Lab Code: 200167-0

FCC PART 15.247

TEST AND MEASUREMENT REPORT

For

Actiontec Electronics, Inc.

760 North Mary Ave.,

Sunnyvale, CA 94085, USA

FCC ID: LNQSG200

Report Type:	**Product Type:**
Original Report	Gateway Device with 802.11b/g/n and Z-Wave Home Control

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Report Number:	R1103282-247
Report Date:	2011-04-27
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1103282-247	Original Report	2011-04-27

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Actiontec Electronics, Inc*., and their product model: *SG200 Rev B (FCC ID: LNQSG200)* or the "EUT" as referred to in this report. The EUT is a Wireless 802.11b/g/n gateway device with Z-Wave Home Control. Operation frequency range is 2400-2483.5MHz for 802.11b/g/n Wi-Fi, 908.4 MHz for Z-Wave control.

1.2 Mechanical Description of EUT

The EUT measures approximately *16cm (L) x 12.5cm (W) x 3cm (H)*, and weighs approximately *275*g.

The test data gathered are from typical production sample, serial number: CSGA1122800028, provided by the manufacturer.

1.3 Objective

This report is prepared on behalf of *Actiontec Electronics, Inc.* in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commissions rules, June 2007.

The objective is to determine compliance with FCC rules for Output Power, Antenna Requirements, 6 dB Bandwidth, and power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Spurious Emissions, Conducted and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

FCC Part 15.249 submission with same FCC ID.

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are: spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values range from +2.0 for Conducted Emissions tests and +4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

Detailed instrumentation measurement uncertainties can be found in BACL report QAP-018.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.7 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test sites at BACL have been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: R-2463 and C-2698. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at http://ts.nist.gov/Standards/scopes/2001670.htm

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.4-2003.

The EUT was tested in a testing mode to represent worst-case results during the final qualification test.

The worst-case data rates are determined to be as follows for each mode based upon investigation by measuring the average power, peak power and PPSD across all data rates bandwidths, and modulations.

2.2 EUT Exercise Software

The EUT had been tested with the following Power settings (worst case):

Radio Mode	Bandwidth (MHz)	Frequency and Power Setting					
		Low CH (MHz)	Power Setting	Mid CH (MHz)	Power Setting	High CH (MHz)	Power Setting
802.11b	20	2412	24	2437	25	2462	30
802.11g	20	2412	55	2437	55	2462	60
802.11n	20	2412	54	2437	58	2462	61

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Special Accessories

N/A

2.5 Local Support Equipment

Manufacturer	Description	Model No.	Serial No.
Actiontec	Debug Card	05441A	-
Dell	Laptop	-	-

2.6 Power Supply and Line Filters

Manufacturer	Description	Model No.	Serial No.
Actiontec	Power Adapter Input:100-120VAC 50/60Hz, 0.45A Output: 10VDC 1.6A	STD-10016U	C4613704

2.7 Interface Ports and Cabling

Cable Description	Length (m)	From	To
RS232 Cable	< 1m	EUT	Laptop
Ethernet Cable	< 1m	EUT	Laptop

2.8 Internal Configuration

Manufacturer	Description	Model No.	Serial No.
Actiontec	PCB Board	SG200(T002929)	GSGA1122800028

3 Summary of Test Results

Results reported relate only to the product tested.

FCC Rules	Description of Test	Results
§15.247 (i), §2.1091	RF Exposure Information	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.247 (e)	Power Spectral Density	Compliant
§15.205	Restricted Bands	Compliant
§15.209 (a) §15.247	Radiated Spurious Emissions	Compliant
§15.247 (a)(2)	Channel Bandwidth	Compliant
§15.247 (d) 210	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.209	Spurious Emissions at Antenna Port	Compliant

4 FCC §15.247 (i) & § 2.1091 - RF Exposure Information

4.1 Applicable Standards

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
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
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

4.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

4.3 MPE Results

Maximum peak output power at antenna input terminal (dBm):	21.19
Maximum peak output power at antenna input terminal (mW):	131.38
Prediction distance (cm):	20
Prediction frequency (MHz):	2462
Maximum Antenna Gain, typical (dBi):	6.66
Maximum Antenna Gain (numeric):	4.634
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.121
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.121 mW/cm^2.

5 FCC §15.203 – Antenna Requirements

5.1 Applicable Standard

According to FCC §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to FCC §15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2 Antenna Connector Construction

EUT has two Transmitter/Receiver antennae which are chip antennaes and features a permanent attachment to the EUT main board. The Transmitter antenna has a max gain of 6.66 dBi which fulfills the requirements of FCC rule 15.203. According to FCC §15.247 (b) (4), the transmitting directional gain of the antenna exceeds 6dBi limit by 0.66dBi, which will require the conducted power limit shall be reduced by 0.66dB.

Frequency Band	Antenna Gain (dBi)
2.4~2.5 GHz	6.66

6 FCC §15.207 – AC Line Conducted Emissions

6.1 Applicable Standard

Per FCC §15.207 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

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

** Decreases with the logarithm of the frequency.*

6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2003 measurement procedure. The specification used was FCC Part15.207 limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

6.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Solar Electronics	LISN	9252-R-24-BNC	511205	2010-07-31
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2010-07-23

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

6.4 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-2.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished

6.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Cable Loss, and Attenuator Factor adding to the Indicated Reading. The basic equation is as follows:

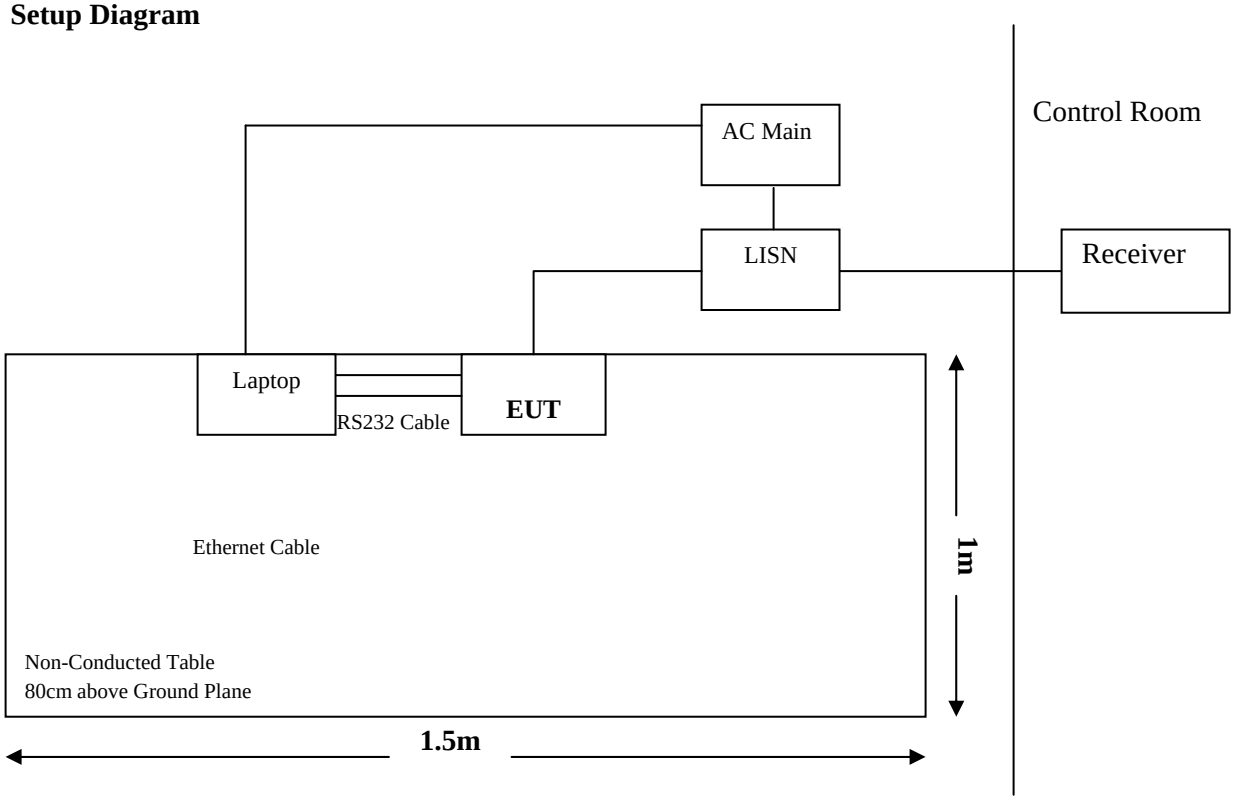
Corrected Amplitude = Indicated Reading + Cable Loss + Attenuator Factor

For example, a Corrected Amplitude of 34.08 dBuV/m = Indicated Reading (23.85 dBuV) + Cable Factor (0.22 dB) + Attenuator Factor (10dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

6.6 Setup Diagram



6.7 Test Environmental Conditions

Temperature:	22 °C
Relative Humidity:	45 %
ATM Pressure:	102.2kPa

The testing was performed by Kevin Li on 2011-04-19 in 5 meter chamber 3.

6.8 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC standard's conducted emissions limits, with the margin reading of:

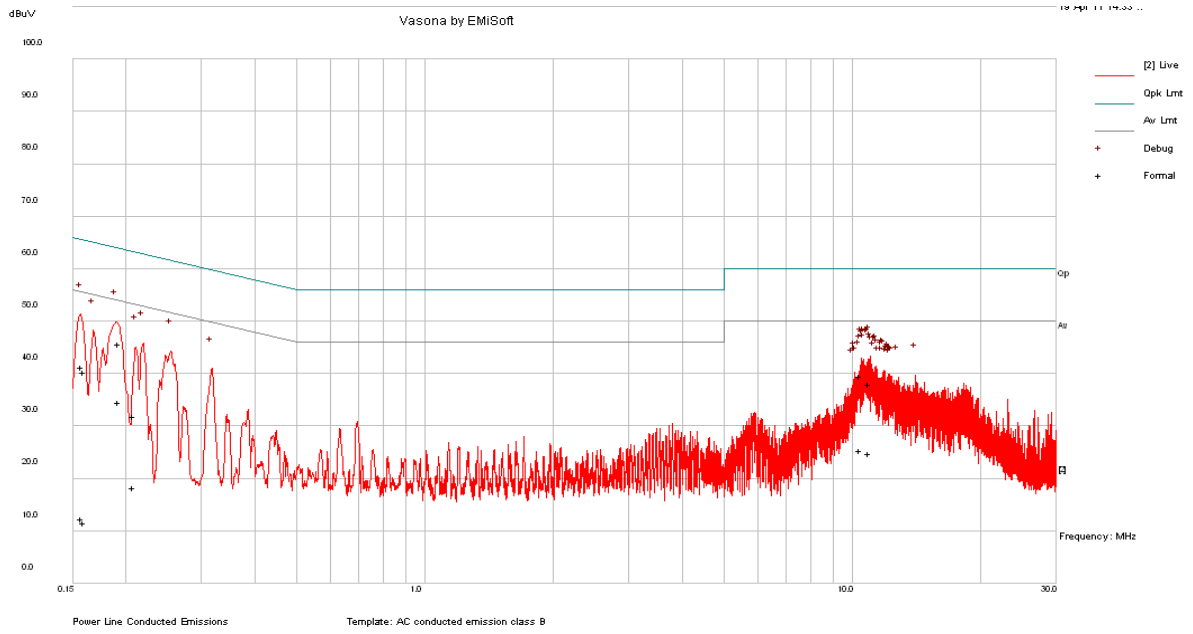
802.11n 20 MHz BW – High Channel Transmitting Mode

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor (Line/Neutral)**	**Range (MHz)**
-18.16	0.192156	Line	0.15 to 30

Note: During the test, EUT was under the max power working mode with worse channel.

6.9 Conducted Emissions Test Plots and Data

120 V, 60 Hz – Line - 802.11 n mode high channel (2462 MHz)



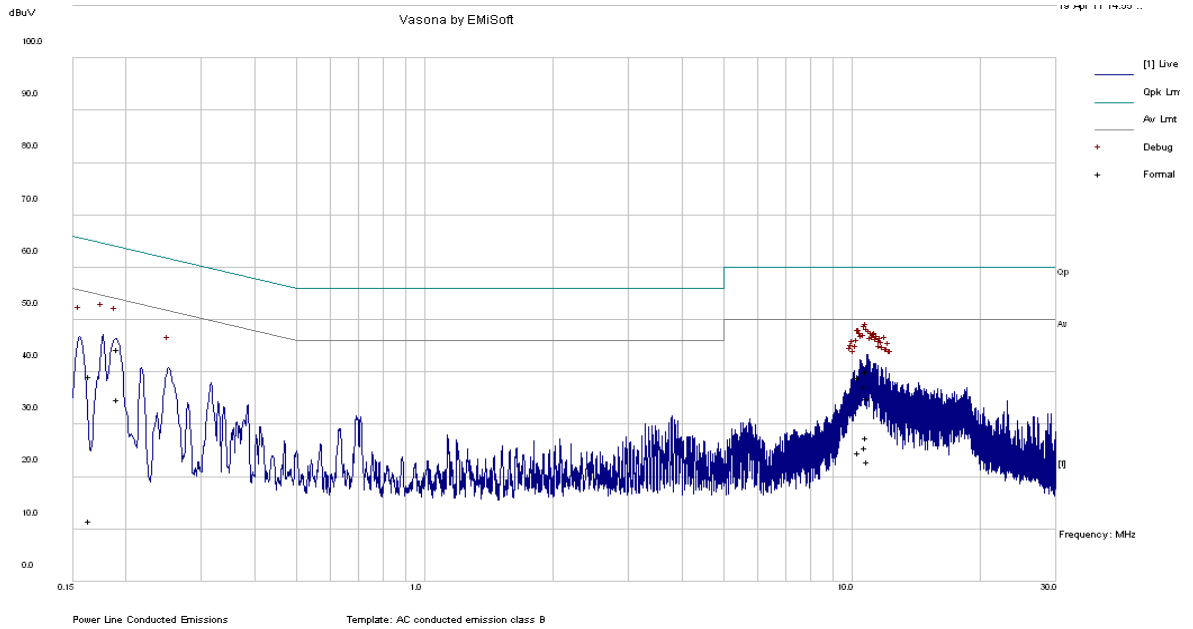
Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.192156	45.79	Line	63.94	-18.16
10.47265	39.61	Line	60	-20.39
10.97589	38.09	Line	60	-21.91
0.157467	41.2	Line	65.6	-24.39
0.160149	40.35	Line	65.46	-25.10
0.208908	31.87	Line	63.25	-31.38

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.192156	34.57	Line	53.94	-19.37
10.47265	25.3	Line	50	-24.70
10.97589	24.74	Line	50	-25.26
0.208908	18.29	Line	53.25	-34.96
0.157467	12.45	Line	55.6	-43.15
0.160149	11.65	Line	55.46	-43.81

120 V, 60 Hz – Neutral - 802.11 b mode high channel (2462 MHz)



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.191364	44.33	Neutral	63.98	-19.65
10.84466	40.1	Neutral	60	-19.90
10.39571	38.92	Neutral	60	-21.08
10.79694	37.31	Neutral	60	-22.69
10.91646	35.02	Neutral	60	-24.98
0.16428	39.12	Neutral	65.24	-26.12

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.191364	34.72	Neutral	53.98	-19.26
10.84466	27.41	Neutral	50	-22.59
10.79694	25.5	Neutral	50	-24.50
10.39571	24.66	Neutral	50	-25.34
10.91646	22.91	Neutral	50	-27.09
0.16428	11.59	Neutral	55.24	-43.65

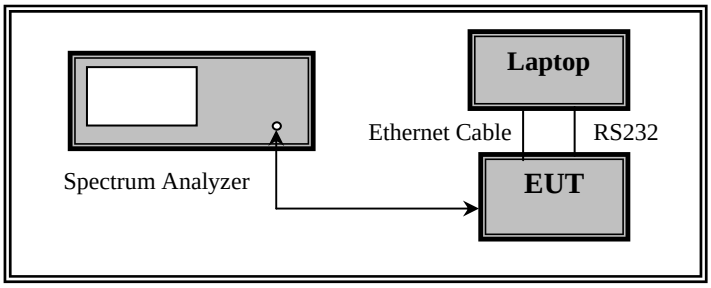
7 FCC §15.247(a) (2) – Emission Bandwidth

7.1 Applicable Standard

According to FCC §15.247(a)(2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

7.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emissions bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



7.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

7.4 Test Environmental Conditions

Temperature:	18~21 °C
Relative Humidity:	40~45 %
ATM Pressure:	102.2-103.2kPa

The testing was performed by Jerry Huang on 2011-04-15 ~ 2011-04-18 in RF site.

7.5 Test Results

Antenna #0:

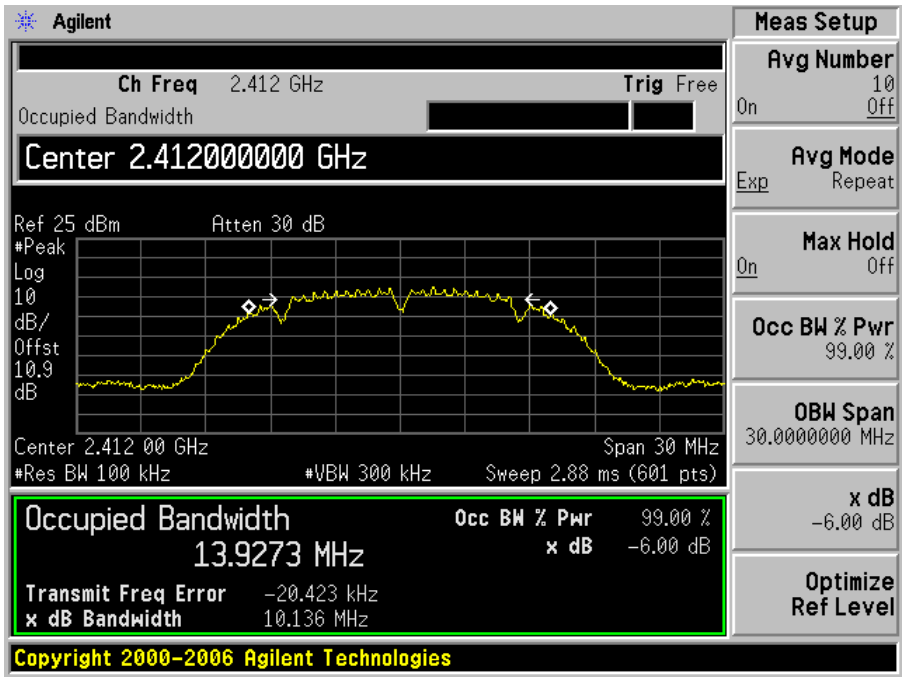
Mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (kHz)	Results
802.11b	Low	2412	10.136	13.9273	> 500	Compliant
	Middle	2437	10.129	13.9943	> 500	Compliant
	High	2462	10.113	14.0029	> 500	Compliant
802.11g	Low	2412	16.408	17.0795	> 500	Compliant
	Middle	2437	16.468	17.1188	> 500	Compliant
	High	2462	16.348	19.2260	> 500	Compliant
n	Low	2412	17.575	17.9127	> 500	Compliant
	Middle	2437	17.605	18.2091	> 500	Compliant
	High	2462	17.607	18.7745	> 500	Compliant

Antenna #1:

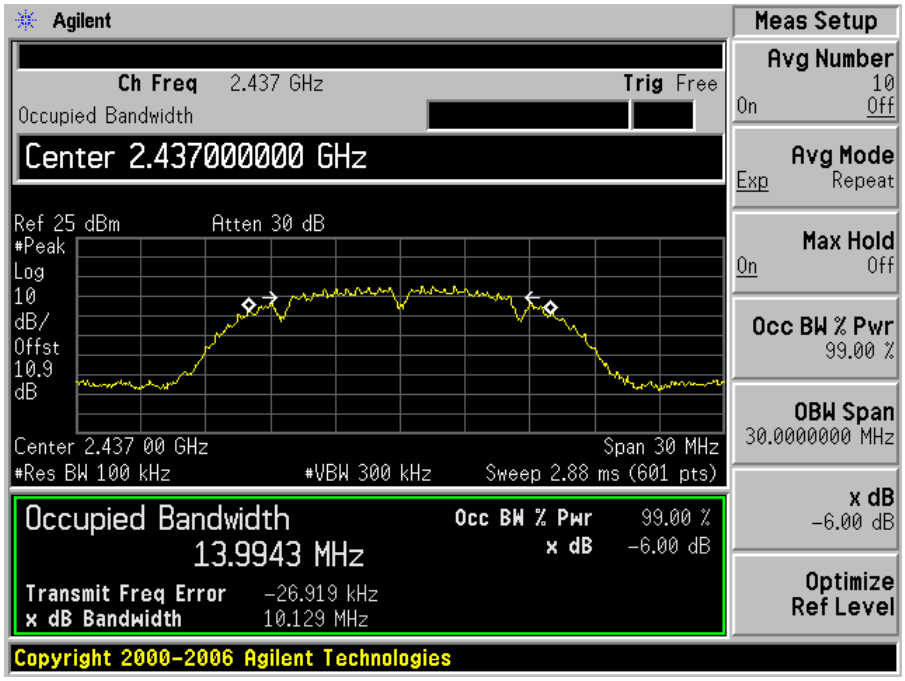
Mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (kHz)	99% Emission Bandwidth (MHz)	Limit (kHz)	Results
802.11b	Low	2412	10.084	13.9361	> 500	Compliant
	Middle	2437	10.101	13.9662	> 500	Compliant
	High	2462	10.121	13.9763	> 500	Compliant
802.11g	Low	2412	16.413	16.8207	> 500	Compliant
	Middle	2437	16.414	16.6707	> 500	Compliant
	High	2462	16.413	18.6715	> 500	Compliant
802.11n	Low	2412	17.599	17.8568	> 500	Compliant
	Middle	2437	17.597	18.2309	> 500	Compliant
	High	2462	17.639	19.1461	> 500	Compliant

Please refer to the following plots for detailed test results:

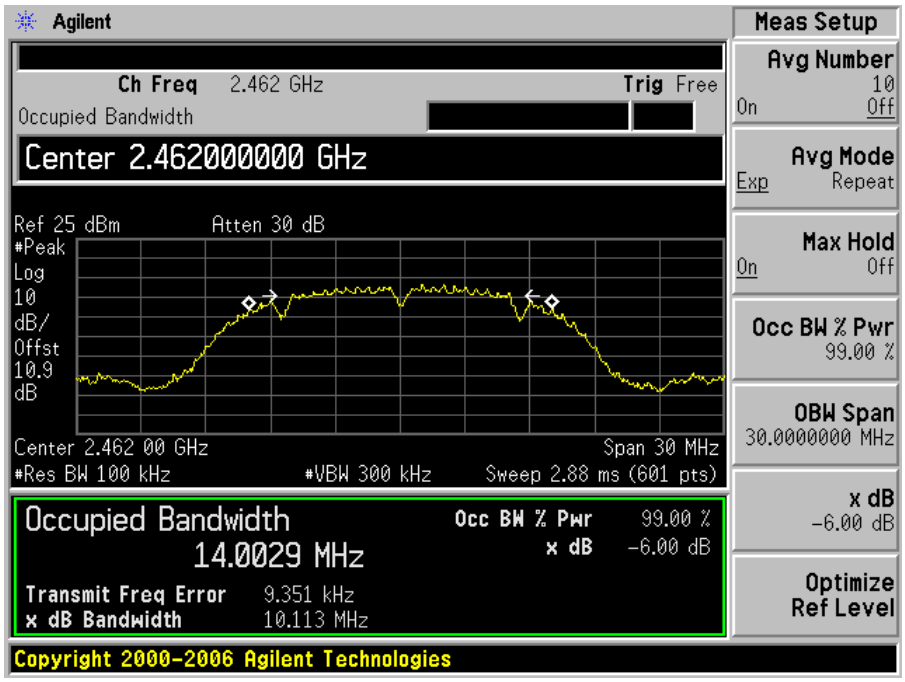
802.11b, Low Channel 2412 MHz - Antenna #0



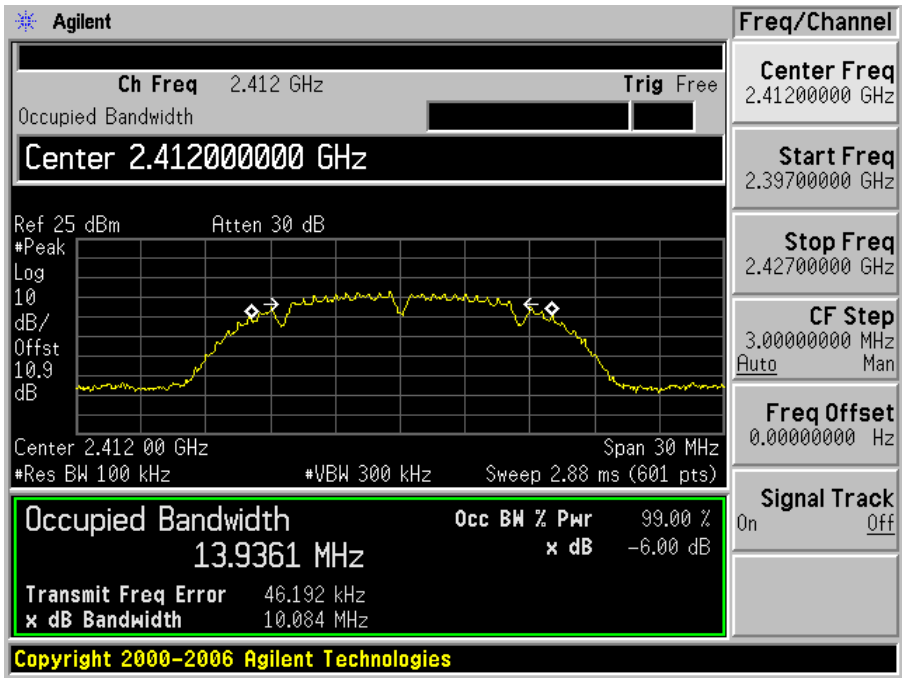
802.11b, Middle Channel 2437 MHz- Antenna #0



802.11b, High Channel 2462 MHz - Antenna #0



802.11b, Low Channel 2412 MHz - Antenna #1



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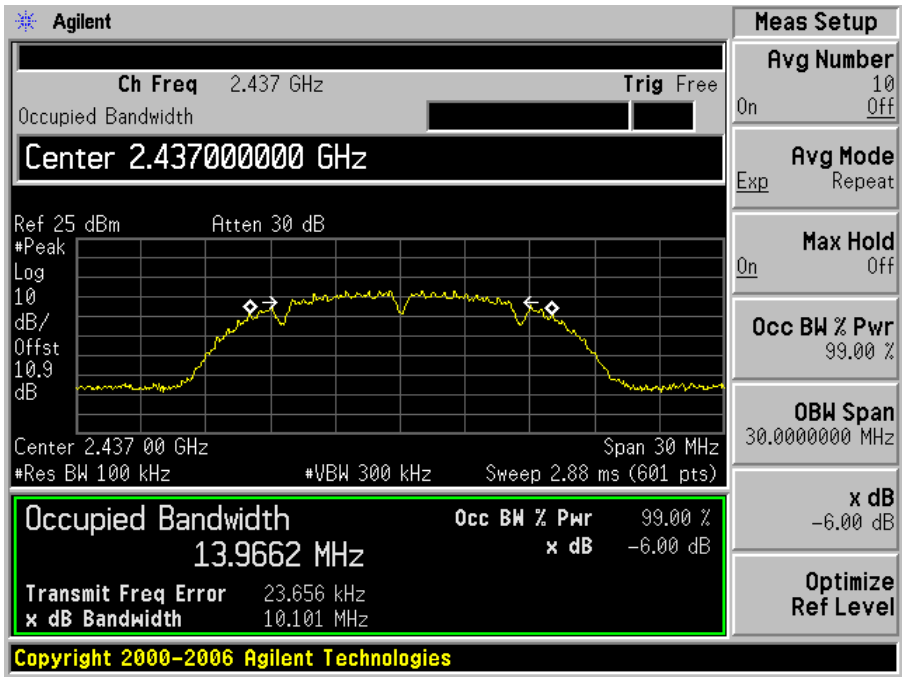
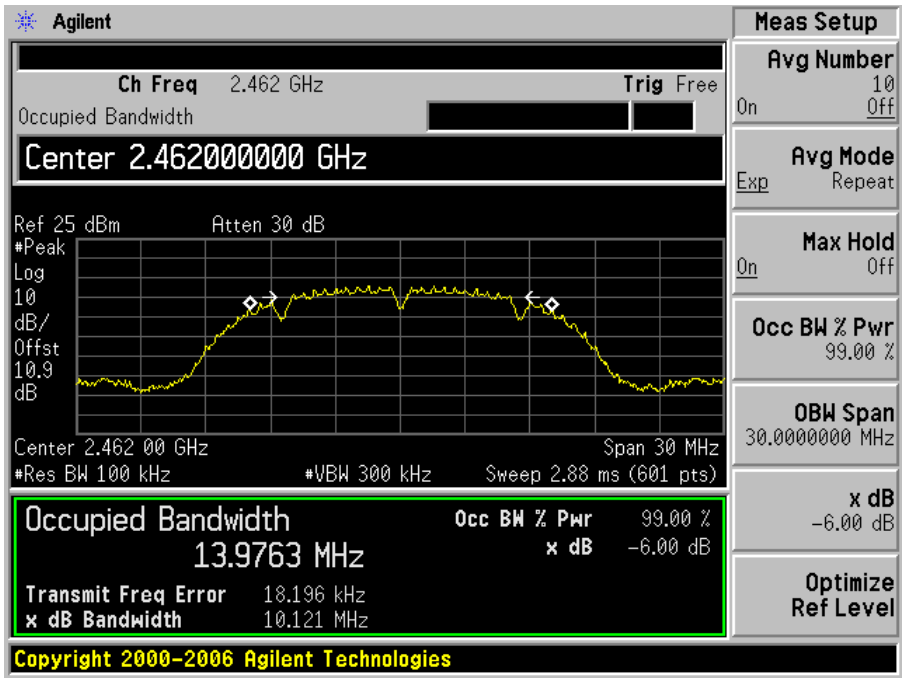
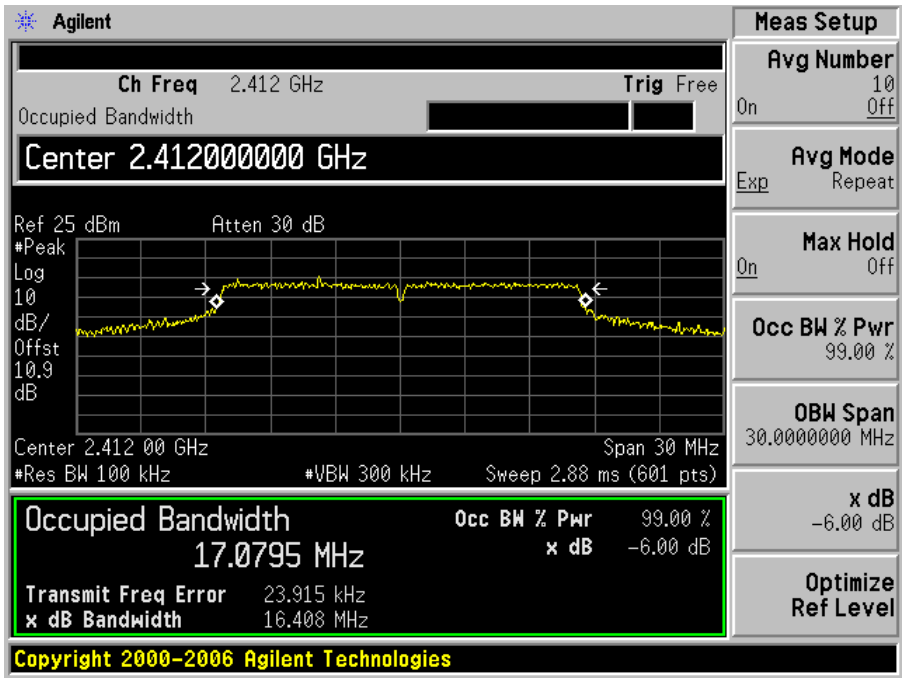


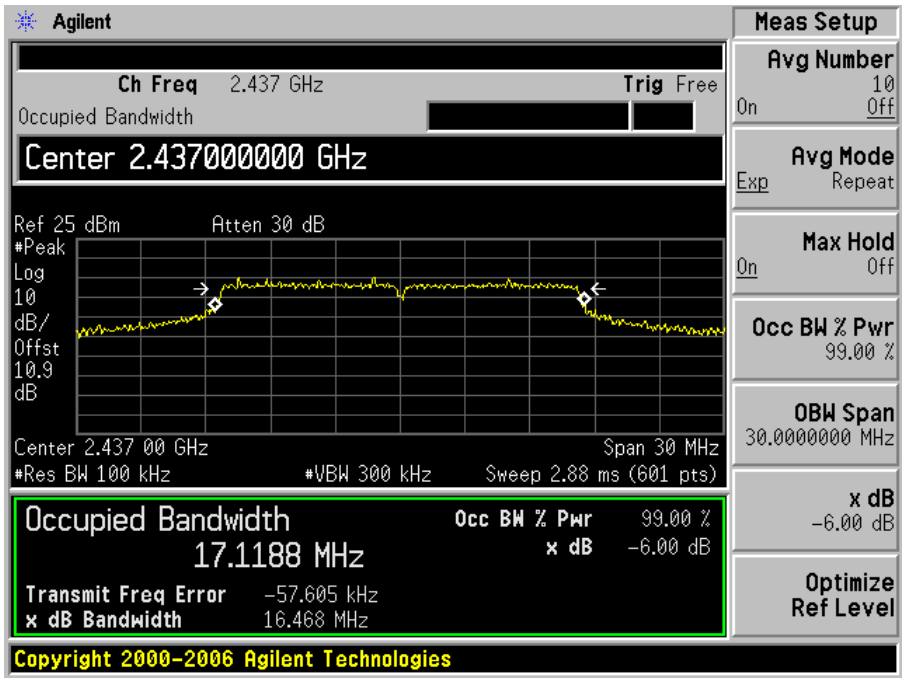
802.11b, High Channel 2462 MHz - Antenna #1



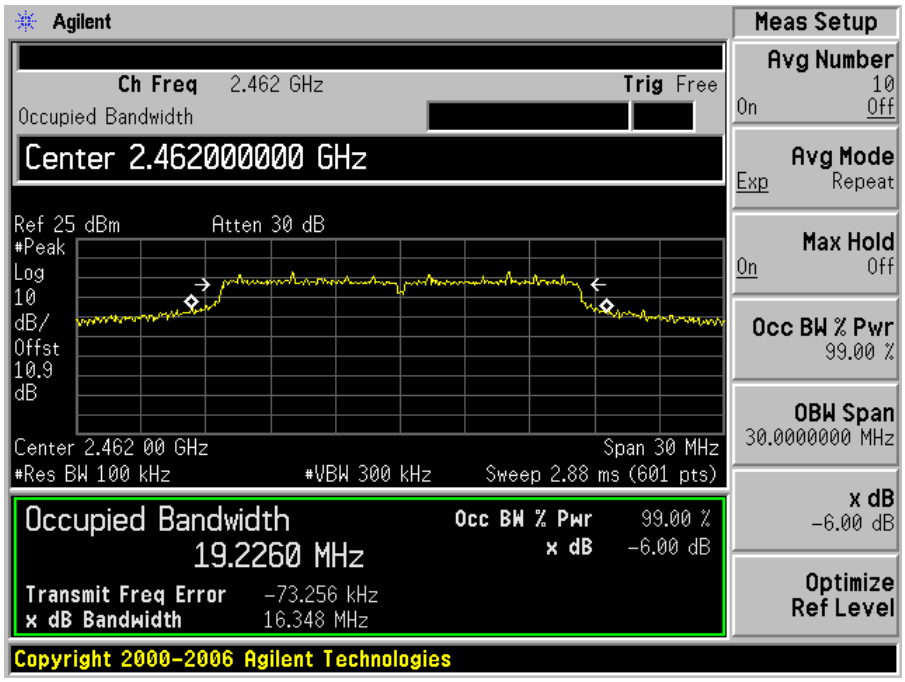
802.11g, Low Channel 2412 MHz - Antenna #0



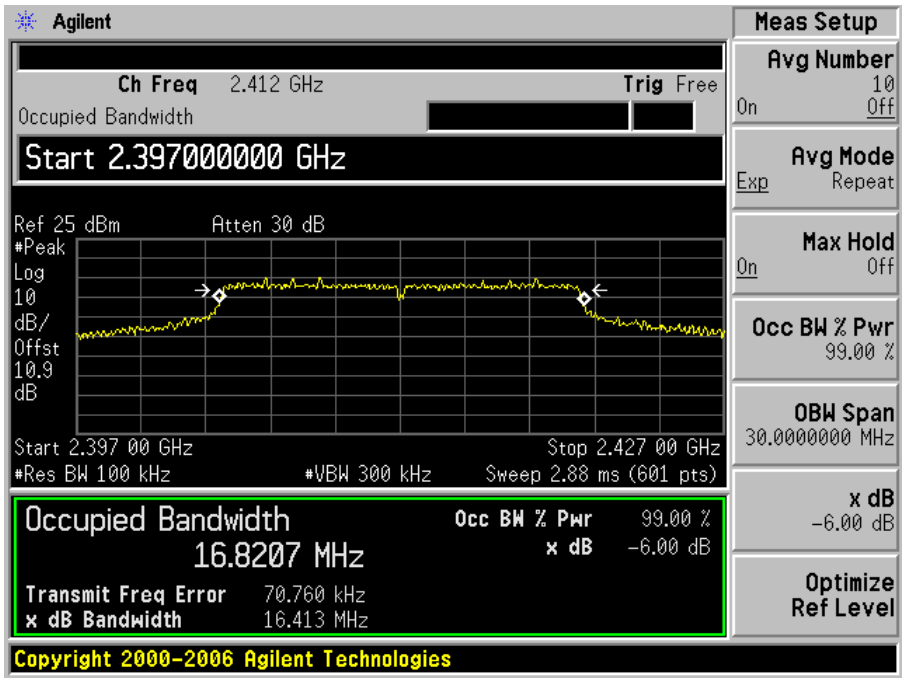
802.11g, Middle Channel 2437 MHz- Antenna #0



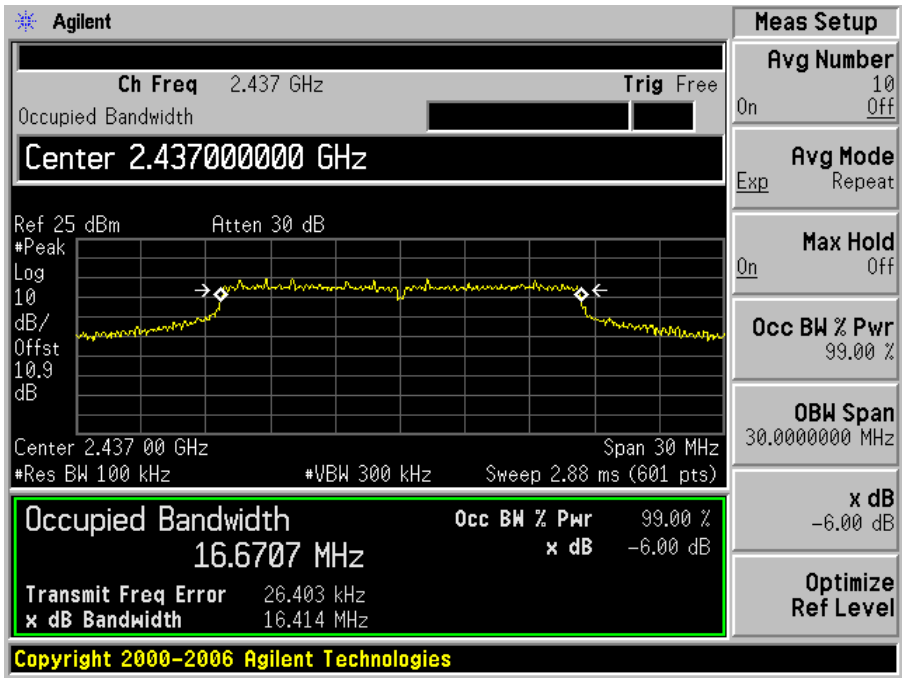
802.11g, High Channel 2462 MHz - Antenna #0



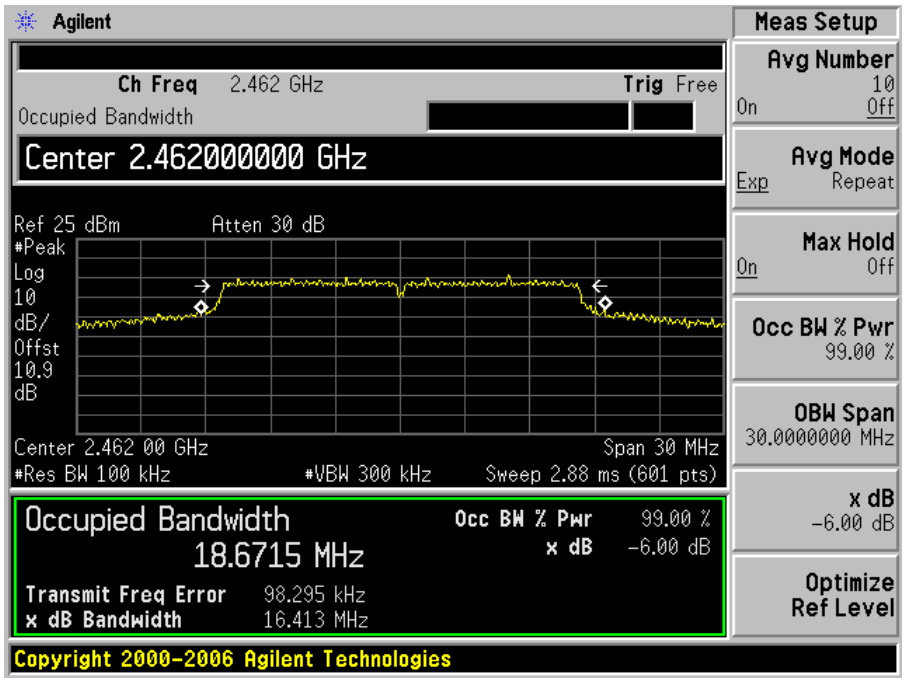
802.11g, Low Channel 2412 MHz - Antenna #1



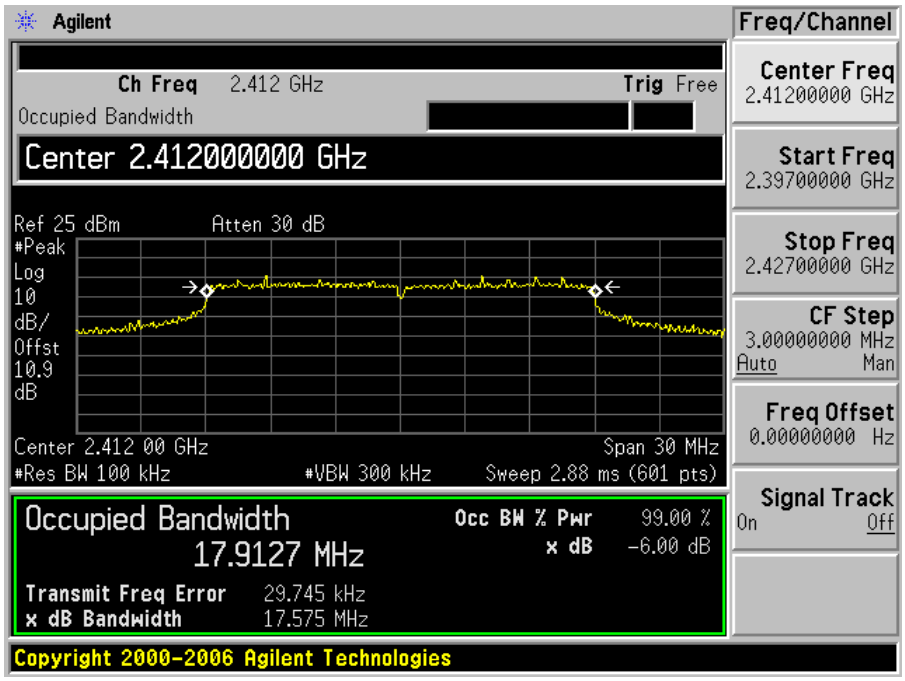
802.11g, Middle Channel 2437 MHz- Antenna #1



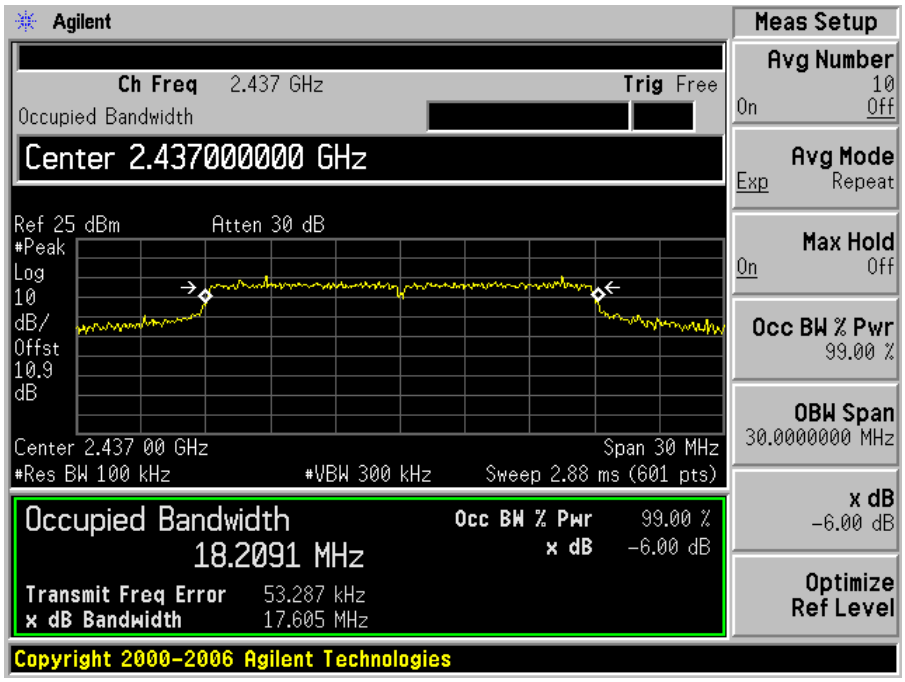
802.11g, High Channel 2462 MHz - Antenna #1



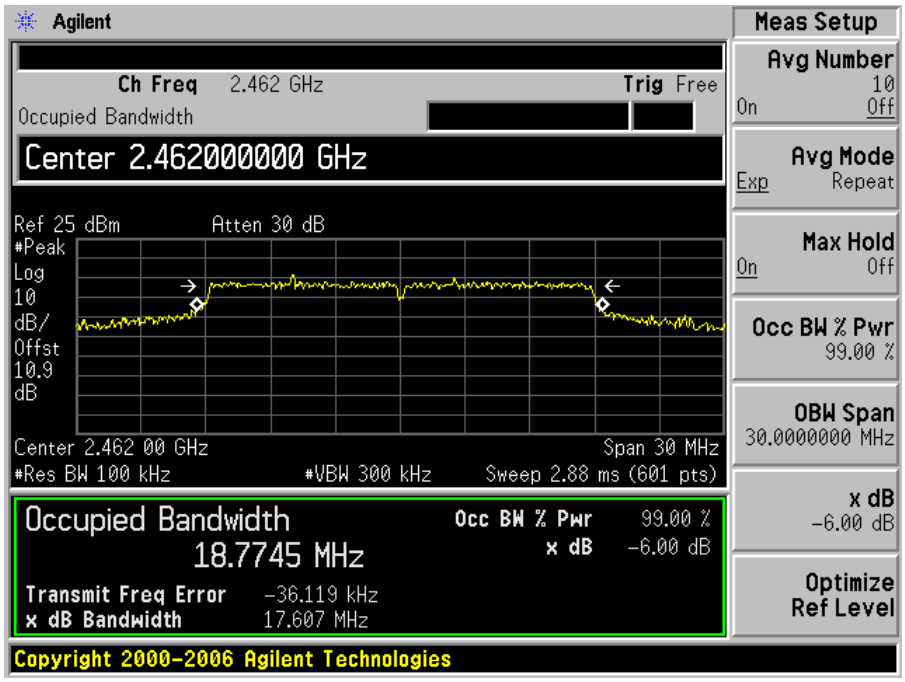
802.11n, Low Channel 2412 MHz - Antenna #0



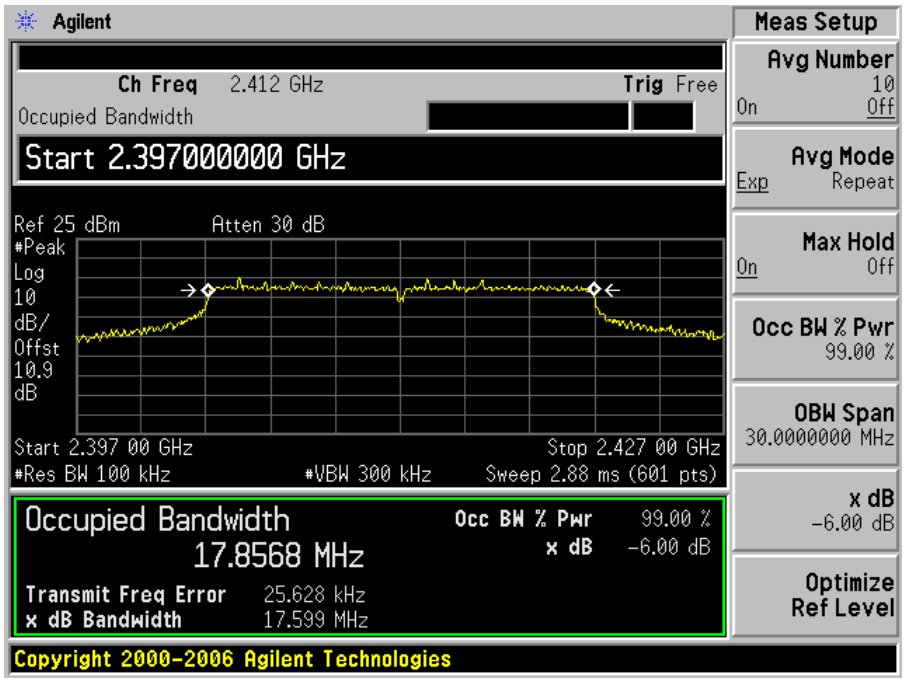
802.11n, Middle Channel 2437 MHz- Antenna #0



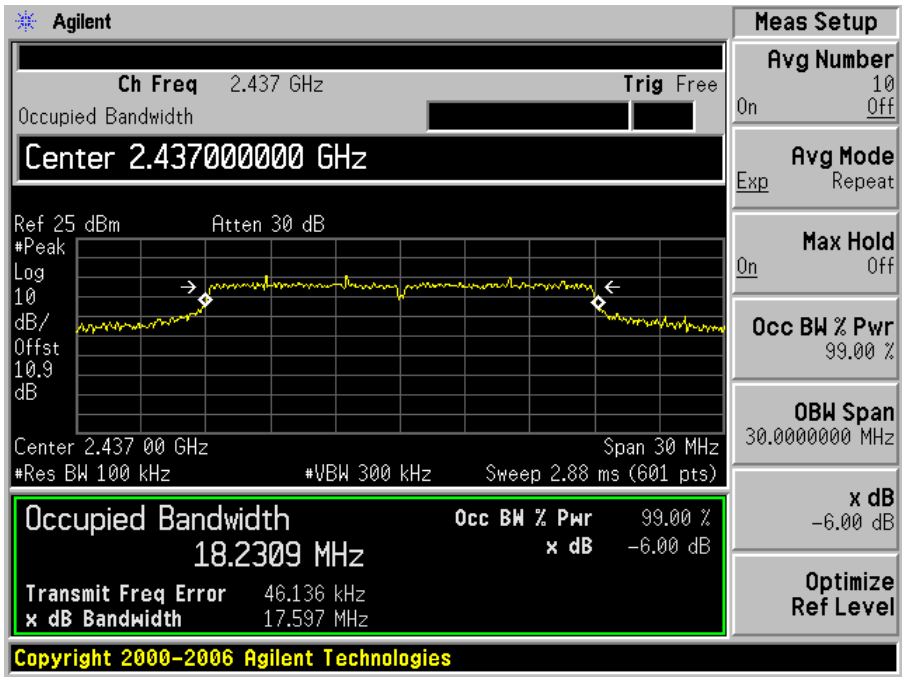
802.11n, High Channel 2462 MHz - Antenna #0



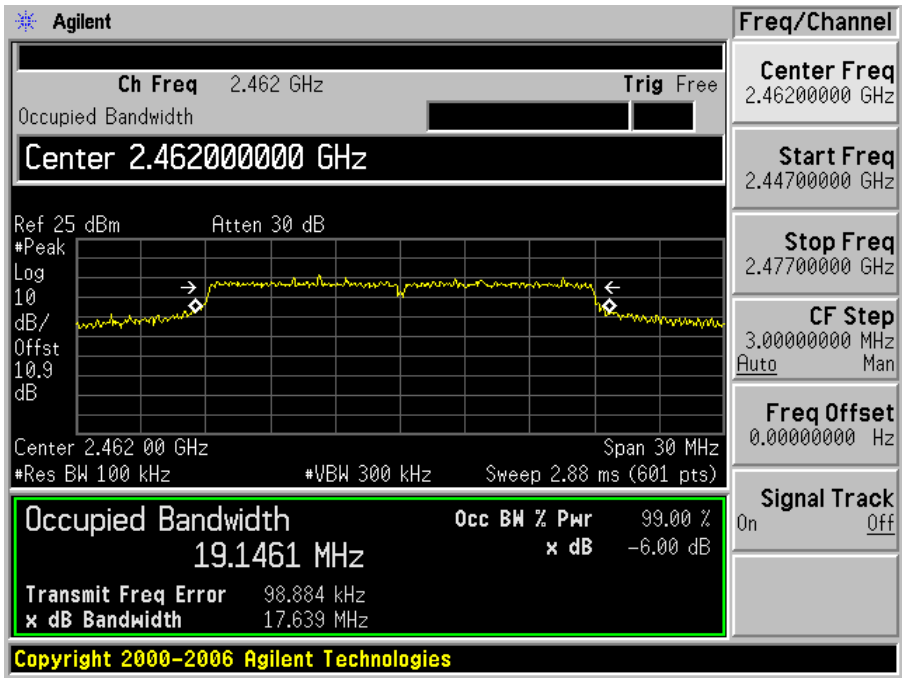
802.11n, Low Channel 2412 MHz - Antenna #1



802.11n, Middle Channel 2437 MHz- Antenna #1



802.11n, High Channel 2462 MHz - Antenna #1



8 FCC §15.247(b) - Peak Output Power Measurement

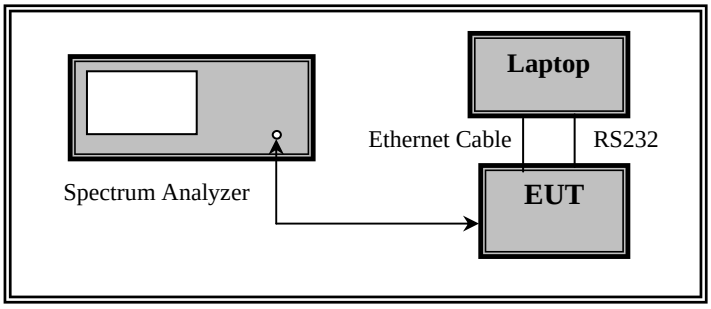
8.1 Applicable Standard

According to FCC §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.

And according to FCC §15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.2 Measurement Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.
3. Add a correction factor to the display.



8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

8.4 Test Environmental Conditions

Temperature:	18~21 °C
Relative Humidity:	40~45 %
ATM Pressure:	102.2-103.2kPa

The testing was performed by Jerry Huang on 2011-04-15 ~ 2011-04-18 in RF site.

8.5 Test Results

Antenna #0:

Mode	Channel	Frequency (MHz)	Conducted Output Power (dBm)	Conducted Output Power (mw)	Limit[1] (mw)	Result
802.11b	Low	2412	9.31	8.53	859.01	pass
	Mid	2437	8.62	7.28	859.01	pass
	High	2462	11.04	12.71	859.01	pass
802.11g	Low	2412	16.28	42.46	859.01	pass
	Mid	2437	16.33	42.95	859.01	pass
	High	2462	17.55	56.89	859.01	pass
802.11n	Low	2412	16.01	39.90	859.01	pass
	Mid	2437	17.48	55.98	859.01	pass
	High	2462	18.20	66.07	859.01	pass

Antenna #1:

Mode	Channel	Frequency (MHz)	Conducted Output Power (dBm)	Conducted Output Power (mw)	Limit[1] (mw)	Result
802.11b	Low	2412	7.74	5.94	859.01	pass
	Mid	2437	7.63	5.79	859.01	pass
	High	2462	10.17	10.40	859.01	pass
802.11g	Low	2412	15.75	37.58	859.01	pass
	Mid	2437	15.52	35.65	859.01	pass
	High	2462	17.34	54.20	859.01	pass
802.11n	Low	2412	15.22	33.27	859.01	pass
	Mid	2437	16.63	46.03	859.01	pass
	High	2462	18.15	65.31	859.01	pass

802.11n (Antenna #0+Antenna #1):

Channel	Frequency (MHz)	Conducted Output Power Antenna #0 (dBm)	Conducted Output Power Antenna #1 (dBm)	Total Output Power (mw)	Limit[1] (mw)	Result
Low	2412	16.01	15.22	73.17	859.01	pass
Mid	2437	17.48	16.63	101.79	859.01	pass
High	2462	18.20	18.15	131.38	859.01	pass

Note: According to the FCC §15.247 (b) (4), the max antenna gain is 6.66 dBi which is 0.66 dBi greater than the 6 dBi limit, the conducted power limit shall be reduced by 0.66 dB as well.

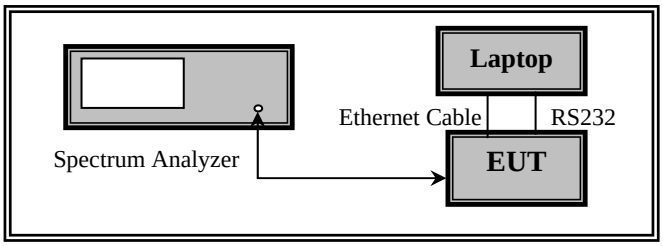
9 FCC §15.247(e) - Power Spectral Density

9.1 Applicable Standard

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

9.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to 1.5MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Repeat above procedures until all frequencies measured were complete.



9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

9.4 Test Environmental Conditions

Temperature:	18~21 °C
Relative Humidity:	40~45 %
ATM Pressure:	102.2-103.2kPa

The testing was performed by Jerry Huang on 2011-04-15 ~ 2011-04-18 in RF site.

9.5 Test Results

Antenna #0:

Mode	Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)	Results
802.11b	Low	2412	-14.25	8	Pass
	Mid	2437	-16.43	8	Pass
	High	2462	-13.35	8	Pass
802.11g	Low	2412	-9.43	8	Pass
	Mid	2437	-9.20	8	Pass
	High	2462	-7.43	8	Pass
802.11n	Low	2412	-9.46	8	Pass
	Mid	2437	-8.25	8	Pass
	High	2462	-8.33	8	Pass

Antenna #1

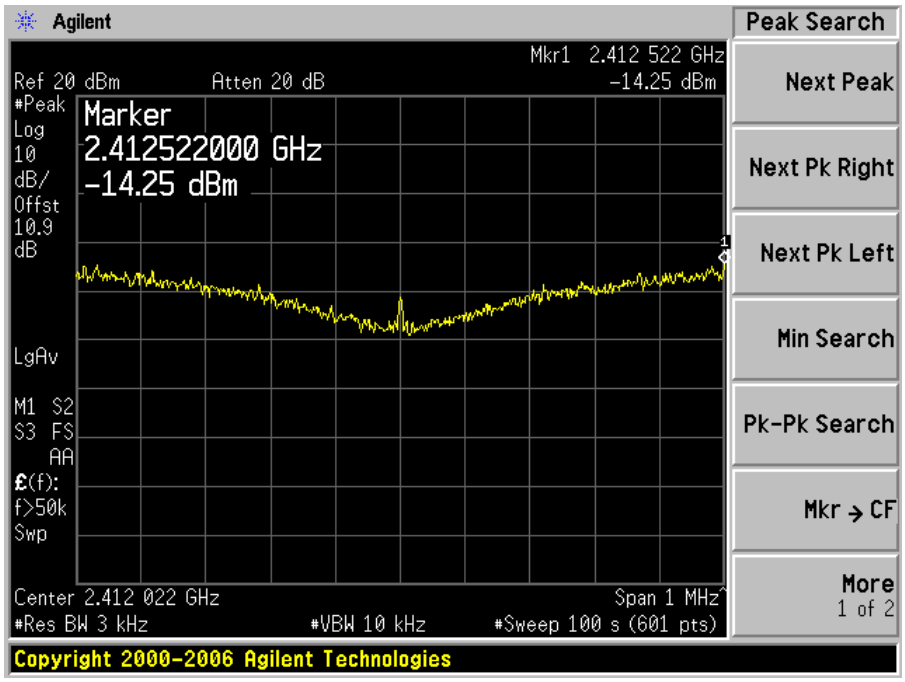
Mode	Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)	Results
802.11b	Low	2412	-14.25	8	Pass
	Mid	2437	-15.33	8	Pass
	High	2462	-13.11	8	Pass
802.11g	Low	2412	-9.43	8	Pass
	Mid	2437	-9.20	8	Pass
	High	2462	-7.67	8	Pass
802.11n	Low	2412	-9.46	8	Pass
	Mid	2437	-8.86	8	Pass
	High	2462	-8.45	8	Pass

802.11n (Antenna #0+Antenna #1)

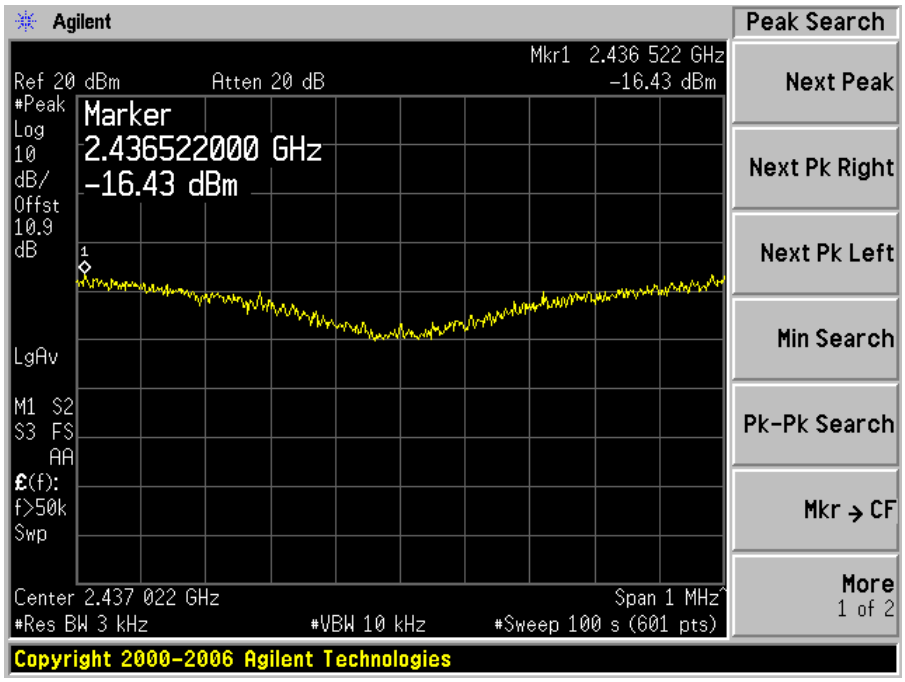
Channel	Frequency (MHz)	Total PSD (dBm)	Limit (dBm)	Result
Low	2412	-4.71	8	pass
Mid	2437	-3.59	8	pass
High	2462	-4.31	8	pass

Please refer to the following plots for detailed test results:

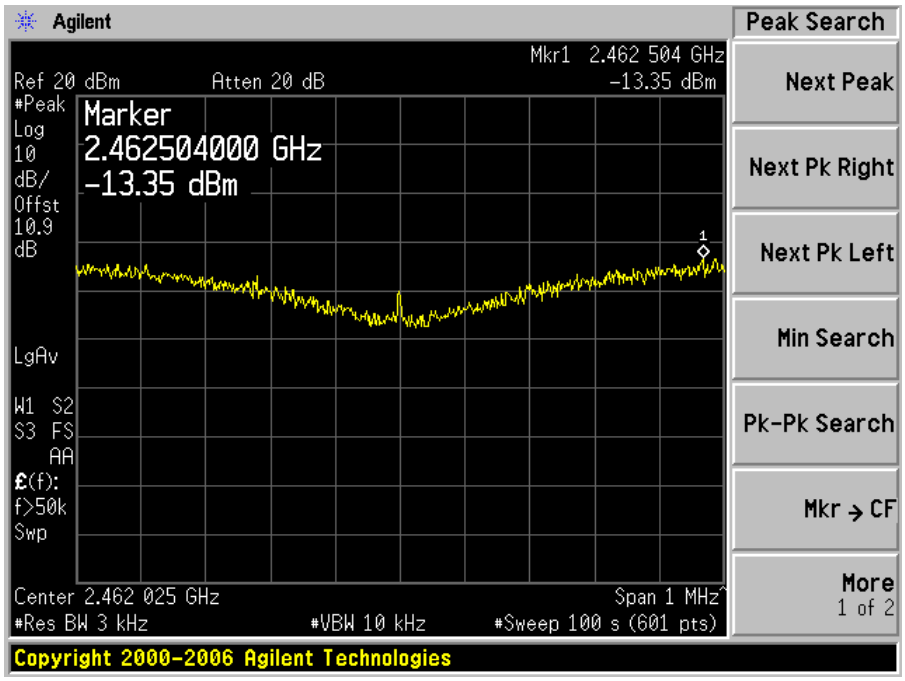
802.11b, Low Channel 2412 MHz - Antenna #0



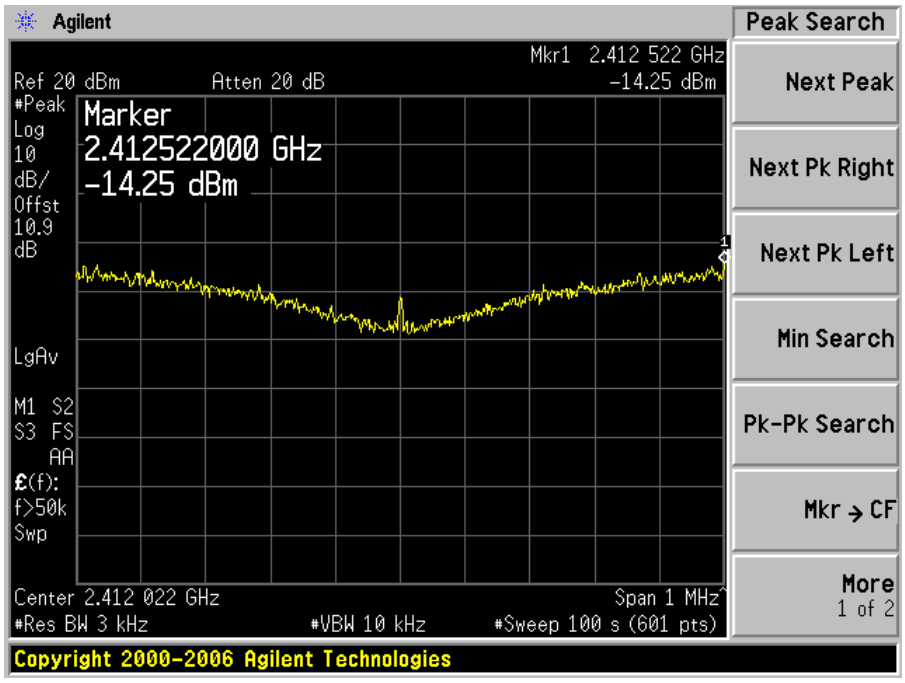
802.11b, Middle Channel 2437 MHz- Antenna #0



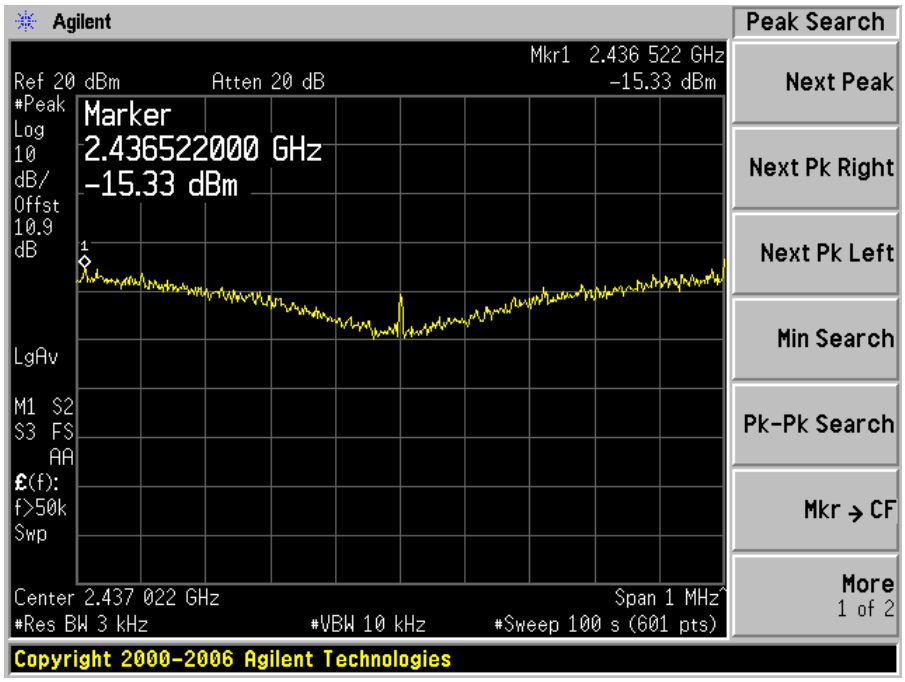
802.11b, High Channel 2462 MHz - Antenna #0



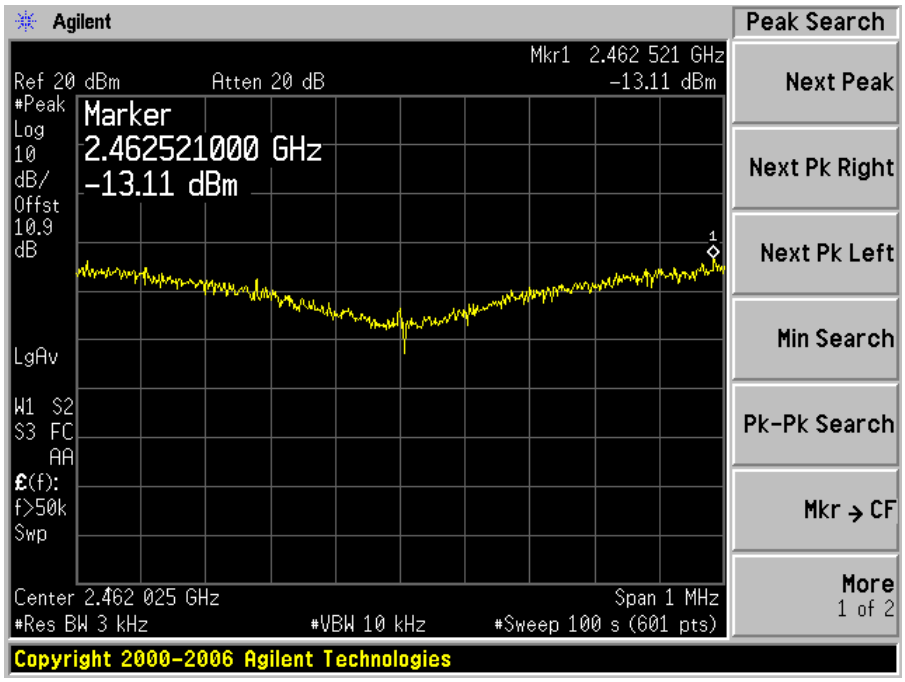
802.11b, Low Channel 2412 MHz - Antenna #1



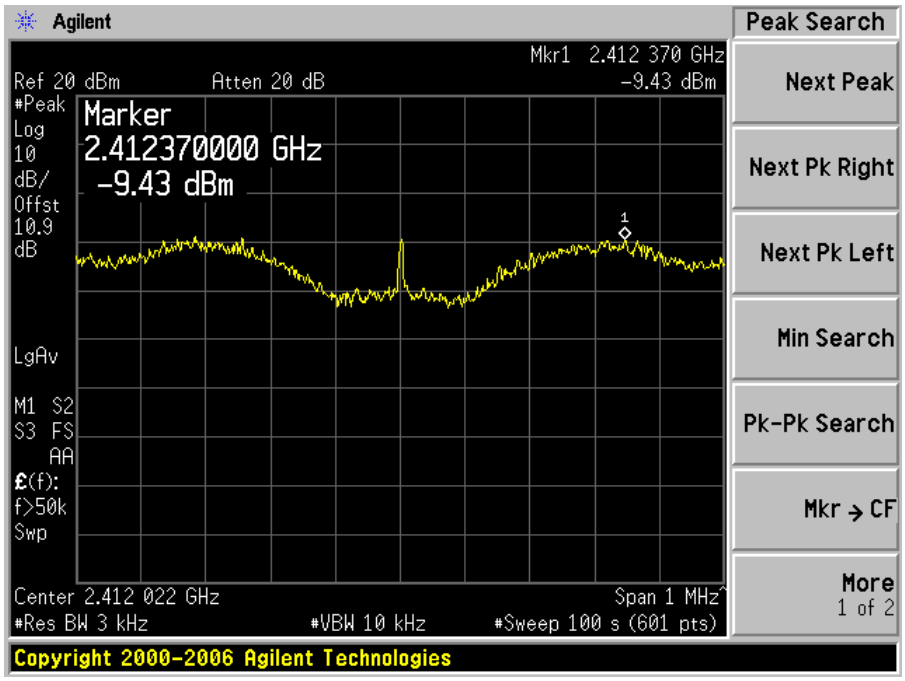
802.11b, Middle Channel 2437 MHz- Antenna #1



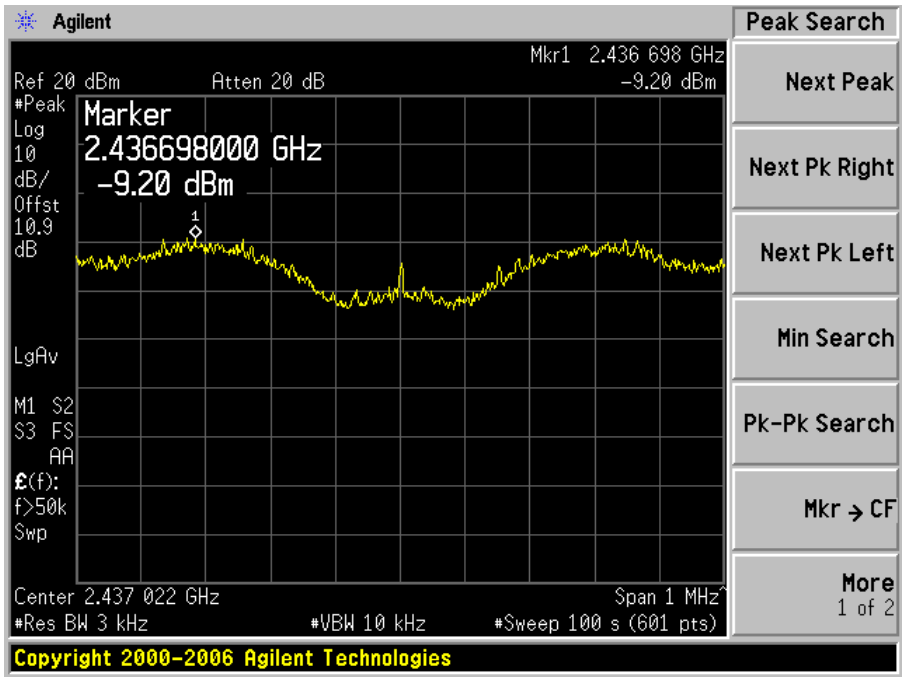
802.11b, High Channel 2462 MHz - Antenna #1



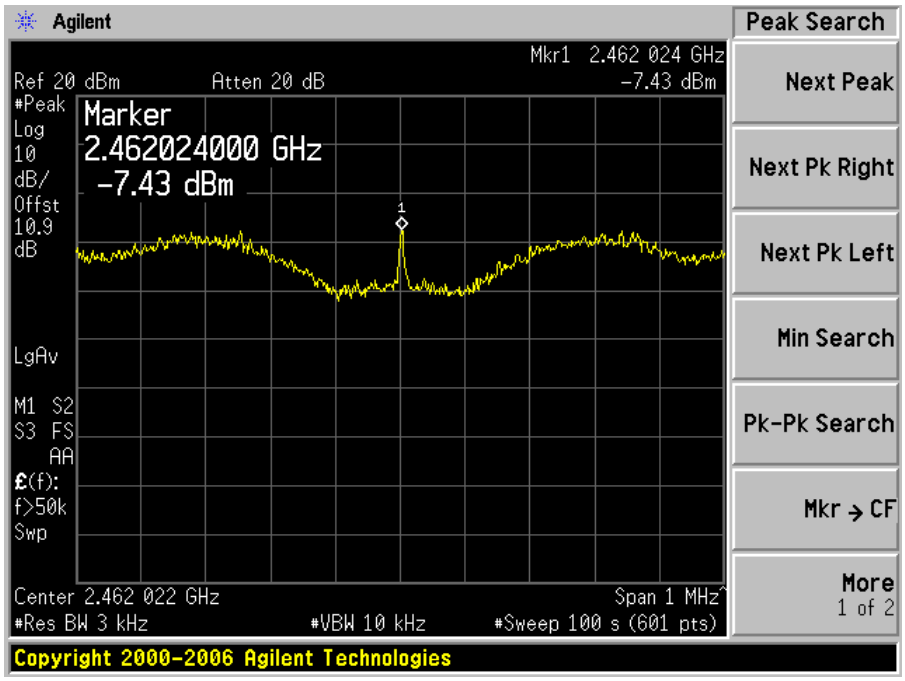
802.11g, Low Channel 2412 MHz - Antenna #0



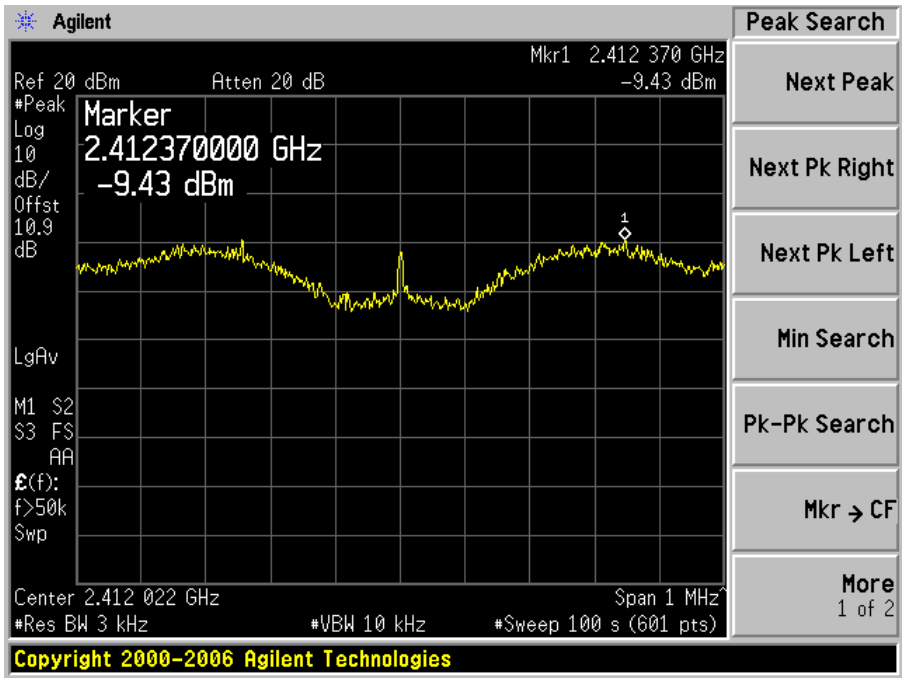
802.11g, Middle Channel 2437 MHz- Antenna #0



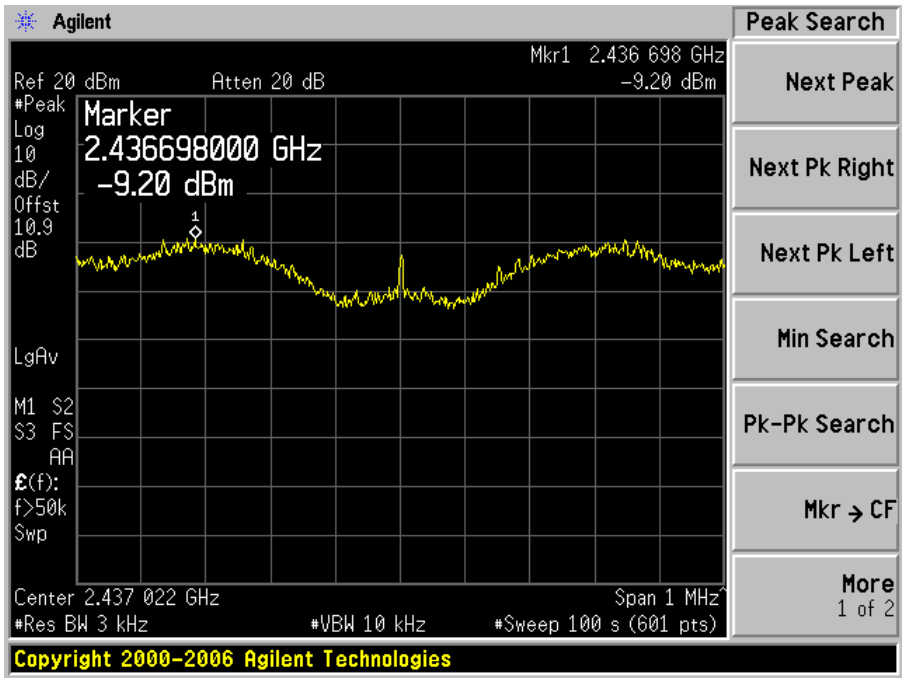
802.11g, High Channel 2462 MHz - Antenna #0



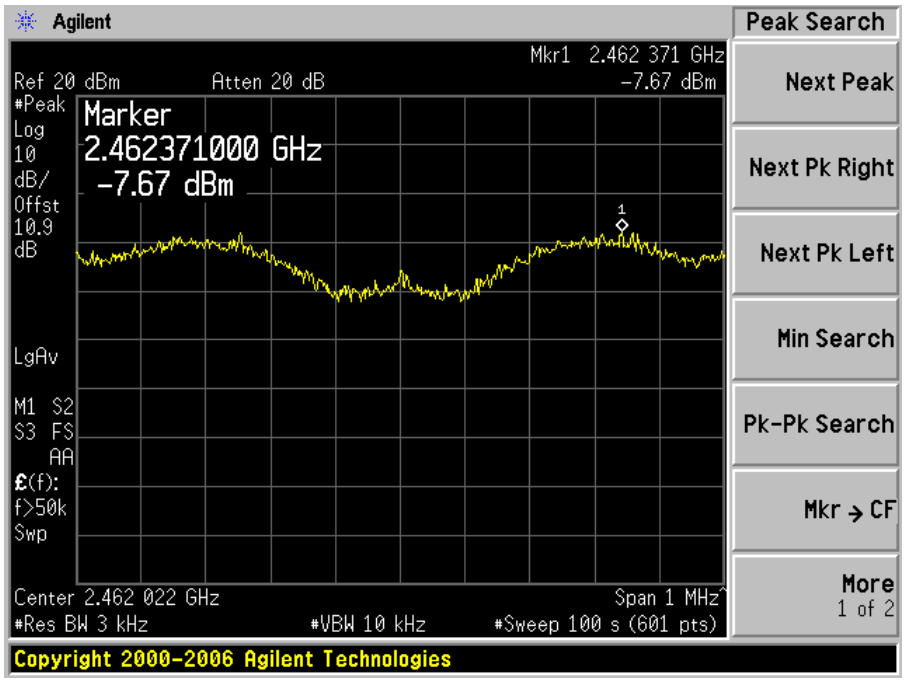
802.11g, Low Channel 2412 MHz - Antenna #1



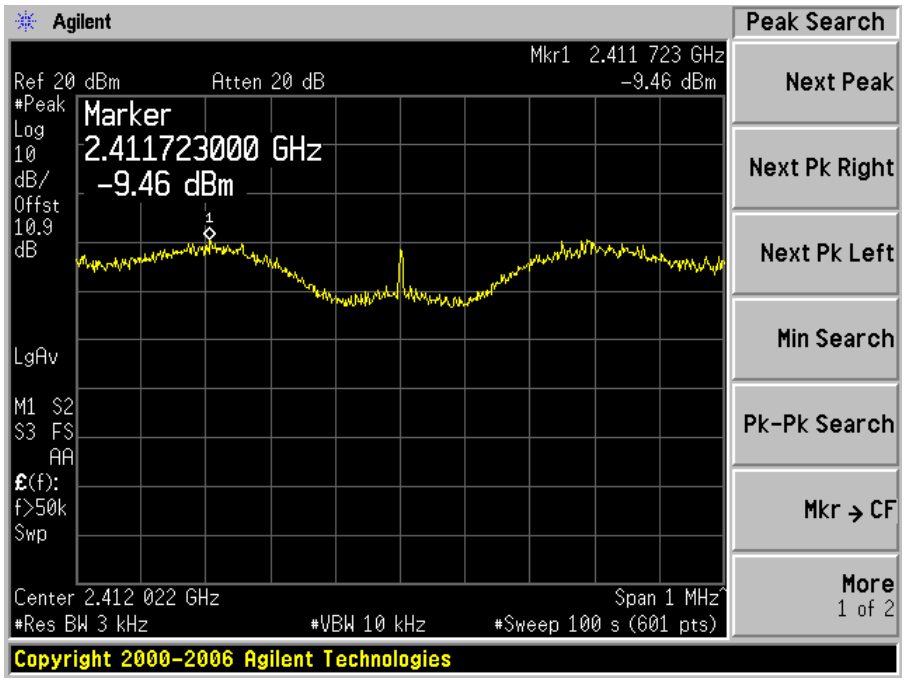
802.11g, Middle Channel 2437 MHz- Antenna #1



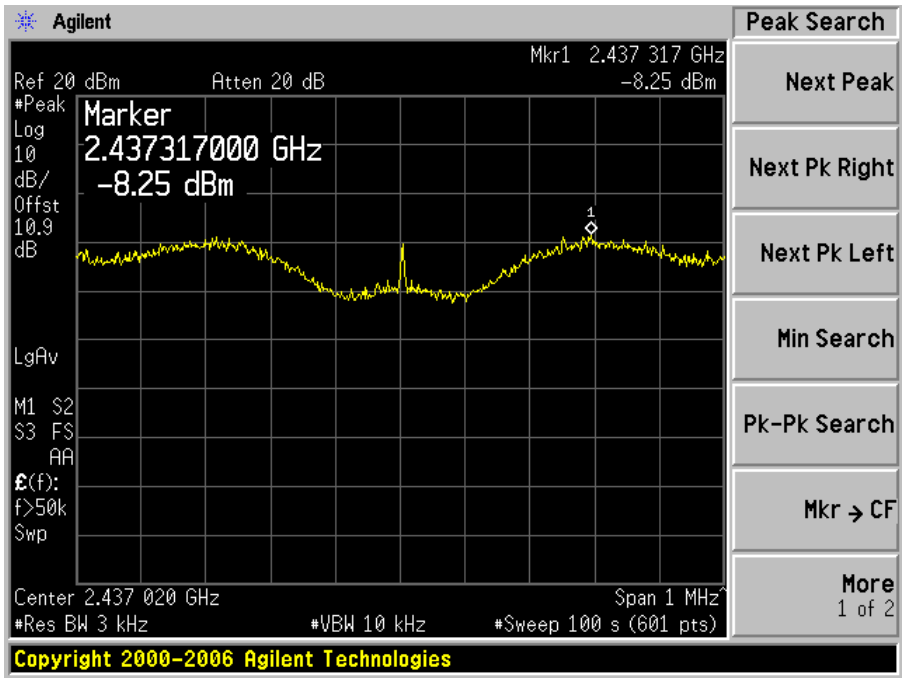
802.11g, High Channel 2462 MHz - Antenna #1



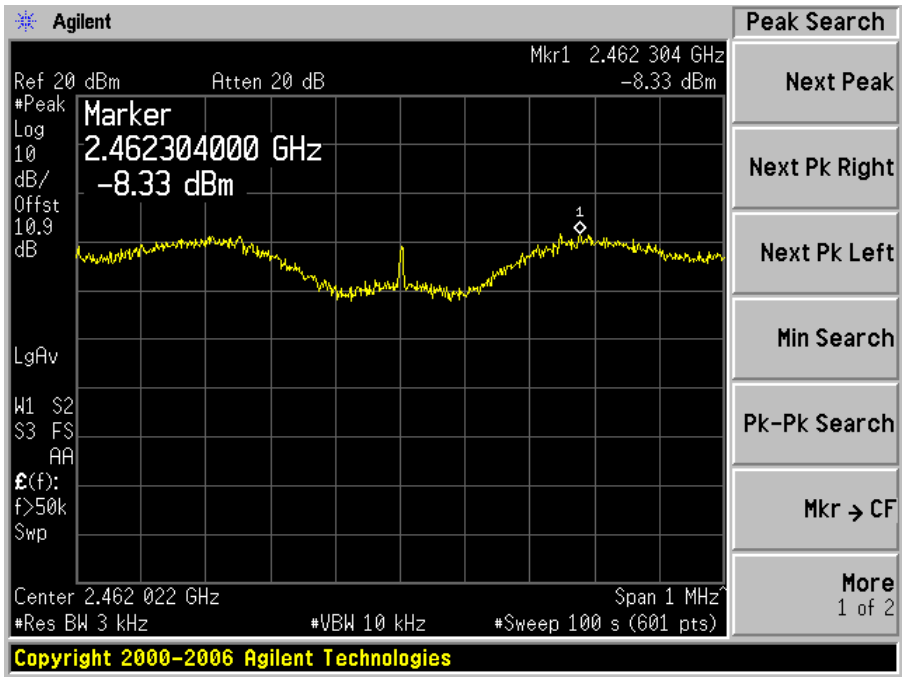
802.11n, Low Channel 2412 MHz - Antenna #0



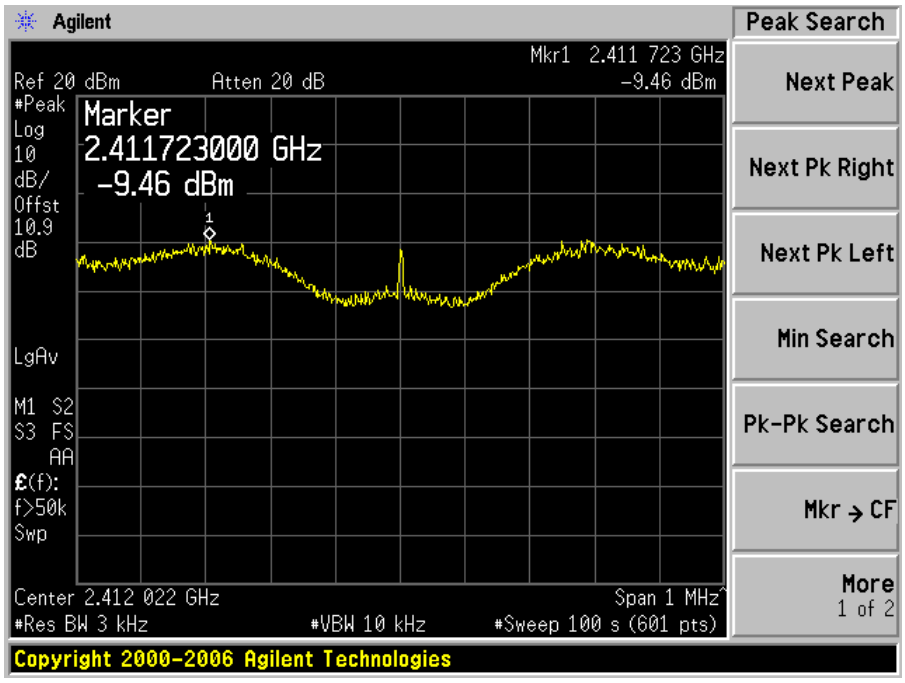
802.11n, Middle Channel 2437 MHz- Antenna #0



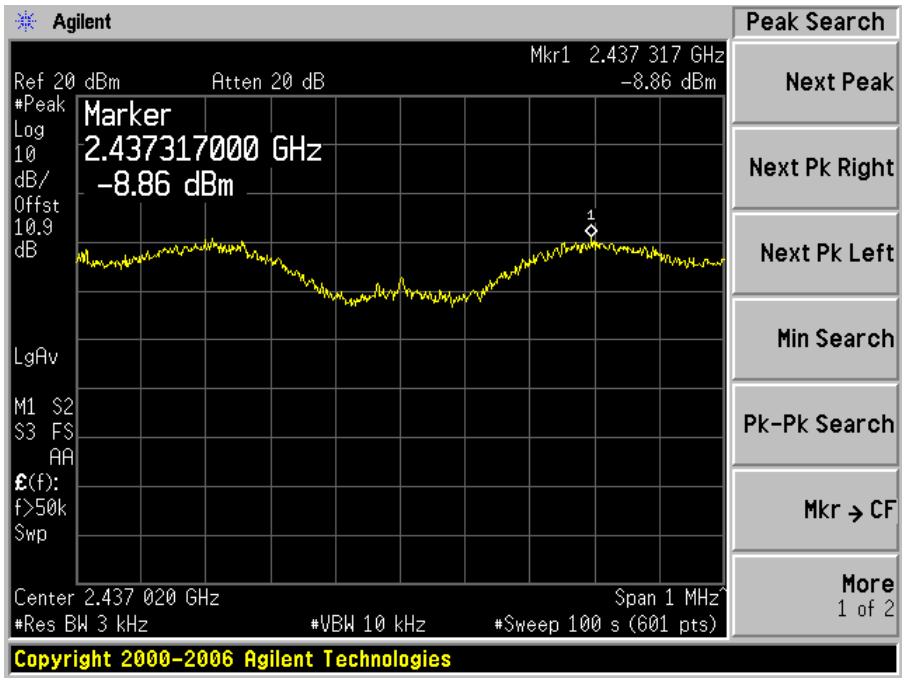
802.11n, High Channel 2462 MHz - Antenna #0



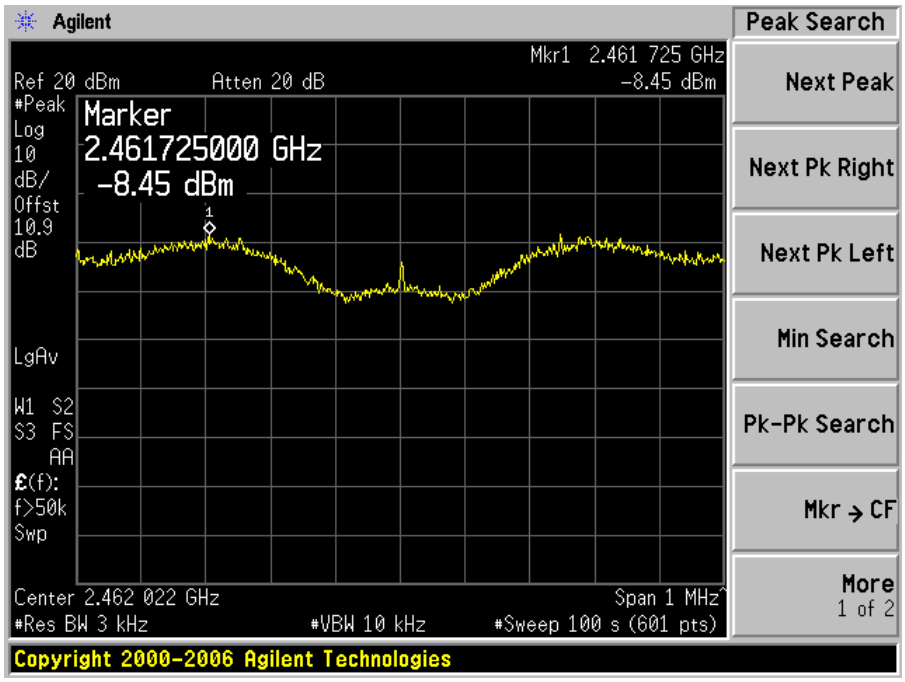
802.11n, Low Channel 2412 MHz - Antenna #1



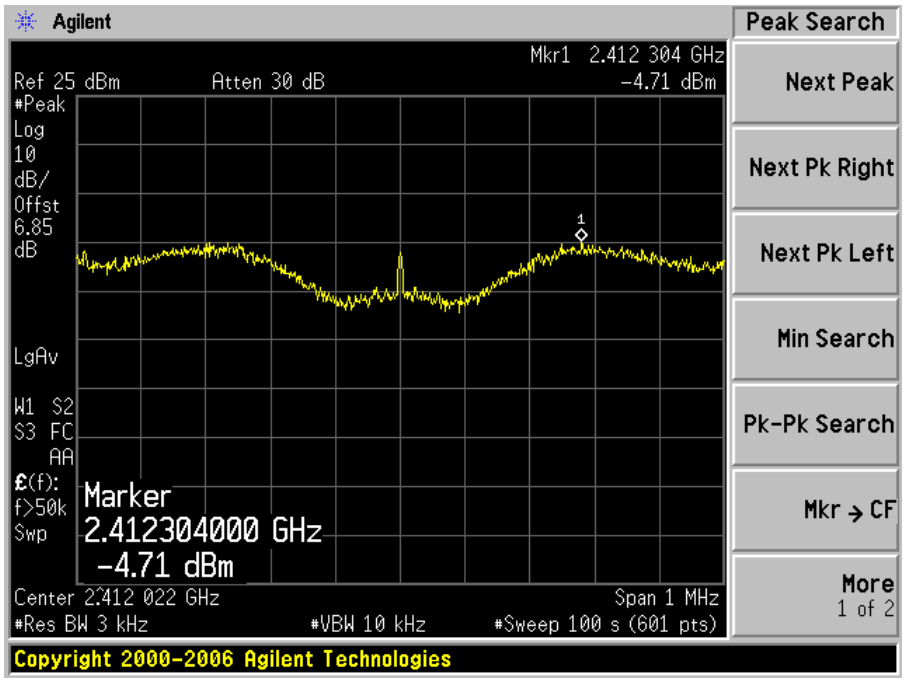
802.11n, Middle Channel 2437 MHz- Antenna #1



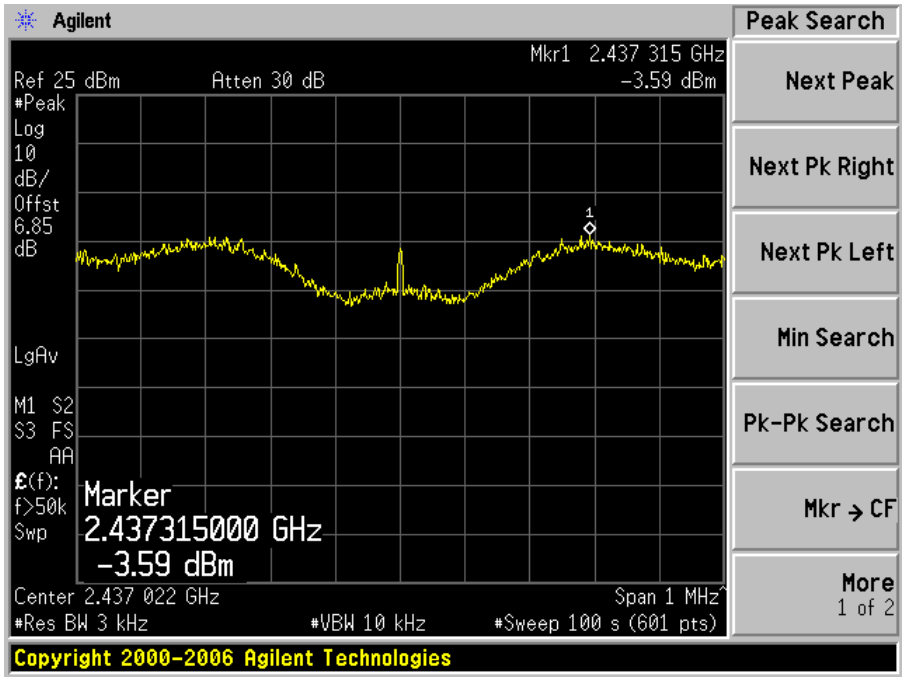
802.11n, High Channel 2462 MHz - Antenna #1



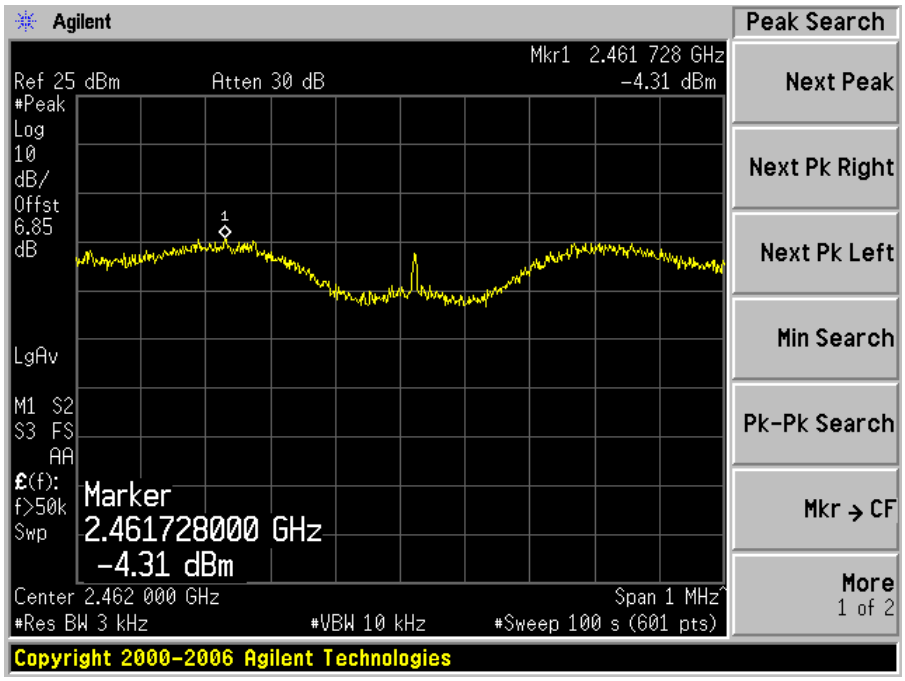
802.11n, Low Channel 2412 MHz - Antenna #0+Antenna #1



802.11n, Middle Channel 2437 MHz- Antenna #0+Antenna #1



802.11n, High Channel 2462 MHz - Antenna #0+Antenna #1



10 FCC §2.1051 & §15.247(d) - Spurious Emissions at Antenna Terminals

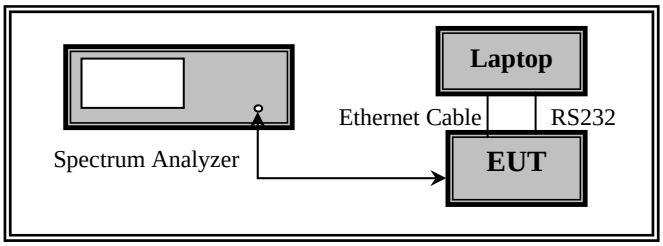
10.1 Applicable Standard

For FCC §15.247(d) 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.

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in FCC §2.1057.

10.2 Measurement Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

10.4 Test Environmental Conditions

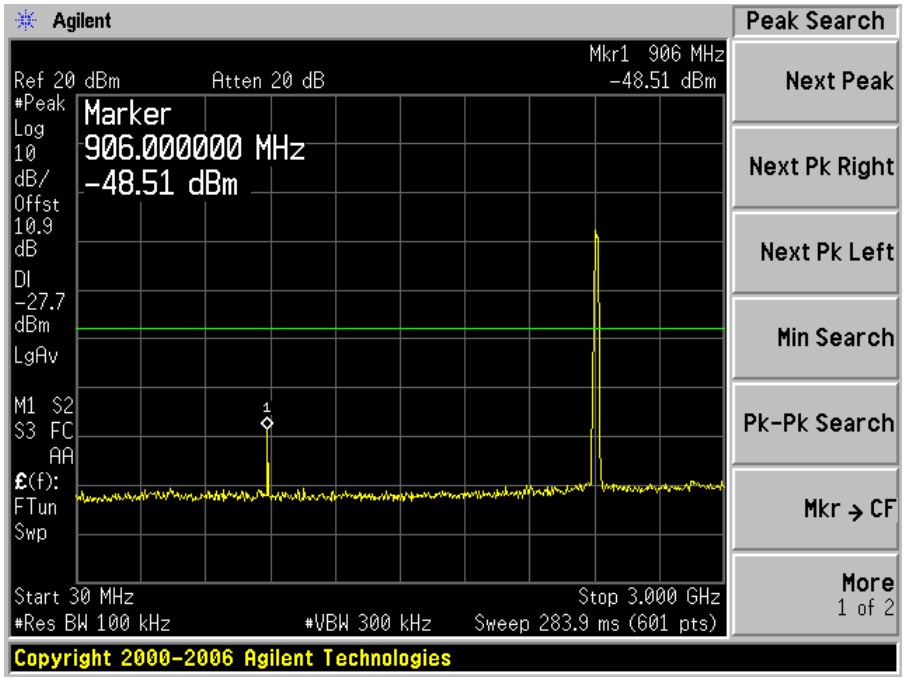
Temperature:	18~21 °C
Relative Humidity:	40~45 %
ATM Pressure:	102.2-103.2kPa

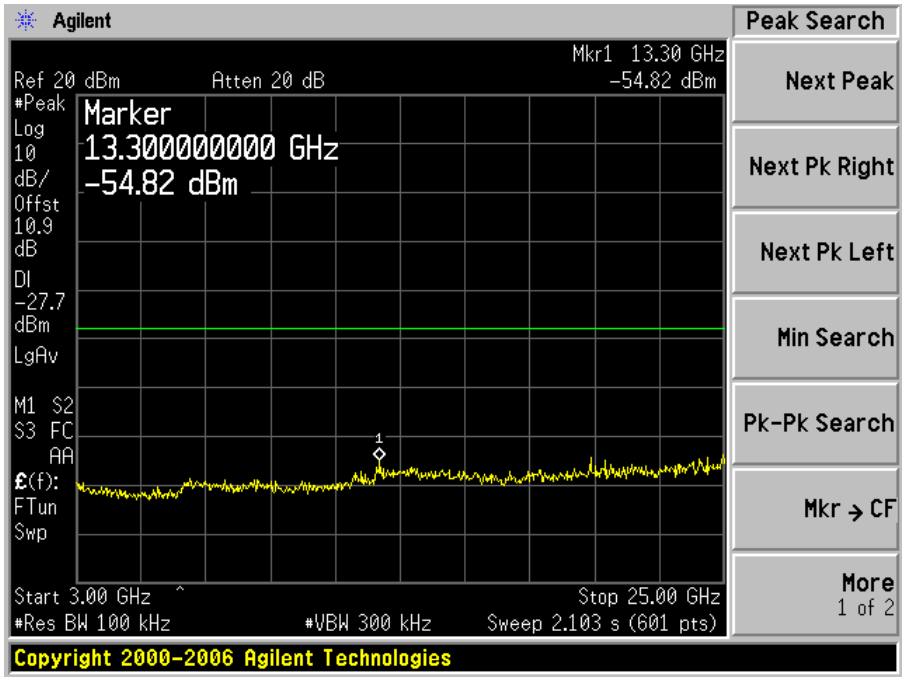
The testing was performed by Jerry Huang on 2011-04-15 ~ 2011-04-18 in RF site.

10.5 Test Results

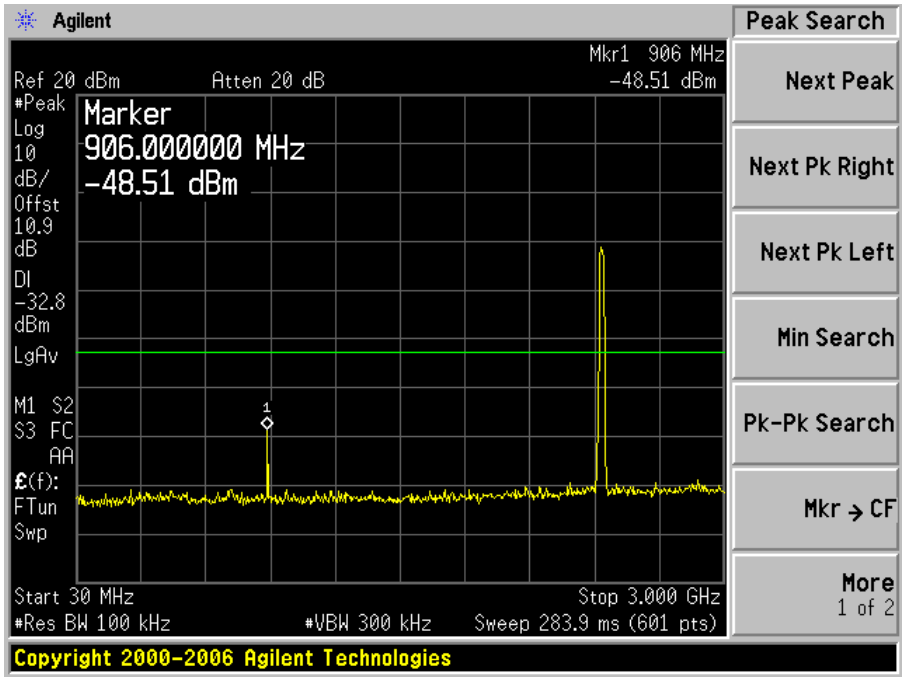
Please refer to following plots of spurious emissions.

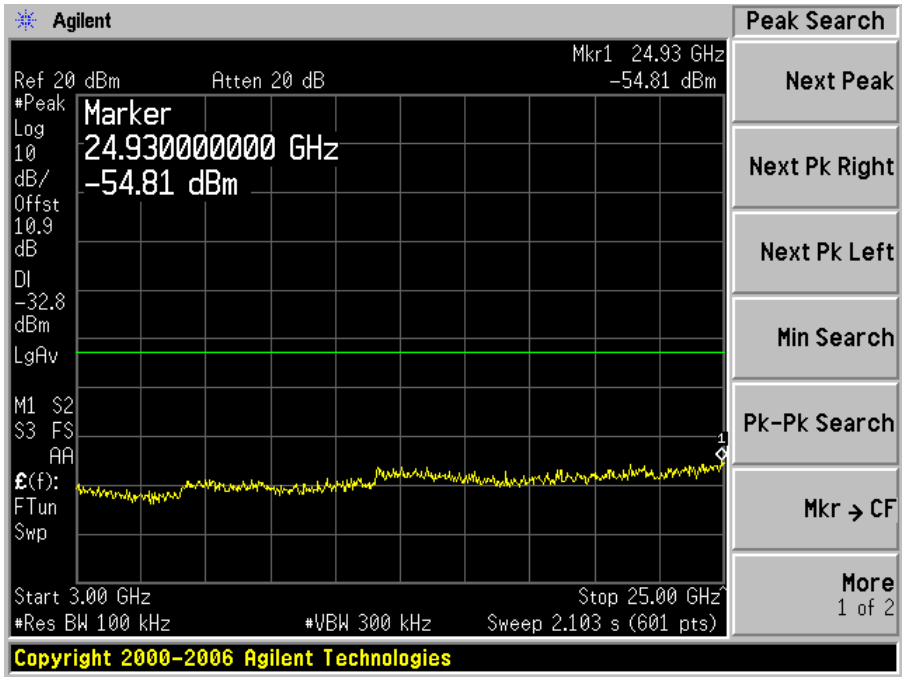
802.11 b, Low Channel 2412 MHz – Antenna #0



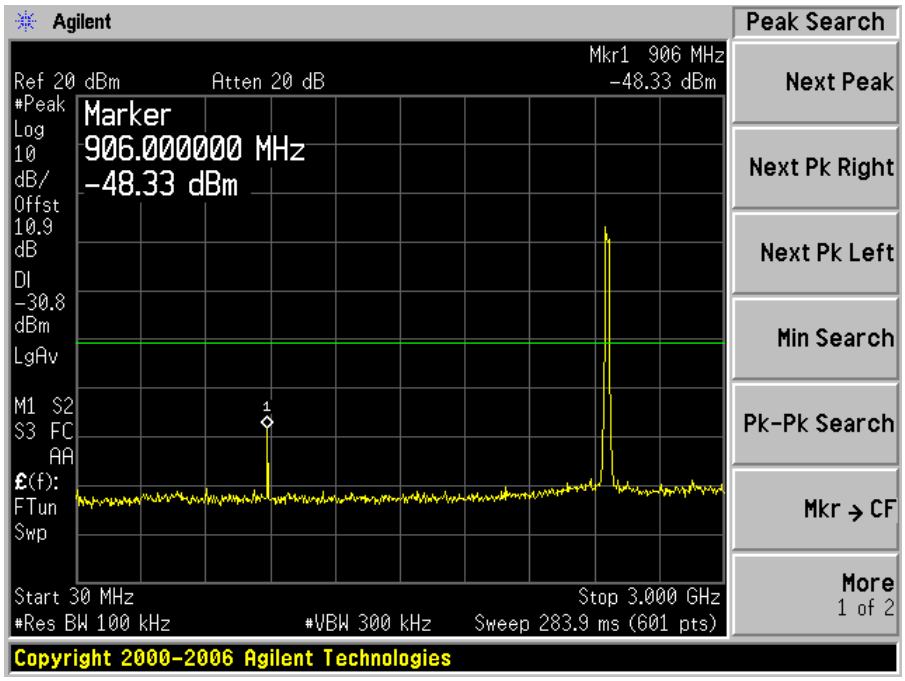


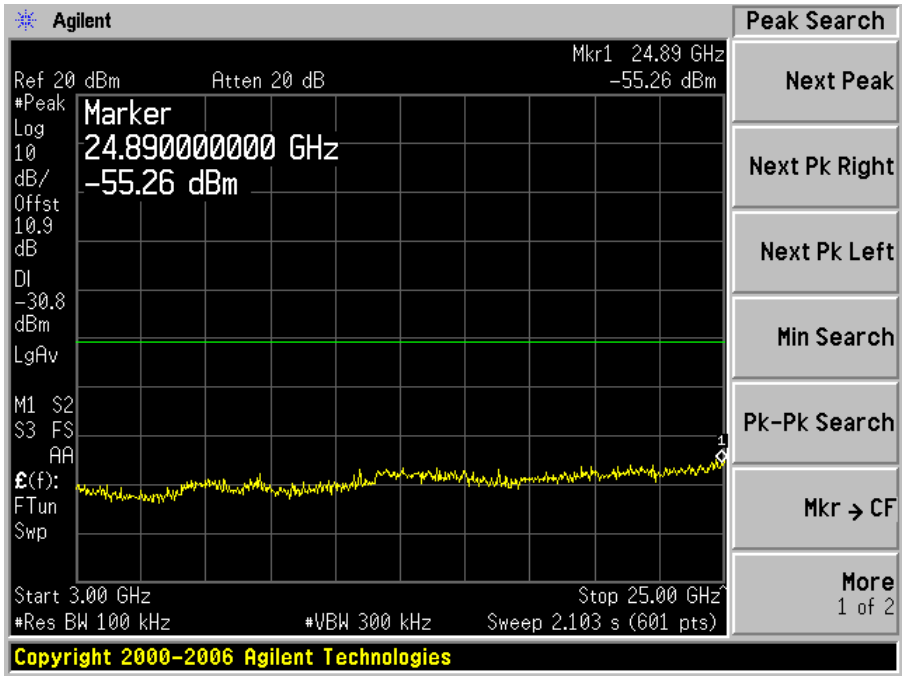
802.11 b, Middle Channel 2437 MHz – Antenna #0



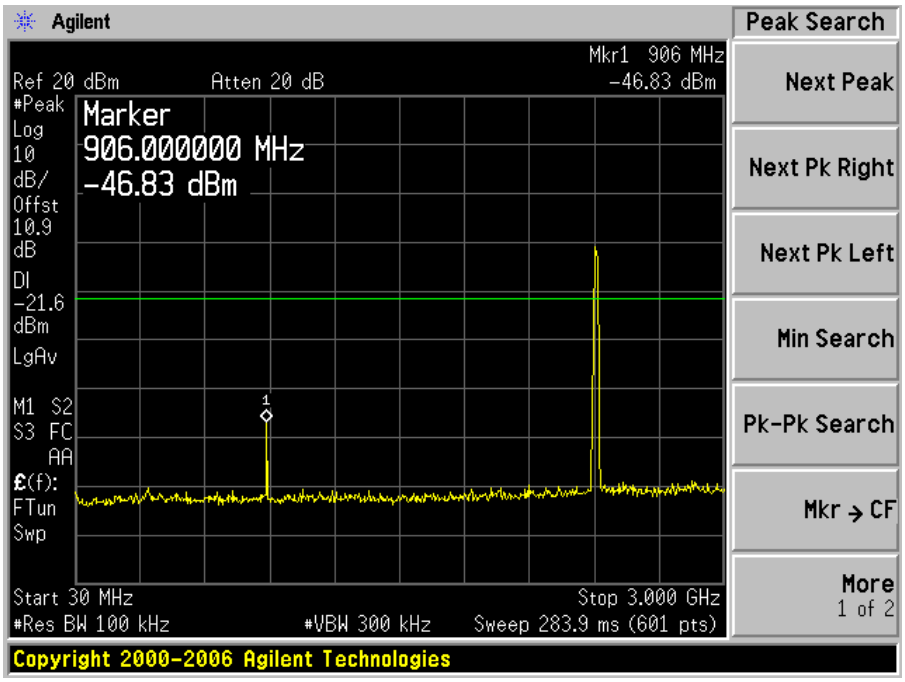


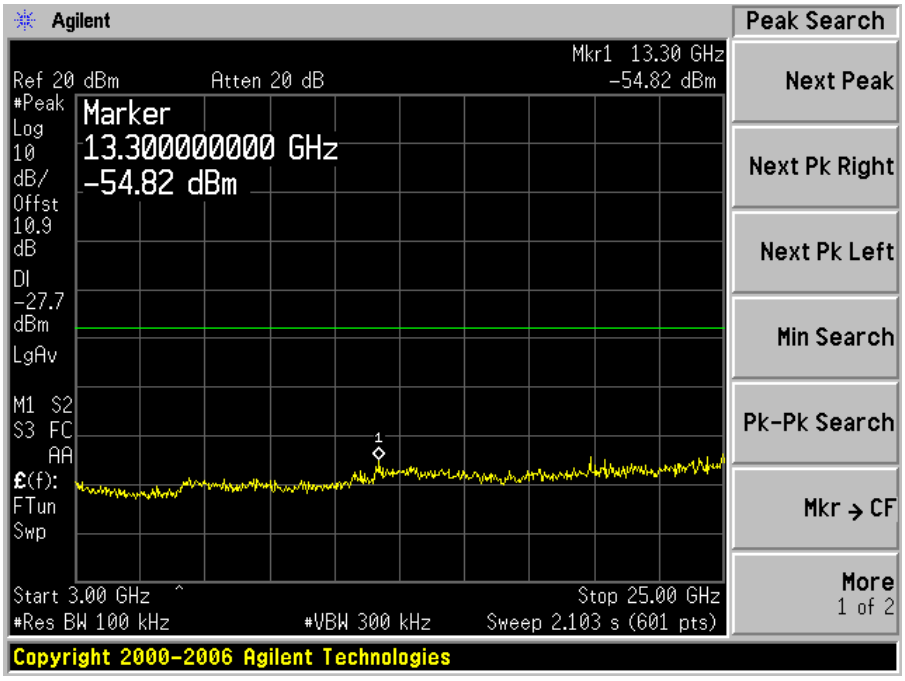
802.11 b, High Channel 2462 MHz – Antenna #0



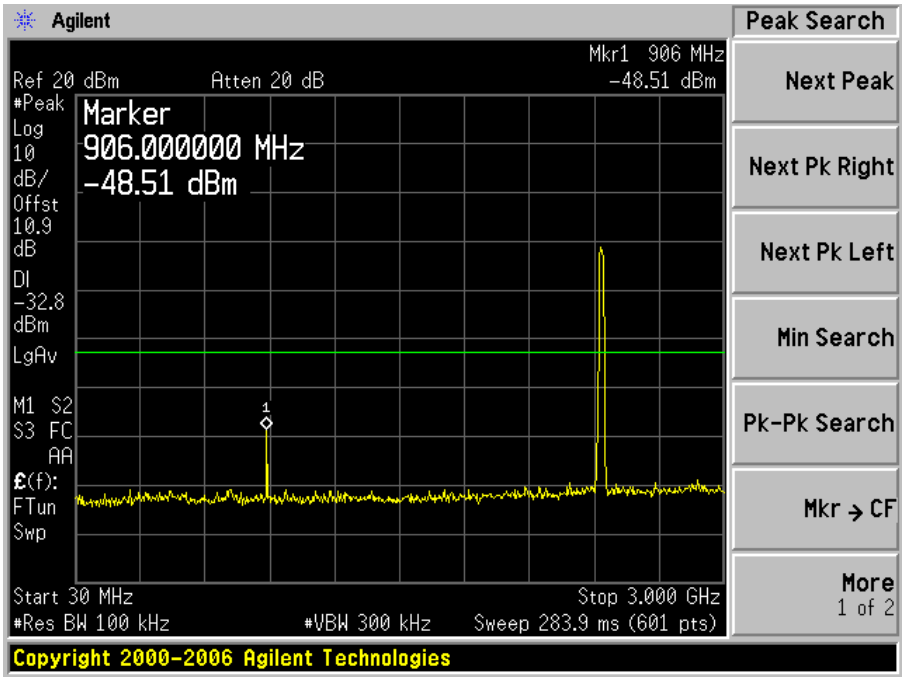


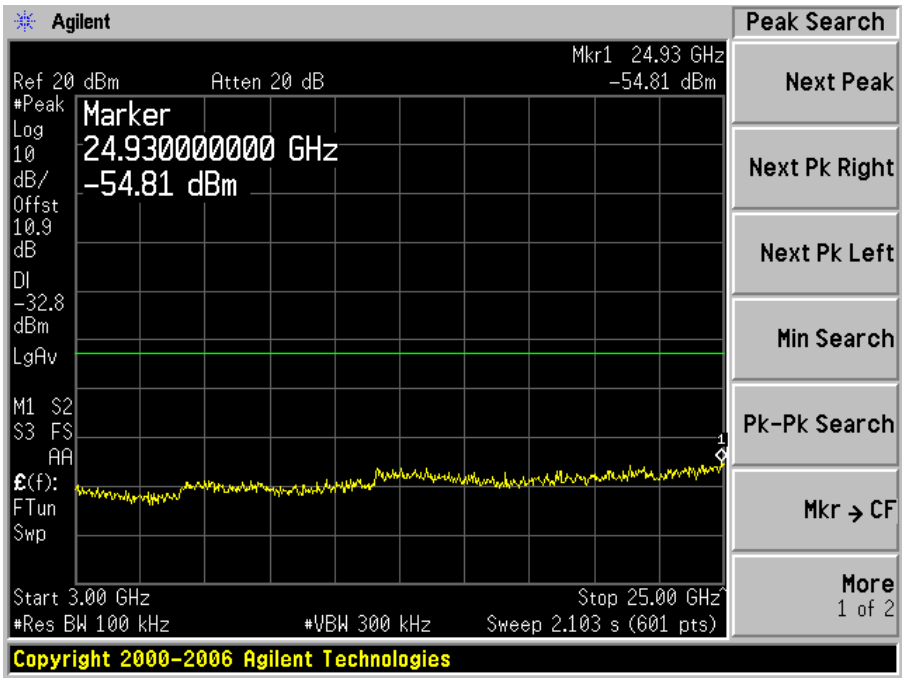
802.11 b, Low Channel 2412 MHz – Antenna #1



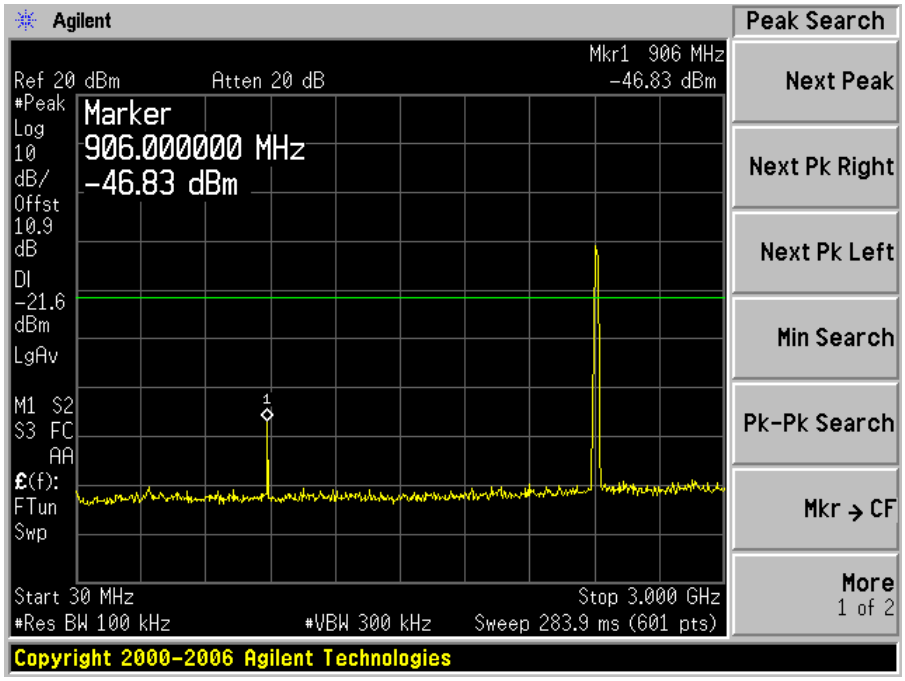


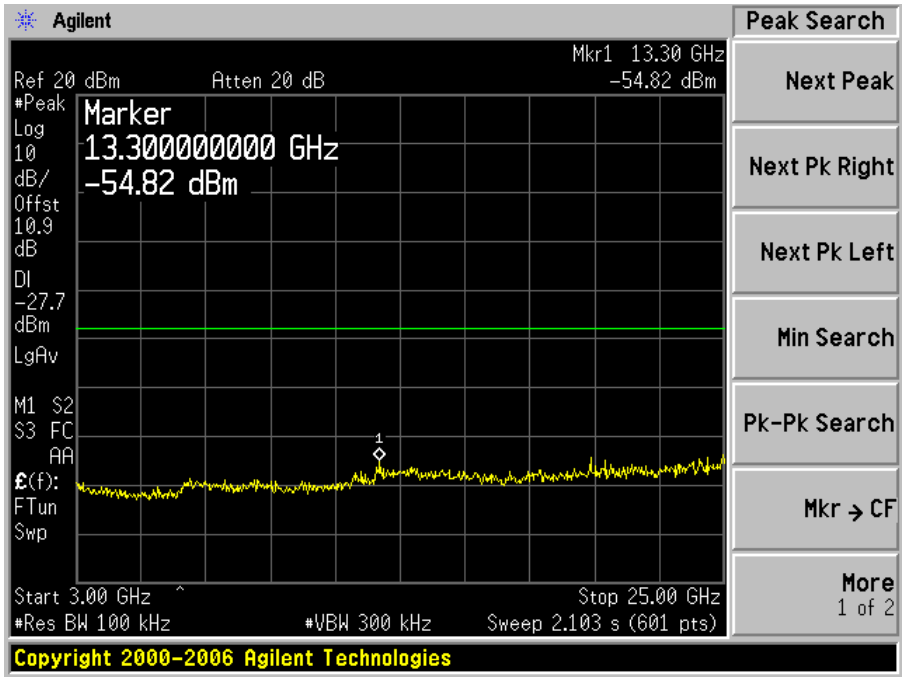
802.11 b, Middle Channel 2437 MHz – Antenna #1



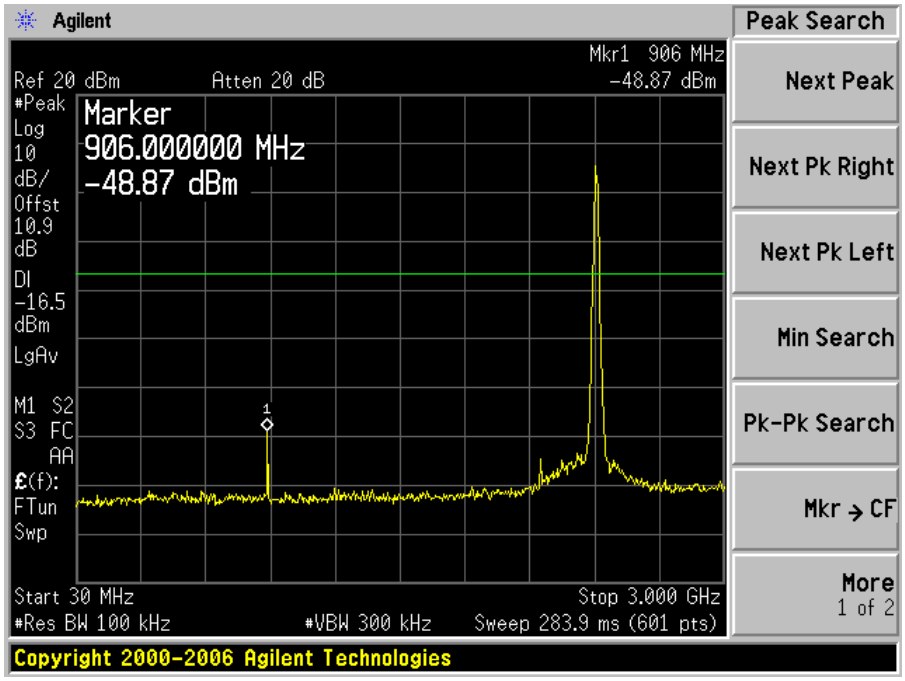


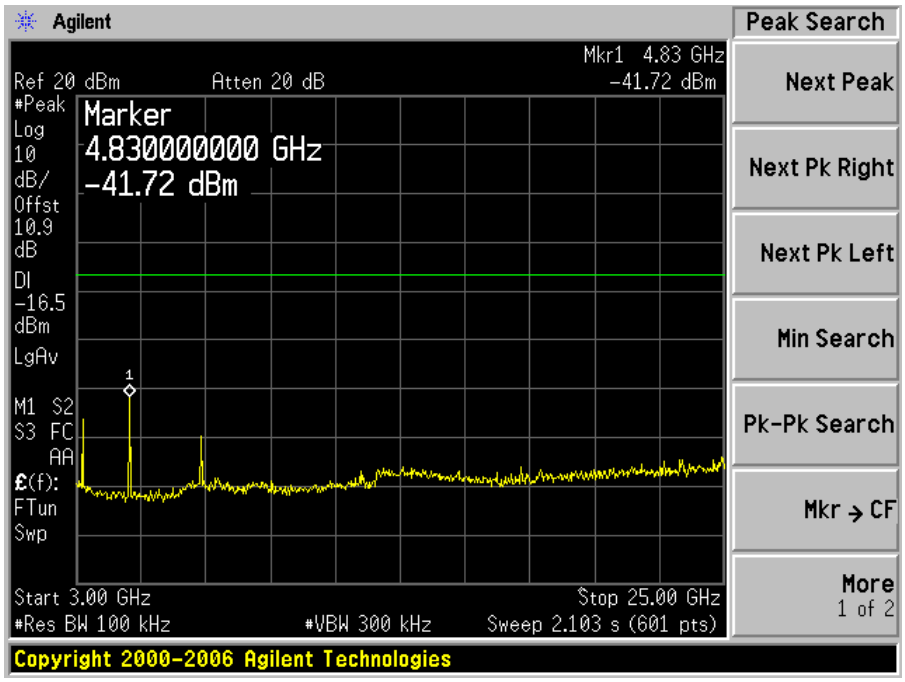
802.11 b, High Channel 2462 MHz – Antenna #1



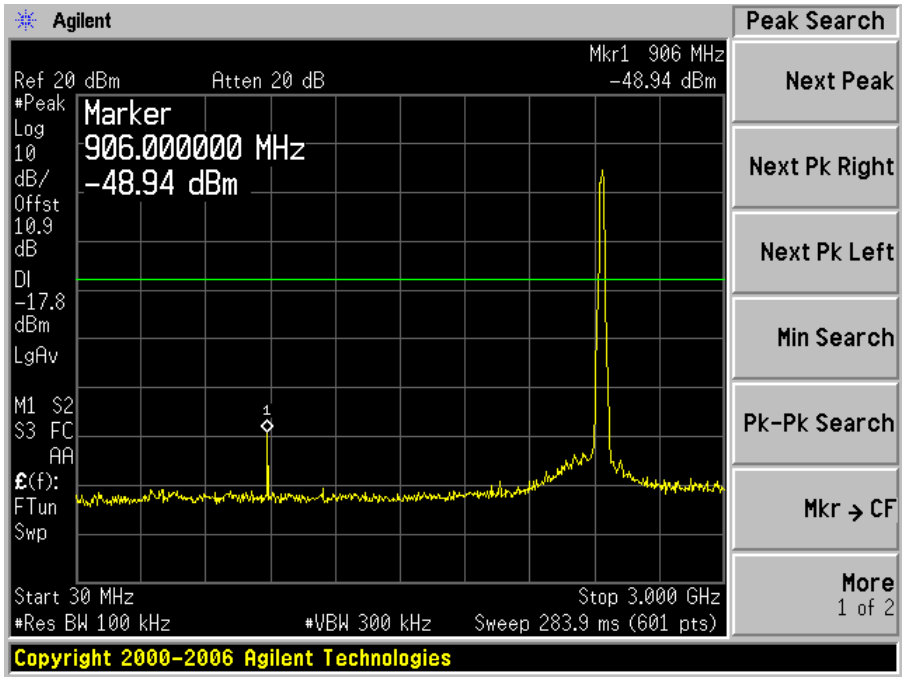


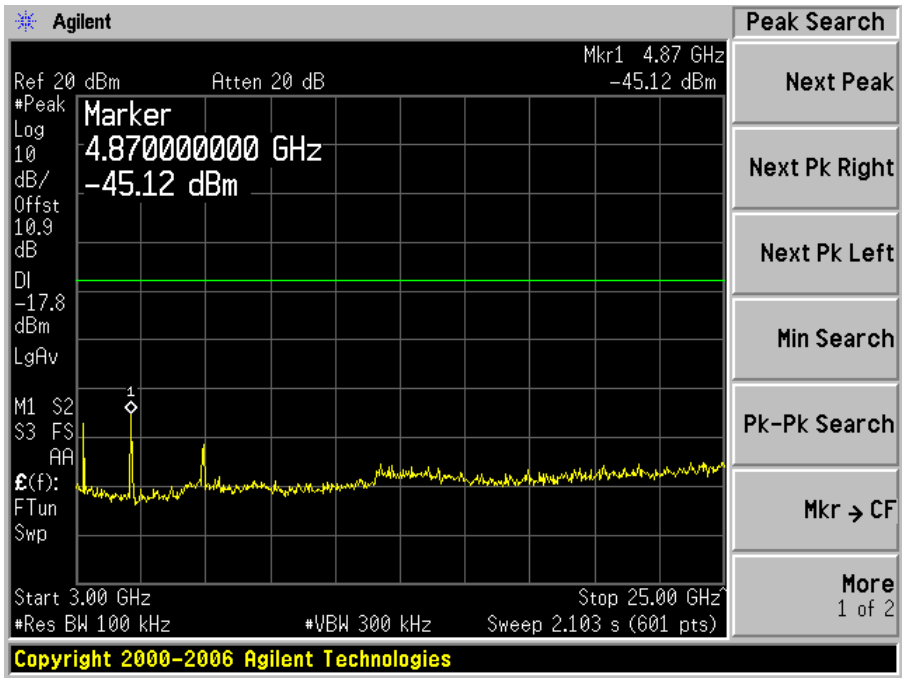
802.11 g, Low Channel 2412 MHz – Antenna #0



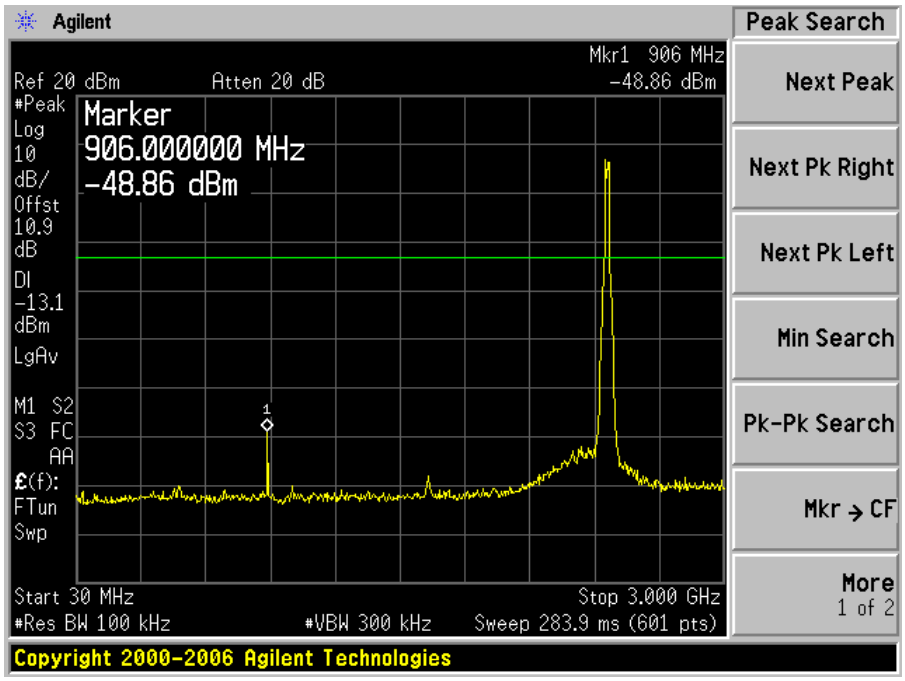


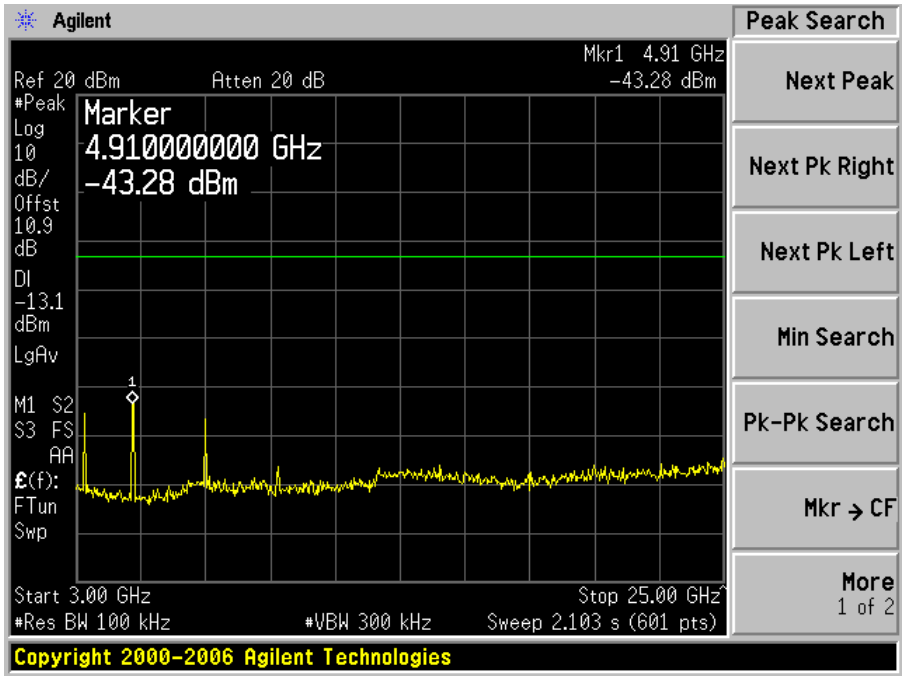
802.11 g, Middle Channel 2437 MHz – Antenna #0



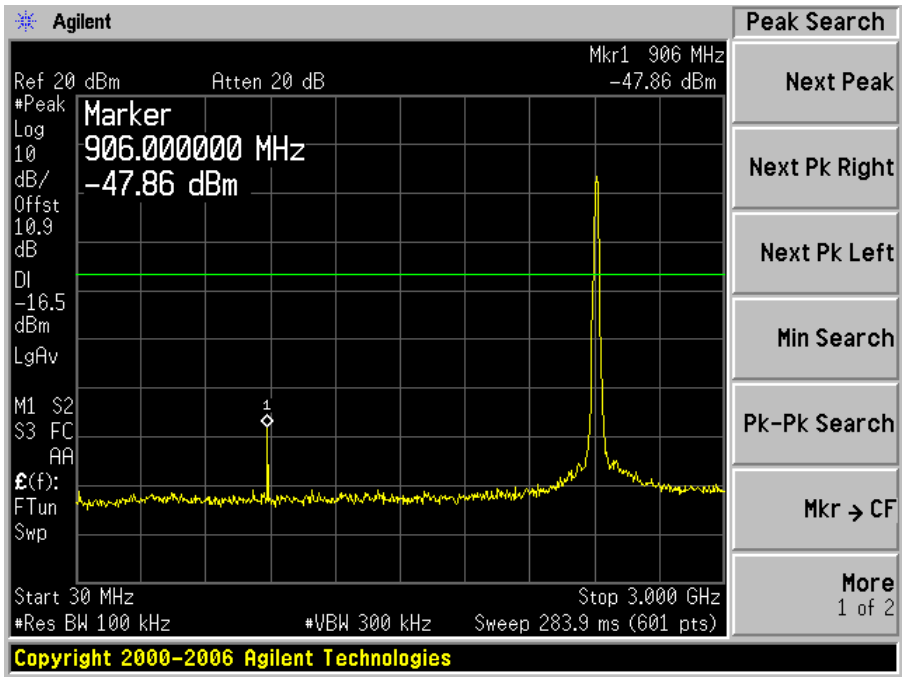


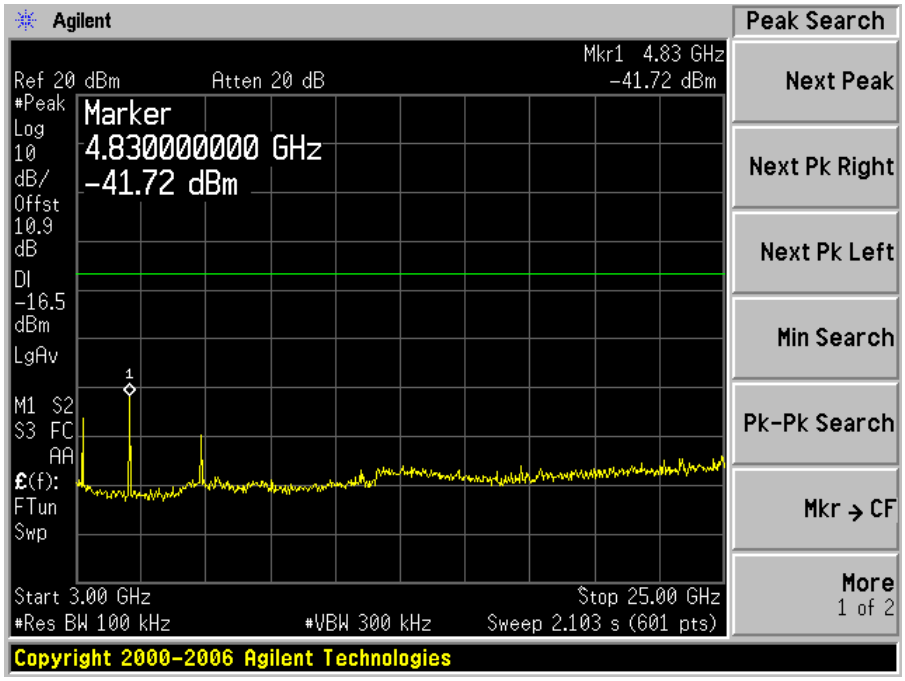
802.11 g, High Channel 2462 MHz – Antenna #0



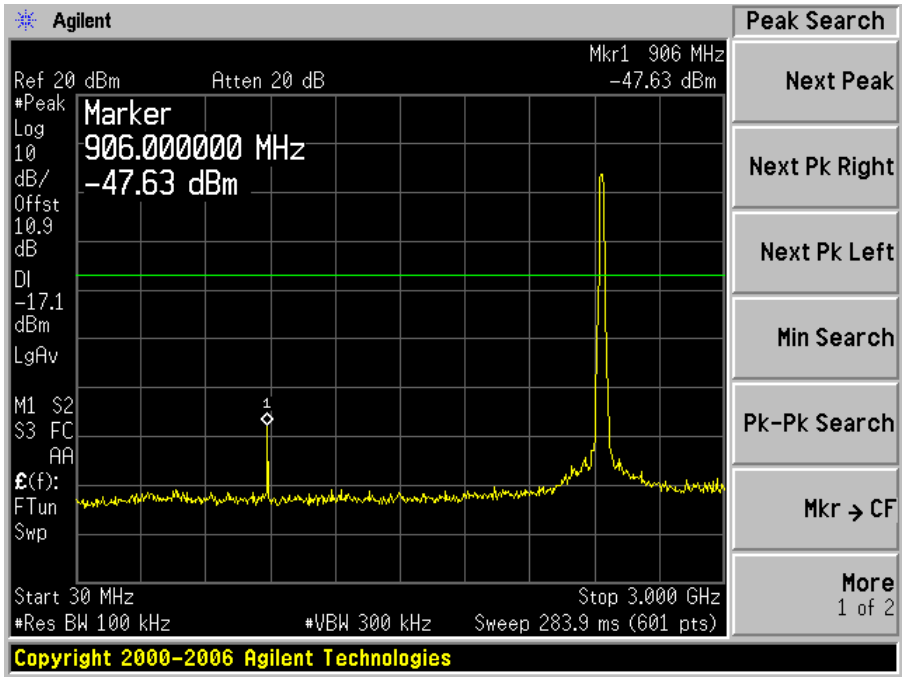


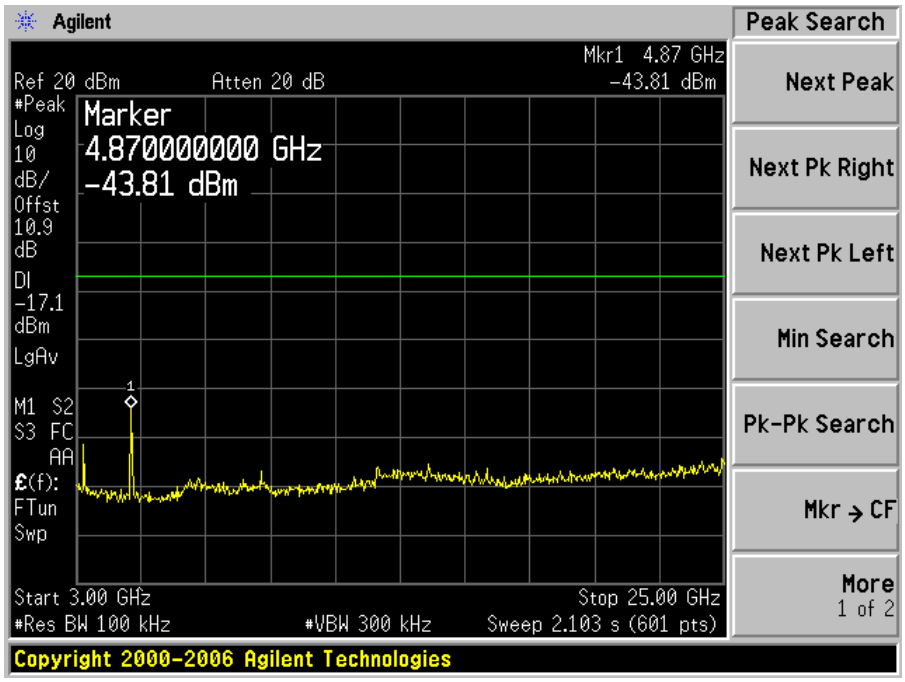
802.11 g, Low Channel 2412 MHz – Antenna #1



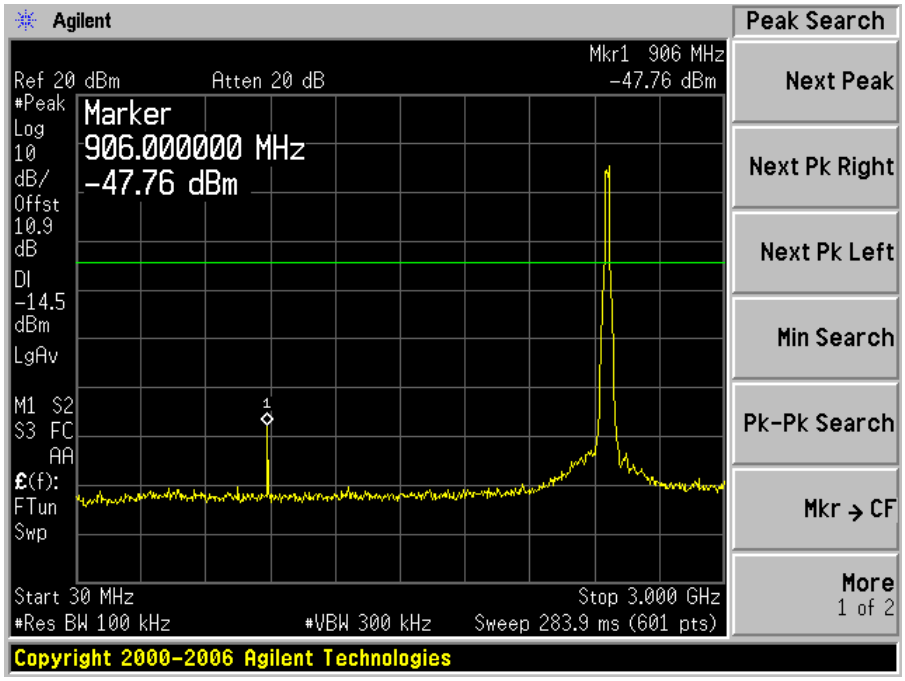


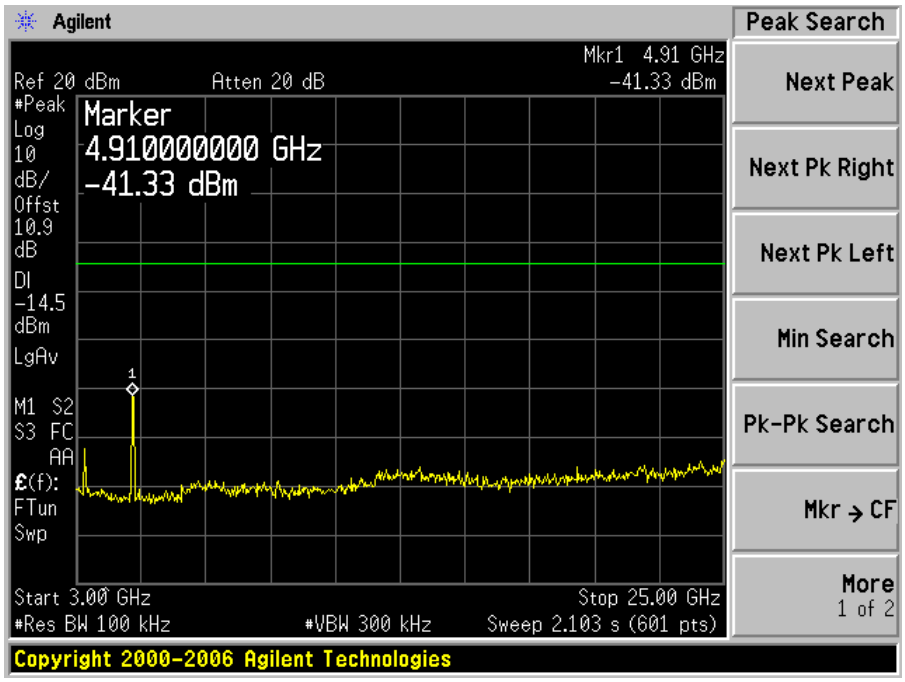
802.11 g, Middle Channel 2437 MHz – Antenna #1



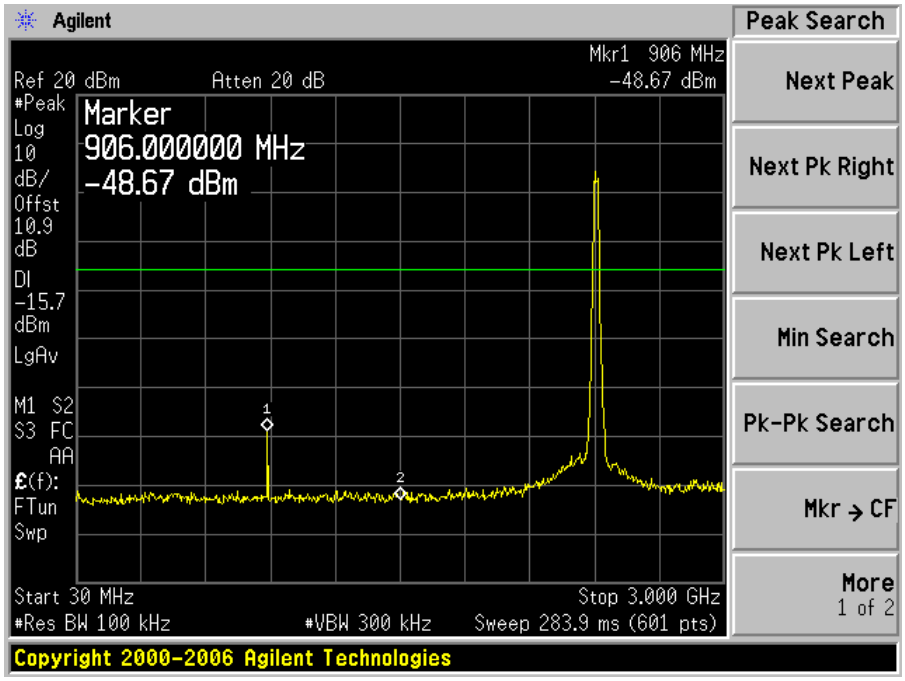


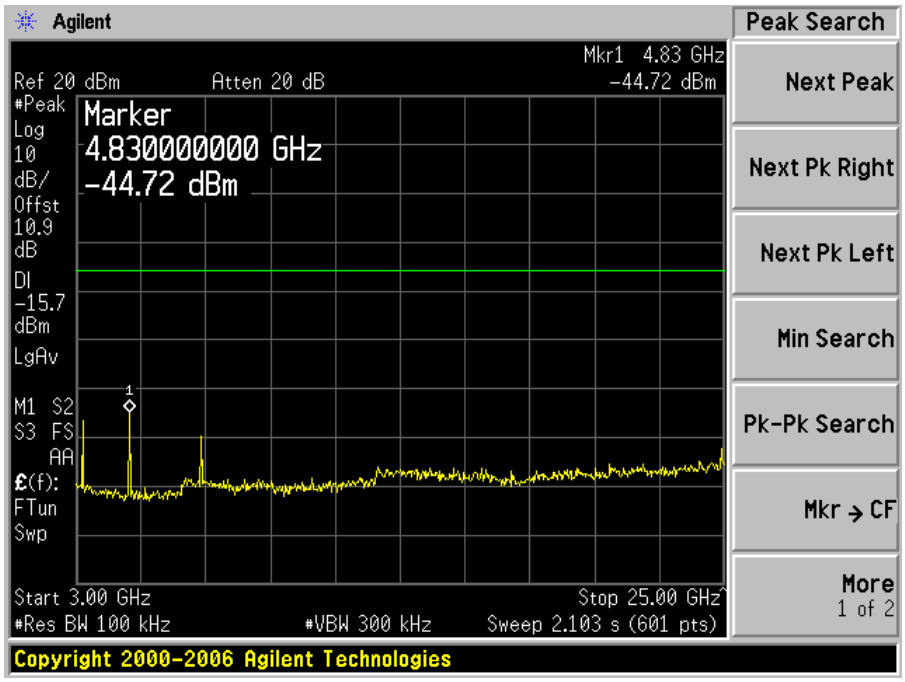
802.11 g, High Channel 2462 MHz – Antenna #1



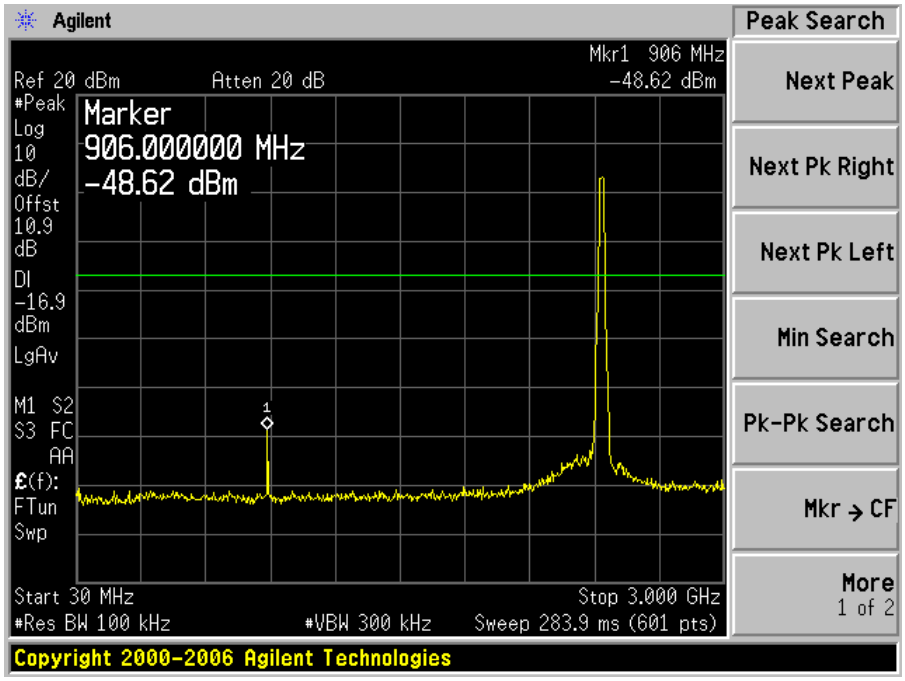


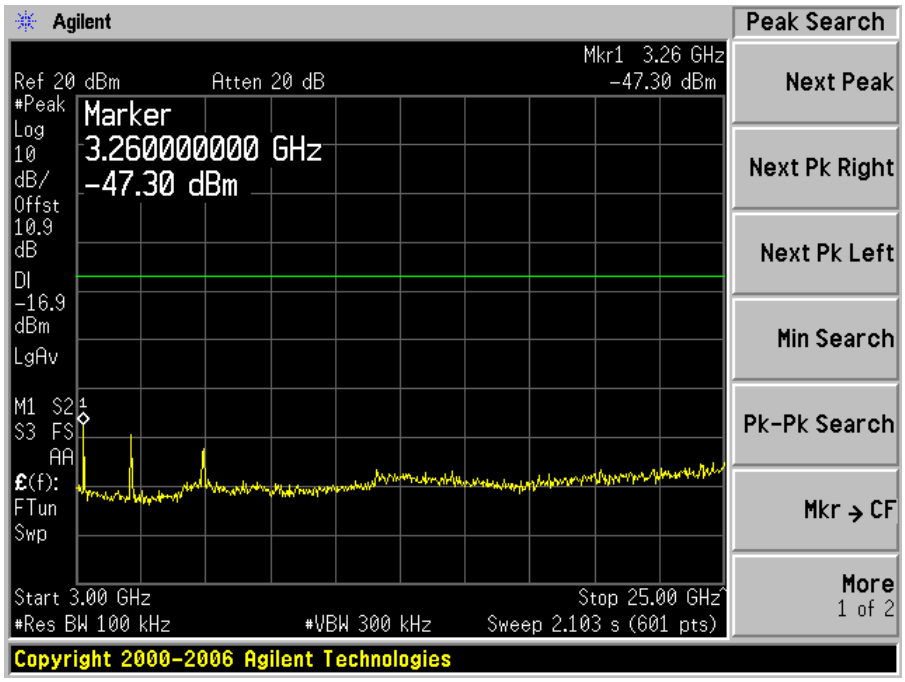
802.11 n, Low Channel 2412 MHz – Antenna #0



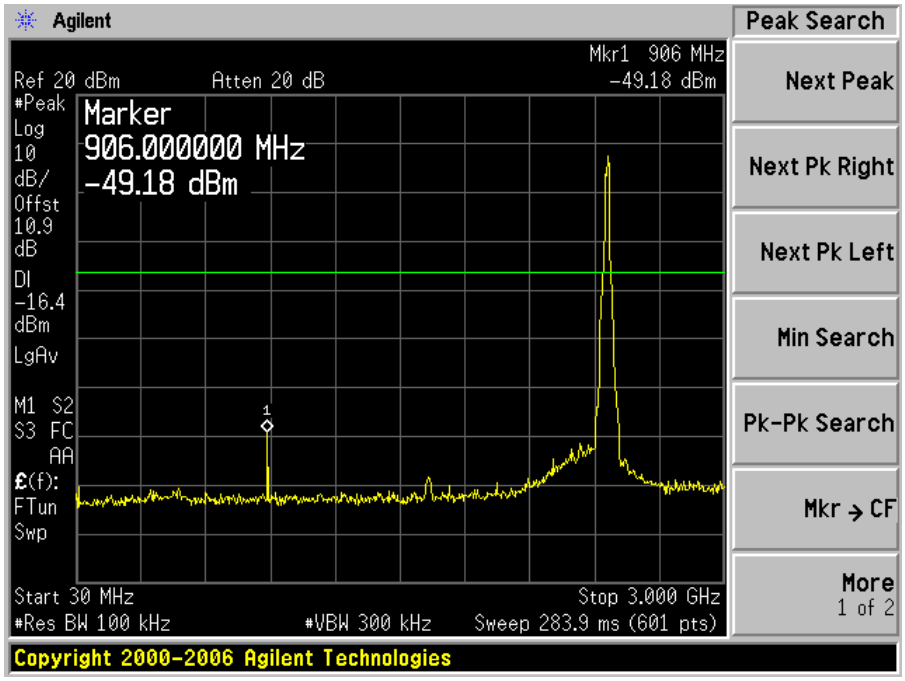


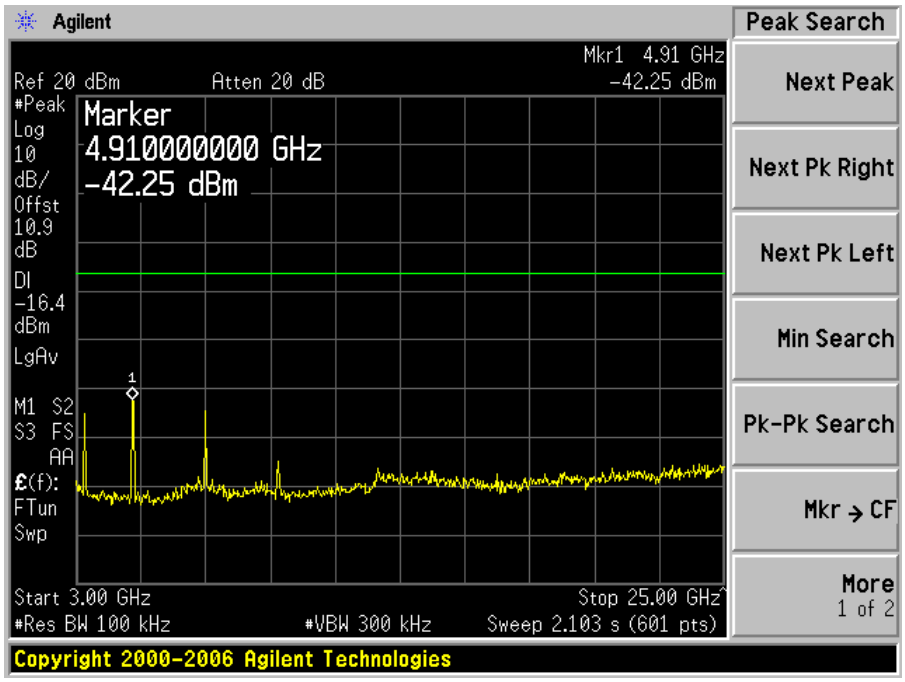
802.11 n, Middle Channel 2437 MHz – Antenna #0



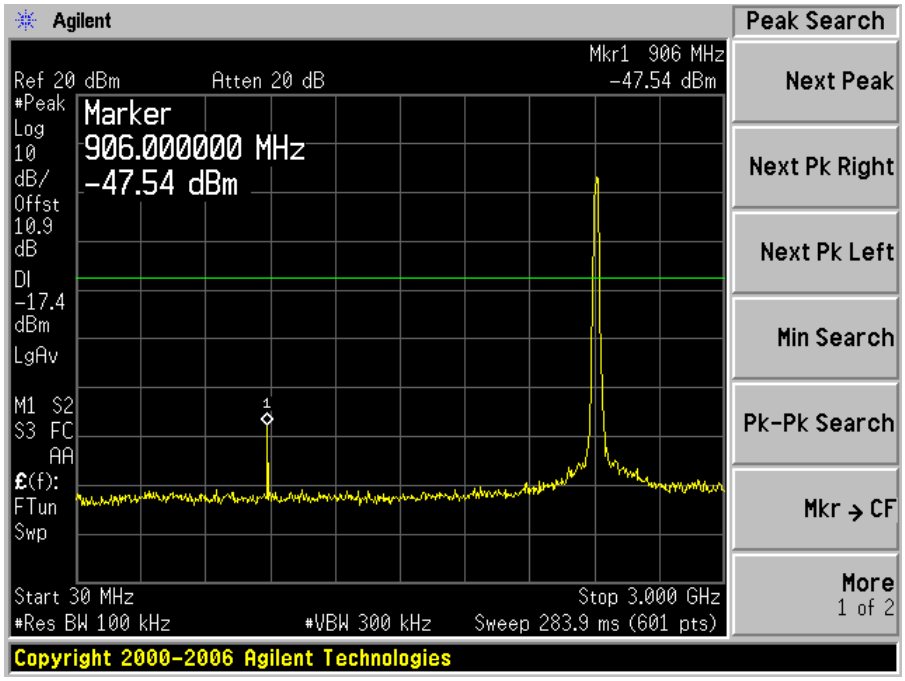


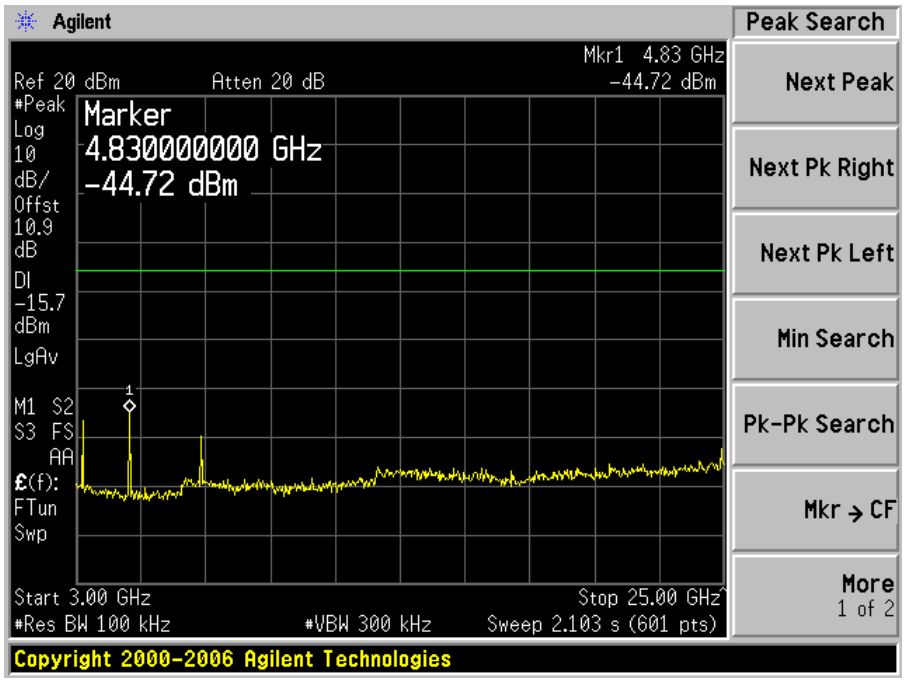
802.11 n, High Channel 2462 MHz – Antenna #0



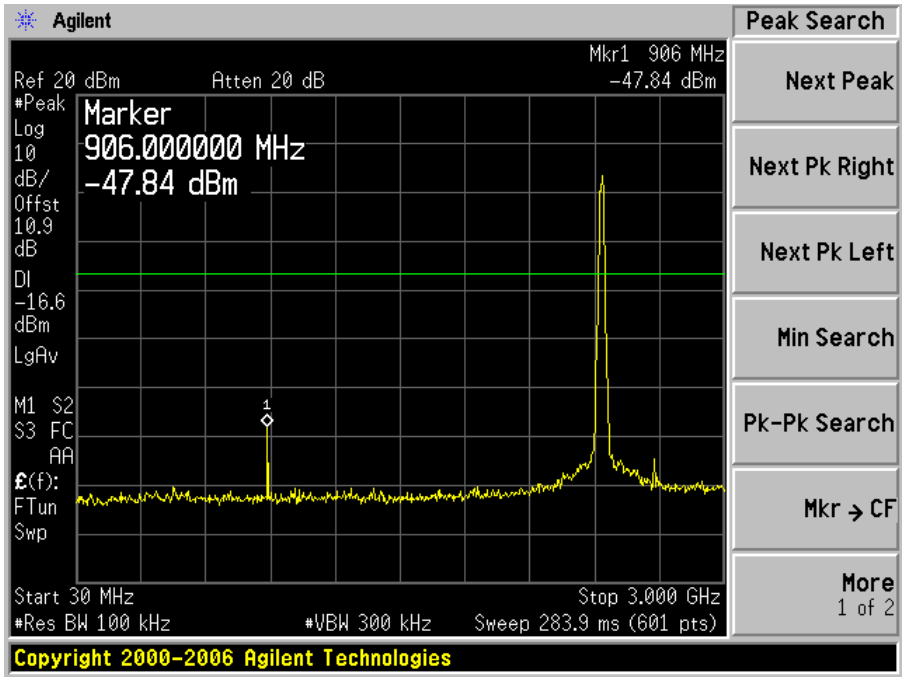


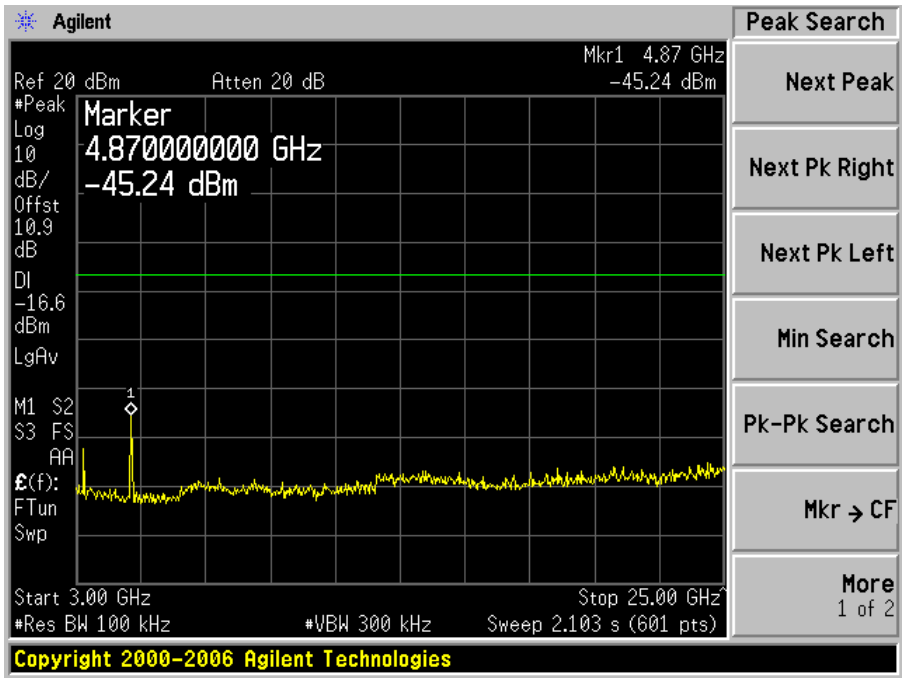
802.11 n, Low Channel 2412 MHz – Antenna #1



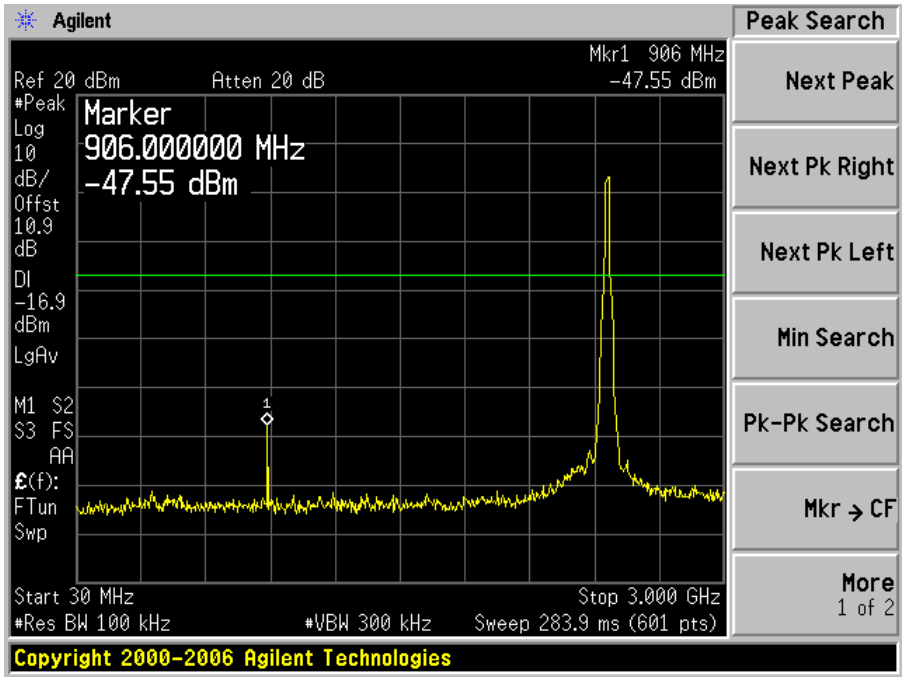


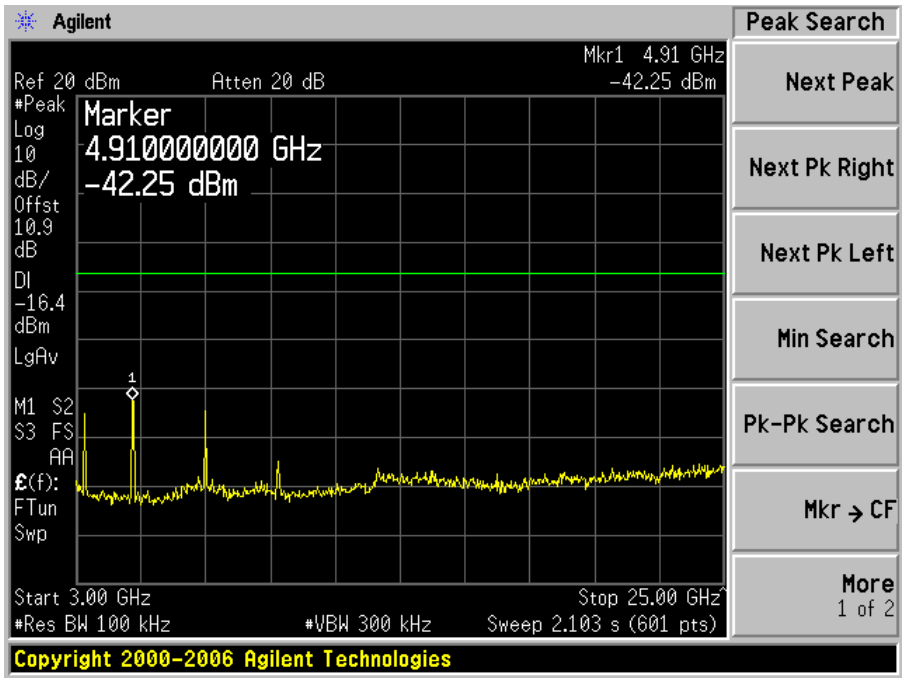
802.11 n, Middle Channel 2437 MHz – Antenna #1



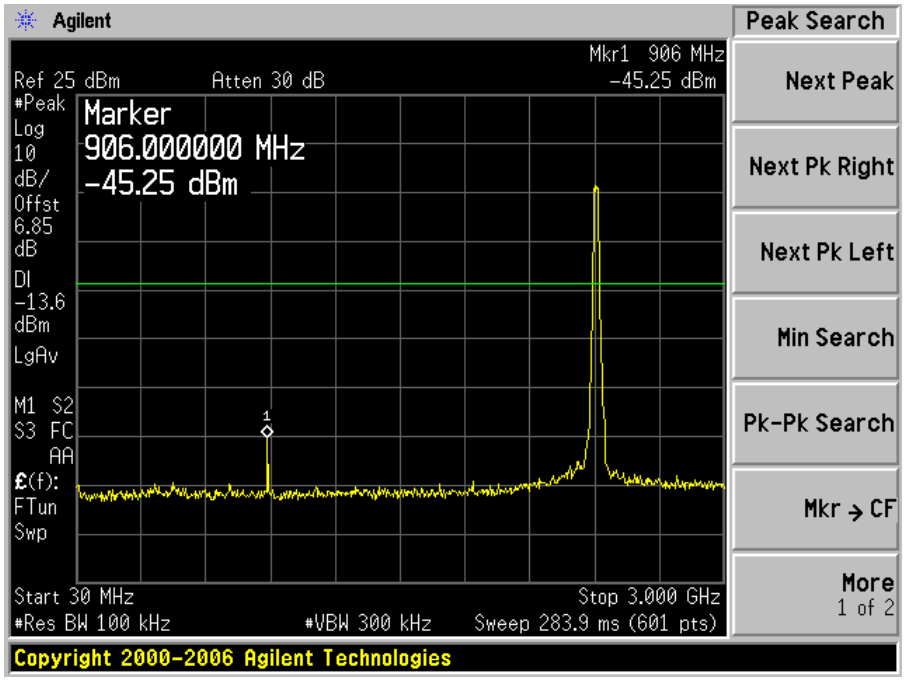


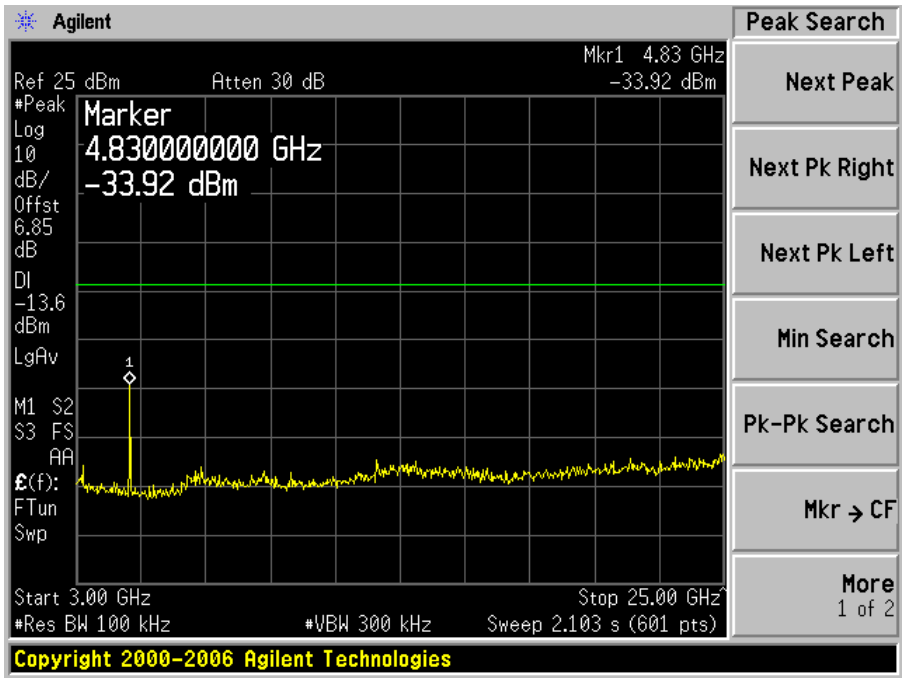
802.11 n, High Channel 2462 MHz – Antenna #1



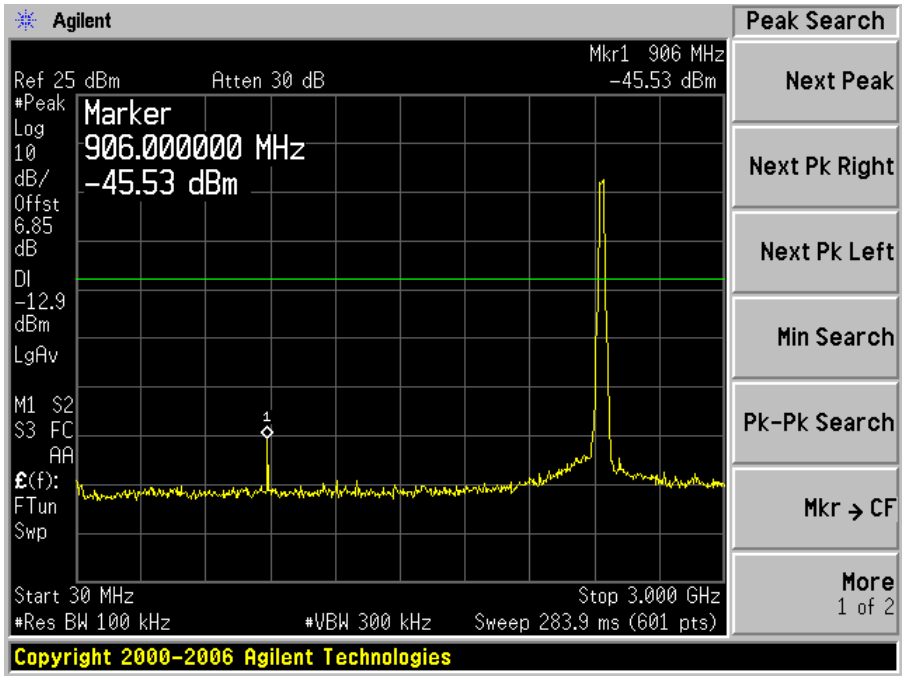


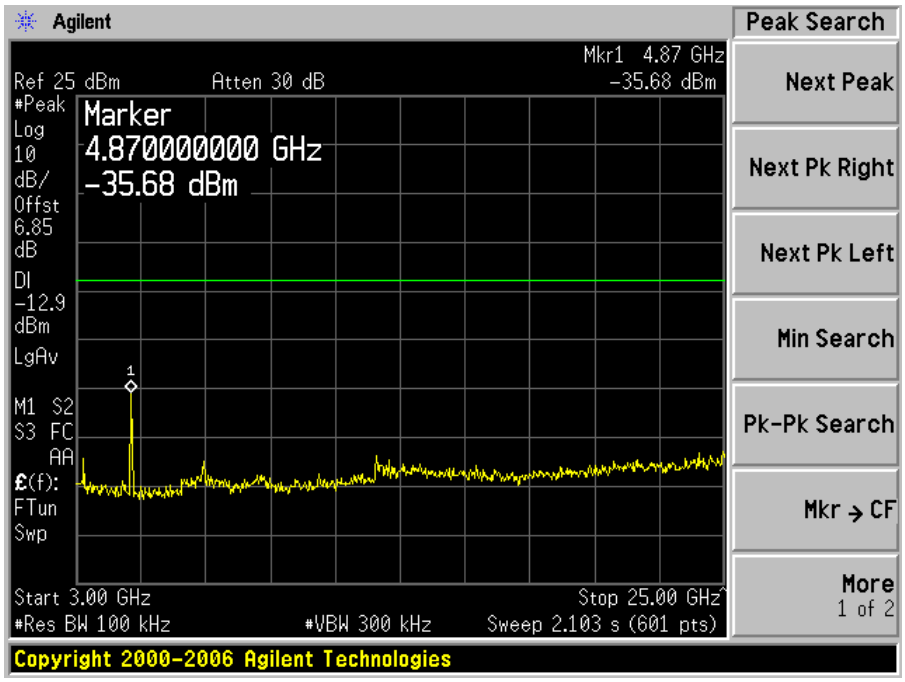
802.11 n, Low Channel 2412 MHz – Antenna #0+Antenna #1



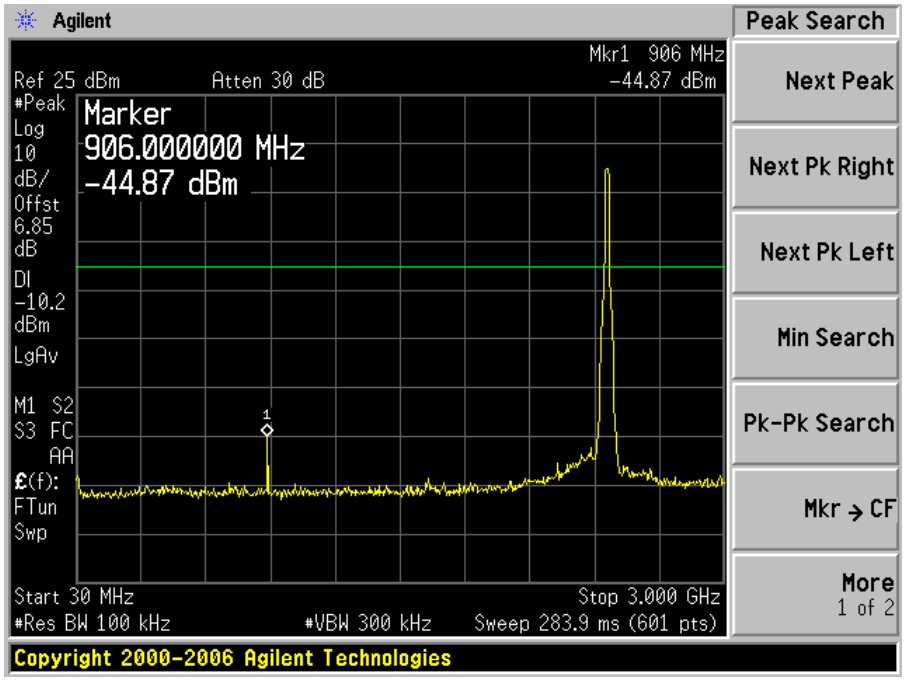


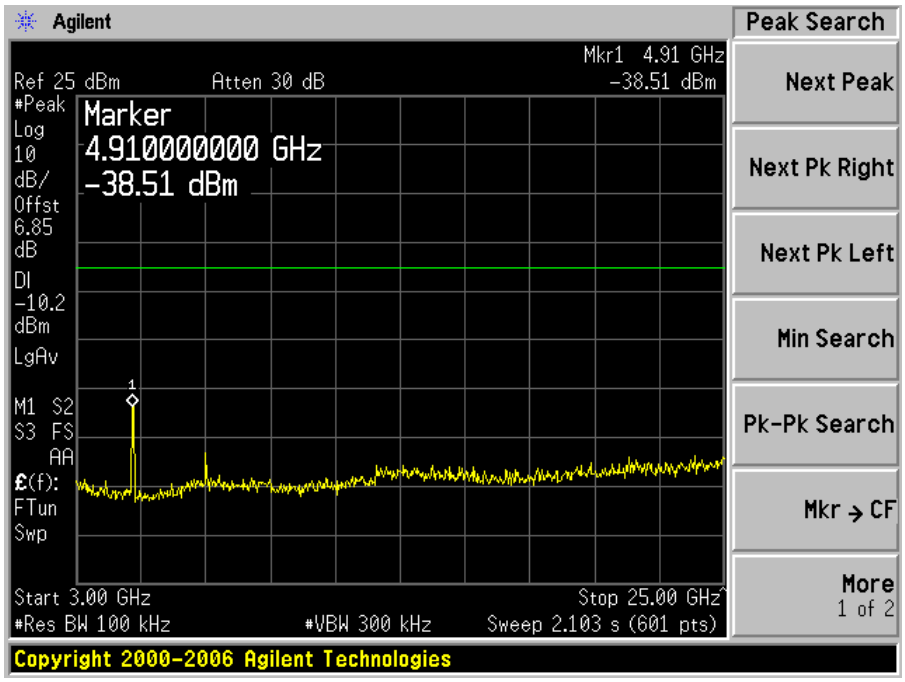
802.11 n, Middle Channel 2437 MHz – Antenna #0+Antenna #1





802.11 n, High Channel 2462 MHz – Antenna #0+Antenna #1





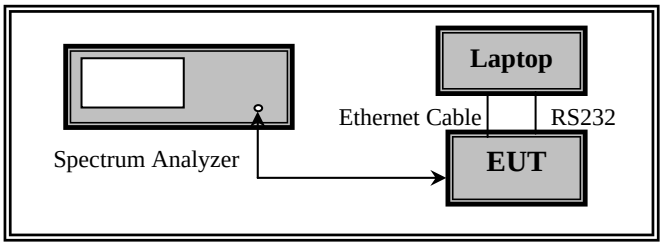
11 FCC §15.247(d) - 100 kHz Bandwidth of Band Edges

11.1 Applicable Standard

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

11.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.



11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

11.4 Test Environmental Conditions

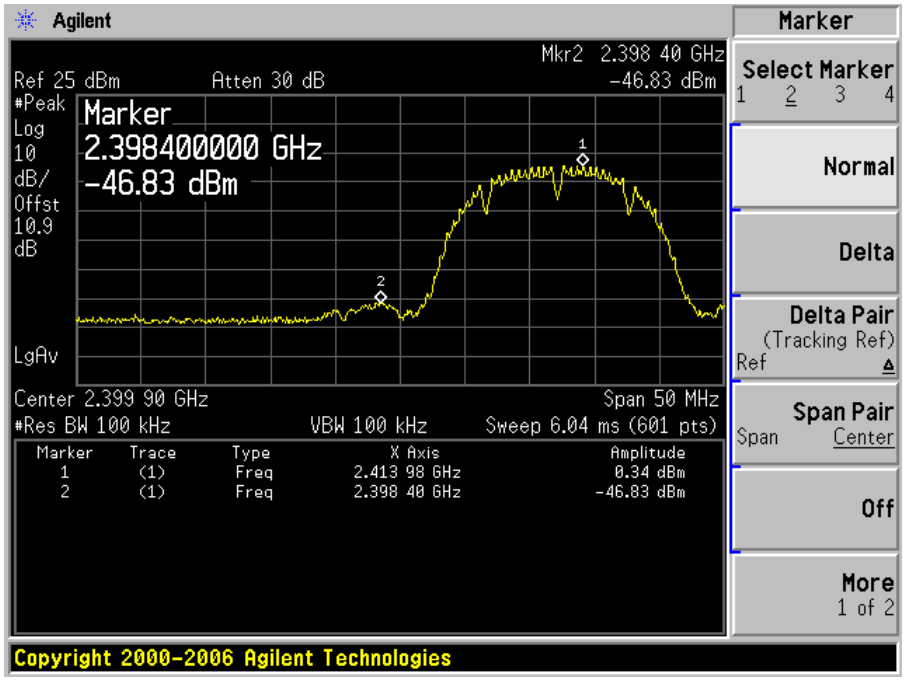
Temperature:	18~21 °C
Relative Humidity:	40~45 %
ATM Pressure:	102.2-103.2kPa

The testing was performed by Jerry Huang on 2011-04-15 ~ 2011-04-18 in RF site.

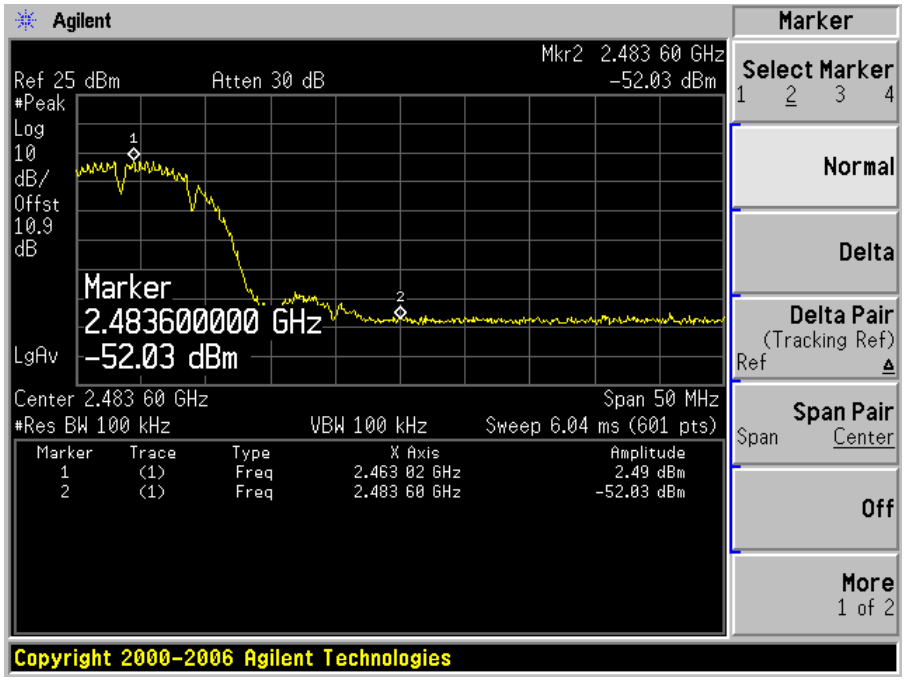
11.5 Test Results

Please refer to following pages for plots of band edge.

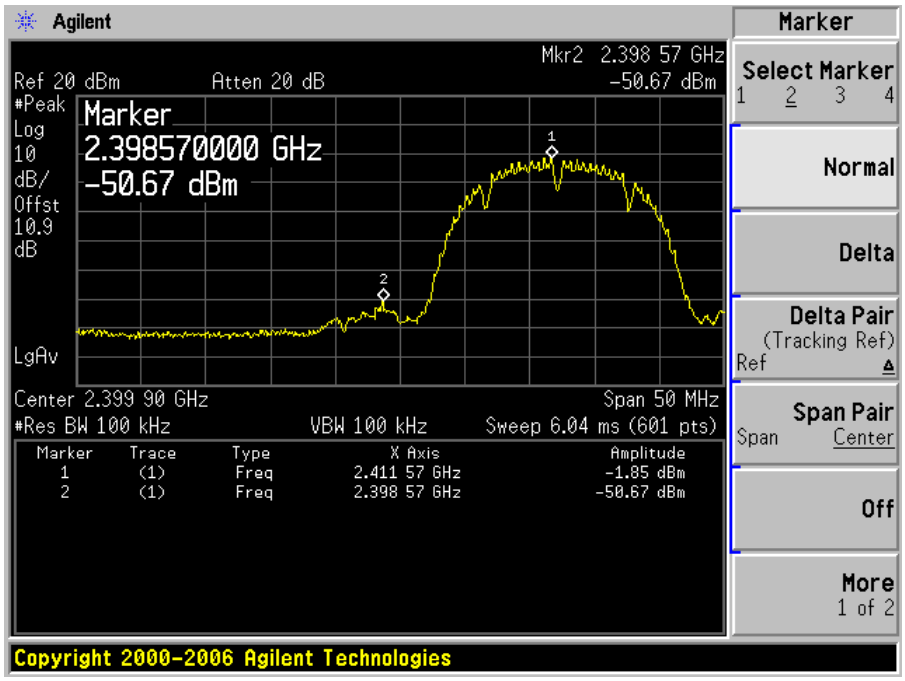
802.11b, Low Band Edge – Antenna #0



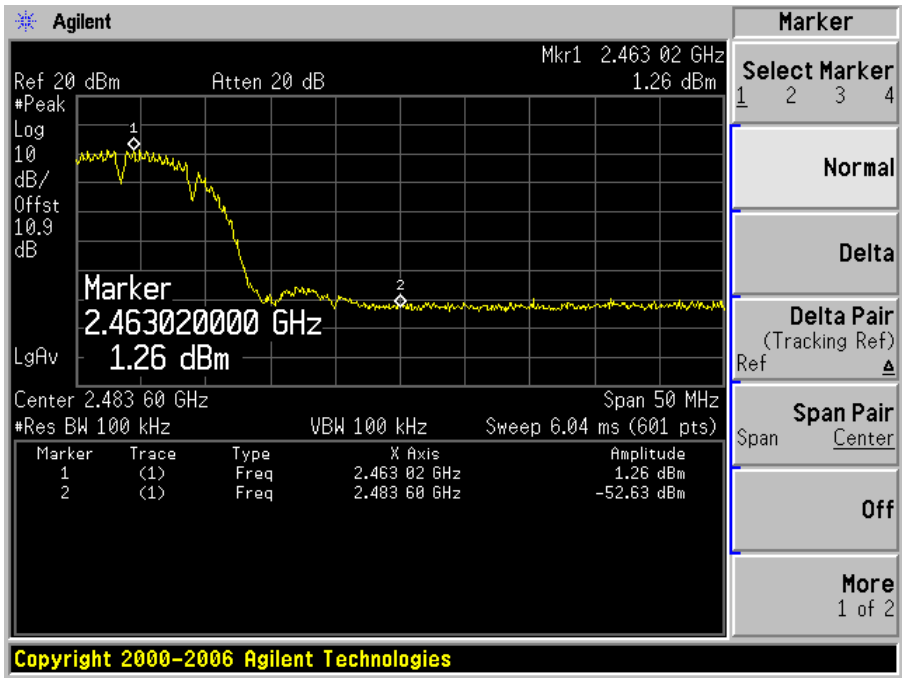
802.11b, High Band Edge – Antenna #0



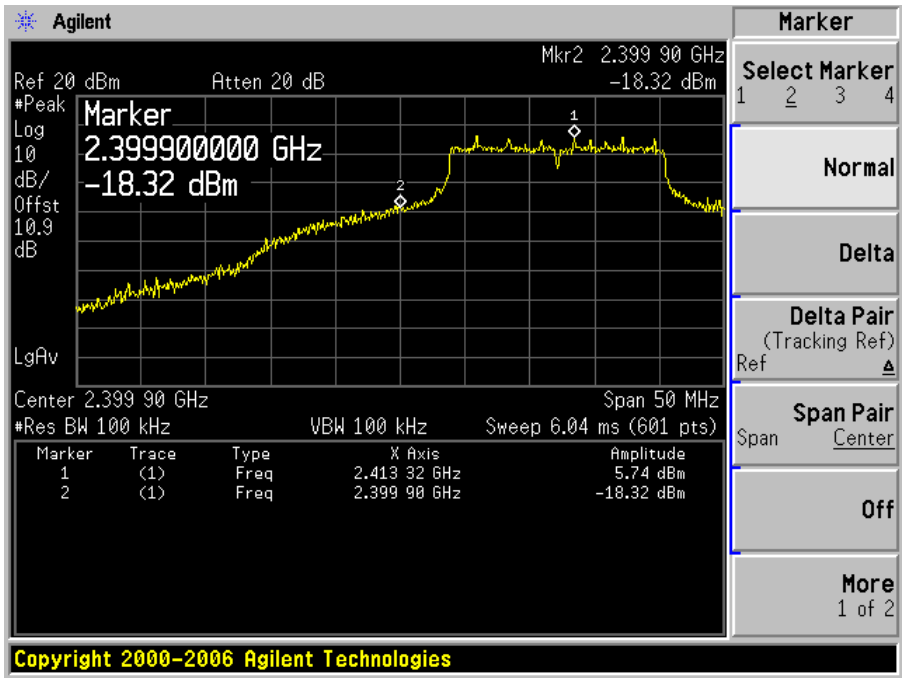
802.11b, Low Band Edge – Antenna #1



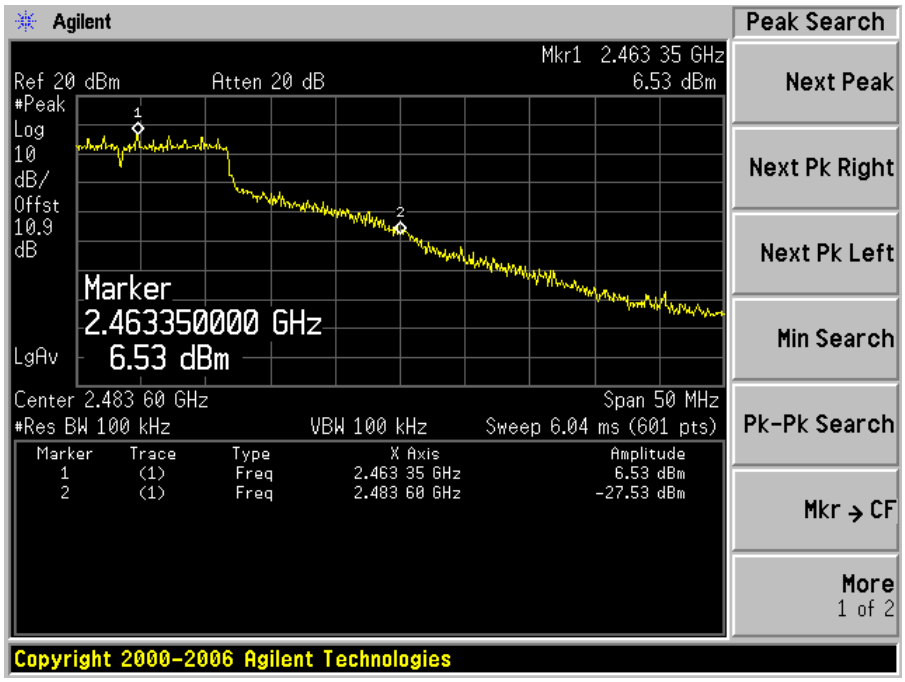
802.11b, High Band Edge – Antenna #1



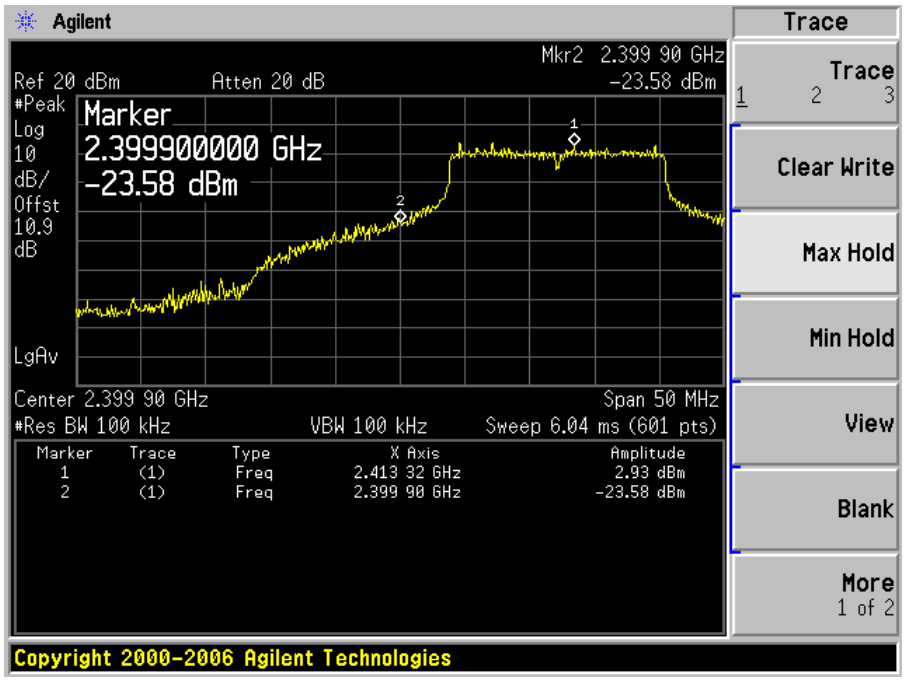
802.11g, Low Band Edge – Antenna #0



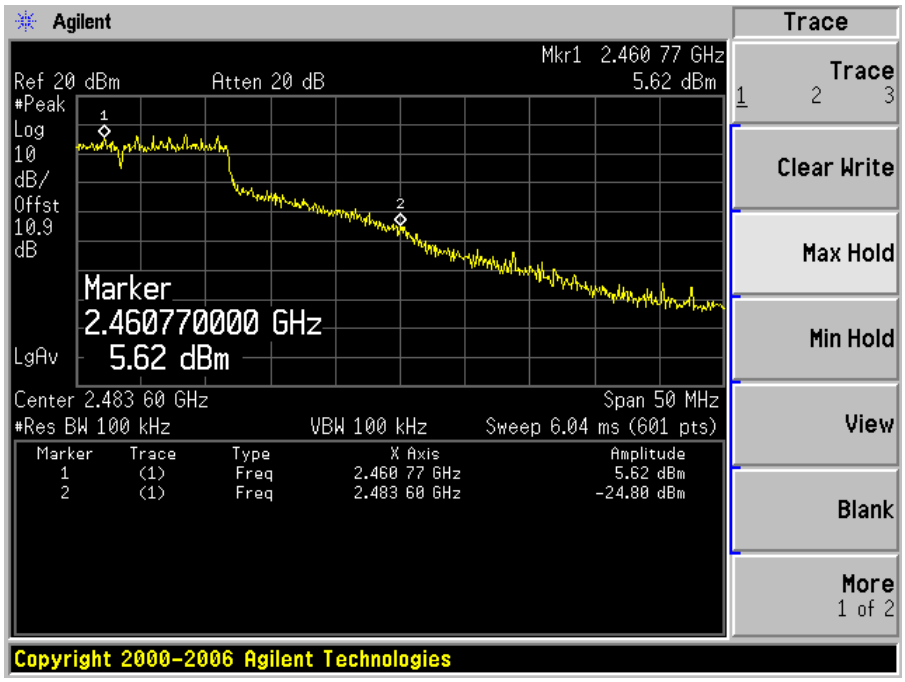
802.11g, High Band Edge Antenna #0



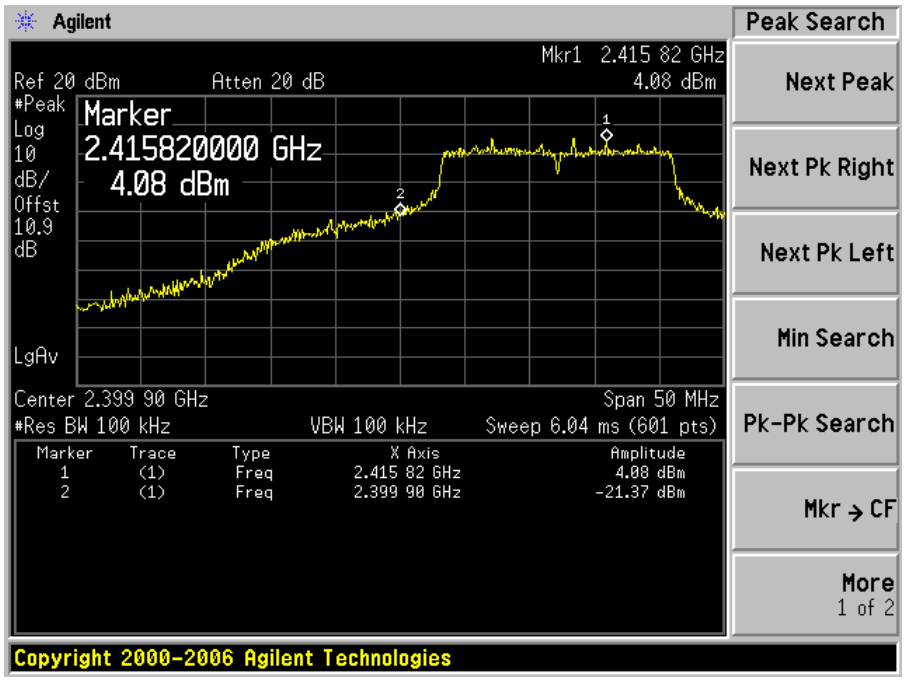
802.11g, Low Band Edge – Antenna #1



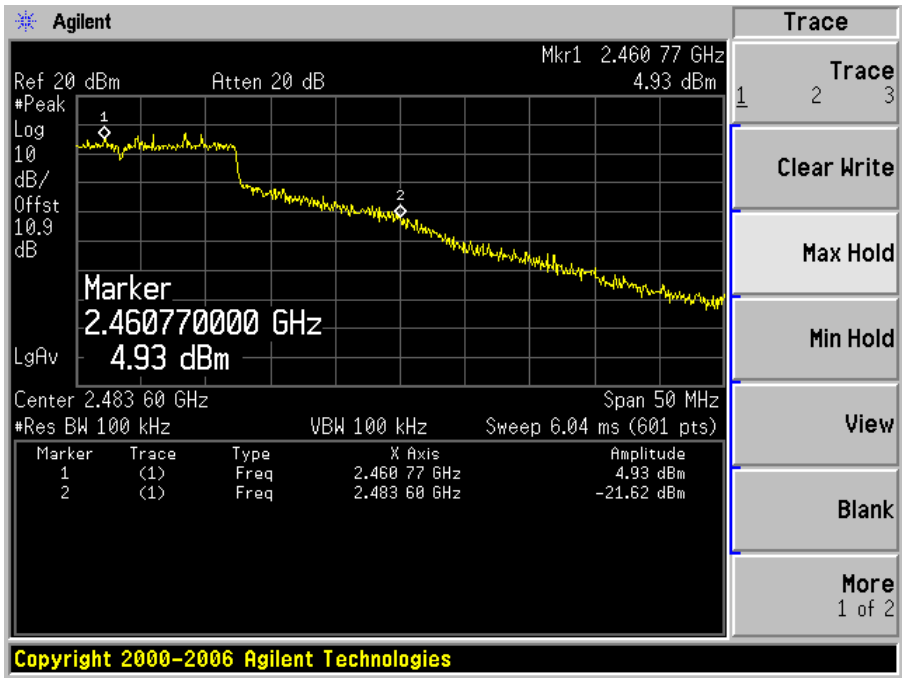
802.11g, High Band Edge Antenna #1



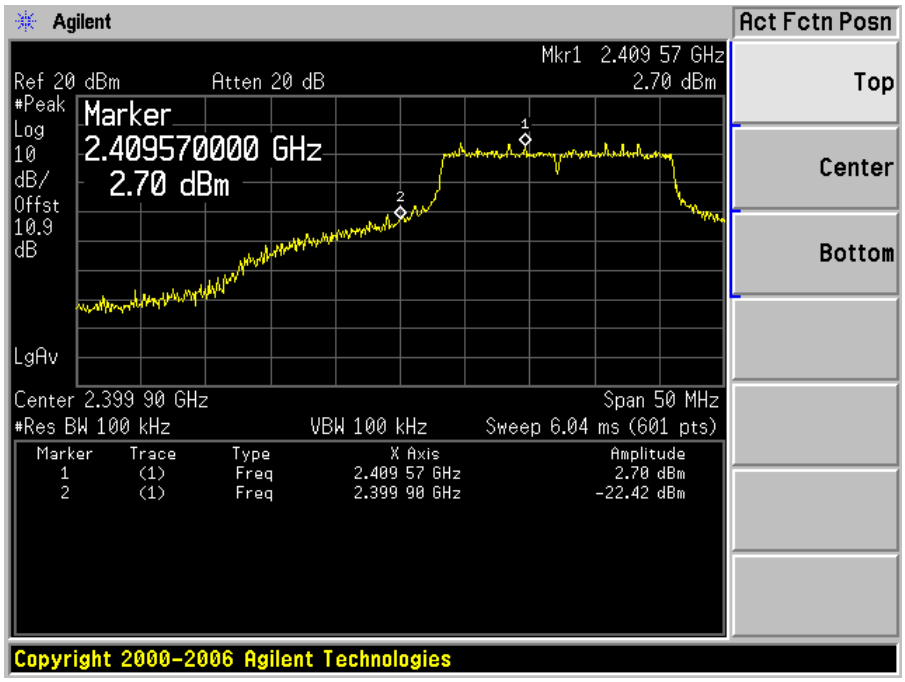
802.11n, Low Band Edge – Antenna #0



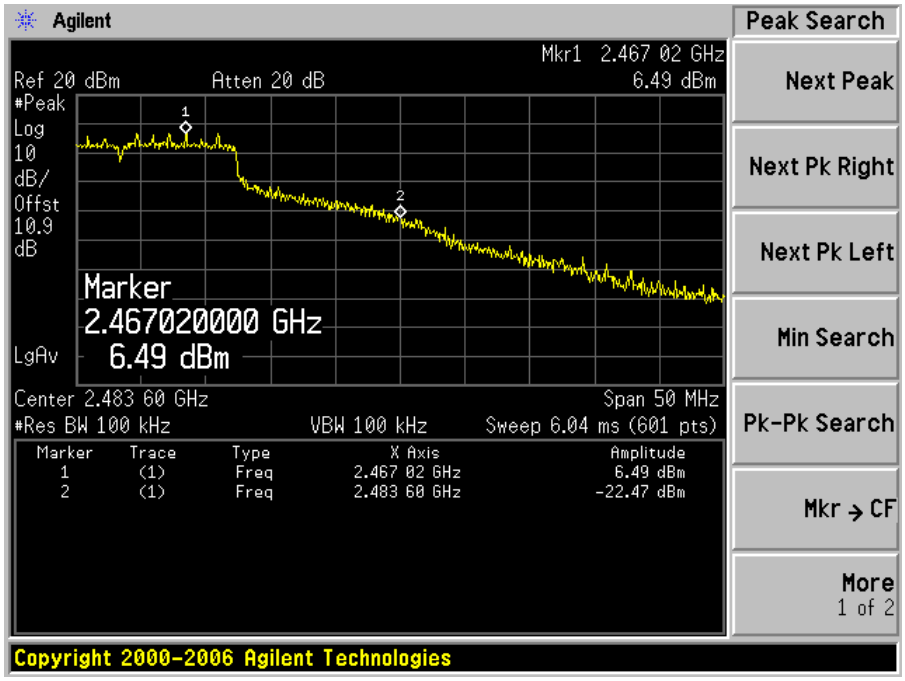
802.11n, High Band Edge Antenna #0



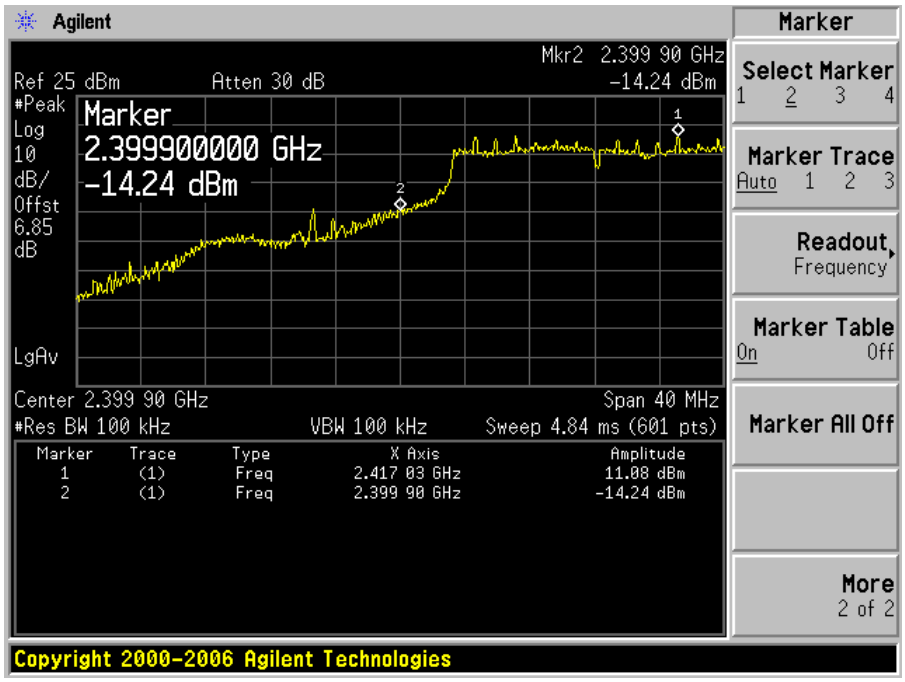
802.11n, Low Band Edge – Antenna #1



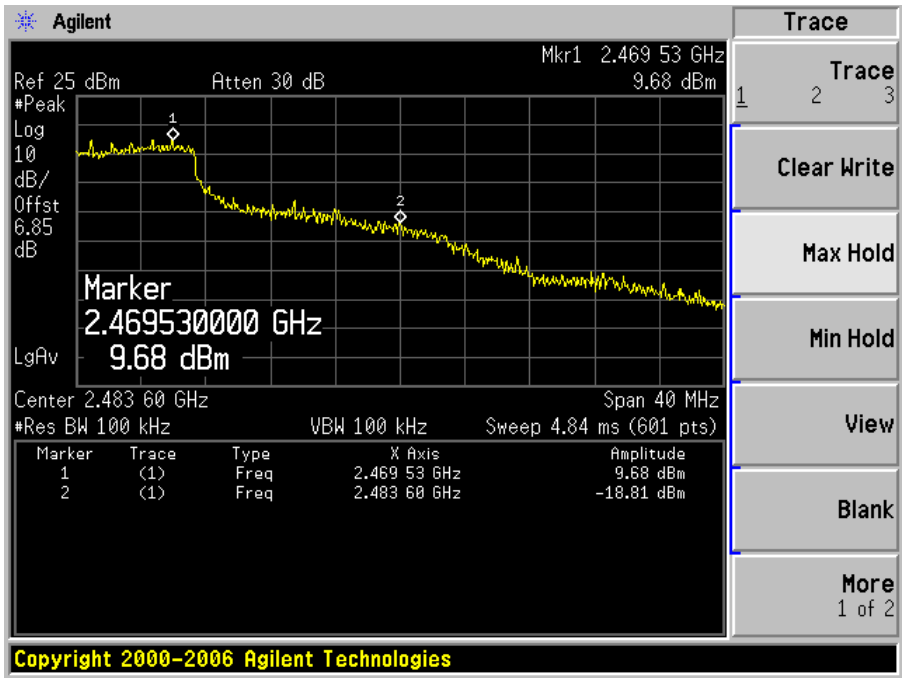
802.11n, High Band Edge Antenna #1



802.11n, Low Band Edge – Antenna #0+Antenna #1



802.11n, High Band Edge – Antenna #0+Antenna #1



12 FCC §15.205, §15.209 & §15.247(c) - SPURIOUS RADIATED EMISSIONS

12.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per FCC §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 (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
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.

As Per FCC §15.205(a) except as show 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	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per FCC §15.247 (d) 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. 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).

12.2 Test Setup

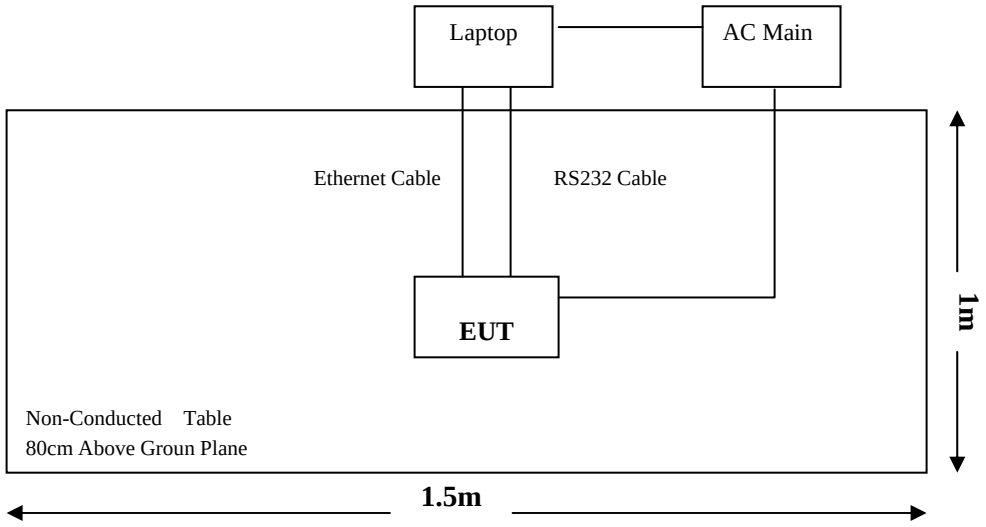
The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

12.3 EUT Setup

The radiated emissions tests were performed using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.



12.4 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

(1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
(2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

12.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Cable Loss, and Attenuator Factor adding to the Indicated Reading. The basic equation is as follows:

Corrected Amplitude = Indicated Reading + Cable Loss + Attenuator Factor

For example, a Corrected Amplitude of 34.08 dBuV/m = Indicated Reading (23.85 dBuV) + Cable Factor (0.22 dB) + Attenuator Factor (10dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

12.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
HP	Pre amplifier	8447D	2944A06639	2010-06-18
Sunol Science Corp.	Combination Antenna	JB1 Antenna	A103105-1	2010-05-28
Mini-circuit	Pre Amplifier	ZCA-183-S	570400946	2010-05-10
Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100337	2011-03-21
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09
A.R.A.	Antenna, Horn	DRG-118/A	1132	2010-11-29

*** Statement of Traceability: BACL** attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

12.7 Test Environmental Conditions

Temperature:	20~25 °C
Relative Humidity:	44~45 %
ATM Pressure:	101.2-103.5kPa

The testing was performed by Jerry Huang on 2011-04-04 ~ 2011-04-13 in 5 meter chamber 3.

12.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247 standard's radiated emissions limits, and had the worst margin of:

30-1000 MHz:

Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
802.11b mode			
-0.97	249.955	Vertical	High, 30 MHz – 1 GHz
802.11g mode			
-1.28	249.954	Vertical	High, 30 MHz – 1 GHz
802.11n mode			
-2.4	249.955	Vertical	High, 30 MHz – 1 GHz

Above 1 GHz:

Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
802.11b mode			
-0.06	4824	Vertical	Low, 1GHz – 25GHz
802.11g mode			
-0.46	4824	Vertical	Low, 1GHz – 25GHz
802.11n mode			
-0.37	4924	Horizontal	High, 1GHz – 25GHz

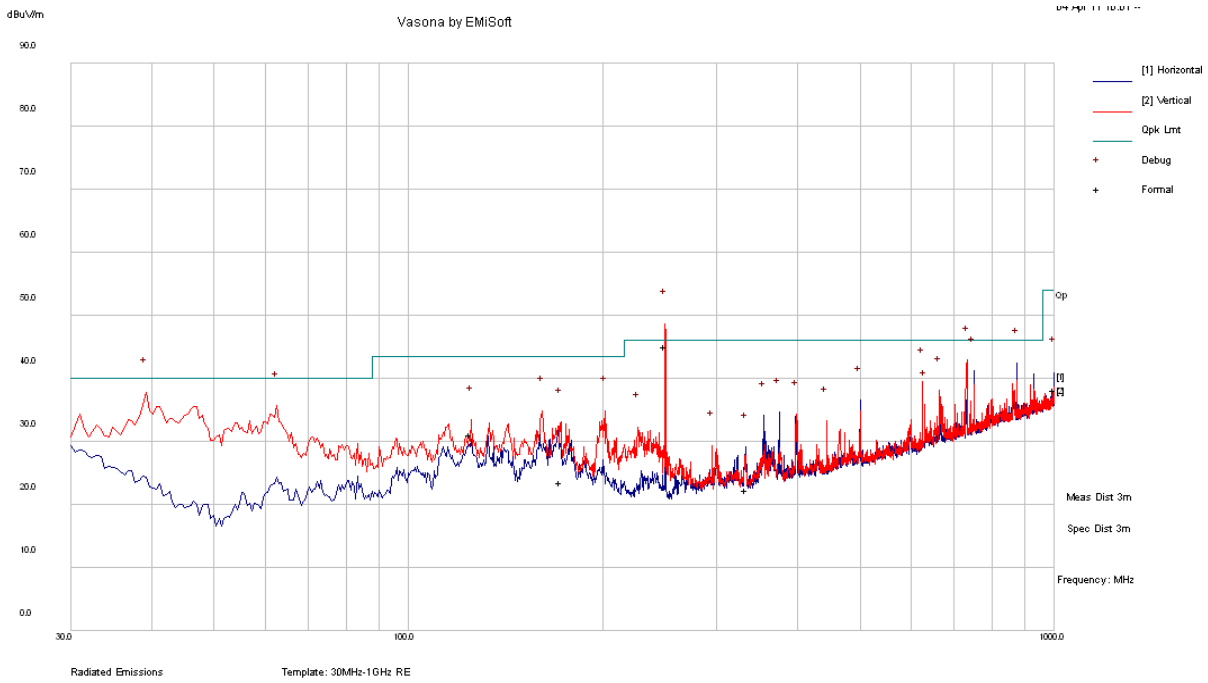
Mode: Co-location - 802.11n mode with Zwave (908.4 MHz)			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-0.65	4924	Horizontal	High, 30 MHz – 1 GHz

Please refer to the following table and plots for specific test result details

12.9 Radiated Emissions Test Data and Plots

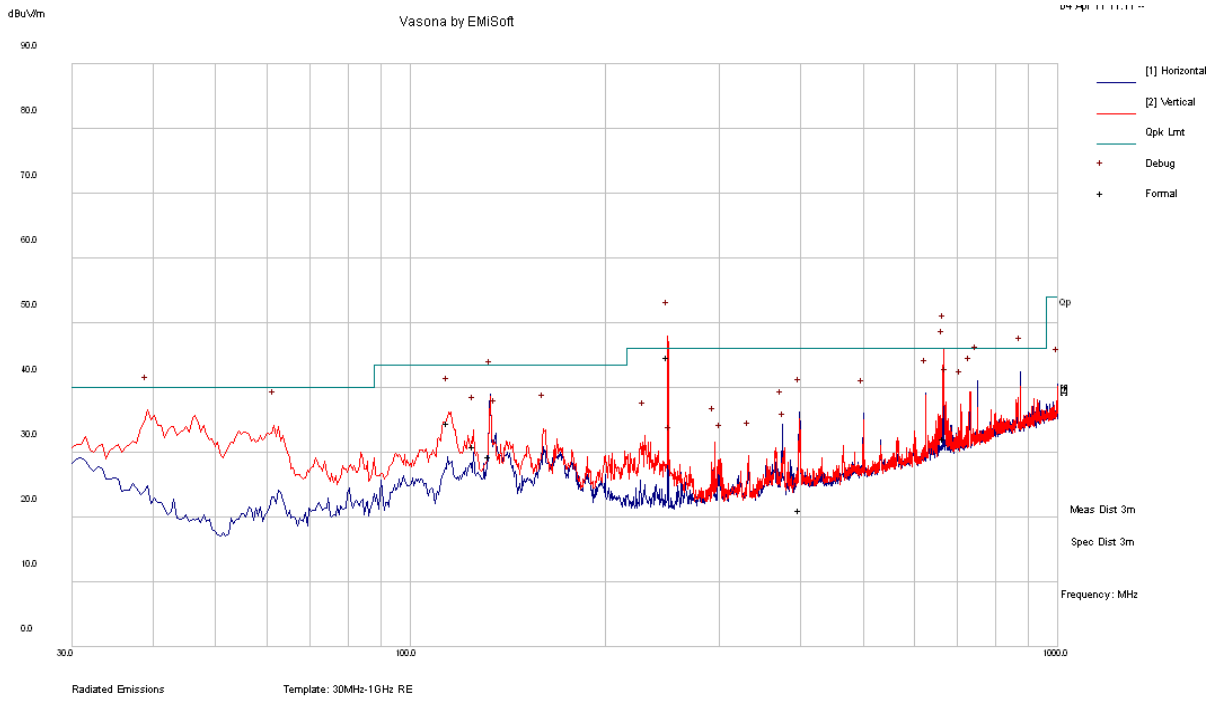
1) Radiated Emission at 3 meters, 30 MHz – 1 GHz

802.11 b Mode – Worse Case: High channel (2462 MHz)



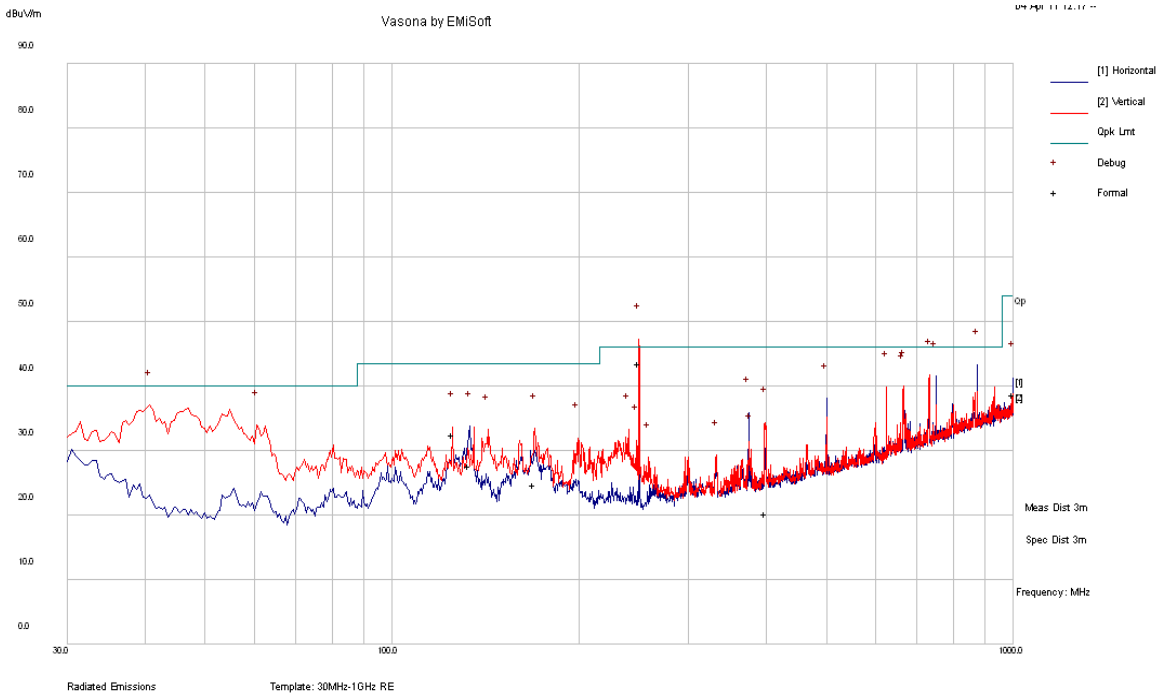
Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Antenna Height (cm)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
249.955	45.03	V	99	251	46	-0.97
124.992	31.16	V	99	360	43.5	-12.34
999.968	38.19	H	104	278	54	-15.81
171.95	23.58	V	103	284	43.5	-19.92
333.2323	22.31	H	129	222	46	-23.69

802.11 g Mode - Worse Case: High channel (2462 MHz)



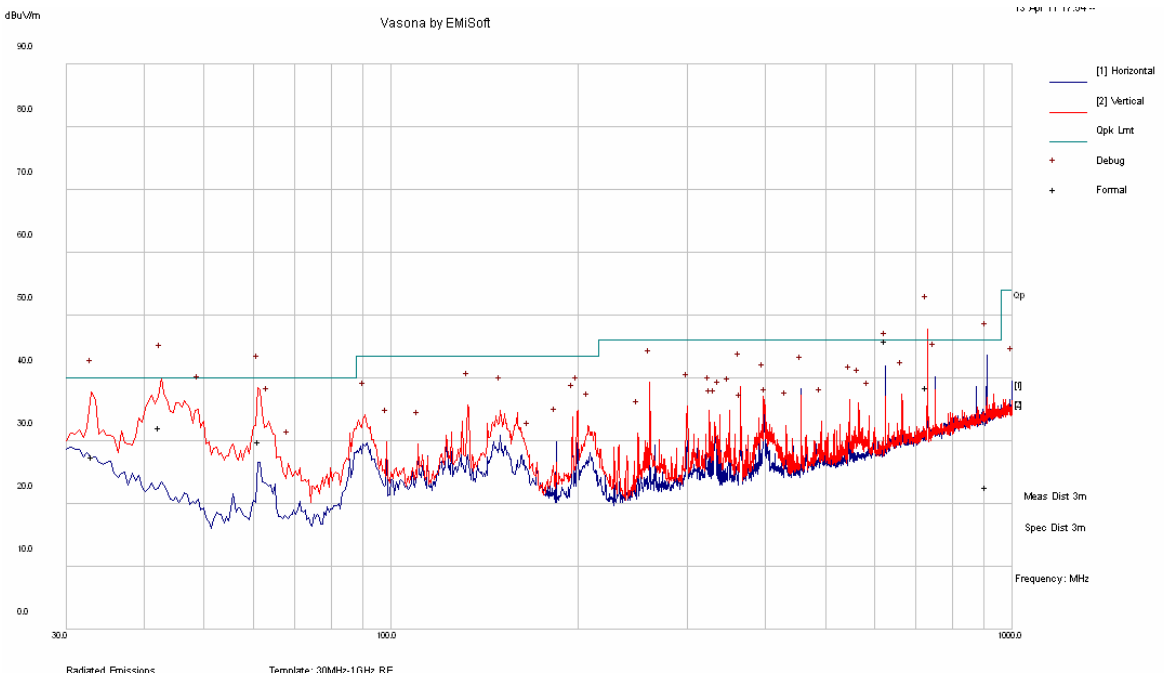
Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Antenna Height (cm)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
249.954	44.72	V	99	248	46	-1.28
114.4075	34.63	V	99	219	43.5	-8.87
665.9888	32.16	V	101	224	46	-13.84
132.58	29.43	H	196	141	43.5	-14.07
399.1505	21.19	H	201	233	46	-24.81

802.11 n Mode - Worse Case: High channel (2462 MHz)



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Antenna Height (cm)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
249.955	43.6	V	99	237	46	-2.40
125.021	32.42	V	99	321	43.5	-11.08
133.1123	27.63	H	164	255	43.5	-15.87
169.5318	24.78	V	124	269	43.5	-18.72
399.0533	20.32	V	130	134	46	-25.68

Co-Location – Worse Case: 802.11n High channel (2462 MHz) with Z-wave (908.4MHz)



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Antenna Height (cm)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
729.152	38.53	V	106	166	46	-7.47
42.3655	32.24	V	194	183	40	-7.76
61.2435	30	V	109	48	40	-10
33.135	27.43	V	187	282	40	-12.57
908.8763	22.6	H	366	300	46	-23.4

2) Radiated Emission at 3 meters, 1 GHz – 25 GHz

802.11b Mode:

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	Part 15C		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
802.11b, Low Channel 2412 MHz, measured at 3 meters											
4824	46.33	182	133	V	32.8	4.54	27.4	56.27	74	-17.73	peak
4824	46.15	2	103	H	32.8	4.54	27.4	56.09	74	-17.91	peak
4824	44	182	133	V	32.8	4.54	27.4	53.94	54	-0.06	Ave
4824	41.43	2	103	H	32.8	4.54	27.4	51.37	54	-2.63	Ave
802.11b, Middle channel 2437 MHz measured at 3 meters											
4874	45.61	180	132	V	32.9	4.54	27.4	55.65	74	-18.35	peak
4874	46.76	0	100	H	32.9	4.54	27.4	56.8	74	-17.2	peak
4874	41.62	180	132	V	32.9	4.54	27.4	51.66	54	-2.34	Ave
4874	42.62	0	100	H	32.9	4.54	27.4	52.66	54	-1.34	Ave
802.11b, High channel 2462 MHz measured at 3 meters											
4924	45.83	179	132	V	32.9	4.52	27.4	55.85	74	-18.15	peak
4924	46.09	0	100	H	32.9	4.52	27.4	56.11	74	-17.89	peak
4924	41.36	179	132	V	32.9	4.52	27.4	51.38	54	-2.62	Ave
4924	42.14	0	100	H	32.9	4.52	27.4	52.16	54	-1.84	Ave

802.11g Mode:

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	Part 15C		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
802.11g, Low Channel 2412 MHz, measured at 3 meters											
4824	55.3	213	100	V	32.8	4.54	27.4	65.24	74	-8.76	peak
4824	57.01	354	100	H	32.8	4.54	27.4	66.95	74	-7.05	peak
4824	43.6	213	100	V	32.8	4.54	27.4	53.54	54	-0.46	Ave
4824	43.17	354	100	H	32.8	4.54	27.4	53.11	54	-0.89	Ave
802.11g, Middle channel 2437 MHz measured at 3 meters											
4874	54.29	198	100	V	32.9	4.54	27.4	64.33	74	-9.67	peak
4874	56.71	0	100	H	32.9	4.54	27.4	66.75	74	-7.25	peak
4874	40.04	198	100	V	32.9	4.54	27.4	50.08	54	-3.92	Ave
4874	43.02	0	100	H	32.9	4.54	27.4	53.06	54	-0.94	Ave
802.11g, High channel 2462 MHz measured at 3 meters											
4924	53.73	182	131	V	32.9	4.52	27.4	63.75	74	-10.25	peak
4924	56.06	0	100	H	32.9	4.52	27.4	66.08	74	-7.92	peak
4924	39.39	182	131	V	32.9	4.52	27.4	49.41	54	-4.59	Ave
4924	42.18	0	100	H	32.9	4.52	27.4	52.2	54	-1.8	Ave

802.11n Mode:

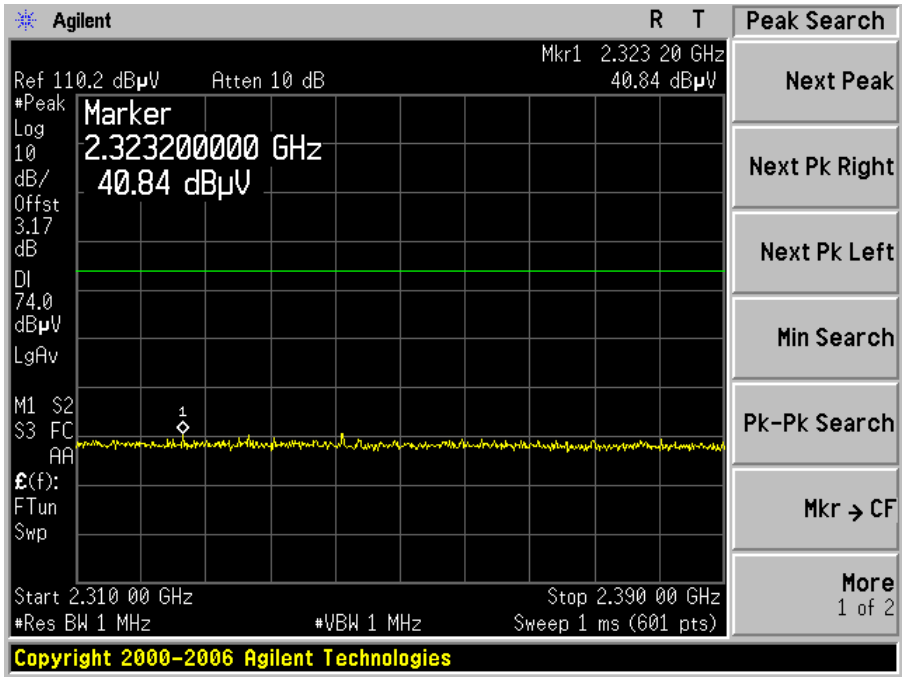
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	Part 15C		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
802.11n, Low Channel 2412 MHz, measured at 3 meters											
4824	56.8	215	100	V	32.8	4.54	27.4	66.74	74	-7.26	peak
4824	56.35	19	100	H	32.8	4.54	27.4	66.29	74	-7.71	peak
4824	42.96	215	100	V	32.8	4.54	27.4	52.9	54	-1.1	Ave
4824	43.65	19	100	H	32.8	4.54	27.4	53.59	54	-0.41	Ave
802.11n, Middle channel 2437 MHz measured at 3 meters											
4874	56.39	215	100	V	32.9	4.54	27.4	66.43	74	-7.57	peak
4874	56.54	0	100	H	32.9	4.54	27.4	66.58	74	-7.42	peak
4874	42.55	215	100	V	32.9	4.54	27.4	52.59	54	-1.41	Ave
4874	43.06	0	100	H	32.9	4.54	27.4	53.1	54	-0.9	Ave
802.11n, High channel 2462 MHz measured at 3 meters											
4924	54.05	196	100	V	32.9	4.52	27.4	64.07	74	-9.93	peak
4924	56.86	0	100	H	32.9	4.52	27.4	66.88	74	-7.12	peak
4924	41.06	196	100	V	32.9	4.52	27.4	51.08	54	-2.92	Ave
4924	43.61	0	100	H	32.9	4.52	27.4	53.63	54	-0.37	Ave

Co-Location: 802.11 n (20 MHz) Mode with Z-wave (908.4 MHz)

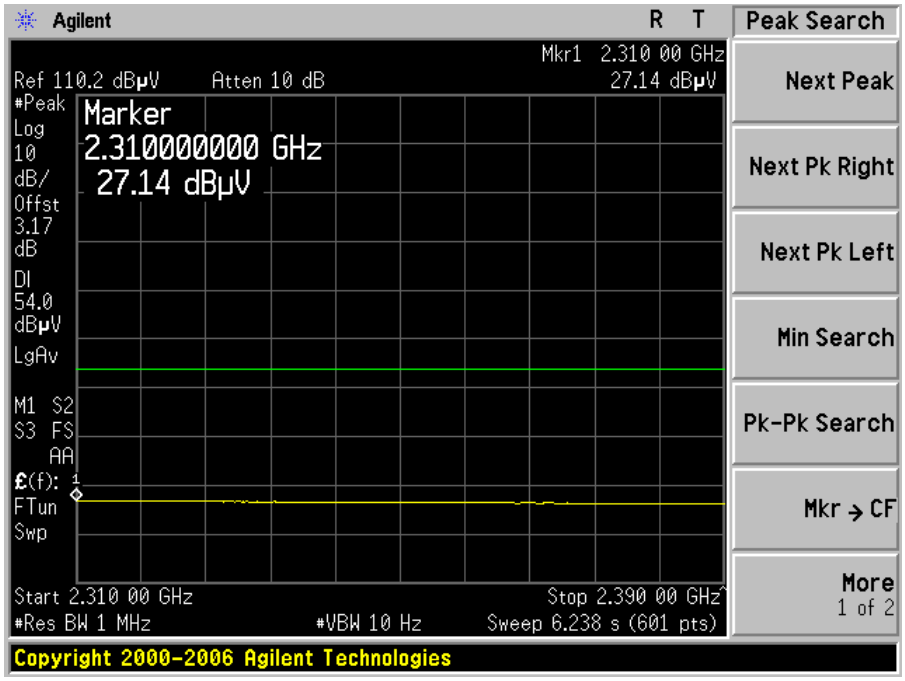
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	Part 15C		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz, measured at 3 meters											
4824	56.45	216	100	V	32.8	4.54	27.4	66.39	74	-7.61	peak
4824	56.24	21	100	H	32.8	4.54	27.4	66.18	74	-7.82	peak
4824	42.36	216	100	V	32.8	4.54	27.4	52.3	54	-1.7	Ave
4824	43.11	21	100	H	32.8	4.54	27.4	53.05	54	-0.95	Ave
Middle channel 2437 MHz measured at 3 meters											
4874	56.46	212	100	V	32.9	4.54	27.4	66.5	74	-7.5	peak
4874	56.36	5	100	H	32.9	4.54	27.4	66.4	74	-7.6	peak
4874	42.59	212	100	V	32.9	4.54	27.4	52.63	54	-1.37	Ave
4874	43.15	5	100	H	32.9	4.54	27.4	53.19	54	-0.81	Ave
High channel 2462 MHz measured at 3 meters											
4924	54.07	200	100	V	32.9	4.52	27.4	64.09	74	-9.91	peak
4924	56.75	7	100	H	32.9	4.52	27.4	66.77	74	-7.23	peak
4924	41.13	100	100	V	32.9	4.52	27.4	51.15	54	-2.85	Ave
4924	43.33	7	100	H	32.9	4.52	27.4	53.35	54	-0.65	Ave

3) Restricted Band Emissions

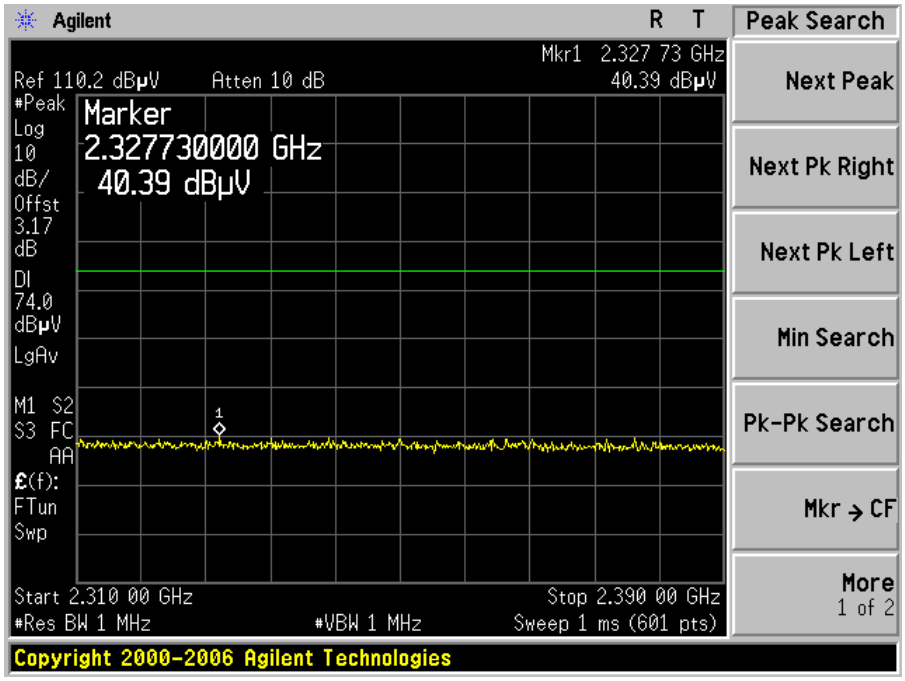
802.11 b, Lowest Channel at Horizontal, Peak



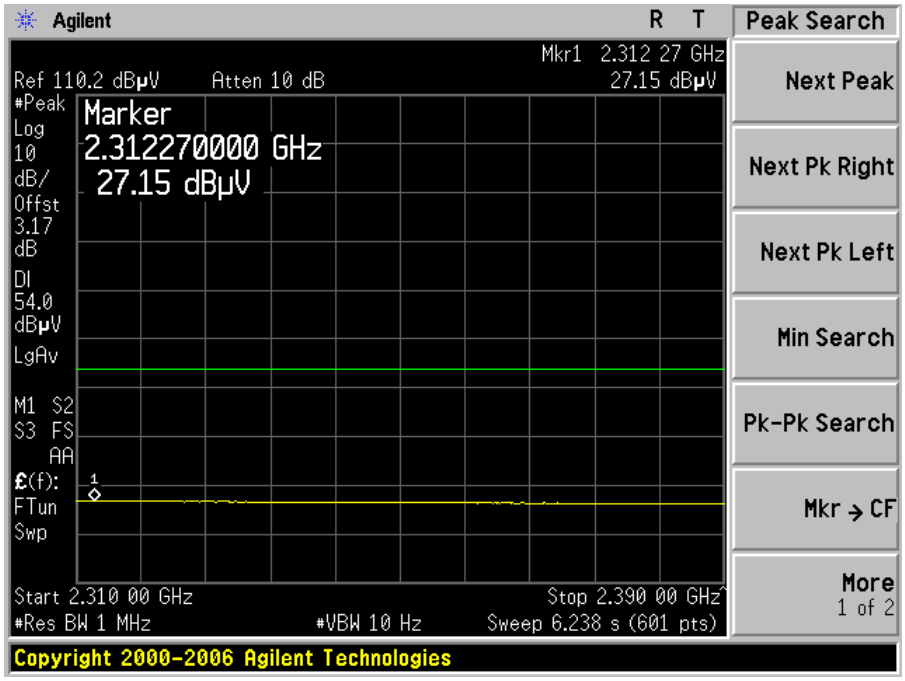
802.11b, Lowest Channel at Horizontal, Average



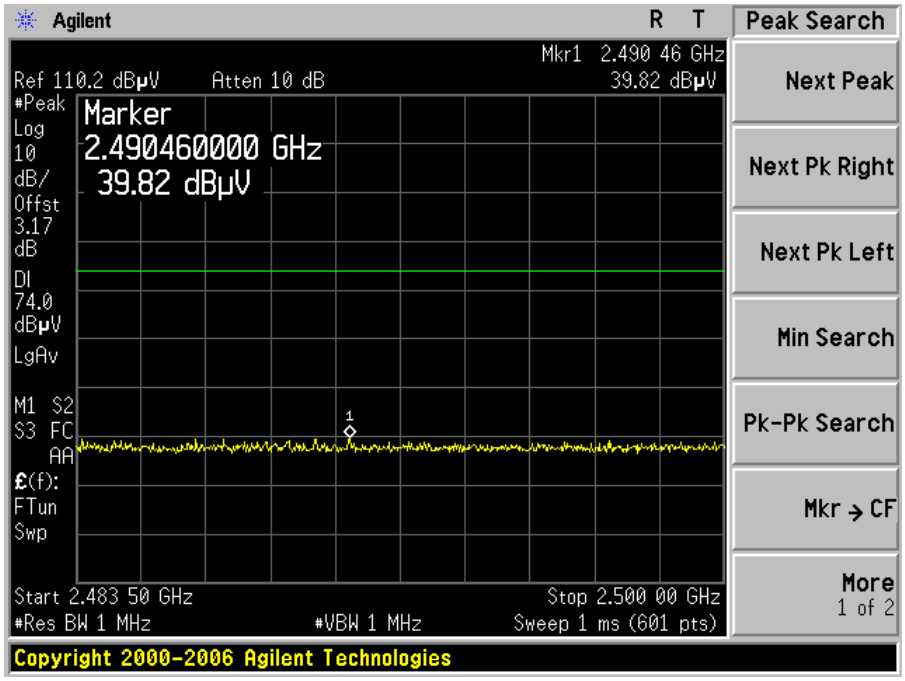
802.11b, Lowest Channel at Vertical, Peak



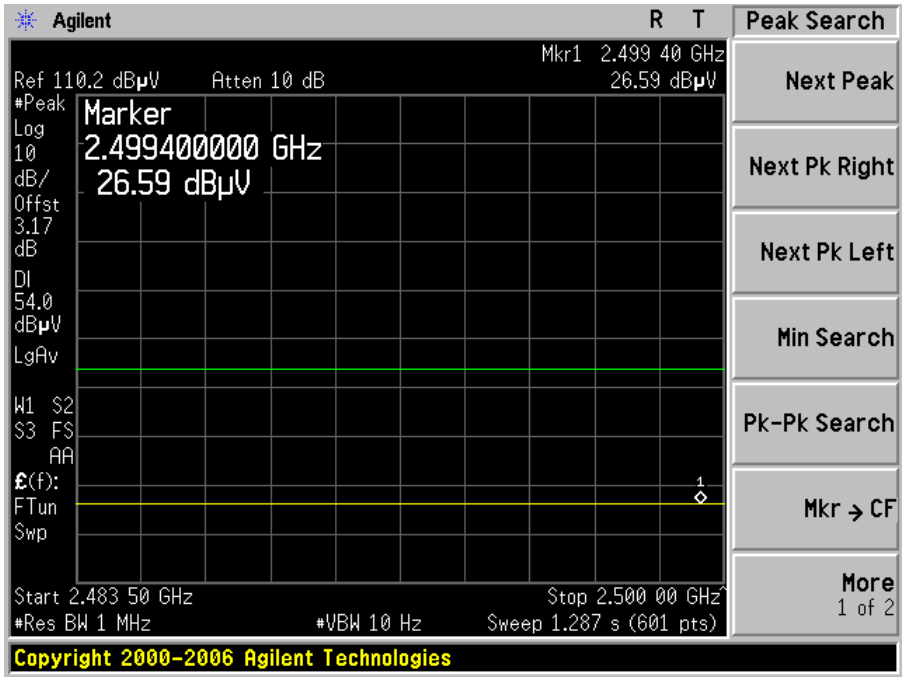
802.11b, Lowest Channel at Vertical, Average



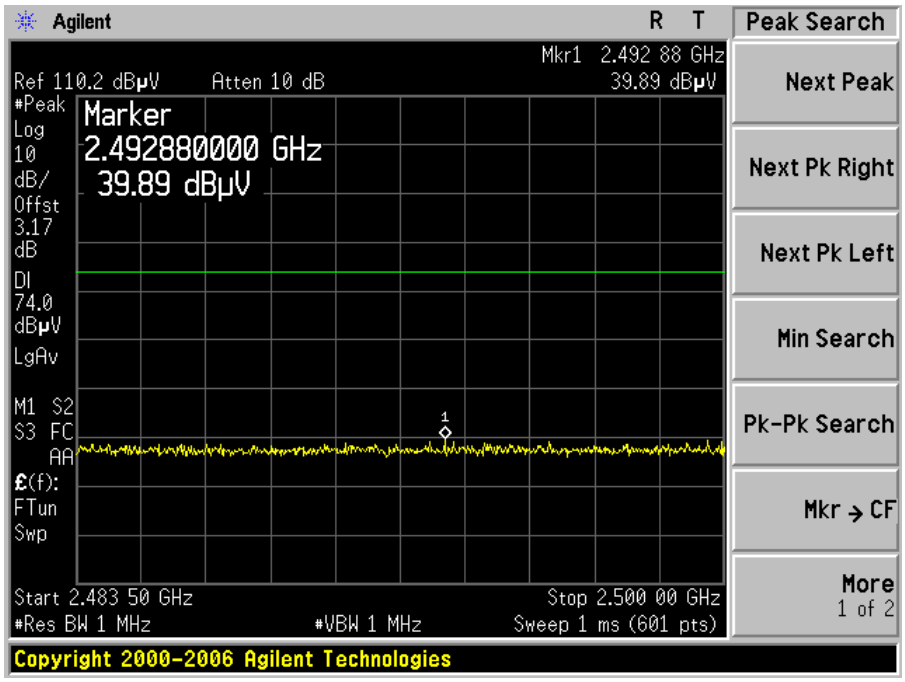
802.11b, Highest Channel at Horizontal, Peak



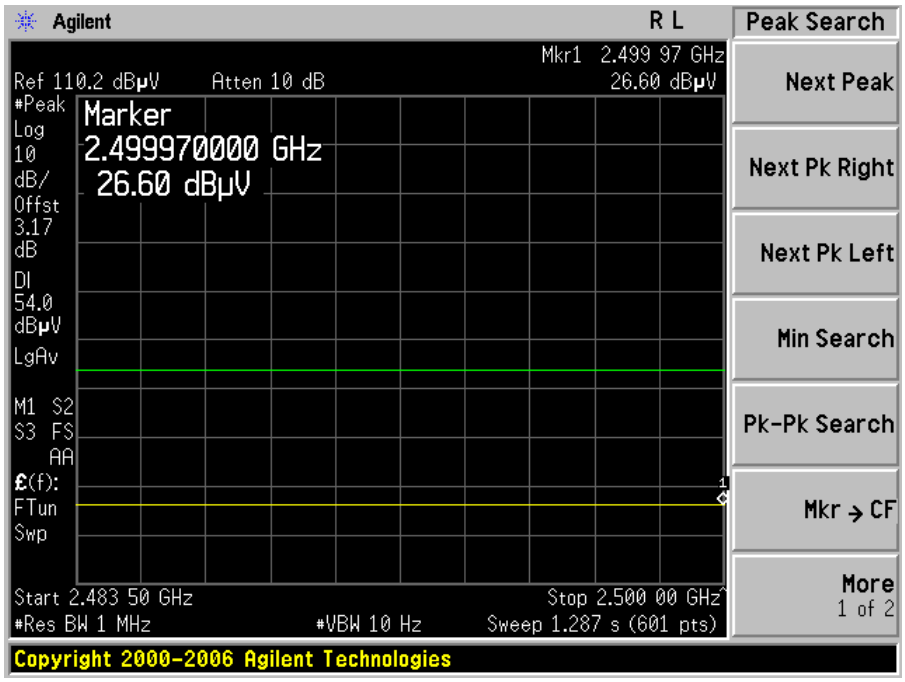
802.11b, Highest Channel at Horizontal, Average



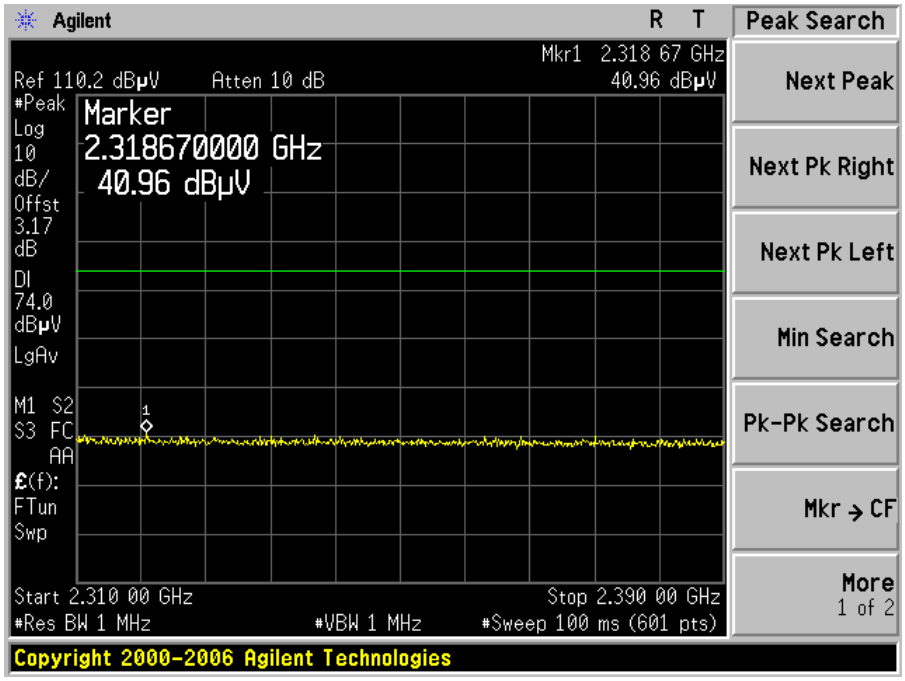
802.11b, Highest Channel at Vertical, Peak



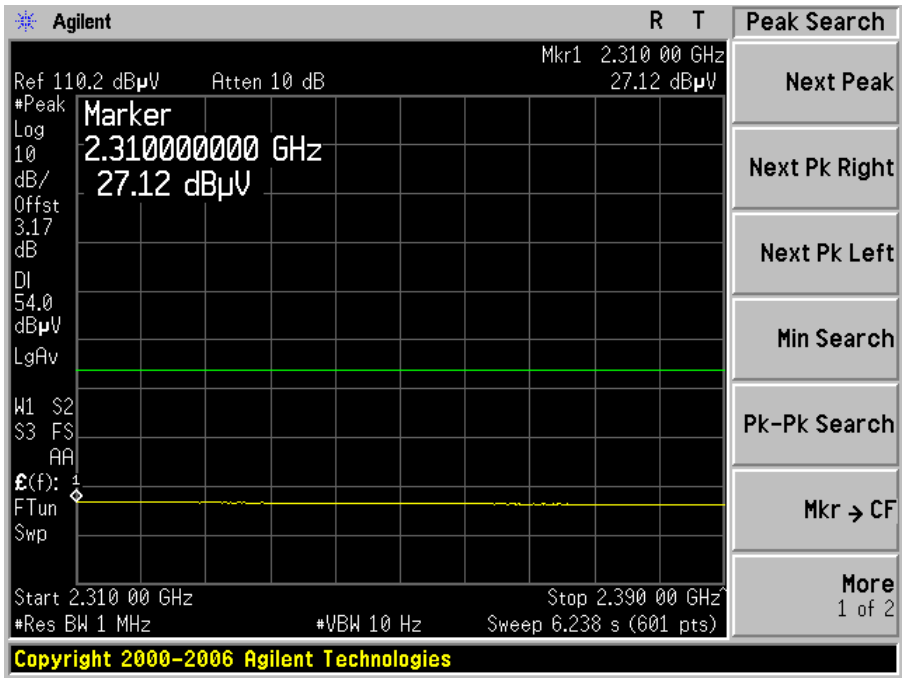
802.11b, Highest Channel at Vertical, Average



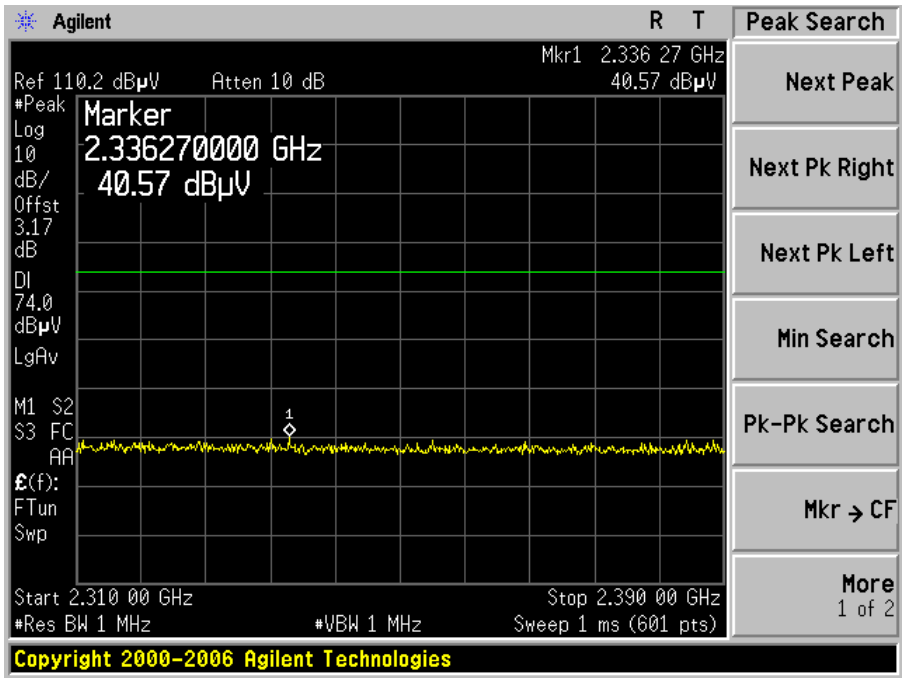
802.11 g, Lowest Channel at Horizontal, Peak



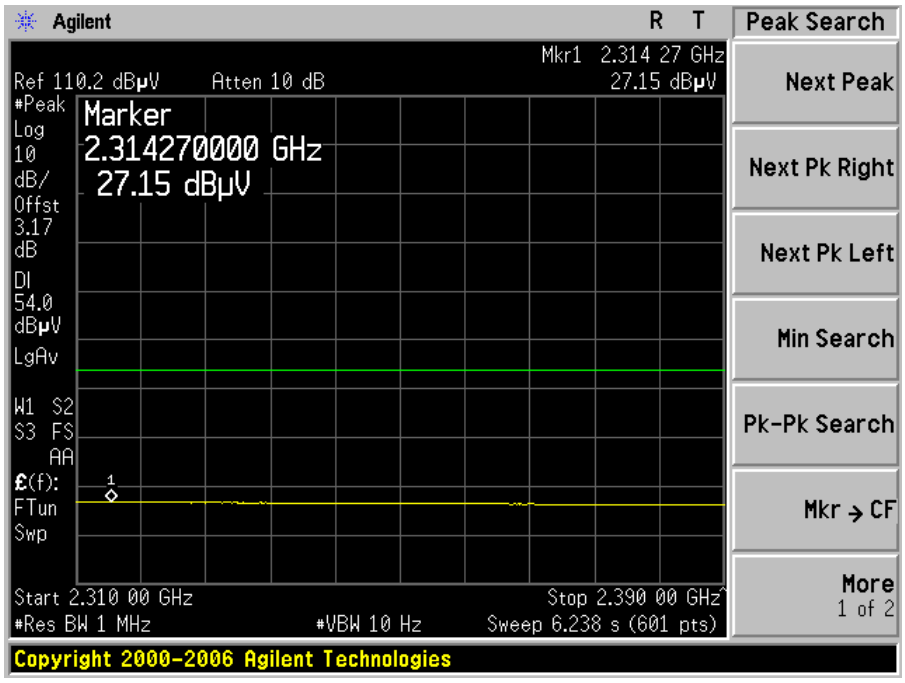
802.11g, Lowest Channel at Horizontal, Average



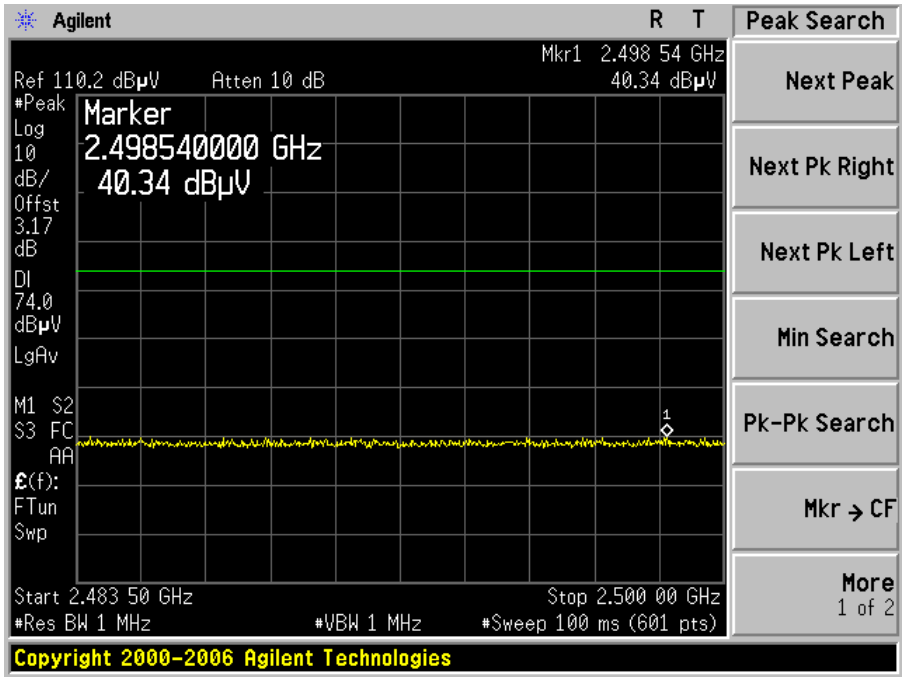
802.11g, Lowest Channel at Vertical, Peak



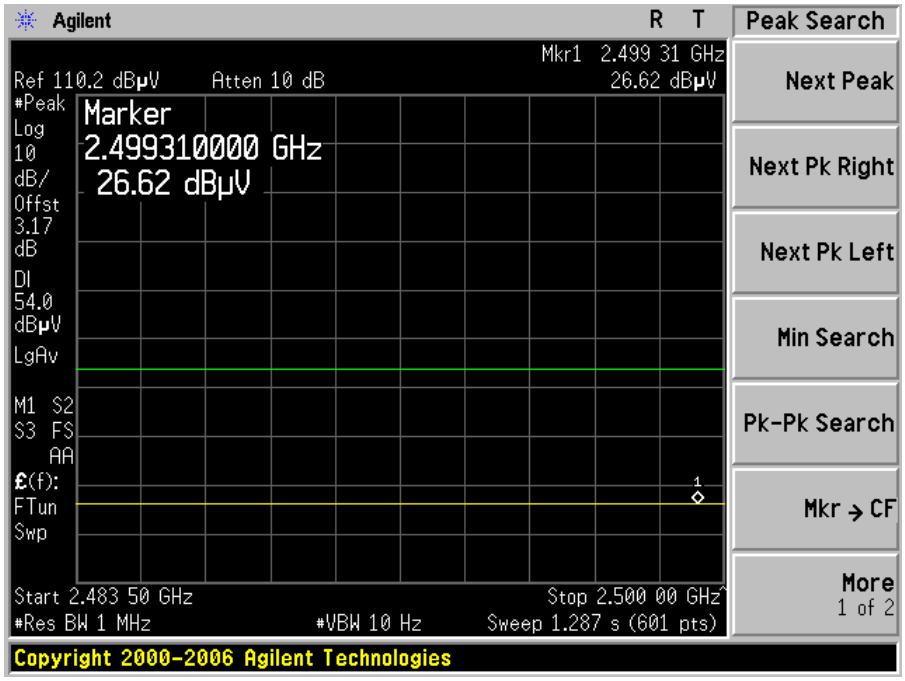
802.11g, Lowest Channel at Vertical, Average



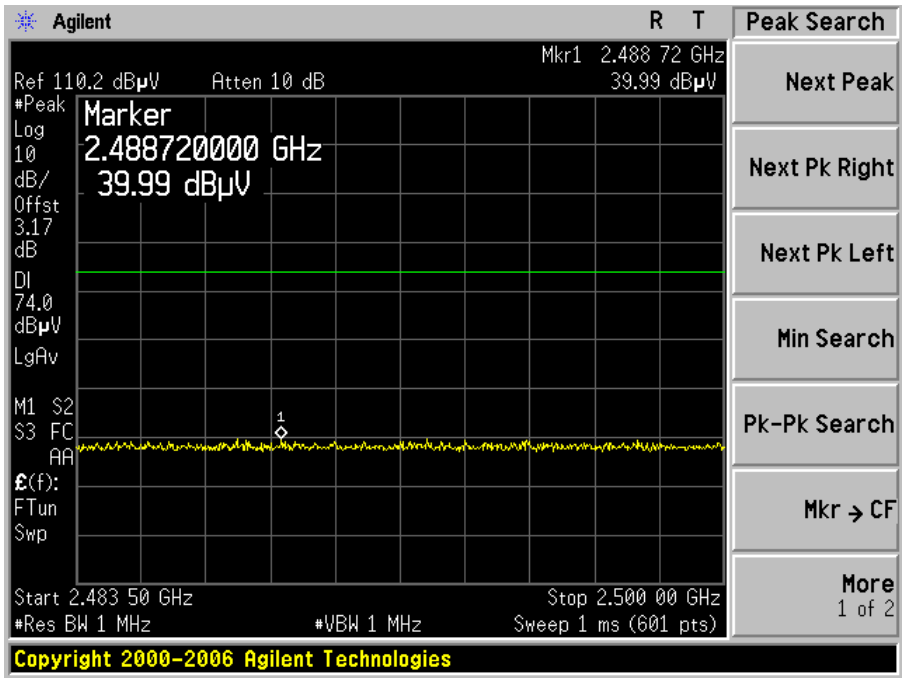
802.11g, Highest Channel at Horizontal, Peak



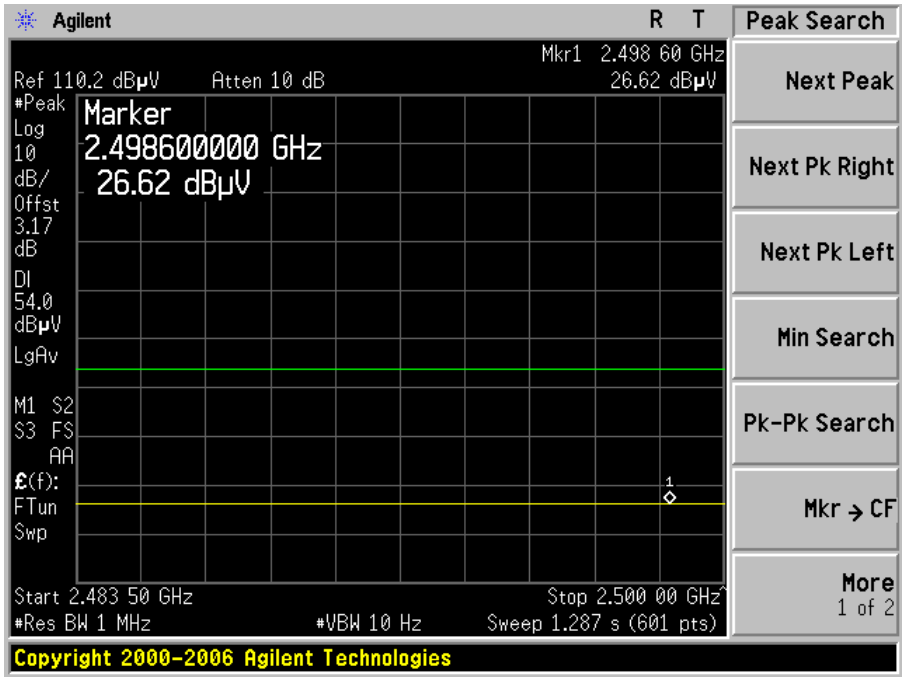
80.211g, Highest Channel at Horizontal, Average



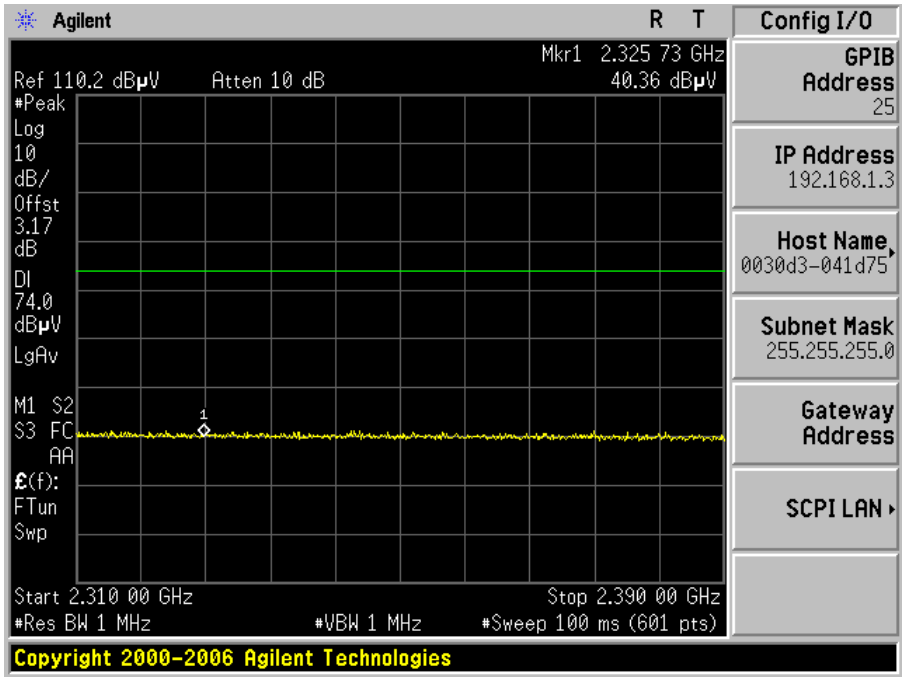
802.11g, Highest Channel at Vertical, Peak



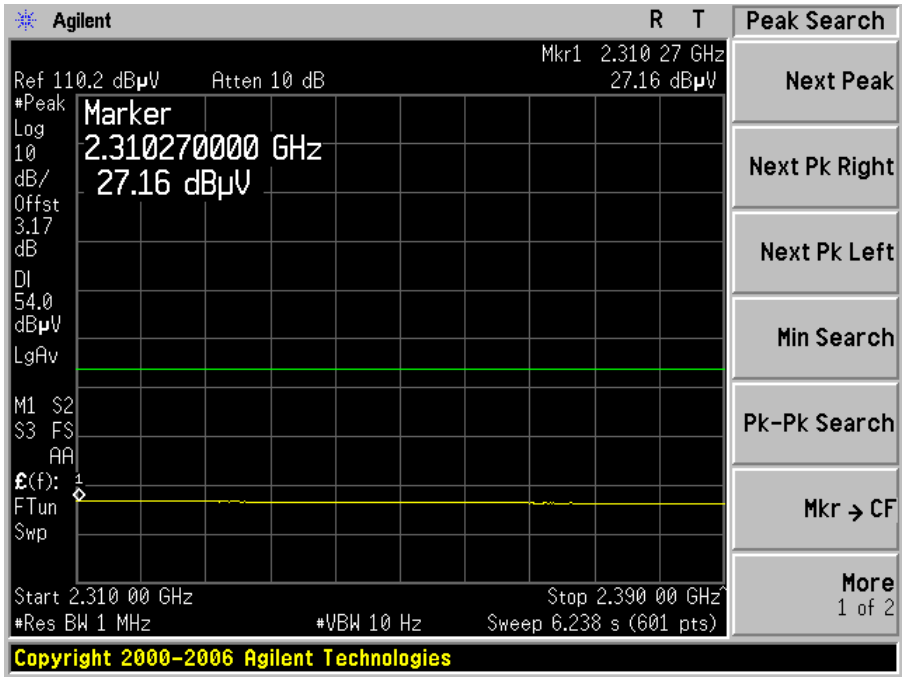
802.11g, Highest Channel at Vertical, Average



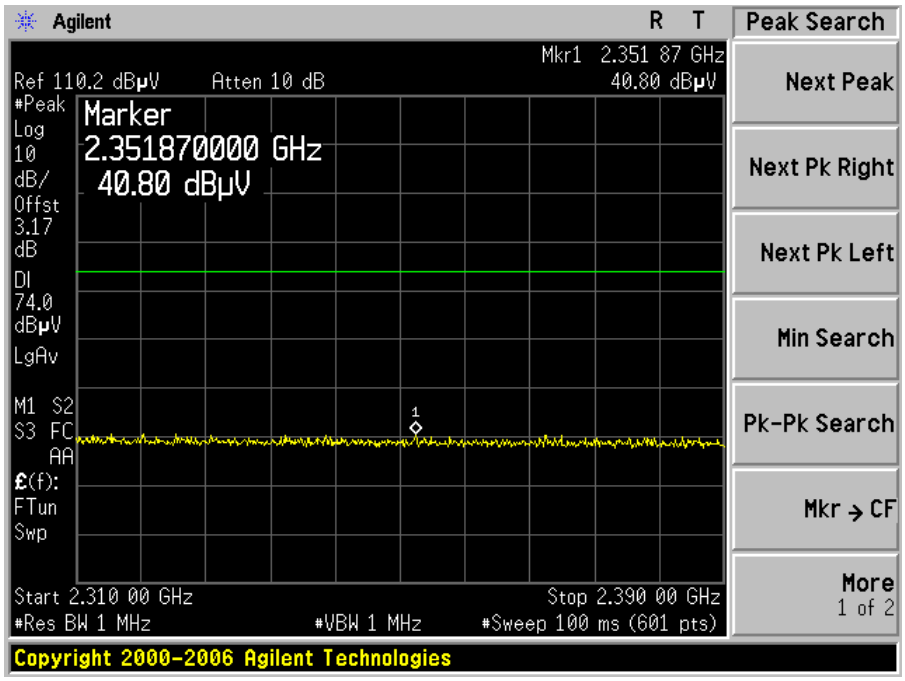
802.11 n, Lowest Channel at Horizontal, Peak



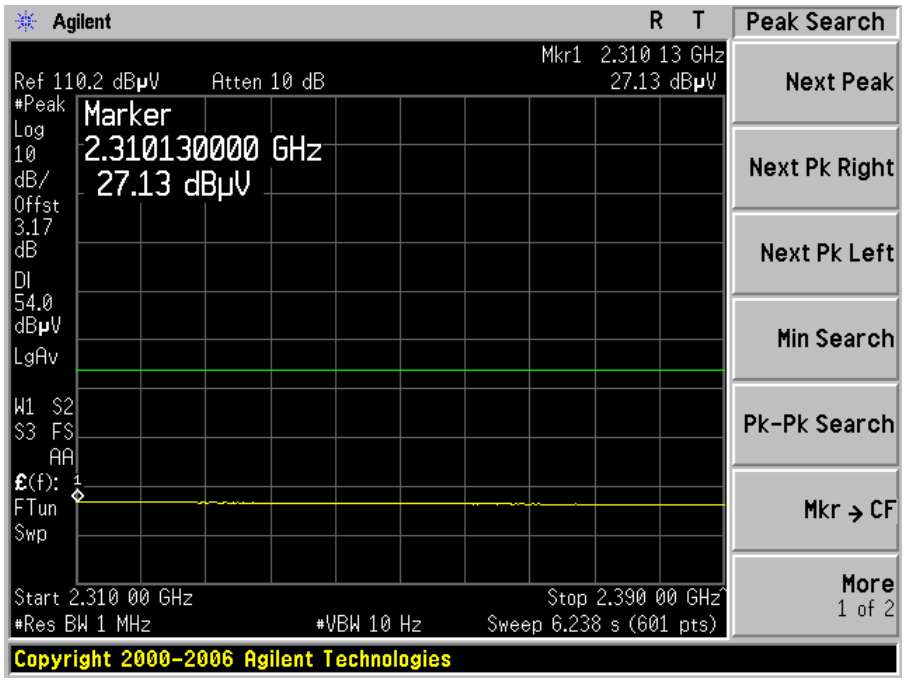
802.11n, Lowest Channel at Horizontal, Average



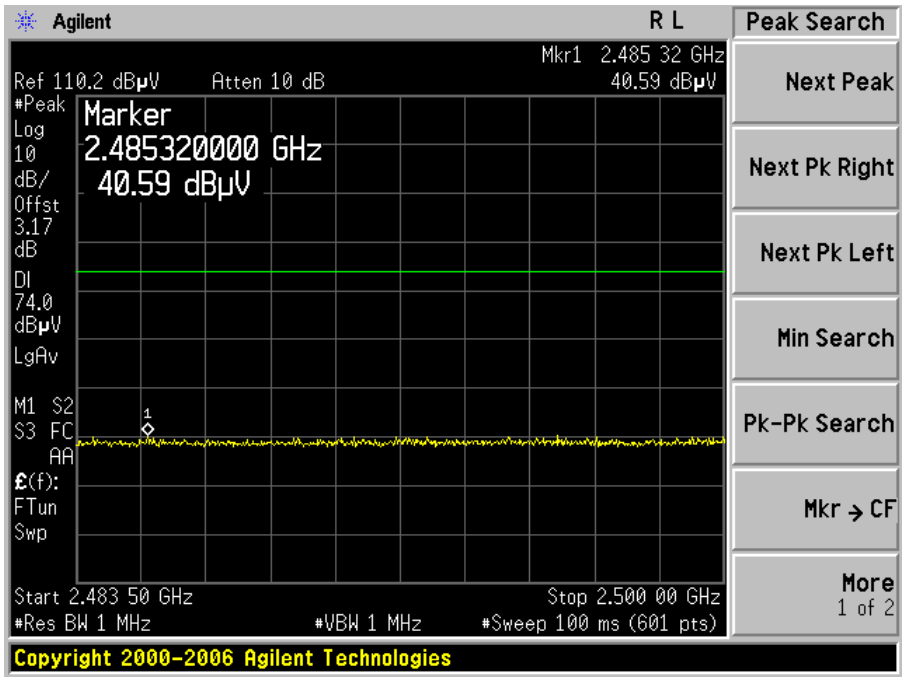
802.11n, Lowest Channel at Vertical, Peak



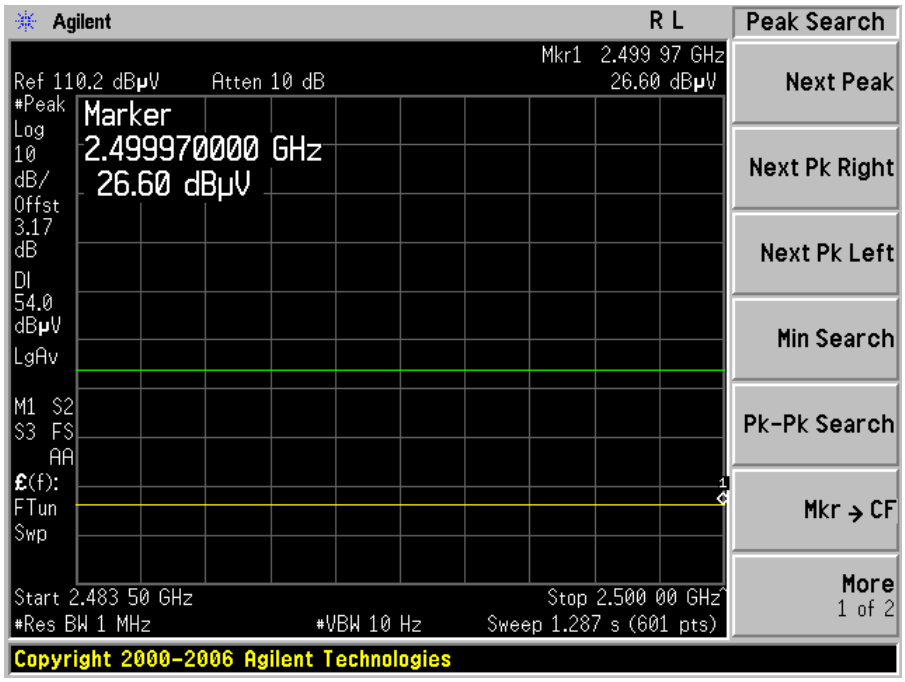
802.11n, Lowest Channel at Vertical, Average



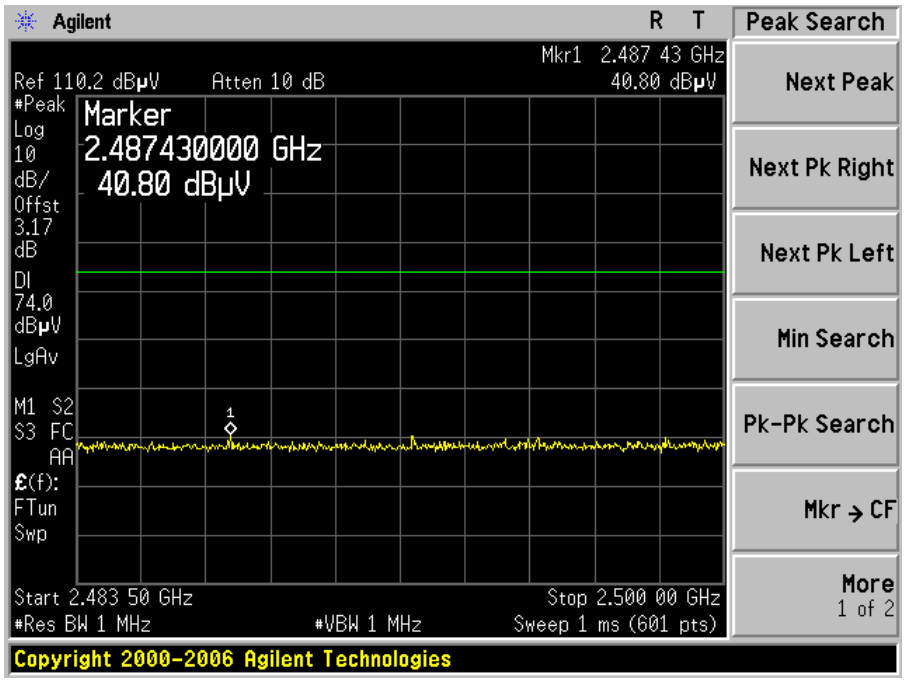
802.11n, Highest Channel at Horizontal, Peak



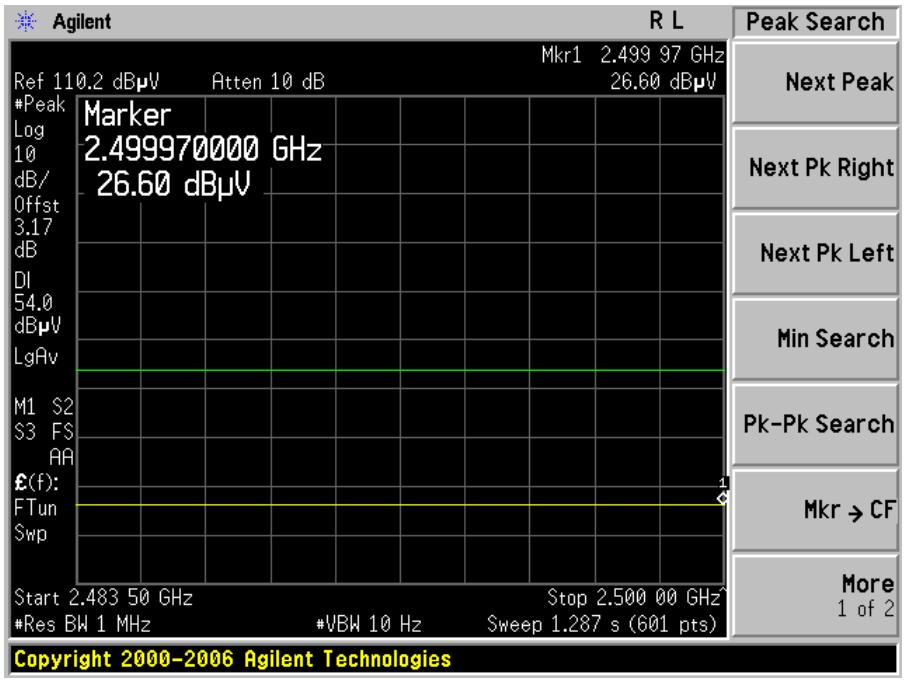
802.11n, Highest Channel at Horizontal, Average



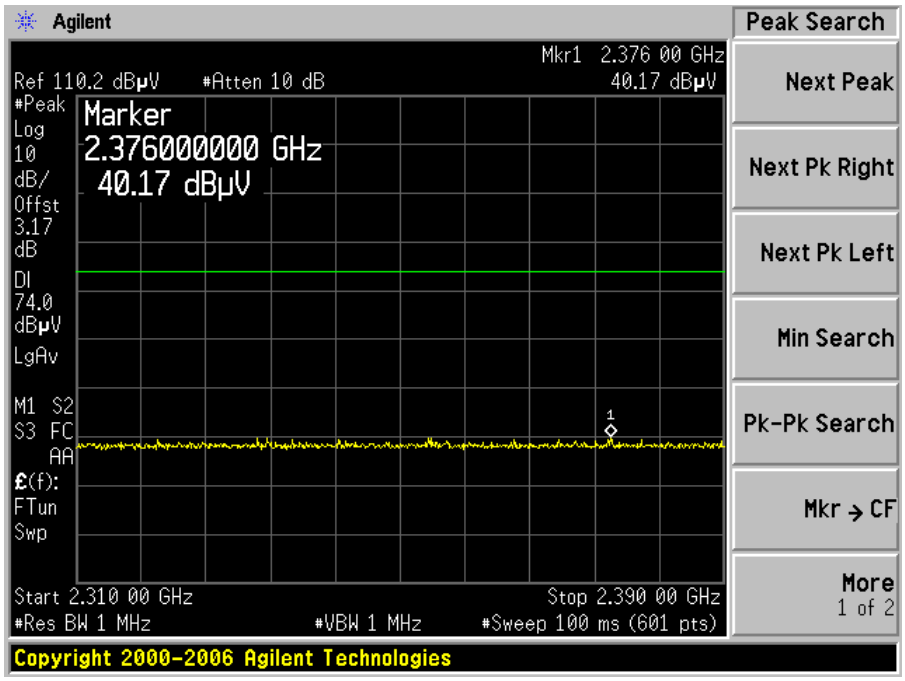
802.11n, Highest Channel at Vertical, Peak



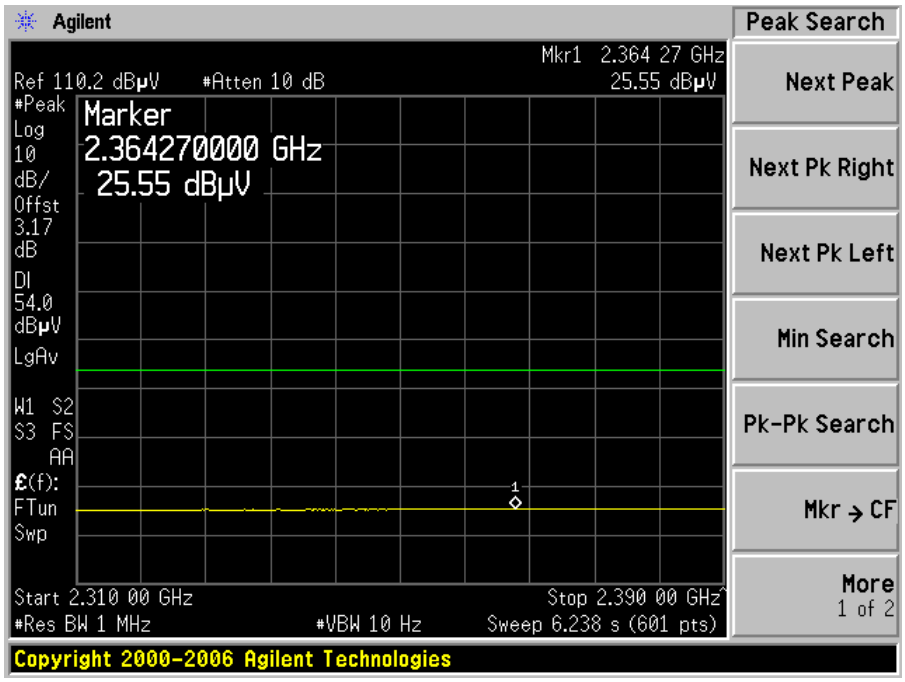
802.11n, Highest Channel at Vertical, Average



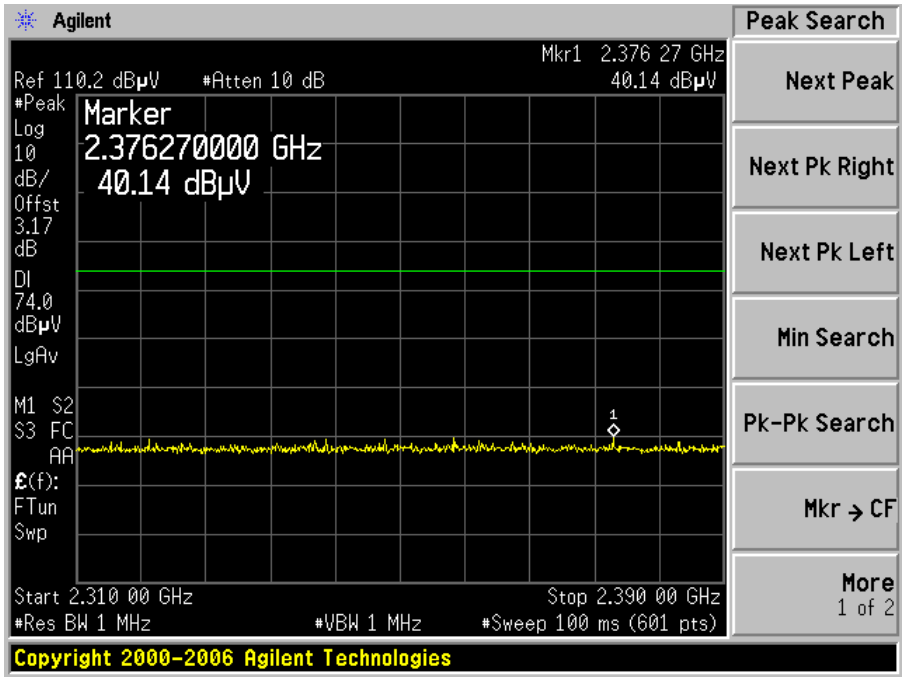
Co-Location, Lowest Channel at Horizontal, Peak



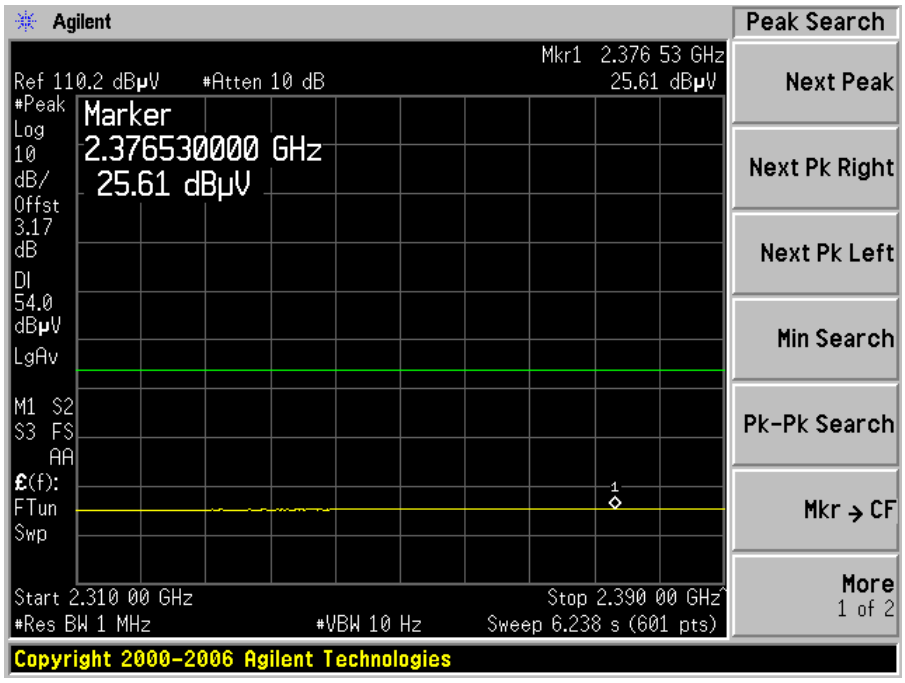
Co-Location, Lowest Channel at Horizontal, Average



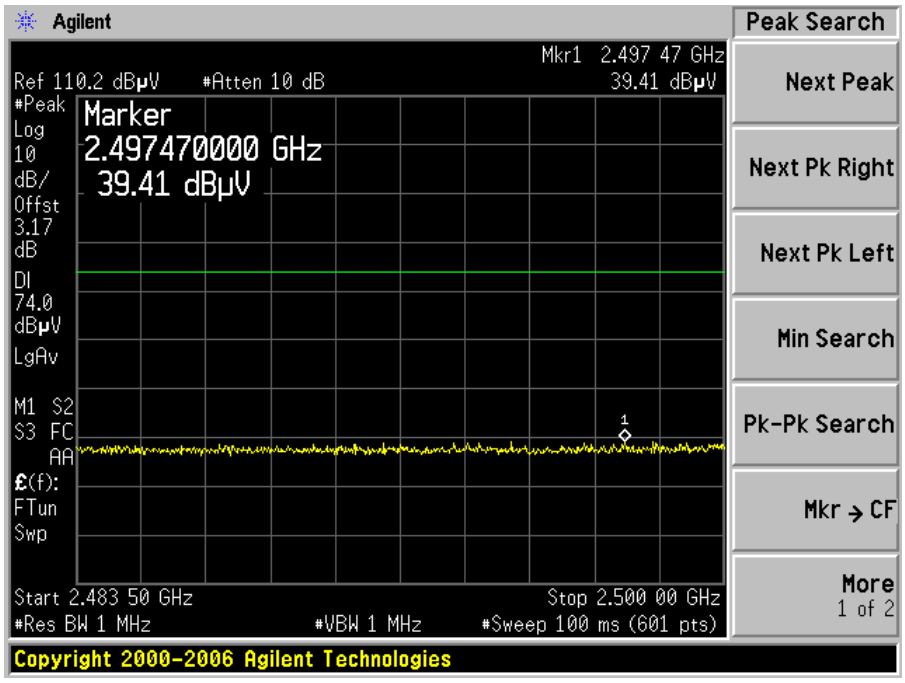
Co-Location, Lowest Channel at Vertical, Peak



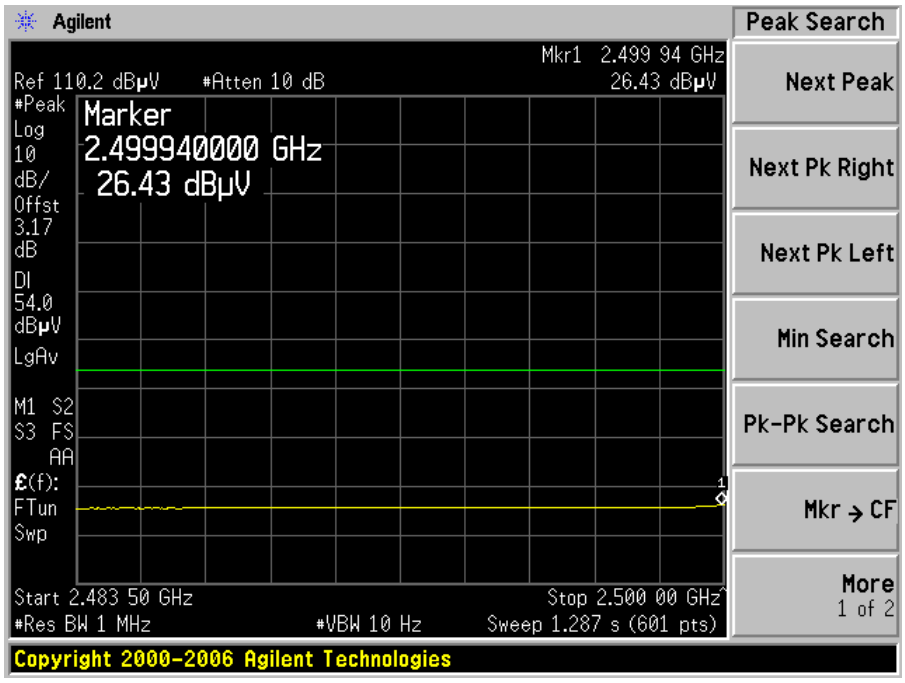
Co-Location, Lowest Channel at Vertical, Average



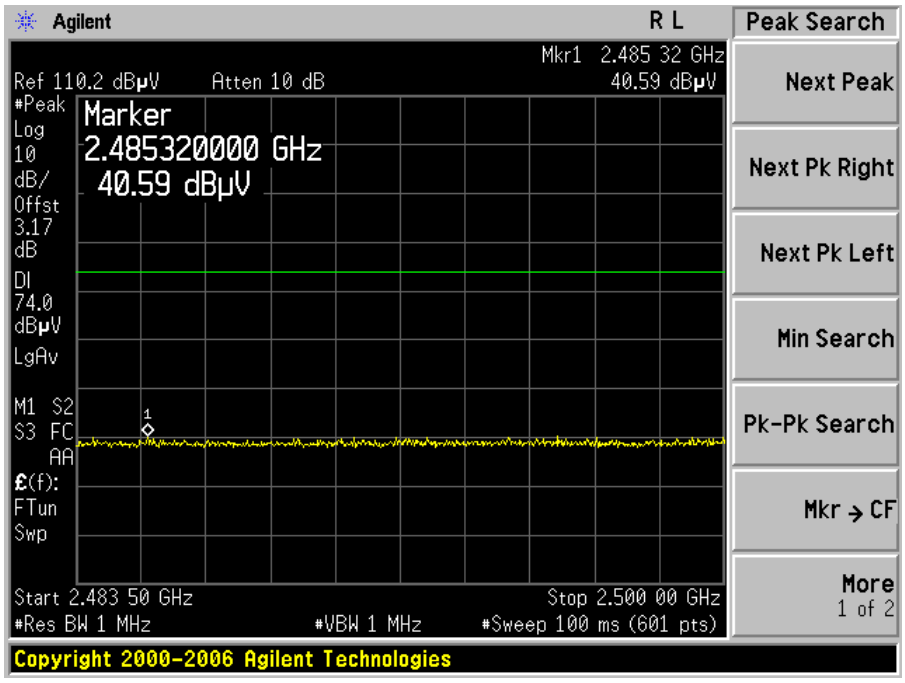
Co-Location, Highest Channel at Horizontal, Peak



Co-Location, Highest Channel at Horizontal, Average



Co-Location, Highest Channel at Vertical, Peak



Co-Location, Highest Channel at Vertical, Average