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

TEST AND MEASUREMENT REPORT

For

Ruckus Wireless, Inc.

350 West Java Drive,

Sunnyvale, CA 94089, USA

FCC ID: S9GZF7372
IC: 5912A-ZF7372

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

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Report Number: R1209061-247

Report Date: 2012-11-02

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TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1209061-247	Original Report	2012-11-02

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Ruckus Wireless, Inc*., and their product model: *ZoneFlex 7372,* or the "EUT" as referred to in this report. The EUT is a 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 Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commissions rules and IC RSS-210 Issue 8, Dec 2010.

The objective is to determine compliance with FCC Part 15.247 and IC RSS-210 rules for Output Power, Antenna Requirements, 6 dB Bandwidth, and power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Spurious Emissions, Conducted and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

FCC Part 15.407 UNI with FCC ID: S9GZF7372, IC: 5912A-ZF7372.

1.5 Test Methodology

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

1.6 Measurement Uncertainty

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

Based on CISPR16-4-2:2003, The Treatment of Uncertainty in EMC Measurements, the values ranging from $\pm$2.0 dB for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 Test Facility

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

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2003, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

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

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

http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b

2 System Test Configuration

2.1 Justification

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

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

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

2.2 EUT Exercise Software

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

2.3 Special Equipment

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

2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 Local Support Equipment

Manufacturer	Description	Model	Serial Number
DELL	Laptop	Latitude E5420	-

2.6 EUT Internal Configuration Details

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

Results reported relate only to the product tested.

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

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

4.1 Applicable Standard

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

Limits for General Population/Uncontrolled Exposure

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

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

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

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

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Time Averaging (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

2.4 GHz band:

Maximum peak output power at antenna input terminal (dBm):	25.86
Maximum peak output power at antenna input terminal (mW):	385.48
Prediction distance (cm):	20
Prediction frequency (MHz):	2412
Maximum Antenna Gain, typical (dBi):	3.0
Maximum Antenna Gain (numeric):	1.995
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.15301
Power density of prediction frequency at 20.0 cm (W/m^2):	1.5301
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

5.8 GH band:

Maximum peak output power at antenna input terminal (dBm):	21.16
Maximum peak output power at antenna input terminal (mW):	130.62
Prediction distance (cm):	20
Prediction frequency (MHz):	5745
Maximum Antenna Gain, typical (dBi):	3.0
Maximum Antenna Gain (numeric):	1.995
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.052
Power density of prediction frequency at 20.0 cm (W/m^2):	0.52
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
MPE limit for uncontrolled exposure at prediction frequency (W/m^2):	10

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.15301 mW/cm^2 (1.5301W/m^2). Limit is 1.0 mW/cm^2 (10 W/m^2).

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

5.1 Applicable Standard

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

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

According to IC RSS-Gen §7.1.2: Transmitter Antenna

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

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

5.2 Antenna List

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

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

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

6.1 Applicable Standards

As per FCC §15.207 and IC RSS-Gen §7.2.4 Conducted limits:

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

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

**Decreases with the logarithm of the frequency.*

6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2009 measurement procedure. The specification used was FCC §15.207 and IC RSS-Gen §7.2.4 limits.

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

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

6.3 Test Procedure

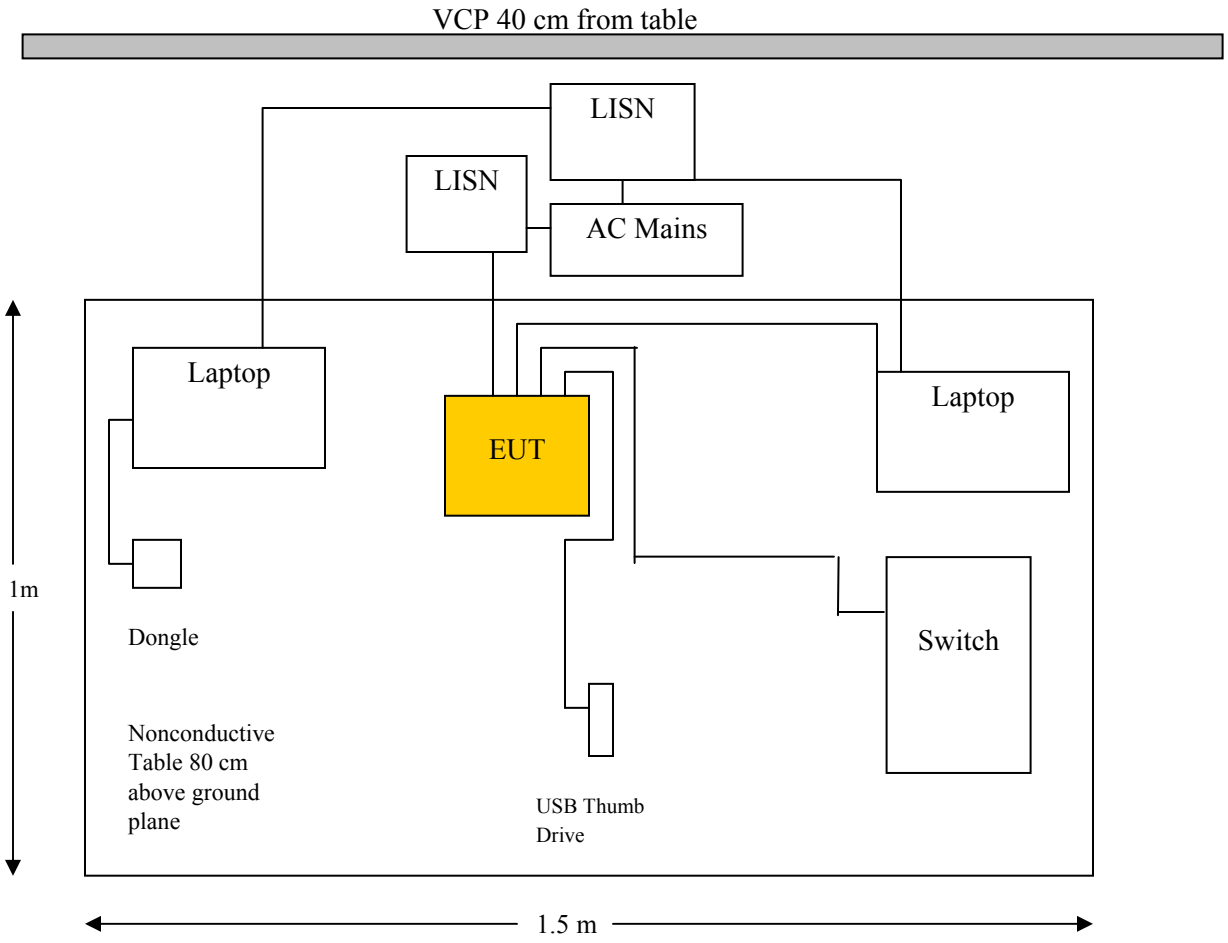
During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-2.

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

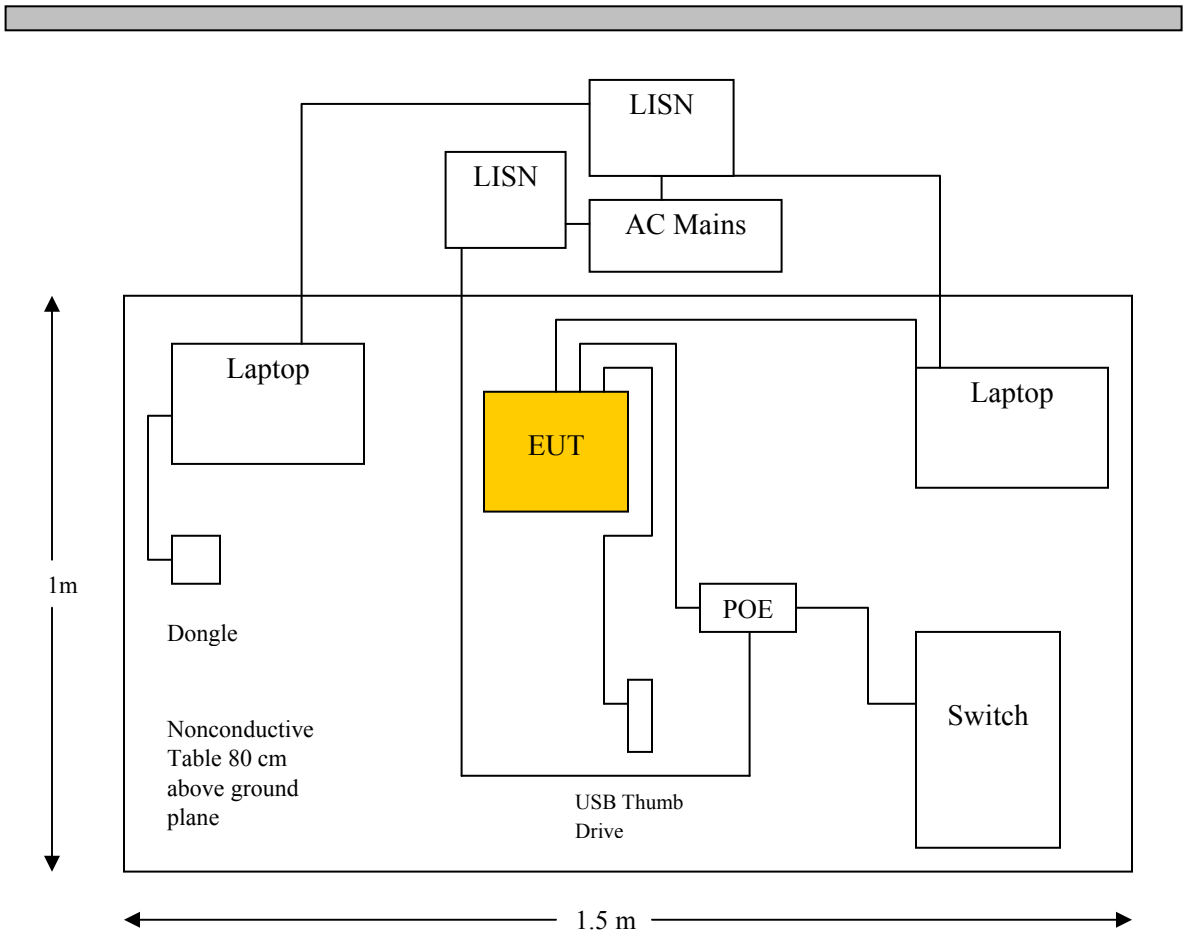
All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with a “QP.” Average readings are distinguished with an “Ave”.

6.4 Test Setup Block Diagram

AC/DC Adaptor:



POE



6.5 Corrected Amplitude & Margin Calculation

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

CA = Ai + CL + Atten

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.7 dB) + Attenuator (10 dB)

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

Margin = Corrected Amplitude - Limit

6.6 Test Equipment List and Details

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

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

6.7 Test Environmental Conditions

Temperature:	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 standard's conducted emissions limits, with the margin reading of:

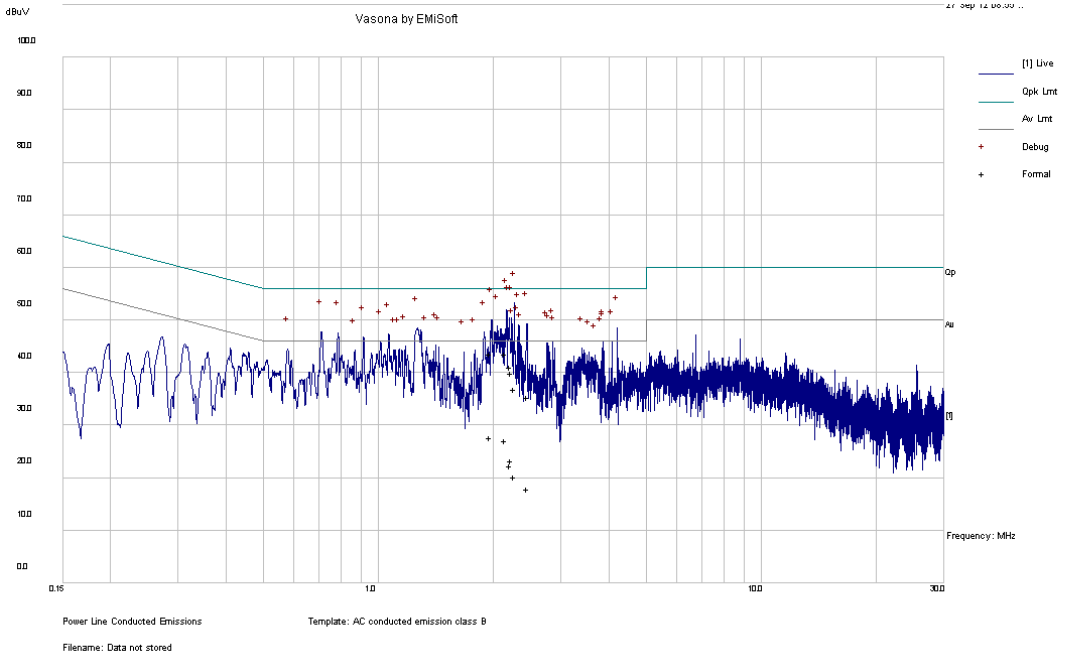
Transmitting Mode: Worst case with both 2.4GHz and 5GHz operating:

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (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:

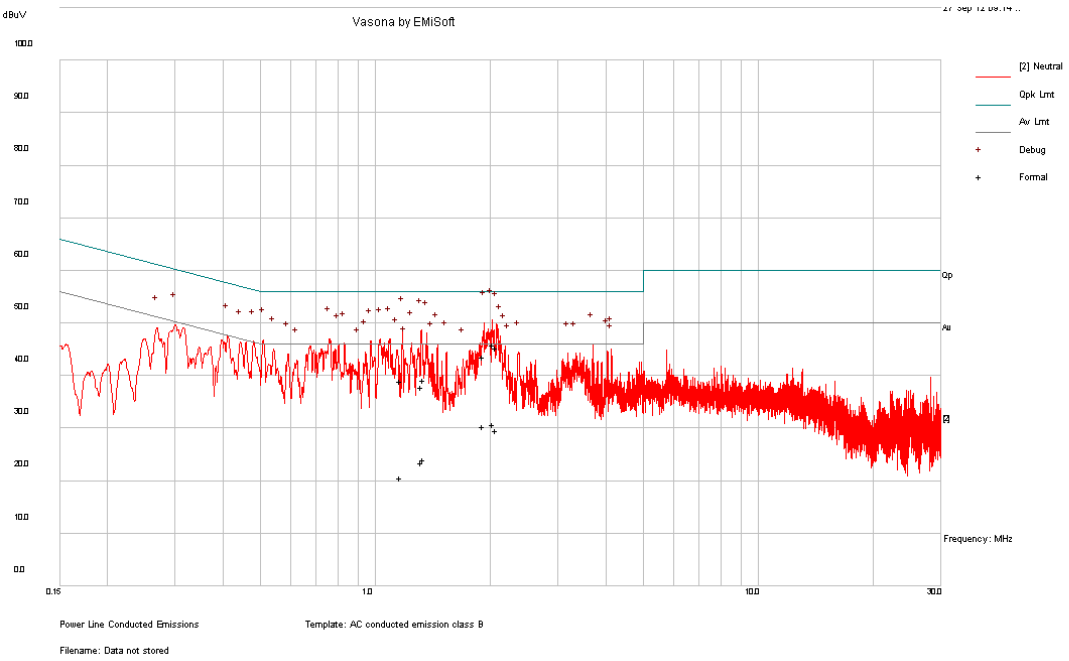
120 V, 60 Hz – Line, AC/DC Adaptor



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.

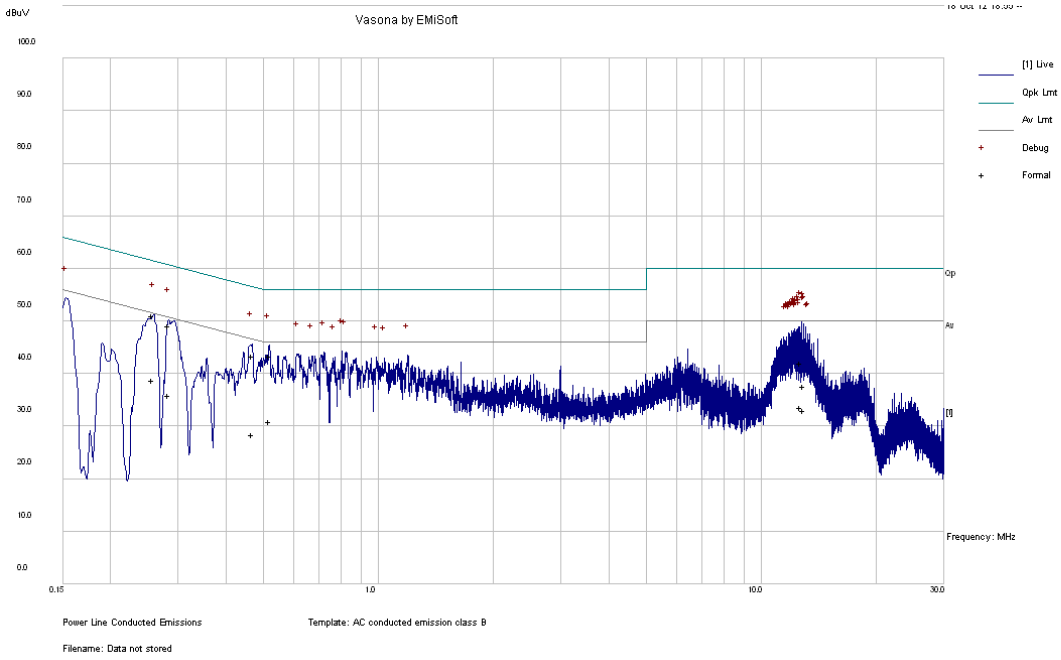
120 V, 60 Hz – Neutral, AC/DC Adaptor



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.

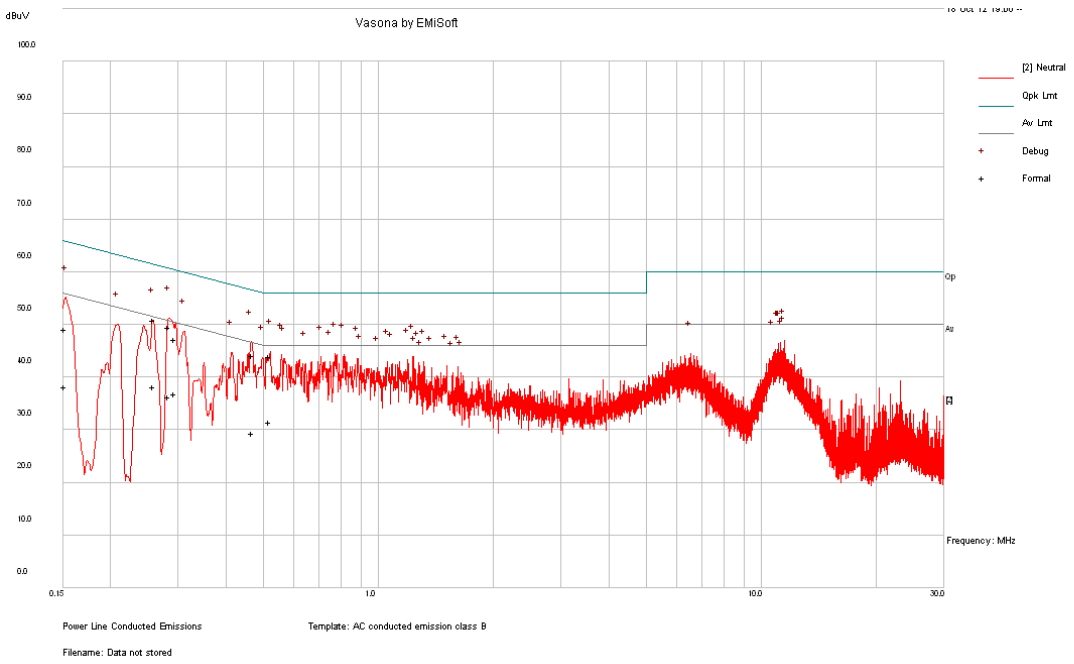
120 V, 60 Hz – Line, POE



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

7.1 Applicable Standard

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

7.2 Measurement Procedure

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

7.3 Test Equipment List and Details

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

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

7.4 Test Environmental Conditions

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

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

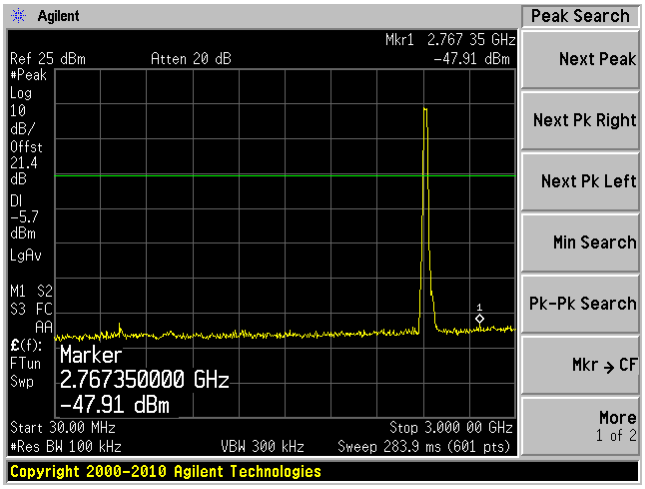
7.5 Test Results

Please refer to following plots of spurious emissions.

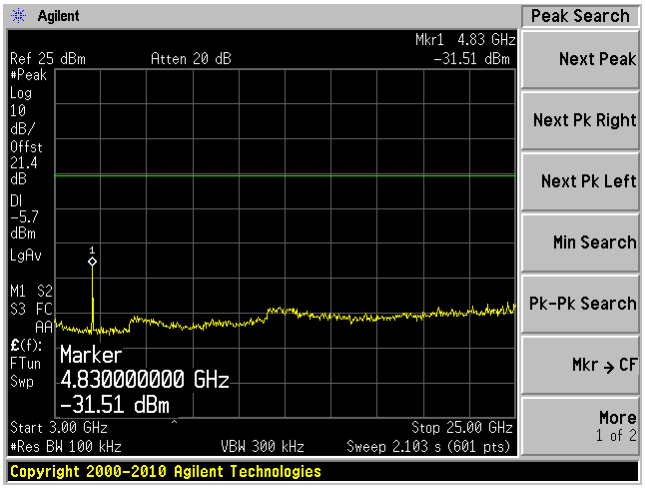
2400-2483.5 MHz

802.11b, Low Channel, 2412 MHz

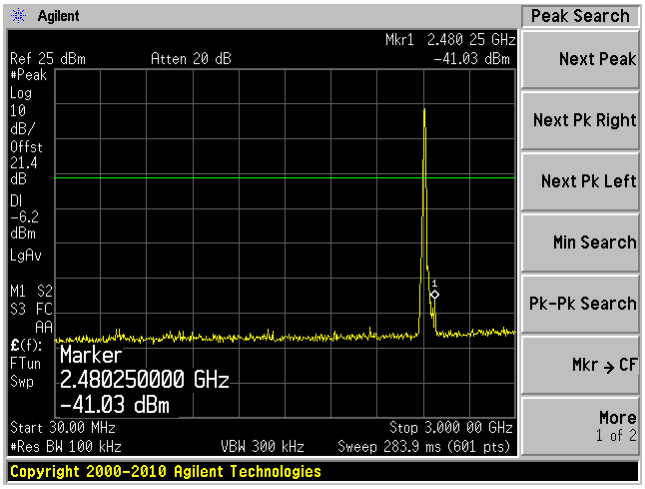
Chain J0, Plot: 30 MHz – 3 GHz



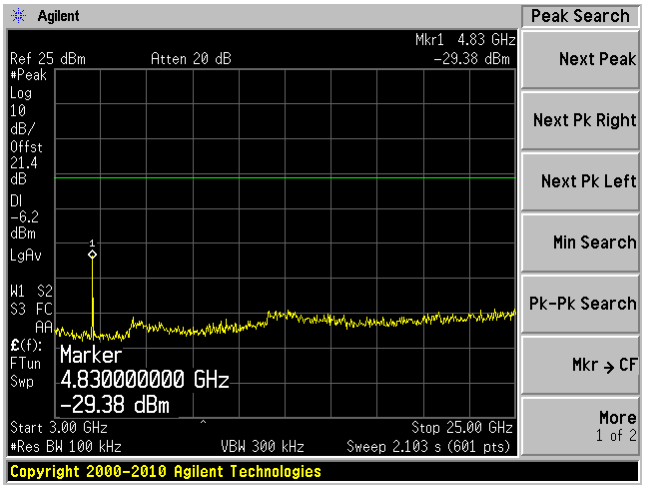
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

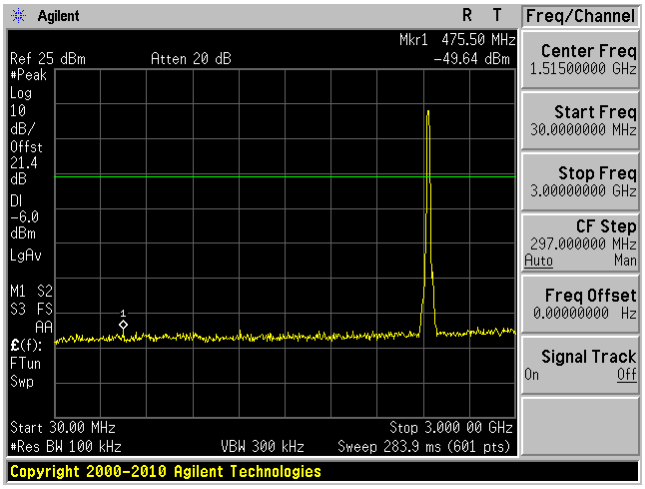


Chain J1, Plot: 3 GHz – 25 GHz

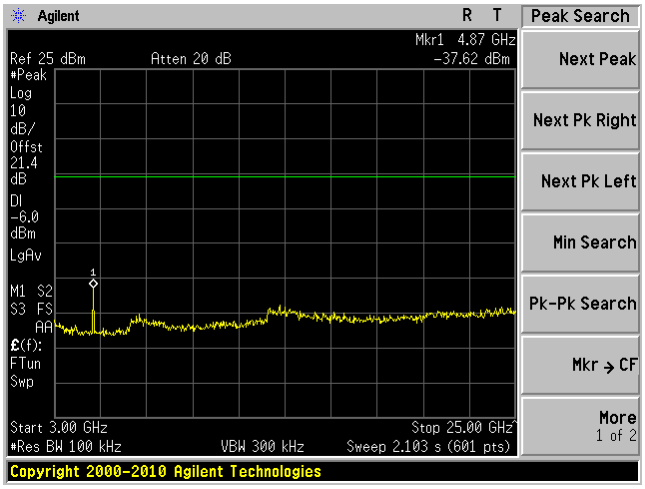


802.11b, Middle Channel, 2437 MHz

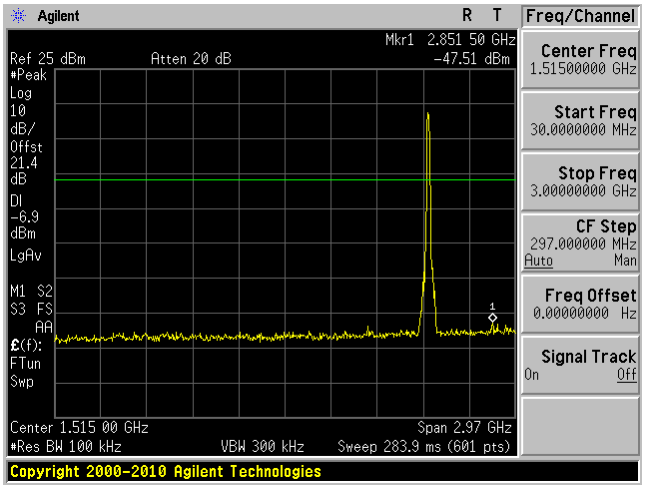
Chain J0, Plot: 30 MHz – 3 GHz



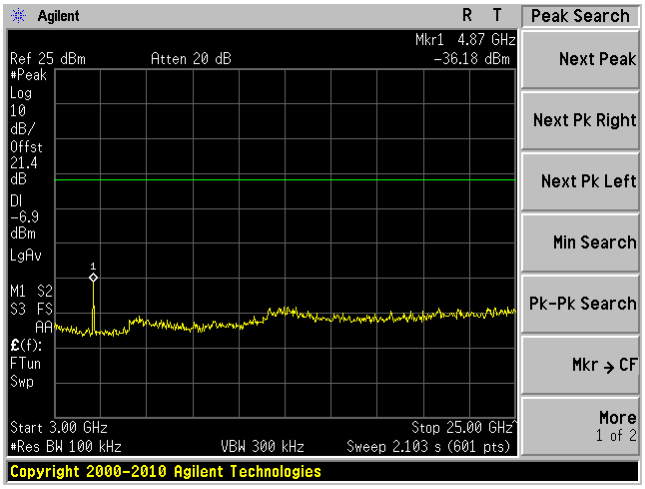
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

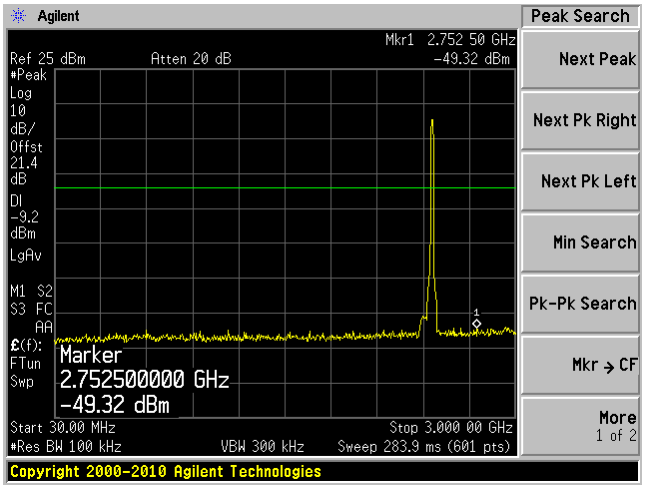


Chain J1, Plot: 3 GHz – 25 GHz

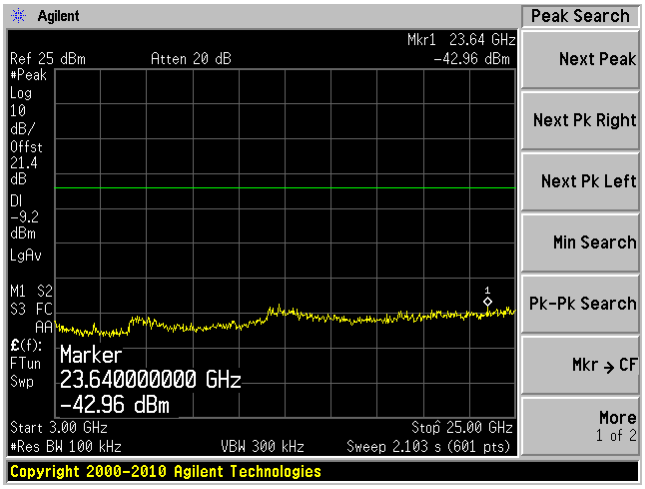


802.11b, High Channel, 2462 MHz

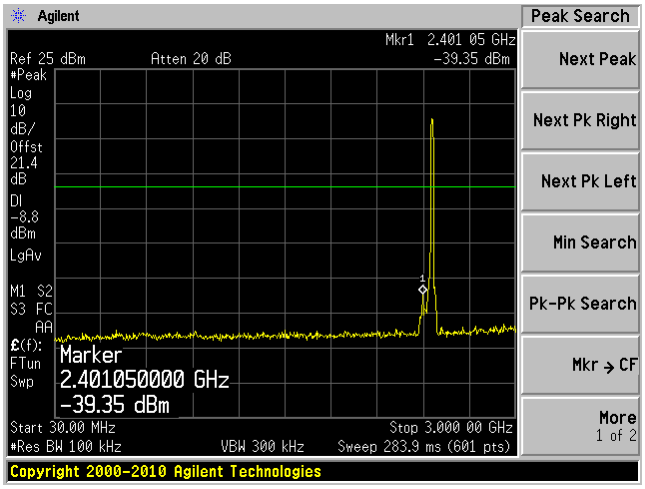
Chain J0, Plot: 30 MHz – 3 GHz



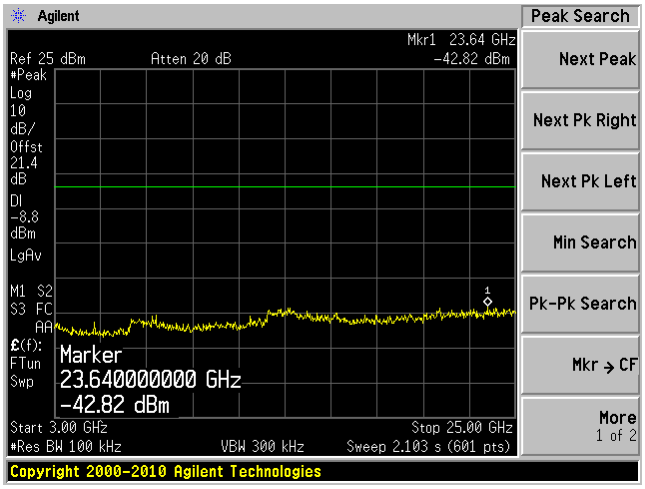
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

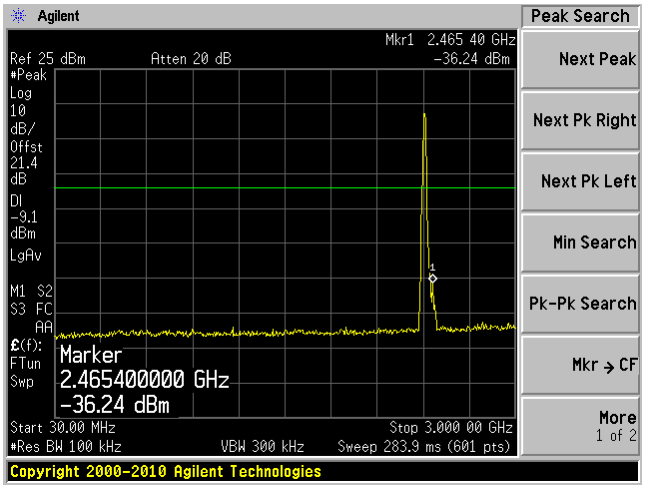


Chain J1, Plot: 3 GHz – 25 GHz

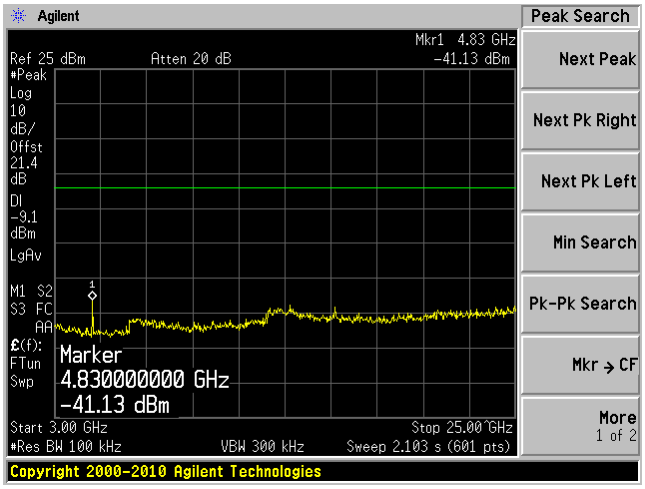


802.11g, Low Channel 2412 MHz

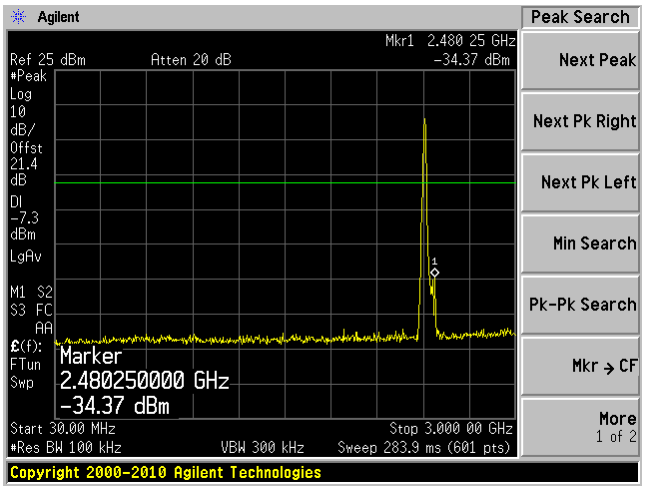
Chain J0, Plot: 30 MHz – 3 GHz



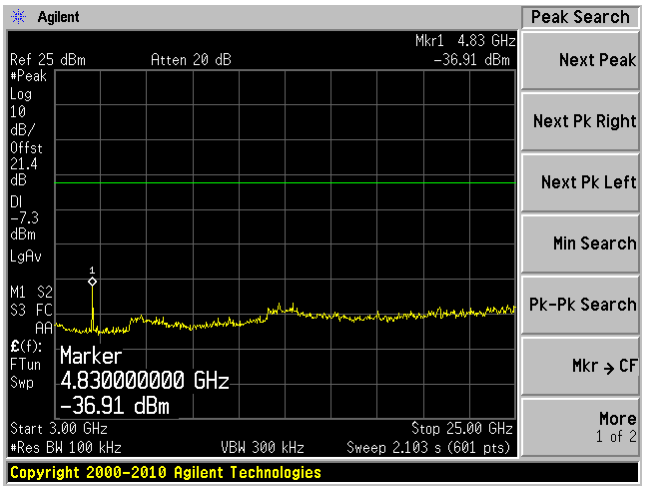
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

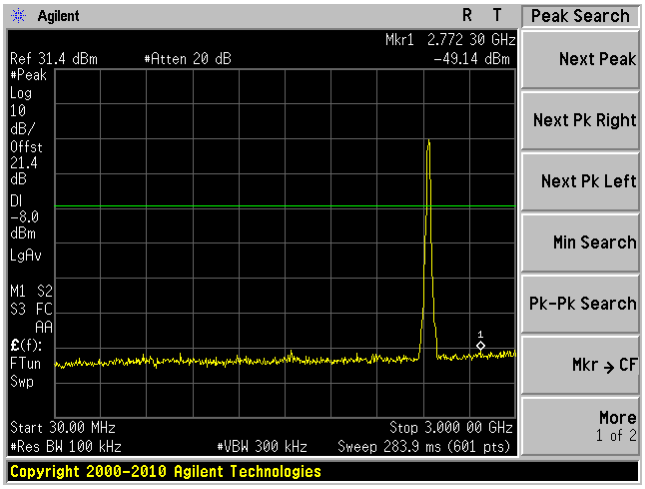


Chain J1, Plot: 3 GHz – 25 GHz

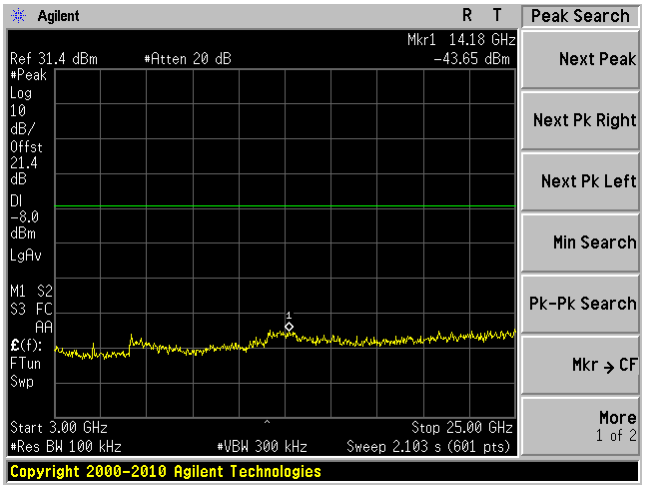


802.11g, Middle Channel 2437 MHz

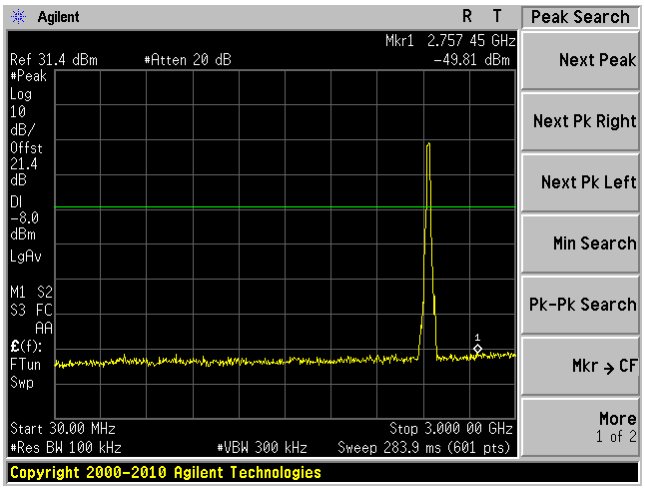
Chain J0, Plot: 30 MHz – 3 GHz



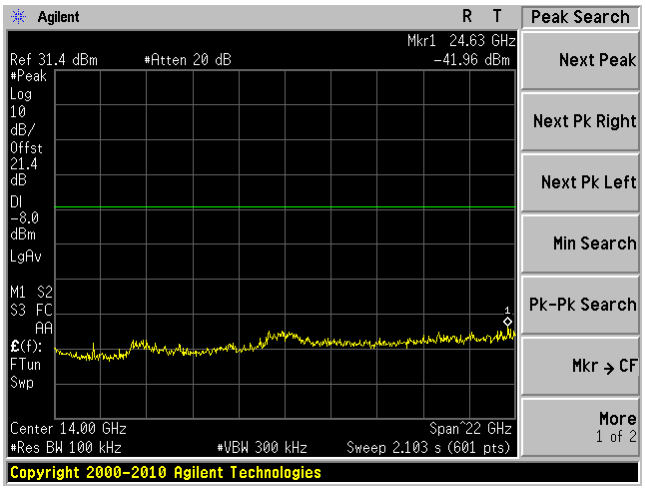
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

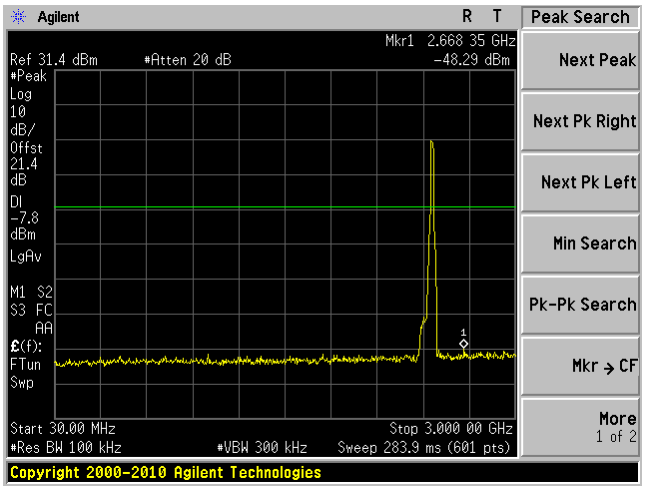


Chain J1, Plot: 3 GHz – 25 GHz

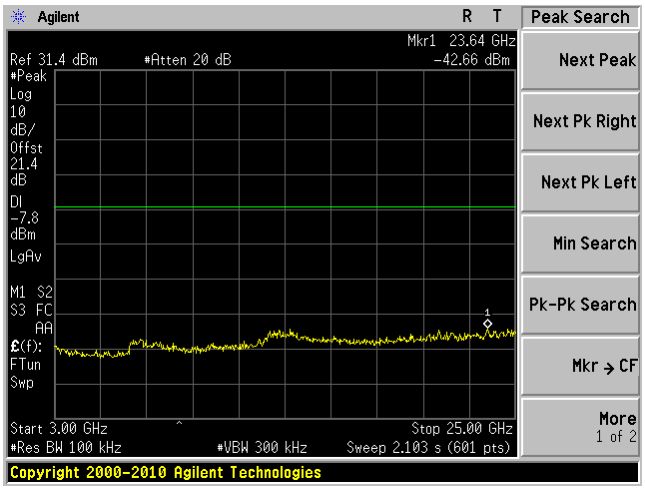


802.11g, High Channel 2462 MHz

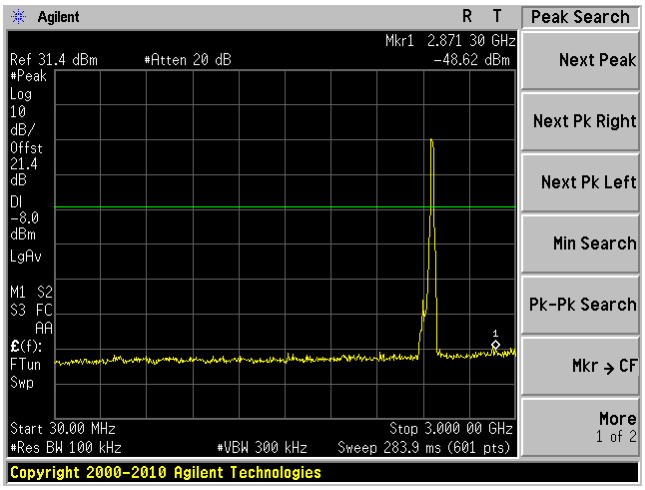
Chain J0, Plot: 30 MHz – 3 GHz



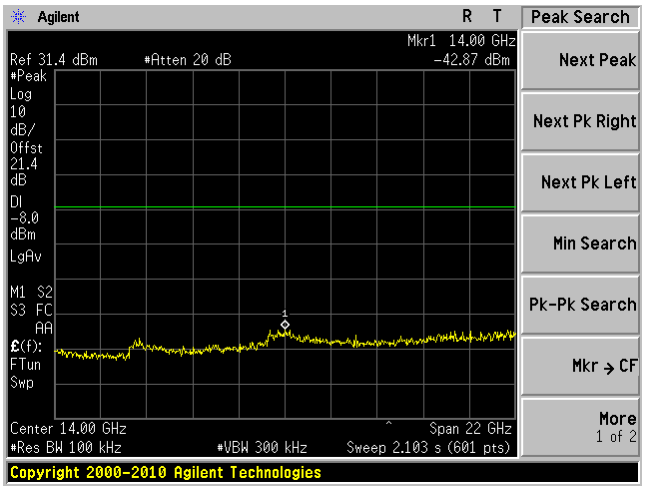
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

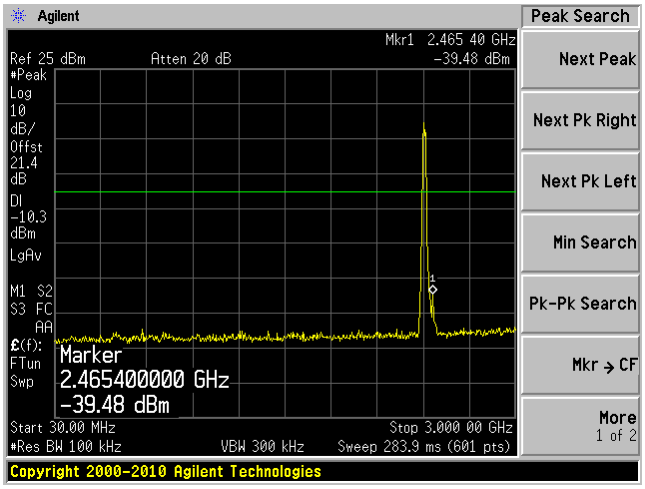


Chain J1, Plot: 3 GHz – 25 GHz

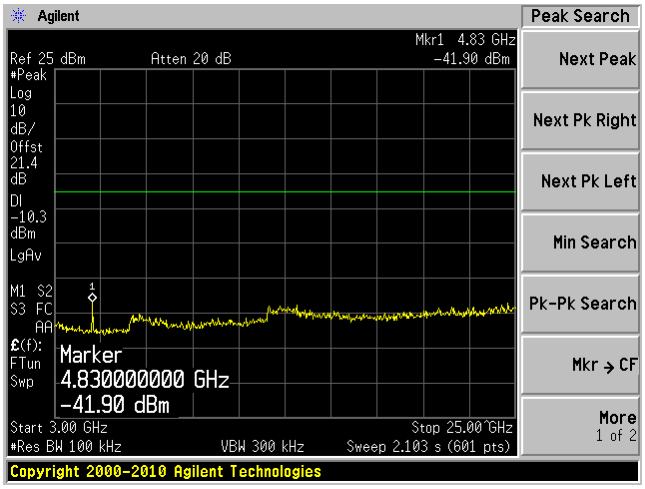


802.11n HT20, Low Channel 2412 MHz

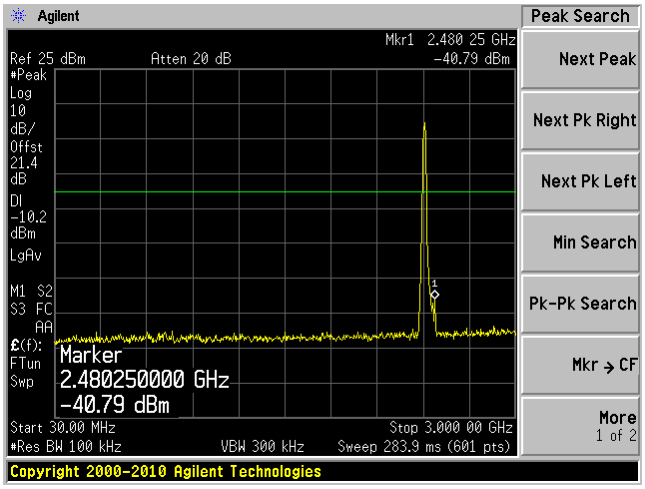
Chain J0, Plot: 30 MHz – 3 GHz



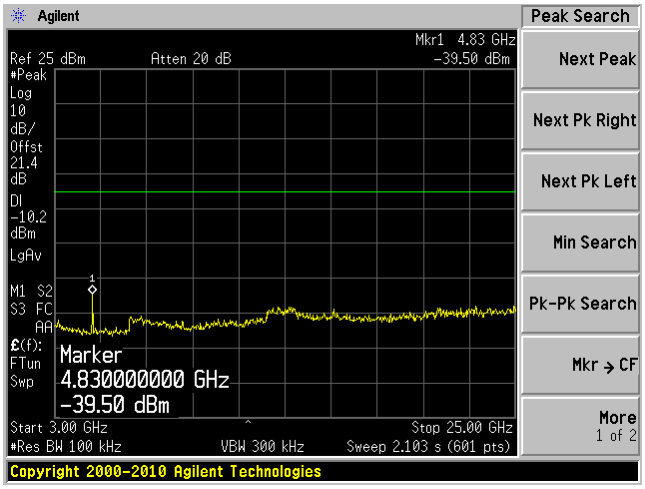
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

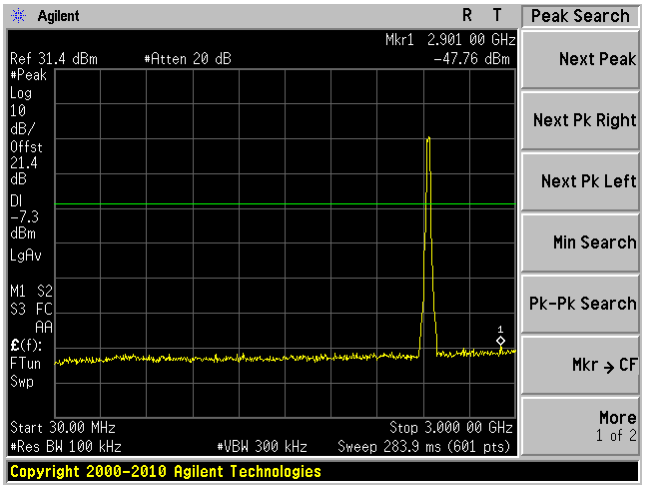


Chain J1, Plot: 3 GHz – 25 GHz

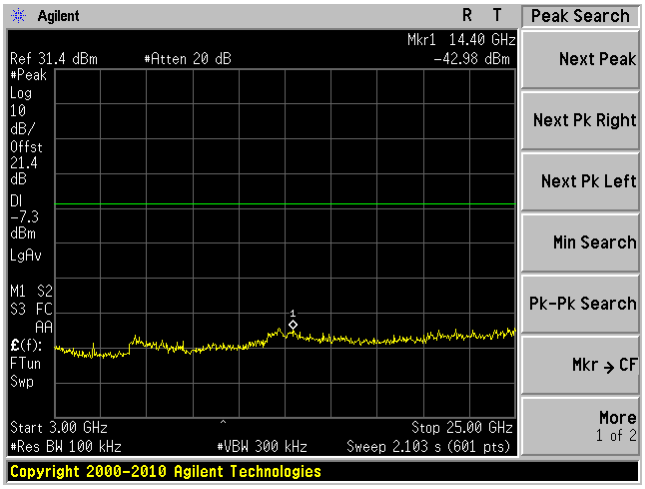


802.11n HT20, Middle Channel 2437 MHz

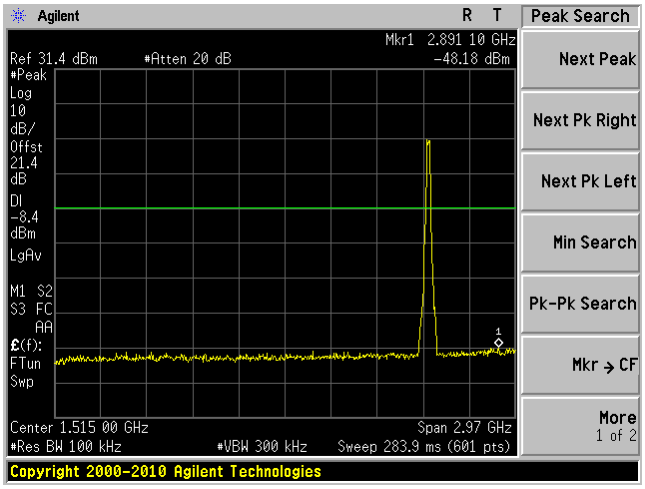
Chain J0, Plot: 30 MHz – 3 GHz



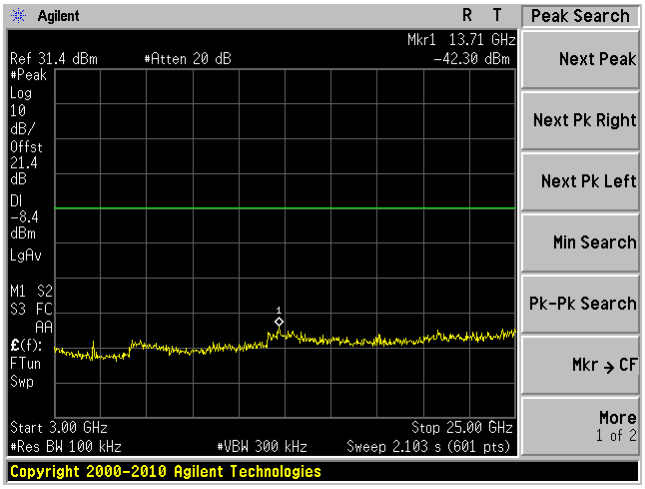
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

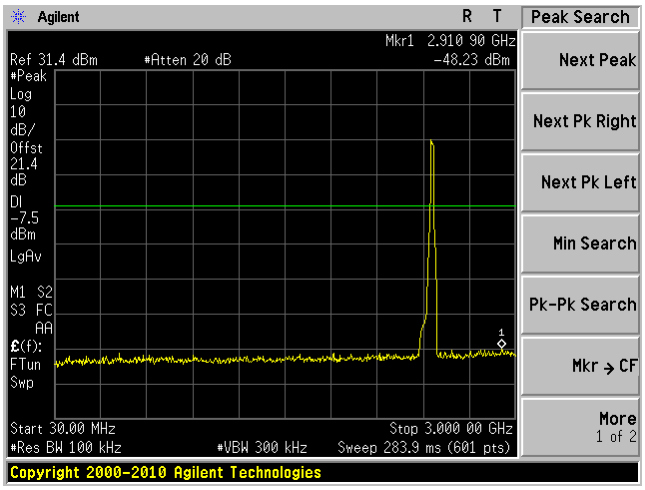


Chain J1, Plot: 3 GHz – 25 GHz

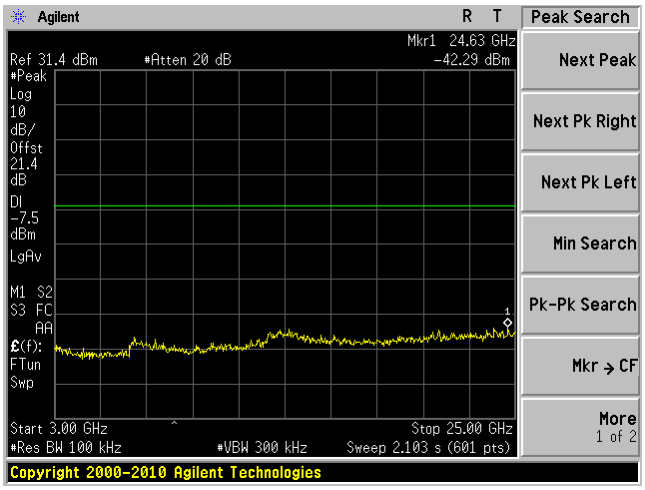


802.11n HT20, High Channel 2462 MHz

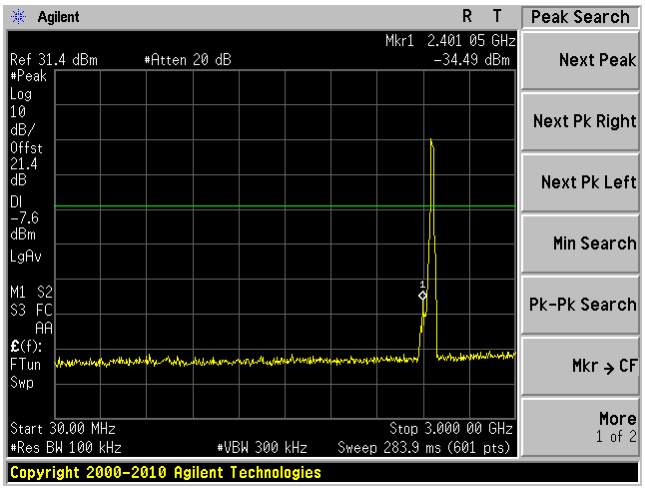
Chain J0, Plot: 30 MHz – 3 GHz



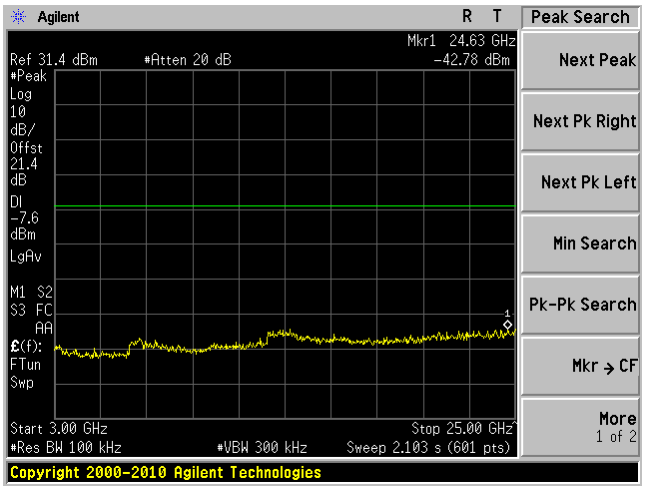
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

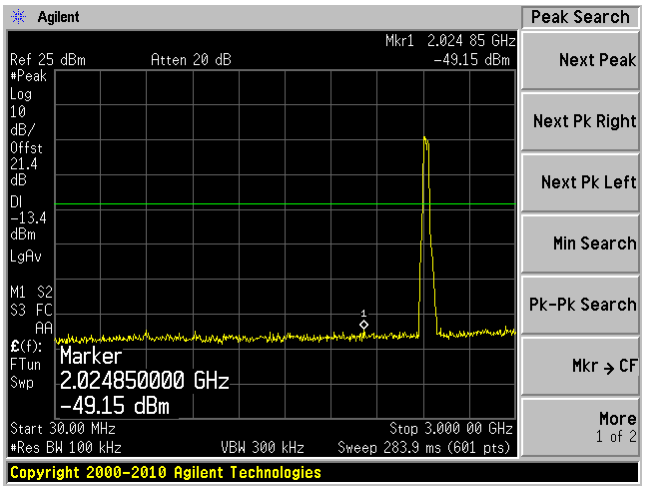


Chain J1, Plot: 3 GHz – 25 GHz

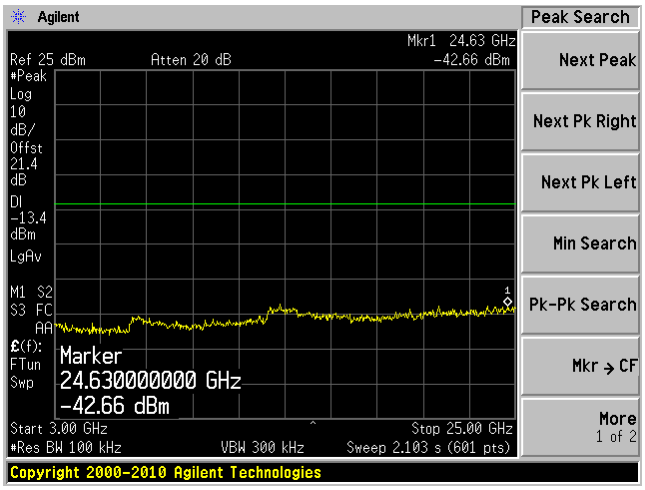


802.11n HT40, Low Channel 2422 MHz

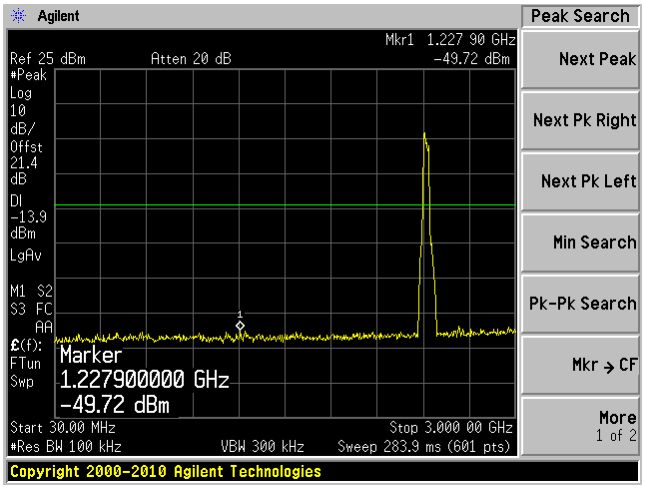
Chain J0, Plot: 30 MHz – 3 GHz



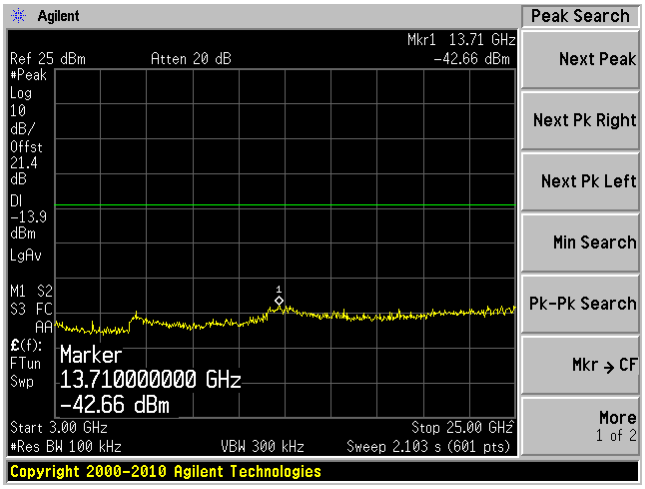
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

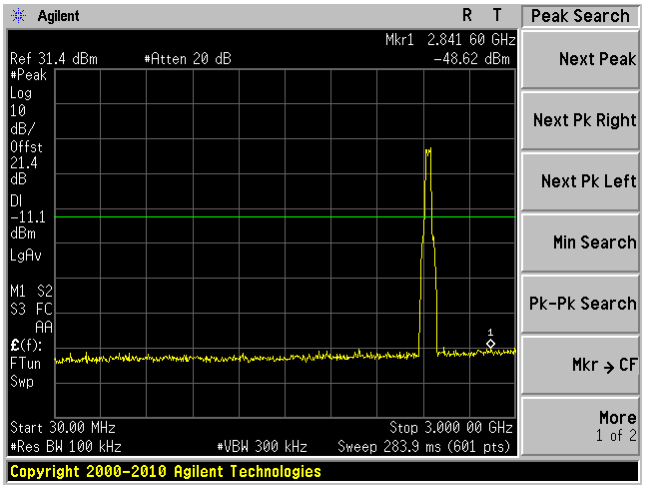


Chain J1, Plot: 3 GHz – 25 GHz

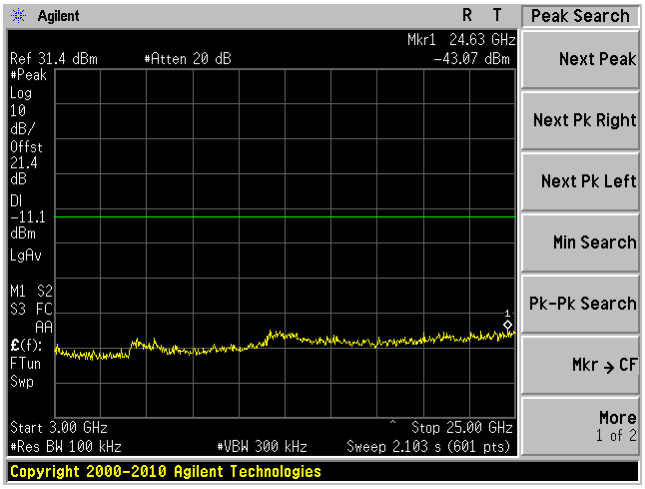


802.11n HT40, Middle Channel 2437 MHz

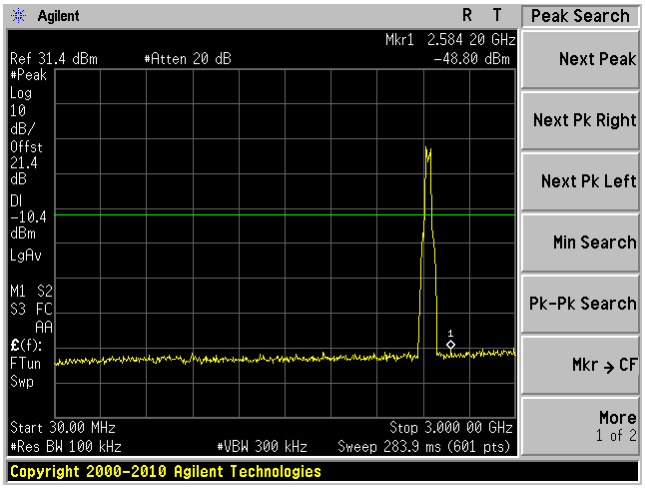
Chain J0, Plot: 30 MHz – 3 GHz



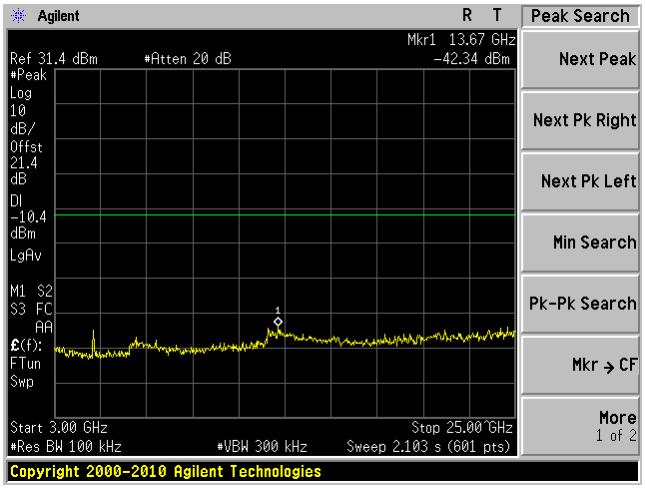
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz

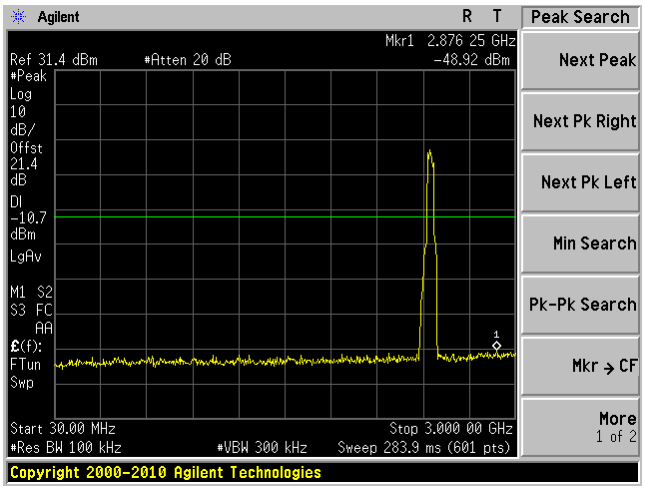


Chain J1, Plot: 3 GHz – 25 GHz

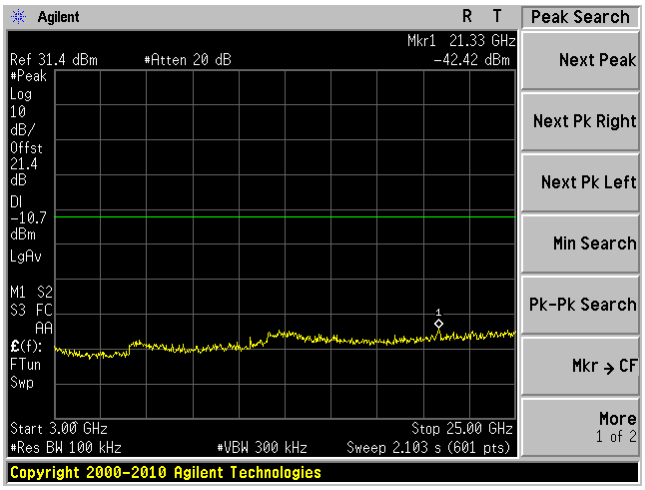


802.11n HT40, High Channel 2452 MHz

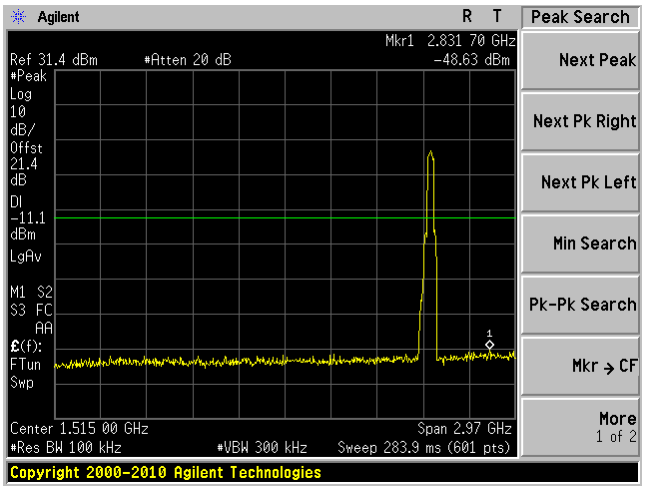
Chain J0, Plot: 30 MHz – 3 GHz



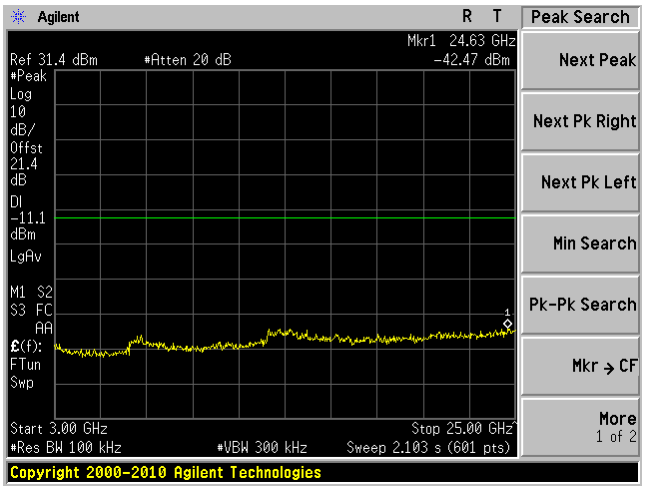
Chain J0, Plot: 3 GHz – 25 GHz



Chain J1, Plot: 30 MHz – 3 GHz



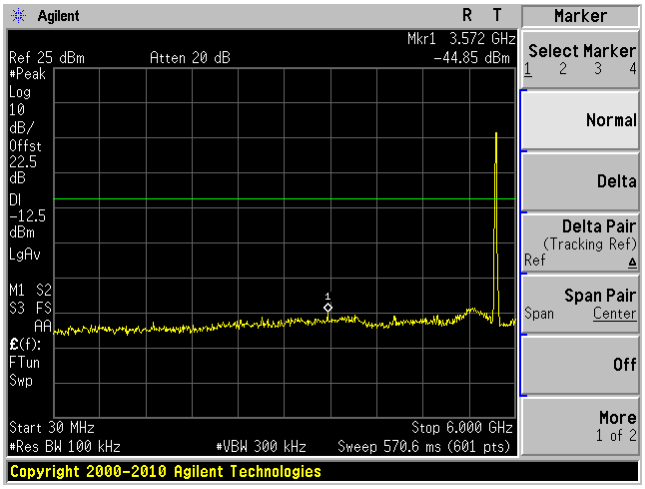
Chain J1, Plot: 3 GHz – 25 GHz



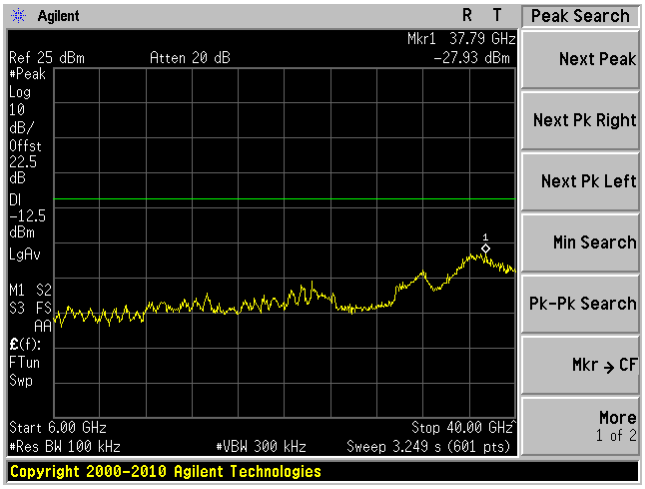
5725-5845 MHz

802.11a, Low Channel 5745 MHz

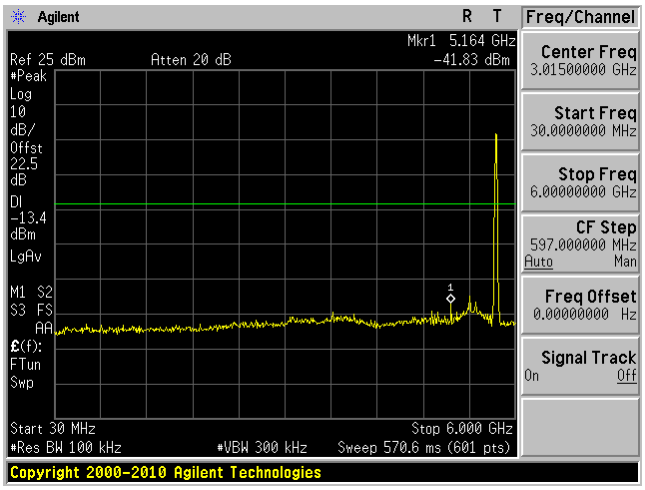
Chain J0, Plot: 30 MHz – 6 GHz



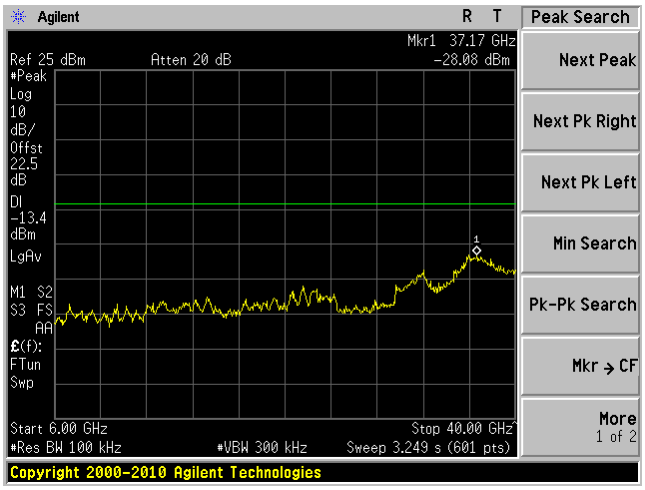
Chain J0, Plot: 6 GHz – 40 GHz



Chain J1, Plot: 30 MHz – 6 GHz

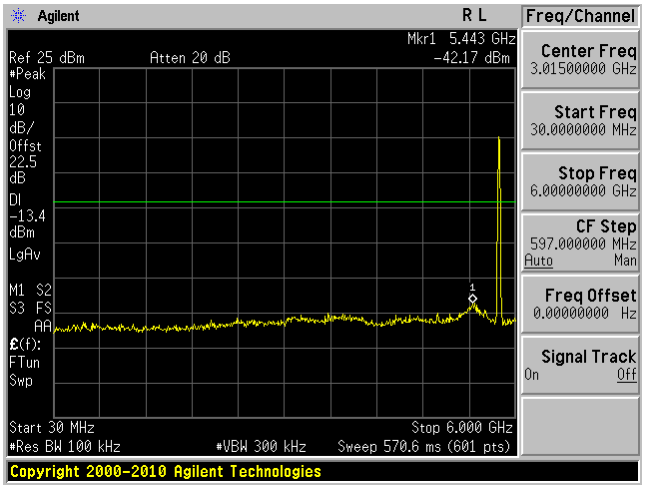


Chain J1, Plot: 6 GHz – 40 GHz

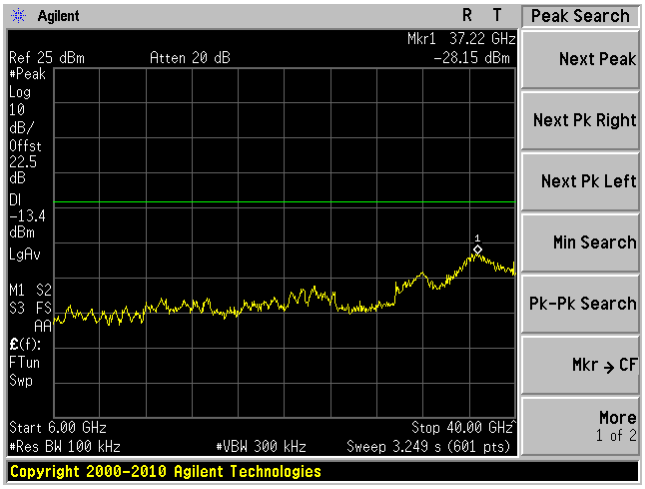


802.11a, Middle Channel 5785 MHz

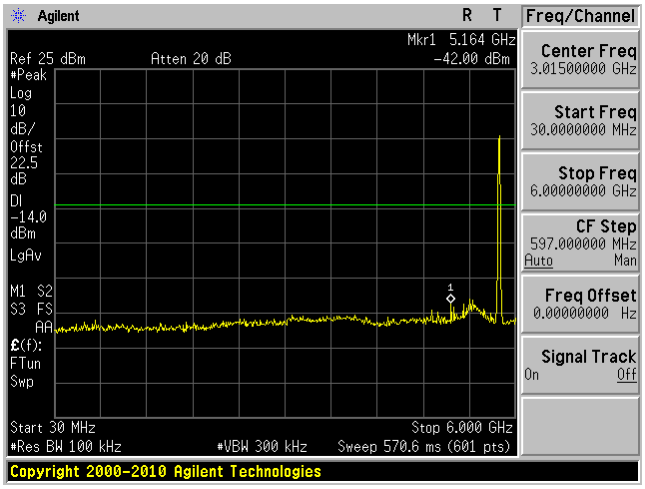
Chain J0, Plot: 30 MHz – 6 GHz



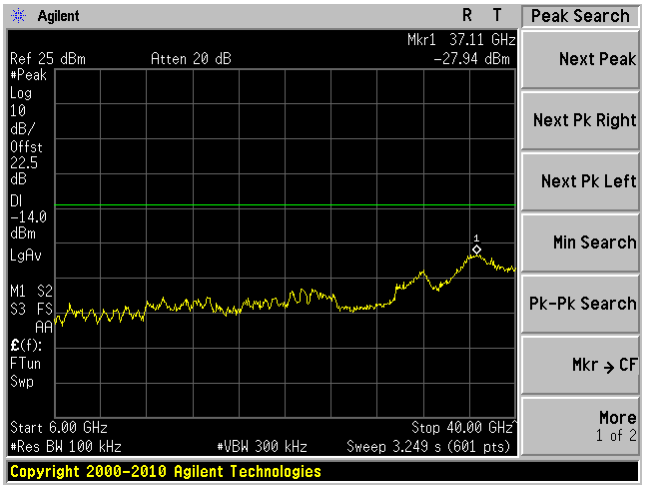
Chain J0, Plot: 6 GHz – 40 GHz



Chain J1, Plot: 30 MHz – 6 GHz

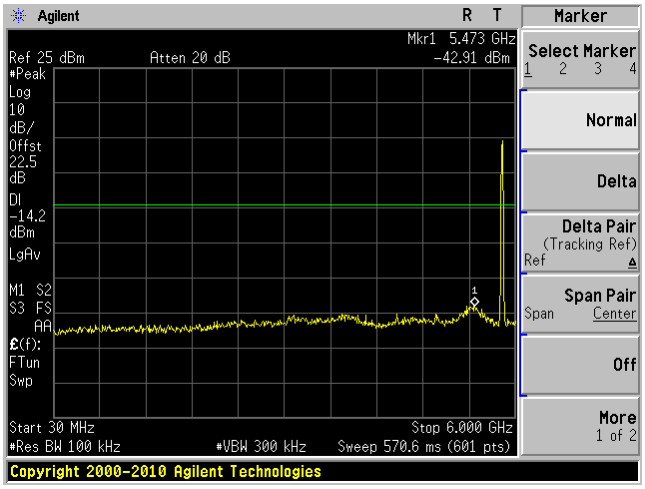


Chain J1, Plot: 6 GHz – 40 GHz

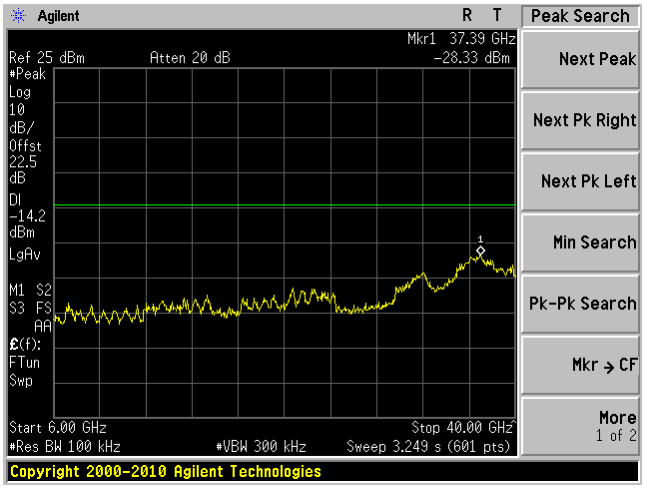


802.11a, High Channel 5825 MHz

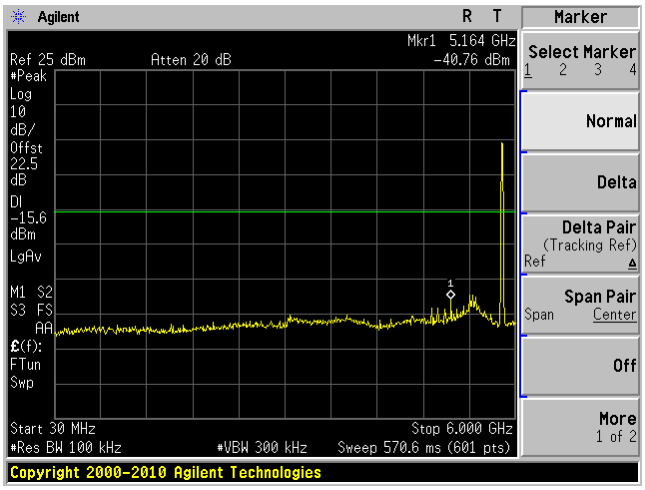
Chain J0, Plot: 30 MHz – 6 GHz



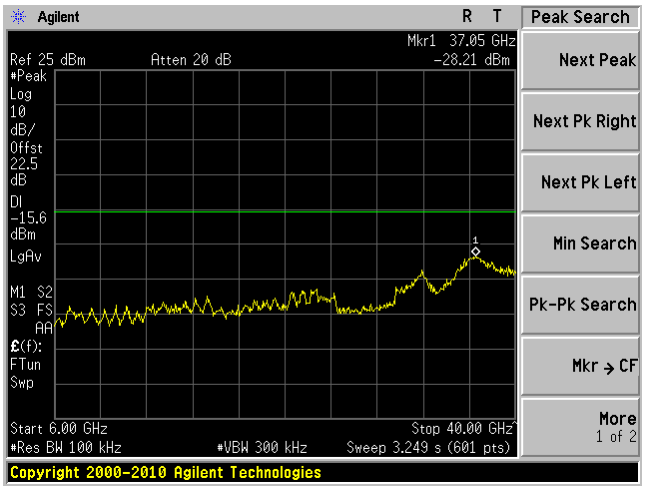
Chain J0, Plot: 6 GHz – 40 GHz



Chain J1, Plot: 30 MHz – 6 GHz

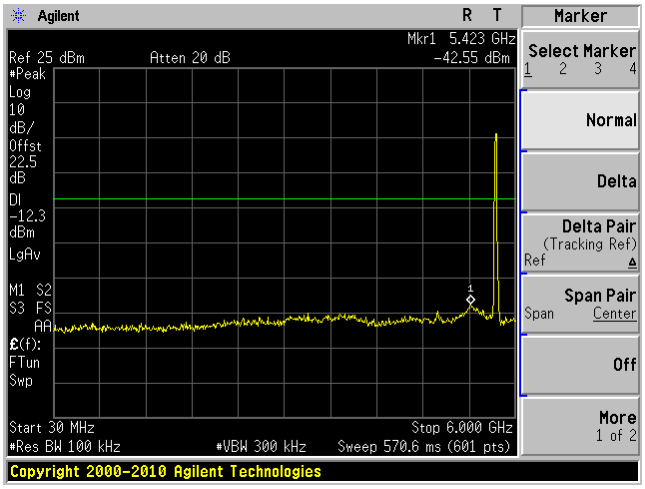


Chain J1, Plot: 6 GHz – 40 GHz

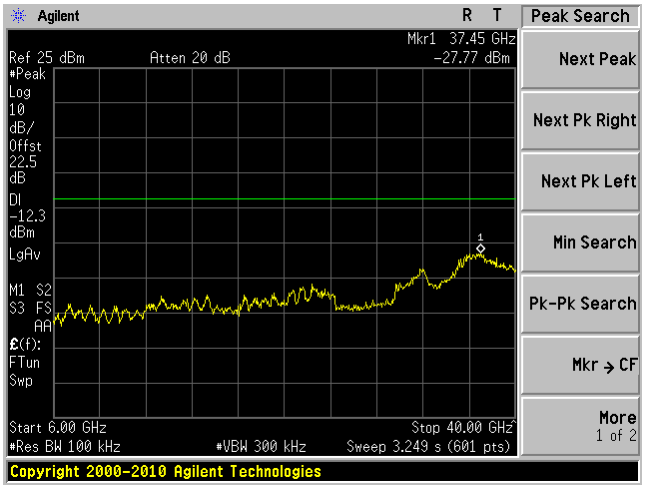


802.11n HT20, Low Channel 5745 MHz

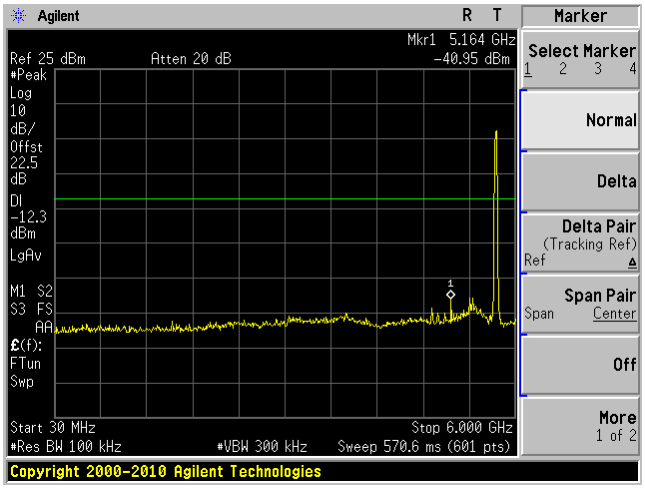
Chain J0, Plot: 30 MHz – 6 GHz



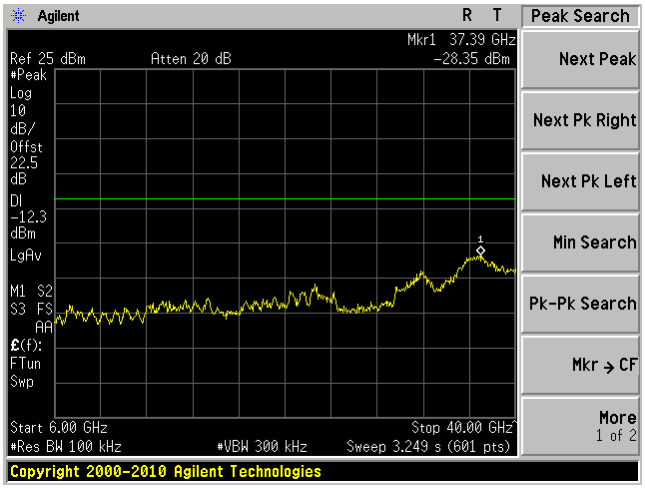
Chain J0, Plot: 6 GHz – 40 GHz



Chain J1, Plot: 30 MHz – 6 GHz

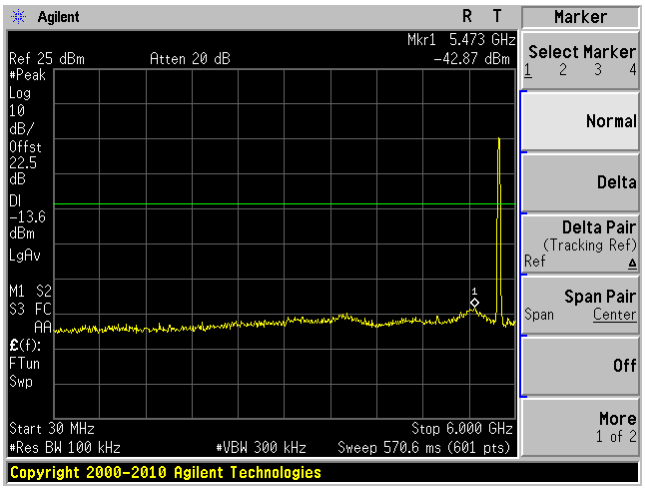


Chain J1, Plot: 6 GHz – 40 GHz

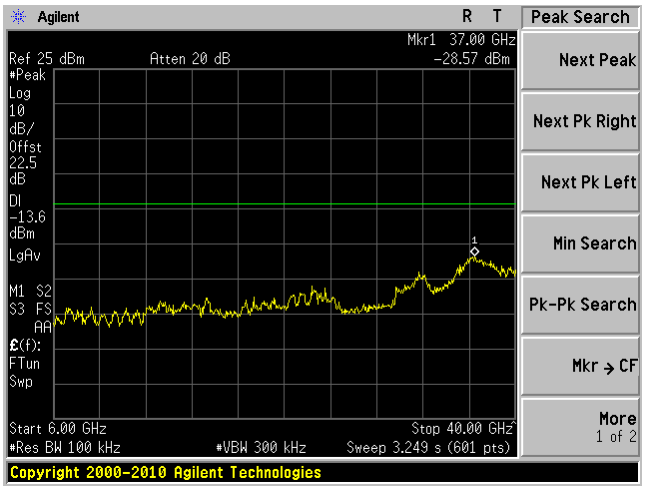


802.11n HT20, Middle Channel 5785 MHz

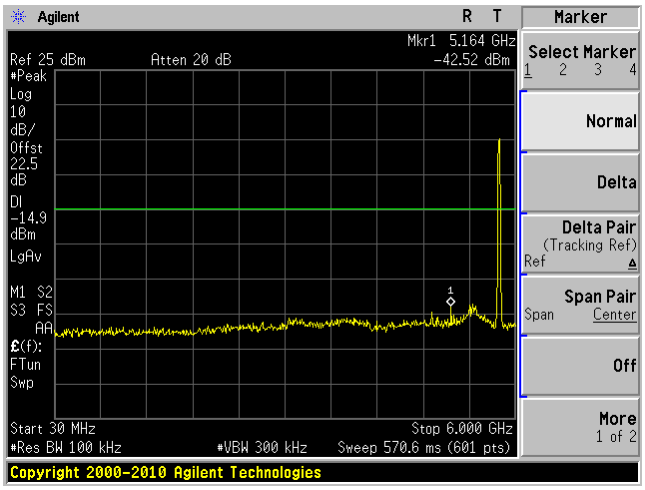
Chain J0, Plot: 30 MHz – 6 GHz



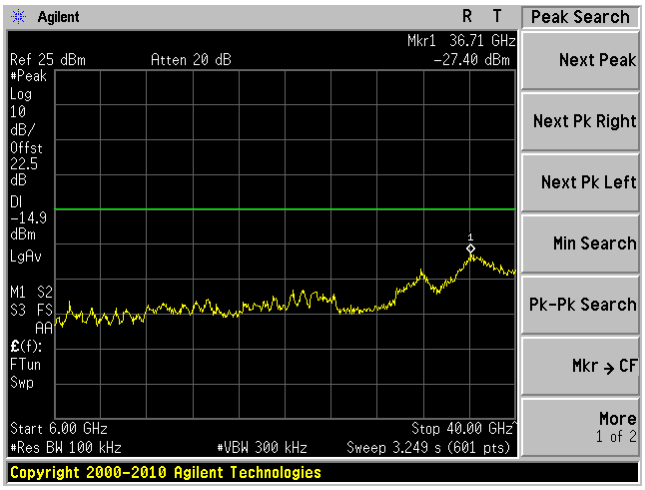
Chain J0, Plot: 6 GHz – 40 GHz



Chain J1, Plot: 30 MHz – 6 GHz

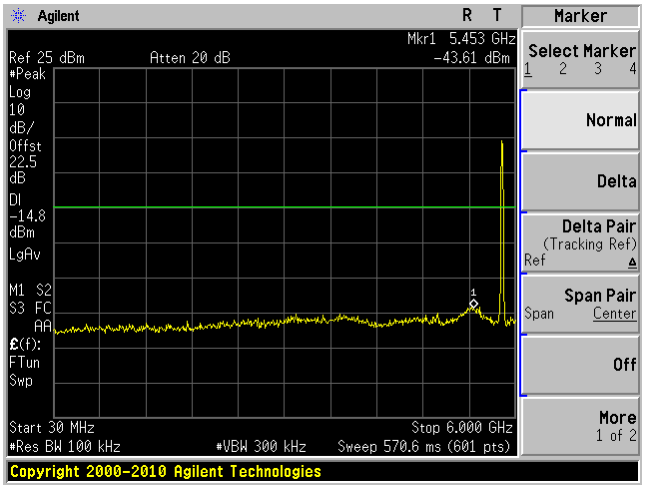


Chain J1, Plot: 6 GHz – 40 GHz

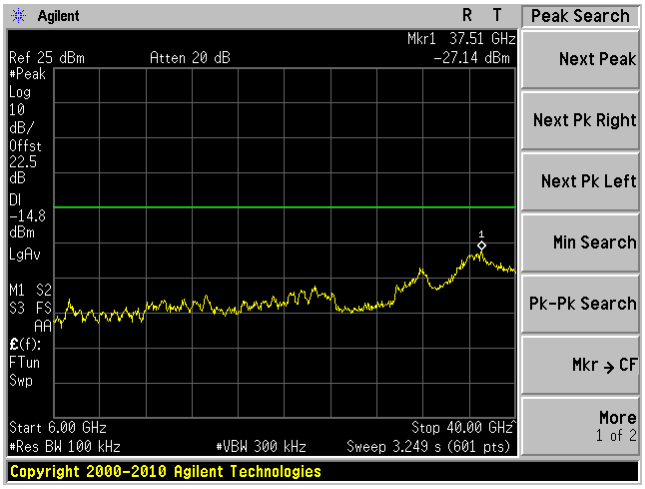


802.11n HT20, High Channel 5825 MHz

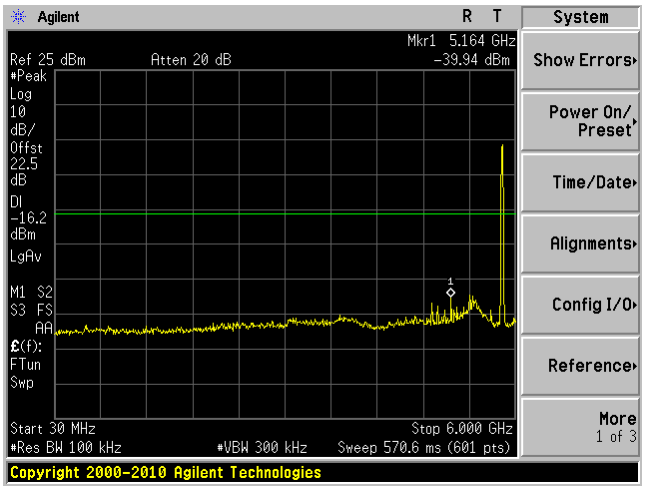
Chain J0, Plot: 30 MHz – 6 GHz



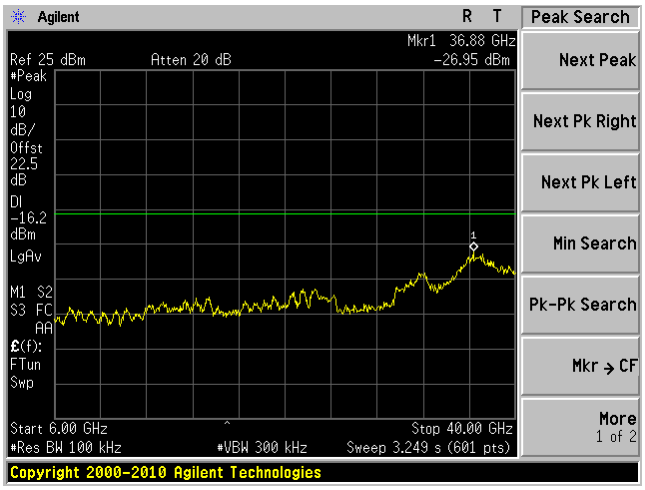
Chain J0, Plot: 6 GHz – 40 GHz



Chain J1, Plot: 30 MHz – 6 GHz

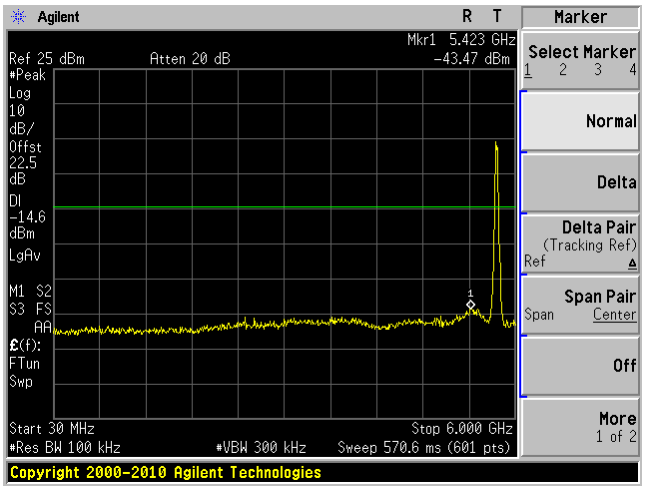


Chain J1, Plot: 6 GHz – 40 GHz

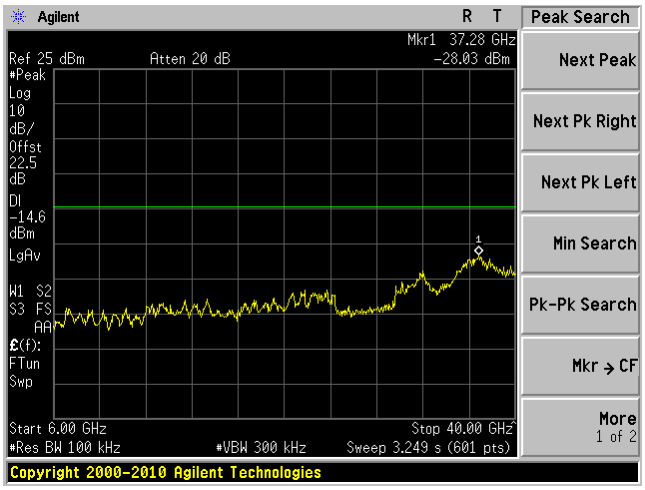


802.11n HT40, Low Channel 5755 MHz

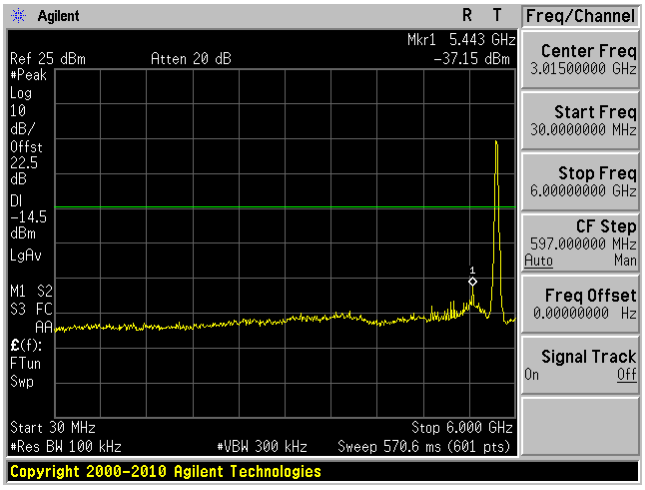
Chain J0, Plot: 30 MHz – 6 GHz



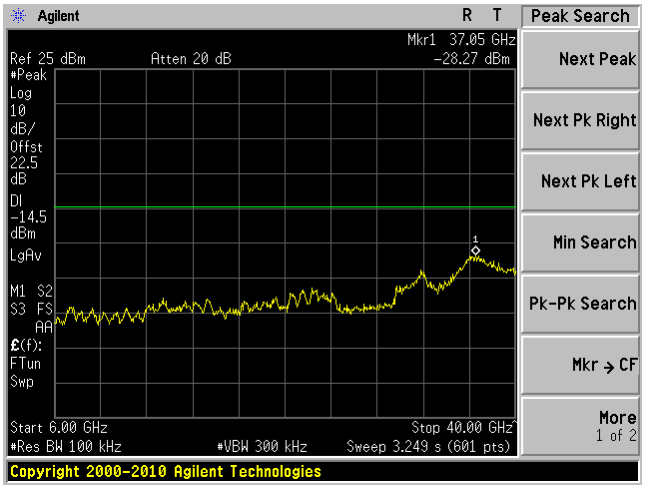
Chain J0, Plot: 6 GHz – 40 GHz



Chain J1, Plot: 30 MHz – 6 GHz

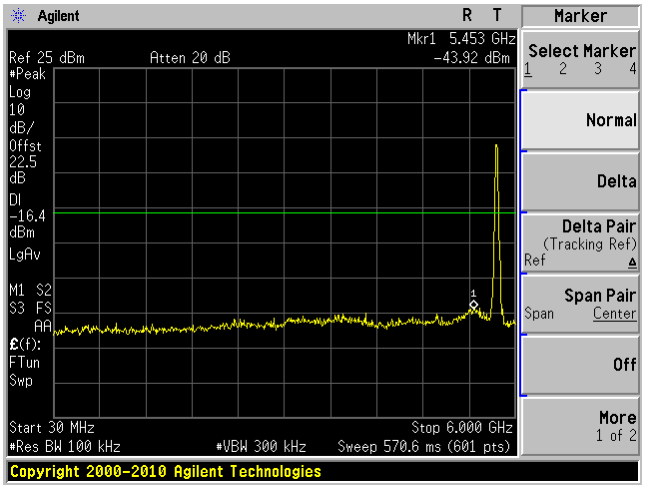


Chain J1, Plot: 6 GHz – 40 GHz

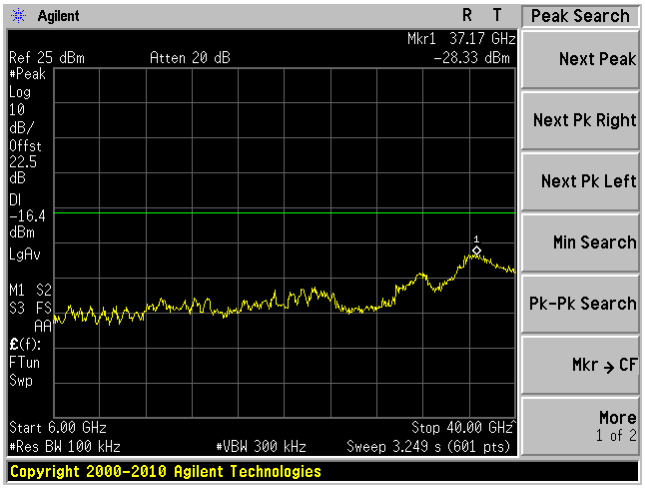


802.11n HT40, High Channel 5795 MHz

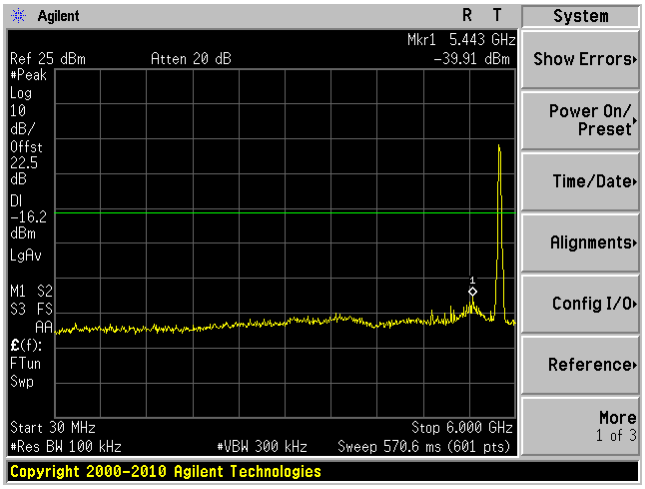
Chain J0, Plot: 30 MHz – 6 GHz



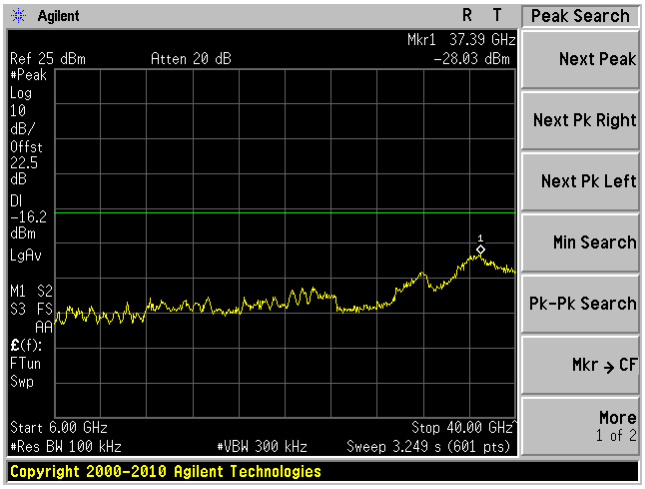
Chain J0, Plot: 6 GHz – 40 GHz



Chain J1, Plot: 30 MHz – 6 GHz



Chain J1, Plot: 6 GHz – 40 GHz



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

8.1 Applicable Standard

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

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

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

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

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

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

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

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

8.2 Test Setup

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

The spacing between the peripherals was 3 centimeters.

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

8.3 Test Procedure

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

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

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

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

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

Above 1000 MHz:

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

8.4 Corrected Amplitude & Margin Calculation

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

CA = Ai + AF + CL + Atten – Ga

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

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

Margin = Corrected Amplitude - Limit

8.5 Test Equipment List and Details

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

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

8.6 Test Environmental Conditions

Temperature:	21-24°C
Relative Humidity:	43-46%
ATM Pressure:	101-103kPa

The testing was performed by Jeffrey Wu from 2012-10-12 to 2012-10-15 at 5 meter 3.

8.7 Summary of Test Results

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

30-1000 MHz:

2.4 GHz Band

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-9.32	43.15775	Vertical	802.11 b mode High Channel

5.8 GHz Band

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-12.24	499.9813	Vertical	802.11n HT40 mode High Channel

1 – 25 GHz:

2.4 GHz Band

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-1.762	4924	Horizontal	802.11 b mode High Channel

1-40 GHz:

5.8 GHz Band

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-1.736	11490	Horizontal	802.11 a mode Low Channel

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

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

8.8 Radiated Emissions Test Data and Plots

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

2.4 GHz Band, Quasi-Peak Measurements

802.11b mode, Low Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
34.917	28.45	100	V	252	40	-11.55
50.7905	28.88	100	V	153	40	-11.12
73.1475	27.18	129	V	14	40	-12.82
105.6783	28.1	108	V	76	43.5	-15.4
135.4153	20.73	340	V	195	43.5	-22.77
499.973	34.8	100	V	43	46	-11.2

802.11b mode, Middle Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
35.32875	28.72	100	V	203	40	-11.28
51.24975	28.55	135	V	107	40	-11.45
72.41925	25.79	183	V	22	40	-14.21
105.6673	33.15	400	V	101	43.5	-10.35
135.4153	20.73	340	V	195	43.5	-22.77
499.9983	34.51	130	V	35	46	-11.49

802.11b mode, High Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
34.79225	28.54	109	V	300	40	-11.46
43.15775	30.68	100	V	193	40	-9.32
56.57475	26.13	169	V	84	40	-13.87
71.20775	23.36	143	V	335	40	-16.64
105.661	31.71	112	V	156	43.5	-11.79
131.2295	23.02	100	V	267	43.5	-20.48

802.11g mode, Low Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
43.14775	30.31	112	V	189	40	-9.69
71.868	22.81	203	V	224	40	-17.19
82.462	24.13	165	V	24	40	-15.87
105.736	30.79	100	V	243	43.5	-12.71
144.1238	19.02	195	V	291	43.5	-24.48
499.967	33.31	109	V	63	46	-12.69

802.11g mode, Middle Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
35.257	26.42	116	V	300	40	-13.58
43.16625	26.8	100	V	251	40	-13.2
56.8465	27.72	118	V	82	40	-12.28
72.17325	21.06	219	V	301	40	-18.94
105.6405	23.6	100	V	334	43.5	-19.9
499.9685	33.6	100	V	57	46	-12.4

802.11g mode, High Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
34.83425	29.38	100	V	240	40	-10.62
50.825	29.88	137	V	349	40	-10.12
71.809	26.46	119	V	0	40	-13.54
98.509	34.17	100	V	241	43.5	-9.33
105.7003	31.58	103	V	223	43.5	-11.92
500.0015	33.66	108	V	54	46	-12.34

802.11n HT40 mode, Low Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
167.6575	22.68	100	V	342	43.5	-20.82
249.927	16.35	262	V	324	46	-29.65
500.003	34.67	102	**V**	61	46	-11.33

802.11n HT40 mode, Middle Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
167.6575	22.78	100	V	355	43.5	-20.72
249.927	16.28	264	V	327	46	-29.72
500.003	34.65	100	**V**	66	46	-11.35

802.11n HT40 mode, High Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
167.6575	23.05	100	V	341	43.5	-20.45
249.927	16.75	264	V	313	46	-29.25
500.003	34.48	101	V	58	46	-11.52

5.8 GHz Band, Quasi-Peak Measurements

802.11a mode, Low Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
167.3443	20.17	100	V	359	43.5	-23.33
249.9513	17.85	233	V	145	46	-28.15
499.9813	31.88	134	V	47	46	-14.12

802.11a mode, Middle Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
167.3443	22.03	101	V	0	43.5	-21.47
249.9513	20.87	234	V	147	46	-25.13
499.9813	33.13	133	V	44	46	-12.87

802.11a mode, High Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
167.3443	21.33	103	V	3	43.5	-22.17
249.9513	20.85	232	V	147	46	-25.15
499.9813	33.54	133	V	72	46	-12.46

802.11n HT40 mode, Low Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
167.3443	21.03	100	V	13	43.5	-22.47
249.9513	21.53	106	V	127	46	-24.47
499.9813	33.28	132	V	46	46	-12.72

802.11 n HT40 mode, High Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
167.3443	20.75	102	V	7	43.5	-22.75
249.9513	20.34	232	V	146	46	-25.66
499.9813	33.76	82	V	135	46	-12.24

2) 1–25 GHz, Measured at 3 meters

2.4 GH Band

802.11b mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz, measured at 3 meters											
2412	74.28	42	120	V	29.0	2.94	-	106.200	-	-	Peak
2412	73.61	37	114	H	29.0	2.94	-	105.530	-	-	Peak
2412	70.46	42	120	V	29.0	2.94	-	102.380	-	-	Ave
2412	69.93	37	114	H	29.0	2.94	-	101.850	-	-	Ave
2390	27.92	342	175	V	29.0	2.94	-	59.840	74	-14.160	Peak
2390	27.32	46	100	H	29.0	2.94	-	59.240	74	-14.760	Peak
2390	12.71	342	175	V	29.0	2.94	-	44.630	54	-9.370	Ave
2390	12.67	46	100	H	29.0	2.94	-	44.590	54	-9.410	Ave
4824	33.64	304	127	V	32.7	4.06	27.70	42.711	74	-31.289	Peak
4828	34.93	294	116	H	32.7	4.06	27.70	44.001	74	-29.999	Peak
4828	22.2	304	127	V	32.7	4.06	27.70	31.271	54	-22.729	Ave
4828	28.17	294	116	H	32.7	4.06	27.70	37.241	54	-16.759	Ave
7236	33.6	0	100	V	36.4	4.88	27.6	47.336	86.2	-38.864	Peak
7236	32.95	0	100	H	36.4	4.88	27.6	46.686	85.53	-38.844	Peak
7236	18.69	0	100	V	36.4	4.88	27.6	32.426	82.38	-49.954	Ave
7236	18.68	0	100	H	36.4	4.88	27.6	32.416	81.85	-49.434	Ave
9648	31.67	0	100	V	37.3	5.82	27.06	47.758	86.2	-38.442	Peak
9648	32.37	0	100	H	37.3	5.82	27.06	48.458	85.53	-37.072	Peak
9648	17.19	0	100	V	37.3	5.82	27.06	33.278	82.38	-49.102	Ave
9648	17.07	0	100	H	37.3	5.82	27.06	33.158	81.85	-48.692	Ave
Middle Channel 2437 MHz, measured at 3 meters											
2437	73.82	46	116	V	29.2	2.94	-	105.951	-	-	Peak
2437	72.58	38	117	H	29.2	2.94	-	104.711	-	-	Peak
2437	69.97	46	116	V	29.2	2.94	-	102.101	-	-	Ave
2437	69.08	38	117	H	29.2	2.94	-	101.211	-	-	Ave
4874	35.34	233	100	V	32.8	4.10	27.7	44.598	74	-29.402	Peak
4874	42.54	232	100	H	32.8	4.10	27.7	51.798	74	-22.202	Peak
4874	24.07	233	100	V	32.8	4.10	27.7	33.328	54	-20.672	Ave
4874	39.51	232	100	H	32.8	4.10	27.7	48.768	54	-5.232	Ave
7311	32.77	330	156	V	36.5	4.83	27.5	46.613	74	-27.387	Peak
7311	34.86	226	127	H	36.5	4.83	27.5	48.703	74	-25.297	Peak
7311	19.24	330	156	V	36.5	4.83	27.5	33.083	54	-20.917	Ave
7311	25.07	226	127	H	36.5	4.83	27.5	38.913	54	-15.087	Ave
9748	33.49	0	100	V	37.3	5.74	27.0	49.568	85.951	-36.383	Peak
9748	32.79	0	100	H	37.3	5.74	27.0	48.868	84.711	-35.843	Peak
9748	17.64	0	100	V	37.3	5.74	27.0	33.718	82.101	-48.383	Ave
9748	17.29	0	100	H	37.3	5.74	27.0	33.368	81.211	-47.843	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz, measured at 3 meters											
2462	72.22	44	111	V	29.2	3.01	-	104.421	-	-	Peak
2462	72.34	37	112	H	29.2	3.01	-	104.541	-	-	Peak
2462	68.48	44	111	V	29.2	3.01	-	100.681	-	-	Ave
2462	68.54	37	112	H	29.2	3.01	-	100.741	-	-	Ave
2483.5	25.89	139	145	V	28.98	3.01	-	57.880	74	-16.12	Peak
2483.5	27.99	351	161	H	28.98	3.01	-	59.980	74	-14.02	Peak
2483.5	12.91	139	100	V	28.98	3.01	-	44.900	54	-9.1	Ave
2483.5	12.49	351	161	H	28.98	3.01	-	44.480	54	-9.52	Ave
4924	36.05	235	235	V	32.9	4.10	27.8	45.258	74	-28.742	Peak
4924	45.1	233	100	H	32.9	4.10	27.8	54.308	74	-19.692	peak
4924	29.27	235	100	V	32.9	4.10	27.8	38.478	54	-15.522	Ave
4924	43.03	233	100	H	32.9	4.10	27.8	52.238	54	-1.762	Ave
7386	34.13	258	151	V	36.3	4.89	27.5	47.853	74	-26.147	Peak
7386	36.91	278	157	H	36.3	4.89	27.5	50.633	74	-23.367	Peak
7386	20.71	258	151	V	36.3	4.89	27.5	34.433	54	-19.567	Ave
7386	28.43	278	157	H	36.3	4.89	27.5	42.153	54	-11.847	Ave
9848	33.45	85	120	V	37.4	5.77	27.0	49.681	84.421	-34.740	Peak
9848	33.76	271	108	H	37.4	5.77	27.0	49.991	84.541	-34.550	Peak
9848	23.76	85	120	V	37.4	5.77	27.0	39.991	80.681	-40.690	Ave
9848	24.08	271	108	H	37.4	5.77	27.0	40.311	80.741	-40.430	Ave

802.11g mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz, measured at 3 meters											
2412	78.1	46	122	V	29.0	2.94	-	110.02	-	-	Peak
2412	77.4	47	121	H	29.0	2.94	-	109.32	-	-	Peak
2412	66.33	46	122	V	29.0	2.94	-	98.25	-	-	Ave
2412	66.16	47	121	H	29.0	2.94	-	98.08	-	-	Ave
2390	31.36	67	119	V	29.0	2.94	-	63.28	74	-10.72	Peak
2390	29.44	80	149	H	29.0	2.94	-	61.36	74	-12.64	Peak
2390	14.45	67	119	V	29.0	2.94	-	46.37	54	-7.63	Ave
2390	13.76	80	149	H	29.0	2.94	-	45.68	54	-8.32	Ave
4824	33.16	16	132	V	32.7	4.06	27.70	42.231	74	-31.769	Peak
4828	40.5	268	119	H	32.7	4.06	27.70	49.571	74	-24.429	Peak
4828	18.71	16	132	V	32.7	4.06	27.70	27.781	54	-26.219	Ave
4828	22.82	268	119	H	32.7	4.06	27.70	31.891	54	-22.109	Ave
7236	34.77	300	100	V	36.4	4.88	27.6	48.506	90.02	-41.514	Peak
7236	33.4	207	100	H	36.4	4.88	27.6	47.136	89.32	-42.184	Peak
7236	18.7	300	100	V	36.4	4.88	27.6	32.436	78.25	-45.814	Ave
7236	18.76	207	100	H	36.4	4.88	27.6	32.496	78.08	-45.584	Ave
9648	31.88	0	100	V	37.3	5.82	27.06	47.968	90.02	-42.052	Peak
9648	32.07	0	100	H	37.3	5.82	27.06	48.158	89.32	-41.162	Peak
9648	17.21	0	100	V	37.3	5.82	27.06	33.298	78.25	-44.952	Ave
9648	17.07	0	100	H	37.3	5.82	27.06	33.158	78.08	-44.922	Ave
Middle Channel 2437 MHz, measured at 3 meters											
2437	77.81	43	112	V	29.2	2.94	-	109.941	-	-	Peak
2437	78.37	38	116	H	29.2	2.94	-	110.501	-	-	Peak
2437	66.54	43	112	V	29.2	2.94	-	98.671	-	-	Ave
2437	65.62	38	116	H	29.2	2.94	-	97.751	-	-	Ave
4874	34.04	306	126	V	32.8	4.10	27.7	43.298	74	-30.702	Peak
4874	43.97	278	115	H	32.8	4.10	27.7	53.228	74	-20.772	Peak
4874	19.63	306	126	V	32.8	4.10	27.7	28.888	54	-25.112	Ave
4874	28.64	278	115	H	32.8	4.10	27.7	37.898	54	-16.102	Ave
7311	38.54	266	117	V	36.5	4.83	27.5	52.383	74	-21.617	Peak
7311	44.14	256	133	H	36.5	4.83	27.5	57.983	74	-16.017	Peak
7311	22.13	26	117	V	36.5	4.83	27.5	35.973	54	-18.027	Ave
7311	26.31	256	133	H	36.5	4.83	27.5	40.153	54	-13.847	Ave
9748	32.16	0	100	V	37.3	5.74	27.0	48.238	89.941	-41.703	Peak
9748	32.33	0	100	H	37.3	5.74	27.0	48.408	90.501	-42.093	Peak
9748	17.44	0	100	V	37.3	5.74	27.0	33.518	78.671	-45.153	Ave
9748	17.11	0	100	H	37.3	5.74	27.0	33.188	77.751	-44.563	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz, measured at 3 meters											
2462	76.86	46	119	V	29.2	3.01	-	109.061	-	-	Peak
2462	77.81	38	113	H	29.2	3.01	-	110.011	-	-	Peak
2462	65.21	46	119	V	29.2	3.01	-	97.411	-	-	Ave
2462	64.61	38	113	H	29.2	3.01	-	96.811	-	-	Ave
2483.5	27.71	90	156	V	29.191	3.01	-	59.911	74	-14.09	Peak
2483.5	28.09	91	146	H	29.191	3.01	-	60.291	74	-13.71	Peak
2483.5	12.68	90	156	V	29.191	3.01	-	44.881	54	-9.12	Ave
2483.5	12.69	91	146	H	29.191	3.01	-	44.891	54	-9.11	Ave
4924	36.47	240	111	V	32.9	4.10	27.8	45.678	74	-28.32	Peak
4924	48.9	257	114	H	32.9	4.10	27.8	58.108	74	-15.89	Peak
4924	21.43	240	111	V	32.9	4.10	27.8	30.638	54	-23.36	Ave
4924	34.51	257	114	H	32.9	4.10	27.8	43.718	54	-10.28	Ave
7386	40.1	263	125	V	36.3	4.89	27.5	53.823	74	-20.18	Peak
7386	45.43	219	150	H	36.3	4.89	27.5	59.153	74	-14.85	Peak
7386	24.35	263	125	V	36.3	4.89	27.5	38.073	54	-15.93	Ave
7386	29.39	219	150	H	36.3	4.89	27.5	43.113	54	-10.89	Ave
9848	36.38	82	120	V	37.4	5.77	27.0	52.611	89.061	-36.45	Peak
9848	35.63	335	148	H	37.4	5.77	27.0	51.861	90.011	-38.15	Peak
9848	21.65	82	120	V	37.4	5.77	27.0	37.881	77.411	-39.53	Ave
9848	21.22	335	148	H	37.4	5.77	27.0	37.451	76.811	-39.36	Ave

802.11n HT40

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2422 MHz, measured at 3 meters											
2422	75.57	46	123	V	29.0	2.94	-	107.490	-	-	Peak
2422	76.16	36	123	H	29.0	2.94	-	108.080	-	-	Peak
2422	64.2	46	123	V	29.0	2.94	-	96.120	-	-	Ave
2422	64.05	36	123	H	29.0	2.94	-	95.970	-	-	Ave
2390	40.9	44	125	V	29.0	2.94	-	72.820	74	-1.18	Peak
2390	37.97	133	122	H	29.0	2.94	-	69.890	74	-4.11	Peak
2390	19.42	73	127	V	29.0	2.94	-	51.340	54	-2.66	Ave
2390	16.99	133	122	H	29.0	2.94	-	48.910	54	-5.09	Ave
4844	33.25	0	100	V	32.8	4.06	27.76	42.378	74	-31.622	Peak
4844	49.21	276	117	H	32.8	4.06	27.76	58.338	74	-15.662	Peak
4844	18.35	0	100	V	32.8	4.06	27.76	27.478	54	-26.522	Ave
4844	31.25	276	117	H	32.8	4.06	27.76	40.378	54	-13.622	Ave
7266	33.58	0	100	V	36.4	4.88	27.6	47.336	74	-26.664	Peak
7266	36.7	253	141	H	36.4	4.88	27.6	50.456	74	-23.544	Peak
7266	18.88	0	100	V	36.4	4.88	27.6	32.636	54	-21.364	Ave
7266	21.08	253	141	H	36.4	4.88	27.6	34.836	54	-19.164	Ave
9688	31.66	0	100	V	37.3	5.74	26.98	47.752	87.49	-39.738	Peak
9688	31.69	0	100	H	37.3	5.74	26.98	47.782	88.08	-40.298	Peak
9688	17.36	0	100	V	37.3	5.74	26.98	33.452	76.12	-42.668	Ave
9688	17.42	0	100	H	37.3	5.74	26.98	33.512	75.97	-42.458	Ave
Middle Channel 2437 MHz, measured at 3 meters											
2437	81.63	45	115	V	29.2	2.94	-	113.761	-	-	Peak
2437	78.29	106	146	H	29.2	2.94	-	110.421	-	-	Peak
2437	69.23	45	115	V	29.2	2.94	-	101.361	-	-	Ave
2437	65.51	106	146	H	29.2	2.94	-	97.641	-	-	Ave
4874	33.14	31	100	V	32.8	4.10	27.7	42.398	74	-31.602	Peak
4874	41.91	324	115	H	32.8	4.10	27.7	51.168	74	-22.832	Peak
4874	18.19	31	100	V	32.8	4.10	27.7	27.448	54	-26.552	Ave
4874	26.85	324	115	H	32.8	4.10	27.7	36.108	54	-17.892	Ave
7311	33.36	0	100	V	36.5	4.88	27.5	47.253	74	-26.747	Peak
7311	40.68	252	137	H	36.5	4.88	27.5	54.573	74	-19.427	Peak
7311	18.87	0	100	V	36.5	4.88	27.5	32.763	54	-21.237	Ave
7311	26.07	252	137	H	36.5	4.88	27.5	39.963	54	-14.037	Ave
9748	32.29	0	100	V	37.3	5.74	27.0	48.368	93.761	-45.393	Peak
9748	32.06	0	100	H	37.3	5.74	27.0	48.138	90.421	-42.283	Peak
9748	17.35	0	100	V	37.3	5.74	27.0	33.428	81.361	-47.933	Ave
9748	17.48	0	100	H	37.3	5.74	27.0	33.558	77.641	-44.083	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Middle Channel 2452 MHz, measured at 3 meters											
2452	72.08	103	126	V	29.2	3.01	-	104.281	-	-	Peak
2452	74.43	128	116	H	29.2	3.01	-	106.631	-	-	Peak
2452	59.74	103	126	V	29.2	3.01	-	91.941	-	-	Ave
2452	61.65	128	116	H	29.2	3.01	-	93.851	-	-	Ave
2483.5	26.87	63	137	V	29.191	3.01	-	59.071	74	-14.929	Peak
2483.5	26.88	134	132	H	29.191	3.01	-	59.081	74	-14.919	Peak
2483.5	12.71	63	137	V	29.191	3.01	-	44.911	54	-9.089	Ave
2483.5	12.67	134	132	H	29.191	3.01	-	44.871	54	-9.129	Ave
4904	34.19	233	102	V	32.9	4.10	27.8	43.398	74	-30.602	Peak
4904	44.9	278	109	H	32.9	4.10	27.8	54.108	74	-19.892	Peak
4904	19.28	233	102	V	32.9	4.10	27.8	28.488	54	-25.512	Ave
4904	29.55	278	109	H	32.9	4.10	27.8	38.758	54	-15.242	Ave
7356	36.9	226	114	V	36.5	4.89	27.6	50.692	74	-23.308	Peak
7356	42.15	272	157	H	36.5	4.89	27.6	55.942	74	-18.058	Peak
7356	23.22	226	114	V	36.5	4.89	27.6	37.012	54	-16.988	Ave
7356	26.78	272	157	H	36.5	4.89	27.6	40.572	54	-13.428	Ave
9808	31.82	0	100	V	37.4	5.77	27.0	48.004	84.281	-36.277	Peak
9808	32.64	163	100	H	37.4	5.77	27.0	48.824	86.631	-37.807	Peak
9808	17.17	0	100	V	37.4	5.77	27.0	33.354	71.941	-38.587	Ave
9808	17.19	163	100	H	37.4	5.77	27.0	33.374	73.851	-40.477	Ave

3) 1–40 GHz, Measured at 3 meters

5.8 GHz Band

802.11a mode, Low Channel

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 5745 MHz, measured at 3 meters											
5745	76.67	38	100	V	33.7	2.95	-	113.328	-	-	Peak
5745	72.83	174	100	H	33.7	2.95	-	109.488	-	-	Peak
5745	62.57	38	100	V	33.7	2.95	-	99.228	-	-	Ave
5745	59.33	174	100	H	33.7	2.95	-	95.988	-	-	Ave
4900	49.24	27	107	V	33.1	4.10	27.72	58.681	74	-15.319	Peak
4900	49.24	47	113	H	33.1	4.10	27.72	58.681	74	-15.319	Peak
4900	35	27	107	V	33.1	4.10	27.72	44.441	54	-9.559	Ave
4900	39.01	47	113	H	33.1	4.10	27.72	48.451	54	-5.549	Ave
5400	49.63	40	152	V	33.9	4.60	27.62	60.519	74	-13.481	Peak
5400	52.39	27	107	H	33.9	4.60	27.62	63.279	74	-10.721	Peak
5400	37.72	40	152	V	33.9	4.60	27.62	48.609	54	-5.391	Ave
5400	40.27	27	107	H	33.9	4.60	27.62	51.159	54	-2.841	Ave
11490	43.1	31	123	V	38.69	7.33	26.94	62.184	74	-11.817	Peak
11490	50.19	151	100	H	38.69	7.33	26.94	69.274	74	-4.726	Peak
11490	27.93	31	123	V	38.69	7.33	26.94	47.014	54	-6.986	Ave
11490	33.18	151	100	H	38.69	7.33	26.94	52.264	54	-1.736	Ave
17235	30.75	0	100	V	38.1	5.17	25.94	48.042	93.328	-45.286	Peak
17235	30.77	0	100	H	38.1	5.17	25.94	48.062	89.488	-41.426	Peak
17235	16.42	0	100	V	38.1	5.17	25.94	33.712	79.228	-45.516	Ave
17235	16.45	0	100	H	38.1	5.17	25.94	33.742	75.988	-42.246	Ave
22980	28.45	0	100	V	35.4	9.74	34.81	38.780	74	-35.220	Peak
22980	28.06	0	100	H	35.4	9.74	34.81	38.390	54	-15.610	Peak
22980	14.32	0	100	V	35.4	9.74	34.81	24.650	74	-49.350	Ave
22980	13.98	0	100	H	35.4	9.74	34.81	24.310	54	-29.690	Ave

802.11a mode, Middle Channel

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 5785 MHz, measured at 3 meters											
5785	73.5	135	100	V	33.8	2.98	-	110.256	-	-	Peak
5785	71	179	100	H	33.8	2.98	-	107.756	-	-	Peak
5785	61.17	135	100	V	33.8	2.98	-	97.926	-	-	Ave
5785	57.33	179	100	H	33.8	2.98	-	94.086	-	-	Ave
4900	53	26	104	V	33.1	4.10	27.72	62.441	74	-11.559	Peak
4900	51.82	23	100	H	33.1	4.10	27.72	61.261	74	-12.739	Peak
4900	37.07	26	104	V	33.1	4.10	27.72	46.511	54	-7.489	Ave
4900	41.31	23	100	H	33.1	4.10	27.72	50.751	54	-3.249	Ave
5400	50.28	56	106	V	33.9	4.60	27.62	61.169	74	-12.831	Peak
5400	50.9	28	106	H	33.9	4.60	27.62	61.789	74	-12.211	Peak
5400	37.8	56	106	V	33.9	4.60	27.62	48.689	54	-5.311	Ave
5400	39.8	28	106	H	33.9	4.60	27.62	50.689	54	-3.311	Ave
11570	38.65	103	100	V	38.8	6.20	27.00	56.683	74	-17.317	Peak
11570	47.63	151	130	H	38.8	6.20	27.00	65.663	74	-8.337	Peak
11570	23.71	103	100	V	38.8	6.20	27.00	41.743	54	-12.257	Ave
11570	30.04	151	130	H	38.8	6.20	27.00	48.073	54	-5.927	Ave
17355	30.62	0	100	V	37.9	8.49	25.86	51.165	90.256	-39.091	Peak
17355	31.12	0	100	H	37.9	8.49	25.86	51.665	87.756	-36.091	Peak
17355	15.88	0	100	V	37.9	8.49	25.86	36.425	77.926	-41.501	Ave
17355	15.89	0	100	H	37.9	8.49	25.86	36.435	74.086	-37.651	Ave
23140	28.32	0	100	V	35.2	9.74	34.74	38.520	90.256	-51.736	Peak
23140	28.09	0	100	H	35.2	9.74	34.74	38.290	87.756	-49.466	Peak
23140	13.39	0	100	V	35.2	9.74	34.74	23.590	77.926	-54.336	Ave
23140	13.39	0	100	V	35.2	9.74	34.74	23.590	77.926	-54.336	Ave

802.11a mode, High Channel

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 5825 MHz, measured at 3 meters											
5825	72.57	134	100	V	33.8	2.98	-	109.326	-	-	Peak
5825	71.5	158	100	H	33.8	2.98	-	108.256	-	-	Peak
5825	60.17	134	100	V	33.8	2.98	-	96.926	-	-	Ave
5825	58.33	158	100	H	33.8	2.98	-	95.086	-	-	Ave
4900	51.38	50	101	V	33.1	4.10	27.72	60.821	74	-13.179	Peak
4900	52.74	45	112	H	33.1	4.10	27.72	62.181	74	-11.819	Peak
4900	37.88	50	101	V	33.1	4.10	27.72	47.321	54	-6.679	Ave
4900	41.96	45	112	H	33.1	4.10	27.72	51.401	54	-2.599	Ave
5400	52.87	55	108	V	33.9	4.60	27.62	63.759	74	-10.241	Peak
5400	53.48	29	100	H	33.9	4.60	27.62	64.369	74	-9.631	Peak
5400	39.48	55	108	V	33.9	4.60	27.62	50.369	54	-3.631	Ave
5400	39.8	29	100	H	33.9	4.60	27.62	50.689	54	-3.311	Ave
11650	39.220	73	102	V	38.8	6.20	27.00	57.253	74	-16.747	Peak
11650	48.74	152	140	H	38.8	6.20	27.00	66.773	74	-7.227	Peak
11650	24.3	73	102	V	38.8	6.20	27.00	42.333	54	-11.667	Ave
11650	31.020	152	140	H	38.8	6.20	27.00	49.053	54	-4.947	Ave
17475	30.2	0	100	V	46.6	8.49	25.73	59.531	89.326	-29.795	Peak
17475	30.13	0	100	H	46.6	8.49	25.73	59.461	88.256	-28.795	Peak
17475	15.78	0	100	V	46.6	8.49	25.73	45.111	76.926	-31.815	Ave
17475	15.78	0	100	H	46.6	8.49	25.73	45.111	75.086	-29.975	Ave
23300	28.15	0	100	V	35.3	9.88	34.71	38.620	89.326	-50.706	Peak
23300	28.17	0	100	H	35.3	9.88	34.71	38.640	88.256	-49.616	Peak
23300	13.68	0	100	V	35.3	9.88	34.71	24.150	76.926	-52.776	Ave
23300	13.47	0	100	H	35.3	9.88	34.71	23.940	75.086	-51.146	Ave

802.11n HT40, Low Channel

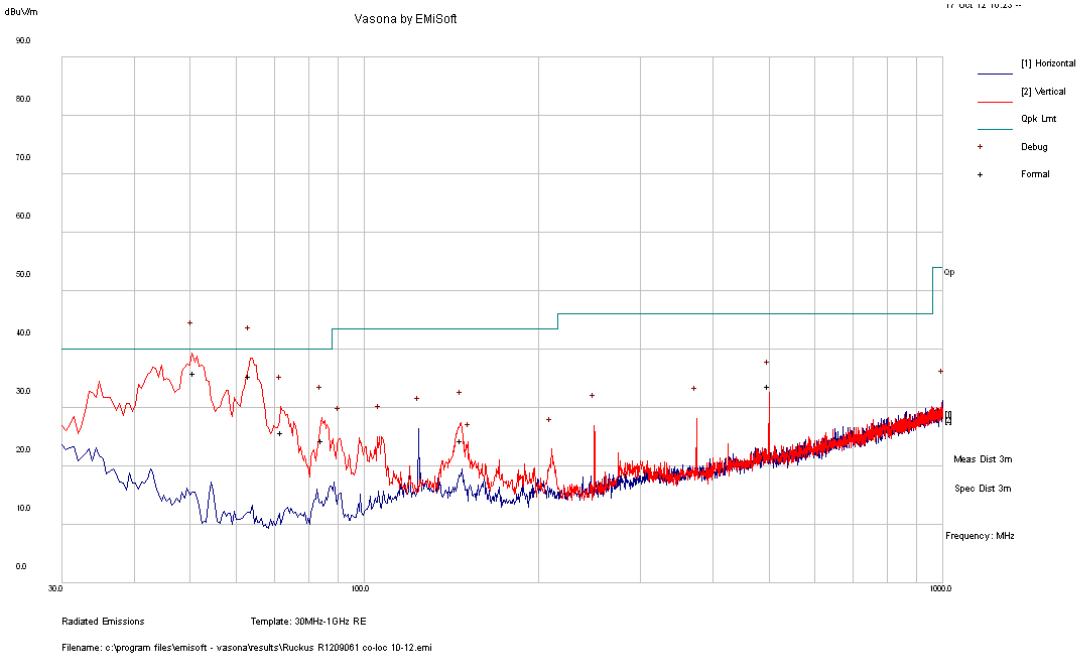
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5755 MHz, measured at 3 meters											
5755	72.67	137	100	V	33.7	2.95	-	109.328	-	-	Peak
5755	69.67	130	100	H	33.7	2.95	-	106.328	-	-	Peak
5755	59.67	137	100	V	33.7	2.95	-	96.328	-	-	Ave
5755	56.33	130	100	H	33.7	2.95	-	92.988	-	-	Ave
4900	50.01	27	106	V	33.1	4.10	27.72	59.451	74	-14.549	Peak
4900	47.6	38	106	H	33.1	4.10	27.72	57.041	74	-16.959	Peak
4900	35.84	27	106	V	33.1	4.10	27.72	45.281	54	-8.719	Ave
4900	37.28	38	106	H	33.1	4.10	27.72	46.721	54	-7.279	Ave
5400	50.64	57	106	V	33.9	4.60	27.62	61.529	74	-12.471	Peak
5400	51.22	29	106	H	33.9	4.60	27.62	62.109	74	-11.891	Peak
5400	37.33	57	106	V	33.9	4.60	27.62	48.219	54	-5.781	Ave
5400	39.1	29	106	H	33.9	4.60	27.62	49.989	54	-4.011	Ave
11510	40.03	87	108	V	38.69	6.2	26.94	57.984	74	-16.017	Peak
11510	45.47	149	107	H	38.69	6.2	26.94	63.424	74	-10.577	Peak
11510	24.05	87	108	V	38.69	6.2	26.94	42.004	54	-11.997	Ave
11510	29.35	149	107	H	38.69	6.2	26.94	47.304	54	-6.696	Ave
17265	31.43	0	100	V	38.1	8.31	25.94	51.862	89.328	-37.466	Peak
17265	31.07	0	100	H	38.1	8.31	25.94	51.502	86.328	-34.826	Peak
17265	16.5	0	100	V	38.1	8.31	25.94	36.932	76.328	-39.396	Ave
17265	16.5	0	100	H	38.1	8.31	25.94	36.932	72.988	-36.056	Ave
23020	30.58	0	100	V	35.4	9.74	34.81	40.910	74	-33.09	Peak
23020	31.21	0	100	H	35.4	9.74	34.81	41.540	74	-32.46	Peak
23020	15.92	0	100	V	35.4	9.74	34.81	26.250	54	-27.75	Ave
23020	16.37	0	100	H	35.4	9.74	34.81	26.700	54	-27.3	Ave

802.11n HT40, High Channel

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 5795 MHz, measured at 3 meters											
5795	70.83	136	100	V	33.8	2.98	-	107.586	-	-	Peak
5795	67.5	128	100	H	33.8	2.98	-	104.256	-	-	Peak
5795	58.17	136	100	V	33.8	2.98	-	94.926	-	-	Ave
5795	52.33	128	100	H	33.8	2.98	-	89.086	-	-	Ave
4900	54.06	26	108	V	33.1	4.10	27.72	63.501	74	-10.499	Peak
4900	52.43	39	115	H	33.1	4.10	27.72	61.871	74	-12.129	Peak
4900	37.67	26	108	V	33.1	4.10	27.72	47.111	54	-6.889	Ave
4900	41.68	39	115	H	33.1	4.10	27.72	51.121	54	-2.879	Ave
5400	50.2	55	108	V	33.9	4.60	27.62	61.089	74	-12.911	Peak
5400	51.28	28	107	H	33.9	4.60	27.62	62.169	74	-11.831	Peak
5400	38.05	55	108	V	33.9	4.60	27.62	48.939	54	-5.061	Ave
5400	39.89	28	107	H	33.9	4.60	27.62	50.779	54	-3.221	Ave
11590	36.05	74	108	V	38.8	6.20	27.00	54.083	74	-19.917	Peak
11590	42.89	152	112	H	38.8	6.20	27.00	60.923	74	-13.077	Peak
11590	21.43	74	108	V	38.8	6.20	27.00	39.463	54	-14.537	Ave
11590	26.42	152	112	H	38.8	6.20	27.00	44.453	54	-9.547	Ave
17385	30.31	0	100	V	37.9	8.49	25.86	50.855	87.586	-36.731	Peak
17385	30.27	0	100	H	37.9	8.49	25.86	50.815	84.256	-33.441	Peak
17385	16.03	0	100	V	37.9	8.49	25.86	36.575	74.926	-38.351	Ave
17385	16.05	0	100	H	37.9	8.49	25.86	36.595	69.086	-32.491	Ave
23180	30.72	0	100	V	35.2	9.74	34.74	40.920	87.586	-46.666	Peak
23180	31.25	0	100	H	35.2	9.74	34.74	41.450	84.256	-42.806	Peak
23180	15.09	0	100	V	35.2	9.74	34.74	25.290	74.926	-49.636	Ave
23180	15.37	0	100	H	35.2	9.74	34.74	25.570	69.086	-43.516	Ave

4) Co-Location

Worst Case: 2.4 GHz 802.11b: 2412 MHz, 5.8 GHz 802.11a: 5745 MHz



30-1000 MHz:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
50.7275	35.95	105	V	327	40	-4.05
63.391	35.44	109	V	101	40	-4.56
72.0015	25.84	195	V	151	40	-14.16
84.484	24.41	148	H	42	40	-15.59
146.8268	24.4	100	V	154	43.5	-19.10
500.0013	33.76	101	V	50	46	-12.24

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	42.9	116	112	V	32.7	4.56	27.70	52.471	74	-21.529	Peak
4824	46.71	144	156	H	32.7	4.56	27.70	56.281	74	-17.719	Peak
4824	29.5	116	112	V	32.7	4.56	27.70	39.071	54	-14.929	Ave
4824	32.87	144	156	H	32.7	4.56	27.70	42.441	54	-11.559	Ave
7236	37.04	274	146	V	36.2	5.49	27.6	51.196	74	-22.804	Peak
7236	40.47	271	151	H	36.2	5.49	27.6	54.626	74	-19.374	Peak
7236	28.68	274	146	V	36.2	5.49	27.6	42.836	54	-11.164	Ave
7236	33.76	271	151	H	36.2	5.49	27.6	47.916	54	-6.084	Ave
11487	40.45	131	141	V	39.4	7.59	26.94	60.508	74	-13.492	Peak
11487	46.82	117	140	H	39.4	7.59	26.94	66.878	74	-7.122	Peak
11487	23.62	131	141	V	39.4	7.59	26.94	43.678	54	-10.322	Ave
11487	28.32	117	140	H	39.4	7.59	26.94	48.378	54	-5.622	Ave

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

9.1 Applicable Standard

According to FCC §15.247(a)(2) and IC RSS-210 A8.2 (a), systems using digital modulation techniques may operate in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz

9.2 Measurement Procedure

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

9.3 Test Equipment List and Details

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

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

9.4 Test Environmental Conditions

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

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

9.5 Test Results

2.4 GHz Band:

802.11 b mode:

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

802.11 g mode:

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

802.11n HT20 mode:

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

802.11n HT40 mode:

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

5.8 GHz Band:

802.11a mode:

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz) J0	6 dB Emission Bandwidth (MHz) J1	99% Emission Bandwidth (MHz) J0	99% Emission Bandwidth (MHz) J1	Limit (MHz)	Results
Low	5745	16.436	16.534	16.9806	16.9460	> 0.5	Compliant
Middle	5785	16.504	16.442	16.9566	16.8343	> 0.5	Compliant
High	5825	16.458	16.459	16.9632	16.8578	> 0.5	Compliant

802.11n HT20 mode:

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz) J0	6 dB Emission Bandwidth (MHz) J1	99% Emission Bandwidth (MHz) J0	99% Emission Bandwidth (MHz) J1	Limit (MHz)	Results
Low	5745	17.755	17.570	18.0949	18.0513	> 0.5	Compliant
Middle	5785	17.666	17.644	18.0845	18.1206	> 0.5	Compliant
High	5825	17.674	17.664	17.9698	17.9800	> 0.5	Compliant

802.11n HT40 mode:

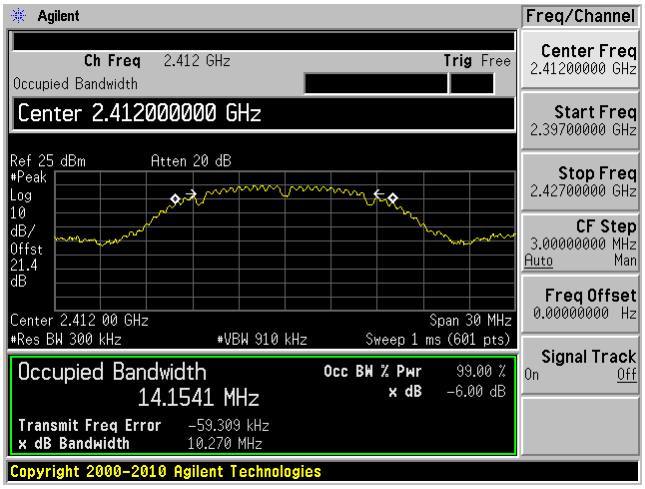
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz) J0	6 dB Emission Bandwidth (MHz) J1	99% Emission Bandwidth (MHz) J0	99% Emission Bandwidth (MHz) J1	Limit (MHz)	Results
Low	5755	36.395	36.622	36.9226	36.9512	> 0.5	Compliant
High	5795	36.713	36.730	36.9310	36.9074	> 0.5	Compliant

Please refer to the following plots for detailed test results

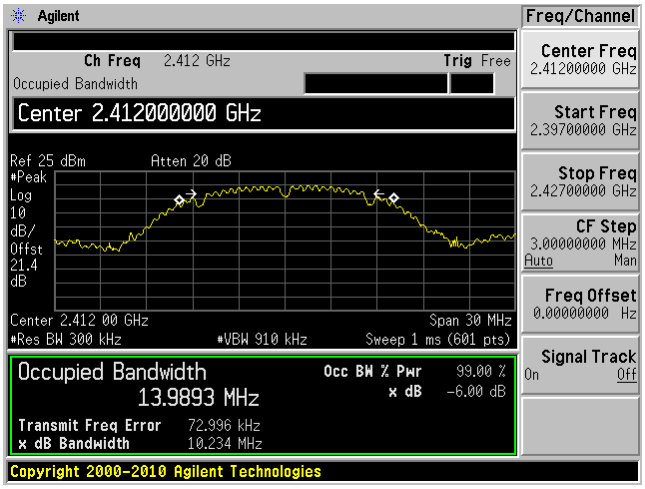
2.4 GHz Band

802.11b mode

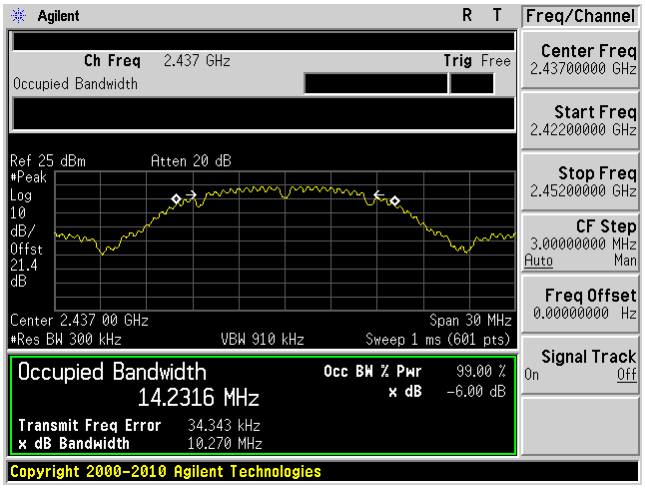
Low channel: 2412 MHz Chain J0



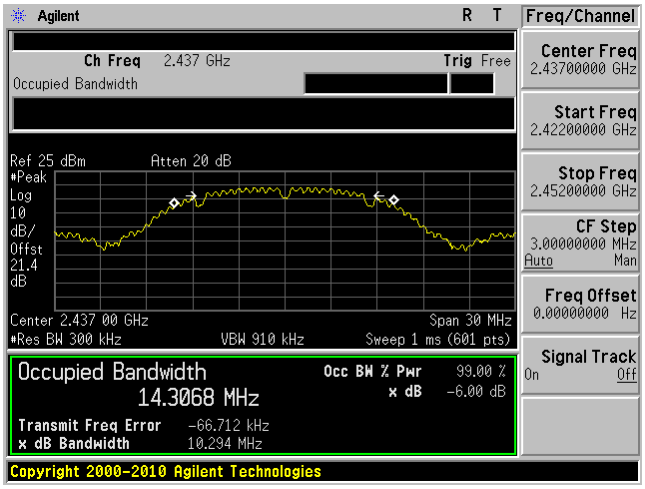
Low channel: 2412 MHz Chain J1



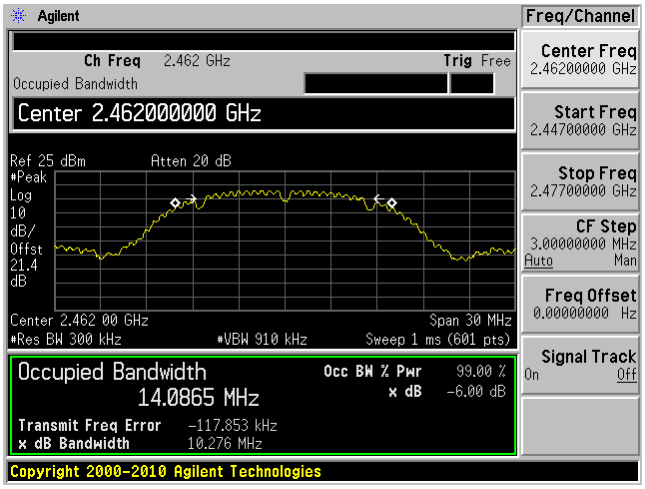
Middle channel: 2437 MHz Chain J0



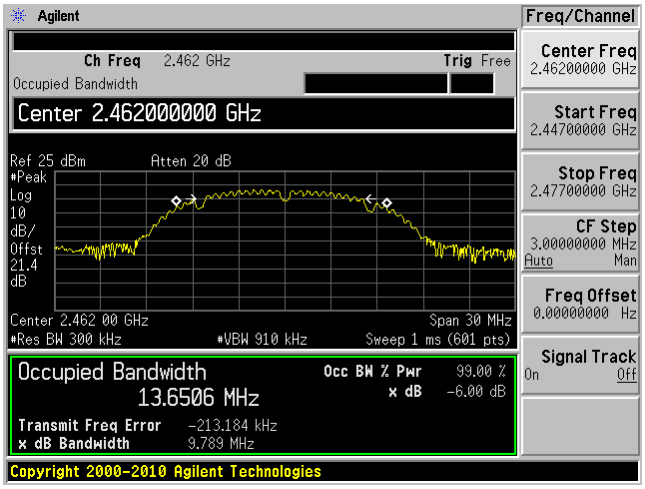
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

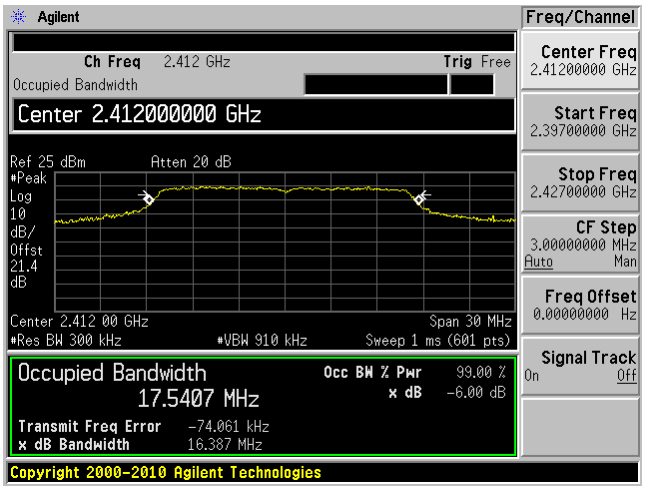


High channel: 2462 MHz Chain J1

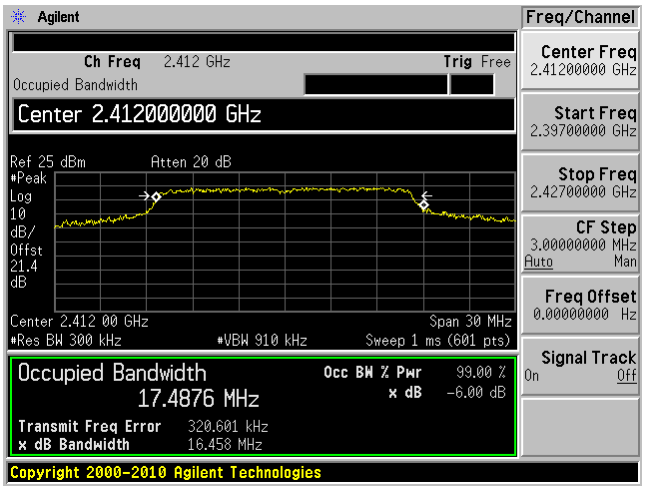


802.11g mode

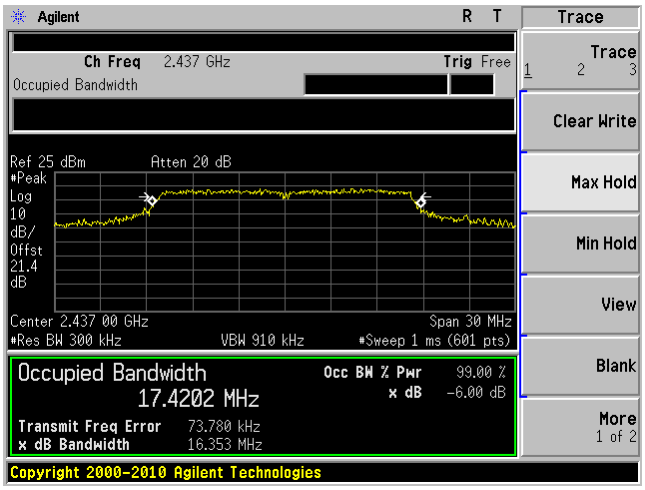
Low channel: 2412 MHz Chain J0



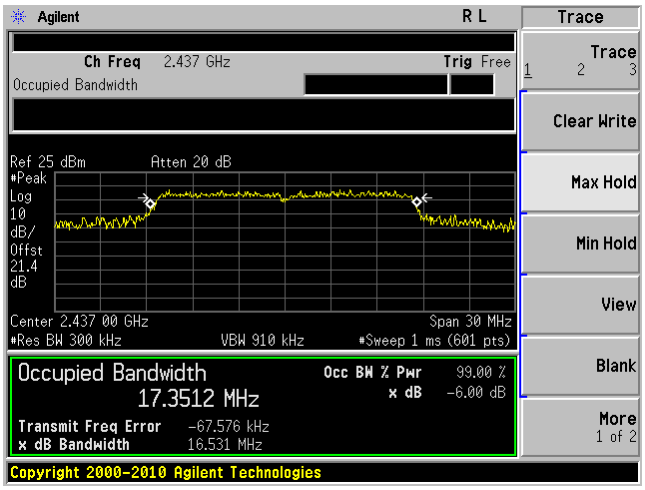
Low channel: 2412 MHz Chain J1



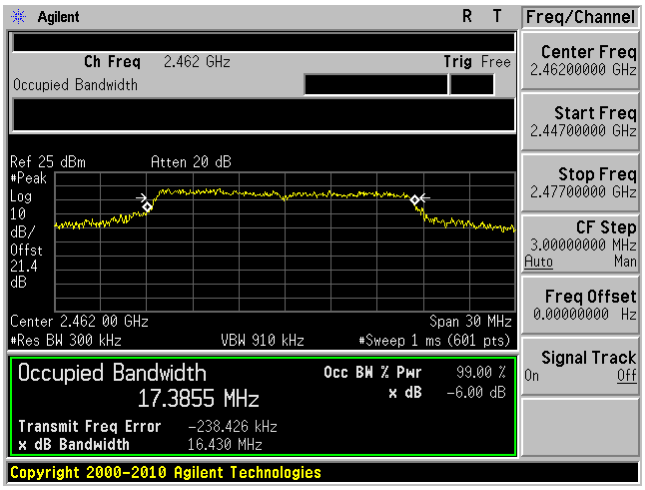
Middle channel: 2437 MHz Chain J0



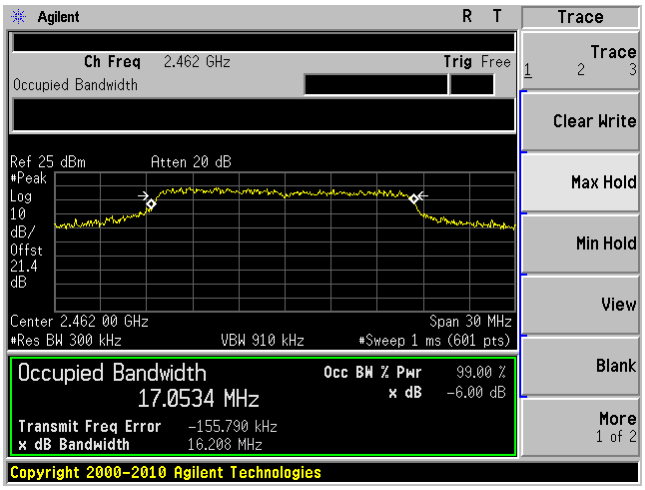
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

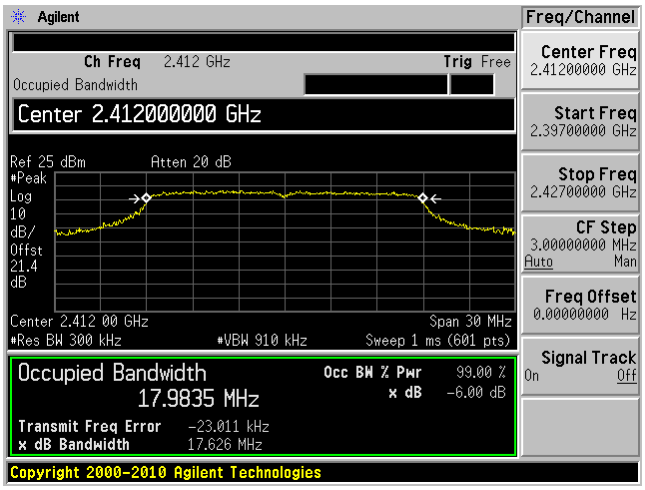


High channel: 2462 MHz Chain J1

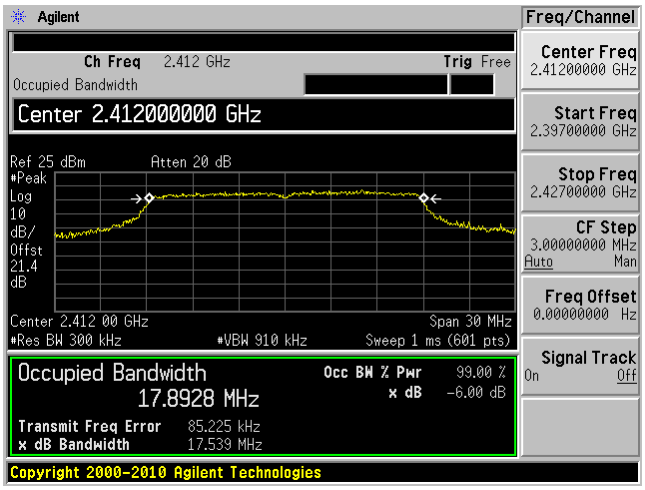


802.11n HT20 mode

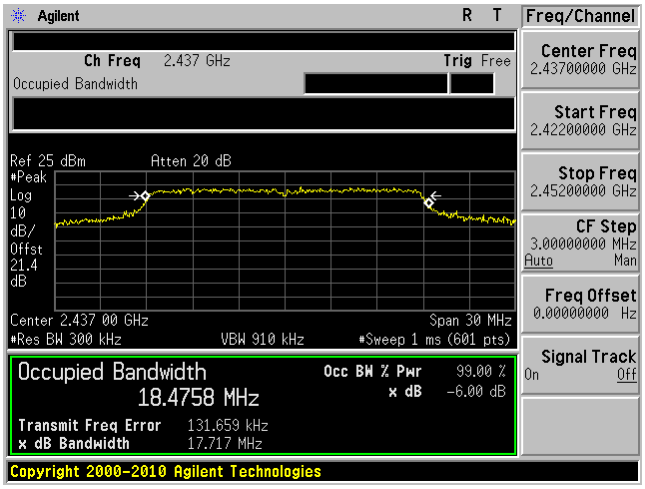
Low channel: 2412 MHz Chain J0



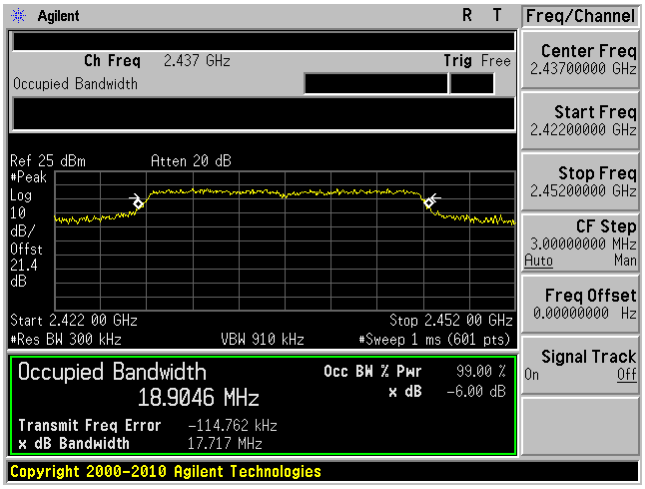
Low channel: 2412 MHz Chain J1



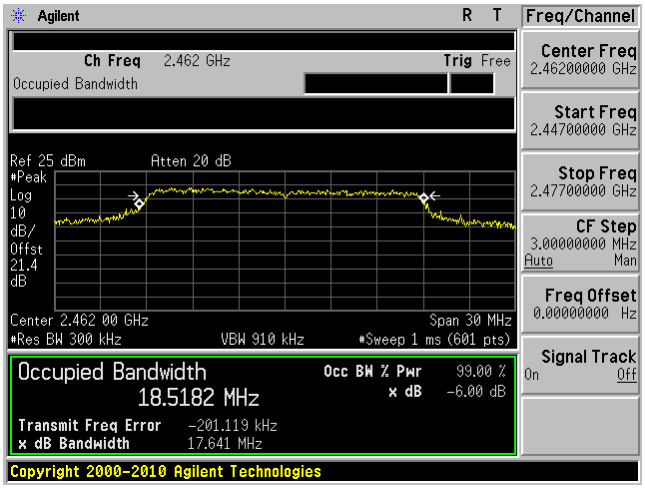
Middle channel: 2437 MHz Chain J0



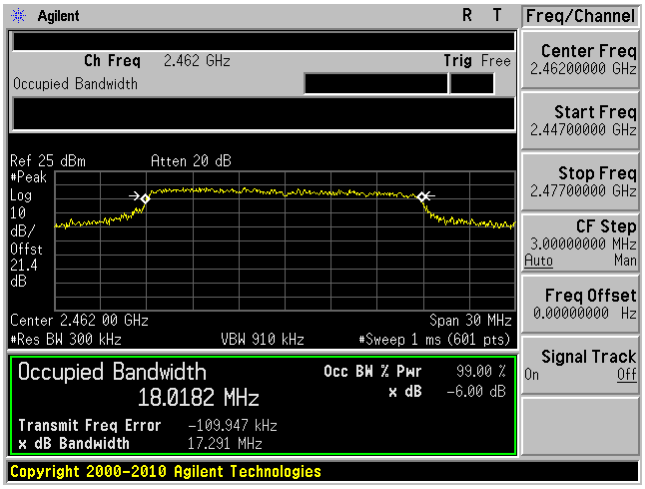
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

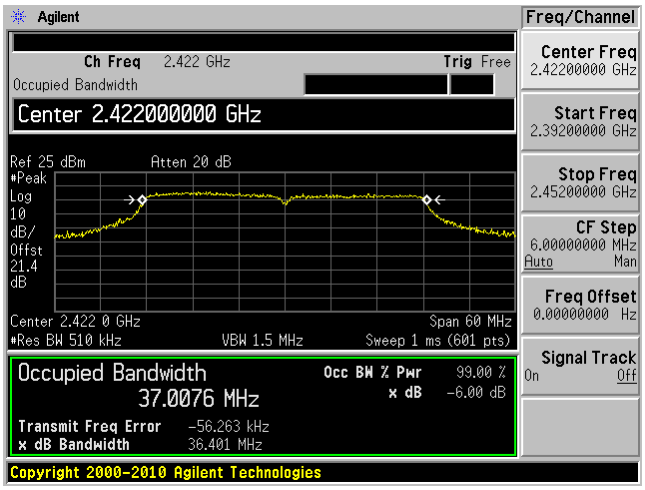


High channel: 2462 MHz Chain J1

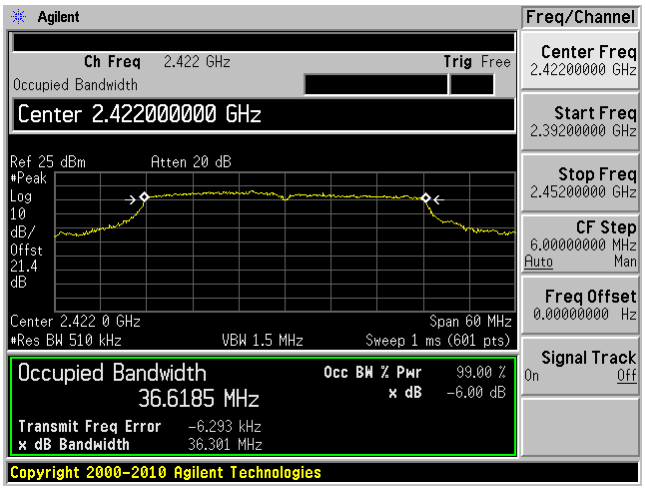


802.11n HT40 mode

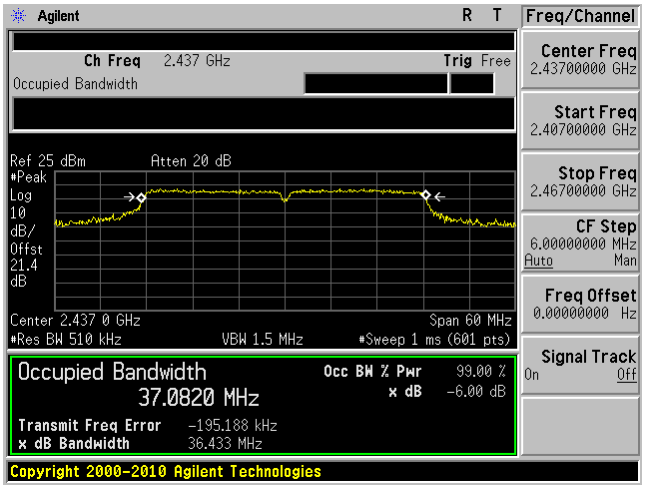
Low channel: 2422 MHz Chain J0



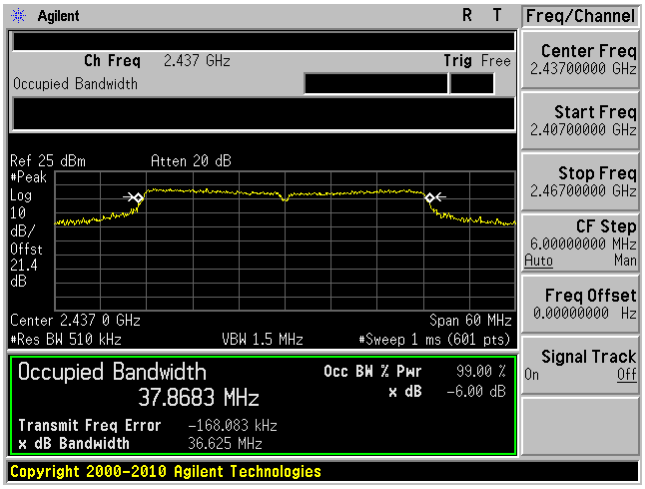
Low channel: 2422 MHz Chain J1



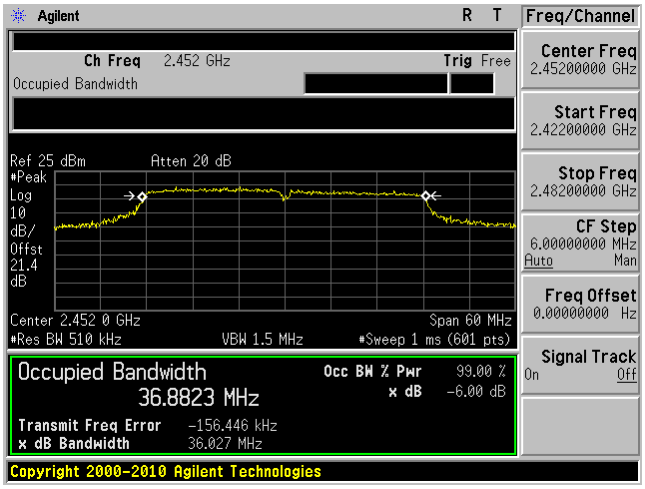
Middle channel: 2437 MHz Chain J0



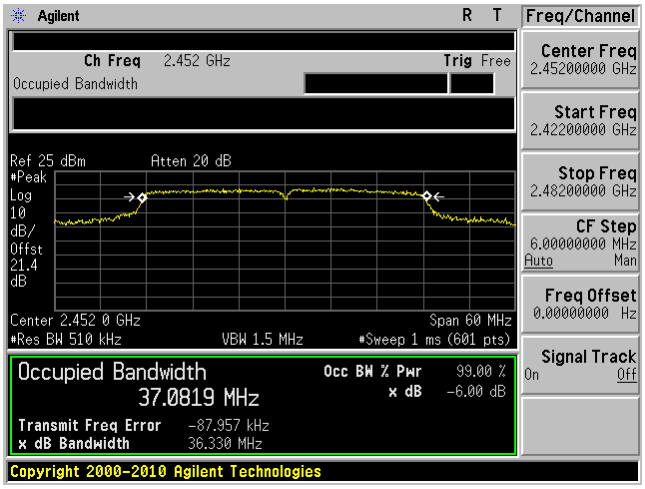
Middle channel: 2437 MHz Chain J1



High channel: 2452 MHz Chain J0



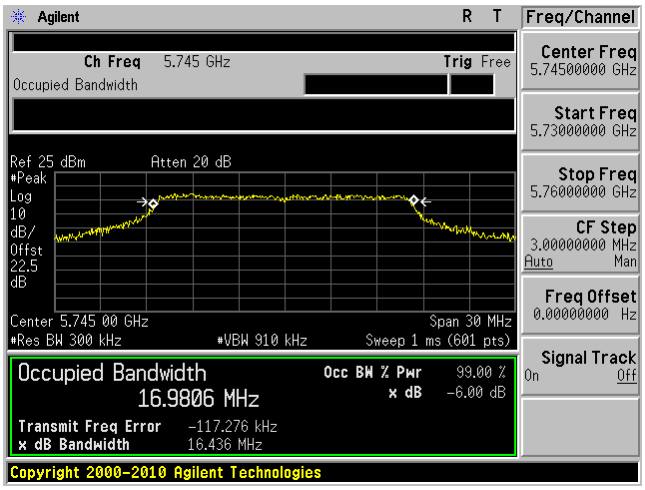
High channel: 2452 MHz Chain J1



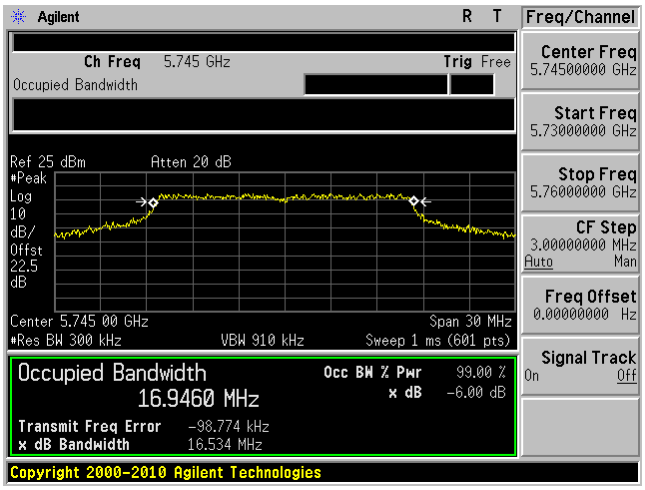
5.8 GHz Band:

802.11a mode

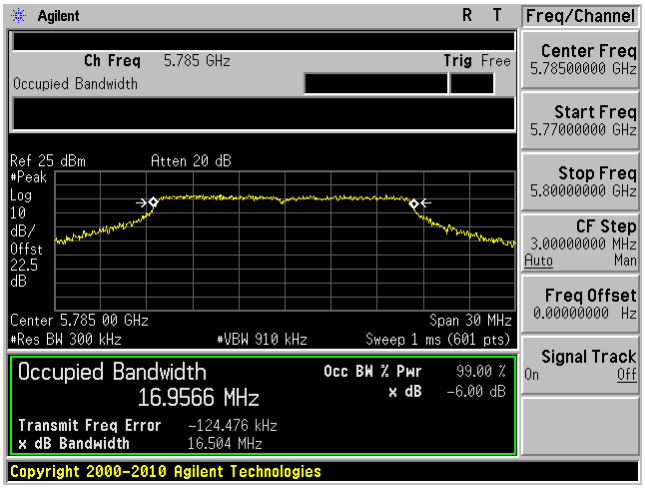
Low channel: 5745 MHz Chain J0



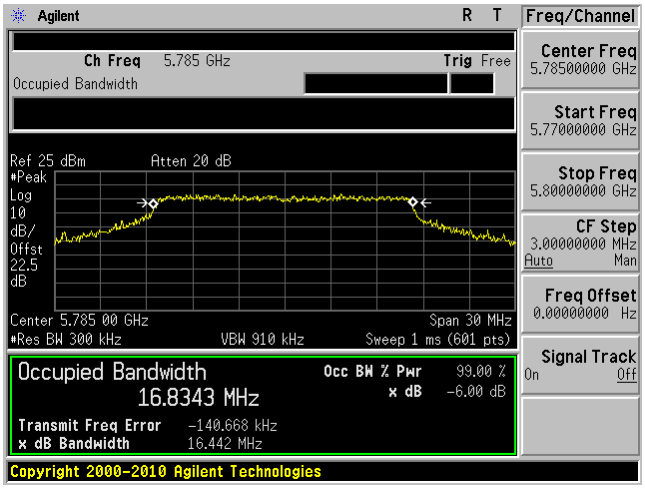
Low channel: 5745 MHz Chain J1



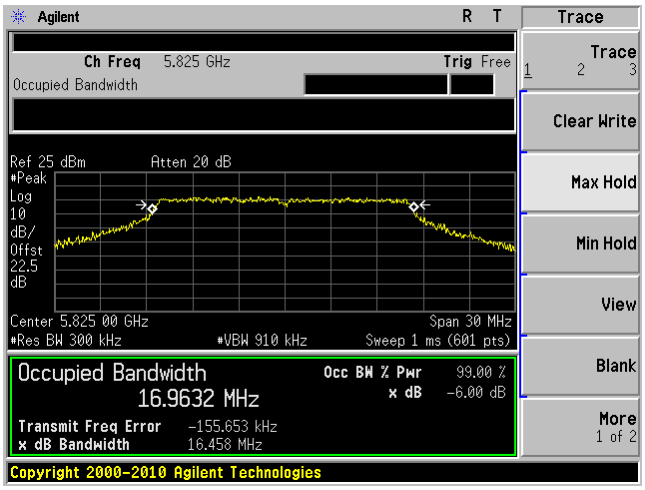
Middle channel: 5785 MHz Chain J0



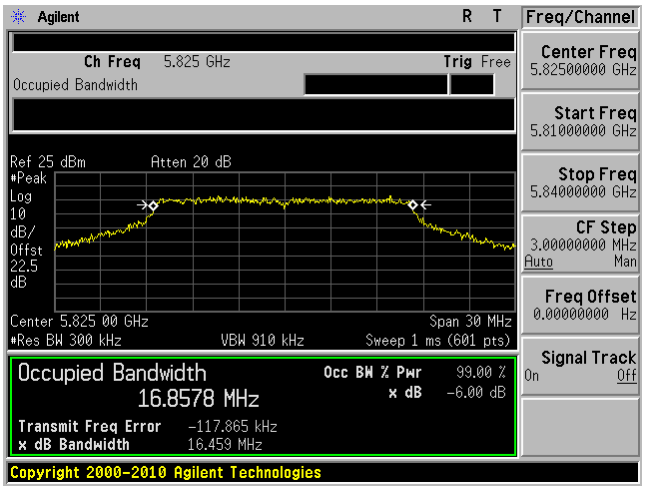
Middle channel: 5785 MHz Chain J1



High channel: 5825 MHz Chain J0

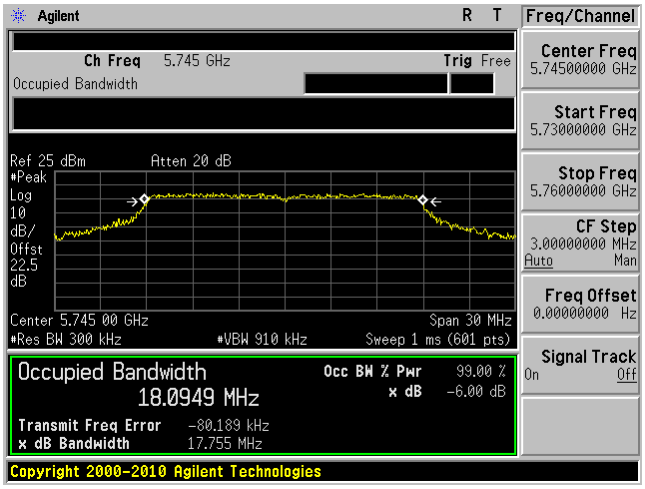


High channel: 5825 MHz Chain J1

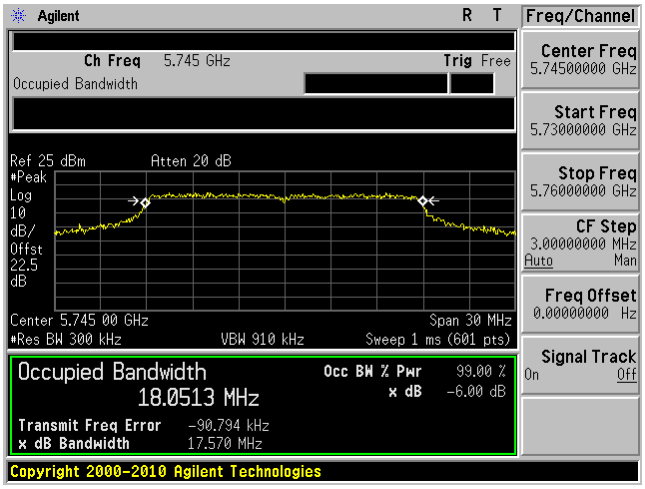


802.11n HT20 mode

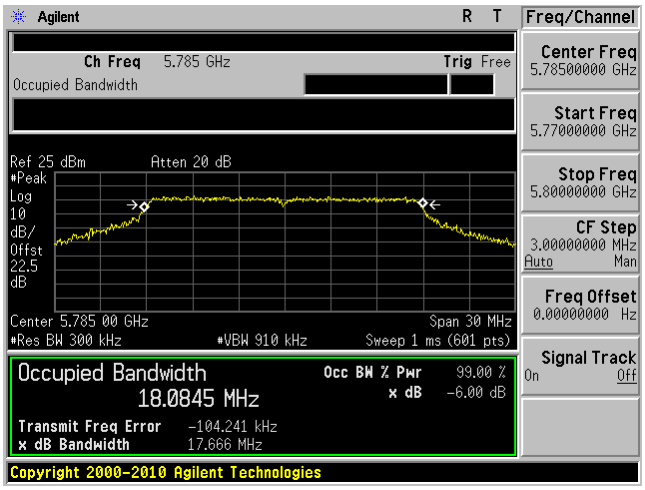
Low channel: 5745 MHz Chain J0



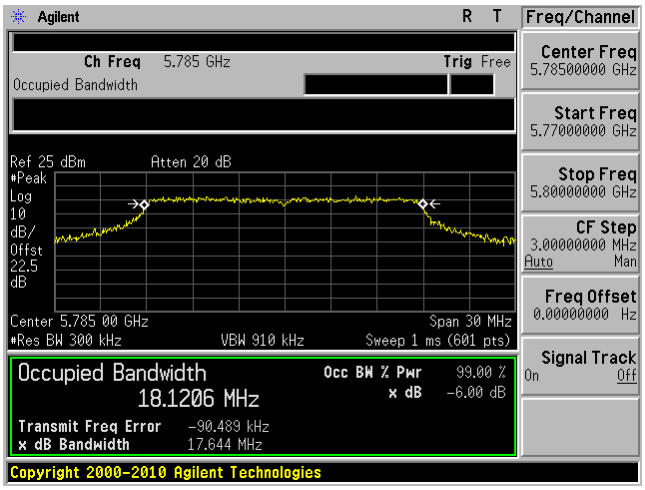
Low channel: 5745 MHz Chain J1



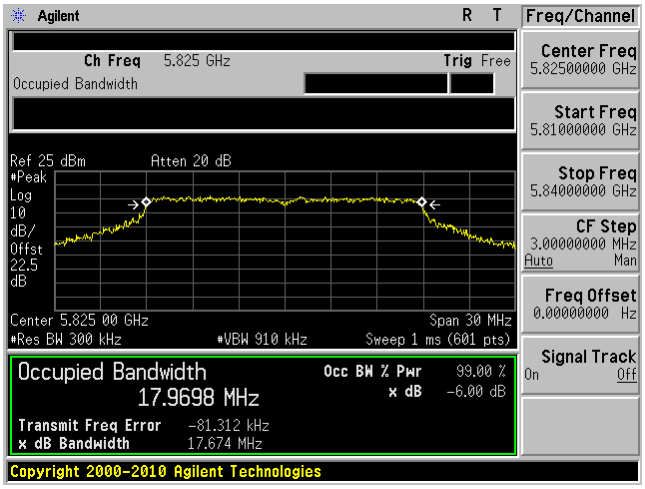
Middle channel: 5785 MHz Chain J0



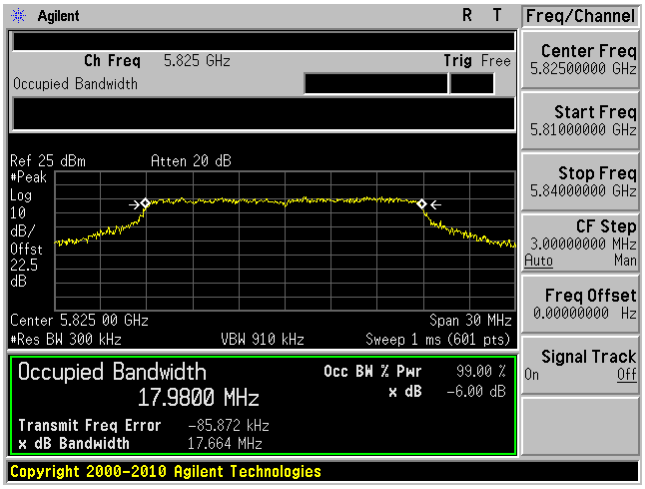
Middle channel: 5785 MHz Chain J1



High channel: 5825 MHz Chain J0

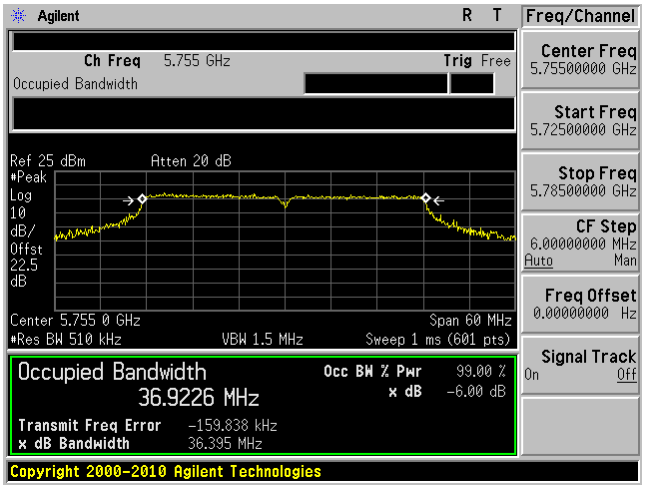


High channel: 5825 MHz Chain J1

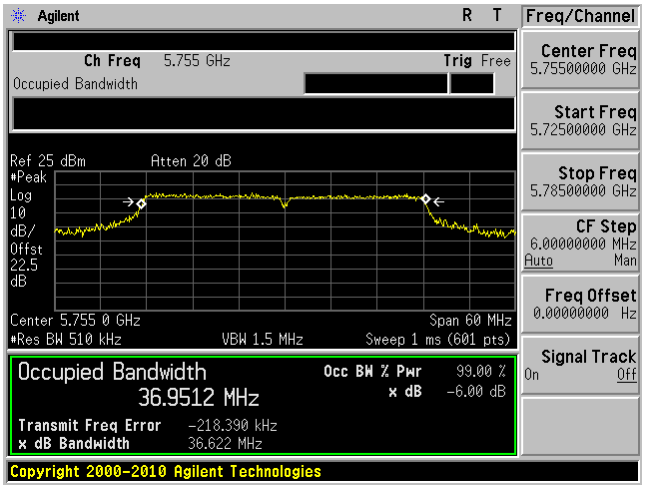


802.11n HT40 mode

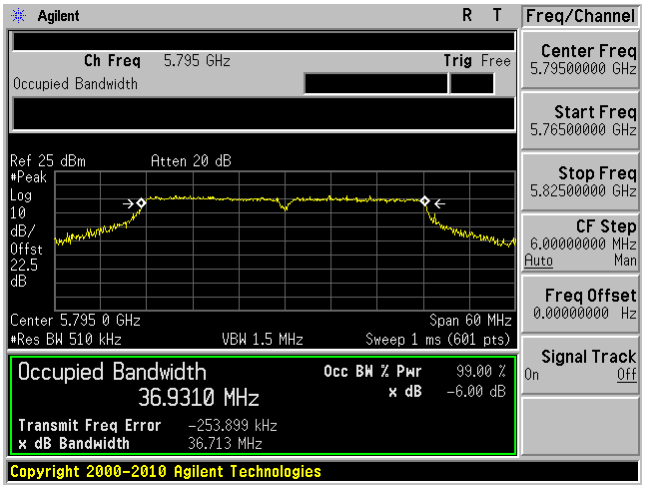
Low channel: 5755 MHz Chain J0



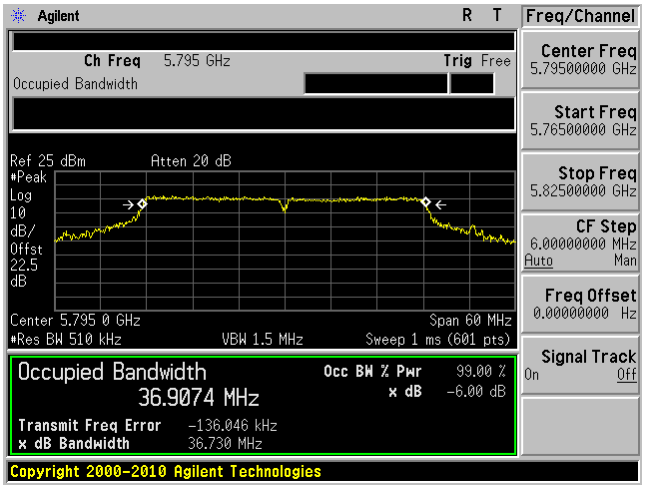
Low channel: 5755 MHz Chain J1



High channel: 5795 MHz Chain J0



High channel: 5795 MHz Chain J1



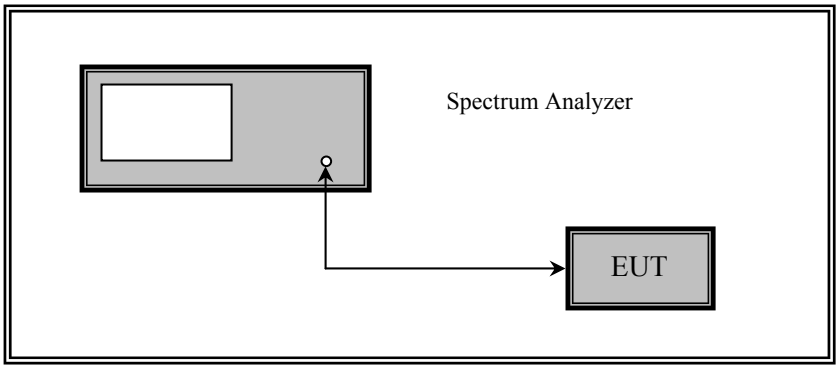
10 FCC §15.247(b) & IC RSS-210 §A8.4 – Peak Output Power Measurement

10.1 Applicable Standard

According to FCC §15.247(b) and IC RSS-210 §A8.4 (4) for systems using digital modulation in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands: 1 Watt.

10.2 Measurement Procedure

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



10.3 Test Equipment List and Details

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

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

10.4 Test Environmental Conditions

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

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

10.5 Test Results

2.4 GHz

802.11b mode

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

802.11g mode

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

802.11n HT20 mode

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

802.11n HT40 mode

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

5.8 GHz 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	5745	18.32	17.98	21.16	30	-8.84	22
Middle	5785	16.96	16.47	19.73	30	-10.27	19.5
High	5825	15.82	15.4	18.63	30	-11.37	19

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	5745	18.38	17.89	21.15	30	-8.85	22
Middle	5785	16.96	16.41	19.70	30	-10.30	19.5
High	5825	15.76	15.21	18.50	30	-11.50	19

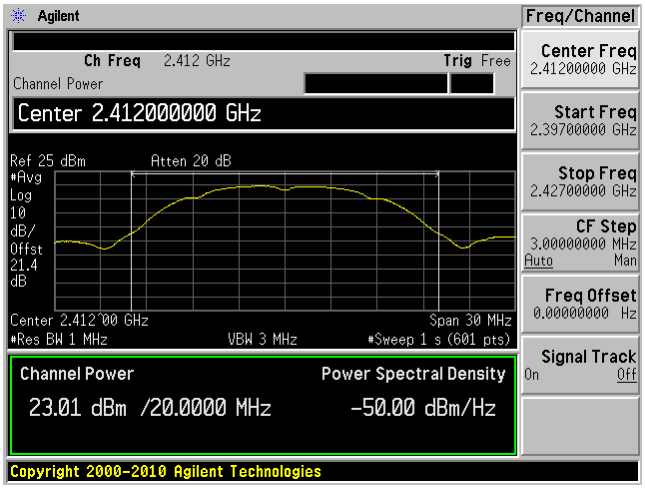
802.11n HT40 mode

Channel	Frequency (MHz)	TX Chain J0 Power (dBm)	TX Chain J1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)	Power Setting
Low	5755	18.36	17.78	21.09	30	-8.91	22
High	5795	16.49	16.03	19.28	30	-10.72	19.5

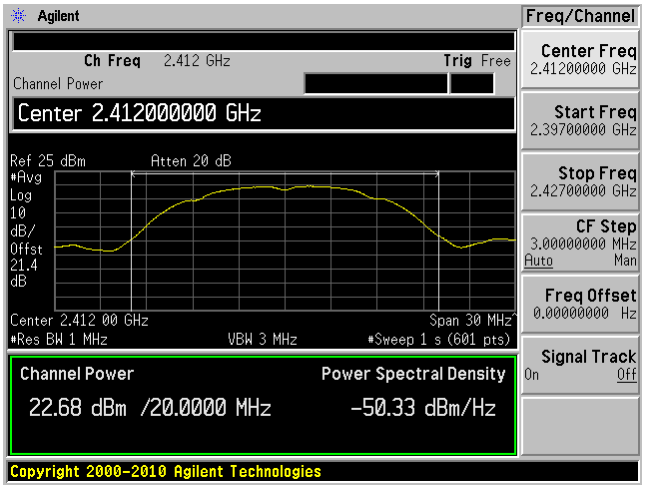
2.4 GHz Band

802.11b mode

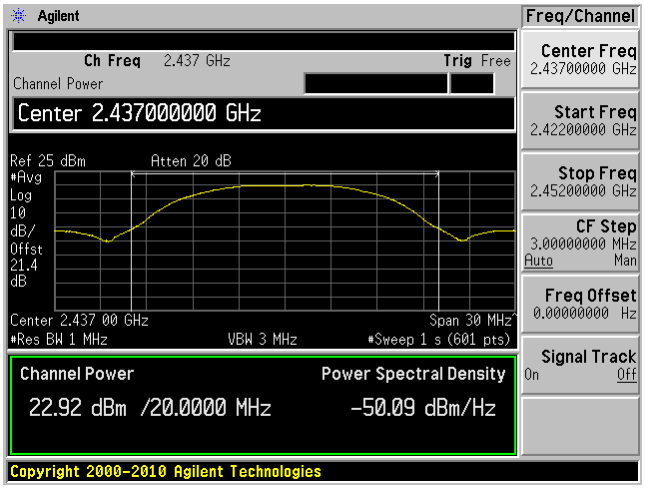
Low channel: 2412 MHz Chain J0



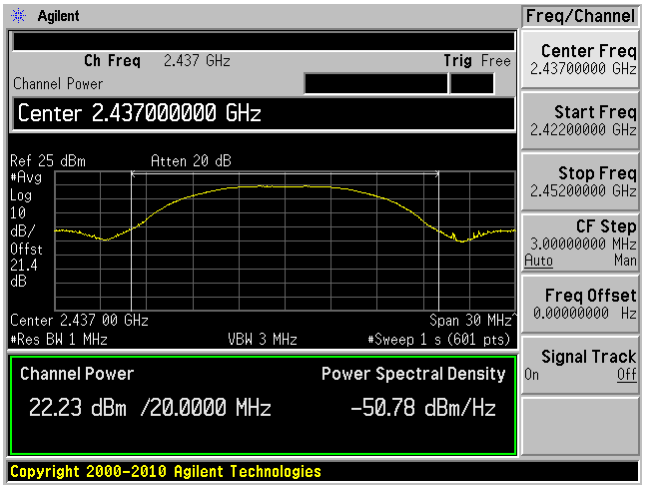
Low channel: 2412 MHz Chain J1



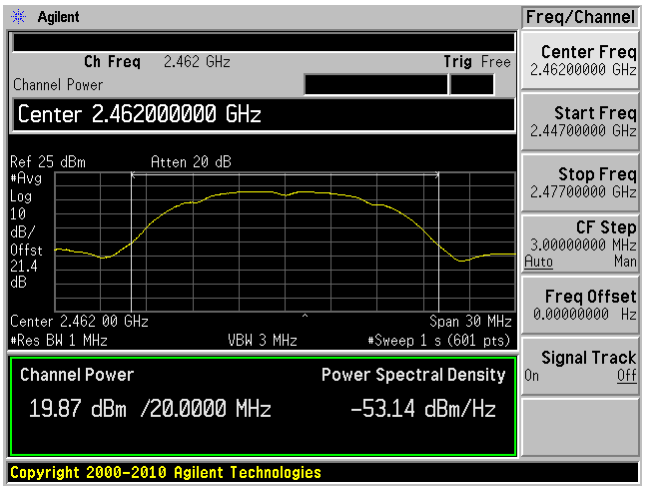
Middle channel: 2437 MHz Chain J0



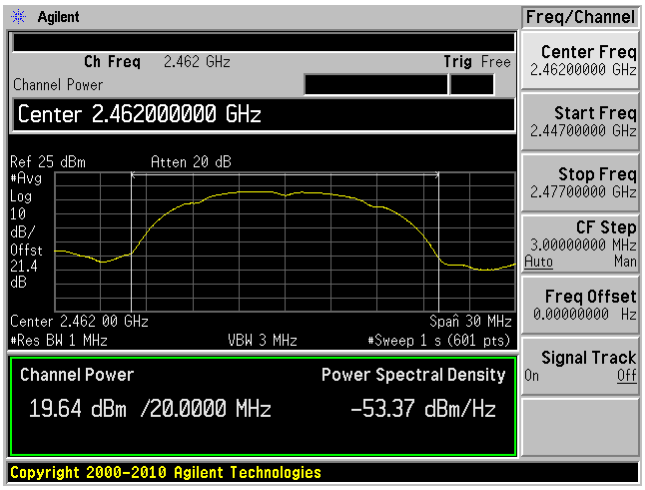
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

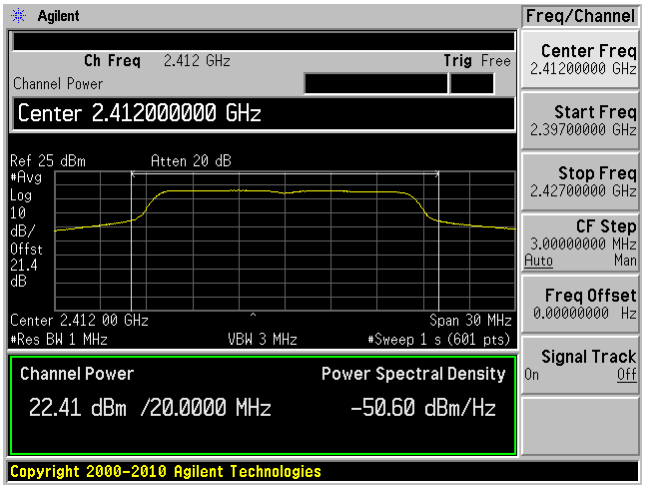


Middle channel: 2462 MHz Chain J1

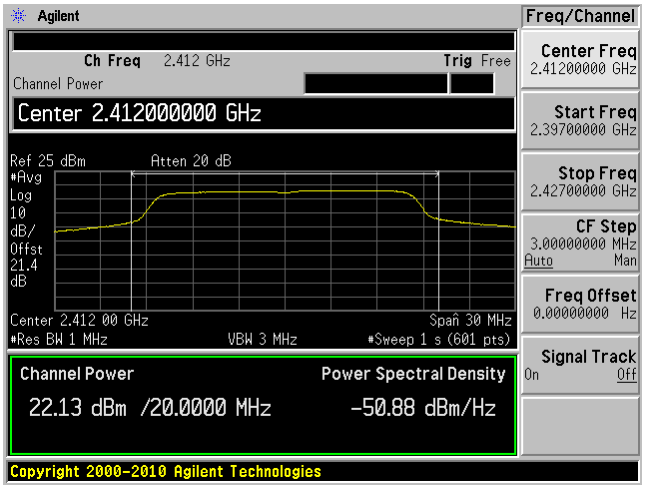


802.11g mode

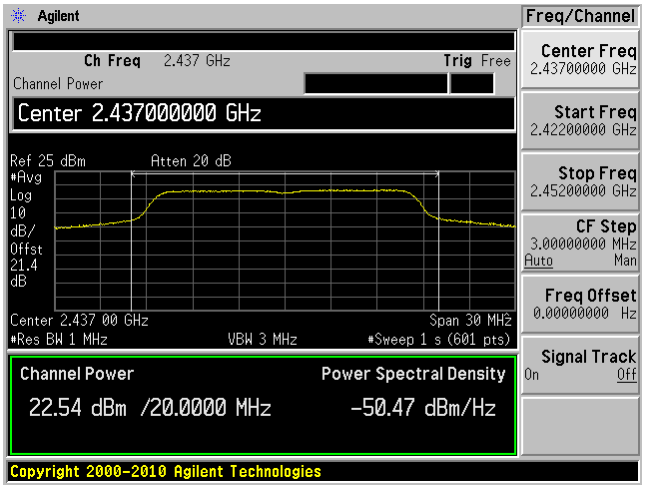
Low channel: 2412 MHz Chain J0



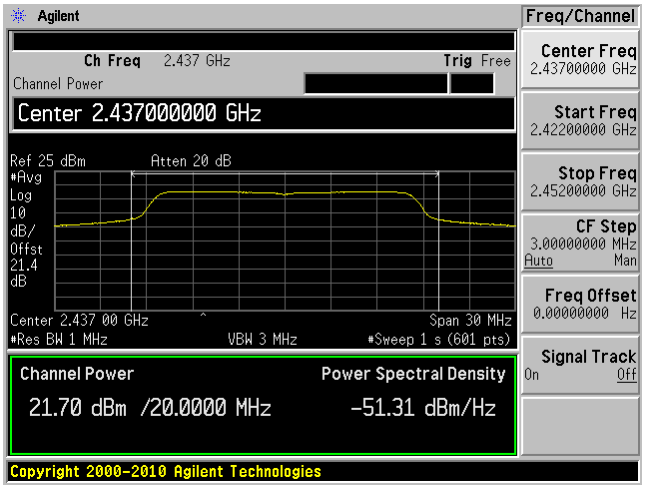
Low channel: 2412 MHz Chain J1



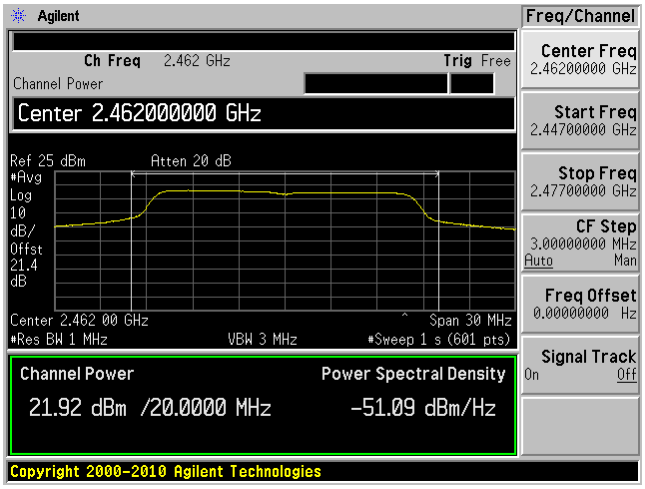
Middle channel: 2437 MHz Chain J0



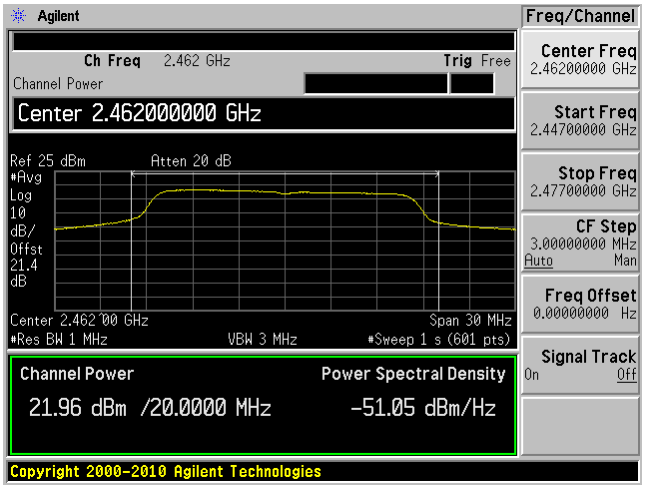
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

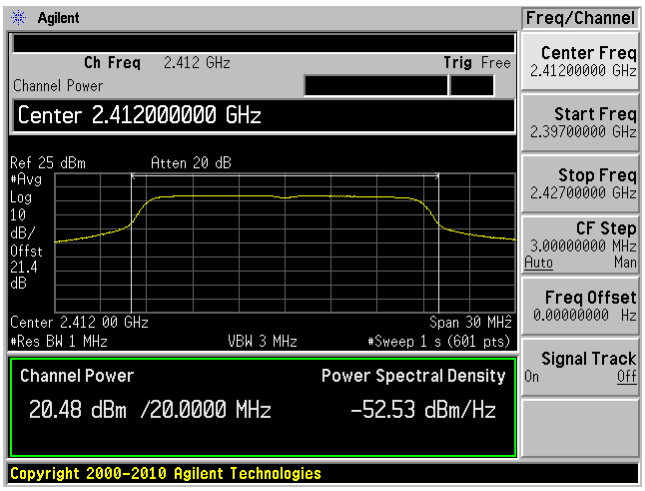


Middle channel: 2462 MHz Chain J1

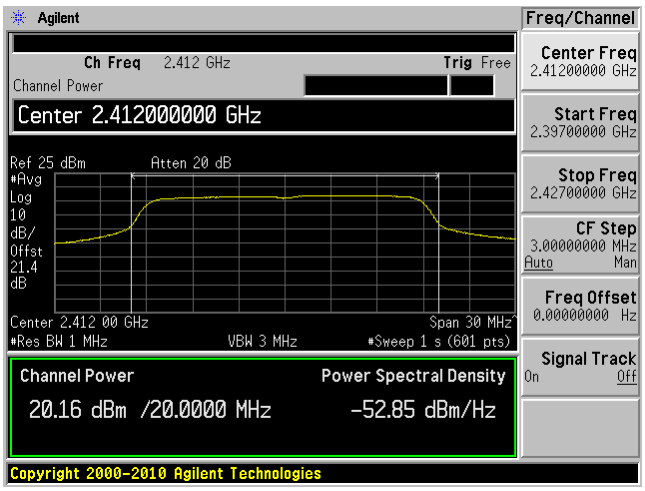


802.11n HT20 mode

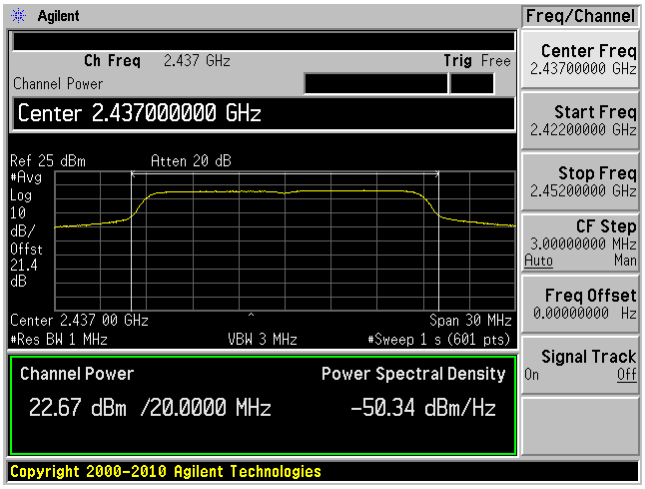
Low channel: 2412 MHz Chain J0



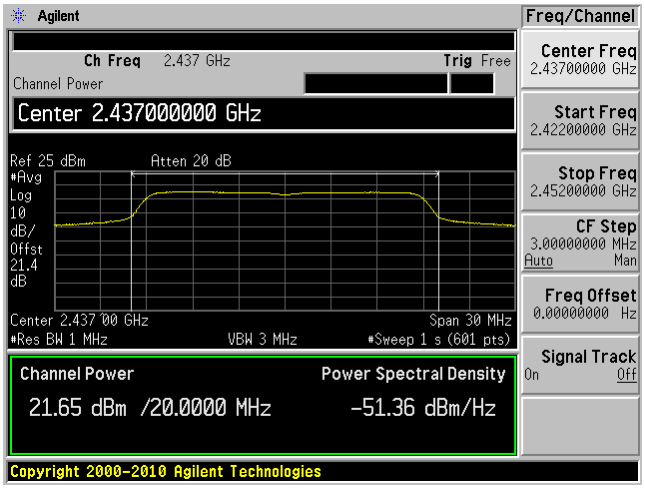
Low channel: 2412 MHz Chain J1



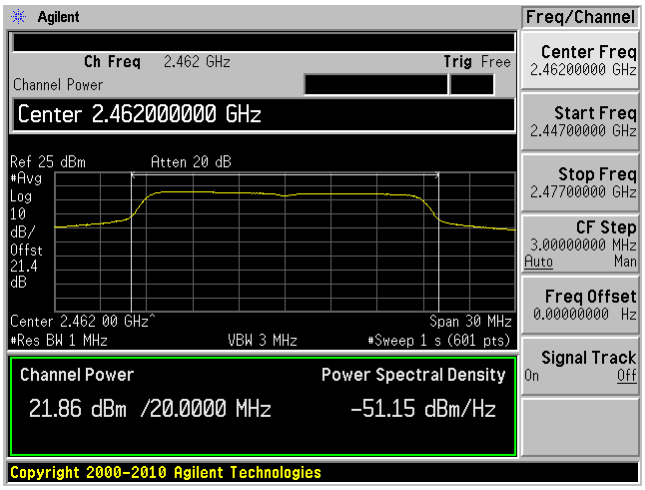
Middle channel: 2437 MHz Chain J0



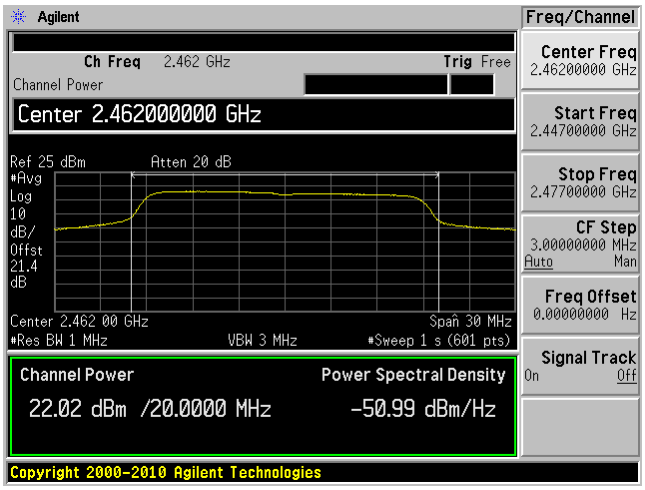
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

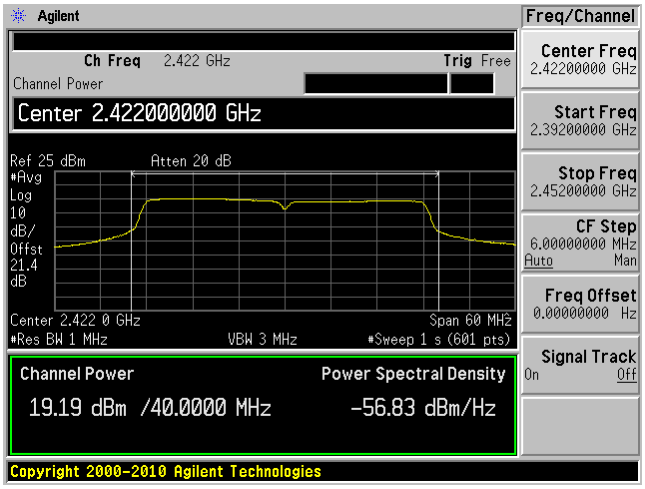


Middle channel: 2462 MHz Chain J1

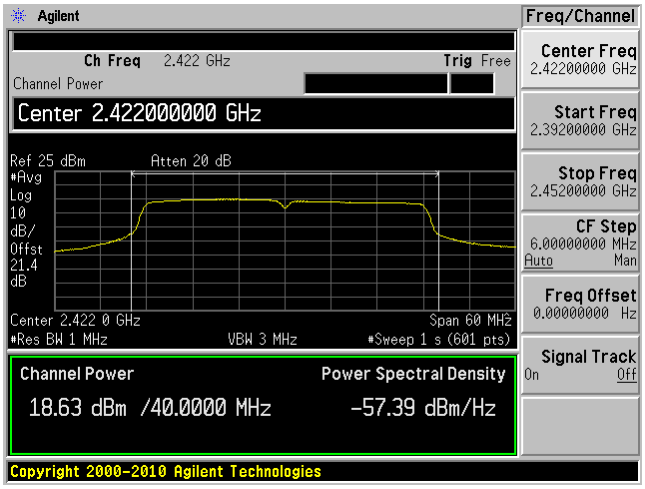


802.11n HT40 mode

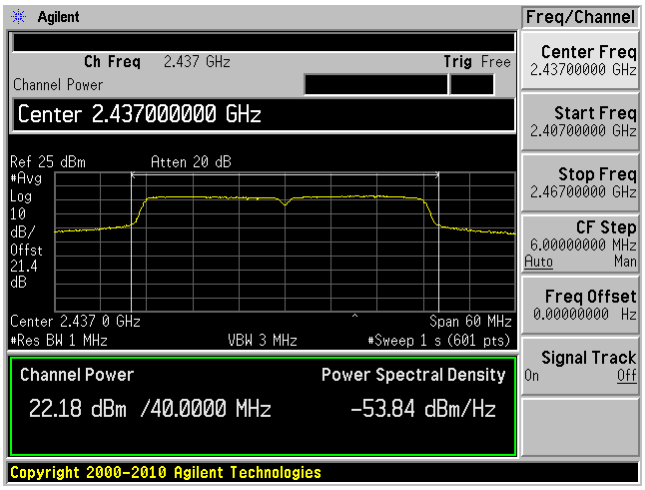
Low channel: 2422 MHz Chain J0



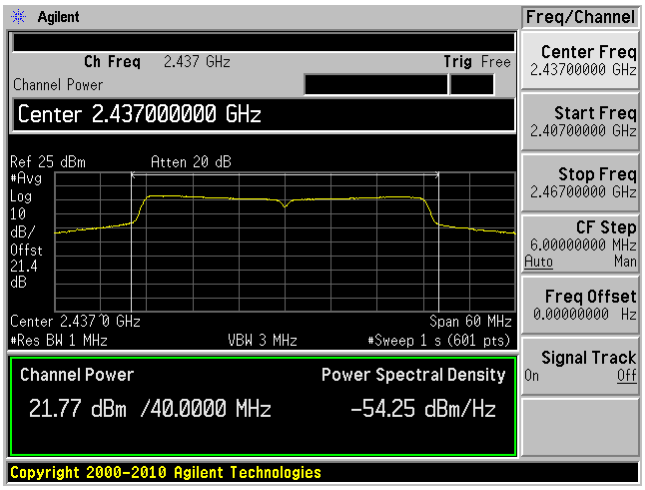
Low channel: 2422 MHz Chain J1



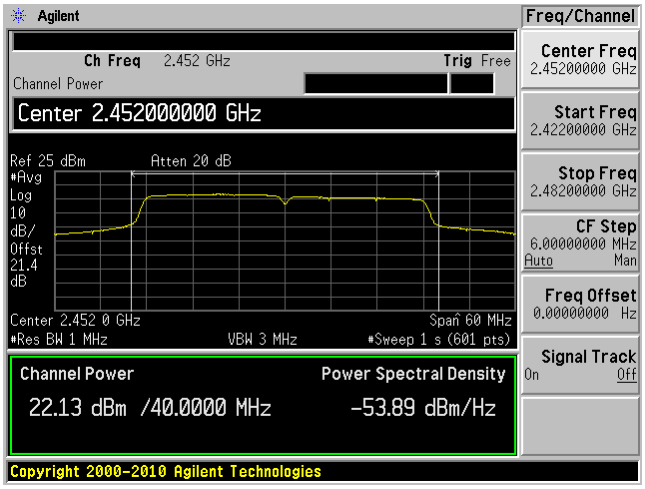
Middle channel: 2437 MHz Chain J0



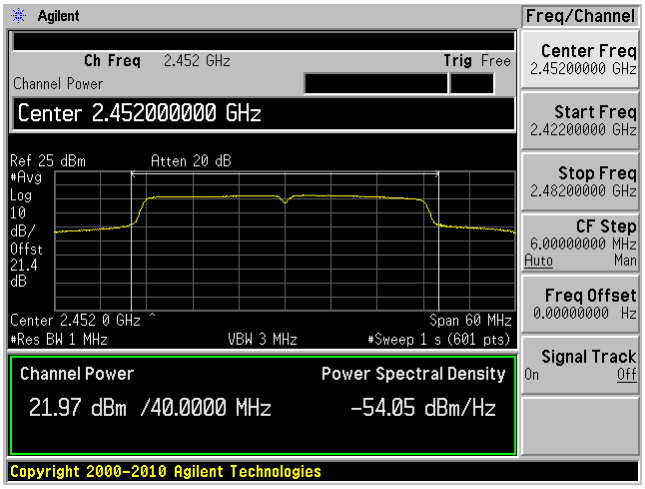
Middle channel: 2437 MHz Chain J1



High channel: 2452 MHz Chain J0



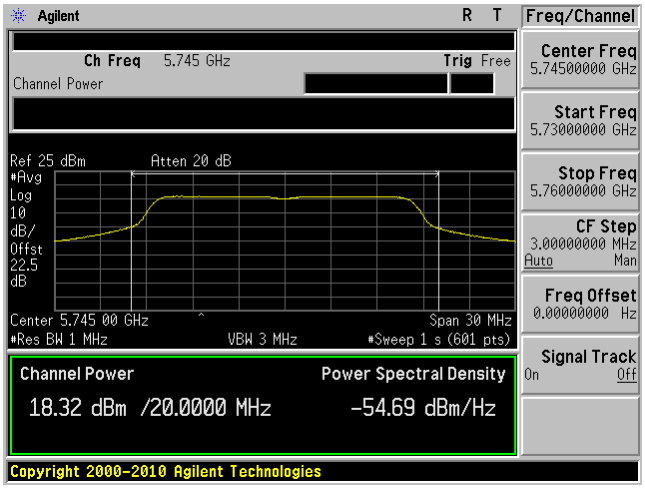
Middle channel: 2452 MHz Chain J1



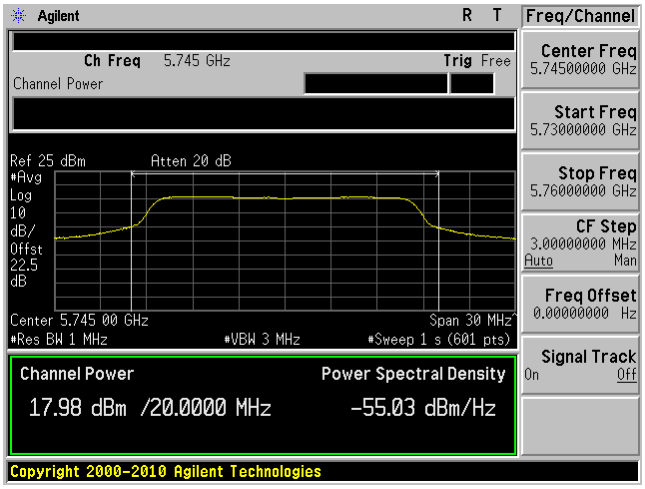
5.8 GHz Band

802.11a mode

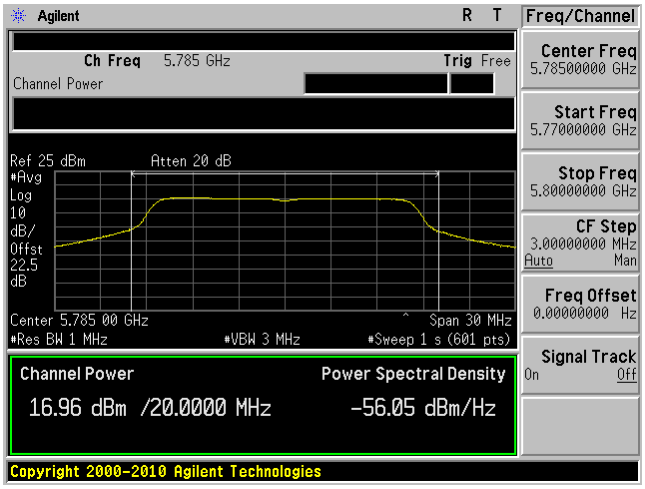
Low channel: 5745 MHz Chain J0



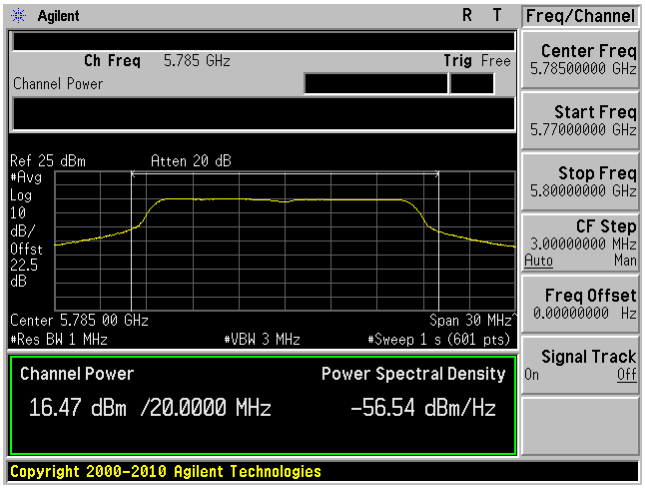
Low channel: 5745 MHz Chain J1



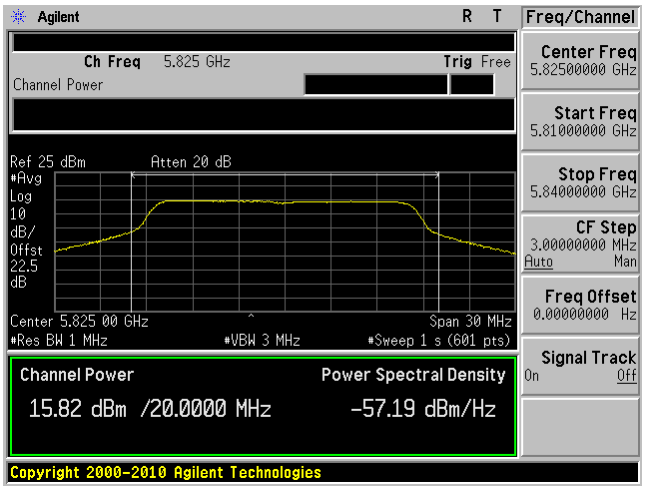
Middle channel: 5785 MHz Chain J0



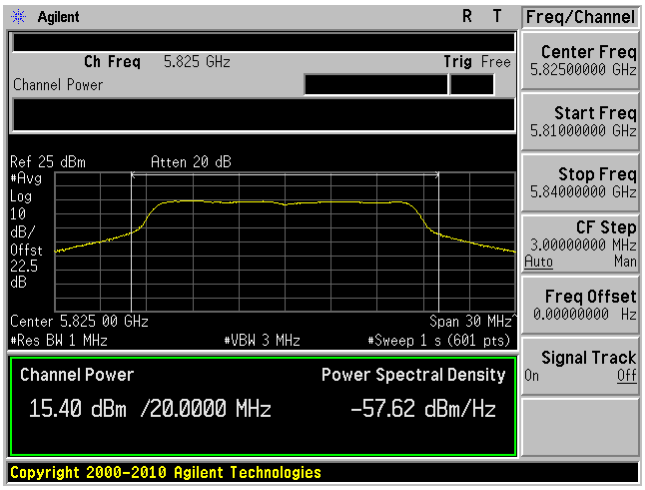
Middle channel: 5785 MHz Chain J1



High channel: 5825 MHz Chain J0

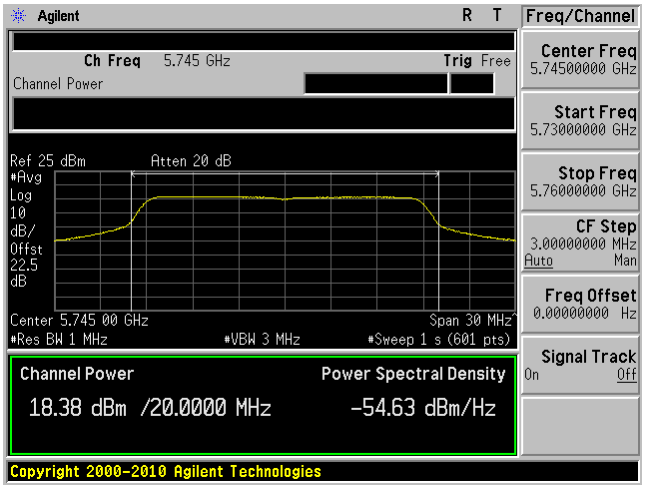


Middle channel: 5825 MHz Chain J1

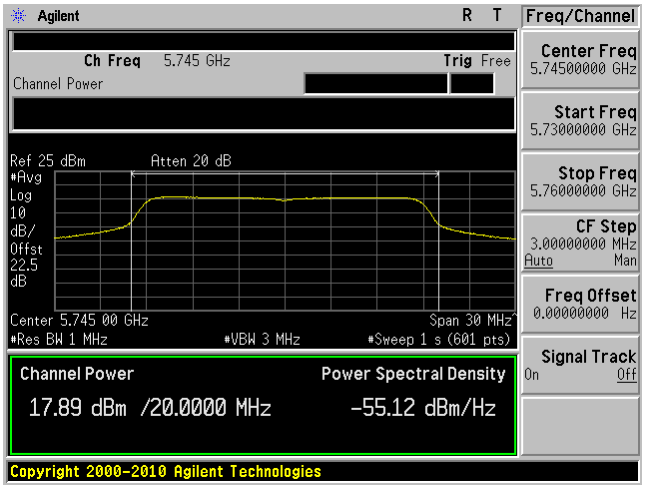


802.11n HT20 mode

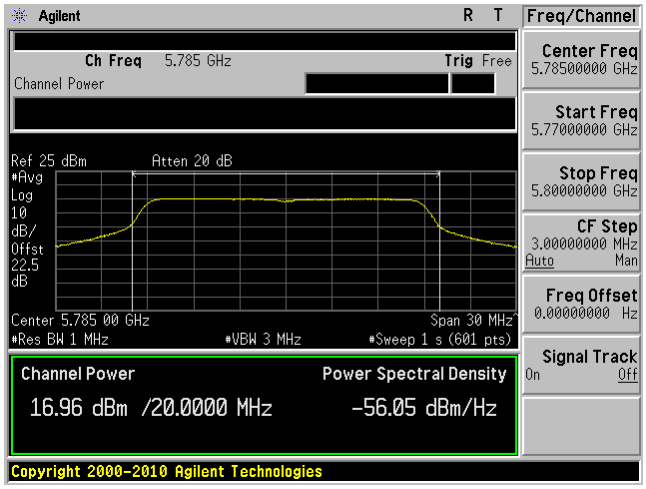
Low channel: 5745 MHz Chain J0



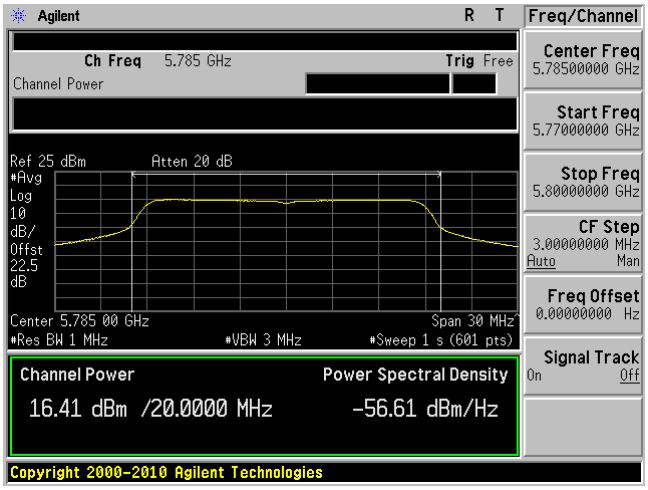
Low channel: 5745 MHz Chain J1



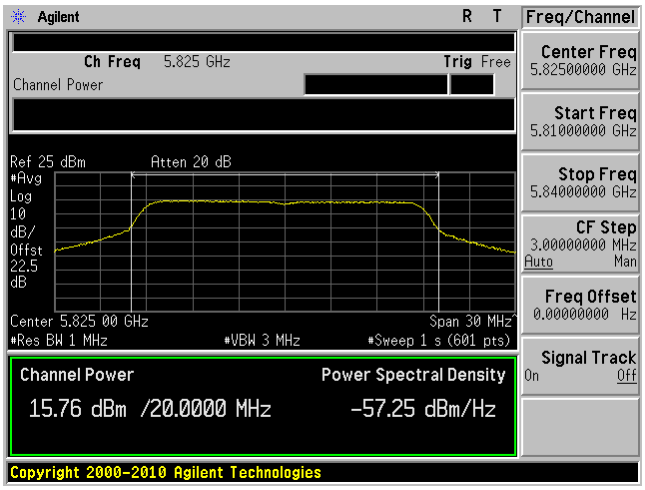
Middle channel: 5785 MHz Chain J0



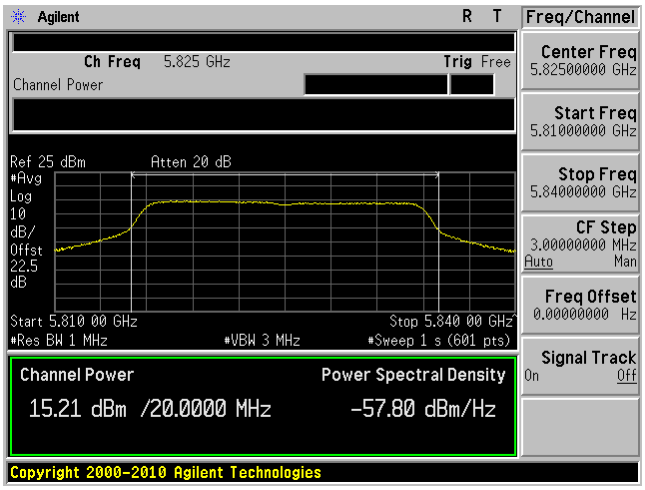
Middle channel: 5785 MHz Chain J1



High channel: 5825 MHz Chain J0

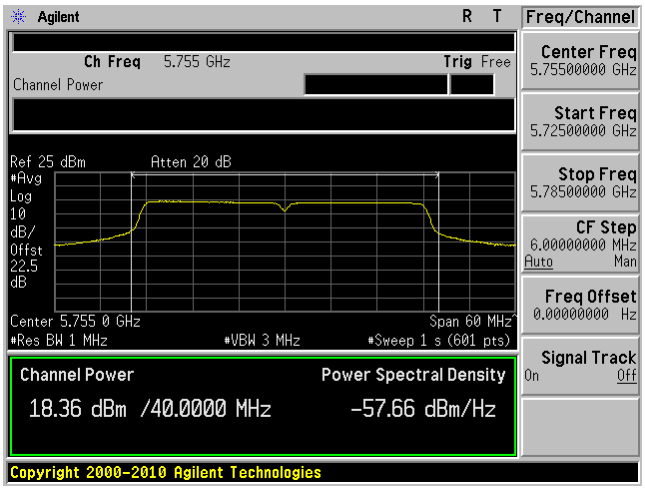


Middle channel: 5825 MHz Chain J1

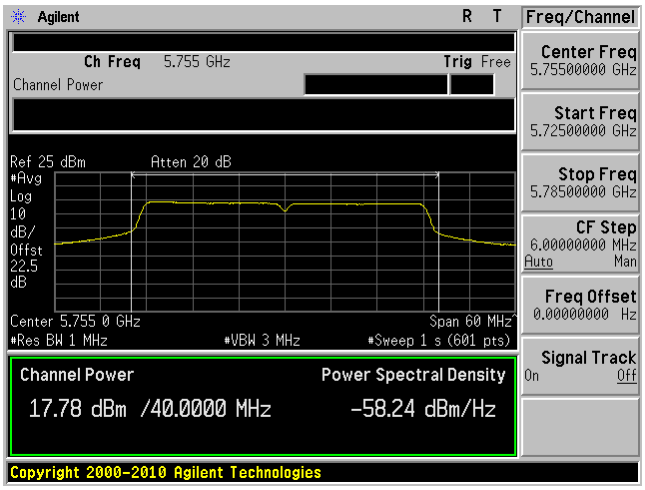


802.11n HT40 mode

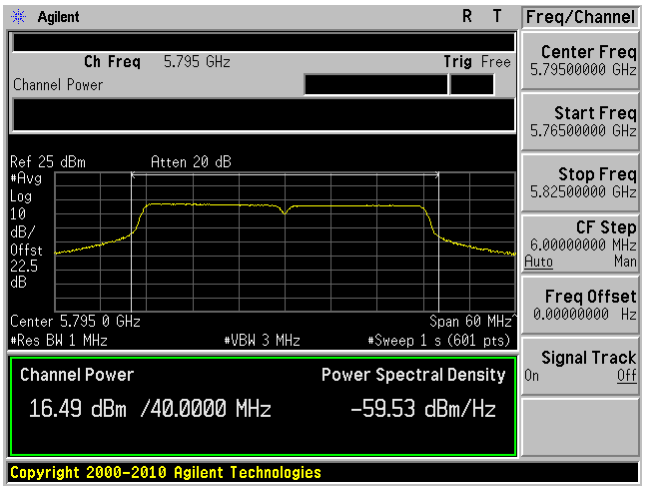
Low channel: 5755 MHz Chain J0



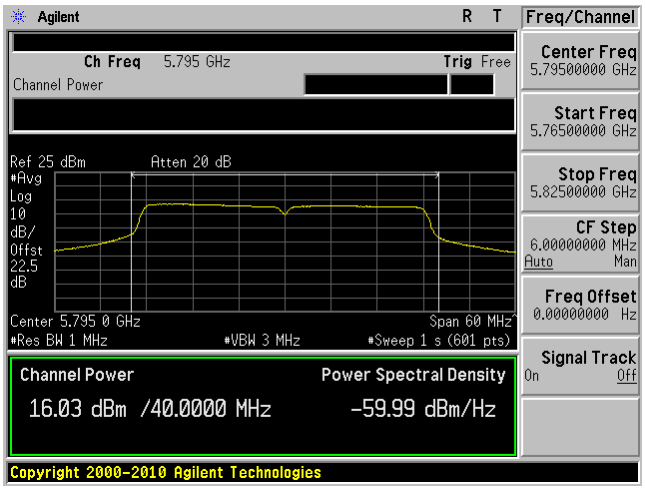
Low channel: 5755 MHz Chain J1



High channel: 5795 MHz Chain J0



Middle channel: 575 MHz Chain J1



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

11.1 Applicable Standard

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

According to IC Rss-210 §A8.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

11.2 Measurement Procedure

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

11.3 Test Equipment List and Details

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

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

11.4 Test Environmental Conditions

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

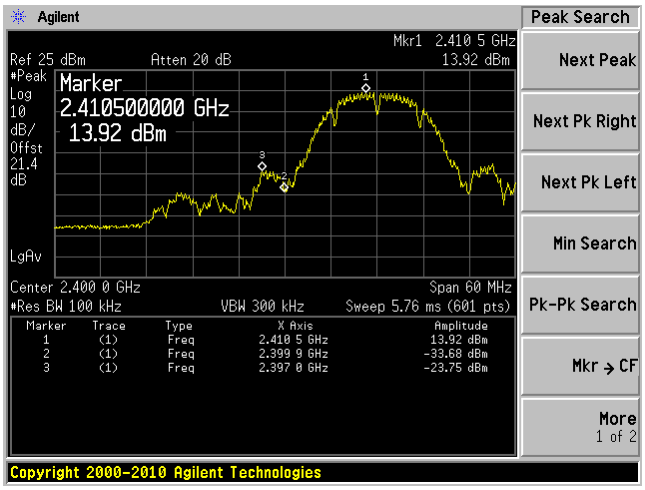
The testing was performed by Jeffrey Wu from 2012-10-1 to 2012-10-15 at RF site.

11.5 Test Results

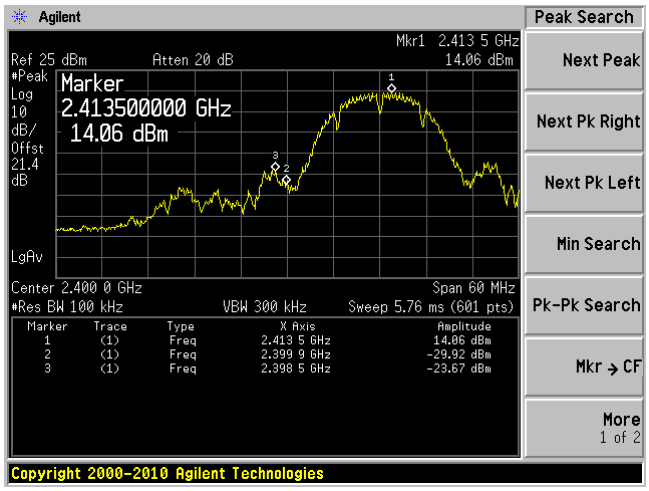
Please refer to following pages for plots of band edge.

2.4 GHz Band

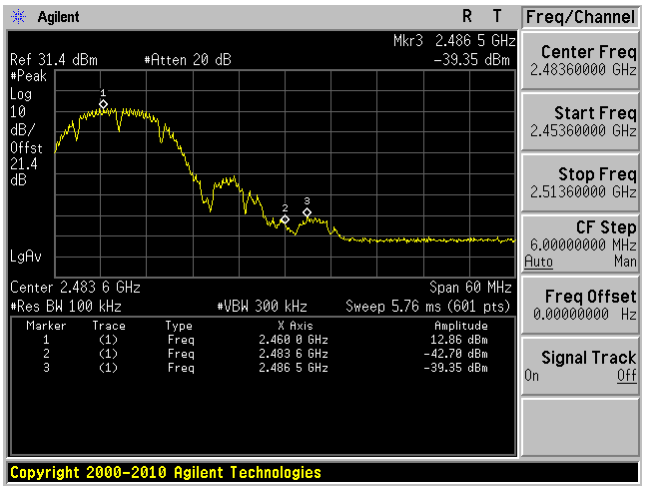
802.11b, Chain J0 Low Band Edge



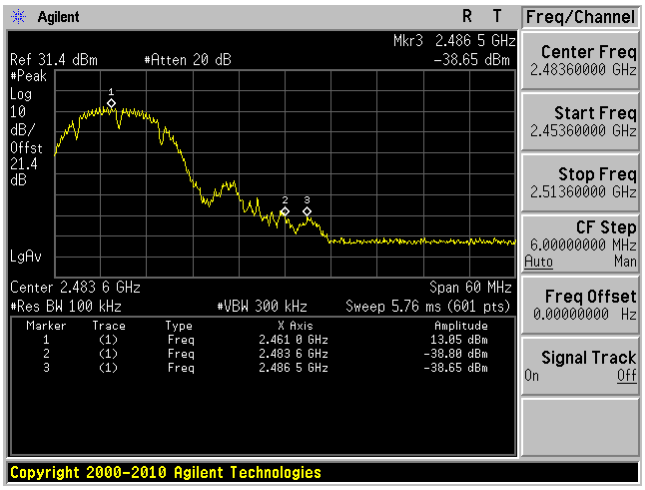
802.11b, Chain J1 Low Band Edge



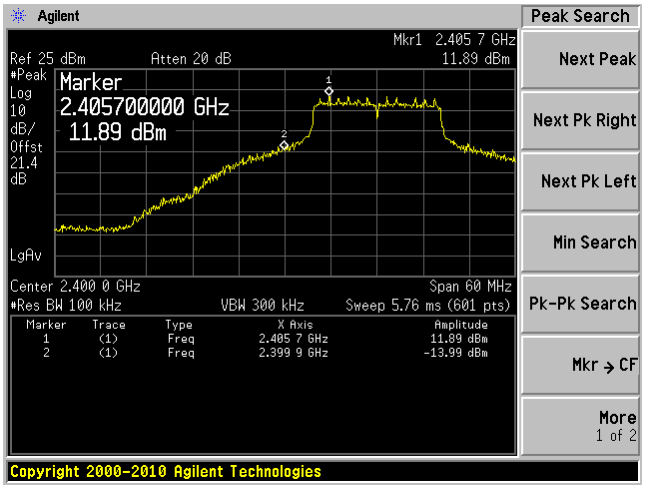
802.11b, Chain J0 High Band Edge



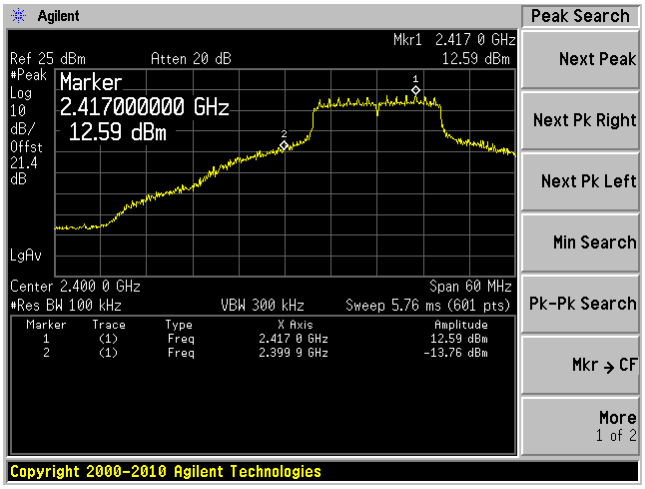
802.11b, Chain J1 High Band Edge



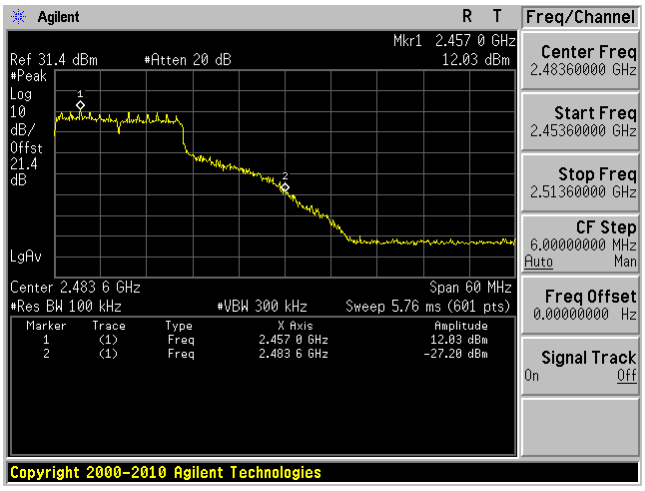
802.11g, Chain J0 Low Band Edge



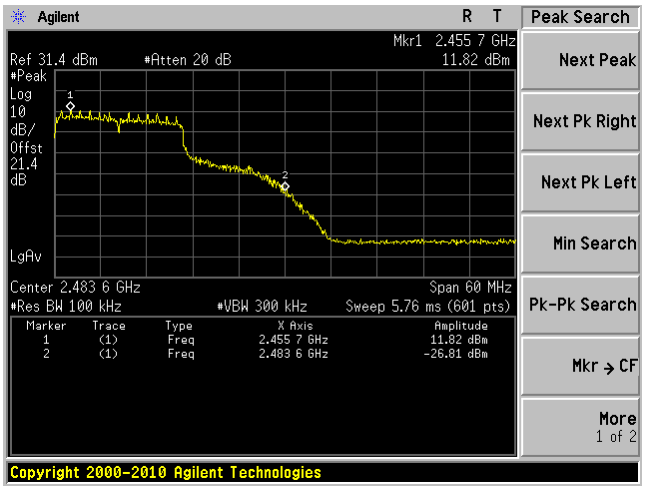
802.11g, Chain J1 Low Band Edge



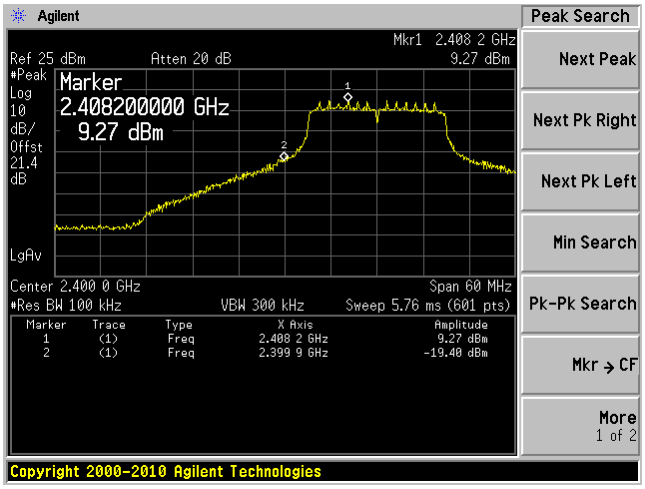
802.11g, Chain J0 High Band Edge



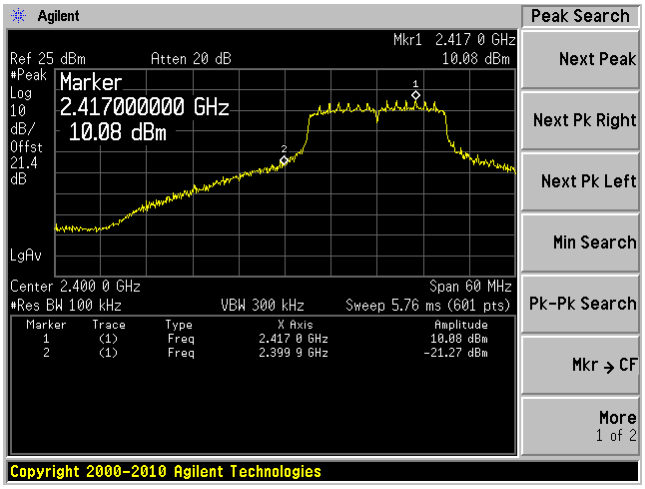
802.11g, Chain J1 High Band Edge



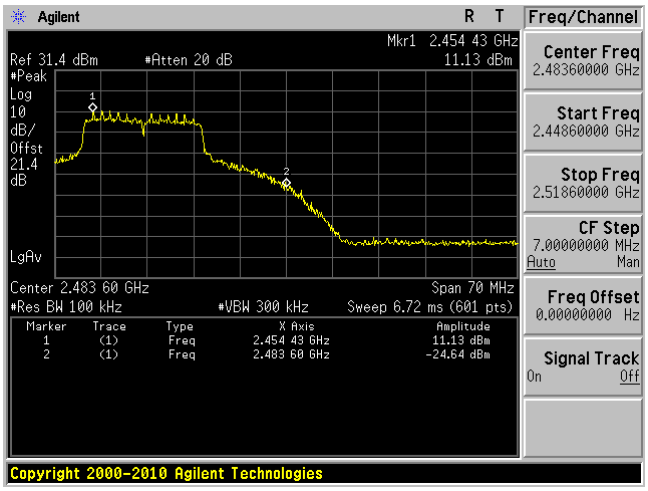
802.11n HT20, Chain J0 Low Band Edge



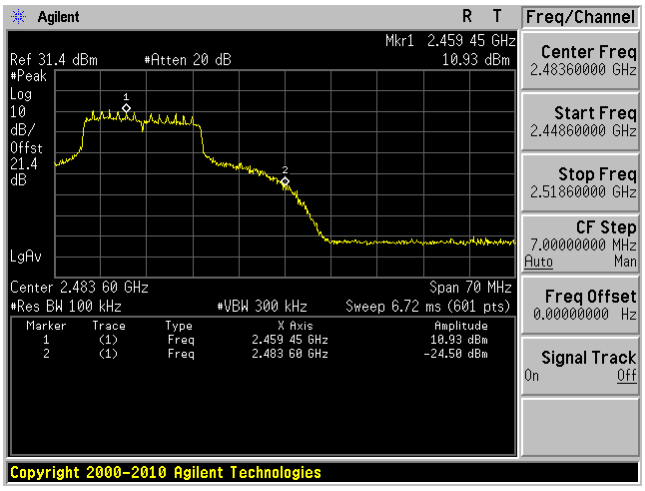
802.11n HT20, Chain J1 Low Band Edge



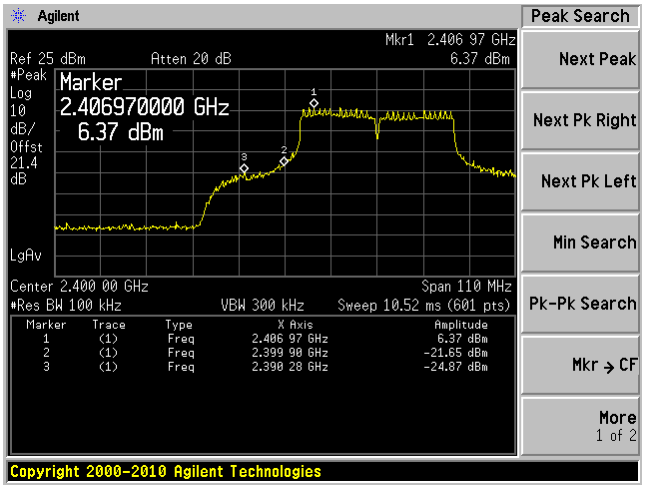
802.11n HT20, Chain J0 High Band Edge



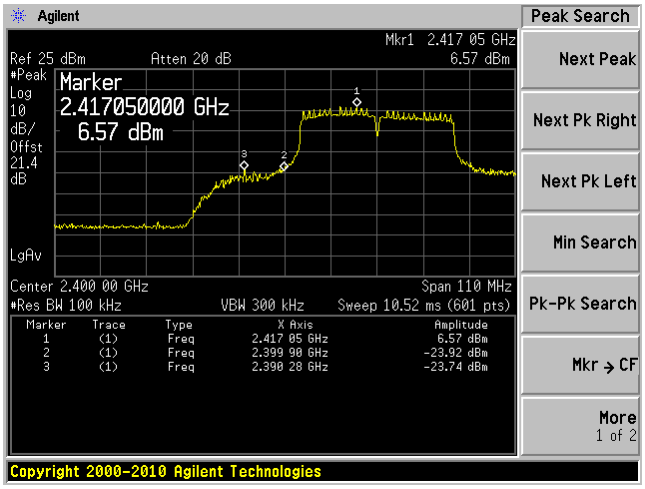
802.11n HT20, Chain J1 High Band Edge



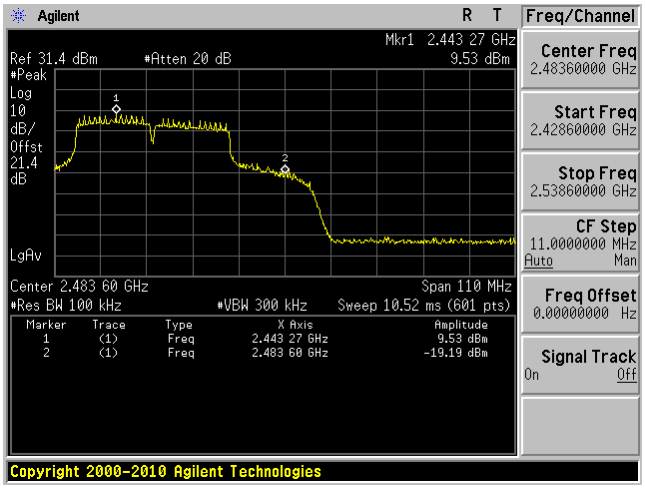
802.11n HT40, Chain J0 Low Band Edge



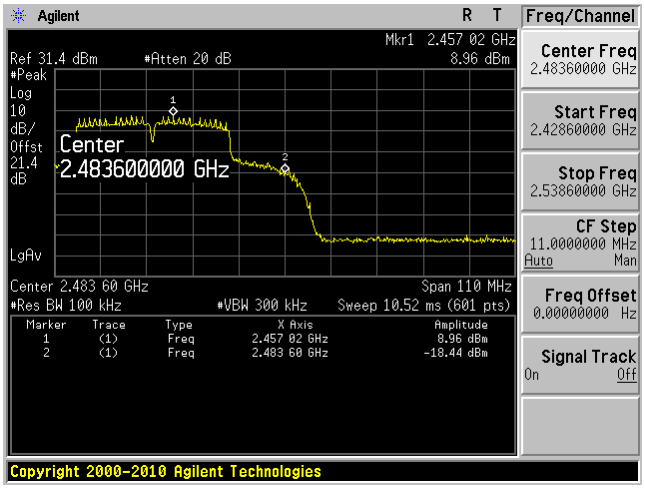
802.11n HT40, Chain J1 Low Band Edge



802.11n HT40, Chain J0 High Band Edge

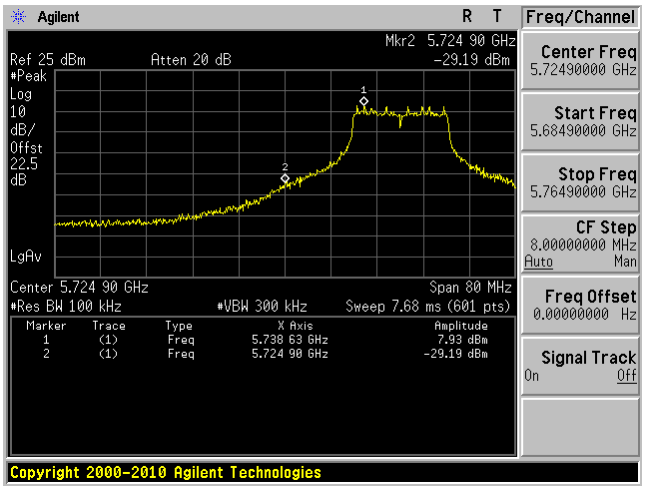


802.11n HT40, Chain J1 High Band Edge

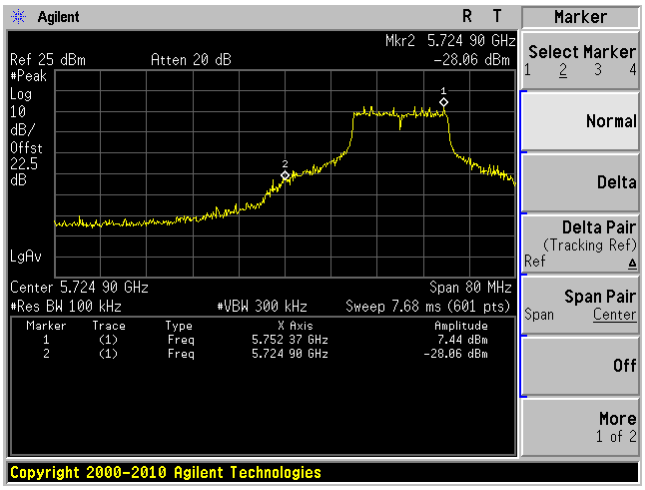


5.8 GHz Band

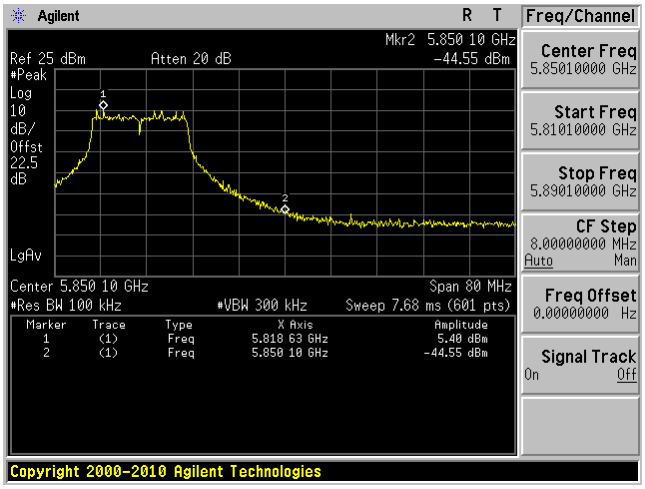
802.11a, Chain J0 Low Band Edge



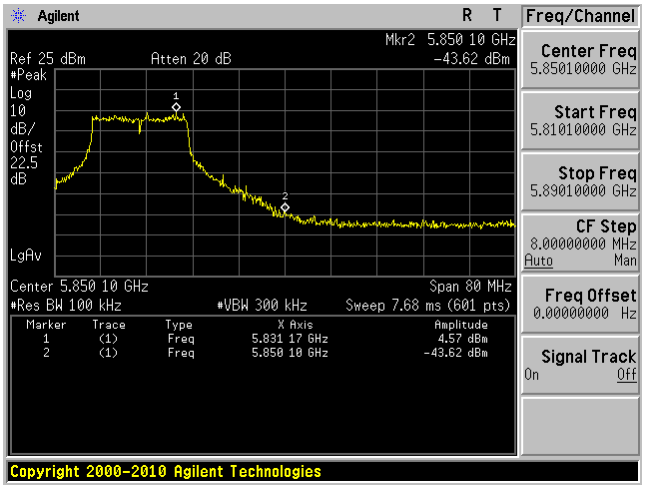
802.11a, Chain J1 Low Band Edge



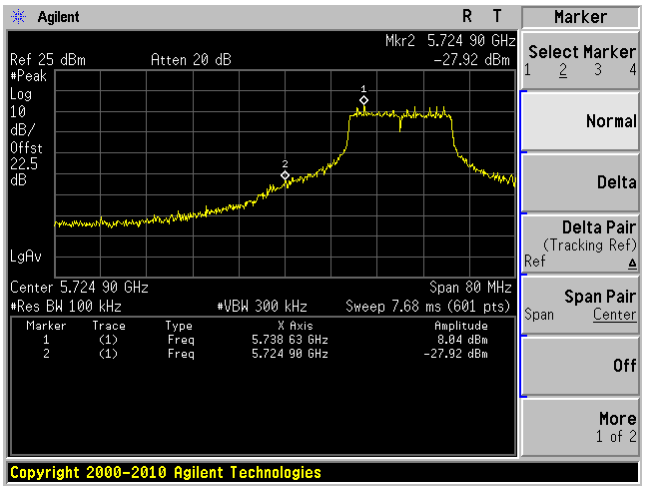
802.11a, Chain J0 High Band Edge



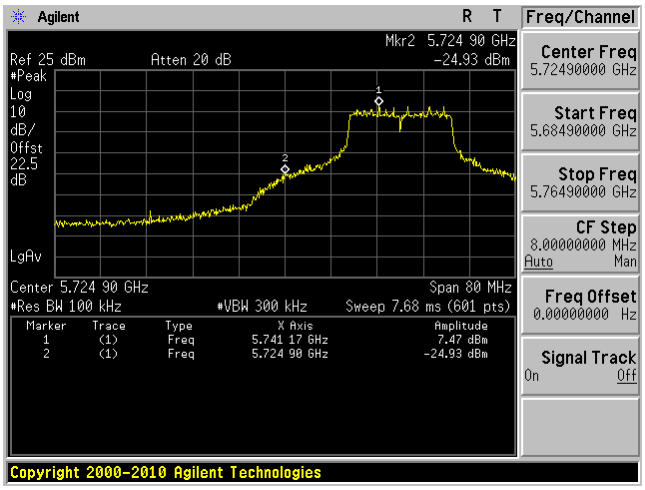
802.11a, Chain J1 High Band Edge



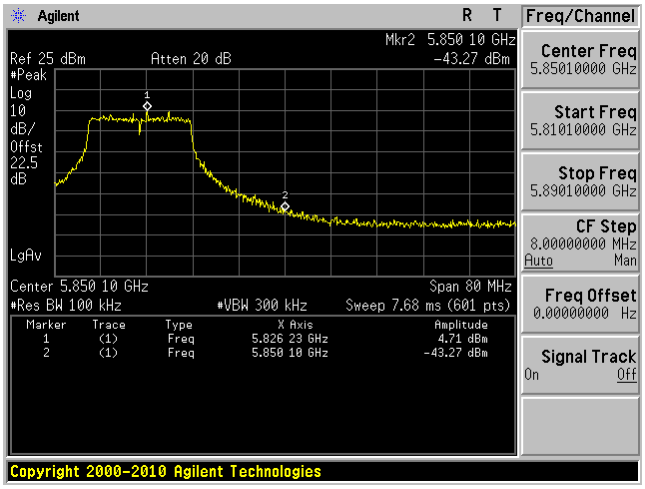
802.11n HT20, Chain J0 Low Band Edge



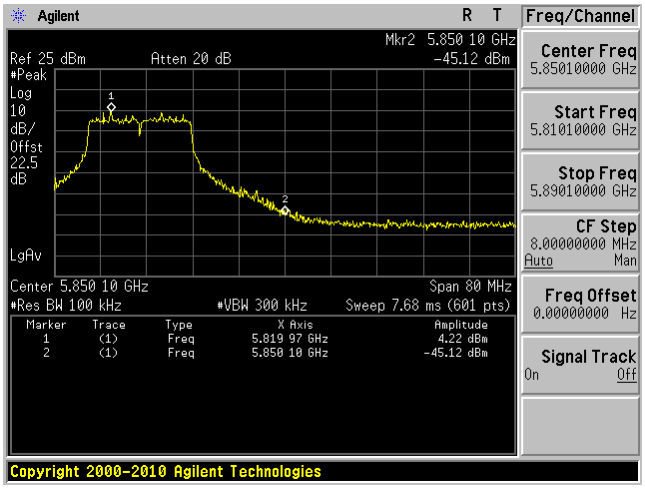
802.11n HT20, Chain J1 Low Band Edge



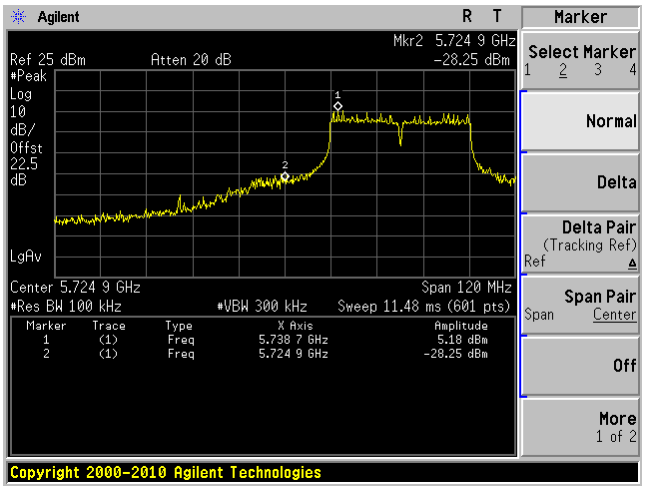
802.11n HT20, Chain J0 High Band Edge



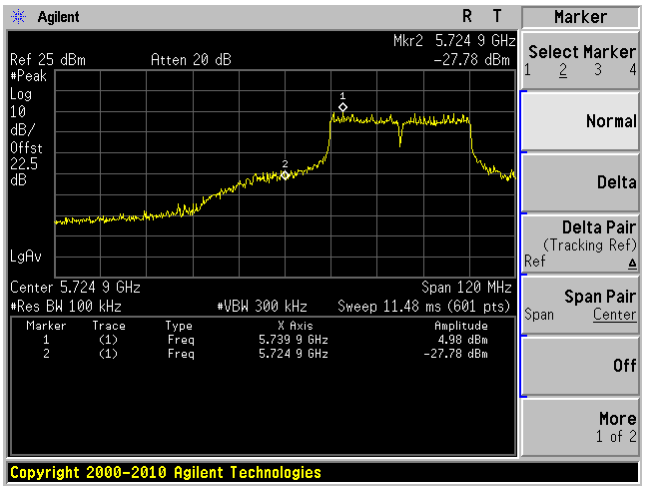
802.11n HT20, Chain J1 High Band Edge



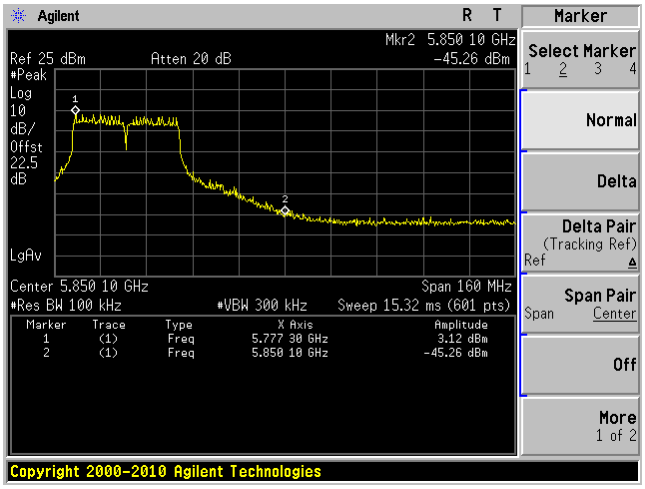
802.11n HT40, Chain J0 Low Band Edge



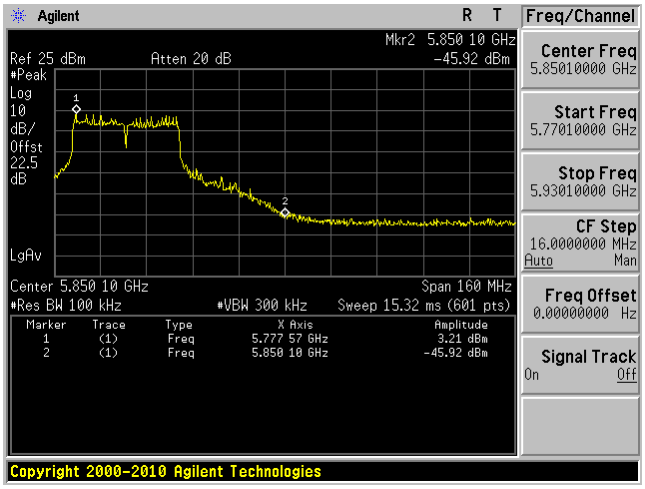
802.11n HT40, Chain J1 Low Band Edge



802.11n HT40, Chain J0 High Band Edge



802.11n HT40, Chain J1 High Band Edge



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

12.1 Applicable Standard

According to FCC §15.247(e) and RSS-210 §A8.2 (b) , for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

12.2 Measurement Procedure

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

12.3 Test Equipment List and Details

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

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

12.4 Test Environmental Conditions

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

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

12.5 Test Results

2.4 GHz Band

802.11b mode

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

802.11 g mode

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

802.11n HT20 mode

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

802.11n HT40 mode

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

5.8 GHz Band

802.11a mode

Channel	Frequency (MHz)	TX Chain J0 PSD (dBm/100 kHz)	TX Chain J1 PSD (dBm/100 kHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)	Power Setting
Low	5745	7.52	6.62	-5.10	8	-13.10	22
Middle	5785	6.62	6.04	-5.85	8	-13.85	19.5
High	5825	5.75	4.45	-7.04	8	-15.04	19

802.11n HT20 mode

Channel	Frequency (MHz)	TX Chain J0 PSD (dBm/100 kHz)	TX Chain J1 PSD (dBm/100 kHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)	Power Setting
Low	5745	7.68	7.69	-4.50	8	-12.50	22
Middle	5785	6.36	5.06	-6.43	8	-14.43	19.5
High	5825	5.17	3.79	-7.66	8	-15.66	19

802.11n HT40 mode

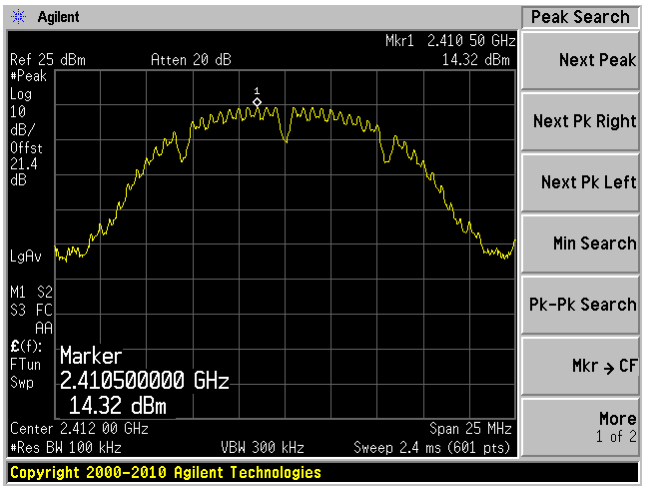
Channel	Frequency (MHz)	TX Chain J0 PSD (dBm/100 kHz)	TX Chain J1 PSD (dBm/100 kHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)	Power Setting
Low	5755	5.45	5.54	-6.69	8	-14.69	22
High	5795	3.59	3.8	-8.49	8	-16.49	19.5

Please refer to the following plots for detailed test results:

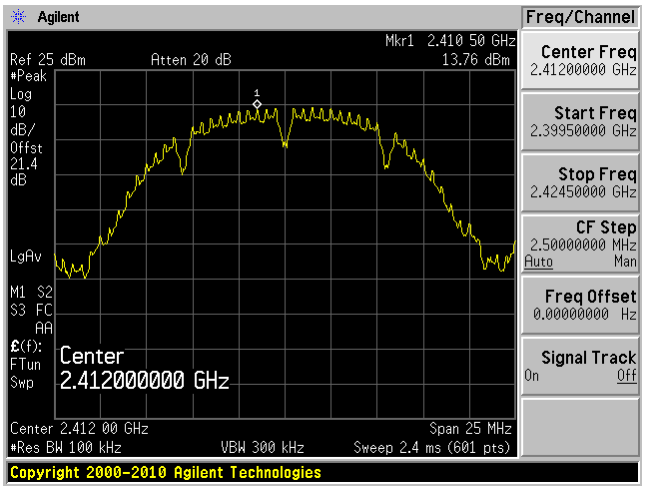
2.4 GHz Band

802.11b mode

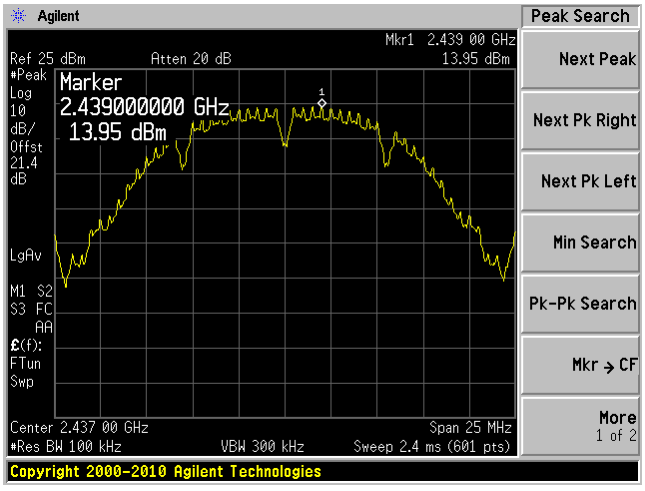
Low channel J0: 2412 MHz



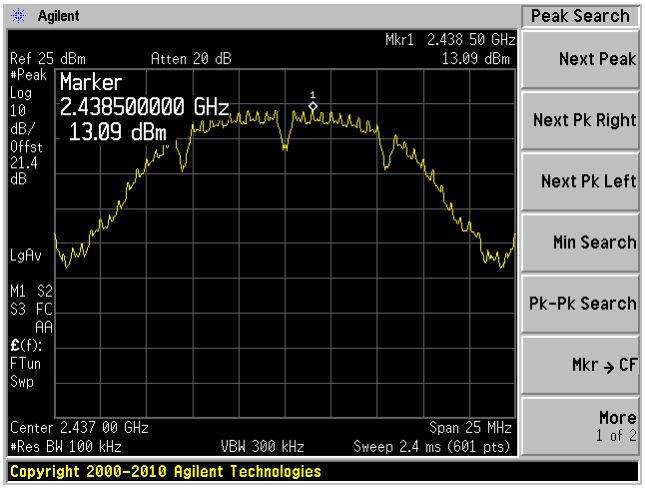
Low channel J1: 2412 MHz



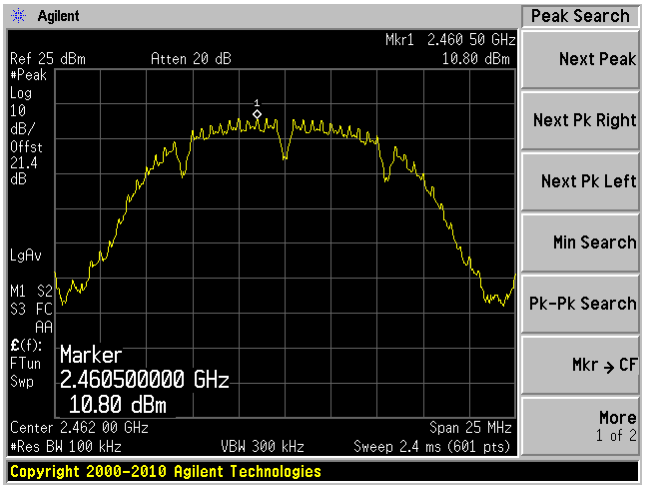
Middle channel J0: 2437 MHz



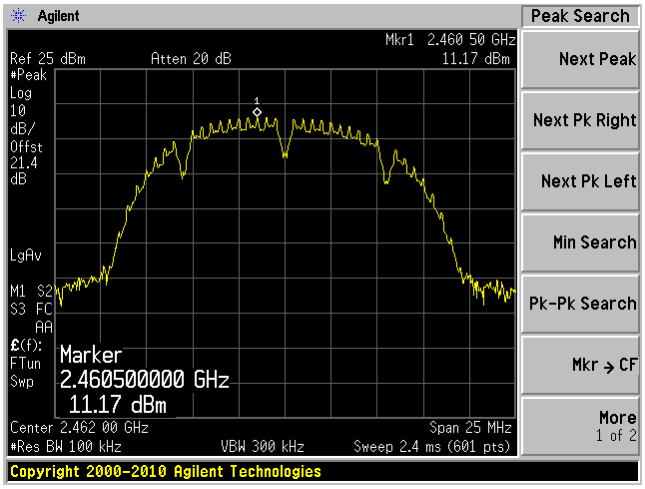
Middle channel J1: 2437 MHz



High channel J0: 2462 MHz

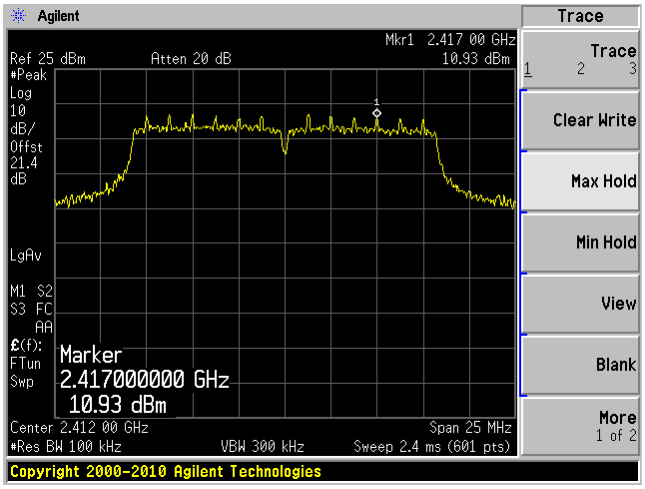


High channel J1: 2462 MHz

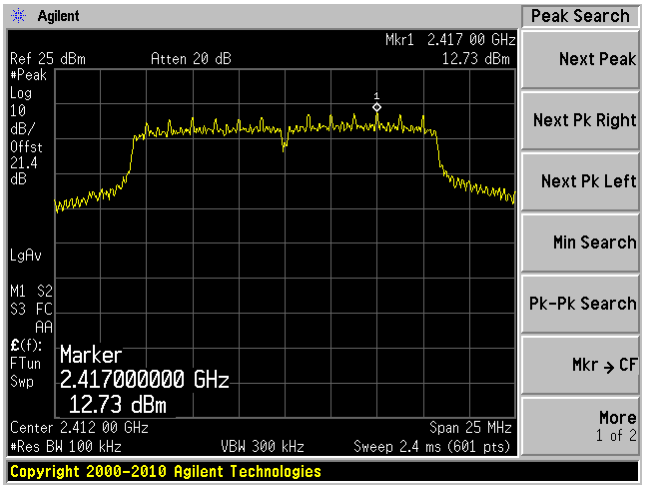


802.11g mode

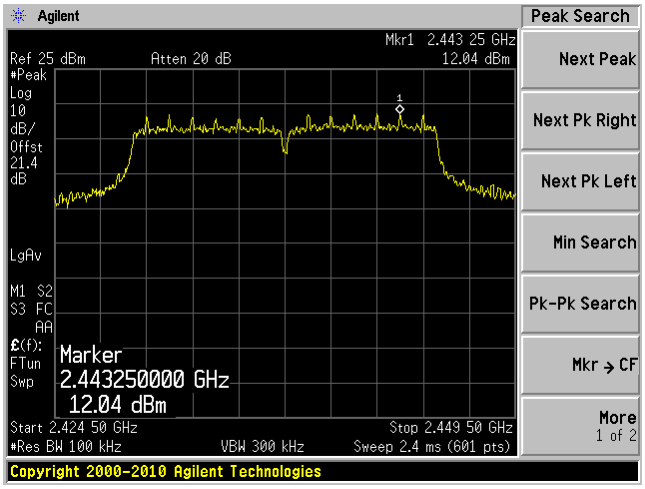
Low channel J0: 2412 MHz



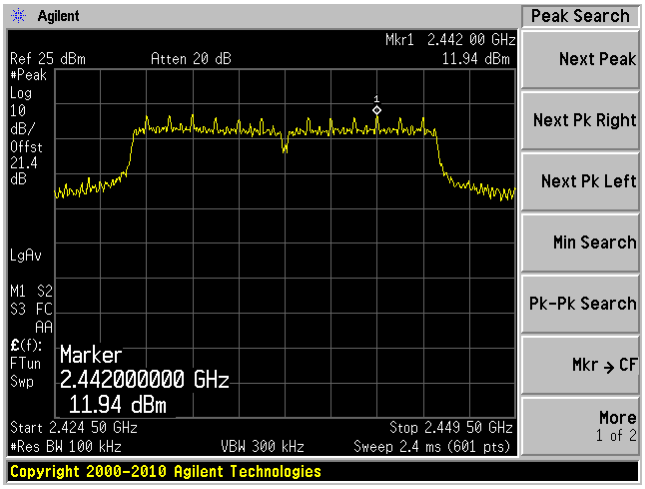
Low channel J1: 2412 MHz



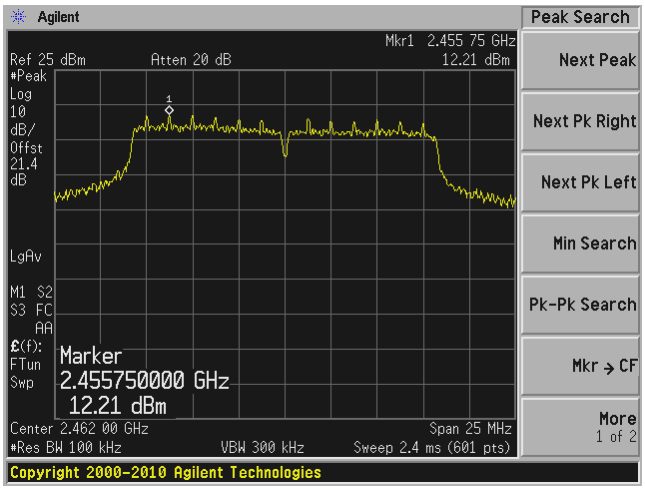
Middle channel J0: 2437 MHz



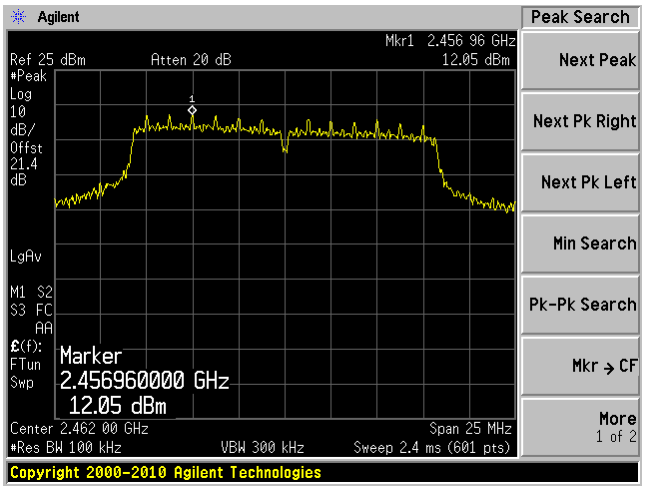
Middle channel J1: 2437 MHz



High channel J0: 2462 MHz

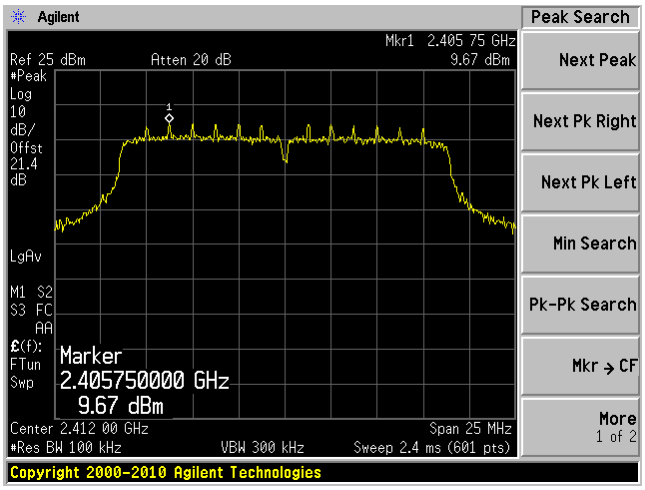


High channel J1: 2462 MHz

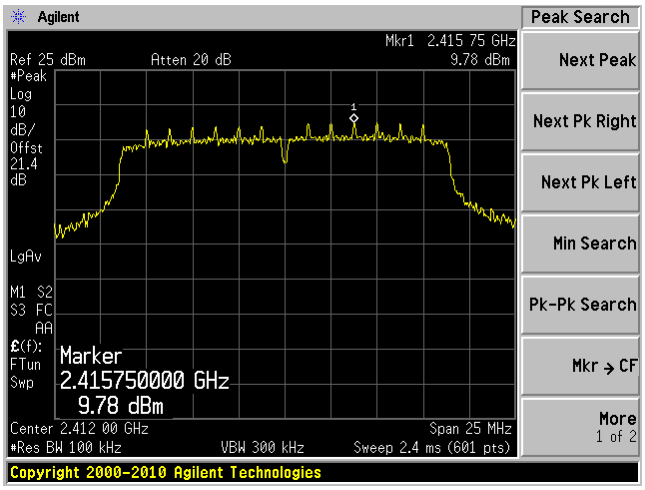


802.11n HT20 mode

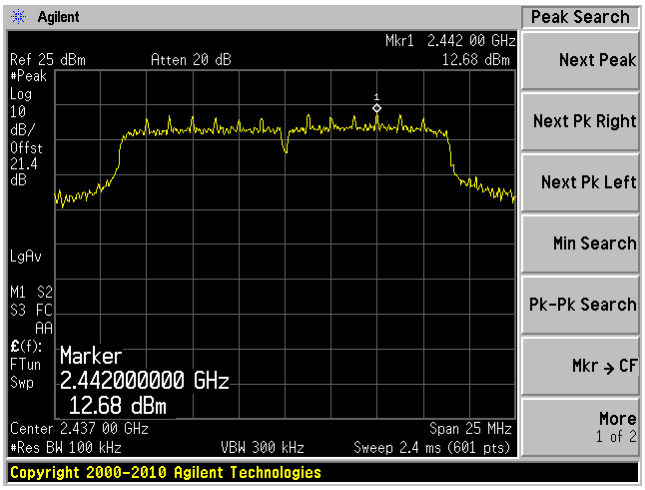
Low channel J0: 2412 MHz



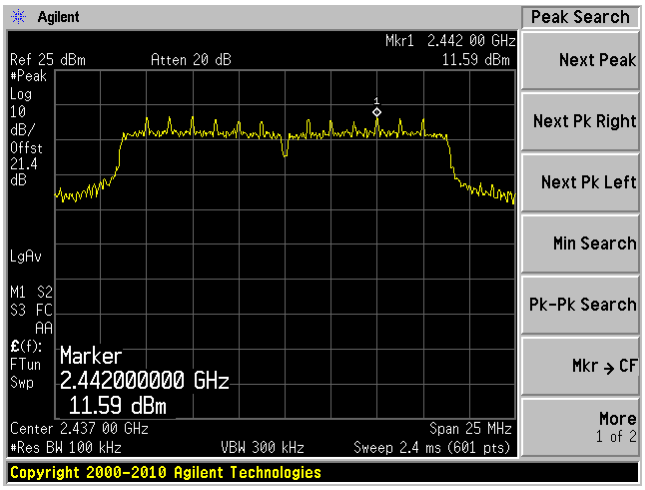
Low channel J1: 2412 MHz



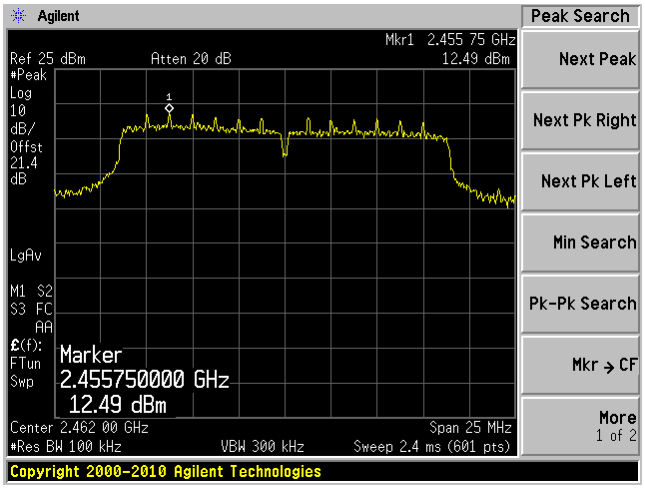
Middle channel J0: 2437 MHz



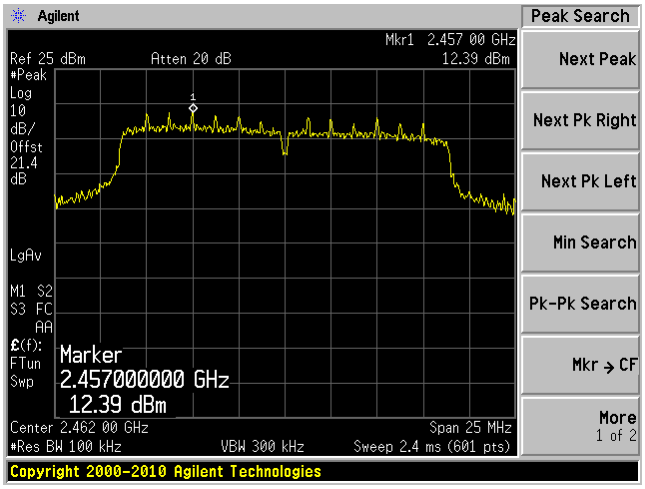
Middle channel J1: 2437 MHz



High channel J0: 2462 MHz

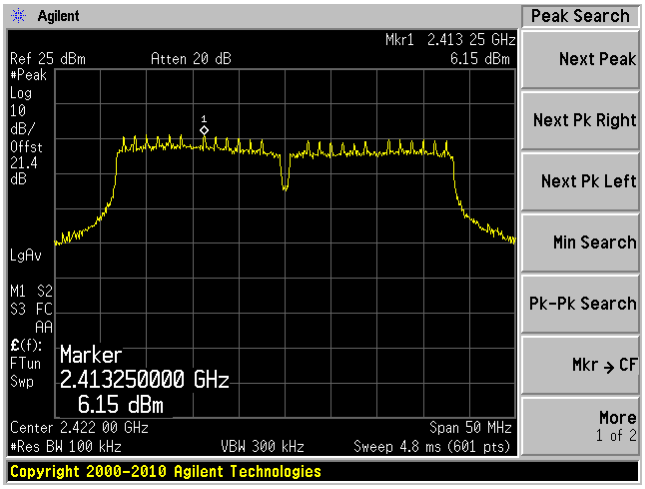


High channel J1: 2462 MHz

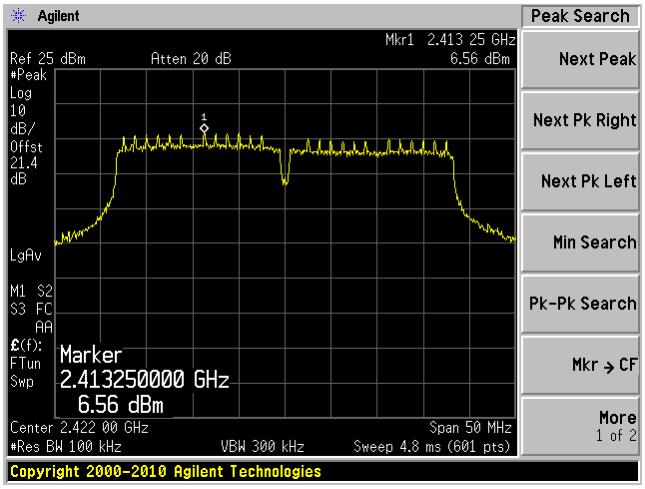


802.11n HT40 mode

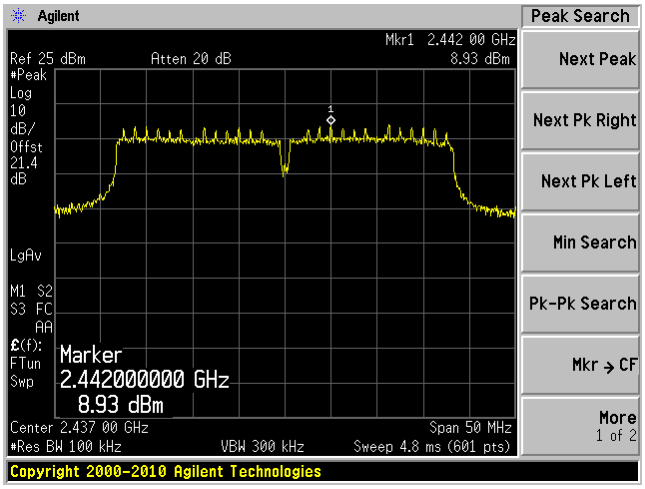
Low channel J0: 2422 MHz



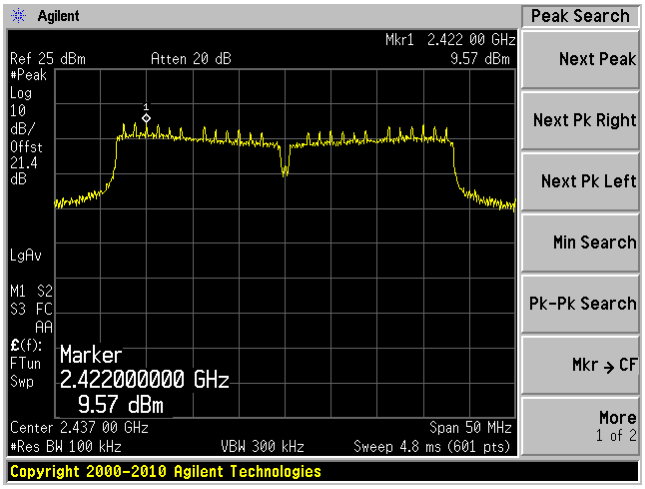
Low channel J1: 2422 MHz



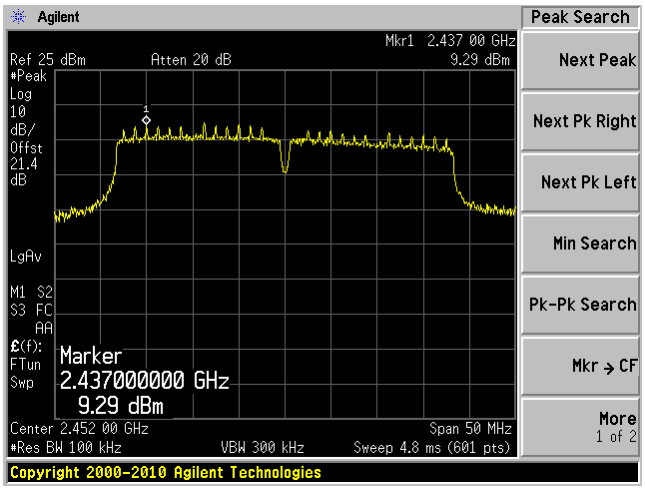
Middle channel J0: 2437 MHz



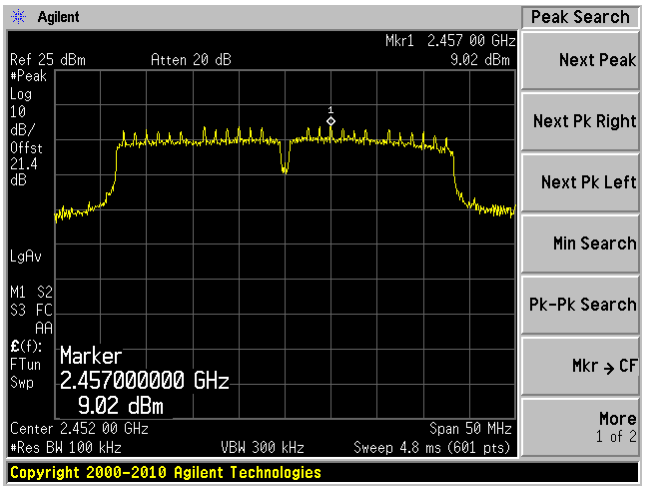
Middle channel J1: 2437 MHz



High channel J0: 2452 MHz



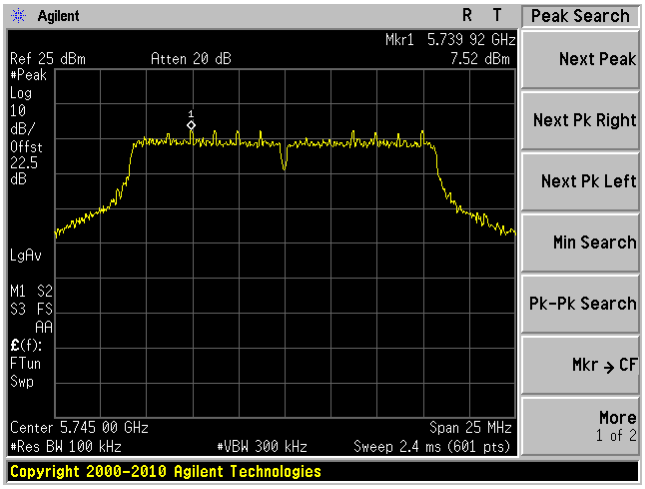
High channel J1: 2452 MHz



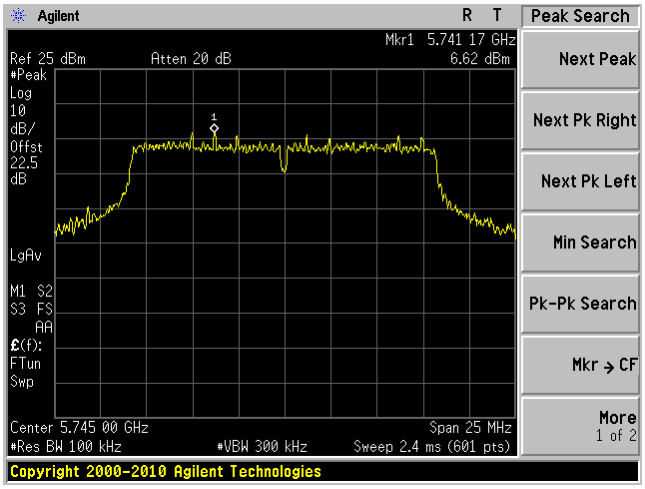
5.8 GHz Band

802.11 a mode

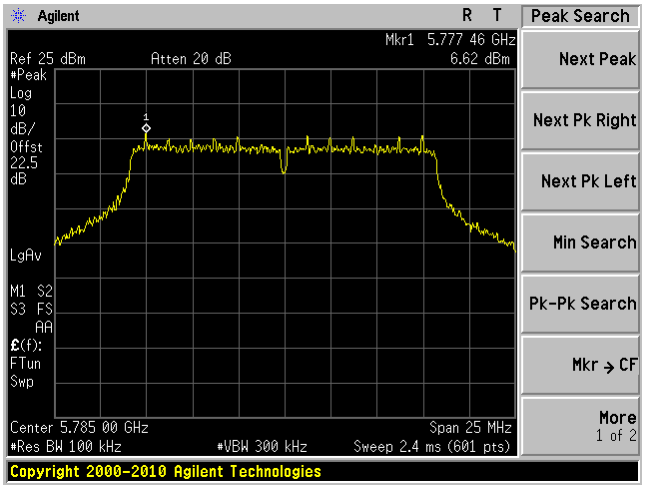
Low channel J0: 5745 MHz



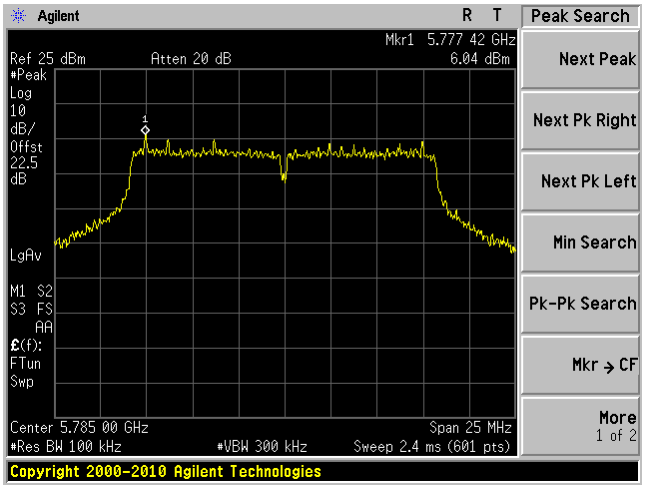
Low channel J1: 5745 MHz



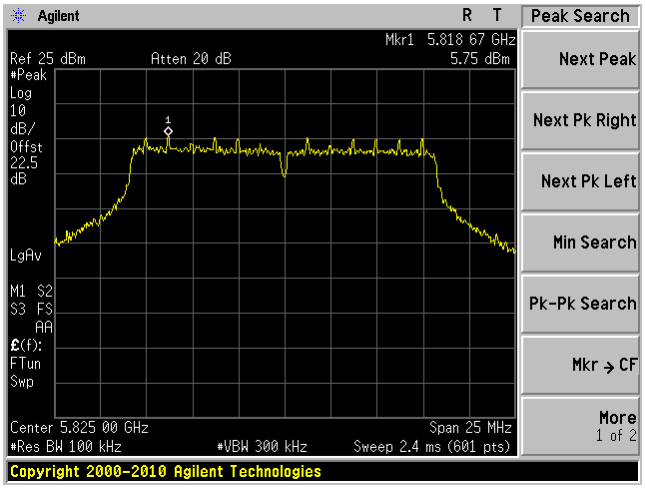
Middle channel J0: 5785 MHz



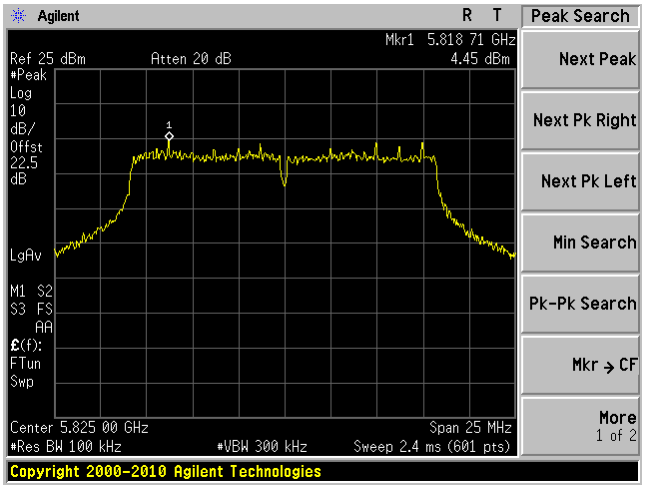
Middle channel J1: 5785 MHz



High channel J0: 5825 MHz

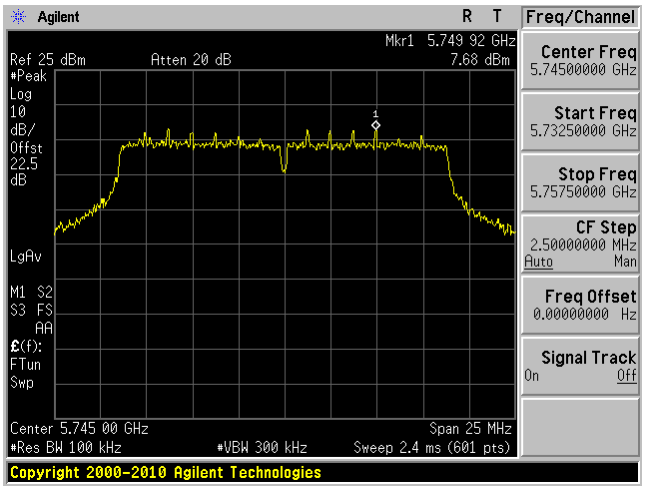


High channel J1: 5825 MHz

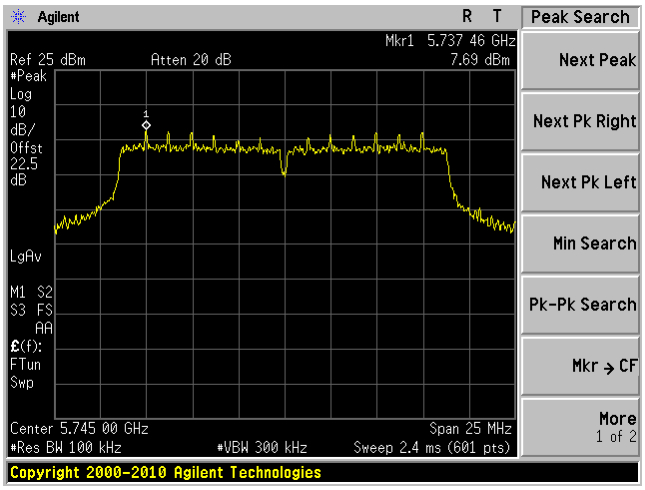


802.11n HT20 mode

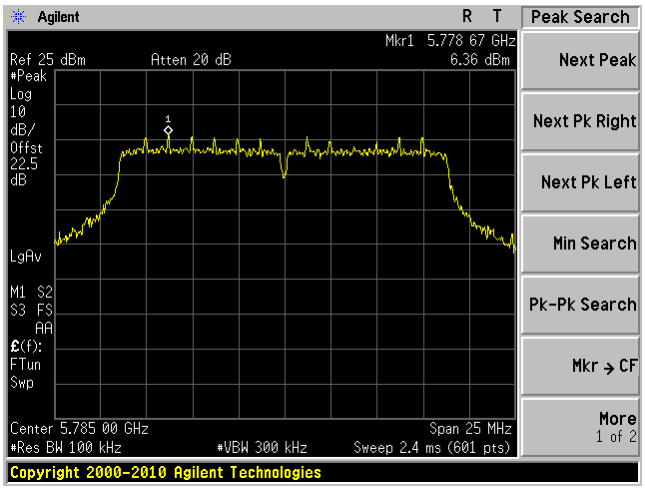
Low channel J0: 5745 MHz



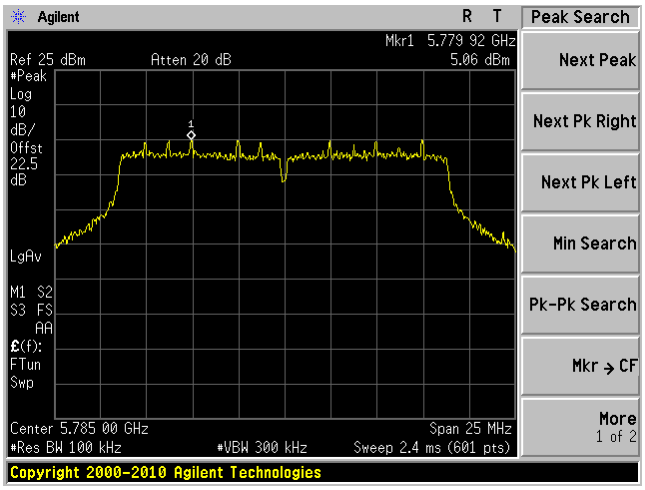
Low channel J1: 5745 MHz



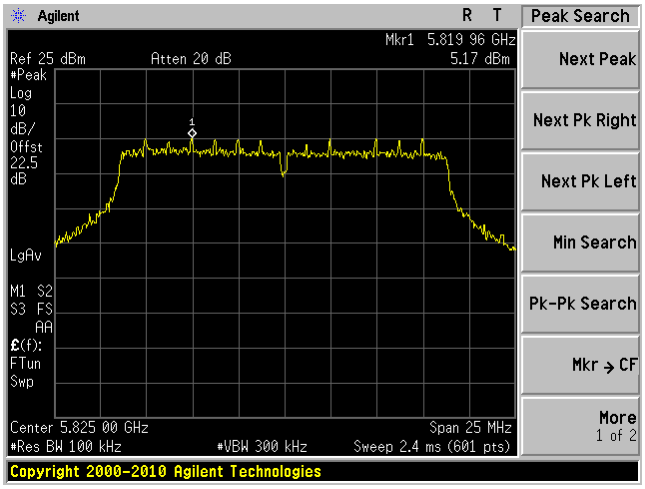
Middle channel J0: 5785 MHz



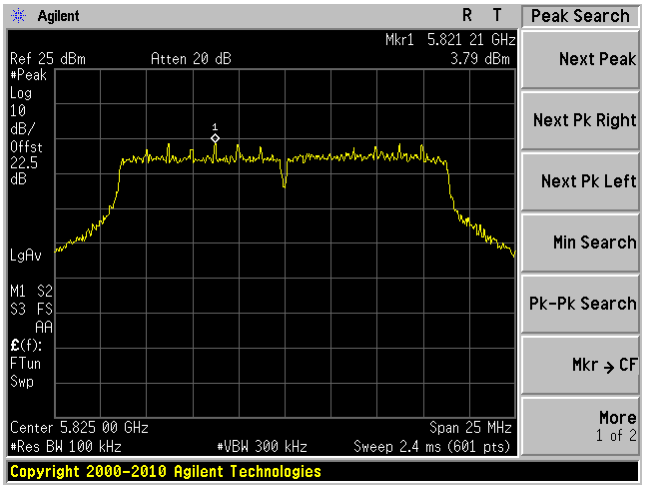
Middle channel J1: 5785 MHz



High channel J0: 5825 MHz

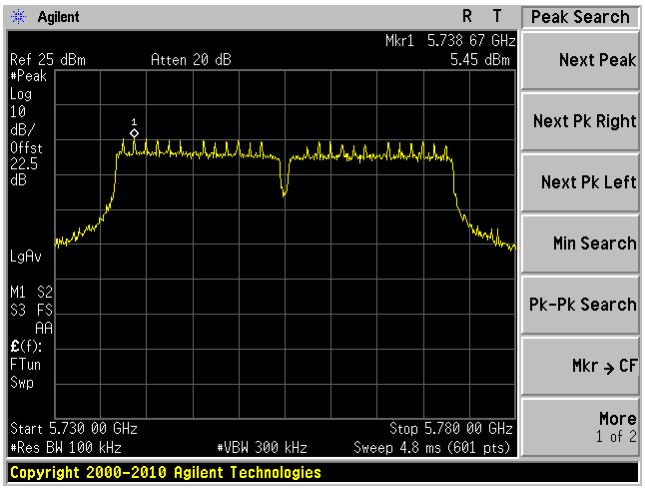


High channel J1: 5825 MHz

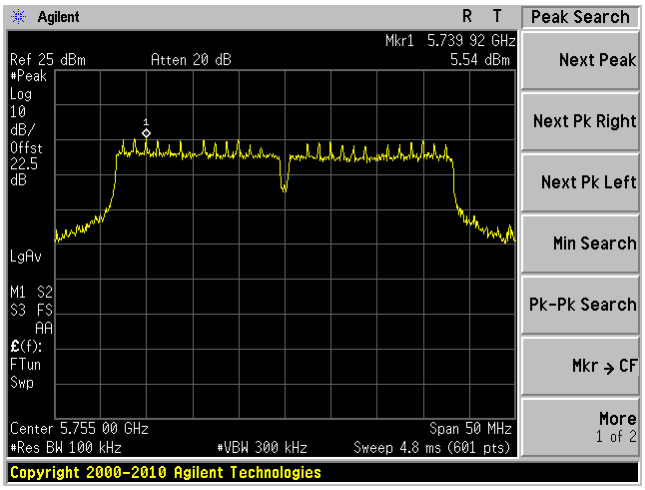


802.11n HT40 mode

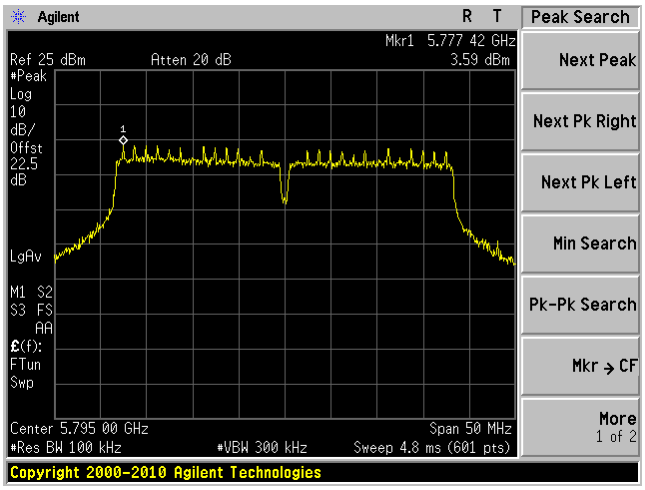
Low channel J0: 5755 MHz



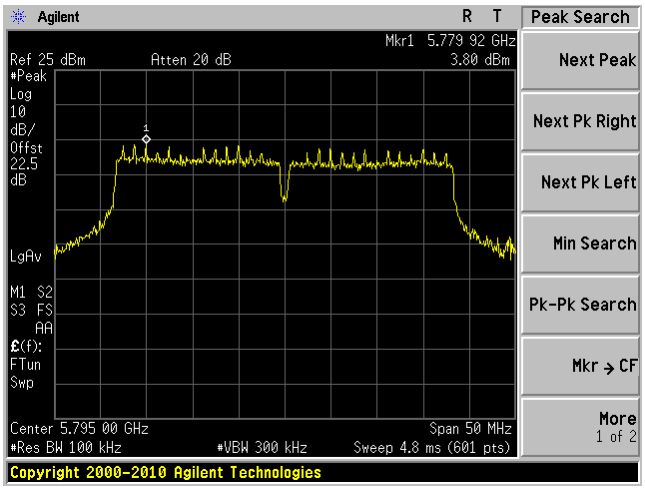
Low channel J1: 5755 MHz



High channel J0: 5795 MHz



High channel J1: 5795 MHz



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, Tables 2 show the general field strength limits of receiver spurious emissions

Table 2: Radiated Limits of Receiver Spurious Emissions

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

13.2 EUT Setup

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

13.3 Test Procedure

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

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

13.4 Corrected Amplitude & Margin Calculation

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

CA = Ai + AF + CL + Atten – Ga

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

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

Margin = Corrected Amplitude - Limit

13.5 Test Equipment Lists and Details

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

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

13.6 Test Environmental Conditions

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

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 RSS-210, with the closest margins from the limit listed below:

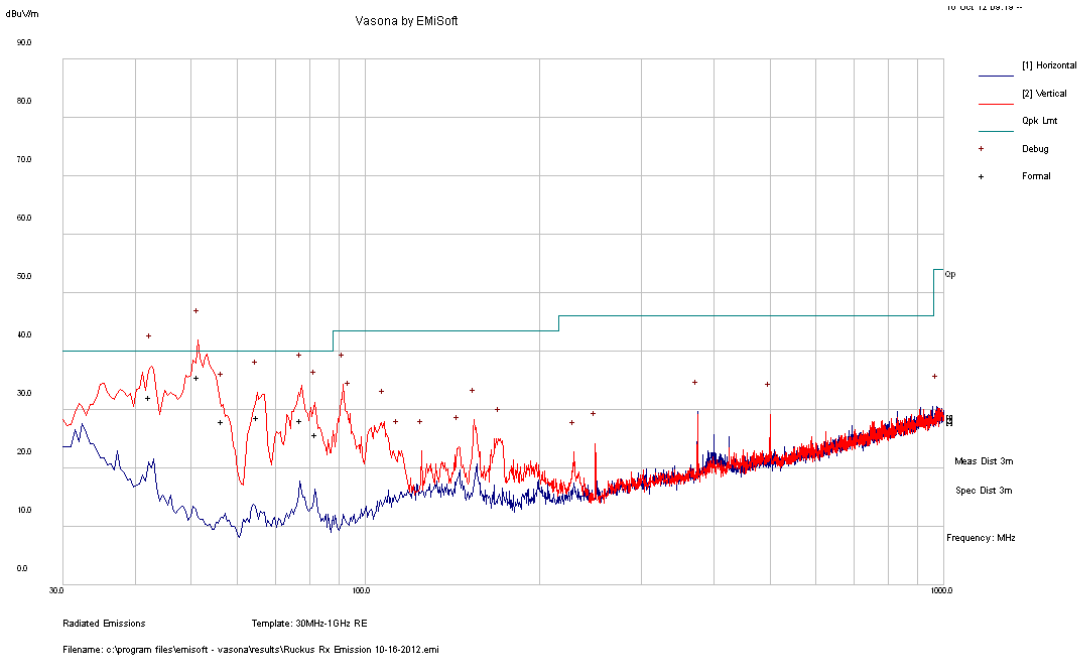
Mode: Receiving			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range (MHz)**
-4.44	51.42024	Vertical	30-18000

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

13.8 Test Results and Plots

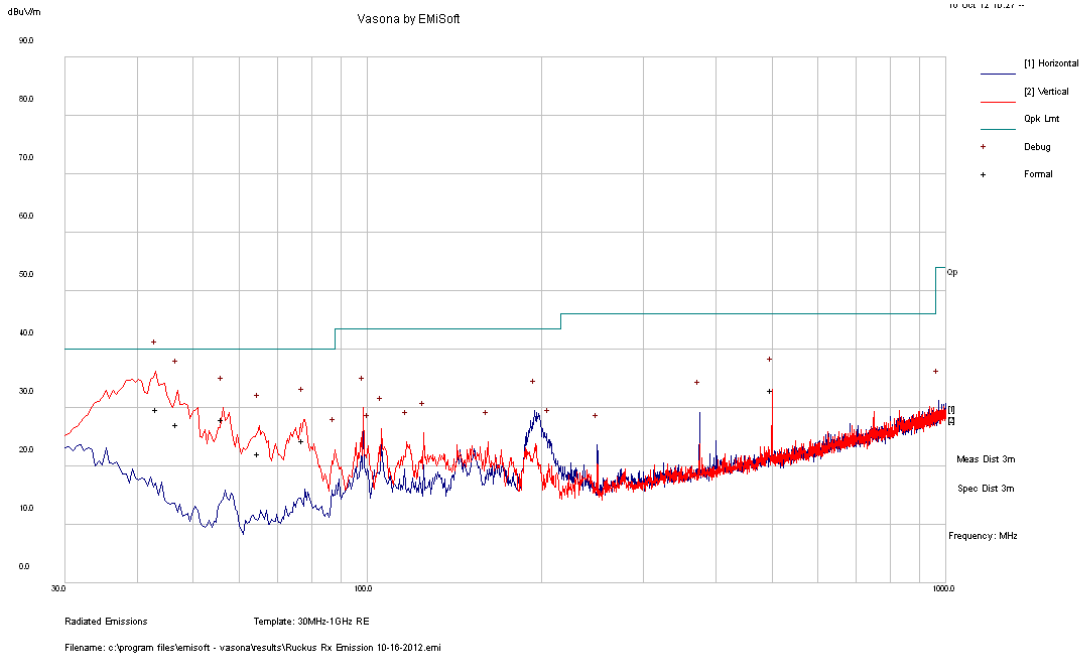
1) 30-1000 MHz, Measured at 3 meters

With AC/DC Adaptor



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector (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) Above 1 GHz Measured at 3 meters

With AC/DC Adaptor

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
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