Lab Code: 200167-0

FCC PART 15 SUBPART C

TEST AND MEASUREMENT REPORT

For

Actiontec Electronics, Inc.

760 N. Mary Avenue,

Sunnyvale, CA 94085, USA

FCC ID: LNQ802MBND
Model: 802MBND

Report Type:	**Product Type:**
Original Report	2.4GHz Wireless 802.11b/g/n Mini PCI Card

Test Engineers: Jack Liu

Report Number: R0910121-247

Report Date: 2009-11-13

Boni Baniqued

Reviewed By: EMC/RF Supervisor

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R0910121-247	Original Report	2009-11-13

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

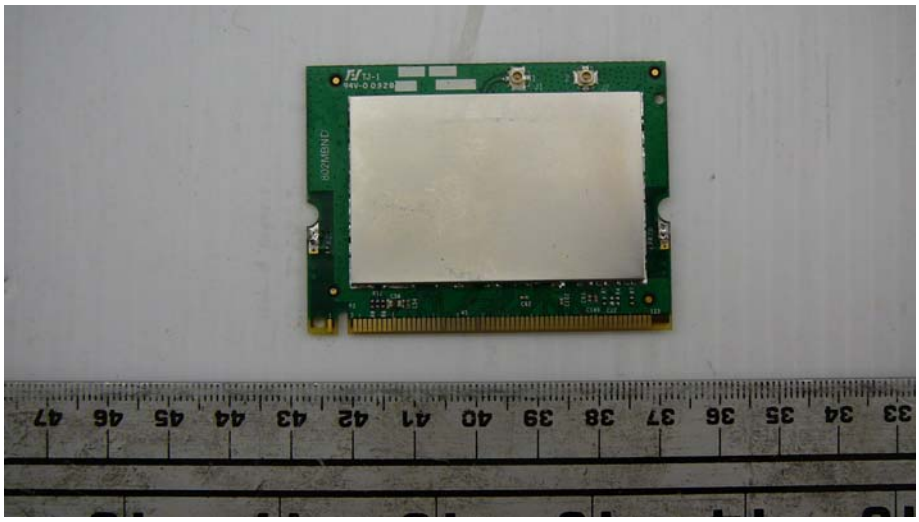
The *Actiontec Electronics, Inc.*, product model: *802MBND*, FCC ID: *LNQ802MBND* or the "EUT" as referred to in this report is a Wireless 802.11n mini PCI card. The EUT provides ultra-high performance (up to 300 Mbps) transmission rate in 2.4GHz bands and backward compatible with the current 802.11b/g network devices.

1.2 Mechanical Description of EUT

The "EUT" measures approximately *6cm* (L) x *4.5cm* (W) x *0.3cm* (H), and weighs approximately *11.5g*.

** The test data gathered are from typical production sample, serial number: C92900008, provided by the manufacturer.*

1.3 EUT Photo



Please refer to Exhibit C for more EUT photographs.

1.4 Objective

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

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.

1.5 Related Submittal(s)/Grant(s)

No Related Submittals

1.6 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.

1.7 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 $\pm$2.0 for Conducted Emissions tests and $\pm$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.

1.8 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 and its host were 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 with the host model: Q1000.

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 data rate settings (worst case):

Radio Mode	Bandwidth (MHz)	Frequency/Data rate		
		Low Channel (MHz/Mbps)	Middle Channel (MHz/Mbps)	High Channel (MHz)
802.11b	20	2412/1	2437/1	2462/1
802.11g	20	2412/6	2437/6	2462/6
802.11n	20	2412/6.5	2437/6.5	2462/6.5

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.
IBM	Laptop	T41	00416
MSI	Netbook	U100	-
Actiontec	Host	Q1000	CVAA9161600045
Actiontec	Debug Board	055441A	-

2.6 Internal Configuration

Manufacturer	Description	Model No.	Serial No.
Actiontec Electronics, Inc.	Host Main Board	Q1000(T002408)	CVAA9221805824

2.7 Power Supply and Line Filters

Manufacturer	Description	Model No.	Serial No.
Actiontec Electronics, Inc.	AC/DC Power Adapter	STD-10016U	82400175

2.8 Interface Ports and Cabling

Cable Description	Length (m)	From	To
Internet Cable	< 2	EUT	Laptop

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	Compliant
§15.203	Antenna Requirement	Compliant
§ 15.207 (a)	Conducted Emissions	Compliant
§2.1051; §15.247 (d)	Spurious Emissions at Antenna Port	Compliant
§15.205	Restricted Bands	Compliant
§15.209 (a); §15.247 (d)	Radiated Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Bandwidth	Compliant
§15.247 (b)(3)	Maximum Peak Output Power	Compliant
§ 15.247 (d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247 (e)	Power Spectral Density	Compliant

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

4.1 Applicable Standard

According to §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.

According to §1.1310 and §2.1091 RF exposure is calculated.

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)
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 page 18 of 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

Mode	Frequency Band	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mw/cm^2)	Result
WLAN	2.4 GHz	20	24.77	8	0.377	Compliant

The predicted power density level at 20 cm is 0.377 mw/cm^2 and it is below the uncontrolled exposure limit of 1.0 mW/cm^2. The EUT shall be used at least 20 cm away from user's body. It is determined as mobile equipment and complies with the MPE limit.

5 FCC §5.203 - Antenna Requirement

5.1 Applicable Standard

According to § 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 § 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 both external antennae and features a permanent attachment to the EUT chassis as well as non-standard connector. The Transmitter antenna has a max gain of 2 dBi which fulfills the requirements of FCC rule 15.203.

Frequency Band	Antenna 0 Gain (dBi)	Antenna 1 Gain (dBi)	Maximum Effective Gain (dBi)
2.4 GHz	5	5	8.01

5.3 Antenna Detail Photo

6 FCC §15.207 - Conducted Emissions

6.1 Applicable Standard

Section 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 unit was connected with LISN-1 which provided 120 V / 60 Hz AC power.

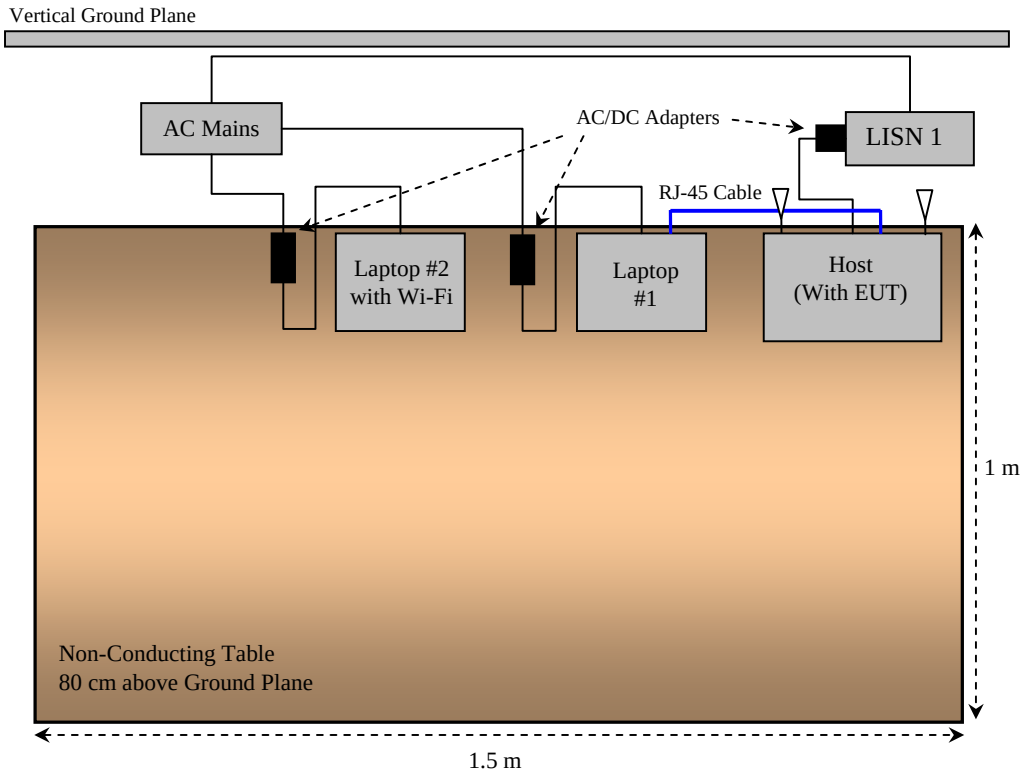
6.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Solar Electronics	LISN	9252-R-24-BNC	511205	2009-07-31
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2009-04-21

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

6.4 Test Setup Block Diagram

Conducted Emissions



6.5 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 with a “QP”. Average readings are distinguished with an “Ave”.

6.6 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 for Class B. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Class B Limit

6.7 Test Environmental Conditions

Temperature:	15-20 °C
Relative Humidity:	43-45 %
ATM Pressure:	101-102kPa

**The testing was performed by Jack Liu from 2009-10-14 to 2009-10-26.*

6.8 Summary of Test Results

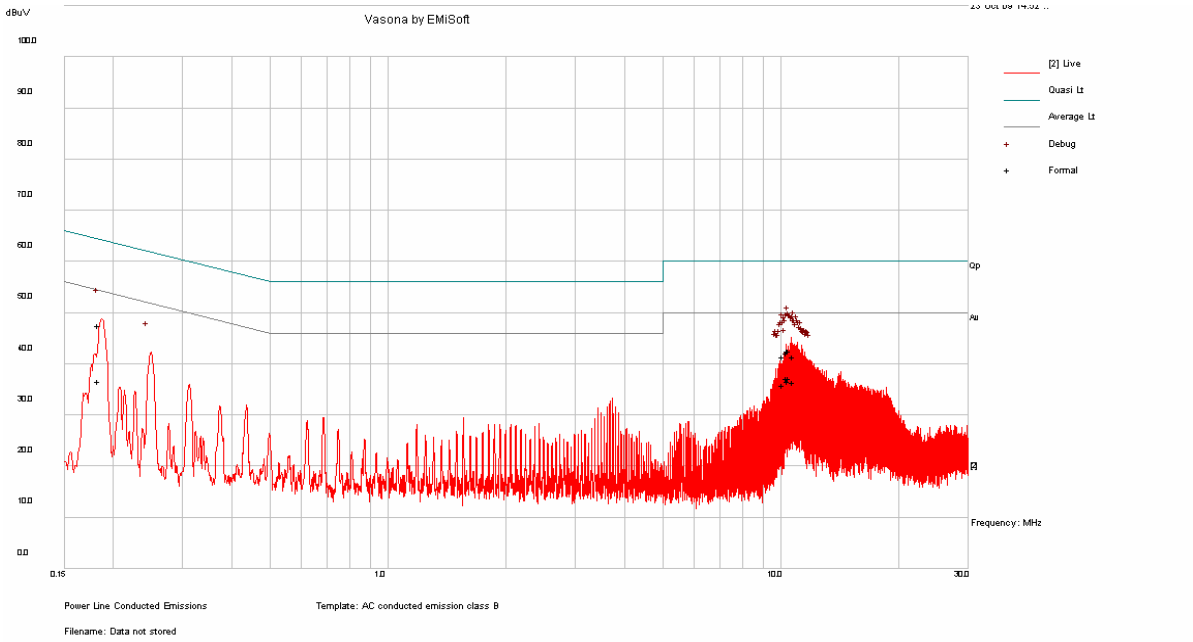
According to the recorded data in following table, the EUT complied with the FCC standard's conducted emissions limits, with the *worst* margin reading of:

Worst Case: 802.11b 20 MHz BW High Channel (2462 MHz)

Connection: AC/DC adapter connected to 120 V/60 Hz AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-12.72	10.69199	Line	0.15 to 30
-13.13	10.69363	Neutral	0.15 to 30

6.9 Conducted Emissions Test Plots and Data

120 V, 60 Hz – Line



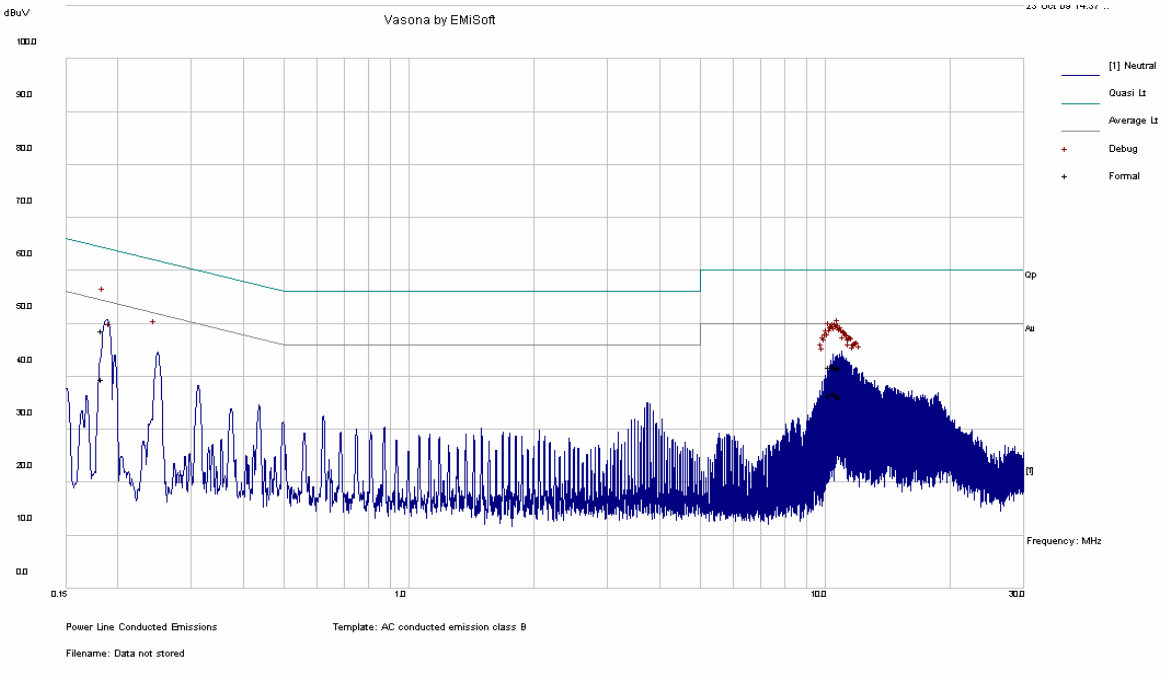
Quasi-Peak Measurements

Frequency (MHz)	Quasi-Peak (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.187377	47.43	Line	64.15	-16.73
10.63019	42.59	Line	60.00	-17.41
10.69199	42.54	Line	60.00	-17.46
10.56666	42.14	Line	60.00	-17.86
10.31787	41.35	Line	60.00	-18.65
11.00252	41.31	Line	60.00	-18.69

Average Measurements

Frequency (MHz)	Average (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
10.69199	37.28	Line	50.00	-12.72
10.56666	37.22	Line	50.00	-12.78
10.63019	36.53	Line	50.00	-13.47
11.00252	36.37	Line	50.00	-13.63
10.31787	35.81	Line	50.00	-14.19
0.187377	36.62	Line	54.15	-17.54

120 V, 60 Hz – Neutral



Quasi-Peak Measurements

Frequency (MHz)	Quasi-Peak (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.187497	48.67	Neutral	64.15	-15.48
10.69363	42.04	Neutral	60.00	-17.96
10.81843	41.81	Neutral	60.00	-18.19
11.00892	41.79	Neutral	60.00	-18.21
10.44659	41.74	Neutral	60.00	-18.26
10.94372	41.35	Neutral	60.00	-18.65

Average Measurements

Frequency (MHz)	Average (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
10.69363	36.87	Neutral	50.00	-13.13
10.81843	36.77	Neutral	50.00	-13.23
10.94372	36.45	Neutral	50.00	-13.55
10.44659	36.40	Neutral	50.00	-13.60
11.00892	35.98	Neutral	50.00	-14.02
0.187497	39.46	Neutral	54.15	-14.69

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

7.1 Applicable Standard

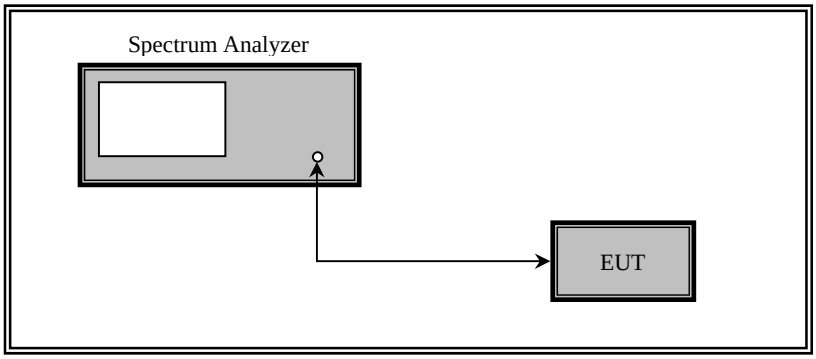
For §15.247(d) in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band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

Requirements: CFR 47, §2.1051.

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

7.2 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.



7.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-07-23

*** 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:	15-20 °C
Relative Humidity:	43-45 %
ATM Pressure:	101-102kPa

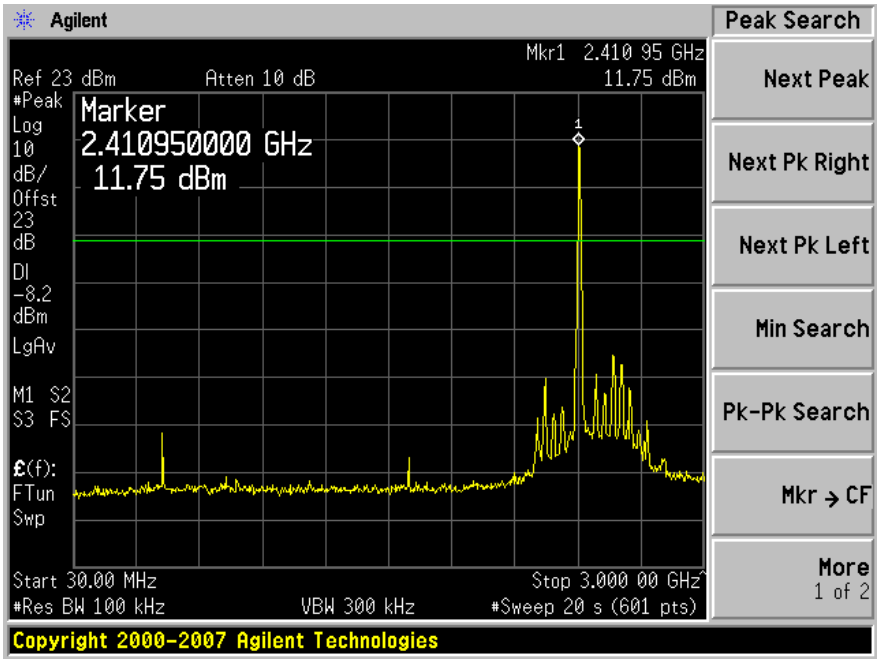
**The testing was performed by Jack Liu from 2009-10-14 to 2009-10-26.*

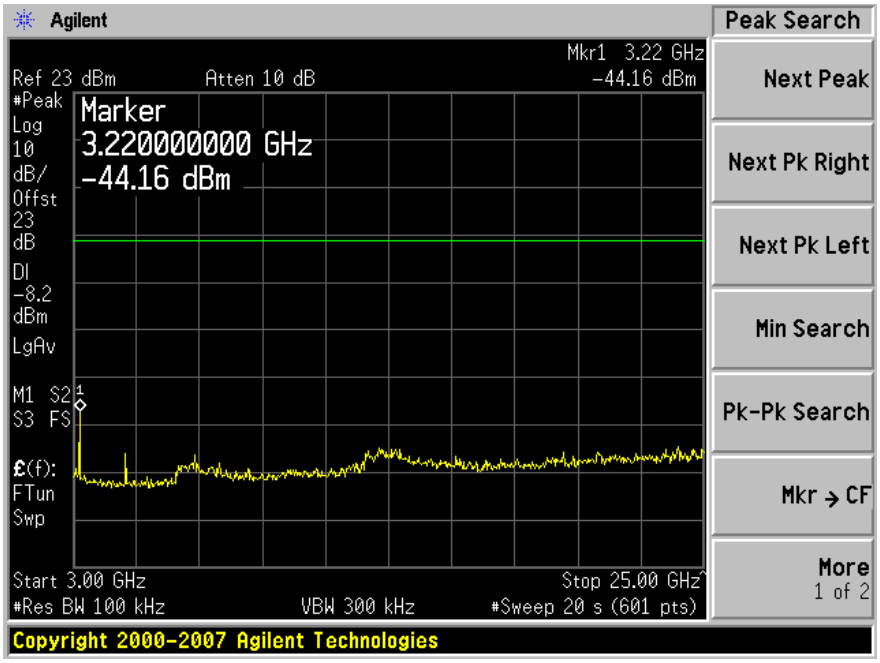
7.5 Measurement Result:

Please refer to following plots of spurious emissions.

802.11 b (Antenna #0)

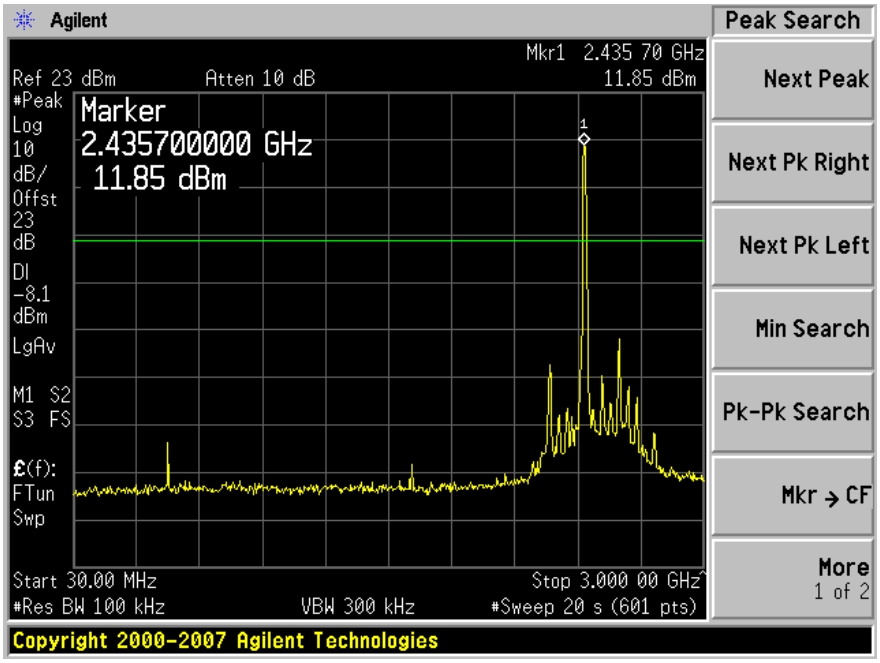
Low Channel 2412 MHz

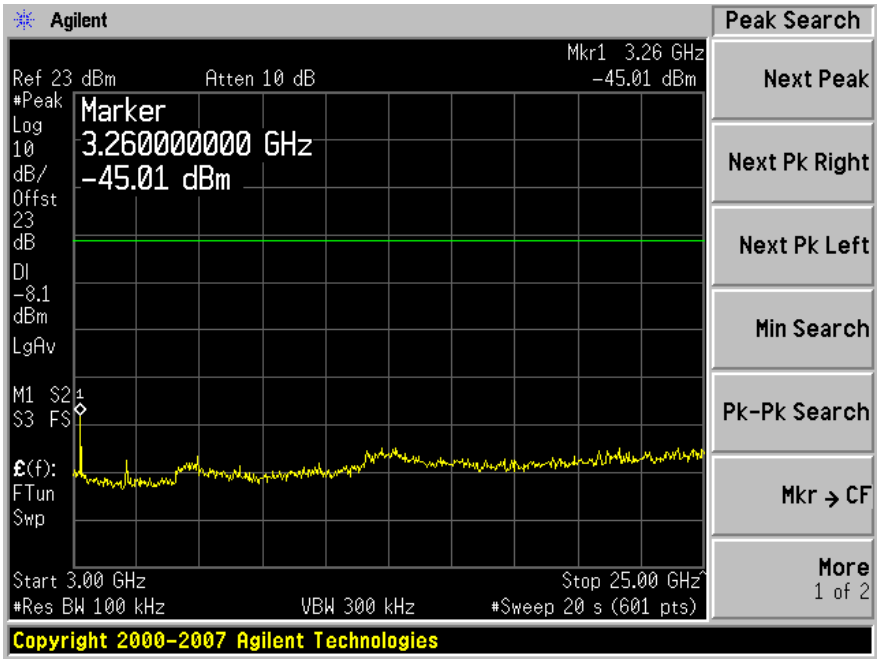




802.11 b (Antenna #0)

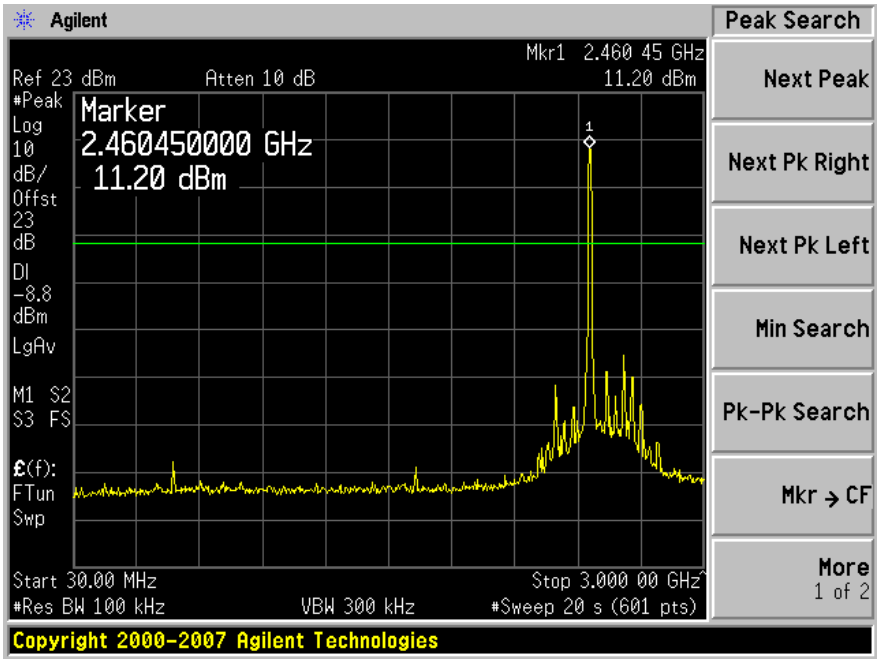
Middle Channel 2437 MHz

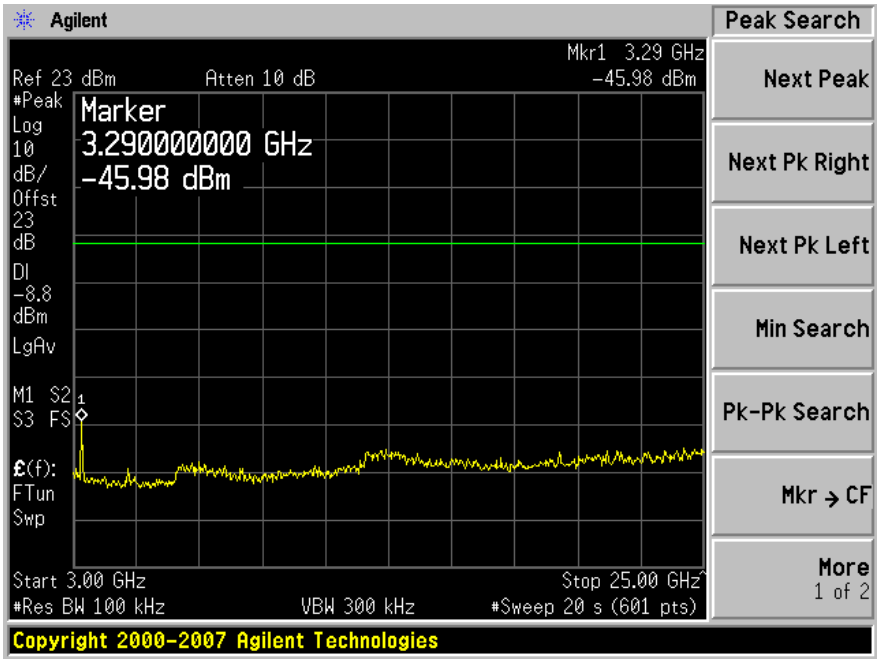




802.11 b (Antenna #0)

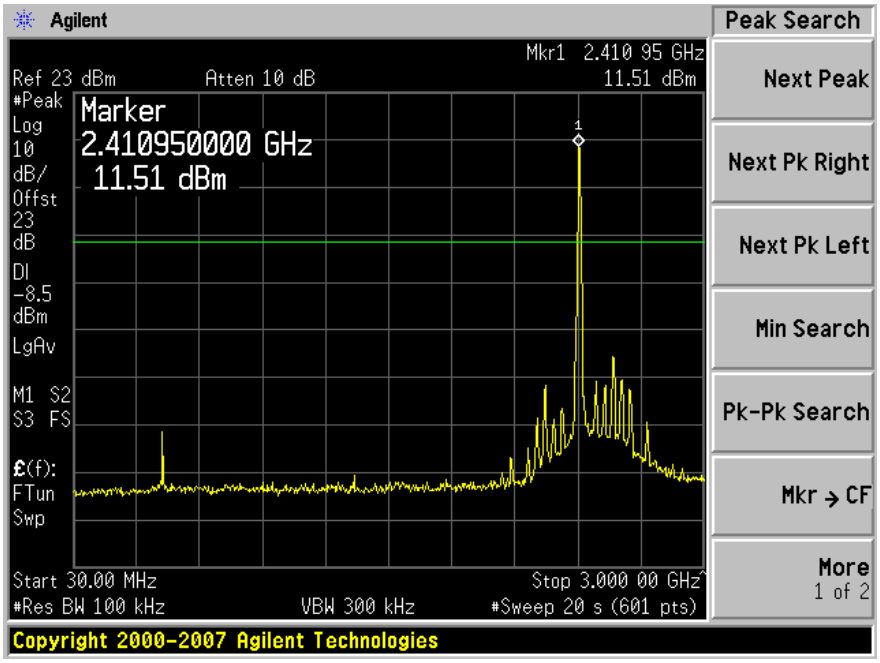
High Channel 2462 MHz

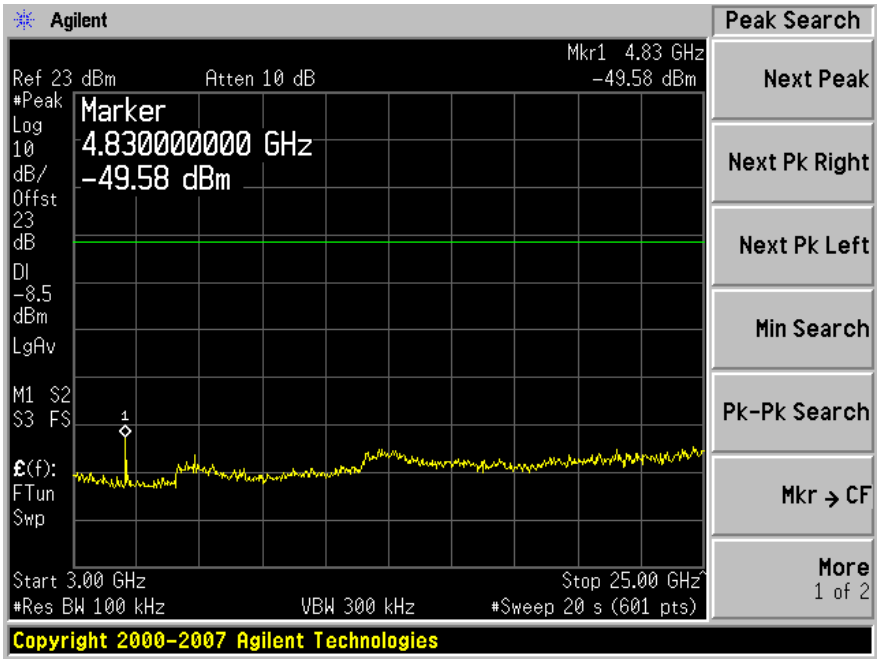




802.11 b (Antenna #1)

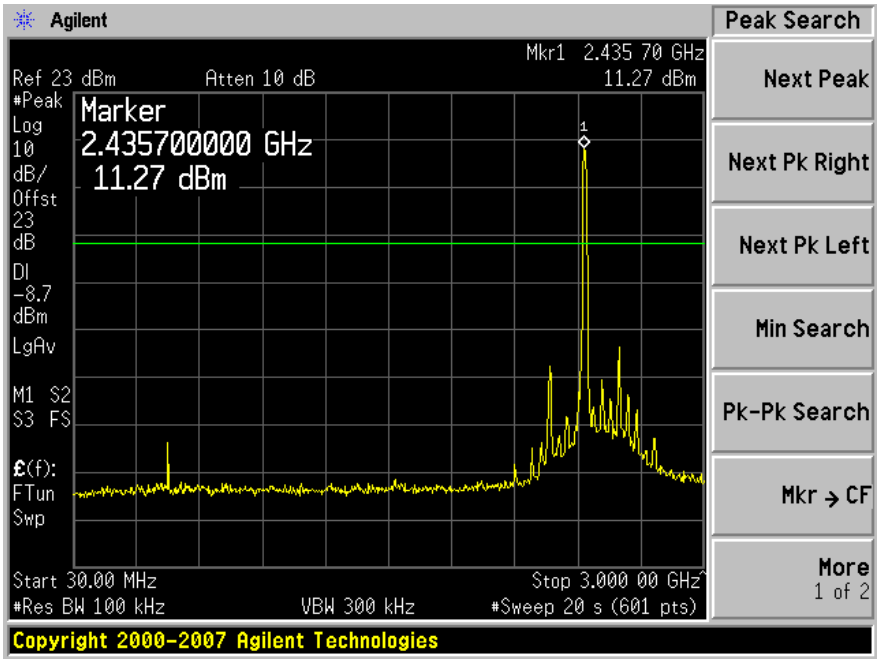
Low Channel 2412 MHz

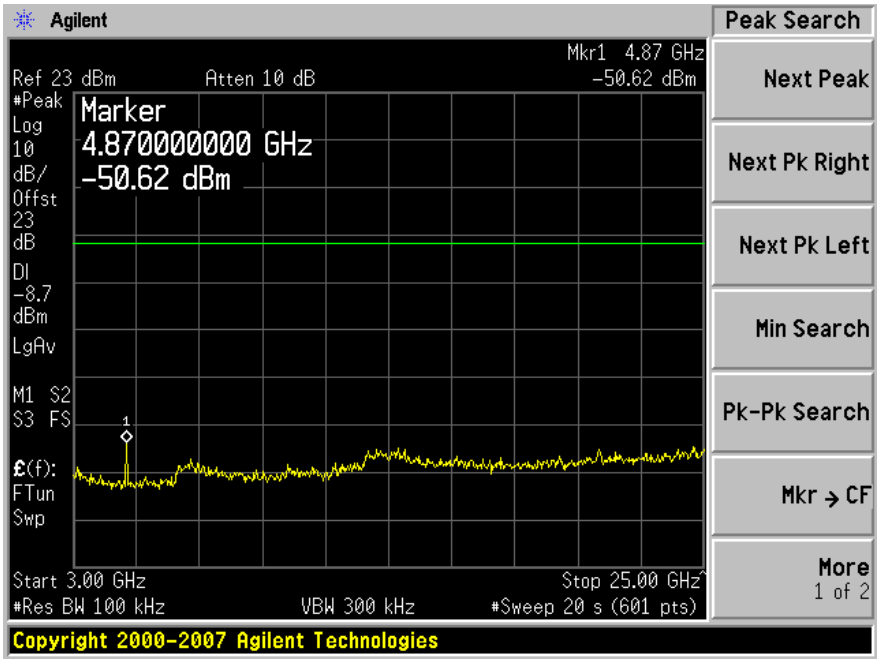




802.11 b (Antenna #1)

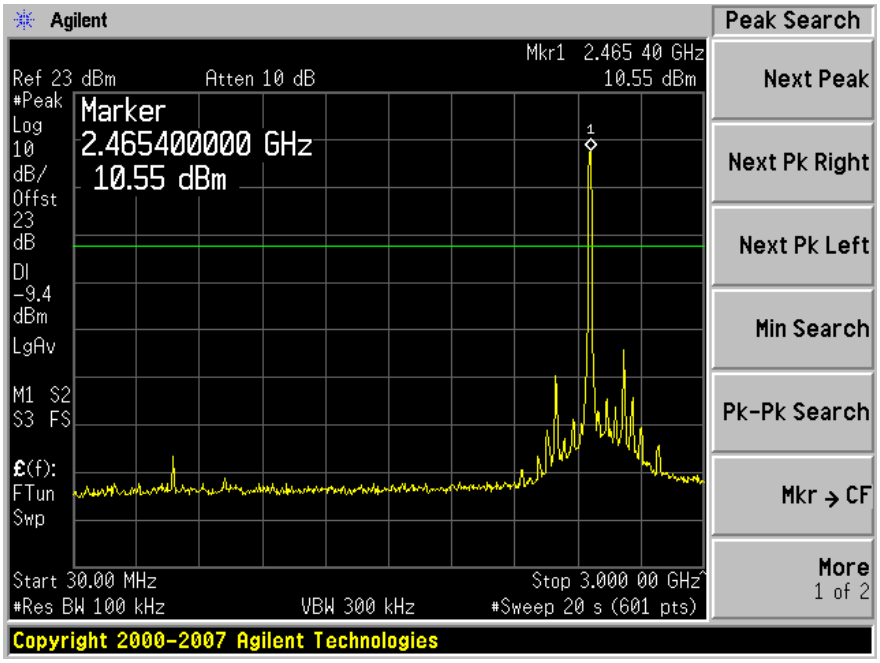
Middle Channel 2437 MHz

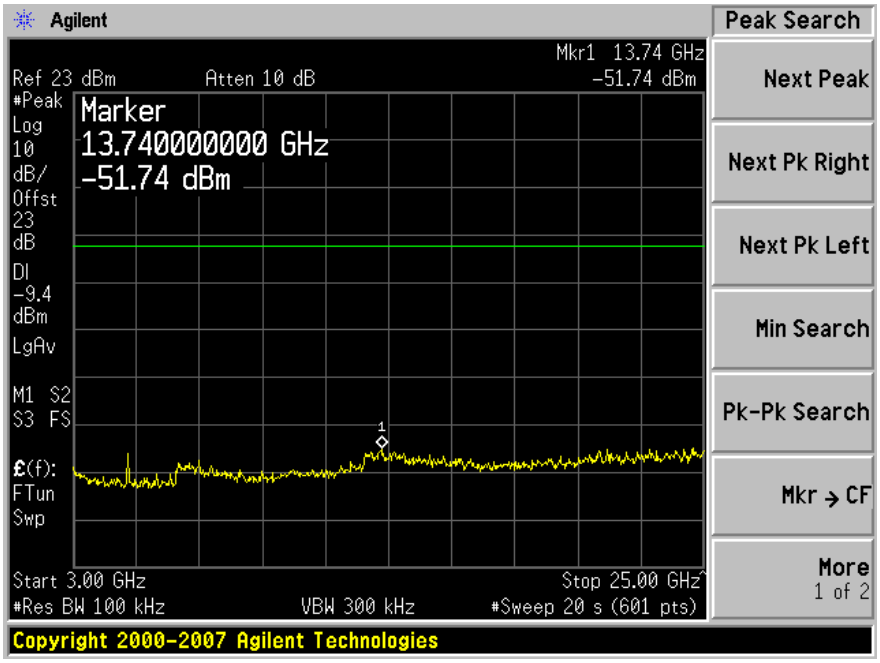




802.11 b (Antenna #1)

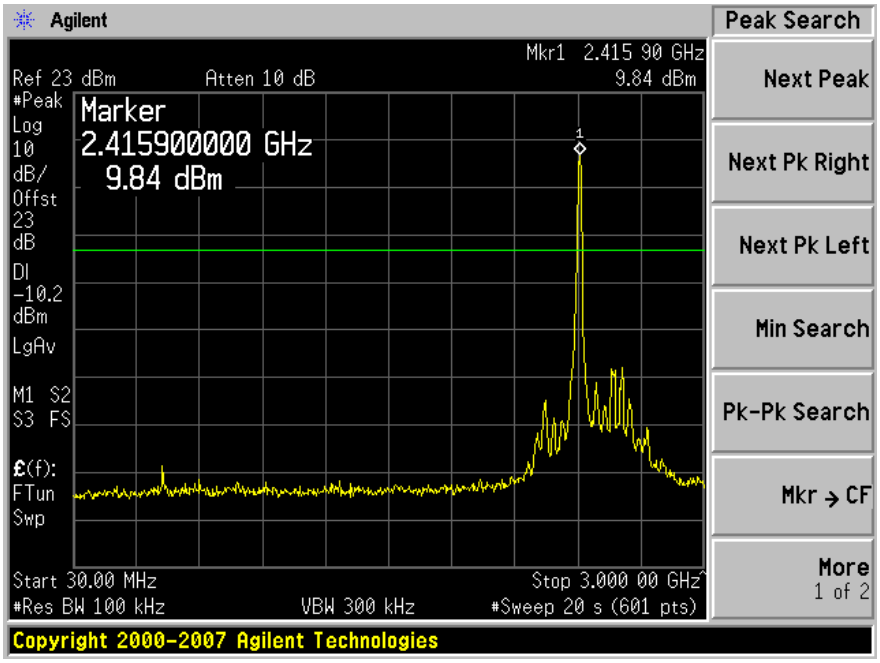
High Channel 2462 MHz

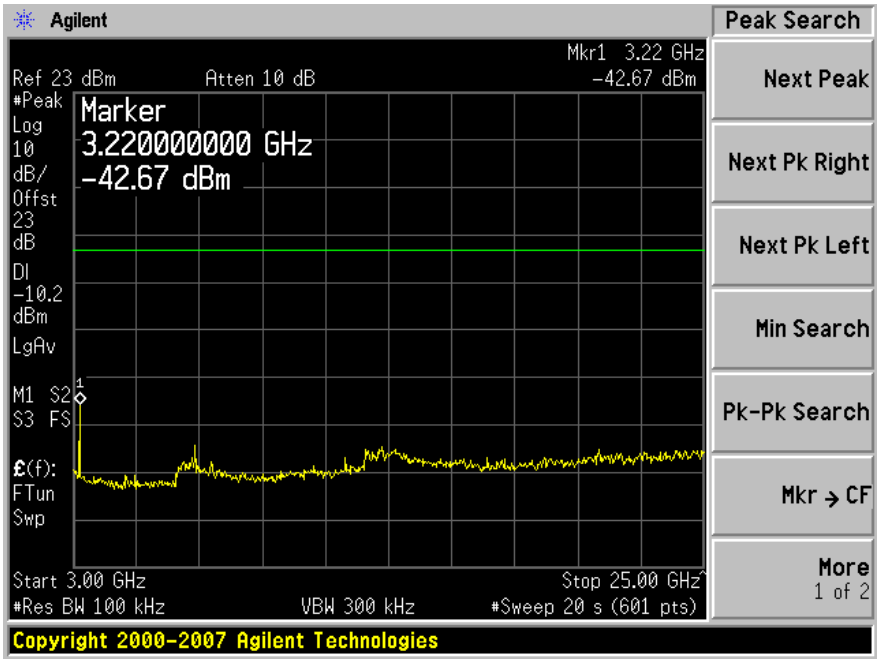




802.11 g (Antenna #0)

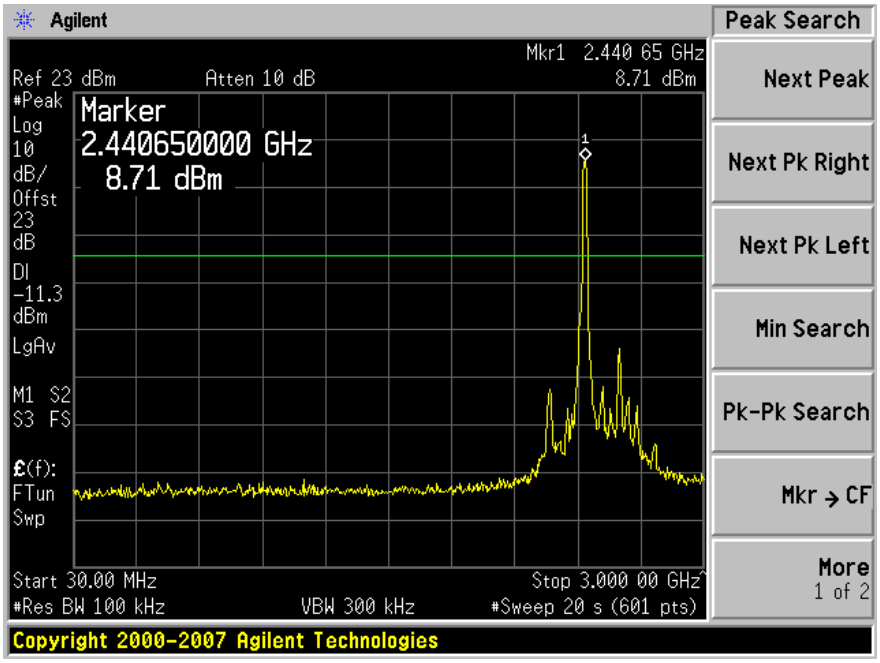
Low Channel 2412 MHz

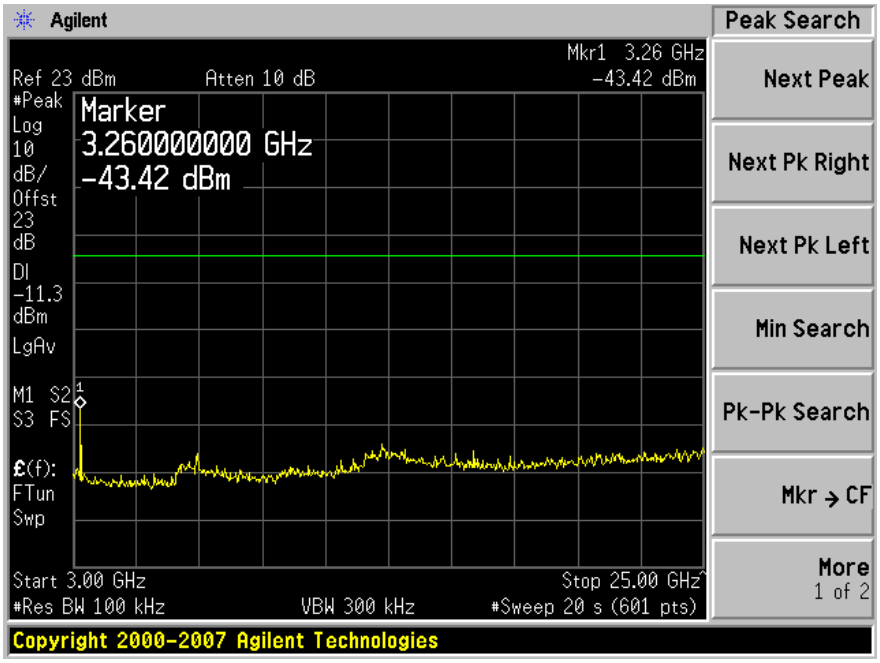




802.11 g (Antenna #0)

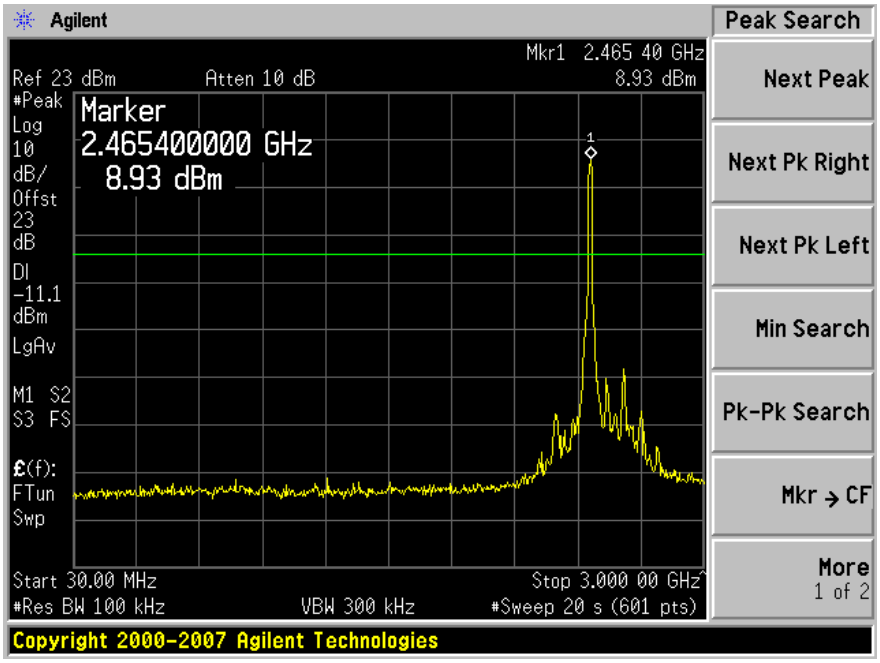
Middle Channel 2437 MHz

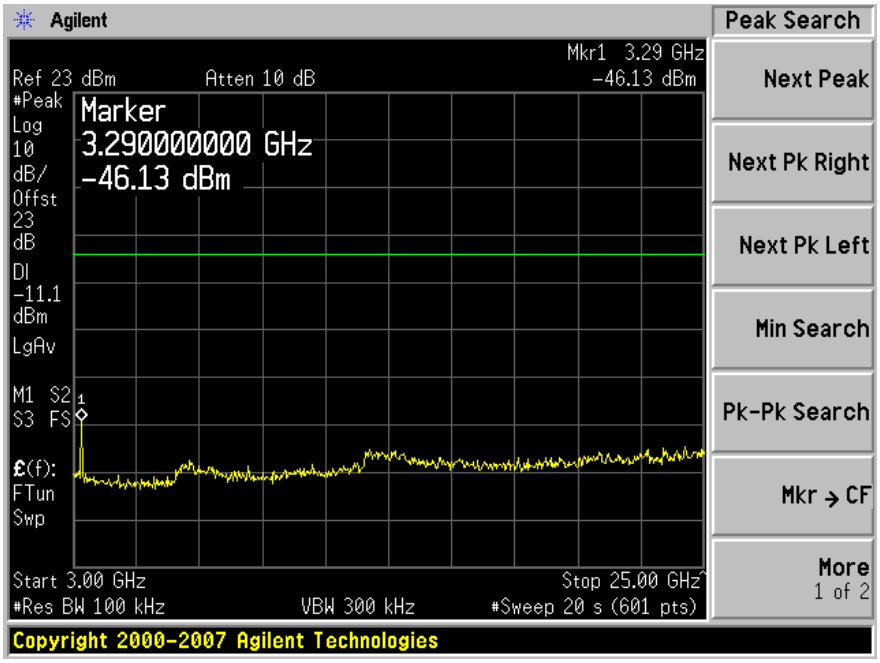




802.11 g (Antenna #0)

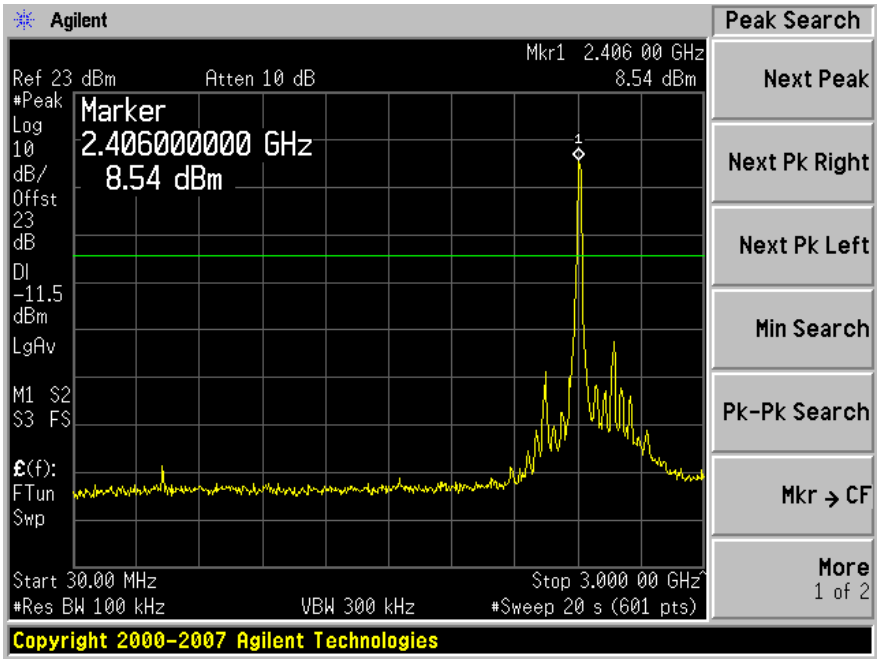
High Channel 2462 MHz

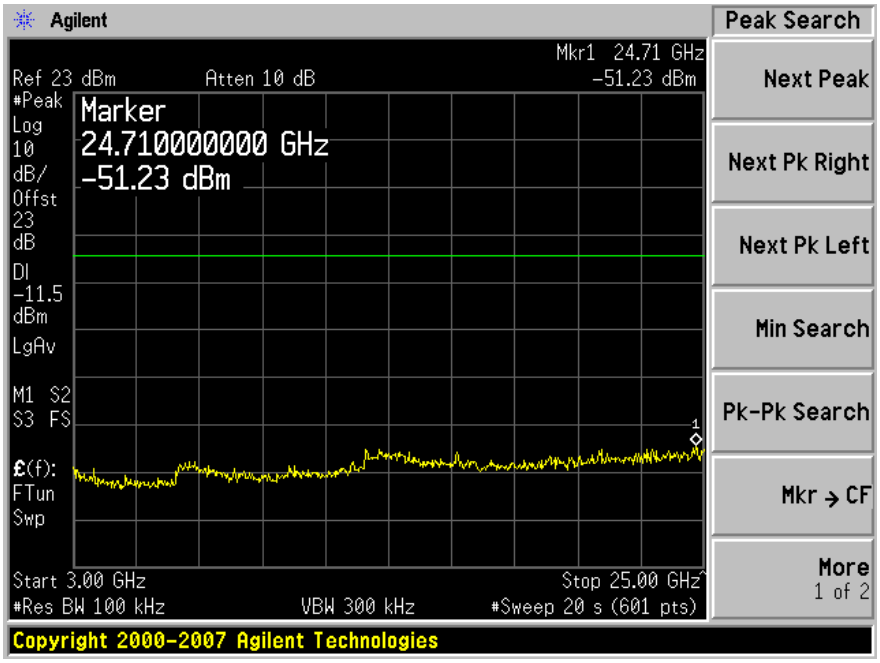




802.11 g (Antenna #1)

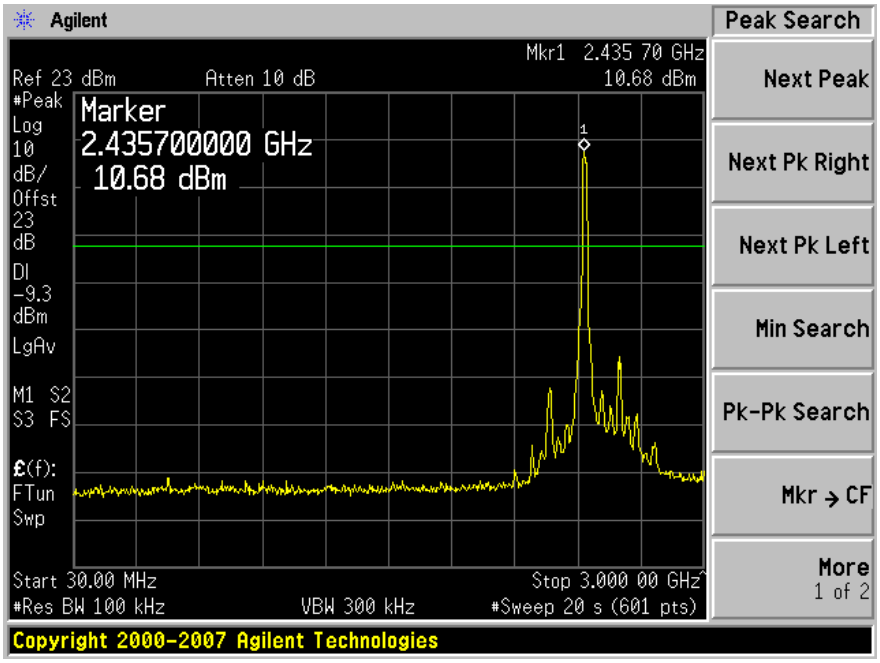
Low Channel 2412 MHz

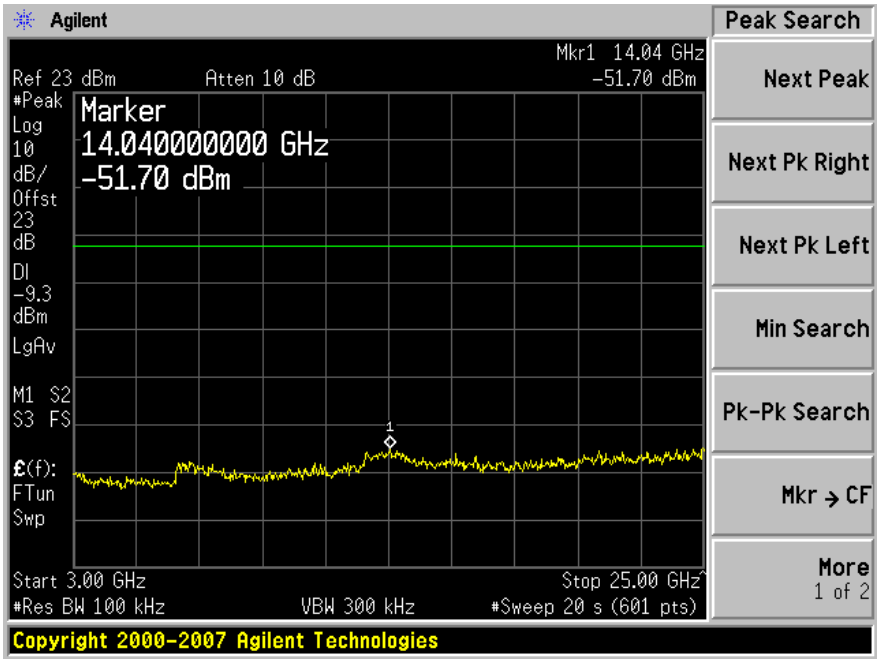




802.11 g (Antenna #1)

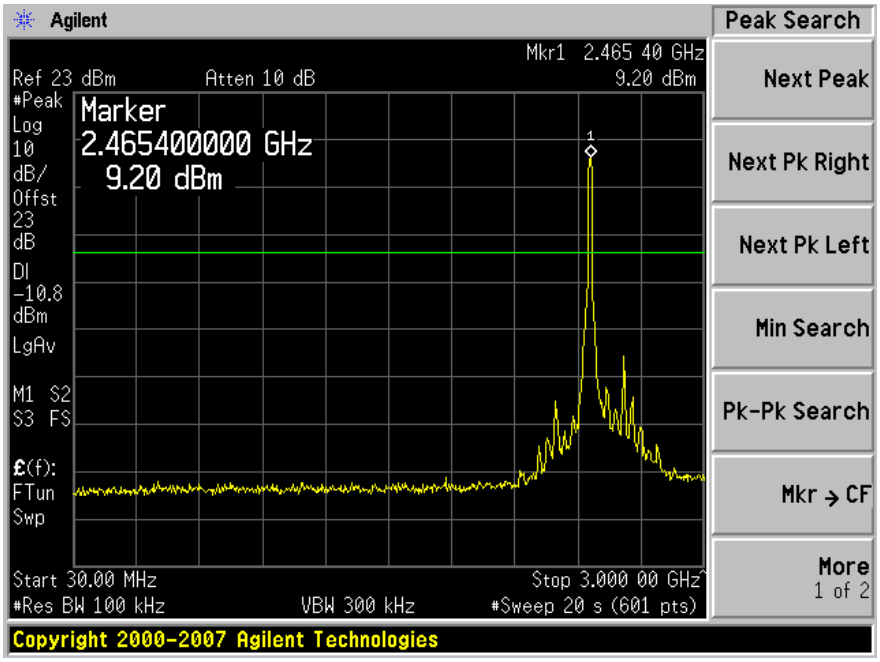
Middle Channel 2437 MHz

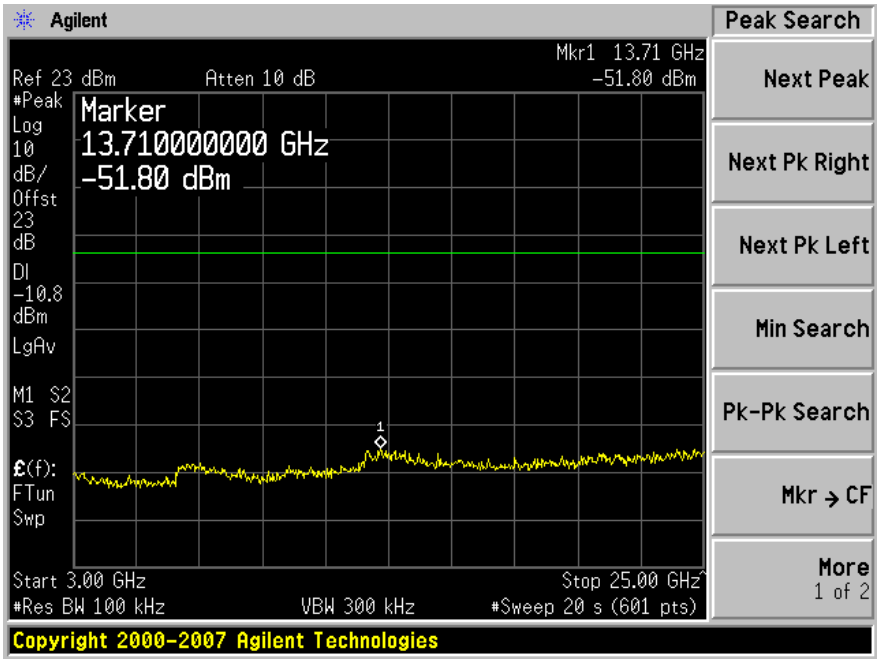




802.11 g (Antenna #1)

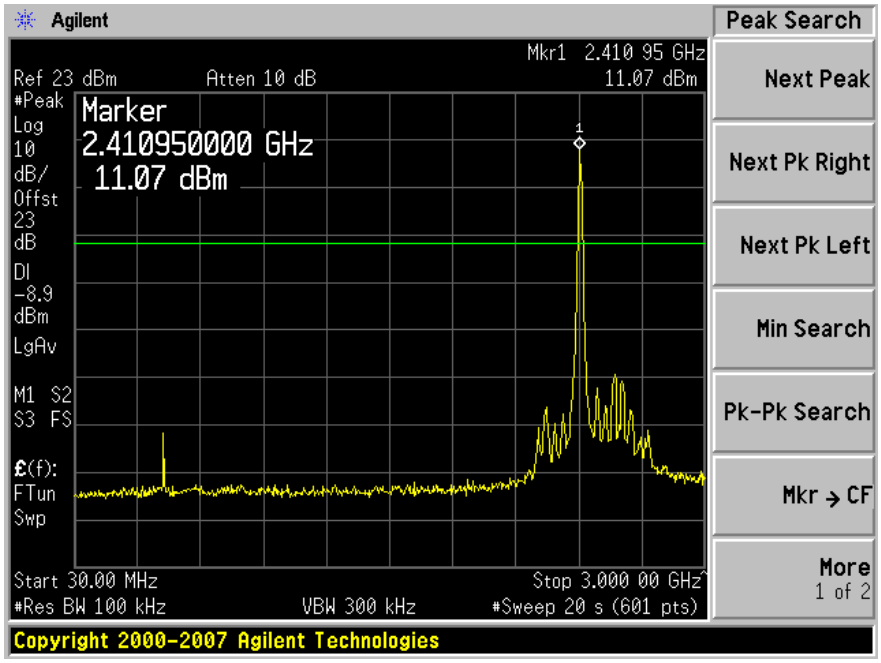
High Channel 2462 MHz

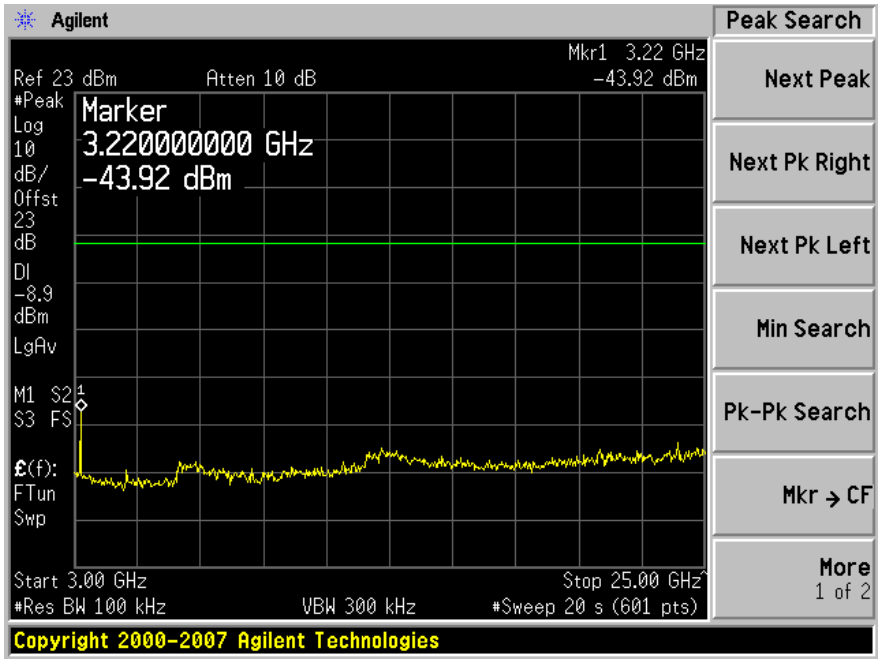




802.11 n 20 MHz (Antenna #0)

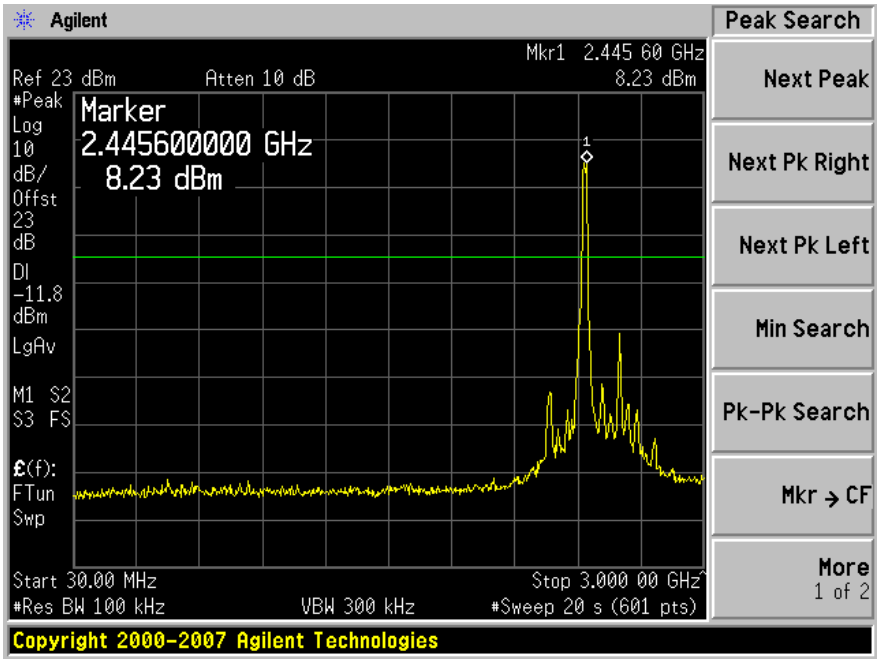
Low Channel 2412 MHz

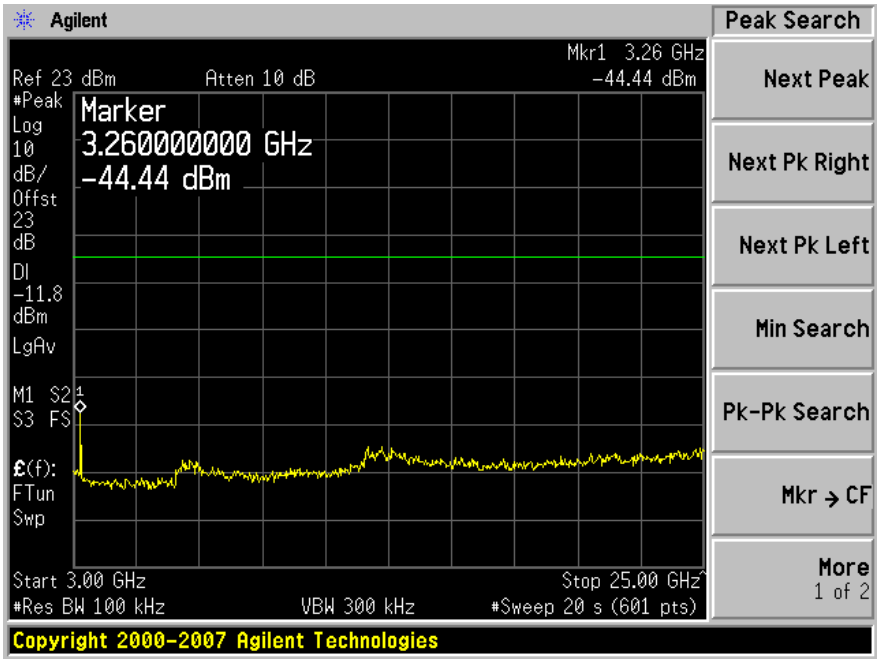




802.11 n 20 MHz (Antenna #0)

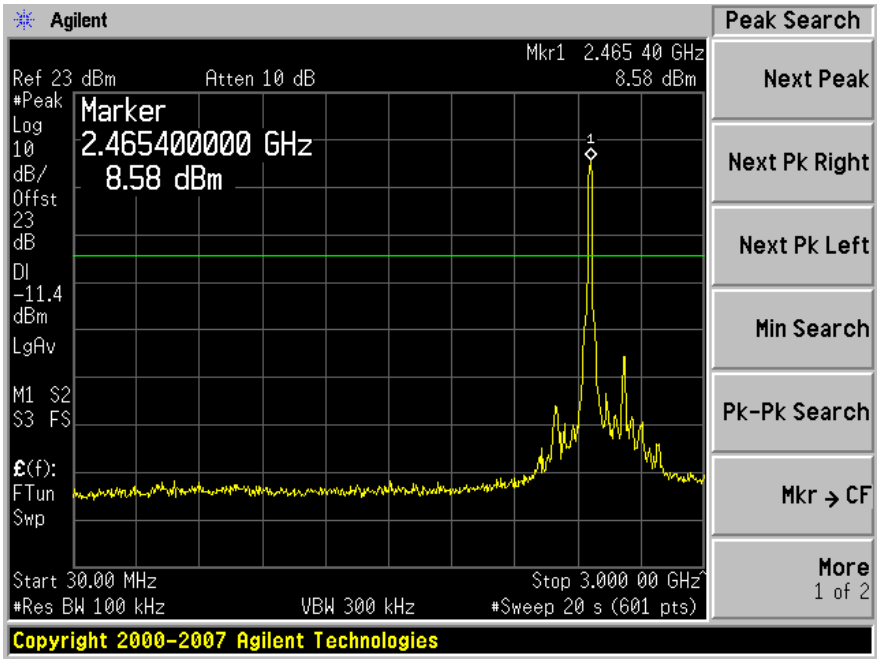
Middle Channel 2437 MHz

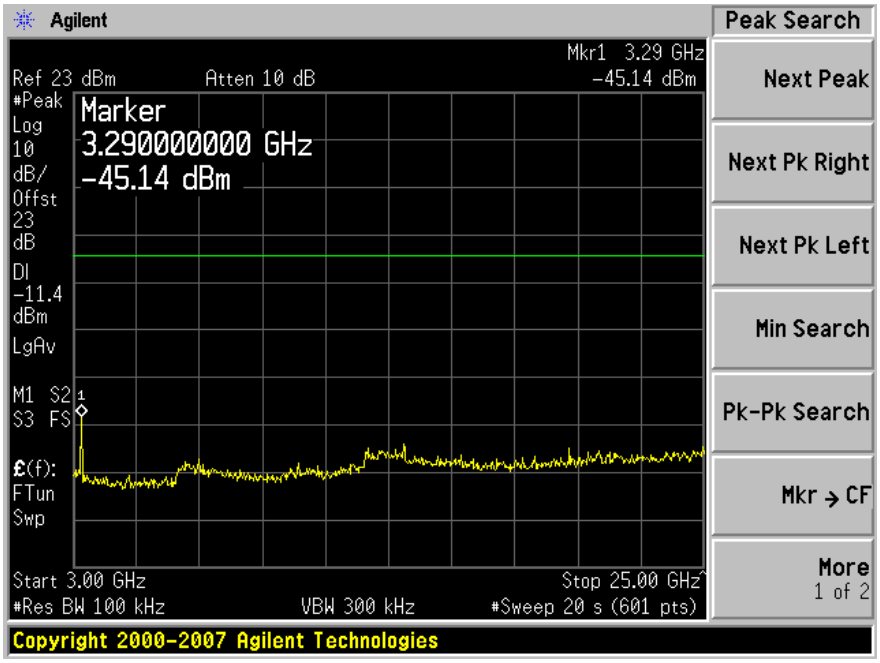




802.11 n 20 MHz (Antenna #0)

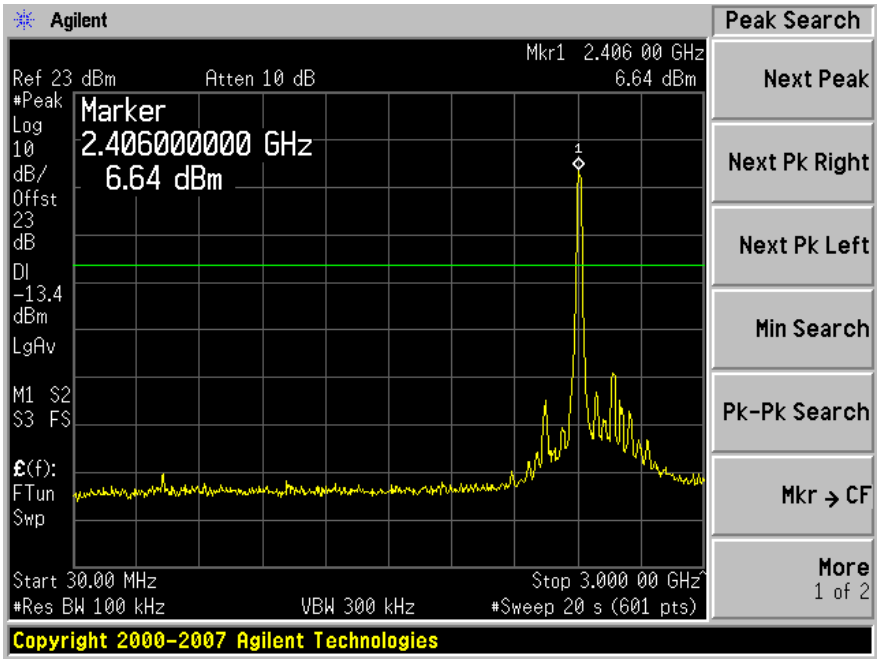
High Channel 2462 MHz

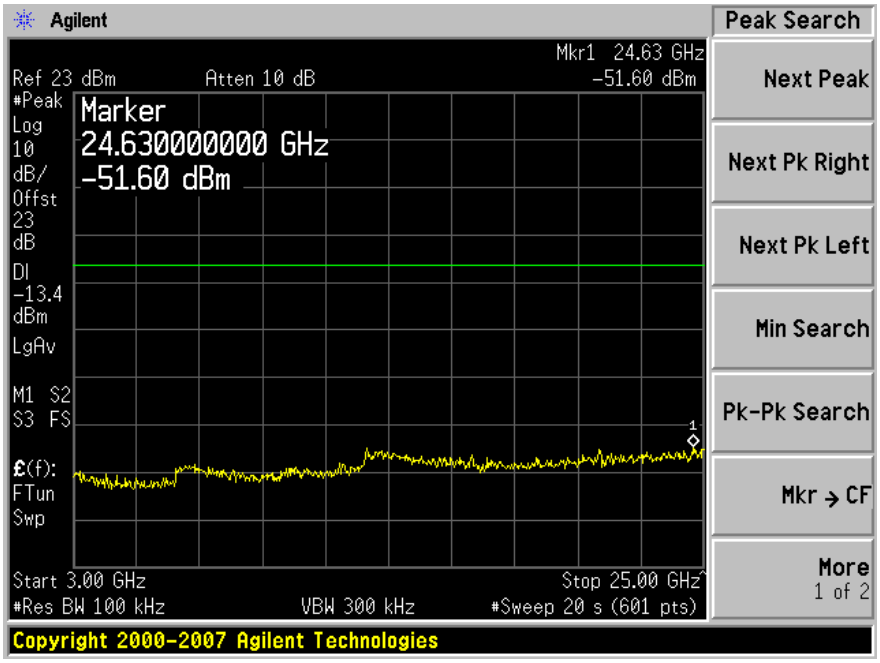




802.11 n 20 MHz (Antenna #1)

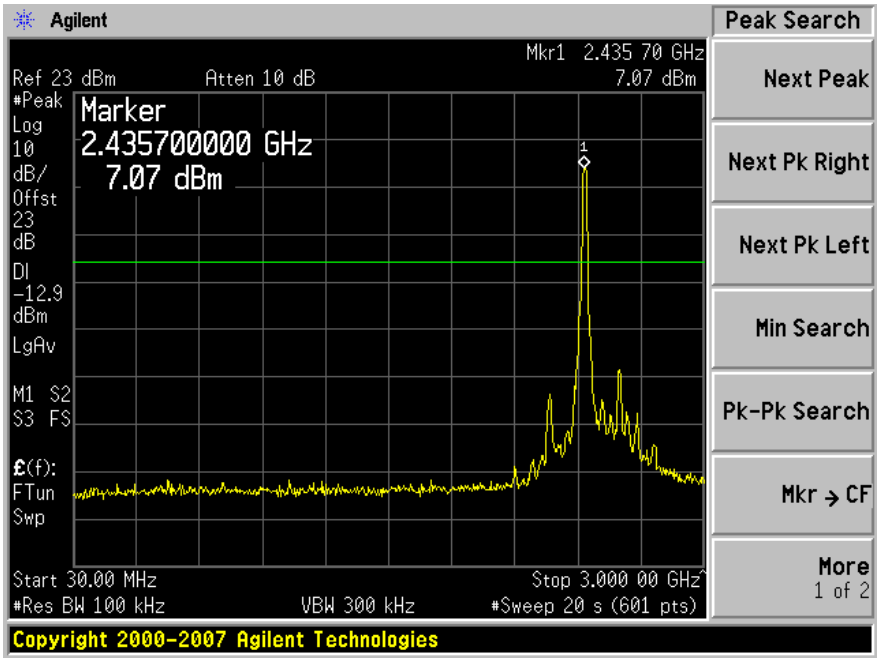
Low Channel 2412 MHz

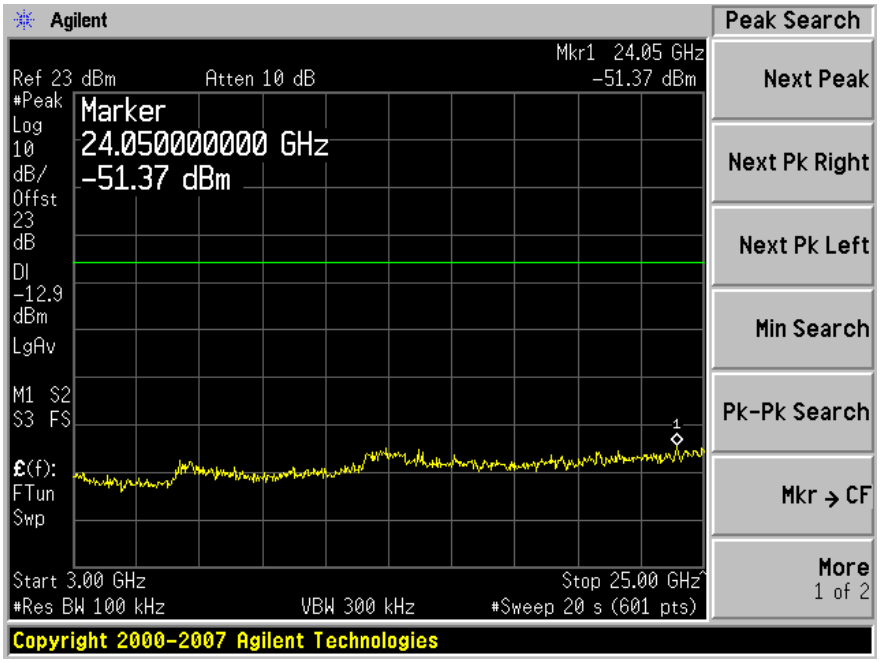




802.11 n 20 MHz (Antenna #1)

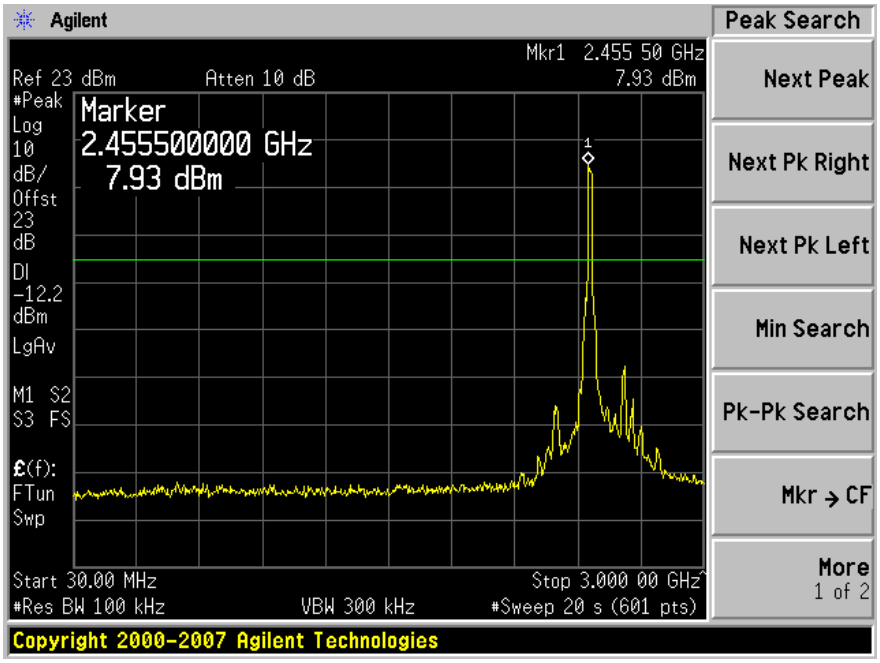
Middle Channel 2437 MHz

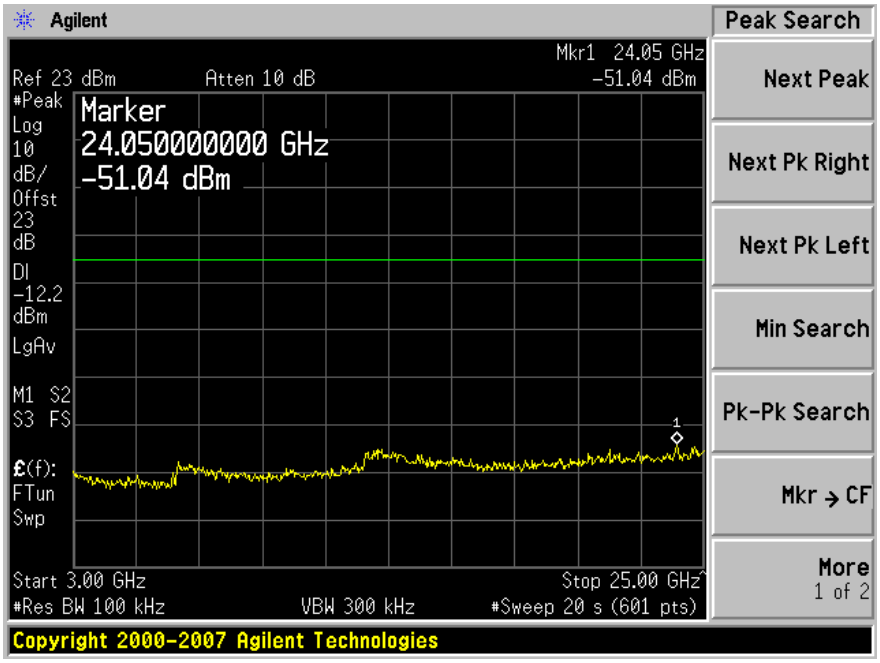




802.11 n 20 MHz (Antenna #1)

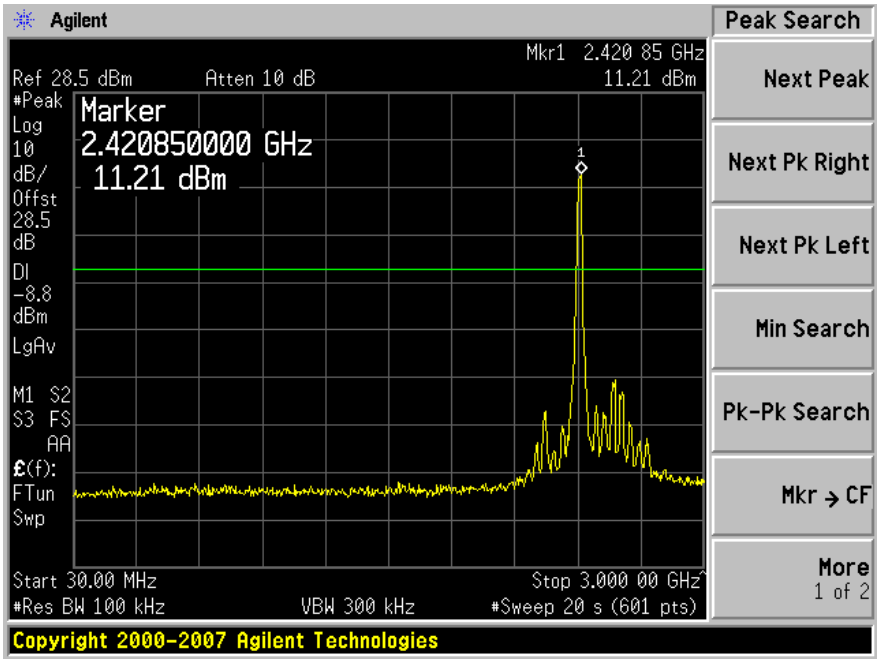
High Channel 2462 MHz

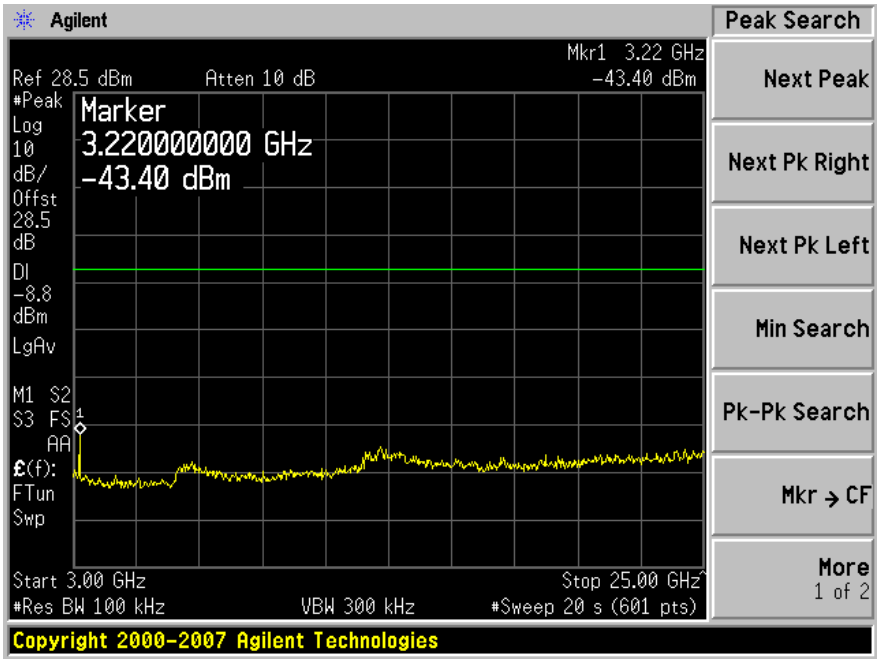




802.11 n 20 MHz (Antenna #0 + Antenna #1)

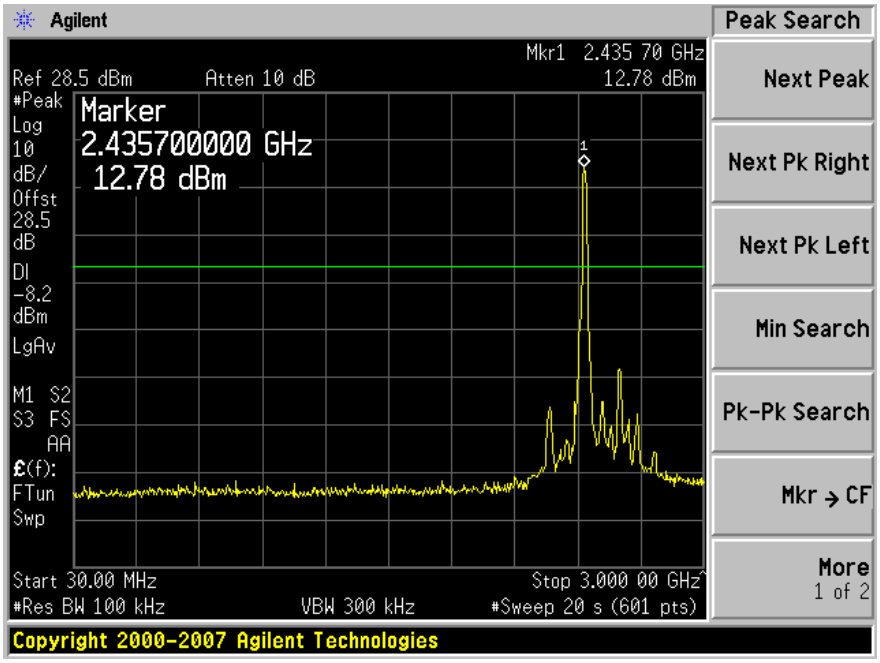
Low Channel 2412 MHz

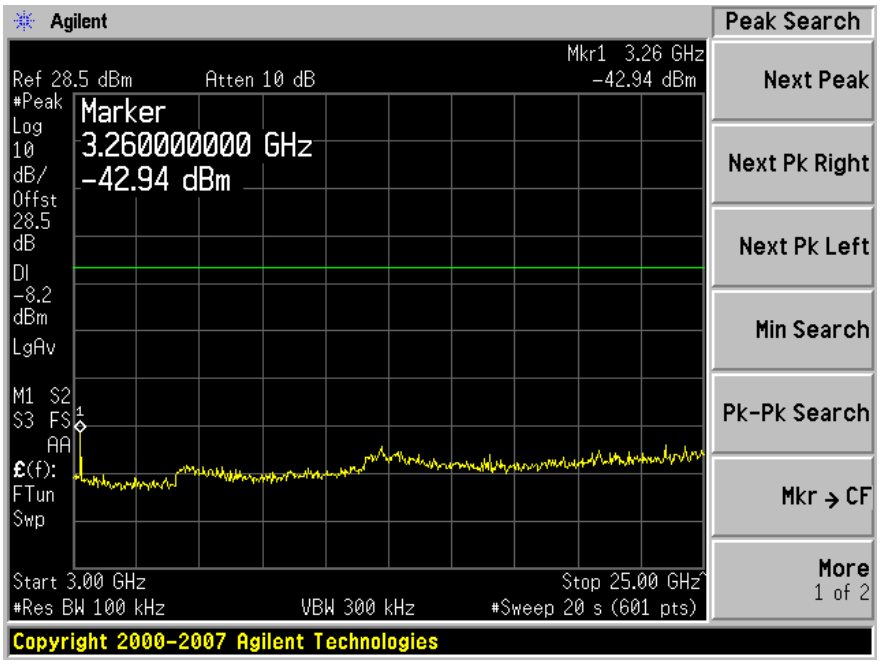




802.11 n 20 MHz (Antenna #0 + Antenna #1)

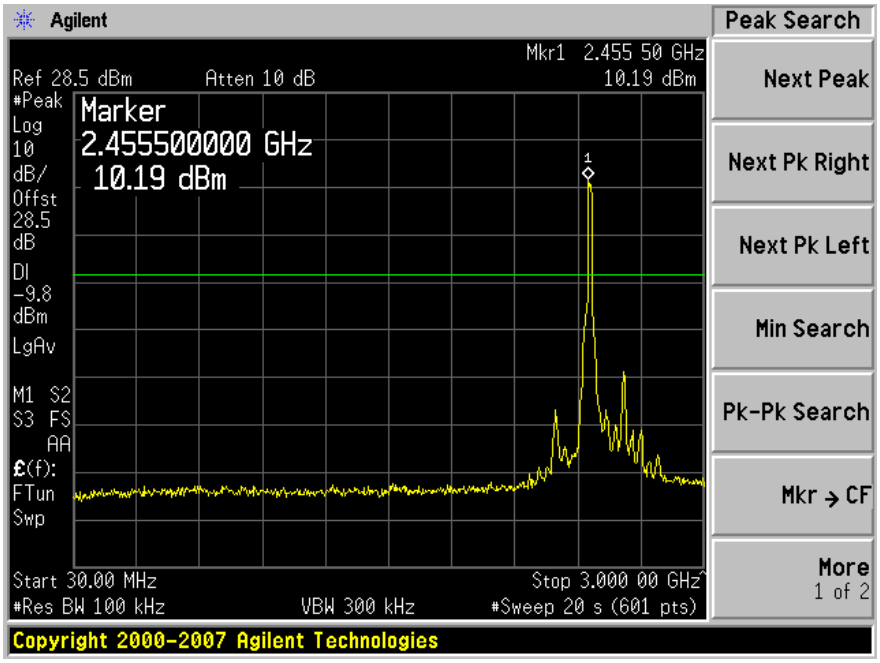
Middle Channel 2437 MHz

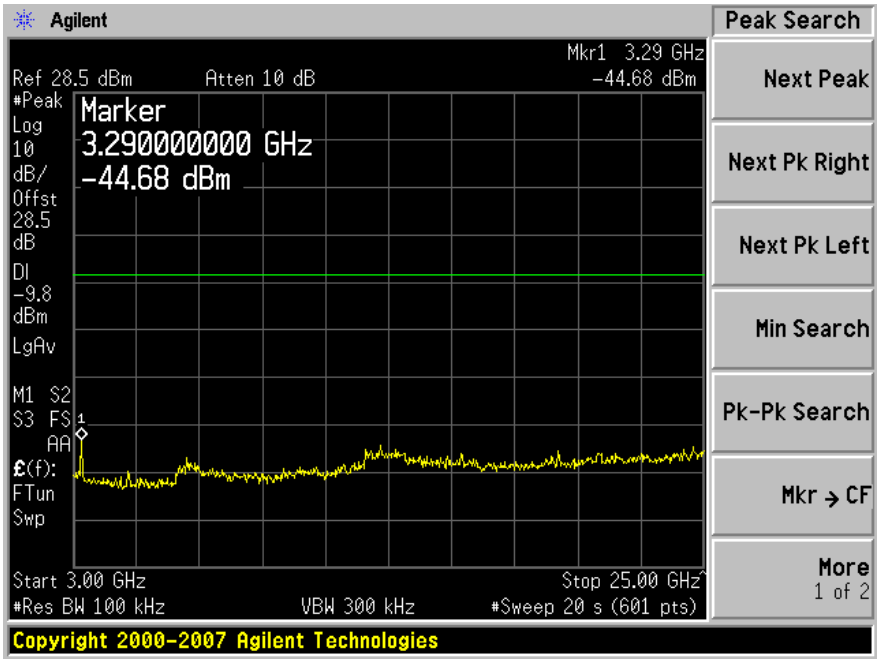




802.11 n 20 MHz (Antenna #0 + Antenna #1)

High Channel 2462 MHz





8 FCC §15.205, §15.209 & §15.247(d) - Spurious Radiated Emissions

8.1 Applicable Standard

As per 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 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.

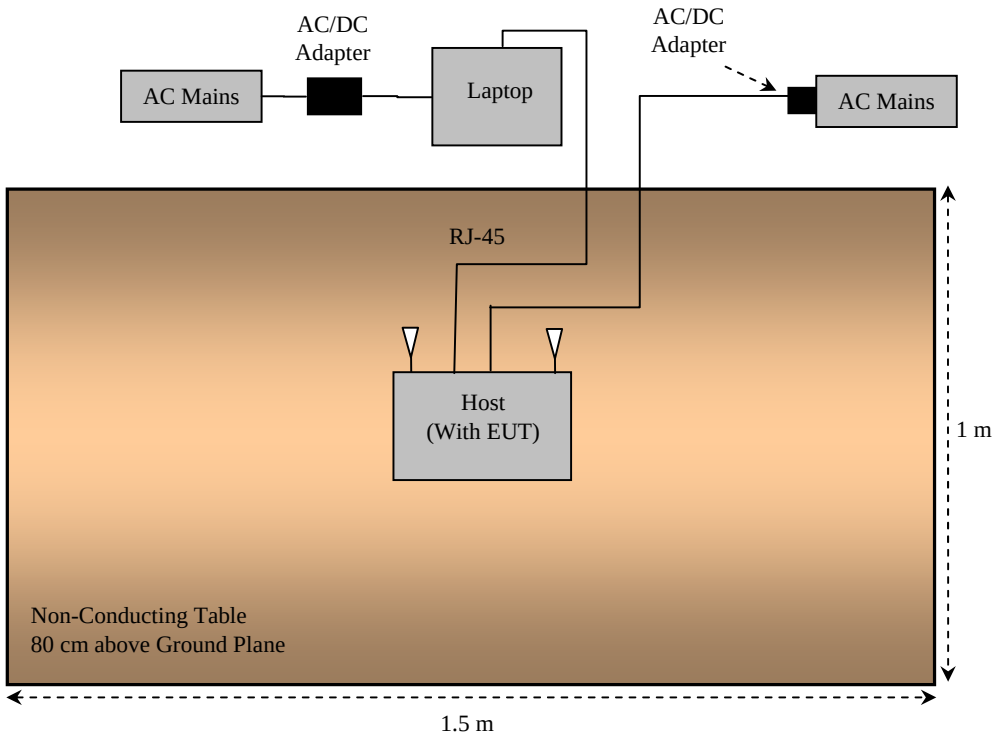
As Per 15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

f (MHz)	f (MHz)	f (MHz)	f (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 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)).

8.2 Test Setup and Diagram

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.



8.3 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.

8.4 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Documun	Pre amplifier	ALN-09173030-01	988251-0312	2009-03-04
HP	Pre amplifier	8447D	2944A06639	2009-06-05
Sunol Science Corp.	Combination Antenna	JB1 Antenna	A103105-3	2009-03-25
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-07-23
A.R.A.	Antenna, Horn	DRG-118/A	1132	2009-10-27

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

8.5 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

8.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna and Attenuator Factor, Cable Loss and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corrected Amplitude = Indicated Reading + Antenna Factor + Cable Loss + Attenuator Factor – Amplifier Gain

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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 for Class B. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Class B Limit

8.7 Test Environmental Conditions

Temperature:	15-20 °C
Relative Humidity:	43-45 %
ATM Pressure:	101-102kPa

**The testing was performed by Jack Liu from 2009-10-14 to 2009-10-26.*

8.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the limits presented in FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247, and had the worst margin of:

802.11 b Mode:

30-1000 MHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-3.51	166.6694	Vertical	High, 30 MHz – 1GHz

** All the Restricted Band Frequencies are more than 20 dB below the margin

Above 1 GHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-4.74	4824	Vertical	Low, 1GHz – 25GHz
-3.40	4874	Vertical	Mid, 1GHz – 25GHz
-7.67	4924	Vertical	High, 1GHz – 25GHz

802.11 g Mode:

30-1000 MHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-4.33	166.6853	Vertical	High, 30 MHz – 1GHz

** All the Restricted Band Frequencies are more than 20 dB below the margin

Above 1 GHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-9.87	4824	Vertical	Low, 1GHz – 25GHz
-11.00	4874	Vertical	Mid, 1GHz – 25GHz
-14.60	4924	Vertical	High, 1GHz – 25GHz

802.11 n 20 MHz Mode:

30-1000 MHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-3.71	249.9438	Horizontal	High, 30 MHz – 1GHz

** All the Restricted Band Frequencies are more than 20 dB below the margin

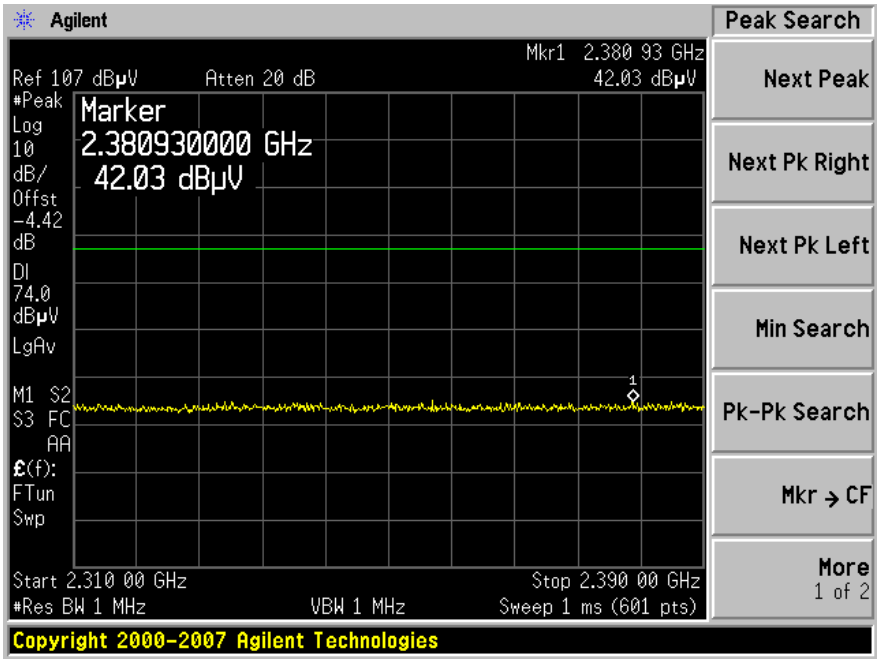
Above 1 GHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-11.50	4824	Vertical	Low, 1GHz – 25GHz
-12.14	4874	Vertical	Mid, 1GHz – 25GHz
-12.70	4924	Vertical	High, 1GHz – 25GHz

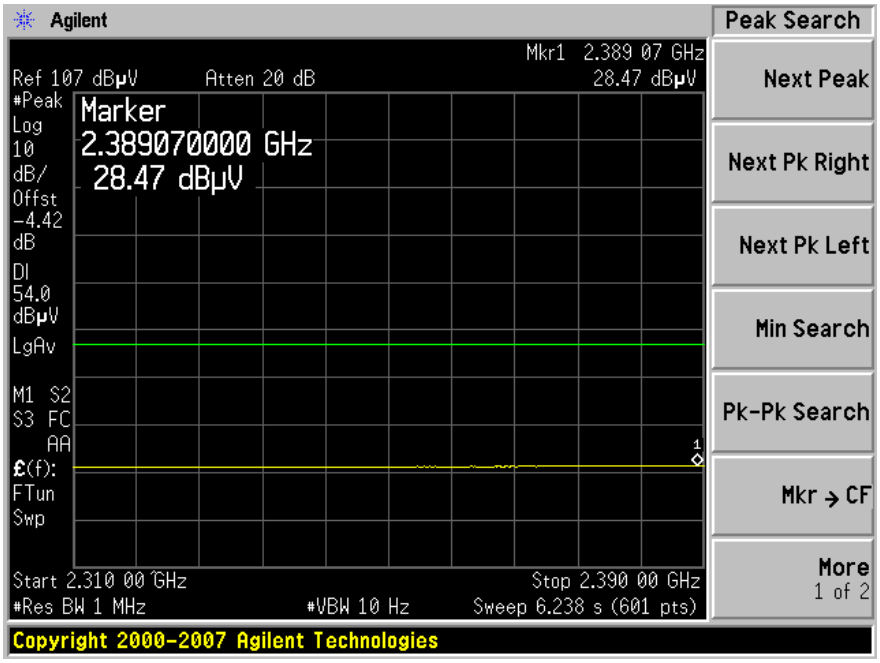
Band Edge Emissions

802.11 b Mode:

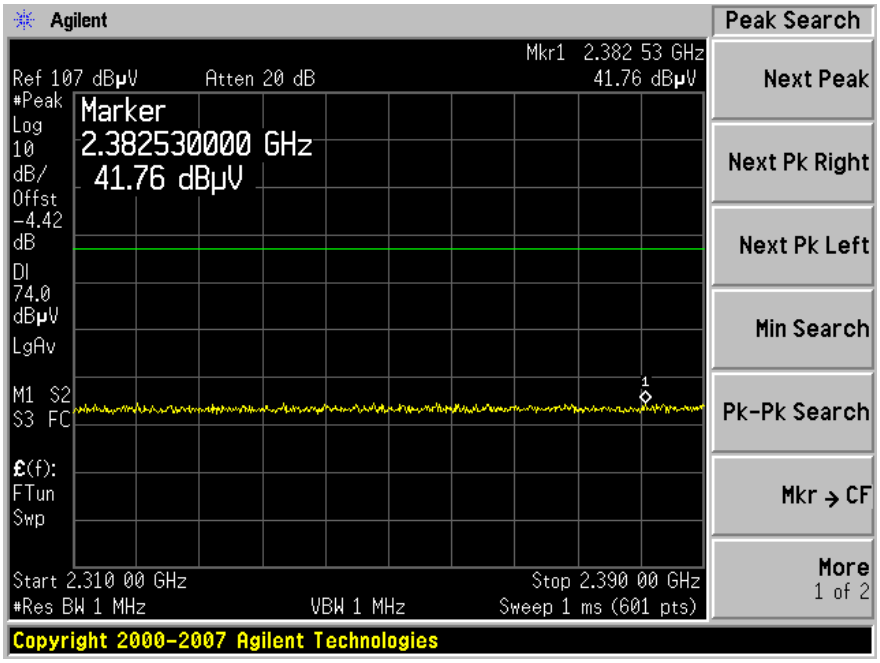
Lowest Channel at Horizontal, Peak



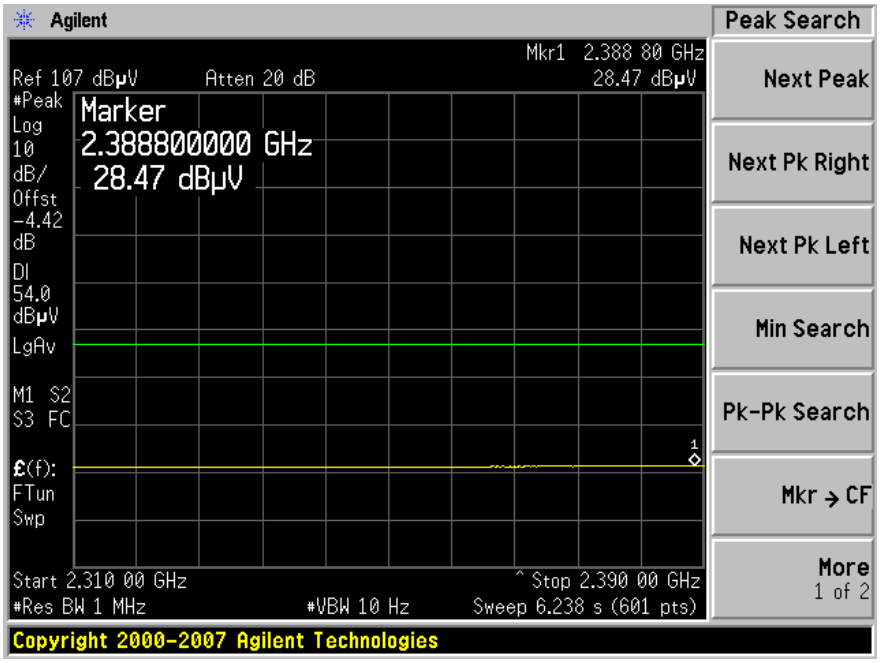
Lowest Channel at Horizontal, Average



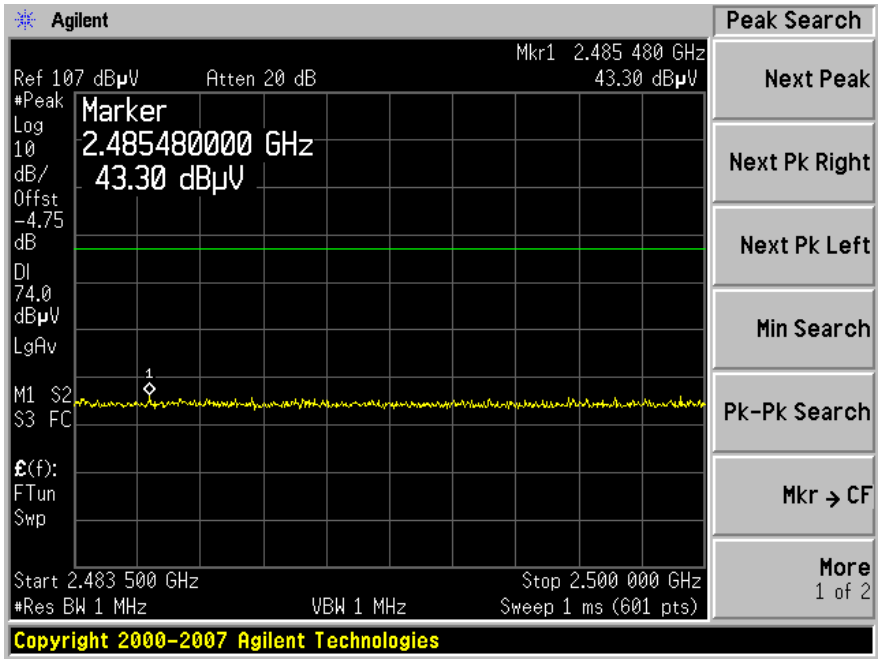
Lowest Channel at Vertical, Peak



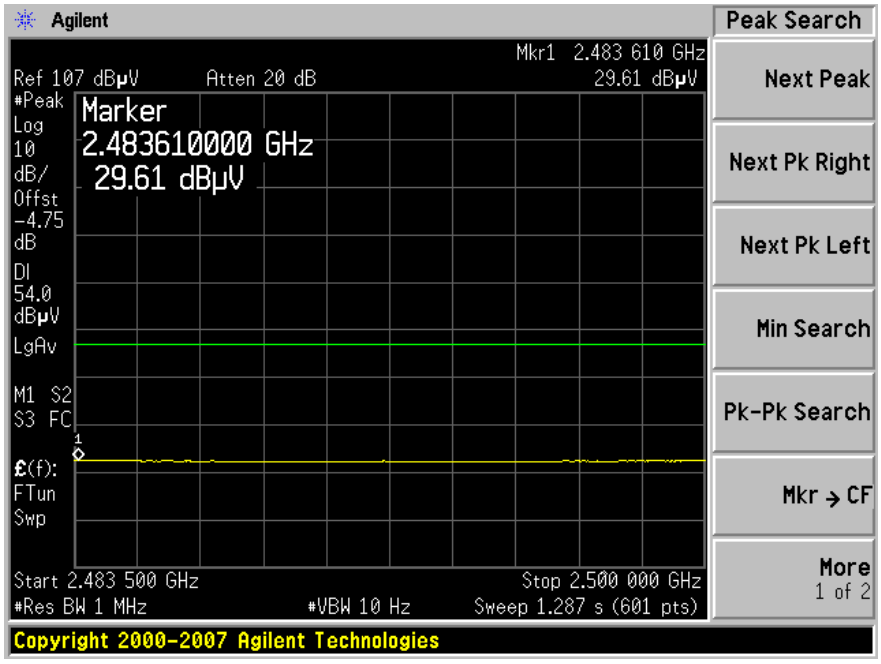
Lowest Channel at Vertical, Average



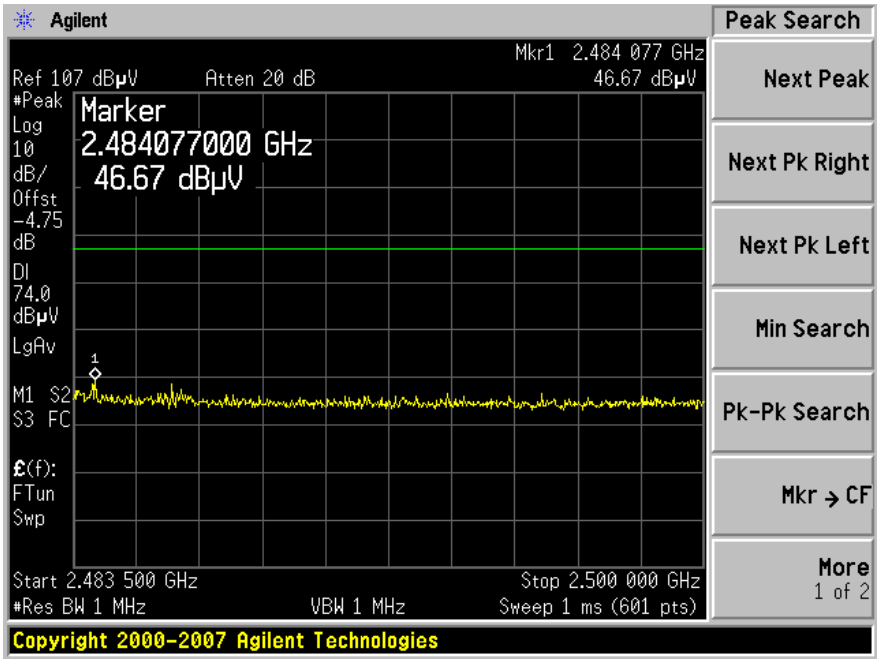
Highest Channel at Horizontal, Peak



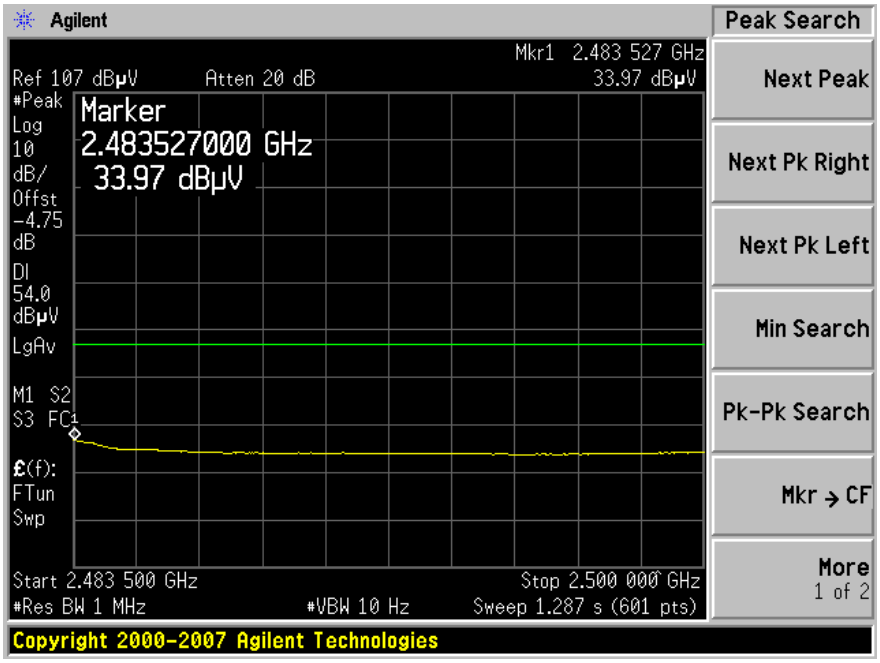
Highest Cannel at Horizontal, Average



Highest Channel at Vertical, Peak

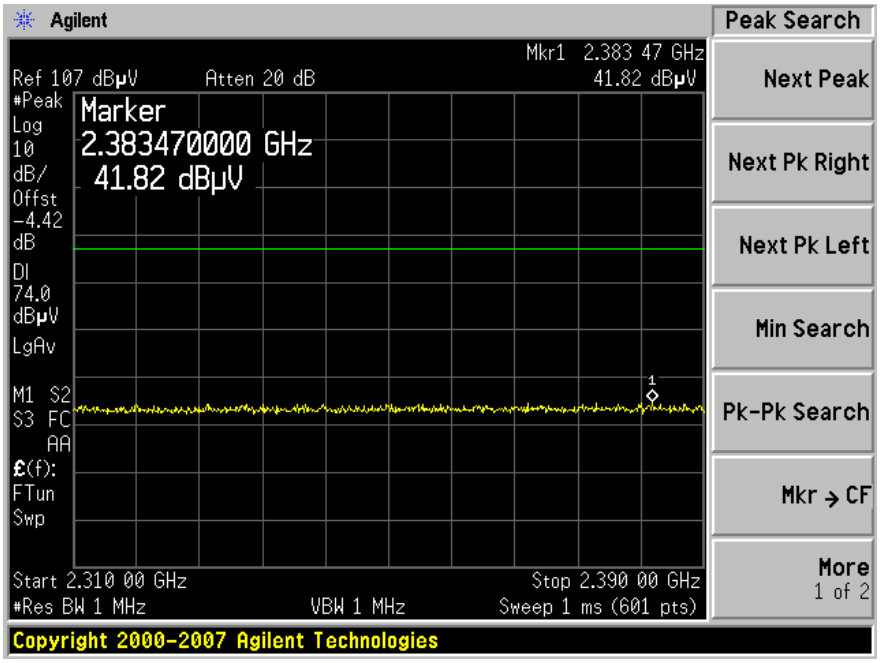


Highest Channel at Vertical, Average

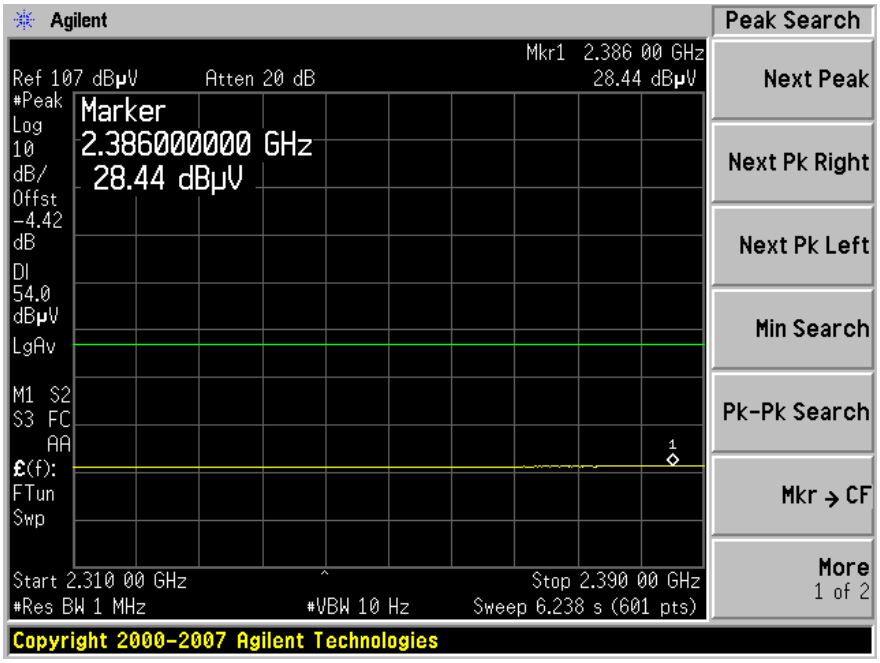


802.11 g Mode:

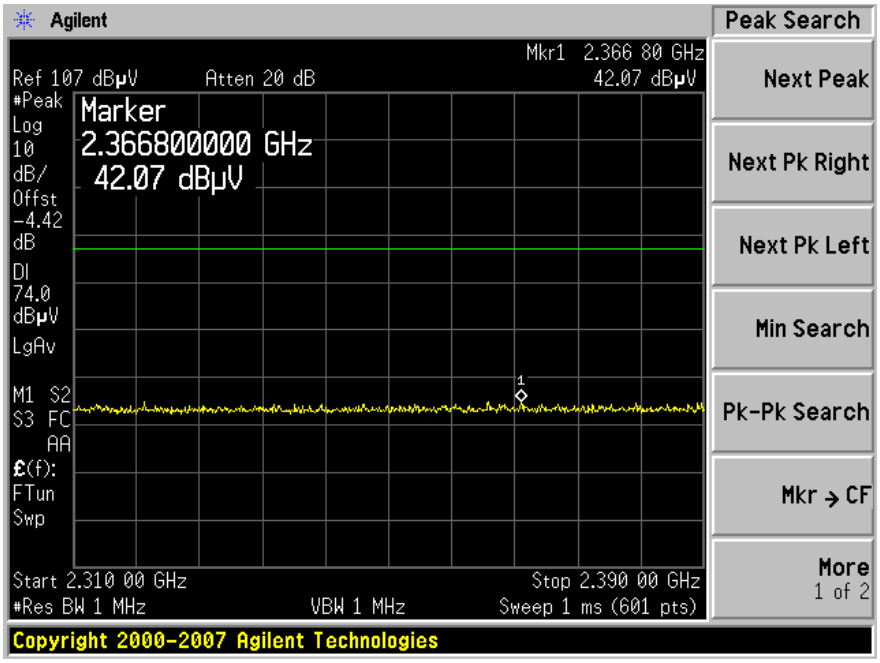
Lowest Channel at Horizontal, Peak



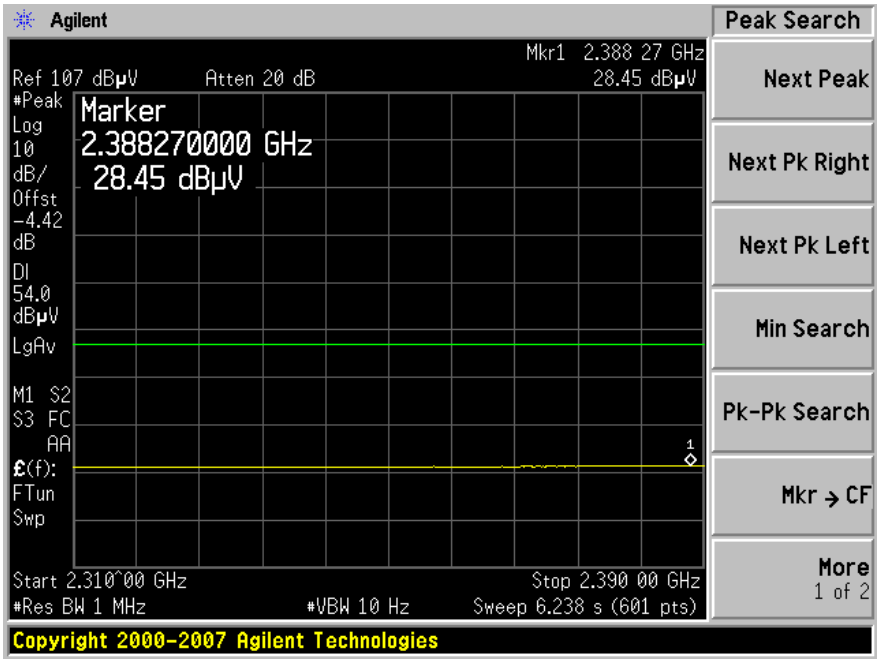
Lowest Channel at Horizontal, Average



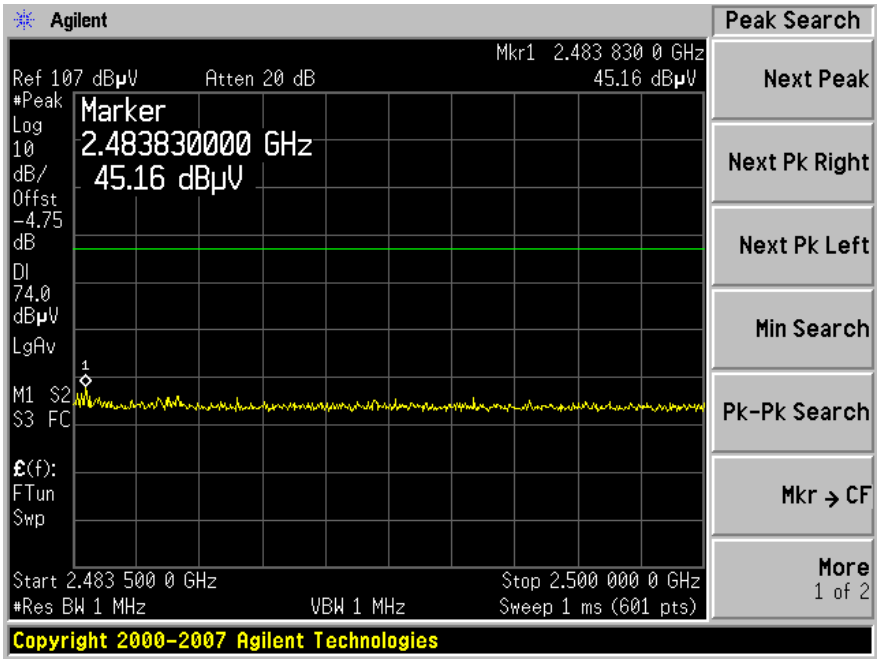
Lowest Channel at Vertical, Peak



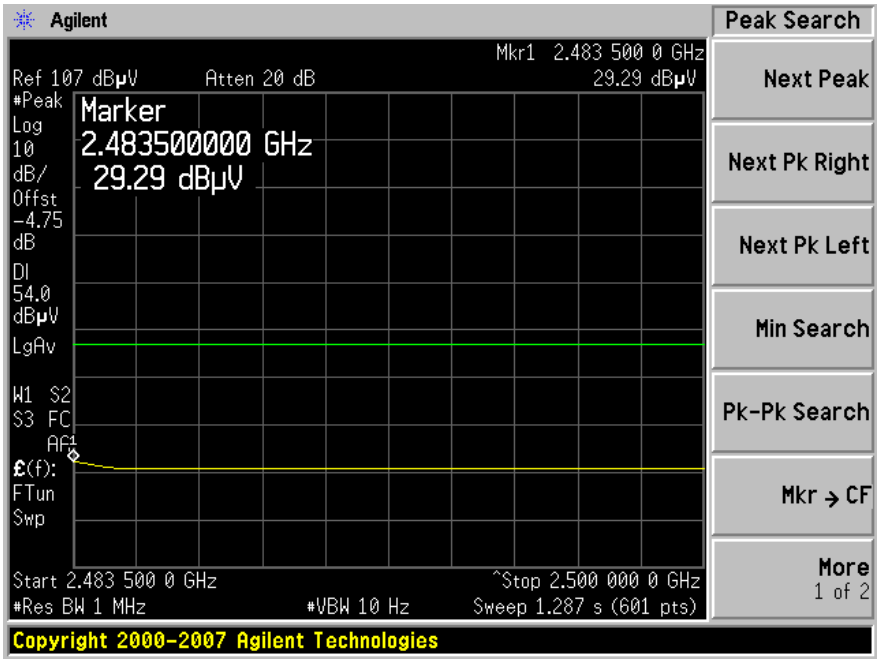
Lowest Channel at Vertical, Average



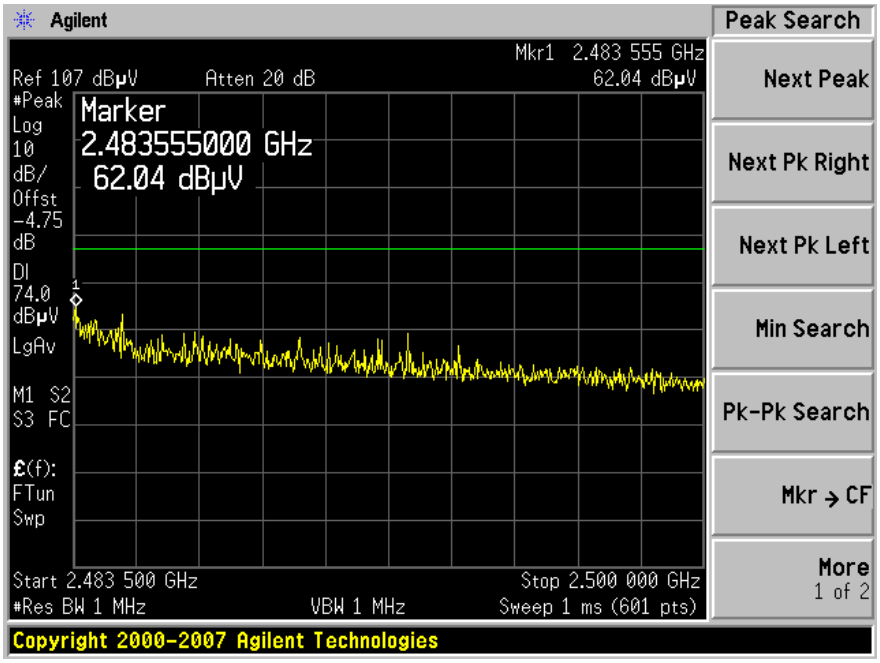
Highest Channel at Horizontal, Peak



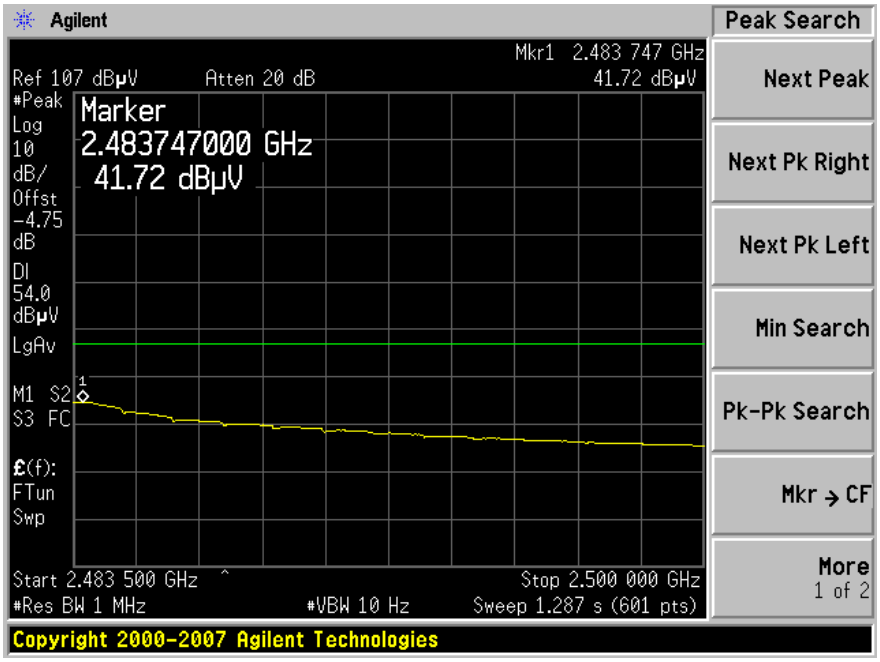
Highest Channel at Horizontal, Average



Highest Channel at Vertical, Peak

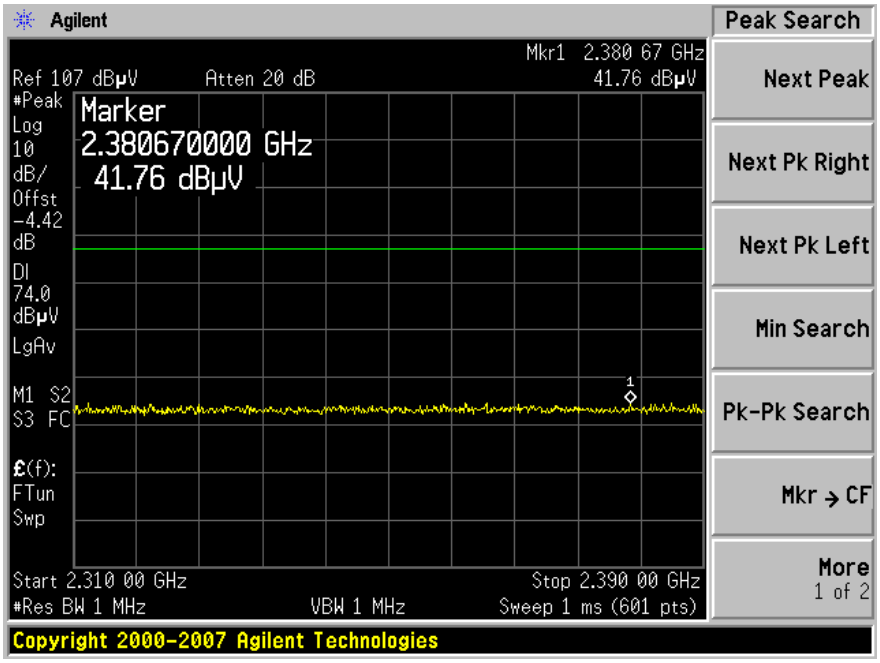


Highest Channel at Vertical, Average

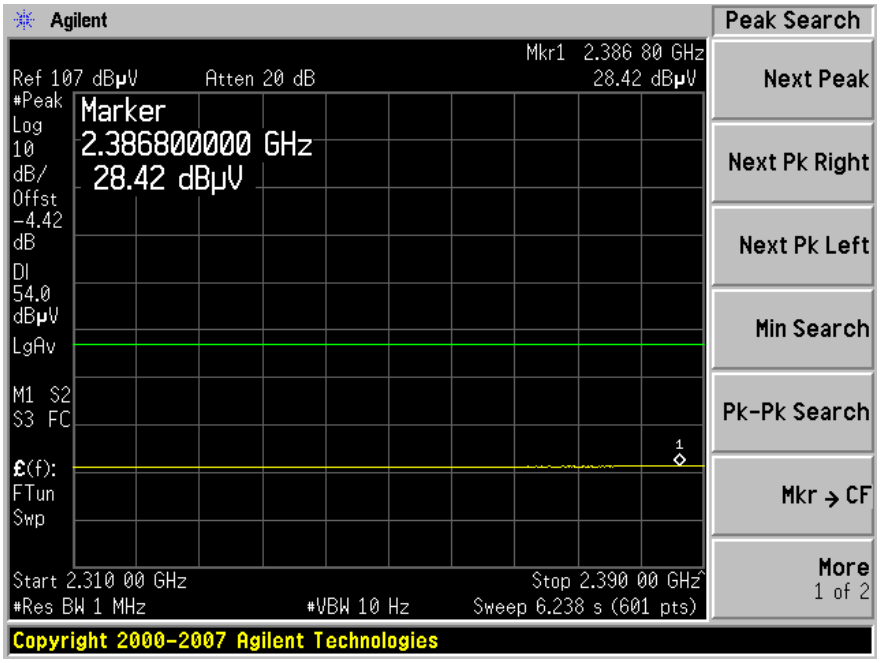


802.11 n 20 MHz Mode:

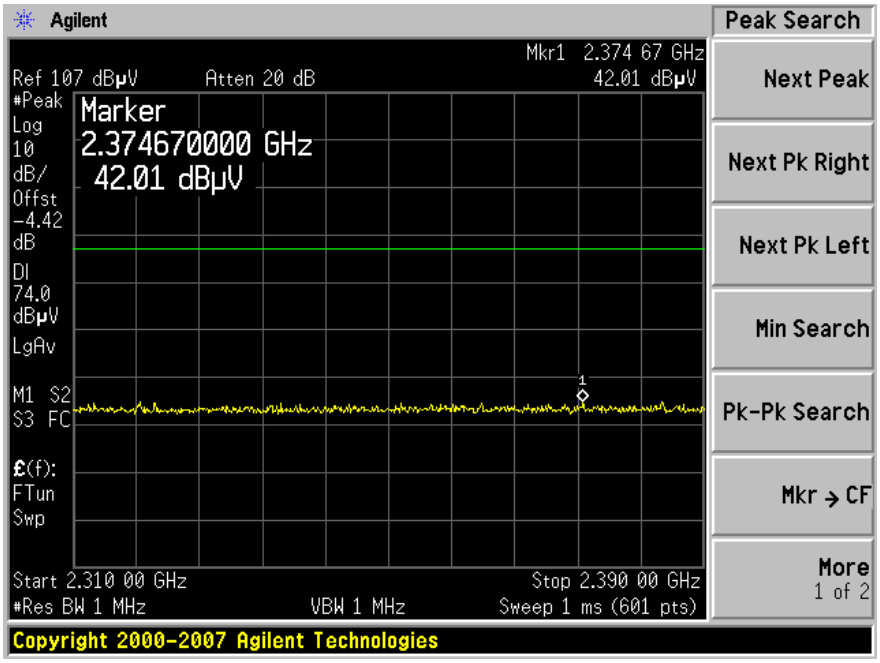
Lowest Channel at Horizontal, Peak



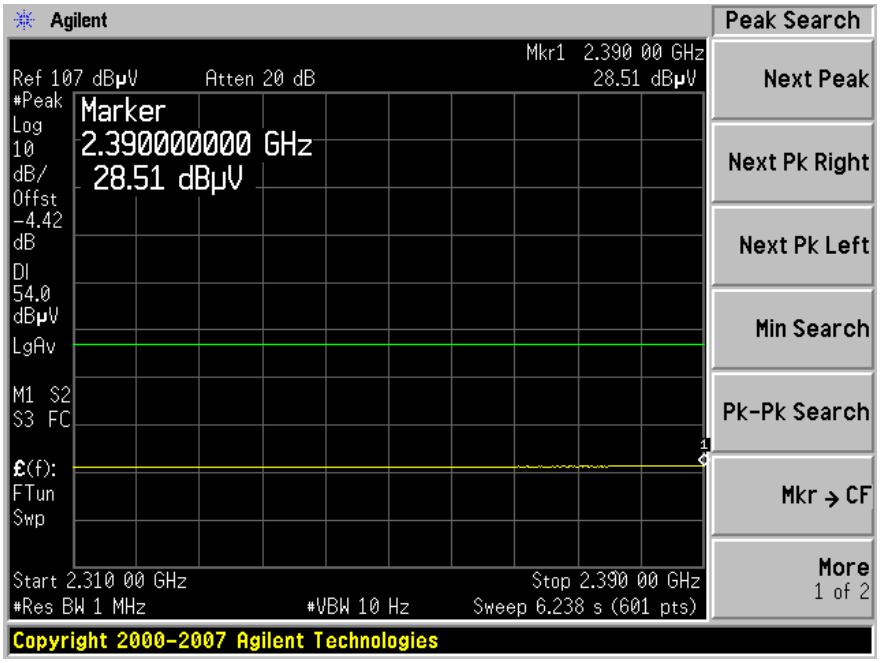
Lowest Channel at Horizontal, Average



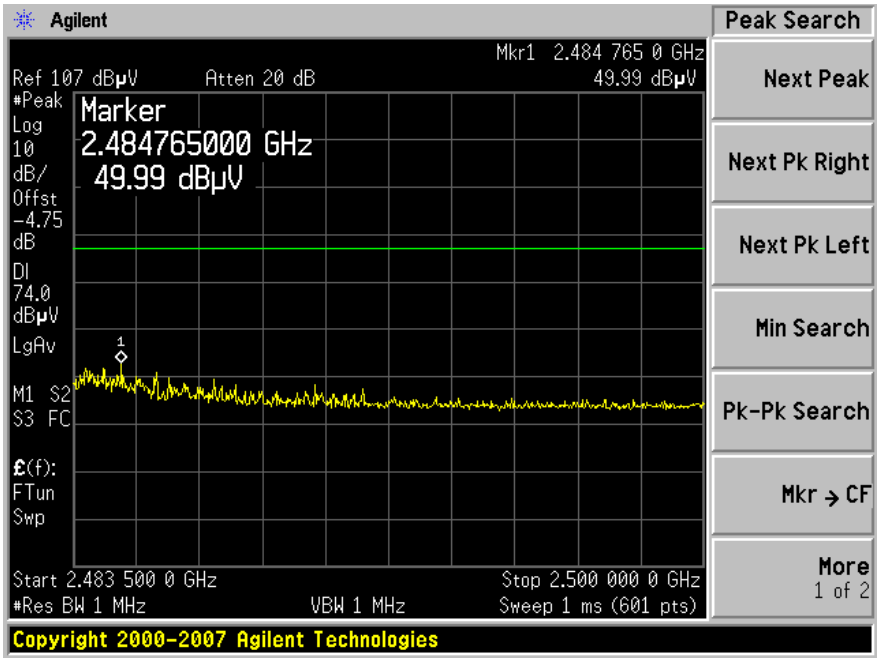
Lowest Channel at Vertical, Peak



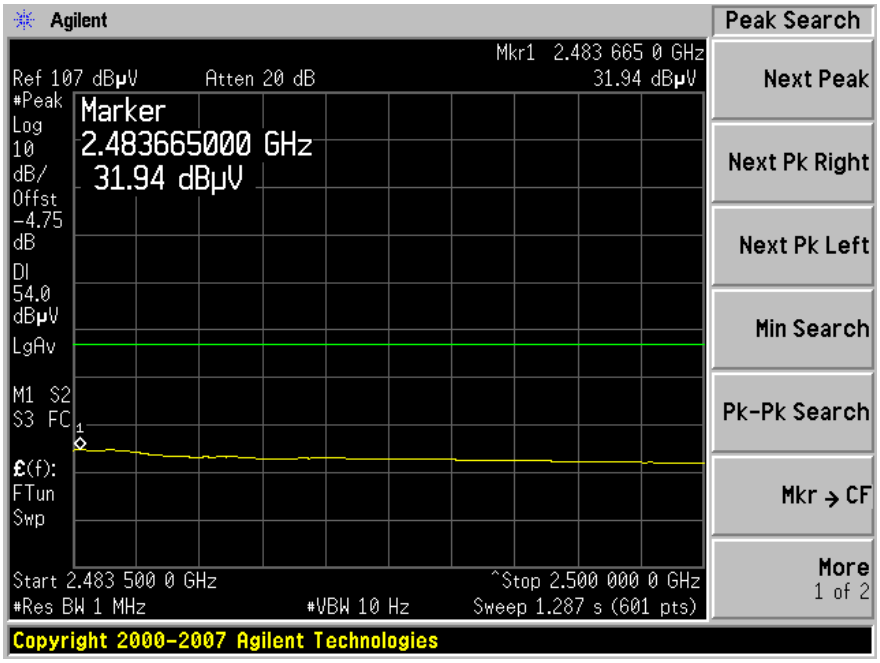
Lowest Channel at Vertical, Average



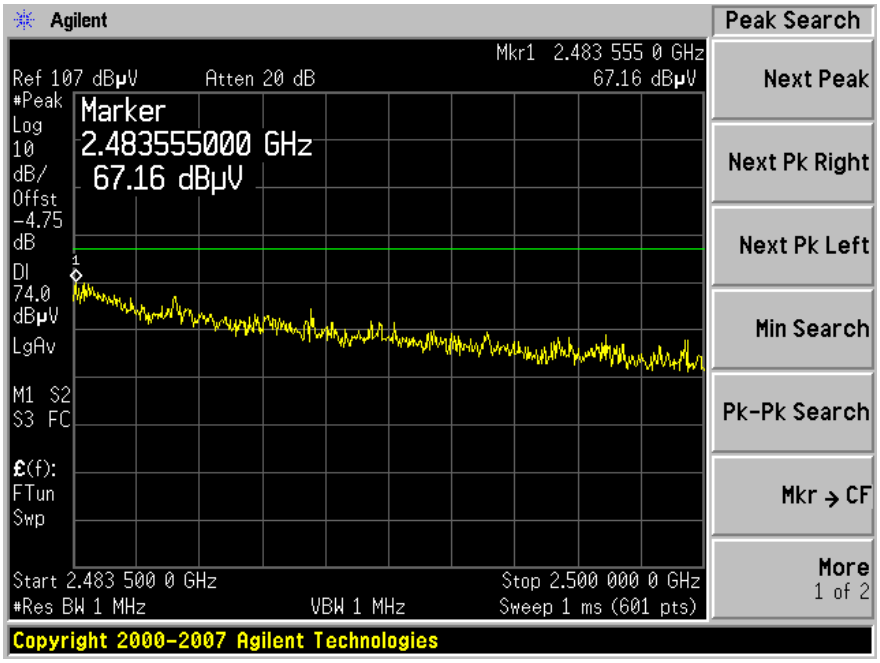
Highest Channel at Horizontal, Peak



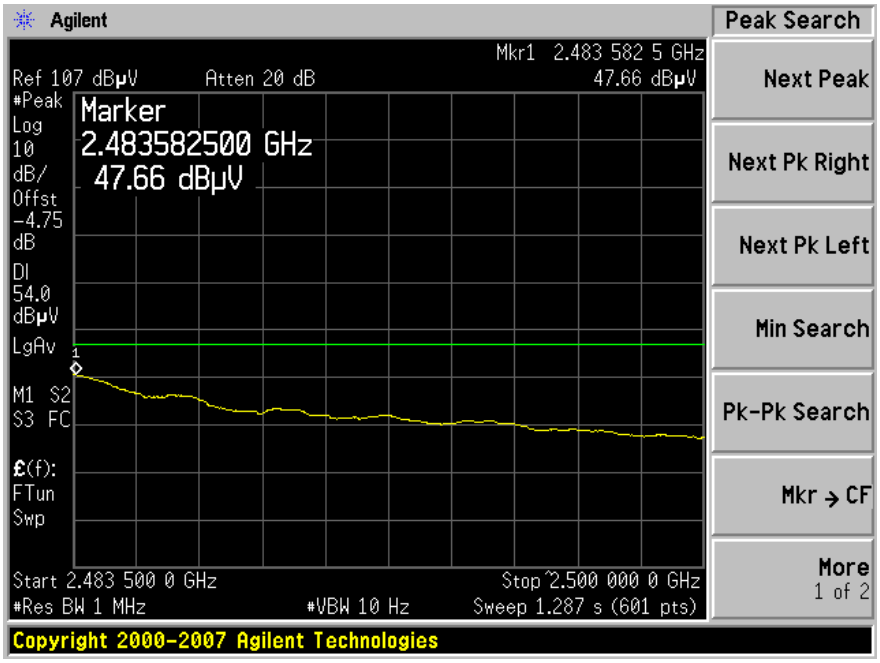
Highest Channel at Horizontal, Average



Highest Channel at Vertical, Peak



Highest Channel at Vertical, Average



8.9 Radiated Emissions Test Data:

802.11b Mode:

30 MHz – 1000 MHz: Worst Case, High Channel 2462 MHz, measured at 3 meters

Frequency (MHz)	Cord. Amp. (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degree)	Limit (dBµV/m)	Margin (dB)
166.6694	39.99	98	V	279	43.5	-3.51
400.0056	37.72	106	V	199	46.5	-8.78
960.0306	44.46	101	H	282	54.0	-9.54
319.9998	34.11	144	H	46	46.5	-12.39
274.2708	31.18	103	H	170	46.5	-15.32
332.6664	28.49	120	V	98	46.5	-18.01

Above 1 GHz:

802.11 b, Low Channel 2412 MHz, measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dBµV/m)	Part 15C		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
4824	43.27	200	150	V	33.1	9.79	36.9	49.26	54	-4.74	Ave
4824	37.98	113	120	H	33.1	9.79	36.9	43.97	54	-10.03	Ave
4824	50.13	200	150	V	33.1	9.79	36.9	56.12	74	-17.88	Peak
4824	49.33	113	120	H	33.1	9.79	36.9	55.32	74	-18.68	Peak

802.11 b, Middle channel 2437 MHz, measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dBµV/m)	Part 15C		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
4874	44.65	215	135	V	33.1	9.75	36.9	50.6	54	-3.4	Ave
4874	34.35	130	122	H	33.1	9.75	36.9	40.3	54	-13.7	Ave
4874	51.23	215	135	V	33.1	9.75	36.9	57.18	74	-16.82	Peak
4874	49.25	130	122	H	33.1	9.75	36.9	55.2	74	-18.8	Peak

802.11 b, High channel 2462 MHz measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dBµV/m)	Part 15C		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
4924	40.38	210	160	V	33.1	9.75	36.9	46.33	54	-7.67	Ave
4924	38.95	170	130	H	33.1	9.75	36.9	44.9	54	-9.1	Ave
4924	50.11	210	160	V	33.1	9.75	36.9	56.06	74	-17.94	Peak
4924	48.31	170	130	H	33.1	9.75	36.9	54.26	74	-19.74	Peak

802.11 g Mode:

30 MHz – 1000 MHz: Worst Case, High Low Channel 2462 MHz, measured at 3 meters

Frequency (MHz)	Cord. Amp. (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degree)	Limit (dBµV/m)	Margin (dB)
166.6853	39.17	98	V	258	43.5	-4.33
1000.000	45.58	110	V	124	54.0	-8.42
400.0176	37.39	101	V	183	46.5	-9.11
266.6714	29.54	139	H	42	46.5	-16.96
333.3501	28.22	121	H	40	46.5	-18.28

Above 1 GHz:

802.11 g, Low Channel 2412 MHz, measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dBµV/m)	Part 15C		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
4824	38.14	230	154	V	33.1	9.79	36.9	44.13	54	-9.87	Ave
4824	35.33	154	133	H	33.1	9.79	36.9	41.32	54	-12.68	Ave
4824	51.45	230	154	V	33.1	9.79	36.9	57.44	74	-16.56	Peak
4824	49.29	154	133	H	33.1	9.79	36.9	55.28	74	-18.72	Peak

802.11 g, Middle channel 2437 MHz measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dBµV/m)	Part 15C		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
4874	37.05	222	154	V	33.1	9.75	36.9	43.00	54	-11.00	Ave
4874	35.64	151	152	H	33.1	9.75	36.9	41.59	54	-12.41	Ave
4874	51.33	222	154	V	33.1	9.75	36.9	57.28	74	-16.72	Peak
4874	49.31	151	152	H	33.1	9.75	36.9	55.26	74	-18.74	Peak

802.11 g, High channel 2462 MHz measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dBµV/m)	Part 15C		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
4924	33.45	220	154	V	33.1	9.75	36.9	39.40	54	-14.60	Ave
4924	33.64	154	142	H	33.1	9.75	36.9	39.59	54	-14.41	Ave
4924	48.35	220	154	V	33.1	9.75	36.9	54.30	74	-19.70	Peak
4924	47.66	154	142	H	33.1	9.75	36.9	53.61	74	-20.39	Peak

802.11 n 20 MHz Mode:

30 MHz – 1000 MHz: Worst Case, High Low Channel 2462 MHz, measured at 3 meters

Frequency (MHz)	Cord. Amp. (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degree)	Limit (dBµV/m)	Margin (dB)
249.9438	42.79	124	H	135	46.5	-3.71
166.6606	38.04	113	V	301	43.5	-5.46
960.0188	46.06	98	H	113	54.0	-7.94
400.0092	37.53	98	V	203	46.5	-8.97
1000.000	44.12	98	V	92	54.0	-9.88
274.2905	29.22	114	H	161	46.5	-17.28

Above 1 GHz:

802.11 n 20 MHz, Low Channel 2412 MHz, measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dBµV/m)	Part 15C		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
4824	36.51	214	148	V	33.1	9.79	36.9	42.50	54	-11.50	Ave
4824	34.21	166	158	H	33.1	9.79	36.9	40.20	54	-13.80	Ave
4824	49.55	214	148	V	33.1	9.79	36.9	55.54	74	-18.46	Peak
4824	48.92	166	158	H	33.1	9.79	36.9	54.91	74	-19.09	Peak

802.11 n 20 MHz, Middle channel 2437 MHz measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dBµV/m)	Part 15C		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
4874	35.91	210	154	V	33.1	9.75	36.9	41.86	54	-12.14	Ave
4874	35.47	144	148	H	33.1	9.75	36.9	41.42	54	-12.58	Ave
4874	49.81	210	154	V	33.1	9.75	36.9	55.76	74	-18.24	Peak
4874	50.62	144	148	H	33.1	9.75	36.9	56.57	74	-17.43	Peak

802.11 n 20 MHz, High channel 2462 MHz measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dBµV/m)	Part 15C		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
4924	35.88	231	152	V	33.1	9.75	36.9	41.83	54	-12.17	Ave
4924	35.47	132	140	H	33.1	9.75	36.9	41.42	54	-12.58	Ave
4924	50.02	231	152	V	33.1	9.75	36.9	55.97	74	-18.03	Peak
4924	49.94	132	140	H	33.1	9.75	36.9	55.89	74	-18.11	Peak

9 FCC §15.247(a)(2) – 6 dB & 99% Bandwidth

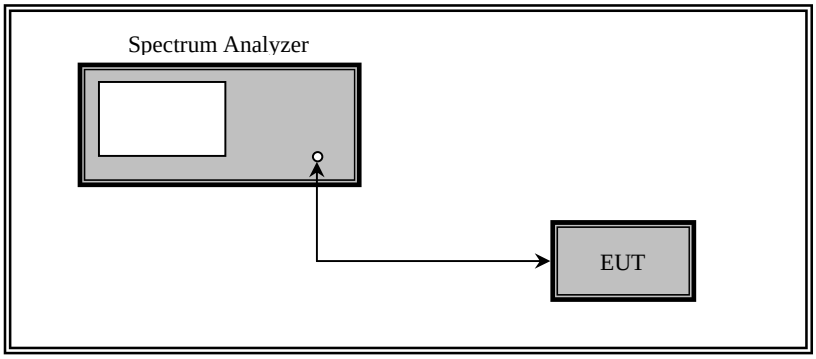
9.1 Applicable Standard

According to §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

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 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.

9.3 Test Setup Diagram



9.4 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-07-23

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

9.5 Test Environmental Conditions

Temperature:	15-20 °C
Relative Humidity:	43-45 %
ATM Pressure:	101-102kPa

**The testing was performed by Jack Liu from 2009-10-14 to 2009-10-26.*

9.6 Summary of Test Results

802.11 b Mode:

Antenna	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (kHz)	Results
Antenna #0	Low	2412	8.148	10.1211	> 500	Compliant
	Middle	2437	8.155	10.1668	> 500	Compliant
	High	2462	8.185	10.1275	> 500	Compliant
Antenna #1	Low	2412	8.076	10.1261	>500	Compliant
	Middle	2437	8.062	10.1474	>500	Compliant
	High	2462	7.437	10.1676	>500	Compliant

802.11 g Mode:

Antenna	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (kHz)	Results
Antenna #0	Low	2412	15.152	16.3367	> 500	Compliant
	Middle	2437	15.101	16.2530	> 500	Compliant
	High	2462	15.044	16.2554	> 500	Compliant
Antenna #1	Low	2412	15.513	16.3898	>500	Compliant
	Middle	2437	14.763	17.5139	>500	Compliant
	High	2462	16.517	17.5321	>500	Compliant

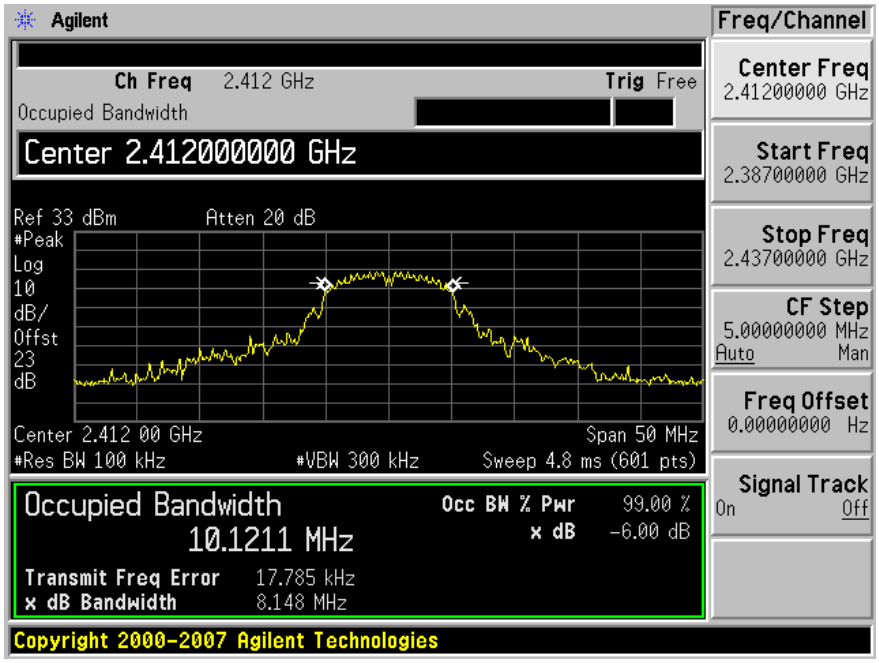
802.11 n 20 MHz Mode:

Antenna	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (kHz)	Results
Antenna #0	Low	2412	15.770	17.5440	> 500	Compliant
	Middle	2437	14.308	17.5119	> 500	Compliant
	High	2462	15.033	17.3699	> 500	Compliant
Antenna #1	Low	2412	17.391	17.5419	>500	Compliant
	Middle	2437	16.068	17.5312	>500	Compliant
	High	2462	15.052	17.4899	>500	Compliant

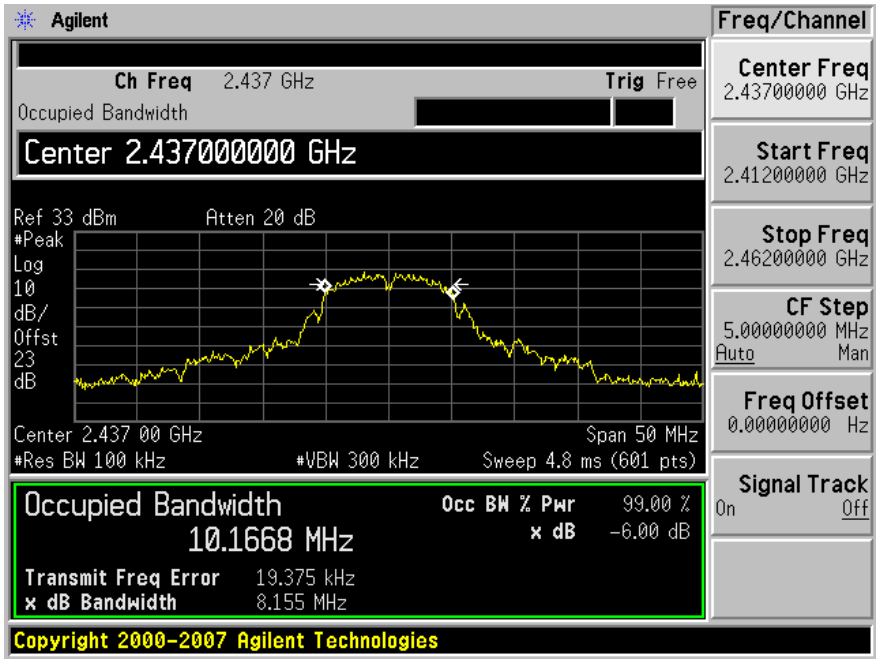
Please refer to the following plots for detailed test results

802.11 b (Antenna #0)

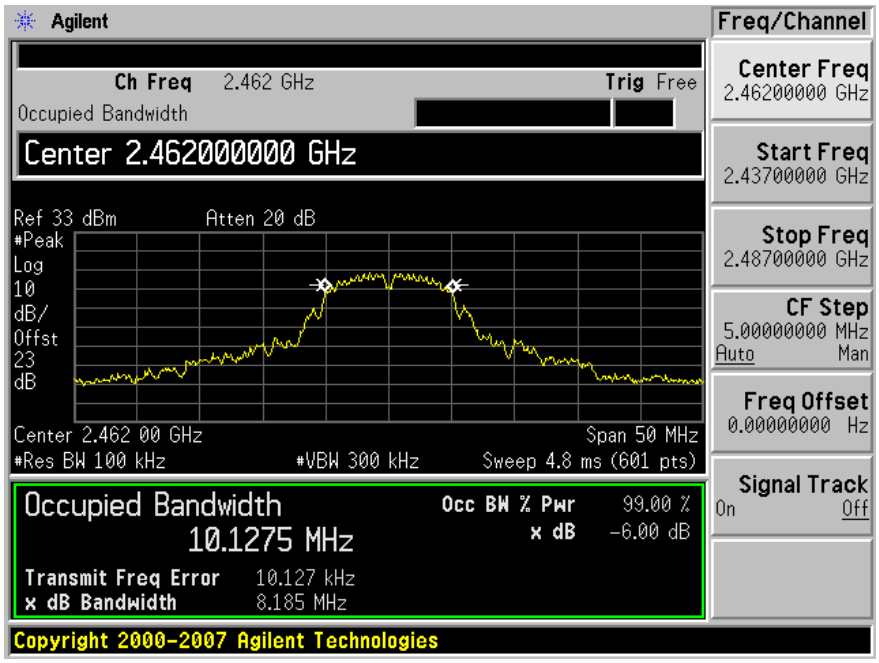
Low Channel 2412 MHz



Middle Channel 2437 MHz

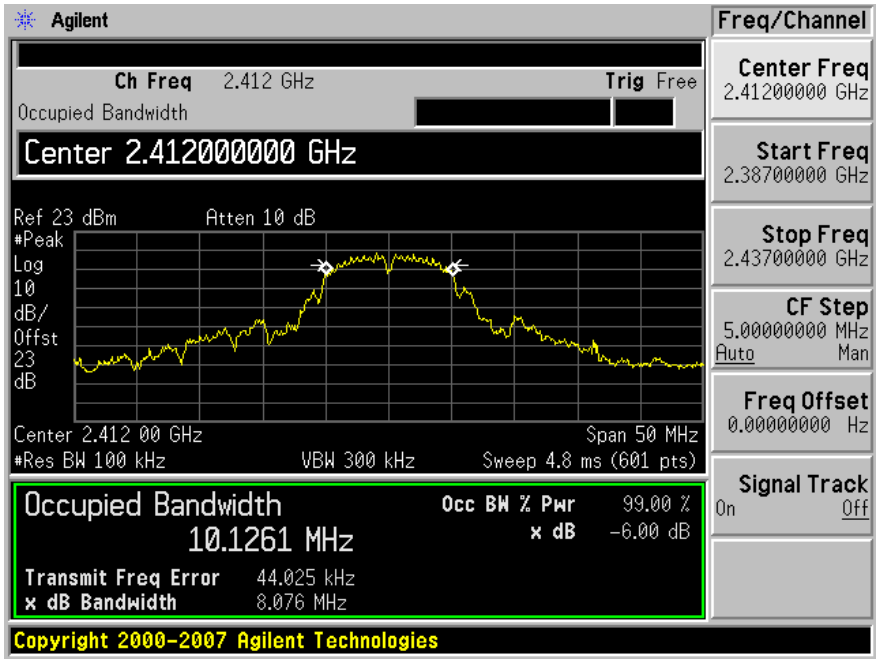


High Channel 2462 MHz

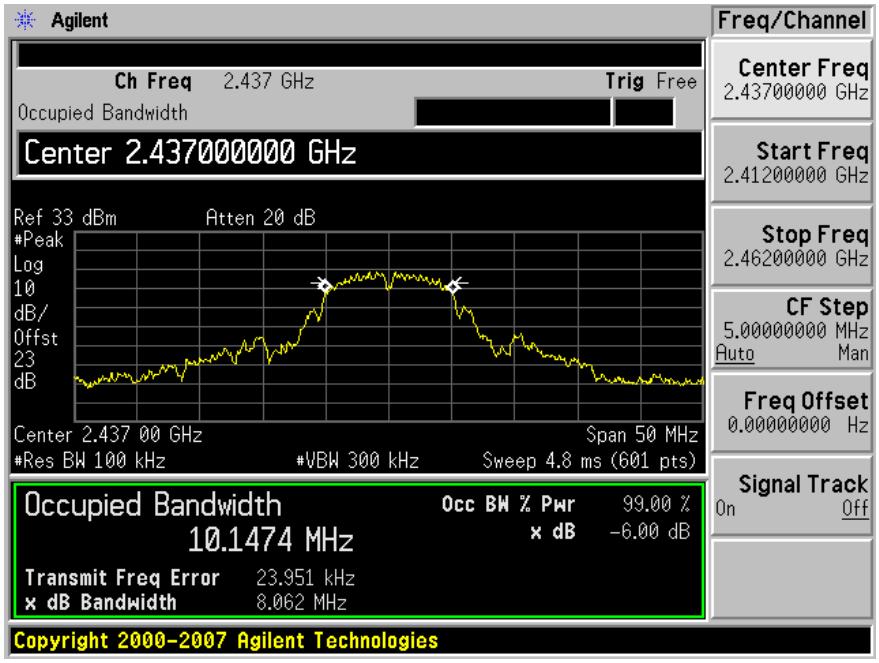


802.11 b (Antenna #1)

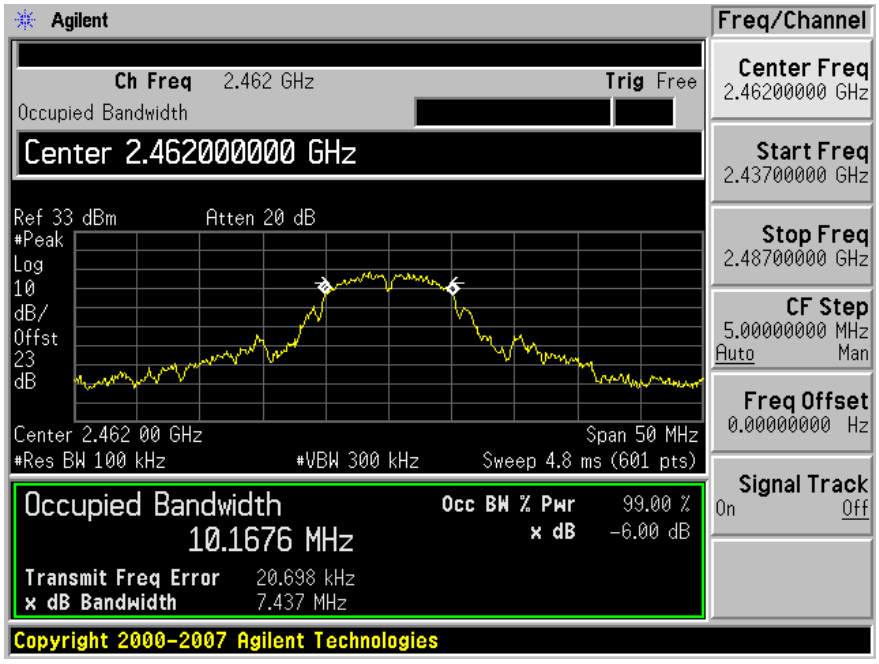
Low Channel 2412 MHz



Middle Channel 2437 MHz

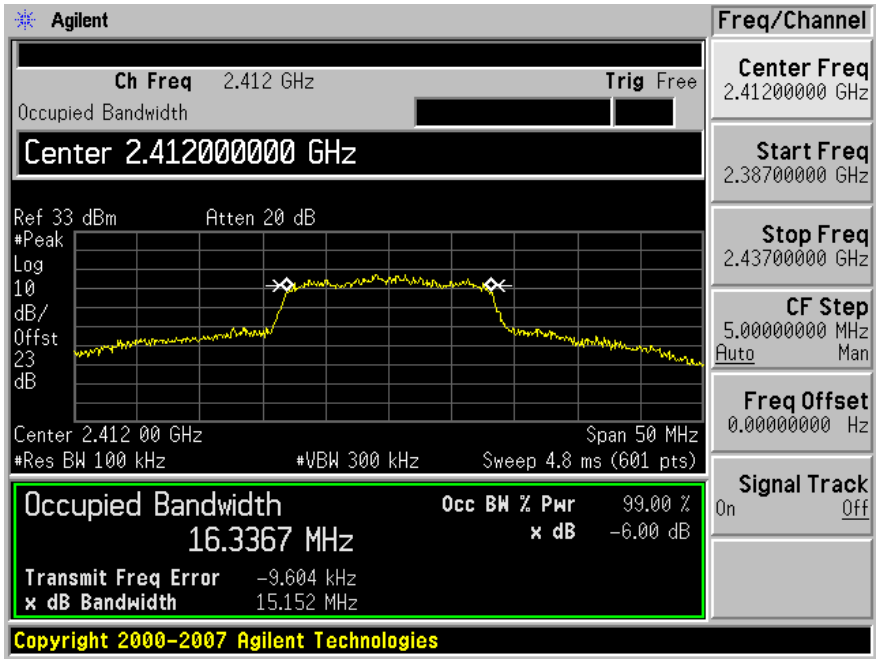


High Channel 2462 MHz

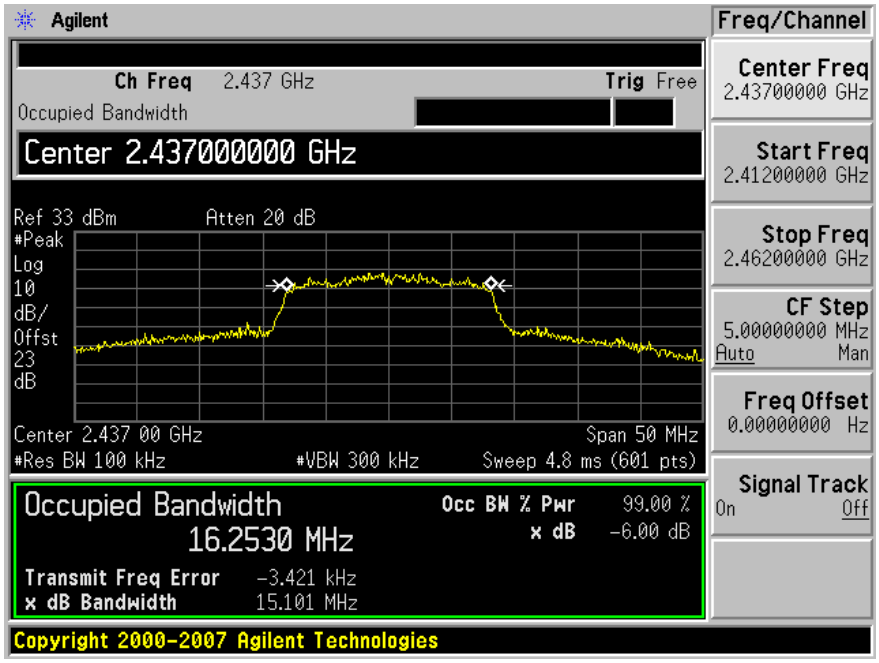


802.11 g (Antenna #0)

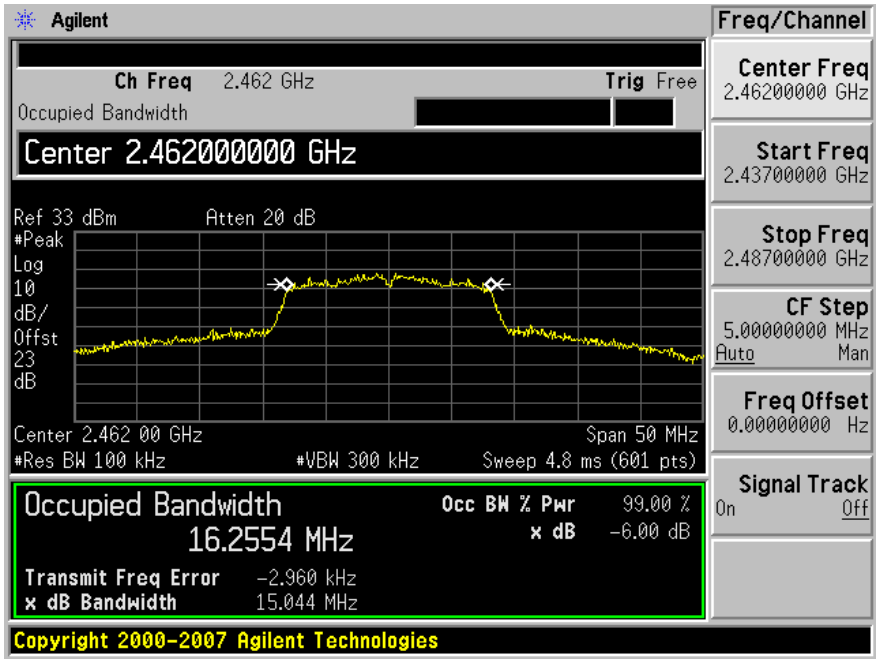
Low Channel 2412 MHz



Middle Channel 2437 MHz

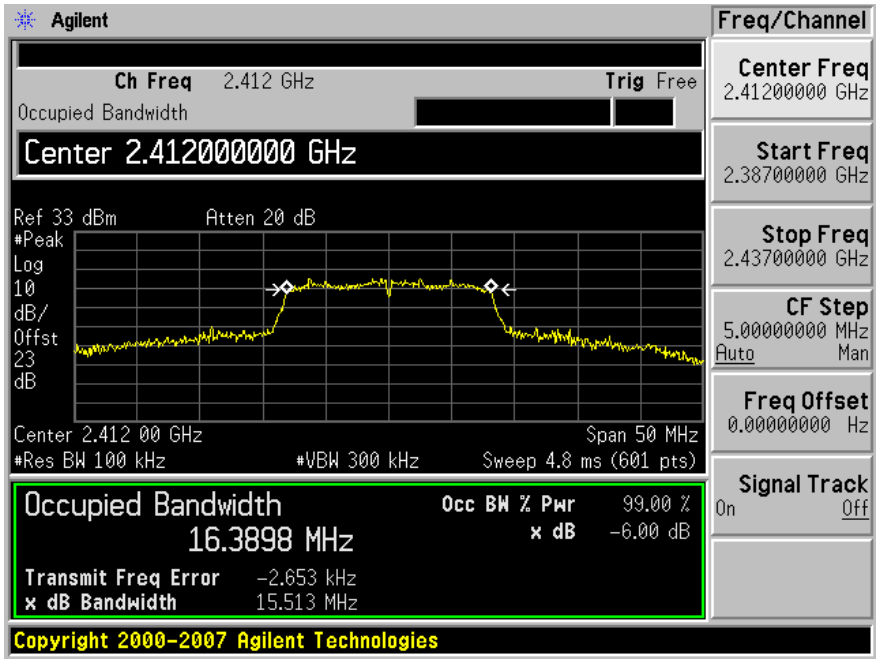


High Channel 2462 MHz

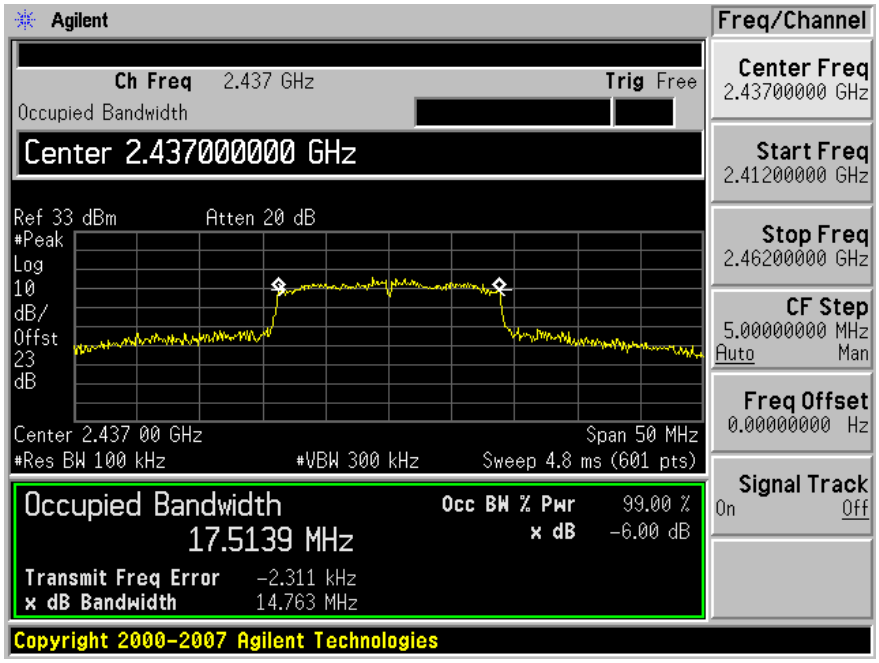


802.11 g (Antenna #1)

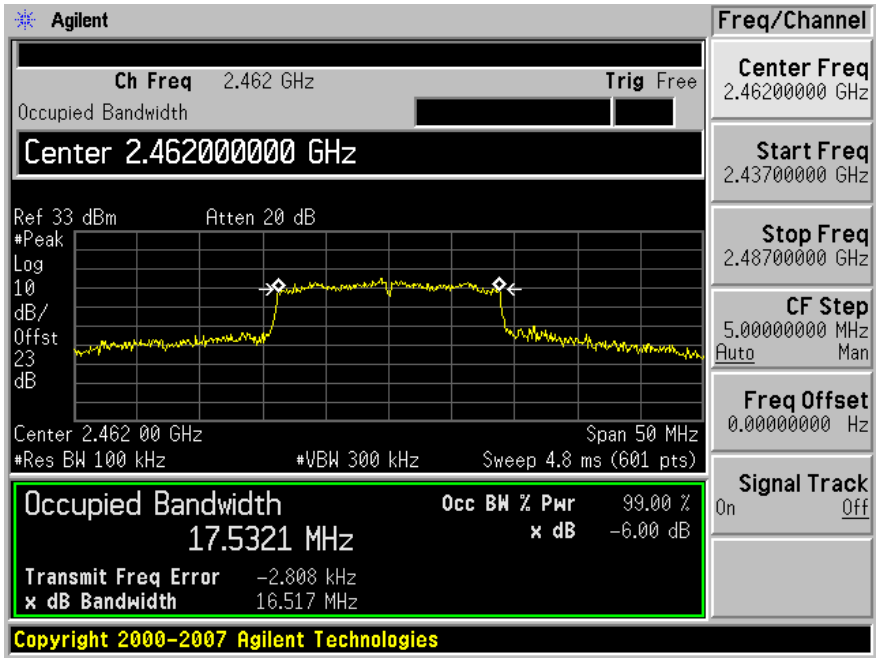
Low Channel 2412 MHz



Middle Channel 2437 MHz

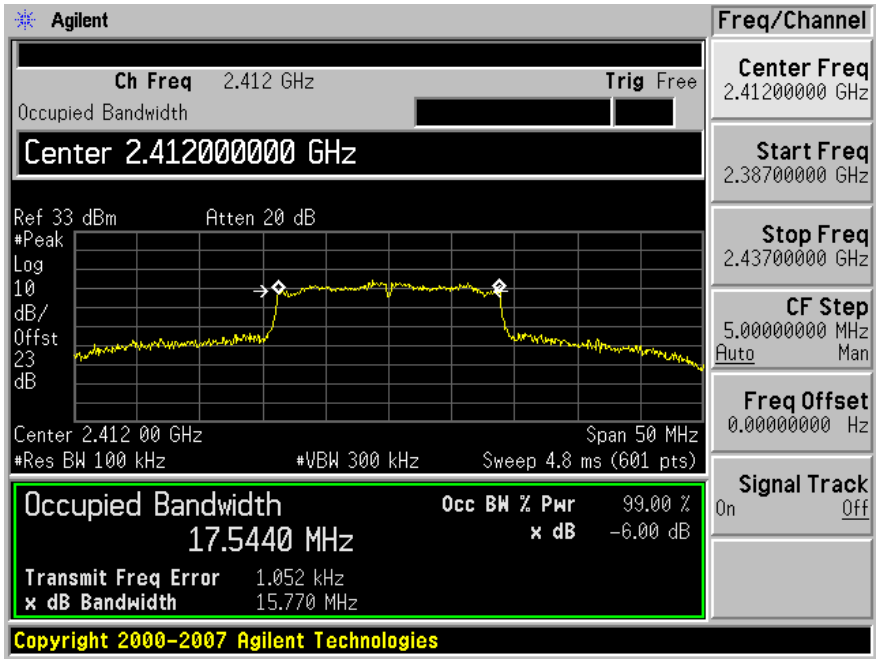


High Channel 2462 MHz

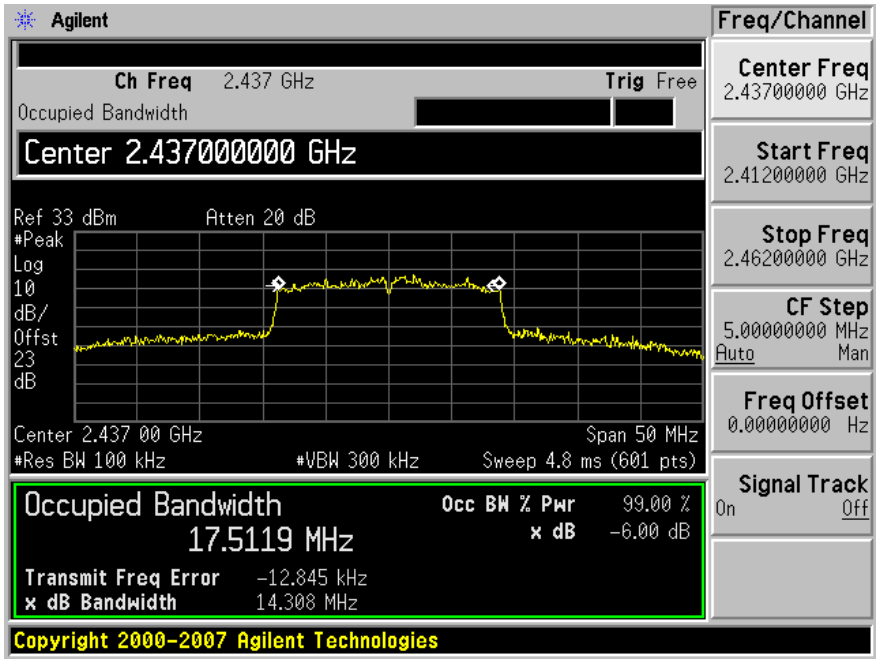


802.11 n 20 MHz (Antenna #0)

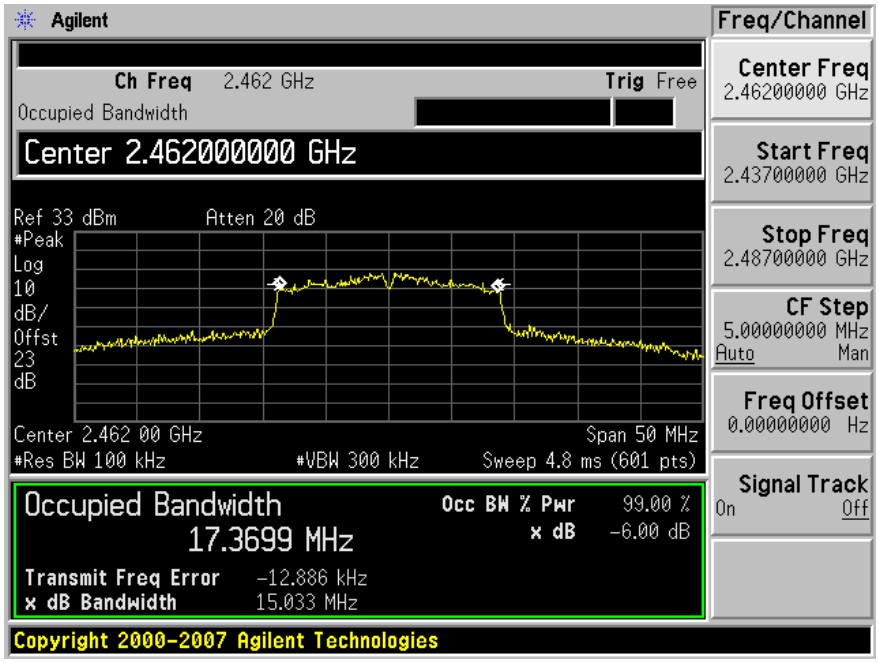
Low Channel 2412 MHz



Middle Channel 2437 MHz

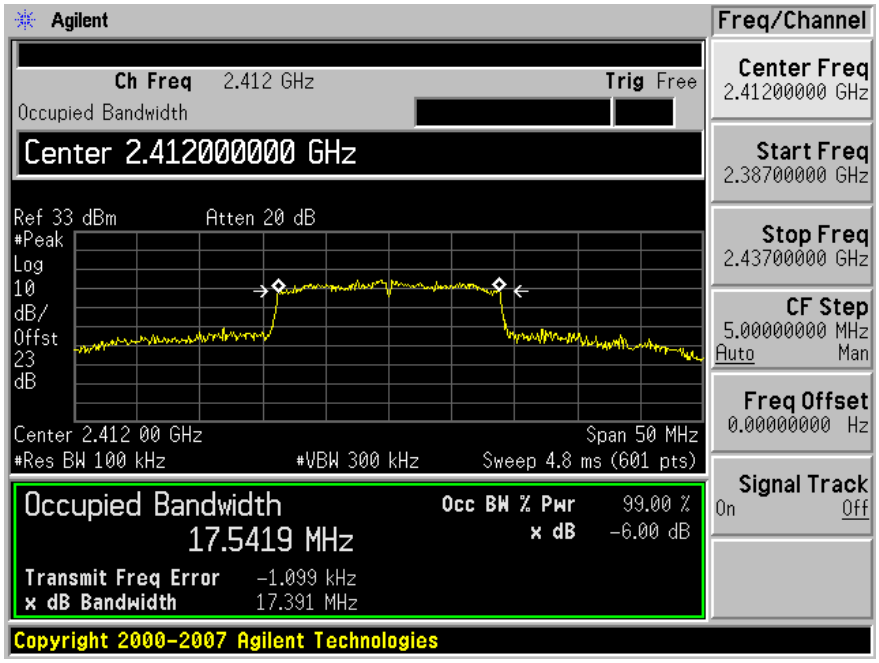


High Channel 2462 MHz

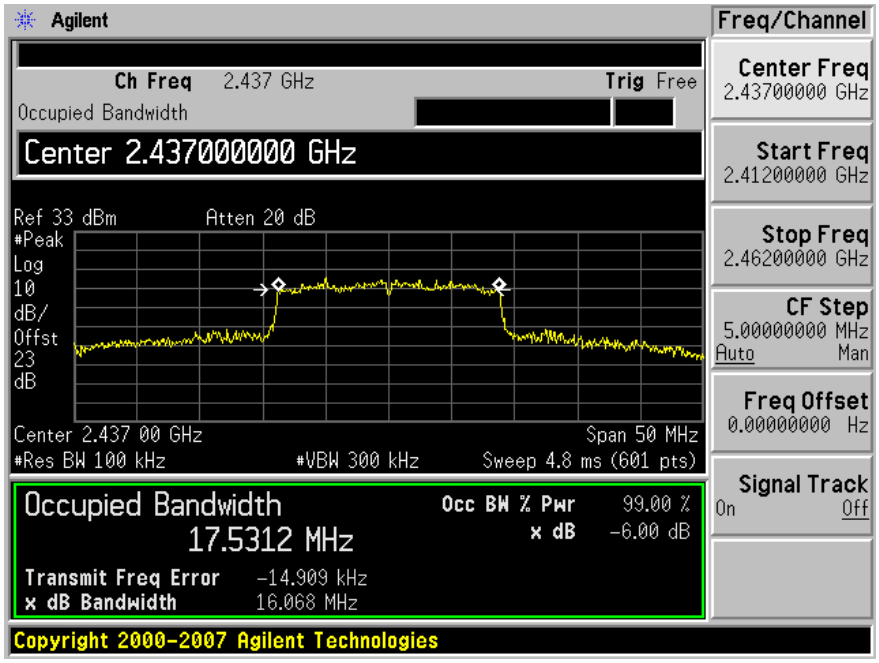


802.11 n 20 MHz (Antenna #1)

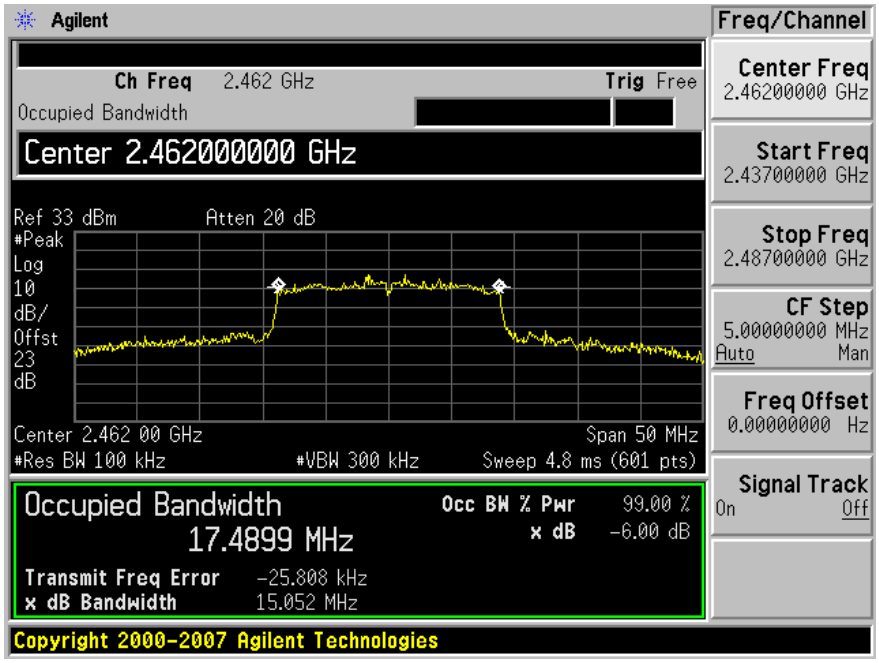
Low Channel 2412 MHz



Middle Channel 2437 MHz



High Channel 2462 MHz



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

10.1 Applicable Standard

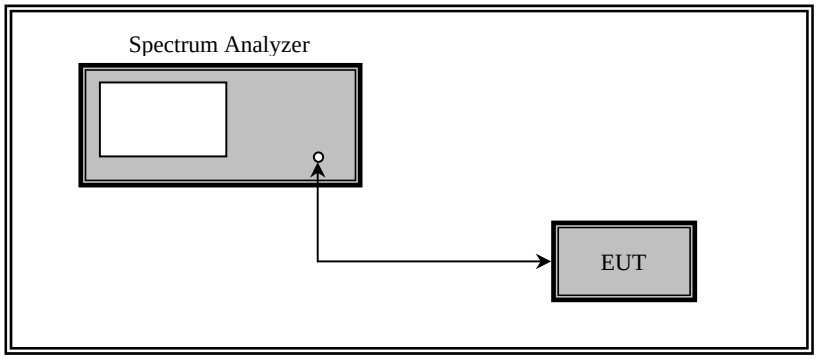
§15.247(b) the maximum peak output power of the intentional radiator shall not exceed the following:

§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.

10.2 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.

10.3 Test Setup Diagram



10.4 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-07-23

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

10.5 Test Environmental Conditions

Temperature:	15-20 °C
Relative Humidity:	43-45 %
ATM Pressure:	101-102kPa

**The testing was performed by Jack Liu from 2009-10-14 to 2009-10-26.*

10.6 Summary of Test Results

802.11 b Mode:

Channel	Frequency (MHz)	Output Power Chain 0 (dBm)	Output Power Chain 1 (dBm)	Highest Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	22.18	21.44	22.18	30	-7.82
Mid	2437	22.20	22.03	22.20	30	-7.80
High	2462	22.23	21.50	22.23	30	-7.77

802.11 g Mode:

Channel	Frequency (MHz)	Output Power Chain 0 (dBm)	Output Power Chain 1 (dBm)	Highest Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	22.04	20.89	22.04	30	-7.82
Mid	2437	22.10	21.44	22.10	30	-7.80
High	2462	22.14	21.00	22.14	30	-7.77

802.11 n 20 MHz mode:

Channel	Frequency (MHz)	Output Power Chain 0 (dBm)	Output Power Chain 1 (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	22.06	21.01	24.58	28	-7.82
Mid	2437	22.17	21.31	24.77	28	-7.80
High	2462	22.12	21.03	24.62	28	-7.77

Note: The maximum antenna gain is 5 dBi, antenna number is 2. The effective gain of antenna is 5 + 10log 2 = 8 dBi, which is 2 dB more of 6 dBi margin; therefore the limit is 30-2=28 dBm.

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

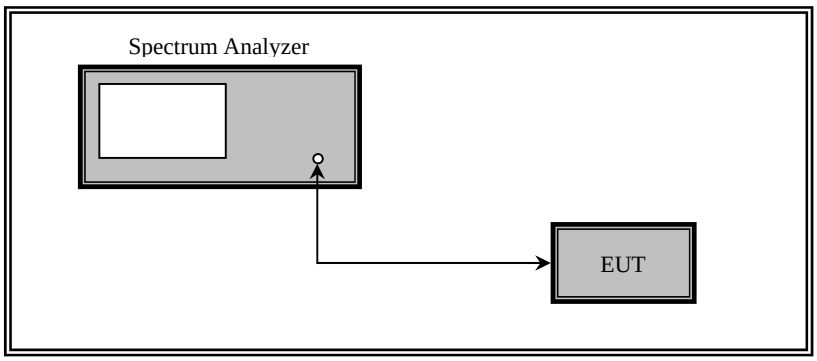
11.1 Applicable Standard

According to §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 Setup Diagram



11.4 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-07-23

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

11.5 Test Environmental Conditions

Temperature:	15-20 °C
Relative Humidity:	43-45 %
ATM Pressure:	101-102kPa

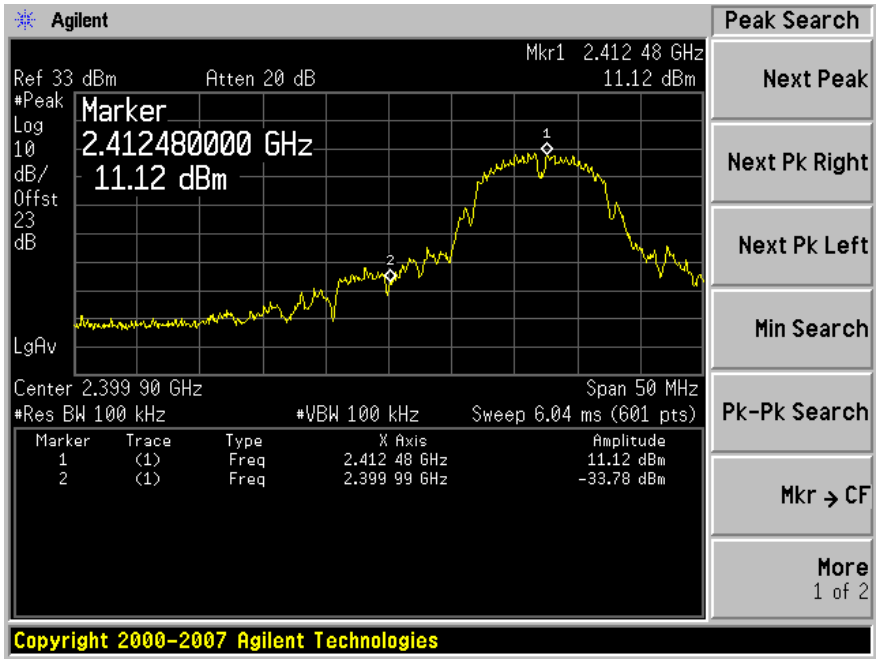
**The testing was performed by Jack Liu from 2009-10-14 to 2009-10-26.*

11.6 Measurement Results

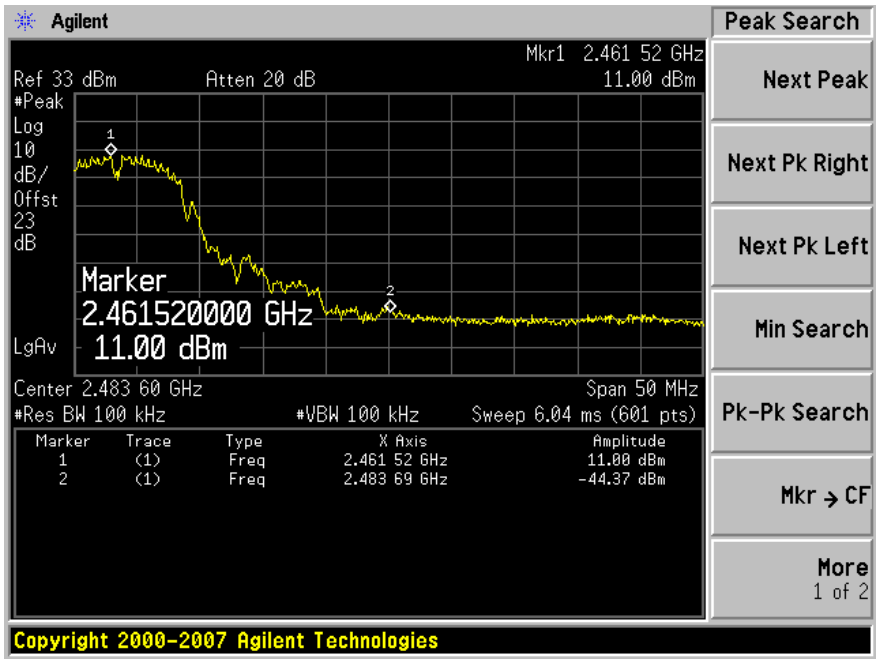
Please refer to following pages for plots of band edge.

802.11 b – Antenna #0

Low Band Edge

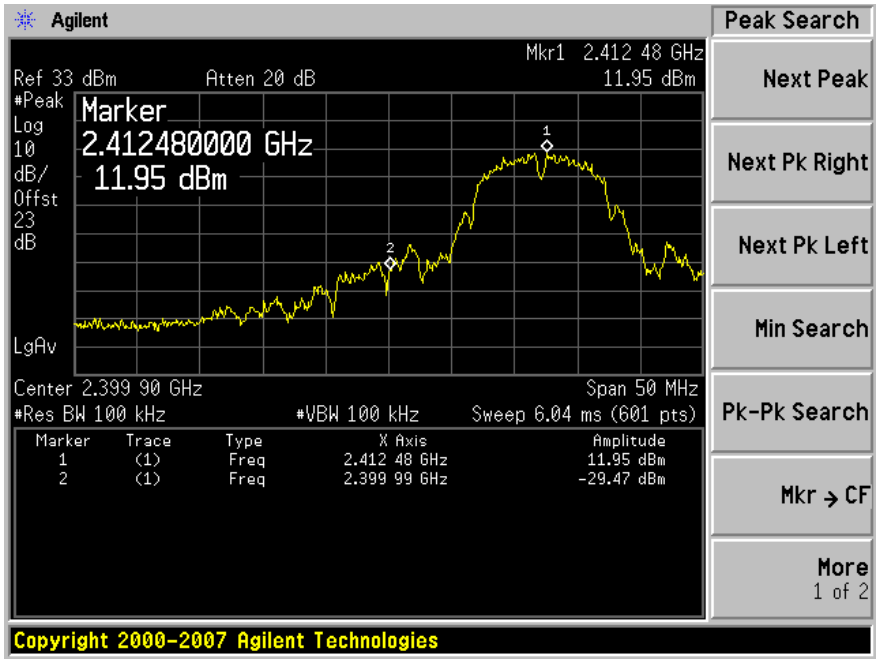


High Band Edge

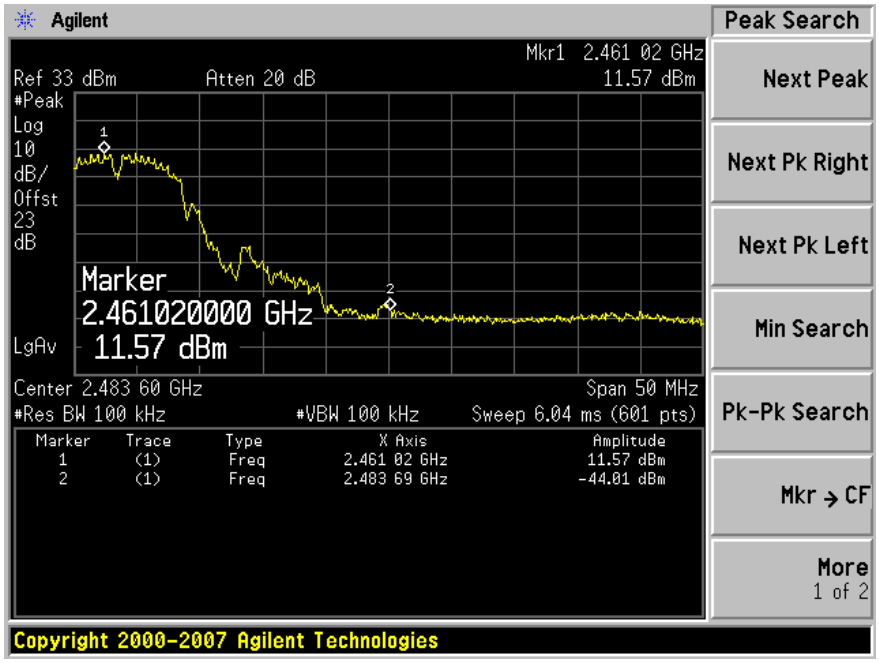


802.11 b – Antenna #1

Low Band Edge

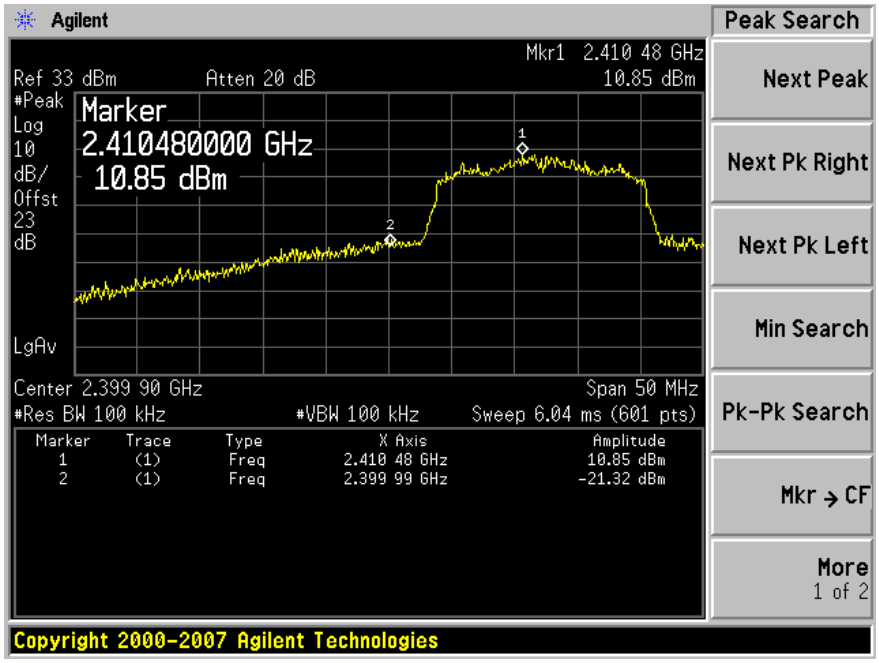


High Band Edge

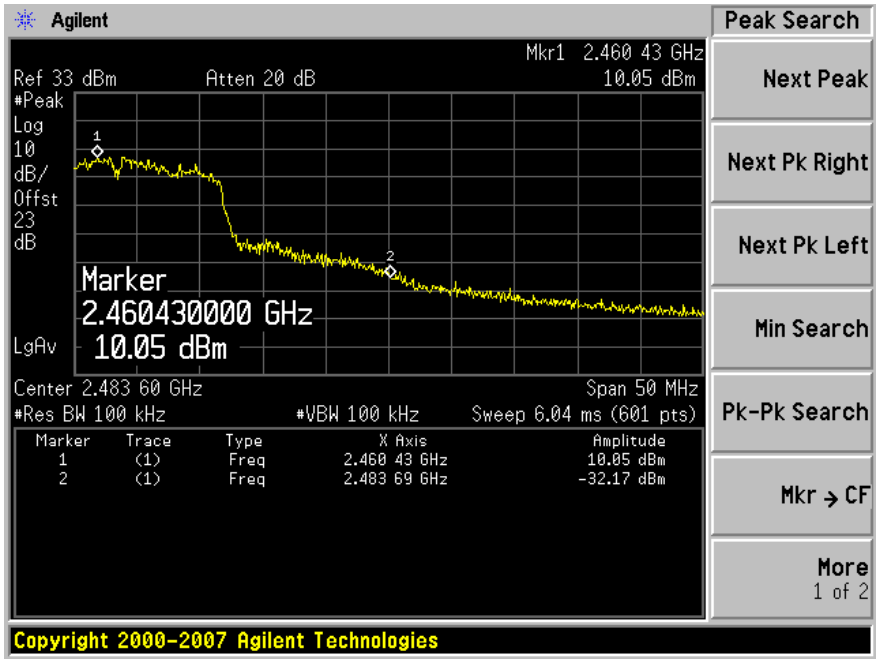


802.11 g – Antenna #0

Low Band Edge

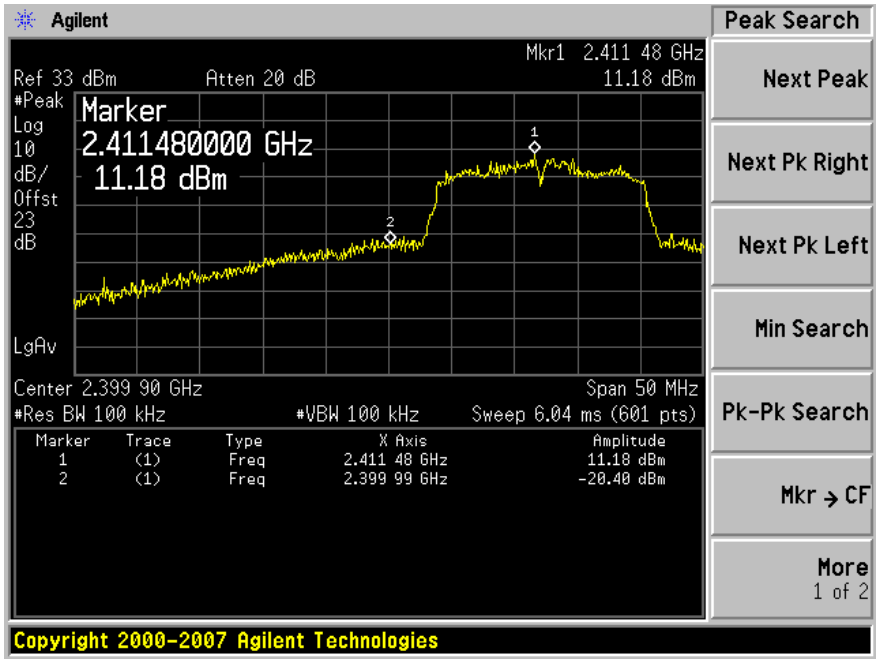


High Band Edge

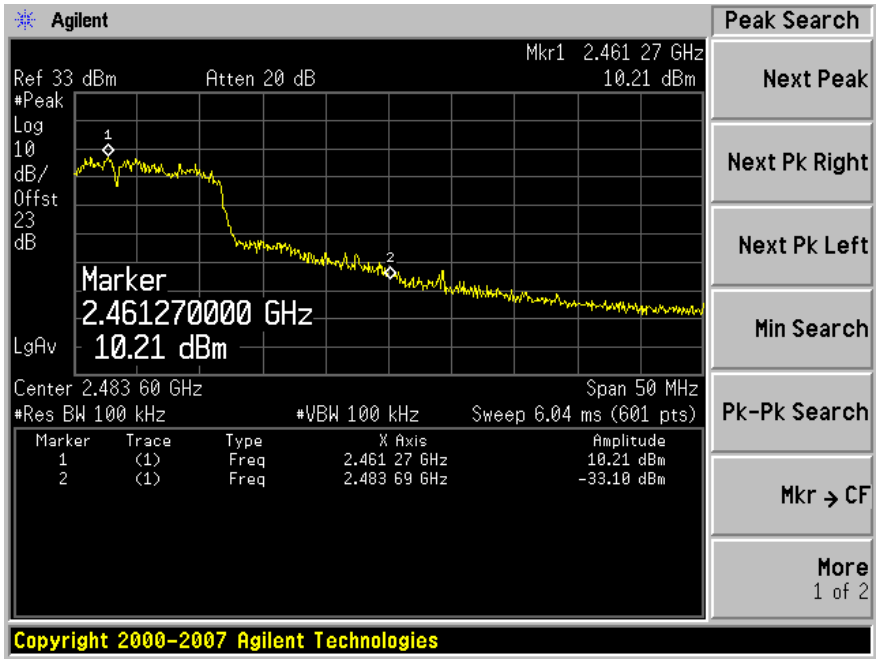


802.11 g – Antenna #1

Low Band Edge

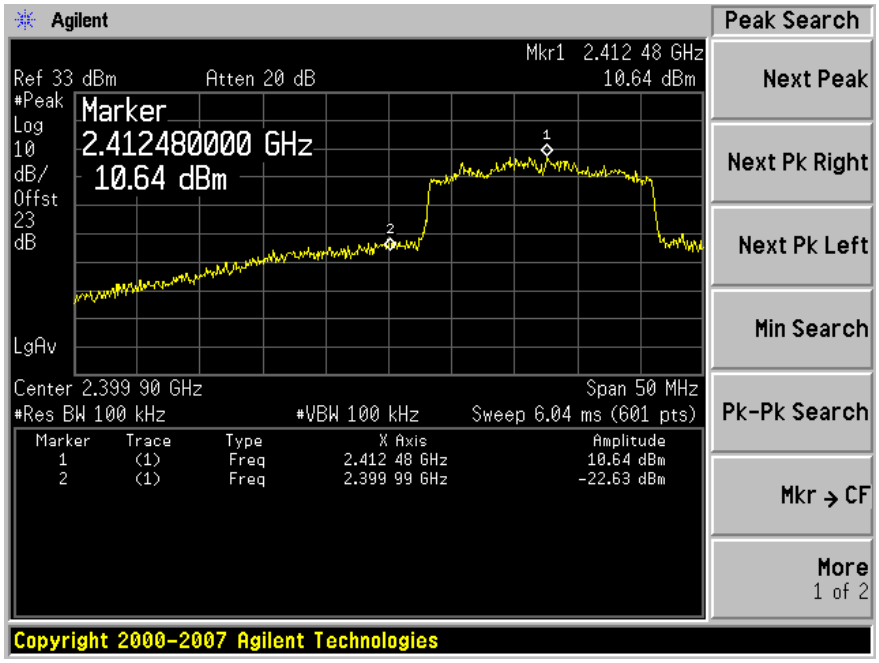


High Band Edge

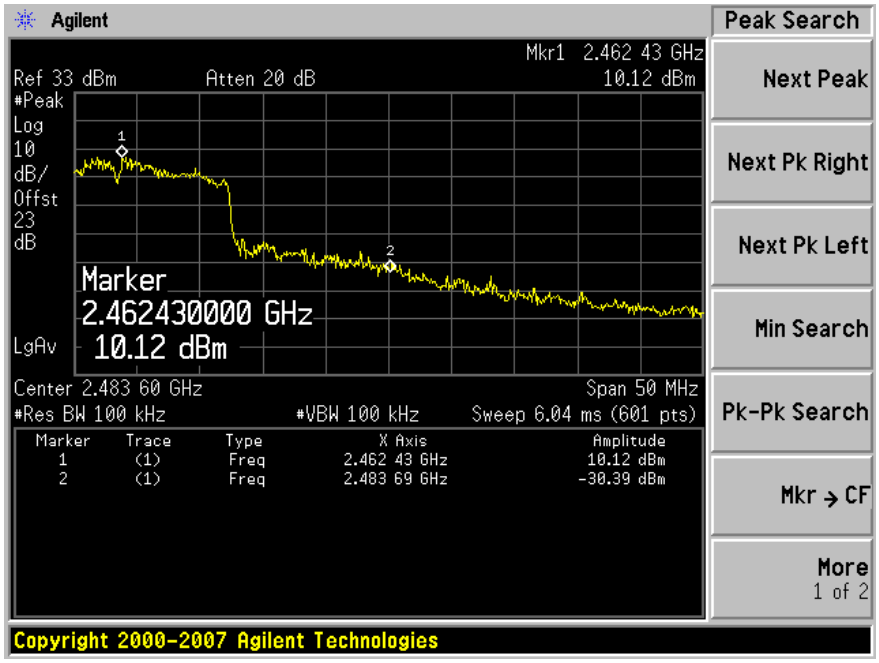


802.11 n 20 MHz – Antenna #0

Low Band Edge

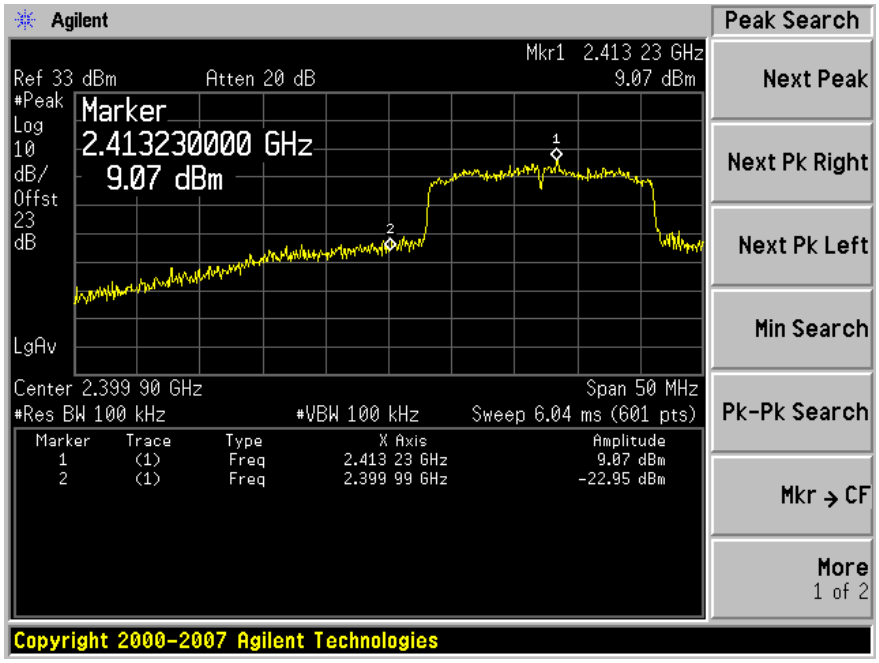


High Band Edge

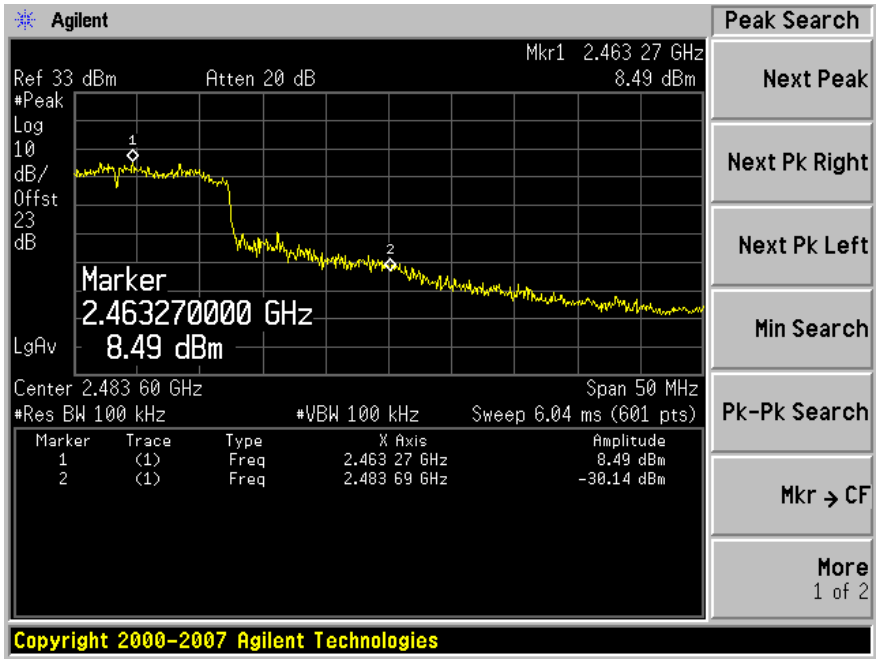


802.11 n 20 MHz – Antenna #1

Low Band Edge



High Band Edge



12 FCC §15.247(e) - Power Spectral Density

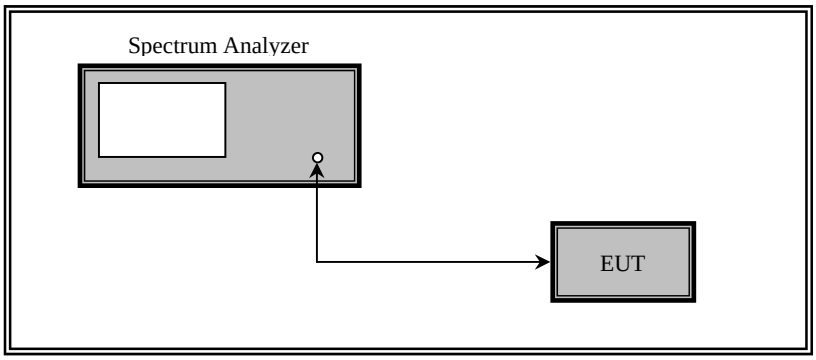
12.1 Applicable Standard

According to §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.

12.2 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.

12.3 Test Setup Diagram



12.4 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-07-23

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

12.5 Test Environmental Conditions

Temperature:	15-20 °C
Relative Humidity:	43-45 %
ATM Pressure:	101-102kPa

**The testing was performed by Jack Liu from 2009-10-14 to 2009-10-26.*

12.6 Summary of Test Results

802.11 b Mode:

Antenna	Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm/3kHz)	Results
Antenna #0	Low	2412	-2.47	8	Compliant
	Mid	2437	-2.14	8	Compliant
	High	2462	-1.11	8	Compliant
Antenna #1	Low	2412	-3.17	8	Compliant
	Mid	2437	-3.13	8	Compliant
	High	2462	-2.80	8	Compliant

802.11 g Mode:

Antenna	Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm/3kHz)	Results
Antenna #0	Low	2412	-1.88	8	Compliant
	Mid	2437	-3.61	8	Compliant
	High	2462	-1.37	8	Compliant
Antenna #1	Low	2412	-2.65	8	Compliant
	Mid	2437	-3.65	8	Compliant
	High	2462	-2.81	8	Compliant

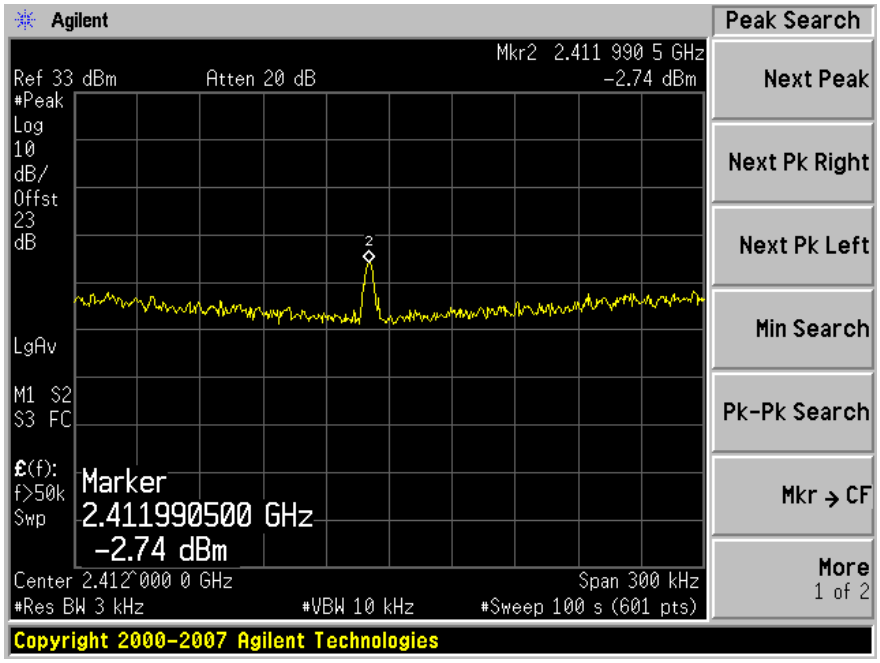
802.11 n 20 MHz Mode:

Antenna	Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm/3kHz)	Results
Antenna #0	Low	2412	-2.84	8	Compliant
	Mid	2437	-2.61	8	Compliant
	High	2462	-3.12	8	Compliant
Antenna #1	Low	2412	-10.18	8	Compliant
	Mid	2437	-10.12	8	Compliant
	High	2462	-10.11	8	Compliant
Antenna #0+#1	Low	2412	-5.05	8	Compliant
	Mid	2437	-1.51	8	Compliant
	High	2462	-3.25	8	Compliant

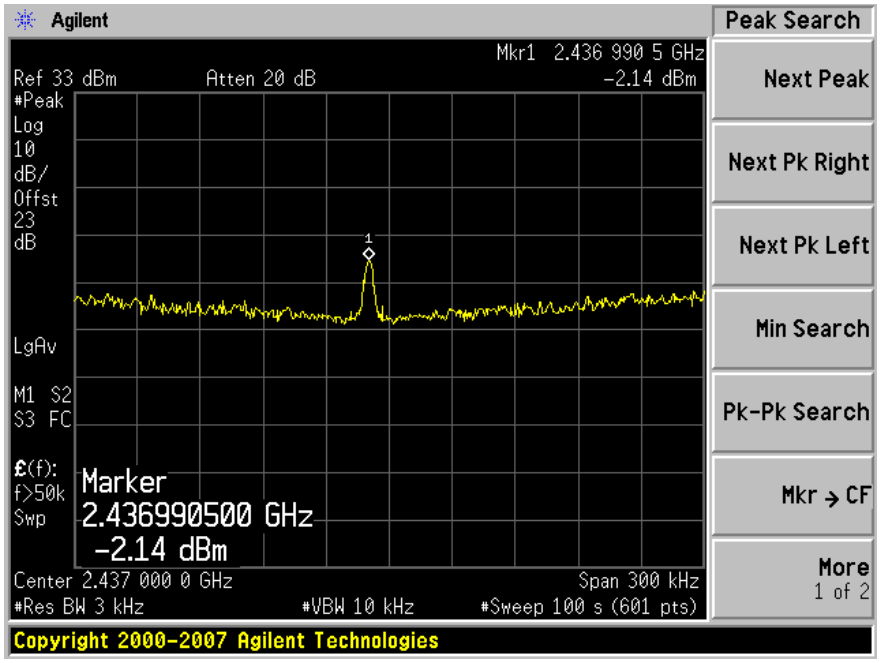
Please refer to the following plots for detailed test results:

802.11 b (Antenna #0)

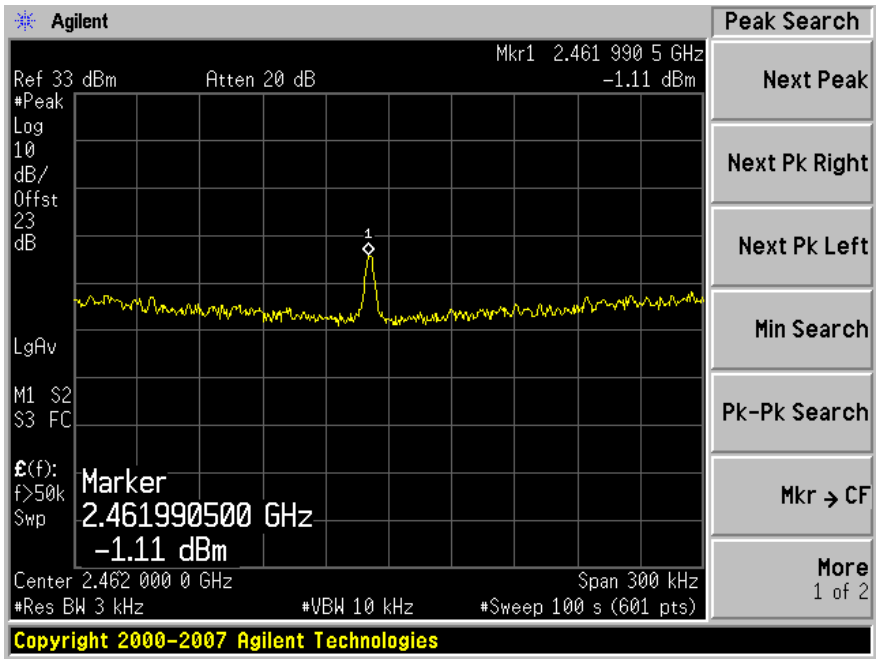
Low Channel 2412 MHz



Middle Channel 2437 MHz

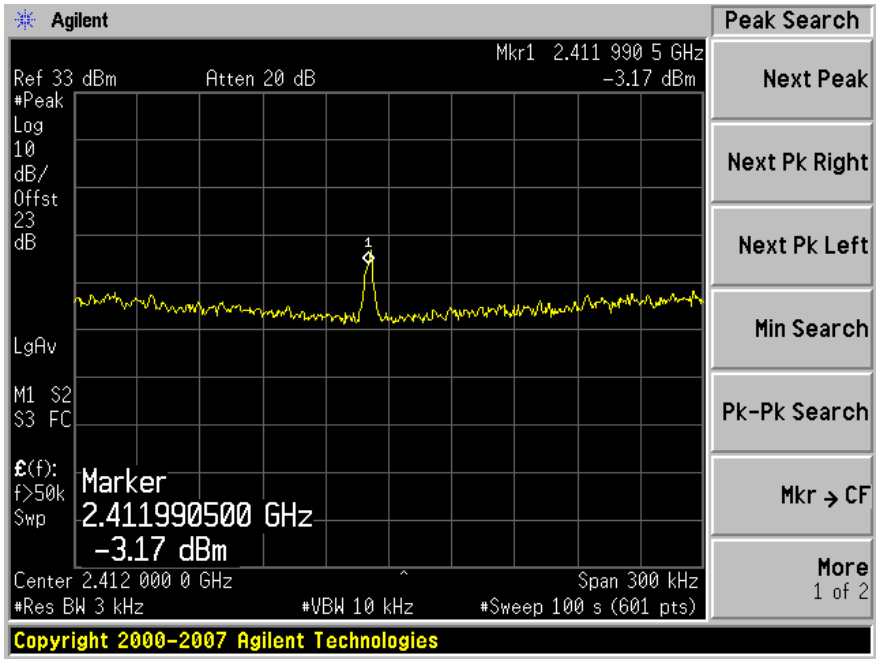


High Channel 2462 MHz

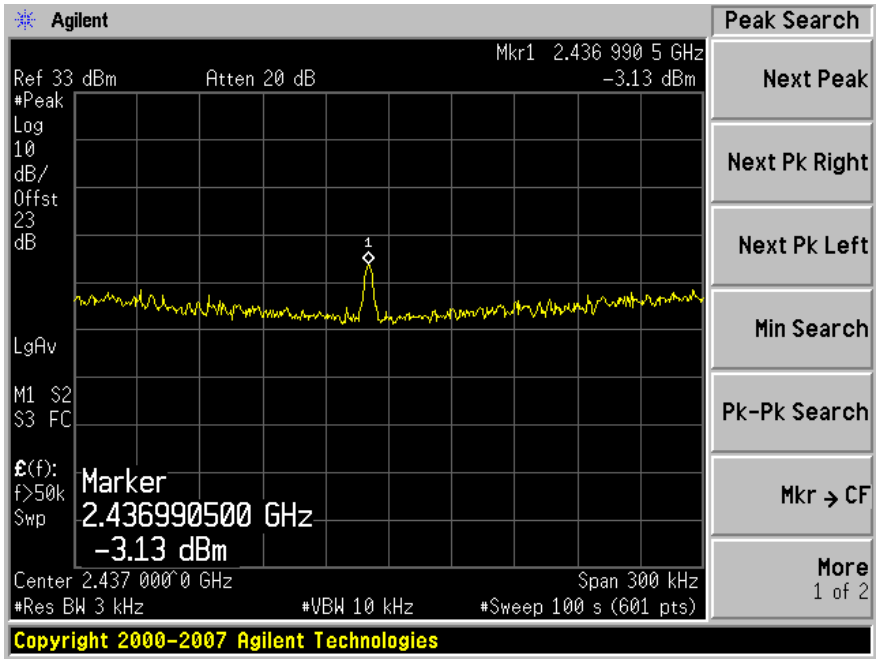


802.11 b (Antenna #1)

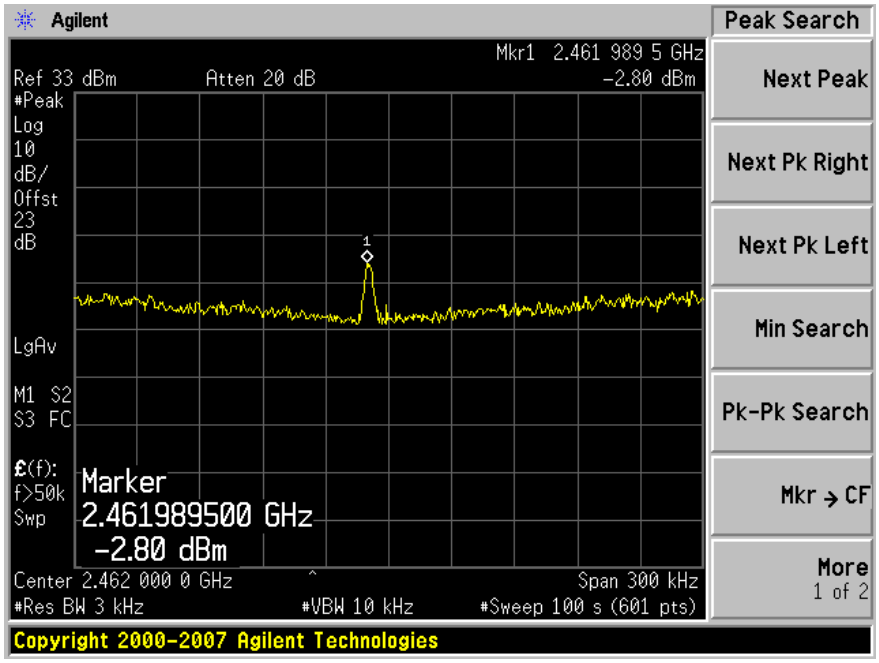
Low Channel 2412 MHz



Middle Channel 2437 MHz

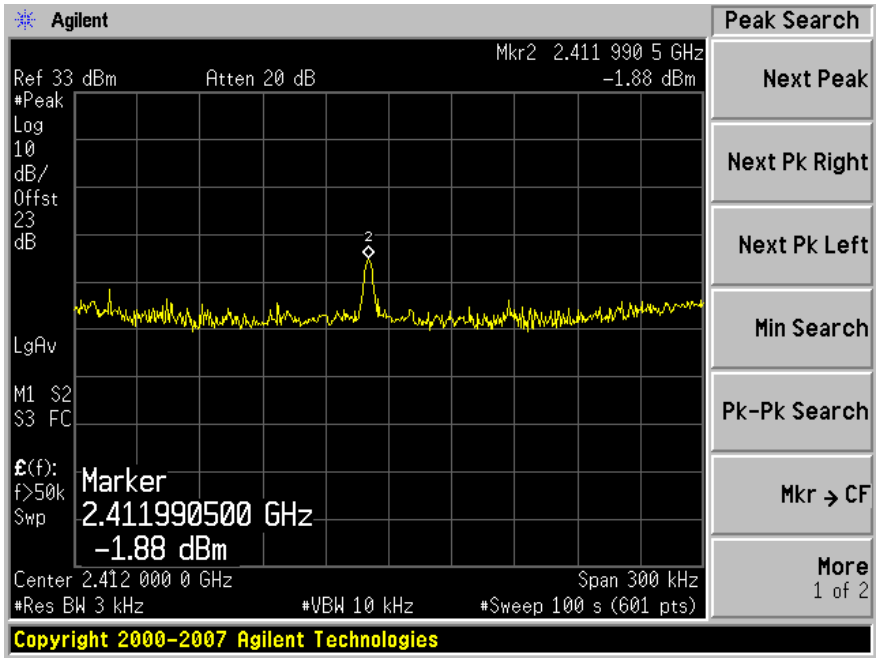


High Channel 2462 MHz

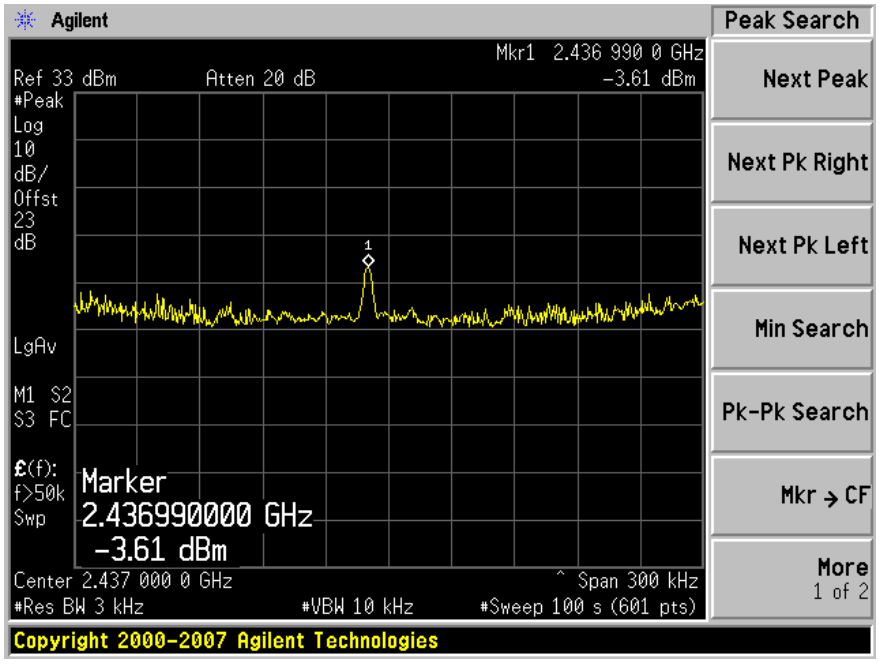


802.11 g (Antenna #0)

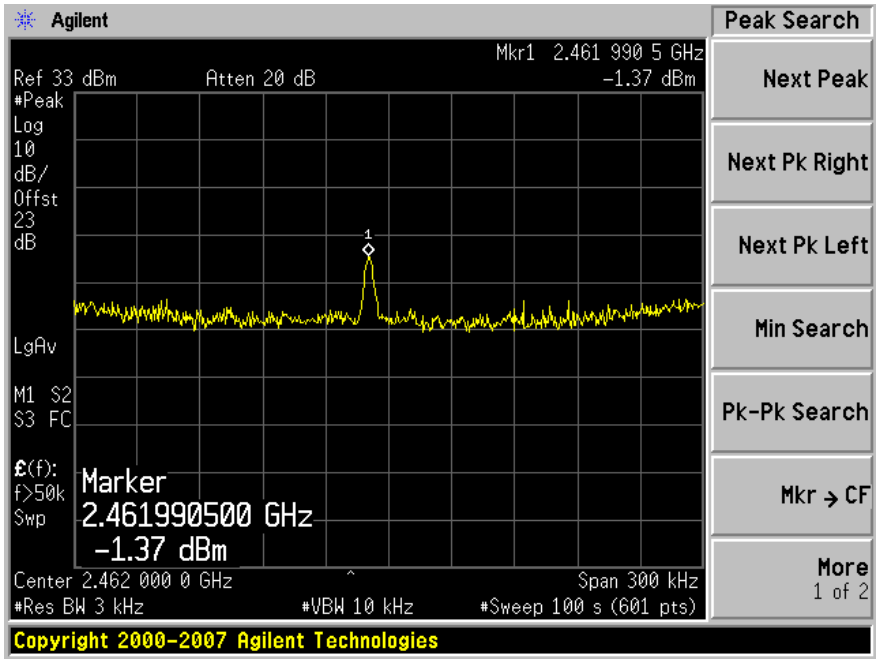
Low Channel 2412 MHz



Middle Channel 2437 MHz

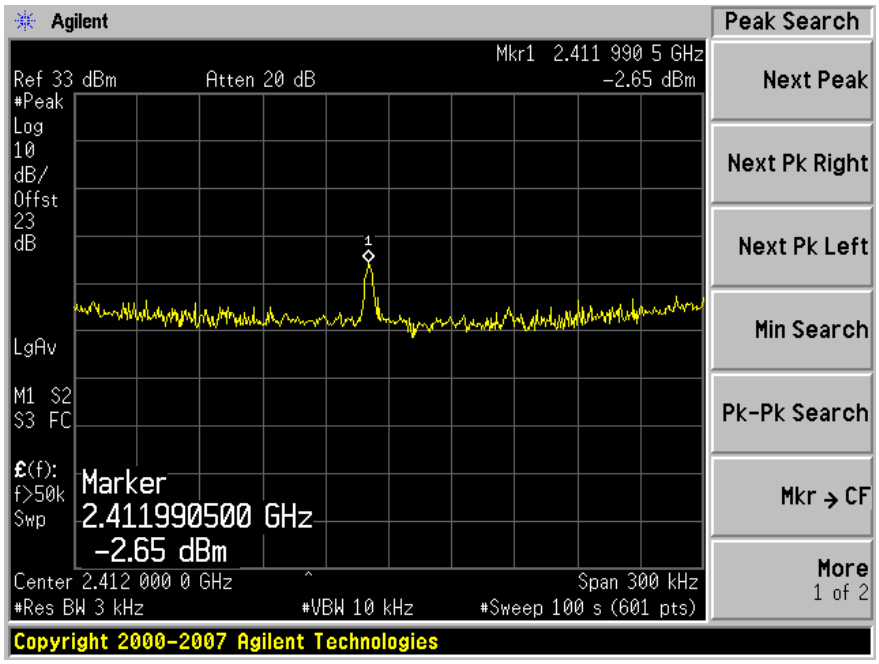


High Channel 2462 MHz

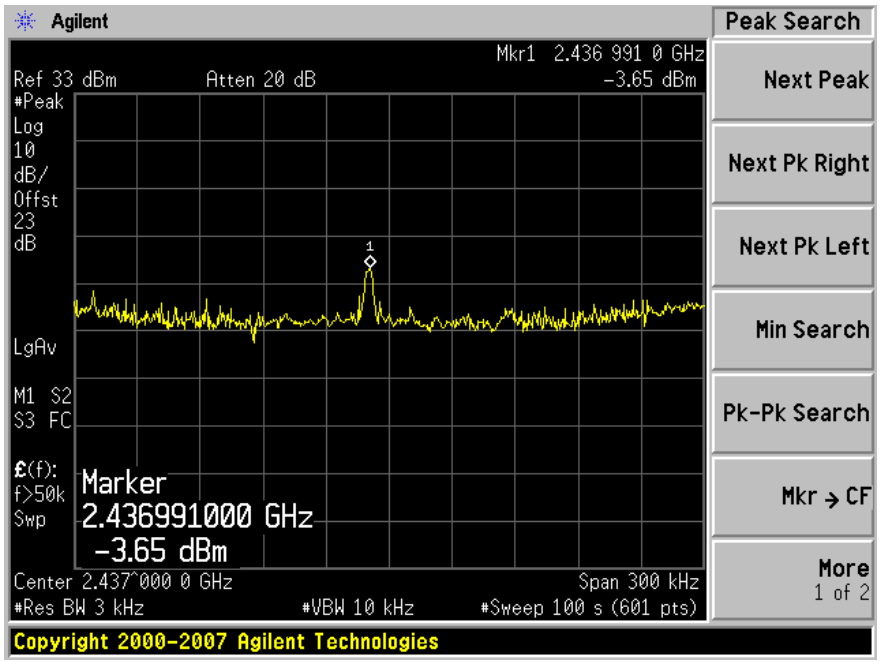


802.11 g (Antenna #1)

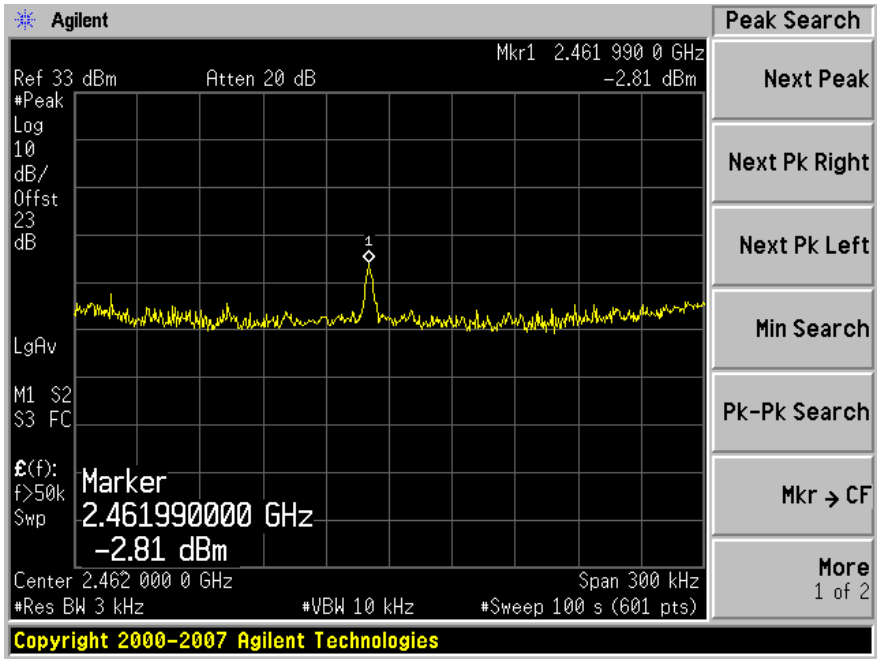
Low Channel 2412 MHz



Middle Channel 2437 MHz

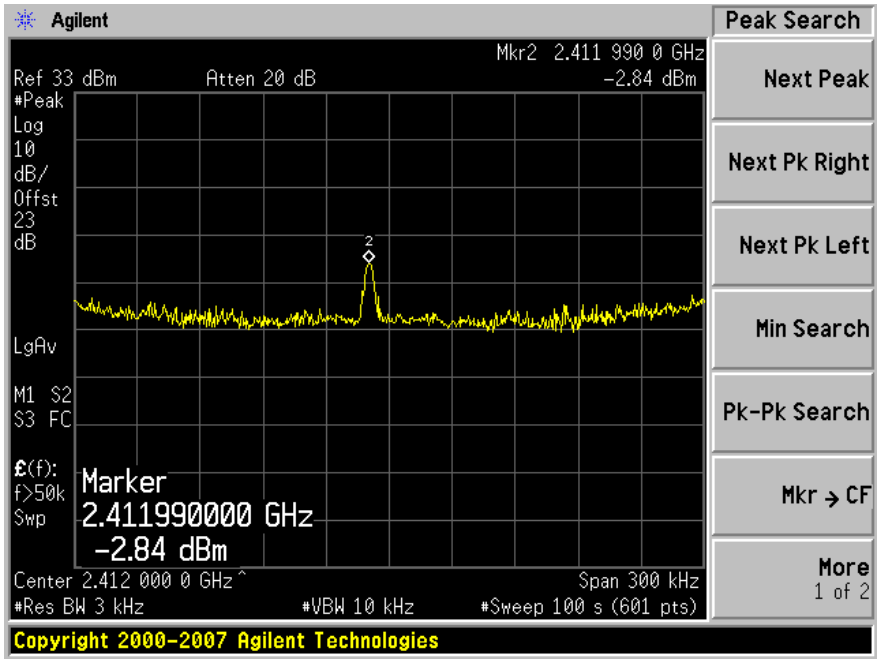


High Channel 2462 MHz

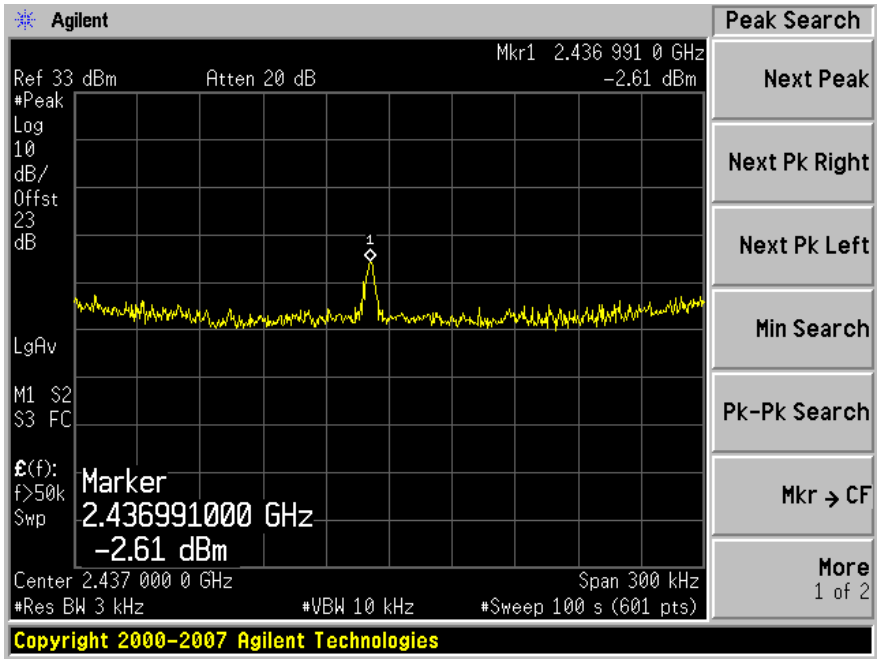


802.11 n 20 MHz (Antenna #0)

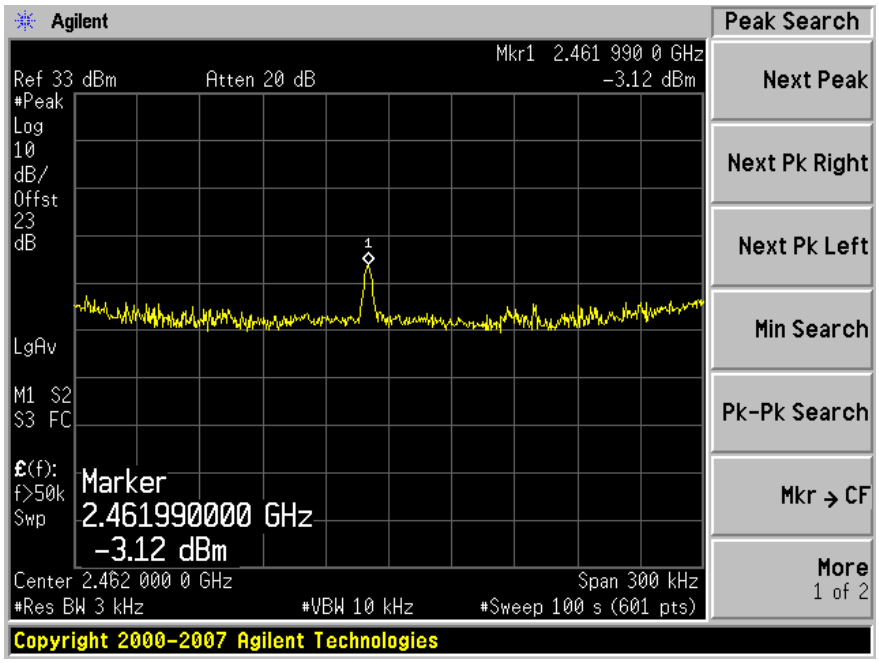
Low Channel 2412 MHz



Middle Channel 2437 MHz

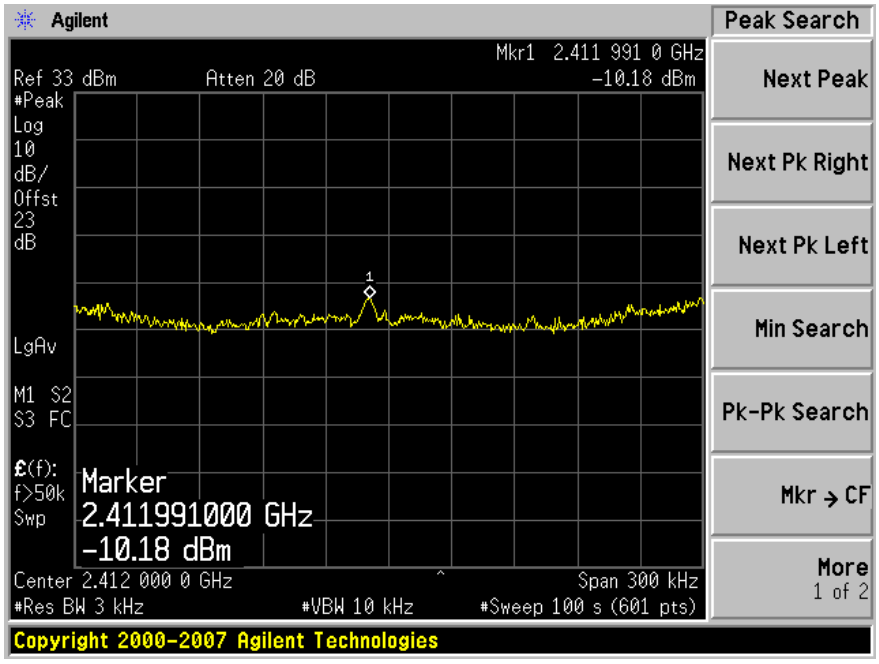


High Channel 2462 MHz

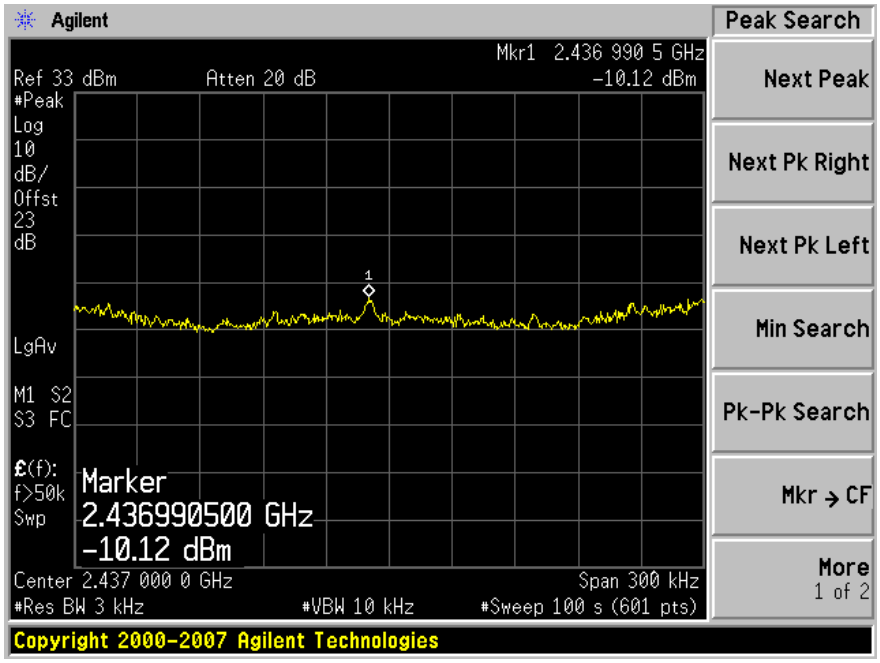


802.11 n 20 MHz (Antenna #1)

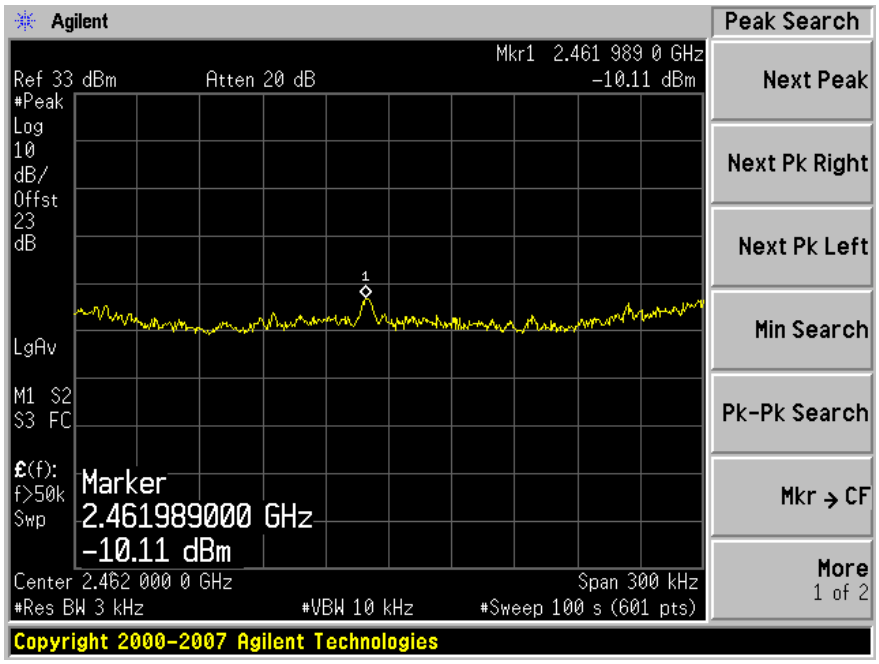
Low Channel 2412 MHz



Middle Channel 2437 MHz

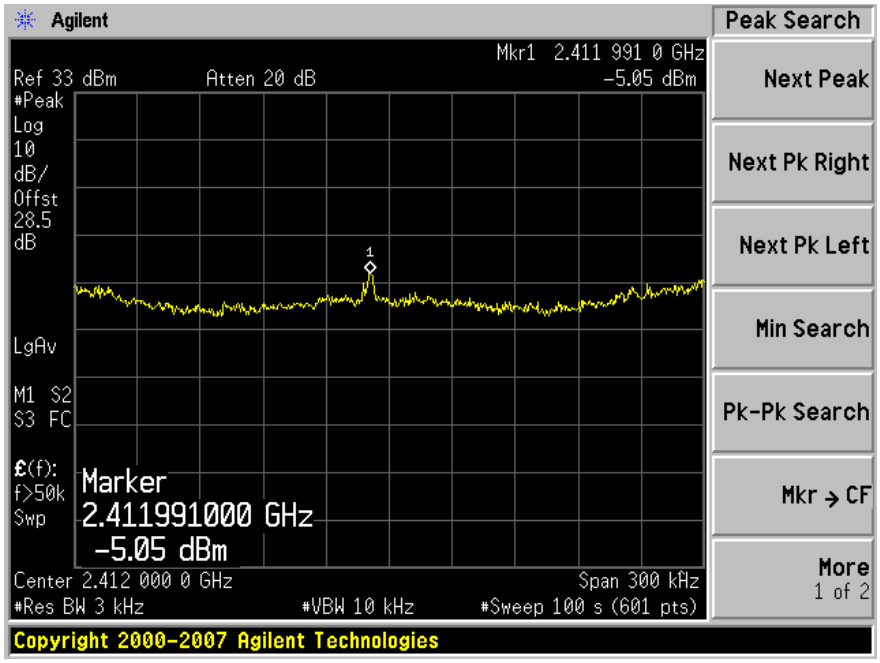


High Channel 2462 MHz

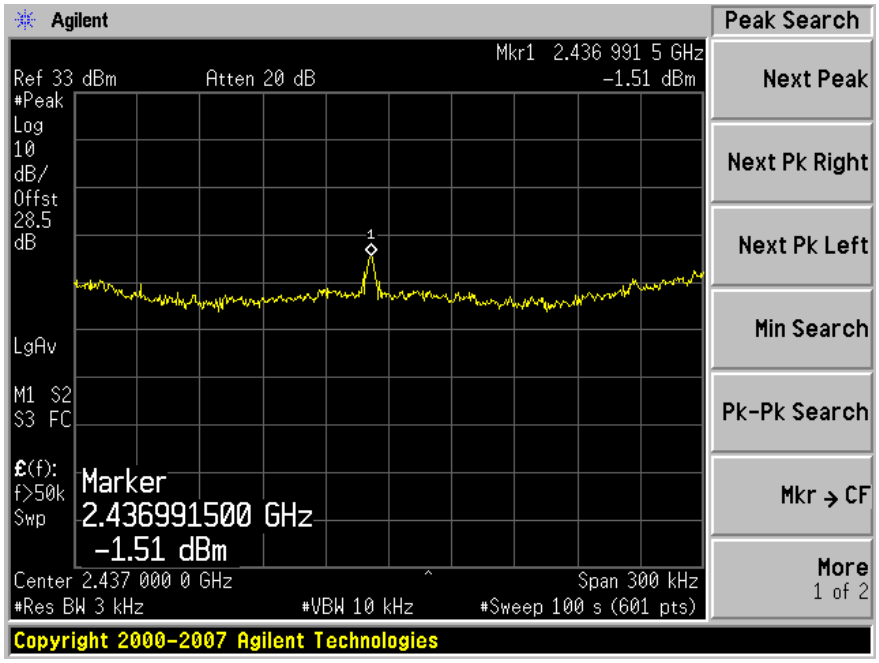


802.11 n 20 MHz (Antenna #0 + Antenna #1)

Low Channel 2412 MHz



Middle Channel 2437 MHz



High Channel 2462 MHz