FCC PART 15, SUBPART C
IC RSS-247, ISSUE 1, MAY 2015
TEST AND MEASUREMENT REPORT

For

Marvell Semiconductor, Inc.

5488 Marvell Lane, MS 6-201,

Santa Clara, CA 95054, USA

FCC ID: UAYK402
IC: 6549A-K402

Report Type:	**Product Type:**
Original Report	Software Development with Wi-Fi and BLE Technology

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Report Number:	R1506088-247 Rev. A
Report Date:	2015-09-09
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TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1506088-247	Original Report	2015-09-04
1	R1506088-247 Rev. A	Updated Report	2015-09-09

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report has been compiled on behalf of *Marvell Semiconductor, Inc.* and their product, *FCC ID: UAYK402; IC: 6549A-K402*, model number: K4-02, which henceforth is referred to as the EUT (Equipment under Test.) The EUT is a Software Development Kit with 2.4/5 GHz Wi-Fi and BLE technology.

1.2 Mechanical Description of EUT

The EUT measures approximately 30 mm (L) x 125 mm (W) x 125 mm (H) and weighs approximately 300 g.

The data gathered are from a typical production sample provided by the manufacturer with serial number: R1506088 – 1 provided by BACL corp.

1.3 Objective

This report is prepared on behalf of *Marvell Semiconductor, Inc.,* in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commission's rules and IC RSS-247 Issue 1, May 2015.

The objective is to determine compliance with FCC Part 15.247 and IC RSS-247 rules for Output Power, Antenna Requirements, AC Line Conducted Emissions, 6 dB Bandwidth, power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Spurious Emissions, Conducted and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

NII application with same FCC ID: UAYK402, IC: 6549A-K402.

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2013, 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 v03r03: 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.

Based on CISPR16-4-2:2011, 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

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 Luminaires 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:
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 C63.4-2014, ANSI C63.4-2014, 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 C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v03r03.

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 PSD across all data rates bandwidths, and modulations.

2.2 EUT Exercise Software

The test utility used was Tera term, provided by *Marvell Semiconductor, Inc.*, and was verified by Ronak Patel to comply with the standard requirements being tested against.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Local Support Equipment

Manufacturer	Description	Model No.	Serial No.
DELL	Laptop	Latitude E6530	-

2.5 EUT Internal Configuration Details

Manufacturer	Description	Model
Marvell	Create Main Board	94v-0 1520mv
Marvell Kinoma	PCB Board	KAR4 – LCD - MT

2.6 Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number
JHD	Power Adapter	JHD-AP012U	050200AB

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
USB Cable	1.5	Laptop	EUT

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 §8.3	Antenna Requirement	Compliant
FCC §15.207(a) IC RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
FCC §15.247 (d) IC RSS-247 §5.5	Spurious Emissions at Antenna Port	Compliant
FCC §15.209, §15.247(d) IC RSS-247 §5.5 IC RSS-Gen §8.9, §8.10	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) IC RSS-247 §5.2 IC RSS-Gen §6.6	6 dB & 99% Emission Bandwidth	Compliant
FCC §15.247(b)(3) IC RSS-247 §5.4	Output Power	Compliant
FCC §15.247(d) IC RSS-247 §5.5	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §15.247(e) IC RSS-247 §5.2	Power Spectral Density	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 field

According to IC RSS-102 Issue 5 section 4, 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)	Reference Period (minutes)
0.003-10[21]	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

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

Maximum peak output power at antenna input terminal (dBm):	14.78
Maximum peak output power at antenna input terminal (mW):	30.06
Prediction distance (cm):	20
Prediction frequency (MHz):	2437
Maximum Antenna Gain, typical (dBi):	0.8
Maximum Antenna Gain (numeric):	1.202
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.00719
Power density of prediction frequency at 20.0 cm (W/m^2):	0.0719
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
IC MPE limit for uncontrolled exposure at prediction frequency (W/m^2):	5.4

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.00719 mW/cm^2 (0.0719 W/m^2). Limit is 1.0 mW/cm^2 (5.4 W/m^2).

5 FCC §15.203 & IC RSS-Gen §8.3 - 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.

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 §8.3: Transmitter Antenna

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. 9 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 a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

5.2 Antenna List

Antenna Type	Manufacturer	Peak Antenna Gain (dBi) @ 2.4 GHz
Chip Antenna	Johanson Technology	0.8

6 FCC §15.207 & IC RSS-Gen §8.8 - AC Line Conducted Emissions

6.1 Applicable Standards

As per FCC §15.207 and IC RSS-Gen §8.8 Conducted limits:

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

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

Note: Decreases with the logarithm of the frequency.
Note: A linear average detector is required

6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.10-2013 measurement procedure. The specification used was FCC §15.207 and IC RSS-Gen §8.8 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-1 and the power cord of the support equipment was connected to 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 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:

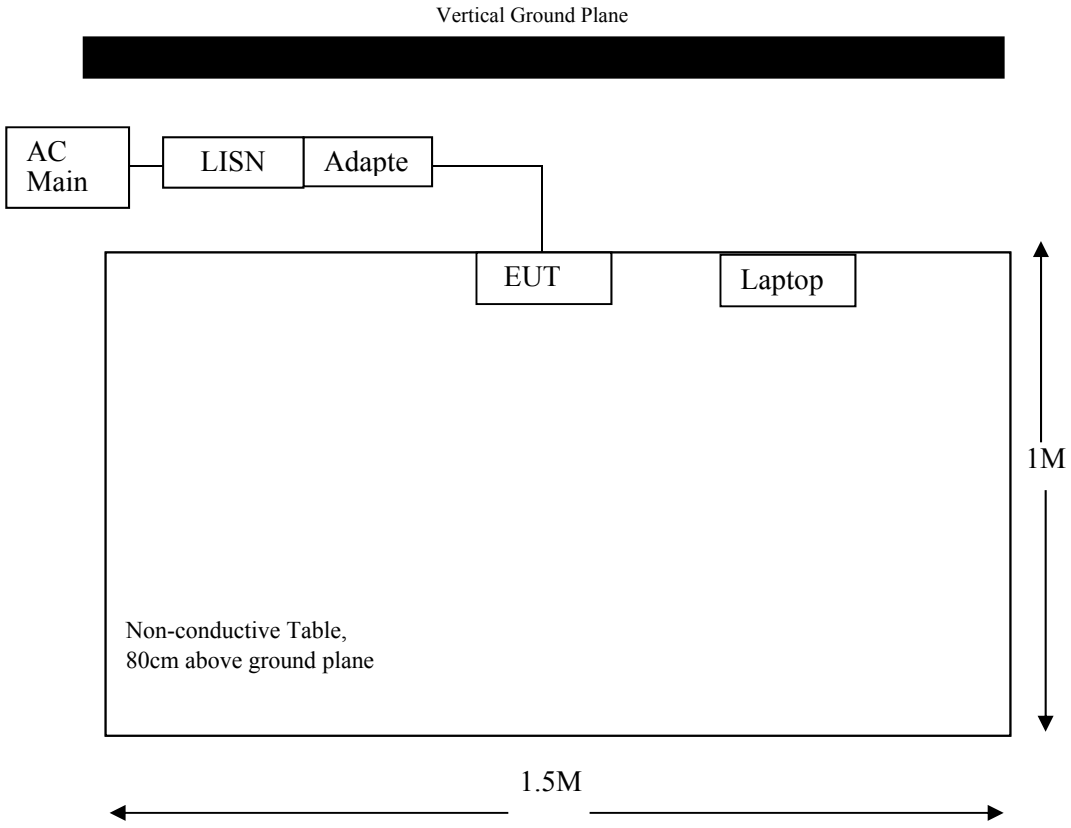
CA = Ai + CL + Atten

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

6.5 Test Setup Block Diagram



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	2014-09-28	1 year
Solar Electronics	LISN	9252-50-R-24-N	160131	2015-07-04	1 year
TTE	Filter, High Pass	H962-150k-50-21378	K7133	2015-01-30	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	Cal. Not Required	N/A
Hewlett-Packard	5 ft N-type RF cable	-	1268	Cal. Not Required	N/A

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:	23 ºC
Relative Humidity:	46 %
ATM Pressure:	105.24 kPa

The testing was performed by Ronak Patel on 2015-07-19 in 5m chamber3.

6.8 Summary of Test Results

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

2.4 GHz Wi-Fi

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-10.98	0.538346	Neutral	0.15-30

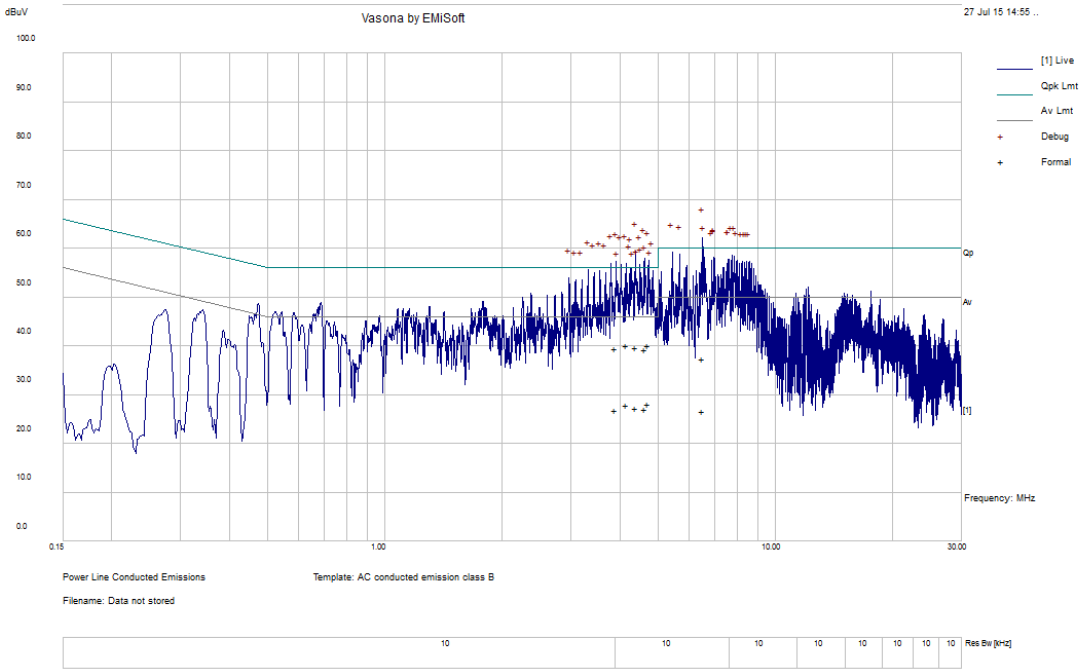
BLE

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-10.25	0.676737	Line	0.15-30

6.9 Conducted Emissions Test Plots and Data

2.4 GHz Wi-Fi Mode

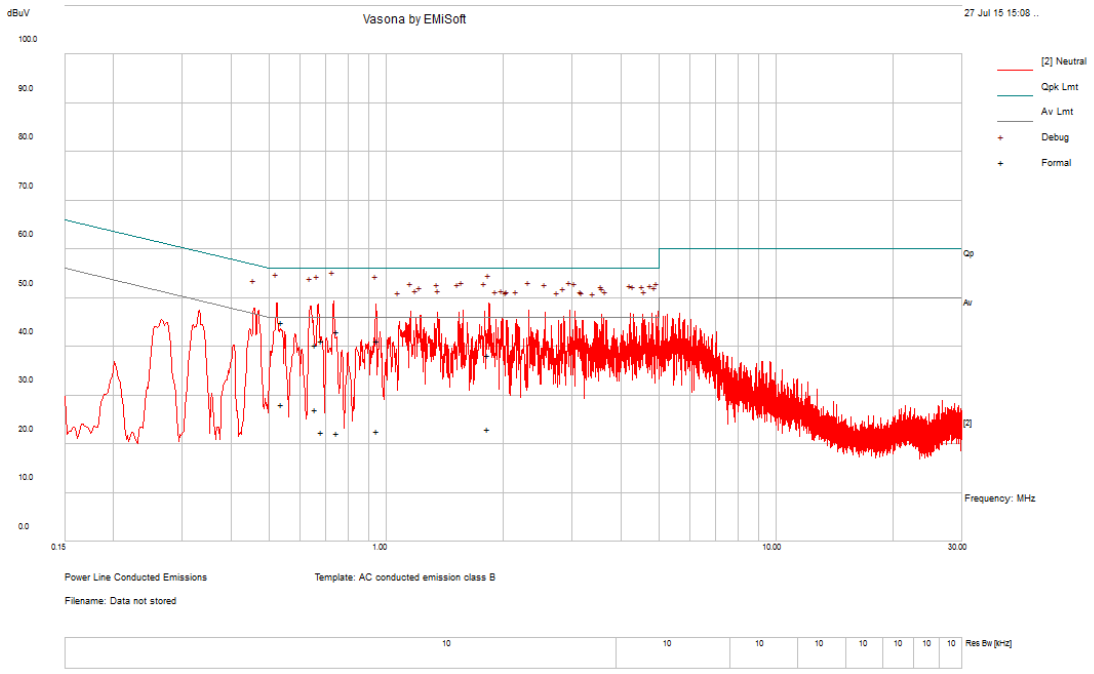
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
4.723136	40.22	Line	56	-15.78	QP
4.161308	40.19	Line	56	-15.81	QP
4.38125	39.75	Line	56	-16.25	QP
3.88925	39.59	Line	56	-16.41	QP
4.629062	39.47	Line	56	-16.53	QP
6.50045	37.50	Line	60	-22.50	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
4.723136	28.32	Line	46	-17.68	Ave.
4.161308	27.97	Line	46	-18.03	Ave
4.38125	27.38	Line	46	-18.62	Ave
4.629062	27.24	Line	46	-18.76	Ave
3.88925	26.91	Line	46	-19.09	Ave
6.50045	26.72	Line	50	-23.28	Ave

120 V, 60 Hz – Neutral

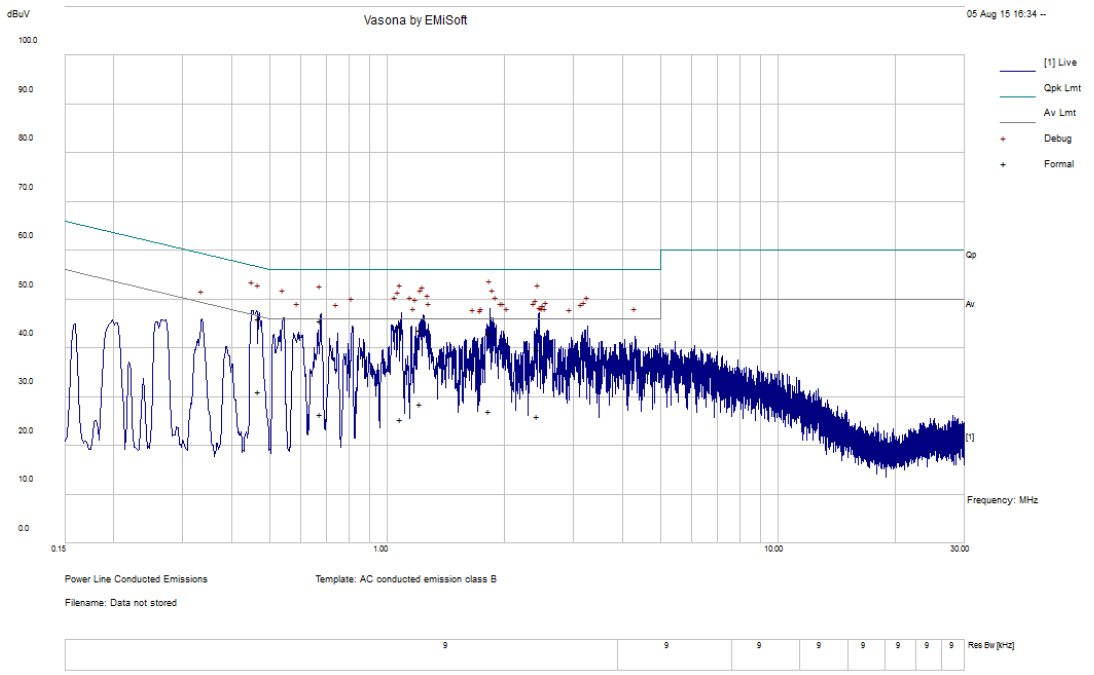


Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.538346	45.02	Neutral	56	-10.98	QP
0.748758	43.11	Neutral	56	-12.89	QP
0.948118	41.22	Neutral	56	-14.78	QP
0.683387	41.2	Neutral	56	-14.80	QP
0.657475	40.35	Neutral	56	-15.65	QP
1.827376	38.23	Neutral	56	-17.77	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.948118	25.71	Neutral	46	-20.29	Ave.
0.538346	25.69	Neutral	46	-20.31	Ave
0.657475	23.58	Neutral	46	-22.42	Ave
0.683387	23.50	Neutral	46	-22.50	Ave
1.827376	22.63	Neutral	46	-23.37	Ave
0.748758	22.28	Neutral	46	-23.72	Ave

BLE Mode:

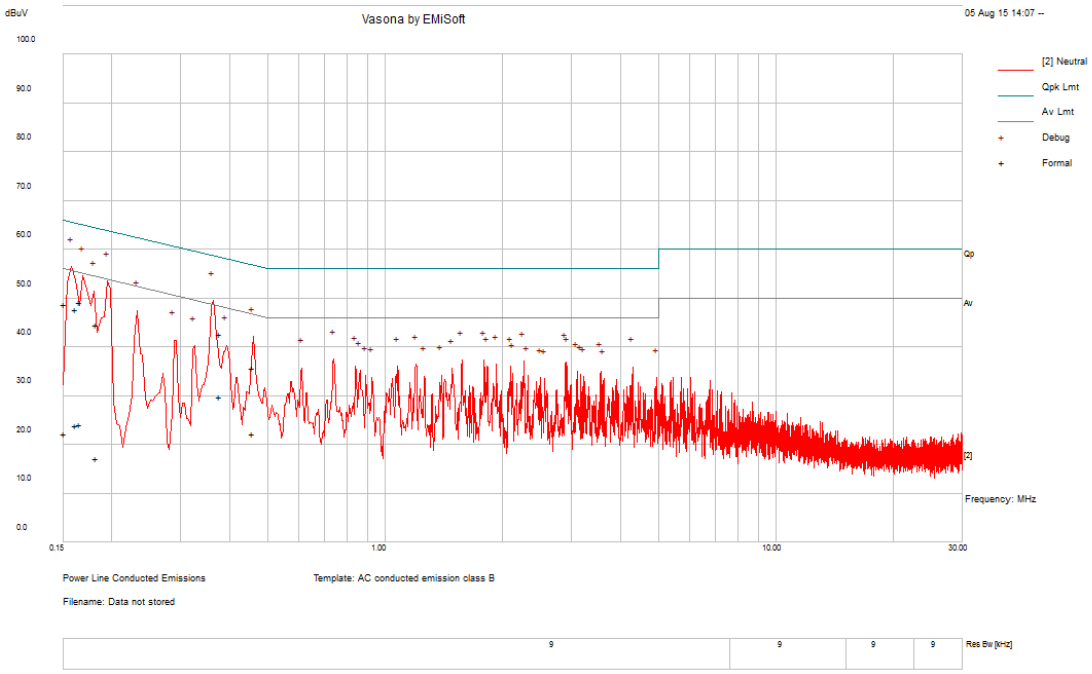
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.676737	45.75	Line	56	-10.25	QP
0.469761	46.07	Line	56.52	-10.45	QP
1.084933	44.40	Line	56	-11.60	QP
1.219623	43.73	Line	56	-12.27	QP
1.828253	43.21	Line	56	-12.79	QP
2.431533	39.77	Line	56	-16.23	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.469761	31.21	Line	46.52	-15.31	Ave.
1.219623	28.59	Line	46	-17.41	Ave
1.828253	27.20	Line	46	-18.80	Ave
0.676737	26.46	Line	46	-19.54	Ave
2.431533	26.02	Line	46	-19.98	Ave
1.084933	25.53	Line	46	-20.47	Ave

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.37706	42.82	Neutral	58.34	-15.52	QP
0.165578	49.35	Neutral	65.18	-15.83	QP
0.151216	48.93	Neutral	65.93	-17.00	QP
0.161855	47.78	Neutral	65.37	-17.59	QP
0.18243	44.69	Neutral	64.37	-19.69	QP
0.459193	35.86	Neutral	56.71	-20.84	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.37706	29.86	Neutral	48.34	-18.49	Ave.
0.459193	22.35	Neutral	46.71	-24.36	Ave
0.165578	24.26	Neutral	55.18	-30.92	Ave
0.161855	23.97	Neutral	55.37	-31.40	Ave
0.151216	22.21	Neutral	55.93	-33.72	Ave
0.18243	17.30	Neutral	54.37	-37.08	Ave

7 FCC §15.209, §15.247(d) & IC RSS-247 §5.5, IC RSS-GEN §8.9 – Spurious Radiated Emissions

7.1 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-247: Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

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

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

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

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

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

As per IC RSS-Gen 8.9,

> Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 or Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 4 – General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Above 30 MHz

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

* Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

Note: Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the specific RSS.

As per IC RSS-247 §5.5, 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 5.4(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.

7.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.10-2013. The specification used was the FCC 15 Subpart C and IC RSS-247 limits.

The spacing between the peripherals was 10 centimeters.

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

7.3 Test Procedure

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

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

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 1.5 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 = 100ms
(2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

7.4 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

7.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2014-09-28	1 year
Agilent	Spectrum Analyzer	E4446A	US44300386	2014-10-24	1 year
Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-3	2014-09-18	1 year
EMCO	Horn Antenna	DRG-118/A	1132	2015-02-19	1 year
Hewlett Packard	Pre-amplifier	8449B	3008A01978	2015-05-19	1 year
WiseWave	Horn Antenna	ARH-4223-02	10555-01	2014-08-09	3 years
Suirong	30 ft conductive emission cable	LMR 400	-	2015-03-05	1 year
-	SMA cable	-	C0001	Each time[1]	N/A
IW Microwave (UTiFLEX)	High Frequency Cable	223458-002	223458-001	2015-05-29	1 year
IW Microwave	High Frequency cable	223458-002	223458-002	2015-05-29	1 year
Suirong	30 ft conductive emission cable	LMR 400		2015-03-05	1 year
Hewlett-Packard	5 ft N-type RF cable	-	1268	2014-07-24	1 year
Agilent	Pre-Amplifier	8449B	3008A01978	2015-03-11	1 year
MICRO -TRONICS	Band Reject	BRM50701	160	N/A	N/A

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.

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

7.6 Test Environmental Conditions

Temperature:	20-25 ºC
Relative Humidity:	40-45 %
ATM Pressure:	101.2-103.5 kPa

The testing was performed by Ronak Patel on 2015-07-19 in 5m chamber3 and RF site.

7.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15C and IC RSS-247 standard's radiated emissions limits, and had the worst margin of:

2.4 GHz Wi-Fi Mode:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-7.15	430.5608	Horizontal	30 - 1000 MHz
-3.605	2483.5	Horizontal	1 - 25 GHz

BLE Mode:

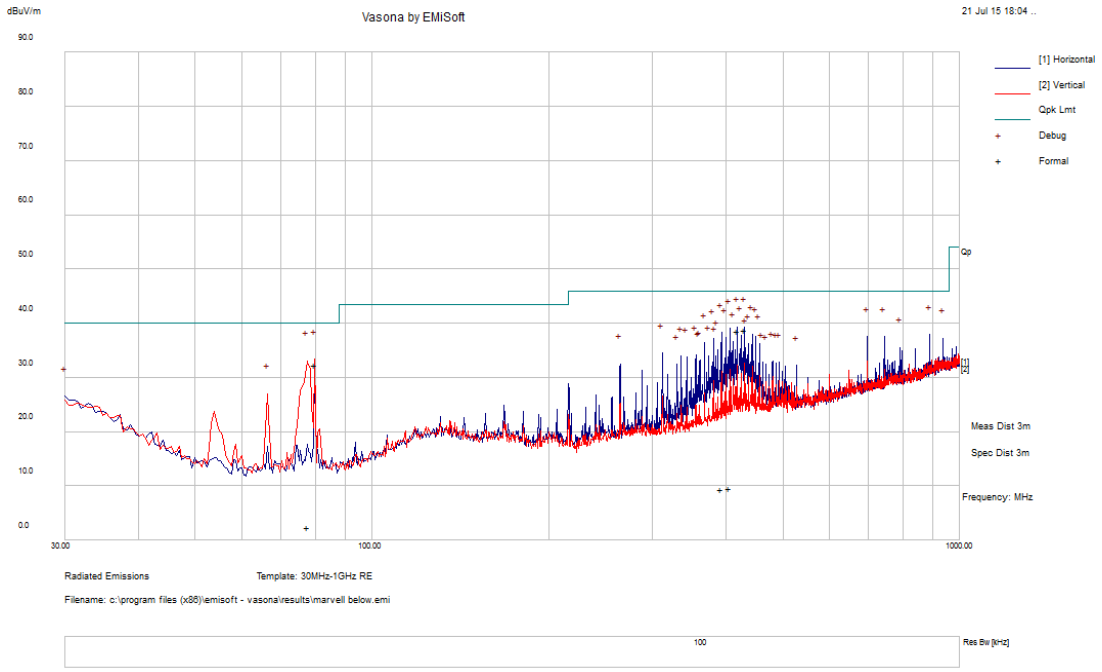
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-3.75	430.5738	Horizontal	30 - 1000 MHz
-8.97	2483.5	Horizontal	1 - 25 GHz

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

7.8 Radiated Emissions Test Data and Plots

1) 30 MHz – 1 GHz @ 2.4 GHz Wi-Fi Mode

Worst Case:



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comments (PK/QP/Ave.)
79.99125	32.37	264	V	42	40	-7.63	QP
430.5608	38.85	99	H	71	46	-7.15	QP
418.0803	38.71	101	H	83	46	-7.29	QP
77.767	30.41	100	V	273	40	37.767	QP
405.7185	38.75	196	H	8	46	359.7185	QP
393.3393	37.53	134	H	337	46	347.3393	QP

2) 1–25 GHz @ 2.4 GHz Wi-Fi Mode:

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 (PK/Ave)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
2412	61.01	290	231	V	28.444	6.650	-	96.104	-	-	PK
2412	65.19	334	128	H	28.461	6.650	-	100.300	-	-	PK
2412	57.32	290	231	V	28.444	6.650	-	92.414	-	-	Ave
2412	61.35	334	128	H	28.461	6.650	-	96.461	-	-	Ave
2361	29.34	290	231	V	28.218	6.650	-	64.208	74.00	-9.792	PK
2370	29.47	334	128	H	28.125	6.650	-	64.245	74.00	-9.755	PK
2360	14.68	290	231	V	28.218	6.650	-	49.548	54.00	-4.452	Ave
2360	14.67	334	128	H	28.125	6.650	-	49.445	54.00	-4.555	Ave
4824	40.79	144	160	V	33.842	9.120	38.20	45.552	74.00	-28.448	PK
4824	50.48	329	127	H	33.795	9.120	38.20	55.195	74.00	-18.805	PK
4824	43.14	144	160	V	33.842	9.120	38.20	47.902	54.00	-6.098	Ave
4824	38.58	329	127	H	33.795	9.120	38.20	43.295	54.00	-10.705	Ave
7236	48.27	148	125	V	38.471	10.620	37.68	59.681	74.00	-14.319	PK
7236	47.96	320	158	H	38.523	10.620	37.68	59.423	74.00	-14.577	PK
7236	32.87	148	125	V	38.471	10.620	37.68	44.281	54.00	-9.719	Ave
7236	32.95	320	148	H	38.523	10.620	37.68	44.413	54.00	-9.587	Ave
9648	48.46	153	133	V	38.588	12.840	38.16	61.728	74.00	-12.272	PK
9648	48.83	337	148	H	38.573	12.840	38.16	62.083	74.00	-11.917	PK
9648	34.06	153	133	V	38.471	12.840	38.16	47.211	54.00	-6.789	Ave
9648	34.14	337	148	H	38.523	12.840	38.16	47.343	54.00	-6.657	Ave
Middle Channel : 2437 MHz											
2437	69.95	293	229	V	28.444	6.650	-	105.044	-	-	PK
2437	70.24	245	174	H	28.461	6.650	-	105.351	-	-	PK
2437	58.69	293	229	V	28.444	6.650	-	93.784	-	-	Ave
2437	66.53	245	174	H	28.461	6.650	-	101.641	-	-	Ave
4874	51.46	157	145	V	33.842	9.120	38.2	56.222	74	-17.778	PK
4874	49.82	333	115	H	33.795	9.120	38.2	54.535	74	-19.465	PK
4874	44.36	157	145	V	33.842	9.120	38.2	49.122	54	-4.878	Ave
4874	39.82	333	115	H	33.795	9.120	38.2	44.535	54	-9.465	Ave
7311	46.58	137	141	V	38.299	10.870	37.68	58.069	74	-15.931	PK
7311	46.58	331	170	H	38.214	10.870	37.68	57.984	74	-16.016	PK
7311	31.95	137	141	V	38.299	10.870	37.68	43.439	54	-10.561	Ave
7311	31.97	331	170	H	38.214	10.870	37.68	43.374	54	-10.626	Ave
9748	48.98	143	147	V	39.739	12.810	38.31	63.219	74	-10.781	PK
9748	48.74	313	152	H	39.730	12.810	38.31	62.970	74	-11.030	PK
9748	33.55	143	147	V	39.739	12.810	38.31	47.789	54	-6.211	Ave
9748	34.07	313	152	H	39.730	12.810	38.31	48.300	54	-5.700	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 (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel : 2462 MHz											
2462	64.18	317	102	V	28.444	6.650	-	99.274	-	-	PK
2462	70.36	259	135	H	28.461	6.650	-	105.471	-	-	PK
2462	60.57	317	102	V	28.444	6.650	-	95.664	-	-	Ave
2462	66.42	259	135	H	28.461	6.650	-	101.531	-	-	Ave
2483.5	28.83	317	102	V	28.218	6.650	-	63.698	74	-10.302	PK
2483.5	33.5	259	135	H	28.125	6.650	-	68.275	74	-5.725	PK
2483.5	14.33	317	102	V	28.218	6.650	-	49.198	54	-4.802	Ave
2483.5	14.83	259	135	H	28.125	6.650	-	49.605	54	-4.395	Ave
4924	51.88	141	120	V	33.873	8.940	38.1	56.593	74	-17.407	PK
4924	49.81	338	107	H	33.888	8.940	38.1	54.538	74	-19.462	PK
4924	45.56	141	120	V	33.873	8.940	38.1	50.273	54	-3.727	Ave
4924	39.61	338	107	H	33.888	8.940	38.1	44.338	54	-9.662	Ave
7386	47.25	164	130	V	38.299	10.870	37.68	58.739	74	-15.261	PK
7386	47.15	316	162	H	38.214	10.870	37.68	58.554	74	-15.446	PK
7386	32.57	164	130	V	38.299	10.870	37.68	44.059	54	-9.941	Ave
7386	32.54	316	162	H	38.214	10.870	37.68	43.944	54	-10.056	Ave
9848	48.24	165	148	V	39.739	13.560	38.31	63.229	74	-10.771	PK
9848	48.07	321	128	H	39.736	13.560	38.31	63.056	74	-10.944	PK
9848	33.83	165	148	V	39.739	13.560	38.31	48.819	54	-5.181	Ave
9848	33.82	321	128	H	39.736	13.560	38.31	48.806	54	-5.194	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 (PK/Ave)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
2412	52.35	295	236	V	28.444	6.650	-	87.444	-	-	PK
2412	60.35	246	174	H	28.461	6.650	-	95.461	-	-	PK
2412	40.18	295	236	V	28.444	6.650	-	75.274	-	-	Ave
2412	48.31	246	174	H	28.461	6.650	-	83.421	-	-	Ave
2341	29.23	295	236	V	28.218	6.650	-	64.098	74	-9.902	Peak
2336	29.61	246	174	H	28.125	6.650	-	64.385	74	-9.615	Peak
2361	14.66	295	236	V	28.218	6.650	-	49.528	54	-4.472	Ave
2361	14.63	246	174	H	28.125	6.650	-	49.405	54	-4.595	Ave
4824	48.58	304	108	V	33.842	9.120	38.2	53.342	74	-20.658	PK
4824	48.3	249	183	H	33.795	9.120	38.2	53.015	74	-20.985	PK
4824	33.39	304	108	V	33.842	9.120	38.2	38.152	54	-15.848	Ave
4824	33.91	249	183	H	33.795	9.120	38.2	38.625	54	-15.375	Ave
7236	47.9	309	136	V	38.471	10.620	37.68	59.311	74	-14.689	PK
7236	47.42	251	141	H	38.523	10.620	37.68	58.883	74	-15.117	PK
7236	32.41	309	136	V	38.471	10.620	37.68	43.821	54	-10.179	Ave
7236	32.45	251	141	H	38.523	10.620	37.68	43.913	54	-10.087	Ave
9648	49.07	330	145	V	38.588	12.840	38.16	62.338	74	-11.662	PK
9648	48.8	255	141	H	38.573	12.840	38.16	62.053	74	-11.947	PK
9648	33.96	330	145	V	38.471	12.840	38.16	47.111	54	-6.889	Ave
9648	33.97	255	141	H	38.523	12.840	38.16	47.173	54	-6.827	Ave
Middle Channel : 2437											
2437	51.51	294	203	V	28.444	6.650	-	86.604	-	-	PK
2437	59.51	248	173	H	28.461	6.650	-	94.621	-	-	PK
2437	39.5	294	204	V	28.444	6.650	-	74.594	-	-	Ave
2437	47.84	248	173	H	28.461	6.650	-	82.951	-	-	Ave
4874	47.85	313	139	V	33.842	9.120	38.2	52.612	74	-21.388	PK
4874	48.22	248	156	H	33.795	9.120	38.2	52.935	74	-21.065	PK
4874	33.11	313	139	V	33.842	9.120	38.2	37.872	54	-16.128	Ave
4874	33.09	248	156	H	33.795	9.120	38.2	37.805	54	-16.195	Ave
7311	46.5	317	148	V	38.299	10.620	37.68	57.739	74	-16.261	PK
7311	46.68	255	149	H	38.214	10.620	37.68	57.834	74	-16.166	PK
7311	31.41	317	148	V	38.299	10.620	37.68	42.649	54	-11.351	Ave
7311	31.4	255	149	H	38.214	10.620	37.68	42.554	54	-11.446	Ave
9748	48.27	314	138	V	39.739	12.810	38.31	62.509	74	-11.491	PK
9748	48.65	242	129	H	39.730	12.810	38.31	62.880	74	-11.120	PK
9748	33.55	314	138	V	39.739	12.810	38.31	47.789	54	-6.211	Ave
9748	33.51	242	129	H	39.730	12.810	38.31	47.740	54	-6.260	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 (PK/Ave)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel : 2462 MHz											
2462	51.37	320	103	V	28.444	6.650	-	86.464	-	-	PK
2462	59.39	245	133	H	28.461	6.650	-	94.501	-	-	PK
2462	39.75	320	103	V	28.444	6.650	-	74.844	-	-	Ave
2462	48.2	245	133	H	28.461	6.650	-	83.311	-	-	Ave
2483.5	28.57	320	103	V	28.218	6.650	-	63.438	74	-10.562	PK
2483.5	29.13	245	133	H	28.125	6.650	-	63.905	74	-10.095	PK
2483.5	14.2	320	103	V	28.218	6.650	-	49.068	54	-4.932	Ave
2483.5	14.34	245	133	H	28.125	6.650	-	49.115	54	-4.885	Ave
4924	48.3	316	130	V	33.873	8.940	38.1	53.013	74	-20.987	PK
4924	48.39	248	153	H	33.888	8.940	38.1	53.118	74	-20.882	PK
4924	33.23	316	130	V	33.873	8.940	38.1	37.943	54	-16.057	Ave
4924	33.63	248	153	H	33.888	8.940	38.1	38.358	54	-15.642	Ave
7386	46.83	320	143	V	38.299	10.620	37.68	58.069	74	-15.931	PK
7386	46.87	269	139	H	38.214	10.620	37.68	58.024	74	-15.976	PK
7386	32.5	320	143	V	38.299	10.620	37.68	43.739	54	-10.261	Ave
7386	32.48	269	139	H	38.214	10.620	37.68	43.634	54	-10.366	Ave
9848	48.11	324	137	V	39.739	13.560	38.31	63.099	74	-10.901	PK
9848	48.15	258	145	H	39.730	13.560	38.31	63.130	74	-10.870	PK
9848	33.72	324	137	V	39.739	13.560	38.31	48.709	54	-5.291	Ave
9848	33.31	258	145	H	39.730	13.560	38.31	48.290	54	-5.710	Ave

802.11n20 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 (PK/Ave)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel : 2412 MHz											
2412	51.13	293	238	V	28.444	6.650	-	86.224	-	-	PK
2412	59.03	245	138	H	28.461	6.650	-	94.141	-	-	PK
2412	39.39	293	238	V	28.444	6.650	-	74.484	-	-	Ave
2412	47.6	245	138	H	28.461	6.650	-	82.711	-	-	Ave
2341	29.05	293	238	V	28.218	6.650	-	63.918	74	-10.082	PK
2336	28.78	245	138	H	28.125	6.650	-	63.555	74	-10.445	PK
2361	14.51	293	238	V	28.218	6.650	-	49.378	54	-4.622	Ave
2361	14.98	245	138	H	28.125	6.650	-	49.755	54	-4.245	Ave
4824	48.38	299	223	V	33.842	9.120	38.2	53.142	74	-20.858	PK
4824	48.58	246	140	H	33.795	9.120	38.2	53.295	74	-20.705	PK
4824	33.74	299	233	V	33.842	9.120	38.2	38.502	54	-15.498	Ave
4824	33.8	246	140	H	33.795	9.120	38.2	38.515	54	-15.485	Ave
7236	47.98	294	233	V	38.471	10.620	37.68	59.391	74	-14.609	PK
7236	47.64	243	140	H	38.523	10.620	37.68	59.103	74	-14.897	PK
7236	32.37	294	233	V	38.471	10.620	37.68	43.781	54	-10.219	Ave
7236	32.39	243	140	H	38.523	10.620	37.68	43.853	54	-10.147	Ave
9648	48.64	290	224	V	38.588	12.840	38.16	61.908	74	-12.092	PK
9648	49.06	256	144	H	38.573	12.840	38.16	62.313	74	-11.687	PK
9648	33.52	290	224	V	38.471	12.840	38.16	46.671	54	-7.329	Ave
9648	33.53	256	144	H	38.523	12.840	38.16	46.733	54	-7.267	Ave
Middle Channel : 2437 MHz											
2437	50.74	292	238	V	28.444	6.650	-	85.834	-	-	PK
2437	59.5	242	137	H	28.461	6.650	-	94.611	-	-	PK
2437	38.62	292	238	V	28.444	6.650	-	73.714	-	-	Ave
2437	47.45	242	137	H	28.461	6.650	-	82.561	-	-	Ave
4874	48.47	301	235	V	33.842	9.120	38.2	53.232	74	-20.768	PK
4874	47.84	251	148	H	33.795	9.120	38.2	52.555	74	-21.445	PK
4874	33.05	301	235	V	33.842	9.120	38.2	37.812	54	-16.188	Ave
4874	33.02	251	148	H	33.795	9.120	38.2	37.735	54	-16.265	Ave
7311	46.34	294	232	V	38.299	10.620	37.68	57.579	74	-16.421	PK
7311	46.72	259	147	H	38.214	10.620	37.68	57.874	74	-16.126	PK
7311	31.3	294	232	V	38.299	10.620	37.68	42.539	54	-11.461	Ave
7311	31.34	259	147	H	38.214	10.620	37.68	42.494	54	-11.506	Ave
9748	48.25	292	221	V	39.739	12.810	38.31	62.489	74	-11.511	PK
9748	48.42	244	148	H	39.730	12.810	38.31	62.650	74	-11.35	PK
9748	33.5	292	221	V	39.739	12.810	38.31	47.739	54	-6.261	Ave
9748	33.51	244	148	H	39.730	12.810	38.31	47.740	54	-6.26	Ave

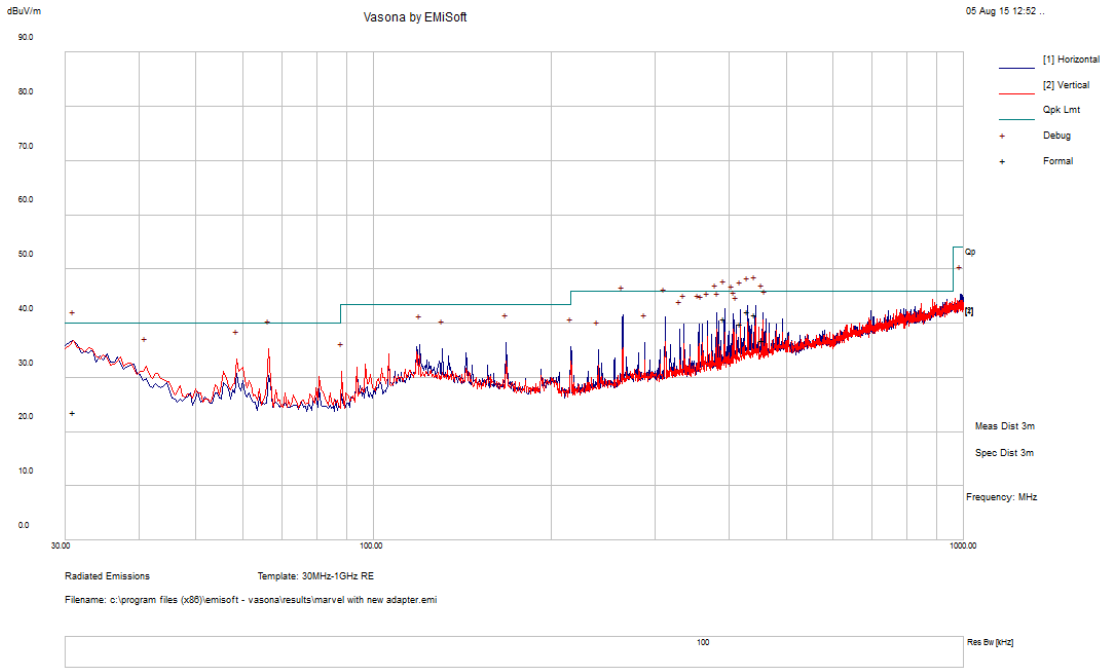
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments (PK/Ave)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel : 2462 MHz											
2462	50.24	240	321	V	28.444	6.650	-	85.334	-	-	PK
2462	59.46	134	245	H	28.461	6.650	-	94.571	-	-	PK
2462	38.7	240	321	V	28.444	6.650	-	73.794	-	-	Ave
2462	47.74	134	245	H	28.461	6.650	-	82.851	-	-	Ave
2483.5	28.51	240	321	V	28.218	6.650	-	63.378	74	-10.622	PK
2483.5	29.27	134	245	H	28.125	6.650	-	64.045	74	-9.955	PK
2483.5	14.57	240	321	V	28.218	6.650	-	49.438	54	-4.562	Ave
2483.5	14.25	134	245	H	28.125	6.650	-	49.025	54	-4.975	Ave
4924	48.37	309	236	V	33.873	8.940	38.1	53.083	74	-20.917	PK
4924	48.49	257	147	H	33.888	8.940	38.1	53.218	74	-20.782	PK
4924	33.2	309	236	V	33.873	8.940	38.1	37.913	54	-16.087	Ave
4924	33.12	257	147	H	33.888	8.940	38.1	37.848	54	-16.152	Ave
7386	46.83	305	225	V	38.299	10.620	37.68	58.069	74	-15.931	PK
7386	46.89	270	152	H	38.214	10.620	37.68	58.044	74	-15.956	PK
7386	31.98	305	225	V	38.299	10.620	37.68	43.219	54	-10.781	Ave
7386	31.98	270	152	H	38.214	10.620	37.68	43.134	54	-10.866	Ave
9848	48.7	311	215	V	39.739	13.560	38.31	63.689	74	-10.311	PK
9848	48.31	305	147	H	39.730	13.560	38.31	63.290	74	-10.710	PK
9848	33.24	311	215	V	39.739	13.560	38.31	48.229	54	-5.771	Ave
9848	33.24	305	147	H	39.730	13.560	38.31	48.220	54	-5.780	Ave

802.11n40 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 (PK/Ave)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel : 2422 MHz											
2422	55.7	289	236	V	28.444	6.650	-	90.794	-	-	PK
2422	63	247	173	H	28.461	6.650	-	98.111	-	-	PK
2422	44.37	289	236	V	28.444	6.650	-	79.464	-	-	Ave
2422	52.32	247	173	H	28.461	6.650	-	87.431	-	-	Ave
2341	27.17	289	236	V	28.218	6.650	-	62.038	74	-11.962	PK
2336	28.62	247	173	H	28.125	6.650	-	63.395	74	-10.605	PK
2361	14.75	289	236	V	28.218	6.650	-	49.618	54	-4.382	Ave
2361	15.2	247	173	H	28.125	6.650	-	49.975	54	-4.025	Ave
4844	48.67	293	231	V	33.842	9.120	38.2	53.432	74	-20.568	PK
4844	48.26	248	165	H	33.795	9.120	38.2	52.975	74	-21.025	PK
4844	33.34	293	231	V	33.842	9.120	38.2	38.102	54	-15.898	Ave
4844	33.33	248	165	H	33.795	9.120	38.2	38.045	54	-15.955	Ave
7266	46.48	296	235	V	38.471	10.620	37.68	57.891	74	-16.109	PK
7266	47.18	253	168	H	38.523	10.620	37.68	58.643	74	-15.357	PK
7266	32.05	296	235	V	38.471	10.620	37.68	43.461	54	-10.539	Ave
7266	32.15	253	168	H	38.523	10.620	37.68	43.613	54	-10.387	Ave
9688	48.45	288	241	V	38.588	12.840	38.16	61.718	74	-12.282	PK
9688	48.66	252	165	H	38.573	12.840	38.16	61.913	74	-12.087	PK
9688	34.04	288	241	V	38.471	12.840	38.16	47.191	54	-6.809	Ave
9688	34.07	252	165	H	38.523	12.840	38.16	47.273	54	-6.727	Ave
Middle Channel : 2437											
2437	56.68	292	230	V	28.444	6.650	-	91.774	-	-	PK
2437	64.16	245	173	H	28.461	6.650	-	99.271	-	-	PK
2437	45.79	292	230	V	28.444	6.650	-	80.884	-	-	Ave
2437	53.02	245	173	H	28.461	6.650	-	88.131	-	-	Ave
4874	48.04	292	236	V	33.842	9.120	38.2	52.802	74	-21.198	PK
4874	48.21	282	166	H	33.795	9.120	38.2	52.925	74	-21.075	PK
4874	33.47	292	236	V	33.842	9.120	38.2	38.232	54	-15.768	Ave
4874	32.94	282	166	H	33.795	9.120	38.2	37.655	54	-16.345	Ave
7311	46.42	295	234	V	38.299	10.620	37.68	57.659	74	-16.341	PK
7311	46.32	242	178	H	38.214	10.620	37.68	57.474	74	-16.526	PK
7311	31.24	295	234	V	38.299	10.620	37.68	42.479	54	-11.521	Ave
7311	31.69	242	178	H	38.214	10.620	37.68	42.844	54	-11.156	Ave
9748	48.46	290	230	V	39.739	12.810	38.31	62.699	74	-11.301	PK
9748	48.7	255	179	H	39.730	12.810	38.31	62.930	74	-11.070	PK
9748	33.47	290	230	V	39.739	12.810	38.31	47.709	54	-6.291	Ave
9748	33.49	255	179	H	39.730	12.810	38.31	47.720	54	-6.280	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 (PK/Ave)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel : 2452 MHz											
2452	56.76	321	104	V	28.444	6.650	-	91.854	-	-	PK
2452	65.12	242	173	H	28.461	6.650	-	100.231	-	-	PK
2452	45.47	321	104	V	28.444	6.650	-	80.564	-	-	Ave
2452	53.95	242	173	H	28.461	6.650	-	89.061	-	-	Ave
2483.5	29.34	321	104	V	28.218	6.650	-	64.208	74	-9.792	PK
2483.5	30.83	242	173	H	28.125	6.650	-	65.605	74	-8.395	PK
2483.5	14.48	321	104	V	28.218	6.650	-	49.348	54	-4.652	Ave
2483.5	15.62	242	173	H	28.125	6.650	-	50.395	54	-3.605	Ave
4904	48.98	291	234	V	33.873	8.940	38.1	53.693	74	-20.307	PK
4904	48.21	243	167	H	33.888	8.940	38.1	52.938	74	-21.062	PK
4904	33.8	291	234	V	33.873	8.940	38.1	38.513	54	-15.487	Ave
4904	33.79	243	167	H	33.888	8.940	38.1	38.518	54	-15.482	Ave
7356	45.53	297	227	V	38.299	10.620	37.68	56.769	74	-17.231	PK
7356	45.71	254	175	H	38.214	10.620	37.68	56.864	74	-17.136	PK
7356	30.91	297	227	V	38.299	10.620	37.68	42.149	54	-11.851	Ave
7356	30.9	254	175	H	38.214	10.620	37.68	42.054	54	-11.946	Ave
9808	47.94	305	230	V	39.739	13.560	38.31	62.929	74	-11.071	PK
9808	48.15	257	166	H	39.730	13.560	38.31	63.130	74	-10.87	PK
9808	33.8	305	230	V	39.739	13.560	38.31	48.789	54	-5.211	Ave
9808	33.36	257	166	H	39.730	13.560	38.31	48.340	54	-5.66	Ave

3) 30 MHz – 1 GHz @ 2.4 GHz BLE Mode



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comments (PK/QP/Ave.)
430.5738	42.25	226	H	156	46	-3.75	QP
443.0405	41.70	216	H	140	46	-4.30	QP
393.127	40.91	103	H	157	46	-5.09	QP
418.0938	40.07	265	H	152	46	-5.93	QP
455.9985	37.05	225	H	165	46	-8.95	QP
31.02525	23.74	173	H	150	40	-16.26	QP

4) 1 – 25 GHz @ 2.4 GHz BLE 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 (PK/Ave)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel : 2402 MHz											
2402	68.05	118	100	V	28.444	3.430	-	99.924	-	-	PK
2402	68.77	74	145	H	28.461	3.430	-	100.661	-	-	PK
2402	42.35	118	100	V	28.444	3.430	-	74.224	-	-	Ave
2402	46.78	74	145	H	28.461	3.430	-	78.671	-	-	Ave
2332	26.37	118	100	V	28.444	3.430	-	58.244	74	-15.756	PK
2369	26	74	145	H	28.461	3.430	-	57.891	74	-16.109	PK
2364	12.6	118	100	V	28.444	3.430	-	44.474	54	-9.526	Ave
2382	12.64	74	145	H	28.461	3.430	-	44.531	54	-9.469	Ave
4804	47.8	138	100	V	33.842	5.340	38.01	48.972	74	-25.028	PK
4804	48.18	72	146	H	33.795	5.340	38.01	49.305	74	-24.695	PK
4804	33.04	138	100	V	33.842	5.340	38.01	34.212	54	-19.788	Ave
4804	33.1	72	146	H	33.795	5.340	38.01	34.225	54	-19.775	Ave
7206	47.7	140	100	V	38.471	6.330	37.53	54.971	74	-19.029	PK
7206	47.56	74	141	H	38.523	6.330	37.53	54.883	74	-19.117	PK
7206	32.14	140	100	V	38.471	6.330	37.53	39.411	54	-14.589	Ave
7206	32.69	74	141	H	38.523	6.330	37.53	40.013	54	-13.987	Ave
9608	47.15	140	100	V	39.588	9.570	38	58.308	74	-15.692	PK
9608	47.02	74	141	H	39.573	9.570	38	58.163	74	-15.837	PK
9608	32.56	140	100	V	39.588	9.570	38	43.718	54	-10.282	Ave
9608	33.1	74	141	H	39.573	9.570	38	44.243	54	-9.757	Ave
Middle Channel : 2440											
2440	59.94	135	100	V	28.444	3.430	-	91.814	-	-	PK
2440	66.63	71	145	H	28.461	3.430	-	98.521	-	-	PK
2440	40.98	135	100	V	28.444	3.430	-	72.854	-	-	Ave
2440	45.2	71	145	H	28.461	3.430	-	77.091	-	-	Ave
4880	48.36	136	100	V	33.873	5.340	37.92	49.653	74	-24.347	PK
4880	48.83	77	142	H	33.888	5.340	37.92	50.138	74	-23.862	PK
4880	33.44	136	100	V	33.873	5.340	37.92	34.733	54	-19.267	Ave
4880	33.3	77	142	H	33.888	5.340	37.92	34.608	54	-19.392	Ave
7320	47.1	144	100	V	38.299	6.270	37.53	54.139	74	-19.861	PK
7320	48.14	77	144	H	38.314	6.270	37.53	55.194	74	-18.806	PK
7320	32.6	144	100	V	38.299	6.270	37.53	39.639	54	-14.361	Ave
7320	32.14	77	144	H	38.314	6.270	37.53	39.194	54	-14.806	Ave
9760	48.17	144	100	V	39.726	9.440	38.27	59.066	74	-14.934	PK
9760	47.36	77	144	H	39.730	9.440	38.27	58.260	74	-15.740	PK
9760	33.66	144	100	V	39.726	9.440	38.27	44.556	54	-9.444	Ave
9760	33.23	77	144	H	39.730	9.440	38.27	44.130	54	-9.870	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 (PK/Ave)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel : 2480 MHz											
2480	54.92	131	232	V	29.043	3.430	-	87.393	-	-	PK
2480	61.8	78	145	H	29.120	3.430	-	94.350	-	-	PK
2480	38.25	131	232	V	29.043	3.430	-	70.723	-	-	Ave
2480	42.22	78	145	H	29.120	3.430	-	74.770	-	-	Ave
2483.5	27.28	131	232	V	29.043	3.430	-	59.753	74	-14.247	PK
2483.5	28.22	78	145	H	29.120	3.430	-	60.770	74	-13.230	PK
2483.5	12.47	131	232	V	29.043	3.430	-	44.943	54	-9.057	Ave
2483.5	12.48	78	145	H	29.120	3.430	-	45.030	54	-8.970	Ave
4960	48.33	132	232	V	33.873	5.250	37.92	49.533	74	-24.467	PK
4960	48.24	73	143	H	33.888	5.250	37.92	49.458	74	-24.542	PK
4960	33.31	132	232	V	33.873	5.250	37.92	34.513	54	-19.487	Ave
4960	33.37	73	143	H	33.888	5.250	37.92	34.588	54	-19.412	Ave
7440	47.03	134	232	V	38.091	6.270	37.62	53.771	74	-20.229	PK
7440	47.18	77	146	H	38.115	6.270	37.62	53.945	74	-20.055	PK
7440	32.48	134	232	V	38.091	6.270	37.62	39.221	54	-14.779	Ave
7440	32.25	77	146	H	38.115	6.270	37.62	39.015	54	-14.985	Ave
9920	47.94	134	232	V	39.849	9.710	38.38	59.119	74	-14.881	PK
9920	48.37	77	146	H	39.844	9.710	38.38	59.544	74	-14.456	PK
9920	33.66	134	232	V	39.849	9.710	38.38	44.839	54	-9.161	Ave
9920	33.68	77	146	H	39.844	9.710	38.38	44.854	54	-9.146	Ave

8 FCC§15.247(a)(2) & IC RSS-247 §5.2 & RSS-Gen §6.6 - 6 dB & 99% Emission Bandwidth

8.1 Applicable Standards

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

According to IC RSS-247 §5.2, the following applies to the bands 902-928 MHz and 2400- 2483.5 MHz: The minimum 6 dB bandwidth shall be 500 kHz.

8.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r03: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 8: DTS bandwidth

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	MY48250238	09-03-2014	1 year
-	RF Cable	-	00609	06-05-2015	1year

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

8.4 Test Environmental Conditions

Temperature:	22 ºC
Relative Humidity:	42 %
ATM Pressure:	102.7 kPa

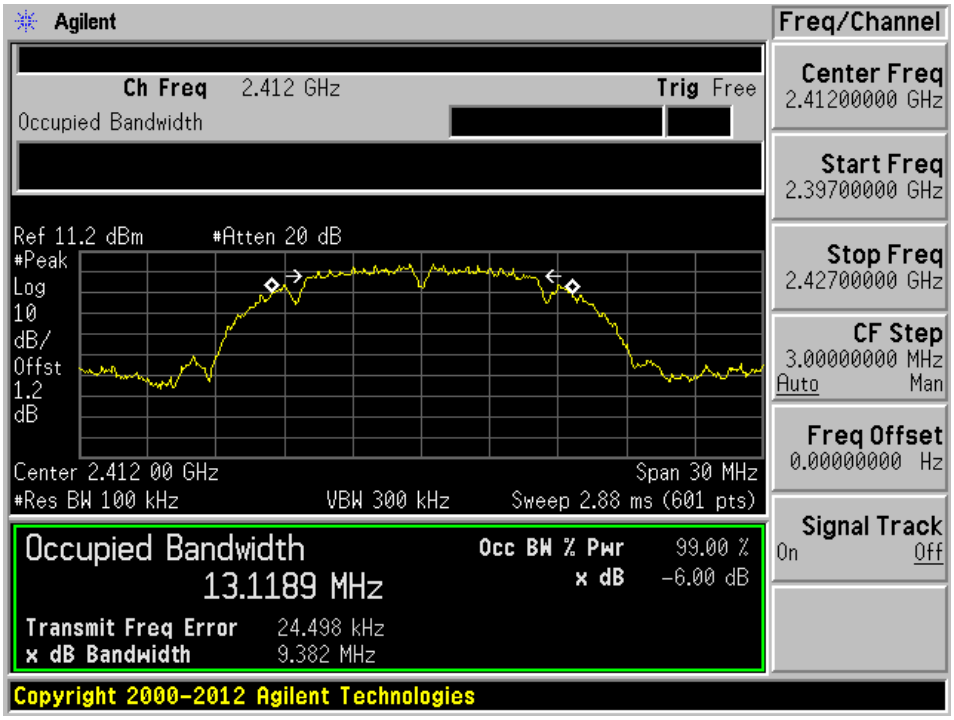
The testing was performed by Ronak Patel on 2015-07-12 to 2015-07-21 in RF site.

8.5 Test Results

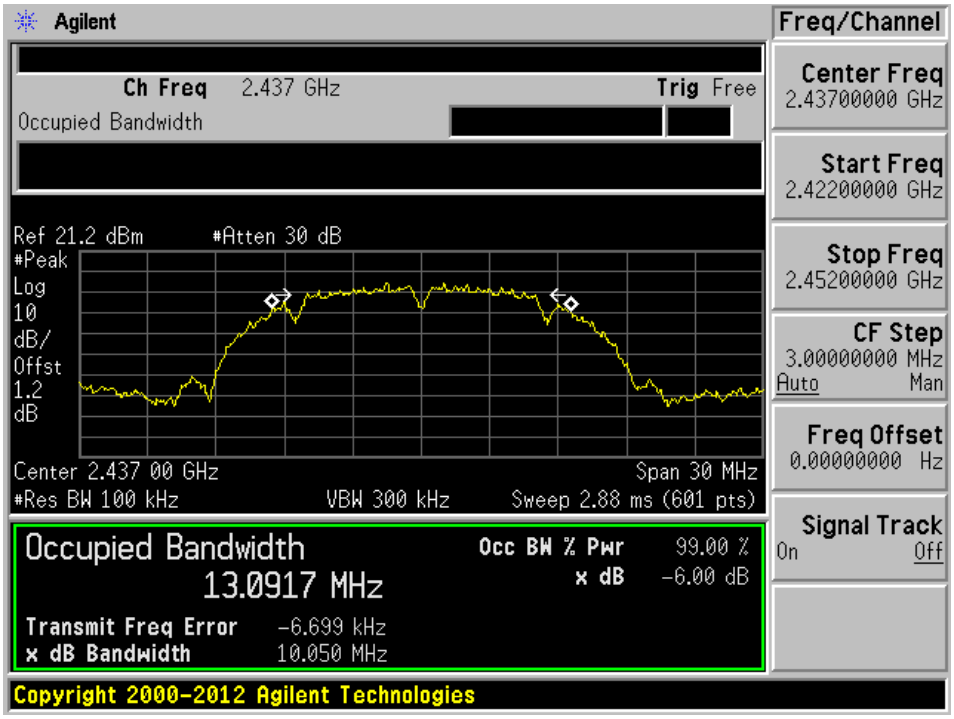
Channel	Frequency (MHz)	99% OBW (MHz)	6 dB OBW (MHz)	6 dB OBW Limit (kHz)	Result
802.11b					
Low	2412	13.1189	9.382	≥ 500	Pass
Middle	2437	13.0917	10.05	≥ 500	Pass
High	2462	13.1612	10.084	≥ 500	Pass
802.11g					
Low	2412	16.4389	16.585	≥ 500	Pass
Middle	2437	16.4344	16.606	≥ 500	Pass
High	2462	16.4284	16.544	≥ 500	Pass
802.11n20					
Low	2412	17.5739	17.718	≥ 500	Pass
Middle	2437	17.5847	17.752	≥ 500	Pass
High	2462	17.5582	17.701	≥ 500	Pass
802.11n40					
Low	2422	36.0022	36.477	≥ 500	Pass
Middle	2437	36.015	36.477	≥ 500	Pass
High	2452	36.0007	36.471	≥ 500	Pass
BLE					
Low	2402	1.0325	0.654312	≥ 500	Pass
Middle	2440	1.0326	0.65245	≥ 500	Pass
High	2480	1.0331	0.652283	≥ 500	Pass

Please refer to the following plots for detailed test results

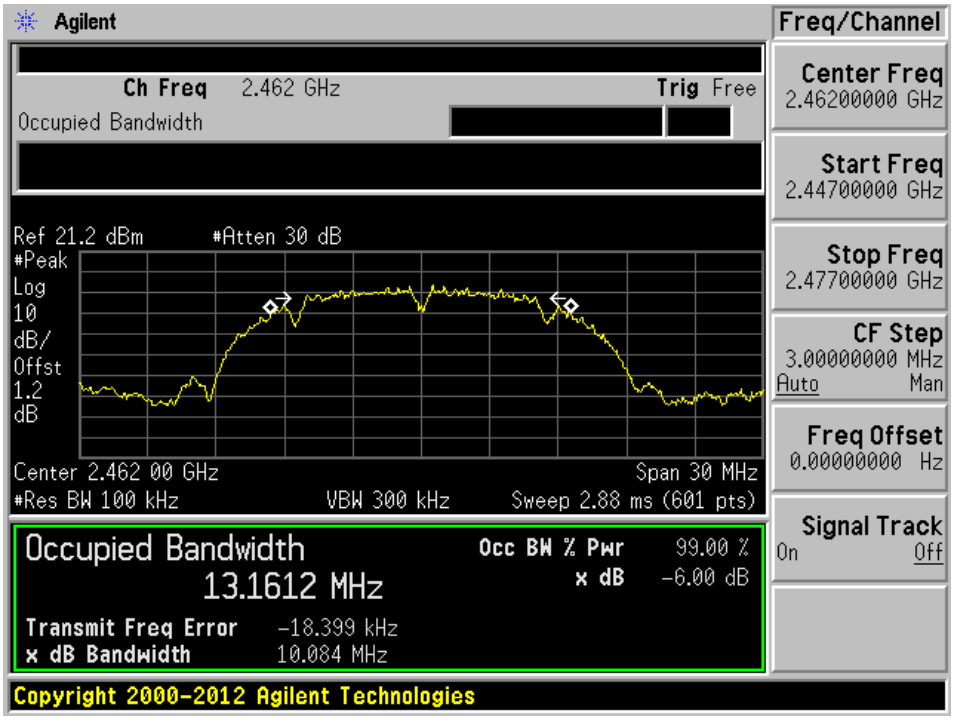
802.11b - 2412 MHz



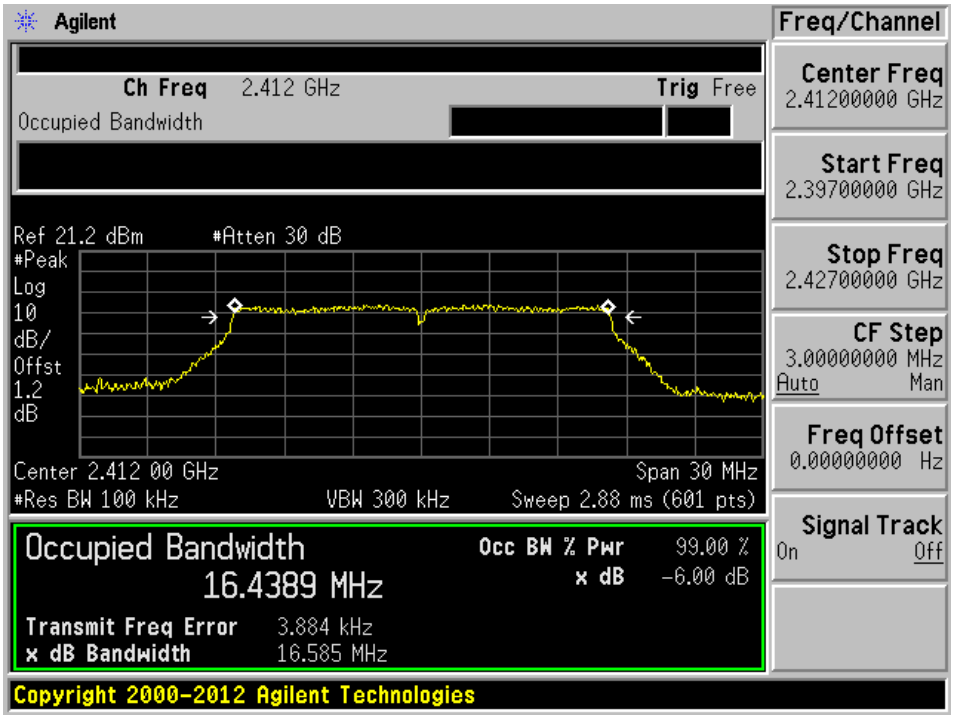
802.11b - 2437 MHz



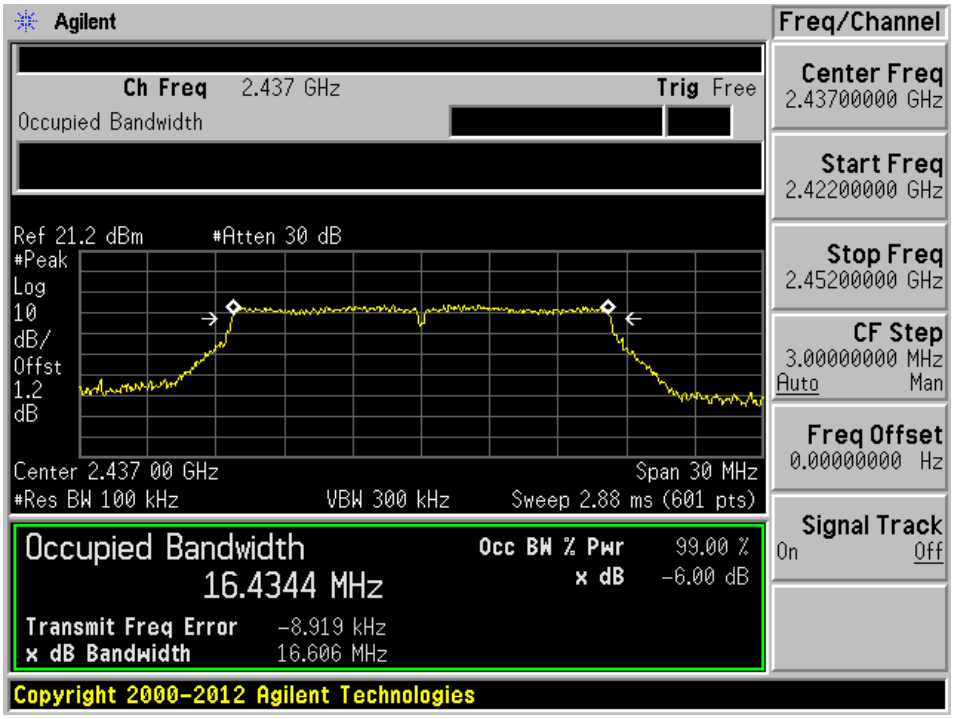
802.11b – 2462 MHz



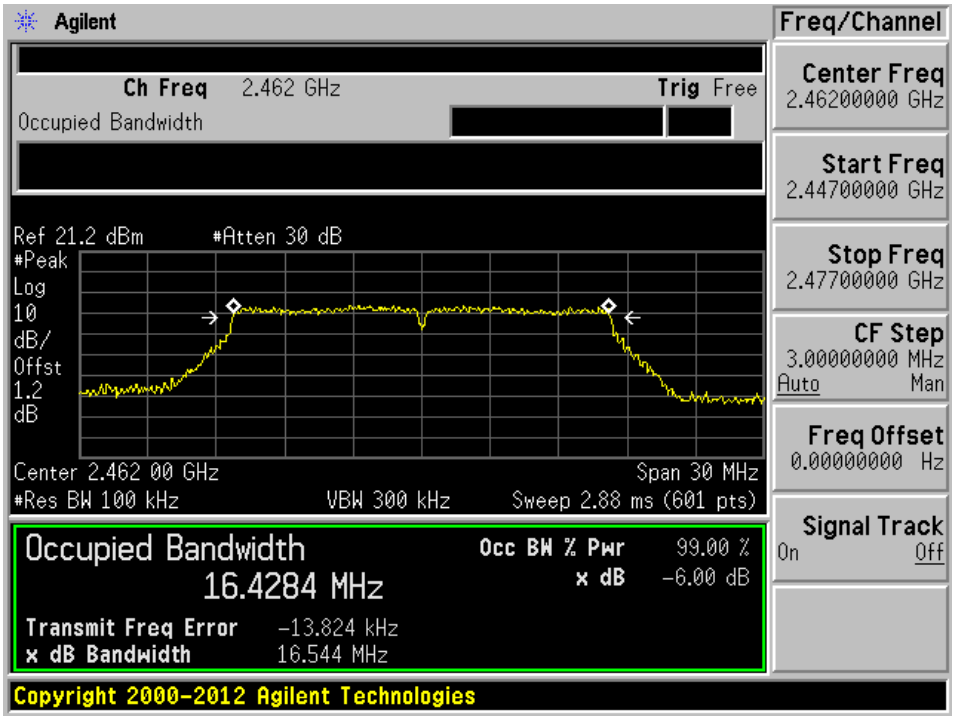
802.11g - 2412 MHz



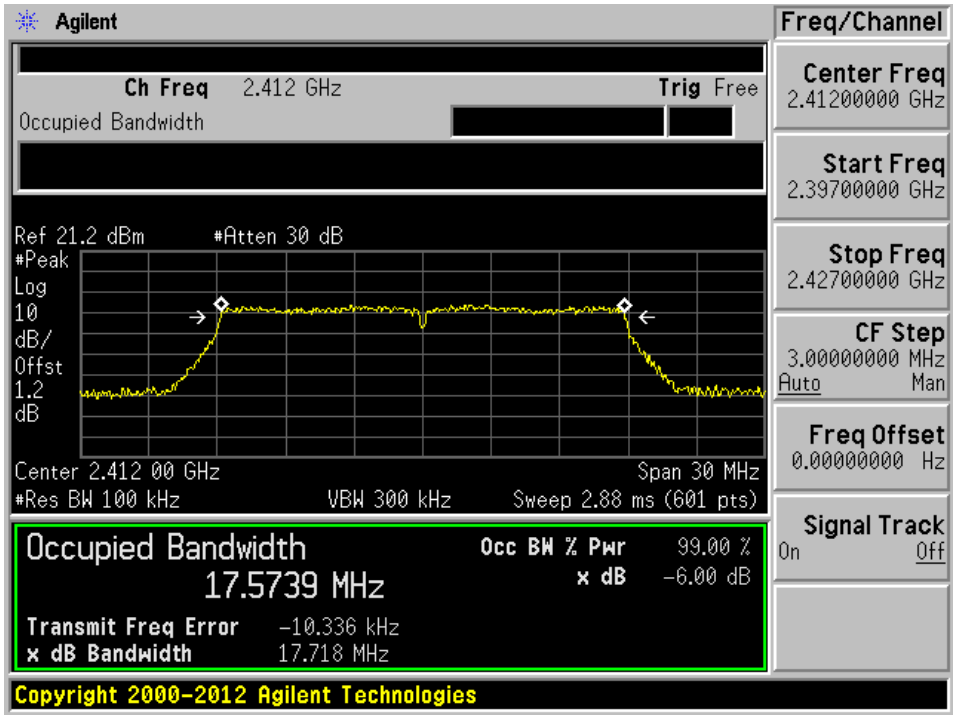
802.11g – 2437 MHz



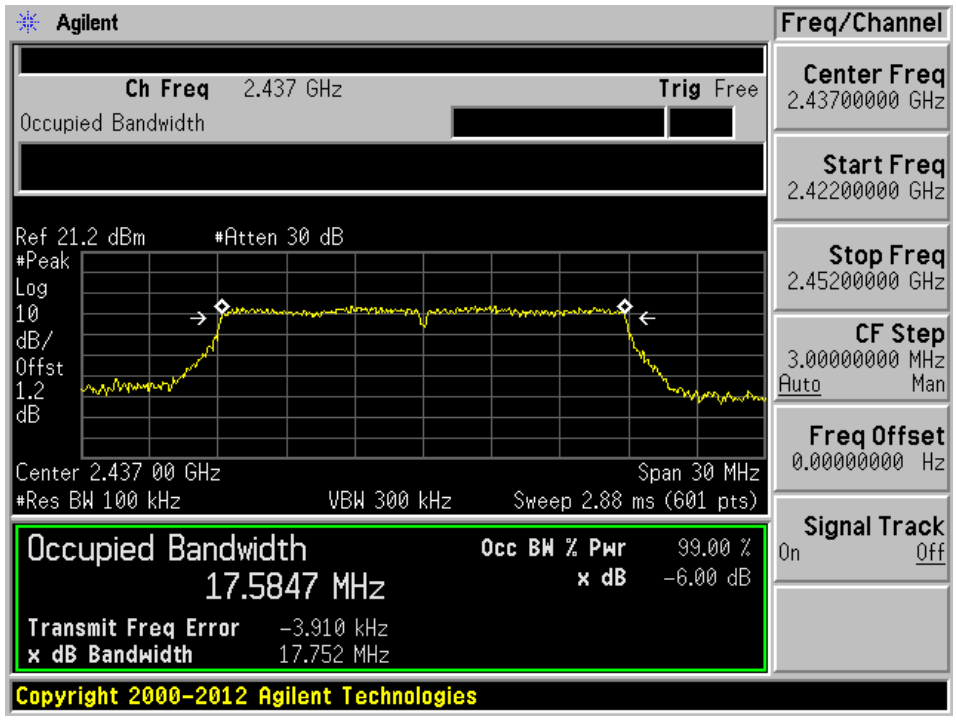
802.11g – 2462 MHz



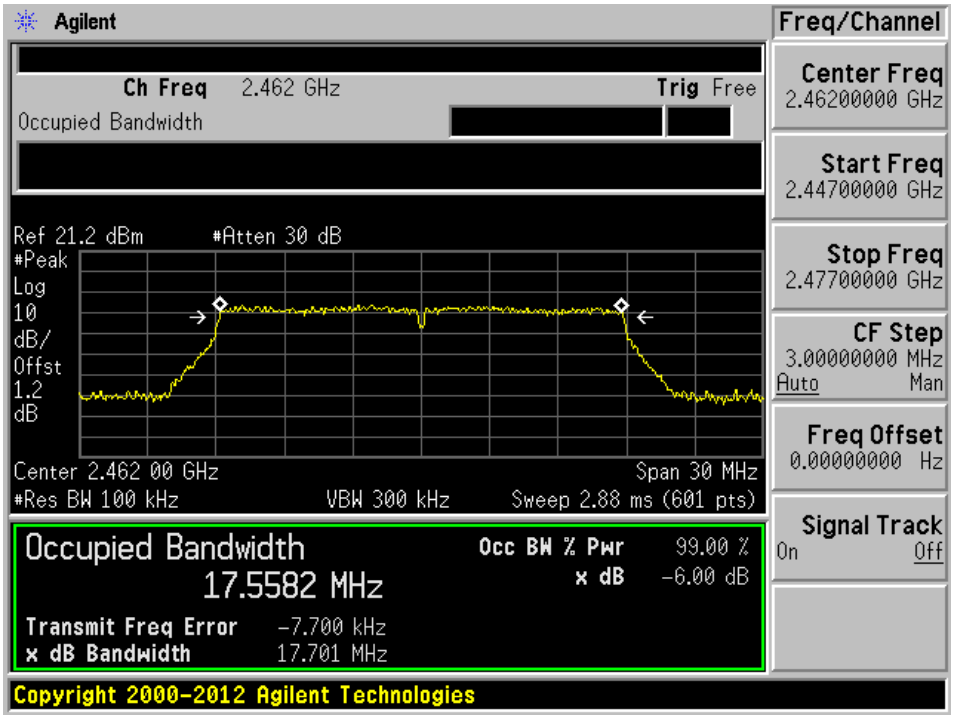
802.11n20 - 2412 MHz



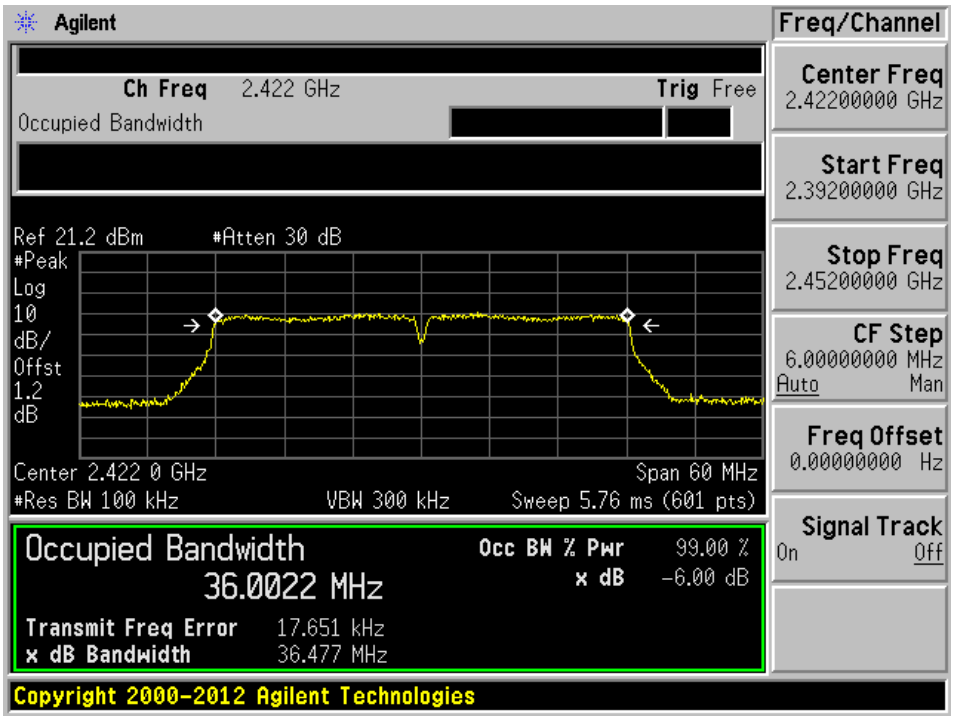
802.11n20 – 2437 MHz



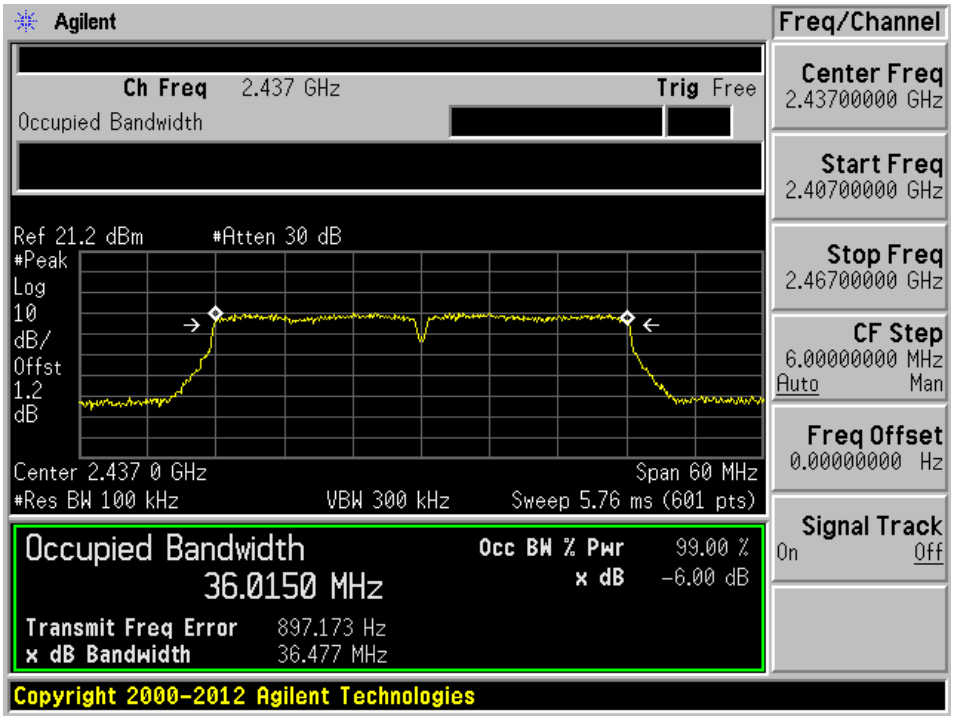
802.11n20 – 2462 MHz



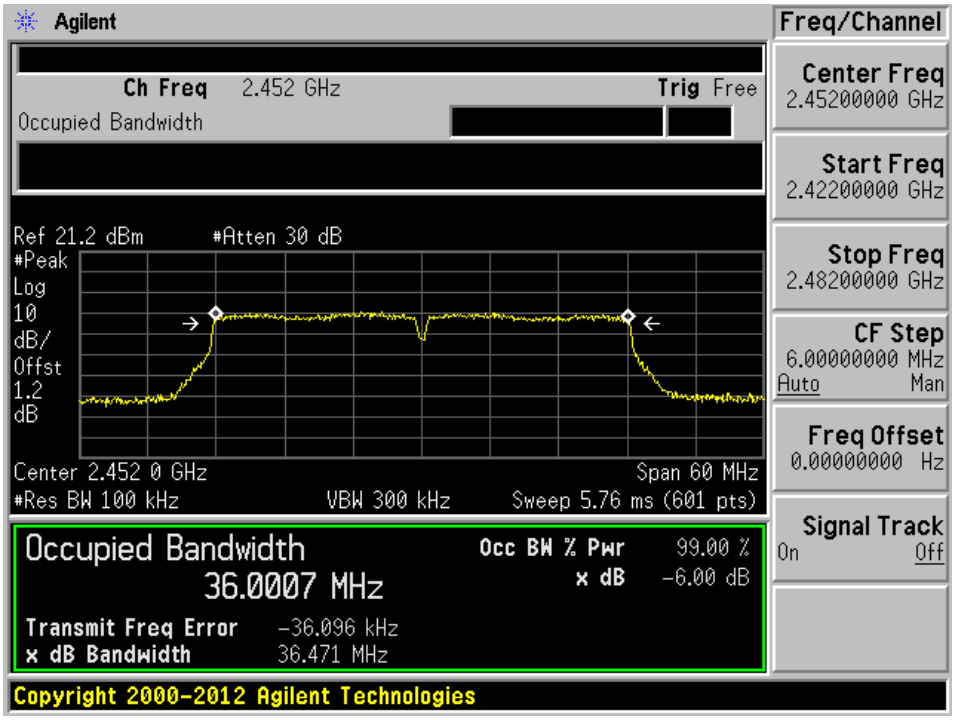
802.11n40 – 2422 MHz



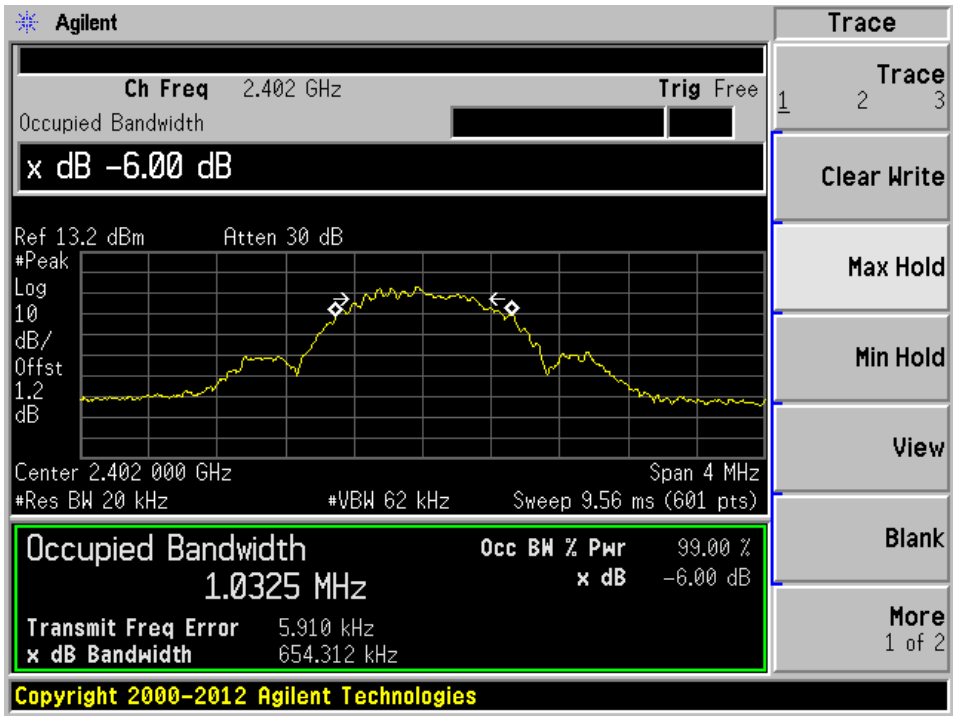
802.11n40 – 2437 MHz



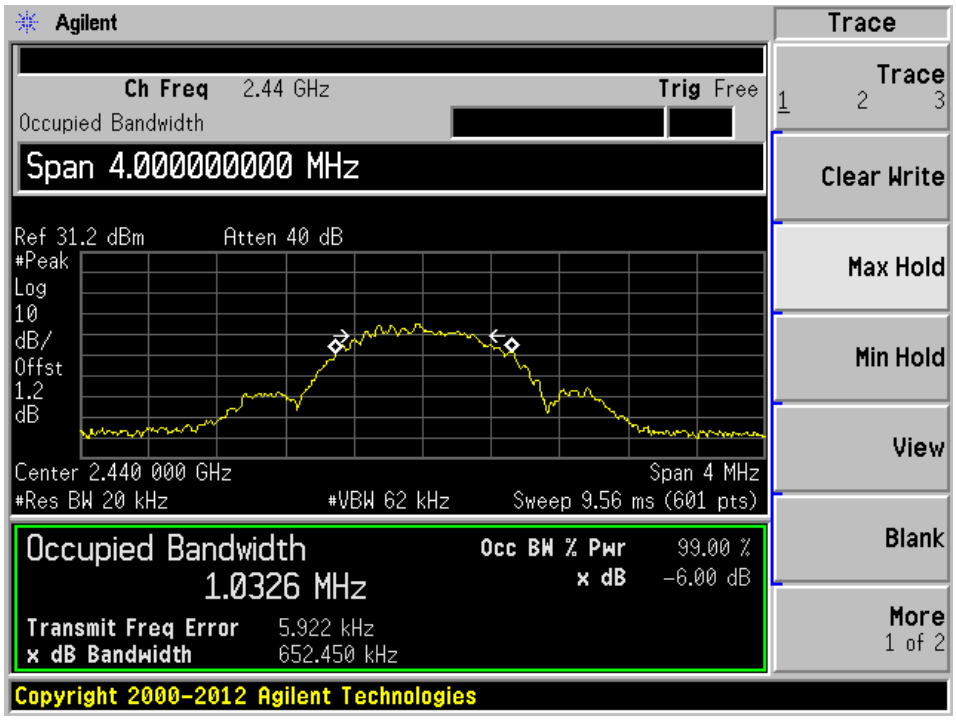
802.11n40 – 2452 MHz



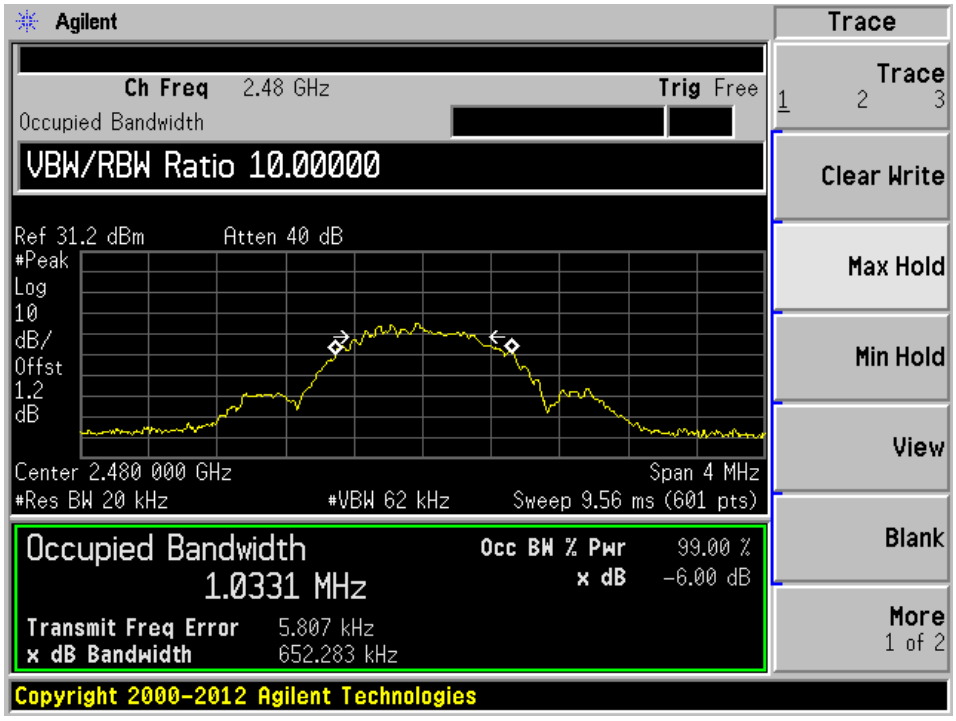
BLE – 2402 MHz



BLE – 2440 MHz



BLE – 2480 MHz


Agilent
Trace
Ch Freq 2.48 GHz
Trig Free
Occupied Bandwidth
VBW/RBW Ratio 10.00000
Ref 31.2 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
1.2
dB
Center 2.480 000 GHz
Span 4 MHz
#Res BW 20 kHz
#VBW 62 kHz
Sweep 9.56 ms (601 pts)
Occupied Bandwidth
1.0331 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error 5.807 kHz
x dB Bandwidth 652.283 kHz
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2
Copyright 2000-2012 Agilent Technologies

9 FCC §15.247(b) (3) & IC RSS-247 §5.4 - Output Power Measurement

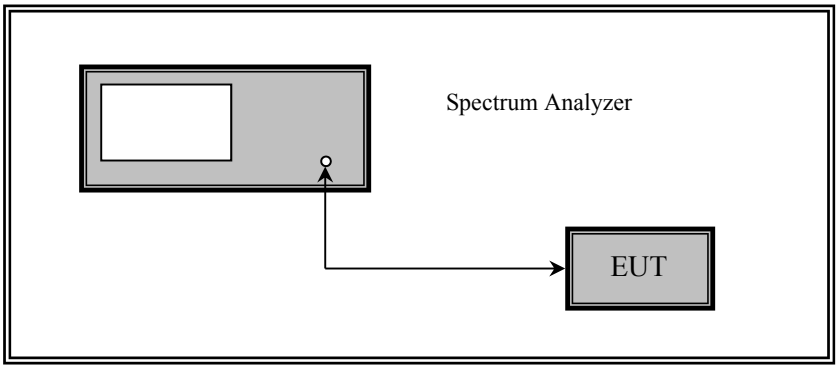
9.1 Applicable Standards

According to FCC §15.247(b) (3) for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

According to IC RSS-247 §5.4 (4), for DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W.

9.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r03: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 9: Fundamental emission output power



9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	MY48250238	09-03-2014	1 year
-	RF cable	-	00609	06-05-2015	1year

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:	21-24 º C
Relative Humidity:	40-44 %
ATM Pressure:	102.1-103.5 kPa

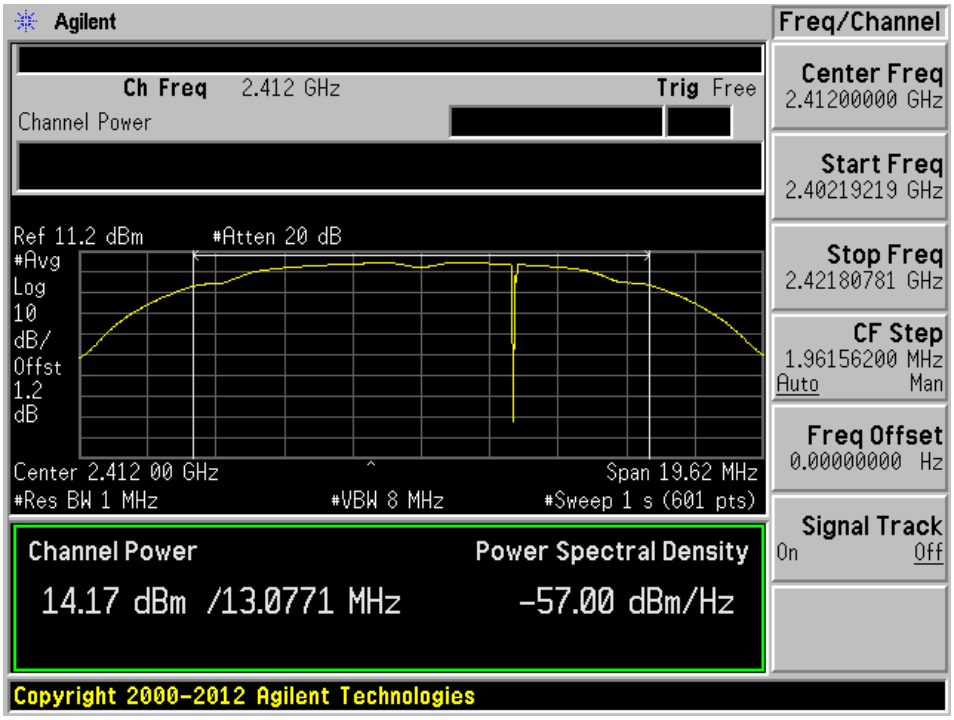
The testing was performed by Ronak Patel on 2015-07-09 to 2015-07-21 in RF site.

9.5 Test Results

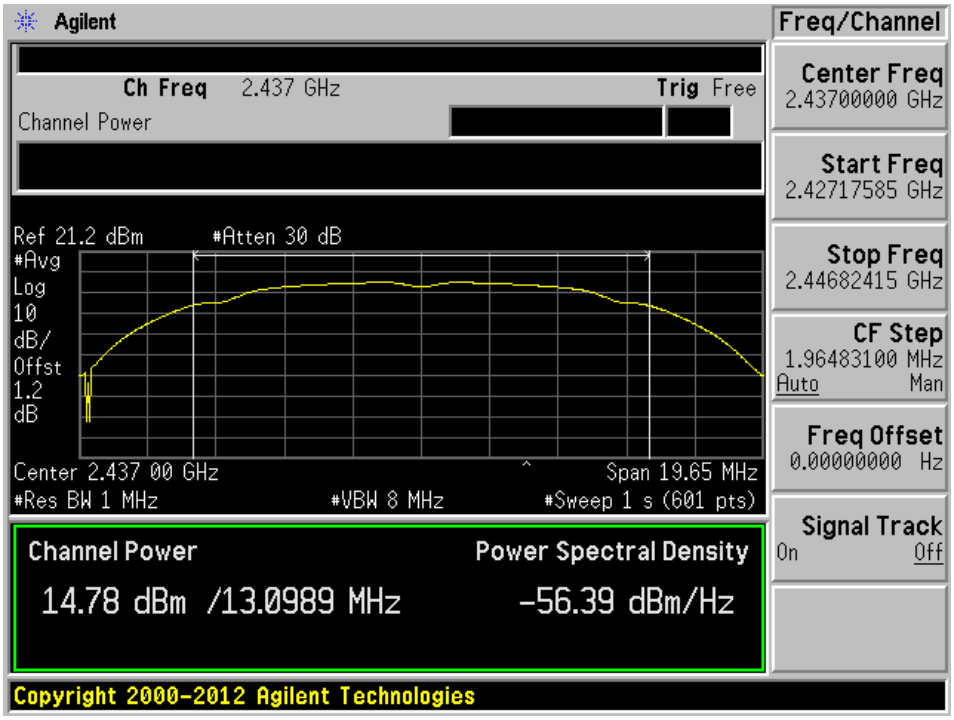
Channel	Frequency (MHz)	Conducted Output Power (dBm)	FCC/IC Limit (dBm)	Margin (dB)	Result
802.11b					
Low	2412	14.17	30	-15.83	Pass
Middle	2437	14.78	30	-15.22	Pass
High	2462	13.85	30	-16.15	Pass
802.11g					
Low	2412	9.01	30	-20.99	Pass
Middle	2437	8.59	30	-21.41	Pass
High	2462	8.57	30	-21.43	Pass
802.11n20					
Low	2412	9.01	30	-20.99	Pass
Middle	2437	8.78	30	-21.22	Pass
High	2462	8.79	30	-21.21	Pass
802.11n40					
Low	2422	8.4	30	-21.6	Pass
Middle	2437	8.15	30	-21.85	Pass
High	2452	8.38	30	-21.62	Pass
BLE					
Low	2402	1.97	30	-28.03	Pass
Middle	2440	2.13	30	-27.87	Pass
High	2480	1.62	30	-28.38	Pass

Please refer to the following plots.

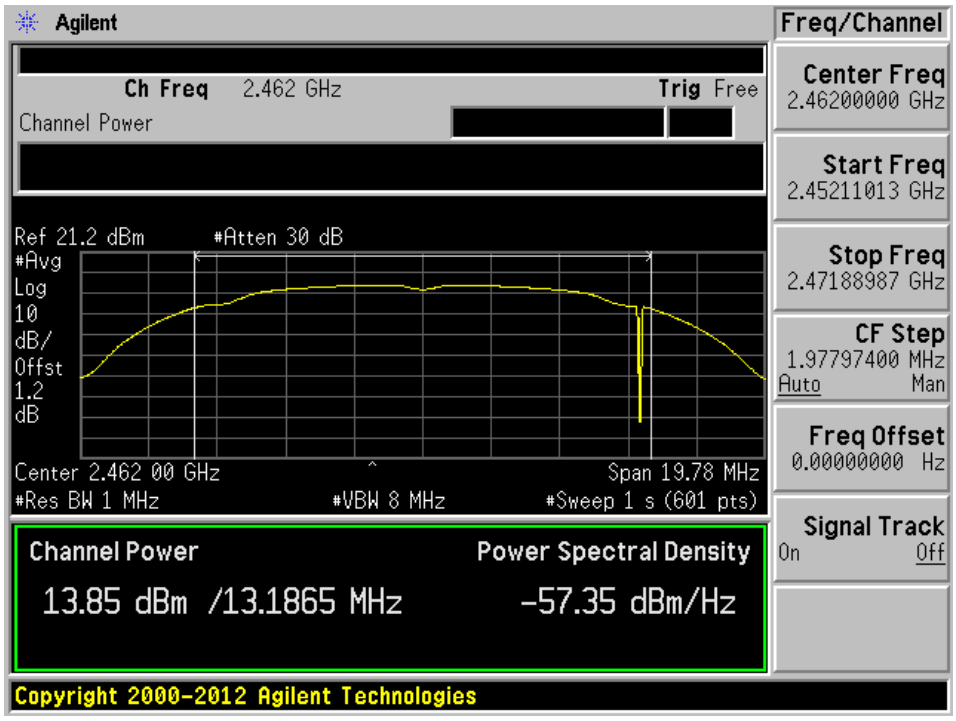
802.11b-2412 MHz



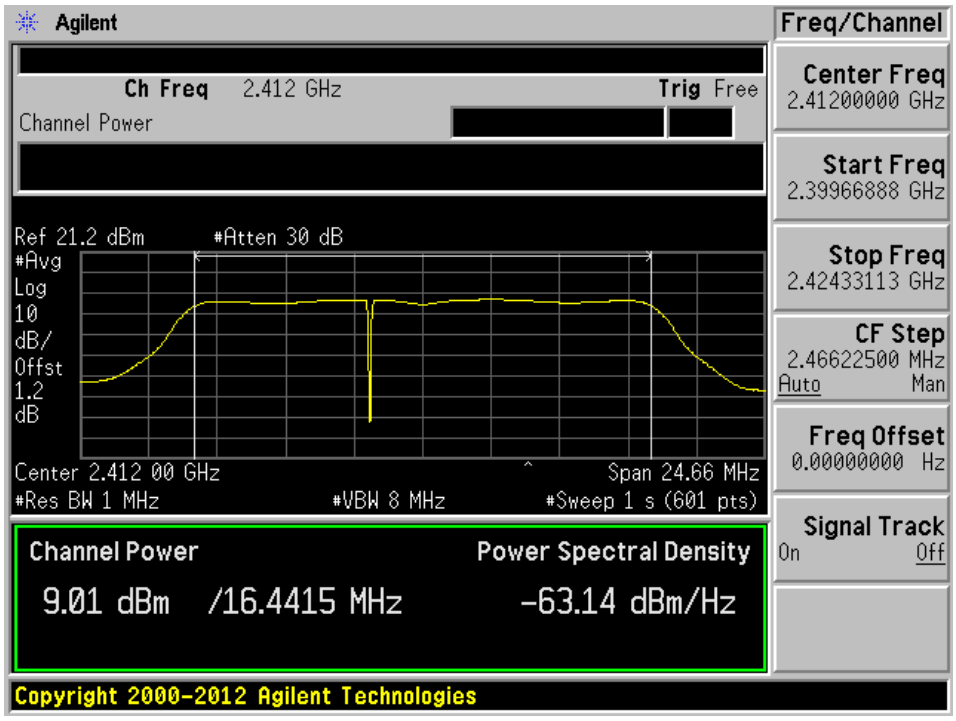
802.11b – 2437 MHz



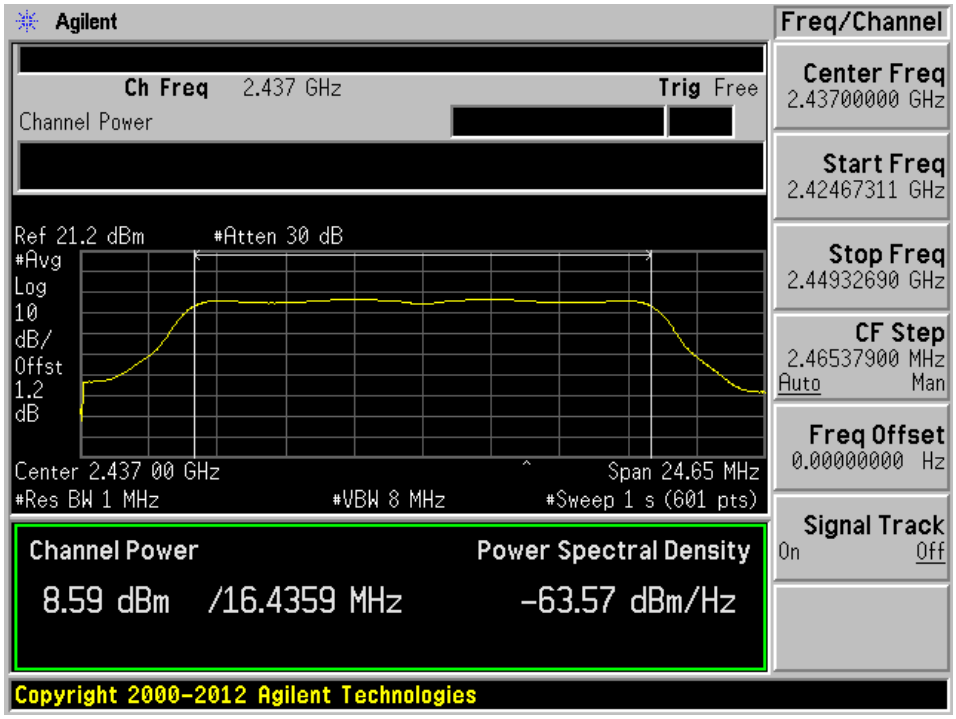
802.11b – 2462 MHz



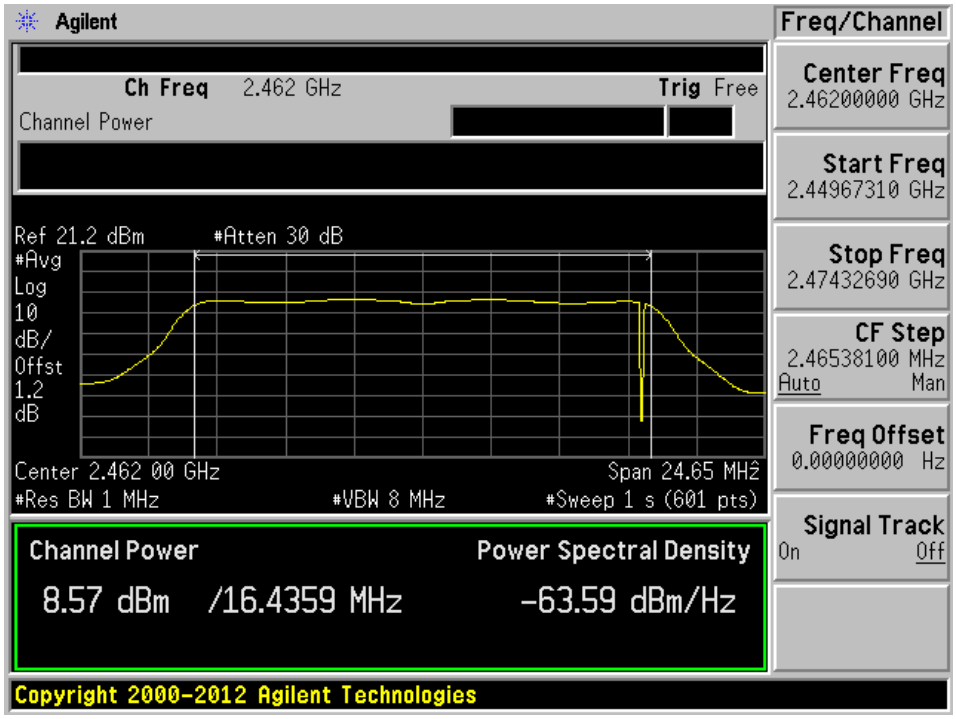
802.11g – 2412 MHz



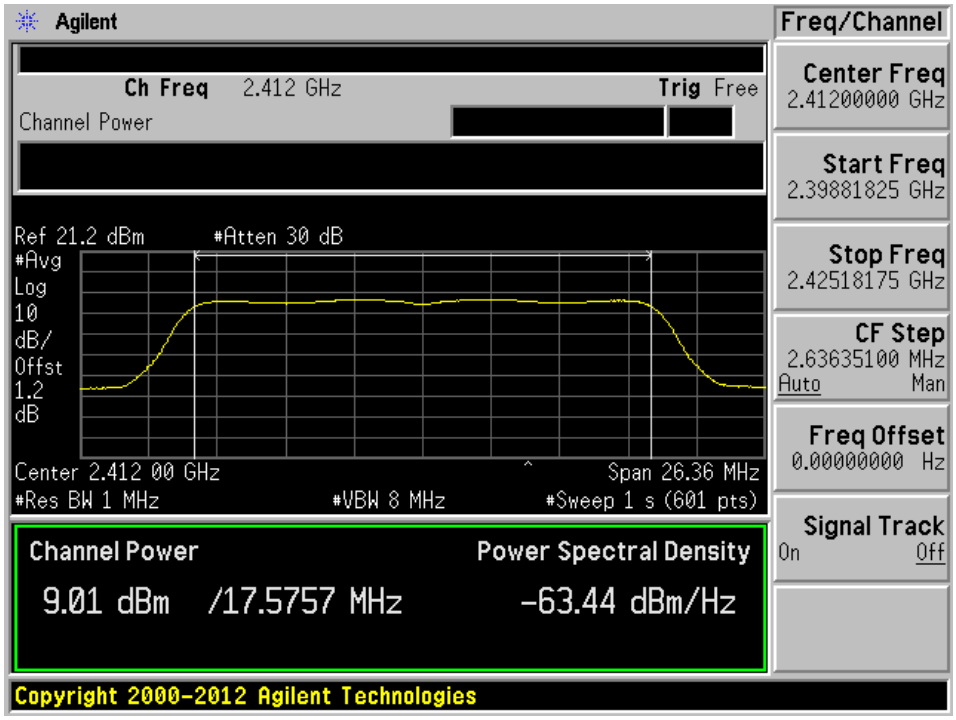
802.11g – 2437 MHz



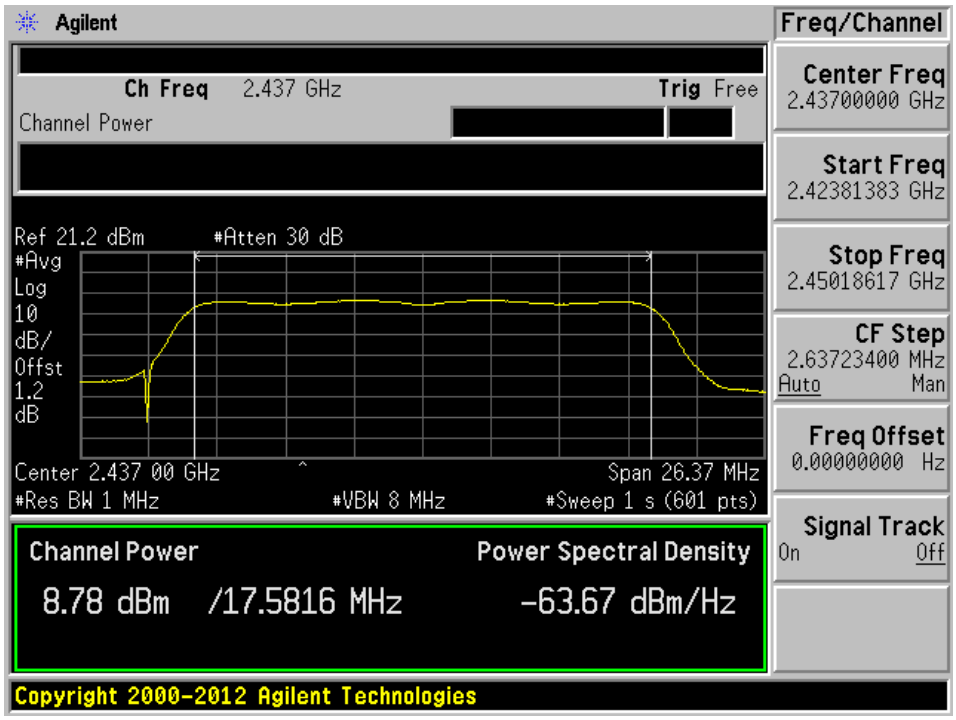
802.11g – 2462 MHz



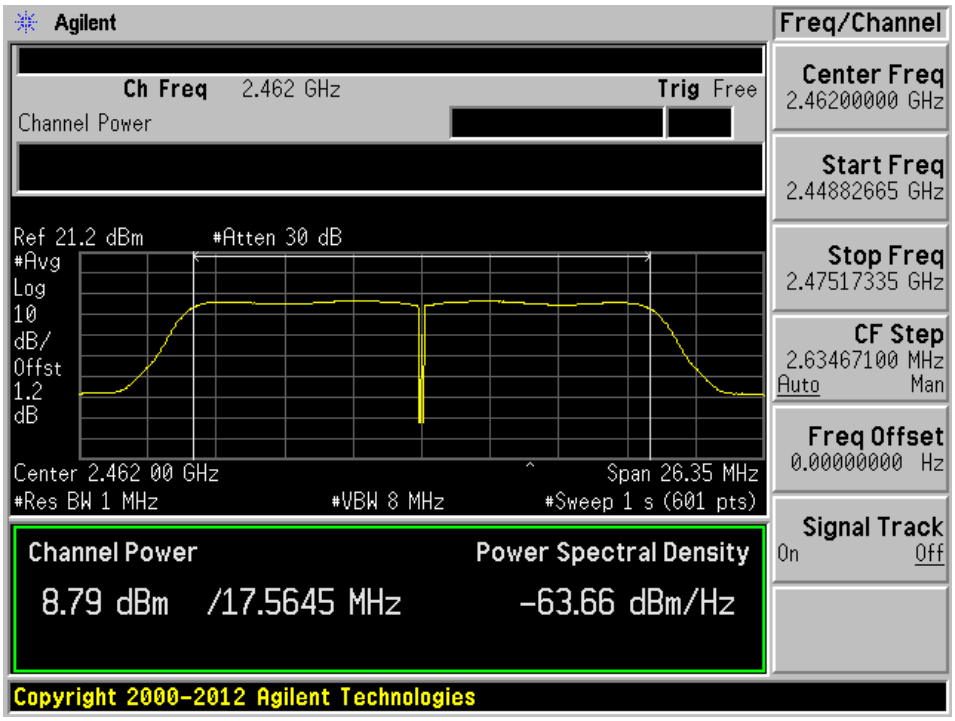
802.11n20 – 2412 MHz



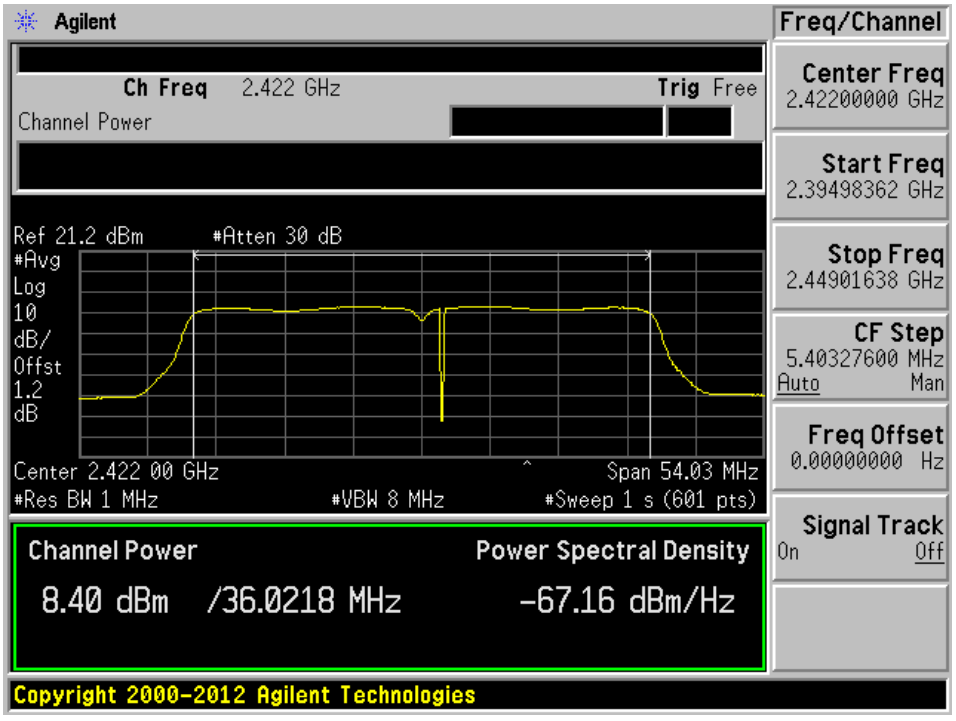
802.11n20 – 2437 MHz



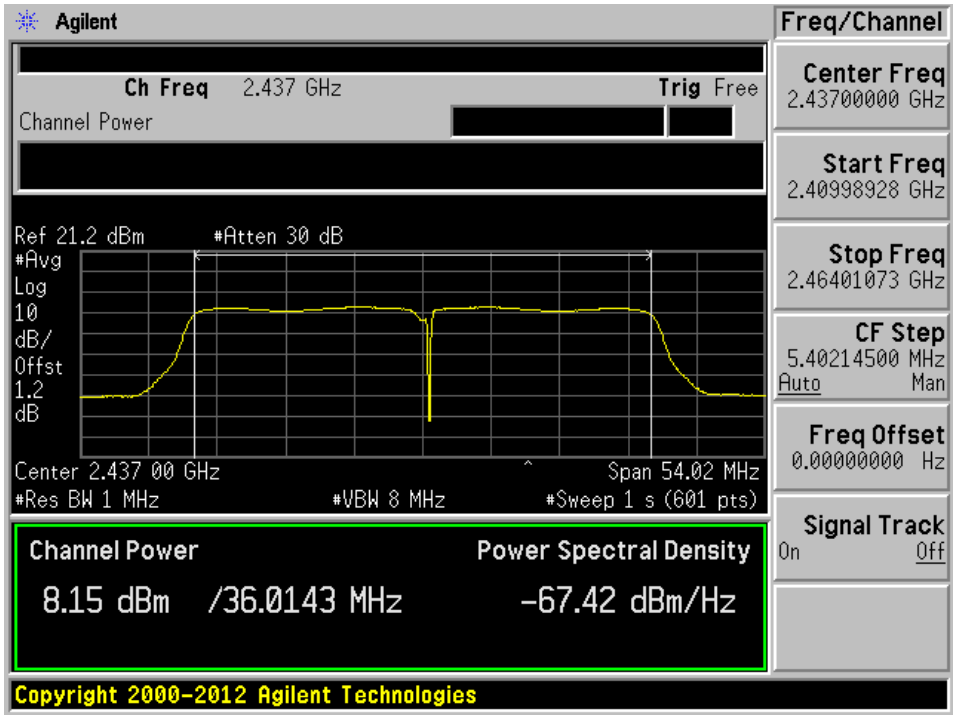
802.11n20 – 2462 MHz



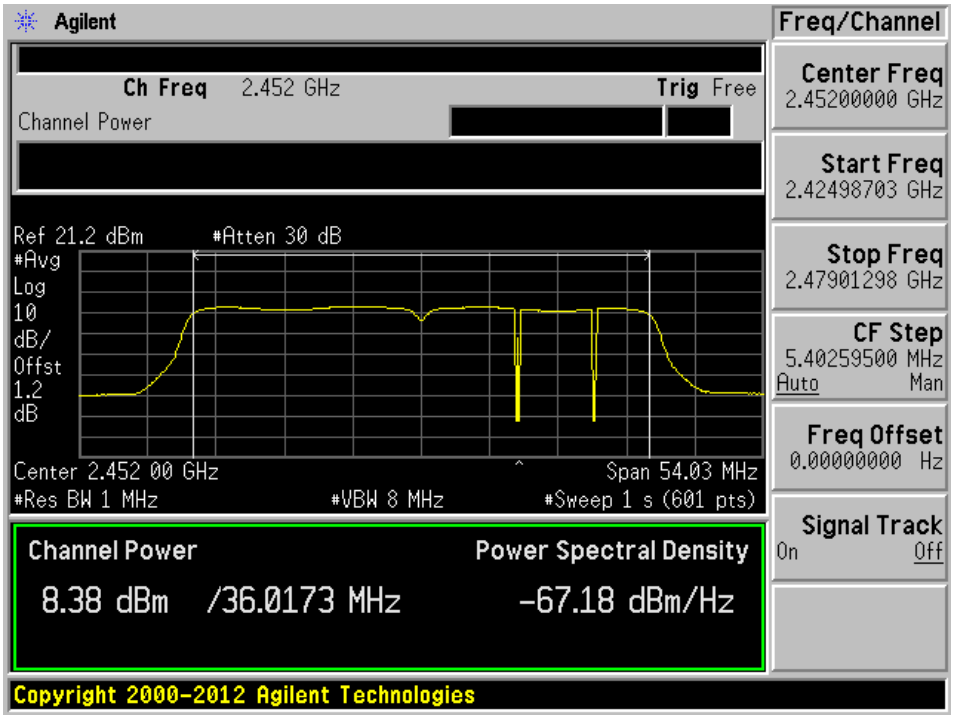
802.11n40 – 2422 MHz



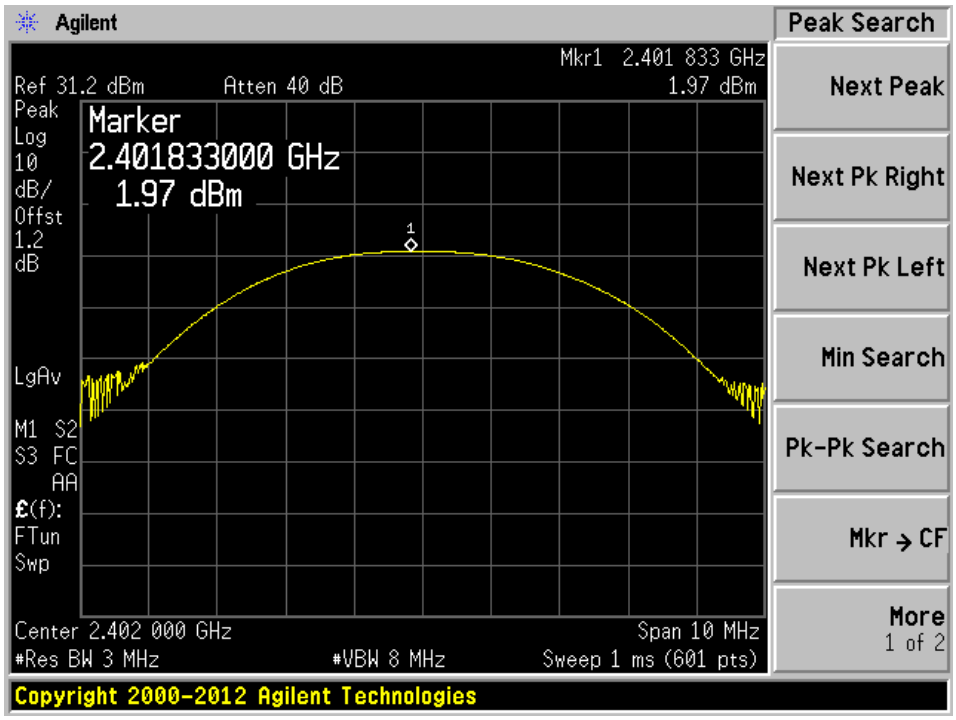
802.11n40 – 2437 MHz



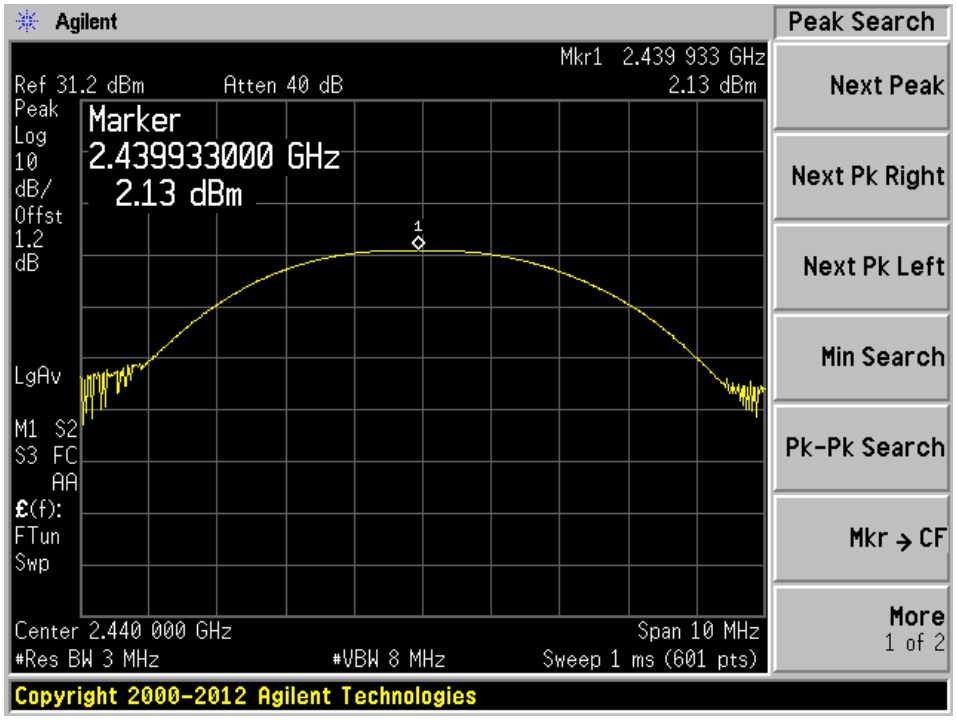
802.11n40 – 2452 MHz



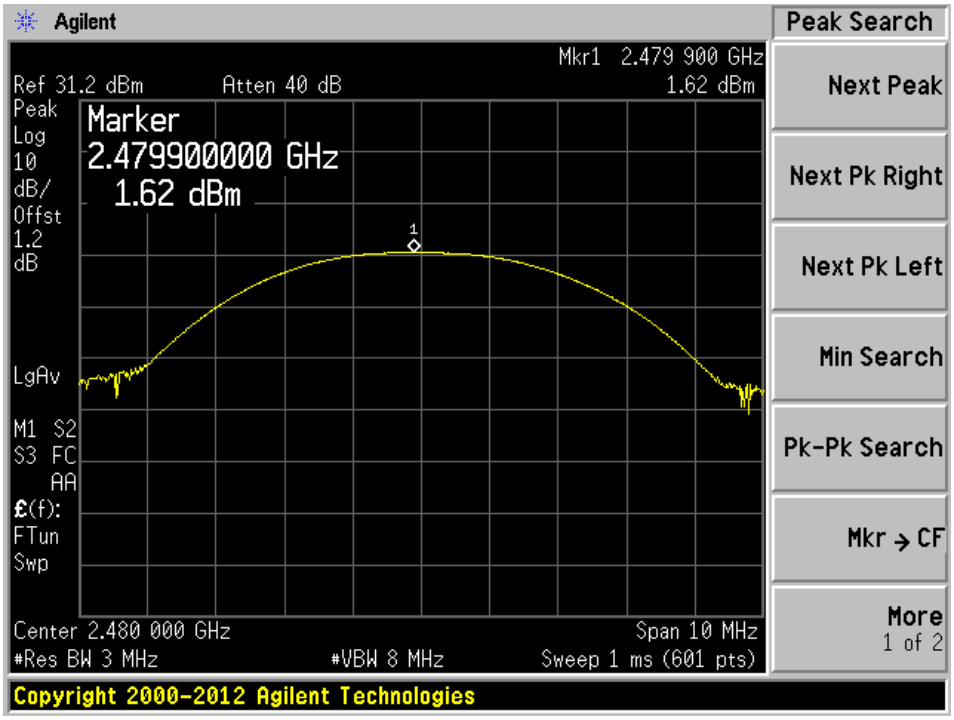
BLE – 2402 MHz



BLE – 2440 MHz



BLE – 2480 MHz


Agilent
Peak Search
Mkr1 2.479 900 GHz
Ref 31.2 dBm
Atten 40 dB
1.62 dBm
Next Peak
Peak
Log
10
dB/
Offst
1.2
dB
Marker
2.479900000 GHz
1.62 dBm
Next Pk Right
Next Pk Left
LgAv
Min Search
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Pk-Pk Search
Mkr → CF
Center 2.480 000 GHz
Span 10 MHz
More
1 of 2
#Res BW 3 MHz
#VBW 8 MHz
Sweep 1 ms (601 pts)
Copyright 2000-2012 Agilent Technologies

10 FCC §15.247(d) & IC RSS-247 §5.5 - 100 kHz Bandwidth of Band Edges

10.1 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-247 §5.5.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 5.4(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.

10.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r03: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 13: Band-edge measurements

10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	MY48250238	09-03-2014	1 year
-	RF cable	-	00609	06-05-2015	1year

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

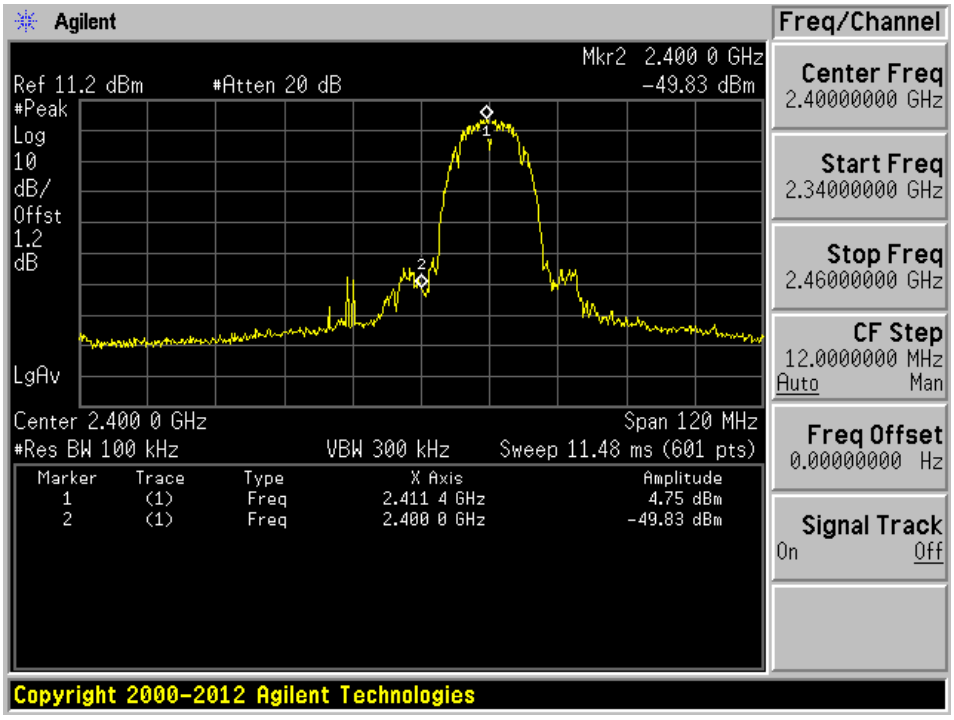
Temperature:	22 ºC
Relative Humidity:	42 %
ATM Pressure:	102.7 kPa

The testing was performed by Ronak Patel on 2015-07-12 to 2015-07-12 in RF site.

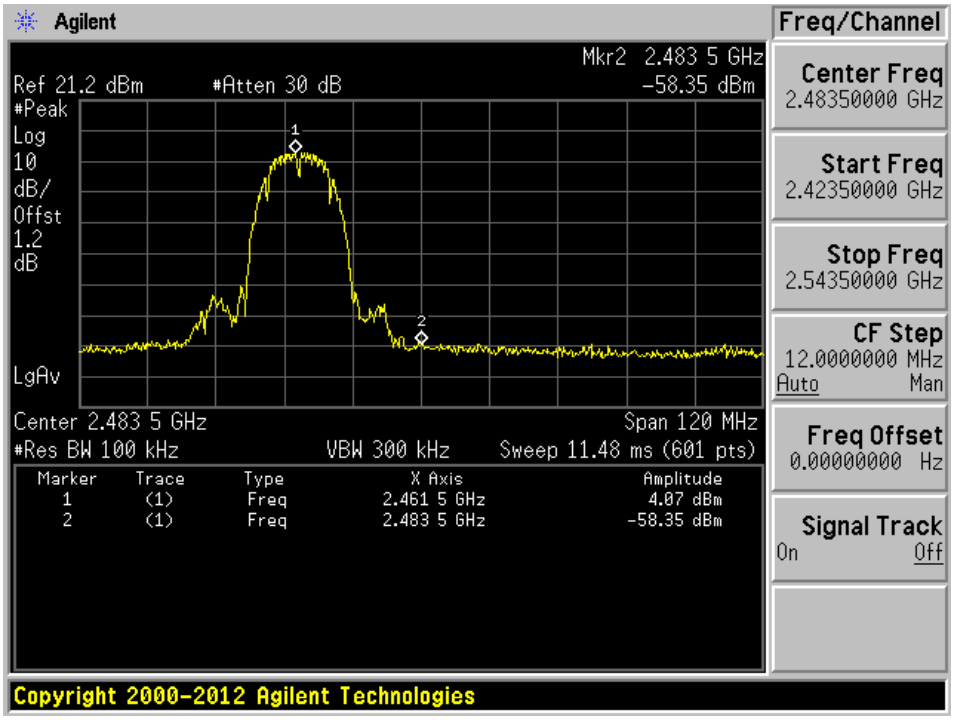
10.5 Test Results

Band Edge

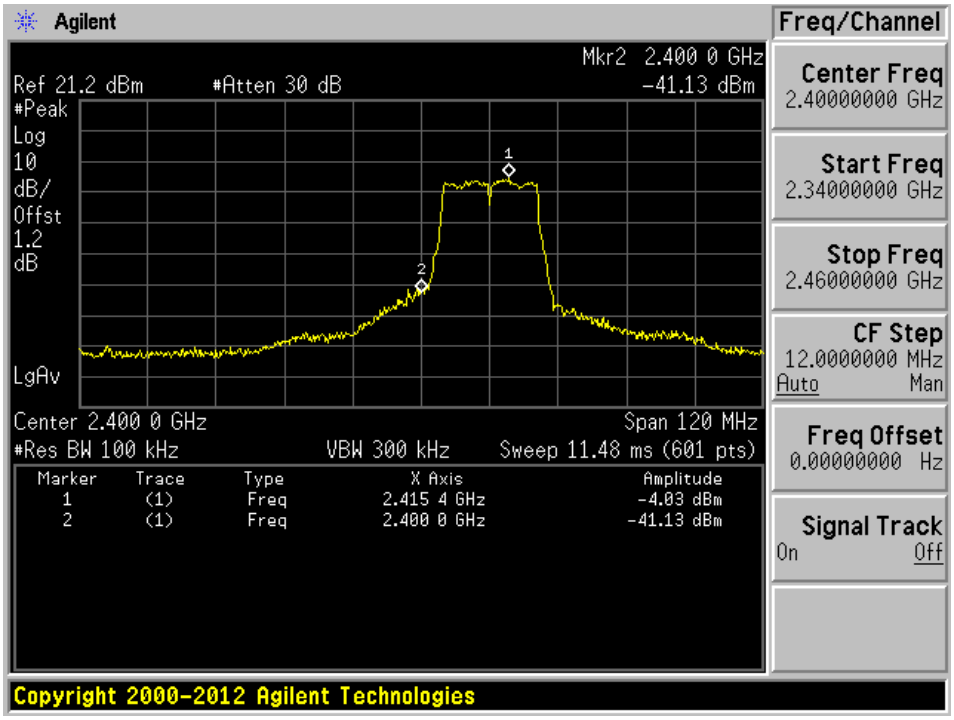
802.11b - Low Band Edge



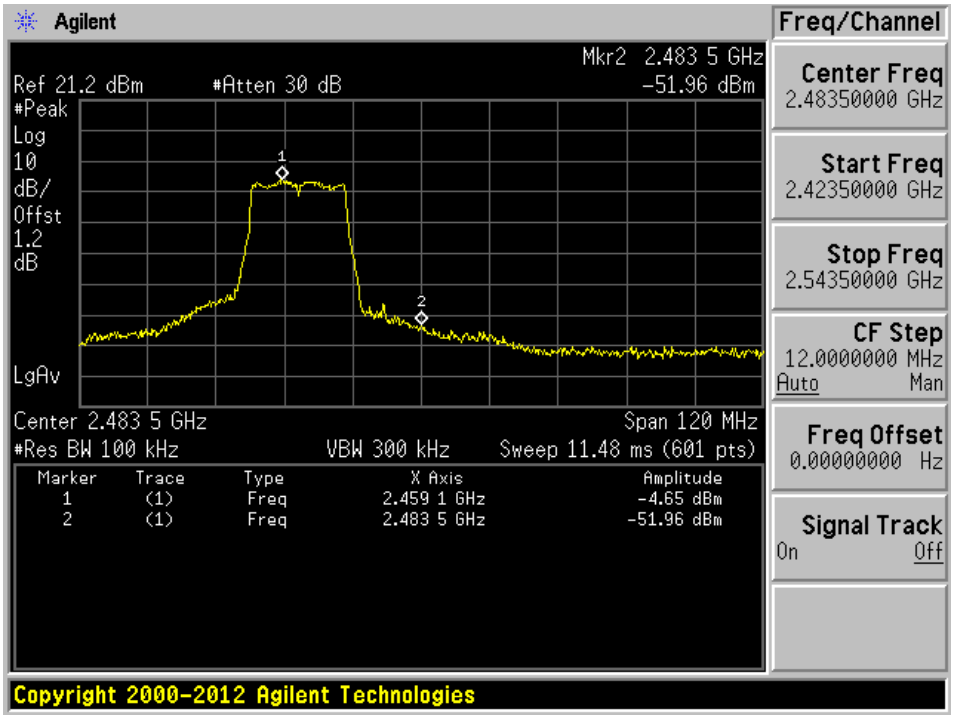
802.11b - High Band Edge



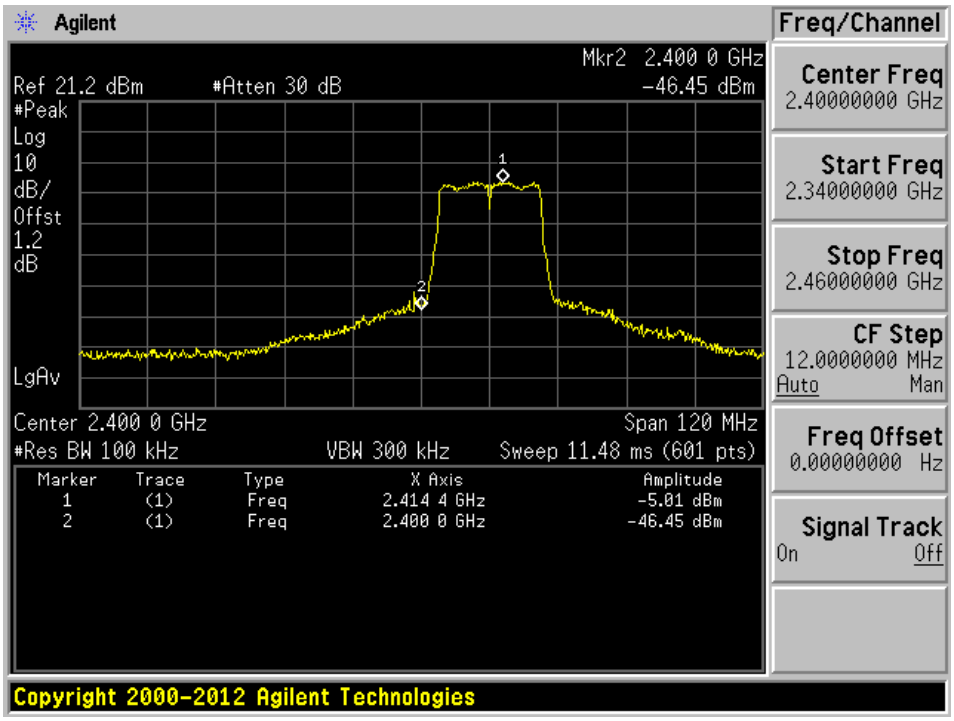
802.11g - Low Band Edge



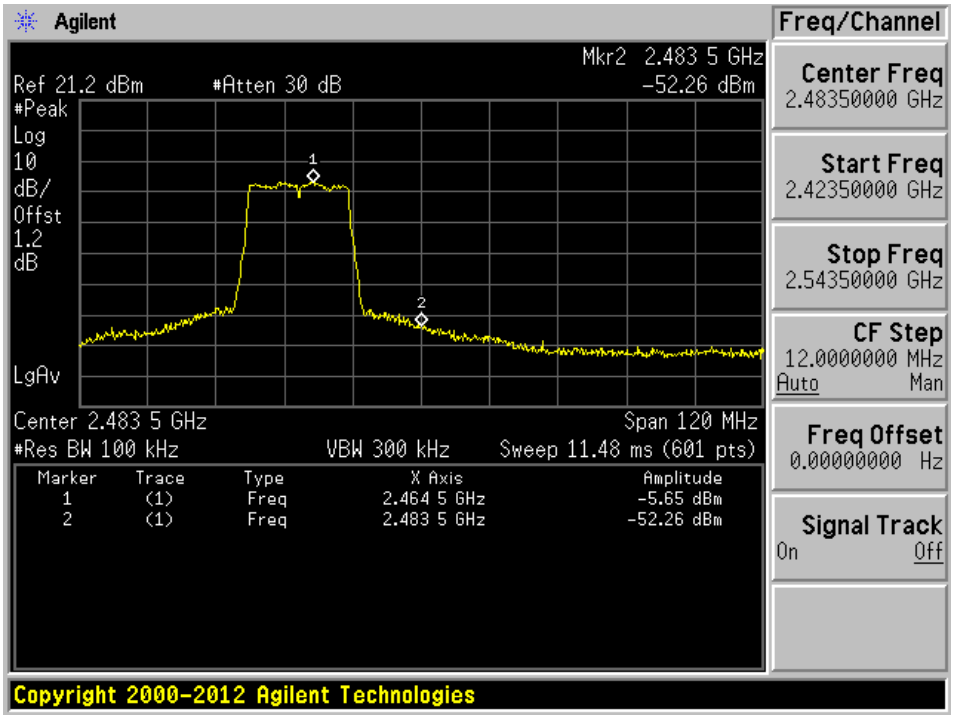
802.11g - High Band Edge



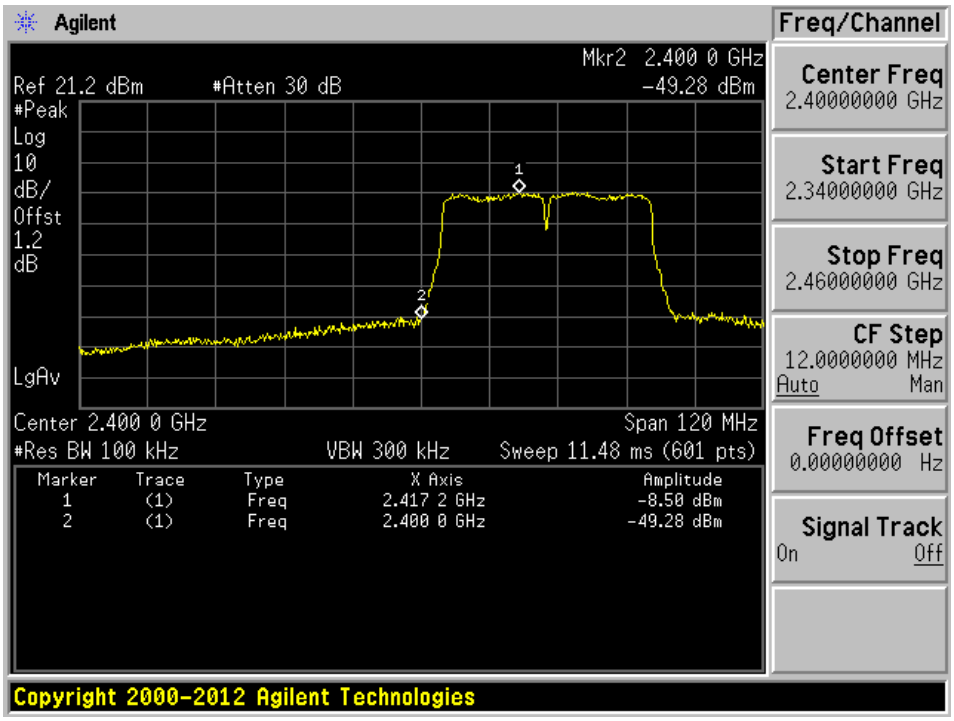
802.11n20 - Low Band Edge



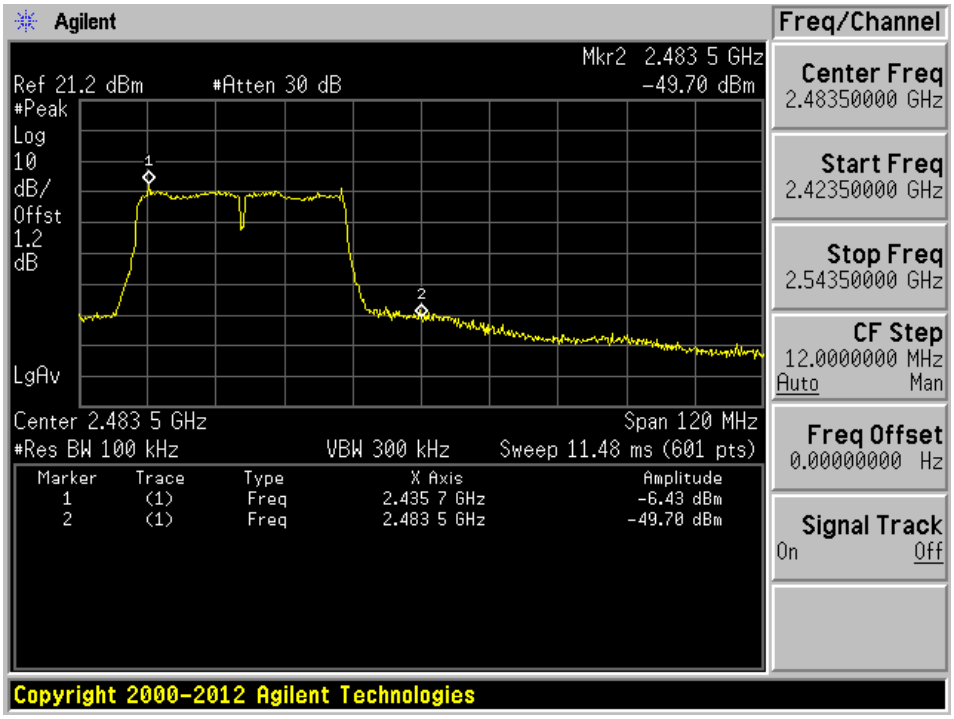
802.11n20 - High Band Edge



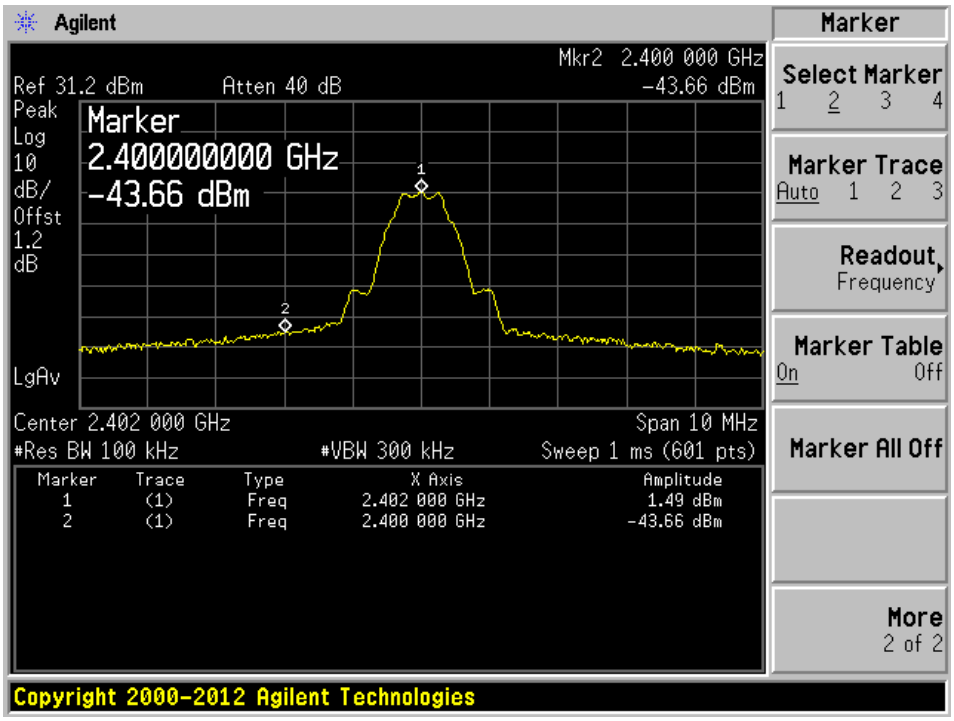
802.11n40 - Low Band Edge



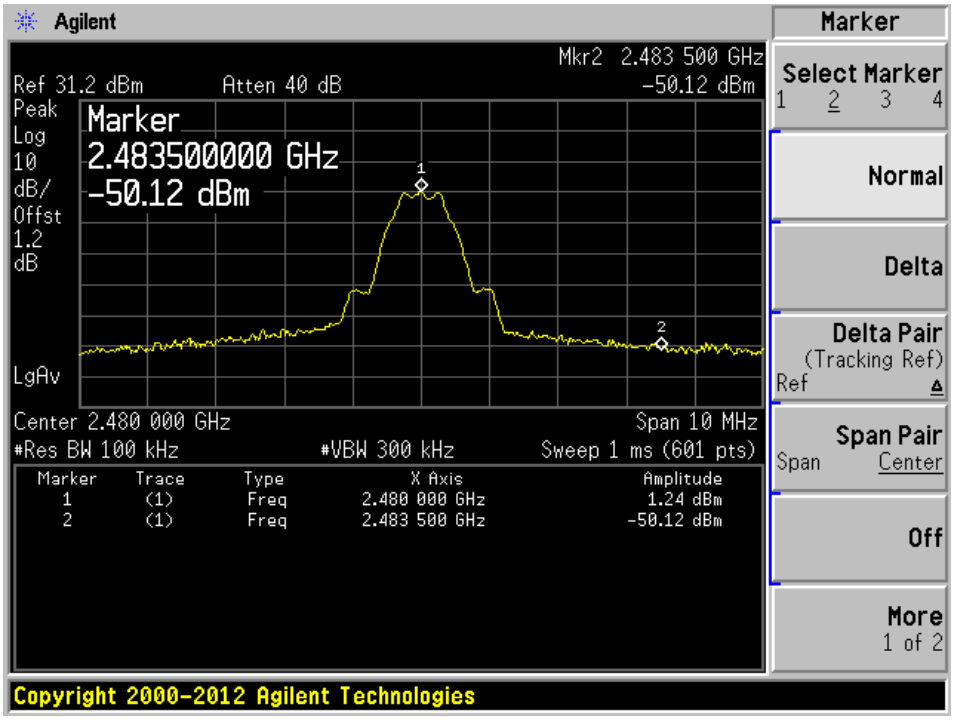
802.11n40 - High Band Edge



BLE Low – 2402 MHz



BLE High – 2480 MHz



11 FCC §15.247(d) & IC RSS-247 §5.5 - Spurious Emissions at Antenna Terminals

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-247 §5.5.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 5.4(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.

11.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r03: 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	E4446A	MY48250238	09-03-2014	1 year
-	RF cable	-	00609	06-05-2015	1year

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

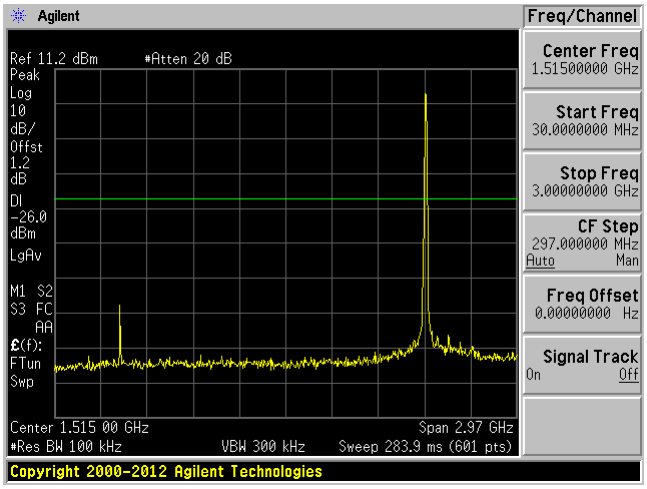
Temperature:	22 ºC
Relative Humidity:	42 %
ATM Pressure:	102.7 kPa

The testing was performed by Ronak Patel on 2015-07-09 to 2015-07-21 in RF site.

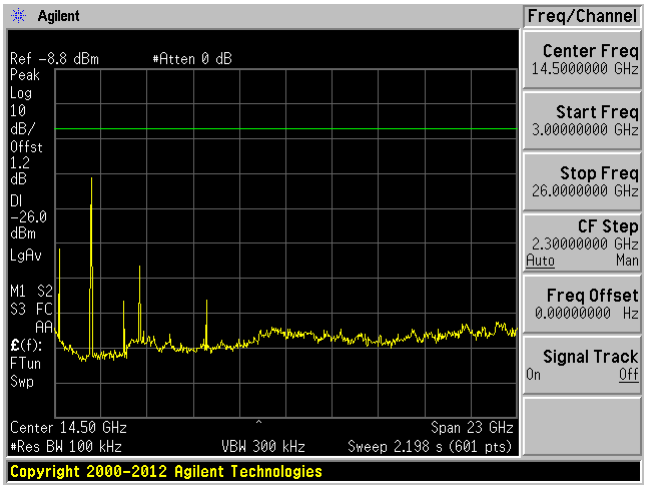
11.5 Test Results

Please refer to the following plots.

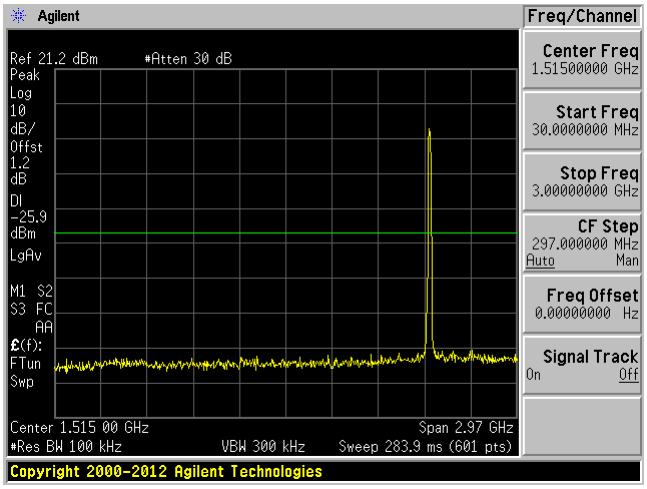
802.11b-2412MHz (30MHz-3GHz)



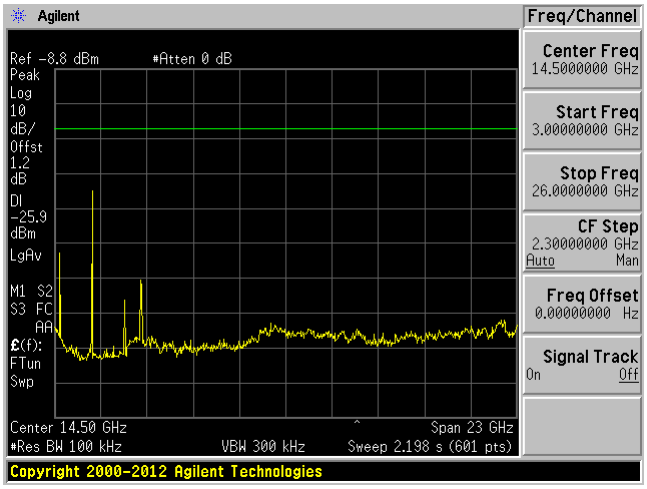
802.11b-2412MHz (3GHz-26GHz)



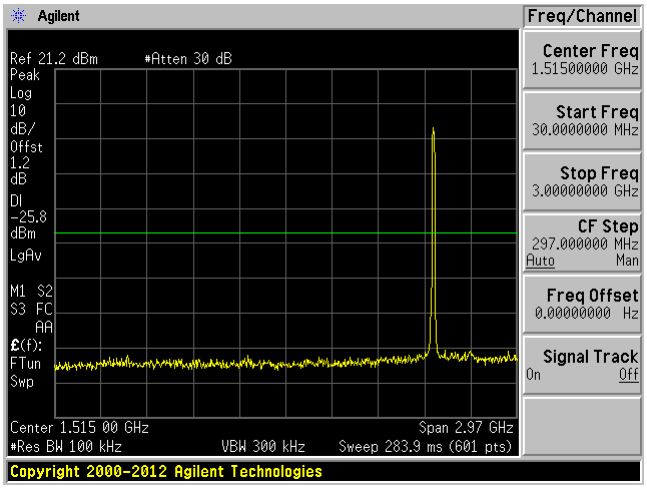
802.11b-2437MHz (30MHz-3GHz)



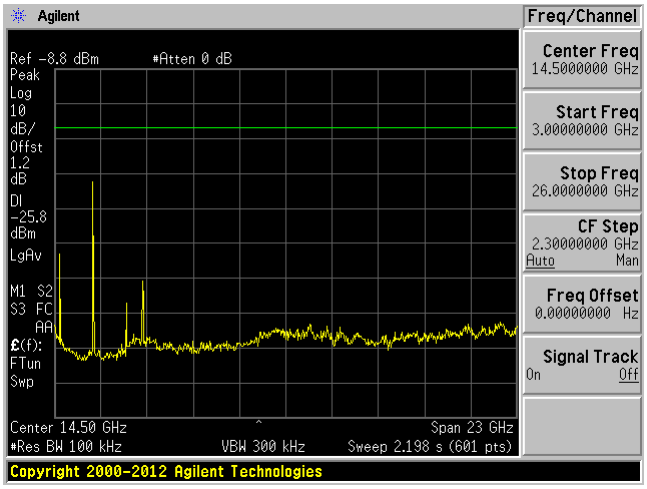
802.11b-2437MHz (3GHz-26GHz)



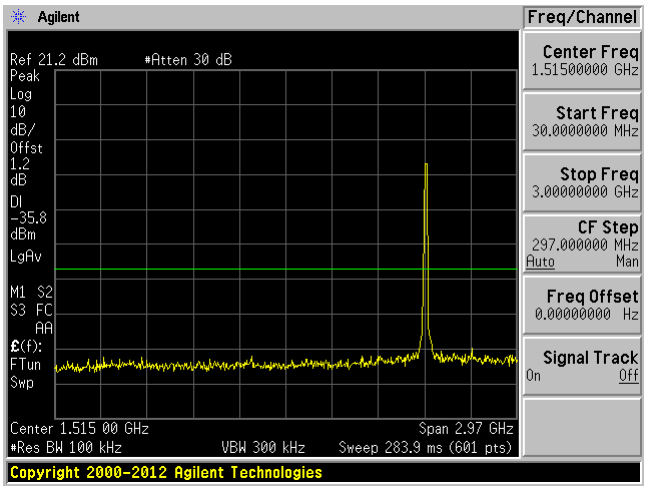
802.11b-2462MHz (30MHz-3GHz)



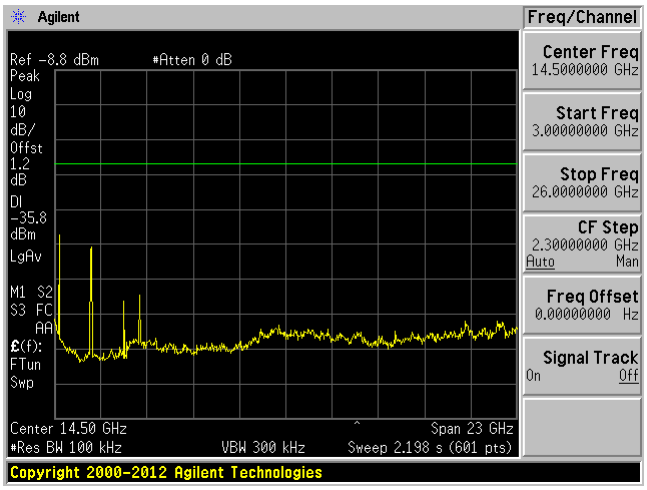
802.11b-2462MHz (3GHz-26GHz)



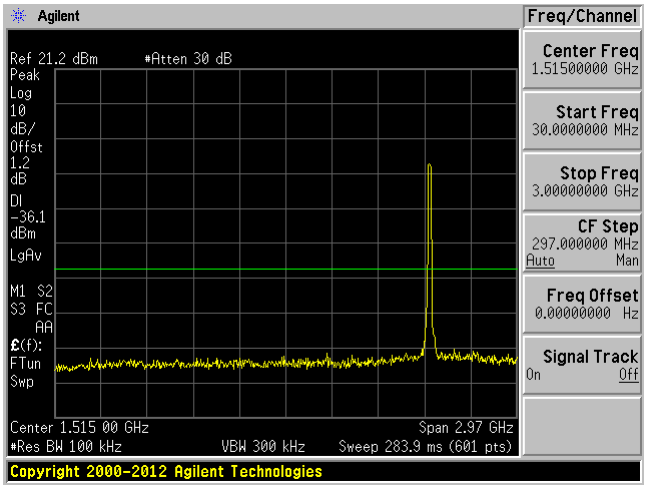
802.11g-2412MHz (30MHz-3GHz)



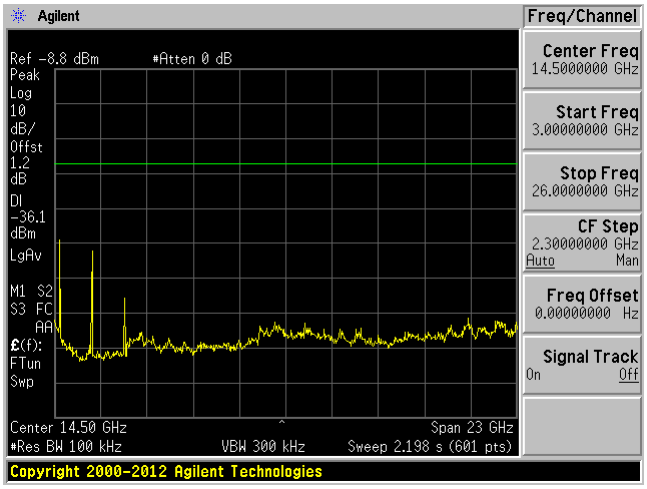
802.11g-2412MHz (30MHz-26GHz)



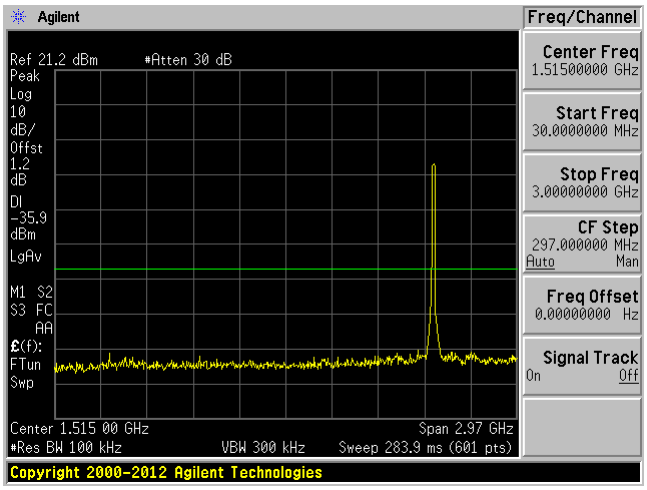
802.11g-2437MHz (30MHz-3GHz)



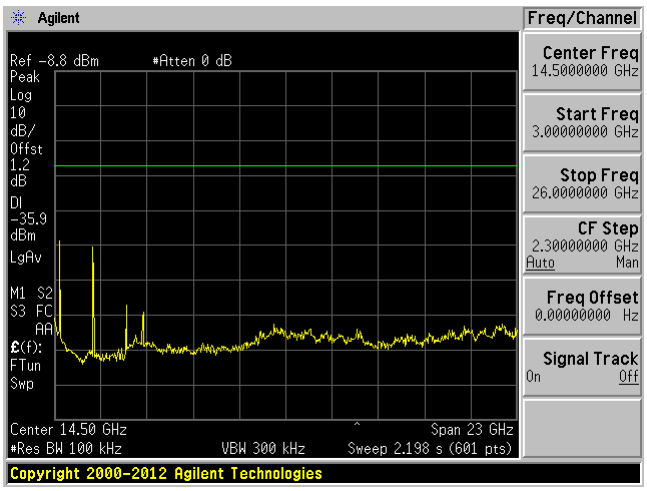
802.11g-2437MHz (3GHz-26GHz)



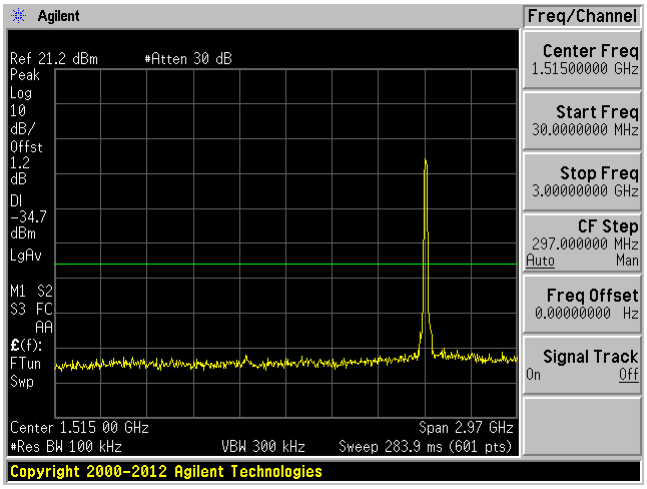
802.11g-2462MHz (30MHz-3GHz)



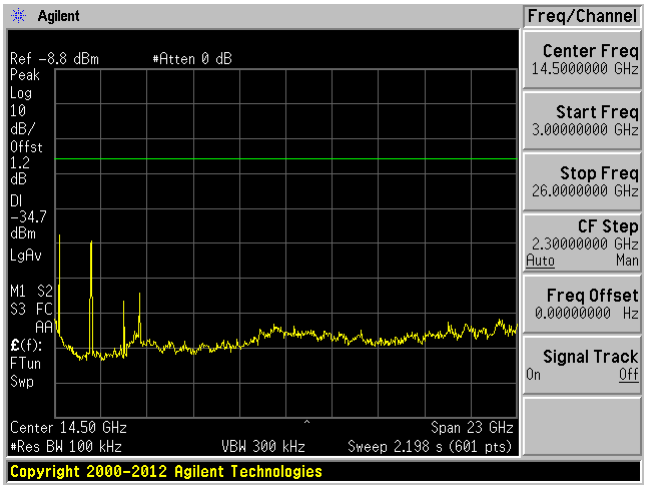
802.11g-2462MHz (3GHz-26GHz)



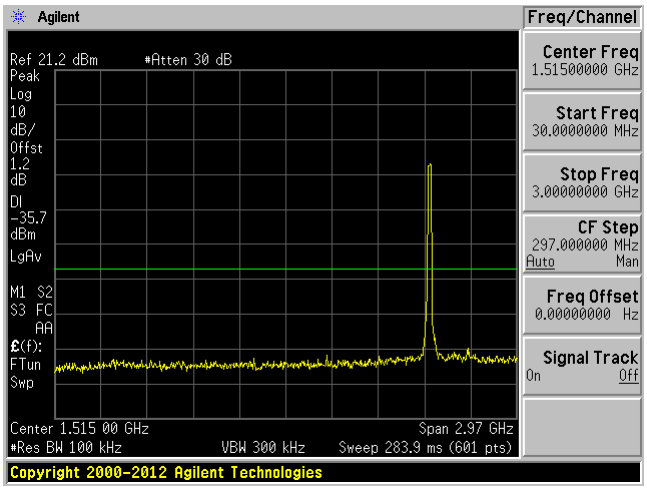
802.11n20-2412MHz (30MHz-3GHz)



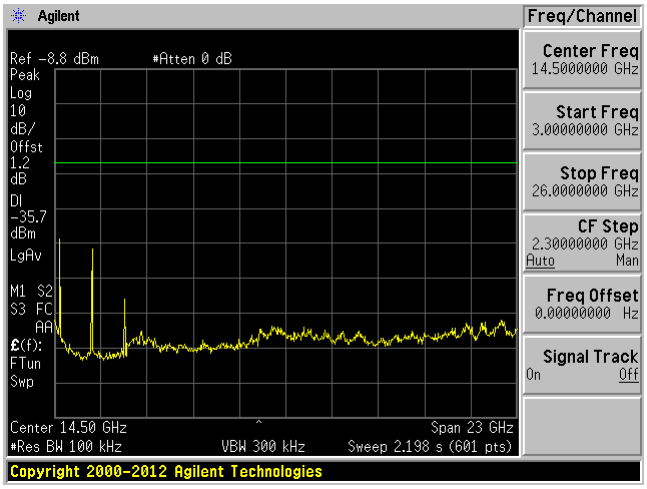
802.11n20-2412MHz (3GHz-26 GHz)



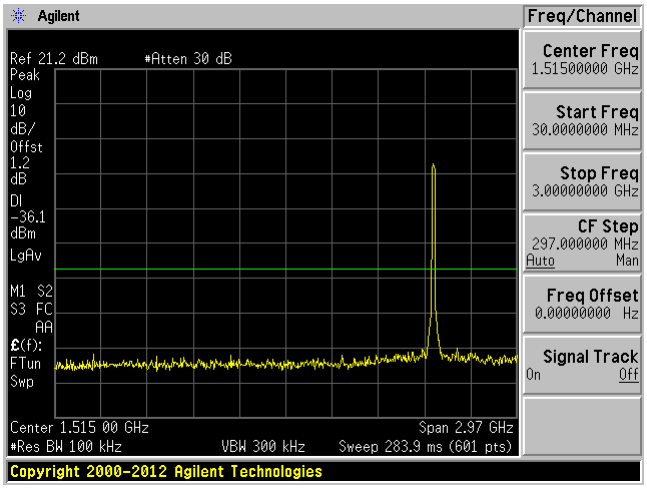
802.11n20-2437MHz (30MHz-3GHz)



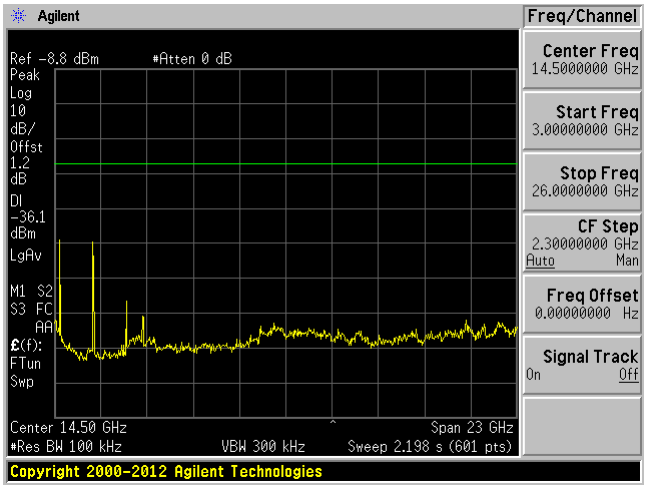
802.11n20-2437MHz (3GHz-26GHz)



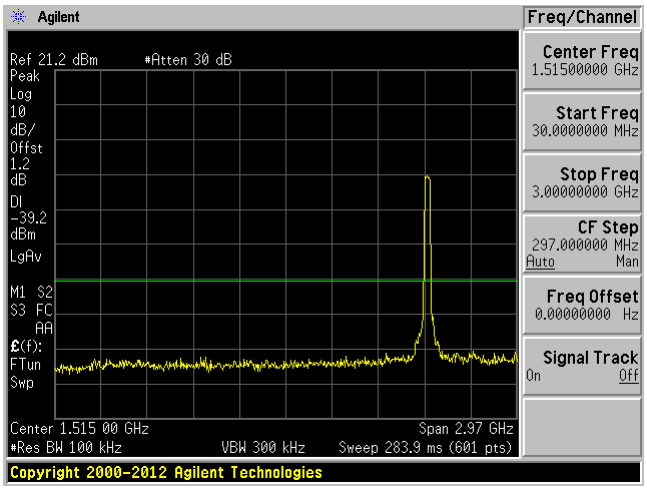
802.11n20-2462MHz (30MHz-3GHz)



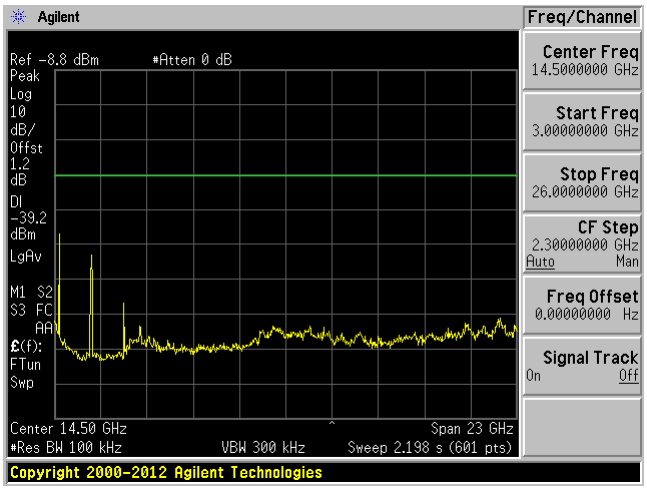
802.11n20-2462MHz (3GHz-26GHz)



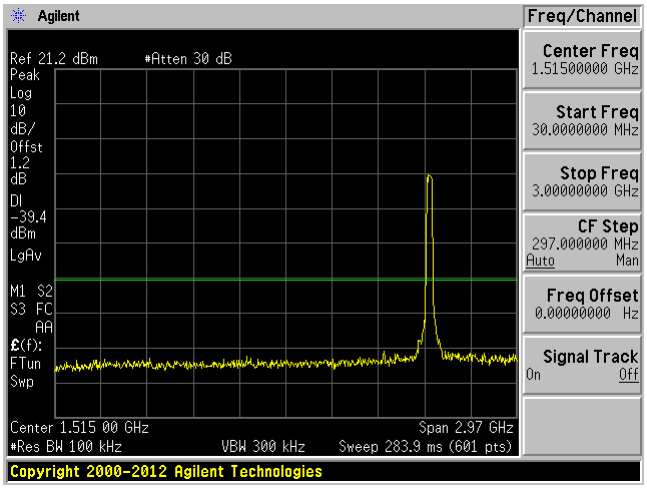
802.11n40-2422MHz (30MHz-3GHz)



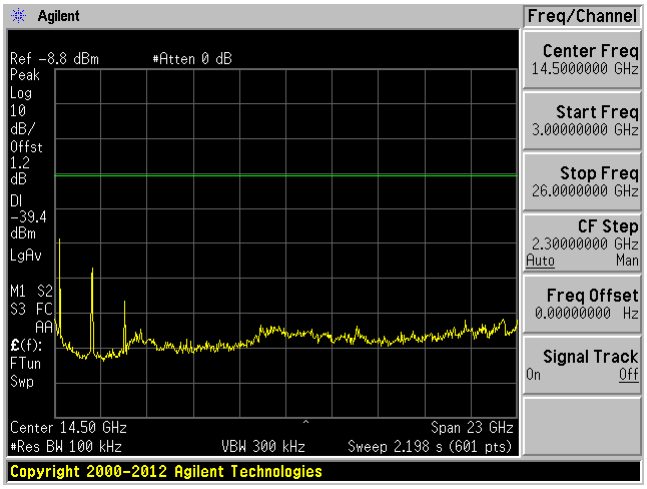
802.11n40-2422MHz (3GHz-26GHz)



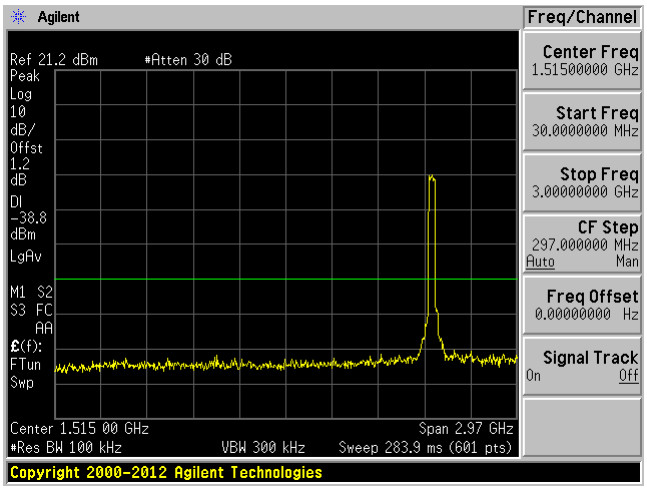
802.11n40 - 2437MHz (30MHz-3GHz)



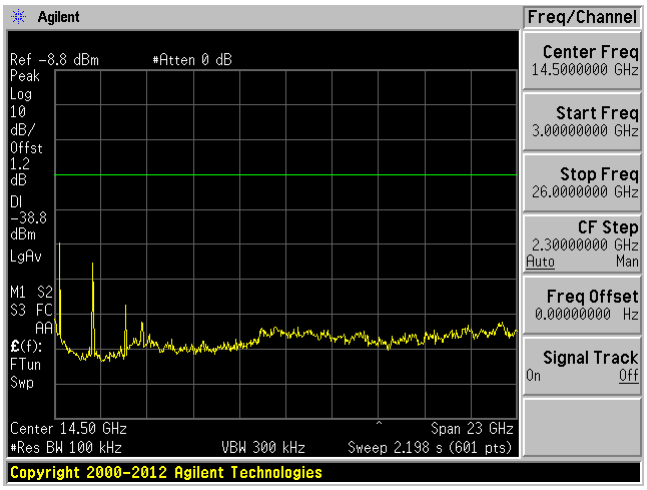
802.11n40 - 2437MHz (3GHz-26GHz)



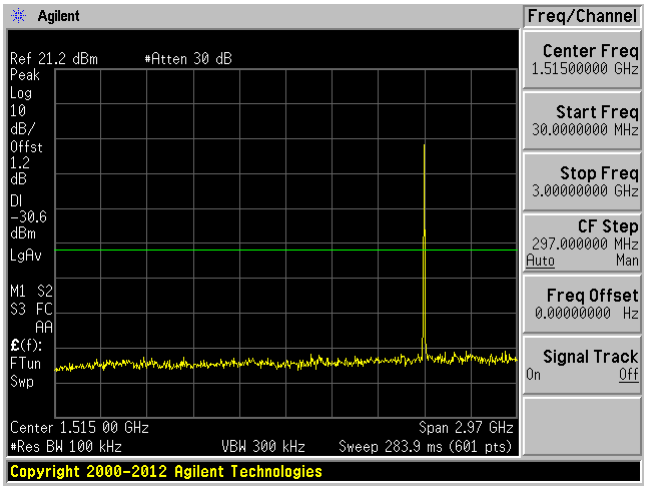
802.11n40-2452MHz (30MHz-3GHz)



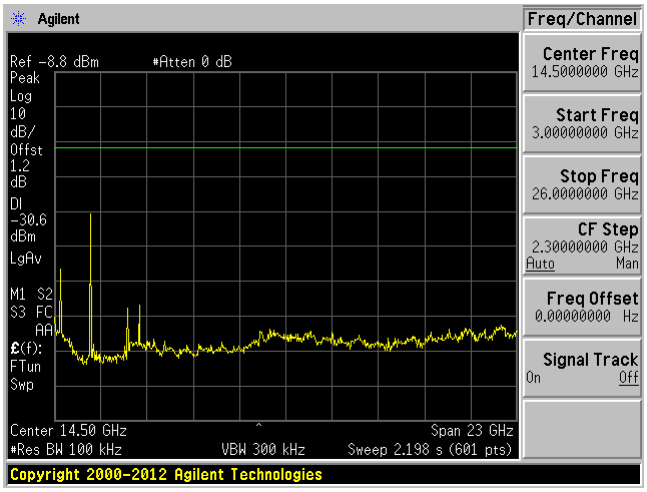
802.11n40-2452MHz (3GHz-26GHz)



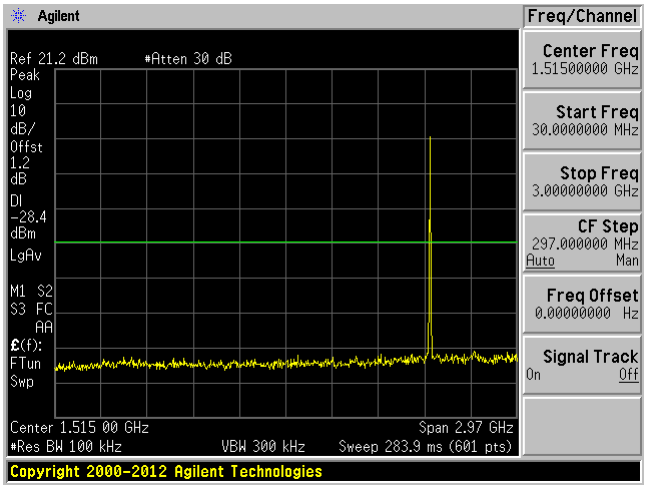
BLE – 2402 (30MHz-3GHz)



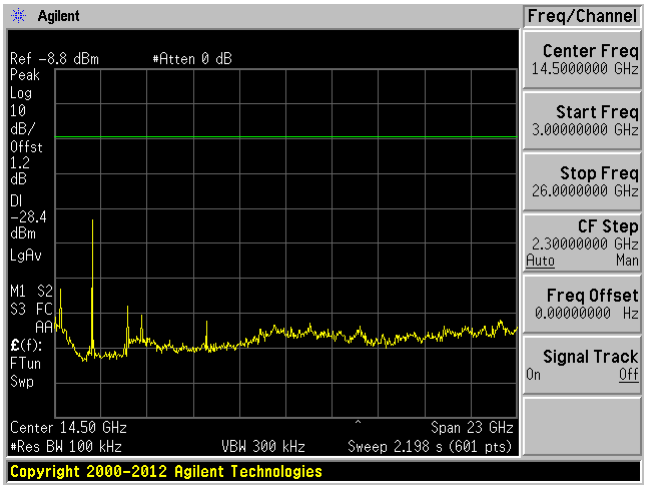
BLE -2402 (3GHz-26GHz)



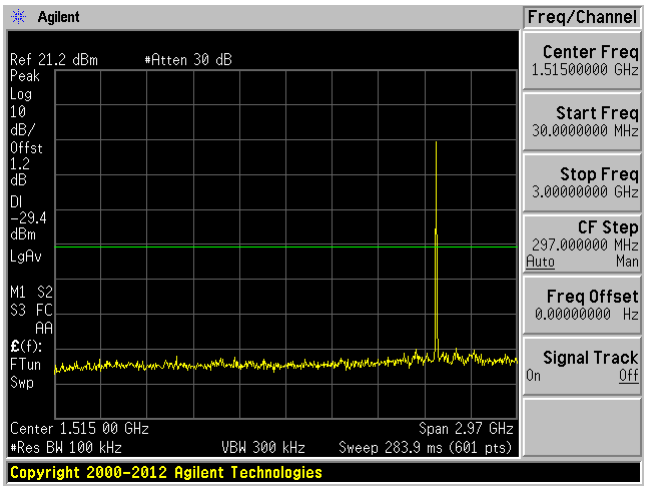
BLE – 2440 (30MHz-3GHz)



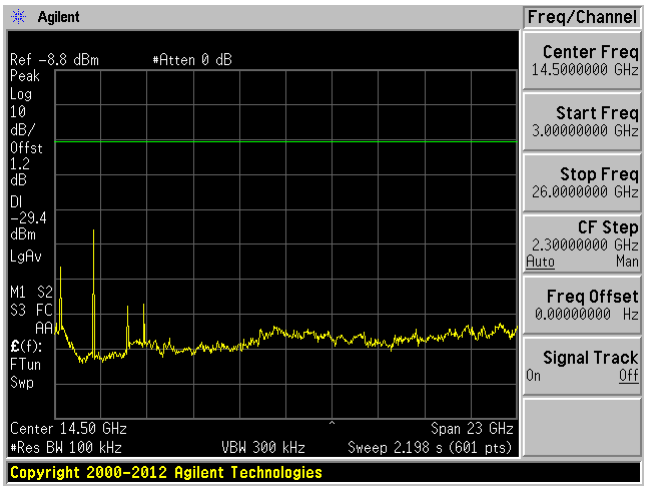
BLE -2440 (3GHz-26GHz)



BLE – 2480 (30MHz-3GHz)



BLE -2480 (3GHz-26GHz)



12 FCC §15.247(e) & IC RSS-247 (b) - Power Spectral Density

12.1 Applicable Standards

According to FCC §15.247(e) and RSS-247 §5.2 (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 based on FCC KDB 558074 D01 DTS Meas Guidance v03r03: 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	E4446A	MY48250238	09-03-2014	1 year
-	RF cable	-	00609	06-05-2015	1year

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:	21-25 ºC
Relative Humidity:	42-45 %
ATM Pressure:	102.1-103.7 kPa

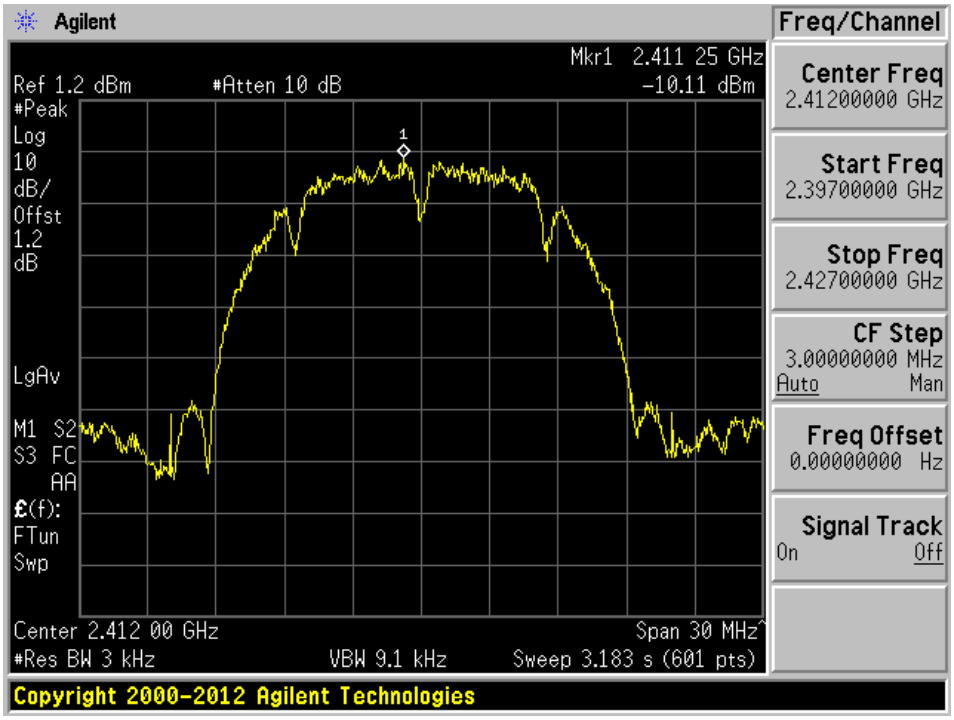
The testing was performed by Ronak Patel on 2015-07-09 to 2015-07-12 in RF site.

12.5 Test Results

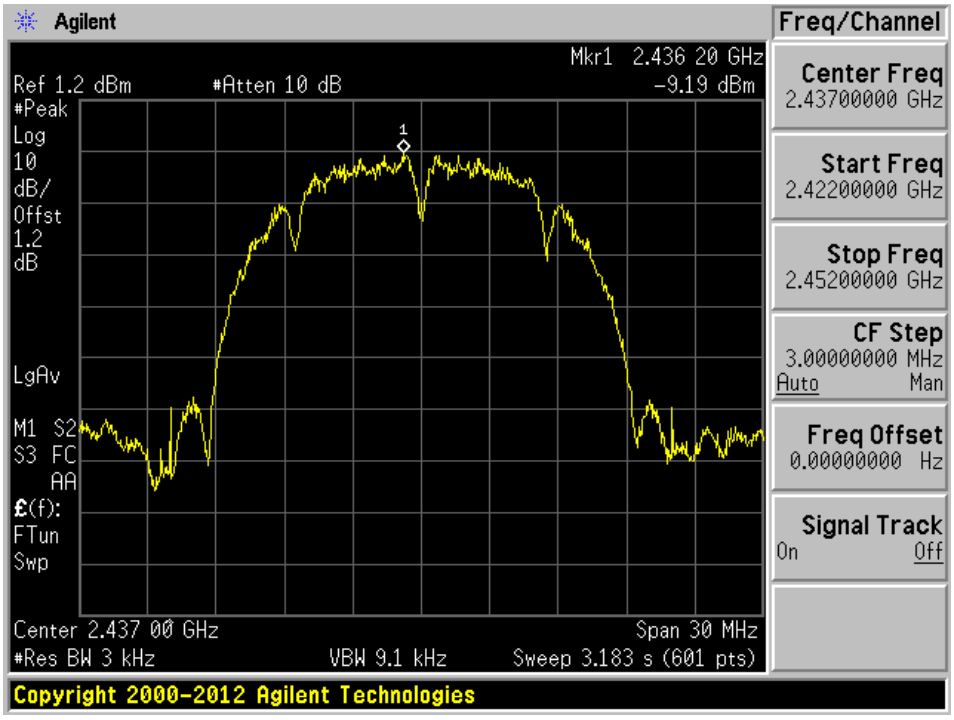
Channel	Frequency (MHz)	PSD (dBm)	FCC/IC Limit (dBm)	Margin (dB)
802.11b				
Low	2412	-10.11	8	-18.11
Middle	2437	-9.19	8	-17.19
High	2462	-9.48	8	-17.48
802.11g				
Low	2412	-17.14	8	-25.14
Middle	2437	-17.65	8	-25.65
High	2462	-18.09	8	-26.09
802.11n20				
Low	2412	-16.43	8	-24.43
Middle	2437	-16.79	8	-24.79
High	2462	-16.73	8	-24.73
802.11n40				
Low	2422	-20.25	8	-28.25
Middle	2437	-20.08	8	-28.08
High	2452	-20	8	-28
BLE				
Low	2402	-13.09	8	-21.09
Middle	2440	-12.82	8	-20.82
High	2480	-13.39	8	-21.39

Please refer to the following plots.

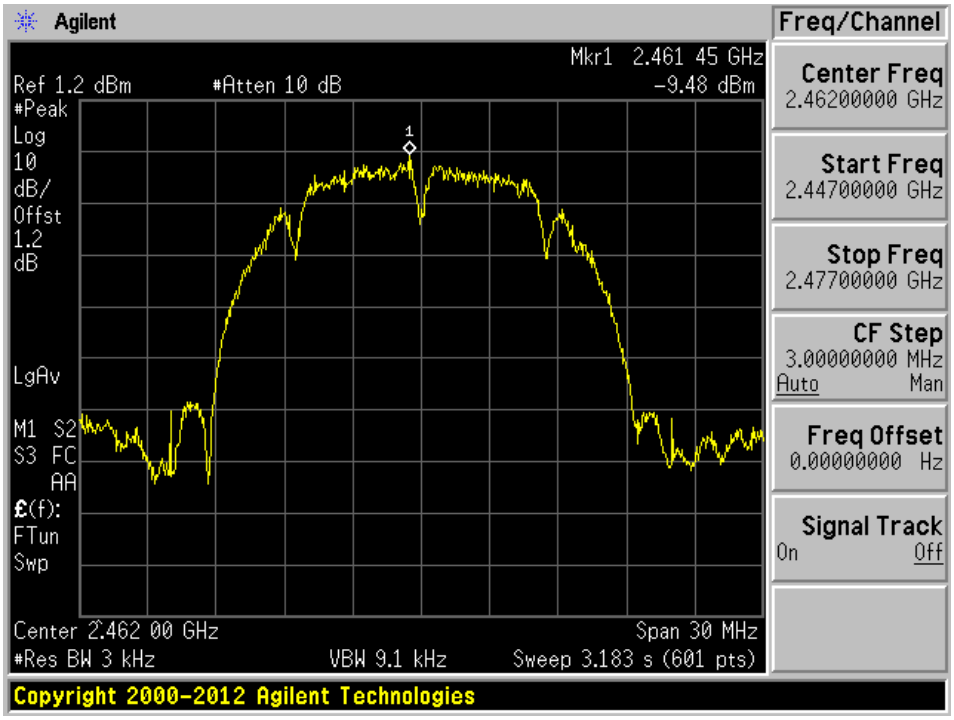
802.11b-2412 MHz



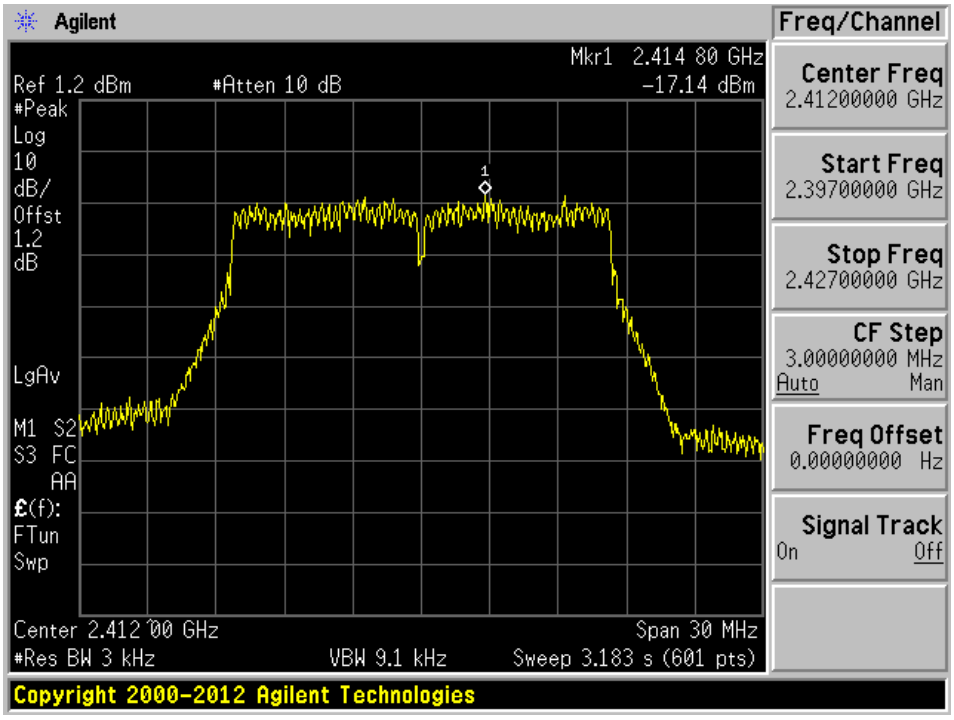
802.11b-2437 MHz



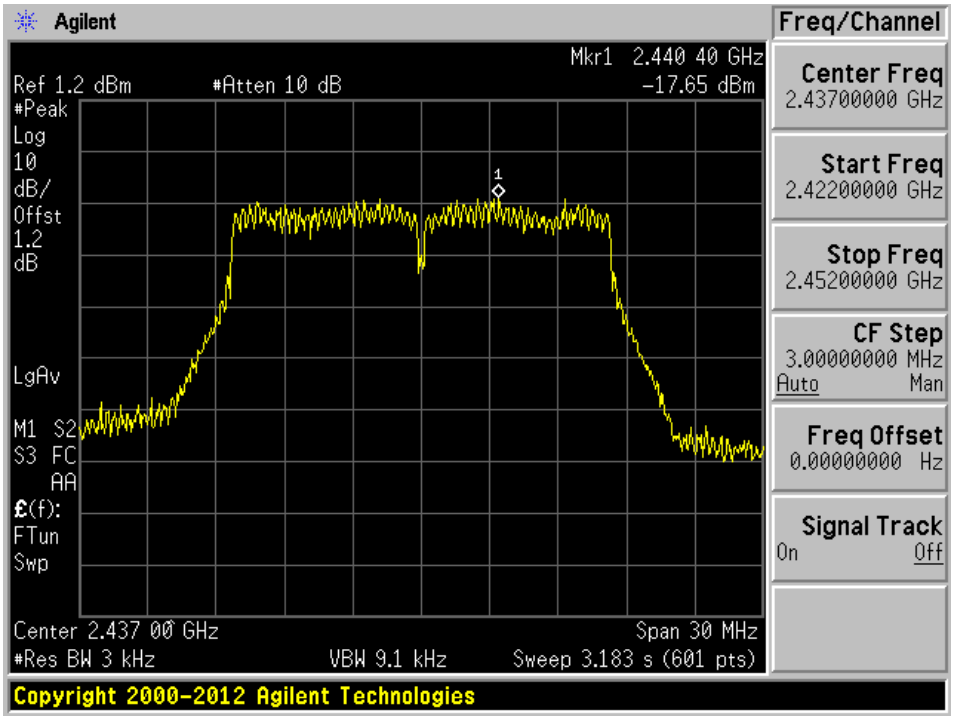
802.11b-2462 MHz



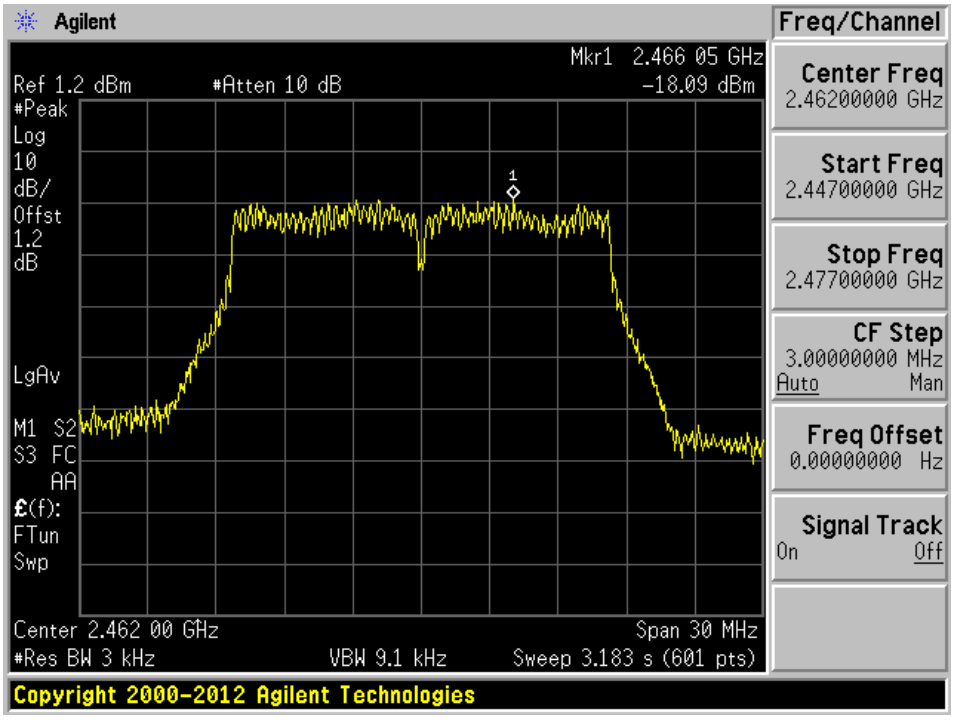
802.11g-2412 MHz



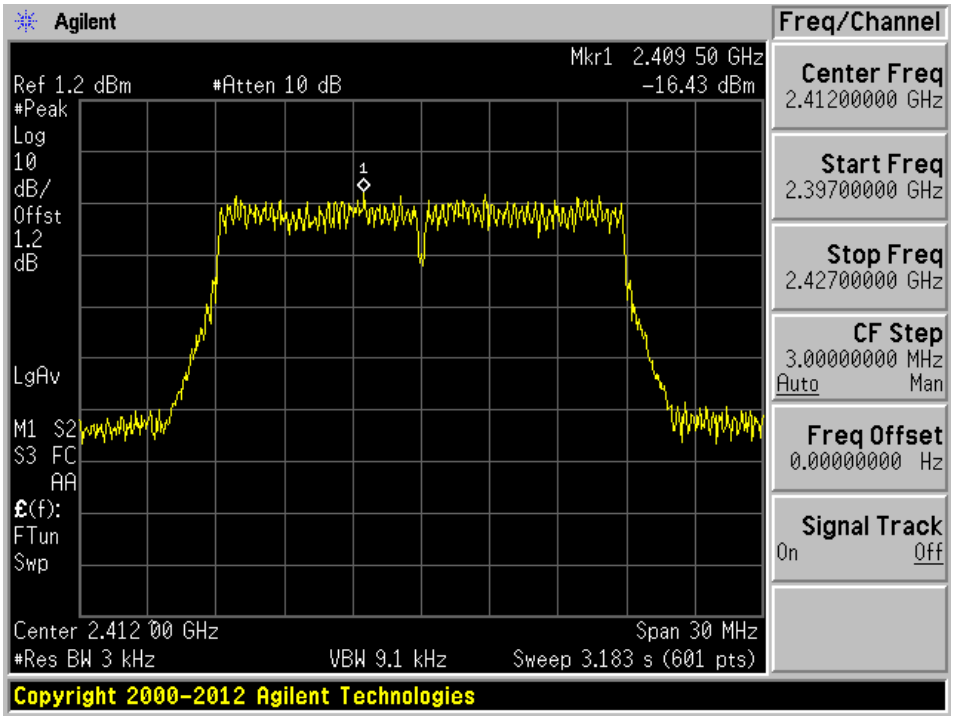
802.11g-2437 MHz



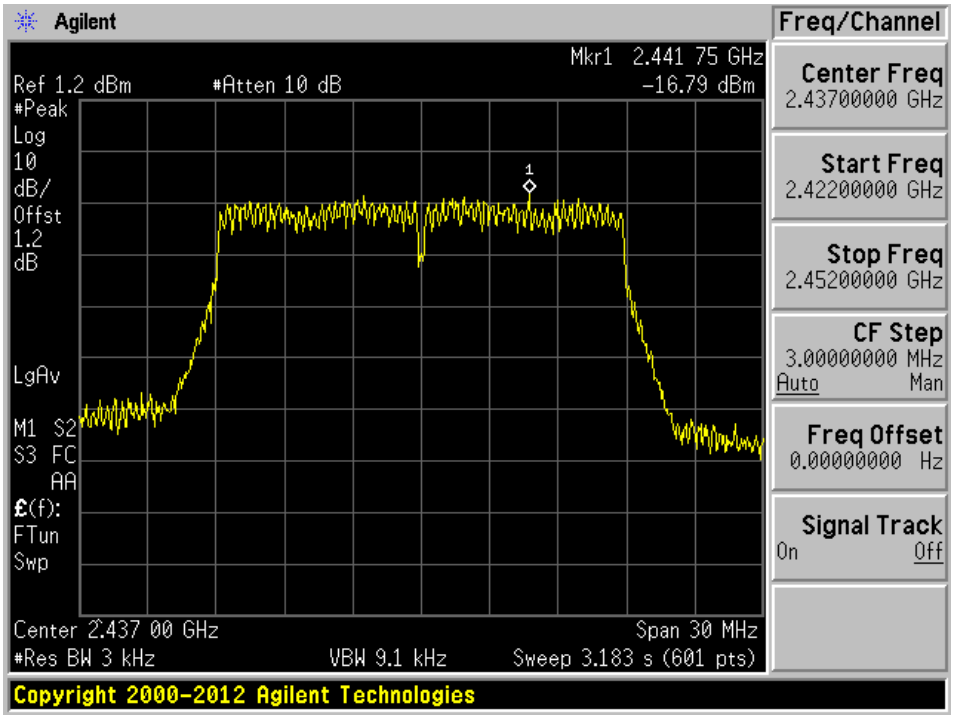
802.11g-2462 MHz



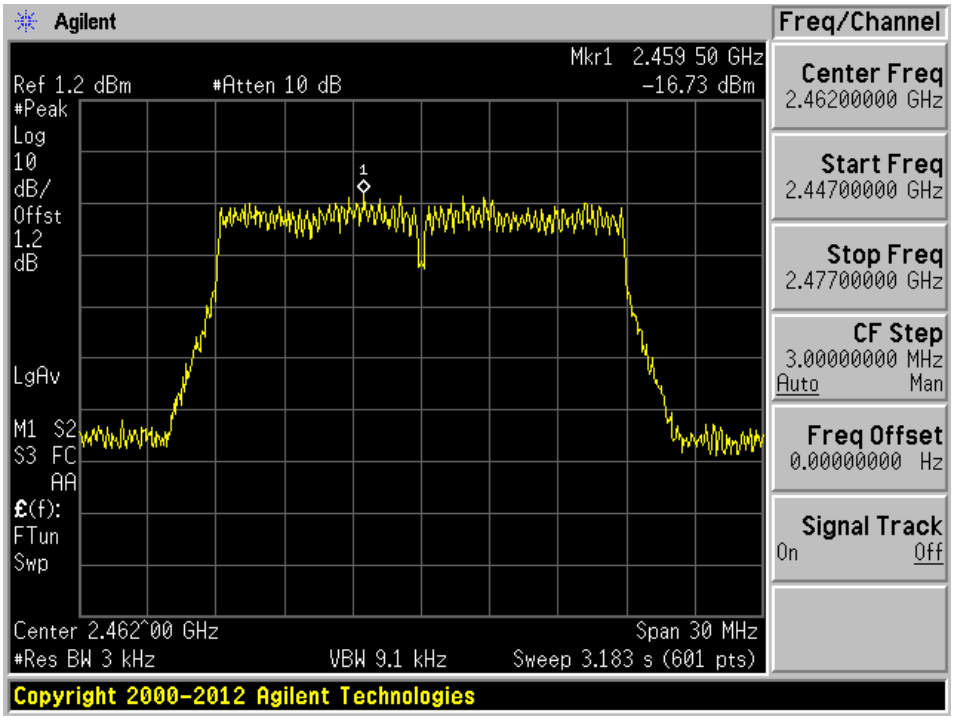
802.11n20-2412 MHz



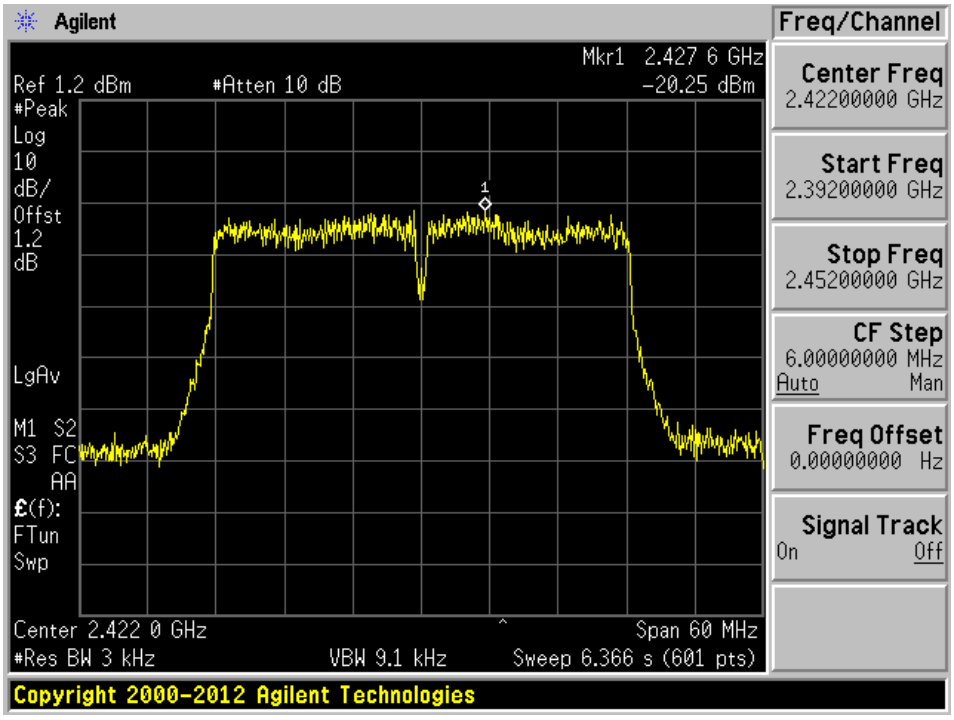
802.11n20-2437 MHz



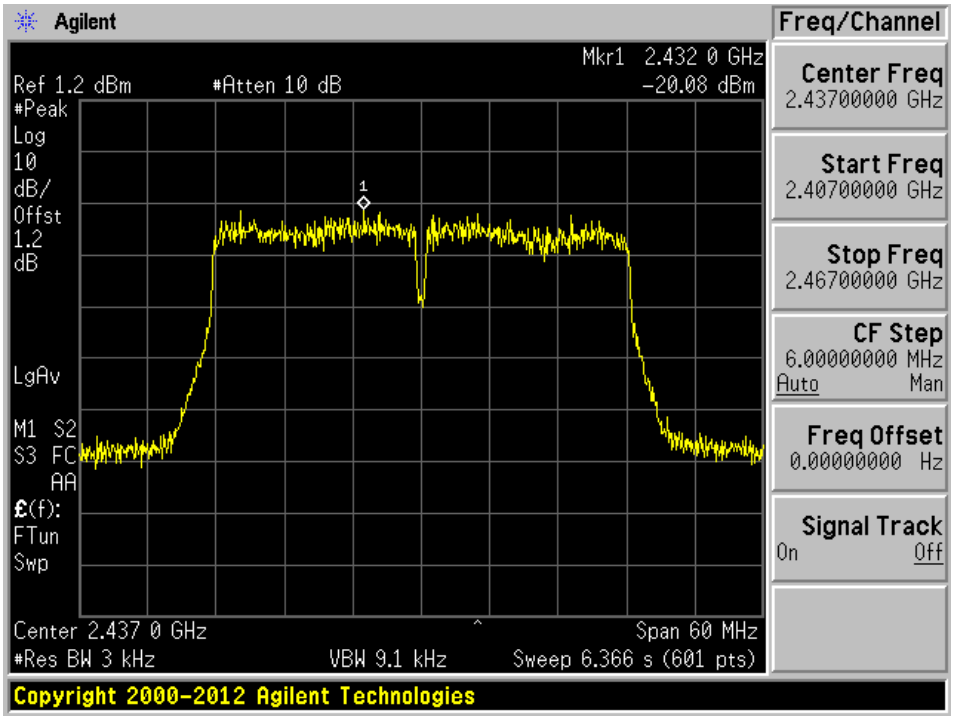
802.11n20 - 2462 MHz



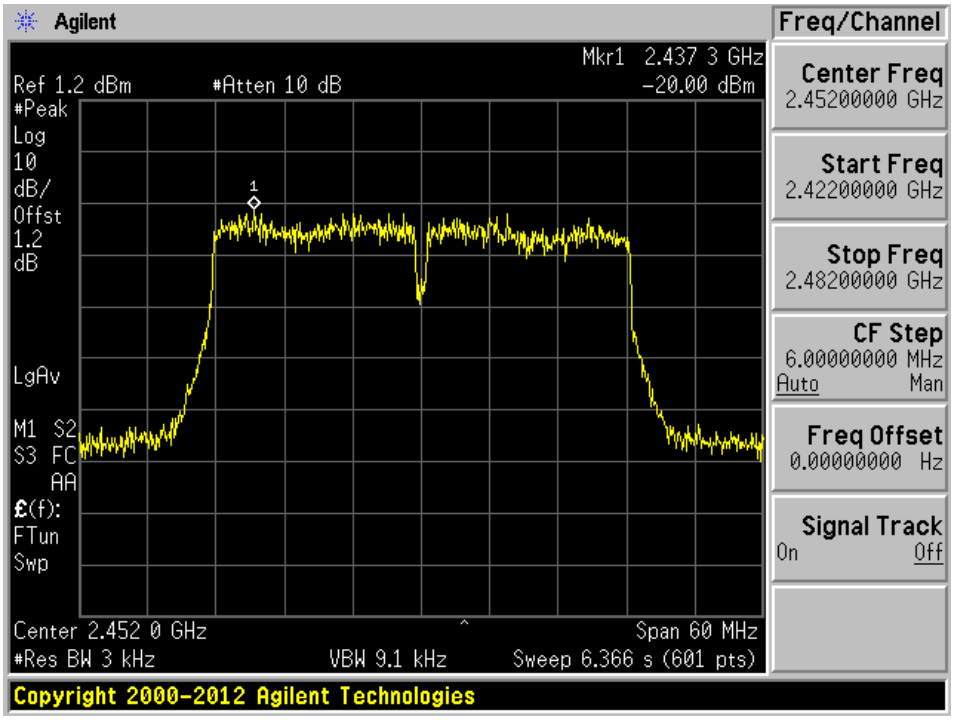
802.11n40 – 2422 MHz



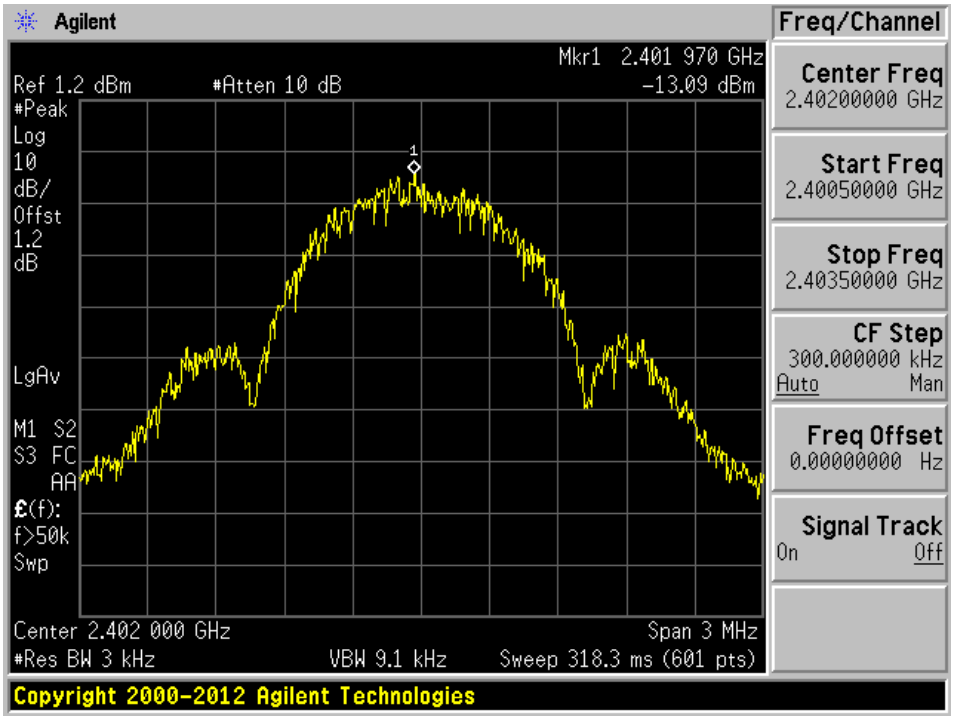
802.11n40 - 2437 MHz



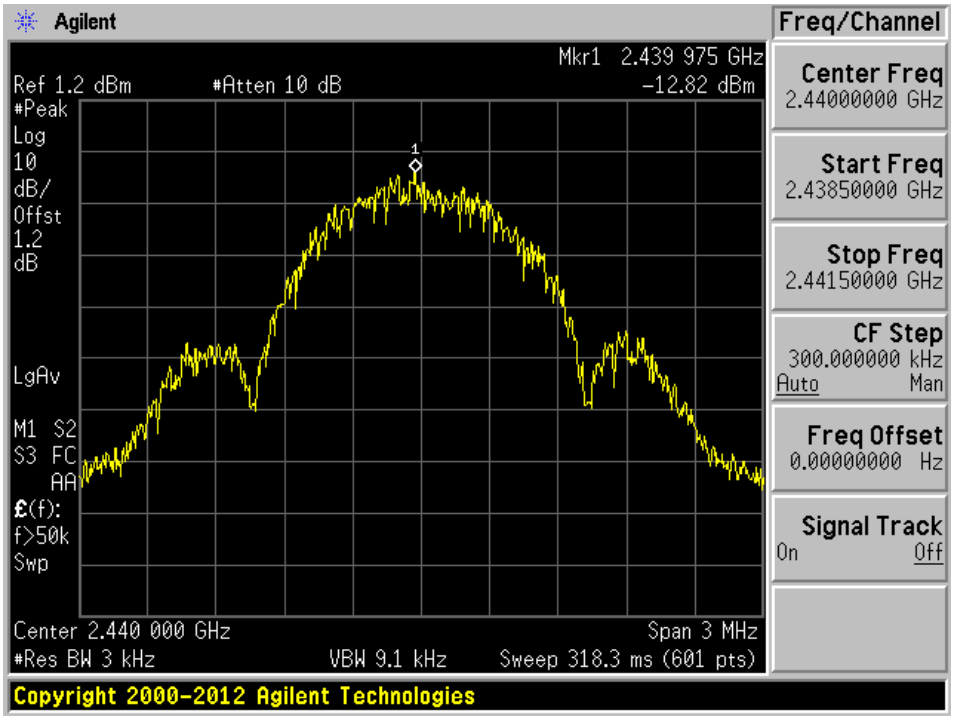
802.11n40 - 2452 MHz



BLE Low – 2402 MHz



BLE Middle – 2440 MHz



BLE High – 2480 MHz