



FCC 47 CFR PART 15 SUBPART C AND ANSI C63.4 : 2003

TEST REPORT

For

802.11g ADSL2+ Firewall Router

Model : BiPAC 5200GRC

**Data Applies To : BiPAC 5200GRD ; BiPAC 5200GRE ; BiPAC 7300GRC ;
BiPAC 7300GRD ; BEC 5200GRC ; BEC 5200GRD ;
BEC 5200GRE ; BEC 7300GRC ; BEC 7300GRD**

Issued for

Billion Electric Co., Ltd.

**8F., NO.192, SEC.2, CHUNG HSING ROAD,
HSIN TIEN CITY, TAIPEI HSIEN, TAIWAN, R.O.C.**

Issued by

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	05/11/2009	Initial Issue	All Page 70	Alex Chiu



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1. TEST REPORT CERTIFICATION

Applicant : Billion Electric Co., Ltd.

Address : 8F., NO.192, SEC.2, CHUNG HSING ROAD,
HSIN TIEN CITY, TAIPEI HSIEN, TAIWAN, R.O.C.

Equipment Under Test : 802.11g ADSL2+ Firewall Router

Model : BiPAC 5200GRC

Data Applies To : BiPAC 5200GRD ; BiPAC 5200GRE ; BiPAC 7300GRC ;
BiPAC 7300GRD ; BEC 5200GRC ; BEC 5200GRD ;
BEC 5200GRE ; BEC 7300GRC ; BEC 7300GRD

Tested Date : March 29 ~ April 30, 2009

APPLICABLE STANDARD	
STANDARD	TEST RESULT
FCC Part 15 Subpart C AND ANSI C63.4:2003	PASS

Approved by:

Reviewed by:

Alex Chiu
Director

Alan Fan
Section Manager

WE HEREBY CERTIFY THAT: The measurements shown in the attachment were made in accordance with the procedures indicated, and the energy emitted by the equipment was found to be within the limits applicable. We assume full responsibility for the accuracy and completeness of these measurements and vouch for the qualifications of all persons taking them.



2. EUT DESCRIPTION

2.1 DESCRIPTION OF EUT & POWER

Product Name	802.11g ADSL2+ Firewall Router
Model Number	BiPAC 5200GRC
Data Applies To	BiPAC 5200GRD ; BiPAC 5200GRE ; BiPAC 7300GRC ; BiPAC 7300GRD ; BEC 5200GRC ; BEC 5200GRD ; BEC 5200GRE ; BEC 7300GRC ; BEC 7300GRD
Frequency Range	IEEE 802.11b/g : 2412MHz to 2462MHz
Transmit Power	IEEE 802.11b : 22.10dBm IEEE 802.11g : 19.61dBm
Channel Spacing	IEEE 802.11b/g : 5MHz
Channel Number	IEEE 802.11b/g : 11 Channels
Transmit Data Rate	IEEE 802.11b : 11, 5.5, 2, 1 Mbps IEEE 802.11g : 54, 48, 36, 24, 18, 12, 9, 6 Mbps
Type of Modulation	IEEE 802.11b : DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g : OFDM (64QAM, 16QAM, QPSK, BPSK)
Frequency Selection	by software / firmware
Antenna Type	Dipole Antenna ,Antenna Gain 2 dBi at 2.4GHz
Power Source	12VAC, 1A (From Power Adapter)

Power Adapter :

No.	Manufacturer	Model No.	Power Input	Power Output
1	OEM	AA-121A	120VAC / 60Hz	12VAC, 1A

The difference of the series model

Different Item Model	WPS puttom	Flash	SDRAM	Housing	PCB	Power	Wireless
BiPAC 5200GRC	X	16M Flash	64M SDRAM	B1/D1	the same	AC	V
BiPAC 5200GRD	X	16M Flash	128M SDRAM	B1/D1	the same	AC	V
BiPAC 5200GRE	V	16M Flash	128M SDRAM	B1/D1	the same	AC	V
BiPAC 7300GRC	X	32M Flash	128M SDRAM	B1/D1	the same	AC	V
BiPAC 7300GRD	X	32M Flash	128M SDRAM	B1/D1	the same	AC	V
BEC 5200GRC	X	16M Flash	64M SDRAM	B1/D1	the same	AC	V
BEC 5200GRD	X	16M Flash	128M SDRAM	B1/D1	the same	AC	V



Different Item Model	WPS puttom	Flash	SDRAM	Housing	PCB	Power	Wireless
BEC 5200GRE	V	16M Flash	128M SDRAM	B1/D1	the same	AC	V
BEC 7300GRC	X	32M Flash	128M SDRAM	B1/D1	the same	AC	V
BEC 7300GRD	X	32M Flash	128M SDRAM	B1/D1	the same	AC	V

Remark:

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: QI3BIL-5200GRC filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.
3. For more details, please refer to the User's manual of the EUT.

3. DESCRIPTION OF TEST MODES

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	2412
Middle	2437
High	2462

IEEE 802.11b : 11Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11g : 6Mbps data rate (worst case) were chosen for full testing.

4. TEST METHODOLOGY

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



5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

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

NO. 989-1 Wen Shan Rd., Shang Shan Village,
Qionglin Shiang Hsinchu County 30741, Taiwan, R.O.C

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

5.2 EQUIPMENT

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

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





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

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

5.3 LABORATORY ACCREDITATIONS LISTINGS

The test facilities used to perform radiated and conducted emissions tests are accredited by Taiwan Accreditation Foundation for the specific scope of accreditation under Lab Code: 0240 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by TAF or any agency of the Government. In addition, the test facilities are listed with Federal Communications Commission (registration no: 90585 and 90584).

5.4 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	 90585, 90584
Japan	VCCI	3/10 meter Open Area Test Sites to perform conducted/radiated measurements	 R-1229/1189 C-1250/1294
Taiwan	TAF	FCC Method-47 CFR Part 15 Subpart C,D,E CISPR 11, FCC METHOD-47 CFR Part 18, EN 55011, CNS 13803, CISPR 13, CNS 13439, FCC Method-47 CFR Part 15 Subpart B, CISPR 14-1, EN 55014-1, CNS 13783-1, EN 55015, CNS 14115, CISPR 22, EN 55022, VCCI CNS 13438, EN 61000-4-2/3/4/5/6/8/11	 Testing Laboratory 0240
Taiwan	BSMI	CNS 13803, CNS 13438, CNS 13439, CNS 13783-1, CNS 14115	 SL2-IS-E-0002 SL2-IN-E-0002 SL2-A1-E-0002 SL2-R1-E-0002 SL2-R2-E-0002 SL2-L1-E-0002

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



6. CALIBRATION AND UNCERTAINTY

6.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

6.2 MEASUREMENT UNCERTAINTY

The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4.

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 1000 MHz	+/- 3.2 dB
Radiated Emission, 1 to 26.5GHz	+/- 3.2 dB
Power Line Conducted Emission	+/- 2.1 dB

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



7. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

No.	Product	Manufacturer	Model No.	Serial No.	FCC ID
1	Notebook PC	DELL	Latitude D610	CN-0C4708-48643-625-5565	E2K24BNHM
2	Notebook PC	HP	nx6130	CNU543274R	CNTWM3B2200BGA
3	SW HUB	ASUS	GX1008B	90-Q872AN1N0NAMA0-88QSA1003522	FCC DoC
4	ADSL iDSLAM	TECOM	M801	H1J00040	-----

SETUP DIAGRAM FOR TESTS

EUT & peripherals setup diagram is shown in appendix setup photos.

EUT OPERATING CONDITION

RF :

TX Mode:

1. Set up whole system for test as shown on diagram.
2. Run 5200GR4 Test software(BIPAC 5120GR,5200G v2.39m11).
3. Select : 27:5102GR2,5200G→Check EVM

Select:(3.Check spectrum mask&Power)

rt ate apstop

rt atetxrate

(1)802.11b→3 (rate 11Mbps)

(2)802.11g→4 (rate 6Mbps)

rt atechannel→Low/ Middle/ High

rt atetxcnt→1000

rt ate txcont

rt atetxpow

(1)802.11b→Low=17 Middle=17 High=8

(2)802.11g→Low=15 Middle=15 High=10

For Normal operating :

1. Setup whole system for test as shown on diagram
2. Notebook PC (1) / (2),ping 192.168.1.254 -t to EUT.
3. All of the function are under run.
4. Start test.



8. APPLICABLE LIMITS AND TEST RESULTS

8.1 6dB BANDWIDTH

LIMIT

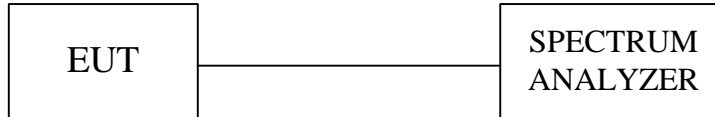
§ 15.207(a) (2) For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
SPECTRUM ANALYZER	AGILENT	E4446A	MY43360132	06/05/2009
SPECTRUM ANALYZER	AGILENT	E4446A	MY46180323	05/21/2009

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

TEST SETUP



TEST PROCEDURE

The transmitter output was connected to a spectrum analyzer. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

**TEST RESULTS**

No non-compliance noted

IEEE 802.11b MODE

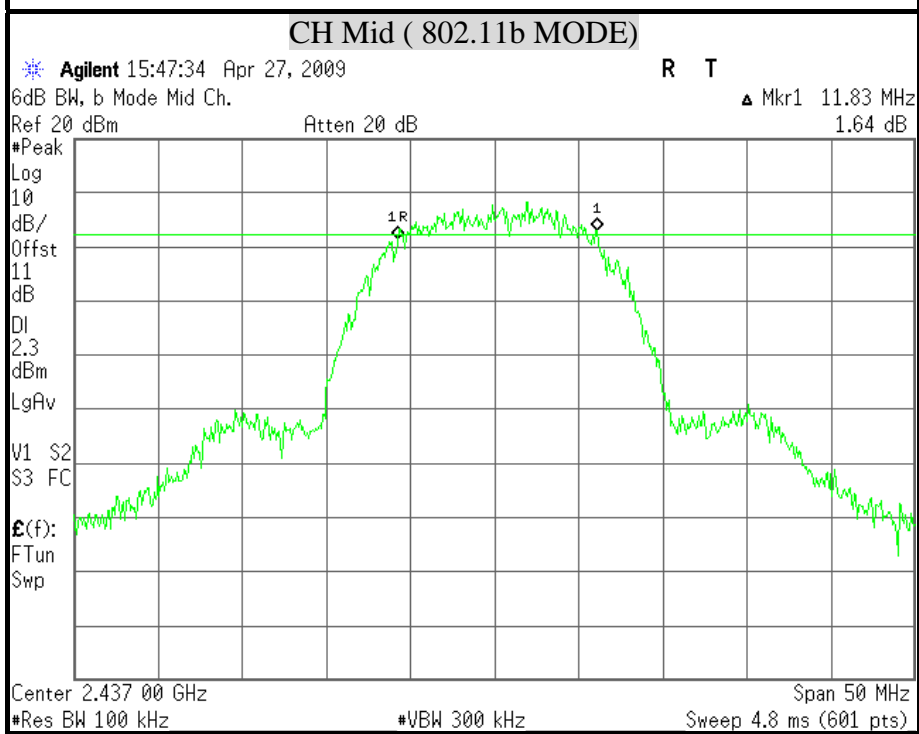
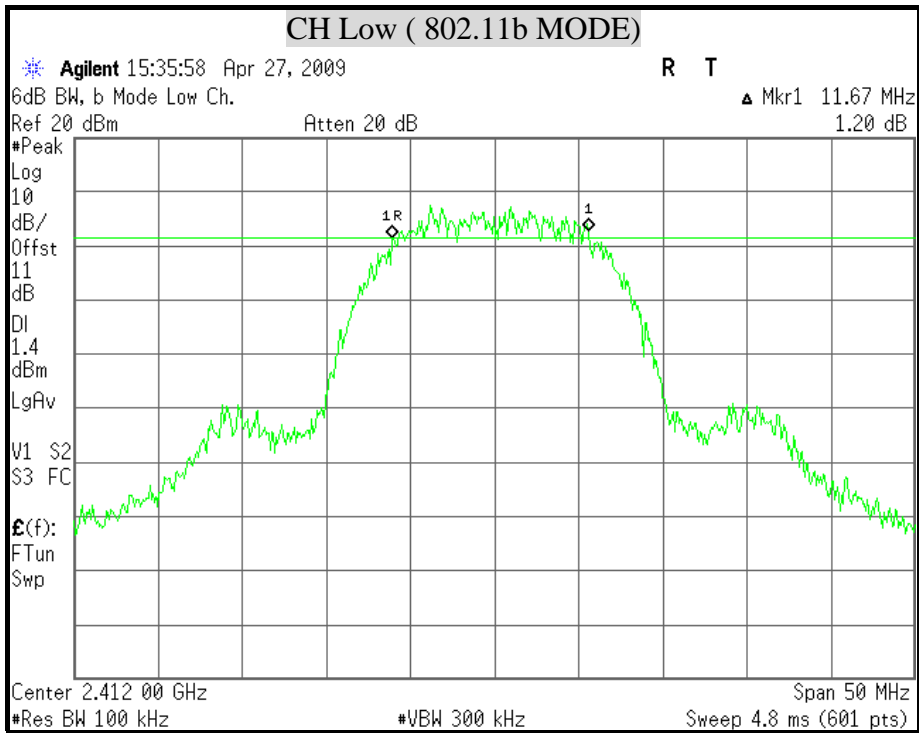
Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	11.67	500	PASS
Middle	2437	11.83	500	PASS
High	2462	11.83	500	PASS

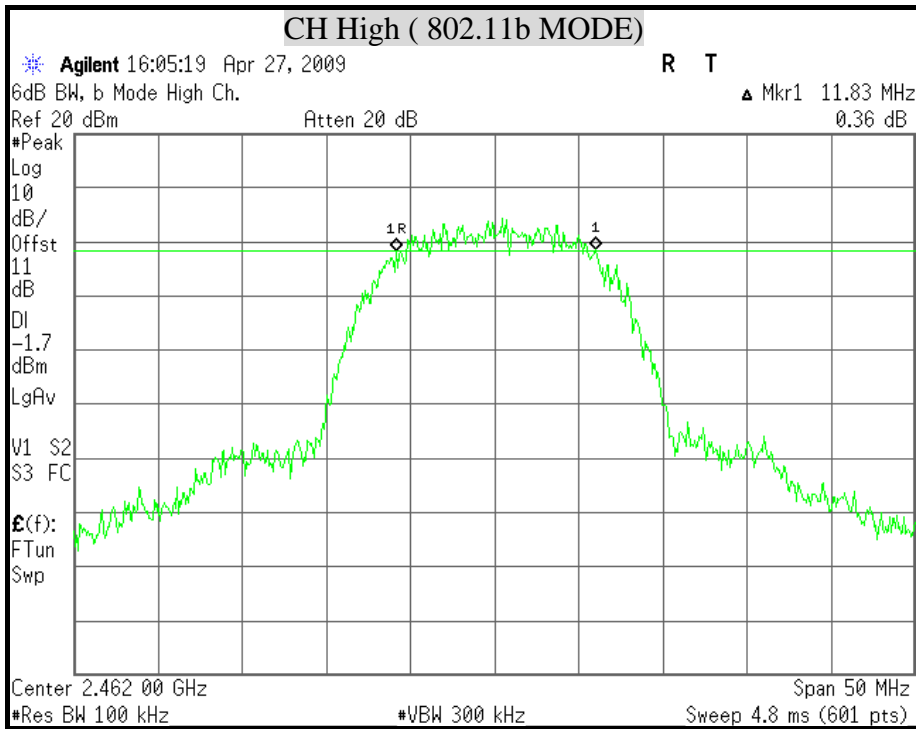
IEEE 802.11g MODE

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	16.42	500	PASS
Middle	2437	16.50	500	PASS
High	2462	16.42	500	PASS



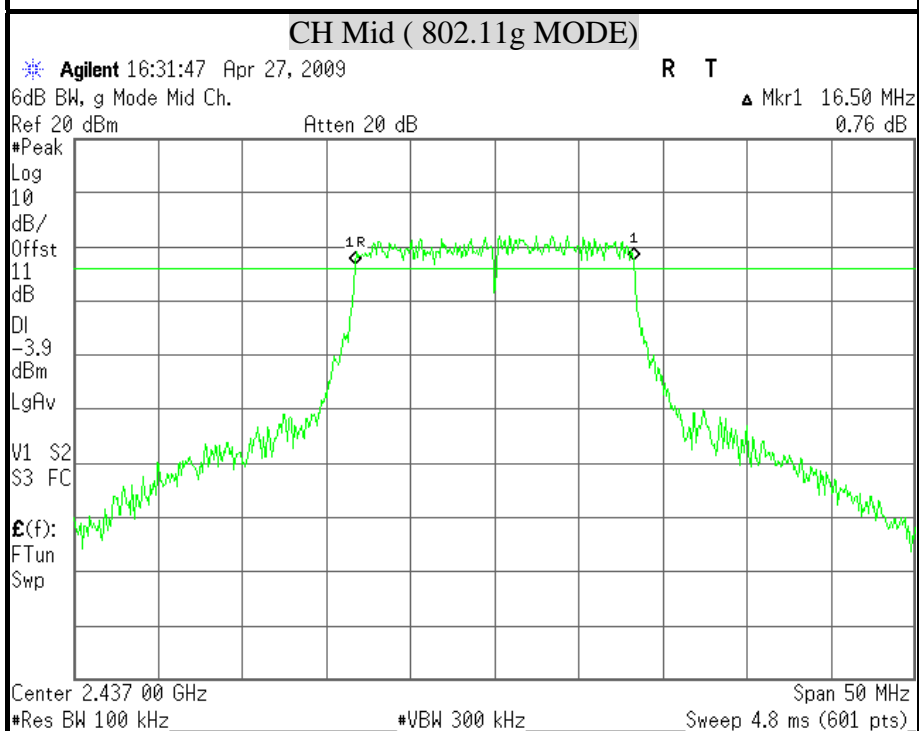
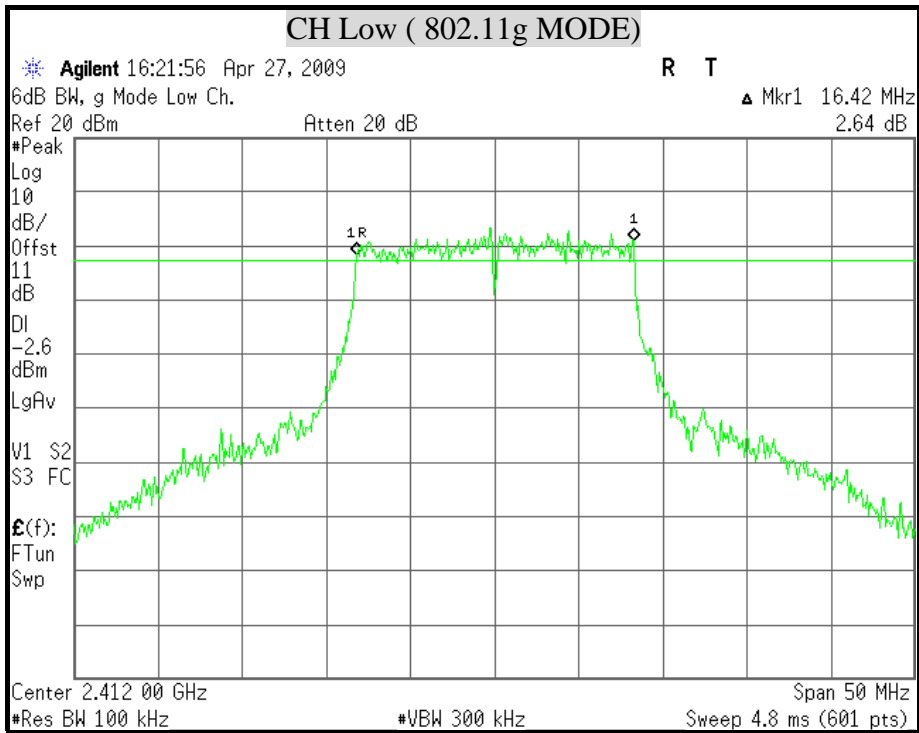
6dB BANDWIDTH (802.11b MODE)

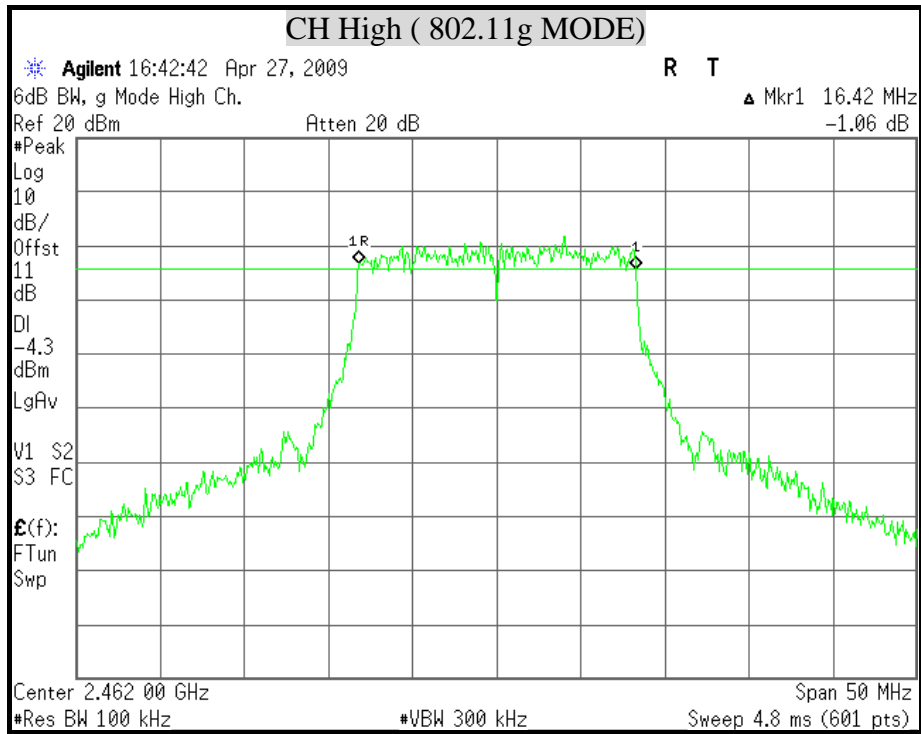






6dB BANDWIDTH (802.11g MODE)







8.2 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
SPECTRUM ANALYZER	AGILENT	E4446A	MY43360132	06/05/2009
SPECTRUM ANALYZER	AGILENT	E4446A	MY46180323	05/21/2009

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

TEST SETUP



TEST PROCEDURE

1. The spectrum shall be set as follows :

Span : The minimum span to fully display the emission and approximately 20dB below peak level.

RBW : The set to 1% to 3% of the approximate emission width.

2. Compute the combined power of all signal responses contained in the trace by covering all the data points.

3. For 99% occupied BW, place the markers at the frequency at which 0.5% of the power lies to the right of the right marker and 0.5% of the power lies to the left of the left marker.

4. The 99% BW is the bandwidth between the right and left markers.

**TEST RESULTS**

No non-compliance noted

IEEE 802.11b MODE

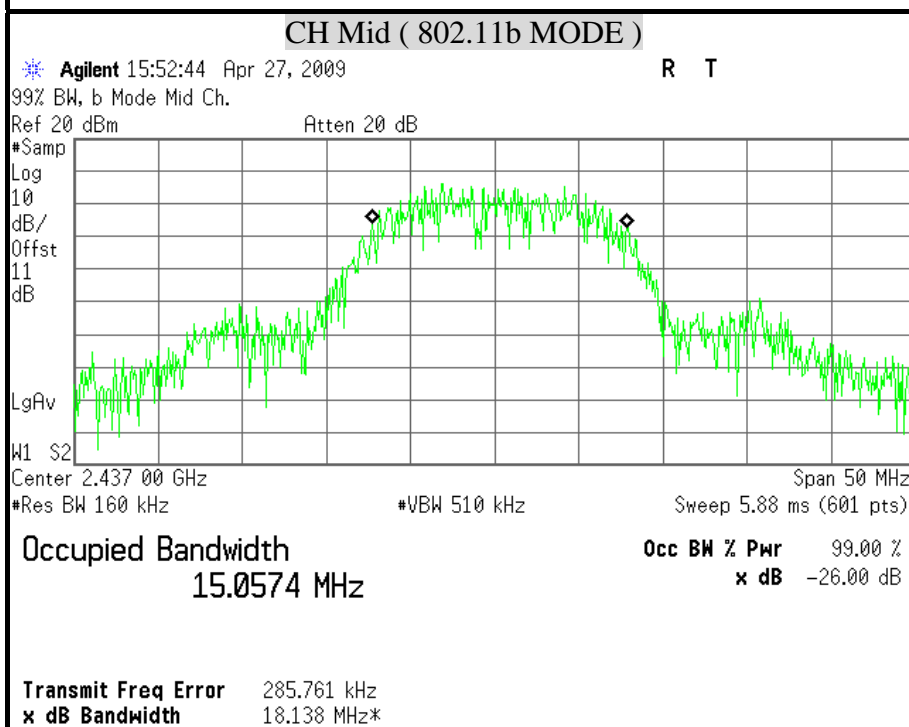
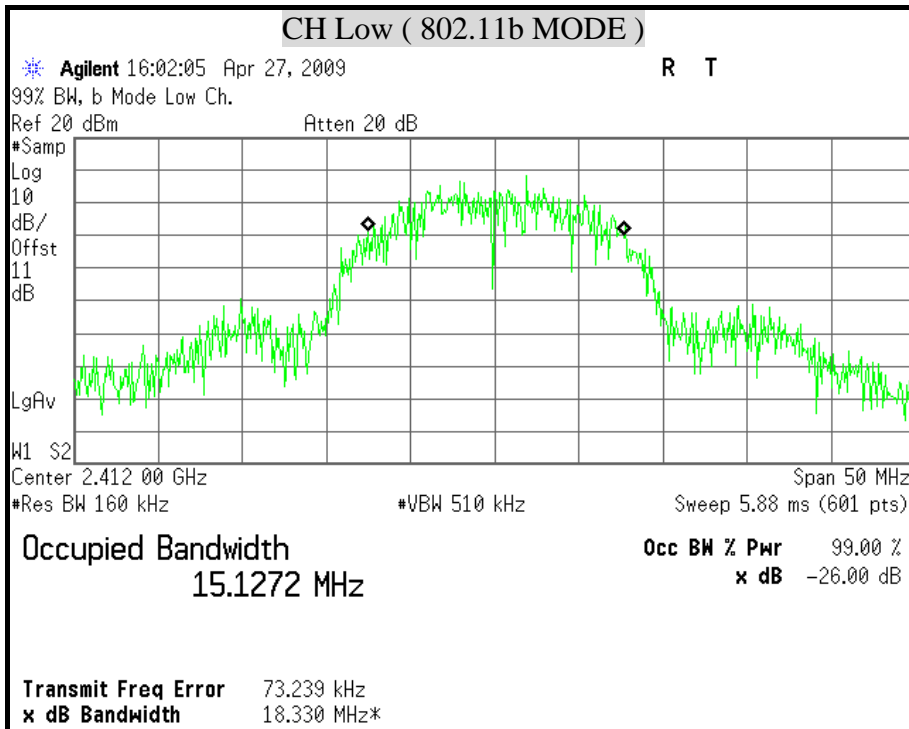
Channel	Channel Frequency (MHz)	99% Occupied power bandwidth (MHz)
Low	2412.00	15.127
Middle	2437.00	15.057
High	2462.00	15.167

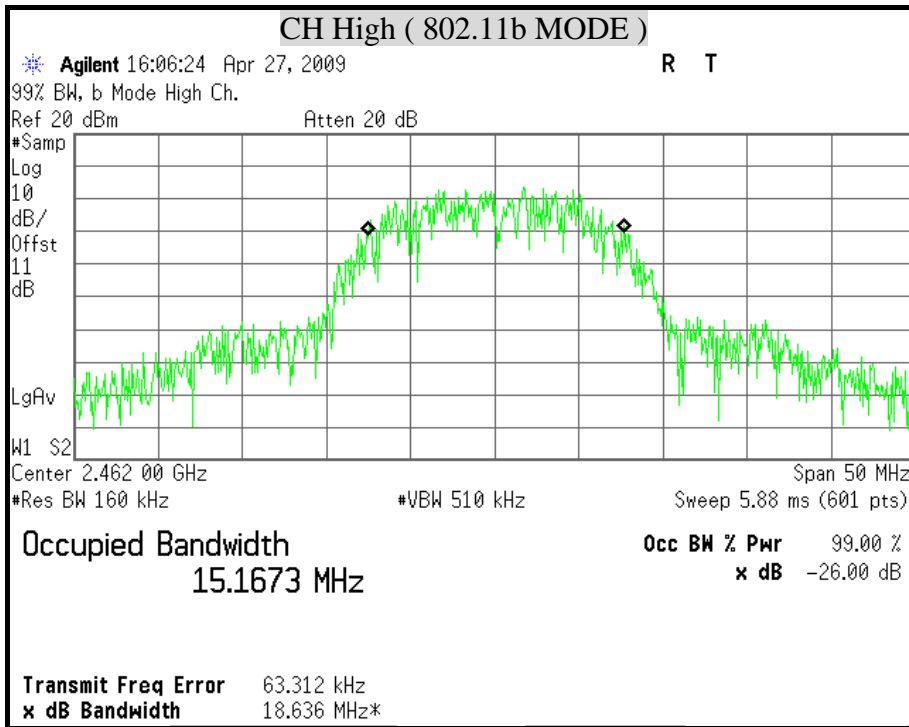
IEEE 802.11g MODE

Channel	Channel Frequency (MHz)	99% Occupied power bandwidth (MHz)
Low	2412.00	16.481
Middle	2437.00	16.350
High	2462.00	16.366



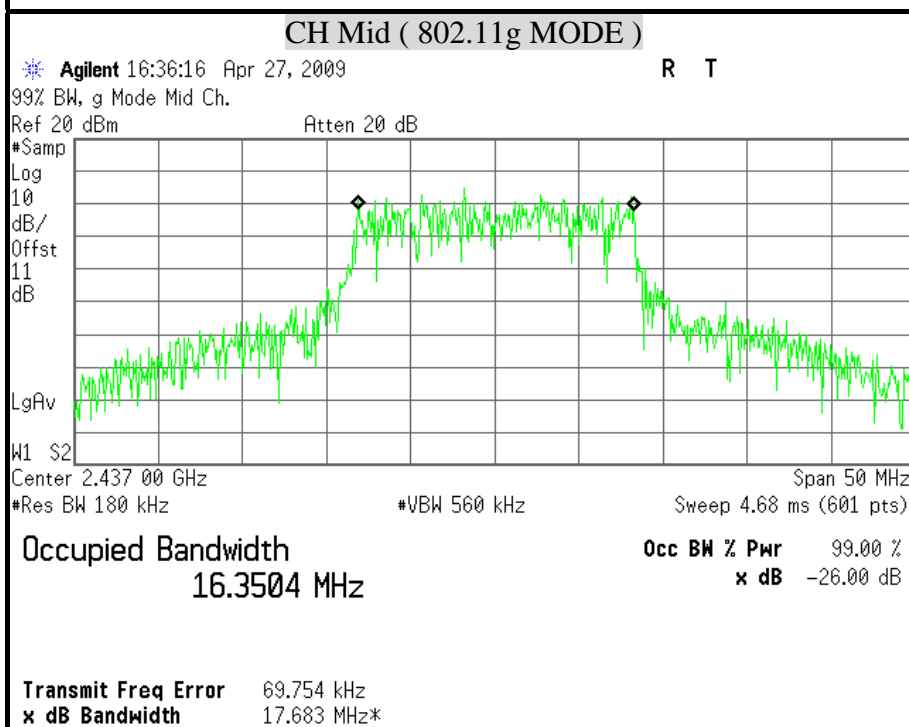
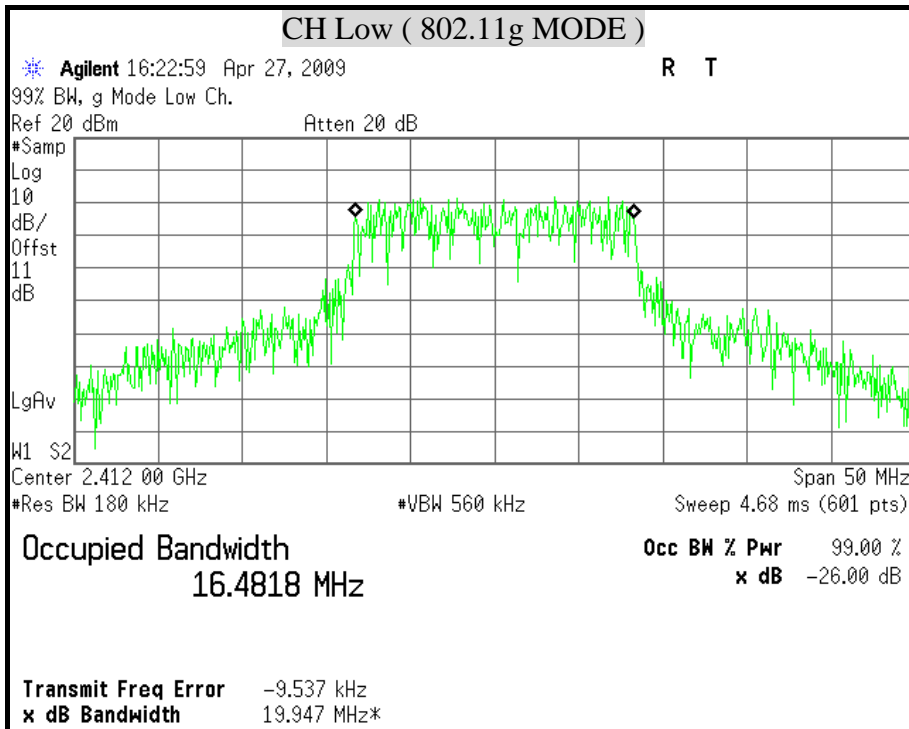
99% BANDWIDTH (802.11b MODE)

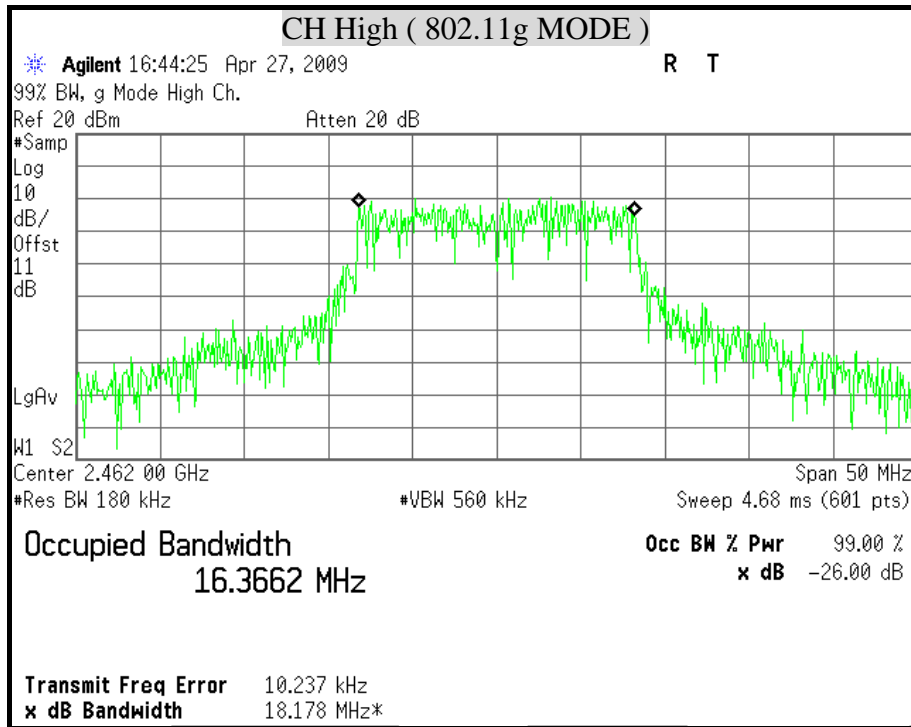






99% BANDWIDTH (802.11g MODE)







8.3 MAXIMUM PEAK OUTPUT POWER

LIMIT

§ 15.247(b) The maximum peak output power of the intentional radiator shall not exceed the following :

§ 15.247(b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands : 1 watt.

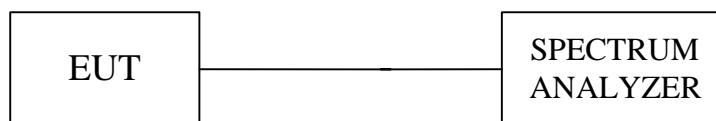
§ 15.247(b) (4) Except as shown in paragraphs (c) of this section , if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2), and (b)(3) of this section , as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
SPECTRUM ANALYZER	AGILENT	E4446A	MY43360132	06/05/2009
SPECTRUM ANALYZER	AGILENT	E4446A	MY46180323	05/21/2009

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

TEST SETUP



TEST PROCEDURE

- The spectrum shall be set as follows :
Span : 1.5 times channel integration bandwidth.
RBW : 1MHz
VBW : 3MHz
Detector : Peak
Sweep : Single trace
- Compute the combined power of all signal responses contained in the trace by covering all the data points.
- For 99% occupied BW, place the markers at the frequency at which 0.5% of the power lies to the right of the right marker and 0.5% of the power lies to the left of the left marker.
- The peak output power is the channel power integrated over 99% bandwidth.

**TEST RESULTS**

No non-compliance noted

IEEE 802.11b MODE

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2412	21.60	30	PASS
Middle	2437	22.10	30	PASS
High	2462	18.77	30	PASS

Remark:

1. At final test to get the worst-case emission at 11Mbps.
2. The cable assembly insertion loss of 11dB (including 10 dB pad and 1 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11g MODE

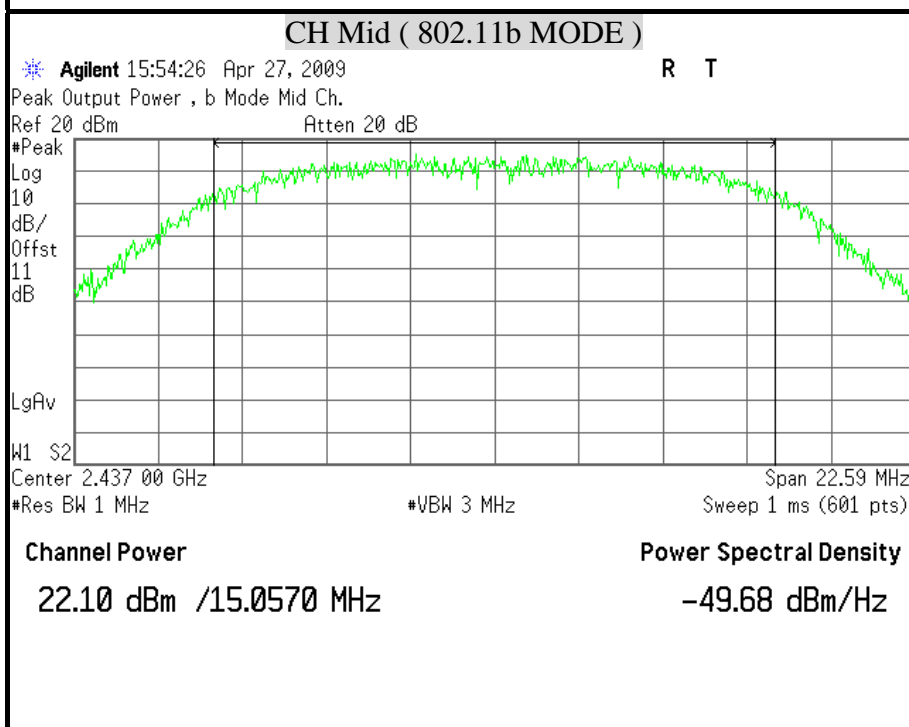
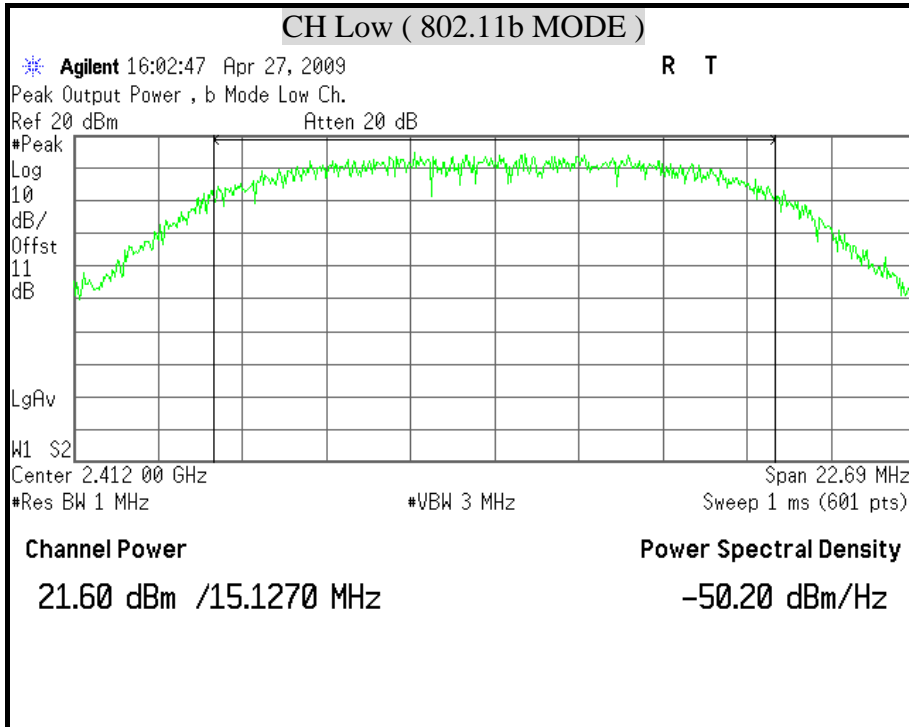
Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2412	19.15	30	PASS
Middle	2437	19.61	30	PASS
High	2462	17.97	30	PASS

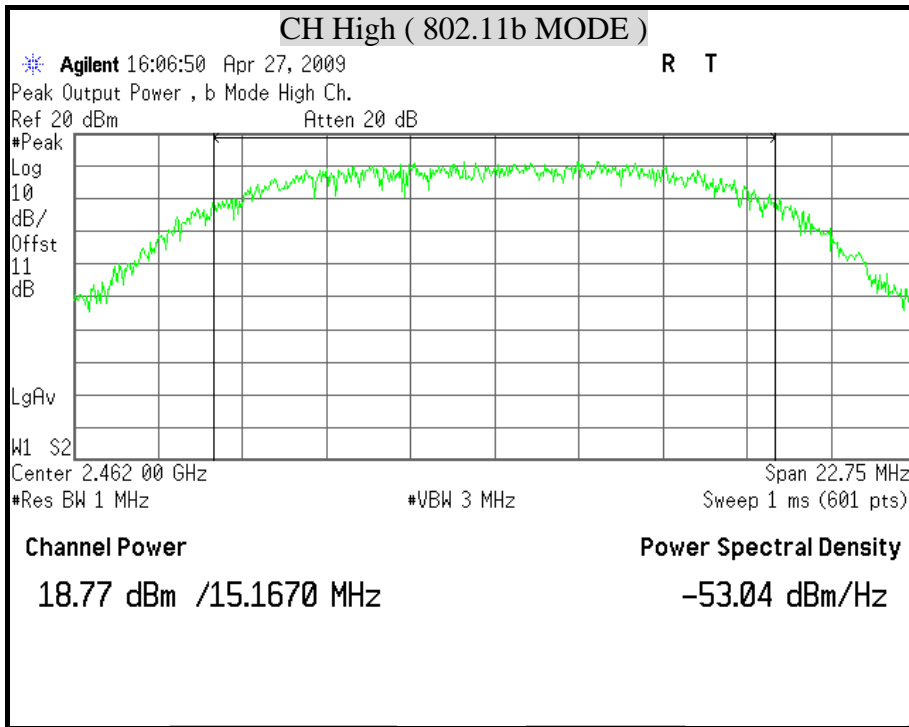
Remark:

1. At final test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 11dB (including 10 dB pad and 1 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.



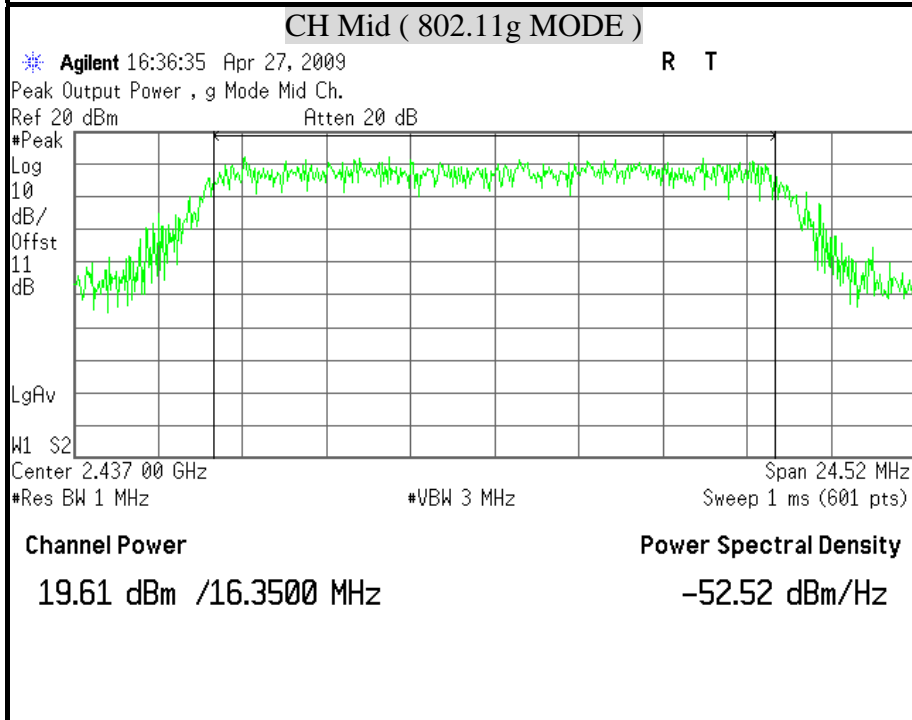
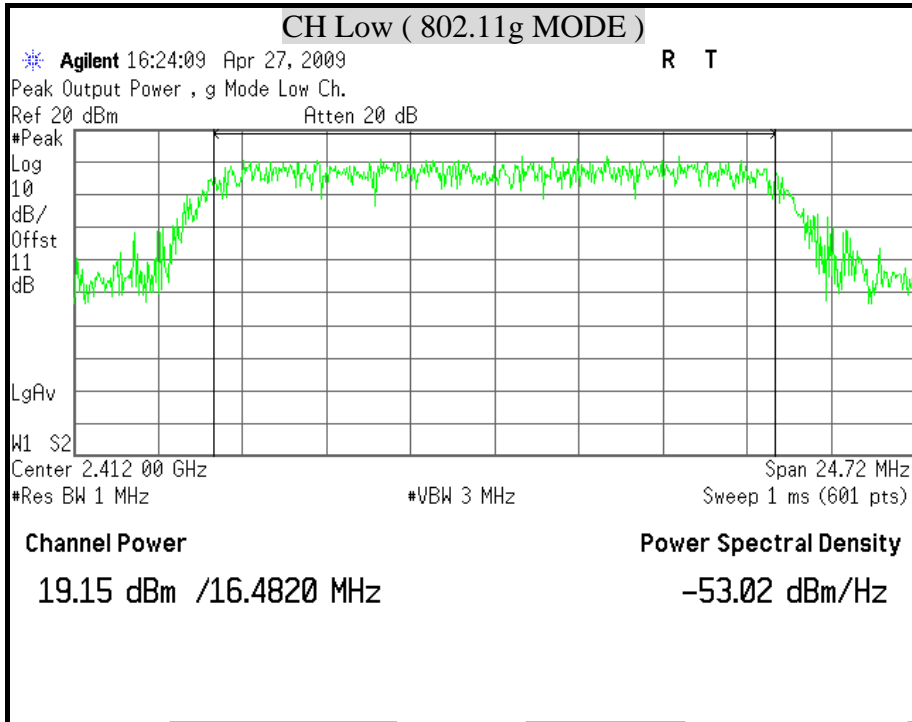
MAXIMUM PEAK OUTPUT POWER (802.11b MODE)

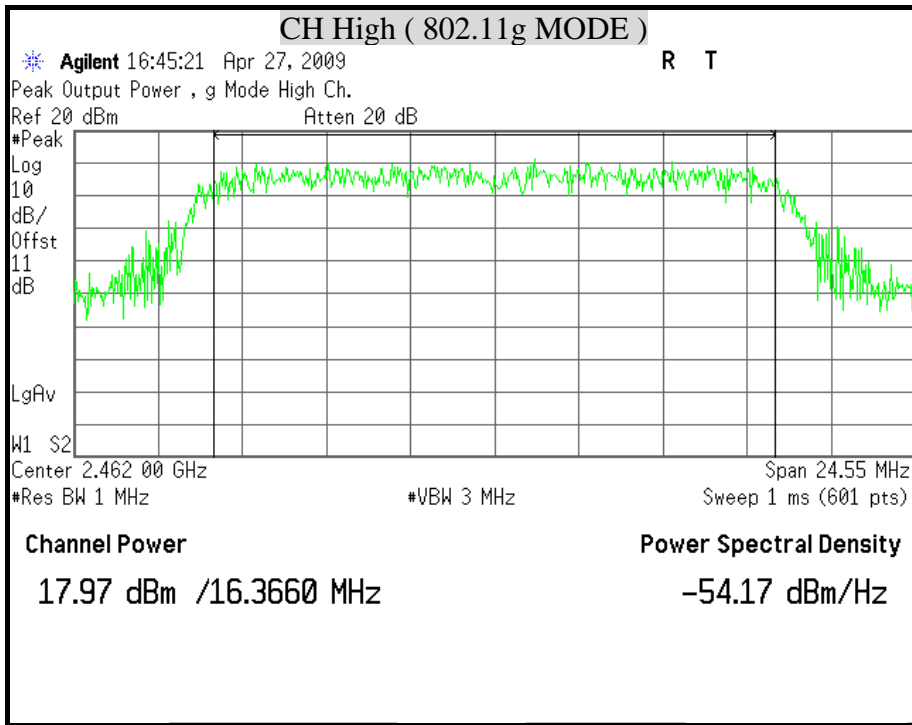






MAXIMUM PEAK OUTPUT POWER (802.11g MODE)







8.4 MAXIMUM PERMISSIBLE EXPOSURE

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b) LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time
(A) Limits for Occupational / Control Exposures				
300-1,500	--	--	F/300	6
1,500-100,000	--	--	5	6
(B) Limits for General Population / Uncontrol Exposures				
300-1,500	--	--	F/1500	6
1,500-100,000	--	--	1	30

CALCULATIONS

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

Where $E =$ Field strength in Volts / meter

$P =$ Power in Watts

$G =$ Numeric antenna gain

$d =$ Distance in meters

$S =$ Power density in milliwatts / square centimeter

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

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

Changing to units of mW and cm, using:

$$P (mW) = P (W) / 1000 \text{ and}$$

$$d (cm) = d(m) / 100$$

Yields

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

Where $d =$ Distance in cm

$P =$ Power in mW

$G =$ Numeric antenna gain

$S =$ Power density in mW / cm²

**LIMIT**

Power Density Limit, $S=1.0\text{mW}/\text{cm}^2$

TEST RESULTS

No non-compliance noted

Mode	Antenna Gain (dBi)	Minimum separation distance (cm)	Output Power (dBm)	Numeric antenna gain (dB)	Power Density Limit (mW/cm^2)	Power Density at 20cm (mW/cm^2)
IEEE 802.11b	2	20.0	22.10	1.58	1.00	0.051135
IEEE 802.11g	2	20.0	19.61	1.58	1.00	0.028822

Remark: For mobile or fixed location transmitters, the maximum power density is $1.0\text{ mW}/\text{cm}^2$ even if the calculation indicates that the power density would be larger.



8.5 AVERAGE POWER

LIMIT

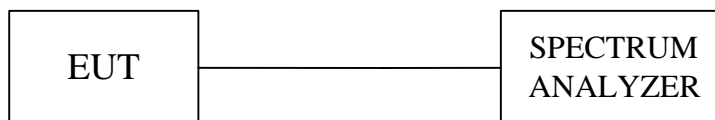
None; for reporting purposes only.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
SPECTRUM ANALYZER	AGILENT	E4446A	MY43360132	06/05/2009
SPECTRUM ANALYZER	AGILENT	E4446A	MY46180323	05/21/2009

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

TEST SETUP



TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer.

**TEST RESULTS**

No non-compliance noted

IEEE 802.11b MODE

Channel	Channel Frequency (MHz)	Average Power Output (dBm)
Low	2412	18.24
Middle	2437	18.68
High	2462	15.69

Remark:

1. At final test to get the worst-case emission at 11Mbps.
2. The cable assembly insertion loss of 11dB (including 10 dB pad and 1 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11g MODE

Channel	Channel Frequency (MHz)	Average Power Output (dBm)
Low	2412	15.67
Middle	2437	16.12
High	2462	14.38

Remark:

1. At final test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 11dB (including 10 dB pad and 1 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.



8.6 POWER SPECTRAL DENSITY

LIMIT

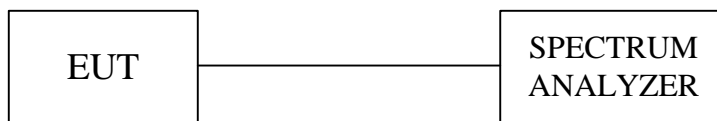
§ 15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
SPECTRUM ANALYZER	AGILENT	E4446A	MY43360132	06/05/2009
SPECTRUM ANALYZER	AGILENT	E4446A	MY46180323	05/21/2009

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

TEST SETUP



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW = 3KHz and VBW = RBW, set sweep time = span / 3KHz.

The power spectral density was measured and recorded.

The sweep time is allowed to be longer than span / 3KHz for a full response of the mixer in the spectrum analyzer.

**TEST RESULTS**

No non-compliance noted

IEEE 802.11b MODE

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Maxmum Limit (dBm)	Pass / Fail
Low	2412	-5.64	8	PASS
Middle	2437	-5.20	8	PASS
High	2462	-8.88	8	PASS

Remark:

1. At finial test to get the worst-case emission at 11Mbps.
2. The cable assembly insertion loss of 11dB (including 10 dB pad and 1 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11g MODE

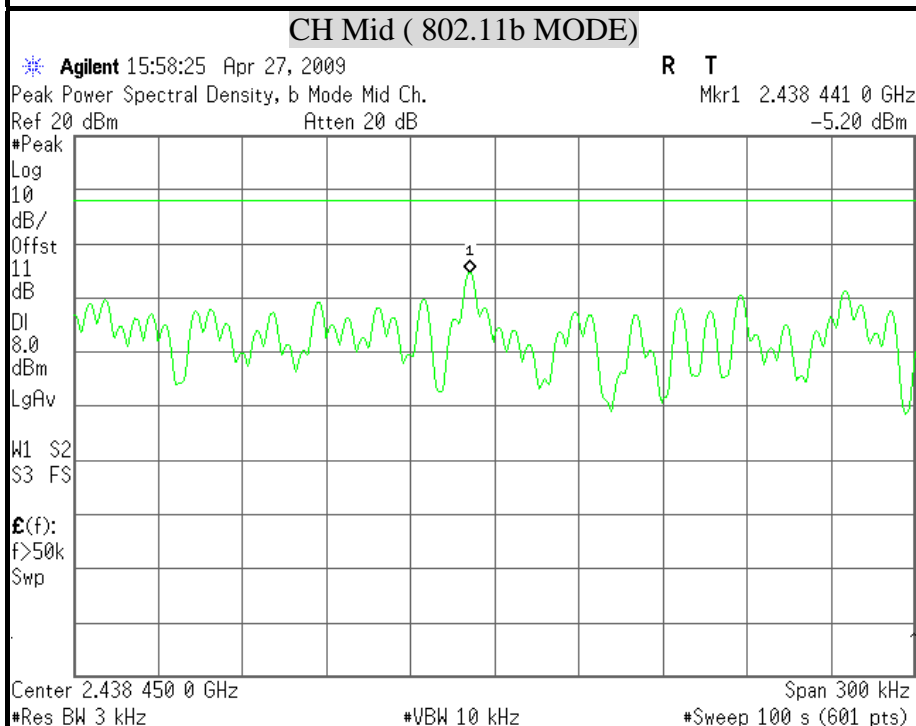
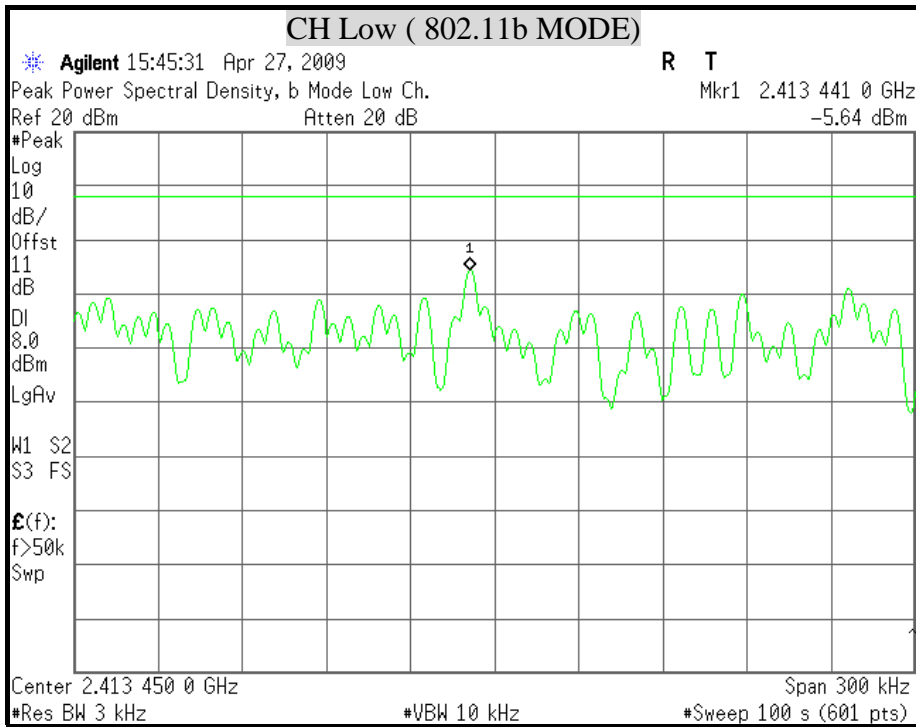
Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Maxmum Limit (dBm)	Pass / Fail
Low	2412	-11.04	8	PASS
Middle	2437	-10.31	8	PASS
High	2462	-12.58	8	PASS

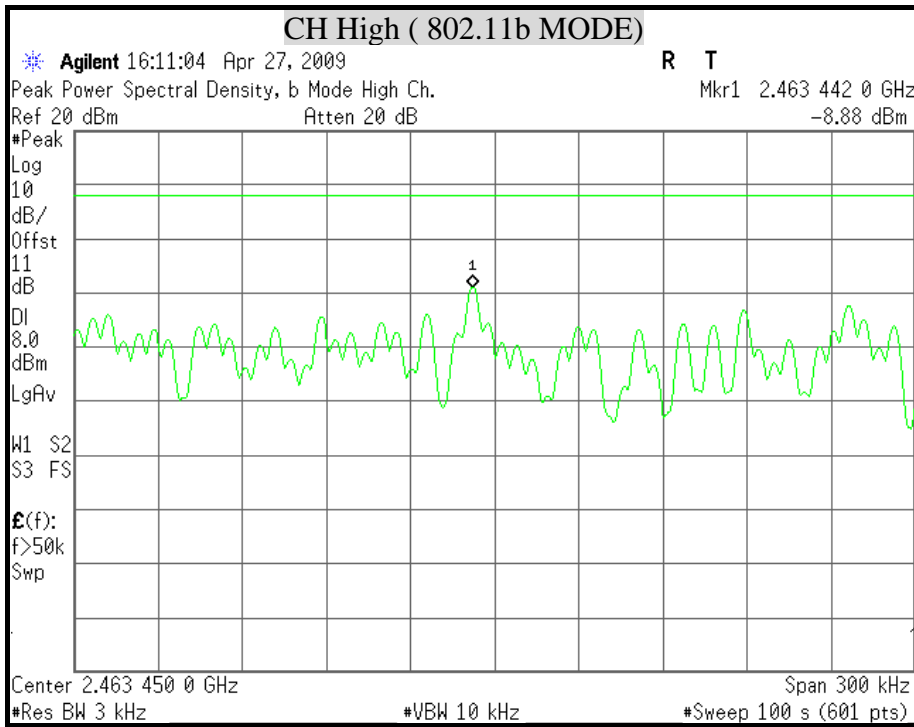
Remark:

1. At finial test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 11dB (including 10 dB pad and 1 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.



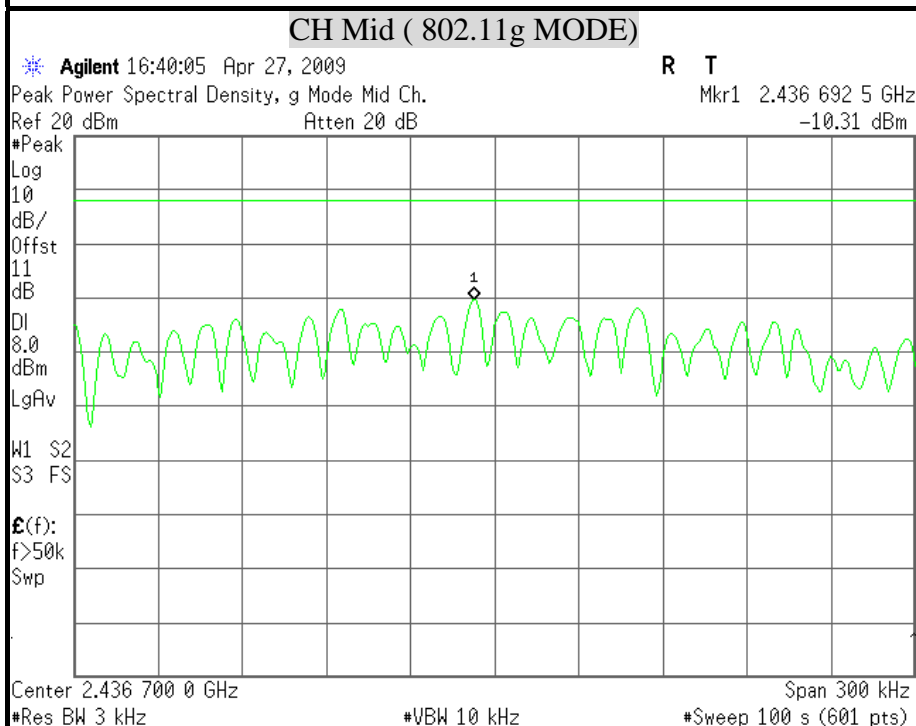
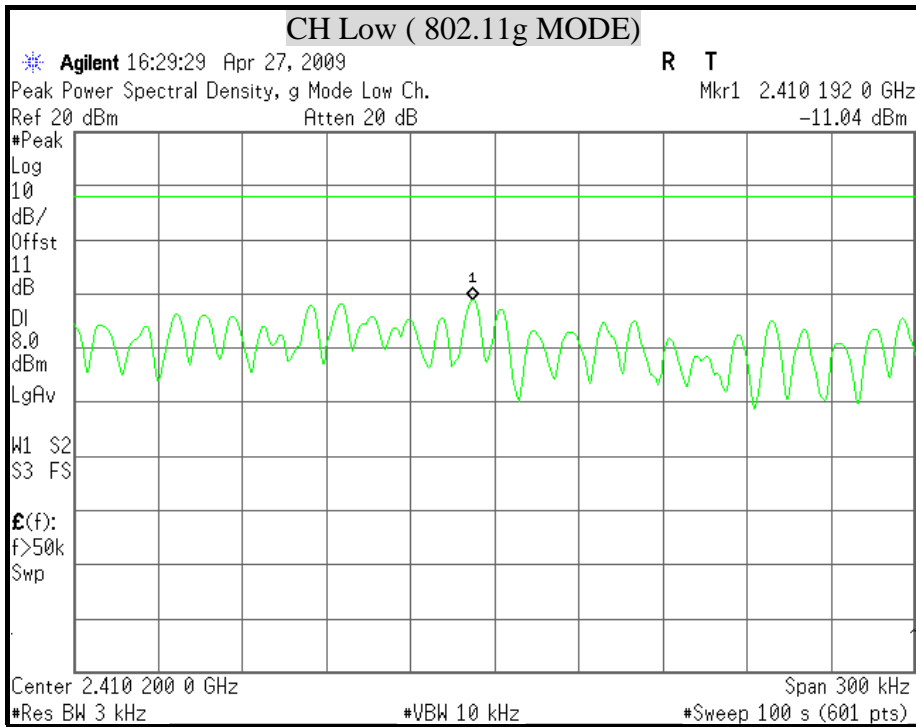
POWER SPECTRAL DENSITY (IEEE 802.11b MODE)

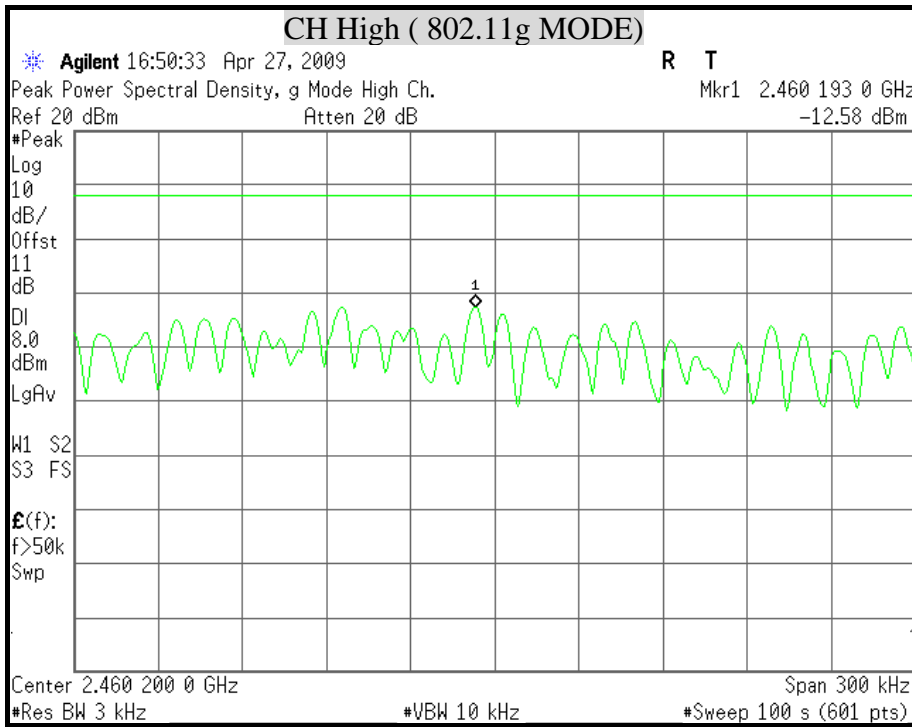






POWER SPECTRAL DENSITY (IEEE 802.11g MODE)







8.7 CONDUCTED SPURIOUS EMISSION

LIMITS

§ 15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in § 15.209(a) is not required. 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 § 15.205(c)).

TEST PROCEDURE

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

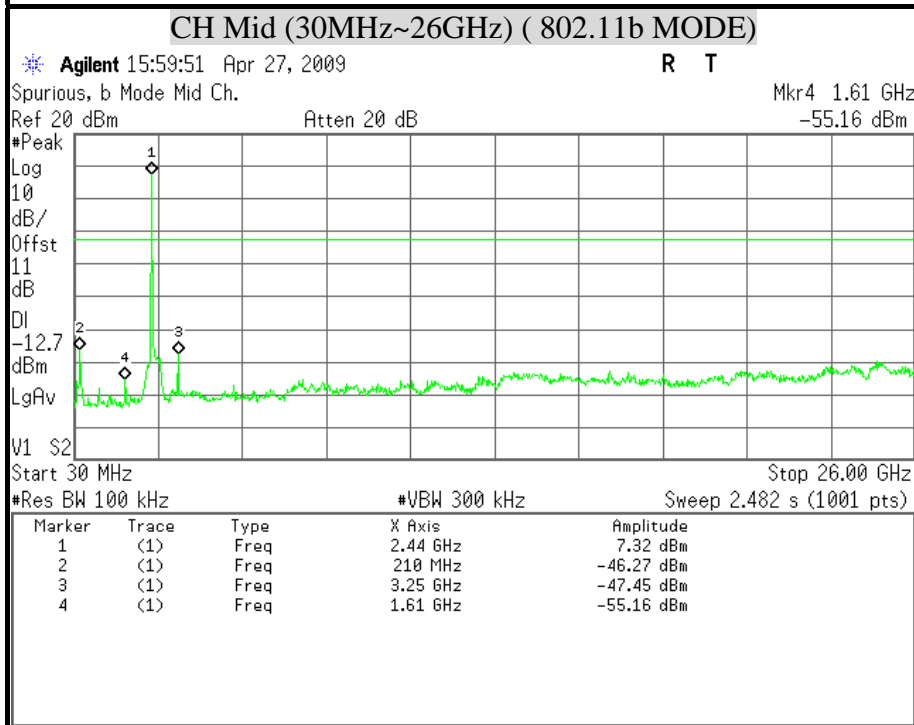
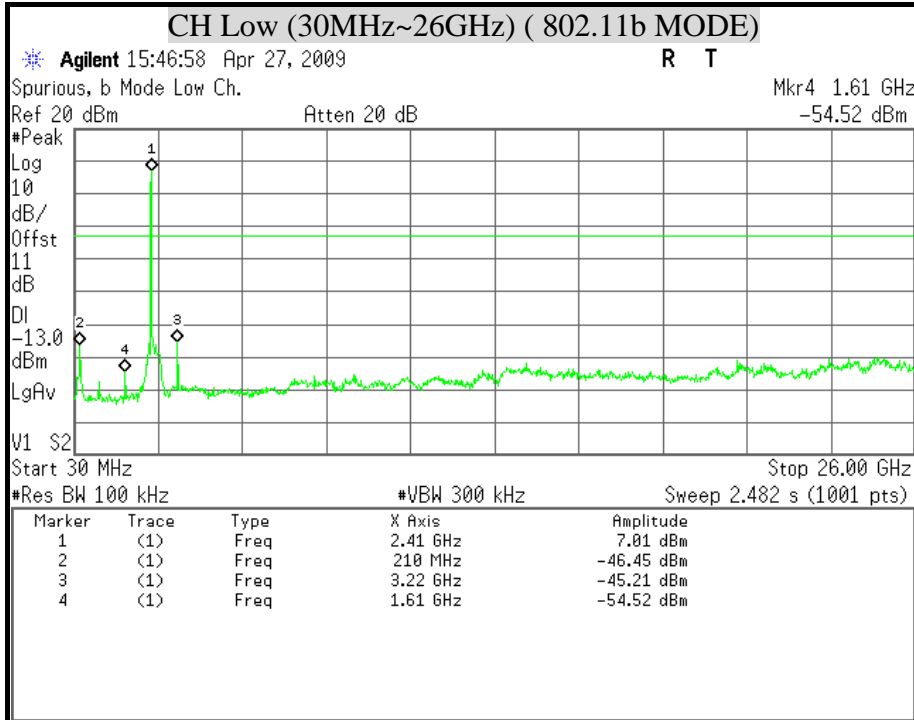
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

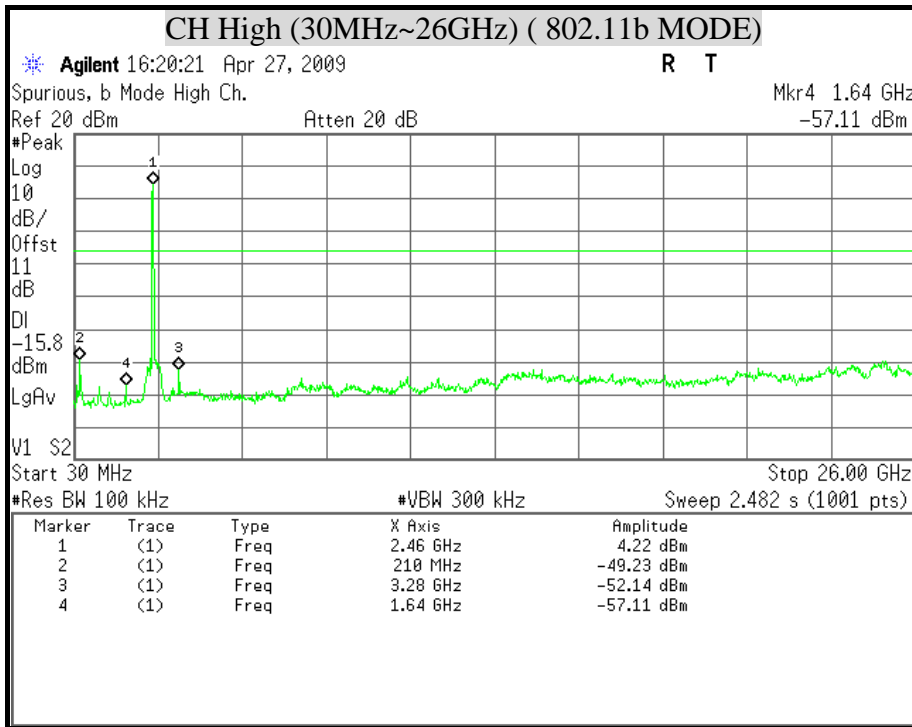
TEST RESULTS

No non-compliance noted



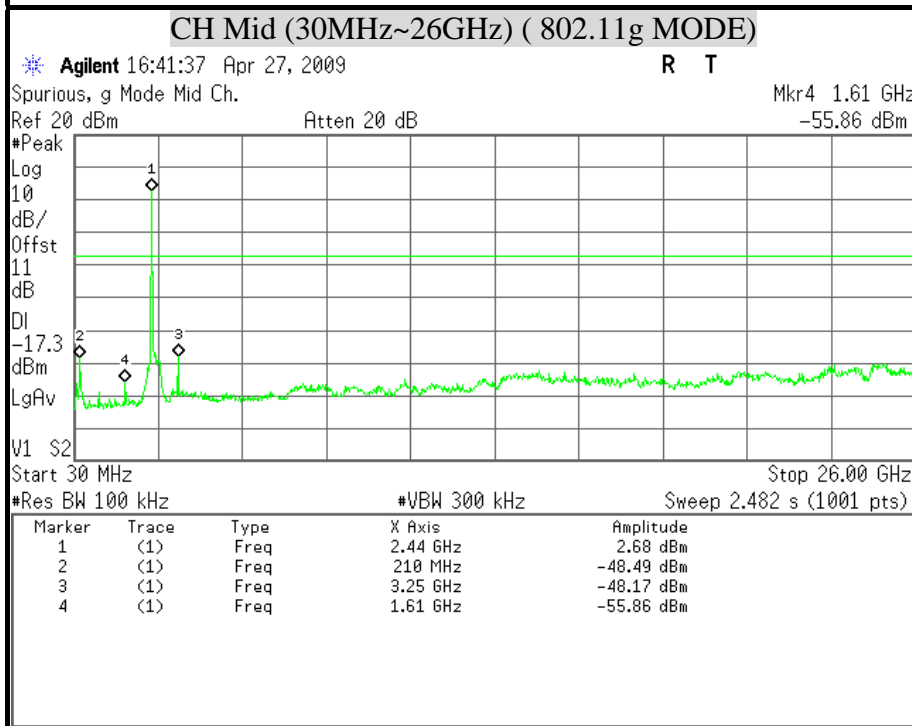
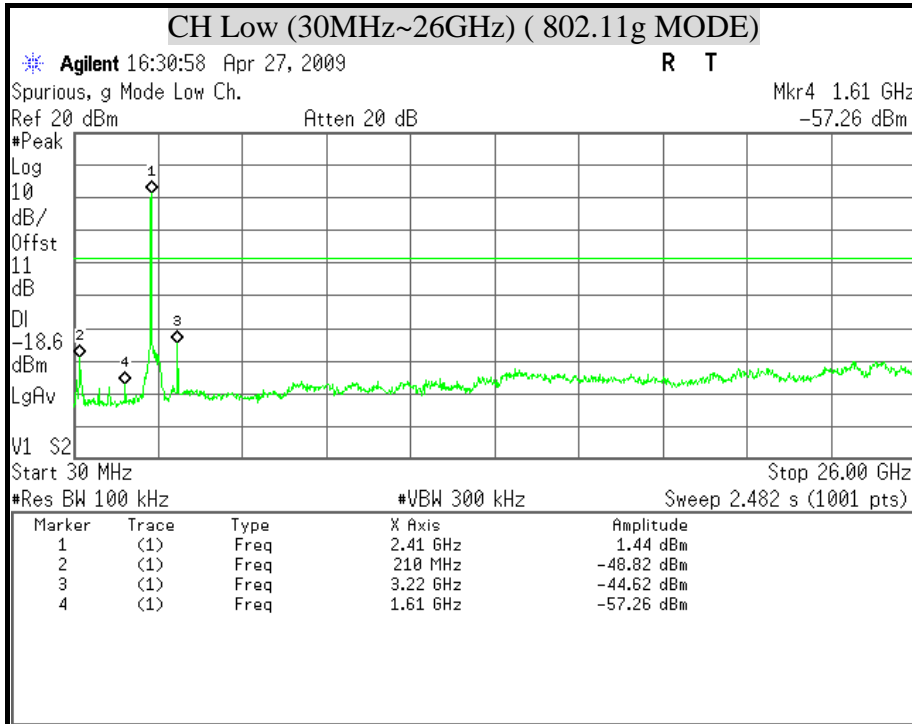
OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT (IEEE 802.11b MODE)

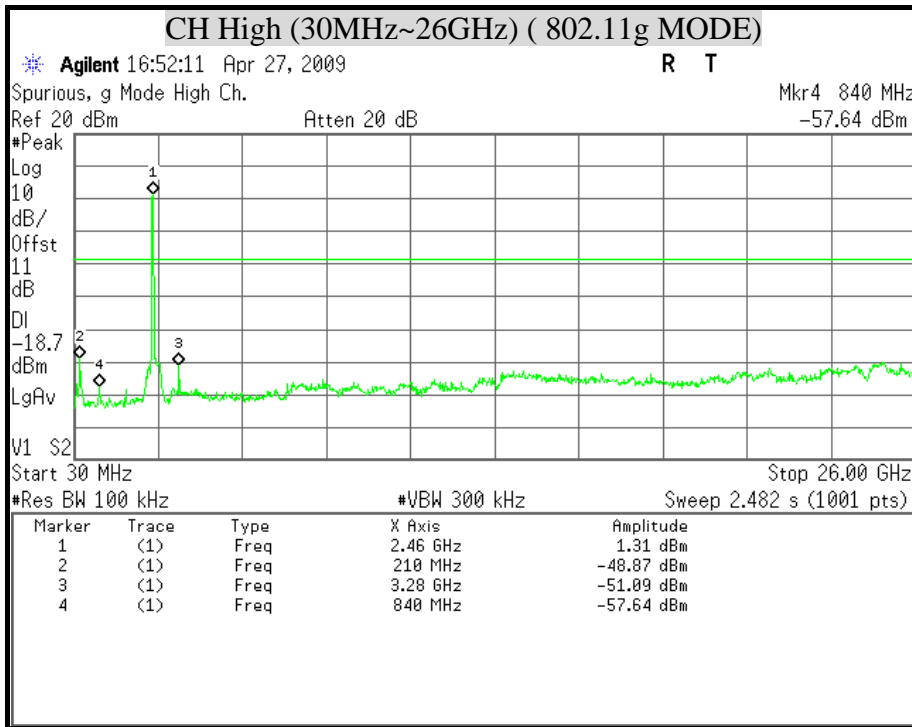






OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT (802.11g MODE)







8.8 RADIATED EMISSIONS

8.8.1 TRANSMITTER RADIATED SUPURIOUS EMSSIONS

LIMITS

§ 15.205 (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 - 3338	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

§ 15.205 (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.



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

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

** 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.

§ 15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST EQUIPMENT

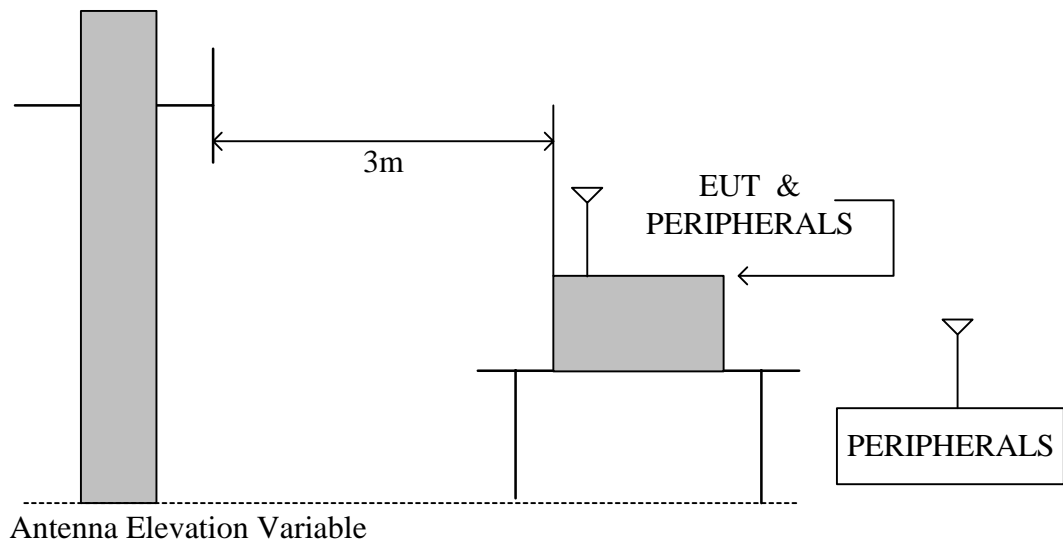
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
SPECTRUM ANALYZER	AGILENT	E4446A	MY43360132	06/05/2009
EMI TEST RECEIVER	R & S	ESCI	100221	05/20/2009
BILOG ANTENNA	SCHWARZBECK	VULB	9168_249	09/17/2009
HORN ANTENNA	ETS LINDGREN	3117	00078732	05/19/2009
PRE-AMPLIFIER	EM	EM30265	07032612	05/21/2009
Band Reject FILTER	Micro-Tronics	BRM50702-01	021	N.C.R.
RF COAXIAL CABLE	HUBERSUHNER	SUCOFLEX 104PEA	SN31350	07/21/2009
LOOP ANTENNA	EMCO	6502	2356	05/28/2010

Remark: 1. Each piece of equipment is scheduled for calibration once a year.

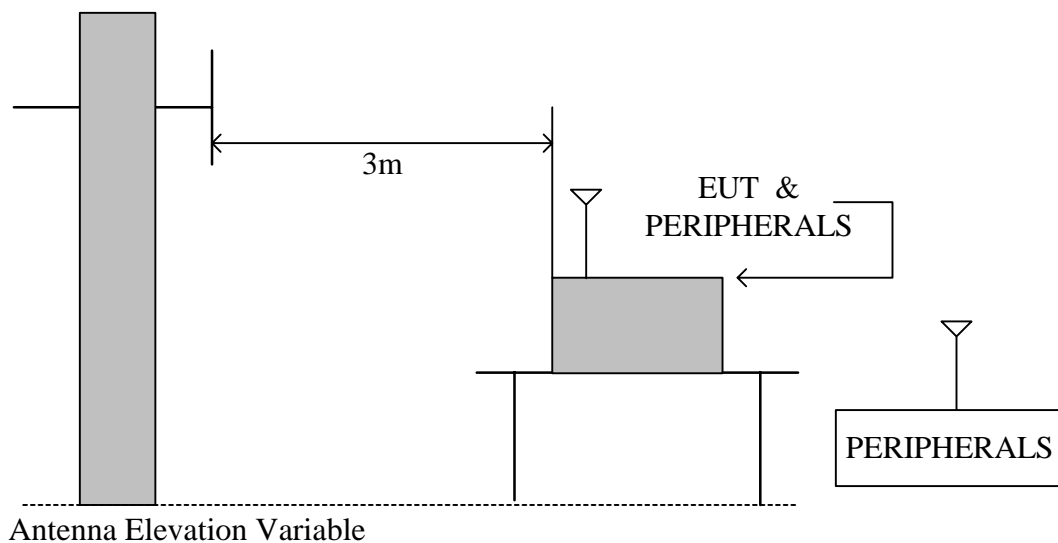
2. N.C.R = No Calibration Request.

TEST SETUP

The diagram below shows the test setup that is utilized to make the measurements for emission from below 1GHz.



The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.



**TEST PROCEDURE**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. While measuring the radiated emission below 1GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. While measuring the radiated emission above 1GHz, the EUT was set 3 meters away from the interference-receiving antenna
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarization of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Note :

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

TEST RESULTS

No non-compliance noted

**8.8.2 WORST-CASE RADIATED EMISSION BELOW 1 GHz****BELOW 1 GHz (9kHz ~ 30MHz)**

No emission found between lowest internal used/generated frequency to 30MHz.

BELOW 1 GHz (30MHz ~ 1GHz)

Product Name	802.11g ADSL2+ Firewall Router	Test Date	2009/04/24
Model	BiPAC 5200GRC	Test By	Vic Lin
Test Mode	Normal operating	TEMP & Humidity	24.5°C, 63%

Horizontal						
Frequency (MHz)	Reading (dBμV)	Correction Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
166.77	65.92	-31.08	34.84	43.50	-8.66	Peak
266.68	72.62	-29.32	43.30	46.00	-2.70	Peak
375.32	64.87	-27.33	37.54	46.00	-8.46	Peak
433.52	65.53	-26.29	39.24	46.00	-6.76	Peak
466.50	66.19	-25.71	40.48	46.00	-5.52	Peak
533.43	64.59	-24.59	40.00	46.00	-6.00	Peak
666.32	63.66	-22.40	41.26	46.00	-4.74	Peak
800.18	57.56	-20.33	37.23	46.00	-8.77	Peak
867.11	57.00	-19.51	37.48	46.00	-8.52	Peak
933.07	55.42	-18.71	36.71	46.00	-9.29	Peak
Vertical						
Frequency (MHz)	Reading (dBμV)	Correction Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
77.53	73.11	-35.40	37.70	40.00	-2.30	Peak
141.55	67.64	-31.53	36.11	43.50	-7.39	Peak
166.77	64.21	-31.08	33.13	43.50	-10.37	Peak
188.11	67.43	-32.59	34.84	43.50	-8.66	Peak
375.32	63.00	-27.33	35.67	46.00	-10.33	Peak
533.43	61.08	-24.59	36.49	46.00	-9.51	Peak
666.32	58.77	-22.40	36.37	46.00	-9.63	Peak
800.18	56.92	-20.33	36.59	46.00	-9.41	Peak
867.11	57.43	-19.51	37.91	46.00	-8.09	Peak
933.07	52.93	-18.71	34.22	46.00	-11.78	Peak

Remark:

1. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit.
2. 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.
3. Margin (dB) = Remark result (dBuV/m) - Quasi-peak limit (dBuV/m).

**8.8.3 TRANSMITTER RADIATED EMISSION ABOVE 1 GHz**

Product Name	802.11g ADSL2+ Firewall Router	Test Date	2009/04/25
Model	BiPAC 5200GRC	Test By	Rueyyan Lin
Test Mode	IEEE 802.11b TX (CH Low)	TEMP & Humidity	24.5°C, 51%

Horizontal									
Frequency (MHz)	Reading-PK (dBμV)	Reading-AV (dBμV)	Correction Factor (dB/m)	Result-PK (dBμV/m)	Result-AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-AV (dBμV/m)	Margin (dB)	Remark
1204.00	61.76	---	-14.25	47.51	---	74.00	54.00	-6.49	Peak
1467.50	56.90	---	-13.62	43.28	---	74.00	54.00	-10.72	Peak
2412.00	112.24	104.06	-8.95	103.29	95.11	---	---	---	Carrier
3218.50	55.96	---	-7.79	48.17	---	74.00	54.00	-5.83	Peak
4825.00	53.04	---	-4.55	48.48	---	74.00	54.00	-5.52	Peak
6431.50	59.78	57.55	-2.26	57.52	55.29	83.29	75.11	-19.82	20dBc AVG Fundamental
7239.00	55.28	44.63	-0.89	54.39	43.74	74.00	54.00	-10.26	AVG
Vertical									
Frequency (MHz)	Reading-PK (dBμV)	Reading-AV (dBμV)	Correction Factor (dB/m)	Result-PK (dBμV/m)	Result-AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-AV (dBμV/m)	Margin (dB)	Remark
1204.00	61.52	---	-14.25	47.27	---	74.00	54.00	-6.73	Peak
1467.50	57.75	---	-13.62	44.13	---	74.00	54.00	-9.87	Peak
2412.00	122.34	113.21	-8.95	113.39	104.26	---	---	---	Carrier
3218.50	57.68	---	-7.79	49.89	---	74.00	54.00	-4.11	Peak
4825.00	57.90	45.30	-4.55	53.35	40.75	74.00	54.00	-0.65	Peak
6431.50	64.10	62.75	-2.26	61.84	60.49	92.39	84.26	-23.77	20dBc AVG Fundamental
7239.00	61.71	52.49	-0.89	60.82	51.60	74.00	54.00	-2.40	AVG

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. 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.
3. 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.
4. 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.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	802.11g ADSL2+ Firewall Router	Test Date	2009/04/25
Model	BiPAC 5200GRC	Test By	Rueyyan Lin
Test Mode	IEEE 802.11b TX (CH Middle)	TEMP & Humidity	24.5°C, 51%

Horizontal									
Frequency (MHz)	Reading-PK (dBμV)	Reading-AV (dBμV)	Correction Factor (dB/m)	Result-PK (dBμV/m)	Result-AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-AV (dBμV/m)	Margin (dB)	Remark
1204.00	60.68	---	-14.25	46.43	---	74.00	54.00	-7.57	Peak
1467.50	56.97	---	-13.62	43.35	---	74.00	54.00	-10.65	Peak
2437.00	114.20	106.63	-8.92	105.28	97.71	---	---	---	Carrier
3252.50	54.69	---	-7.74	46.95	---	74.00	54.00	-7.05	Peak
4876.00	54.18	---	-4.42	49.76	---	74.00	54.00	-4.24	Peak
6499.50	60.16	57.96	-2.19	57.97	55.77	85.28	77.71	-21.94	20dBc AVG Fundamental
7315.50	52.32	---	-0.83	51.49	---	74.00	54.00	-2.51	Peak
Vertical									
Frequency (MHz)	Reading-PK (dBμV)	Reading-AV (dBμV)	Correction Factor (dB/m)	Result-PK (dBμV/m)	Result-AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-AV (dBμV/m)	Margin (dB)	Remark
1195.50	61.39	---	-14.27	47.12	---	74.00	54.00	-6.88	Peak
1467.50	57.03	---	-13.62	43.41	---	74.00	54.00	-10.59	Peak
2437.00	121.38	114.00	-8.92	112.46	105.08	---	---	---	Carrier
3252.50	55.62	---	-7.74	47.88	---	74.00	54.00	-6.12	Peak
4876.00	54.23	---	-4.42	49.81	---	74.00	54.00	-4.19	Peak
6499.50	63.75	62.40	-2.19	61.56	60.21	92.46	85.08	-24.87	20dBc AVG Fundamental
7307.00	62.56	53.42	-0.84	61.72	52.58	74.00	54.00	-1.42	AVG

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. 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.
3. 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.
4. 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.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	802.11g ADSL2+ Firewall Router	Test Date	2009/04/25
Model	BiPAC 5200GRC	Test By	Rueyyan Lin
Test Mode	IEEE 802.11b TX (CH High)	TEMP & Humidity	24.5°C, 51%

Horizontal									
Frequency (MHz)	Reading-PK (dBμV)	Reading-AV (dBμV)	Correction Factor (dB/m)	Result-PK (dBμV/m)	Result-AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-AV (dBμV/m)	Margin (dB)	Remark
1204.00	61.06	---	-14.25	46.81	---	74.00	54.00	-7.19	Peak
1467.50	57.52	---	-13.62	43.90	---	74.00	54.00	-10.10	Peak
2462.00	109.49	102.17	-8.89	100.60	93.28	---	---	---	Carrier
3286.50	54.56	---	-7.69	46.87	---	74.00	54.00	-7.13	Peak
4927.00	52.43	---	-4.29	48.14	---	74.00	54.00	-5.86	Peak
6567.50	60.55	57.98	-2.03	58.52	55.95	80.60	73.28	-17.33	20dBc AVG Fundamental
7383.50	50.21	---	-0.78	49.43	---	74.00	54.00	-4.57	Peak
Vertical									
Frequency (MHz)	Reading-PK (dBμV)	Reading-AV (dBμV)	Correction Factor (dB/m)	Result-PK (dBμV/m)	Result-AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-AV (dBμV/m)	Margin (dB)	Remark
1204.00	61.06	---	-14.25	46.81	---	74.00	54.00	-7.19	Peak
1467.50	55.87	---	-13.62	42.24	---	74.00	54.00	-11.76	Peak
2462.00	119.91	112.23	-8.89	111.02	103.34	---	---	---	Carrier
3286.50	54.86	---	-7.69	47.17	---	74.00	54.00	-6.83	Peak
4927.00	54.30	---	-4.29	50.01	---	74.00	54.00	-3.99	Peak
6567.50	64.02	62.65	-2.03	61.99	60.62	91.02	83.34	-22.72	20dBc AVG Fundamental

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. 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.
3. 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.
4. 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.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	802.11g ADSL2+ Firewall Router	Test Date	2009/04/25
Model	BiPAC 5200GRC	Test By	Rueyyan Lin
Test Mode	IEEE 802.11g TX (CH Low)	TEMP & Humidity	24.5°C, 51%

Horizontal									
Frequency (MHz)	Reading-PK (dBμV)	Reading-AV (dBμV)	Correction Factor (dB/m)	Result-PK (dBμV/m)	Result-AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-AV (dBμV/m)	Margin (dB)	Remark
1204.00	61.57	---	-14.25	47.32	---	74.00	54.00	-6.68	Peak
1467.50	57.33	---	-13.62	43.71	---	74.00	54.00	-10.29	Peak
2412.00	110.52	100.87	-8.95	101.57	91.92	---	---	---	Carrier
3218.50	54.96	---	-7.79	47.17	---	74.00	54.00	-6.83	Peak
6431.50	60.02	57.60	-2.26	57.76	55.34	81.57	71.92	-16.58	20dBc AVG Fundamental
7230.50	51.88	---	-0.89	50.98	---	74.00	54.00	-3.02	Peak
Vertical									
Frequency (MHz)	Reading-PK (dBμV)	Reading-AV (dBμV)	Correction Factor (dB/m)	Result-PK (dBμV/m)	Result-AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-AV (dBμV/m)	Margin (dB)	Remark
1204.00	61.45	---	-14.25	47.20	---	74.00	54.00	-6.80	Peak
1467.50	57.30	---	-13.62	43.68	---	74.00	54.00	-10.32	Peak
2412.00	121.07	110.49	-8.95	112.12	101.54	---	---	---	Carrier
3218.50	58.51	---	-7.79	50.72	---	74.00	54.00	-3.28	Peak
4808.00	51.87	---	-4.60	47.28	---	74.00	54.00	-6.72	Peak
5573.00	51.98	---	-3.21	48.78	---	74.00	54.00	-5.22	Peak
6431.50	64.08	62.48	-2.26	61.82	60.22	92.12	81.54	-21.32	20dBc AVG Fundamental
7247.50	64.31	46.65	-0.88	63.43	45.77	74.00	54.00	-8.23	AVG

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. 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.
3. 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.
4. 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.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	802.11g ADSL2+ Firewall Router	Test Date	2009/04/25
Model	BiPAC 5200GRC	Test By	Rueyyan Lin
Test Mode	IEEE 802.11g TX (CH Middle)	TEMP & Humidity	24.5°C, 51%

Horizontal									
Frequency (MHz)	Reading-PK (dBμV)	Reading-AV (dBμV)	Correction Factor (dB/m)	Result-PK (dBμV/m)	Result-AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-AV (dBμV/m)	Margin (dB)	Remark
1204.00	61.03	---	-14.25	46.78	---	74.00	54.00	-7.22	Peak
1467.50	56.63	---	-13.62	43.01	---	74.00	54.00	-10.99	Peak
2437.00	111.17	101.59	-8.92	102.25	92.67	---	---	---	Carrier
3252.50	54.32	---	-7.74	46.58	---	74.00	54.00	-7.42	Peak
6499.50	60.09	58.07	-2.19	57.90	55.88	82.25	72.67	-16.79	20dBc AVG Fundamental
7324.00	51.17	---	-0.83	50.34	---	74.00	54.00	-3.66	Peak
Vertical									
Frequency (MHz)	Reading-PK (dBμV)	Reading-AV (dBμV)	Correction Factor (dB/m)	Result-PK (dBμV/m)	Result-AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-AV (dBμV/m)	Margin (dB)	Remark
1195.50	60.81	---	-14.27	46.54	---	74.00	54.00	-7.46	Peak
1467.50	57.09	---	-13.62	43.46	---	74.00	54.00	-10.54	Peak
2437.00	121.03	111.34	-8.92	112.11	102.42	---	---	---	Carrier
3252.50	55.63	---	-7.74	47.89	---	74.00	54.00	-6.11	Peak
4876.00	53.48	---	-4.42	49.05	---	74.00	54.00	-4.95	Peak
6499.50	63.76	62.14	-2.19	61.57	59.95	92.11	82.42	-22.47	20dBc AVG Fundamental
7315.50	65.02	47.25	-0.83	64.19	46.42	74.00	54.00	-7.58	AVG

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. 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.
3. 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.
4. 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.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	802.11g ADSL2+ Firewall Router	Test Date	2009/04/25
Model	BiPAC 5200GRC	Test By	Rueyyan Lin
Test Mode	IEEE 802.11g TX (CH High)	TEMP & Humidity	24.5°C, 51%

Horizontal									
Frequency (MHz)	Reading-PK (dBμV)	Reading-AV (dBμV)	Correction Factor (dB/m)	Result-PK (dBμV/m)	Result-AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-AV (dBμV/m)	Margin (dB)	Remark
1204.00	61.23	---	-14.25	46.98	---	74.00	54.00	-7.02	Peak
1467.50	56.34	---	-13.62	42.72	---	74.00	54.00	-11.28	Peak
2462.00	108.93	98.68	-8.89	100.04	89.79	---	---	---	Carrier
3286.50	53.86	---	-7.69	46.17	---	74.00	54.00	-7.83	Peak
6567.50	60.23	57.88	-2.03	58.20	55.85	80.04	69.79	-13.94	20dBc AVG Fundamental
Vertical									
Frequency (MHz)	Reading-PK (dBμV)	Reading-AV (dBμV)	Correction Factor (dB/m)	Result-PK (dBμV/m)	Result-AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-AV (dBμV/m)	Margin (dB)	Remark
1204.00	61.04	---	-14.25	46.79	---	74.00	54.00	-7.21	Peak
1331.50	56.15	---	-13.95	42.21	---	74.00	54.00	-11.79	Peak
1467.50	57.12	---	-13.62	43.50	---	74.00	54.00	-10.50	Peak
2232.50	54.27	---	-9.15	45.12	---	74.00	54.00	-8.88	Peak
2462.00	121.21	110.78	-8.89	112.32	101.89	---	---	---	Carrier
3286.50	53.89	---	-7.69	46.20	---	74.00	54.00	-7.80	Peak
4918.50	51.99	---	-4.31	47.68	---	74.00	54.00	-6.32	Peak
6567.50	64.04	62.74	-2.03	62.01	60.71	92.32	81.89	-21.18	20dBc AVG Fundamental
7383.50	52.66	---	-0.78	51.87	---	74.00	54.00	-2.13	Peak

Remark:

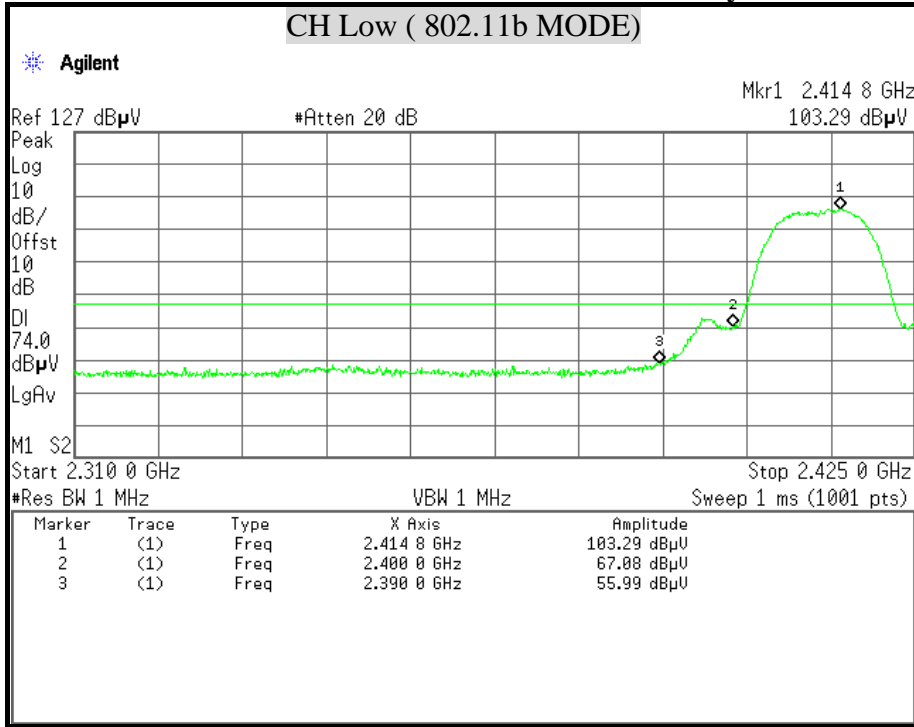
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
3. 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.
4. 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.
5. Result = Reading + Correction Factor
Margin = Result – Limit
Remark Peak = Result(PK) – Limit(AV)
Remark AVG = Result(AV) – Limit(AV)



8.8.4 RESTRICTED BAND EDGES

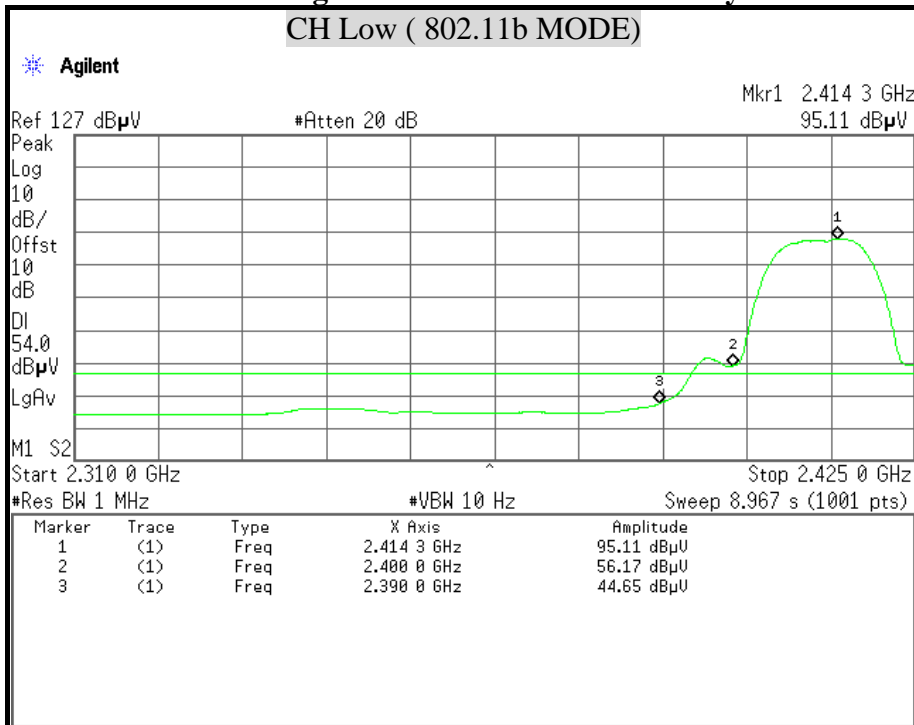
Detector mode : Peak

Polarity : Horizontal



Detector mode : Average

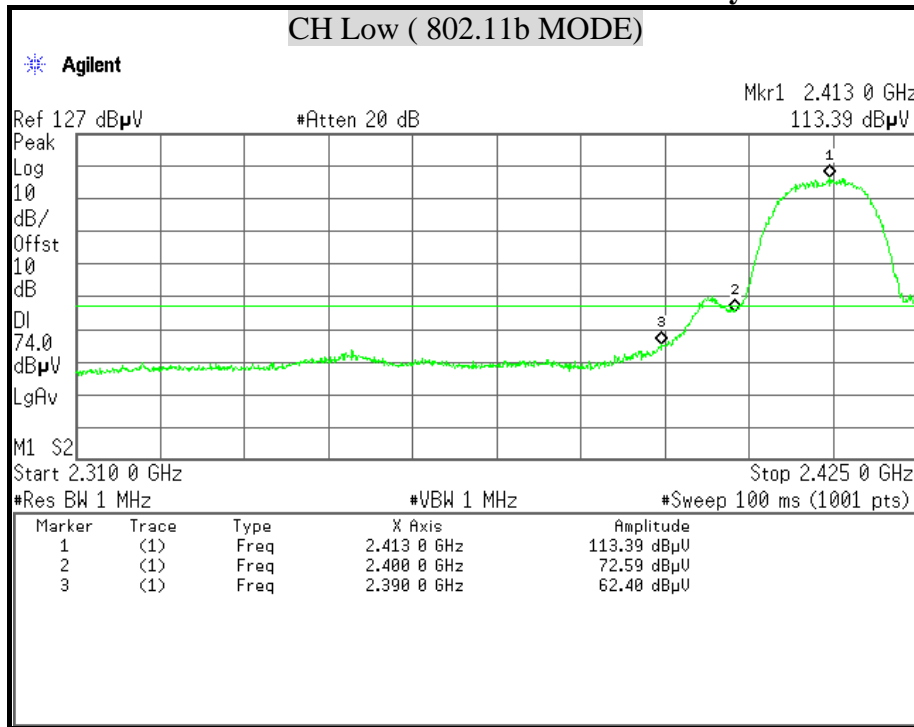
Polarity : Horizontal





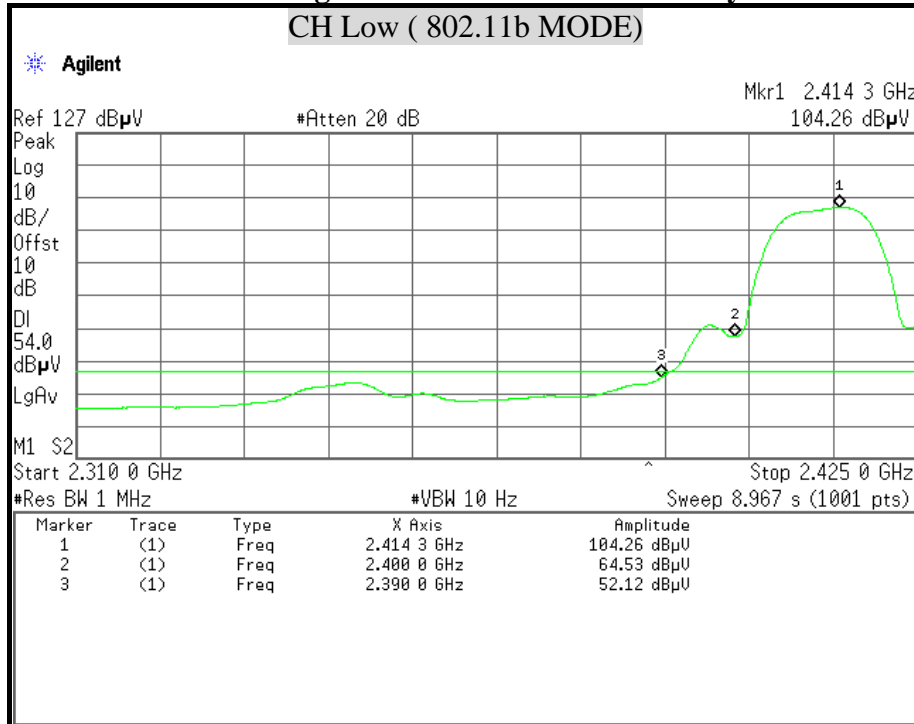
Detector mode : Peak

Polarity : Vertical



Detector mode : Average

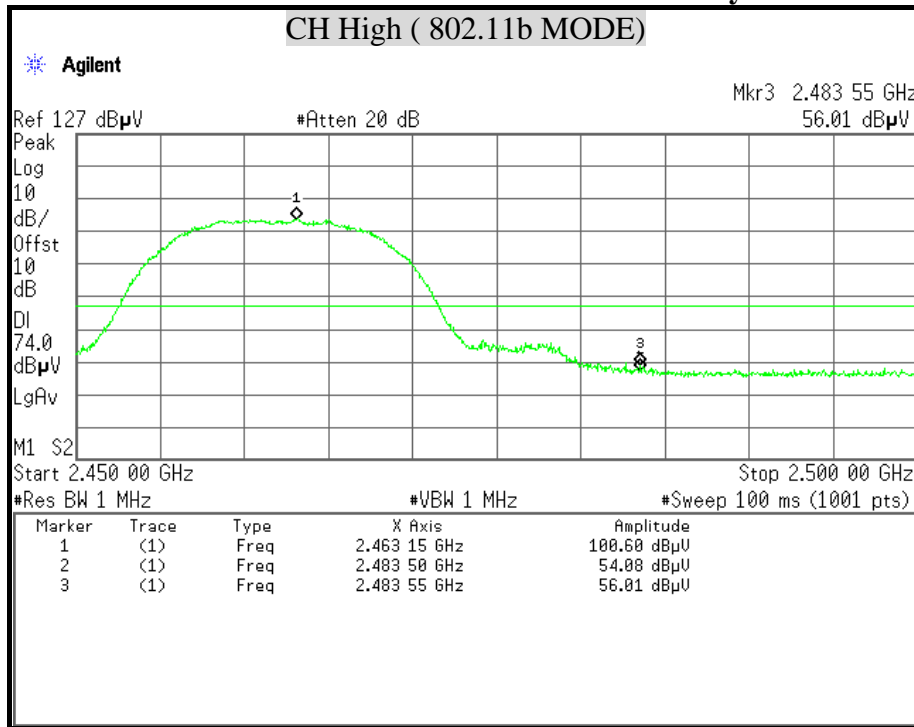
Polarity : Vertical





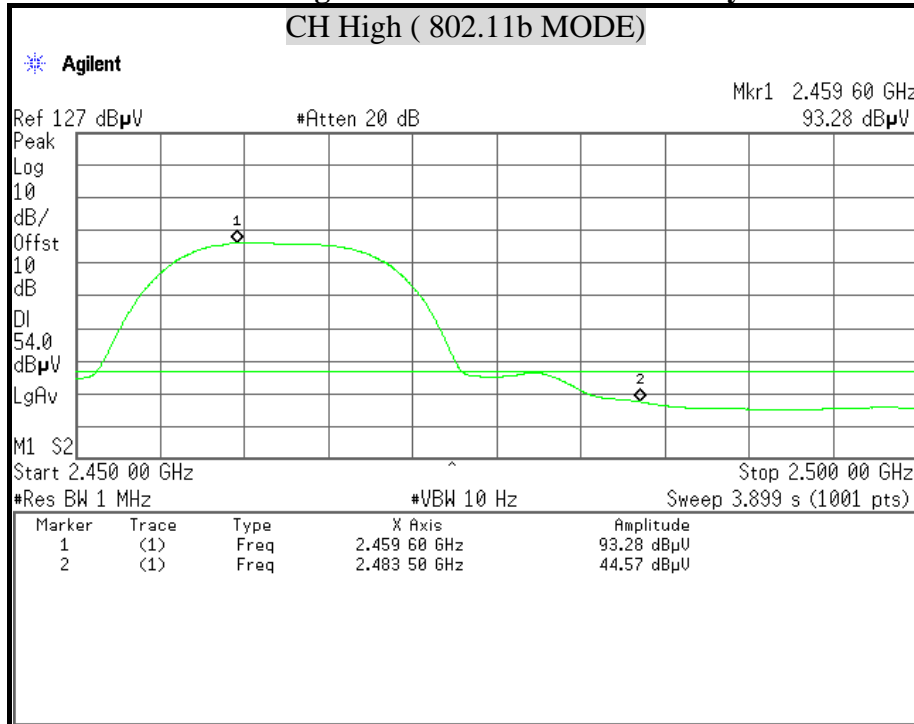
Detector mode : Peak

Polarity : Horizontal



Detector mode : Average

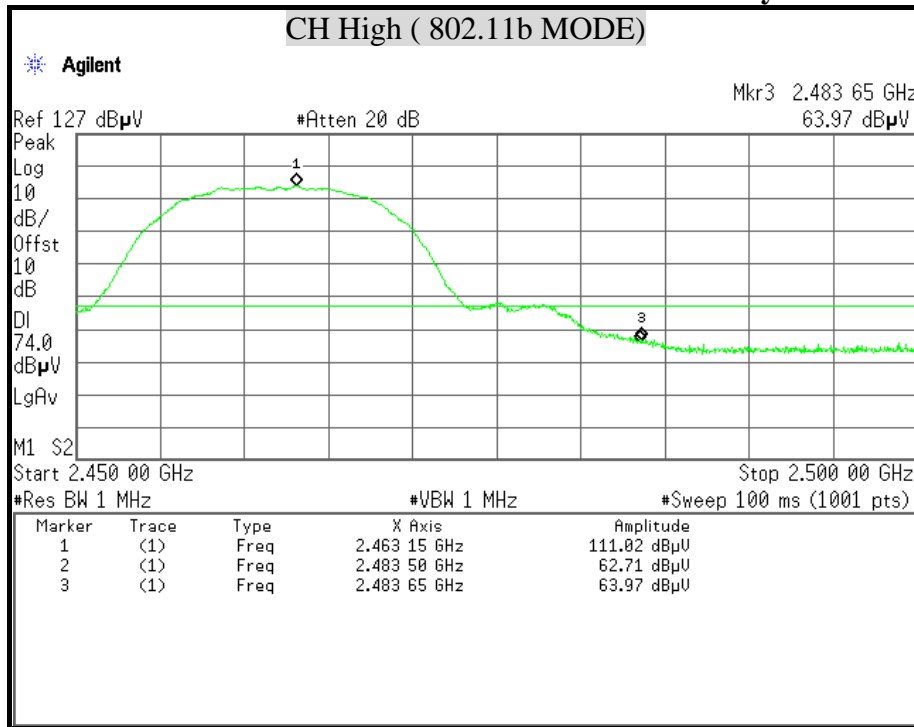
Polarity : Horizontal





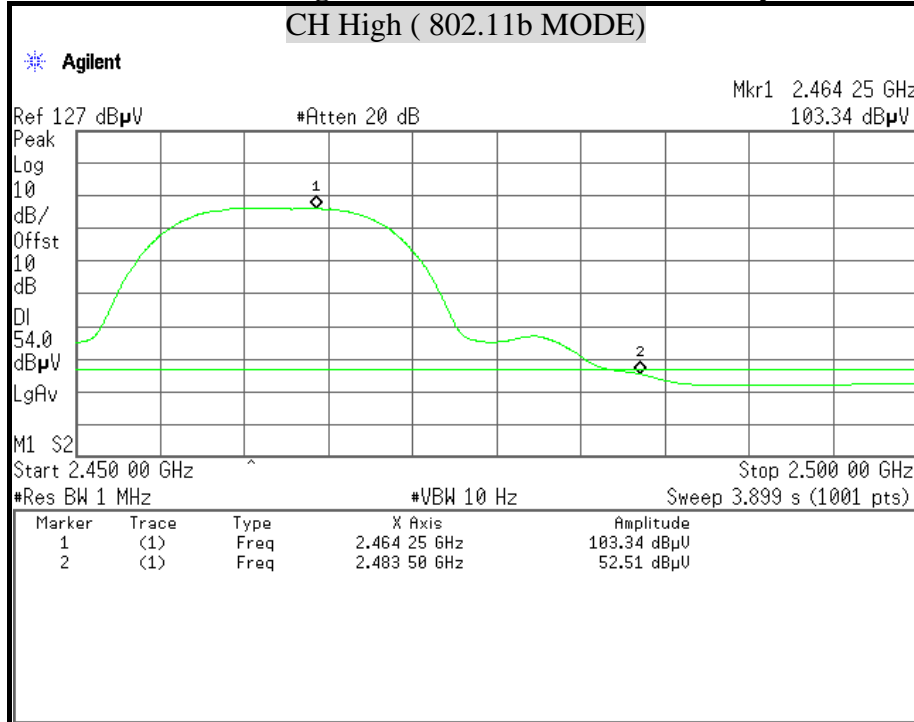
Detector mode : Peak

Polarity : Vertical



Detector mode : Average

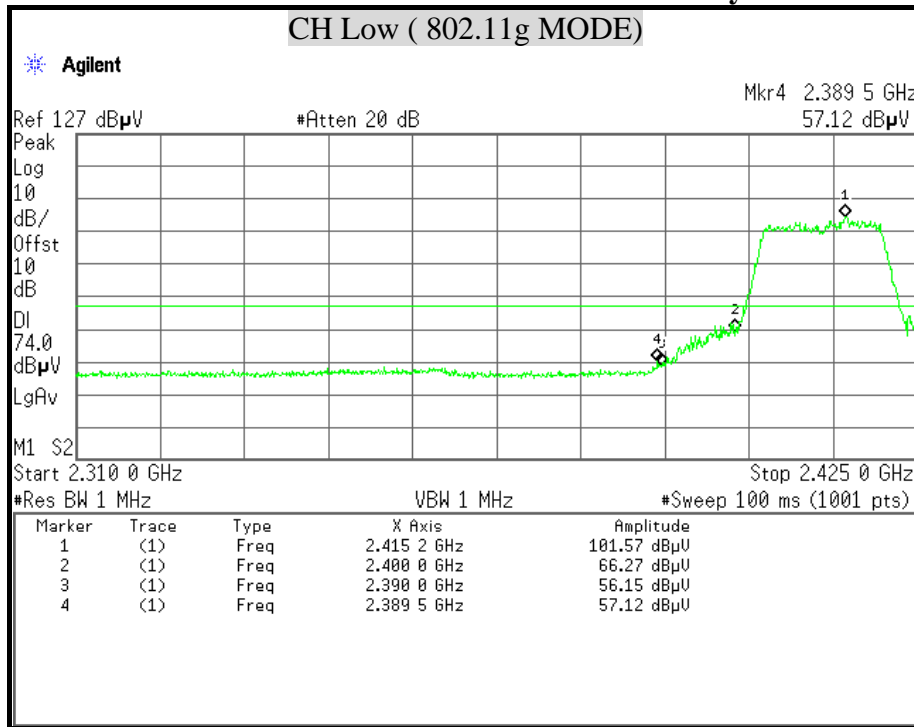
Polarity : Vertical





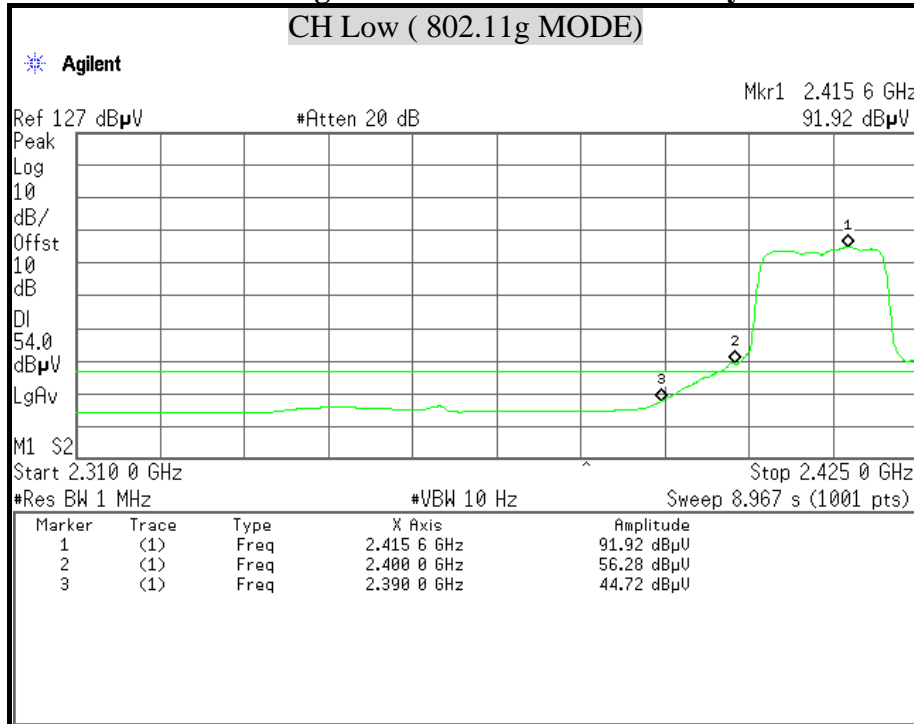
Detector mode : Peak

Polarity : Horizontal



Detector mode : Average

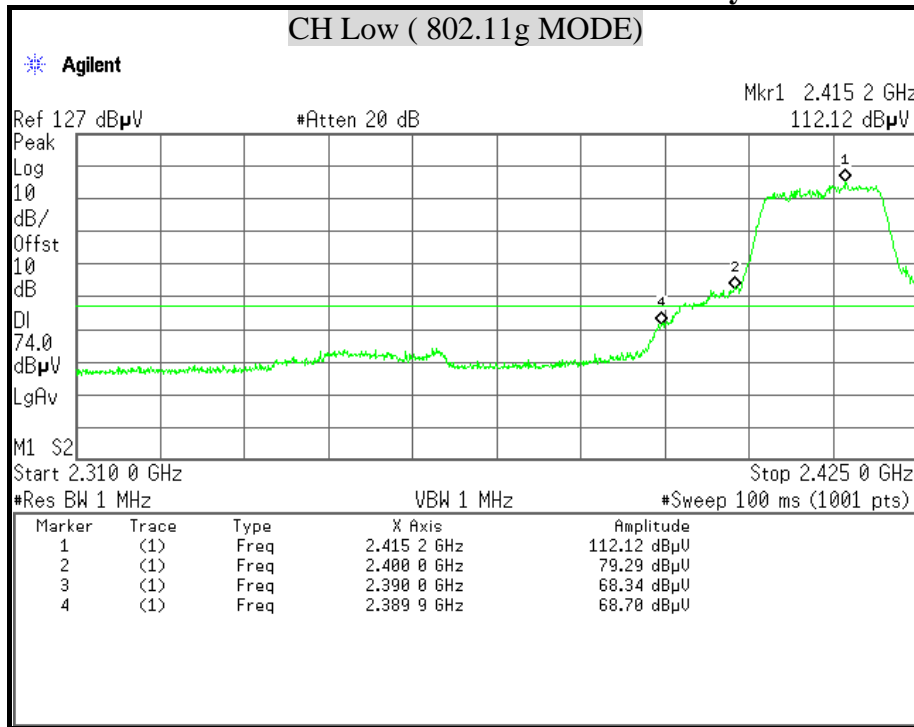
Polarity : Horizontal





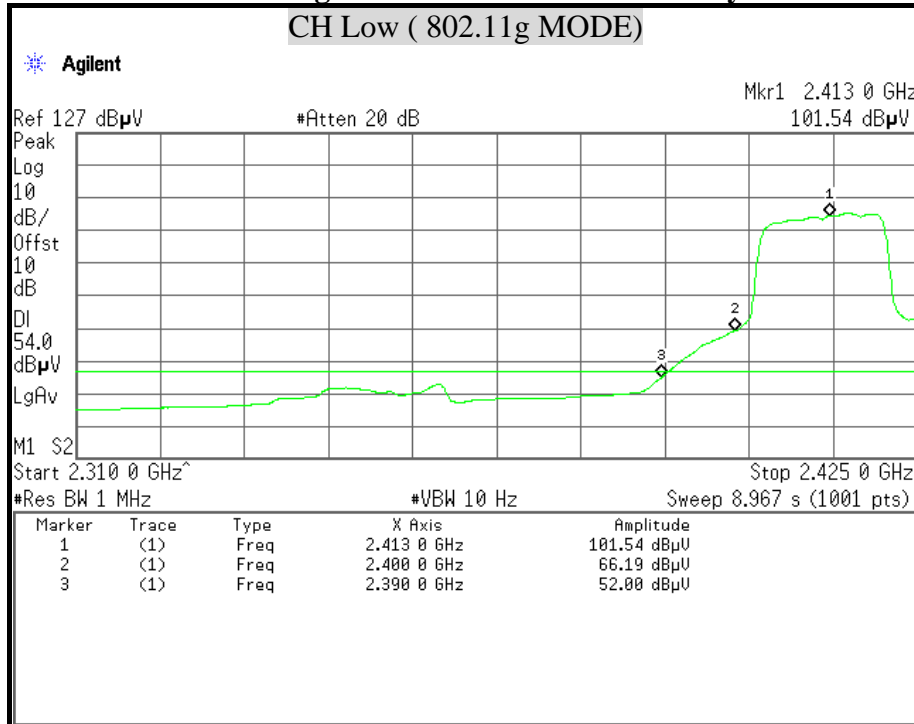
Detector mode : Peak

Polarity : Vertical



Detector mode : Average

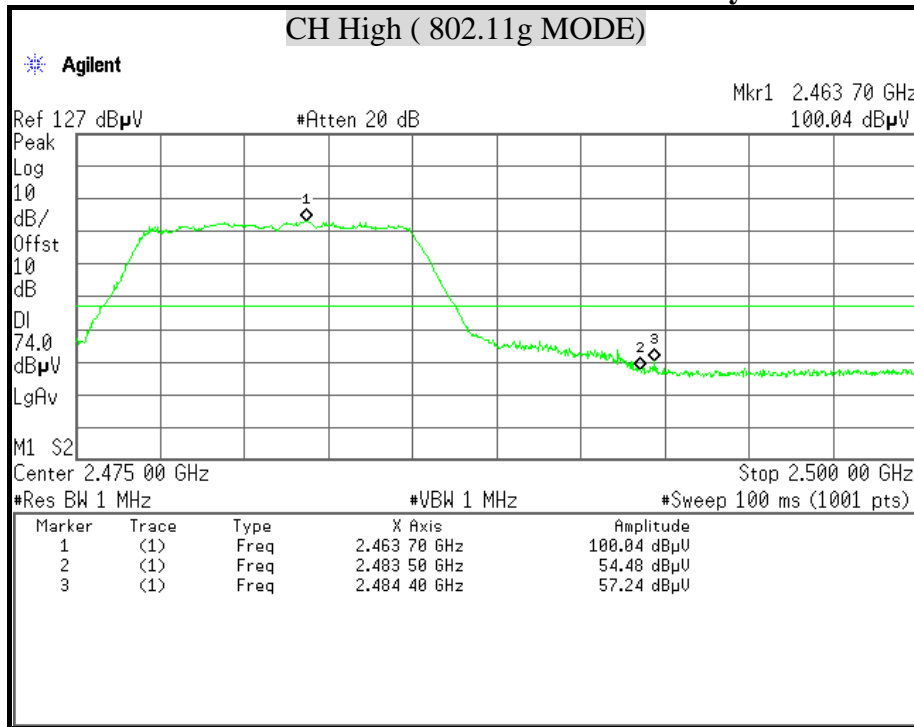
Polarity : Vertical





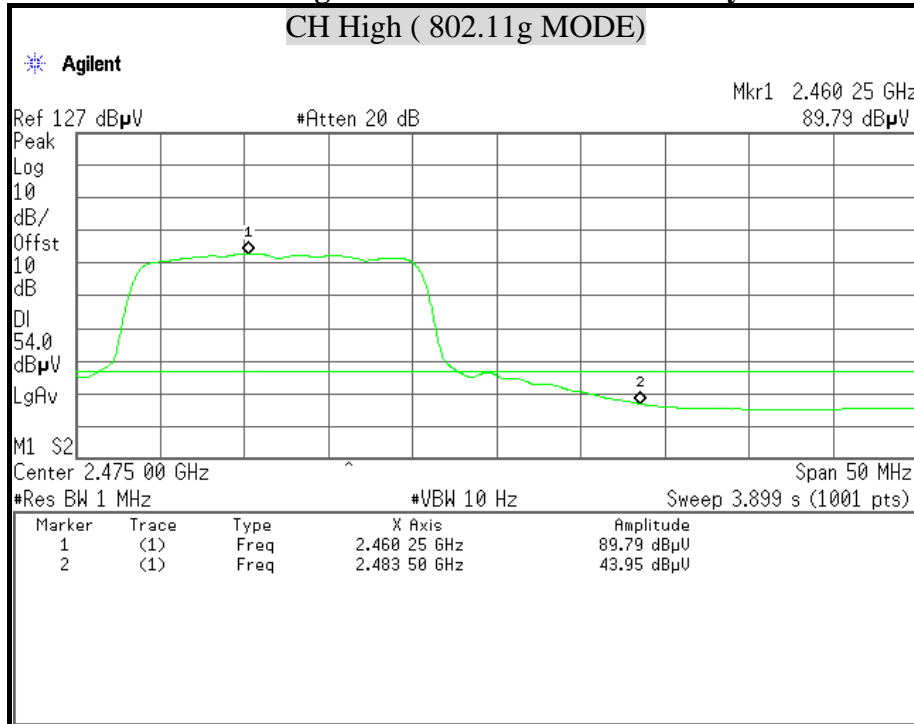
Detector mode : Peak

Polarity : Horizontal



Detector mode : Average

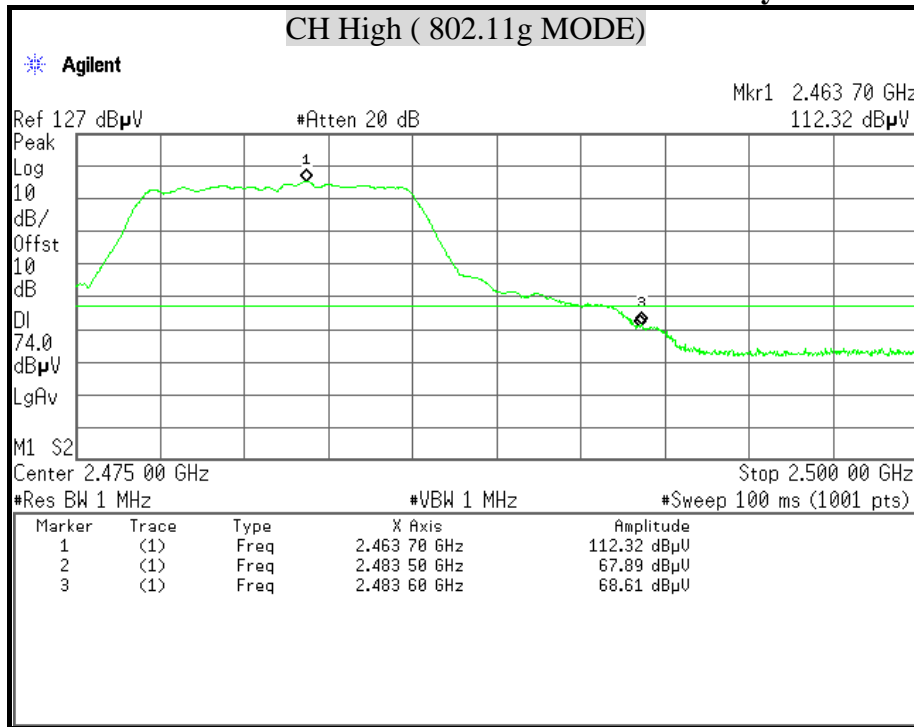
Polarity : Horizontal





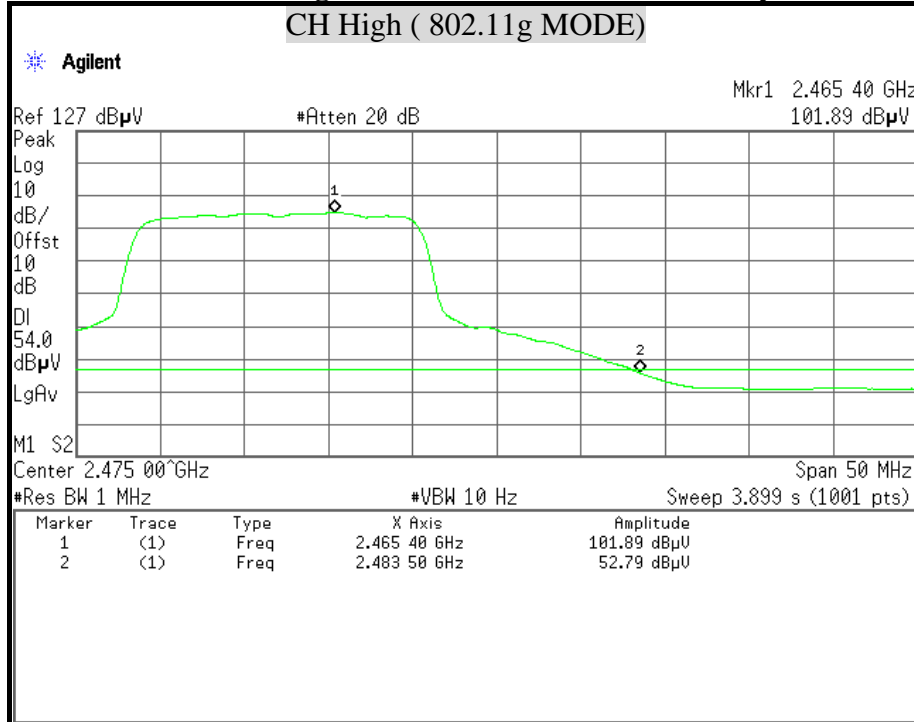
Detector mode : Peak

Polarity : Vertical



Detector mode : Average

Polarity : Vertical





8.9 POWERLINE CONDUCTED EMISSIONS

LIMITS

§ 15.207 (a) Except as shown in paragraph (b) and (c) 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 μ H/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 of Emission (MHz)	Conducted limit (dB μ v)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.5 - 5	56	46
5 - 30	60	50

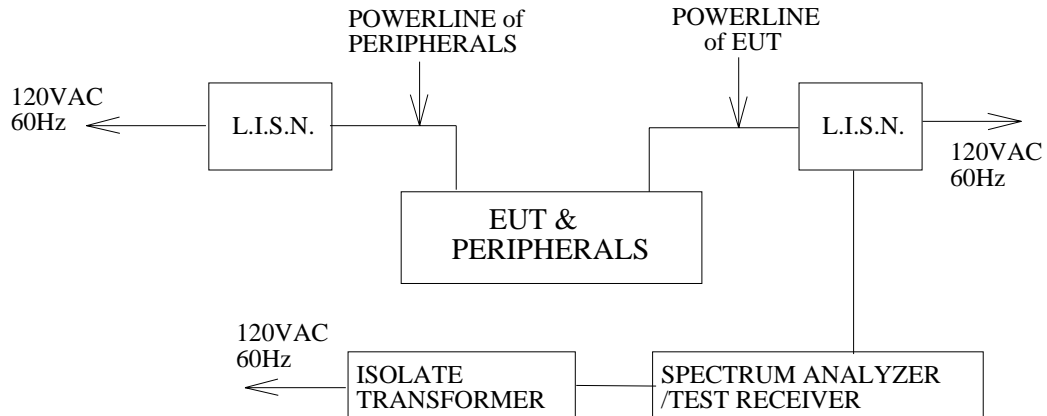
TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
L.I.S.N	SCHWARZBECK	NSLK 8127	8127-465	08/13/2009
L.I.S.N	SCHWARZBECK	NSLK 8127	8127-473	10/12/2009
TEST RECEIVER	R & S	ESHS30	838550/003	02/02/2010
PULSE LIMIT	R & S	ESH3-Z2	100117	09/23/2009
N TYPE COAXIAL CABLE	BELDEN	8268 M17/164	003	09/13/2009

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



TEST SETUP



TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80cm above the horizontal ground plane. The EUT IS CONFIGURED IN ACCORDANCE WITH ANSI C63.4:2003.

The resolution bandwidth is set to 9 kHz for both quasi-peak detection and average detection measurements.

Line conducted data is recorded for both NEUTRAL and LINE.

TEST RESULTS

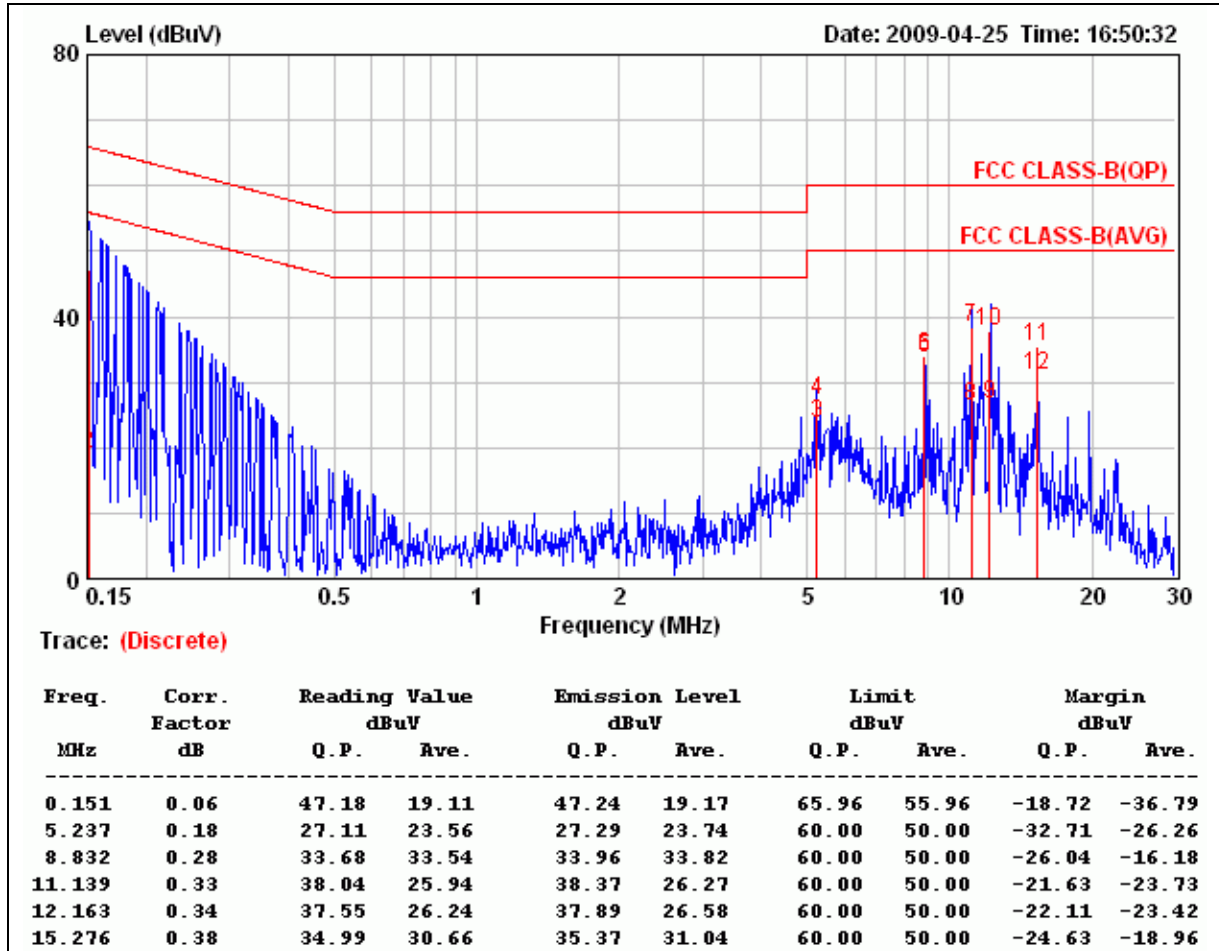
No non-compliance noted



CONDUCTED RF VOLTAGE MEASUREMENT

Product Name	802.11g ADSL2+ Firewall Router	Test Date	2009/04/25
Model Name	BiPAC 5200GRC	Test By	Vic Lin
Test Mode	Normal operating	TEMP & Humidity	25.3°C, 51%

LINE



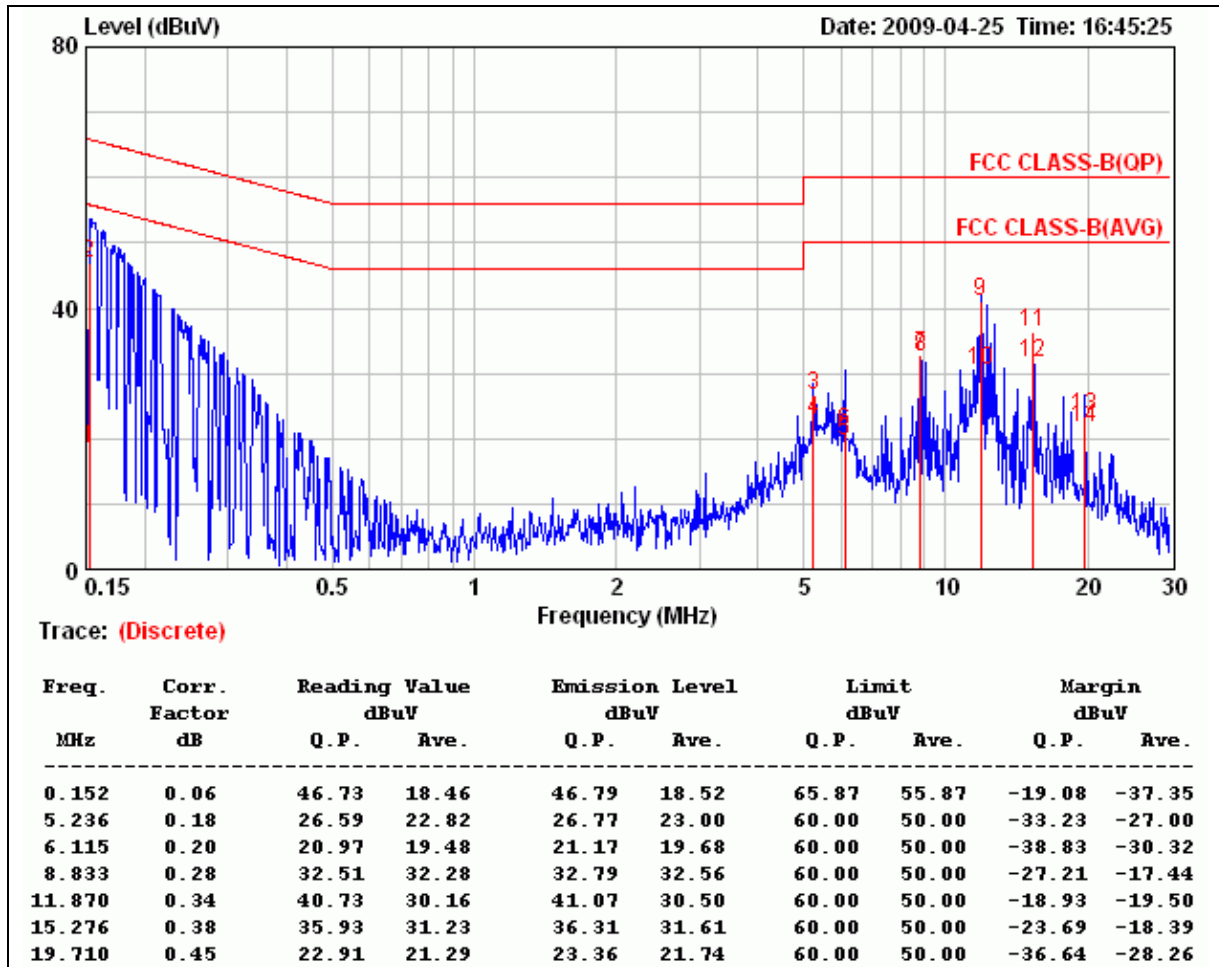
Remark:

1. Correction Factor = Insertion loss + cable loss
2. Margin value = Emission level – Limit value



Product Name	802.11g ADSL2+ Firewall Router	Test Date	2009/04/25
Model Name	BiPAC 5200GRC	Test By	Vic Lin
Test Mode	Normal operating	TEMP & Humidity	25.3°C, 51%

NEUTRAL



Remark:

1. Correction Factor = Insertion loss + cable loss
2. Margin value = Emission level – Limit value