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

TEST REPORT

For

(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router

Model : BiPAC 7404VGOX

Data Applies To : BiPAC 7404VGPX；BiPAC 6404VGOX；BiPAC 6404VGPX；BiPAC 7401VGOX；BiPAC 7401VGPX；BiPAC6401VGOX；BiPAC 6401VGPX；BiPAC 7404VGOR3；BiPAC 7404VGPR3；BiPAC 6404VGOR3；BiPAC 6404VGPR3；BiPAC 7401VGOR3；BiPAC 7401VGPR3；BiPAC 6401VGOR3；BiPAC 6401VGPR3

Trade Name : BILLION、BEC

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

Compliance Certification Services Inc.
Hsinchu Lab.
Rm. 258, Bldg. 17, NO.195, Sec.4 Chung HsingRd.,

ChuTung Chen, Hsinchu, Taiwan 310, R.O.C
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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	06/03/2008	Initial Issue	All Page 75	Jason Chang

TABLE OF CONTENTS

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	：(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router
Model	：BiPAC 7404VGOX
Data Applies To	：BiPAC 7404VGPX；BiPAC 6404VGOX；BiPAC 6404VGPX；BiPAC 7401VGOX；BiPAC 7401VGPX；BiPAC6401VGOX；BiPAC 6401VGPX；BiPAC 7404VGOR3；BiPAC 7404VGPR3；BiPAC 6404VGOR3；BiPAC 6404VGPR3；BiPAC 7401VGOR3；BiPAC 7401VGPR3；BiPAC 6401VGOR3；BiPAC 6401VGPR3
Trade Name	：BILLION、BEC
Tested Date	：April 10 ~ August 30, 2008

APPLICABLE STANDARD	
STANDARD	**TEST RESULT**
FCC Part 15 Subpart C AND ANSI C63.4:2003	No non-compliance noted

Approved by: ***Reviewed by:***

Jason Chang
Team Leader of Hsinchu Laboratory
Compliance Certification Services Inc.

Alan Fan
Team Leader of Hsinchu Laboratory
Compliance Certification Services Inc.

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	(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router
Model Number	BiPAC 7404VGOX
Data Applies To	BiPAC 7404VGPX；BiPAC 6404VGOX；BiPAC 6404VGPX；BiPAC 7401VGOX；BiPAC 7401VGPX；BiPAC6401VGOX；BiPAC 6401VGPX；BiPAC 7404VGOR3；BiPAC 7404VGPR3；BiPAC 6404VGOR3；BiPAC 6404VGPR3；BiPAC 7401VGOR3；BiPAC 7401VGPR3；BiPAC 6401VGOR3；BiPAC 6401VGPR3；BEC 7404VGOX
Trade Name	BILLION、BEC
Frequency Range	IEEE 802.11b/g:2412MHz～2462MHz
Transmit Power	IEEE 802.11b: 13.57dBm (DTS Band) IEEE 802.11g: 19.01dBm (DTS Band)
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, 1Mbps IEEE 802.11g : 54, 48 ,36, 24, 18, 12, 9, 6Mbps
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	15VDC, 1.6A、12V DC, 1.2A (From Power Adapter)

Power Adapter

No.	Manufacturer	Model No.	Power Input	Power Output
1	OEM	ADS0271-W 150160	100-240V 50-60Hz 0.6A	15V 1.6A
2	OEM	ADS18B-W 120120	100-240V 50-60Hz 0.5A	12V 1.2A

The difference of the series model

Model / Different Item	BiPAC 7404VGOX	BiPAC 7404VGPX	BiPAC 6404VGOX	BiPAC 6404VGPX	BiPAC 7401VGOX	BiPAC 7401VGPX	BiPAC 6401VGOX	BiPAC 6401VGPX
Trade Name	BILLION	BILLION	BILLION	BILLION	BILLION	BILLION	BILLION	BILLION
External Color	Gray	White	Gray	White	Gray	White	Gray	White
Housing Drawing	D3	D3	D3	D3	D3	D3	D3	D3
Support 802.11b/g	○	○	○	○	○	○	○	○
VPN	○	×	○	×	○	×	○	×
Circuits Design	○	○	○	○	○	○	○	○
Model Module	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB
Power Supply	DC15V/1.6A	DC15V/1.6A	DC 15V/1.6 A	DC15V/1.6A	DC15V/1.6A	DC15V/1.6A	DC15V/1.6A	DC15V/1.6A

Model / Different Item	BiPAC 7404VGOR3	BiPAC 7404VGPR3	BiPAC 6404VGOR3	BiPAC 6404VGPR3	BiPAC 7401VGOR3	BiPAC 7401VGPR3	BiPAC 6401VGOR3	BiPAC 6401VGPR3
Trade Name	BILLION	BILLION	BILLION	BILLION	BILLION	BILLION	BILLION	BILLION
External Color	Gray	White	Gray	White	Gray	White	Gray	White
Housing Drawing	D3	D3	D3	D3	D3	D3	D3	D3
Support 802.11b/g	○	○	○	○	○	○	○	○
VPN	○	×	○	×	○	×	○	×
Circuits Design	○	○	○	○	○	○	○	○
Model Module	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB
Power Supply	DC12V/ 1.2A	DC12V/ 1.2A	DC12V/ 1.2A	DC12V/ 1.2A	DC12V/ 1.2A	DC12V/ 1.2A	DC12V/ 1.2A	DC12V/ 1.2A

Model / Different Item	BiPAC 7404VGOX	BiPAC 7404VGPX	BiPAC 6404VGOX	BiPAC 6404VGPX	BiPAC 7401VGOX	BiPAC 7401VGPX	BiPAC 6401VGOX	BiPAC 6401VGPX
Trade Name	BEC	BEC	BEC	BEC	BEC	BEC	BEC	BEC
External Color	Gray	White	Gray	White	Gray	White	Gray	White
Housing Drawing	D3	D3	D3	D3	D3	D3	D3	D3
Support 802.11b/g	○	○	○	○	○	○	○	○
VPN	○	×	○	×	○	×	○	×
Circuits Design	○	○	○	○	○	○	○	○
Model Module	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB
Power Supply	DC15V/1.6A	DC15V/1.6A	DC 15V/1.6 A	DC15V/1.6A	DC15V/1.6A	DC15V/1.6A	DC15V/1.6A	DC15V/1.6A

Model / Different Item	BiPAC 7404VGOR3	BiPAC 7404VGPR3	BiPAC 6404VGOR3	BiPAC 6404VGPR3	BiPAC 7401VGOR3	BiPAC 7401VGPR3	BiPAC 6401VGOR3	BiPAC 6401VGPR3
Trade Name	BEC	BEC	BEC	BEC	BEC	BEC	BEC	BEC
External Color	Gray	White	Gray	White	Gray	White	Gray	White
Housing Drawing	D3	D3	D3	D3	D3	D3	D3	D3
Support 802.11b/g	○	○	○	○	○	○	○	○
VPN	○	×	○	×	○	×	○	×
Circuits Design	○	○	○	○	○	○	○	○
Model Module	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB	Flash 4MB SDRAM 32MB
Power Supply	DC12V/ 1.2A	DC12V/ 1.2A	DC12V/ 1.2A	DC12V/ 1.2A	DC12V/ 1.2A	DC12V/ 1.2A	DC12V/ 1.2A	DC12V/ 1.2A

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-7404VGOX 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

IEEE 802.11b/g mode (DTS Band)

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 mode : 11Mbps data rate (worst case) were chosen for full testing.
IEEE 802.11g mode : 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
Rm.258, Bldg.17, NO.195 , Sec. 4, Chung Hsing Rd., Chu-Tung Chen. Hsin-Chu,
Taiwan 310 R.O.C.
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 :2003and 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	VCCI 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	TAF 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
Canada	Industry Canada	RSS-GEN Issue 2	Canada IC 4417-1, IC-4417-2

** 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

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

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

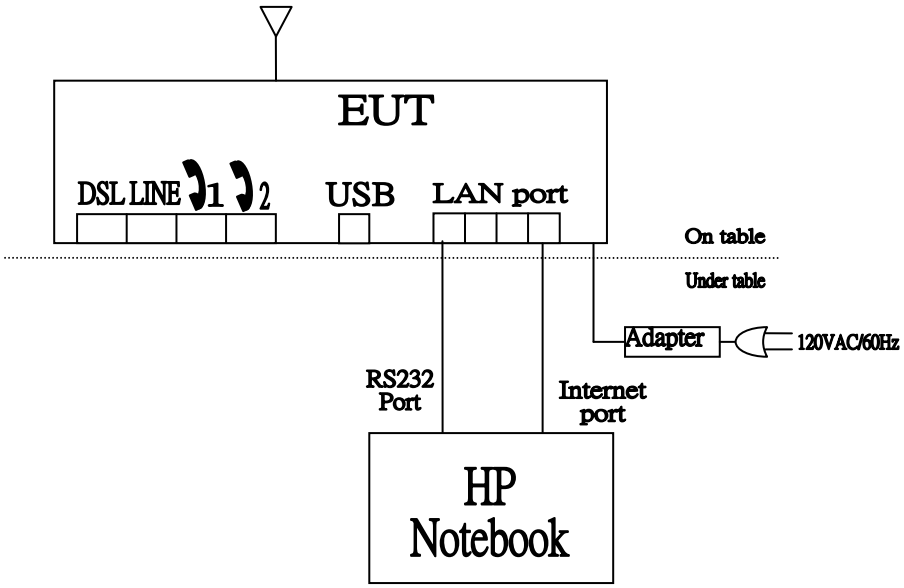
The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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	DoC
2	Notebook PC	DELL	Latitude D610	CN-0XD762-48643-637-1743	DoC
3	Notebook PC	HP	nx6130	CNU543274R	DoC
4	ADSL iDSLAM	TECOM	M801	HIL0017	DoC
5	Pen Driver	SanDisk	SDCZ6-1024	BB0706I6B	DoC
6	Telephone	Sweetone	RS-802HF	0305012781	--------
7	Telephone	Sweetone	RS-802HF	0305012786	--------

SETUP DIAGRAM FOR TESTS



EUT OPERATING CONDITION

TX Mode:

1. Set up whole system for test as shown on diagram.
2. Enter terminal machine select COM1
   Select :9600 / 8 / No / 1 / No
3. Enter terminal machine keep pressing space 2~3 second EUT reset
   (1) terminal machine→netboot
   (2) Run gui_bootsvr.exe(PET2.7.17\ gui_bootsvr.exe)
   GUI BootSever v0.01(Bootserver Core v0.01)
   Select : search MAC address:0:4:ed:0:0:0→OK

4. Gui_bootsvr.exe(PET2.7.17\ gui_bootsvr.exe)
   GUI BootSever v0.01(Bootserver Core v0.01)
   Device IP address : 192.168.1.254
   Host IP address : 192.168.1.xxx
   MAC address : 0:4:ed:0:0:0
   Boot file : F:/EUT driver/PET2.5.17 / 7404VGOR3-10.0.1.56.dsl

5. Run Launch Prism Engineering Tool.exe
   Open Adapter (Available Adapters List)
   Select :Power Control 0
   IEEE 802.11b Rate=11Mbps
   IEEE 802.11g Rate=6Mbps
   (1) IEEE 802.11b power level→Low=27000 Middle=28000 High=28000
   (2) IEEE 802.11g power level→Low=45000 Middle=45500 High=45500
   Start: Cont.TX

RX Mode:

Select:Repeat Frame
(1)IEEE 802.11b Rate=11Mbps32.
(2)IEEE 802.11g Rate=6Mbps
Channel→Low/ Middle/ High
Start: Receive

8. APPLICABLE LIMITS AND TEST RESULTS

8.1 6dB BANDWIDTH

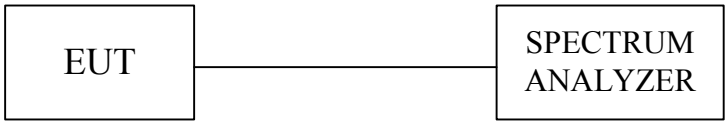
LIMIT

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

TEST EQUIPMENT

Description & Manufacturer	Model No.	Serial No.	Date of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	October 25, 2007
AGILENT SPECTRUM ANALYZER	E4446A	MY433601.32	June 06, 2008

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

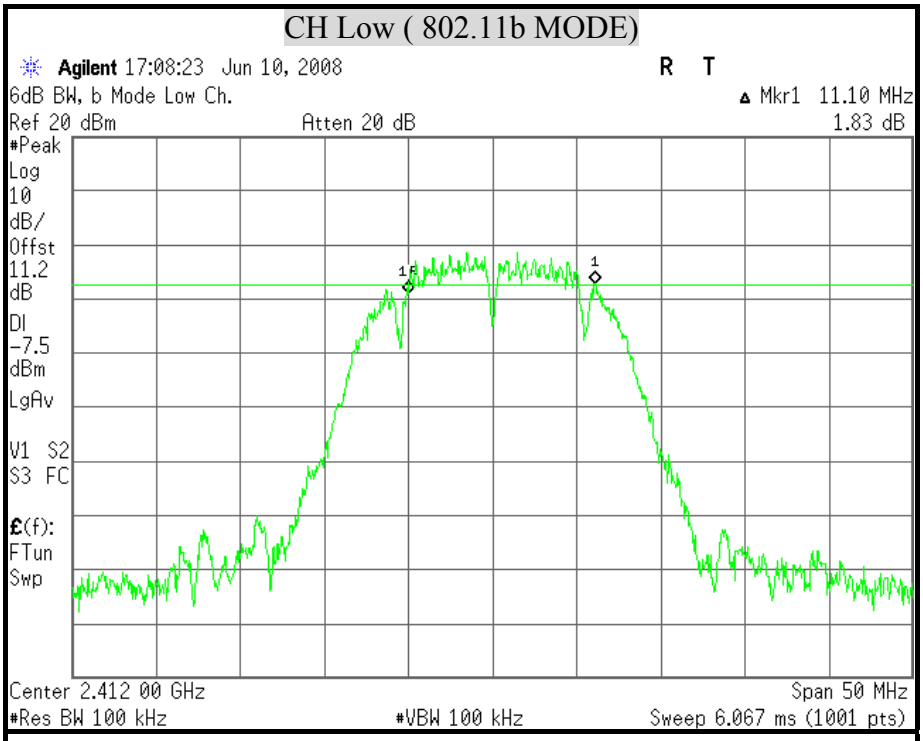
Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	11100	500	PASS
Middle	2437	11100	500	PASS
High	2462	11100	500	PASS

IEEE 802.11g MODE

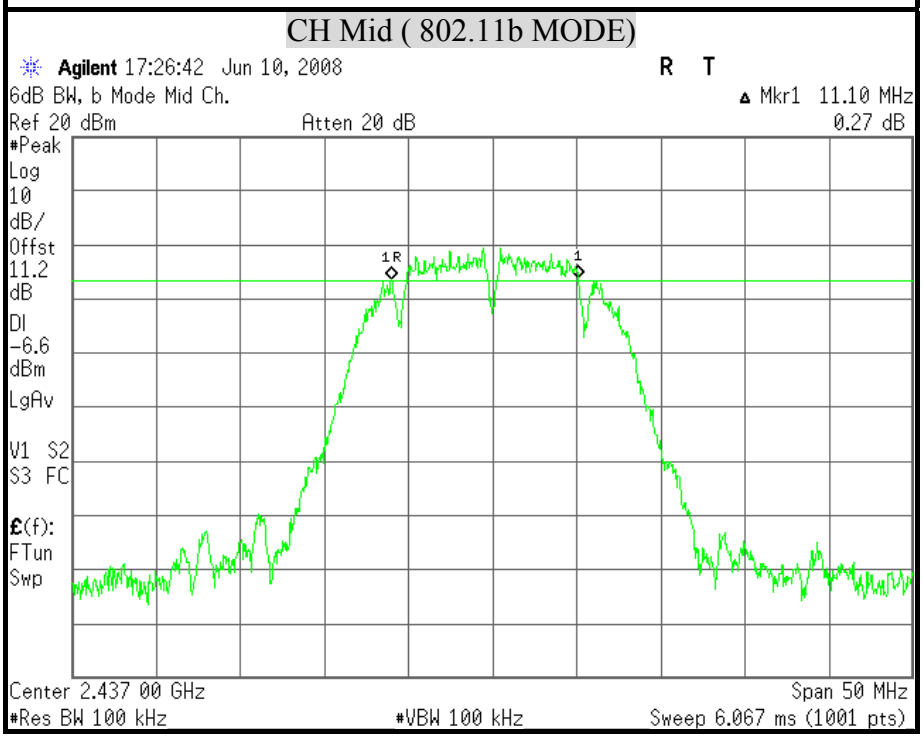
Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	16450	500	PASS
Middle	2437	16500	500	PASS
High	2462	16550	500	PASS

6dB BANDWIDTH (802.11b MODE)

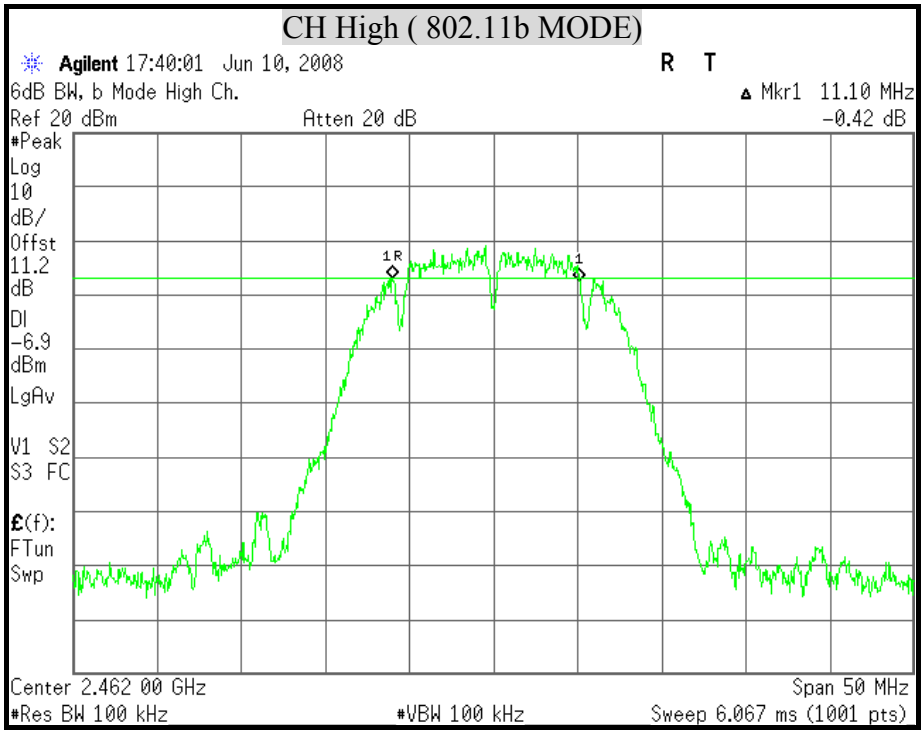
CH Low (802.11b MODE)



CH Mid (802.11b MODE)

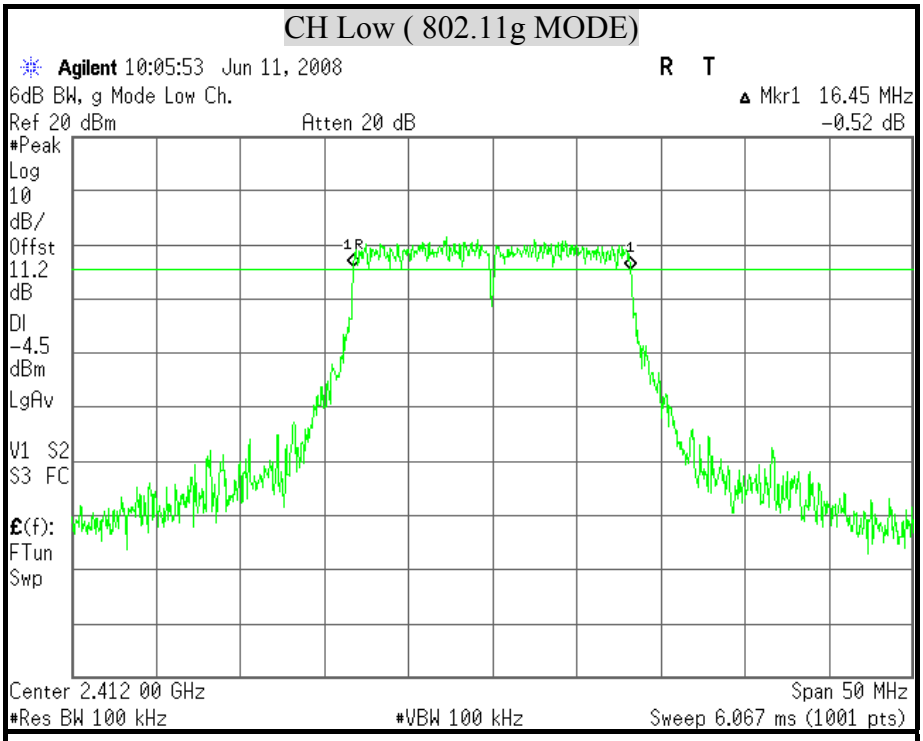


CH High (802.11b MODE)

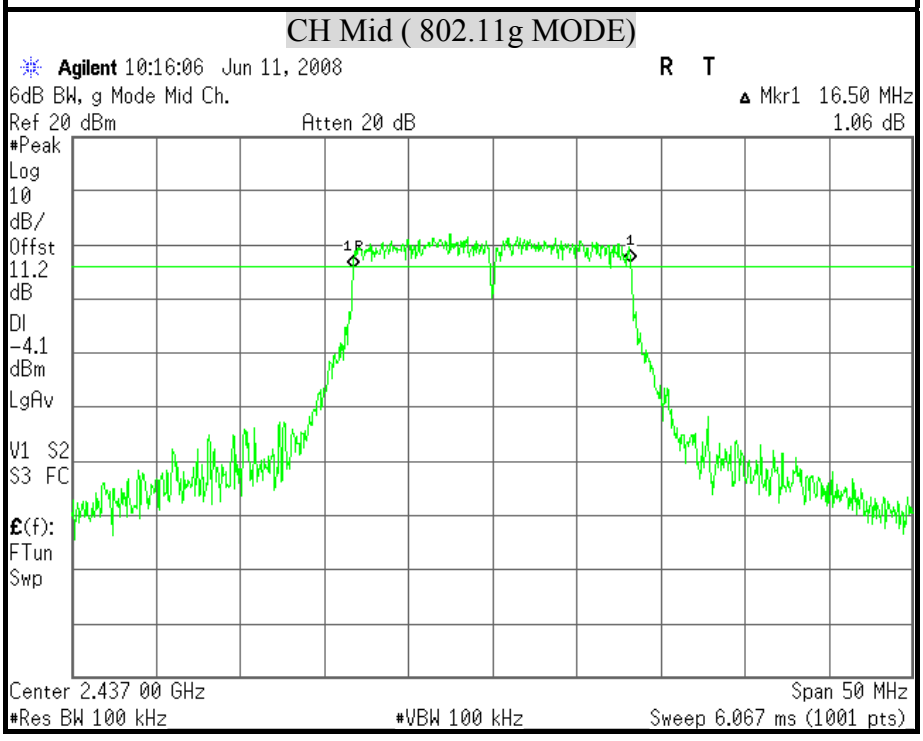


6dB BANDWIDTH (802.11g MODE)

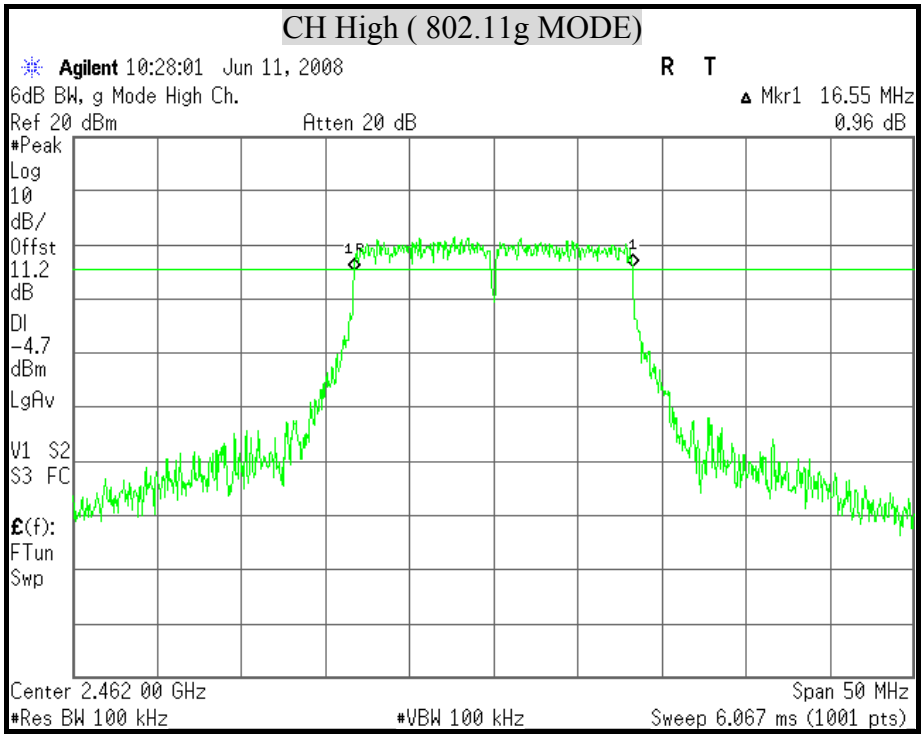
CH Low (802.11g MODE)



CH Mid (802.11g MODE)



CH High (802.11g MODE)



8.2 99% BANDWIDTH

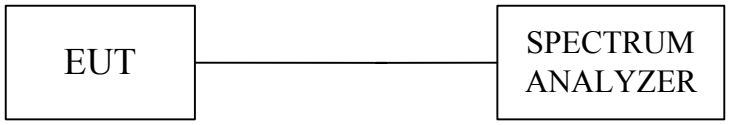
LIMIT

None; for reporting purposes only.

TEST EQUIPMENT

Description & Manufacturer	Model No.	Serial No.	Date of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	October 25, 2007
AGILENT SPECTRUM ANALYZER	E4446A	MY433601.32	June 06, 2008

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

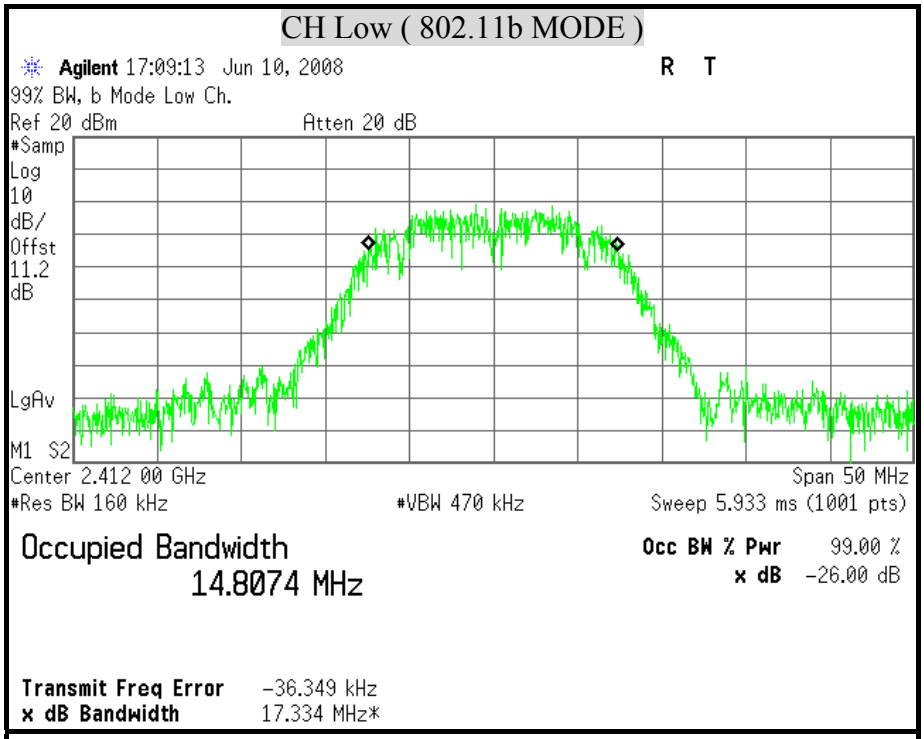
Channel	Channel Frequency (MHz)	99% Occupied power bandwidth (MHz)
Low	2412.00	14.807
Middle	2437.00	14.78
High	2462.00	15.177

IEEE 802.11g MODE

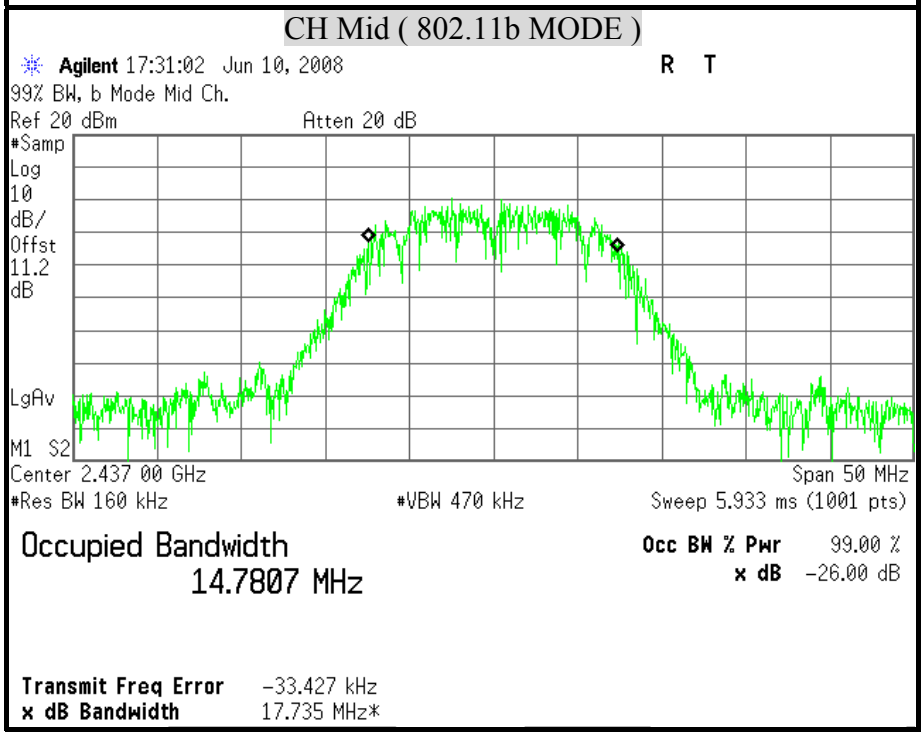
Channel	Channel Frequency (MHz)	99% Occupied power bandwidth (MHz)
Low	2412.00	16.349
Middle	2437.00	16.382
High	2462.00	16.41

99% BANDWIDTH (802.11b MODE)

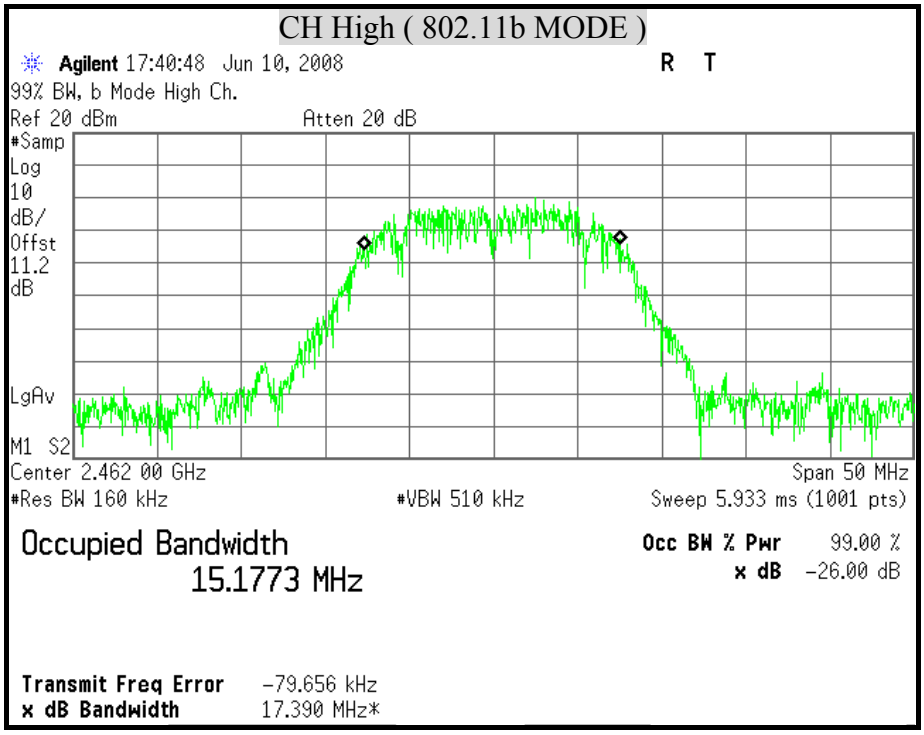
CH Low (802.11b MODE)



CH Mid (802.11b MODE)

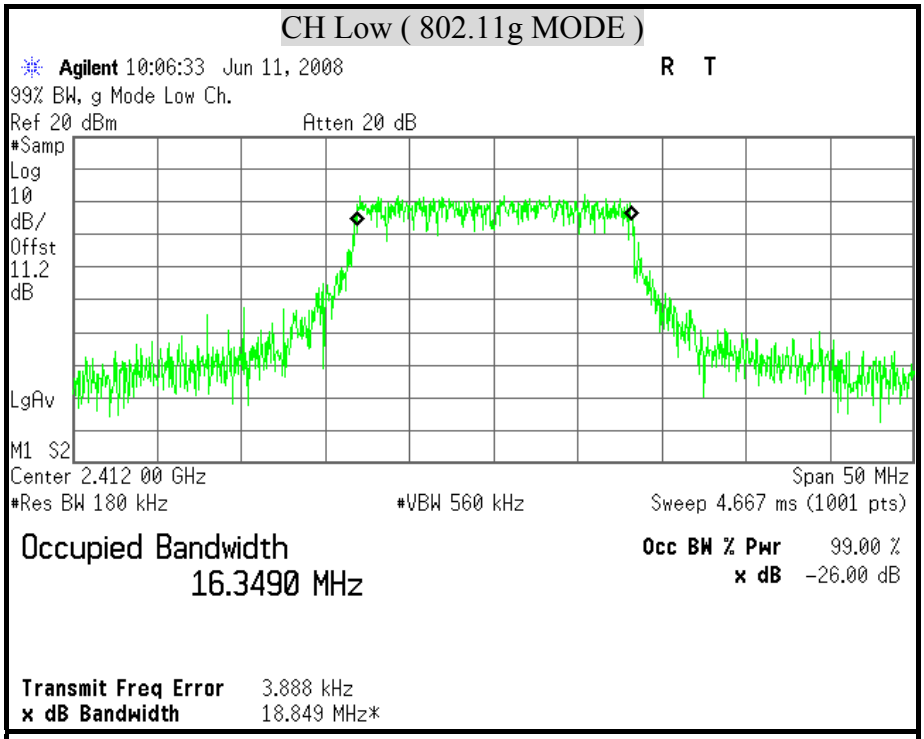


CH High (802.11b MODE)

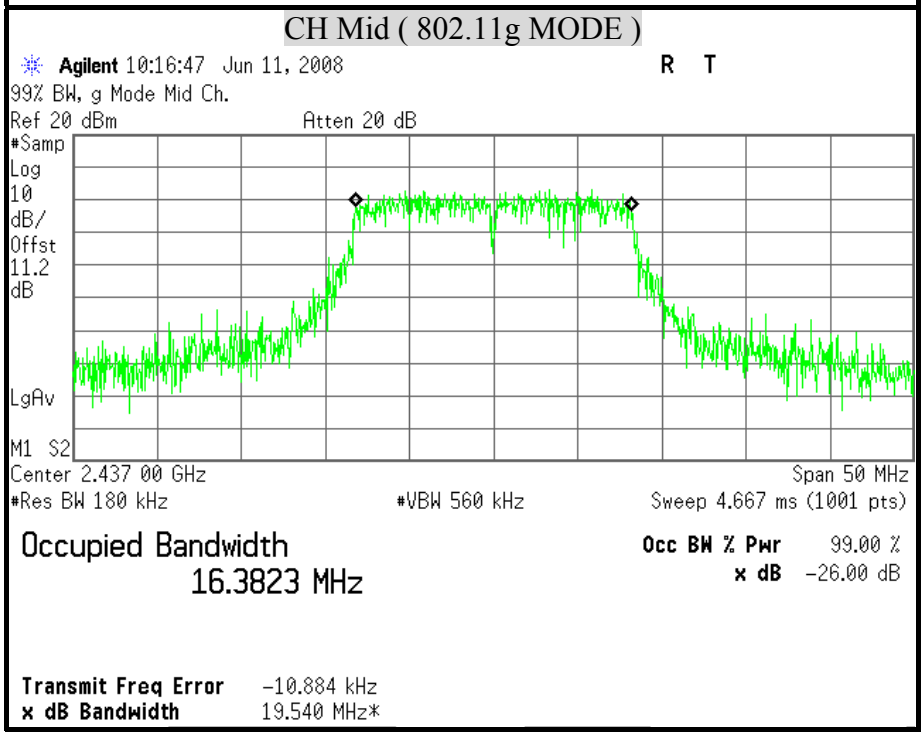


99% BANDWIDTH (802.11g MODE)

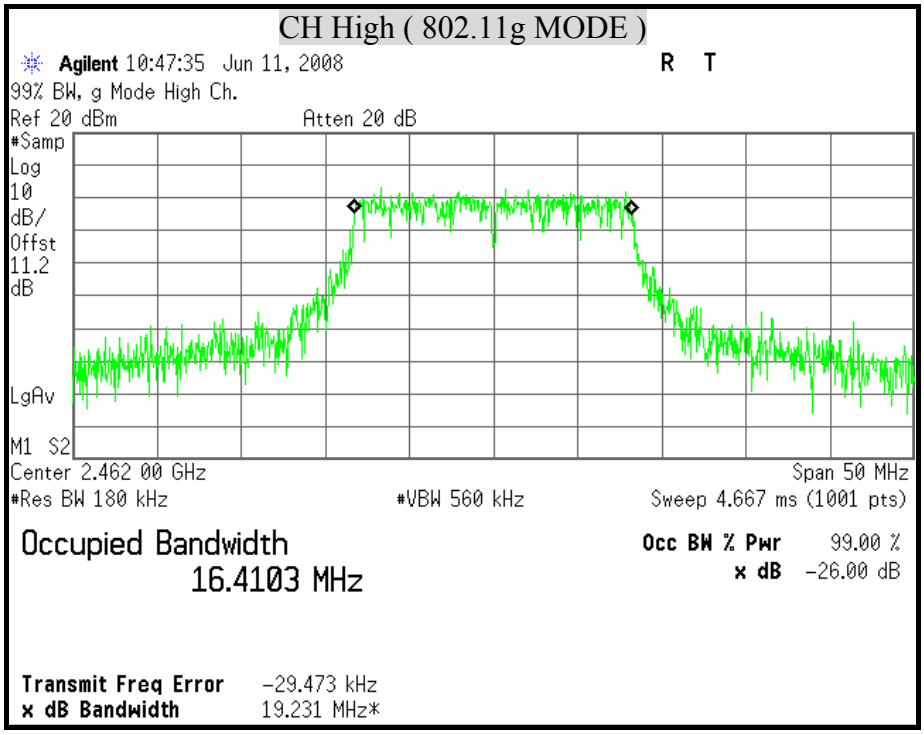
CH Low (802.11g MODE)



CH Mid (802.11g MODE)



CH High (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

Description & Manufacturer	Model No.	Serial No.	Date of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	October 25, 2007
AGILENT SPECTRUM ANALYZER	E4446A	MY433601.32	June 06, 2008

TEST SETUP

TEST PROCEDURE

1. The spectrum shall be set as follows :
   Span : 1.5 times channel integration bandwidth.
   RBW : 1MHz
   VBW : 3MHz
   Detector : Peak
   Sweep : Single trace
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 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	12.7	30	PASS
Middle	2437	13.57	30	PASS
High	2462	13.32	30	PASS

Remark:

1. At finial test to get the worst-case emission at 1Mbps.
2. The cable assembly insertion loss of 11.2dB (including 10 dB pad and 1.2 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11g MODE

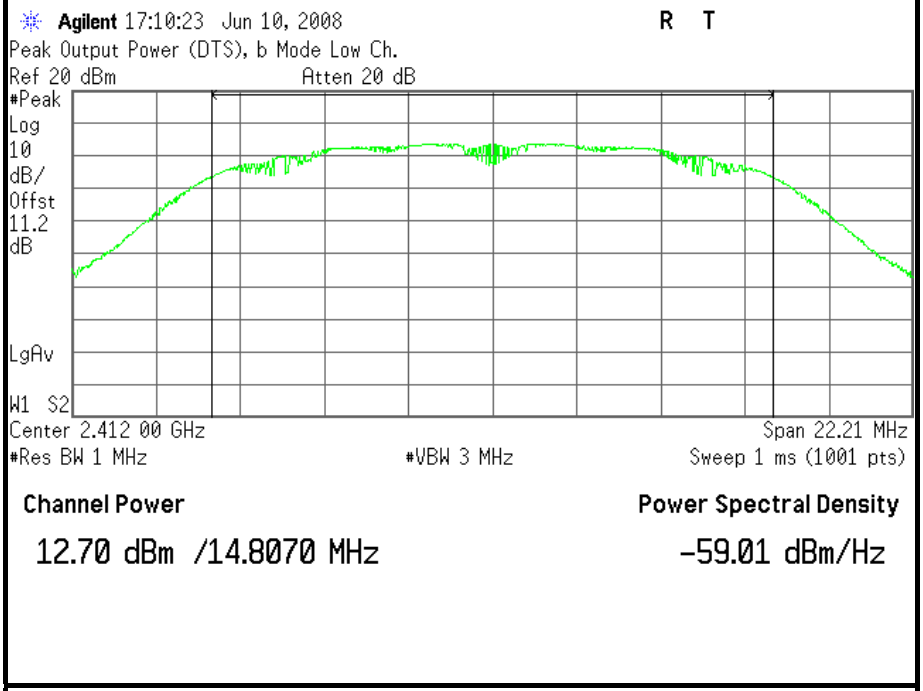
Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2412	18.54	30	PASS
Middle	2437	19.01	30	PASS
High	2462	18.67	30	PASS

Remark:

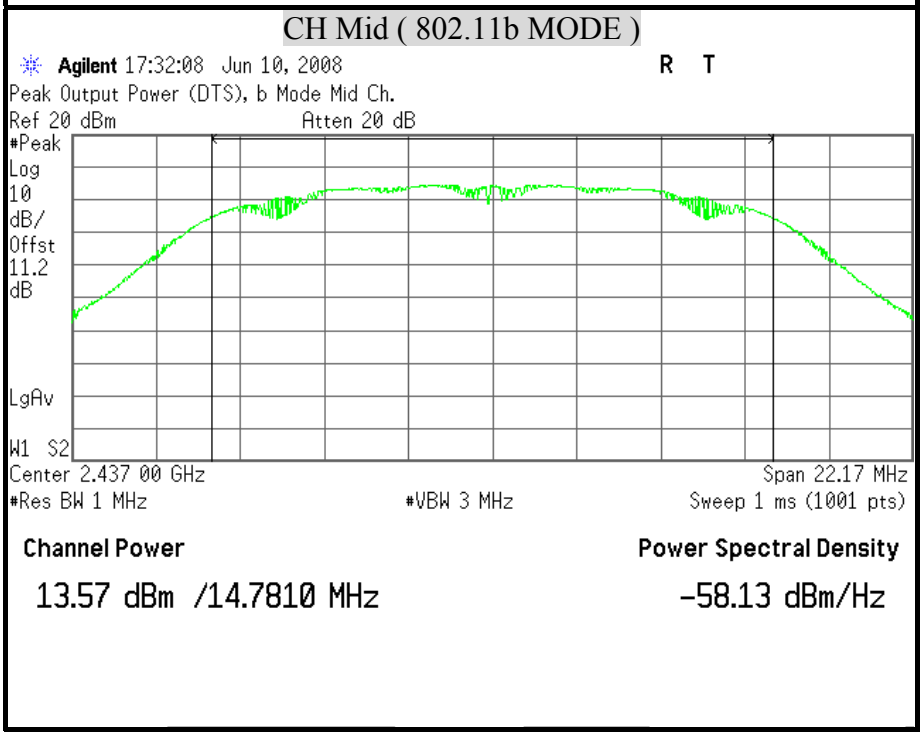
1.At finial test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 11.2dB (including 10 dB pad and 1.2 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

MAXIMUM PEAK OUTPUT POWER (802.11b MODE)

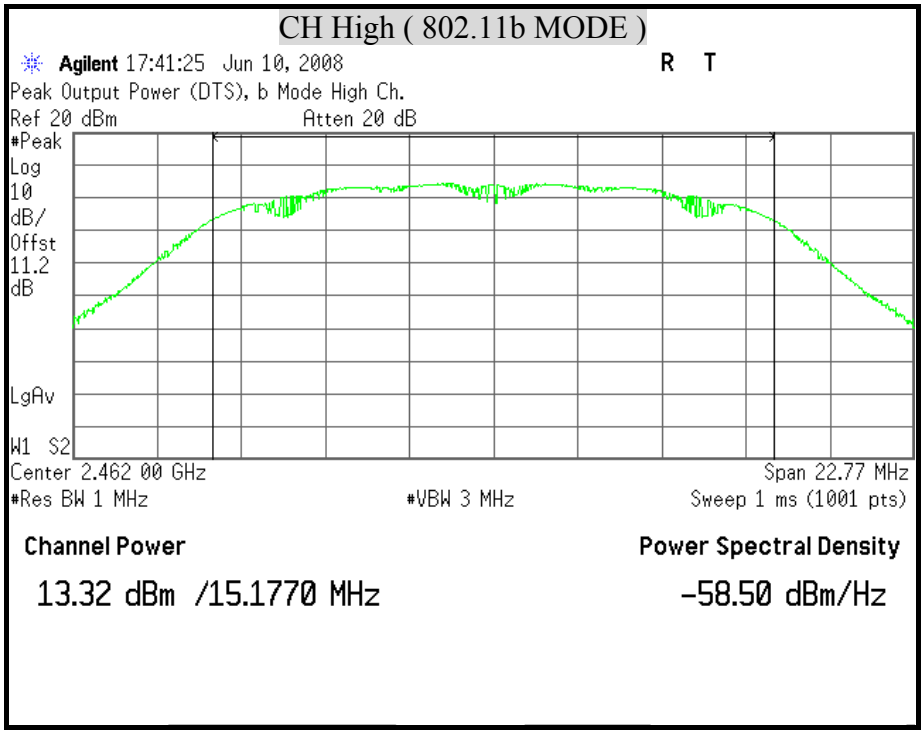
CH Low (802.11b MODE)



CH Mid (802.11b MODE)

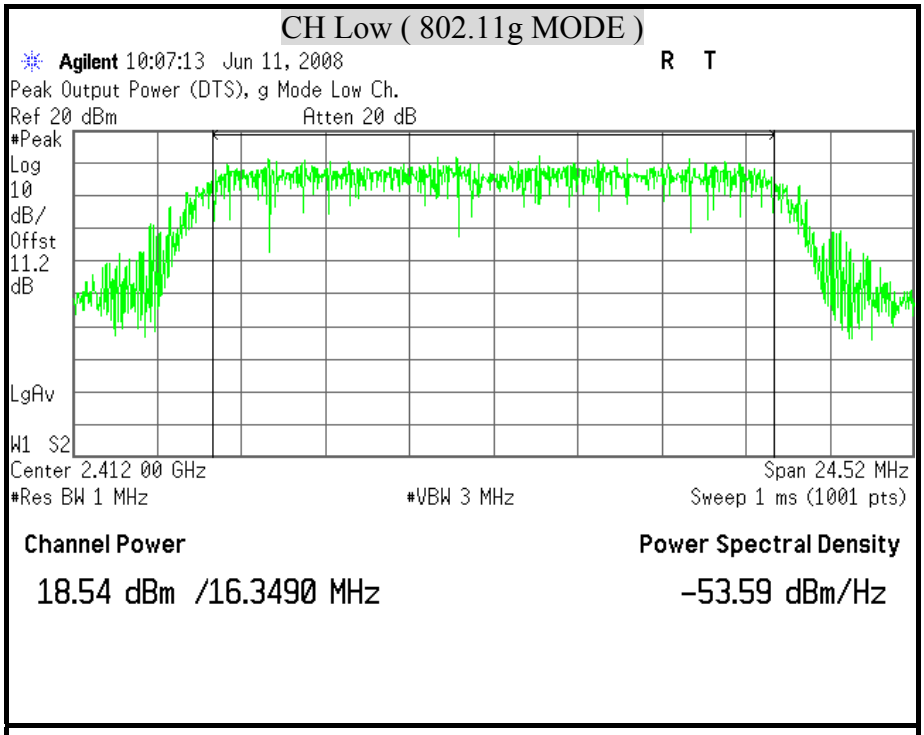


CH High (802.11b MODE)

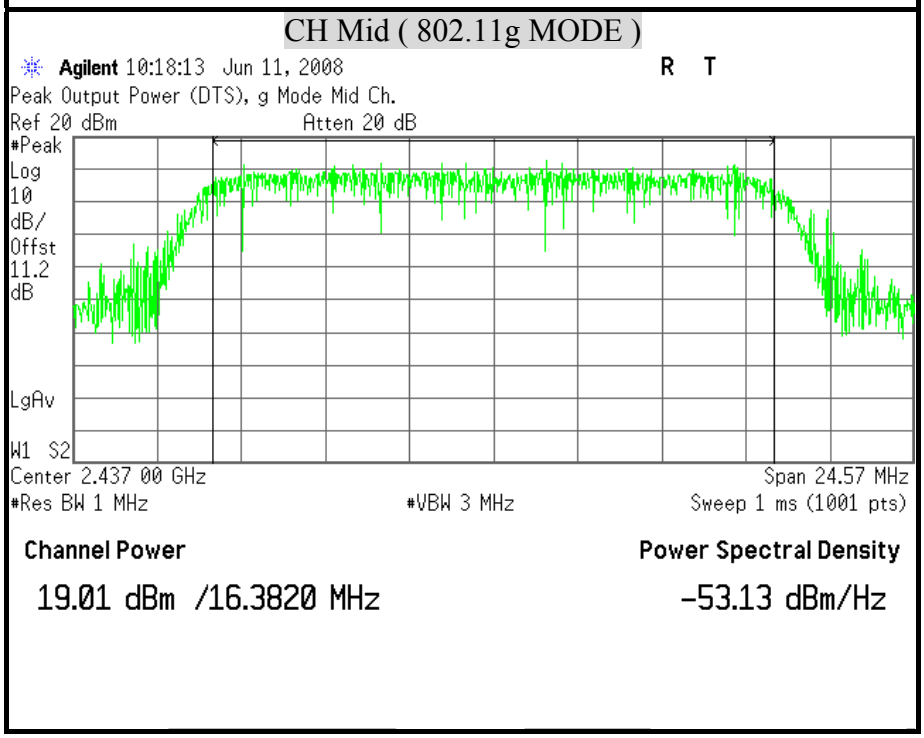


MAXIMUM PEAK OUTPUT POWER (802.11g MODE)

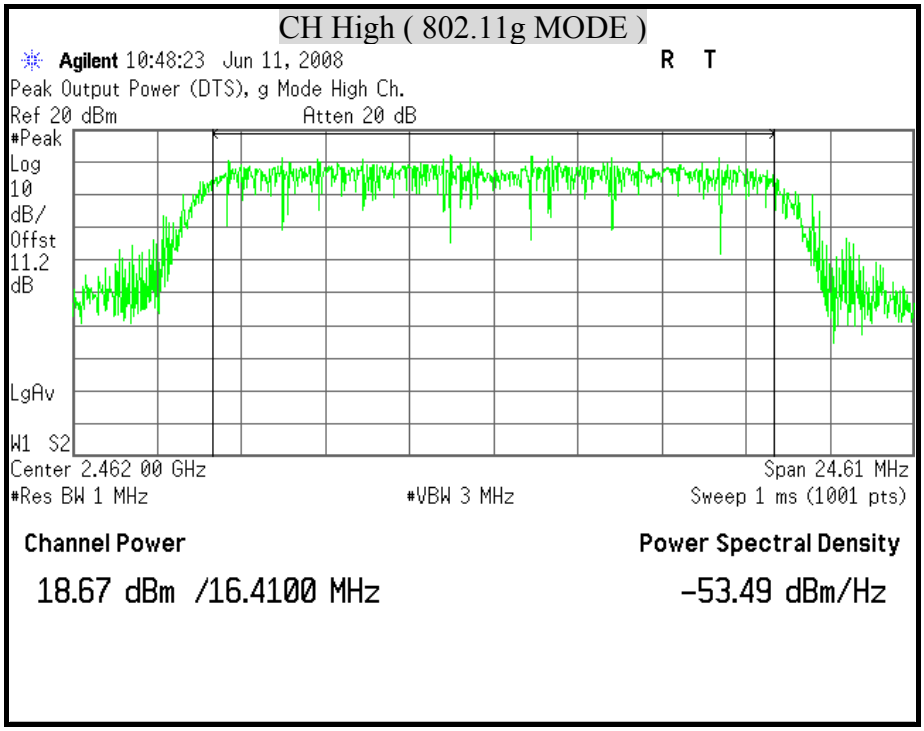
CH Low (802.11g MODE)



CH Mid (802.11g MODE)



CH High (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 theenvironment 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:

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

Changing to units of mW and cm, using:

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

d (cm) = d(m) / 100

Yields

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

Where d = *Distance in cm*

P = *Power in mW*

G = *Numeric antenna gain*

S = *Power density in* mW / cm^2

LIMIT

Power Density Limit, S=1.0mW/cm^2

TEST RESULTS

No non-compliance noted

Mode	Minimum separation distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density Limit (mW/cm^2)	Power Density at 20cm (mW/cm^2)
IEEE 802.11b	20.0	13.57	2.00	1.00	0.007173
IEEE 802.11g	20.0	19.01	2.00	1.00	0.025103

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

8.5 AVERAGE POWER

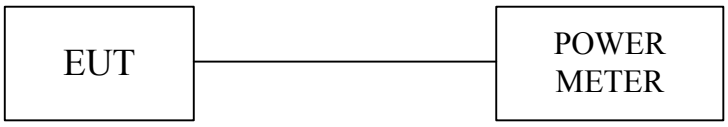
LIMIT

None; for reporting purposes only.

TEST EQUIPMENT

Description & Manufacturer	Model No.	Serial No.	Date of Calibration
ANRITSU POWER METER	ML2487A MAL2491A	6K00001783 030982	March 06, 2008

TEST SETUP



TEST PROCEDURE

The transmitter output is connected to a power meter.

TEST RESULTS

No non-compliance noted

IEEE 802.11b MODE

Channel	Channel Frequency (MHz)	Average Power Output (dBm)
Low	2412	10.5
Middle	2437	11.35
High	2462	11.09

Remark:

1. At finial test to get the worst-case emission at 1Mbps.
2. The cable assembly insertion loss of 11.2dB (including 10 dB pad and 1.2dB 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	15.93
Middle	2437	16.25
High	2462	15.96

Remark:

1. At finial test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 11.2dB (including 10 dB pad and 1.2 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

8.6 POWER SPECTRAL DENSITY

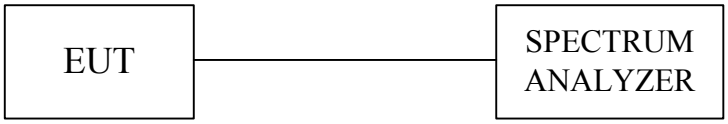
LIMIT

§ 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

Description & Manufacturer	Model No.	Serial No.	Date of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	October 25, 2007
AGILENT SPECTRUM ANALYZER	E4446A	MY433601.32	June 06, 2008

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	-18.9	8	PASS
Middle	2437	-17.93	8	PASS
High	2462	-18.17	8	PASS

Remark:

1. At finial test to get the worst-case emission at 1Mbps.
2. The cable assembly insertion loss of 11.2dB (including 10 dB pad and 1.2 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11g MODE

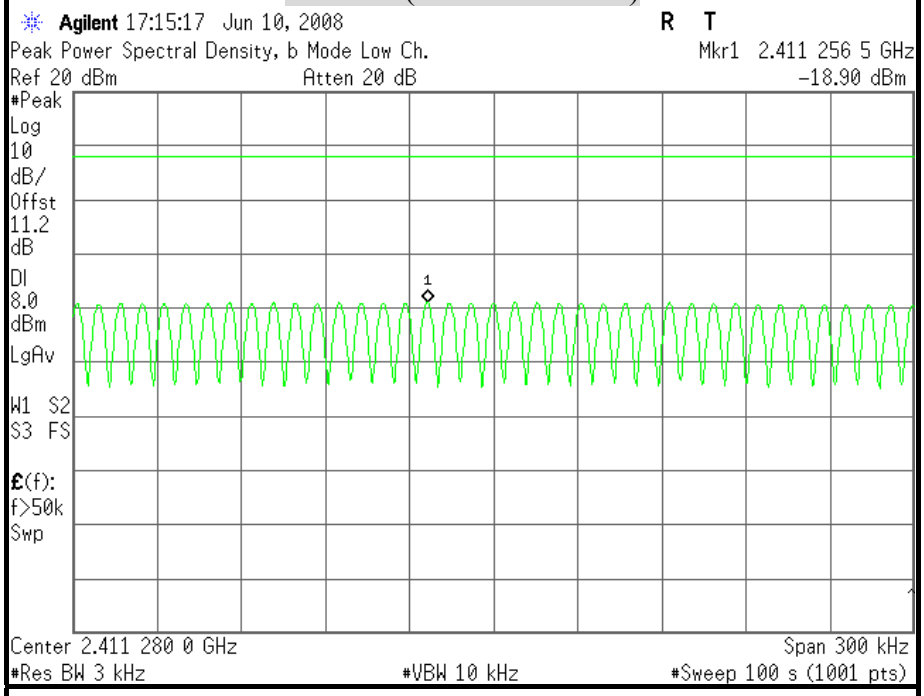
Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Maxmum Limit (dBm)	Pass / Fail
Low	2412	-12.75	8	PASS
Middle	2437	-12.4	8	PASS
High	2462	-12.89	8	PASS

Remark:

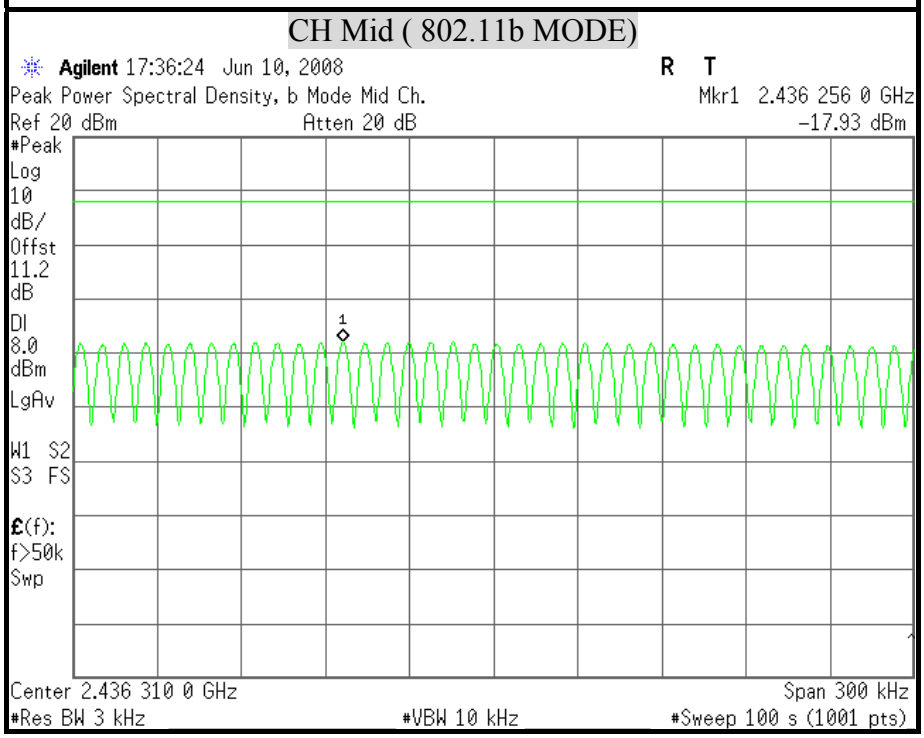
1. At finial test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 11.2dB (including 10 dB pad and 1.2 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

POWER SPECTRAL DENSITY (IEEE 802.11b MODE)

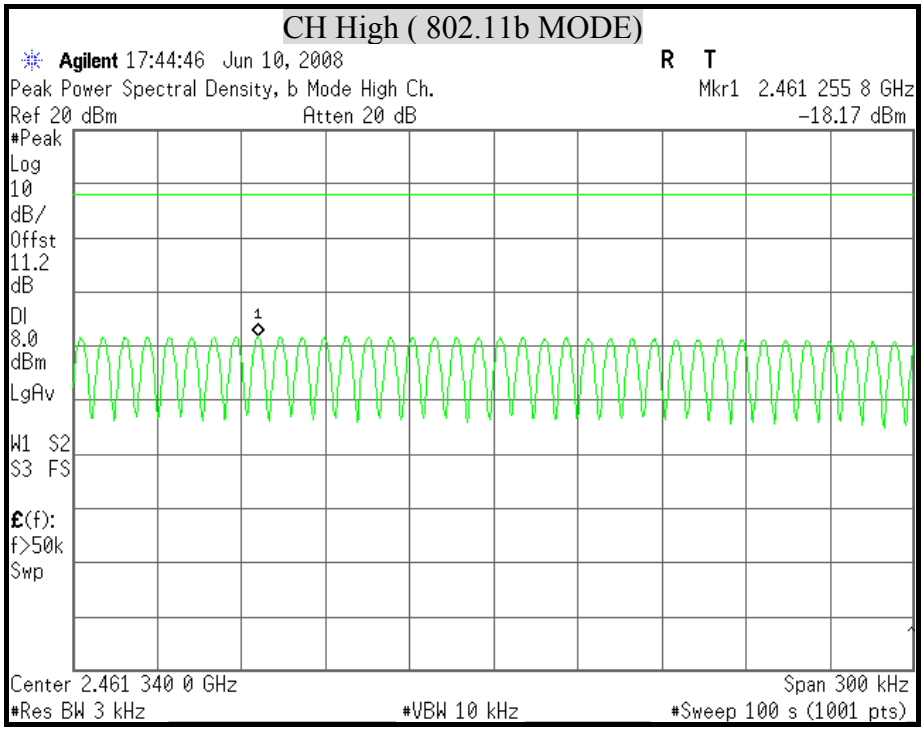
CH Low (802.11b MODE)



CH Mid (802.11b MODE)

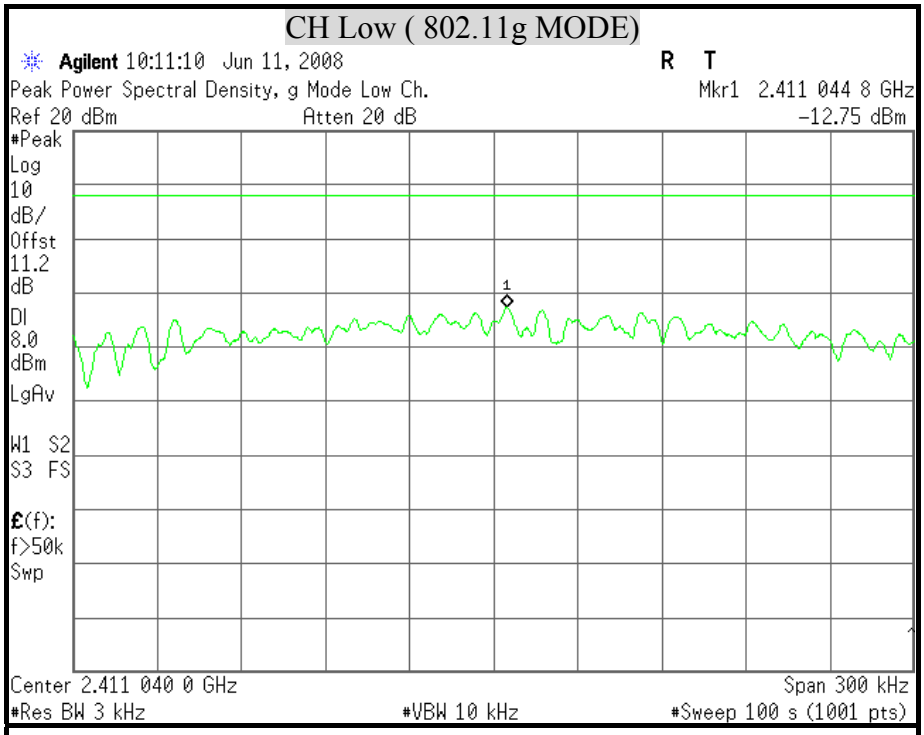


CH High (802.11b MODE)

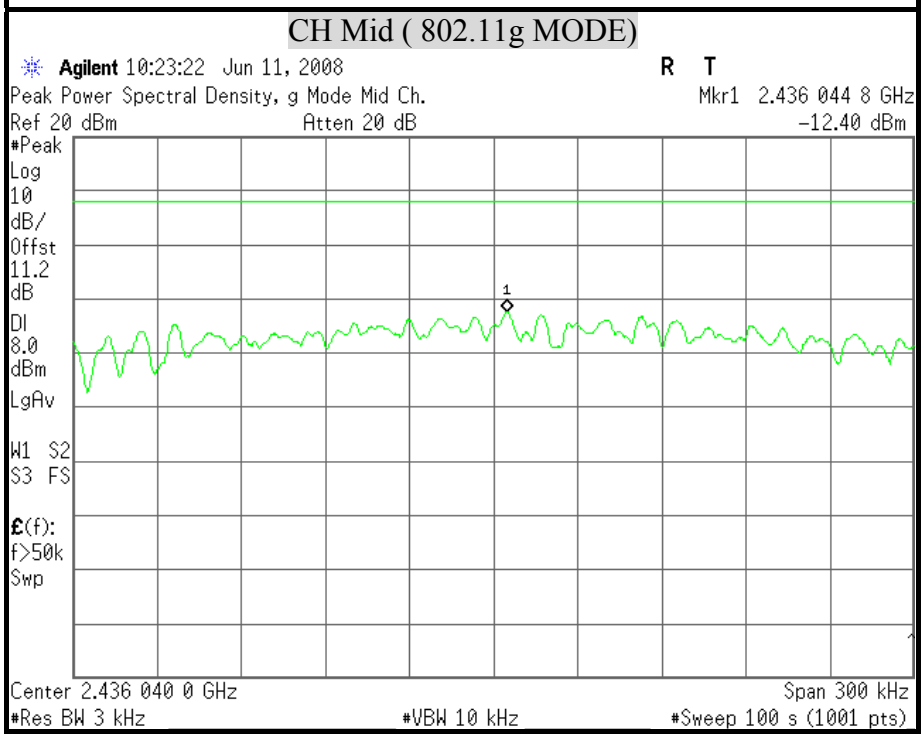


POWER SPECTRAL DENSITY (IEEE 802.11g MODE)

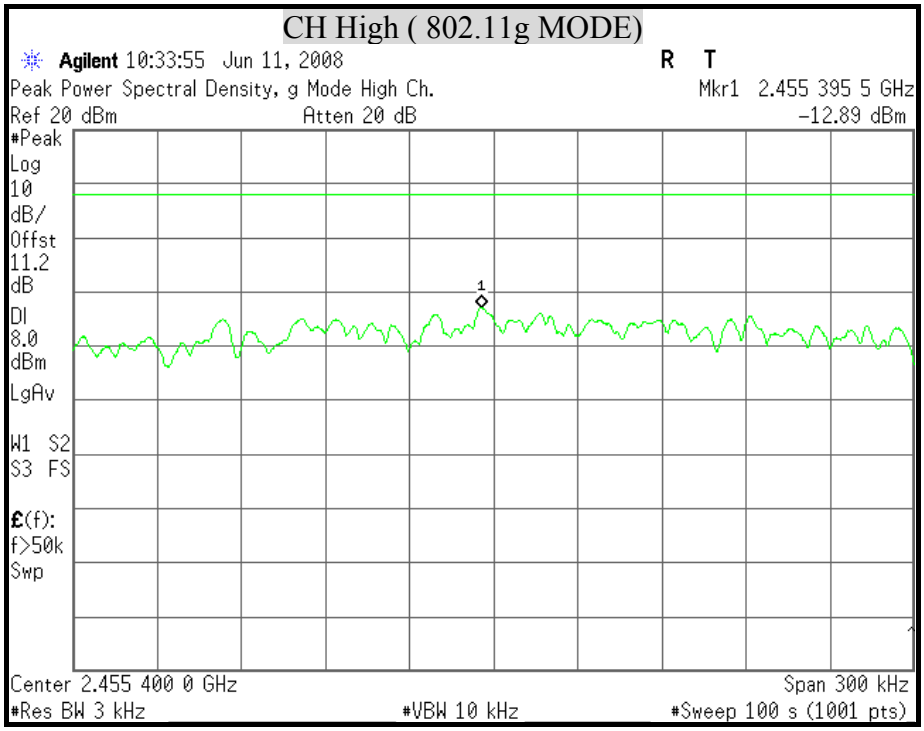
CH Low (802.11g MODE)



CH Mid (802.11g MODE)



CH High (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 and 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.

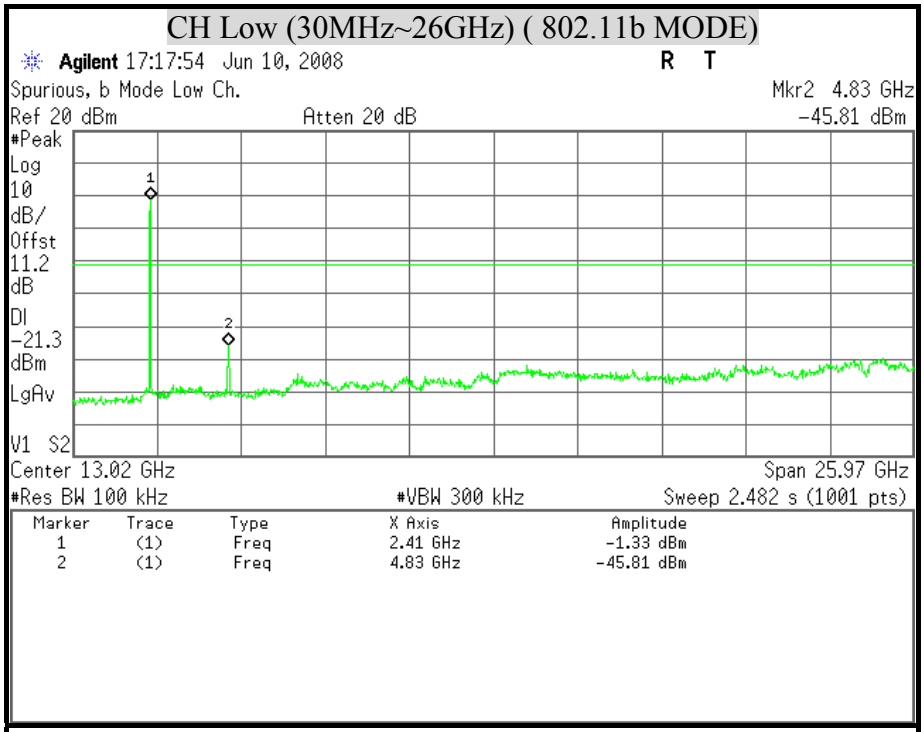
TEST RESULTS

No non-compliance noted

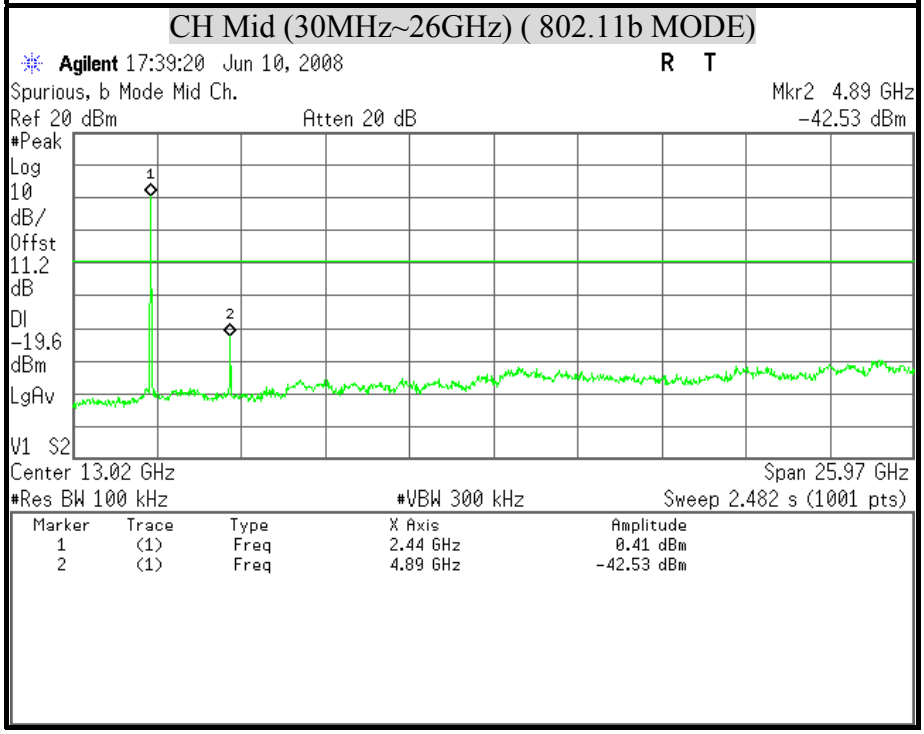
OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

(IEEE 802.11b MODE)

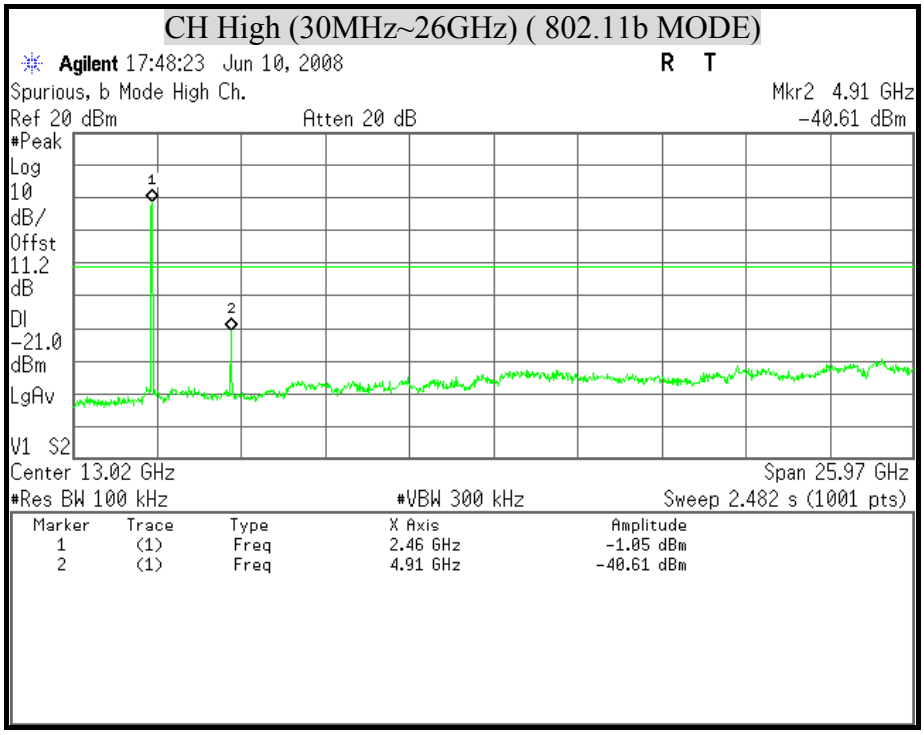
CH Low (30MHz~26GHz) (802.11b MODE)



CH Mid (30MHz~26GHz) (802.11b MODE)



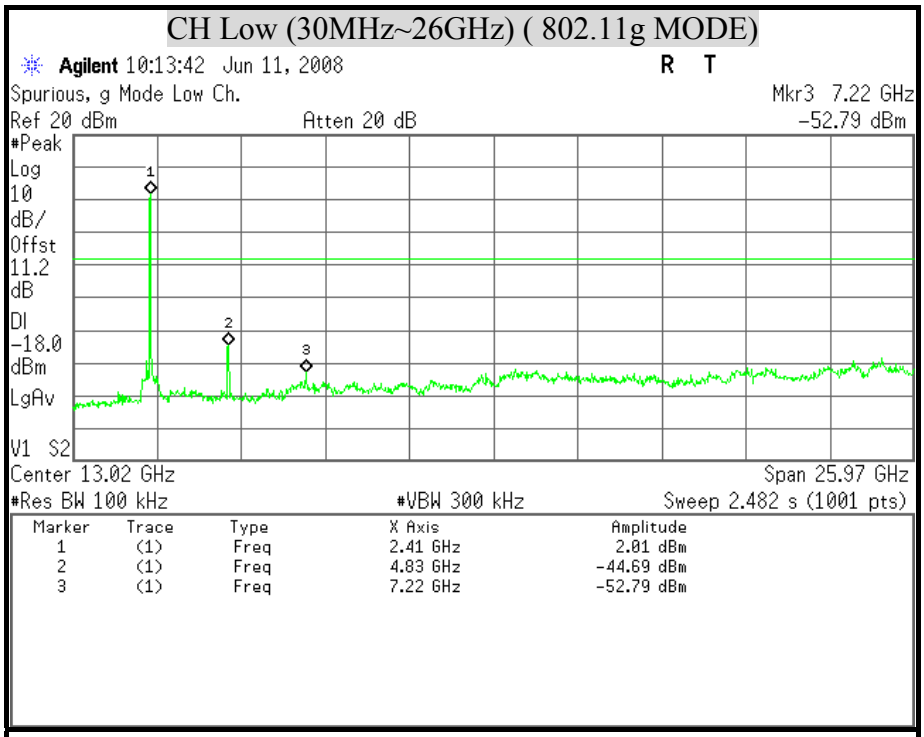
CH High (30MHz~26GHz) (802.11b MODE)



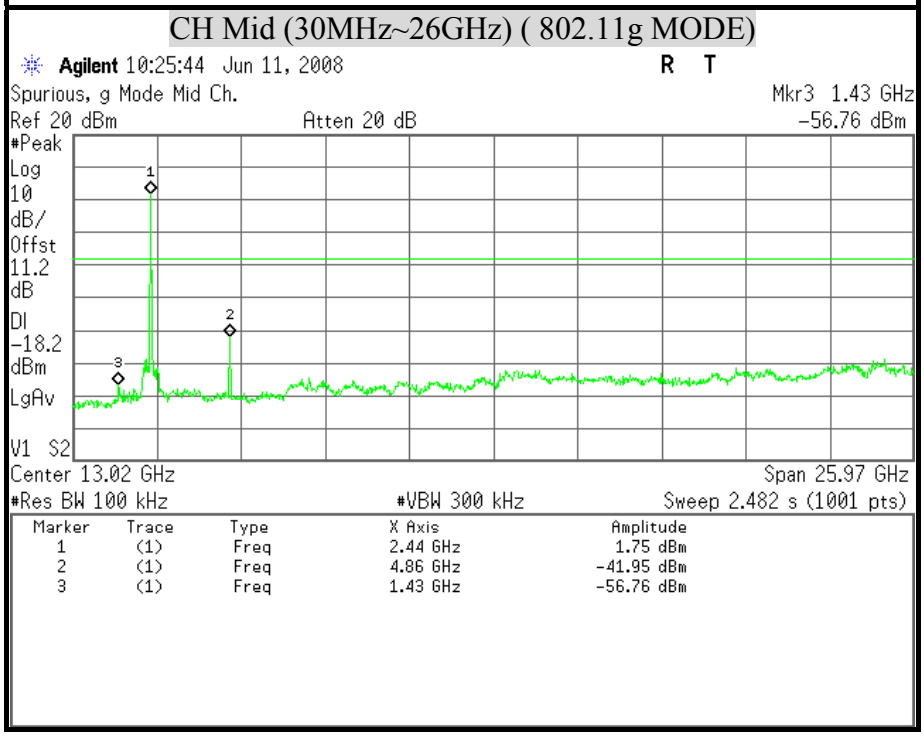
OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

(802.11g MODE)

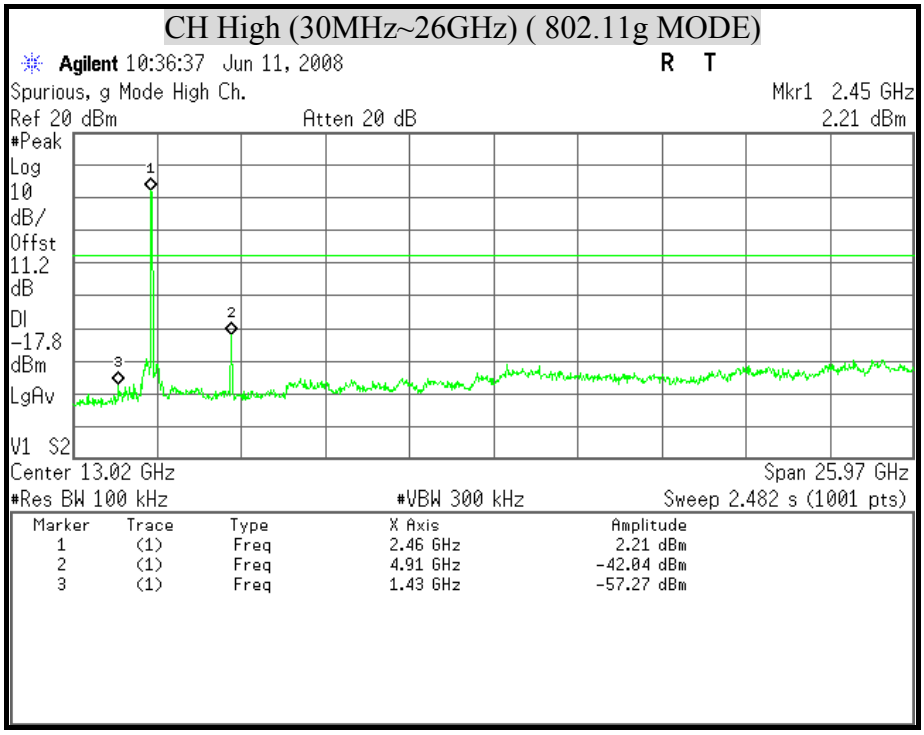
CH Low (30MHz~26GHz) (802.11g MODE)



CH Mid (30MHz~26GHz) (802.11g MODE)



CH High (30MHz~26GHz) (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 is 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.

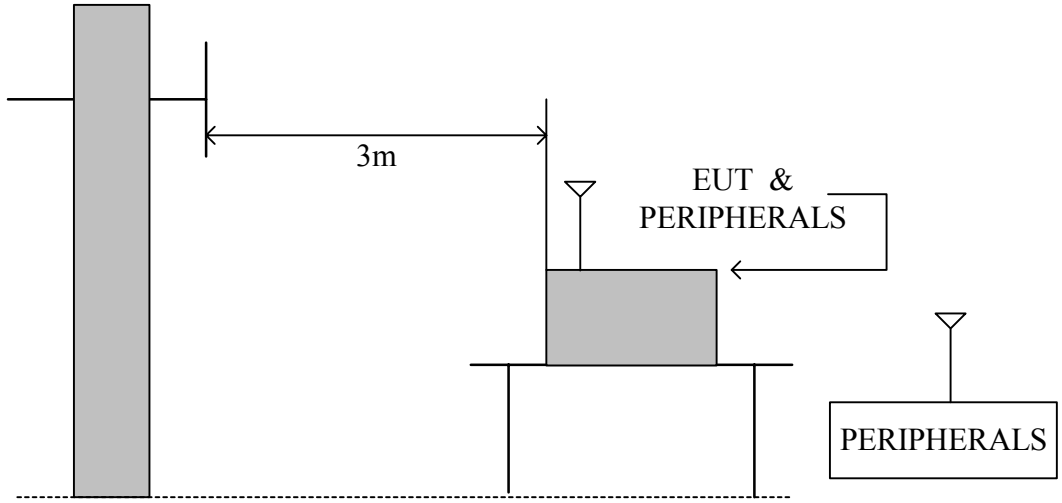
TEST EQUIPMENT

The following test equipment is utilized in making the measurements contained in this report.

Manufacturer or Type	Model No.	Serial No.	Date of Calibration	Calibration Period	Remark
CHASE BILOG ANTENNA	CBL6112B	2817	December 21, 2007	1 Year	FINAL
R/S SPECTRUM ANALYZER	FSEK30	835253/002	October 25, 2007	1 Year	FINAL
AGILENT SPECTRUM ANALYZER	E4446A	MY433601.32	June 06, 2008	1 Year	FINAL
R/S EMI TEST RECEIVER	ESCS30	835418/008	October 16, 2007	1 Year	FINAL
OPEN SITE	----------	No.2	May 07, 2008	1 Year	FINAL
MIYAZAKI N TYPE COAXIAL CABLE	8D-FB	02	May 16, 2008	1 Year	FINAL
Horn Antenna	AH-118	10089	October 18, 2007	1 Year	FINAL
Horn Antenna	AH-840	03077	December 25, 2007	1 Year	FINAL
Agilent Pre-amplifier	8449B	3008A01471	December 20, 2007	1 Year	FINAL
HP Amplifier	8447D	2944A10052	December 24, 2007	1 Year	FINAL
HP High pass filter	84300/80038	002	CAL. ON USE	1 Year	FINAL
HP High pass filter	84300/80039	003	CAL. ON USE	1 Year	FINAL

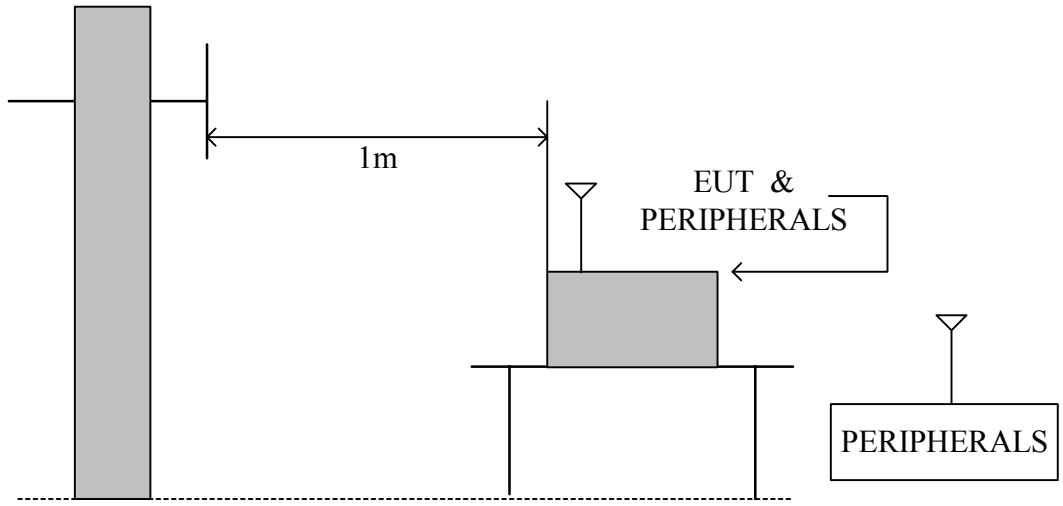
TEST SETUP

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



Antenna Elevation Variable

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



Antenna Elevation Variable

TEST PROCEDURE

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. White 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. White measuring the radiated emission above 1GHz, the EUT was set 1 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

Product Name	(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router	**Test Date**	2008/07/24
Model	BiPAC 7404VGOX	**Test By**	Rueyyan Lin
Test Mode	Normal operating / ADS0271-W 150160	**TEMP & Humidity**	37°C, 54%

Horizontal					
Frequency (MHz)	Correction Factor (dB)	Meter Reading at 3m (dBμV)	Limits (dBμV/m)	Emission Level at 3m (dBμV/m)	Margin Limit (dB)
480.00	20.5	24.20	46.00	44.70	-1.30
550.00	21.7	22.60	46.00	44.25	-1.75
600.00	22.5	21.80	46.00	44.30	-1.70
660.00	23.0	19.40	46.00	42.44	-3.56
700.00	23.4	20.30	46.00	43.70	-2.30
959.98	26.5	17.20	46.00	43.66	-2.34

Vertical					
Frequency (MHz)	Correction Factor (dB)	Meter Reading at 3m (dBμV)	Limits (dBμV/m)	Emission Level at 3m (dBμV/m)	Margin Limit (dB)
65.03	7.7	31.20	40.00	38.90	-1.10
132.00	13.8	27.80	43.50	41.58	-1.92
480.02	20.5	24.30	46.00	44.80	-1.20
792.02	24.6	19.50	46.00	44.10	-1.90
800.01	24.7	19.90	46.00	44.60	-1.40
959.98	26.5	18.20	46.00	44.66	-1.34

Remark:

1. Correction Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB)

2. Emission level (dBμV/m) = Correction Factor (dB) + Meter Reading (dBμV)

Product Name	(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router	**Test Date**	2008/08/27
Model	BiPAC 7404VGOX	**Test By**	Rueyyan Lin
Test Mode	Normal operating / ADS18B-W 120120	**TEMP & Humidity**	29°C, 72%

Horizontal					
Frequency (MHz)	Correction Factor (dB)	Meter Reading at 3m (dBμV)	Limits (dBμV/m)	Emission Level at 3m (dBμV/m)	Margin Limit (dB)
480.02	20.5	20.30	46.00	40.8	-5.2
500.00	20.8	17.50	46.00	38.3	-7.7
550.00	21.7	19.50	46.00	41.2	-4.8
560.03	21.8	21.20	46.00	43.0	-3.0
600.00	22.5	20.60	46.00	43.1	-2.9
959.98	26.5	17.50	46.00	44.0	-2.0
Vertical					
Frequency (MHz)	Correction Factor (dB)	Meter Reading at 3m (dBμV)	Limits (dBμV/m)	Emission Level at 3m (dBμV/m)	Margin Limit (dB)
121.18	14.2	21.9	43.50	36.1	-7.4
130.00	13.9	21.5	43.50	35.4	-8.1
500.00	20.8	18.5	46.00	39.3	-6.7
600.00	22.5	14.3	46.00	36.8	-9.2
700.25	23.4	18.6	46.00	42.0	-4.0
960.00	26.5	16.5	46.00	43.0	-3.0

Remark:

1. Correction Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB)

2. Emission level (dBμV/m) = Correction Factor (dB) + Meter Reading (dBμV)

8.8.3 TRANSMITTER RADIATED EMISSION ABOVE 1 GHz

Product Name	(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router	**Test Date**	2008/04/11
Model	BiPAC 7404VGOX	**Test By**	Gundam Lin
Test Mode	IEEE 802.11b TX (CH Low)	**TEMP & Humidity**	28°C, 67%

Measurement Distance at 1m Horizontal polarity

Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)
1584.06	50.95	27.21	3.73	35.27	9.50	0.00	37.12	74.00	-36.88	P
1584.06	42.10	27.21	3.73	35.27	9.50	0.00	28.27	54.00	-25.73	A
4823.93	53.00	34.71	6.32	35.66	9.50	0.35	49.21	74.00	-24.79	P
4823.93	49.33	34.71	6.32	35.66	9.50	0.35	45.54	54.00	-8.46	A
7236.00	47.56	39.22	8.27	35.89	9.50	0.90	50.56	74.00	-23.44	P
7236.00	33.77	39.22	8.27	35.89	9.50	0.90	36.77	54.00	-17.23	A
9648.06	47.06	39.31	9.35	36.12	9.50	0.54	50.64	74.00	-23.36	P
9648.06	34.07	39.31	9.35	36.12	9.50	0.54	37.65	54.00	-16.35	A
12060.00	47.61	41.36	10.56	35.40	9.50	0.43	55.06	74.00	-18.94	P
12060.00	33.31	41.36	10.56	35.40	9.50	0.43	40.76	54.00	-13.24	A

Measurement Distance at 1m Vertical polarity

Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)
1584.06	52.85	27.21	3.73	35.27	9.50	0.00	39.02	74.00	-34.98	P
1584.06	47.76	27.21	3.73	35.27	9.50	0.00	33.93	54.00	-20.07	A
4823.93	57.91	34.71	6.32	35.66	9.50	0.35	54.12	74.00	-19.88	P
4823.93	54.72	34.71	6.32	35.66	9.50	0.35	50.93	54.00	-3.07	A
7236.00	47.10	39.22	8.27	35.89	9.50	0.90	50.10	74.00	-23.90	P
7236.00	33.67	39.22	8.27	35.89	9.50	0.90	36.67	54.00	-17.33	A
9648.06	47.33	39.31	9.35	36.12	9.50	0.54	50.91	74.00	-23.09	P
9648.06	34.96	39.31	9.35	36.12	9.50	0.54	38.54	54.00	-15.46	A
12060.00	47.12	41.36	10.56	35.40	9.50	0.43	54.57	74.00	-19.43	P
12060.00	33.81	41.36	10.56	35.40	9.50	0.43	41.26	54.00	-12.74	A

Remark:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
4. The result basic equation calculation is as follow:
Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
5. The other emission levels were 20dB below the limit
6. The test limit distance is 3M limit.

Product Name	(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router	Test Date	2008/04/11
Model	BiPAC 7404VGOX	Test By	Gundam Lin
Test Mode	IEEE 802.11b TX (CH Middle)	TEMP & Humidity	28°C, 67%

Measurement Distance at 1m Horizontal polarity										
Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)
1584.00	50.87	27.20	3.73	35.27	9.50	0.00	37.04	74.00	-36.96	P
1584.00	41.69	27.20	3.73	35.27	9.50	0.00	27.86	54.00	-26.14	A
4873.95	53.59	34.82	6.32	35.67	9.50	0.30	49.85	74.00	-24.15	P
4873.95	50.50	34.82	6.32	35.67	9.50	0.30	46.76	54.00	-7.24	A
7311.00	46.91	39.38	8.30	35.92	9.50	0.83	50.00	74.00	-24.00	P
7311.00	33.35	39.38	8.30	35.92	9.50	0.83	36.44	54.00	-17.56	A
9748.05	47.28	39.25	9.54	36.20	9.50	0.57	50.95	74.00	-23.05	P
9748.05	34.62	39.25	9.54	36.20	9.50	0.57	38.29	54.00	-15.71	A
12185.00	47.30	41.49	10.52	35.20	9.50	0.39	55.00	74.00	-19.00	P
12185.00	33.65	41.49	10.52	35.20	9.50	0.39	41.35	54.00	-12.65	A

Measurement Distance at 1m Vertical polarity										
Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)
1584.00	52.68	27.20	3.73	35.27	9.50	0.00	38.85	74.00	-35.15	P
1584.00	47.53	27.20	3.73	35.27	9.50	0.00	33.70	54.00	-20.30	A
4873.95	56.67	34.82	6.32	35.67	9.50	0.30	52.93	74.00	-21.07	P
4873.95	54.37	34.82	6.32	35.67	9.50	0.30	50.63	54.00	-3.37	A
7311.00	46.92	39.38	8.30	35.92	9.50	0.83	50.01	74.00	-23.99	P
7311.00	33.10	39.38	8.30	35.92	9.50	0.83	36.19	54.00	-17.81	A
9748.05	47.33	39.25	9.54	36.20	9.50	0.57	51.00	74.00	-23.00	P
9748.05	34.95	39.25	9.54	36.20	9.50	0.57	38.62	54.00	-15.38	A
12185.00	47.15	41.49	10.52	35.20	9.50	0.39	54.85	74.00	-19.15	P
12185.00	33.32	41.49	10.52	35.20	9.50	0.39	41.02	54.00	-12.98	A

Remark:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
4. The result basic equation calculation is as follow:
Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
5. The other emission levels were 20dB below the limit
6. The test limit distance is 3M limit.

Product Name	(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router	Test Date	2008/04/11
Model	BiPAC 7404VGOX	Test By	Gundam Lin
Test Mode	IEEE 802.11b TX (CH High)	TEMP & Humidity	28°C, 67%

Measurement Distance at 1m Horizontal polarity

Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)
1584.05	50.52	27.21	3.73	35.27	9.50	0.00	36.69	74.00	-37.31	P
1584.05	41.36	27.21	3.73	35.27	9.50	0.00	27.53	54.00	-26.47	A
4924.05	55.53	34.93	6.32	35.68	9.50	0.25	51.84	74.00	-22.16	P
4924.05	52.62	34.93	6.32	35.68	9.50	0.25	48.93	54.00	-5.07	A
7386.00	46.89	39.55	8.33	35.95	9.50	0.76	50.08	74.00	-23.92	P
7386.00	33.22	39.55	8.33	35.95	9.50	0.76	36.41	54.00	-17.59	A
9847.96	47.51	39.19	9.73	36.28	9.50	0.61	51.26	74.00	-22.74	P
9847.96	34.28	39.19	9.73	36.28	9.50	0.61	38.03	54.00	-15.97	A
12310.00	47.29	41.61	10.49	35.00	9.50	0.35	55.23	74.00	-18.77	P
12310.00	33.48	41.61	10.49	35.00	9.50	0.35	41.42	54.00	-12.58	A

Measurement Distance at 1m Vertical polarity

Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)
1584.05	52.56	27.21	3.73	35.27	9.50	0.00	38.73	74.00	-35.27	P
1584.05	47.85	27.21	3.73	35.27	9.50	0.00	34.02	54.00	-19.98	A
4924.05	57.42	34.93	6.32	35.68	9.50	0.25	53.73	74.00	-20.27	P
4924.05	55.30	34.93	6.32	35.68	9.50	0.25	51.61	54.00	-2.39	A
7386.00	47.39	39.55	8.33	35.95	9.50	0.76	50.58	74.00	-23.42	P
7386.00	33.86	39.55	8.33	35.95	9.50	0.76	37.05	54.00	-16.95	A
9847.96	47.28	39.19	9.73	36.28	9.50	0.61	51.03	74.00	-22.97	P
9847.96	34.73	39.19	9.73	36.28	9.50	0.61	38.48	54.00	-15.52	A
12310.00	47.13	41.61	10.49	35.00	9.50	0.35	55.07	74.00	-18.93	P
12310.00	33.61	41.61	10.49	35.00	9.50	0.35	41.55	54.00	-12.45	A

Remark:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
4. The result basic equation calculation is as follow:
Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
5. The other emission levels were 20dB below the limit
6. The test limit distance is 3M limit.

Product Name	(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router	Test Date	2008/04/11
Model	BiPAC 7404VGOX	Test By	Gundam Lin
Test Mode	IEEE 802.11g TX (CH Low)	TEMP & Humidity	28°C, 67%

Measurement Distance at 1m Horizontal polarity										
Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)
1584.12	50.77	27.21	3.73	35.27	9.50	0.00	36.94	74.00	-37.06	P
1584.12	42.31	27.21	3.73	35.27	9.50	0.00	28.48	54.00	-25.52	A
4820.20	62.79	34.70	6.32	35.66	9.50	0.35	59.00	74.00	-15.00	P
4820.20	48.97	34.70	6.32	35.66	9.50	0.35	45.18	54.00	-8.82	A
7229.36	55.30	39.20	8.27	35.89	9.50	0.91	58.29	74.00	-15.71	P
7229.36	34.96	39.20	8.27	35.89	9.50	0.91	37.95	54.00	-16.05	A
9649.49	47.26	39.31	9.35	36.12	9.50	0.54	50.85	74.00	-23.15	P
9649.49	34.87	39.31	9.35	36.12	9.50	0.54	38.46	54.00	-15.54	A
12060.00	47.38	41.36	10.56	35.40	9.50	0.43	54.83	74.00	-19.17	P
12060.00	34.03	41.36	10.56	35.40	9.50	0.43	41.48	54.00	-12.52	A

Measurement Distance at 1m Vertical polarity										
Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)
1584.12	52.10	27.21	3.73	35.27	9.50	0.00	38.27	74.00	-35.73	P
1584.12	47.50	27.21	3.73	35.27	9.50	0.00	33.67	54.00	-20.33	A
4820.20	67.05	34.70	6.32	35.66	9.50	0.35	63.26	74.00	-10.74	P
4820.20	54.05	34.70	6.32	35.66	9.50	0.35	50.26	54.00	-3.74	A
7229.36	57.37	39.20	8.27	35.89	9.50	0.91	60.36	74.00	-13.64	P
7229.36	35.79	39.20	8.27	35.89	9.50	0.91	38.78	54.00	-15.22	A
9649.49	50.15	39.31	9.35	36.12	9.50	0.54	53.74	74.00	-20.26	P
9649.49	35.97	39.31	9.35	36.12	9.50	0.54	39.56	54.00	-14.44	A
12060.00	47.57	41.36	10.56	35.40	9.50	0.43	55.02	74.00	-18.98	P
12060.00	34.21	41.36	10.56	35.40	9.50	0.43	41.66	54.00	-12.34	A

Remark:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
4. The result basic equation calculation is as follow:
Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
5. The other emission levels were 20dB below the limit
6. The test limit distance is 3M limit.

Product Name	(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router	Test Date	2008/04/11
Model	BiPAC 7404VGOX	Test By	Gundam Lin
Test Mode	IEEE 802.11g TX (CH Middle)	TEMP & Humidity	28°C, 67%

Measurement Distance at 1m Horizontal polarity

Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)
1584.07	50.75	27.21	3.73	35.27	9.50	0.00	36.92	74.00	-37.08	P
1584.07	41.69	27.21	3.73	35.27	9.50	0.00	27.86	54.00	-26.14	A
4869.27	64.61	34.81	6.32	35.67	9.50	0.30	60.87	74.00	-13.13	P
4869.27	50.72	34.81	6.32	35.67	9.50	0.30	46.98	54.00	-7.02	A
7302.22	52.75	39.36	8.29	35.92	9.50	0.84	55.83	74.00	-18.17	P
7302.22	35.50	39.36	8.29	35.92	9.50	0.84	38.58	54.00	-15.42	A
9747.79	48.13	39.25	9.54	36.20	9.50	0.57	51.80	74.00	-22.20	P
9747.79	35.25	39.25	9.54	36.20	9.50	0.57	38.92	54.00	-15.08	A
12185.00	47.66	41.49	10.52	35.20	9.50	0.39	55.36	74.00	-18.64	P
12185.00	33.53	41.49	10.52	35.20	9.50	0.39	41.23	54.00	-12.77	A

Measurement Distance at 1m Vertical polarity

Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)
1584.07	52.46	27.21	3.73	35.27	9.50	0.00	38.63	74.00	-35.37	P
1584.07	47.80	27.21	3.73	35.27	9.50	0.00	33.97	54.00	-20.03	A
4869.27	67.73	34.81	6.32	35.67	9.50	0.30	63.99	74.00	-10.01	P
4869.27	54.29	34.81	6.32	35.67	9.50	0.30	50.55	54.00	-3.45	A
7302.22	54.50	39.36	8.29	35.92	9.50	0.84	57.58	74.00	-16.42	P
7302.22	36.55	39.36	8.29	35.92	9.50	0.84	39.63	54.00	-14.37	A
9747.79	51.78	39.25	9.54	36.20	9.50	0.57	55.45	74.00	-18.55	P
9747.79	37.13	39.25	9.54	36.20	9.50	0.57	40.80	54.00	-13.20	A
12185.00	47.67	41.49	10.52	35.20	9.50	0.39	55.37	74.00	-18.63	P
12185.00	33.59	41.49	10.52	35.20	9.50	0.39	41.29	54.00	-12.71	A

Remark:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
4. The result basic equation calculation is as follow:
Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
5. The other emission levels were 20dB below the limit
6. The test limit distance is 3M limit.

Product Name	(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router	Test Date	2008/04/11
Model	BiPAC 7404VGOX	Test By	Gundam Lin
Test Mode	IEEE 802.11g TX (CH High)	TEMP & Humidity	28°C, 67%

Measurement Distance at 1m Horizontal polarity										
Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)
1584.02	50.47	27.20	3.73	35.27	9.50	0.00	36.64	74.00	-37.36	P
1584.02	41.52	27.20	3.73	35.27	9.50	0.00	27.69	54.00	-26.31	A
4925.58	60.59	34.94	6.32	35.69	9.50	0.24	56.91	74.00	-17.09	P
4925.58	47.95	34.94	6.32	35.69	9.50	0.24	44.27	54.00	-9.73	A
7377.58	50.01	39.53	8.32	35.95	9.50	0.77	53.19	74.00	-20.81	P
7377.58	34.20	39.53	8.32	35.95	9.50	0.77	37.38	54.00	-16.62	A
9847.83	47.63	39.19	9.73	36.28	9.50	0.61	51.38	74.00	-22.62	P
9847.83	34.67	39.19	9.73	36.28	9.50	0.61	38.42	54.00	-15.58	A
12310.00	47.51	41.61	10.49	35.00	9.50	0.35	55.45	74.00	-18.55	P
12310.00	34.30	41.61	10.49	35.00	9.50	0.35	42.24	54.00	-11.76	A

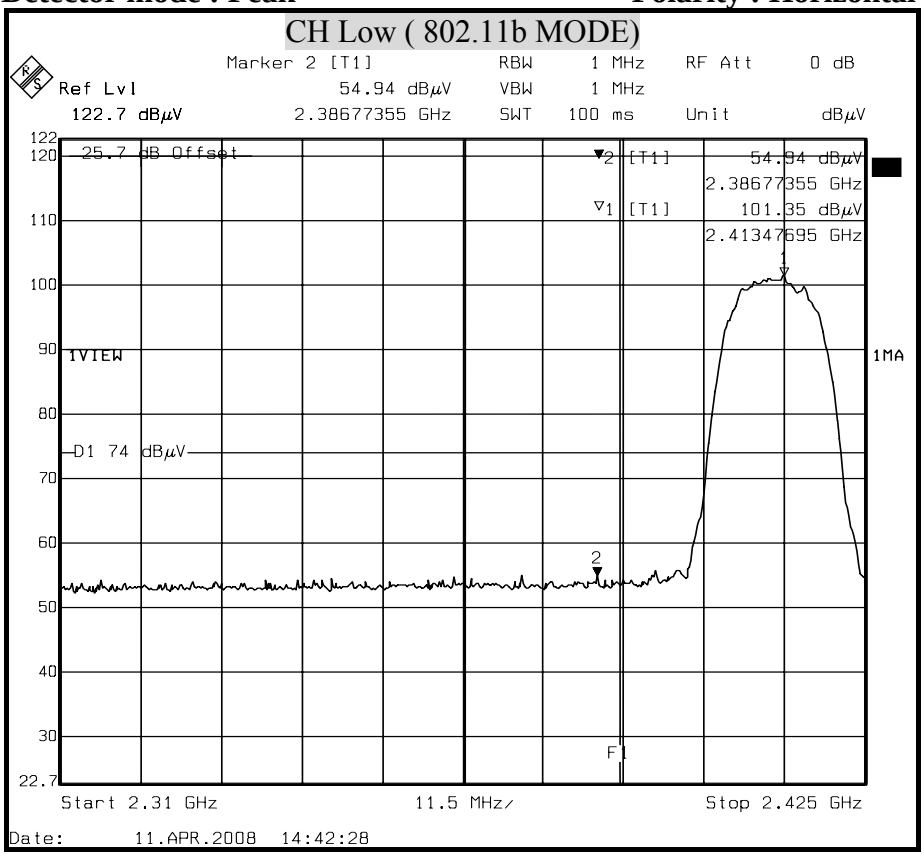
Measurement Distance at 1m Vertical polarity										
Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)
1584.02	51.69	27.20	3.73	35.27	9.50	0.00	37.86	74.00	-36.14	P
1584.02	47.48	27.20	3.73	35.27	9.50	0.00	33.65	54.00	-20.35	A
4925.58	63.91	34.94	6.32	35.69	9.50	0.24	60.23	74.00	-13.77	P
4925.58	51.10	34.94	6.32	35.69	9.50	0.24	47.42	54.00	-6.58	A
7377.58	52.21	39.53	8.32	35.95	9.50	0.77	55.39	74.00	-18.61	P
7377.58	35.39	39.53	8.32	35.95	9.50	0.77	38.57	54.00	-15.43	A
9847.83	50.11	39.19	9.73	36.28	9.50	0.61	53.86	74.00	-20.14	P
9847.83	36.13	39.19	9.73	36.28	9.50	0.61	39.88	54.00	-14.12	A
12310.00	47.61	41.61	10.49	35.00	9.50	0.35	55.55	74.00	-18.45	P
12310.00	34.25	41.61	10.49	35.00	9.50	0.35	42.19	54.00	-11.81	A

Remark:

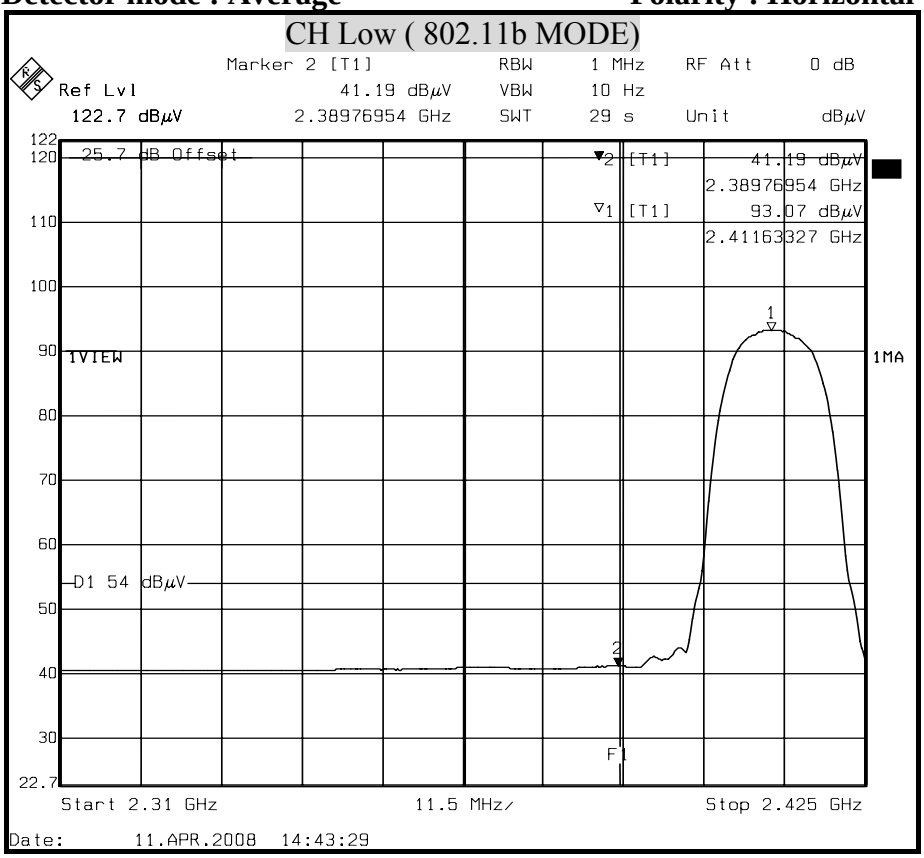
1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
4. The result basic equation calculation is as follow:
Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
5. The other emission levels were 20dB below the limit
6. The test limit distance is 3M limit.

8.8.4 RESTRICTED BAND EDGES

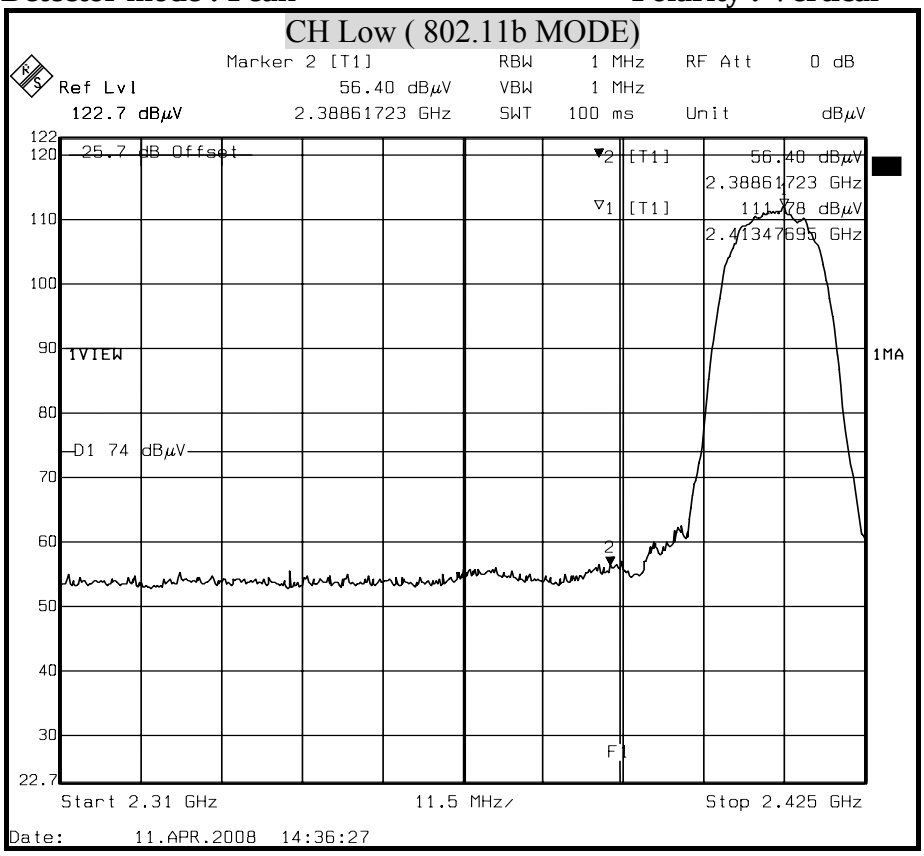
Detector mode : Peak **Polarity : Horizontal**



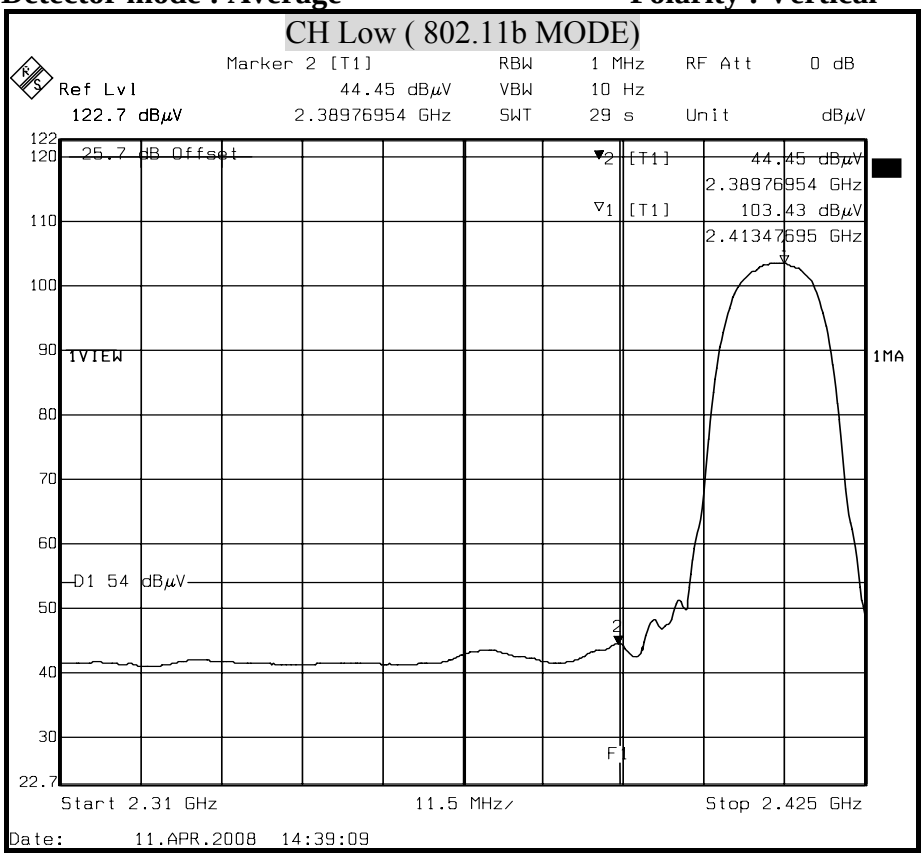
Detector mode : Average **Polarity : Horizontal**



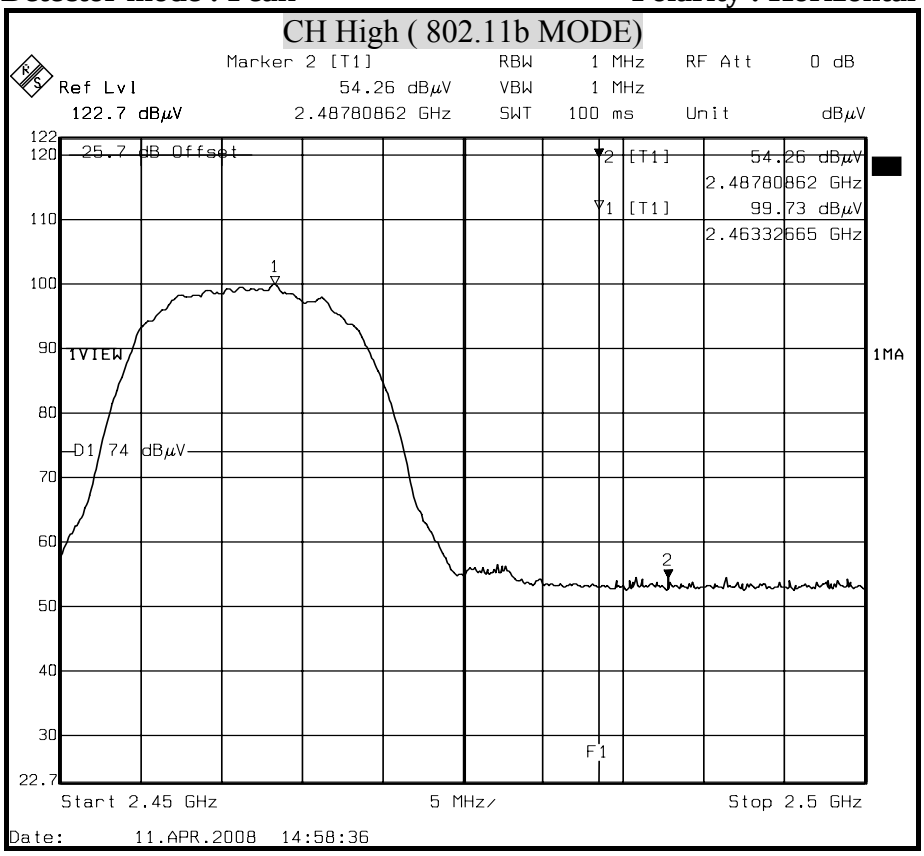
Detector mode : Peak **Polarity : Vertical**



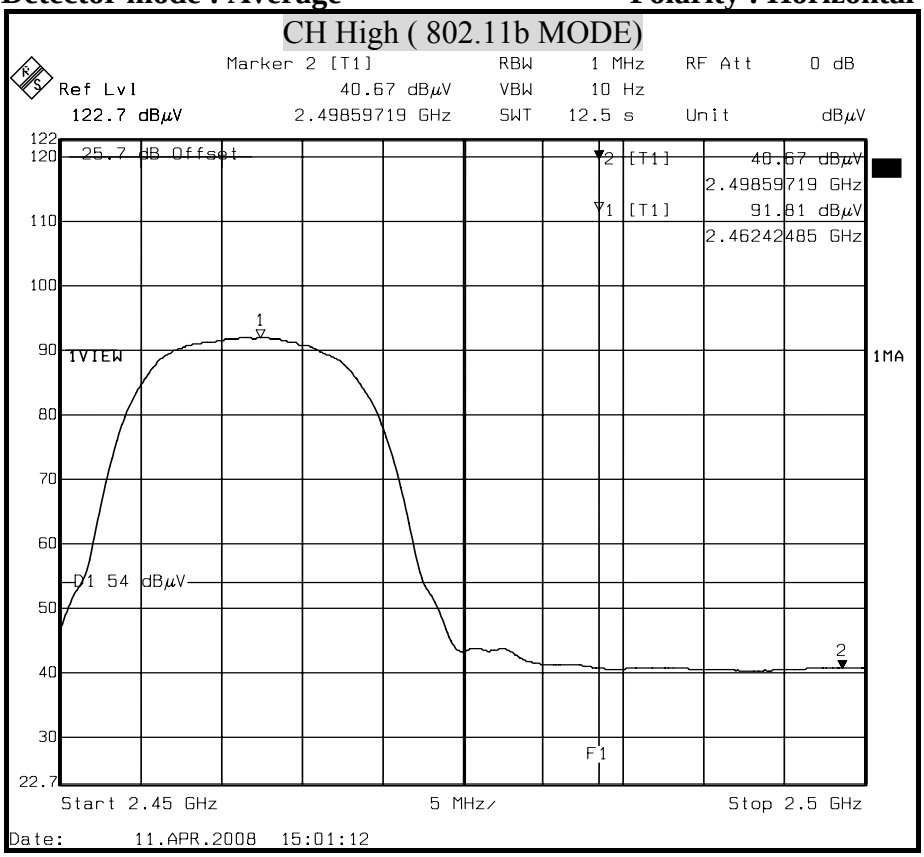
Detector mode : Average **Polarity : Vertical**



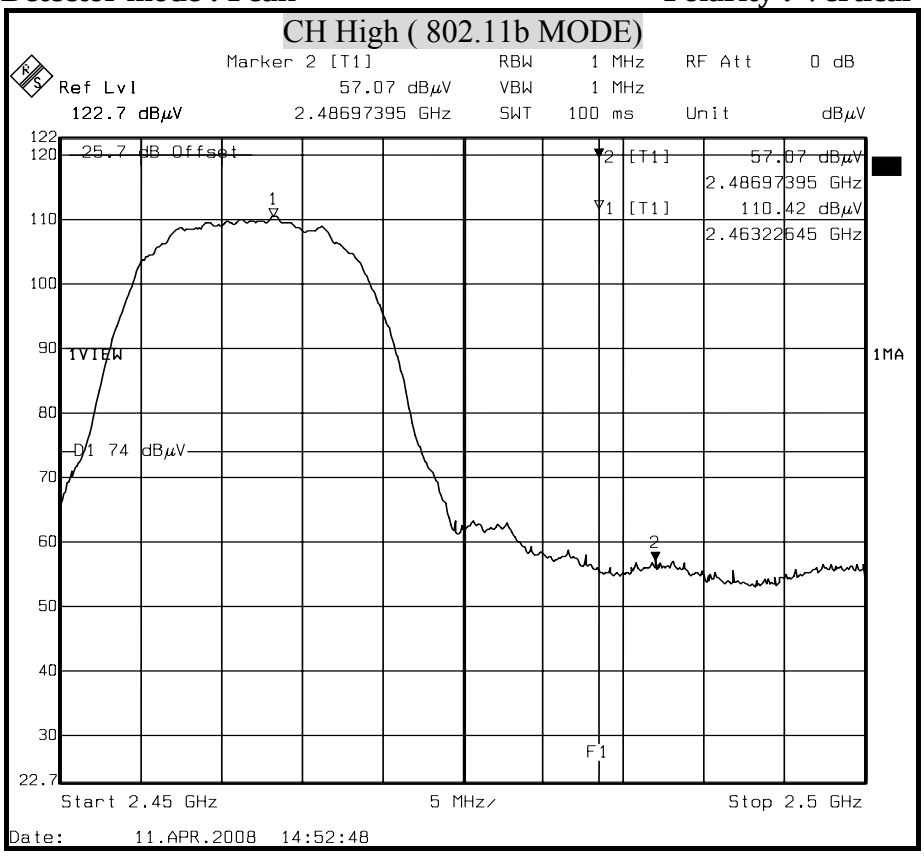
Detector mode : Peak **Polarity : Horizontal**



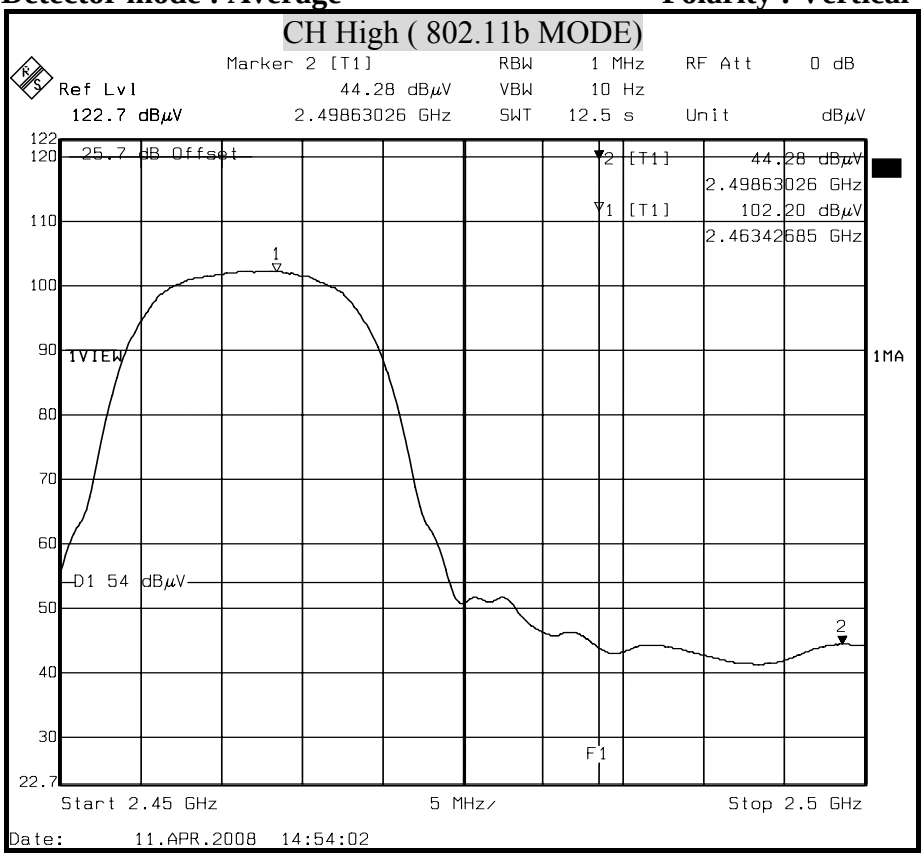
Detector mode : Average **Polarity : Horizontal**



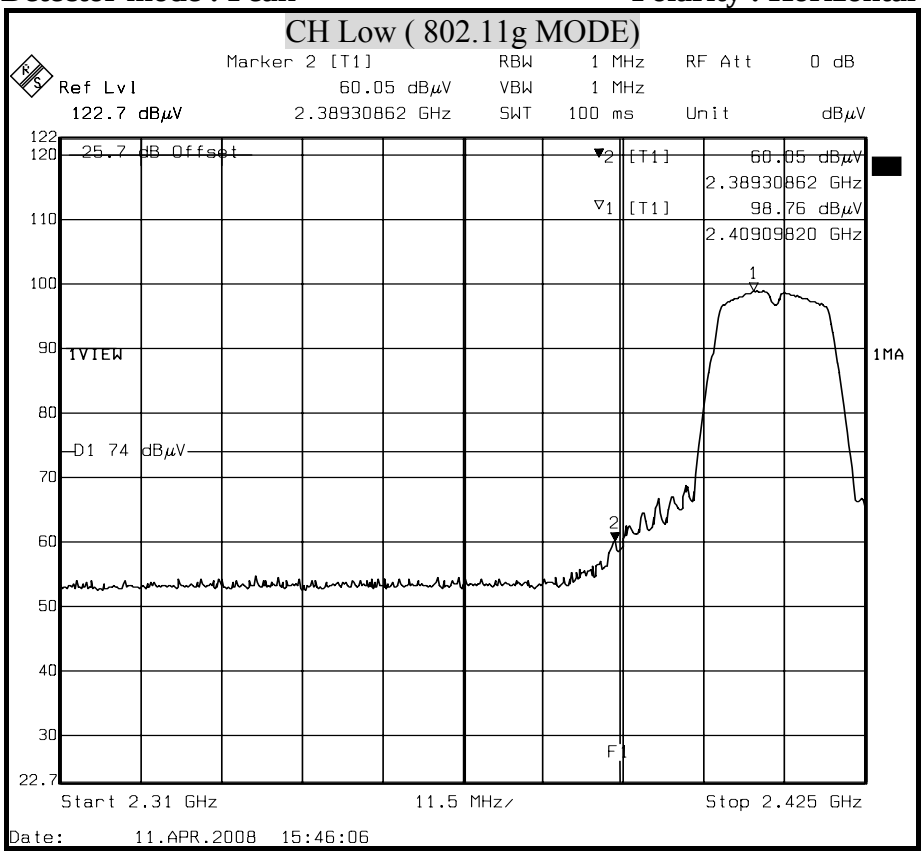
Detector mode : Peak **Polarity : Vertical**



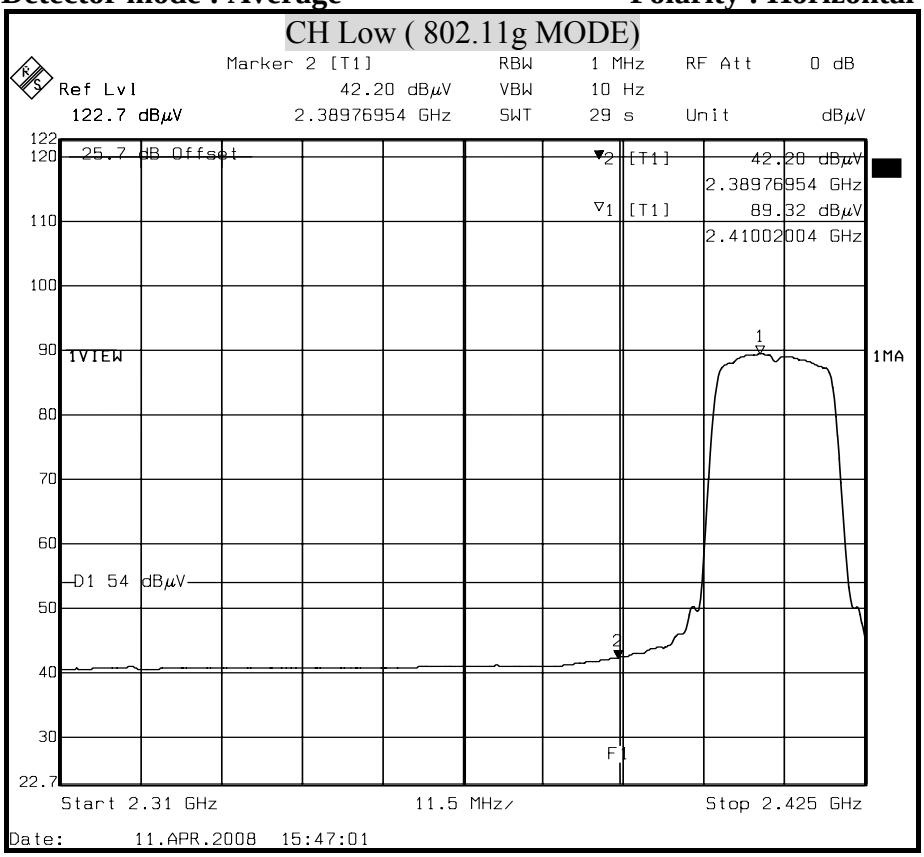
Detector mode : Average **Polarity : Vertical**



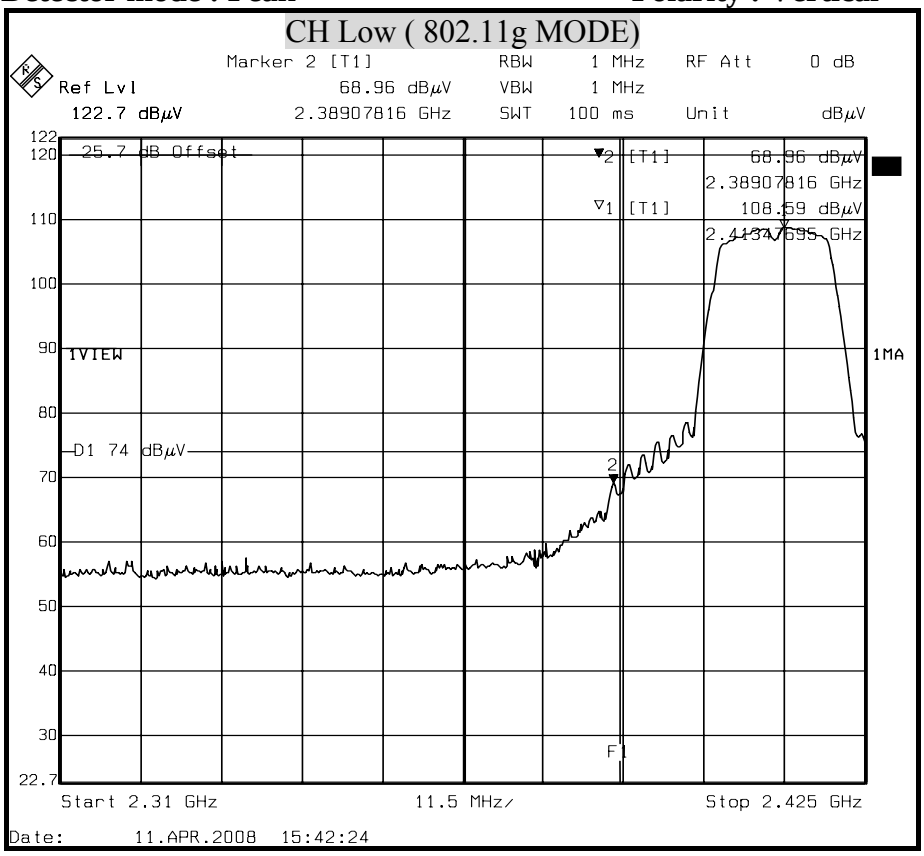
Detector mode : Peak **Polarity : Horizontal**



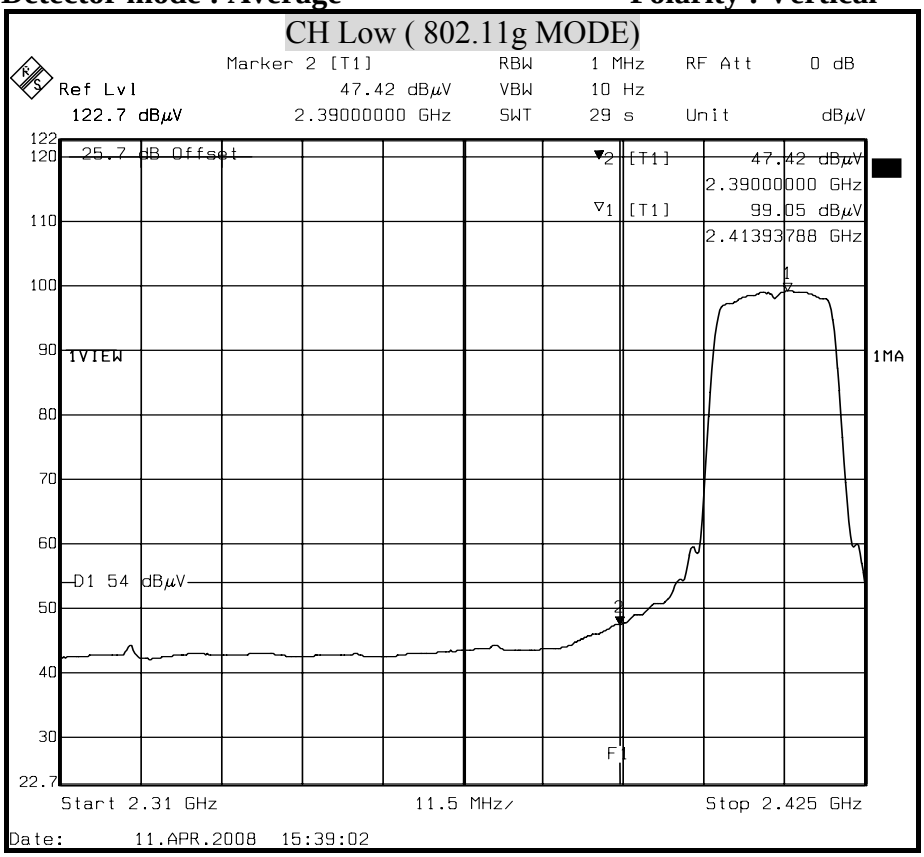
Detector mode : Average **Polarity : Horizontal**



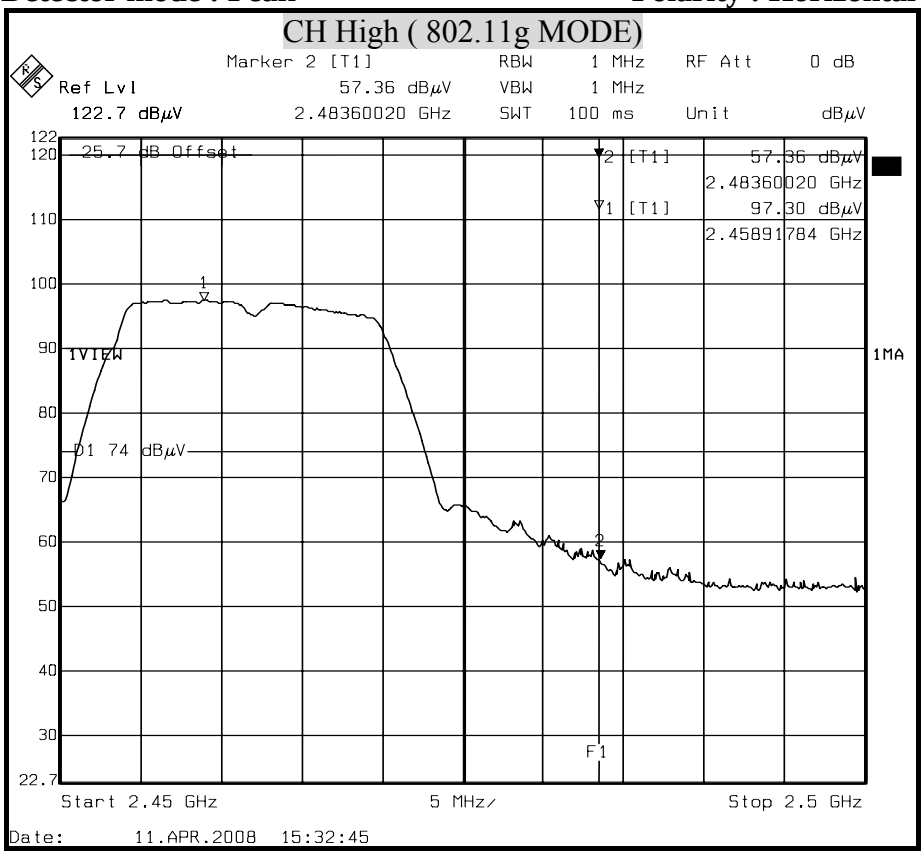
Detector mode : Peak **Polarity : Vertical**



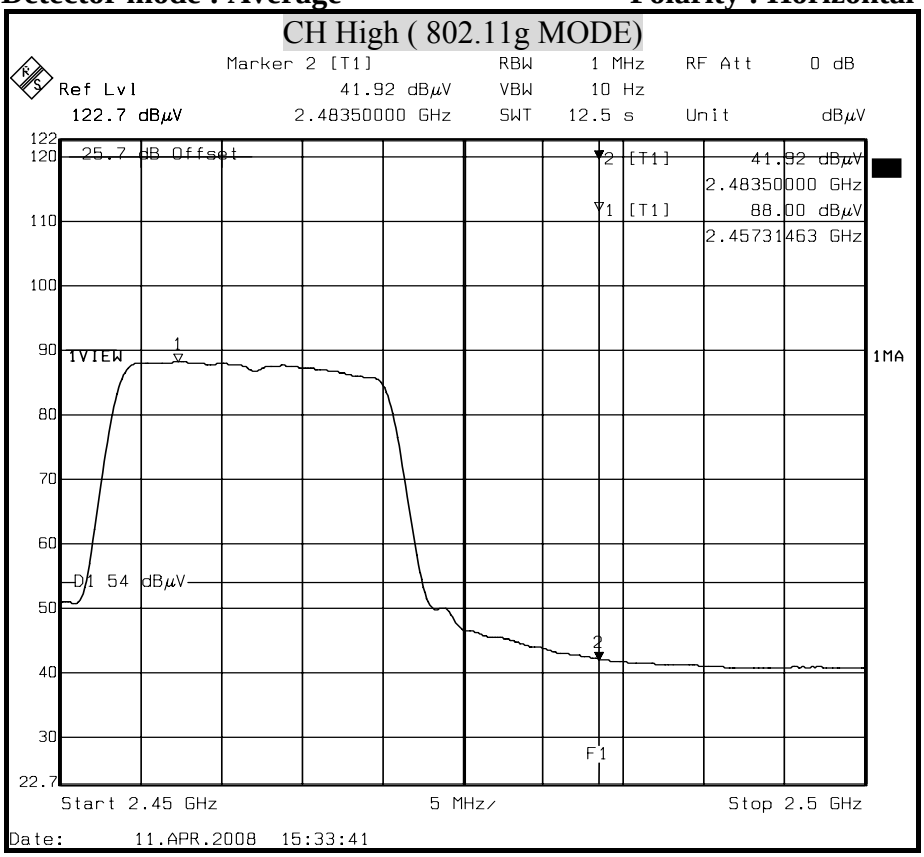
Detector mode : Average **Polarity : Vertical**



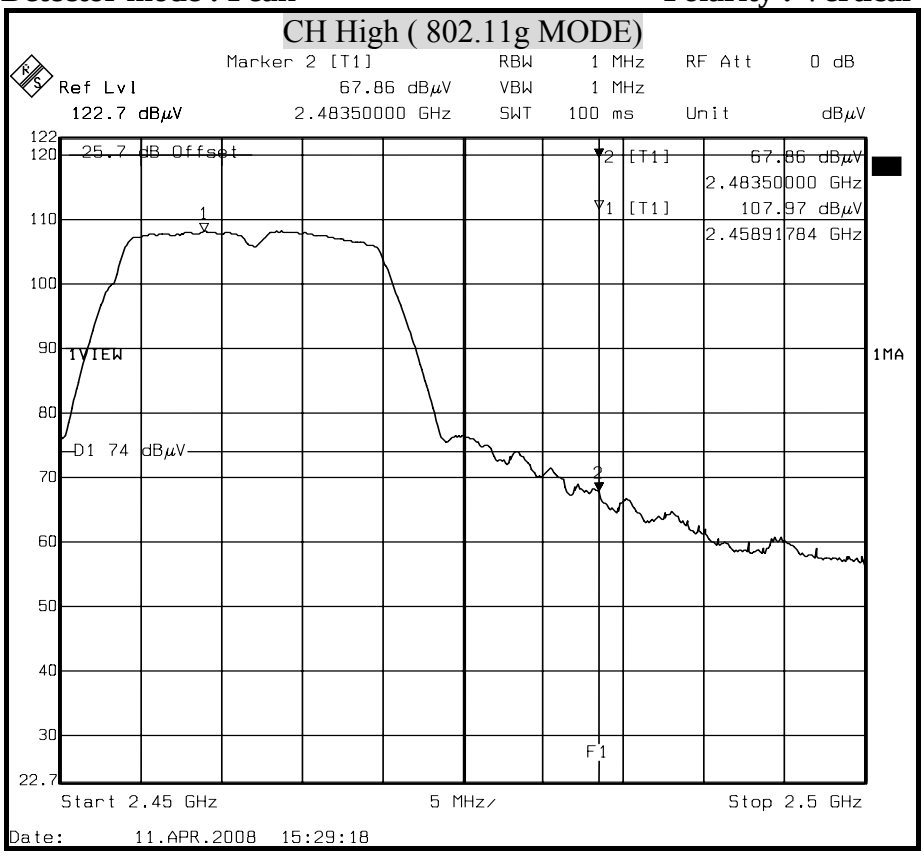
Detector mode : Peak **Polarity : Horizontal**



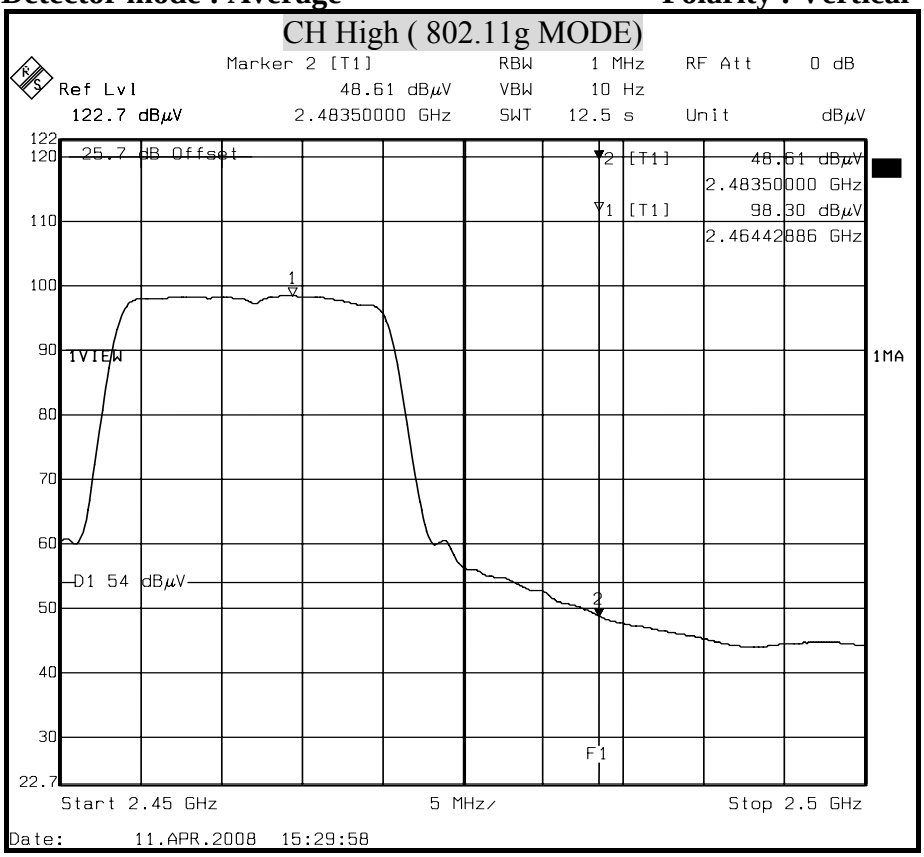
Detector mode : Average **Polarity : Horizontal**



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 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.

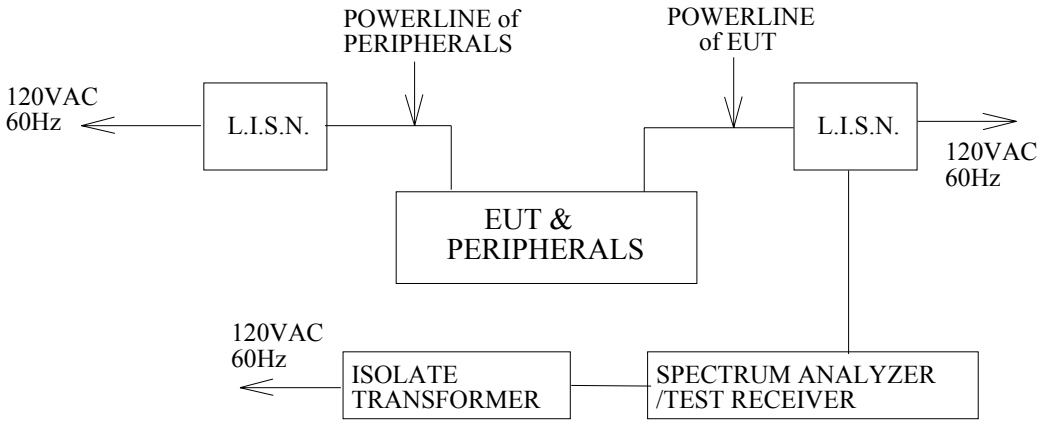
Frequency of Emission (MHz)	Conducted limit (dBμv)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.5 - 5	56	46
5 - 30	60	50

TEST EQUIPMENT

The following test equipment is used during the conducted powerline tests：

Manufacturer or Type	Model No.	Serial No.	Date of Calibration	Calibration Period	Remark
SCHWARZBECK L.I.S.N	NSLK 8127	8127-465	July 09, 2008	1 Year	FINAL
SCHWARZBECK L.I.S.N	NSLK 8127	8127-473	October 04, 2007	1 Year	FINAL
R & S TEST RECEIVER	ESHS30	838550/003	January 23, 2008	1 Year	FINAL
KEENE SHIELDED ROOM	5983	No.1	N/A	N/A	FINAL
R & S PULSE LIMIT	ESH3-Z2	10117	September 17, 2007	1 Year	FINAL
BELDEN N TYPE COAXIAL CABLE	8268 M17/164	003	September 14, 2007	1 Year	FINAL

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.

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.

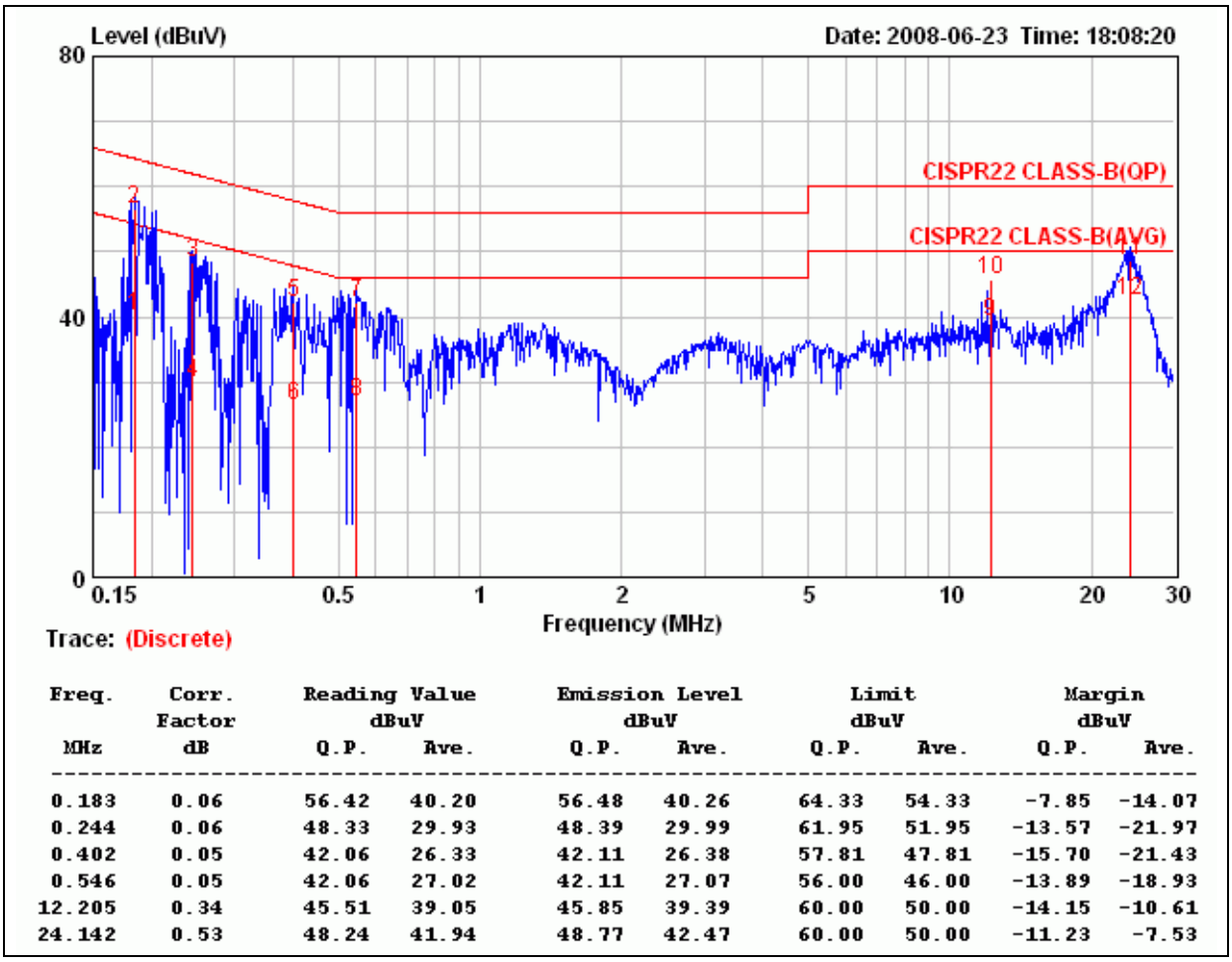
TEST RESULTS

No non-compliance noted

CONDUCTED RF VOLTAGE MEASUREMENT

Product Name	(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router	Test Date	2008/06/23
Model Name	BiPAC 7404VGOX	Test By	Rueyyan Lin
Test Mode	Normal operating(ADS0271-W)	TEMP & Humidity	25.7°C, 60%

LINE



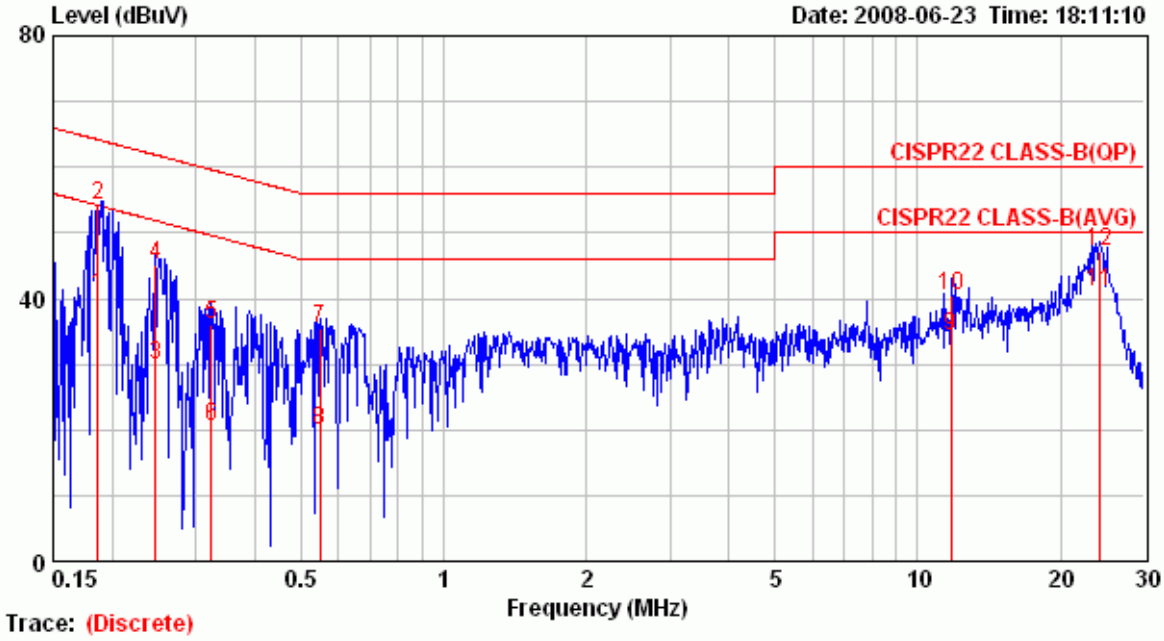
Freq.	Corr. Factor	Reading Value dBuV		Emission Level dBuV		Limit dBuV		Margin dBuV	
MHz	dB	Q.P.	Ave.	Q.P.	Ave.	Q.P.	Ave.	Q.P.	Ave.
0.183	0.06	56.42	40.20	56.48	40.26	64.33	54.33	-7.85	-14.07
0.244	0.06	48.33	29.93	48.39	29.99	61.95	51.95	-13.57	-21.97
0.402	0.05	42.06	26.33	42.11	26.38	57.81	47.81	-15.70	-21.43
0.546	0.05	42.06	27.02	42.11	27.07	56.00	46.00	-13.89	-18.93
12.205	0.34	45.51	39.05	45.85	39.39	60.00	50.00	-14.15	-10.61
24.142	0.53	48.24	41.94	48.77	42.47	60.00	50.00	-11.23	-7.53

Remark:

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

Product Name	(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router	Test Date	2008/06/23
Model Name	BiPAC 7404VGOX	Test By	Rueyyan Lin
Test Mode	Normal operating(ADS0271-W)	TEMP & Humidity	25.7°C, 60%

NEUTRAL



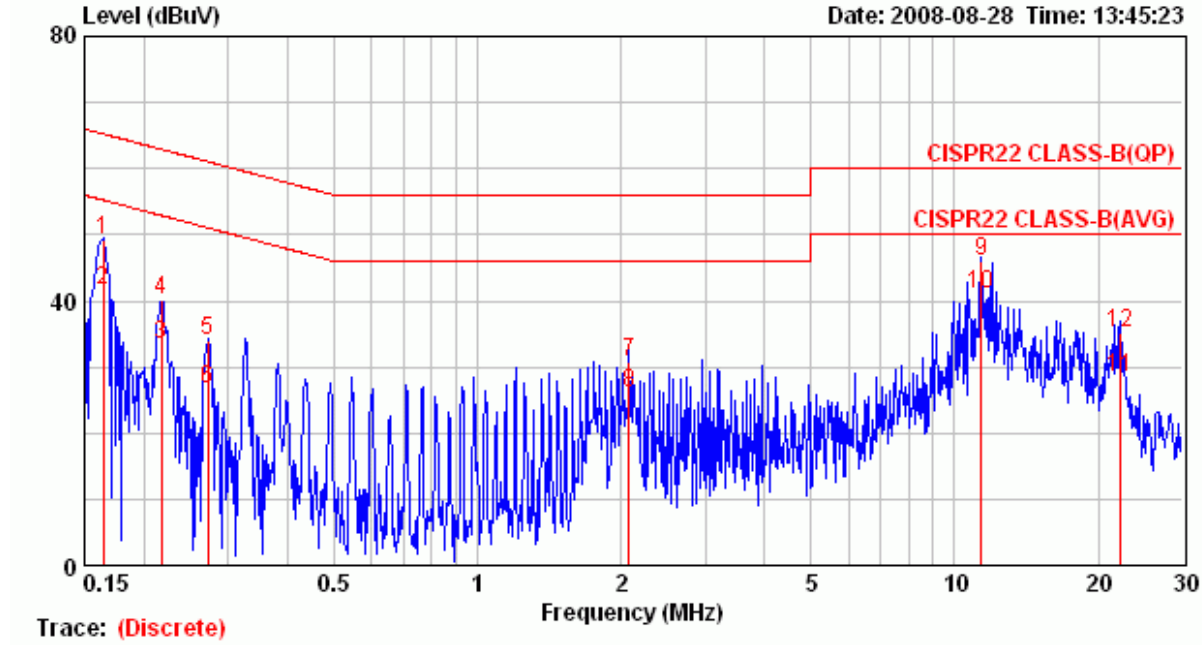
Freq.	Corr. Factor	Reading Value dBuV		Emission Level dBuV		Limit dBuV		Margin dBuV	
MHz	dB	Q.P.	Ave.	Q.P.	Ave.	Q.P.	Ave.	Q.P.	Ave.
0.186	0.06	54.06	40.49	54.12	40.55	64.20	54.20	-10.08	-13.65
0.247	0.06	45.11	29.85	45.17	29.91	61.86	51.86	-16.70	-21.96
0.323	0.06	35.94	20.50	36.00	20.56	59.62	49.62	-23.62	-29.06
0.548	0.05	35.41	19.74	35.46	19.79	56.00	46.00	-20.54	-26.21
11.779	0.33	40.13	33.88	40.46	34.21	60.00	50.00	-19.54	-15.79
24.142	0.52	46.76	40.42	47.28	40.94	60.00	50.00	-12.72	-9.06

Remark:

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

Product Name	(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router	Test Date	2008/08/28
Model	BiPAC 7404VGOX	Test By	Rueyyan Lin
Test Mode	Normal operating(ADS18B-W)	TEMP & Humidity	25.7°C, 60%

LINE



Freq. MHz	Corr. Factor dB	Reading Value dBuV Q.P.	Reading Value dBuV Ave.	Emission Level dBuV Q.P.	Emission Level dBuV Ave.	Limit dBuV Q.P.	Limit dBuV Ave.	Margin dBuV Q.P.	Margin dBuV Ave.
0.164	0.06	49.26	41.69	49.32	41.75	65.25	55.25	-15.93	-13.50
0.217	0.06	40.12	33.46	40.18	33.52	62.92	52.92	-22.74	-19.40
0.272	0.06	33.91	26.56	33.97	26.62	61.07	51.07	-27.10	-24.45
2.077	0.11	30.60	25.83	30.71	25.94	56.00	46.00	-25.29	-20.06
11.362	0.33	45.59	40.80	45.92	41.13	60.00	50.00	-14.08	-8.87
22.280	0.50	34.66	28.05	35.16	28.55	60.00	50.00	-24.84	-21.45

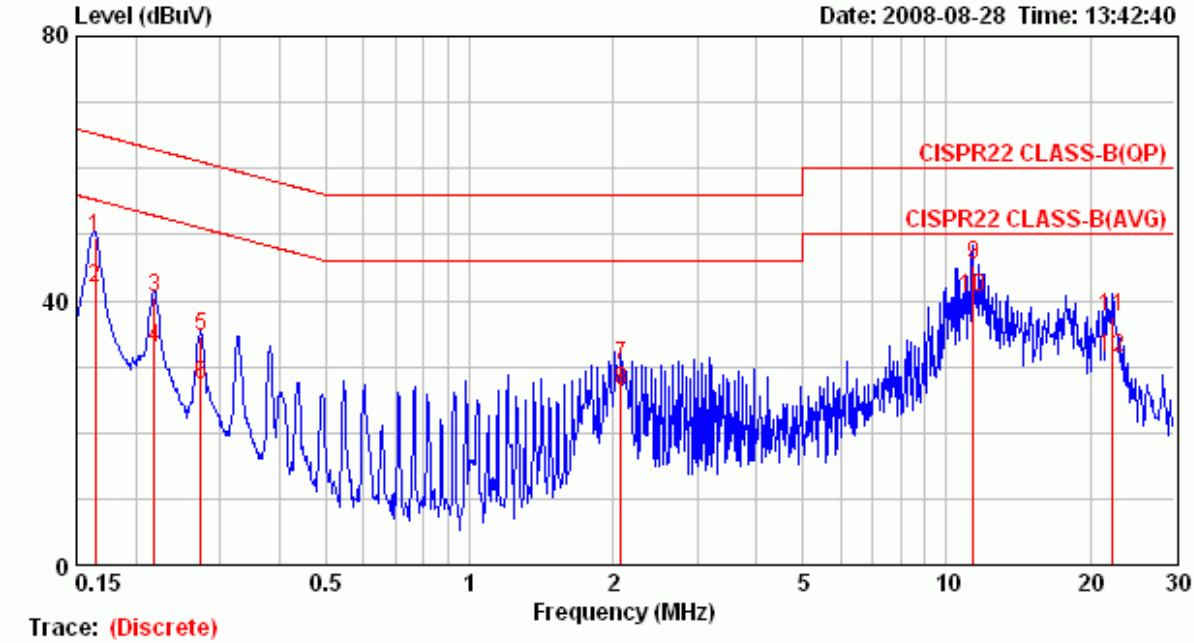
Remark:

1. Correction Factor = Insertion loss + cable loss

2. Margin value = Emission level – Limit value

Product Name	(3G) / VoIP/ 802.11g ADSL2+ (VPN) Firewall Router	Test Date	2008/08/28
Model	BiPAC 7404VGOX	Test By	Rueyyan Lin
Test Mode	Normal operating(ADS18B-W)	TEMP & Humidity	25.7°C, 60%

NEUTRAL



Freq. MHz	Corr. Factor dB	Reading Value dBuV Q.P.	Reading Value dBuV Ave.	Emission Level dBuV Q.P.	Emission Level dBuV Ave.	Limit dBuV Q.P.	Limit dBuV Ave.	Margin dBuV Q.P.	Margin dBuV Ave.
0.164	0.06	49.42	41.79	49.48	41.85	65.25	55.25	-15.77	-13.40
0.219	0.06	40.36	32.75	40.42	32.81	62.88	52.88	-22.46	-20.07
0.273	0.06	34.51	27.24	34.57	27.30	61.03	51.03	-26.46	-23.73
2.077	0.11	30.12	26.20	30.23	26.31	56.00	46.00	-25.77	-19.69
11.364	0.33	44.97	40.25	45.30	40.58	60.00	50.00	-14.70	-9.42
22.277	0.49	37.00	30.93	37.49	31.42	60.00	50.00	-22.51	-18.58

Remark:

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

9. ANTENNA REQUIREMENT

9.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

9.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used for this product is Dipole antenna. The temporary antenna connector is SMA reverse connector and the peak gain of this antenna is only 2 dBi.