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: S9GT504
IC: 5912A-T504

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

Prepared By: Rui Zhou

Report Number: R1409183-247 Rev A

Report Date: 2015-02-17

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1409183-247	Initial	2015-02-13
1	R1409183-247 Rev A	Revised Report	2015-02-17

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: T504. FCC ID: S9GT504, IC: 5912A- T504 or the "EUT" as referred to in this report. The EUT is an 802.11 a/b/g/n/ac modular..

1.2 Mechanical Description of EUT

The EUT measures approximately 160 mm (L) x 120 mm (W) x 8 mm (H) and weighs approximately 118 g.

The test data gathered are from typical production sample, serial number: 25140600007

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.

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

1.4 Related Submittal(s)/Grant(s)

N/A

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz and FCC KDB 558074 D01 DTS Meas Guidance v03r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

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.

The following calculation follows the procedures as set forth in clause 7.2.3, ETSI TR 100 028-1 V1.4.1 (2001-12), the expression of Uncertainty in Radiated RF Testing is in accordance to ISO/IEC 17025 and TR 100 028-1 V1.4.1 (2001-12).

The expanded Measurement Uncertainty value having a confidence factor of 95%, is within a range of 5.48 dB. This means that the value of conducted RF carrier power test will be within +/- 2.74 dB of the measuring radiated emissions power versus the expected value.
The expected value is defined as the power at the antenna of the Transmitter under Test.

1.7 Test Facility

Bay area compliance Laboratories Corp. (BACL) is:
1- An independent Commercial Test Laboratory accredited to **ISO 17025: 2005** by **A2LA**, in the fields of: Electromagnetic Compatibility & Telecommunications covering Emissions, Immunity, Radio, RF Exposure, Safety and Telecom. This includes NEBS (Network Equipment Building System), Wireless RF, Telecommunications Terminal Equipment (TTE); Network Equipment; Information Technology Equipment (ITE); Medical Electrical Equipment; Industrial, Commercial, and Medical Test Equipment; Professional Audio and Video Equipment; Electronic (Digital) Products; Industrial and Scientific Instruments; Cabled Distribution Systems and Energy Efficiency Lighting.

2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of Luminares and Computers.

3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC(Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI - Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.

4- A Product Certification Body accredited to **ISO Guide 65: 1996** by **A2LA** to certify:
1- Unlicensed, Licensed radio frequency devices and Telephone Terminal Equipment for the FCC. Scope A1, A2, A3, A4, B1, B2, B3, B4 & C.
2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.
3. Radio Communication Equipment for Singapore.
4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.
5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).
6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (Including GU24s),Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

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 C63.4-2009, 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 and FCC KDB 558074 D01 DTS Meas Guidance v03r02.

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 *T504 ART* was provided by Ruckus Wireless Inc., and was verified by *Rui Zhou* to comply with the standard requirements being tested against.

2.3 Special Equipment

N/A

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	CHZCMQ1

2.6 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
Ruckus	Main Board (SANTORINI)	ASM 120-11266-001 rev.3.1	RUK03828

2.7 Interface Ports and Cables

Cable Description	Length (m)	From	To
Ethernet Cable	1m	Laptop	EUT
RF Cable x2	<1m	EUT	PSA

2.8 Power Supply List and Details

Manufacturer	Description	Model	Part Number
Ruckus	AC Power Supply	MPBS-12020000	740-64129-011

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

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

4.1 Applicable Standards

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 field

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:

Maximum peak output power at antenna input terminal (dBm):	24.92
Maximum peak output power at antenna input terminal (mW):	310.46
Prediction distance (cm):	20
Prediction frequency (MHz):	2437
Maximum Antenna Gain, typical (dBi):	3
Maximum Antenna Gain (numeric):	1.995
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.123
Power density of prediction frequency at 20.0 cm (W/m^2):	1.23
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 GHz:

Maximum peak output power at antenna input terminal (dBm):	24.26
Maximum peak output power at antenna input terminal (mW):	266.7
Prediction distance (cm):	20
Prediction frequency (MHz):	5795
Maximum Antenna Gain, typical (dBi):	5
Maximum Antenna Gain (numeric):	3.162
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.1678
Power density of prediction frequency at 20.0 cm (W/m^2):	1.678
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

According to KDB 447498 D01 General RF Exposure Guidance v05r02, EUT has two 2.4 GHz band antenna and two 5 GHz band antenna. The power density for 5 GHz band is 0.1678 (refer to T504 5 GHz band report R1409183-407). So the sum of MPE ratio for four antennas is: 0.123 + 0.1678 = 0.2908 W/m^2, which is smaller than 1.0. So the colocation exposure exclusion applies.

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

5.1 Applicable Standards

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.

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.
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 than the level reported.

5.2 Antenna Description

The device has 2.4/5 GHz antennas. The Antenna gain is 3 dBi at 2.4 GHz and 5 dBi at 5 GHz. Please refer to the 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 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.

As per IC RSS-Gen §7.2.4 Conducted limits:

Except when the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply, either directly or indirectly (such as with abattery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table below. The more stringent limit applies at the frequency range boundaries. The conducted emissions shall be measured with a 50 ohm/50 microhenry line impedance stabilization network (LISN).

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, IC RSS-Gen limits.

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

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

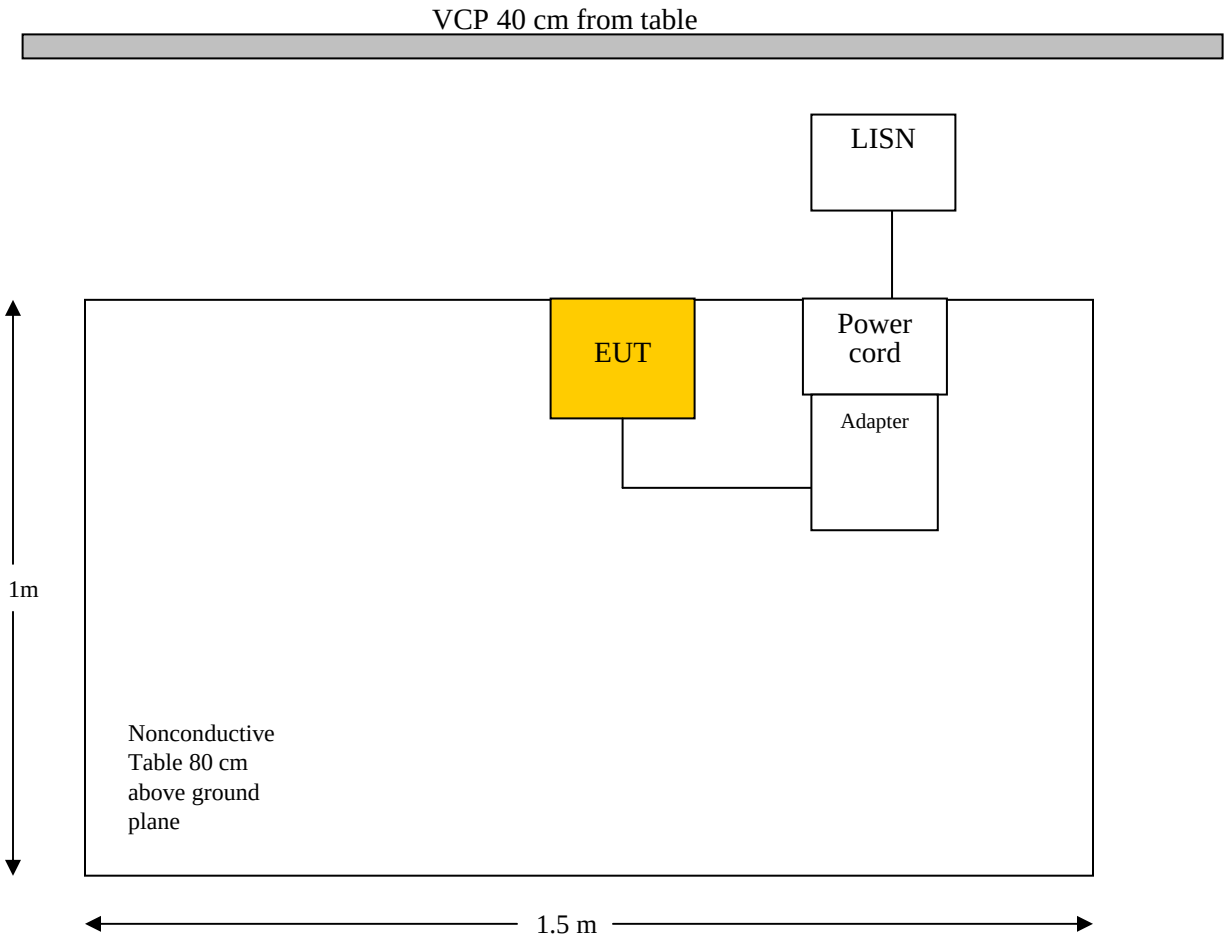
6.3 Test Procedure

Maximizing procedure was performed on the 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:



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	100337	2014-03-28	1 year
Solar Electronics	LISN	9252-50-R-24-N	511213	2014-07-14	1 year

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

6.7 Test Environmental Conditions

Temperature:	22-24 ºC
Relative Humidity:	40-41 %
ATM Pressure:	103.1-104.1 kPa

The testing was performed by Rui Zhou on 2014-10-15 in 5 m chamber 3.

6.8 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC 15C and IC RSS-210 standard's conducted emissions limits, with the margin reading of:

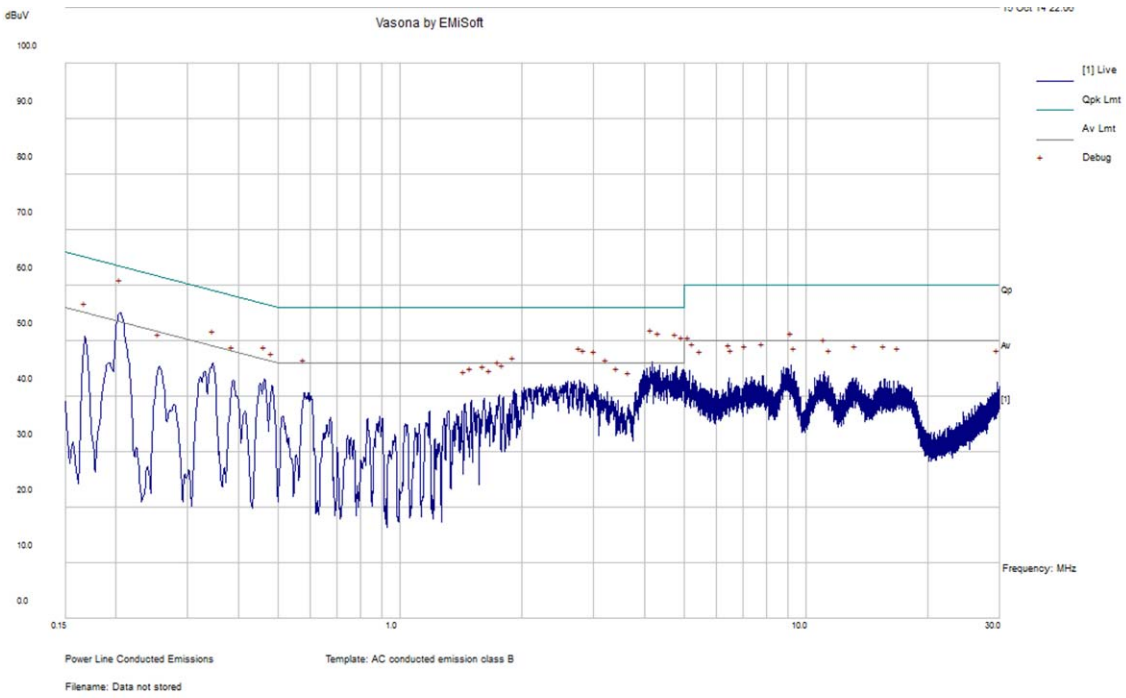
Note: The EUT is transmitting at worst case: 2.4 GHz and 5 GHz simultaneously.

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-11.84	0.194769	Line	0.15-30

6.9 Conducted Emissions Test Plots and Data

Note: The EUT is transmitting at worst case: 2.4 GHz and 5 GHz simultaneously.

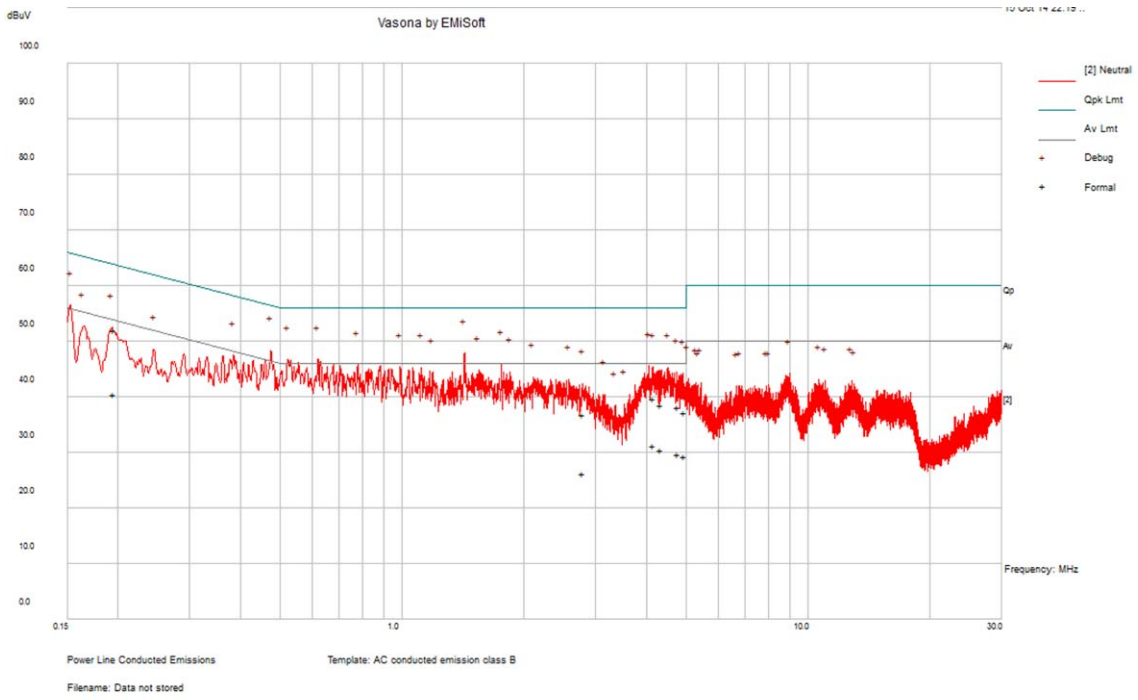
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.194769	51.99	Line	63.83	-11.84	QP
4.170098	39.75	Line	56	-16.25	QP
4.34813	38.59	Line	56	-17.41	QP
4.786835	38.25	Line	56	-17.75	QP
4.972067	37.28	Line	56	-18.72	QP
2.782478	36.82	Line	56	-19.18	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.194769	40.56	Line	53.83	-13.27	Ave.
4.170098	31.27	Line	46	-14.73	Ave.
4.34813	30.44	Line	46	-15.56	Ave.
4.786835	29.84	Line	46	-16.16	Ave.
4.972067	29.32	Line	46	-16.68	Ave.
2.782478	26.22	Line	46	-19.78	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.469209	34.95	Neutral	56.53	-21.57	QP
1.415133	35.01	Neutral	56	-20.99	QP
0.637149	25.41	Neutral	56	-30.59	QP
0.518499	27.96	Neutral	56	-28.04	QP
0.152601	43.04	Neutral	65.86	-22.81	QP
1.752492	35.42	Neutral	56	-20.58	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.469209	23.65	Neutral	46.53	-22.87	Ave.
1.415133	22.71	Neutral	46	-23.29	Ave.
0.637149	10.16	Neutral	46	-35.84	Ave.
0.518499	16.15	Neutral	46	-29.85	Ave.
0.152601	17.99	Neutral	55.86	-37.87	Ave.
1.752492	22.74	Neutral	46	-23.26	Ave.

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

7.1 Applicable Standards

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 30 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 measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 11: Emissions in non-restricted frequency bands and section 12: Emissions in restricted frequency bands.

7.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2013-10-16	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:	101-102 kPa

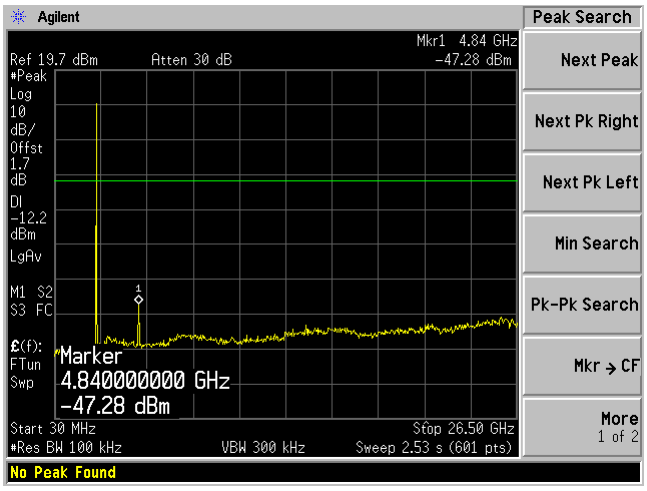
The testing was performed by Rui Zhou from 2014-10-06 to2014-10-15 at RF site.

7.5 Test Results

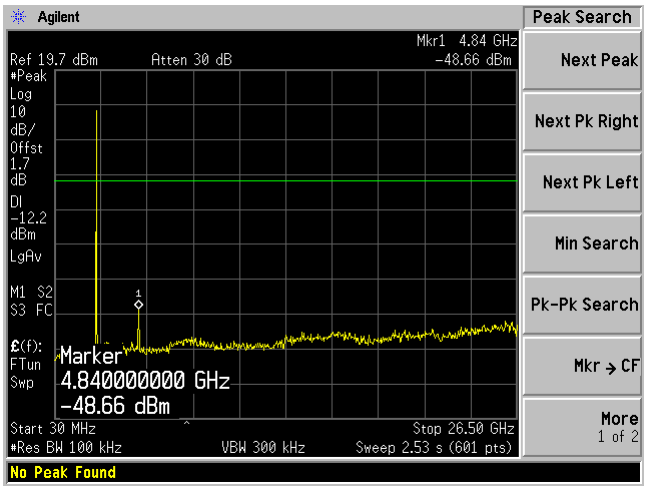
Please refer to following plots of spurious emissions.

802.11b, Low Channel, 2412 MHz

WIFI 0: 30MHz- 26GHz

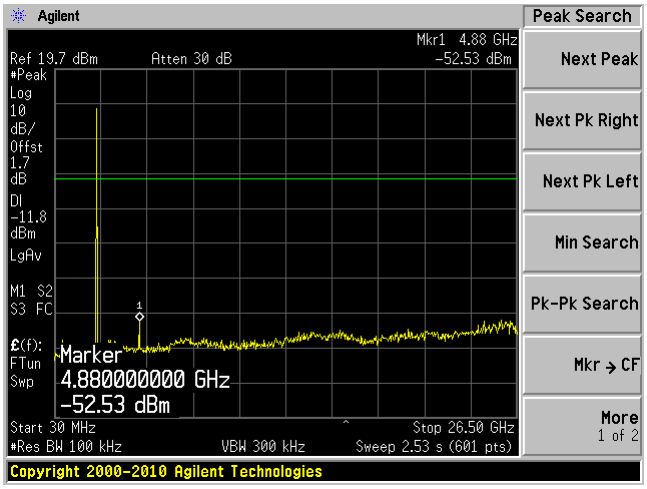


WIFI 1: 30MHz – 26 GHz

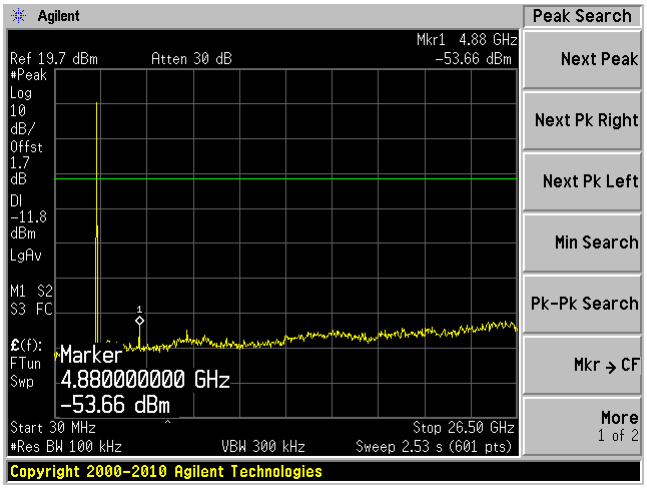


802.11b, Middle Channel, 2437 MHz

WIFI 0: 30MHz- 26GHz

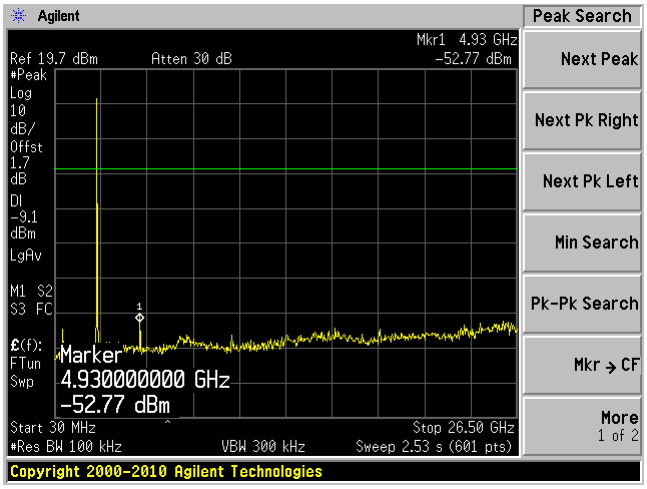


WIFI 1: 30MHz – 26 GHz

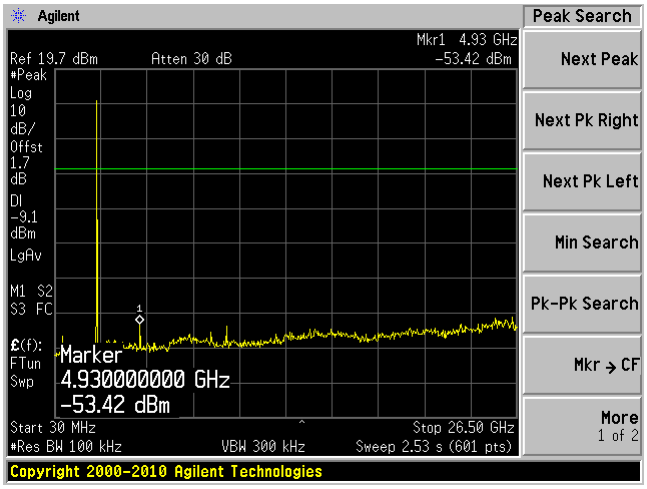


802.11b, High Channel, 2462 MHz

WIFI 0: 30MHz- 26GHz

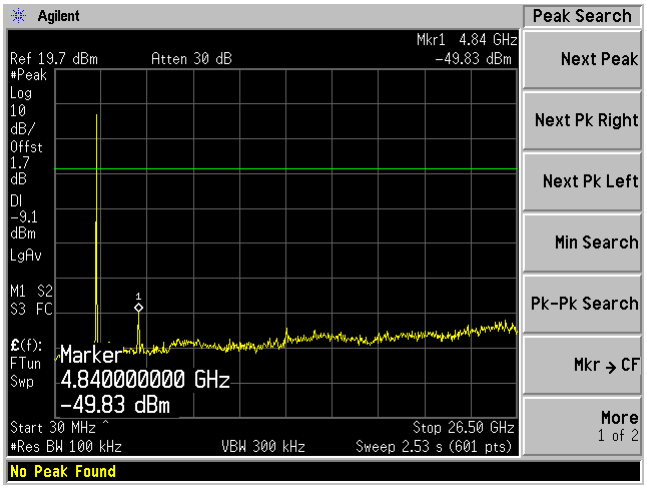


WIFI 1: 30MHz – 26 GHz

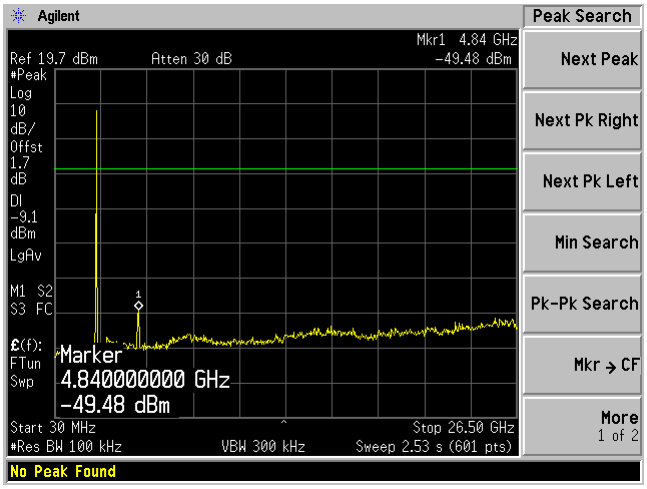


802.11g, Low Channel 2412 MHz

WIFI 0: 30MHz- 26GHz

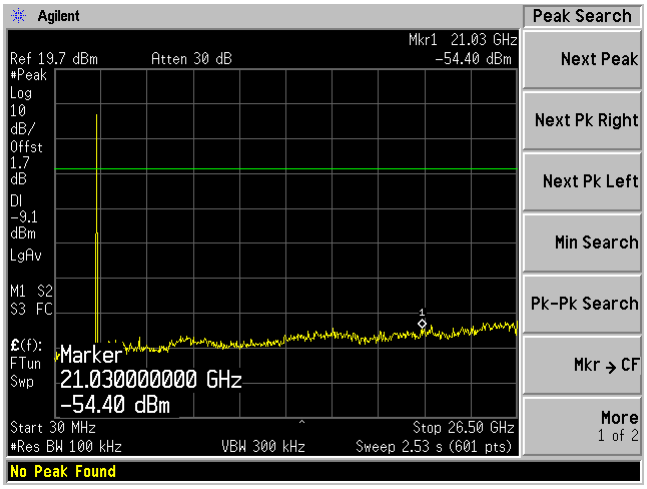


WIFI 1: 30MHz – 26 GHz

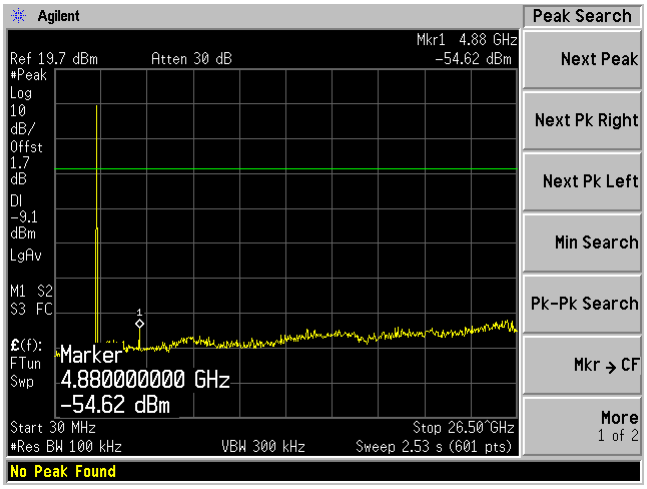


802.11g, Middle Channel 2437 MHz

WIFI 0: 30MHz- 26GHz

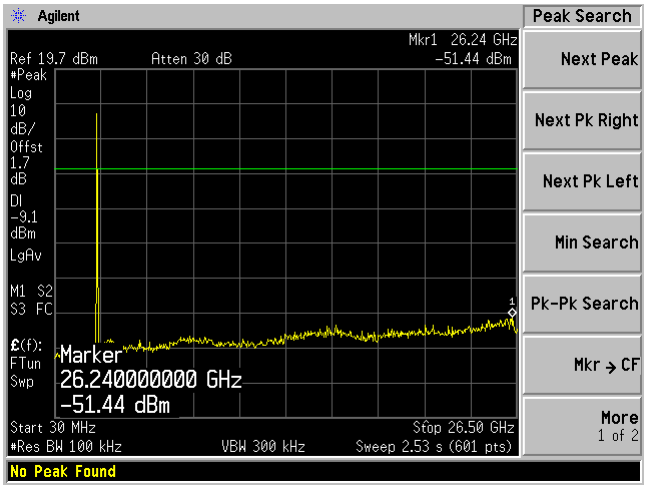


WIFI 1: 30MHz – 26 GHz

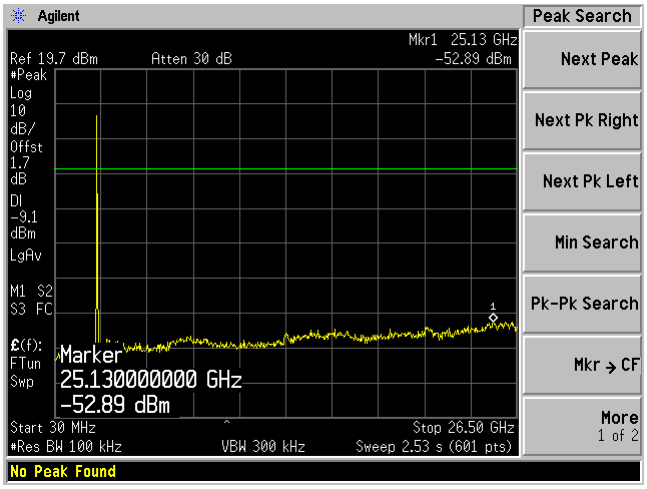


802.11g, High Channel 2462 MHz

WIFI 0: 30MHz- 26GHz

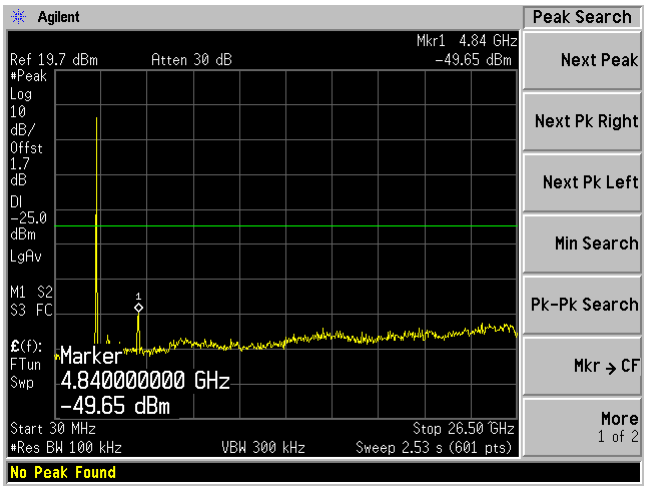


WIFI 1: 30MHz – 26 GHz

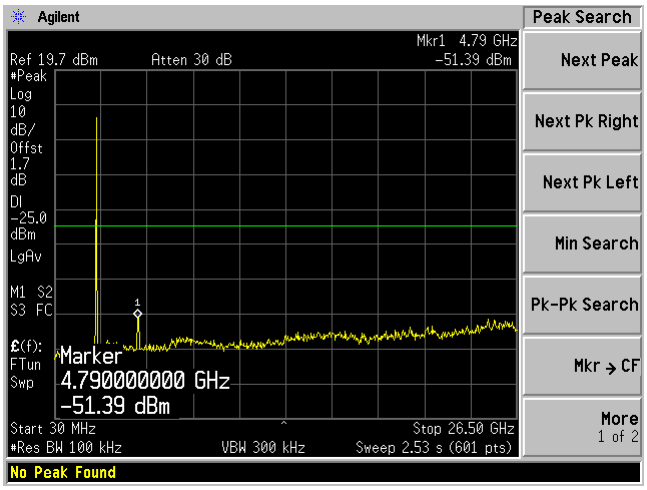


802.11n-HT20, Low Channel 2412 MHz

WIFI 0: 30MHz- 26GHz

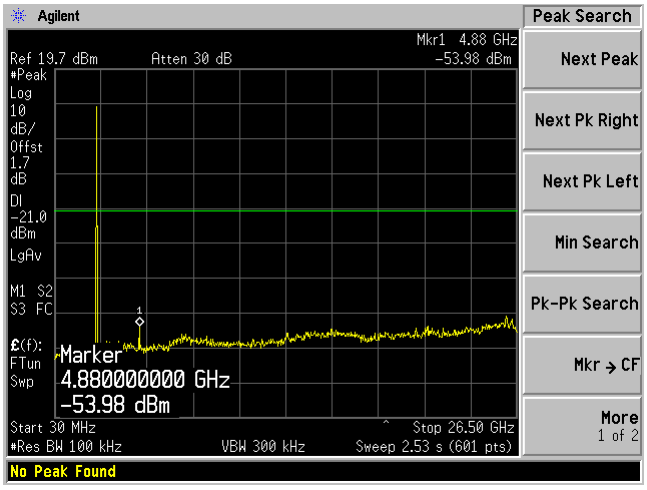


WIFI 1: 30MHz – 26 GHz

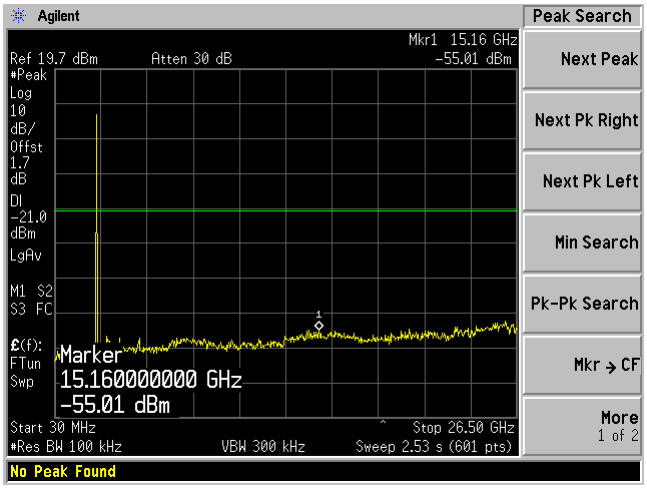


802.11n-HT20, Middle Channel 2437 MHz

WIFI 0: 30MHz- 26GHz

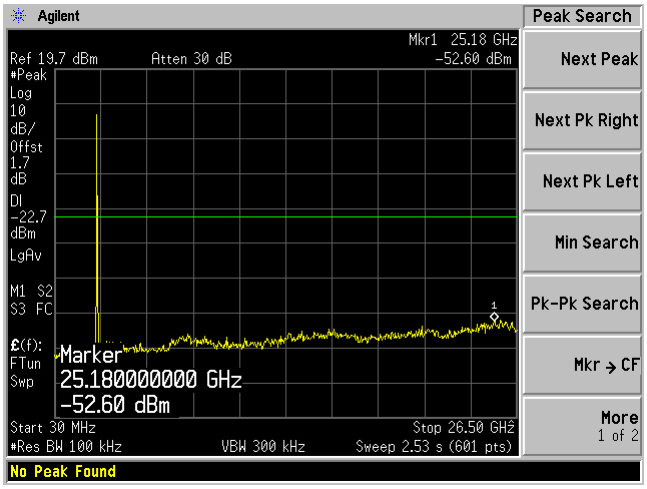


WIFI 1: 30MHz – 26 GHz

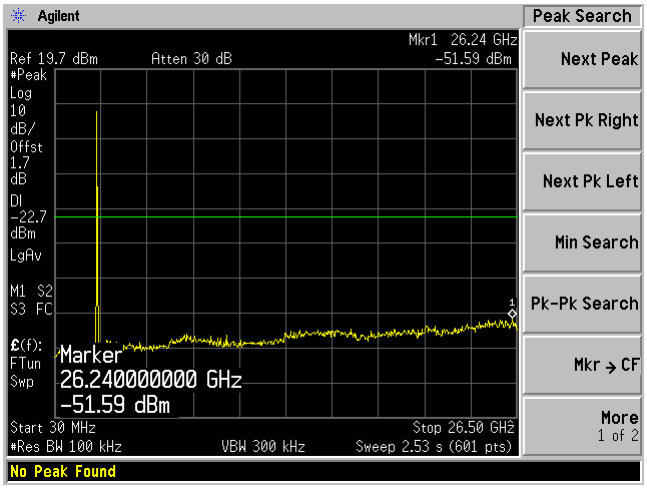


802.11n-HT20, High Channel 2462 MHz

WIFI 0: 30MHz- 26GHz

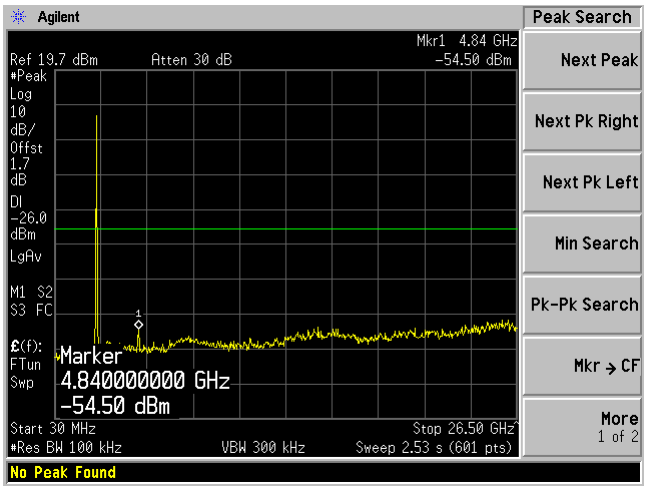


WIFI 1: 30MHz – 26 GHz

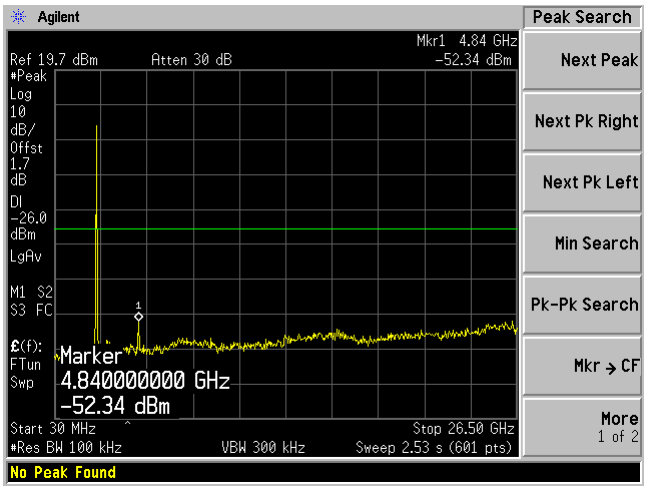


802.11n-HT40, Low Channel 2422 MHz

WIFI 0: 30MHz- 26GHz

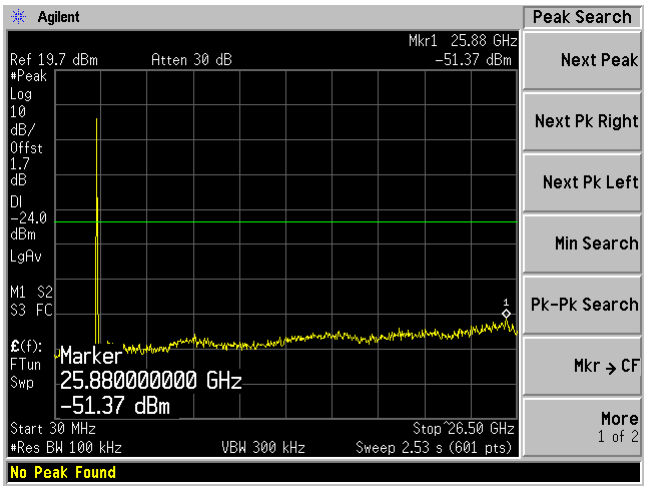


WIFI 1: 30MHz – 26 GHz

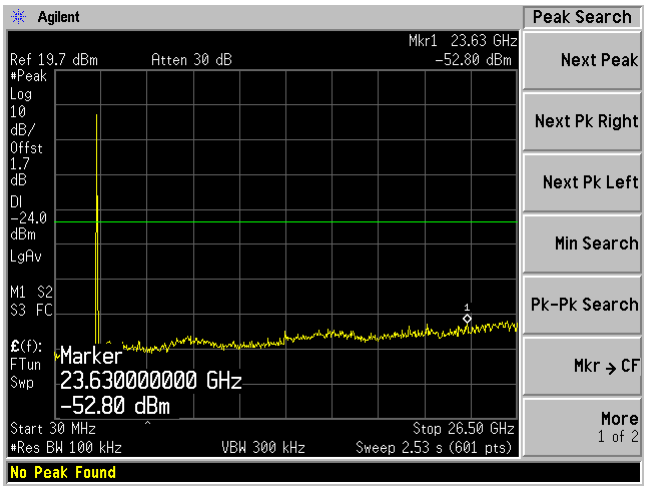


802.11n-HT40, Middle Channel 2437 MHz

WIFI 0: 30MHz- 26GHz

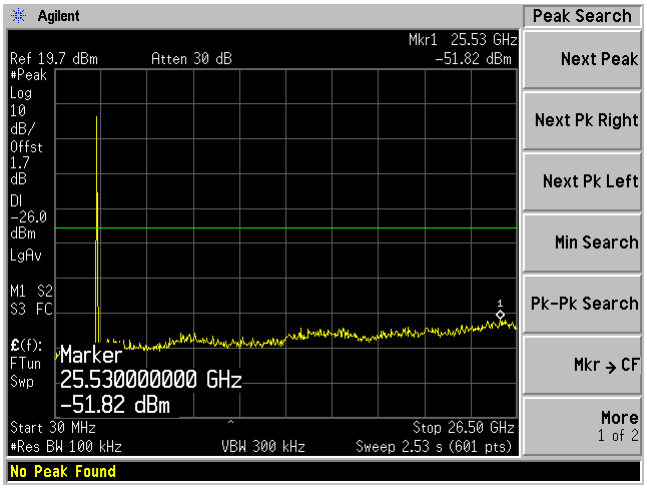


WIFI 1: 30MHz – 26 GHz

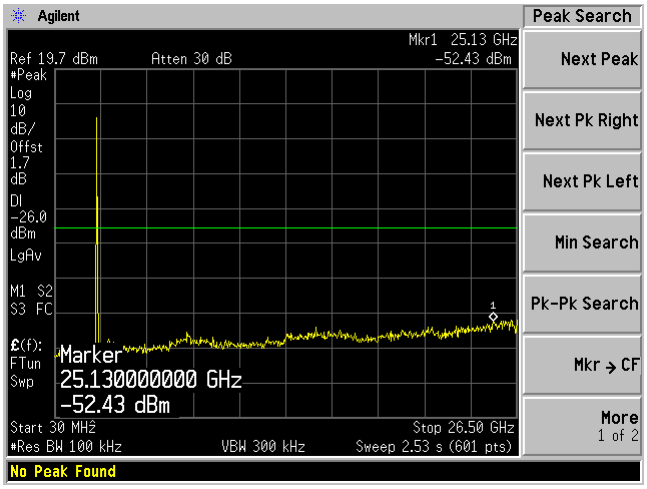


802.11n-HT40, High Channel 2452 MHz

WIFI 0: 30MHz- 26GHz



WIFI 1: 30MHz – 26 GHz



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

8.1 Applicable Standards

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 10 centimeters.

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

8.3 Test Procedure

The measurements are base on FCC KDB 558074 D01 DTS Meas Guidance v03r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 11: Emissions in non-restricted frequency bands and section 12: Emissions in restricted frequency bands. As well as ANSI C63.4: 2009 as described below:

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	A020106-3	2014-07-24	1 year
Hewlett Packard	Pre-amplifier 1-26.5 GHz	8447D	2944A06639	2014-04-26	1 year
Agilent	Spectrum Analyzer	E4440A	MY44303352	2013-11-07	1 year
EMCO	Horn Antenna	3315	9511-4627	2013-10-17	1 year
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2013-10-28	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:	22 º C
Relative Humidity:	52 %
ATM Pressure:	101.9 kPa

The testing was performed by Rui Zhou on 2014-10-15 in 5 m chamber 3.

8.7 Summary of Test Results

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

30-1000 MHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-3.44	31.693	Vertical	2.4 GHz and 5 GHz Simultaneously transmit

Above 1 GHz:

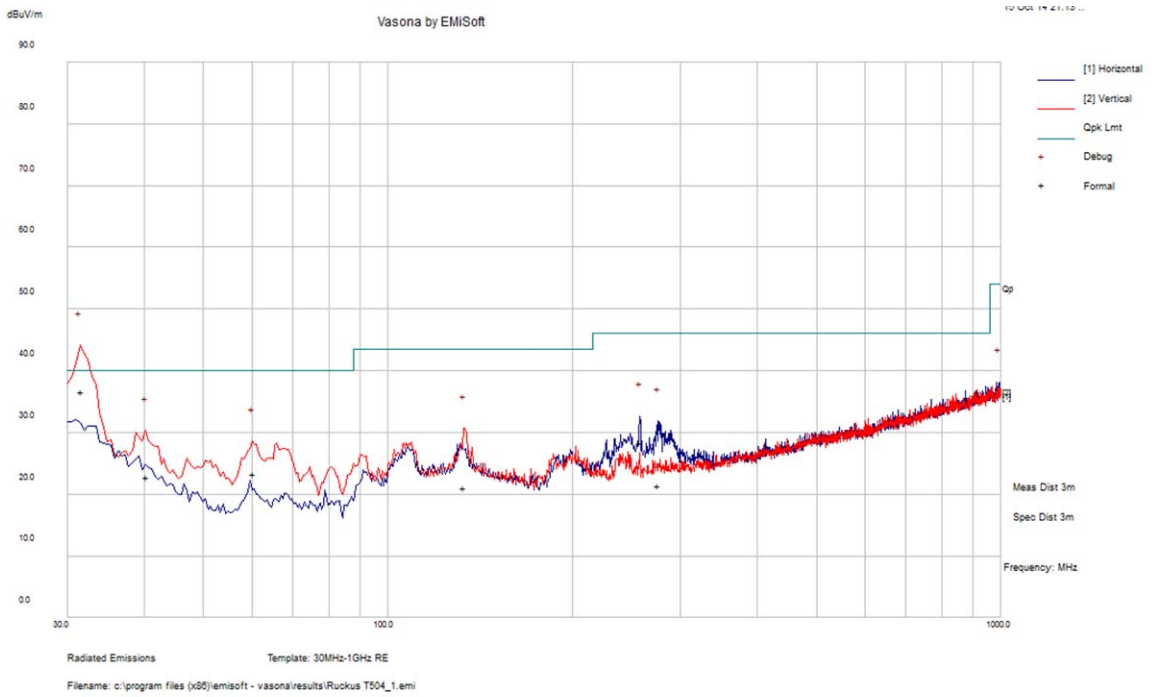
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-13.81	9848	Vertical	802.11 g mode High Channel

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

8.8 Radiated Emissions Test Results

1) 30 MHz – 1 GHz

Note: The EUT is 2.4 GHz and 5 GHz Simultaneous transmitting.



Worse-Case:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment (PK/QP/Ave.)
31.693	36.56	124	V	266	40	-3.44	QP
40.366	22.78	106	V	255	40	-17.22	QP
60.27425	23.31	108	V	112	40	-16.69	QP
133.0018	21.04	118	V	328	43.5	-22.46	QP
257.4115	28.29	129	H	139	46	-17.71	QP
275.671	21.42	148	H	140	46	-24.58	QP

2) Above 1 GHz, Measured at 3 meters

802.11b mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz, measured at 3 meters											
4824	46.44	0	100	V	33.1	4.08	38.8	44.82	74	-29.18	Peak
4824	46.65	0	100	H	33.1	4.08	38.8	45.03	74	-28.97	Peak
4824	34.11	0	100	V	33.1	4.08	38.8	32.49	54	-21.51	Ave
4824	34.09	0	100	H	33.1	4.08	38.8	32.47	54	-21.53	Ave
7236	47.32	0	100	V	37.3	3.93	38.9	49.65	74	-24.35	Peak
7236	46.31	0	100	H	37.3	3.93	38.9	48.64	74	-25.36	Peak
7236	34.23	0	100	V	37.3	3.93	38.9	36.56	54	-17.44	Ave
7236	34.24	0	100	H	37.3	3.93	38.9	36.57	54	-17.43	Ave
9648	46.94	0	100	V	38.9	5.72	40	51.56	74	-22.44	Peak
9648	47.32	0	100	H	38.9	5.72	40	51.94	74	-22.06	Peak
9648	35.01	0	100	V	38.9	5.72	40	39.63	54	-14.37	Ave
9648	34.35	0	100	H	38.9	5.72	40	38.97	54	-15.03	Ave
Middle Channel 2437 MHz, measured at 3 meters											
4874	47.15	0	100	V	33.1	4.07	38.7	45.62	74	-28.38	Peak
4874	47.52	0	100	H	33.1	4.07	38.7	45.99	74	-28.01	Peak
4874	35.02	0	100	V	33.1	4.07	38.7	33.49	54	-20.51	Ave
4874	34.28	0	100	H	33.1	4.07	38.7	32.75	54	-21.25	Ave
7311	47.54	0	100	V	37.3	3.94	39.03	49.75	74	-24.25	Peak
7311	46.75	0	100	H	37.3	3.94	39.03	48.96	74	-25.04	Peak
7311	33.67	0	100	V	37.3	3.94	39.03	35.88	54	-18.12	Ave
7311	33.67	0	100	H	37.3	3.94	39.03	35.88	54	-18.12	Ave
9748	46.92	0	100	V	38.9	5.78	40.21	51.39	74	-22.61	Peak
9748	47.29	0	100	H	38.9	5.78	40.21	51.76	74	-22.24	Peak
9748	34.14	0	100	V	38.9	5.78	40.21	38.61	54	-15.39	Ave
9748	33.74	0	100	H	38.9	5.78	40.21	38.21	54	-15.79	Ave
High Channel 2462 MHz, measured at 3 meters											
4924	45.53	0	100	V	33.1	4.09	38.6	44.12	74	-29.88	Peak
4924	45.70	0	100	H	33.1	4.09	38.6	44.29	74	-29.71	Peak
4924	33.38	0	100	V	33.1	4.09	38.6	31.97	54	-22.03	Ave
4924	33.93	0	100	H	33.1	4.09	38.6	32.52	54	-21.48	Ave
7386	46.40	0	100	V	37.3	5.17	39.1	49.77	74	-24.23	Peak
7386	45.71	0	100	H	37.3	3.93	39.1	47.84	74	-26.16	Peak
7386	34.74	0	100	V	37.3	3.93	39.1	36.87	54	-17.13	Ave
7386	34.74	0	100	H	37.3	3.93	39.1	36.87	54	-17.13	Ave
9848	47.88	0	100	V	38.9	5.78	39.9	52.66	74	-21.34	Peak
9848	47.70	0	100	H	38.9	5.78	39.9	52.48	74	-21.52	Peak
9848	35.07	0	100	V	38.9	5.78	39.9	39.85	54	-14.15	Ave
9848	34.69	0	100	H	38.9	5.78	39.9	39.47	54	-14.53	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											
4824	46.61	0	100	V	33.1	4.08	38.8	44.99	74	-29.01	Peak
4824	47.16	0	100	H	33.1	4.08	38.8	45.54	74	-28.46	Peak
4824	34.89	0	100	V	33.1	4.08	38.8	33.27	54	-20.73	Ave
4824	34.91	0	100	H	33.1	4.08	38.8	33.29	54	-20.71	Ave
7236	48.13	0	100	V	37.3	3.93	38.9	50.46	74	-23.54	Peak
7236	46.34	0	100	H	37.3	3.93	38.9	48.67	74	-25.33	Peak
7236	34.99	0	100	V	37.3	3.93	38.9	37.32	54	-16.68	Ave
7236	33.28	0	100	H	37.3	3.93	38.9	35.61	54	-18.39	Ave
9648	46.40	0	100	V	38.9	5.72	40	51.02	74	-22.98	Peak
9648	46.33	0	100	H	38.9	5.72	40	50.95	74	-23.05	Peak
9648	34.89	0	100	V	38.9	5.72	40	39.51	54	-14.49	Ave
9648	33.38	0	100	H	38.9	5.72	40	38.00	54	-16.00	Ave
Middle Channel 2437 MHz, measured at 3 meters											
4874	46.86	0	100	V	33.1	4.07	38.7	45.33	74	-28.67	Peak
4874	47.45	0	100	H	33.1	4.07	38.7	45.92	74	-28.08	Peak
4874	34.78	0	100	V	33.1	4.07	38.7	33.25	54	-20.75	Ave
4874	34.59	0	100	H	33.1	4.07	38.7	33.06	54	-20.94	Ave
7311	47.78	0	100	V	37.3	3.94	39.03	49.99	74	-24.01	Peak
7311	46.63	0	100	H	37.3	3.94	39.03	48.84	74	-25.16	Peak
7311	33.69	0	100	V	37.3	3.94	39.03	35.90	54	-18.10	Ave
7311	34.07	0	100	H	37.3	3.94	39.03	36.28	54	-17.72	Ave
9748	46.84	0	100	V	38.9	5.78	40.21	51.31	74	-22.69	Peak
9748	47.29	0	100	H	38.9	5.78	40.21	51.76	74	-22.24	Peak
9748	34.69	0	100	V	38.9	5.78	40.21	39.16	54	-14.84	Ave
9748	34.17	0	100	H	38.9	5.78	40.21	38.64	54	-15.36	Ave
High Channel 2462 MHz, measured at 3 meters											
4924	45.63	0	100	V	33.1	4.09	38.6	44.22	74	-29.78	Peak
4924	45.76	0	100	H	33.1	4.09	38.6	44.35	74	-29.65	Peak
4924	33.39	0	100	V	33.1	4.09	38.6	31.98	54	-22.02	Ave
4924	33.26	0	100	H	33.1	4.09	38.6	31.85	54	-22.15	Ave
7386	47.05	0	100	V	37.3	5.17	39.1	50.42	74	-23.58	Peak
7386	46.29	0	100	H	37.3	3.93	39.1	48.42	74	-25.58	Peak
7386	33.52	0	100	V	37.3	3.93	39.1	35.65	54	-18.35	Ave
7386	34.28	0	100	H	37.3	3.93	39.1	36.41	54	-17.59	Ave
9848	46.94	0	100	V	38.9	5.78	39.9	51.72	74	-22.28	Peak
9848	48.03	0	100	H	38.9	5.78	39.9	52.81	74	-21.19	Peak
9848	35.41	0	100	V	38.9	5.78	39.9	40.19	54	-13.81	Ave
9848	35.19	0	100	H	38.9	5.78	39.9	39.97	54	-14.03	Ave

802.11n-HT20 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											
4824	46.86	0	100	V	33.1	4.08	38.8	45.24	74	-28.76	Peak
4824	47.24	0	100	H	33.1	4.08	38.8	45.62	74	-28.38	Peak
4824	34.82	0	100	V	33.1	4.08	38.8	33.20	54	-20.80	Ave
4824	34.76	0	100	H	33.1	4.08	38.8	33.14	54	-20.86	Ave
7236	47.53	0	100	V	37.3	3.93	38.9	49.86	74	-24.14	Peak
7236	46.93	0	100	H	37.3	3.93	38.9	49.26	74	-24.74	Peak
7236	34.67	0	100	V	37.3	3.93	38.9	37.00	54	-17.00	Ave
7236	34.83	0	100	H	37.3	3.93	38.9	37.16	54	-16.84	Ave
9648	45.95	0	100	V	38.9	5.72	40	50.57	74	-23.43	Peak
9648	46.73	0	100	H	38.9	5.72	40	51.35	74	-22.65	Peak
9648	34.40	0	100	V	38.9	5.72	40	39.02	54	-14.98	Ave
9648	33.40	0	100	H	38.9	5.72	40	38.02	54	-15.98	Ave
Middle Channel 2437 MHz, measured at 3 meters											
4874	47.05	0	100	V	33.1	4.08	38.7	45.53	74	-28.47	Peak
4874	47.63	0	100	H	33.1	4.08	38.7	46.11	74	-27.89	Peak
4874	34.57	0	100	V	33.1	4.08	38.7	33.05	54	-20.95	Ave
4874	35.04	0	100	H	33.1	4.08	38.7	33.52	54	-20.48	Ave
7311	47.86	0	100	V	37.3	3.93	39.03	50.06	74	-23.94	Peak
7311	47.10	0	100	H	37.3	3.93	39.03	49.30	74	-24.70	Peak
7311	33.90	0	100	V	37.3	3.93	39.03	36.10	54	-17.90	Ave
7311	33.93	0	100	H	37.3	3.93	39.03	36.13	54	-17.87	Ave
9748	46.34	0	100	V	38.9	5.72	40.21	50.75	74	-23.25	Peak
9748	46.60	0	100	H	38.9	5.72	40.21	51.01	74	-22.99	Peak
9748	34.61	0	100	V	38.9	5.72	40.21	39.02	54	-14.98	Ave
9748	33.55	0	100	H	38.9	5.72	40.21	37.96	54	-16.04	Ave
High Channel 2462 MHz, measured at 3 meters											
4924	47.43	0	100	V	33.1	4.08	38.6	46.01	74	-27.99	Peak
4924	47.17	0	100	H	33.1	4.08	38.6	45.75	74	-28.25	Peak
4924	34.22	0	100	V	33.1	4.08	38.6	32.80	54	-21.20	Ave
4924	34.22	0	100	H	33.1	4.08	38.6	32.80	54	-21.20	Ave
7386	47.65	0	100	V	37.3	3.93	39.1	49.78	74	-24.22	Peak
7386	47.25	0	100	H	37.3	3.93	39.1	49.38	74	-24.62	Peak
7386	33.77	0	100	V	37.3	3.93	39.1	35.90	54	-18.10	Ave
7386	33.52	0	100	H	37.3	3.93	39.1	35.65	54	-18.35	Ave
9848	46.93	0	100	V	38.9	5.72	39.9	51.65	74	-22.35	Peak
9848	47.19	0	100	H	38.9	5.72	39.9	51.91	74	-22.09	Peak
9848	34.90	0	100	V	38.9	5.72	39.9	39.62	54	-14.38	Ave
9848	34.21	0	100	H	38.9	5.72	39.9	38.93	54	-15.07	Ave

802.11n-HT40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz, measured at 3 meters											
4844	46.86	0	100	V	33.1	4.08	38.8	45.24	74	-28.76	Peak
4844	47.24	0	100	H	33.1	4.08	38.8	45.62	74	-28.38	Peak
4844	34.82	0	100	V	33.1	4.08	38.8	33.20	54	-20.80	Ave
4844	34.76	0	100	H	33.1	4.08	38.8	33.14	54	-20.86	Ave
7266	47.53	0	100	V	37.3	3.93	38.9	49.86	74	-24.14	Peak
7266	46.93	0	100	H	37.3	3.93	38.9	49.26	74	-24.74	Peak
7266	34.67	0	100	V	37.3	3.93	38.9	37.00	54	-17.00	Ave
7266	34.83	0	100	H	37.3	3.93	38.9	37.16	54	-16.84	Ave
9688	45.95	0	100	V	38.9	5.72	40	50.57	74	-23.43	Peak
9688	46.73	0	100	H	38.9	5.72	40	51.35	74	-22.65	Peak
9688	34.40	0	100	V	38.9	5.72	40	39.02	54	-14.98	Ave
9688	33.40	0	100	H	38.9	5.72	40	38.02	54	-15.98	Ave
Middle Channel 2437 MHz, measured at 3 meters											
4874	47.05	0	100	V	33.1	4.08	38.7	45.53	74	-28.47	Peak
4874	47.63	0	100	H	33.1	4.08	38.7	46.11	74	-27.89	Peak
4874	34.57	0	100	V	33.1	4.08	38.7	33.05	54	-20.95	Ave
4874	35.04	0	100	H	33.1	4.08	38.7	33.52	54	-20.48	Ave
7311	47.86	0	100	V	37.3	3.93	39.03	50.06	74	-23.94	Peak
7311	47.10	0	100	H	37.3	3.93	39.03	49.30	74	-24.70	Peak
7311	33.90	0	100	V	37.3	3.93	39.03	36.10	54	-17.90	Ave
7311	33.93	0	100	H	37.3	3.93	39.03	36.13	54	-17.87	Ave
9748	46.34	0	100	V	38.9	5.72	40.21	50.75	74	-23.25	Peak
9748	46.60	0	100	H	38.9	5.72	40.21	51.01	74	-22.99	Peak
9748	34.61	0	100	V	38.9	5.72	40.21	39.02	54	-14.98	Ave
9748	33.55	0	100	H	38.9	5.72	40.21	37.96	54	-16.04	Ave
High Channel 2462 MHz, measured at 3 meters											
4904	47.43	0	100	V	33.1	4.08	38.6	46.01	74	-27.99	Peak
4904	47.17	0	100	H	33.1	4.08	38.6	45.75	74	-28.25	Peak
4904	34.22	0	100	V	33.1	4.08	38.6	32.80	54	-21.20	Ave
4904	34.22	0	100	H	33.1	4.08	38.6	32.80	54	-21.20	Ave
7356	47.65	0	100	V	37.3	3.93	39.1	49.78	74	-24.22	Peak
7356	47.25	0	100	H	37.3	3.93	39.1	49.38	74	-24.62	Peak
7356	33.77	0	100	V	37.3	3.93	39.1	35.90	54	-18.10	Ave
7356	33.52	0	100	H	37.3	3.93	39.1	35.65	54	-18.35	Ave
9808	46.93	0	100	V	38.9	5.72	39.9	51.65	74	-22.35	Peak
9808	47.19	0	100	H	38.9	5.72	39.9	51.91	74	-22.09	Peak
9808	34.90	0	100	V	38.9	5.72	39.9	39.62	54	-14.38	Ave
9808	34.21	0	100	H	38.9	5.72	39.9	38.93	54	-15.07	Ave

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

9.1 Applicable Standards

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

The measurements are base on FCC KDB 558074 D01 DTS Meas Guidance v03r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 8: DTS bandwidth

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2013-11-07	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:	101-102 kPa

The testing was performed by Rui Zhou from 2014-10-15 at RF site.

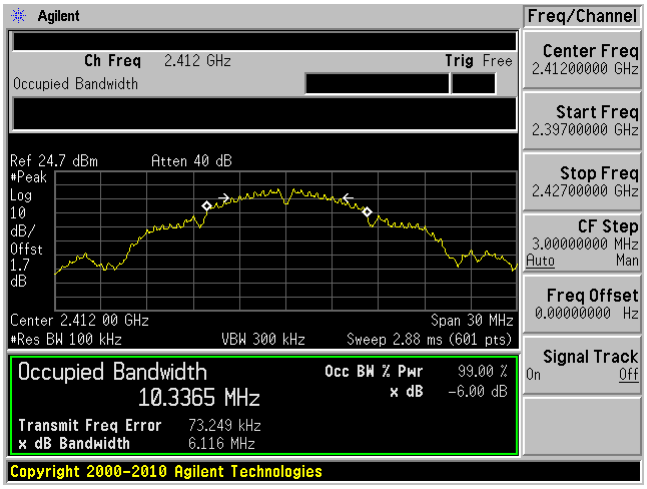
9.5 Test Results

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)		99% Emission Bandwidth (MHz)		6 dB OBW Limit (MHz)	Results
		J0	J1	J0	J1		
802.11b mode							
Low	2412	6.116	6.092	10.3365	10.3011	> 0.5	Compliant
Middle	2437	6.061	6.116	11.1017	11.2962	> 0.5	Compliant
High	2462	6.07	6.579	13.2264	13.9447	> 0.5	Compliant
802.11g mode							
Low	2412	16.459	16.457	17.6423	17.5877	> 0.5	Compliant
Middle	2437	16.513	16.456	17.0756	17.7335	> 0.5	Compliant
High	2462	16.077	16.478	17.9272	19.4638	> 0.5	Compliant
802.11n-HT20 mode							
Low	2412	17.743	17.774	18.4483	19.4535	> 0.5	Compliant
Middle	2437	17.672	17.747	18.0126	18.4837	> 0.5	Compliant
High	2462	17.732	17.685	19.0455	20.1443	> 0.5	Compliant
802.11n-HT40 mode							
Low	2422	35.448	36.523	36.1071	36.2292	> 0.5	Compliant
Middle	2437	36.546	36.543	36.3931	36.3995	> 0.5	Compliant
High	2452	36.215	35.818	37.0444	37.479	> 0.5	Compliant

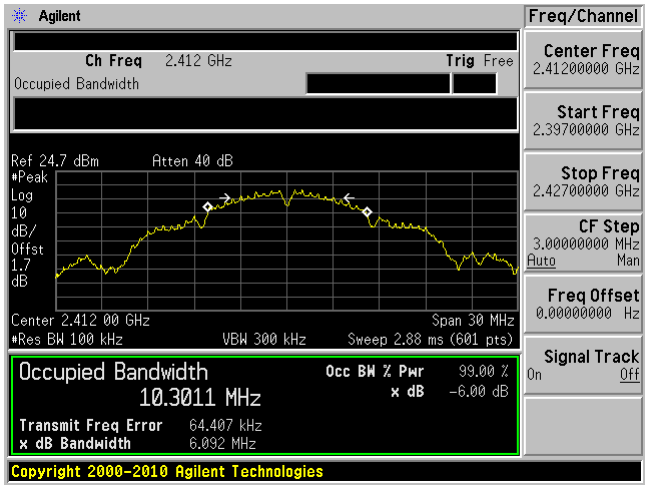
Please refer to the following plots for detailed test results

802.11 b mode

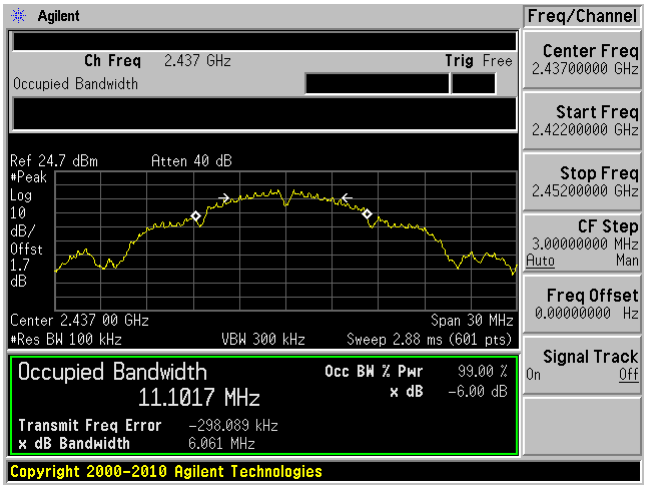
Low channel: 2412 MHz Chain J0



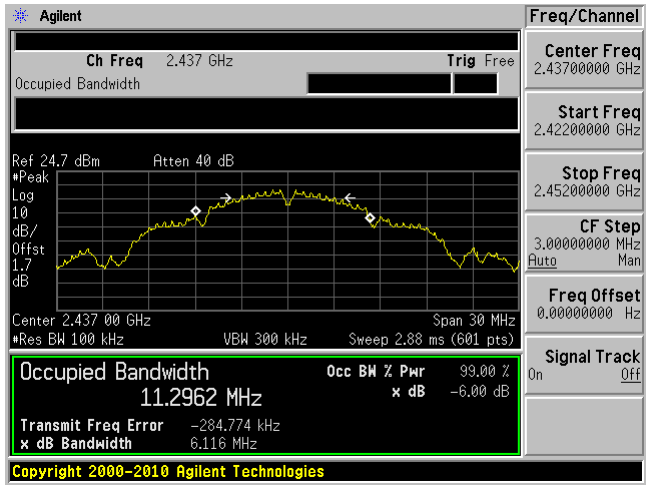
Low channel: 2412 MHz Chain J1



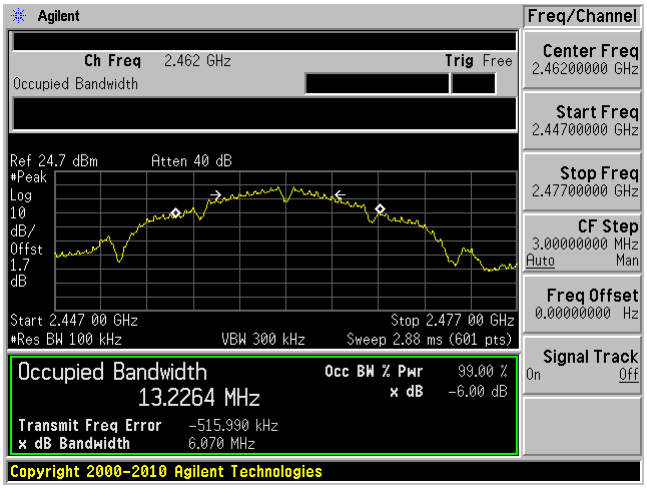
Middle channel: 2437 MHz Chain J0



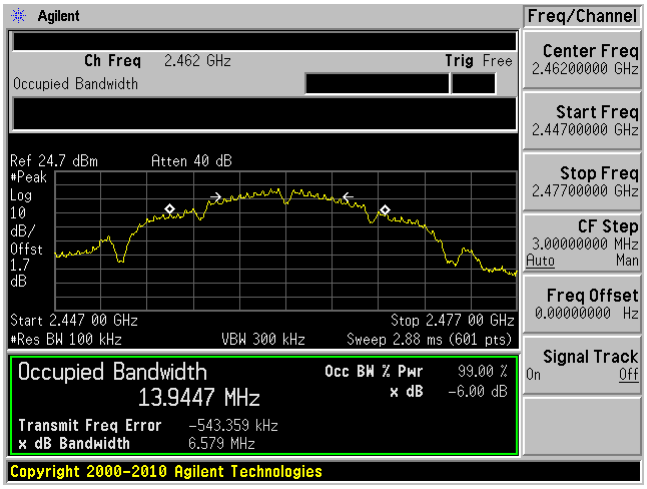
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

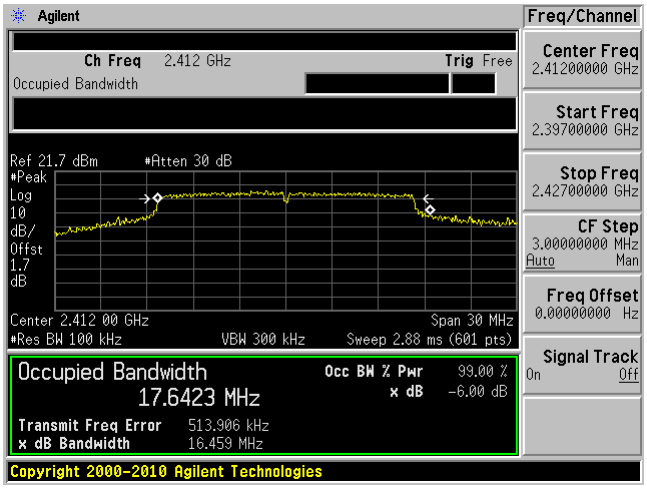


High channel: 2462 MHz Chain J1

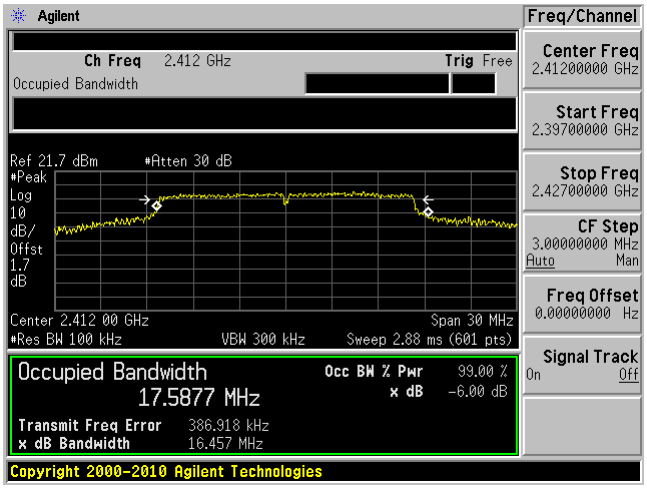


802.11 g mode

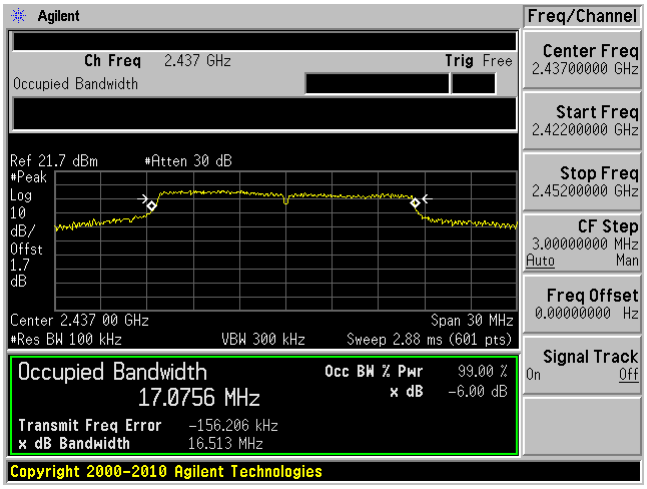
Low channel: 2412 MHz Chain J0



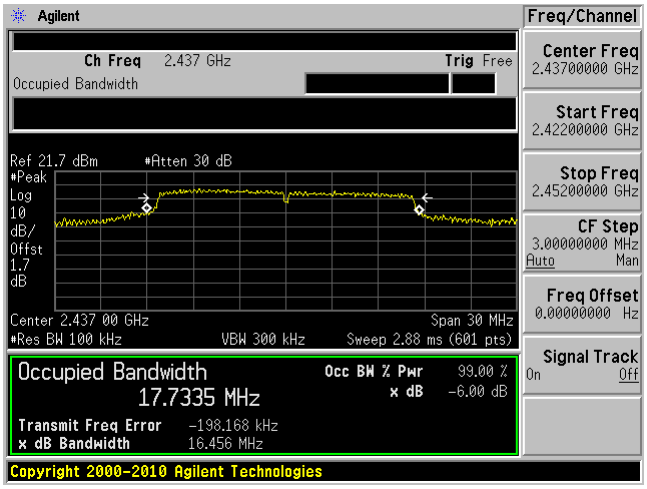
Low channel: 2412 MHz Chain J1



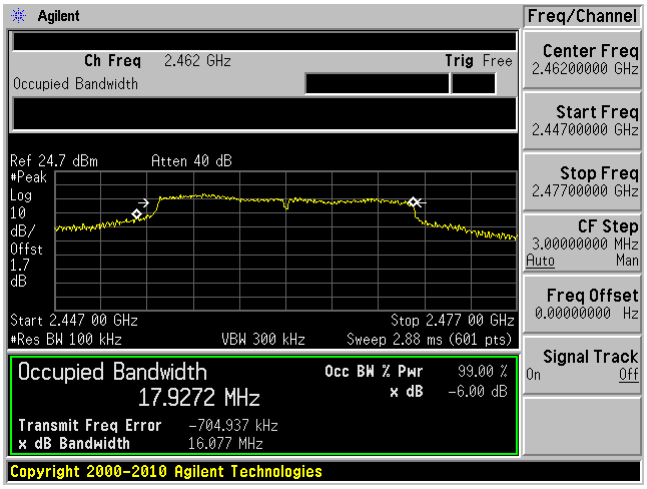
Middle channel: 2437 MHz Chain J0



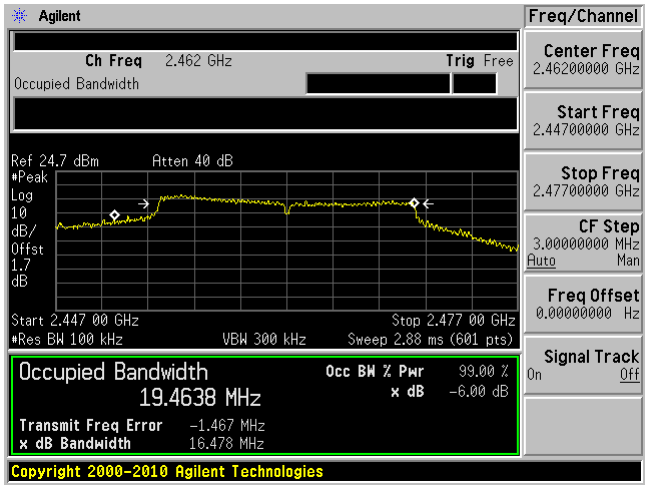
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

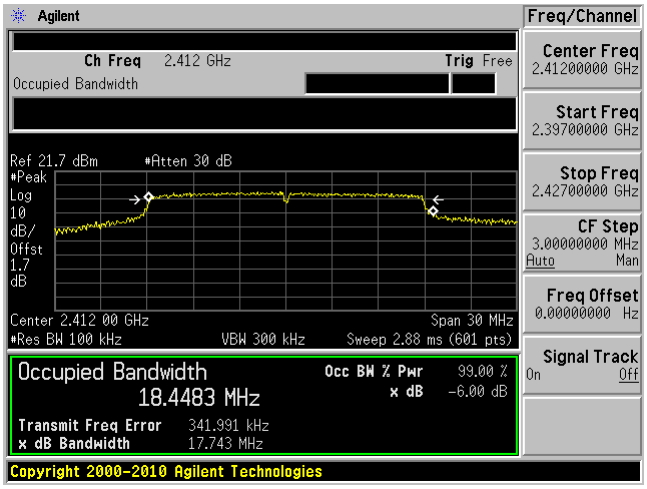


High channel: 2462 MHz Chain J1

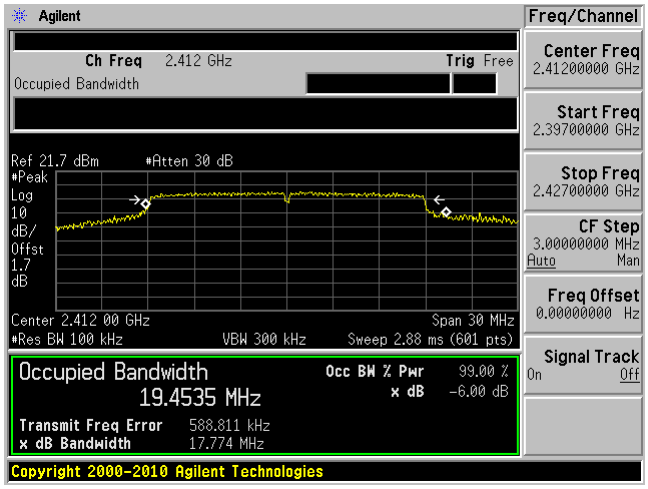


802.11n-HT20 mode

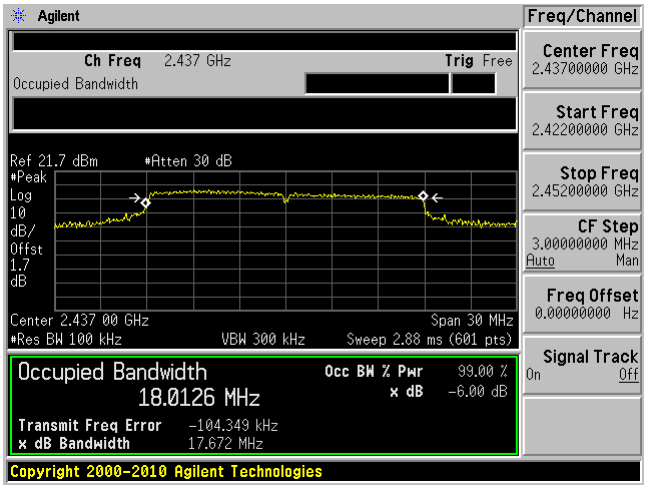
Low channel: 2412 MHz Chain J0



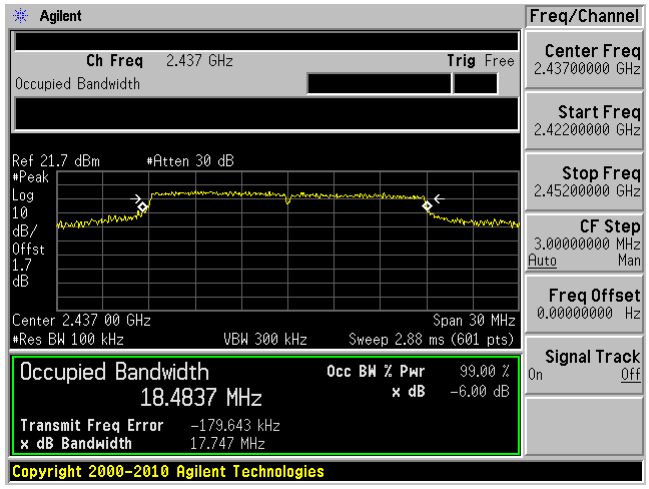
Low channel: 2412 MHz Chain J1



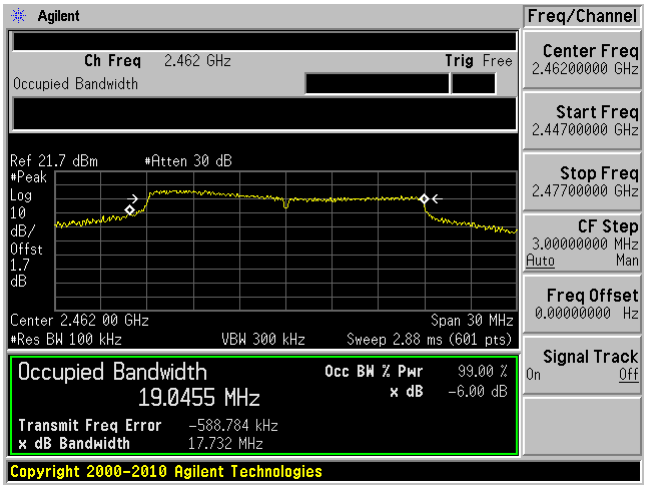
Middle channel: 2437 MHz Chain J0



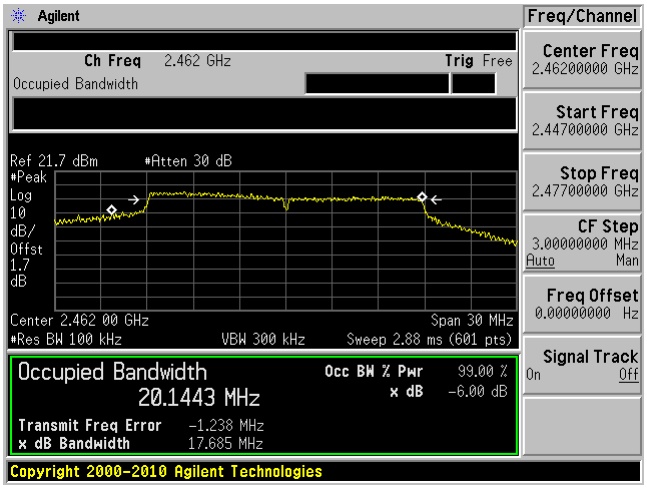
Middle channel: 2437 MHz Chain J1



High channel: 2462 MHz Chain J0

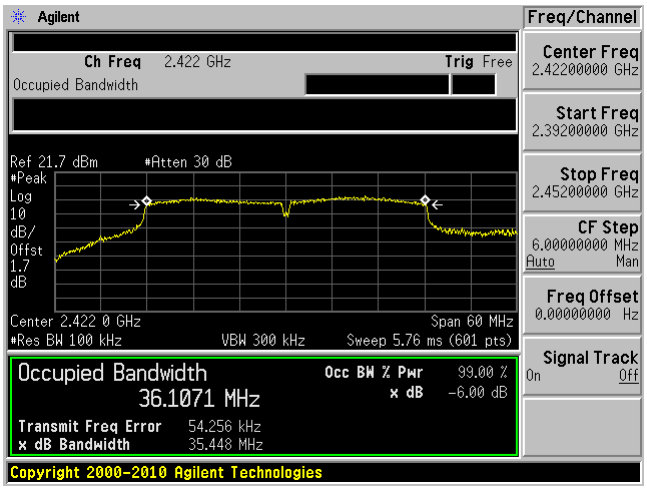


High channel: 2462 MHz Chain J1

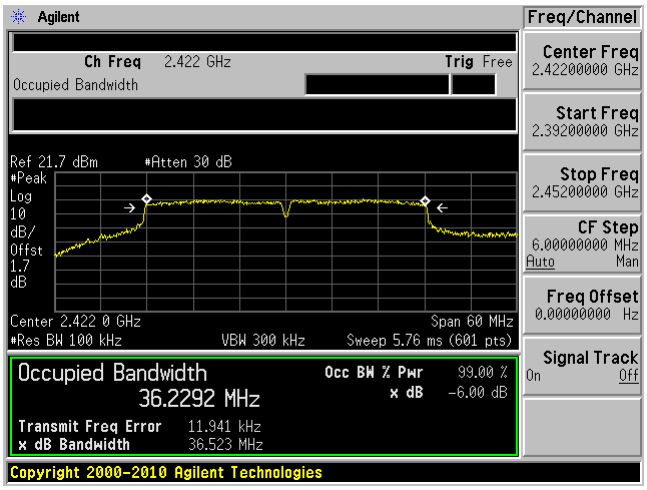


802.11n-HT40 mode

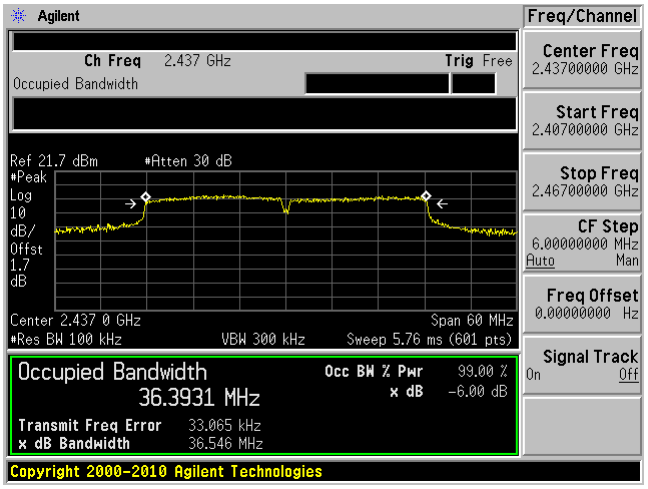
Low channel: 2422 MHz Chain J0



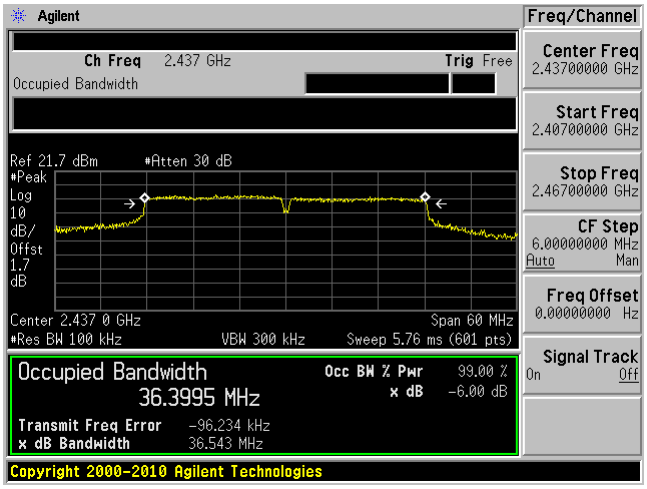
Low channel: 2422 MHz Chain J1



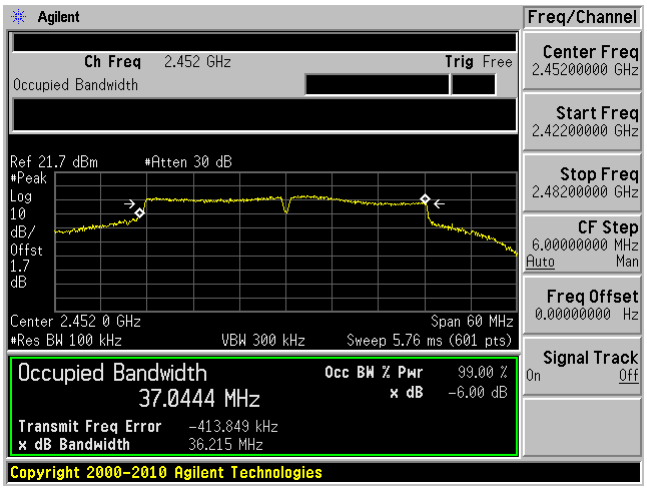
Middle channel: 2437 MHz Chain J0



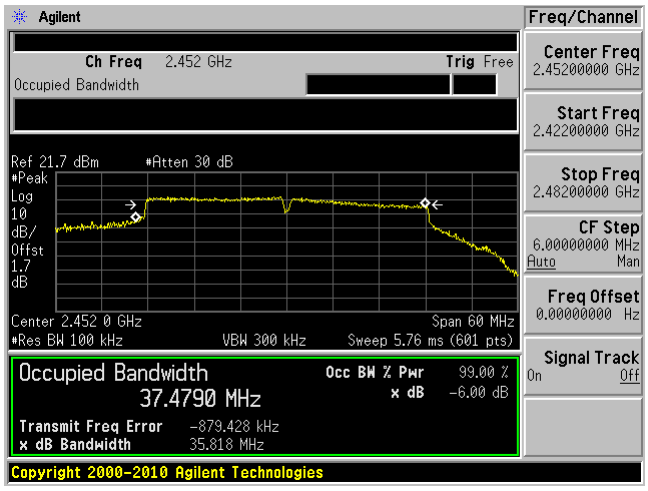
Middle channel: 2437 MHz Chain J1



High channel: 2452 MHz Chain J0



High channel: 2452 MHz Chain J1



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

10.1 Applicable Standards

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

The measurements are base on FCC KDB 558074 D01 DTS Meas Guidance v03r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 9: Fundamental emission output power

10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2013-11-07	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:	101-102 kPa

The testing was performed by Rui Zhou from 2014-10-15 at RF site.

10.5 Test Results

Channel	Frequency (MHz)	Conducted Output Power (dBm)		Total Output Power (dBm)	Limit (dBm)	Result	Power Setting
		Chain J0	Chain J1				
802.11b mode							
Low	2412	17.75	17.69	20.73	30	Pass	18
Middle	2437	18.25	18.12	21.20	30	Pass	19
High	2462	20.93	19.69	23.36	30	Pass	target
802.11g mode							
Low	2412	21.94	21.23	24.61	30	Pass	target
Middle	2437	21.94	21.87	24.92	30	Pass	target
High	2462	21.69	20.8	24.28	30	Pass	target
802.11n-HT20 mode							
Low	2412	21.53	21.3	24.43	30	Pass	target
Middle	2437	22.05	21.55	24.82	30	Pass	target
High	2462	21.61	20.76	24.22	30	Pass	target
802.11n-HT40 mode							
Low	2422	19.47	19.6	22.55	30	Pass	20
Middle	2437	21.66	21.23	24.46	30	Pass	target
High	2452	21.81	20.98	24.43	30	Pass	target

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

11.1 Applicable Standards

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

The measurements are base on FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 13: Band-edge measurements

11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2013-11-07	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:	101-102 kPa

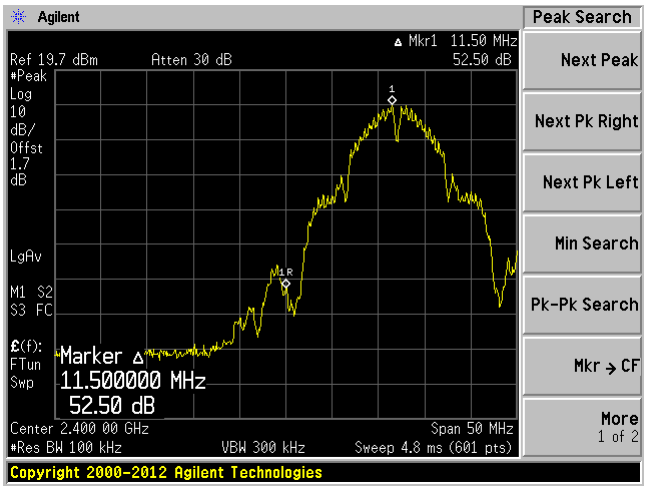
The testing was performed by Rui Zhou from 2014-10-15 at RF site.

11.5 Test Results

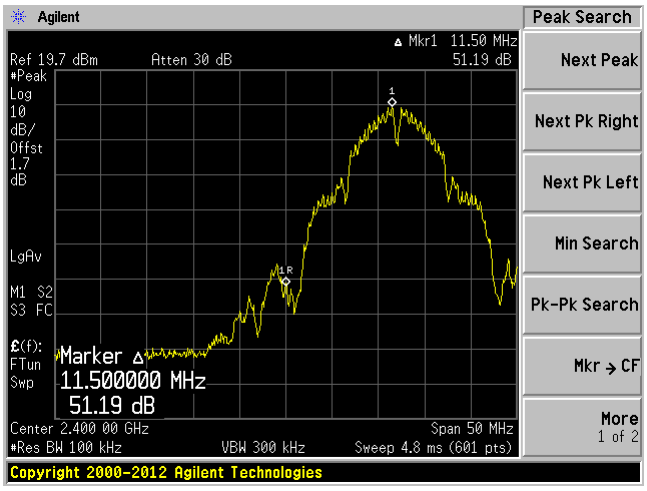
Please refer to following pages for plots of band edge.

802.11b mode

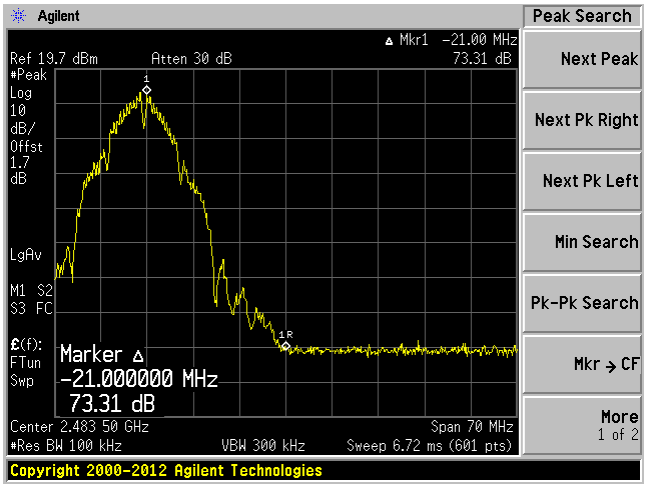
802.11b, Chain J0 Low Band Edge



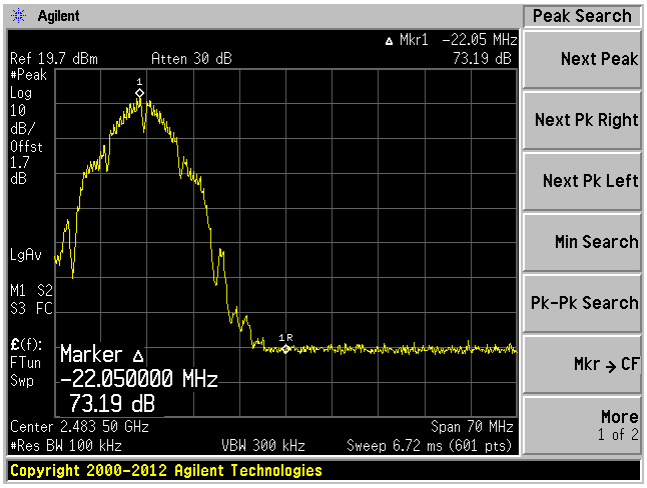
802.11b, Chain J1 Low Band Edge



802.11b, Chain J0 High Band Edge

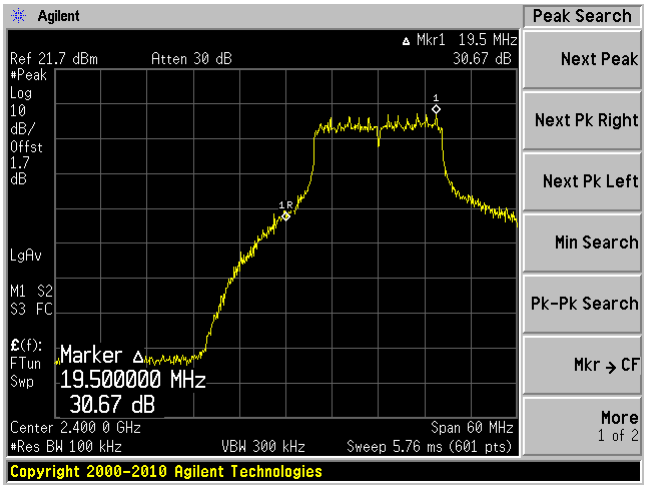


802.11b, Chain J1 High Band Edge

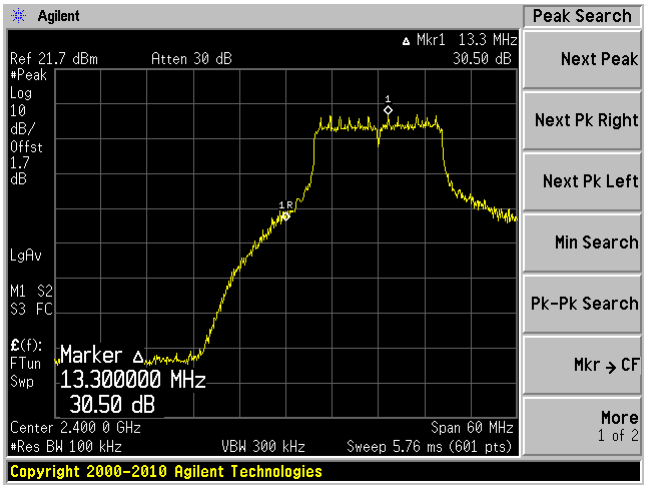


802.11g mode

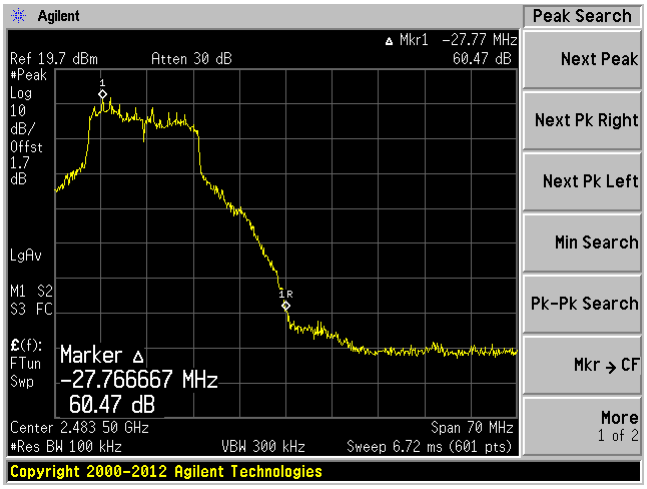
802.11g, Chain J0 Low Band Edge



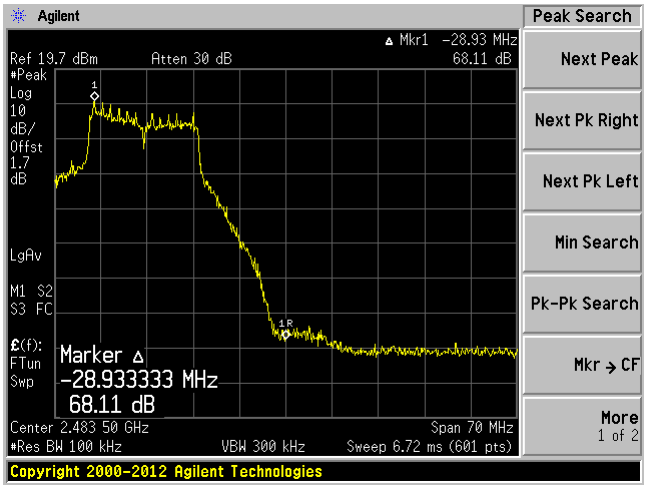
802.11g, Chain J1 Low Band Edge



802.11g, Chain J0 High Band Edge

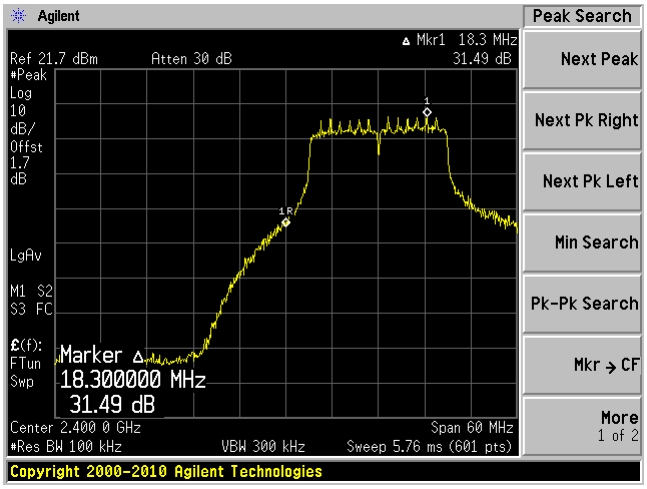


802.11g, Chain J1 High Band Edge

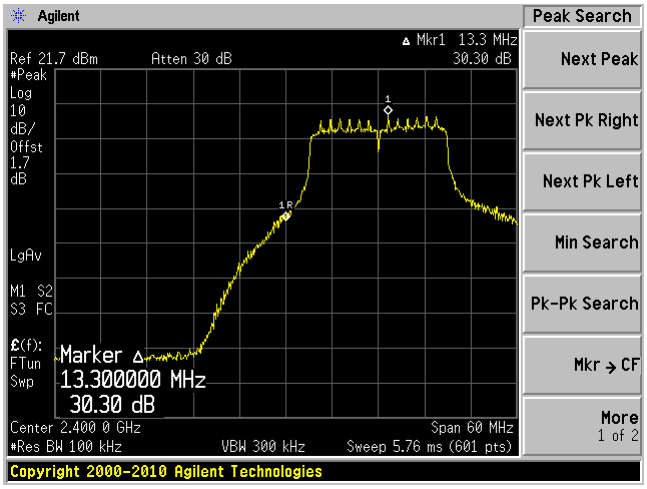


802.11n-HT20 mode

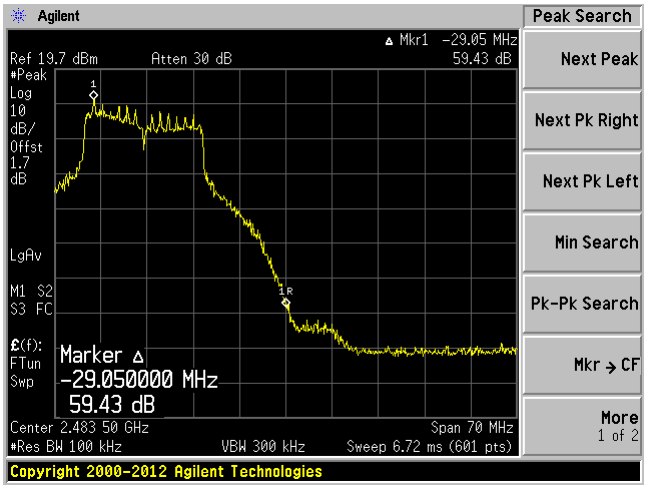
802.11n-HT20, Chain J0 Low Band Edge



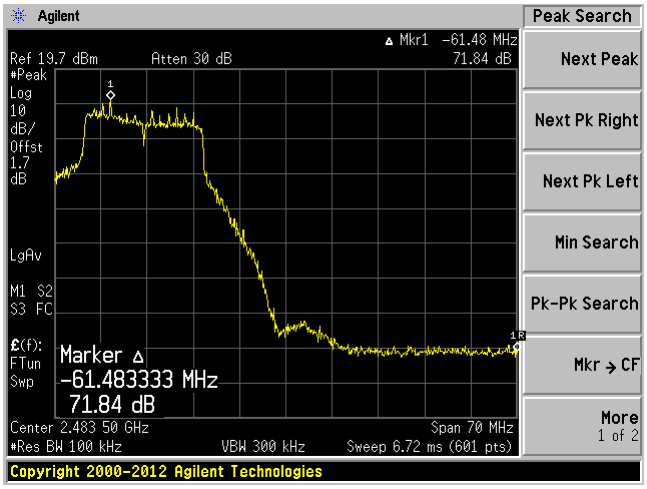
802.11n-HT20, Chain J1 Low Band Edge



802.11n-HT20, Chain J0 High Band Edge

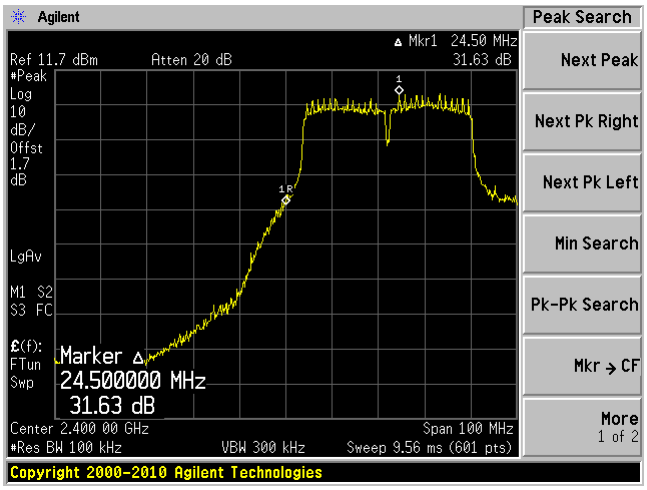


802.11n-HT20, Chain J1 High Band Edge

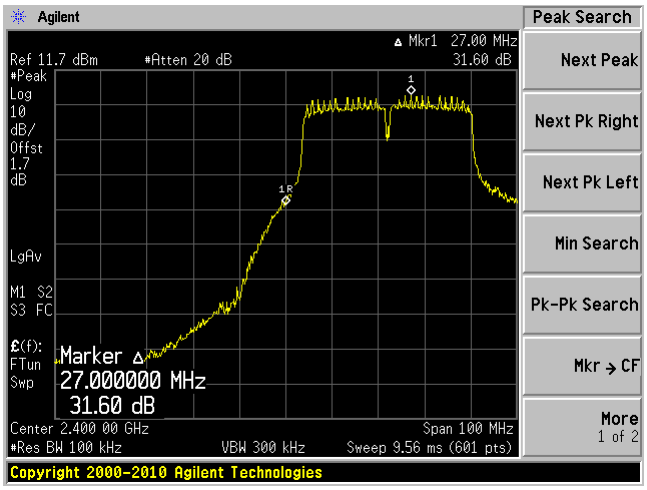


802.11n-HT40 mode

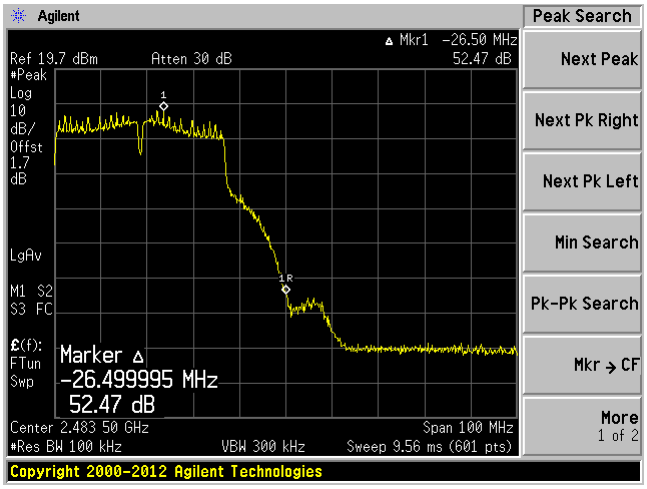
802.11n-HT40, Chain J0 Low Band Edge



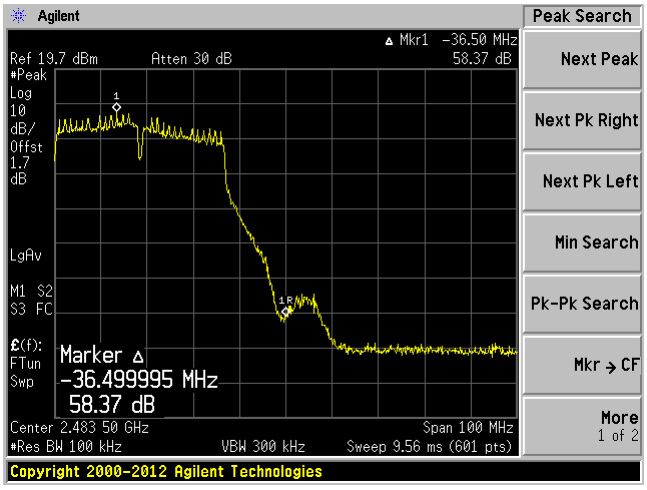
802.11n-HT40, Chain J1 Low Band Edge



802.11n-HT40, Chain J0 High Band Edge



802.11n-HT40, Chain J1 High Band Edge



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

12.1 Applicable Standards

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

The measurements are base on FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 10: Maximum power spectral density level in the fundamental emission

12.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2013-11-07	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:	101-102 kPa

The testing was performed by Rui Zhou on 2014-10-15 at RF site.

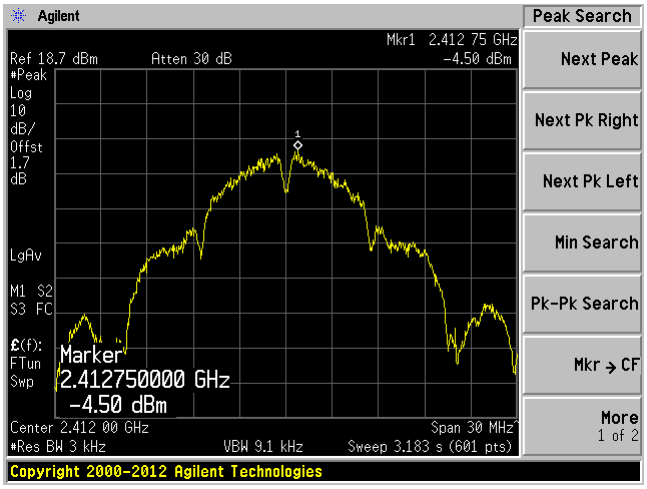
12.5 Test Results

Channel	Frequency (MHz)	PSD (dBm)		Total PSD (dBm)	Limit (dBm)	Result
		Chain J0	Chain J1			
802.11b mode						
Low	2412	-4.5	-6.22	-2.27	8	Compliant
Middle	2437	-4.36	-4.47	-1.40	8	Compliant
High	2462	-0.96	-2.49	1.35	8	Compliant
802.11g mode						
Low	2412	-3.86	-4.52	-1.17	8	Compliant
Middle	2437	-3.99	-4.72	-1.33	8	Compliant
High	2462	-3.91	-3.37	-0.62	8	Compliant
802.11n-HT20 mode						
Low	2412	-4.89	-4.83	-1.85	8	Compliant
Middle	2437	-4.25	-4.7	-1.46	8	Compliant
High	2462	-4.4	-3.44	-0.88	8	Compliant
802.11n-HT40 mode						
Low	2422	-9.32	-9.43	-6.36	8	Compliant
Middle	2437	-7.56	-7.53	-4.53	8	Compliant
High	2452	-6.24	-6.81	-3.51	8	Compliant

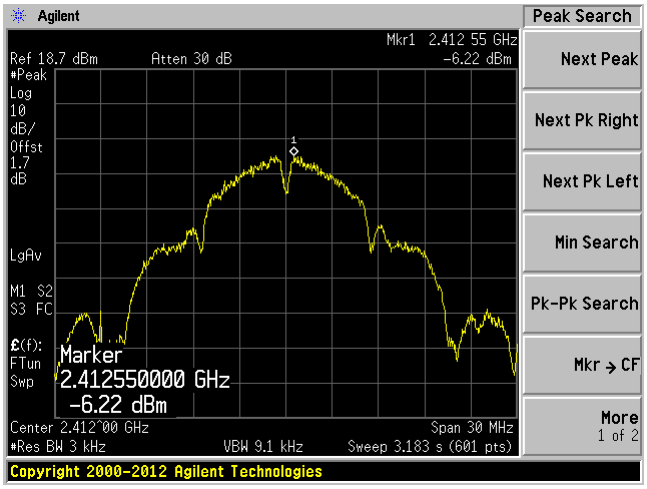
Please refer to the following plots for detailed test results:

802.11b mode

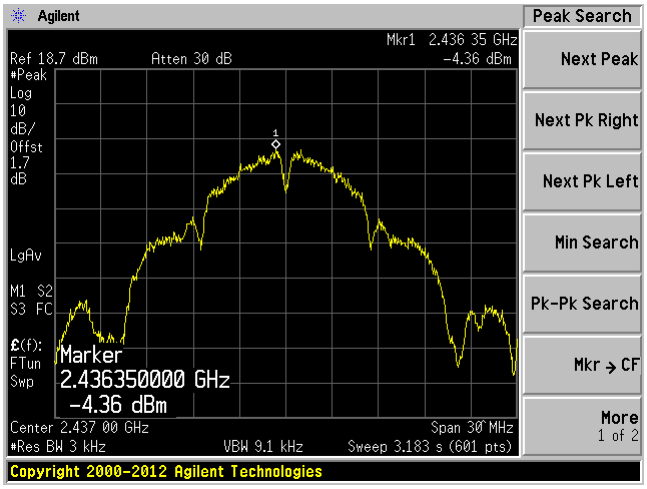
Low channel J0: 2412 MHz



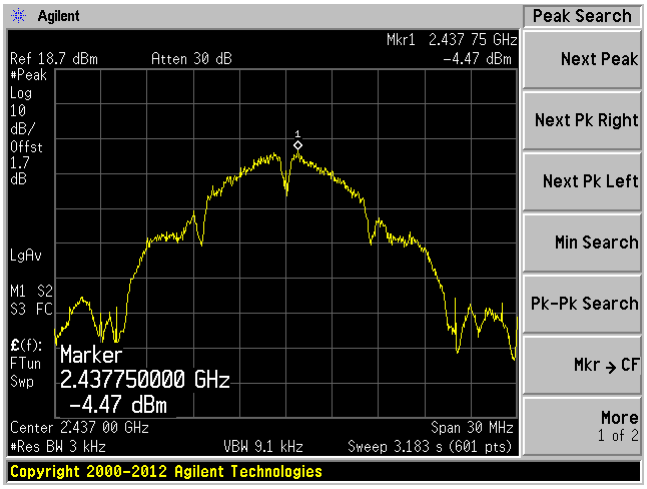
Low channel J1: 2412 MHz



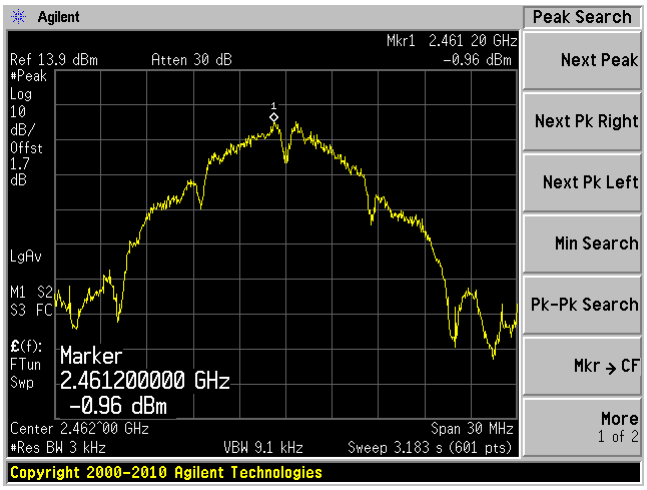
Middle channel J0: 2437 MHz



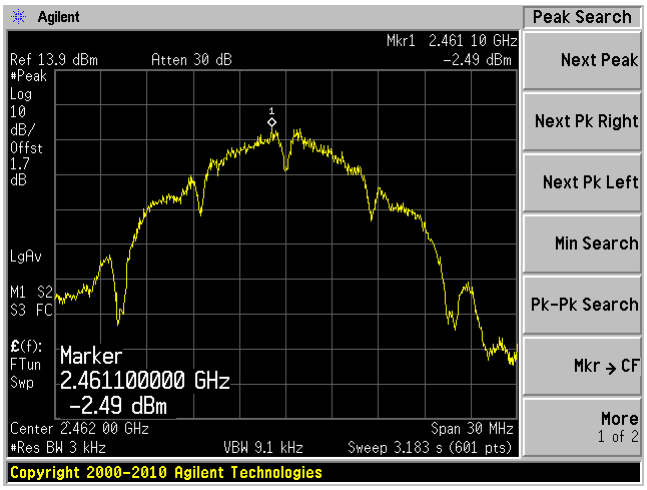
Middle channel J1: 2437 MHz



High channel J0: 2462 MHz

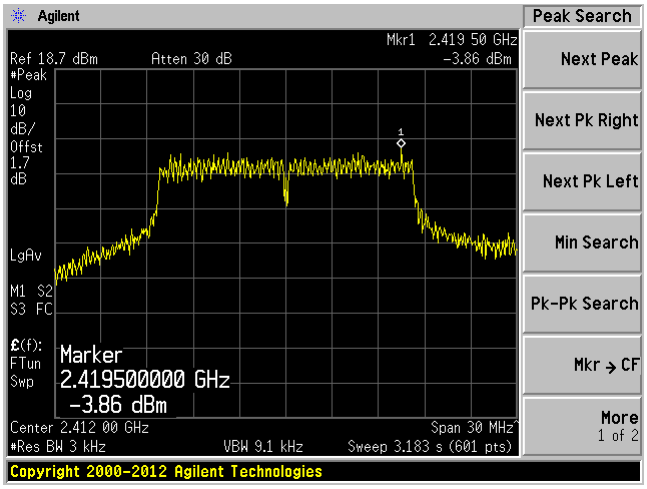


High channel J1: 2462 MHz

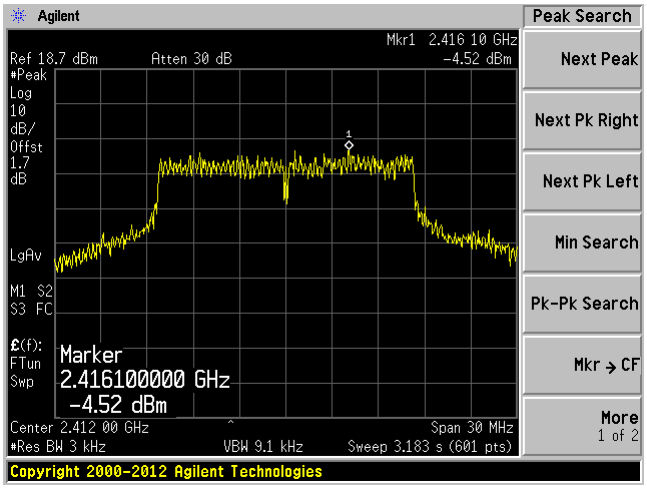


802.11g mode

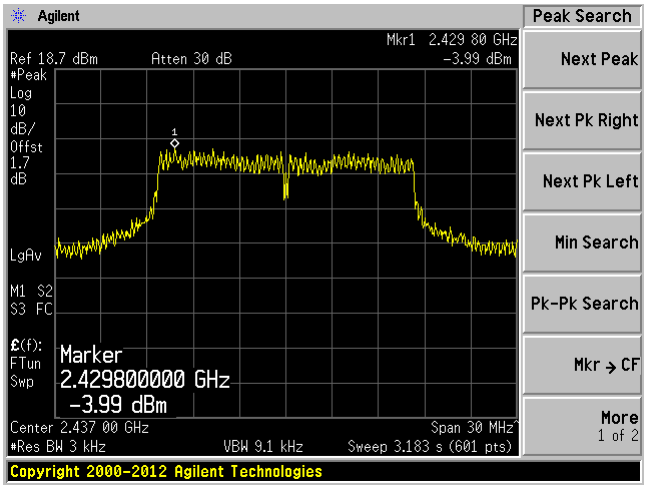
Low channel J0: 2412 MHz



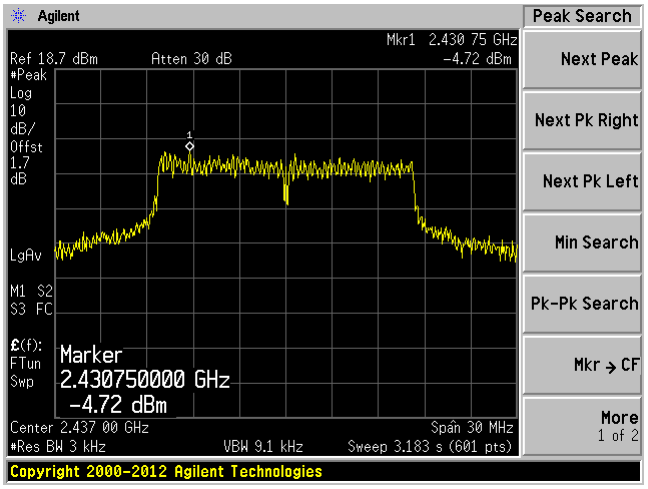
Low channel J1: 2412 MHz



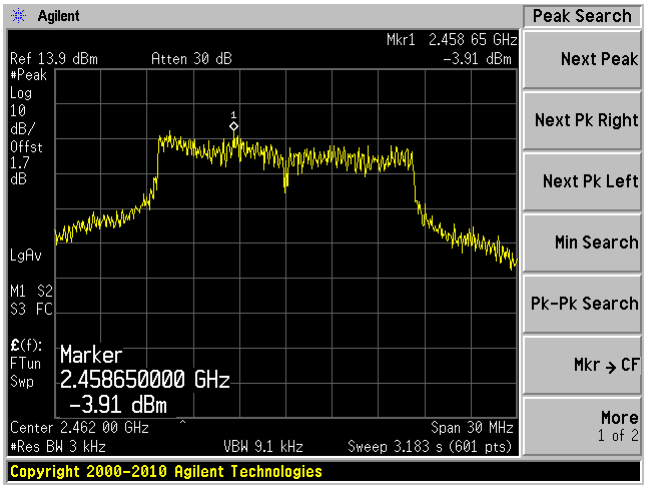
Middle channel J0: 2437 MHz



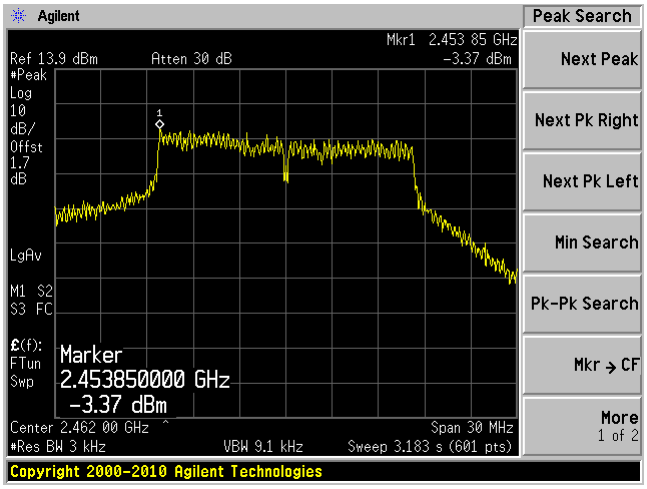
Middle channel J1: 2437 MHz



High channel J0: 2462 MHz

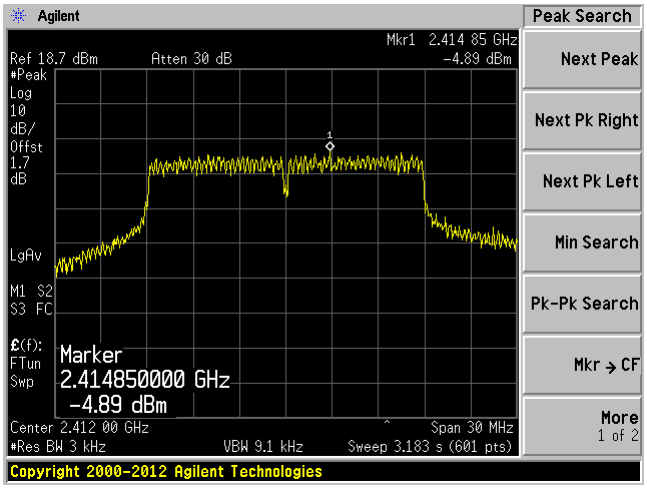


High channel J1: 2462 MHz

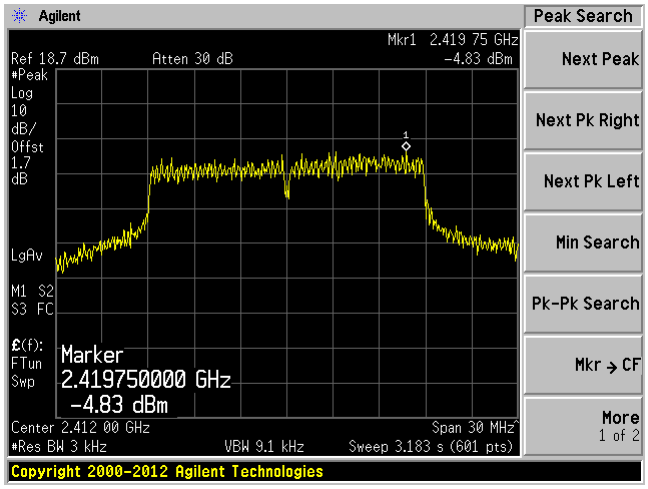


802.11n-HT20 mode

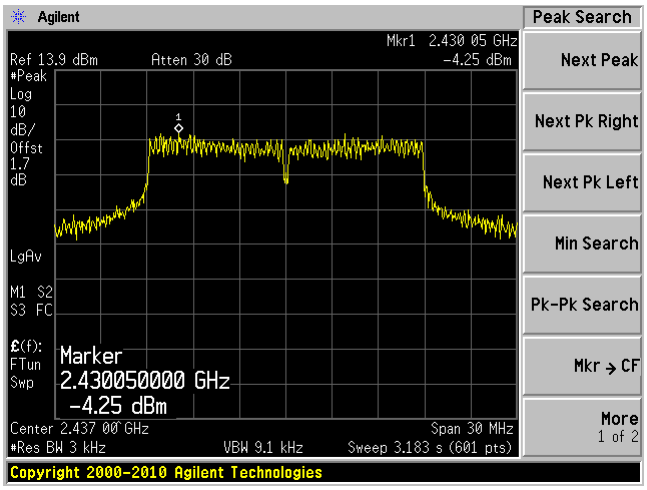
Low channel J0: 2412 MHz



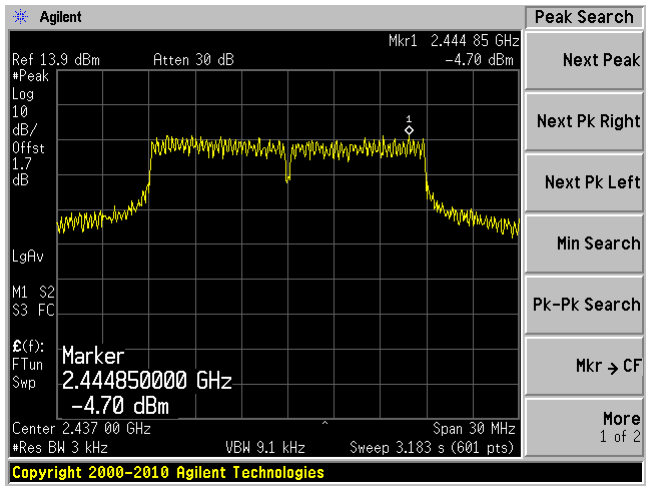
Low channel J1: 2412 MHz



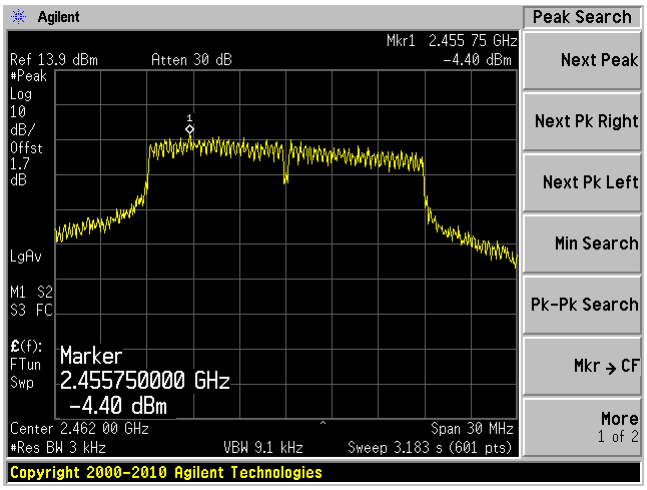
Middle channel J0: 2437 MHz



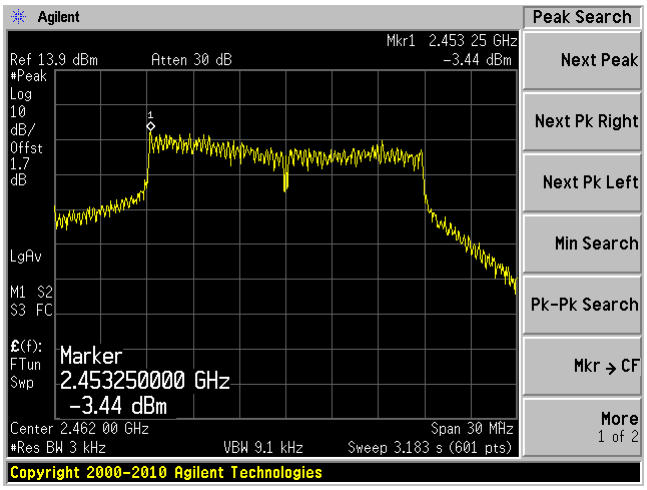
Middle channel J1: 2437 MHz



High channel J0: 2462 MHz

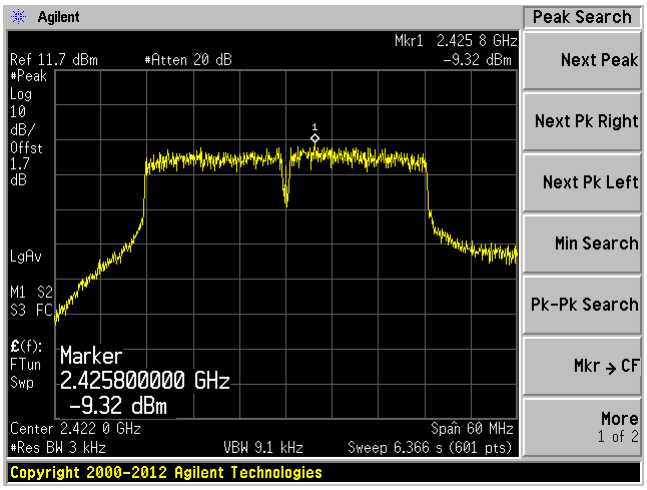


High channel J1: 2462 MHz

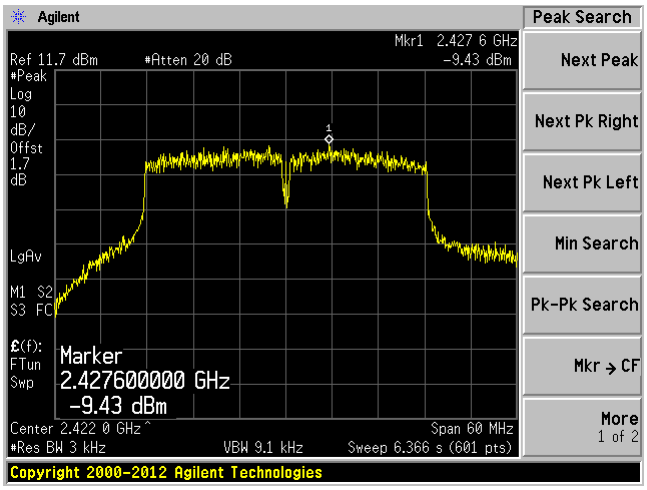


802.11n-HT40 mode

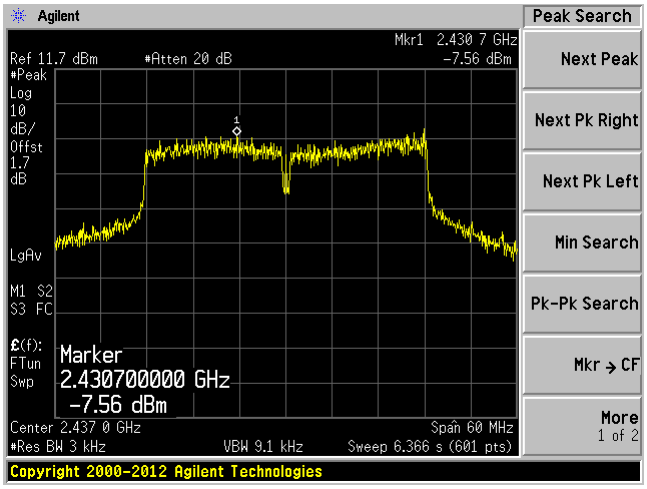
Low channel J0: 2422 MHz



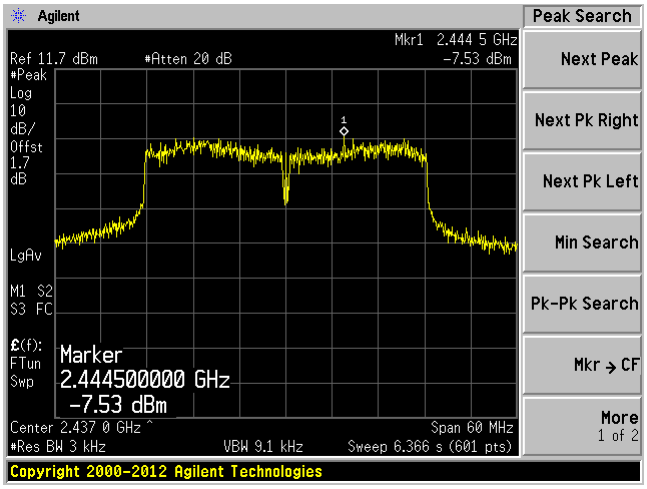
Low channel J1: 2422 MHz



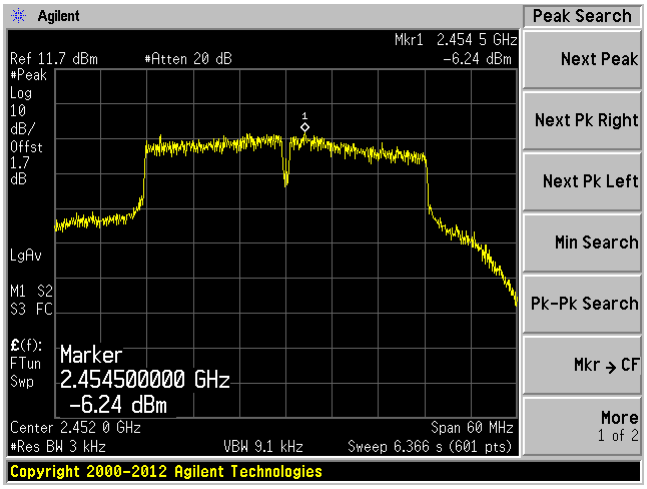
Middle channel J0: 2437 MHz



Middle channel J1: 2437 MHz



High channel J0: 2452 MHz



High channel J1: 2452 MHz