



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

TEST REPORT

For

802.11 b/g MIMO Mini-PCI Card

Model : WMP-N06

Trade Name : Sonos

Issued for

Sonos, Inc.

223 East De La Guerra, Santa Barbara, CA93101.

Issued by

Compliance Certification Services Inc.

Tainan Laboratory

No. 8, Jiu Cheng Ling, Jiaokeng Village, Sinhua
Township, Tainan Hsien 712, Taiwan R.O.C.

TEL: 886-6-580-2201

FAX: 886-6-580-2202



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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	09/10/2009	Initial Issue	All Page 208	Jeter Wu



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1. TEST REPORT CERTIFICATION

Applicant : Sonos, Inc.
Address : 223 East De La Guerra, Santa Barbara, CA93101.
Equipment Under Test : 802.11 b/g MIMO Mini-PCI Card
Model : WMP-N06
Trade Name : Sonos
Tested Date : March 12 ~ September 10, 2009

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

Approved by:

Jeter Wu
Section Manager

Reviewed by:

Eric Yang
Senior Engineer

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	802.11 b/g MIMO Mini-PCI Card
Model Number	WMP-N06
Frequency Range	IEEE 802.11b/g, 802.11n HT20 : 2412MHz ~ 2462MHz IEEE 802.11n HT40 : 2422MHz ~ 2452MHz
Transmit Power	IEEE 802.11b : 27.88dBm IEEE 802.11g : 28.78dBm IEEE 802.11n HT20 : 28.80dBm IEEE 802.11n HT40 : 25.20dBm
Channel Spacing	IEEE 802.11b/g, 802.11n HT20/HT40 : 5MHz
Channel Number	IEEE 802.11b/g, 802.11n HT20 : 11 Channels IEEE 802.11n HT40 : 7 Channels
Transmit Data Rate	IEEE 802.11b:11, 5.5, 2, 1Mbps IEEE 802.11g : 54, 48, 36, 24, 18, 12, 11, 9, 6Mbps IEEE 802.11n HT20 : 144.444, 130, 117, 115.556, 104, 86.667, 78, 72.2, 65, 58.5, 57.8, 57.778, 52, 43.333, 43.3, 39, 28.9, 28.889, 26, 21.7, 19.5, 14.444, 14.4, 13, 7.2, 6.5 Mbps IEEE 802.11n HT40 : 300, 270, 243, 240, 216, 180, 162, 150, 135, 121.5, 120, 108, 90, 81, 60, 54, 45, 40.5, 30, 27, 15, 13.5Mbps
Type of Modulation	IEEE 802.11b : DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g : OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20/40 : OFDM (64QAM, 16QAM, QPSK, BPSK)
Frequency Selection	by software / firmware
Antenna Type	Antenna (1) Monopole Antenna, Antenna Gain 2.4dBi at 2.4GHz (× 3), Model: ZP120 Antenna (2) Monopole Antenna, Antenna Gain 2.1dBi at 2.4GHz (× 3), Model: ZP90
Power Source	3.3VDC (From Notebook PC, Powered From Host Device)

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: SBVRM002 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 is an 802.11n MIMO transceiver in Mini-PCI module form factor. It has three transmitter chains and three receive chains (3×3 configurations). The 3×3 configuration is implemented with three outside chains (Chain 0, 1 and 2).

The RF chipset is manufactured by Atheros Communications Inc.

The antenna peak gain 2.4dBi (highest gain) were chosen for full testing. (For Antenna model: ZP120)

IEEE 802.11 b ,802.11g ,802.11n HT20 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.

IEEE 802.11n HT20 mode : 6.5Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11n HT40 mode (DTS Band)

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	2422
Middle	2437
High	2452

IEEE 802.11n HT40 mode : 13.5Mbps data rate (worst case) were chosen for full testing.

The worst-case data rates are determined according to the description above, based on the investigations by measuring the PSD, peak power and average power across all the data rates, bandwidths, modulations and spatial stream modes.

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 2437 MHz.

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. 8, Jiu Cheng Ling, Jiaokeng Village, Sinhua Township, Tainan Hsien 712, Taiwan R.O.C.
The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR
Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with 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: 1109 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. In addition, the test facilities are listed with Industry Canada, Certification and Engineering Bureau, IC 2324H-1 for OATS -6.



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	 455173 TW-1037
Japan	VCCI	3/10 meter Open Area Test Sites to perform conducted/radiated measurements	 C-2882 R-2635
Taiwan	TAF	CISPR 11, FCC METHOD-47 CFR Part 18, EN 55011, EN 60601-1-2, CISPR 22, CNS 13438, EN 55022, EN 55024, AS/NZS CISPR 22 CISPR 14, EN 55014-1, EN 55014-2, CNS 13783-1, CISPR 22, CNS 13439, EN 55013, FCC Method-47 CFR Part 15 Subpart B, IC ICES-003, VCCI V-3 & V-4 FCC Method-47 CFR Part 15 Subpart C and ANSI C63.4, LP 0002 EN / IEC 61000-4-2 / -3 / -4 / -5 / -6 / -8 / -11 EN 61000-3-2, EN 61000-3-3 EN 61000-6-3, EN 61000-6-1, AS/NZS 4251.1, EN 61000-6-4, EN 61000-6-2, AS/NZS 4251.2, EN 61204-3, EN 50130-4, EN 62040-2, EN 50371, EN 50385, AS/NZS 4268, ETSI EN 300 386 ETSI EN 300 328, ETSI EN 301 489-1/-3/-9/-17 ETSI EN 301 893, ETSI EN 300 220-2/-1 ETSI EN 300 440-2/-1 ETSI EN 301 357-2/-1 RSS-310, RSS-210 Issue 7, RSS-Gen Issue 2	  Testing Laboratory 1109
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS13439	 SL2-IN-E-0039 SL2-R1/R2-0039 SL2-A1-E-0039
Canada	Industry Canada	RSS210, Issue 7	

* 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	Wireless Access Point	D-Link	DWL-7100AP	DQ6114B00002	KA22003040018-1
4	Modem	ZyXEL	Omni 56K	S1Z4107727	1880MN156K

SETUP DIAGRAM FOR TESTS

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

EUT OPERATING CONDITION

RF

1. Set up all computers like the setup diagram.
2. The “Atheros Radio Test <ART> Devilib Revision 0.3 BUILD #4 ART_11n” software was used for testing.

The EUT driver software installed in the host support equipment during testing was Atheros AR5002, ANWI Diagnostic Kernel Drive.

WHIP Antenna 2.4 dBi:

(1) TX Mode:

- ⇒ Tx Antenna: ANT_A, [TX99]
- ⇒ Tx Data Rate: 11Mbps long (IEEE 802.11b mode, chain 0/1/2 TX)
6Mbps (IEEE 802.11g mode, chain 0/1/2 TX)
6.5Mbps (IEEE 802.11n HT20 mode, chain 0/1/2 TX)
13.5Mbps (IEEE 802.11n HT40 mode, chain 0/1/2 TX)

⇒ Power control mode

Target Power: IEEE 802.11b Channel Low (2412MHz) = 16

IEEE 802.11b Channel Middle (2437MHz) = 18

IEEE 802.11b Channel High (2462MHz) = 16.5

Target Power: IEEE 802.11g Channel Low (2412MHz) = 12

IEEE 802.11g Channel Middle (2437MHz) = 19

IEEE 802.11g Channel High (2462MHz) = 13

Target Power: IEEE 802.11n HT20 Channel Low (2412MHz) = 10.5

IEEE 802.11n HT20 Channel Middle (2437MHz) = 19

IEEE 802.11n HT20 Channel High (2462MHz) = 12



Target Power: IEEE 802.11n HT40 Channel Low (2422MHz) = 7.5

IEEE 802.11n HT40 Channel Middle (2437MHz) = 15

IEEE 802.11n HT40 Channel High (2452MHz) = 9.5

3. All of the function are under run.
4. Start test.

For Normal operating :

1. Set up all computers like the setup diagram.
2. Notebook PC (2) ping 192.168.0.10 -t to Notebook PC (1).
3. Notebook PC (1) ping 192.168.0.20 -t to Notebook PC (2).
4. Notebook PC (1) (2) ping 192.168.0.50 -t to AP.
5. All of the function are under run.
6. Start test.

8. APPLICABLE LIMITS AND TEST RESULTS

8.1 6dB BANDWIDTH

LIMIT

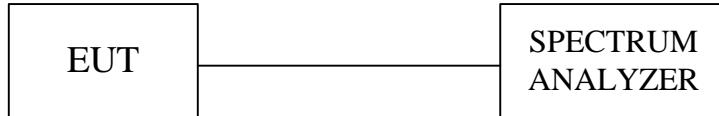
§ 15.207(a) (2) For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
SPECTRUM ANALYZER	AGILENT	E4446A	MY43360132	06/09/2010
SPECTRUM ANALYZER	AGILENT	E4446A	MY46180323	05/26/2010

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 (Three TX)

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)			Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
Low	2412	11500	11330	11170	500	PASS
Middle	2437	11580	12170	11830	500	PASS
High	2462	11170	11670	11250	500	PASS

IEEE 802.11g mode (Three TX)

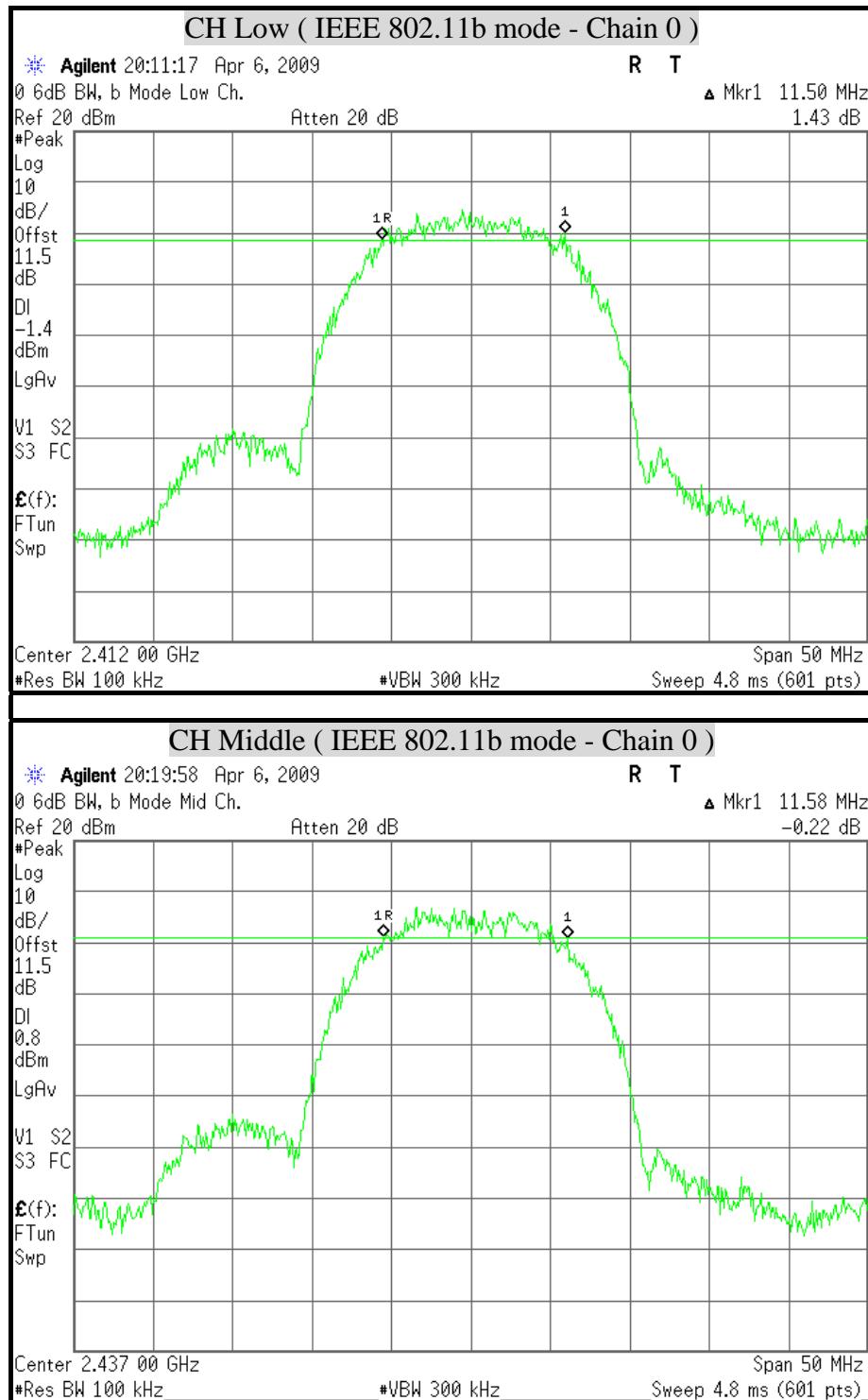
Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)			Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
Low	2412	16580	16500	16580	500	PASS
Middle	2437	16500	16420	16580	500	PASS
High	2462	16580	16500	16500	500	PASS

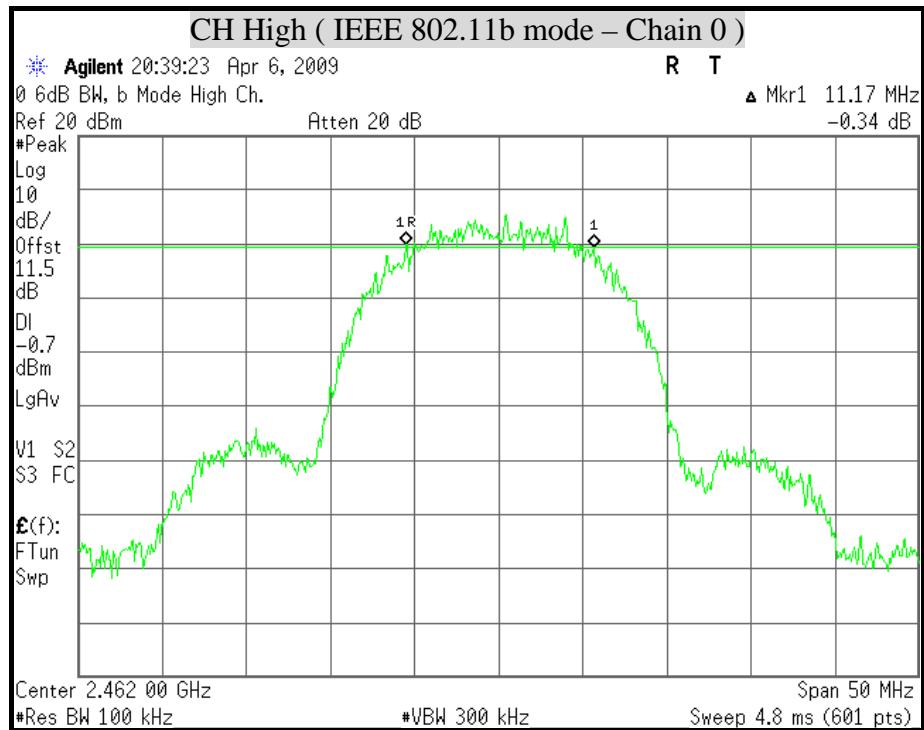
IEEE 802.11n HT20 mode (Three TX)

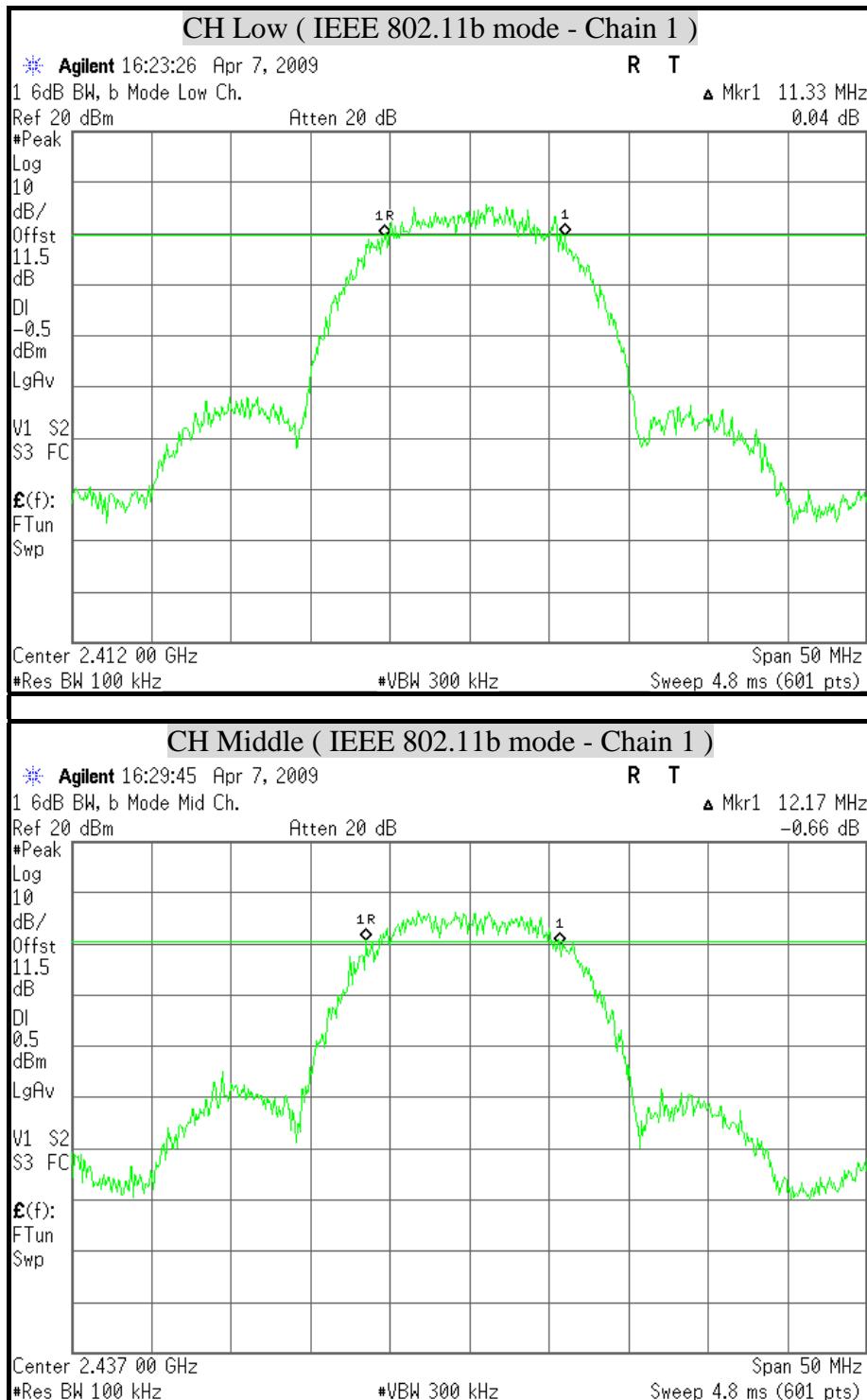
Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)			Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
Low	2412	17580	17670	17830	500	PASS
Middle	2437	17670	17750	17750	500	PASS
High	2462	17750	17750	17670	500	PASS

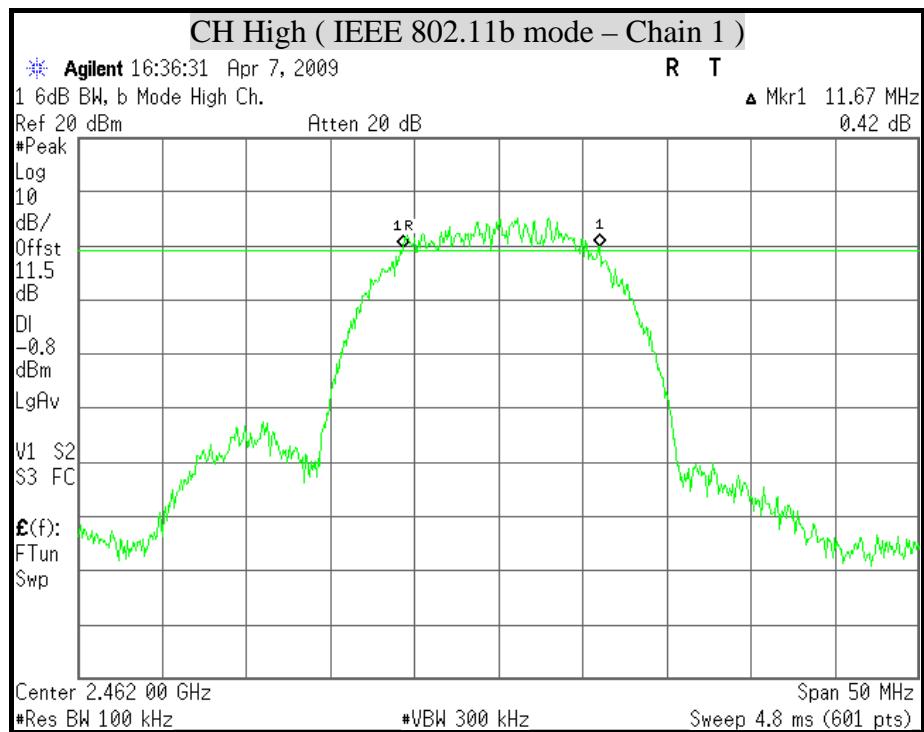
IEEE 802.11n HT40 mode (Three TX)

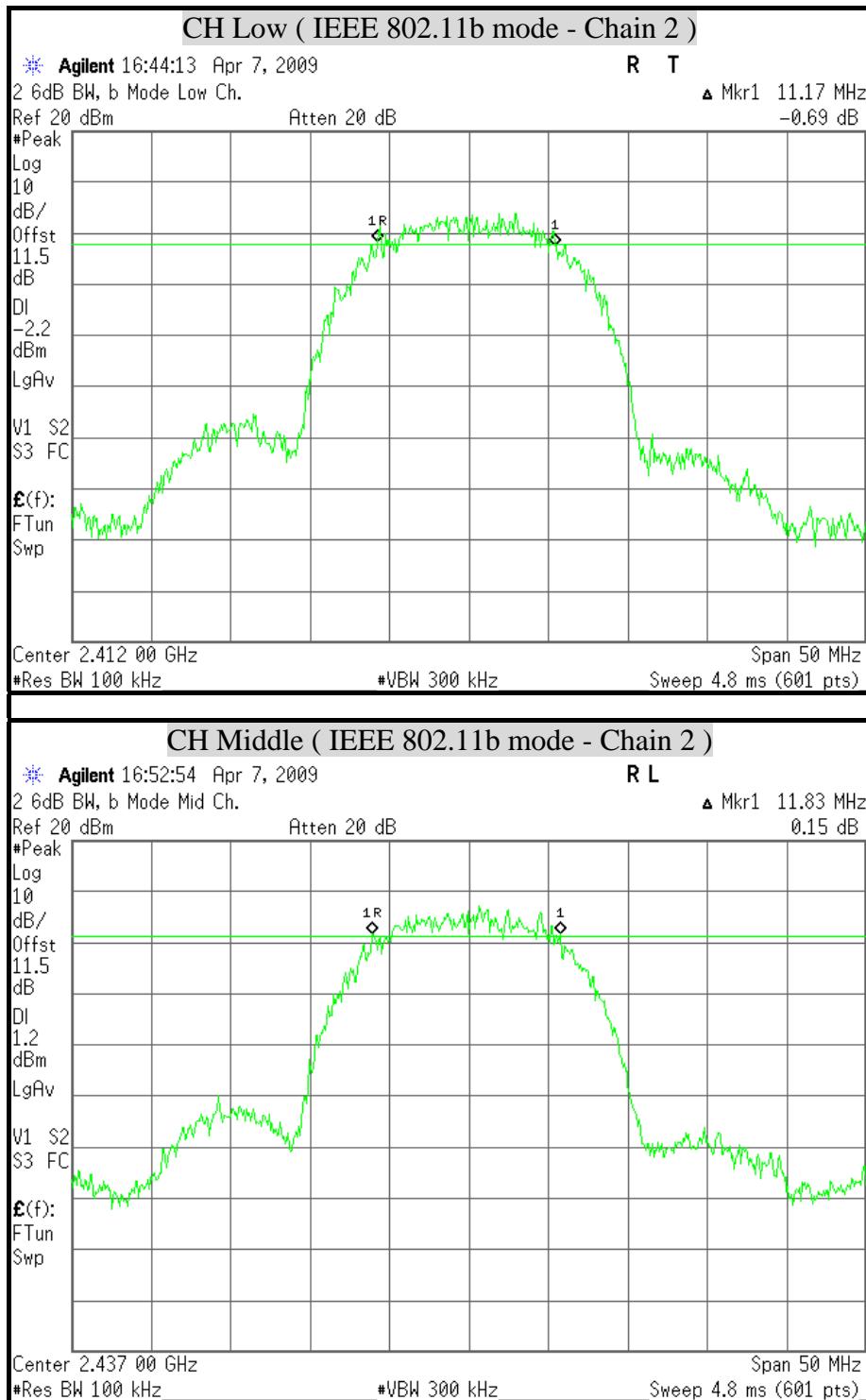
Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)			Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
Low	2422	36500	36500	36500	500	PASS
Middle	2437	36580	36500	36500	500	PASS
High	2452	36500	36500	36500	500	PASS

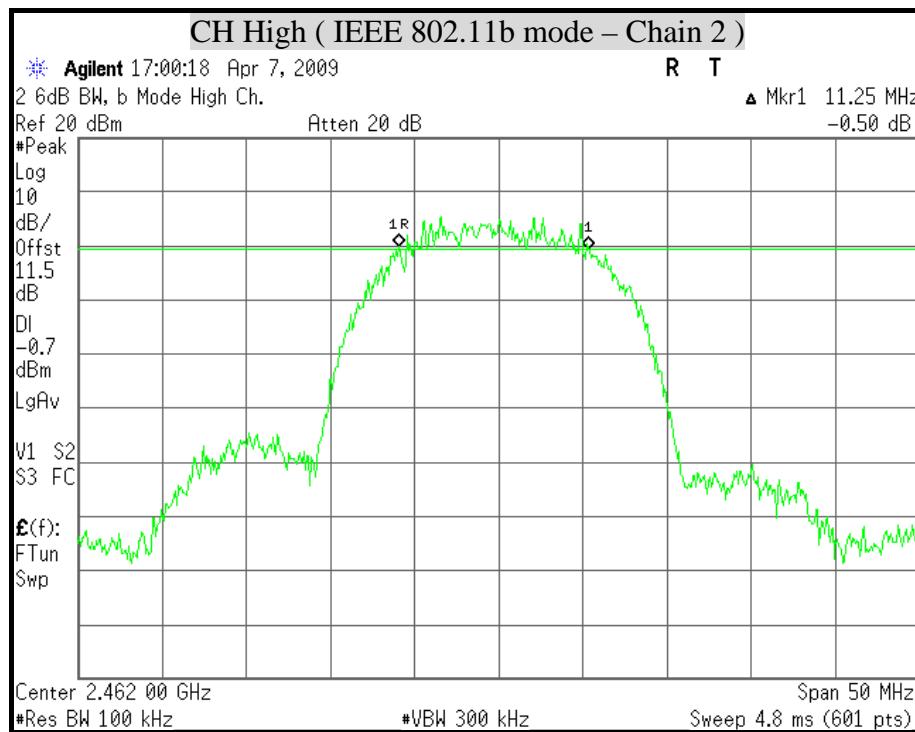
6dB BANDWIDTH (IEEE 802.11b mode)

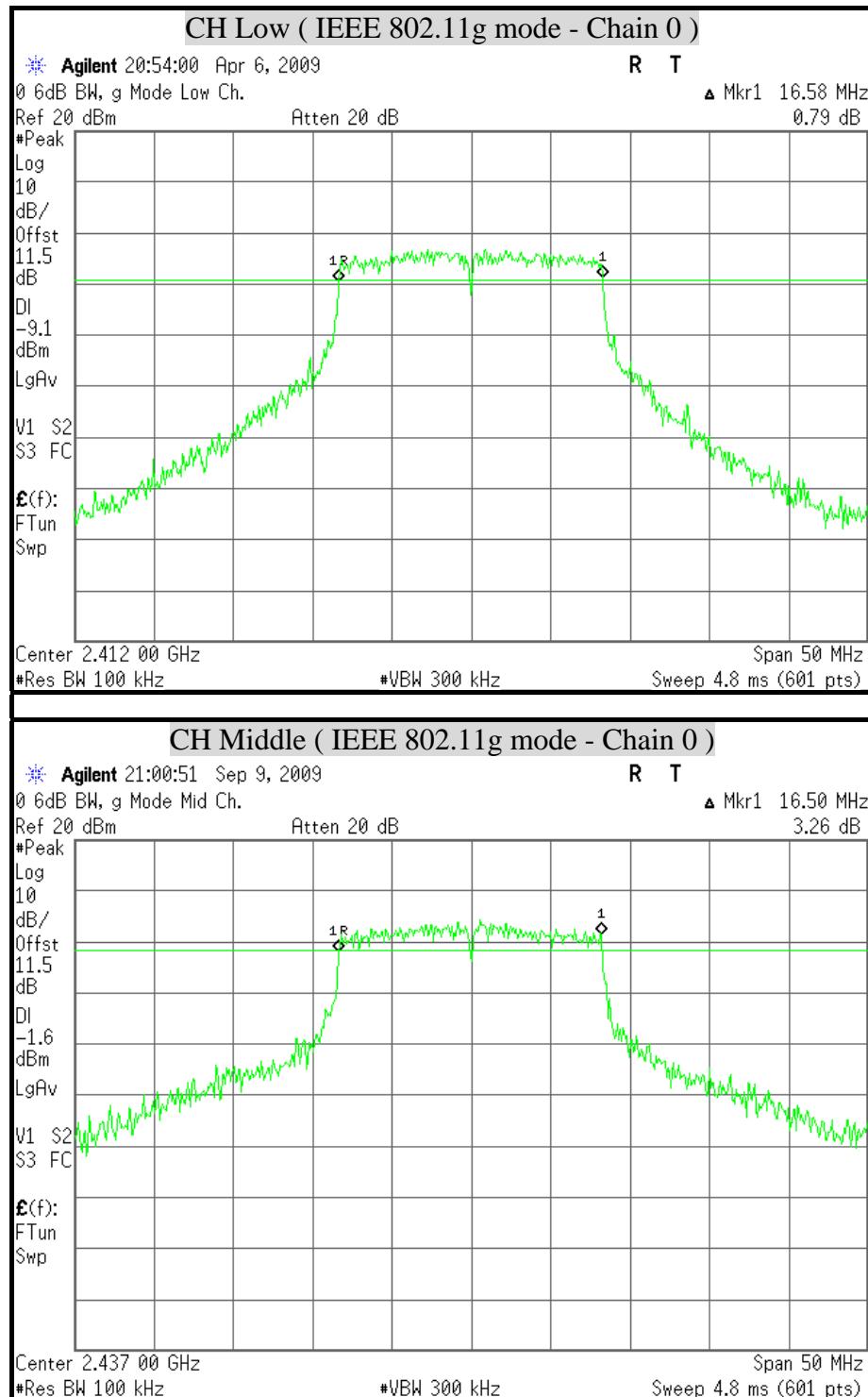


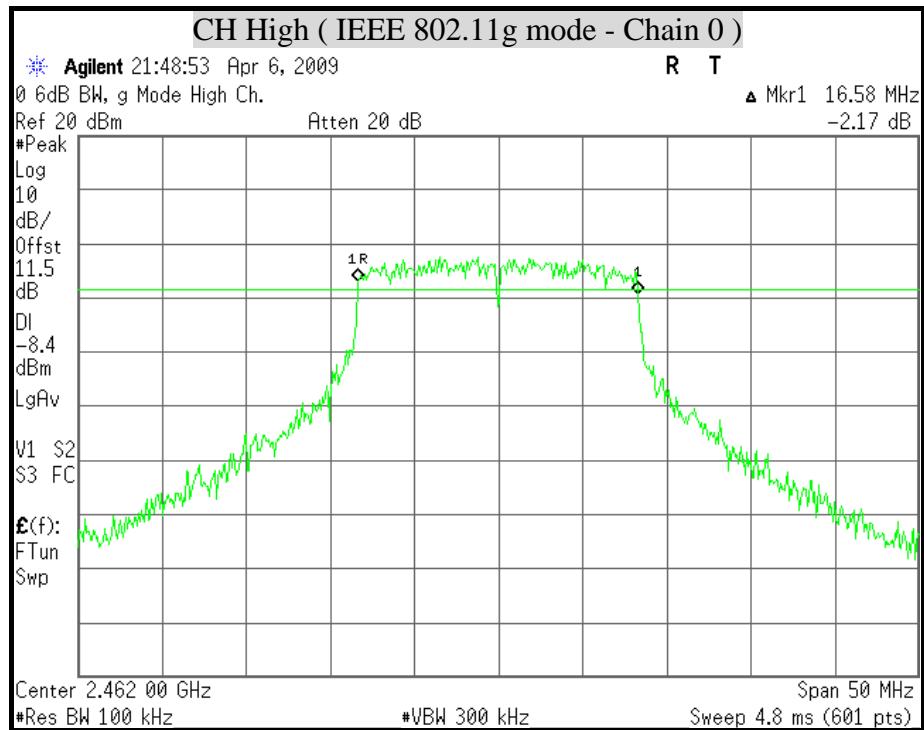


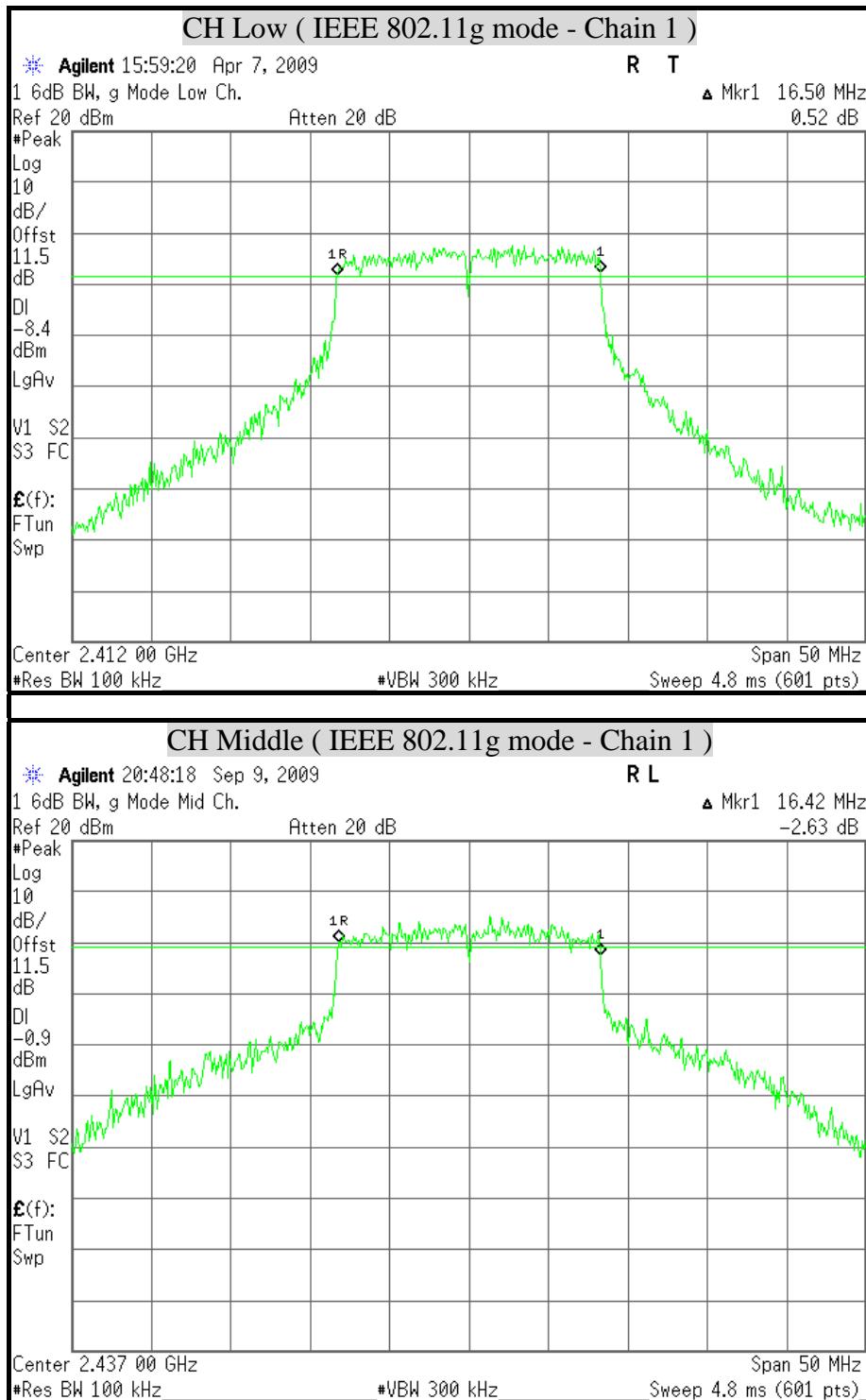


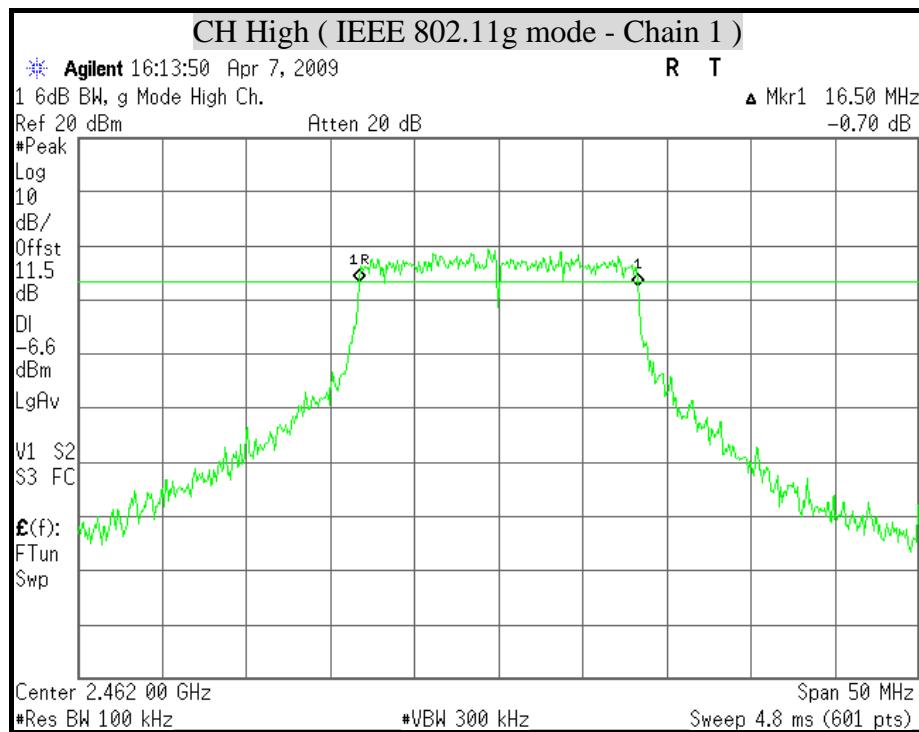


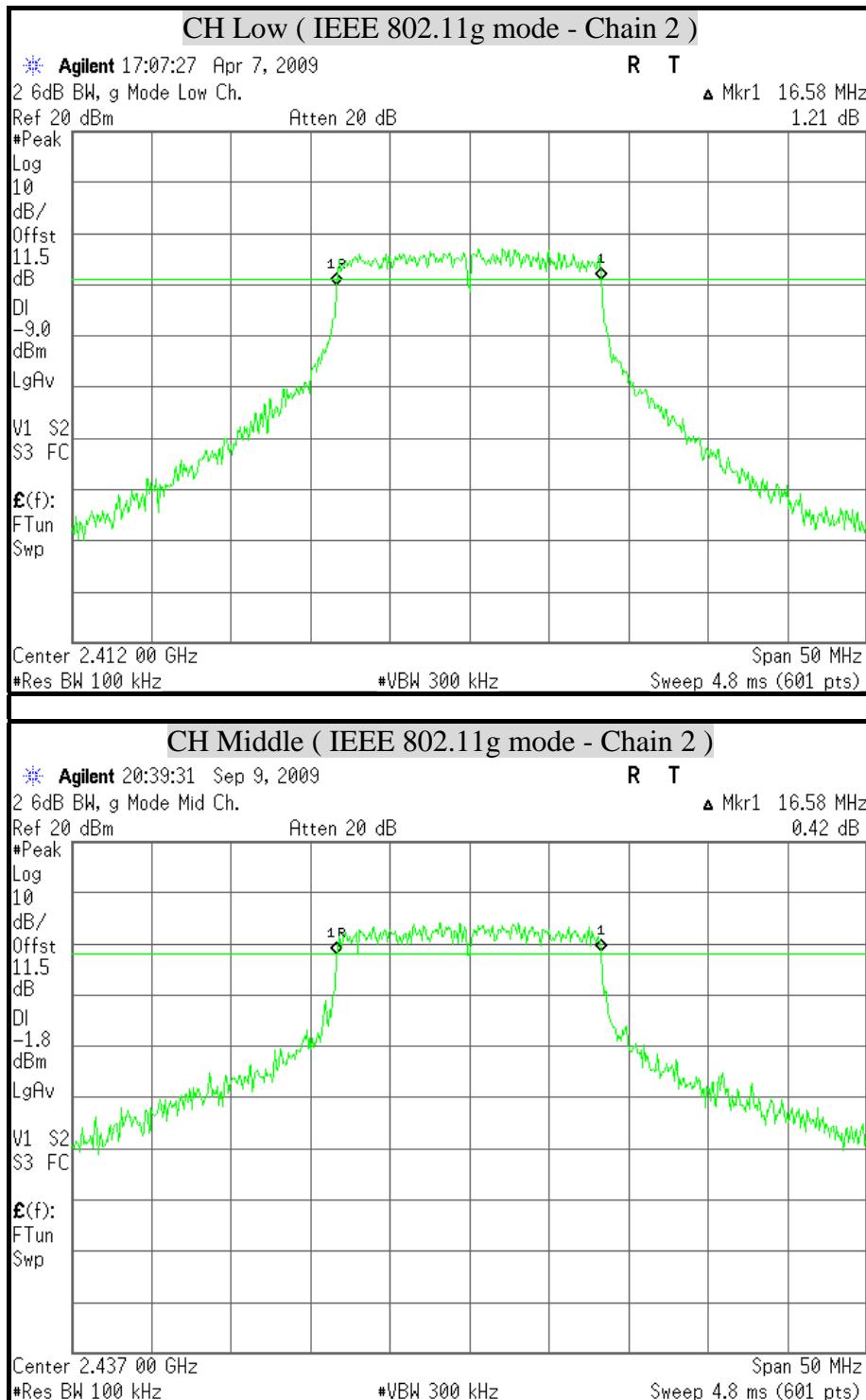


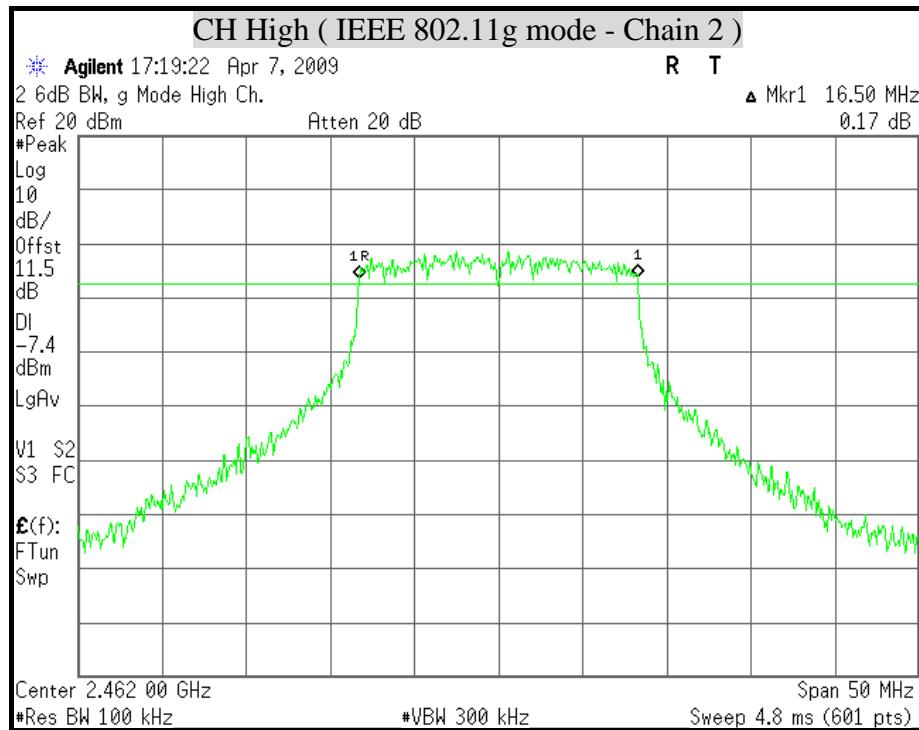
6dB BANDWIDTH (IEEE 802.11g mode)

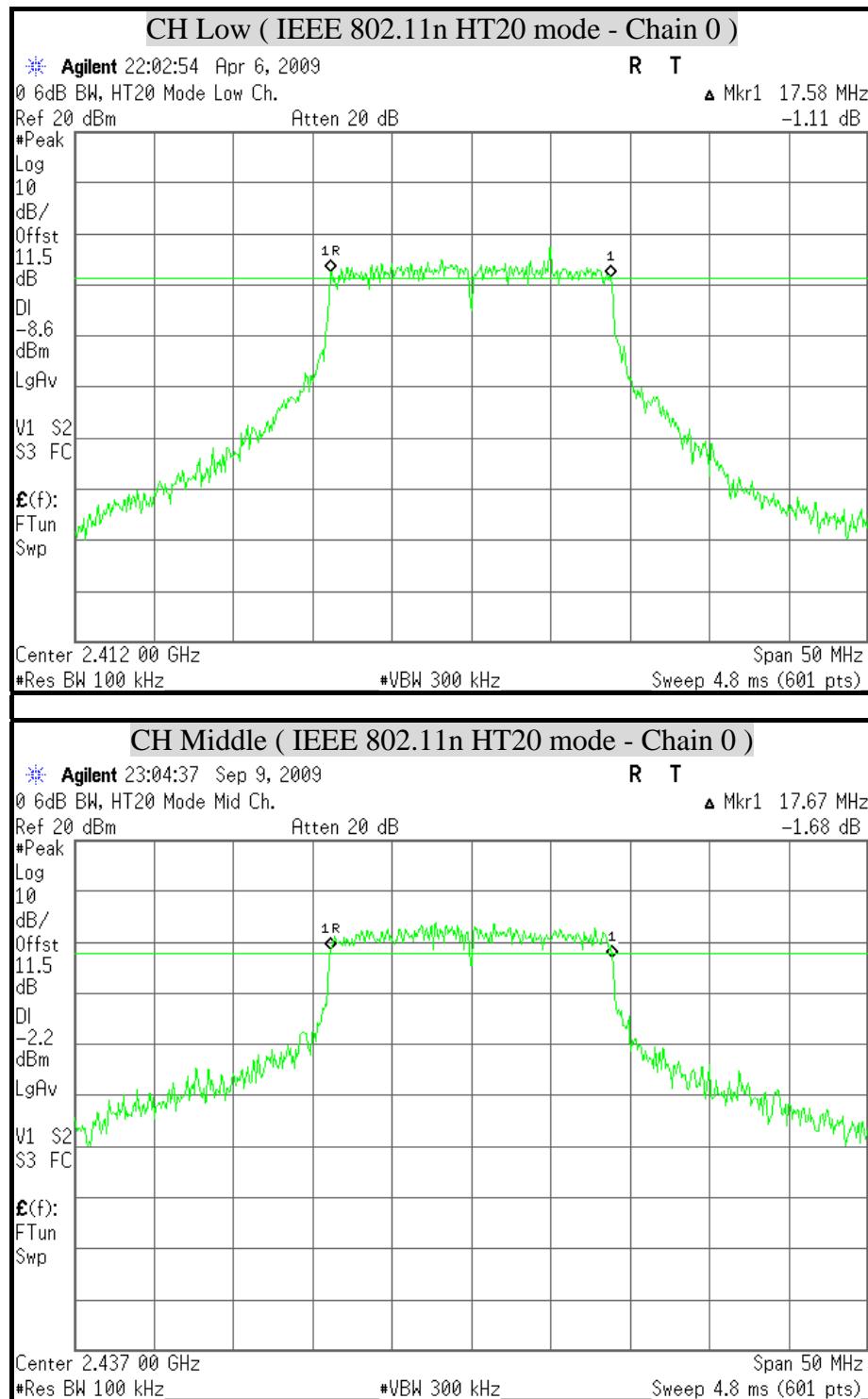


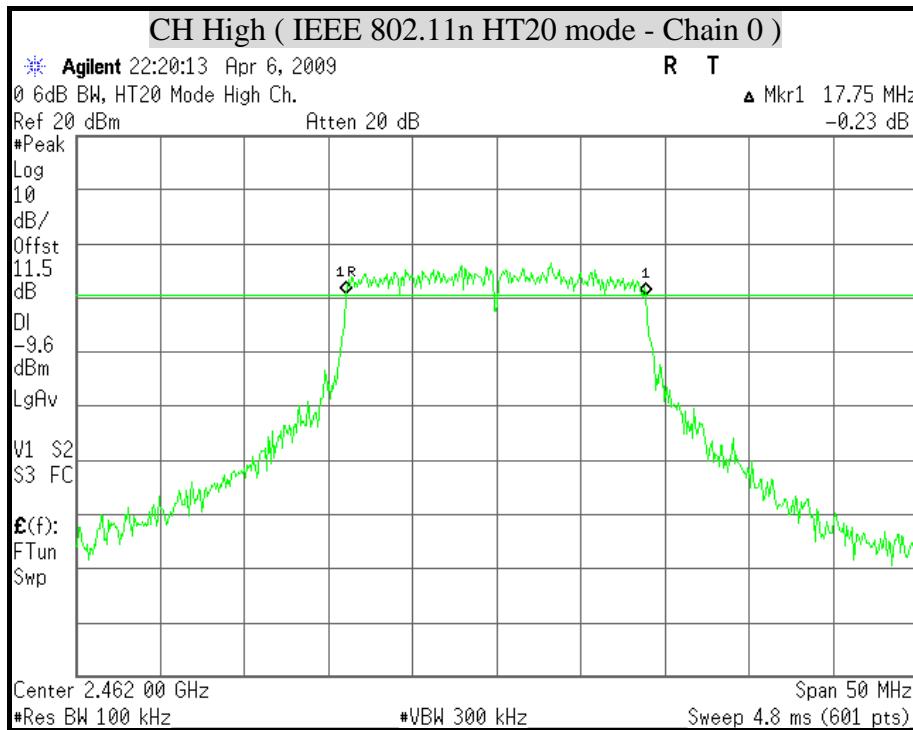


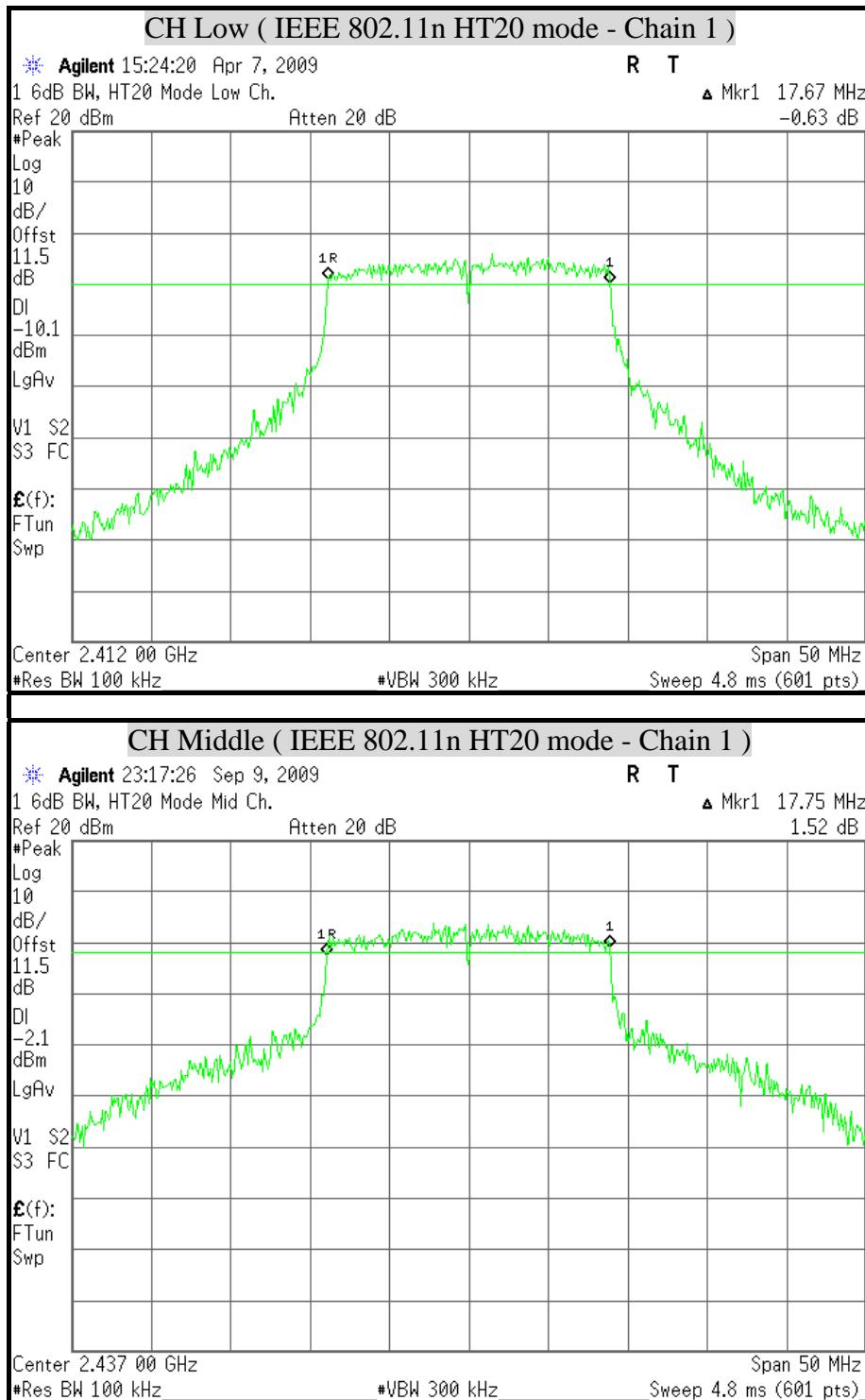


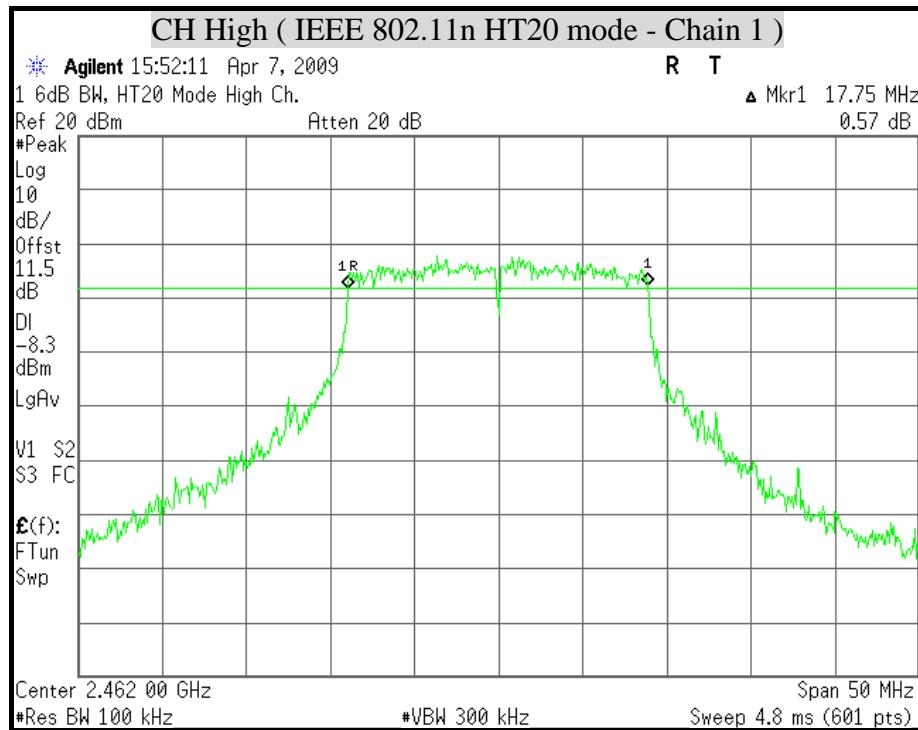


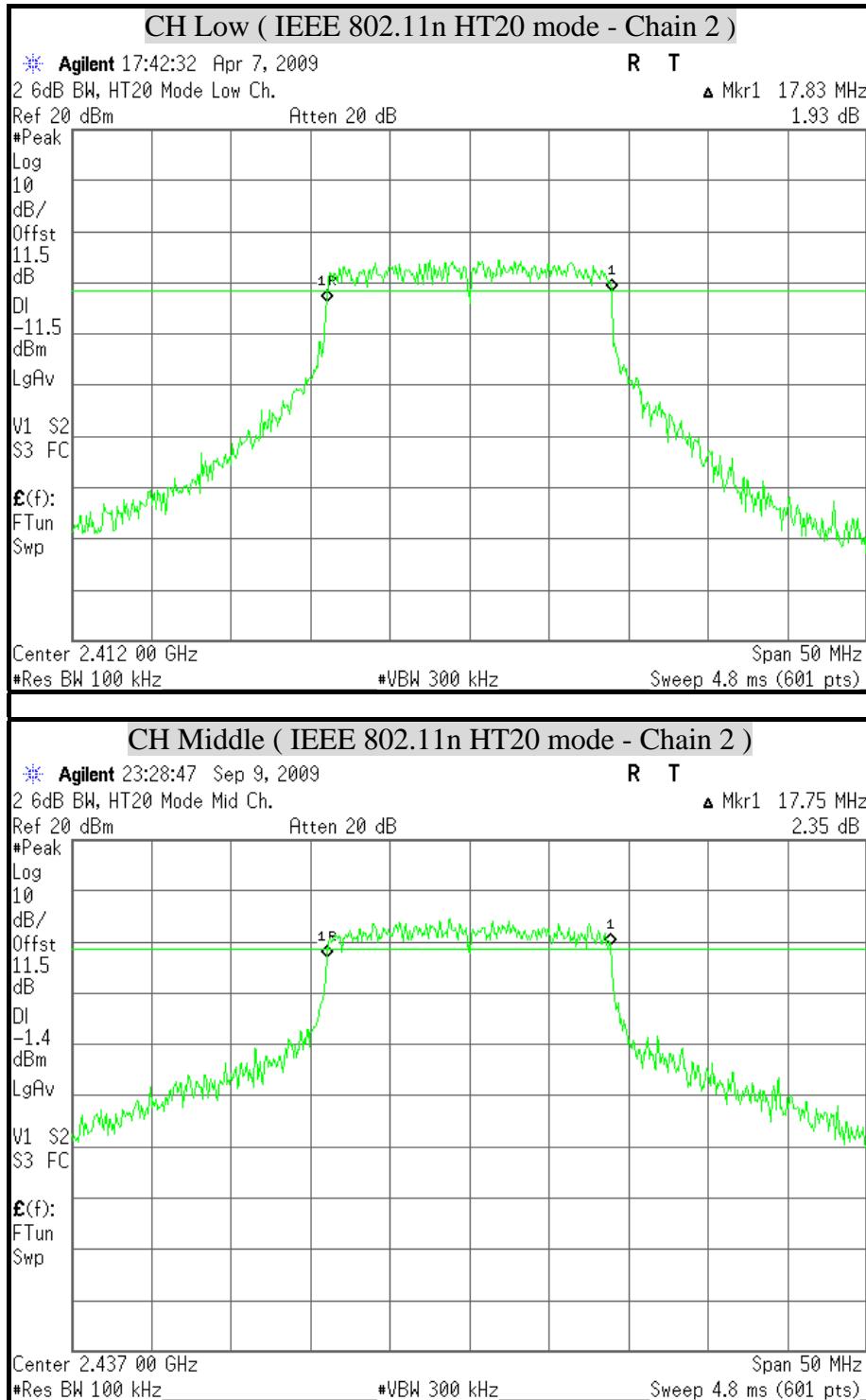


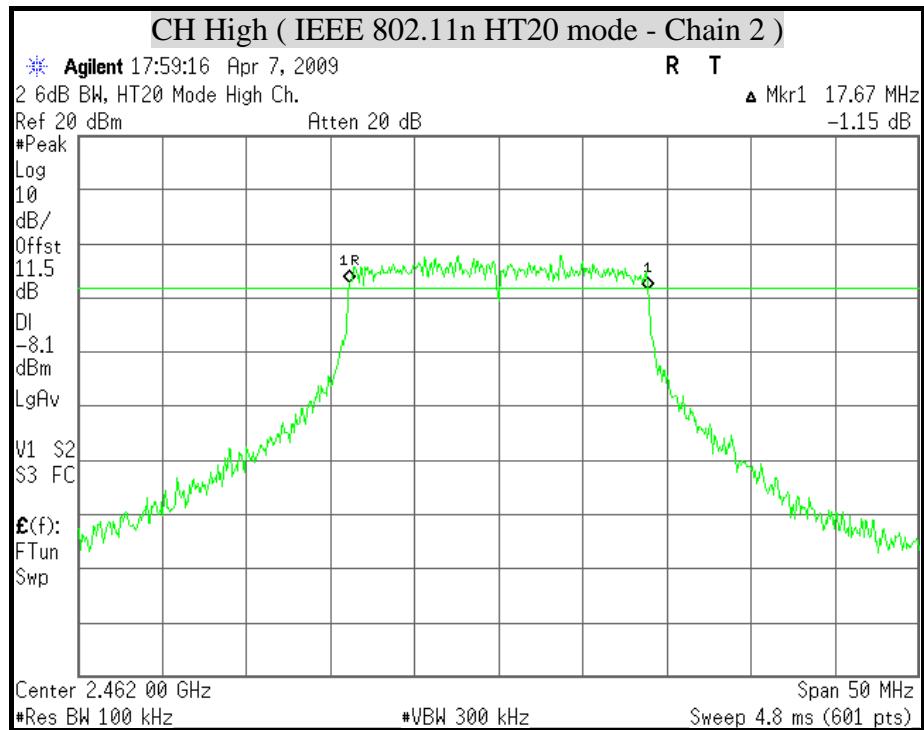
6dB BANDWIDTH (IEEE 802.11n HT20 mode)

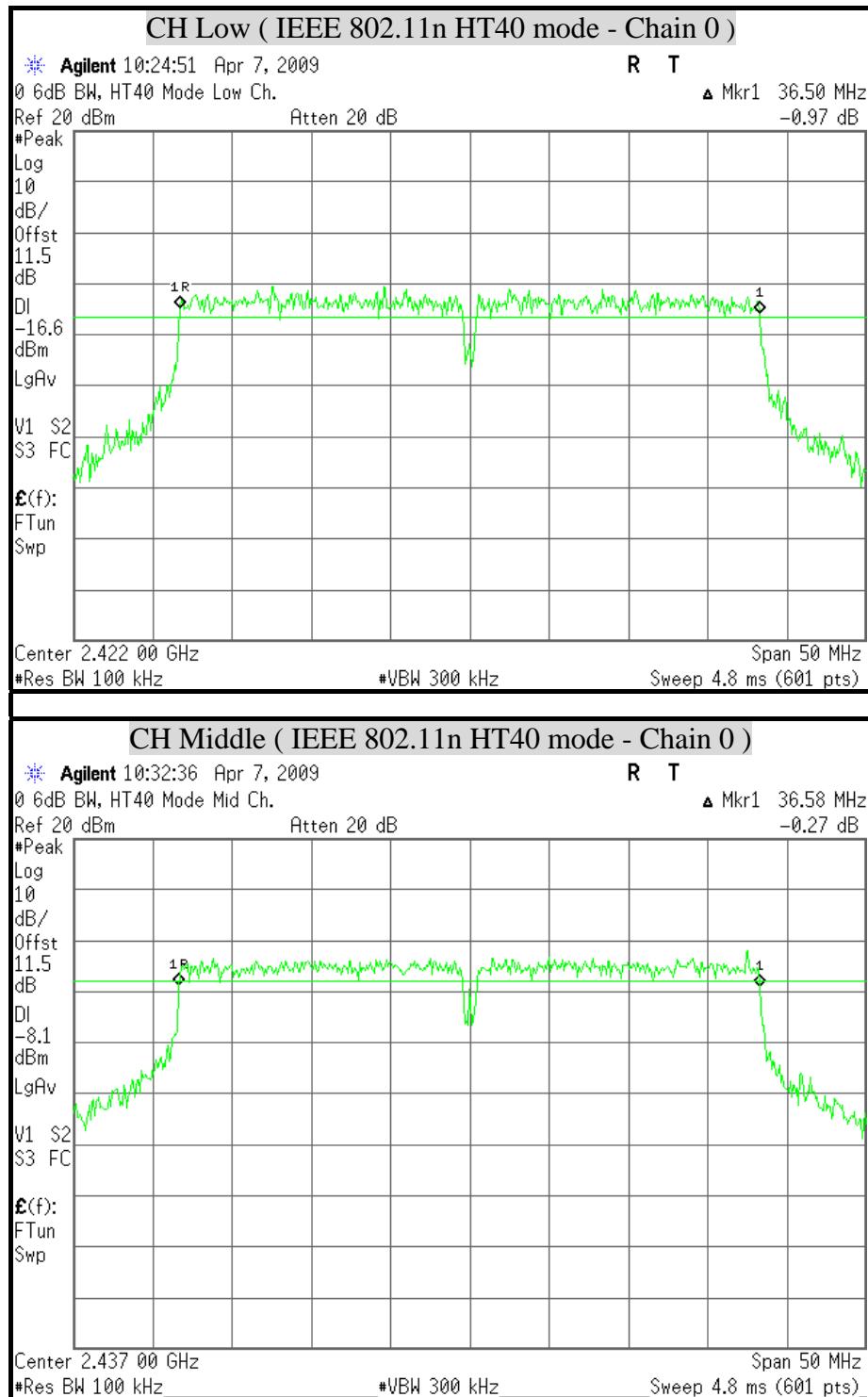


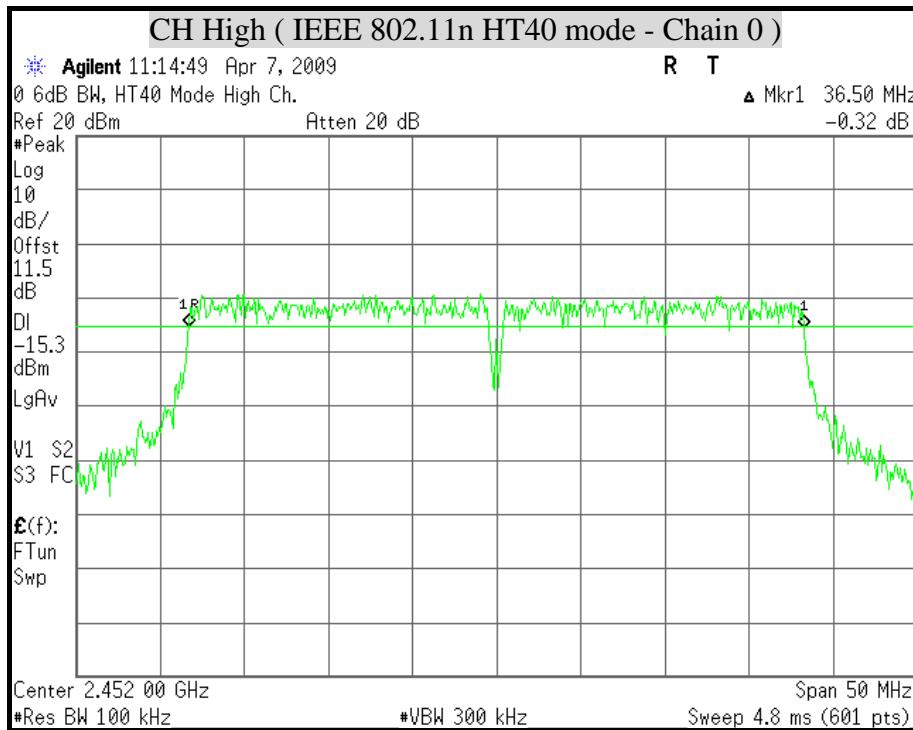


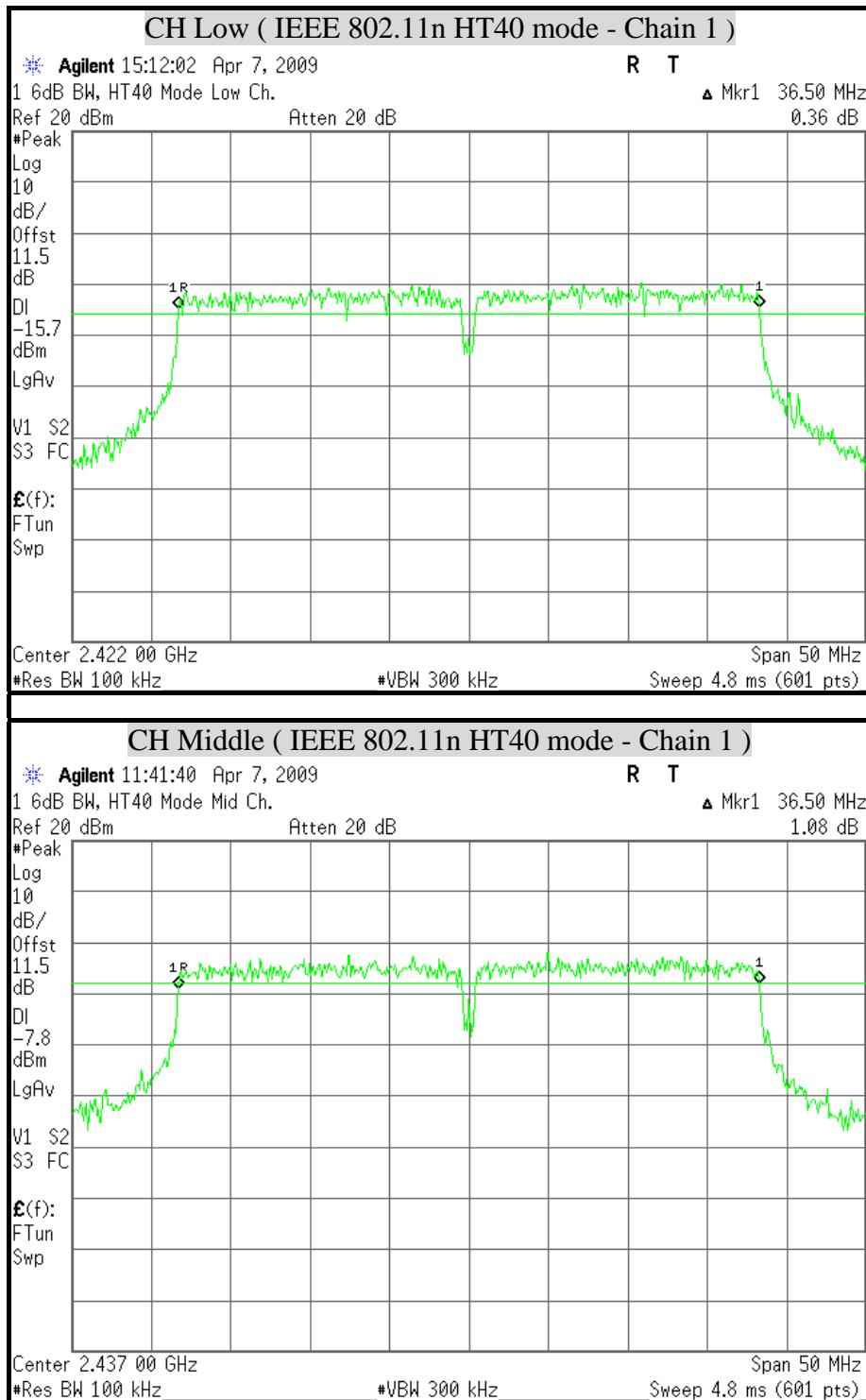


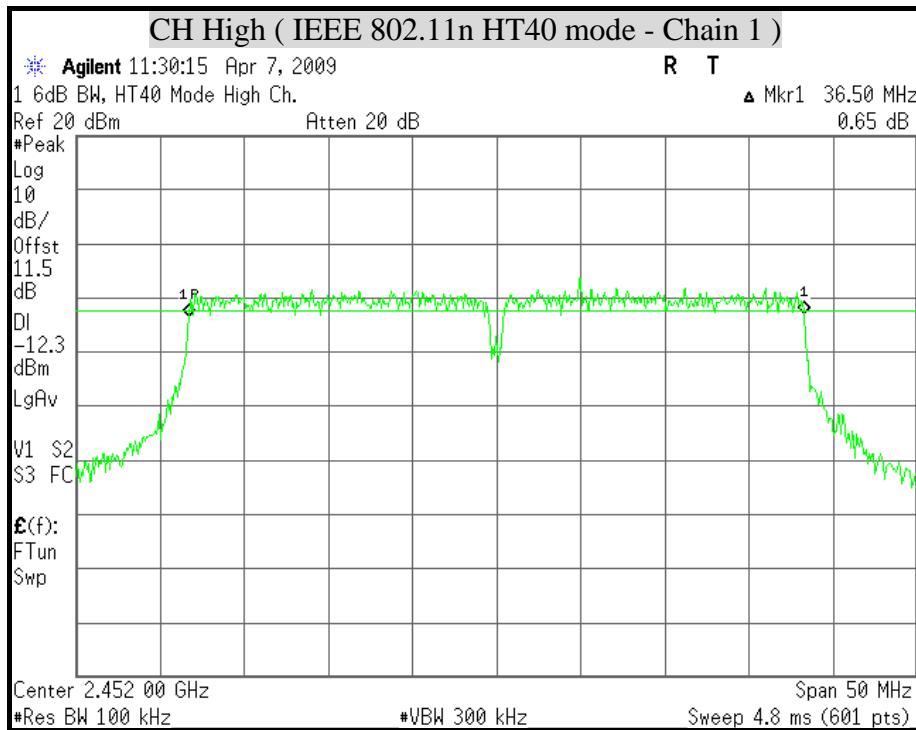


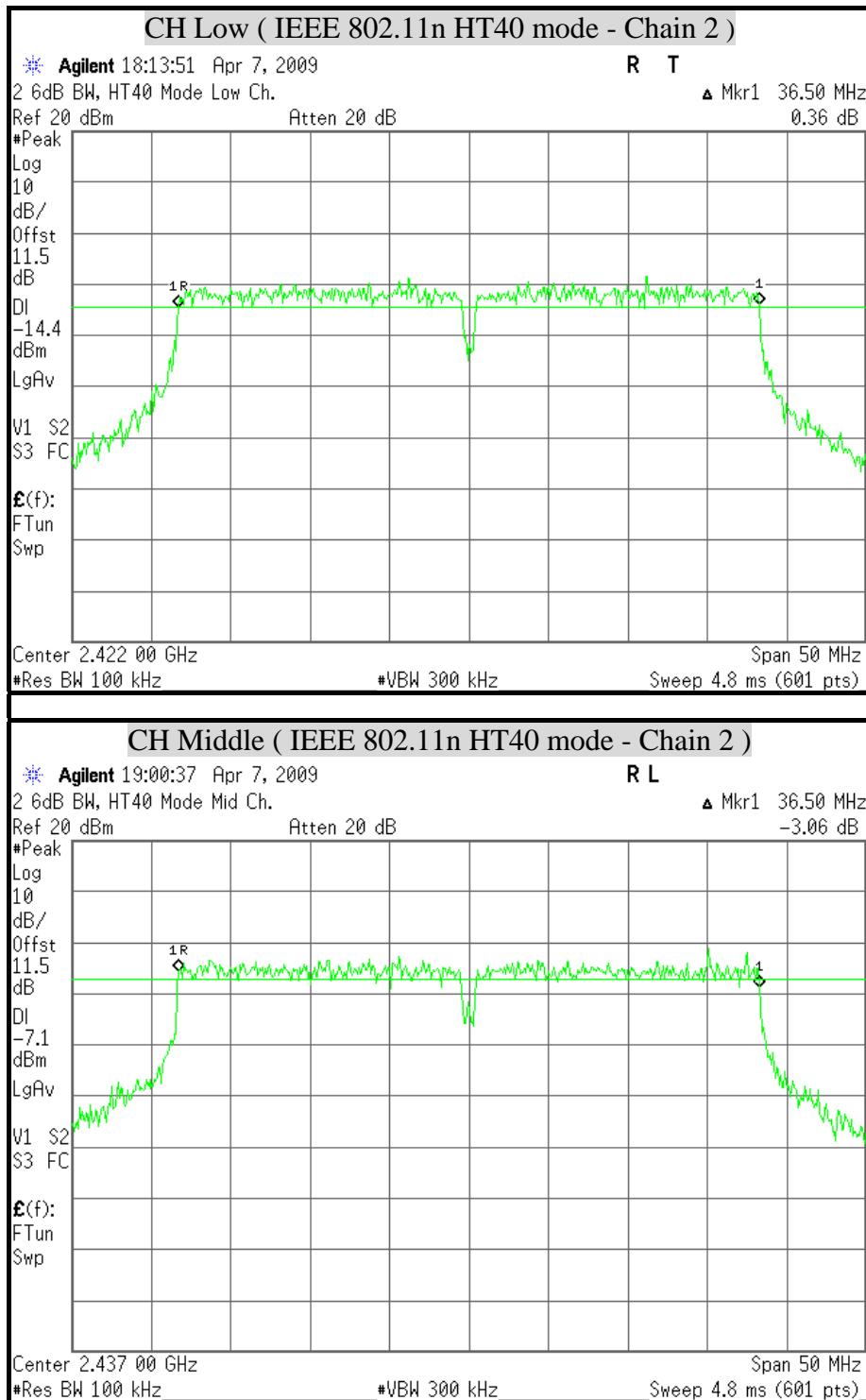


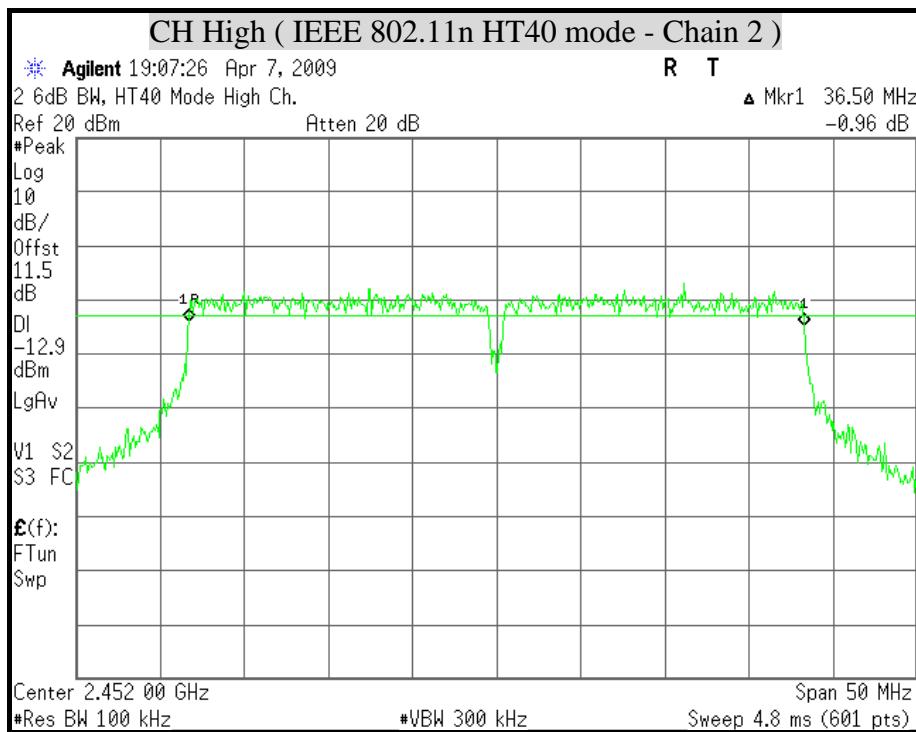
6dB BANDWIDTH (IEEE 802.11n HT40 mode)











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	06/09/2010
SPECTRUM ANALYZER	AGILENT	E4446A	MY46180323	05/26/2010

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 (Three TX)

Channel	Channel Frequency (MHz)	99% Occupied power bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
Low	2412	15.40	15.55	15.57
Middle	2437	15.34	15.31	15.31
High	2462	15.24	15.37	15.21

IEEE 802.11g mode (Three TX)

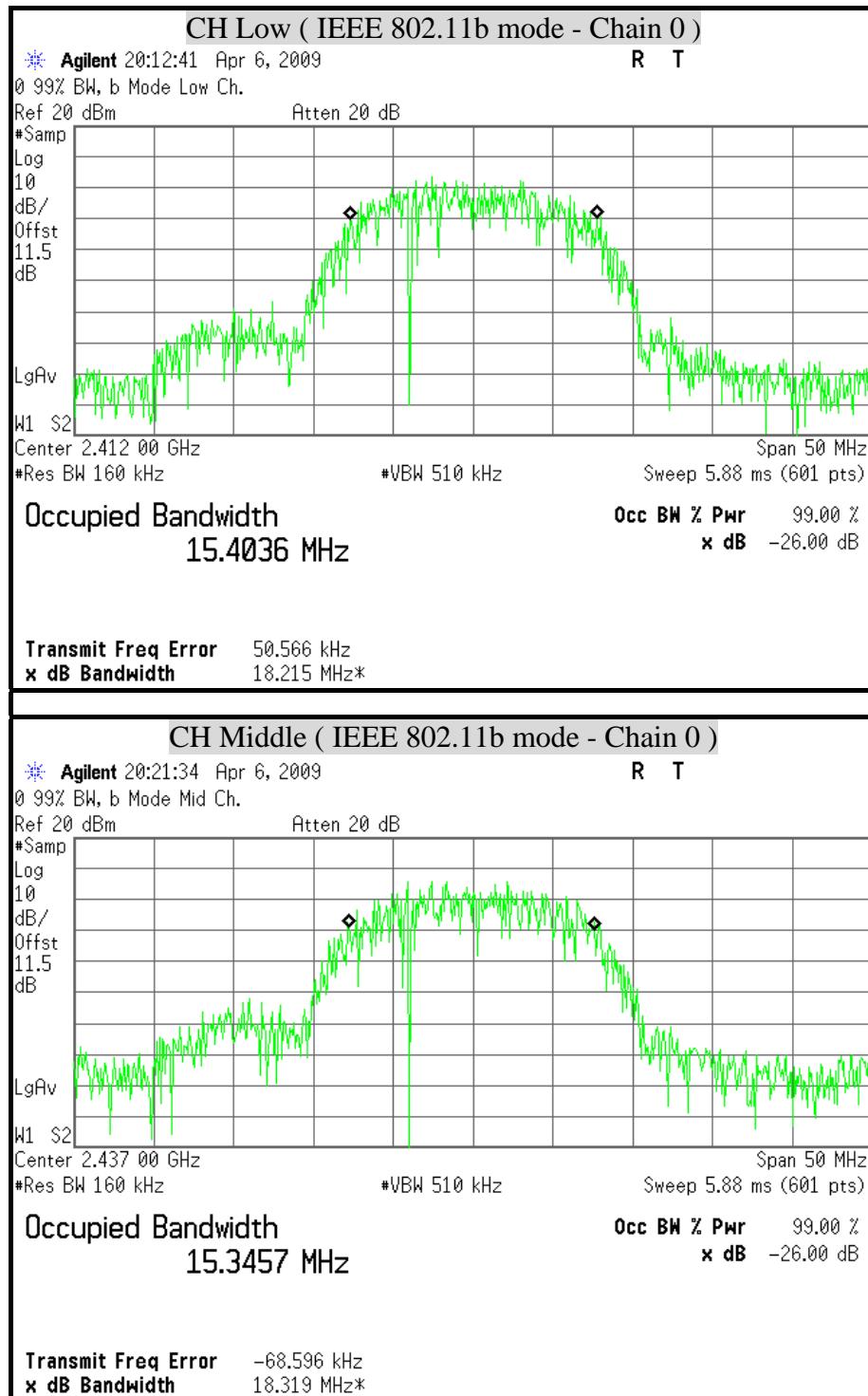
Channel	Channel Frequency (MHz)	99% Occupied power bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
Low	2412	16.57	16.58	16.53
Middle	2437	16.42	16.39	16.55
High	2462	16.62	16.58	16.51

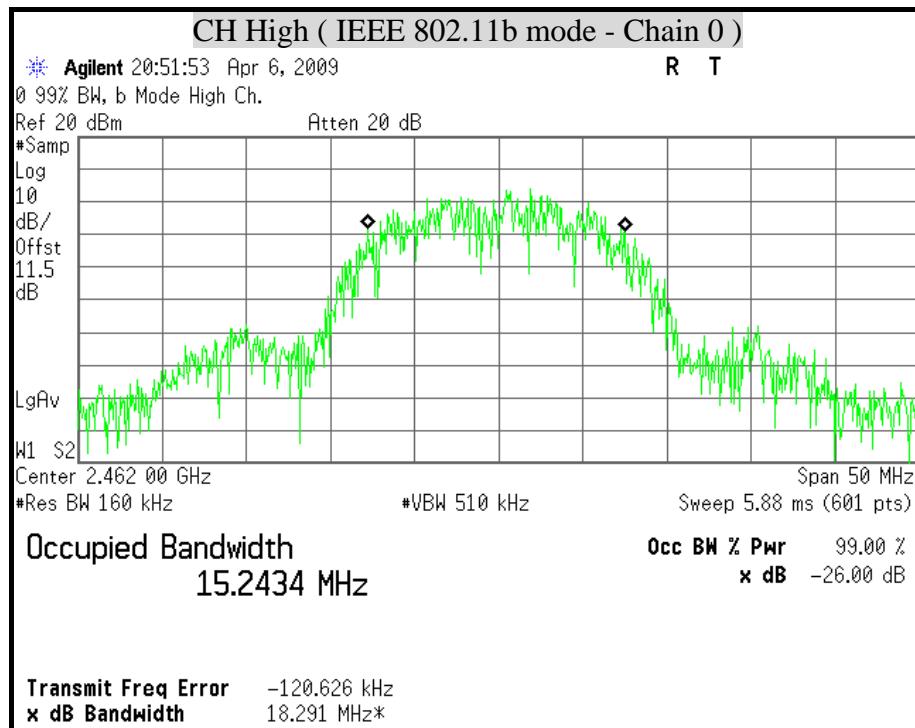
IEEE 802.11n HT20 mode (Three TX)

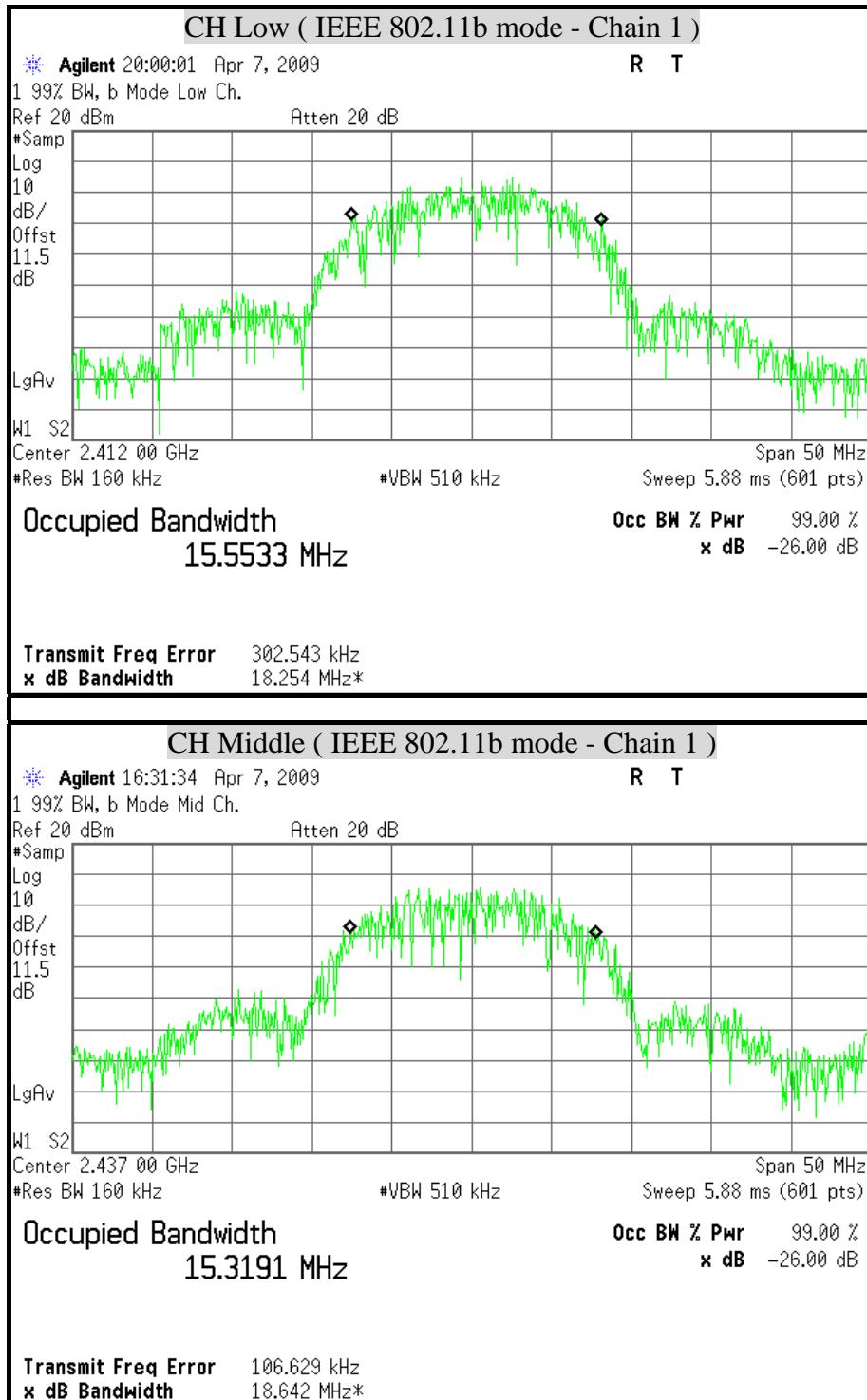
Channel	Channel Frequency (MHz)	99% Occupied power bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
Low	2412	17.53	17.61	17.69
Middle	2437	17.58	17.68	17.68
High	2462	17.69	17.66	17.62

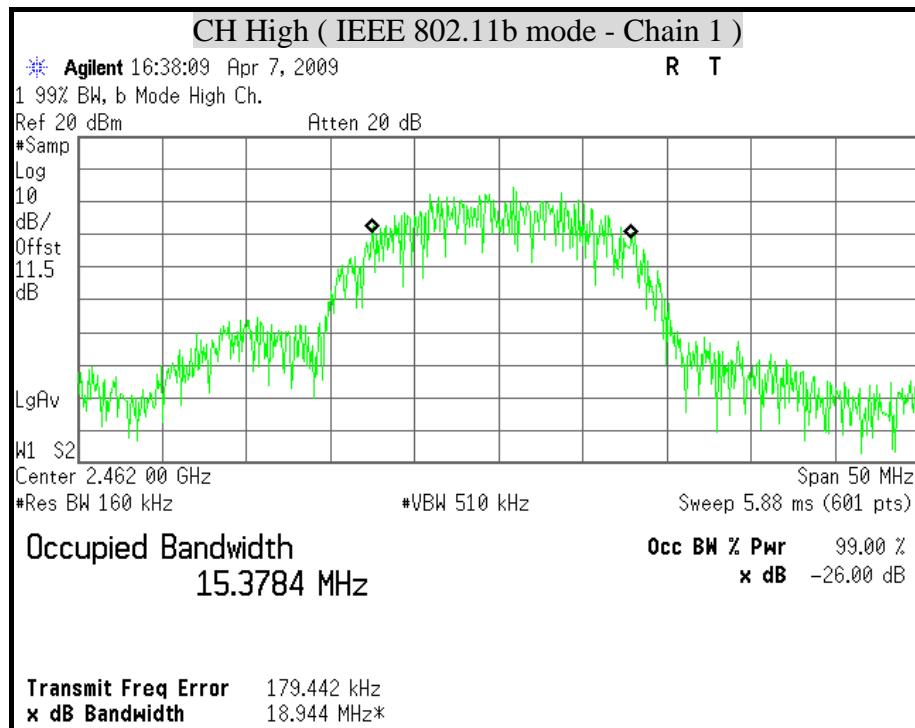
IEEE 802.11n HT40 mode (Three TX)

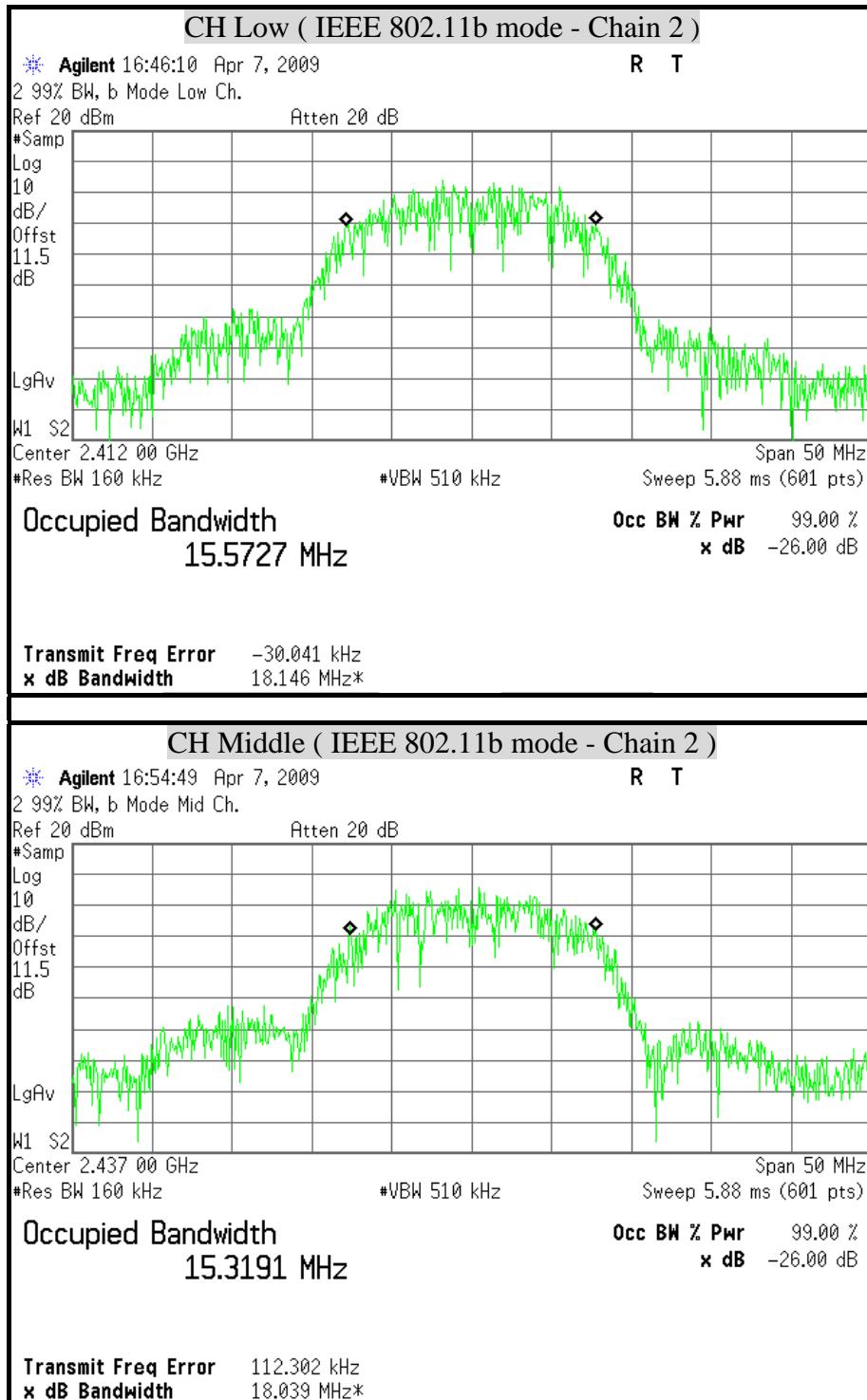
Channel	Channel Frequency (MHz)	99% Occupied power bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
Low	2422	36.28	36.38	36.22
Middle	2437	36.22	36.34	36.26
High	2452	36.31	36.24	36.01

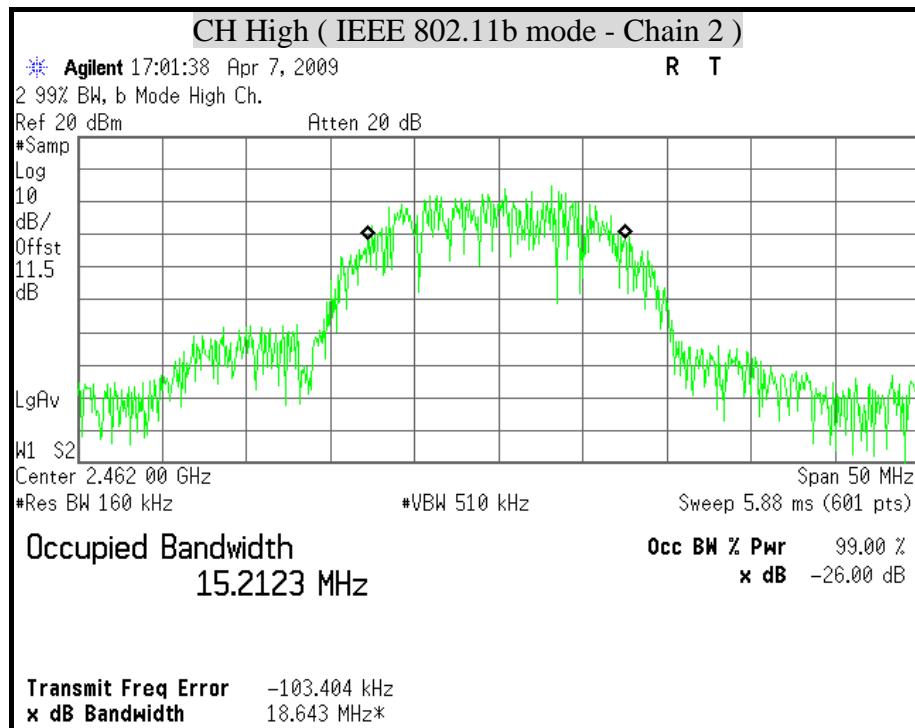
99% BANDWIDTH (IEEE 802.11b mode)

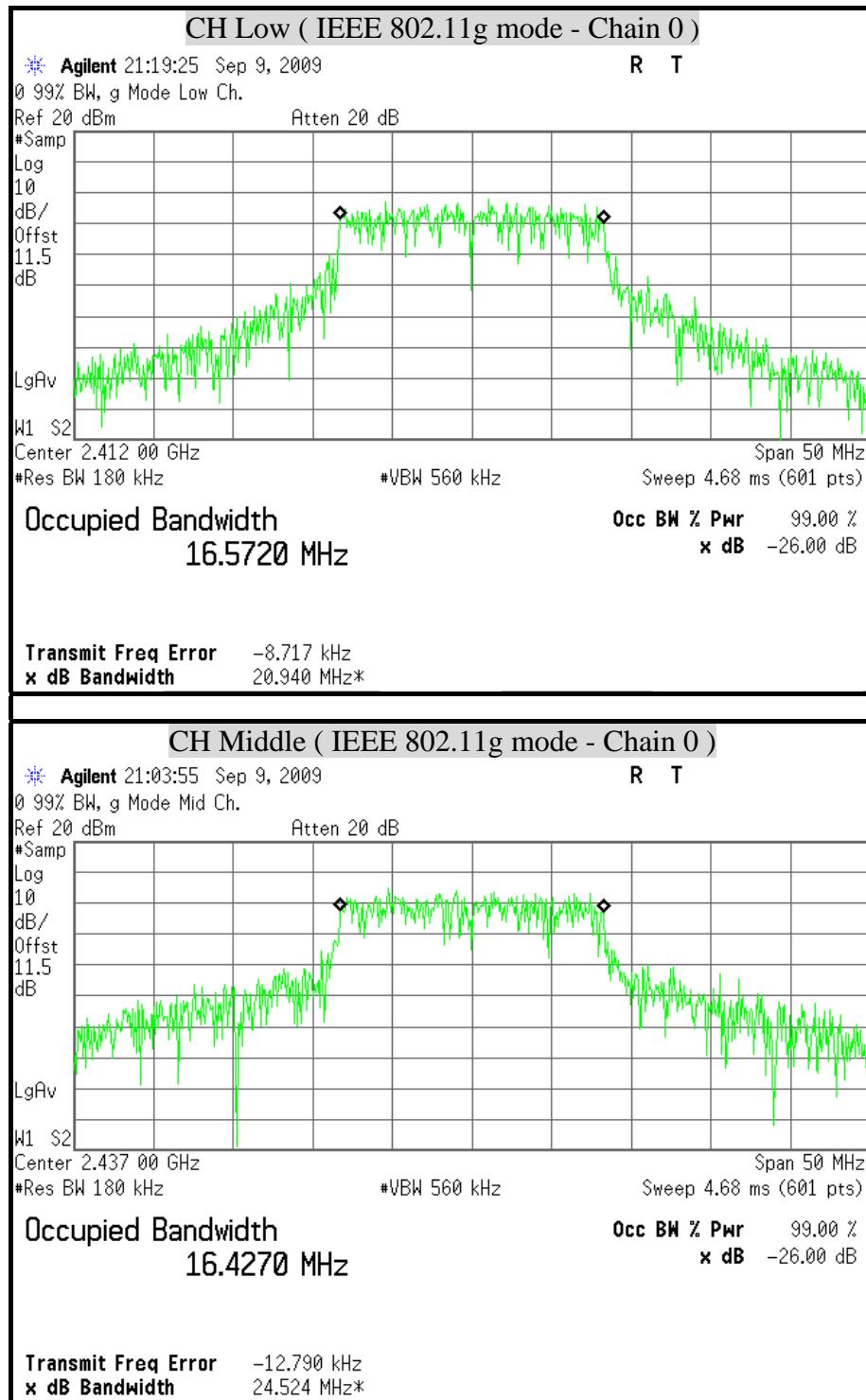


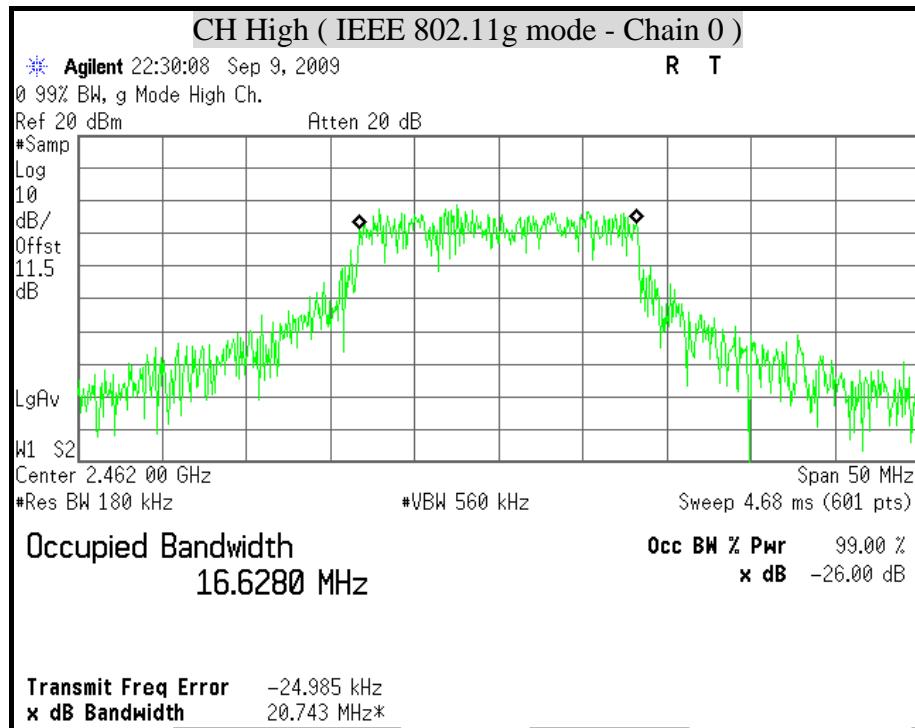


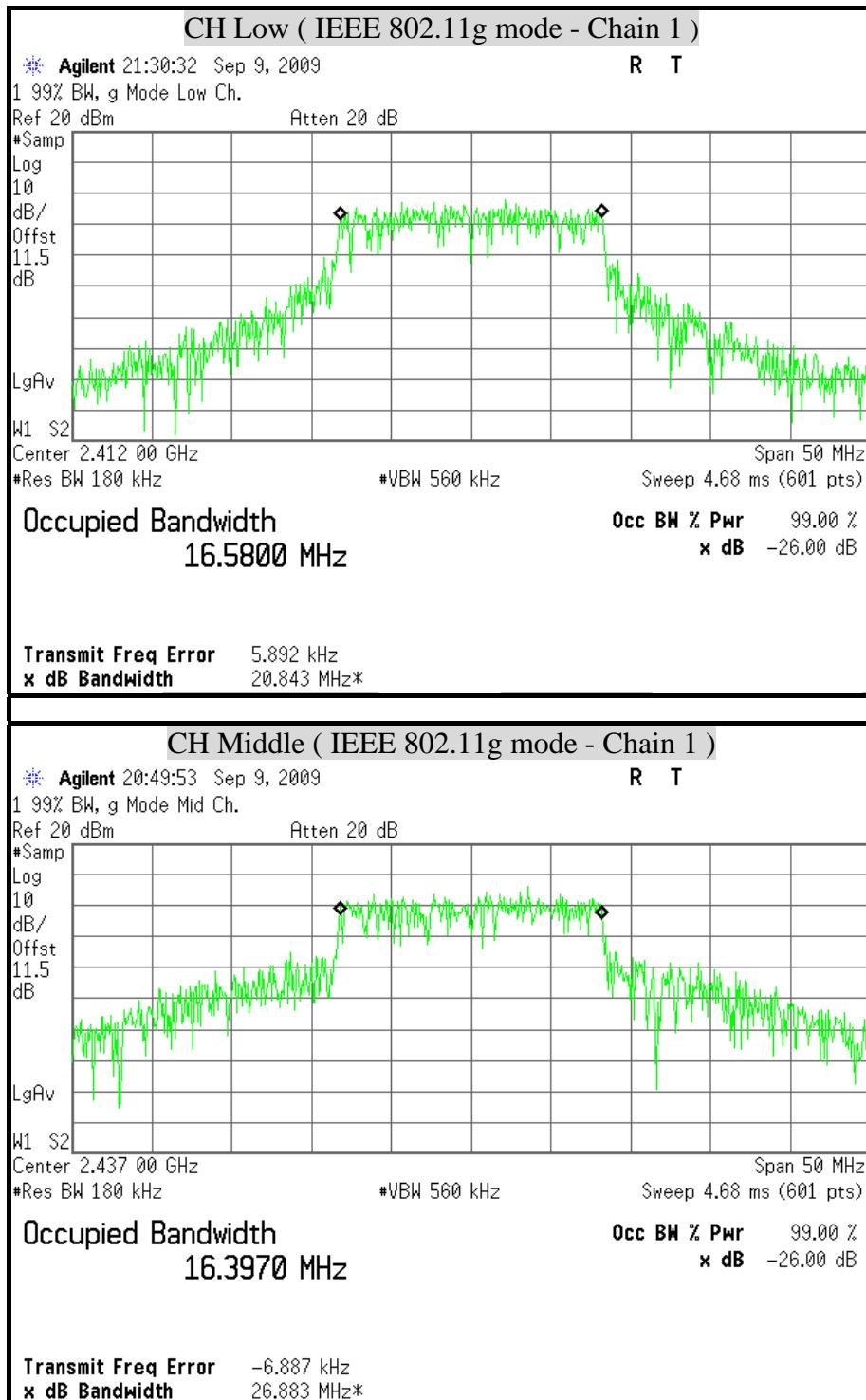


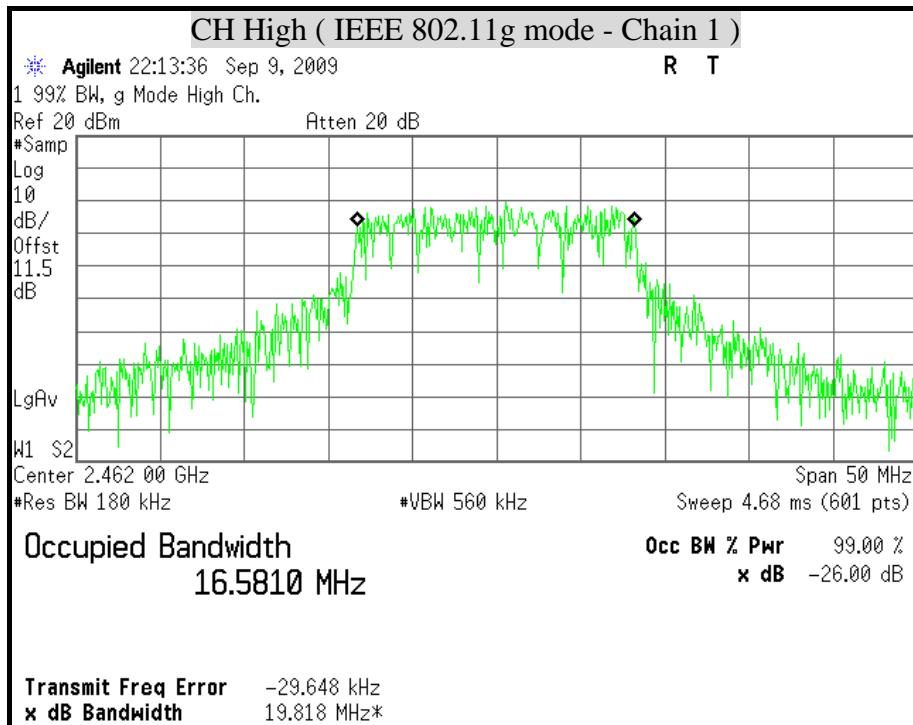


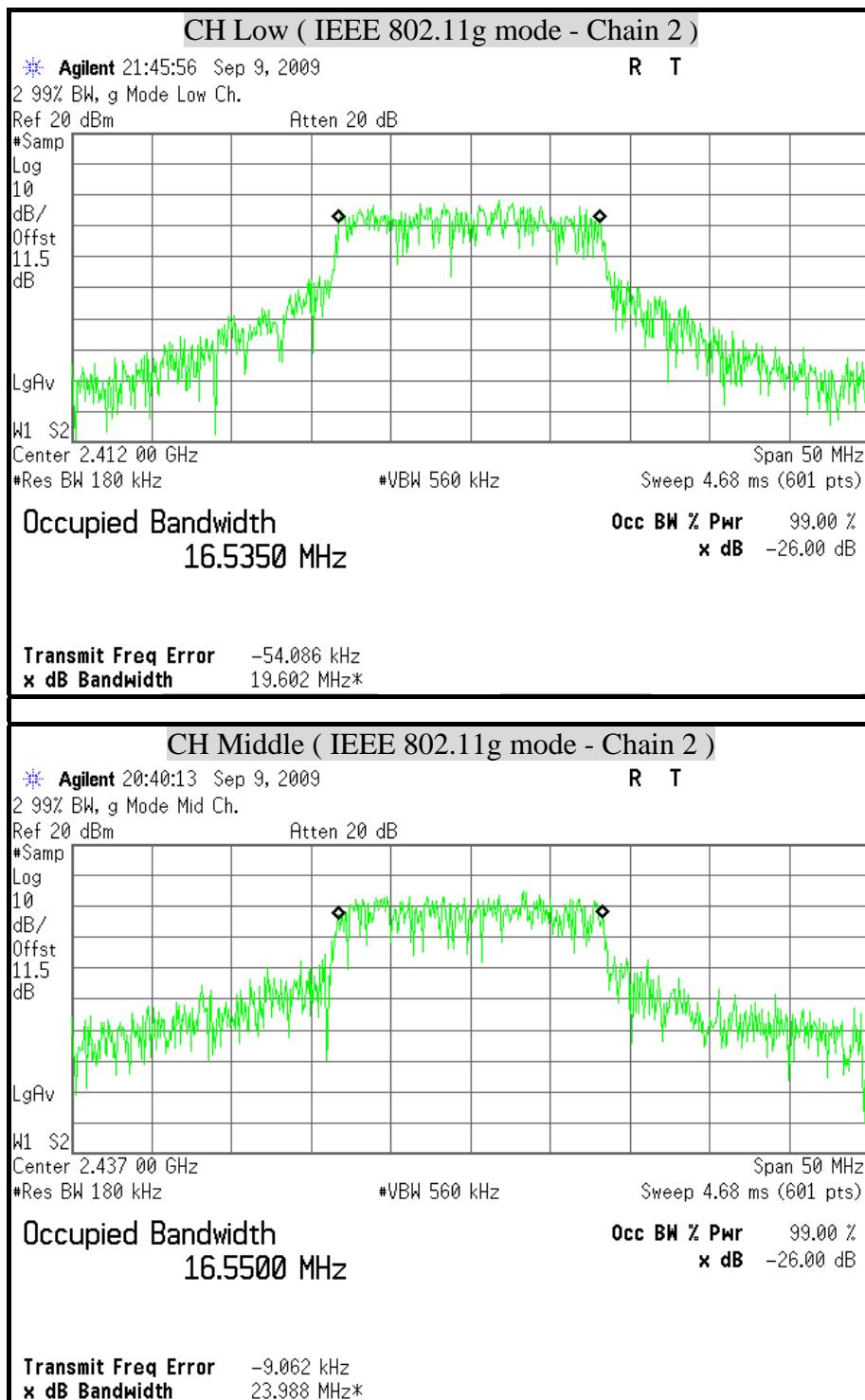


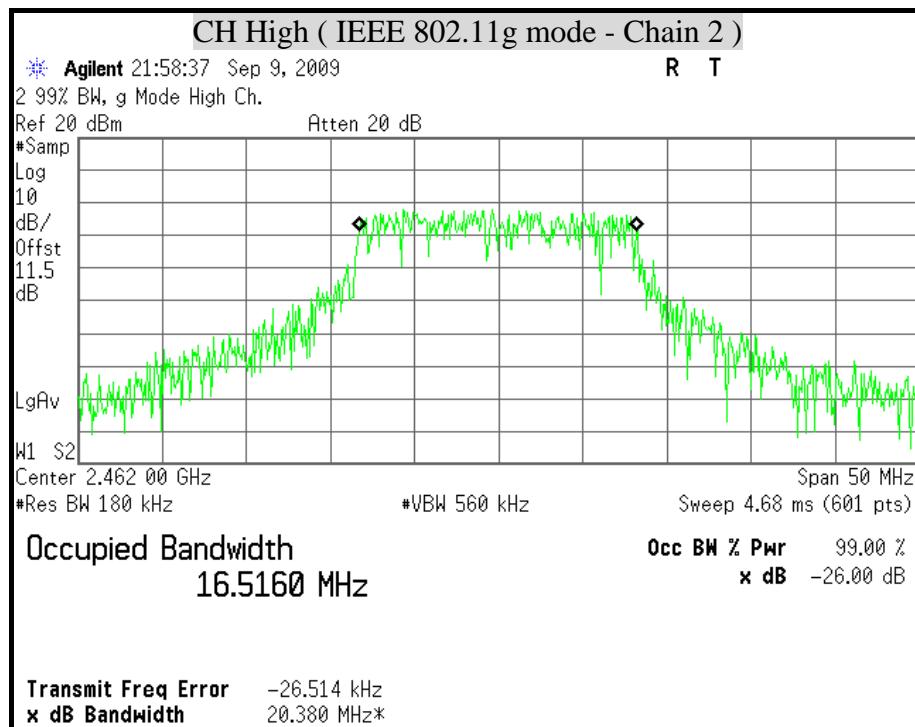
99% BANDWIDTH (IEEE 802.11g mode)

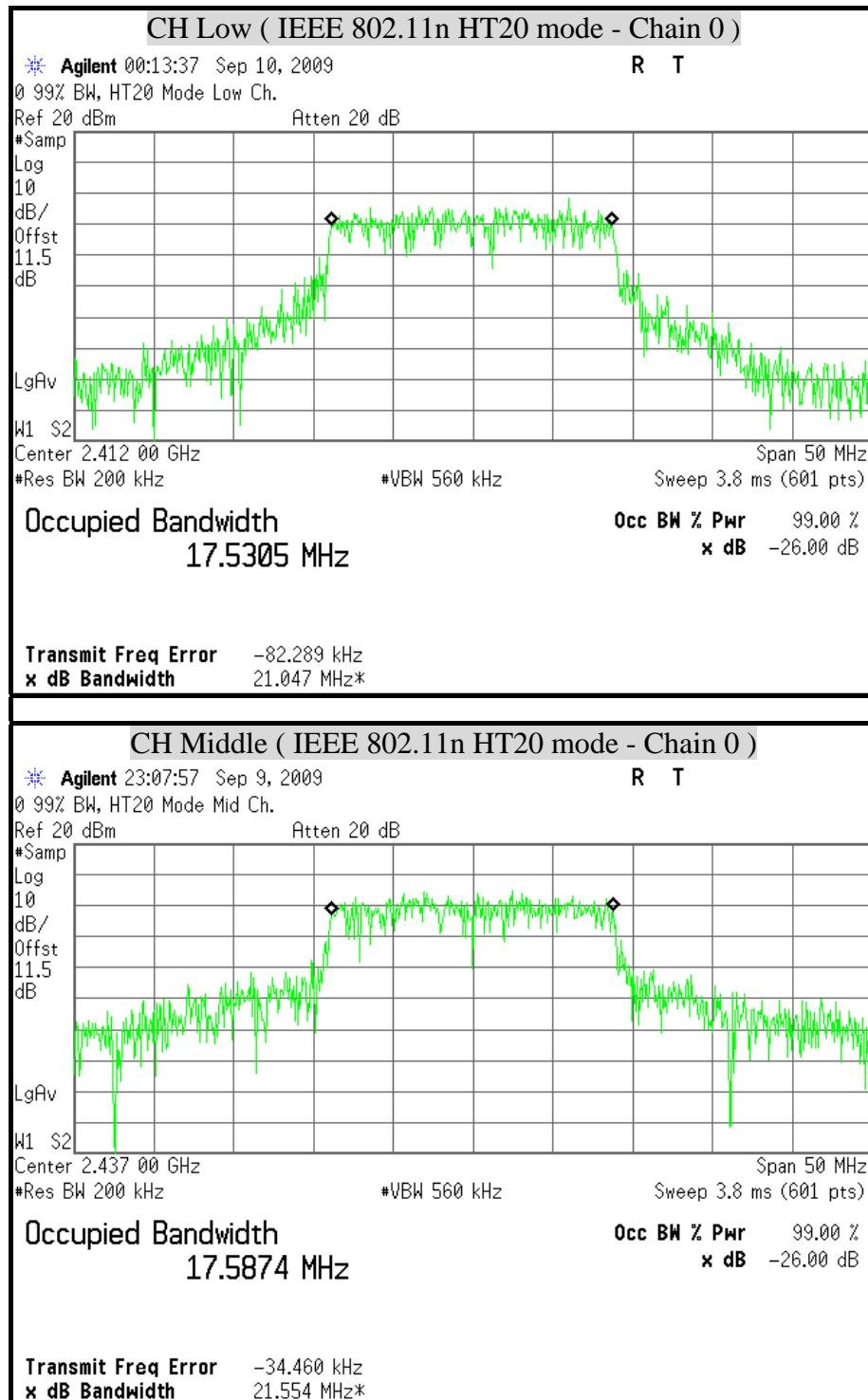


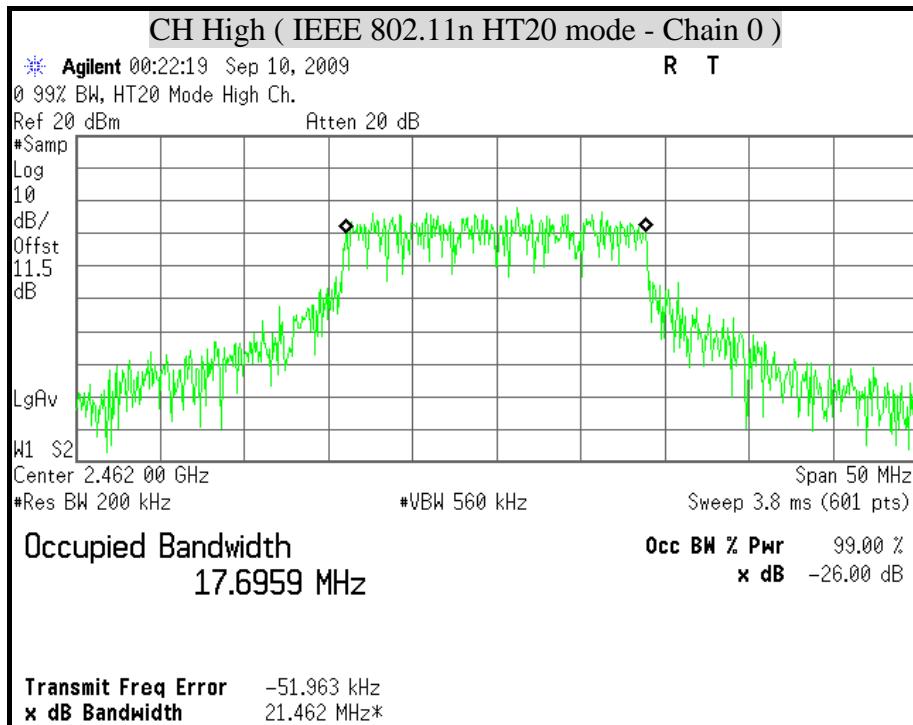


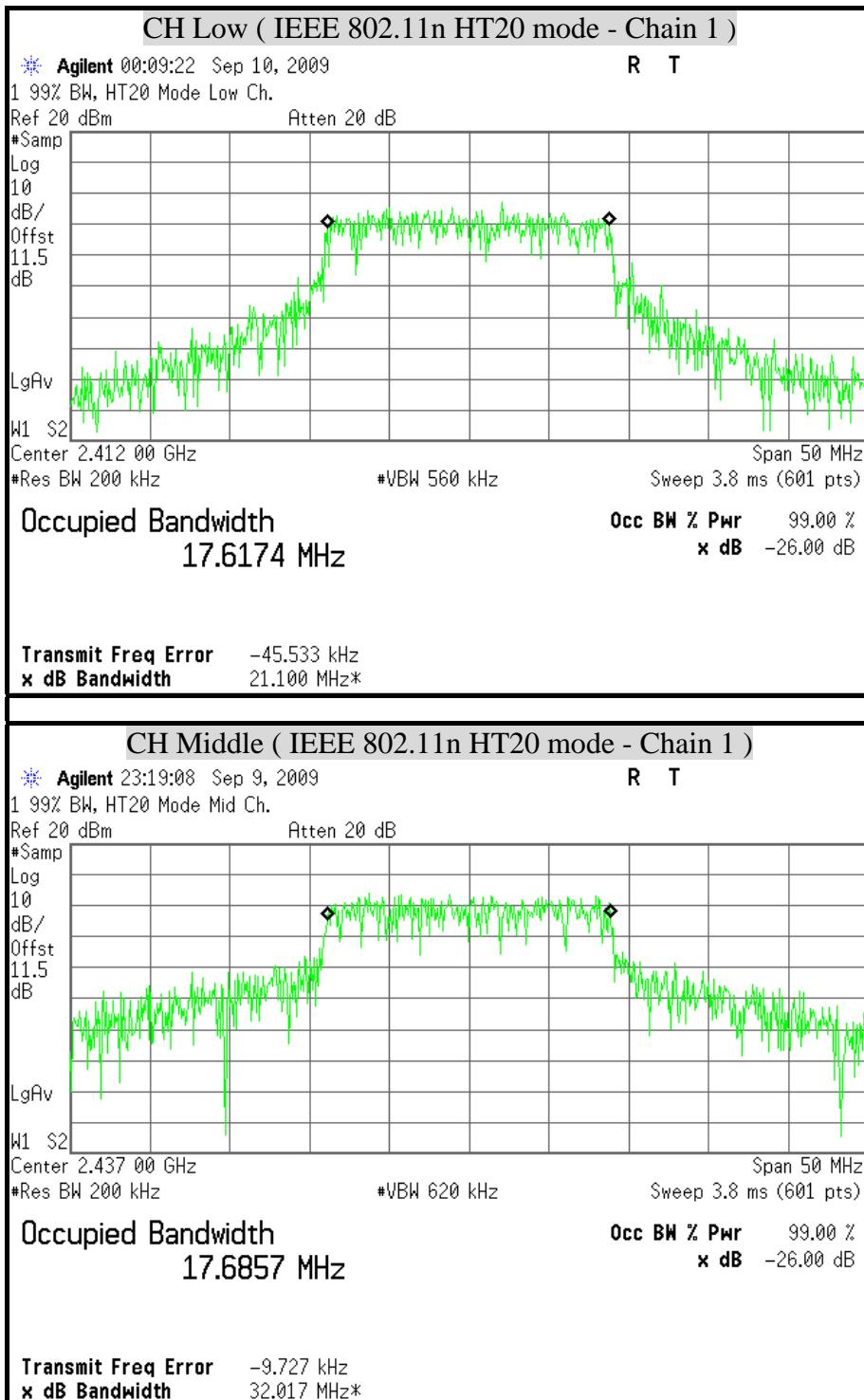


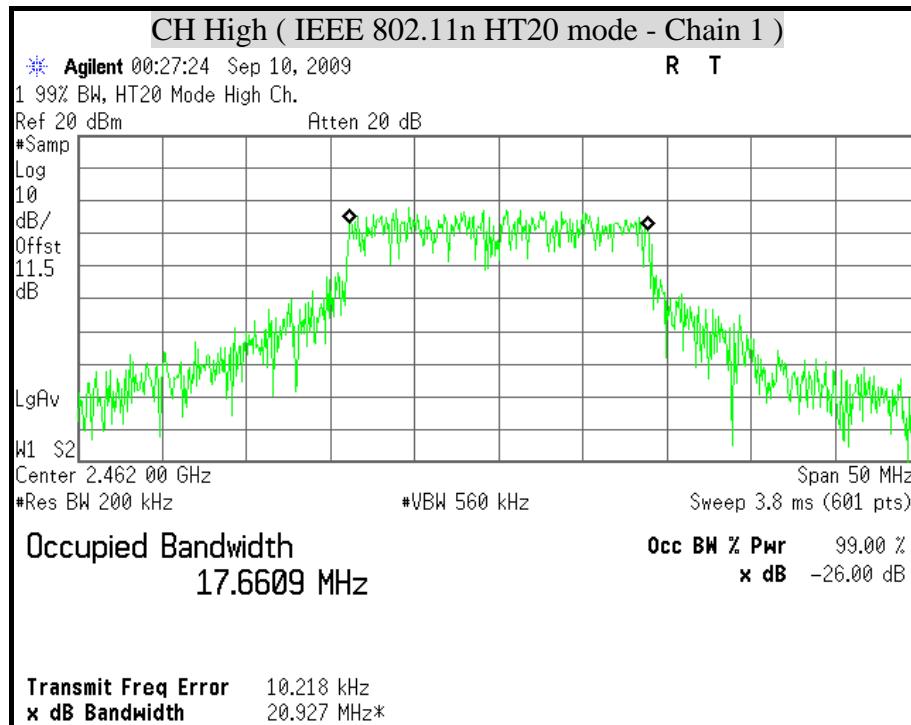


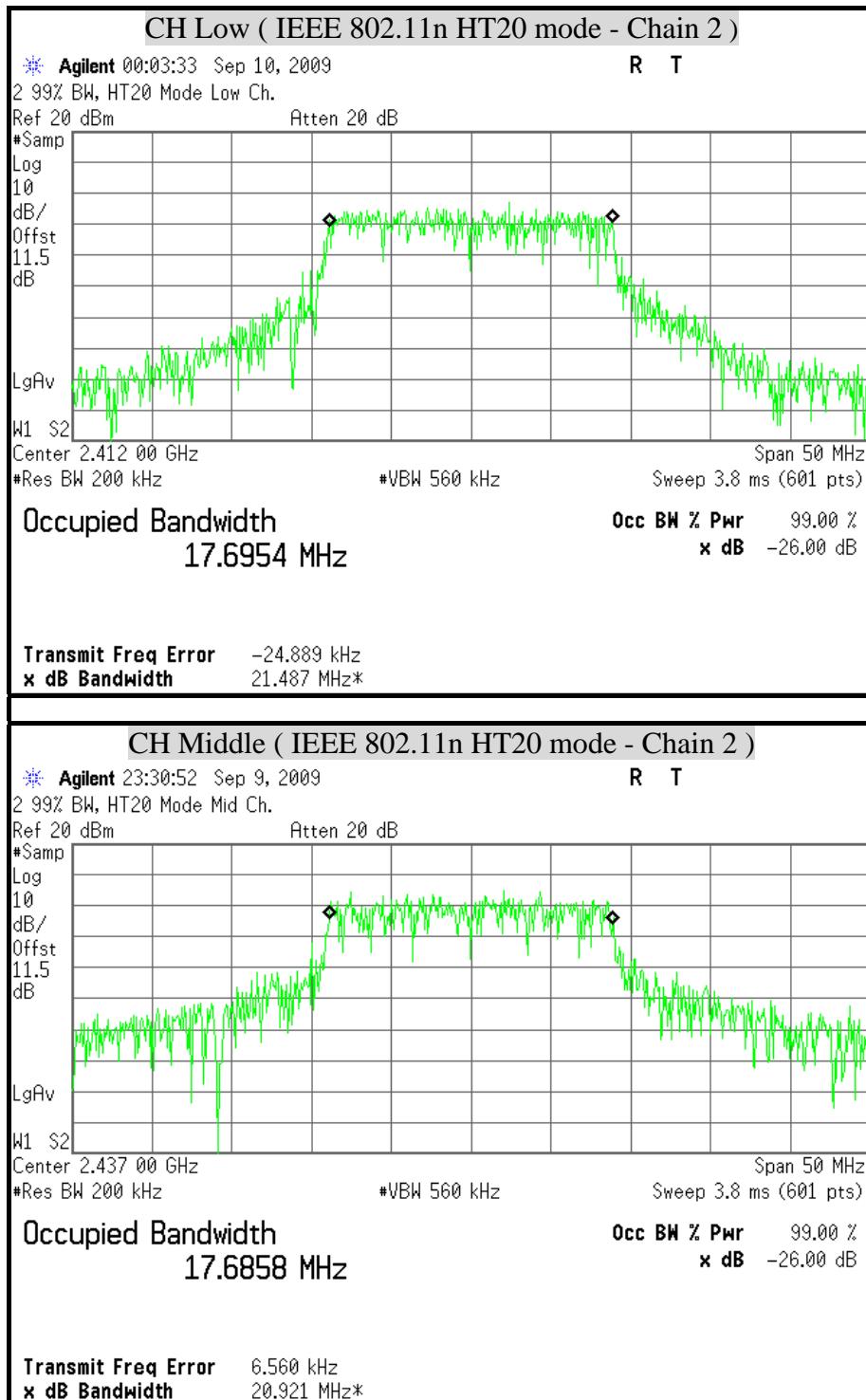


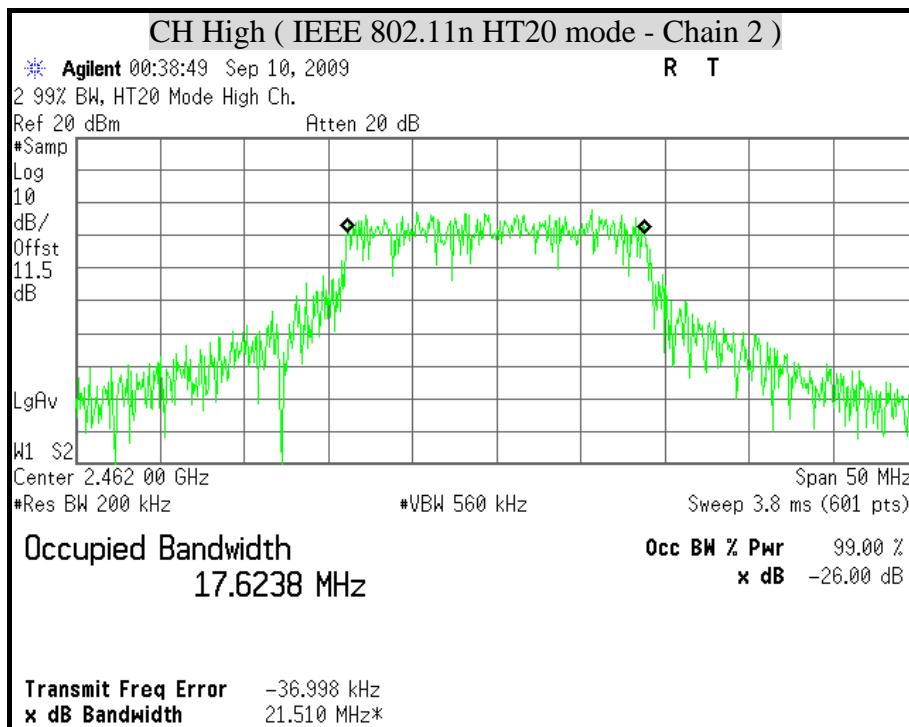
99% BANDWIDTH (IEEE 802.11n HT20 mode)

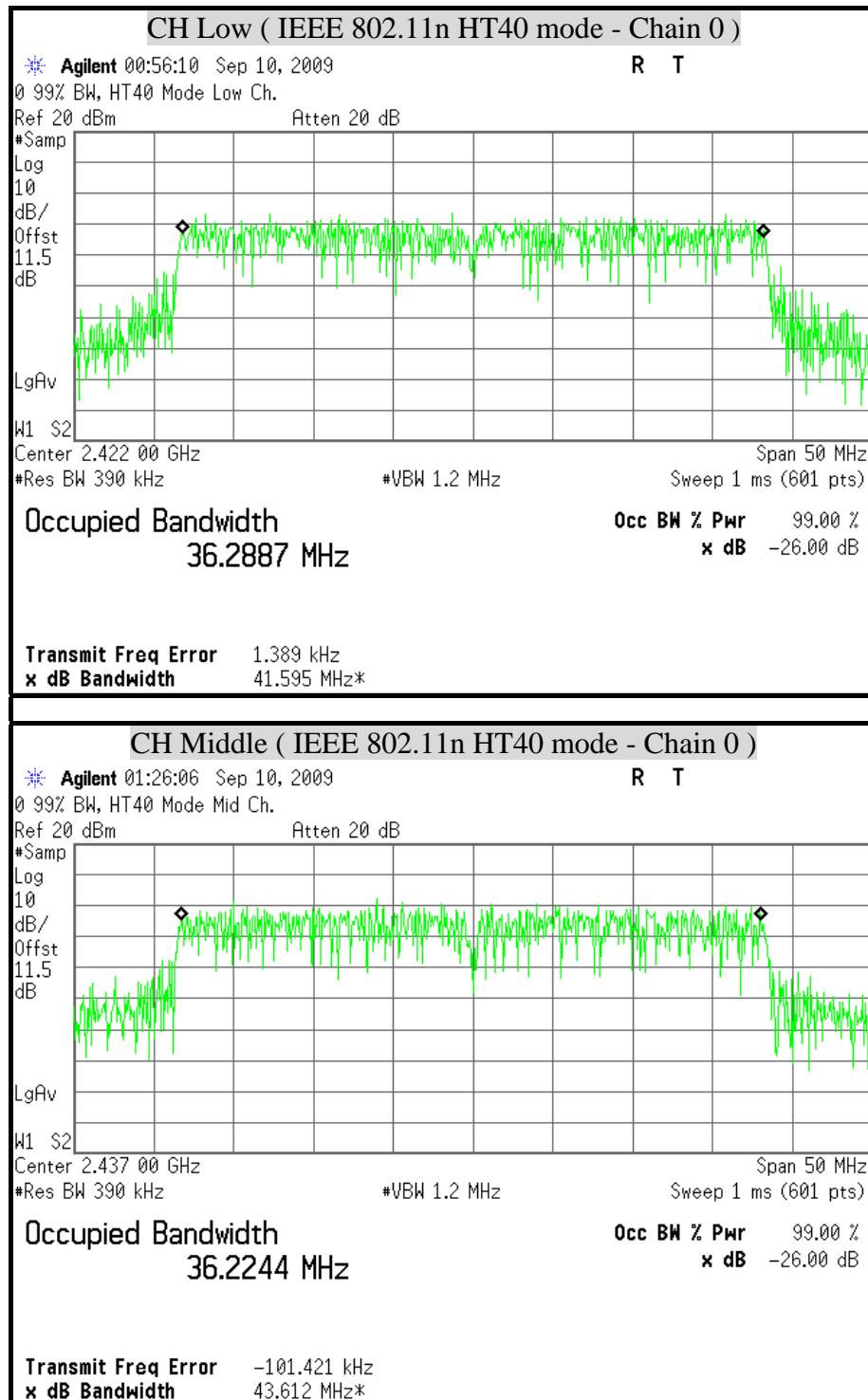


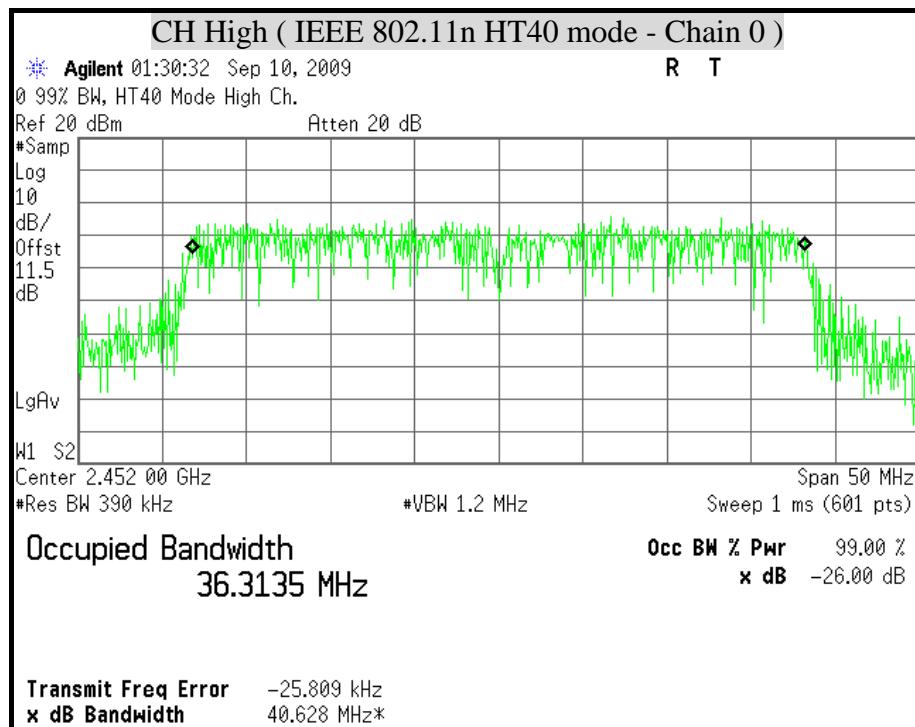


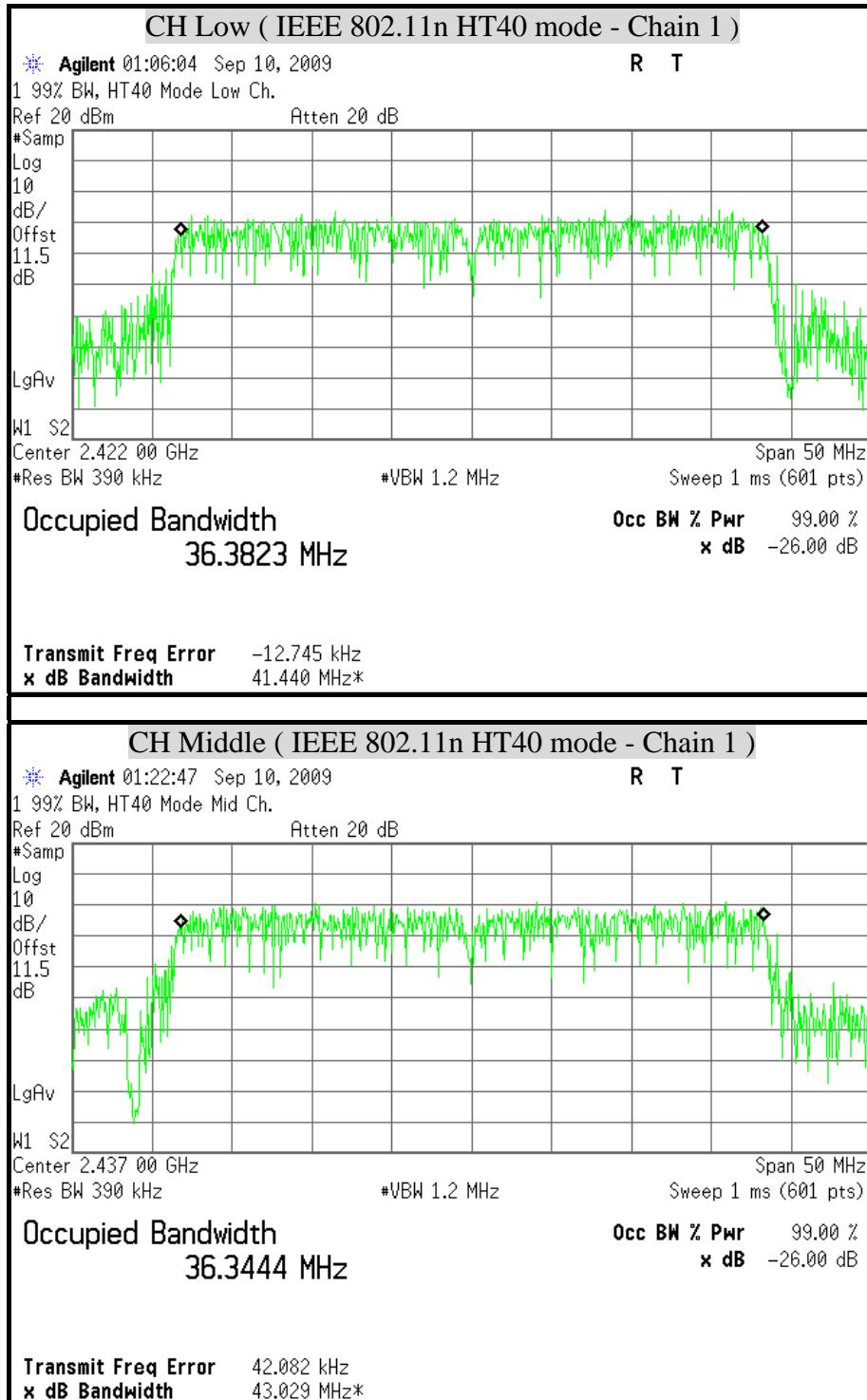


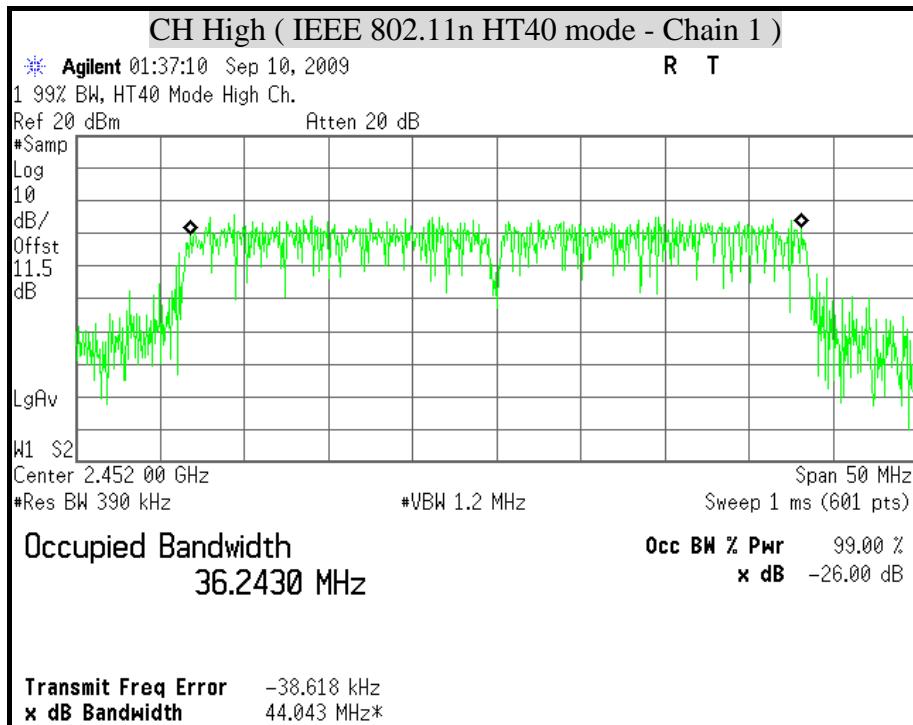


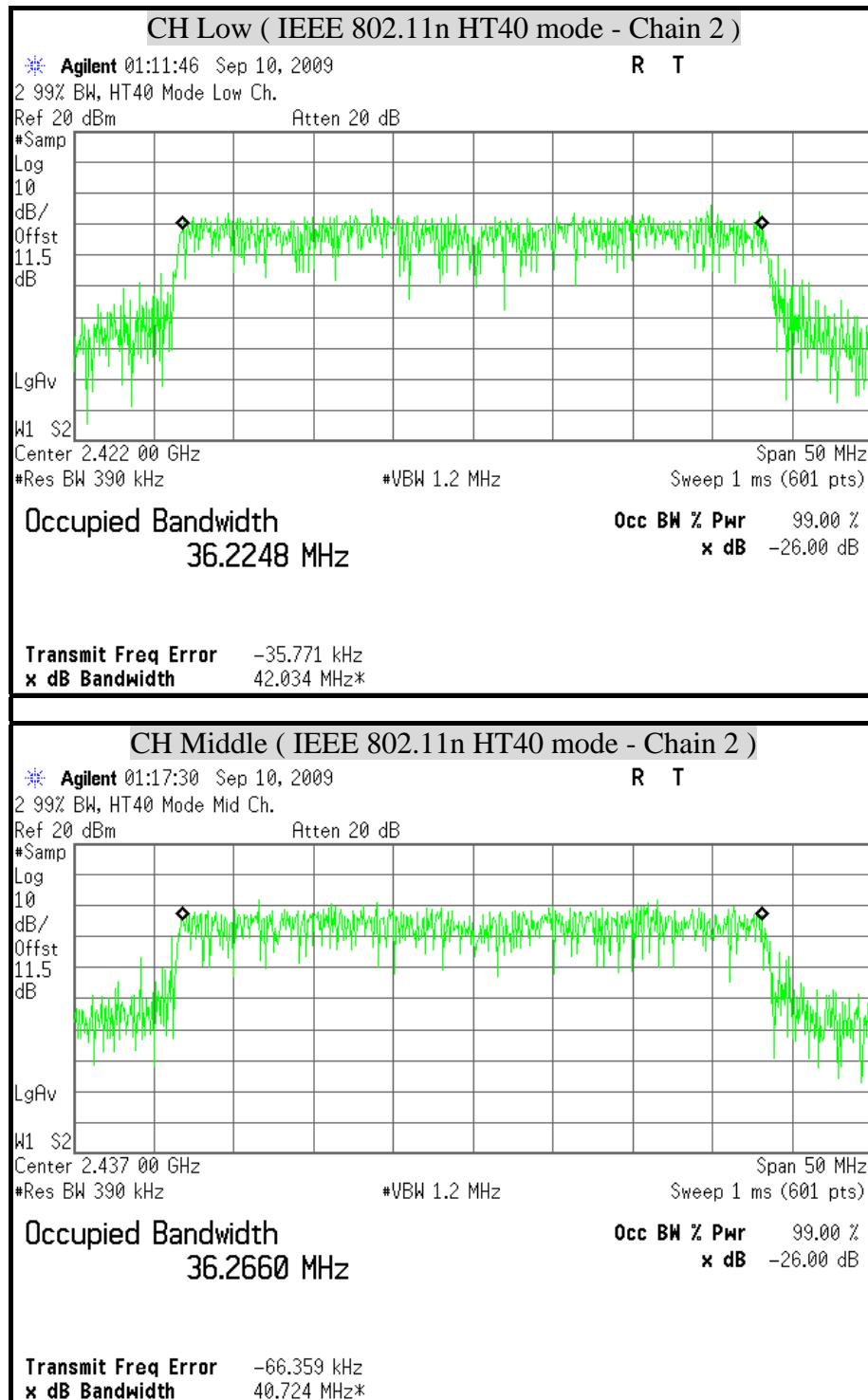


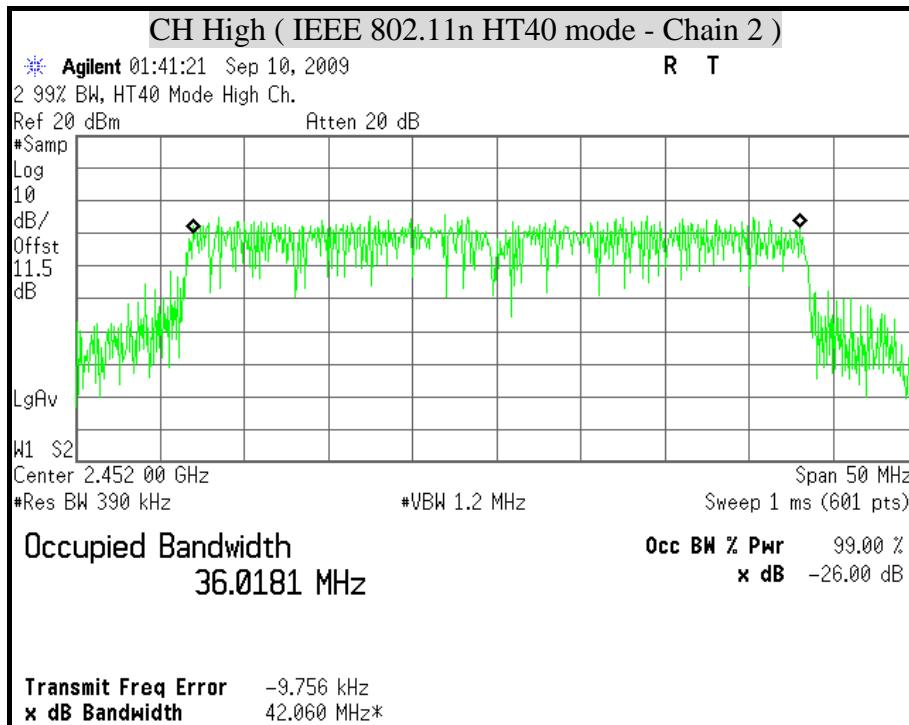
99% BANDWIDTH (IEEE 802.11n HT40 mode)











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.

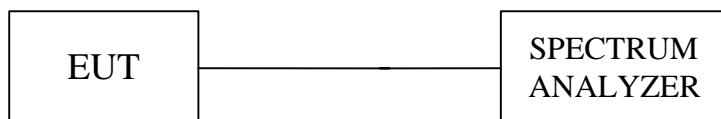
§ 15.247(b) (4) Except as shown in paragraphs (c) of this section , if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2), and (b)(3) of this section , as appropriate, 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	06/09/2010
SPECTRUM ANALYZER	AGILENT	E4446A	MY46180323	05/26/2010

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 : 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

Total peak power calculation formula:

$$10 \log (10^{\text{Chain 0 Power} / 10} + 10^{\text{Chain1 Power} / 10} + 10^{\text{Chain2 Power} / 10})$$

The maximum antenna gain is 2.4 dBi, therefore the limit is 30 dBm.

In the legacy mode, the effective antenna gain is $2.4 + 10 \times \log (3) = 7.17$ dBi.

IEEE 802.11b mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)			Peak Power Total (dBm)	Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2			
Low	2412	20.46	20.82	20.88	25.49	28.83	PASS
Middle	2437	22.87	23.35	23.10	27.88	28.83	PASS
High	2462	21.00	21.15	21.29	26.04	28.83	PASS

Remark:

1. At final test to get the worst-case emission at 11Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 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 Total (dBm)	Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2			
Low	2412	17.02	17.27	17.37	21.99	28.83	PASS
Middle	2437	23.99	23.82	24.22	28.78	28.83	PASS
High	2462	18.17	19.20	18.75	23.49	28.83	PASS

Remark:

1. At final test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

**IEEE 802.11n HT20 mode (Three TX)**

Channel	Channel Frequency (MHz)	Peak Power (dBm)			Peak Power Total (dBm)	Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2			
Low	2412	15.55	15.54	15.65	20.35	30.00	PASS
Middle	2437	24.01	23.97	24.11	28.80	30.00	PASS
High	2462	16.49	17.62	17.70	22.07	30.00	PASS

Remark:

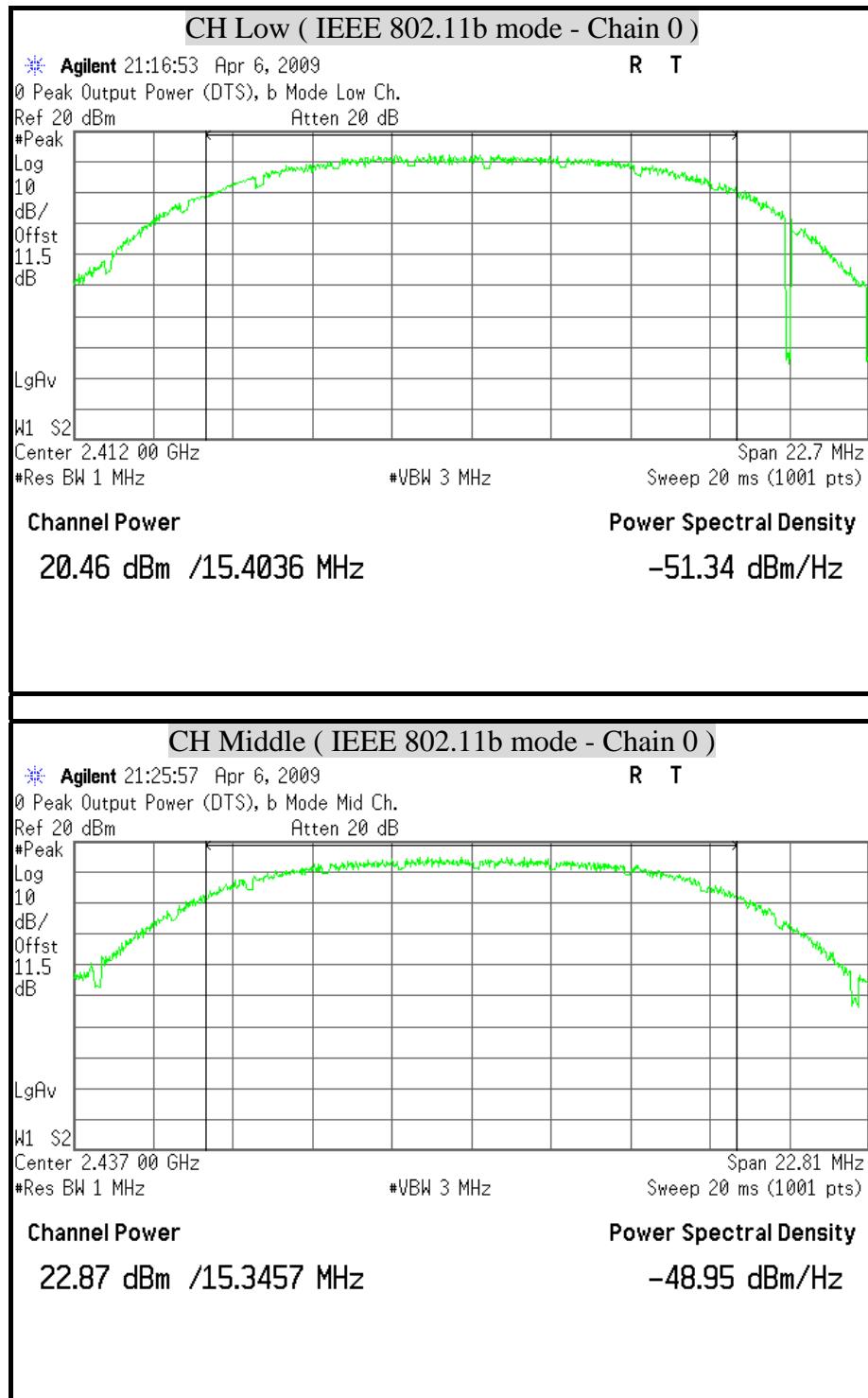
1. At final test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

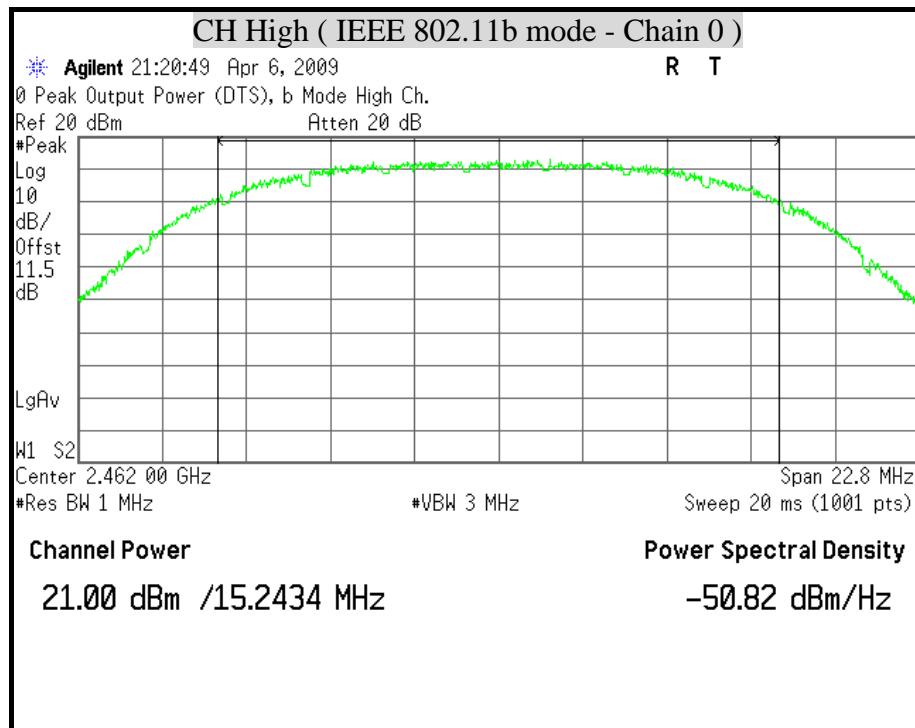
IEEE 802.11n HT40 mode (Three TX)

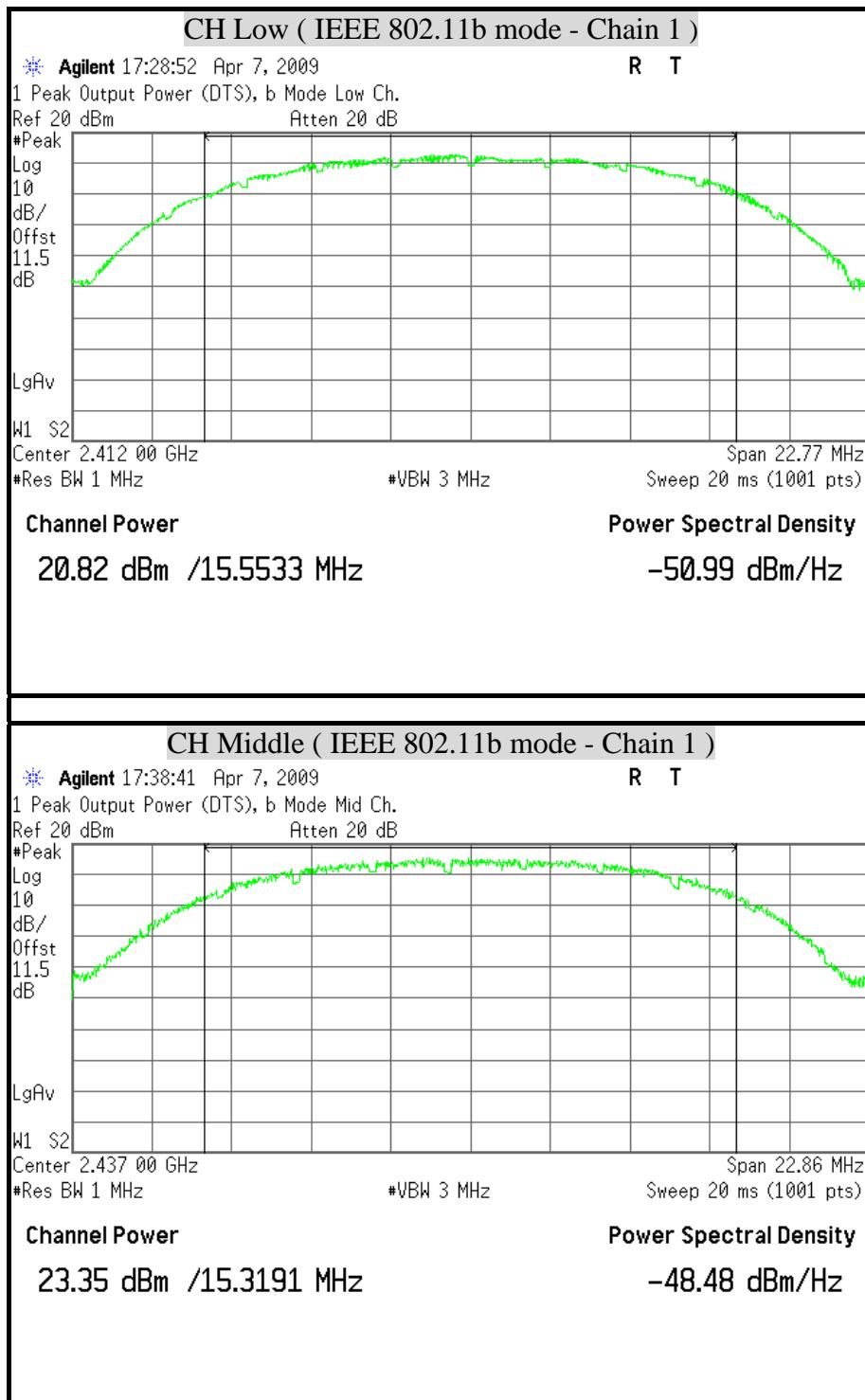
Channel	Channel Frequency (MHz)	Peak Power (dBm)			Peak Power Total (dBm)	Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2			
Low	2422	13.00	13.69	13.60	18.21	30.00	PASS
Middle	2437	20.31	20.59	20.40	25.20	30.00	PASS
High	2452	14.57	15.69	17.08	20.67	30.00	PASS

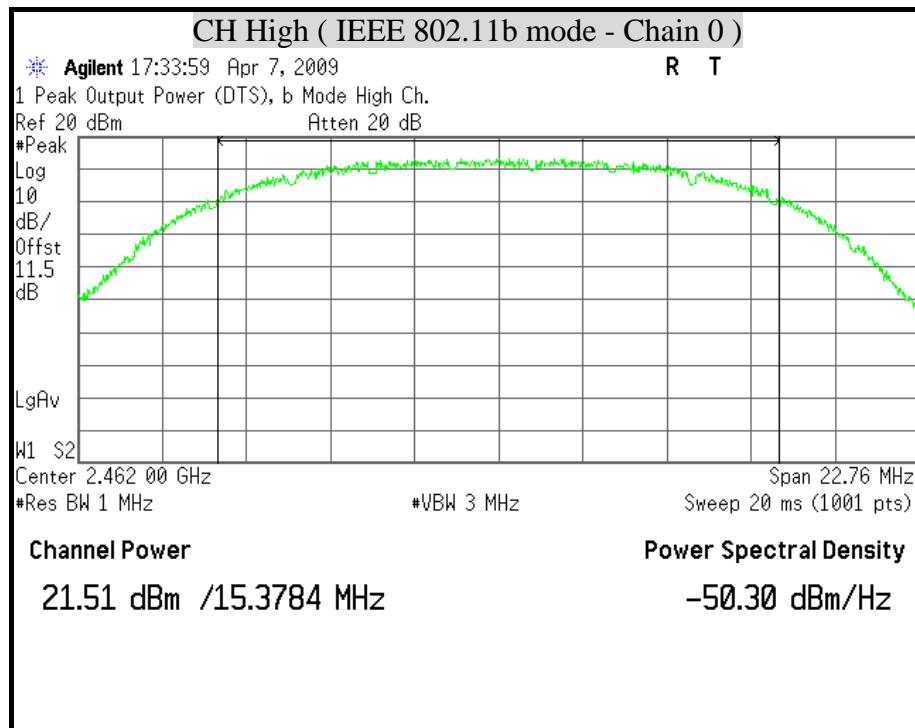
Remark:

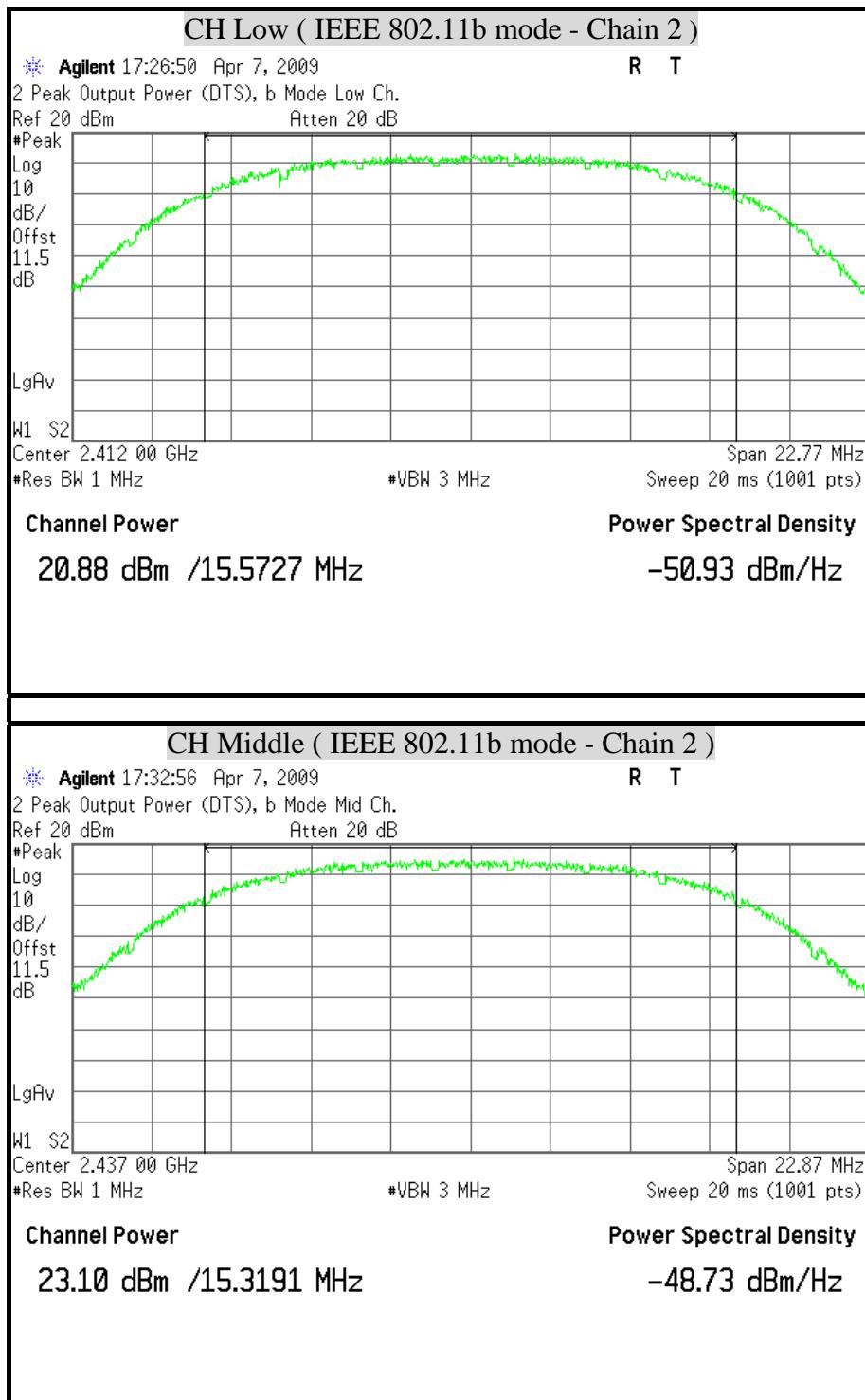
1. At final test to get the worst-case emission at 13.5Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

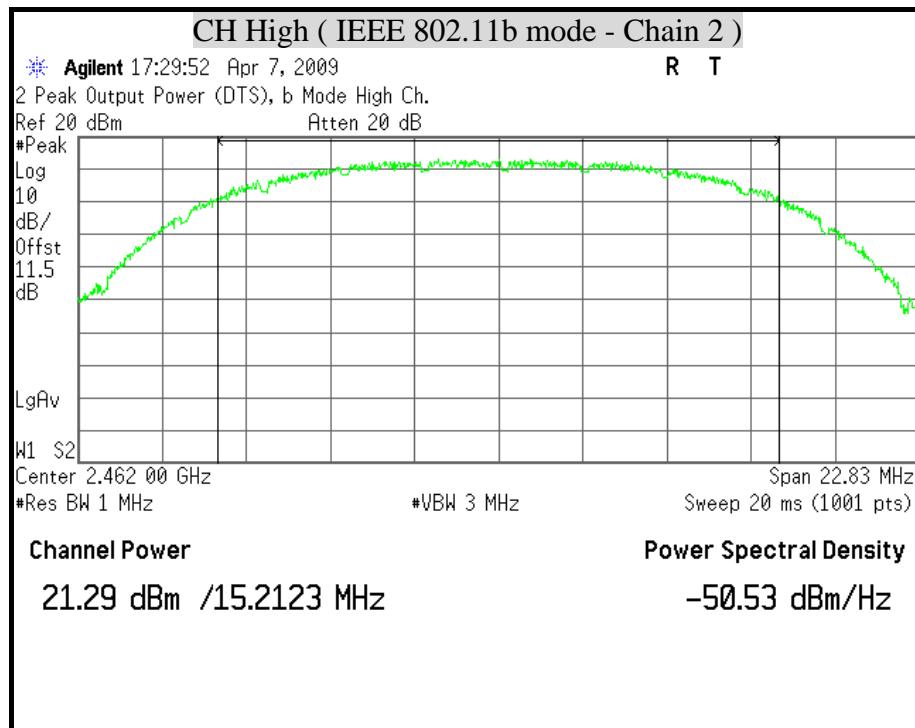
MAXIMUM PEAK OUTPUT POWER (IEEE 802.11b mode)

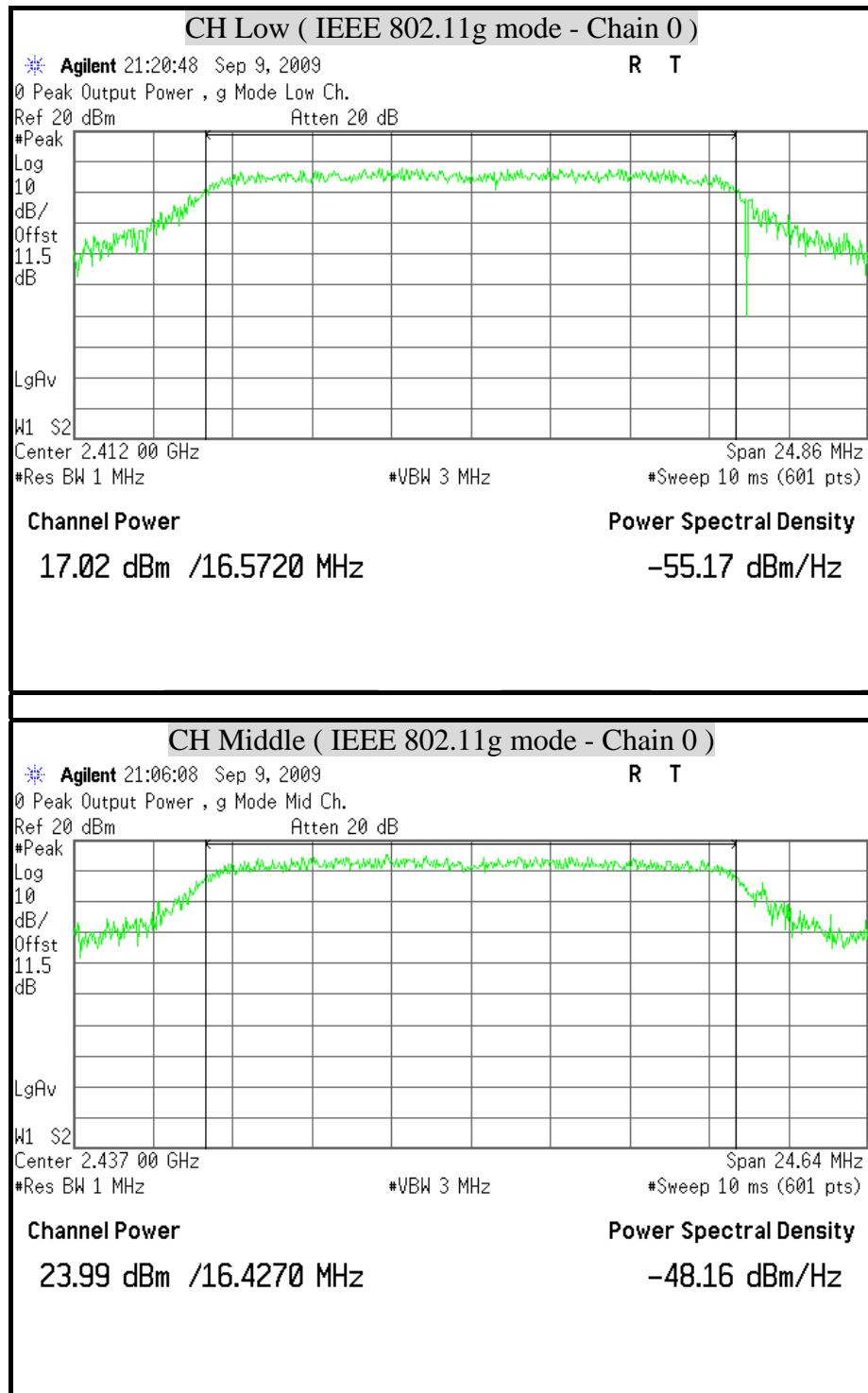


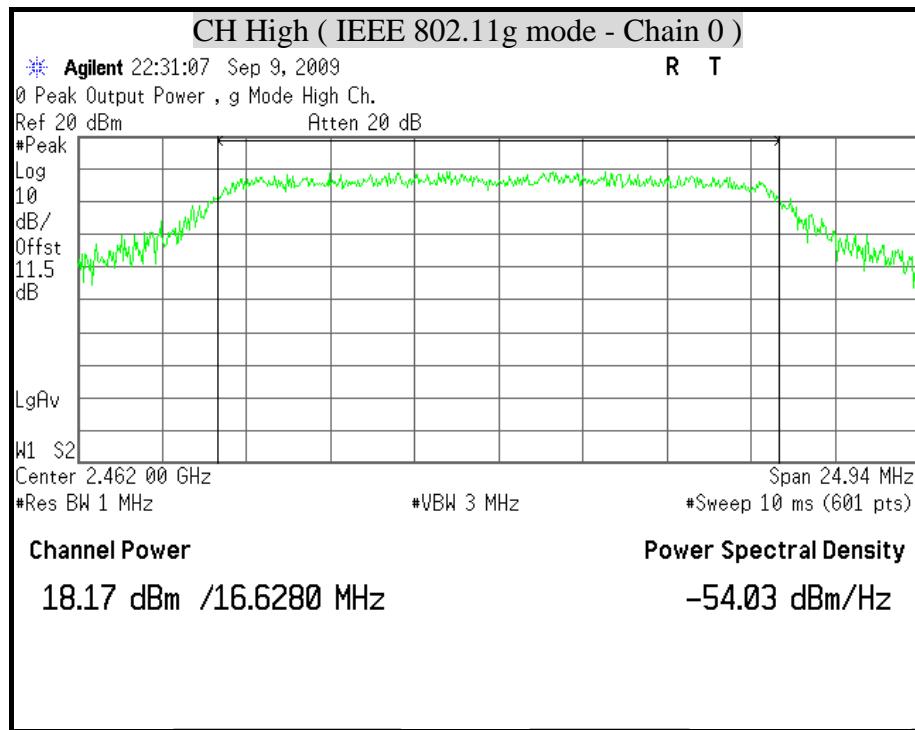


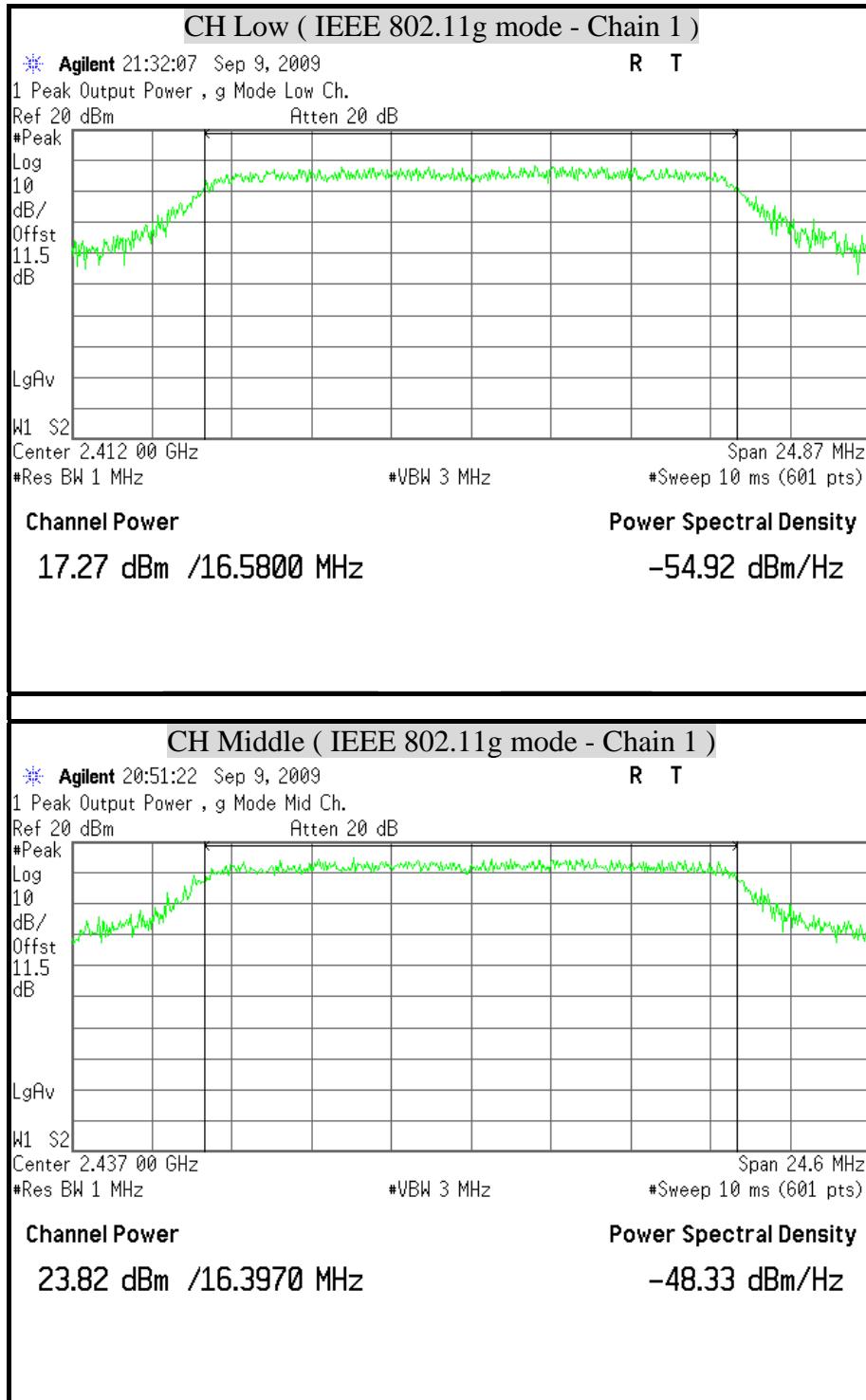


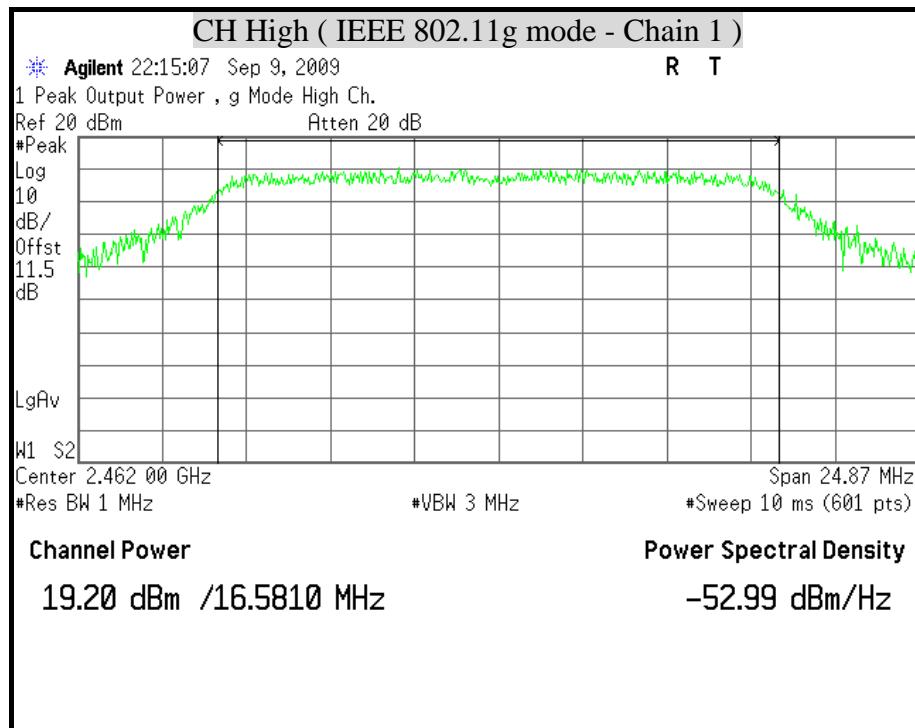


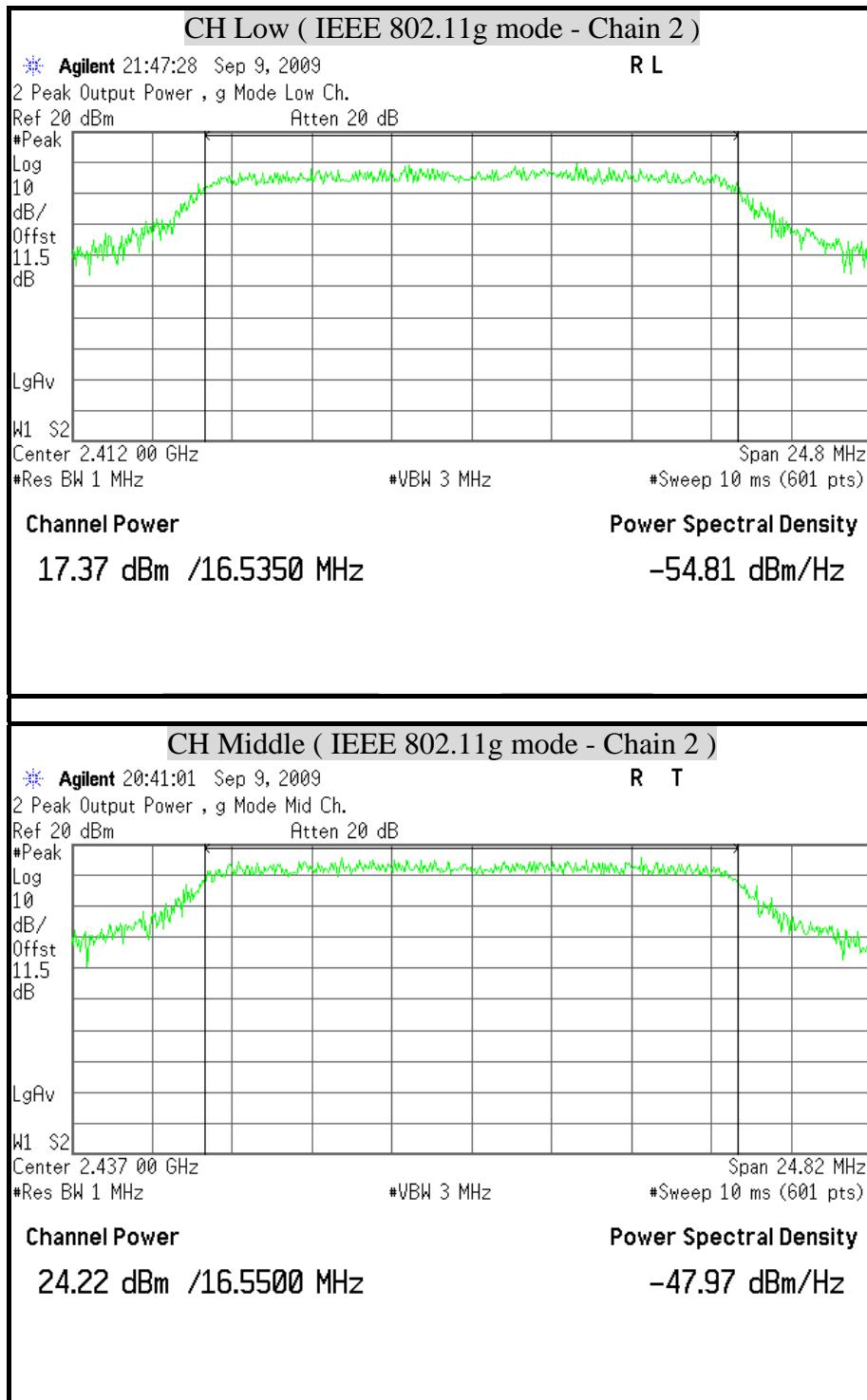


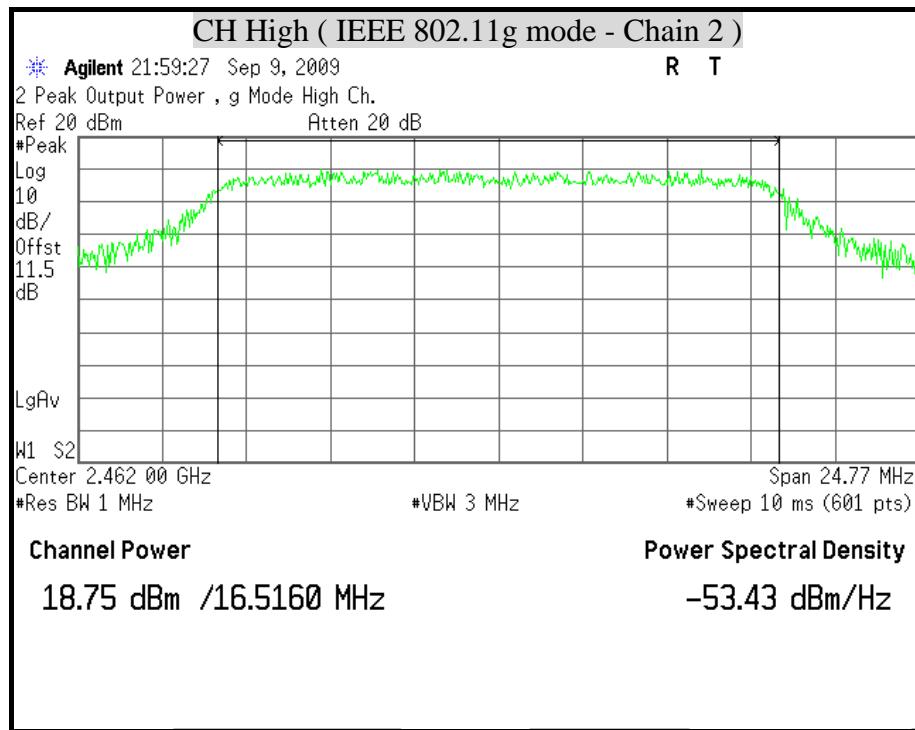
MAXIMUM PEAK OUTPUT POWER (IEEE 802.11g mode)

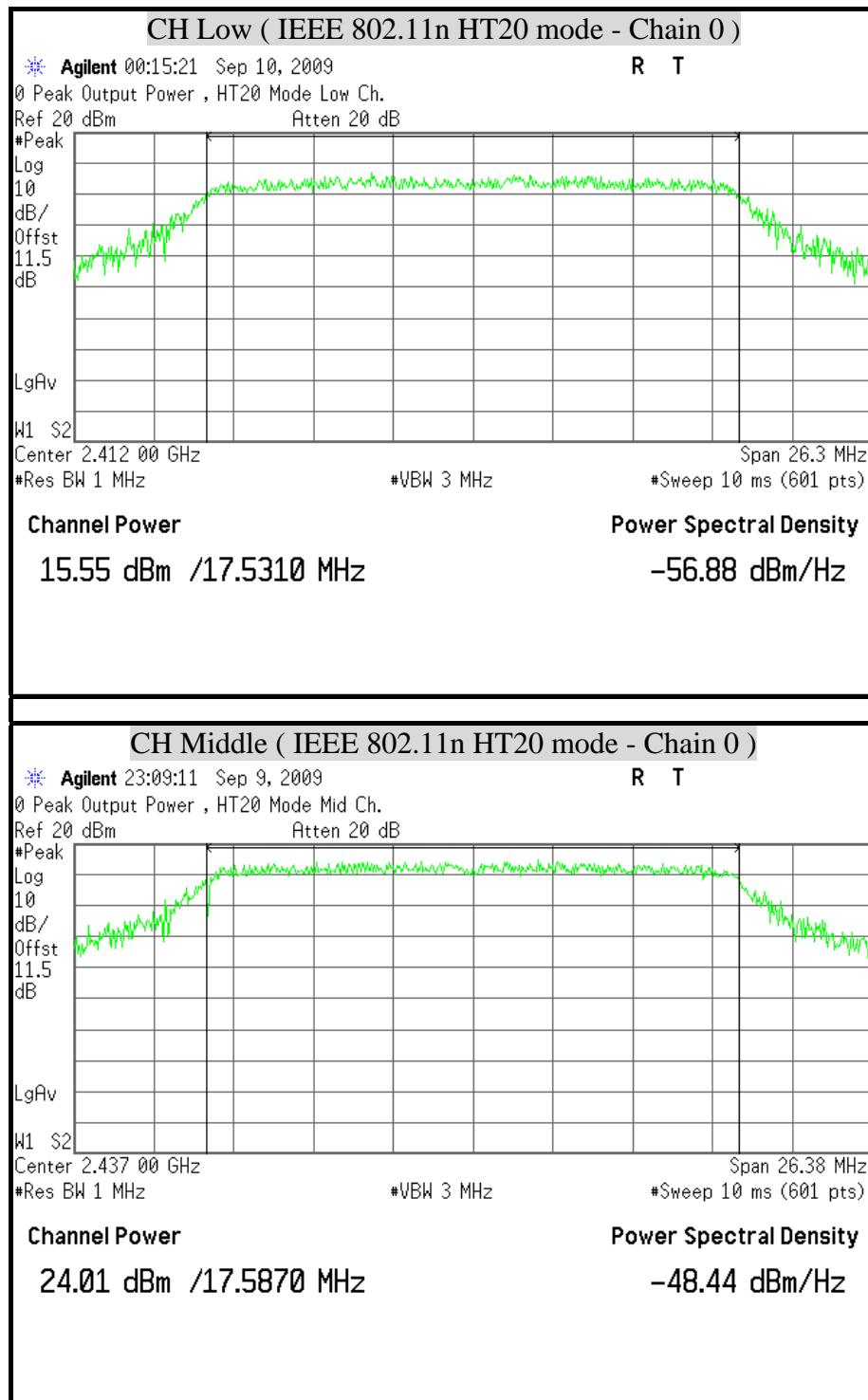


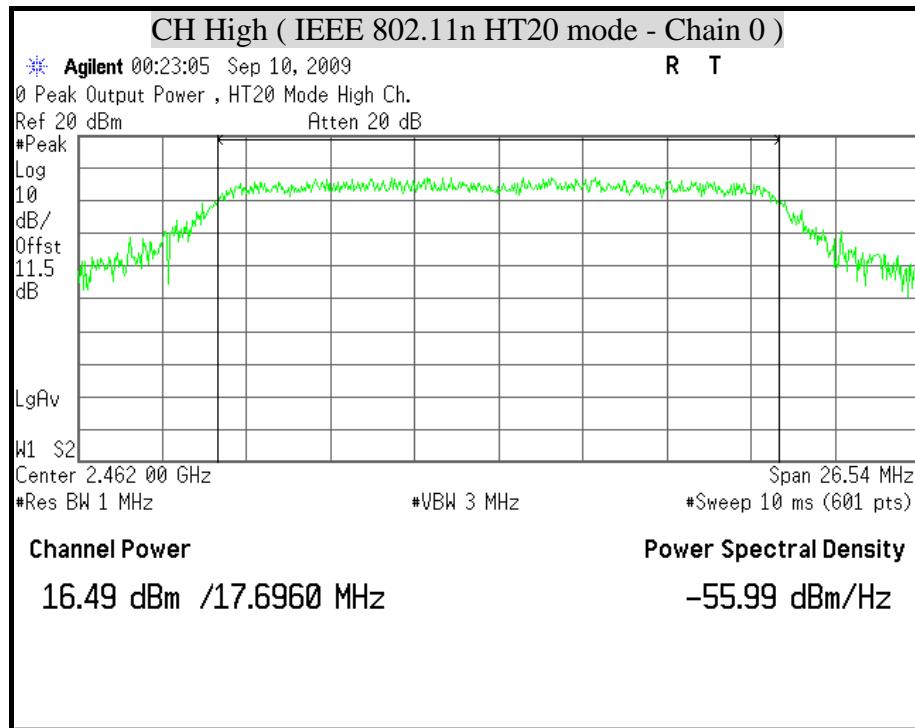


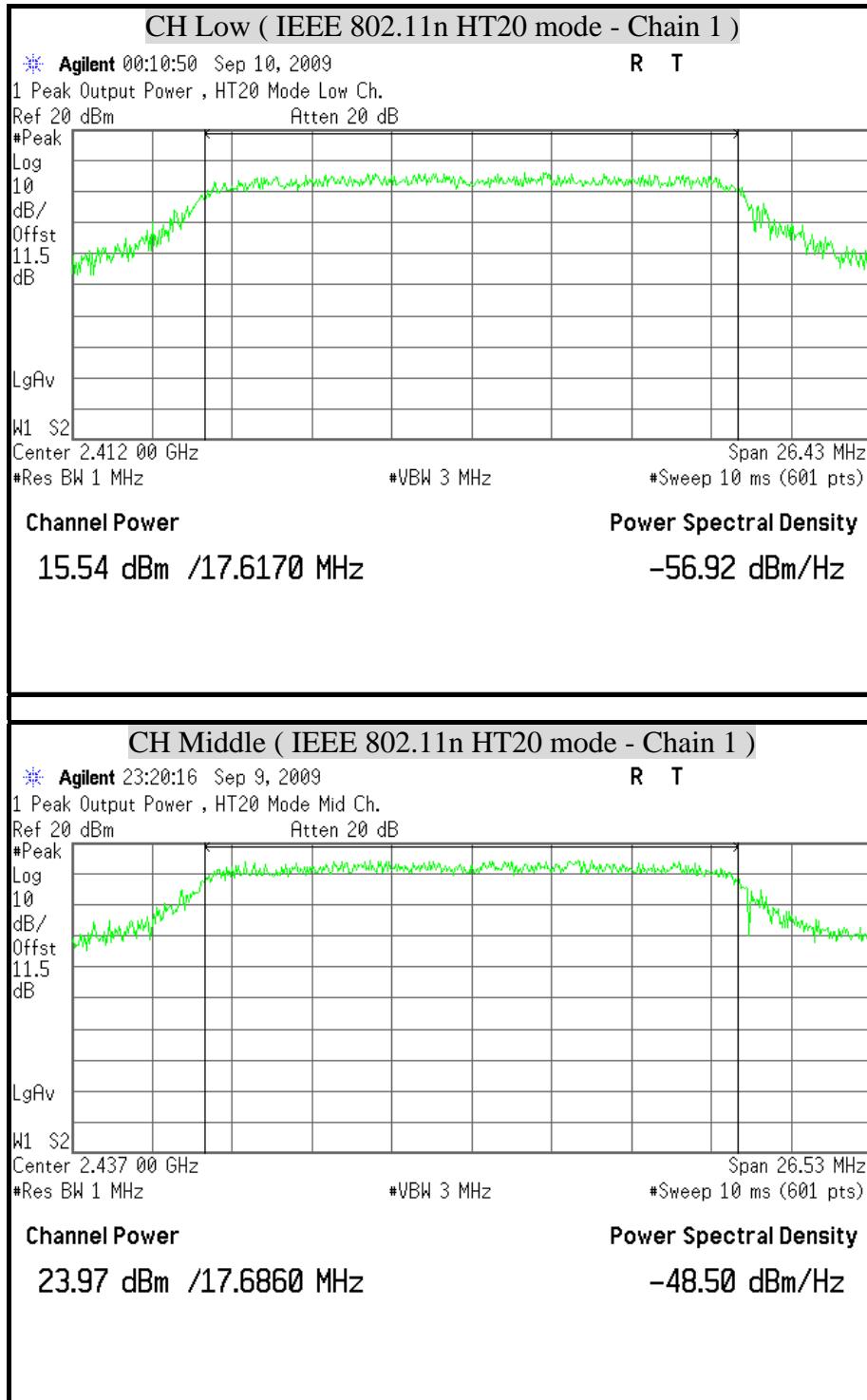


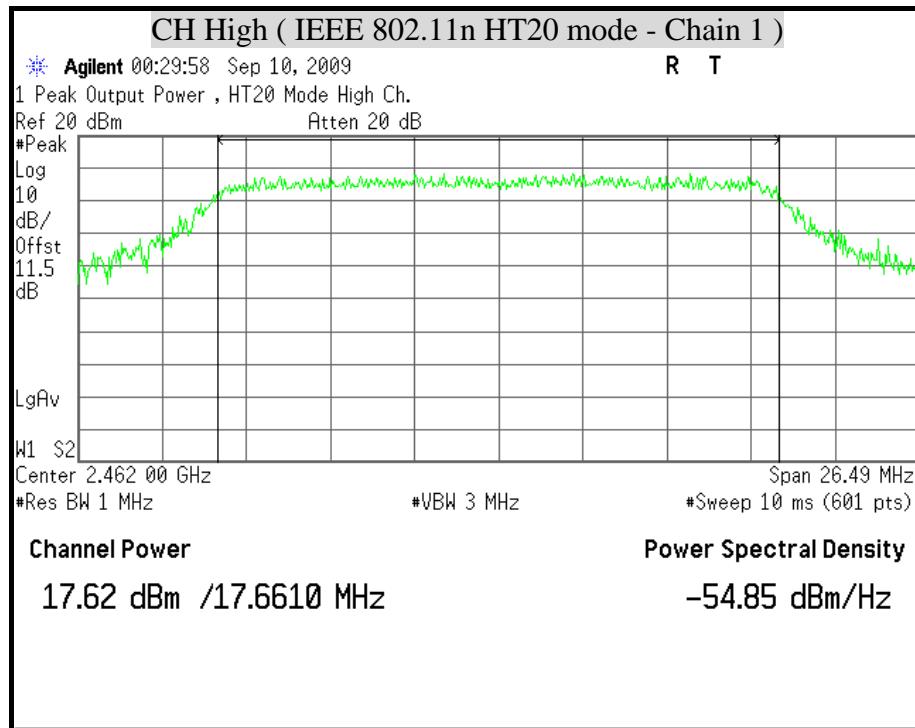


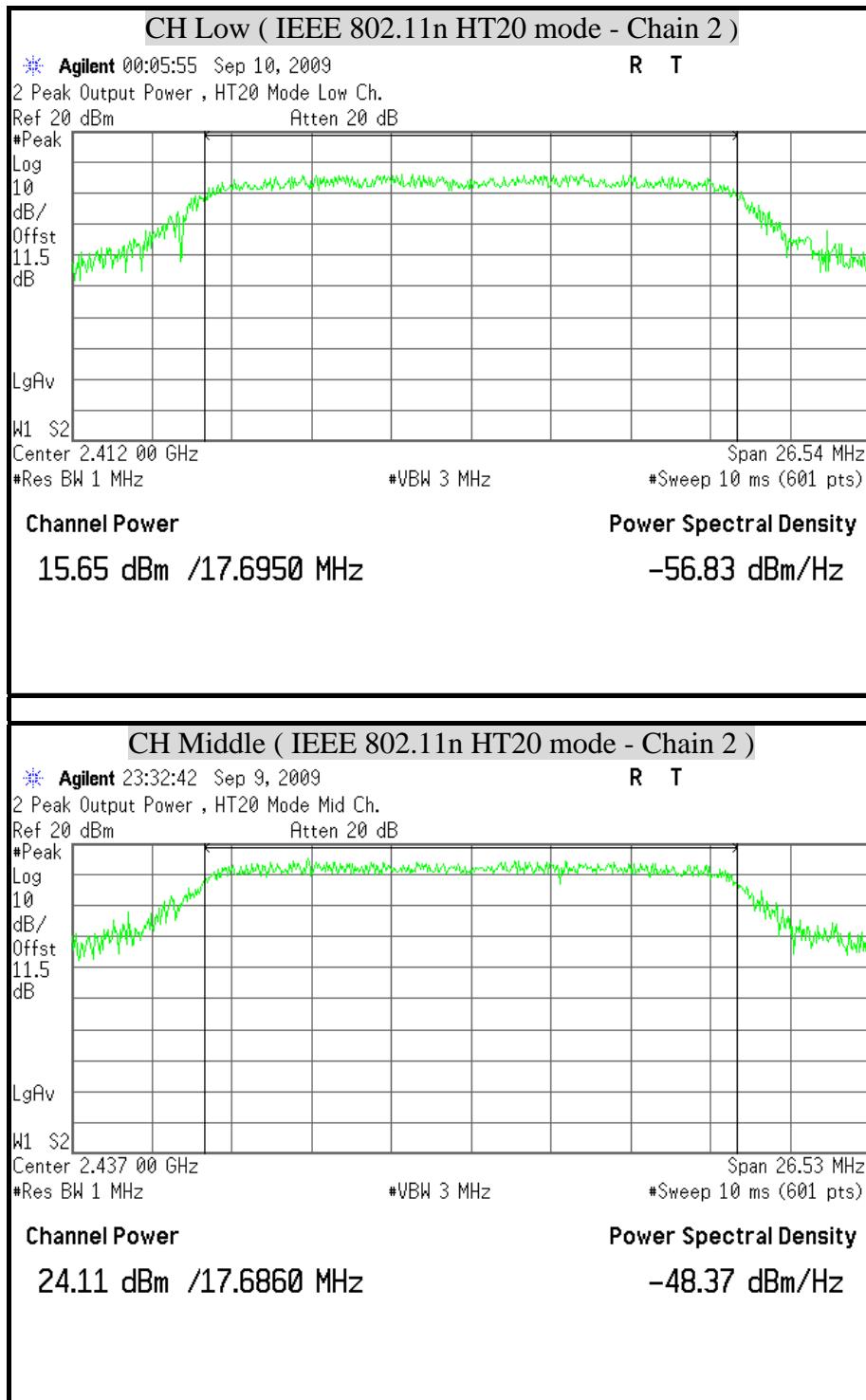


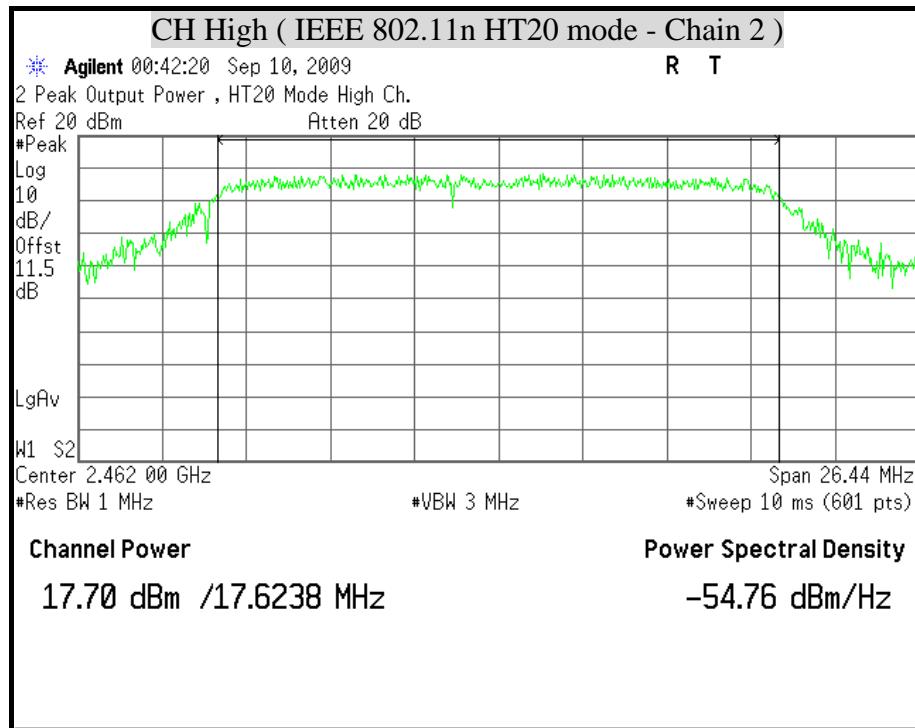
MAXIMUM PEAK OUTPUT POWER (IEEE 802.11n HT20 mode)

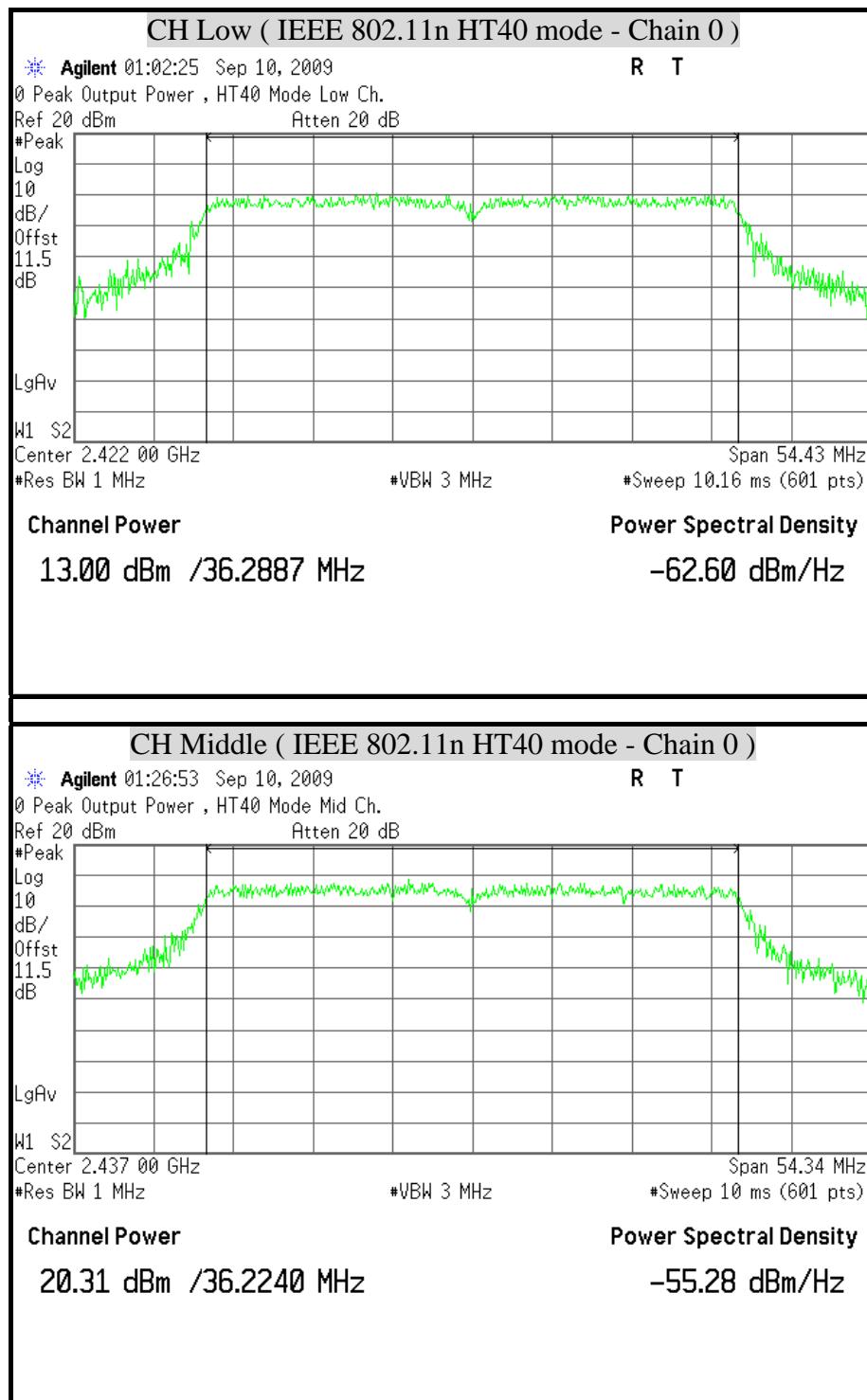


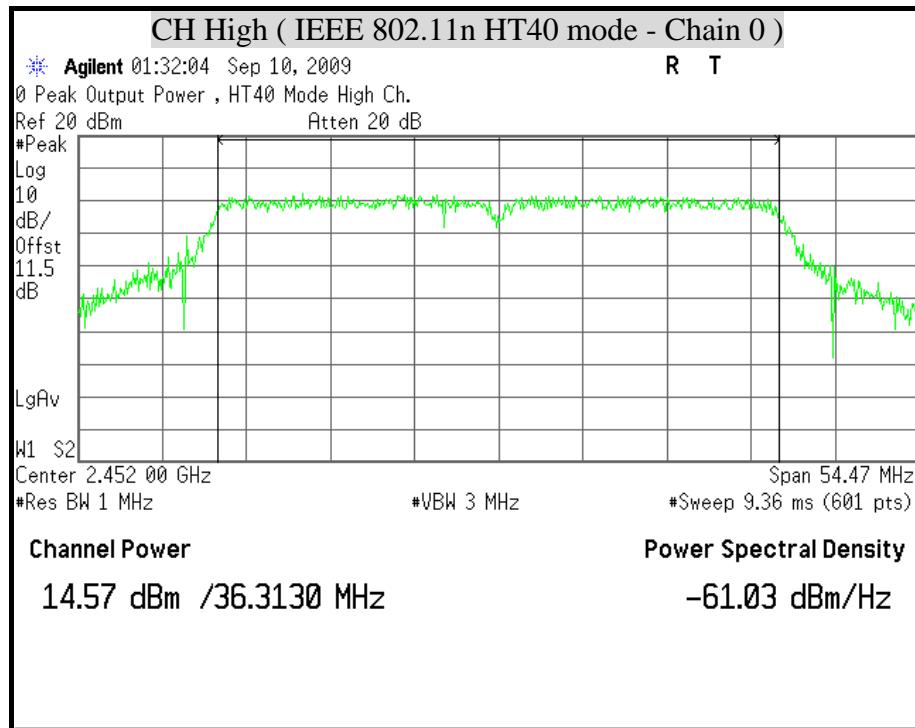


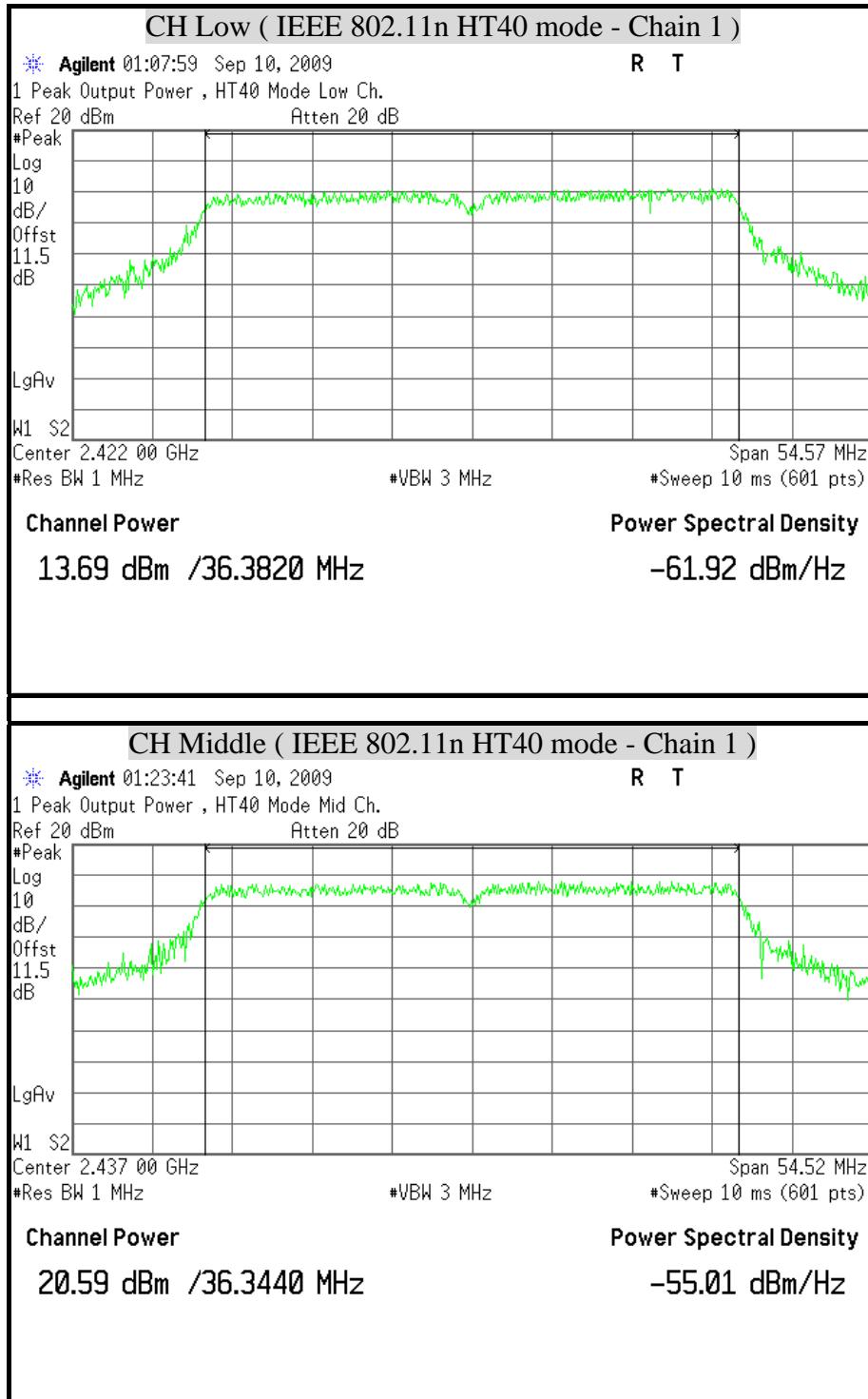


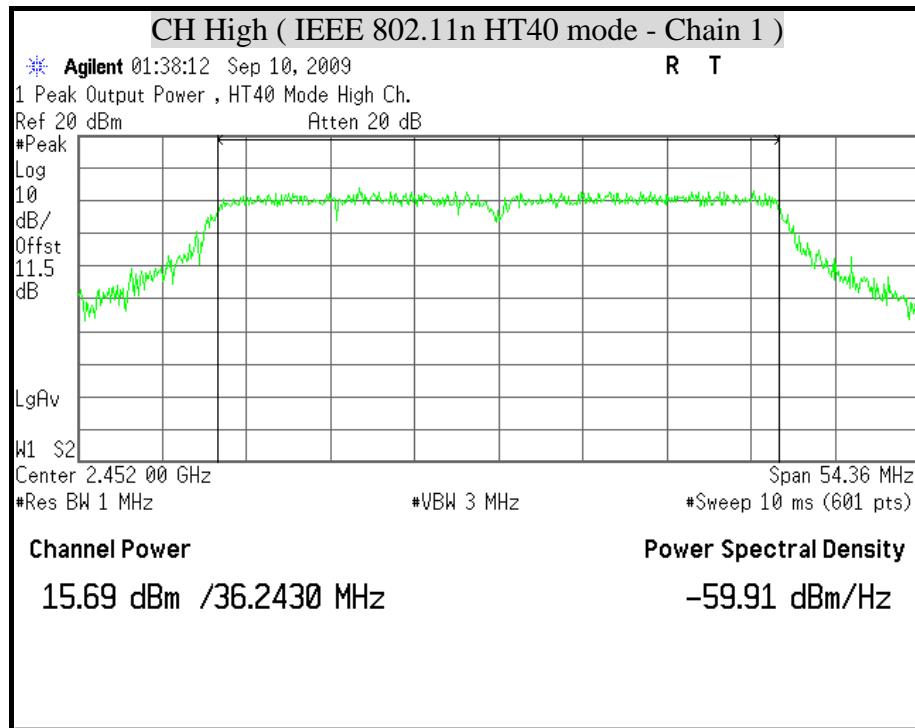


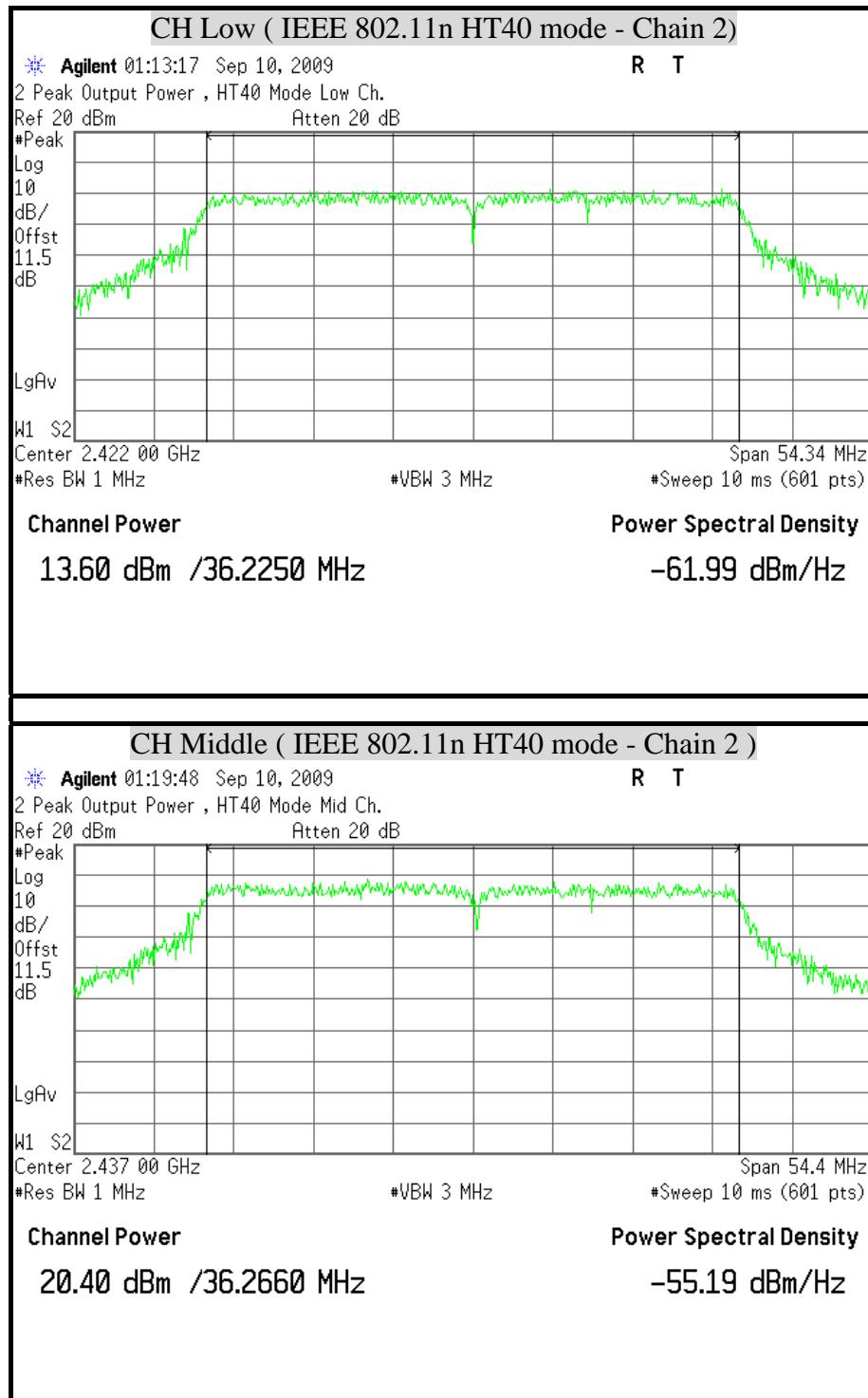


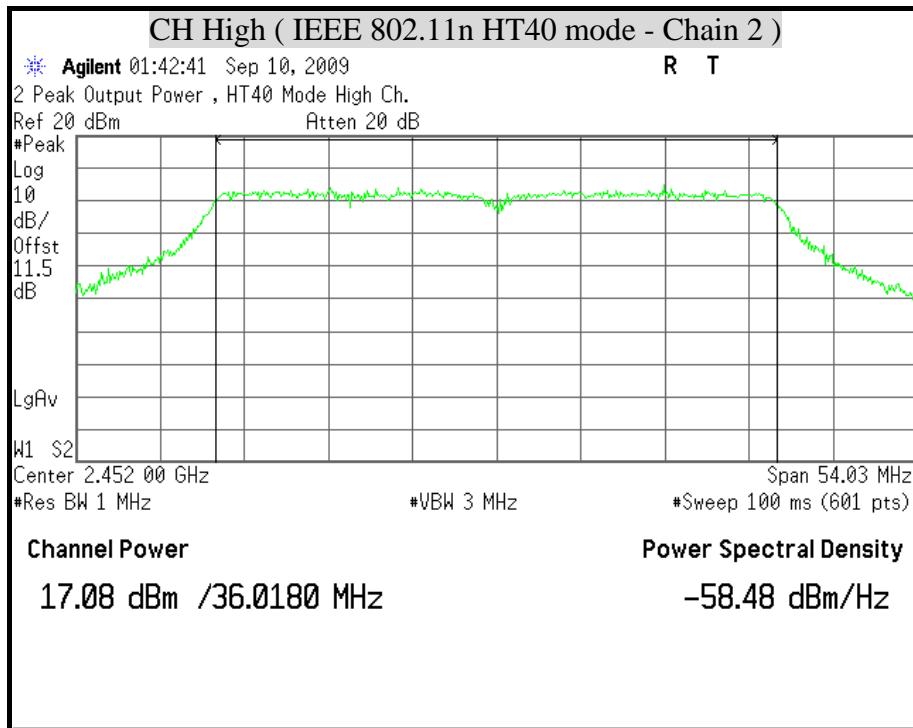
MAXIMUM PEAK OUTPUT POWER (IEEE 802.11n HT40 mode)













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

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:

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

$$d \text{ (cm)} = d \text{ (m)} / 100$$

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, $S=1.0\text{mW/cm}^2$ **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	2.4	20.0	27.88	1.74	1.00	0.212188
IEEE 802.11g	2.4	20.0	28.78	1.74	1.00	0.261048
IEEE 802.11n HT20	2.4	20.0	28.80	1.74	1.00	0.262253
IEEE 802.11n HT40	2.4	20.0	25.20	1.74	1.00	0.114477

Remark: For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm² even if the calculation indicates that the power density would be larger.



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	06/09/2010
SPECTRUM ANALYZER	AGILENT	E4446A	MY46180323	05/26/2010

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

Total avg power calculation formula:

$10 \log (10^{\wedge} (\text{Chain 0 Power} / 10) + 10^{\wedge} (\text{Chain1 Power} / 10) + 10^{\wedge} (\text{Chain2 Power} / 10))$

IEEE 802.11b mode (Three TX)

Channel	Channel Frequency (MHz)	Average Power (dBm)			Average Power Total (dBm)
		Chain 0	Chain 1	Chain 2	
Low	2412	15.81	16.35	15.88	20.79
Middle	2437	17.95	18.35	18.10	22.90
High	2462	16.19	16.53	16.41	21.15

Remark:

1. At finial test to get the worst-case emission at 11.5Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11g mode (Three TX)

Channel	Channel Frequency (MHz)	Average Power (dBm)			Average Power Total (dBm)
		Chain 0	Chain 1	Chain 2	
Low	2412	11.30	11.77	11.76	16.38
Middle	2437	18.11	18.09	18.38	22.96
High	2462	12.31	13.17	12.99	17.61

Remark:

1. At finial test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

**IEEE 802.11n HT20 mode (Three TX)**

Channel	Channel Frequency (MHz)	Average Power (dBm)			Average Power Total (dBm)
		Chain 0	Chain 1	Chain 2	
Low	2412	11.01	9.73	9.76	14.98
Middle	2437	18.21	18.1	18.46	23.03
High	2462	11.03	12.13	11.75	16.43

Remark:

1. At final test to get the worst-case emission at 6.5Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11n HT40 mode (Three TX)

Channel	Channel Frequency (MHz)	Average Power (dBm)			Average Power Total (dBm)
		Chain 0	Chain 1	Chain 2	
Low	2422	7.53	7.70	7.92	12.49
Middle	2437	14.70	14.59	14.61	19.40
High	2452	8.61	9.55	9.66	14.06

Remark:

1. At final test to get the worst-case emission at 13.5Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

8.6 POWER SPECTRAL DENSITY

LIMIT

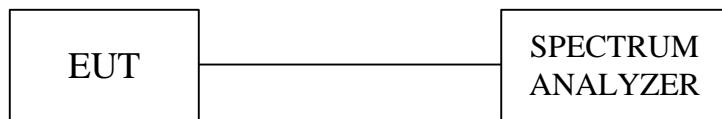
§ 15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
SPECTRUM ANALYZER	AGILENT	E4446A	MY43360132	06/09/2010
SPECTRUM ANALYZER	AGILENT	E4446A	MY46180323	05/26/2010

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

Total peak power calculation formula:

$$10 \log (10^{\wedge} (\text{Chain 0 Power} / 10) + 10^{\wedge} (\text{Chain1 Power} / 10) + 10^{\wedge} (\text{Chain2 Power} / 10))$$

IEEE 802.11b mode (Three TX)

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)			PPSD Total (dBm)	Maxmum Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2			
Low	2412	-9.13	-4.38	-7.87	-1.86	8	PASS
Middle	2437	-6.28	-4.10	-6.81	-0.79	8	PASS
High	2462	-7.96	-5.03	-5.93	-1.37	8	PASS

Remark:

1. At finial test to get the worst-case emission at 11Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11b Combined mode (Three TX)

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Maxmum Limit (dBm)	Pass / Fail
Low	2412	-1.52	8	PASS
Middle	2437	3.18	8	PASS
High	2462	2.69	8	PASS

Remark:

1. At finial test to get the worst-case emission at 11Mbps.
2. The cable assembly insertion loss of 16.5dB (including 10 dB pad and 6.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

**IEEE 802.11g mode (Three TX)**

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)			PPSD Total (dBm)	Maximum Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2			
Low	2412	-12.91	-12.88	-13.09	-8.18	8	PASS
Middle	2437	-6.50	-6.05	-4.25	-0.71	8	PASS
High	2462	-12.80	-11.05	-9.41	-6.09	8	PASS

Remark:

1. At final test to get the worst-case emission at 11Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11g Combined mode (Three TX)

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Maximum Limit (dBm)	Pass / Fail
Low	2412	-2.81	8	PASS
Middle	2437	2.34	8	PASS
High	2462	-1.61	8	PASS

Remark:

1. At final test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 16.5dB (including 10 dB pad and 6.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11n HT20 mode (Three TX)

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)			PPSD Total (dBm)	Maximum Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2			
Low	2412	-15.73	-13.37	-14.34	-9.60	8	PASS
Middle	2437	-6.21	-6.74	-3.68	-0.55	8	PASS
High	2462	-14.47	-13.11	-12.52	-8.52	8	PASS

Remark:

1. At final test to get the worst-case emission at 11Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

**IEEE 802.11n HT20 Combined mode (Three TX)**

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Maxmum Limit (dBm)	Pass / Fail
Low	2412	-2.93	8	PASS
Middle	2437	2.23	8	PASS
High	2462	-3.12	8	PASS

Remark:

1. At finial test to get the worst-case emission at 6.5Mbps.
2. The cable assembly insertion loss of 16.5dB (including 10 dB pad and 6.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11n HT40 mode (Three TX)

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)			PPSD Total (dBm)	Maxmum Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2			
Low	2422	-20.11	-18.67	-19.13	-14.49	8	PASS
Middle	2437	-11.66	-12.12	-12.44	-7.29	8	PASS
High	2452	-18.26	-17.45	-18.19	-13.17	8	PASS

Remark:

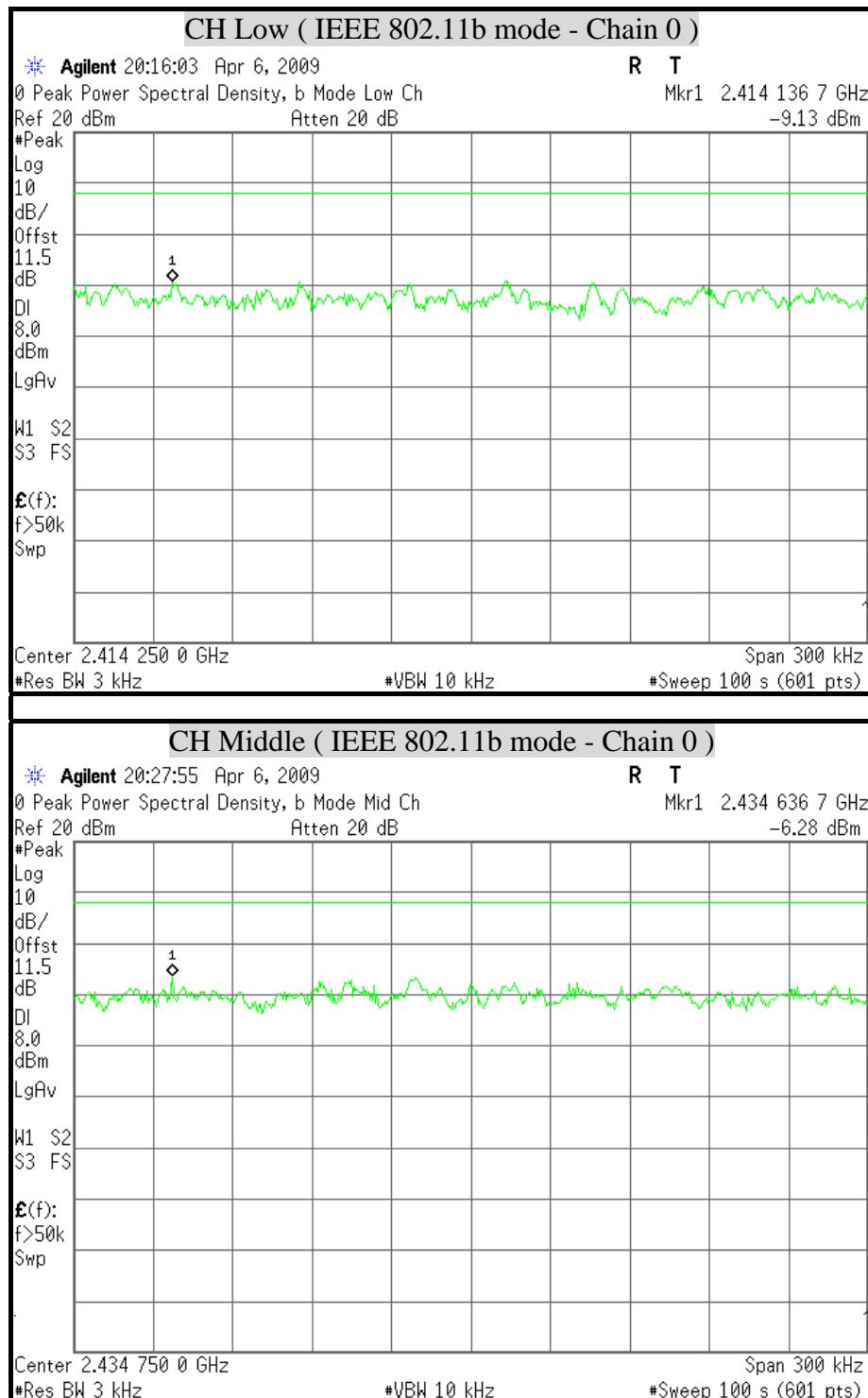
1. At finial test to get the worst-case emission at 13.5Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

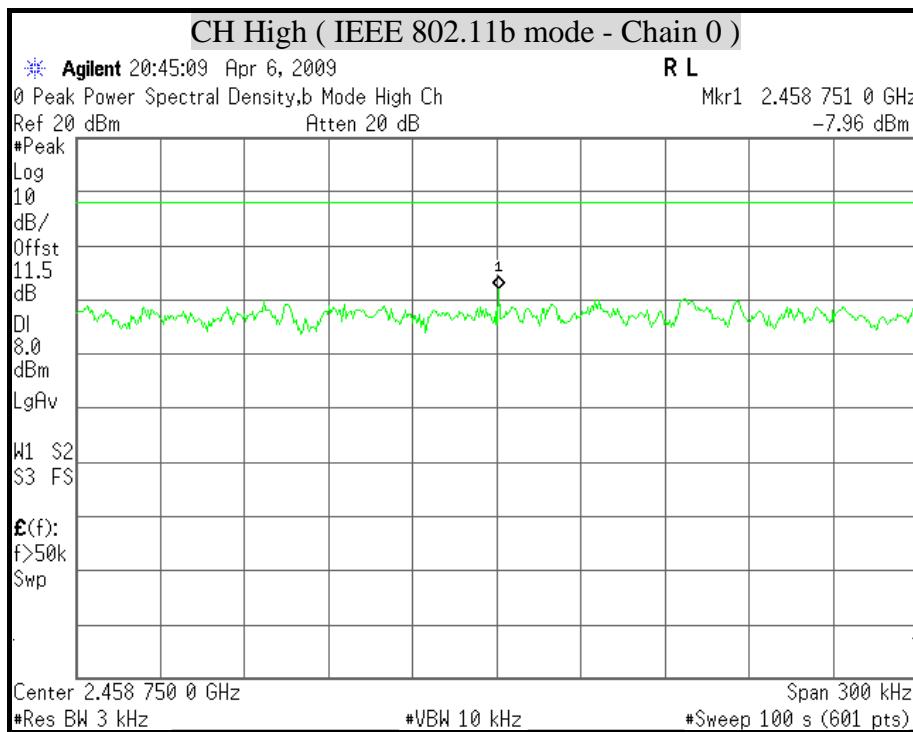
IEEE 802.11n HT40 Combined mode (Three TX)

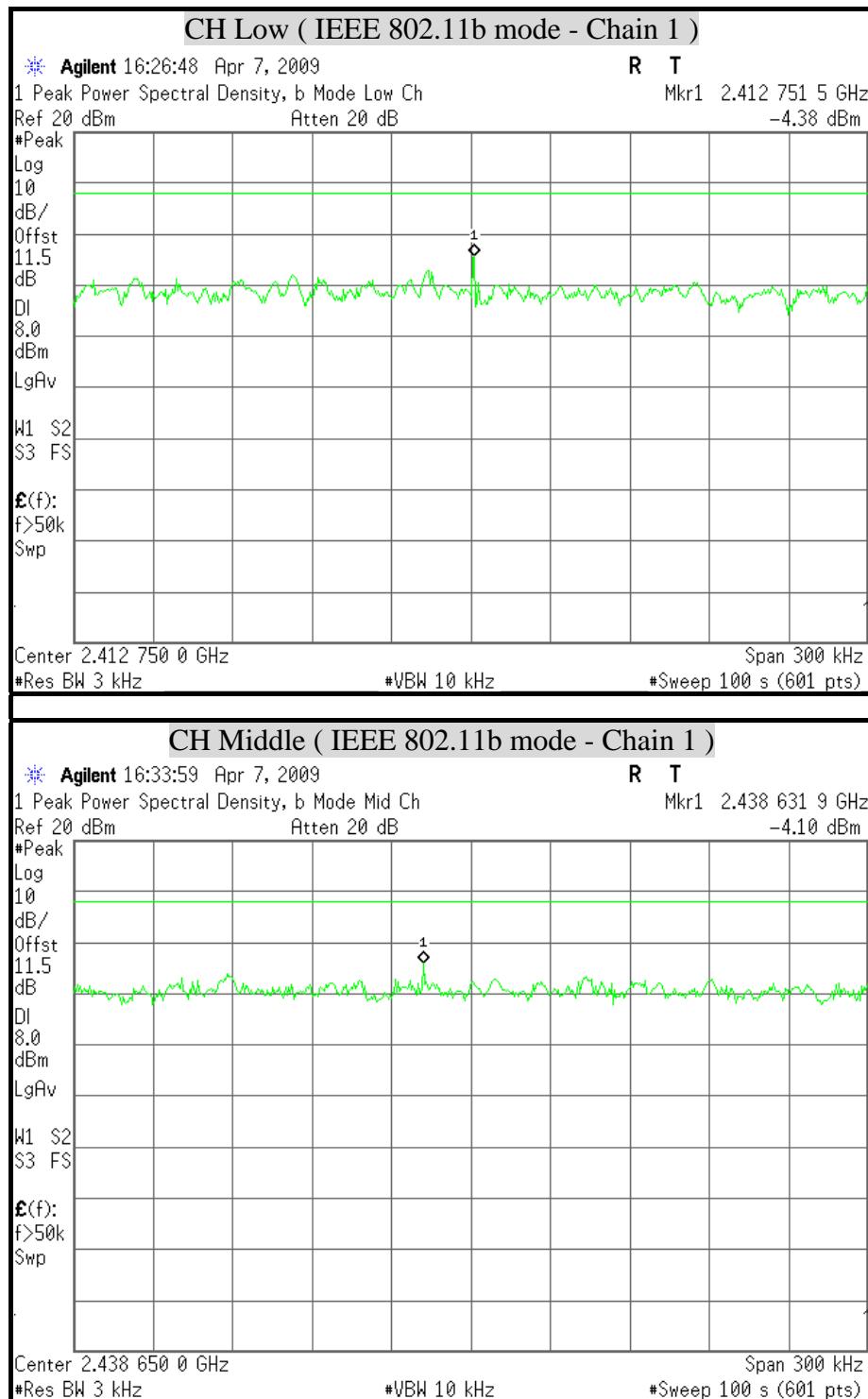
Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Maxmum Limit (dBm)	Pass / Fail
Low	2412	-8.95	8	PASS
Middle	2437	-4.74	8	PASS
High	2462	-8.58	8	PASS

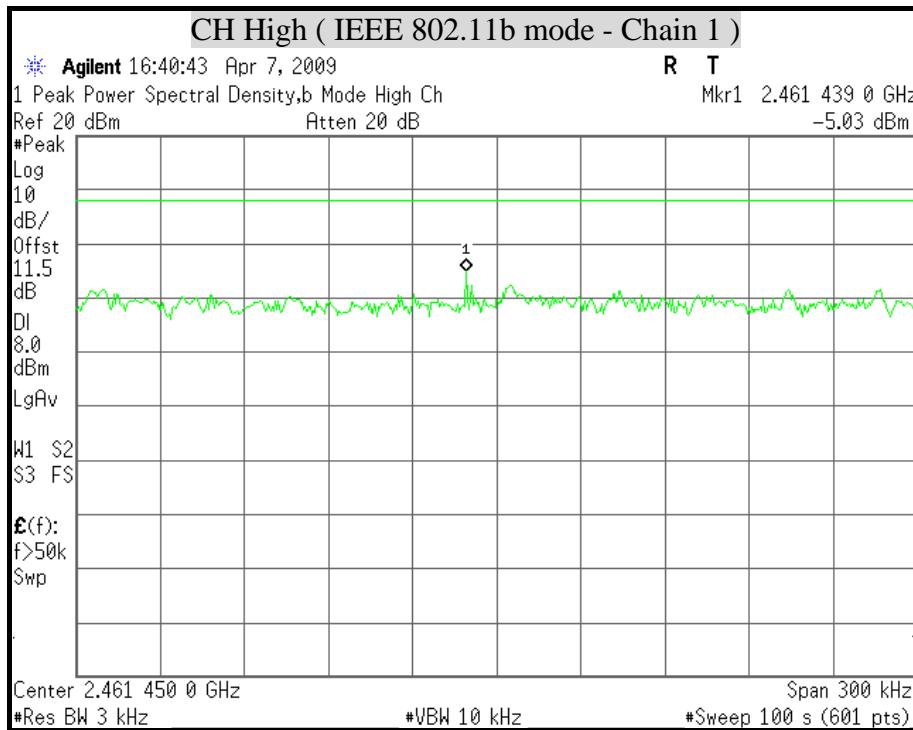
Remark:

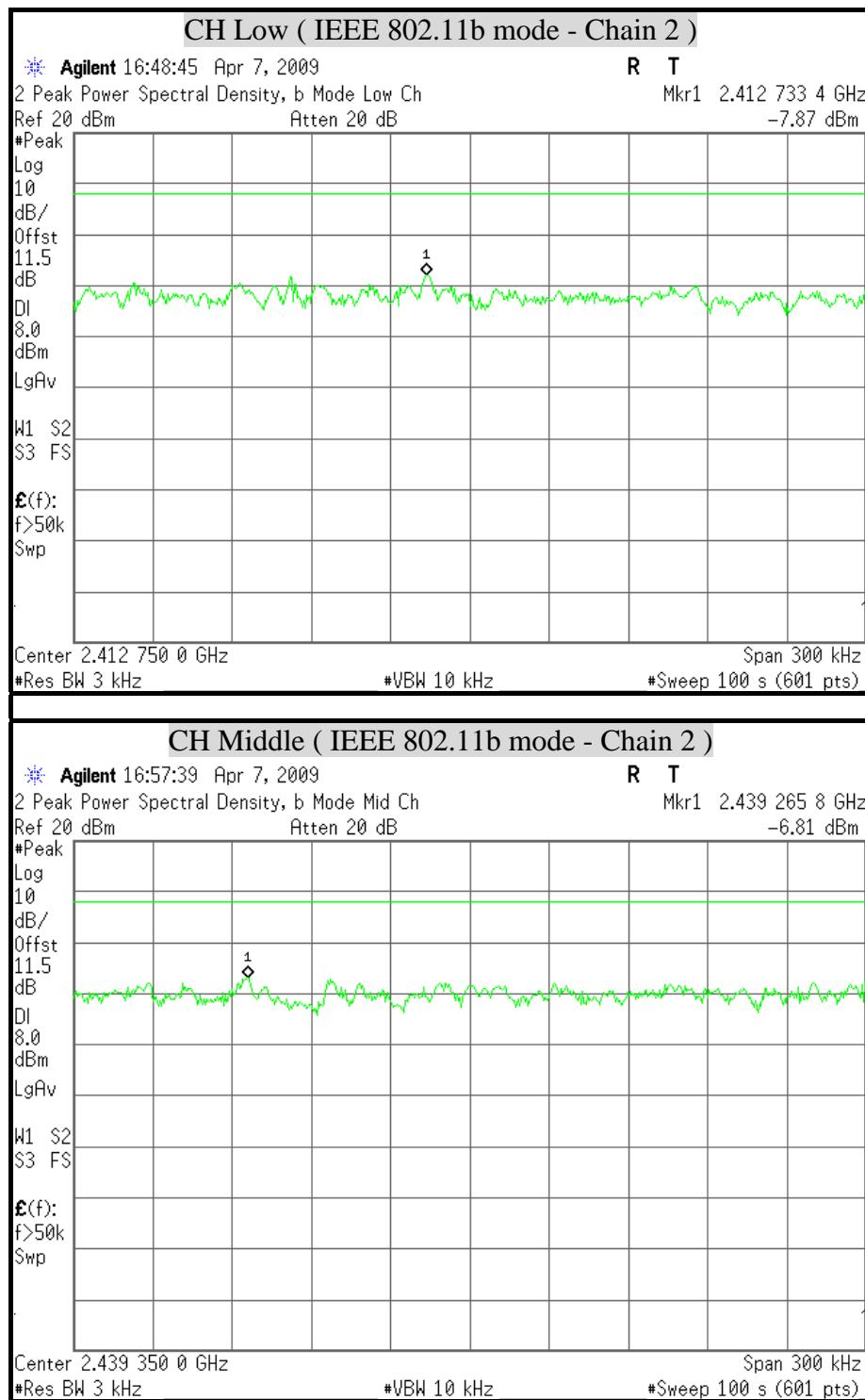
1. At finial test to get the worst-case emission at 13.5Mbps.
2. The cable assembly insertion loss of 16.5dB (including 10 dB pad and 6.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

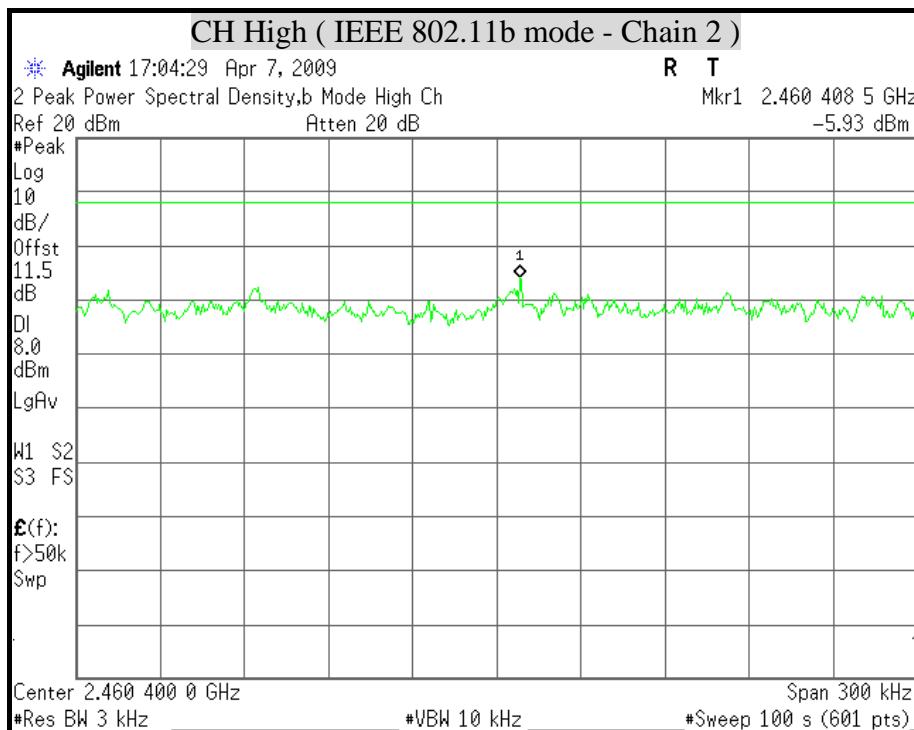
POWER SPECTRAL DENSITY (IEEE 802.11b mode)

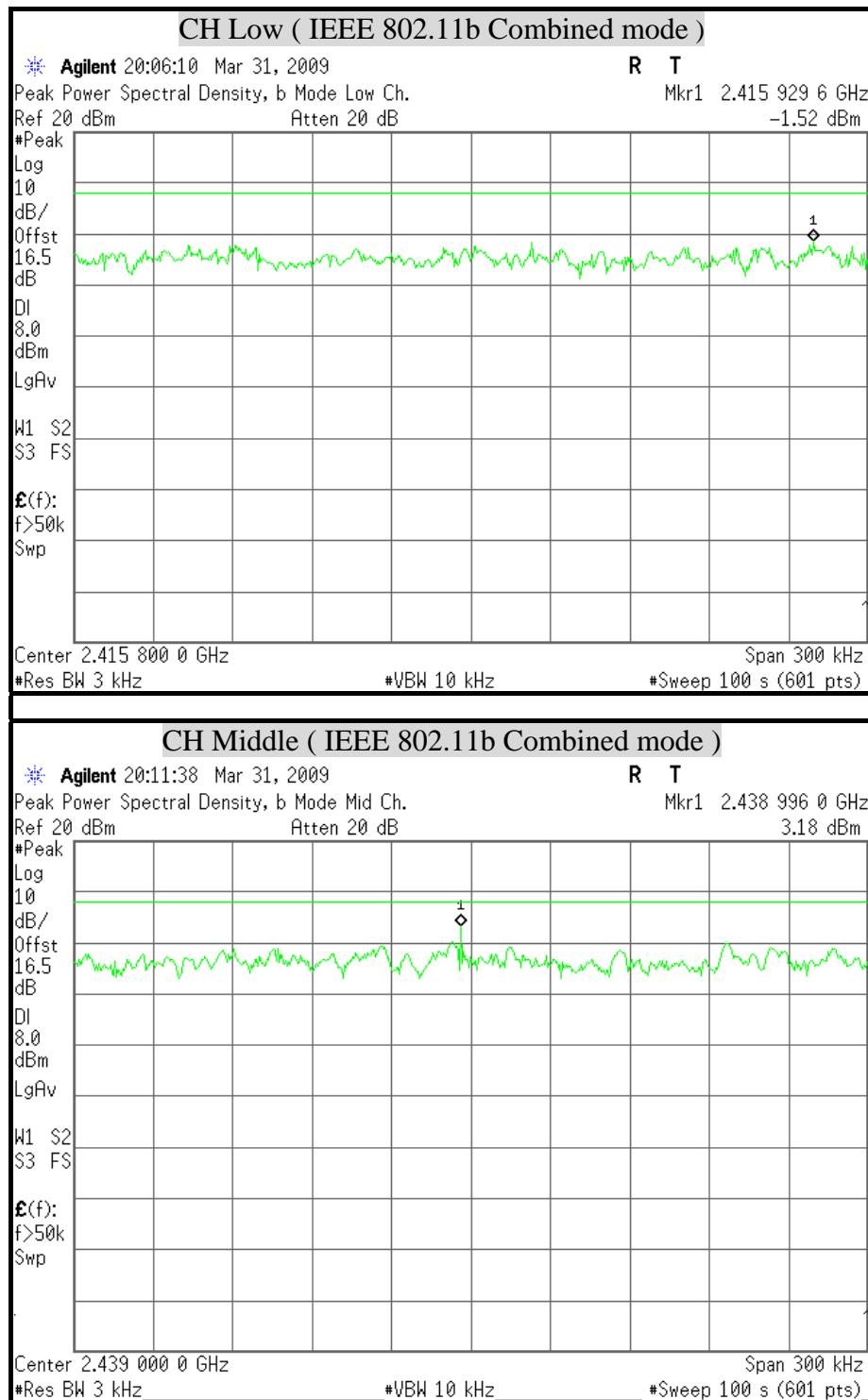


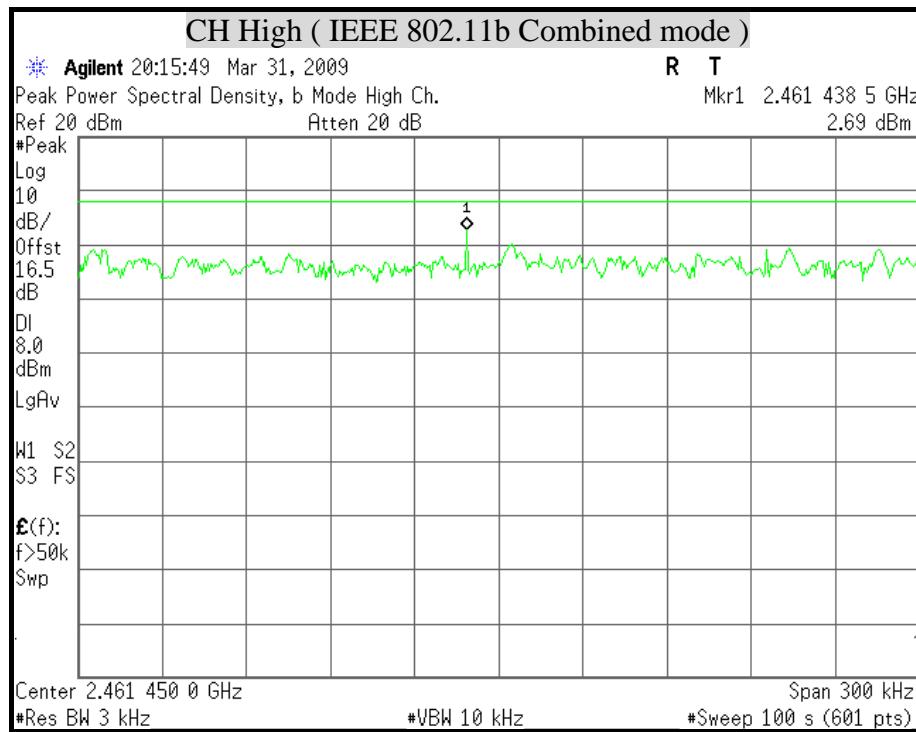


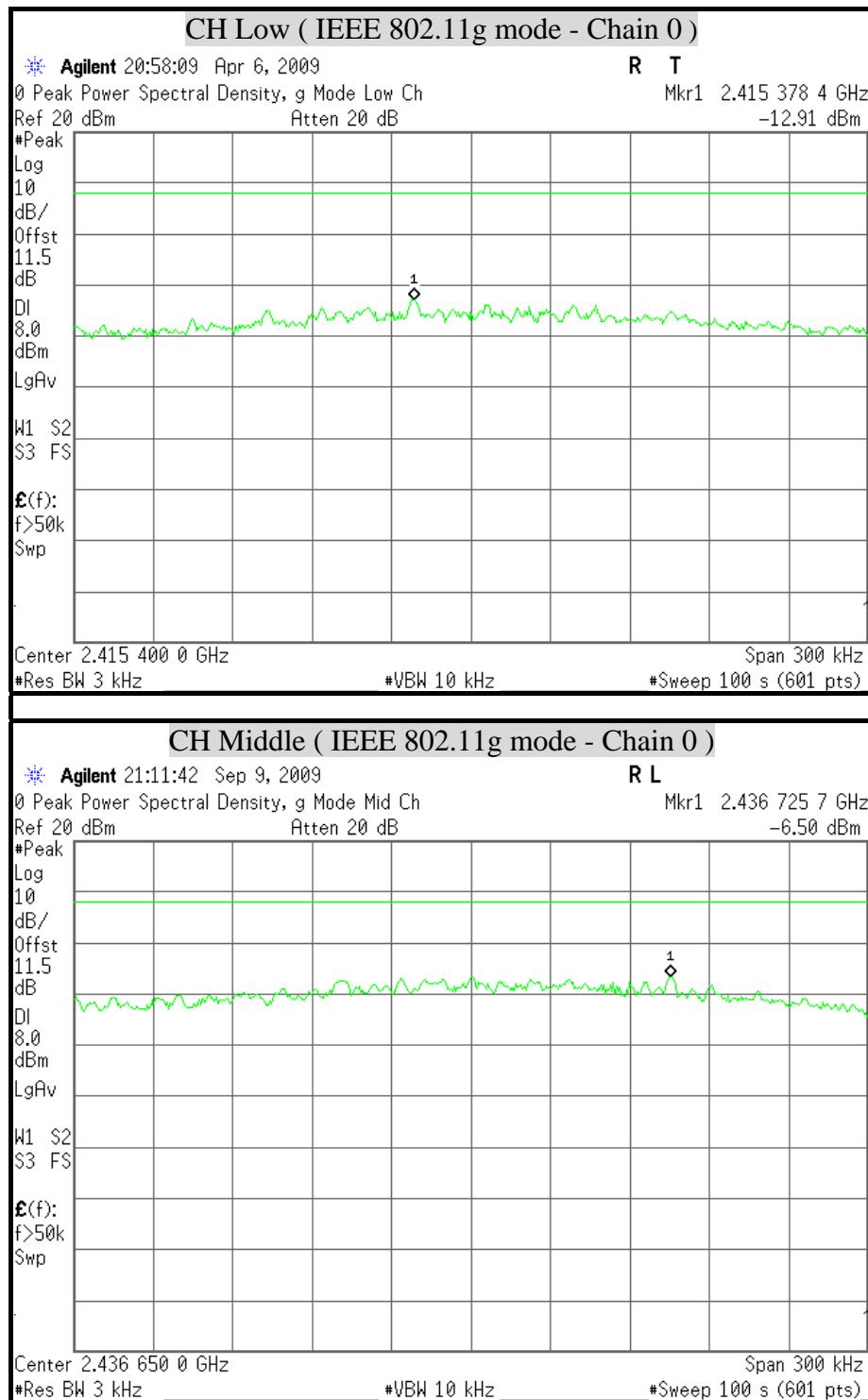


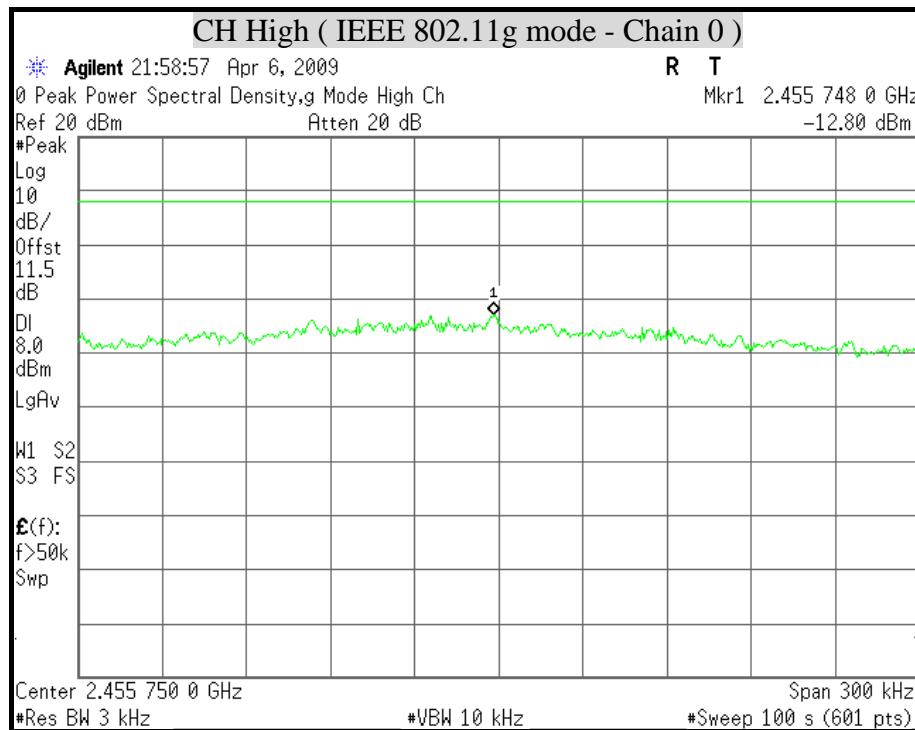


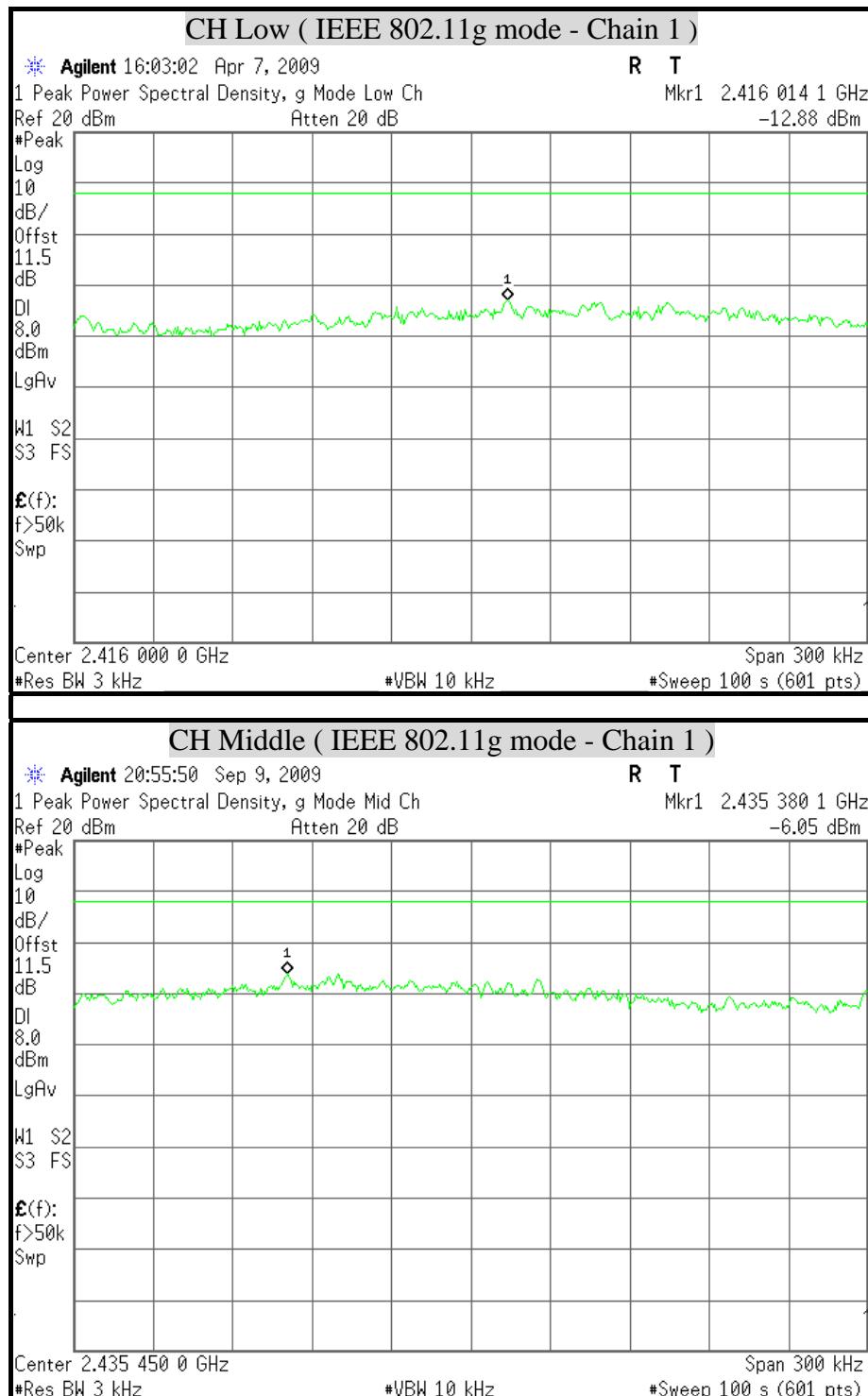


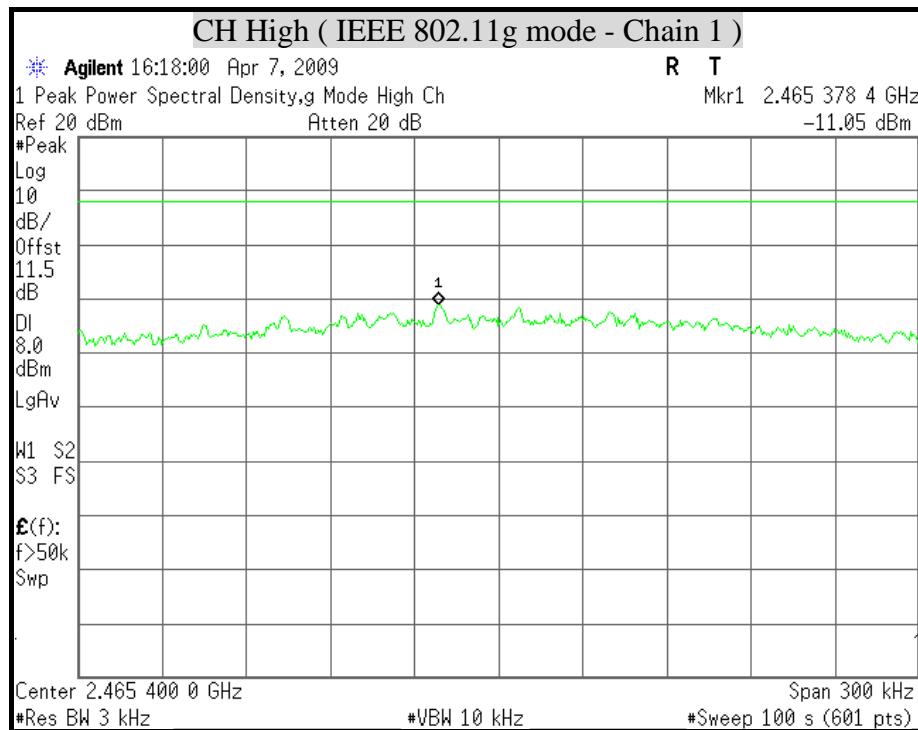
POWER SPECTRAL DENSITY (IEEE 802.11b Combined mode)

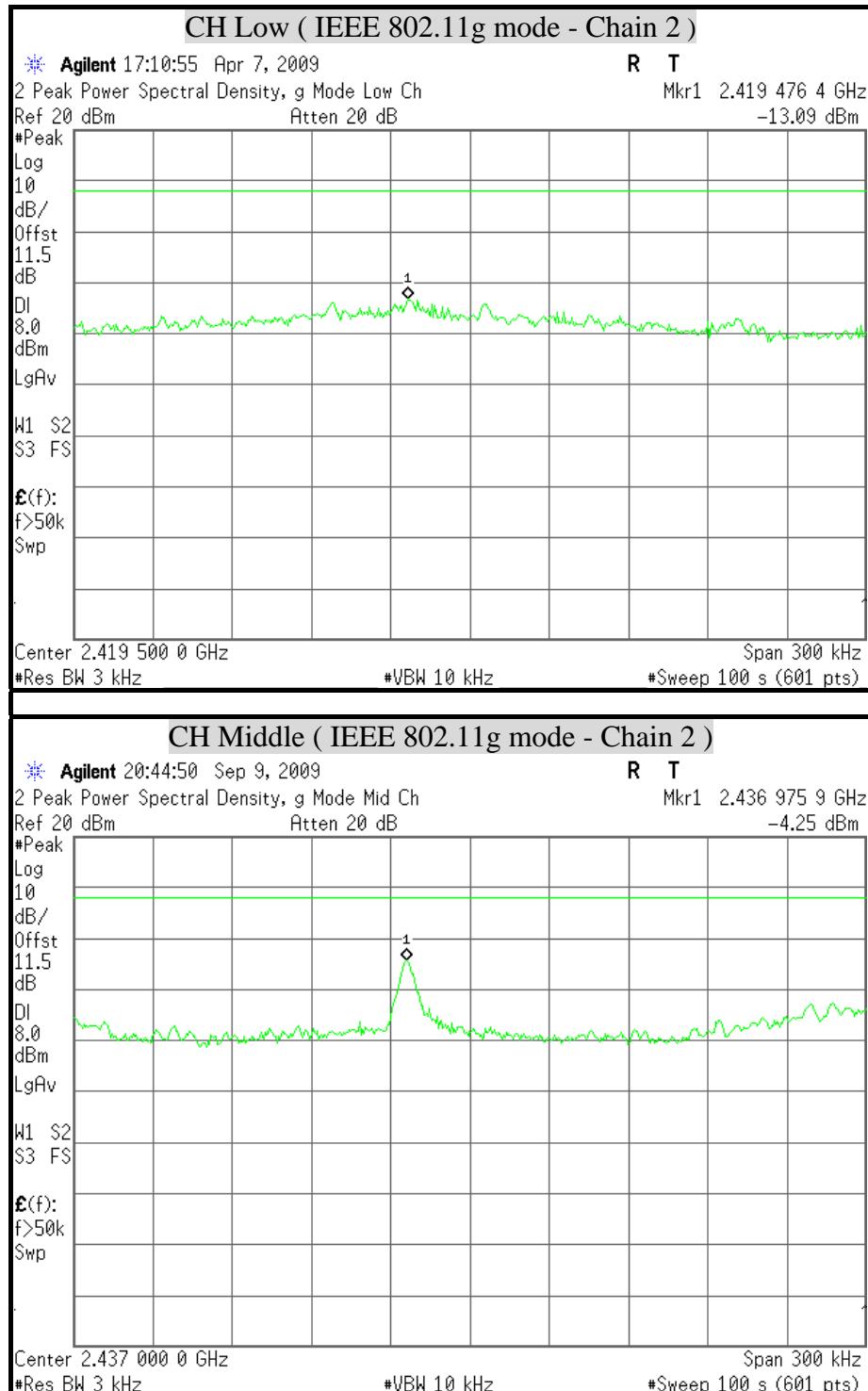


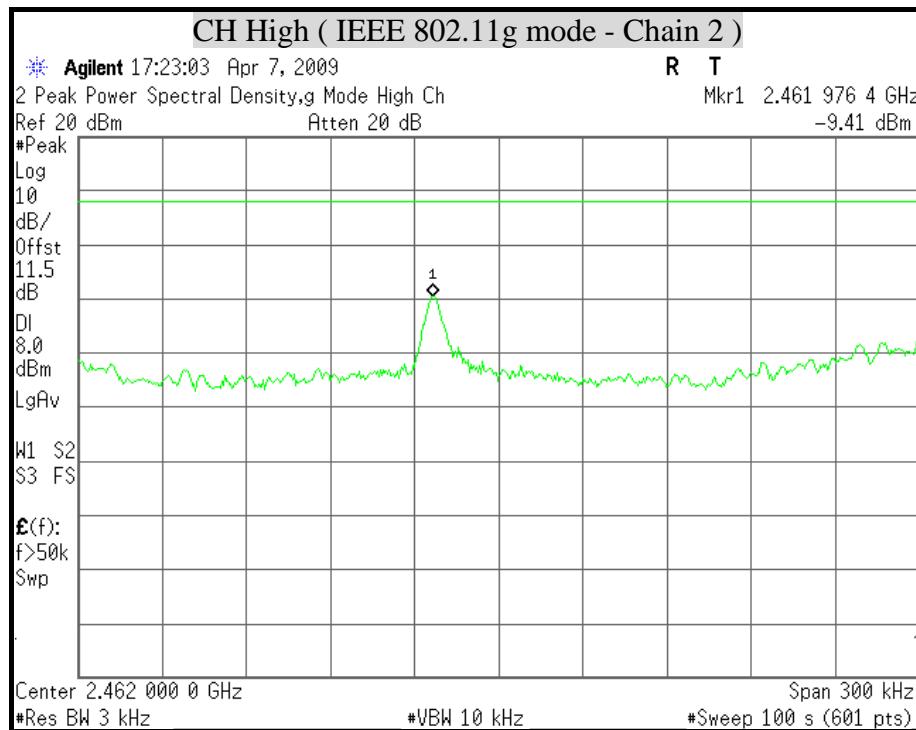
POWER SPECTRAL DENSITY (IEEE 802.11g mode)

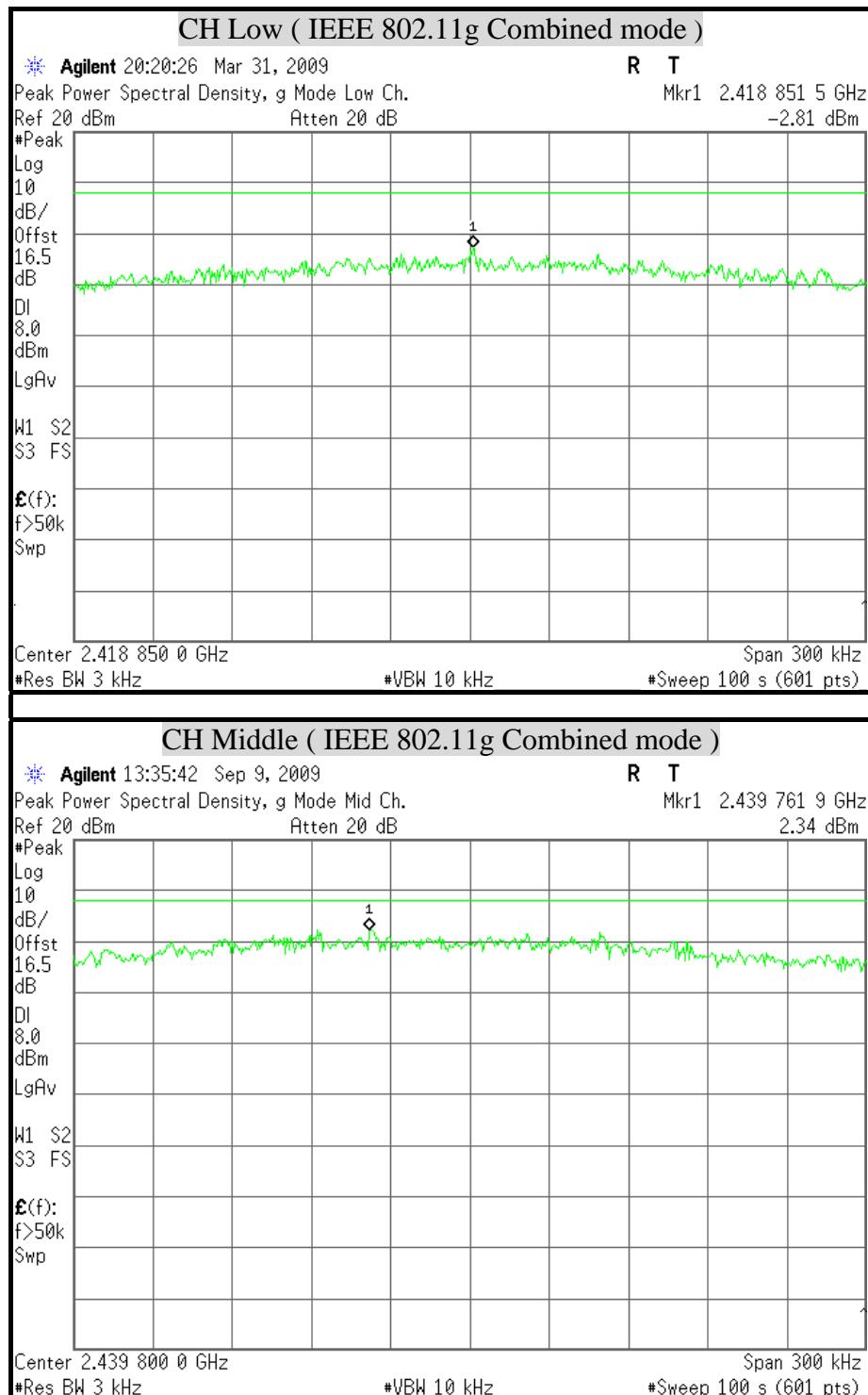


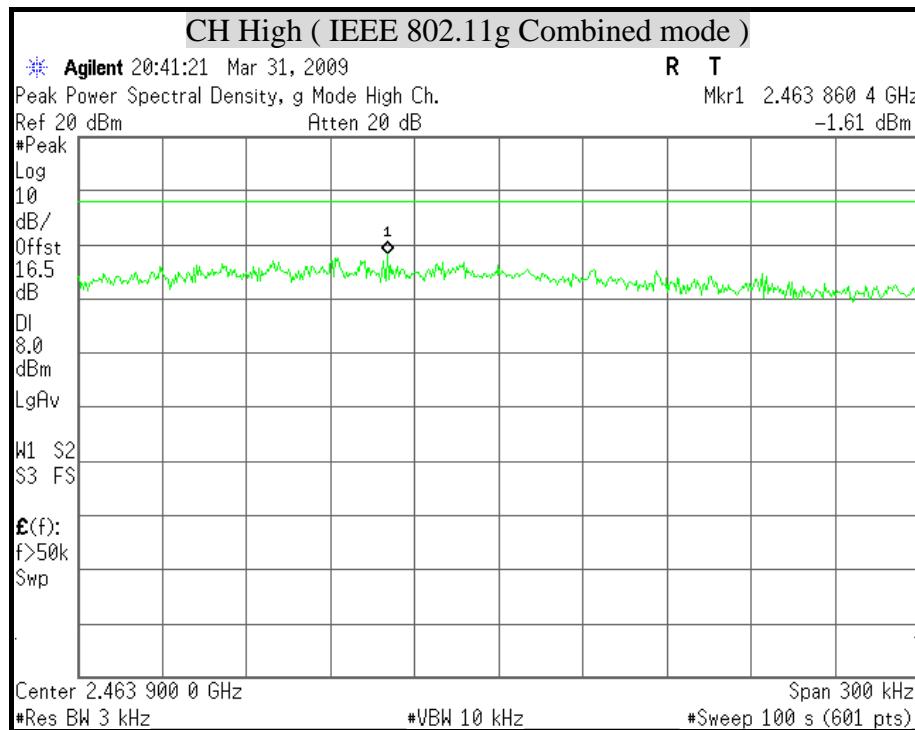


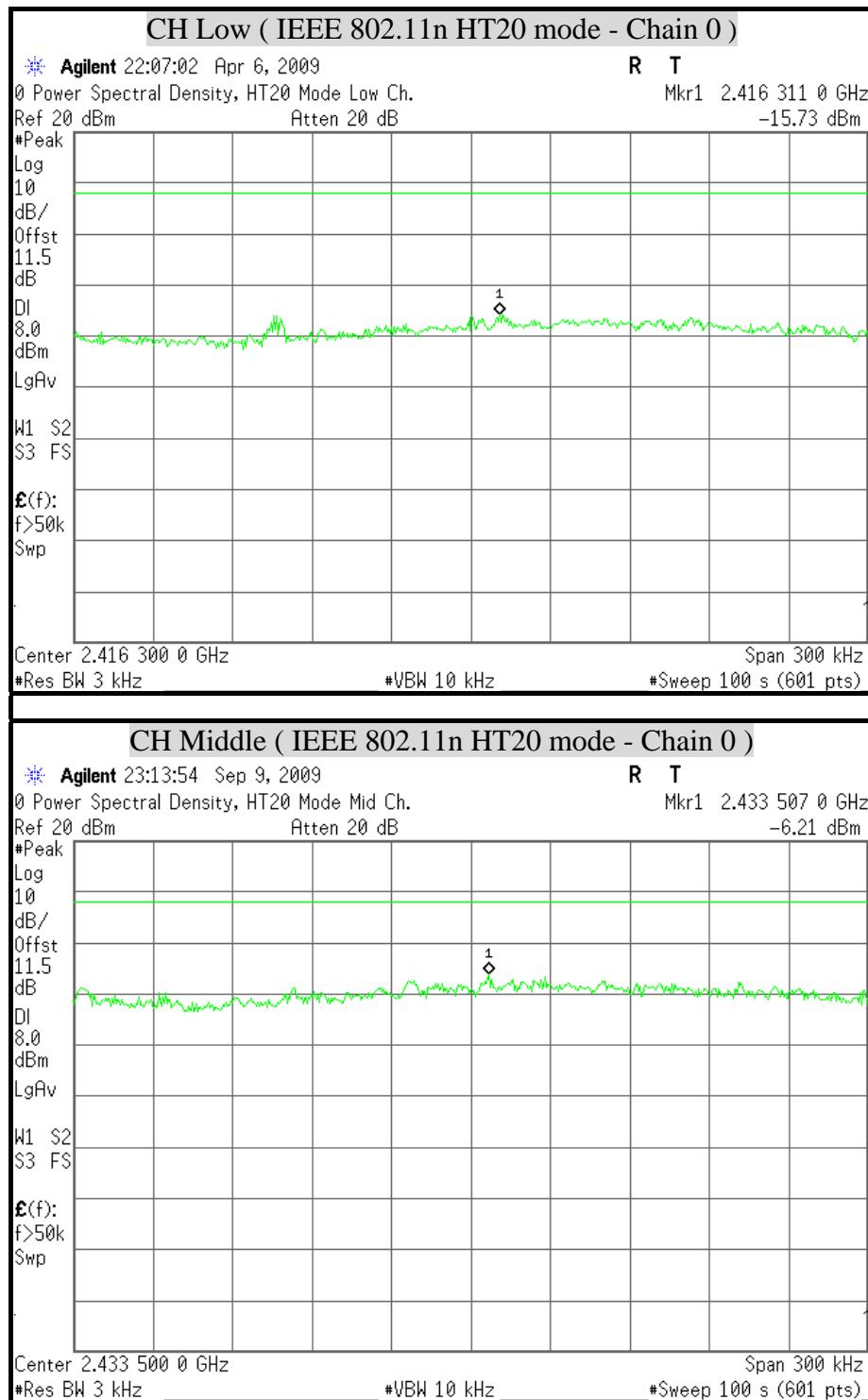


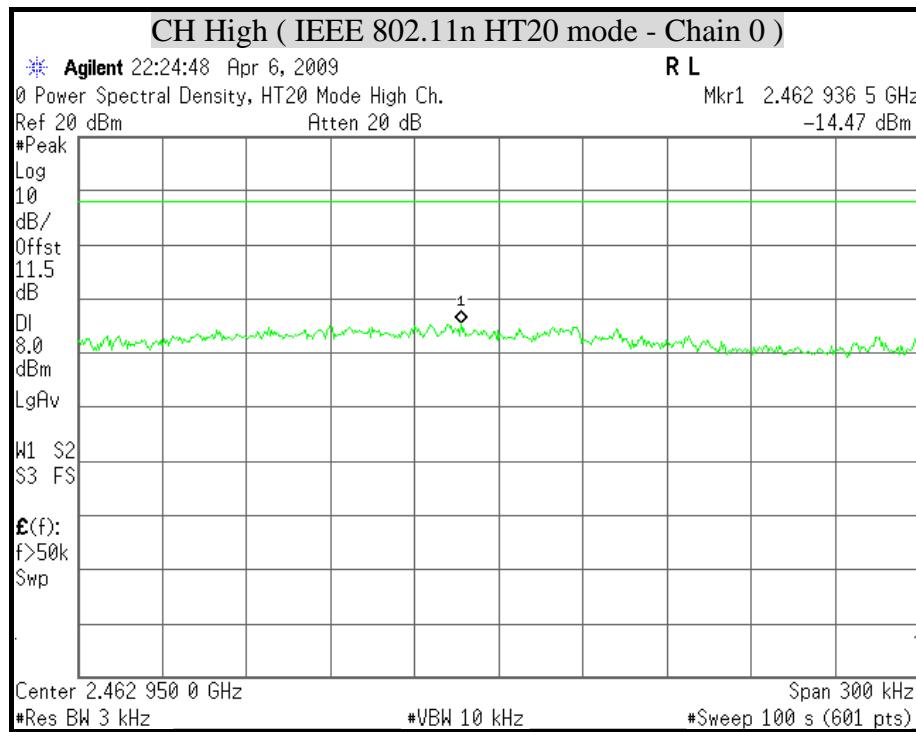


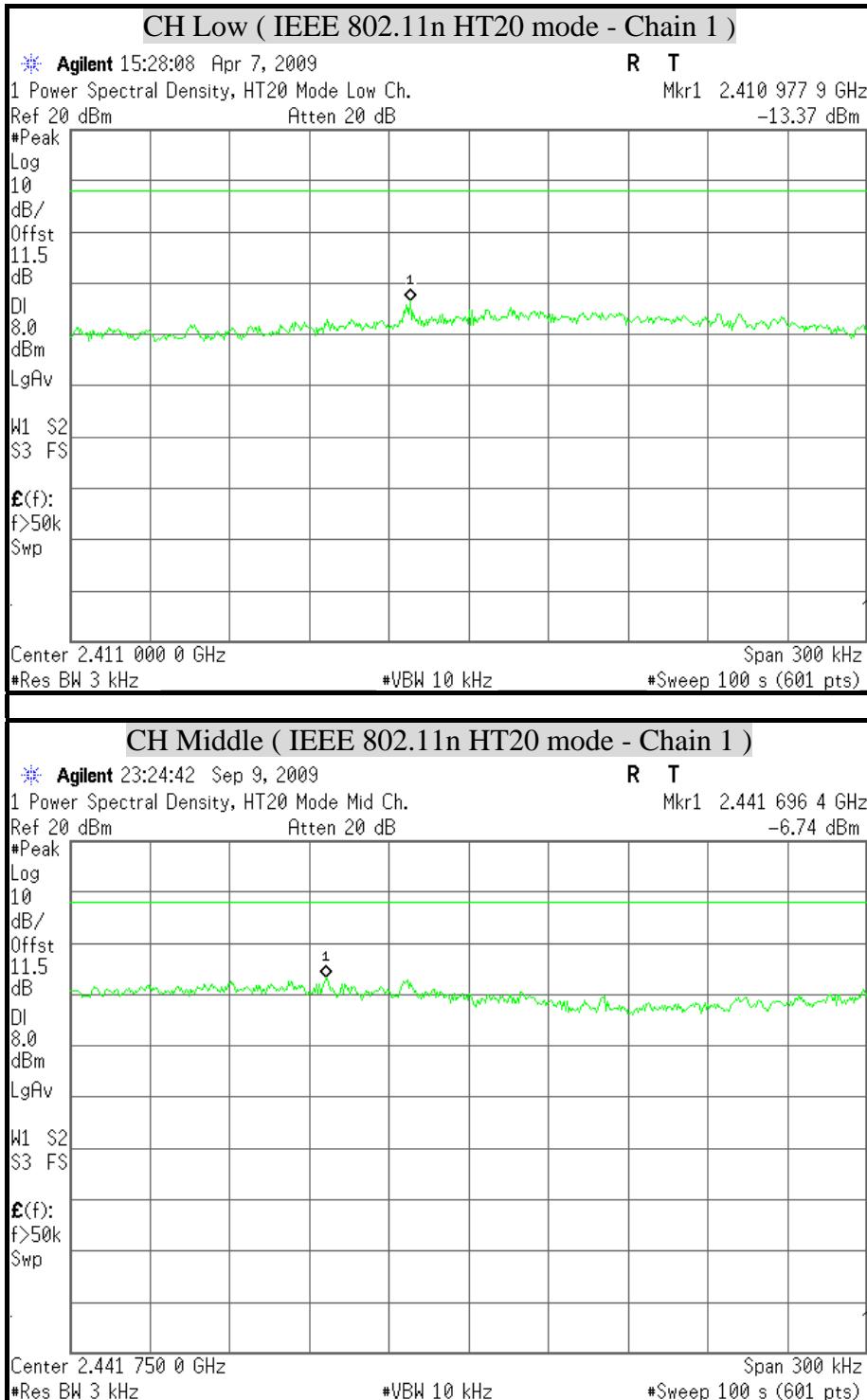


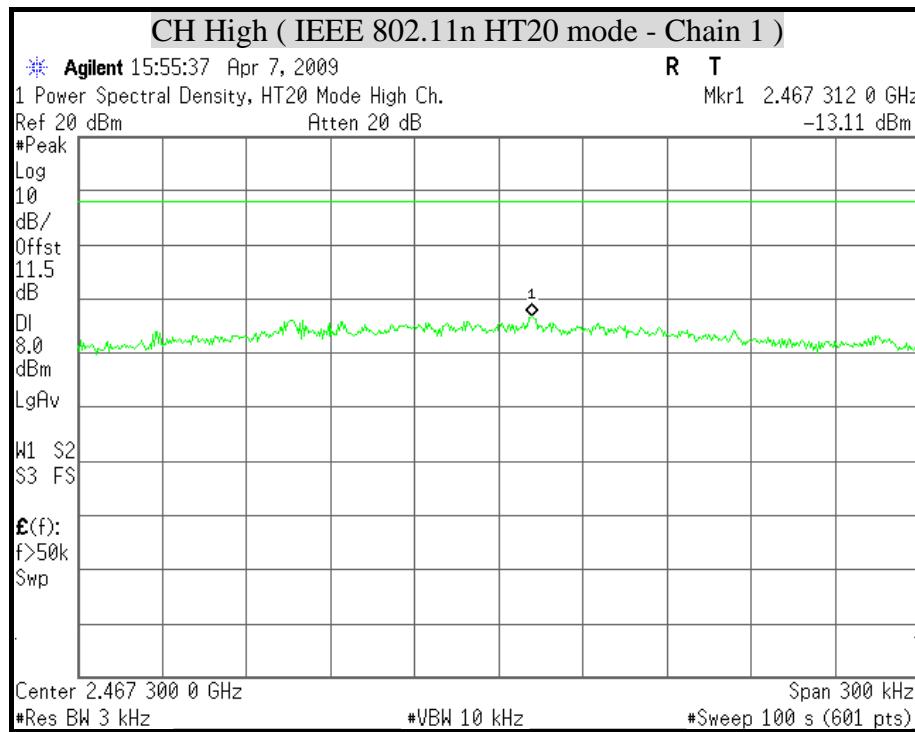
POWER SPECTRAL DENSITY (IEEE 802.11g Combined mode)

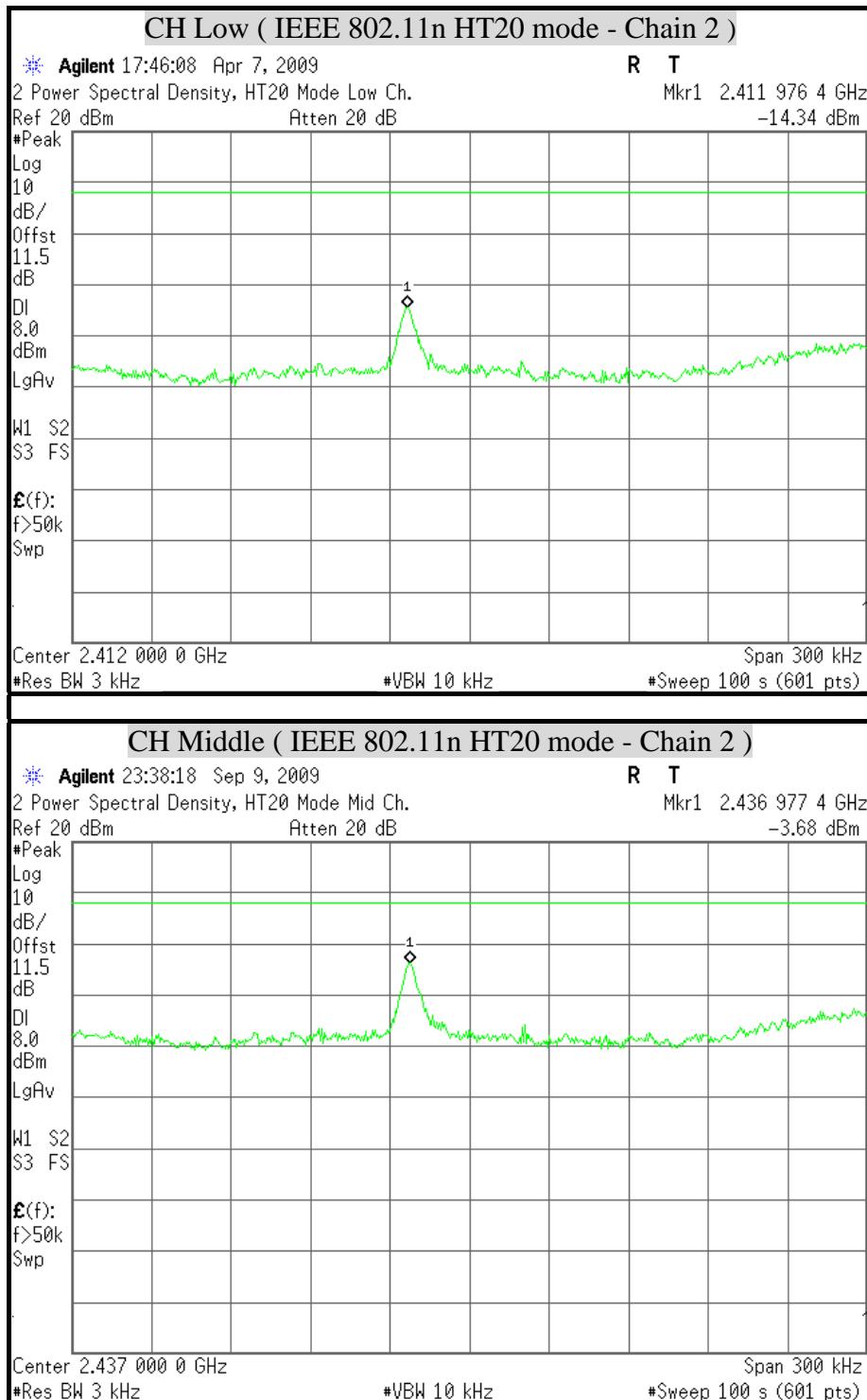


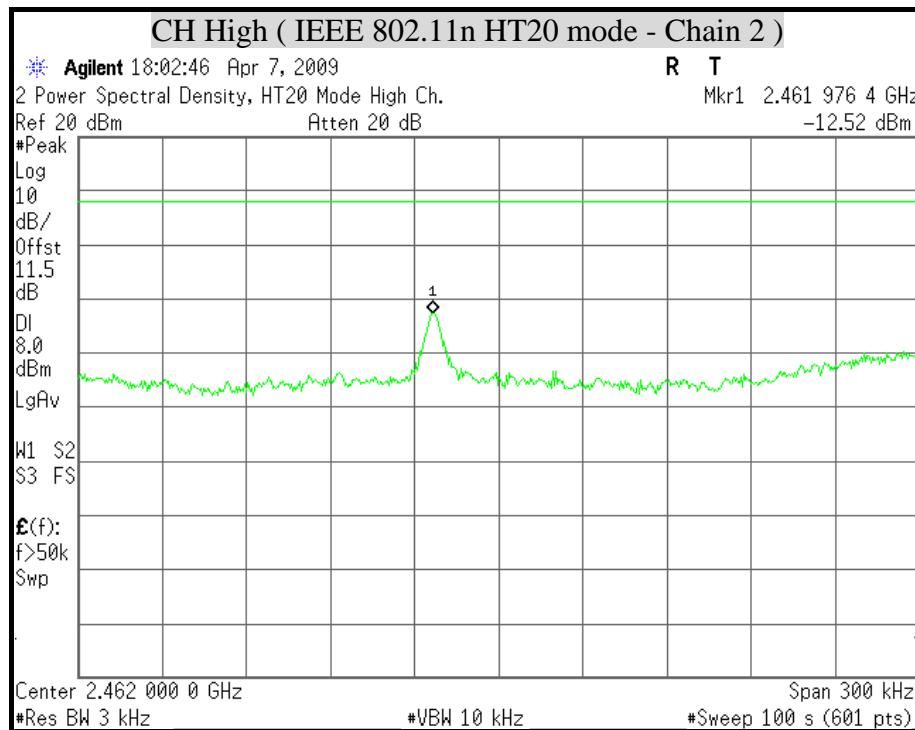
POWER SPECTRAL DENSITY (IEEE 802.11n HT20 mode)

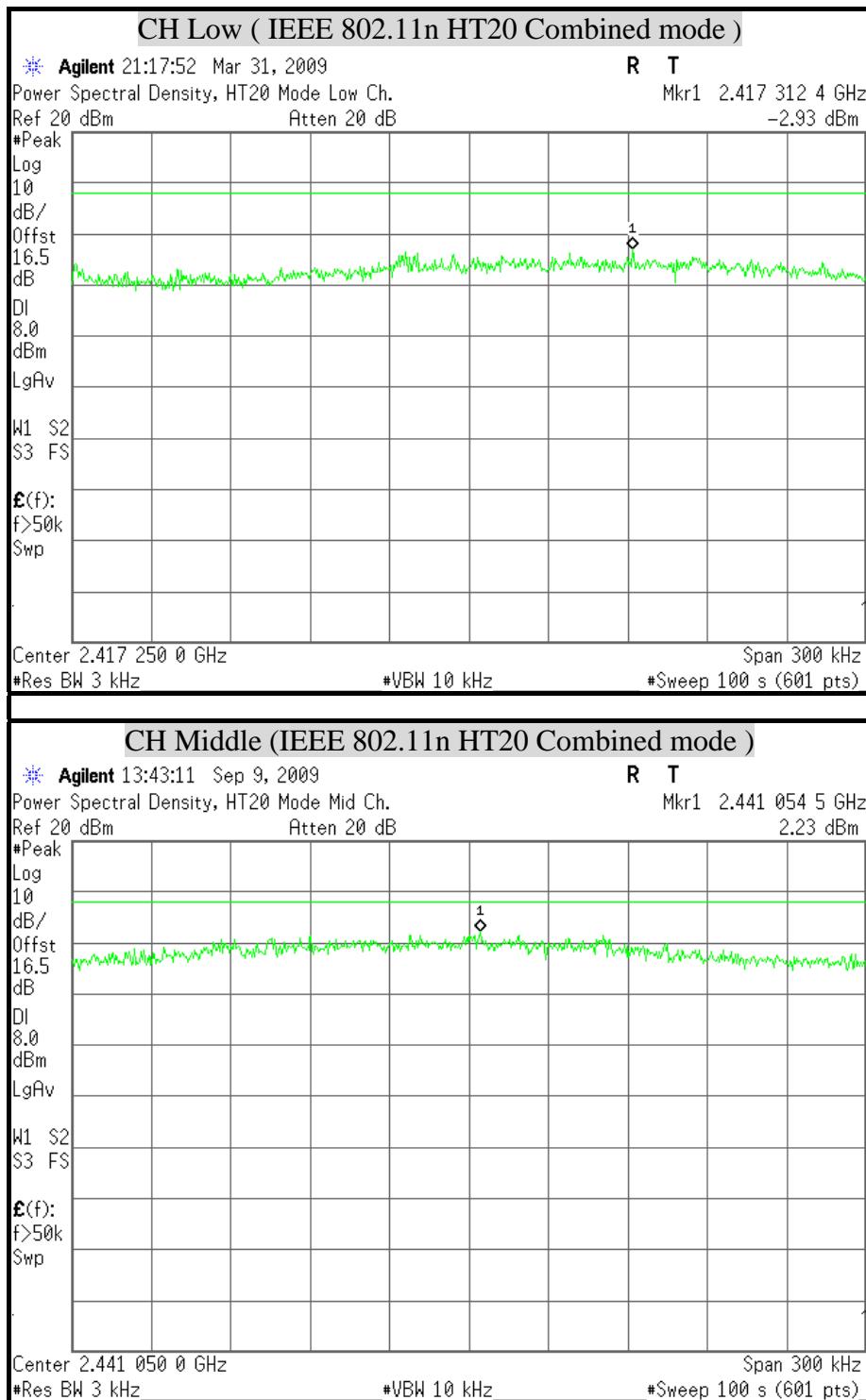


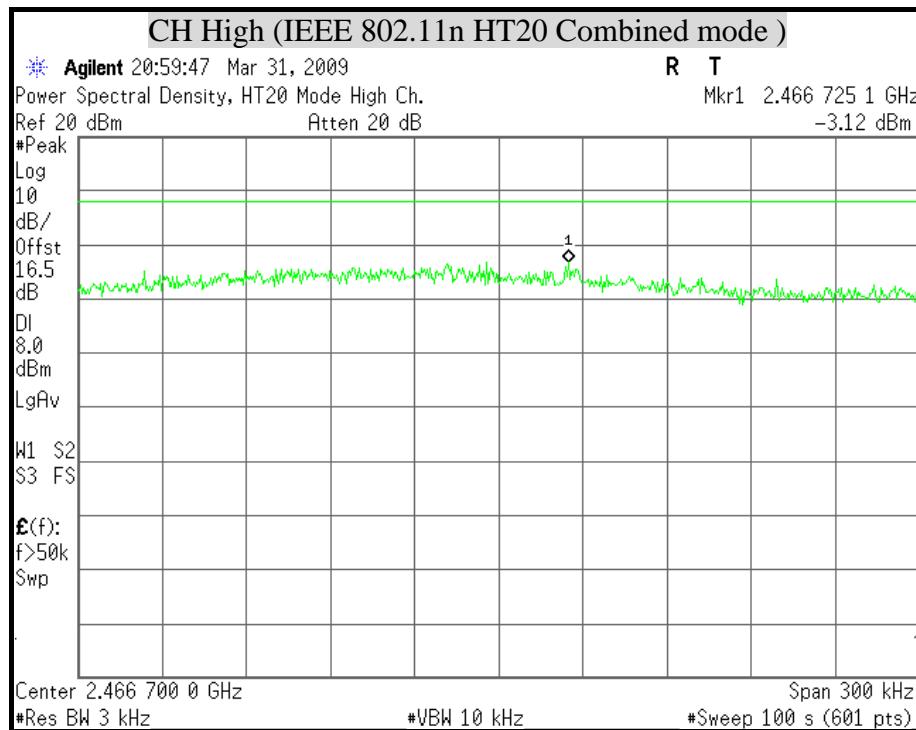


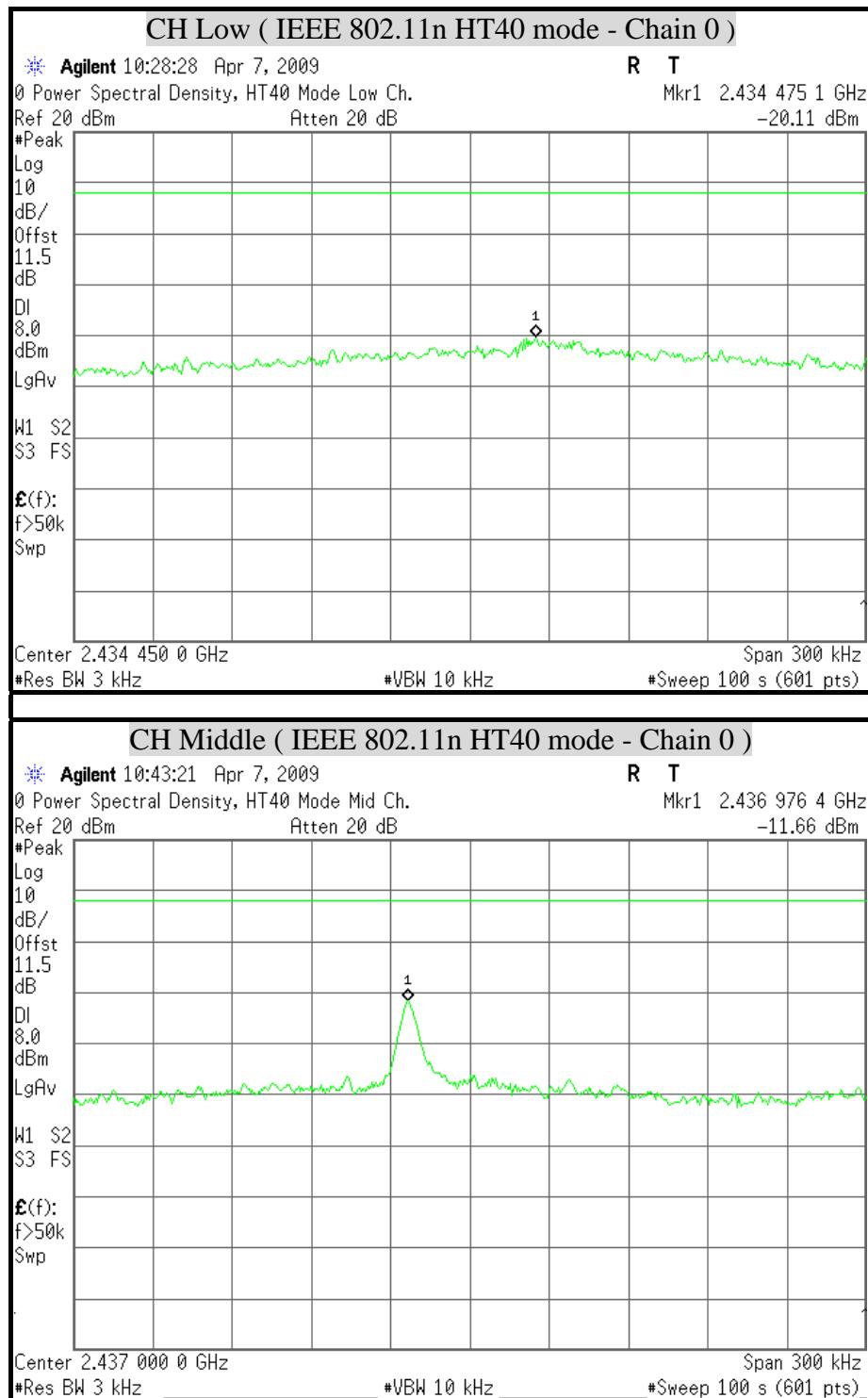


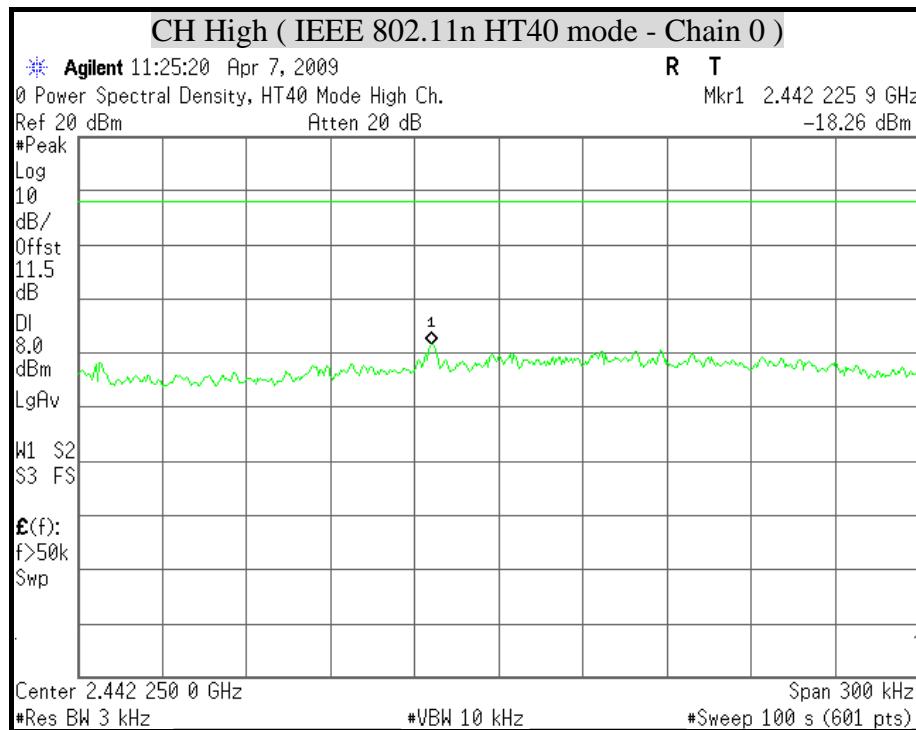


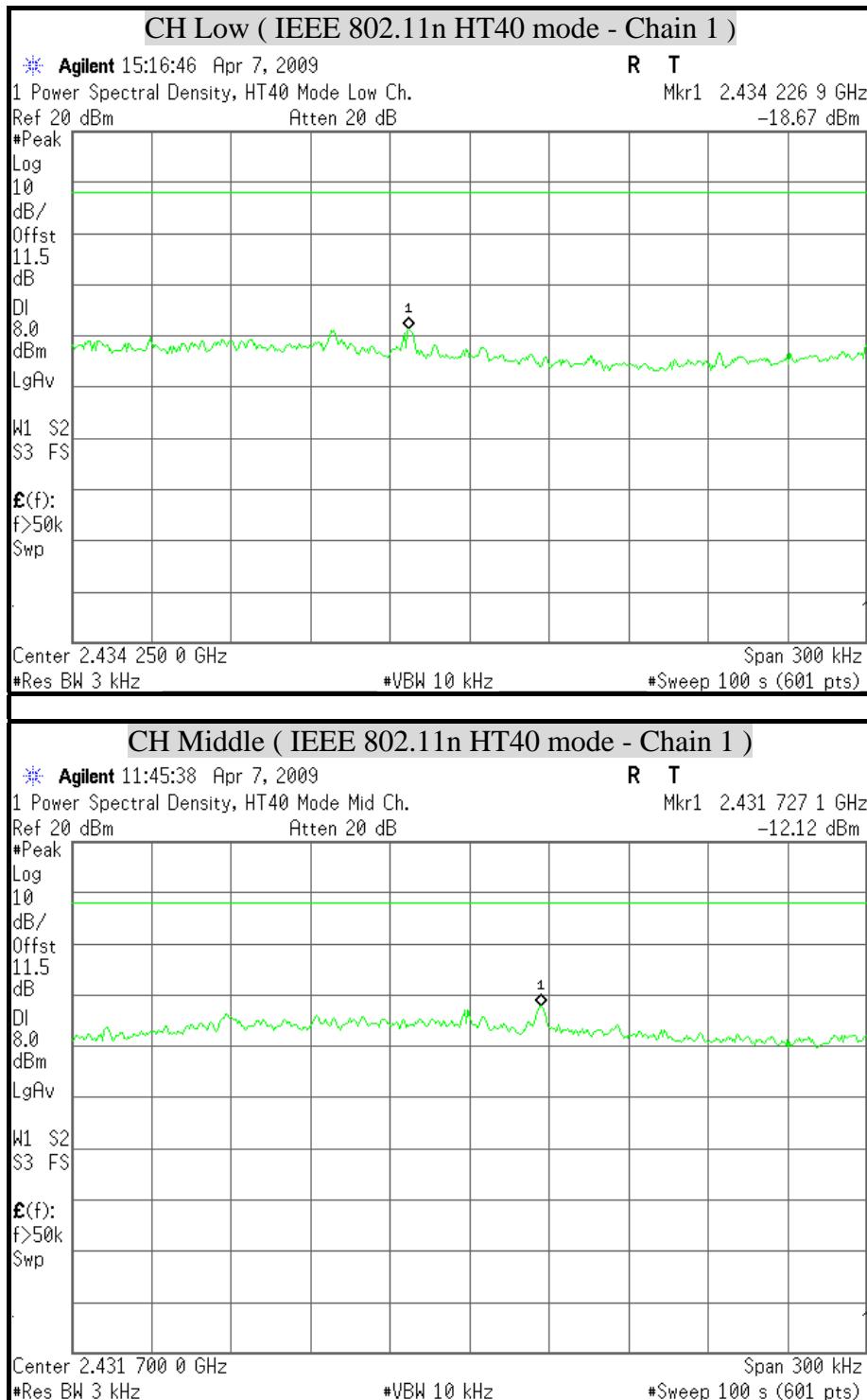


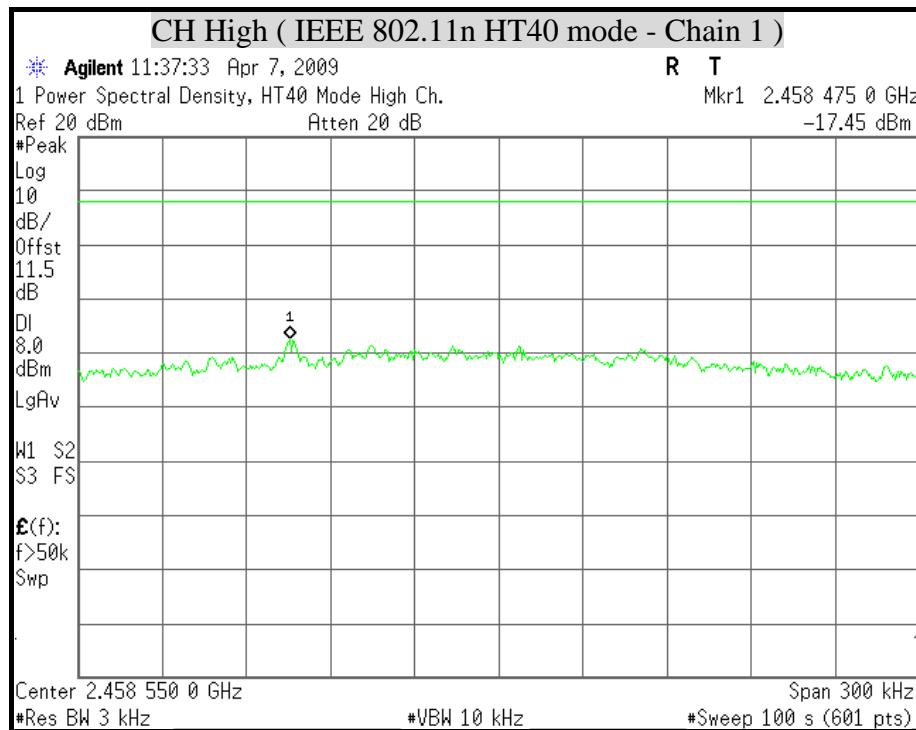
**POWER SPECTRAL DENSITY (IEEE 802.11n HT20 Combined mode)**

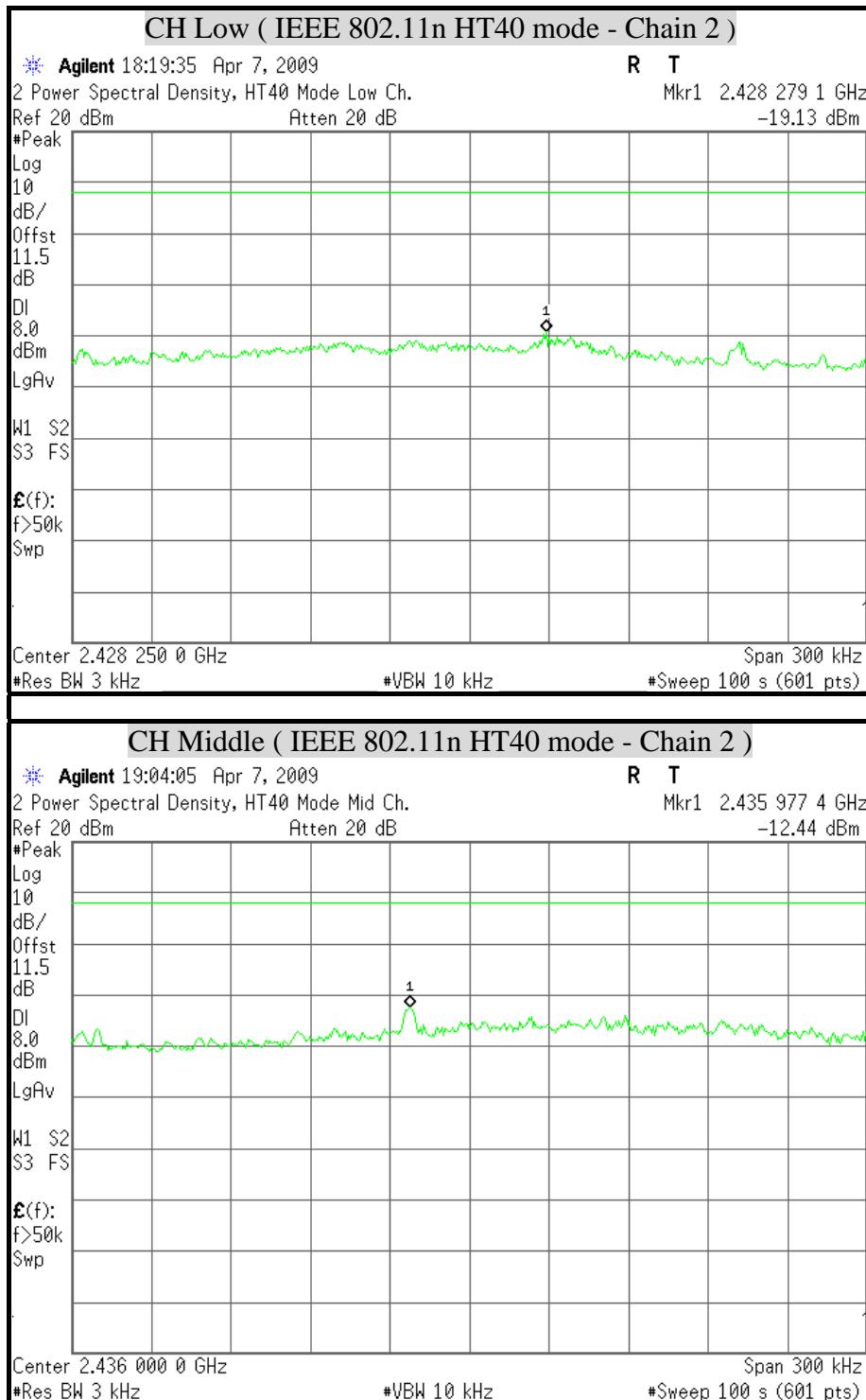


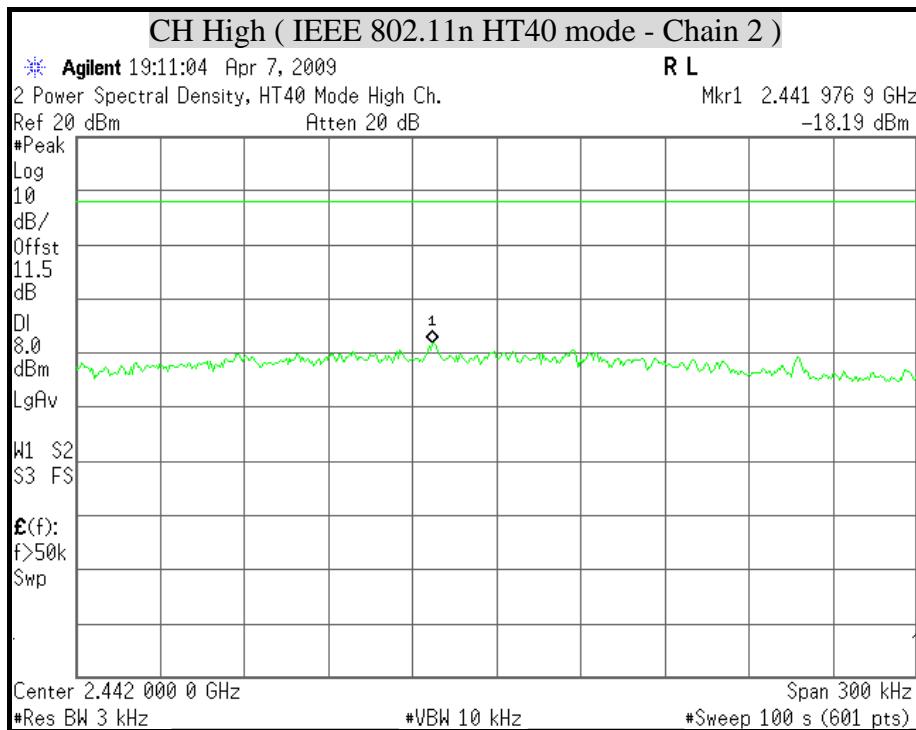
POWER SPECTRAL DENSITY (IEEE 802.11n HT40 mode)

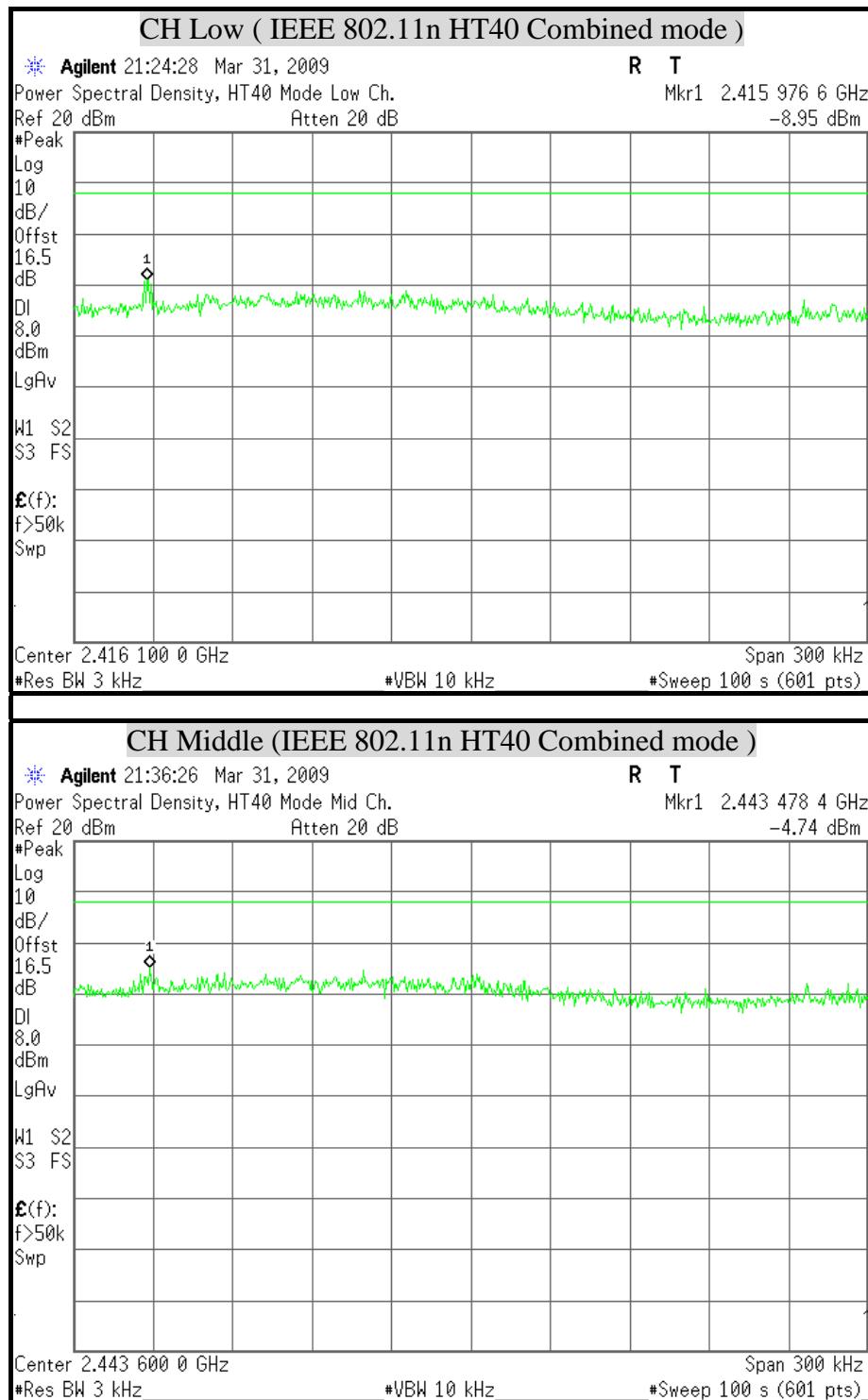


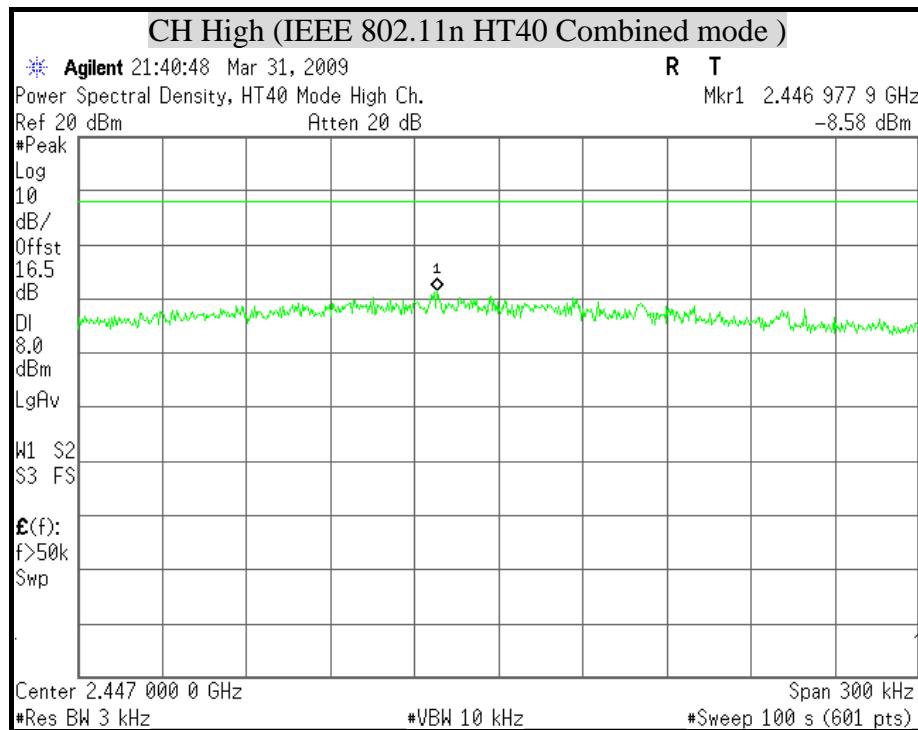








POWER SPECTRAL DENSITY (IEEE 802.11n HT40 Combined mode)



8.7 CONDUCTED SPURIOUS EMISSION

LIMITS

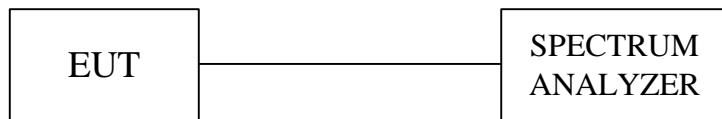
§ 15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the and that contains the highest level 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.

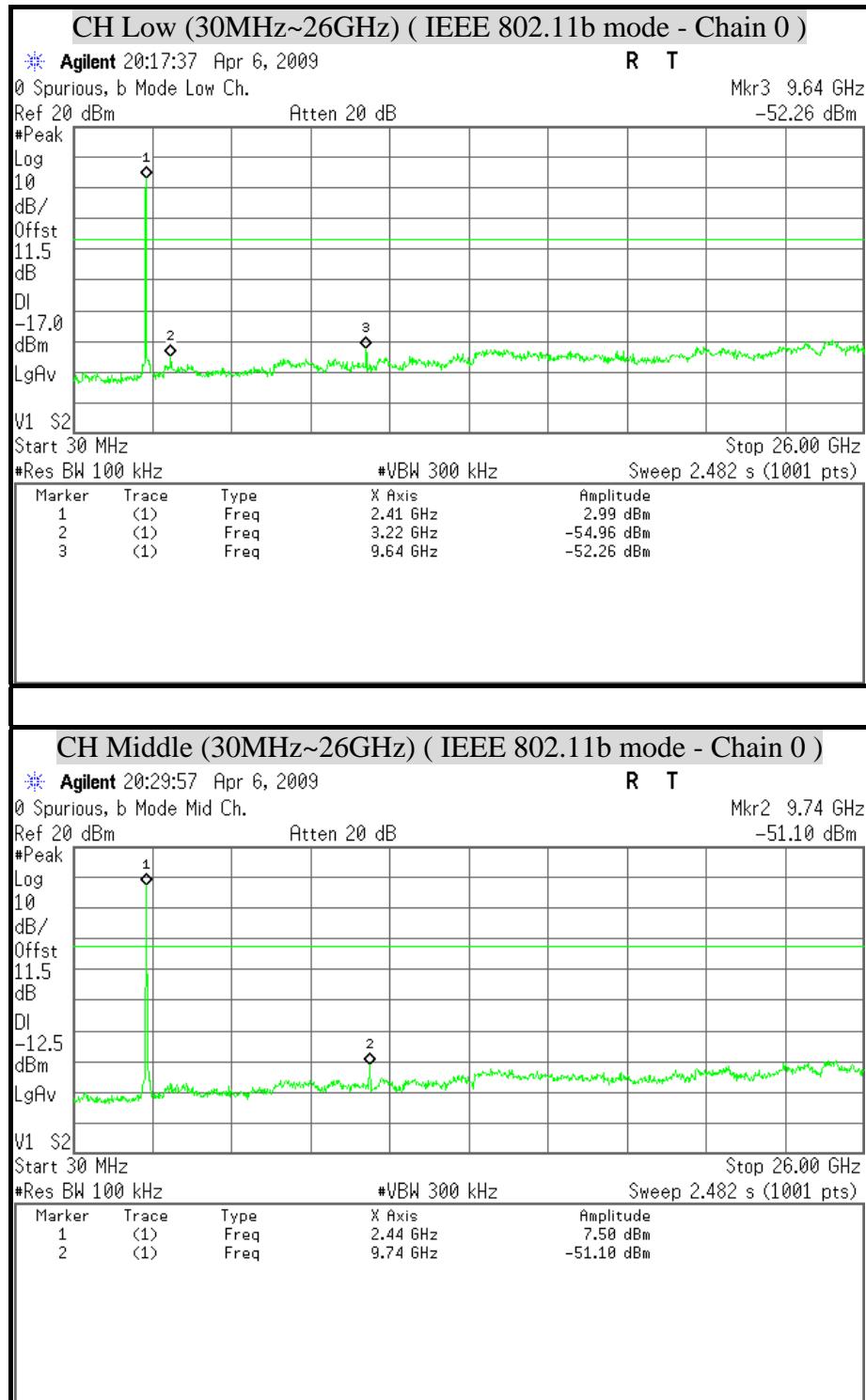
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

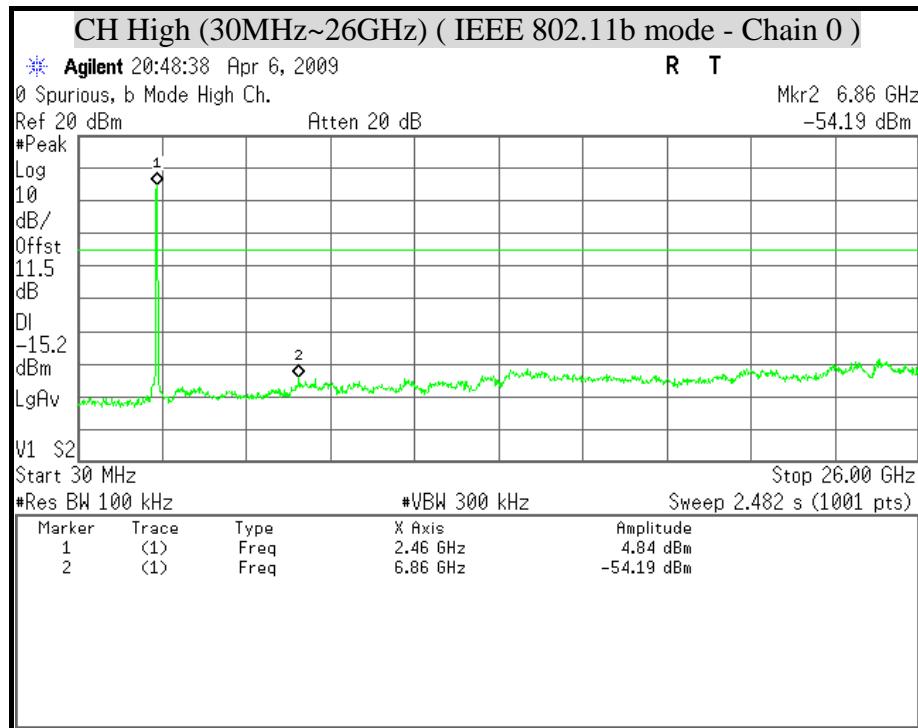
TEST SETUP

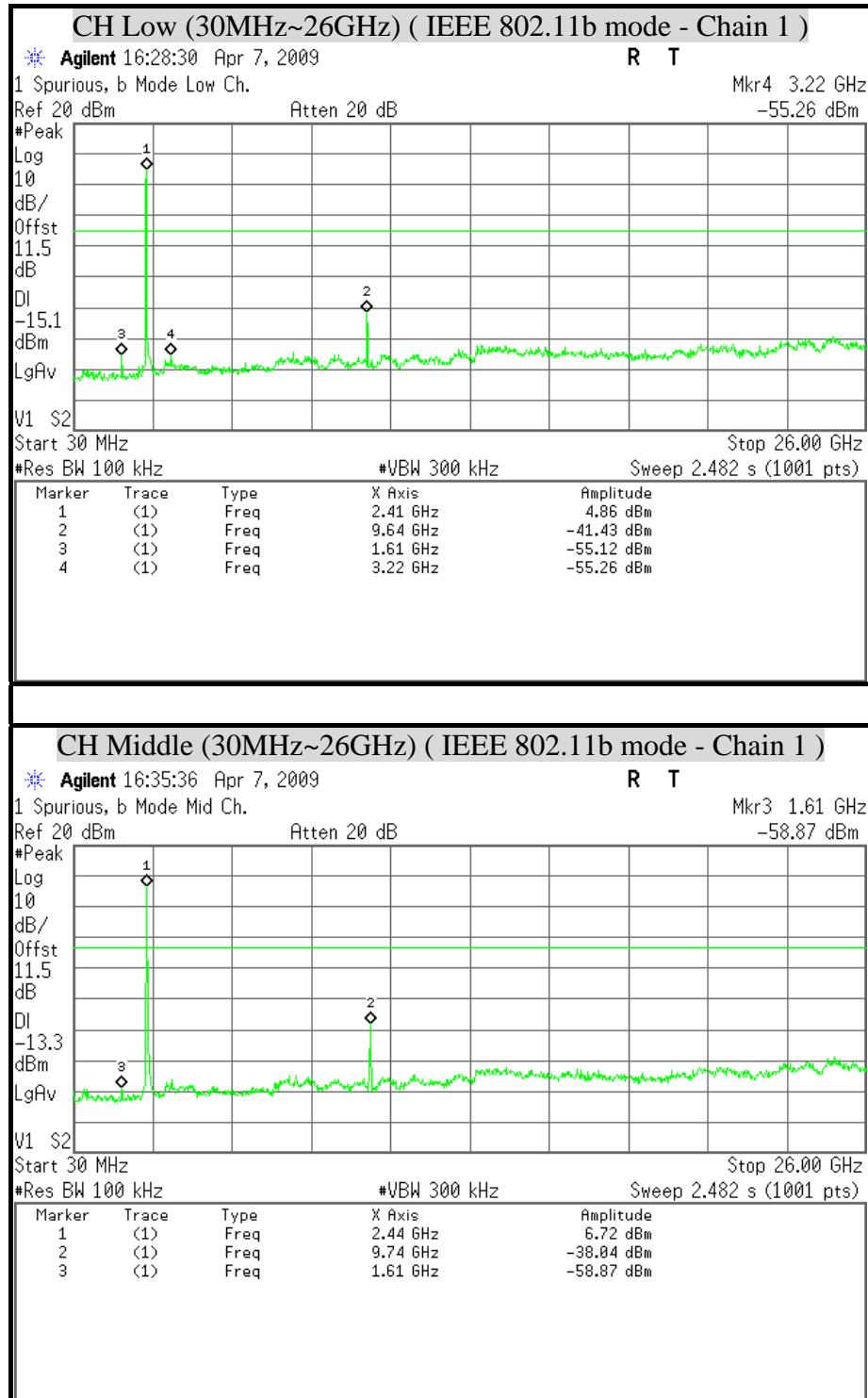


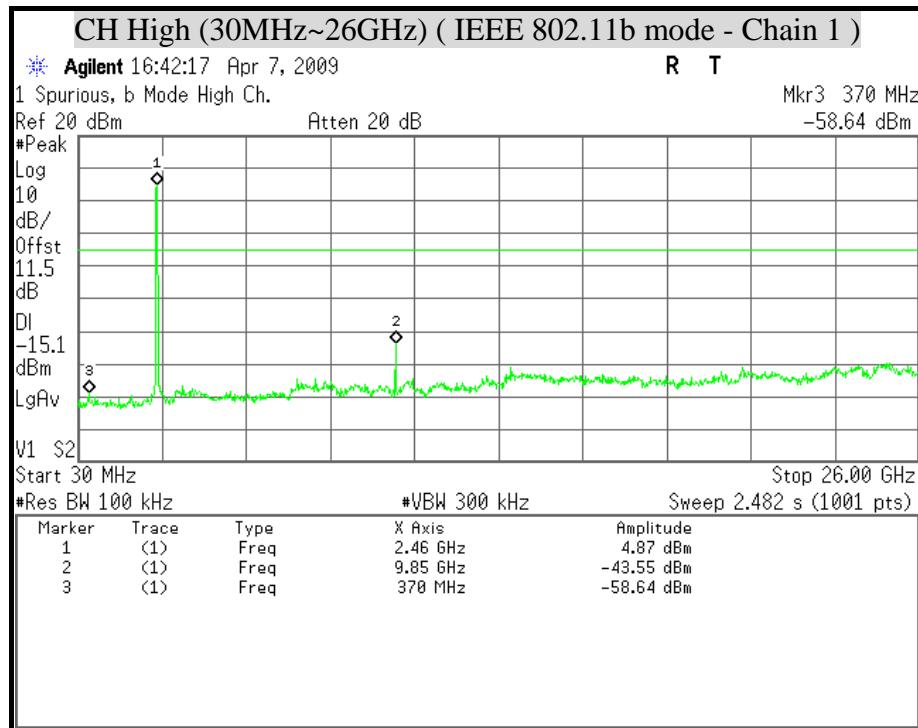
TEST RESULTS

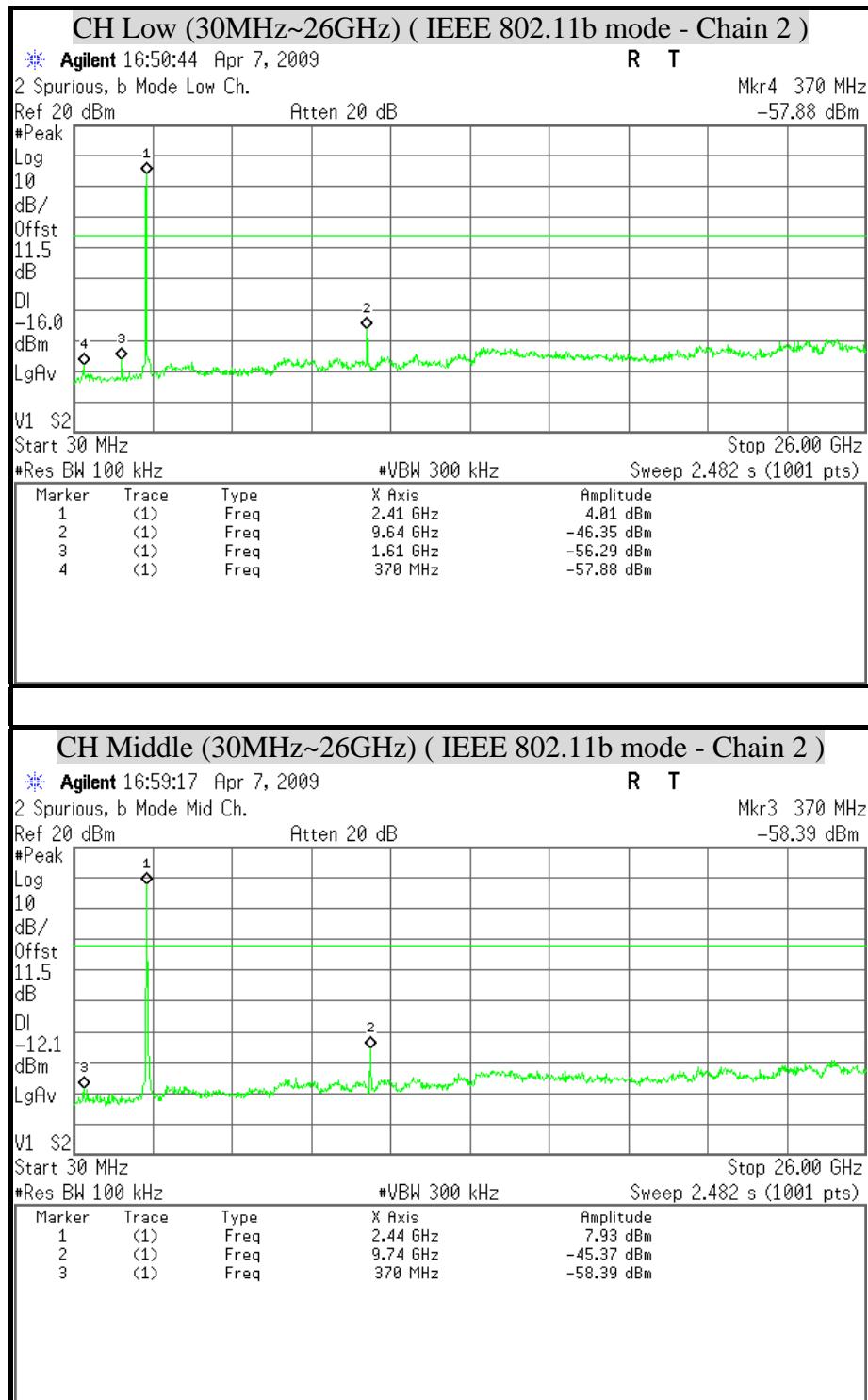
No non-compliance noted

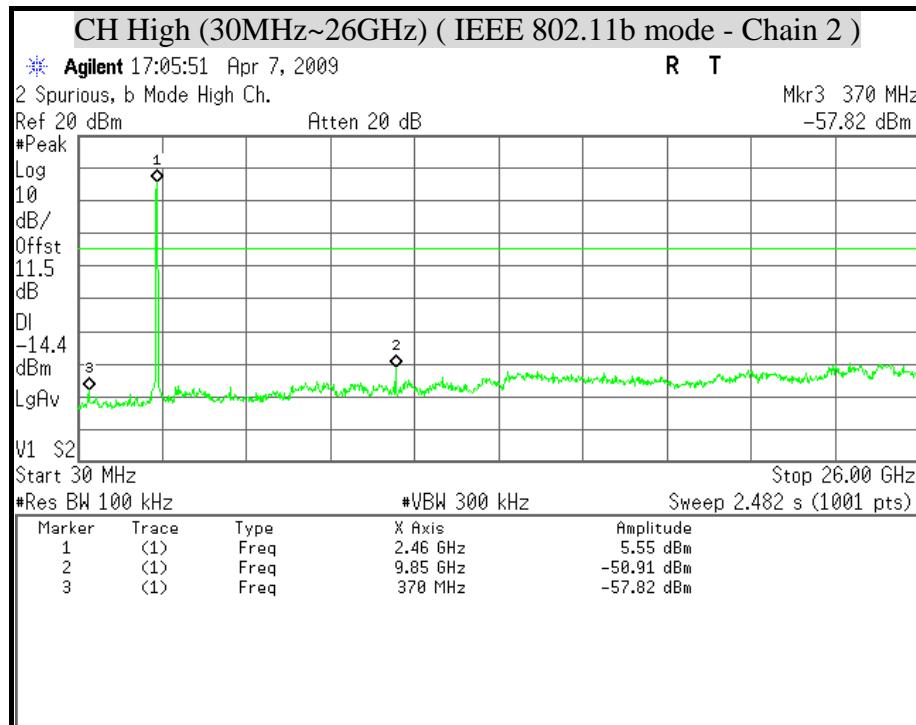
OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT**(IEEE 802.11b mode)**

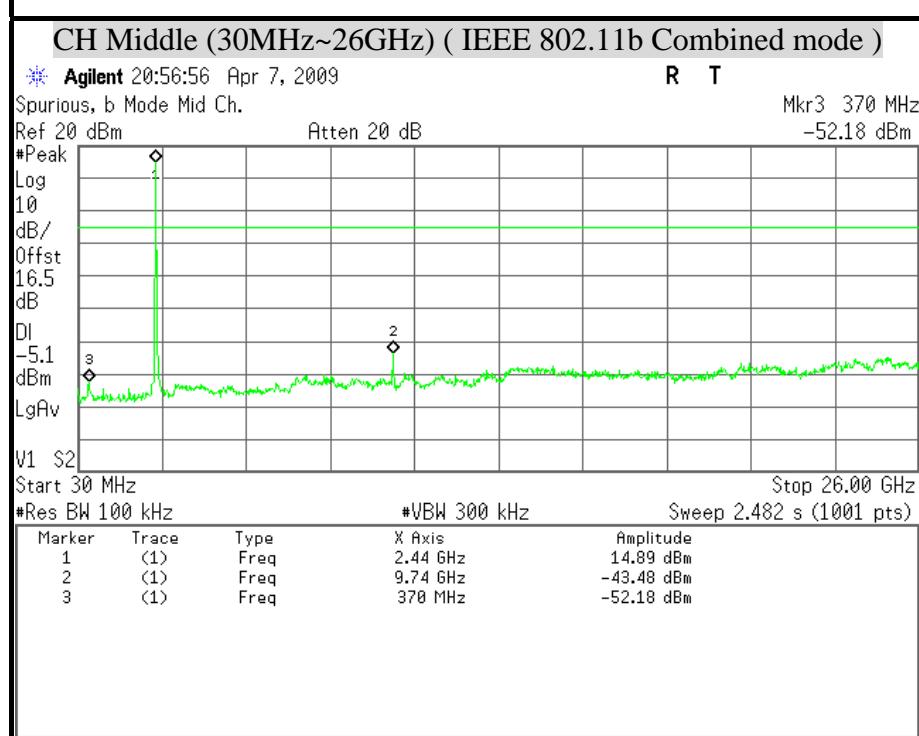
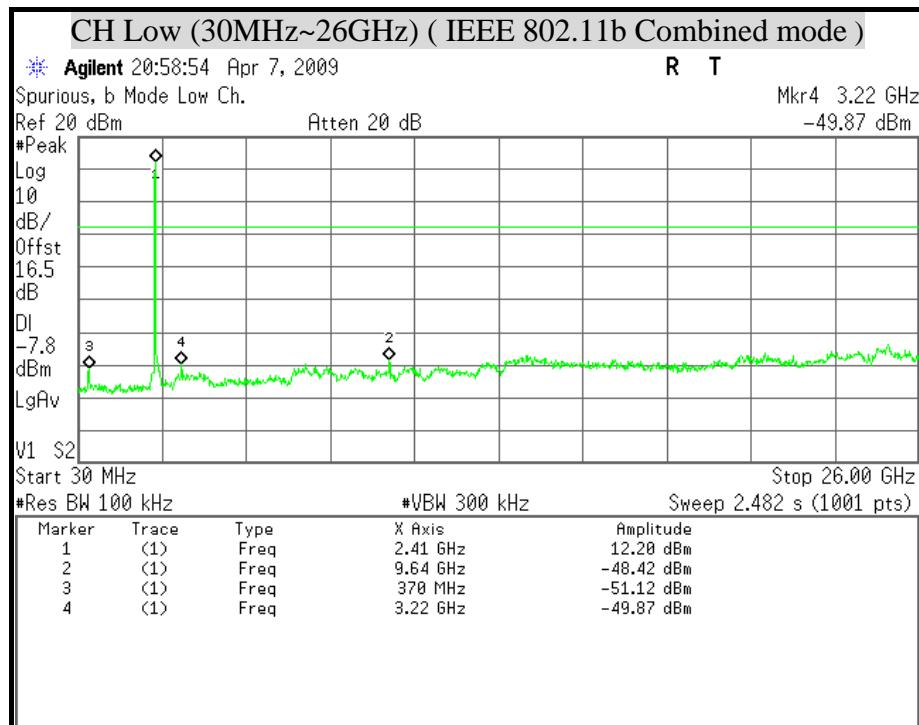


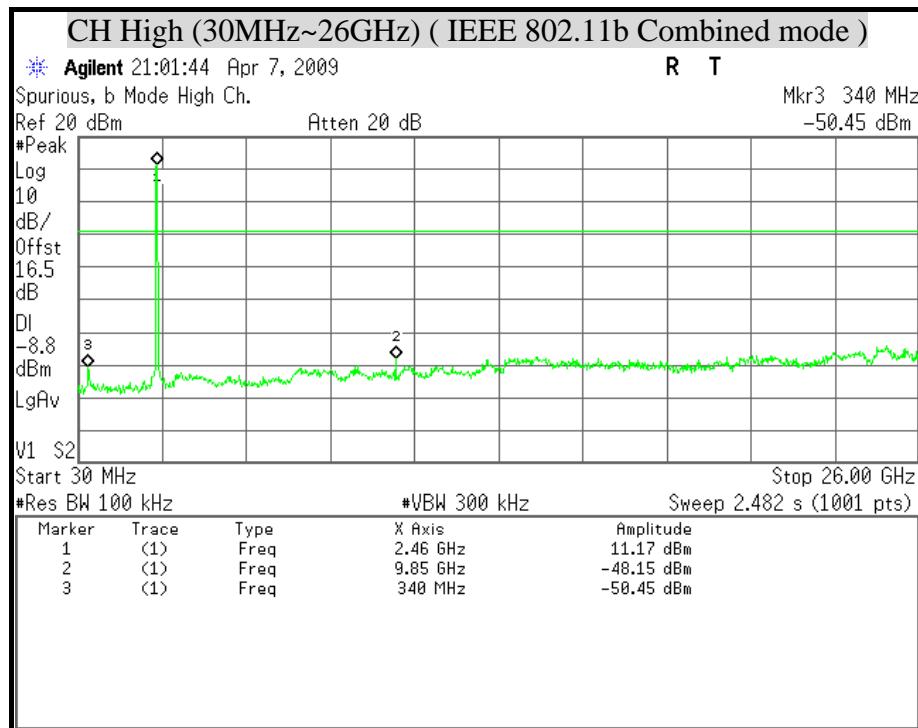






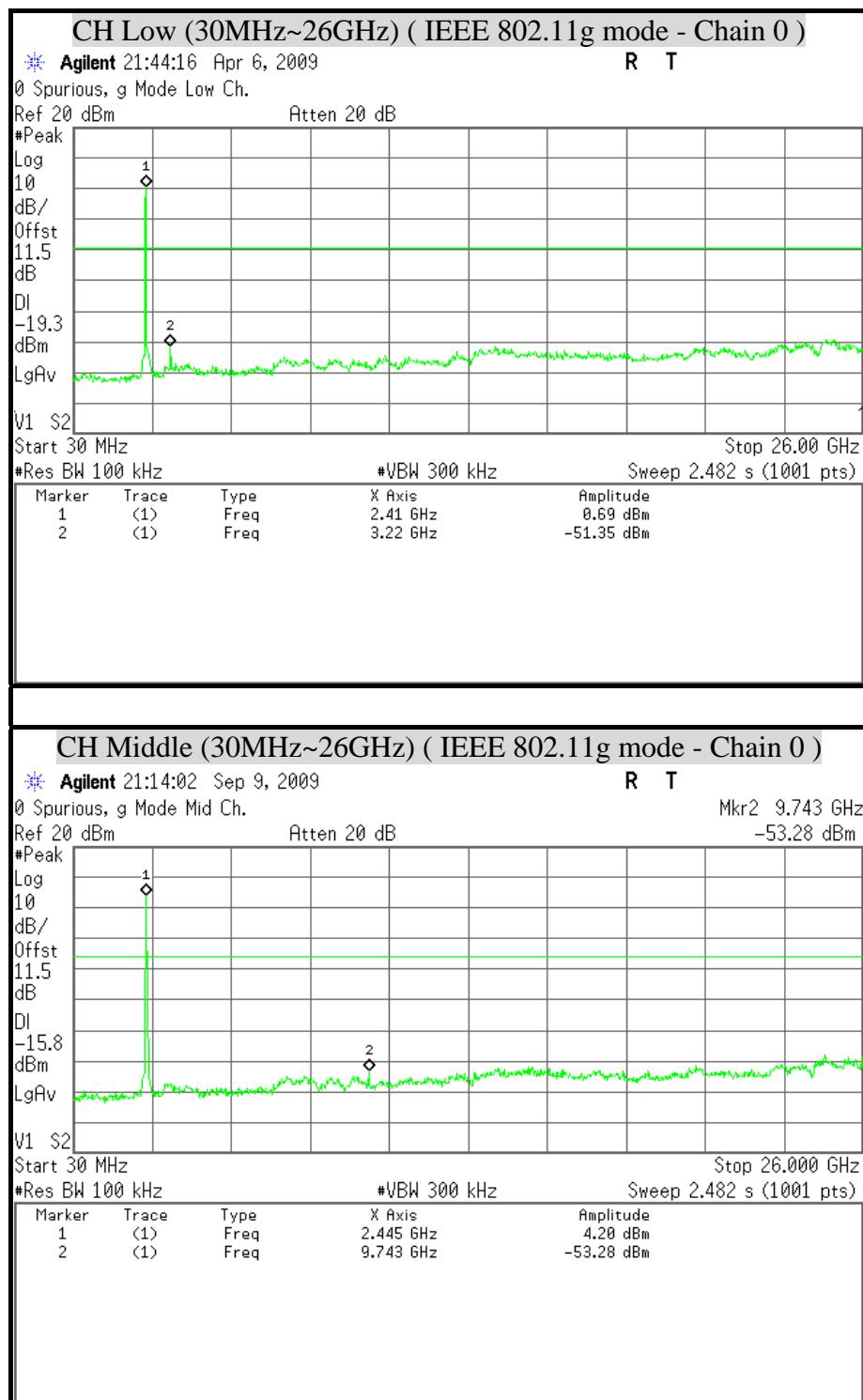


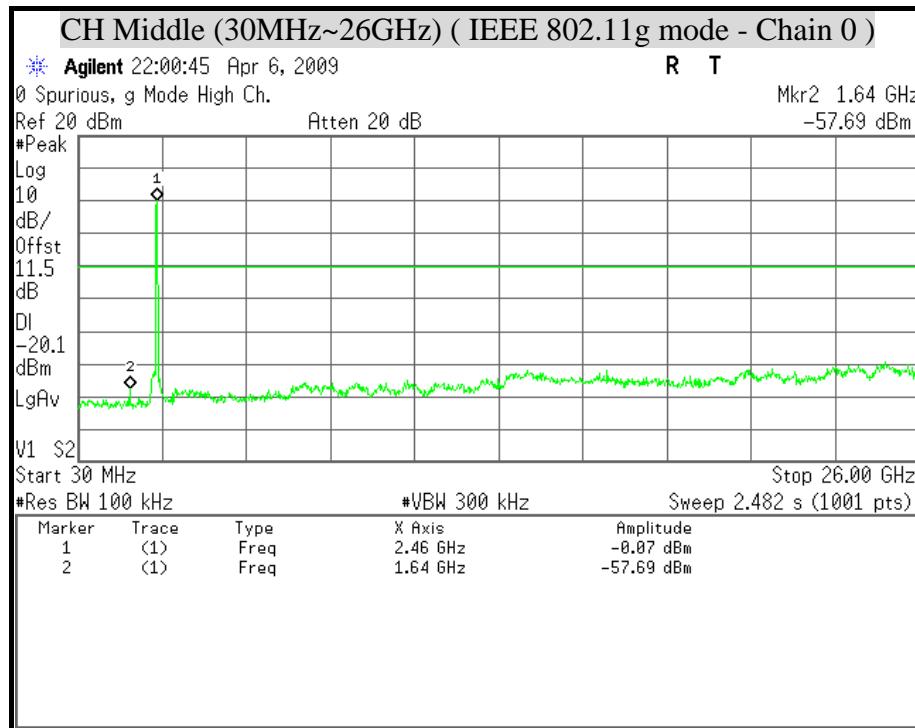
OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT**(IEEE 802.11b Combined mode)**

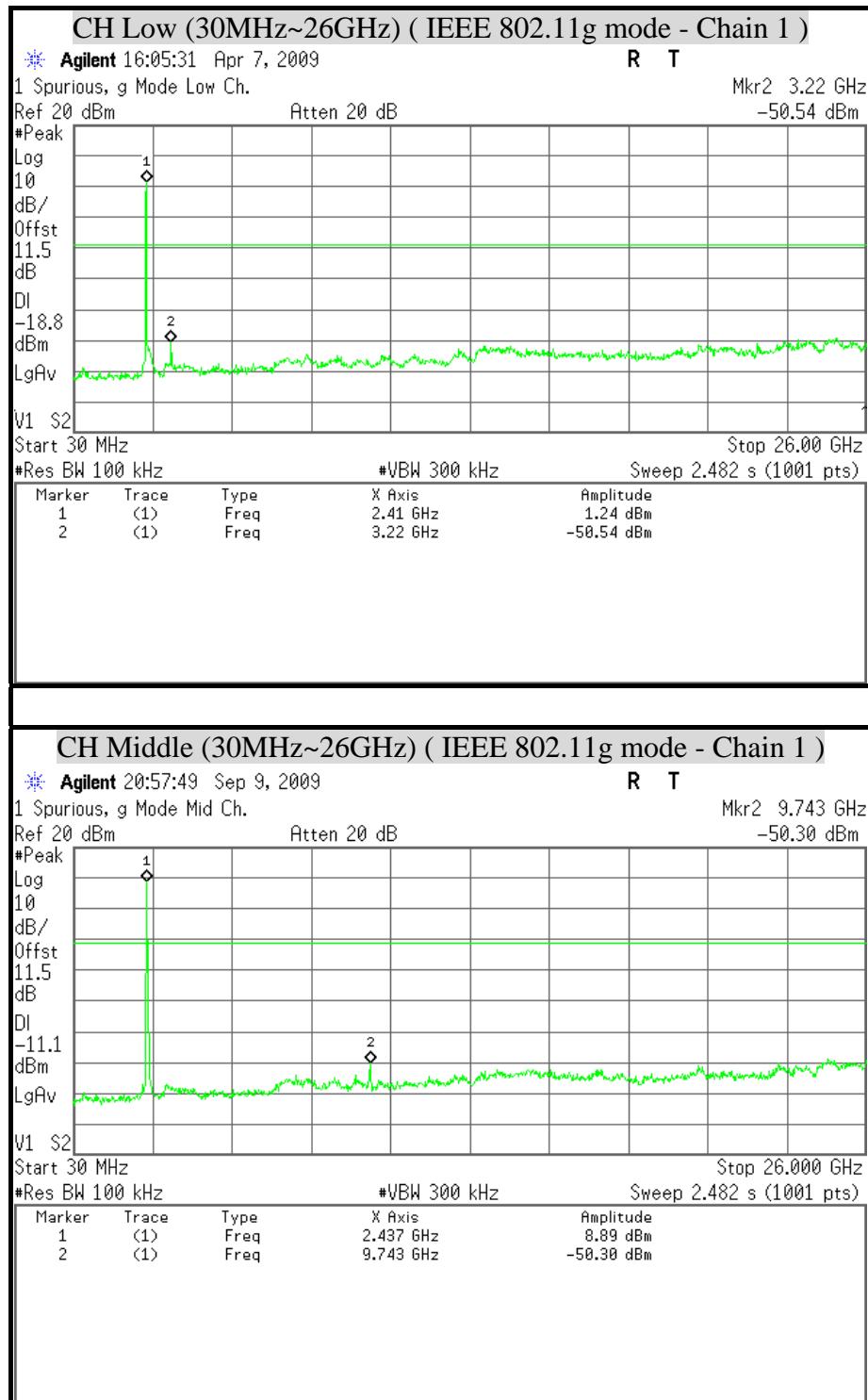


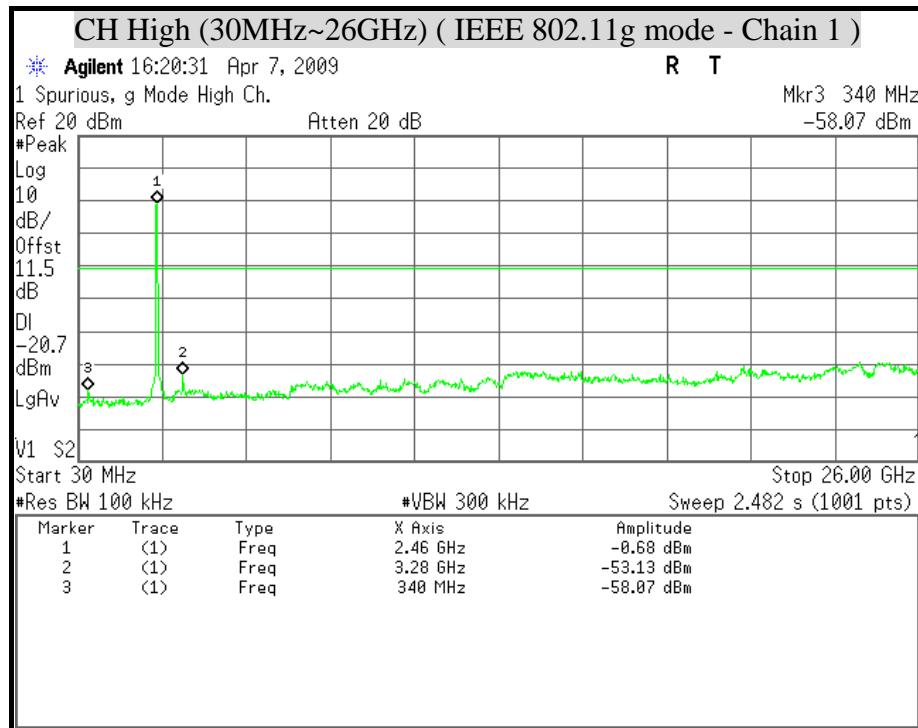
OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

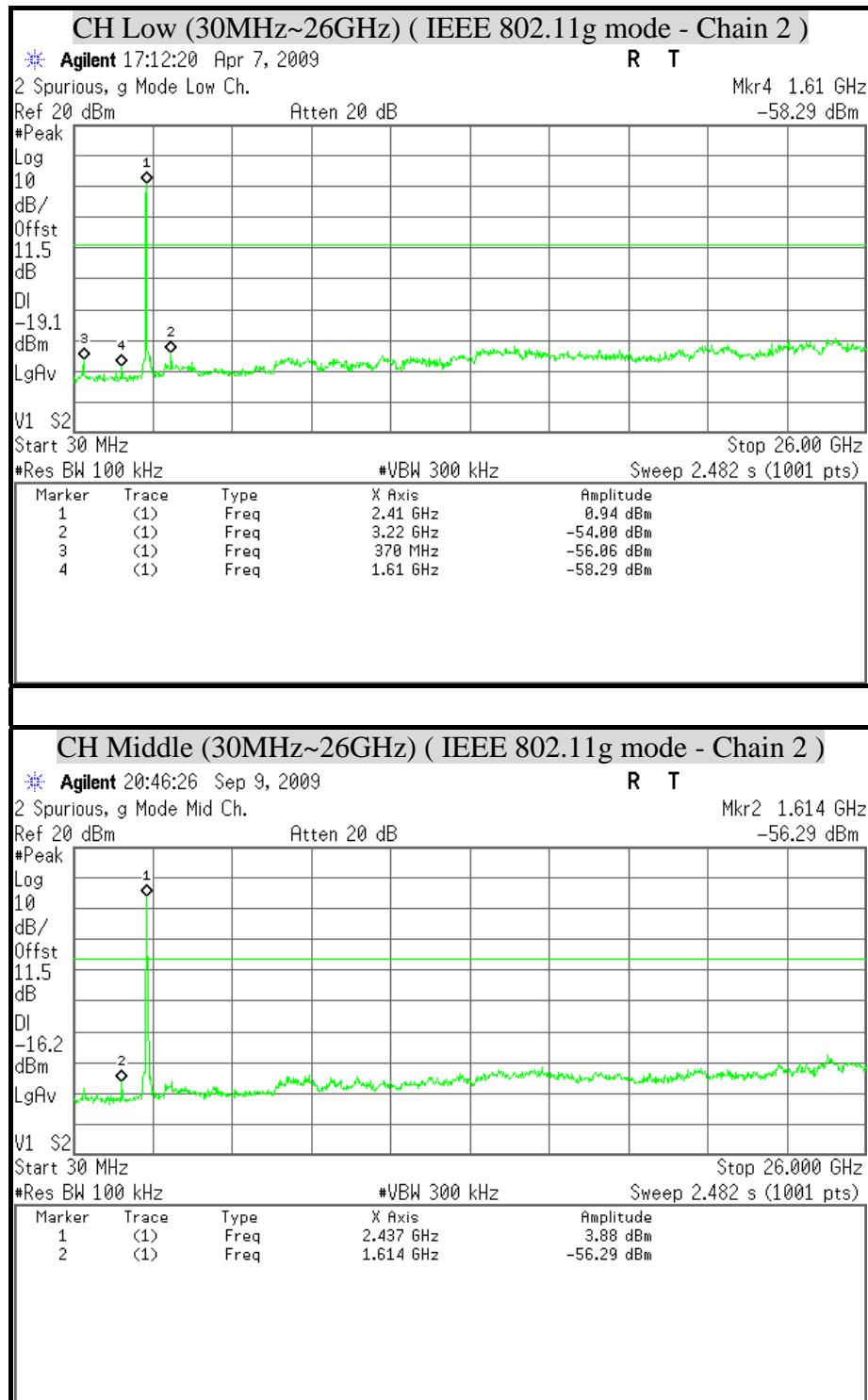
(IEEE 802.11g mode)

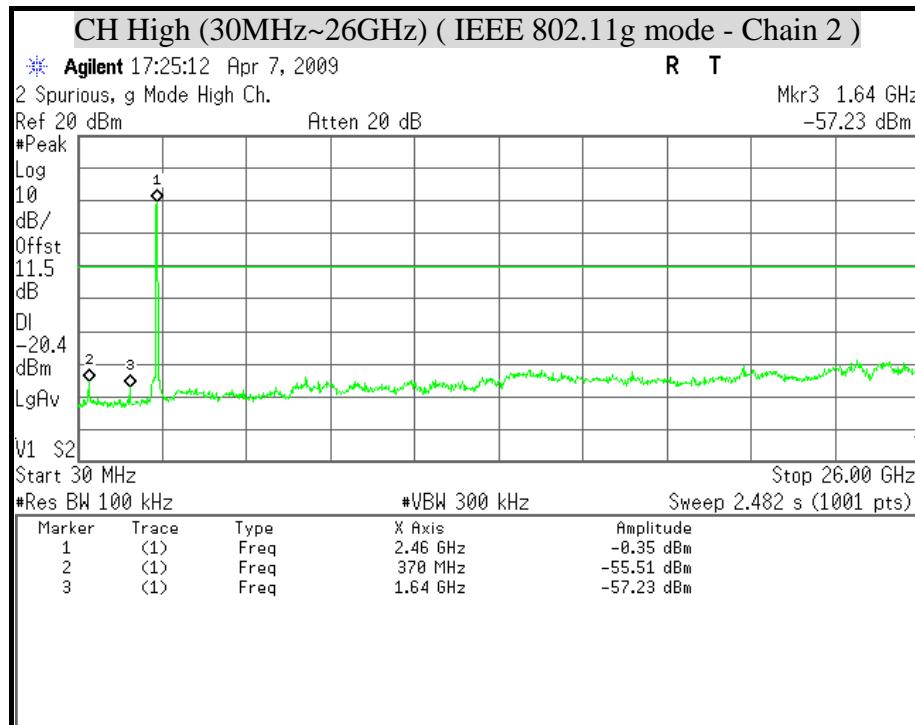


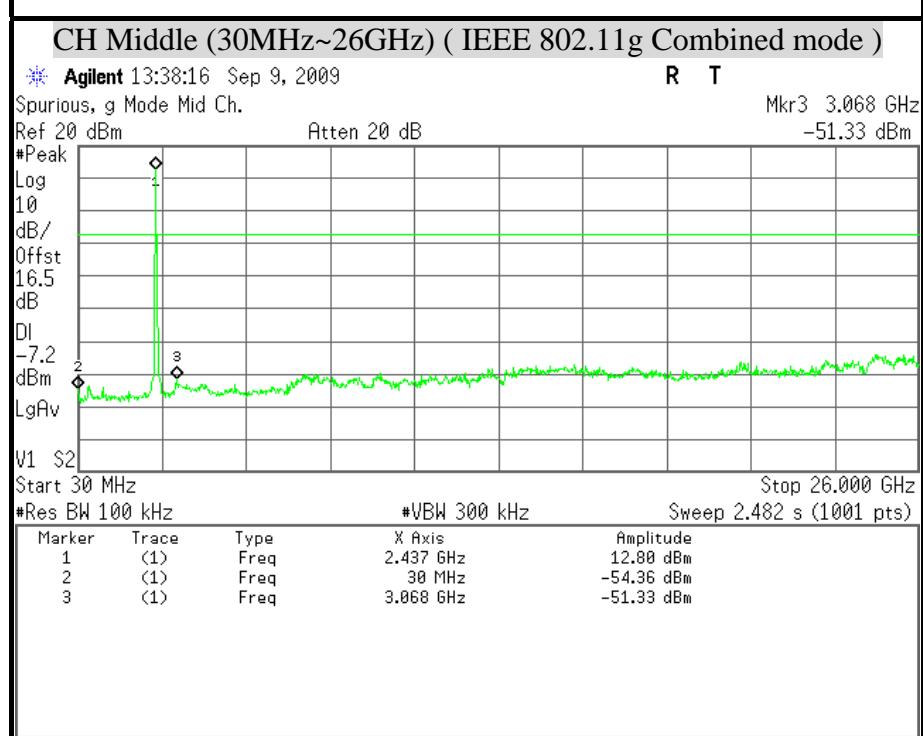
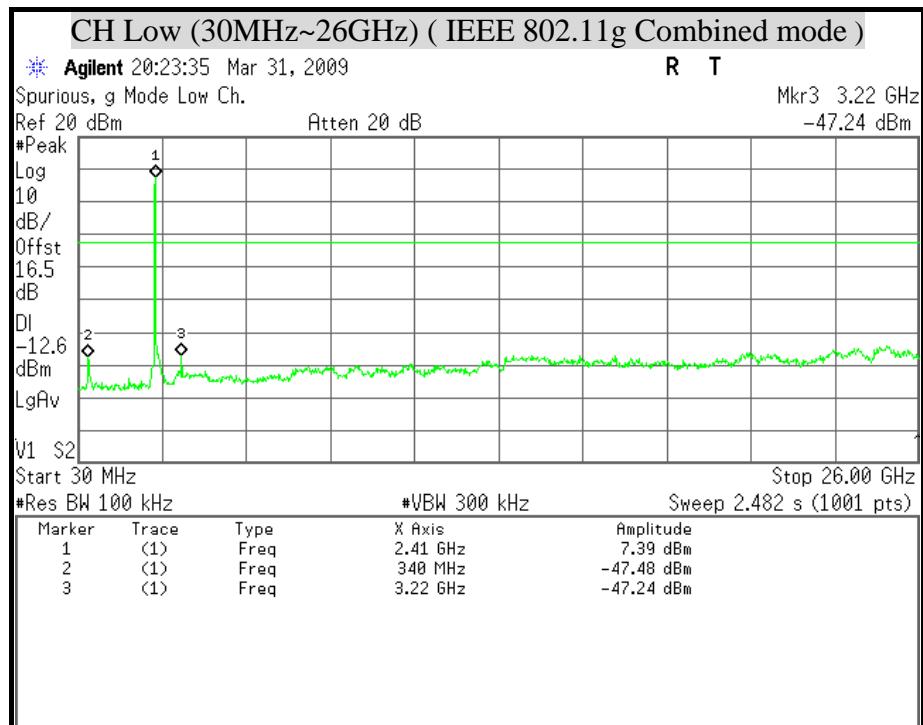


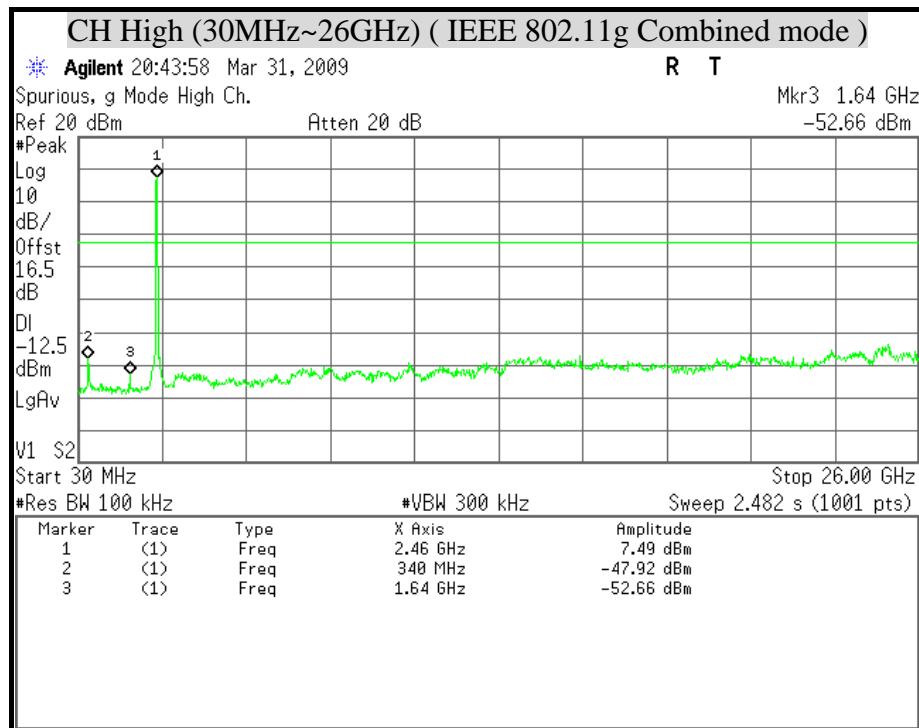


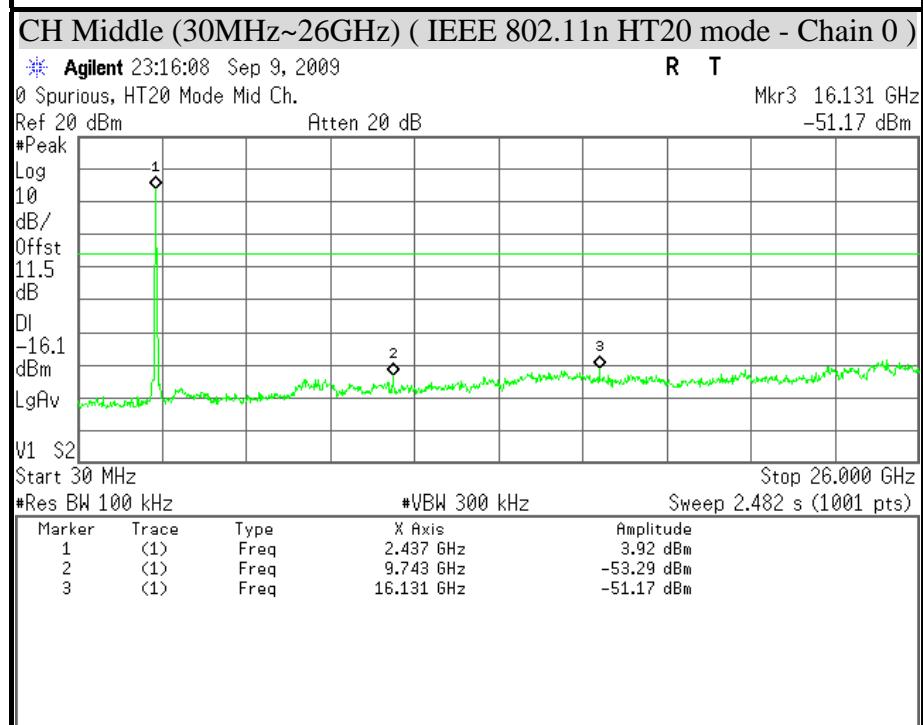
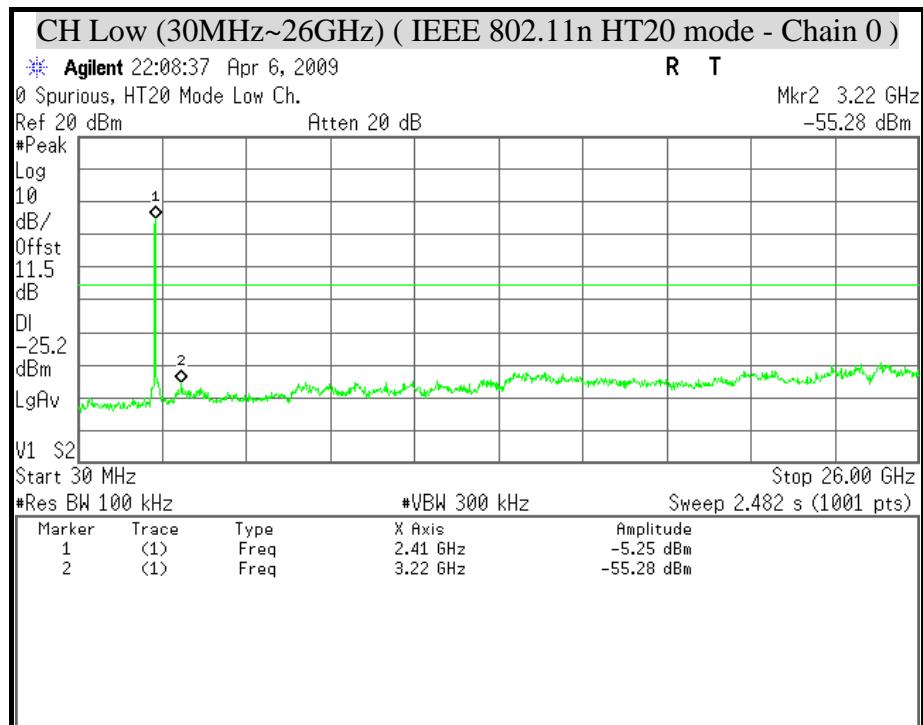


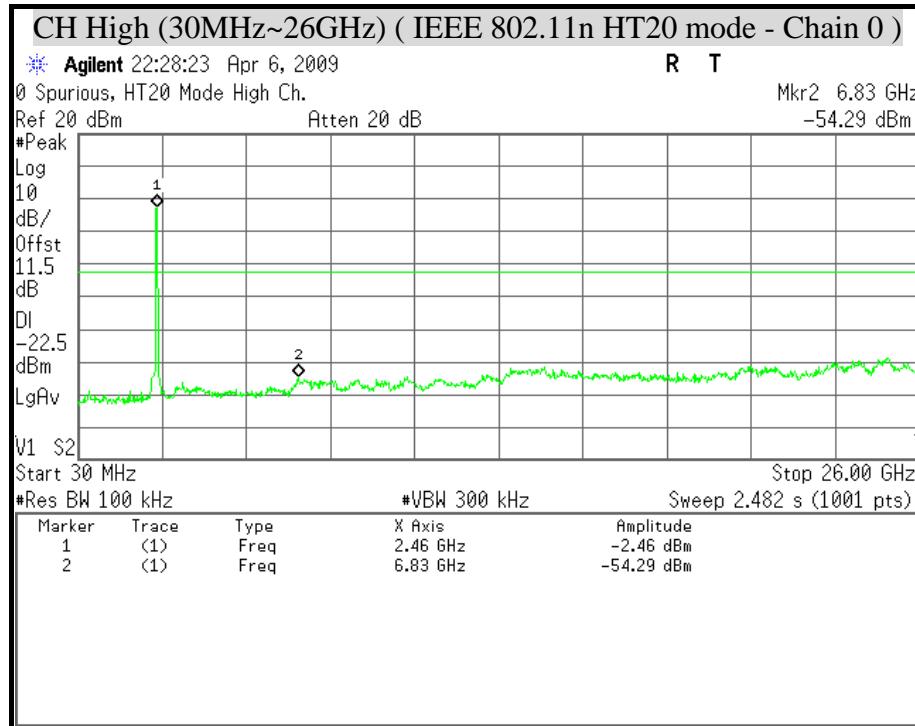




OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT**(IEEE 802.11g Combined mode)**



OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT**(IEEE 802.11n HT20 mode)**



CH Low (30MHz~26GHz) (IEEE 802.11n HT20 mode - Chain 1)

* Agilent 15:29:51 Apr 7, 2009

R T

1 Spurious, HT20 Mode Low Ch.

Mkr3 340 MHz

Ref 20 dBm Atten 20 dB

-59.49 dBm

#Peak

Log

10

dB/

0ffst

11.5

dB

DI

-24.6

dBm

LgAv

V1 S2

Start 30 MHz

Stop 26.00 GHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 2.482 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.41 GHz	-4.57 dBm
2	(1)	Freq	3.22 GHz	-52.10 dBm
3	(1)	Freq	340 MHz	-59.49 dBm

CH Middle (30MHz~26GHz) (IEEE 802.11n HT20 mode - Chain 1)

* Agilent 23:27:01 Sep 9, 2009

R T

1 Spurious, HT20 Mode Mid Ch.

Mkr1 2.437 GHz

Ref 20 dBm

4.14 dBm

Atten 20 dB

#Peak

Log

10

dB/

0ffst

11.5

dB

DI

-15.9

dBm

LgAv

V1 S2

Start 30 MHz

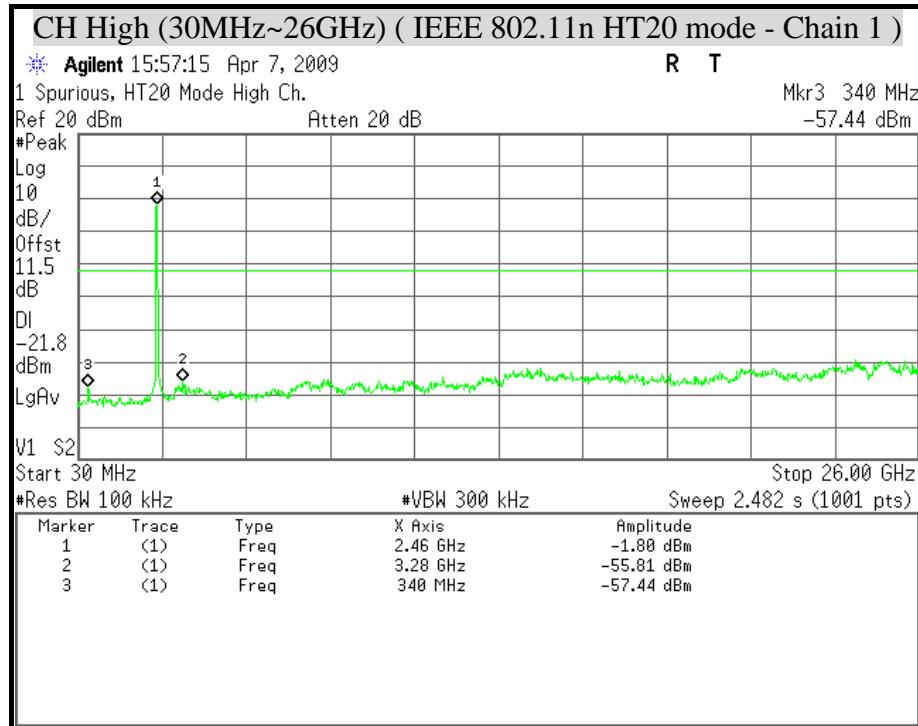
Stop 26.000 GHz

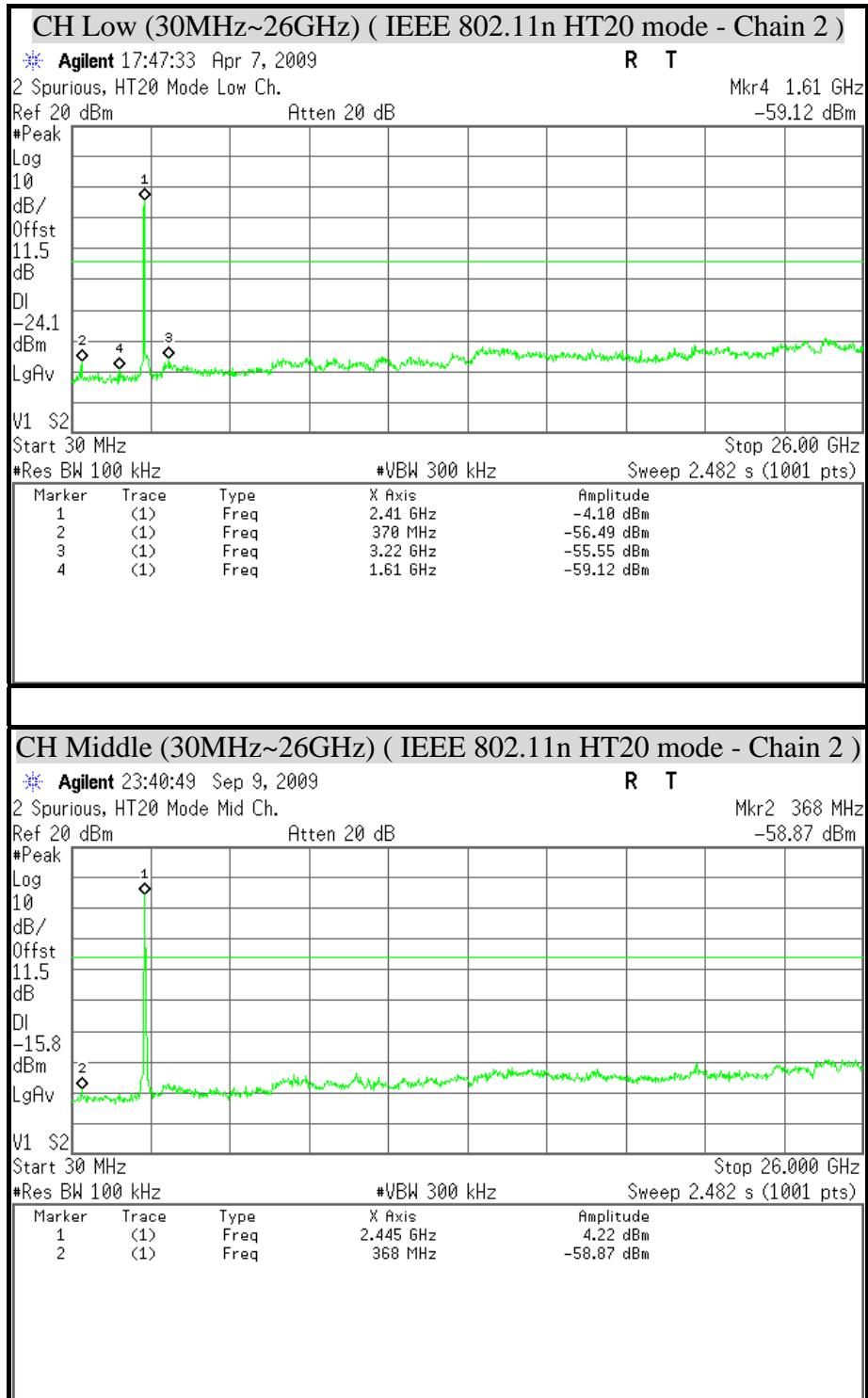
#Res BW 100 kHz

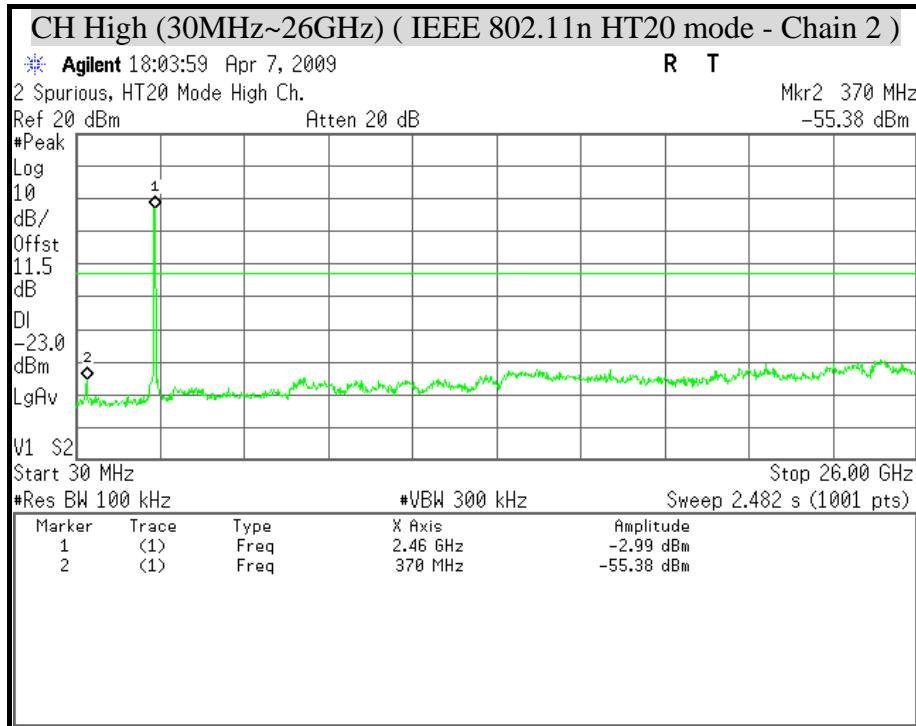
#VBW 300 kHz

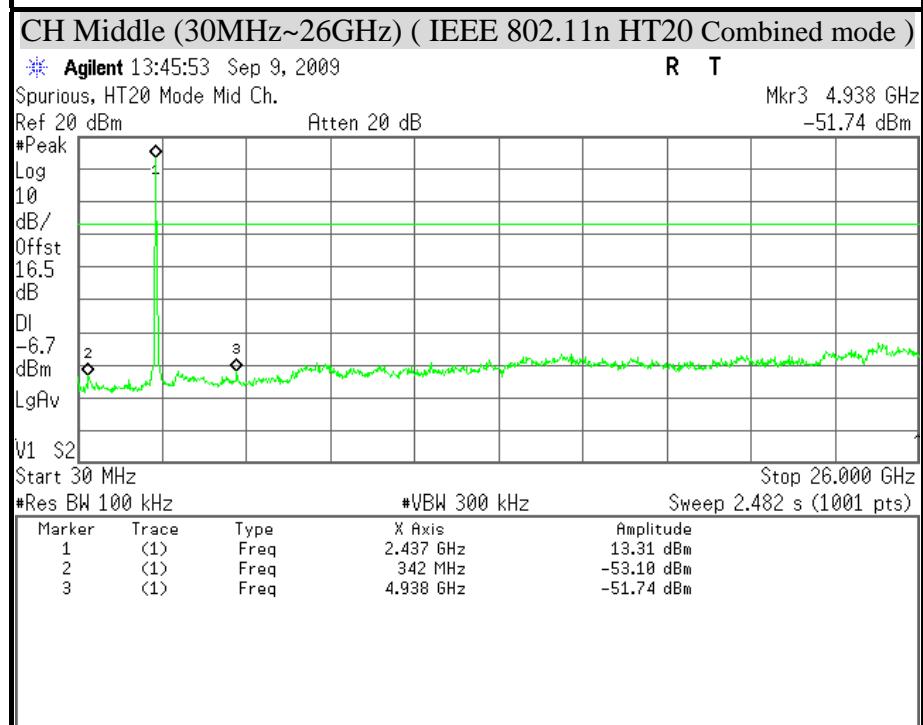
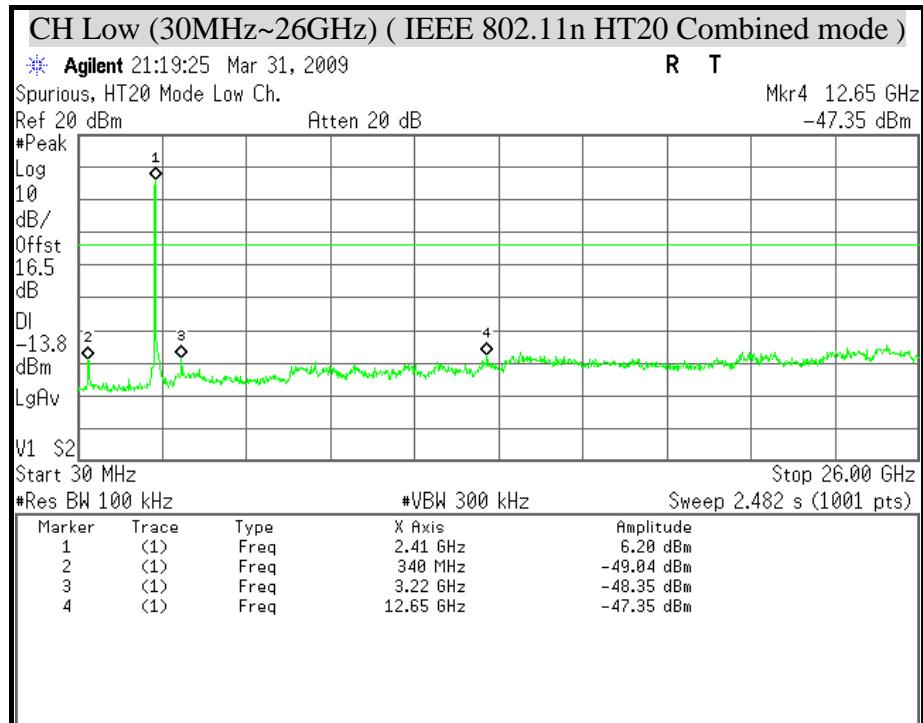
Sweep 2.482 s (1001 pts)

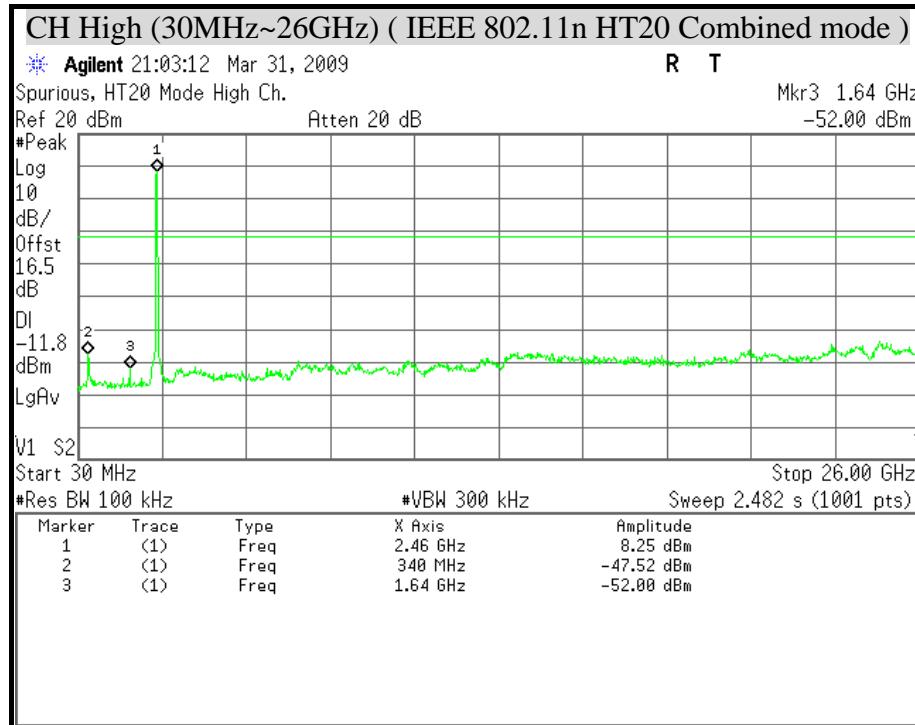
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.437 GHz	4.14 dBm
2	(1)	Freq	7.328 GHz	-52.84 dBm
3	(1)	Freq	9.743 GHz	-50.42 dBm

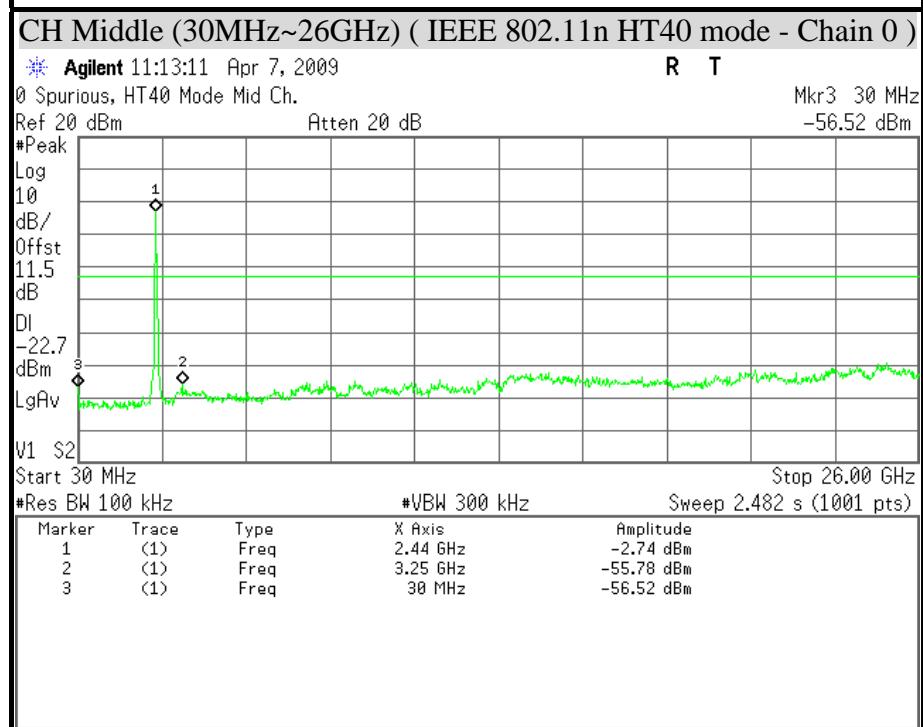
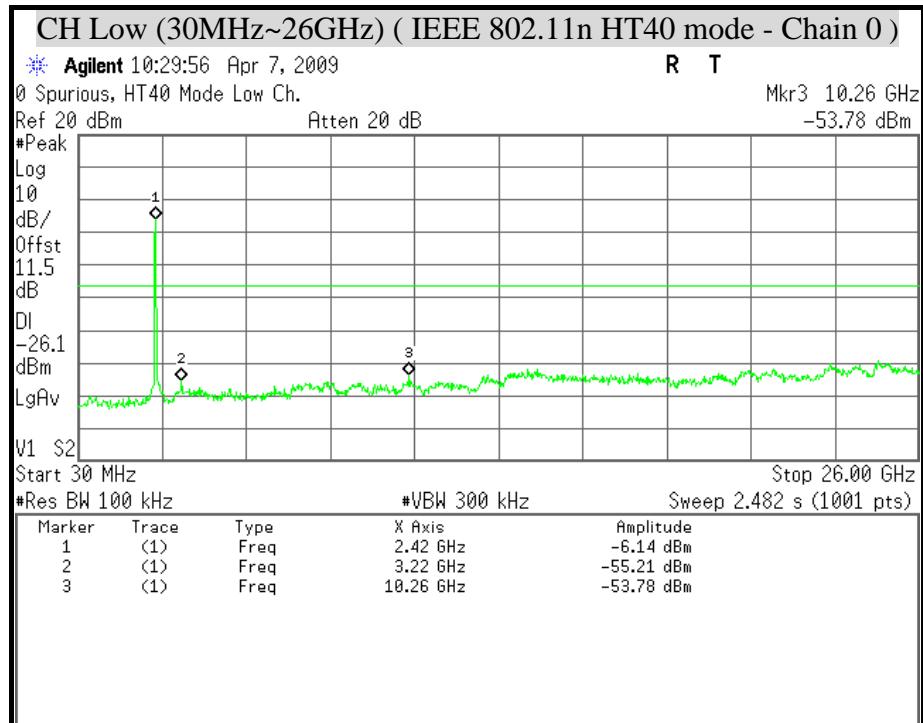


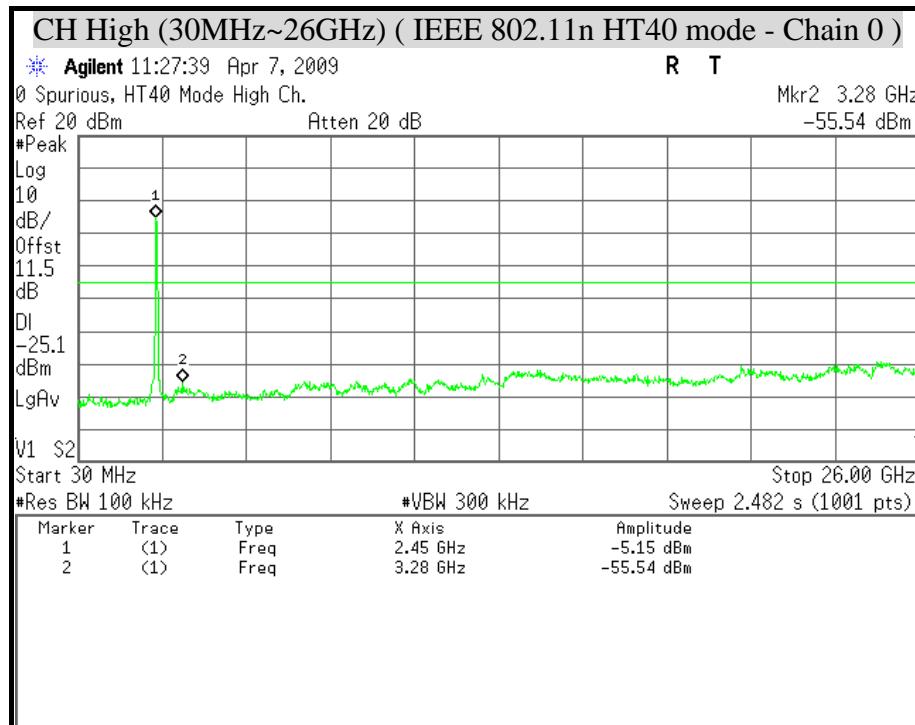


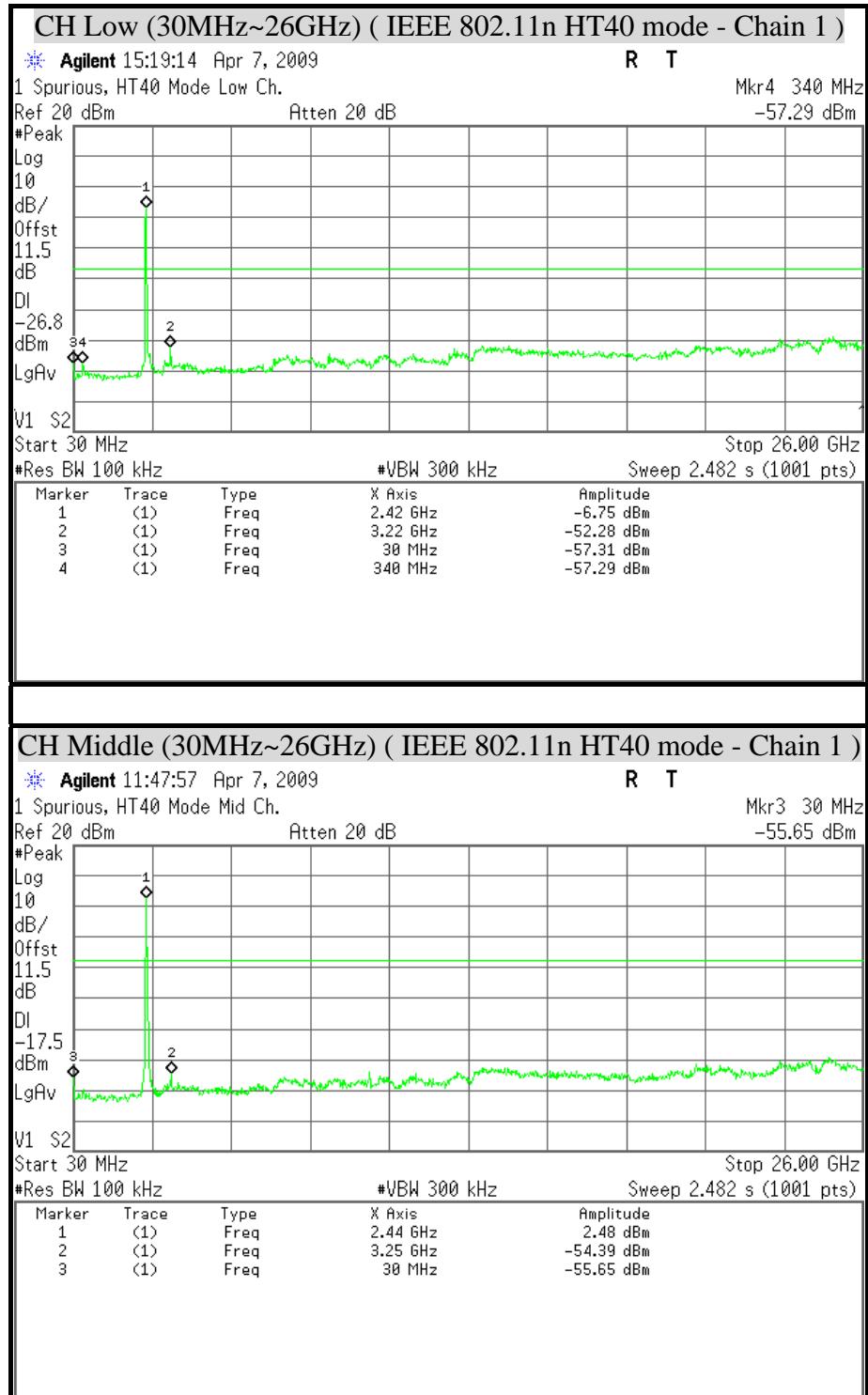


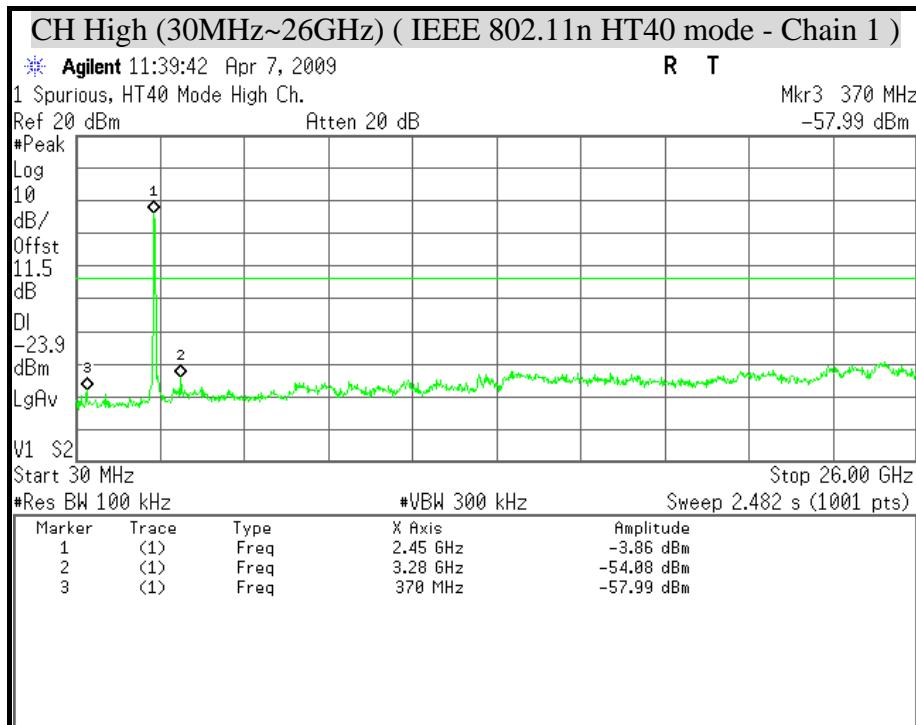
OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT**(IEEE 802.11n HT20 Combined mode)**



OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT**(IEEE 802.11n HT40 mode)**







CH Low (30MHz~26GHz) (IEEE 802.11n HT40 mode - Chain 2)*** Agilent 18:30:12 Apr 7, 2009****R T**

2 Spurious, HT40 Mode Low Ch.

Mkr4 3.22 GHz

Ref 20 dBm

Atten 20 dB

-54.08 dBm

#Peak

Log

10

dB/

0ffst

11.5

dB

DI

-26.0

dBm

LgAv

W1 S2

Start 30 MHz

Stop 26.00 GHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 2.482 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.42 GHz	-5.99 dBm
2	(1)	Freq	370 MHz	-54.03 dBm
3	(1)	Freq	1.61 GHz	-56.40 dBm
4	(1)	Freq	3.22 GHz	-54.08 dBm

CH Middle (30MHz~26GHz) (IEEE 802.11n HT40 mode - Chain 2)*** Agilent 19:06:14 Apr 7, 2009****R T**

2 Spurious, HT40 Mode Mid Ch.

Mkr4 3.25 GHz

Ref 20 dBm

Atten 20 dB

-55.16 dBm

#Peak

Log

10

dB/

0ffst

11.5

dB

DI

-18.9

dBm

LgAv

W1 S2

Start 30 MHz

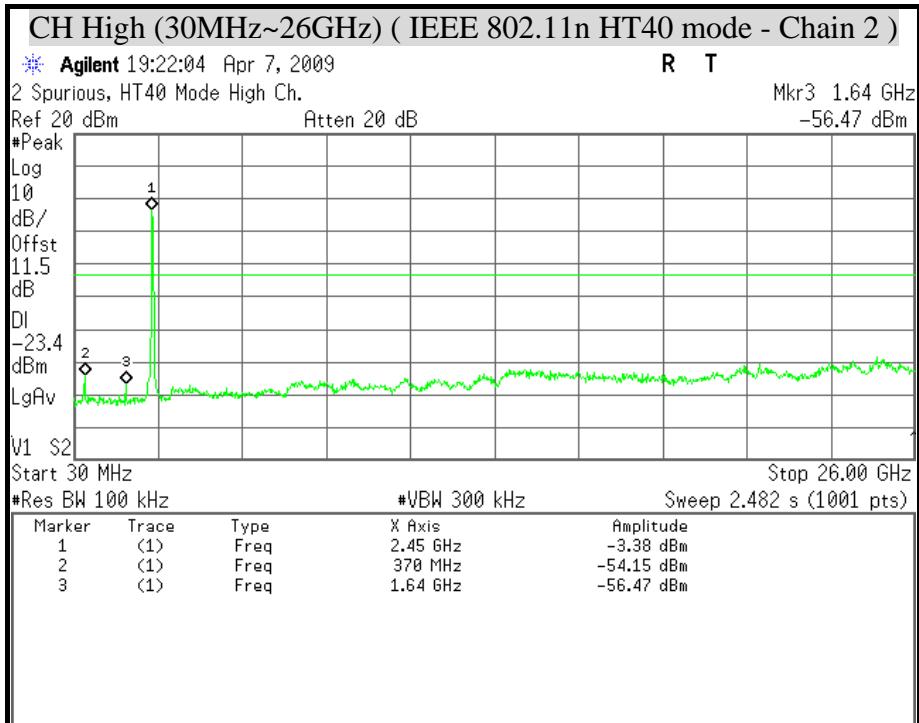
Stop 26.00 GHz

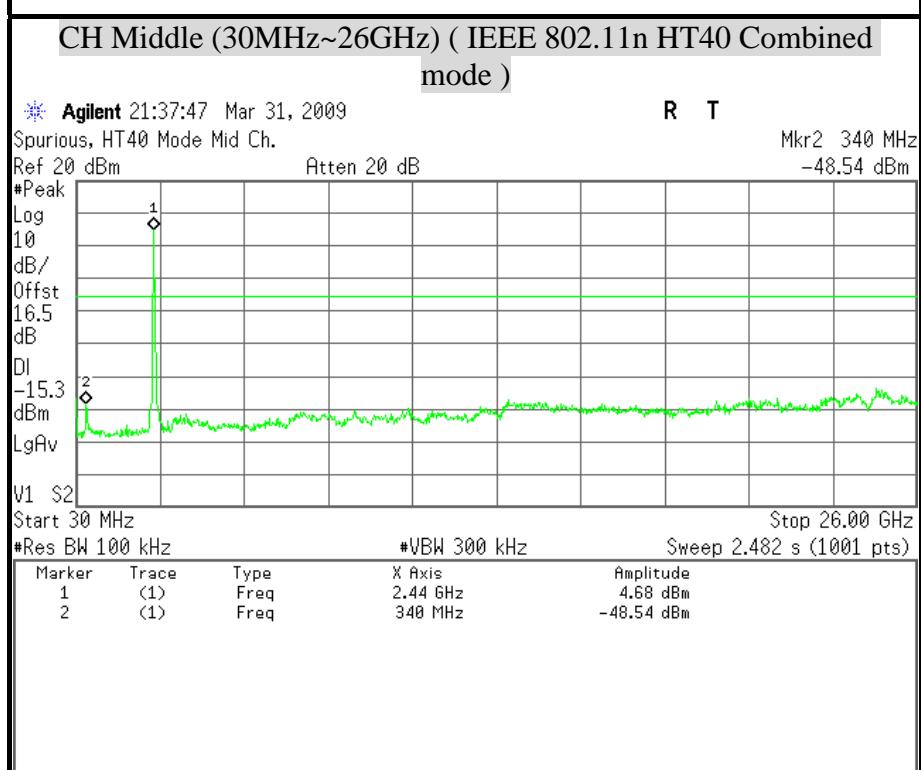
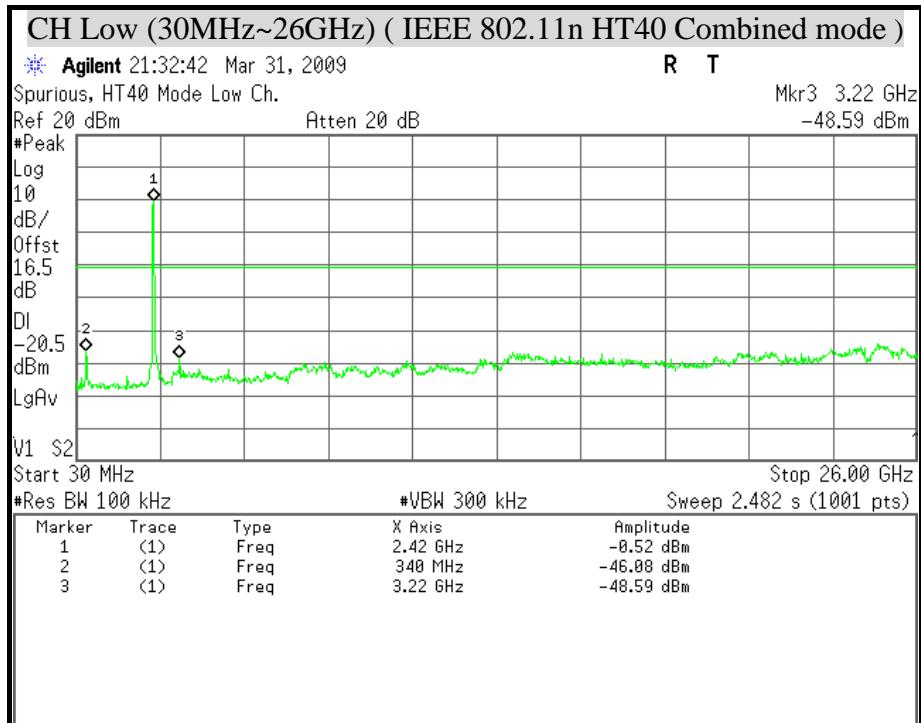
#Res BW 100 kHz

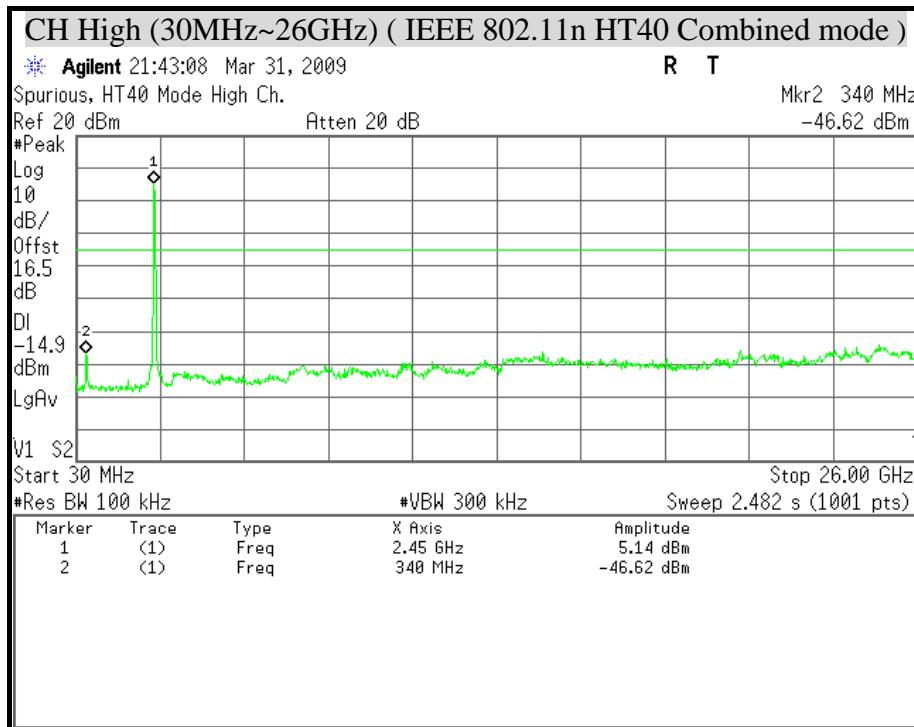
#VBW 300 kHz

Sweep 2.482 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.44 GHz	1.08 dBm
2	(1)	Freq	1.61 GHz	-53.95 dBm
3	(1)	Freq	38 MHz	-56.42 dBm
4	(1)	Freq	3.25 GHz	-55.16 dBm



OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT**(IEEE 802.11n HT40 Combined mode)**





8.8 RADIATED EMISSIONS

8.8.1 TRANSMITTER RADIATED SUPURIOUS EMISSIONS

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

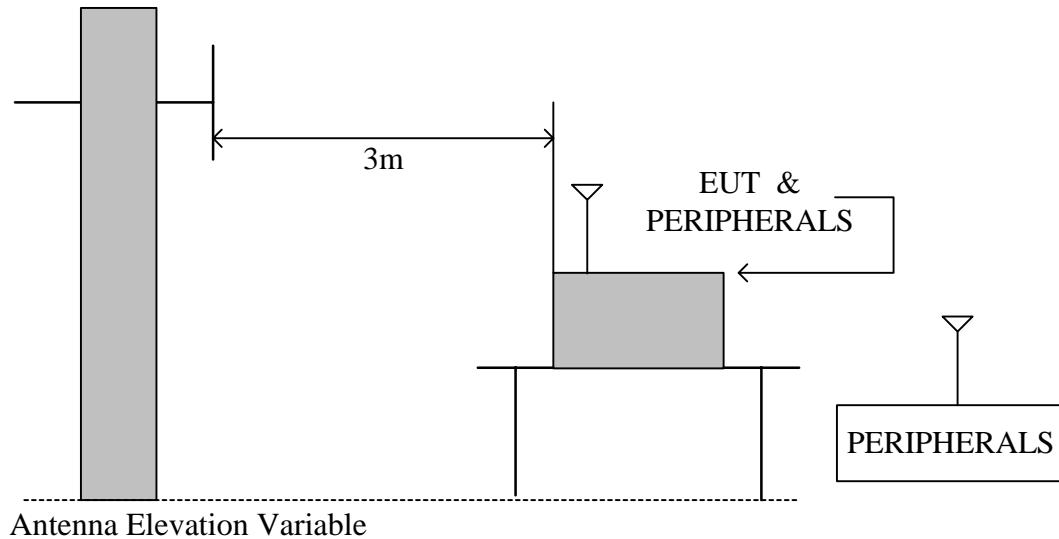
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
SPECTRUM ANALYZER	AGILENT	E4446A	MY46180323	06/09/2010
EMI TEST RECEIVER	R & S	ESCI	100221	05/17/2010
BILOG ANTENNA	SCHWARZBECK	VULB9168	9168_249	09/17/2009
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00078732	06/30/2010
PRE-AMPLIFIER	EM	EM30265	07032611	07/14/2010
Notch Filters Band Reject	Micro-Tronics	BRM50702-01	009	N.C.R.
RF COAXIAL CABLE	HUBERSUHNER	SUCOFLEX 104PEA	SN31350	07/21/2010
LOOP ANTENNA	EMCO	6502	2356	05/28/2010

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

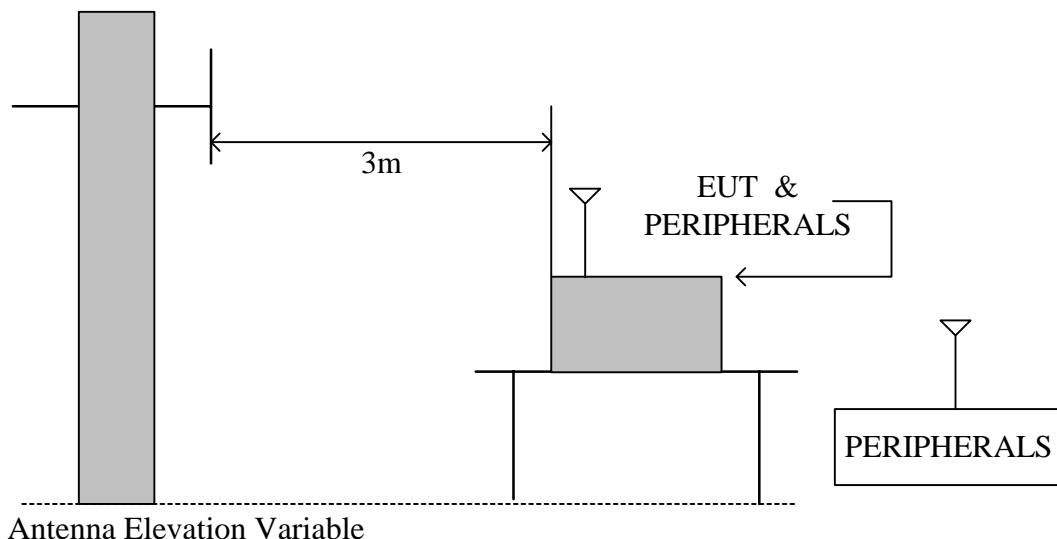
2. N.C.R = No Calibration Request.

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

Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/04/02
Model	WMP-N06	Test By	Gundam Lin
Test Mode	Normal operating	TEMP & Humidity	21.6°C, 50%

Horizontal						
Frequency (MHz)	Reading (dB μ V)	Correction Factor (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Remark
128.94	70.50	-32.81	37.69	43.50	-5.81	QP
154.16	67.50	-30.85	36.65	43.50	-6.85	QP
172.59	69.60	-31.56	38.04	43.50	-5.46	QP
217.21	74.58	-33.12	41.46	46.00	-4.54	Peak
269.59	71.10	-29.14	41.96	46.00	-4.04	QP
332.64	69.23	-27.81	41.41	46.00	-4.59	Peak
366.59	69.80	-27.47	42.33	46.00	-3.67	QP
599.39	63.77	-23.33	40.44	46.00	-5.56	Peak
Vertical						
Frequency (MHz)	Reading (dB μ V)	Correction Factor (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Remark
99.84	71.28	-36.22	35.06	43.50	-8.44	Peak
114.39	73.45	-34.46	38.99	43.50	-4.51	Peak
198.78	71.30	-33.14	38.16	43.50	-5.34	QP
298.69	66.74	-28.00	38.74	46.00	-7.26	Peak
366.59	66.24	-27.47	38.77	46.00	-7.23	Peak
527.61	58.37	-24.69	33.68	46.00	-12.32	Peak
599.39	56.56	-23.33	33.23	46.00	-12.77	Peak
701.24	55.20	-21.93	33.27	46.00	-12.73	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 (dB μ V/m) - Quasi-peak limit (dB μ V/m).



8.8.3 TRANSMITTER RADIATED EMISSION ABOVE 1 GHz

Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/03/30
Model	WMP-N06	Test By	Gundam Lin
Test Mode	IEEE 802.11b TX (CH Low)	TEMP & Humidity	19.3°C, 65%

Horizontal									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1382.50	59.10	---	-13.82	45.27	---	74.00	54.00	-8.73	Peak
2412.00	121.04	112.88	-8.85	112.19	104.03	---	---	---	Carrier
2768.00	54.98	---	-8.45	46.53	---	74.00	54.00	-7.47	Peak
4646.50	51.90	---	-5.01	46.89	---	74.00	54.00	-7.11	Peak
9644.50	59.82	54.86	2.51	62.33	57.37	92.19	84.03	-26.66	AVG

Vertical									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1110.50	56.61	---	-14.47	42.14	---	74.00	54.00	-11.86	Peak
1357.00	61.71	---	-13.88	47.83	---	74.00	54.00	-6.17	Peak
1561.00	56.90	---	-13.04	43.86	---	74.00	54.00	-10.14	Peak
2232.50	53.93	---	-9.15	44.78	---	74.00	54.00	-9.22	Peak
2412.00	124.40	116.01	-8.85	115.55	107.16	---	---	---	Carrier
3218.50	54.04	---	-7.79	46.26	---	74.00	54.00	-7.74	Peak
9644.50	59.70	55.48	2.51	62.21	57.99	95.55	87.16	-29.17	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. Result = Reading + Correction Factor
Margin = Result – Limit
Remark Peak = Result(PK) – Limit(AV)
Remark AVG = Result(AV) – Limit(AV)
5. 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.



Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/03/30
Model	WMP-N06	Test By	Gundam Lin
Test Mode	IEEE 802.11b TX (CH Middle)	TEMP & Humidity	19.3°C, 65%

Horizontal									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1374.00	57.88	---	-13.84	44.03	---	74.00	54.00	-9.97	Peak
2436.00	123.79	112.64	-8.82	114.97	103.82	---	---	---	Carrier
4612.50	51.95	---	-5.10	46.86	---	74.00	54.00	-7.14	Peak
9746.50	61.43	57.50	2.66	64.09	60.16	94.97	83.82	-23.66	AVG
Vertical									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1357.00	59.56	---	-13.88	45.67	---	74.00	54.00	-8.33	Peak
1569.50	56.87	---	-12.97	43.90	---	74.00	54.00	-10.10	Peak
2436.00	126.18	115.80	-8.82	117.36	106.98	---	---	---	Carrier
2734.00	55.39	---	-8.50	46.89	---	74.00	54.00	-7.11	Peak
7315.50	51.16	---	-0.83	50.32	---	74.00	54.00	-3.68	Peak
9746.50	62.32	58.22	2.66	64.98	60.88	97.36	86.98	-26.10	AVG
14481.00	46.66	35.78	11.66	58.32	47.44	74.00	54.00	-6.56	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. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)
5. 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.



Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/03/30
Model	WMP-N06	Test By	Gundam Lin
Test Mode	IEEE 802.11b TX (CH High)	TEMP & Humidity	19.3°C, 65%

Horizontal									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1382.50	57.63	---	-13.82	43.80	---	74.00	54.00	-10.20	Peak
1782.00	54.38	---	-11.21	43.17	---	74.00	54.00	-10.83	Peak
2462.00	122.33	112.33	-8.79	113.54	103.54	---	---	---	Carrier
5020.50	52.01	---	-4.07	47.94	---	74.00	54.00	-6.06	Peak
9848.50	58.73	55.60	2.80	61.53	58.40	93.54	83.54	-25.14	AVG

Vertical									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1068.00	57.20	---	-14.57	42.63	---	74.00	54.00	-11.37	Peak
1365.50	60.50	---	-13.86	46.64	---	74.00	54.00	-7.36	Peak
1578.00	56.98	---	-12.90	44.08	---	74.00	54.00	-9.92	Peak
2462.00	125.93	117.27	-8.79	117.14	108.48	---	---	---	Carrier
9848.50	59.45	56.50	2.80	62.25	59.30	97.14	88.48	-29.18	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. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)
5. 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.



Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/03/30
Model	WMP-N06	Test By	Gundam Lin
Test Mode	IEEE 802.11g TX (CH Low)	TEMP & Humidity	19.3°C, 65%

Horizontal									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1374.00	57.64	---	-13.84	43.80	---	74.00	54.00	-10.20	Peak
4247.00	51.78	---	-6.02	45.76	---	74.00	54.00	-8.24	Peak
9644.50	48.74	---	2.51	51.25	---	74.00	54.00	-2.75	Peak

Vertical									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1093.50	56.21	---	-14.51	41.70	---	74.00	54.00	-12.30	Peak
1365.50	59.42	---	-13.86	45.55	---	74.00	54.00	-8.45	Peak
1552.50	57.97	---	-13.11	44.85	---	74.00	54.00	-9.15	Peak
3218.50	57.89	---	-7.79	50.10	---	74.00	54.00	-3.90	Peak
9644.50	54.15	41.28	2.51	56.66	43.79	74.00	54.00	-10.21	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. Result = Reading + Correction Factor

Margin = Result - Limit

Remark Peak = Result(PK) - Limit(AV)

Remark AVG = Result(AV) - Limit(AV)



Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/09/10
Model	WMP-N06	Test By	Rick Lin
Test Mode	IEEE 802.11g TX (CH Middle)	TEMP & Humidity	25.1°C, 50%

Horizontal									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
7320.00	55.71	40.40	1.84	57.55	42.24	74.00	54.00	-11.76	AVG
9742.50	61.35	47.39	4.64	65.99	52.03	74.00	54.00	-1.97	AVG
Vertical									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
7312.50	59.63	45.01	1.84	61.47	46.85	74.00	54.00	-7.15	AVG
9742.50	60.88	46.79	4.64	65.52	51.43	74.00	54.00	-2.57	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. Result = Reading + Correction Factor

Margin = Result - Limit

Remark Peak = Result(PK) - Limit(AV)

Remark AVG = Result(AV) - Limit(AV)



Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/03/30
Model	WMP-N06	Test By	Gundam Lin
Test Mode	IEEE 802.11g TX (CH High)	TEMP & Humidity	19.3°C, 65%

Horizontal									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1365.50	57.57	---	-13.86	43.70	---	74.00	54.00	-10.30	Peak
5734.50	51.66	---	-3.02	48.64	---	74.00	54.00	-5.36	Peak
8752.00	48.74	---	1.51	50.26	---	74.00	54.00	-3.74	Peak

Vertical									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1357.00	59.79	---	-13.88	45.90	---	74.00	54.00	-8.10	Peak
1578.00	57.90	---	-12.90	45.00	---	74.00	54.00	-9.00	Peak
5556.00	51.56	---	-3.22	48.34	---	74.00	54.00	-5.66	Peak
8599.00	49.37	---	1.22	50.59	---	74.00	54.00	-3.41	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. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/03/30
Model	WMP-N06	Test By	Gundam Lin
Test Mode	IEEE 802.11n HT20 TX (CH Low)	TEMP & Humidity	19.3°C, 65%

Horizontal									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1374.00	57.29	---	-13.84	43.44	---	74.00	54.00	-10.56	Peak
2759.50	54.32	---	-8.47	45.85	---	74.00	54.00	-8.15	Peak
3218.50	54.04	---	-7.79	46.25	---	74.00	54.00	-7.75	Peak

Vertical									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1365.50	59.25	---	-13.86	45.38	---	74.00	54.00	-8.62	Peak
1552.50	60.02	---	-13.11	46.91	---	74.00	54.00	-7.09	Peak
3218.50	56.06	---	-7.79	48.27	---	74.00	54.00	-5.73	Peak
7723.50	49.47	---	-0.21	49.26	---	74.00	54.00	-4.74	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. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/09/10
Model	WMP-N06	Test By	Rick Lin
Test Mode	IEEE 802.11n HT20 TX (CH Middle)	TEMP & Humidity	25.1°C, 50%

Horizontal									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
7305.00	55.61	39.86	1.84	57.45	41.70	74.00	54.00	-12.30	AVG
9735.00	61.44	46.41	4.64	66.08	51.05	74.00	54.00	-2.95	AVG
Vertical									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
7312.50	59.75	43.94	1.84	61.59	45.78	74.00	54.00	-8.22	AVG
9735.00	58.58	44.12	4.64	63.22	48.76	74.00	54.00	-5.24	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. Result = Reading + Correction Factor

Margin = Result - Limit

Remark Peak = Result(PK) - Limit(AV)

Remark AVG = Result(AV) - Limit(AV)



Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/03/30
Model	WMP-N06	Test By	Gundam Lin
Test Mode	IEEE 802.11n HT20 TX (CH High)	TEMP & Humidity	19.3°C, 65%

Horizontal									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1102.00	55.42	---	-14.49	40.93	---	74.00	54.00	-13.07	Peak
1374.00	56.69	---	-13.84	42.85	---	74.00	54.00	-11.15	Peak
1561.00	54.68	---	-13.04	41.64	---	74.00	54.00	-12.36	Peak
5063.00	51.46	---	-4.00	47.46	---	74.00	54.00	-6.54	Peak
Vertical									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1357.00	60.45	---	-13.88	46.56	---	74.00	54.00	-7.44	Peak
1561.00	57.63	---	-13.04	44.59	---	74.00	54.00	-9.41	Peak
3278.00	53.96	---	-7.70	46.26	---	74.00	54.00	-7.74	Peak
6032.00	50.96	---	-2.69	48.27	---	74.00	54.00	-5.73	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. Result = Reading + Correction Factor

Margin = Result - Limit

Remark Peak = Result(PK) - Limit(AV)

Remark AVG = Result(AV) - Limit(AV)



Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/04/02
Model	WMP-N06	Test By	Gundam Lin
Test Mode	IEEE 802.11n HT40 TX (CH Low)	TEMP & Humidity	21.6°C, 50%

Horizontal									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1365.50	57.73	---	-13.86	43.87	---	74.00	54.00	-10.13	Peak
1595.00	59.37	---	-12.76	46.61	---	74.00	54.00	-7.39	Peak
3227.00	55.00	---	-7.78	47.22	---	74.00	54.00	-6.78	Peak
4978.00	52.01	---	-4.16	47.85	---	74.00	54.00	-6.15	Peak
6193.50	51.39	---	-2.52	48.88	---	74.00	54.00	-5.12	Peak

Vertical									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1357.00	58.58	---	-13.88	44.70	---	74.00	54.00	-9.30	Peak
1595.00	62.97	---	-12.76	50.21	---	74.00	54.00	-3.79	Peak
3227.00	55.59	---	-7.78	47.82	---	74.00	54.00	-6.18	Peak
4986.50	52.13	---	-4.14	48.00	---	74.00	54.00	-6.00	Peak
8760.50	49.05	---	1.53	50.58	---	74.00	54.00	-3.42	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. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/04/02
Model	WMP-N06	Test By	Gundam Lin
Test Mode	IEEE 802.11n HT40 TX (CH Middle)	TEMP & Humidity	21.6°C, 50%

Horizontal									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1382.50	57.71	---	-13.82	43.89	---	74.00	54.00	-10.11	Peak
1595.00	58.24	---	-12.76	45.48	---	74.00	54.00	-8.52	Peak
5522.00	51.40	---	-3.26	48.14	---	74.00	54.00	-5.86	Peak
9746.50	48.09	---	2.66	50.75	---	74.00	54.00	-3.25	Peak
Vertical									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1357.00	61.22	---	-13.88	47.34	---	74.00	54.00	-6.66	Peak
1595.00	68.21	52.23	-12.76	55.45	39.47	74.00	54.00	-14.53	AVG
3252.50	54.49	---	-7.74	46.75	---	74.00	54.00	-7.25	Peak
6958.50	49.57	---	-1.15	48.42	---	74.00	54.00	-5.58	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. Result = Reading + Correction Factor

Margin = Result - Limit

Remark Peak = Result(PK) - Limit(AV)

Remark AVG = Result(AV) - Limit(AV)



Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/04/02
Model	WMP-N06	Test By	Gundam Lin
Test Mode	IEEE 802.11n HT40 TX (CH High)	TEMP & Humidity	21.6°C, 50%

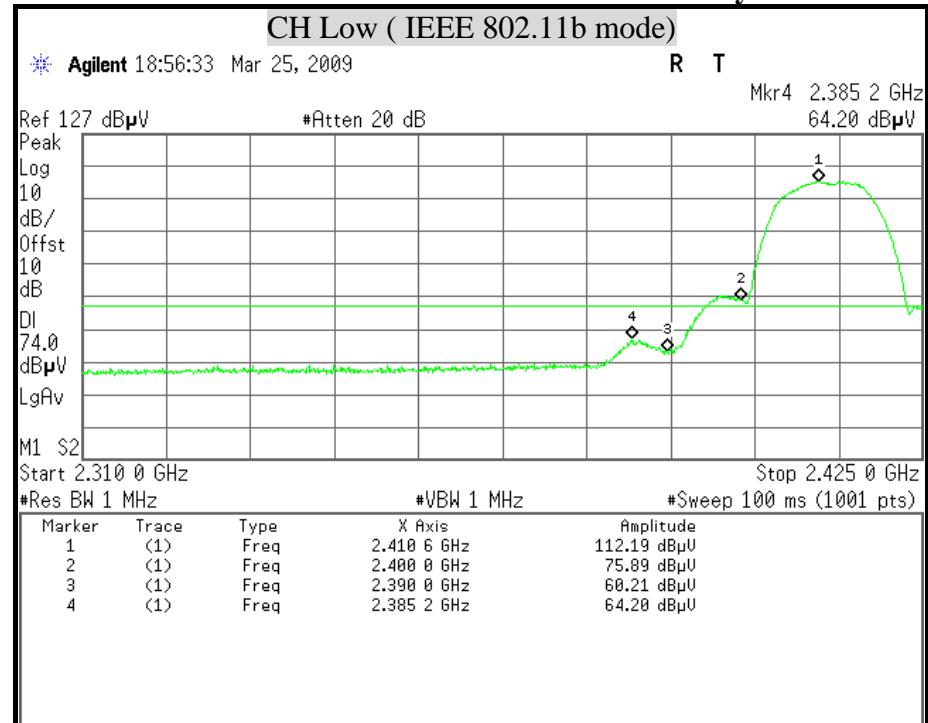
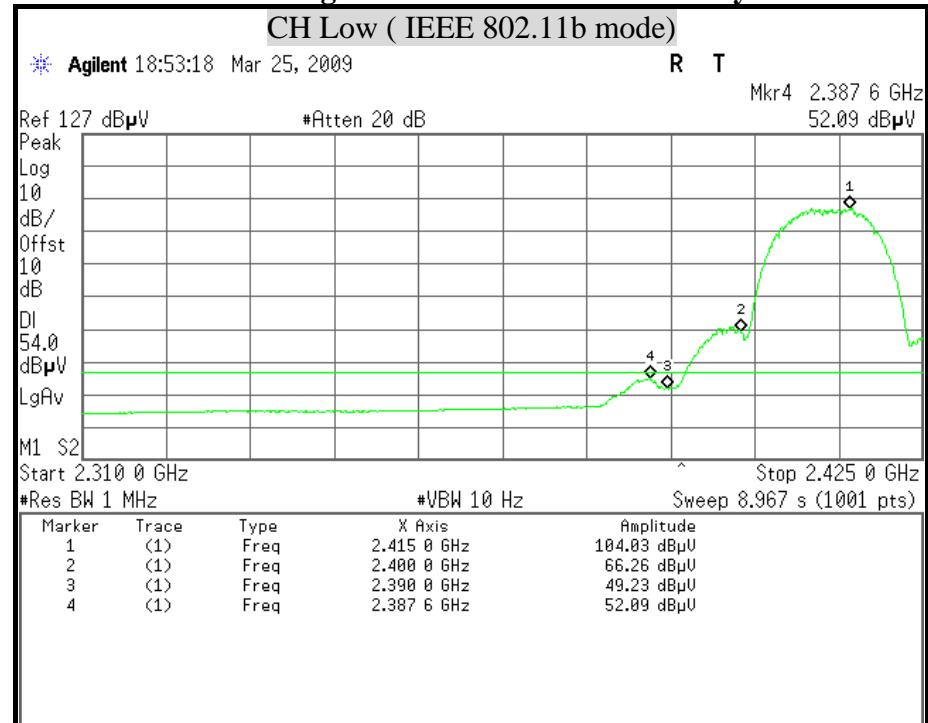
Horizontal									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1391.00	58.88	---	-13.80	45.08	---	74.00	54.00	-8.92	Peak
1595.00	59.48	---	-12.76	46.72	---	74.00	54.00	-7.28	Peak
2751.00	54.17	---	-8.48	45.69	---	74.00	54.00	-8.31	Peak
9330.00	49.69	---	2.20	51.88	---	74.00	54.00	-2.12	Peak
10129.00	51.07	36.71	3.11	54.18	39.82	74.00	54.00	-14.18	AVG

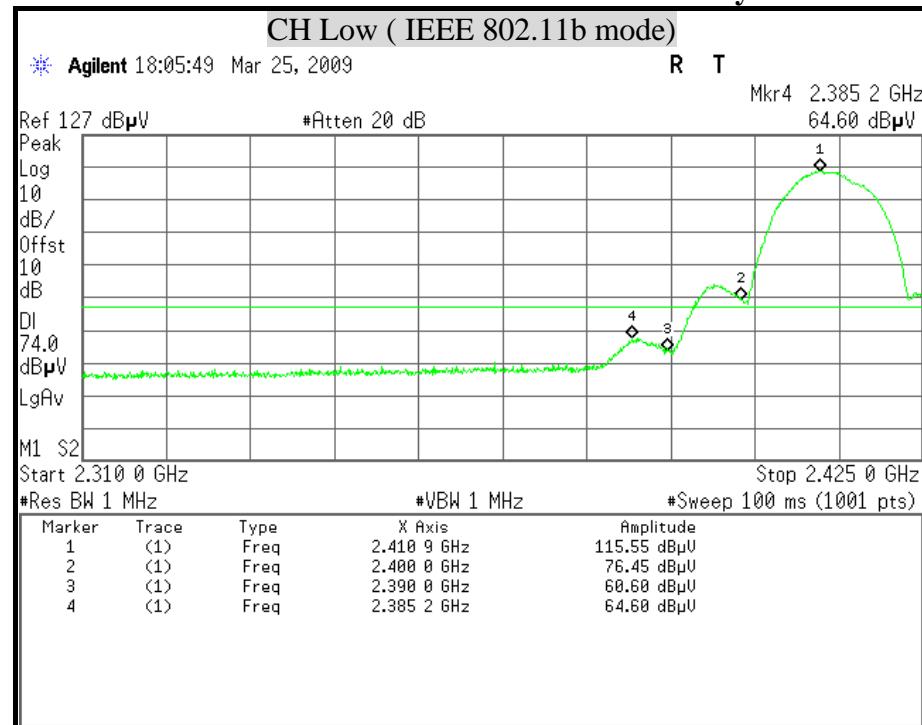
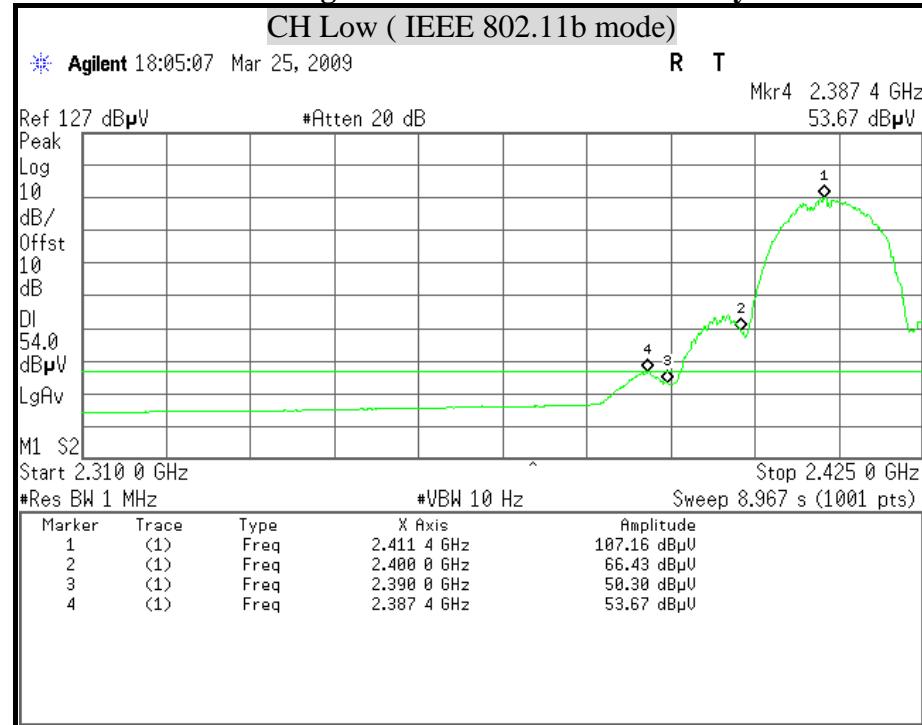
Vertical									
Frequency (MHz)	Reading-PK (dB μ V)	Reading-AV (dB μ V)	Correction Factor (dB/m)	Result-PK (dB μ V/m)	Result-AV (dB μ V/m)	Limit-PK (dB μ V/m)	Limit-AV (dB μ V/m)	Margin (dB)	Remark
1357.00	60.20	---	-13.88	46.31	---	74.00	54.00	-7.69	Peak
1595.00	63.78	---	-12.76	51.02	---	74.00	54.00	-2.98	Peak
3269.50	54.58	---	-7.71	46.86	---	74.00	54.00	-7.14	Peak
5037.50	51.62	---	-4.04	47.57	---	74.00	54.00	-6.43	Peak
7451.50	50.34	---	-0.74	49.61	---	74.00	54.00	-4.39	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. 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**

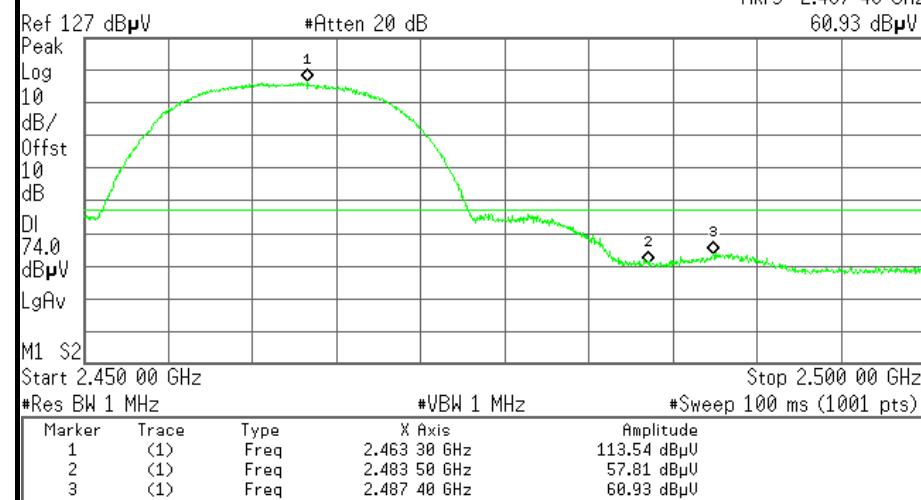
Detector mode : Peak**Polarity : Vertical****Detector mode : Average****Polarity : Vertical**

Detector mode : Peak**Polarity : Horizontal**

CH High (IEEE 802.11b mode)

Agilent 19:40:14 Mar 25, 2009

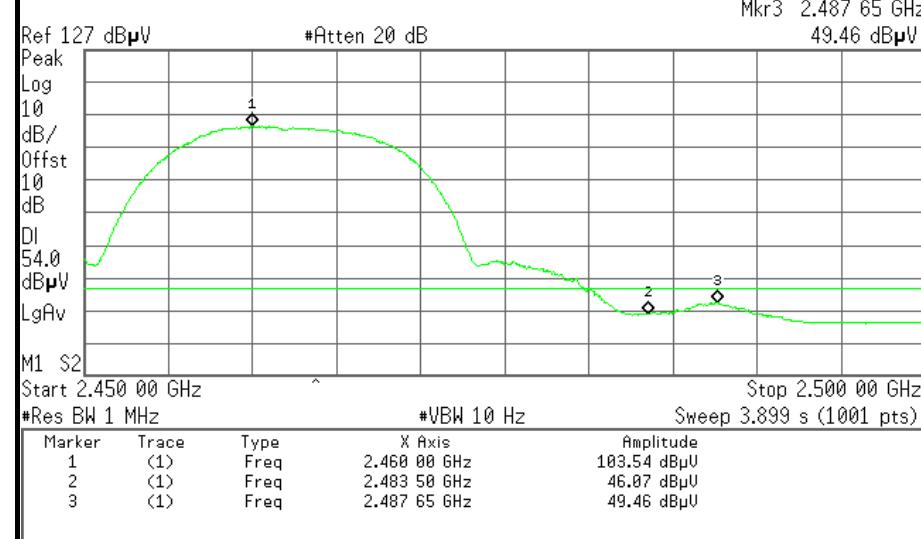
R T

Mkr3 2.487 40 GHz
60.93 dB μ V**Detector mode : Average****Polarity : Horizontal**

CH High (IEEE 802.11b mode)

Agilent 19:37:23 Mar 25, 2009

R T

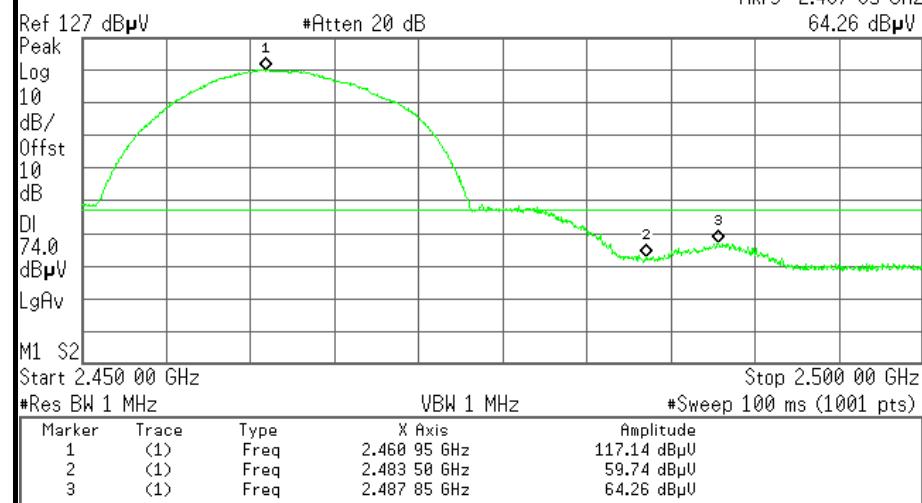
Mkr3 2.487 65 GHz
49.46 dB μ V

Detector mode : Peak**Polarity : Vertical**

CH High (IEEE 802.11b mode)

Agilent 19:27:08 Mar 25, 2009

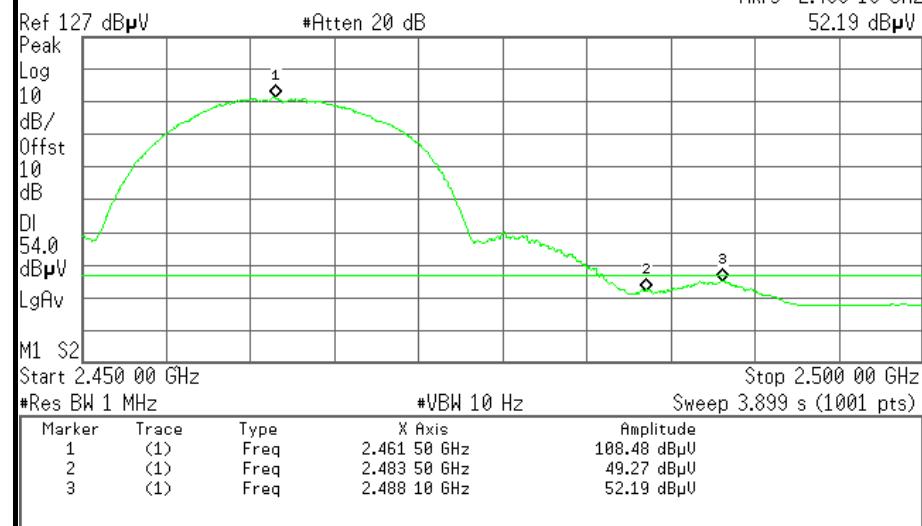
R T

Mkr3 2.487 85 GHz
64.26 dB μ V**Detector mode : Average****Polarity : Vertical**

CH High (IEEE 802.11b mode)

Agilent 19:26:17 Mar 25, 2009

R T

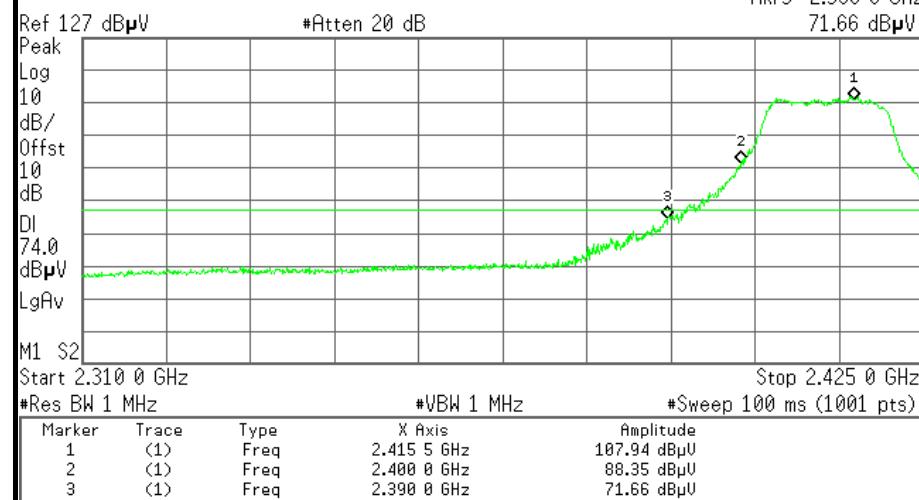
Mkr3 2.488 10 GHz
52.19 dB μ V

Detector mode : Peak**Polarity : Horizontal**

CH Low (IEEE 802.11g mode)

Agilent 20:47:16 Mar 25, 2009

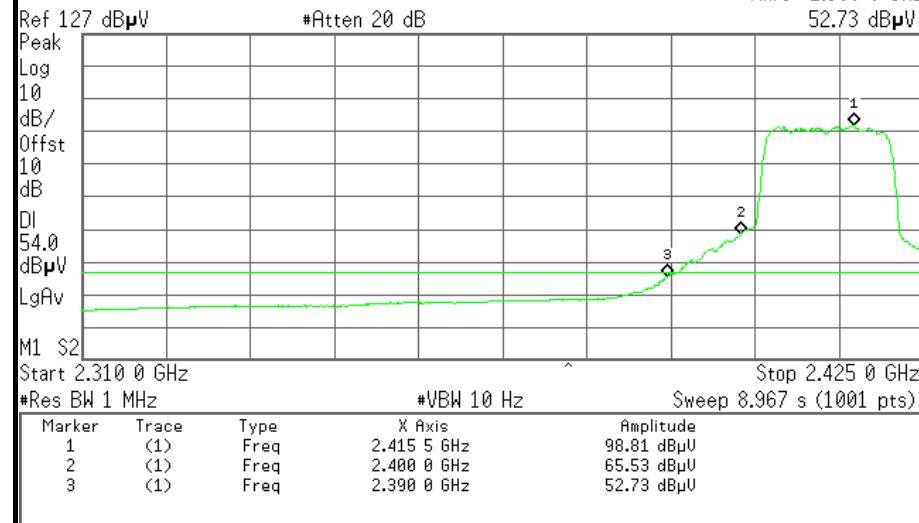
R T

Mkr3 2.390 0 GHz
71.66 dB μ V**Detector mode : Average****Polarity : Horizontal**

CH Low (IEEE 802.11g mode)

Agilent 20:45:36 Mar 25, 2009

R T

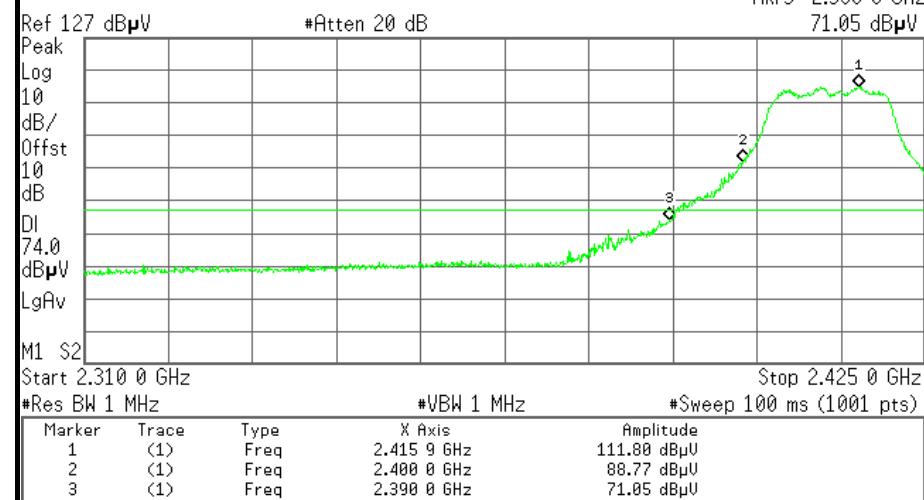
Mkr3 2.390 0 GHz
52.73 dB μ V

Detector mode : Peak**Polarity : Vertical**

CH Low (IEEE 802.11g mode)

Agilent 20:39:33 Mar 25, 2009

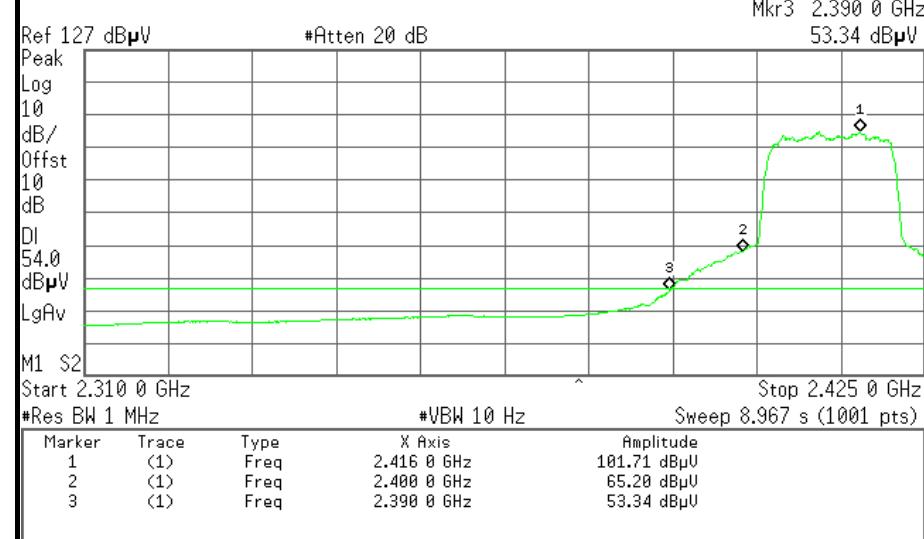
R T

Mkr3 2.390 0 GHz
71.05 dB μ V**Detector mode : Average****Polarity : Vertical**

CH Low (IEEE 802.11g mode)

Agilent 20:36:03 Mar 25, 2009

R T

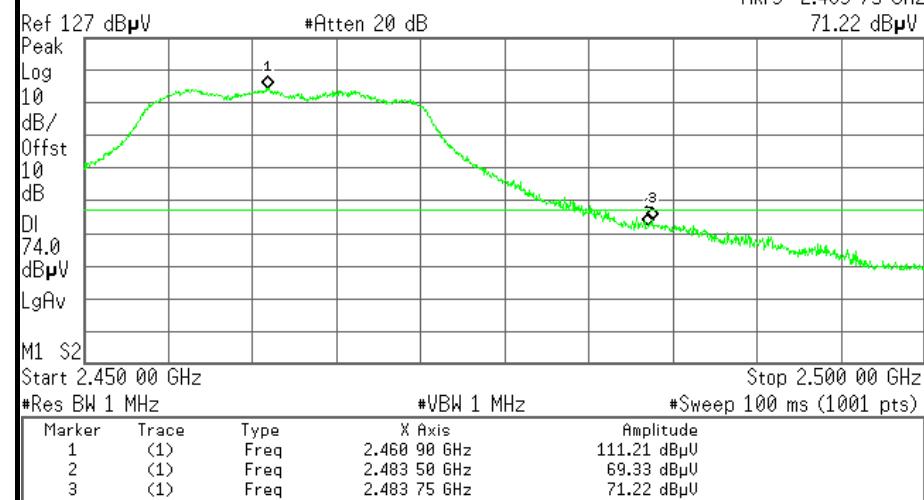
Mkr3 2.390 0 GHz
53.34 dB μ V

Detector mode : Peak**Polarity : Horizontal**

CH High (IEEE 802.11g mode)

Agilent 20:19:40 Mar 25, 2009

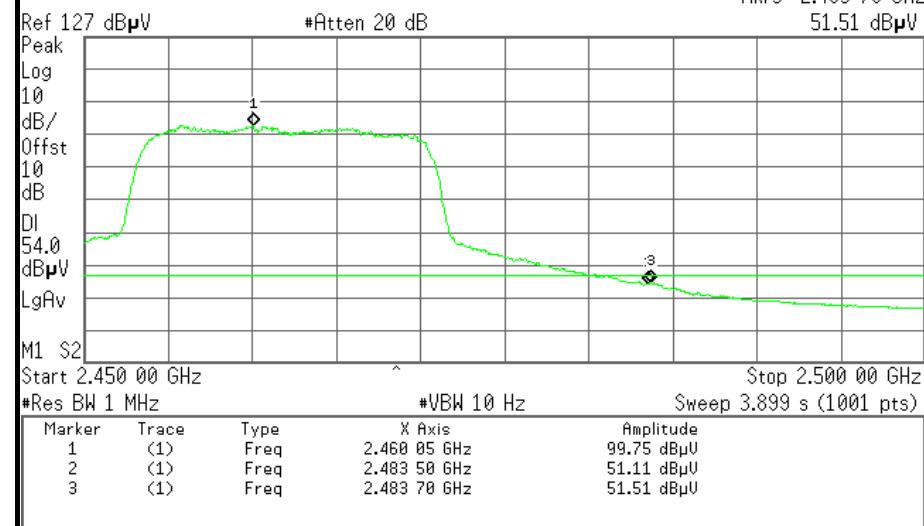
R T

Mkr3 2.483 75 GHz
71.22 dB μ V**Detector mode : Average****Polarity : Horizontal**

CH High (IEEE 802.11g mode)

Agilent 20:17:40 Mar 25, 2009

R T

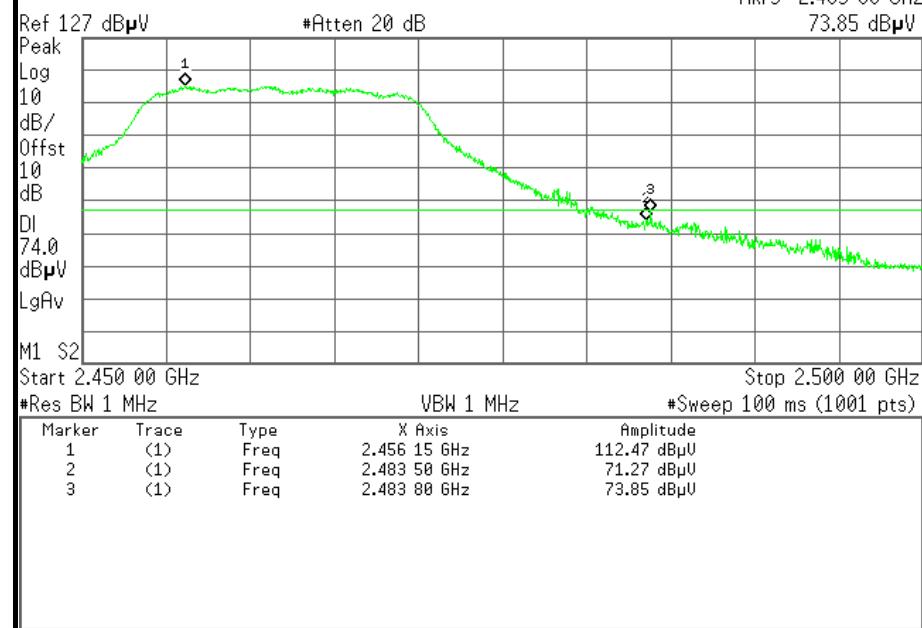
Mkr3 2.483 70 GHz
51.51 dB μ V

Detector mode : Peak**Polarity : Vertical**

CH High (IEEE 802.11g mode)

Agilent 20:07:09 Mar 25, 2009

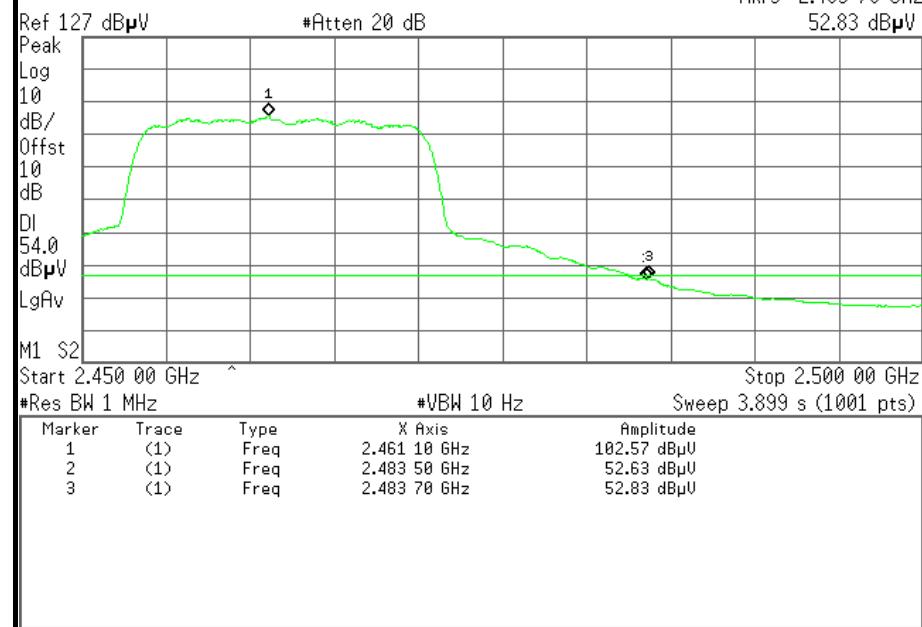
R T

Mkr3 2.483 80 GHz
73.85 dB μ V**Detector mode : Average****Polarity : Vertical**

CH High (IEEE 802.11g mode)

Agilent 20:10:27 Mar 25, 2009

R T

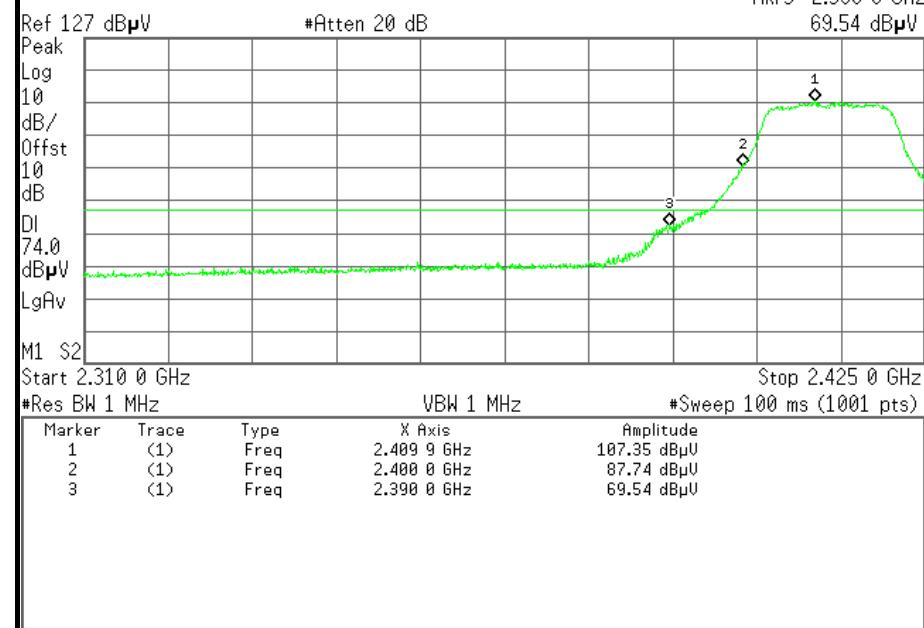
Mkr3 2.483 70 GHz
52.83 dB μ V

Detector mode : Peak**Polarity : Horizontal**

CH Low (IEEE 802.11n HT20 mode)

Agilent 21:18:57 Mar 25, 2009

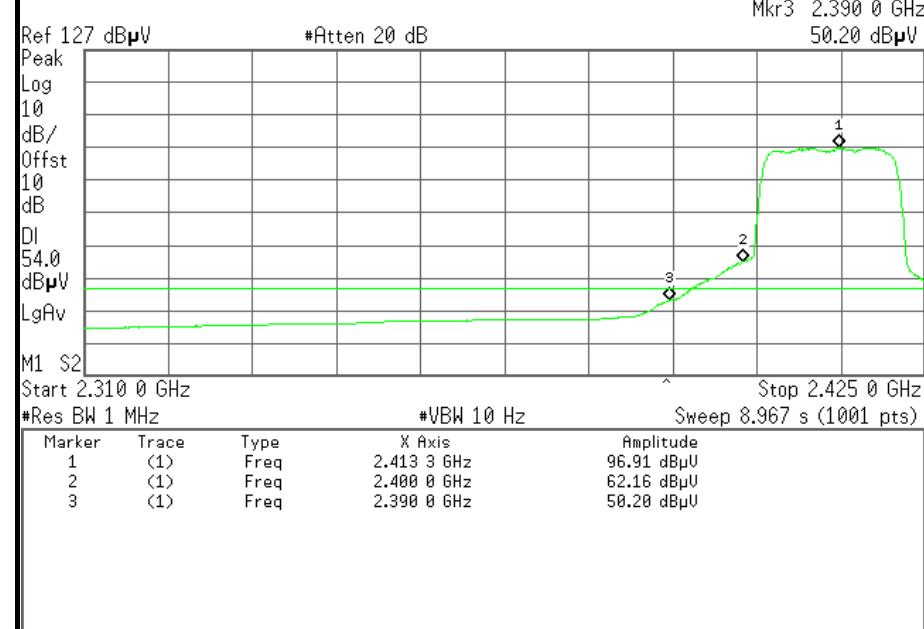
R T

Mkr3 2.390 0 GHz
69.54 dB μ V**Detector mode : Average****Polarity : Horizontal**

CH Low (IEEE 802.11n HT20 mode)

Agilent 21:16:10 Mar 25, 2009

R T

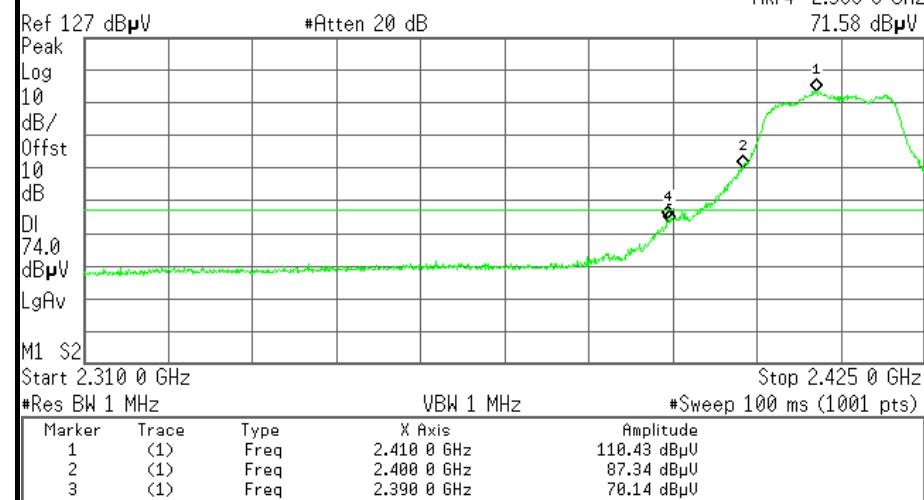
Mkr3 2.390 0 GHz
50.20 dB μ V

Detector mode : Peak**Polarity : Vertical**

CH Low (IEEE 802.11n HT20 mode)

Agilent 21:03:46 Mar 25, 2009

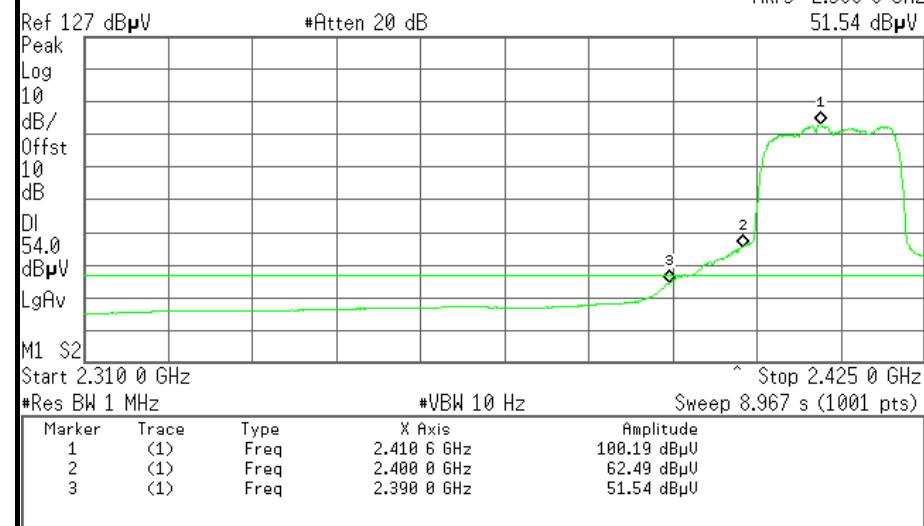
R T

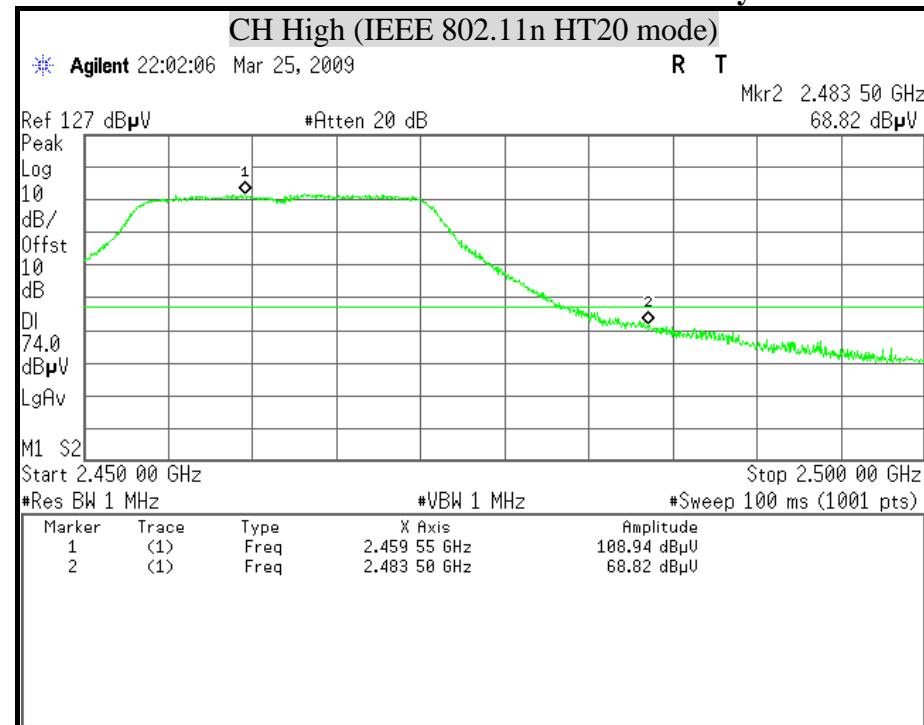
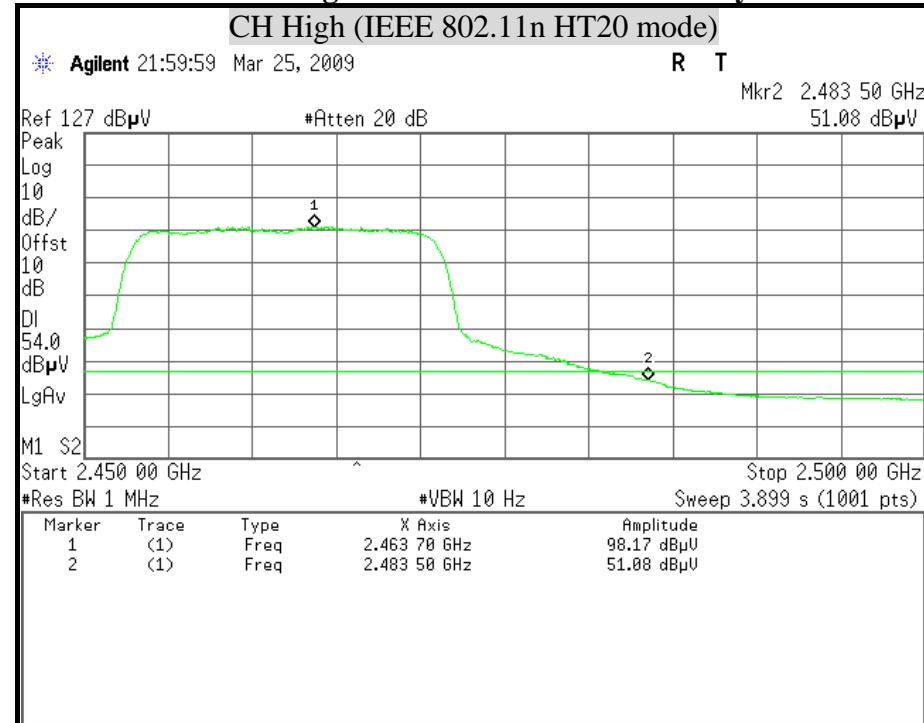
Mkr4 2.389 8 GHz
71.58 dB μ V**Detector mode : Average****Polarity : Vertical**

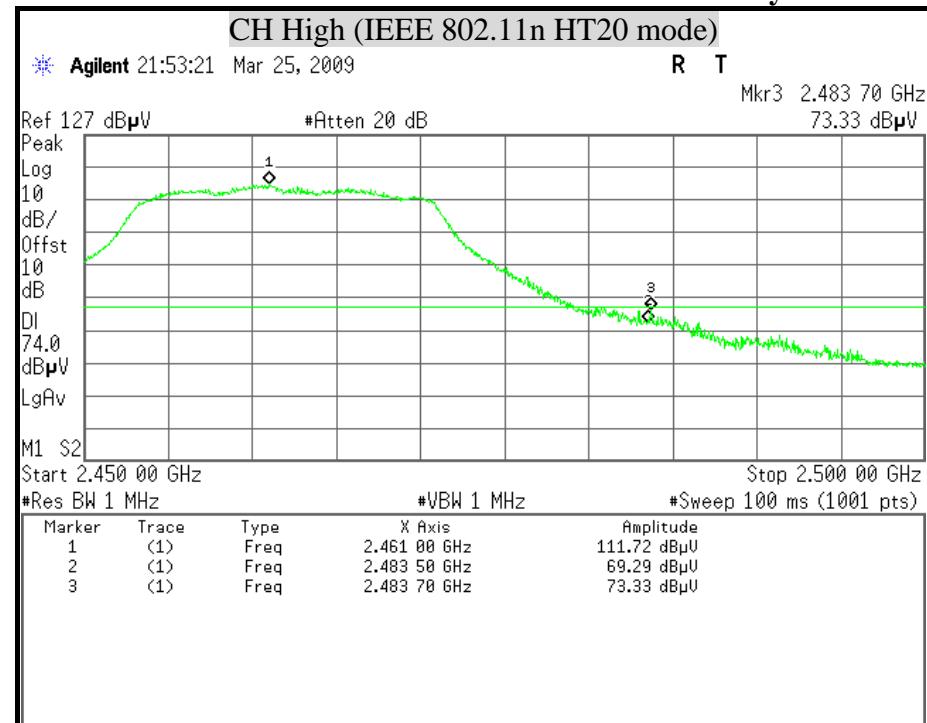
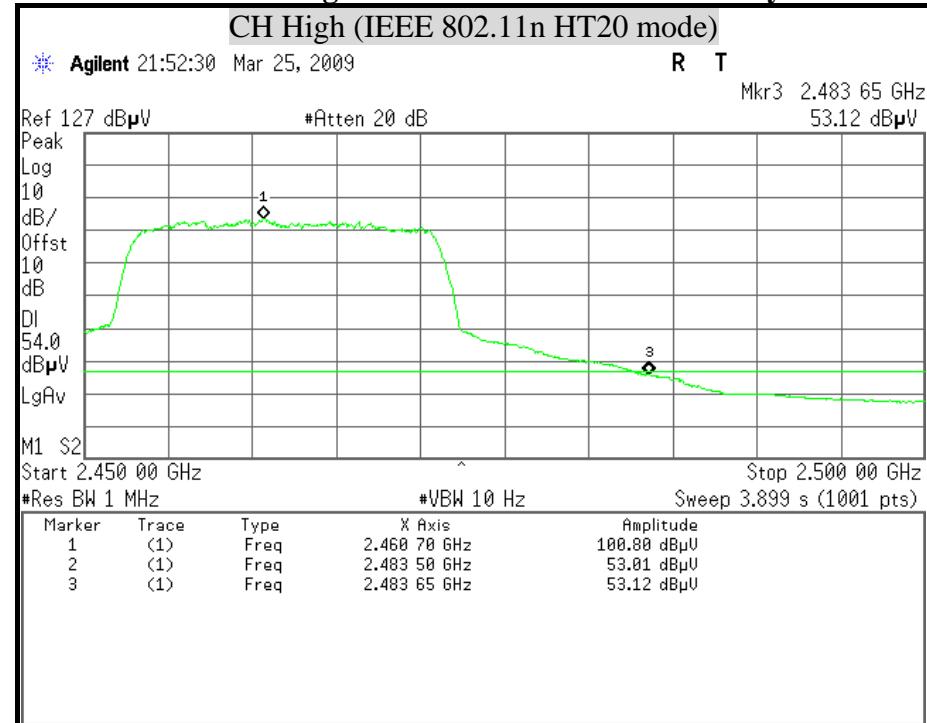
CH Low (IEEE 802.11n HT20 mode)

Agilent 20:59:46 Mar 25, 2009

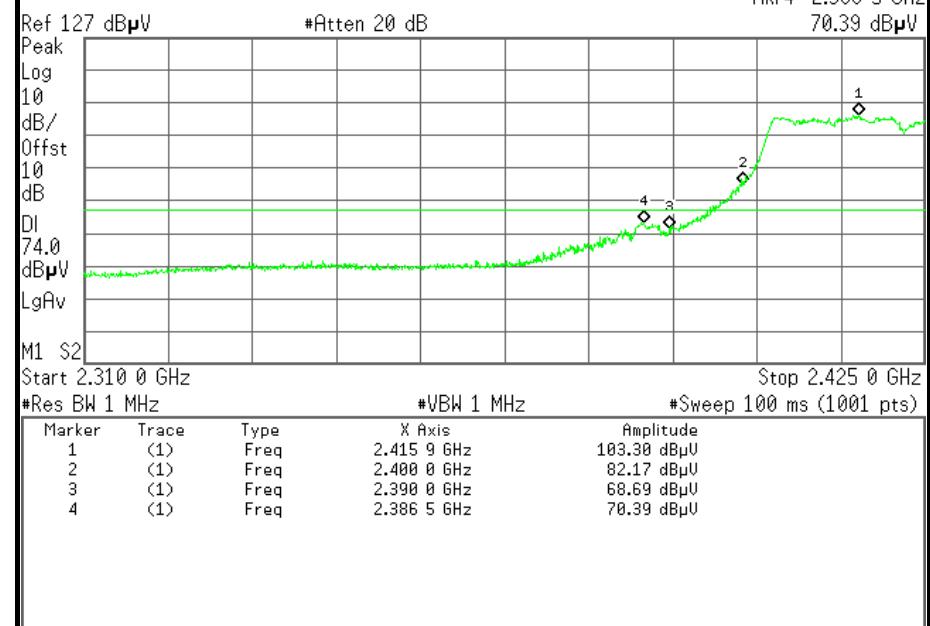
R T

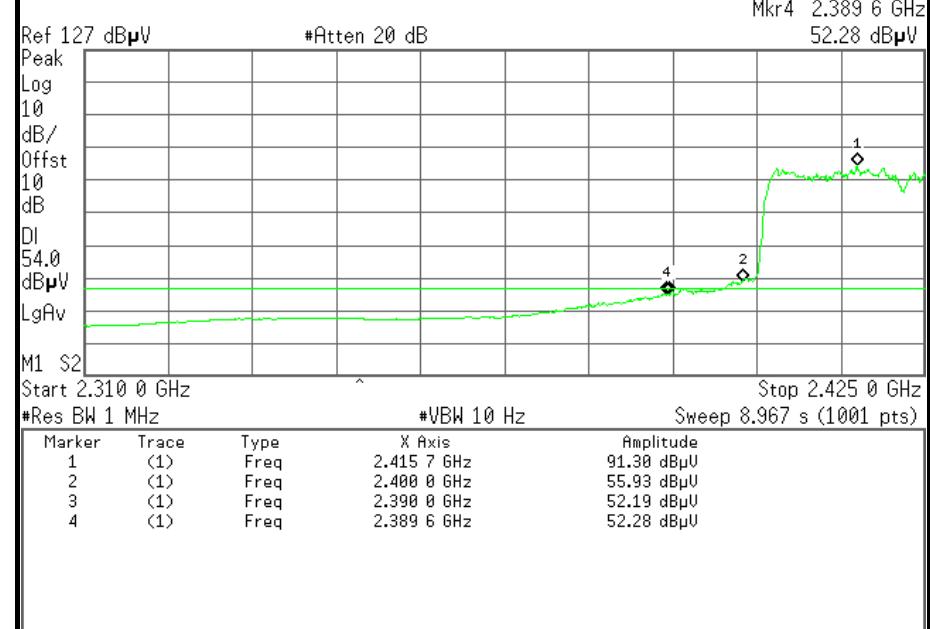
Mkr3 2.390 0 GHz
51.54 dB μ V

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
CH Low (IEEE 802.11n HT40 mode)
Agilent 18:10:29 Mar 27, 2009
T

 Mkr4 2.386 5 GHz
 70.39 dB μ V

Detector mode : Average
Polarity : Horizontal
CH Low (IEEE 802.11n HT40 mode)
Agilent 18:08:40 Mar 27, 2009
T

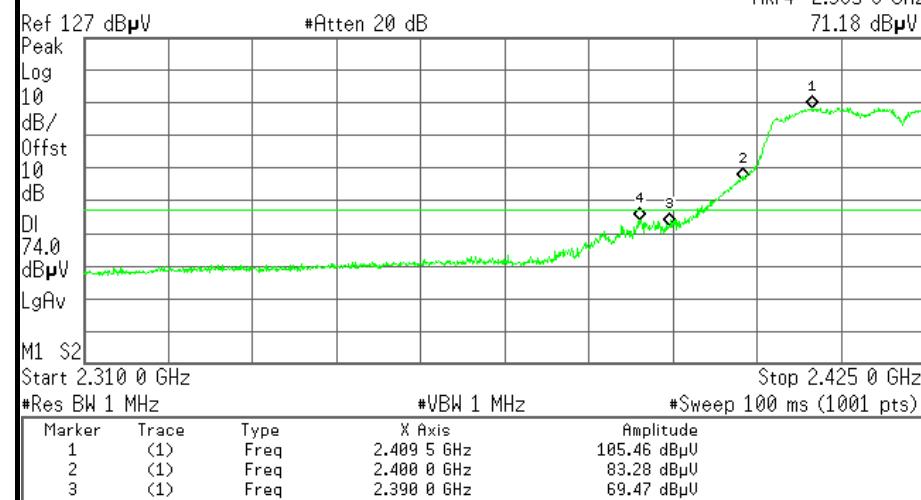
 Mkr4 2.389 6 GHz
 52.28 dB μ V


Detector mode : Peak**Polarity : Vertical**

CH Low (IEEE 802.11n HT40 mode)

Agilent 18:00:01 Mar 27, 2009

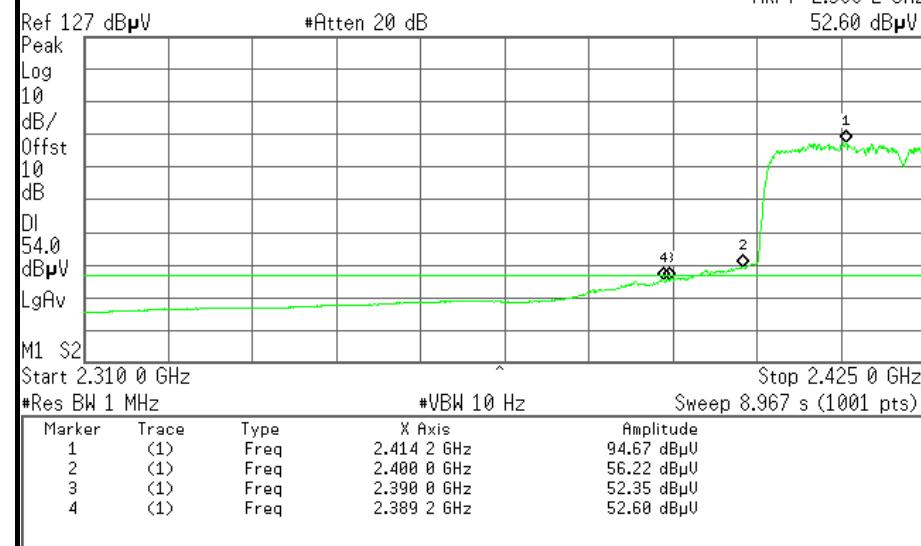
T

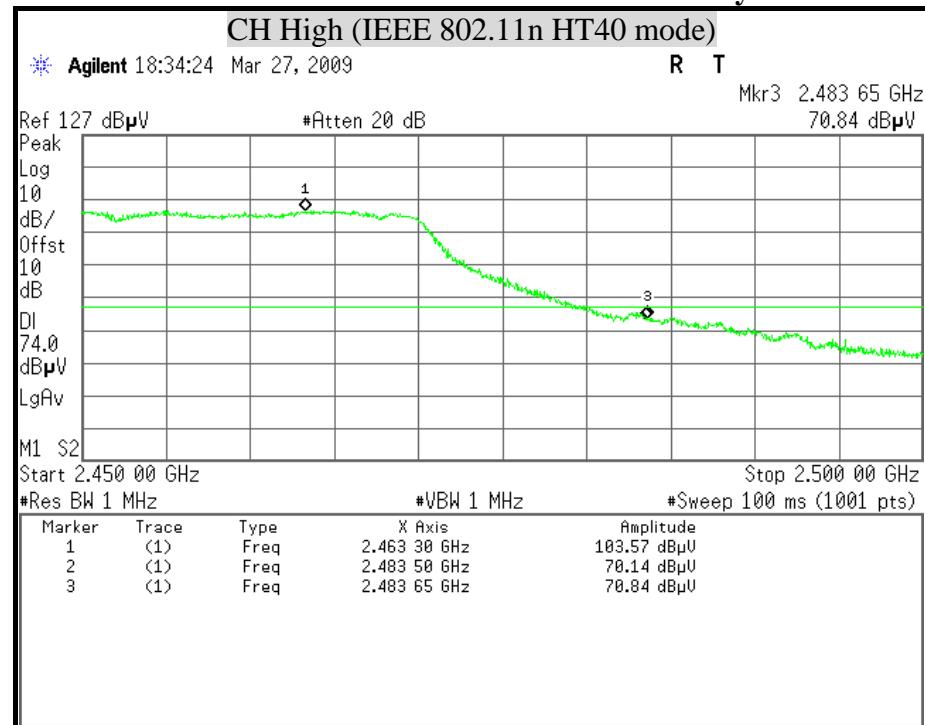
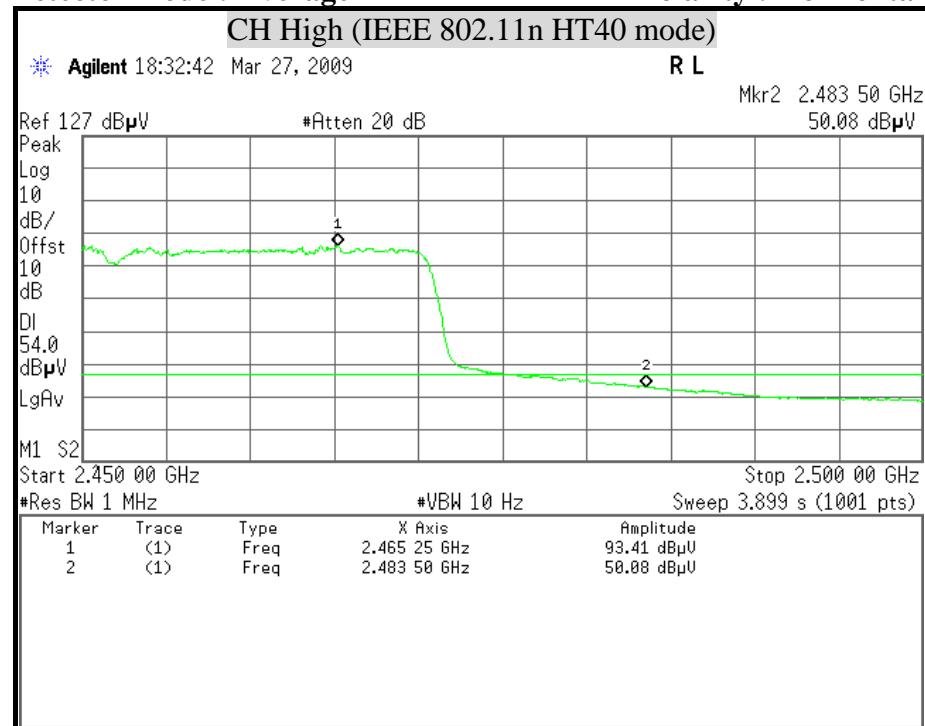
Mkr4 2.385 9 GHz
71.18 dB μ V**Detector mode : Average****Polarity : Vertical**

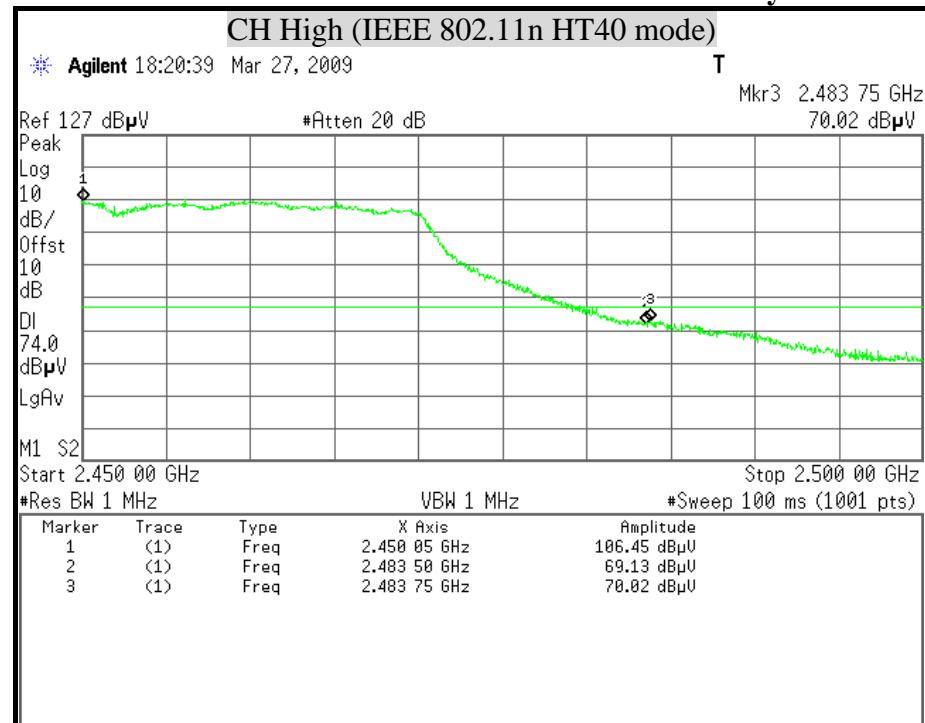
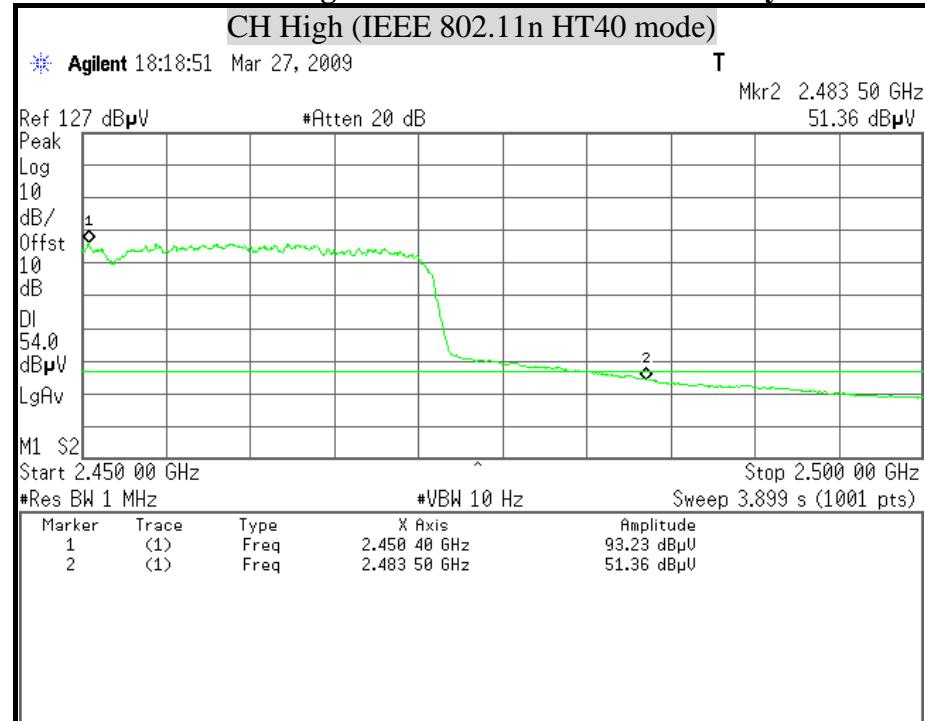
CH Low (IEEE 802.11n HT40 mode)

Agilent 17:58:20 Mar 27, 2009

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Mkr4 2.389 2 GHz
52.60 dB μ V

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.

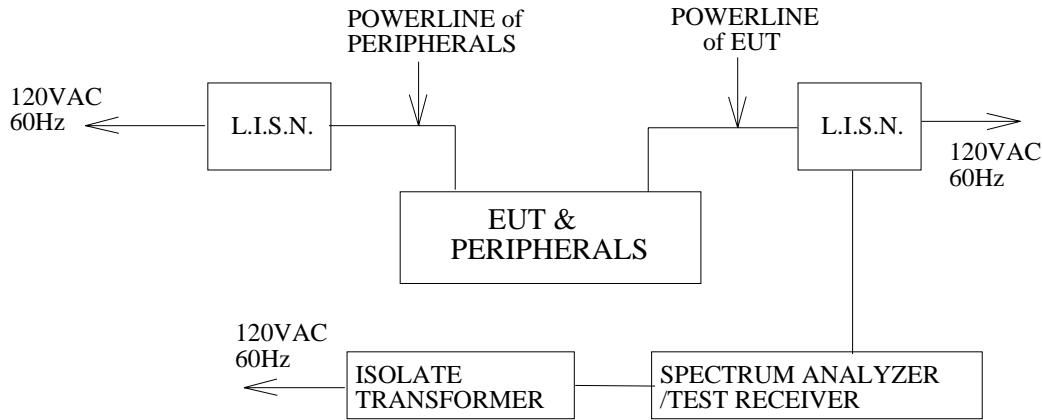
Frequency of Emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.5 - 5	56	46
5 - 30	60	50

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
L.I.S.N	SCHWARZBECK	NSLK 8127	8127-465	08/14/2009
L.I.S.N	SCHWARZBECK	NSLK 8127	8127-473	10/13/2009
TEST RECEIVER	R & S	ESHS30	838550/003	02/03/2010
PULSE LIMIT	R & S	ESH3-Z2	100117	09/24/2009
N TYPE COAXIAL CABLE	BELDEN	8268 M17/164	003	09/14/2009

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.

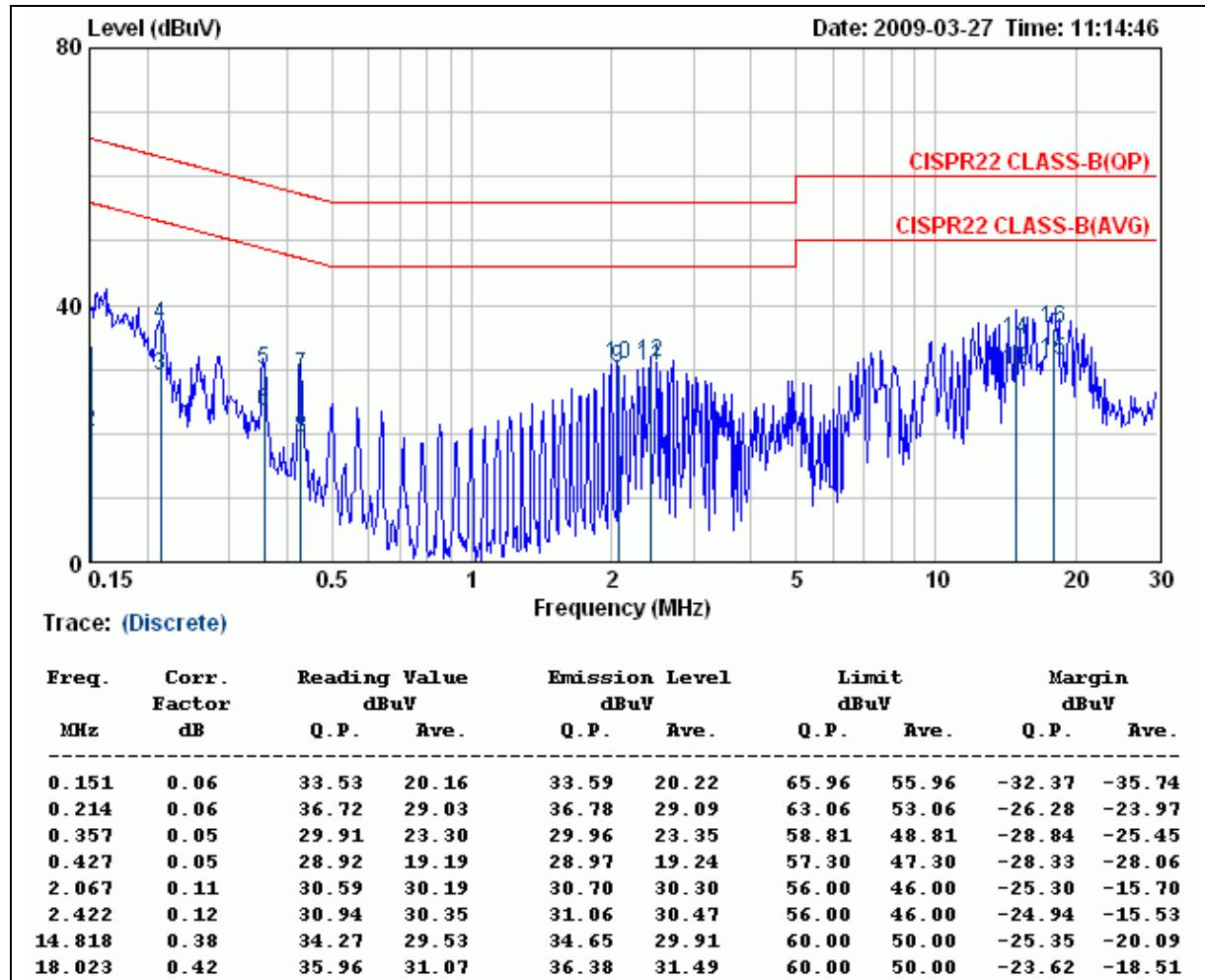
Line conducted data is recorded for both NEUTRAL and LINE.

TEST RESULTS

No non-compliance noted

**CONDUCTED RF VOLTAGE MEASUREMENT**

Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/03/27
Model Name	WMP-N06	Test By	Gundam Lin
Test Mode	Normal operating (worst case)	TEMP & Humidity	23.6°C, 67%

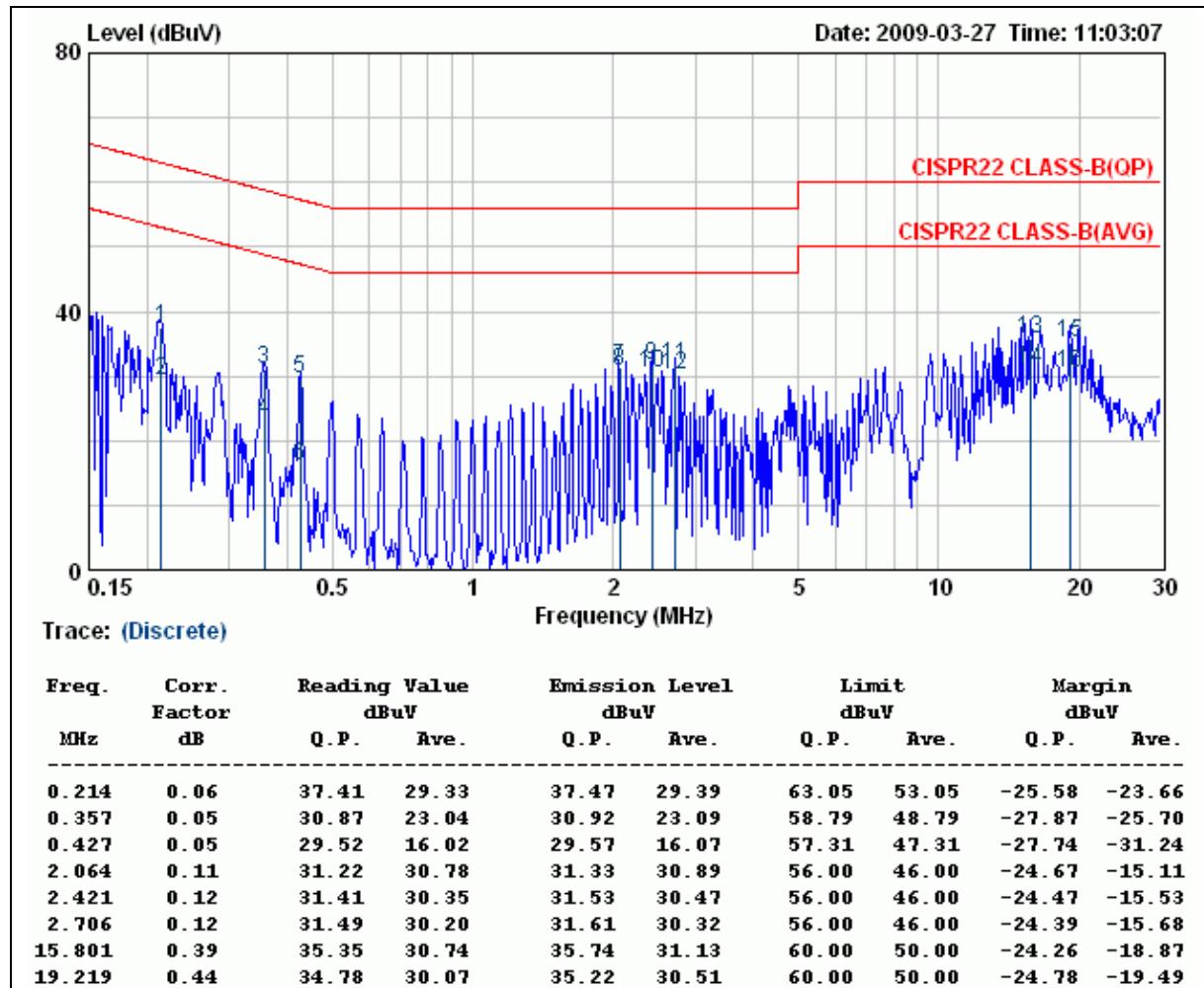
LINE**Remark:**

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



Product Name	802.11 b/g MIMO Mini-PCI Card	Test Date	2009/03/27
Model Name	WMP-N06	Test By	Gundam Lin
Test Mode	Normal operating (worst case)	TEMP & HUMIDITY	23.6 °C, 67%

NEUTRAL



Remark:

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