



**FCC CFR47 PART 15 SUBPART C
CERTIFICATION
TEST REPORT**

FOR

2x2 MiniPCI MIMO RoHS RADIO MODULE

MODEL NUMBER: AGN3022MP-11

FCC ID: SA3-AGN3022MP1100

REPORT NUMBER: 06U10181-1B

ISSUE DATE: APRIL 26, 2006

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NVLAP[®]
LAB CODE:200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	4/18/2006	Initial Issue	Alvin Ilarina
B	4/26/2006	Revised PPSD plots	Alvin Ilarina

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: AIRGO NETWORKS, INC.
900 ARASTADERO RD.
PALO ALTO, CA 94304, USA

EUT DESCRIPTION: 2x2 MiniPCI MIMO RoHS RADIO MODULE

MODEL: AGN3022MP-11

SERIAL NUMBER: 1751

DATE TESTED: April 4 – 17, 2006

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



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EMC SUPERVISOR
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EMC ENGINEER
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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

4. CALIBRATION AND UNCERTAINTY

4.1. 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.

4.2. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11b/g 2X2 mini PCI radio module transceiver.

The radio module is manufactured by Airgo Networks.

All data in this report is applicable to the model number documented in Section 1 above.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

2400 to 2483.5 MHz Authorized Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	25.53	357.27
2412 - 2462	802.11g	25.22	332.66
2432-2442	SIMO	20.10	102.33
2432-2442	MIMO	20.40	109.65

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes two whip or PC antennas in MIMO configuration, each with a maximum gain of 2 dBi.

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was Airgo PTT 2.1.0.155. The test software is capable of operating both chains simultaneously for MIMO and SIMO operation.

5.5. WORST-CASE CONFIGURATION AND MODE

EUT was inserted into a host laptop computer with software to control the operation of the EUT. EUT was tested for all four modes of operation, (802.11b, 802.11g, MIMO and SIMO).

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Remarks
Laptop Computer	Dell	Inspiron 1150	11915129989	N/A
AC/DC Adapter	Dell	PA-1900-02D	CN-09T215-71615-47I-7634	N/A

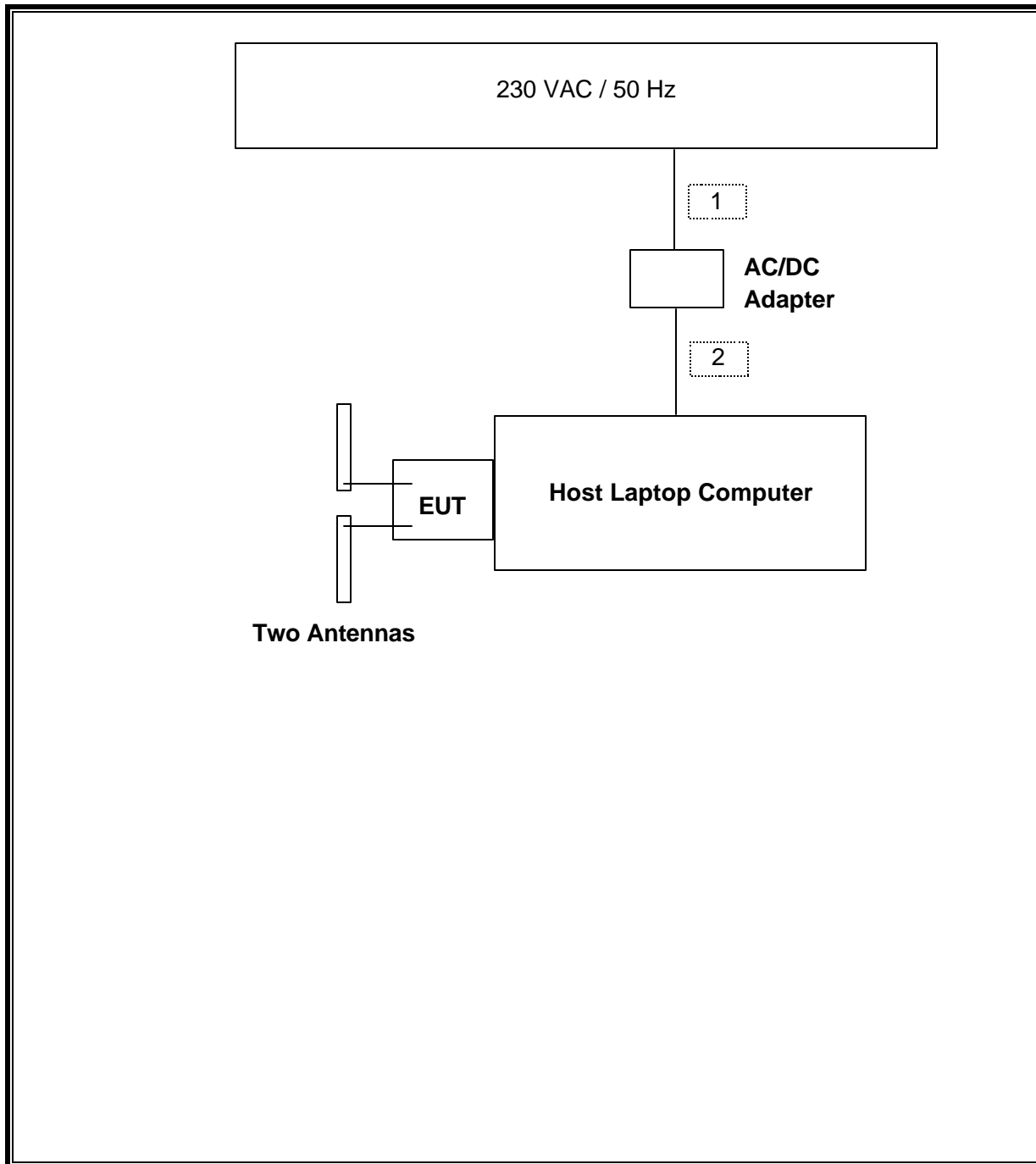
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	AC	Unshielded	0.5m	N/A
2	DC	1	DC	Unshielded	1m	N/A

TEST SETUP

The EUT is installed in a host laptop computer via a cardbus-to-miniPCI adapter / extension board during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent	E4446A	US42510266	10/19/2006
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	4/22/2006
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	9/3/2006
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	2/4/2007
RF Filter Section	HP	85420E	3705A00256	2/4/2007
Preamplifier, 1300 MHz	HP	8447D	1937A02062	1/23/2007
Preamplifier, 1 ~ 26 GHz	Miteq	NSP2600-SP	924342	9/2/2006
EMI Test Receiver	R & S	ESHS 20	827129/006	6/3/2006
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2006
Peak Power Meter	Agilent	E4416A	GB41291160	12/2/2007
Peak / Average Power Sensor	Agilent	E9327A	US40440755	12/2/2007
4.0 High Pass Filter	Micro Tronics	HPM13351	3	NCR

7. LIMITS AND RESULTS

7.1. CHANNEL TESTS FOR THE 2400 TO 2483.5 MHz BAND

7.1.1. 6 dB BANDWIDTH

LIMIT

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

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

No non-compliance noted:

TRANSMIT CHAIN 0

802.11b Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	11080	500	10580
Middle	2437	11170	500	10670
High	2462	11080	500	10580

802.11g Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	16000	500	15500
Middle	2437	15670	500	15170
High	2462	15170	500	14670

SIMO

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2432	30750	500	30250
High	2442	25750	500	25250

MIMO

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2432	27670	500	27170
High	2442	27750	500	27250

TRANSMIT CHAIN 1

802.11b Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	10250	500	9750
Middle	2437	10080	500	9580
High	2462	12080	500	11580

802.11g Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	15170	500	14670
Middle	2437	15250	500	14750
High	2462	15080	500	14580

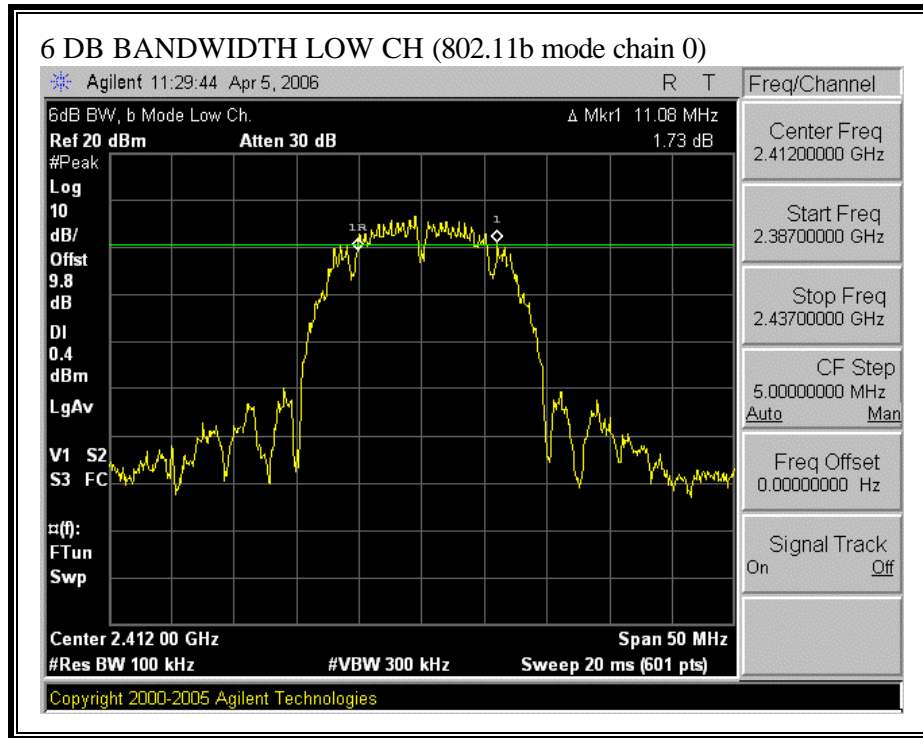
SIMO

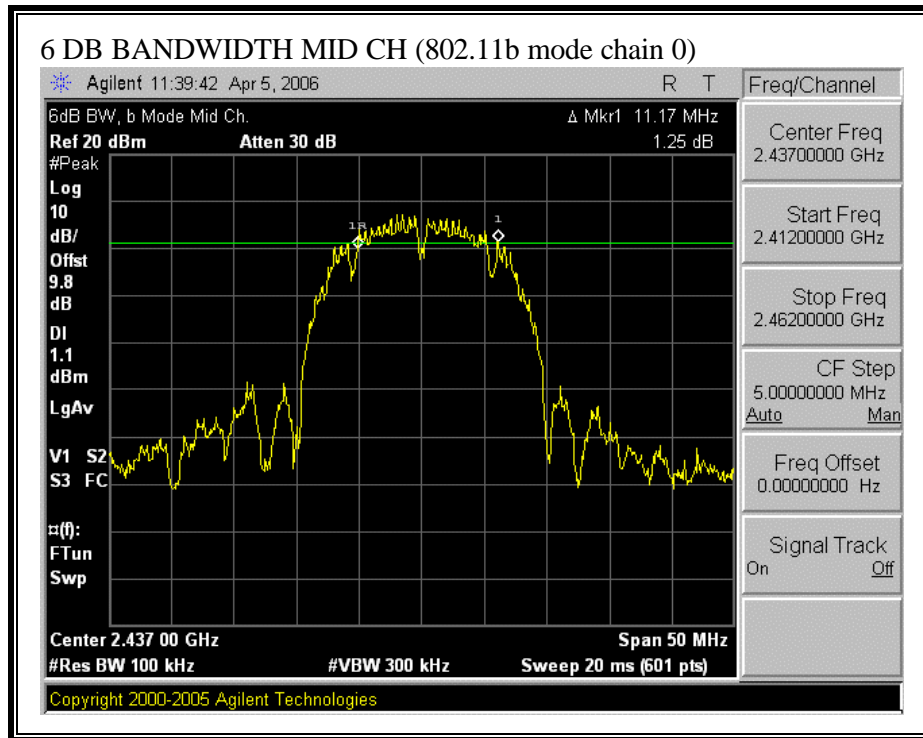
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2432	29420	500	28920
High	2442	28170	500	27670

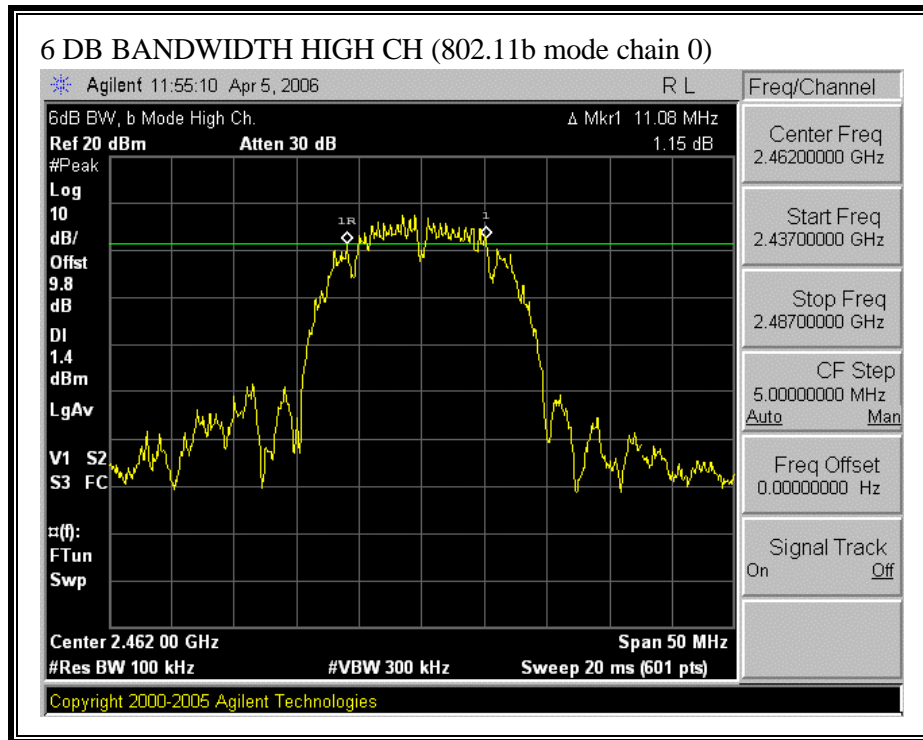
MIMO

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2432	25000	500	24500
High	2442	26170	500	25670

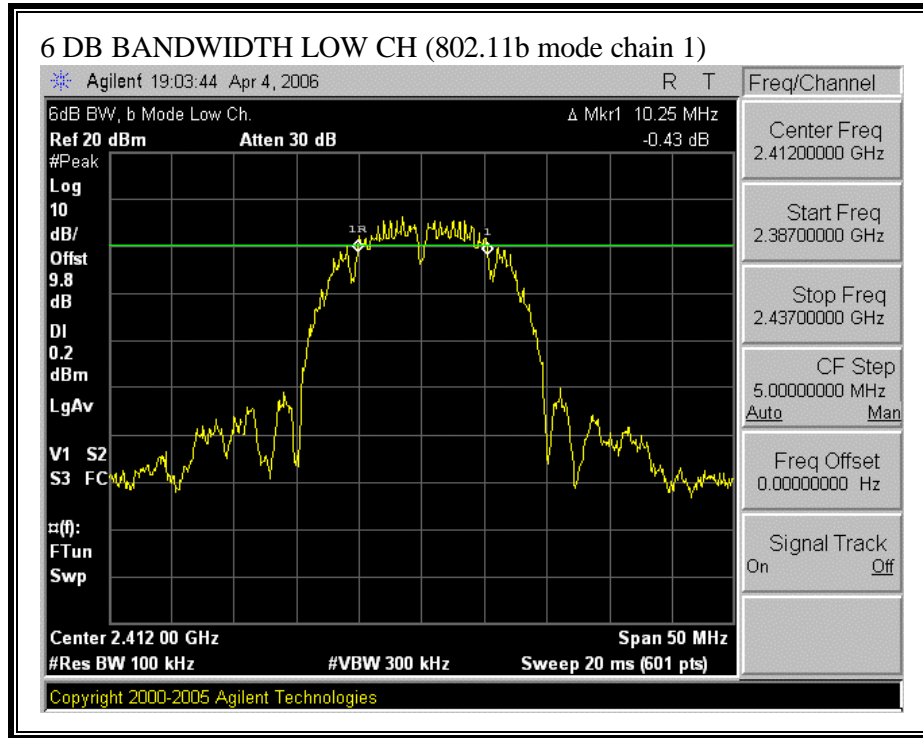
6 DB BANDWIDTH (802.11b MODE CHAIN 0)

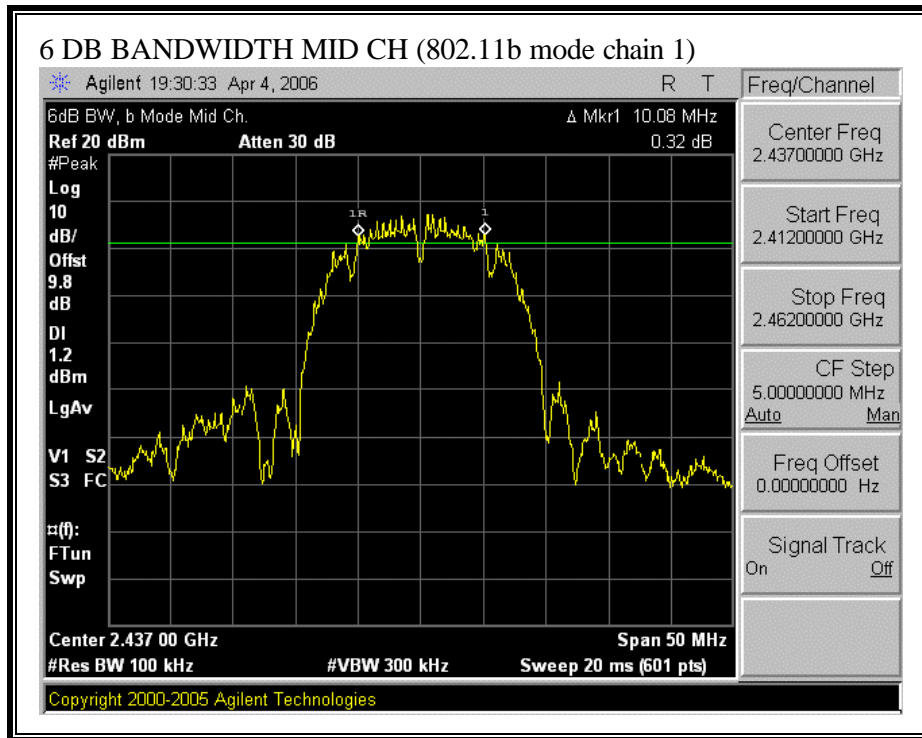


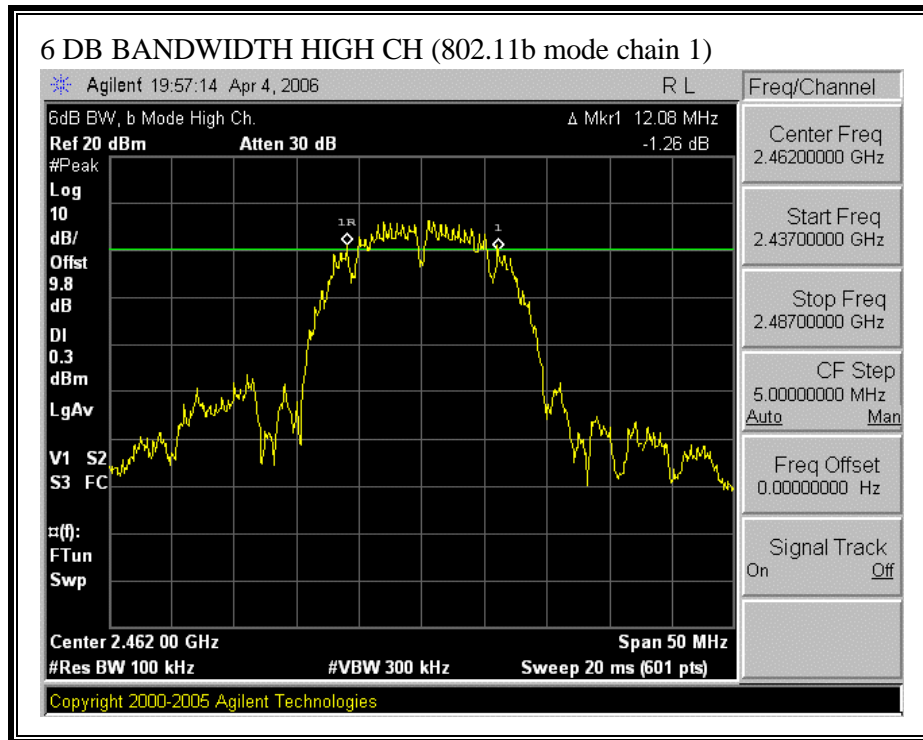




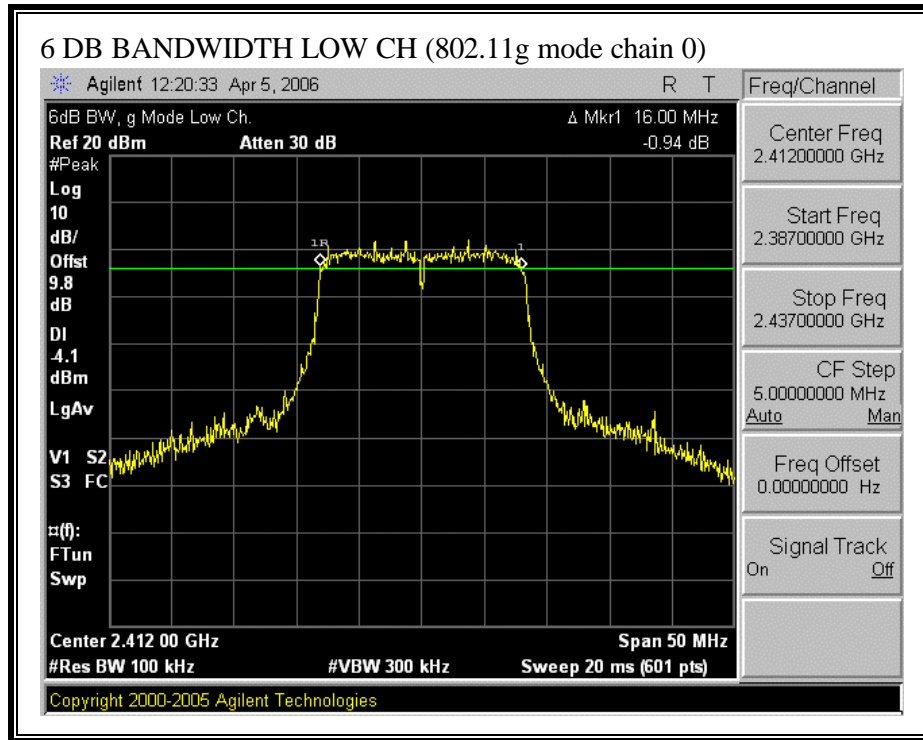
6 DB BANDWIDTH (802.11b MODE CHAIN 1)

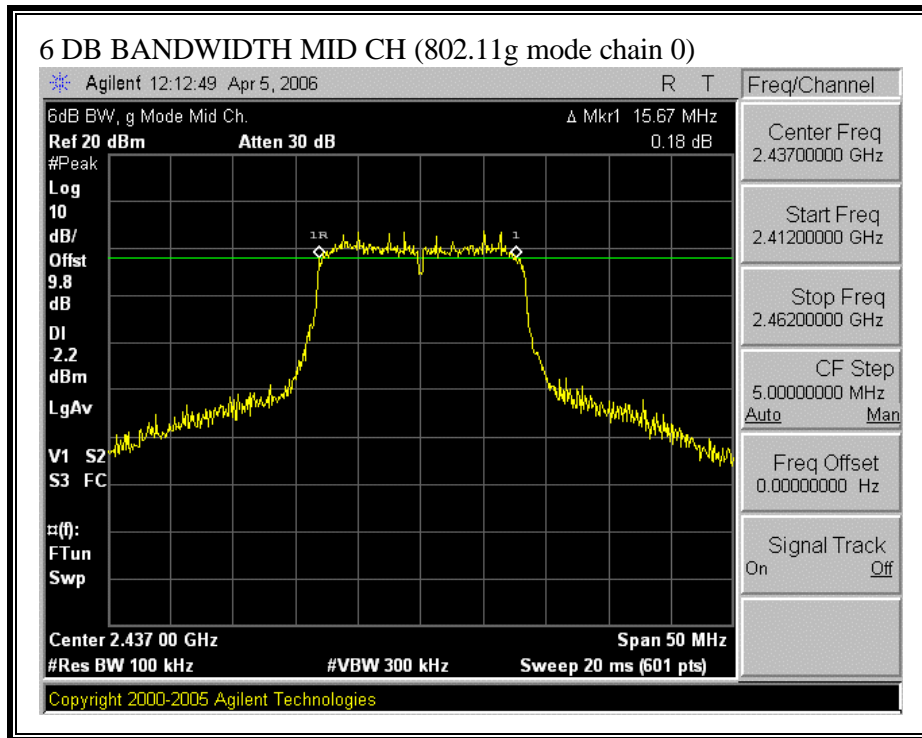


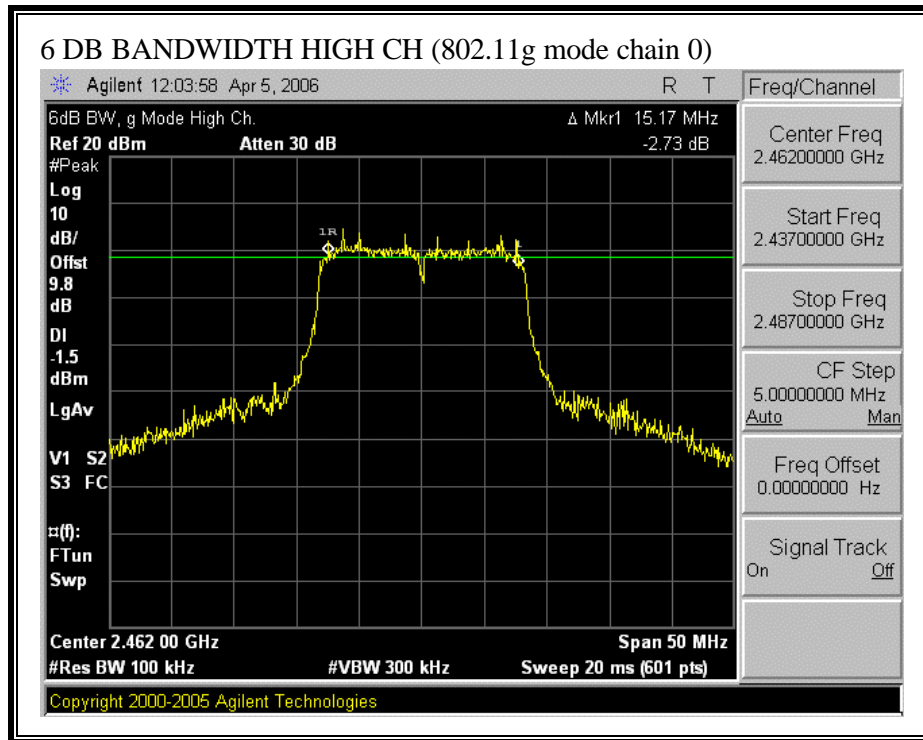




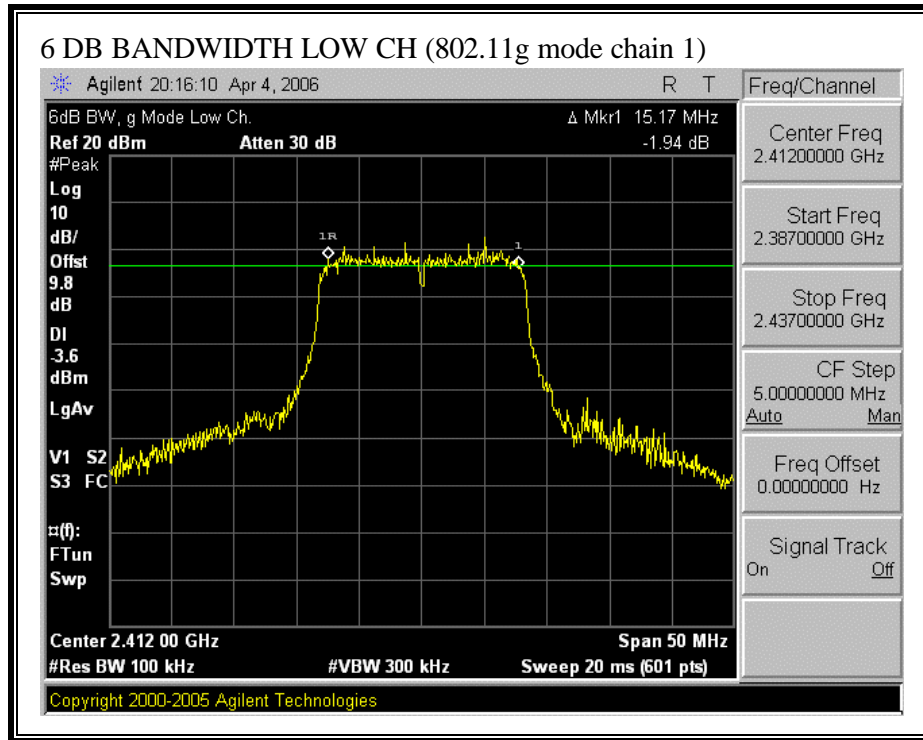
6 DB BANDWIDTH (802.11g MODE CHAIN 0)

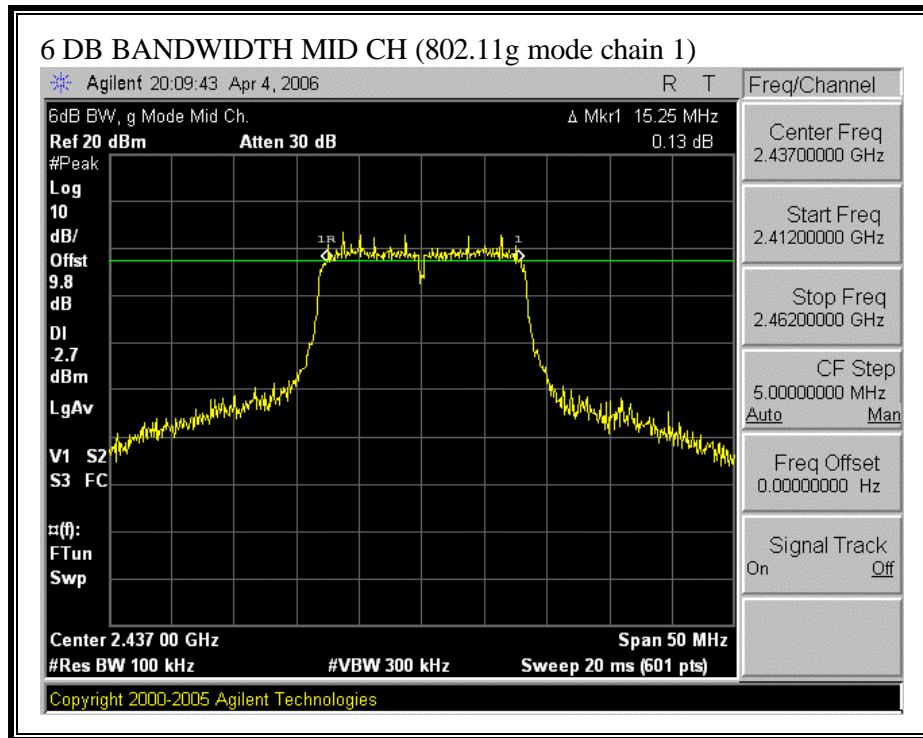


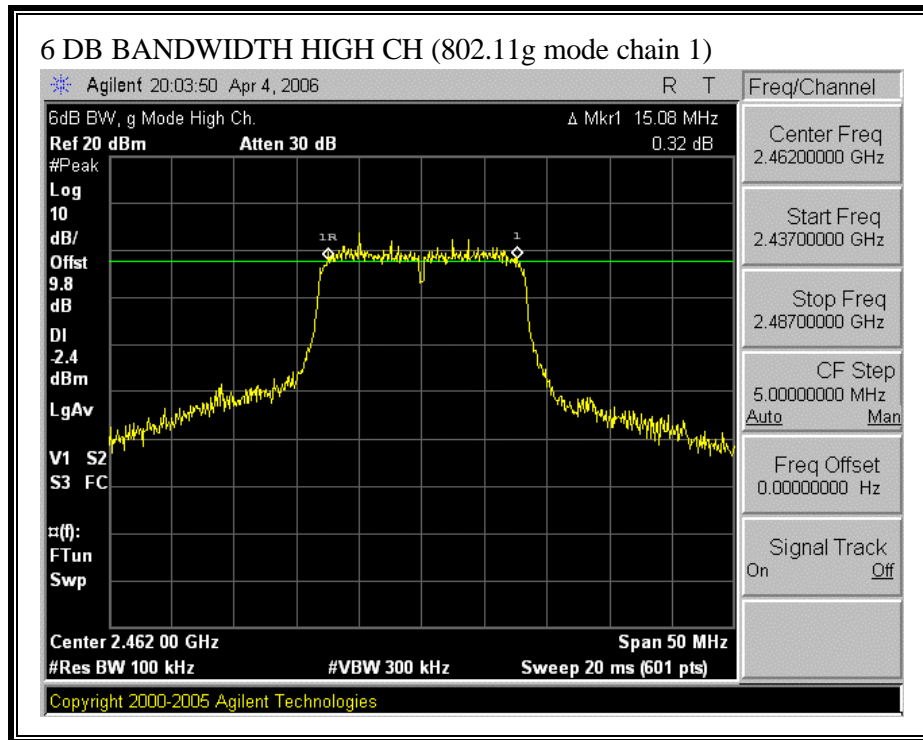




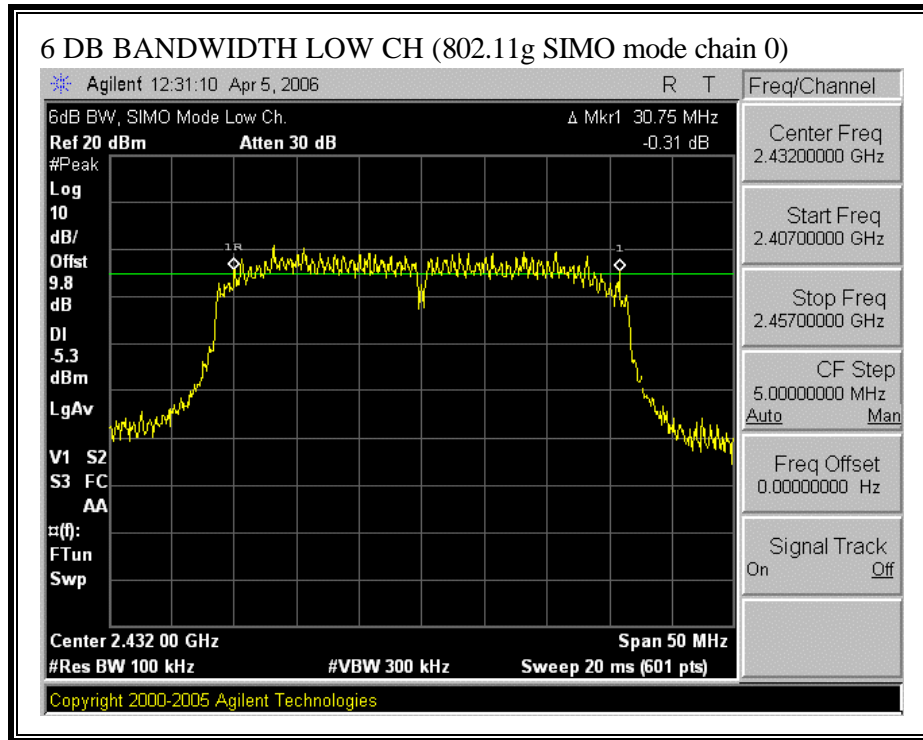
6 DB BANDWIDTH (802.11g MODE CHAIN 1)

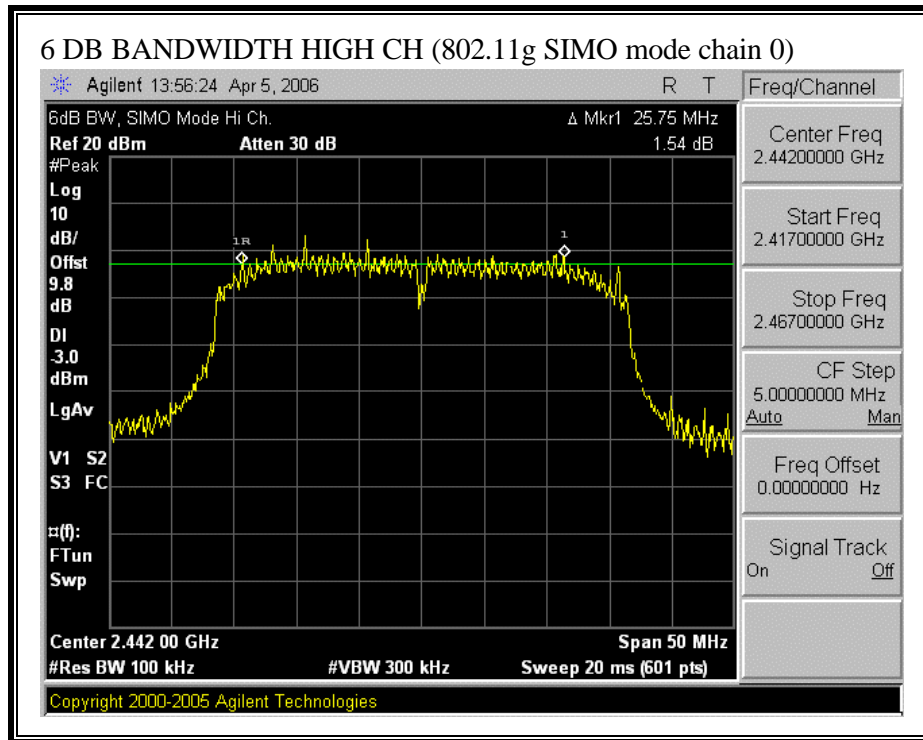




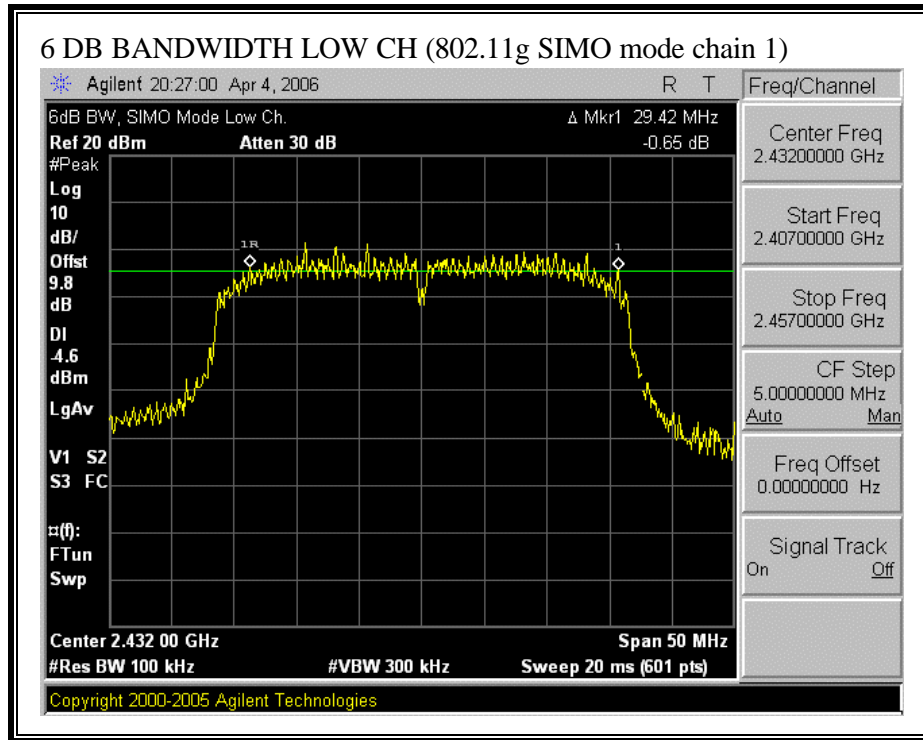


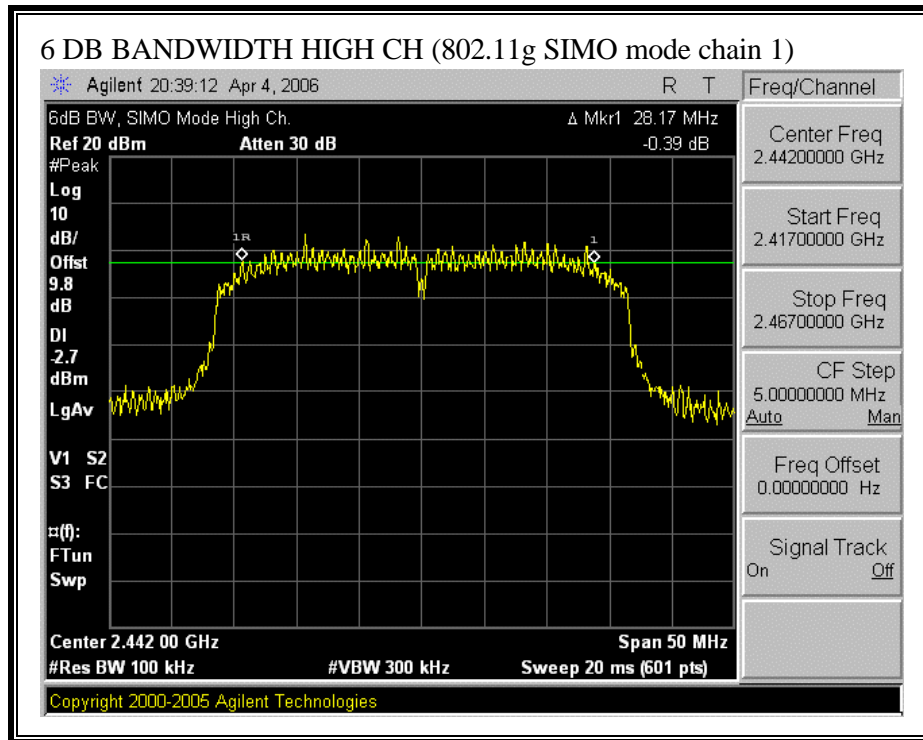
6 DB BANDWIDTH (802.11g SIMO MODE CHAIN 0)



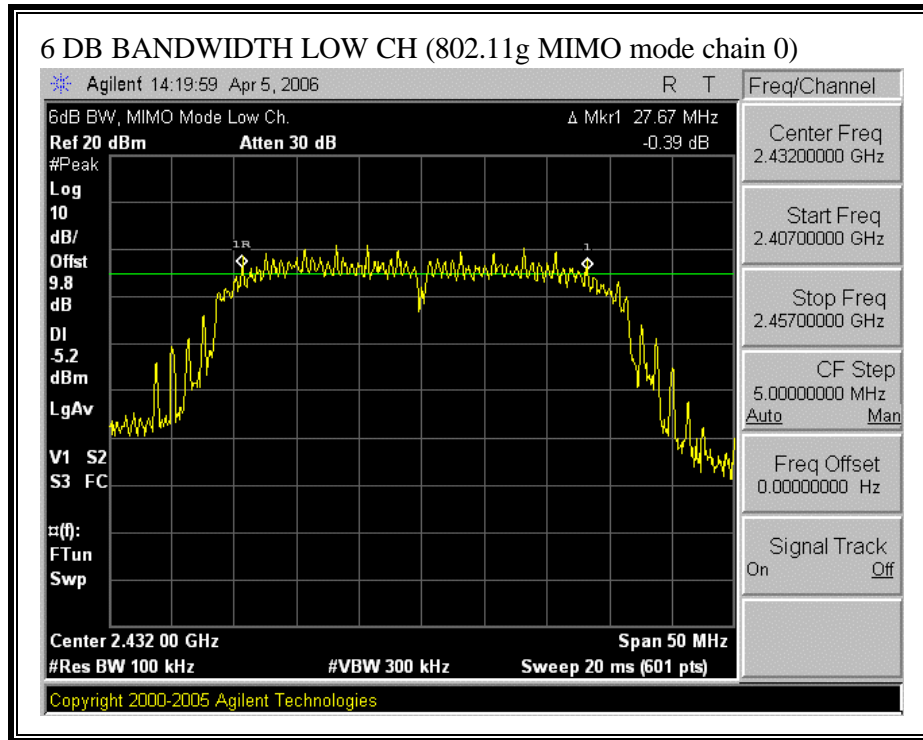


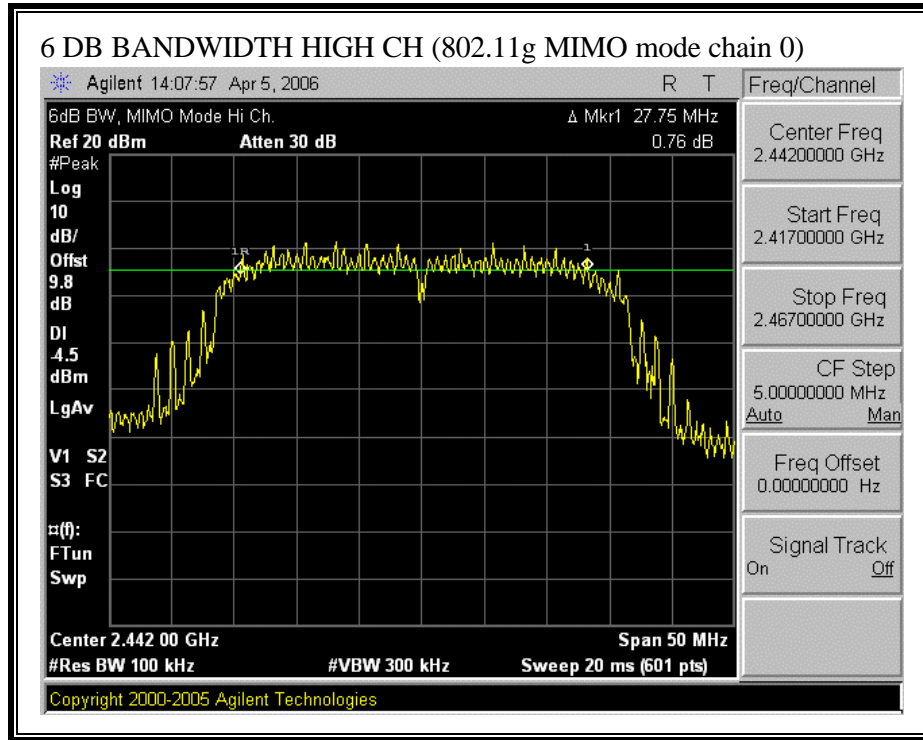
6 DB BANDWIDTH (802.11g SIMO MODE CHAIN 1)



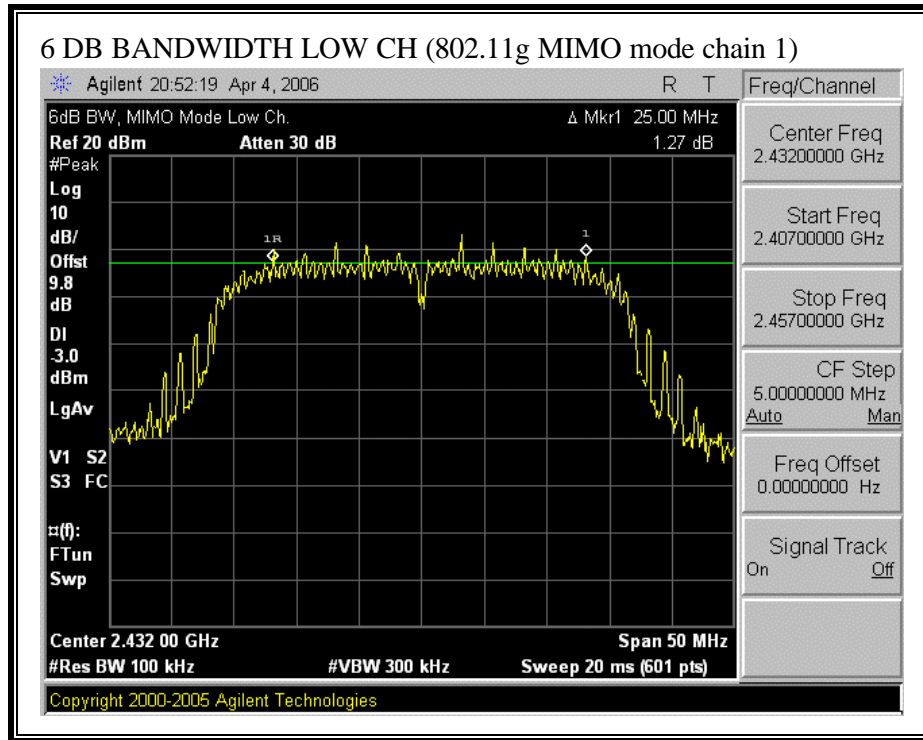


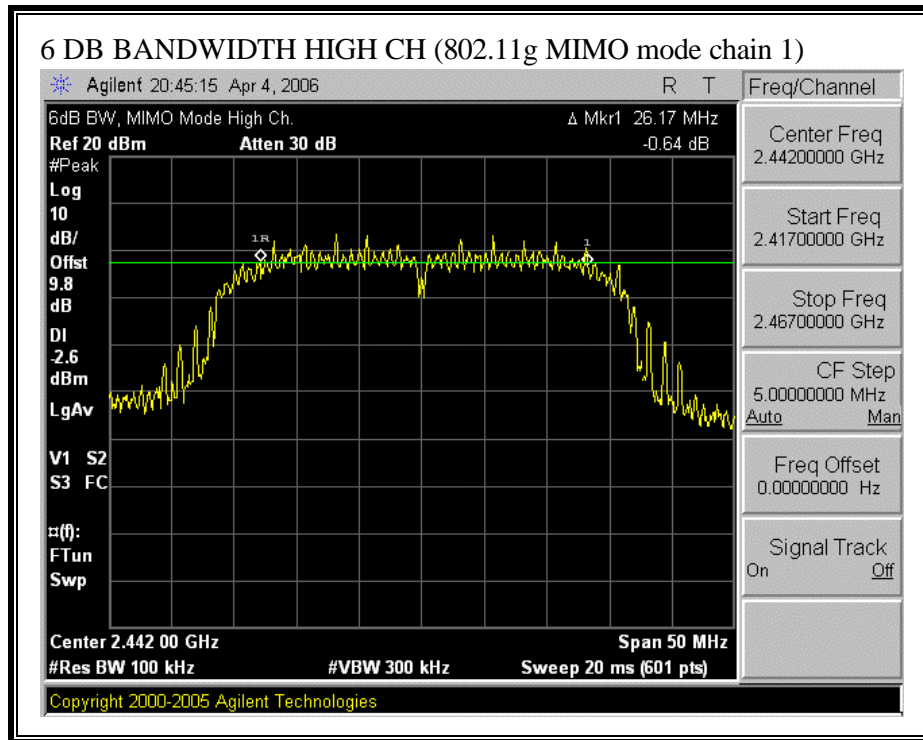
6 DB BANDWIDTH (802.11g MIMO MODE CHAIN 0)





6 DB BANDWIDTH (802.11g MIMO MODE CHAIN 1)





7.1.2. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	2412	14.96	14.96
Middle	2437	14.97	14.95
High	2462	14.97	14.97

802.11g Mode

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	2412	16.29	16.31
Middle	2437	16.32	16.32
High	2462	16.32	16.35

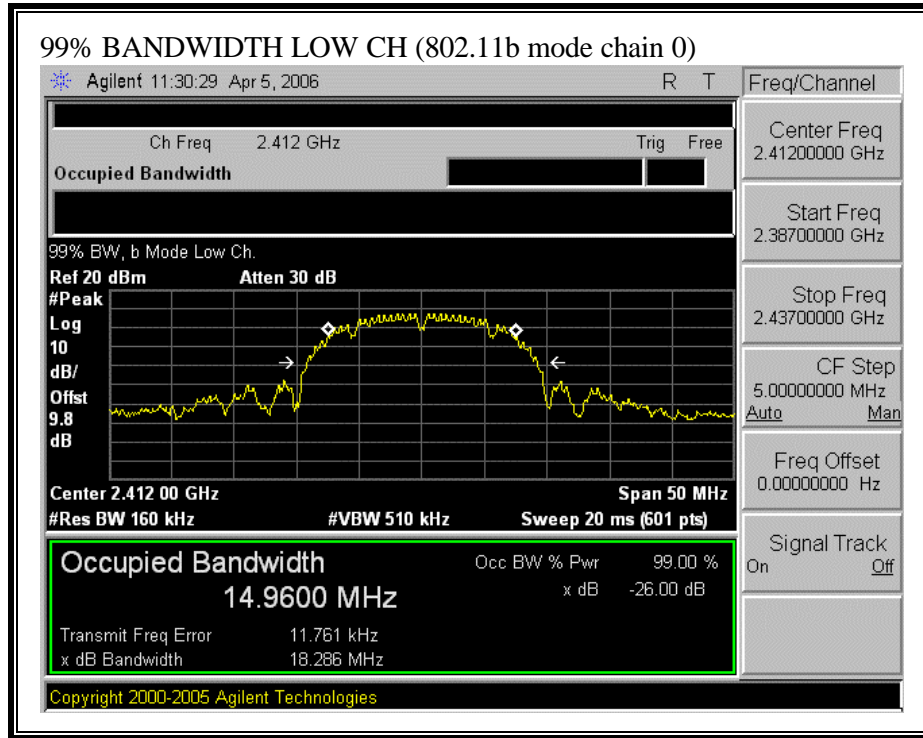
802.11g SIMO Mode

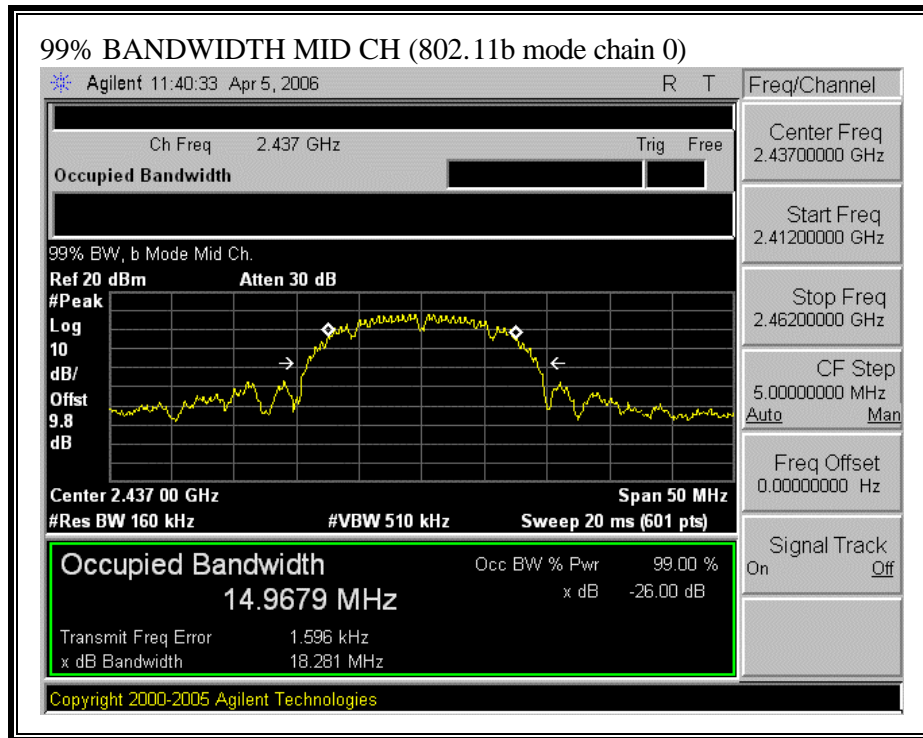
Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	2432	31.63	31.64
High	2442	31.67	31.72

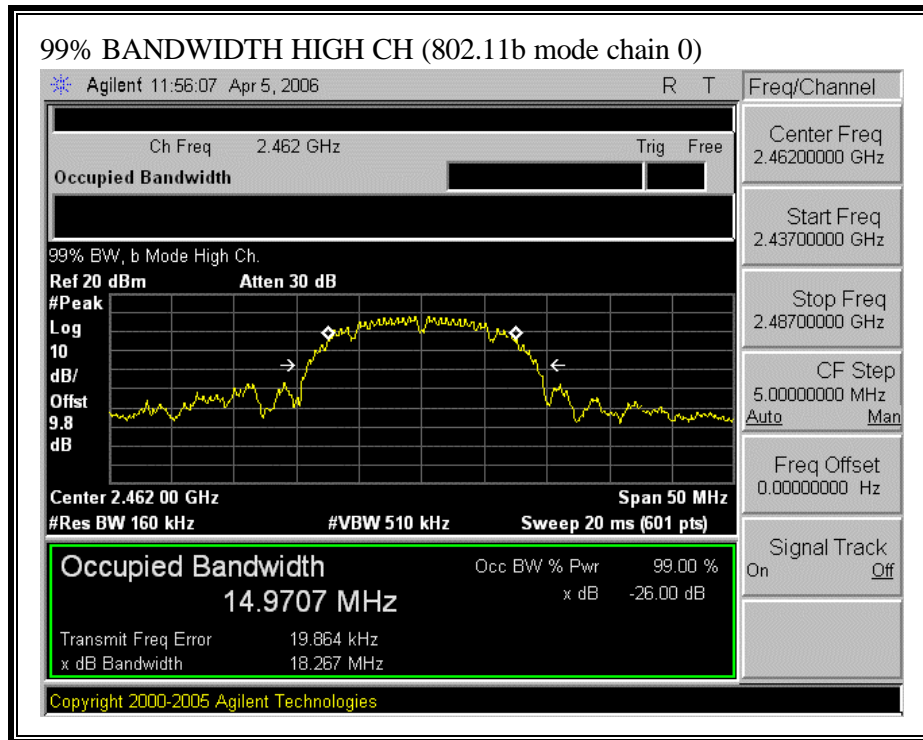
802.11g MIMO Mode

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	2432	32.17	32.16
High	2442	32.23	32.23

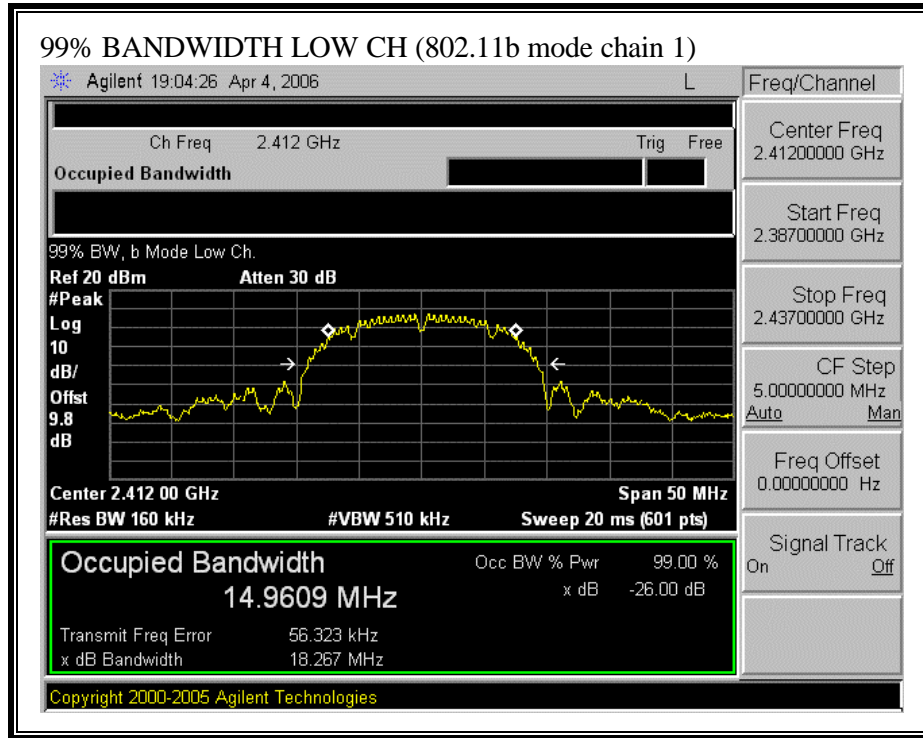
99% BANDWIDTH (802.11b MODE CHAIN 0)

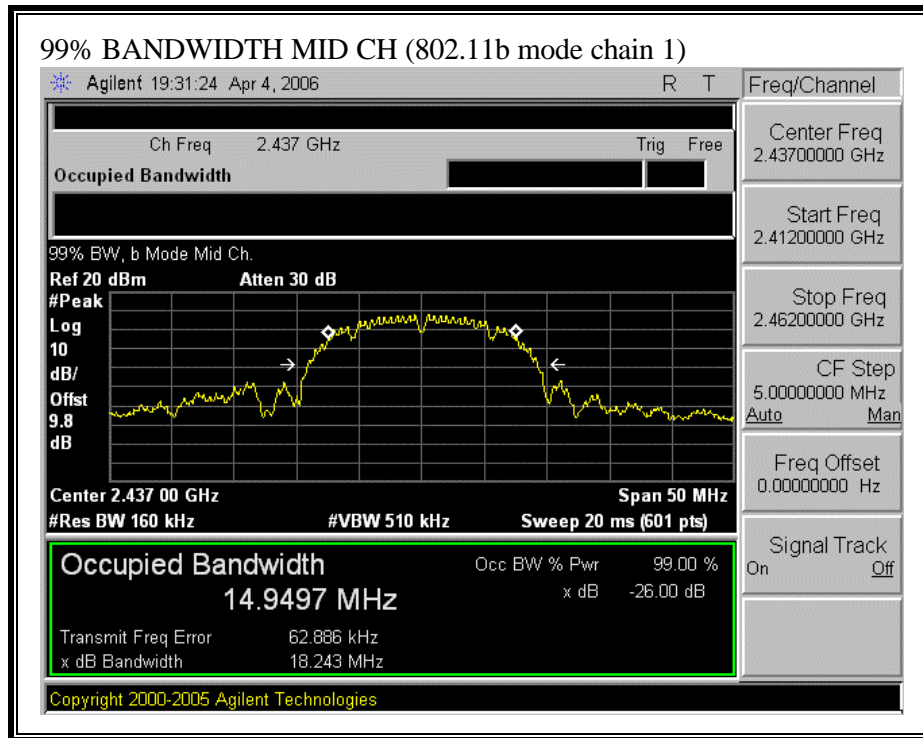


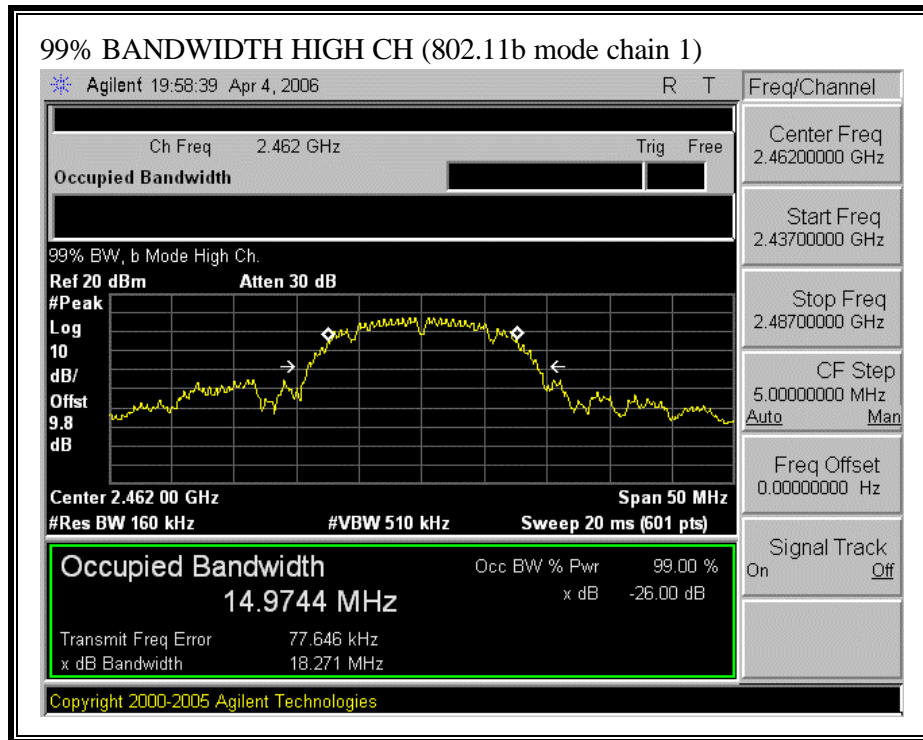




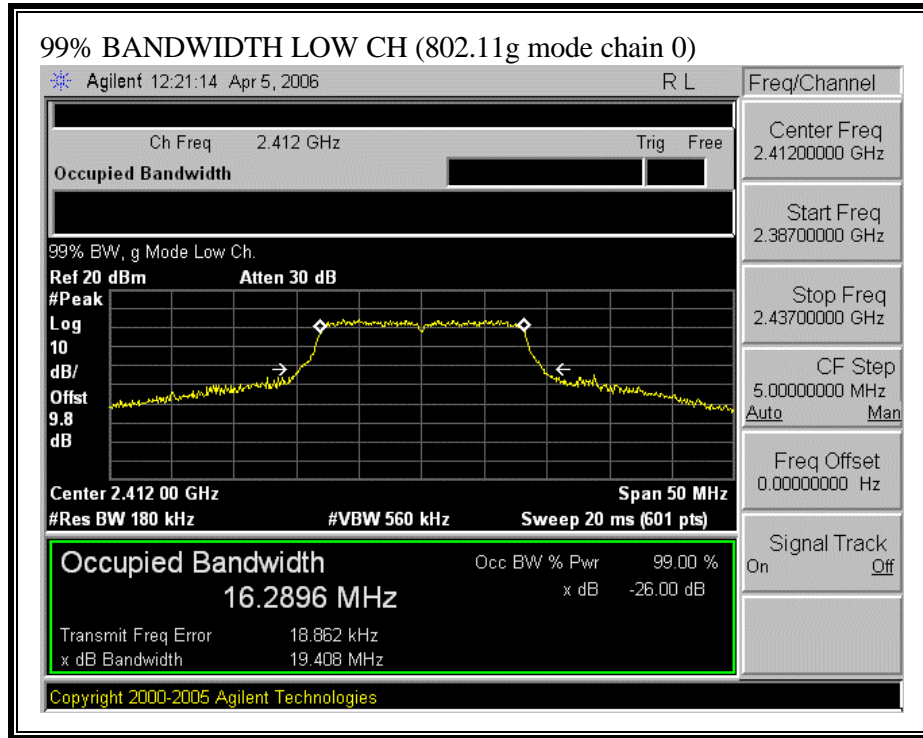
99% BANDWIDTH (802.11b MODE CHAIN 1)

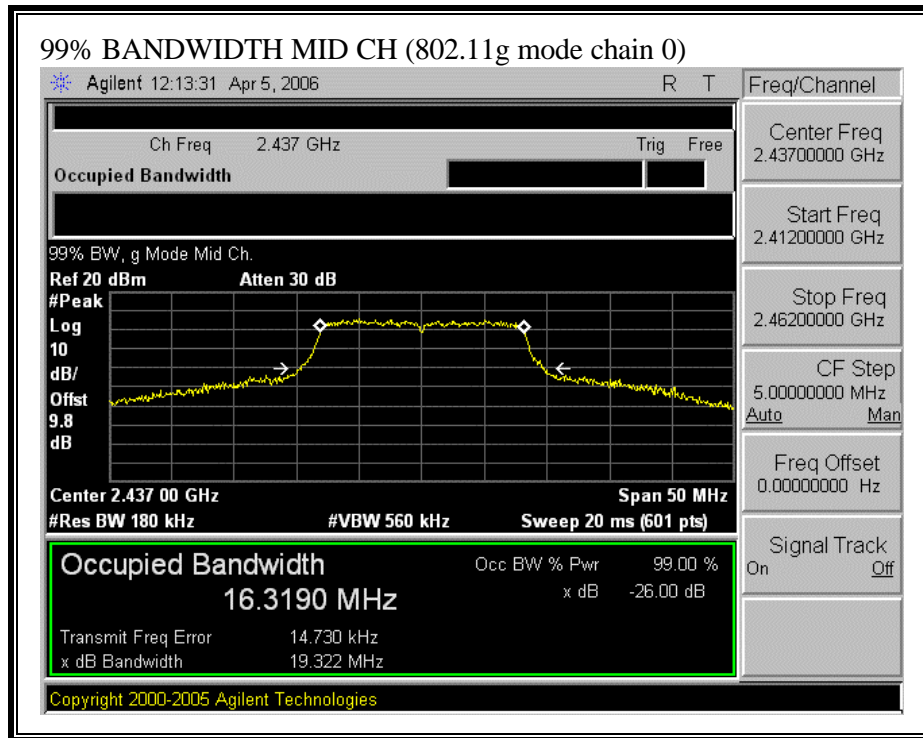


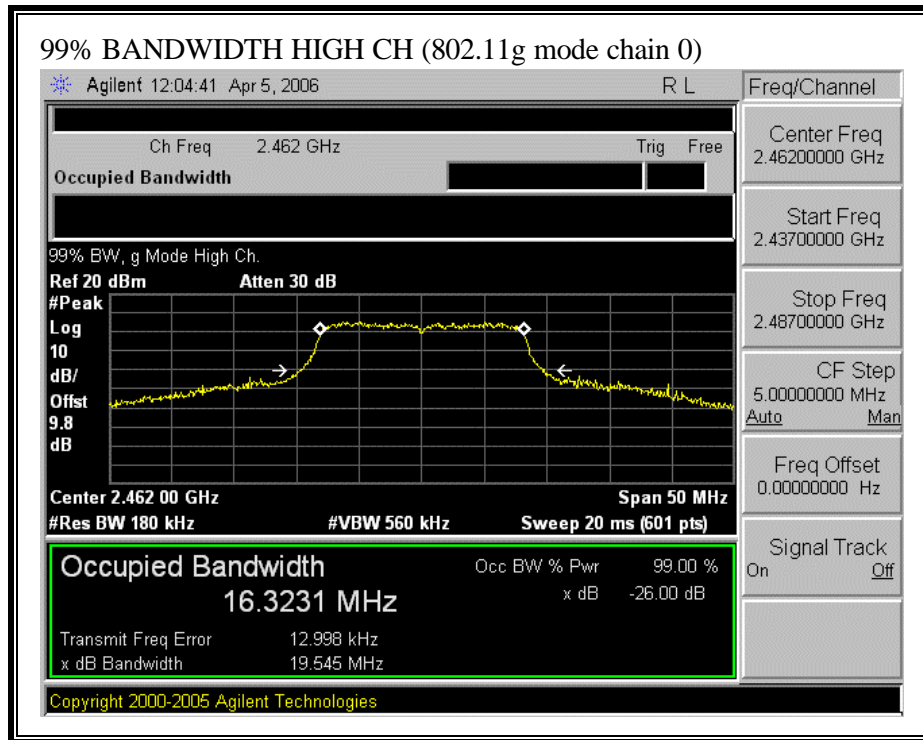




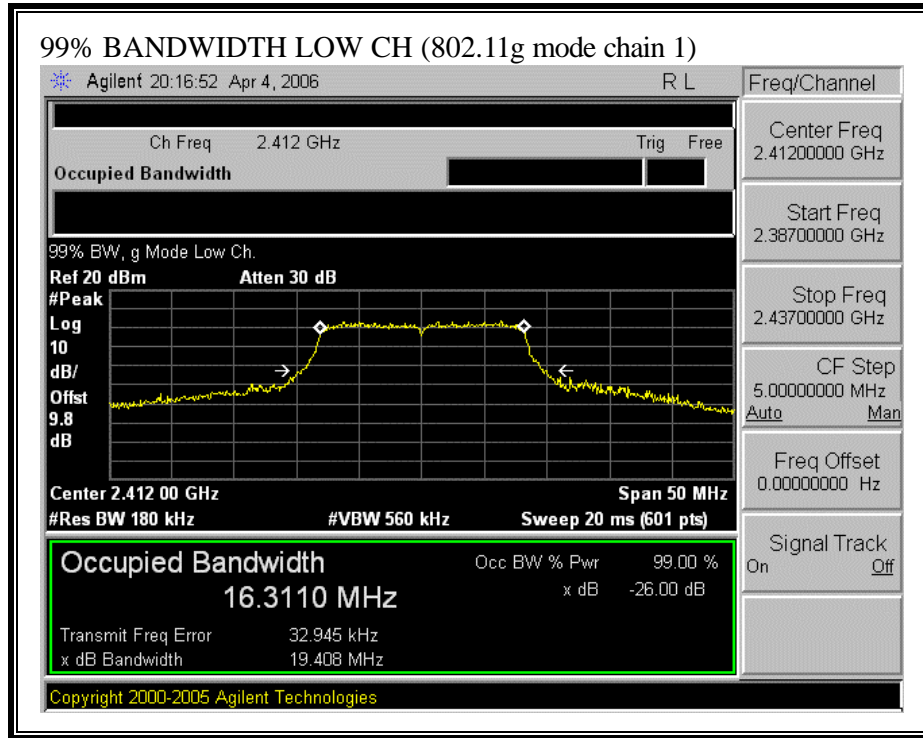
99% BANDWIDTH (802.11g MODE CHAIN 0)

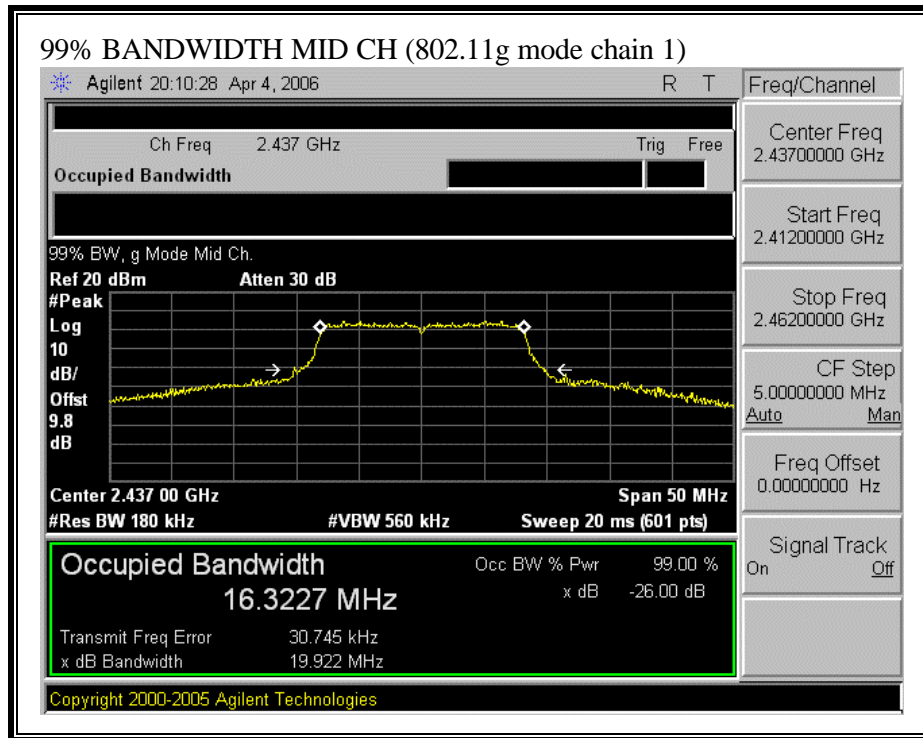


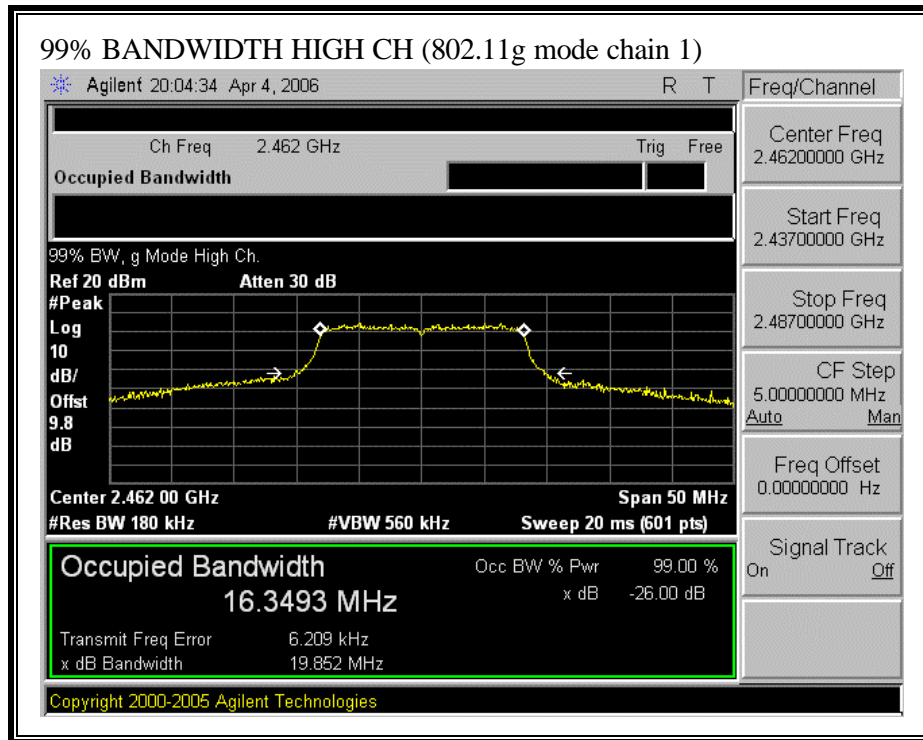




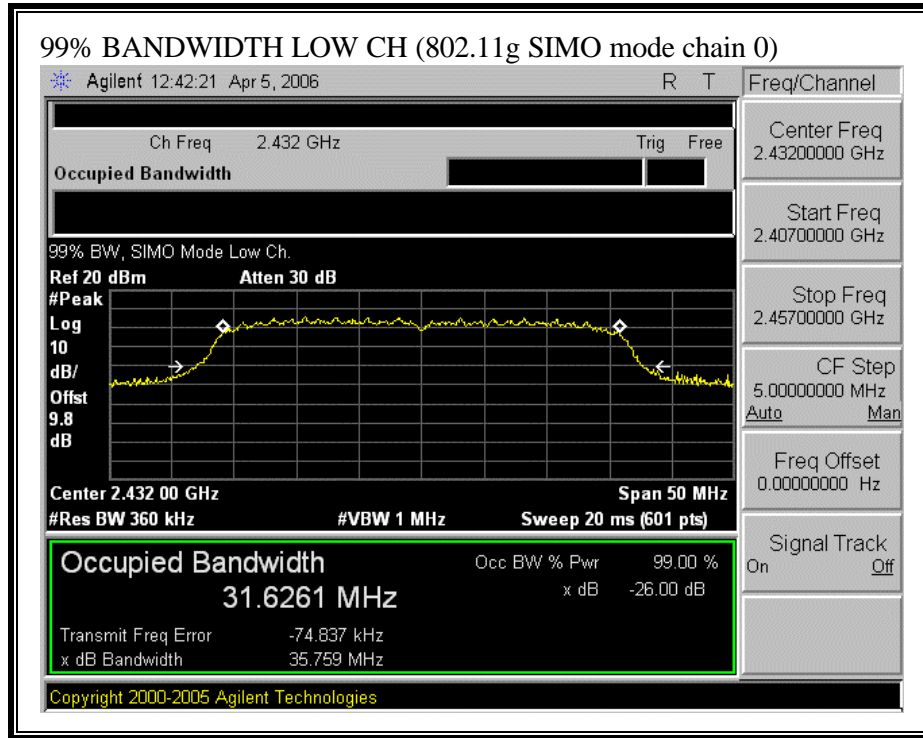
99% BANDWIDTH (802.11g MODE CHAIN 1)

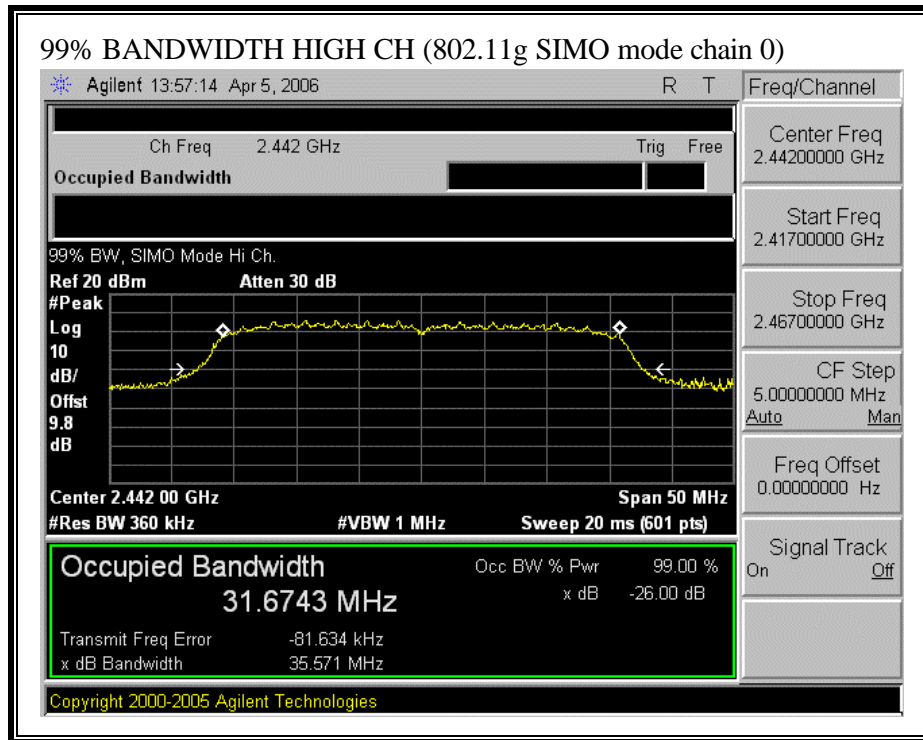




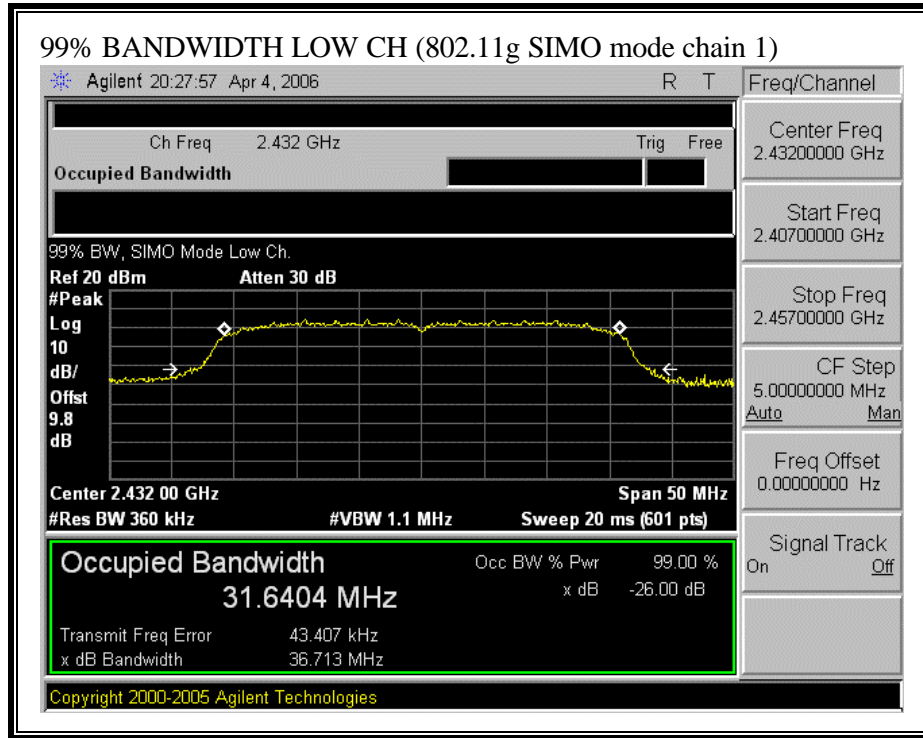


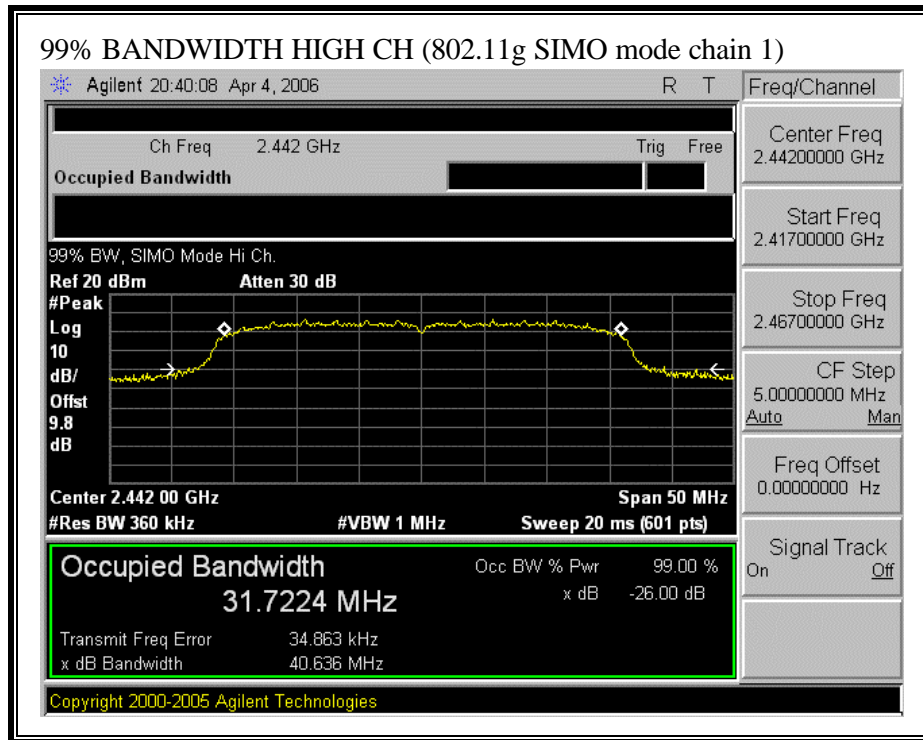
99% BANDWIDTH (802.11g SIMO MODE CHAIN 0)



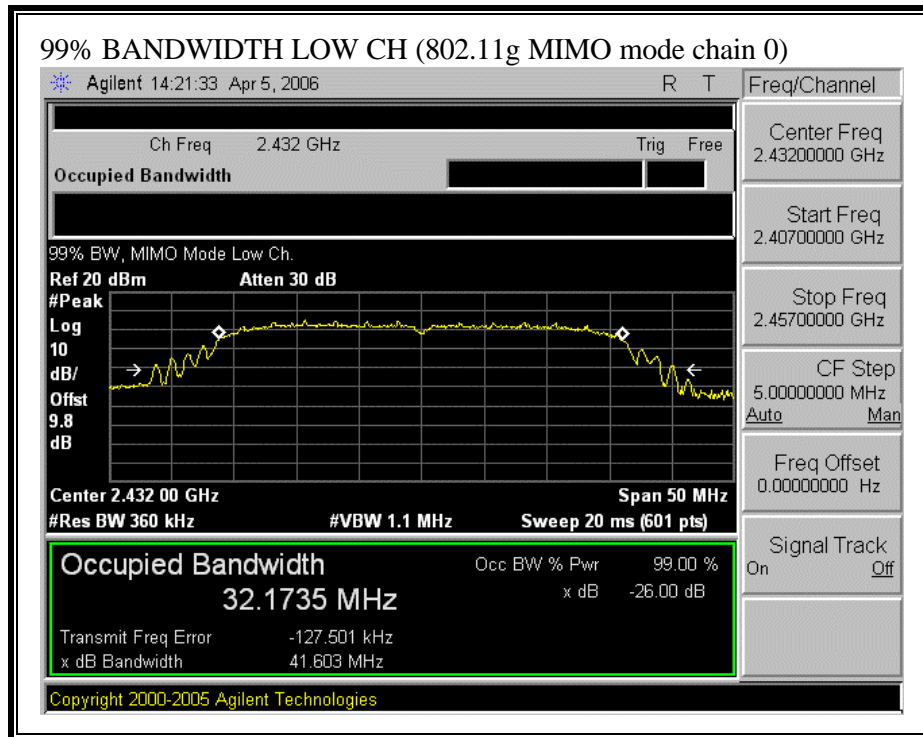


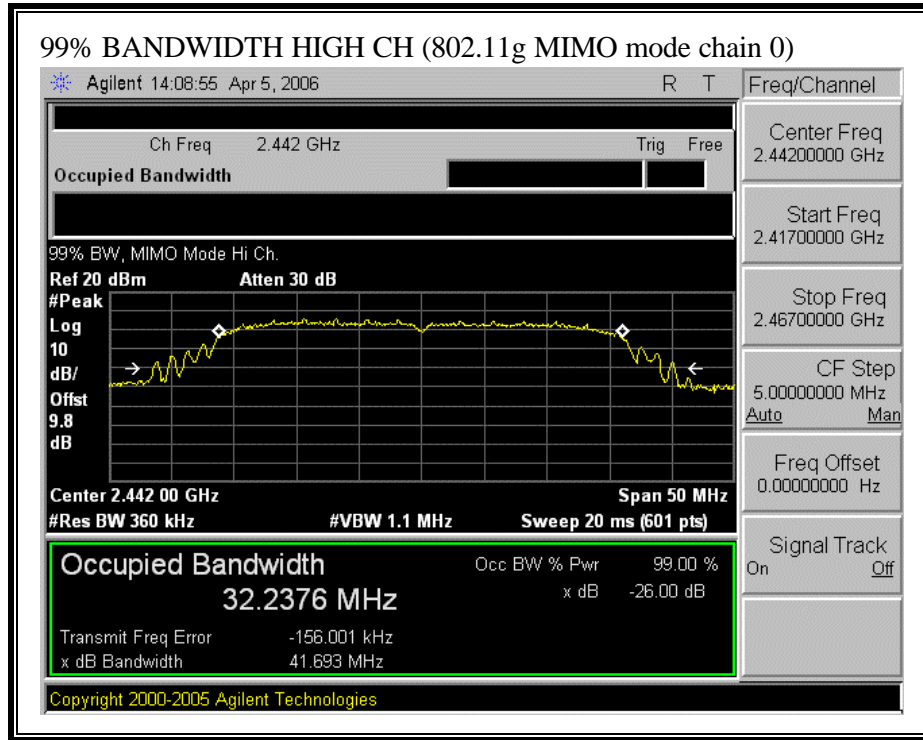
99% BANDWIDTH (802.11g SIMO MODE CHAIN 1)



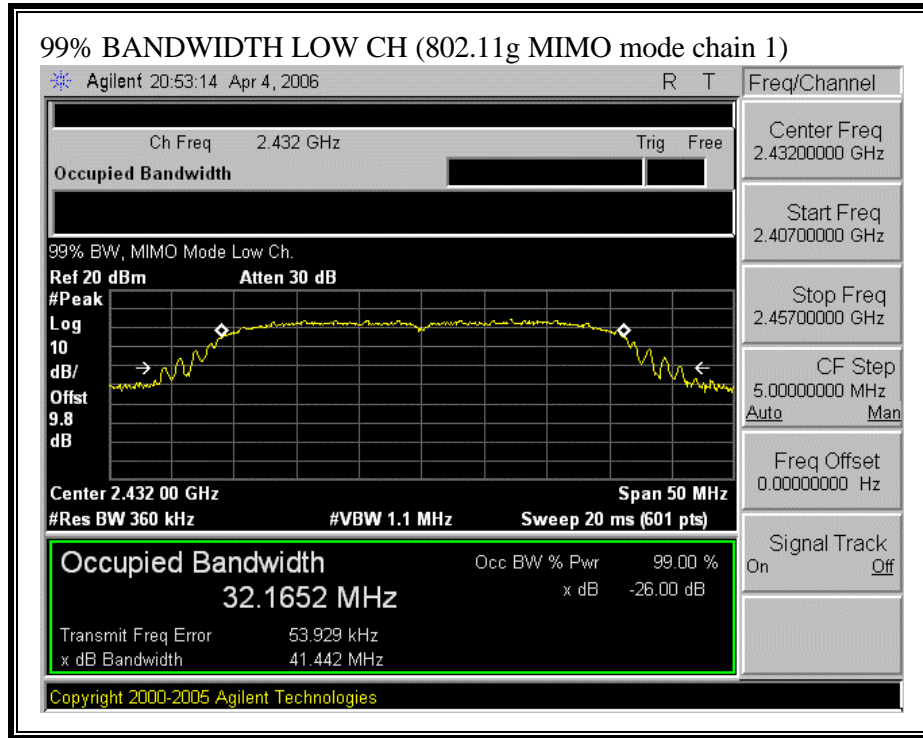


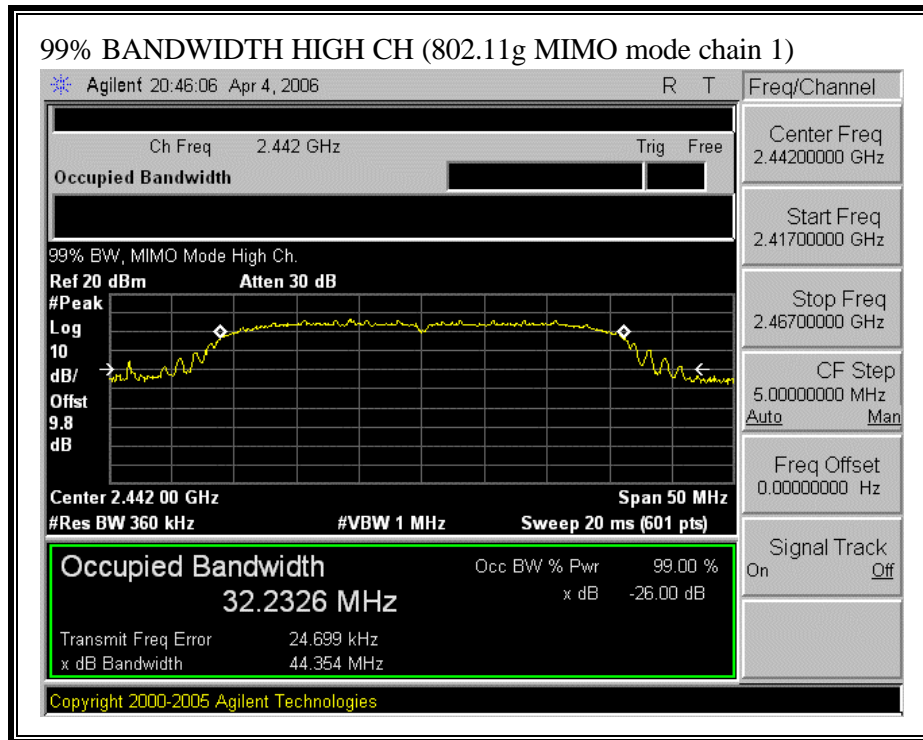
99% BANDWIDTH (802.11g MIMO MODE CHAIN 0)





99% BANDWIDTH (802.11g MIMO MODE CHAIN 1)





7.1.3. PEAK OUTPUT POWER

PEAK 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) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

§15.247 (b) (4) (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.

The test is performed in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005. The transmitter operates continuously therefore Power Output Option 2, Method # 1 is used.

RESULTS

The maximum antenna gain is 2 dBi for other than fixed, point-to-point operations, therefore the limit is 30 dBm.

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	18.03	18.13	21.09	30	-11.87
Middle	2437	22.50	22.53	25.53	30	-7.47
High	2462	17.80	17.93	20.88	30	-12.07

802.11g Mode

Channel	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	15.85	15.90	18.89	30	-14.10
Middle	2437	22.23	22.18	25.22	30	-7.82
High	2462	15.89	15.74	18.83	30	-14.26

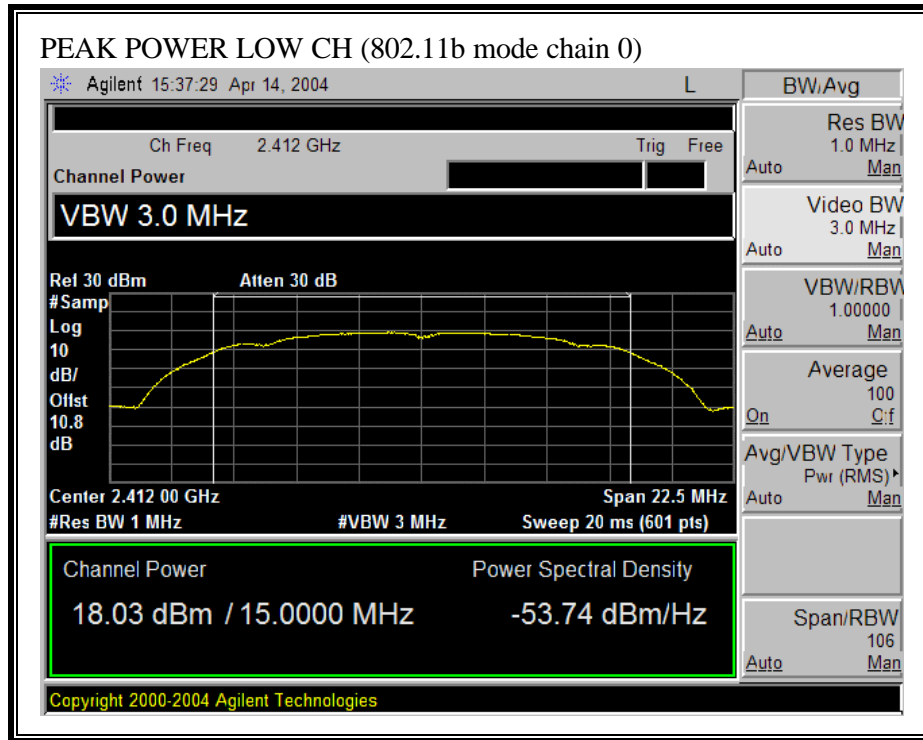
802.11g SIMO Mode

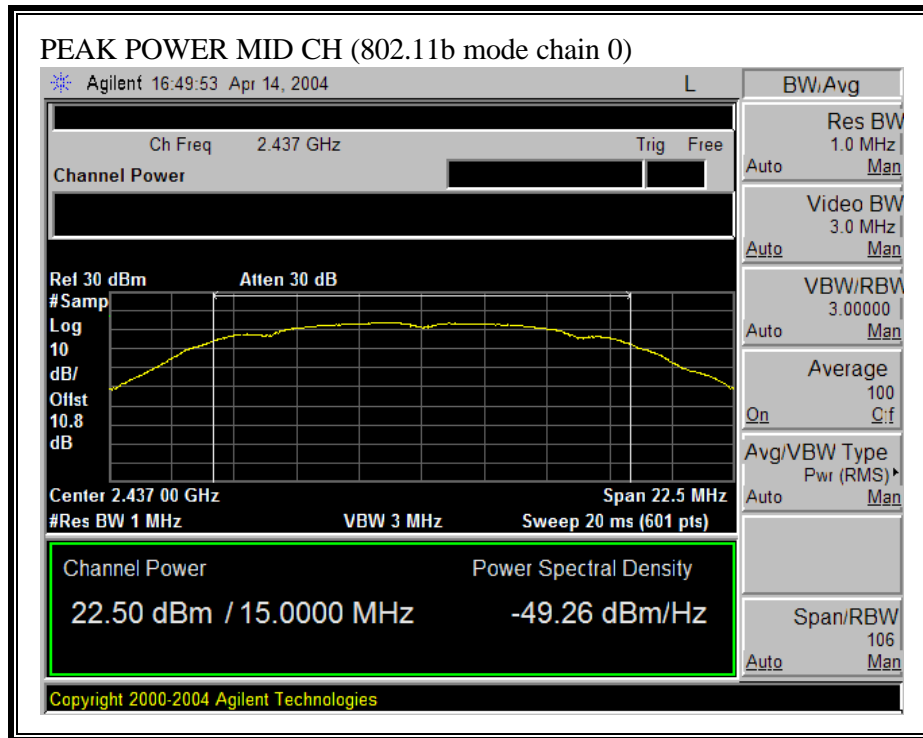
Channel	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2432	15.96	15.96	18.97	30	-14.04
High	2442	17.23	17	20.13	30	-13.00

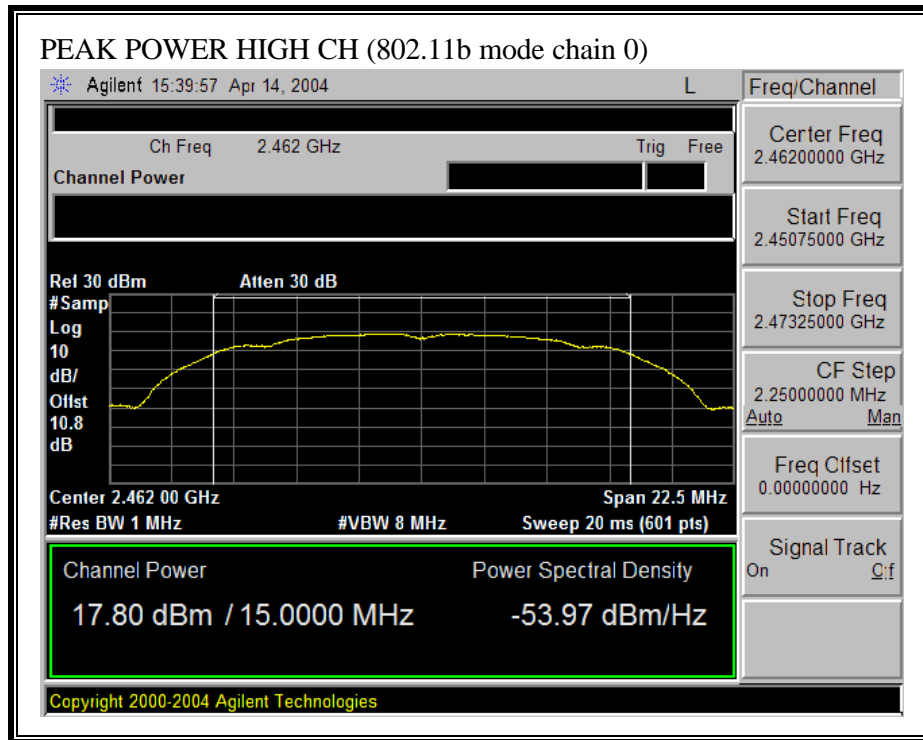
802.11g MIMO Mode

Channel	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2432	15.94	16.10	19.03	30	-13.90
High	2442	17.38	17.43	20.42	30	-12.57

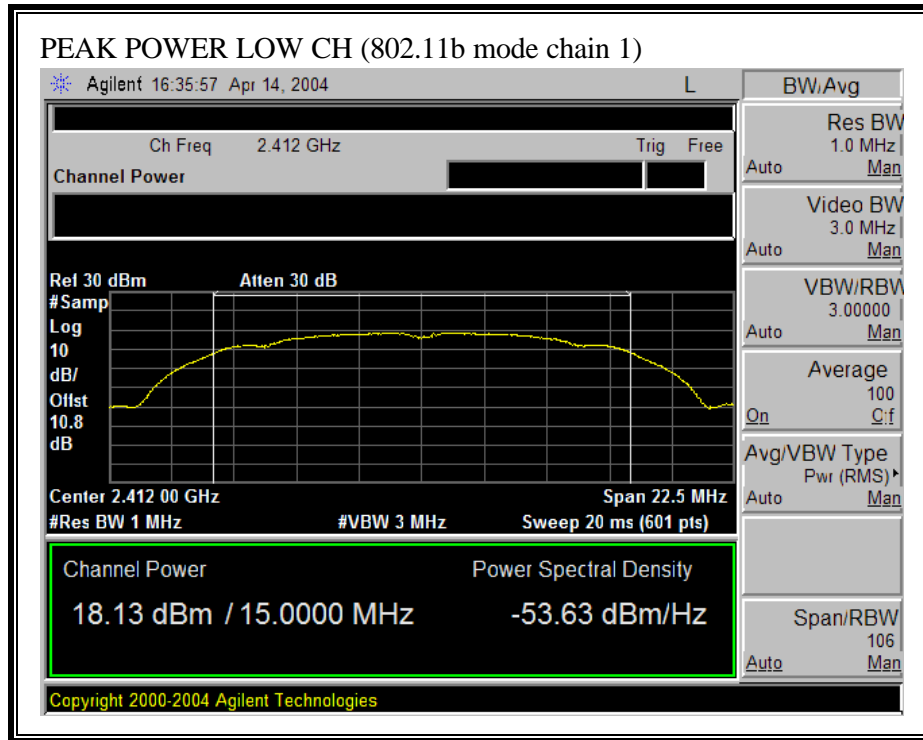
OUTPUT POWER (802.11b MODE CHAIN 0)

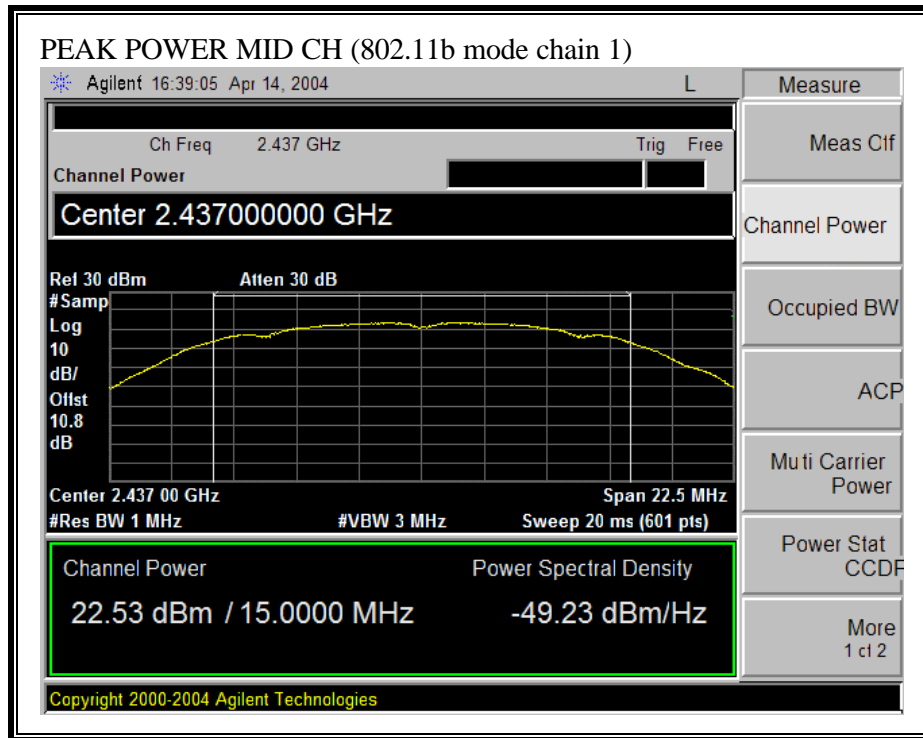


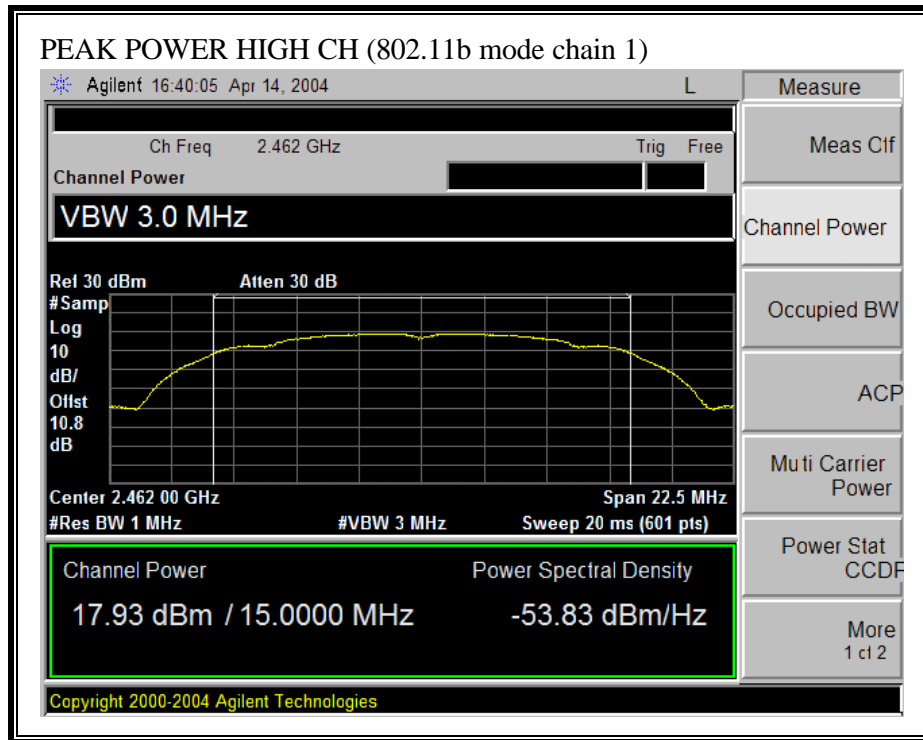




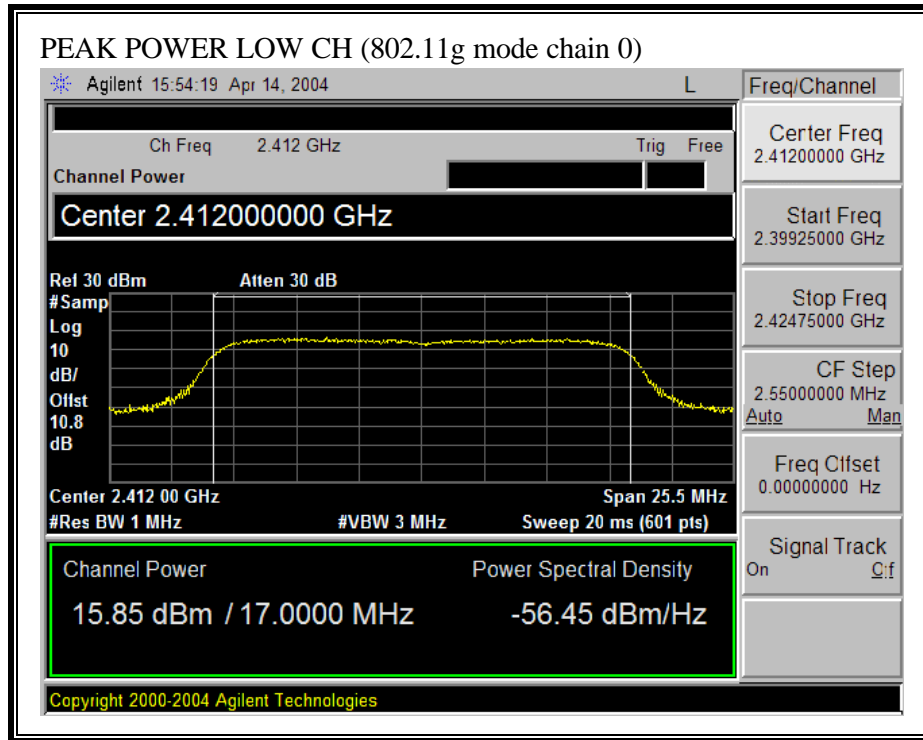
OUTPUT POWER (802.11b MODE CHAIN 1)

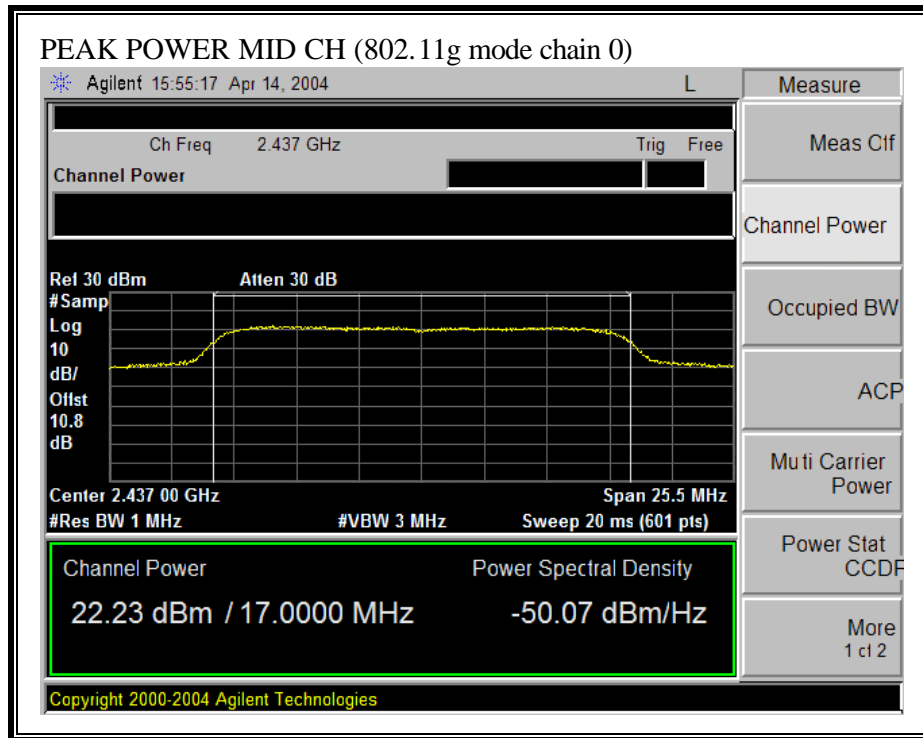


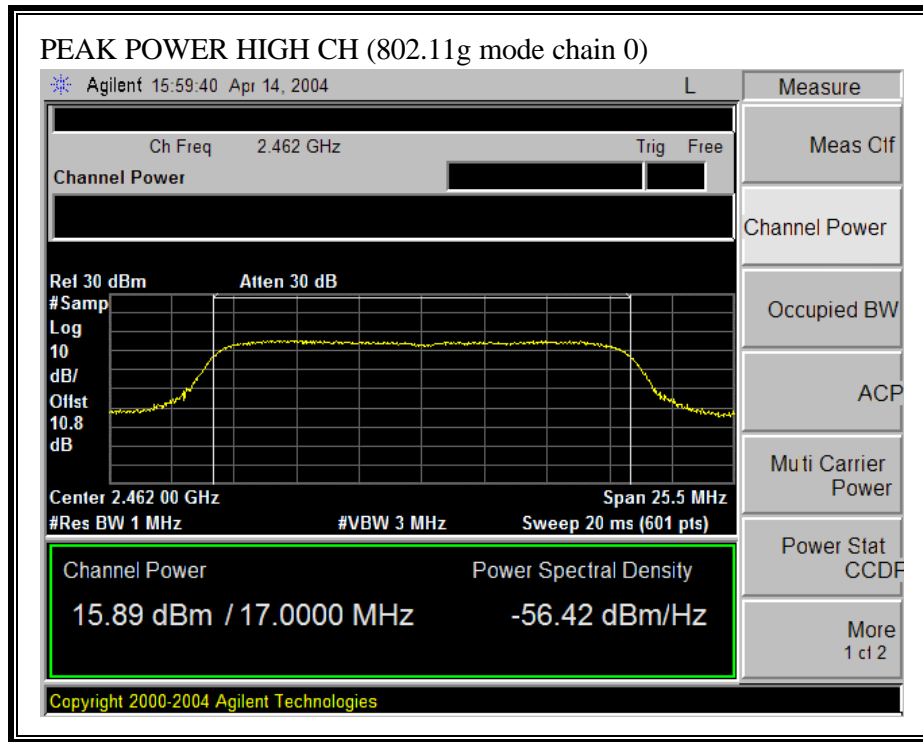




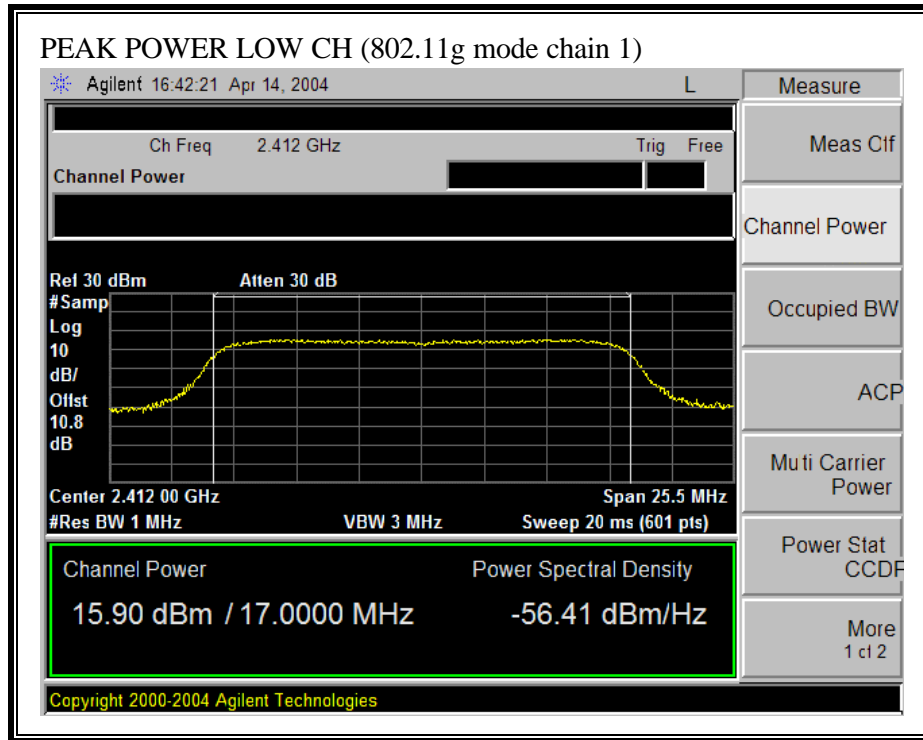
OUTPUT POWER (802.11g MODE CHAIN 0)

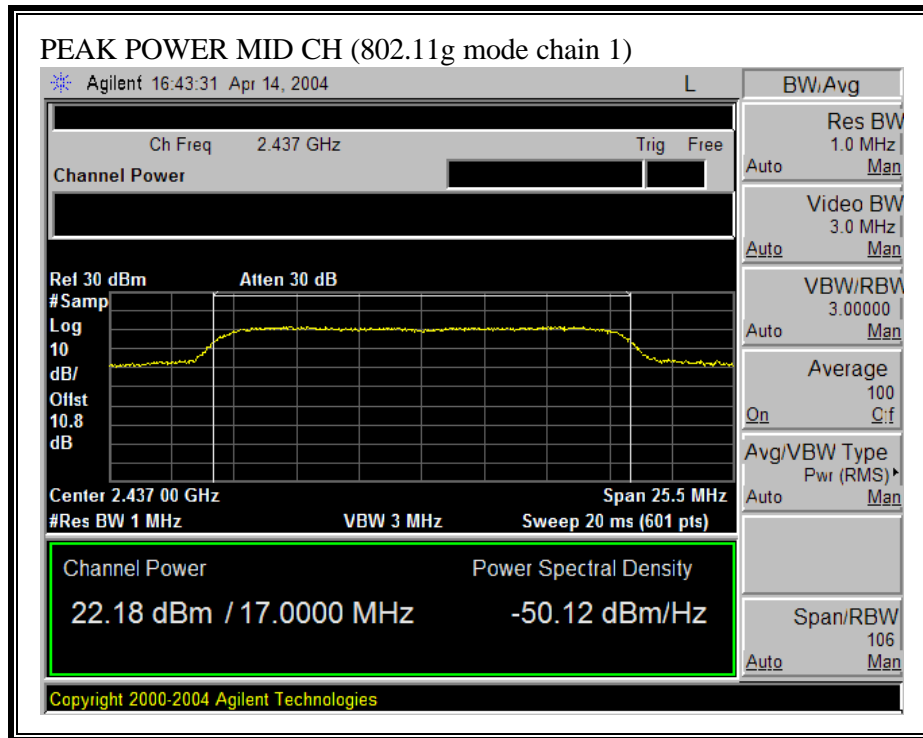


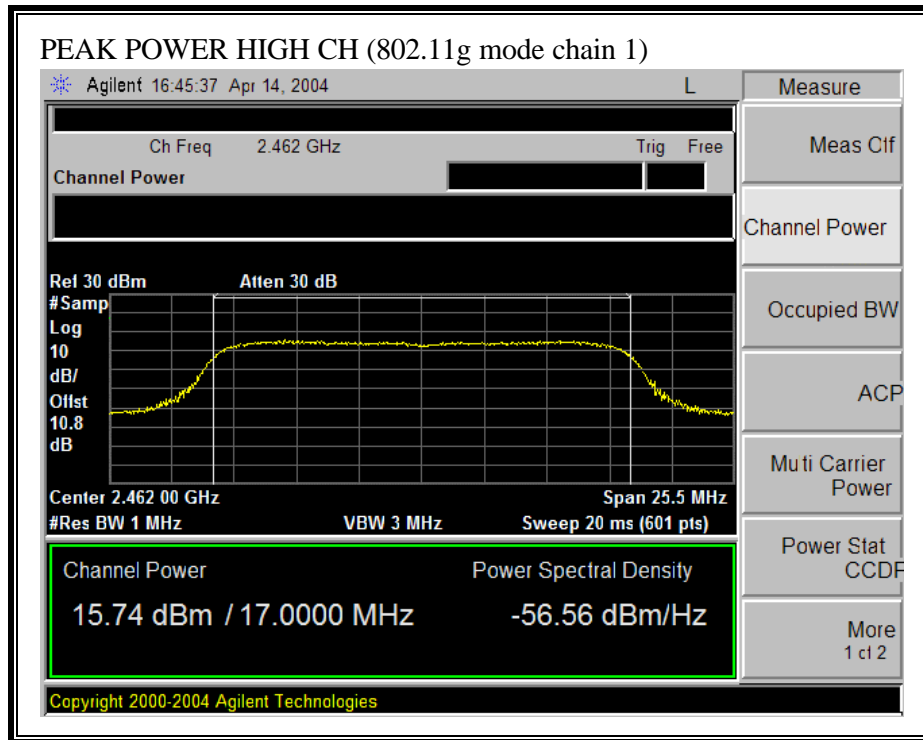




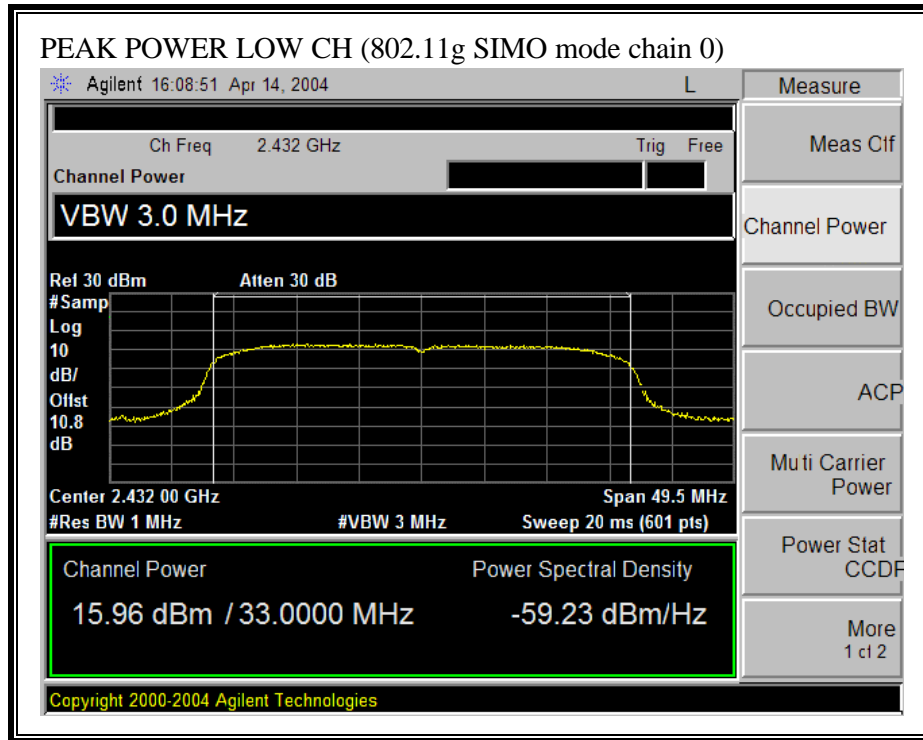
OUTPUT POWER (802.11g MODE CHAIN 1)

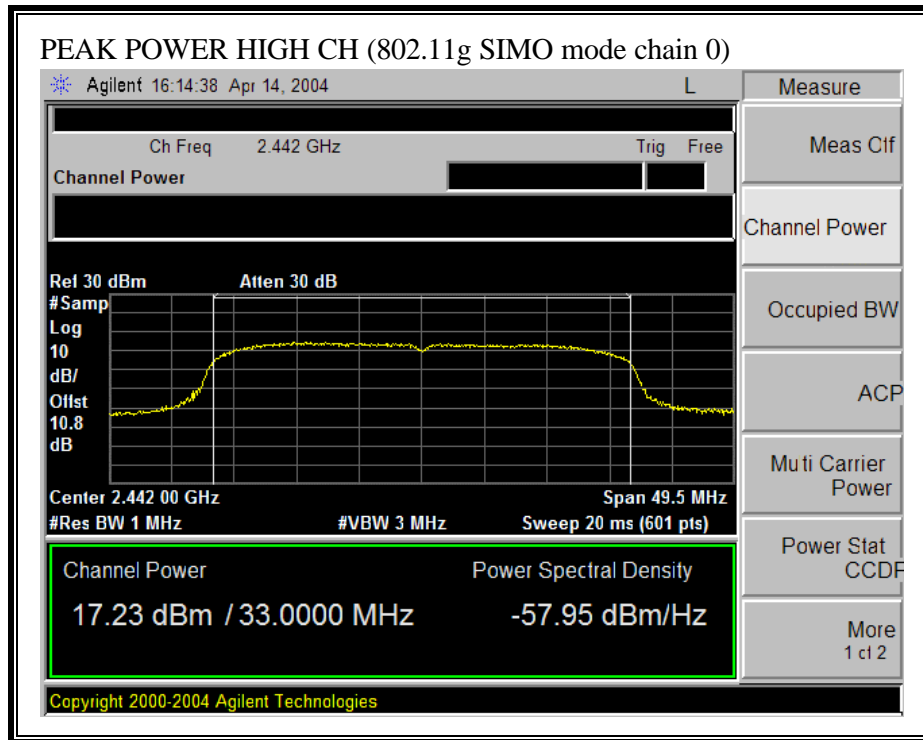




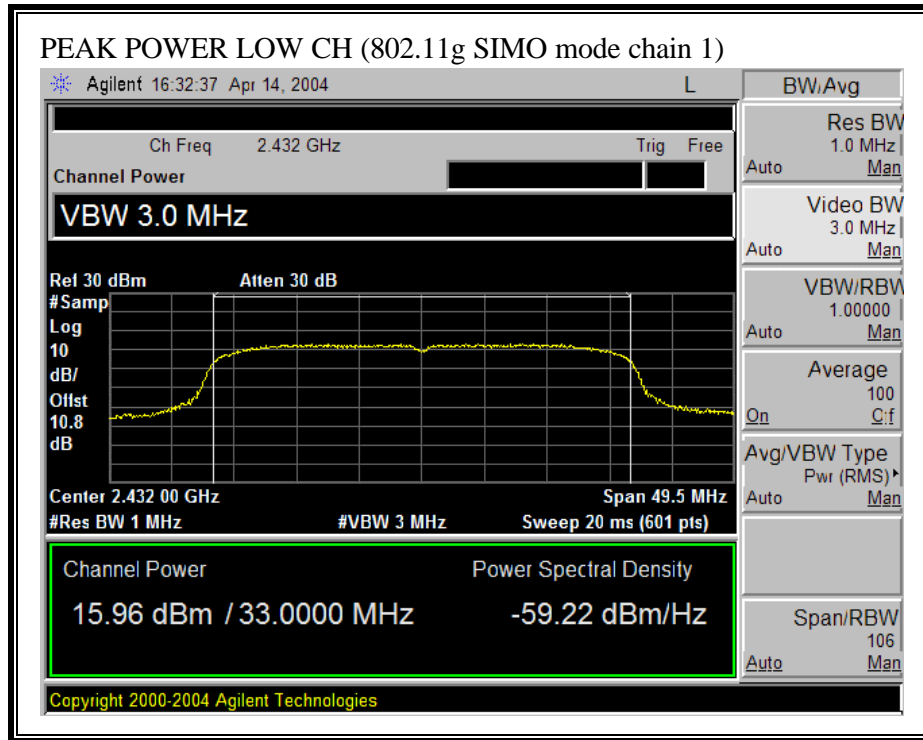


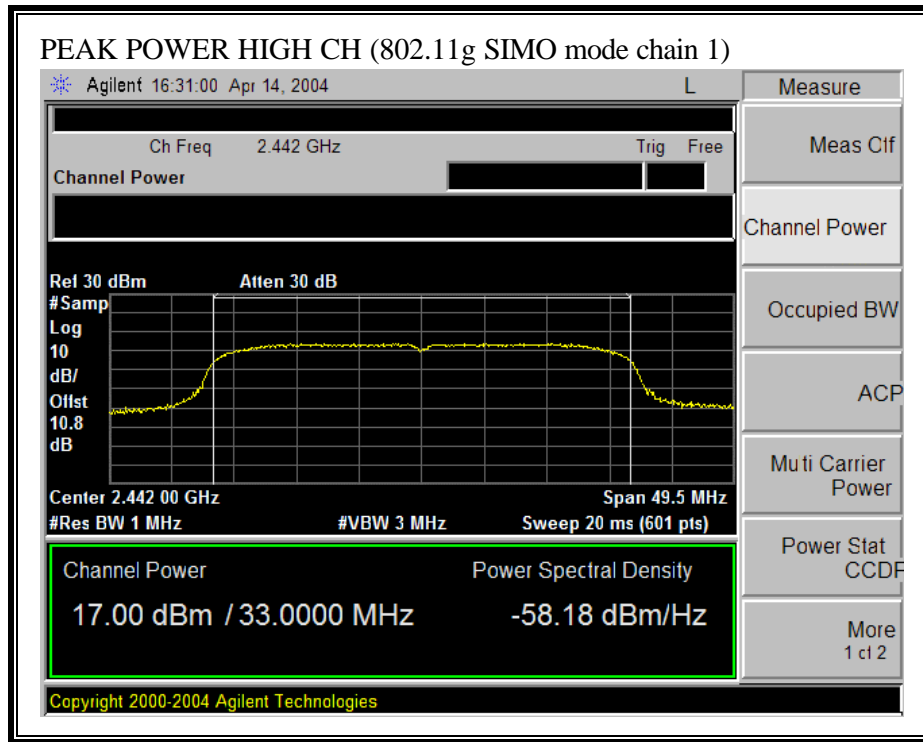
OUTPUT POWER (802.11g SIMO MODE CHAIN 0)



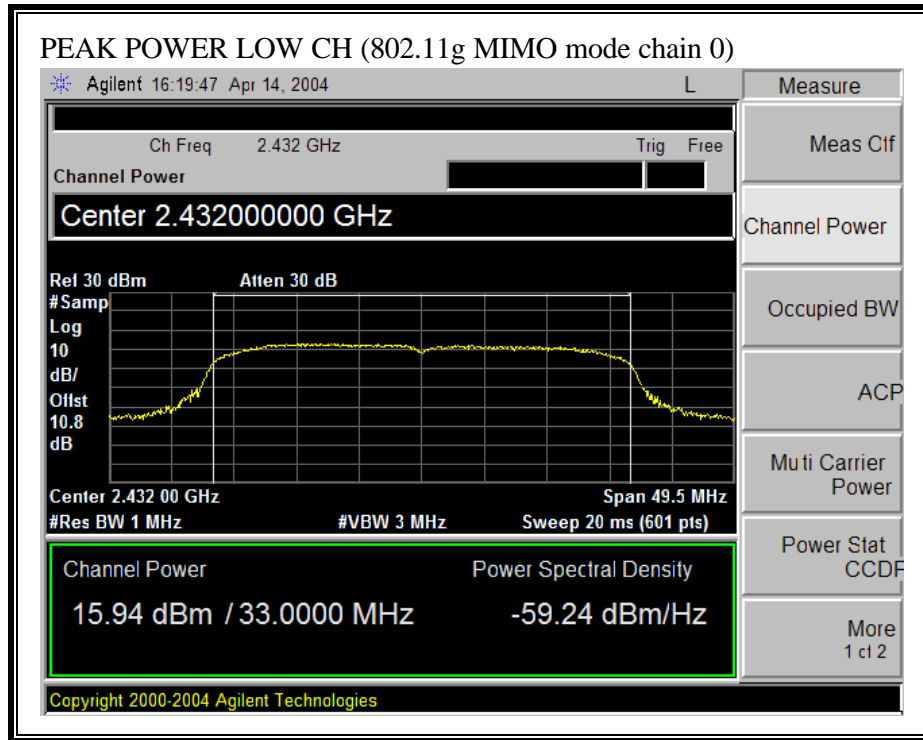


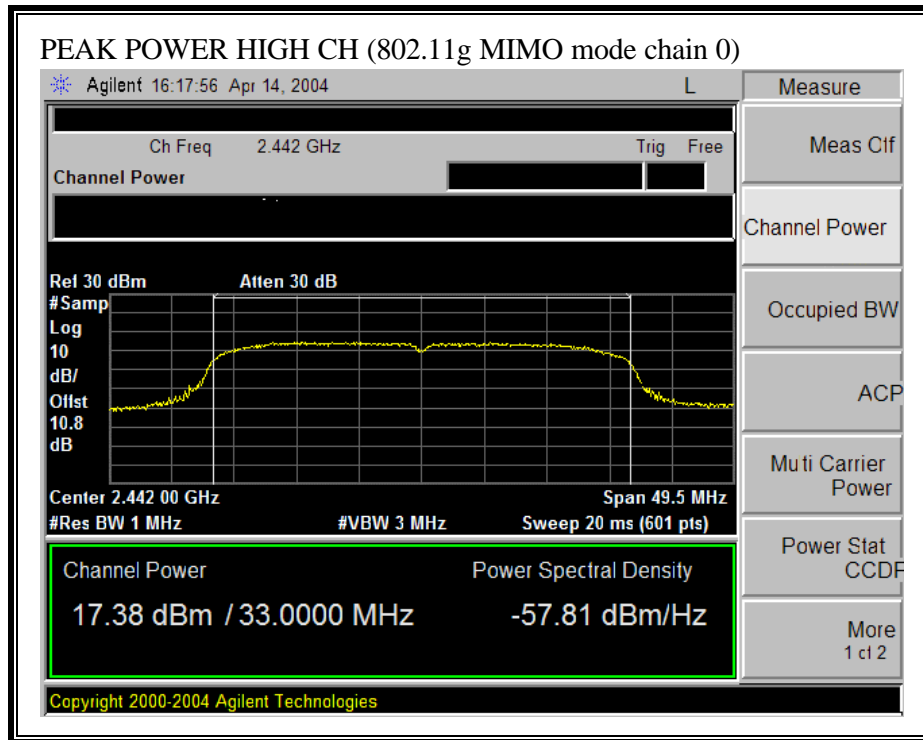
OUTPUT POWER (802.11g SIMO MODE CHAIN 1)



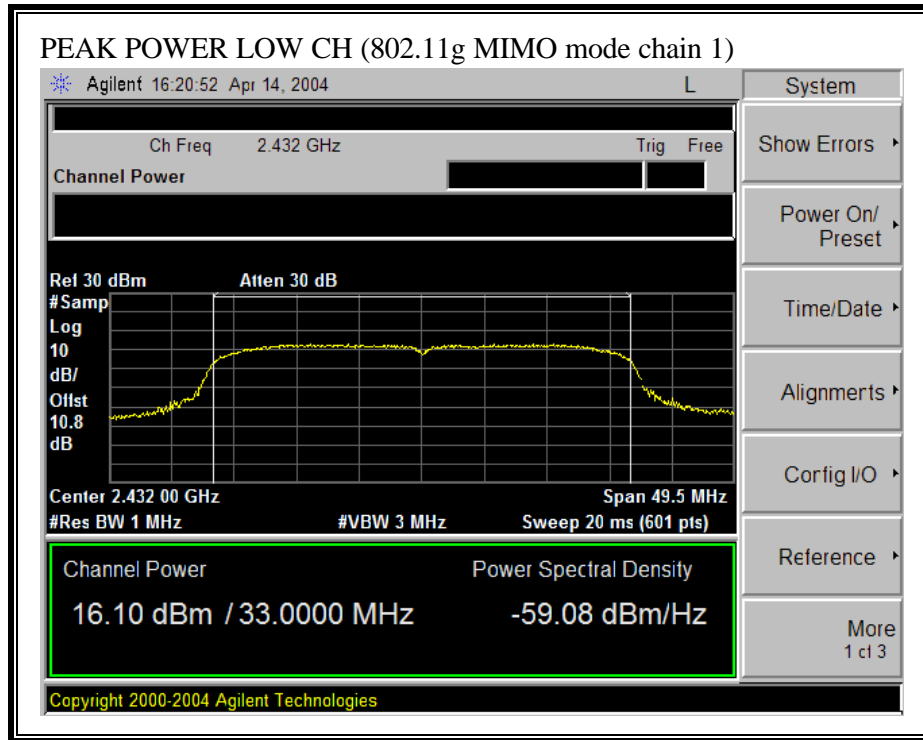


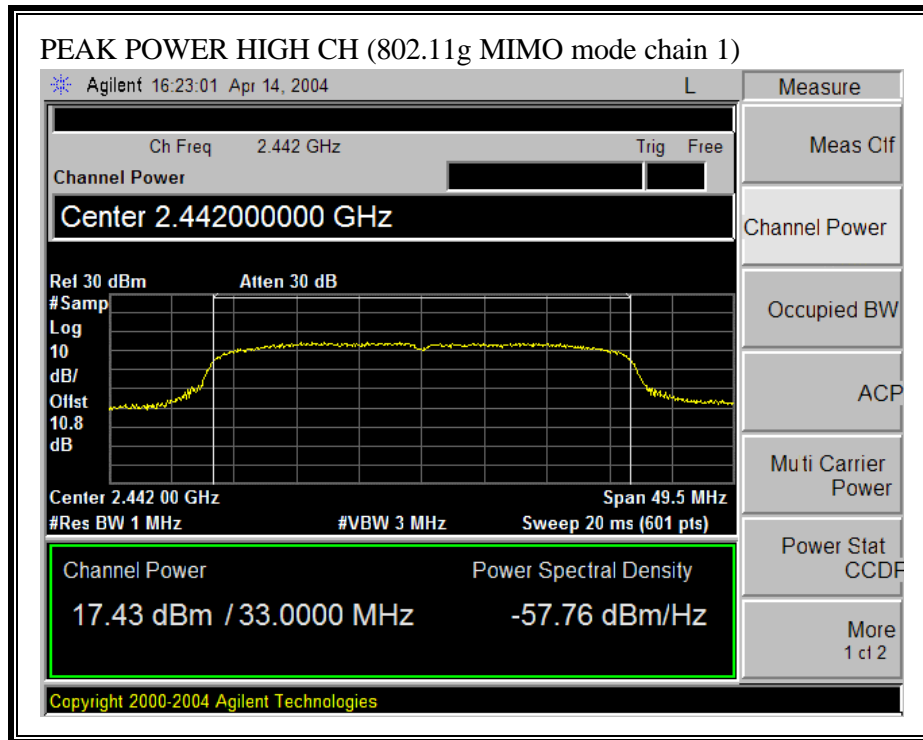
OUTPUT POWER (802.11g MIMO MODE CHAIN 0)





OUTPUT POWER (802.11g MIMO MODE CHAIN 1)





7.1.4. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

$$E = \sqrt{(30 * P * G) / d}$$

and

$$S = E^2 / 3770$$

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 rearranging the terms to express the distance as a function of the remaining variables yields:

$$d = \sqrt{((30 * P * G) / (3770 * S))}$$

Changing to units of Power to mW and Distance to cm, using:

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

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

yields

$$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$$

$$d = 0.282 * \sqrt{(P * G / S)}$$

where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power Density in mW/cm²

Substituting the logarithmic form of power and gain using:

$$P \text{ (mW)} = 10^{(P \text{ (dBm)} / 10)} \text{ and}$$

$$G \text{ (numeric)} = 10^{(G \text{ (dBi)} / 10)}$$

yields

$$d = 0.282 * 10^{((P + G) / 20)} / \sqrt{S}$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm²

Rearranging terms to calculate the power density at a specific distance yields

$$S = 0.0795 * 10^{((P + G) / 10)} / (d^2)$$

LIMITS

From §1.1310 Table 1 (B), the maximum value of $S = 1.0 \text{ mW/cm}^2$

RESULTS

No non-compliance noted: (MPE distance equals 20 cm)

Mode	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm²)
802.11b	20.0	25.53	2.00	0.11
802.11g	20.0	25.22	2.00	0.10
802.11g SIMO	20.0	20.10	2.00	0.03
802.11g MIMO	20.0	20.40	2.00	0.03

7.1.5. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 21.53 dB (including 20.55 dB pad and 0.98 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11b Mode

Channel	Frequency (MHz)	Power Chain 0 (dBm)	Power Chain 1 (dBm)	Total Average Power (dBm)
Low	2412	17.83	17.71	20.78
Middle	2437	22.01	22.03	25.03
High	2462	17.81	18.03	20.93

802.11g Mode

Channel	Frequency (MHz)	Power Chain 0 (dBm)	Power Chain 1 (dBm)	Total Average Power (dBm)
Low	2412	15.66	15.64	18.66
Middle	2437	22.02	22.03	25.04
High	2462	15.71	15.68	18.71

802.11g SIMO Mode

Channel	Frequency (MHz)	Power Chain 0 (dBm)	Power Chain 1 (dBm)	Total Average Power (dBm)
Low	2412	15.81	15.87	18.85
High	2462	16.85	16.86	19.87

802.11g MIMO Mode

Channel	Frequency (MHz)	Power Chain 0 (dBm)	Power Chain 1 (dBm)	Total Average Power (dBm)
Low	2412	15.84	15.92	18.89
High	2462	17.23	17.17	20.21

7.1.6. PEAK POWER SPECTRAL DENSITY

LIMIT

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

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

RESULTS

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 1 (dBm)	Limit (dBm)
Low	2412	-12.63	-11.48	8
Middle	2437	-4.50	-6.55	8
High	2462	-11.58	-11.32	8

802.11g Mode

Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 1 (dBm)	Limit (dBm)
Low	2412	-16.69	-16.86	8
Middle	2437	-9.66	-10.52	8
High	2462	-17.77	-17.32	8

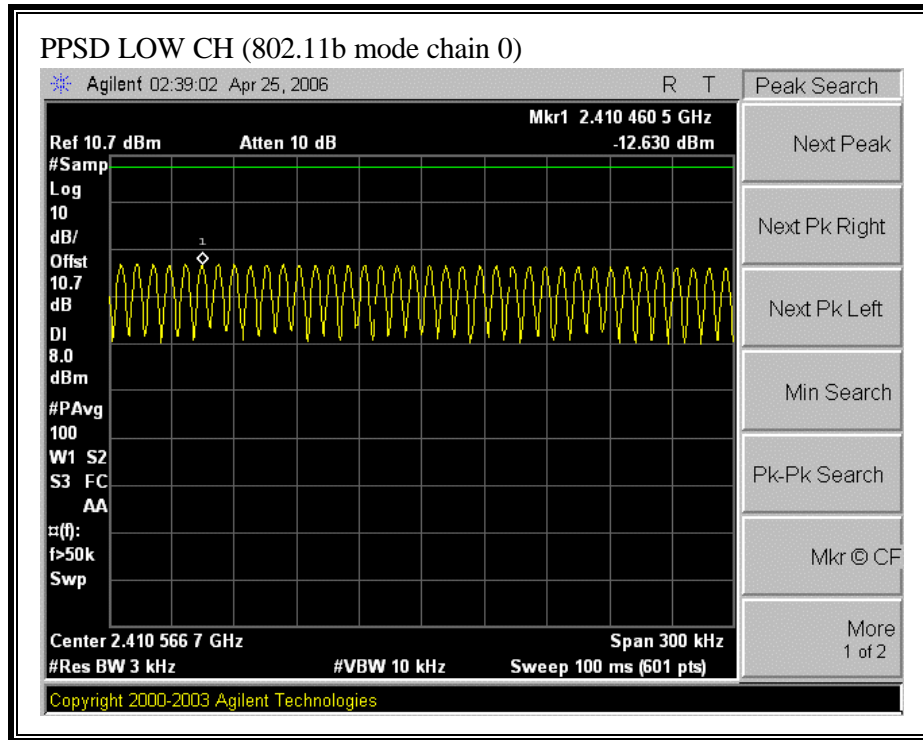
802.11g SIMO Mode

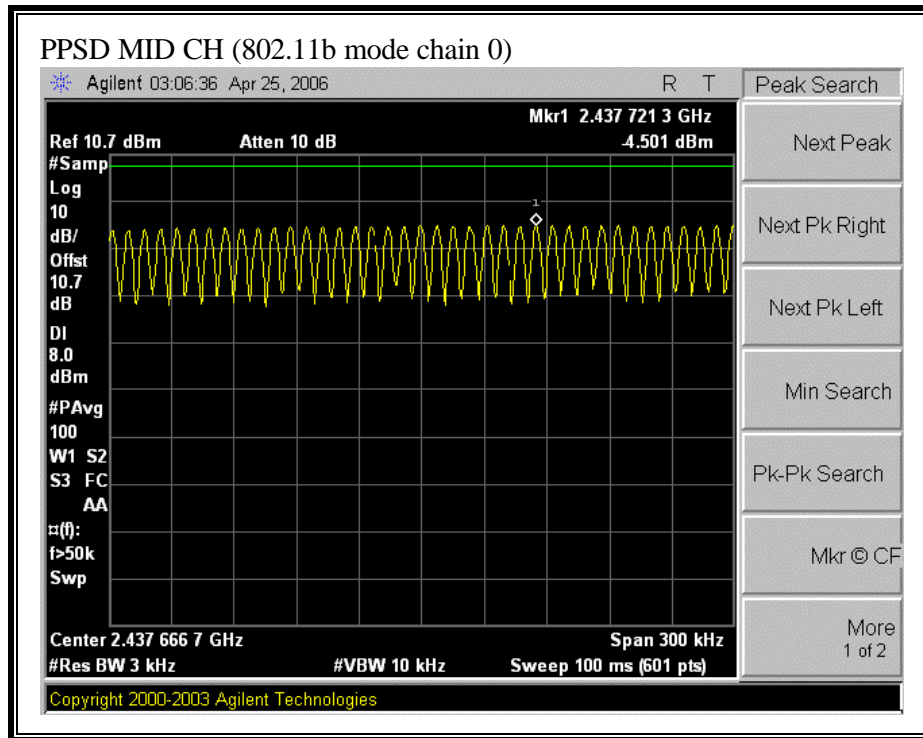
Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 1 (dBm)	Limit (dBm)
Low	2432	-13.64	-17.06	8
High	2442	-15.286	-16.765	8

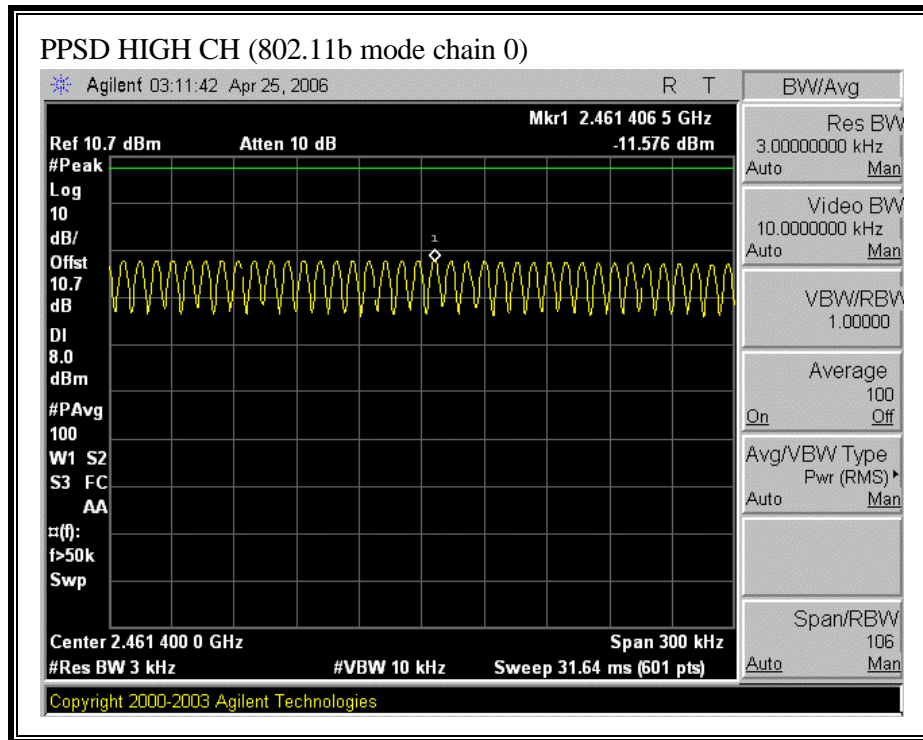
802.11g MIMO Mode

Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 1 (dBm)	Limit (dBm)
Low	2432	-16.60	-16.97	8
High	2442	-16.28	-15.847	8

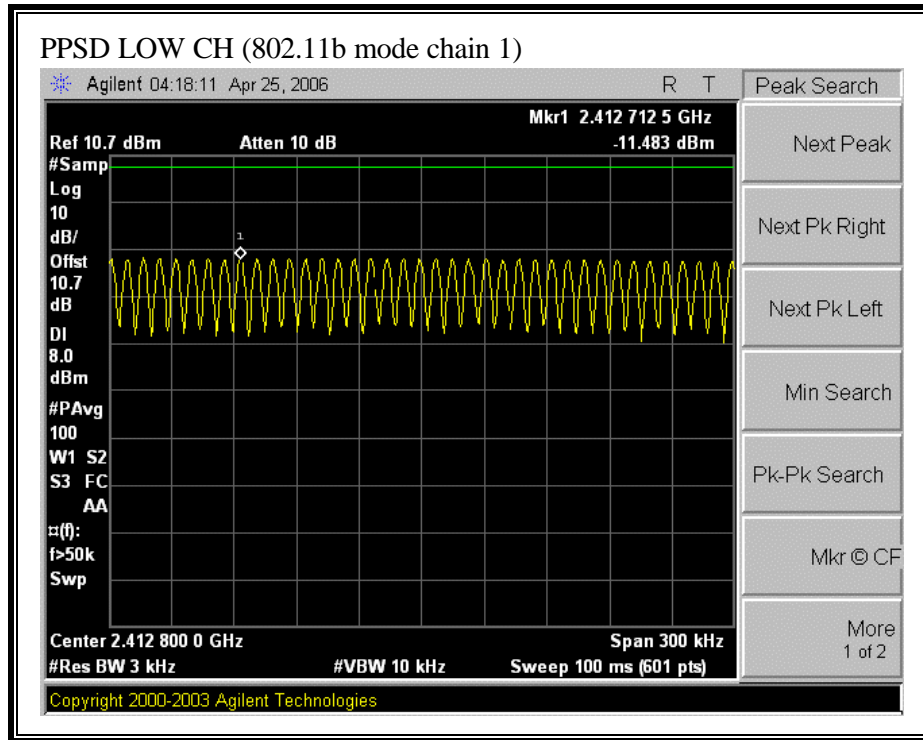
PEAK POWER SPECTRAL DENSITY (802.11b MODE CHAIN 0)

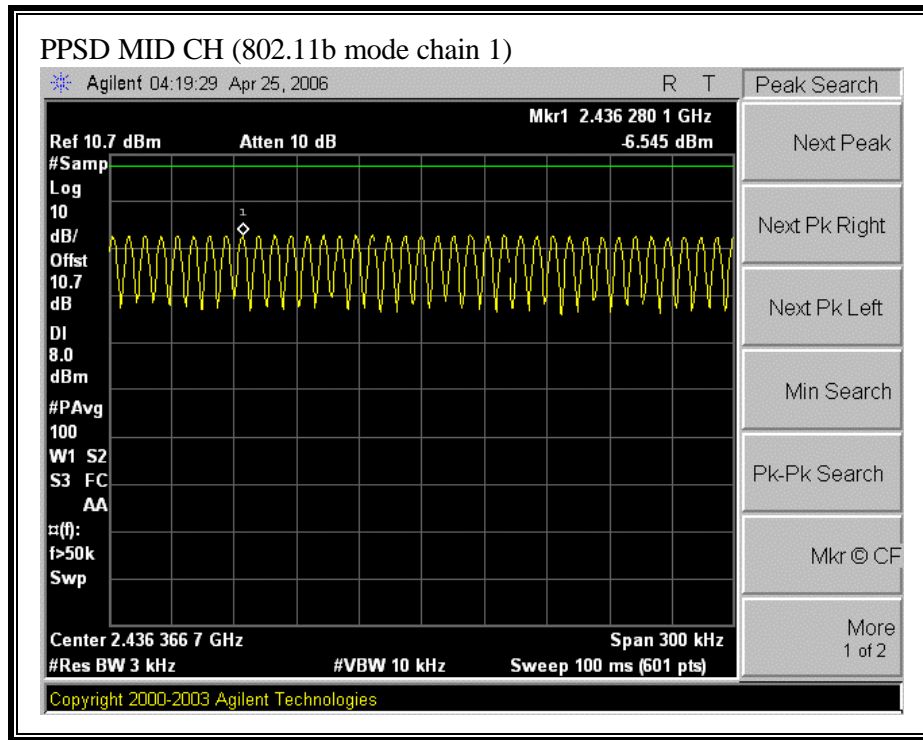


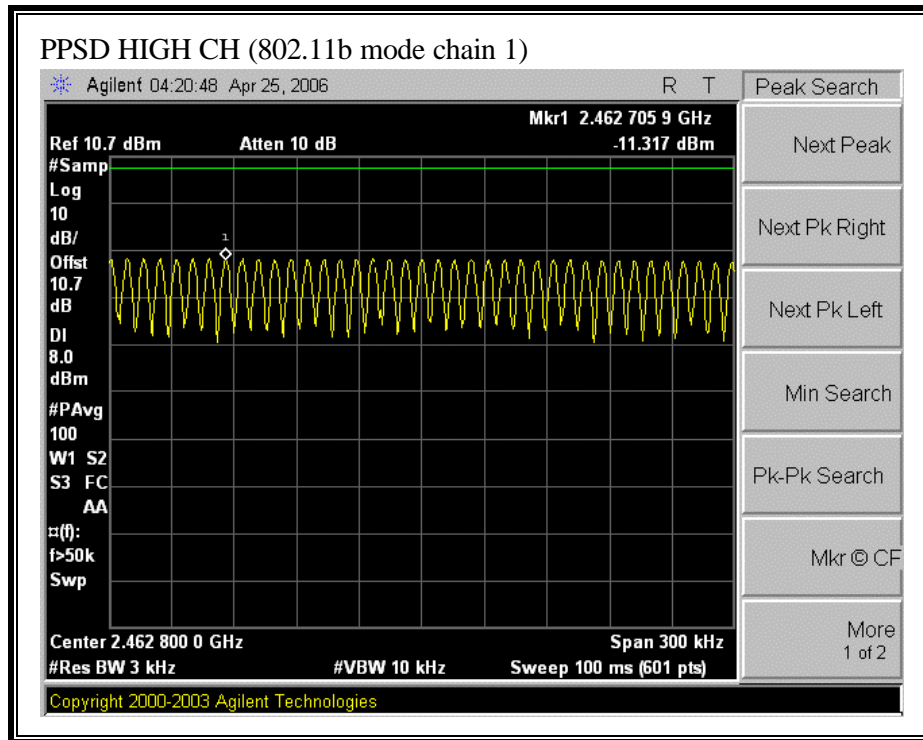




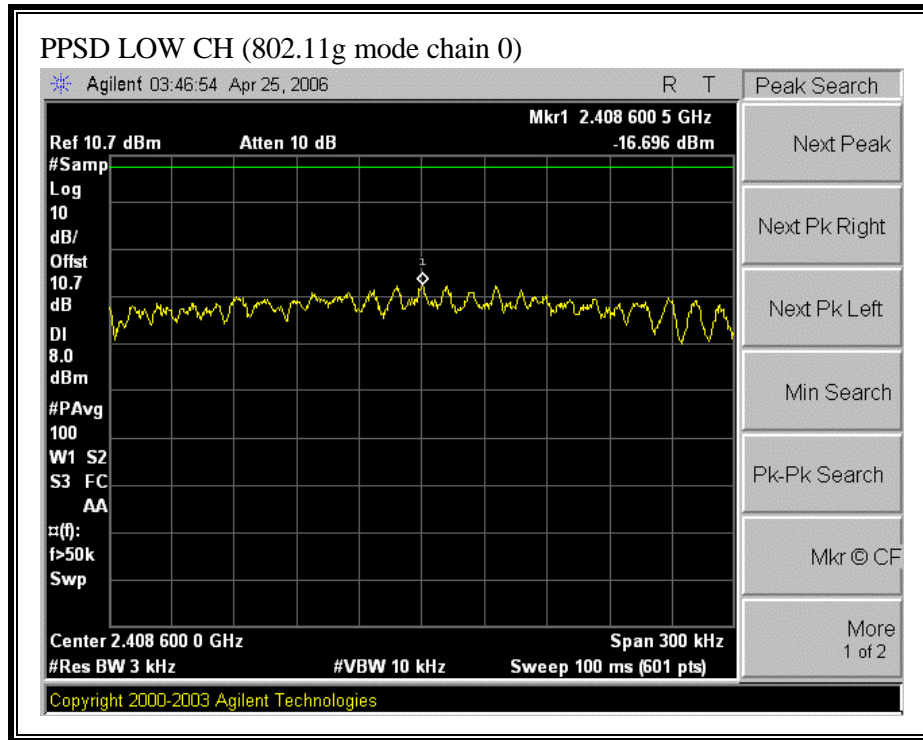
PEAK POWER SPECTRAL DENSITY (802.11b MODE CHAIN 1)

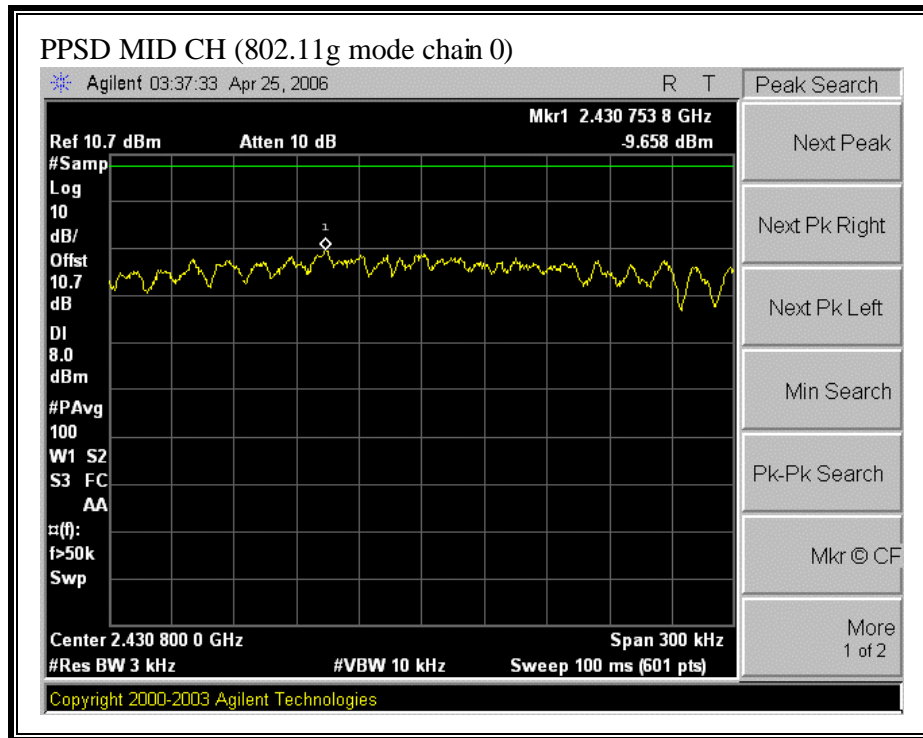


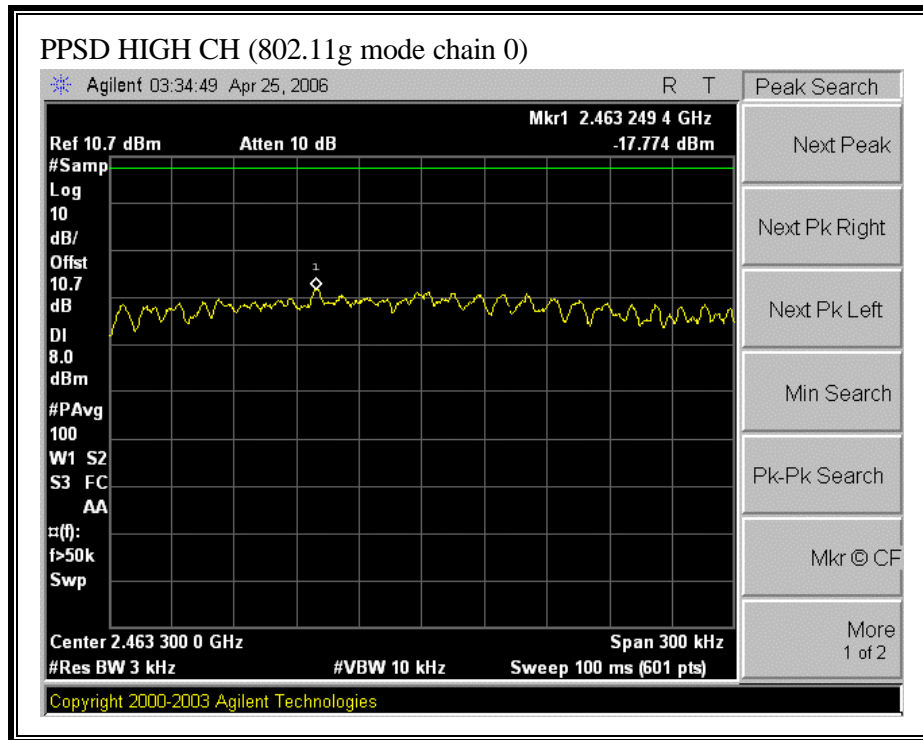




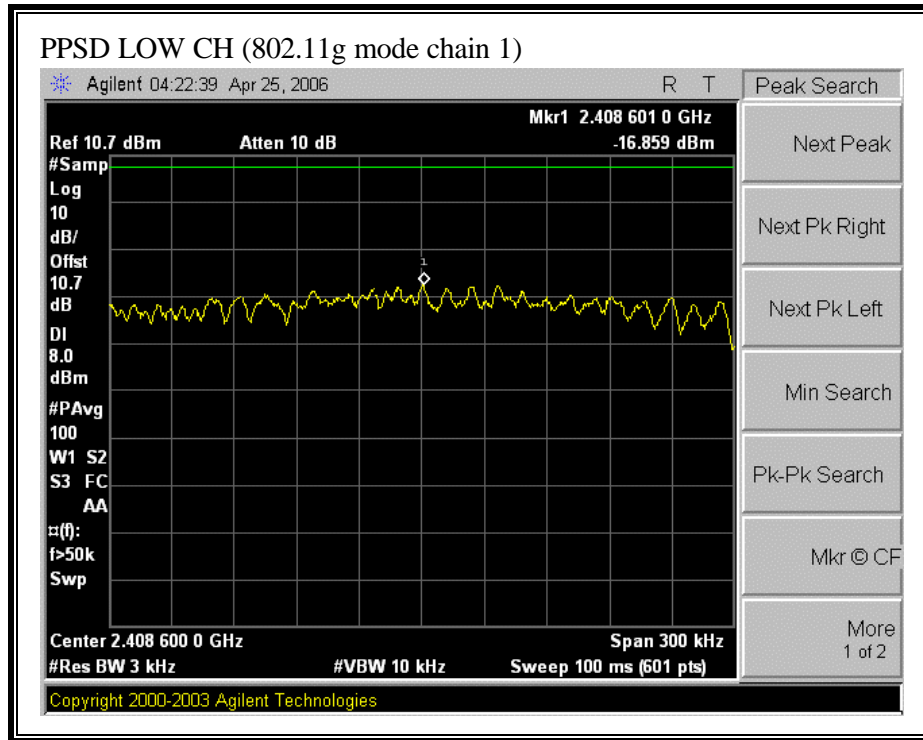
PEAK POWER SPECTRAL DENSITY (802.11g MODE CHAIN 0)

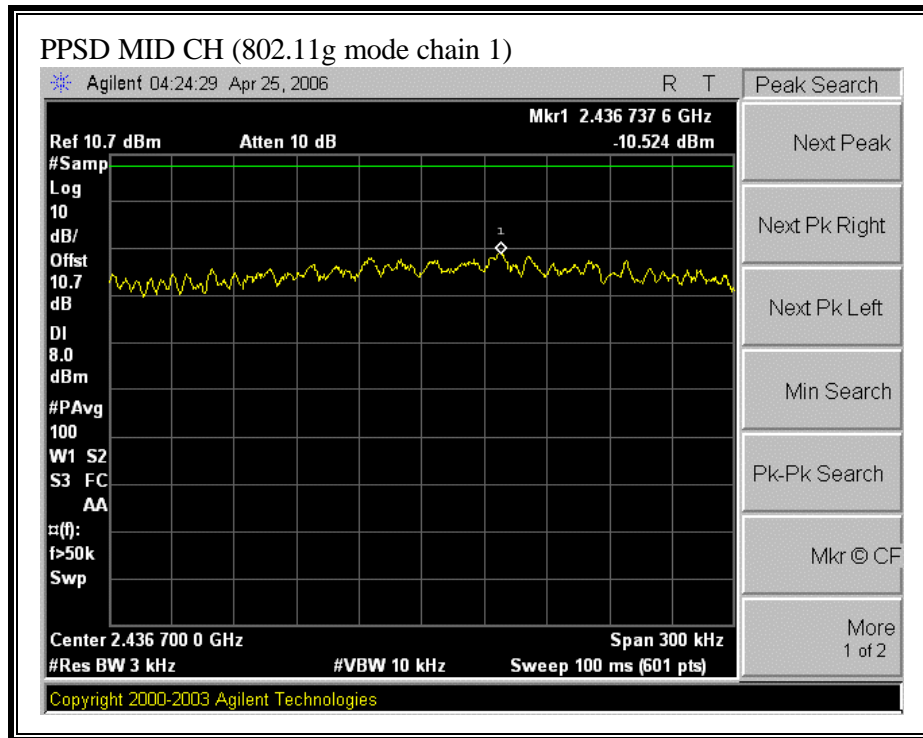


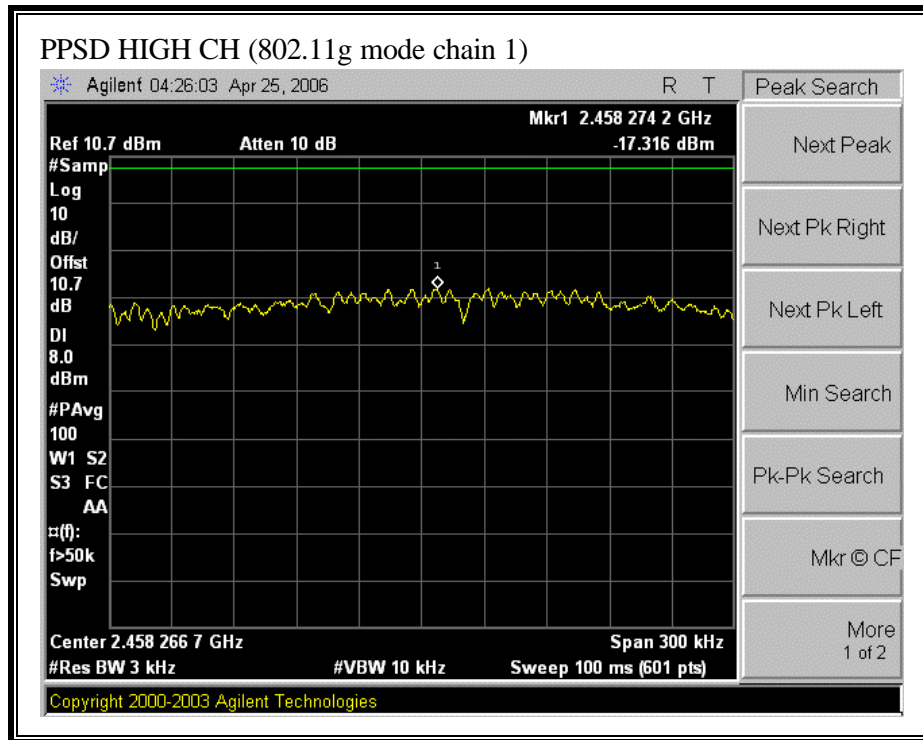




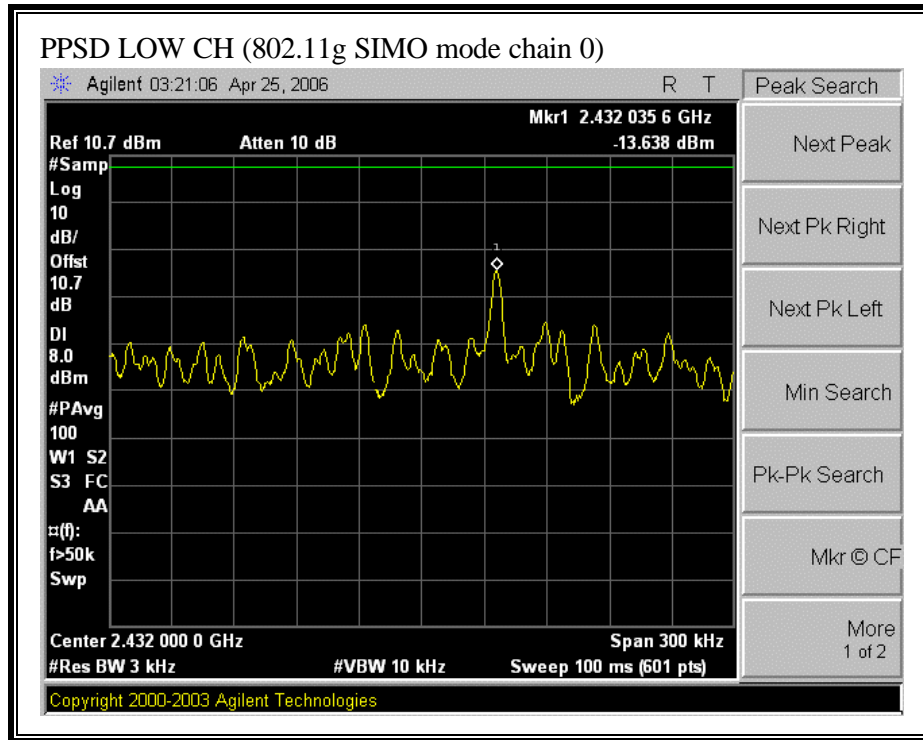
PEAK POWER SPECTRAL DENSITY (802.11g MODE CHAIN 1)

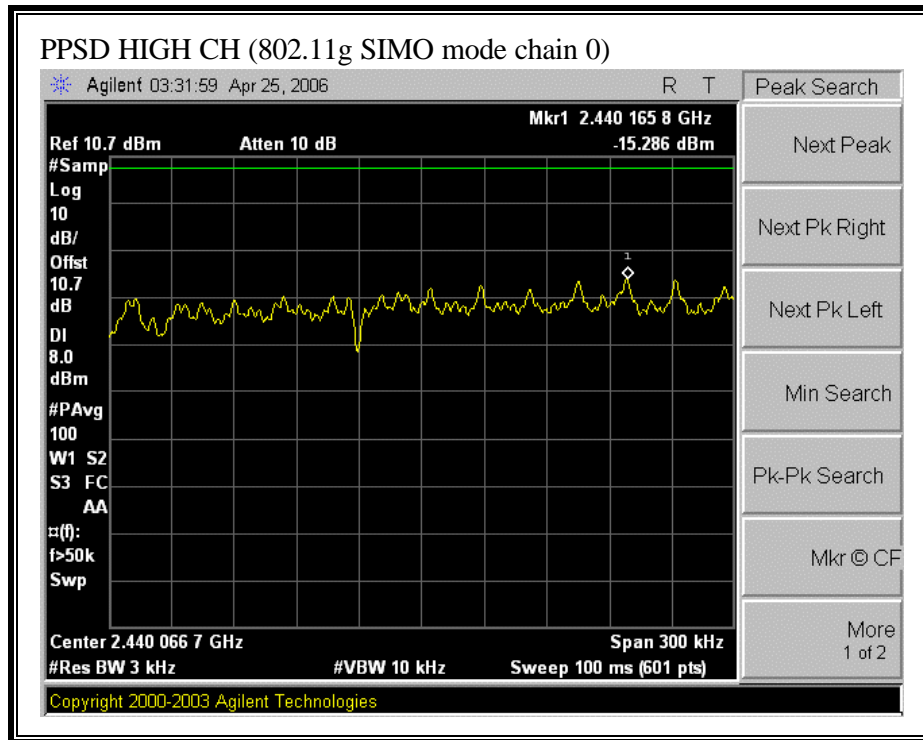




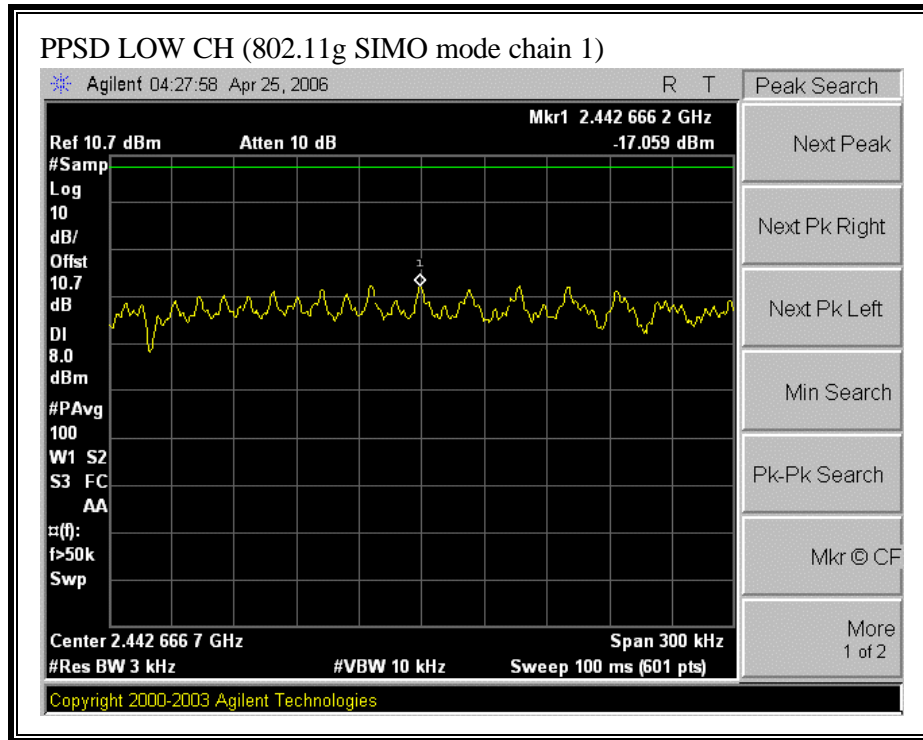


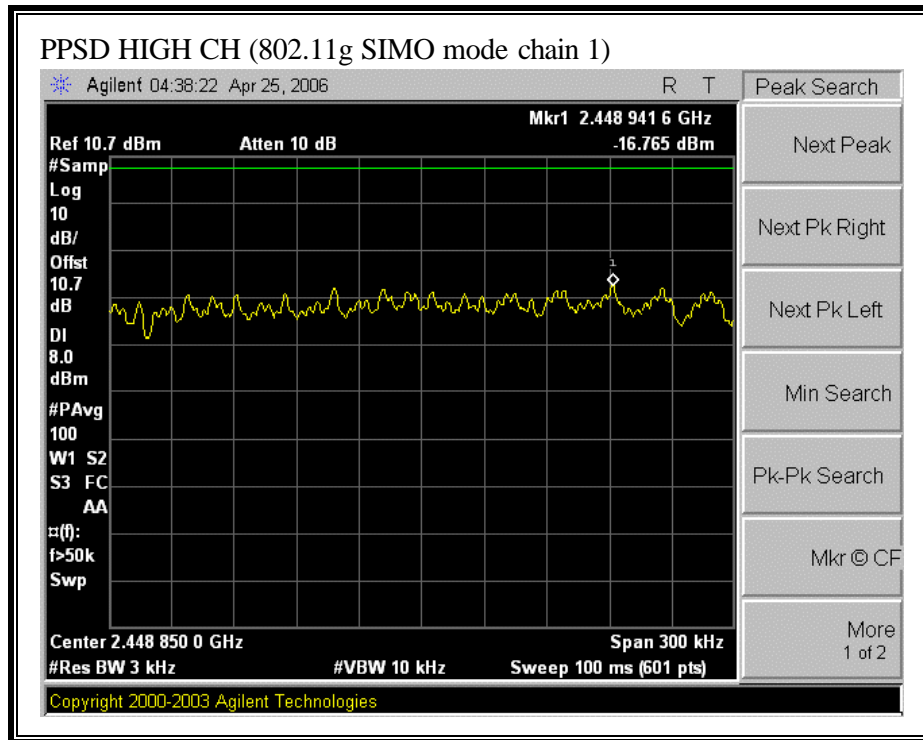
PEAK POWER SPECTRAL DENSITY (802.11g SIMO MODE CHAIN 0)



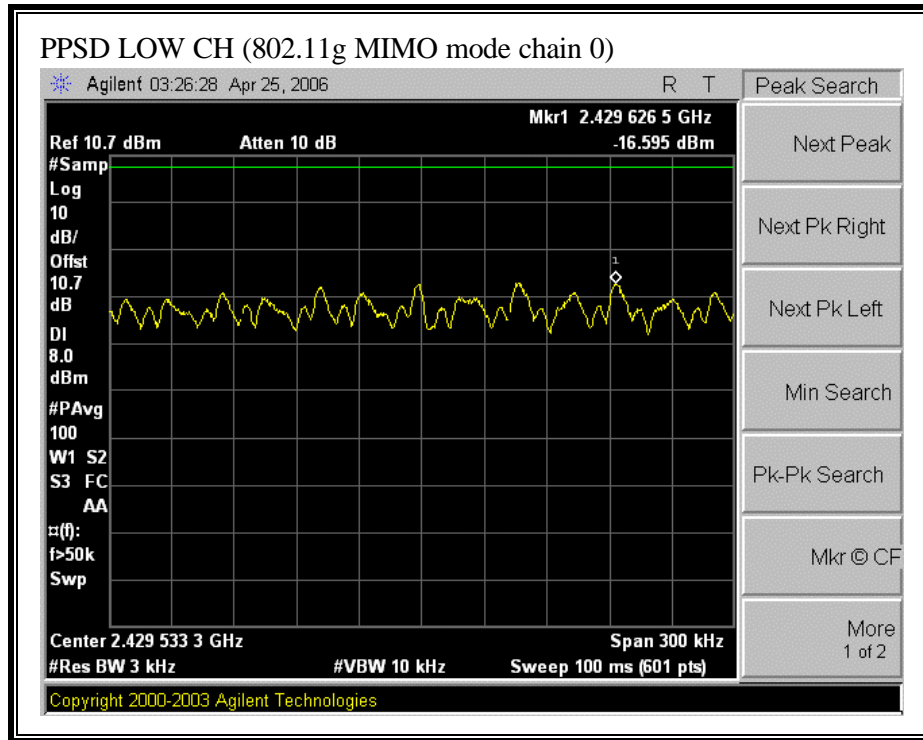


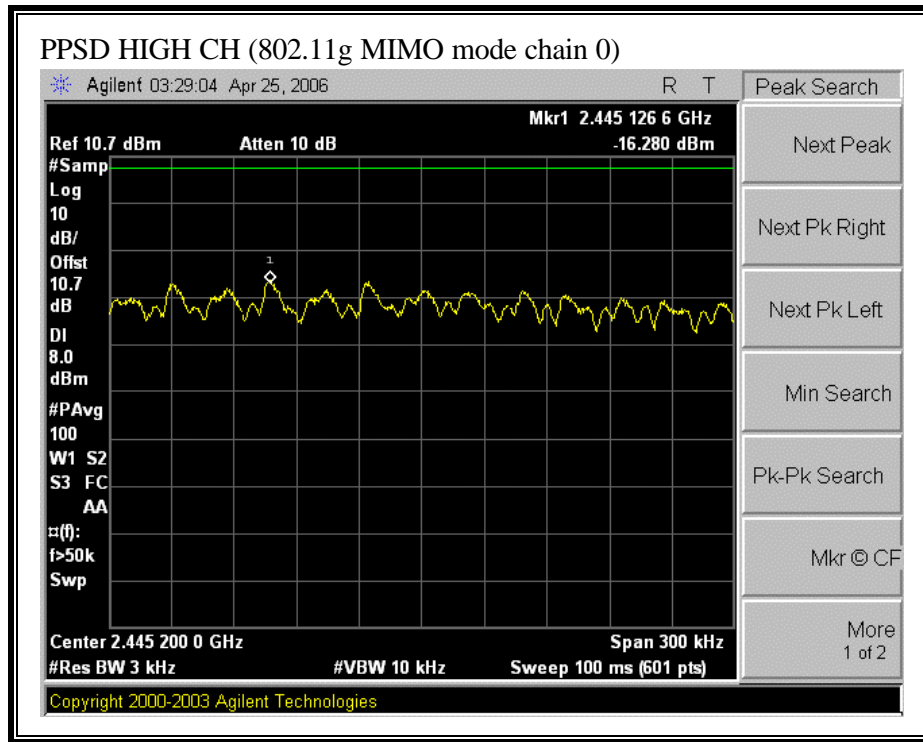
PEAK POWER SPECTRAL DENSITY (802.11g SIMO MODE CHAIN 1)



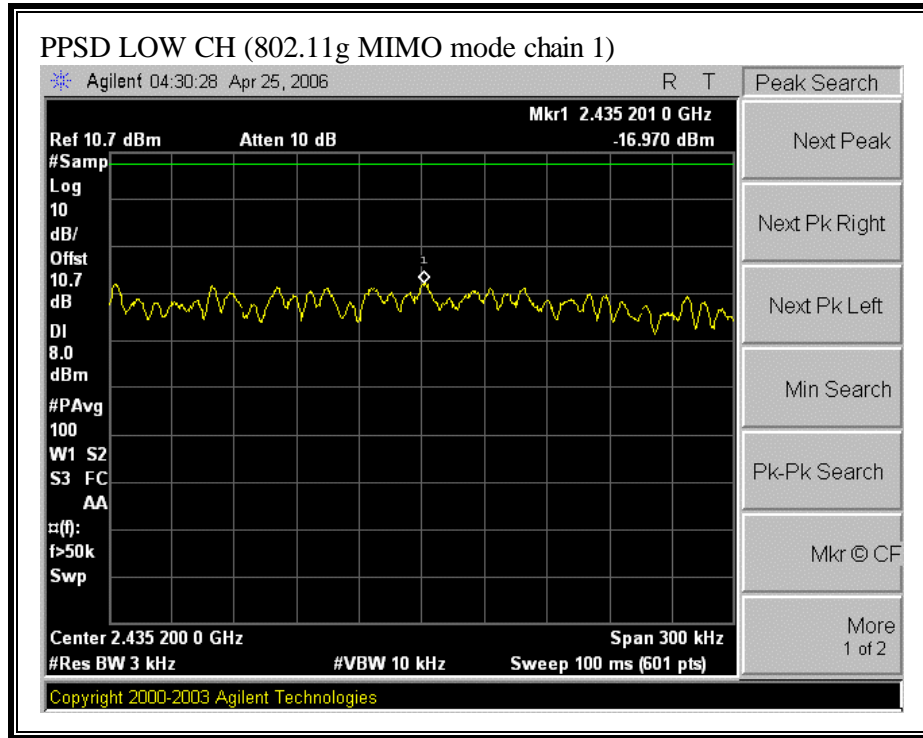


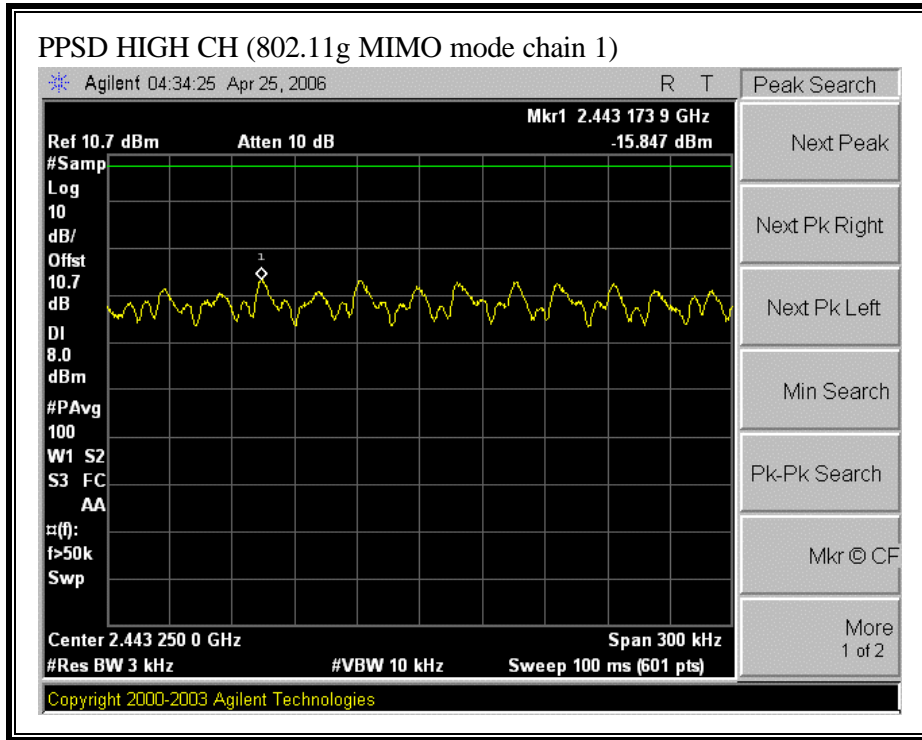
PEAK POWER SPECTRAL DENSITY (802.11g MIMO MODE CHAIN 0)





PEAK POWER SPECTRAL DENSITY (802.11g MIMO MODE CHAIN 1)





7.1.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Conducted power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dB.

TEST PROCEDURE

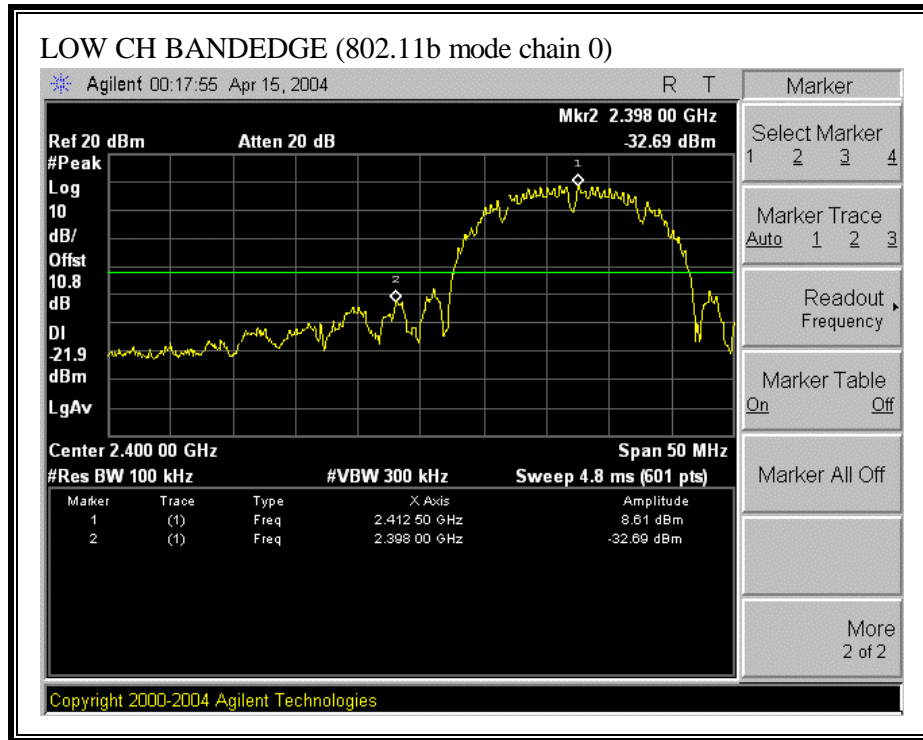
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

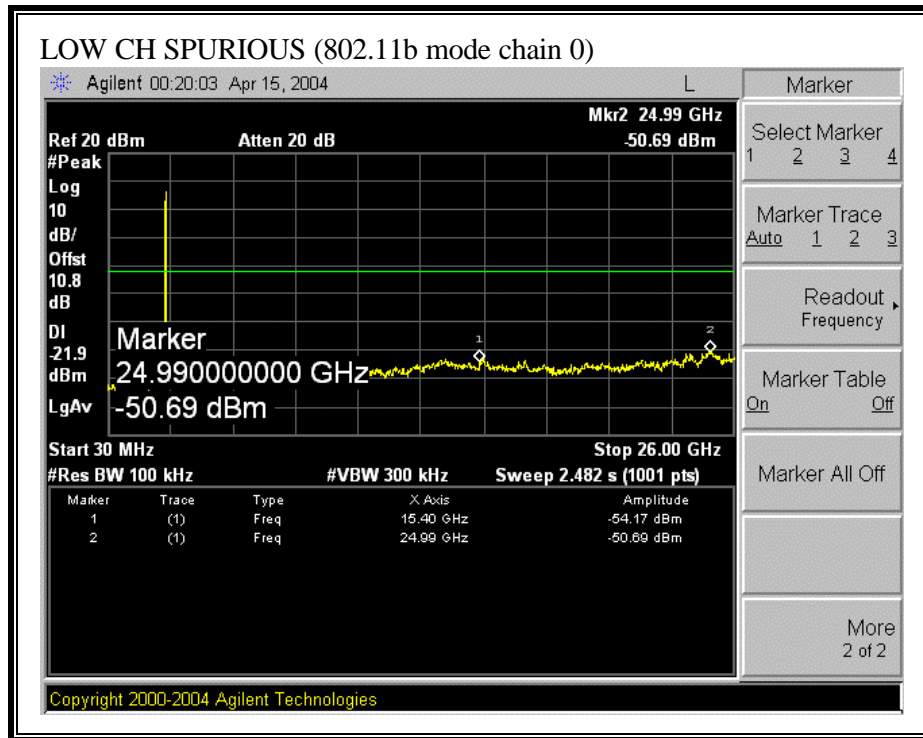
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

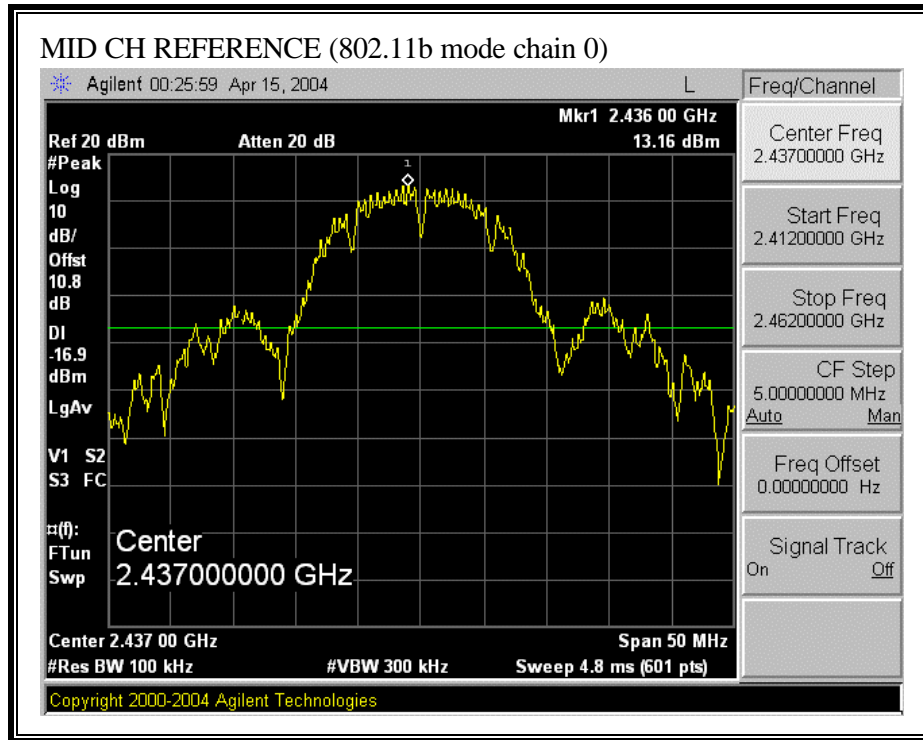
No non-compliance noted:

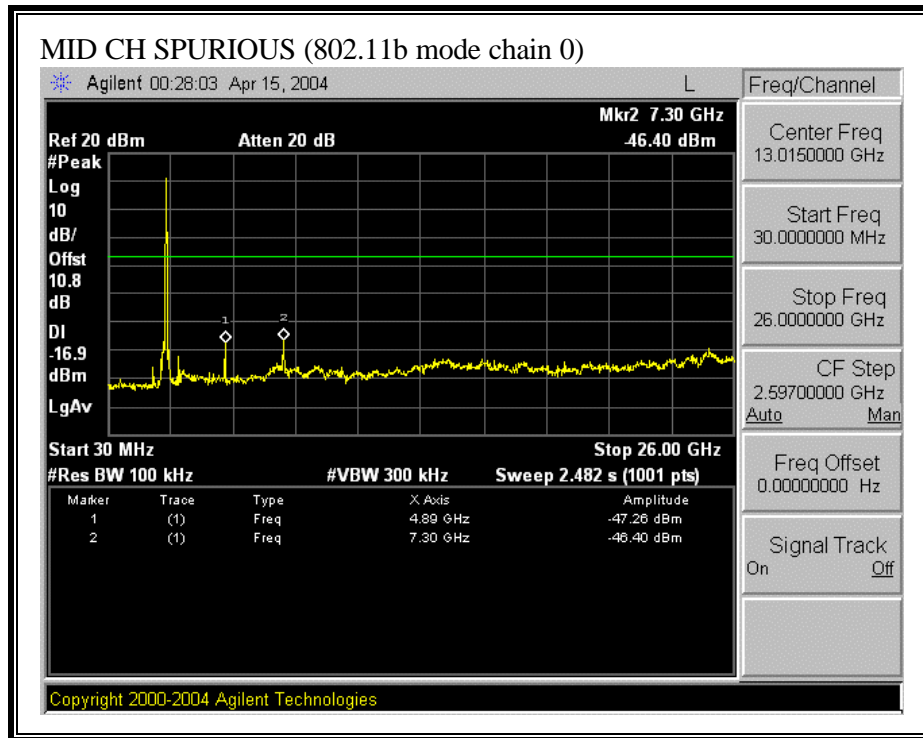
SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE CHAIN 0)



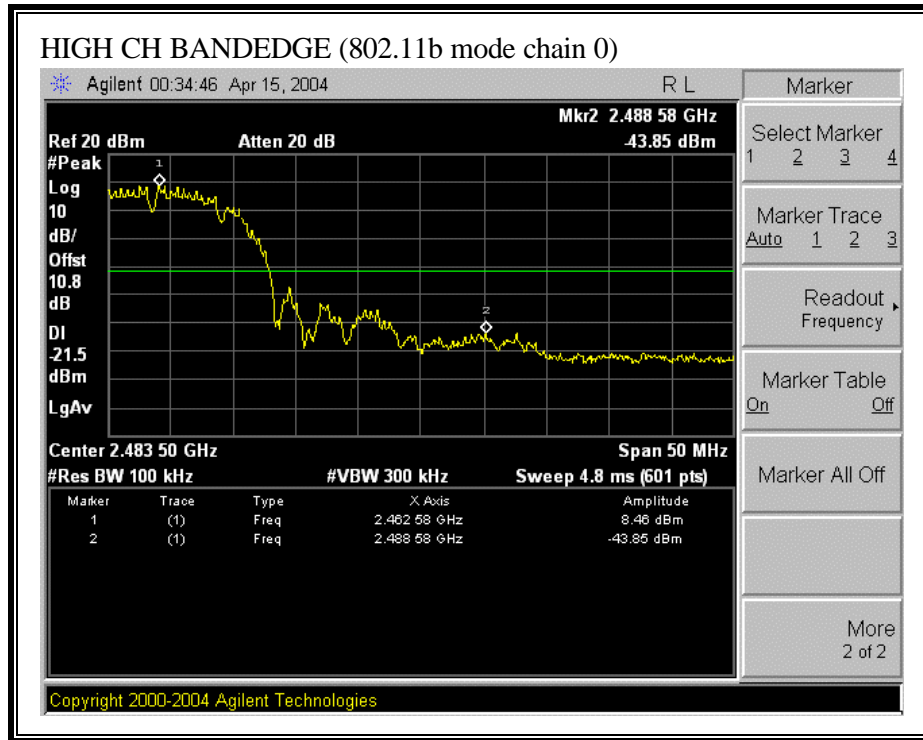


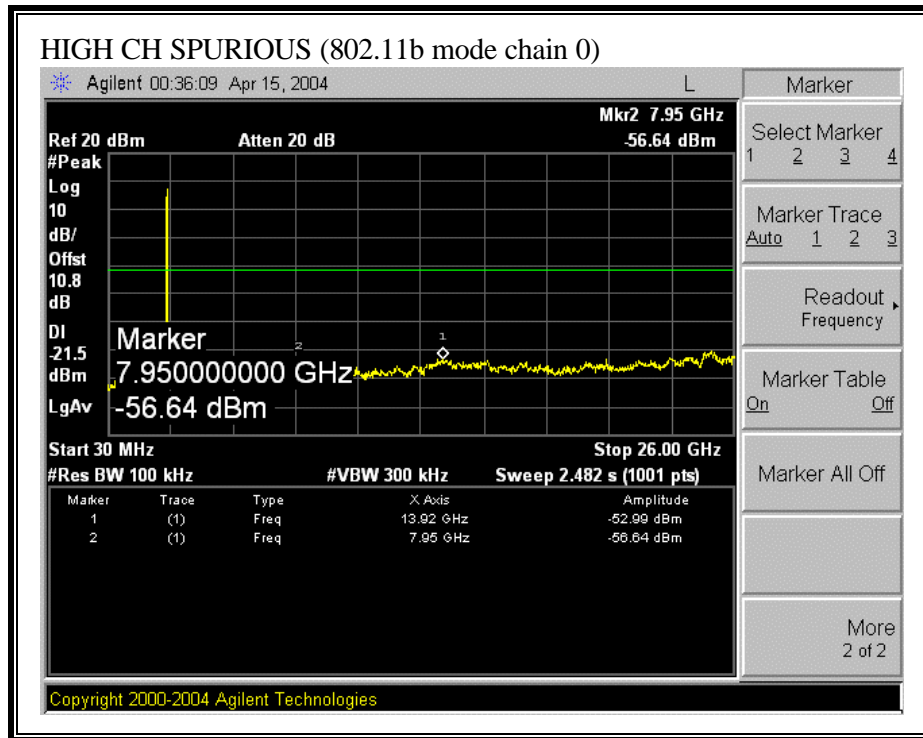
SPURIOUS EMISSIONS, MID CHANNEL (802.11B MODE CHAIN 0)



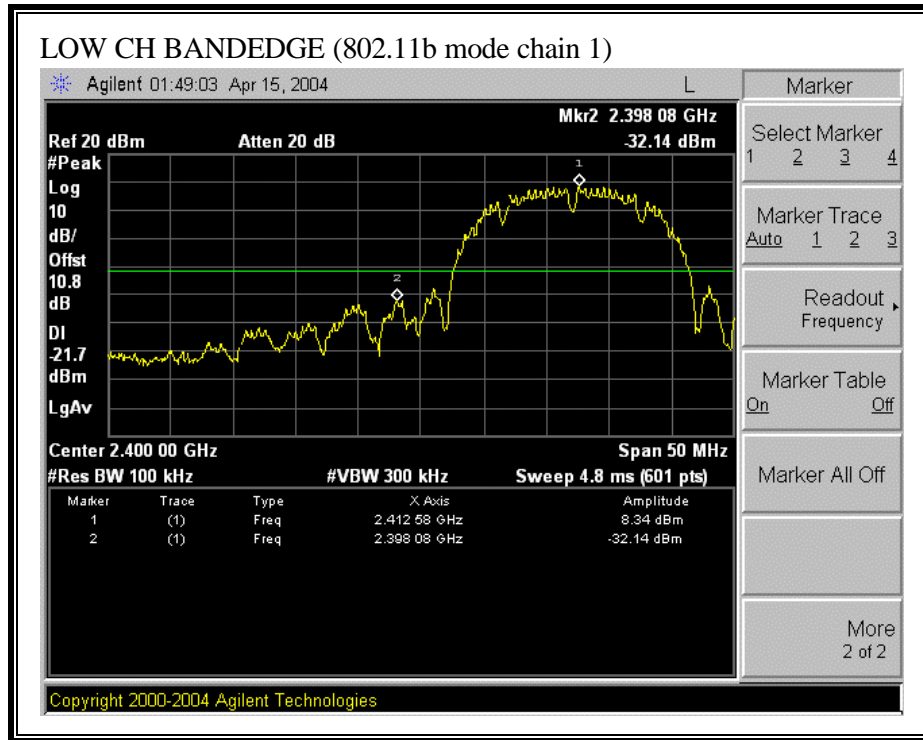


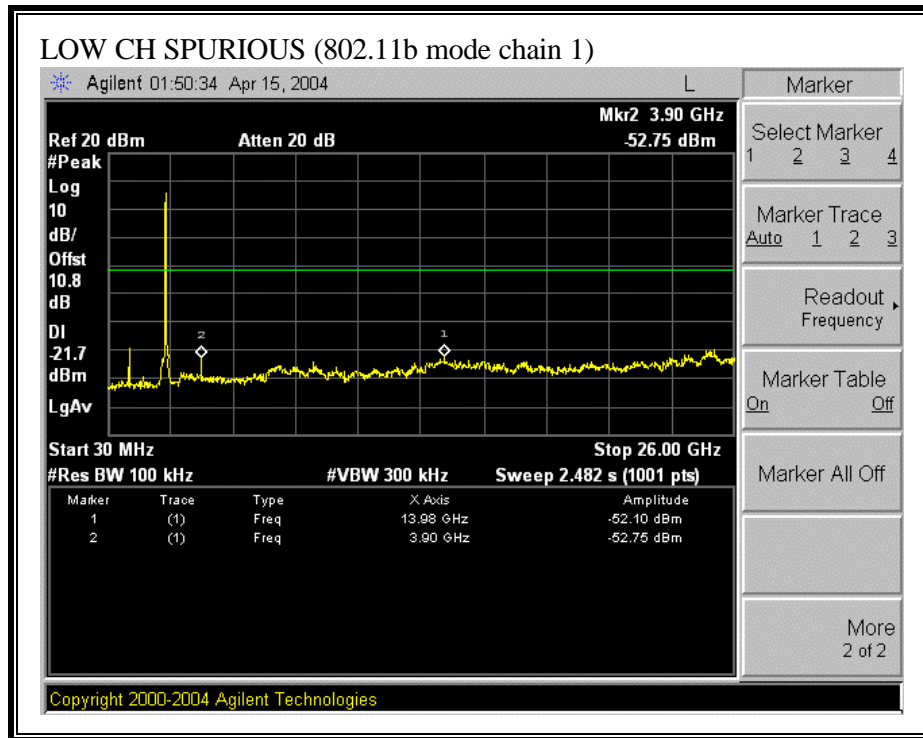
SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE CHAIN 0)



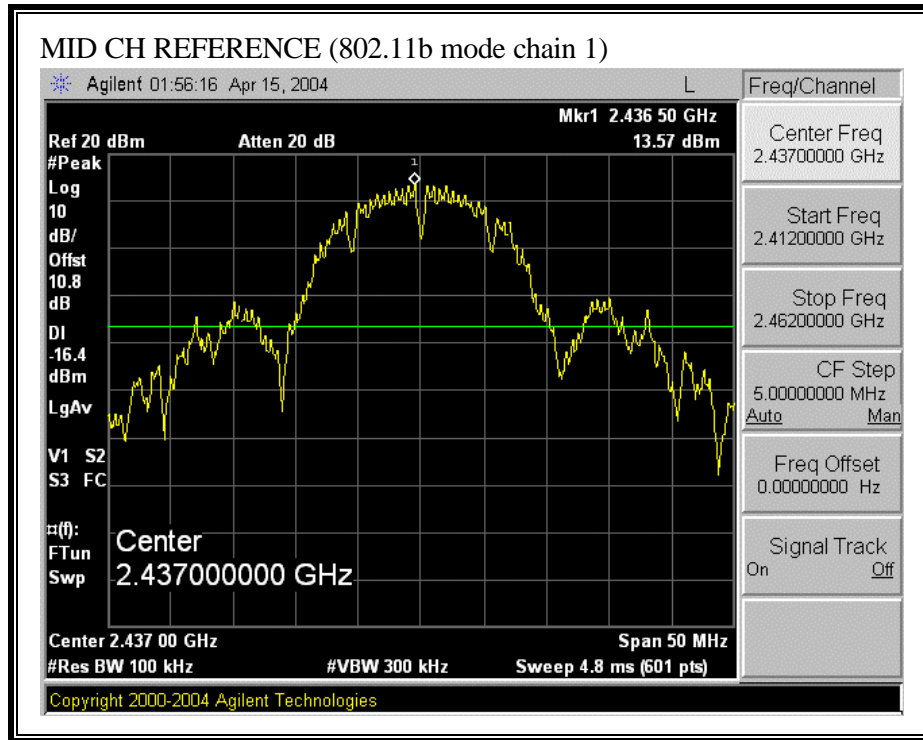


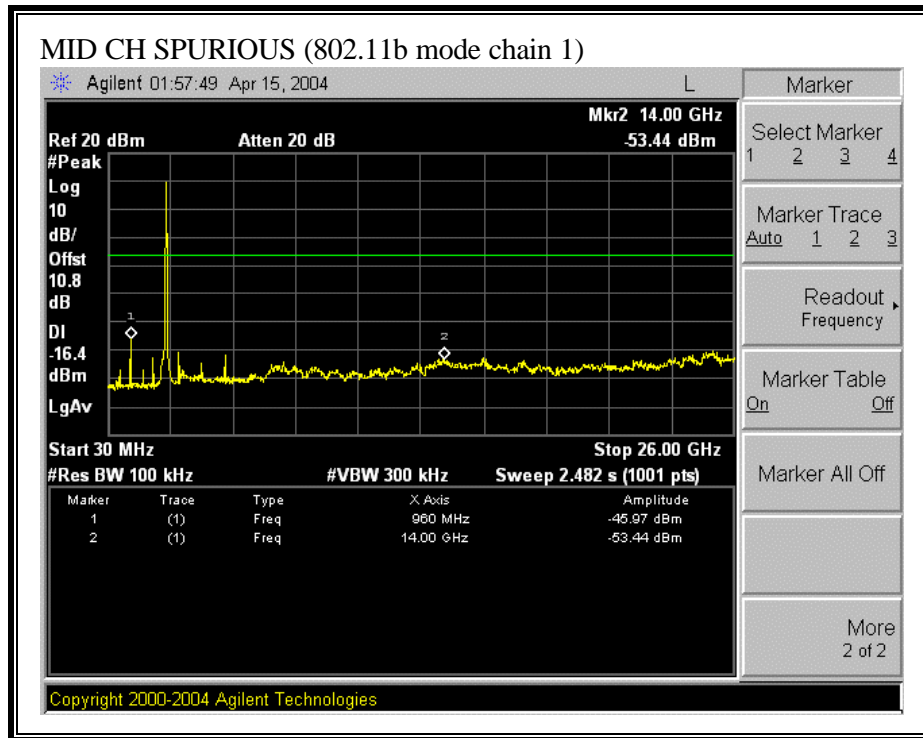
SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE CHAIN 1)



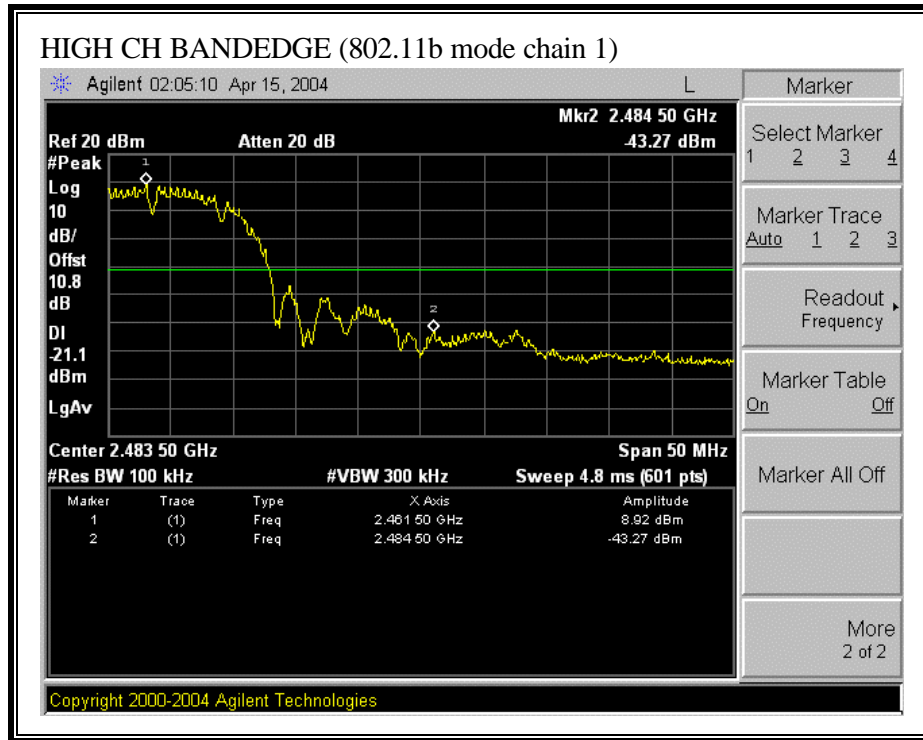


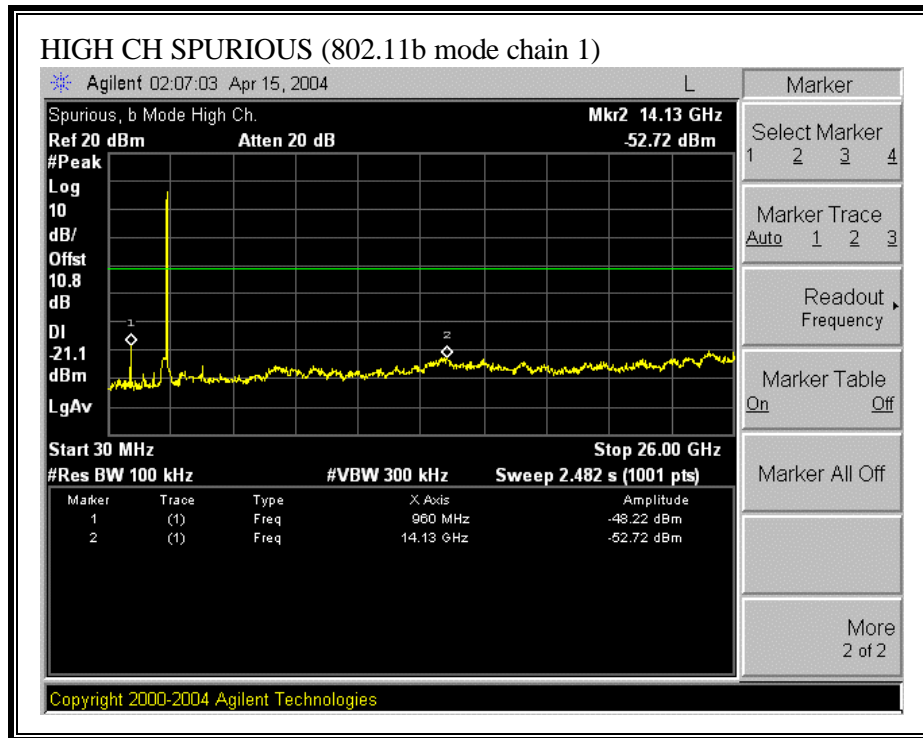
SPURIOUS EMISSIONS, MID CHANNEL (802.11B MODE CHAIN 1)



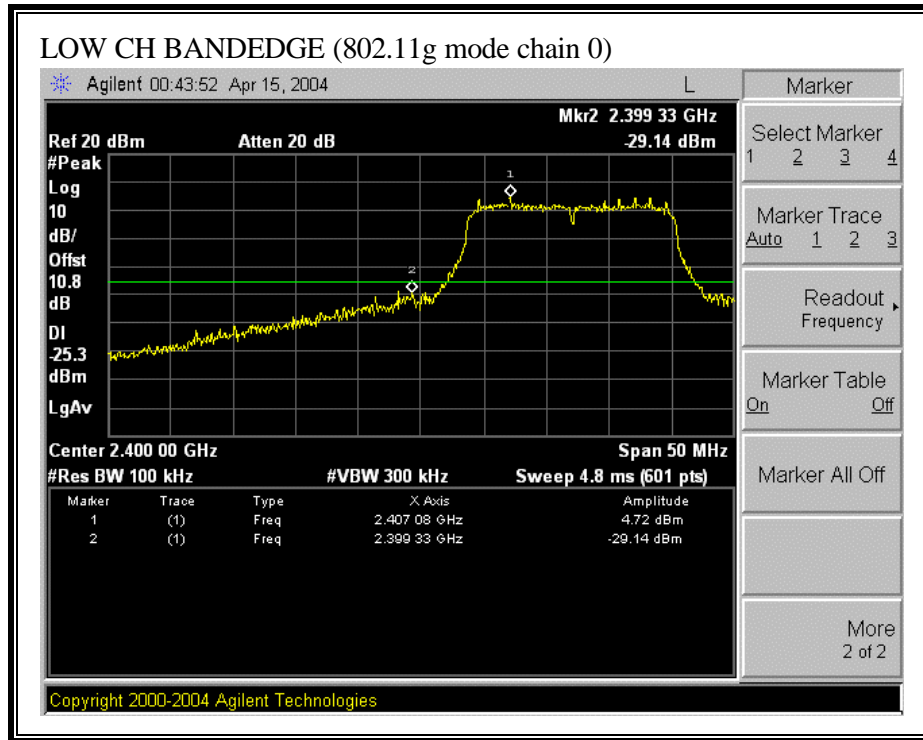


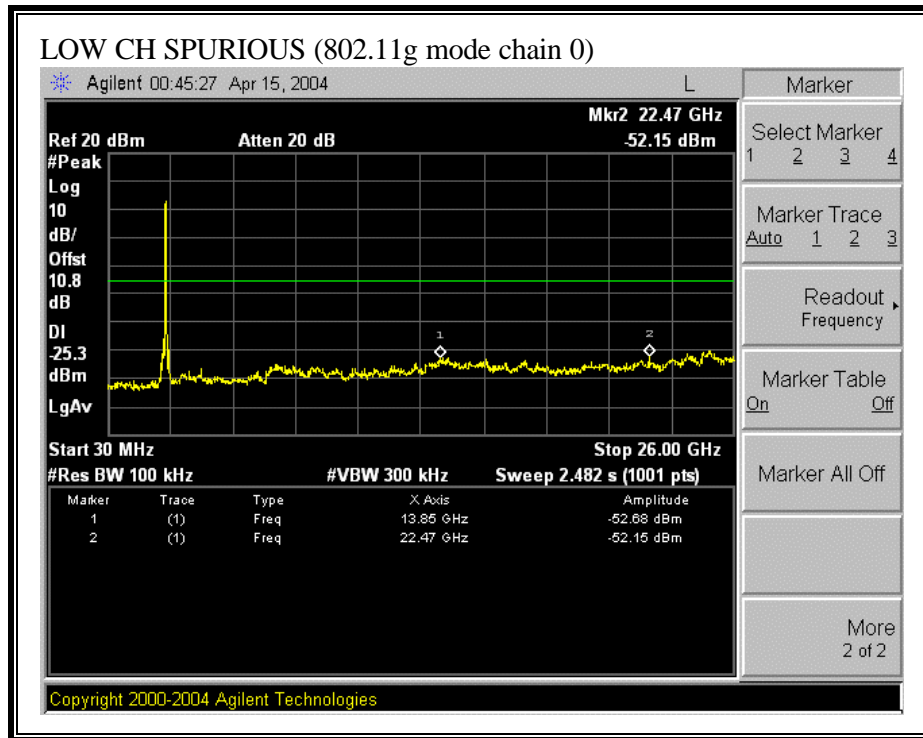
SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE CHAIN 1)



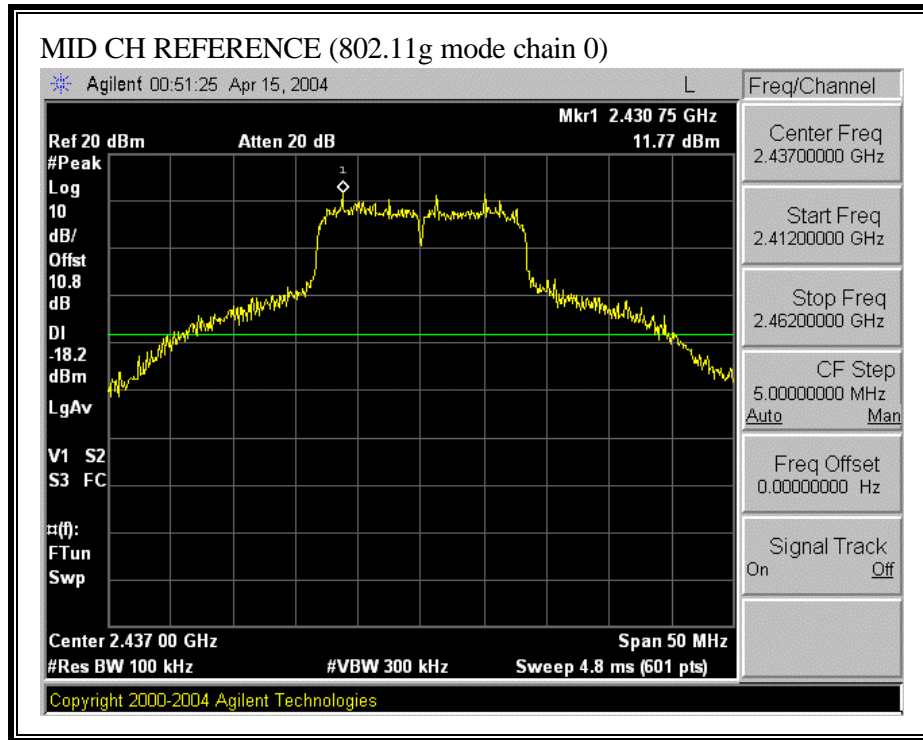


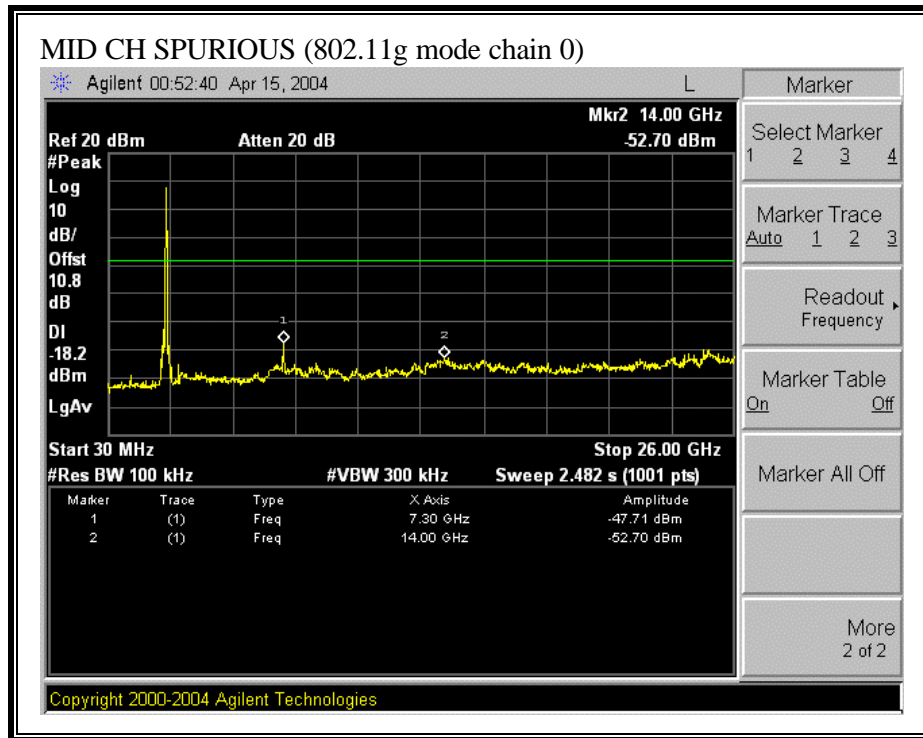
SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MODE CHAIN 0)



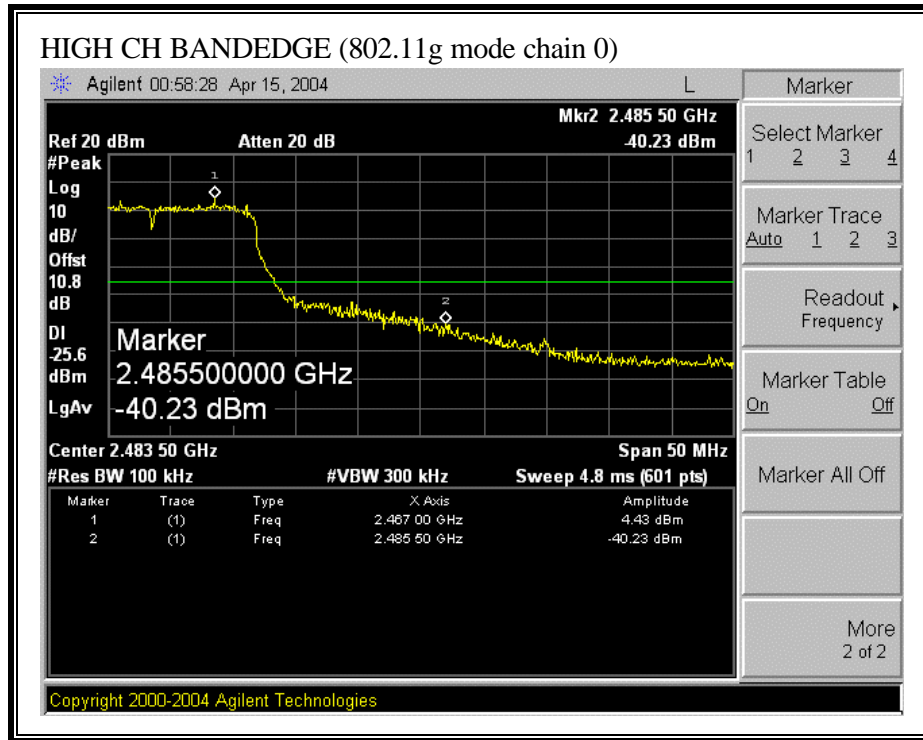


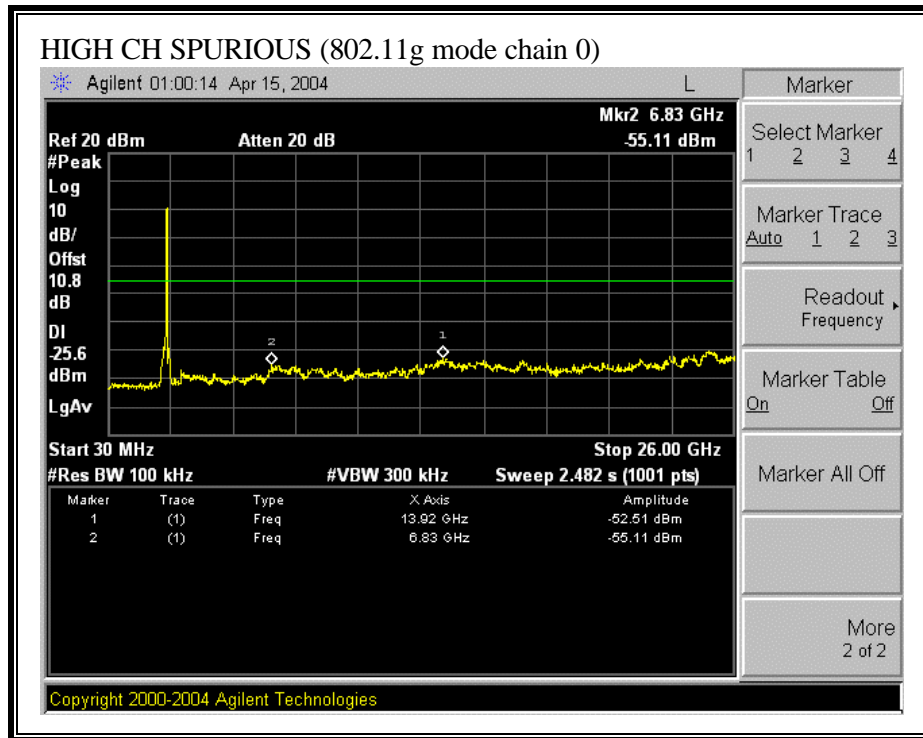
SPURIOUS EMISSIONS, MID CHANNEL (802.11g MODE CHAIN 0)



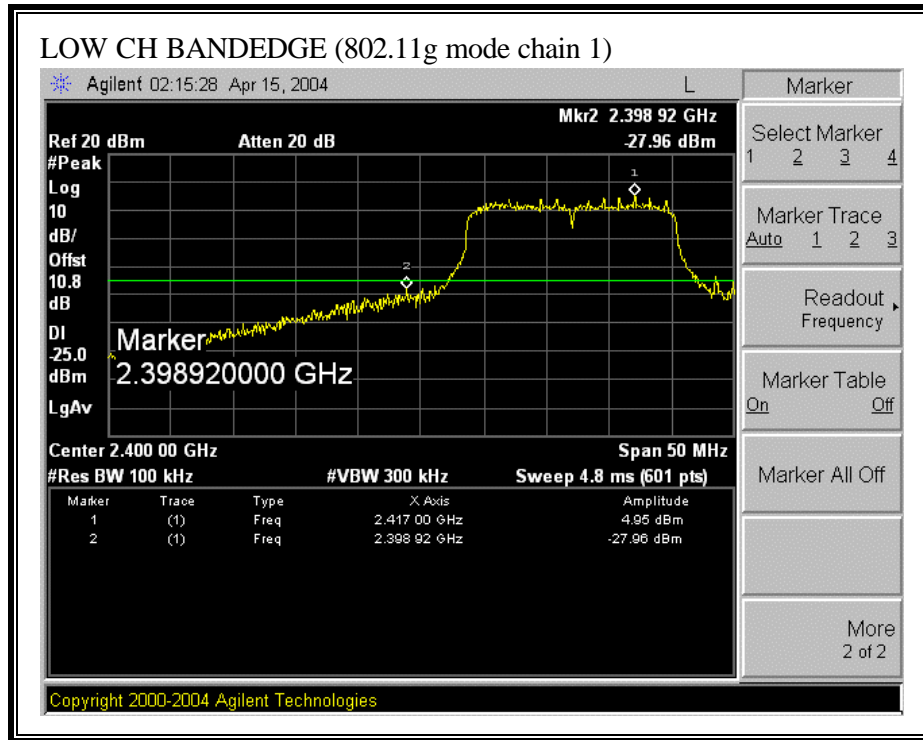


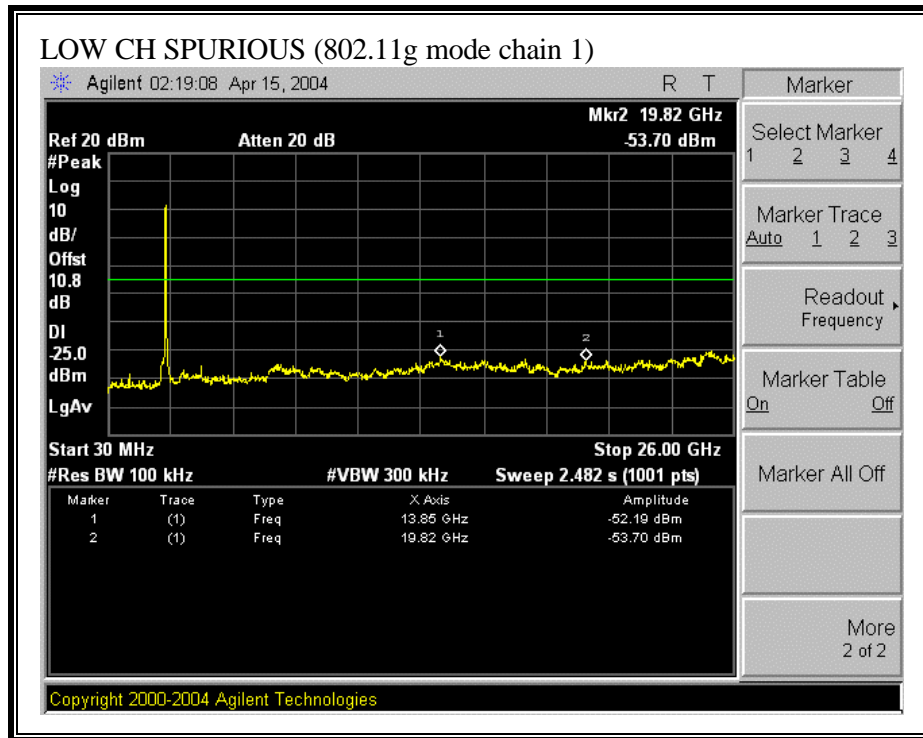
SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MODE CHAIN 0)



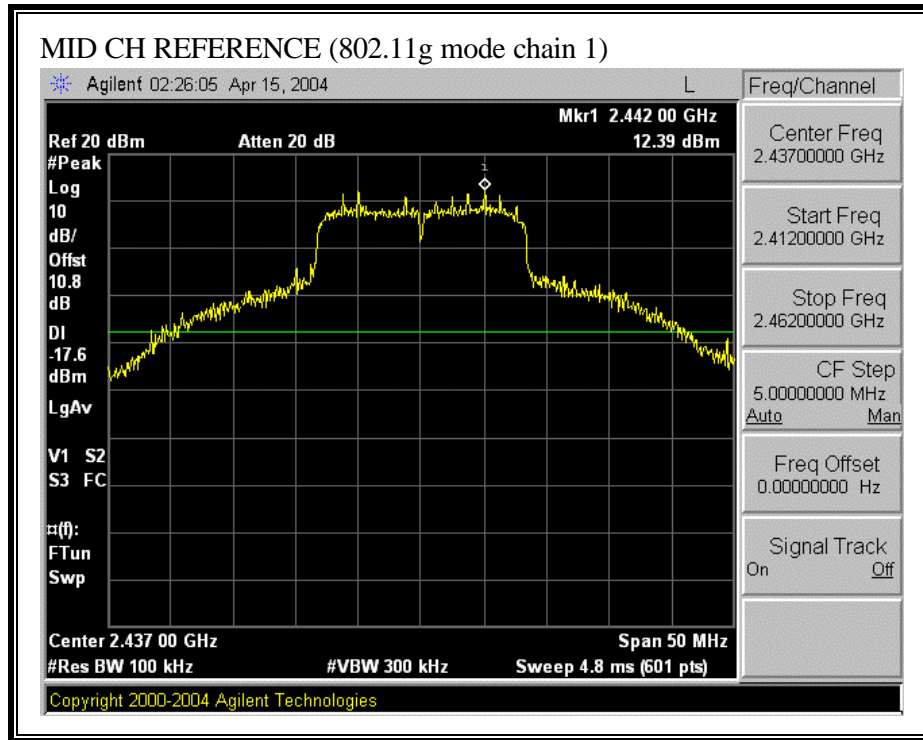


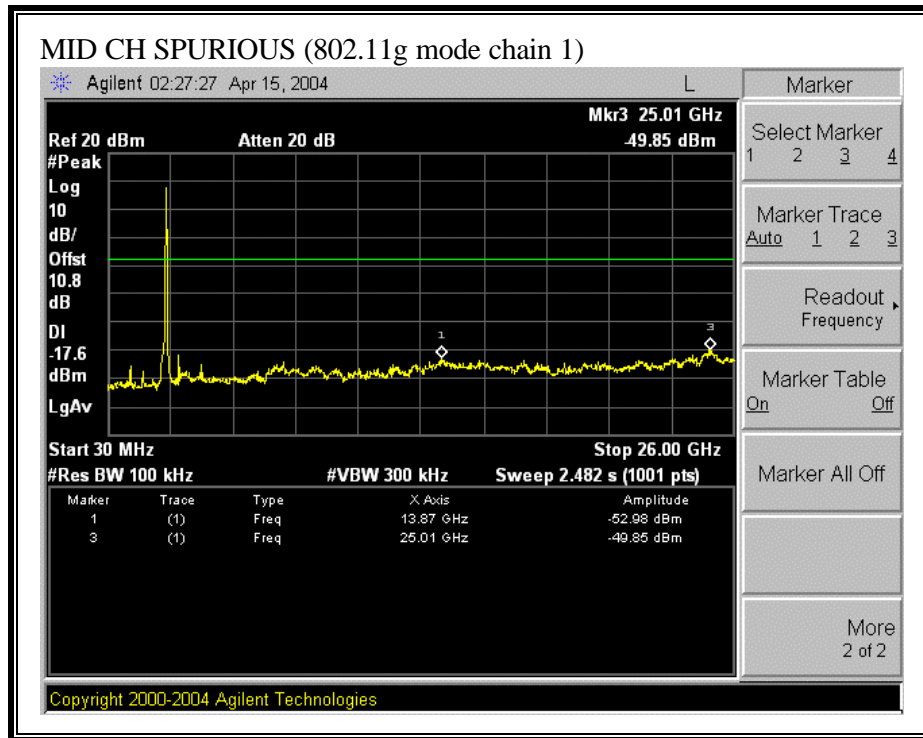
SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MODE CHAIN 1)



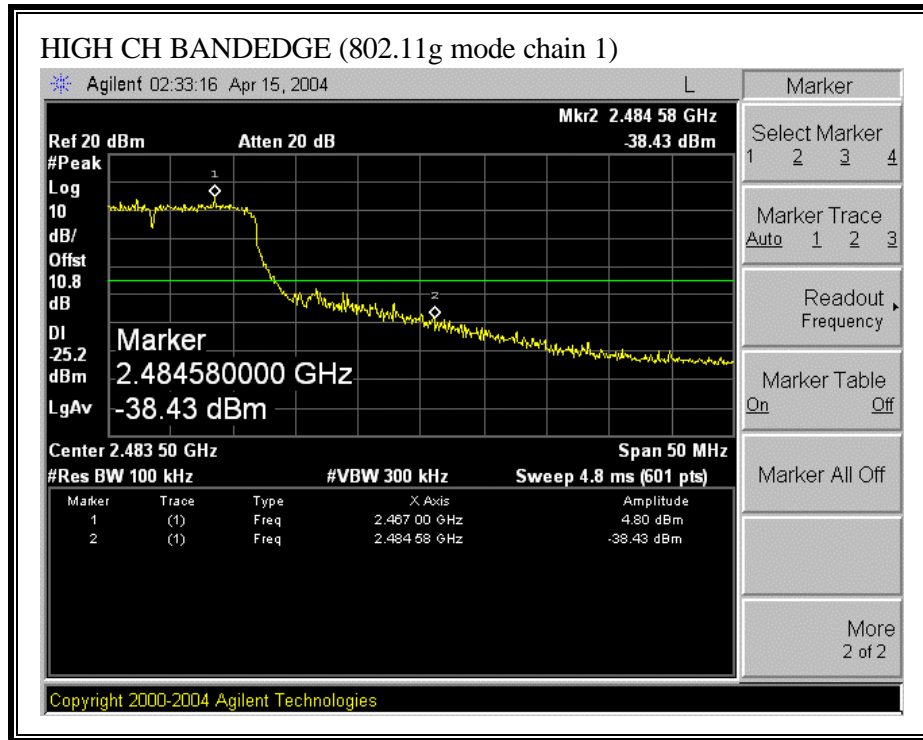


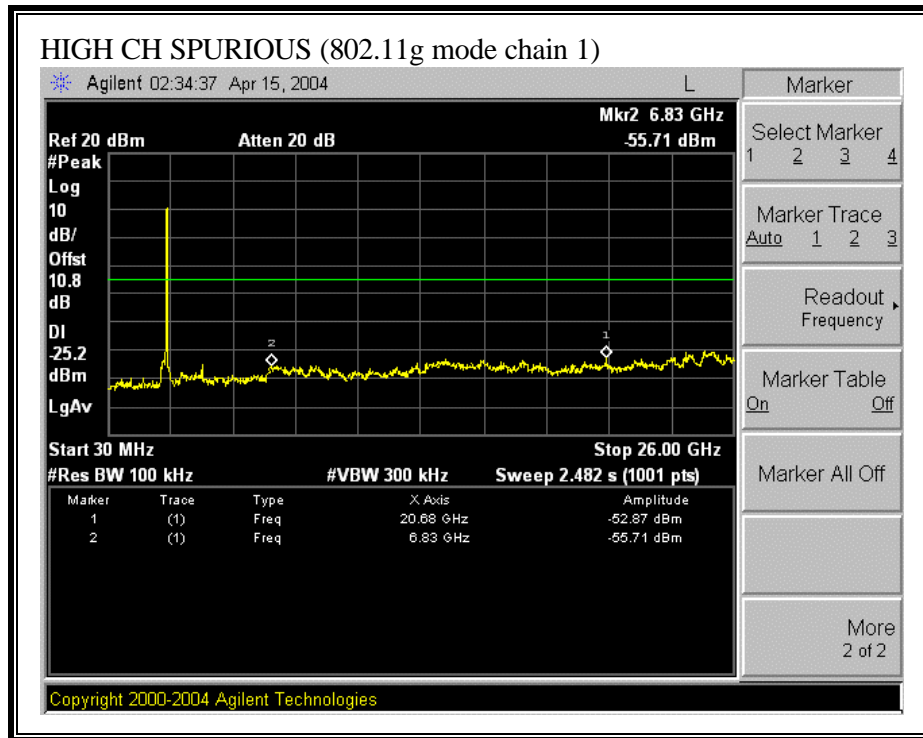
SPURIOUS EMISSIONS, MID CHANNEL (802.11g MODE CHAIN 1)



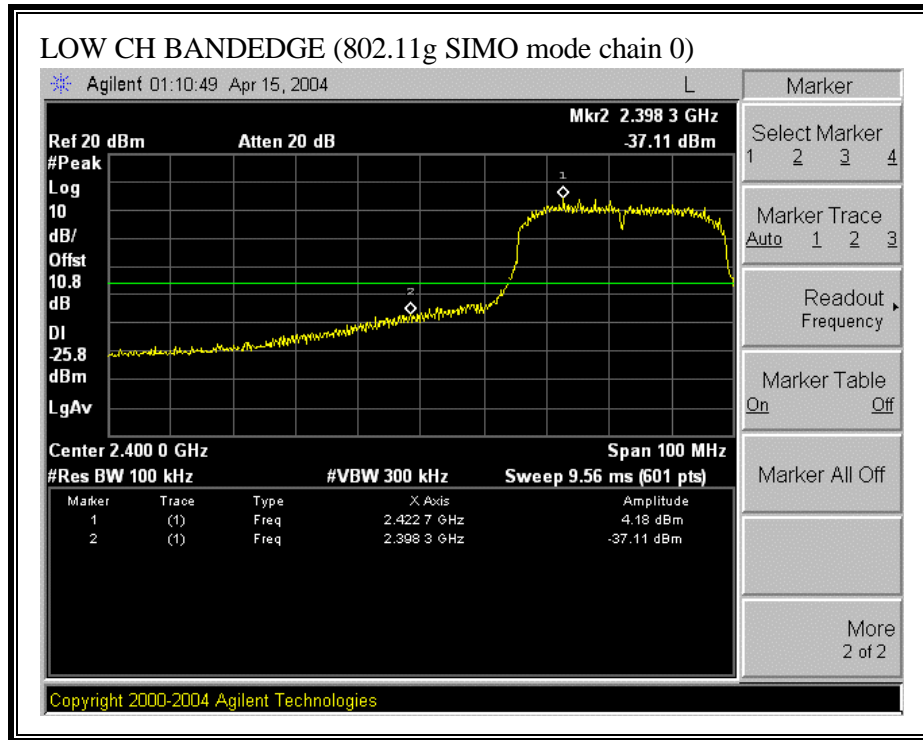


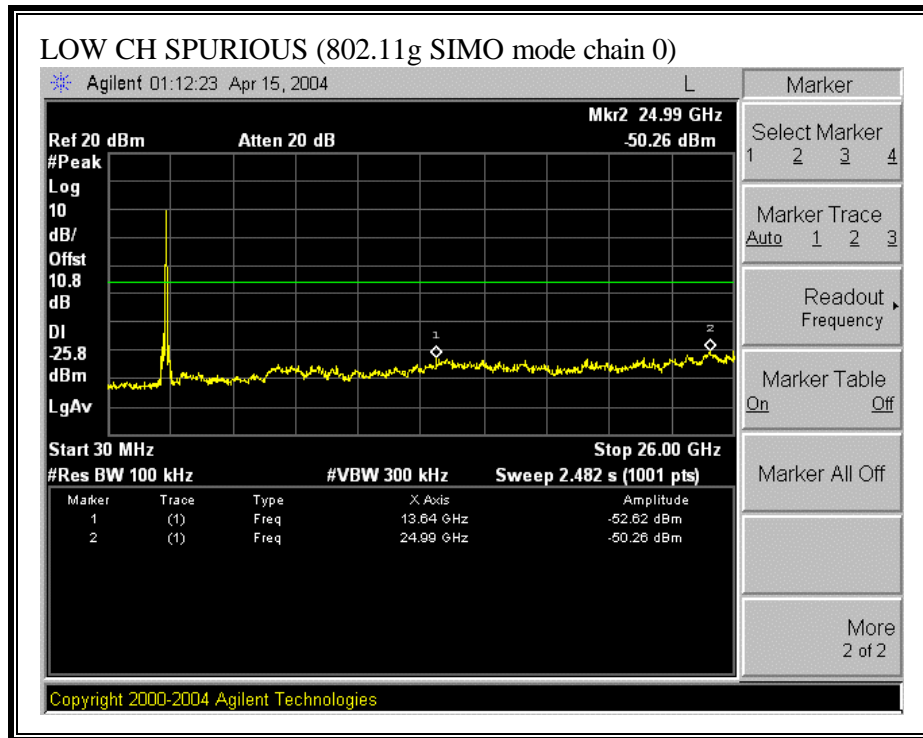
SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MODE CHAIN 1)



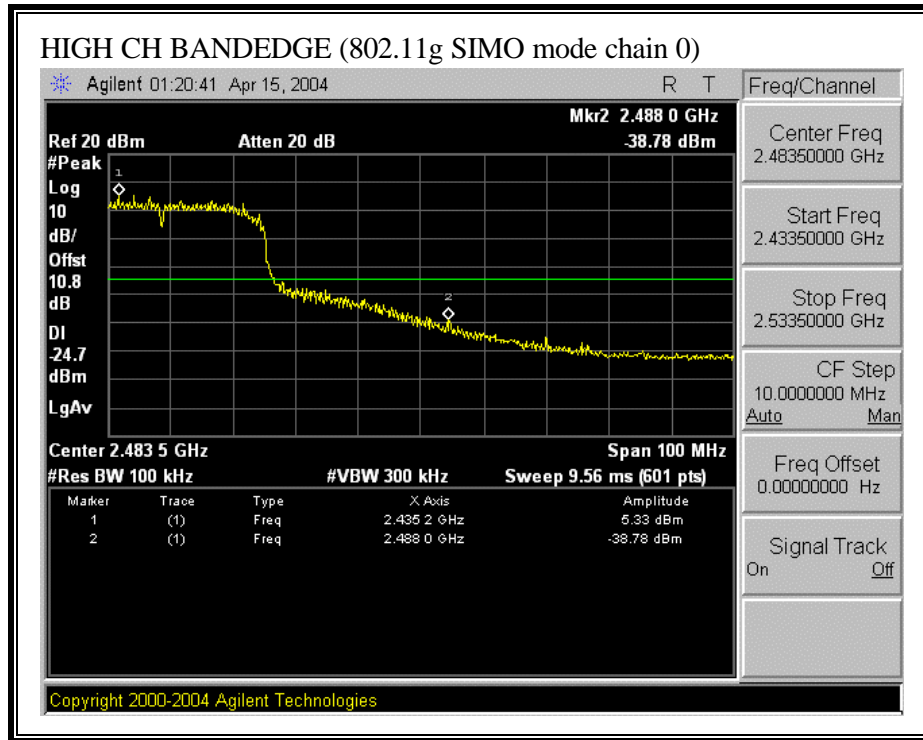


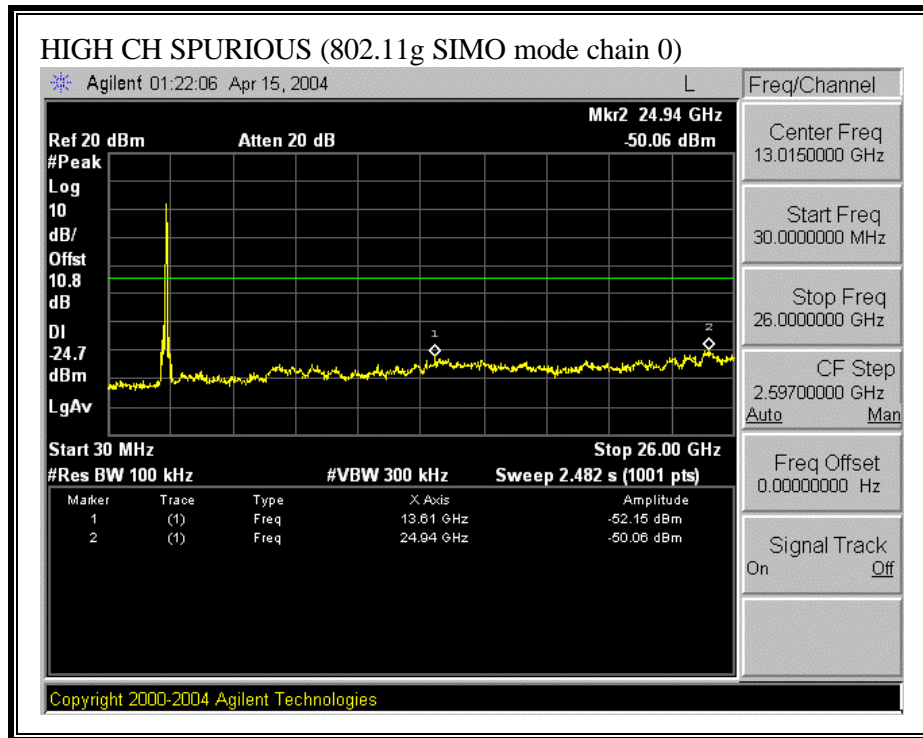
SPURIOUS EMISSIONS, LOW CHANNEL (802.11g SIMO MODE CHAIN 0)



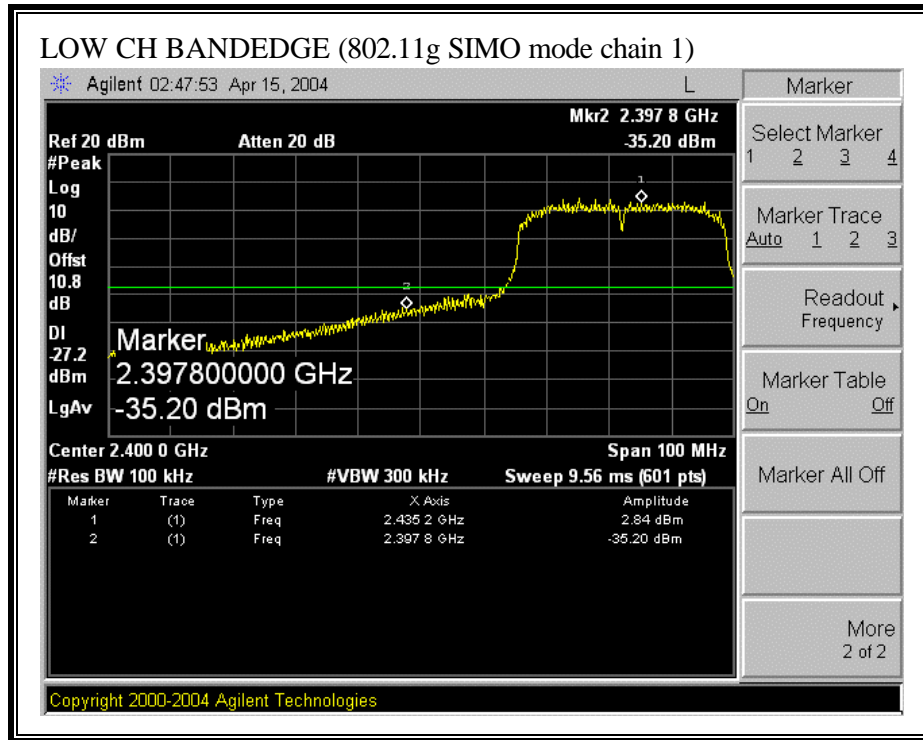


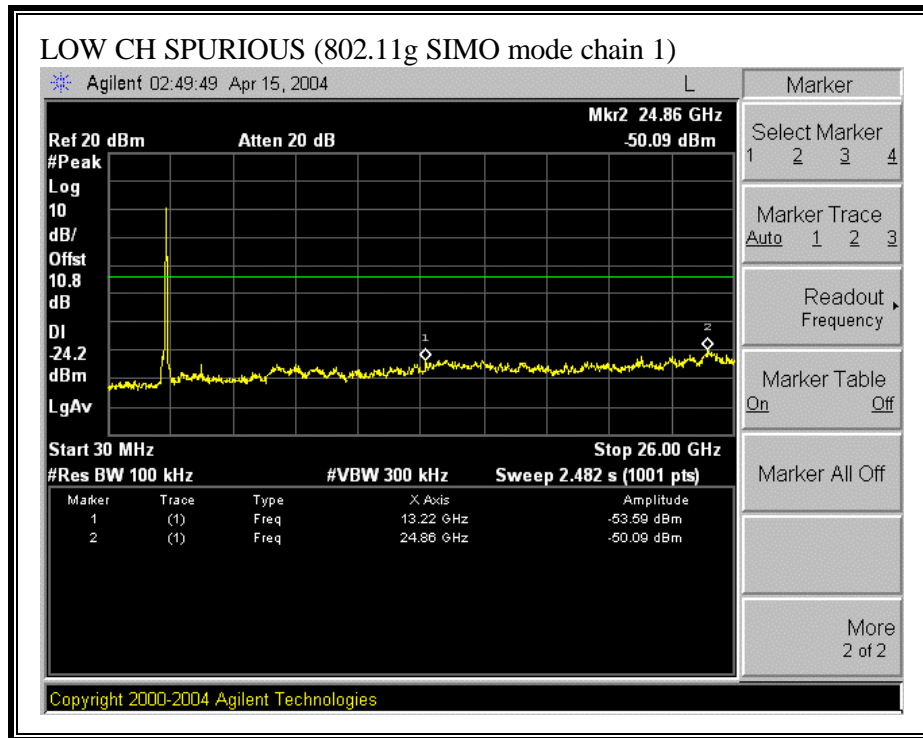
SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g SIMO MODE CHAIN 0)



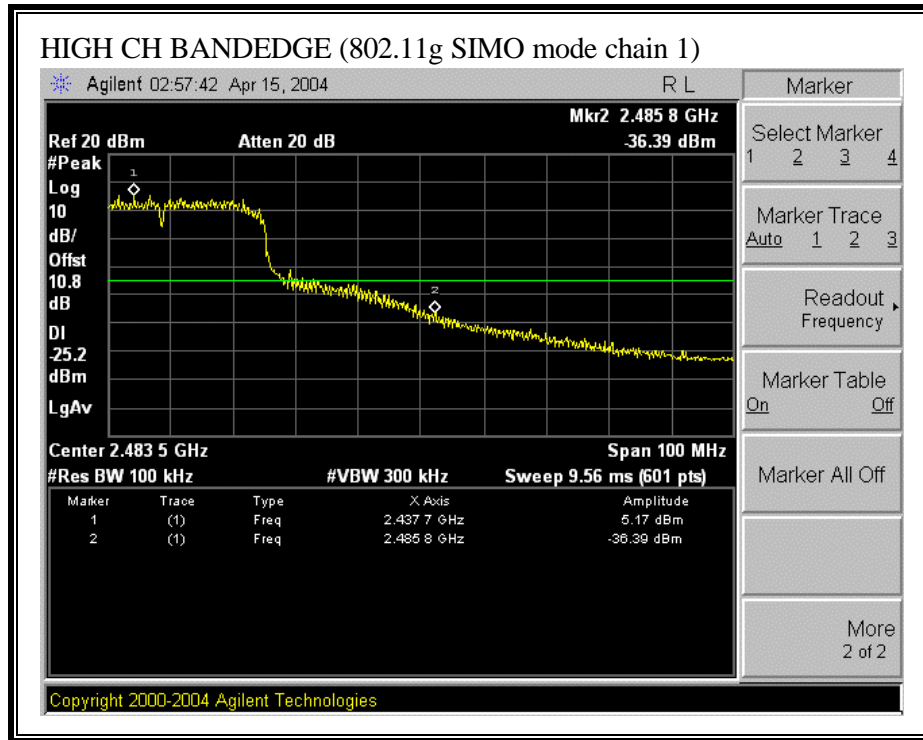


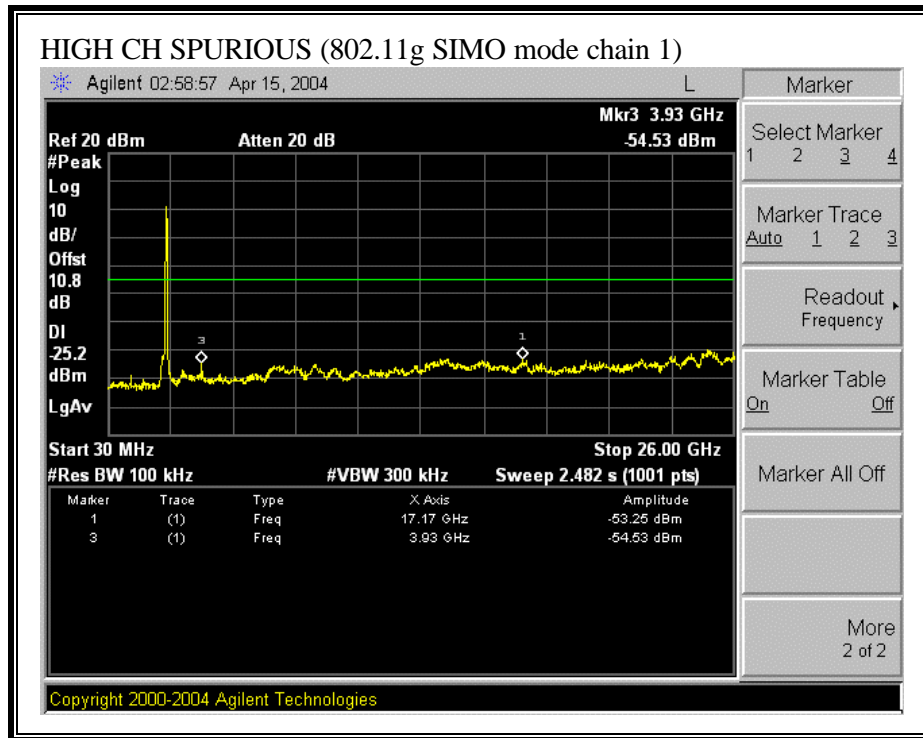
SPURIOUS EMISSIONS, LOW CHANNEL (802.11g SIMO MODE CHAIN 1)



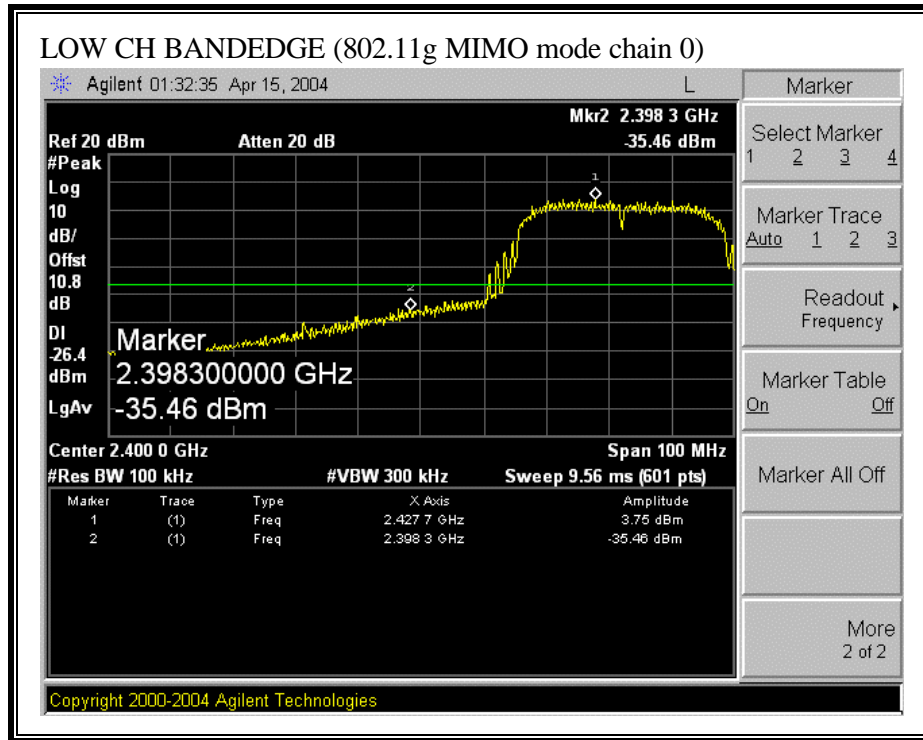


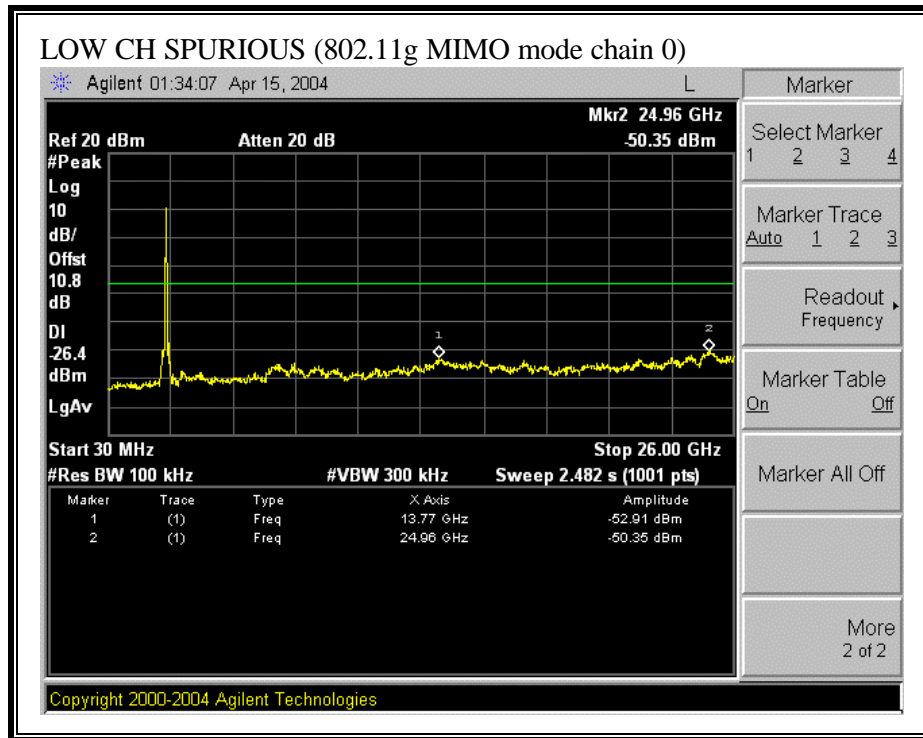
SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g SIMO MODE CHAIN 1)



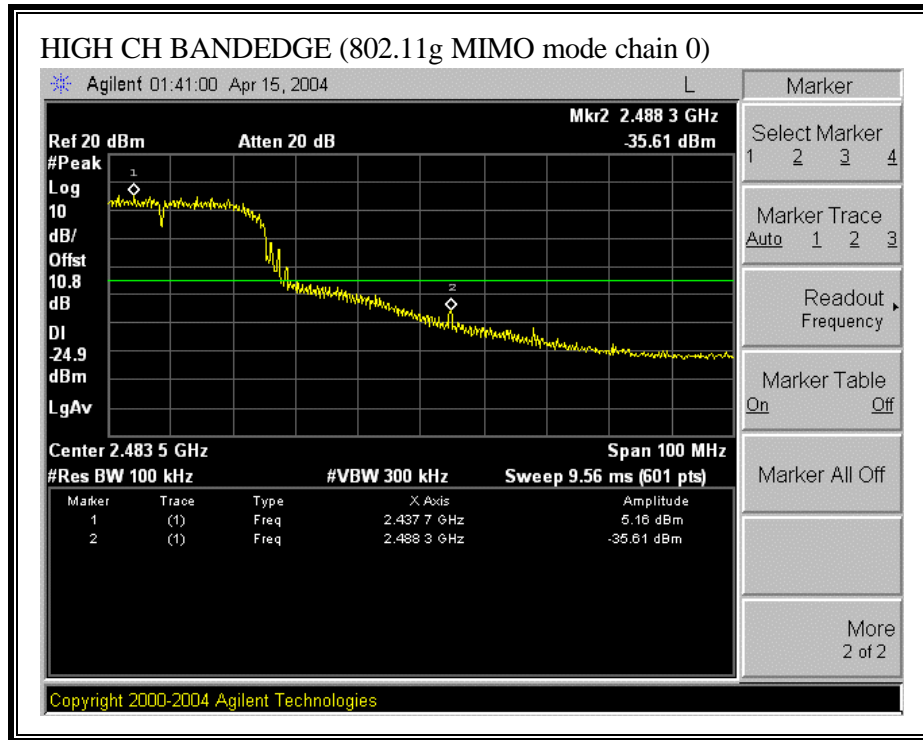


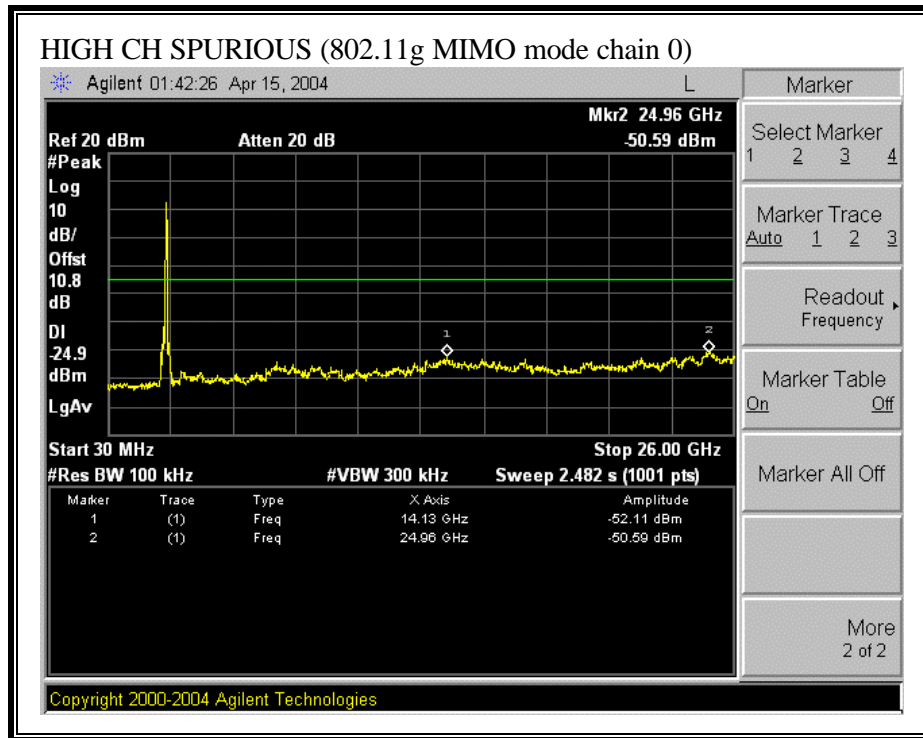
SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MIMO MODE CHAIN 0)



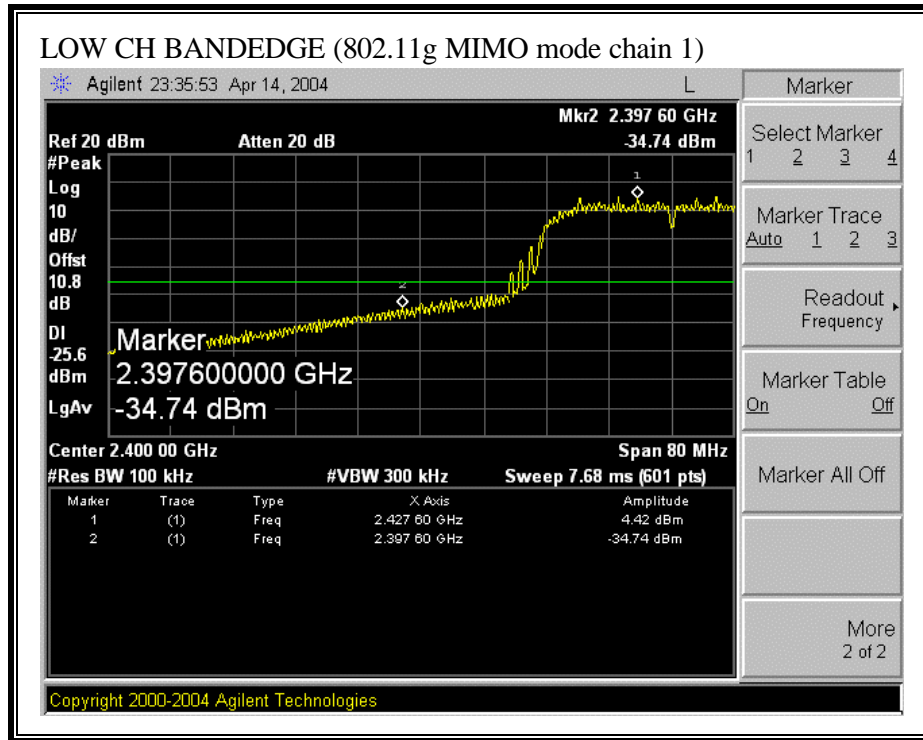


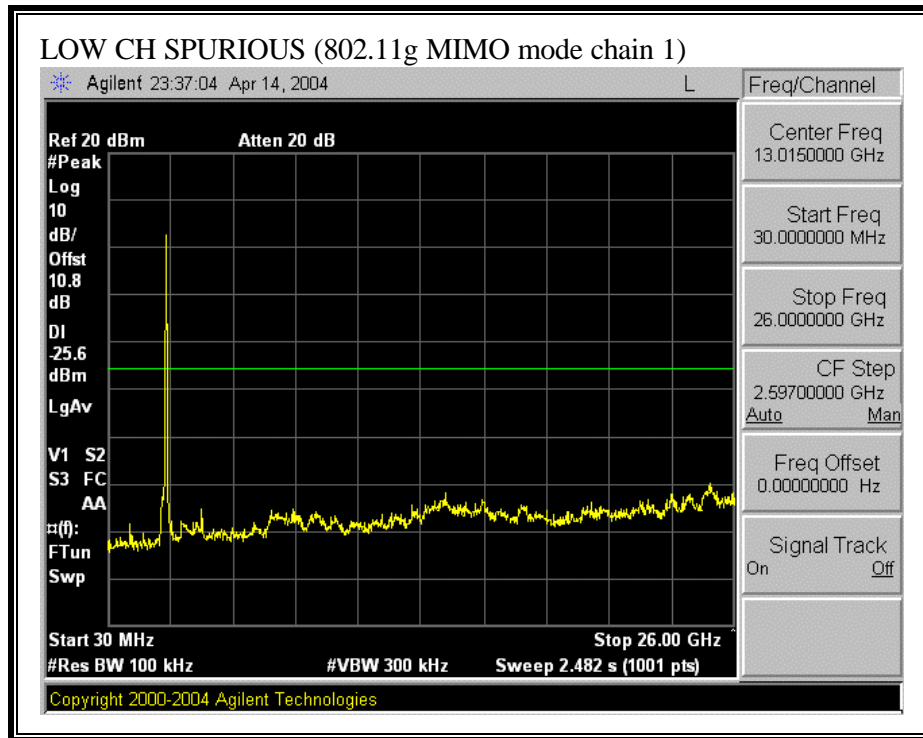
SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MIMO MODE CHAIN 0)



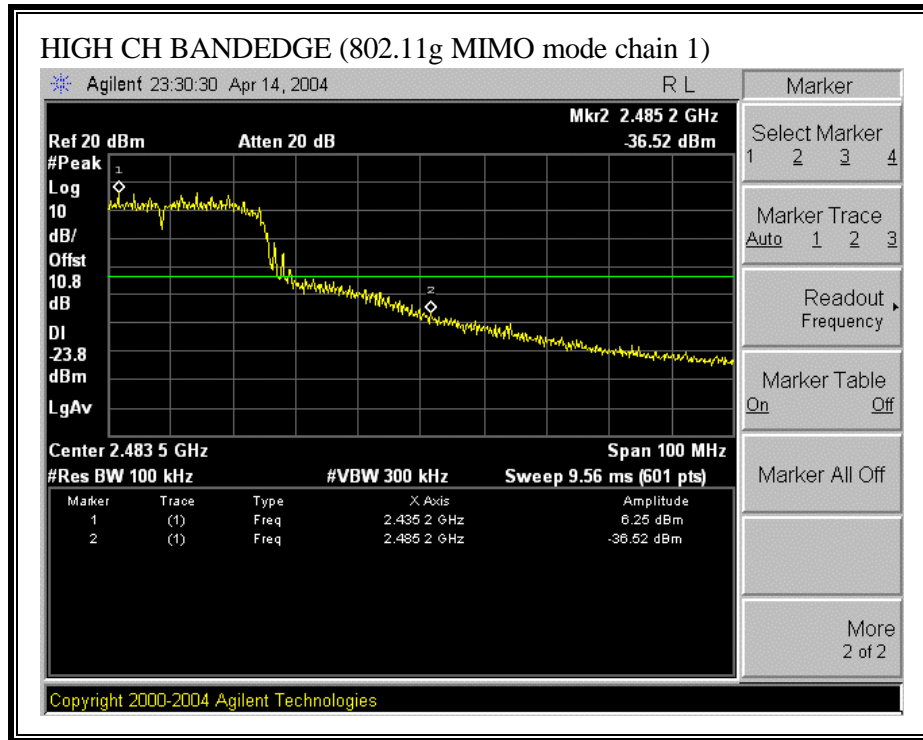


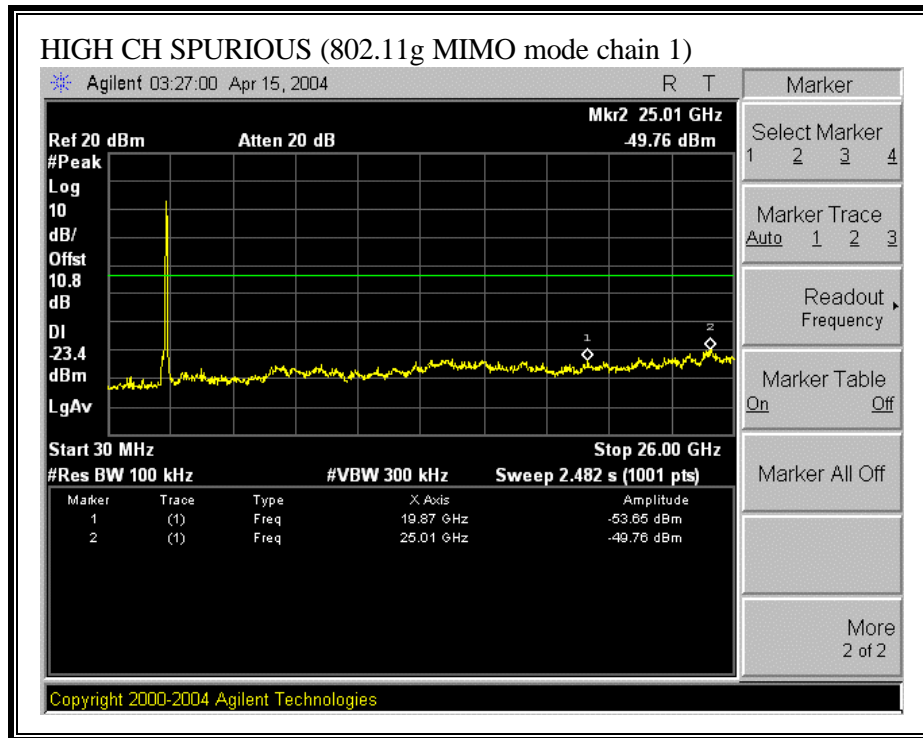
SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MIMO MODE CHAIN 1)





SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MIMO MODE CHAIN 1)





7.2. RADIATED EMISSIONS

7.2.1. TRANSMITTER RADIATED SPURIOUS 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 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

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

² Above 38.6

§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 PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

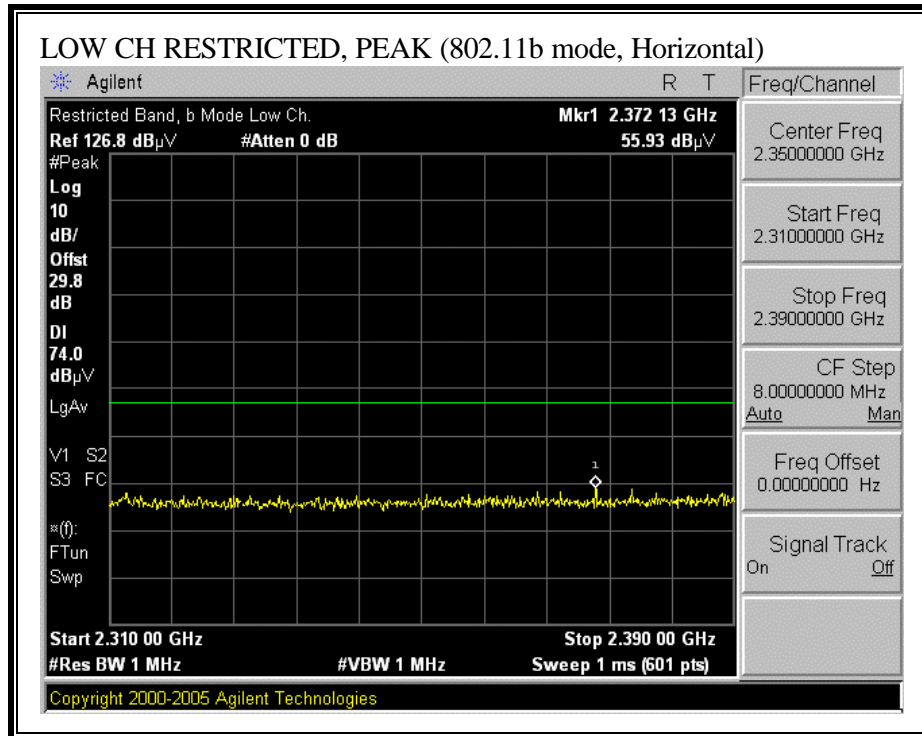
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

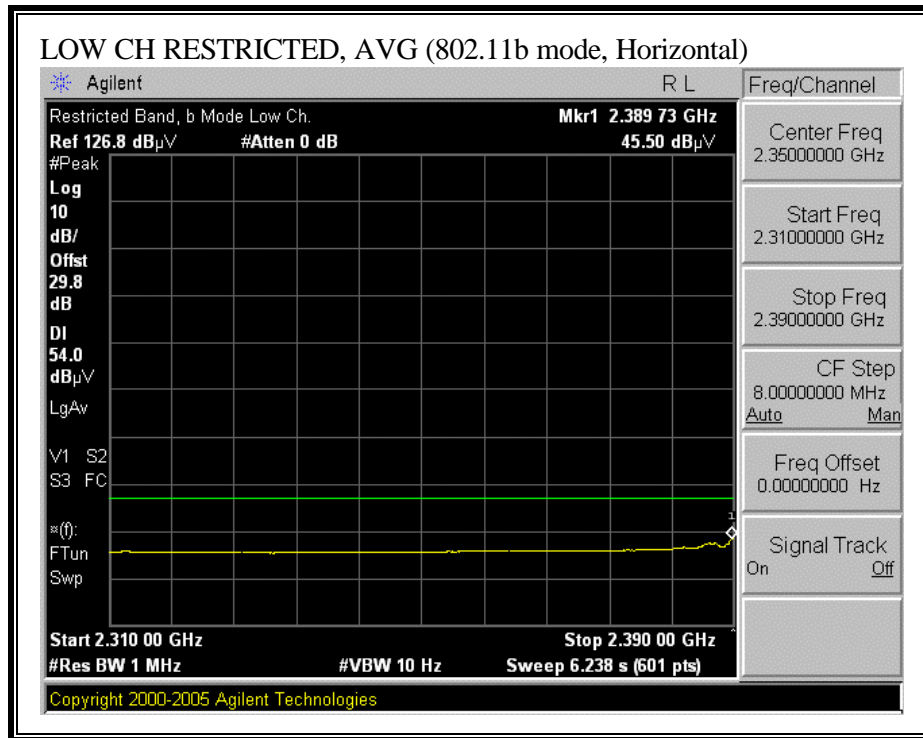
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

7.2.2. TRANSMITTER ABOVE 1 GHz - WITH WHIP ANTENNAS

RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)

