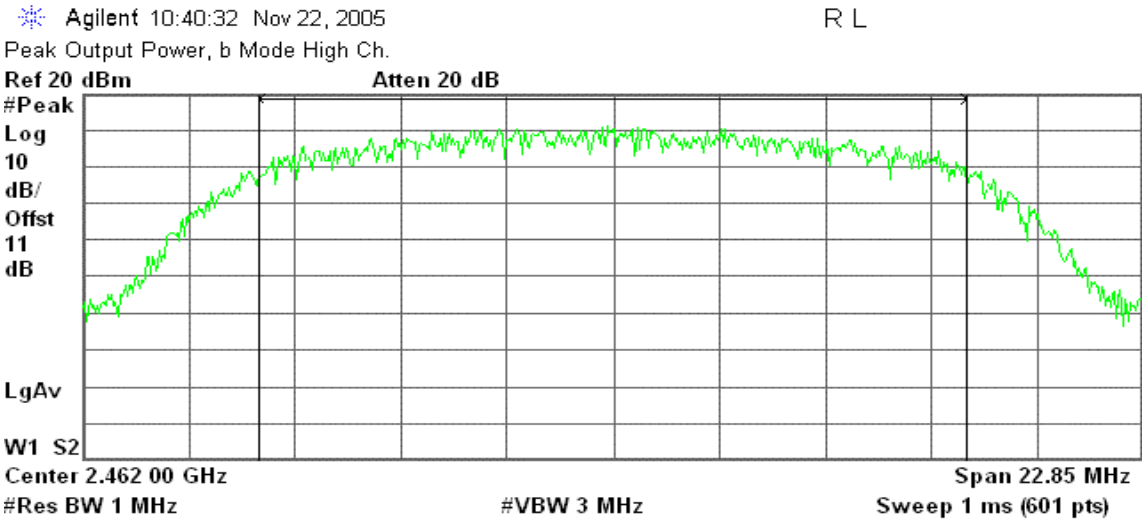
Peak Power (CH Mid)



Channel Power
18.31 dBm / 15.2310 MHz

Power Spectral Density
-53.52 dBm/Hz

Peak Power (CH High)

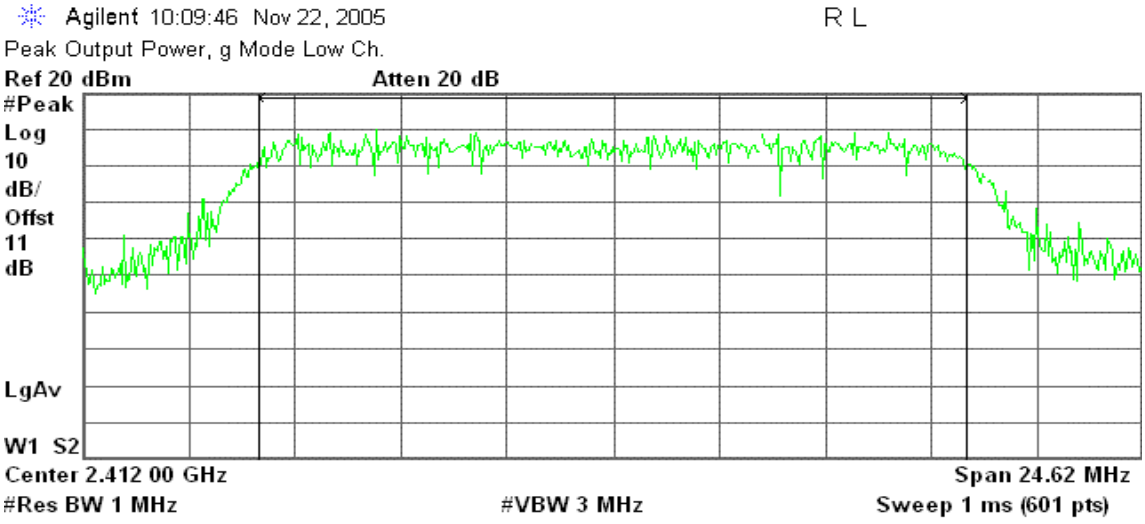


Channel Power
18.03 dBm / 15.2350 MHz

Power Spectral Density
-53.80 dBm/Hz

IEEE 802.11g

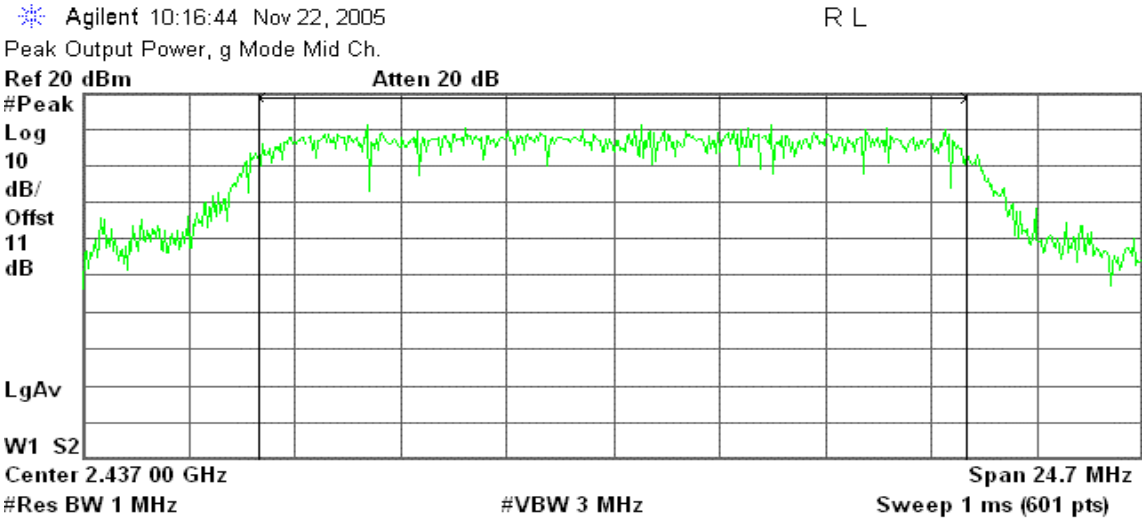
Peak Power (CH Low)



Channel Power
17.18 dBm / 16.4110 MHz

Power Spectral Density
-54.98 dBm/Hz

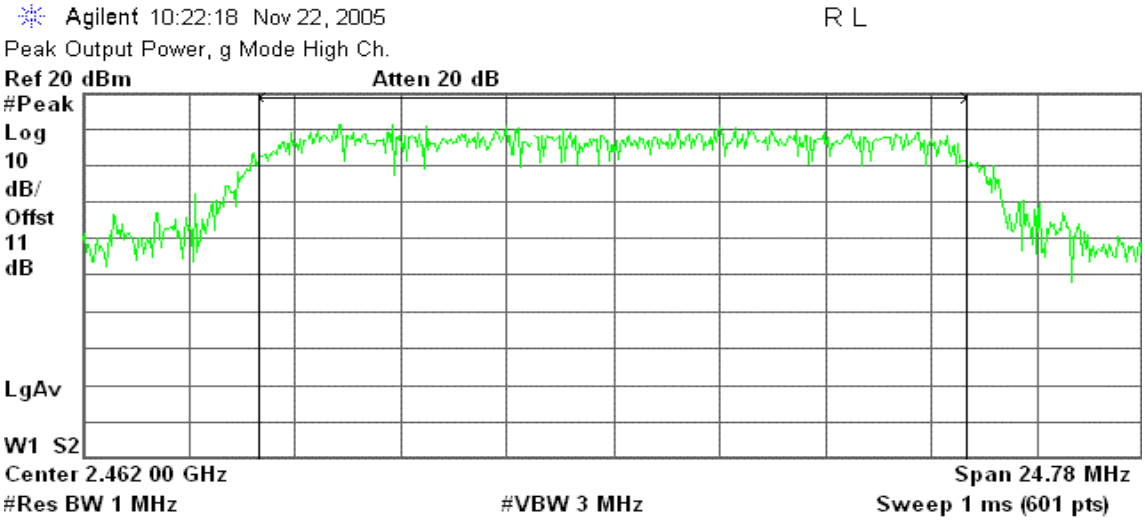
Peak Power (CH Mid)



Channel Power
18.94 dBm / 16.4700 MHz

Power Spectral Density
-53.23 dBm/Hz

Peak Power (CH High)



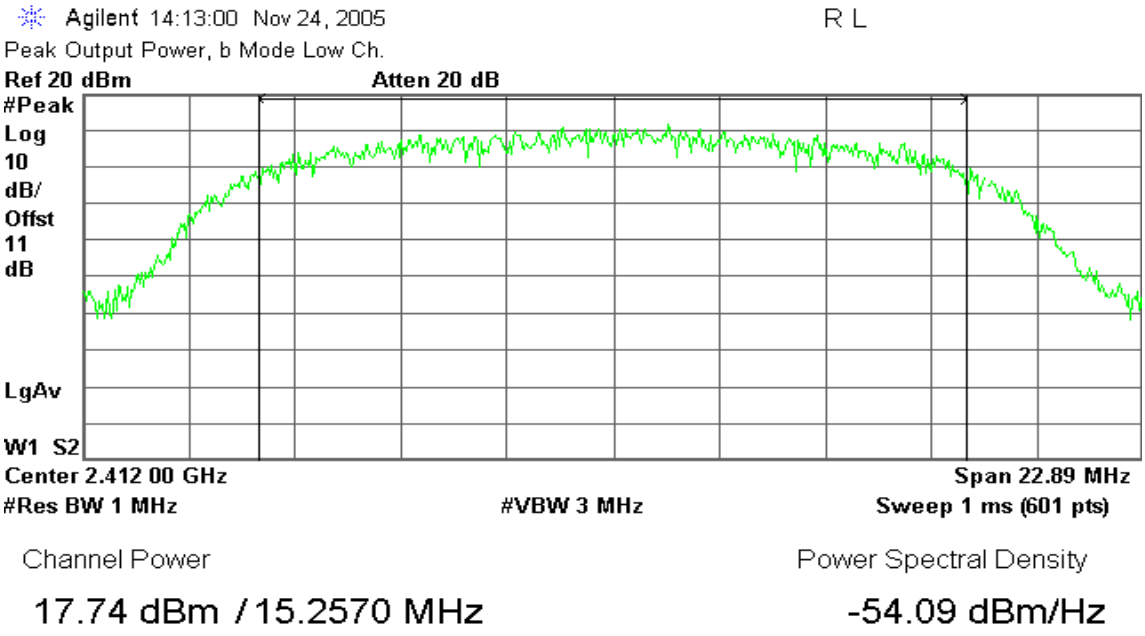
Channel Power
18.97 dBm / 16.5170 MHz

Power Spectral Density
-53.21 dBm/Hz

Internal Antenna: PIFA Antenna / Gain: 1.77 dBi

IEEE 802.11b

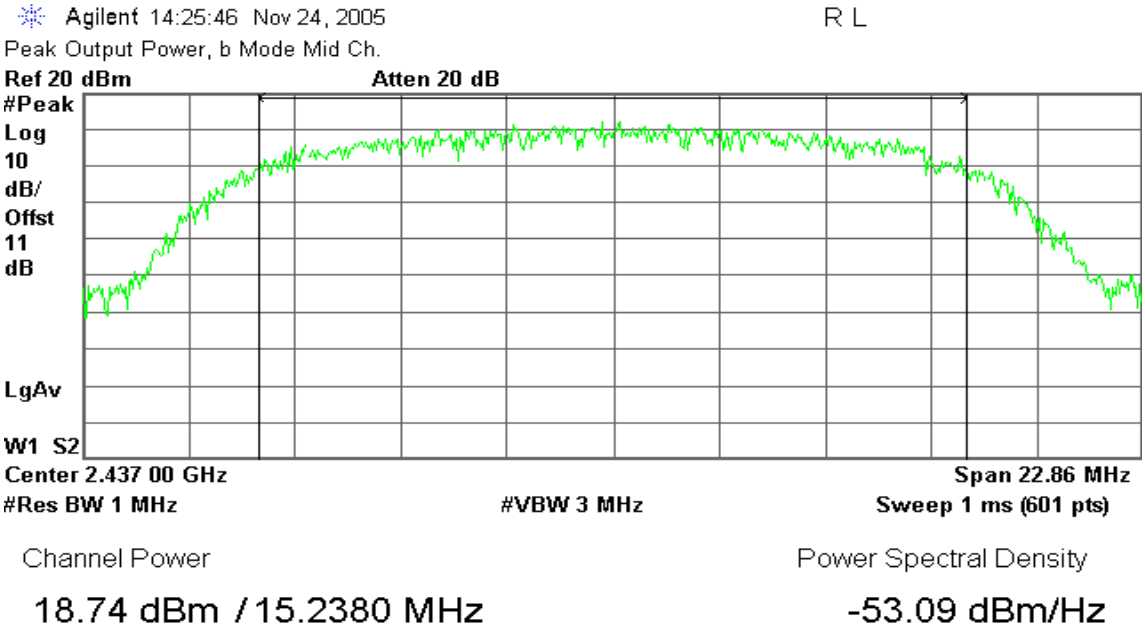
Peak Power (CH Low)



Channel Power
17.74 dBm / 15.2570 MHz

Power Spectral Density
-54.09 dBm/Hz

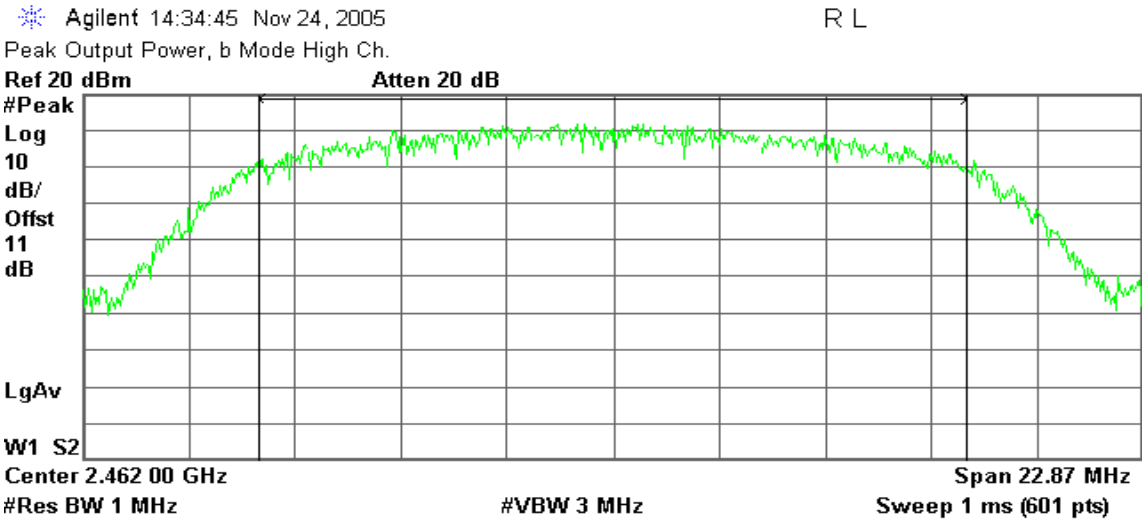
Peak Power (CH Mid)



Channel Power
18.74 dBm / 15.2380 MHz

Power Spectral Density
-53.09 dBm/Hz

Peak Power (CH High)

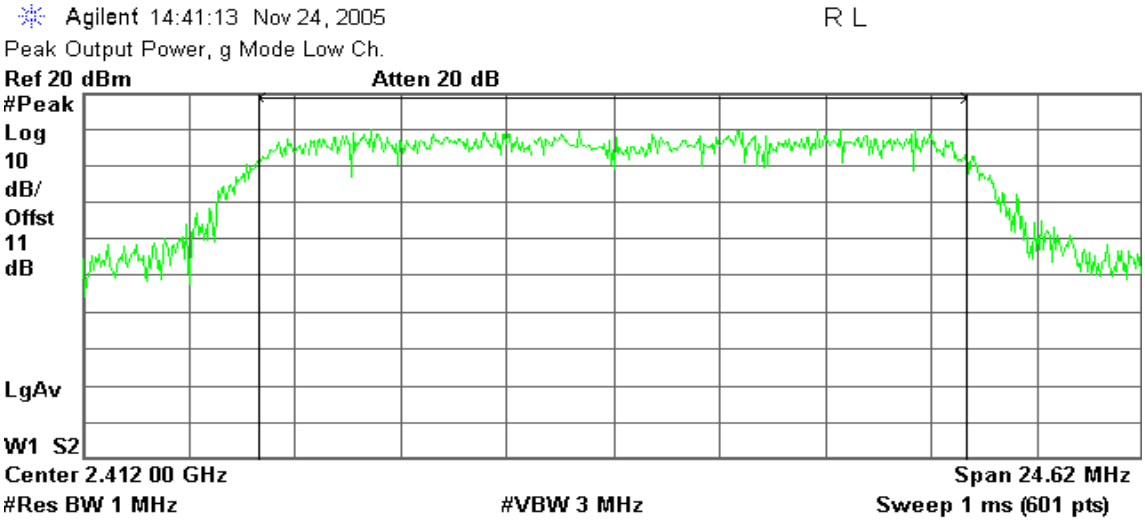


Channel Power
18.99 dBm / 15.2450 MHz

Power Spectral Density
-52.84 dBm/Hz

IEEE 802.11g

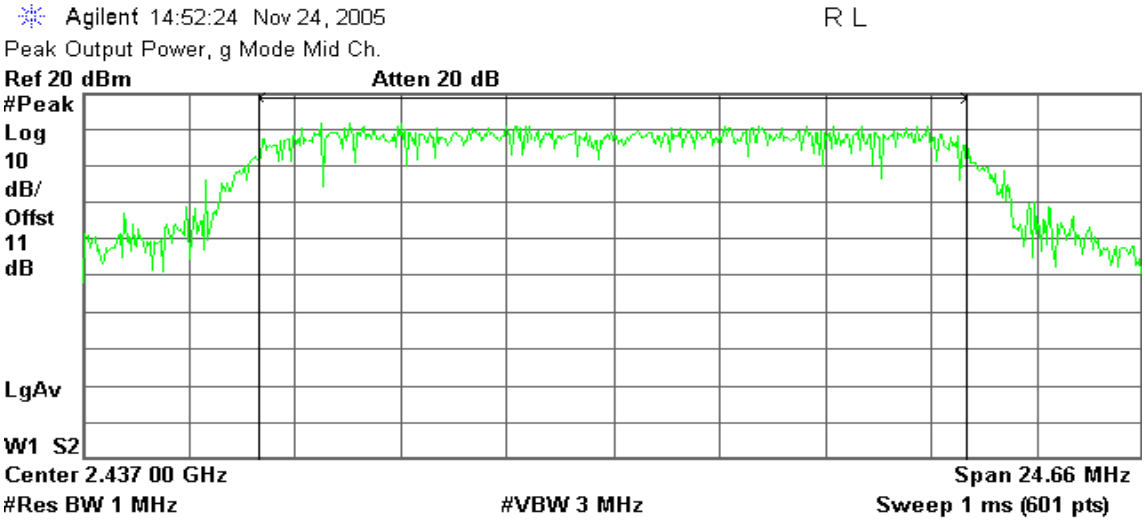
Peak Power (CH Low)



Channel Power
18.09 dBm / 16.4140 MHz

Power Spectral Density
-54.06 dBm/Hz

Peak Power (CH Mid)



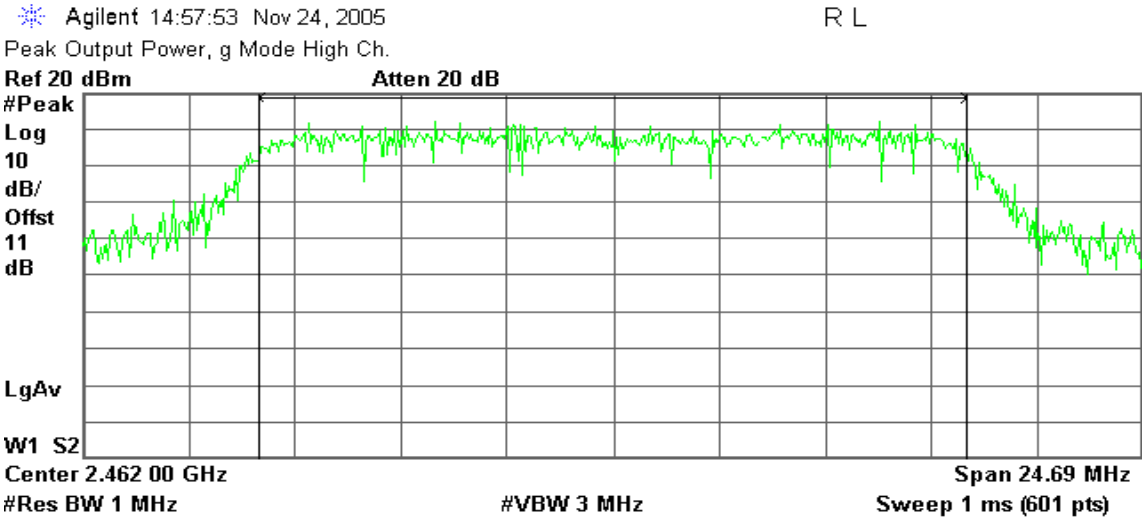
Channel Power

20.05 dBm / 16.4430 MHz

Power Spectral Density

-52.11 dBm/Hz

Peak Power (CH High)



Channel Power

19.55 dBm / 16.4600 MHz

Power Spectral Density

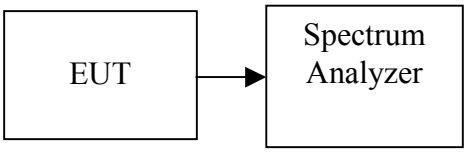
-52.61 dBm/Hz

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

External Antenna: Dipole Antenna / Gain: 2 dBi

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	14.23	0.0265
Mid	2437	15.64	0.0366
High	2462	14.82	0.0303

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	13.51	0.0224
Mid	2437	15.54	0.0358
High	2462	15.26	0.0336

Internal Antenna: PIFA Antenna / Gain: 1.77 dBi

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	14.62	0.0265
Mid	2437	15.91	0.0366
High	2462	15.76	0.0303

Test mode: IEEE 802.11g mode

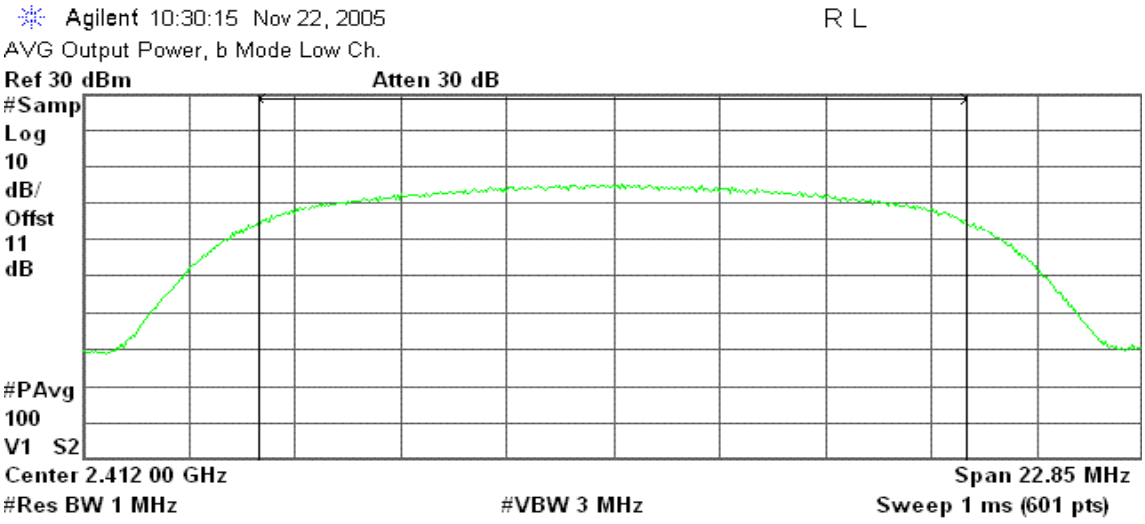
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	14.59	0.0224
Mid	2437	16.64	0.0358
High	2462	16.11	0.0336

Test Plot

External Antenna: Dipole Antenna / Gain: 2 dBi

IEEE 802.11b

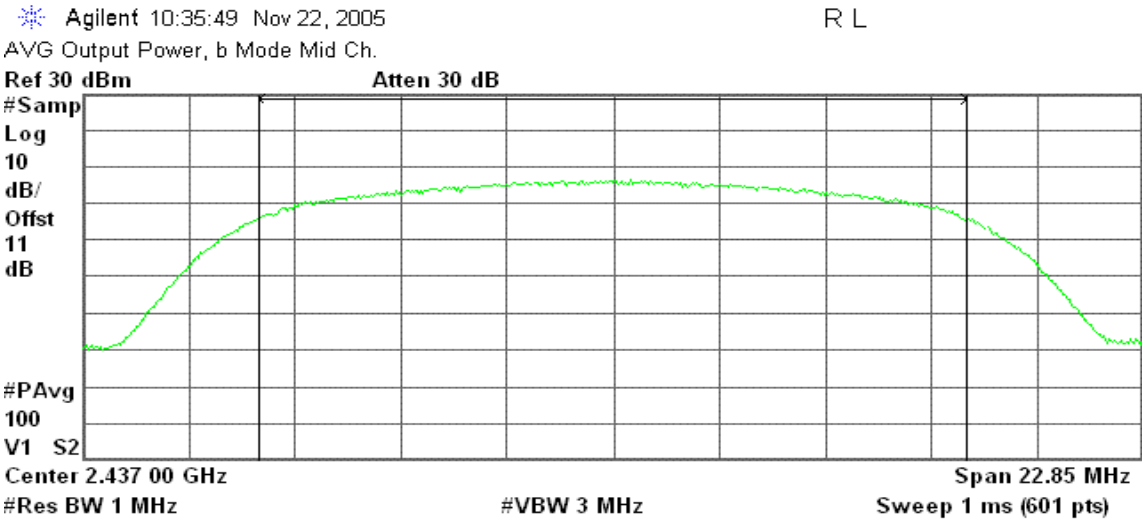
CH Low



Channel Power
14.23 dBm / 15.2360 MHz

Power Spectral Density
-57.60 dBm/Hz

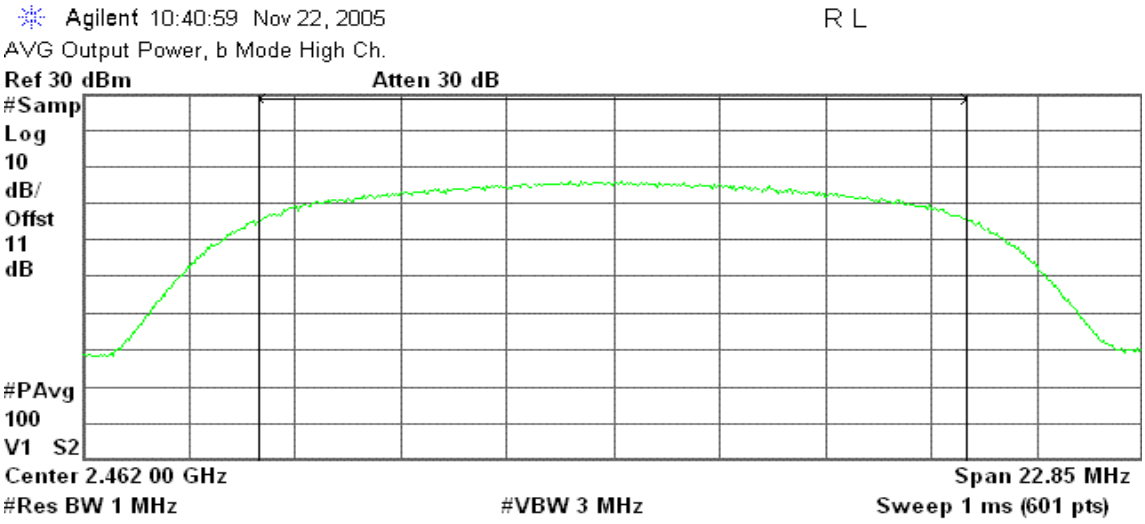
CH Mid



Channel Power
15.64 dBm / 15.2310 MHz

Power Spectral Density
-56.19 dBm/Hz

CH High

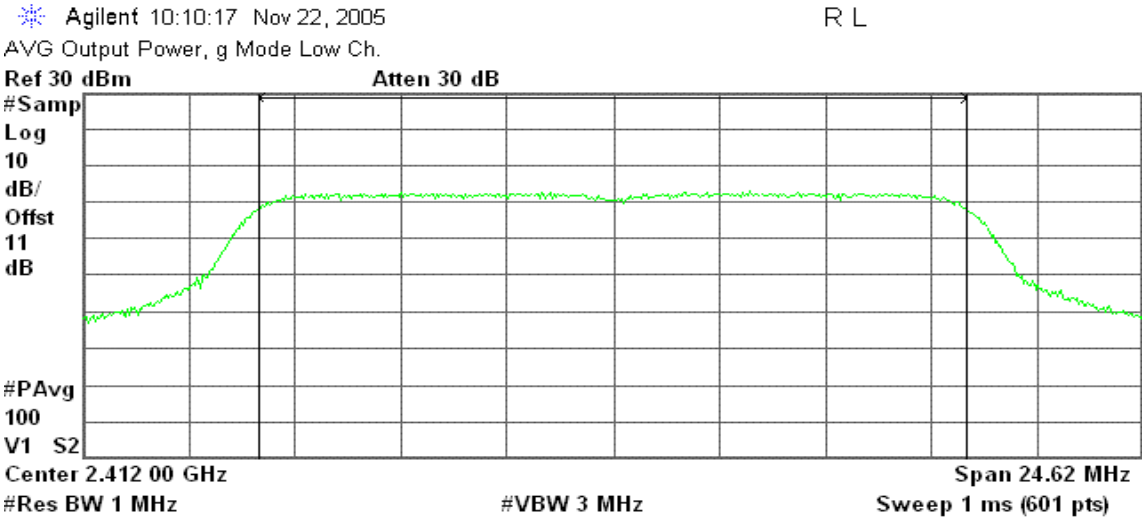


Channel Power
14.82 dBm / 15.2350 MHz

Power Spectral Density
-57.01 dBm/Hz

IEEE 802.11g

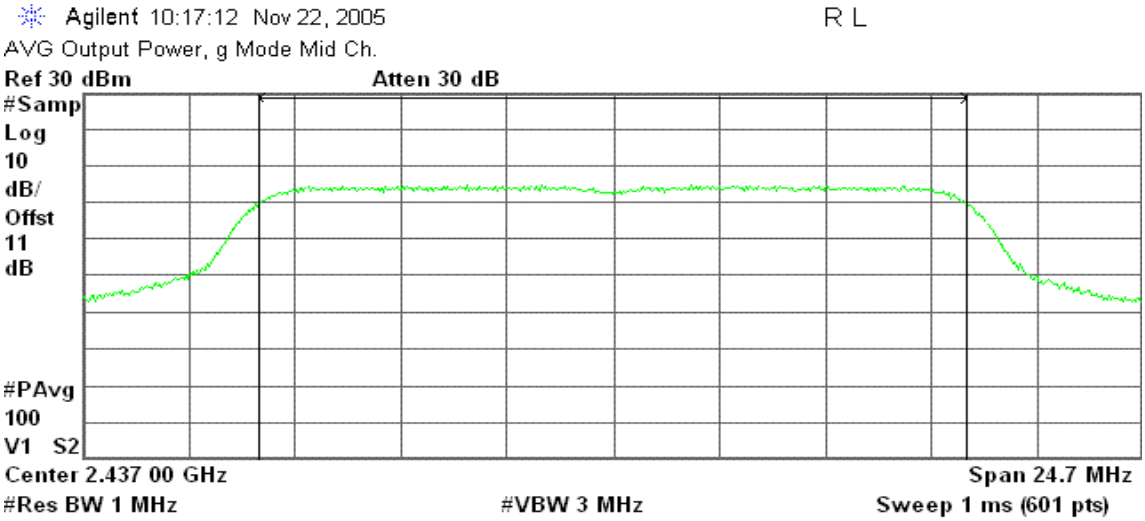
CH Low



Channel Power
13.51 dBm / 16.4110 MHz

Power Spectral Density
-58.64 dBm/Hz

CH Mid



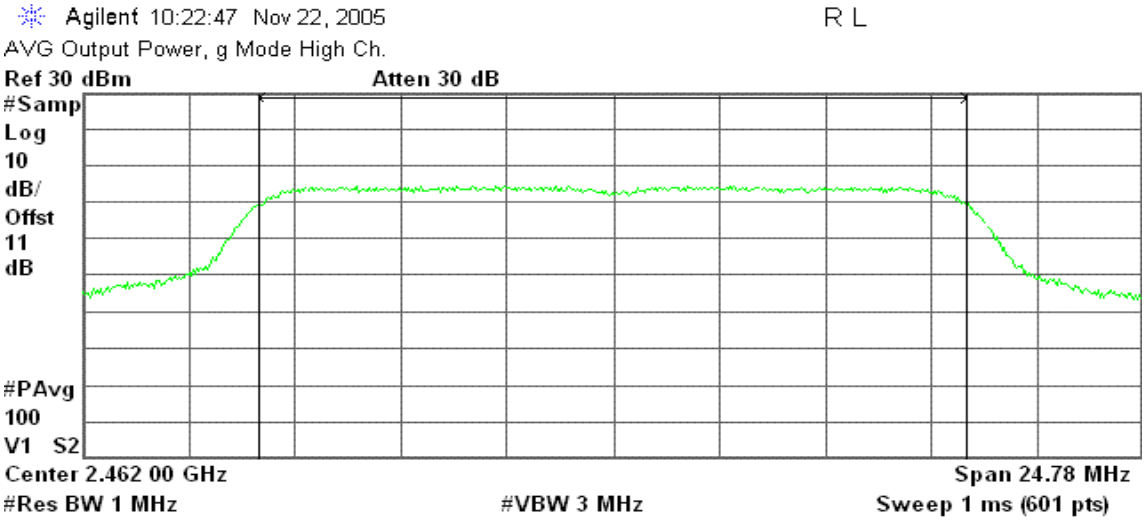
Channel Power

15.54 dBm / 16.4700 MHz

Power Spectral Density

-56.62 dBm/Hz

CH High



Channel Power

15.26 dBm / 16.5170 MHz

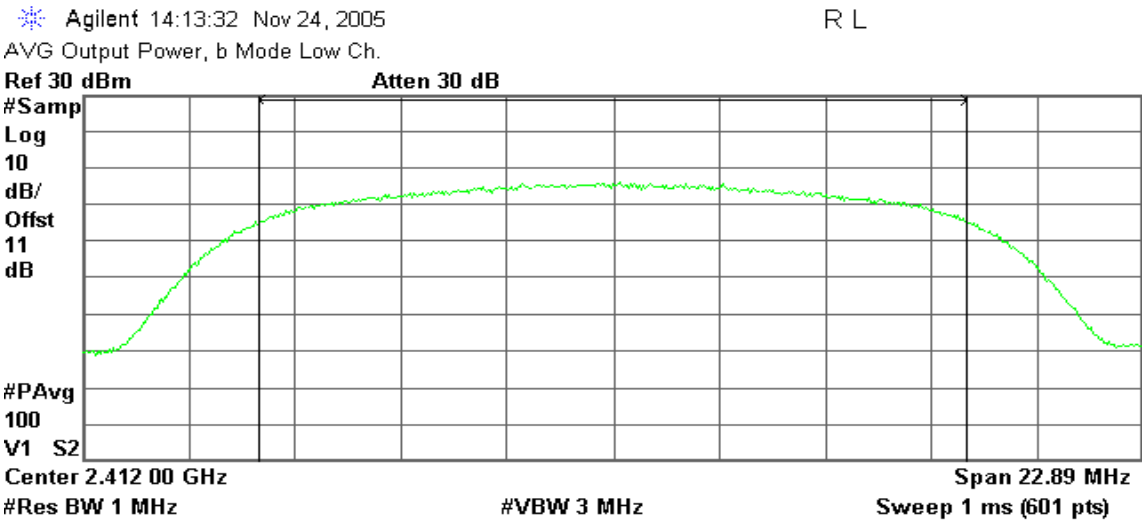
Power Spectral Density

-56.92 dBm/Hz

Internal Antenna: PIFA Antenna / Gain: 1.77 dBi

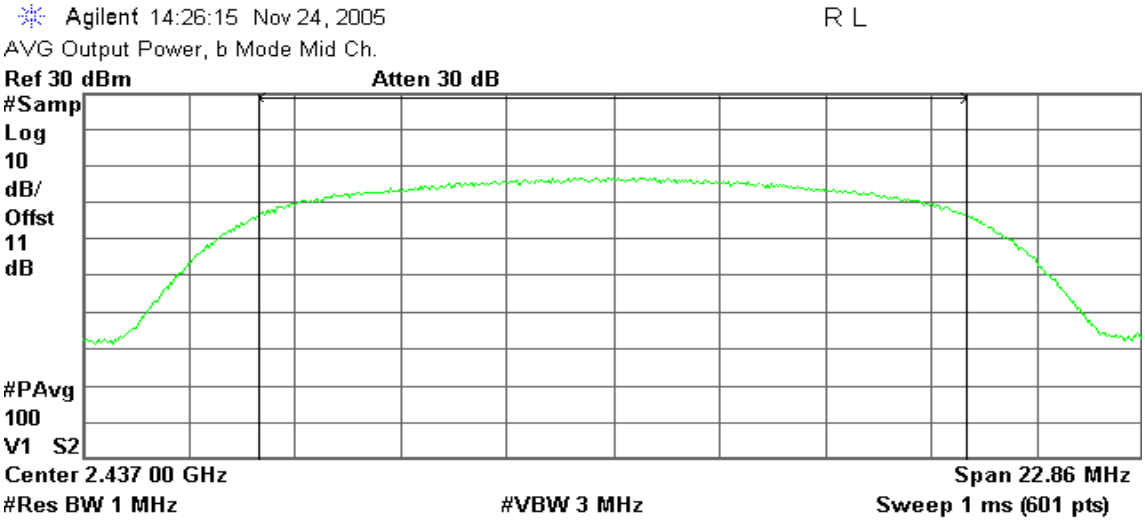
IEEE 802.11b

CH Low



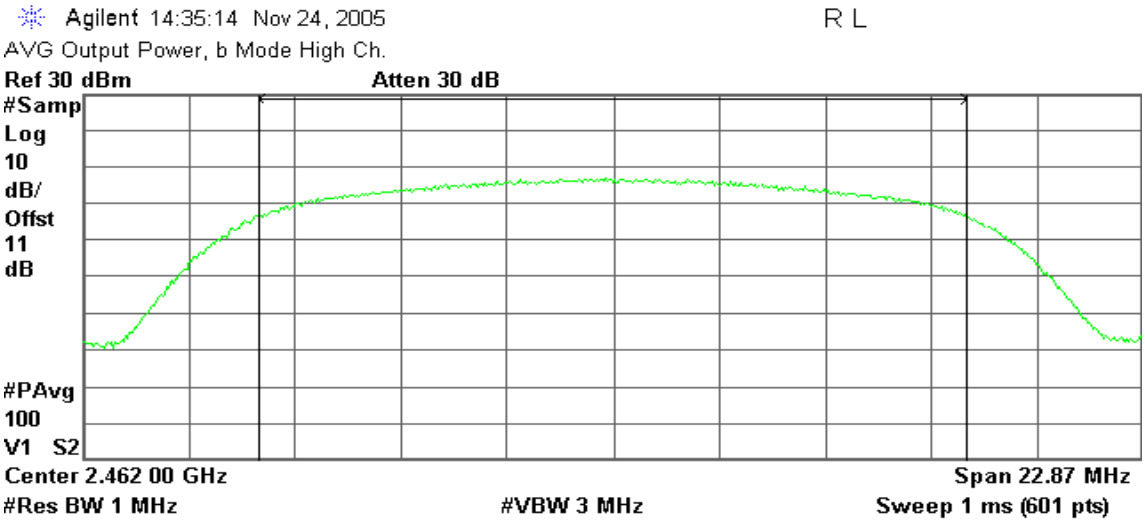
Channel Power	Power Spectral Density
14.62 dBm / 15.2570 MHz	-57.21 dBm/Hz

CH Mid



Channel Power	Power Spectral Density
15.91 dBm / 15.2380 MHz	-55.91 dBm/Hz

CH High



Channel Power

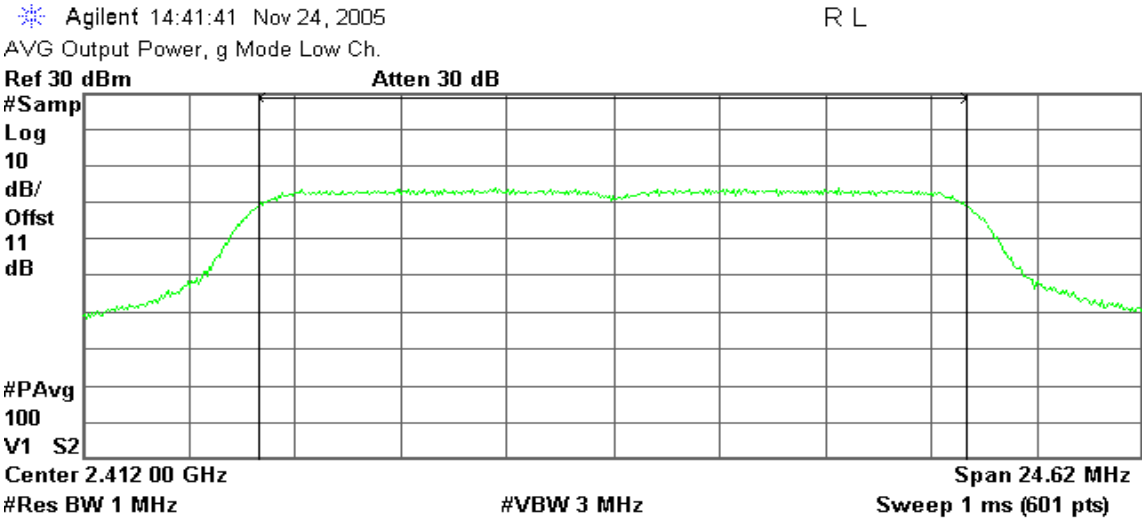
15.76 dBm / 15.2450 MHz

Power Spectral Density

-56.08 dBm/Hz

IEEE 802.11g

CH Low



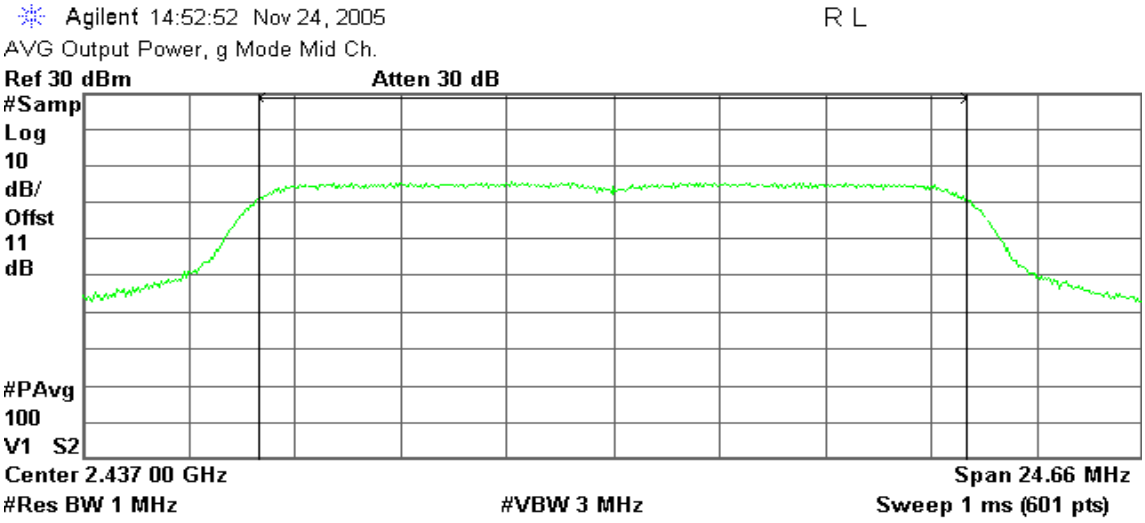
Channel Power

14.59 dBm / 16.4140 MHz

Power Spectral Density

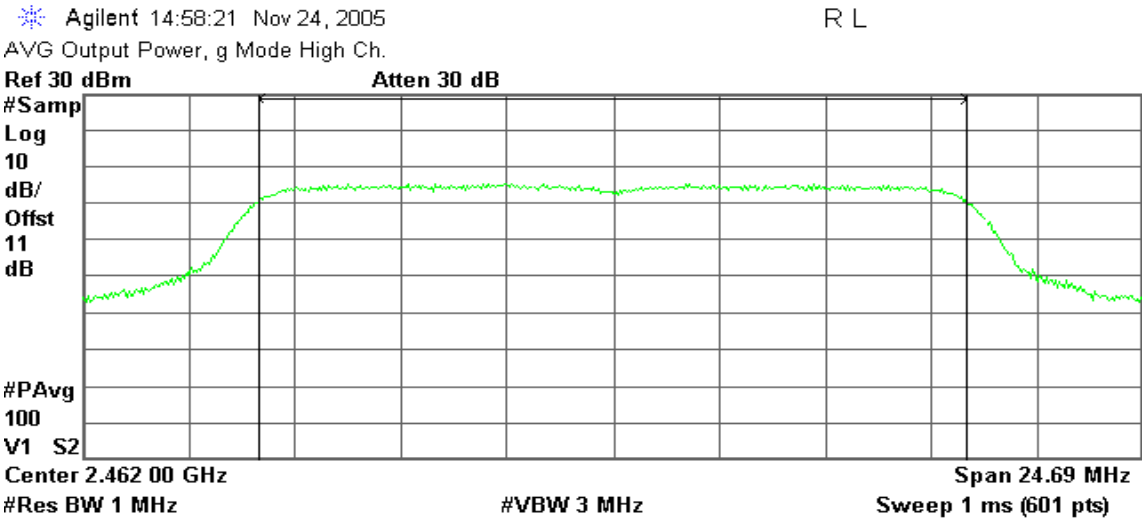
-57.57 dBm/Hz

CH Mid



Channel Power	Power Spectral Density
16.64 dBm / 16.4430 MHz	-55.52 dBm/Hz

CH High



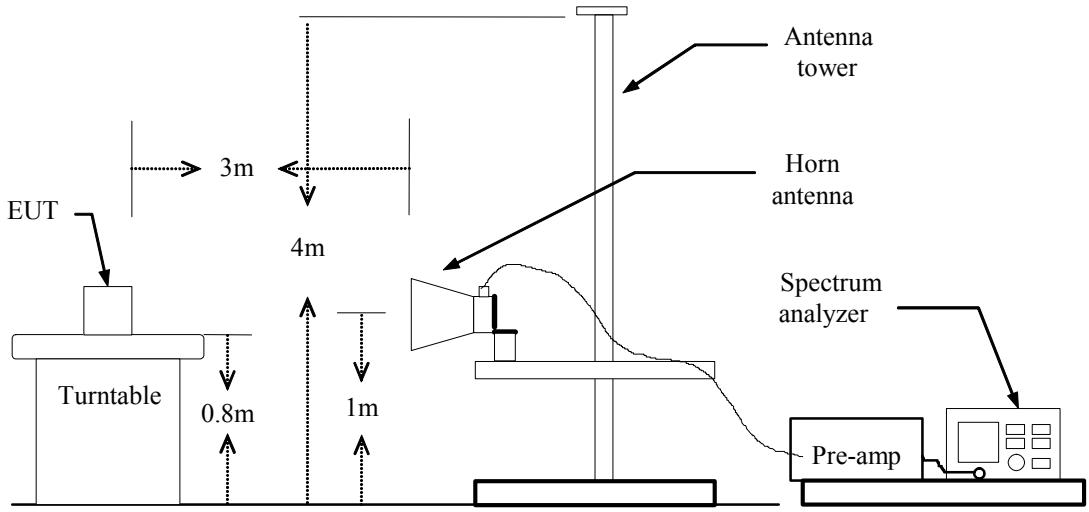
Channel Power	Power Spectral Density
16.11 dBm / 16.4600 MHz	-56.06 dBm/Hz

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.

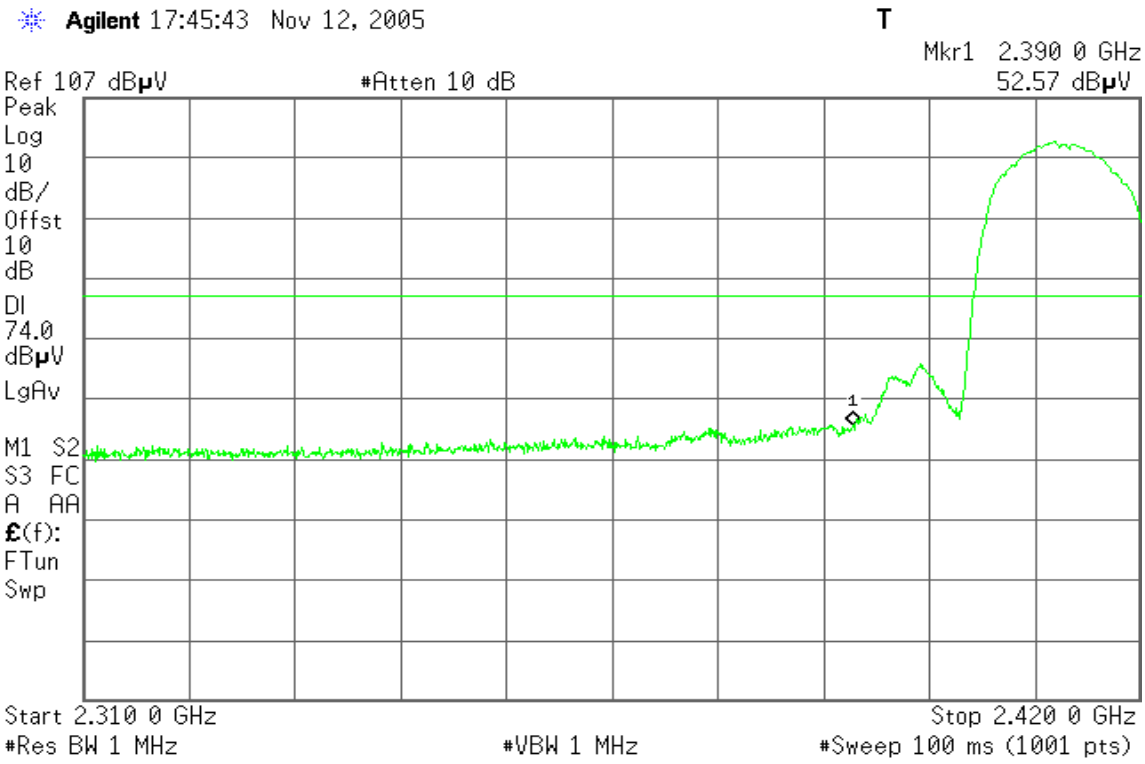
TEST RESULTS

Refer to attach spectrum analyzer data chart.

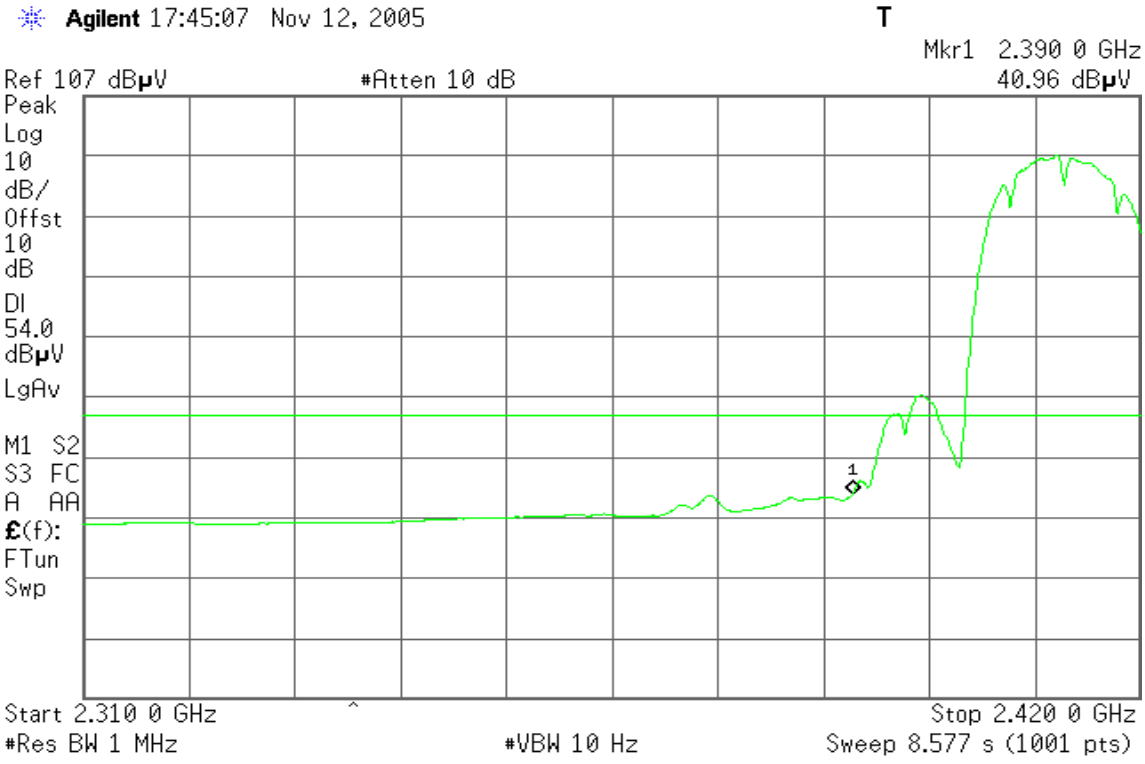
External Antenna: Dipole Antenna / Gain: 2 dBi

Band Edges (IEEE 802.11b / CH Low)

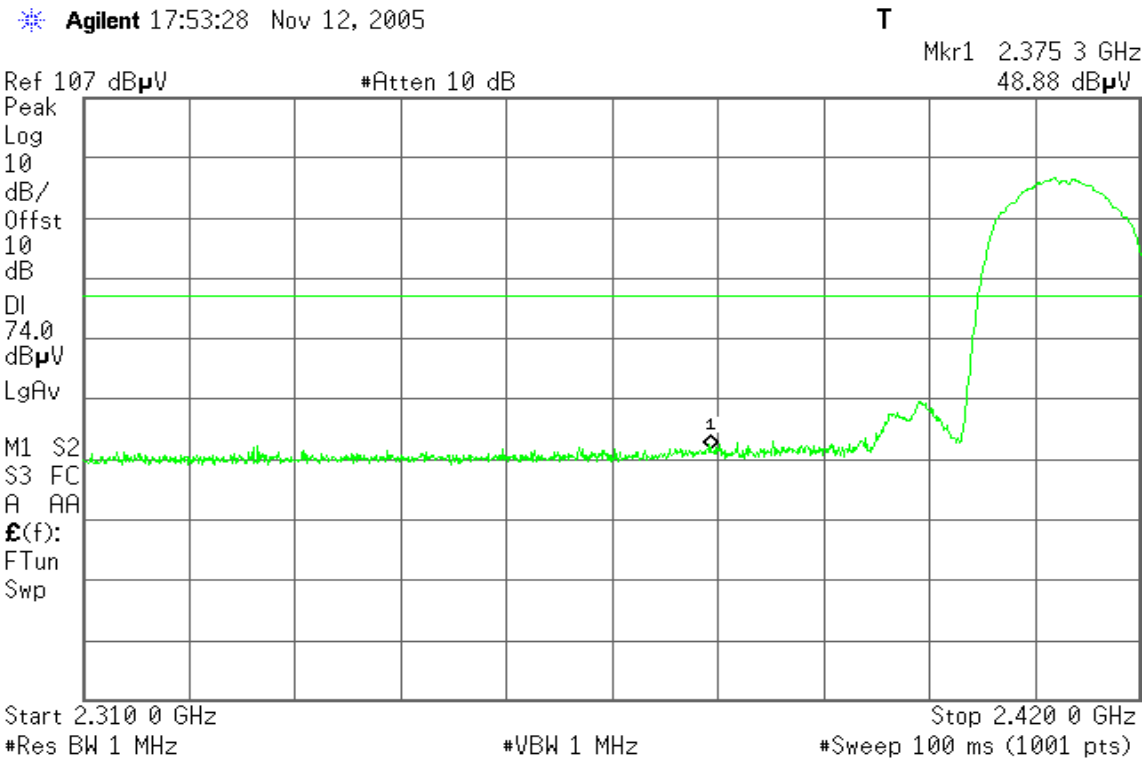
Detector mode: Peak **Polarity: Vertical**



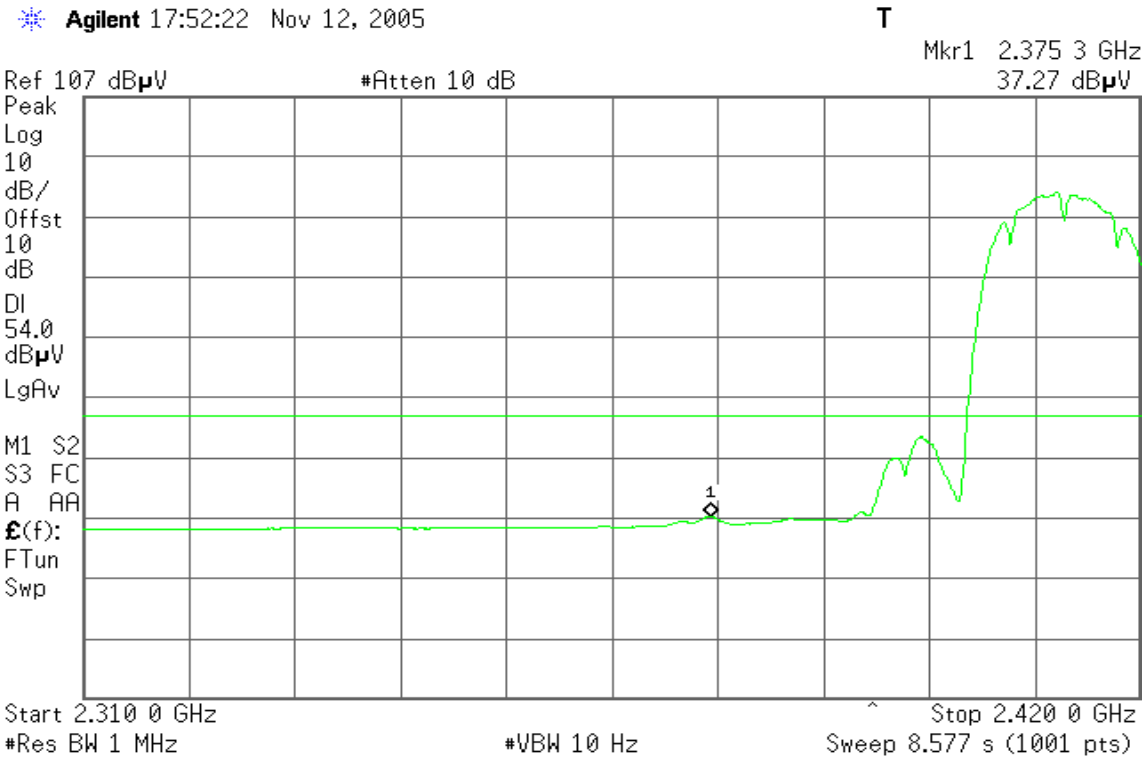
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

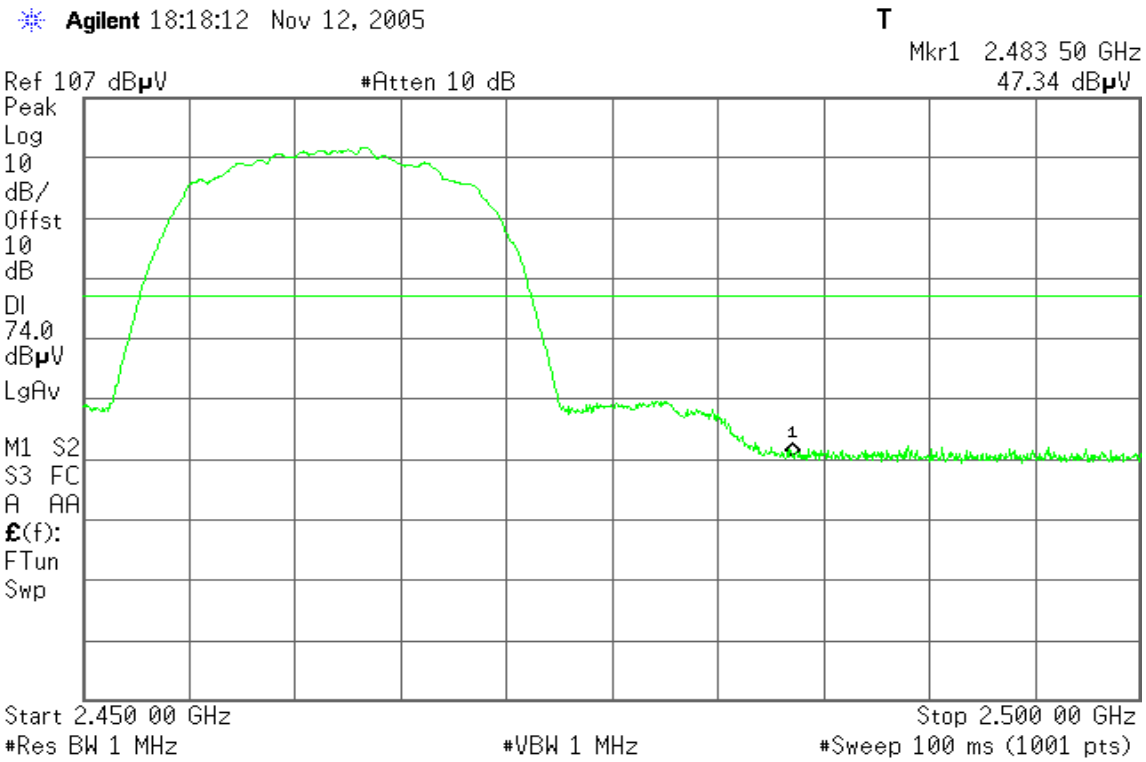


Detector mode: Average **Polarity: Horizontal**

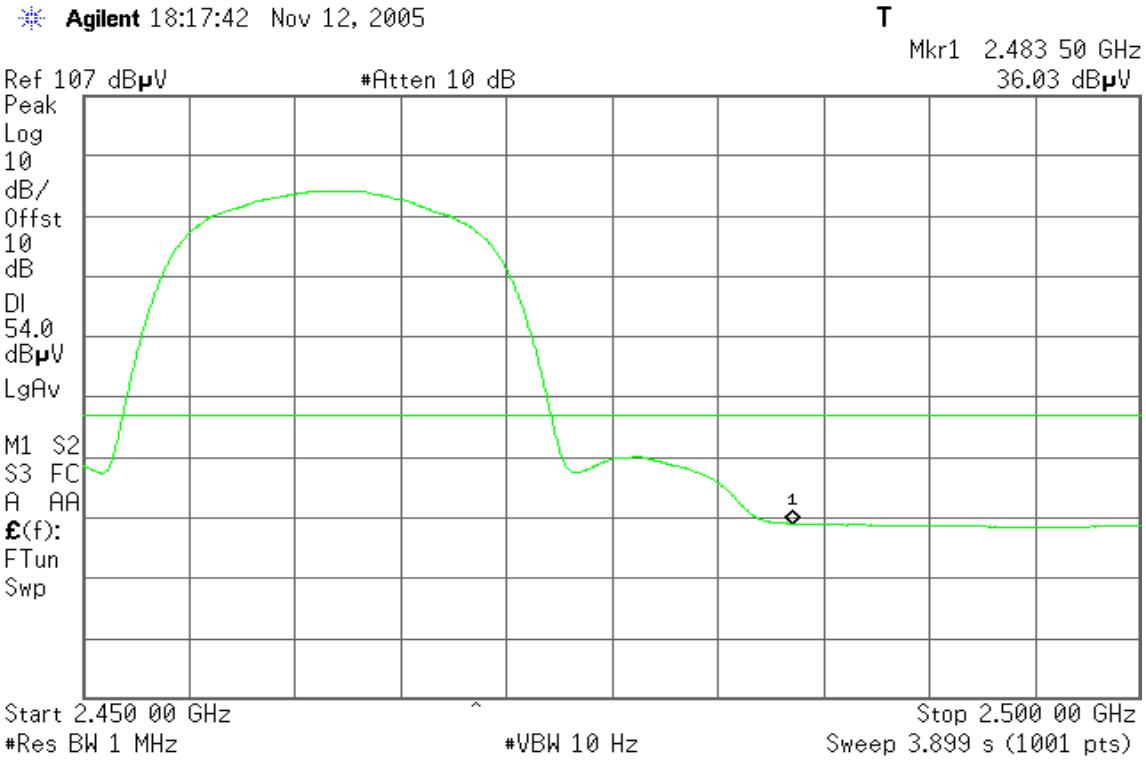


Band Edges (IEEE 802.11b / CH High)

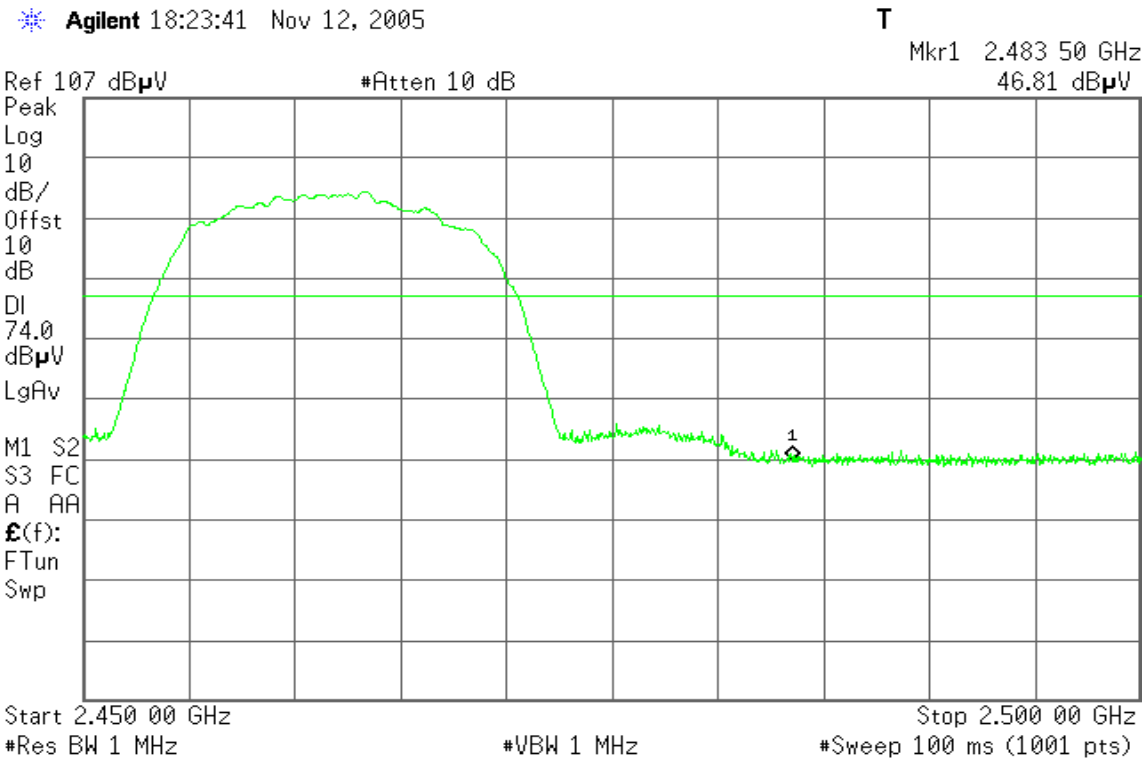
Detector mode: Peak Polarity: Vertical



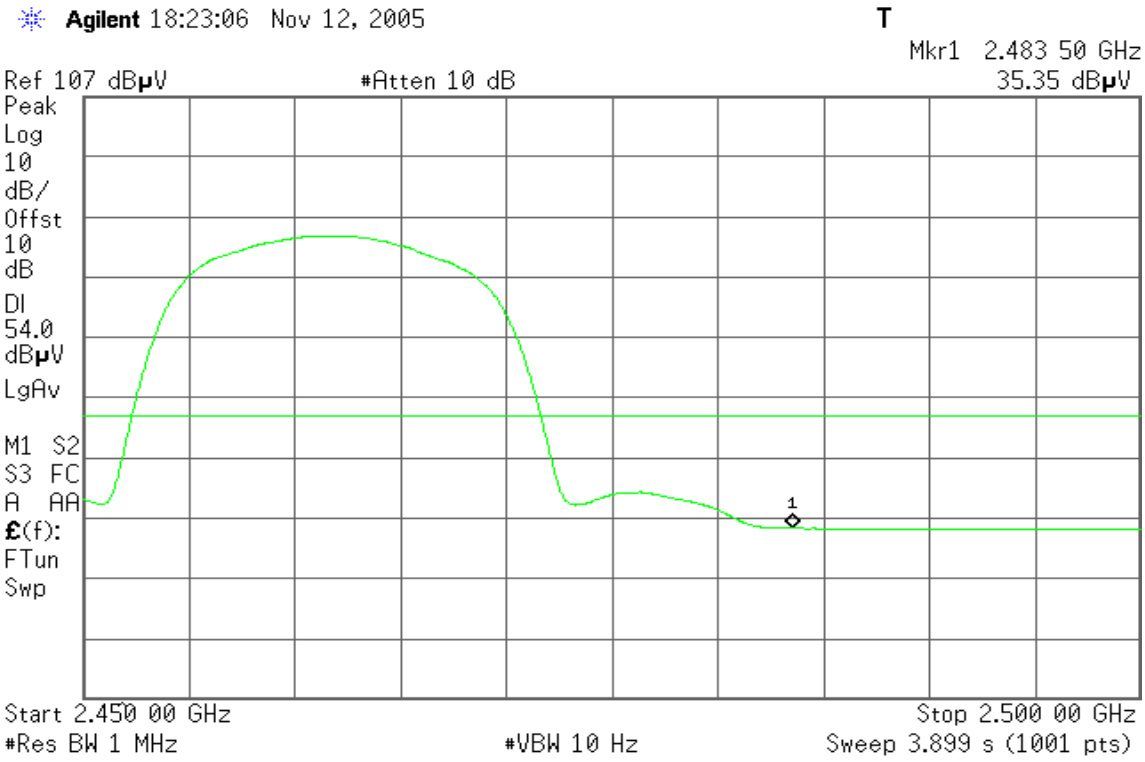
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

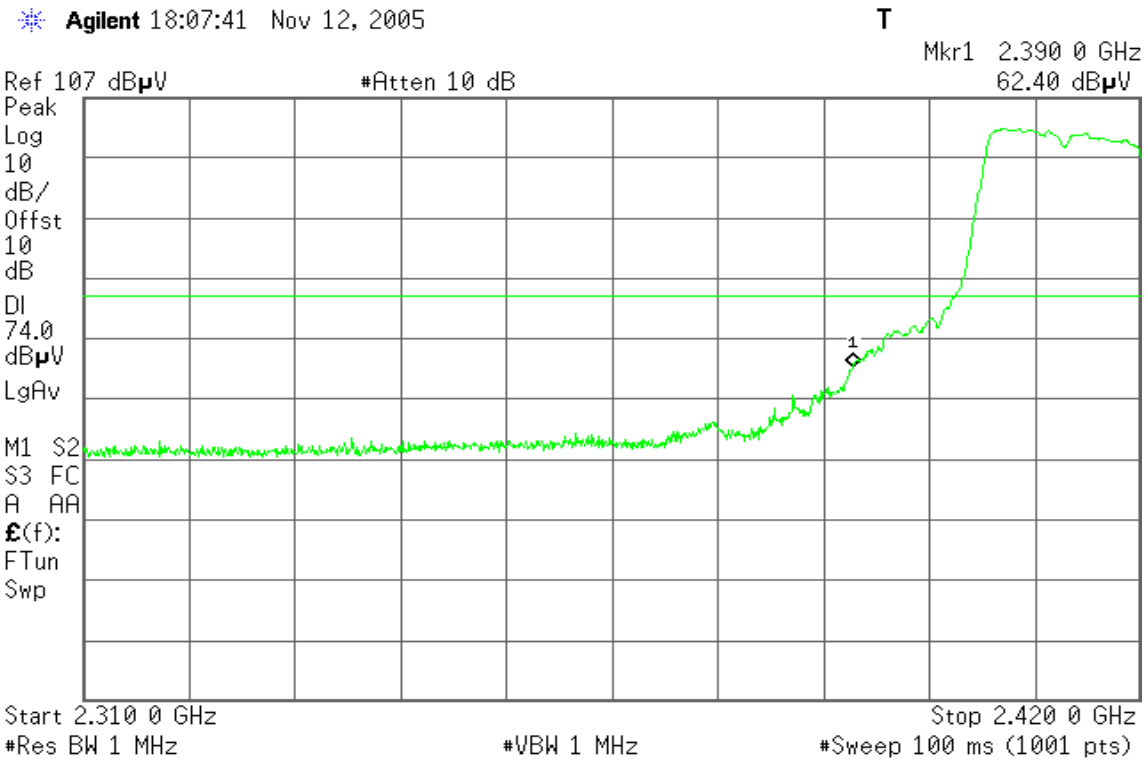


Detector mode: Average **Polarity: Horizontal**

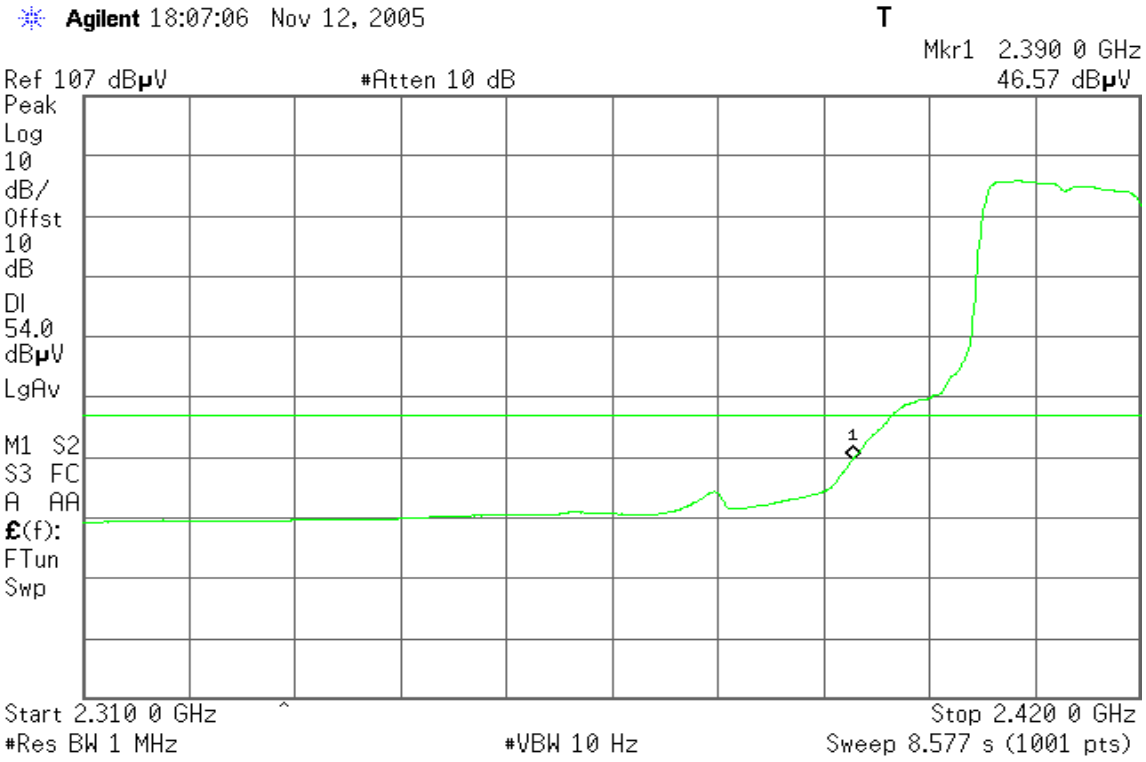


Band Edges (IEEE 802.11g / CH Low)

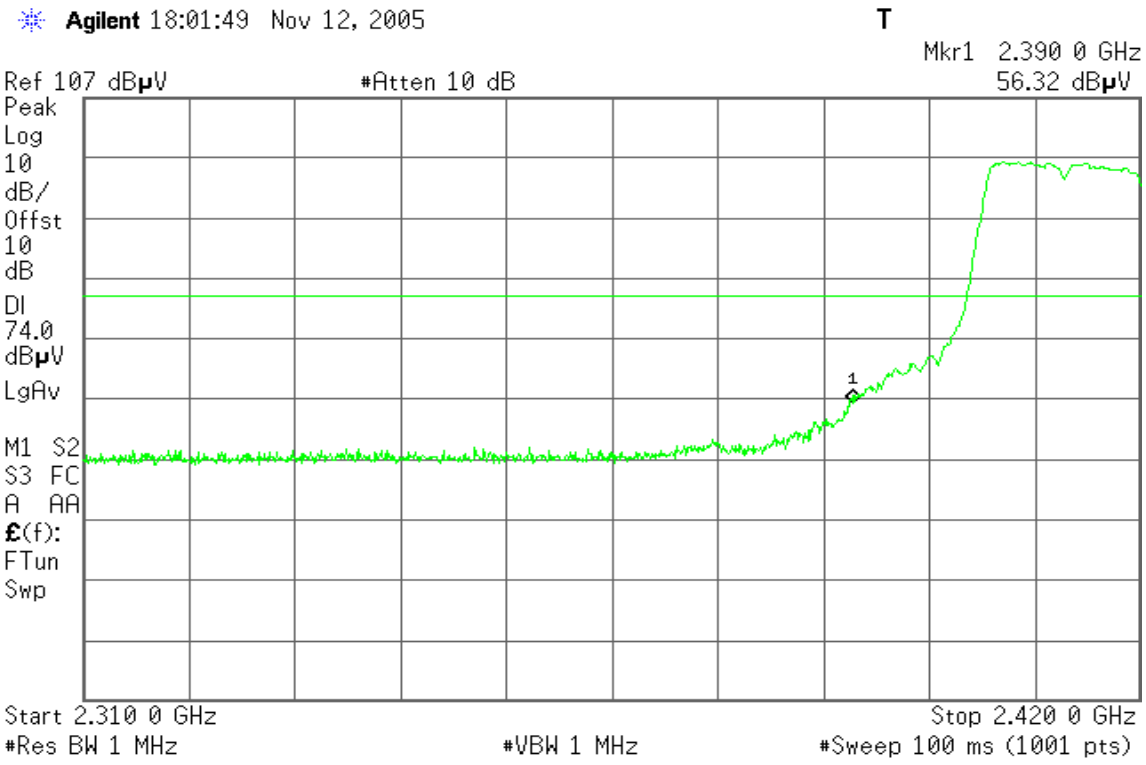
Detector mode: Peak Polarity: Vertical



Detector mode: Average Polarity: Vertical



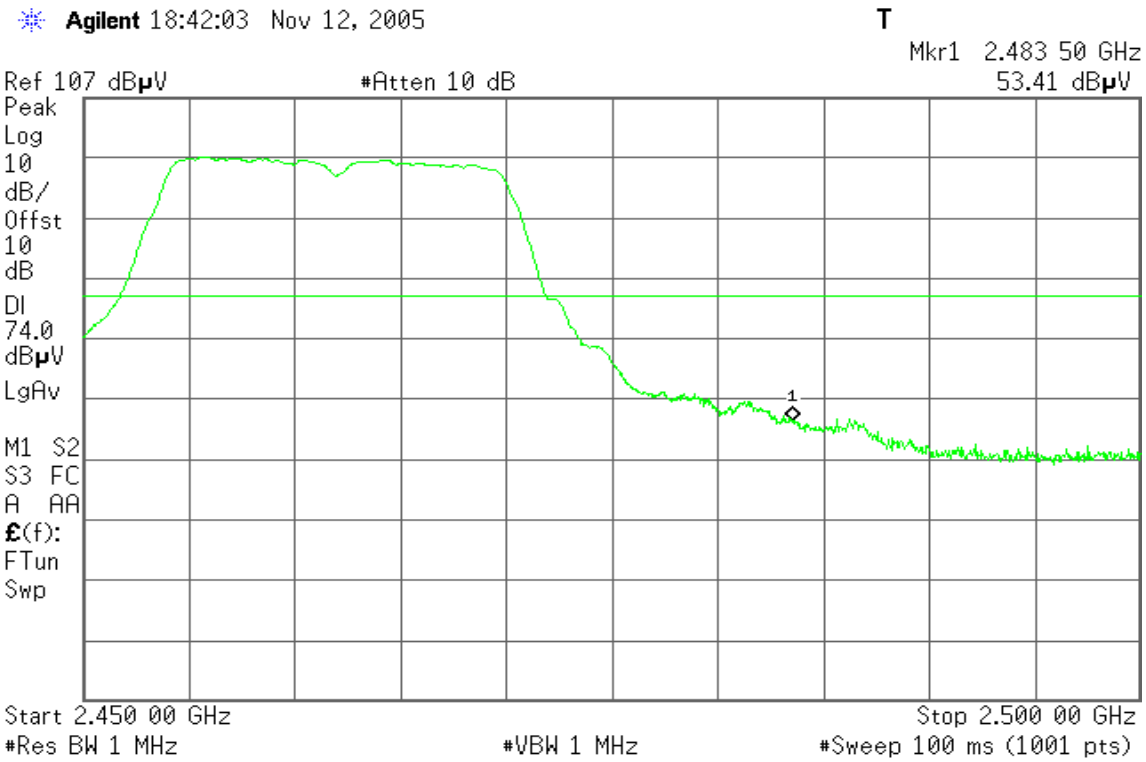
Detector mode: Peak **Polarity: Horizontal**



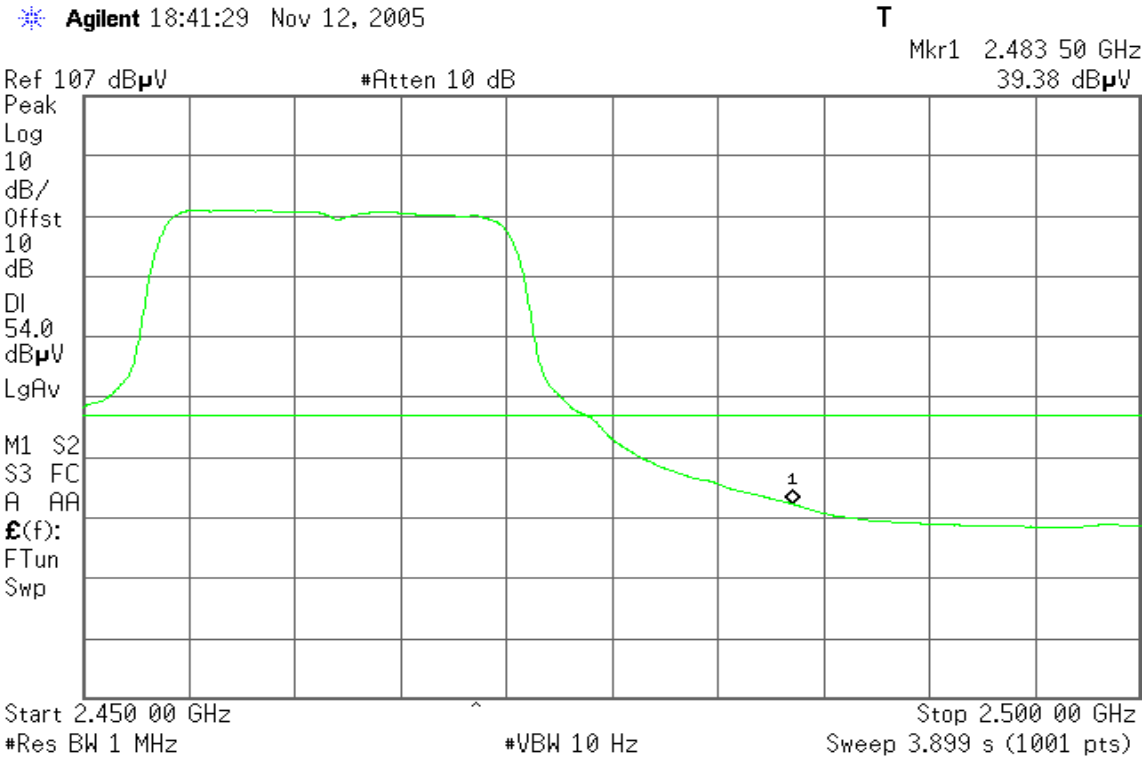
Detector mode: Average **Polarity: Horizontal**

Band Edges (IEEE 802.11g / CH High)

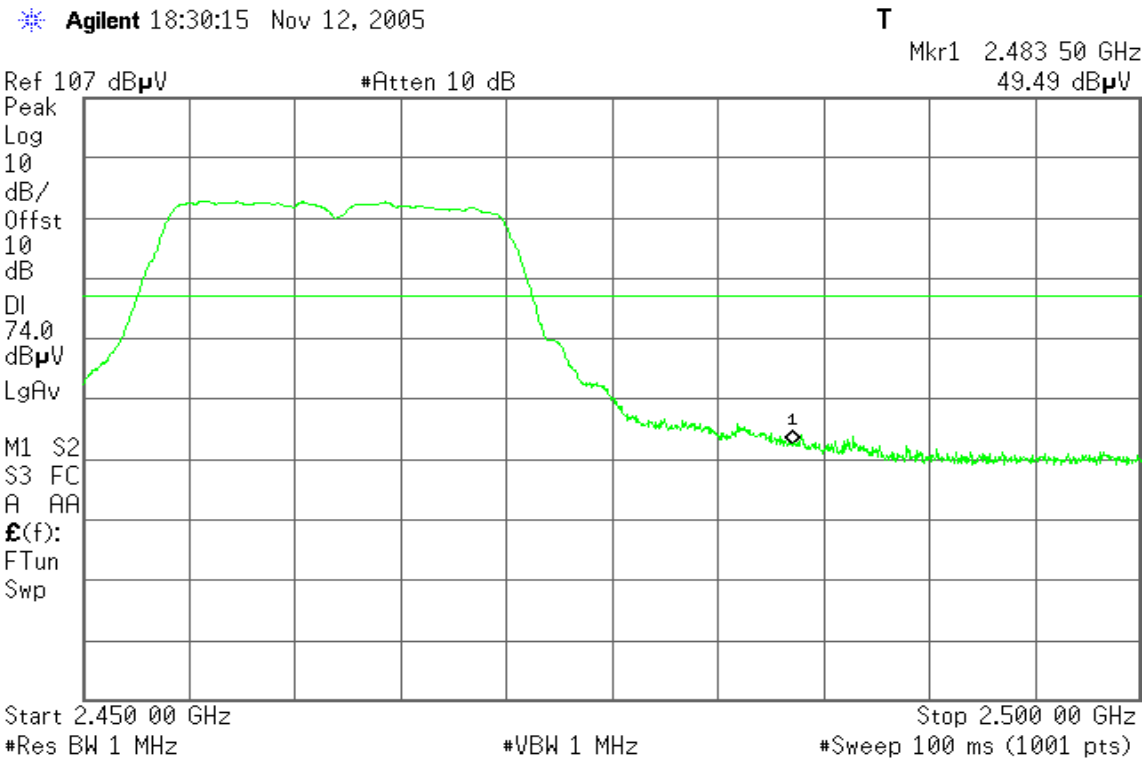
Detector mode: Peak Polarity: Vertical



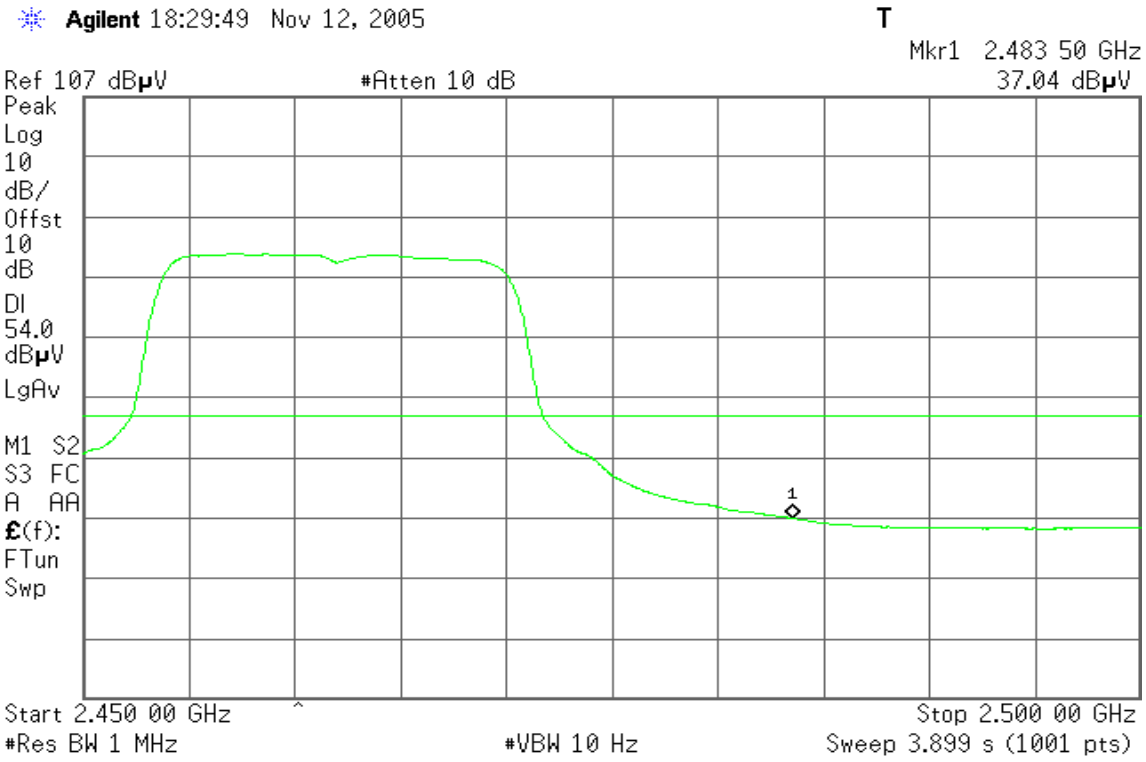
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**



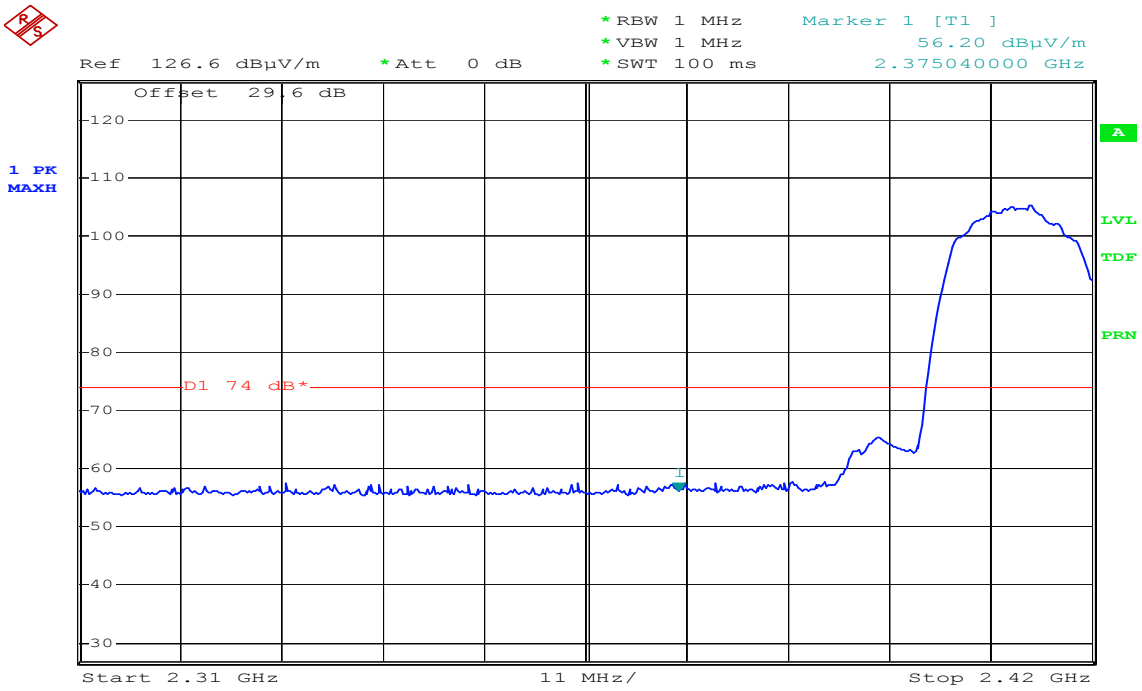
Detector mode: Average **Polarity: Horizontal**



Internal Antenna: PIFA Antenna / Gain: 1.77 dBi

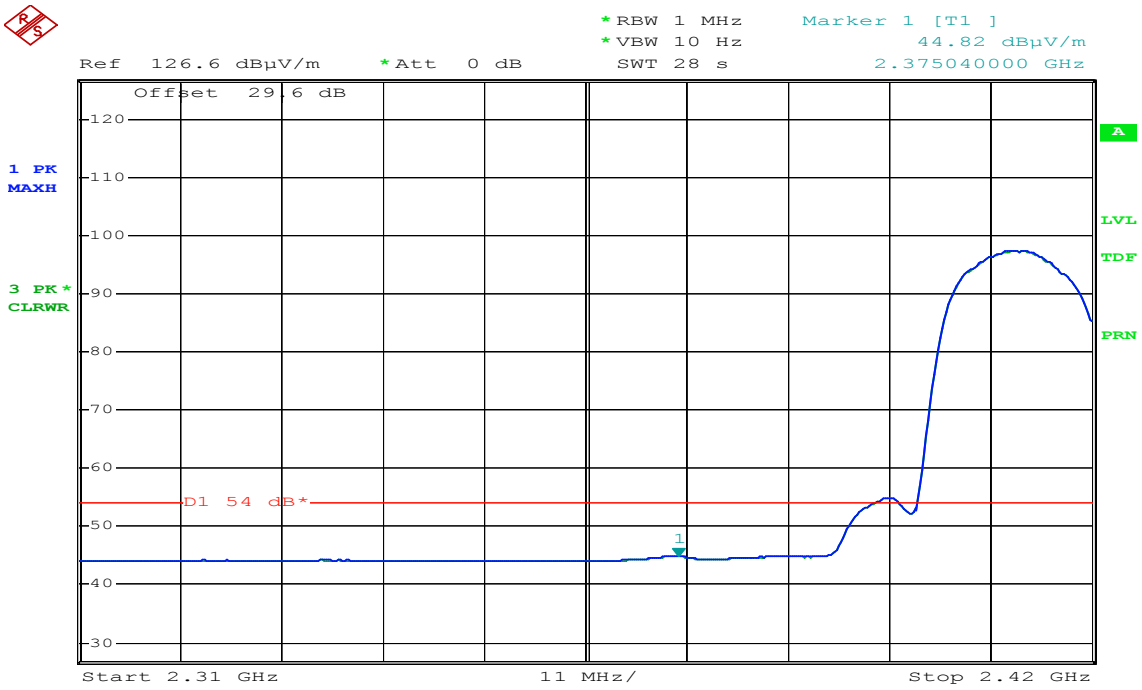
Band Edges (IEEE 802.11b / CH Low)

Detector mode: Peak Polarity: Vertical



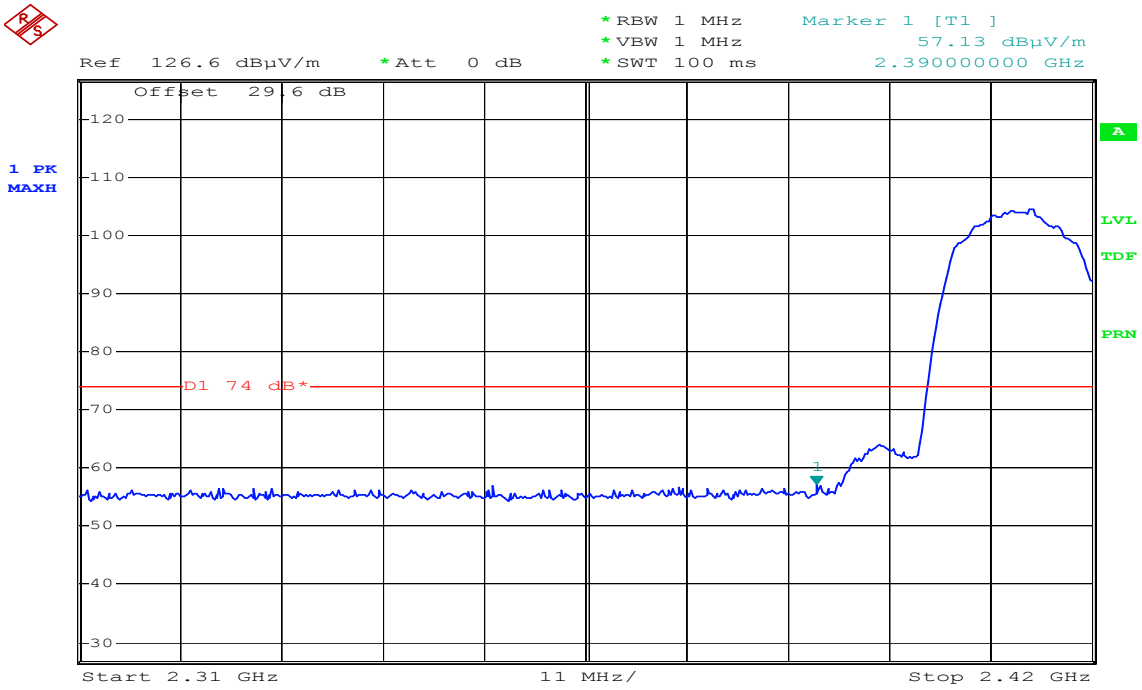
Date: 24.NOV.2005 05:14:32

Detector mode: Average Polarity: Vertical



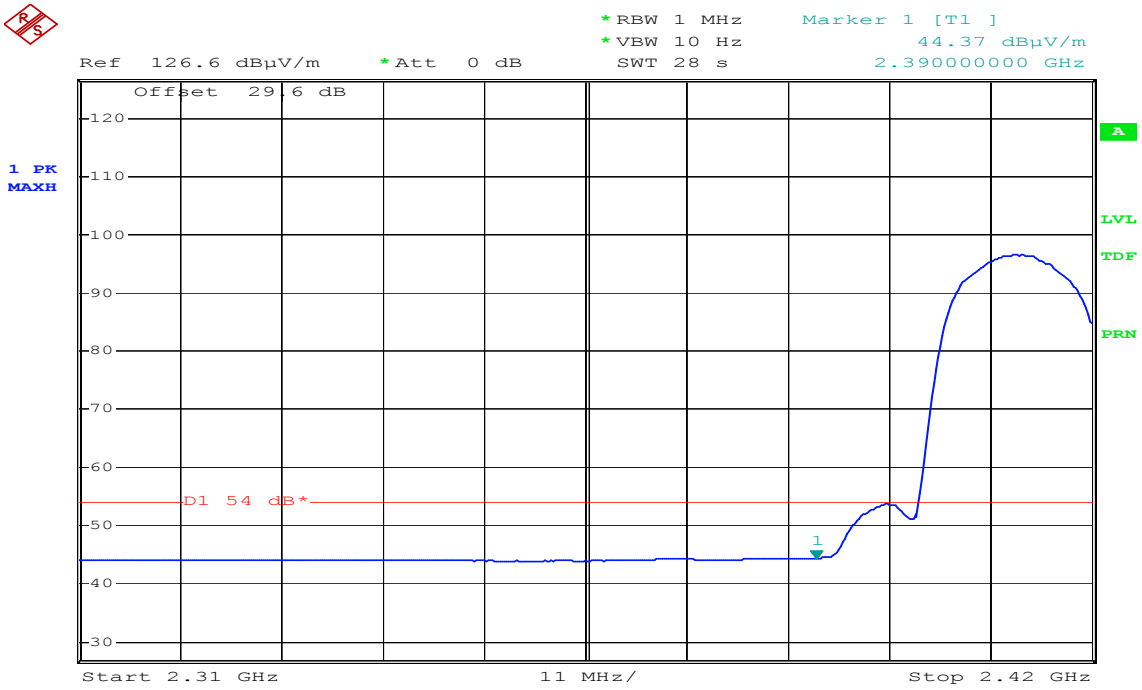
Date: 24.NOV.2005 05:11:28

Detector mode: Peak Polarity: Horizontal



Date: 24.NOV.2005 06:31:24

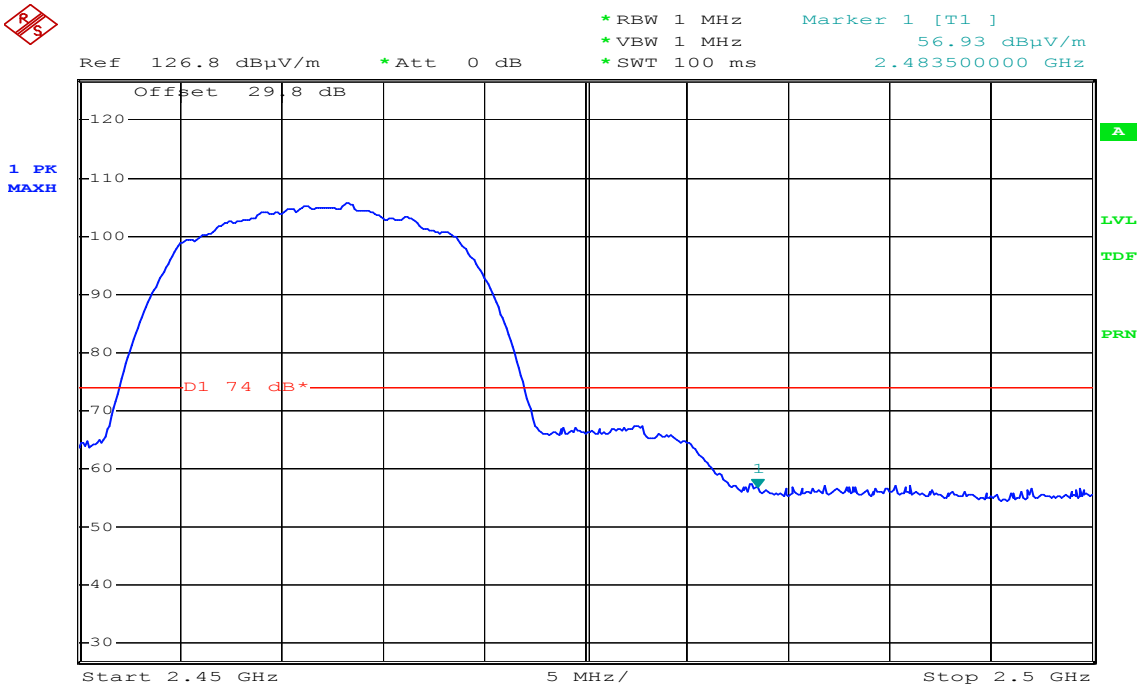
Detector mode: Average Polarity: Horizontal



Date: 24.NOV.2005 06:30:23

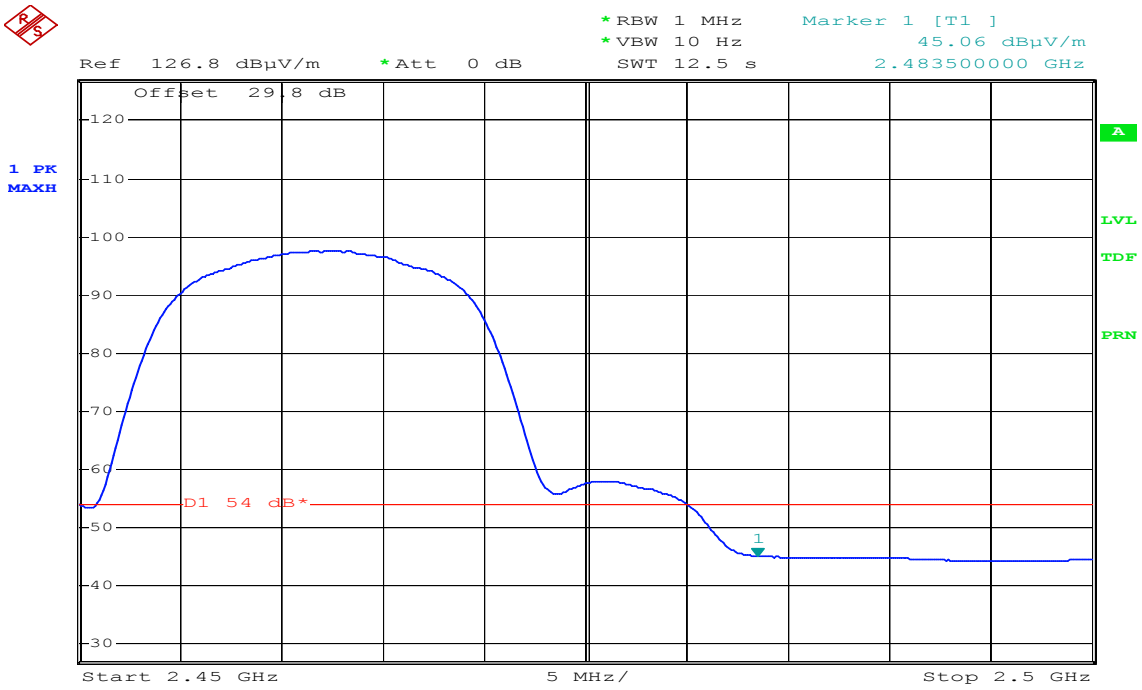
Band Edges (IEEE 802.11b / CH High)

Detector mode: Peak Polarity: Vertical



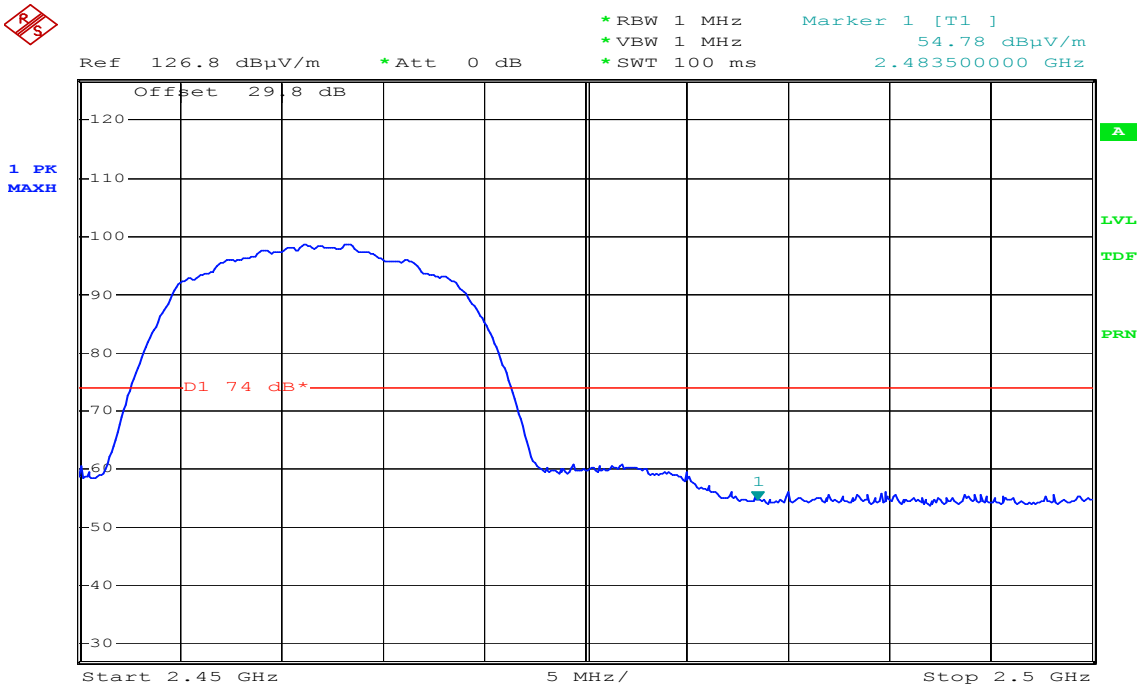
Date: 24.NOV.2005 06:46:06

Detector mode: Average Polarity: Vertical



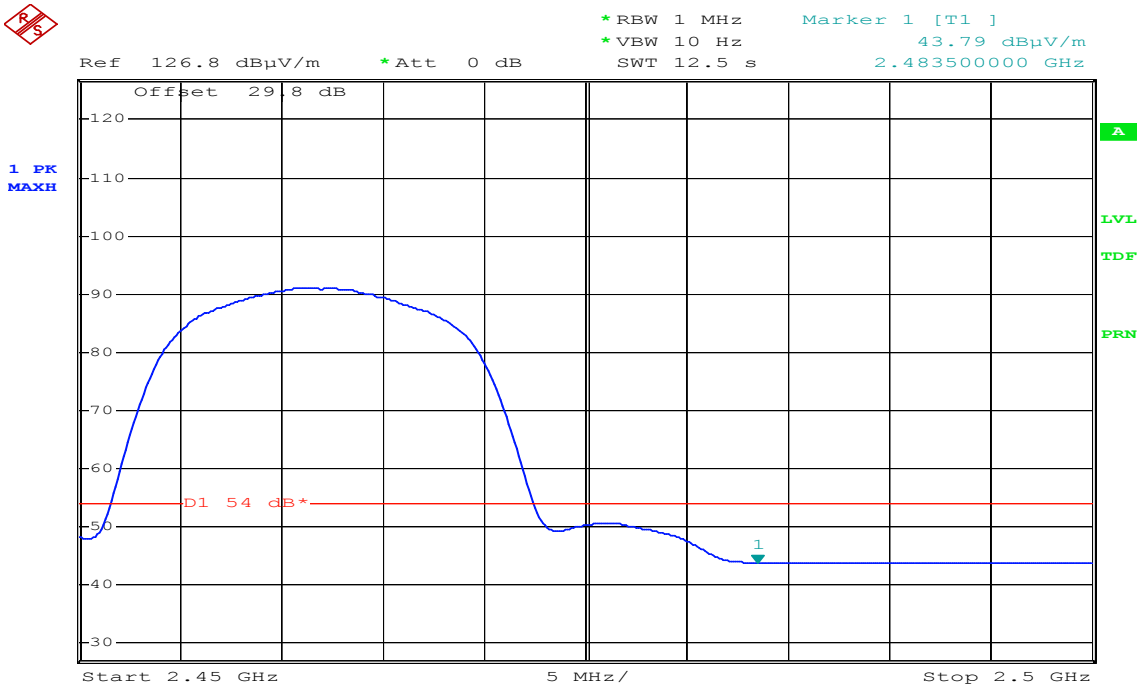
Date: 24.NOV.2005 06:47:15

Detector mode: Peak Polarity: Horizontal



Date: 24.NOV.2005 06:51:33

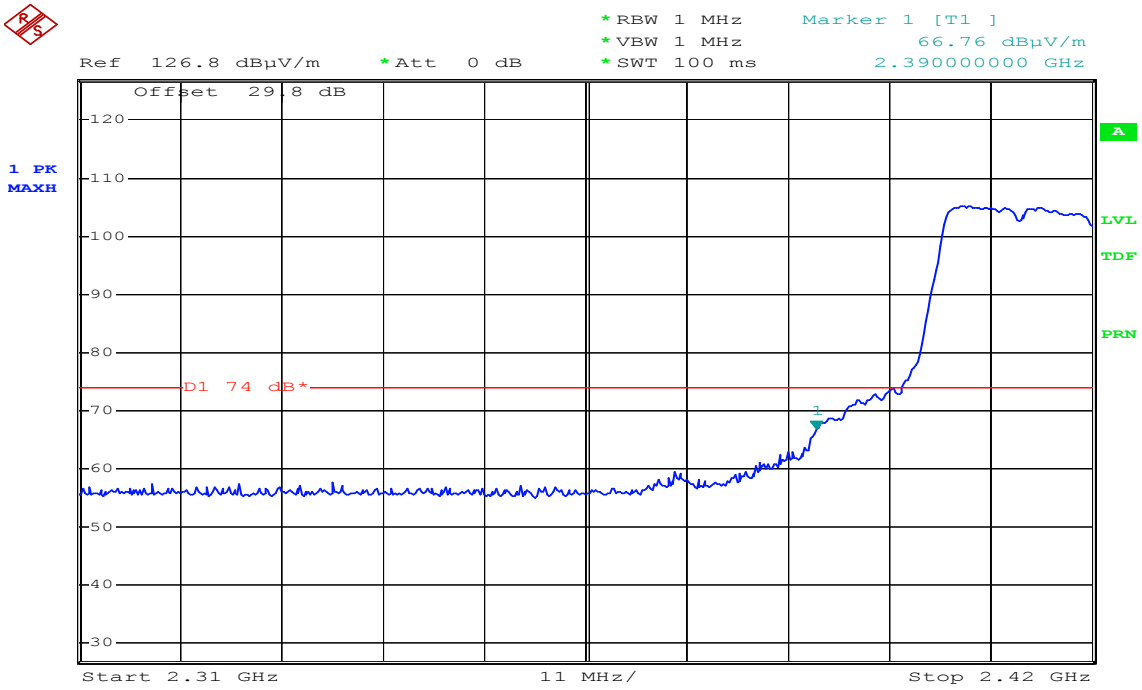
Detector mode: Average Polarity: Horizontal



Date: 24.NOV.2005 06:50:52

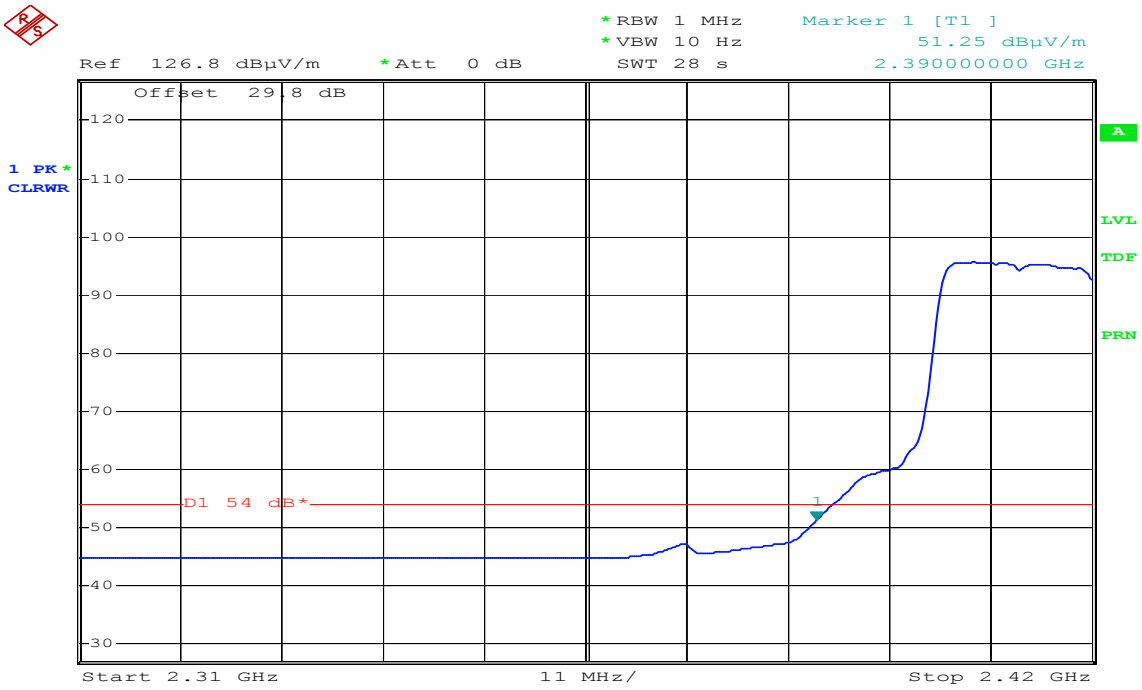
Band Edges (IEEE 802.11g / CH Low)

Detector mode: Peak Polarity: Vertical



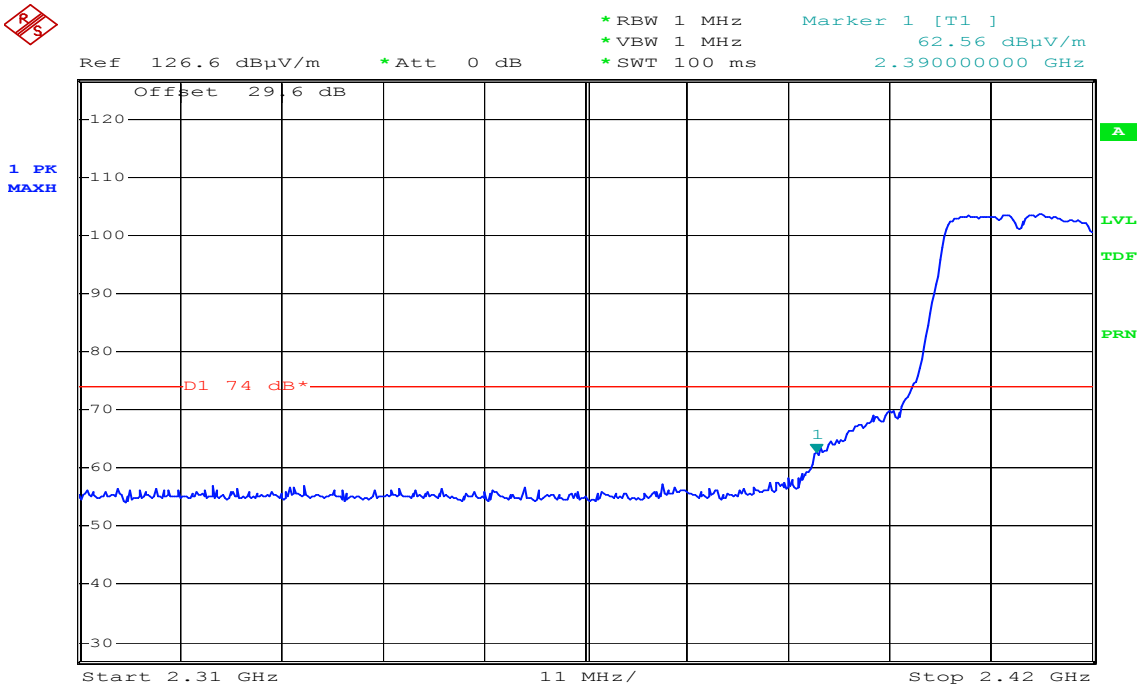
Date: 24.NOV.2005 07:06:04

Detector mode: Average Polarity: Vertical



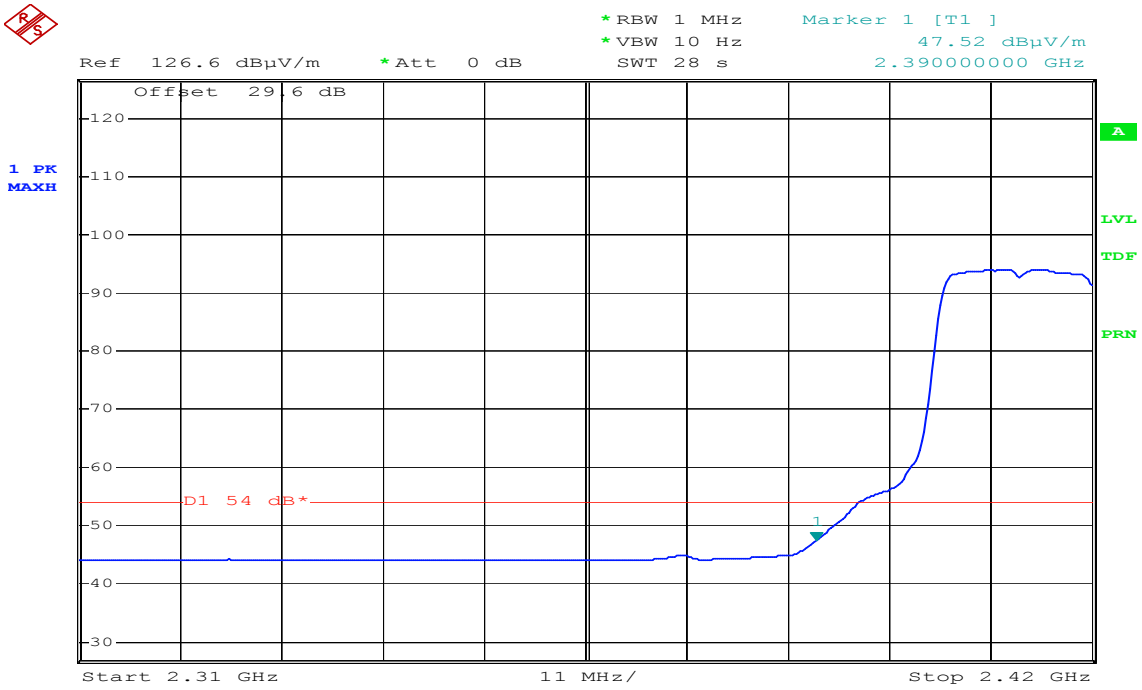
Date: 24.NOV.2005 07:05:24

Detector mode: Peak Polarity: Horizontal



Date: 24.NOV.2005 06:34:35

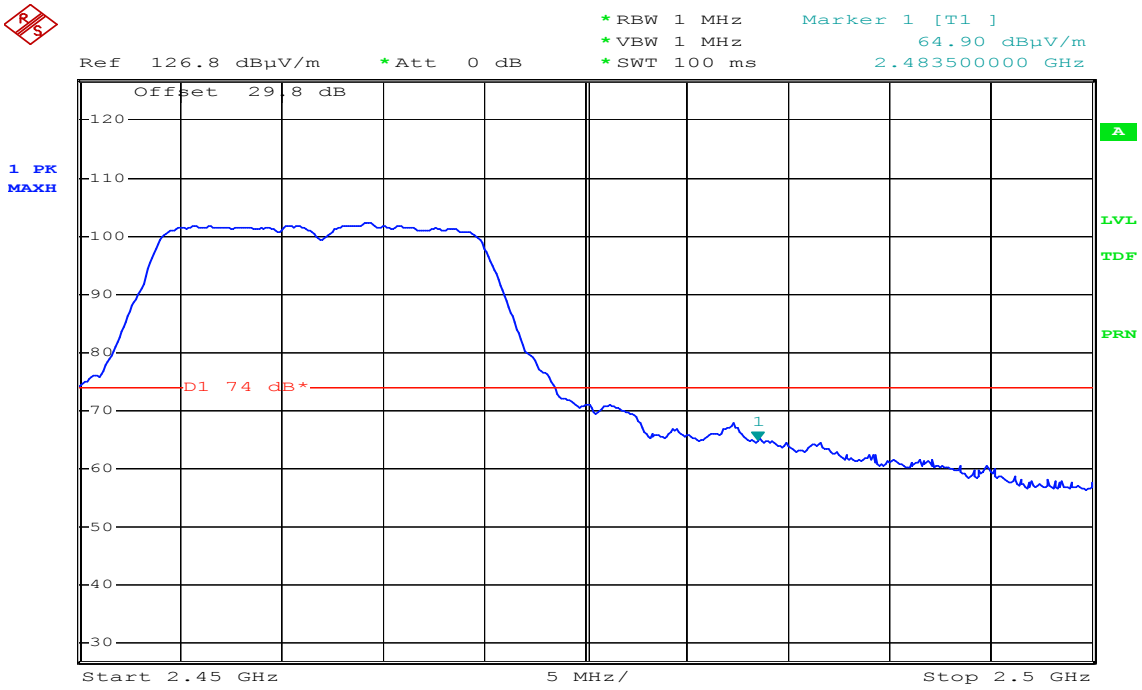
Detector mode: Average Polarity: Horizontal



Date: 24.NOV.2005 06:36:00

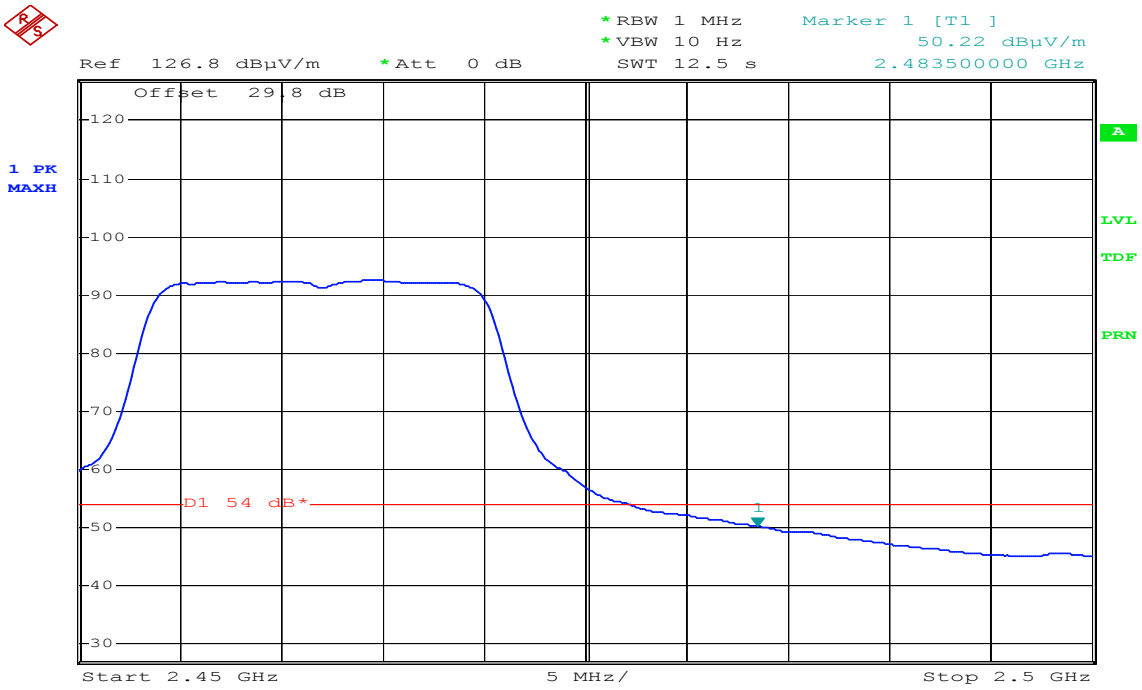
Band Edges (IEEE 802.11g / CH High)

Detector mode: Peak Polarity: Vertical



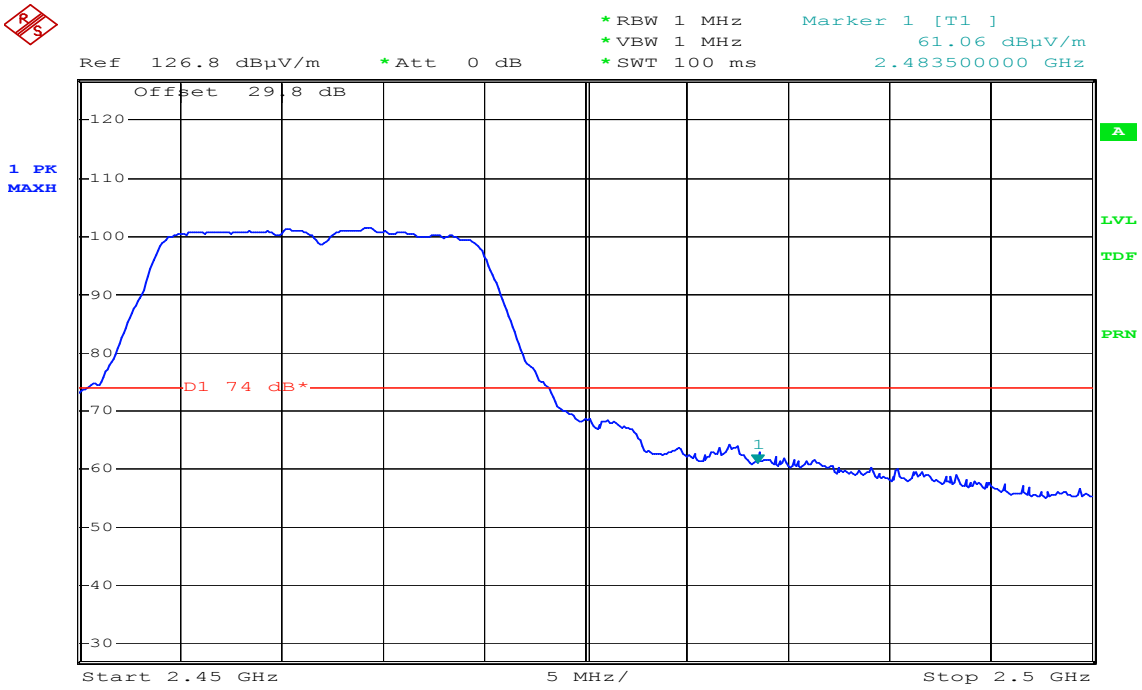
Date: 24.NOV.2005 06:59:50

Detector mode: Average Polarity: Vertical



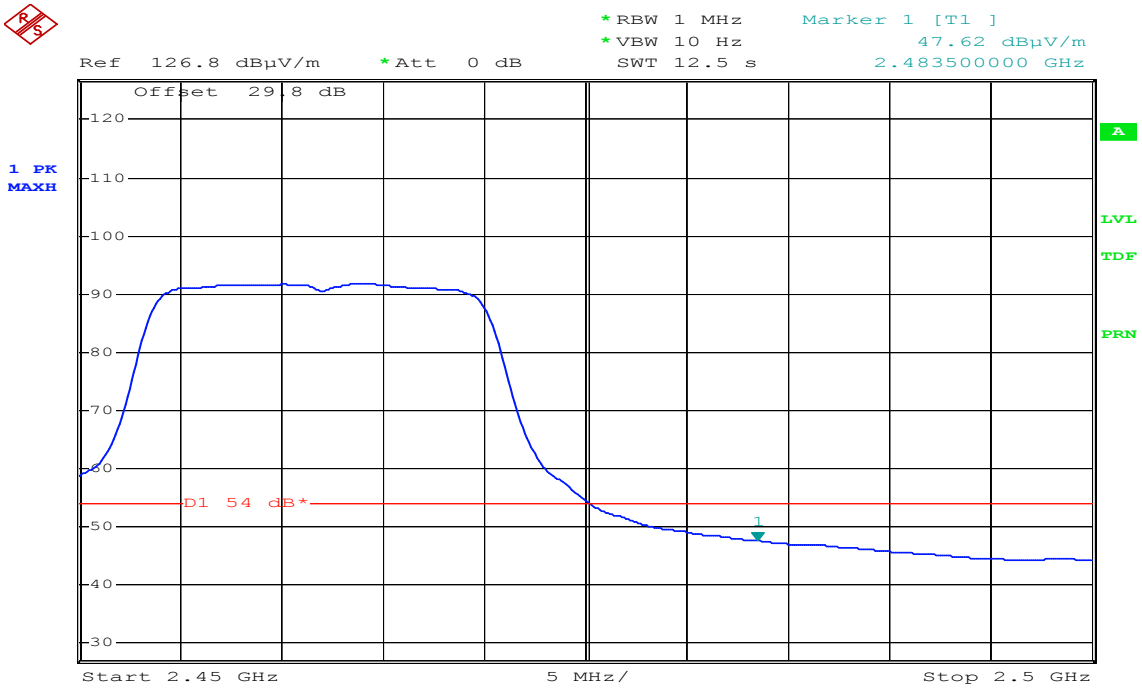
Date: 24.NOV.2005 06:59:15

Detector mode: Peak Polarity: Horizontal



Date: 24.NOV.2005 06:56:09

Detector mode: Average Polarity: Horizontal



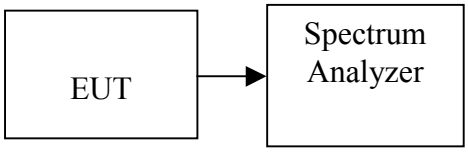
Date: 24.NOV.2005 06:55:32

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 = 3 kHz, VBW = 10 kHz, Span = 300 kHz, Sweep = 100 s
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

External Antenna: Dipole Antenna / Gain: 2 dBi

Test mode: IEEE 802.11b

Channel	Frequency	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-9.67	8.00	PASS
Mid	2437	-8.42		PASS
High	2462	-8.64		PASS

Test mode: IEEE 802.11g

Channel	Frequency	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-15.29	8.00	PASS
Mid	2437	-13.33		PASS
High	2462	-13.39		PASS

Internal Antenna: PIFA Antenna / Gain: 1.77 dBi

Test mode: IEEE 802.11b

Channel	Frequency	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-9.20	8.00	PASS
Mid	2437	-7.89		PASS
High	2462	-7.84		PASS

Test mode: IEEE 802.11g

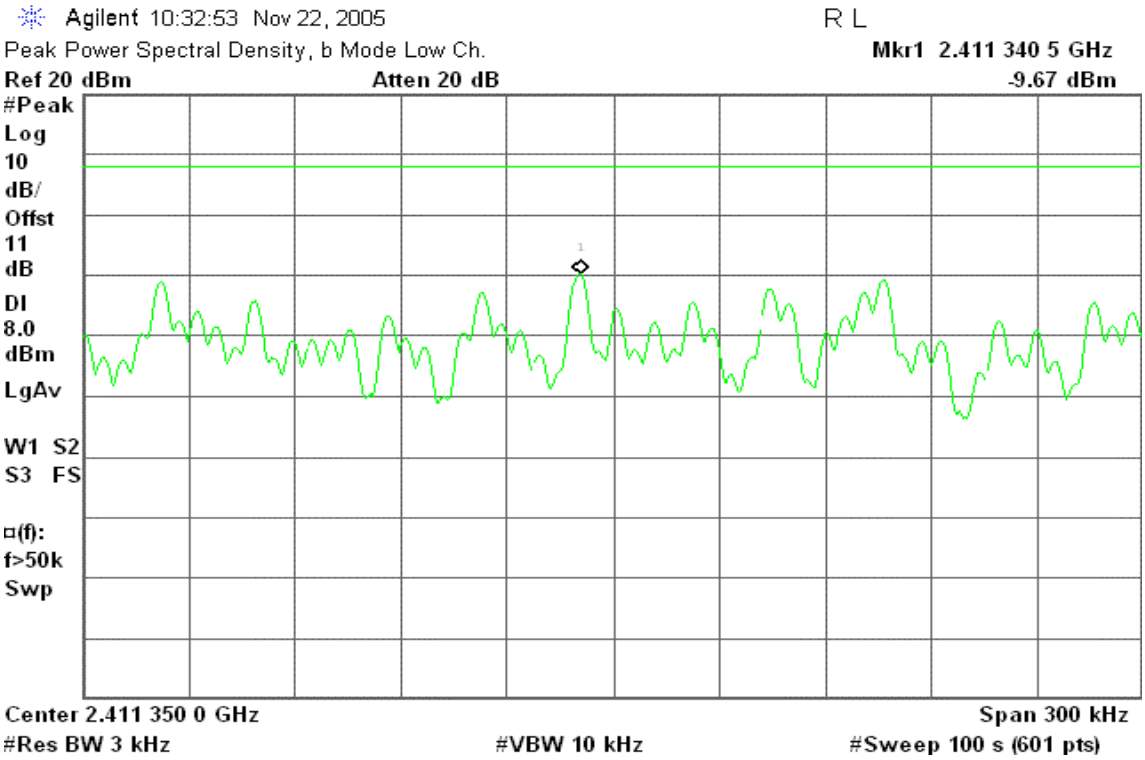
Channel	Frequency	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-14.23	8.00	PASS
Mid	2437	-12.27		PASS
High	2462	-12.54		PASS

Test Plot

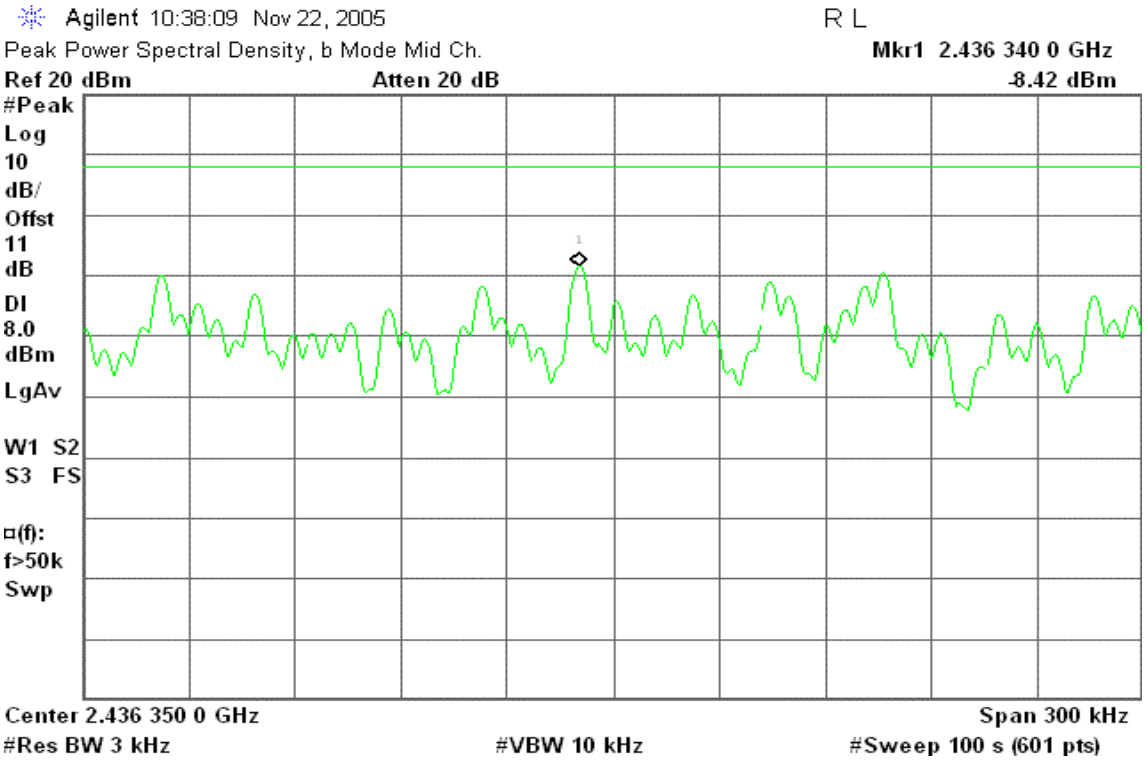
External Antenna: Dipole Antenna / Gain: 2 dBi

IEEE 802.11b

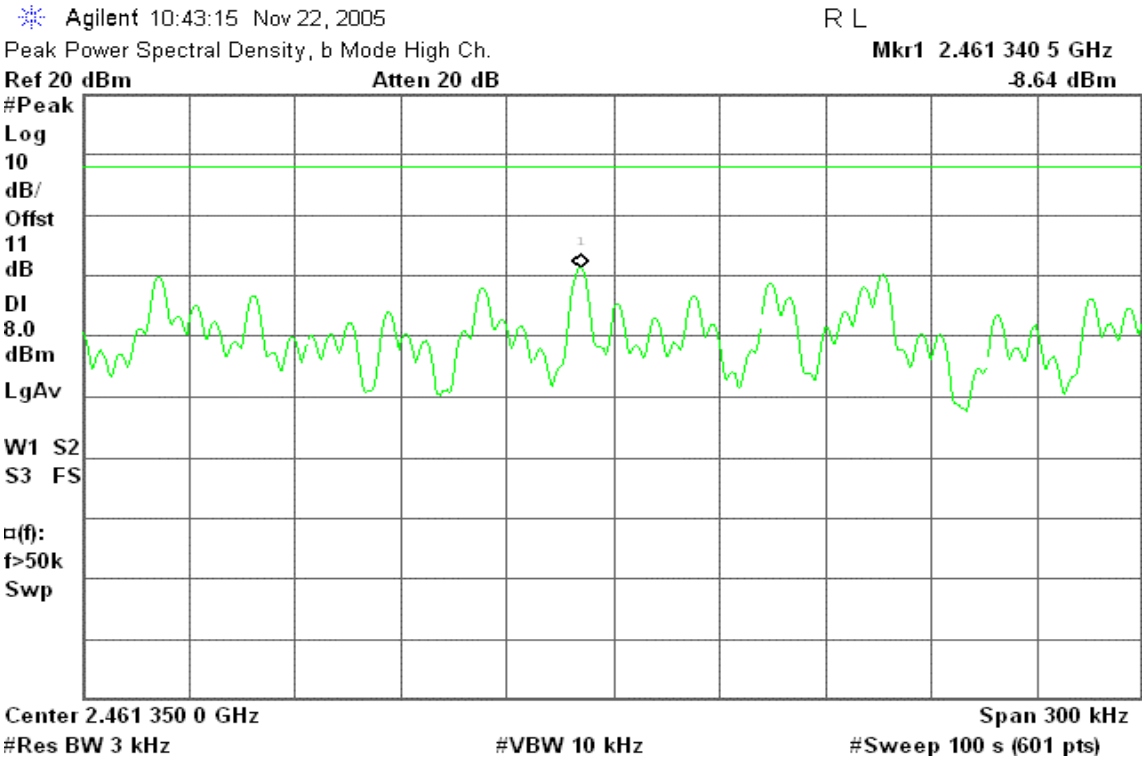
PPSD (CH Low)



PPSD (CH Mid)

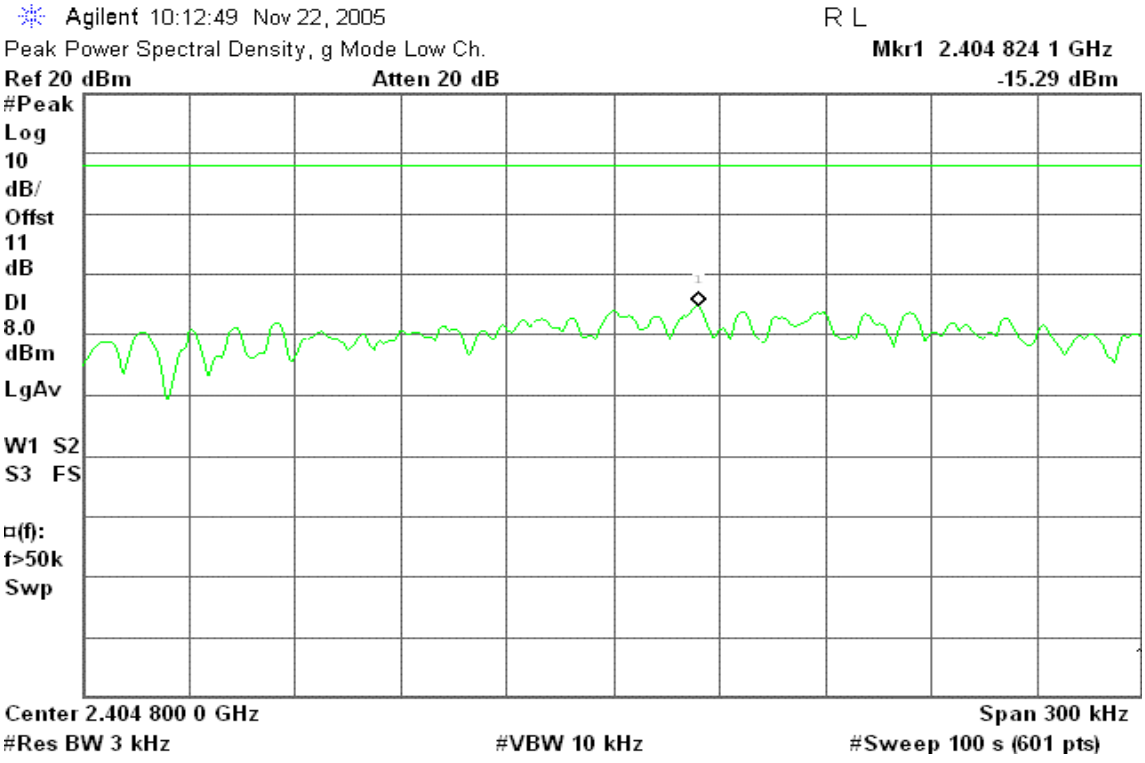


PPSD (CH High)

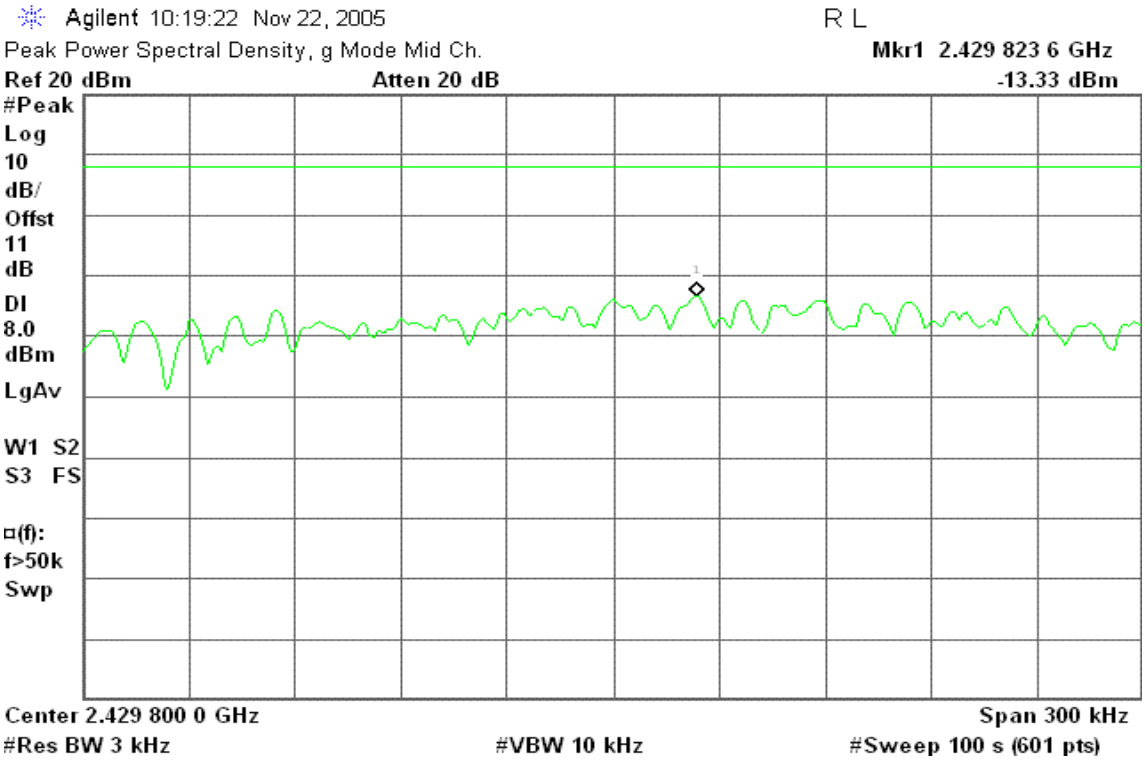


IEEE 802.11g

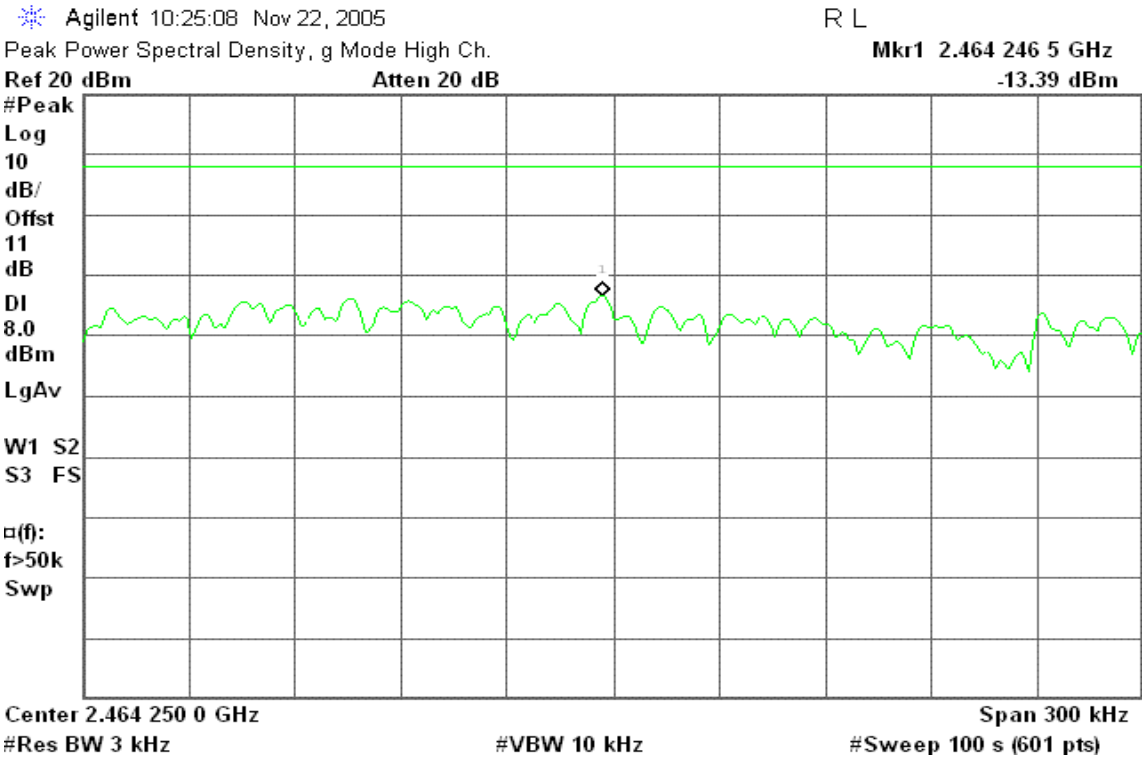
PPSD (CH Low)



PPSD (CH Mid)



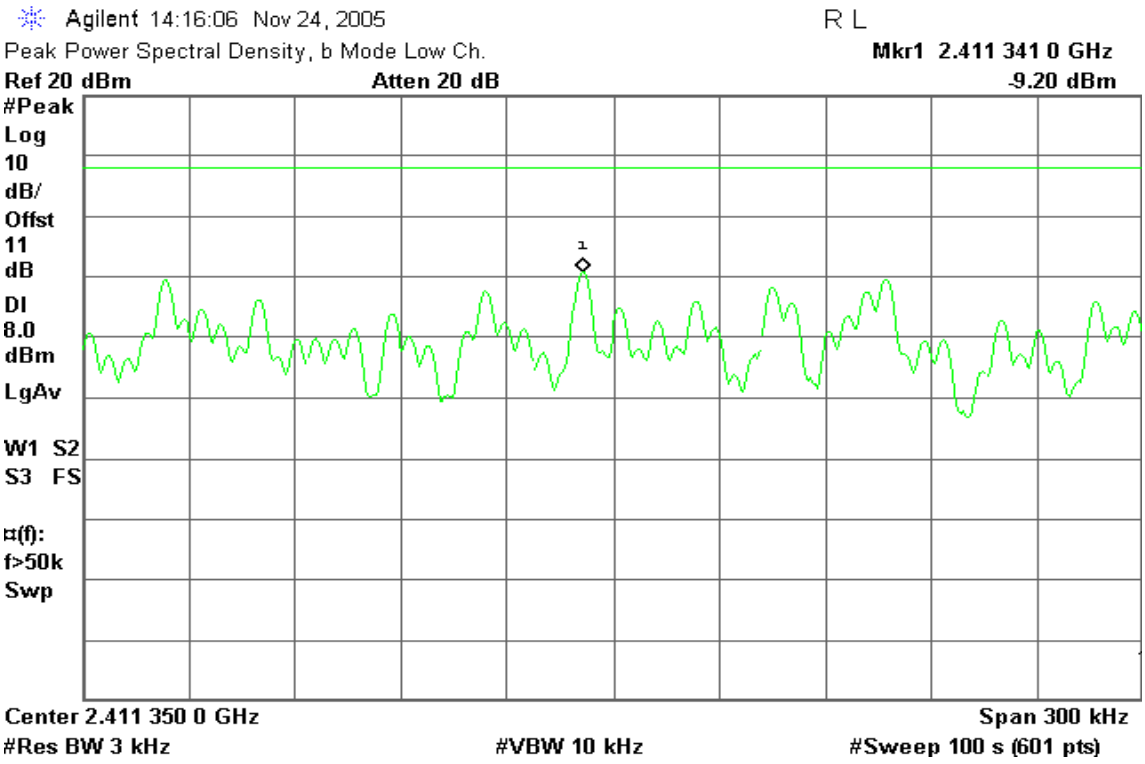
PPSD (CH High)



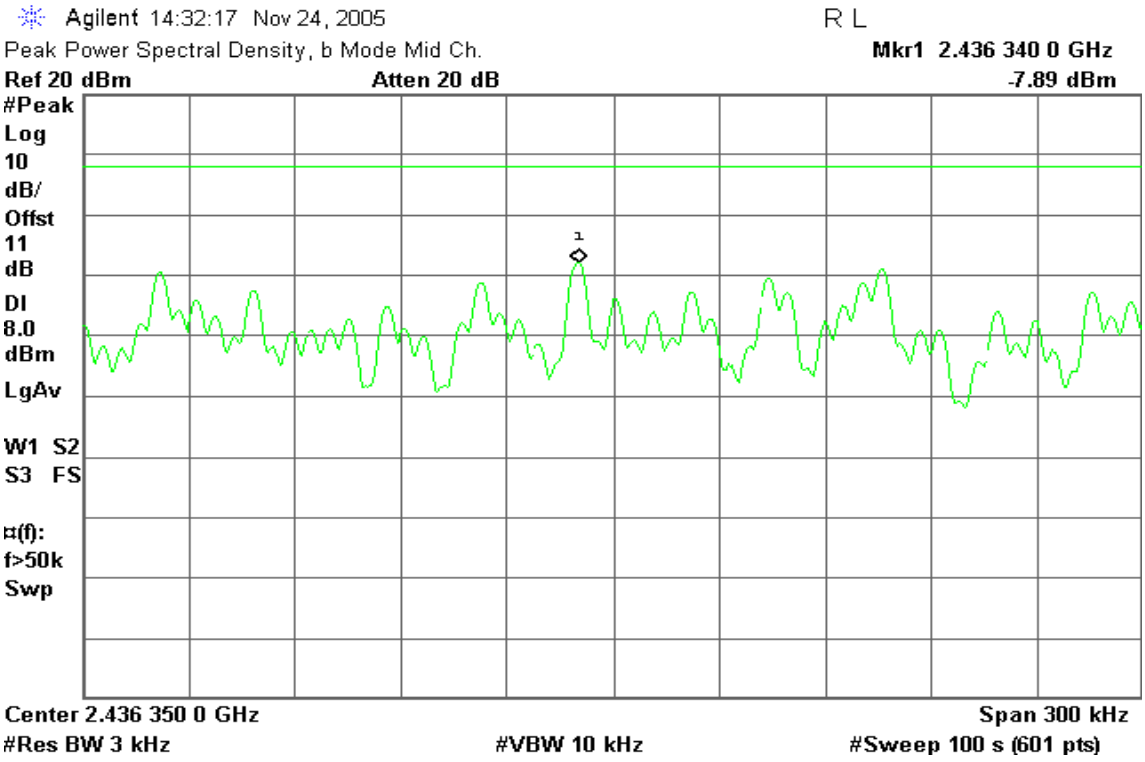
Internal Antenna: PIFA Antenna / Gain: 1.77 dBi

IEEE 802.11b

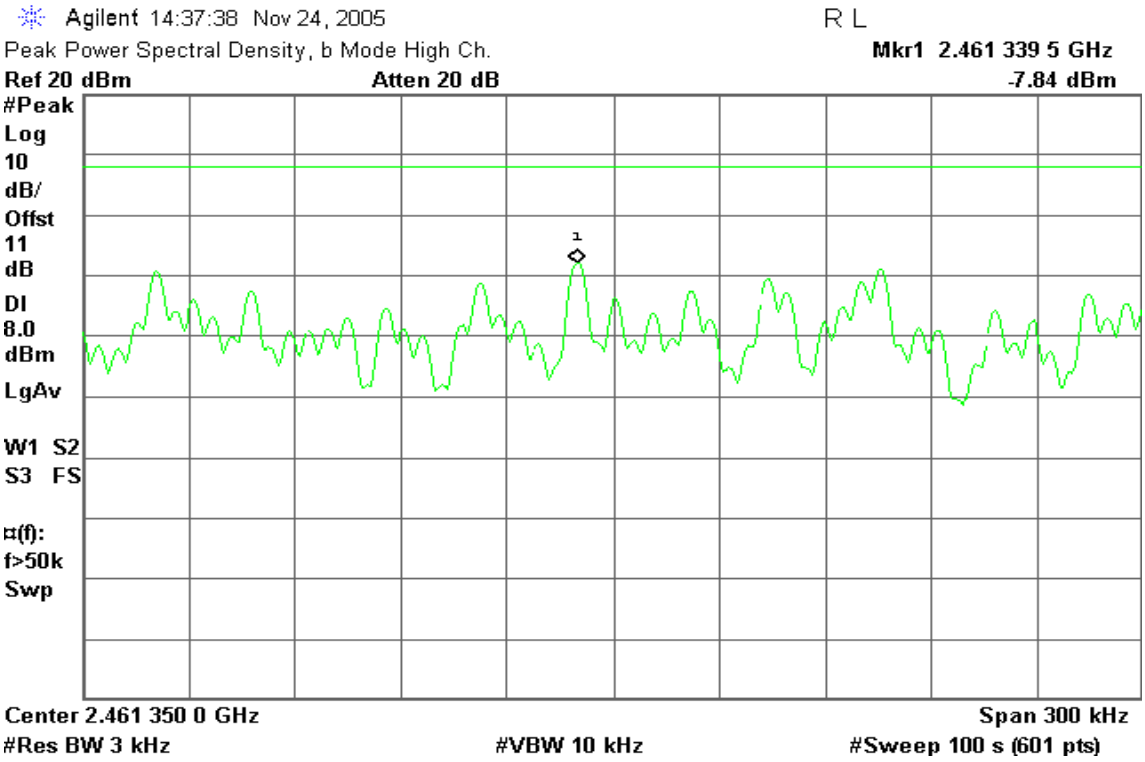
PPSD (CH Low)



PPSD (CH Mid)

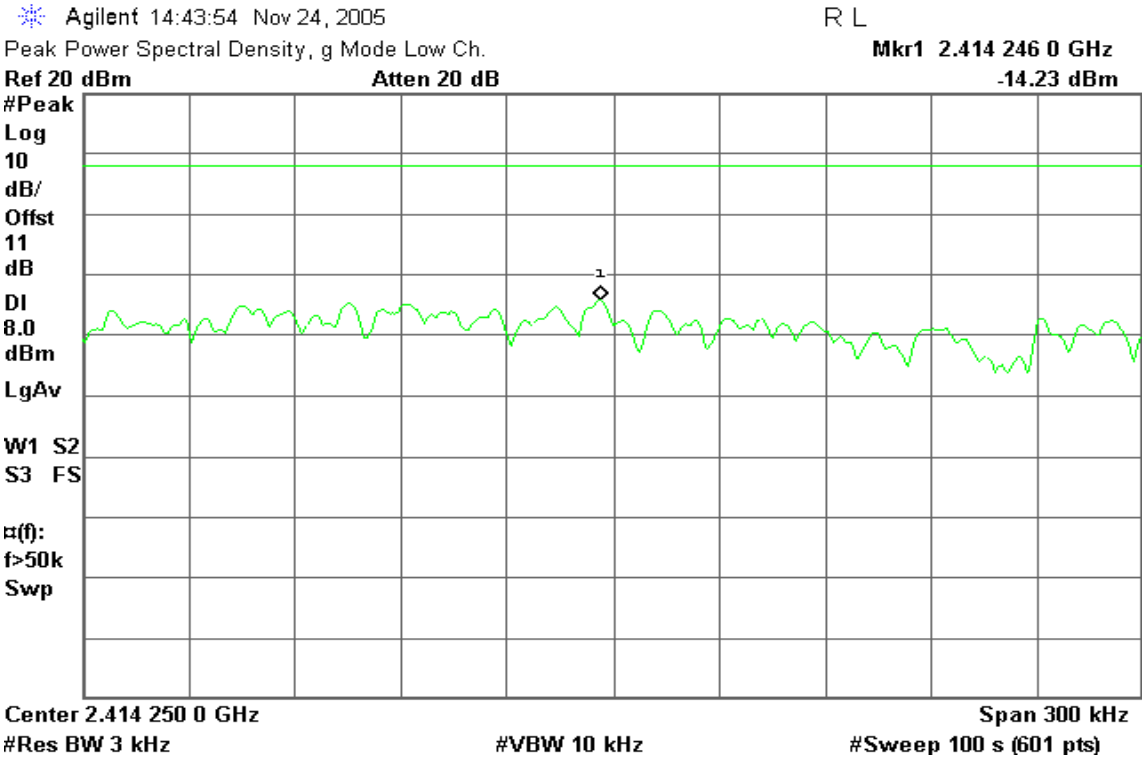


PPSD (CH High)

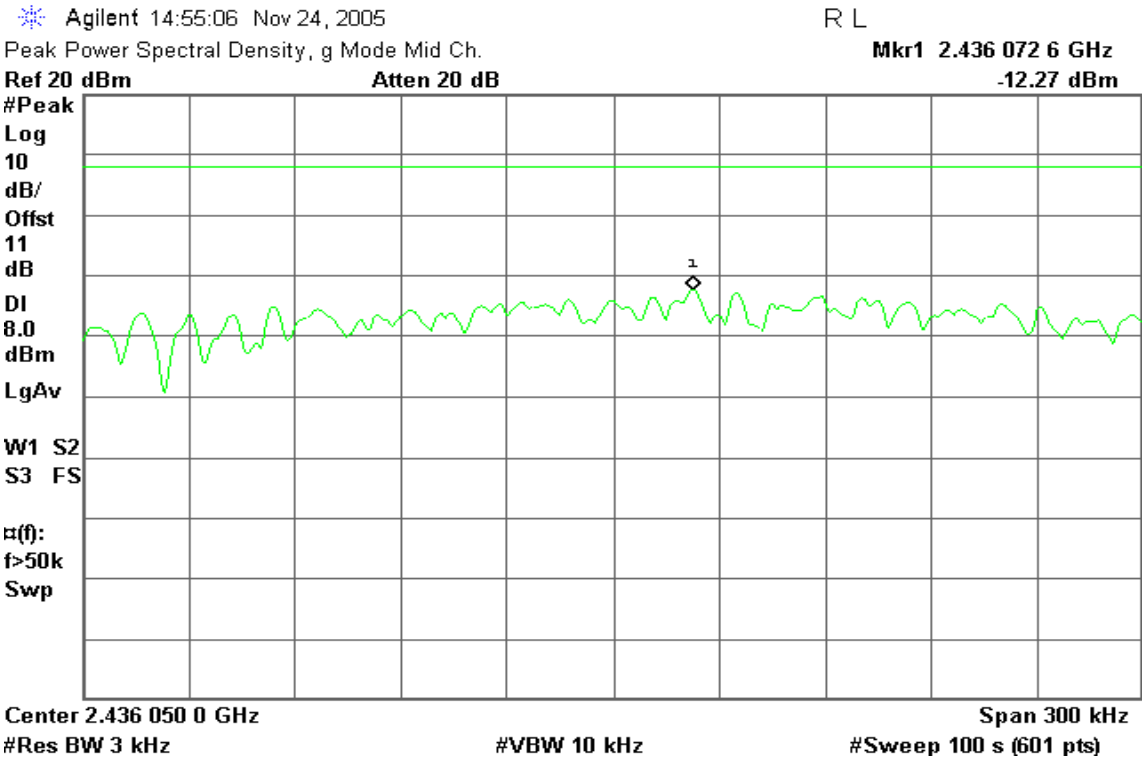


IEEE 802.11g

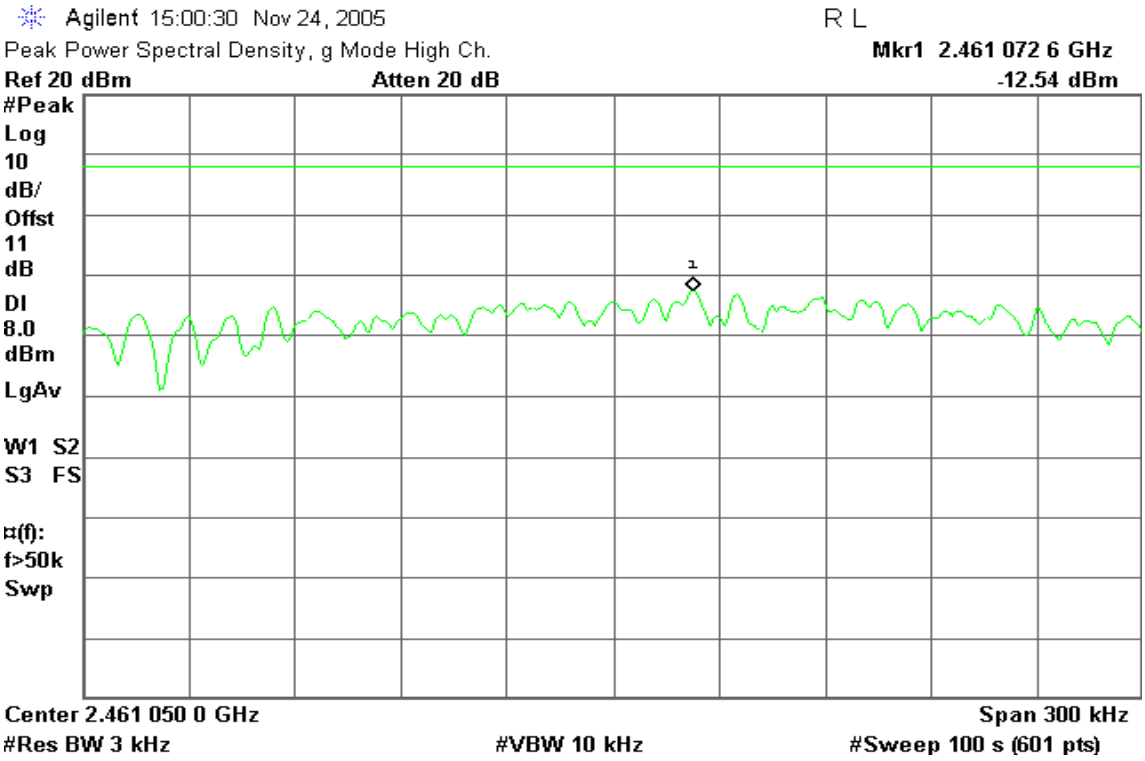
PPSD (CH Low)



PPSD (CH Mid)



PPSD (CH High)



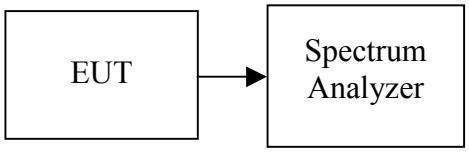
7.6 SPURIOUS EMISSIONS

7.6.1 Conducted Measurement

LIMIT

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

Test Configuration



TEST PROCEDURE

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

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

TEST RESULTS

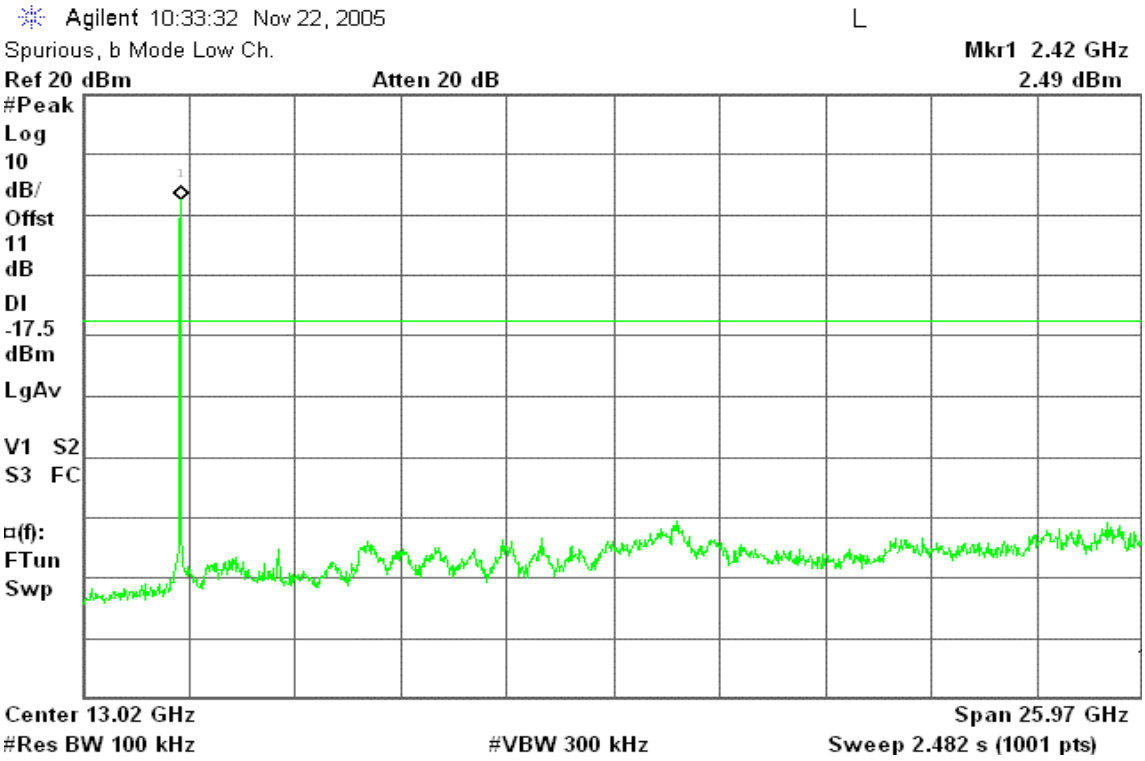
No non-compliance noted

Test Plot

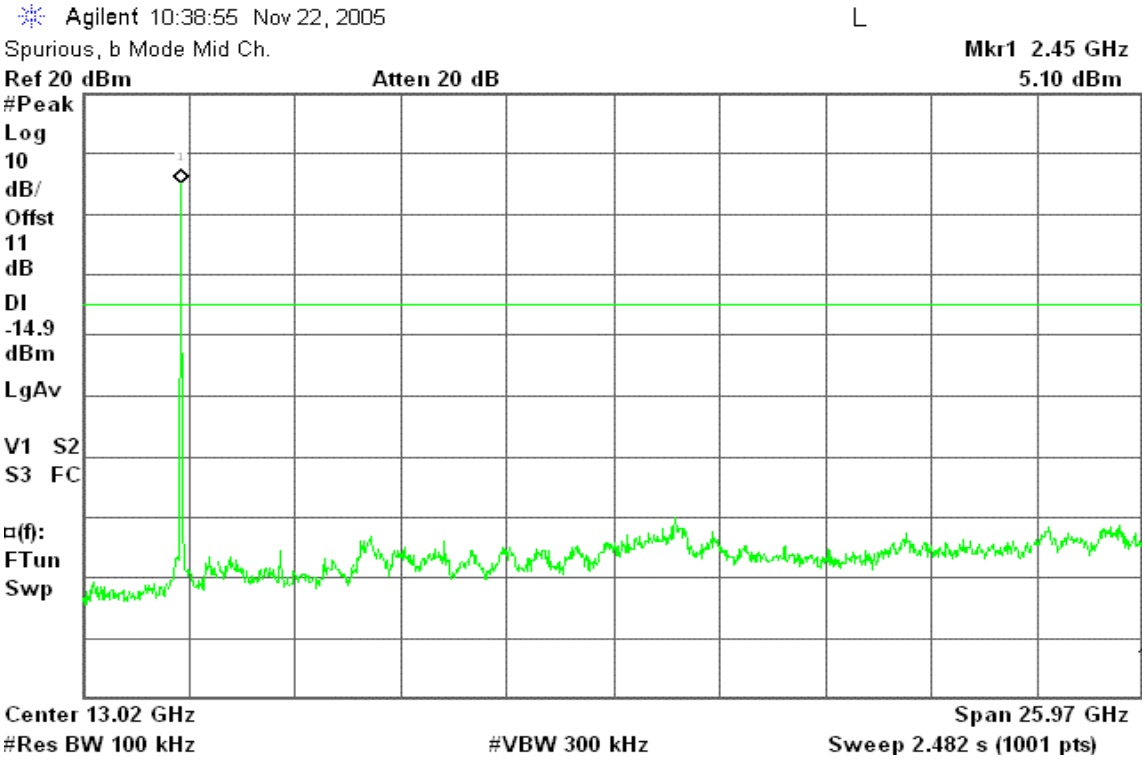
External Antenna: Dipole Antenna / Gain: 2 dBi

IEEE 802.11b

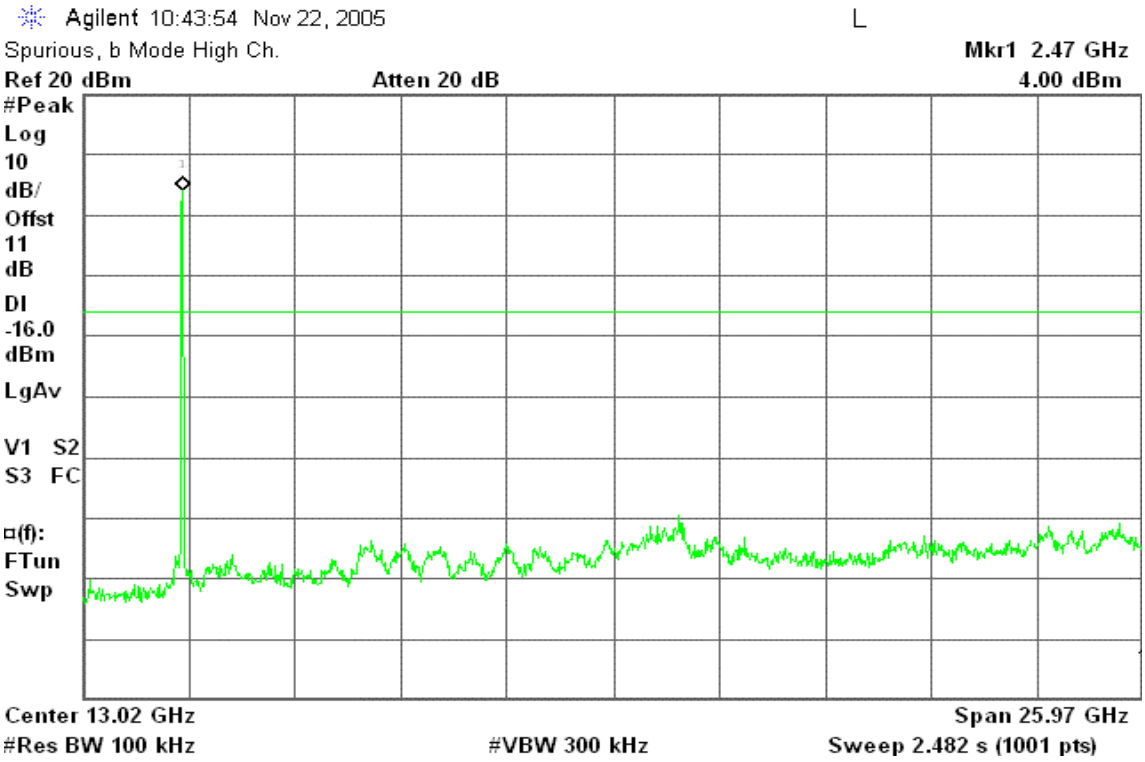
CH Low



CH Mid

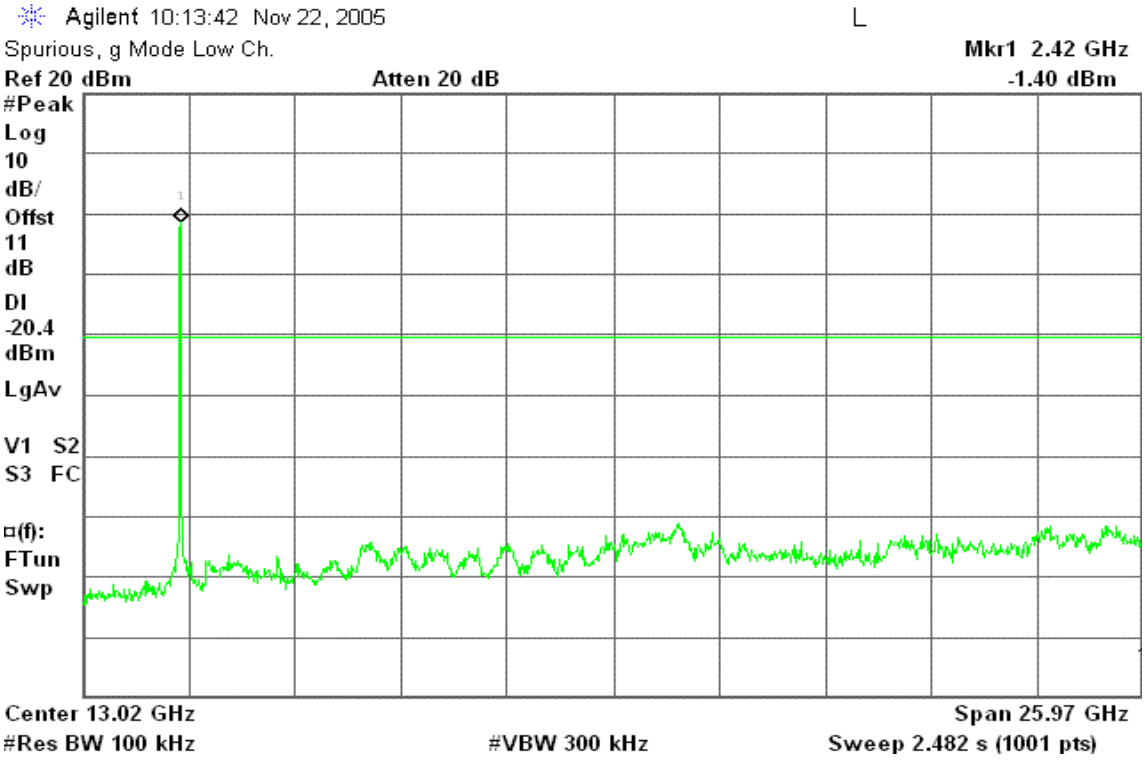


CH High

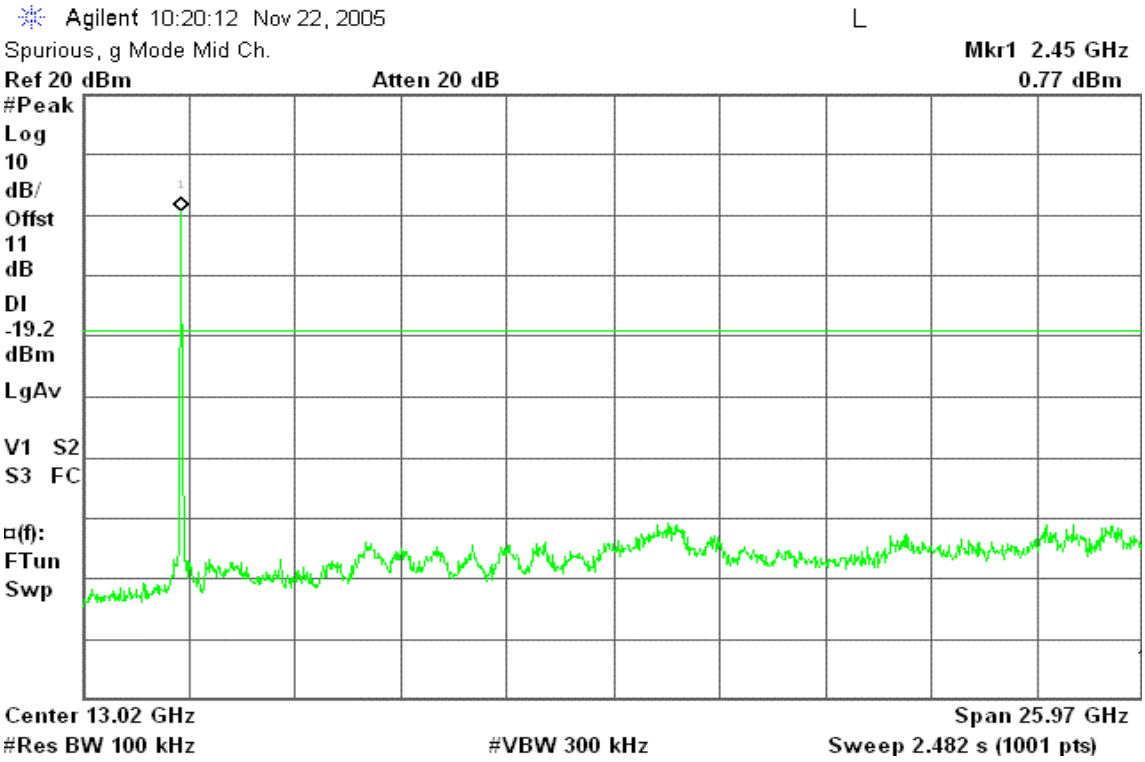


IEEE 802.11g

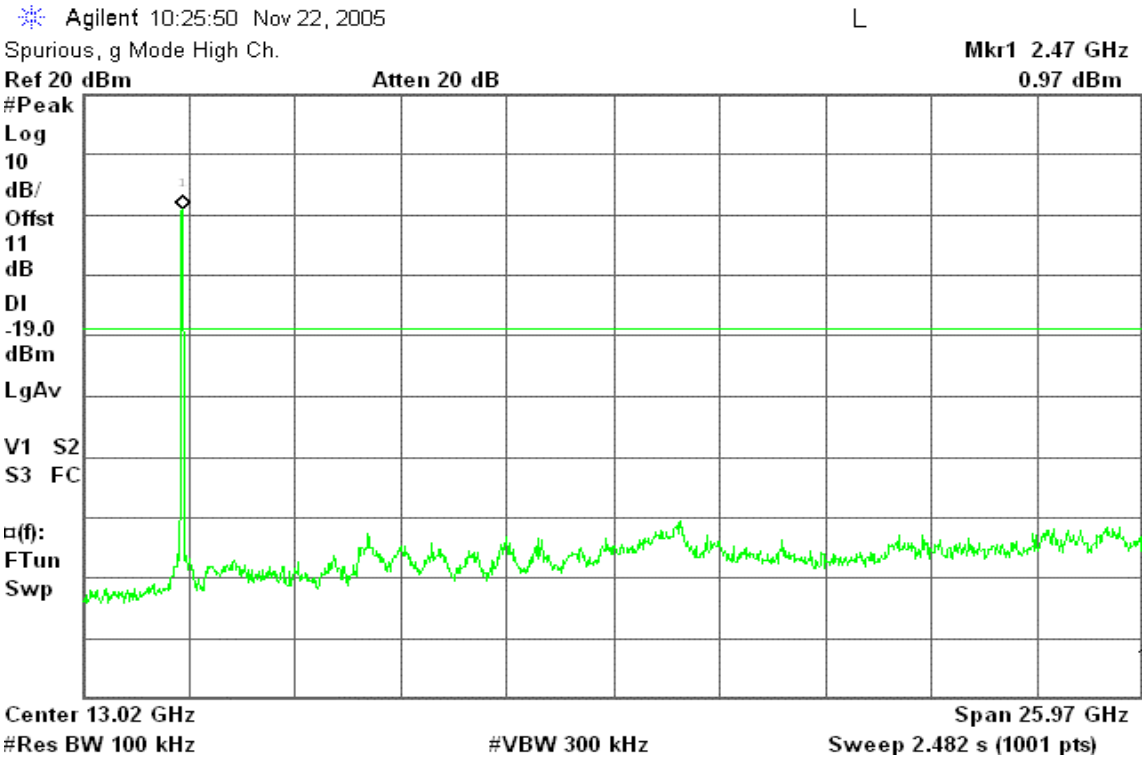
CH Low



CH Mid



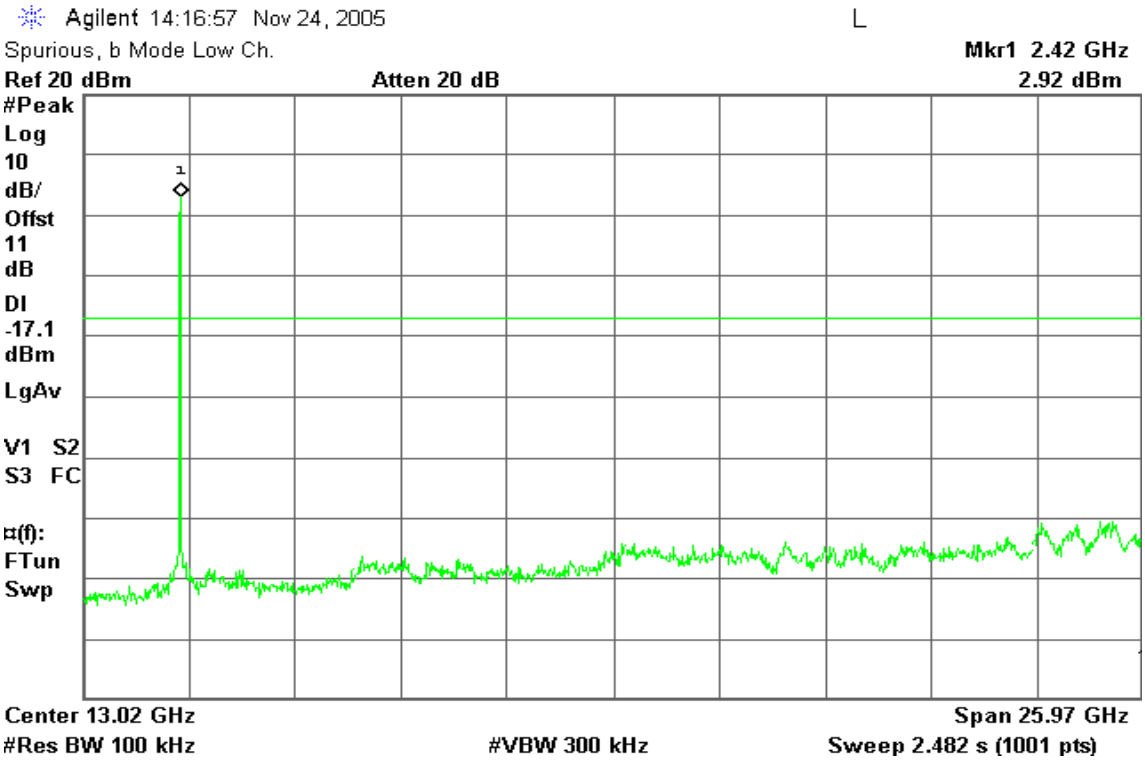
CH High



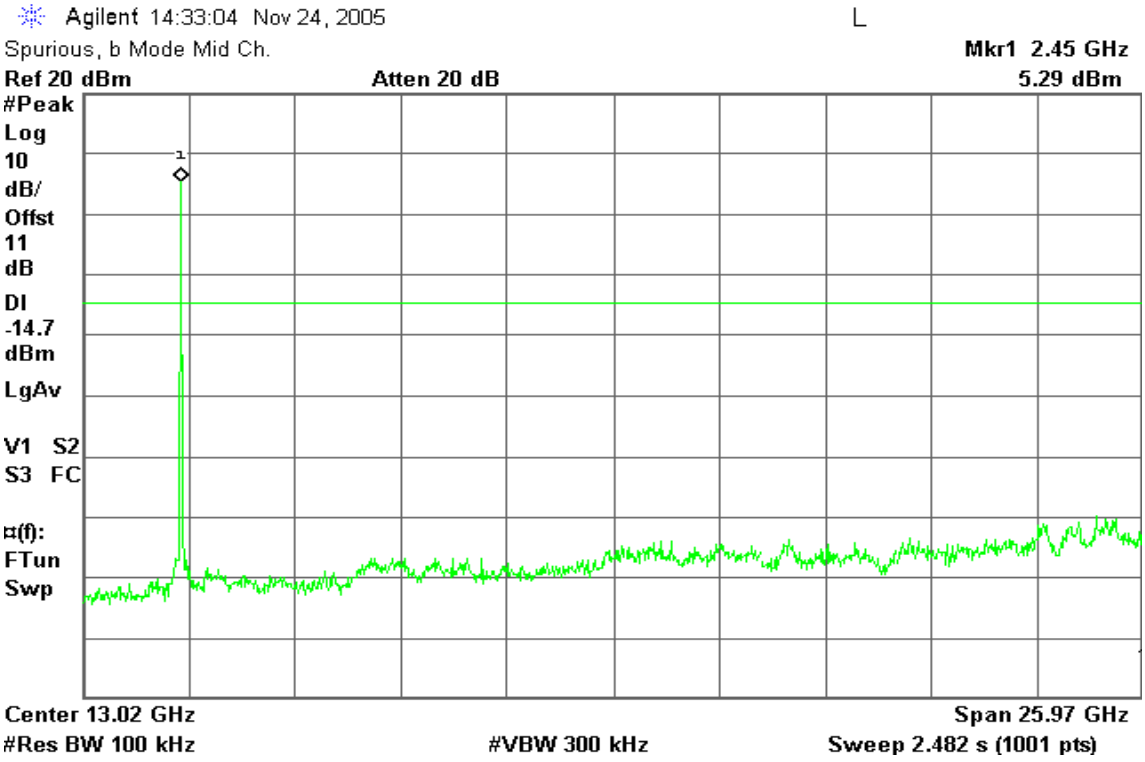
Internal Antenna: PIFA Antenna / Gain: 1.77 dBi

IEEE 802.11b

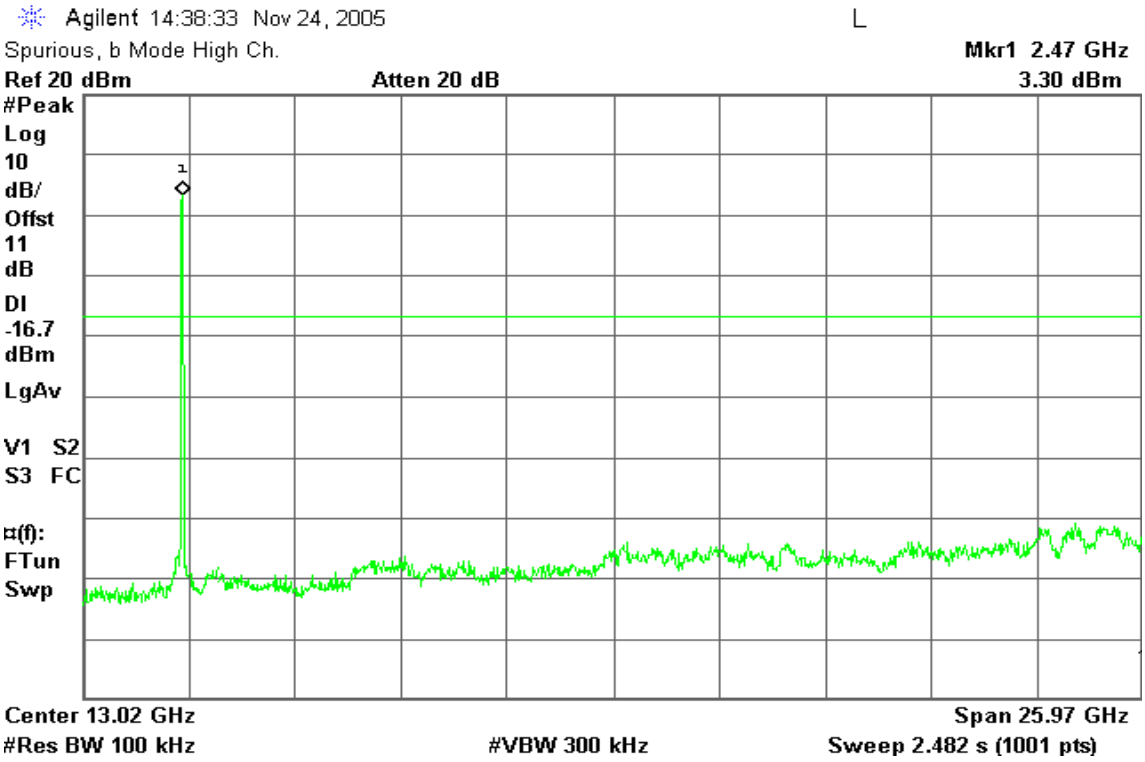
CH Low



CH Mid

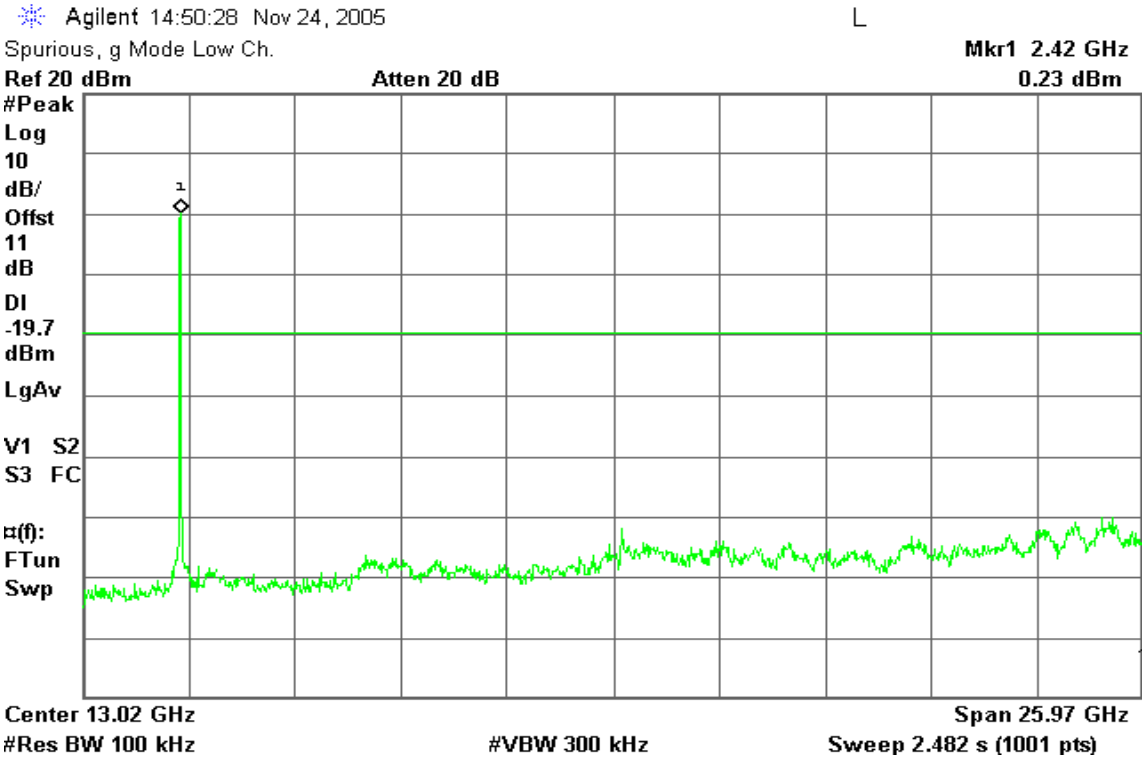


CH High

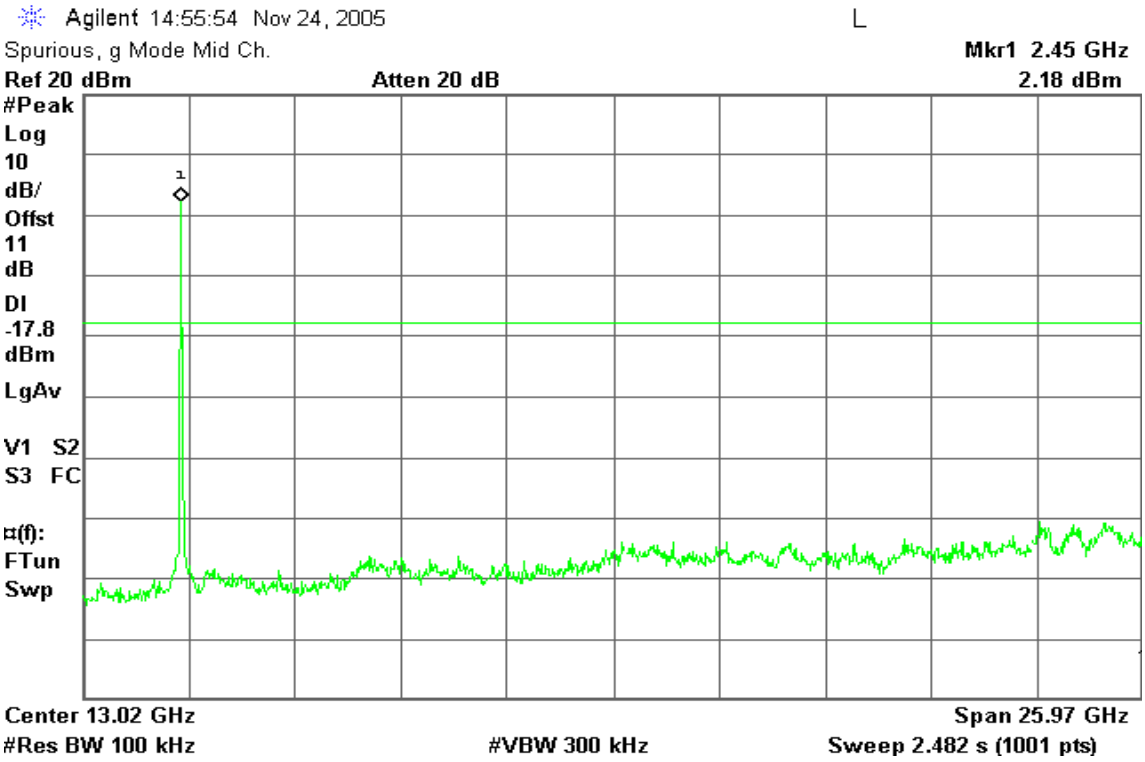


IEEE 802.11g

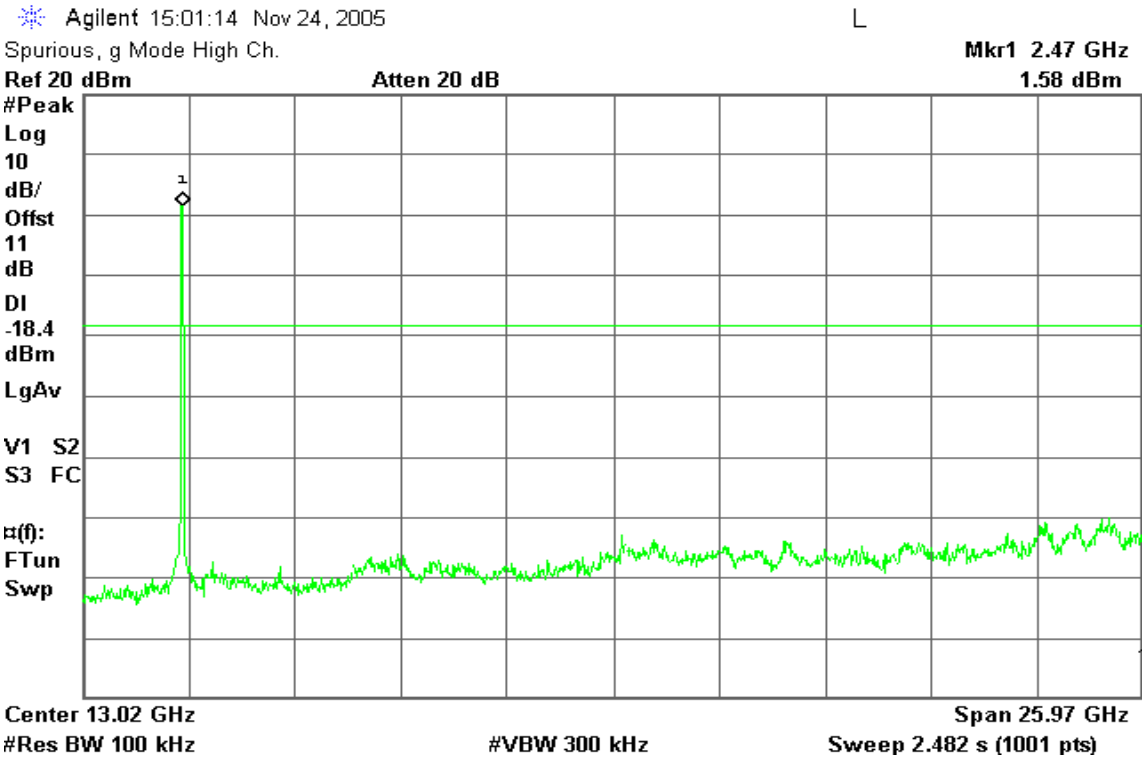
CH Low



CH Mid



CH High



7.6.2 RADIATED EMISSIONS

LIMIT

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

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

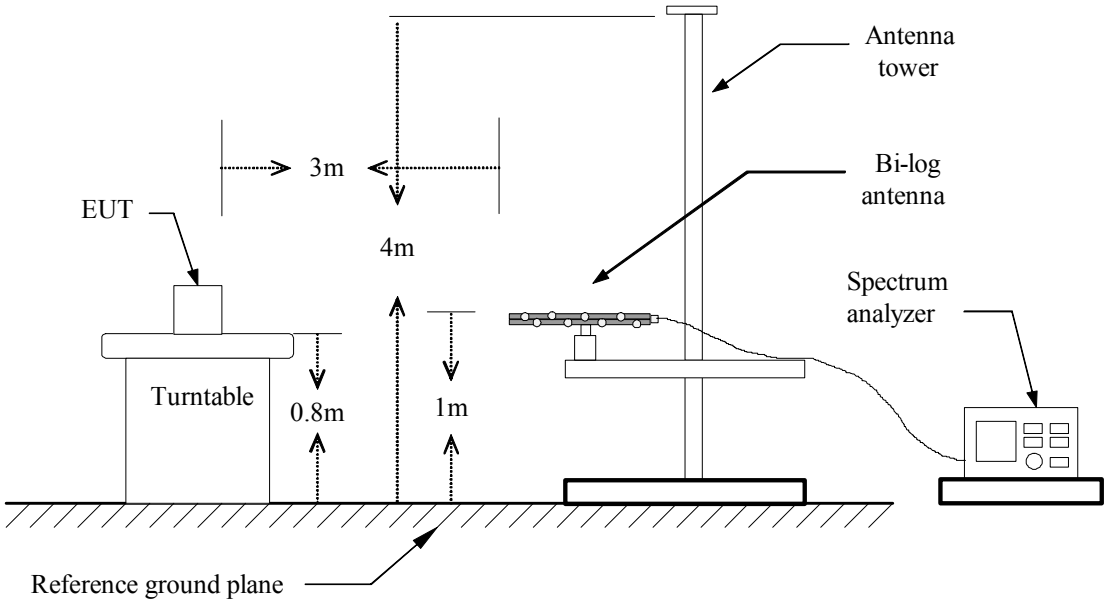
Remark: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

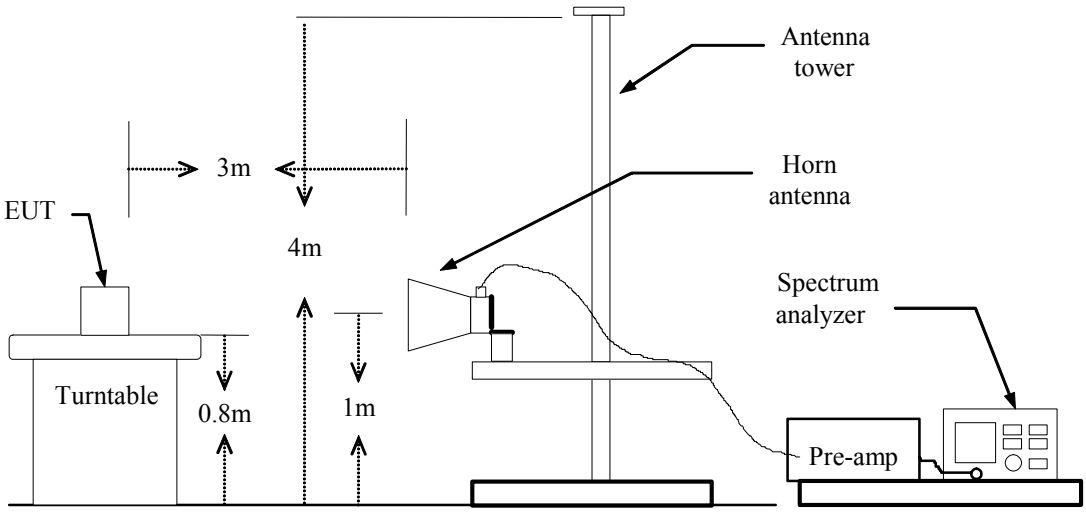
Frequency (MHz)	Field Strength (µV/m at 3-meter)	Field Strength (dBµV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Configuration

Below 1 GHz



Above 1 GHz



TEST PROCEDURE

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

   Below 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

Operation Mode: Normal Link **Test Date:** November 10, 2005

Temperature: 28°C **Tested by:** Ryan Chen

Humidity: 55% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (QP) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (QP) (dBuV/m)	Limit (QP) (dBuV/m)	Margin (dB)	Remark
13.51	V	42.17	---	-11.52	30.65	---	46.00	-15.35	Peak
15.54	V	39.84	---	-10.28	29.57	---	46.00	-16.43	Peak
15.26	V	37.62	---	-7.86	29.76	---	46.00	-16.24	Peak
13.51	V	35.15	---	-6.25	28.89	---	46.00	-17.11	Peak
15.54	V	32.20	---	-5.60	26.59	---	46.00	-19.41	Peak
15.26	V	31.45	---	-4.68	26.76	---	46.00	-19.24	Peak
274.78	H	49.30	---	-11.52	37.78	---	46.00	-8.22	Peak
329.78	H	41.48	---	-10.28	31.20	---	46.00	-14.80	Peak
516.78	H	35.23	---	-7.85	27.37	---	46.00	-18.63	Peak
599.85	H	37.18	---	-6.25	30.93	---	46.00	-15.07	Peak
666.80	H	37.96	---	-5.61	32.35	---	46.00	-13.65	Peak
749.88	H	35.45	---	-4.68	30.77	---	46.00	-15.23	Peak

Remark:

1. *Measuring frequencies from 30 MHz to the 1GHz.*
2. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.*
3. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit.*
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) – Quasi-peak limit (dBuV/m).*

Above 1 GHz

External Antenna: Dipole Antenna / Gain: 2 dBi

Operation Mode: TX / IEEE 802.11b / CH Low **Test Date:** November 17, 2005

Temperature: 25°C **Tested by:** Jason Lin

Humidity: 55 % 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
1250.00	V	51.63	---	-6.90	44.73	---	74.00	54.00	-9.27	Peak
4825.00	V	49.22	---	0.64	49.86	---	74.00	54.00	-4.14	Peak
9650.00	V	75.09	---	-34.53	40.56	---	74.00	54.00	-13.44	Peak
N/A										
1250.00	H	51.62	---	-6.90	44.72	---	74.00	54.00	-9.28	Peak
1376.00	H	49.13	---	-6.96	42.17	---	74.00	54.00	-11.83	Peak
1500.00	H	49.50	---	-7.02	42.48	---	74.00	54.00	-11.52	Peak
9650.00	H	63.25	---	-34.53	28.73	---	74.00	54.00	-25.27	Peak
10050.00	H	65.10	---	-33.74	31.35	---	74.00	54.00	-22.65	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
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:** November 17, 2005

Temperature: 25°C **Tested by:** Jason Lin

Humidity: 55 % 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
1250.00	V	51.79	---	-6.90	44.89	---	74.00	54.00	-9.11	Peak
4875.00	V	51.42	---	0.81	52.24	---	74.00	54.00	-1.76	Peak
9750.00	V	70.15	---	-34.26	35.89	---	74.00	54.00	-18.11	Peak
N/A										
1250.00	H	47.46	---	-6.90	40.56	---	74.00	54.00	-13.44	Peak
1376.00	H	47.60	---	-6.96	40.64	---	74.00	54.00	-13.36	Peak
1500.00	H	48.24	---	-7.02	41.22	---	74.00	54.00	-12.78	Peak
9750.00	H	64.05	---	-34.26	29.80	---	74.00	54.00	-24.20	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
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:** November 17, 2005

Temperature: 25°C **Tested by:** Jason Lin

Humidity: 55 % 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
1250.00	V	51.10	---	-6.90	44.20	---	74.00	54.00	-9.8	Peak
9850.00	V	70.57	---	-33.99	36.58	---	74.00	54.00	-17.42	Peak
N/A										
1250.00	H	47.73	---	-6.90	40.83	---	74.00	54.00	-13.17	Peak
1374.00	H	48.35	---	-6.96	41.40	---	74.00	54.00	-12.60	Peak
1500.00	H	47.61	---	-7.02	40.59	---	74.00	54.00	-13.41	Peak
9850.00	H	65.49	---	-33.99	31.51	---	74.00	54.00	-22.49	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
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:** November 17, 2005

Temperature: 25°C **Tested by:** Jason Lin

Humidity: 55 % 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
1250.00	V	49.64	---	-6.90	42.74	---	74.00	54.00	-11.26	Peak
4825.00	V	49.55	---	0.64	50.19	---	74.00	54.00	-3.81	Peak
9650.00	V	71.11	---	-34.53	36.58	---	74.00	54.00	-17.42	Peak
N/A										
1250.00	H	47.78	---	-6.90	40.88	---	74.00	54.00	-13.12	Peak
1376.00	H	47.10	---	-6.96	40.14	---	74.00	54.00	-13.86	Peak
1500.00	H	47.65	---	-7.02	40.63	---	74.00	54.00	-13.37	Peak
9650.00	H	63.32	---	-34.53	28.79	---	74.00	54.00	-25.21	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
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:** November 17, 2005

Temperature: 25°C **Tested by:** Jason Lin

Humidity: 55 % 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
1250.00	V	49.86	---	-6.90	42.96	---	74.00	54.00	-11.04	Peak
4875.00	V	49.12	---	0.81	49.93	---	74.00	54.00	-4.07	Peak
9750.00	V	70.11	---	-34.26	35.86	---	74.00	54.00	-18.14	Peak
N/A										
1250.00	H	48.07	---	-6.90	41.17	---	74.00	54.00	-12.83	Peak
1374.00	H	46.77	---	-6.96	39.81	---	74.00	54.00	-14.19	Peak
1500.00	H	46.95	---	-7.02	39.93	---	74.00	54.00	-14.07	Peak
9750.00	H	63.70	---	-34.26	29.44	---	74.00	54.00	-24.56	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
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:** November 17, 2005

Temperature: 25°C **Tested by:** Jason Lin

Humidity: 55 % 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
1250.00	V	50.16	---	-6.90	43.26	---	74.00	54.00	-10.74	Peak
4925.00	V	49.42	---	0.99	50.41	---	74.00	54.00	-3.59	Peak
9850.00	V	69.76	---	-33.99	35.77	---	74.00	54.00	-18.23	Peak
N/A										
1250.00	H	47.87	---	-6.90	40.97	---	74.00	54.00	-13.03	Peak
1374.00	H	47.31	---	-6.96	40.35	---	74.00	54.00	-13.65	Peak
1500.00	H	47.52	---	-7.02	40.50	---	74.00	54.00	-13.50	Peak
9850.00	H	65.24	---	-33.99	31.25	---	74.00	54.00	-22.75	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
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).*

Internal Antenna: PIFA Antenna / Gain: 1.77 dBi

Operation Mode: TX / IEEE 802.11b / CH Low **Test Date:** November 17, 2005

Temperature: 25°C **Tested by:** Jason Lin

Humidity: 55 % 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
1212.00	V	60.04	---	-9.06	50.99	---	74.00	54.00	-3.01	Peak
4822.50	V	56.74	51.79	0.35	57.09	52.14	74.00	54.00	-0.86	Average
N/A										
1696.00	H	60.18	---	-6.72	53.46	---	74.00	54.00	-20.54	Peak
4822.50	H	50.65	---	0.35	51.00	---	74.00	54.00	-3.00	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
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:** November 17, 2005

Temperature: 25°C **Tested by:** Jason Lin

Humidity: 55 % 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
1250.00	V	59.95	---	-8.94	51.02	---	74.00	54.00	-2.98	Peak
4875.00	V	56.36	51.92	0.40	56.76	52.32	74.00	54.00	-1.68	Average
N/A										
1468.00	H	60.45	---	-8.23	52.21	---	74.00	54.00	-1.79	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
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:** November 17, 2005

Temperature: 25°C **Tested by:** Jason Lin

Humidity: 55 % 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
1614.00	V	60.95	---	-7.31	53.64	---	74.00	54.00	-0.36	Peak
4923.75	V	55.74	51.22	0.45	56.19	51.67	74.00	54.00	-2.33	Average
N/A										
1500.00	H	60.27	---	-8.13	52.14	---	74.00	54.00	-1.86	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
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:** November 17, 2005

Temperature: 25°C **Tested by:** Jason Lin

Humidity: 55 % 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
1462.00	V	60.95	---	-8.25	52.70	---	74.00	54.00	-1.30	Peak
4822.50	V	52.40	---	0.35	52.75	---	74.00	54.00	-1.25	Peak
N/A										
1254.00	H	60.61	---	-8.92	51.69	---	74.00	54.00	-2.31	Peak
4822.50	H	51.11	---	0.35	51.46	---	74.00	54.00	-2.54	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
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:** November 17, 2005

Temperature: 25°C **Tested by:** Jason Lin

Humidity: 55 % 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
1320.00	V	60.70	---	-8.71	51.99	---	74.00	54.00	-2.01	Peak
4875.00	V	55.19	44.20	0.40	55.59	44.60	74.00	54.00	-9.40	Average
N/A										
1074.00	H	60.88	---	-9.50	51.38	---	74.00	54.00	-2.62	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
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:** November 17, 2005

Temperature: 25°C **Tested by:** Jason Lin

Humidity: 55 % 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
2322.00	V	64.15	50.50	-3.88	60.27	46.62	74.00	54.00	-7.38	Average
4923.75	V	57.04	46.42	0.45	57.49	46.87	74.00	54.00	-7.13	Average
N/A										
1484.00	H	60.51	---	-8.18	52.33	---	74.00	54.00	-1.67	Peak
4923.75	H	51.98	---	0.45	52.42	---	74.00	54.00	-1.58	Peak
N/A										

Remark:

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

7.7 POWERLINE CONDUCTED EMISSIONS

LIMIT

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

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

** Decreases with the logarithm of the frequency.*

Test Configuration

See test photographs attached in Appendix 1 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:**	November 16, 2005
Temperature:	25°C	**Tested by:**	Ryan Chen
Humidity:	55% RH		

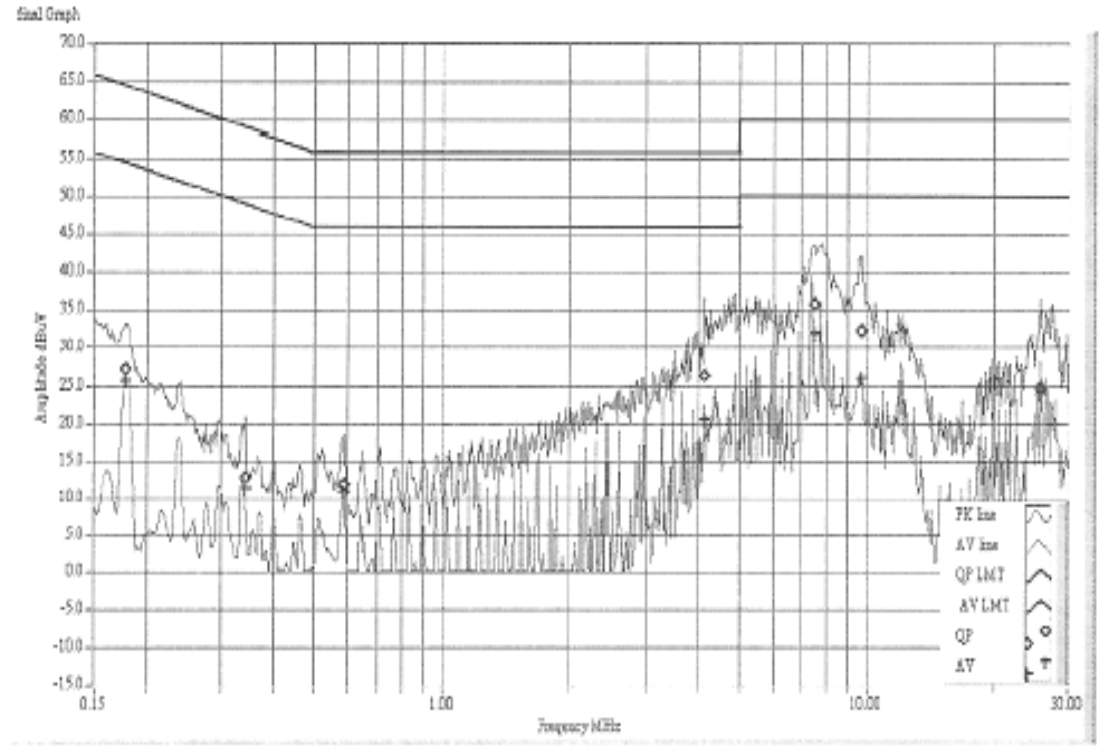
Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB)	QP Result (dBuV)	AV Result (dBuV)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.177	27.310	25.590	0.146	27.456	25.736	64.625	54.625	-37.169	-28.889	L1
0.586	11.780	10.820	0.100	11.880	10.920	56.000	46.000	-44.120	-35.080	L1
4.127	26.410	20.490	0.113	26.523	20.603	56.000	46.000	-29.477	-25.397	L1
7.503	35.750	31.490	0.450	36.200	32.390	60.000	50.000	-23.800	-17.610	L1
9.682	32.320	25.940	0.668	32.988	26.608	60.000	50.000	-27.012	-23.392	L1
25.799	24.790	23.940	1.232	26.022	25.172	60.000	50.000	-33.978	-24.828	L1
0.177	23.050	23.450	0.146	23.196	23.596	64.625	54.625	-41.429	-31.029	L2
0.586	10.230	9.060	0.100	10.330	9.160	56.000	46.000	-45.670	-36.840	L2
5.814	26.580	20.250	0.281	26.861	20.531	60.000	50.000	-33.139	-29.469	L2
7.563	34.310	25.710	0.456	34.766	26.166	60.000	50.000	-25.234	-23.834	L2
9.759	32.130	25.390	0.676	32.806	26.066	60.000	50.000	-27.194	-23.934	L2
27.497	25.410	21.480	1.300	26.710	22.780	60.000	50.000	-33.290	-27.220	L2

Remark:

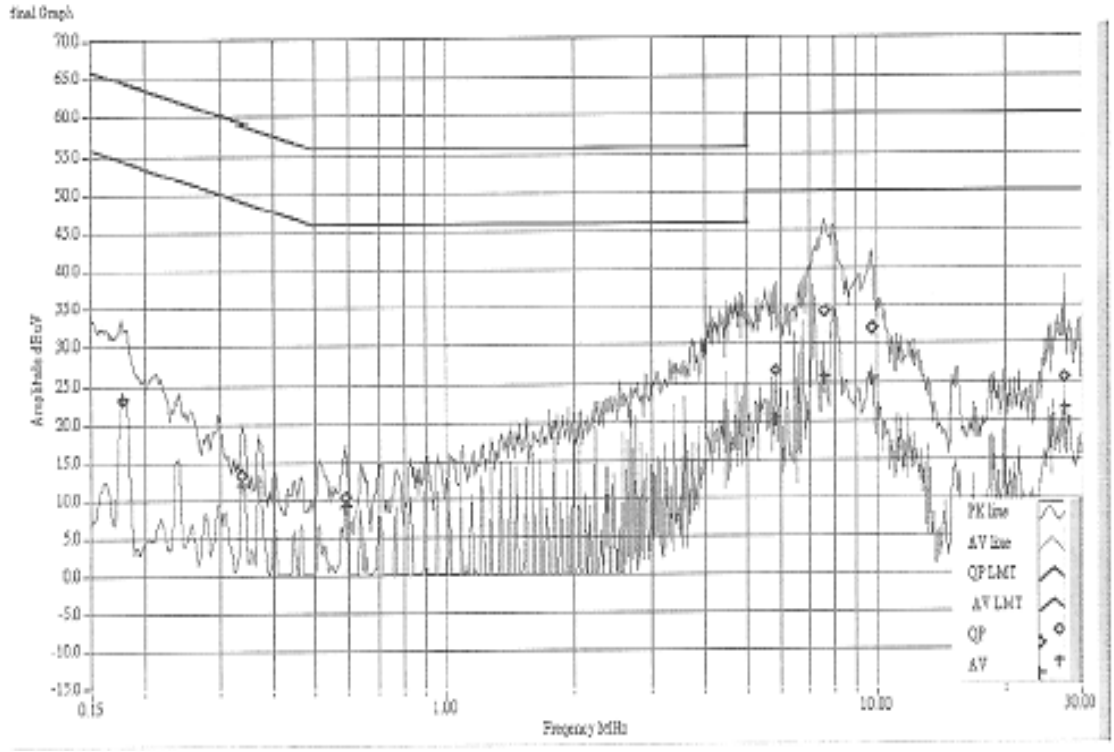
1. *Measuring frequencies from 0.15 MHz to 30MHz.*
2. *The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.*
3. *The IF bandwidth of SPA between 0.15MHz and 30MHz was 10 kHz; the IF bandwidth of Test Receiver between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

Test Plots

Conducted emissions (Line 1)



Conducted emissions (Line 2)



APPENDIX 1
RADIO FREQUENCY EXPOSURE

LIMIT

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

EUT Specification

EUT	802.11b/g WiFi Module
Frequency band (Operating)	☒ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz ☐ WLAN: 5.745GHz ~ 5.825GHz ☐ Others
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm^2) ☒ General Population/Uncontrolled exposure (S=1mW/cm^2)
Antenna diversity	☐ Single antenna ☒ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☒ Tx/Rx diversity
Max. output power	External Antenna: IEEE 802.11b: 18.31 dBm(67.76mW) IEEE 802.11g: 18.97 dBm(78.89mW) Internal Antenna: IEEE 802.11b: 18.99 dBm(79.25mW) IEEE 802.11g: 20.05 dBm(101.16mW)
Antenna gain (Max)	External Antenna: 2 dBi (Numeric gain: 1.58) Internal Antenna: 1.77 dBi (Numeric gain: 1.50)
Evaluation applied	☒ MPE Evaluation ☐ SAR Evaluation

Remark:

1. *The maximum output power is 20.05dBm (101.16mW) at 2437MHz (with 1.58 numeric antenna gain.)*
2. *DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.*
3. *For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm^2 even if the calculation indicates that the power density would be larger.*

TEST RESULTS

No non-compliance noted.

Calculation

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

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

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

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

Changing to units of mW and cm, using:

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

d (cm) = d(m) / 100

Yields

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

Where *d = Distance in cm*
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm²

Maximum Permissible Exposure

External Antenna:
EUT output power = 78.89mW
Numeric Antenna gain = 1.58
Internal Antenna:
EUT output power = 101.16mW
Numeric Antenna gain = 1.50
Substituting the MPE safe distance using d = 20 cm into Equation 1:
Yields

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

Where *P = Power in mW*
G = Numeric antenna gain
S = Power density in mW / cm²

External Antenna:
→ Power density = 0.0248 mW / cm²
Internal Antenna:
→ Power density = 0.0302 mW / cm²
(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm² even if the calculation indicates that the power density would be larger.)