FCC PART 15 SUBPART C
IC RSS-210, ISSUE 8, DECEMBER 2010

TEST AND MEASUREMENT REPORT

For

Ruckus Wireless, Inc.

350 West Java Drive,

Sunnyvale, CA 94089, USA

FCC ID: S9GZF7352
IC: 5912A-ZF7352

Report Type:	**Product Type:**
Original Report	802.11 b/g/n Wireless Access Point

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Report Number:	R1209101-247
Report Date:	2013-01-02
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1209101-247	Original Report	2013-01-02

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Ruckus Wireless, Inc*., and their product FCC ID: S9GZF7352, IC: 5912A-ZF7352, model: *ZoneFlex 7352* or the "EUT" as referred to in this report. The EUT is a 2x2 MIMO 802.11 b/g/n WLAN Access Point.

Note: Model Zoneflex7352 is the depopulate version of model Zoneflex 7372. Zoneflex 7352 does not contain the 5 GHz module and all other RF components are the same.

1.2 Mechanical Description of EUT

The EUT measures approximately 160 cm (L) x 160 cm (W) x 35 cm (H) and weighs 334.5g.

The test data gathered are from typical production sample, serial number: 981202006375*, provided by the Manufacture.*

1.3 Objective

This report is prepared on behalf of *Ruckus Wireless, Inc*. in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commissions rules and IC RSS-210 Issue 8, Dec 2010.

The objective is to determine compliance with FCC Part 15.247 and IC RSS-210 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)

N/A

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the 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 CISPR16-4-2:2003, The Treatment of Uncertainty in EMC Measurements, the values ranging from $\pm$2.0 dB 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 Corp.

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 site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have 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 test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2003, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b3678l6b

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.4-2009.

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

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

2.2 EUT Exercise Software

The test utility used was St Bernard Art_Ver_2_18_2 was provided by Ruckus Wireless Inc., and was verified Jeffrey Wu to comply with the standard requirements being tested against.

2.3 Special Equipment

There were no special accessories were required, included, or intended for use with EUT during these tests.

2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 Local Support Equipment

Manufacturer	Description	Model	Serial Number
DELL	Laptop	Latitude E5420	-

2.6 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
Ruckus	Motherboard	St. Bernard ASM 120-11214 REV 4	71150401520128H04A
Ruckus	Antenna (2.4 GHz)	ZF7300 Horizontal	-
Ruckus	Antenna (2.4 GHz)	ZF7300 Vertical	-

2.7 Interface Ports and Cables

Cable Description	Length (m)	To	From
RF Cable	< 1.0	PSA	EUT
RJ 45 Cable	< 1.0	LAPTOP	EUT

2.8 Power Supply List and Details

Manufacturer	Description	Model	Part Number
Ruckus	Power Supply	HK-AD-120A100-US	740-64190-011
Ruckus	POE	NPE-5818	740-64157-001
Ruckus	POE Power Adapter	8A-201WU48	740-64125-010

3 Summary of Test Results

Results reported relate only to the product tested.

FCC & IC Rules	Description of Test	Results
FCC §15.247(i), §2.1091 IC RSS-102	RF Exposure	Compliant
FCC §15.203 IC RSS-Gen §7.1.2	Antenna Requirement	Compliant
FCC §15.207(a) IC RSS-Gen §7.2.4	AC Line Conducted Emissions	Compliant
FCC §15.247 (d) IC RSS-210 §A8.5	Spurious Emissions at Antenna Port	Compliant
FCC §15.205 IC RSS-210 §2.2	Restricted Bands	Compliant
FCC §15.209, §15.247 (d) IC RSS-210 §A8.5	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) IC RSS-210 §A8.2	6 dB Emission Bandwidth	Compliant
FCC §15.247(b)(3) IC RSS-210 §A8.4	Maximum Peak Output Power	Compliant
FCC §15.247(d) IC RSS-210 §A8.5	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §15.247(e) IC RSS-210 §A8.2(b)	Power Spectral Density	Compliant
IC RSS-210 §2.3 & RSS-Gen §4.10	Receiver Spurious Emissions	Compliant

4 FCC §15.247 (i), §2.1091 & IC RSS-102 – RF Exposure

4.1 Applicable Standard

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

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* (100)	30
1.34-30	824/f	2.19/f	* ($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF fields.

According to IC RSS-102 Issue 2 section 4.1, RF limits used for general public will be applied to the EUT.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Time Averaging (minutes)
0.003 - 1	280	2.19	-	6
1 - 10	280 / f	2.19 / f	-	6
10 - 30	28	2.19 / f	-	6
30 – 300	28	0.073	2*	6
300 – 1 500	$1.585\ f^{0.5}$	$0.0042\ f^{0.5}$	f / 150	6
1 500 – 15 000	61.4	0.163	10	6
15 000 – 150 000	61.4	0.163	10	$616000 / f^{1.2}$
150 000- 300 000	$0.158\ f^{0.5}$	$4.21 \times 10\ -4\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000 / f^{1.2}$

Note: *f* is frequency in MHz
* = Power density limit is applicable at frequencies greater than 100 MHz

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

2.4 GHz band:

Maximum peak output power at antenna input terminal (dBm):	25.86
Maximum peak output power at antenna input terminal (mW):	385.48
Prediction distance (cm):	20
Prediction frequency (MHz):	2412
Maximum Antenna Gain, typical (dBi):	3.0
Maximum Antenna Gain (numeric):	1.995
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.153
Power density of prediction frequency at 20.0 cm (W/m^2):	1.53
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
MPE limit for uncontrolled exposure at prediction frequency (W/m^2):	10

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.153 mW/cm^2 (1.53 W/m^2). Limit is 1.0 mW/cm^2 (10 W/m^2).

5 FCC §15.203 & IC RSS-Gen §7.1.2 – Antenna Requirements

5.1 Applicable Standard

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

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

According to IC RSS-Gen §7.1.2: Transmitter Antenna

A transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 mW or less. For devices of output powers greater than 10 mW, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

5.2 Antenna List

Manufacturers	Models/Name	Antenna Gain (dBi) @ 2.4 GHz
Ruckus	ZF7300 Horizontal	3.0
Ruckus	ZF7300 Vertical	2.0

Note: The power setting was controlled by manufacture with different antenna configuration. The power setting of the different antenna will be set with the corresponded value and no more then the level reported.

The antenna consists of non-standard (UFL) connectors with less 6 dBi gain; therefore, it complies with the antenna requirement. Please refer tot eh internal photos.

6 FCC §15.207 & IC RSS-Gen §7.2.4 – AC Line Conducted Emissions

6.1 Applicable Standards

As per FCC §15.207 and IC RSS-Gen §7.2.4 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 C63.4-2009 measurement procedure. The specification used was FCC §15.207 and IC RSS-Gen §7.2.4 limits.

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

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

6.3 Test Procedure

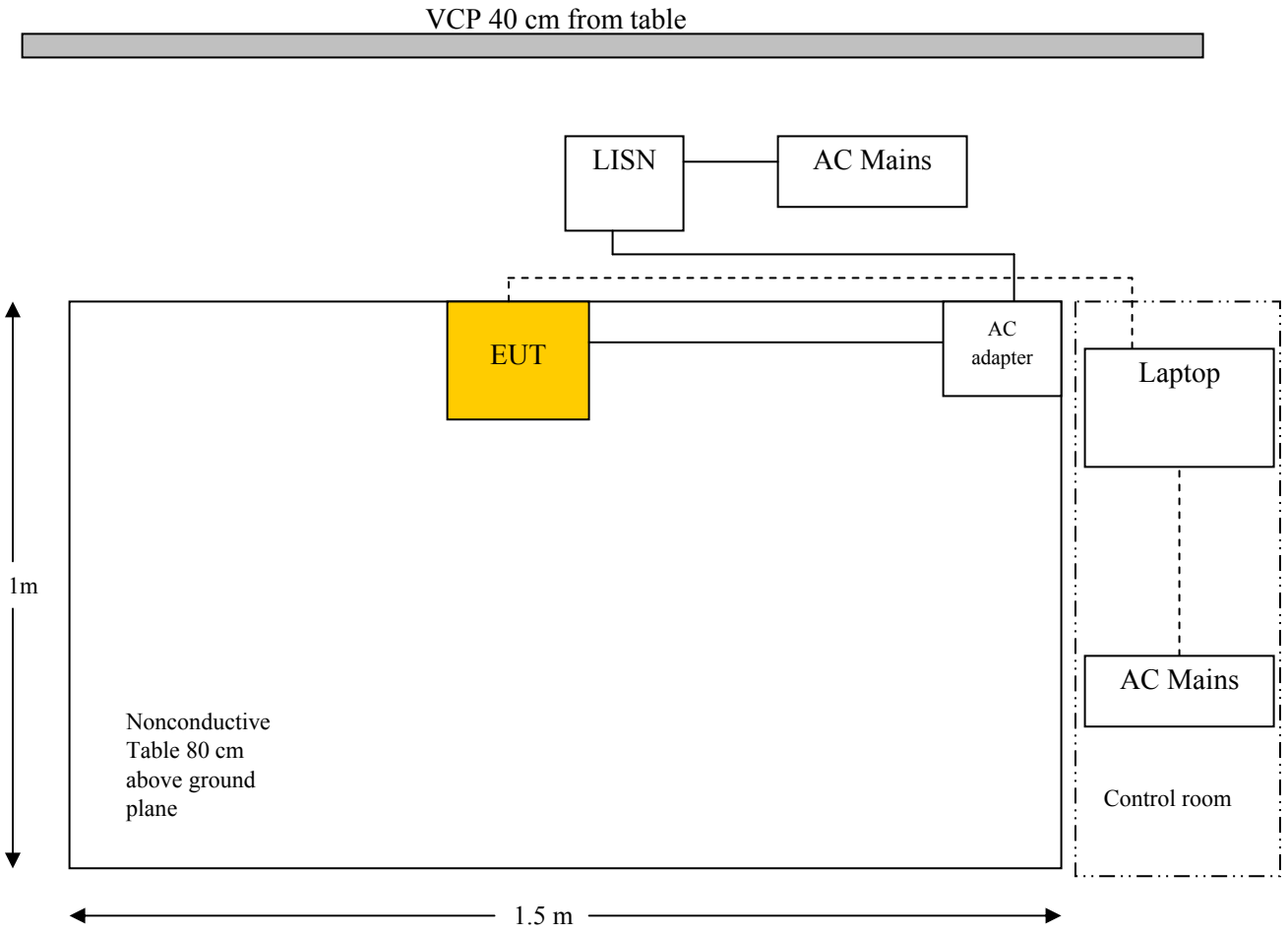
During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-2.

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

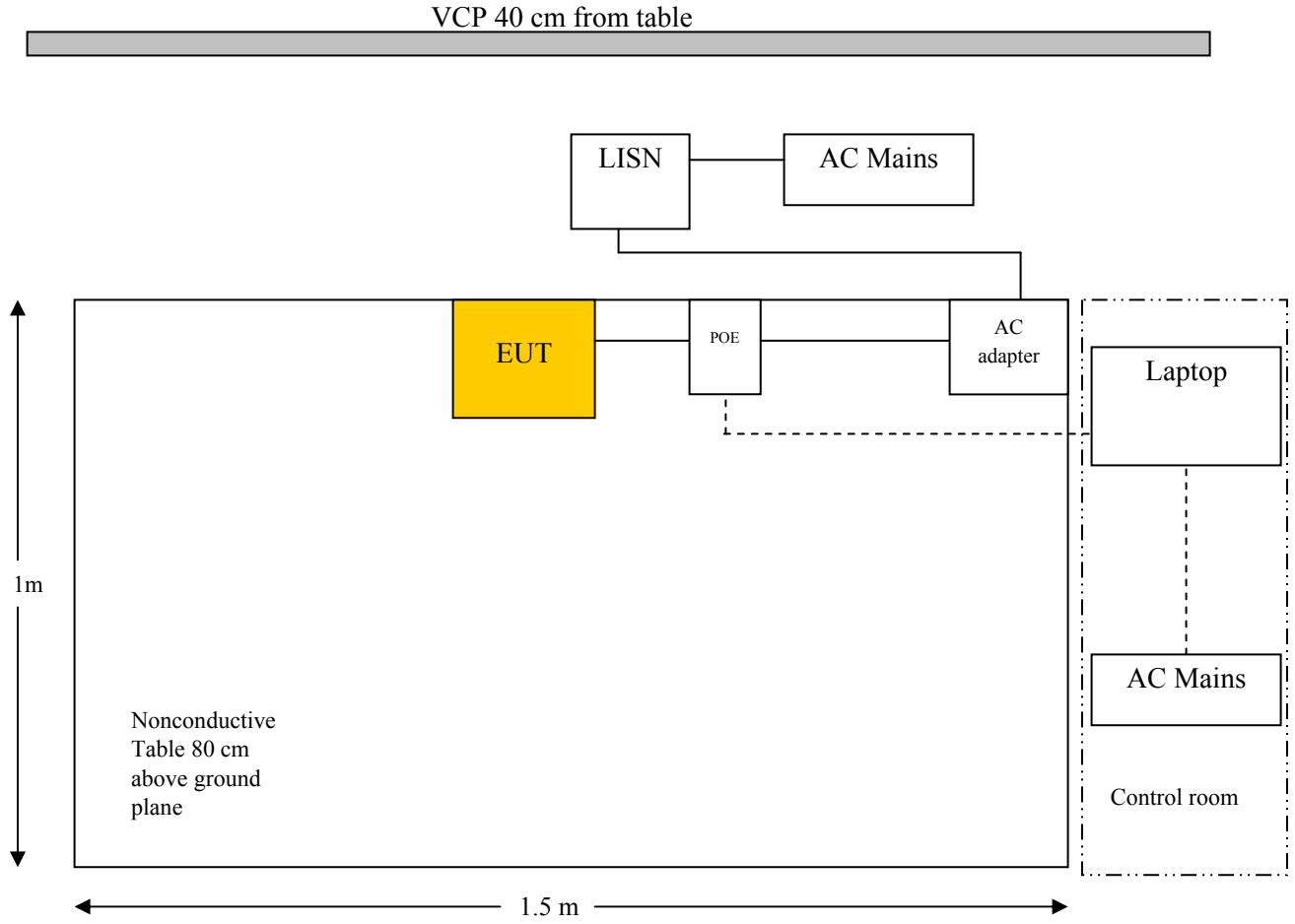
All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with a "QP." Average readings are distinguished with an "Ave".

6.4 Test Setup Block Diagram

AC



POE



6.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Cable Loss (CL), the Attenuator Factor (Atten) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + CL + Atten

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.7 dB) + Attenuator (10 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. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

6.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100044	2012-04-18	1 year
Solar Electronics	LISN	9252-R-24-BNC	511205	2012-06-25	1 year
TTE	Filter, High Pass	H9962-150K-50-21378	K7133	2012-05-30	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

6.7 Test Environmental Conditions

Temperature:	22 ºC
Relative Humidity:	51%
ATM Pressure:	101.58 kPa

The testing was performed by Charles Vergonio on 2012-11-08 in 10 m chamber 1.

6.8 Summary of Test Results

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

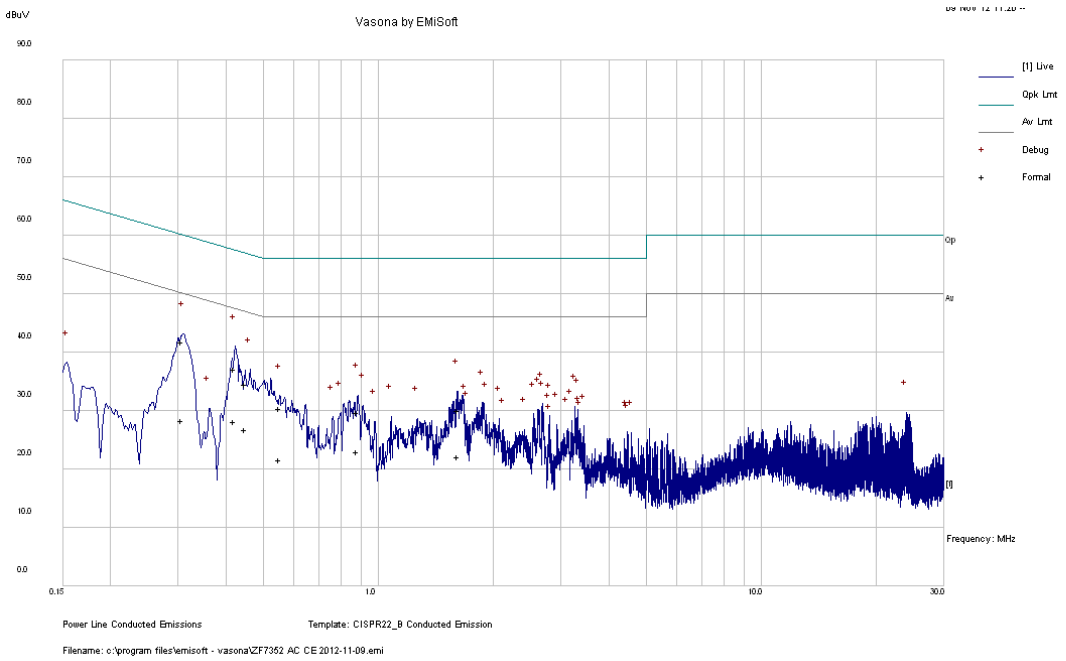
Transmitting Mode:

Connection: POE connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-7.17	0.283488	Neutral	0.15-30

6.9 Conducted Emissions Test Plots and Data

Transmitting Mode:

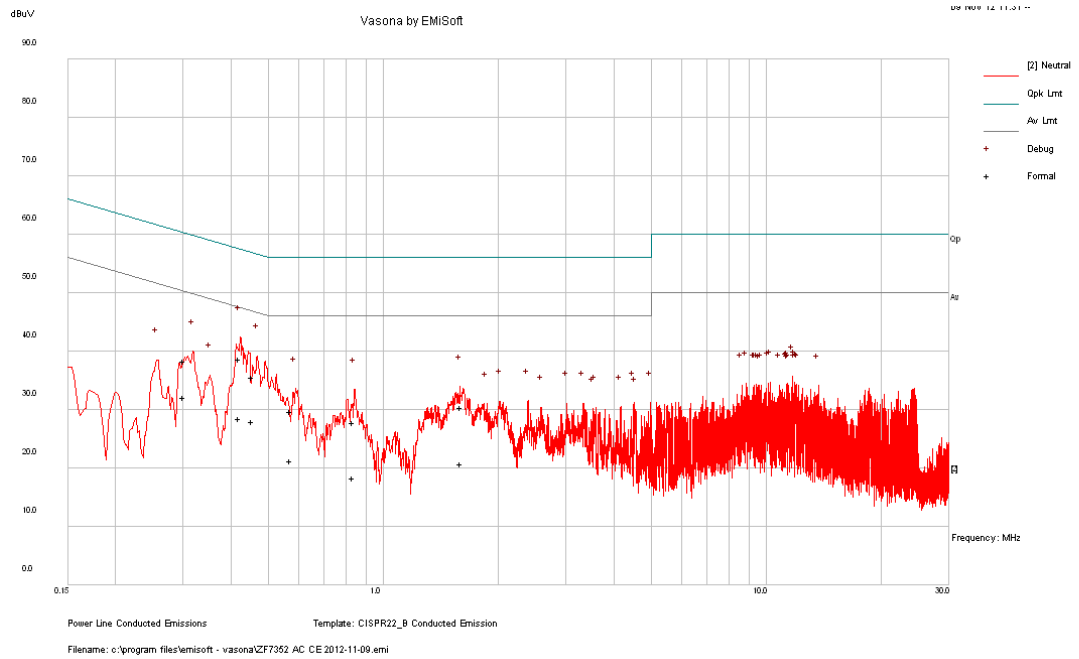
120 V, 60 Hz – Line, AC/DC Adaptor



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.307164	41.81	Line	60.05	-18.24	QP
0.422075	37.1	Line	57.41	-20.31	QP
0.449839	34.61	Line	56.88	-22.27	QP
0.551868	30.39	Line	56	-25.61	QP
1.613364	30.01	Line	56	-25.99	QP
0.882926	29.77	Line	56	-26.23	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.422075	28.16	Line	47.41	-19.25	Ave.
0.449839	26.73	Line	46.88	-20.14	Ave.
0.307164	28.37	Line	50.05	-21.68	Ave.
0.882926	22.96	Line	46	-23.04	Ave.
1.613364	22.12	Line	46	-23.88	Ave.
0.551868	21.56	Line	46	-24.44	Ave.

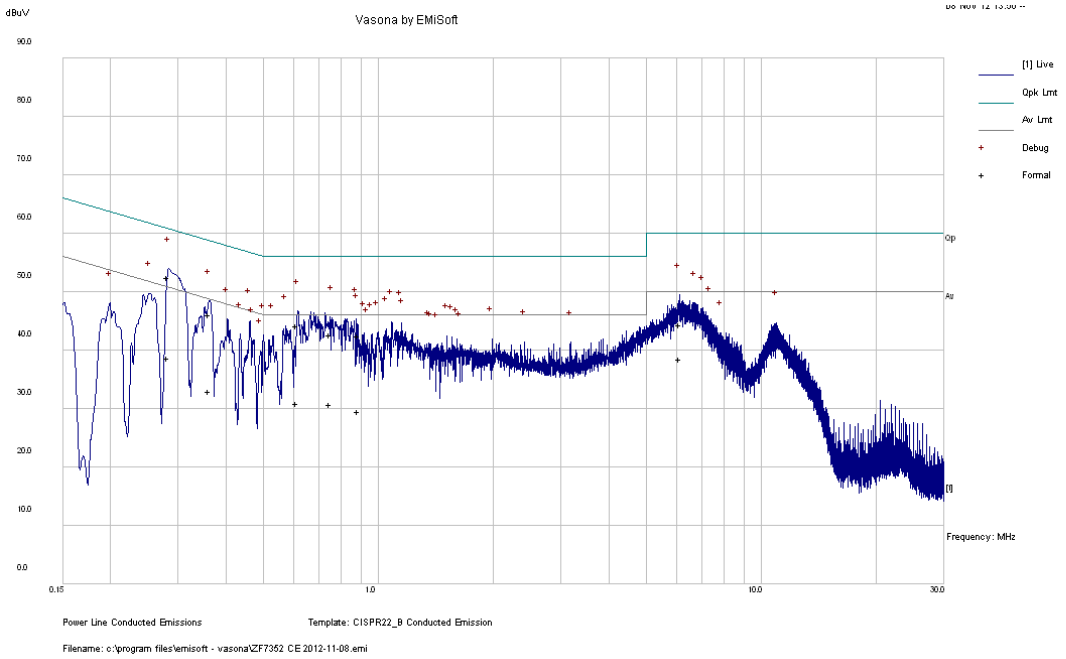
120 V, 60 Hz – Neutral, AC/DC Adaptor



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.420743	38.74	Neutral	57.44	-18.7	QP
0.455555	35.61	Neutral	56.77	-21.16	QP
0.301425	38.4	Neutral	60.2	-21.81	QP
1.601238	30.49	Neutral	56	-25.51	QP
0.573165	29.71	Neutral	56	-26.29	QP
0.837655	27.78	Neutral	56	-28.22	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.301425	32.17	Neutral	50.2	-18.03	Ave.
0.455555	27.96	Neutral	46.77	-18.82	Ave.
0.420743	28.56	Neutral	47.43	-18.87	Ave.
0.573165	21.28	Neutral	46	-24.72	Ave.
1.601238	20.84	Neutral	46	-25.16	Ave.
0.837655	18.34	Neutral	46	-27.66	Ave.

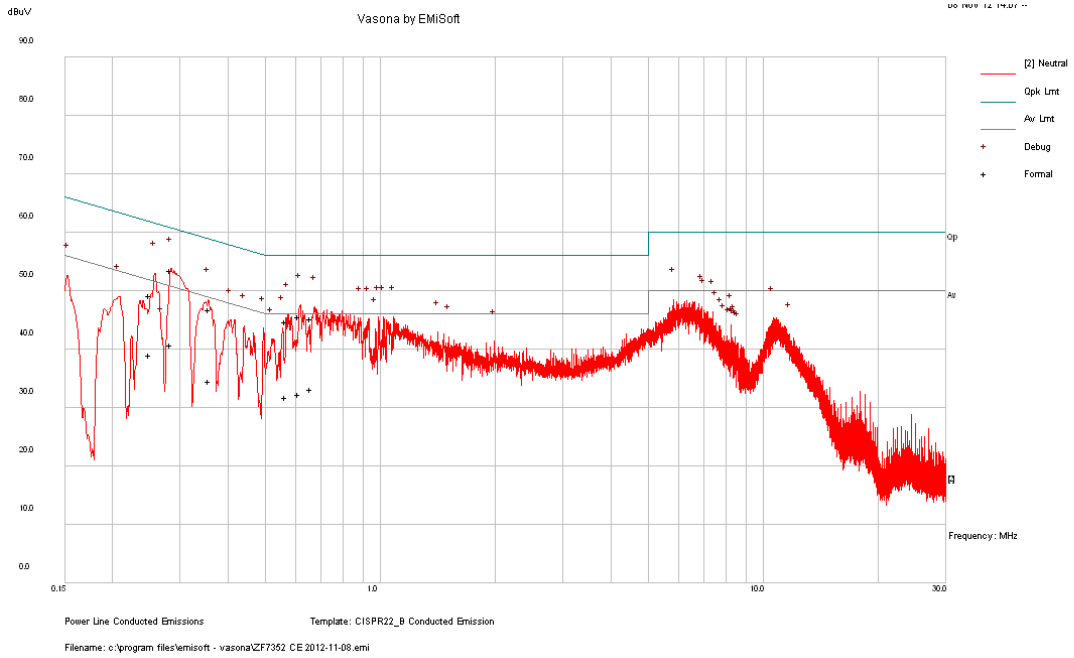
120 V, 60 Hz – Line, POE



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.282429	52.55	Line	60.74	-8.19	QP
0.612198	44.26	Line	56	-11.74	QP
0.361266	46.08	Line	58.7	-12.62	QP
0.75069	42.6	Line	56	-13.4	QP
0.885699	42.5	Line	56	-13.5	QP
6.115556	44.45	Line	60	-15.55	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
6.115556	38.47	Line	50	-11.53	Ave.
0.282429	38.79	Line	50.74	-11.96	Ave.
0.612198	31.02	Line	46	-14.98	Ave.
0.75069	30.74	Line	46	-15.26	Ave.
0.361266	33.01	Line	48.7	-15.69	Ave.
0.885699	29.53	Line	46	-16.47	Ave.

120 V, 60 Hz – Neutral, POE



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.283488	53.54	Neutral	60.71	-7.17	QP
0.613905	45.65	Neutral	56	-10.35	QP
0.660576	45.26	Neutral	56	-10.74	QP
0.56694	44.75	Neutral	56	-11.25	QP
0.356754	46.87	Neutral	58.8	-11.93	QP
0.250758	49.26	Neutral	61.73	-12.47	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.283488	40.83	Neutral	50.71	-9.89	Ave.
0.250758	39.05	Neutral	51.73	-12.68	Ave.
0.660576	33.15	Neutral	46	-12.85	Ave.
0.613905	32.35	Neutral	46	-13.65	Ave.
0.56694	31.89	Neutral	46	-14.11	Ave.
0.356754	34.56	Neutral	48.8	-14.25	Ave.

7 FCC §2.1051, §15.247(d) & IC RSS-210 §A8.5 – Spurious Emissions at Antenna Terminals

7.1 Applicable Standard

For FCC §15.247(d) and IC RSS-210 §A8.5 in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

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	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

7.4 Test Environmental Conditions

Temperature:	22-24 °C
Relative Humidity:	42-45 %
ATM Pressure:	101-102kPa

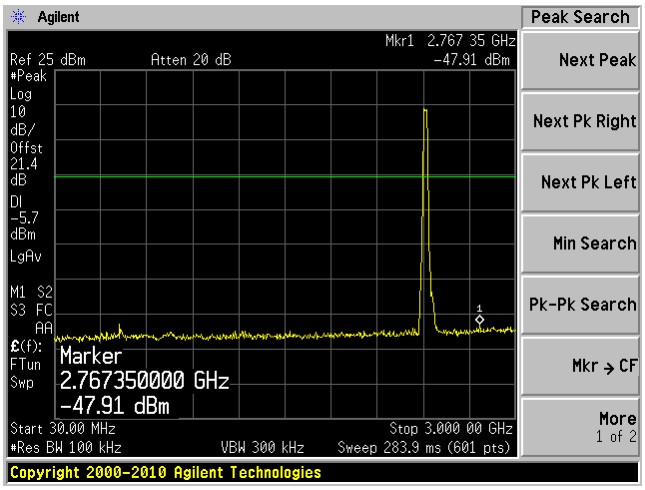
The testing was performed by Jeffrey Wu from 2012-10-1 to 2012-10-15 at RF site.

7.5 Test Results

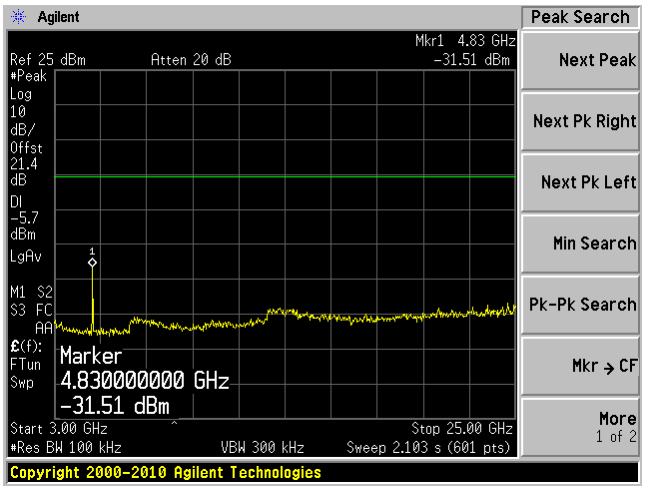
Please refer to following plots of spurious emissions.

802.11b, Low Channel, 2412 MHz

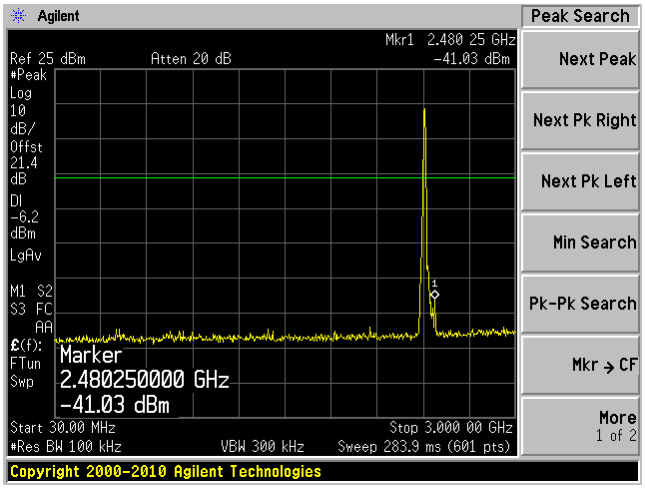
Chain J0, Plot: 30 MHz – 3 GHz



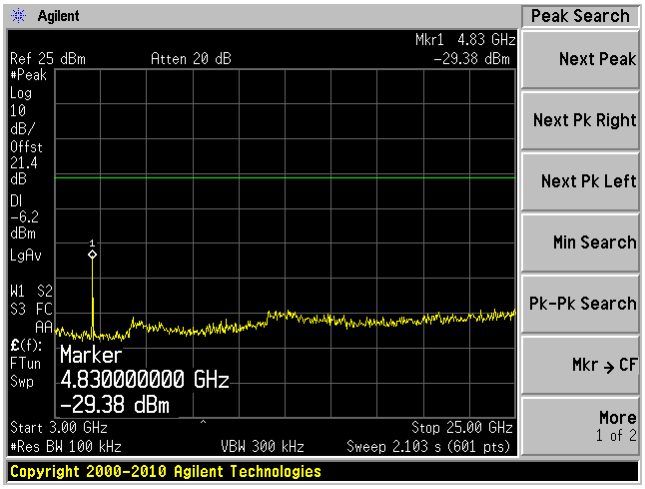
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

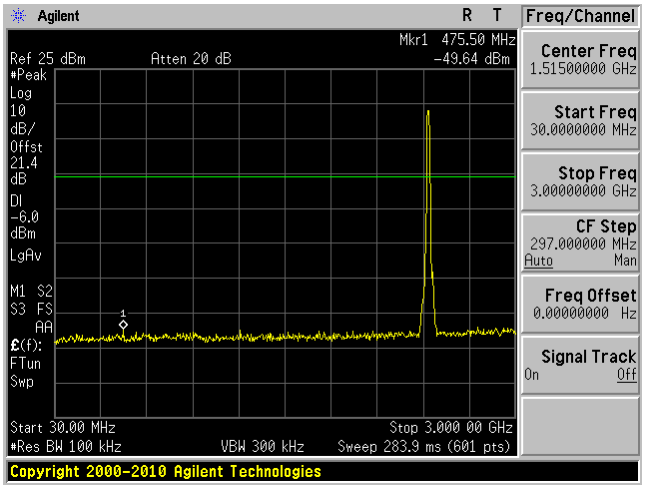


Chain J1, Plot: 3 GHz – 25 GHz

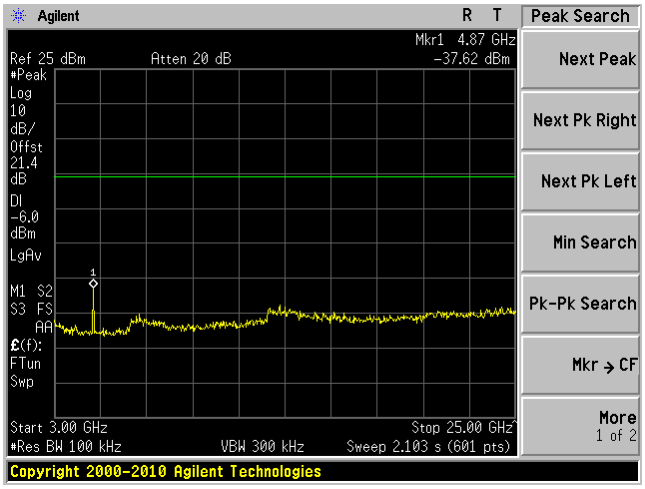


802.11b, Middle Channel, 2437 MHz

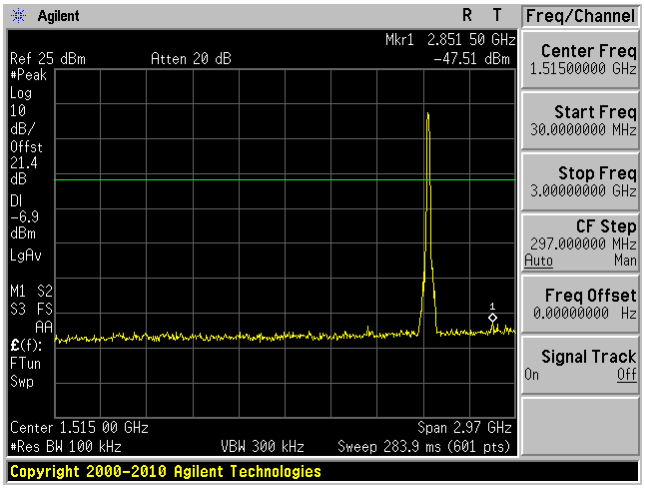
Chain J0, Plot: 30 MHz – 3 GHz



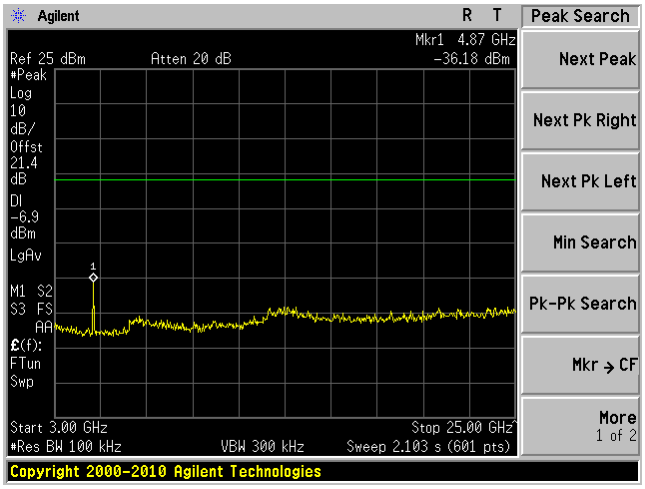
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

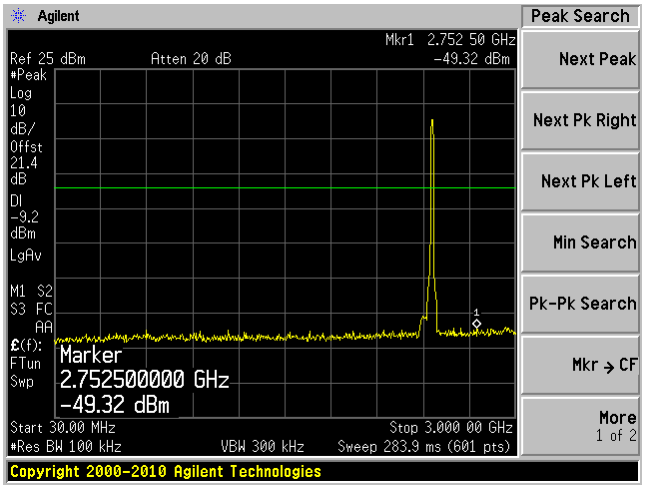


Chain J1, Plot: 3 GHz – 25 GHz

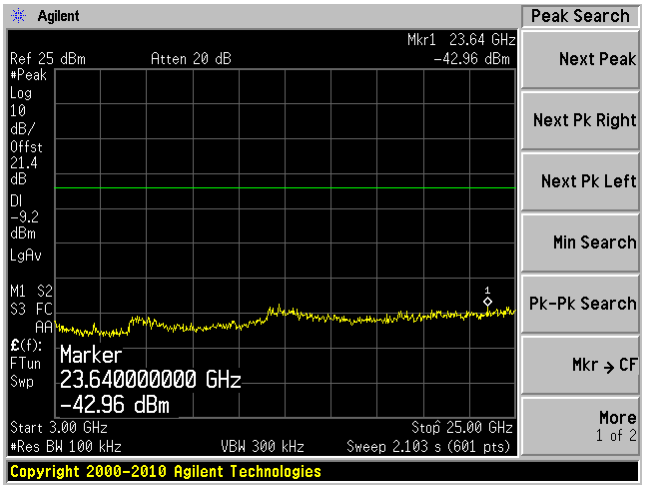


802.11b, High Channel, 2462 MHz

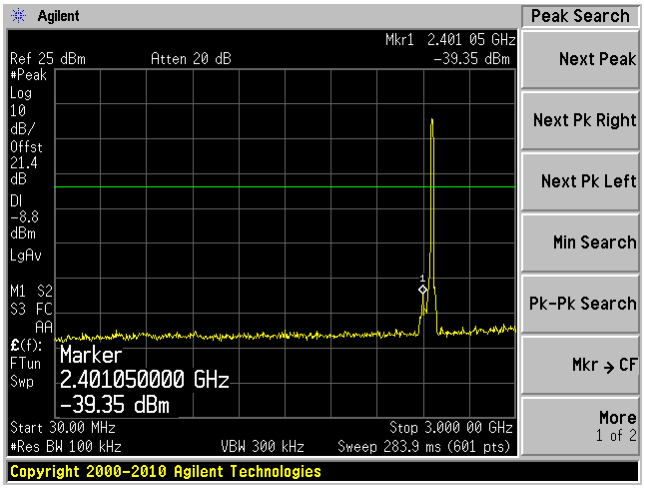
Chain J0, Plot: 30 MHz – 3 GHz



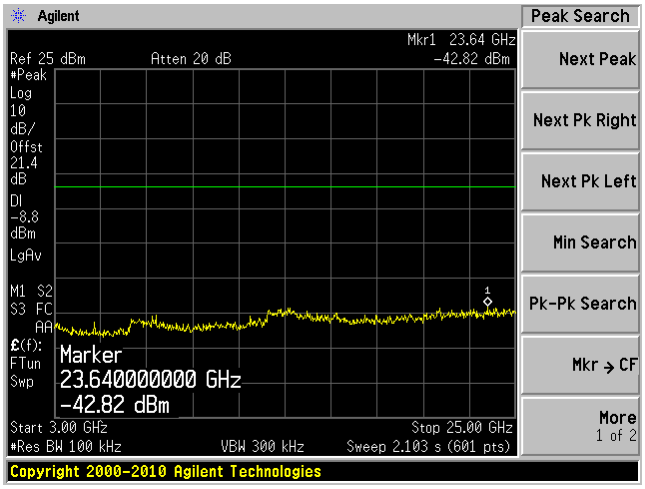
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

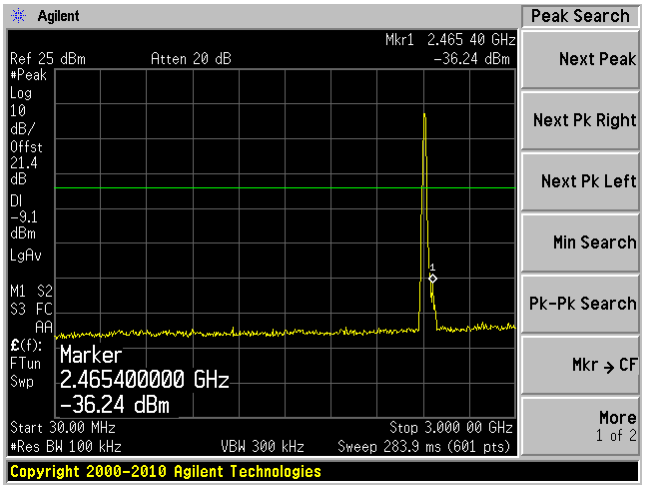


Chain J1, Plot: 3 GHz – 25 GHz

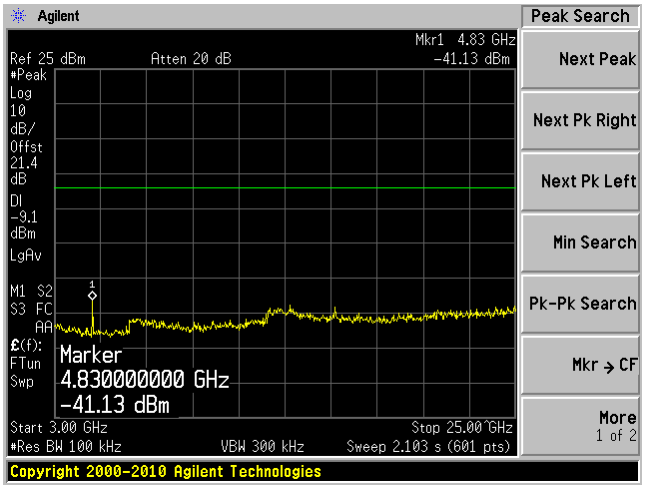


802.11g, Low Channel 2412 MHz

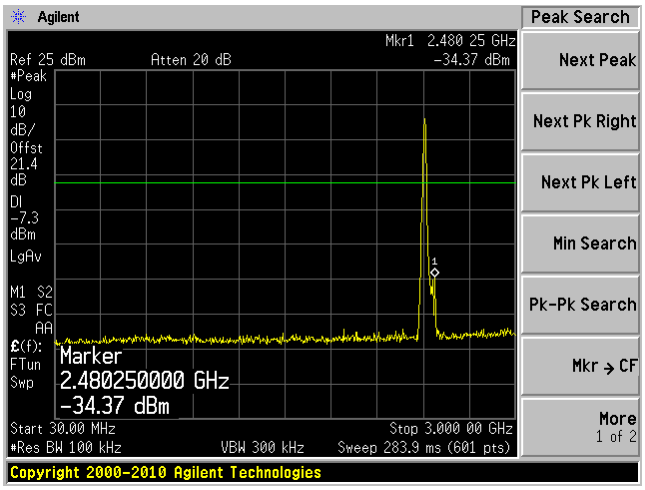
Chain J0, Plot: 30 MHz – 3 GHz



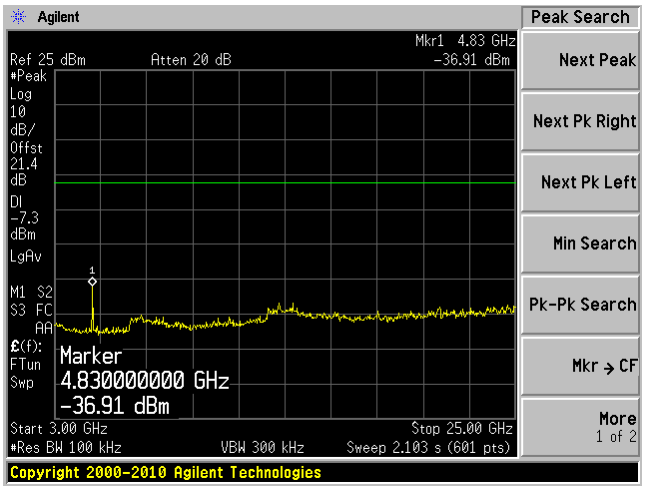
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

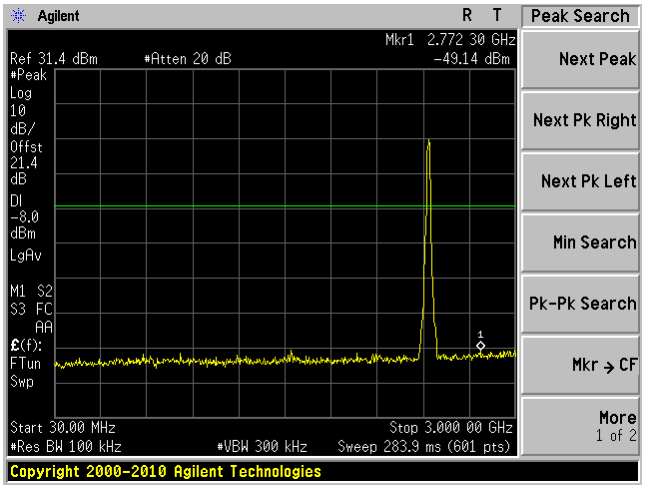


Chain J1, Plot: 3 GHz – 25 GHz

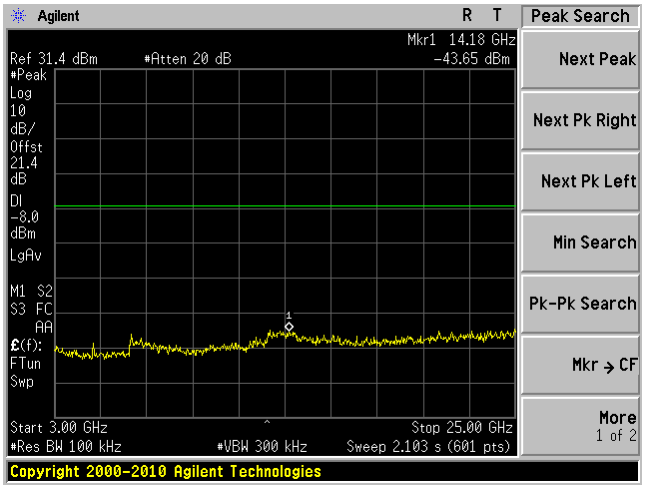


802.11g, Middle Channel 2437 MHz

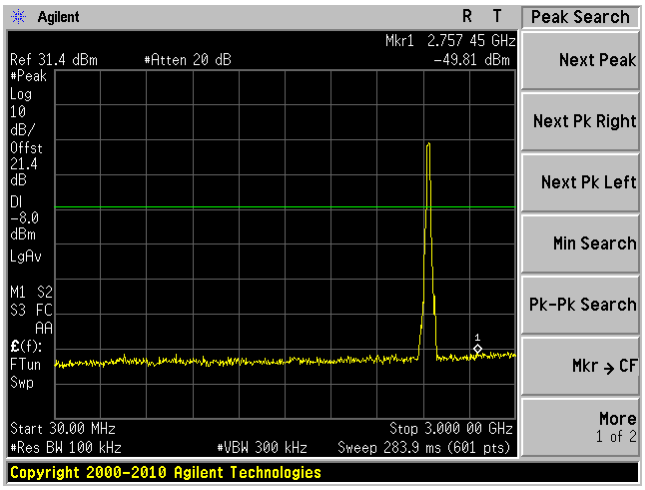
Chain J0, Plot: 30 MHz – 3 GHz



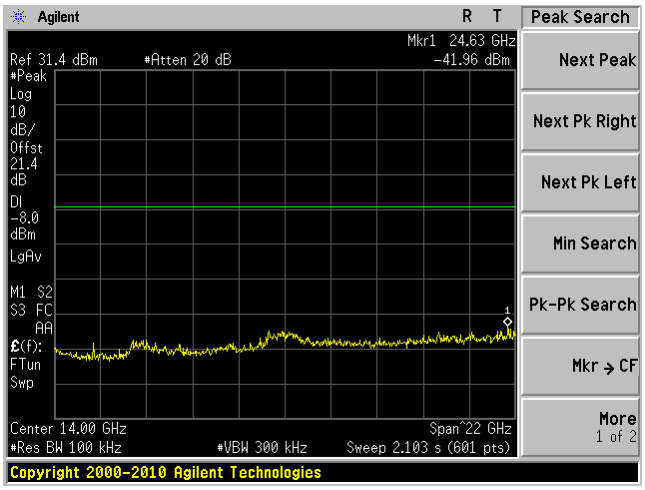
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

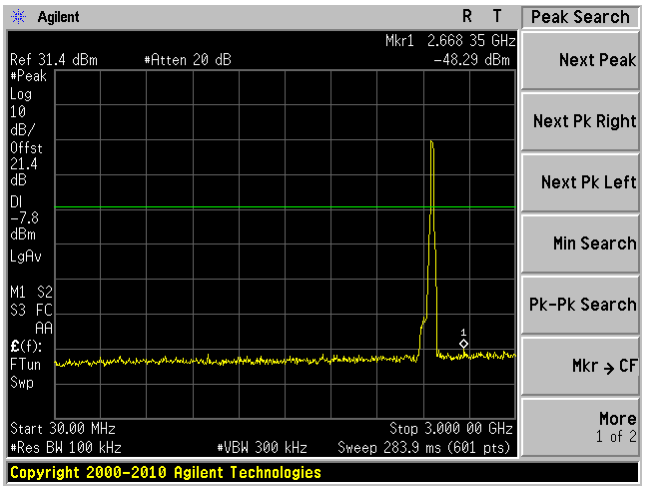


Chain J1, Plot: 3 GHz – 25 GHz

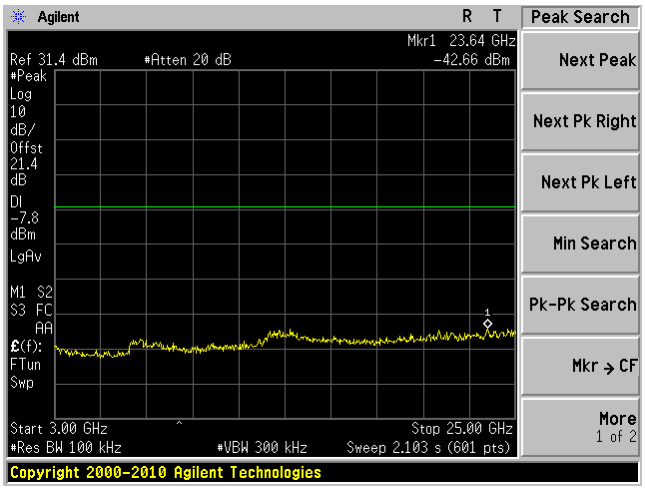


802.11g, High Channel 2462 MHz

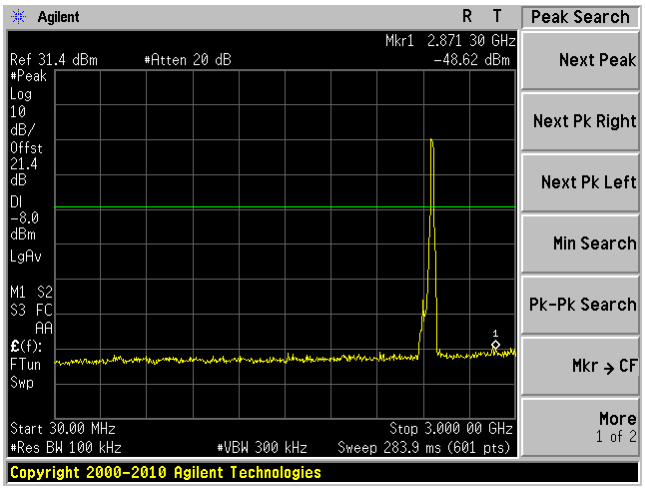
Chain J0, Plot: 30 MHz – 3 GHz



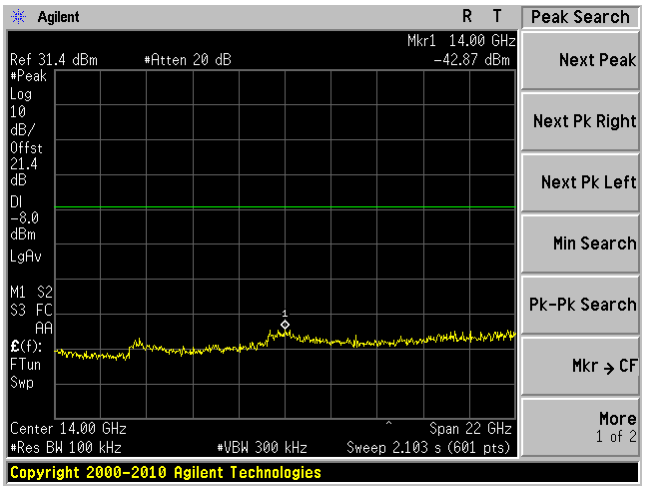
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

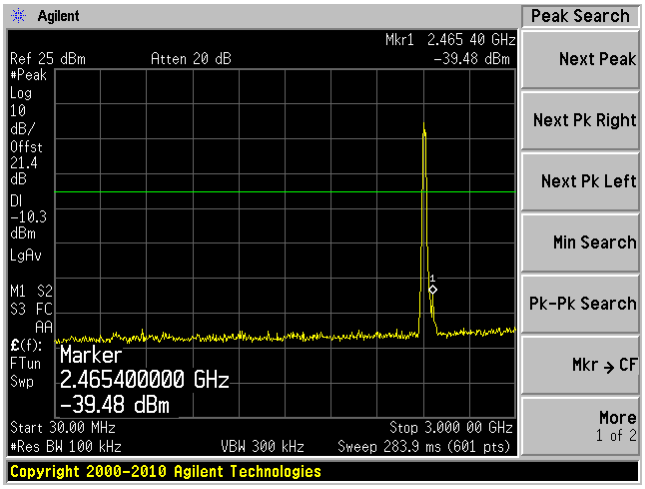


Chain J1, Plot: 3 GHz – 25 GHz

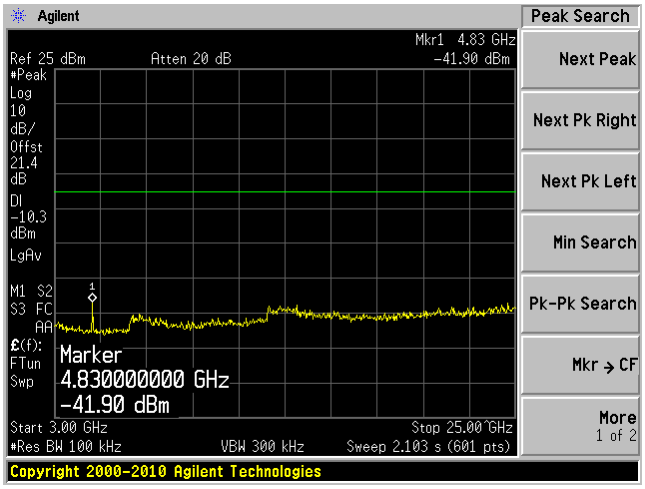


802.11n HT20, Low Channel 2412 MHz

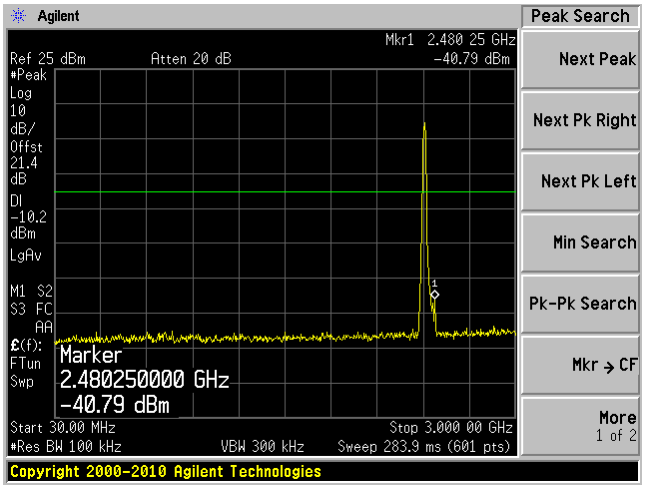
Chain J0, Plot: 30 MHz – 3 GHz



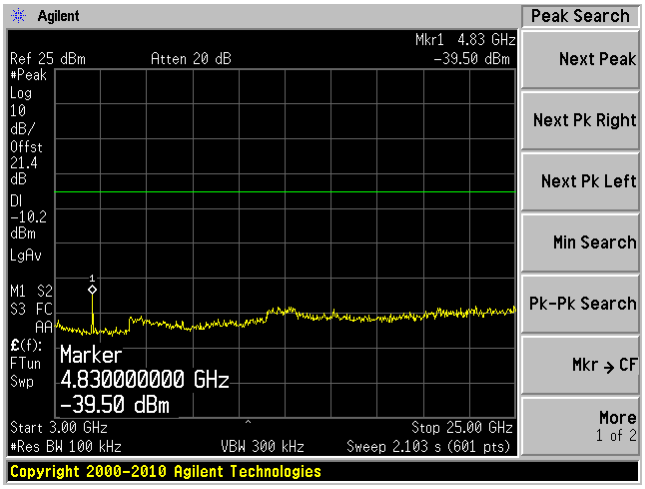
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

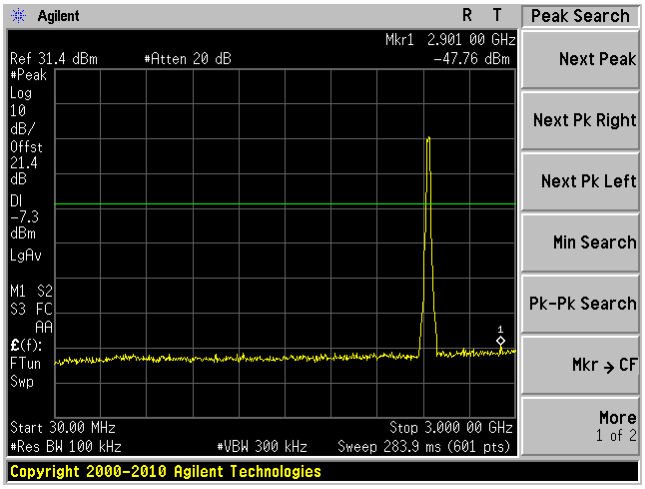


Chain J1, Plot: 3 GHz – 25 GHz

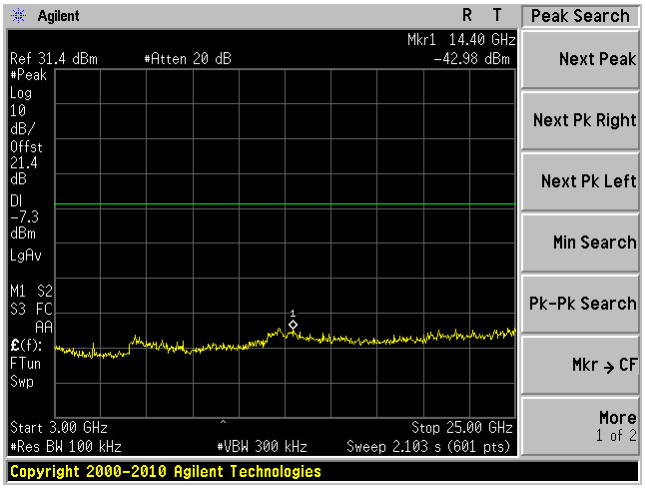


802.11n HT20, Middle Channel 2437 MHz

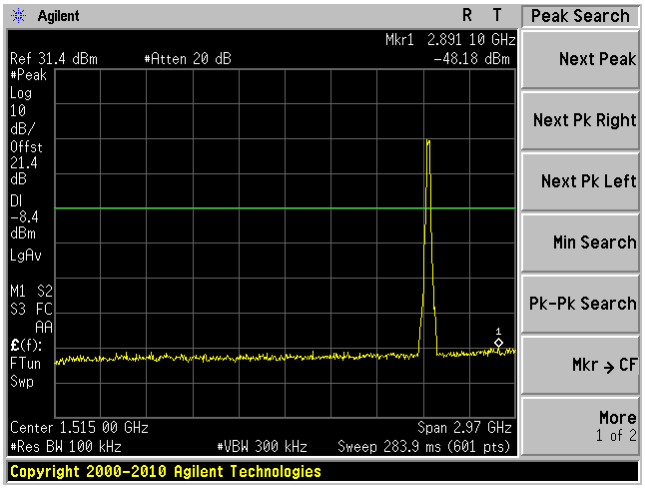
Chain J0, Plot: 30 MHz – 3 GHz



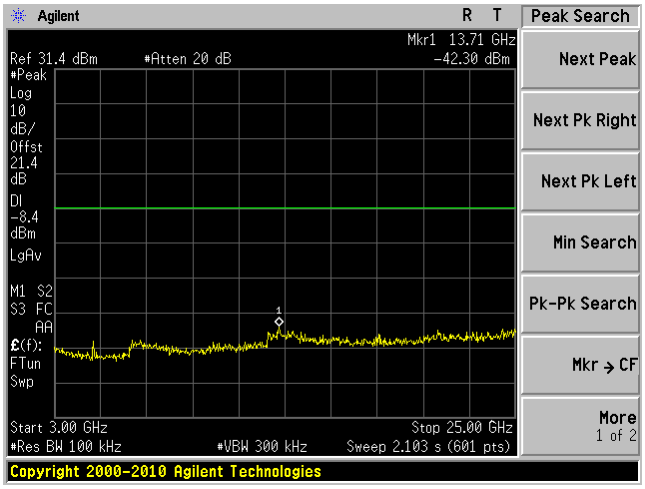
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

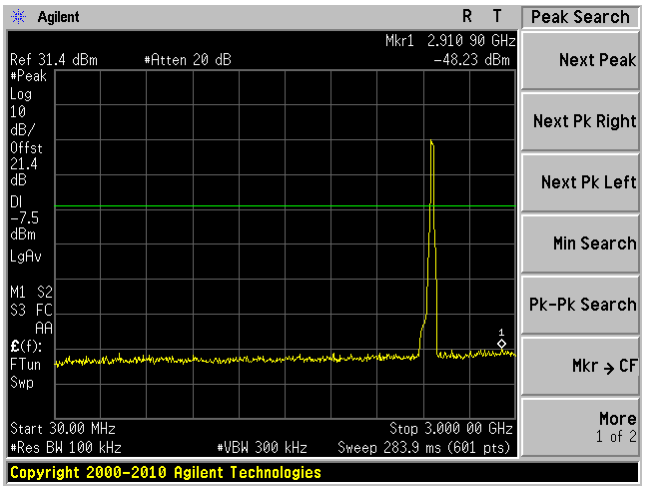


Chain J1, Plot: 3 GHz – 25 GHz

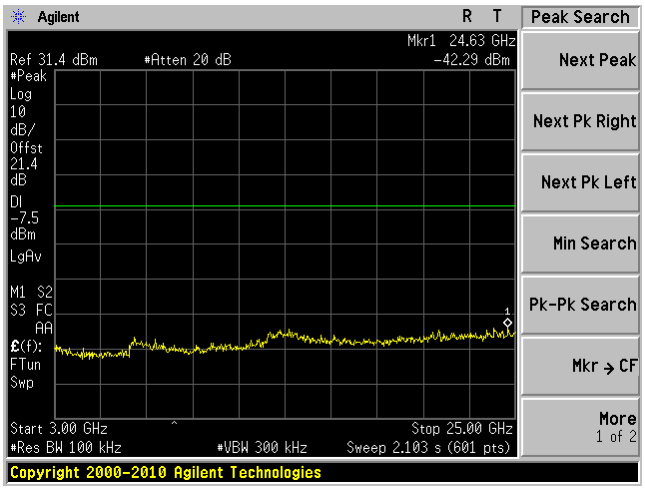


802.11n HT20, High Channel 2462 MHz

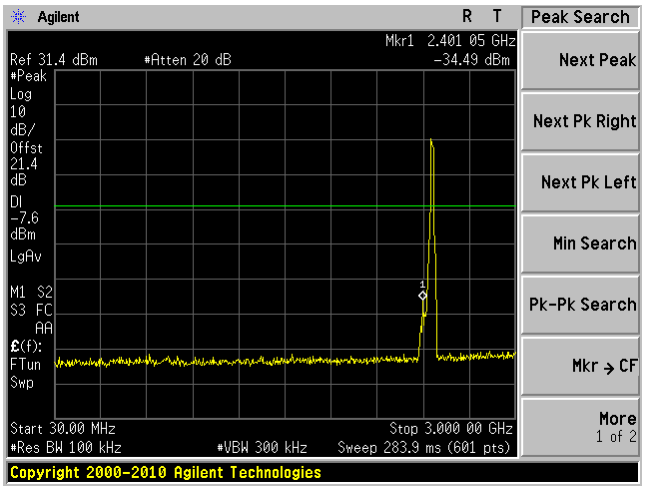
Chain J0, Plot: 30 MHz – 3 GHz



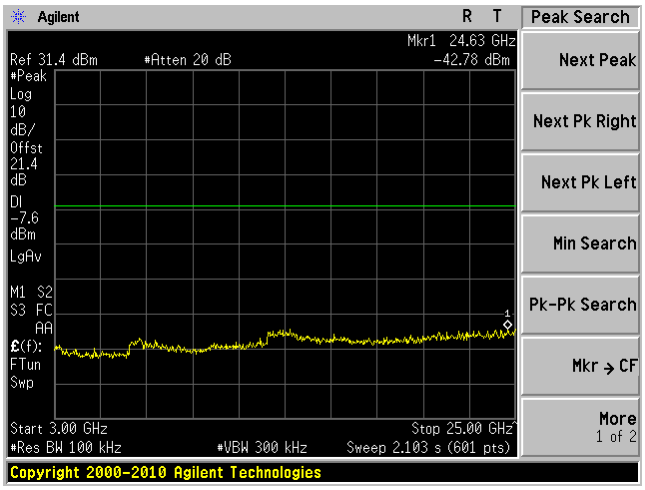
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

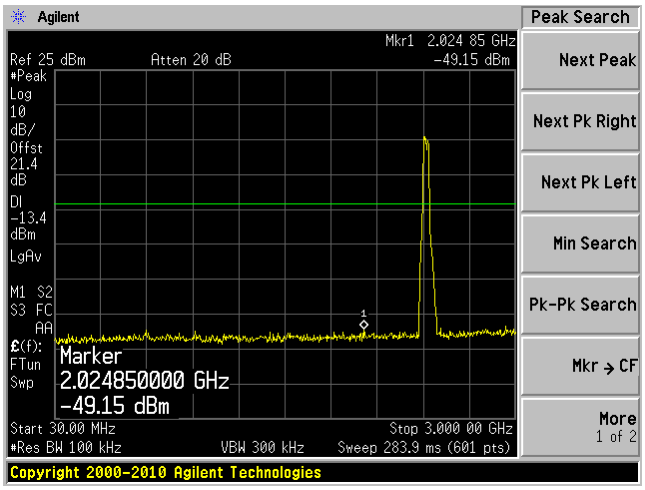


Chain J1, Plot: 3 GHz – 25 GHz

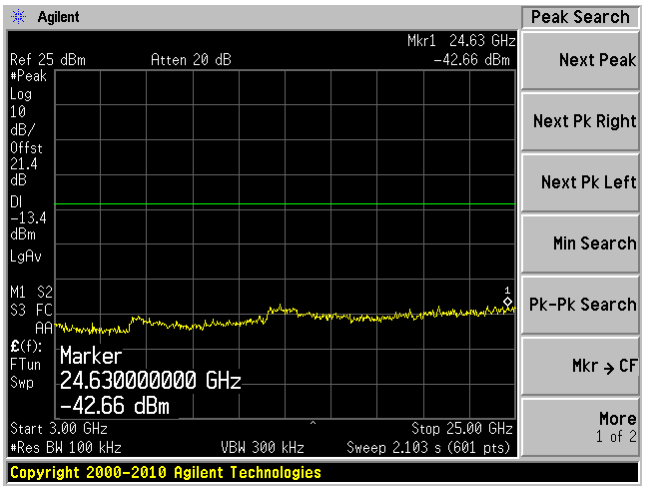


802.11n HT40, Low Channel 2422 MHz

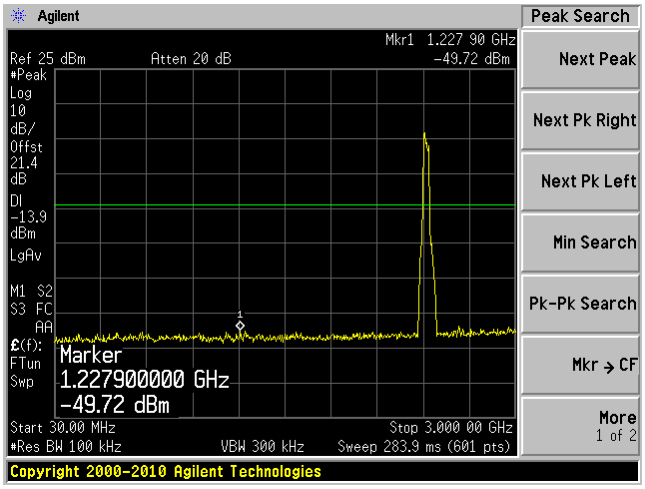
Chain J0, Plot: 30 MHz – 3 GHz



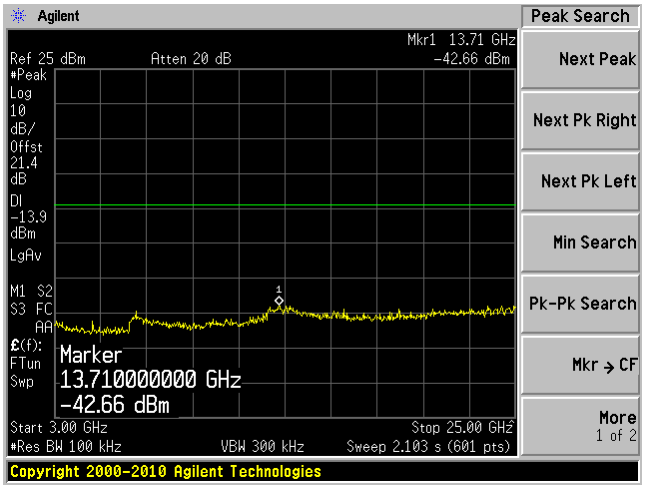
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

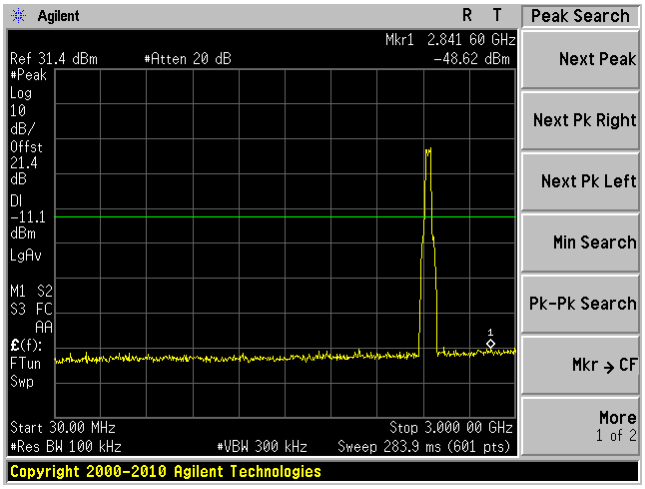


Chain J1, Plot: 3 GHz – 25 GHz

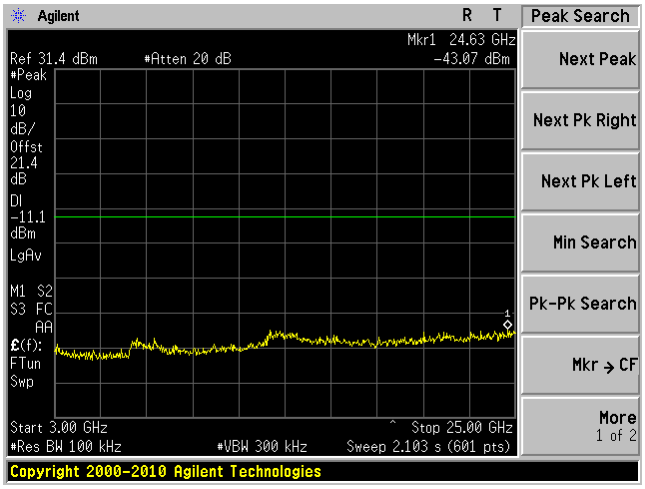


802.11n HT40, Middle Channel 2437 MHz

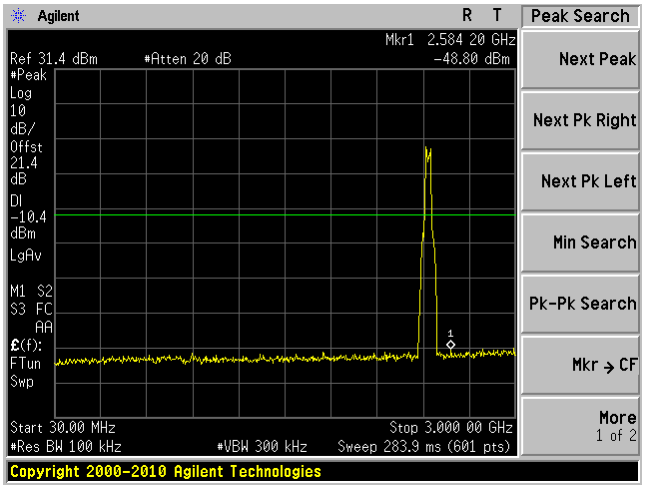
Chain J0, Plot: 30 MHz – 3 GHz



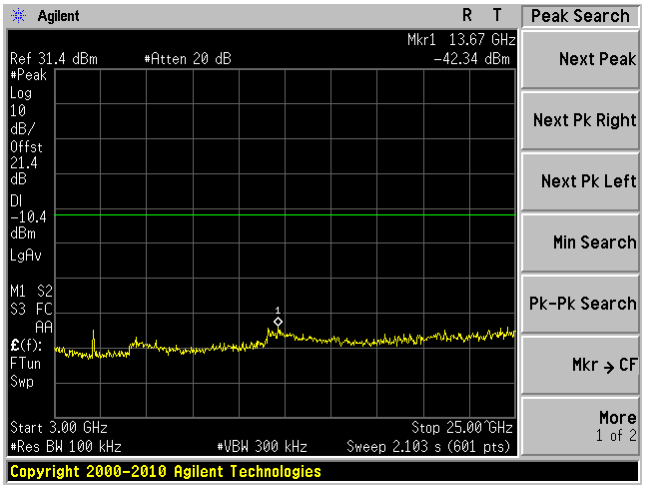
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

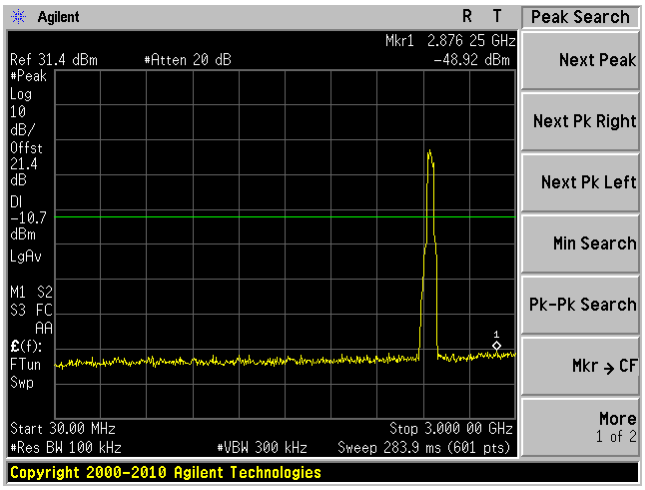


Chain J1, Plot: 3 GHz – 25 GHz

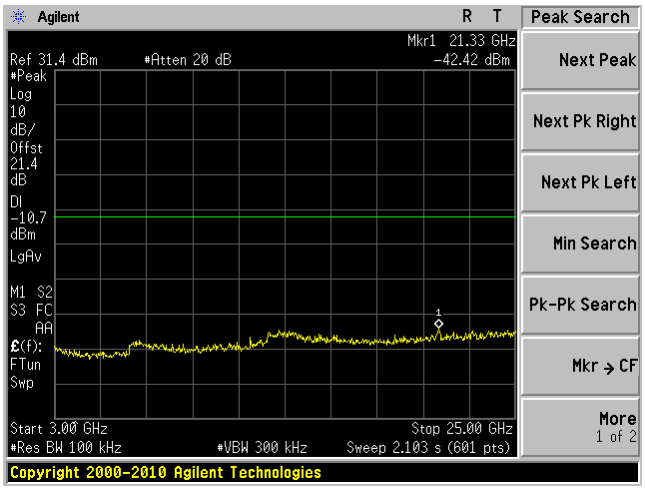


802.11n HT40, High Channel 2452 MHz

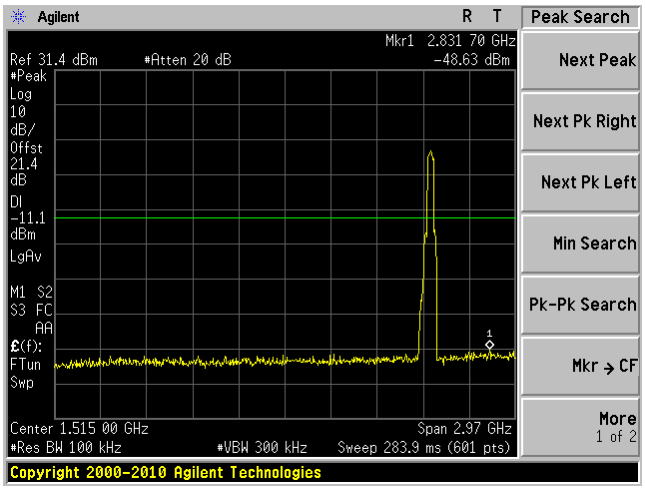
Chain J0, Plot: 30 MHz – 3 GHz



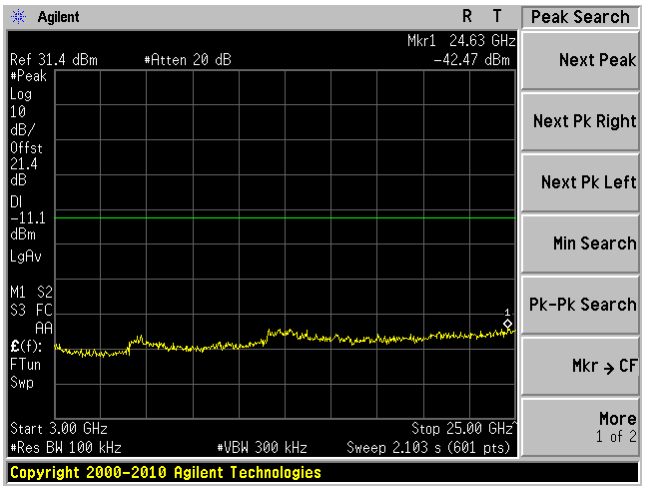
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz



Chain J1, Plot: 3 GHz – 25 GHz



8 FCC §15.205, §15.209 & §15.247(d) & IC RSS-210 §A8.5 – Spurious Radiated Emissions

8.1 Applicable Standard

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

As per FCC §15.209(a) and RSS-210: Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

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

MHz	MHz	MHz	GHz
0.090 – 0.110 0.495 – 0.505 2.1735 – 2.1905 4.125 – 4.128 4.17725 – 4.17775 4.20725 – 4.20775 6.215 – 6.218 6.26775 – 6.26825 6.31175 – 6.31225 8.291 – 8.294 8.362 – 8.366 8.37625 – 8.38675 8.41425 – 8.41475 12.29 – 12.293 12.51975 – 12.52025 12.57675 – 12.57725 13.36 – 13.41	16.42 – 16.423 16.69475 – 16.69525 25.5 – 25.67 37.5 – 38.25 73 – 74.6 74.8 – 75.2 108 – 121.94 123 – 138 149.9 – 150.05 156.52475 – 156.52525 156.7 – 156.9 162.0125 –167.17 167.72 – 173.2 240 – 285 322 – 335.4 399.9 – 410 608 – 614	960 – 1240 1300 – 1427 1435 – 1626.5 1645.5 – 1646.5 1660 – 1710 1718.8 – 1722.2 2200 – 2300 2310 – 2390 2483.5 – 2500 2690 – 2900 3260 – 3267 3.332 – 3.339 3 3458 – 3 358 3.600 – 4.400	4. 5 – 5. 15 5. 35 – 5. 46 7.25 – 7.75 8.025 – 8.5 9.0 – 9.2 9.3 – 9.5 10.6 – 12.7 13.25 – 13.4 14.47 – 14.5 15.35 – 16.2 17.7 – 21.4 22.01 – 23.12 23.6 – 24.0 31.2 – 31.8 36.43 – 36.5 Above 38.6

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

As per IC RSS-210 A8.5 Out-of-band Emissions, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

8.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.4-2009. The specification used was the FCC 15 Subpart C and IC RSS-210 limits.

The spacing between the peripherals was 3 centimeters.

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

8.3 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

8.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

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. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

8.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-2	2012-08-15	1 year
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2012-06-09	1 year
Mini-Circuits	Pre-amplifier	ZVA-183-S	570400946	2012-05-09	1 year
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year
Sunol Science Corp	Horn Antenna	DHR-118	A052704	2012-02-24	1 year
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2012-03-22	1 year

Statement of Traceability: BACL *attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

8.6 Test Environmental Conditions

Temperature:	21-23°C
Relative Humidity:	42-45%
ATM Pressure:	101-102kPa

The testing was performed by Bo Li on 2012-11-14 at 5 meter 3.

8.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15C and IC RSS-210 standard's radiated emissions limits, and had the worst margin of:

30-1000 MHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-6.91	105.748	Vertical	802.11 g mode low Channel

1 – 25 GHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-1.944	2390	Vertical	802.11 N40 mode Low Channel

Please refer to the following table for specific test result details

Note: Radiated emissions were performed on 802.11b/g/n HT20/ n HT40. Between 802.11 b/g/ n HT20/n HT40, worst case was measured.

8.8 Radiated Emissions Test Data and Plots

1) 30 MHz – 1 GHz, Measured at 3 meters

2.4 GHz Band, Quasi-Peak Measurements

802.11b mode, Low Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
42.75325	27.09	122	V	312	40	-12.91
57.8035	26.18	129	V	347	40	-13.82
74.4725	23.8	185	V	340	40	-16.2
87.4415	25.82	138	V	201	40	-14.18
105.6285	35.09	160	V	223	43.5	-8.41
249.92175	10.13	160	V	284	46	-35.87

802.11b mode, Middle Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
43.1185	29.41	104	V	235	40	-10.59
64.935	24.79	113	V	59	40	-15.21
105.69625	36.06	116	V	190	43.5	-7.44
73.8835	23.71	139	V	298	40	-16.29
249.9455	12.76	201	V	168	46	-33.24
374.9885	31.43	138	V	343	46	-14.57

802.11b mode, High Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
42.9395	23.67	161	V	34	40	-16.33
57.50025	24.2	147	V	258	40	-15.8
73.8455	17.32	109	V	245	40	-22.68
105.734	25.86	147	V	184	43.5	-17.64
87.98925	23.37	119	V	208	40	-16.63
249.955	20.85	132	V	13	46	-25.15

802.11g mode, Low Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
43.756	28.31	112	V	240	40	-11.69
57.7496	28.54	175	V	312	40	-11.46
73.8784	25.03	213	V	186	40	-14.97
85.4732	27.52	112	V	208	40	-12.48
105.748	36.59	109	V	323	43.5	-6.91
249.9455	12.35	176	V	86	46	-33.65

802.11g mode, Middle Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
43.16625	28.25	86	V	145	40	-11.75
56.8465	27.07	247	V	220	40	-12.93
72.17325	22.96	174	V	112	40	-17.04
87.98925	28.57	100	V	324	40	-11.43
249.955	15.27	216	V	310	46	-30.73
374.9885	32.7	151	V	92	46	-13.3

802.11g mode, High Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
42.9395	28.57	173	V	54	40	-11.43
51.452	27.12	264	V	330	40	-12.88
72.967	28.16	103	V	100	40	-11.84
98.104	31.96	160	V	245	43.5	-11.54
105.701	33.87	135	V	100	43.5	-9.63
499.975	35.74	53	V	162	46	-10.26

802.11n HT40 mode, Low Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
105.678	31.05	100	V	179	43.5	-12.45
249.9523	21.09	121	V	367	46	-24.91
499.968	35.02	110	**V**	76	46	-10.98

802.11n HT40 mode, Middle Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
105.678	31.53	105	V	185	43.5	-11.97
249.9523	20.29	114	V	358	46	-25.71
499.968	33.57	108	**V**	69	46	-11.33

802.11n HT40 mode, High Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
105.678	31.46	106	V	182	43.5	-12.04
249.9523	20.86	264	V	313	46	-25.14
499.968	34.63	103	V	63	46	-11.37

2) 1–25 GHz, Measured at 3 meters

802.11b mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz, measured at 3 meters											
2412	73.38	64	100	V	28.838	3.12	-	105.338	-	-	Peak
2412	72.32	312	204	H	28.838	3.12	-	104.278	-	-	Peak
2412	69.23	64	100	V	28.838	3.12	-	101.188	-	-	Ave
2412	68.75	312	204	H	28.838	3.12	-	100.708	-	-	Ave
2390	27.3	0	100	V	28.838	3.12	-	59.258	74	-14.742	Peak
2390	27.1	0	100	H	28.838	3.12	-	59.058	74	-14.942	Peak
2390	12.52	0	100	V	28.838	3.12	-	44.478	54	-9.522	Ave
2390	12.49	0	100	H	28.838	3.12	-	44.448	54	-9.552	Ave
4824	33.42	70	100	V	33.097	4.56	27.7	43.377	74	-30.623	Peak
4824	34.65	78	118	H	33.097	4.56	27.7	44.607	74	-29.393	Peak
4824	22.1	70	100	V	33.097	4.56	27.7	32.057	54	-21.943	Ave
4824	27.83	78	118	H	33.097	4.56	27.7	37.787	54	-16.213	Ave
7236	33.6	0	100	V	35.928	5.49	27.58	47.438	81.338	-33.9	Peak
7236	34.92	0	100	H	35.928	5.49	27.58	48.758	82.278	-33.52	Peak
7236	18.97	0	100	V	35.928	5.49	27.58	32.808	77.188	-44.38	Ave
7236	20.08	0	100	H	35.928	5.49	27.58	33.918	78.708	-44.79	Ave
9648	32.25	0	100	V	37.954	6.54	27.06	49.684	81.338	-31.654	Peak
9648	32.97	0	100	H	37.954	6.54	27.06	50.404	82.278	-31.874	Peak
9648	17.26	0	100	V	37.954	6.54	27.06	34.694	77.188	-42.494	Ave
9648	18.47	0	100	H	37.954	6.54	27.06	35.904	78.708	-42.804	Ave
Middle Channel 2437 MHz, measured at 3 meters											
2437	74.3	124	100	V	28.965	3.12	-	106.385	-	-	Peak
2437	73.8	38	100	H	28.965	3.12	-	105.885	-	-	Peak
2437	69.62	124	100	V	28.965	3.12	-	101.705	-	-	Ave
2437	68.96	38	100	H	28.965	3.12	-	101.045	-	-	Ave
4874	41.99	45	143	V	33.327	4.54	27.76	52.097	74	-21.903	Peak
4874	41.08	78	100	H	33.327	4.54	27.76	51.187	74	-22.813	Peak
4874	38.8	45	143	V	33.327	4.54	27.76	48.907	54	-5.093	Ave
4874	37.27	78	100	H	33.327	4.54	27.76	47.377	54	-6.623	Ave
7311	36.58	226	124	V	36.369	5.57	27.51	51.009	74	-22.991	Peak
7311	35.03	0	100	H	36.369	5.57	27.51	49.459	74	-24.541	Peak
7311	27.45	226	124	V	36.369	5.57	27.51	41.879	54	-12.121	Ave
7311	20.65	0	100	H	36.369	5.57	27.51	35.079	54	-18.921	Ave
9748	35.04	119	140	V	38.087	6.62	26.98	52.767	86.385	-33.618	Peak
9748	34.62	233	100	H	38.087	6.62	26.98	52.347	85.885	-33.538	Peak
9748	19.05	119	140	V	38.087	6.62	26.98	36.777	81.705	-44.928	Ave
9748	18.78	233	100	H	38.087	6.62	26.98	36.507	81.045	-44.538	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz, measured at 3 meters											
2462	73.82	150	100	V	29.155	3.25	-	106.225	-	-	Peak
2462	73.2	316	125	H	29.155	3.25	-	105.605	-	-	Peak
2462	69.83	150	100	V	29.155	3.25	-	102.235	-	-	Ave
2462	69.5	316	125	H	29.155	3.25	-	101.905	-	-	Ave
2483.5	28.36	0	100	V	29.391	3.25	-	61.001	74	-12.999	Peak
2483.5	28.13	0	100	H	29.391	3.25	-	60.771	74	-13.229	Peak
2483.5	13.48	0	100	V	29.391	3.25	-	46.121	54	-7.879	Ave
2483.5	13.16	0	100	H	29.391	3.25	-	45.801	54	-8.199	Ave
4924	38.61	48	120	V	33.327	4.52	27.75	48.705	74	-25.295	Peak
4924	40.38	307	128	H	33.327	4.52	27.75	50.475	74	-23.525	Peak
4924	33.89	48	120	V	33.327	4.52	27.75	43.985	54	-10.015	Ave
4924	37.13	307	128	H	33.327	4.52	27.75	47.225	54	-6.775	Ave
7386	34.29	0	100	V	36.565	5.62	27.51	48.9697	74	-25.0303	Peak
7386	34.3	0	100	H	36.565	5.62	27.51	48.9797	74	-25.0203	Peak
7386	19.41	0	100	V	36.565	5.62	27.51	34.0897	54	-19.9103	Ave
7386	20.59	0	100	H	36.565	5.62	27.51	35.2697	54	-18.7303	Ave
9848	32.23	0	100	V	38.287	6.55	26.98	50.0862	88.225	-38.1388	Peak
9848	31.97	0	100	H	38.287	6.55	26.98	49.8262	90.605	-40.7788	Peak
9848	17.39	0	100	V	38.287	6.55	26.98	35.2462	85.235	-49.9888	Ave
9848	17.24	0	100	H	38.287	6.55	26.98	35.0962	87.905	-52.8088	Ave

802.11g mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz, measured at 3 meters											
2412	78.17	38	139	V	28.838	3.12	-	110.128	-	-	Peak
2412	77.28	312	119	H	28.838	3.12	-	109.238	-	-	Peak
2412	66.28	38	139	V	28.838	3.12	-	98.238	-	-	Ave
2412	65.85	312	119	H	28.838	3.12	-	97.808	-	-	Ave
2390	26.19	0	100	V	28.838	3.12	-	58.148	74	-15.852	Peak
2390	26.65	0	100	H	28.838	3.12	-	58.608	74	-15.392	Peak
2390	12.53	0	100	V	28.838	3.12	-	44.488	54	-9.512	Ave
2390	12.52	0	100	H	28.838	3.12	-	44.478	54	-9.522	Ave
4824	35.1	313	100	V	33.097	4.19	27.7	44.687	74	-29.313	Peak
4824	39.31	78	117	H	33.097	4.19	27.7	48.897	74	-25.103	Peak
4824	18.81	313	100	V	33.097	4.19	27.7	28.397	54	-25.603	Ave
4824	20.12	78	117	H	33.097	4.19	27.7	29.707	54	-24.293	Ave
7236	36.42	256	164	V	35.928	5.49	27.58	50.258	86.128	-35.87	Peak
7236	35.23	0	100	H	35.928	5.49	27.58	49.068	86.238	-37.17	Peak
7236	19.98	256	164	V	35.928	5.49	27.58	33.818	73.238	-39.42	Ave
7236	18.57	0	100	H	35.928	5.49	27.58	32.408	74.808	-42.4	Ave
9648	33.3	0	100	V	37.954	6.62	27.02	50.854	86.128	-35.274	Peak
9648	38.12	75	118	H	37.954	6.62	27.02	55.674	86.238	-30.564	Peak
9648	17.08	0	100	V	37.954	6.62	27.02	34.634	73.238	-38.604	Ave
9648	19.96	75	118	H	37.954	6.62	27.02	37.514	74.808	-37.294	Ave
Middle Channel 2437 MHz, measured at 3 meters											
2437	78.77	150	108	V	28.965	3.12	-	110.855	-	-	Peak
2437	79.36	316	128	H	28.965	3.12	-	111.445	-	-	Peak
2437	67.49	150	108	V	28.965	3.12	-	99.575	-	-	Ave
2437	67.17	316	128	H	28.965	3.12	-	99.255	-	-	Ave
4874	43.05	162	100	V	33.327	4.54	27.76	53.157	74	-20.843	Peak
4874	44.24	235	100	H	33.327	4.54	27.76	54.347	74	-19.653	Peak
4874	26.69	162	100	V	33.327	4.54	27.76	36.797	54	-17.203	Ave
4874	27.72	235	100	H	33.327	4.54	27.76	37.827	54	-16.173	Ave
7311	40.02	227	120	V	36.369	5.57	27.51	54.449	74	-19.551	Peak
7311	41.73	331	155	H	36.369	5.57	27.51	56.159	74	-17.841	Peak
7311	23.82	227	120	V	36.369	5.57	27.51	38.249	54	-15.751	Ave
7311	23.89	331	155	H	36.369	5.57	27.51	38.319	54	-15.681	Ave
9748	34.77	117	100	V	38.087	6.62	26.98	52.497	94.855	-42.358	Peak
9748	35.99	278	134	H	38.087	6.62	26.98	53.717	95.445	-41.728	Peak
9748	18.71	117	100	V	38.087	6.62	26.98	36.437	82.575	-46.138	Ave
9748	19.44	278	134	H	38.087	6.62	26.98	37.167	84.255	-47.088	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz, measured at 3 meters											
2462	77.35	150	100	V	29.155	3.25	-	115.755	-	-	Peak
2462	78.33	316	100	H	29.155	3.25	-	115.735	-	-	Peak
2462	65.33	150	100	V	29.155	3.25	-	103.735	-	-	Ave
2462	66.51	316	100	H	29.155	3.25	-	104.915	-	-	Ave
2483.5	32.58	88	100	V	29.391	3.25	-	65.221	74	-8.779	Peak
2483.5	33.16	340	100	H	29.391	3.25	-	65.801	74	-8.199	Peak
2483.5	17.6	0	100	V	29.391	3.25	-	50.241	54	-3.759	Ave
2483.5	17.32	340	100	H	29.391	3.25	-	49.961	54	-4.039	Ave
4924	41.05	156	100	V	33.327	4.52	27.75	51.147	74	-22.853	Peak
4924	45.74	308	133	H	33.327	4.52	27.75	55.837	74	-18.163	Peak
4924	23.5	156	100	V	33.327	4.52	27.75	33.597	54	-20.403	Ave
4924	28.92	308	133	H	33.327	4.52	27.75	39.017	54	-14.983	Ave
7386	41.4	227	132	V	36.565	5.62	27.51	56.075	74	-17.925	Peak
7386	45.68	333	156	H	36.565	5.62	27.51	60.355	74	-13.645	Peak
7386	24.73	227	132	V	36.565	5.62	27.51	39.405	54	-14.595	Ave
7386	26.99	333	156	H	36.565	5.62	27.51	41.665	54	-12.335	Ave
9848	34.21	0	100	V	38.287	6.55	26.98	52.067	95.755	-43.688	Peak
9848	34.07	0	100	H	38.287	6.55	26.98	51.927	95.735	-43.808	Peak
9848	17.53	0	100	V	38.287	6.55	26.98	35.387	83.735	-48.348	Ave
9848	17.4	0	100	H	38.287	6.55	26.98	35.257	84.915	-49.658	Ave

802.11n HT40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2422 MHz, measured at 3 meters											
2422	77.22	242	100	V	28.956	3.12	-	109.296	-	-	Peak
2422	78.33	321	128	H	28.956	3.12	-	110.406	-	-	Peak
2422	65.55	242	100	V	28.956	3.12	-	97.626	-	-	Ave
2422	67.33	321	128	H	28.956	3.12	-	99.406	-	-	Ave
2390	39.98	153	100	V	28.956	3.12	-	72.056	74	-1.944	Peak
2390	38.59	36	100	H	28.956	3.12	-	70.666	74	-3.334	Peak
2390	18.6	153	100	V	28.956	3.12	-	50.676	54	-3.324	Ave
2390	17.52	36	100	H	28.956	3.12	-	49.596	54	-4.404	Ave
4844	40.85	66	100	V	33.327	4.56	27.7	51.037	74	-22.963	Peak
4844	41.72	335	100	H	33.327	4.56	27.7	51.907	74	-22.093	Peak
4844	21.88	66	100	V	33.327	4.56	27.7	32.067	54	-21.933	Ave
4844	25.06	335	100	H	33.327	4.56	27.7	35.247	54	-18.753	Ave
7266	33.91	0	100	V	36.369	5.49	27.56	48.209	74	-25.791	Peak
7266	32.82	0	100	H	36.369	5.49	27.56	47.119	74	-26.881	Peak
7266	18.3	0	100	V	36.369	5.49	27.56	32.599	54	-21.401	Ave
7266	18.38	0	100	H	36.369	5.49	27.56	32.679	54	-21.321	Ave
9688	31.32	0	100	V	38.087	6.56	26.98	48.987	89.296	-40.309	Peak
9688	31.43	0	100	H	38.087	6.56	26.98	49.097	90.406	-41.309	Peak
9688	16.26	0	100	V	38.087	6.56	26.98	33.927	77.626	-43.699	Ave
9688	16.21	0	100	H	38.087	6.56	26.98	33.877	79.406	-45.529	Ave
Middle Channel 2437 MHz, measured at 3 meters											
2437	79.24	154	100	V	28.965	3.12	-	111.325	-	-	Peak
2437	78.23	321	100	H	28.965	3.12	-	110.315	-	-	Peak
2437	67.41	154	100	V	28.965	3.12	-	99.495	-	-	Ave
2437	67.11	321	100	H	28.965	3.12	-	99.195	-	-	Ave
4874	37.43	320	100	V	33.327	4.54	27.76	47.537	74	-26.463	Peak
4874	39.82	333	123	H	33.327	4.54	27.76	49.927	74	-24.073	Peak
4874	22.33	320	100	V	33.327	4.54	27.76	32.437	54	-21.563	Ave
4874	23.42	333	123	H	33.327	4.54	27.76	33.527	54	-20.473	Ave
7311	36.75	230	119	V	36.369	5.57	27.51	51.179	74	-22.821	Peak
7311	32.9	0	100	H	36.369	5.57	27.51	47.329	74	-26.671	Peak
7311	21.68	230	119	V	36.369	5.57	27.51	36.109	54	-17.891	Ave
7311	17.81	0	100	H	36.369	5.57	27.51	32.239	54	-21.761	Ave
9748	31.63	0	100	V	38.087	6.62	26.98	49.357	91.325	-41.968	Peak
9748	31.31	0	100	H	38.087	6.62	26.98	49.037	90.315	-41.278	Peak
9748	16.53	0	100	V	38.087	6.62	26.98	34.257	79.495	-45.238	Ave
9748	16.23	0	100	H	38.087	6.62	26.98	33.957	79.195	-45.238	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2452 MHz, measured at 3 meters											
2452	68.83	41	100	V	29.155	3.25	-	101.235	-	-	Peak
2452	70.82	312	119	H	29.155	3.25	-	103.225	-	-	Peak
2452	55.24	41	100	V	29.155	3.25	-	87.645	-	-	Ave
2452	56.52	312	119	H	29.155	3.25	-	88.925	-	-	Ave
2483.5	27.27	0	100	V	29.391	3.25	-	59.911	74	-14.089	Peak
2483.5	27.53	0	100	H	29.391	3.25	-	60.171	74	-13.829	Peak
2483.5	12.89	0	100	V	29.391	3.25	-	45.531	54	-8.469	Ave
2483.5	12.86	0	100	H	29.391	3.25	-	45.501	54	-8.499	Ave
4904	32.47	0	100	V	32.9	4.1	27.8	41.67	74	-32.33	Peak
4904	31.91	0	100	H	32.9	4.1	27.8	41.11	74	-32.89	Peak
4904	17.83	0	100	V	32.9	4.1	27.8	27.03	54	-26.97	Ave
4904	17.26	0	100	H	32.9	4.1	27.8	26.46	54	-27.54	Ave
7356	34.09	0	100	V	36.5	4.89	27.6	47.88	74	-26.12	Peak
7356	32.73	0	100	H	36.5	4.89	27.6	46.52	74	-27.48	Peak
7356	19.17	0	100	V	36.5	4.89	27.6	32.96	54	-21.04	Ave
7356	18.39	0	100	H	36.5	4.89	27.6	32.18	54	-21.82	Ave
9808	31.54	0	100	V	37.4	5.77	27	47.71	81.235	-33.525	Peak
9808	31.07	0	100	H	37.4	5.77	27	47.24	83.225	-35.985	Peak
9808	16.64	0	100	V	37.4	5.77	27	32.81	67.645	-34.835	Ave
9808	16.58	0	100	H	37.4	5.77	27	32.75	68.925	-36.175	Ave

9 FCC§15.247(a)(2) & IC RSS-210 §A8.2 – 6 dB & 99% Emission Bandwidth

9.1 Applicable Standard

According to FCC §15.247(a)(2) and IC RSS-210 A8.2 (a), 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	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

9.4 Test Environmental Conditions

Temperature:	22-24 °C
Relative Humidity:	42-45 %
ATM Pressure:	101-102kPa

The testing was performed by Jeffrey Wu from 2012-10-1 to 2012-10-15 at RF site.

9.5 Test Results

802.11 b mode:

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz) J0	6 dB Emission Bandwidth (MHz) J1	99% Emission Bandwidth (MHz) J0	99% Emission Bandwidth (MHz) J1	Limit (MHz)	Results
Low	2412	10.270	10.234	14.1541	13.9893	> 0.5	Compliant
Middle	2437	10.270	10.294	14.2316	14.3068	> 0.5	Compliant
High	2462	10.276	9.789	14.0865	13.6506	> 0.5	Compliant

802.11 g mode:

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz) J0	6 dB Emission Bandwidth (MHz) J1	99% Emission Bandwidth (MHz) J0	99% Emission Bandwidth (MHz) J1	Limit (MHz)	Results
Low	2412	16.387	16.458	17.5407	17.4876	> 0.5	Compliant
Middle	2437	16.353	16.531	17.4202	17.3512	> 0.5	Compliant
High	2462	16.430	16.208	17.3855	17.0534	> 0.5	Compliant

802.11n HT20 mode:

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz) J0	6 dB Emission Bandwidth (MHz) J1	99% Emission Bandwidth (MHz) J0	99% Emission Bandwidth (MHz) J1	Limit (MHz)	Results
Low	2412	17.626	17.539	17.9835	17.8928	> 0.5	Compliant
Middle	2437	17.717	17.717	18.4758	18.9046	> 0.5	Compliant
High	2462	17.641	17.291	18.5182	18.0182	> 0.5	Compliant

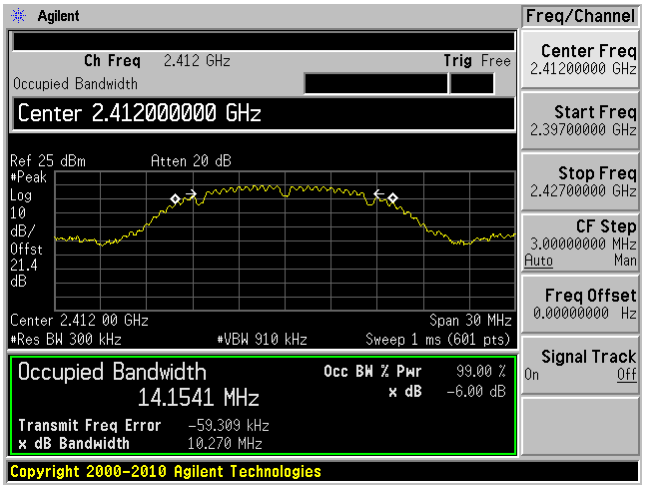
802.11n HT40 mode:

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz) J0	6 dB Emission Bandwidth (MHz) J1	99% Emission Bandwidth (MHz) J0	99% Emission Bandwidth (MHz) J1	Limit (MHz)	Results
Low	2422	36.401	36.301	37.0076	36.6185	> 0.5	Compliant
Middle	2437	36.433	36.625	37.0820	37.8683	> 0.5	Compliant
High	2452	36.027	36.330	36.8823	37.0819	> 0.5	Compliant

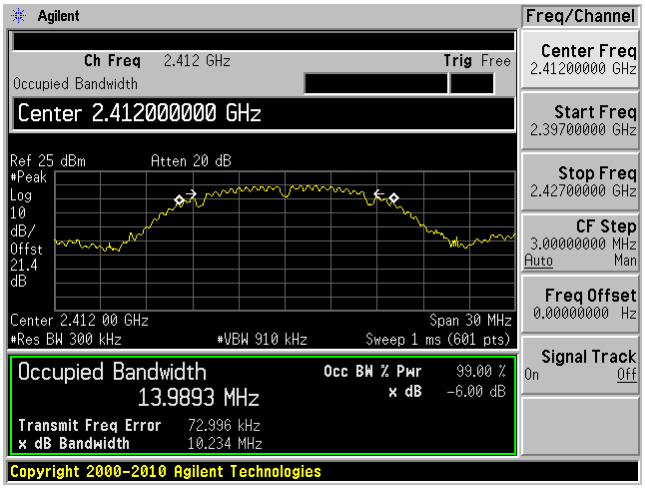
Please refer to the following plots for detailed test results

802.11b mode

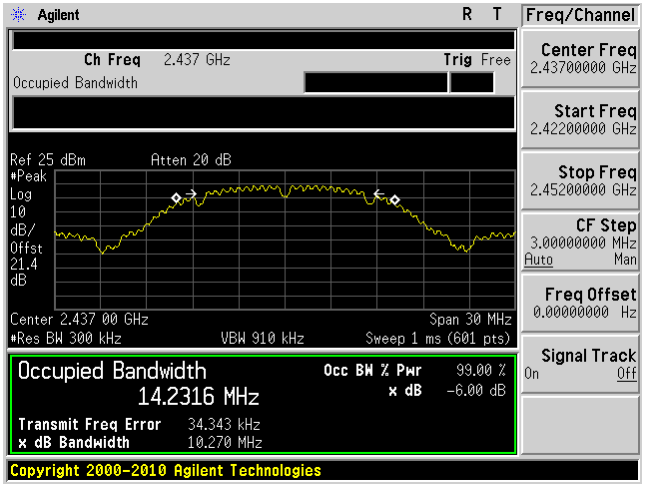
Low channel: 2412 MHz Chain J0



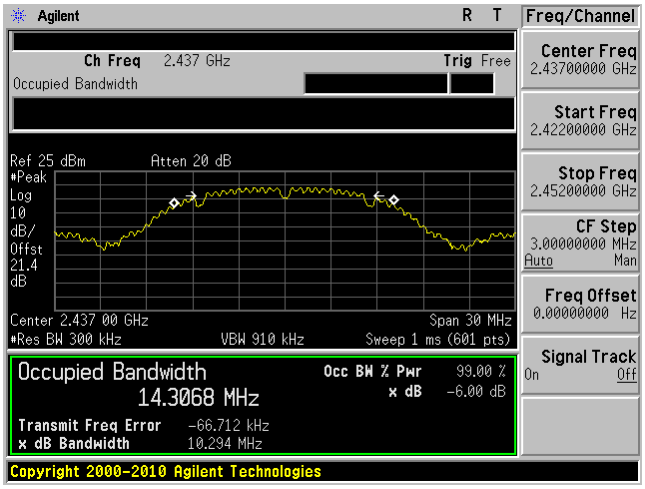
Low channel: 2412 MHz Chain J1



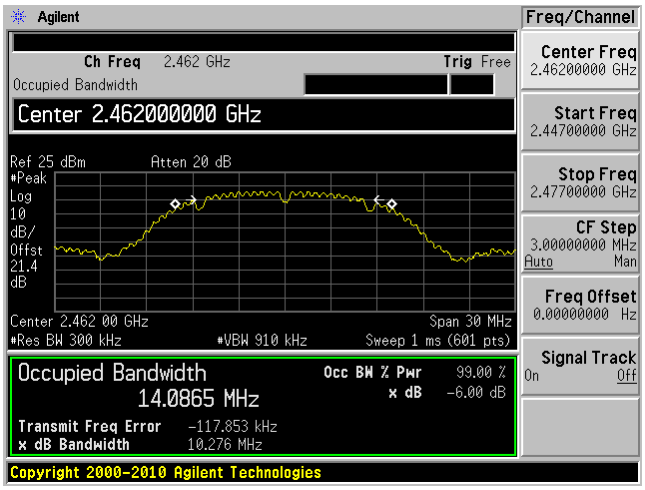
Middle channel: 2437 MHz Chain J0



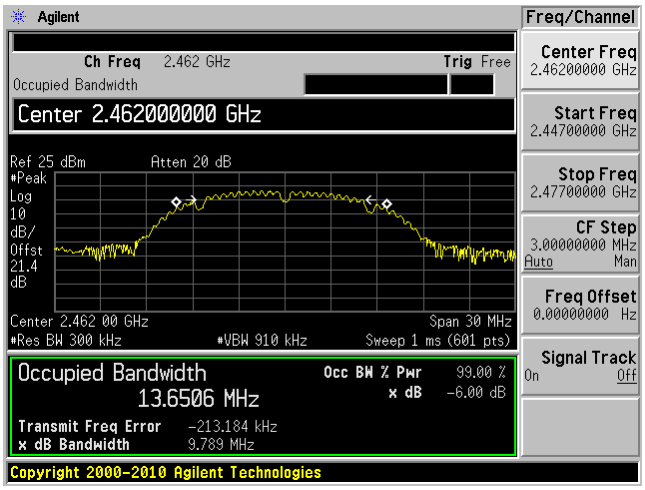
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

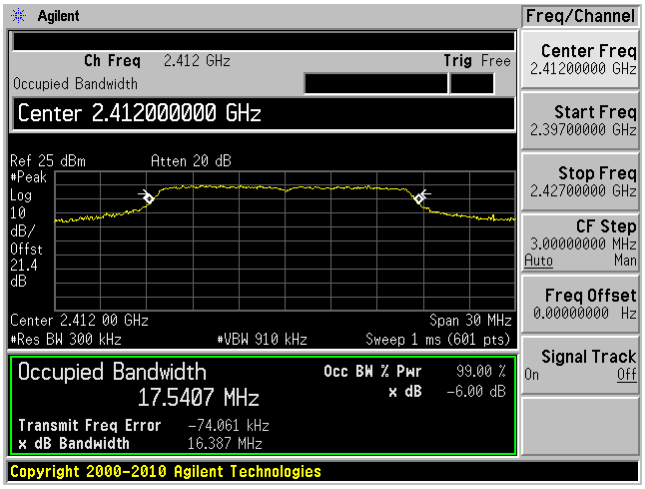


High channel: 2462 MHz Chain J1

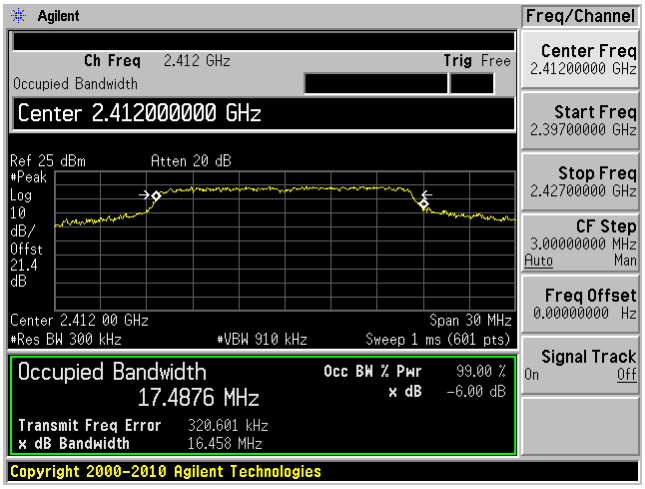


802.11g mode

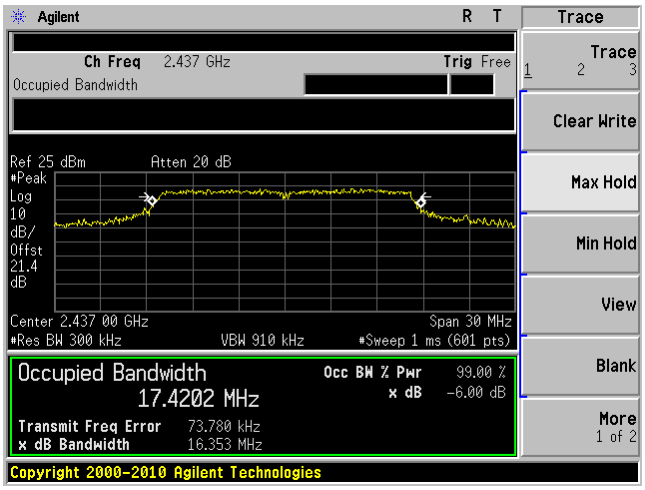
Low channel: 2412 MHz Chain J0



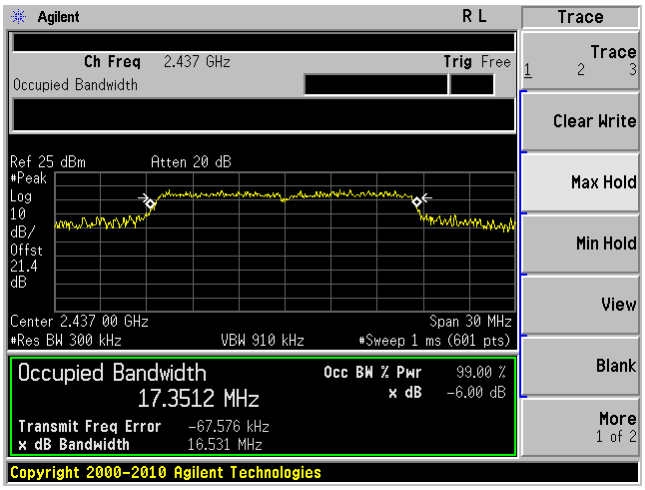
Low channel: 2412 MHz Chain J1



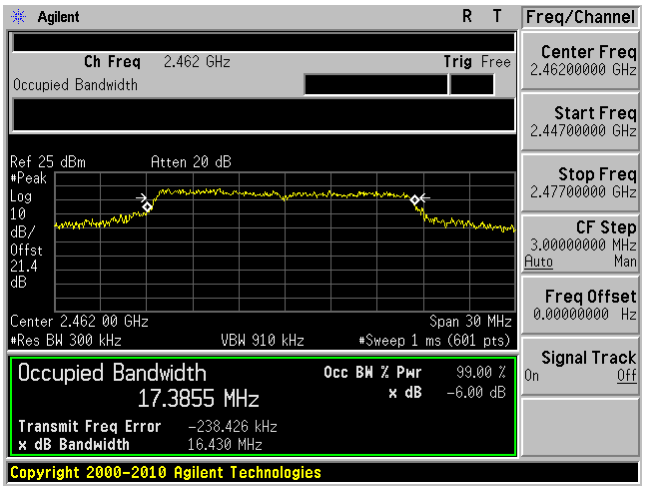
Middle channel: 2437 MHz Chain J0



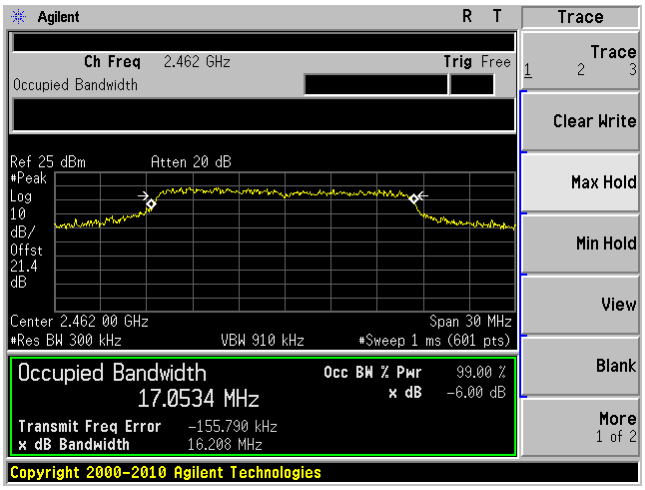
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

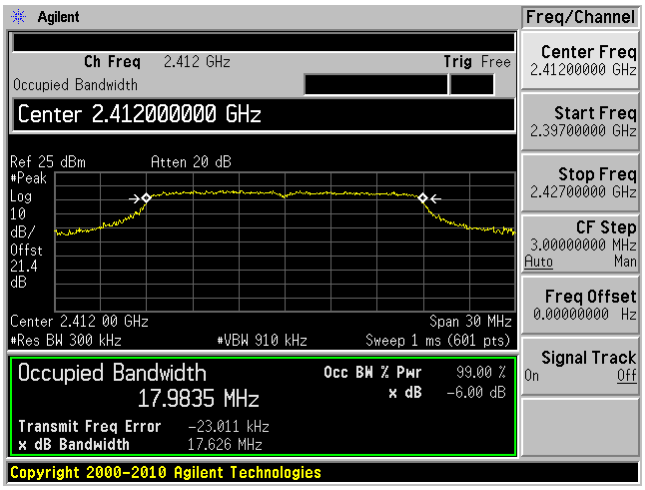


High channel: 2462 MHz Chain J1

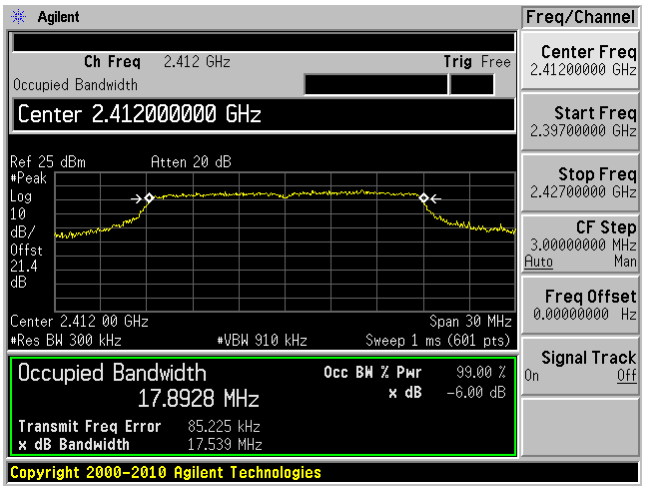


802.11n HT20 mode

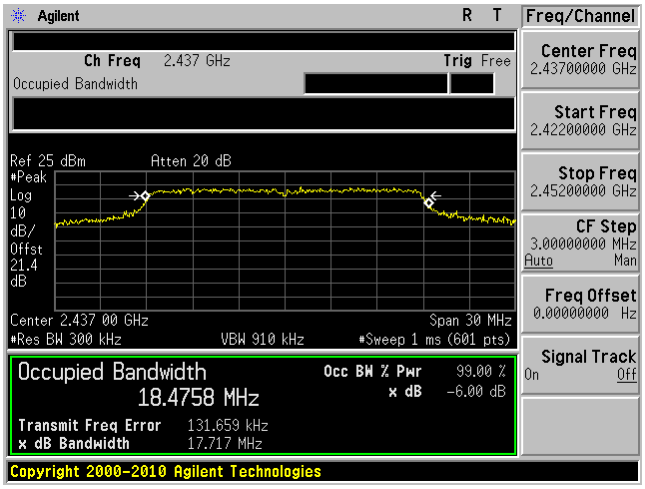
Low channel: 2412 MHz Chain J0



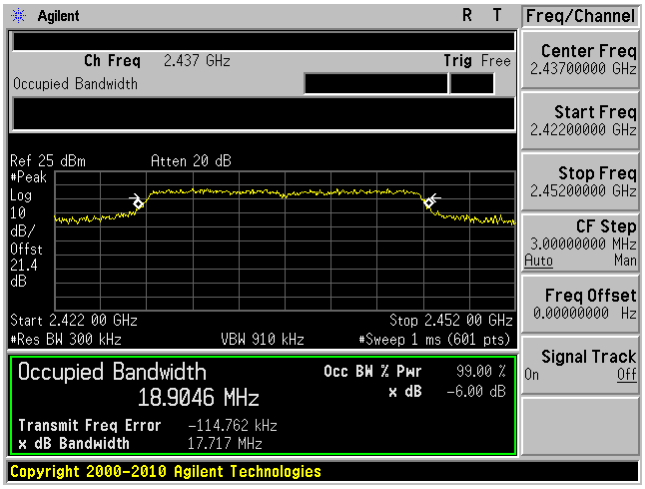
Low channel: 2412 MHz Chain J1



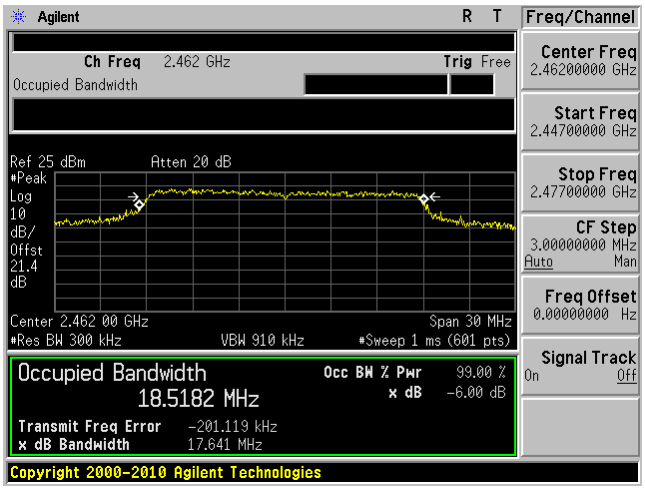
Middle channel: 2437 MHz Chain J0



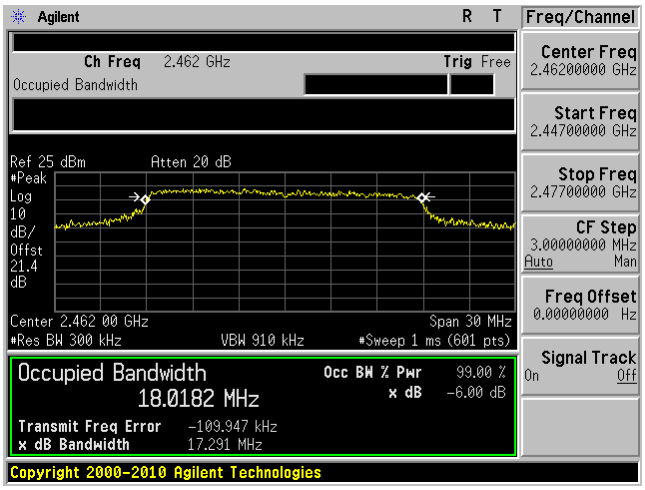
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

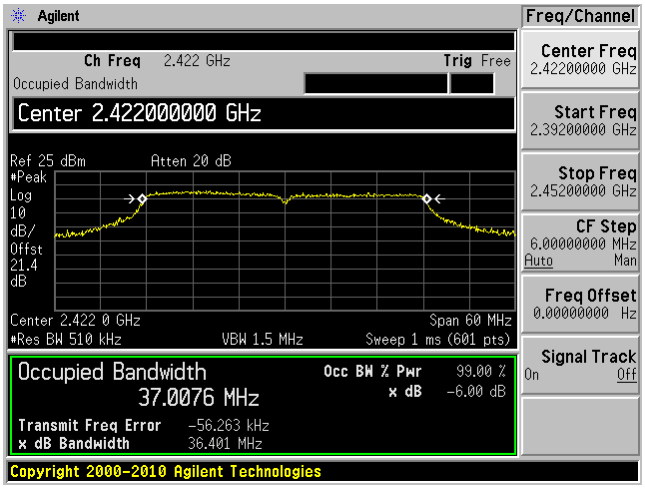


High channel: 2462 MHz Chain J1

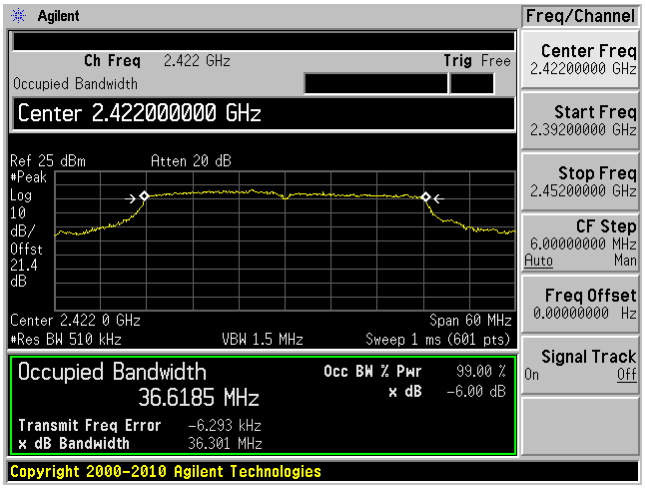


802.11n HT40 mode

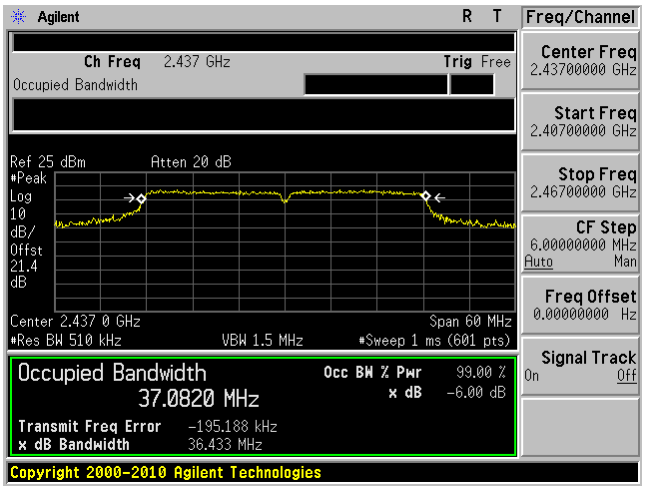
Low channel: 2422 MHz Chain J0



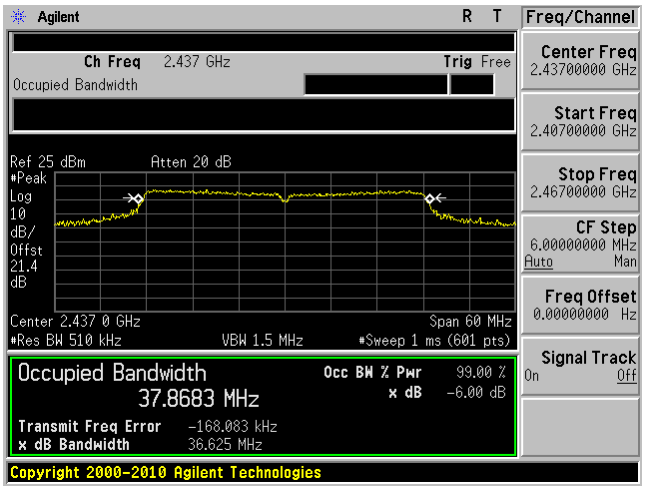
Low channel: 2422 MHz Chain J1



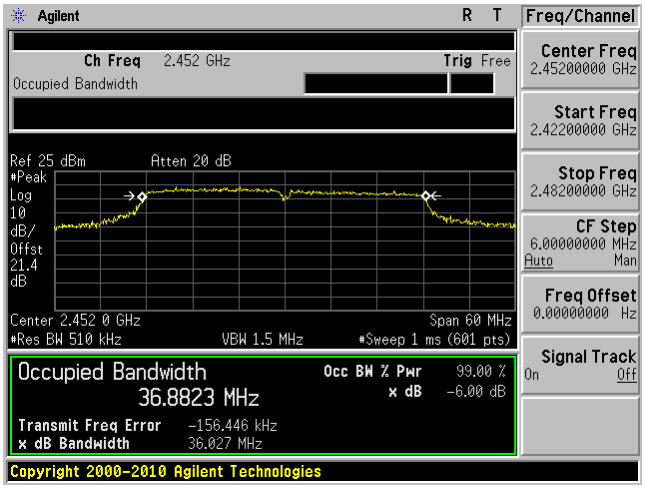
Middle channel: 2437 MHz Chain J0



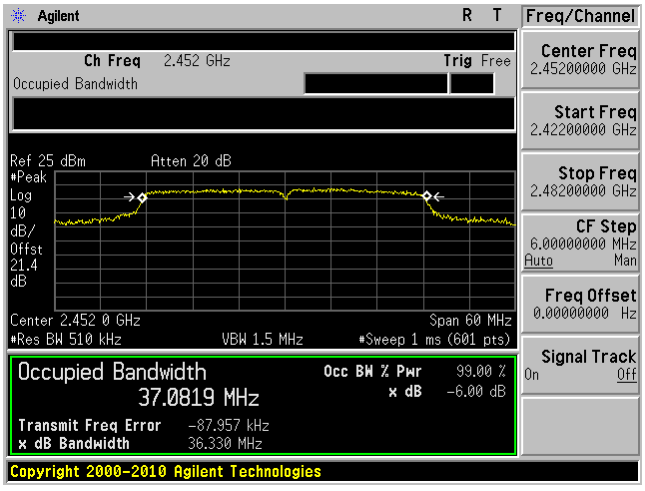
Middle channel: 2437 MHz Chain J1



High channel: 2452 MHz Chain J0



High channel: 2452 MHz Chain J1



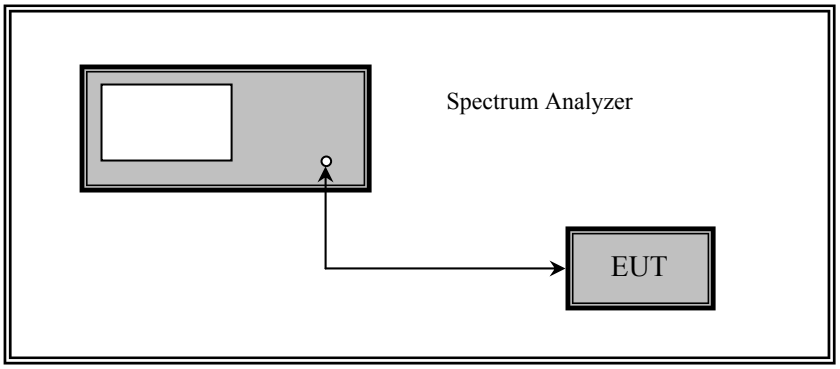
10 FCC §15.247(b) & IC RSS-210 §A8.4 – Peak Output Power Measurement

10.1 Applicable Standard

According to FCC §15.247(b) and IC RSS-210 §A8.4 (4) 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	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

10.4 Test Environmental Conditions

Temperature:	22-24 °C
Relative Humidity:	42-45 %
ATM Pressure:	101-102kPa

The testing was performed by Jeffrey Wu from 2012-10-1 to 2012-10-15 at RF site.

10.5 Test Results

802.11b mode

Channel	Frequency (MHz)	TX Chain J0 Power (dBm)	TX Chain J1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)	Power Setting
Low	2412	23.01	22.68	25.86	30	-4.14	22
Middle	2437	22.92	22.23	25.60	30	-4.40	22
High	2462	19.87	19.64	22.77	30	-7.23	20

802.11g mode

Channel	Frequency (MHz)	TX Chain J0 Power (dBm)	TX Chain J1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)	Power Setting
Low	2412	22.41	22.13	25.28	30	-4.72	22
Middle	2437	22.54	21.7	25.15	30	-4.85	22
High	2462	21.92	21.96	24.95	30	-5.05	22

802.11n HT20 mode

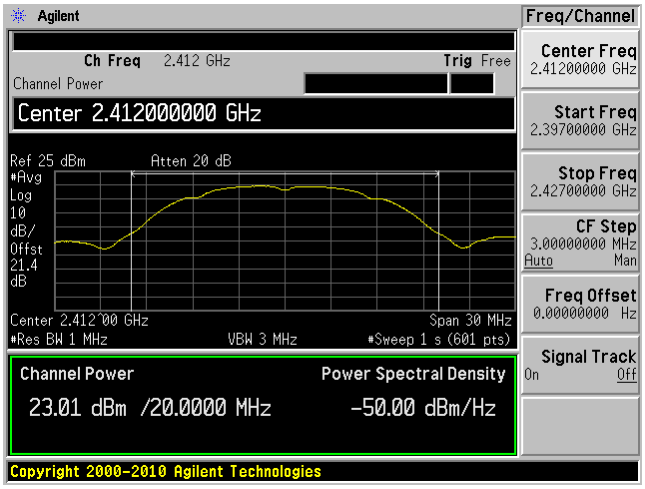
Channel	Frequency (MHz)	TX Chain J0 Power (dBm)	TX Chain J1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)	Power Setting
Low	2412	20.48	20.16	23.33	30	-6.67	20
Middle	2437	22.67	21.65	25.20	30	-4.80	22
High	2462	21.86	22.02	24.95	30	-5.05	22

802.11n HT40 mode

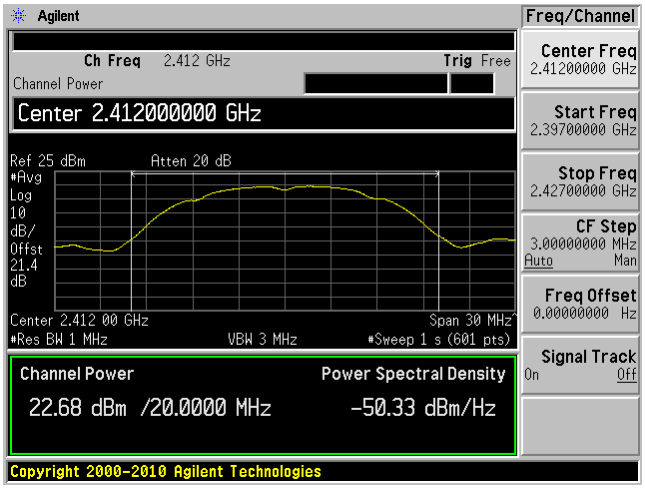
Channel	Frequency (MHz)	TX Chain J0 Power (dBm)	TX Chain J1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)	Power Setting
Low	2422	19.19	18.63	21.93	30	-8.07	19.5
Middle	2437	22.18	21.77	24.99	30	-5.01	22
High	2452	22.13	21.97	25.06	30	-4.94	22

802.11b mode

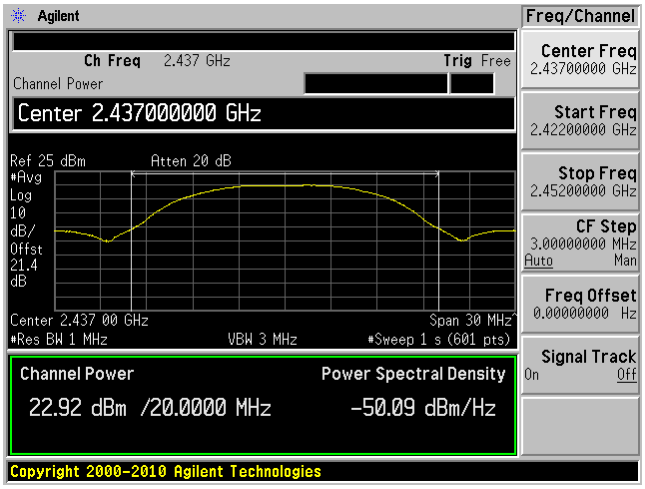
Low channel: 2412 MHz Chain J0



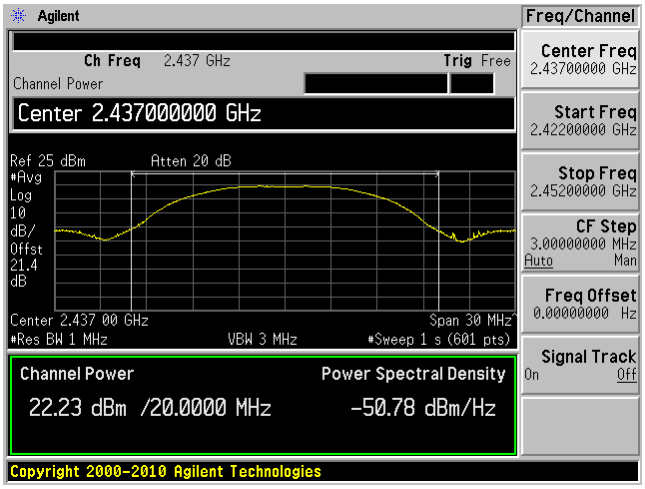
Low channel: 2412 MHz Chain J1



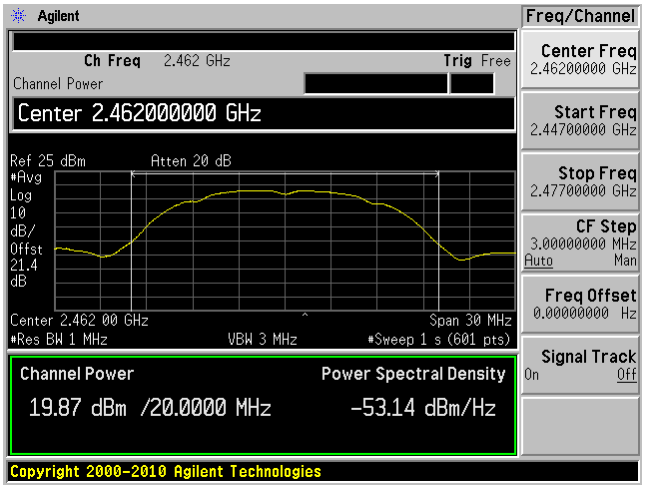
Middle channel: 2437 MHz Chain J0



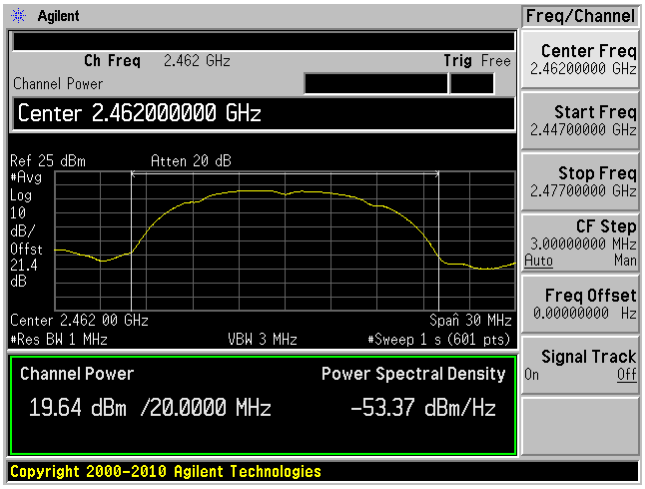
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

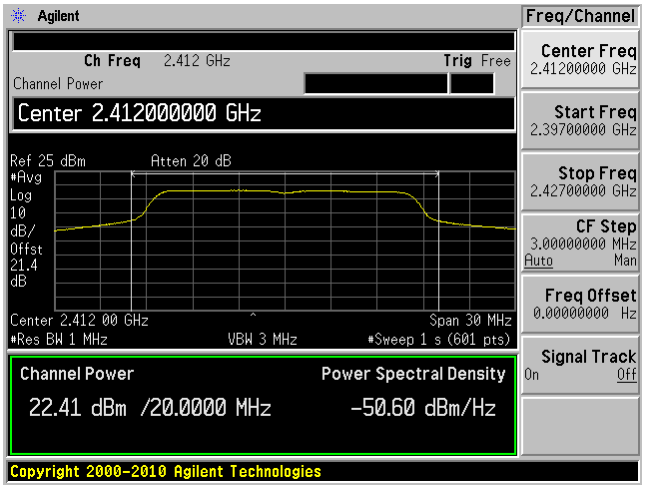


High channel: 2462 MHz Chain J1

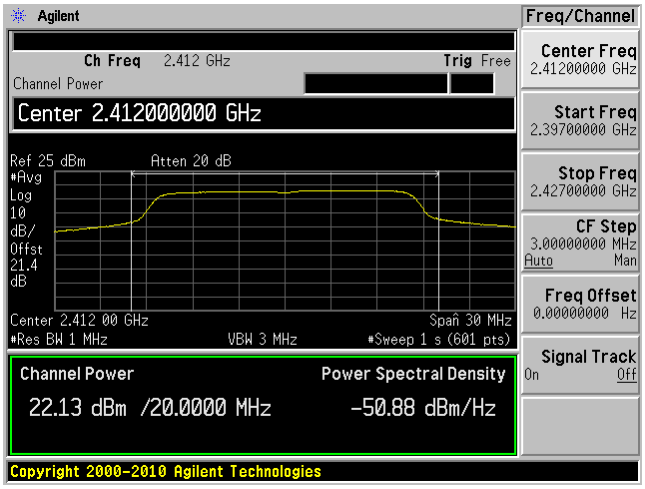


802.11g mode

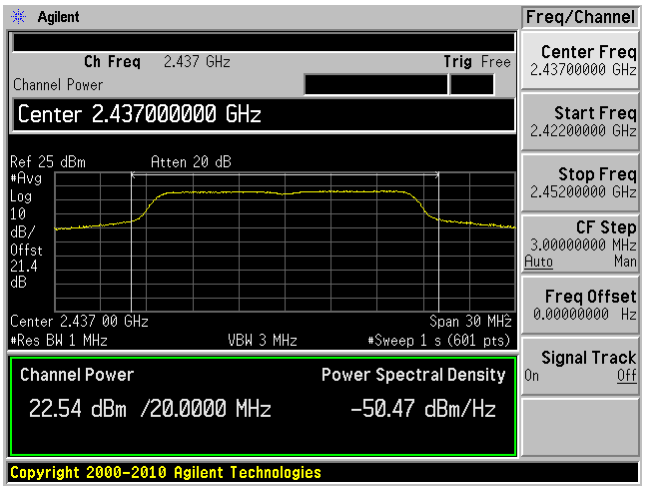
Low channel: 2412 MHz Chain J0



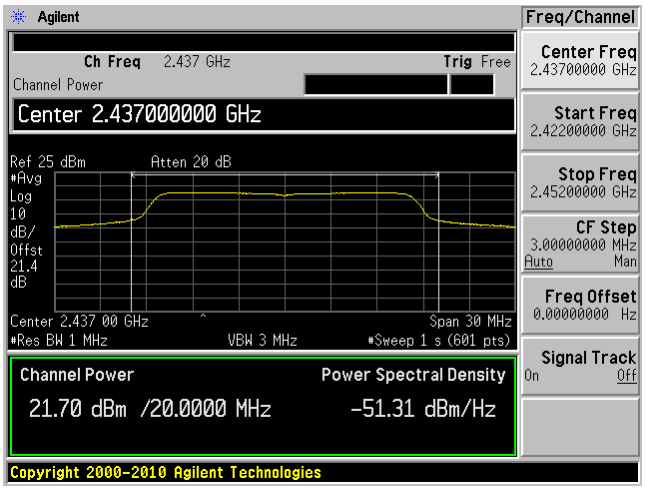
Low channel: 2412 MHz Chain J1



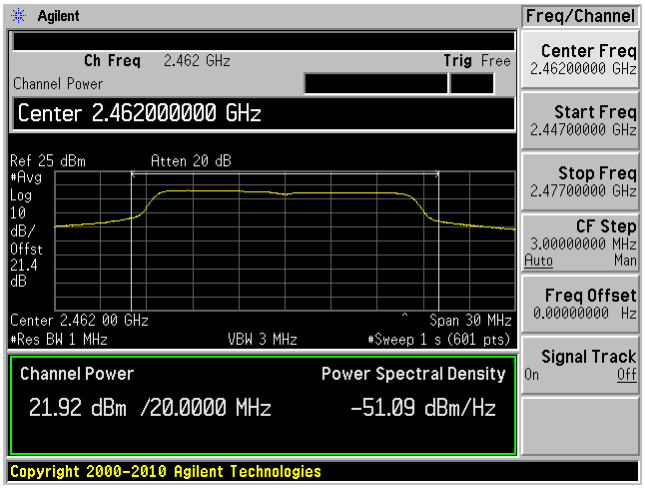
Middle channel: 2437 MHz Chain J0



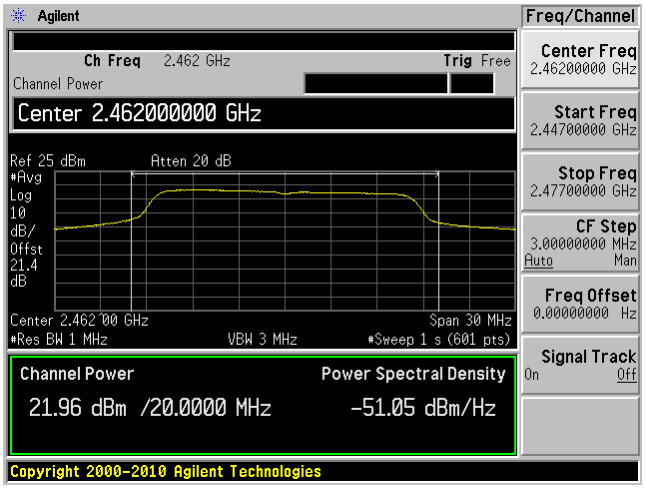
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

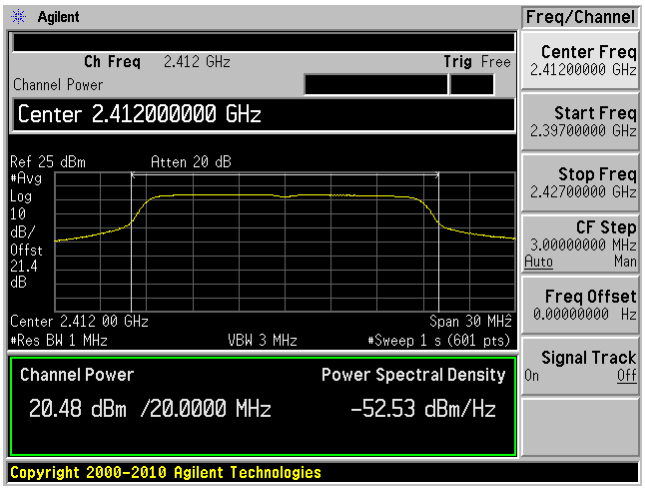


High channel: 2462 MHz Chain J1

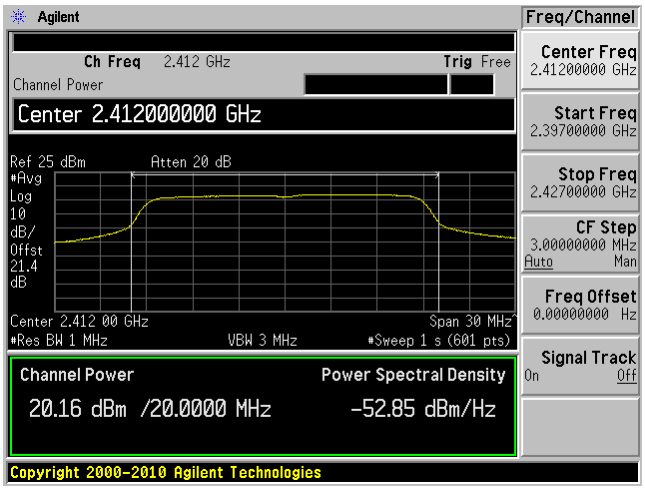


802.11n HT20 mode

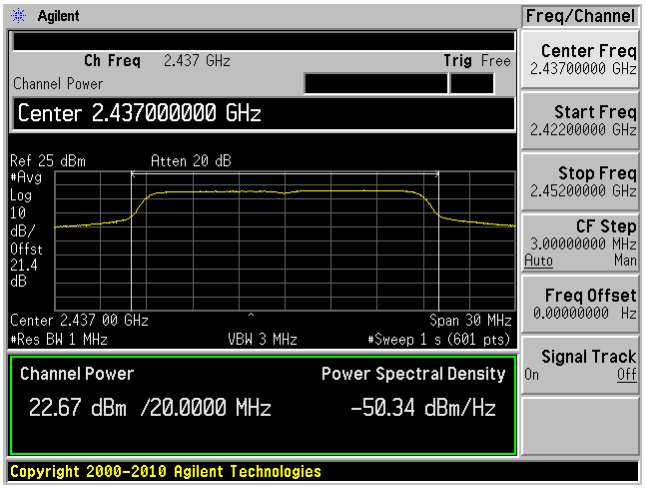
Low channel: 2412 MHz Chain J0



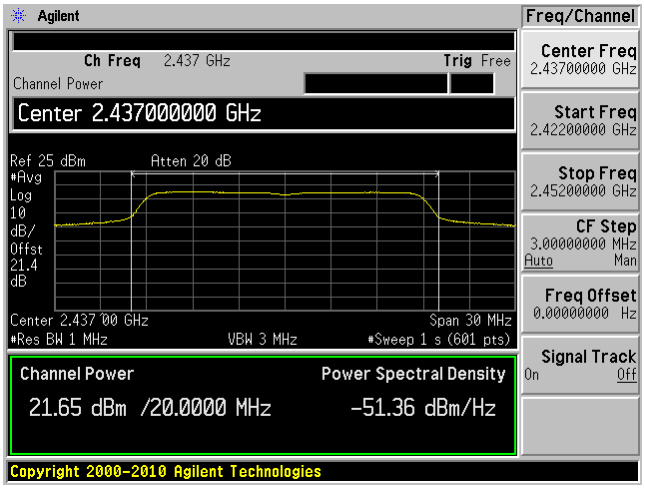
Low channel: 2412 MHz Chain J1



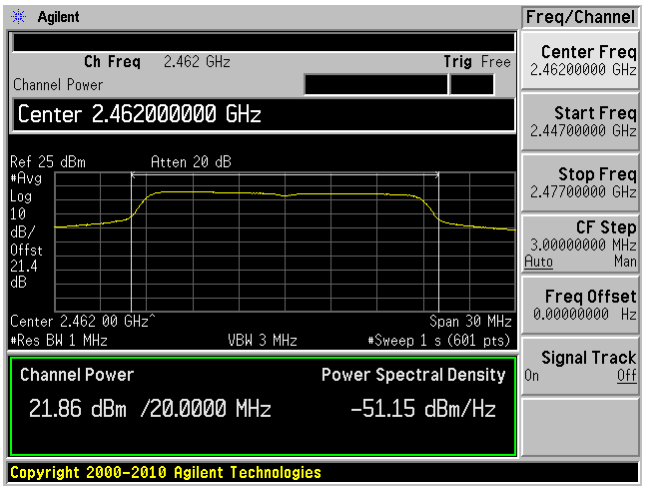
Middle channel: 2437 MHz Chain J0



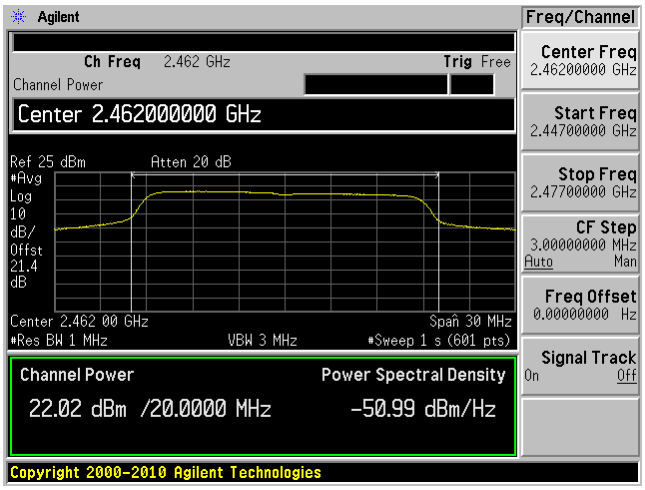
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

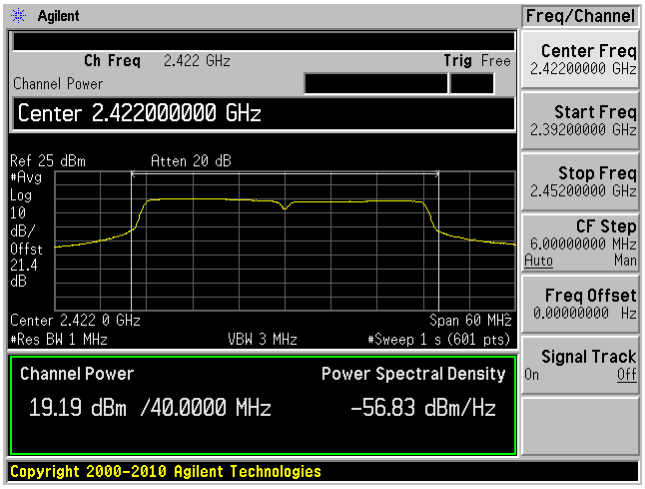


High channel: 2462 MHz Chain J1

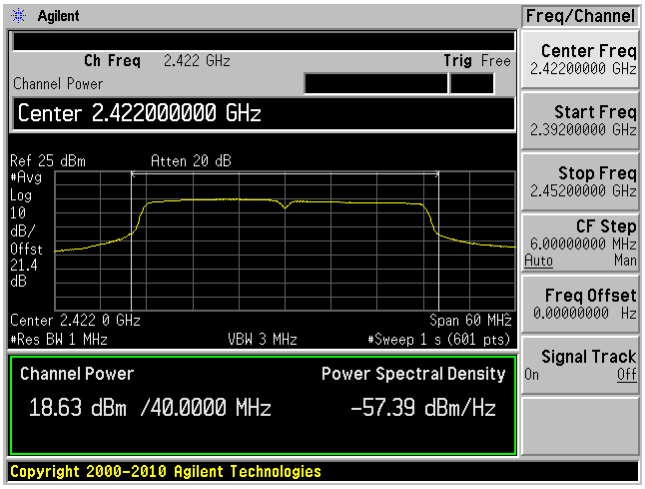


802.11n HT40 mode

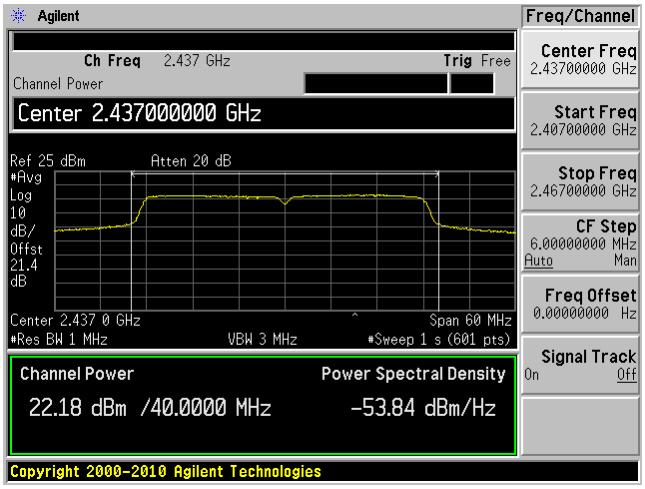
Low channel: 2422 MHz Chain J0



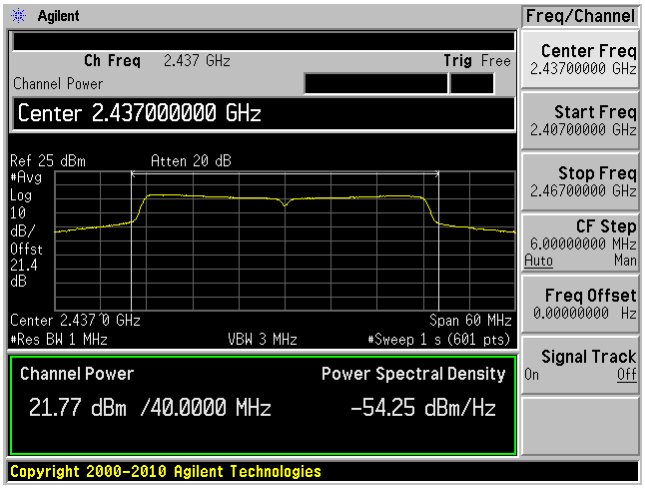
Low channel: 2422 MHz Chain J1



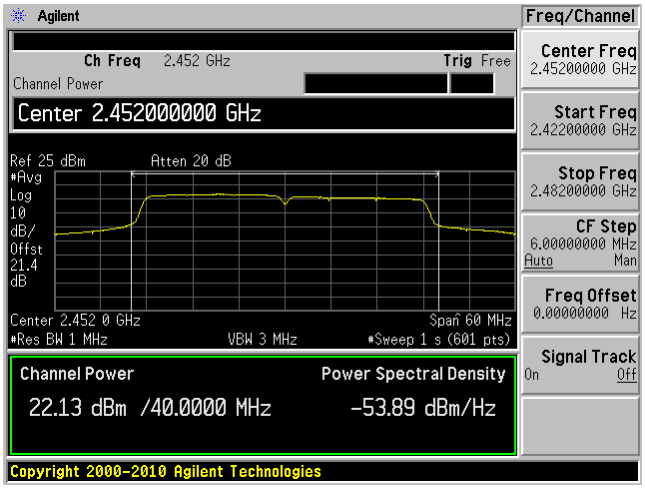
Middle channel: 2437 MHz Chain J0



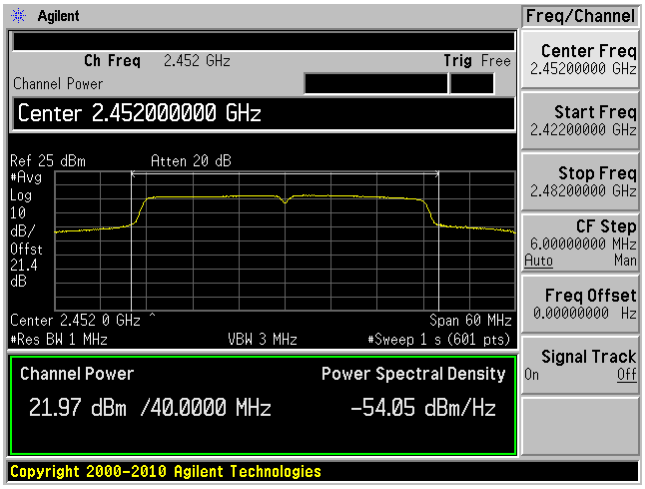
Middle channel: 2437 MHz Chain J1



High channel: 2452 MHz Chain J0



High channel: 2452 MHz Chain J1



11 FCC §15.247(d) & IC RSS-210 §A8.5 – 100 kHz Bandwidth of Band Edges

11.1 Applicable Standard

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

According to IC Rss-210 §A8.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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 section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

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	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

11.4 Test Environmental Conditions

Temperature:	22-24 °C
Relative Humidity:	42-45 %
ATM Pressure:	101-102kPa

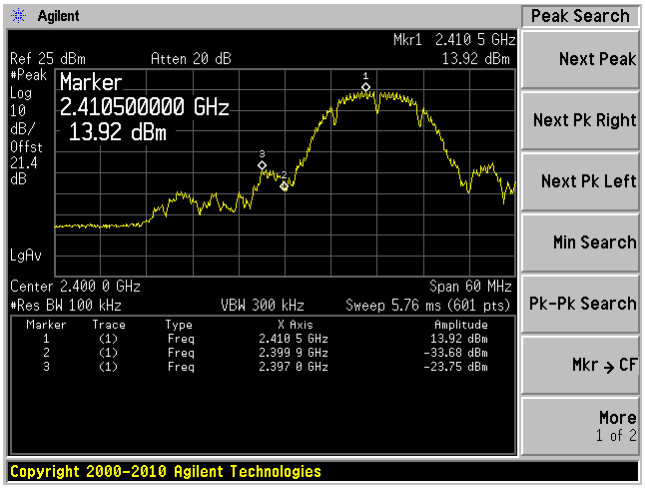
The testing was performed by Jeffrey Wu from 2012-10-1 to 2012-10-15 at RF site.

11.5 Test Results

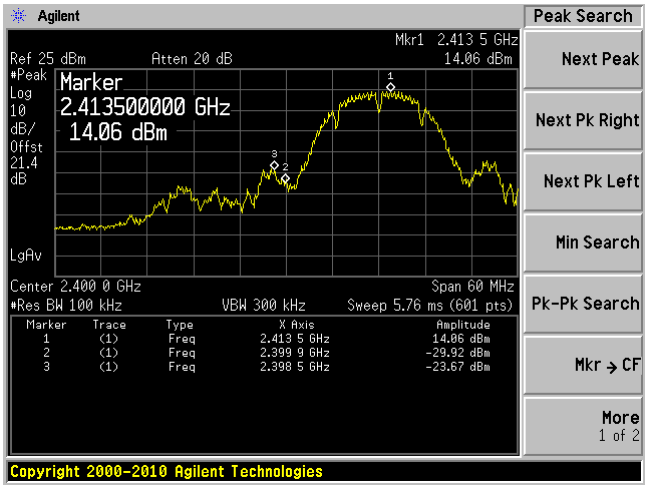
Please refer to following pages for plots of band edge.

802.11b mode

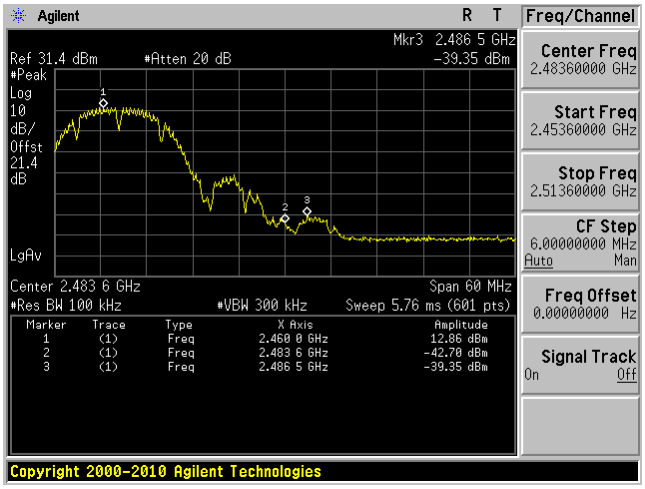
802.11b, Chain J0 Low Band Edge



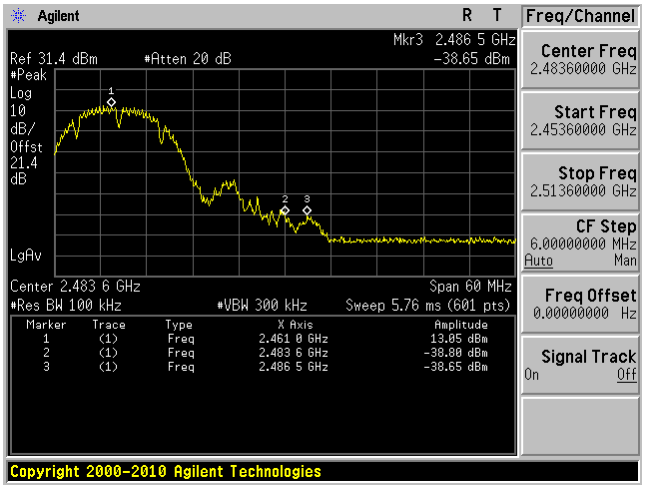
802.11b, Chain J1 Low Band Edge



802.11b, Chain J0 High Band Edge

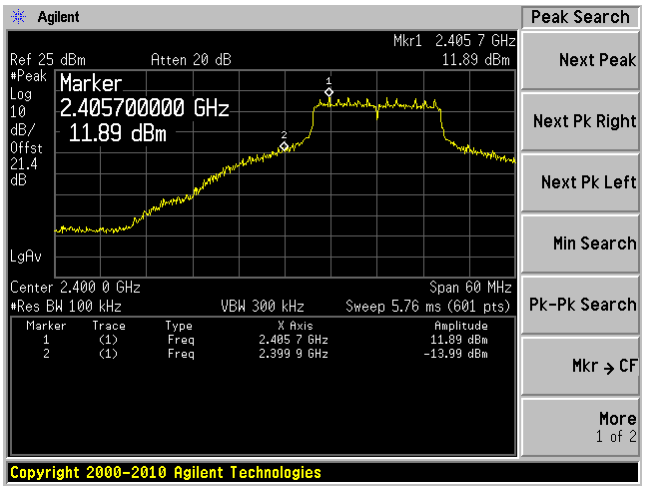


802.11b, Chain J1 High Band Edge

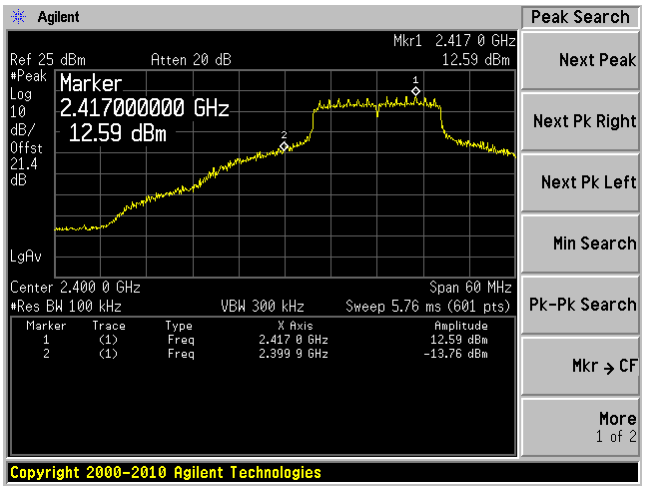


802.11g mode

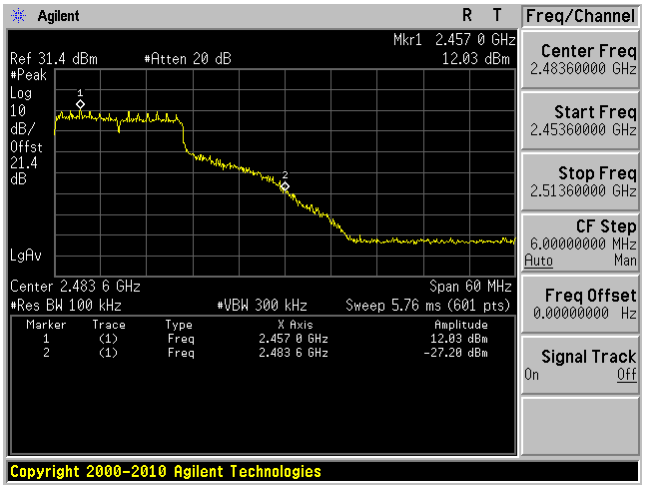
802.11g, Chain J0 Low Band Edge



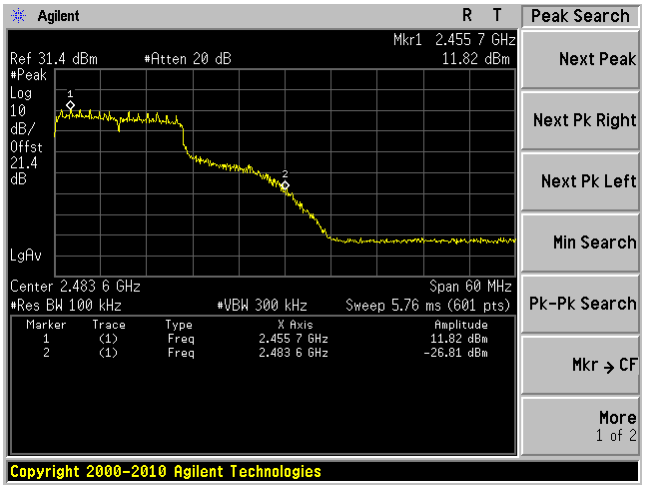
802.11g, Chain J1 Low Band Edge



802.11g, Chain J0 High Band Edge

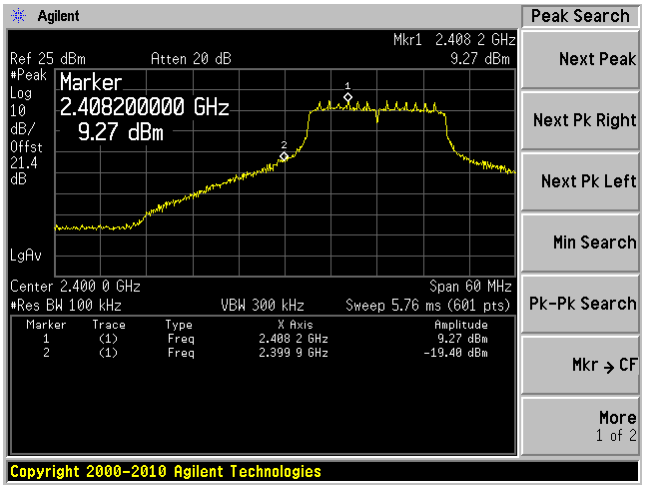


802.11g, Chain J1 High Band Edge

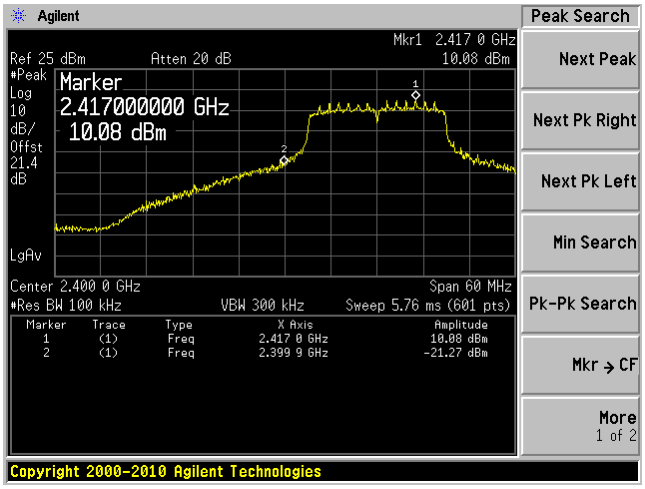


802.11n HT20 mode

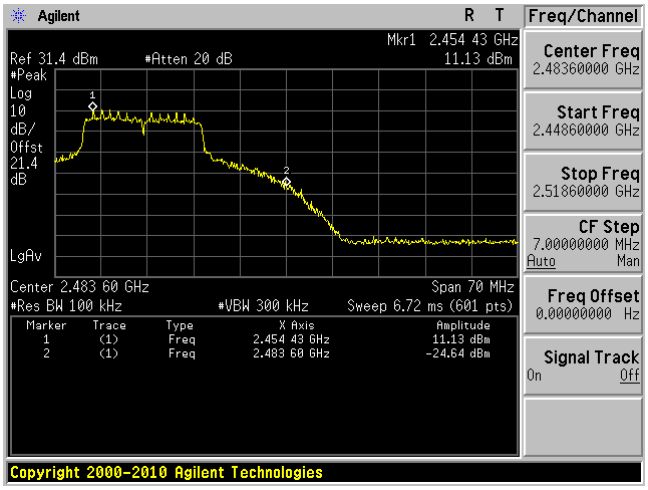
802.11n HT20, Chain J0 Low Band Edge



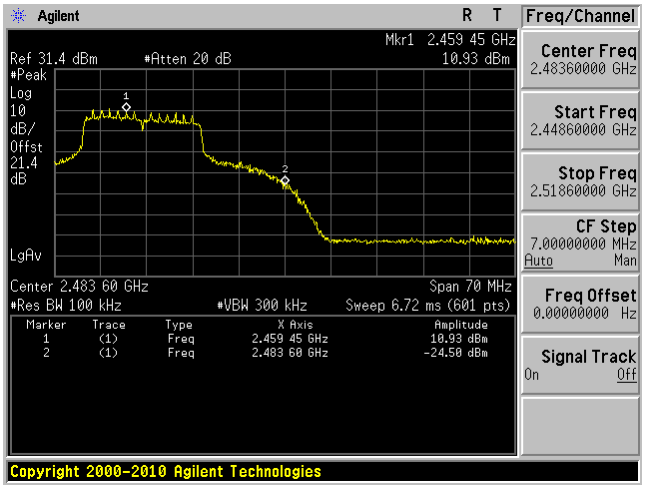
802.11n HT20, Chain J1 Low Band Edge



802.11n HT20, Chain J0 High Band Edge

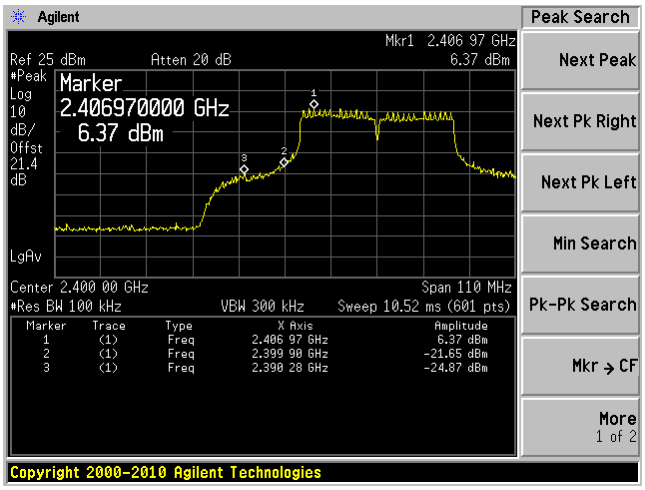


802.11n HT20, Chain J1 High Band Edge

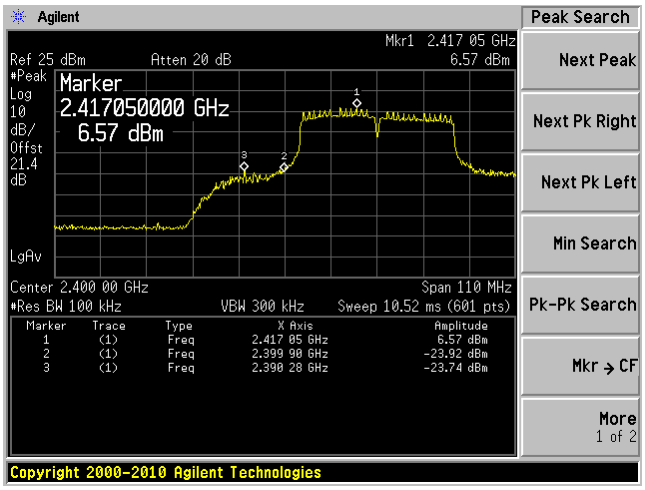


802.11n HT40 mode

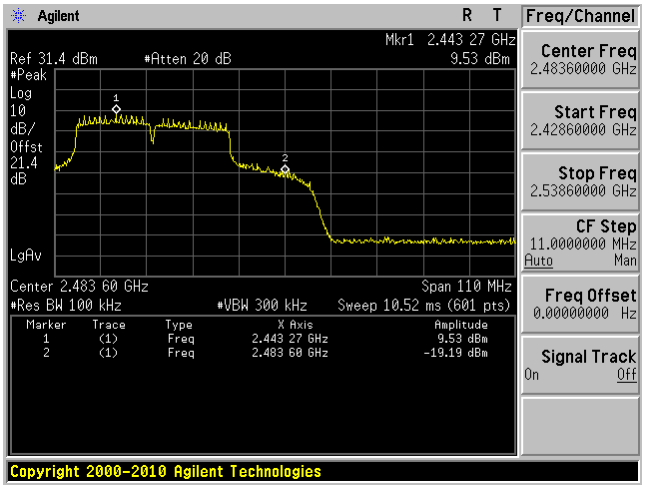
802.11n HT40, Chain J0 Low Band Edge



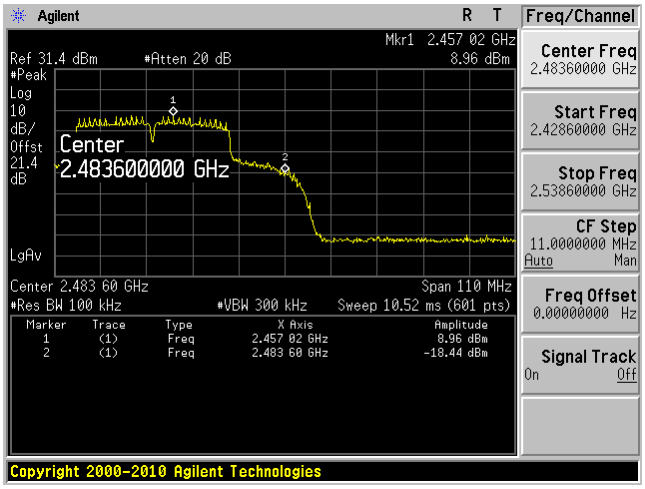
802.11n HT40, Chain J1 Low Band Edge



802.11n HT40, Chain J0 High Band Edge



802.11n HT40, Chain J1 High Band Edge



12 FCC §15.247(e) & IC RSS-210 §A8.2 (b) – Power Spectral Density

12.1 Applicable Standard

According to FCC §15.247(e) and RSS-210 §A8.2 (b) , 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. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 100 kHz.
3. Set the VBW ≥ 300 kHz.
4. Set the span to 5-30 % greater than the EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
10. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log (3 kHz/100 kHz = -15.2 dB).
11. The resulting peak PSD level must be ≤ 8 dBm.

12.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

12.4 Test Environmental Conditions

Temperature:	22-24 °C
Relative Humidity:	42-45 %
ATM Pressure:	101-102kPa

The testing was performed by Jeffrey Wu from 2012-09-12 to 2012-10-15 at RF site.

12.5 Test Results

802.11b mode

Channel	Frequency (MHz)	TX Chain J0 PSD (dBm/100 kHz)	TX Chain J1 PSD (dBm/100 kHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)	Power Setting
Low	2412	14.32	13.76	1.86	8	-6.14	22
Middle	2437	13.95	13.09	1.35	8	-6.65	22
High	2462	10.8	11.17	-1.20	8	-9.20	20

802.11 g mode

Channel	Frequency (MHz)	TX Chain J0 PSD (dBm/100 kHz)	TX Chain J1 PSD (dBm/100 kHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)	Power Setting
Low	2412	10.93	12.73	-0.27	8	-8.27	22
Middle	2437	12.04	11.94	-0.20	8	-8.20	22
High	2462	12.21	12.05	-0.06	8	-8.06	22

802.11n HT20 mode

Channel	Frequency (MHz)	TX Chain J0 PSD (dBm/100 kHz)	TX Chain J1 PSD (dBm/100 kHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)	Power Setting
Low	2412	9.67	9.78	-2.46	8	-10.46	20
Middle	2437	12.68	11.59	-0.02	8	-8.02	22
High	2462	12.49	12.39	0.25	8	-7.75	22

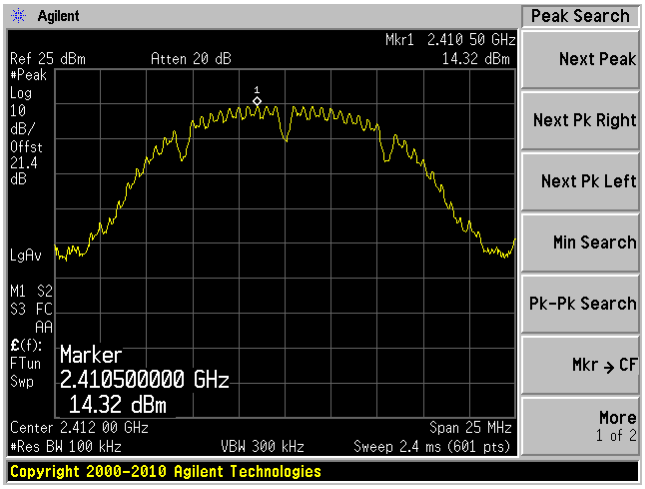
802.11n HT40 mode

Channel	Frequency (MHz)	TX Chain J0 PSD (dBm/100 kHz)	TX Chain J1 PSD (dBm/100 kHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)	Power Setting
Low	2422	6.15	6.56	-5.83	8	-13.83	19.5
Middle	2437	8.93	9.57	-2.93	8	-10.93	22
High	2452	9.29	9.02	-3.03	8	-11.03	22

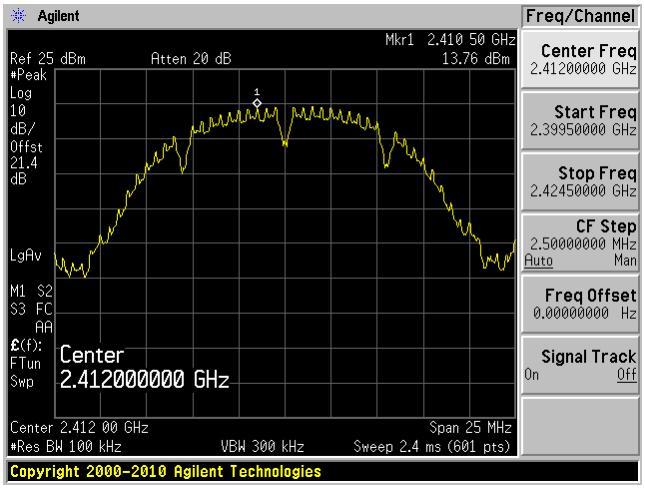
Please refer to the following plots for detailed test results:

802.11b mode

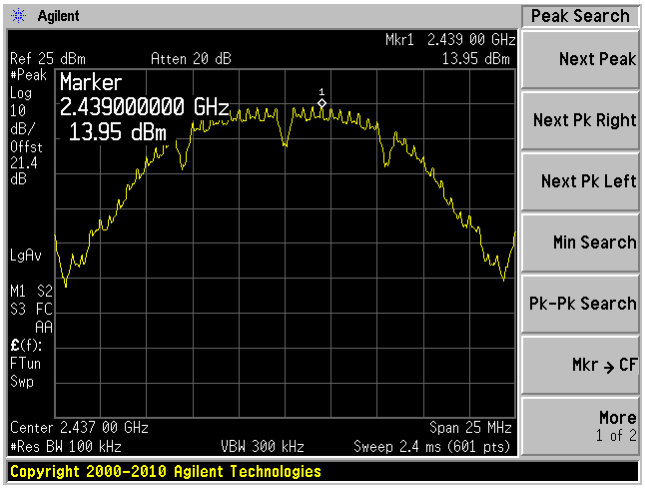
Low channel J0: 2412 MHz



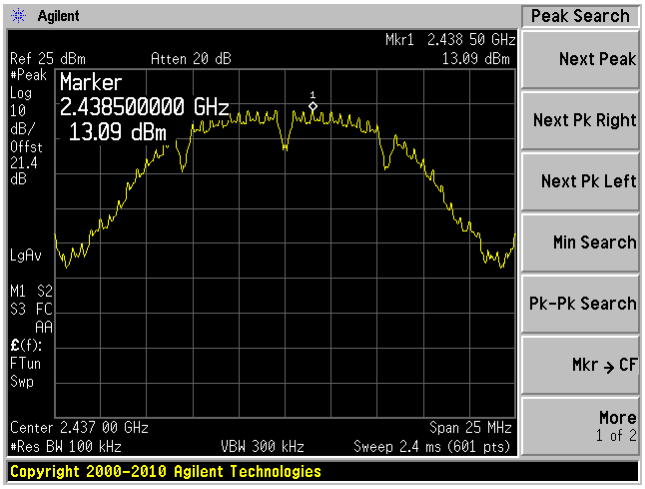
Low channel J1: 2412 MHz



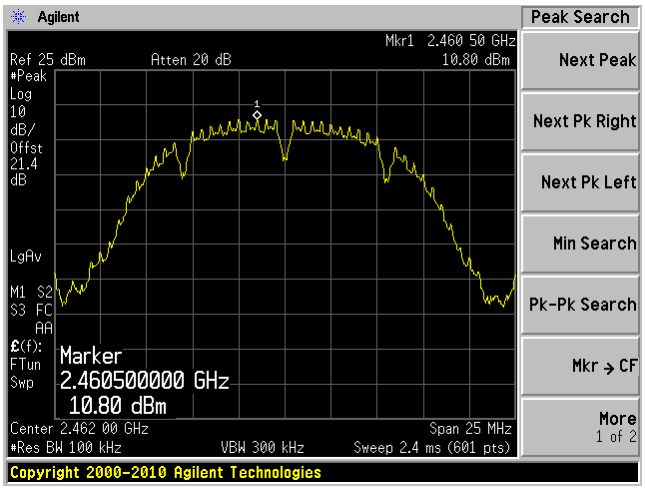
Middle channel J0: 2437 MHz



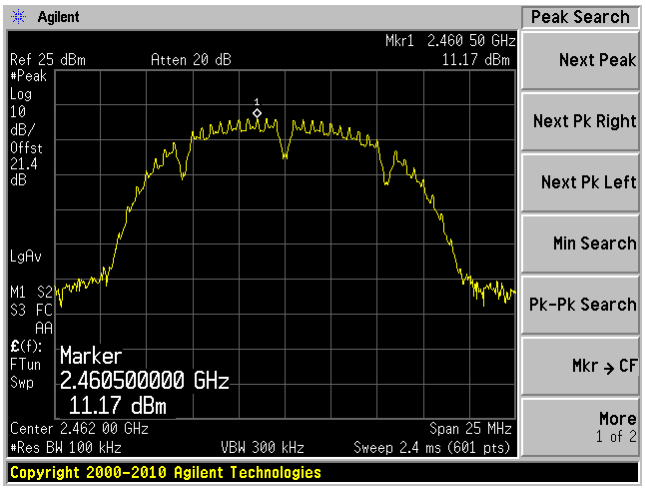
Middle channel J1: 2437 MHz



High channel J0: 2462 MHz

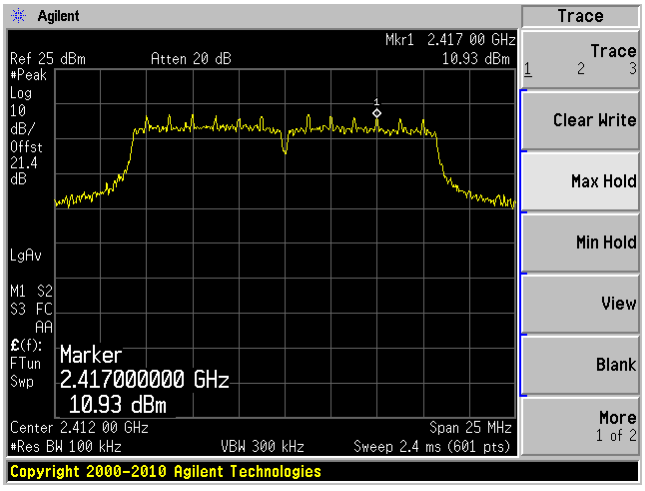


High channel J1: 2462 MHz

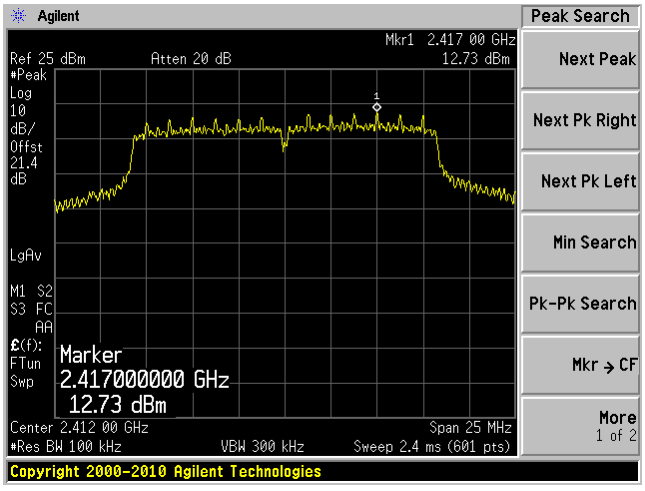


802.11g mode

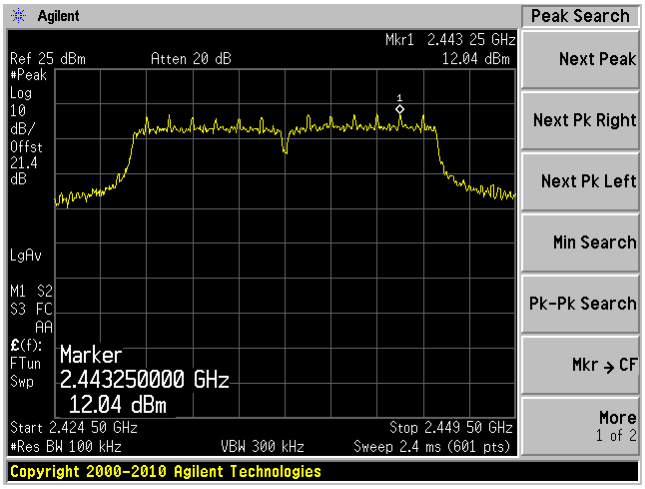
Low channel J0: 2412 MHz



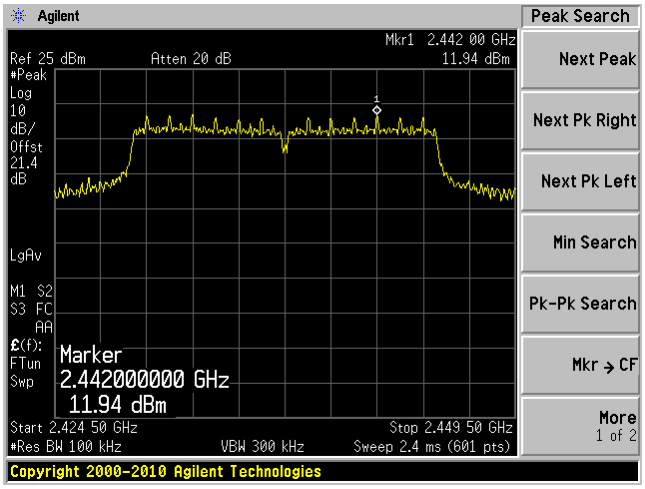
Low channel J1: 2412 MHz



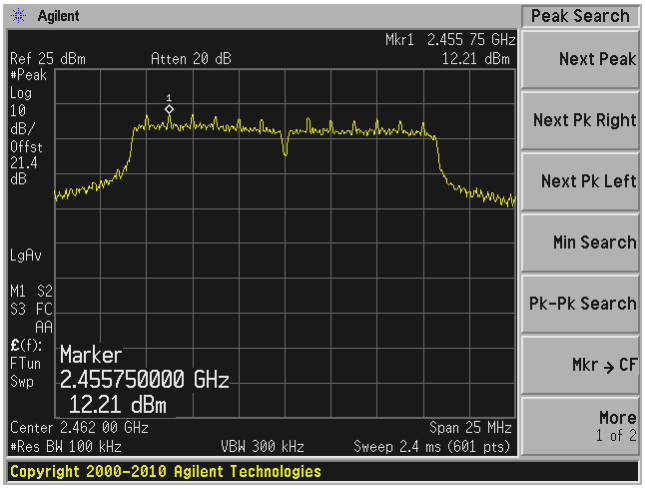
Middle channel J0: 2437 MHz



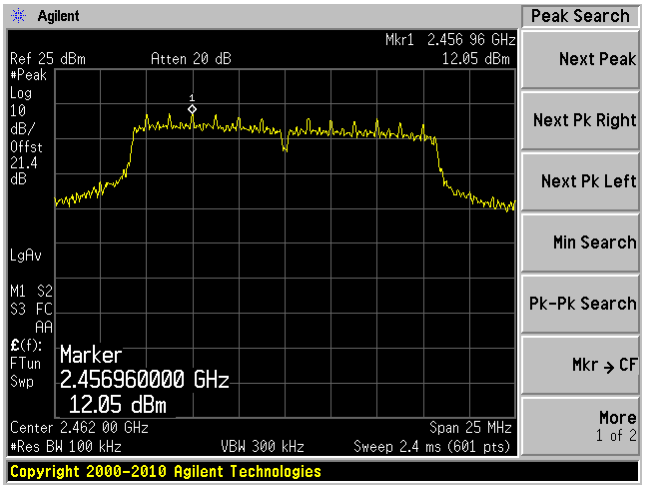
Middle channel J1: 2437 MHz



High channel J0: 2462 MHz

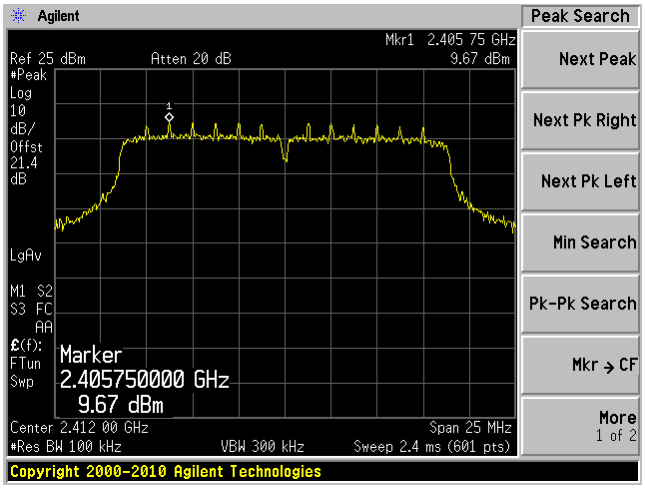


High channel J1: 2462 MHz

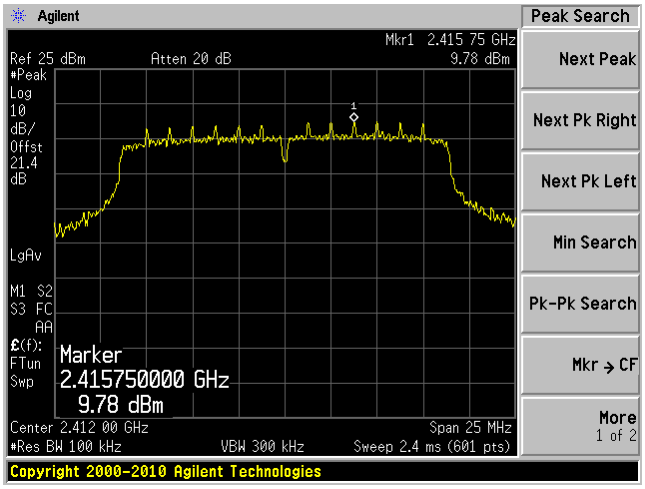


802.11n HT20 mode

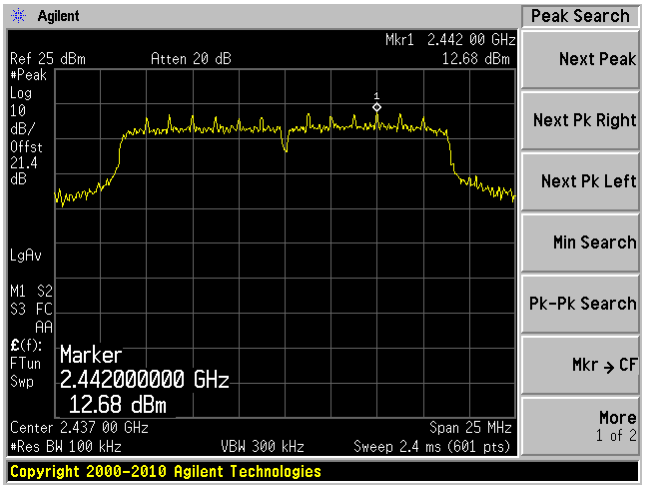
Low channel J0: 2412 MHz



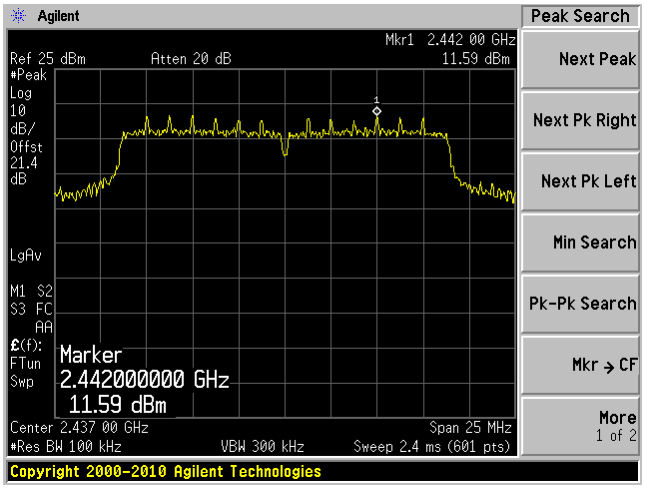
Low channel J1: 2412 MHz



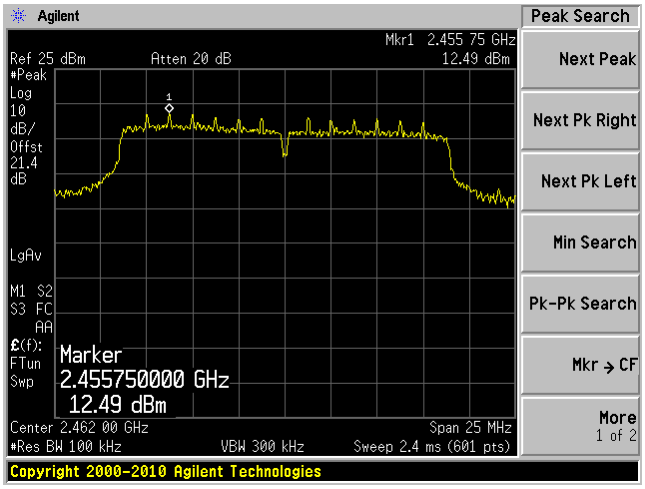
Middle channel J0: 2437 MHz



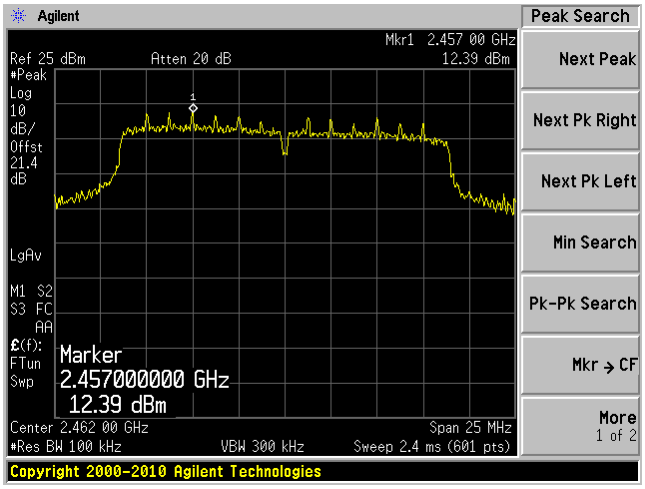
Middle channel J1: 2437 MHz



High channel J0: 2462 MHz

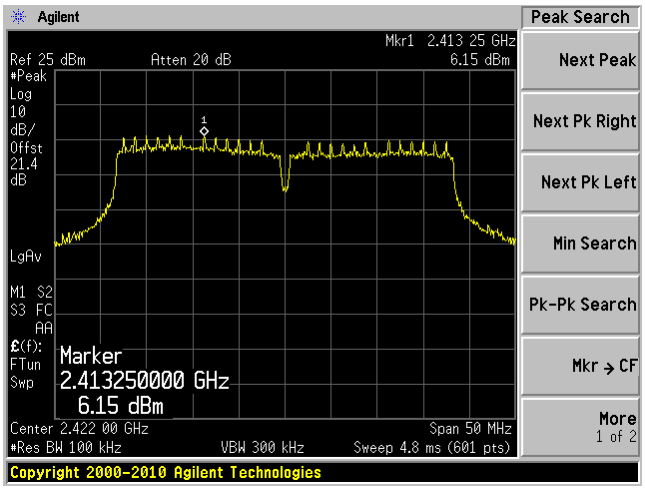


High channel J1: 2462 MHz

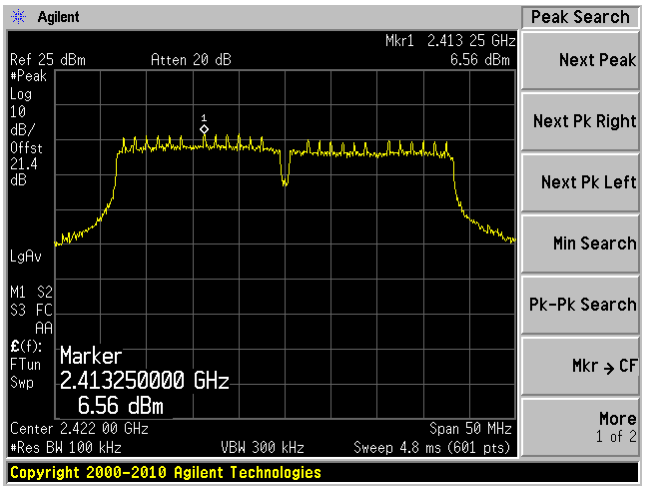


802.11n HT40 mode

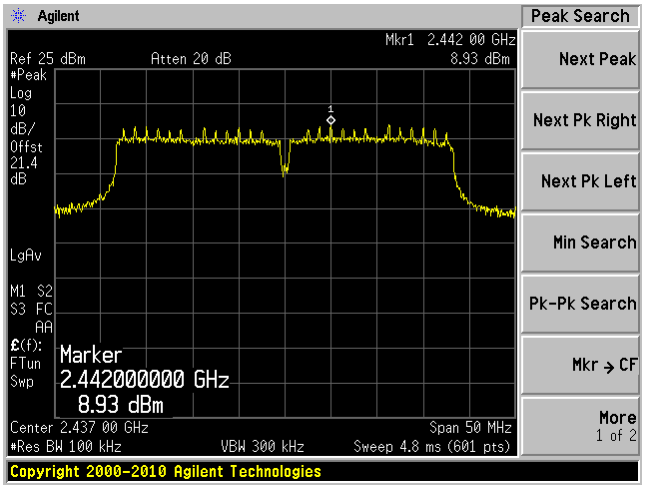
Low channel J0: 2422 MHz



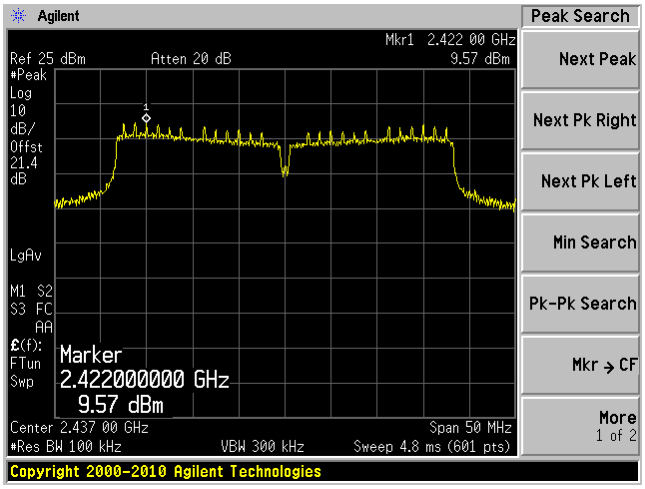
Low channel J1: 2422 MHz



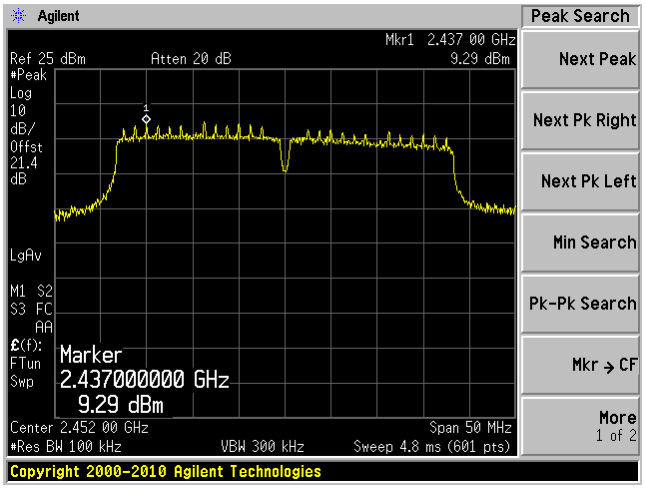
Middle channel J0: 2437 MHz



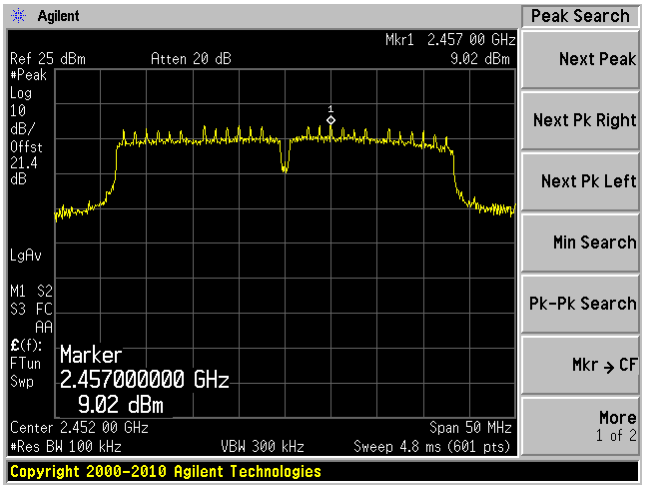
Middle channel J1: 2437 MHz



High channel J0: 2452 MHz



High channel J1: 2452 MHz



13 IC RSS-210 §2.3 & RSS-Gen §4.10 – Receiver Spurious Emissions

13.1 Applicable Standard

According to IC RSS-Gen §4.10, the receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate.

Unless otherwise specified in the applicable RSS, the radiated emission measurement is the standard measurement method (with the device's antenna in place) to measure receiver spurious emissions.

Radiated emission measurements are to be performed using a calibrated open-area test site.

For either method, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

For emissions below 1 GHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector with the same measurement bandwidth as that for CISPR quasi-peak measurements. Above 1 GHz, measurements shall be performed using an average detector and a resolution bandwidth of 300 kHz to 1 MHz.

According to RSS-Gen §6.1, Tables 2 show the general field strength limits of receiver spurious emissions

Table 2: Radiated Limits of Receiver Spurious Emissions

Frequency (MHz)	Field Strength (Microvolts/m at 3 meters)
30-88	100
88-216	150
216-960	200
Above 960	500

13.2 EUT Setup

The radiated emissions tests were performed in the 3 meter chamber, using the setup in accordance with ANSI C63.4-2009.

13.3 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data were recorded in the peak detection mode. Quasi-peak readings was performed only when an emissions was found to be marginal (within -4 dB of specification limits), and are distinguished with a "**QP**" in the data table.

13.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

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. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

13.5 Test Equipment Lists and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-2	2012-08-15	1 year
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2012-06-09	1 year
Mini-Circuits	Pre-amplifier	ZVA-183-S	570400946	2012-05-09	1 year
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year
Sunol Science Corp	Horn Antenna	DHR-118	A052704	2012-02-24	1 year
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2012-03-22	1 year

Statement of Traceability: *BACL attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

13.6 Test Environmental Conditions

Temperature:	22°C
Relative Humidity:	45%
ATM Pressure:	102.1kPa

The testing was performed by Bo Li on 2012-11-18 at 5 meter 3.

13.7 Summary of Test Results

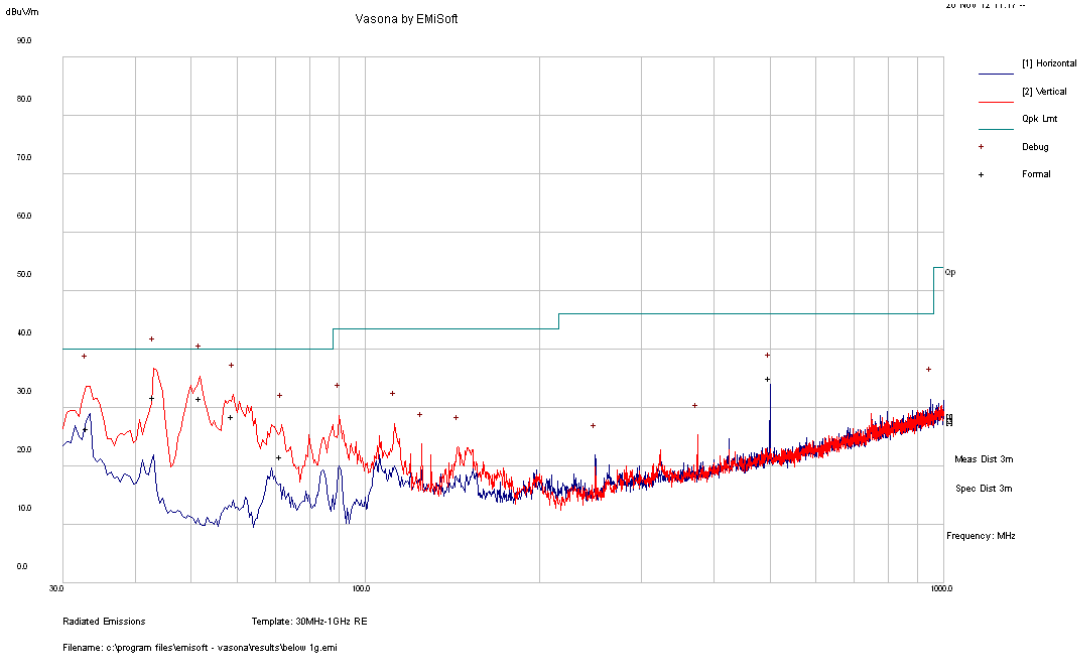
According to the test data, the EUT complied with the with the RSS-210, with the closest margins from the limit listed below:

Mode: Receiving			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range (MHz)**
-8.12	43.14475	Vertical	30-18000

13.8 Test Results and Plots

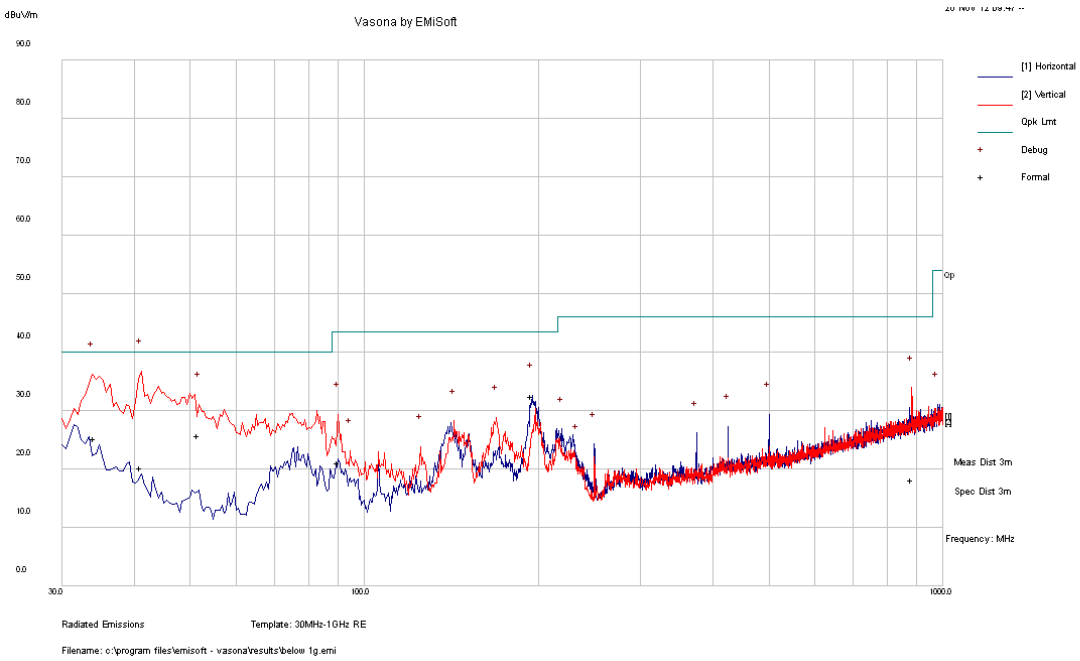
1) 30-1000 MHz, Measured at 3 meters

With AC/DC Adaptor



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector (PK/QP/Ave.)
43.14475	34.8	99	V	113	40	-8.12	QP
51.8125	38.51	133	V	2	40	-8.31	QP
33.067	21.77	279	V	314	40	-13.61	QP
58.899	35.79	118	V	27	40	-11.51	QP
500.00025	30.13	169	H	0	46	-10.86	QP
71.54075	27.87	175	V	3	40	-18.35	QP

With POE



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector (PK/QP/Ave.)
41.12425	21.7	244	V	252	40	-19.82	QP
34.1255	21.45	99	V	154	40	-14.69	QP
51.64075	32.55	211	V	42	40	-14.24	QP
194.92	34.23	205	H	301	43.5	-11.07	QP
882.9768	7.37	286	V	222	46	-27.89	QP
90.1275	27.81	123	V	126	43.5	-22.32	QP

2) Above 1 GHz Measured at 3 meters

With AC/DC Adaptor

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
2240	39.660	100	V	0	74	-34.340	Peak
2240	41.230	100	H	0	74	-32.770	Peak
2240	25.880	100	V	0	54	-28.120	Ave
2240	25.890	100	H	0	54	-28.110	Ave
2788	40.936	100	V	0	74	-33.064	Peak
2788	41.186	100	H	0	74	-32.814	Peak
2788	26.336	100	V	0	54	-27.664	Ave
2788	26.306	100	H	0	54	-27.694	Ave
12577	51.854	100	V	0	74	-22.146	Peak
12577	51.684	100	H	0	74	-22.316	Peak
12577	37.244	100	V	0	54	-16.756	Ave
12577	37.244	100	H	0	54	-16.756	Ave

With POE

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
1220	38.134	100	V	172	74	-35.866	Peak
1220	37.214	100	H	73	74	-36.786	Peak
1220	23.964	100	V	172	54	-30.036	Ave
1220	22.944	100	H	73	54	-31.056	Ave
2264	40.302	100	V	0	74	-33.698	Peak
2264	40.812	100	H	0	74	-33.188	Peak
2264	25.682	100	V	0	54	-28.318	Ave
2264	25.662	100	H	0	54	-28.338	Ave
8173	46.924	100	V	0	74	-27.076	Peak
8173	47.094	100	H	0	74	-26.906	Peak
8173	32.054	100	V	0	54	-21.946	Ave
8173	32.014	100	H	0	54	-21.986	Ave