





**FCC PART 15C
TEST AND MEASUREMENT REPORT**

For

Actiontec Electronics, Inc.

760 N. Mary Avenue,
Sunnyvale, CA 94085, USA

**FCC ID: LNQMI424WRH
Model: MI424-WR REV H**

Report Type: Original Report	Product Type: Wireless Broadband Home Router
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Report Number: R1007192-247	
Report Date: 2010-09-07	
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* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk “*”

TABLE OF CONTENTS

1	General Description.....	5
1.1	Product Description for Equipment Under Test (EUT).....	5
1.2	Mechanical Description of EUT	5
1.3	Objective	5
1.4	Related Submittal(s)/Grant(s)	5
1.5	Test Methodology	5
1.6	Measurement Uncertainty	5
1.7	Test Facility.....	6
2	System Test Configuration.....	7
2.1	Justification	7
2.2	EUT Exercise Software.....	7
2.3	Equipment Modifications.....	7
2.4	Special Accessories	7
2.5	Local Support Equipment	7
2.6	Internal Configuration	7
2.7	Power Supply and Line Filters.....	8
2.8	Interface Ports and Cabling.....	8
3	Summary of Test Results.....	9
4	FCC §15.247 (i) & § 2.1091 - RF Exposure.....	10
4.1	Applicable Standard.....	10
4.2	MPE Prediction.....	10
4.3	MPE Results.....	10
5	FCC §15.203 - Antenna Requirement	11
5.1	Applicable Standard.....	11
5.2	Antenna Connector Construction	11
5.3	Antenna Photo.....	11
6	FCC §15.207 - Conducted Emissions	12
6.1	Applicable Standard.....	12
6.2	Test Setup.....	12
6.3	Test Setup Block Diagram	12
6.4	Test Procedure.....	13
6.5	Test Equipment List and Details	13
6.6	Test Environmental Conditions.....	13
6.7	Summary of Test Results	13
6.8	Conducted Emissions Test Plots and Data	13
7	FCC §2.1051 & §15.247(d) - Spurious Emissions at Antenna Terminals	16
7.1	Applicable Standard.....	16
7.2	Measurement Procedure.....	16
7.3	Test Equipment List and Details	16
7.4	Test Environmental Conditions.....	16
7.5	Measurement Result:.....	16
8	FCC §15.205, §15.209 & §15.247(d) - Spurious Radiated Emissions	38
8.1	Applicable Standard.....	38
8.2	Test Setup.....	39
8.3	EUT Setup.....	39
8.4	Test Setup Block Diagram	39
8.5	Test Procedure.....	40
8.6	Corrected Amplitude & Margin Calculation.....	40
8.7	Test Equipment List and Details	40

8.8	Test Environmental Conditions.....	41
8.9	Summary of Test Results	41
8.10	Radiated Emissions Test plot & data	54
9	FCC §15.247(a) (2) – 6 dB & 99% Bandwidth	60
9.1	Applicable Standard.....	60
9.2	Measurement Procedure.....	60
9.3	Test Equipment List and Details	60
9.4	Test Environmental Conditions.....	60
9.5	Summary of Test Results	61
10	FCC §15.247(b) - Peak Output Power Measurement	71
10.1	Applicable Standard.....	71
10.2	Measurement Procedure.....	71
10.3	Test Equipment List and Details	71
10.4	Test Environmental Conditions.....	71
10.5	Summary of Test Results	72
11	FCC §15.247(d) - 100 kHz Bandwidth of Band Edges.....	73
11.1	Applicable Standard.....	73
11.2	Measurement Procedure.....	73
11.3	Test Equipment List and Details	73
11.4	Test Environmental Conditions.....	73
11.5	Measurement Results	73
12	FCC §15.247(e) - Power Spectral Density.....	81
12.1	Applicable Standard.....	81
12.2	Measurement Procedure.....	81
12.3	Test Equipment List and Details	81
12.4	Test Environmental Conditions.....	81
12.5	Summary of Test Results	82
13	Exhibit A - FCC ID Label Information.....	94
13.1	FCC ID Label Requirements.....	94
13.2	FCC ID Label Content	94
13.3	FCC ID Label Location on EUT	95
14	Exhibit B - Test Setup Photographs	96
14.1	AC Line Conducted Emissions –Front View	96
14.2	AC Line Conducted Emissions – Side View.....	96
14.3	Radiated Emissions – Front View	97
14.4	Radiated Emissions – Rear View (Below 1 GHz).....	97
14.5	Radiated Emissions – Rear View (Above 1 GHz)	98
15	Exhibit C - EUT Photographs.....	99
15.1	EUT – Front View.....	99
15.2	EUT – Top View.....	99
15.3	EUT- Port View	100
15.4	EUT –Bottom View	100
15.5	Antenna View	101
15.6	AC/DC Adapter.....	101
15.7	EUT –Cover off View	102
15.8	Main Board Top View (with Shielding).....	102
15.9	Main Board Top View (without Shielding)	103
15.10	Main Board Bottom View	103
15.11	RF Potion near View	104

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1007192-247	Original Report	2010-09-07

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: *MI424-WR REV H*, FCC ID: *LNQMI424WRH* which will henceforth be referred to as the “EUT”. The EUT is a Wireless 11802.11b/g/n Broadband Home Router.

1.2 Mechanical Description of EUT

The “EUT” measures approximately 25.5 cm (L) x 14 cm (W) x 4.5 cm (H), and weighs approximately 539 g.

The test data gathered are from typical production sample, serial number: CSJH0311600022, provided by the manufacturer.

1.3 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.

1.4 Related Submittal(s)/Grant(s)

No Related Submittals

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 and ANSI C63.10-2009, American National Standard for Testing Unlicensed Wireless Devices.

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: C-2463 and R-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 & ANSI C63.10-2009.

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	99-P3NYB
Dell	Laptop	PP18L	17899297525
Dlink	802.11 N Wireless Transceiver	DWA-131	F3X31A4000463

2.6 Internal Configuration

Manufacturer	Description	Model No.	Serial No.
Actiontec	PCB Board	06404A	-

2.7 Power Supply and Line Filters

Manufacturer	Description	Model No.	Serial No.
Actiontec Electronics, Inc.	AC/DC Power Adapter	STD-12018U1	C1950011

2.8 Interface Ports and Cabling

Cable Description	Length (m)	From	To
RJ45 Cable	<2m	EUT	Laptop
RF Cable	<2m	EUT	PSA

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
§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 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	26.38	2.0	0.137	Compliance

The predicted power density level at 20 cm is 0.137 mw/cm² which is below the uncontrolled exposure limit of 1.0 mW/cm². The EUT is used at least 20 cm away from user's body. It is determined as mobile equipment and complies with the MPE limit.

5 FCC §15.203 - 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)
2.4 GHz	2.0	2.0

5.3 Antenna 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 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the 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

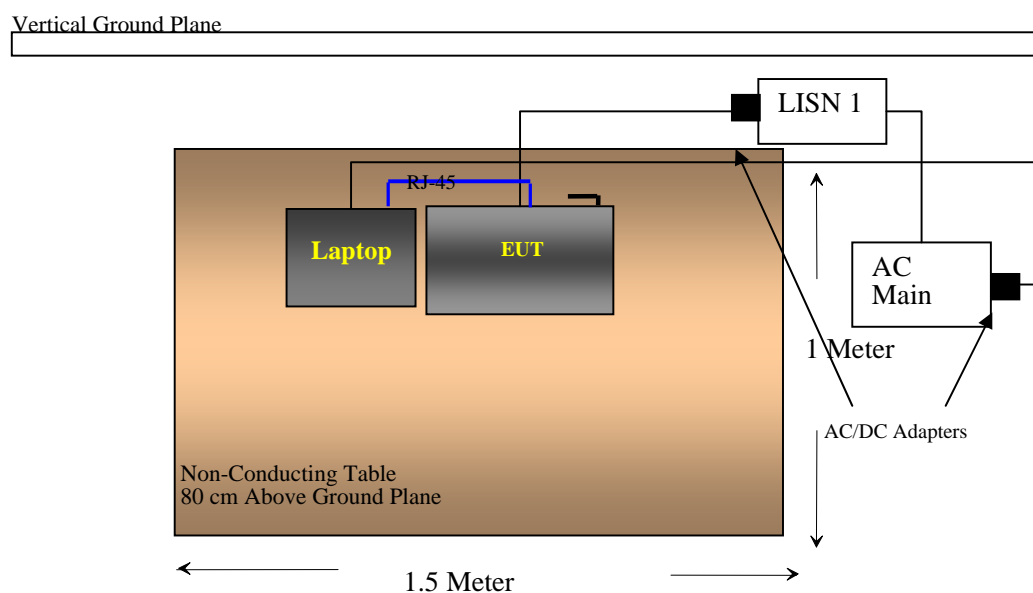
* Decreases with the logarithm of the frequency.

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 Setup Block Diagram



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 with a "QP". Average readings are distinguished with an "Ave".

6.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2010-03-24
Solar Electronics	LISN	9252-R-24-BNC	511205	2010-06-25

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

6.6 Test Environmental Conditions

Temperature:	20-25 °C
Relative Humidity:	30-45 %
ATM Pressure:	100-103kPa

The testing was performed by Jack Liu from 2010-07-30 to 2010-08-31.

6.7 Summary of Test Results

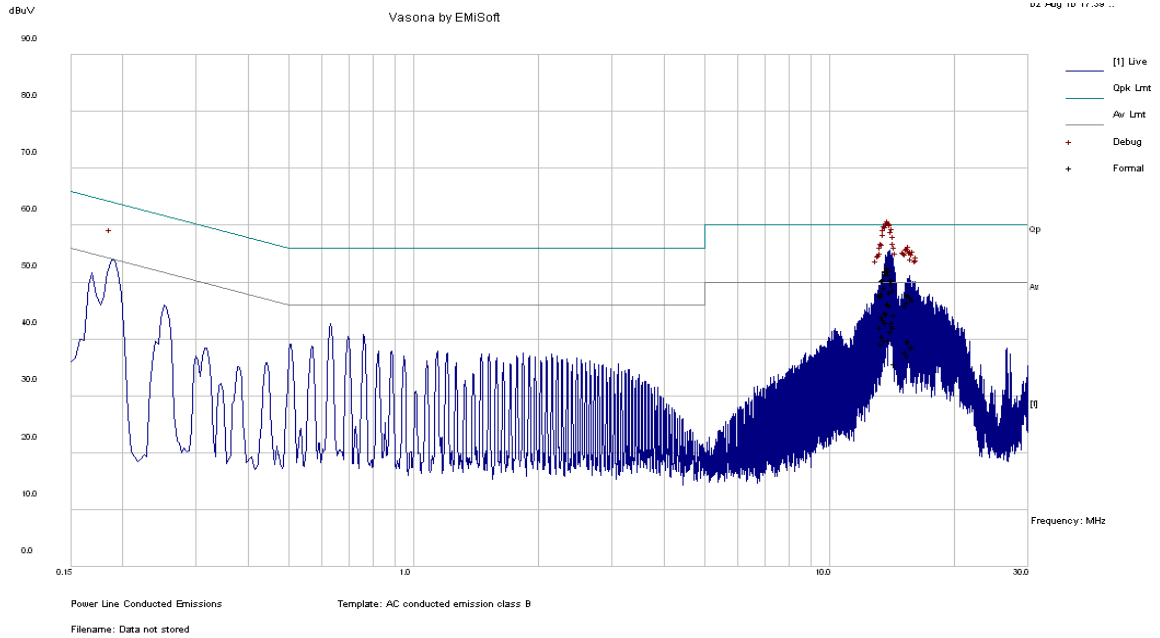
According to the recorded data in following table, the EUT complied with the FCC standard's conducted emissions limits, with the *worst* margin reading of:

Connection: AC/DC adapter connected to 120 V/60 Hz, Mode: 802.11 b, High Channel Transmitting			
Margin (dB)	Frequency (MHz)	Conductor Mode (Line/Neutral)	Range (MHz)
-3.81	13.89692	Line	0.15 to 30
-3.69	13.88937	Neutral	0.15 to 30

6.8 Conducted Emissions Test Plots and Data

Please refer to the following plots and tables.

120 V, 60 Hz – Line



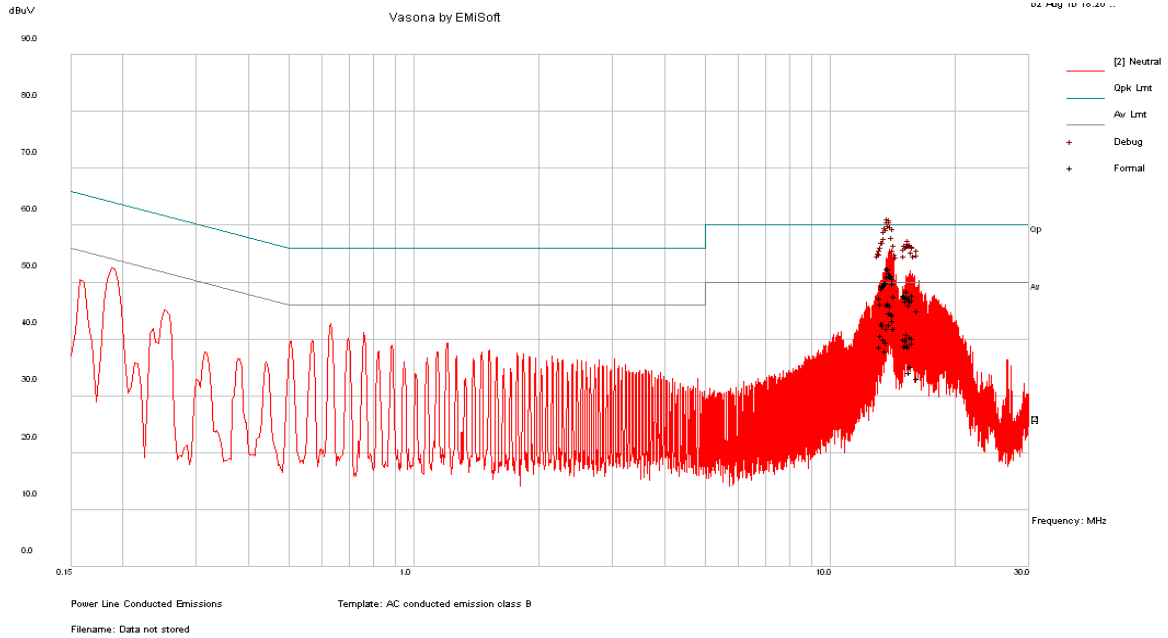
Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
13.89692	52.57	Line	60	-7.43
14.01475	52.04	Line	60	-7.96
13.76468	51.98	Line	60	-8.02
13.8364	51.93	Line	60	-8.07
13.70801	51.47	Line	60	-8.53
13.96546	51.3	Line	60	-8.7

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
13.89692	46.19	Line	50	-3.81
14.01475	46.13	Line	50	-3.87
14.07671	45.82	Line	50	-4.18
13.70801	44.6	Line	50	-5.4
13.8364	44.56	Line	50	-5.44
13.5147	43.9	Line	50	-6.1

120 V, 60 Hz – Neutral



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dB μ V)	Conductor (Line/Neutral)	Limit (dB μ V)	Margin (dB)
13.88937	52.45	Neutral	60	-7.55
13.82703	52.39	Neutral	60	-7.61
14.01956	51.76	Neutral	60	-8.24
13.9613	51.27	Neutral	60	-8.73
14.14156	51.27	Neutral	60	-8.73
14.07657	51.17	Neutral	60	-8.83

Average Measurements

Frequency (MHz)	Corrected Amplitude (dB μ V)	Conductor (Line/Neutral)	Limit (dB μ V)	Margin (dB)
13.88937	46.31	Neutral	50	-3.69
13.82703	45.95	Neutral	50	-4.05
14.07657	45.88	Neutral	50	-4.12
14.01956	44.61	Neutral	50	-5.39
14.14156	44.54	Neutral	50	-5.46
14.20061	44.3	Neutral	50	-5.70

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	MY44303352	2010-05-11

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:	20-25 °C
Relative Humidity:	30-45 %
ATM Pressure:	100-103kPa

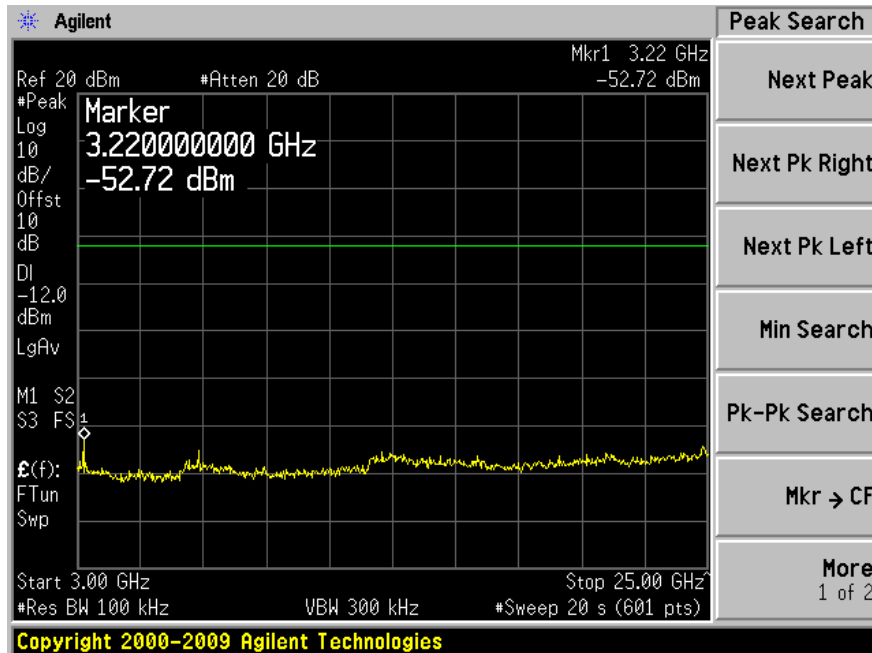
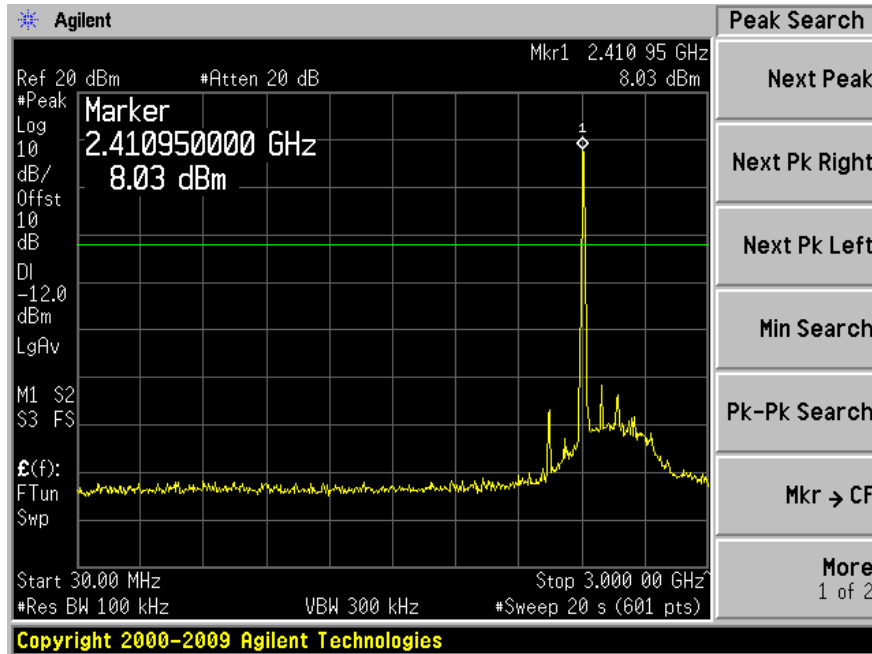
The testing was performed by Jack Liu from 2010-07-30 to 2010-08-31.

7.5 Measurement Result:

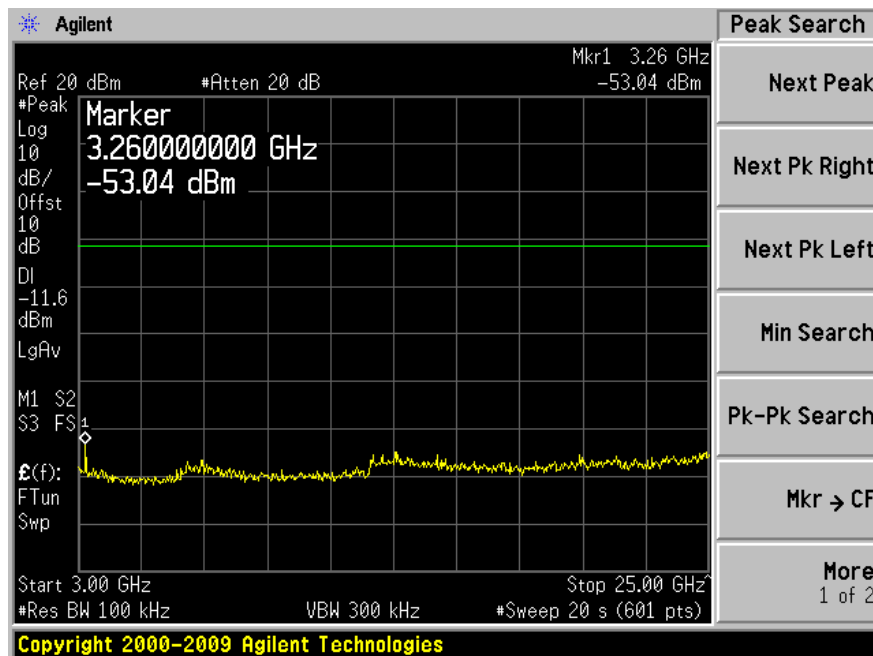
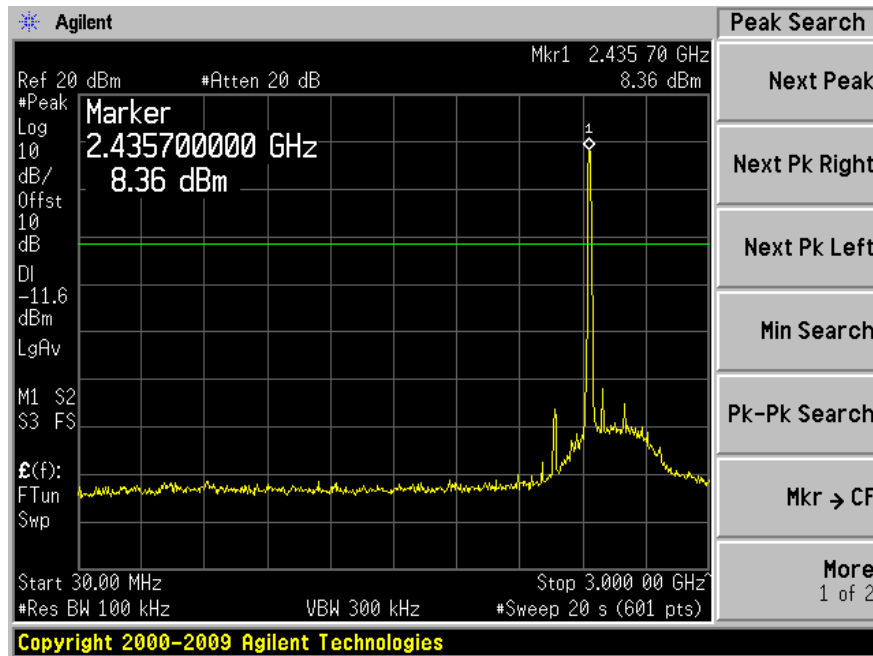
Please refer to following plots of spurious emissions.

802.11 b (Antenna #0)

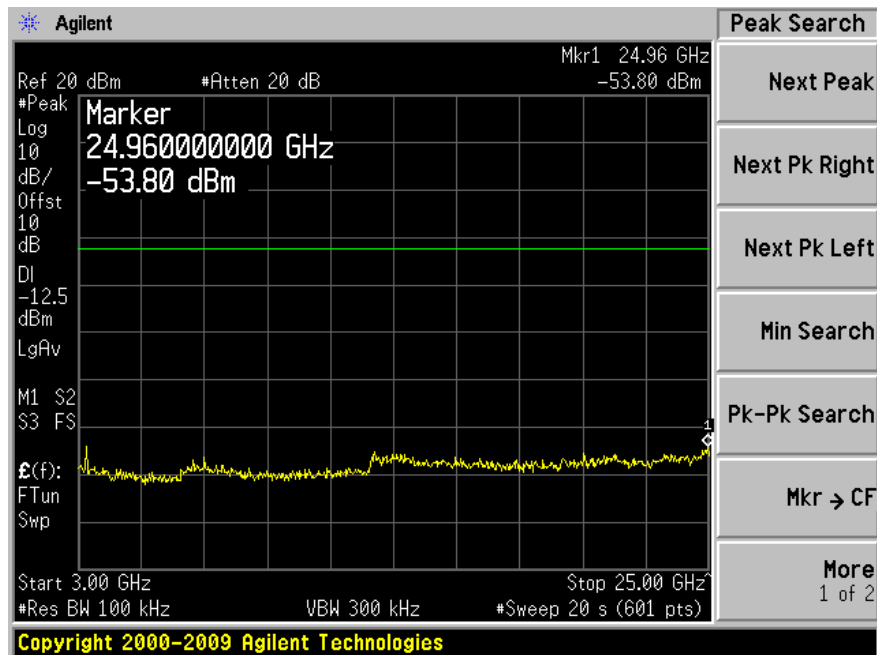
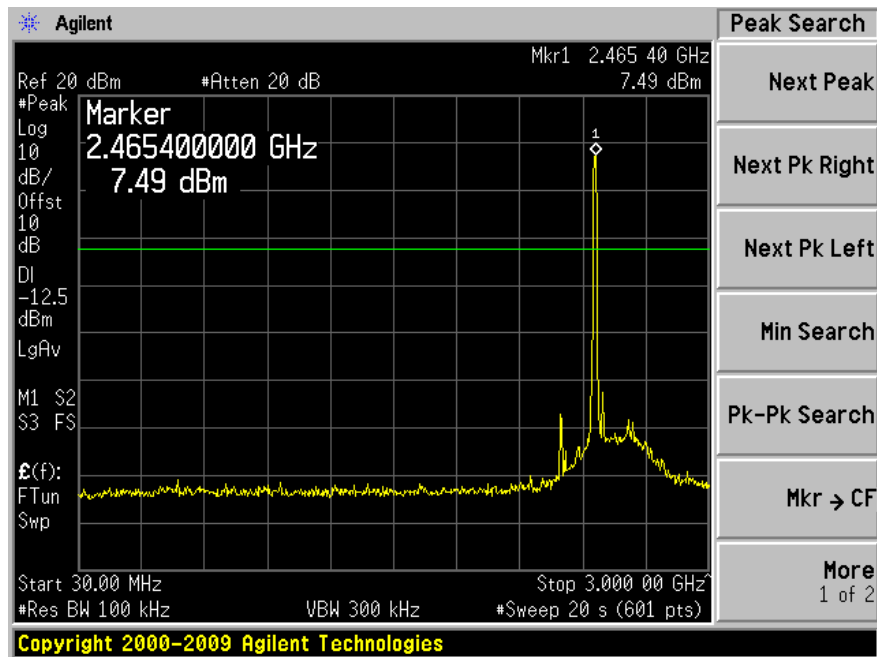
Low Channel 2412 MHz



Middle Channel 2437 MHz

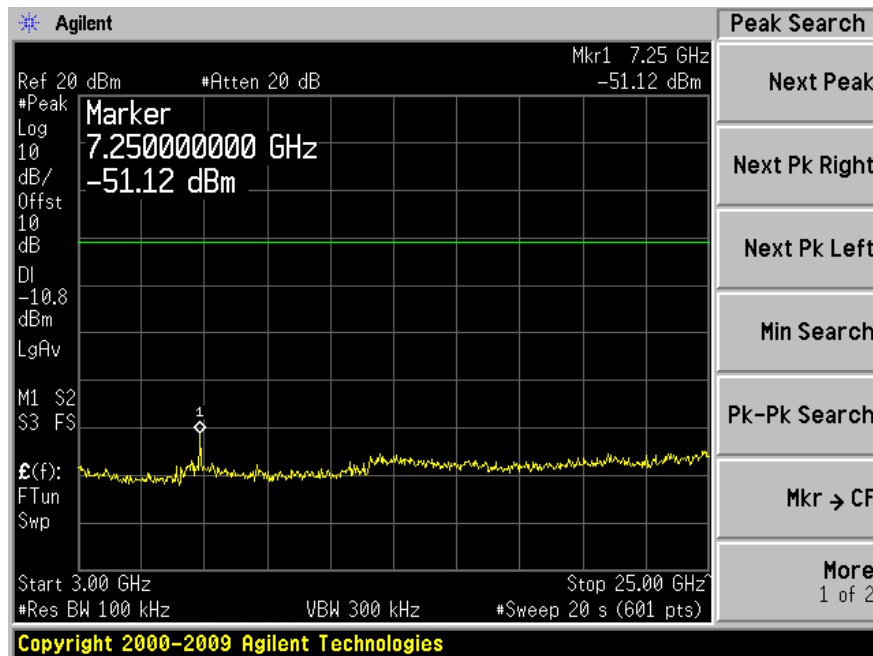
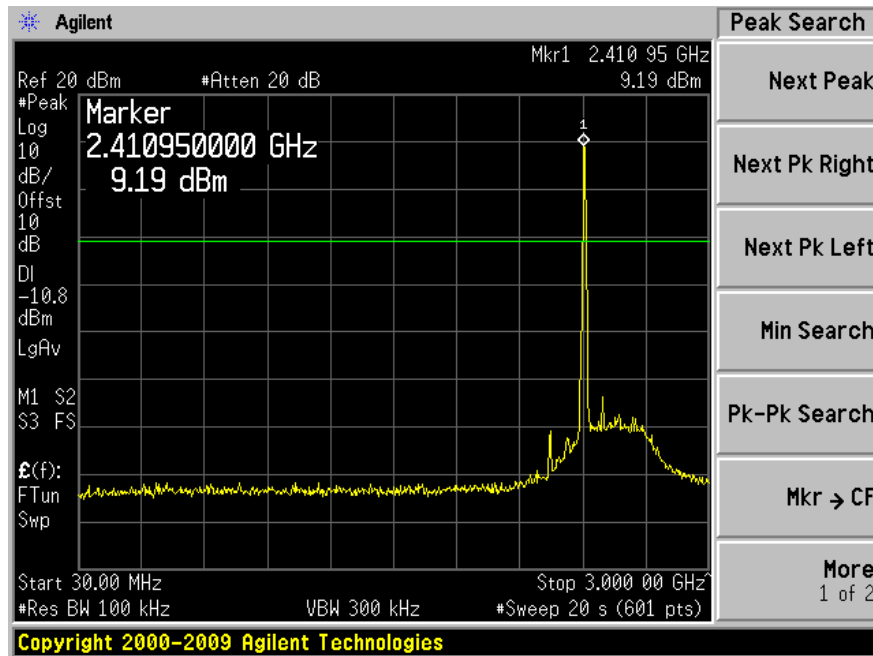


High Channel 2462 MHz

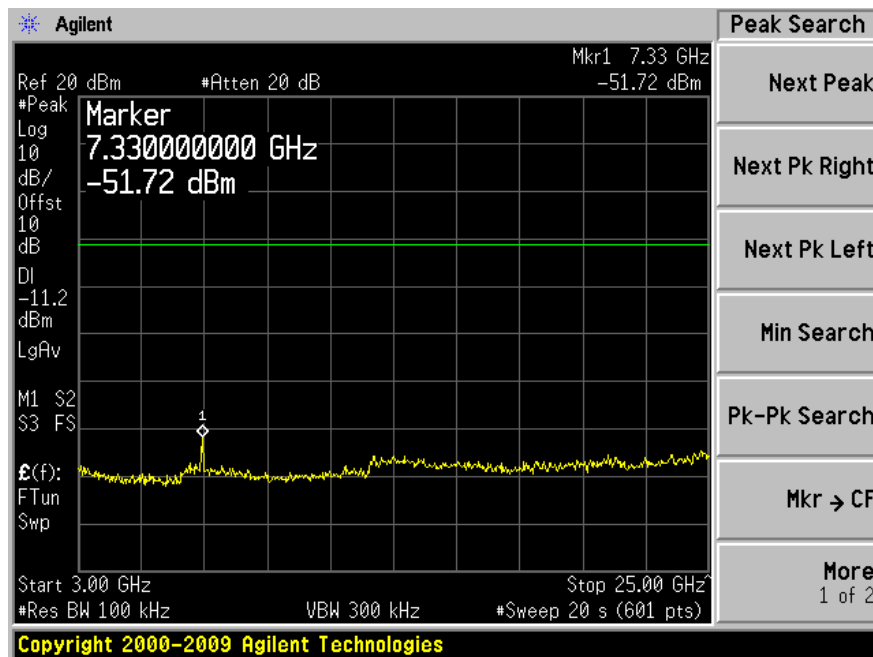
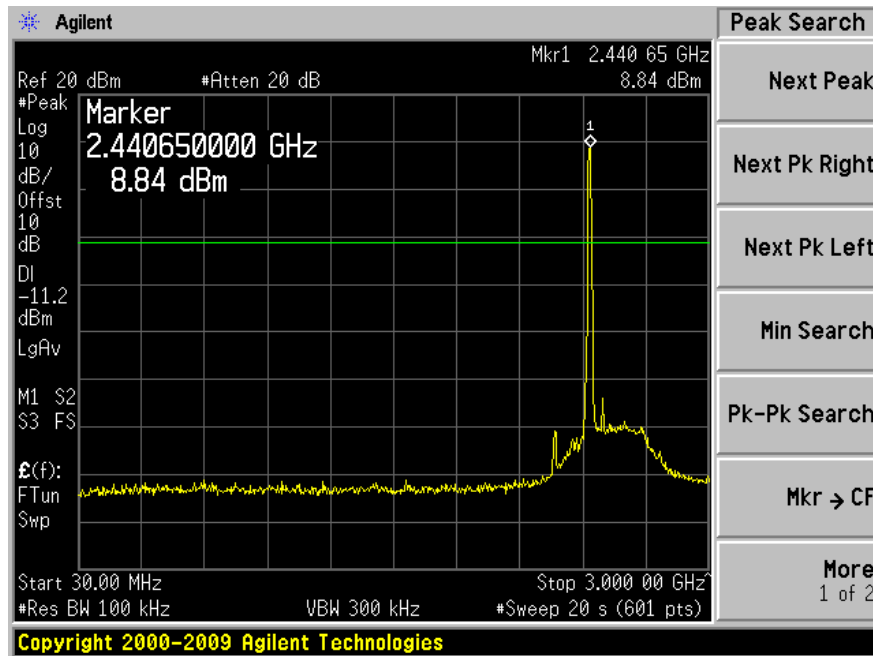


802.11 b (Antenna #1)

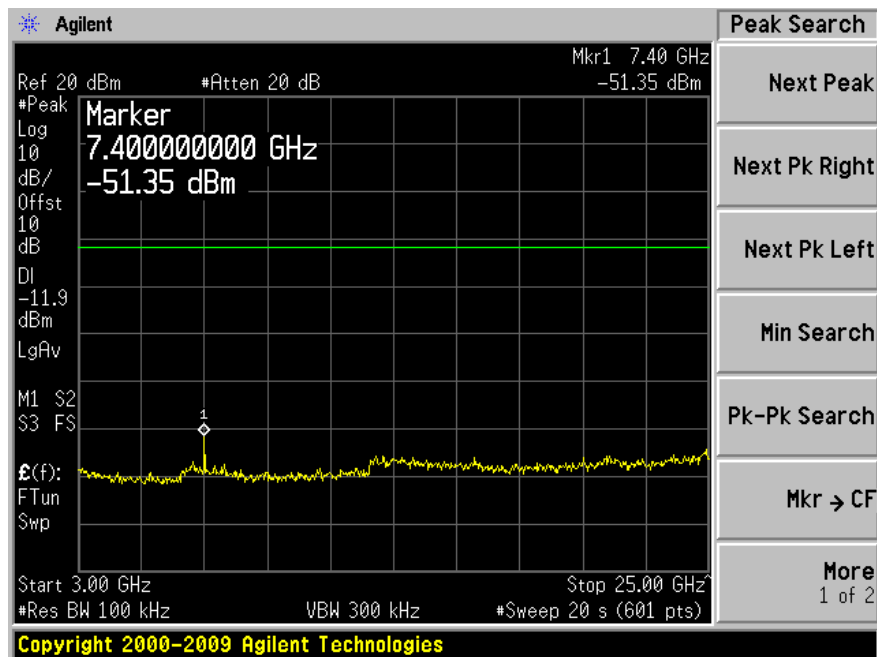
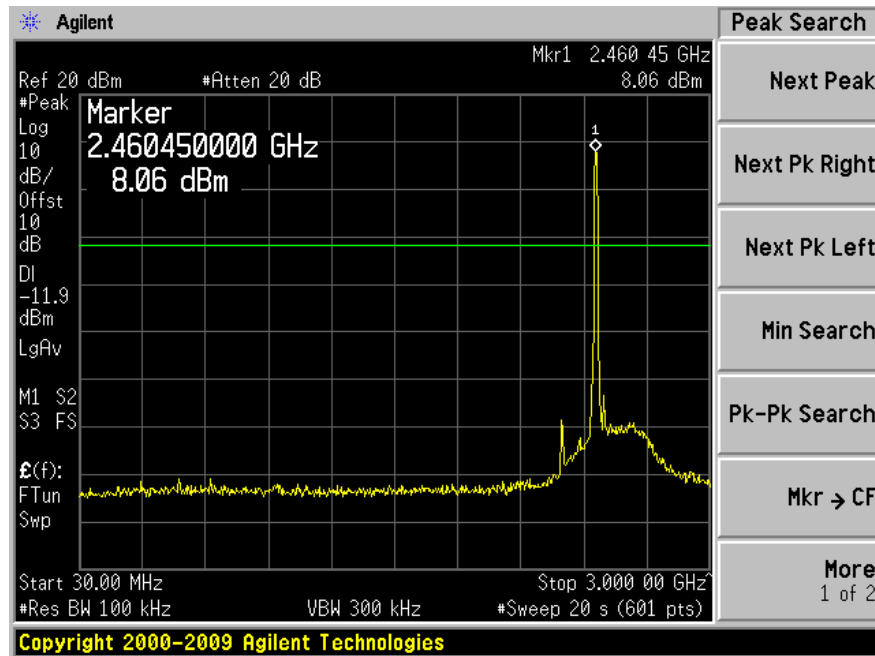
Low Channel 2412 MHz



Middle Channel 2437 MHz

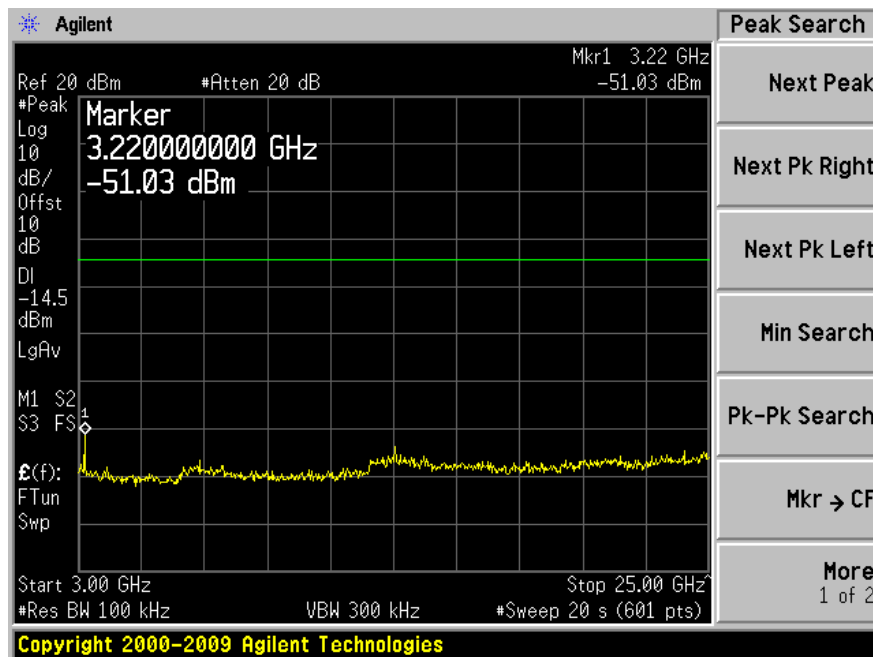
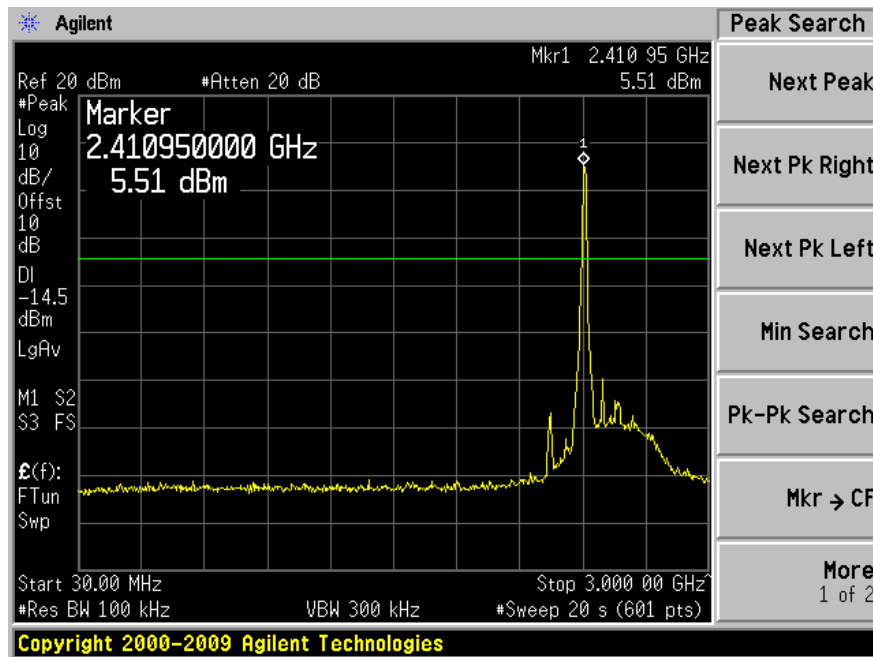


High Channel 2462 MHz

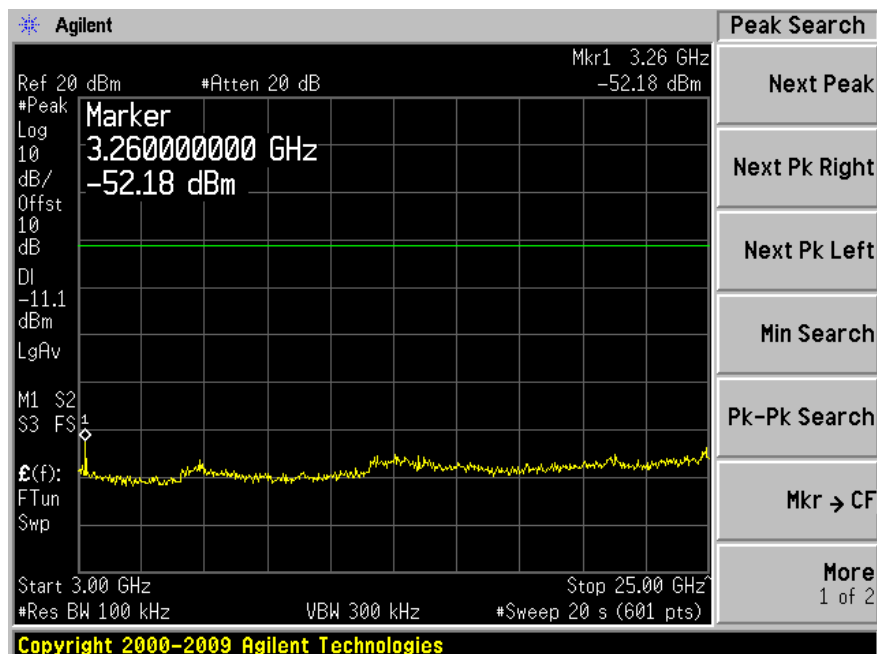
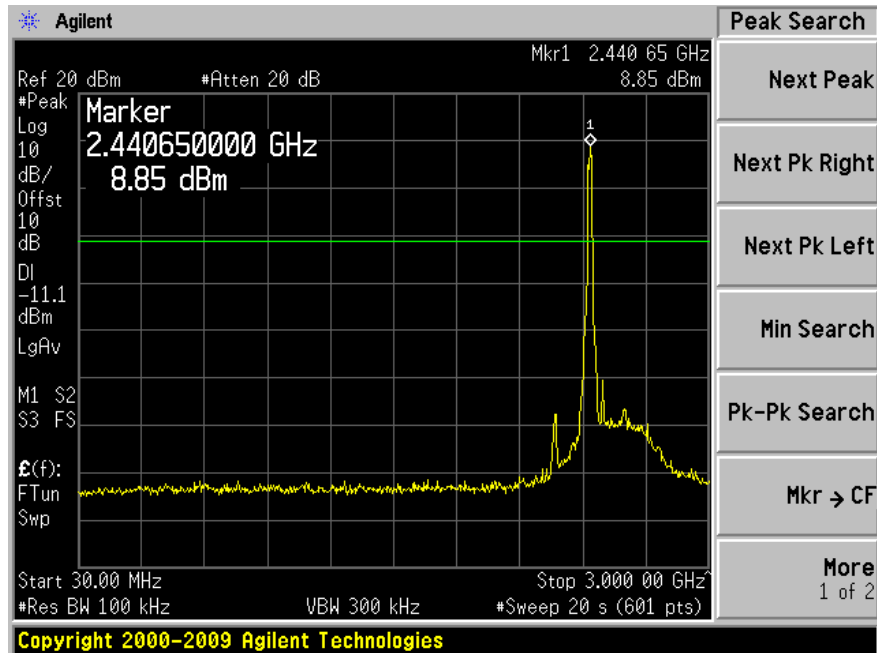


802.11 g (Antenna #0)

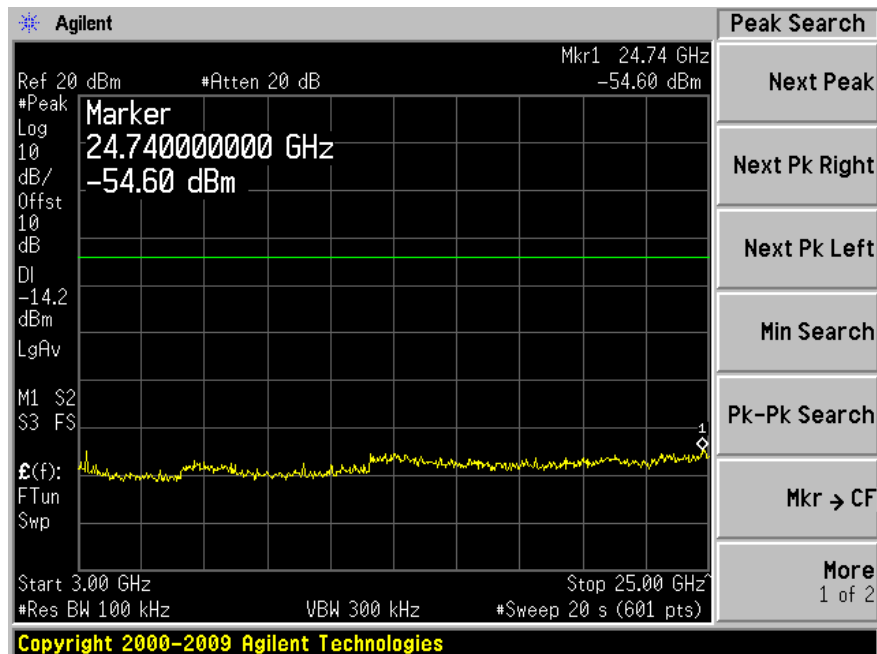
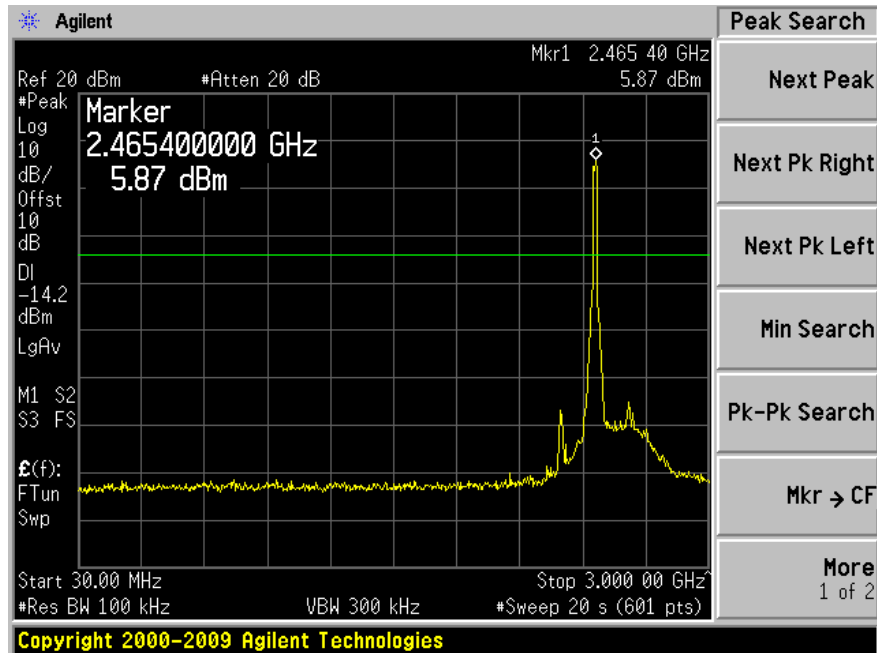
Low Channel 2412 MHz



Middle Channel 2437 MHz

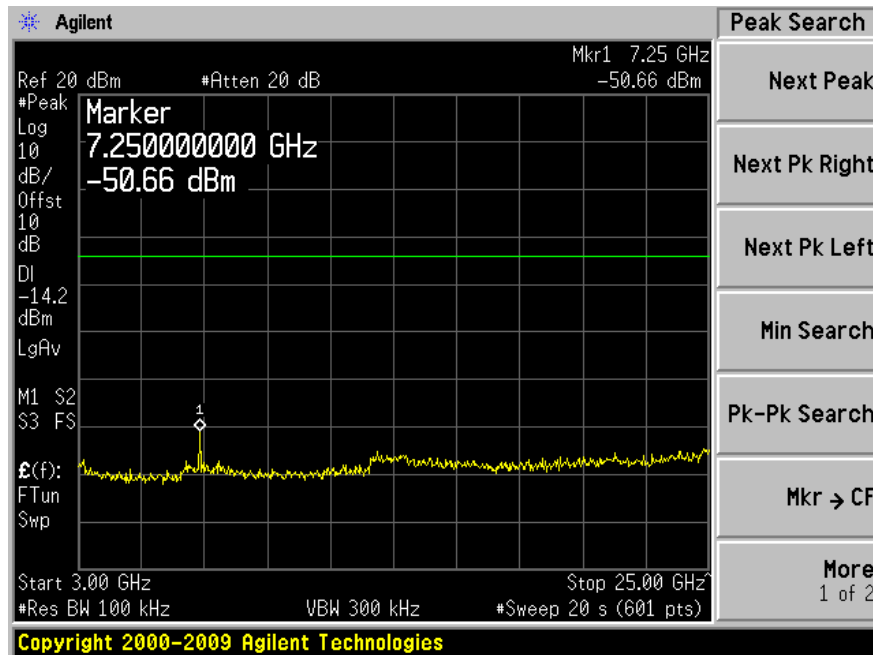
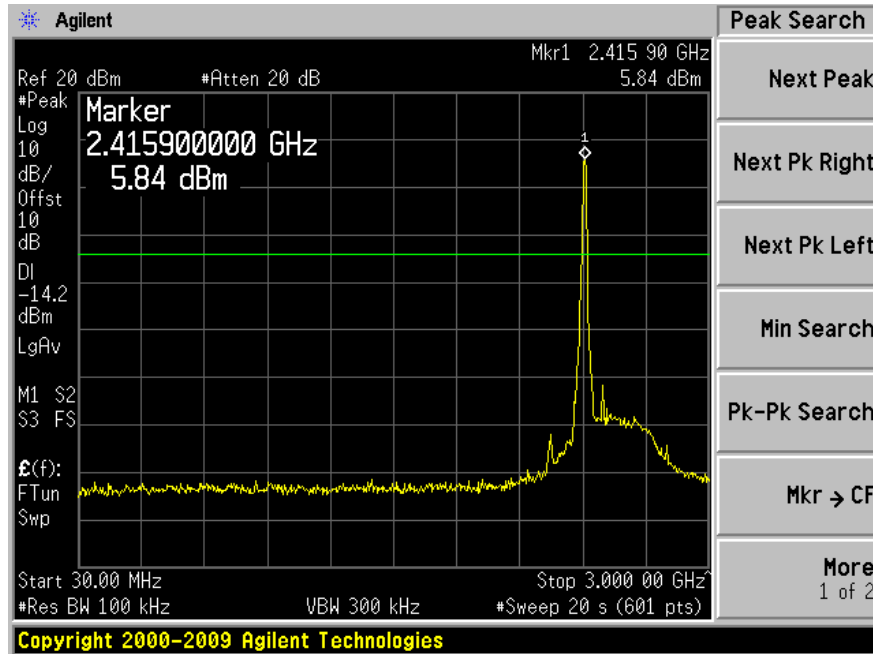


High Channel 2462 MHz

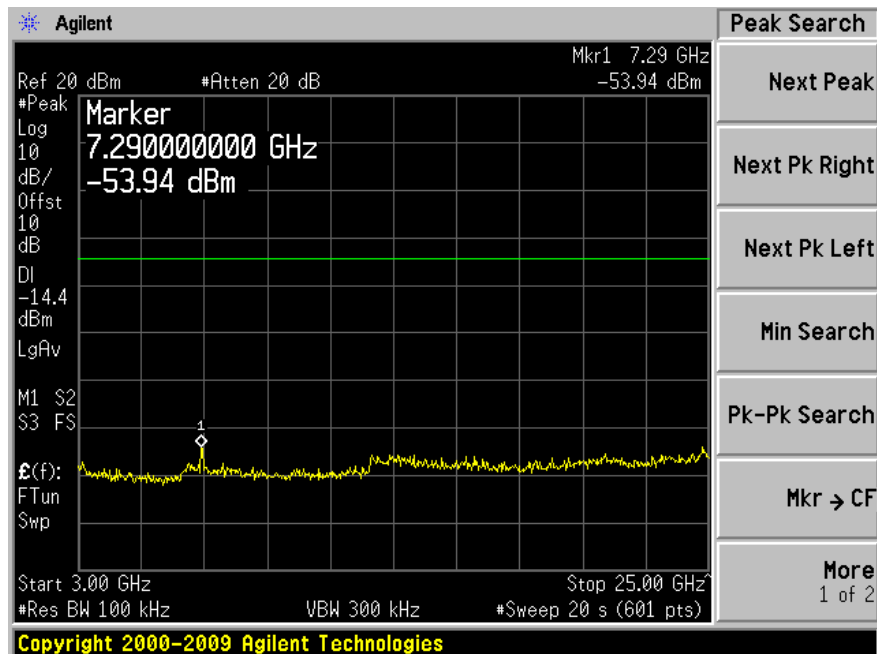
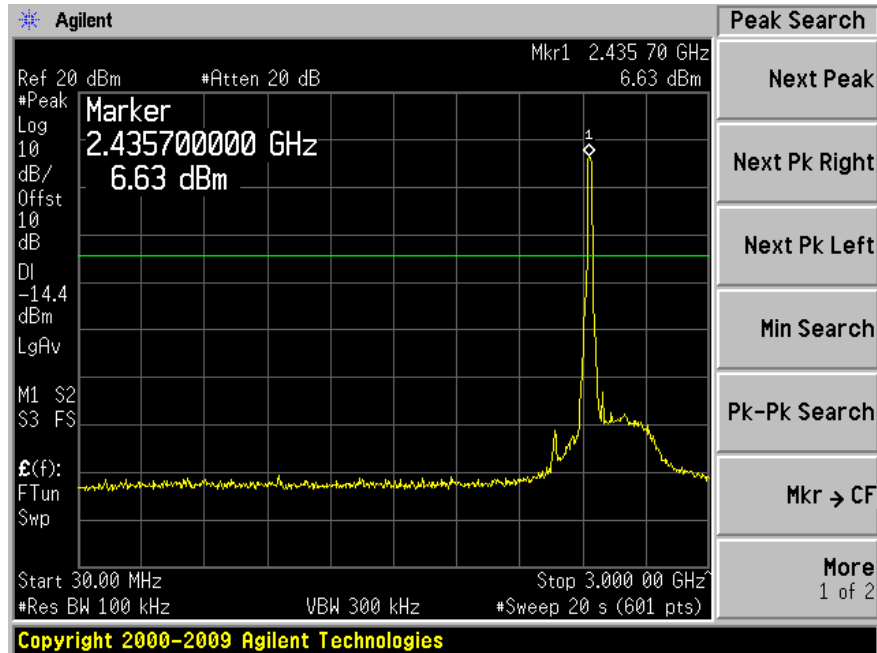


802.11 g (Antenna #1)

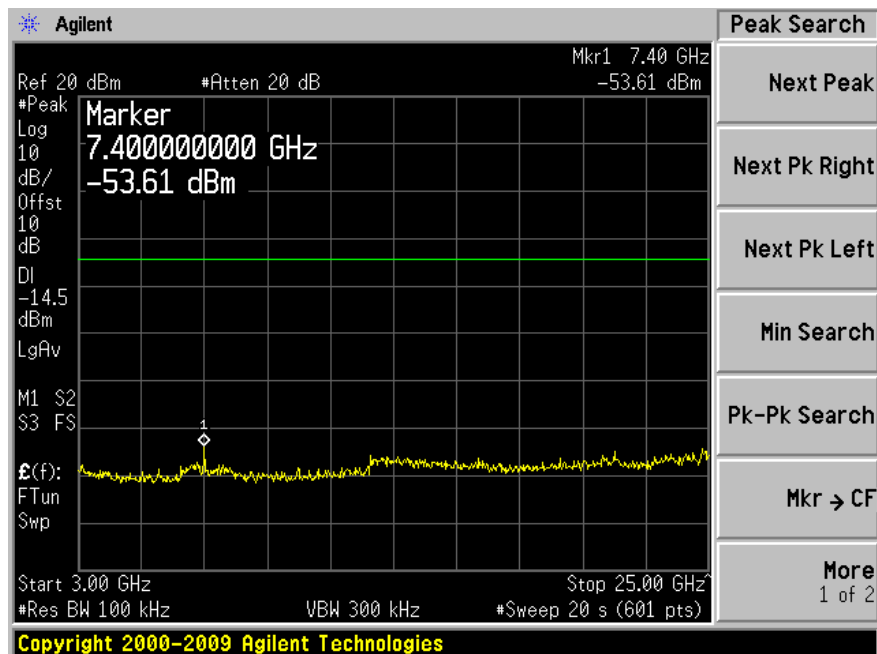
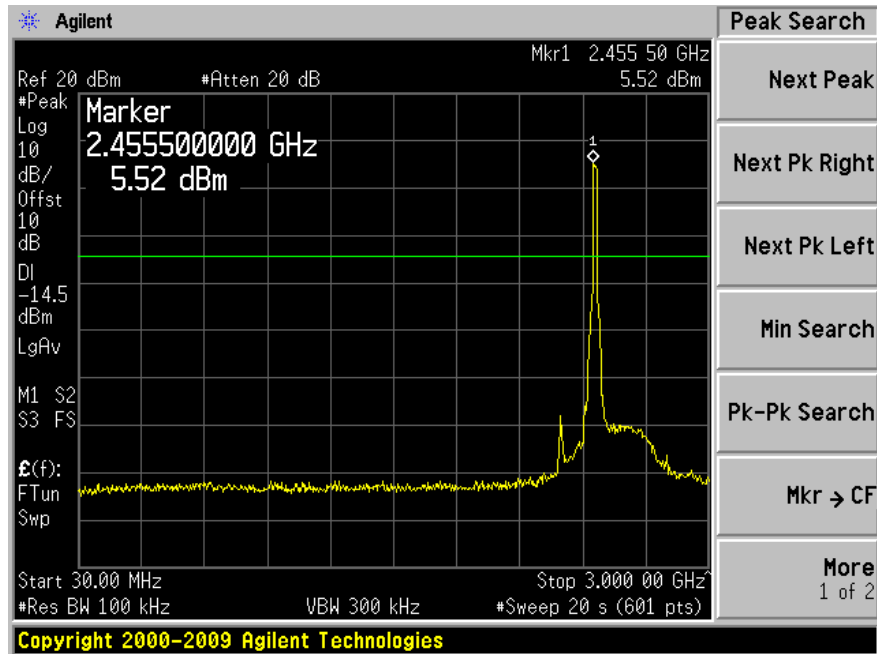
Low Channel 2412 MHz



Middle Channel 2437 MHz

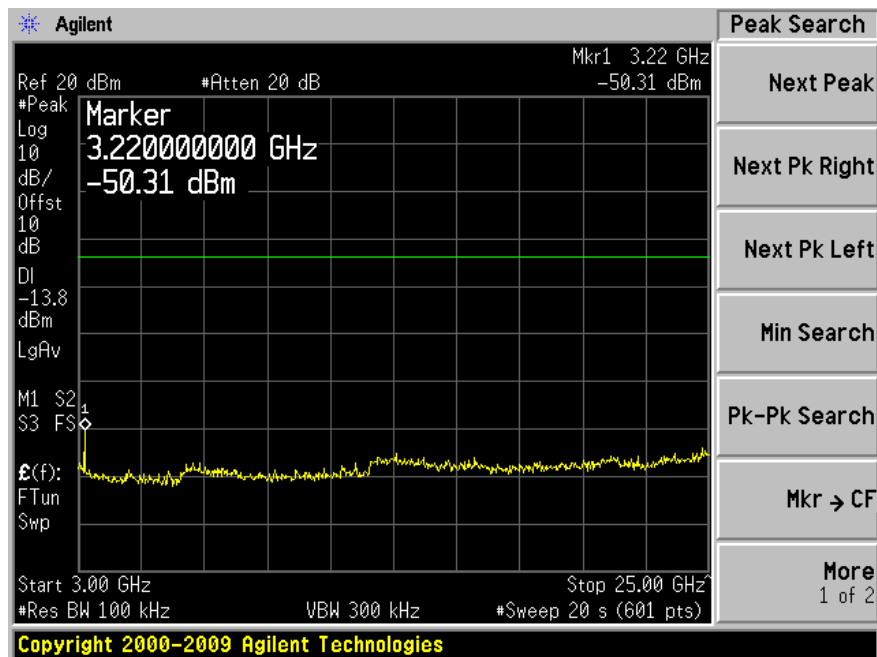
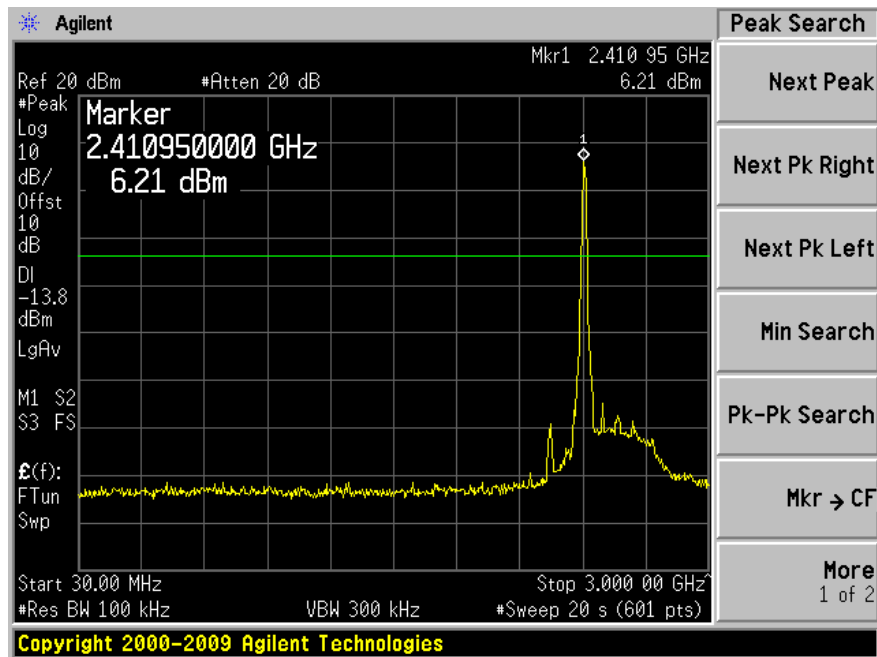


High Channel 2462 MHz

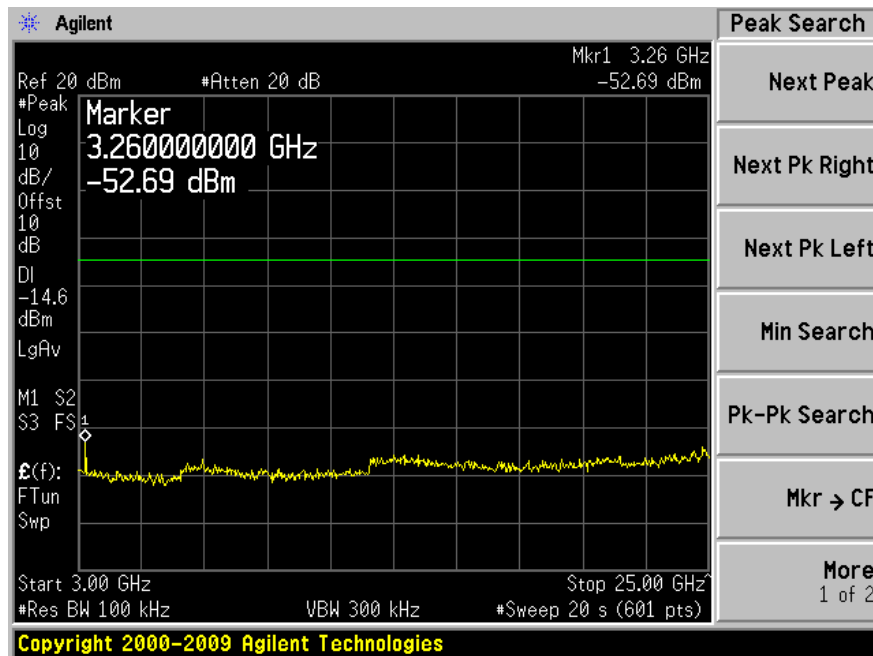
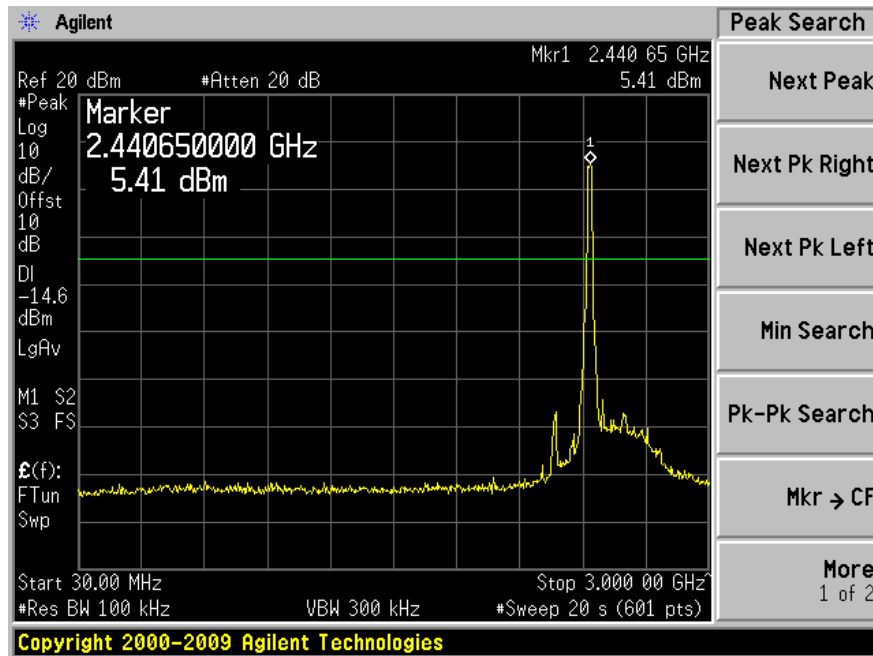


802.11 n 20 MHz (Antenna #0)

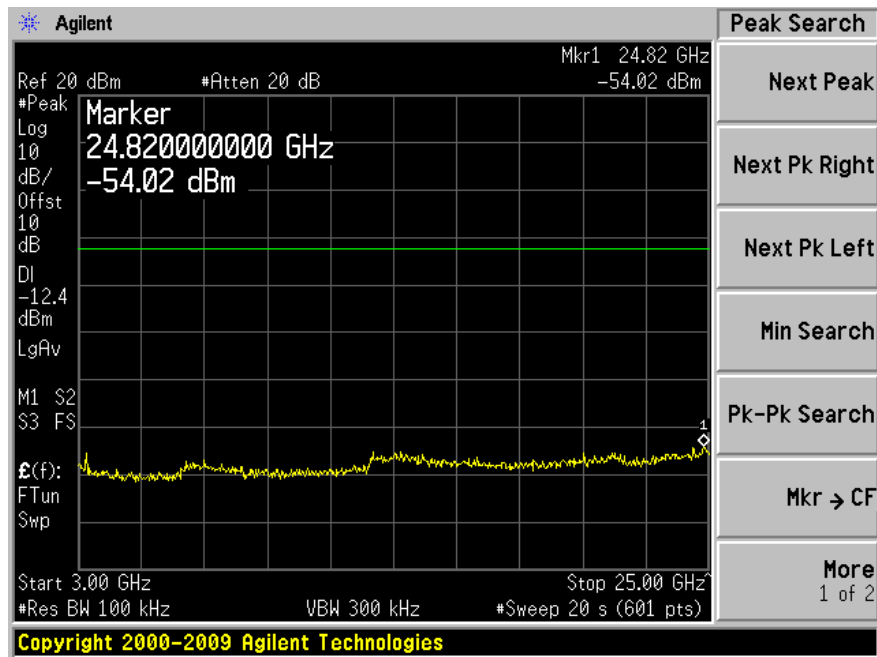
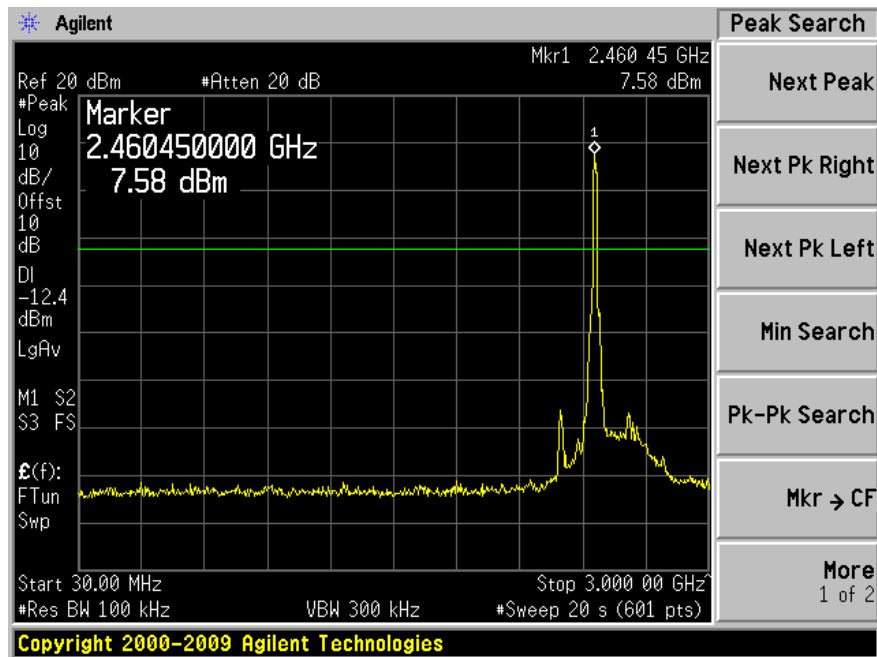
Low Channel 2412 MHz



Middle Channel 2437 MHz

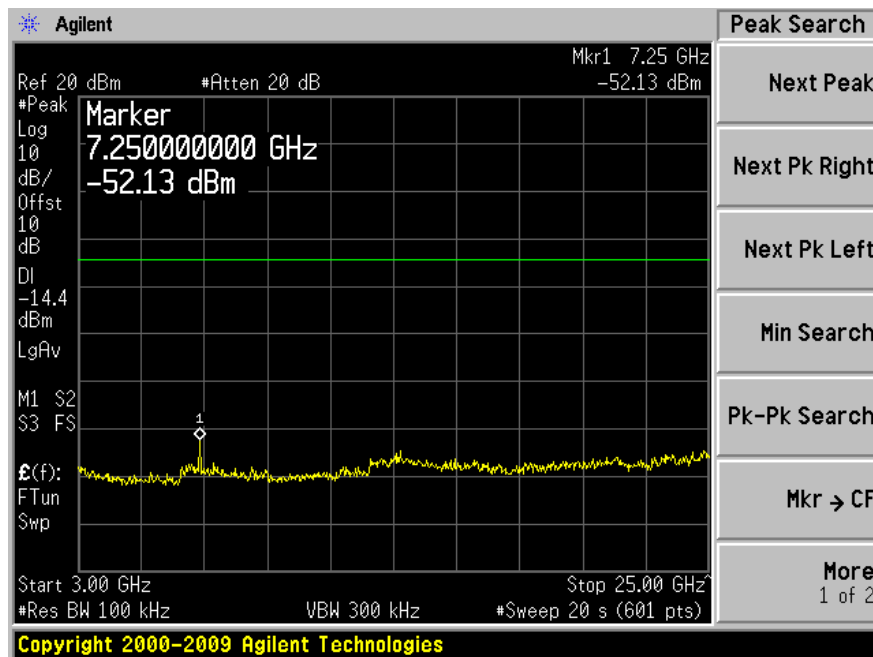
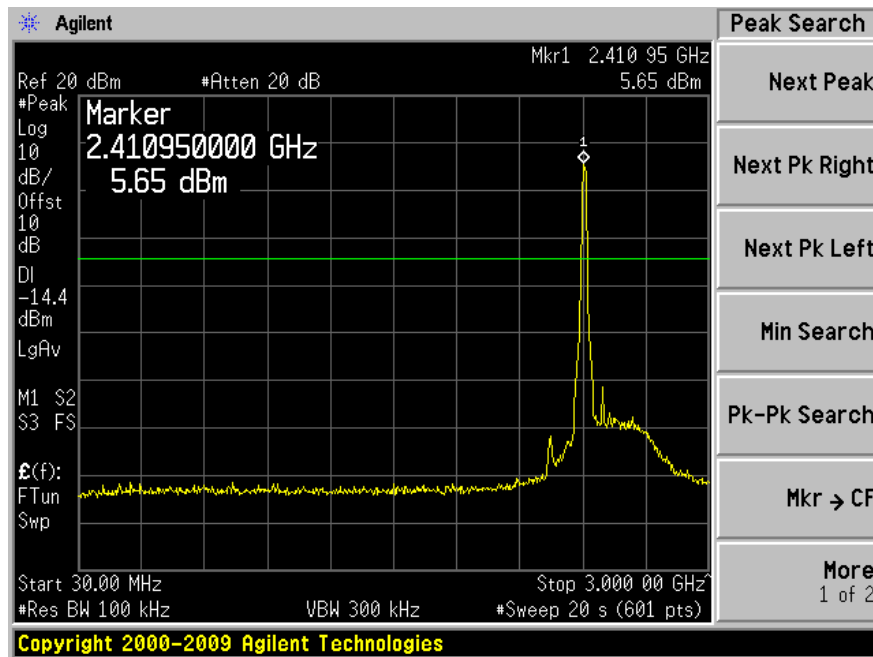


High Channel 2462 MHz

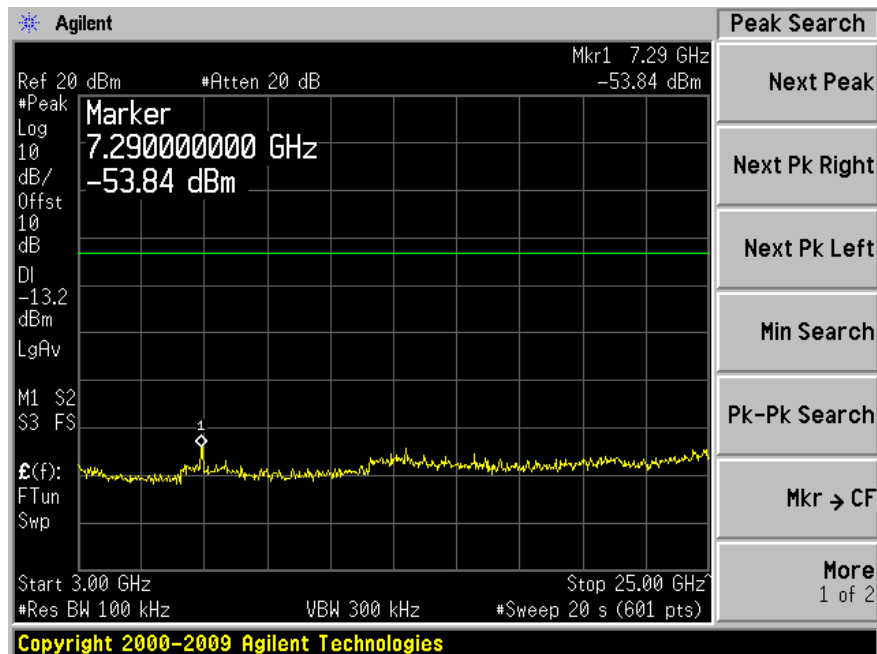
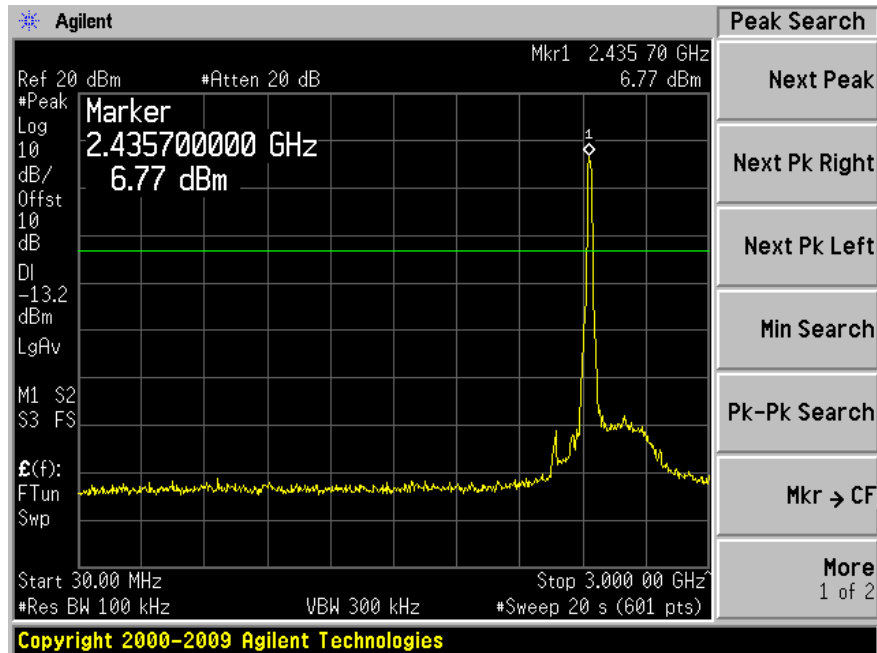


802.11 n 20 MHz (Antenna #1)

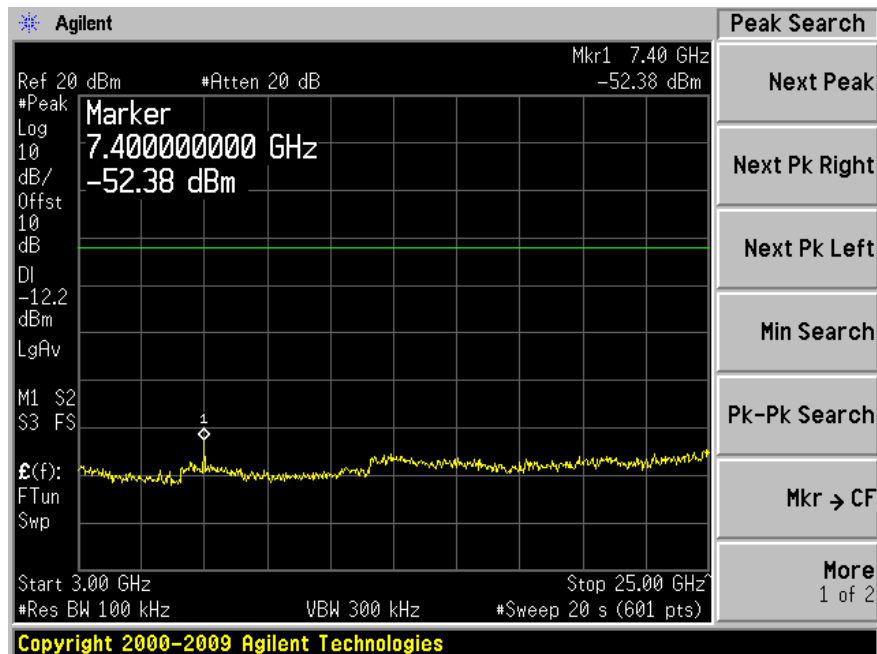
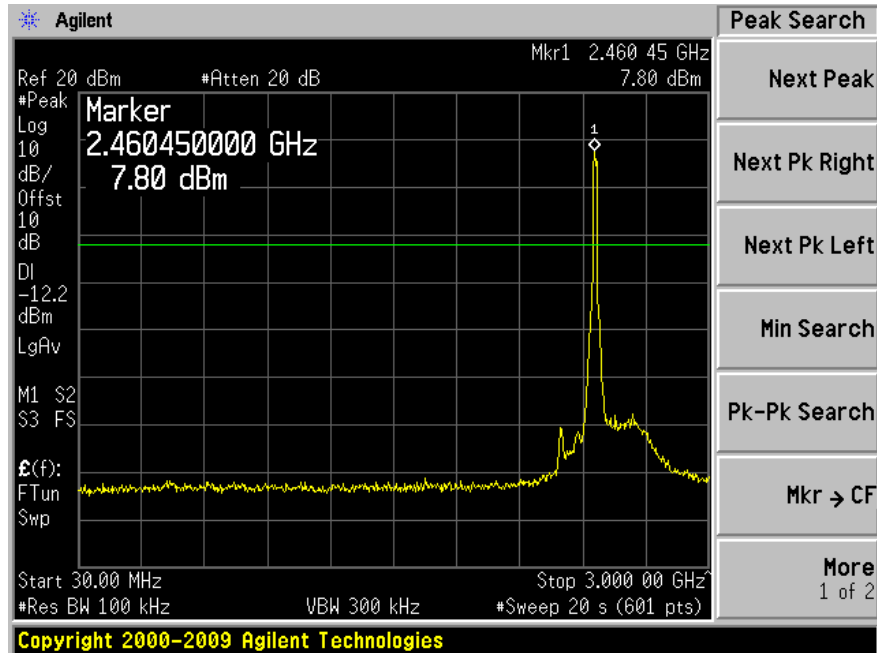
Low Channel 2412 MHz



Middle Channel 2437 MHz

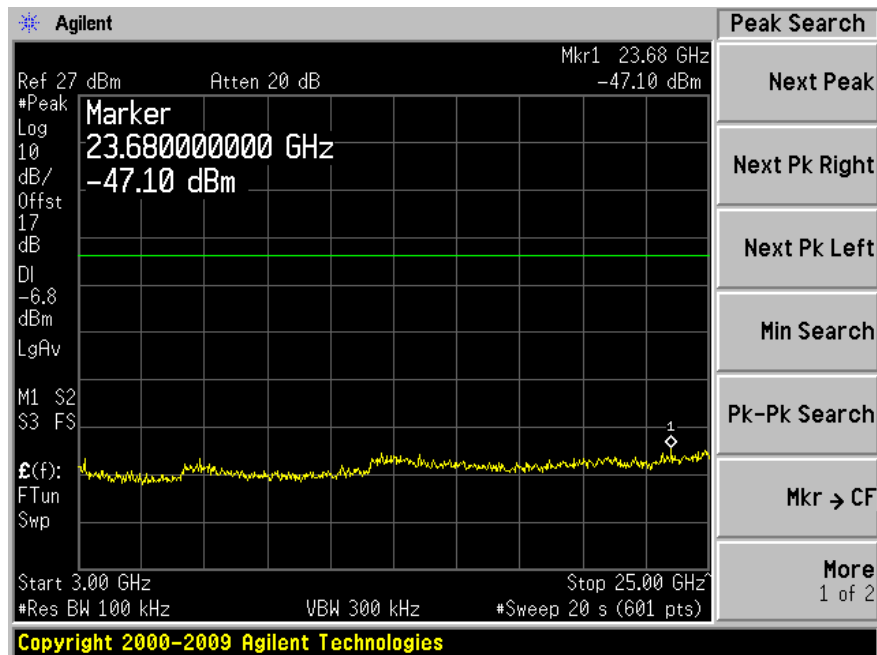
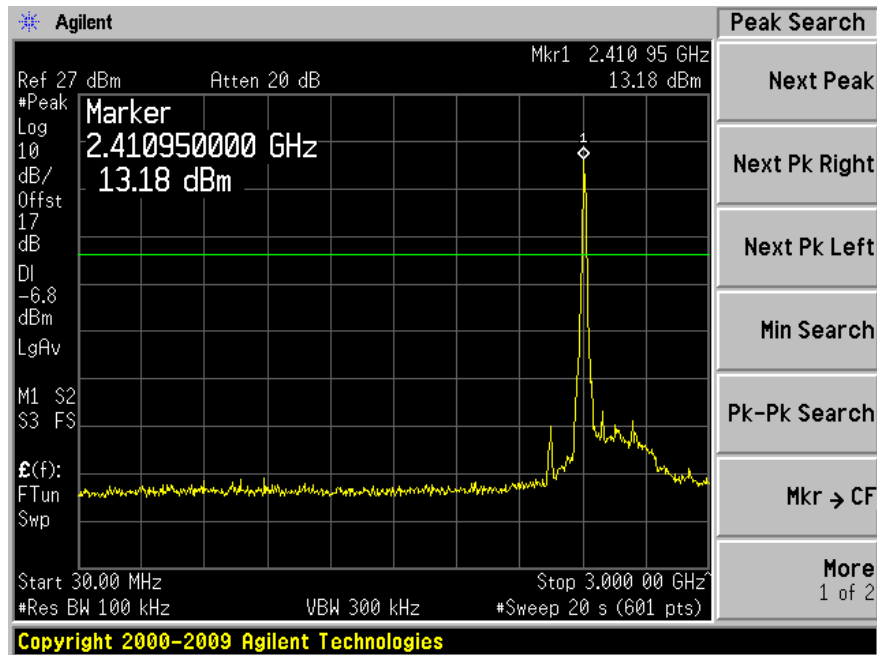


High Channel 2462 MHz

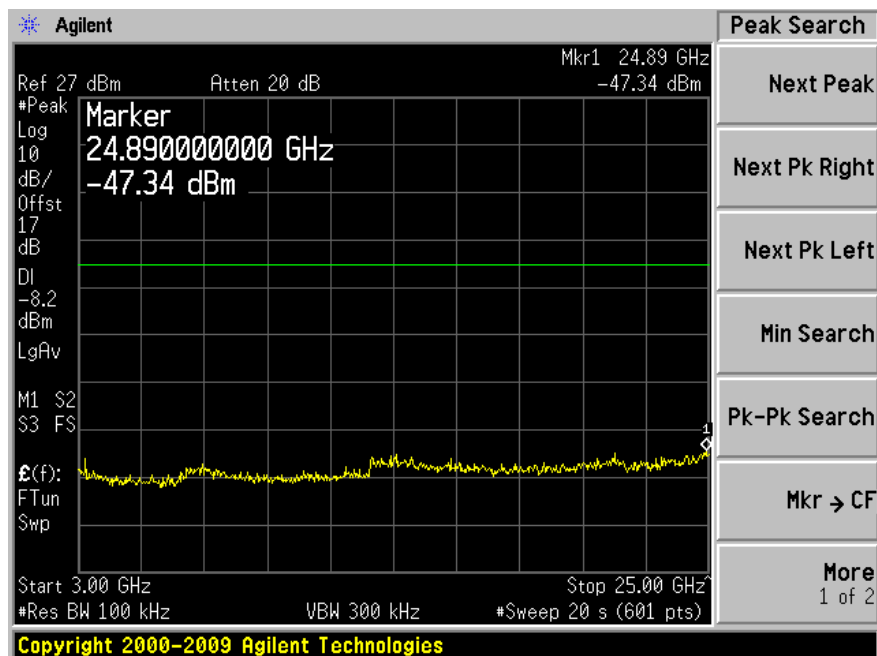
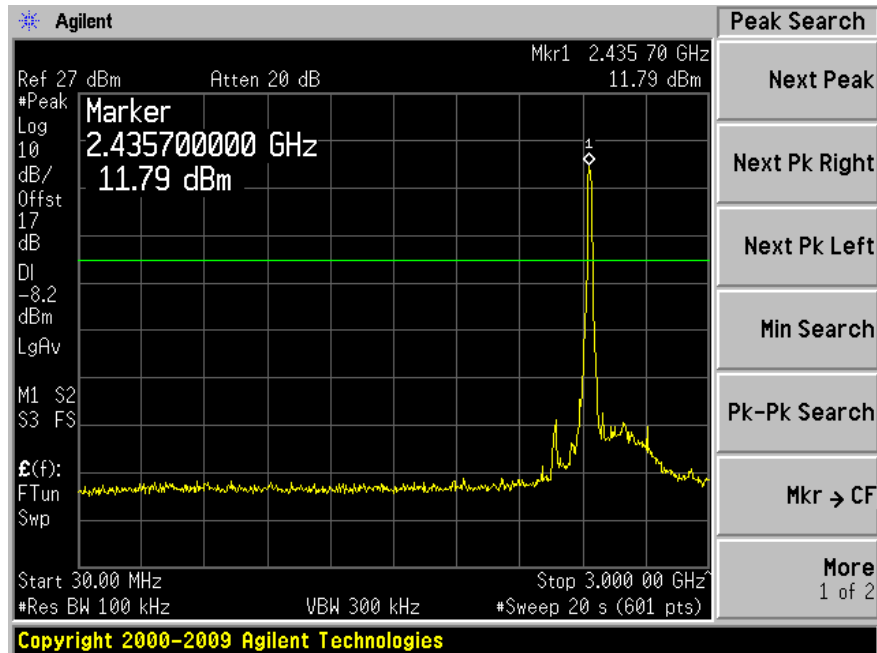


802.11 n 20 MHz (Antenna #0 + Antenna #1)

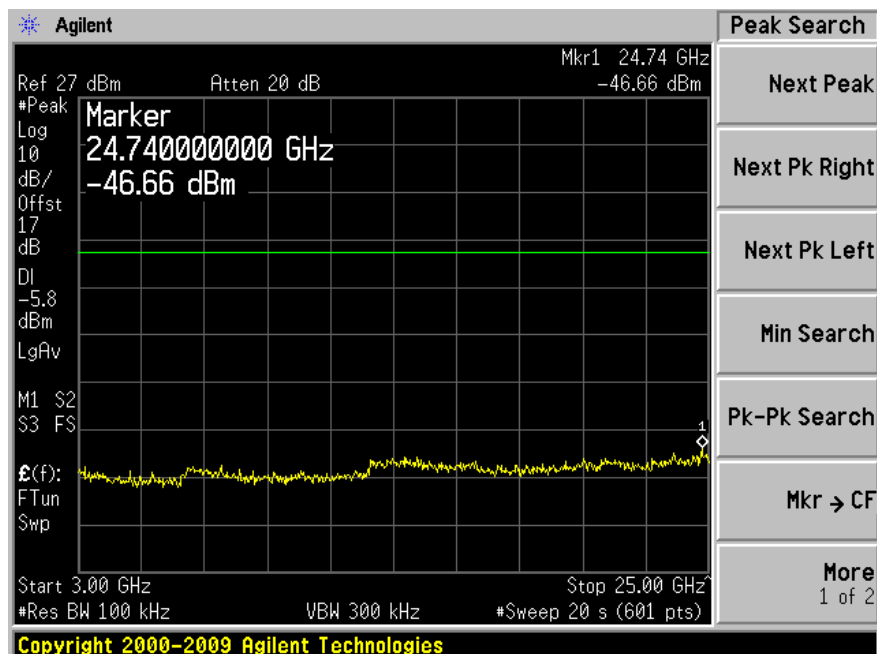
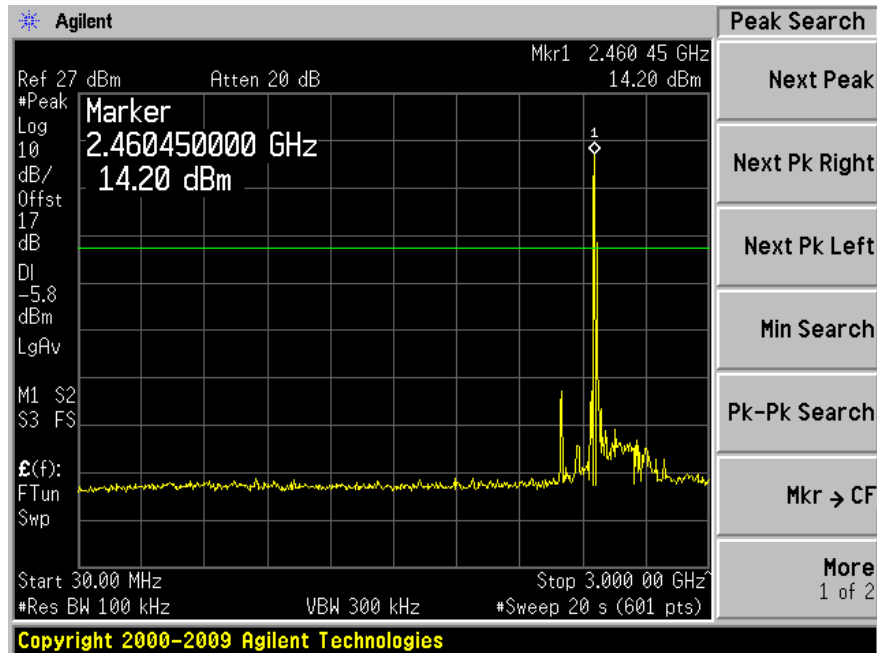
Low Channel 2412 MHz



Middle Channel 2437 MHz



High Channel 2462 MHz



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

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

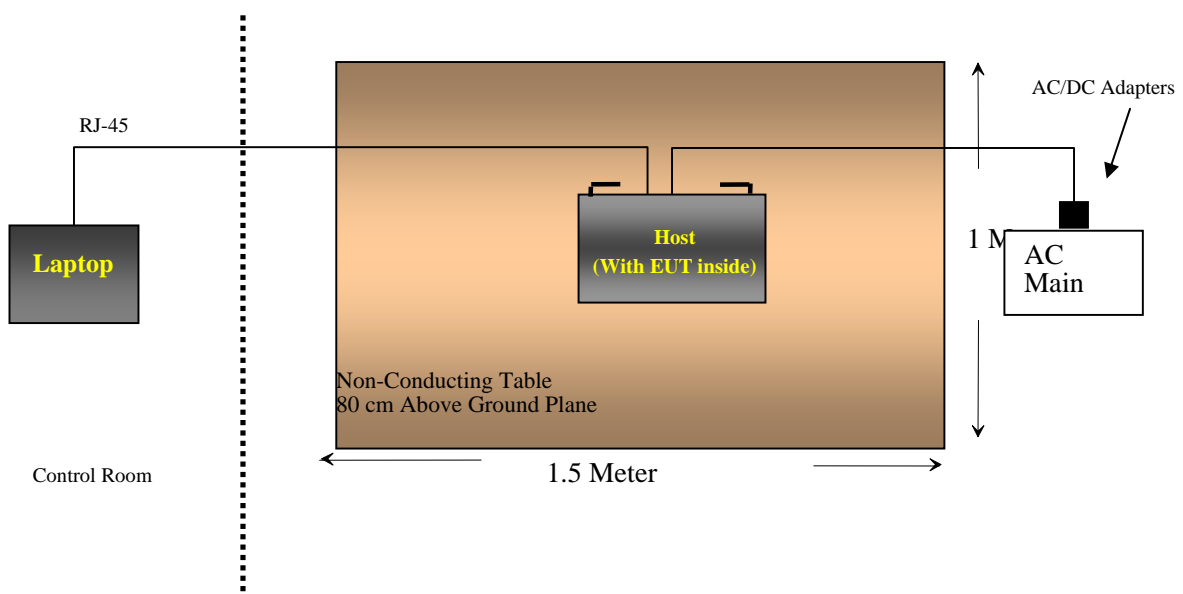
The radiated emissions tests were performed using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15C limits.

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 Setup Block Diagram

Radiated Emissions



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:

$$\text{RBW} = 100 \text{ kHz} / \text{VBW} = 300 \text{ kHz} / \text{Sweep} = \text{Auto}$$

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 Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

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

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

8.7 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2010-05-11
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2010-03-24
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Sunol Science Corp	Combination Antenna	JB3	A0020106-3	2010-06-16
Hewlett Packard	Pre amplifier	8447D	2944A06639	2010-06-18
A.R.A Inc	Horn antenna	DRG-1181A	1132	2009-10-27
Agilent	Pre Amplifier	8449B	3008A01978	2010-01-29

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

8.8 Test Environmental Conditions

Temperature:	20-25 °C
Relative Humidity:	30-45 %
ATM Pressure:	100-103kPa

The testing was performed by Jack Liu from 2010-07-30 to 2010-08-31 in 5 meter chamber #3.

8.9 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:

Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
30-1000 MHz			
-1.46	33.446	Vertical	High, 30 MHz – 1GHz
Above 1 GHz			
-1.6	7236	Vertical	Low, 1GHz – 25GHz
-1.08	7311	Vertical	Mid, 1GHz – 25GHz
-2.47	7386	Vertical	High, 1GHz – 25GHz

802.11 g mode:

Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
30-1000 MHz			
-3.4	53.52975	Vertical	High, 30 MHz – 1GHz
Above 1 GHz			
-5.87	7236	Vertical	Low, 1GHz – 25GHz
-7.85	7311	Vertical	Mid, 1GHz – 25GHz
-7.6	7386	Vertical	High, 1GHz – 25GHz

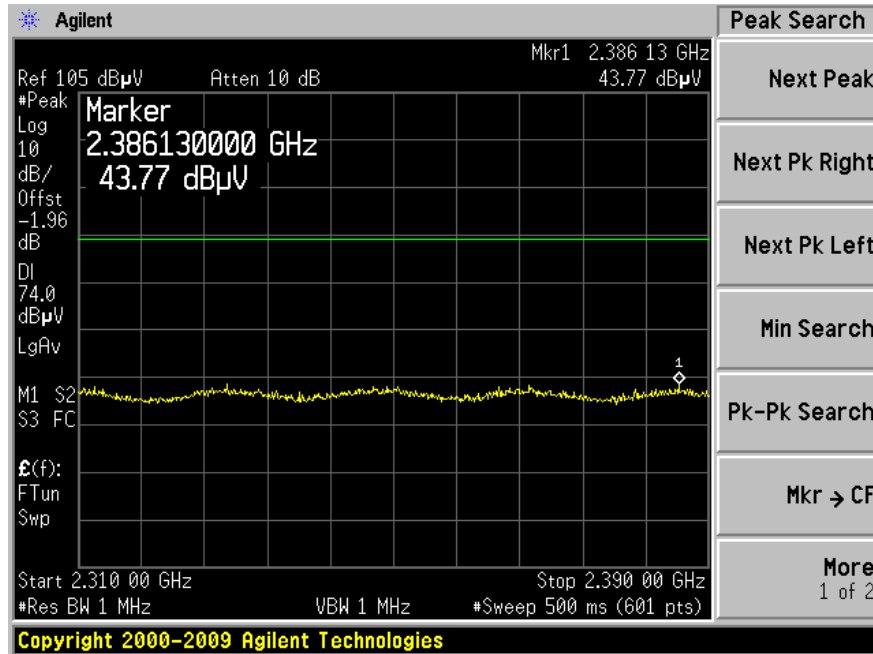
802.11 n mode:

Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
30-1000 MHz			
43.811725	-3.1	Vertical	High, 30 MHz – 1GHz
Above 1 GHz			
-4.07	7236	Vertical	Low, 1GHz – 25GHz
-4.23	7311	Vertical	Mid, 1GHz – 25GHz
-4.77	7386	Vertical	High, 1GHz – 25GHz

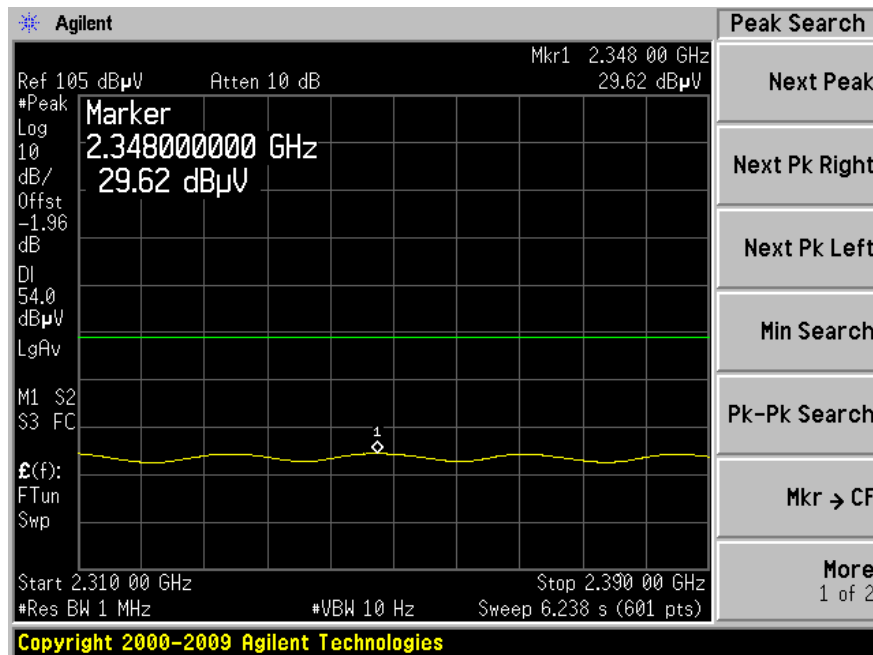
Restrict Bands Emissions:

802.11 b mode:

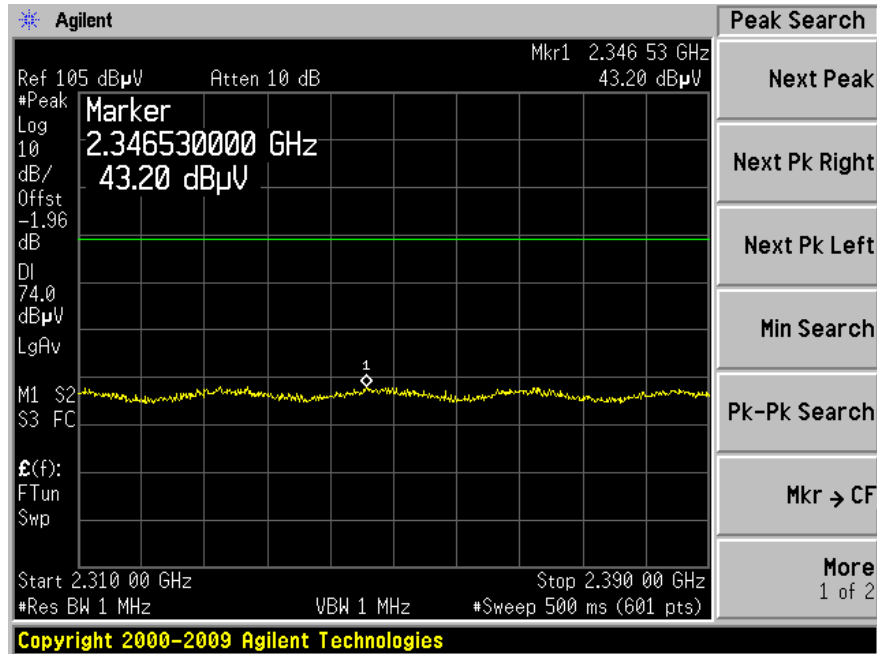
Lowest Channel at Horizontal, Peak



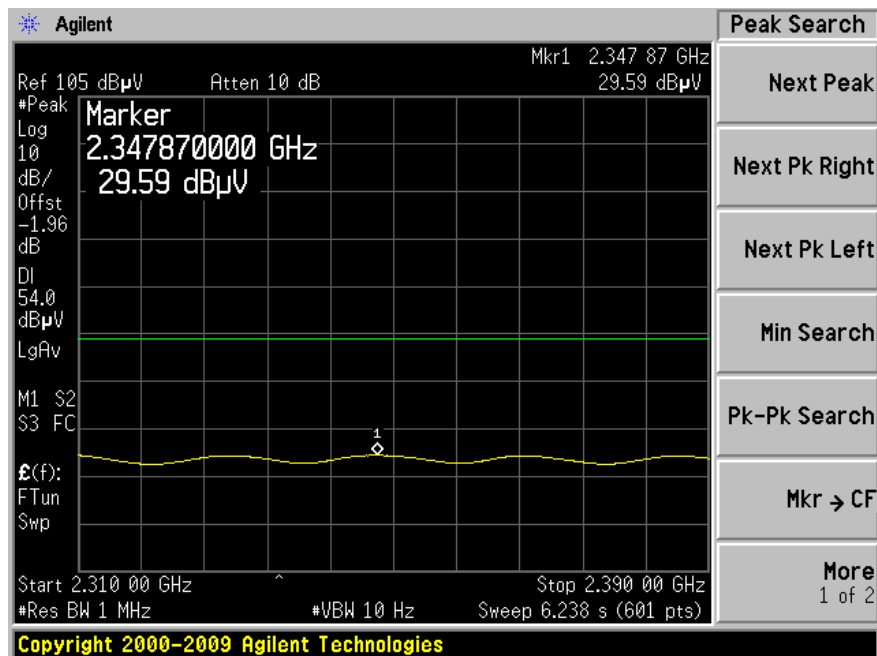
Lowest Channel at Horizontal, Average



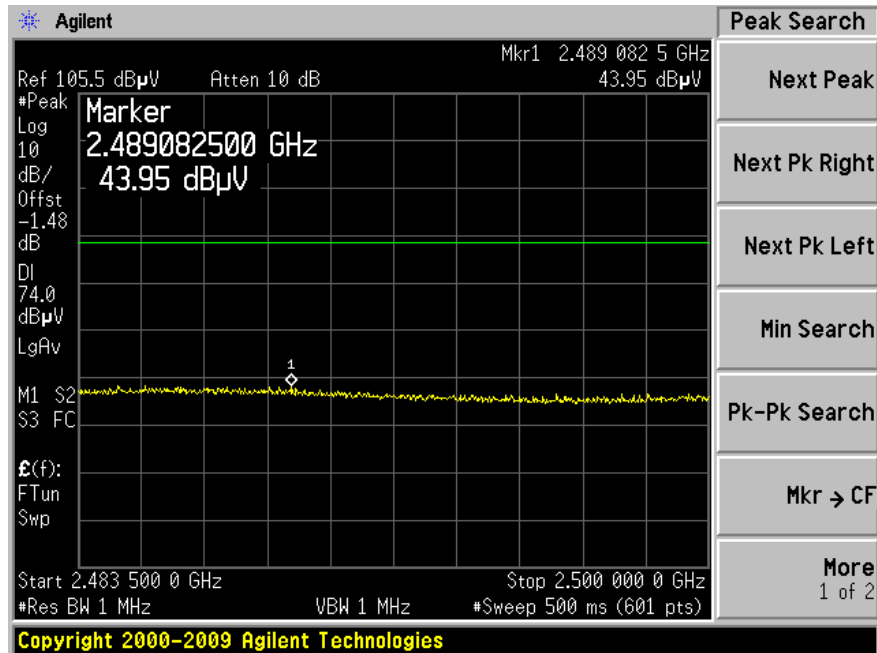
Lowest Channel at Vertical, Peak



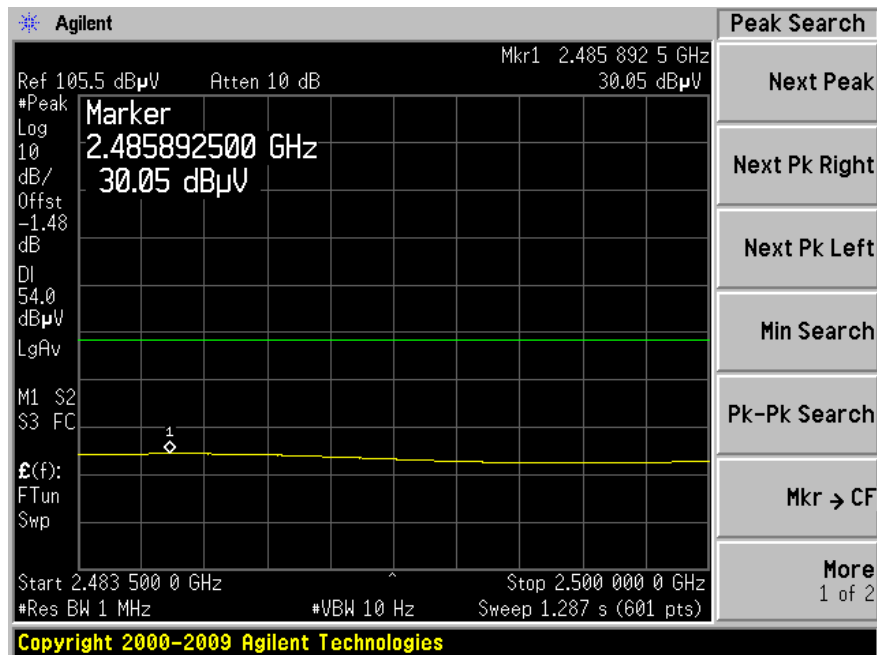
Lowest Channel at Vertical, Average



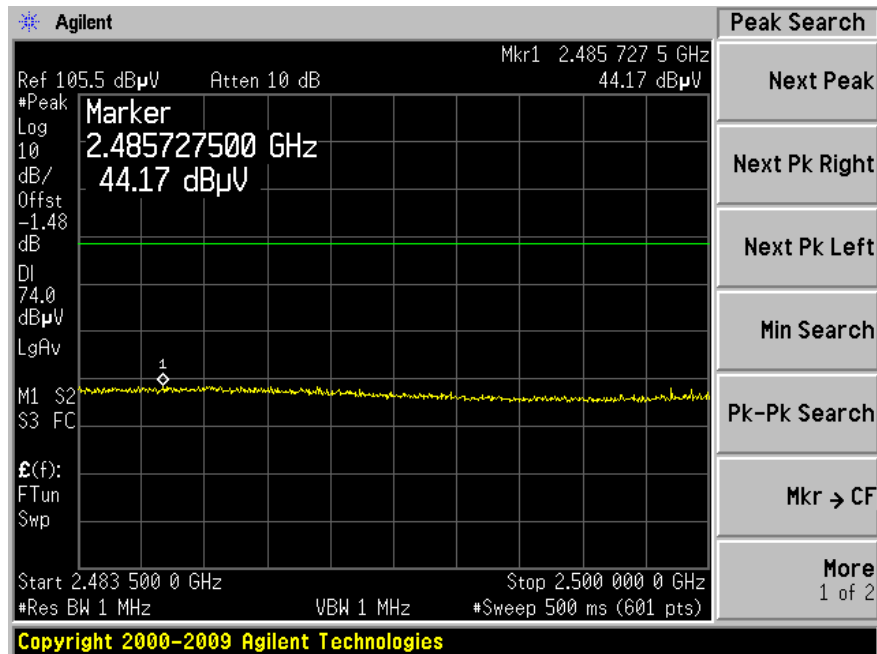
Highest Channel at Horizontal, Peak



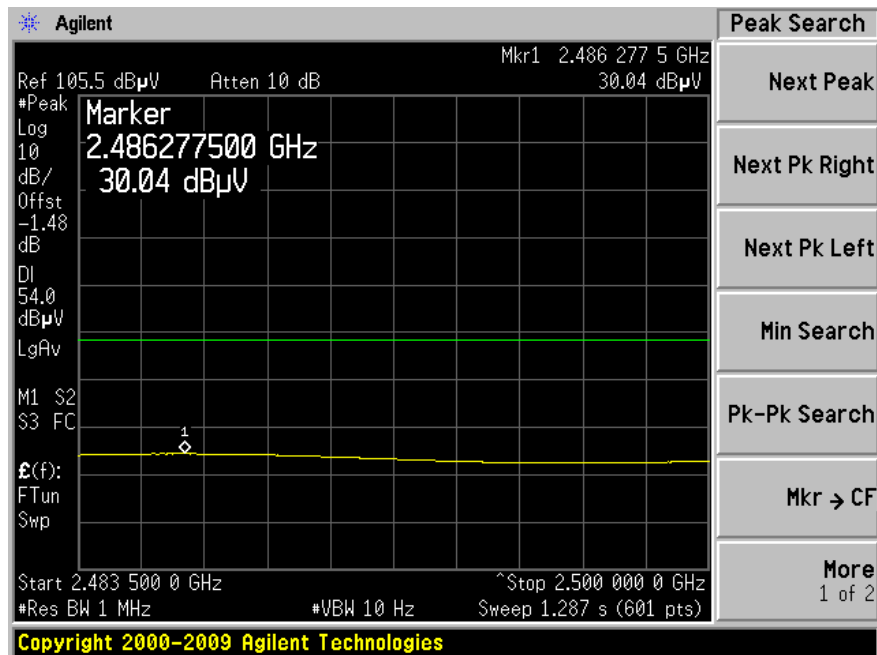
Highest Cannel at Horizontal, Average



Highest Channel at Vertical, Peak

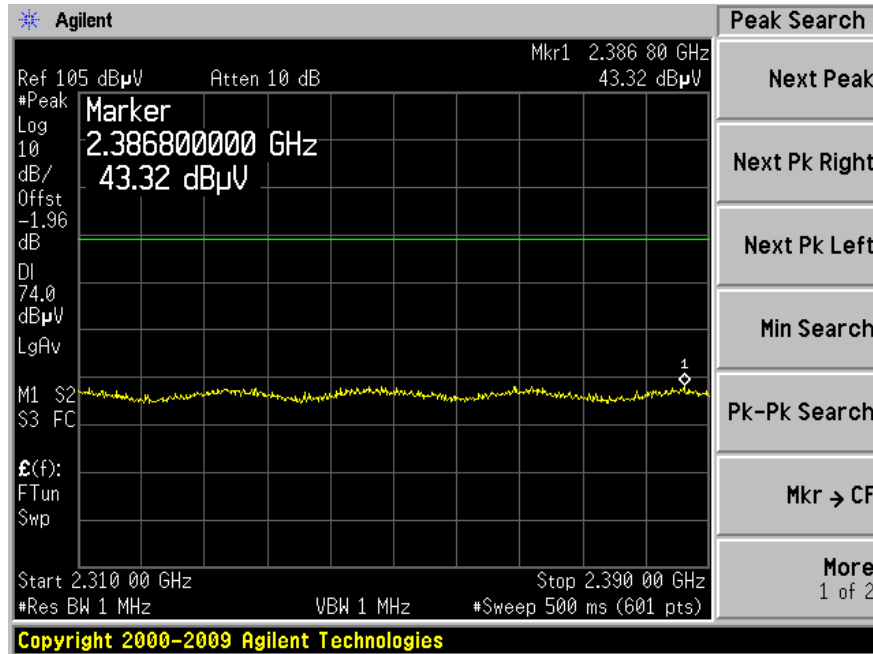


Highest Channel at Vertical, Average

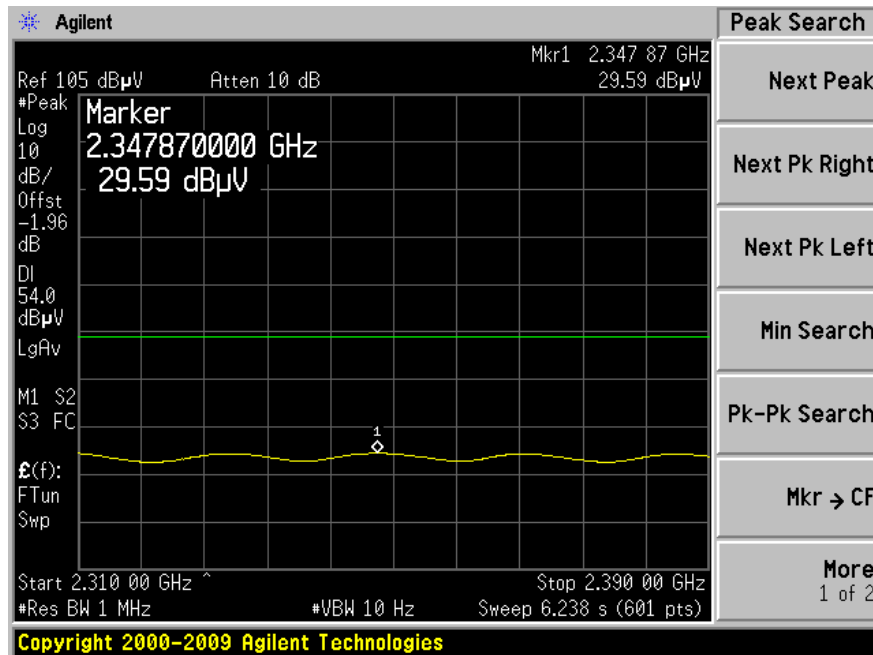


802.11 g mode:

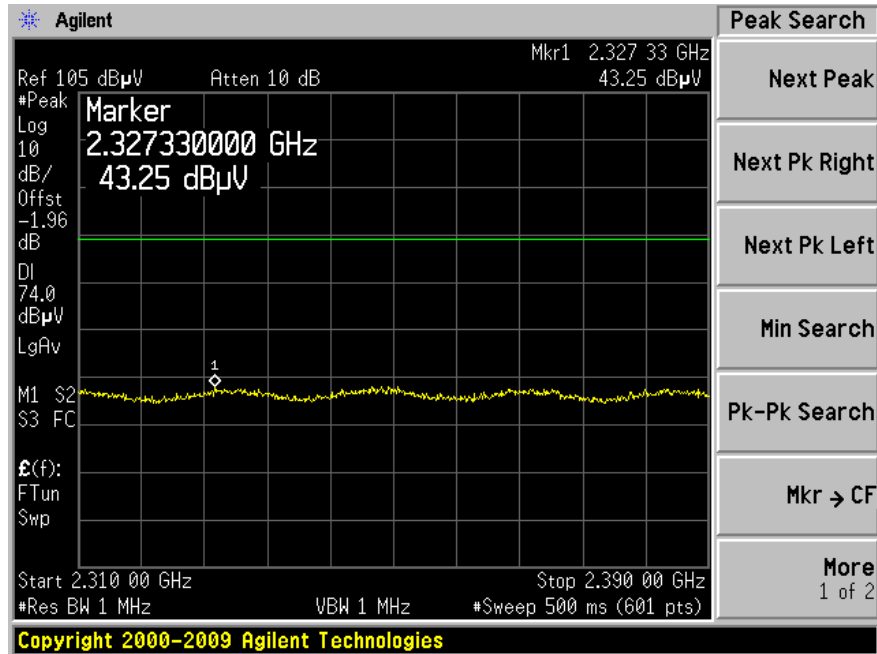
Lowest Channel at Horizontal, Peak



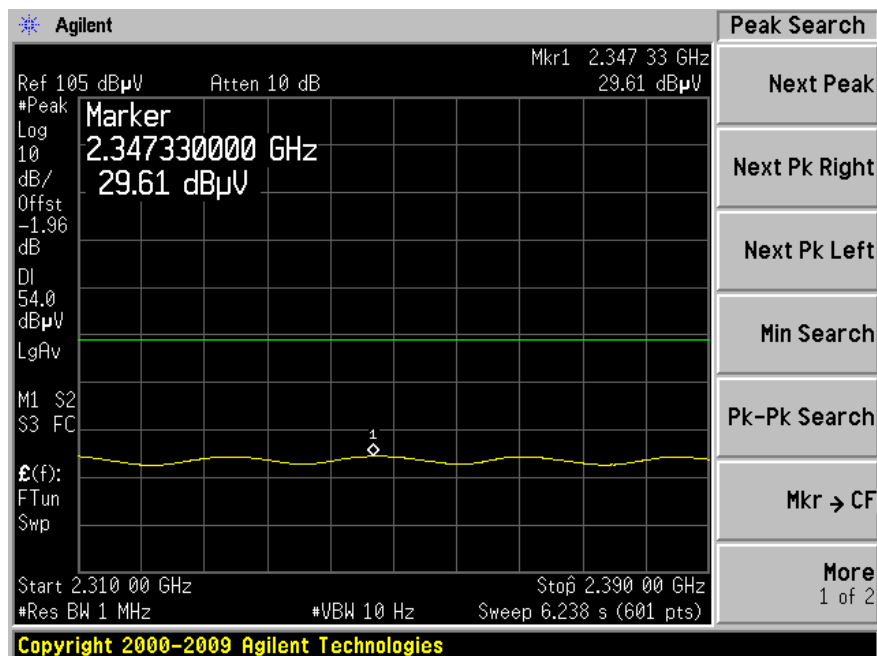
Lowest Channel at Horizontal, Average



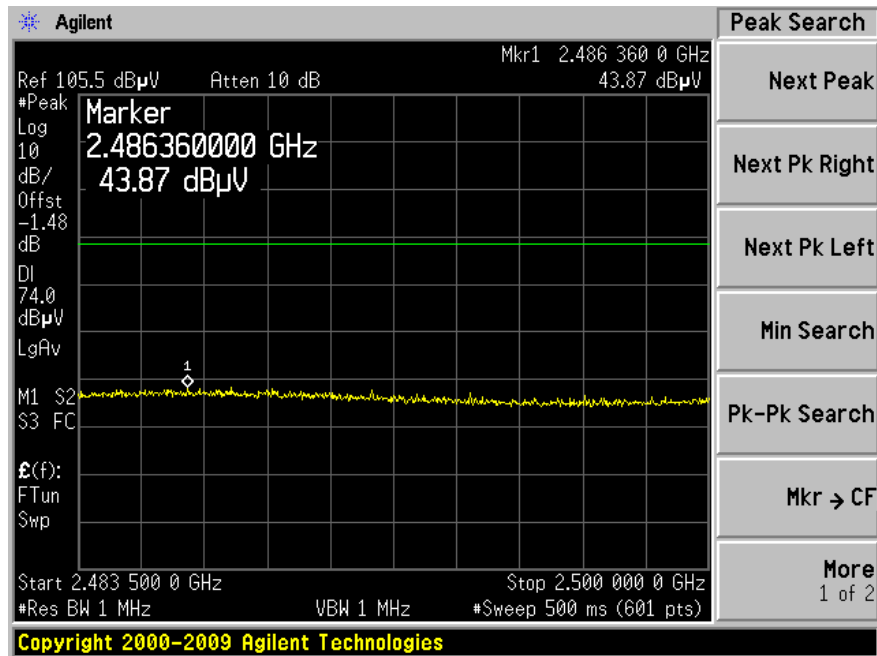
Lowest Channel at Vertical, Peak



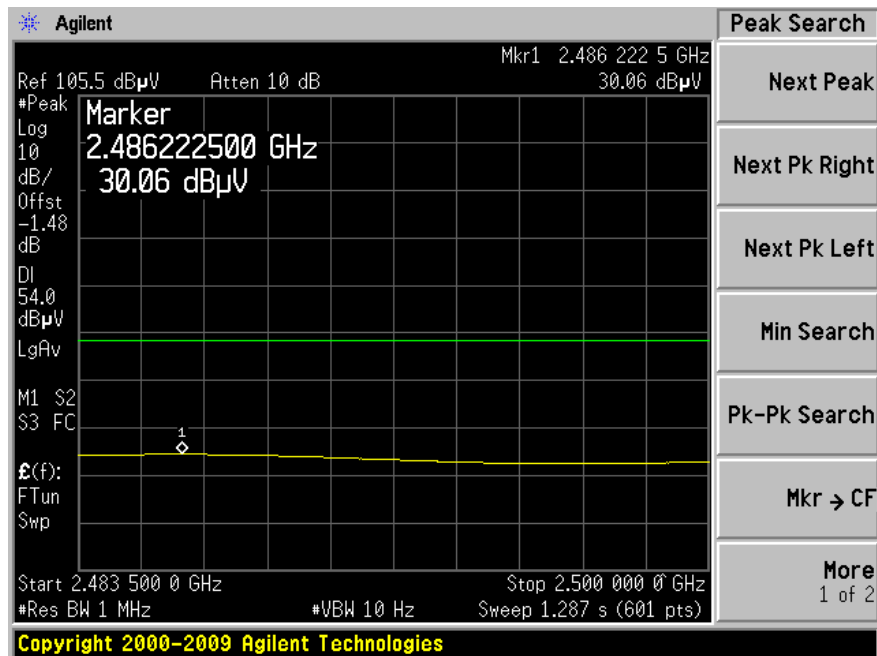
Lowest Channel at Vertical, Average



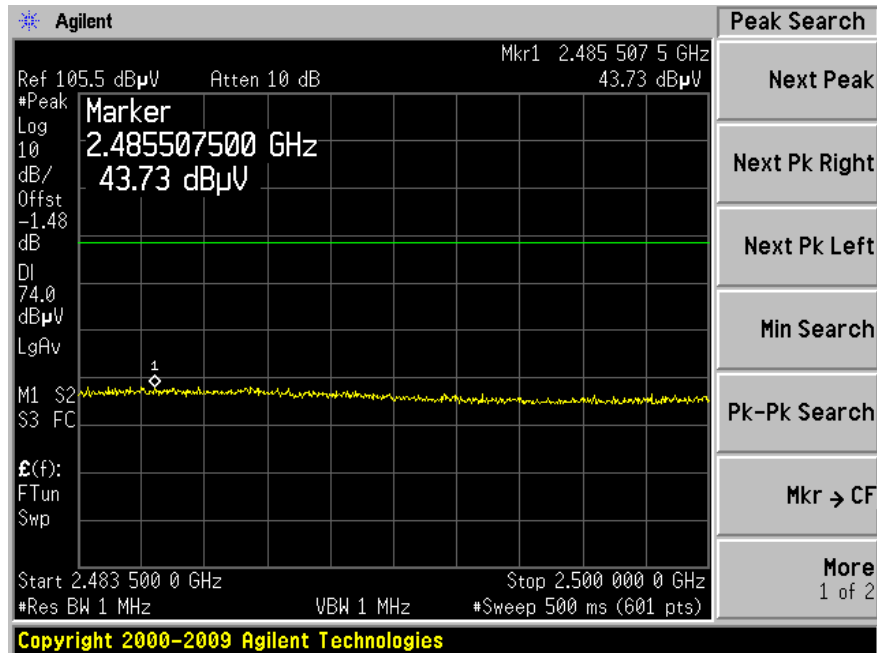
Highest Channel at Horizontal, Peak



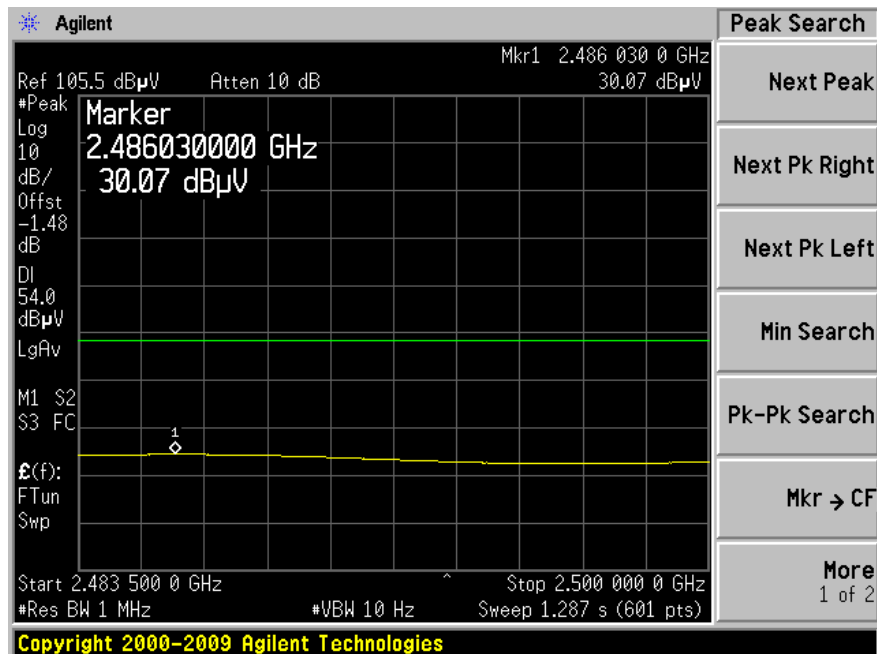
Highest Channel at Horizontal, Average



Highest Channel at Vertical, Peak

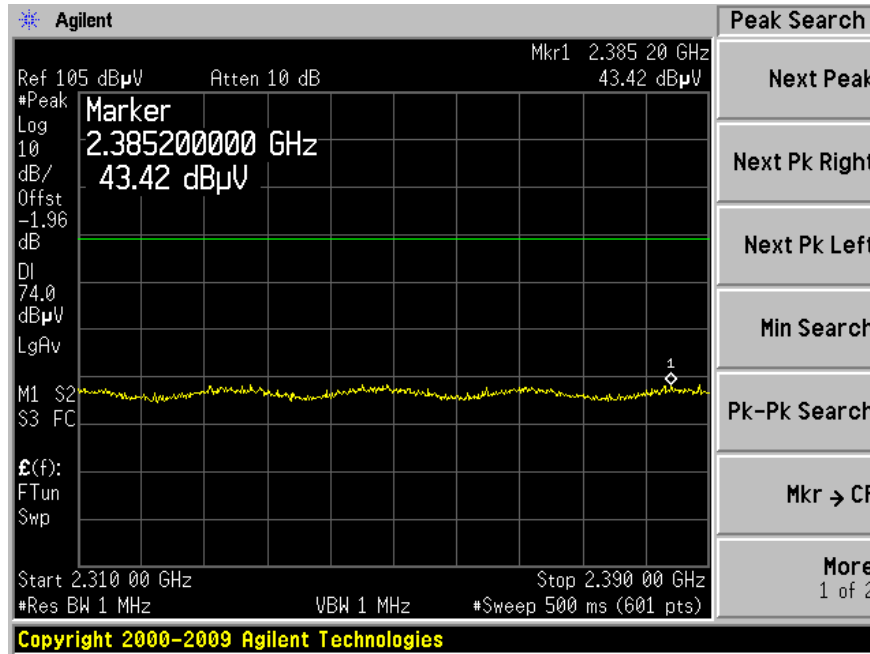


Highest Channel at Vertical, Average

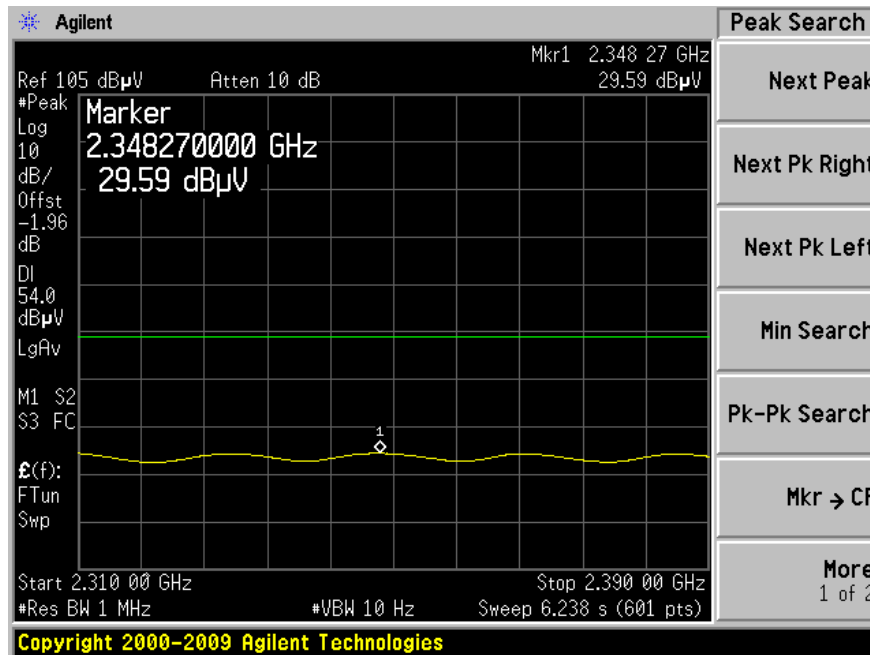


802.11 n 20 MHz mode:

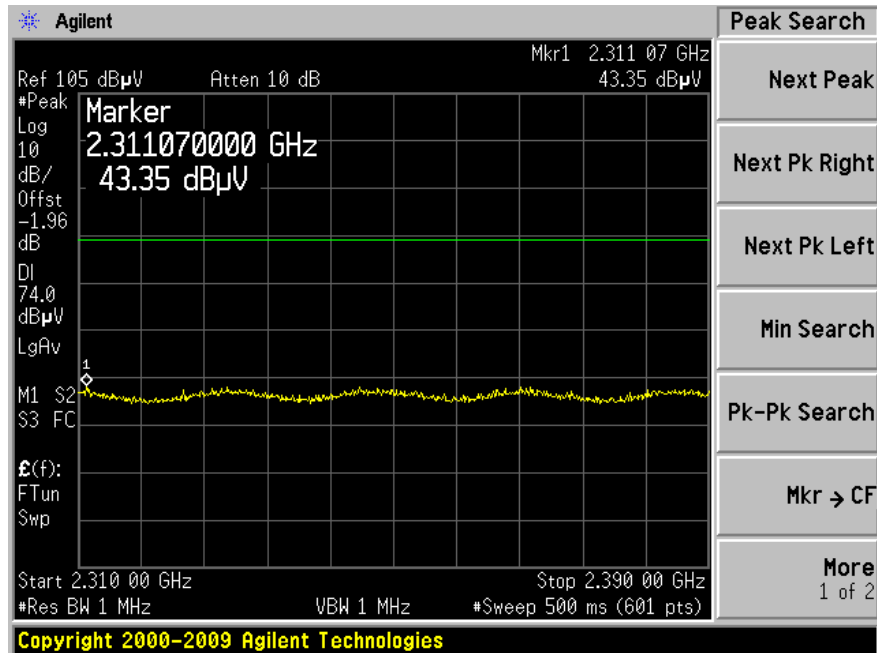
Lowest Channel at Horizontal, Peak



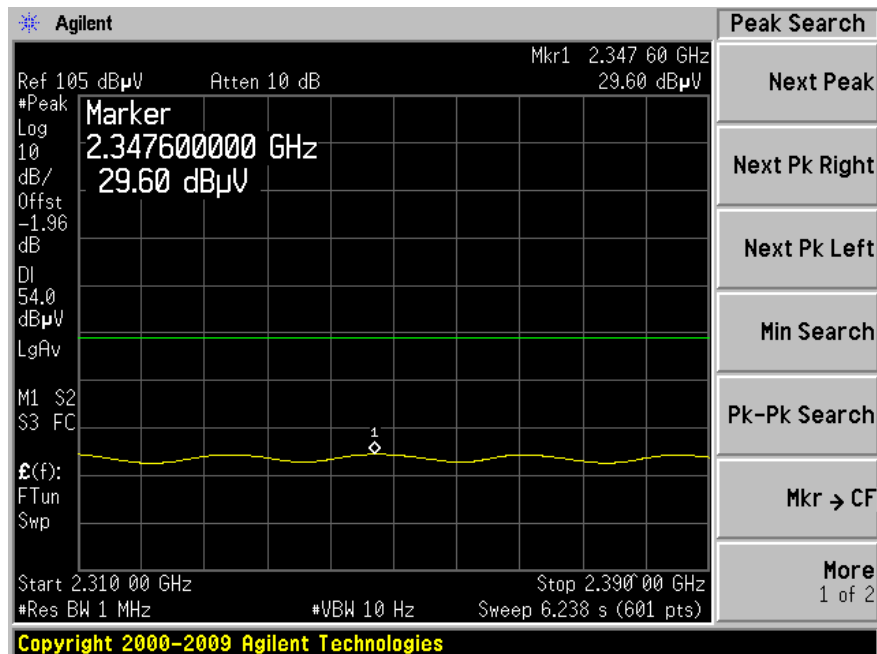
Lowest Channel at Horizontal, Average



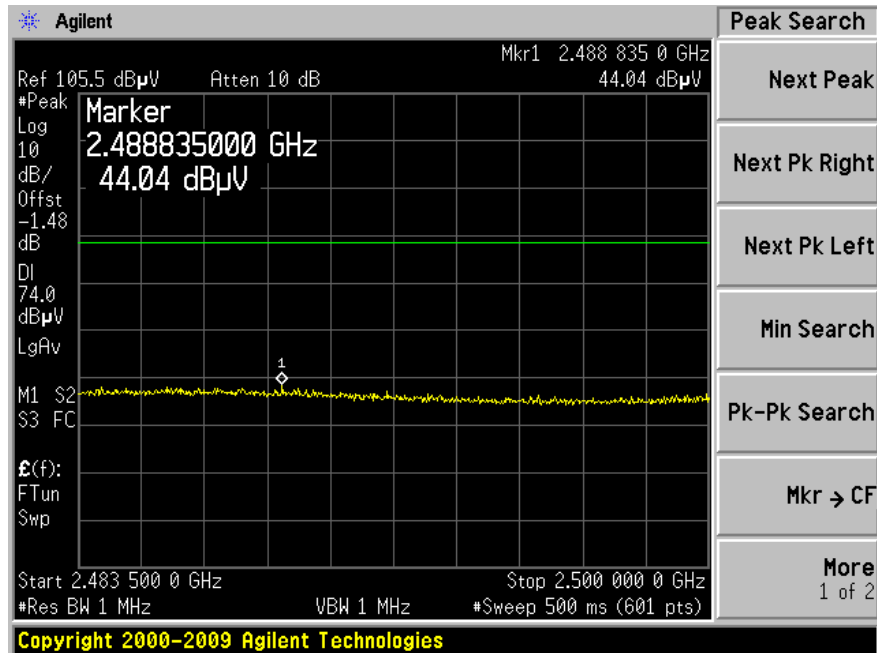
Lowest Channel at Vertical, Peak



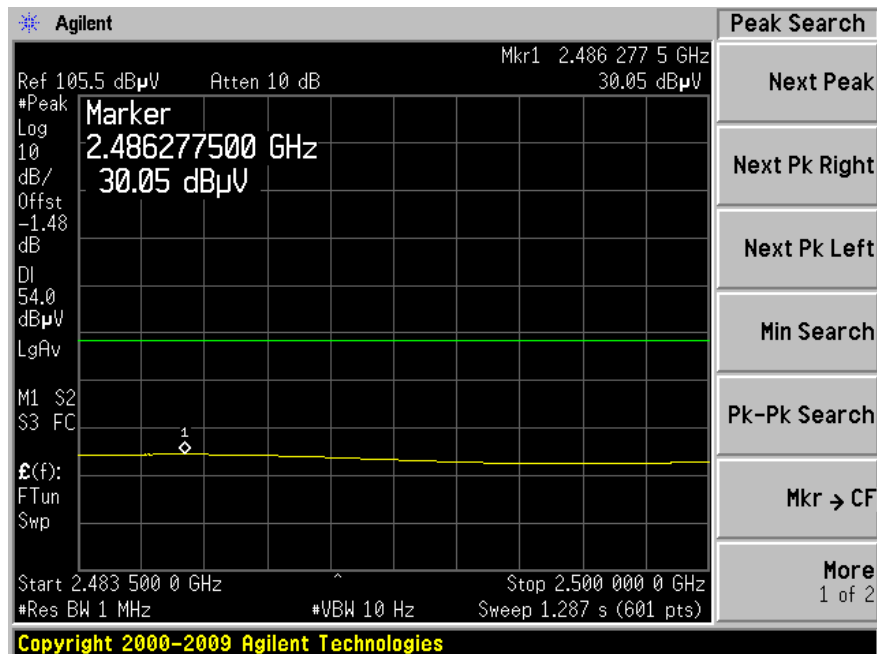
Lowest Channel at Vertical, Average



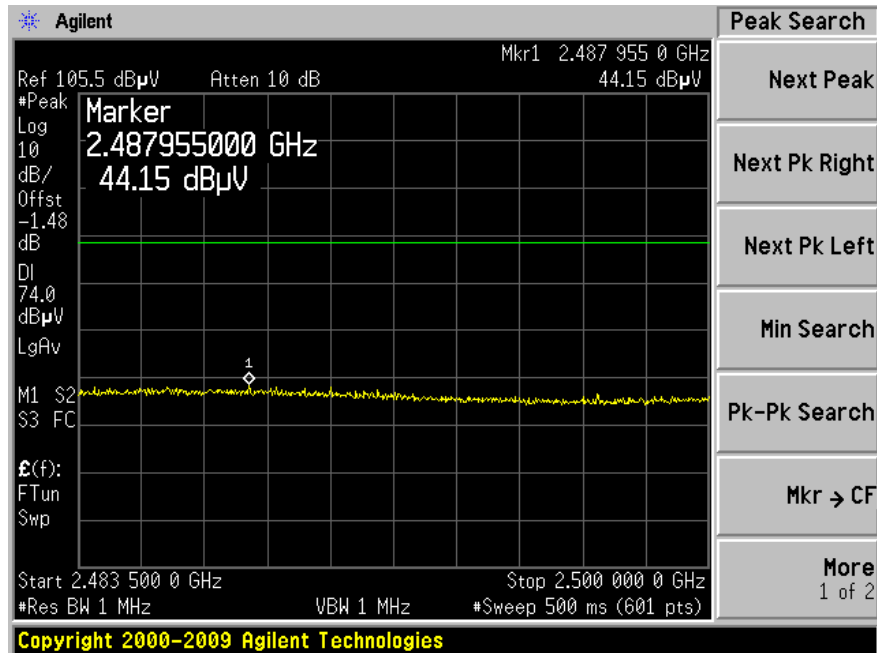
Highest Channel at Horizontal, Peak



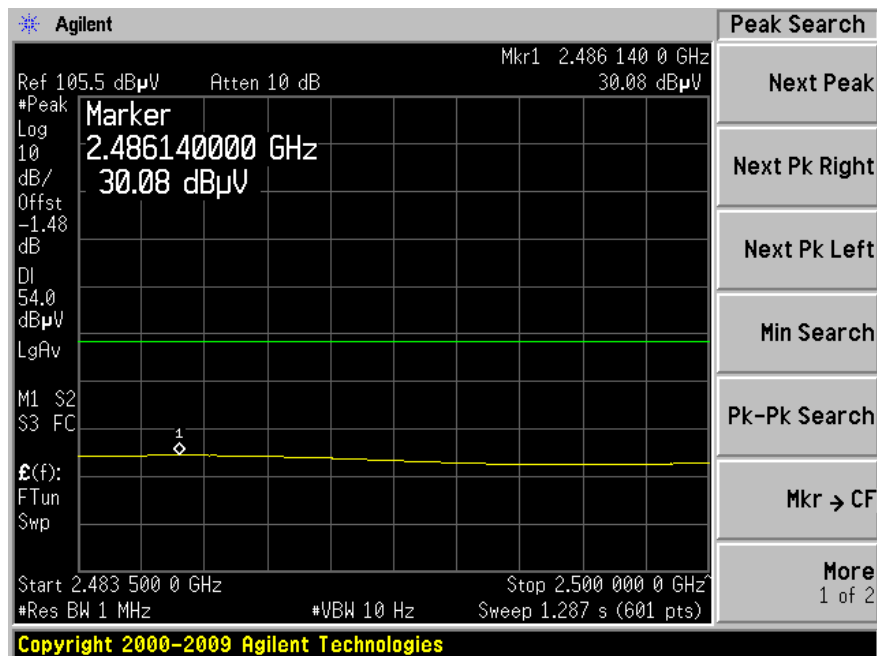
Highest Channel at Horizontal, Average



Highest Channel at Vertical, Peak



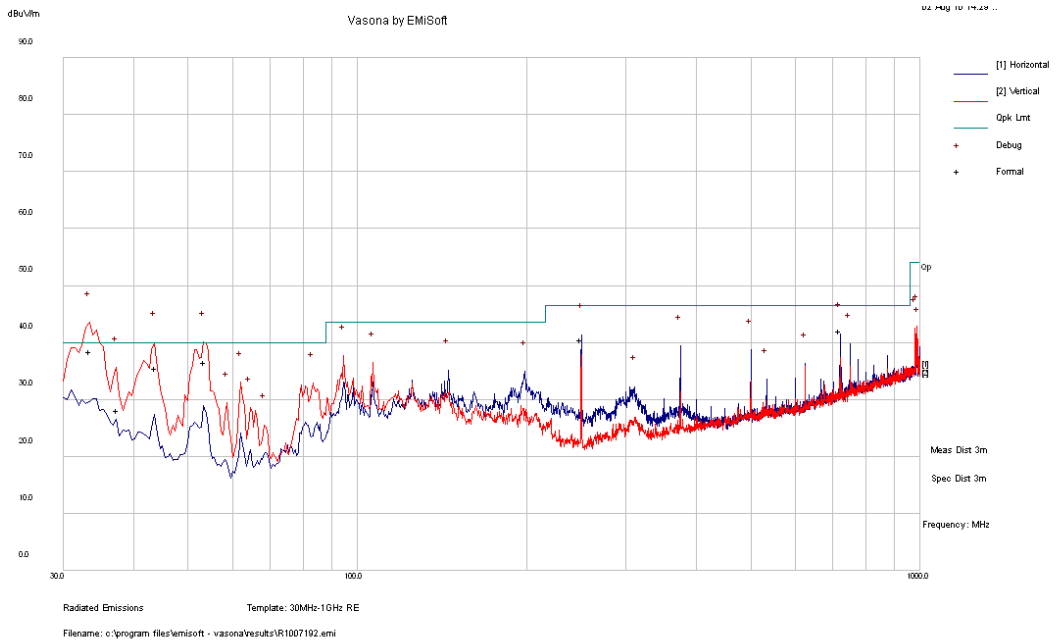
Highest Channel at Vertical, Average



8.10 Radiated Emissions Test plot & data

802.11b Mode:

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



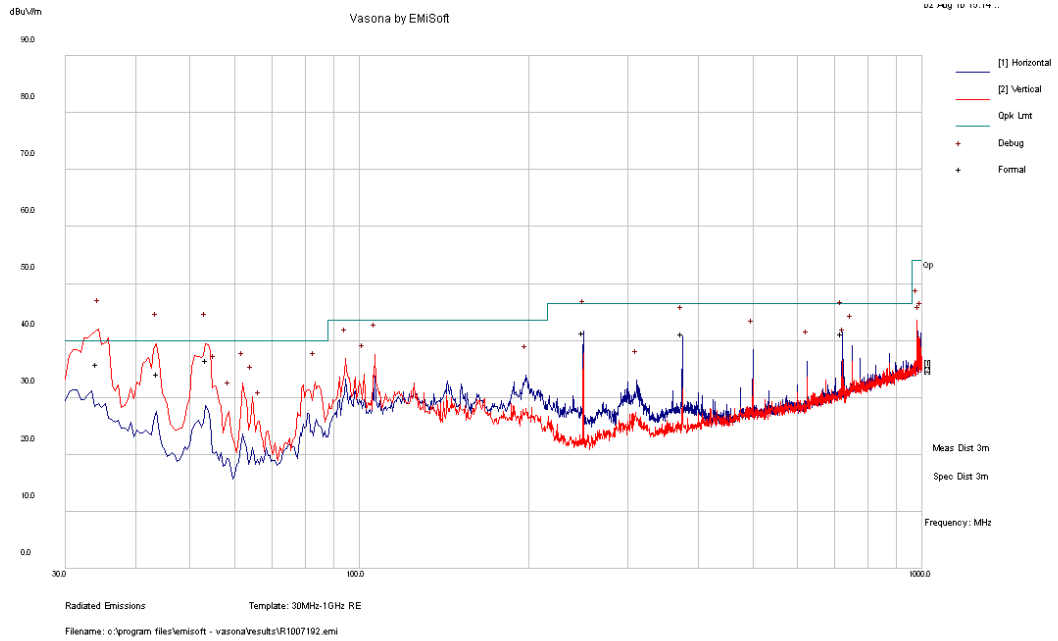
Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
33.446	38.54	97	V	153	40	-1.46
53.518	36.62	95	V	276	40	-3.38
43.7955	35.59	117	V	123	40	-4.41
720.0263	42.06	104	H	239	46	-3.94
249.9828	40.59	120	H	138	46	-5.41
37.514	28.07	105	V	225	40	-11.93

Above 1 GHz:

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dBµV/m)	Part 15.247/209		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
802.11 b, Low Channel 2412 MHz, measured at 3 meters											
1375	53.14	49	100	V	25	3.98	36.29	45.83	74	-28.17	peak
1375	52.88	137	100	H	25	3.98	36.29	45.57	74	-28.43	peak
1375	47.62	49	100	V	25	3.98	36.29	40.31	54	-13.69	Ave
1375	46.01	137	100	H	25	3.98	36.29	38.7	54	-15.3	Ave
1500	52.55	31	100	V	24.9	4.11	36.12	45.44	74	-28.56	peak
1500	50.75	191	100	H	24.9	4.11	36.12	43.64	74	-30.36	peak
1500	43.67	31	100	V	24.9	4.11	36.12	36.56	54	-17.44	Ave
1500	42.39	191	100	H	24.9	4.11	36.12	35.28	54	-18.72	Ave
7236	48.58	202	100	V	38.9	10.68	35.16	63	74	-11	peak
7236	43.32	103	100	H	38.9	10.68	35.16	57.74	74	-16.26	peak
7236	37.98	202	100	V	38.9	10.68	35.16	52.4	54	-1.6	Ave
7236	30.11	103	100	H	38.9	10.68	35.16	44.53	54	-9.47	Ave
802.11 b, Middle channel 2437 MHz, measured at 3 meters											
1375	53.18	49	100	V	25	3.98	36.29	45.87	74	-28.13	peak
1375	52.03	137	100	H	25	3.98	36.29	44.72	74	-29.28	peak
1375	47.74	49	100	V	25	3.98	36.29	40.43	54	-13.57	Ave
1375	46.62	137	100	H	25	3.98	36.29	39.31	54	-14.69	Ave
1500	53.02	31	100	V	24.9	4.11	36.12	45.91	74	-28.09	peak
1500	50.18	191	100	H	24.9	4.11	36.12	43.07	74	-30.93	peak
1500	43.95	31	100	V	24.9	4.11	36.12	36.84	54	-17.16	Ave
1500	42.19	191	100	H	24.9	4.11	36.12	35.08	54	-18.92	Ave
7311	47.03	202	100	V	38.9	10.68	35.14	61.47	74	-12.53	peak
7311	43.71	103	100	H	38.9	10.68	35.14	58.15	74	-15.85	peak
7311	38.48	202	100	V	38.9	10.68	35.14	52.92	54	-1.08	Ave
7311	31.08	103	100	H	38.9	10.68	35.14	45.52	54	-8.48	Ave
802.11 b, High channel 2462 MHz measured at 3 meters											
1375	53.26	49	100	V	25	3.98	36.29	45.95	74	-28.05	peak
1375	52.4	138	100	H	25	3.98	36.29	45.09	74	-28.91	peak
1375	48.32	49	100	V	25	3.98	36.29	41.01	54	-12.99	Ave
1375	47.38	138	100	H	25	3.98	36.29	40.07	54	-13.93	Ave
1500	52.62	31	100	V	24.9	4.11	36.12	45.51	74	-28.49	peak
1500	50.68	191	100	H	24.9	4.11	36.12	43.57	74	-30.43	peak
1500	44.45	31	100	V	24.9	4.11	36.12	37.34	54	-16.66	Ave
1500	42.17	191	100	H	24.9	4.11	36.12	35.06	54	-18.94	Ave
7386	45.58	202	100	V	39	11.25	35.16	60.67	74	-13.33	peak
7386	43.11	103	100	H	39	11.25	35.16	58.2	74	-15.8	peak
7386	36.44	202	100	V	39	11.25	35.16	51.53	54	-2.47	Ave
7386	30.96	103	100	H	39	11.25	35.16	46.05	54	-7.95	Ave

802.11 g Mode:

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



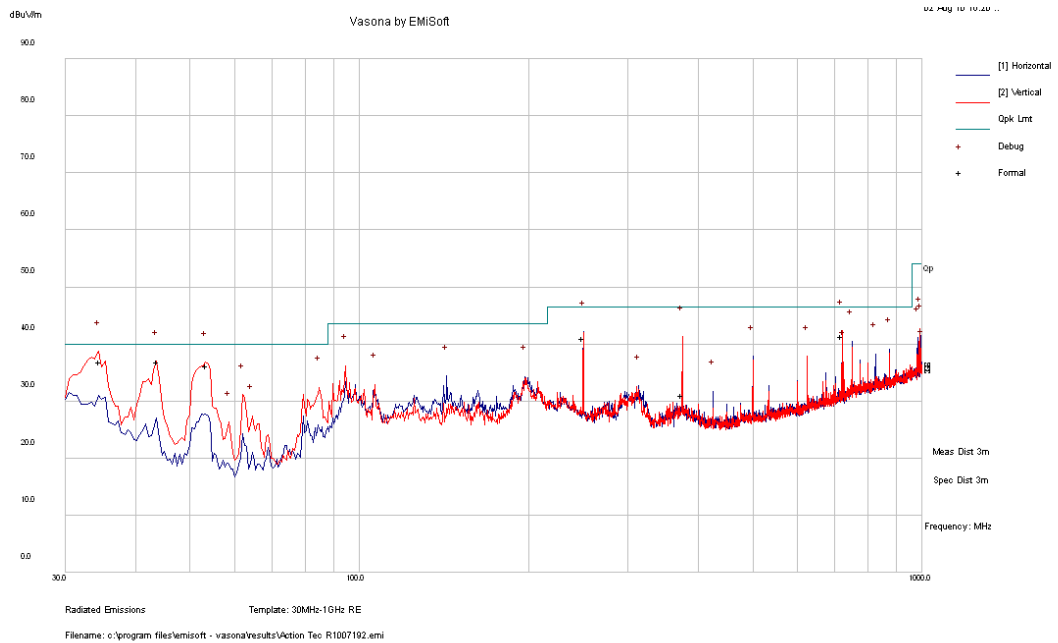
Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
53.52975	36.60	132	V	353	40.0	-3.40
34.136	35.95	113	V	201	40.0	-4.05
249.9975	41.43	96	H	137	46.5	-5.07
720.0415	41.30	93	H	233	46.5	-5.20
374.9878	41.15	91	H	313	46.5	-5.35
43.7935	34.13	171	V	113	40.0	-5.87

Above 1 GHz:

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dBµV/m)	Part 15.247/209		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
802.11 g, Low Channel 2412 MHz, measured at 3 meters											
1375	54.15	54	100	V	25	3.98	36.29	46.84	74	-27.16	peak
1375	52.51	141	100	H	25	3.98	36.29	45.2	74	-28.8	peak
1375	50.22	54	100	V	25	3.98	36.29	42.91	54	-11.09	Ave
1375	47.21	141	100	H	25	3.98	36.29	39.9	54	-14.1	Ave
1500	52.68	67	100	V	24.9	4.11	36.12	45.57	74	-28.43	peak
1500	48.57	123	100	H	24.9	4.11	36.12	41.46	74	-32.54	peak
1500	46.62	67	100	V	24.9	4.11	36.12	39.51	54	-14.49	Ave
1500	39.41	123	100	H	24.9	4.11	36.12	32.3	54	-21.7	Ave
7236	47.56	335	100	V	38.9	10.68	35.16	61.98	74	-12.02	peak
7236	43.49	224	100	H	38.9	10.68	35.16	57.91	74	-16.09	peak
7236	33.71	335	100	V	38.9	10.68	35.16	48.13	54	-5.87	Ave
7236	30.21	224	100	H	38.9	10.68	35.16	44.63	54	-9.37	Ave
802.11 g, Middle channel 2437 MHz, measured at 3 meters											
1375	54.38	54	100	V	25	3.98	36.29	47.07	74	-26.93	peak
1375	52.74	141	100	H	25	3.98	36.29	45.43	74	-28.57	peak
1375	50.29	54	100	V	25	3.98	36.29	42.98	54	-11.02	Ave
1375	47.42	141	100	H	25	3.98	36.29	40.11	54	-13.89	Ave
1500	53.04	67	100	V	24.9	4.11	36.12	45.93	74	-28.07	peak
1500	48.72	123	100	H	24.9	4.11	36.12	41.61	74	-32.39	peak
1500	47	67	100	V	24.9	4.11	36.12	39.89	54	-14.11	Ave
1500	39.74	123	100	H	24.9	4.11	36.12	32.63	54	-21.37	Ave
7311	47.04	344	100	V	38.9	10.68	35.14	61.48	74	-12.52	peak
7311	43.33	224	100	H	38.9	10.68	35.14	57.77	74	-16.23	peak
7311	31.71	344	100	V	38.9	10.68	35.14	46.15	54	-7.85	Ave
7311	29.64	224	100	H	38.9	10.68	35.14	44.08	54	-9.92	Ave
802.11 g, High channel 2462 MHz measured at 3 meters											
1375	53.78	58	100	V	25	3.98	36.29	46.47	74	-27.53	peak
1375	52.76	142	100	H	25	3.98	36.29	45.45	74	-28.55	peak
1375	49.46	58	100	V	25	3.98	36.29	42.15	54	-11.85	Ave
1375	47.51	142	100	H	25	3.98	36.29	40.2	54	-13.8	Ave
1500	53.06	67	100	V	24.9	4.11	36.12	45.95	74	-28.05	peak
1500	49.6	123	100	H	24.9	4.11	36.12	42.49	74	-31.51	peak
1500	46.54	67	100	V	24.9	4.11	36.12	39.43	54	-14.57	Ave
1500	40.13	123	100	H	24.9	4.11	36.12	33.02	54	-20.98	Ave
7386	47.1	23	100	V	39	11.25	35.16	62.19	74	-11.81	peak
7386	43.17	53	100	H	39	11.25	35.16	58.26	74	-15.74	peak
7386	31.31	23	100	V	39	11.25	35.16	46.4	54	-7.6	Ave
7386	30.24	53	100	H	39	11.25	35.16	45.33	54	-8.67	Ave

802.11 n 20 MHz Mode:

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



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBμV/m)	Margin (dB)
43.81175	36.90	89	V	126	40	-3.10
34.61325	36.89	148	V	348	40	-3.11
53.529	36.17	96	V	93	40	-3.83
720.0283	41.34	90	H	241	46.5	-5.16
249.995	41.05	116	H	149	46.5	-5.45
375.0073	31.07	153	V	321	46.5	-15.43

Above 1 GHz:

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dBµV/m)	Part 15.247/209		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
802.11 n, Low Channel 2412 MHz, measured at 3 meters											
1375	54.24	54	100	V	25	3.98	36.29	46.93	74	-27.07	peak
1375	51.97	143	100	H	25	3.98	36.29	44.66	74	-29.34	peak
1375	50.59	54	100	V	25	3.98	36.29	43.28	54	-10.72	Ave
1375	47.11	143	100	H	25	3.98	36.29	39.8	54	-14.2	Ave
1500	50.59	84	100	V	24.9	4.11	36.12	43.48	74	-30.52	peak
1500	49.39	158	100	H	24.9	4.11	36.12	42.28	74	-31.72	peak
1500	41.43	84	100	V	24.9	4.11	36.12	34.32	54	-19.68	Ave
1500	42.2	158	100	H	24.9	4.11	36.12	35.09	54	-18.91	Ave
7236	51.18	335	100	V	38.9	10.68	35.16	65.6	74	-8.4	peak
7236	42.306	224	100	H	38.9	10.68	35.16	56.726	74	-17.274	peak
7236	35.51	335	100	V	38.9	10.68	35.16	49.93	54	-4.07	Ave
7236	29.72	224	100	H	38.9	10.68	35.16	44.14	54	-9.86	Ave
802.11 n, Middle channel 2437 MHz, measured at 3 meters											
1375	53.96	54	100	V	25	3.98	36.29	46.65	74	-27.35	peak
1375	52.51	195	100	H	25	3.98	36.29	45.2	74	-28.8	peak
1375	49.46	54	100	V	25	3.98	36.29	42.15	54	-11.85	Ave
1375	46.82	195	100	H	25	3.98	36.29	39.51	54	-14.49	Ave
1500	52.18	85	100	V	24.9	4.11	36.12	45.07	74	-28.93	peak
1500	49.8	158	100	H	24.9	4.11	36.12	42.69	74	-31.31	peak
1500	42.3	85	100	V	24.9	4.11	36.12	35.19	54	-18.81	Ave
1500	41.75	158	100	H	24.9	4.11	36.12	34.64	54	-19.36	Ave
7311	50.05	351	100	V	38.9	10.68	35.14	64.49	74	-9.51	peak
7311	44.02	224	100	H	38.9	10.68	35.14	58.46	74	-15.54	peak
7311	35.33	351	100	V	38.9	10.68	35.14	49.77	54	-4.23	Ave
7311	29.59	224	100	H	38.9	10.68	35.14	44.03	54	-9.97	Ave
802.11 n, High channel 2462 MHz measured at 3 meters											
1375	54.17	54	100	V	25	3.98	36.29	46.86	74	-27.14	peak
1375	53.86	195	100	H	25	3.98	36.29	46.55	74	-27.45	peak
1375	49.9	54	100	V	25	3.98	36.29	42.59	54	-11.41	Ave
1375	48.99	195	100	H	25	3.98	36.29	41.68	54	-12.32	Ave
1500	51.97	85	100	V	24.9	4.11	36.12	44.86	74	-29.14	peak
1500	50.32	158	100	H	24.9	4.11	36.12	43.21	74	-30.79	peak
1500	42.64	85	100	V	24.9	4.11	36.12	35.53	54	-18.47	Ave
1500	42.37	123	100	H	24.9	4.11	36.12	35.26	54	-18.74	Ave
7386	48.25	351	100	V	39	11.25	35.16	63.34	74	-10.66	peak
7386	43.74	224	100	H	39	11.25	35.16	58.83	74	-15.17	peak
7386	34.14	351	100	V	39	11.25	35.16	49.23	54	-4.77	Ave
7386	29.71	224	100	H	39	11.25	35.16	44.8	54	-9.2	Ave

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 Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2010-05-11

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

9.4 Test Environmental Conditions

Temperature:	20-25 °C
Relative Humidity:	30-45 %
ATM Pressure:	100-103kPa

The testing was performed by Jack Liu from 2010-07-30 to 2010-08-31 at RF Site.

9.5 Summary of Test Results

802.11 b Mode:

Antenna	Channel	Frequency (MHz)	99% Bandwidth (MHz)	6 dB Channel Bandwidth (MHz)	Limit (MHz)	Results
#0	Low	2412	10.0491	7.701	> 0.5	Compliant
	Middle	2437	10.0647	8.068	> 0.5	Compliant
	High	2462	10.0740	8.056	> 0.5	Compliant
#1	Low	2412	10.1181	8.162	> 0.5	Compliant
	Middle	2437	10.0879	8.142	> 0.5	Compliant
	High	2462	10.0854	8.128	> 0.5	Compliant

802.11 g Mode:

Antenna	Channel	Frequency (MHz)	99% Bandwidth (MHz)	6 dB Channel Bandwidth (MHz)	Limit (MHz)	Results
#0	Low	2412	16.2788	14.055	> 0.5	Compliant
	Middle	2437	16.2868	12.906	> 0.5	Compliant
	High	2462	16.3399	14.534	> 0.5	Compliant
#1	Low	2412	16.3891	14.506	> 0.5	Compliant
	Middle	2437	16.3855	13.650	> 0.5	Compliant
	High	2462	16.3597	15.072	> 0.5	Compliant

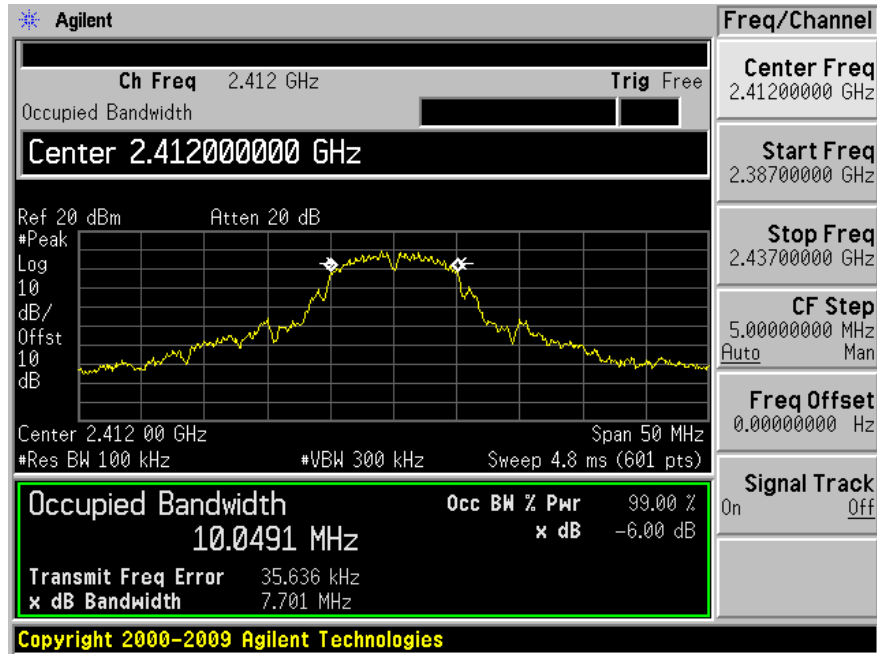
802.11 n 20 MHz Mode:

Antenna	Channel	Frequency (MHz)	99% Bandwidth (MHz)	6 dB Channel Bandwidth (MHz)	Limit (MHz)	Results
#0	Low	2412	17.4512	15.097	> 0.5	Compliant
	Middle	2437	17.4928	17.025	> 0.5	Compliant
	High	2462	17.4772	16.016	> 0.5	Compliant
#1	Low	2412	17.5245	16.369	> 0.5	Compliant
	Middle	2437	17.4730	15.099	> 0.5	Compliant
	High	2462	17.5209	17.506	> 0.5	Compliant

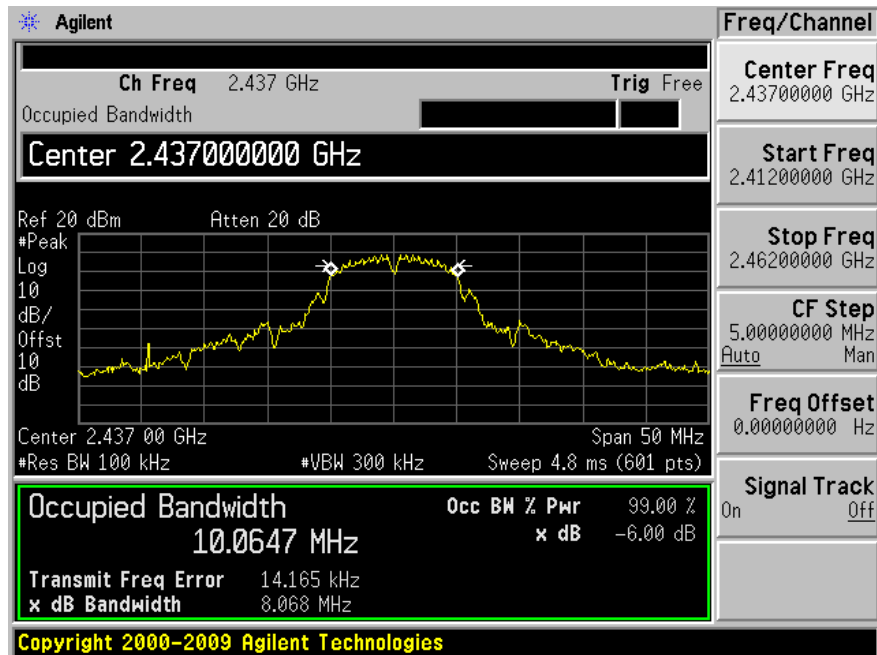
Please refer to the following plots for detailed test results

802.11 b (Antenna #0)

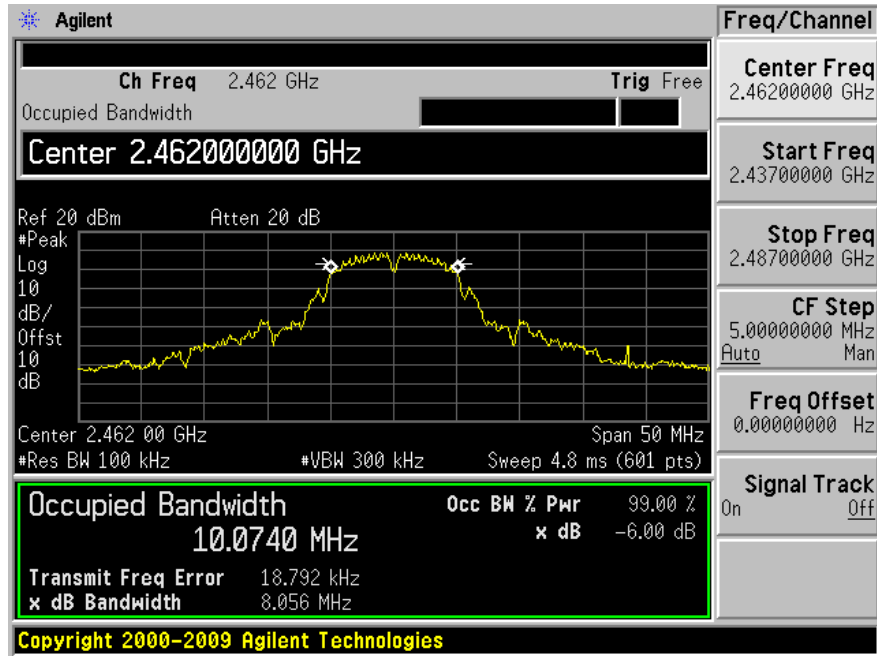
Low Channel 2412 MHz



Middle Channel 2437 MHz

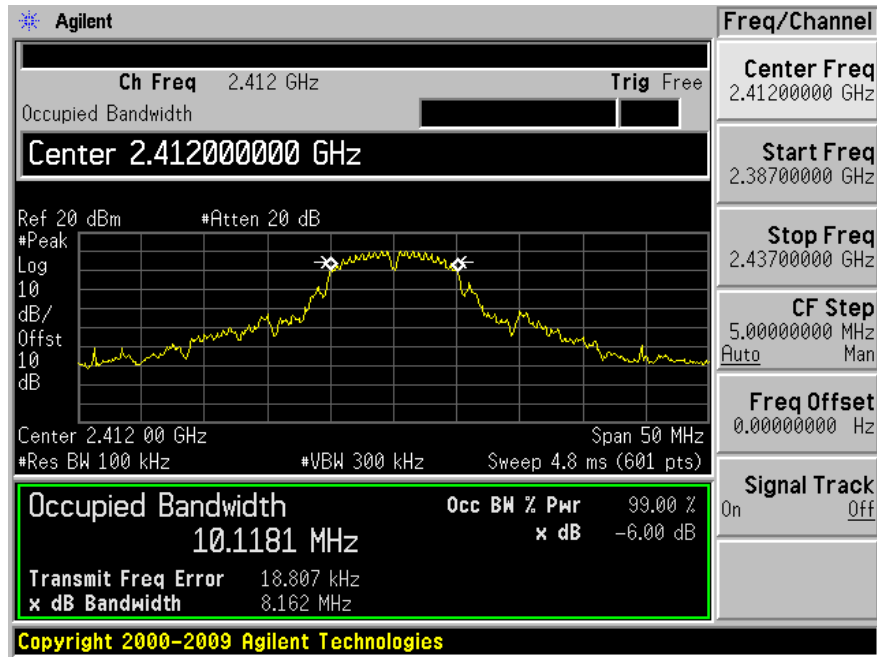


High Channel 2462 MHz

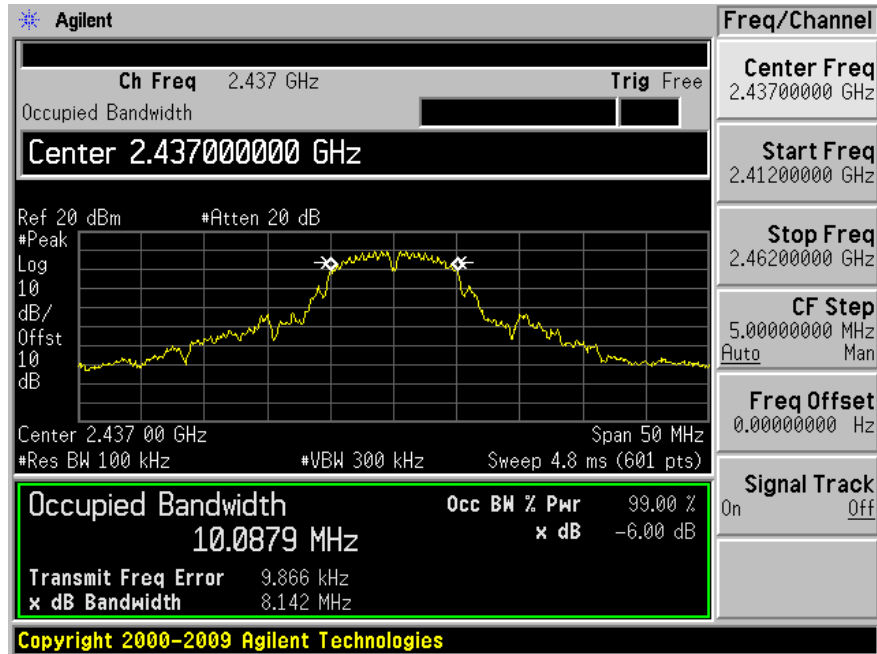


802.11 b (Antenna #1)

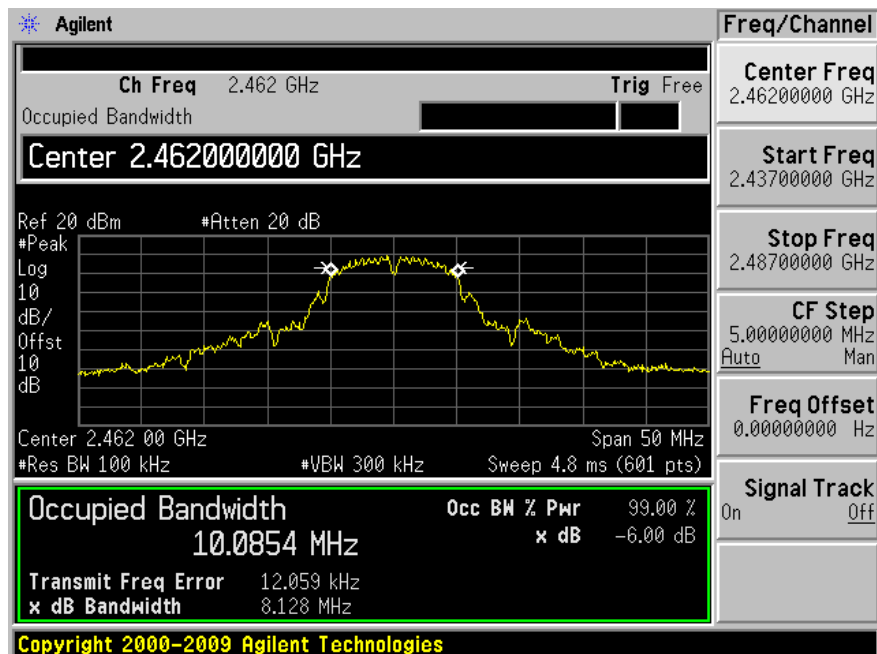
Low Channel 2412 MHz



Middle Channel 2437 MHz

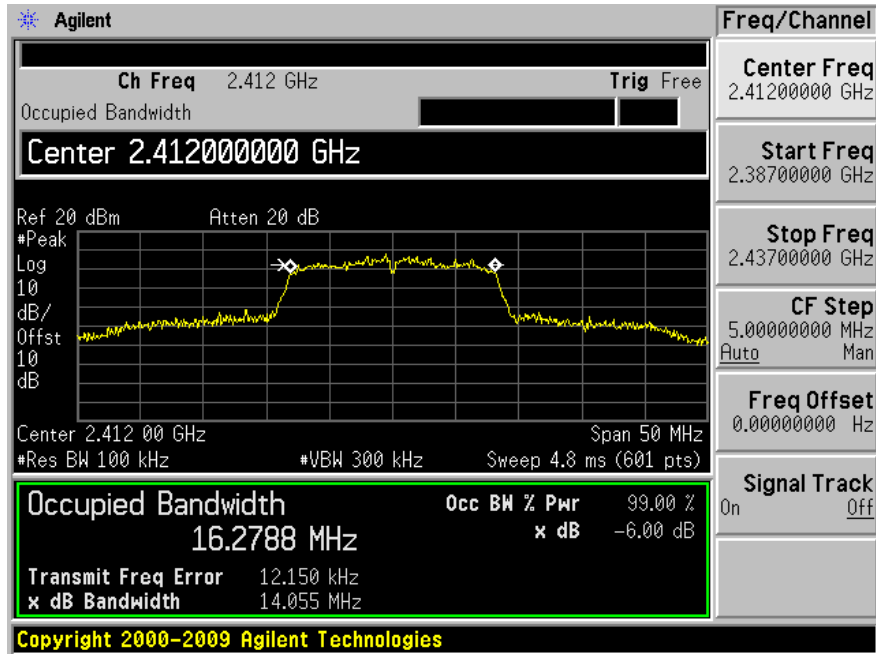


High Channel 2462 MHz

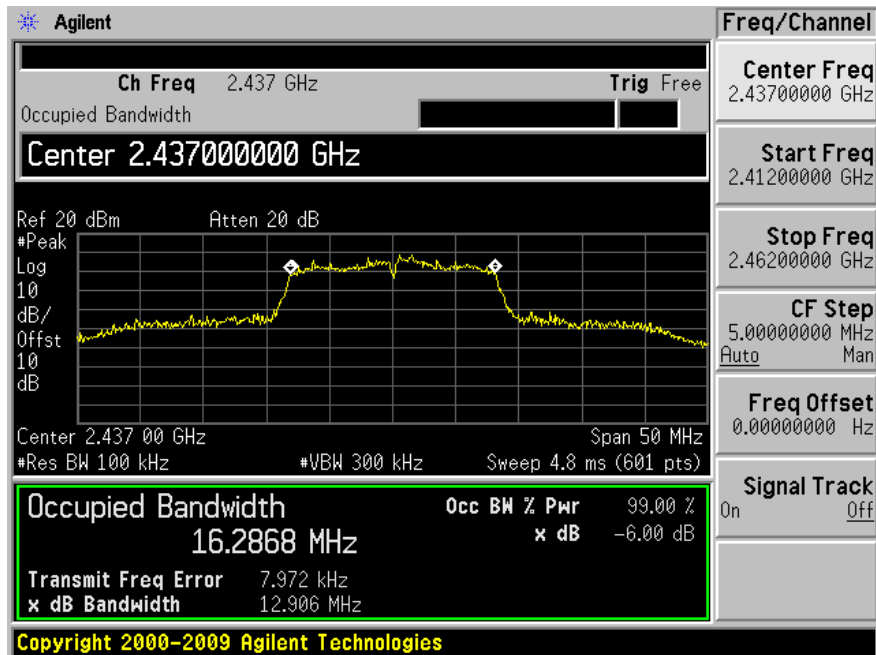


802.11 g (Antenna #0)

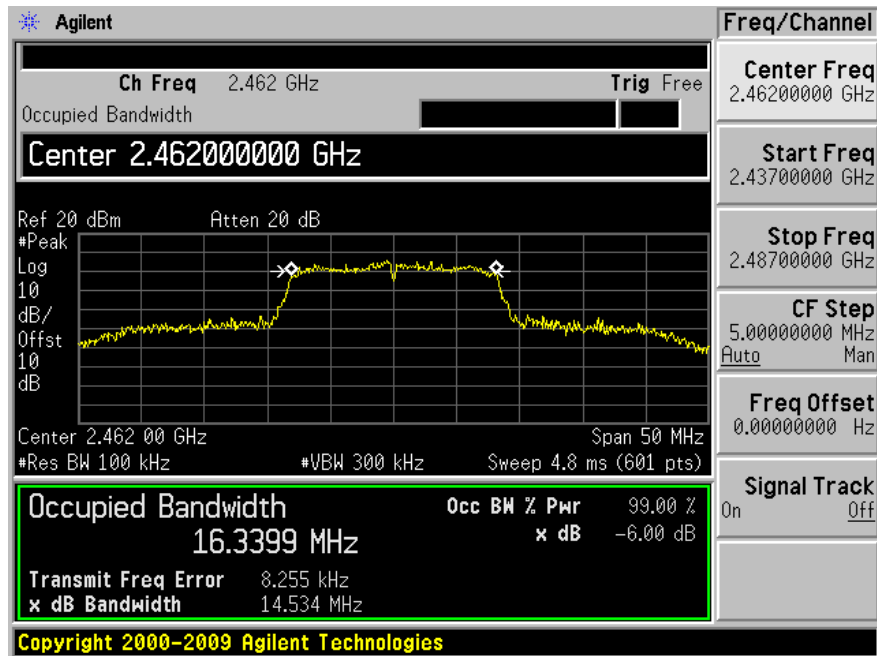
Low Channel 2412 MHz



Middle Channel 2437 MHz

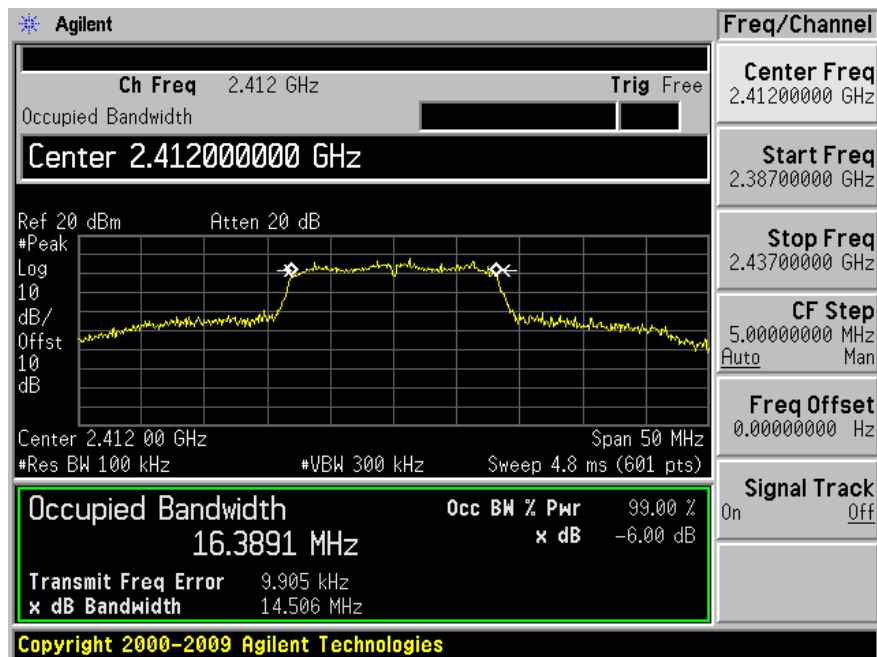


High Channel 2462 MHz

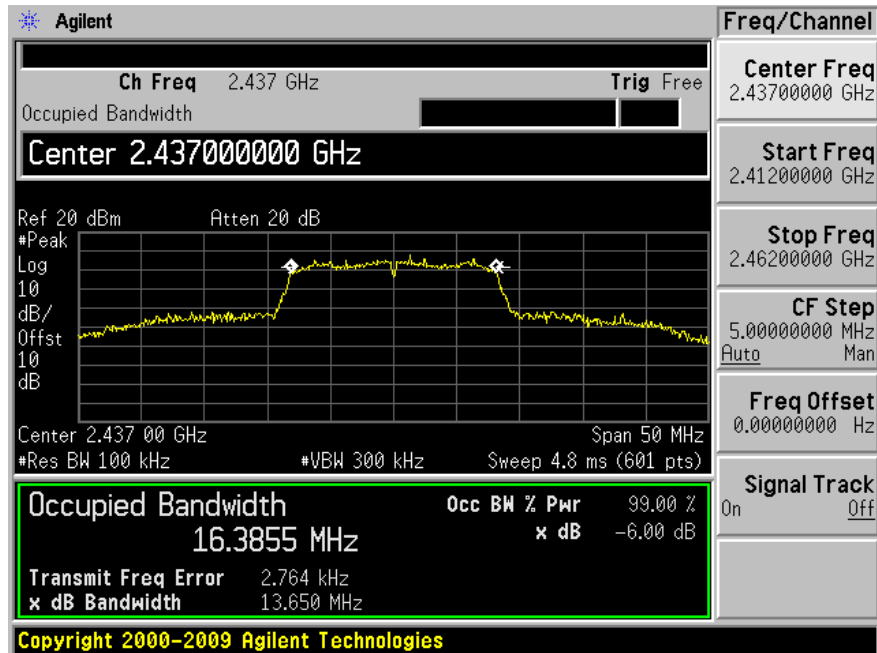


802.11 g (Antenna #1)

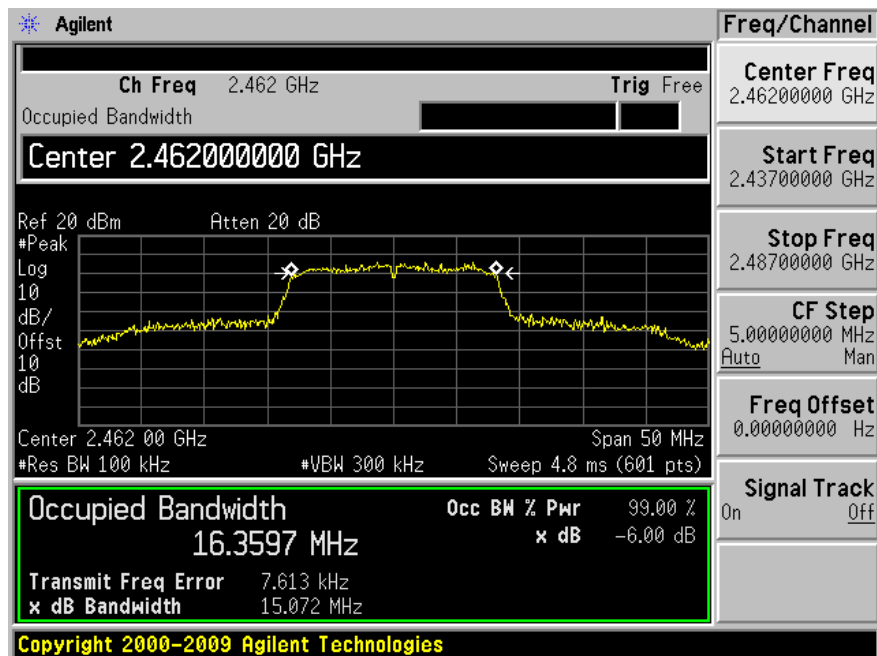
Low Channel 2412 MHz



Middle Channel 2437 MHz

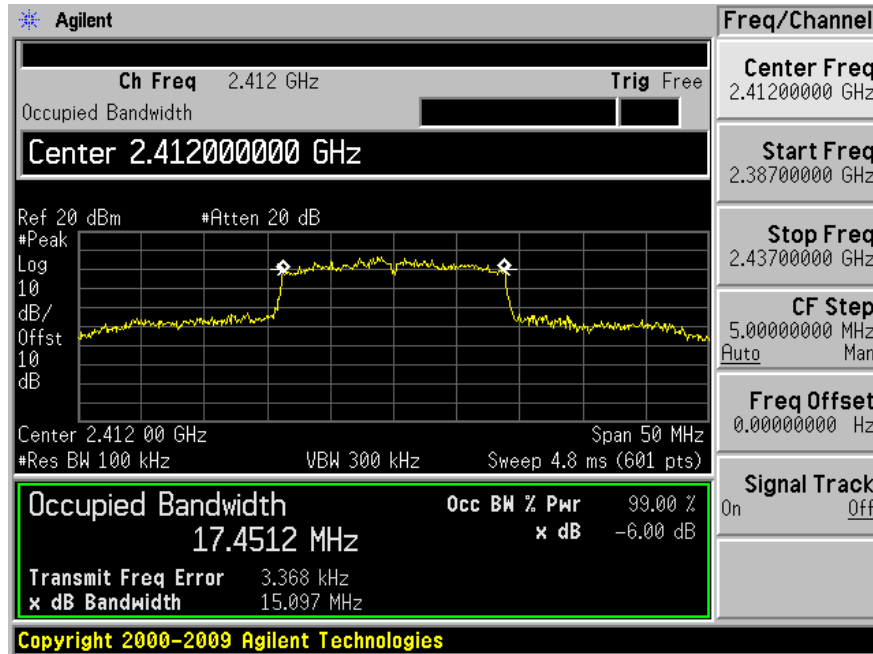


High Channel 2462 MHz

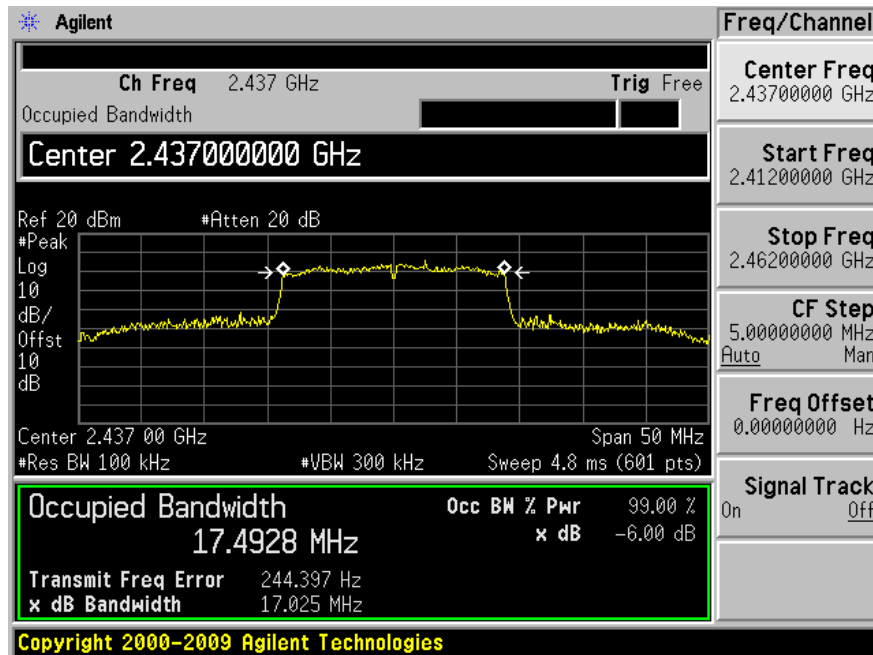


802.11 n 20 MHz (Antenna #0)

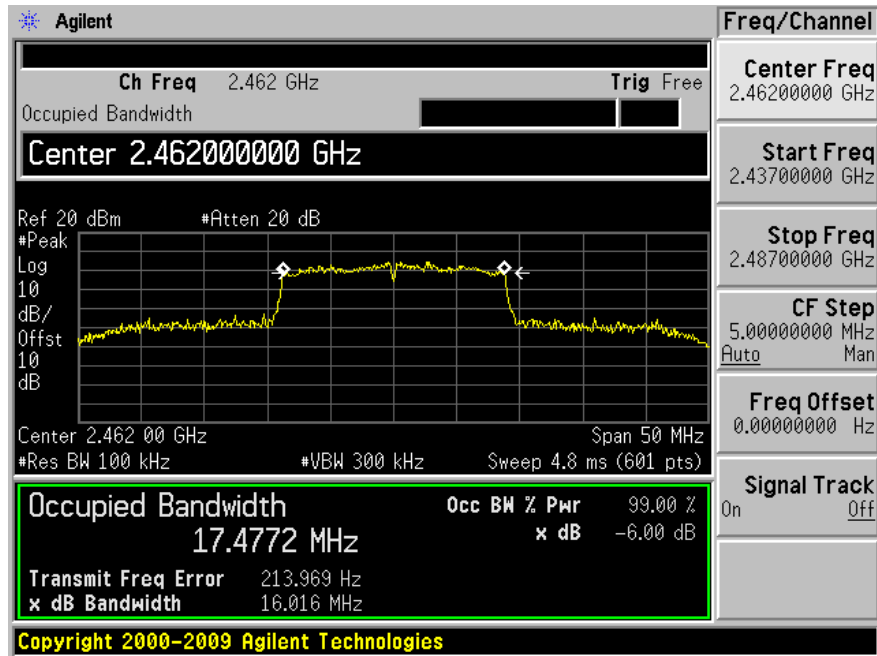
Low Channel 2412 MHz



Middle Channel 2437 MHz

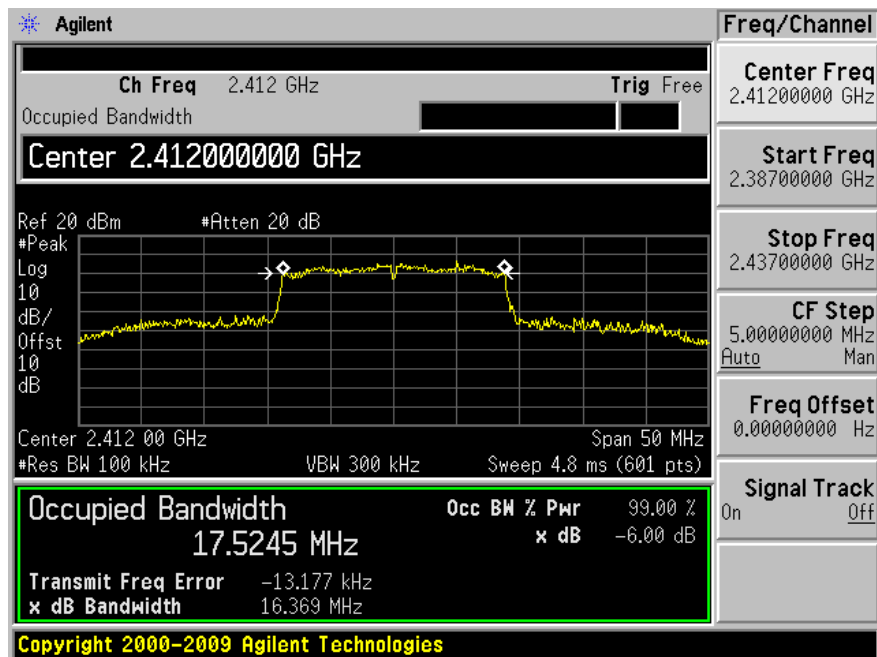


High Channel 2462 MHz

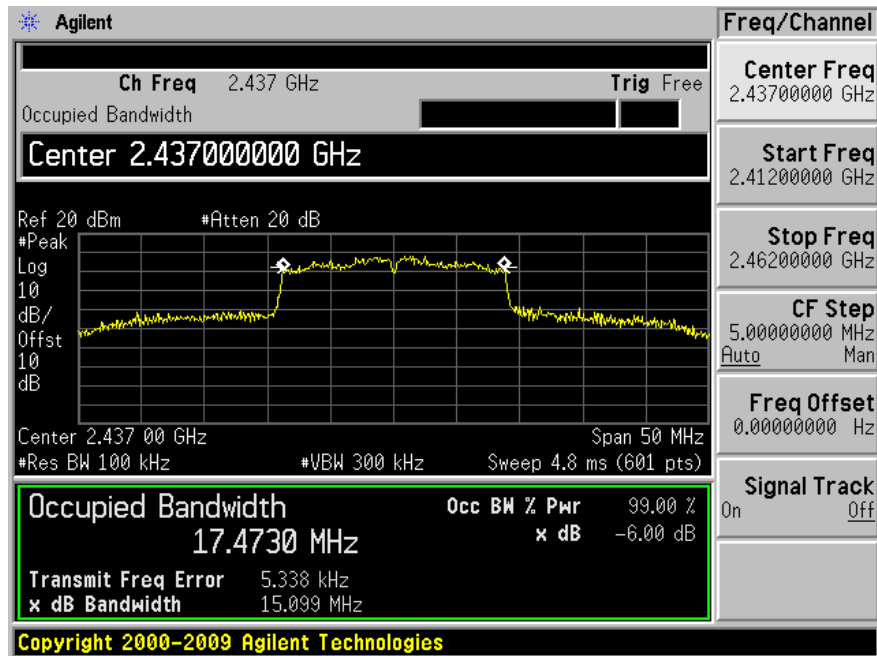


802.11 n 20 MHz (Antenna #1)

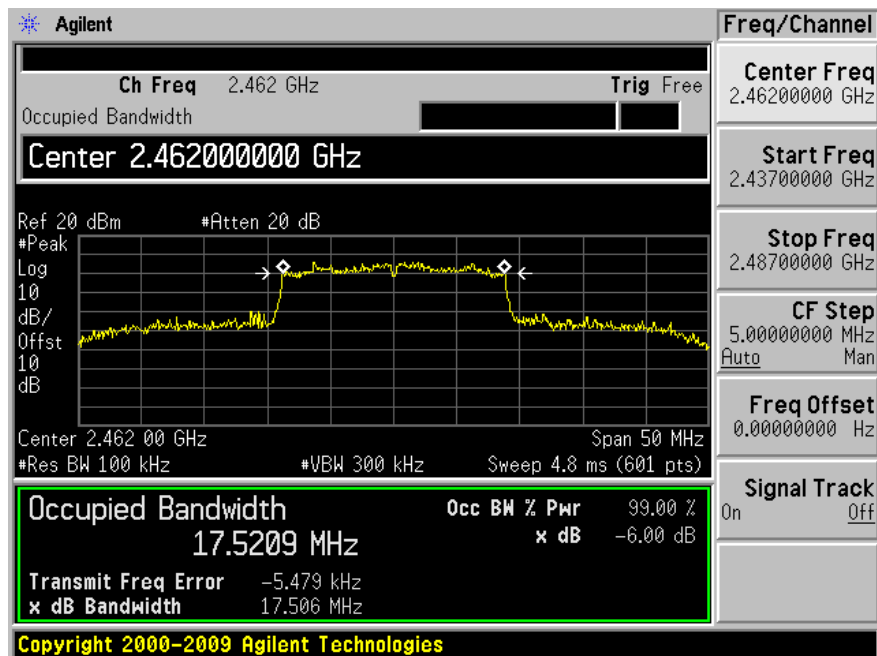
Low Channel 2412 MHz



Middle Channel 2437 MHz



High Channel 2462 MHz



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

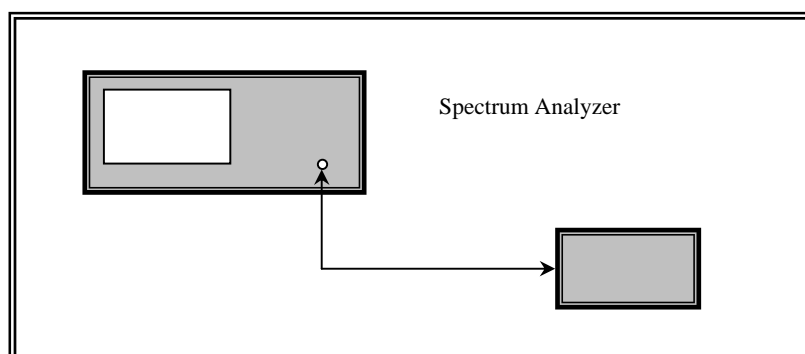
10.1 Applicable Standard

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

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.

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 Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2010-05-11

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:	20-25 °C
Relative Humidity:	30-45 %
ATM Pressure:	100-103kPa

The testing was performed by Jack Liu from 2010-07-30 to 2010-08-31 at RF Site.

10.5 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	23.94	23.65	23.94	30	-6.06
Mid	2437	24.34	24.10	24.10	30	-5.90
High	2462	24.41	24.05	24.41	30	-5.59

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	23.00	23.12	23.12	30	-6.88
Mid	2437	23.83	23.7	23.83	30	-6.17
High	2462	23.89	23.97	23.97	30	-6.03

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	21.19	22.41	24.85	30	-5.15
Mid	2437	22.65	23.3	26.00	30	-4.00
High	2462	23.1	23.63	26.38	30	-3.62

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 Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2010-05-11

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:	20-25 °C
Relative Humidity:	30-45 %
ATM Pressure:	100-103kPa

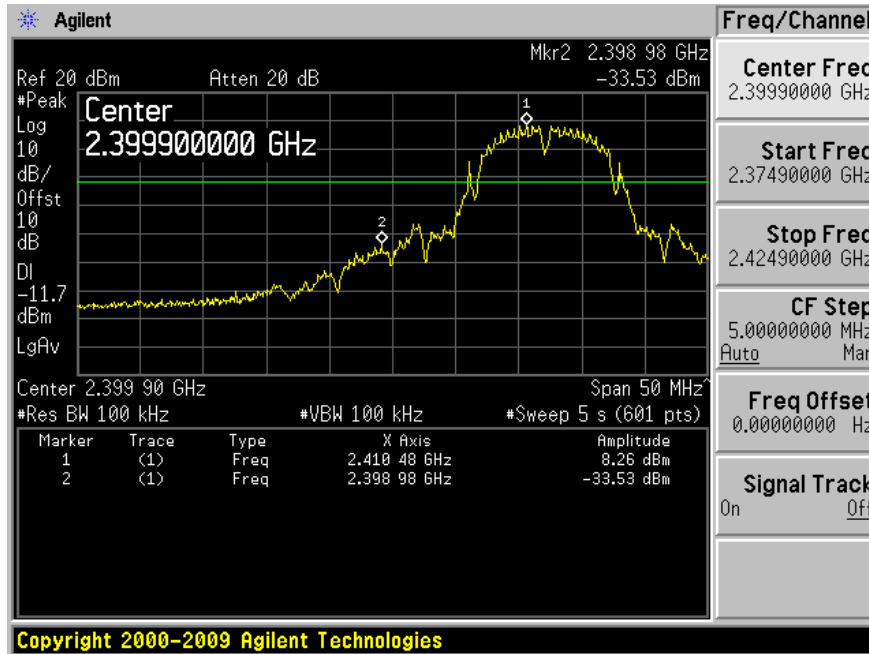
The testing was performed by Jack Liu from 2010-07-30 to 2010-08-31 at RF Site.

11.5 Measurement Results

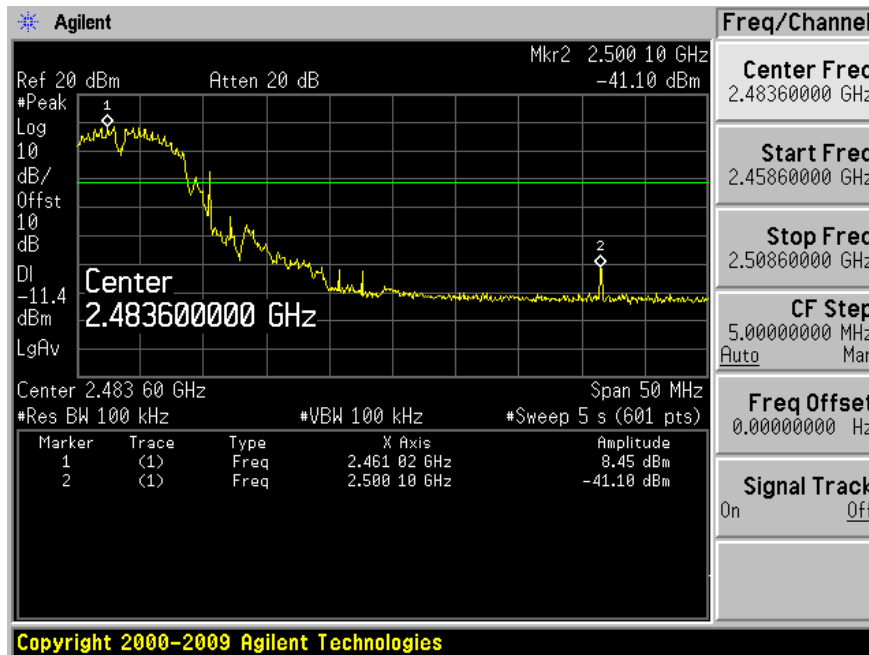
Please refer to following pages for plots of band edge.

802.11 b – Antenna #0

Low Band Edge

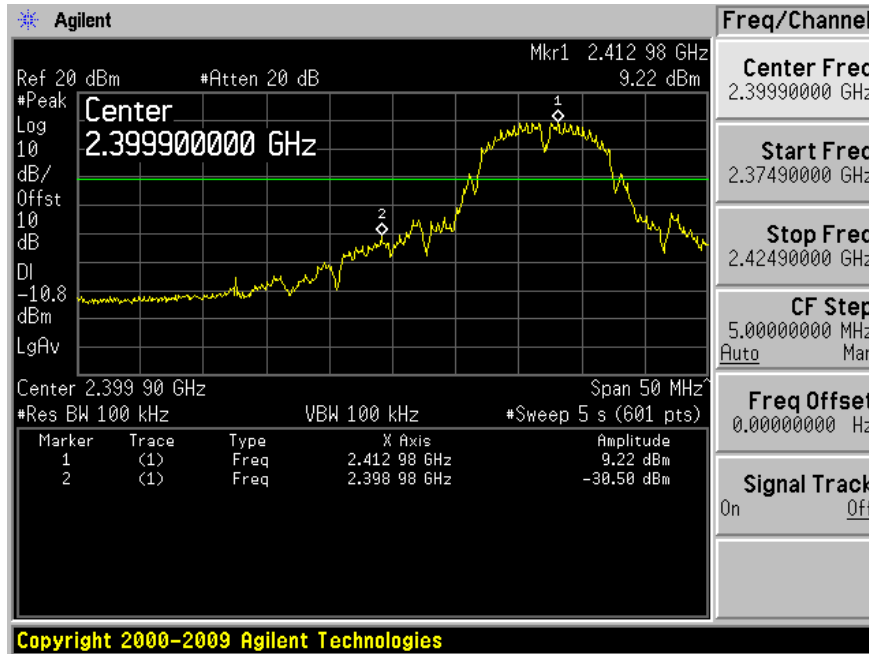


High Band Edge

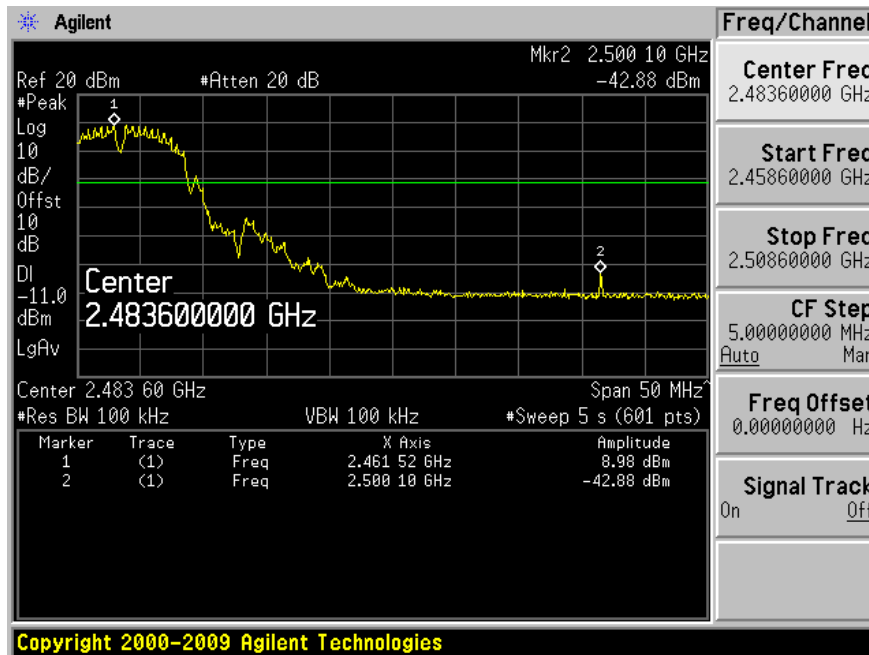


802.11 b – Antenna #1

Low Band Edge

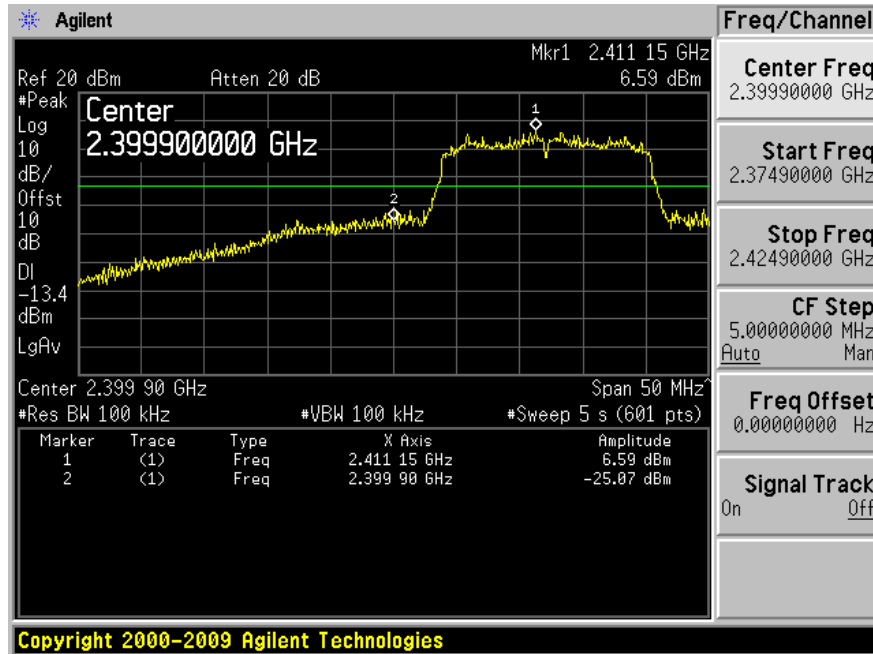


High Band Edge

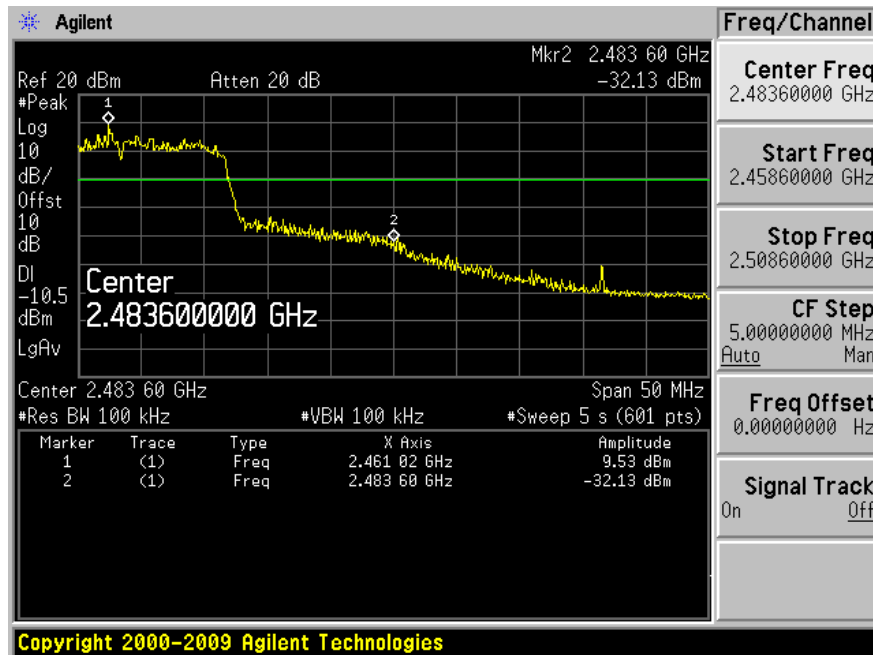


802.11 g – Antenna #0

Low Band Edge

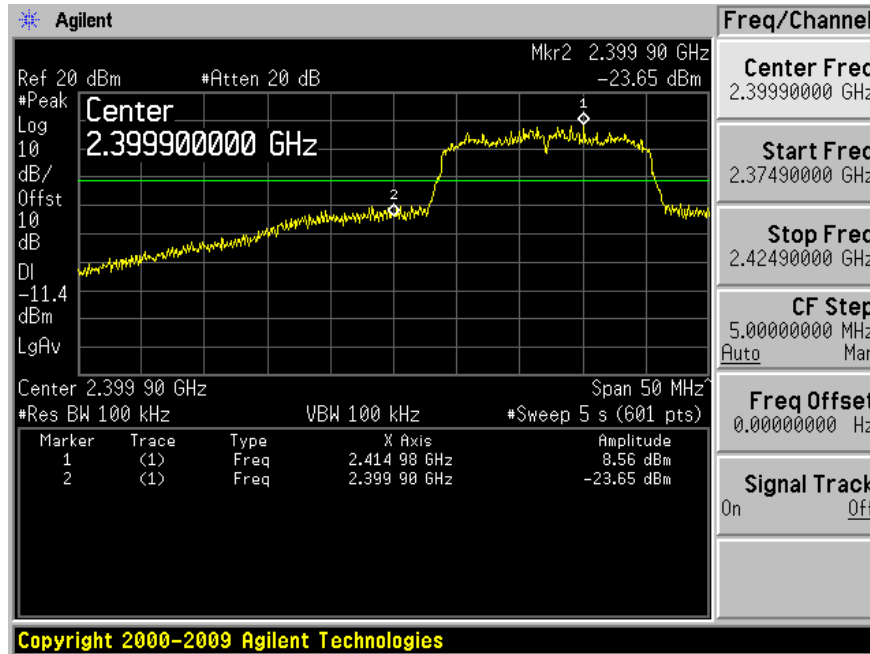


High Band Edge

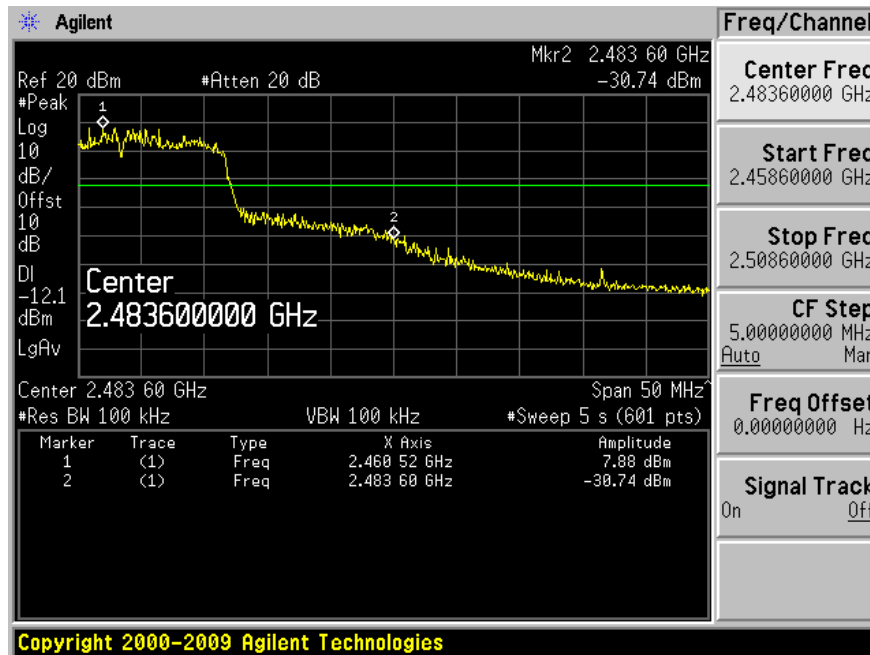


802.11 g – Antenna #1

Low Band Edge

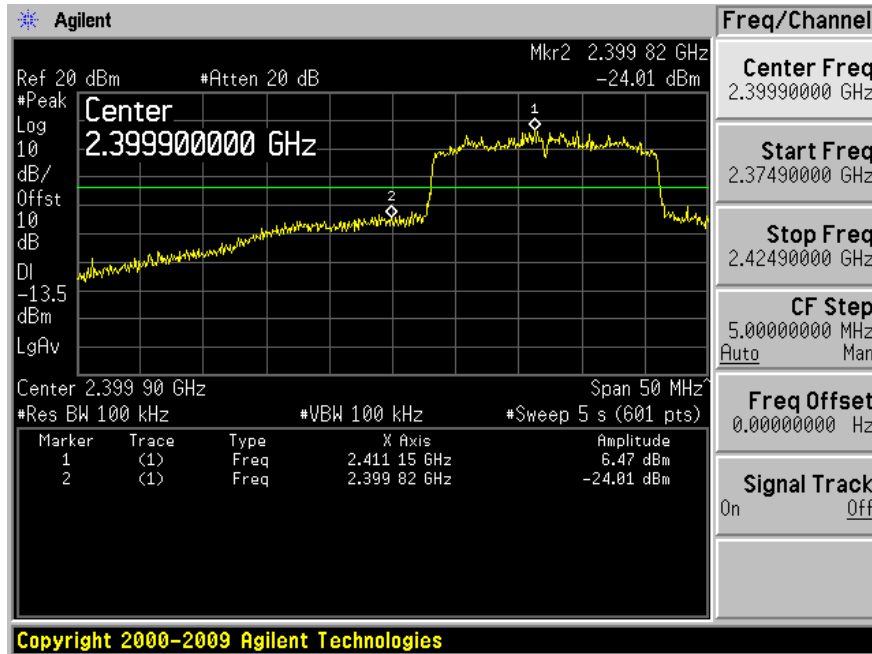


High Band Edge

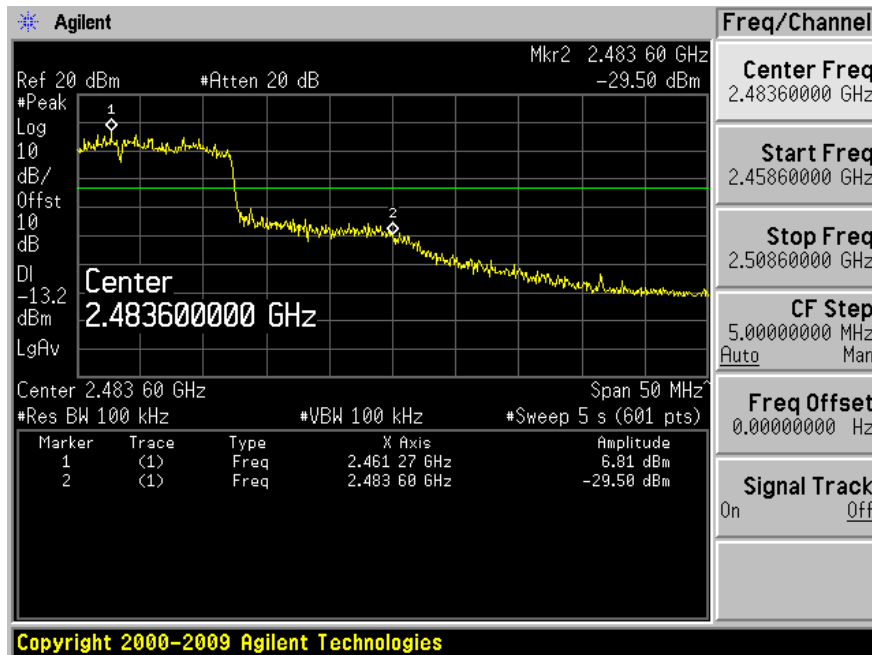


802.11 n 20 MHz – Antenna #0

Low Band Edge

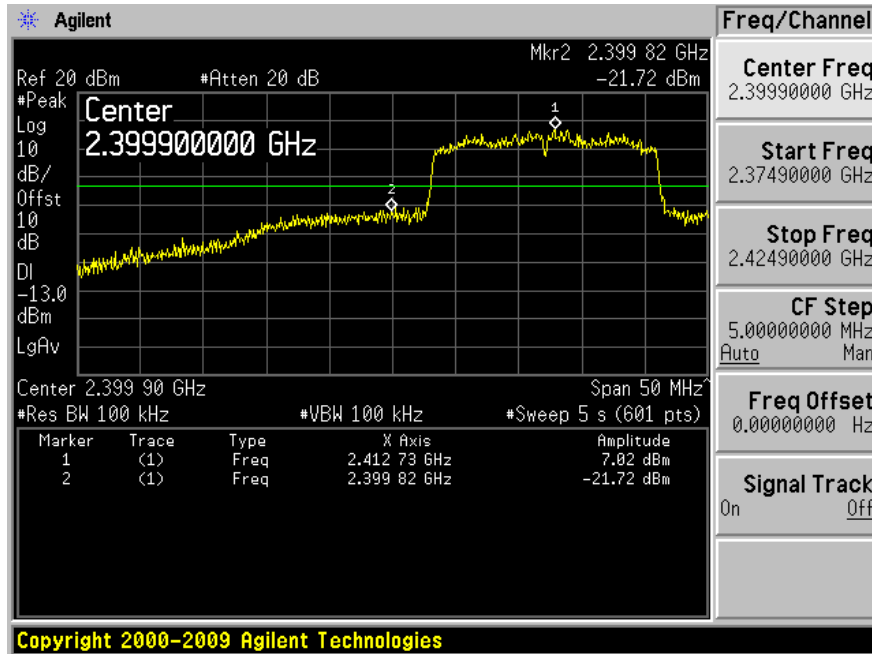


High Band Edge

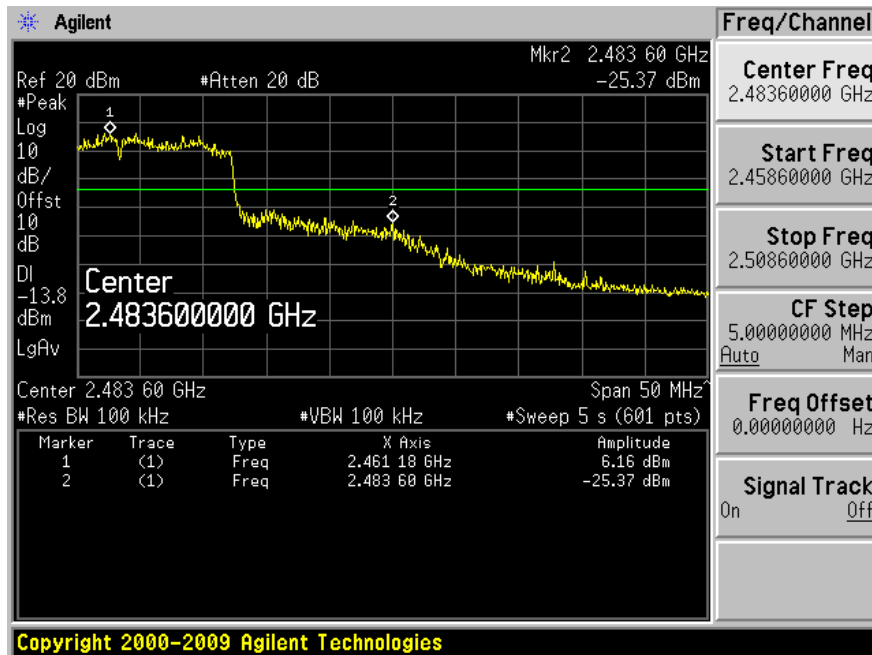


802.11 n 20 MHz – Antenna #1

Low Band Edge

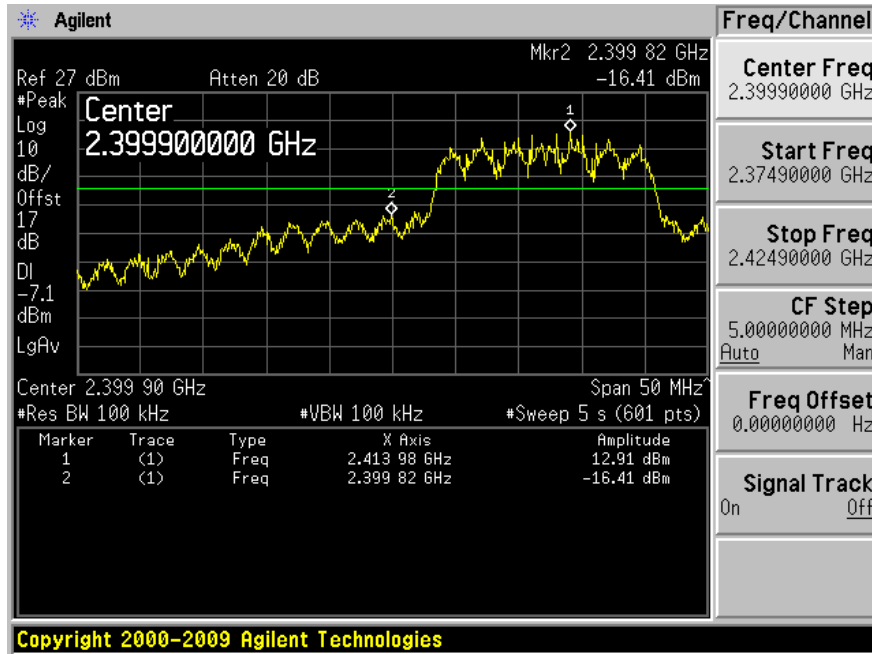


High Band Edge

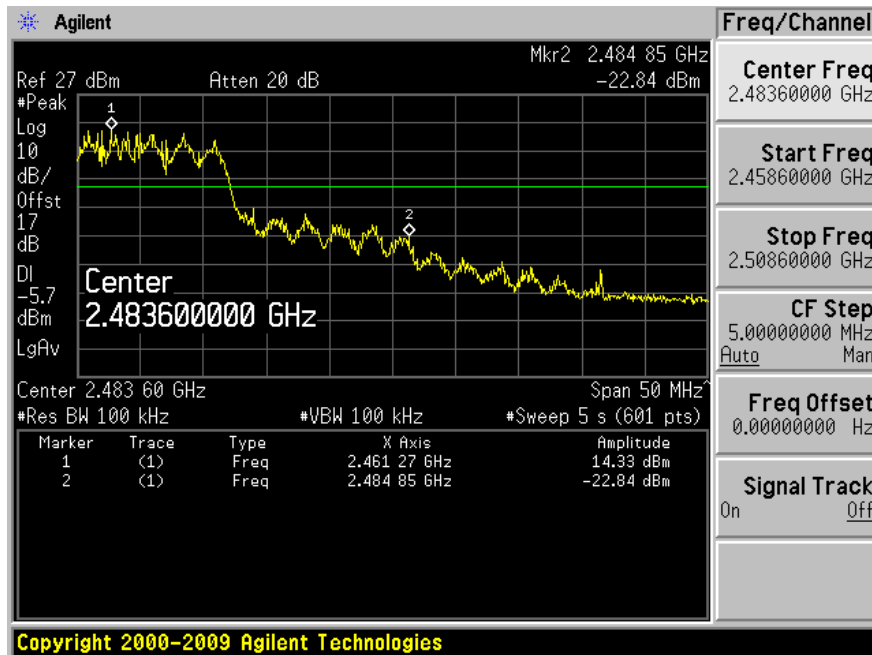


802.11 n 20 MHz (Antenna #0 + Antenna #1)

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 Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2010-05-11

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

12.4 Test Environmental Conditions

Temperature:	20-25 °C
Relative Humidity:	30-45 %
ATM Pressure:	100-103kPa

The testing was performed by Jack Liu from 2010-07-30 to 2010-08-31 at RF Site.

12.5 Summary of Test Results

802.11 b mode:

Antenna	Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm/3kHz)	Results
#0	Low	2412	-7.25	8	Compliant
	Mid	2437	-6.88	8	Compliant
	High	2462	-7.30	8	Compliant
#1	Low	2412	-7.12	8	Compliant
	Mid	2437	-9.10	8	Compliant
	High	2462	-7.77	8	Compliant

802.11 g mode:

Antenna	Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm/3kHz)	Results
#0	Low	2412	-7.50	8	Compliant
	Mid	2437	-7.30	8	Compliant
	High	2462	-7.64	8	Compliant
#1	Low	2412	-8.59	8	Compliant
	Mid	2437	-9.88	8	Compliant
	High	2462	-7.64	8	Compliant

802.11 n 20 MHz mode:

Antenna	Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm/3kHz)	Results
#0	Low	2412	-7.71	8	Compliant
	Mid	2437	-7.16	8	Compliant
	High	2462	-4.82	8	Compliant
#1	Low	2412	-9.47	8	Compliant
	Mid	2437	-7.70	8	Compliant
	High	2462	-8.04	8	Compliant

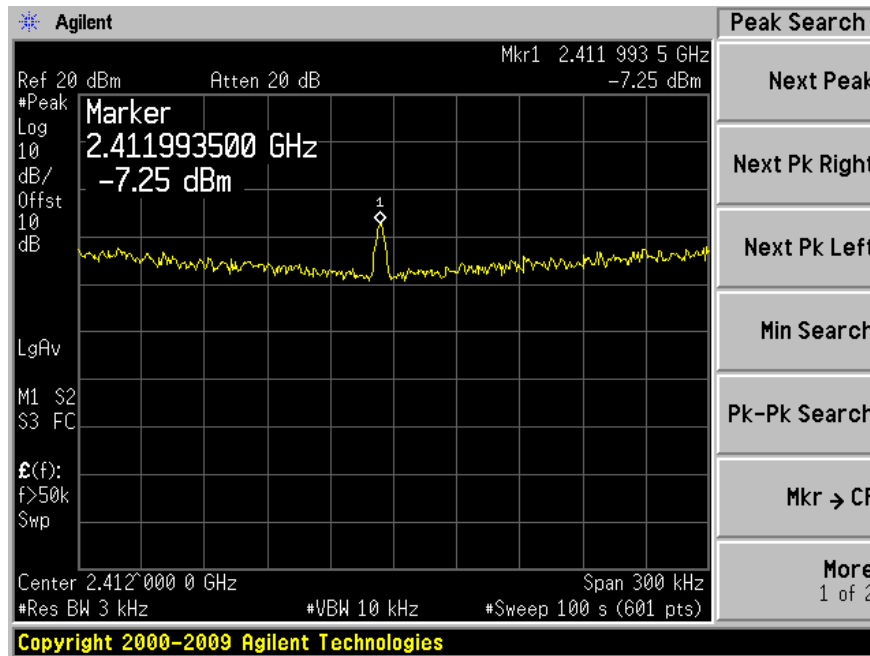
Antenna #0 + Antenna #1

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm/3kHz)	Results
Low	2412	-1.34	8	Compliant
Mid	2437	-0.33	8	Compliant
High	2462	-1.82	8	Compliant

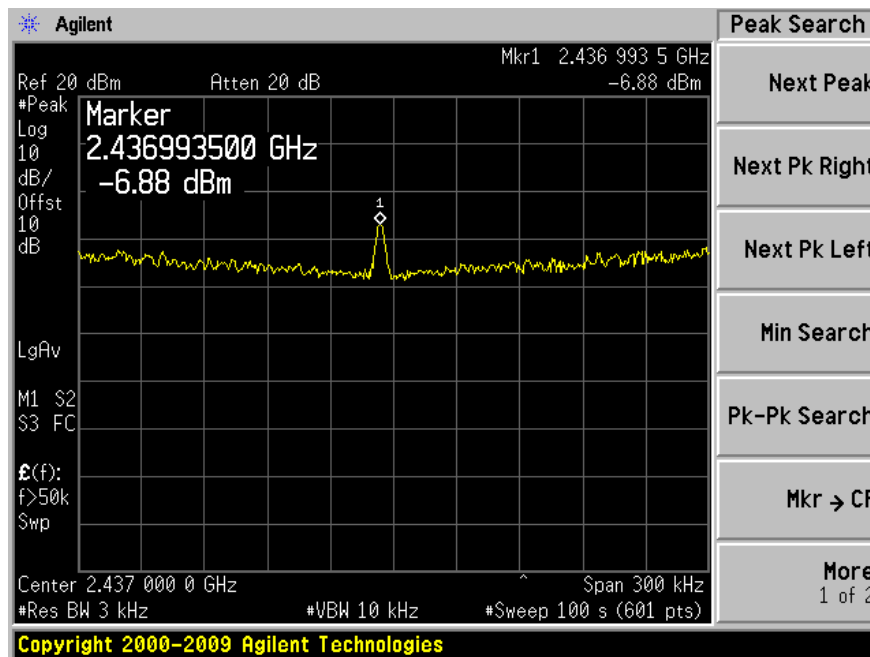
Please refer to the following plots for detailed test results:

802.11 b (Antenna #0)

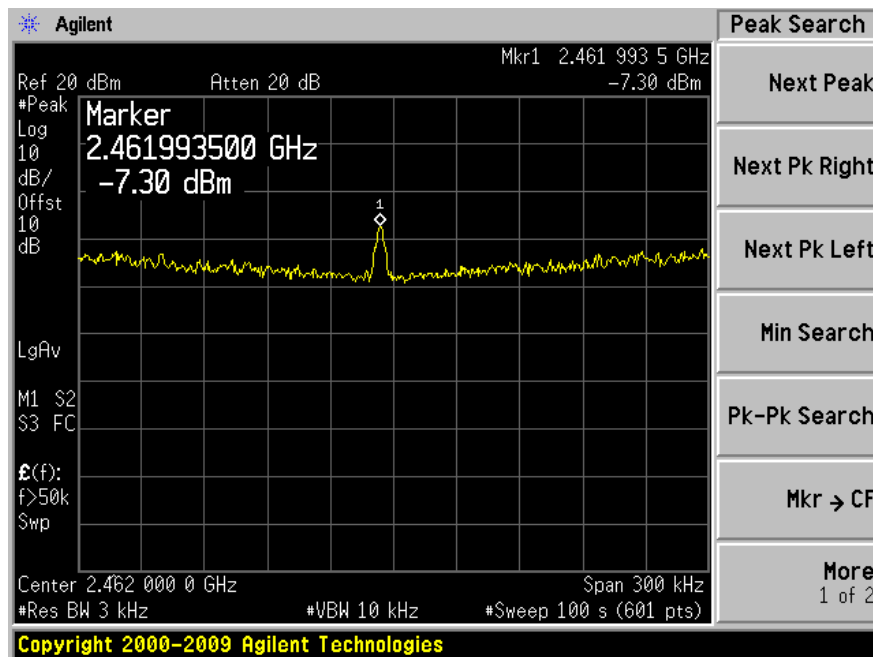
Low Channel 2412 MHz



Middle Channel 2437 MHz

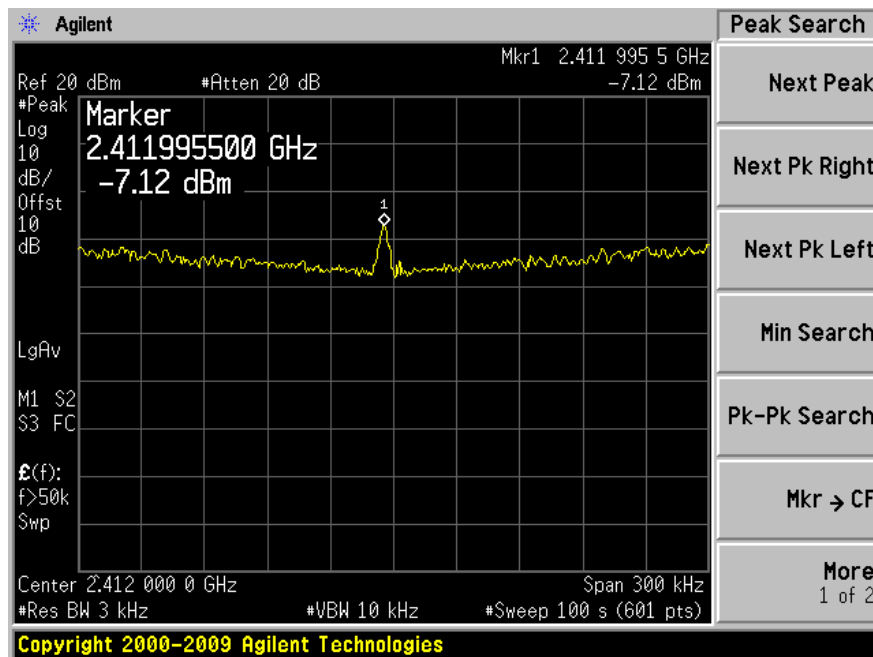


High Channel 2462 MHz

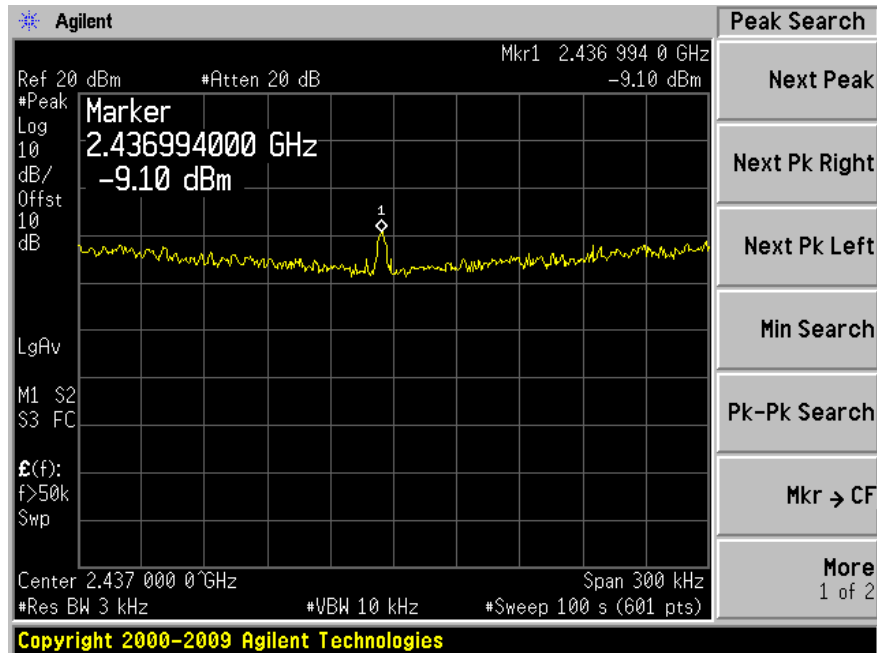


802.11 b (Antenna #1)

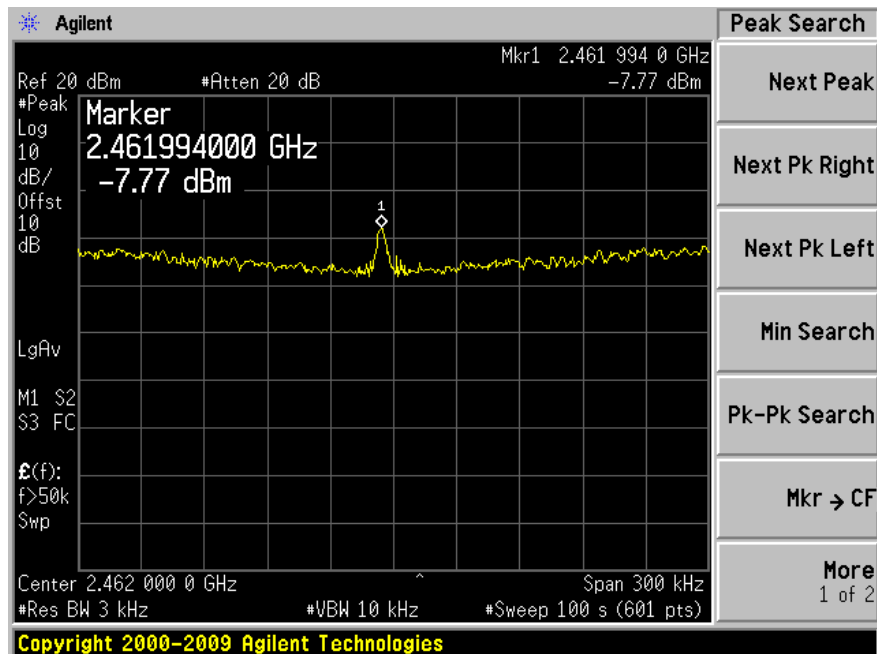
Low Channel 2412 MHz



Middle Channel 2437 MHz

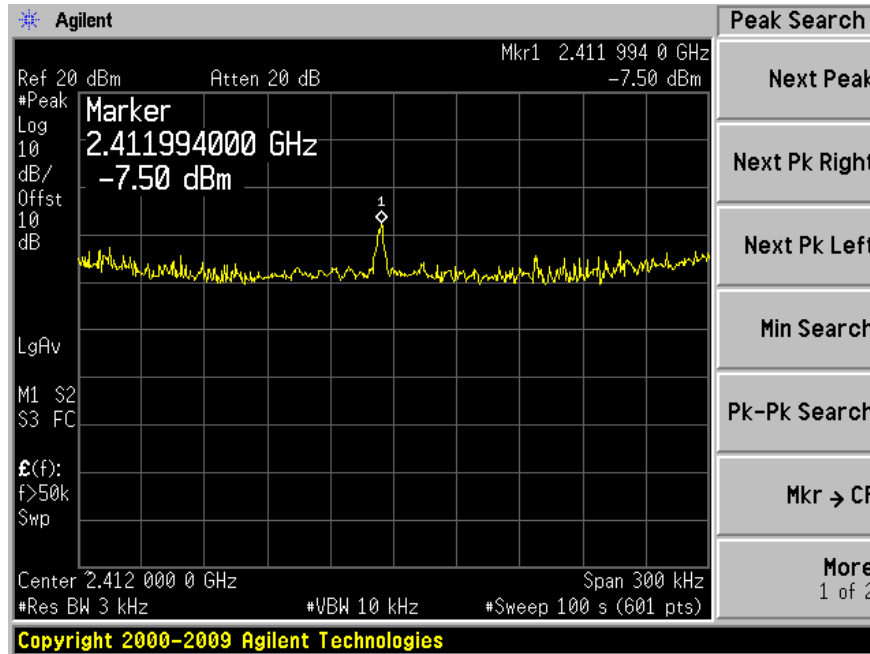


High Channel 2462 MHz

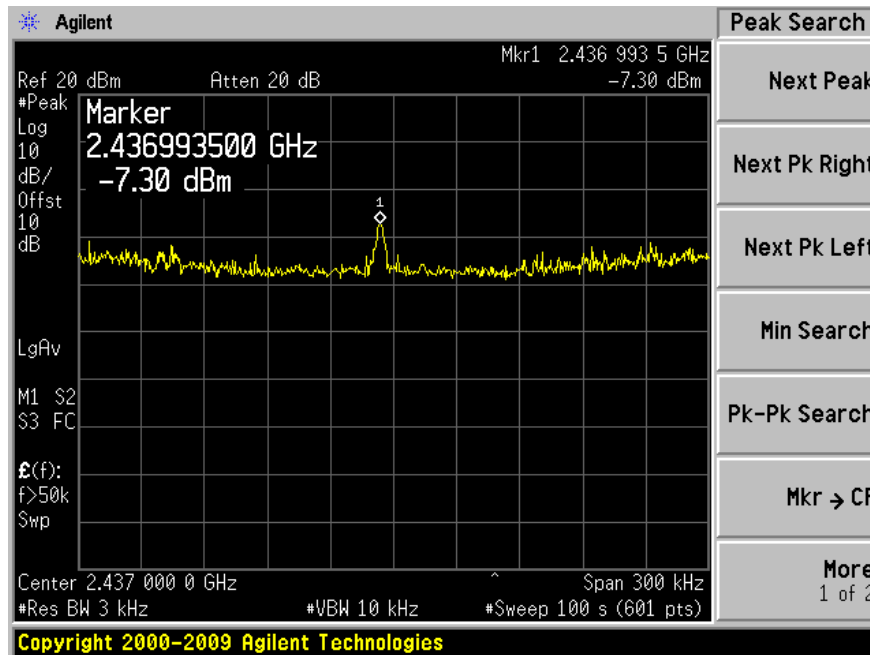


802.11 g (Antenna #0)

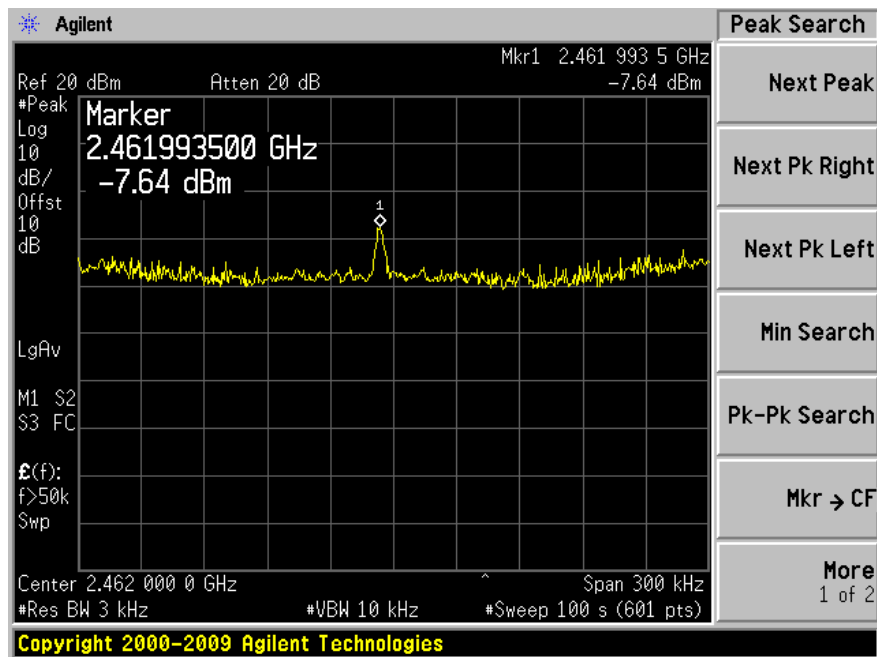
Low Channel 2412 MHz



Middle Channel 2437 MHz

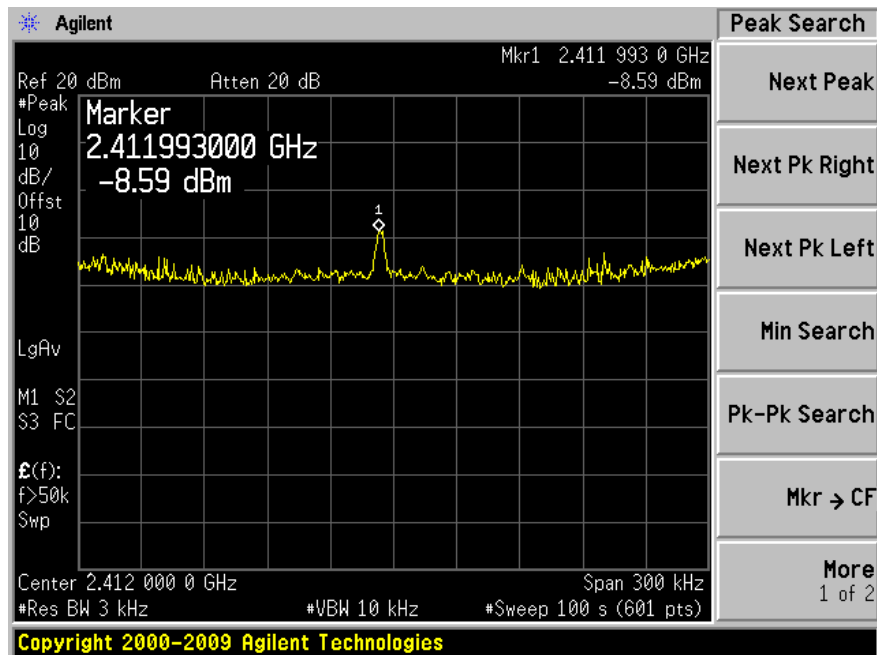


High Channel 2462 MHz

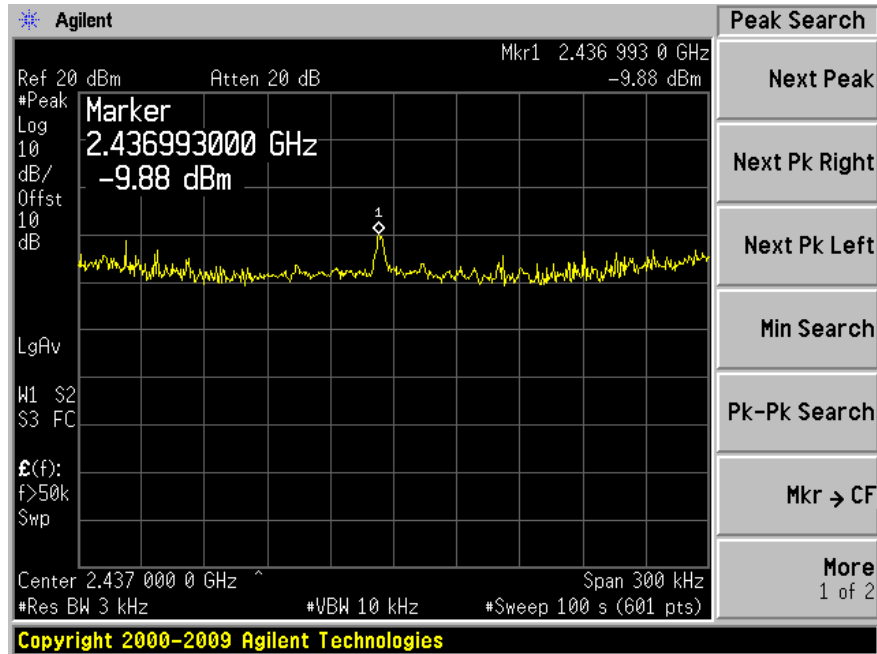


802.11 g (Antenna #1)

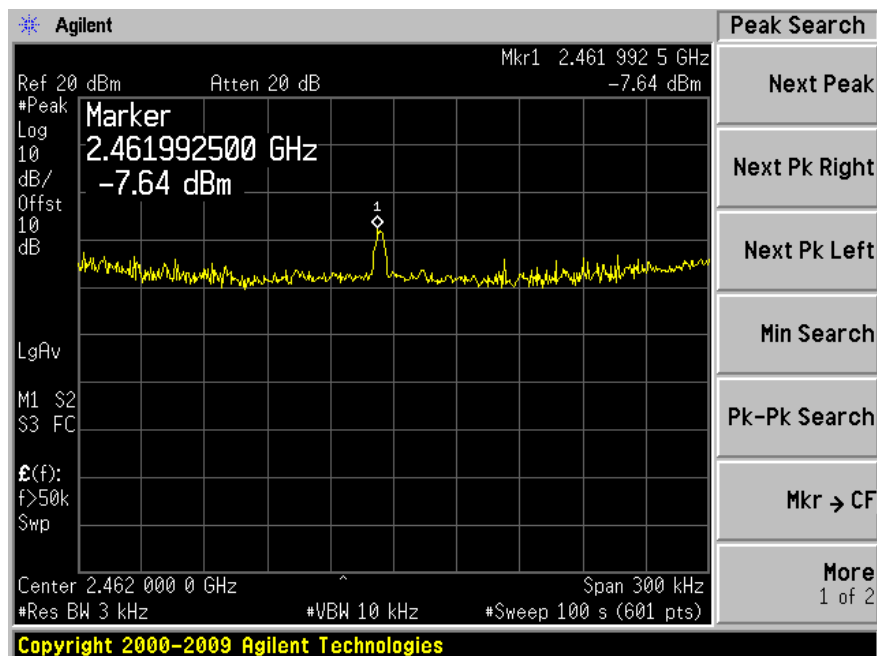
Low Channel 2412 MHz



Middle Channel 2437 MHz

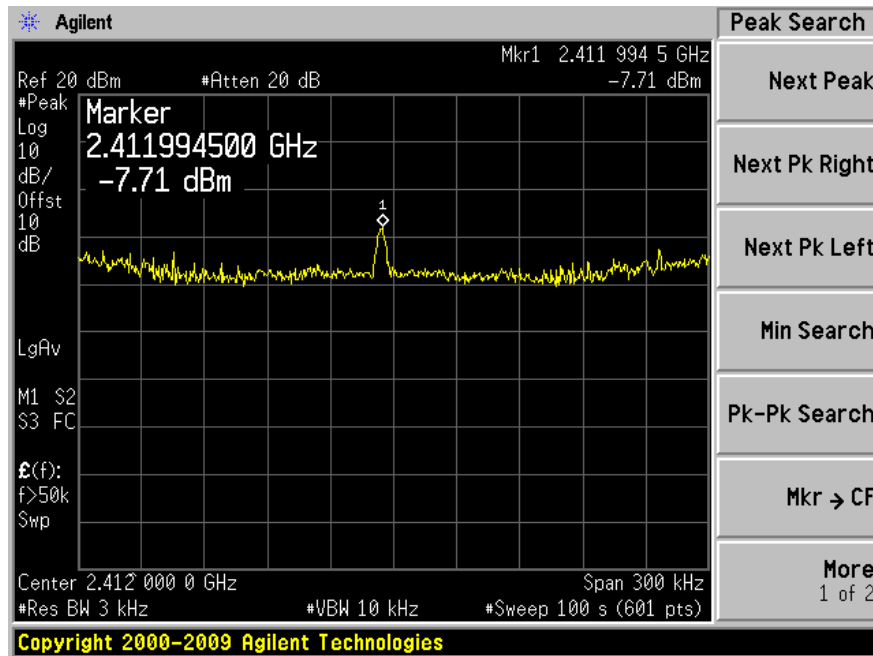


High Channel 2462 MHz

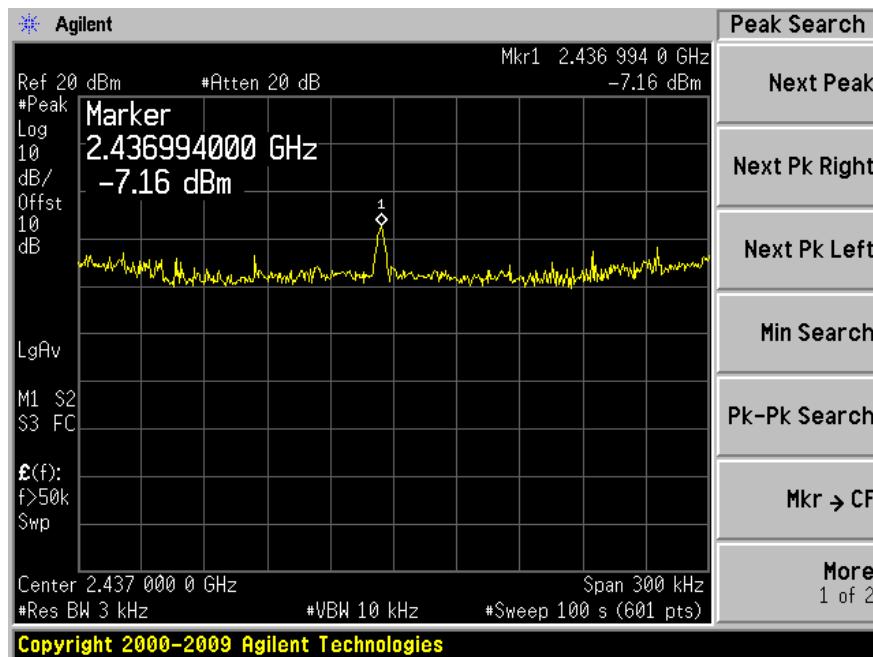


802.11 n 20 MHz (Antenna #0)

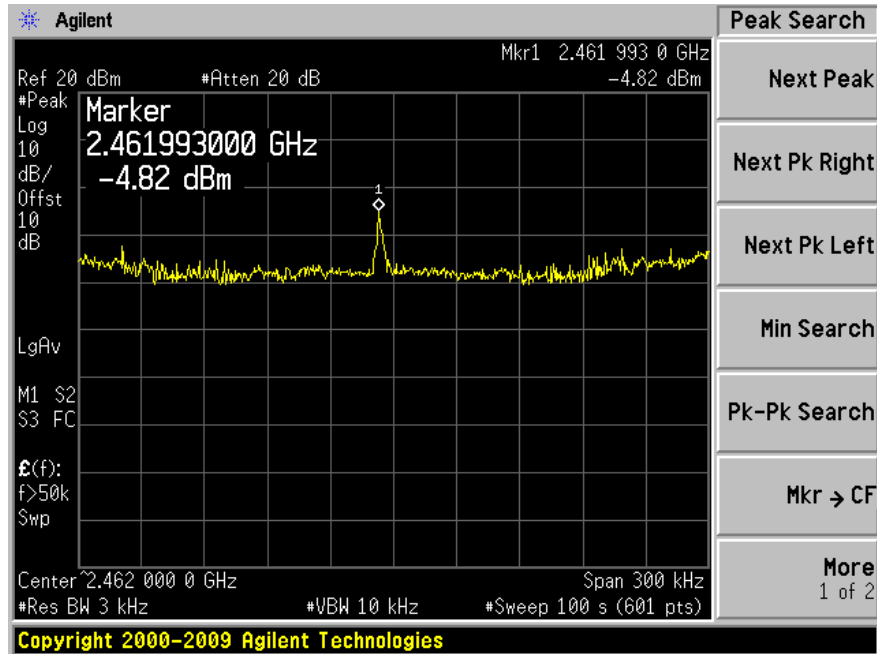
Low Channel 2412 MHz



Middle Channel 2437 MHz

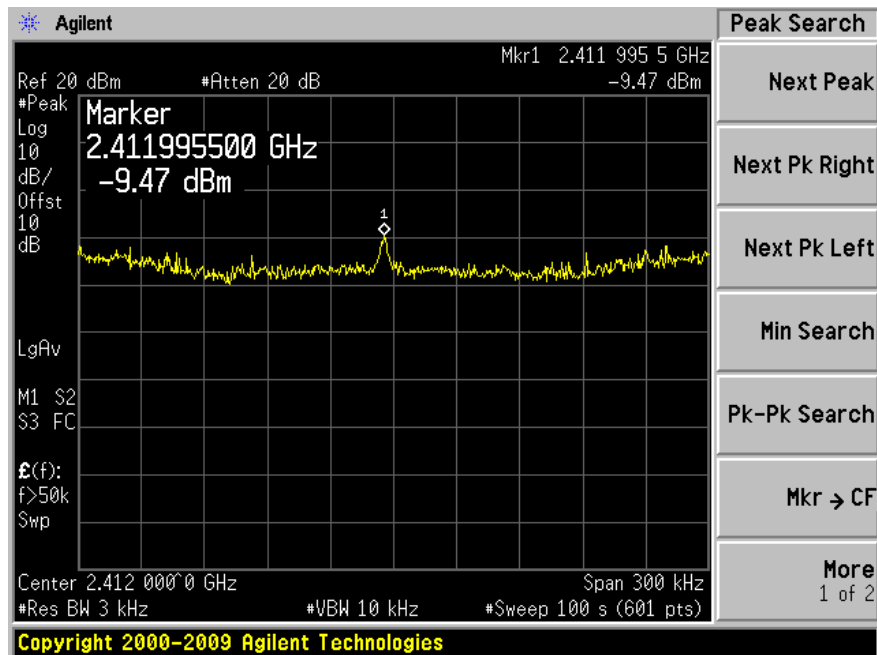


High Channel 2462 MHz

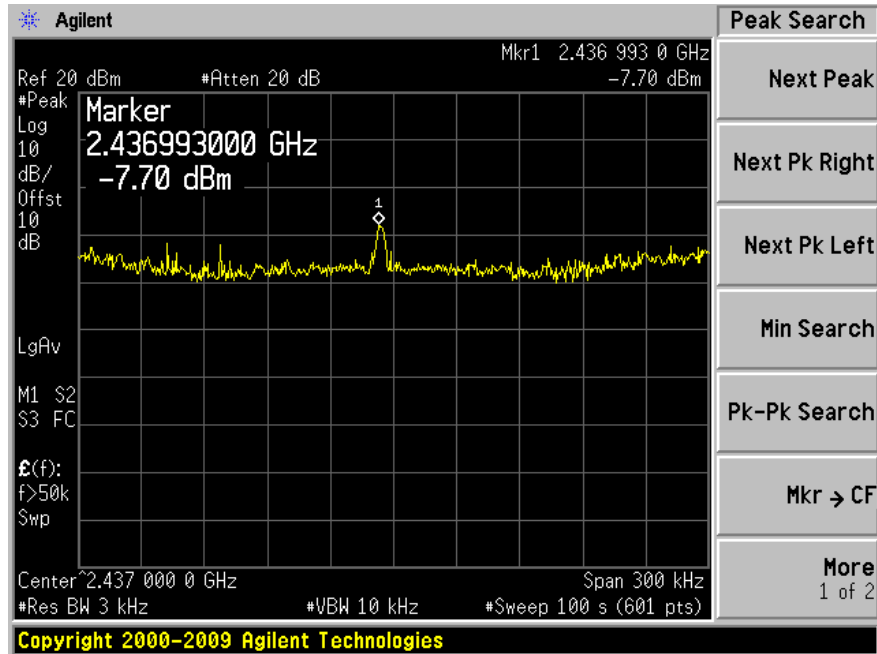


802.11 n 20 MHz (Antenna #1)

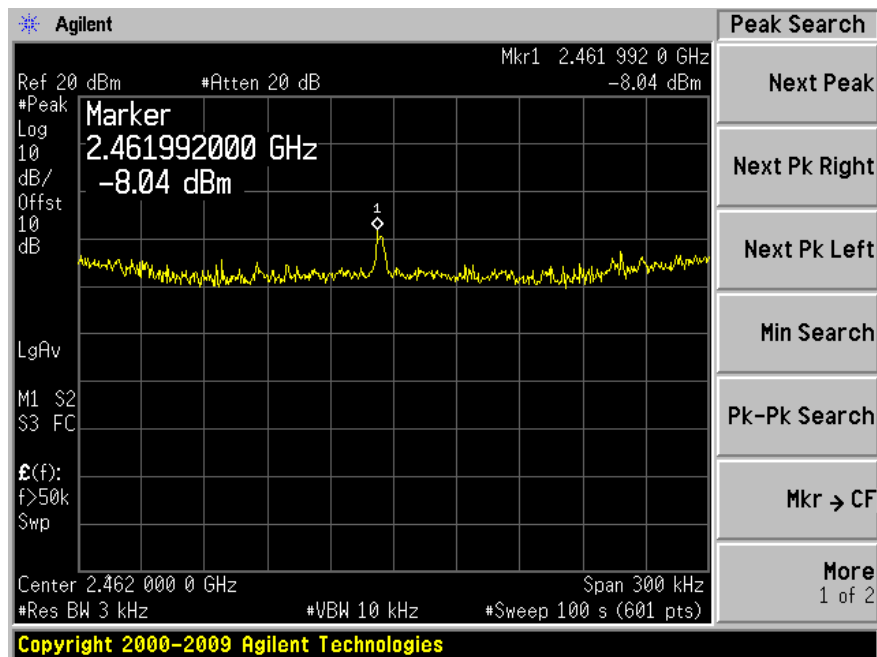
Low Channel 2412 MHz



Middle Channel 2437 MHz

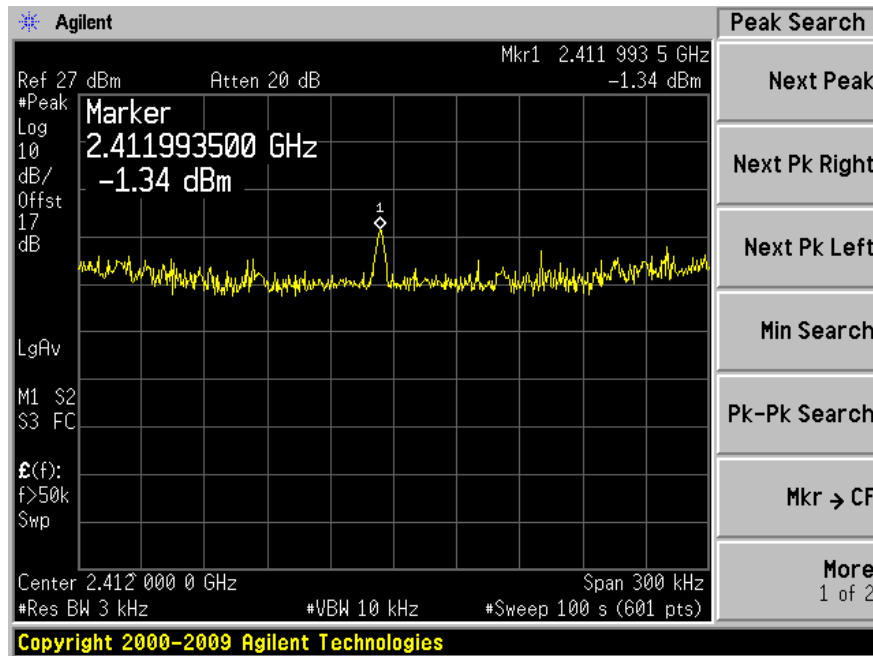


High Channel 2462 MHz

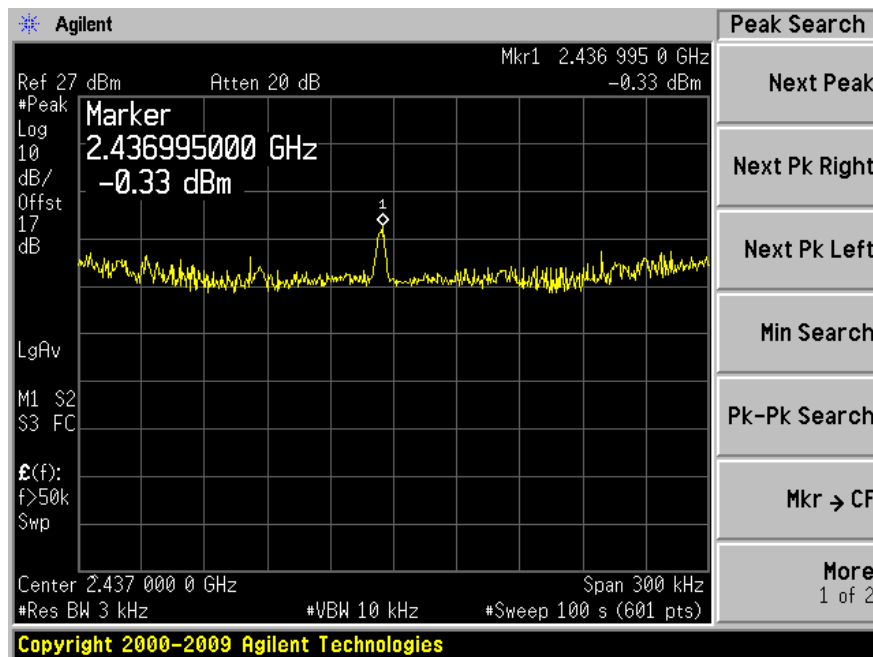


802.11 n 20 MHz (Antenna #0 + Antenna #1)

Low Channel 2412 MHz



Middle Channel 2437 MHz



High Channel 2462 MHz

