FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

IEEE. 11a/g WLAN OutDoor AP

Model: ZW-2200-OD, ZW-2200-IA

Trade Name: Zinwell

Issued to

ZINWELL CORPORATION
2, Wen-Hua Road, Hsinchu Industrial Park Hsinchu Hsien 303, Taiwan

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
No. 0824-01

TAF
Testing Laboratory
0363

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1. TEST RESULT CERTIFICATION

Applicant: ZINWELL CORPORATION
2, Wen-Hua Road, Hsinchu Industrial Park Hsinchu Hsien 303, Taiwan

Equipment Under Test: IEEE. 11a/g WLAN OutDoor AP

Trade Name: Zinwell

Model: ZW-2200-OD, ZW-2200-IA

Date of Test: October 18 ~ November 6, 2006

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	IEEE. 11a/g WLAN OutDoor AP
Trade Name	Zinwell
Model Number	ZW-2200-OD, ZW-2200-IA
Model Discrepancy	All the specification and layout are identical except they come with different external appearance and model numbers. Please refer to the external photos for reference. ZW-2200-OD with external 5GHz antenna option.
Power Supply	Power Adapter Model: SA06L48-V I/P: 100-240V, 0.6A, 50-60Hz O/P: 48V, 0.4A
Frequency Range	IEEE 802.11a mode: 5.745 ~ 5.825 GHz IEEE 802.11b/g mode: 2.412 ~ 2.462 GHz
Transmit Power	IEEE 802.11a mode: 17.86 dBm IEEE 802.11b mode: 19.75 dBm IEEE 802.11g mode: 19.64 dBm
Modulation Technique	IEEE 802.11a: OFDM (QPSK, BPSK, 16-QAM, 64-QAM) 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 802.11a: 54, 48, 36, 24, 18, 12, 9, 6 Mbps IEEE 802.11b: 11, 5.5, 2, 1 Mbps IEEE 802.11g: 54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, 1Mbps
Number of Channels	IEEE 802.11a mode: 5 Channels IEEE 802.11b/g mode: 11 Channels
Antenna Specification	IEEE 802.11b/g mode: External Antenna 1: Omni Antenna / Gain: 12dBi for ZW-2200-IA External Antenna 2: Omni Antenna / Gain: 15dBi for ZW-2200-IA External Antenna 3: Panel Antenna / Gain: 16dBi for ZW-2200-IA IEEE 802.11a mode: External Antenna 4: Omni Antenna / Gain: 12dBi for ZW-2200-OD External Antenna 5: Panel Antenna / Gain: 16dBi for ZW-2200-OD Internal Antenna 6: Panel Antenna / Gain: 18dBi for ZW-2200-OD

Remark:

1. *The sample selected for test was production product and was provided by manufacturer.*
2. *This submittal(s) (test report) is intended for FCC ID: **RIW-ZW-2200** ling 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 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

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

[2] Above 38.6

(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 had been tested under operating condition.

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

The worst case data rate is determined as the data rate with highest output power.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

IEEE 802.11b mode for ZW-2200-IA:
Channel Low(2412MHz), Channel Mid(2437MHz) and Channel High(2462MHz) with 11Mbps data rate were chosen for full testing.

IEEE 802.11g mode for ZW-2200-IA:
Channel Low(2412MHz), Channel Mid(2437MHz) and Channel High(2462MHz) with 6Mbps data rate were chosen for full testing.

IEEE 802.11a mode for ZW-2200-OD:
Channel Low(5745MHz), Channel Mid(5785MHz) and Channel High(5825MHz) 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	01/18/2007
Spectrum Analyzer	R&S	FSEK30	10026	03/22/2007

3M Semi Anechoic Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	US42510252	08/02/2007
Test Receiver	Rohde&Schwarz	ESCI	100064	11/05/2007
Switch Controller	TRC	Switch Controller	SC94050010	05/05/2007
4 Port Switch	TRC	4 Port Switch	SC94050020	05/05/2007
Horn-Antenna	TRC	HA-0502	06	06/06/2007
Horn-Antenna	TRC	HA-0801	04	05/05/2007
Horn-Antenna	TRC	HA-1201A	01	07/10/2007
Horn-Antenna	TRC	HA-1301A	01	07/18/2007
Bilog- Antenna	Sunol Sciences	JB3	A030205	03/09/2007
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	09/26/2008
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	09/26/2007
TWO-LINE V-NETWORK 9kHz-30MHz	SCHAFFNER	NNB41	03/10013	06/14/2007
LISN 10kHz-100MHz	EMCO	3825/2	9106-1809	03/20/2007
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, EIC/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 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 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 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 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	WLAN: ANO20030400LEG Bluetooth: ANO20020100MTN	LAN Cable: Unshielded, 10m Line Cable: Unshielded, 10m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
2.	Notebook PC (Remote)	IBM	2672 (X31)	99KPZYN	WLAN: ANO20030400LEG Bluetooth: ANO20020100`MTN	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
3.	Notebook PC (Remote)	IBM	2672 (X31)	9985H9M	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.*

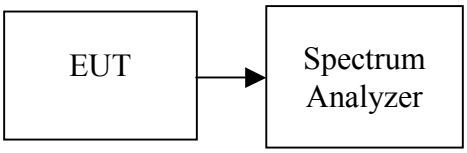
7. FCC PART 15.247 REQUIREMENTS

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 = 100kHz, VBW = RBW, Span = 50Hz, Sweep = auto.
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	9500	>500	PASS
Mid	2437	8670		PASS
High	2462	8580		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	15750	>500	PASS
Mid	2437	15750		PASS
High	2462	16420		PASS

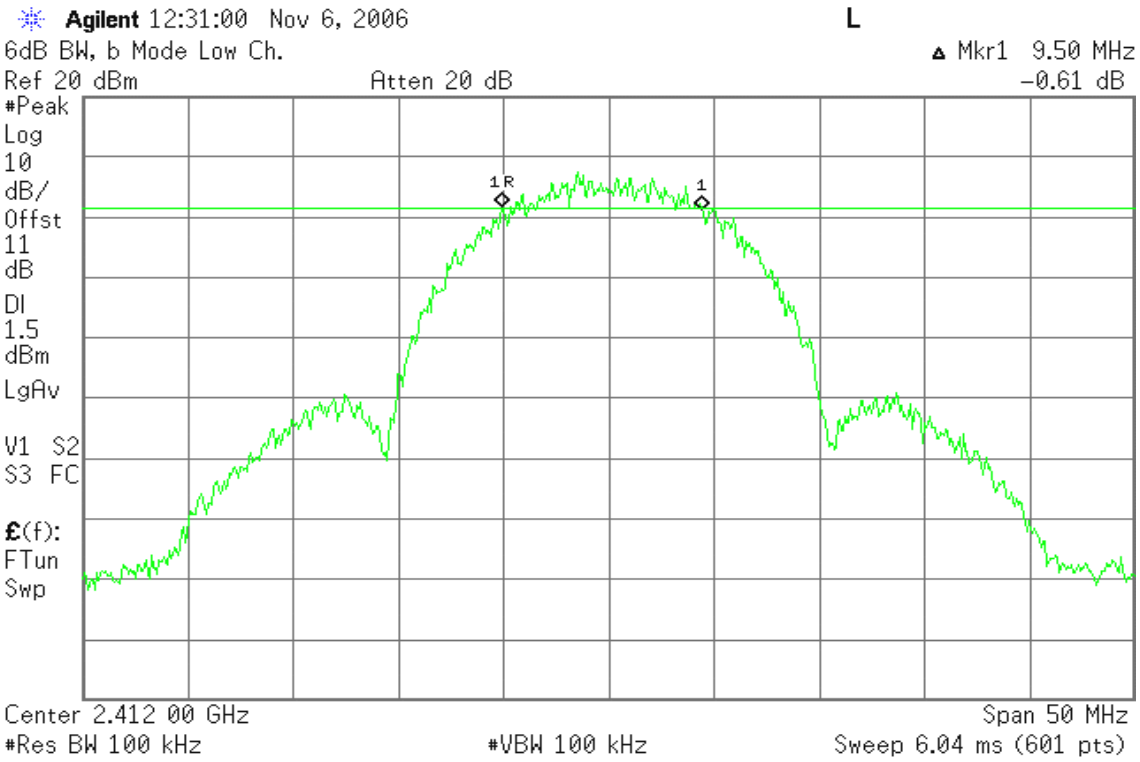
Test mode: IEEE 802.11a mode

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	5745	16080	>500	PASS
Mid	5785	16080		PASS
High	5825	15920		PASS

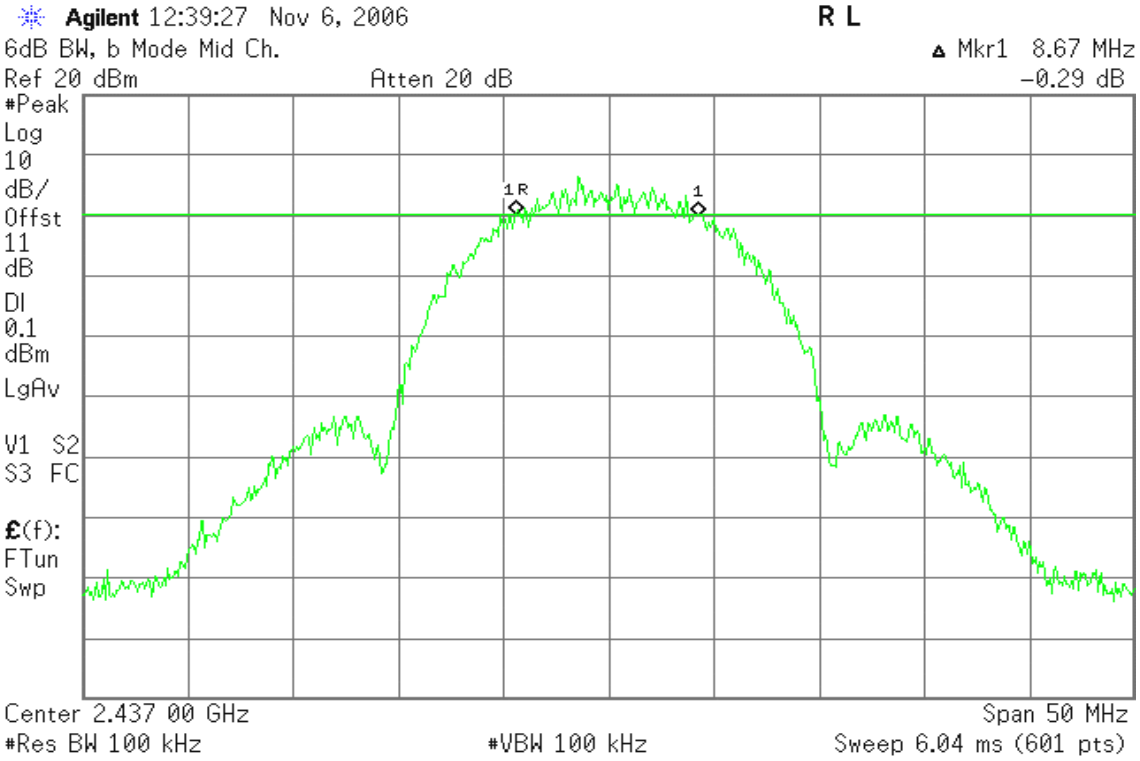
Test Plot

IEEE 802.11b mode

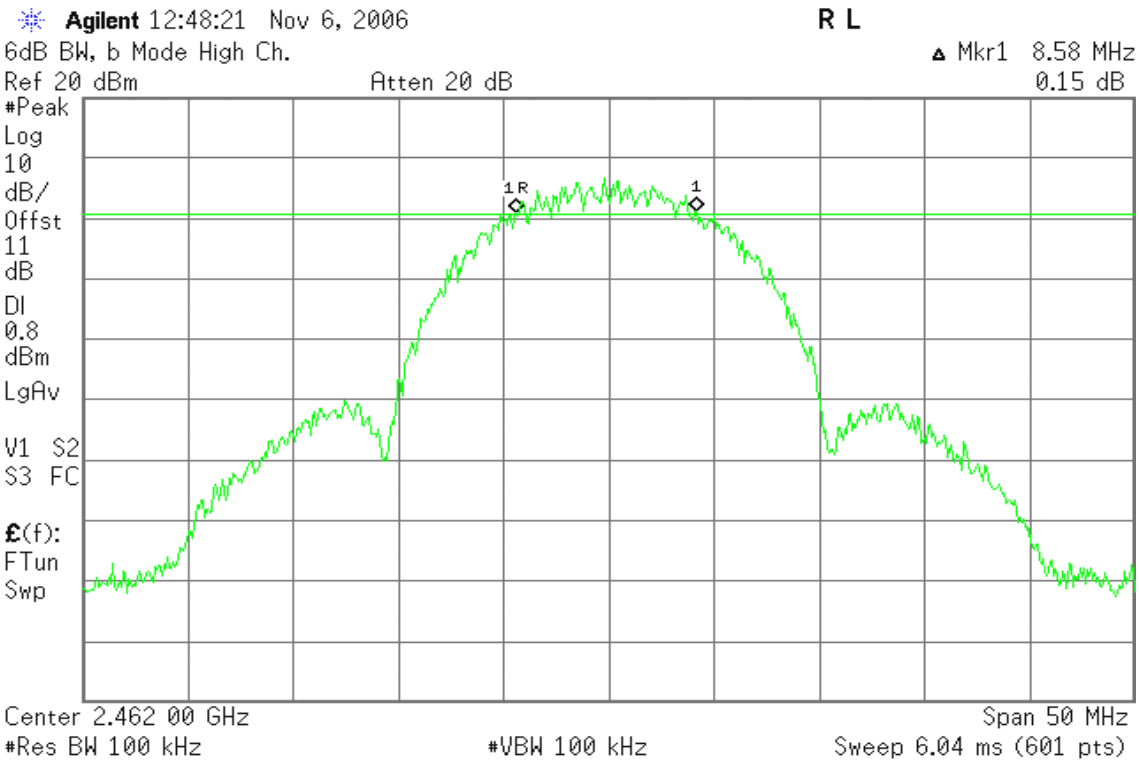
CH Low



CH Mid

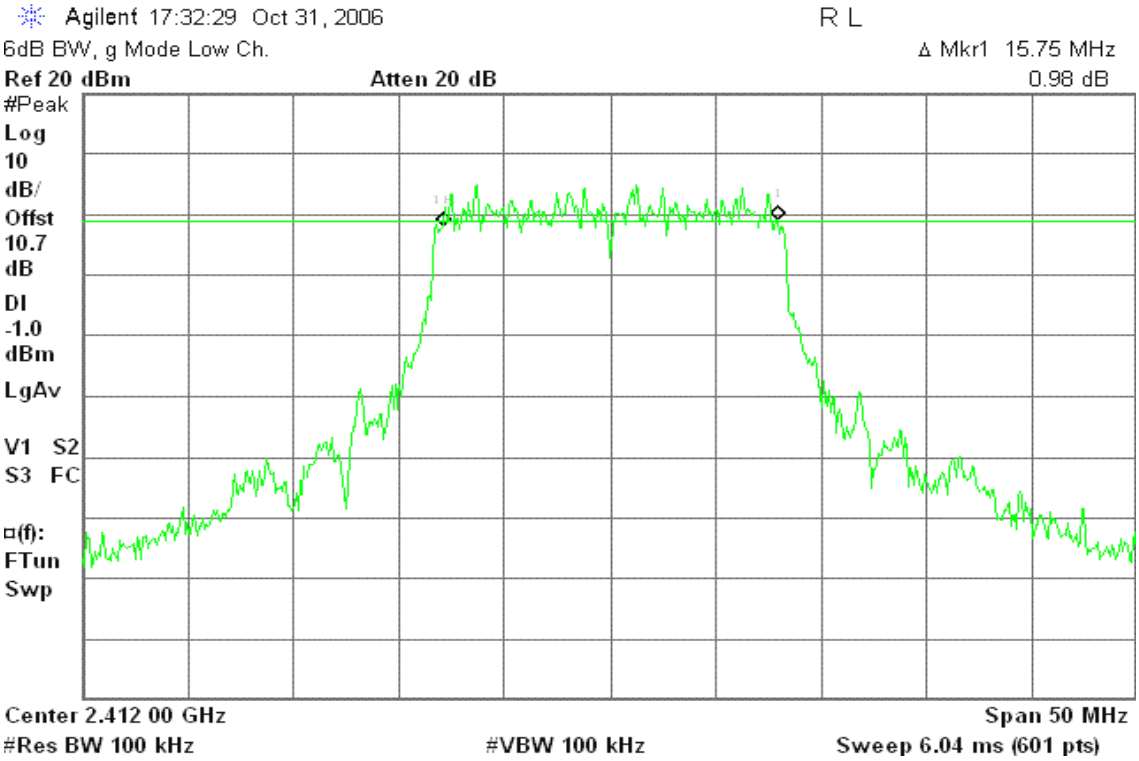


CH High

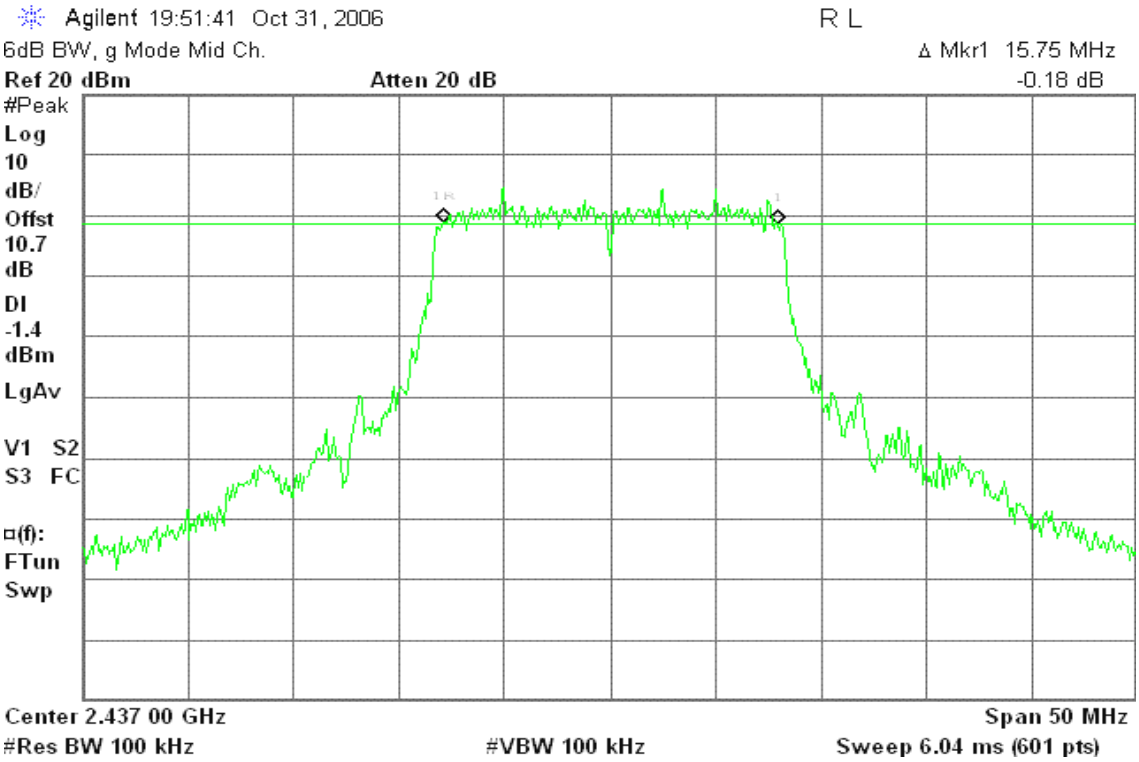


IEEE 802.11g mode

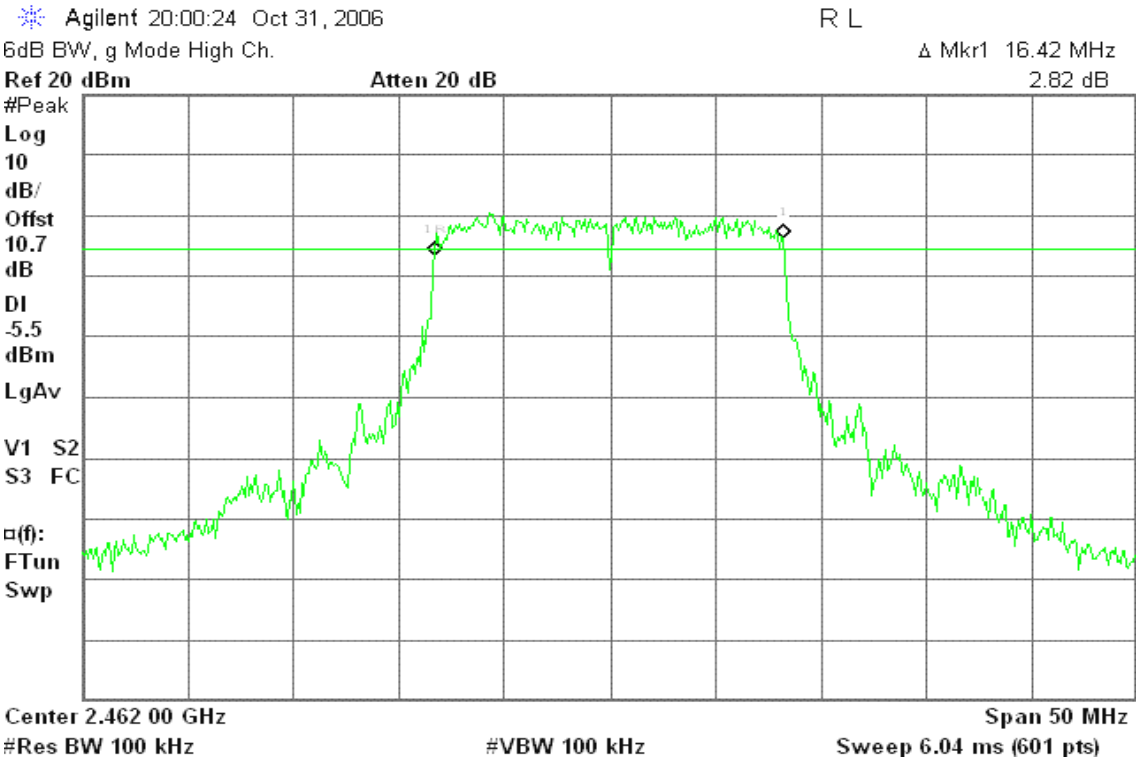
CH Low



CH Mid

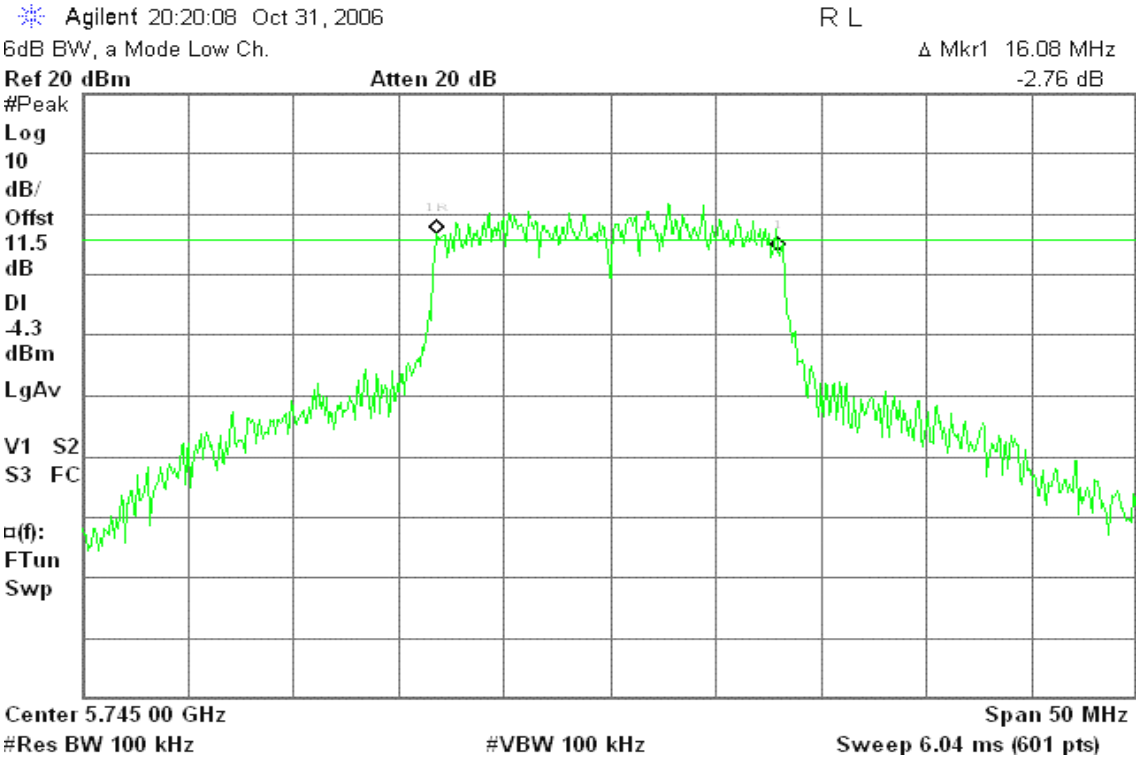


CH High

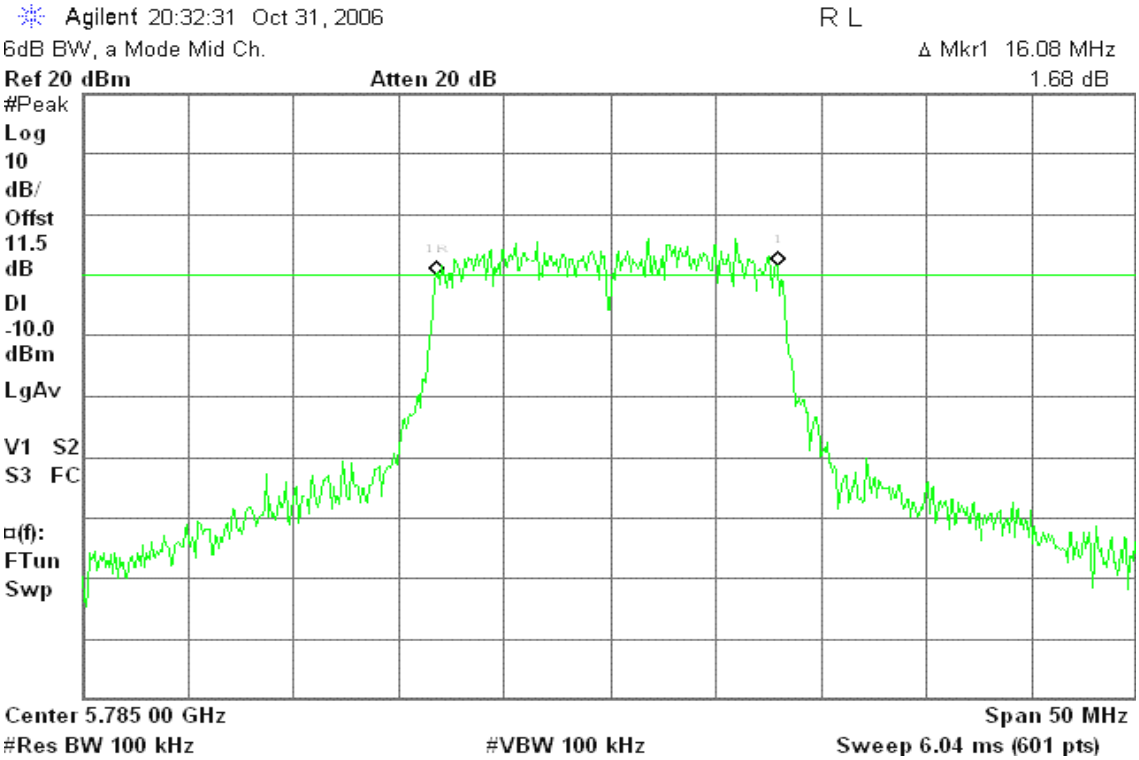


IEEE 802.11a mode

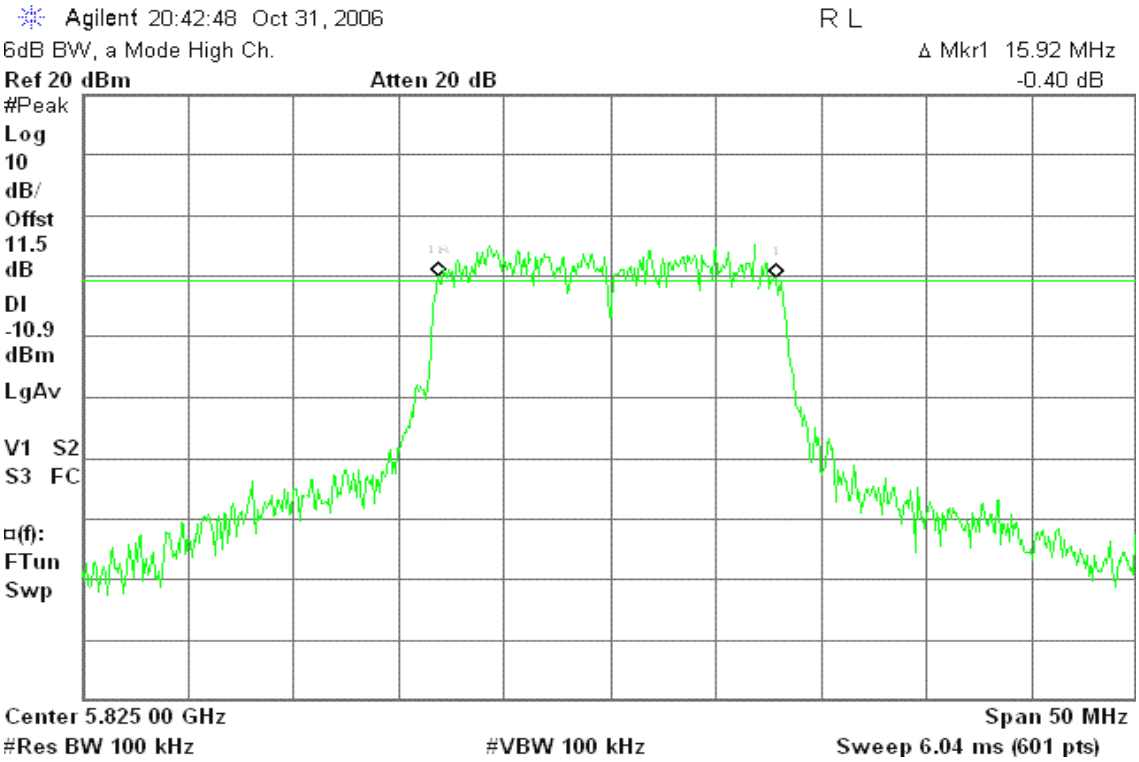
CH Low



CH Mid



CH High


Agilent 20:42:48 Oct 31, 2006
R L
6dB BW, a Mode High Ch.
Δ Mkr1 15.92 MHz
Ref 20 dBm
Atten 20 dB
-0.40 dB
#Peak
Log
10
dB/
Offst
11.5
dB
Dl
-10.9
dBm
LgAv
V1 S2
S3 FC
¤(f):
FTun
Swp
Center 5.825 00 GHz
Span 50 MHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 6.04 ms (601 pts)

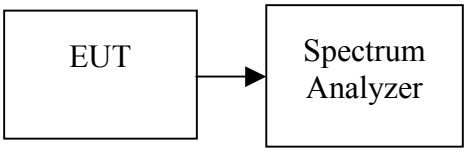
7.2 PEAK POWER

LIMIT

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

1. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the Spectrum analyzer. The Spectrum analyzer is set to the peak power detection.

TEST RESULTS

No non-compliance noted.

Test Data

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	19.31	0.08531	0.1000	PASS
Mid	2437	19.75	0.09441		PASS
High	2462	19.66	0.09247		PASS

***Remark**: The maximum antenna gain is 16 dBi; therefore the reduction due to antenna gain is 10 dB, so the limit is 20 dBm.*

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	19.64	0.09204	0.1000	PASS
Mid	2437	19.13	0.08185		PASS
High	2462	19.58	0.09078		PASS

***Remark**: The maximum antenna gain is 16 dBi; therefore the reduction due to antenna gain is 10 dB, so the limit is 20 dBm.*

Test mode: IEEE 802.11a mode

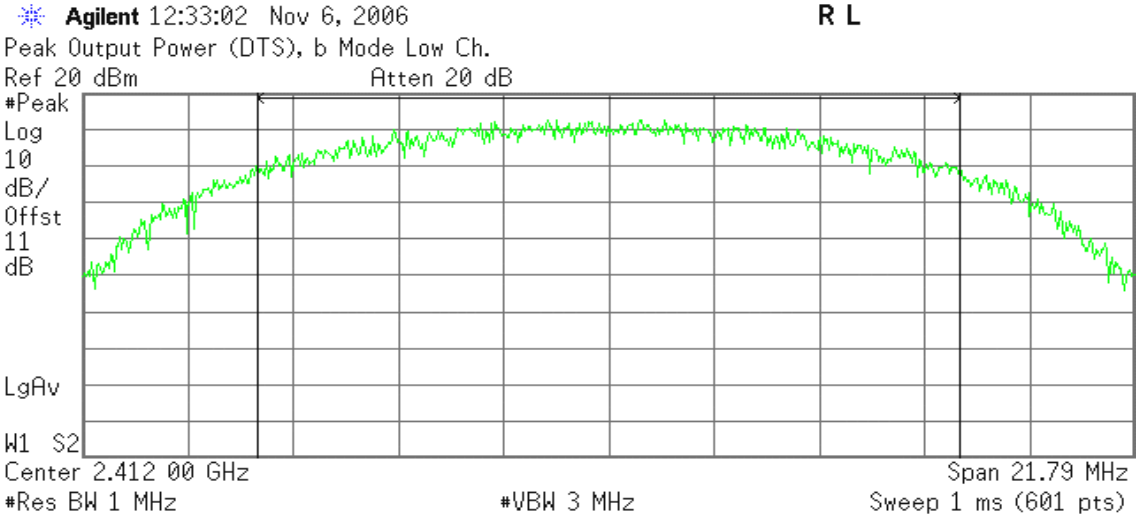
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	5745	17.86	0.06109	0.0631	PASS
Mid	5785	17.21	0.05260		PASS
High	5825	17.32	0.05395		PASS

***Remark**: The maximum antenna gain is 18 dBi; therefore the reduction due to antenna gain is 12 dB, so the limit is 18 dBm.*

Test Plot

IEEE 802.11b mode

CH Low



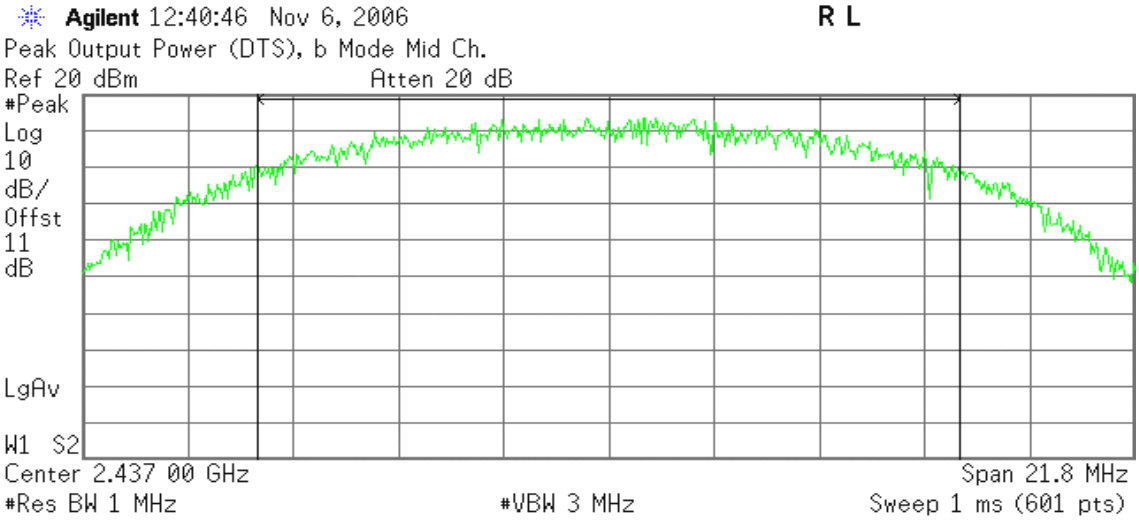
Channel Power

19.31 dBm /14.5260 MHz

Power Spectral Density

-52.31 dBm/Hz

CH Mid



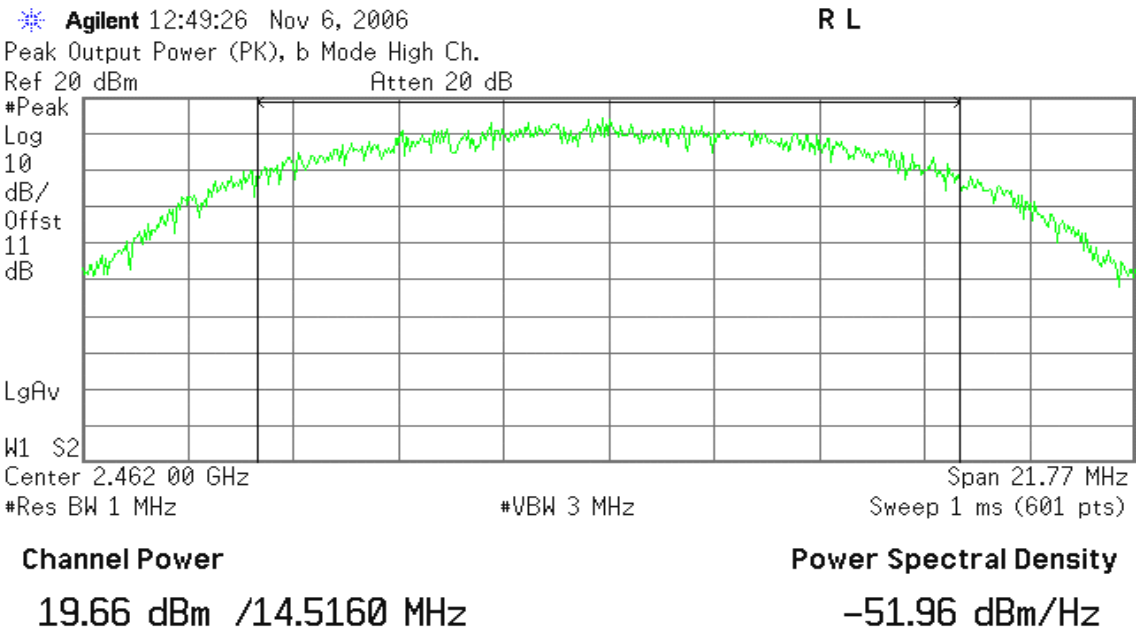
Channel Power

19.75 dBm /14.5360 MHz

Power Spectral Density

-51.87 dBm/Hz

CH High



Channel Power

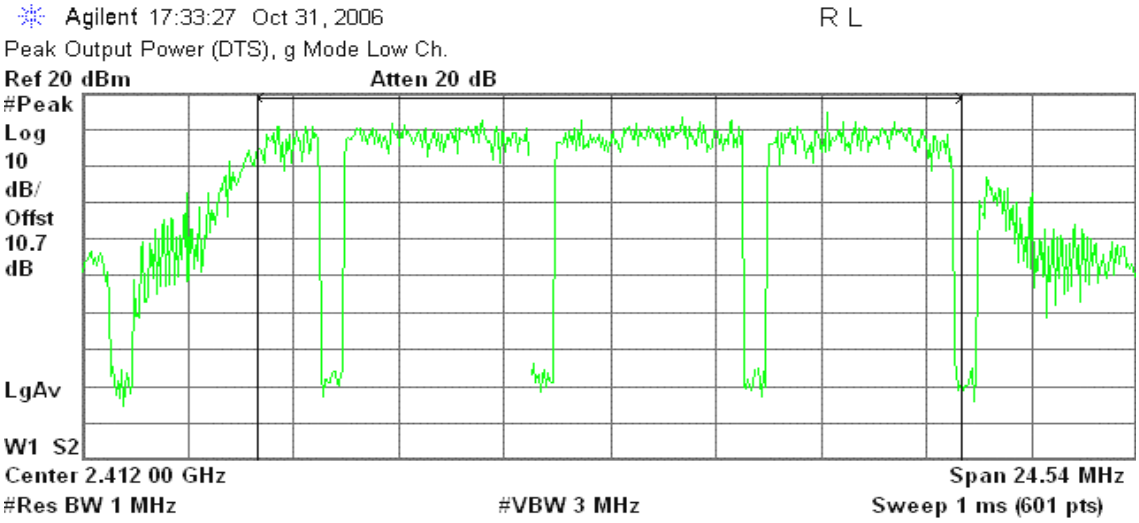
19.66 dBm /14.5160 MHz

Power Spectral Density

-51.96 dBm/Hz

IEEE 802.11g mode

CH Low



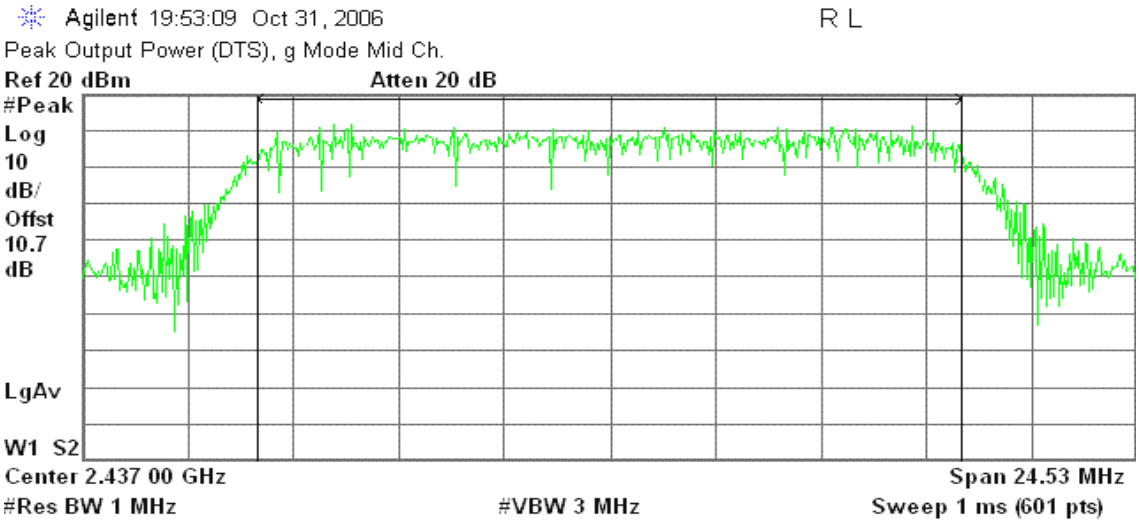
Channel Power

19.64 dBm / 16.3630 MHz

Power Spectral Density

-52.50 dBm/Hz

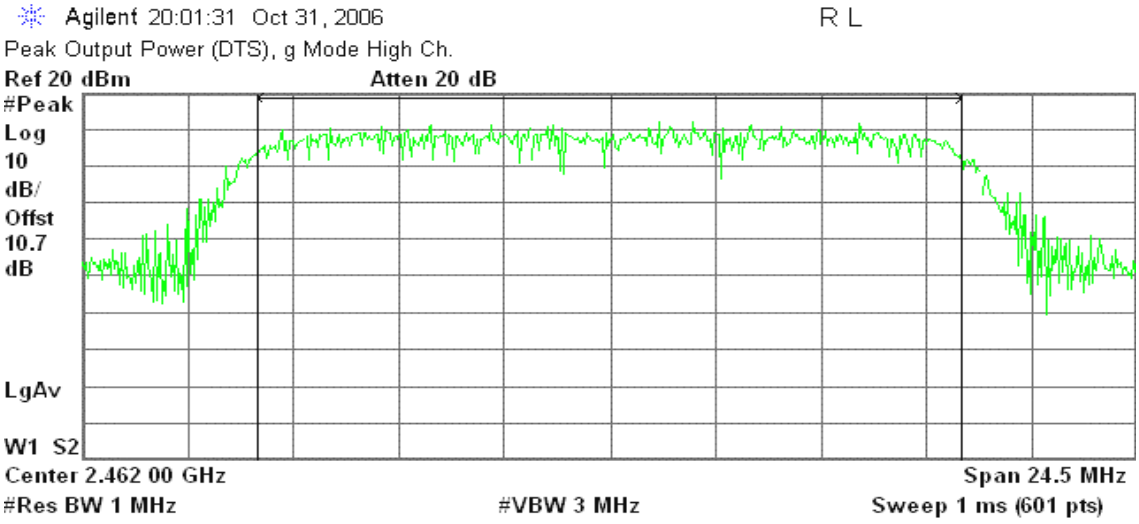
CH Mid



Channel Power
19.13 dBm / 16.3560 MHz

Power Spectral Density
-53.01 dBm/Hz

CH High

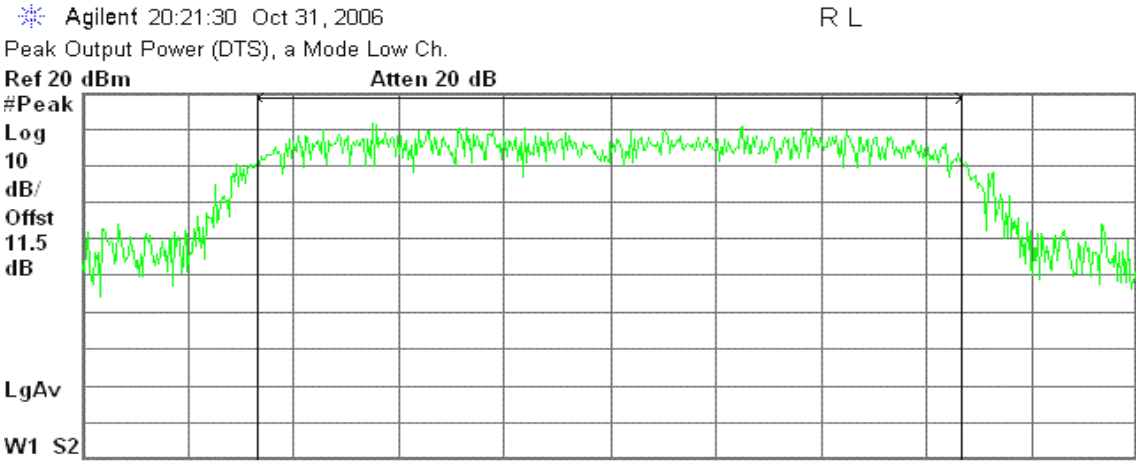


Channel Power
19.58 dBm / 16.3300 MHz

Power Spectral Density
-52.55 dBm/Hz

IEEE 802.11a mode

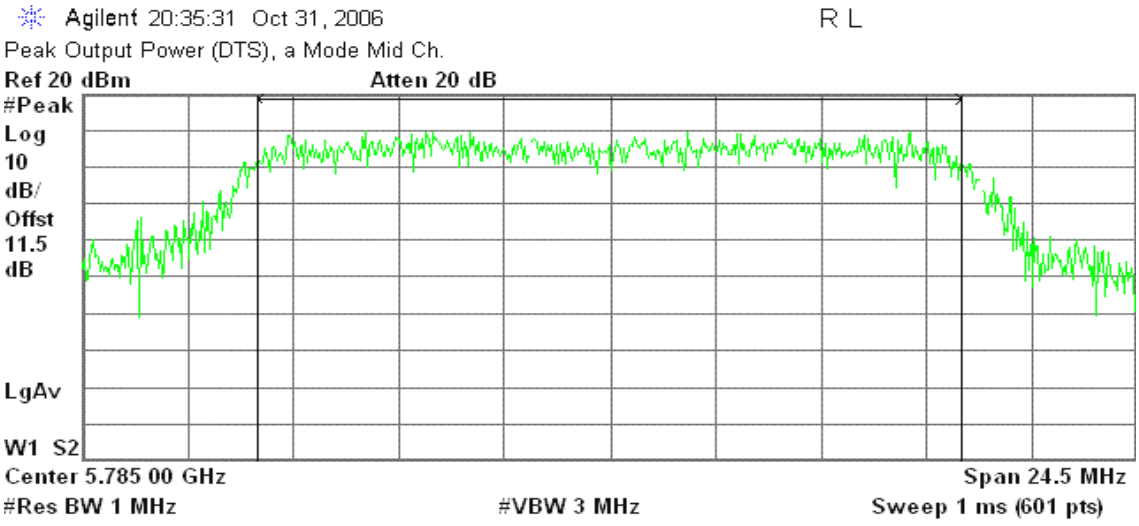
CH Low



Channel Power
17.86 dBm / 16.3980 MHz

Power Spectral Density
-54.29 dBm/Hz

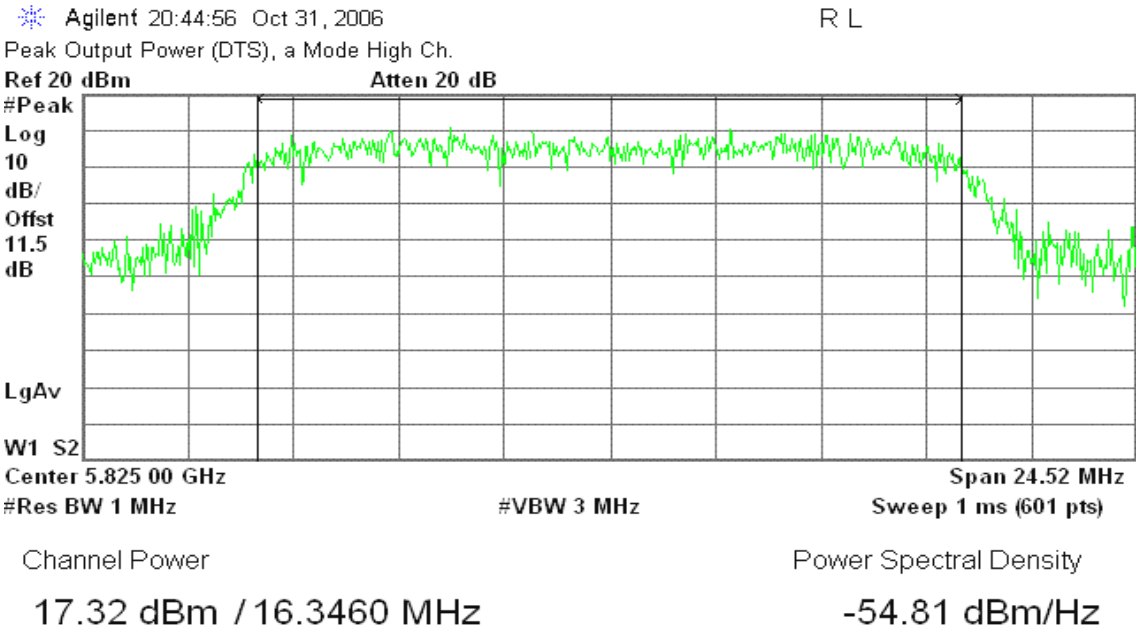
CH Mid



Channel Power
17.21 dBm / 16.3340 MHz

Power Spectral Density
-54.93 dBm/Hz

CH High



Channel Power

17.32 dBm / 16.3460 MHz

Power Spectral Density

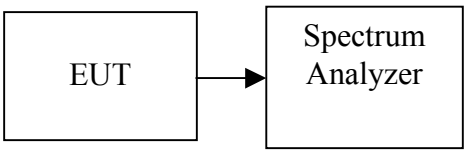
-54.81 dBm/Hz

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)	Output Power (dBm)	Output Power (W)
Low	2412	16.47	0.04436
Mid	2437	16.42	0.04385
High	2462	16.60	0.04571

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	16.45	0.04416
Mid	2437	15.86	0.03855
High	2462	15.95	0.03936

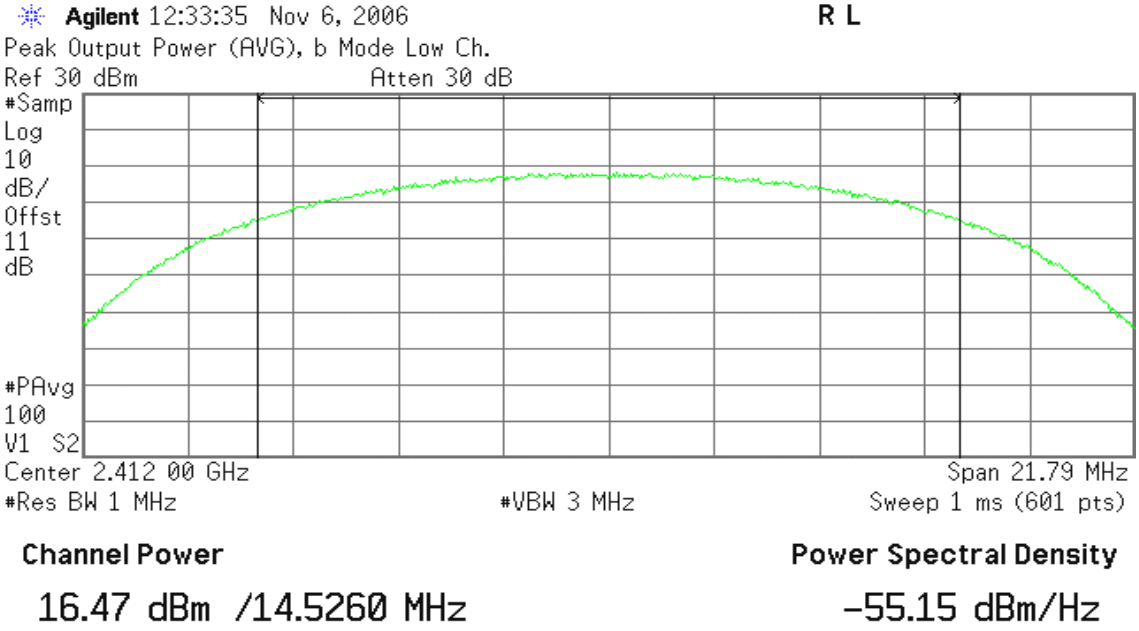
Test mode: IEEE 802.11a mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	5745	14.25	0.02661
Mid	5785	13.46	0.02218
High	5825	13.77	0.02382

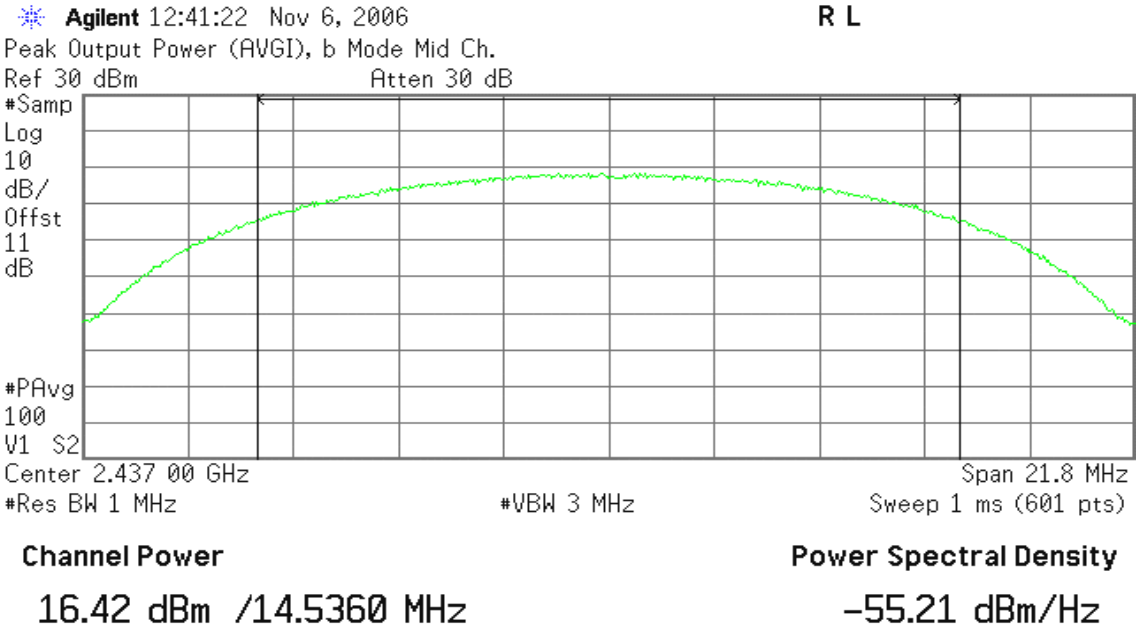
Test Plot

IEEE 802.11b mode

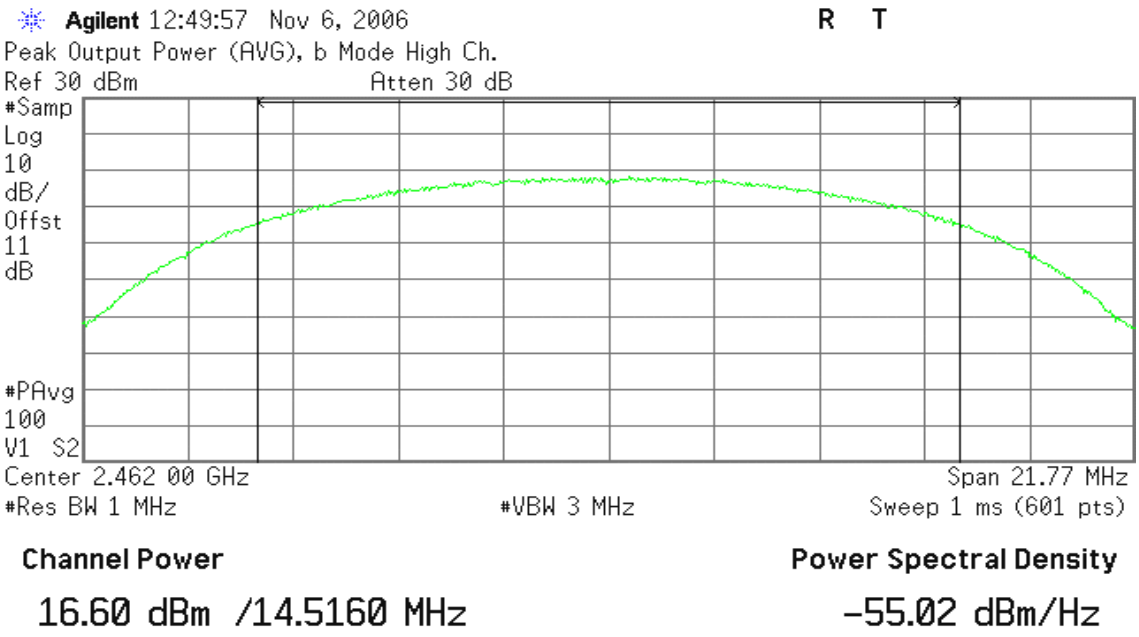
CH Low



CH Mid



CH High



Channel Power

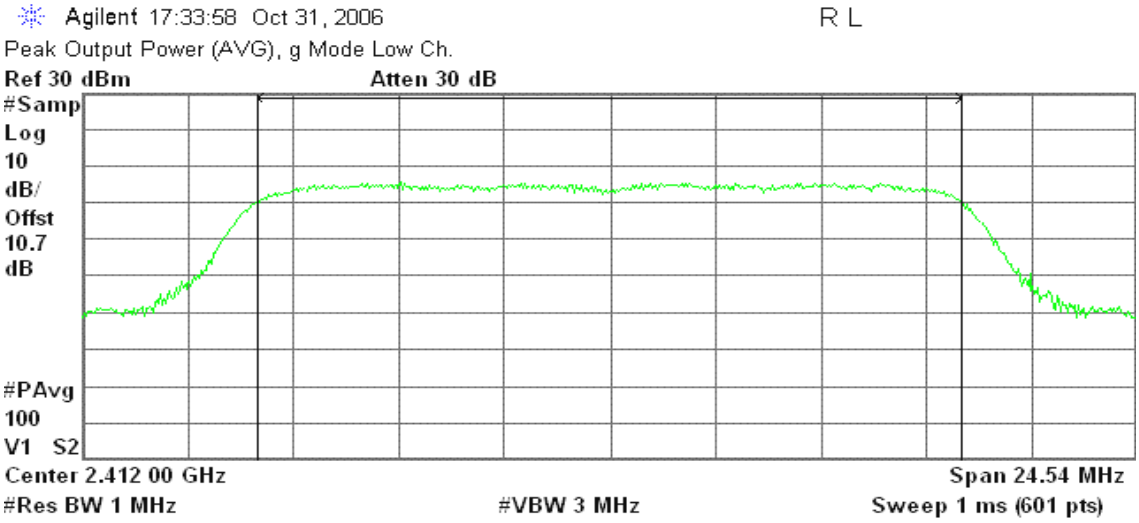
16.60 dBm /14.5160 MHz

Power Spectral Density

-55.02 dBm/Hz

IEEE 802.11g mode

CH Low



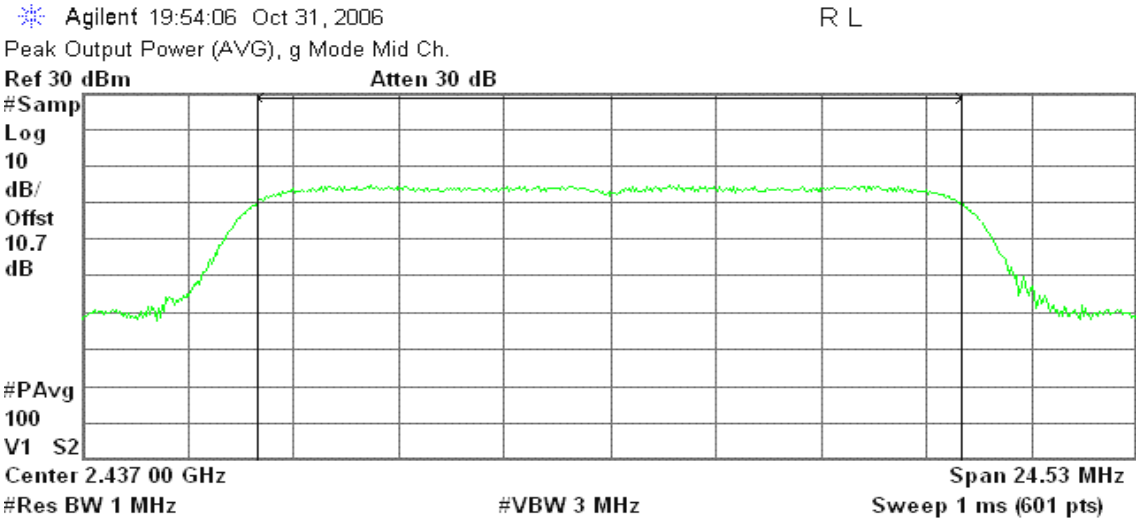
Channel Power

16.45 dBm / 16.3630 MHz

Power Spectral Density

-55.69 dBm/Hz

CH Mid



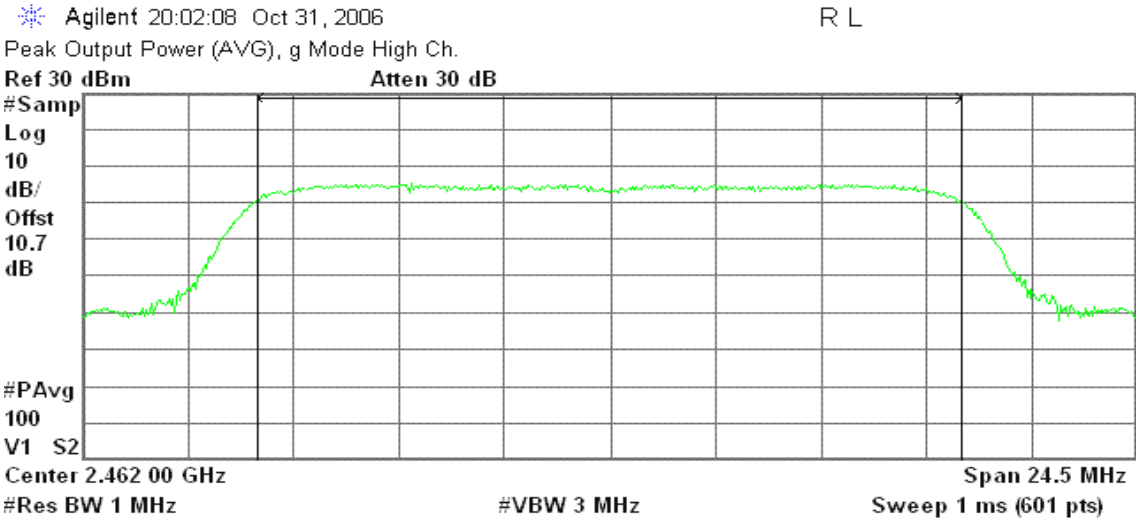
Channel Power

15.86 dBm / 16.3560 MHz

Power Spectral Density

-56.28 dBm/Hz

CH High



Channel Power

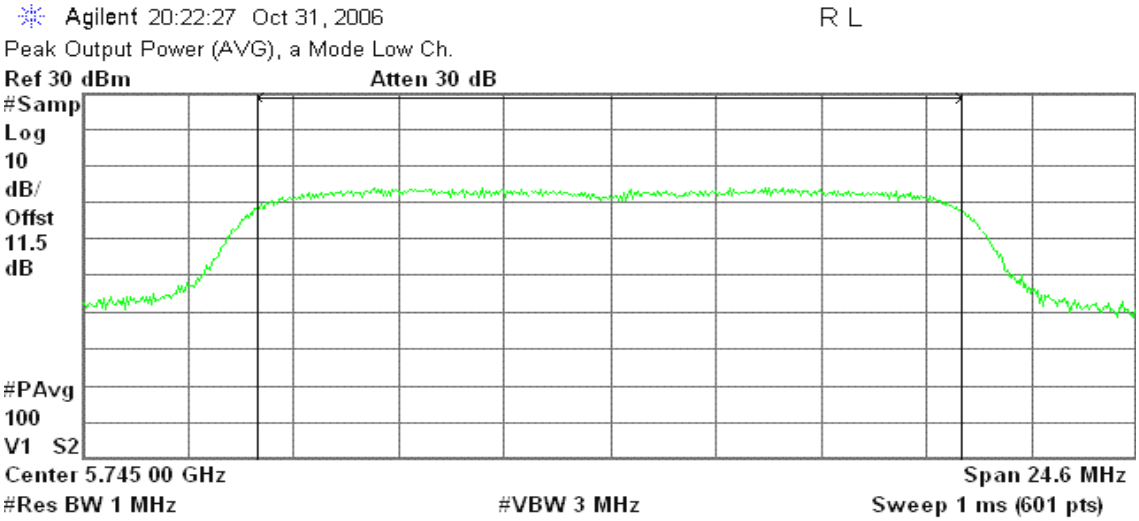
15.95 dBm / 16.3300 MHz

Power Spectral Density

-56.18 dBm/Hz

IEEE 802.11a mode

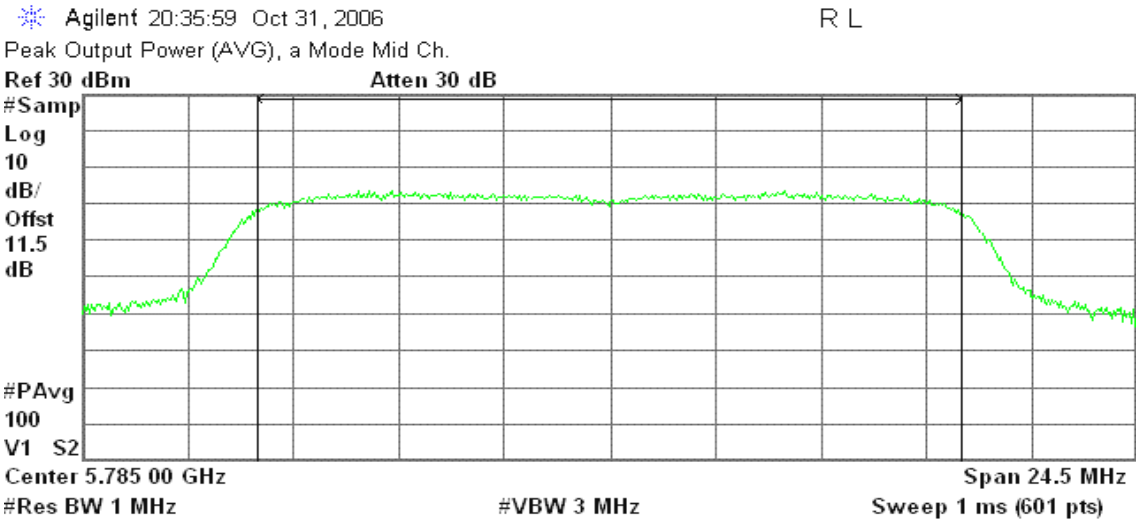
CH Low



Channel Power
14.25 dBm / 16.3980 MHz

Power Spectral Density
-57.90 dBm/Hz

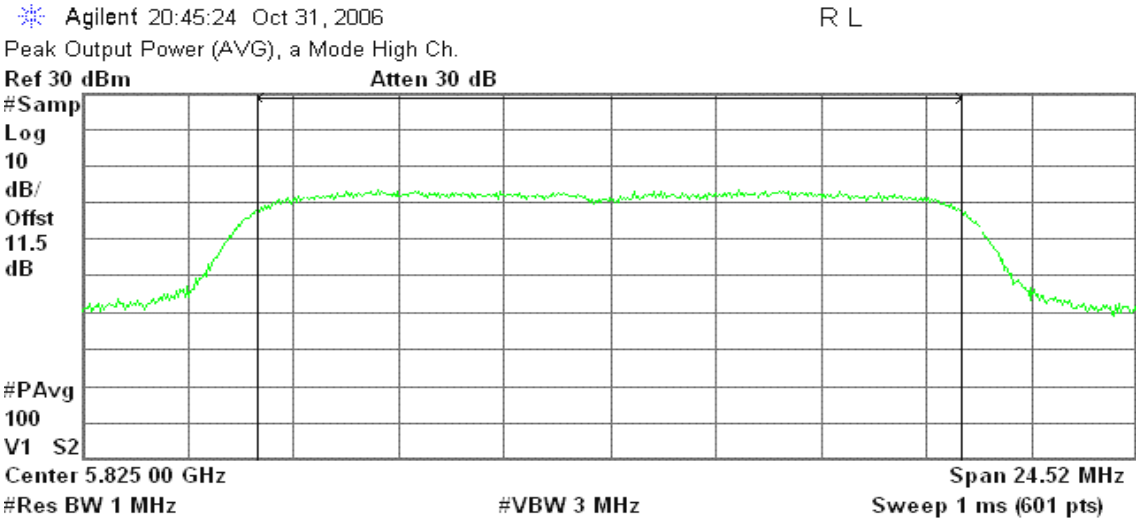
CH Mid



Channel Power
13.46 dBm / 16.3340 MHz

Power Spectral Density
-58.67 dBm/Hz

CH High



Channel Power

13.77 dBm / 16.3460 MHz

Power Spectral Density

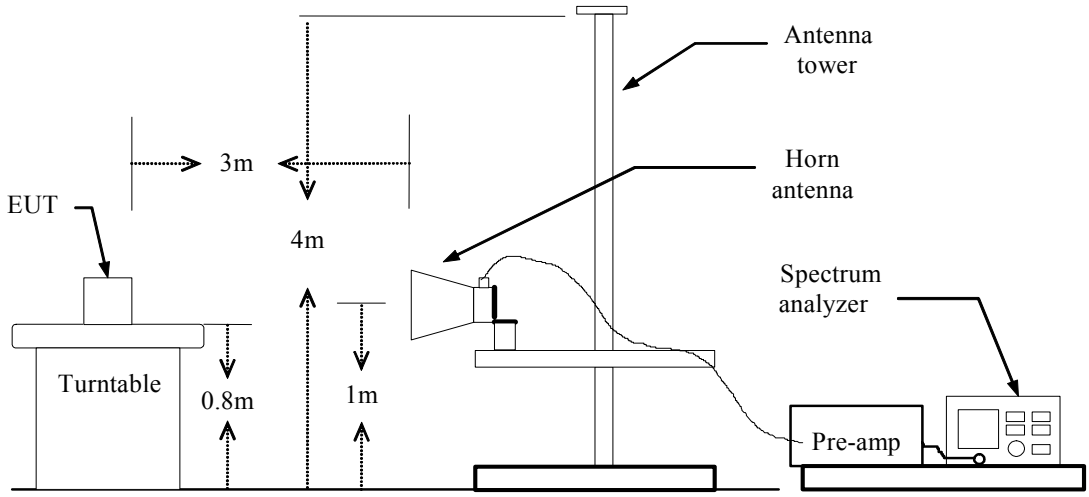
-58.36 dBm/Hz

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.

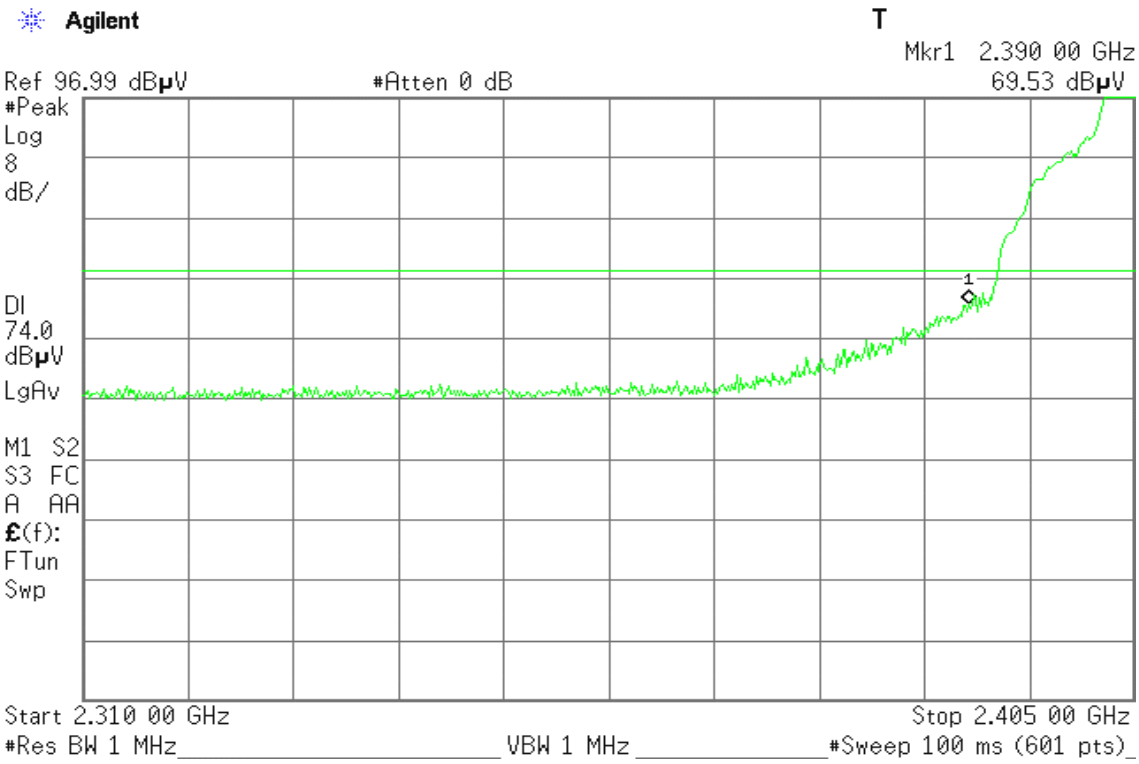
TEST RESULTS

Refer to attach spectrum analyzer data chart.

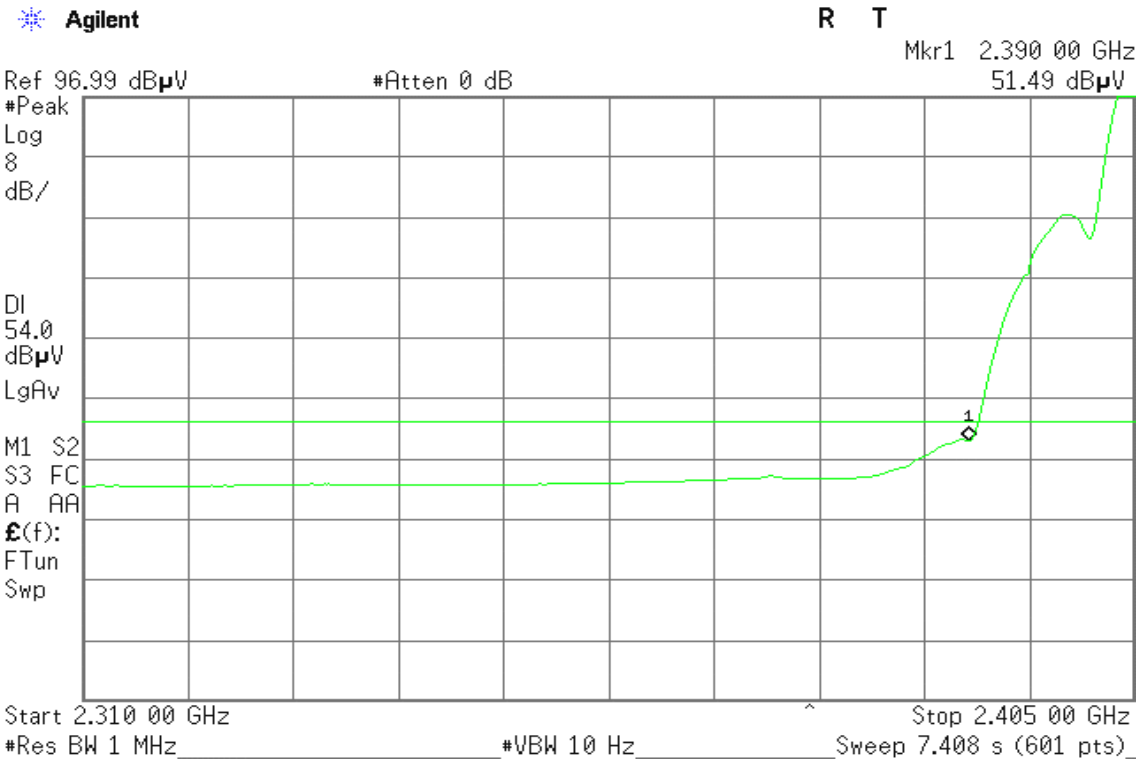
External Antenna: Omni Antenna 15dBi for ZW-2200-IA

Band Edges (IEEE 802.11b mode / CH Low)

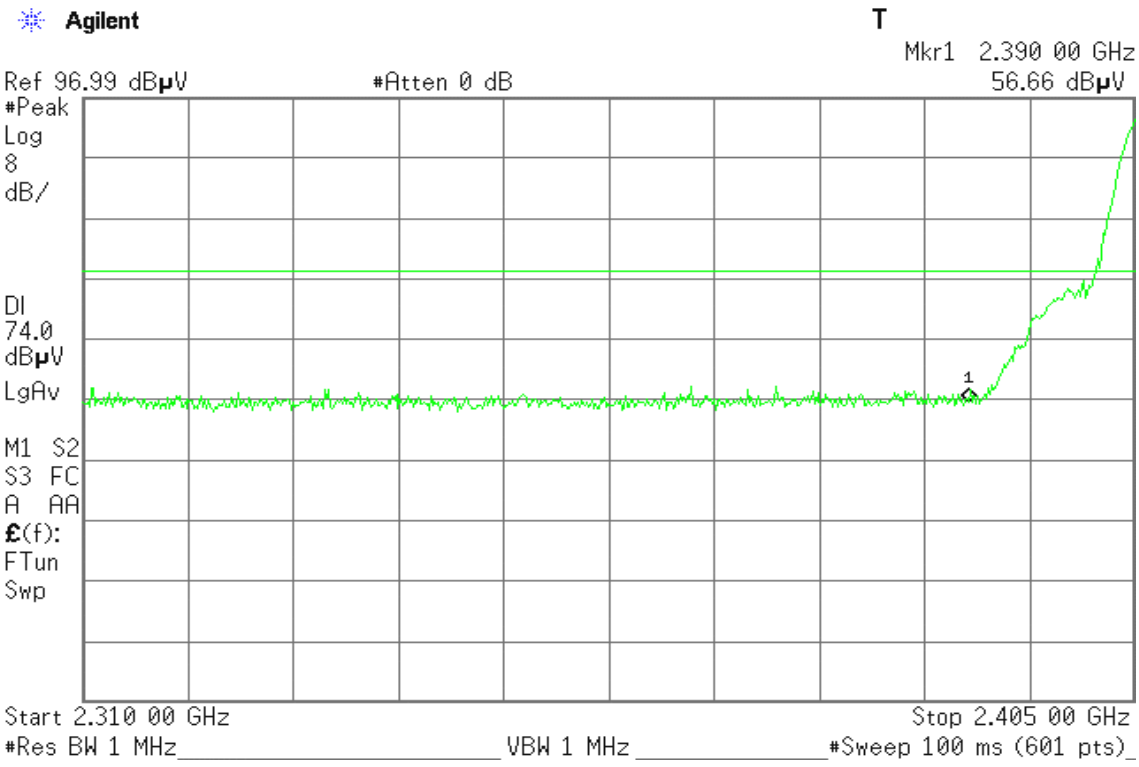
Detector mode: Peak **Polarity: Vertical**



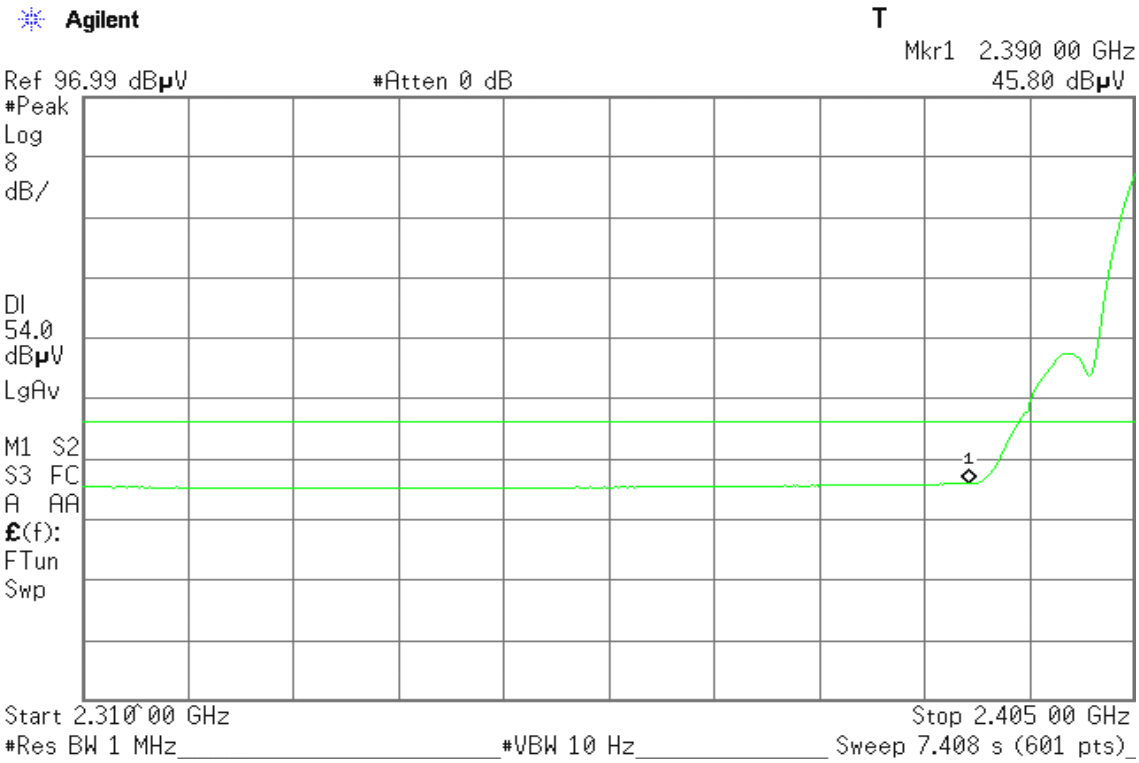
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

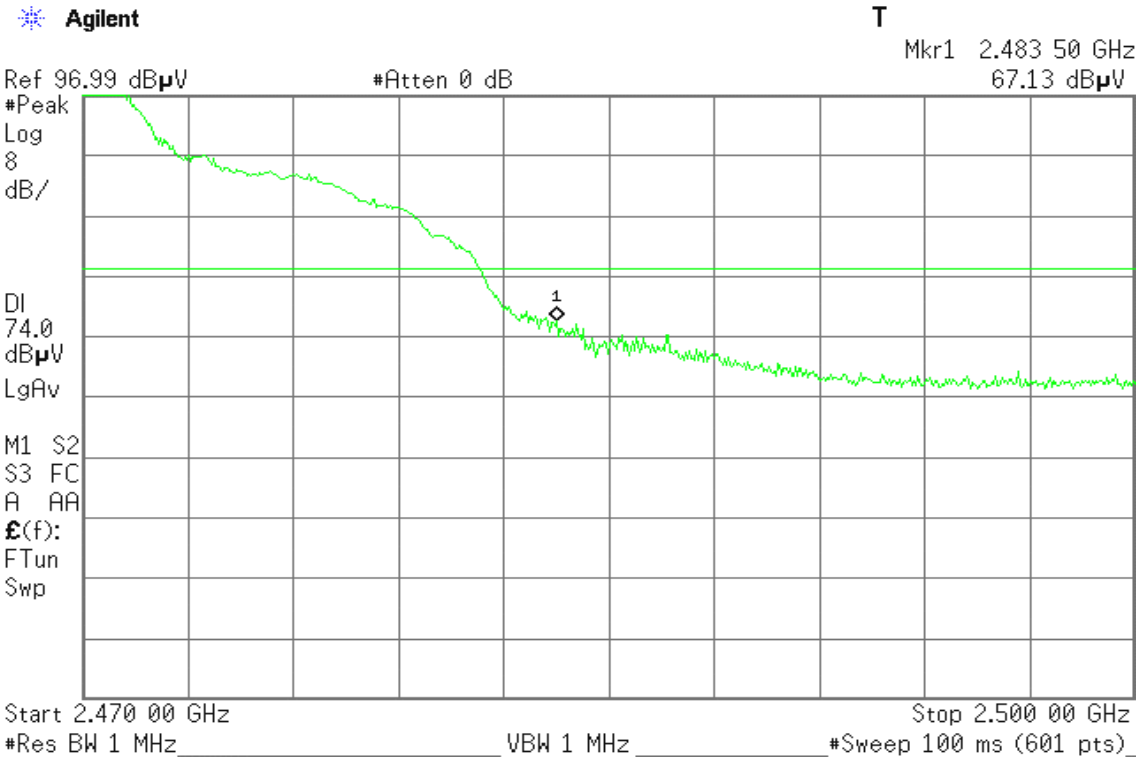


Detector mode: Average **Polarity: Horizontal**

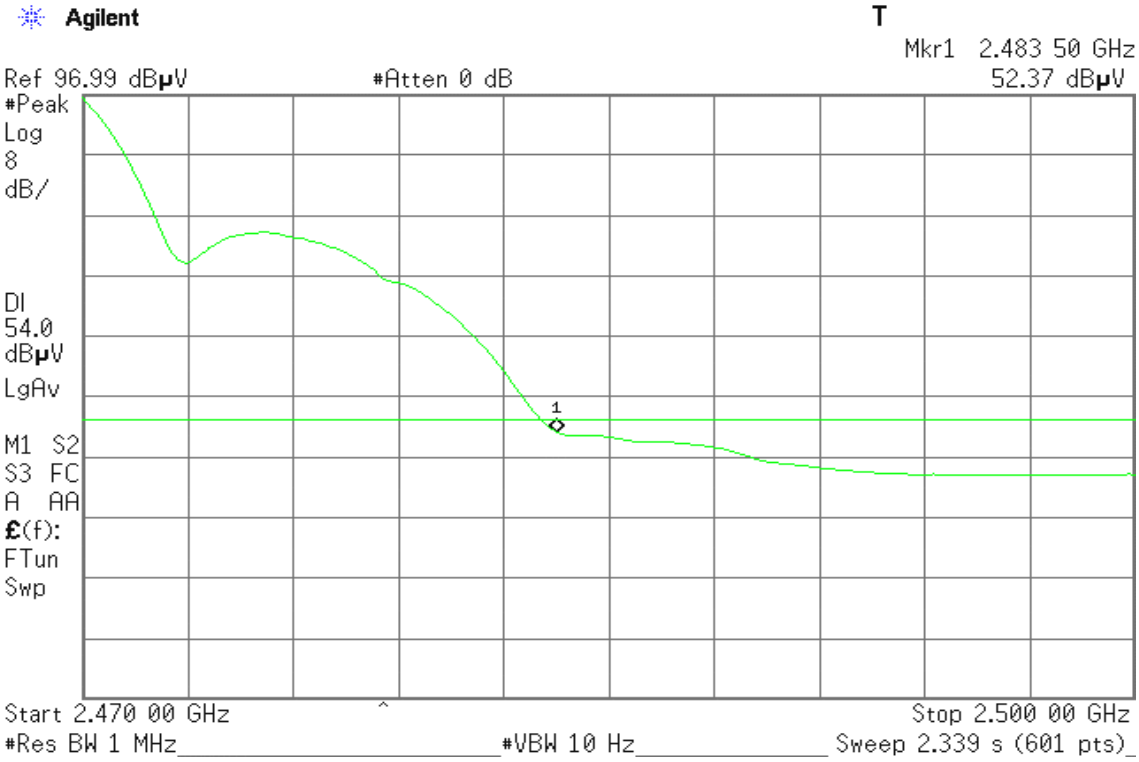


Band Edges (IEEE 802.11b mode / CH High)

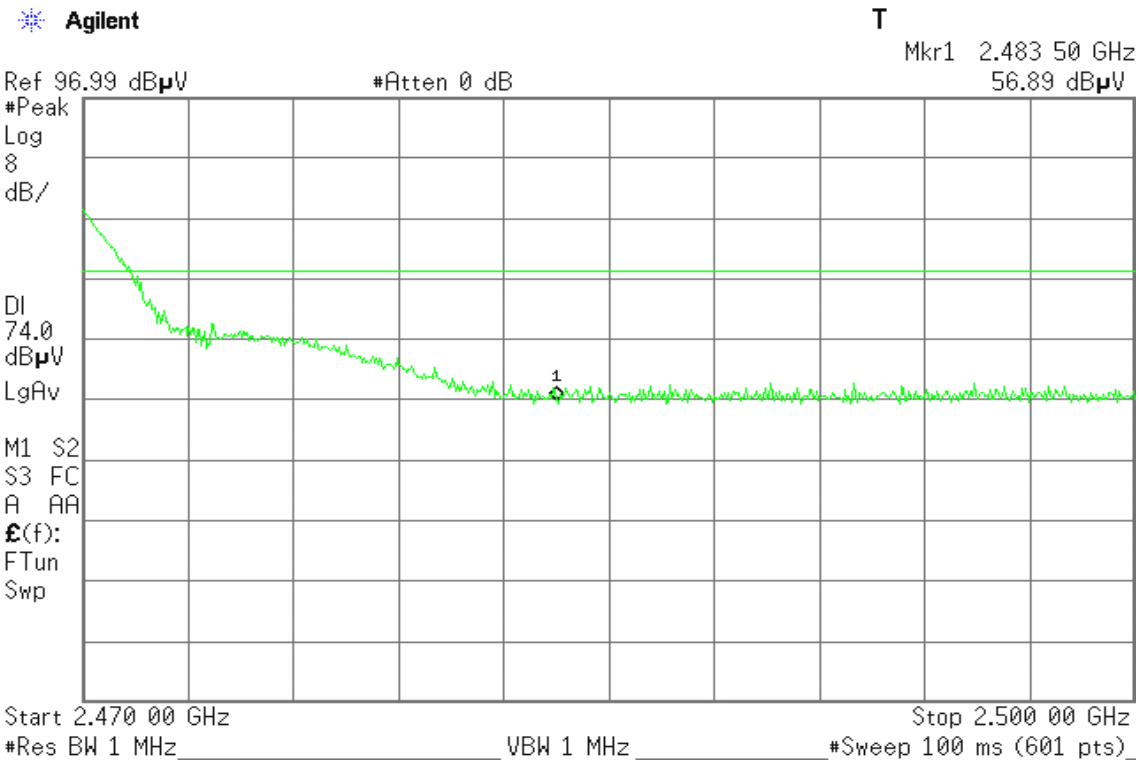
Detector mode: Peak Polarity: Vertical



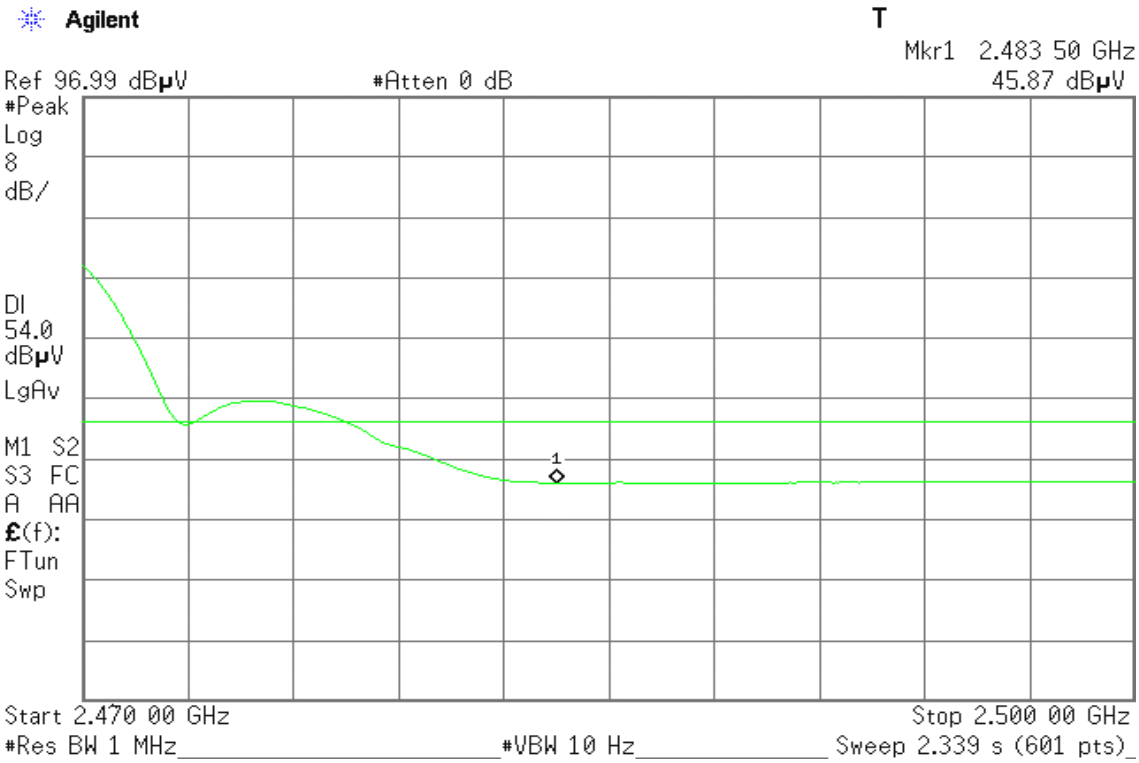
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

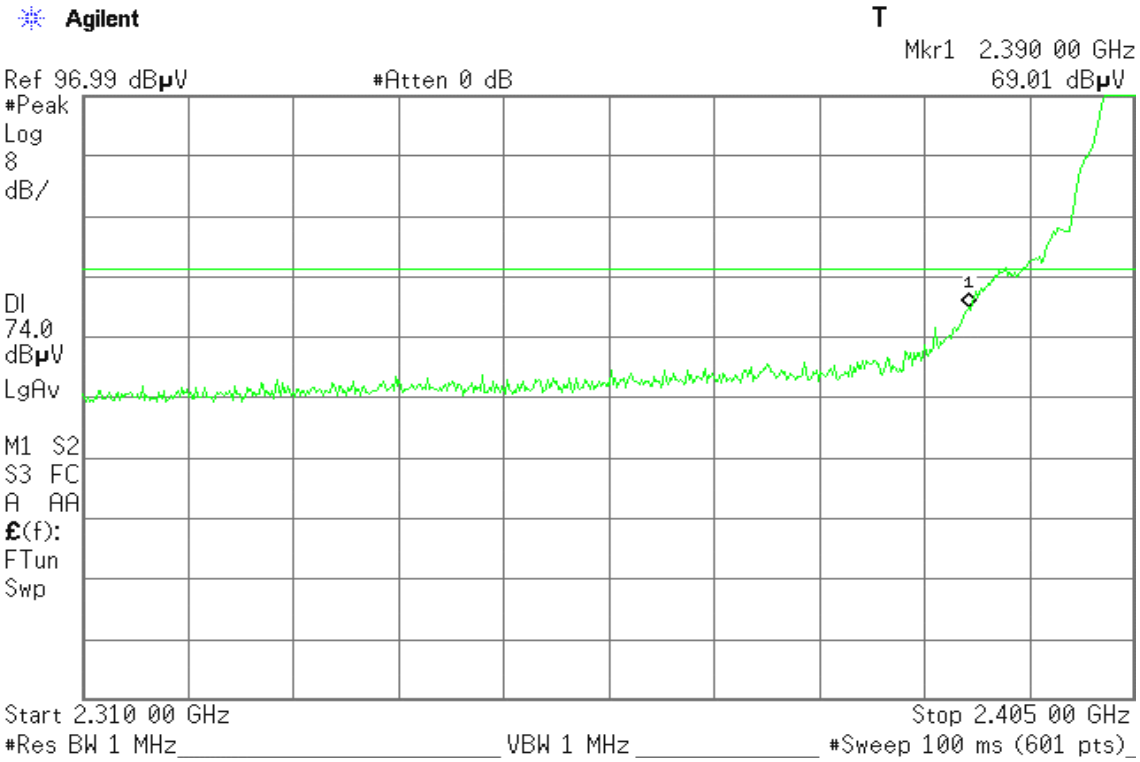


Detector mode: Average **Polarity: Horizontal**

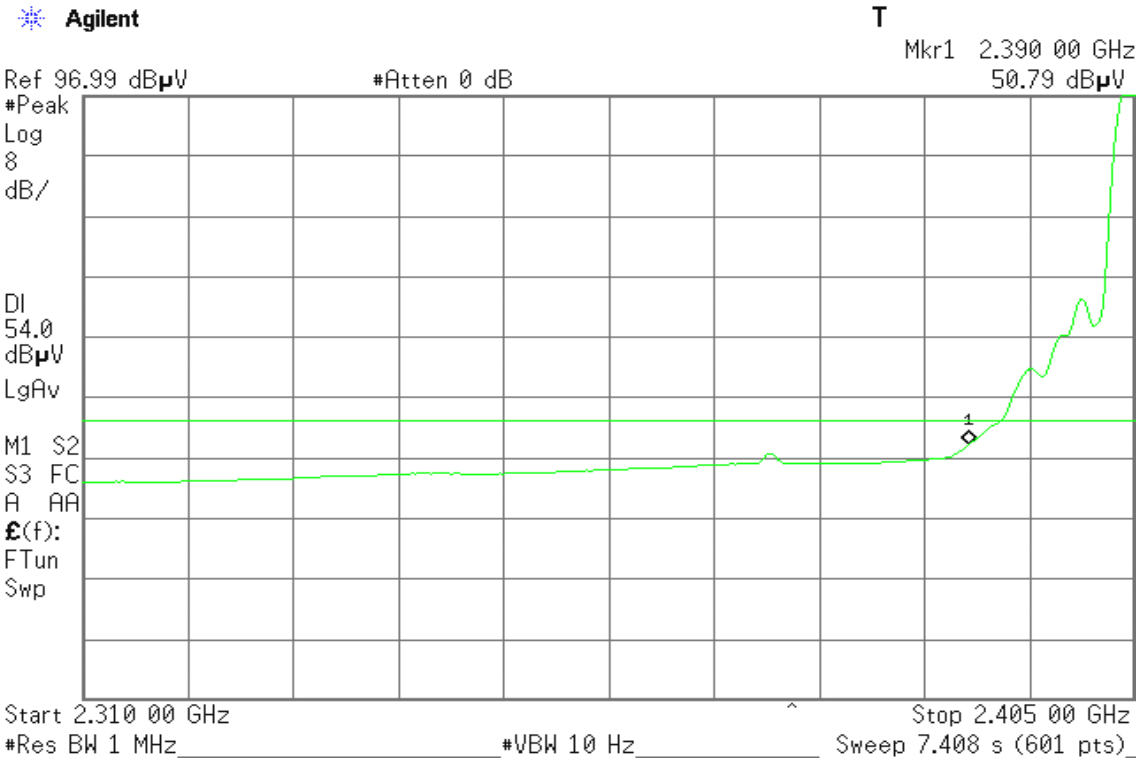


Band Edges (IEEE 802.11g mode / CH Low)

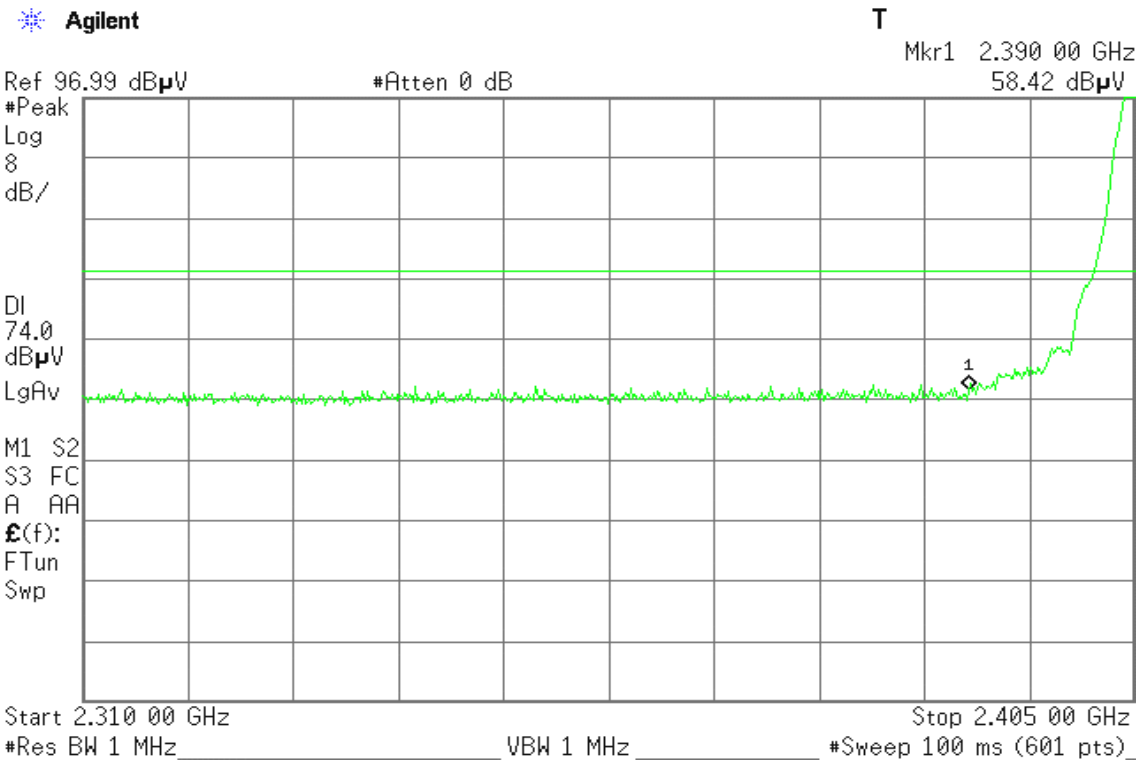
Detector mode: Peak **Polarity: Vertical**



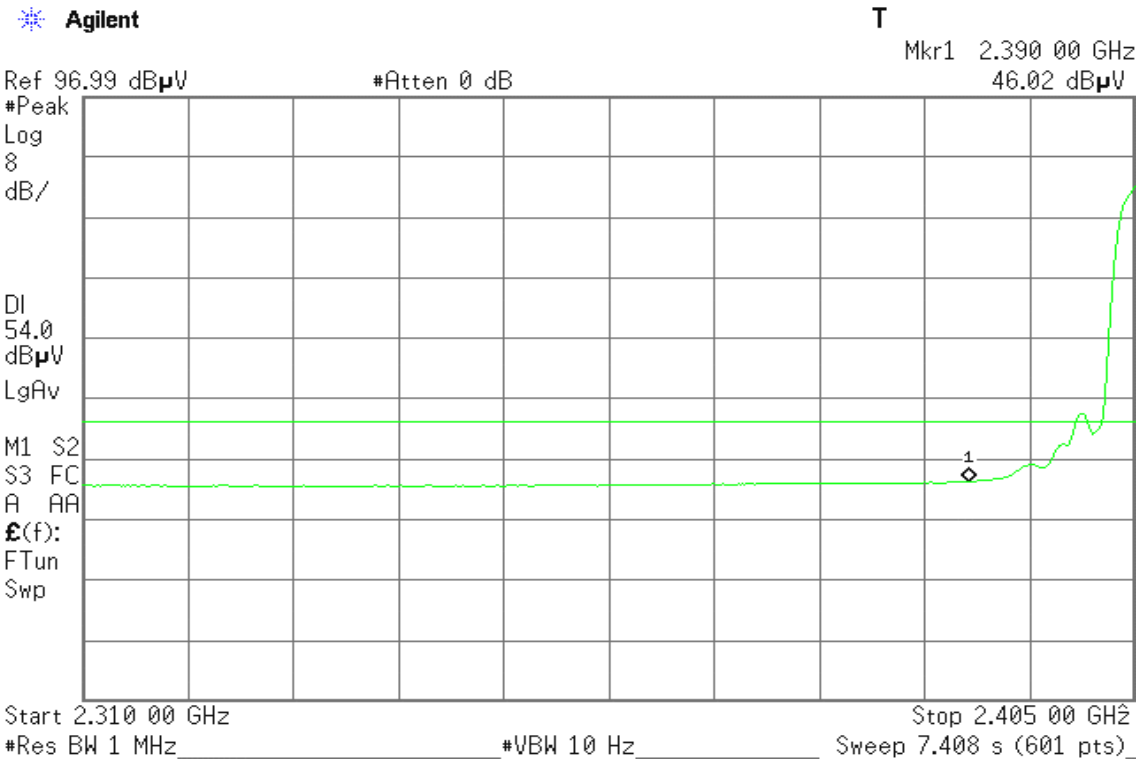
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

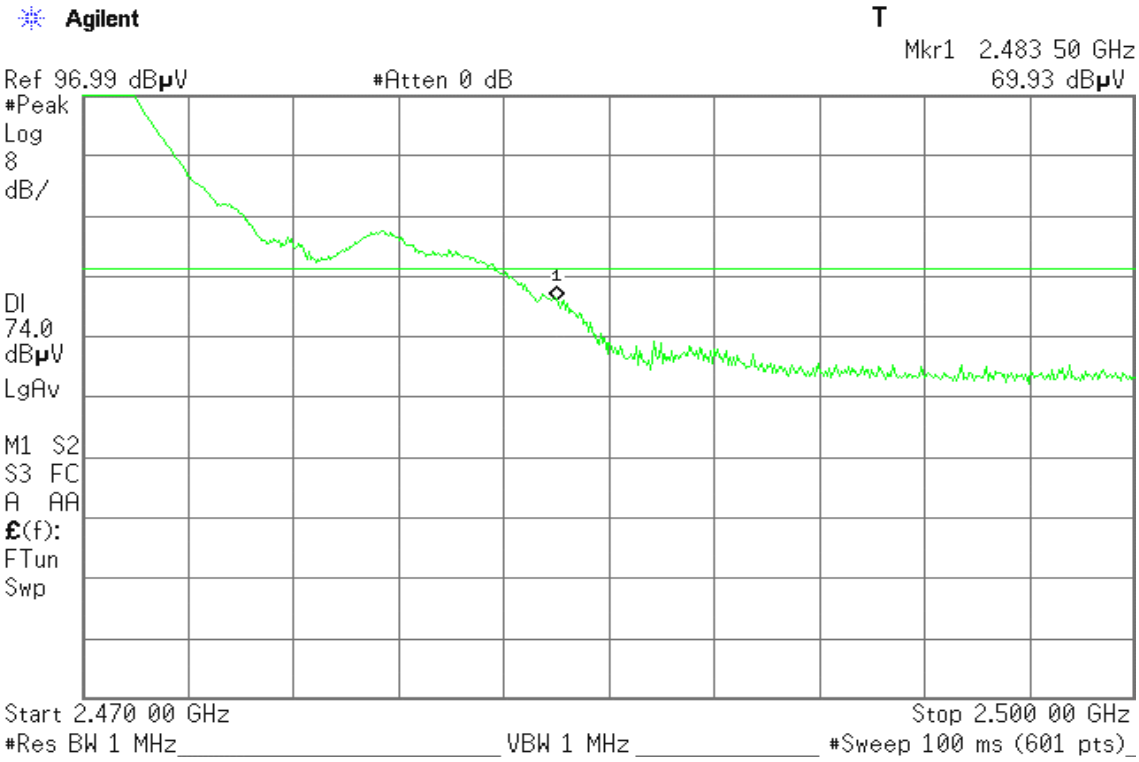


Detector mode: Average **Polarity: Horizontal**

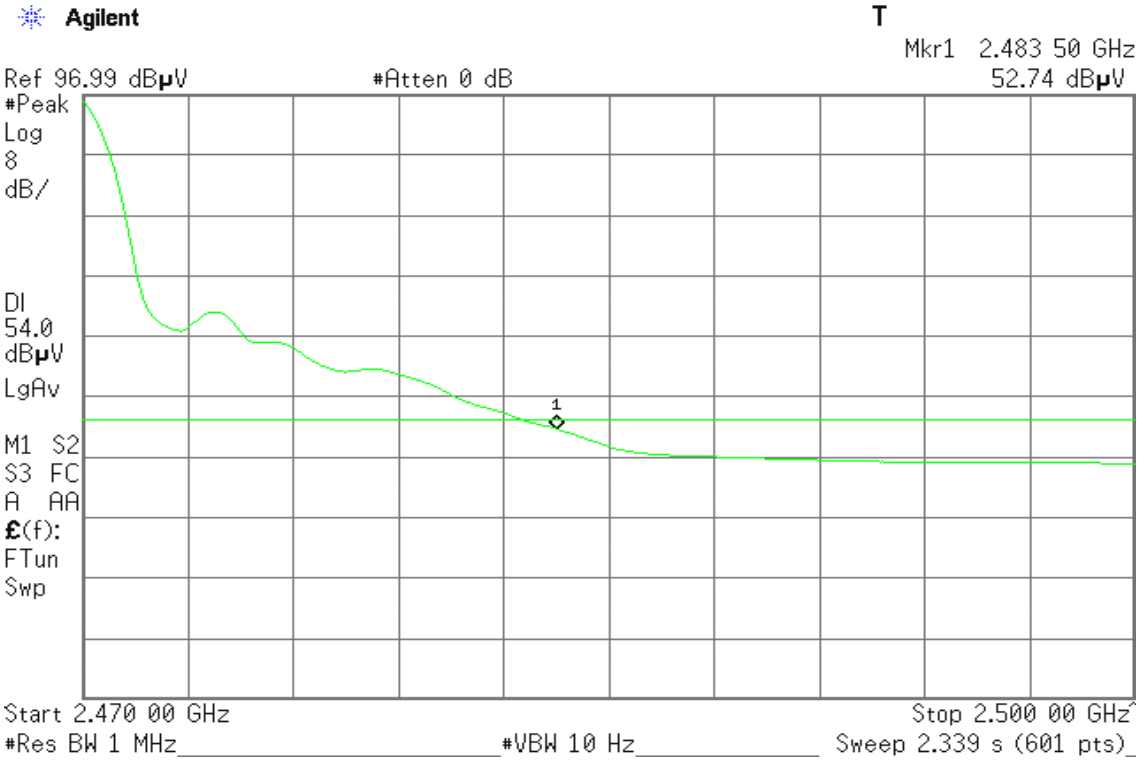


Band Edges (IEEE 802.11g mode / CH High)

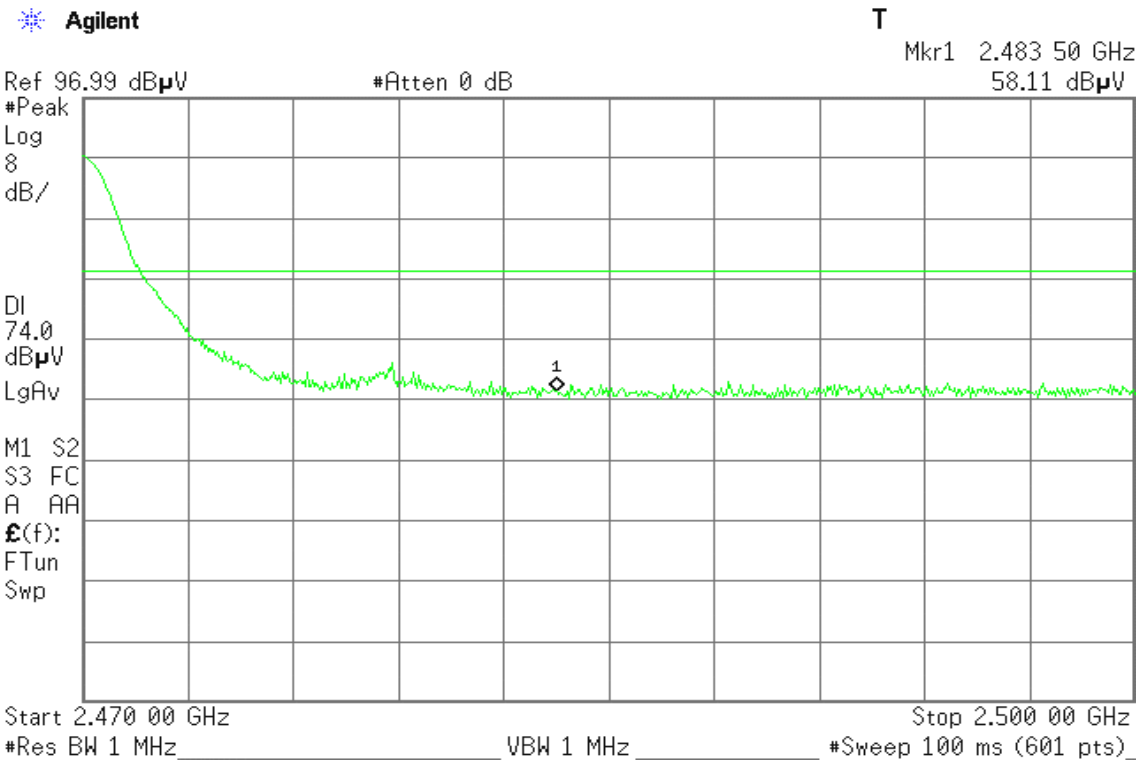
Detector mode: Peak Polarity: Vertical



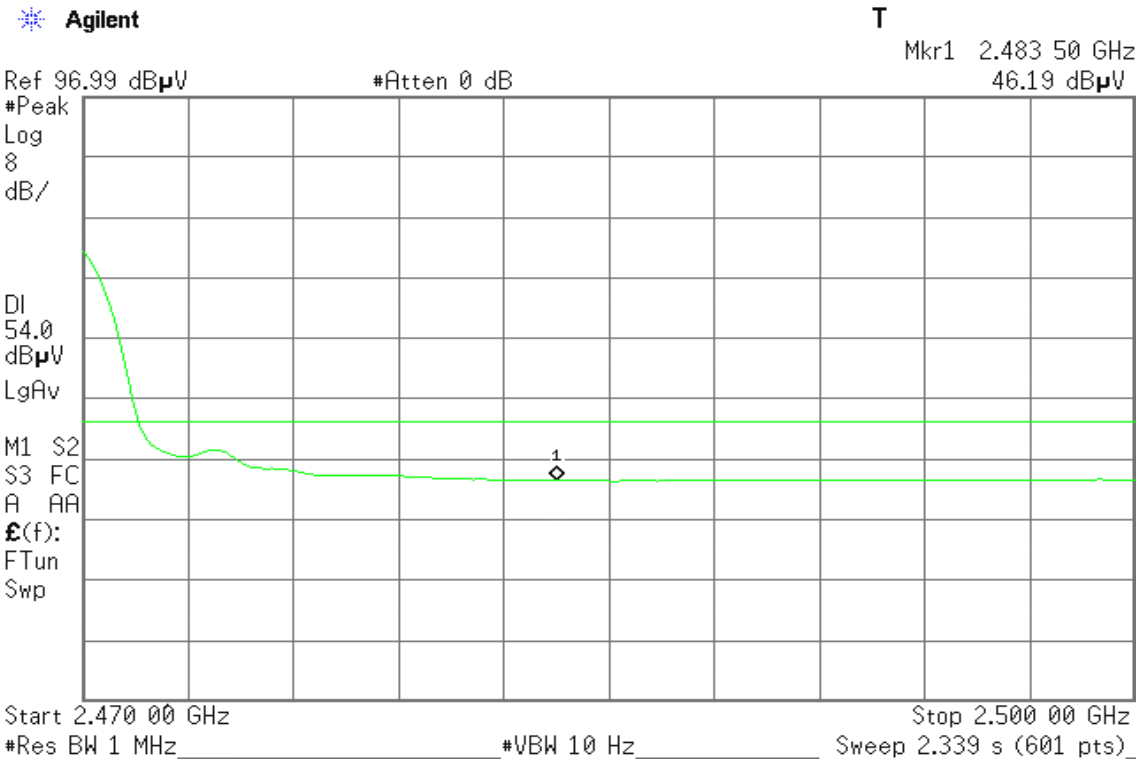
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**



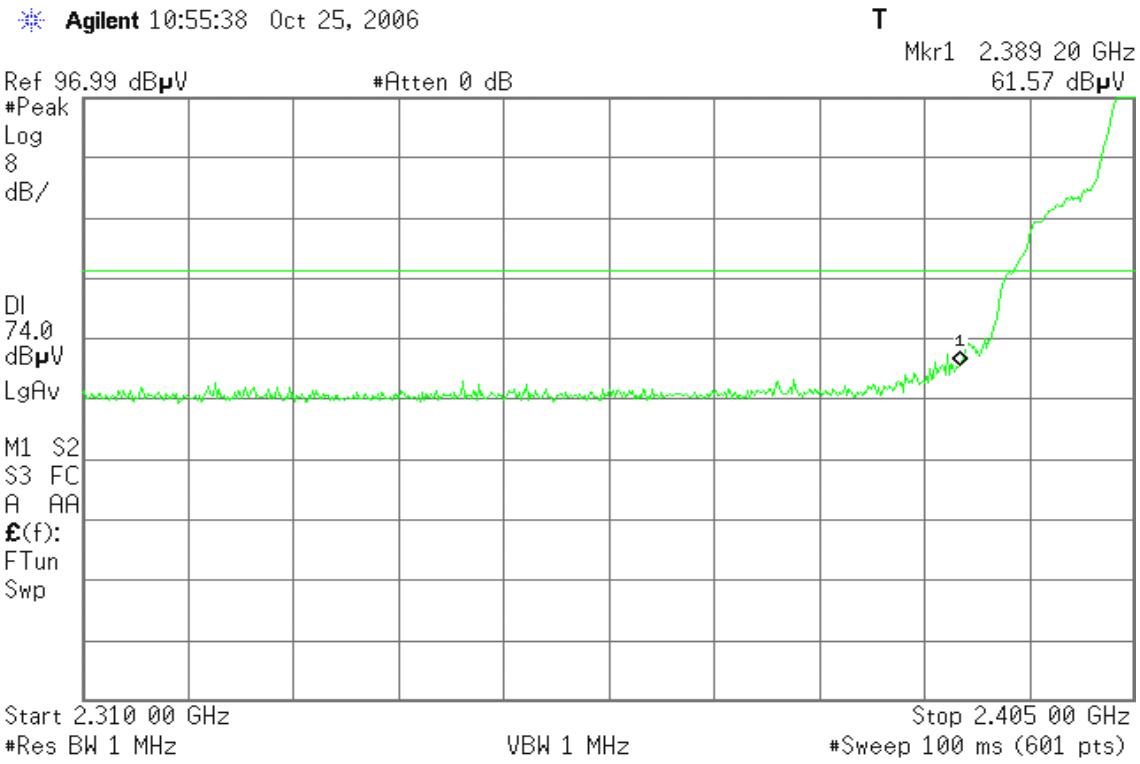
Detector mode: Average **Polarity: Horizontal**



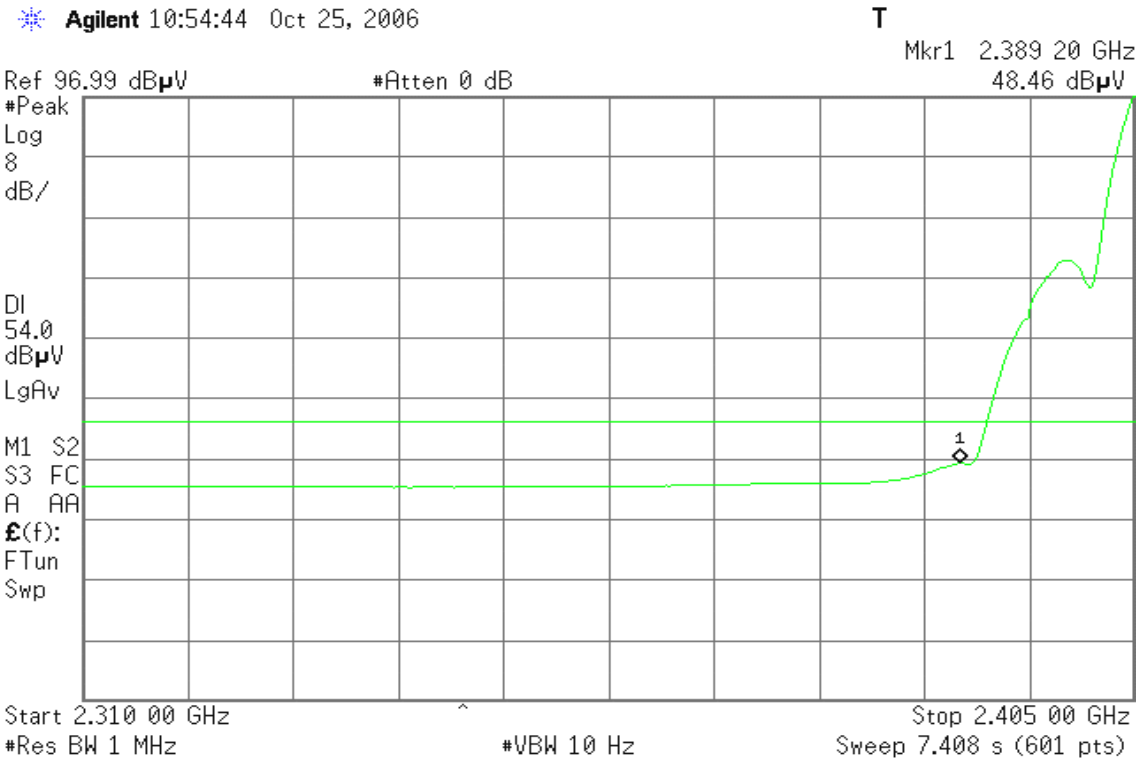
External Antenna: Panel Antenna 16dBi for ZW-2200-IA

Band Edges (IEEE 802.11b mode / CH Low)

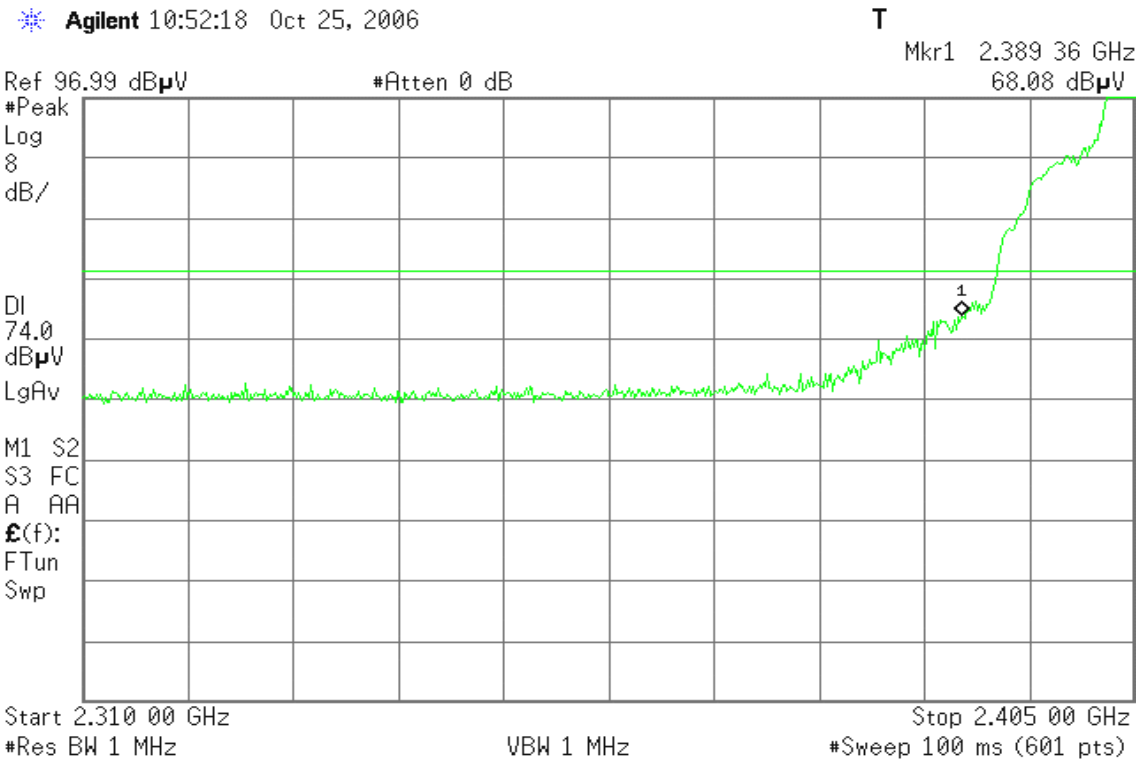
Detector mode: Peak **Polarity: Vertical**



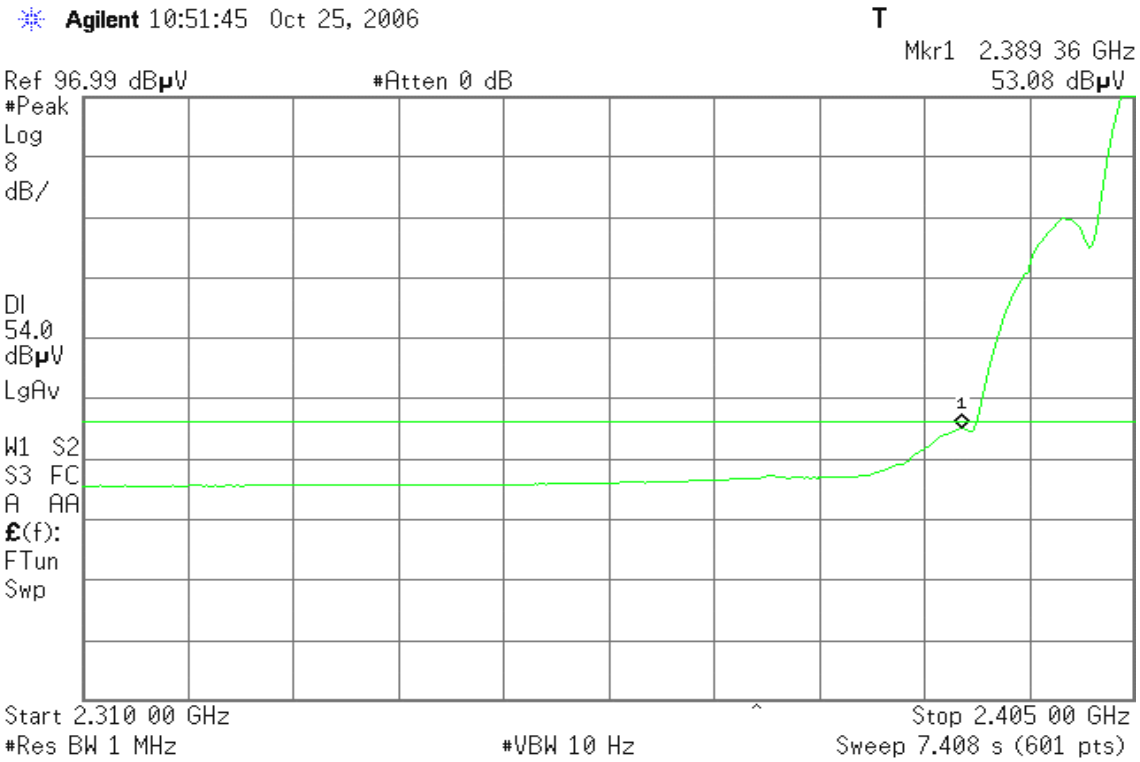
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

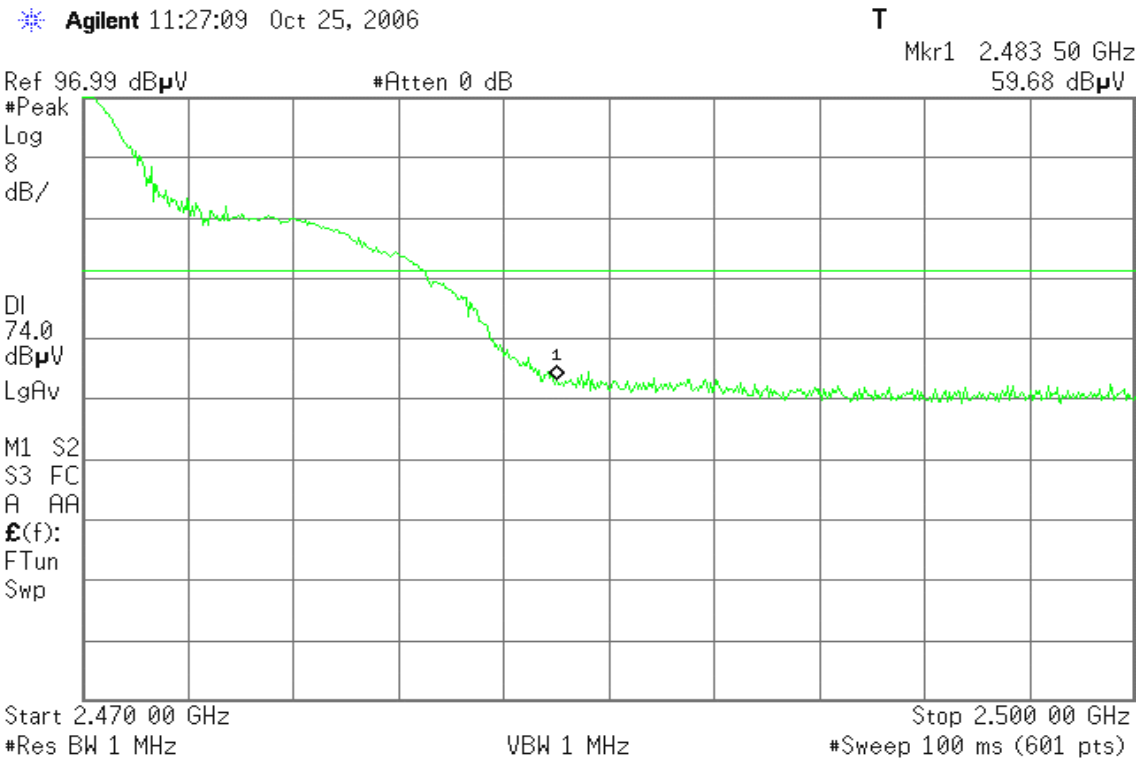


Detector mode: Average **Polarity: Horizontal**

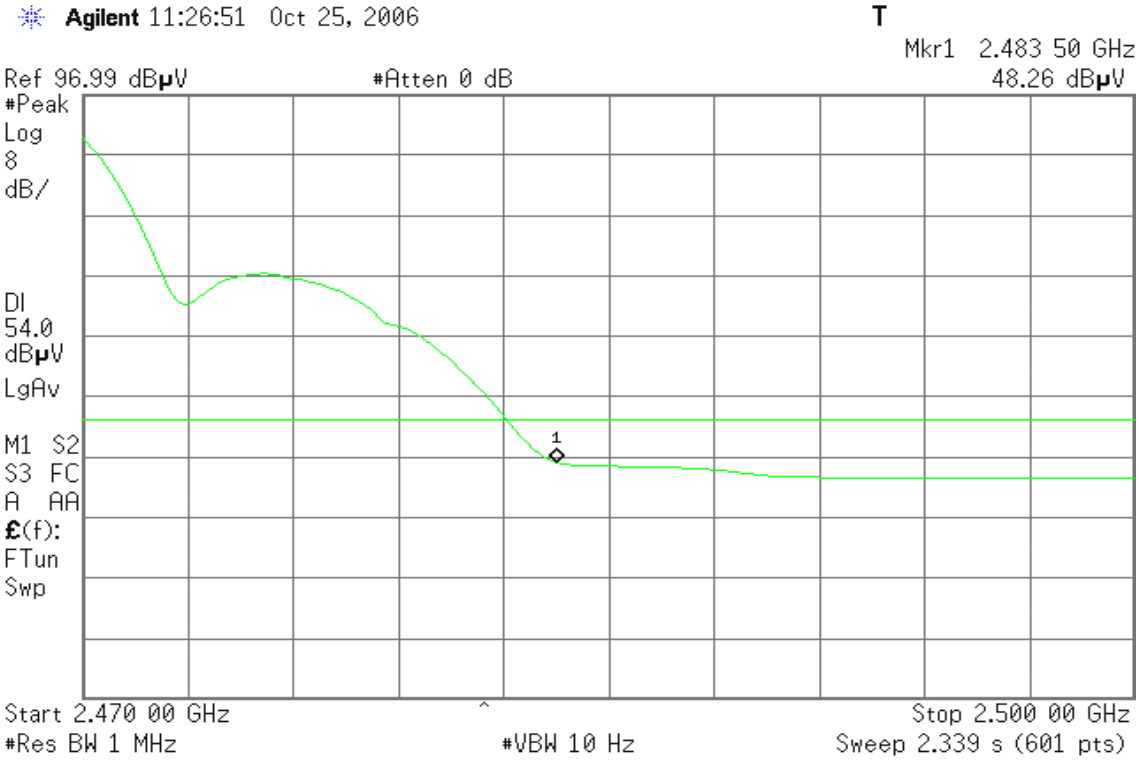


Band Edges (IEEE 802.11b mode / CH High)

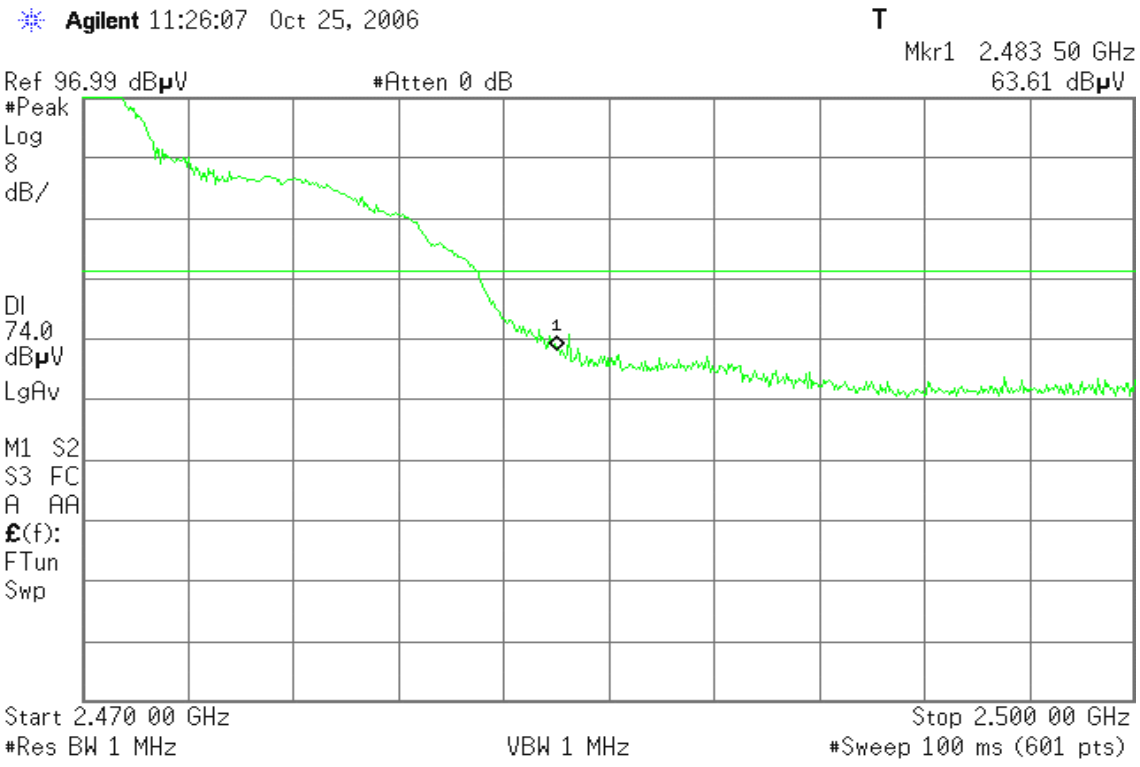
Detector mode: Peak Polarity: Vertical



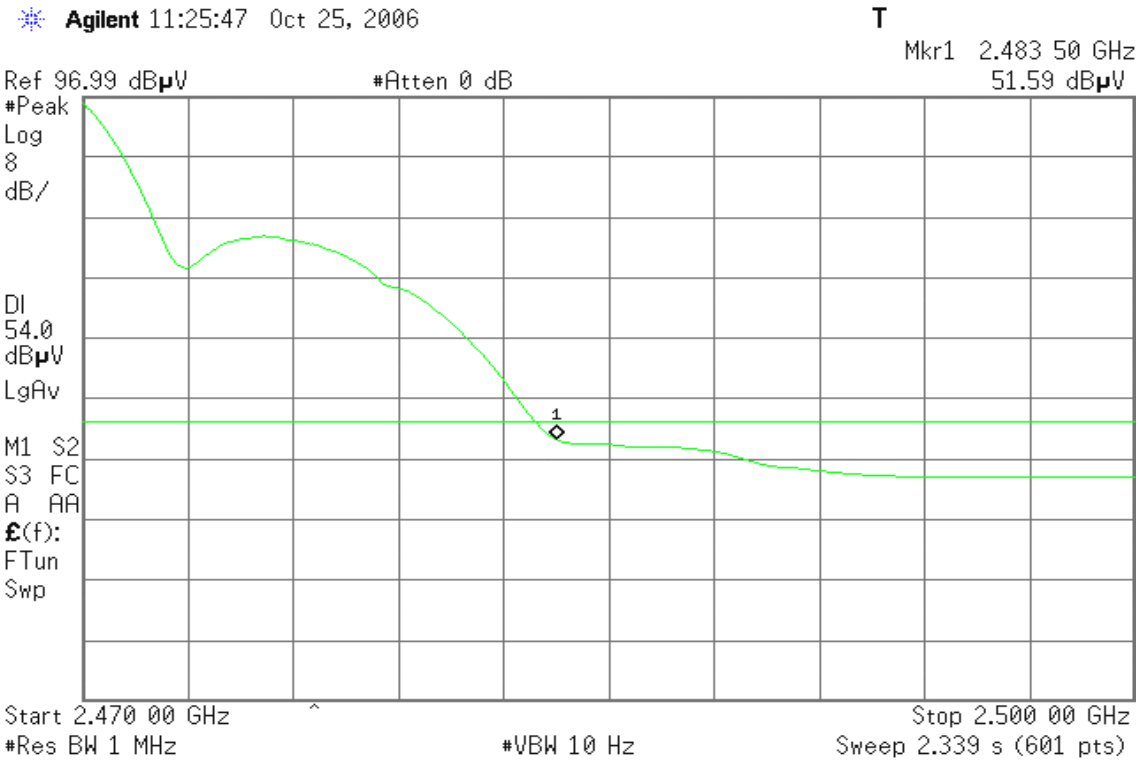
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

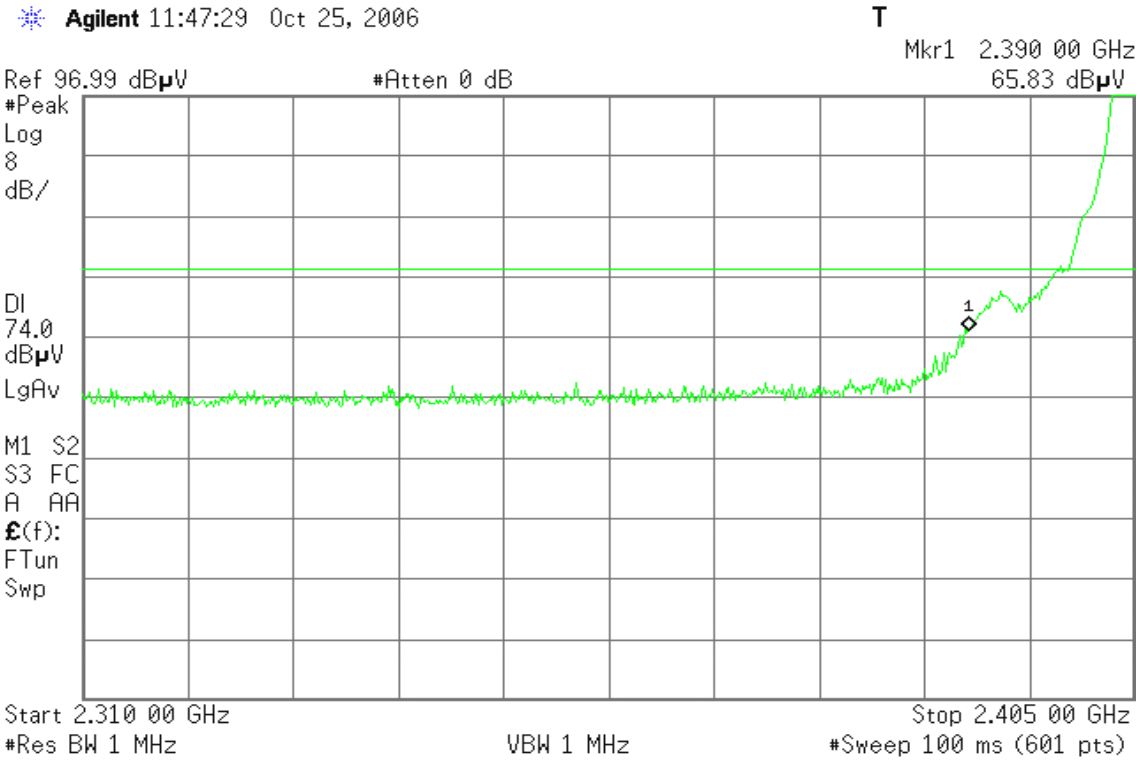


Detector mode: Average **Polarity: Horizontal**

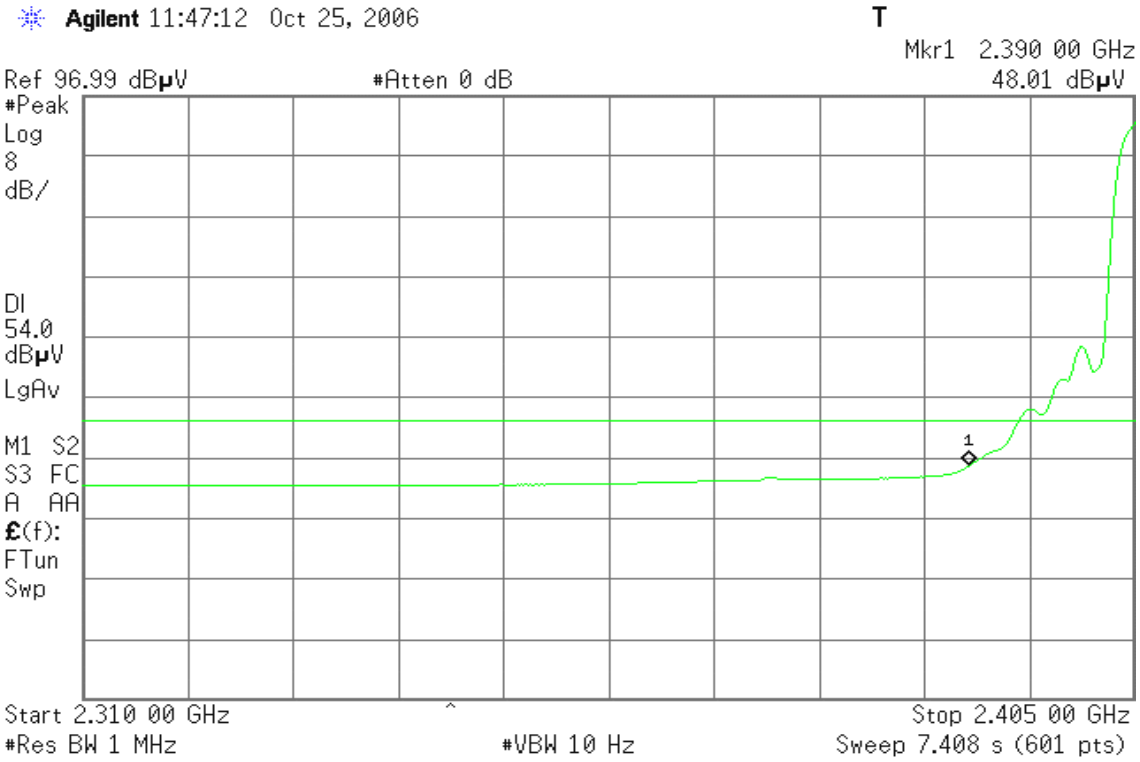


Band Edges (IEEE 802.11g mode / CH Low)

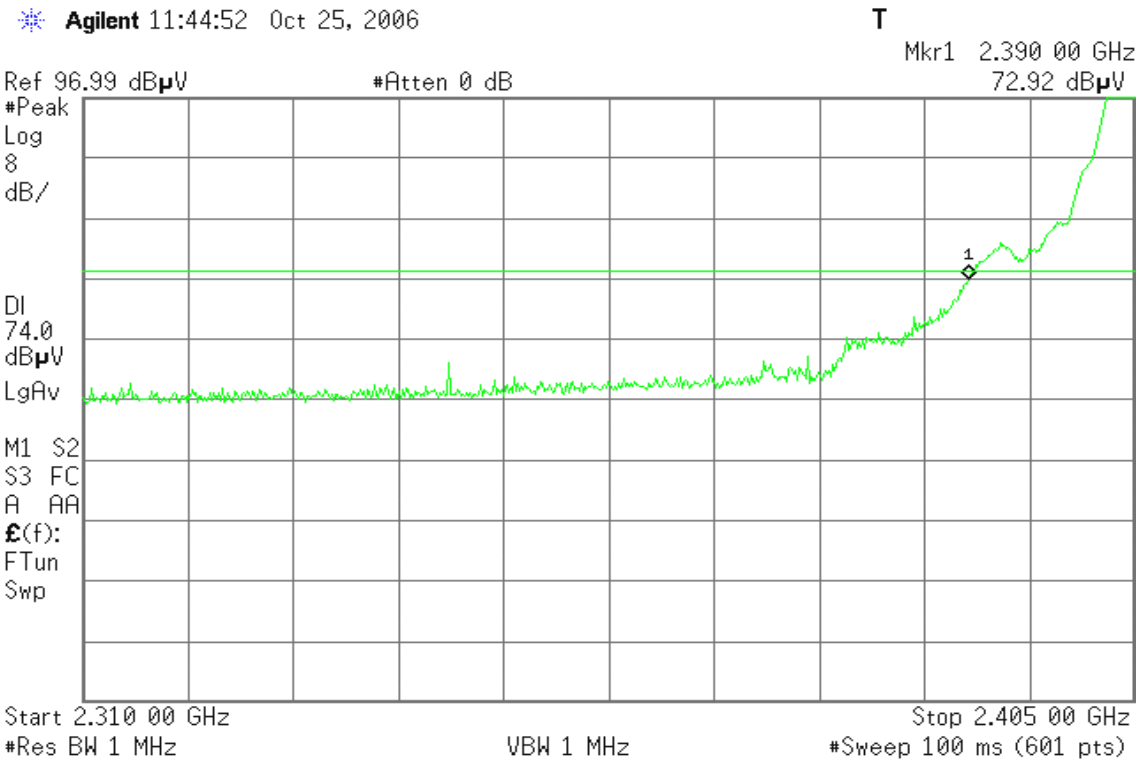
Detector mode: Peak **Polarity: Vertical**



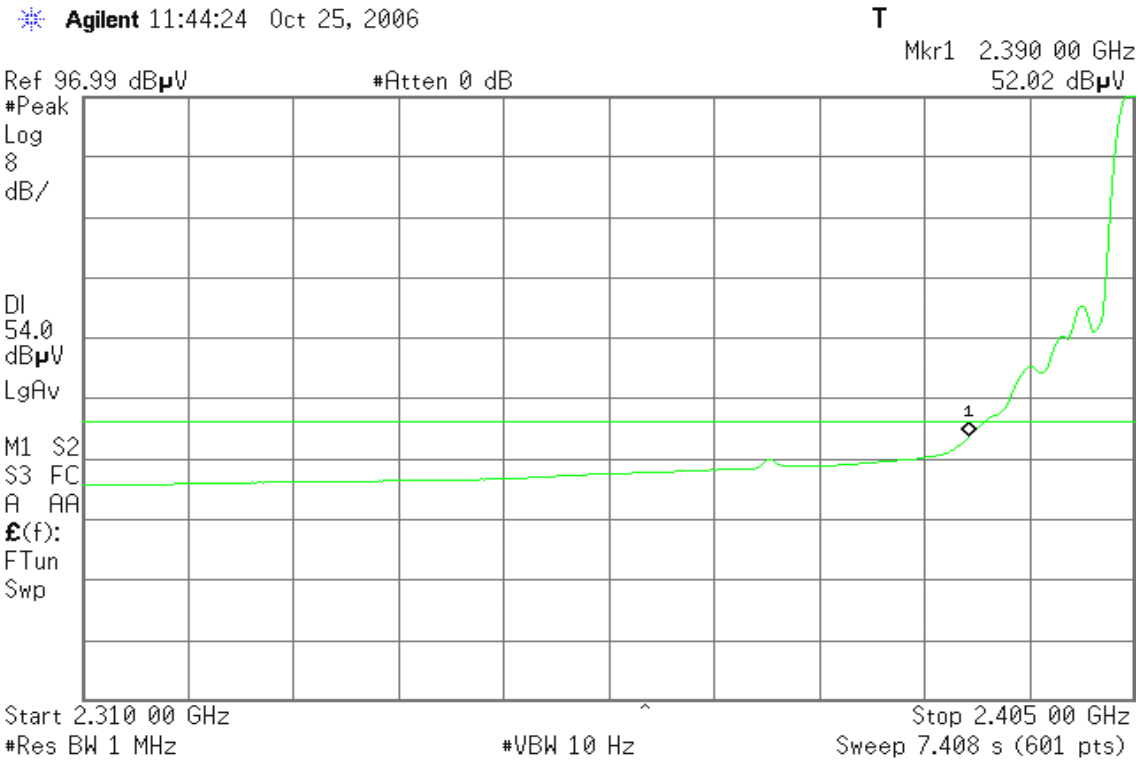
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

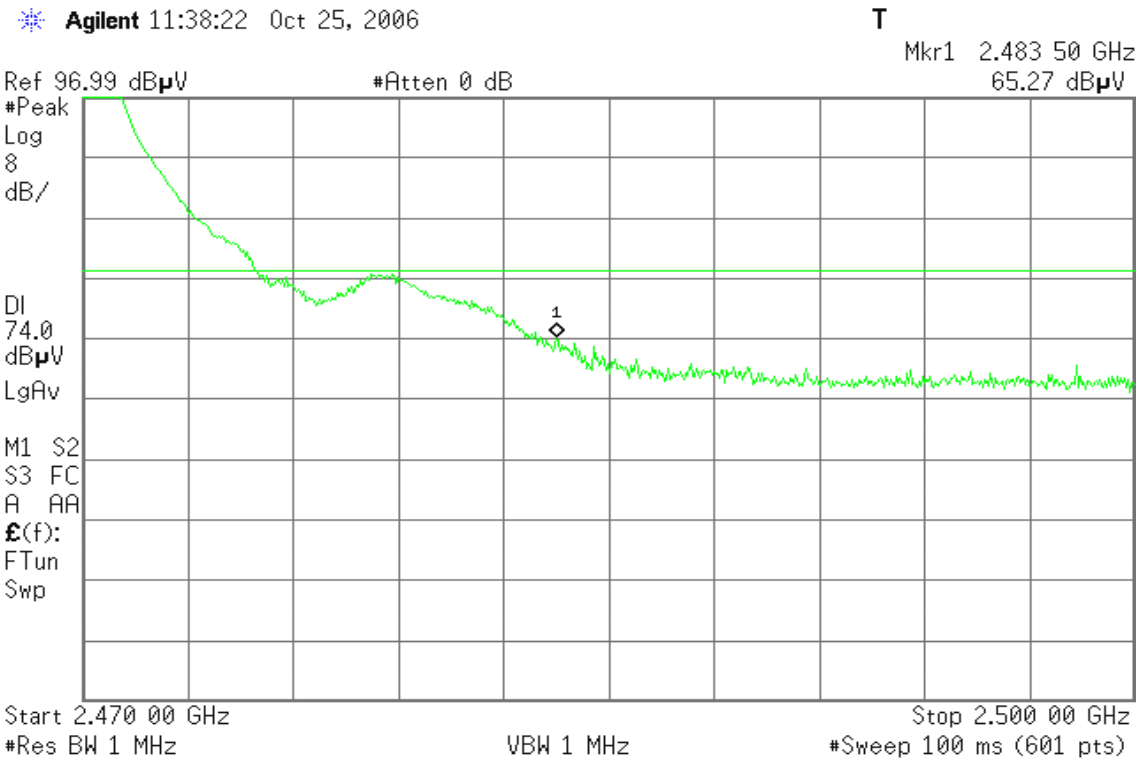


Detector mode: Average **Polarity: Horizontal**

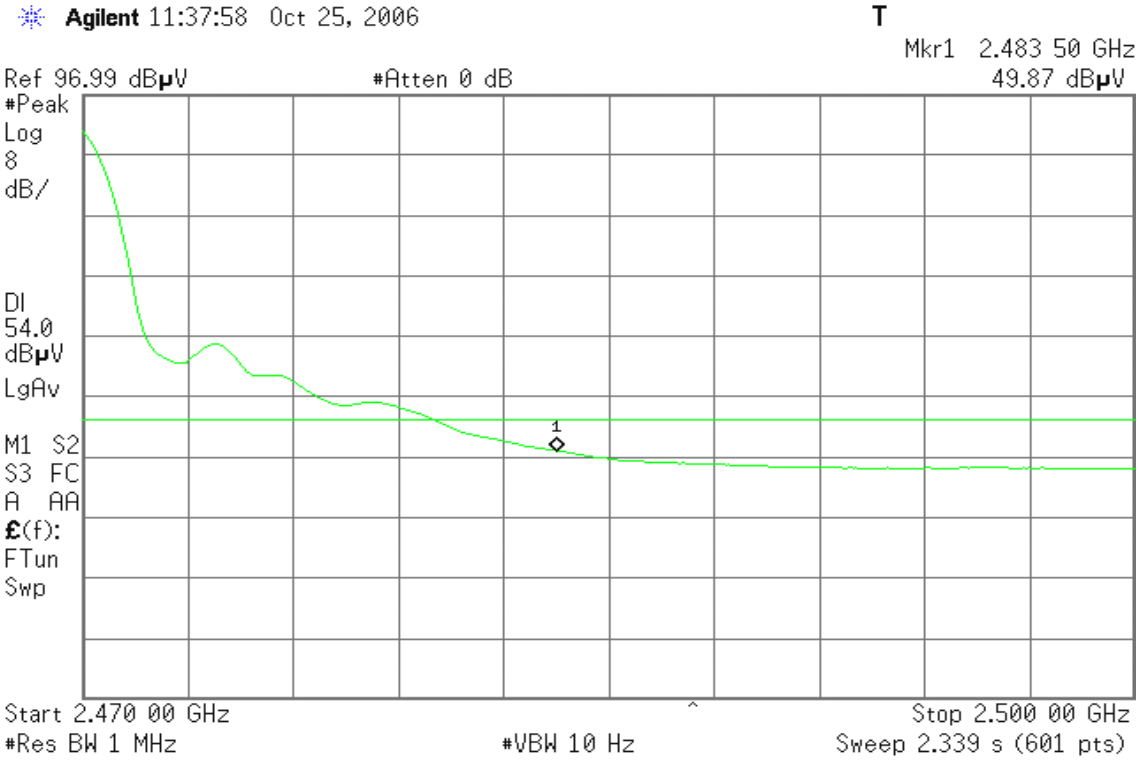


Band Edges (IEEE 802.11g mode / CH High)

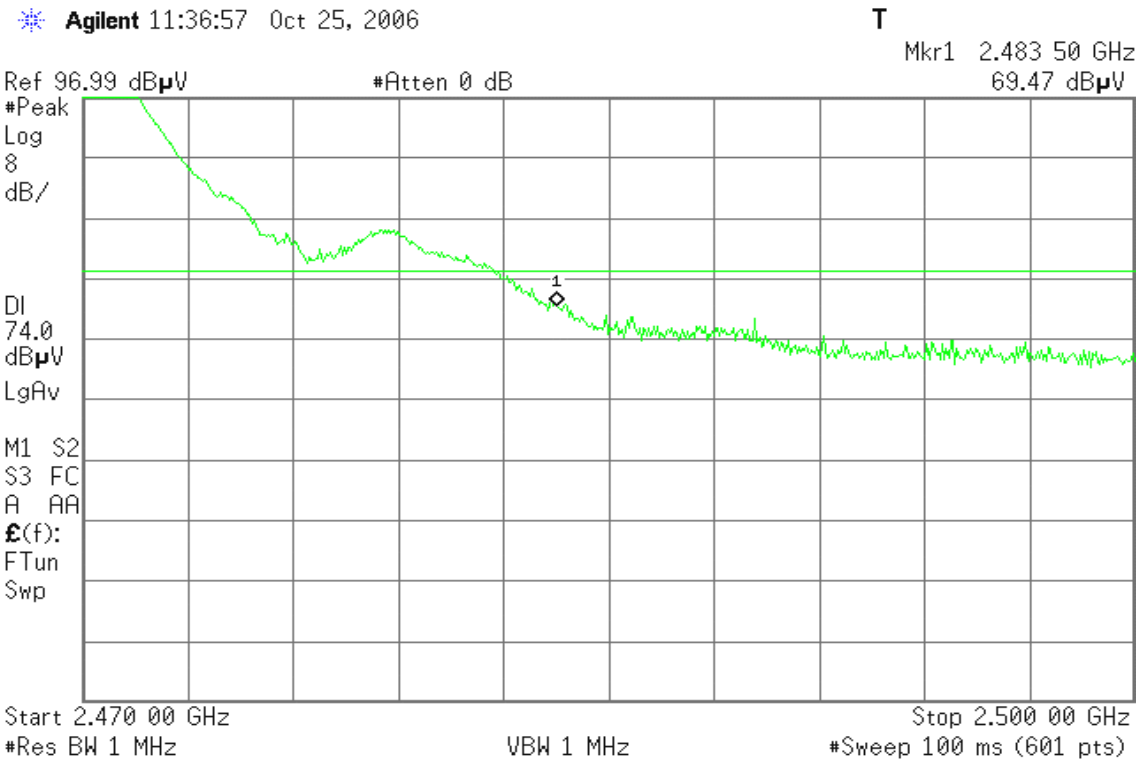
Detector mode: Peak Polarity: Vertical



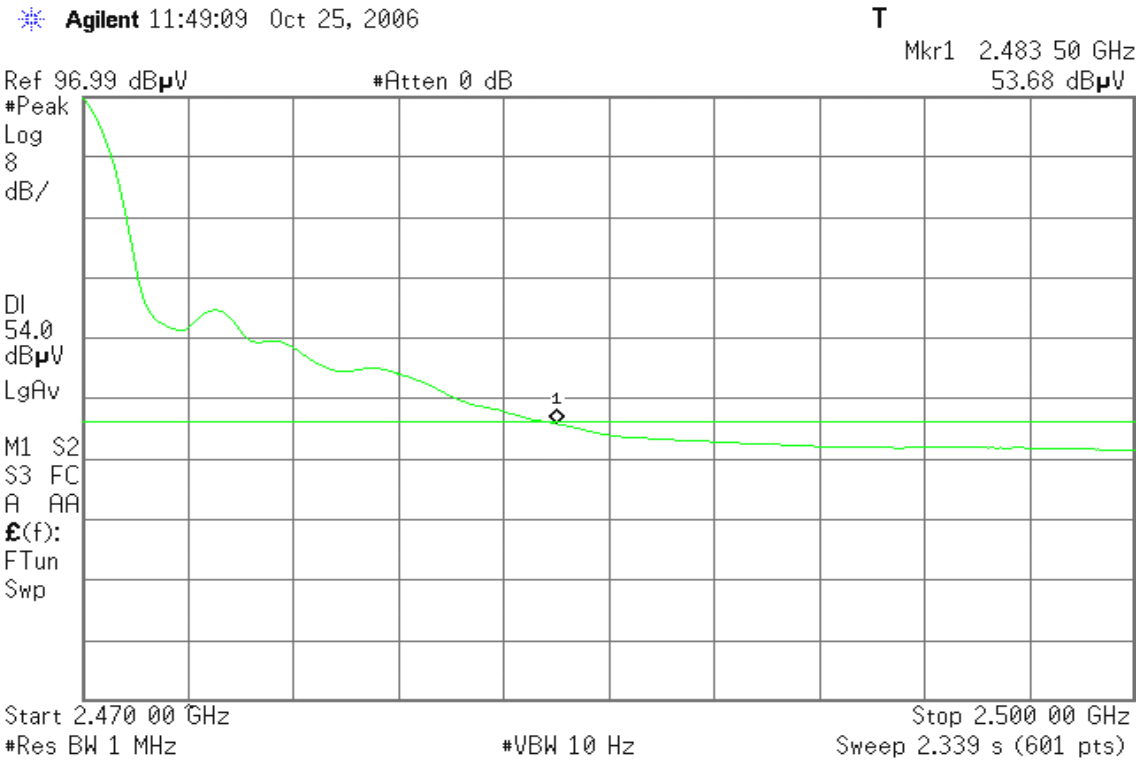
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**

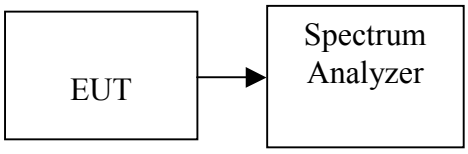


7.5 PEAK POWER SPECTRAL DENSITY

LIMIT

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

Test Configuration



TEST PROCEDURE

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

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-6.85	-2.00	PASS
Mid	2437	-6.42		PASS
High	2462	-6.61		PASS

***Remark**: The maximum antenna gain is 16 dBi; therefore the reduction due to antenna gain is 10 dB, so the limit is -2 dBm.*

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-7.87	-2.00	PASS
Mid	2437	-10.89		PASS
High	2462	-10.12		PASS

***Remark**: The maximum antenna gain is 16 dBi; therefore the reduction due to antenna gain is 10 dB, so the limit is -2 dBm.*

Test mode: IEEE 802.11a mode

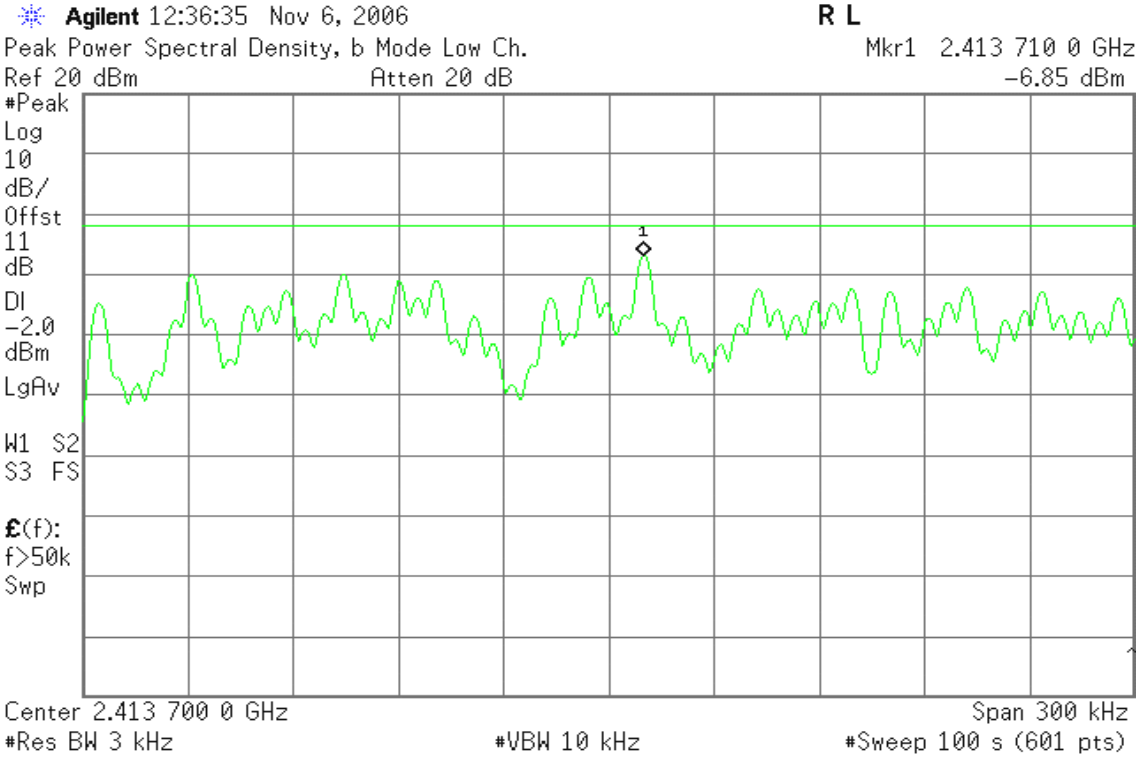
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	5745	-11.89	-4.00	PASS
Mid	5785	-12.67		PASS
High	5825	-13.92		PASS

***Remark**: The maximum antenna gain is 18dBi; therefore the reduction due to antenna gain is 12 dB, so the limit is -4dBm.*

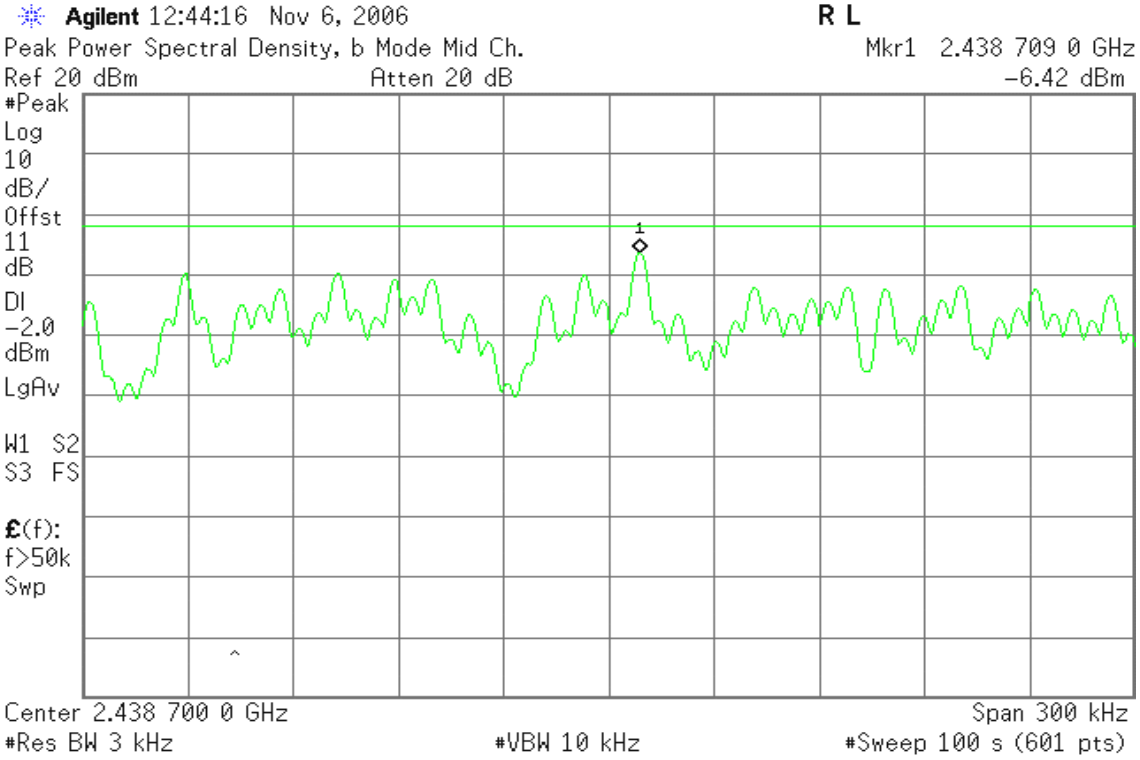
Test Plot

IEEE 802.11b mode

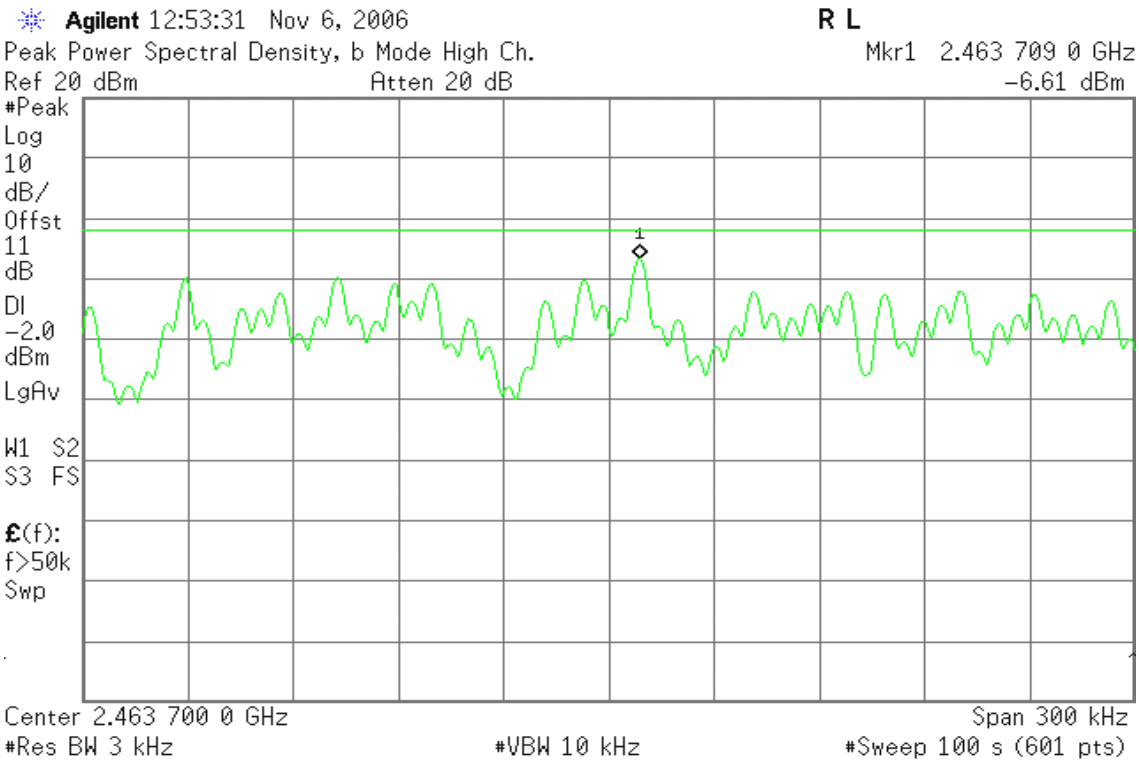
CH Low



CH Mid

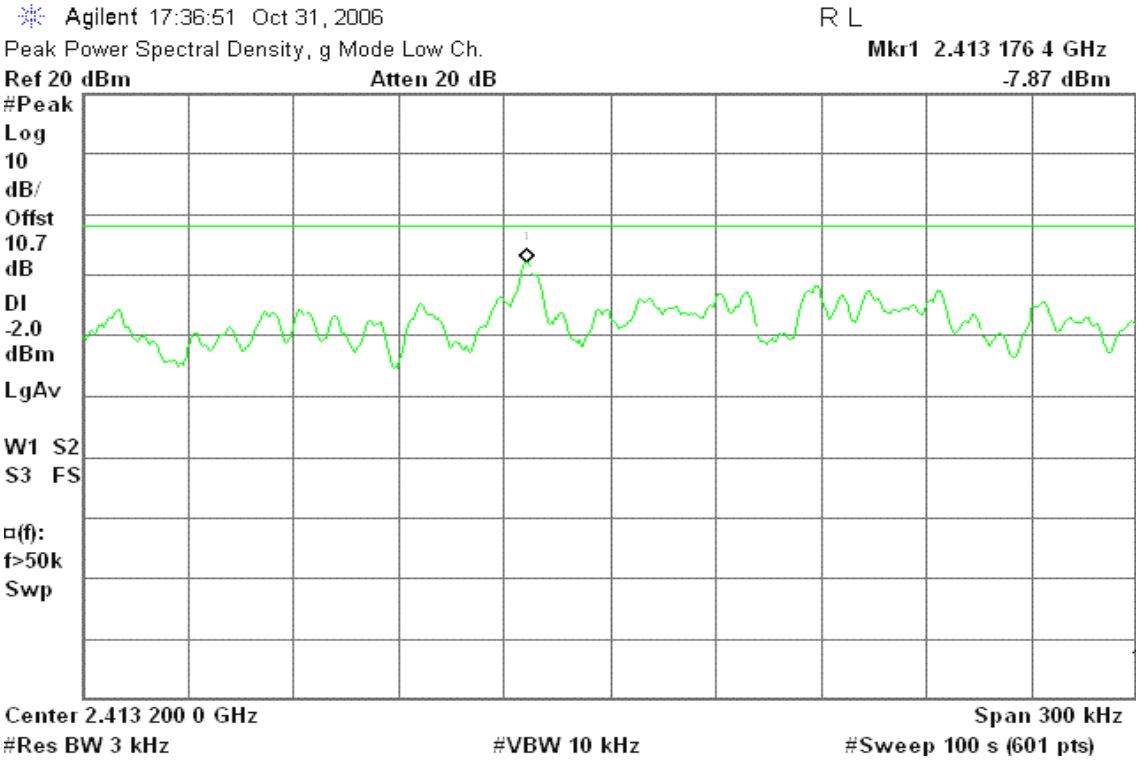


CH High

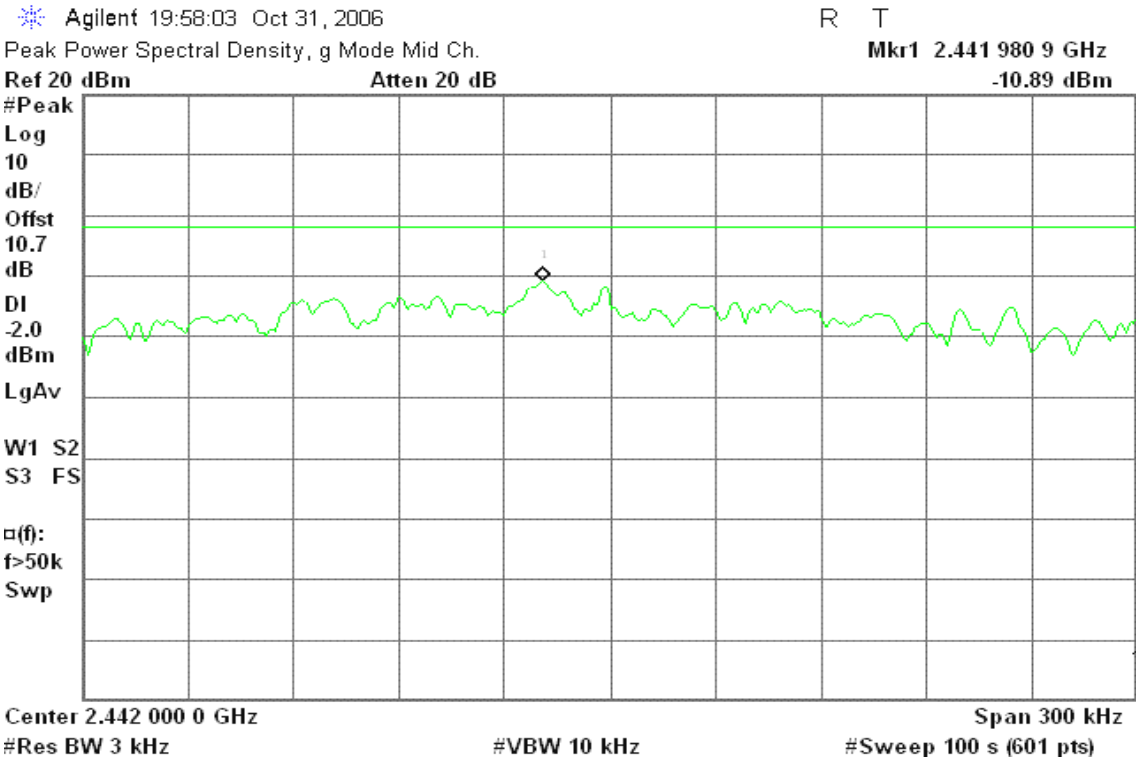


IEEE 802.11g mode

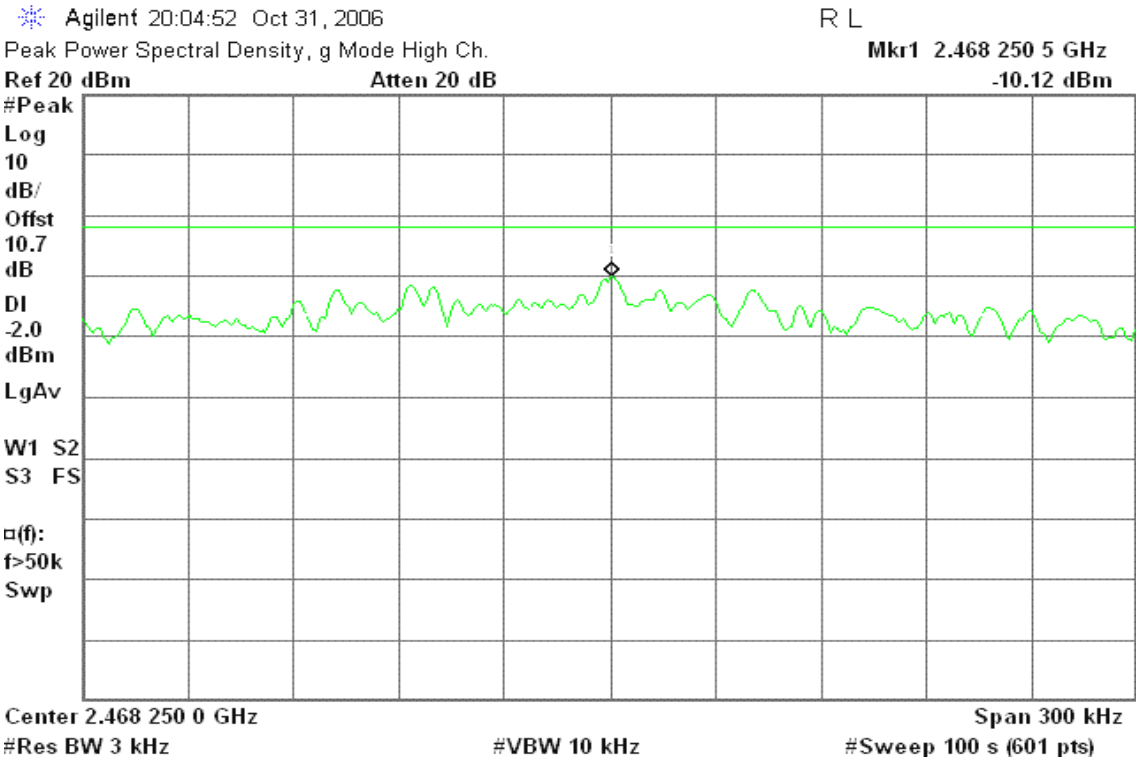
CH Low



CH Mid

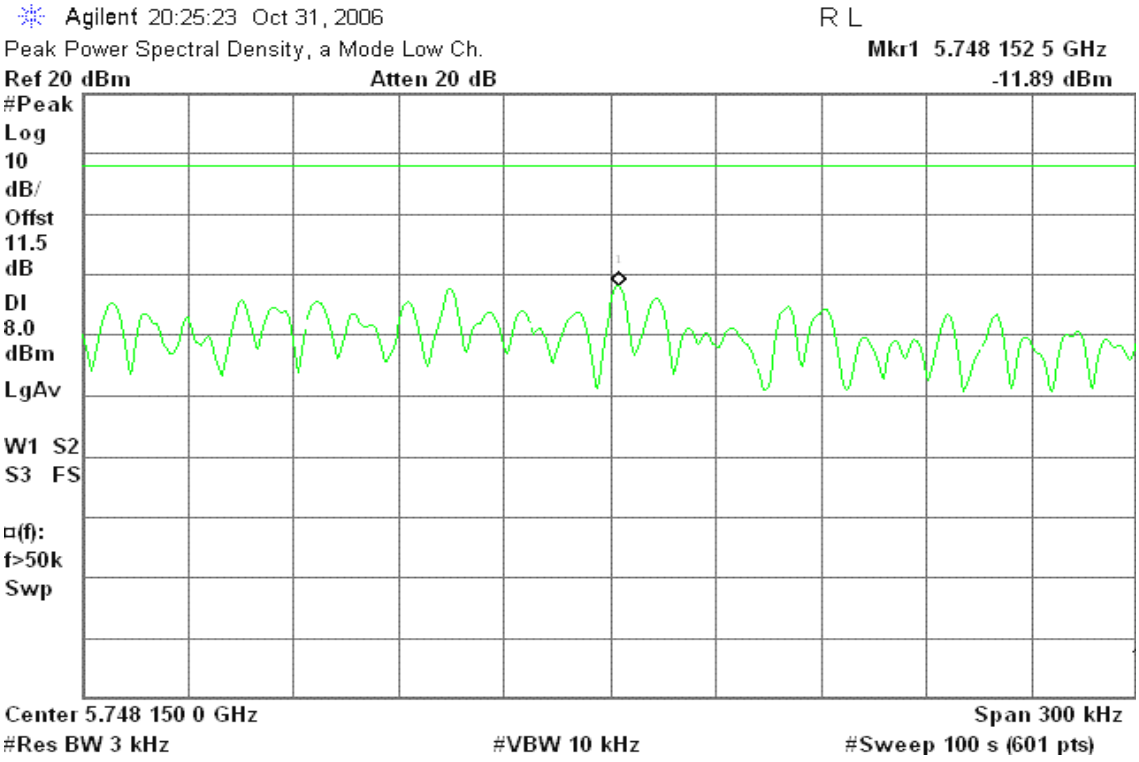


CH High

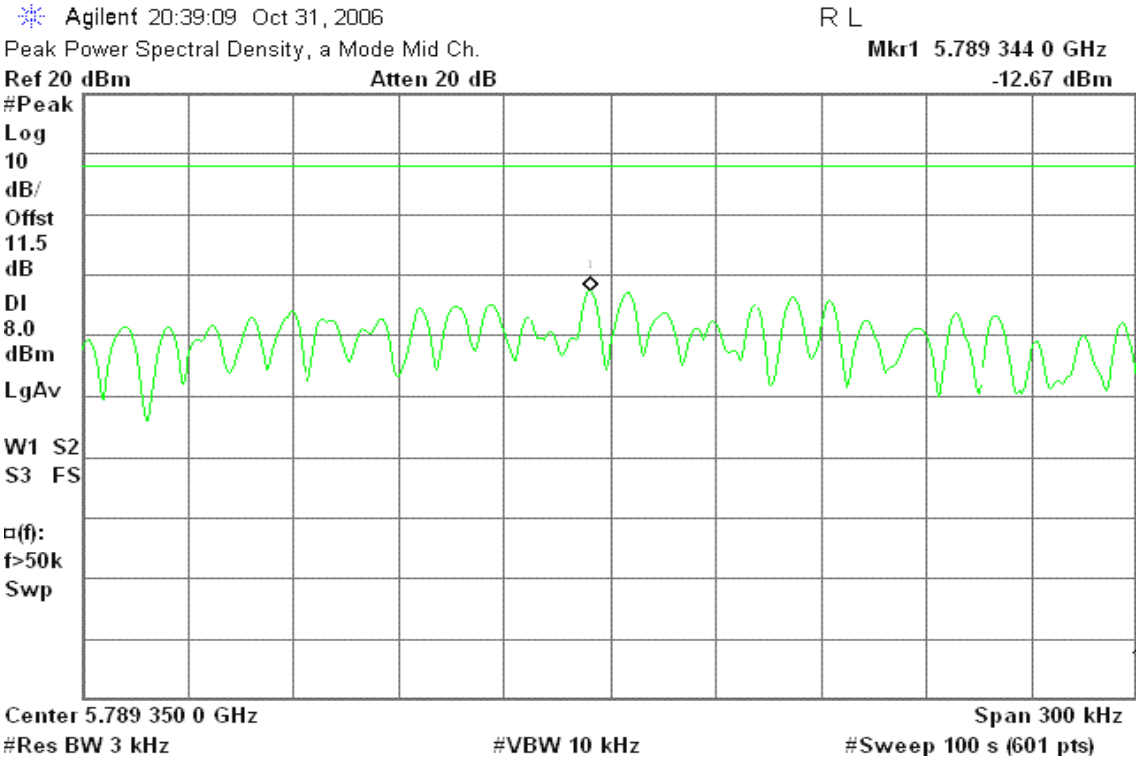


IEEE 802.11a mode

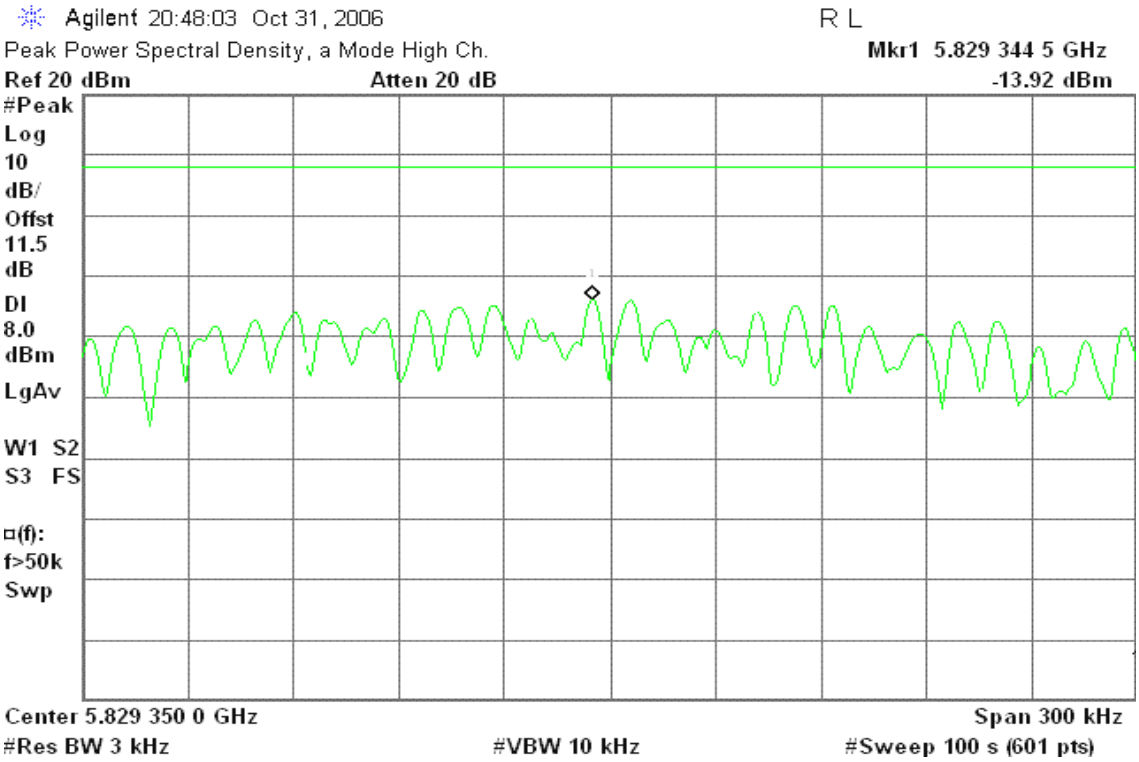
CH Low



CH Mid



CH High


Agilent 20:48:03 Oct 31, 2006
R L
Peak Power Spectral Density, a Mode High Ch.
Mkr1 5.829 344 5 GHz
Ref 20 dBm
Atten 20 dB
-13.92 dBm
#Peak
Log
10
dB/
Offst
11.5
dB
Dl
8.0
dBm
LgAv
W1 S2
S3 FS
¤(f):
f>50k
Swp
Center 5.829 350 0 GHz
Span 300 kHz
#Res BW 3 kHz
#VBW 10 kHz
#Sweep 100 s (601 pts)

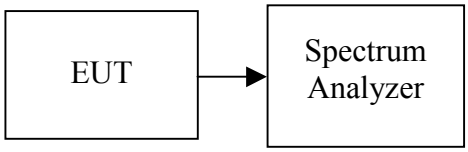
7.6 SPURIOUS EMISSIONS

7.6.1 CONDUCTED MEASUREMENT

LIMIT

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

Test Configuration



TEST PROCEDURE

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

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

Measurements are made over the 30MHz to 26GHz range for IEEE 802.11b/g, 20MHz to 40GHz range for IEEE 802.11a with the transmitter set to the lowest, middle, and highest channels.

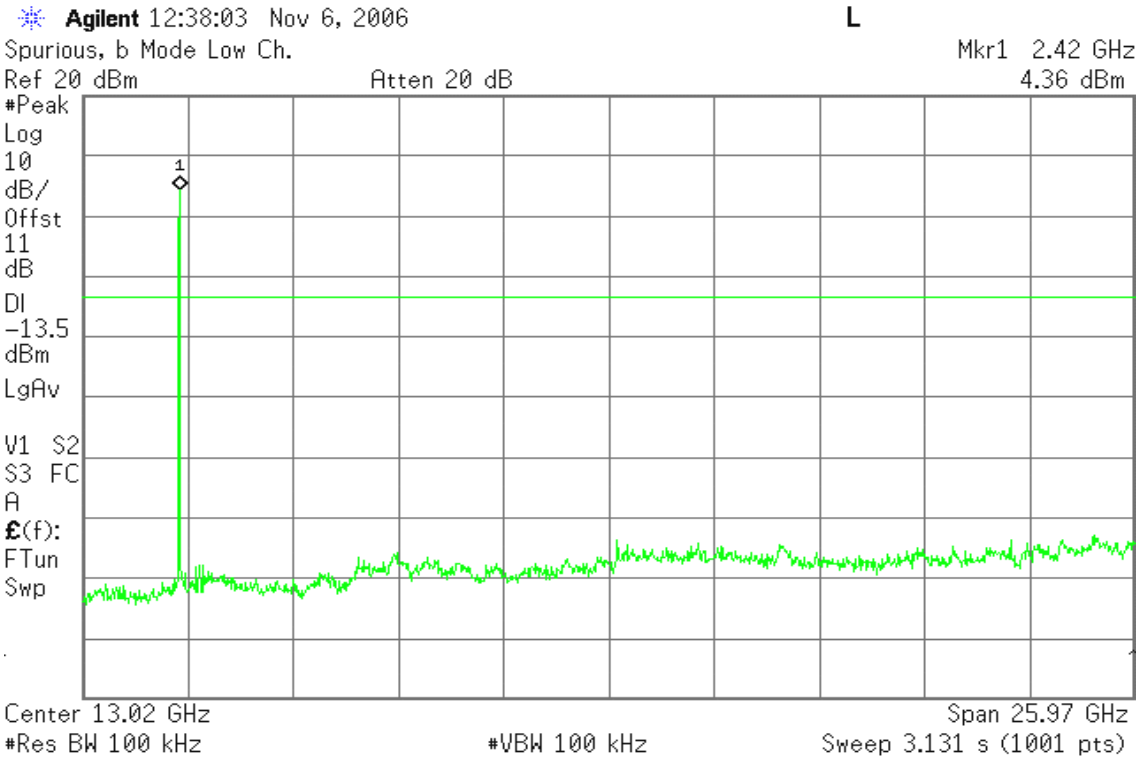
TEST RESULTS

No non-compliance noted.

Test Plot

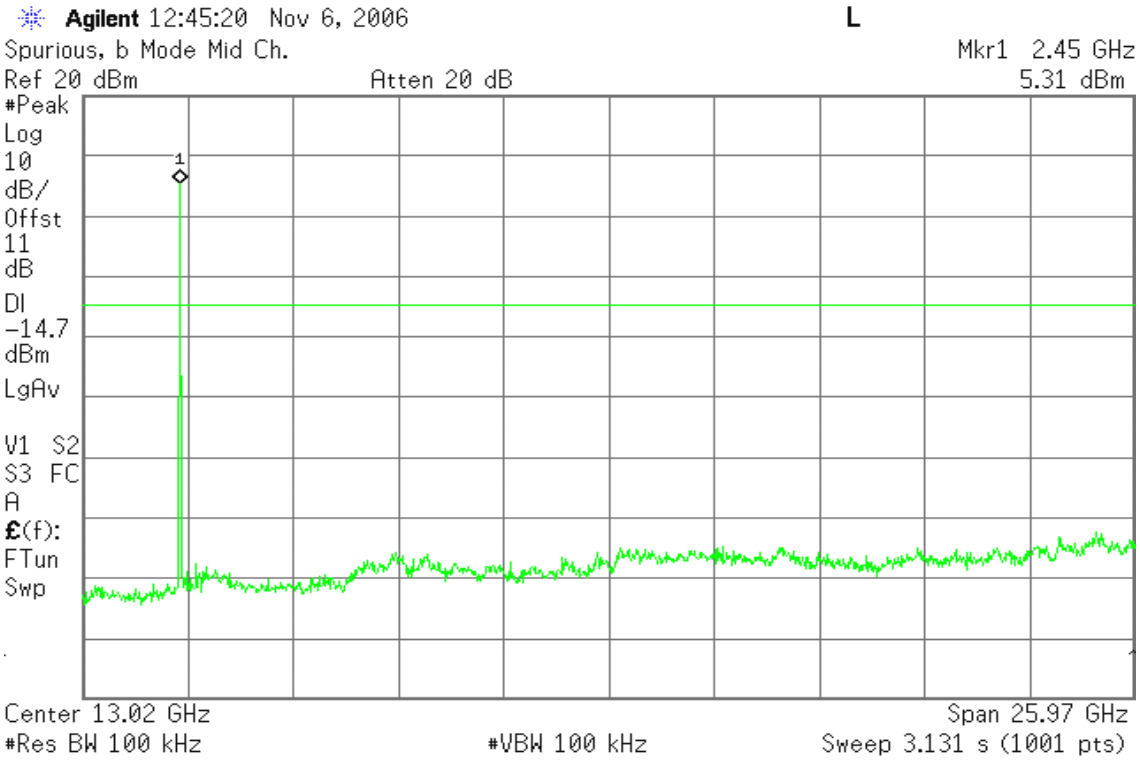
IEEE 802.11b mode / CH Low

30MHz ~ 26GHz



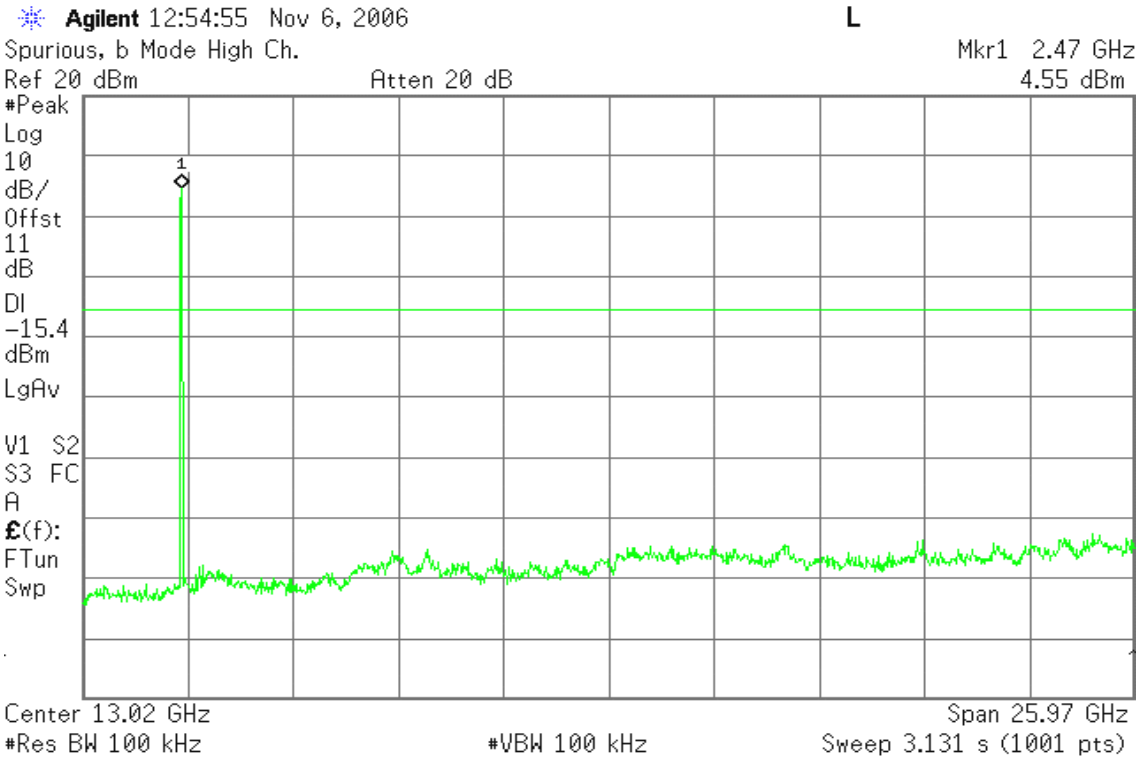
IEEE 802.11b mode / CH Mid

30MHz ~ 26GHz



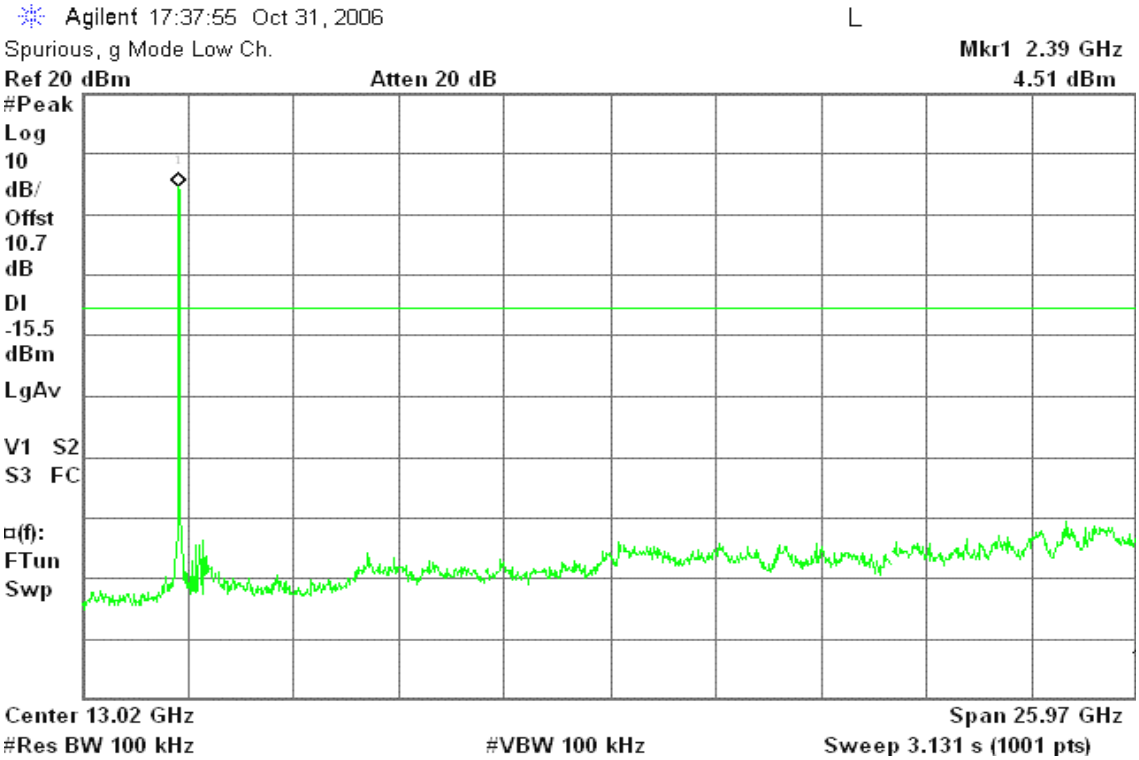
IEEE 802.11b mode / CH High

30MHz ~ 26GHz



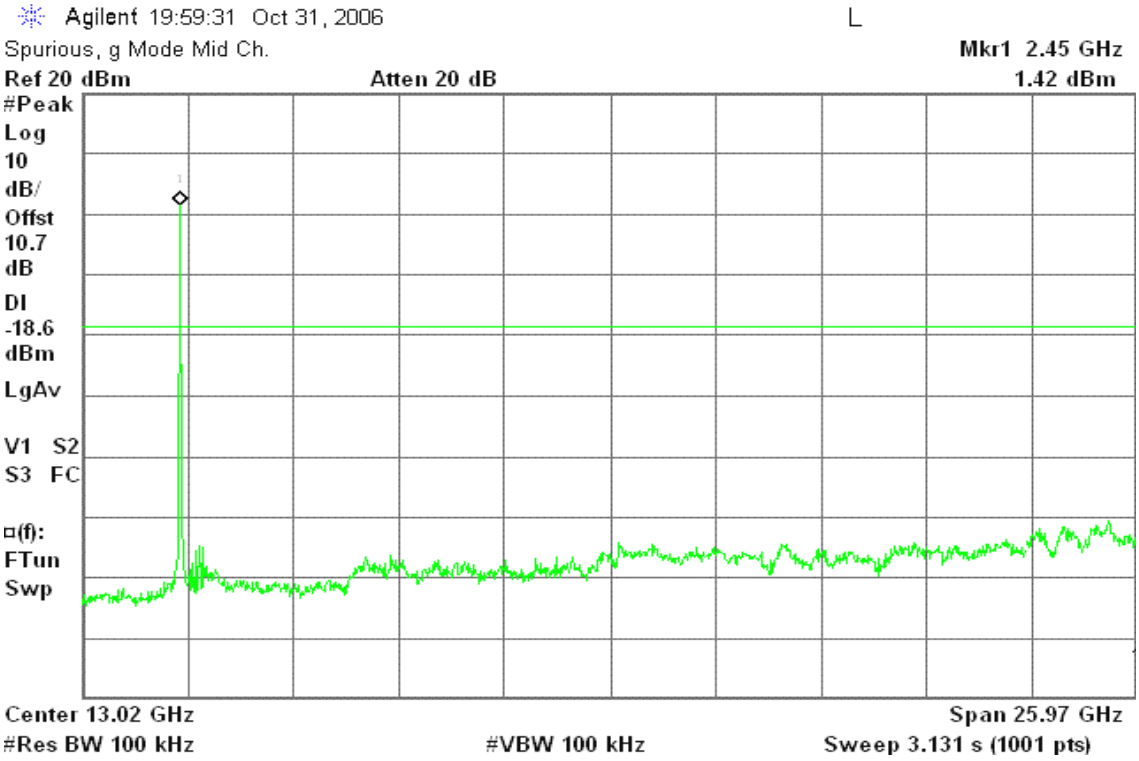
IEEE 802.11g mode / CH Low

30MHz ~ 26GHz



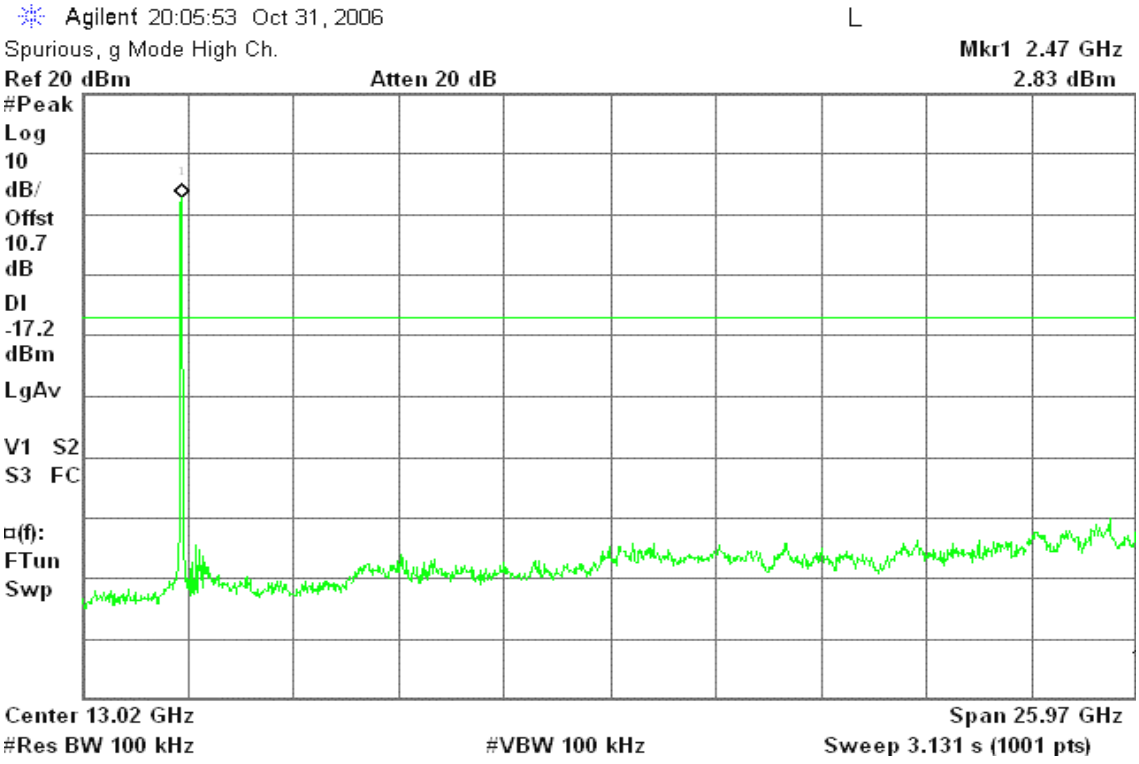
IEEE 802.11g mode / CH Mid

30MHz ~ 26GHz



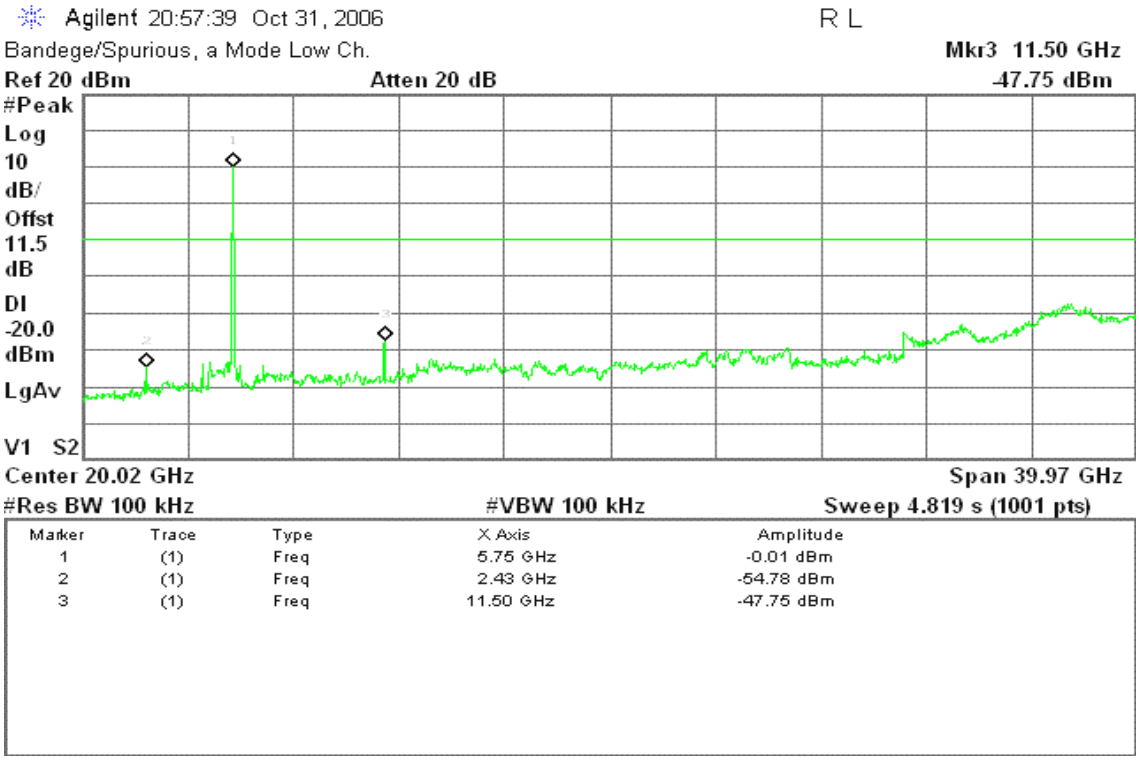
IEEE 802.11g mode / CH High

30MHz ~ 26GHz



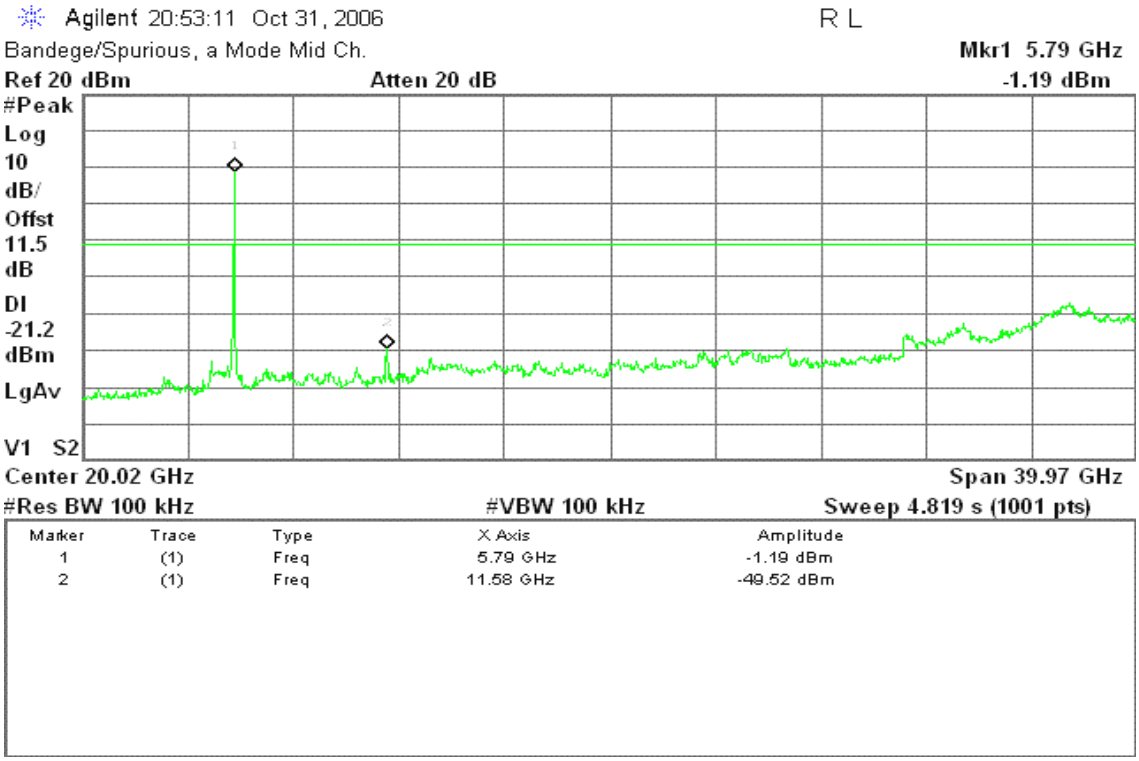
IEEE 802.11a mode / CH Low

20MHz ~ 40GHz



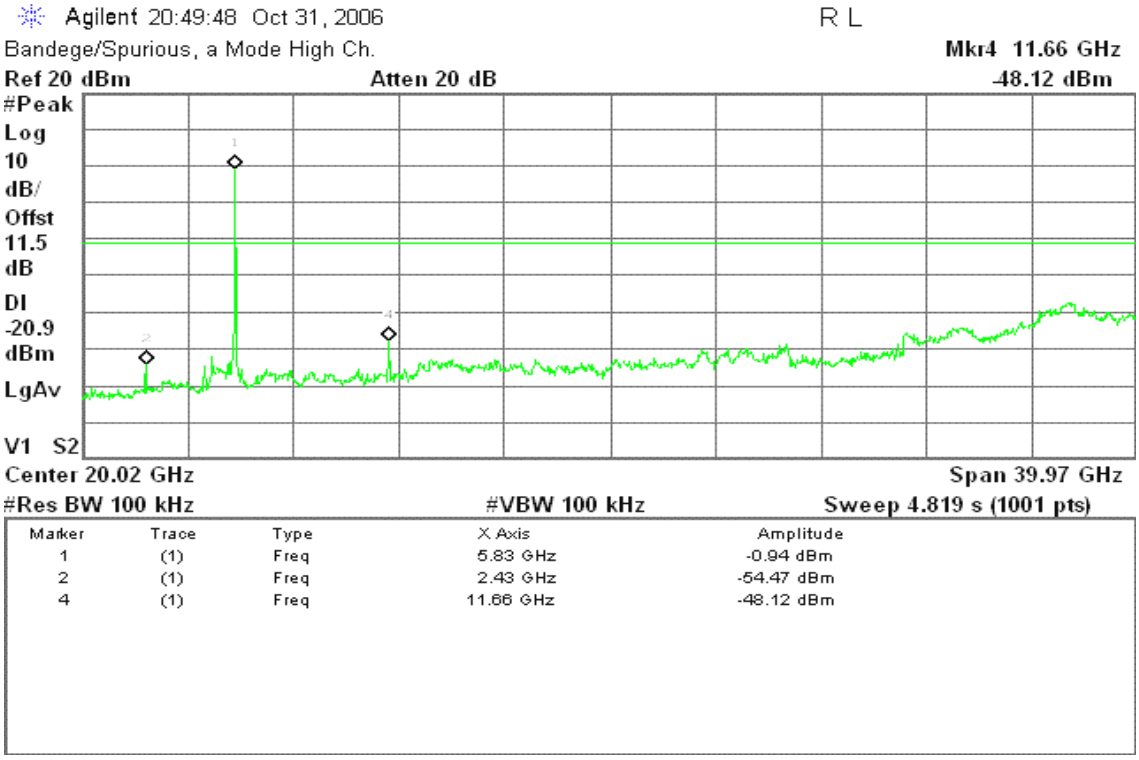
IEEE 802.11a mode / CH Mid

20MHz ~ 40GHz



IEEE 802.11a mode / CH High

20MHz ~ 40GHz



7.6.2 Radiated Emissions

LIMIT

1. 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

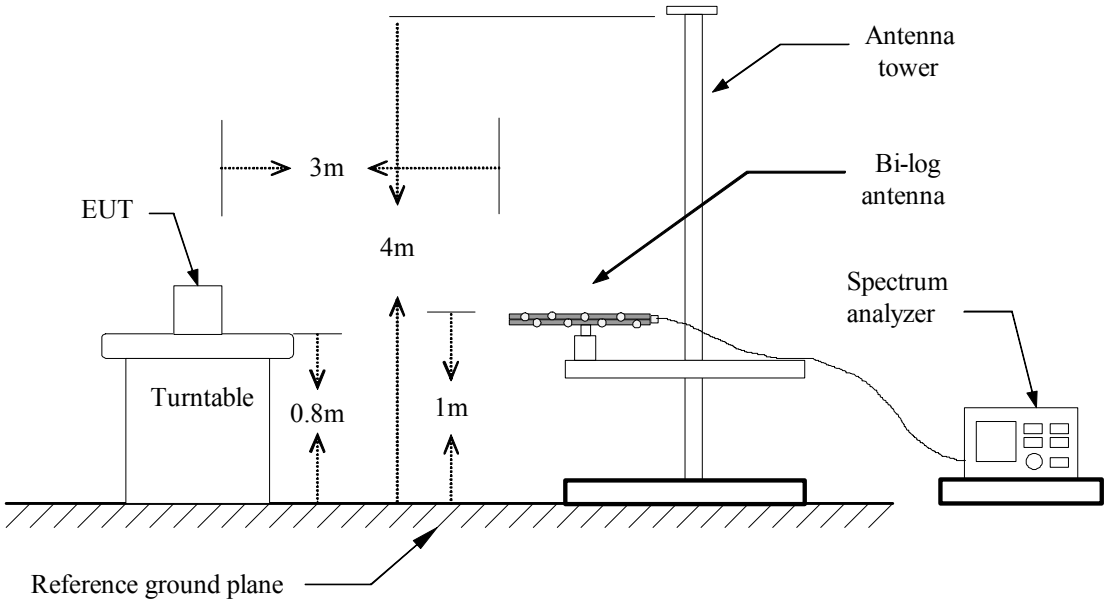
Remark: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

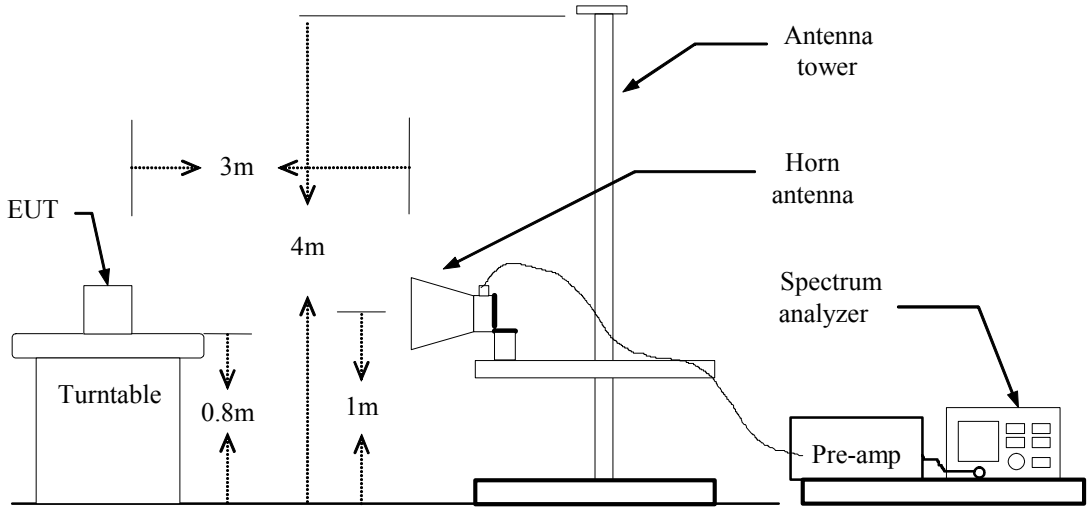
Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

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

Below 1 GHz

Operation Mode: Normal Link **Test Date:** October 31, 2006

Temperature: 20°C **Tested by:** James Yu

Humidity: 51% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
55.87	V	48.44	-19.18	29.26	40.00	-10.74	QP
432.55	V	50.99	-8.97	42.02	46.00	-3.98	Peak
464.88	V	45.42	-8.10	37.32	46.00	-8.68	QP
540.87	V	45.97	-6.97	39.00	46.00	-7.00	QP
666.97	V	46.29	-4.89	41.40	46.00	-4.60	Peak
799.53	V	38.11	-3.16	34.95	46.00	-11.05	QP
130.23	H	50.56	-13.29	37.27	43.50	-6.23	Peak
432.55	H	50.00	-8.97	41.03	46.00	-4.97	Peak
540.87	H	42.71	-6.97	35.74	46.00	-10.26	QP
702.53	H	45.87	-4.89	40.97	46.00	-5.03	Peak
807.62	H	34.43	-2.97	31.46	46.00	-14.54	QP
920.78	H	40.43	-1.58	38.85	46.00	-7.15	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 or as required by the applicant.*
4. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
5. *Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).*

External Antenna: Omni Antenna 15dBi for ZW-2200-IA

Above 1 GHz

Operation Mode: Tx / IEEE 802.11b mode / CH Low **Test Date:** October 31, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
1303.33	V	19.54	---	30.80	50.34	---	74.00	54.00	-3.66	Peak
4825.00	V	69.45	56.57	-4.55	64.90	52.02	74.00	54.00	-1.98	AVG
7233.33	V	44.71	---	2.05	46.76	---	74.00	54.00	-7.24	Peak
N/A										
1300.00	H	19.70	---	30.80	50.50	---	74.00	54.00	-3.50	Peak
4825.00	H	66.16	53.24	-4.55	61.61	48.69	74.00	54.00	-5.31	AVG
N/A										

Remark:

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

Operation Mode: Tx / IEEE 802.11b mode / CH Mid **Test Date:** October 31, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
1330.00	V	20.08	---	30.80	50.88	---	74.00	54.00	-3.12	Peak
4800.00	V	52.10	---	-4.56	47.54	---	74.00	54.00	-6.46	Peak
4875.00	V	69.96	57.19	-4.52	65.44	52.67	74.00	54.00	-1.33	AVG
7308.33	V	44.05	---	2.10	46.15	---	74.00	54.00	-7.85	Peak
N/A										
1300.00	H	20.00	---	30.80	50.80	---	74.00	54.00	-3.20	Peak
4875.00	H	66.94	54.12	-4.52	62.42	49.60	74.00	54.00	-4.40	AVG
N/A										

Remark:

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

Operation Mode: Tx / IEEE 802.11b mode / CH High **Test Date:** October 31, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
1313.33	V	20.18	---	30.80	50.98	---	74.00	54.00	-3.02	Peak
4800.00	V	51.98	---	-4.56	47.42	---	74.00	54.00	-6.58	Peak
4925.00	V	63.06	50.35	-4.49	58.57	45.86	74.00	54.00	-8.14	AVG
N/A										
1313.33	H	19.61	---	30.80	50.41	---	74.00	54.00	-3.59	Peak
4800.00	H	43.96	---	-4.56	39.40	---	74.00	54.00	-14.60	Peak
4925.00	H	62.65	49.72	-4.49	58.16	45.23	74.00	54.00	-8.77	AVG
N/A										

Remark:

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

Operation Mode: Tx / IEEE 802.11g mode / CH Low **Test Date:** October 31, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
1306.67	V	19.94	---	30.80	50.74	---	74.00	54.00	-3.26	Peak
4825.00	V	53.72	---	-4.55	49.18	---	74.00	54.00	-4.82	Peak
N/A										
1306.67	H	20.13	---	30.80	50.93	---	74.00	54.00	-3.07	Peak
4816.67	H	50.09	---	-4.55	45.54	---	74.00	54.00	-8.46	Peak
N/A										

Remark:

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

Operation Mode: Tx / IEEE 802.11g mode / CH Mid **Test Date:** October 31, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
1306.67	V	19.70	---	30.80	50.50	---	74.00	54.00	-3.50	Peak
3000.00	V	47.14	---	-7.33	39.81	---	74.00	54.00	-14.19	Peak
3083.33	V	47.92	---	-7.23	40.70	---	74.00	54.00	-13.30	Peak
4816.67	V	51.57	---	-4.55	47.02	---	74.00	54.00	-6.98	Peak
4875.00	V	62.89	48.84	-4.52	58.37	44.32	74.00	54.00	-9.68	AVG
N/A										
1306.67	H	19.58	---	30.80	50.38	---	74.00	54.00	-3.62	Peak
4875.00	H	52.31	---	-4.52	47.79	---	74.00	54.00	-6.21	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 or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: Tx / IEEE 802.11g mode / CH High **Test Date:** October 31, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
1273.33	V	19.68	---	30.80	50.48	---	74.00	54.00	-3.52	Peak
3000.00	V	45.81	---	-7.33	38.48	---	74.00	54.00	-15.52	Peak
3041.67	V	46.76	---	-7.28	39.48	---	74.00	54.00	-14.52	Peak
3083.33	V	46.89	---	-7.23	39.66	---	74.00	54.00	-14.34	Peak
4800.00	V	51.91	---	-4.56	47.35	---	74.00	54.00	-6.65	Peak
4925.00	V	53.67	---	-4.49	49.18	---	74.00	54.00	-4.82	Peak
1326.67	H	20.02	---	30.80	50.82	---	74.00	54.00	-3.18	Peak
4925.00	H	52.24	---	-4.49	47.74	---	74.00	54.00	-6.26	Peak
N/A										

Remark:

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

External Antenna: Panel Antenna 16dBi for ZW-2200-IA

Above 1 GHz

Operation Mode: Tx / IEEE 802.11b mode / CH Low **Test Date:** October 31, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
1280.00	V	19.04	---	30.80	49.84	---	74.00	54.00	-4.16	Peak
4716.67	V	53.65	---	-4.60	49.05	---	74.00	54.00	-4.95	Peak
4825.00	V	68.23	55.43	-4.55	63.68	50.88	74.00	54.00	-3.12	AVG
7233.33	V	44.96	---	2.05	47.00	---	74.00	54.00	-7.00	Peak
N/A										
1293.33	H	19.32	---	30.80	50.12	---	74.00	54.00	-3.88	Peak
3000.00	H	46.72	---	-7.33	39.39	---	74.00	54.00	-14.61	Peak
3041.67	H	50.62	---	-7.28	43.34	---	74.00	54.00	-10.66	Peak
3083.33	H	46.62	---	-7.23	39.40	---	74.00	54.00	-14.60	Peak
3116.67	H	43.87	---	-7.19	36.68	---	74.00	54.00	-17.32	Peak
4825.00	H	67.52	54.63	-4.55	62.97	50.08	74.00	54.00	-3.92	AVG

Remark:

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

Operation Mode: Tx / IEEE 802.11b mode / CH Mid **Test Date:** October 30, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
1220.00	V	19.83	---	30.80	50.63	---	74.00	54.00	-3.37	Peak
4716.67	V	54.78	---	-4.60	50.17	---	74.00	54.00	-3.83	Peak
4875.00	V	70.05	57.46	-4.52	65.53	52.94	74.00	54.00	-1.06	AVG
7308.33	V	46.03	---	2.10	48.13	---	74.00	54.00	-5.87	Peak
N/A										
1220.00	H	19.28	---	30.80	50.08	---	74.00	54.00	-3.92	Peak
3000.00	H	46.09	---	-7.33	38.76	---	74.00	54.00	-15.24	Peak
3041.67	H	50.71	---	-7.28	43.43	---	74.00	54.00	-10.57	Peak
3083.33	H	45.47	---	-7.23	38.24	---	74.00	54.00	-15.76	Peak
4875.00	H	66.53	53.79	-4.52	62.01	49.27	74.00	54.00	-4.73	AVG
7308.33	H	43.56	---	2.10	45.66	---	74.00	54.00	-8.34	Peak

Remark:

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

Operation Mode: Tx / IEEE 802.11b mode / CH High **Test Date:** October 30, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
1246.67	V	19.43	---	30.80	50.23	---	74.00	54.00	-3.77	Peak
4708.33	V	54.10	---	-4.61	49.49	---	74.00	54.00	-4.51	Peak
4925.00	V	69.06	56.36	-4.49	64.57	51.87	74.00	54.00	-2.13	AVG
7383.33	V	44.27	---	2.14	46.41	---	74.00	54.00	-7.59	Peak
N/A										
1246.67	H	19.22	---	30.80	50.02	---	74.00	54.00	-3.98	Peak
3000.00	H	49.07	---	-7.33	41.74	---	74.00	54.00	-12.26	Peak
3041.67	H	48.70	---	-7.28	41.42	---	74.00	54.00	-12.58	Peak
3083.33	H	50.20	---	-7.23	42.97	---	74.00	54.00	-11.03	Peak
4925.00	H	66.31	53.76	-4.49	61.82	49.27	74.00	54.00	-4.73	AVG
N/A										

Remark:

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

Operation Mode: Tx / IEEE 802.11g mode / CH Low **Test Date:** October 30, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
1333.33	V	19.59	---	30.80	50.39	---	74.00	54.00	-3.61	Peak
3041.67	V	44.31	---	-7.28	37.03	---	74.00	54.00	-16.97	Peak
4708.33	V	53.77	---	-4.61	49.17	---	74.00	54.00	-4.83	Peak
4816.67	V	52.58	---	-4.55	48.03	---	74.00	54.00	-5.97	Peak
N/A										
3000.00	H	49.75	---	-7.33	42.42	---	74.00	54.00	-11.58	Peak
3041.67	H	53.81	---	-7.28	46.53	---	74.00	54.00	-7.47	Peak
3083.33	H	49.43	---	-7.23	42.21	---	74.00	54.00	-11.79	Peak
3116.67	H	46.39	---	-7.19	39.21	---	74.00	54.00	-14.79	Peak
4708.33	H	45.01	---	-4.61	40.40	---	74.00	54.00	-13.60	Peak
4825.00	H	49.93	---	-4.55	45.38	---	74.00	54.00	-8.62	Peak

Remark:

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

Operation Mode: Tx / IEEE 802.11g mode / CH Mid **Test Date:** October 30, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
1353.33	V	20.61	---	30.80	51.41	---	74.00	54.00	-2.59	Peak
3041.67	V	47.48	---	-7.28	40.20	---	74.00	54.00	-13.80	Peak
3083.33	V	44.93	---	-7.23	37.70	---	74.00	54.00	-16.30	Peak
4708.33	V	53.37	---	-4.61	48.76	---	74.00	54.00	-5.24	Peak
4875.00	V	61.38	52.65	-4.52	56.86	48.13	74.00	54.00	-6.26	AVG
N/A										
3000.00	H	51.96	---	-7.33	44.64	---	74.00	54.00	-9.36	Peak
3041.67	H	57.97	---	-7.28	50.69	---	74.00	54.00	-3.31	Peak
3083.33	H	53.51	---	-7.23	46.28	---	74.00	54.00	-7.72	Peak
3116.67	H	49.33	---	-7.19	42.15	---	74.00	54.00	-11.85	Peak
4708.33	H	44.04	---	-4.61	39.43	---	74.00	54.00	-14.57	Peak
4875.00	H	52.02	---	-4.52	47.50	---	74.00	54.00	-6.50	Peak

Remark:

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

Operation Mode: Tx / IEEE 802.11g mode / CH High **Test Date:** October 30, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
1346.67	V	19.84	---	30.80	50.64	---	74.00	54.00	-3.36	Peak
3000.00	V	45.43	---	-7.33	38.10	---	74.00	54.00	-15.90	Peak
3083.33	V	47.18	---	-7.23	39.95	---	74.00	54.00	-14.05	Peak
4716.67	V	53.70	---	-4.60	49.10	---	74.00	54.00	-4.90	Peak
4925.00	V	54.33	---	-4.49	49.84	---	74.00	54.00	-4.16	Peak
N/A										
1263.33	H	20.22	---	30.80	51.02	---	74.00	54.00	-2.98	Peak
3000.00	H	53.49	---	-7.33	46.16	---	74.00	54.00	-7.84	Peak
3041.67	H	55.14	---	-7.28	47.86	---	74.00	54.00	-6.14	Peak
3083.33	H	54.18	---	-7.23	46.96	---	74.00	54.00	-7.04	Peak
3116.67	H	48.12	---	-7.19	40.93	---	74.00	54.00	-13.07	Peak
4925.00	H	52.57	---	-4.49	48.07	---	74.00	54.00	-5.93	Peak

Remark:

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

External Antenna: Omni Antenna 12dBi for ZW-2200-OD

Operation Mode: Tx / IEEE 802.11a mode / CH Low **Test Date:** October 24, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
2411.67	V	79.43	47.58	-9.21	70.22	38.37	74.00	54.00	-15.63	AVG
N/A										
2411.67	H	70.56	47.06	-9.21	61.35	37.85	74.00	54.00	-16.15	AVG
4826.67	H	66.95	47.04	-4.55	62.40	42.49	74.00	54.00	-11.51	AVG
N/A										

Remark:

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

Operation Mode: Tx / IEEE 802.11a mode / CH Mid **Test Date:** October 24, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
5783.33	V	107.30	97.65	-3.34	103.96	94.31	Fundamental			
2411.67	V	85.54	48.03	-9.21	76.33	38.82	83.96	73.96	-35.14	30dBc AVG Fundamental
4826.67	V	59.16	46.18	-4.55	54.61	41.63	74.00	54.00	-12.37	AVG
11566.67	V	48.15	34.33	14.41	62.56	48.74	74.00	54.00	-5.26	AVG
N/A										
2411.67	H	81.22	47.71	-9.21	72.01	38.50	74.00	54.00	-15.50	AVG
11566.67	H	46.85	33.74	14.41	61.26	48.15	74.00	54.00	-5.85	AVG
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*
7. *In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.*

Operation Mode: Tx / IEEE 802.11a mode / CH High **Test Date:** October 24, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
1863.33	V	55.99	---	-11.26	44.72	---	74.00	54.00	-9.28	Peak
11650.00	V	44.81	31.98	15.21	60.02	47.19	74.00	54.00	-6.81	AVG
N/A										
1828.33	H	56.64	---	-11.37	45.27	---	74.00	54.00	-8.73	Peak
2411.67	H	79.89	47.52	-9.21	70.68	38.31	74.00	54.00	-15.69	AVG
N/A										

Remark:

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

External Antenna: Panel Antenna 16dBi

Operation Mode: Tx / IEEE 802.11a mode / CH Low **Test Date:** October 18, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
5748.33	V	119.46	109.87	-3.46	116.00	106.41	Fundamental			
2411.67	V	91.54	47.52	-9.21	82.33	38.31	96.00	76.41	-38.1	30dBc AVG Fundamental
4826.67	V	65.57	46.38	-4.55	61.02	41.83	74.00	54.00	-12.17	AVG
11483.33	V	51.32	38.90	13.79	65.11	52.69	74.00	54.00	-1.31	AVG
N/A										
2411.67	H	80.60	46.82	-9.21	71.39	37.61	74.00	54.00	-16.39	AVG
4826.67	H	68.06	46.39	-4.55	63.51	41.84	74.00	54.00	-12.16	AVG
11483.33	H	44.61	31.14	13.79	58.40	44.93	74.00	54.00	-9.07	AVG
N/A										

Remark:

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

Operation Mode: Tx / IEEE 802.11a mode / CH Mid **Test Date:** October 23, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
5795.00	V	120.25	110.70	-3.30	116.95	107.40	Fundamental			
2411.67	V	89.53	47.56	-9.21	80.32	38.35	96.95	77.40	-39.50	30dBc AVG Fundamental
5550.00	V	68.43	56.29	-4.14	64.29	52.15	74.00	54.00	-1.85	AVG
11566.67	V	49.20	36.66	14.41	63.61	51.07	74.00	54.00	-2.93	AVG
N/A										
2411.67	H	79.77	46.71	-9.21	70.56	37.50	74.00	54.00	-16.50	AVG
11566.67	H	51.96	38.56	14.41	66.37	52.97	74.00	54.00	-1.03	AVG
N/A										

Remark:

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

Operation Mode: Tx / IEEE 802.11a mode / CH High **Test Date:** October 18, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
5830.00	V	117.84	108.17	-3.18	114.66	104.99	Fundamental			
2411.67	V	86.45	47.07	-9.21	77.24	37.86	94.66	74.99	-37.13	30dBc AVG Fundamental
4826.67	V	58.82	45.43	-4.55	54.27	40.88	74.00	54.00	-13.12	AVG
5573.33	V	68.66	55.91	-4.06	64.60	51.85	74.00	54.00	-2.15	AVG
11650.00	V	48.68	35.97	15.21	63.89	51.18	74.00	54.00	-2.82	AVG
N/A										
5818.33	H	92.63	---	-3.22	102.62	91.89	Fundamental			
1198.33	H	57.64	---	-13.18	44.46	---	74.00	54.00	-9.54	20dBc Peak Fundamental
2411.67	H	85.23	47.32	-9.21	76.02	38.11	82.62	61.89	-14.57	AVG
11650.00	H	49.01	35.31	15.21	64.22	50.52	74.00	54.00	-3.48	AVG
N/A										

Remark:

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

Internal Antenna: Panel Antenna 18dBi for ZW-2200-OD

Operation Mode: Tx / IEEE 802.11a mode / CH Low **Test Date:** October 24, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
5748.33	V	119.56	110.02	-3.46	116.10	106.56	Fundamental			
2411.67	V	85.47	47.82	-9.21	76.26	38.61	96.10	76.56	-37.95	30dBc AVG Fundamental
4826.67	V	66.53	46.90	-4.55	61.98	42.35	74.00	54.00	-11.65	AVG
5503.33	V	73.02	61.07	-4.30	68.72	56.77	96.10	76.56	-19.79	30dBc AVG Fundamental
11500.00	V	49.28	37.34	13.77	63.05	51.11	74.00	54.00	-2.89	AVG
N/A										
5736.67	H	94.98	---	-3.50	108.76	93.54	Fundamental			
2411.67	H	88.74	48.18	-9.21	79.53	38.97	88.76	63.54	-24.57	30dBc AVG Fundamental
4826.67	H	71.91	47.45	-4.55	67.36	42.90	74.00	54.00	-11.10	AVG
11500.00	H	52.62	39.83	13.77	66.39	53.60	74.00	54.00	-0.40	AVG
N/A										

Remark:

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

Operation Mode: Tx / IEEE 802.11a mode / CH Mid **Test Date:** October 23, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
5795.00	V	118.52	108.91	-3.30	115.22	105.61	Fundamental			
1863.33	V	56.74	---	-11.26	45.47	---	74.00	54.00	-8.53	Peak
2411.67	V	94.38	48.53	-9.21	85.17	39.32	95.22	75.61	-36.29	30dBc AVG Fundamental
3368.33	V	58.82	---	-6.88	51.95	---	74.00	54.00	-2.05	Peak
5538.33	V	67.59	55.46	-4.18	63.41	51.28	74.00	54.00	-2.72	AVG
9650.00	V	41.98	---	10.00	51.98	---	74.00	54.00	-2.02	Peak
11566.67	V	49.02	36.84	14.41	63.43	51.25	74.00	54.00	-2.75	AVG
5783.33	H	94.89	---	-3.34	109.58	94.85	Fundamental			
2411.67	H	90.65	48.24	-9.21	81.44	39.03	89.58	64.85	-25.82	30dBc AVG Fundamental
4826.67	H	70.55	47.25	-4.55	66.00	42.70	74.00	54.00	-11.30	AVG
9650.00	H	51.86	30.65	10.00	61.86	40.65	74.00	54.00	-13.35	AVG
11566.67	H	51.21	39.35	14.41	65.62	53.76	74.00	54.00	-0.24	AVG
N/A										

Remark:

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

Operation Mode: Tx / IEEE 802.11a mode / CH High **Test Date:** October 24, 2006

Temperature: 22°C **Tested by:** James Yu

Humidity: 51% 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
5830.00	V	118.73	109.01	-3.18	115.55	105.83	Fundamental			
2411.67	V	95.40	48.60	-9.21	86.19	39.39	95.55	75.83	-36.44	30dBc AVG Fundamental
3415.00	V	71.64	46.57	-6.82	64.82	39.75	74.00	54.00	-14.25	AVG
5538.33	V	71.76	59.19	-4.18	67.58	55.01	95.55	75.83	-20.82	30dBc AVG Fundamental
9650.00	V	53.53	30.65	10.00	63.53	40.65	74.00	54.00	-13.35	AVG
11650.00	V	46.18	38.46	15.21	61.40	53.67	74.00	54.00	-0.33	AVG
N/A										
5830.00	H	96.72	---	-3.18	110.25	97.56	Fundamental			
1221.67	H	59.04	---	-13.12	45.92	---	74.00	54.00	-8.08	Peak
2411.67	H	94.82	50.50	-9.21	85.61	41.29	90.25	67.56	-26.27	30dBc AVG Fundamental
4826.67	H	73.83	47.91	-4.55	69.28	43.36	74.00	54.00	-10.64	AVG
11650.00	H	49.82	38.01	15.21	65.03	53.22	74.00	54.00	-0.78	AVG
N/A										

Remark:

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

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 2, 2006
Temperature:	25°C	**Tested by:**	Jason Chang
Humidity:	55% RH		

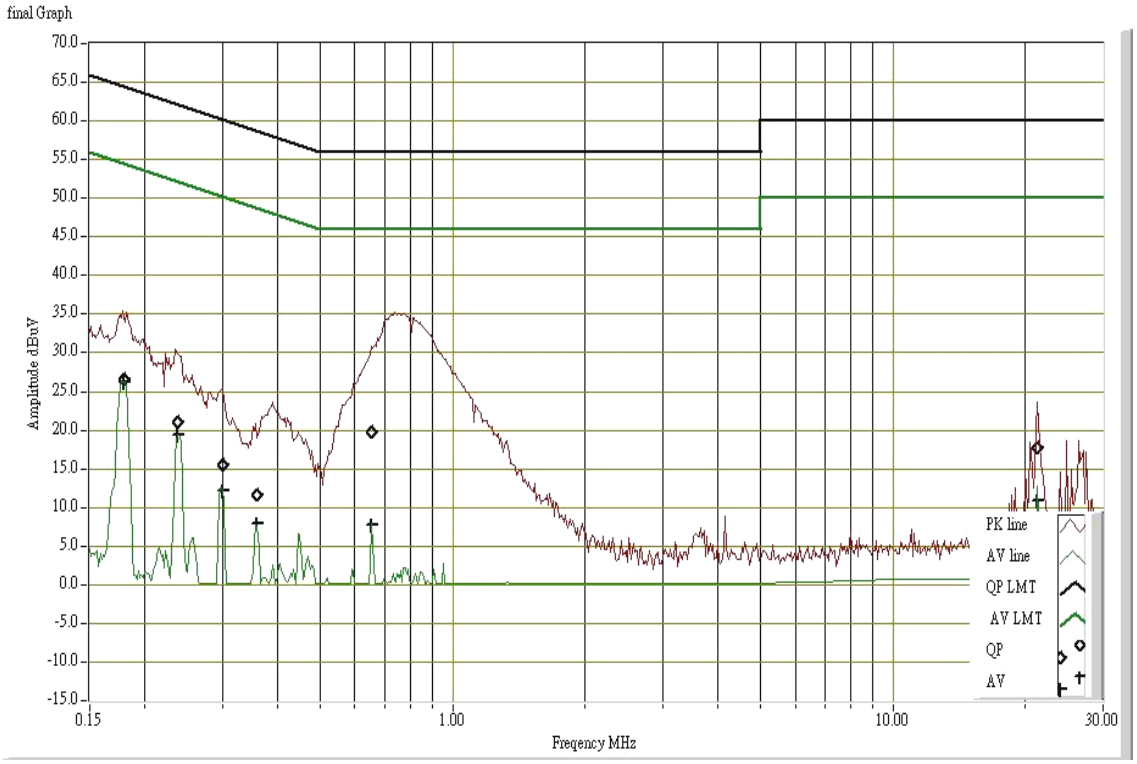
Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB)	QP Result (dBuV)	AV Result (dBuV)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.179	26.640	26.130	0.142	26.782	26.272	64.532	54.532	-37.750	-28.260	L1
0.238	21.070	19.280	0.100	21.170	19.380	62.166	52.166	-40.996	-32.786	L1
0.300	15.470	12.180	0.100	15.570	12.280	60.243	50.243	-44.673	-37.963	L1
0.360	11.680	7.980	0.100	11.780	8.080	58.729	48.729	-46.949	-40.649	L1
0.655	19.780	7.640	0.100	19.880	7.740	56.000	46.000	-36.120	-38.260	L1
21.308	17.780	10.900	1.200	18.980	12.100	60.000	50.000	-41.020	-37.900	L1
0.179	27.680	26.130	0.142	27.822	26.272	64.532	54.532	-36.710	-28.260	L2
0.240	23.290	19.280	0.100	23.390	19.380	62.096	52.096	-38.706	-32.716	L2
0.300	17.800	11.900	0.100	17.900	12.000	60.243	50.243	-42.343	-38.243	L2
0.454	13.490	4.940	0.100	13.590	5.040	56.802	46.802	-43.212	-41.762	L2
0.655	23.390	8.660	0.100	23.490	8.760	56.000	46.000	-32.510	-37.240	L2
21.308	15.160	8.870	1.200	16.360	10.070	60.000	50.000	-43.640	-39.930	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 to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz.*
4. *L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)*

Test Plots

Conducted emissions (Line 1)



Conducted emissions (Line 2)