FCC PART 15.407
IC RSS-210, ISSUE 8, DEC 2010
TEST AND MEASUREMENT REPORT

For

Ruckus Wireless, Inc.

350 West Java Drive,

Sunnyvale, CA 94089, USA

FCC ID: S9GZF7372
IC: 5912A-ZF7372

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

Test Engineers:	Quinn Jiang
Report Number:	R1209061-407 W52
Report Date:	2012-11-07
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1209061-407 W52	Original Report	2012-11-07

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 model: *ZoneFlex 7372, FCC ID: S9GZF7372, IC: 5912A-ZF7372* or the "EUT" as referred to in this report. The EUT is an 2x2 MIMO 802.11 a/b/g/n RLAN Access Point.

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: Radiated Unit:407, and Conducted Unit: 405, provided by the manufacturer

1.3 Objective

This report is prepared on behalf of *Ruckus Wireless, Inc., in* accordance with FCC CFR47 §15.407 and IC RSS-210 Issue 8, Dec 2010.

The objective is to add additional antenna with class II permissive change on the original application by determine compliance with FCC/IC rules for Antenna Requirements, Conducted Emissions, Occupied Bandwidth, Output Power, Power Spectral Density, Radiated and Conducted Spurious Emissions, and Band Edge. Please refer to the detail antenna list in the antenna requirement section.

1.4 Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS with FCC ID: S9GZF7372, IC: 5912A-ZF7372.

1.5 Test Methodology

FCC CFR 47 Part2, Part15.407 and IC RSS-210 Issue 8, Dec 2010.

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.

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

1.7 Test Facility

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

The test 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=8430d44f1f47cf2996124343c704b367816b

2 EUT 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 Equipment Modifications

No modifications were made to the EUT.

2.4 Special Accessories

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

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	-
Ruckus	Antenna (5 GHz)	ZF7300 Horizontal	-
Ruckus	Antenna (5 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	740-64190-001
Ruckus	POE	NPE-5818	-
Ruckus	POE Power Adapter	8A201WU48	740-64125-010

3 Summary of Test Results

FCC & IC Rules	Description of Test	Result
FCC §15.407(f), §2.1091 IC RSS-102	RF Exposure	Compliant
FCC §15.203 IC RSS-Gen §7.1.2	Antenna Requirement	Compliant
FCC §15.207 IC RSS-Gen §7.2.4	AC Power Line Conducted Emissions	Compliant
FCC §15.209(a), 15.407(b) IC RSS-210 §A9.2	Spurious Radiated Emissions	Compliant
FCC §15.407(a) IC RSS-210 §A9.2	26 dB and 99% Emission Bandwidth	Compliant
FCC §407(a)(1) IC RSS-210 §A9.2	Peak Output Power Measurement	Compliant
FCC §2.1051, §15.407(b) IC RSS-210 §A9.2	Band Edges	Compliant
FCC §15.407(a)(1) IC RSS-210 §A9.2	Power Spectral Density	Compliant
FCC §15.407(a)(6)	Peak Excursion Ratio	Compliant
IC RSS-210 §2.3 IC RSS-Gen §4.10	Receiver Spurious Radiated Emissions	Compliant
FCC §2.1051, §15.407(b) IC RSS-210 §A9.2	Spurious Emissions at Antenna Terminals	Compliant

4 FCC §15.407(f), §2.1091 & IC RSS-102 - RF Exposure

4.1 Applicable Standard

According to FCC §15.407(f) 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 (min)
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

W52 Band:

Maximum peak output power at antenna input terminal (dBm):	16.38
Maximum peak output power at antenna input terminal (mW):	43.45
Prediction distance (cm):	20
Prediction frequency (MHz):	5230
Maximum Antenna Gain, typical (dBi):	3
Maximum Antenna Gain (numeric):	1.995
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.017
Power density of prediction frequency at 20.0 cm (W/m^2):	0.17
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 meets FCC/IC MPE requirement for uncontrolled exposure environment at 20 cm distance.

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.

As per 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 milliwatts or less. For devices of output powers greater than 10 milliwatts, 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

Manufacturers	Models/Name	Antenna Gain (dBi) @ 5 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 UFL connectors with less 6 dBi gain; therefore, it complies with the antenna requirement.

6 FCC §15.207 & IC RSS-Gen §7.2.4 - AC Power 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 Note 1	56 to 46 Note 1
0.5-5	56	46
5-30	60	50

Note 1 Decreases with the logarithm of the frequency.

6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2003 measurement procedure. The specification used was FCC §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 test support board was connected with LISN-1 which provided 120 V / 60 Hz AC power.

6.3 Test Procedure

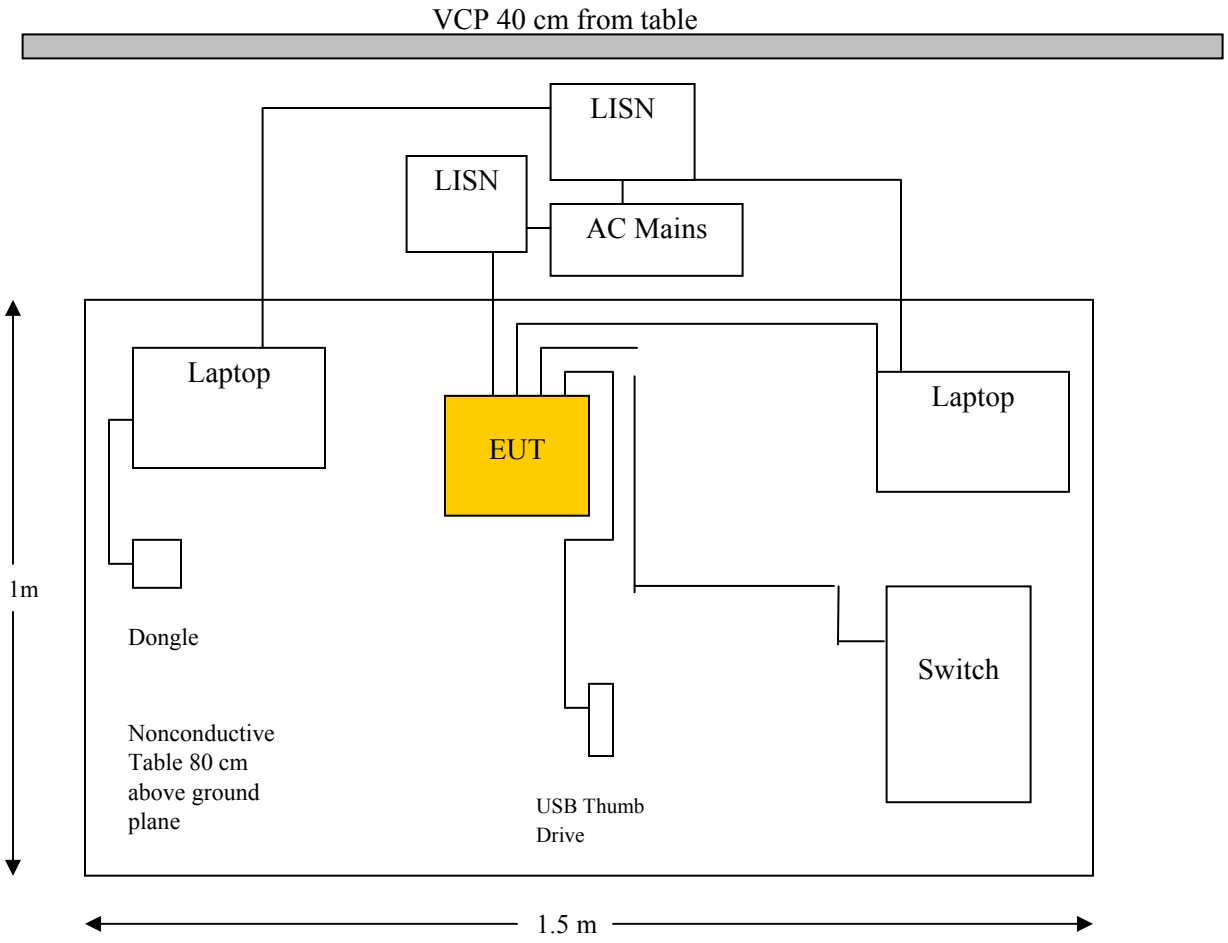
During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-2.

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

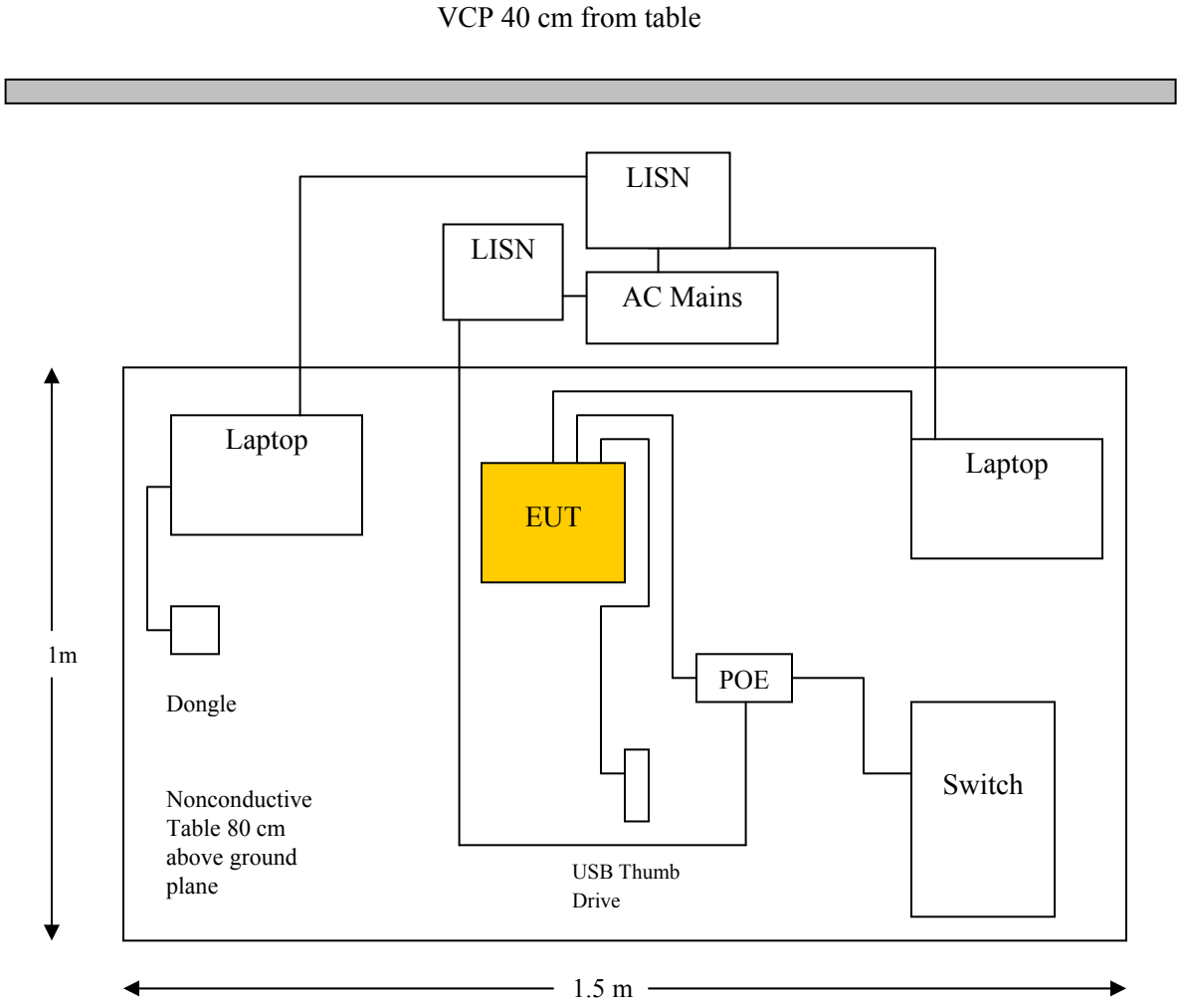
All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with a “QP.” Average readings are distinguished with an “Ave”.

6.4 Test Setup Block Diagram

AC/DC Adaptor:



POE:


VCP 40 cm from table
LISN
LISN
AC Mains
Laptop
EUT
Laptop
1m
POE
Dongle
Switch
Nonconductive
Table 80 cm
above ground
plane
USB Thumb
Drive
1.5 m

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 according to A2LA requirements, traceable to the NIST.*

6.7 Test Environmental Conditions

Temperature:	21 ºC
Relative Humidity:	51%
ATM Pressure:	101.42 kPa

The testing was performed by Bryan Smith on 2012-09-27 in 5 m chamber 2.

6.8 Summary of Test Results

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

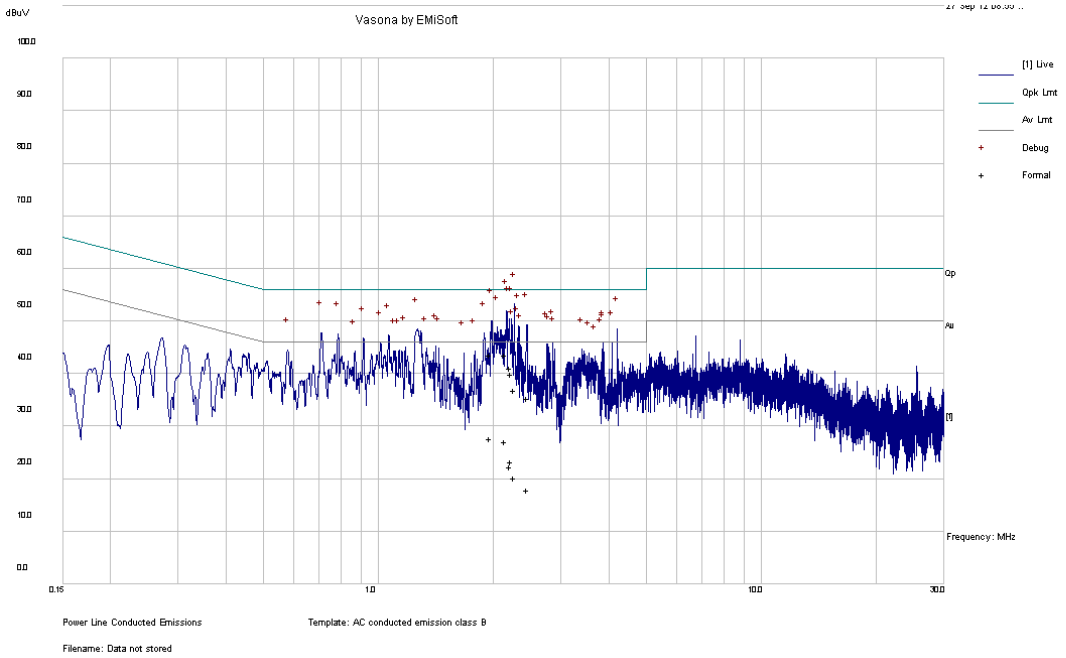
Transmitting Mode: Worst case with both 2.4GHz and 5GHz operating:

Connection: 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor (Line/Neutral)**	**Range (MHz)**
-10.1	2.033856	Neutral	0.15-30

6.9 Conducted Emissions Test Plots and Data

Transmitting Mode: Worst case with both 2.4 GHz and 5 GHz operating:

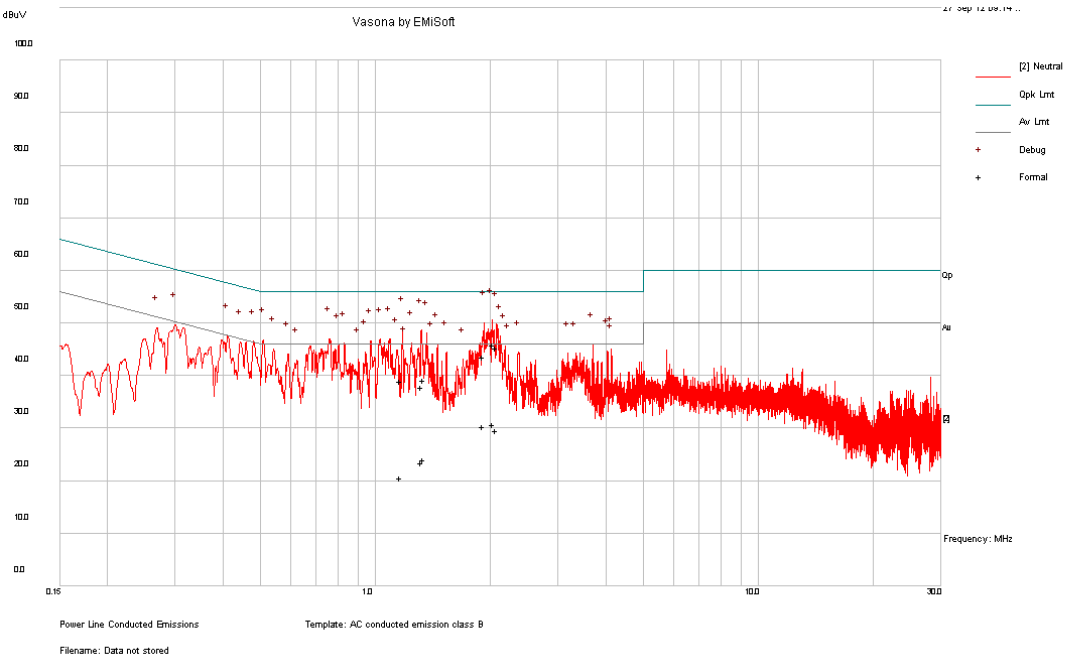
120 V, 60 Hz – Line, AC/DC Adaptor



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
2.14583	43.66	Line	56	-12.34	QP
1.961336	43.55	Line	56	-12.45	QP
2.2109	41.09	Line	56	-14.91	QP
2.224376	40.04	Line	56	-15.96	QP
2.272382	36.93	Line	56	-19.07	QP
2.42981	34.75	Line	56	-21.25	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
1.961336	28.18	Line	46	-17.82	Ave.
2.14583	27.08	Line	46	-18.92	Ave.
2.224376	23.21	Line	46	-22.79	Ave.
2.2109	22.26	Line	46	-23.74	Ave.
2.272382	20.26	Line	46	-25.74	Ave.
2.42981	16.59	Line	46	-29.41	Ave.

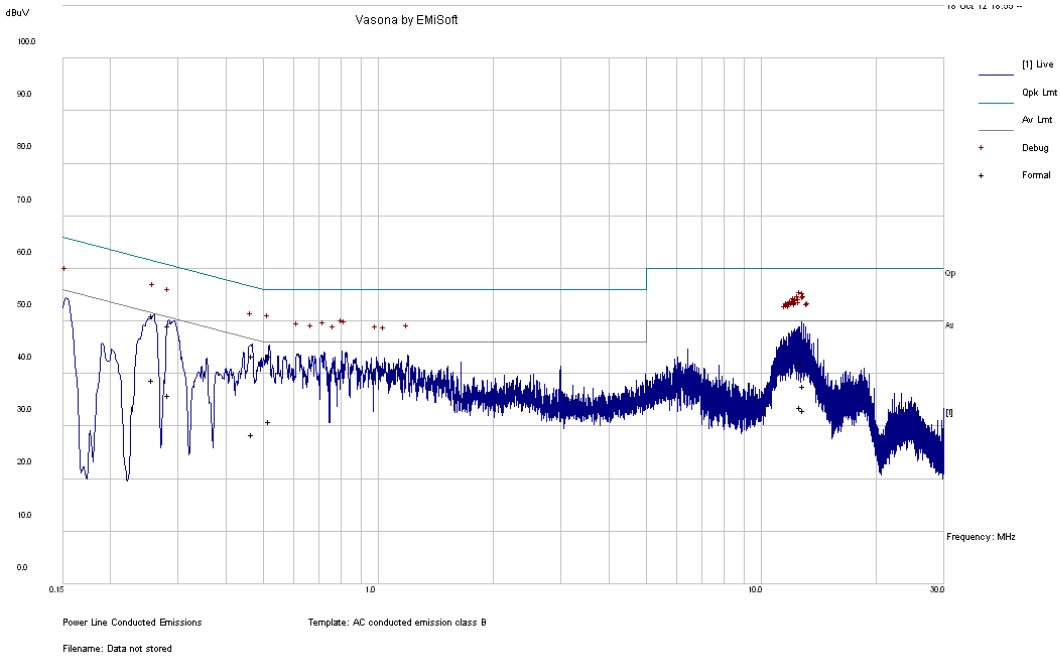
120 V, 60 Hz – Neutral, AC/DC Adaptor



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
2.033856	45.9	Neutral	56	-10.10	QP
2.069532	45.25	Neutral	56	-10.75	QP
1.913054	43.57	Neutral	56	-12.43	QP
1.342622	39.21	Neutral	56	-16.79	QP
1.168757	39.01	Neutral	56	-16.99	QP
1.324043	37.93	Neutral	56	-18.07	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
2.033856	30.74	Neutral	46	-15.26	Ave.
1.913054	30.3	Neutral	46	-15.70	Ave.
2.069532	29.64	Neutral	46	-16.36	Ave.
1.342622	24.12	Neutral	46	-21.88	Ave.
1.324043	23.38	Neutral	46	-22.62	Ave.
1.168757	20.62	Neutral	46	-25.38	Ave.

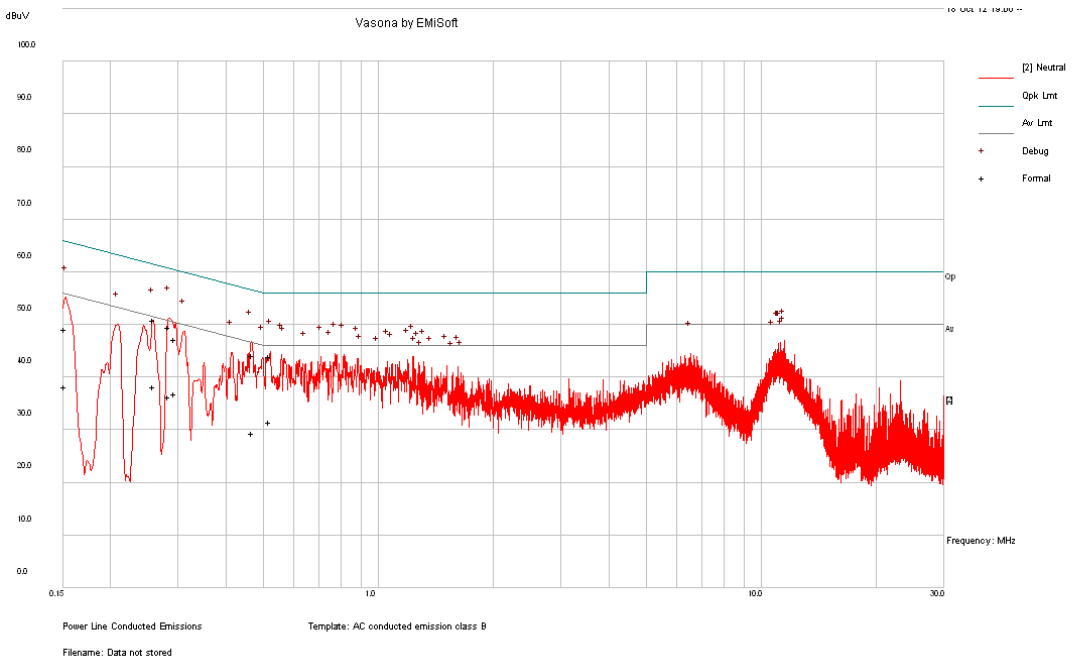
120 V, 60 Hz – Line, POE



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.258441	51.1	Line	61.48	-10.38	QP
0.283167	49.13	Line	60.72	-11.59	QP
0.519939	43.43	Line	56	-12.57	QP
0.468858	43.39	Line	56.53	-13.15	QP
12.69896	41.97	Line	60	-18.03	QP
12.89667	37.71	Line	60	-22.29	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.258441	38.73	Line	51.48	-12.75	Ave.
0.283167	36.02	Line	50.72	-14.70	Ave.
0.519939	31.03	Line	46	-14.97	Ave.
12.69896	33.58	Line	50	-16.42	Ave.
12.89667	33.06	Line	50	-16.94	Ave.
0.468858	28.48	Line	46.53	-18.05	Ave.

120 V, 60 Hz – Neutral, POE



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.259128	50.95	Neutral	61.46	-10.51	QP
0.283362	49.59	Neutral	60.72	-11.13	QP
0.520359	43.88	Neutral	56	-12.12	QP
0.468399	44.21	Neutral	56.54	-12.34	QP
0.294582	47.32	Neutral	60.39	-13.07	QP
0.152043	49.2	Neutral	65.89	-16.68	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.259128	38.19	Neutral	51.46	-13.27	Ave.
0.294582	36.98	Neutral	50.39	-13.42	Ave.
0.283362	36.33	Neutral	50.72	-14.39	Ave.
0.520359	31.56	Neutral	46	-14.44	Ave.
0.468399	29.42	Neutral	46.54	-17.12	Ave.
0.152043	38.23	Neutral	55.89	-17.65	Ave.

7 FCC §15.209, §15.407(b) & IC RSS-210 §A9.2 - Spurious Radiated Emissions

7.1 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 IC 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 Note 1	3
88 - 216	150 Note 1	3
216 - 960	200 Note 1	3
Above 960	500	3

Note 1: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

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

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

7.2 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 15C/15E and IC RSS-210/RSS-Gen limits.

The spacing between the peripherals was 10 centimeters.

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

7.3 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

7.4 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

7.5 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 Corp. *attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.*

7.6 Test Environmental Conditions

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

The testing was performed by Jeffrey Wu from 2012-09-18 to 2012-09-27 in 5 meter chamber 3.

7.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15.205, 15.209 and 15.407 & IC RSS-210, RSS-Gen standard's radiated emissions limits, and had the worst margin of:

5150-5250 MHz

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-0.457	5150	Vertical	Above 1 GHz

Note: Radiated emissions were performed on 802.11a/ht20 and 802.11.ht40. Between 802.11a and 802.11n HT20, worst case was measured.

7.8 Radiated Emissions Test Result Data

1) Radiated Emission at 3 meters, 5150-5250 MHz Band

802.11n HT20 Mode, Low Channel

Below 1 GHz

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
167.3443	21.34	100	V	0	43.5	-22.16	QP
249.9513	20.96	215	V	244	46	-25.04	QP
499.9813	33.68	132	V	73	46	-12.32	QP

Above 1 GHz

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 5180 MHz, measured at 3 meters											
5180	72.83	127	100	V	33.8	2.82	0.00	109.424	-	-	Peak
5180	72.67	140	100	H	33.8	2.82	0.00	109.264	-	-	Peak
5180	60.83	127	100	V	33.8	2.82	0.00	97.424	-	-	Ave
5180	60.5	140	100	H	33.8	2.82	0.00	97.094	-	-	Ave
4900	44.35	45	114	V	32.8	4.10	27.75	53.500	74	-20.500	Peak
4900	45.65	55	114	H	32.8	4.10	27.75	54.800	74	-19.200	Peak
4900	33.31	45	114	V	32.8	4.10	27.75	42.460	54	-11.540	Ave
4900	37.78	55	114	H	32.8	4.10	27.75	46.930	54	-7.070	Ave
5150	32.83	127	100	V	33.5	4.52	0.00	70.843	74	-3.157	Peak
5150	28.36	140	100	H	33.5	4.52	0.00	66.373	74	-7.627	Peak
5150	15.53	127	100	V	33.5	4.52	0.00	53.543	54	-0.457	Ave
5150	13.99	140	100	H	33.5	4.52	0.00	52.003	54	-1.997	Ave
10360	37.92	129	164	V	38.1	6.14	26.98	55.166	88.23	-33.064	Peak
10360	38.42	122	139	H	38.1	6.14	26.98	55.666	88.23	-32.564	Peak
10360	21.96	129	164	V	38.1	6.14	26.98	39.206	68.23	-29.024	Ave
10360	22.84	122	139	H	38.1	6.14	26.98	40.086	68.23	-28.144	Ave
15540	32.4	0	100	V	38.1	7.47	25.92	52.012	74	-21.988	Peak
15540	32.29	0	100	H	38.1	7.47	25.92	51.902	74	-22.098	Peak
15540	18.03	0	100	V	38.1	7.47	25.92	37.642	54	-16.358	Ave
15540	18.04	0	100	H	38.1	7.47	25.92	37.652	54	-16.348	Ave
20720	32.42	0	100	V	34.4	9.36	29.00	47.180	74	-26.820	Peak
20720	31.57	0	100	H	34.4	9.36	29.00	46.33	74	-27.67	Peak
20720	18.78	0	100	V	34.4	9.36	29.00	33.540	54	-20.460	Ave
20720	17.68	0	100	H	34.4	9.36	29.00	32.44	54	-21.56	Ave

802.11n HT20 Mode, Middle Channel

Below 1 GHz

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
167.3443	20.98	103	V	4	43.5	-22.52	QP
249.9513	20.85	227	V	248	46	-25.15	QP
499.9813	34.62	101	V	64	46	-11.38	QP

Above 1 GHz

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)	
Middle Channel 5200 MHz, measured at 3 meters											
5200	73	43	100	V	33.8	2.82	0.00	109.594	-	-	Peak
5200	73.5	12	100	H	33.8	2.82	0.00	110.094	-	-	Peak
5200	60.67	43	100	V	33.8	2.82	0.00	97.264	-	-	Ave
5200	60.33	12	100	H	33.8	2.82	0.00	96.924	-	-	Ave
4900	44.35	45	114	V	32.8	4.10	27.75	53.500	74	-20.500	Peak
4900	45.65	55	114	H	32.8	4.10	27.75	54.800	74	-19.200	Peak
4900	33.31	45	114	V	32.8	4.10	27.75	42.460	54	-11.540	Ave
4900	37.78	55	114	H	32.8	4.10	27.75	46.930	54	-7.070	Ave
5150	27.61	0	100	V	33.5	4.52	0.00	65.623	74	-8.377	Peak
5150	27.44	0	100	H	33.5	4.52	0.00	65.453	74	-8.547	Peak
5150	14.28	0	100	V	33.5	4.52	0.00	52.293	54	-1.707	Ave
5150	13.35	0	100	H	33.5	4.52	0.00	51.363	54	-2.637	Ave
10400	35.64	53	160	V	38.0	6.14	26.97	52.841	88.23	-35.389	Peak
10400	41.32	41	143	H	38.0	6.14	26.97	58.521	88.23	-29.709	Peak
10400	20.54	53	160	V	38.0	6.14	26.97	37.741	68.23	-30.489	Ave
10400	24.59	41	143	H	38.0	6.14	26.97	41.791	68.23	-26.439	Ave
15600	32.84	0	100	V	37.9	7.47	26.00	52.225	74	-21.775	Peak
15600	32.49	0	100	H	37.9	7.47	26.00	51.875	74	-22.125	Peak
15600	18.16	0	100	V	37.9	7.47	26.00	37.545	54	-16.455	Ave
15600	18.15	0	100	H	37.9	7.47	26.00	37.535	54	-16.465	Ave
20800	31.61	0	100	V	34.6	9.36	28.90	46.670	74	-27.330	Peak
20800	31.67	0	100	H	34.6	9.36	28.90	46.730	74	-27.270	Peak
20800	18.24	0	100	V	34.6	9.36	28.90	33.300	54	-20.700	Ave
20800	18.27	0	100	H	34.6	9.36	28.90	33.330	54	-20.670	Ave

802.11n HT20 Mode, High Channel

Below 1 GHz

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
167.3443	21.45	102	V	6	43.5	-22.05	QP
249.9513	19.46	221	V	235	46	-26.54	QP
499.9813	34.85	107	V	60	46	-11.15	QP

Above 1 GHz

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 5240 MHz, measured at 3 meters											
5240	74	44	100	V	33.8	2.82	0.00	110.594	-	-	Peak
5240	73.33	13	100	H	33.8	2.82	0.00	109.924	-	-	Peak
5240	61.33	44	100	V	33.8	2.82	0.00	97.924	-	-	Ave
5240	60.67	13	100	H	33.8	2.82	0.00	97.264	-	-	Ave
4900	43.9	55	114	V	32.8	4.10	27.75	53.050	74	-20.950	Peak
4900	44.35	43	114	H	32.8	4.10	27.75	53.500	74	-20.500	Peak
4900	33.63	55	114	V	32.8	4.10	27.75	42.780	54	-11.220	Ave
4900	38.88	43	114	H	32.8	4.10	27.75	48.030	54	-5.970	Ave
5150	28.22	0	100	V	33.5	4.52	0.00	66.233	74	-7.767	Peak
5150	28.22	0	100	H	33.5	4.52	0.00	66.233	74	-7.767	Peak
5150	13.66	0	100	V	33.5	4.52	0.00	51.673	54	-2.327	Ave
5150	14.13	0	100	H	33.5	4.52	0.00	52.143	54	-1.857	Ave
10480	31.07	0	100	V	38.1	6.14	26.93	48.341	88.23	-39.889	Peak
10480	31.46	0	100	H	38.1	6.14	26.93	48.731	88.23	-39.499	Peak
10480	16.23	0	100	V	38.1	6.14	26.93	33.501	68.23	-34.729	Ave
10480	16.24	0	100	H	38.1	6.14	26.93	33.511	68.23	-34.719	Ave
15720	33.13	0	100	V	37.6	7.47	25.97	52.242	74	-21.758	Peak
15720	32.86	0	100	H	37.6	7.47	25.97	51.972	74	-22.028	Peak
15720	18.3	0	100	V	37.6	7.47	25.97	37.412	54	-16.588	Ave
15720	18.46	0	100	H	37.6	7.47	25.97	37.572	54	-16.428	Ave
20960	31.95	0	100	V	34.6	9.36	29.00	46.910	74	-27.090	Peak
20960	32.08	0	100	H	34.6	9.36	29.00	47.040	74	-26.960	Peak
20960	18.92	0	100	V	34.6	9.36	29.00	33.880	54	-20.120	Ave
20960	19.13	0	100	H	34.6	9.36	29.00	34.090	54	-19.910	Ave

802.11n HT40 Mode, Low Channel

Below 1 GHz

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
167.3443	21.56	103	V	1	43.5	-21.94	QP
249.9513	21.03	200	V	250	46	-24.97	QP
499.9813	34.56	100	V	62	46	-11.44	QP

Above 1 GHz

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 5190 MHz, measured at 3 meters											
5190	72.17	44	100	V	33.8	2.82	0.00	108.764	-	-	Peak
5190	72.5	13	100	H	33.8	2.82	0.00	109.094	-	-	Peak
5190	59.17	44	100	V	33.8	2.82	0.00	95.764	-	-	Ave
5190	58.67	13	100	H	33.8	2.82	0.00	95.264	-	-	Ave
4900	46.73	138	104	V	32.8	4.10	27.75	55.880	74	-18.120	Peak
4900	43.11	40	118	H	32.8	4.10	27.75	52.260	74	-21.740	Peak
4900	27.9	138	104	V	32.8	4.10	27.75	37.050	54	-16.950	Ave
4900	34.44	40	118	H	32.8	4.10	27.75	43.590	54	-10.410	Ave
5150	32.91	129	100	V	33.5	4.52	0.00	70.93	74	-3.07	Peak
5150	30.36	37	100	H	33.5	4.52	0.00	68.373	74	-5.627	Peak
5150	15.43	129	100	V	33.5	4.52	0.00	53.45	54	-0.55	Ave
5150	14.35	37	100	H	33.5	4.52	0.00	52.363	54	-1.637	Ave
10380	38.19	50	169	V	38.1	6.14	26.98	55.436	88.23	-32.794	Peak
10360	42.04	41	144	H	38.1	6.14	26.98	59.286	88.23	-28.944	Peak
10360	22.47	50	169	V	38.1	6.14	26.98	39.716	68.23	-28.514	Ave
10360	26.08	41	144	H	38.1	6.14	26.98	43.326	68.23	-24.904	Ave
15570	31.51	0	100	V	38.1	7.47	25.92	51.122	74	-22.878	Peak
15570	32.59	0	100	H	38.1	7.47	25.92	52.202	74	-21.798	Peak
15570	18.03	0	100	V	38.1	7.47	25.92	37.642	54	-16.358	Ave
15570	18.18	0	100	H	38.1	7.47	25.92	37.792	54	-16.208	Ave
20760	32.65	0	100	V	34.4	9.36	29.00	47.410	74	-26.590	Peak
20760	31.78	0	100	H	34.4	9.36	29.00	46.540	74	-27.460	Peak
20760	19.25	0	100	V	34.4	9.36	29.00	34.010	54	-19.990	Ave
20760	18.57	0	100	H	34.4	9.36	29.00	33.330	54	-20.670	Ave

802.11n HT40 Mode, High Channel

Below 1 GHz

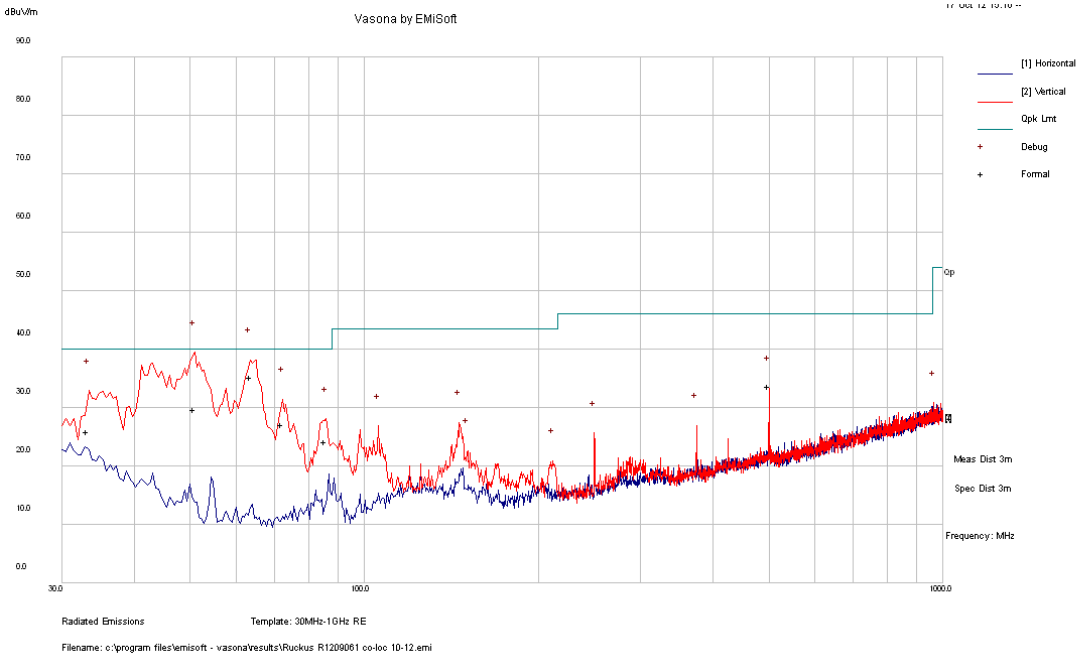
Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
167.3443	21.78	102	V	4	43.5	-21.72	QP
249.9513	21.56	223	V	258	46	-24.44	QP
499.9813	34.72	100	V	58	46	-11.28	QP

Above 1 GHz

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 5230 MHz, measured at 3 meters											
5230	72.33	45	100	V	33.8	2.82	0.00	108.924	-	-	Peak
5230	72.17	15	100	H	33.8	2.82	0.00	108.764	-	-	Peak
5230	59.5	45	100	V	33.8	2.82	0.00	96.094	-	-	Ave
5230	59.17	15	100	H	33.8	2.82	0.00	95.764	-	-	Ave
4900	46.21	143	105	V	32.8	4.10	27.75	55.360	74	-18.640	Peak
4900	42.23	30	172	H	32.8	4.10	27.75	51.380	74	-22.620	Peak
4900	27.33	143	105	V	32.8	4.10	27.75	36.480	54	-17.520	Ave
4900	35.21	30	172	H	32.8	4.10	27.75	44.360	54	-9.640	Ave
5150	27.52	0	100	V	33.5	4.52	0.00	65.533	74	-8.467	Peak
5150	27.5	0	100	H	33.5	4.52	0.00	65.513	74	-8.487	Peak
5150	13.58	0	100	V	33.5	4.52	0.00	51.593	54	-2.407	Ave
5150	13.89	0	100	H	33.5	4.52	0.00	51.903	54	-2.097	Ave
10460	34.29	147	222	V	38.0	6.14	26.92	51.528	88.23	-36.702	Peak
10460	40.43	41	135	H	38.0	6.14	26.92	57.668	88.23	-30.562	Peak
10460	19.66	147	222	V	38.0	6.14	26.92	36.898	68.23	-31.332	Ave
10460	24.95	41	135	H	38.0	6.14	26.92	42.188	68.23	-26.042	Ave
15690	32.33	0	100	V	37.8	7.47	25.94	51.632	74	-22.368	Peak
15690	33.59	0	100	H	37.8	7.47	25.94	52.892	74	-21.108	Peak
15690	18.39	0	100	V	37.8	7.47	25.94	37.692	54	-16.308	Ave
15690	18.39	0	100	H	37.8	7.47	25.94	37.692	54	-16.308	Ave
20920	31.86	0	100	V	34.7	9.36	29.00	46.920	74	-27.080	Peak
20920	31.59	0	100	H	34.7	9.36	29.00	46.650	74	-27.350	Peak
20920	18.54	0	100	V	34.7	9.36	29.00	33.600	54	-20.400	Ave
20920	18.29	0	100	H	34.7	9.36	29.00	33.350	54	-20.650	Ave

2) Co-location with 2.4 GHz and 5 GHz

Worst Case: 2.4 GHz: 802.11b, 2412 MHz; 5.2GHz: 802.11a, 5230MHz



30-1000 MHz:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
33.18275	25.88	138	V	84	40	-14.12
50.75575	29.69	172	V	353	40	-10.31
63.48775	35.2	100	V	312	40	-4.80
71.976	27.24	100	V	201	40	-12.76
85.609	24.2	144	V	264	40	-15.80
500.0003	33.72	99	V	51	46	-12.28

Above 1 GHz:

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)	
4824	44.9	119	163	V	32.7	4.56	27.70	54.471	74	-19.529	Peak
4824	46.06	338	173	H	32.7	4.56	27.70	55.631	74	-18.369	Peak
4824	42.47	119	163	V	32.7	4.56	27.70	52.041	54	-1.959	Ave
4824	43.89	338	173	H	32.7	4.56	27.70	53.461	54	-0.539	Ave
7236	36.05	282	167	V	36.2	5.49	27.6	50.206	74	-23.794	Peak
7236	40.97	303	179	H	36.2	5.49	27.6	55.126	74	-18.874	Peak
7236	27.55	282	167	V	36.2	5.49	27.6	41.706	54	-12.294	Ave
7236	34.72	303	179	H	36.2	5.49	27.6	48.876	54	-5.124	Ave
10460	36.95	52	156	V	37.9	7.02	26.92	54.979	74	-19.021	Peak
10460	42.43	109	133	H	37.9	7.02	26.92	60.459	74	-13.541	Peak
10460	21.49	52	156	V	37.9	7.02	26.92	39.519	54	-14.481	Ave
10460	25.66	109	133	H	37.9	7.02	26.92	43.689	54	-10.311	Ave

8 FCC §15.407(a) & IC RSS-210 §A9.2 – 26 dB & 99% Emission Bandwidth

8.1 Applicable Standard

FCC §15.407(a) and IC RSS-210 §A9.2.

8.2 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 26 dB from the reference level. Record the frequency difference as the emissions bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

8.3 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 according to A2LA requirements, traceable to the NIST.*

8.4 Test Environmental Conditions

Temperature:	22 °C
Relative Humidity:	43 %
ATM Pressure:	101.1 kPa

The testing was performed by Jeffrey Wu on 2012-10-17in RF site.

8.5 Test Results

5150-5250 MHz Band

802.11a mode

Channel	Frequency (MHz)	26 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (kHz)	Results
Chain J0					
Low	5180	23.267	16.9112	> 500	Compliant
Middle	5200	22.553	16.8436	> 500	Compliant
High	5240	24.019	16.9090	> 500	Compliant
Chain J1					
Low	5180	23.580	17.0160	> 500	Compliant
Middle	5200	25.076	16.9917	> 500	Compliant
High	5240	25.457	16.9786	> 500	Compliant

802.11n HT20 mode

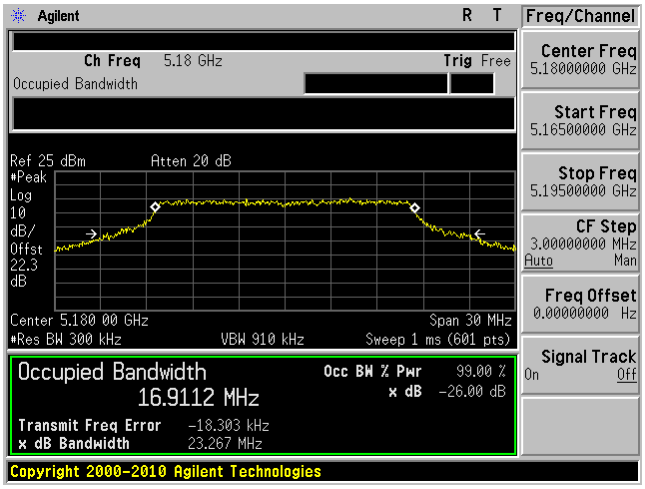
Channel	Frequency (MHz)	26 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (kHz)	Results
Chain J0					
Low	5180	24.563	18.0252	> 500	Compliant
Middle	5200	24.693	18.0157	> 500	Compliant
High	5240	24.686	18.1046	> 500	Compliant
Chain J1					
Low	5180	24.792	18.1423	> 500	Compliant
Middle	5200	24.425	18.0967	> 500	Compliant
High	5240	24.757	18.1508	> 500	Compliant

802.11n HT40 mode

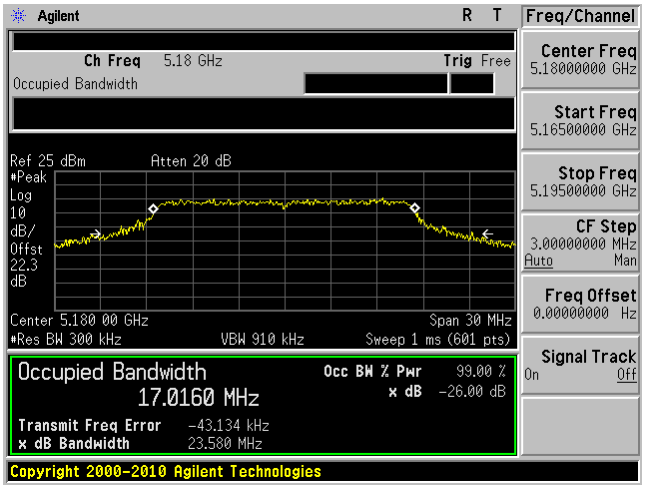
Channel	Frequency (MHz)	26 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (kHz)	Results
Chain J0					
Low	5190	48.119	36.8389	> 500	Compliant
High	5230	50.151	36.7987	> 500	Compliant
Chain J1					
Low	5190	49.997	37.1143	> 500	Compliant
High	5230	50.302	37.0477	> 500	Compliant

5150-5250 MHz Band

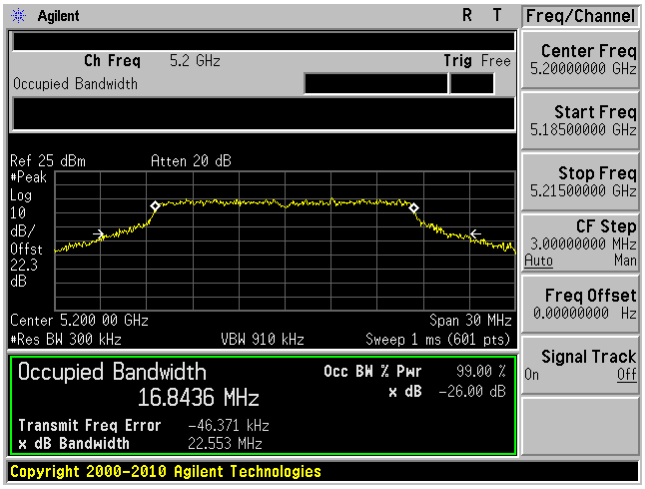
802.11a mode, 5180 MHz, Chain J0



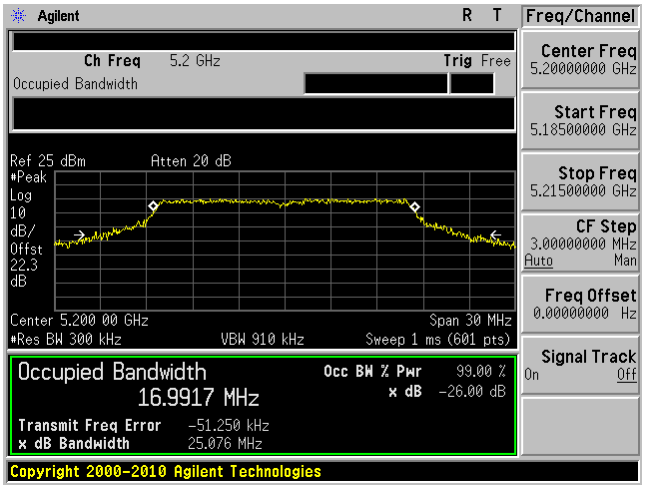
802.11a mode, 5180 MHz, Chain J1



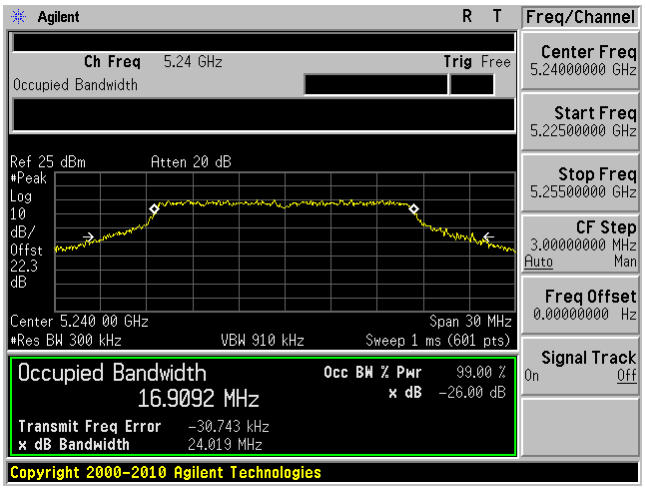
802.11a mode, 5200 MHz, Chain J0



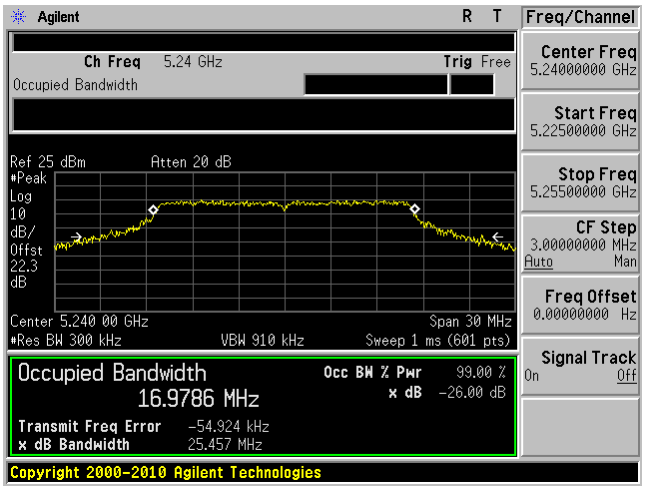
802.11a mode, 5200 MHz, Chain J1



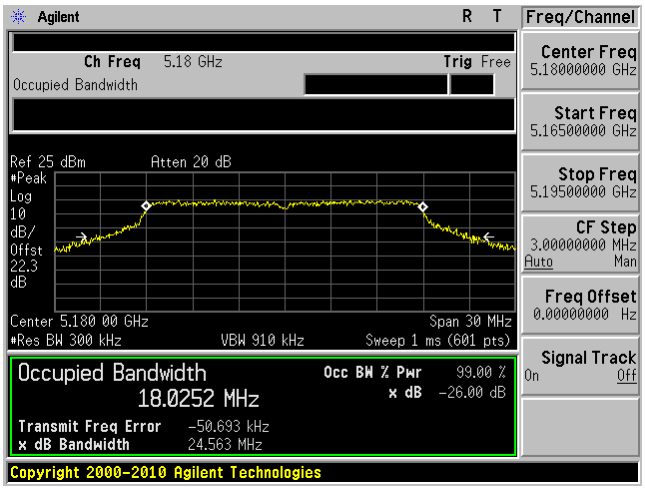
802.11a mode, 5240 MHz, Chain J0



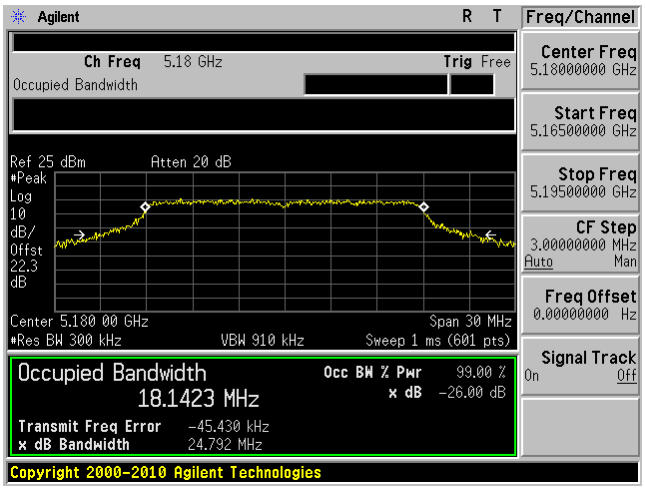
802.11a mode, 5240 MHz, Chain J1



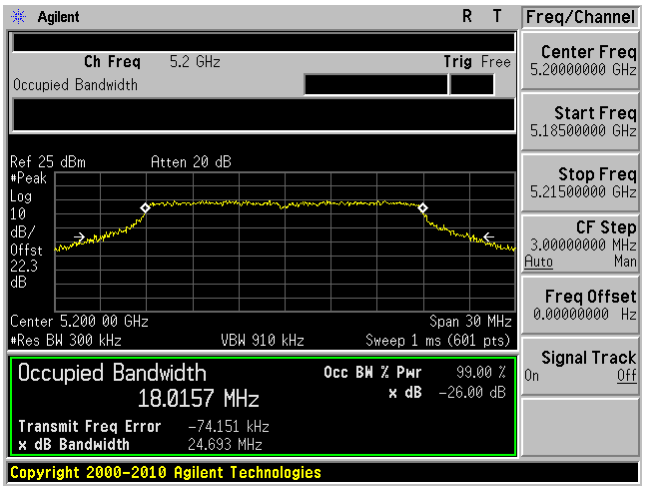
802.11n HT20 mode, 5180 MHz, Chain J0



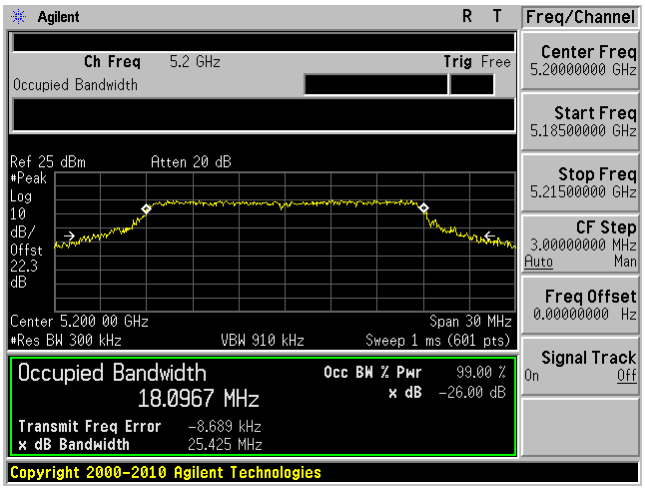
802.11n HT20 mode, 5180 MHz, Chain J1



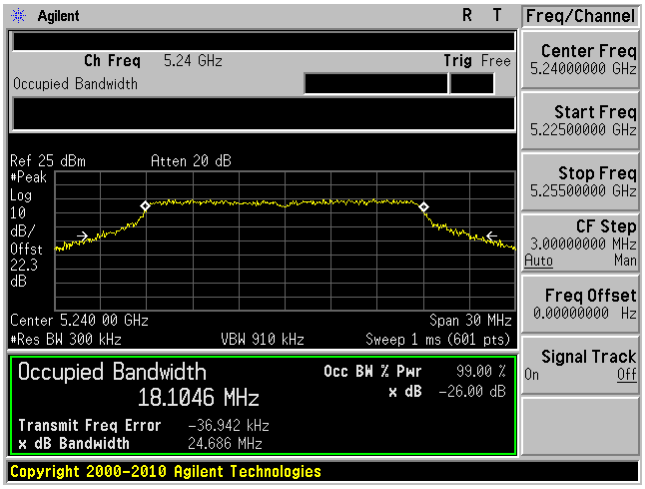
802.11n HT20 mode, 5200 MHz, Chain J0



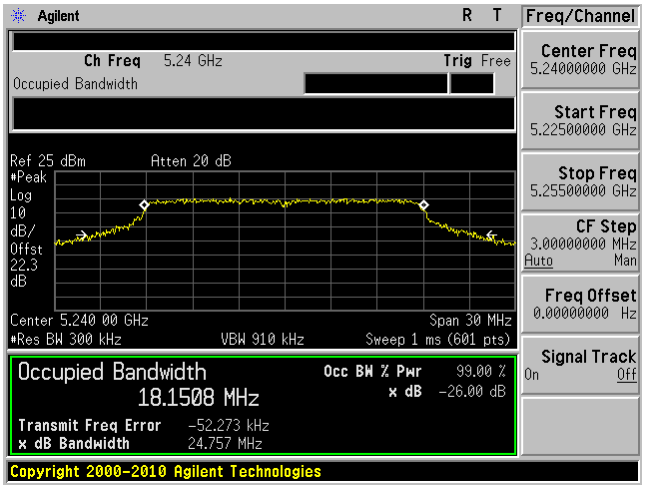
802.11n HT20 mode, 5200 MHz, Chain J1



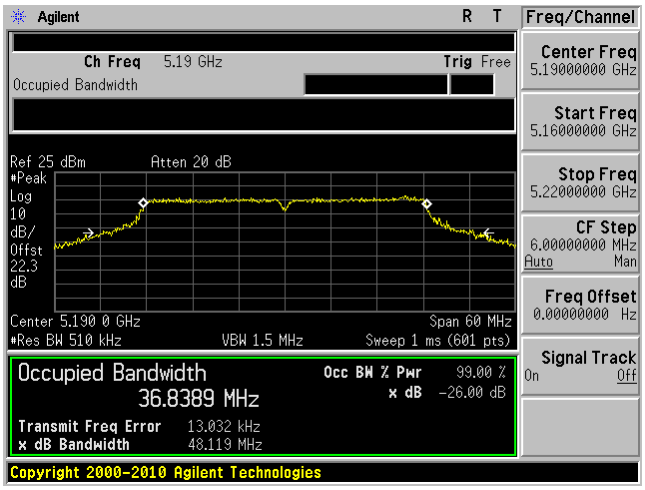
802.11n HT20 mode, 5240 MHz, Chain J0



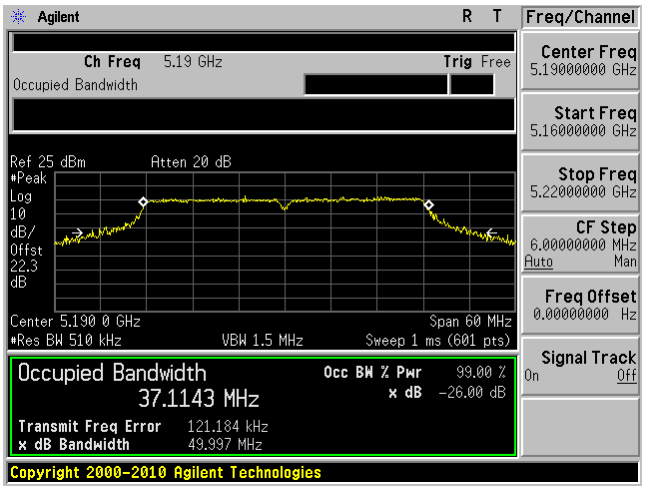
802.11n HT20 mode, 5240 MHz, Chain J1



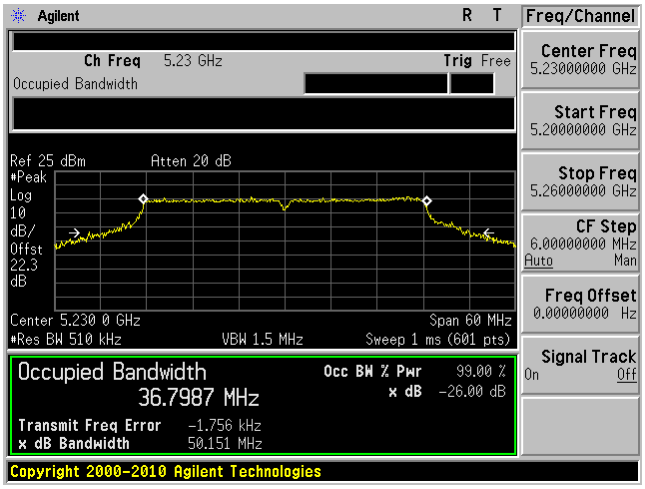
802.11n HT40 mode, 5190 MHz, Chain J0



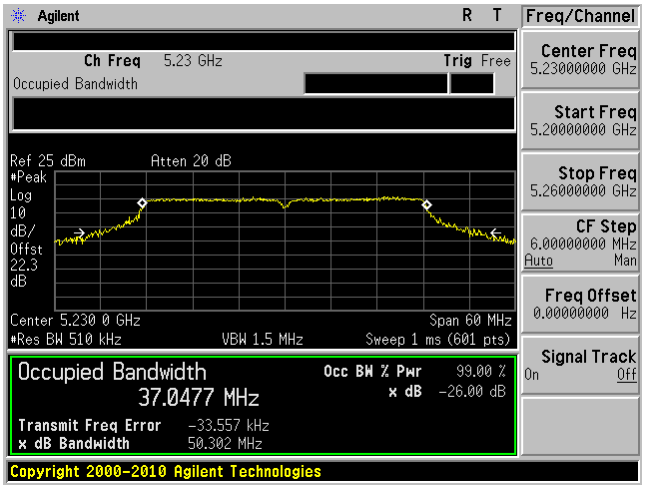
802.11n HT40 mode, 5190 MHz, Chain J1



802.11n HT40 mode, 5230 MHz, Chain J0



802.11n HT40 mode, 5230 MHz, Chain J1



9 FCC §407(a)(1) & IC RSS-210 §A9.2 - Peak Output Power Measurement

9.1 Applicable Standard

According to FCC §15.407(a)(1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

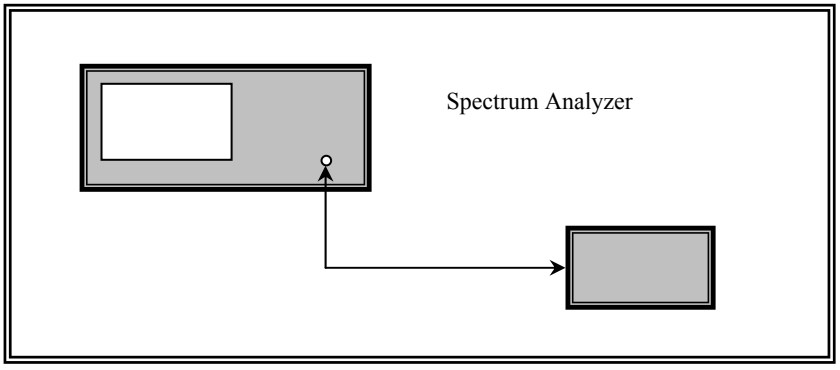
For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to IC RSS-210 §A9.2:

For the 5.15–5.250 GHz bands, the maximum e.i.r.p shall not exceed 200 mW or 10 + 10 log B, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p spectral density shall not exceed 10 dBm in any 1.0 MHz band.

9.2 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.



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 according to A2LA requirements, traceable to the NIST.*

9.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	43 %
ATM Pressure:	101.5 kPa

The testing was performed by Jeffrey Wu on 2012-09-24 in RF site.

9.5 Test Results

5150-5250 MHz Band:

802.11a mode

Channel	Frequency (MHz)	TX Chain J0 Power (dBm)	TX Chain J1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)	Power Setting
Low	5180	11.6	11.71	14.67	17	-2.33	13.5
Middle	5200	11.21	11.83	14.54	17	-2.46	13.5
High	5240	11.51	11.56	14.55	17	-2.45	14

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	5180	12.21	12.28	15.26	17	-1.74	14
Middle	5200	12.19	12.72	15.47	17	-1.53	14.5
High	5240	11.79	11.94	14.88	17	-2.12	14.5

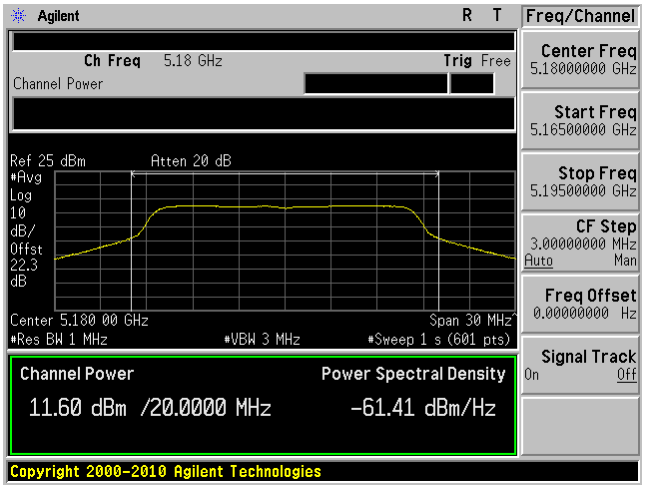
802.11n HT40 mode

Channel	Frequency (MHz)	TX Chain J0 Power (dBm)	TX Chain J1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)	Power Setting
Low	5190	11.44	11.62	14.45	17	-2.55	13
High	5230	13.03	13.69	16.38	17	-0.62	15

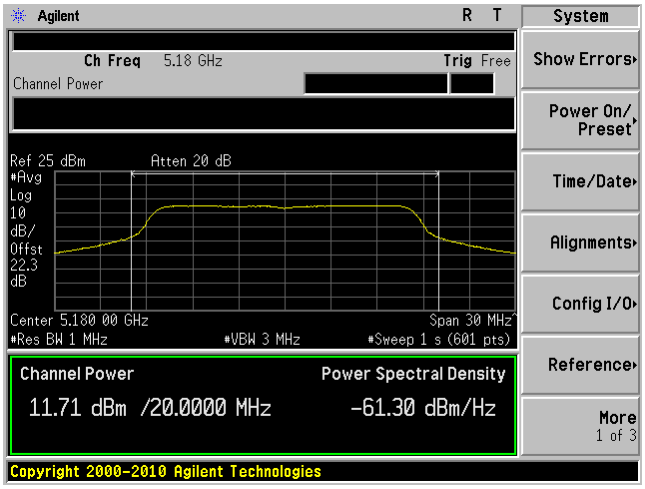
5150-5250 MHz Band

802.11a mode

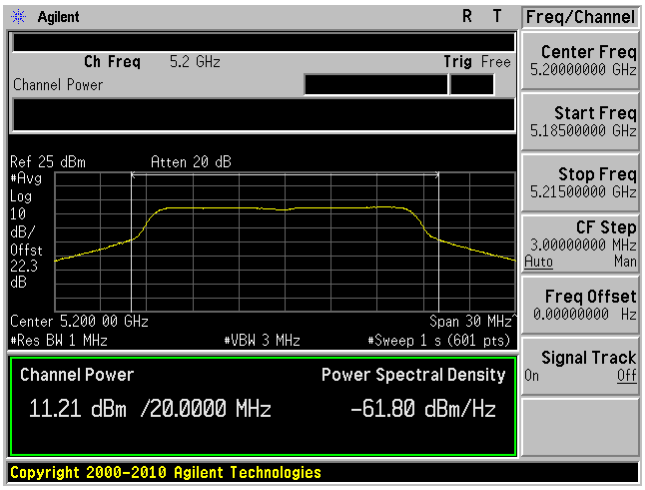
802.11a mode, 5180 MHz, Chain J0



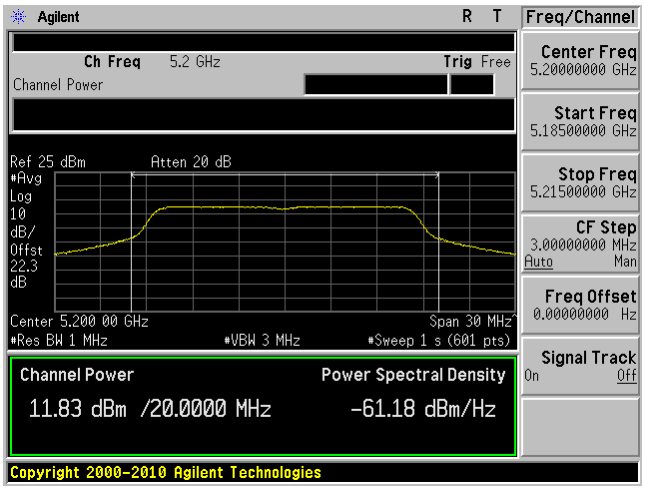
802.11a mode, 5180 MHz, Chain J1



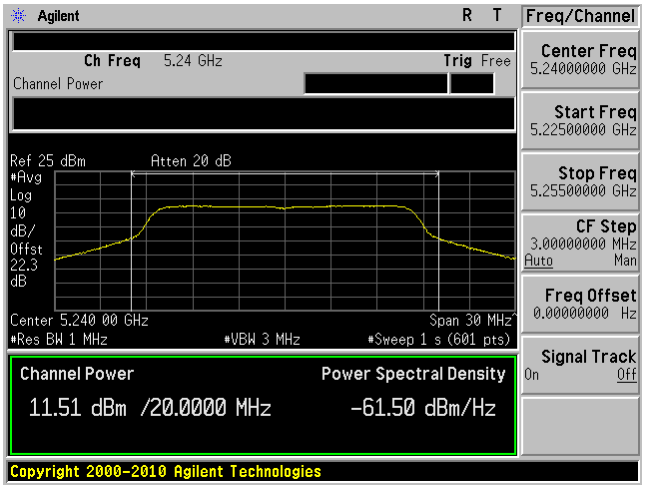
802.11a mode, 5200 MHz, Chain J0



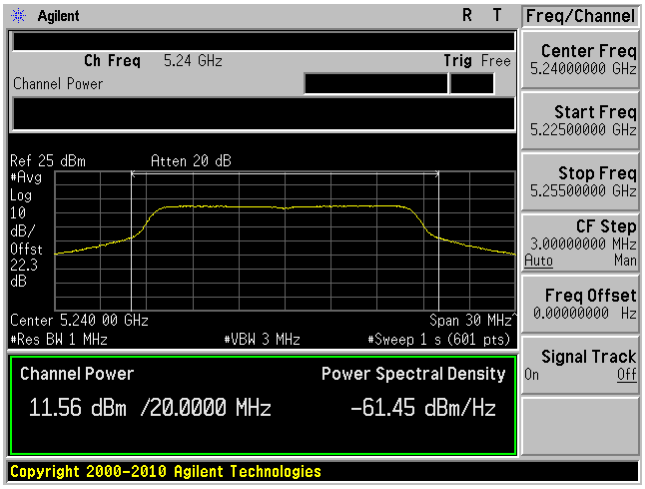
802.11a mode, 5200 MHz, Chain J1



802.11a mode, 5240 MHz, Chain J0

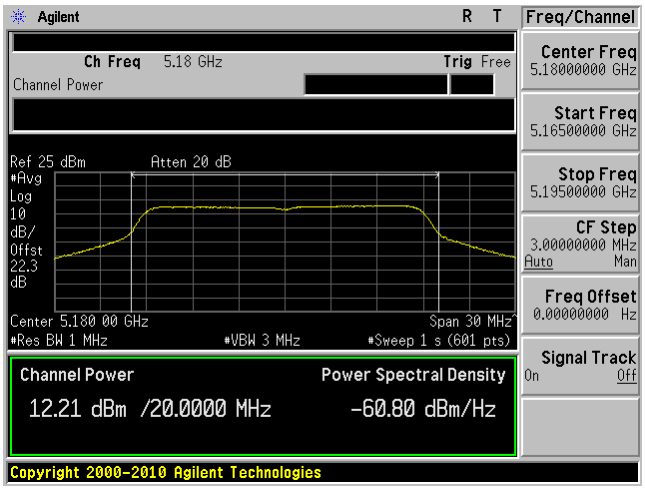


802.11a mode, 5240 MHz, Chain J1

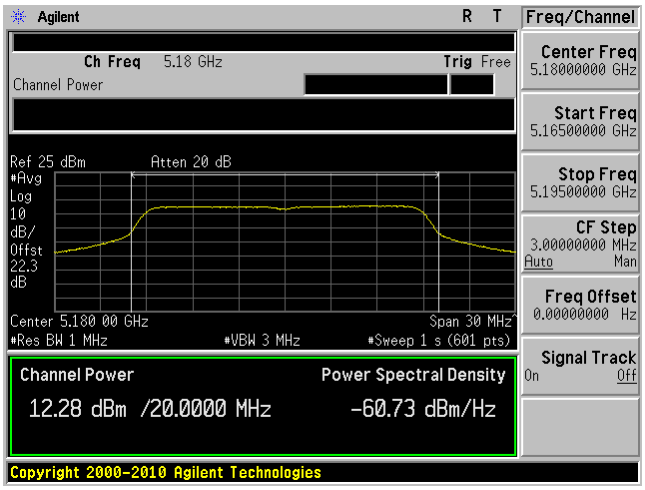


802.11n HT20 mode

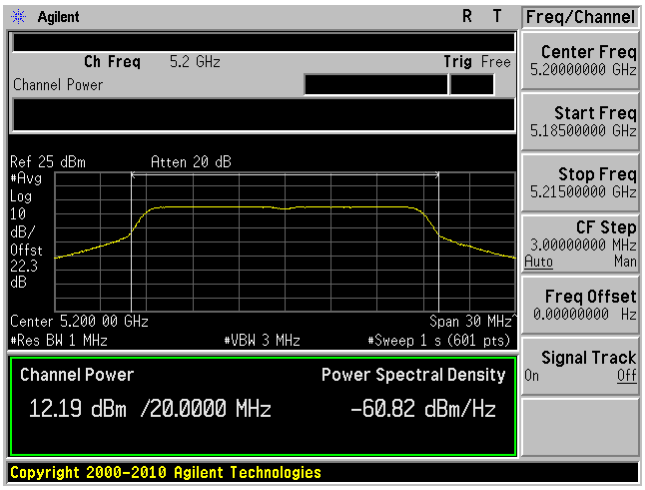
802.11n HT20 mode, 5180 MHz, Chain J0



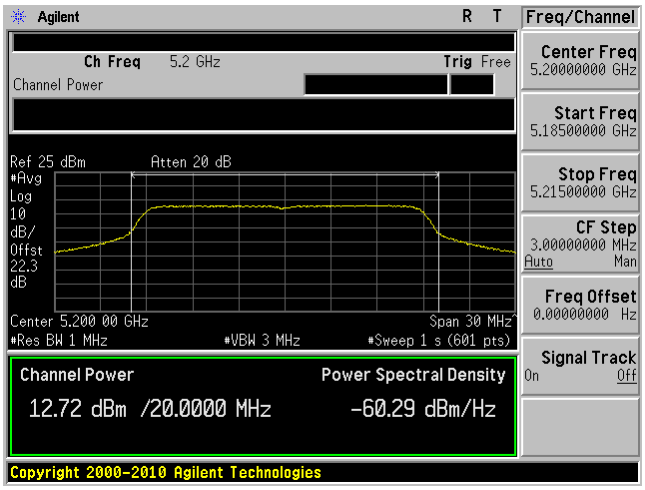
802.11n HT20 mode, 5180 MHz, Chain J1



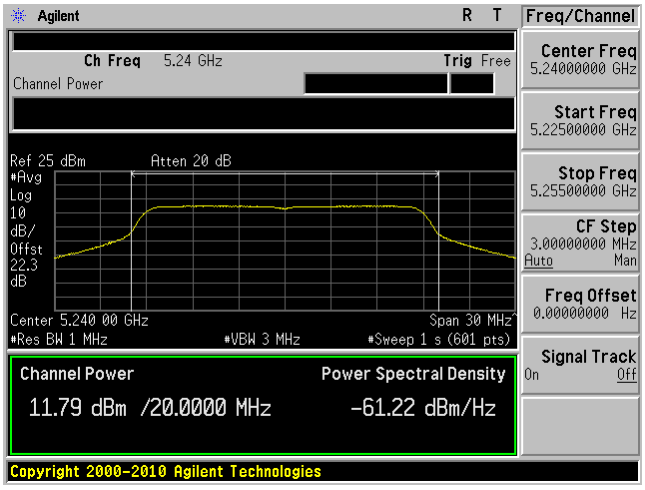
802.11n HT20 mode, 5200 MHz, Chain J0



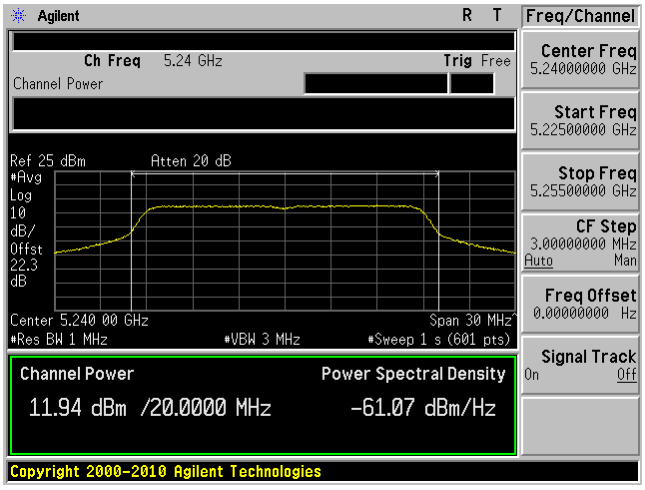
802.11n HT20 mode, 5200 MHz, Chain J1



802.11n HT20 mode, 5240 MHz, Chain J0

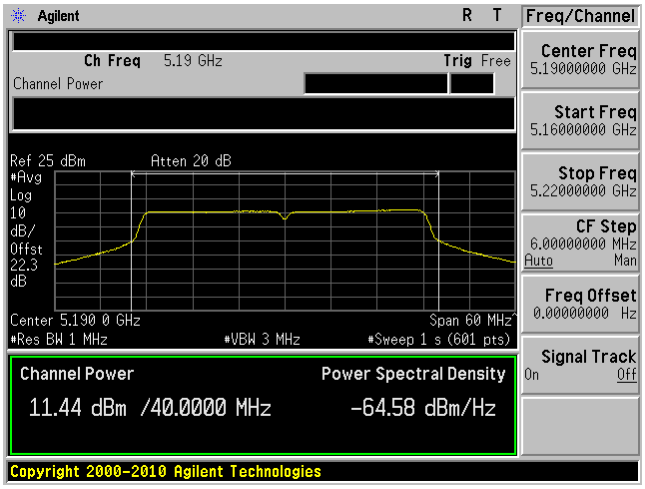


802.11n HT20 mode, 5240 MHz, Chain J1

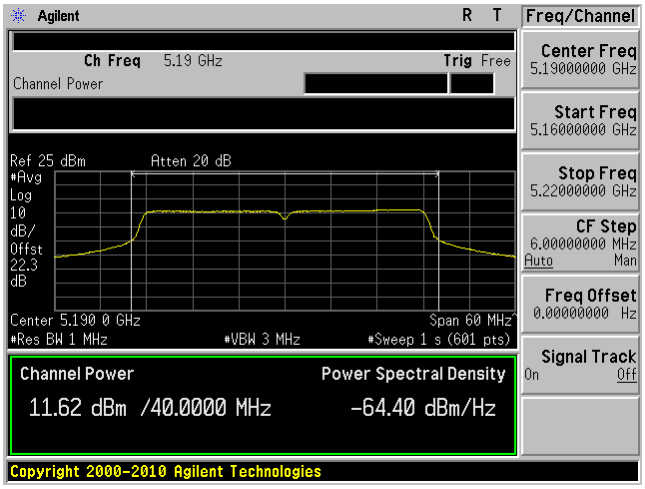


802.11n HT40 mode

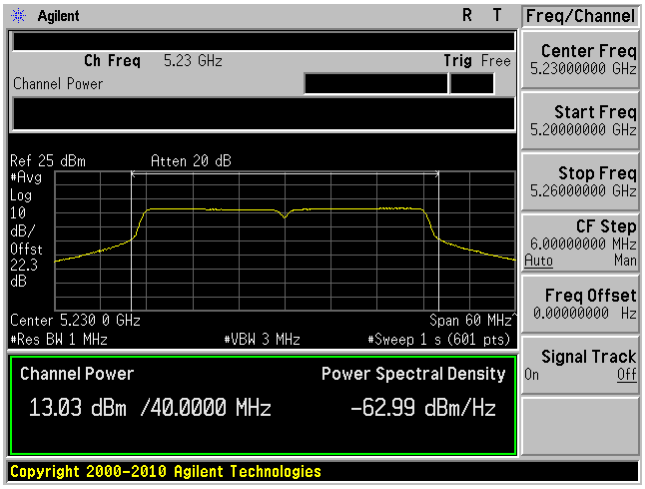
802.11n HT40 mode, 5190 MHz, Chain J0



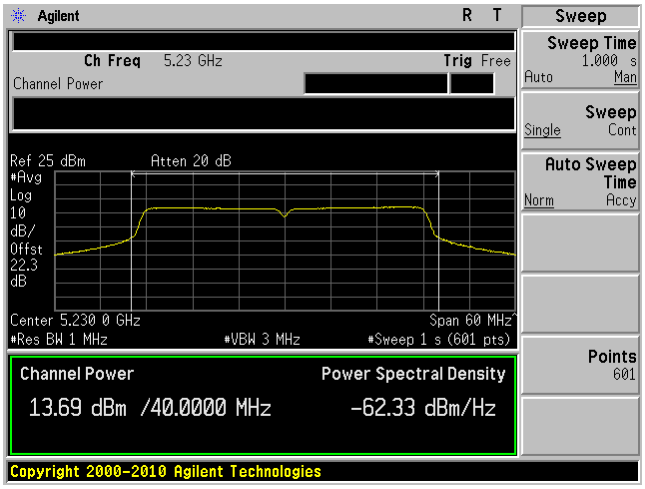
802.11n HT40 mode, 5190 MHz, Chain J1



802.11n HT40 mode, 5230 MHz, Chain J0



802.11n HT40 mode, 5230 MHz, Chain J1



10 FCC §15.407(b) & IC RSS-210 §A9.2 - Out of Band Emissions

10.1 Applicable Standard

According to FCC §15.407(b)

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of −27 dBm/MHz

According to 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.

10.2 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 RBW of spectrum analyzer to 1 MHz with a convenient frequency span.
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.

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 according to A2LA requirements, traceable to the NIST.*

10.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	44 %
ATM Pressure:	101.2 kPa

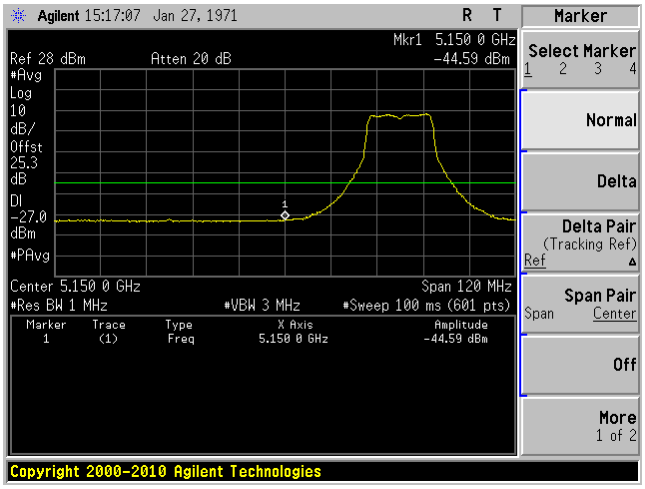
The testing was performed by Jeffrey Wu on 2012-09-17in RF site.

10.5 Test Results

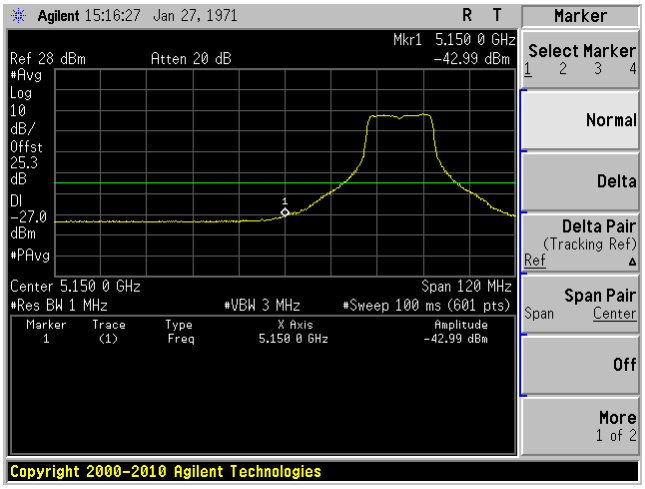
Please refer to following pages for plots of band edge.

5150-5250 MHz Band

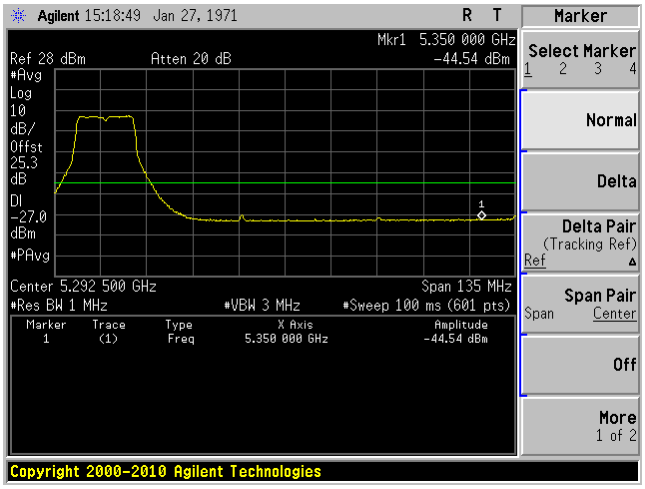
802.11a mode, Lowest Channel, Chain J0



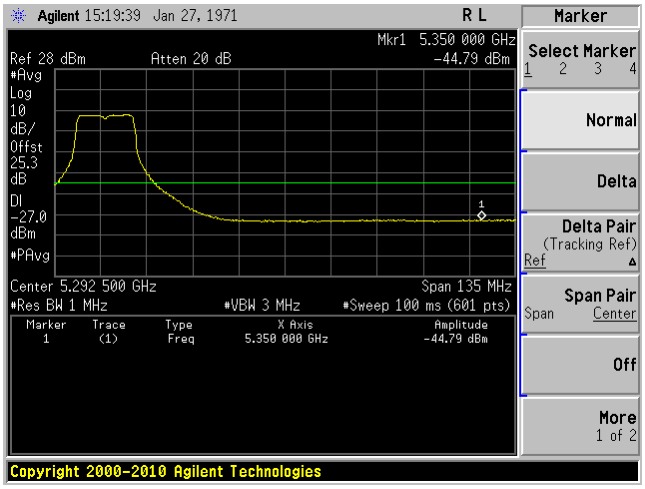
802.11a mode, Lowest Channel, Chain J1



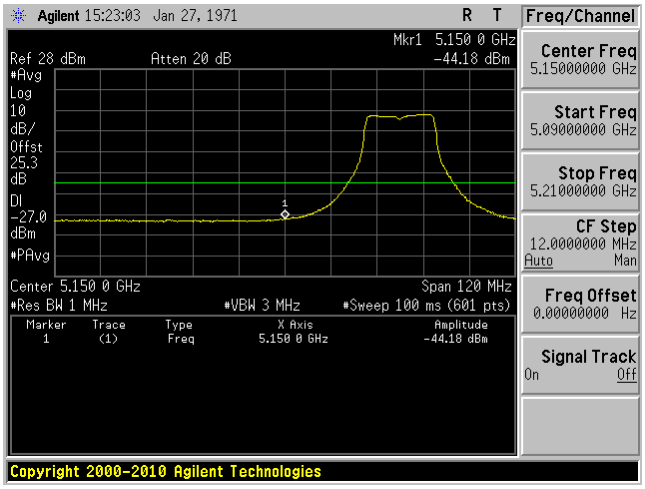
802.11a mode, Highest Channel, Chain J0



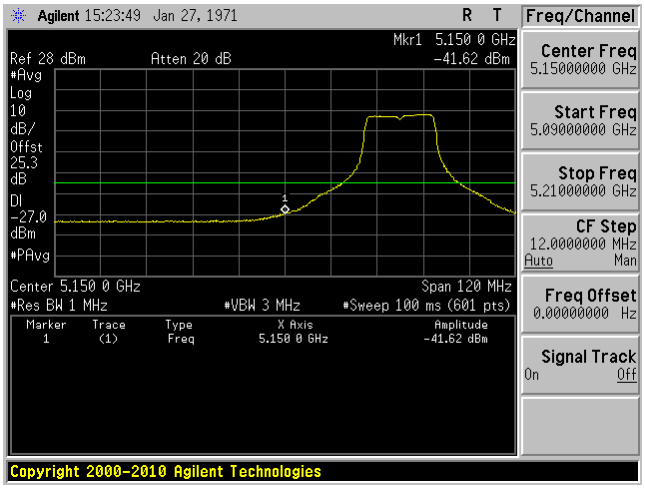
802.11a mode, Highest Channel, Chain J1



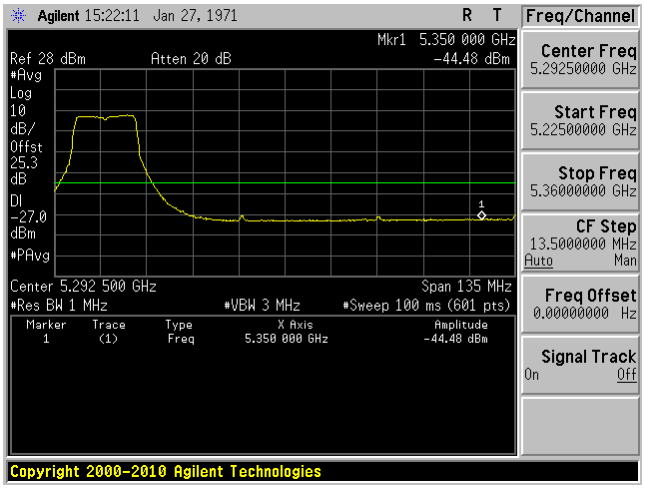
802.11n HT20 mode, Lowest Channel, Chain J0



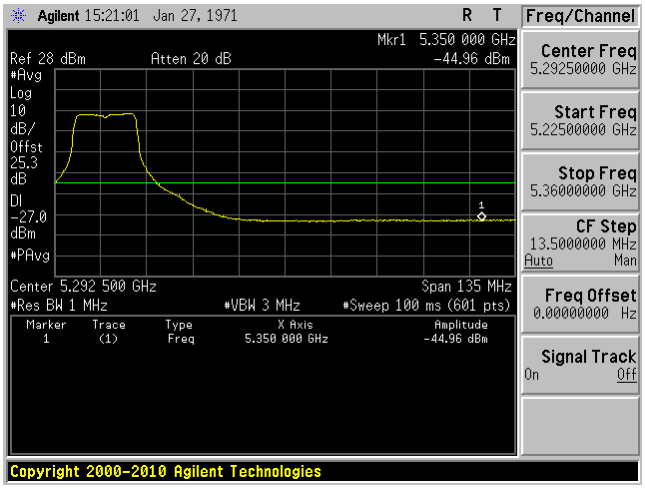
802.11n HT20 mode, Lowest Channel, Chain J1



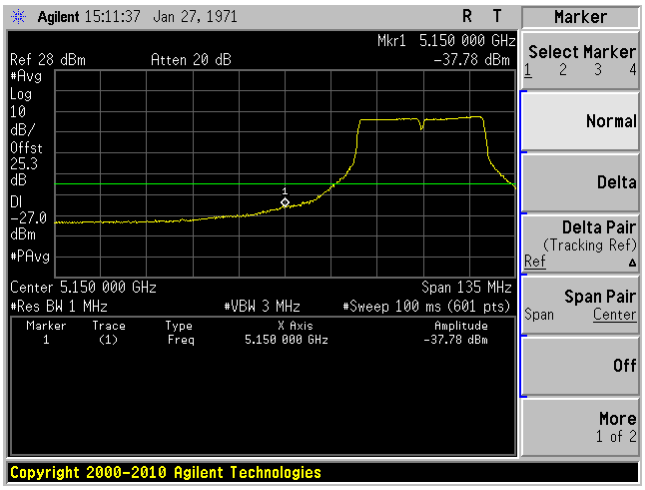
802.11n HT20 mode, Highest Channel, Chain J0



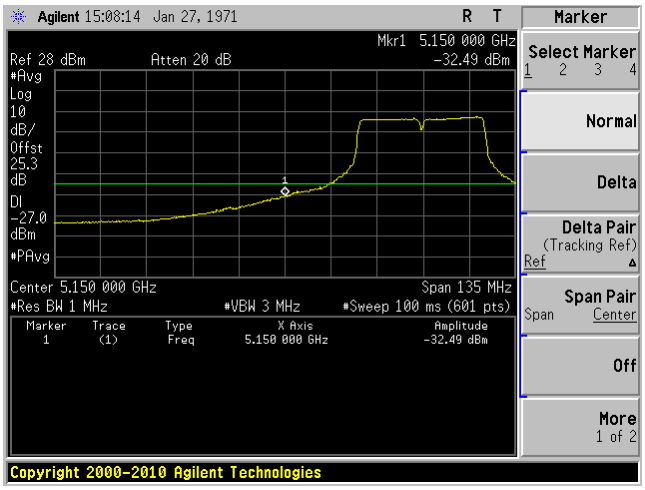
802.11n HT20 mode, Highest Channel, Chain J1



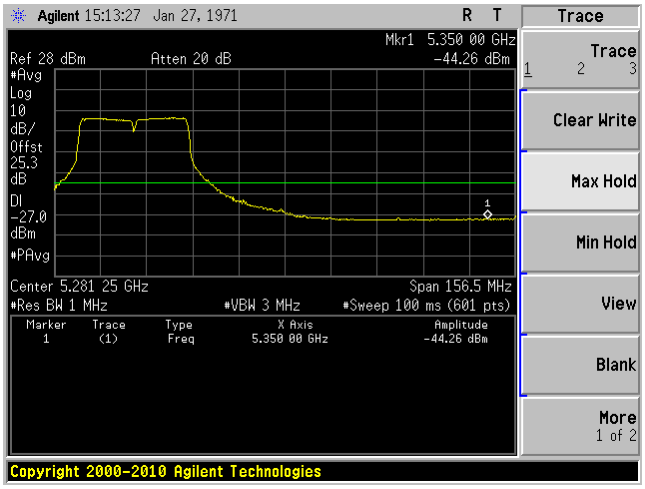
802.11n HT40 mode, Lowest Channel, Chain J0



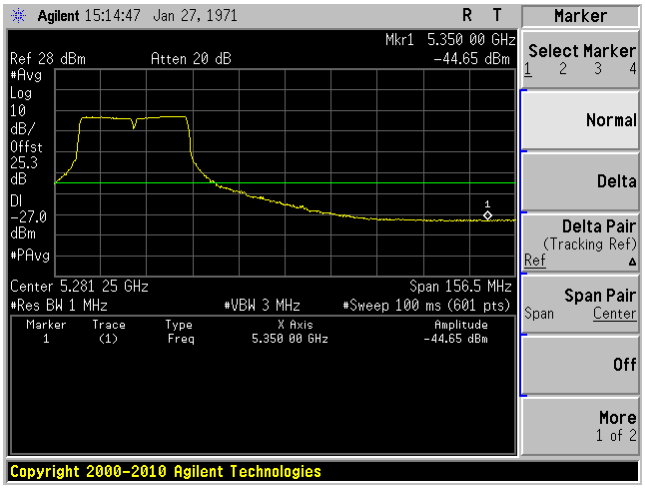
802.11n HT40 mode, Lowest Channel, Chain J1



802.11n HT40 mode, Highest Channel, Chain J0



802.11n HT40 mode, Highest Channel, Chain J1



11 FCC §15.407(a)(1) & IC RSS-210 §A9.2 - Power Spectral Density

11.1 Applicable Standard

According to FCC §15.407(a)(1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to IC RSS-210 §A9.2:

5150-5250MHz the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

11.2 Measurement Procedure

(i) Set span to encompass the entire emission bandwidth (EBW) of the signal.
(ii) Set RBW = 1 MHz.
(iii) Set VBW ≥ 3 MHz.
(iv) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
(v) Sweep time = auto.
(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".
(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
(ix) Compute power by integrating the spectrum across the 26 dB EBW of the signal using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges. If the spectrum analyzer does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the 26 dB EBW of the spectrum.

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 according to A2LA requirements, traceable to the NIST.*

11.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	43 %
ATM Pressure:	101.5 kPa

The testing was performed by Jeffrey Wu on 2012-09-24 in RF site.

11.5 Test Results

5150-5250 MHz Band

802.11a mode

Channel	Frequency (MHz)	TX Chain J0 Power (dBm)	TX Chain J1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	0.548	0.547	3.56	4	-0.44
Middle	5200	0.492	0.557	3.53	4	-0.47
High	5240	0.408	0.232	3.33	4	-0.67

802.11n HT20 mode

Channel	Frequency (MHz)	TX Chain J0 Power (dBm)	TX Chain J1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	0.779	0.677	3.74	4	-0.26
Middle	5200	0.676	0.984	3.84	4	-0.16
High	5240	0.447	0.319	3.39	4	-0.61

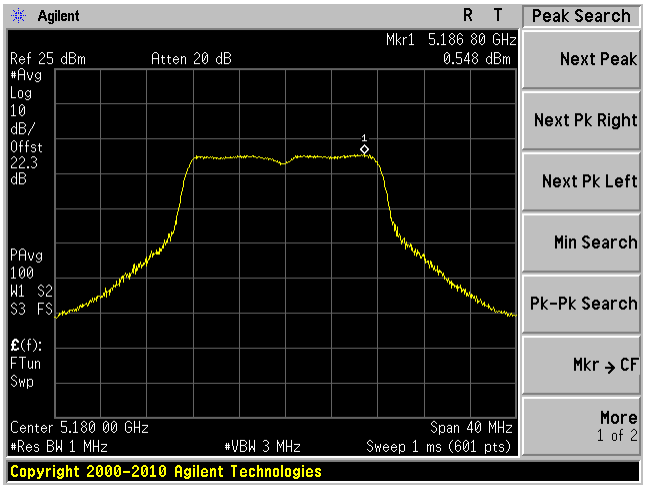
802.11n HT40 mode

Channel	Frequency (MHz)	TX Chain J0 Power (dBm)	TX Chain J8 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5190	-2.481	-2.81	0.37	4	-3.63
High	5230	-1.525	-0.484	2.04	4	-1.96

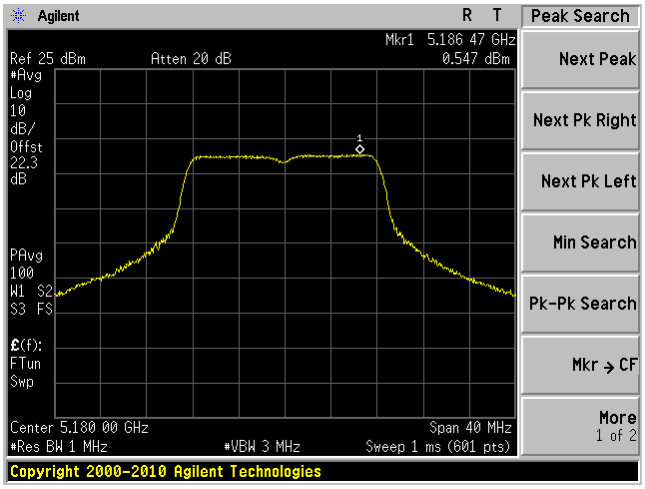
Please refer to the following plots.

802.11a mode

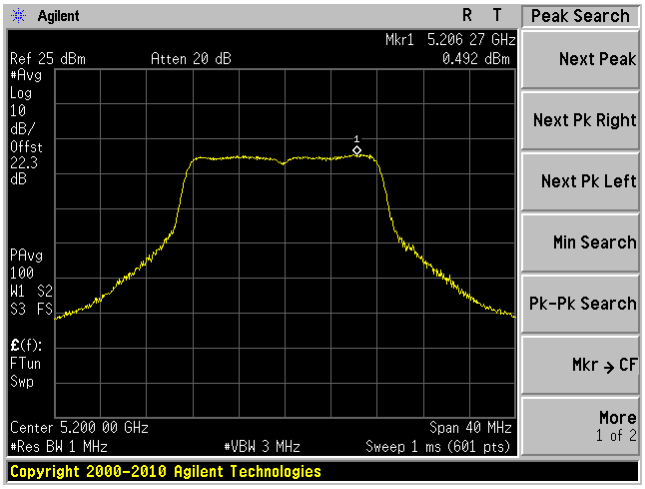
802.11a mode, 5180 MHz, Chain J0



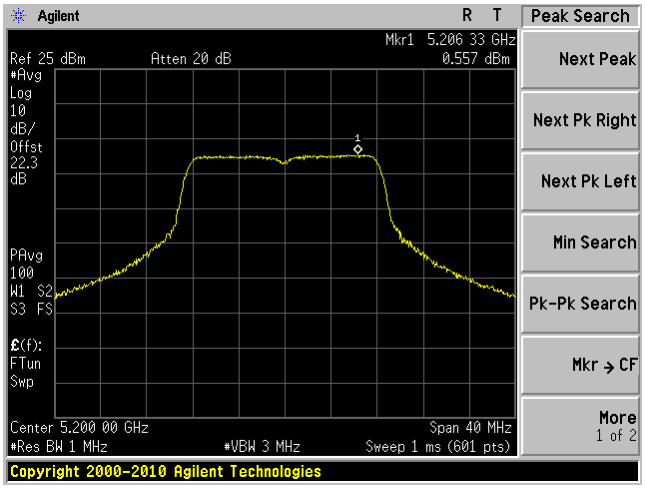
802.11a mode, 5180 MHz, Chain J1



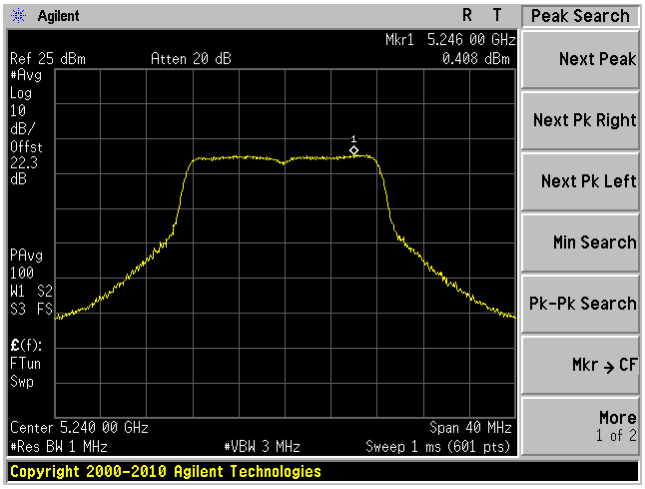
802.11a mode, 5200 MHz, Chain J0



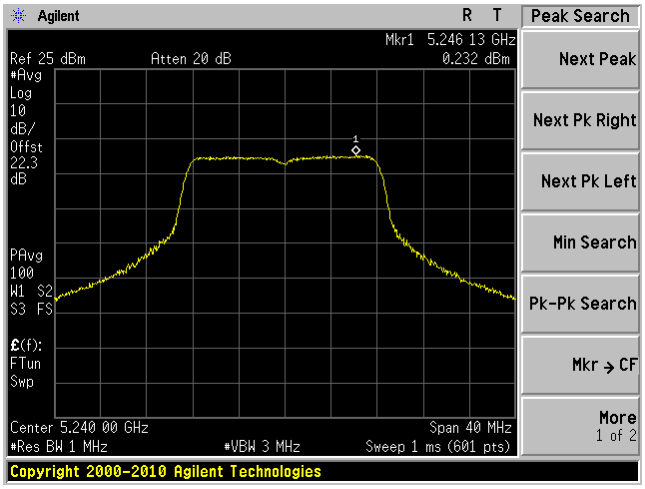
802.11a mode, 5200 MHz, Chain J1



802.11a mode, 5240 MHz, Chain J0

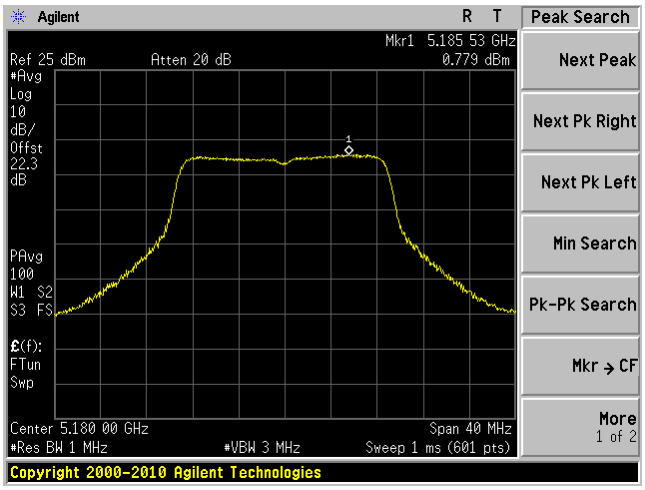


802.11a mode, 5240 MHz, Chain J1

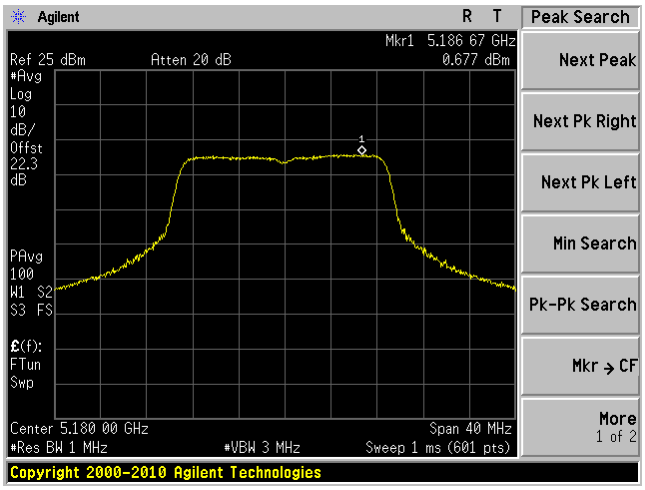


802.11n HT20 mode

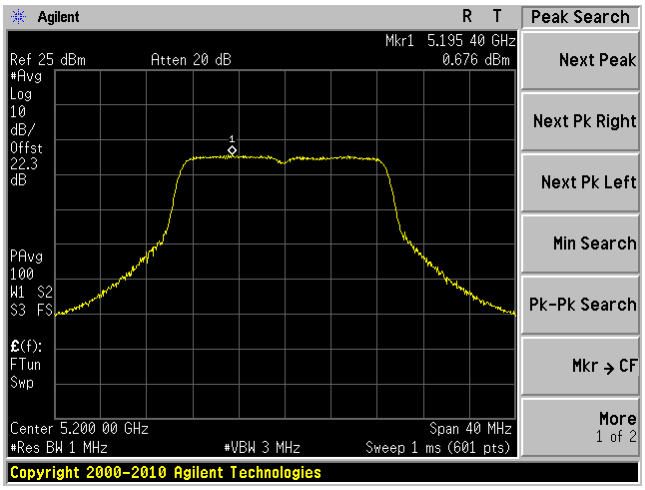
802.11n HT20 mode, 5180 MHz, Chain J0



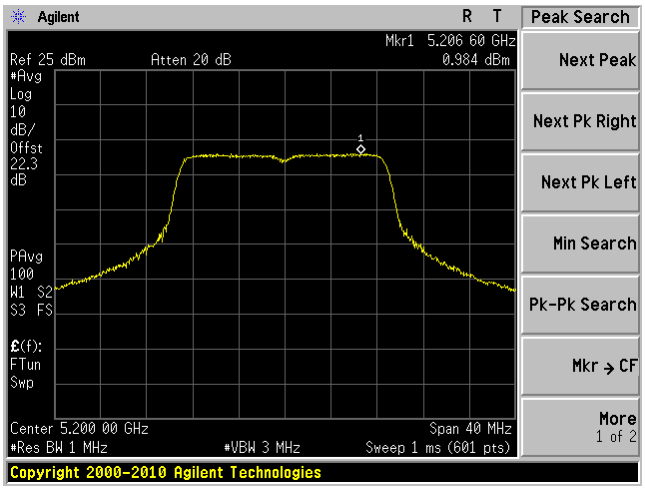
802.11n HT20 mode, 5180 MHz, Chain J1



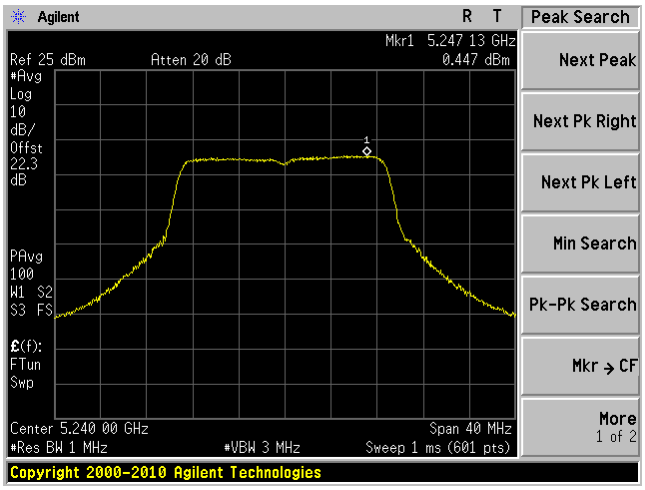
802.11n HT20 mode, 5200 MHz, Chain J0



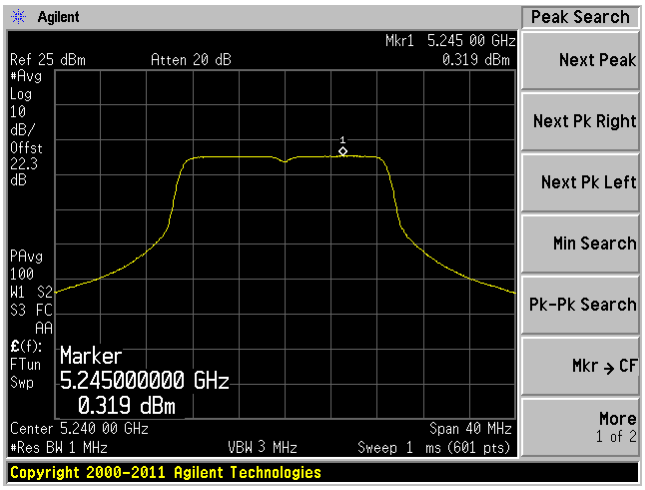
802.11n HT20 mode, 5200 MHz, Chain J1



802.11n HT20 mode, 5240 MHz, Chain J0

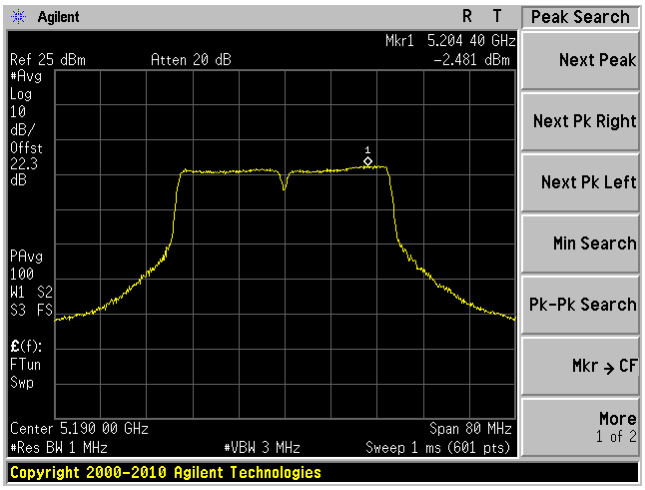


802.11n HT20 mode, 5240 MHz, Chain J1

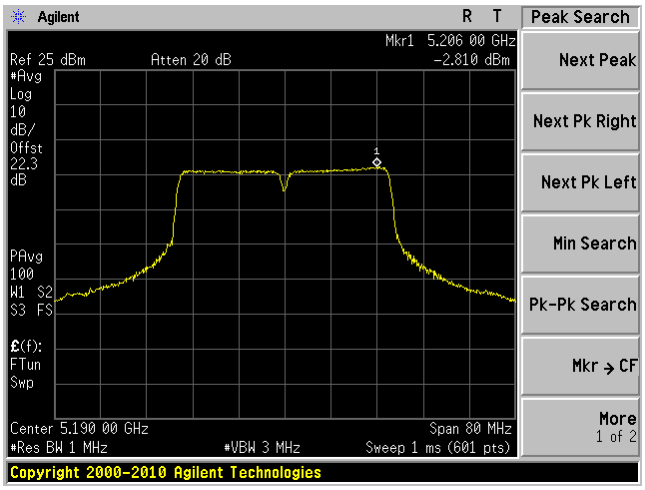


802.11 n 40 mode

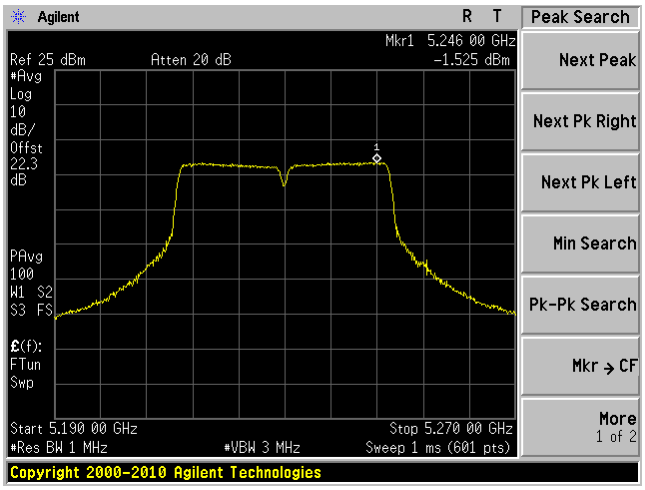
802.11n HT40 mode, 5190 MHz, Chain J0



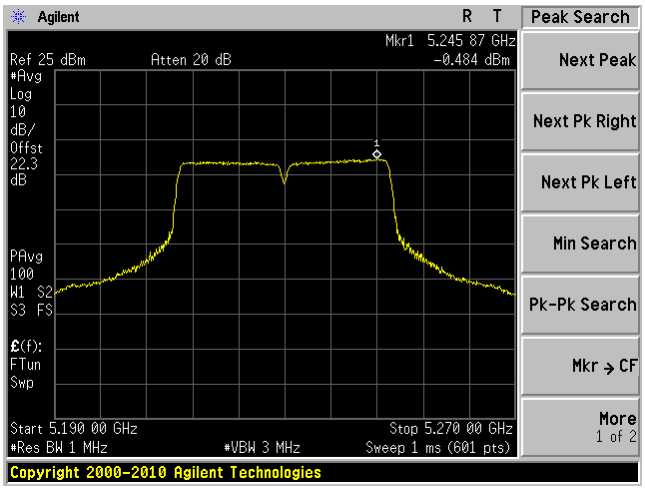
802.11n HT40 mode, 5190 MHz, Chain J1



802.11n HT40 mode, 5230 MHz, Chain J0



802.11n HT40 mode, 5230 MHz, Chain J1



12 FCC §15.407(a)(6) – Peak Excursion Ratio

12.1 Applicable Standard

According to FCC §15.407(a) (6), the ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

12.2 Test Procedure

Set the spectrum analyzer span to view the entire emission bandwidth.
The largest difference between the following two traces must be ≤ 13 dB for all frequencies across the emission bandwidth. Submit a plot.

1st Trace:
• Set RBW = 1 MHz, VBW ≥ 3 MHz with peak detector and maxhold settings.

2nd Trace:
• create the 2nd trace using the settings described in the setion "FCC §15.407(a)(1)(2) – CONDUCTED TRANSMITTER OUTPUT POWER".

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 according to A2LA requirements, traceable to the NIST.*

12.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	44 %
ATM Pressure:	101.2 kPa

The testing was performed by Jeffrey Wu on 2012-09-17 in RF site.

12.5 Test Results

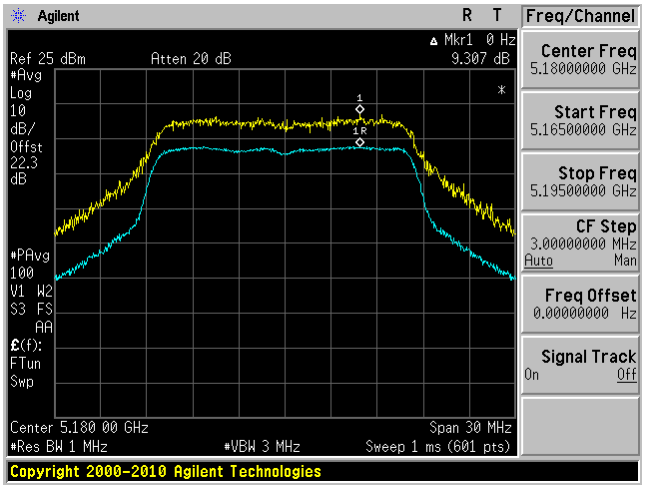
5150-5250 MHz Band

Channel	Frequency (MHz)	TX Chain J0 PER (dB)	TX Chain J1 PER (dB)	Limit (dB)
802.11a mode				
Low	5180	9.307	8.555	13
Middle	5200	9.181	8.265	
High	5240	8.849	8.956	
802.11n HT20 mode				
Low	5180	8.702	7.918	13
Middle	5200	8.381	8.292	
High	5240	8.271	8.131	
802.11n HT40 mode				
Low	5190	9.475	8.023	13
High	5230	9.821	8.152	

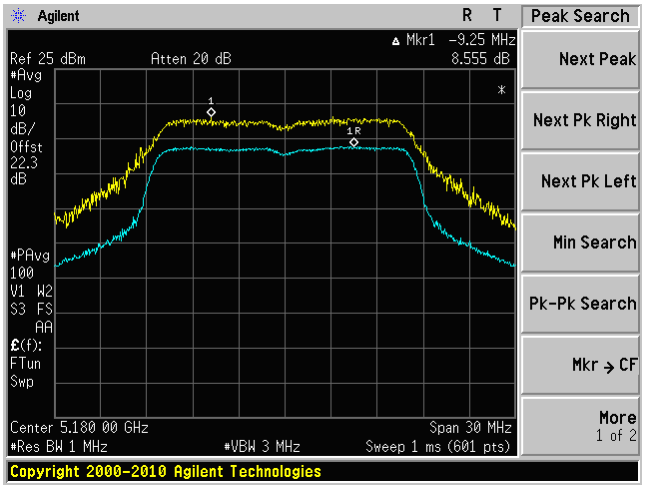
Please refer to the following plots for detailed test results:

5150-5250 MHz Band

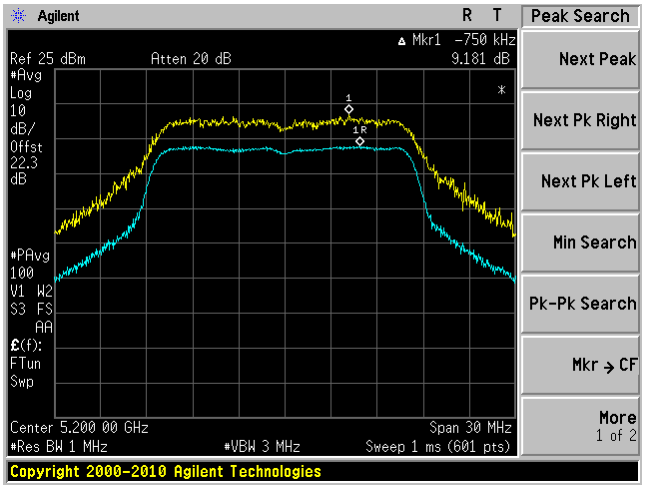
802.11a mode, 5180 MHz, Chain J0



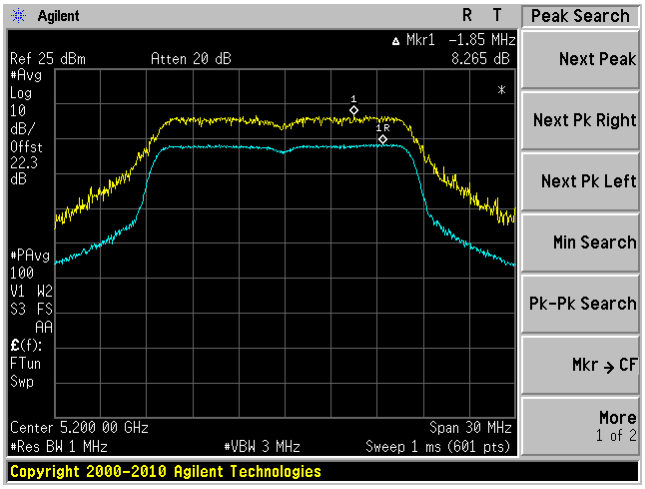
802.11a mode, 5180 MHz, Chain J1



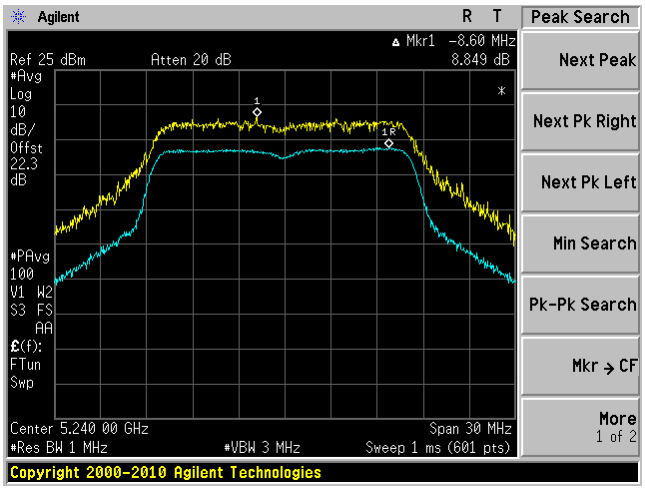
802.11a mode, 5200 MHz, Chain J0



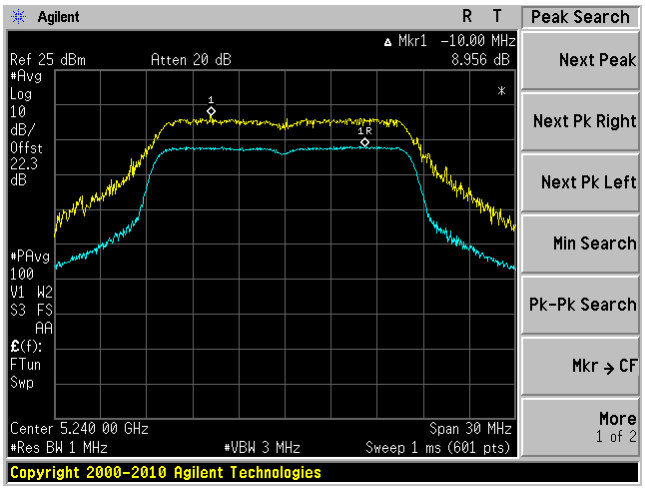
802.11a mode, 5200 MHz, Chain J1



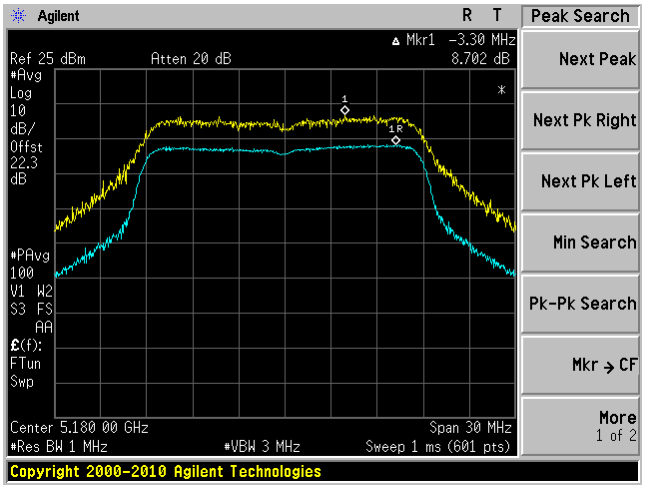
802.11a mode, 5240 MHz, Chain J0



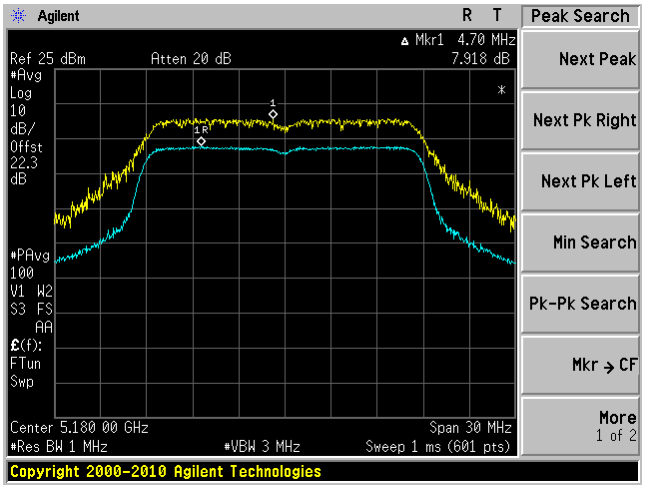
802.11a mode, 5240 MHz, Chain J1



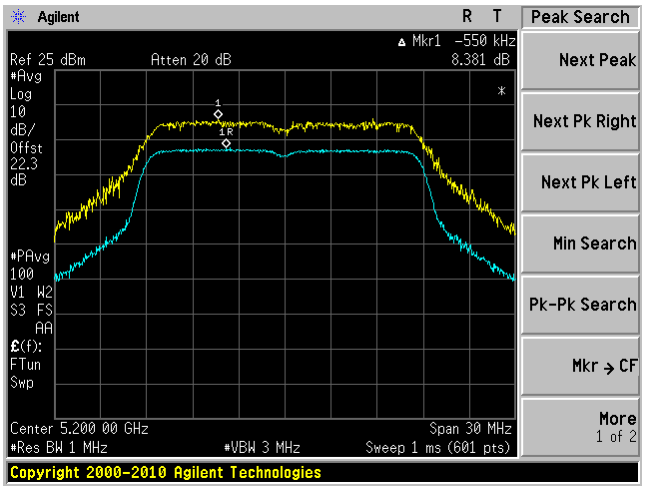
802.11n HT20 mode, 5180 MHz, Chain J0



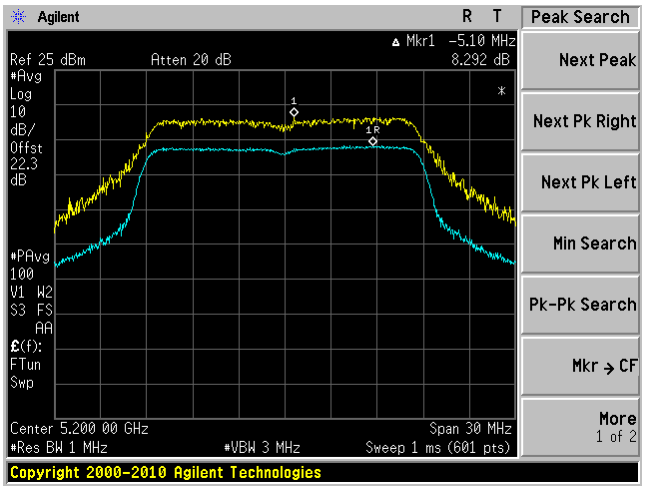
802.11n HT20 mode, 5180 MHz, Chain J1



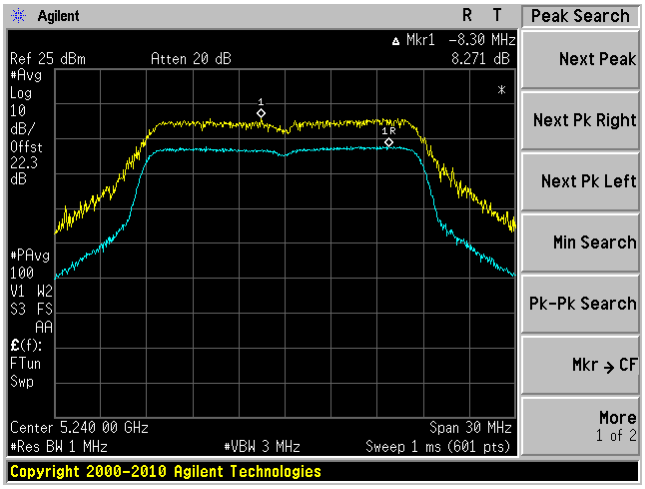
802.11n HT20 mode, 5200 MHz, Chain J0



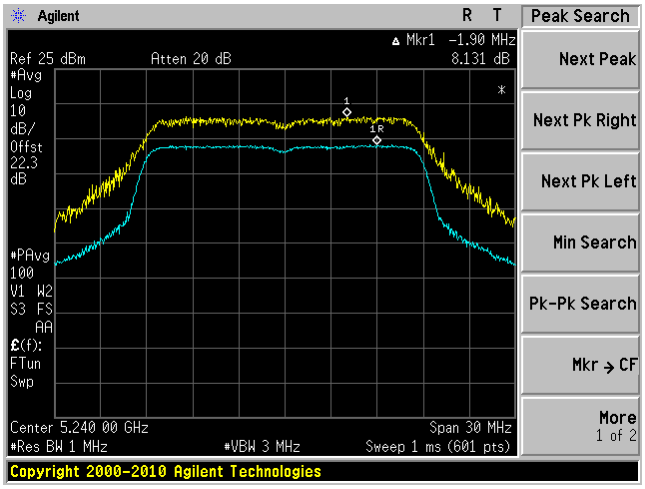
802.11n HT20 mode, 5200 MHz, Chain J1



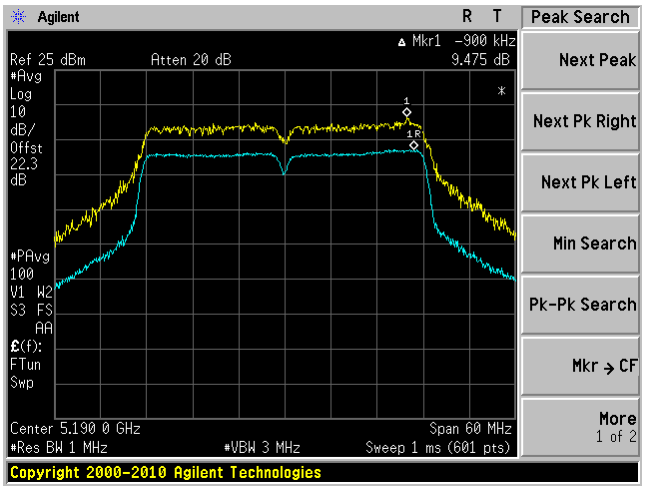
802.11n HT20 mode, 5240 MHz, Chain J0



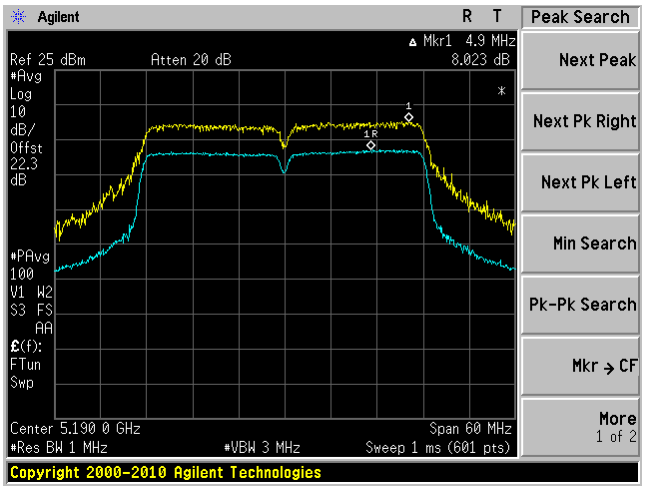
802.11n HT20 mode, 5240 MHz, Chain J1



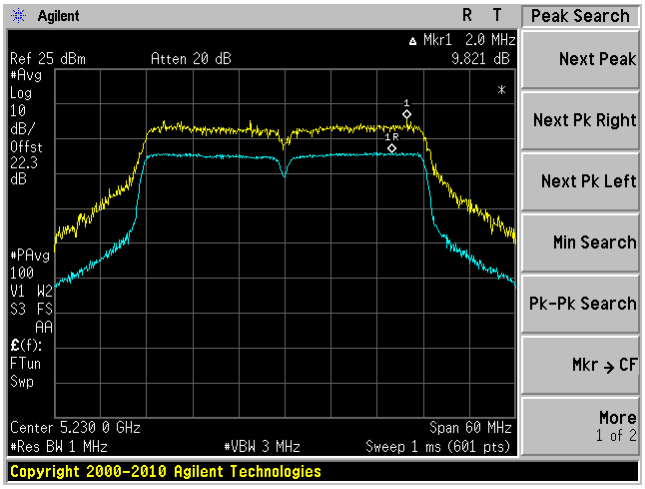
802.11n HT40 mode, 5190 MHz, Chain J0



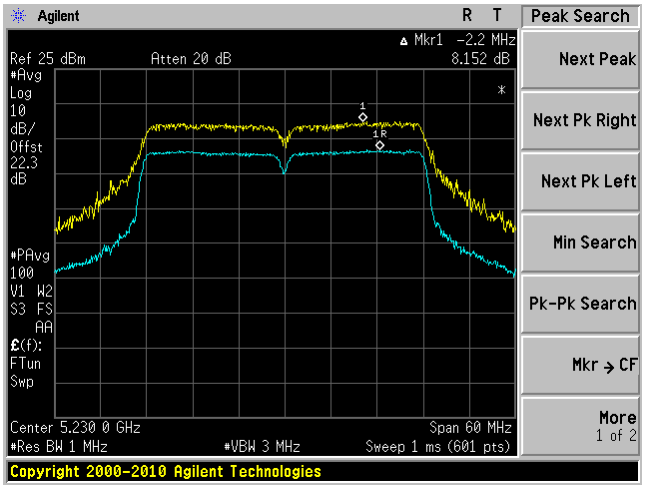
802.11n HT40 mode, 5190 MHz, Chain J1



802.11n HT40 mode, 5230 MHz, Chain J0



802.11n HT40 mode, 5230 MHz, Chain J1



13 IC RSS-210 §2.3 & RSS-Gen §4.10 - Receiver Spurious Radiated 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, Table 2, the radiated limit 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 NVLAP requirements, traceable to NIST.*

13.6 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	44 %
ATM Pressure:	101.2 kPa

The testing was performed by Jeffrey Wu on 2012-10-16 at 5 meter 3.

13.7 Summary of Test Results

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

5150-5350 MHz Band

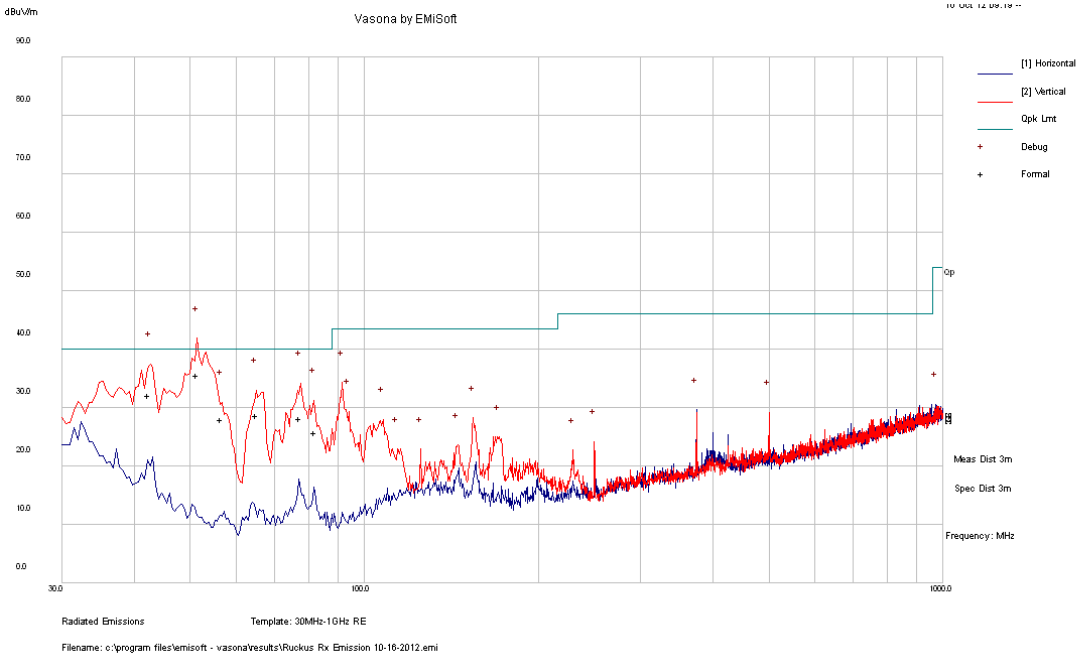
Mode: Receiving			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range (MHz)**
-4.44	51.42024	Vertical	30-18000

Note: Both 2.4 GHz and 5 GHz radios were under receiver mode.

13.8 Radiated Emissions Test Result Data

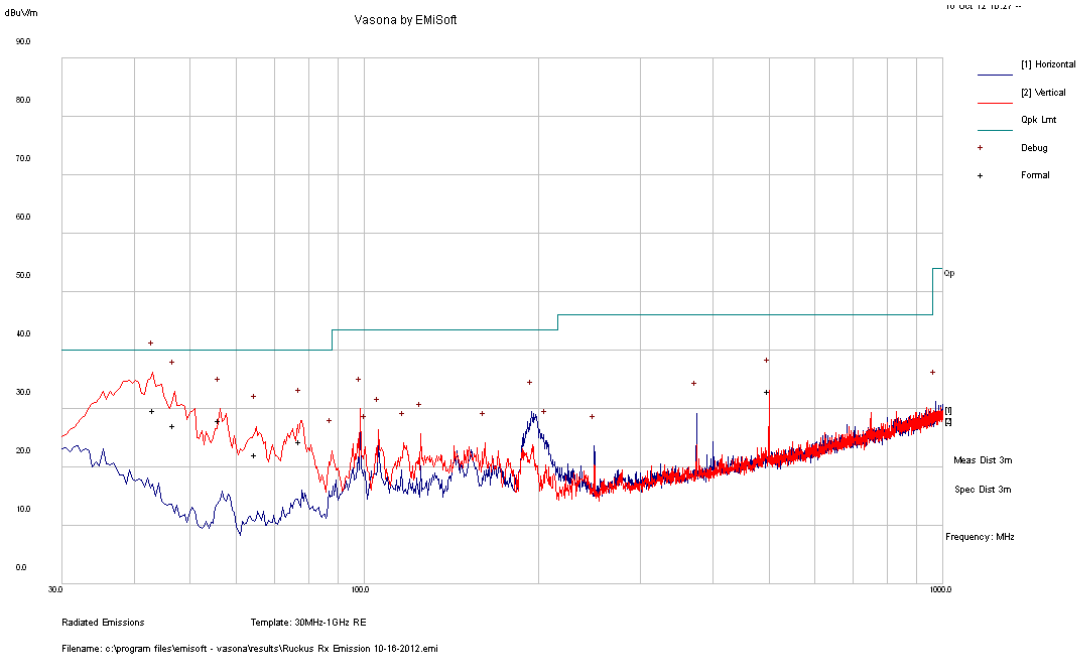
(1) Radiated Emission at 3 meters, 30 MHz – 1 GHz

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 (QP/Ave.)
42.442	32.12	170	V	344	40	-7.88	QP
51.42025	35.56	100	V	105	40	-4.44	QP
56.61875	27.99	107	V	8	40	-12.01	QP
65.07825	28.78	119	V	59	40	-11.22	QP
77.4055	28.16	192	V	341	40	-11.84	QP
82.05875	25.87	175	V	336	40	-14.13	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 (QP/Ave.)
43.33925	29.81	177	V	249	40	-10.19	Ave.
46.80575	27.16	100	V	17	40	-12.84	Ave.
56.093	27.95	136	V	33	40	-12.05	Ave.
64.89475	22.22	259	V	239	40	-17.78	Ave.
77.50725	24.37	99	V	92	40	-15.63	Ave.
500.0055	33	107	V	111	46	-13.00	Ave.

(2) Radiated Emission at 3 meters, above 1 GHz

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
2211	40.670	100	V	164	74	-33.330	Peak
2211	39.160	100	H	349	74	-34.840	Peak
2211	25.890	100	V	164	54	-28.110	Ave
2211	25.900	100	H	349	54	-28.100	Ave
2779	41.506	100	V	175	74	-32.494	Peak
2779	41.786	102	H	350	74	-32.214	Peak
2779	26.726	100	V	175	54	-27.274	Ave
2779	26.706	102	H	350	54	-27.294	Ave
12349	52.103	103	V	230	74	-21.897	Peak
12349	52.883	100	H	165	74	-21.117	Peak
12349	37.793	103	V	230	54	-16.207	Ave
12349	37.843	100	H	165	54	-16.157	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
1125	38.066	100	V	198	74	-35.934	Peak
1125	37.946	100	H	318	74	-36.054	Peak
1125	27.176	100	V	198	54	-26.824	Ave
1125	25.526	100	H	318	54	-28.474	Ave
1921	39.887	100	V	200	74	-34.113	Peak
1921	39.837	100	H	320	74	-34.163	Peak
1921	25.007	100	V	200	54	-28.993	Ave
1921	25.117	100	H	320	54	-28.883	Ave
3149	41.687	100	V	0	74	-32.313	Peak
3149	44.407	115	H	216	74	-29.593	Peak
3149	27.137	100	V	0	54	-26.863	Ave
3149	31.647	115	H	216	54	-22.353	Ave

14 FCC §15.407(b) & IC RSS-210 §A9.2 - Spurious Emissions at Antenna Terminals

14.1 Applicable Standard

According to FCC §15.407(b)

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of −27 dBm/MHz

According to 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.

14.2 Measurement Procedure

4) Procedure for Unwanted Emissions Measurements Below 1000 MHz.
a) Follow the requirements in section G)3), “General Requirements for Unwanted Emissions Measurements”.
b) Compliance shall be demonstrated using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.

6) Procedures for Average Unwanted Emissions Measurements above 1000 MHz.
a) Follow the requirements in section G)3), “General Requirements for Unwanted Emissions Measurements”.
b) Average emission levels shall be measured using one of the following two methods.
c) Method AD (Average Detection): Primary method
(i) RBW = 1 MHz.
(ii) VBW ≥ 3 MHz.
(iii) Detector = RMS, if span/(# of points in sweep) ≤ RBW/2. Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, the detector mode shall be set to peak.
(iv) Averaging type = power (i.e., RMS)
• As an alternative, the detector and averaging type may be set for linear voltage averaging. Some analyzers require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.
(v) Sweep time = auto.
(vi) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, the number of traces shall be increased by a factor of 1/x, where x is the duty cycle. For example, with 50 percent duty cycle, at least 200 traces should be averaged.
(vii) If tests are performed with the EUT transmitting at a duty cycle less than 98 percent, a correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
• If power averaging (RMS) mode was used in step (iv) above, the correction factor is10 log(1/x), where x is the duty cycle. For example, if the transmit duty cycle was 50 percent, then 3 dB must be added to the measured emission levels.

• If linear voltage averaging mode was used in step (iv) above, the correction factor is 20 log(1/x), where x is the duty cycle. For example, if the transmit duty cycle was 50 percent, then 6 dB must be added to the measured emission levels.

14.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	US44300386	2012-09-29	1 year

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

14.4 Test Environmental Conditions

Temperature:	24 °C
Relative Humidity:	44 %
ATM Pressure:	101.3kPa

The testing was performed by Jeffrey Wu on 2012-10-04 in RF site.

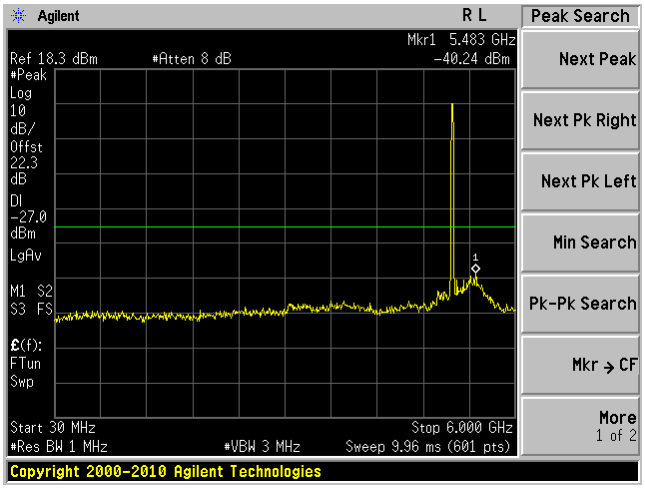
14.5 Test Results

Please refer to following plots of spurious emissions.

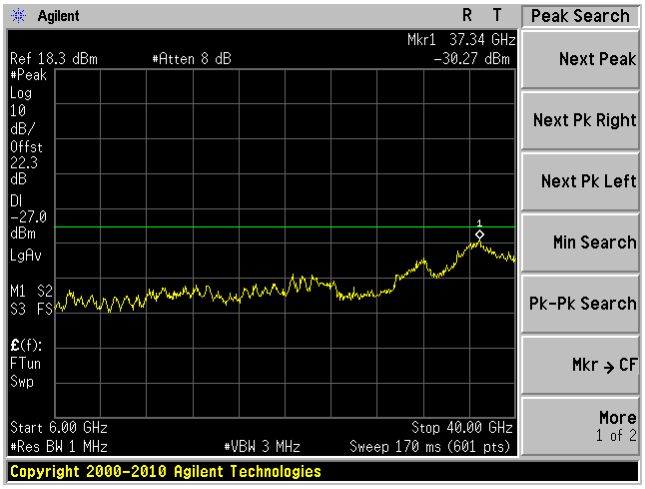
5150-5250 MHz Band

802.11 a mode, Low Channel

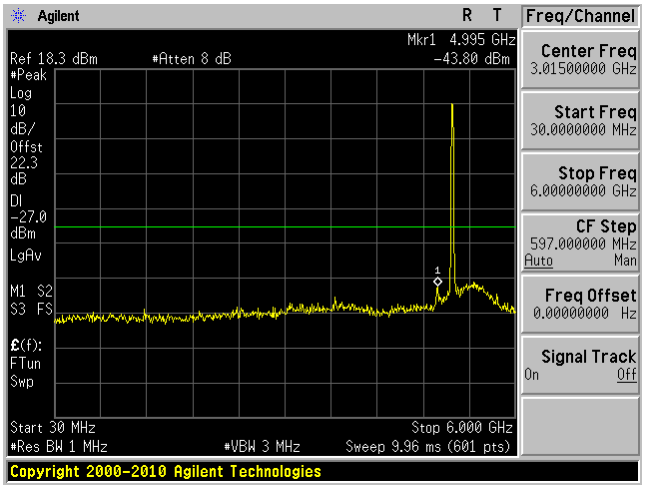
802.11 a mode, 5180MHz, Chain J0 1



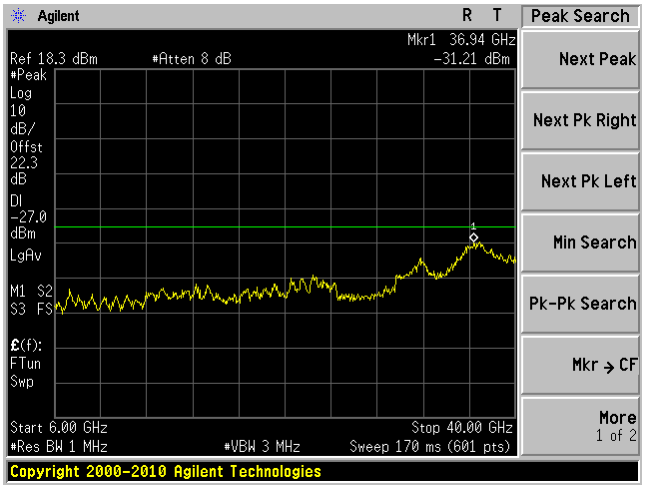
802.11 a mode, 5180 MHz, Chain J0 2



802.11a mode, 5180 MHz, Chain J1 1

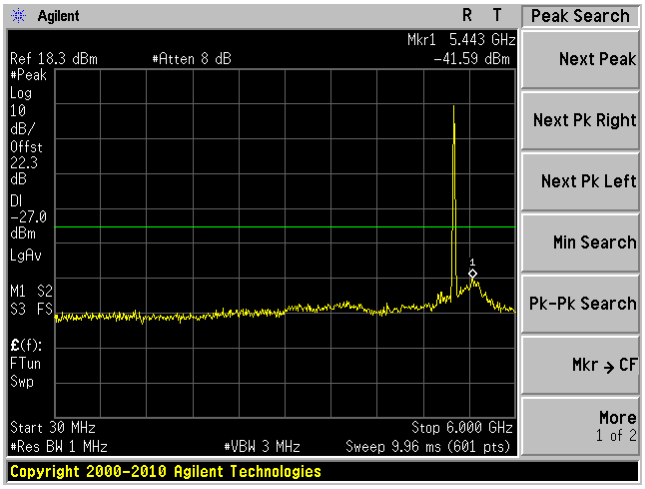


802.11a mode, 5180 MHz, Chain J1 2

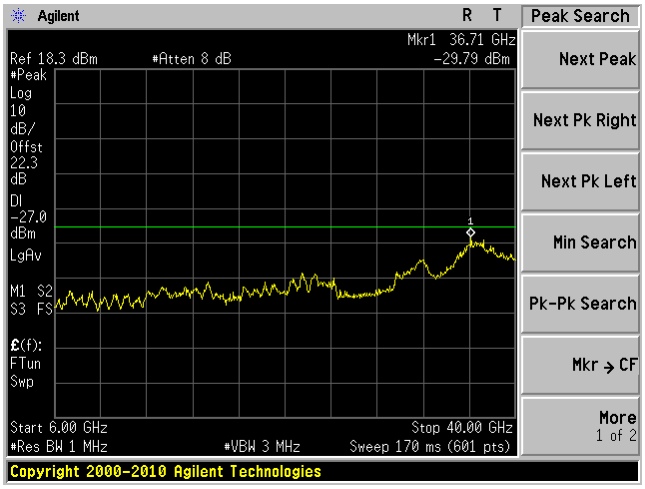


802.11a mode, Middle Channel

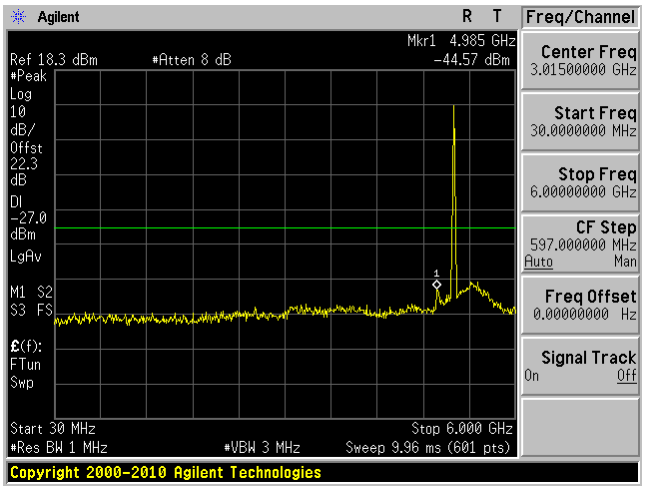
802.11a mode, 5200 MHz, Chain J0 1



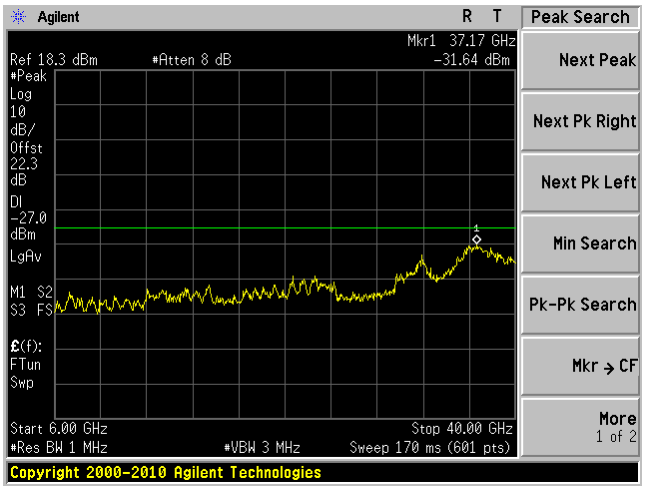
802.11a mode, 5200 MHz, Chain J0 2



802.11a mode, 5200 MHz, Chain J1 1

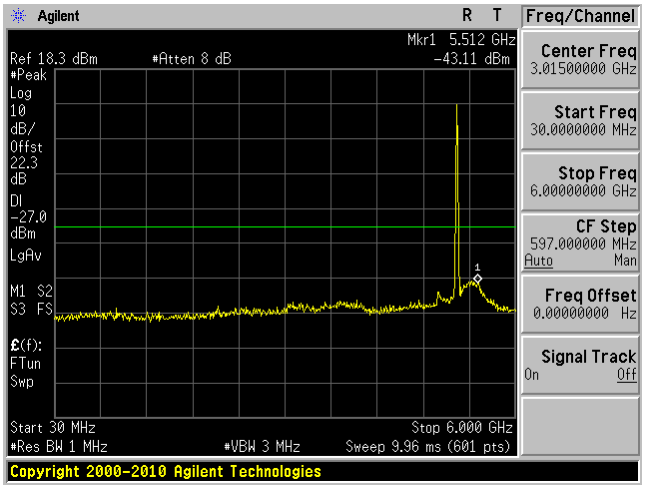


802.11a mode, 5200 MHz, Chain J1 2

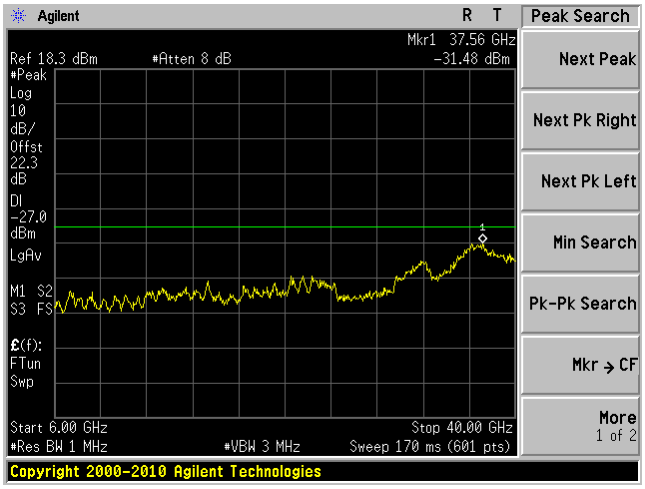


802.11a mode, High Channel

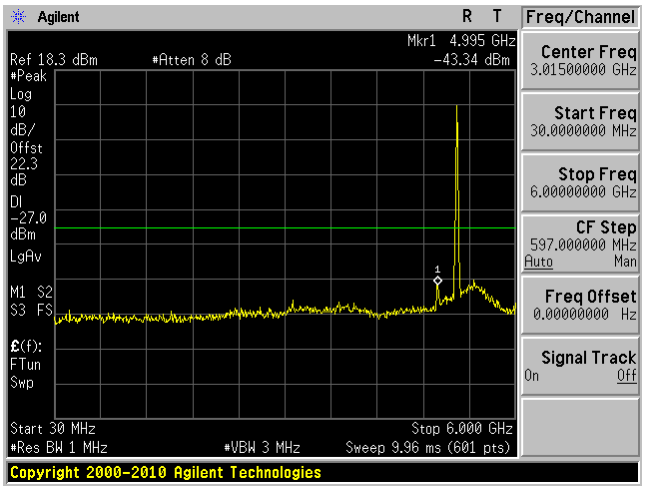
802.11 a mode, 5240 MHz, Chain J0 1



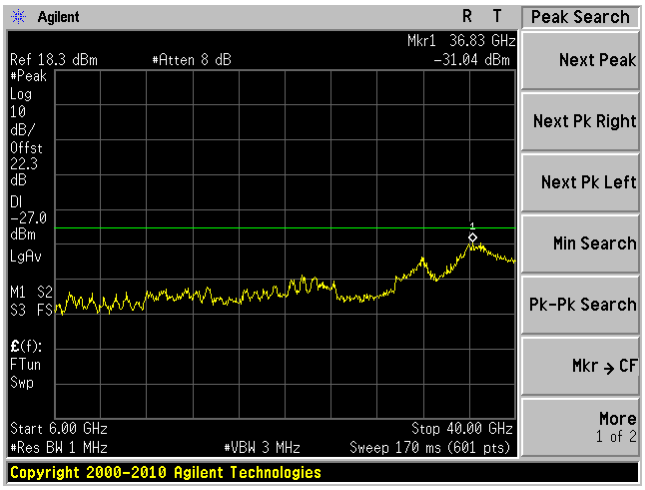
802.11a mode, 5240 MHz, Chain J0 2



802.11a mode, 5240 MHz, Chain J1 1

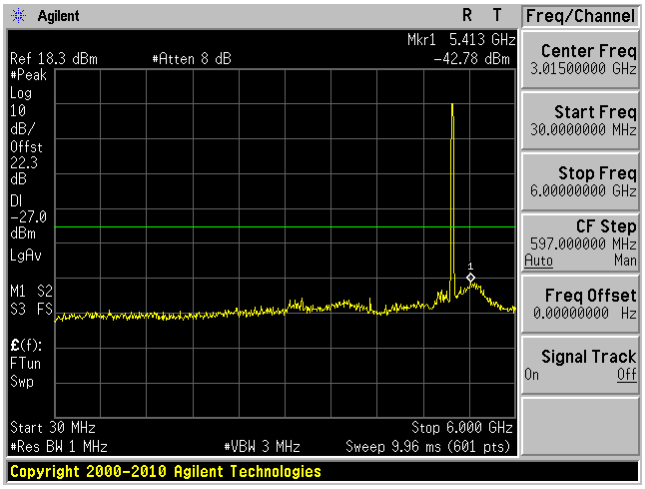


802.11a mode, 5240 MHz, Chain J1 2

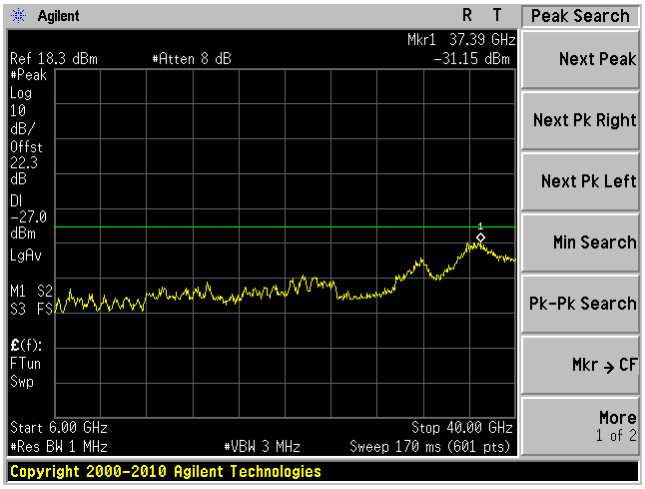


802.11 n HT20 mode, Low channel

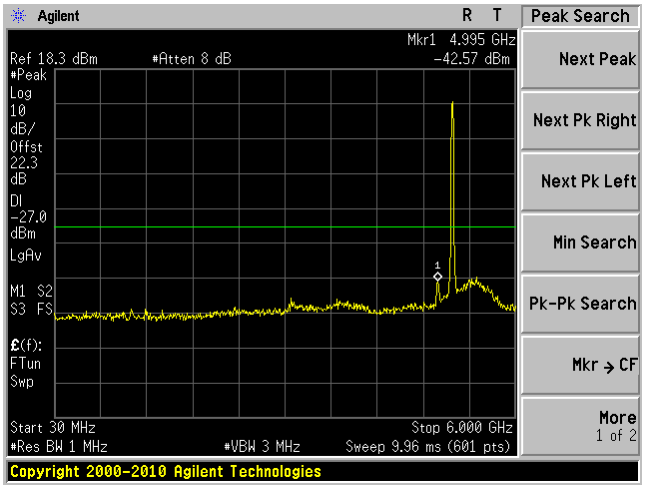
802.11n HT20 mode, 5180 MHz, Chain J0 1



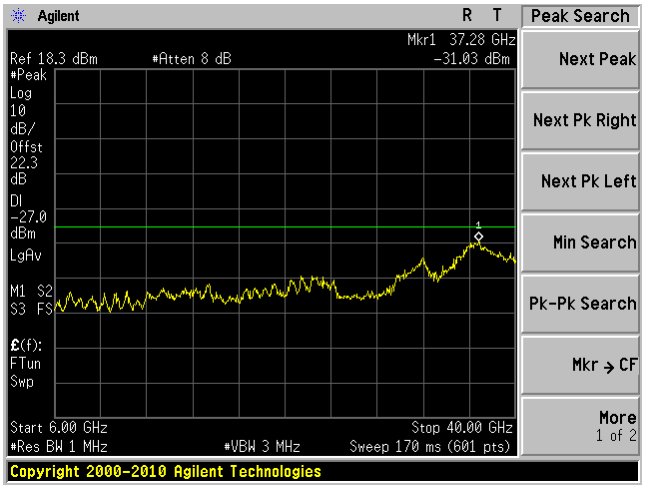
802.11n HT20 mode, 5180 MHz, Chain J0 2



802.11n HT20 mode, 5180 MHz, Chain J1 1

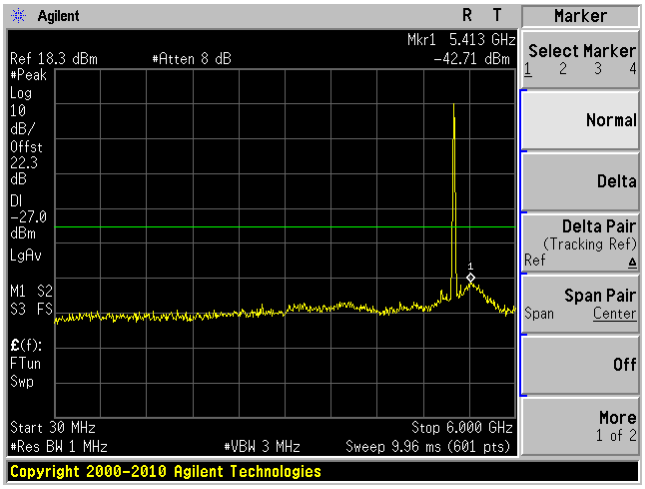


802.11n HT20 mode, 5180 MHz, Chain J1 2

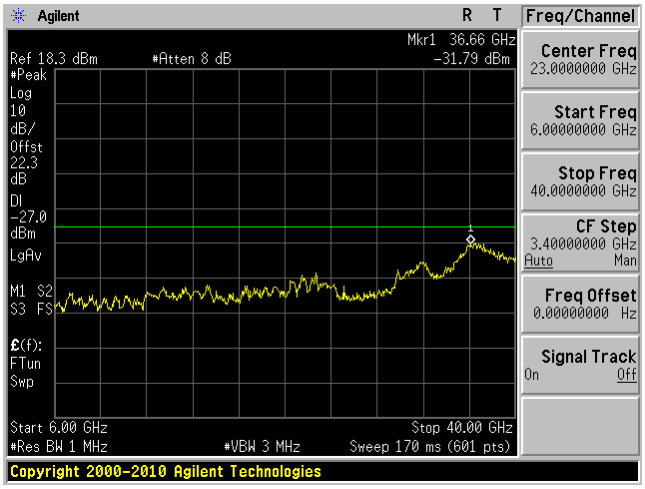


802.11 n HT20 mode, Middle Channel

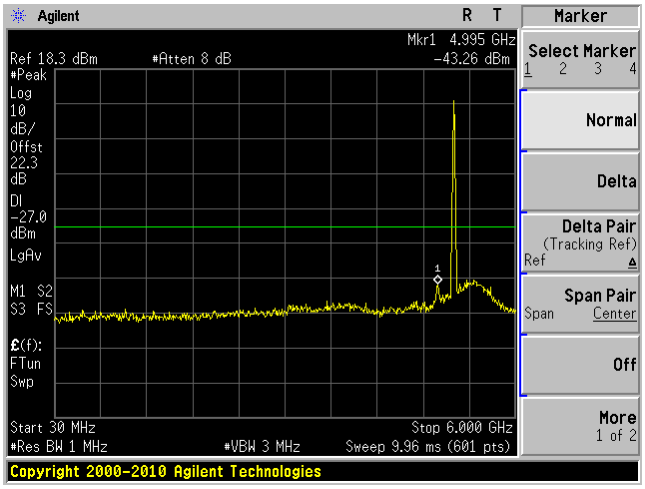
802.11n HT20 mode, 5200 MHz, Chain J0 1



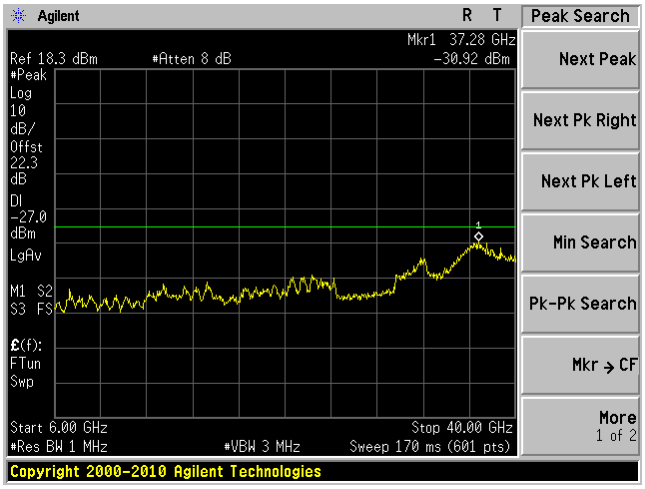
802.11n HT20 mode, 5200 MHz, Chain J0 2



802.11n HT20 mode, 5200 MHz, Chain J1 1

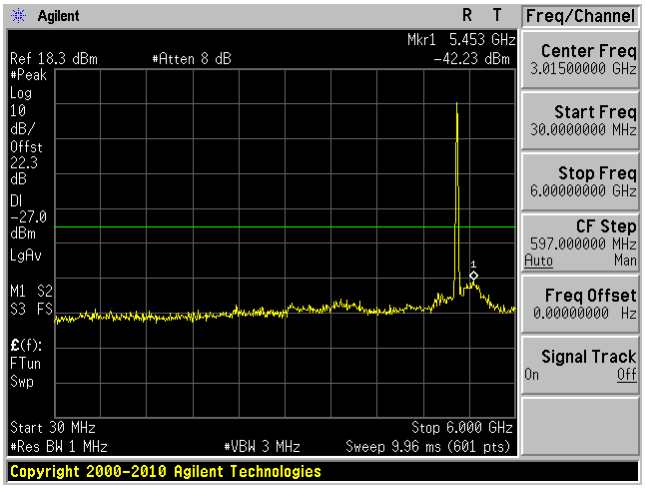


802.11n HT20 mode, 5200 MHz, Chain J1 2

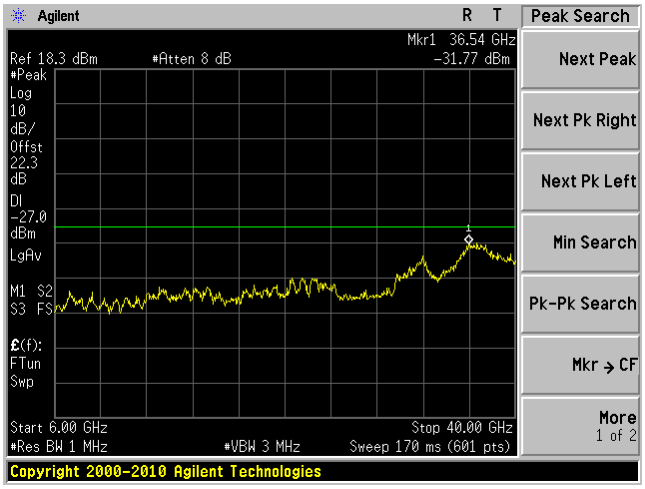


802.11 n HT20 mode, High Channel

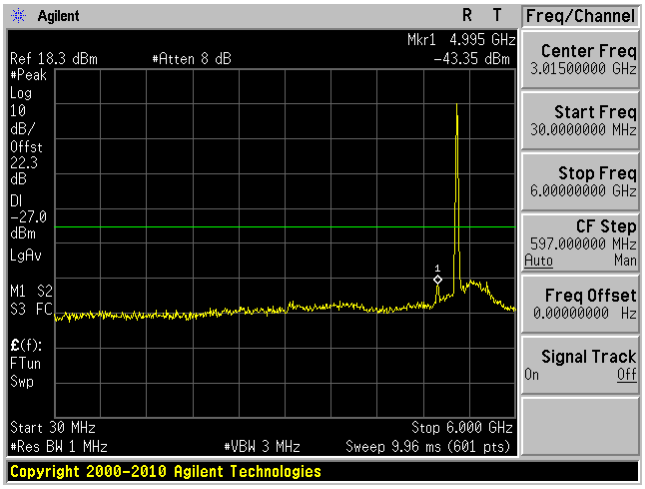
802.11n HT20 mode, 5240 MHz, Chain J0 1



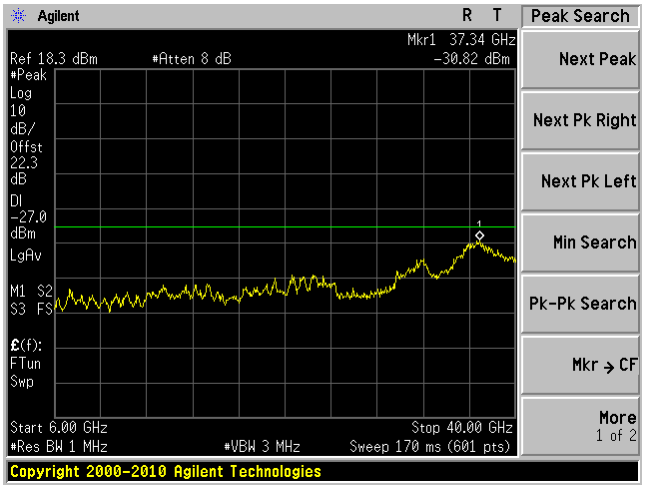
802.11n HT20 mode, 5240 MHz, Chain J0 2



802.11n HT20 mode, 5240 MHz, Chain J1 1

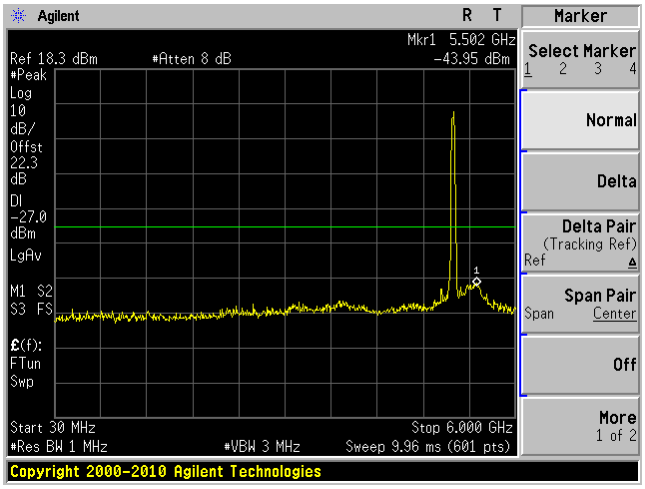


802.11n HT20 mode, 5240 MHz, Chain J1 2

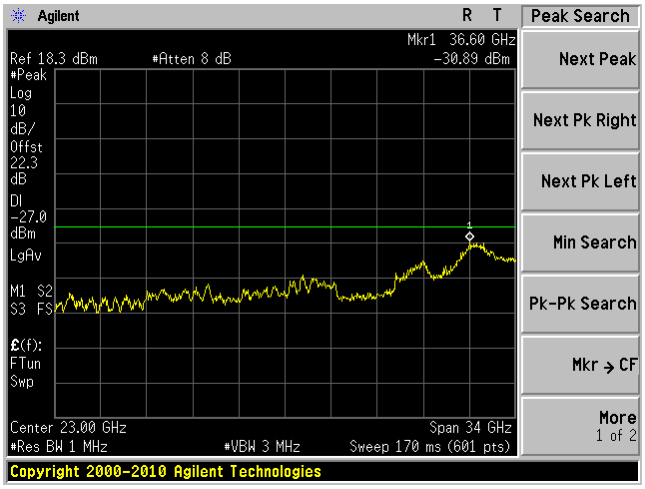


802.11n HT40 mode, Low channel

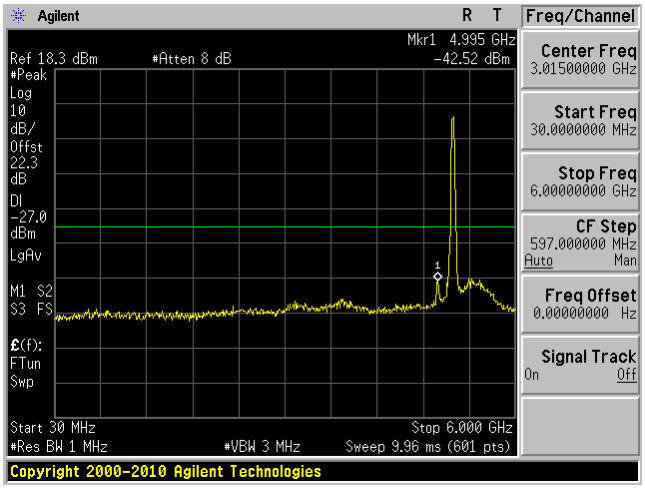
802.11n HT40 mode, 5190 MHz, Chain J0 1



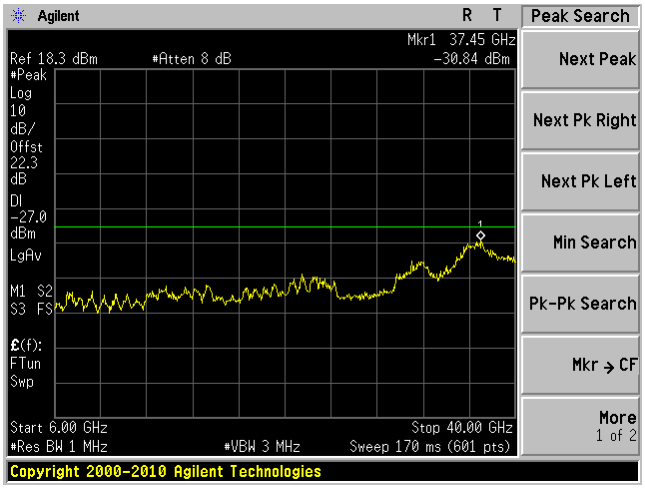
802.11n HT40 mode, 5190 MHz, Chain J0 2



802.11n HT40 mode, 5190 MHz, Chain J1 1

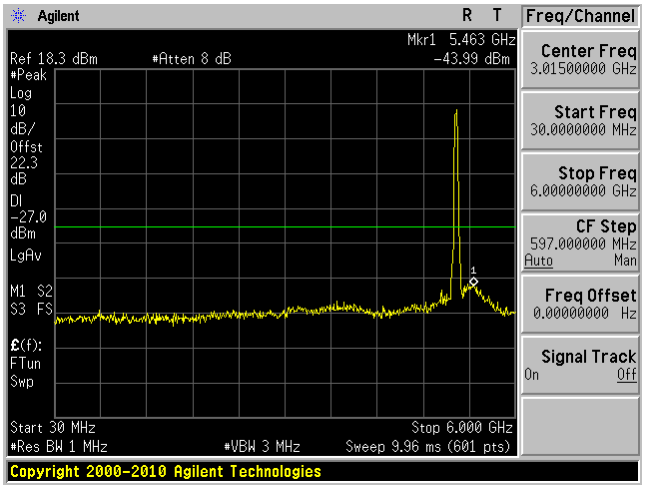


802.11n HT40 mode, 5190 MHz, Chain J1 2

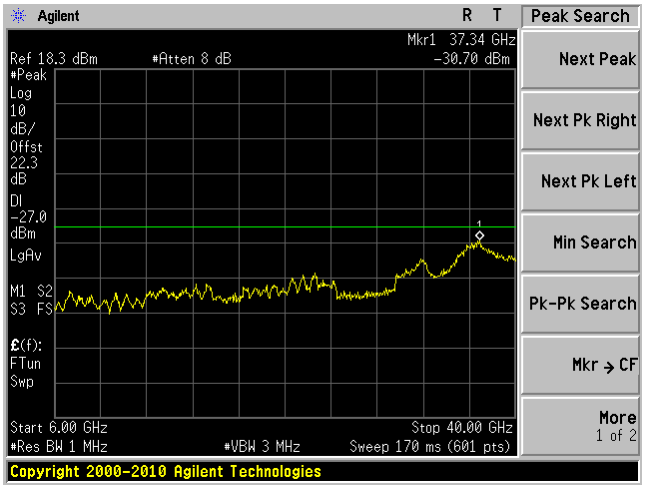


802.11n HT40 mode, High Channel

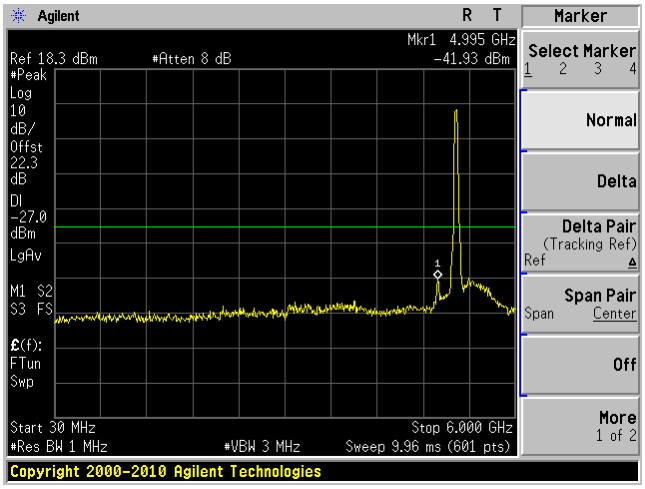
802.11n HT40 mode, 5230 MHz, Chain J0 1



802.11n HT40 mode, 5230 MHz, Chain J0 2



802.11n HT40 mode, 5230 MHz, Chain J1 1



802.11n HT40 mode, 5230 MHz, Chain J1 2