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

TEST AND MEASUREMENT REPORT

For

GoPro, Inc.

3000 Clearview Way, San Mateo, CA 94402, USA

FCC ID: CNFHWHL1
IC: 10193A-HWHL1

Report Type:	**Product Type:**
Original Report	Portable Camera with 2.4 GHz WLAN and BLE

Prepared By:	Chen Ge Test Engineer
Report Number:	R1503022-247 Rev A
Report Date:	2015-05-05
Reviewed By:	Bo Li RF Lead

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1503022-247	Original Report	2015-03-30
1	R1503022-247 Rev A	Revised Test data	2015-05-05

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report has been compiled on behalf of *GoPro Inc*., and their product, *FCC ID: CNFHWHL1; IC: 10193A-HWHL1*, model number: *HWHL1*, which henceforth is referred to as the EUT (Equipment Under Test.) The EUT is a portable camera with 2.4 GHz WLAN and BLE.

1.2 Mechanical Description of EUT

The EUT measures approximately 65 mm (L) x 58 mm (W) x 36mm (H) and weighs approximately 150 g.

The data gathered are from a typical production sample provided by the manufacturer with serial number: A30615D0601 provided by customer.

1.3 Objective

This report is prepared on behalf of *GoPro, 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-210 Issue 8, Dec 2010.

The objective is to determine compliance with FCC Part 15.247 and IC RSS-210 rules for Output Power, Antenna Requirements, 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)

R1503022-SAR

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.

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 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:
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 *Tera Term*, provided by *GoPro, Inc.*, and was verified by Chen Ge 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	Serial Number
GoPro	SD card + USB board	1000435
GoPro	Main board	1000086
GoPro	Camera board	218A0875
GoPro	LCD	018M089AD1 0S02N4CW2335

2.6 Power Supply and Line Filters

Manufacturer	Description	Model	Part Number
GoPro	AC adapter	AWALC-001(TSC-5D)	WALCD0213020015

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
USB Cable	1M	EUT	Laptop
RF Cable	<1M	PSA	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), §2.1093 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-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 IC RSS-Gen §8.9	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

*: please refer to SAR report R1503022-SAR

4 FCC §15.247(i), §2.1093 & IC RSS-102 – RF Exposure

4.1 Applicable Standards

FCC §2.1093, §15.247(i) and IC RSS-102

4.2 Test Result

Compliance, please refer to the SAR report: R1503022-SAR.

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 Description

Antenna Type	Antenna Gain (dBi) @ 2.4 GHz
Internal PCB	0.5

6 FCC §15.207 & IC RSS-Gen §8.8 – 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.

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.

According to RSS GEN §8.8

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits in Table 3.
Unless 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 a battery 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 Table 3 below.
The more stringent limit applies at the frequency range boundaries. The conducted emissions shall be measured in accordance with the reference publication mentioned in Section 3.

Table 3 – AC Power Line Conducted Emissions Limits

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

**: The level decreases linearly with the logarithm of the frequency.*
***: A linear average detector is required.*

6.2 Test Setup

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

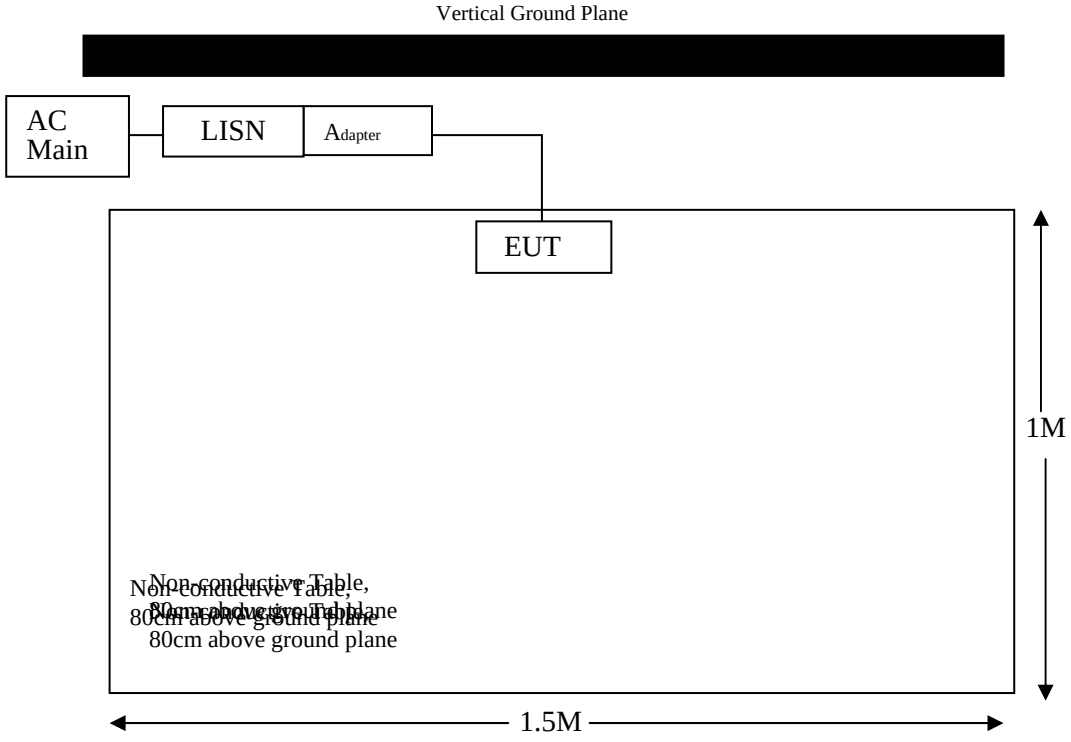
CA = Ai + CL + Atten

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	511205	2014-06-25	1 year
TTE	Filter, High Pass	H962-150k-50-21378	K7133	2015-01-30	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	2015-03-05	1 year
Hewlett-Packard	5 ft RF cable	-	1268	2014-07-24	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 Chen Ge on 2015-03-11 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)**
-9.63	0.800299	Line	0.15-30

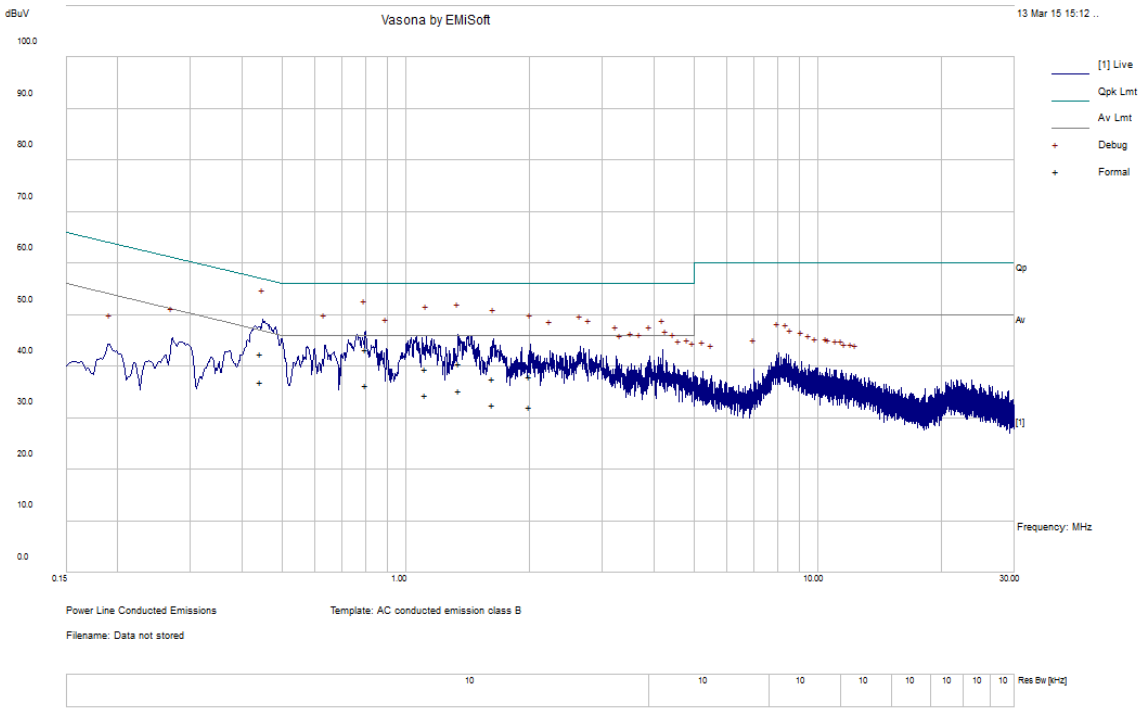
2.4 GHz BLE

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-7.82	0.45308	Line	0.15-30

6.9 Conducted Emissions Test Plots and Data

2.4 GHz Wi-Fi:

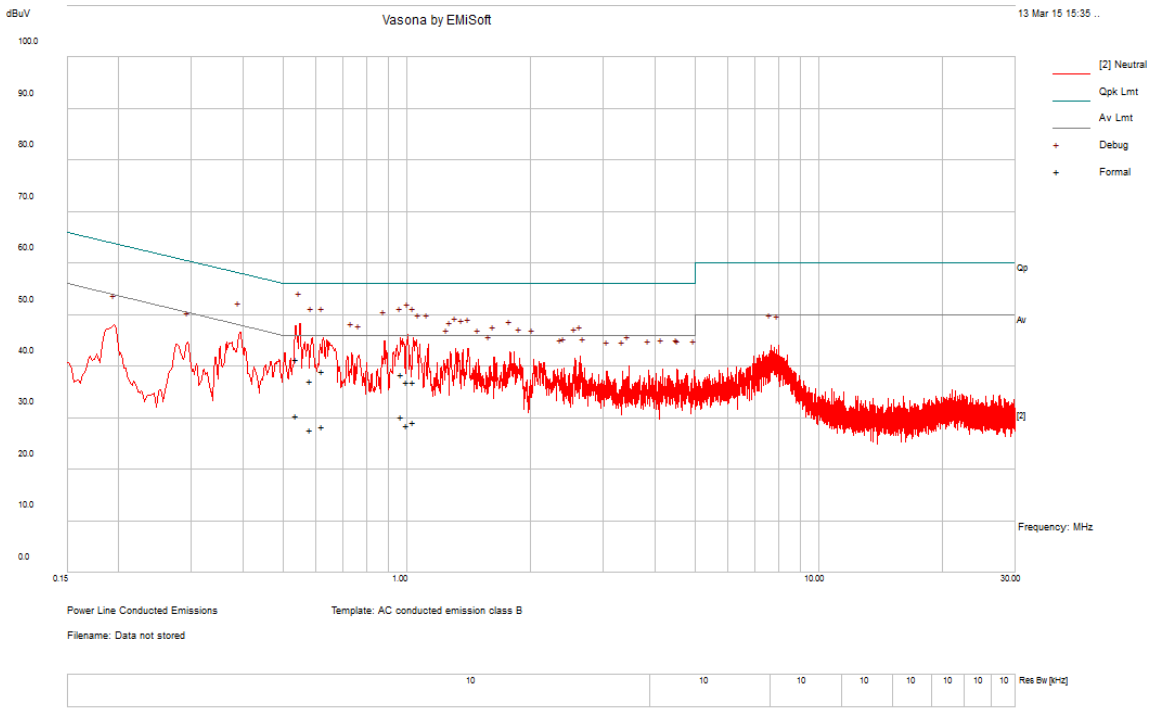
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.444172	42.54	Line	56.98	-14.44	QP
0.800299	43.43	Line	56	-12.57	QP
1.343933	40.67	Line	56	-15.33	QP
1.11739	39.6	Line	56	-16.4	QP
1.626017	37.66	Line	56	-18.34	QP
1.996134	38.08	Line	56	-17.92	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.444172	37.11	Line	46.98	-9.87	Ave.
0.800299	36.37	Line	46	-9.63	Ave.
1.343933	35.36	Line	46	-10.64	Ave.
1.11739	34.61	Line	46	-11.39	Ave.
1.626017	32.66	Line	46	-13.34	Ave.
1.996134	32.19	Line	46	-13.81	Ave.

120 V, 60 Hz – Neutral

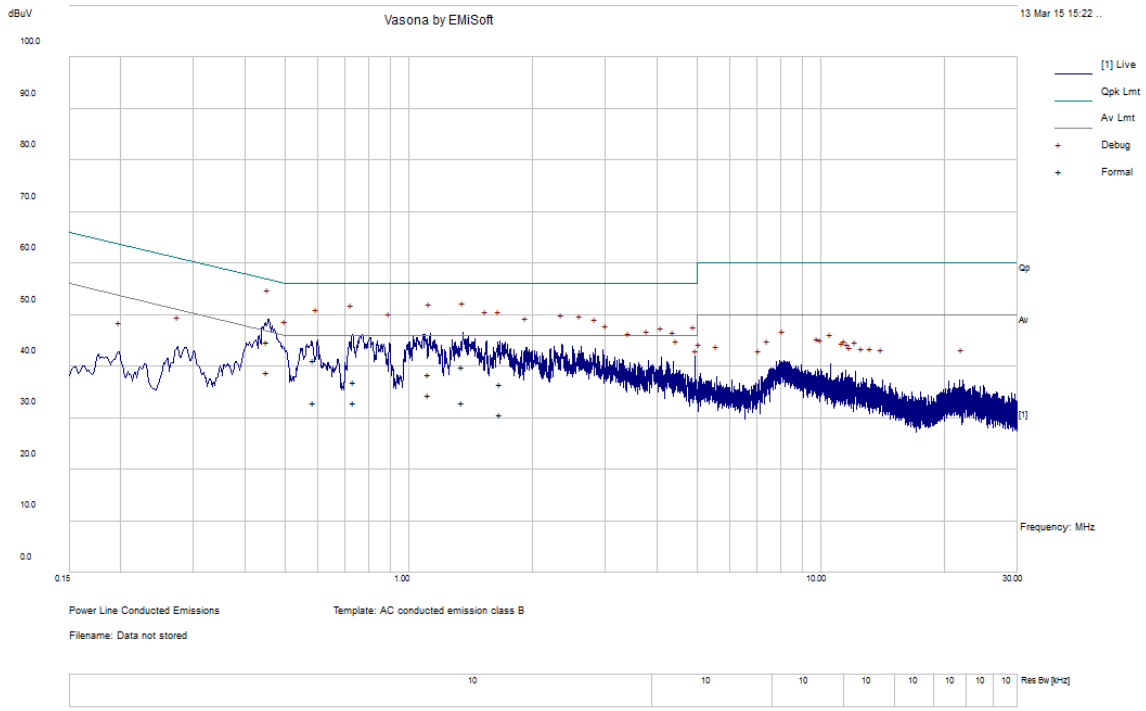


Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.538321	41.5	Neutral	56	-14.5	QP
1.001045	36.97	Neutral	56	-19.03	QP
0.622859	39.17	Neutral	56	-16.83	QP
0.97414	38.45	Neutral	56	-17.55	QP
1.036275	37.01	Neutral	56	-18.99	QP
0.584055	37.21	Neutral	56	-18.79	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.538321	30.53	Neutral	46	-15.47	Ave.
1.001045	28.69	Neutral	46	-17.31	Ave.
0.622859	28.4	Neutral	46	-17.6	Ave.
0.97414	30.23	Neutral	46	-15.77	Ave.
1.036275	29.2	Neutral	46	-16.8	Ave.
0.584055	27.9	Neutral	46	-18.1	Ave.

2.4 GHz BLE:

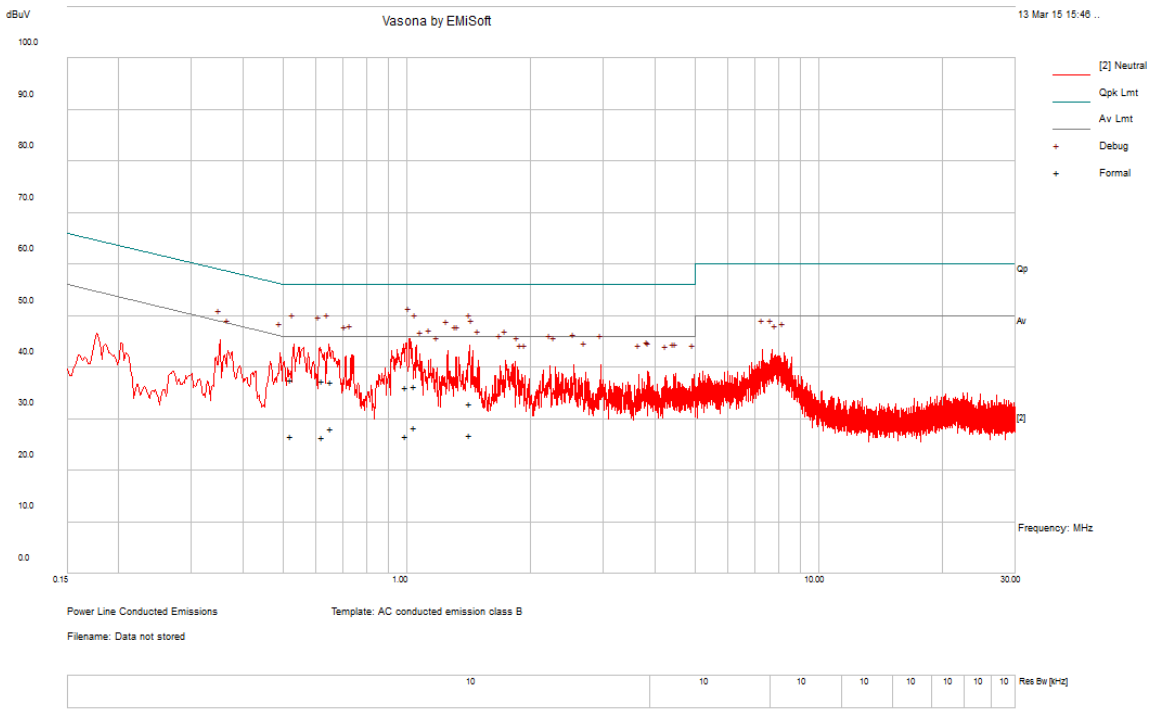
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.45308	44.88	Line	56.82	-11.94	QP
1.350134	40.03	Line	56	-15.97	QP
1.115091	38.48	Line	56	-17.52	QP
0.736513	37.11	Line	56	-18.89	QP
0.588894	41.23	Line	56	-14.77	QP
1.663917	36.58	Line	56	-19.42	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.45308	38.99	Line	46.82	-7.82	Ave.
1.350134	33.1	Line	46	-12.9	Ave.
1.115091	34.53	Line	46	-11.47	Ave.
0.736513	33.07	Line	46	-12.93	Ave.
0.588894	33	Line	46	-13	Ave.
1.663917	30.81	Line	46	-15.19	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.995817	36.21	Neutral	56	-19.79	QP
0.524064	37.61	Neutral	56	-18.39	QP
0.656652	37.18	Neutral	56	-18.82	QP
1.044154	36.36	Neutral	56	-19.64	QP
1.425842	33.16	Neutral	56	-22.84	QP
0.622592	37.45	Neutral	56	-18.55	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.995817	26.75	Neutral	46	-19.25	Ave.
0.524064	26.74	Neutral	46	-19.26	Ave.
0.656652	28.23	Neutral	46	-17.77	Ave.
1.044154	28.47	Neutral	46	-17.53	Ave.
1.425842	26.98	Neutral	46	-19.02	Ave.
0.622592	26.58	Neutral	46	-19.42	Ave.

7 FCC §15.209, §15.247(d) & IC RSS-210 §A8.5, 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-210: Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

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

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

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

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

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

As per IC RSS-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-210 A8.5, 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 the100 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.

7.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.4-2009. The specification used was the FCC 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.

7.3 Test Procedure

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

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

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

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

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

Above 1000 MHz:

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

7.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the 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	E4440A	MY44303352	2014-10-16	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	3115	9511-4627	2014-10-17	1 year
Hewlett Packard	Pre-amplifier	8447D	2944A10187	2014-08-08	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	-	C0002	Each time[1]	N/A
IW Microwave	High Frequency Cable	DC-1438	SPS-2303-3840-SPS	2014-09-23	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

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

The testing was performed by Chen Ge on 2015-03-11 in 5m chamber3.

7.7 Summary of Test Results

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

30 MHz – 25 GHz:

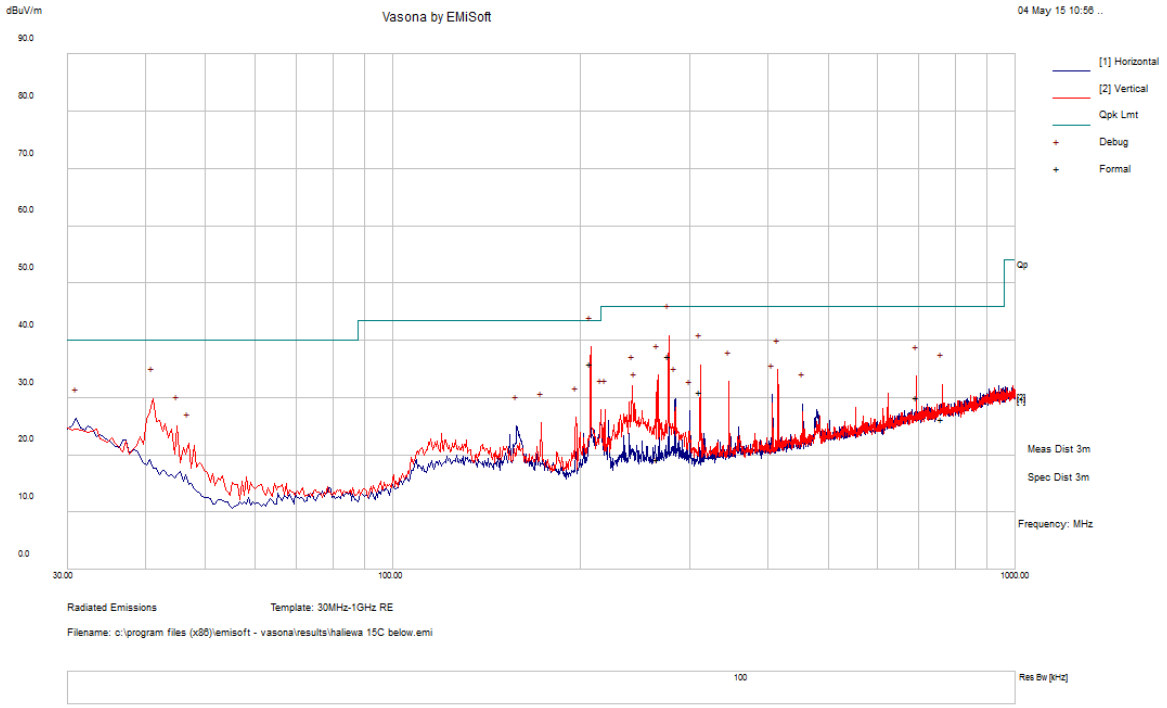
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-0.893	2483.5	Vertical	802.11n-HT20 mode High Channel

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

7.8 Radiated Emissions Test Data and Plots

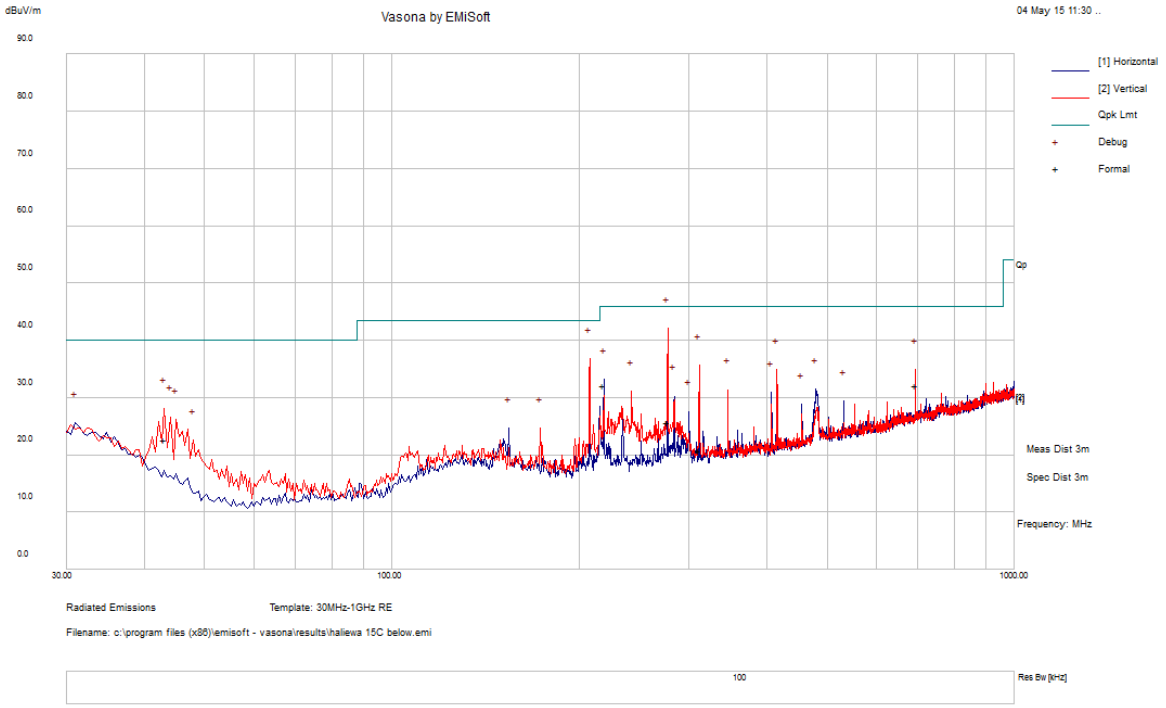
1) 30 MHz – 1 GHz

2.4 GHz Wi-Fi:



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comments
207.863	35.92	109	V	32	43.5	-7.58	QP
277.154	37.31	107	V	27	46	-8.69	QP
311.796	31.07	183	V	171	46	-14.93	QP
266.484	19.36	100	V	165	46	-26.64	QP
692.8313	30.06	100	V	241	46	-15.94	QP
762.1048	26.3	107	V	244	46	-19.7	QP

2.4 GHz BLE:



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comments
277.146	25.79	100	V	110	46	-20.21	QP
311.8023	20.75	172	V	102	46	-25.25	QP
692.8578	32.28	135	V	301	46	-13.72	QP
43.1705	22.75	122	V	227	40	-17.25	QP
219.0223	32.29	116	H	275	46	-13.71	QP

2)1–25 GHz

2.4 GHz Wi-Fi, 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											
2412	80.53	276	100	V	28.197	2.86	0	111.587	-	-	Peak
2412	74.76	325	135	H	28.197	2.86	0	105.817	-	-	Peak
2412	70.64	276	100	V	28.197	2.86	0	101.697	-	-	Ave
2412	64.92	325	135	H	28.197	2.86	0	95.977	-	-	Ave
2390	27.41	276	100	V	28.197	2.86	0	58.467	74	-15.533	Peak
2390	25.12	325	135	H	28.197	2.86	0	56.177	74	-17.823	Peak
2390	16.08	276	100	V	28.197	2.86	0	47.137	54	-6.863	Ave
2390	14.45	325	135	H	28.197	2.86	0	45.507	54	-8.493	Ave
4824	48.78	0	100	V	33.182	4.29	34.76	51.492	74	-22.508	Peak
4824	48.69	0	100	H	33.182	4.29	34.76	51.402	74	-22.598	Peak
4824	33.21	0	100	V	33.182	4.29	34.76	35.922	54	-18.078	Ave
4824	33.23	0	100	H	33.182	4.29	34.76	35.942	54	-18.058	Ave
7236	46.73	0	100	V	37.442	5.67	35.06	54.782	91.587	-36.805	Peak
7236	46.12	0	100	H	37.442	5.67	35.06	54.172	85.817	-31.645	Peak
7236	31.58	0	100	V	37.442	5.67	35.06	39.632	81.697	-42.065	Ave
7236	31.96	0	100	H	37.442	5.67	35.06	40.012	75.977	-35.965	Ave
9648	46.53	0	100	V	38.834	8.7	35.57	58.494	91.587	-33.093	Peak
9648	46.49	0	100	H	38.834	8.7	35.57	58.454	85.817	-27.363	Peak
9648	32.02	0	100	V	38.834	8.7	35.57	43.984	81.697	-37.713	Ave
9648	32.52	0	100	H	38.834	8.7	35.57	44.484	75.977	-31.493	Ave
Middle Channel 2437 MHz											
2437	81.23	278	100	V	28.197	2.86	0	112.287	-	-	Peak
2437	75.31	133	112	H	28.197	2.86	0	106.367	-	-	Peak
2437	70.84	278	100	V	28.197	2.86	0	101.897	-	-	Ave
2437	65.13	133	112	H	28.197	2.86	0	96.187	-	-	Ave
4874	48.47	0	100	V	33.182	4.29	34.76	51.182	74	-22.818	Peak
4874	48.25	0	100	H	33.182	4.29	34.76	50.962	74	-23.038	Peak
4874	33.02	0	100	V	33.182	4.29	34.76	35.732	54	-18.268	Ave
4874	33.65	0	100	H	33.182	4.29	34.76	36.362	54	-17.638	Ave
7311	47.01	0	100	V	37.442	5.67	35.06	55.062	74	-18.938	Peak
7311	46.6	0	100	H	37.442	5.67	35.06	54.652	74	-19.348	Peak
7311	32.66	0	100	V	37.442	5.67	35.06	40.712	54	-13.288	Ave
7311	32.18	0	100	H	37.442	5.67	35.06	40.232	54	-13.768	Ave
9748	46.62	0	100	V	38.834	8.7	35.57	58.584	92.287	-33.703	Peak
9748	46.79	0	100	H	38.834	8.7	35.57	58.754	86.367	-27.613	Peak
9748	32.15	0	100	V	38.834	8.7	35.57	44.114	81.897	-37.783	Ave
9748	32.36	0	100	H	38.834	8.7	35.57	44.324	76.187	-31.863	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz											
2462	80.57	277	100	V	28.197	2.86	0	111.627	-	-	Peak
2462	74.87	323	100	H	28.197	2.86	0	105.927	-	-	Peak
2462	69.15	277	100	V	28.197	2.86	0	100.207	-	-	Ave
2462	64.66	323	100	H	28.197	2.86	0	95.717	-	-	Ave
2483.5	29.56	277	100	V	28.197	2.86	0	60.617	74	-13.383	Peak
2483.5	26.14	0	100	H	28.197	2.86	0	57.197	74	-16.803	Peak
2483.5	14.46	277	100	V	28.197	2.86	0	45.517	54	-8.483	Ave
2483.5	13.84	0	100	H	28.197	2.86	0	44.897	54	-9.103	Ave
4924	48.25	0	100	V	33.182	4.29	34.76	50.962	74	-23.038	Peak
4924	48.36	0	100	H	33.182	4.29	34.76	51.072	74	-22.928	Peak
4924	33.22	0	100	V	33.182	4.29	34.76	35.932	54	-18.068	Ave
4924	33.36	0	100	H	33.182	4.29	34.76	36.072	54	-17.928	Ave
7386	46.88	0	100	V	37.442	5.67	35.06	54.932	74	-19.068	Peak
7386	46.2	0	100	H	37.442	5.67	35.06	54.252	74	-19.748	Peak
7386	32.47	0	100	V	37.442	5.67	35.06	40.522	54	-13.478	Ave
7386	32.12	0	100	H	37.442	5.67	35.06	40.172	54	-13.828	Ave
9848	46.84	0	100	V	38.834	8.7	35.57	58.804	91.627	-32.823	Peak
9848	46.41	0	100	H	38.834	8.7	35.57	58.374	85.927	-27.553	Peak
9848	32.1	0	100	V	38.834	8.7	35.57	44.064	80.207	-36.143	Ave
9848	33.66	0	100	H	38.834	8.7	35.57	45.624	75.717	-30.093	Ave

2.4 GHz Wi-Fi, 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											
2412	75.7	276	100	V	28.197	2.86	0	106.757	-	-	Peak
2412	68.25	79	115	H	28.197	2.86	0	99.307	-	-	Peak
2412	61.08	276	100	V	28.197	2.86	0	92.137	-	-	Ave
2412	57.87	79	115	H	28.197	2.86	0	88.927	-	-	Ave
2390	38.72	221	100	V	28.197	2.86	0	69.777	74	-4.223	Peak
2390	33.73	109	100	H	28.197	2.86	0	64.787	74	-9.213	Peak
2390	21.98	221	100	V	28.197	2.86	0	53.037	54	-0.963	Ave
2390	17.83	109	100	H	28.197	2.86	0	48.887	54	-5.113	Ave
4824	47.93	0	100	V	33.182	4.29	34.76	50.642	74	-23.358	Peak
4824	48.32	0	100	H	33.182	4.29	34.76	51.032	74	-22.968	Peak
4824	33.15	0	100	V	33.182	4.29	34.76	35.862	54	-18.138	Ave
4824	33.33	0	100	H	33.182	4.29	34.76	36.042	54	-17.958	Ave
7236	46.63	0	100	V	37.442	5.67	35.06	54.682	86.757	-32.075	Peak
7236	46.57	0	100	H	37.442	5.67	35.06	54.622	79.307	-24.685	Peak
7236	32.11	0	100	V	37.442	5.67	35.06	40.162	72.137	-31.975	Ave
7236	32.55	0	100	H	37.442	5.67	35.06	40.602	68.927	-28.325	Ave
9648	46.84	0	100	V	38.834	8.7	35.57	58.804	86.757	-27.953	Peak
9648	47.08	0	100	H	38.834	8.7	35.57	59.044	79.307	-20.263	Peak
9648	32.63	0	100	V	38.834	8.7	35.57	44.594	72.137	-27.543	Ave
9648	32.44	0	100	H	38.834	8.7	35.57	44.404	68.927	-24.523	Ave
Middle Channel 2437 MHz											
2437	76.58	277	100	V	28.197	2.86	0	107.637	-	-	Peak
2437	69.44	80	114	H	28.197	2.86	0	100.497	-	-	Peak
2437	65.87	277	100	V	28.197	2.86	0	96.927	-	-	Ave
2437	62.04	80	114	H	28.197	2.86	0	93.097	-	-	Ave
4874	47.58	0	100	V	33.182	4.29	34.76	50.292	74	-23.708	Peak
4874	47.62	0	100	H	33.182	4.29	34.76	50.332	74	-23.668	Peak
4874	33.52	0	100	V	33.182	4.29	34.76	36.232	54	-17.768	Ave
4874	33.21	0	100	H	33.182	4.29	34.76	35.922	54	-18.078	Ave
7311	46.89	0	100	V	37.442	5.67	35.06	54.942	74	-19.058	Peak
7311	46.62	0	100	H	37.442	5.67	35.06	54.672	74	-19.328	Peak
7311	32.33	0	100	V	37.442	5.67	35.06	40.382	54	-13.618	Ave
7311	32.14	0	100	H	37.442	5.67	35.06	40.192	54	-13.808	Ave
9748	46.72	0	100	V	38.834	8.7	35.57	58.684	87.637	-28.953	Peak
9748	46.27	0	100	H	38.834	8.7	35.57	58.234	80.497	-22.263	Peak
9748	32.25	0	100	V	38.834	8.7	35.57	44.214	76.927	-32.713	Ave
9748	32.36	0	100	H	38.834	8.7	35.57	44.324	73.097	-28.773	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz											
2462	76.25	169	100	V	28.197	2.86	0	107.307	-	-	Peak
2462	69.25	80	115	H	28.197	2.86	0	100.307	-	-	Peak
2462	65.19	169	100	V	28.197	2.86	0	96.247	-	-	Ave
2462	62.47	80	115	H	28.197	2.86	0	93.527	-	-	Ave
2483.5	38.83	155	100	V	28.197	2.86	0	69.887	74	-4.113	Peak
2483.5	33.54	75	100	H	28.197	2.86	0	64.597	74	-9.403	Peak
2483.5	21.35	155	100	V	28.197	2.86	0	52.407	54	-1.593	Ave
2483.5	17.05	75	100	H	28.197	2.86	0	48.107	54	-5.893	Ave
4924	48.25	0	100	V	33.182	4.29	34.76	50.962	74	-23.038	Peak
4924	48.3	0	100	H	33.182	4.29	34.76	51.012	74	-22.988	Peak
4924	33.15	0	100	V	33.182	4.29	34.76	35.862	54	-18.138	Ave
4924	33.05	0	100	H	33.182	4.29	34.76	35.762	54	-18.238	Ave
7386	47.08	0	100	V	37.442	5.67	35.06	55.132	74	-18.868	Peak
7386	46.87	0	100	H	37.442	5.67	35.06	54.922	74	-19.078	Peak
7386	31.69	0	100	V	37.442	5.67	35.06	39.742	54	-14.258	Ave
7386	31.85	0	100	H	37.442	5.67	35.06	39.902	54	-14.098	Ave
9848	47.06	0	100	V	38.834	8.7	35.57	59.024	87.307	-28.283	Peak
9848	46.25	0	100	H	38.834	8.7	35.57	58.214	80.307	-22.093	Peak
9848	32.11	0	100	V	38.834	8.7	35.57	44.074	76.247	-32.173	Ave
9848	32.69	0	100	H	38.834	8.7	35.57	44.654	73.527	-28.873	Ave

2.4 GHz Wi-Fi, 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											
2412	74.41	345	100	V	28.197	2.86	0	105.467	-	-	Peak
2412	70.02	153	105	H	28.197	2.86	0	101.077	-	-	Peak
2412	53.08	345	100	V	28.197	2.86	0	84.137	-	-	Ave
2412	48.46	153	105	H	28.197	2.86	0	79.517	-	-	Ave
2390	41.75	348	100	V	28.197	2.86	0	72.807	74	-1.193	Peak
2390	38.55	153	100	H	28.197	2.86	0	69.607	74	-4.393	Peak
2390	21.88	348	100	V	28.197	2.86	0	52.937	54	-1.063	Ave
2390	18.72	153	100	H	28.197	2.86	0	49.777	54	-4.223	Ave
4824	47.85	0	100	V	33.182	4.29	34.76	50.562	74	-23.438	Peak
4824	47.69	0	100	H	33.182	4.29	34.76	50.402	74	-23.598	Peak
4824	31.08	0	100	V	33.182	4.29	34.76	33.792	54	-20.208	Ave
4824	31.35	0	100	H	33.182	4.29	34.76	34.062	54	-19.938	Ave
7236	46.32	0	100	V	37.442	5.67	35.06	54.372	85.467	-31.095	Peak
7236	46.25	0	100	H	37.442	5.67	35.06	54.302	81.077	-26.775	Peak
7236	33.22	0	100	V	37.442	5.67	35.06	41.272	64.137	-22.865	Ave
7236	33.33	0	100	H	37.442	5.67	35.06	41.382	59.517	-18.135	Ave
9648	46.56	0	100	V	38.834	8.7	35.57	58.524	85.467	-26.943	Peak
9648	47.07	0	100	H	38.834	8.7	35.57	59.034	81.077	-22.043	Peak
9648	32.21	0	100	V	38.834	8.7	35.57	44.174	64.137	-19.963	Ave
9648	32.22	0	100	H	38.834	8.7	35.57	44.184	59.517	-15.333	Ave
Middle Channel 2437 MHz											
2437	75.24	199	100	V	28.197	2.86	0	106.297	-	-	Peak
2437	71.33	123	100	H	28.197	2.86	0	102.387	-	-	Peak
2437	54.58	199	100	V	28.197	2.86	0	85.637	-	-	Ave
2437	49.56	123	100	H	28.197	2.86	0	80.617	-	-	Ave
4874	47.53	0	100	V	33.182	4.29	34.76	50.242	74	-23.758	Peak
4874	47.36	0	100	H	33.182	4.29	34.76	50.072	74	-23.928	Peak
4874	31.25	0	100	V	33.182	4.29	34.76	33.962	54	-20.038	Ave
4874	31.65	0	100	H	33.182	4.29	34.76	34.362	54	-19.638	Ave
7311	46.65	0	100	V	37.442	5.67	35.06	54.702	74	-19.298	Peak
7311	46.88	0	100	H	37.442	5.67	35.06	54.932	74	-19.068	Peak
7311	32.22	0	100	V	37.442	5.67	35.06	40.272	54	-13.728	Ave
7311	32.15	0	100	H	37.442	5.67	35.06	40.202	54	-13.798	Ave
9748	46.71	0	100	V	38.834	8.7	35.57	58.674	86.297	-27.623	Peak
9748	46.99	0	100	H	38.834	8.7	35.57	58.954	82.387	-23.433	Peak
9748	32.15	0	100	V	38.834	8.7	35.57	44.114	65.637	-21.523	Ave
9748	32.32	0	100	H	38.834	8.7	35.57	44.284	60.617	-16.333	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz											
2462	75.06	255	100	V	28.197	2.86	0	106.117	-	-	Peak
2462	70.87	153	100	H	28.197	2.86	0	101.927	-	-	Peak
2462	56.21	255	100	V	28.197	2.86	0	87.267	-	-	Ave
2462	48.75	153	100	H	28.197	2.86	0	79.807	-	-	Ave
2483.5	41.89	255	100	V	28.197	2.86	0	72.947	74	-1.053	Peak
2483.5	38.14	122	100	H	28.197	2.86	0	69.197	74	-4.803	Peak
2483.5	22.05	255	100	V	28.197	2.86	0	53.107	54	-0.893	Ave
2483.5	18.95	122	100	H	28.197	2.86	0	50.007	54	-3.993	Ave
4924	47.55	0	100	V	33.182	4.29	34.76	50.262	74	-23.738	Peak
4924	47.61	0	100	H	33.182	4.29	34.76	50.322	74	-23.678	Peak
4924	33.02	0	100	V	33.182	4.29	34.76	35.732	54	-18.268	Ave
4924	32.84	0	100	H	33.182	4.29	34.76	35.552	54	-18.448	Ave
7386	46.71	0	100	V	37.442	5.67	35.06	54.762	74	-19.238	Peak
7386	46.15	0	100	H	37.442	5.67	35.06	54.202	74	-19.798	Peak
7386	31.58	0	100	V	37.442	5.67	35.06	39.632	54	-14.368	Ave
7386	31.36	0	100	H	37.442	5.67	35.06	39.412	54	-14.588	Ave
9848	46.76	0	100	V	38.834	8.7	35.57	58.724	86.117	-27.393	Peak
9848	46.67	0	100	H	38.834	8.7	35.57	58.634	81.927	-23.293	Peak
9848	32.47	0	100	V	38.834	8.7	35.57	44.434	67.267	-22.833	Ave
9848	32.14	0	100	H	38.834	8.7	35.57	44.104	59.807	-15.703	Ave

2.4 GHz BLE

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 2402 MHz											
2402	70.92	344	100	V	28.197	2.86	0	101.977	-	-	Peak
2402	64.41	152	135	H	28.197	2.86	0	95.467	-	-	Peak
2402	62.97	344	100	V	28.197	2.86	0	94.027	-	-	Ave
2402	56.46	152	135	H	28.197	2.86	0	87.517	-	-	Ave
2390	26.05	0	100	V	28.197	2.86	0	57.107	74	-16.893	Peak
2390	26.12	0	135	H	28.197	2.86	0	57.177	74	-16.823	Peak
2390	12.36	0	100	V	28.197	2.86	0	43.417	54	-10.583	Ave
2390	12.08	0	135	H	28.197	2.86	0	43.137	54	-10.863	Ave
4804	52.11	41	137	V	33.182	4.29	34.76	54.822	74	-19.178	Peak
4804	52.39	350	126	H	33.182	4.29	34.76	55.102	74	-18.898	Peak
4804	37.15	41	137	V	33.182	4.29	34.76	39.862	54	-14.138	Ave
4804	37.72	350	126	H	33.182	4.29	34.76	40.432	54	-13.568	Ave
7206	46.32	0	100	V	37.442	5.67	35.06	54.372	81.977	-27.605	Peak
7206	46.25	0	100	H	37.442	5.67	35.06	54.302	75.467	-21.165	Peak
7206	32.32	0	100	V	37.442	5.67	35.06	40.372	74.027	-33.655	Ave
7206	32.45	0	100	H	37.442	5.67	35.06	40.502	67.517	-27.015	Ave
9608	46.35	0	100	V	38.834	8.7	35.57	58.314	81.977	-23.663	Peak
9608	46.25	0	100	H	38.834	8.7	35.57	58.214	75.467	-17.253	Peak
9608	32.71	0	100	V	38.834	8.7	35.57	44.674	74.027	-29.353	Ave
9608	32.36	0	100	H	38.834	8.7	35.57	44.324	67.517	-23.193	Ave
Middle Channel 2440 MHz											
2440	70.39	345	100	V	28.197	2.86	0	101.447	-	-	Peak
2440	65.05	153	128	H	28.197	2.86	0	96.107	-	-	Peak
2440	62.44	345	100	V	28.197	2.86	0	93.497	-	-	Ave
2440	57.1	153	128	H	28.197	2.86	0	88.157	-	-	Ave
4880	51.58	40	135	V	33.182	4.29	34.76	54.292	74	-19.708	Peak
4880	52.11	79	100	H	33.182	4.29	34.76	54.822	74	-19.178	Peak
4880	37.36	40	135	V	33.182	4.29	34.76	40.072	54	-13.928	Ave
4880	37.25	79	100	H	33.182	4.29	34.76	39.962	54	-14.038	Ave
7320	46.36	0	100	V	37.442	5.67	35.06	54.412	74	-19.588	Peak
7320	46.33	0	100	H	37.442	5.67	35.06	54.382	74	-19.618	Peak
7320	32.12	0	100	V	37.442	5.67	35.06	40.172	54	-13.828	Ave
7320	32.33	0	100	H	37.442	5.67	35.06	40.382	54	-13.618	Ave
9760	46.4	0	100	V	38.834	8.7	35.57	58.364	81.447	-23.083	Peak
9760	46.23	0	100	H	38.834	8.7	35.57	58.194	76.107	-17.913	Peak
9760	32.14	0	100	V	38.834	8.7	35.57	44.104	73.497	-29.393	Ave
9760	32.25	0	100	H	38.834	8.7	35.57	44.214	68.157	-23.943	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2480 MHz											
2480	70.55	169	102	V	28.197	2.86	0	101.607	-	-	Peak
2480	64.22	177	136	H	28.197	2.86	0	95.277	-	-	Peak
2480	62.6	169	102	V	28.197	2.86	0	93.657	-	-	Ave
2480	56.27	177	136	H	28.197	2.86	0	87.327	-	-	Ave
2483.5	26.24	0	100	V	28.197	2.86	0	57.297	74	-16.703	Peak
2483.5	26.4	0	100	H	28.197	2.86	0	57.457	74	-16.543	Peak
2483.5	12.37	0	100	V	28.197	2.86	0	43.427	54	-10.573	Ave
2483.5	12.23	0	100	H	28.197	2.86	0	43.287	54	-10.713	Ave
4960	51.25	139	132	V	33.182	4.29	34.76	53.962	74	-20.038	Peak
4960	52.39	79	121	H	33.182	4.29	34.76	55.102	74	-18.898	Peak
4960	37.58	139	132	V	33.182	4.29	34.76	40.292	54	-13.708	Ave
4960	37.22	79	121	H	33.182	4.29	34.76	39.932	54	-14.068	Ave
7440	47.09	0	100	V	37.442	5.67	35.06	55.142	74	-18.858	Peak
7440	46.9	0	100	H	37.442	5.67	35.06	54.952	74	-19.048	Peak
7440	31.94	0	100	V	37.442	5.67	35.06	39.992	54	-14.008	Ave
7440	31.58	0	100	H	37.442	5.67	35.06	39.632	54	-14.368	Ave
9920	47.06	0	100	V	38.834	8.7	35.57	59.024	81.607	-22.583	Peak
9920	46.29	0	100	H	38.834	8.7	35.57	58.254	75.277	-17.023	Peak
9920	32.21	0	100	V	38.834	8.7	35.57	44.174	73.657	-29.483	Ave
9920	32.37	0	100	H	38.834	8.7	35.57	44.334	67.327	-22.993	Ave

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

8.1 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

8.2 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 8: DTS bandwidth

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	US44300386	2014-09-29	1 year
Mini Circuit	Precision Fixed Attenuator, 10 dB	BW-S10W5	-	Each Time[1]	N/A

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

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

The testing was performed by Chen Ge on 2015-03-11 in RF site.

8.5 Test Results

2.4 GHz Wi-Fi

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (MHz)	Results
802.11b mode					
Low	2412	7.155	12.4462	> 0.5	Compliant
Middle	2437	7.131	12.4149	> 0.5	Compliant
High	2462	6.660	12.3812	> 0.5	Compliant
802.11g mode					
Low	2412	16.513	16.4506	> 0.5	Compliant
Middle	2437	16.537	16.4356	> 0.5	Compliant
High	2462	16.544	16.4400	> 0.5	Compliant
802.11n-HT20 mode					
Low	2412	17.647	17.6543	> 0.5	Compliant
Middle	2437	17.013	17.6385	> 0.5	Compliant
High	2462	17.109	17.6147	> 0.5	Compliant

2.4 GHz BLE

Channel	Frequency (MHz)	6 dB Emission Bandwidth (kHz)	99% Occupied Bandwidth (kHz)	Limit (kHz)	Results
Low	2402	605.383	1057.7	> 500	Compliant
Middle	2440	622.455	1011.2	> 500	Compliant
High	2480	568.233	1037.7	> 500	Compliant

Please refer to the following plots for detailed test results

802.11b mode

Low channel: 2412 MHz

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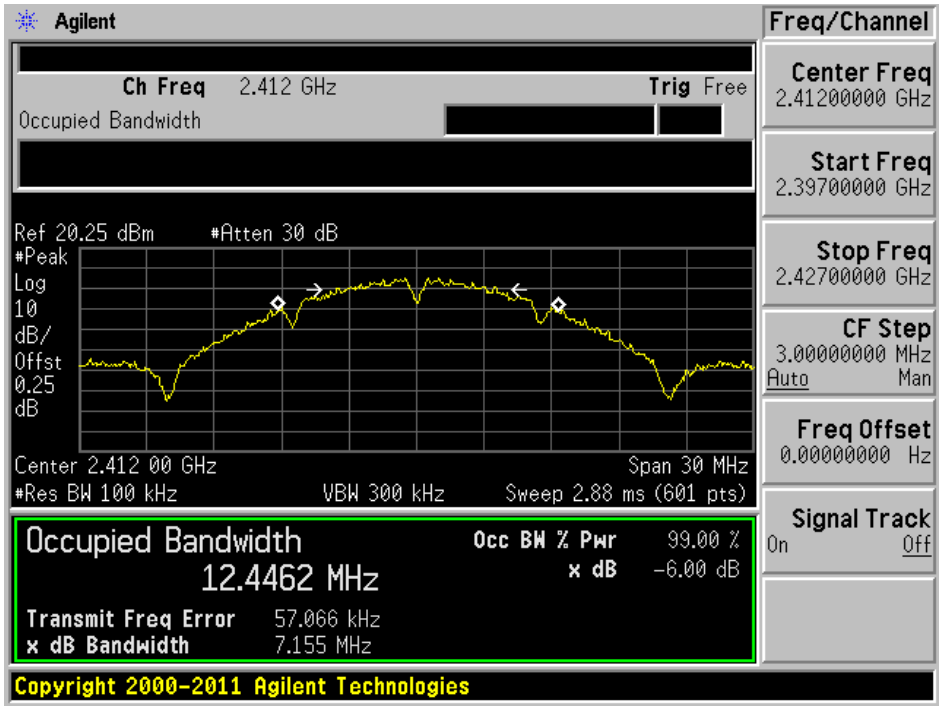
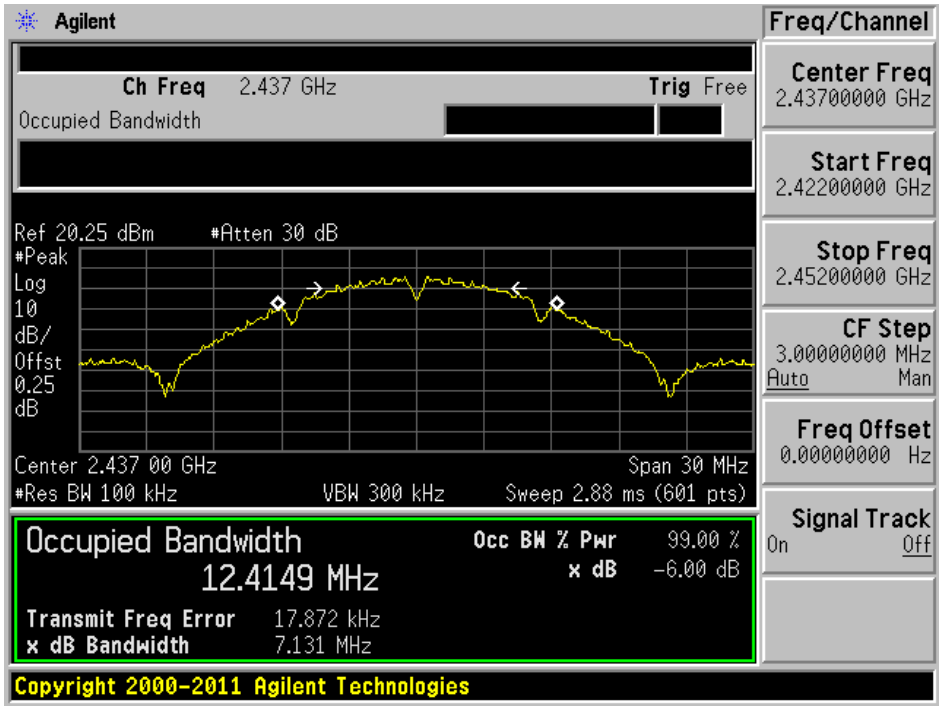
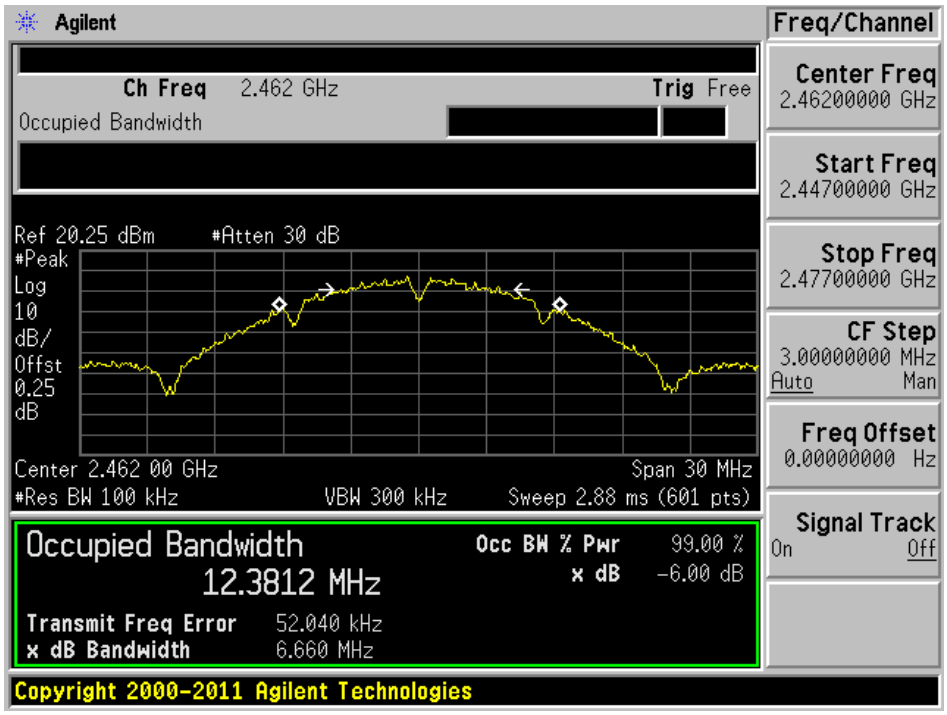


Middle channel: 2437 MHz

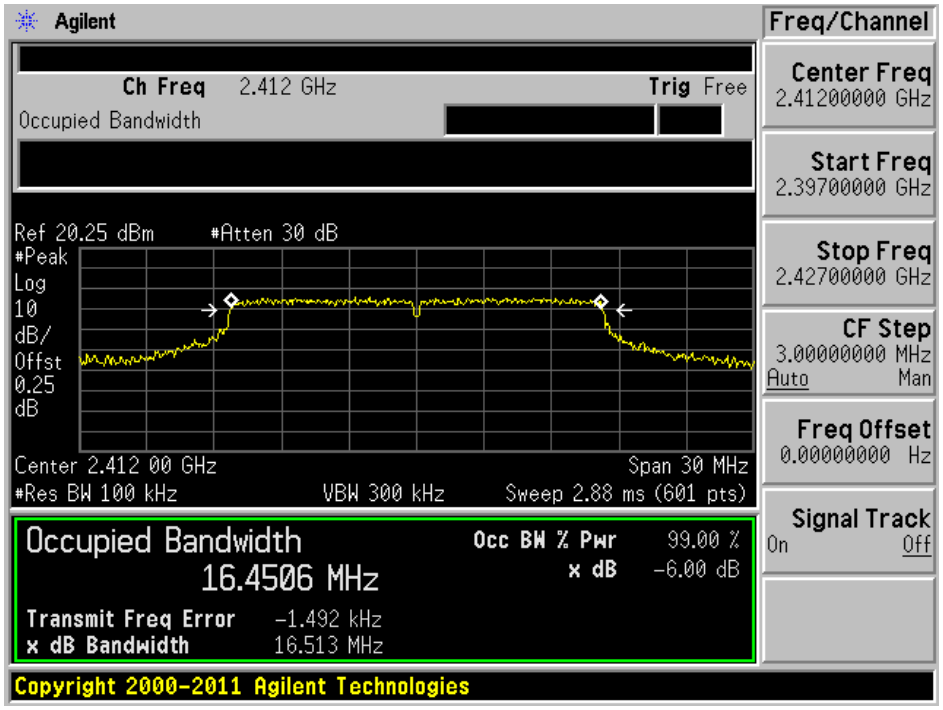


High channel: 2462 MHz

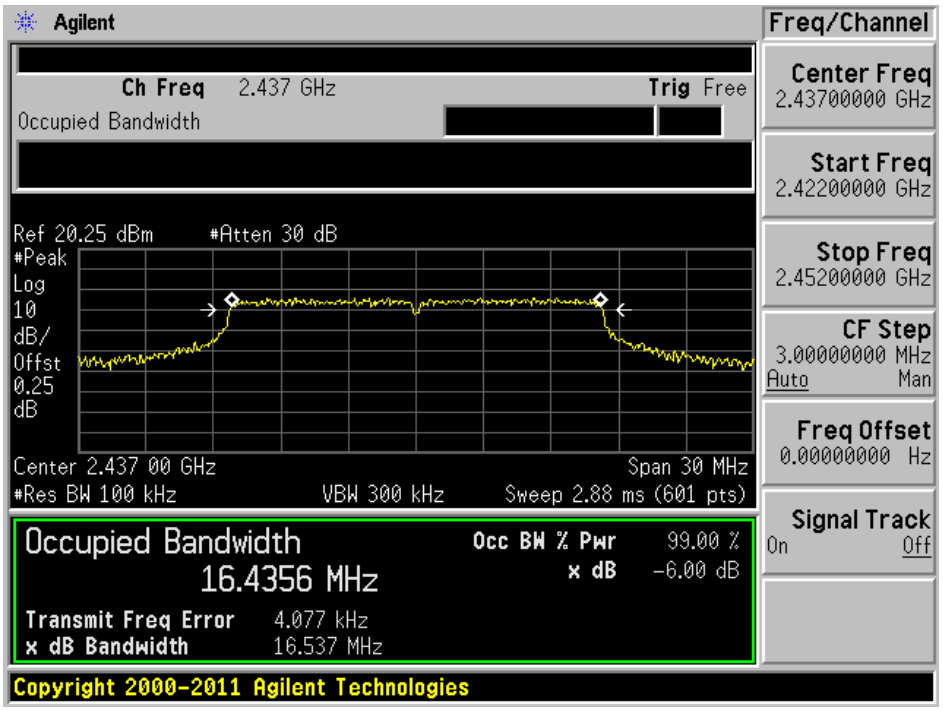


802.11g mode

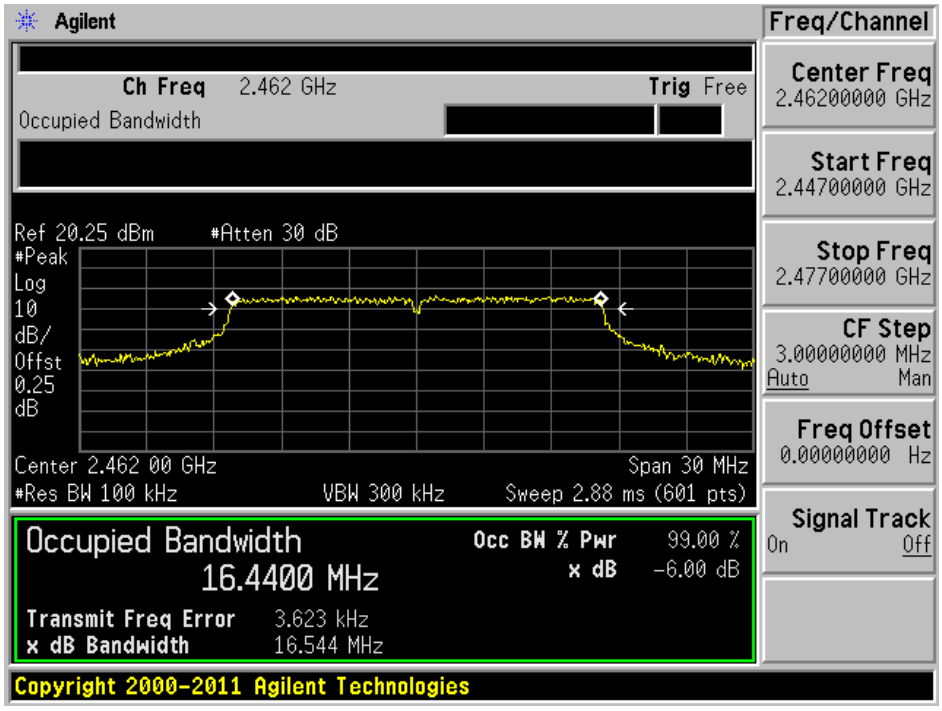
Low channel: 2412 MHz



Middle channel: 2437 MHz

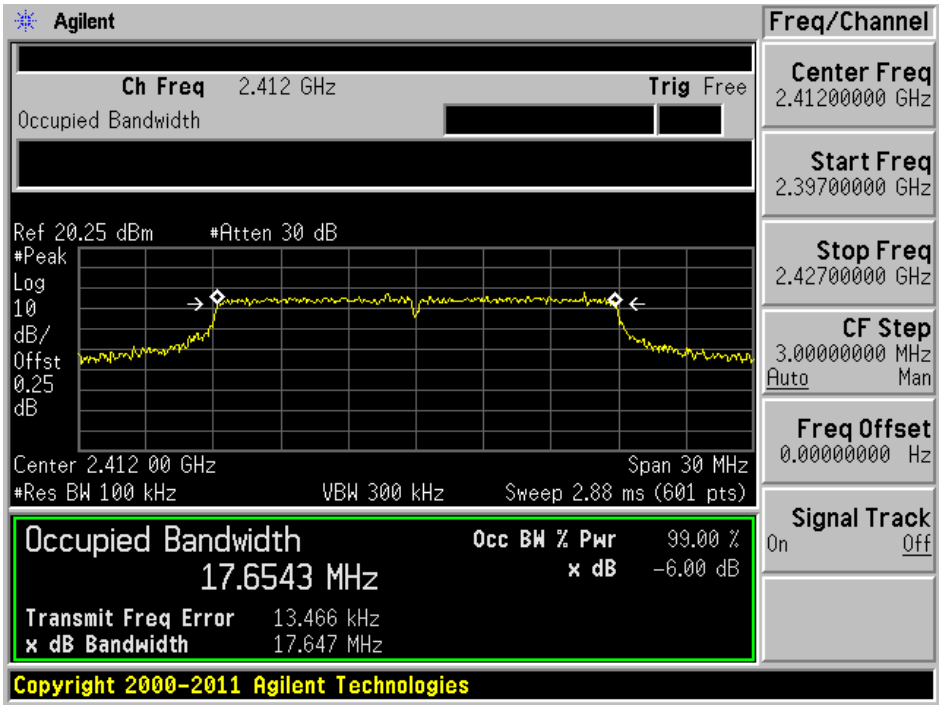


High channel: 2462 MHz

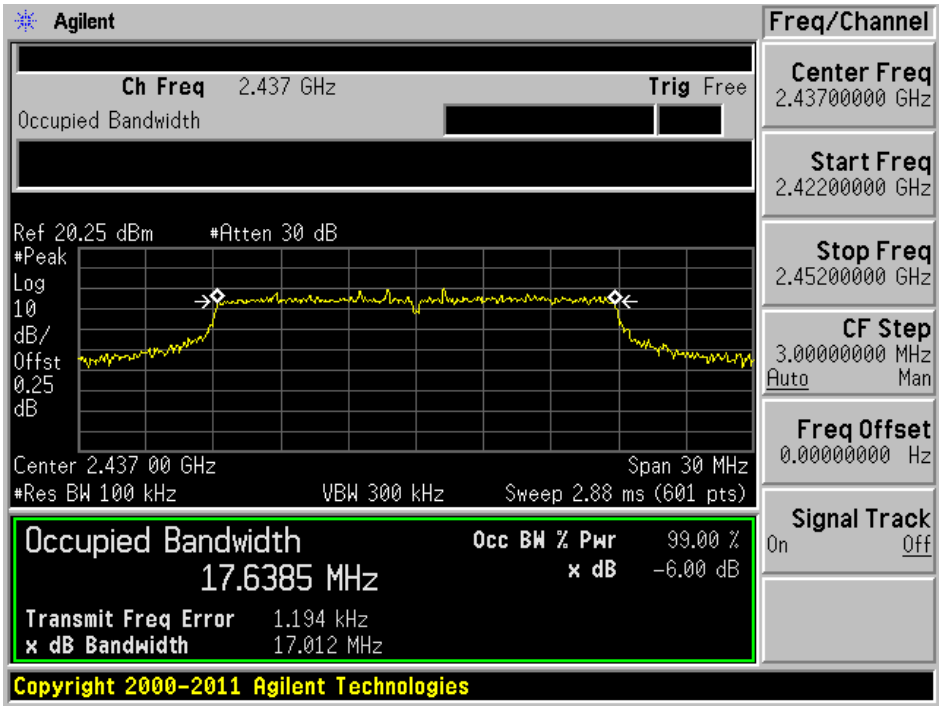


802.11n-HT20 mode

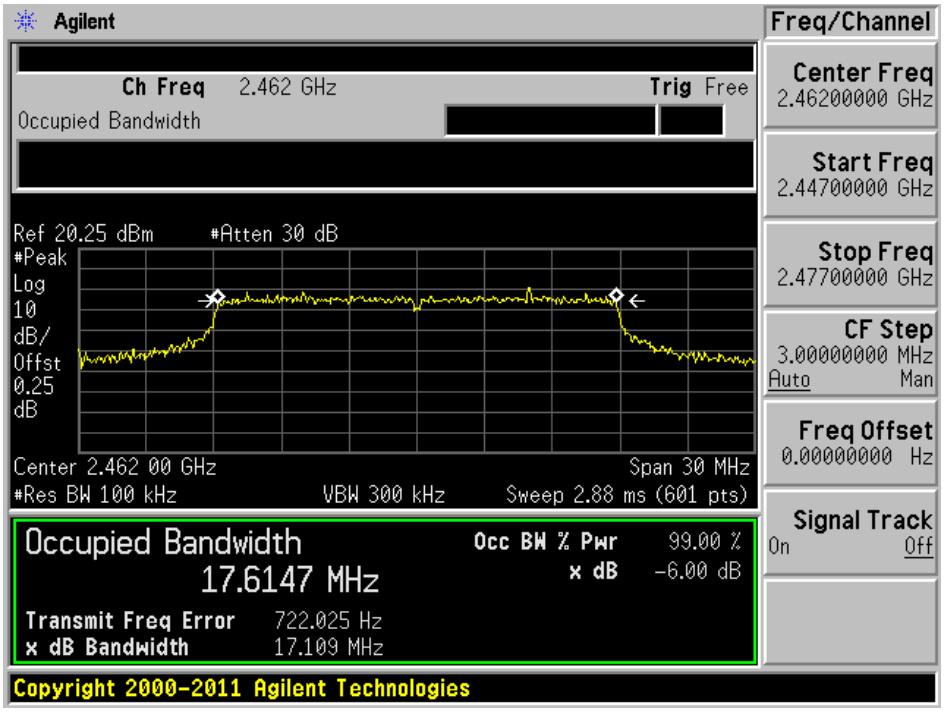
Low channel: 2412 MHz



Middle channel: 2437 MHz

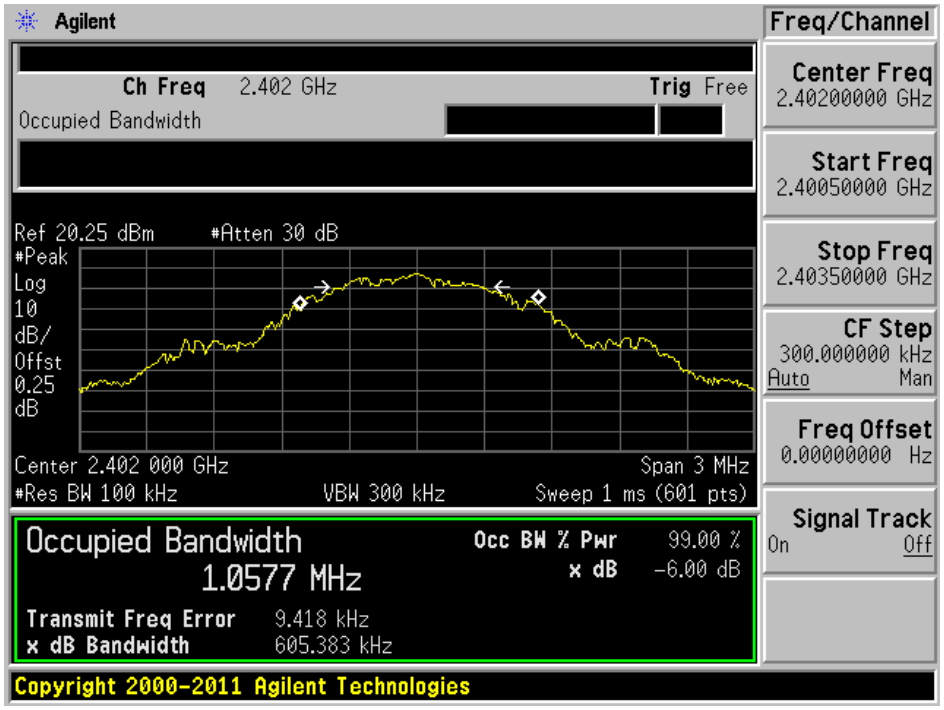


High channel: 2462 MHz

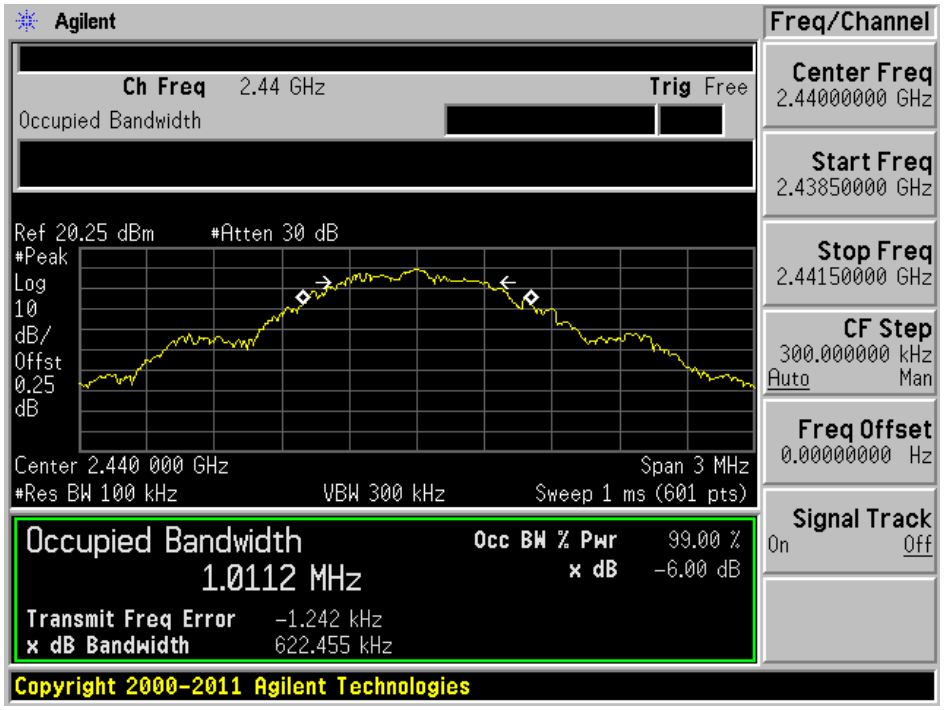


2.4 GHz BLE

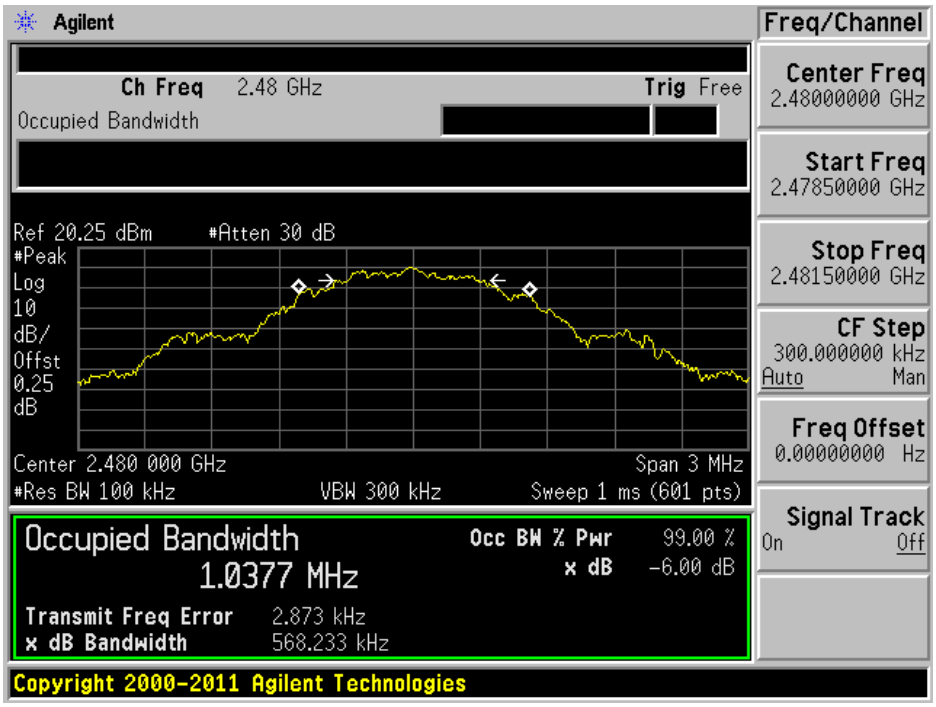
Low channel: 2402 MHz



Middle channel: 2440 MHz



High channel: 2480 MHz



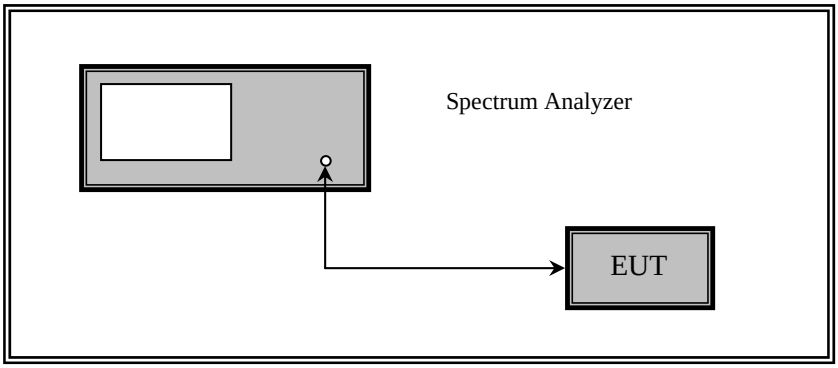
9 FCC §15.247(b) & IC RSS-210 §A8.4 – Output Power Measurement

9.1 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.

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 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	US44300386	2014-09-29	1 year
Mini Circuit	Precision Fixed Attenuator, 10 dB	BW-S10W5	-	Each Time[1]	N/A

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

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

The testing was performed by Chen Ge on 2015-03-11 in RF site.

9.5 Test Results

2.4 GHz Wi-Fi (Average)

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Margin
802.11b mode				
Low	2412	14.32	30	-15.68
Middle	2437	15.09	30	-14.91
High	2462	15.59	30	-14.41
802.11g mode				
Low	2412	9.62	30	-20.38
Middle	2437	9.95	30	-20.05
High	2462	10.48	30	-19.52
802.11n-HT20 mode				
Low	2412	10.43	30	-19.57
Middle	2437	10.67	30	-19.33
High	2462	11.20	30	-18.8

2.4 GHz Wi-Fi (Peak)

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Margin
802.11b mode				
Low	2412	17.58	30	-12.42
Middle	2437	17.68	30	-12.32
High	2462	18.43	30	-11.57
802.11g mode				
Low	2412	13.03	30	-16.97
Middle	2437	13.37	30	-16.63
High	2462	14.03	30	-15.97
802.11n-HT20 mode				
Low	2412	13.99	30	-16.01
Middle	2437	14.15	30	-15.85
High	2462	14.74	30	-15.26

2.4 GHz BLE (Peak)

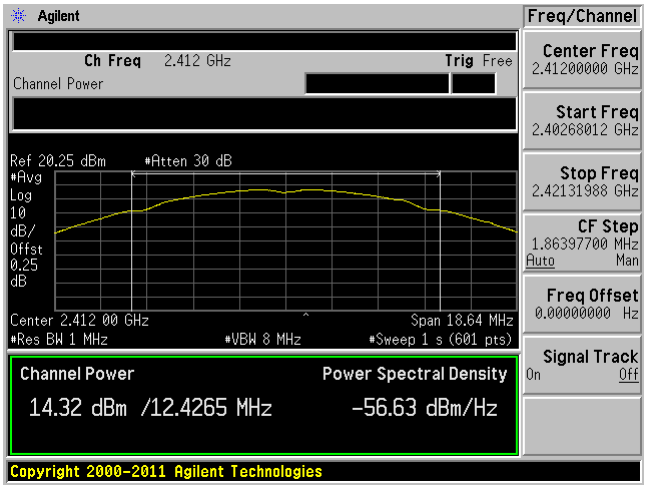
Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)
Low	2402	6.25	30
Middle	2440	6.27	30
High	2480	6.56	30

Please refer to following plots.

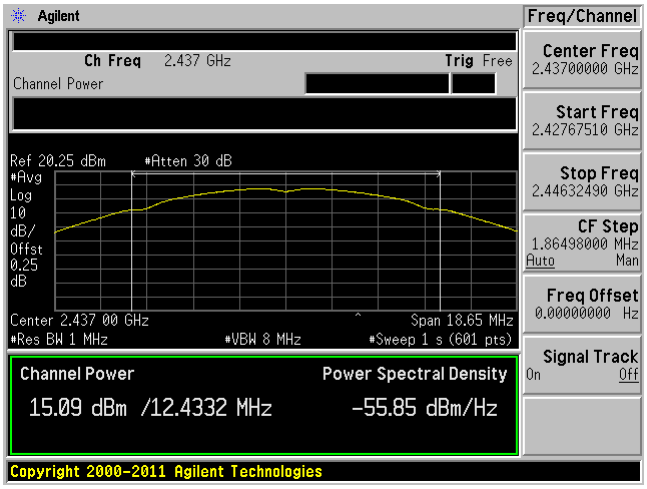
2.4 GHz Wi-Fi

802.11b mode

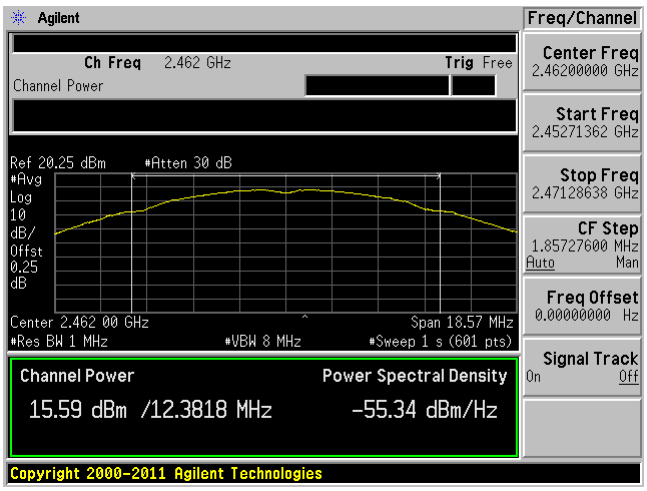
Low Channel



Middle Channel

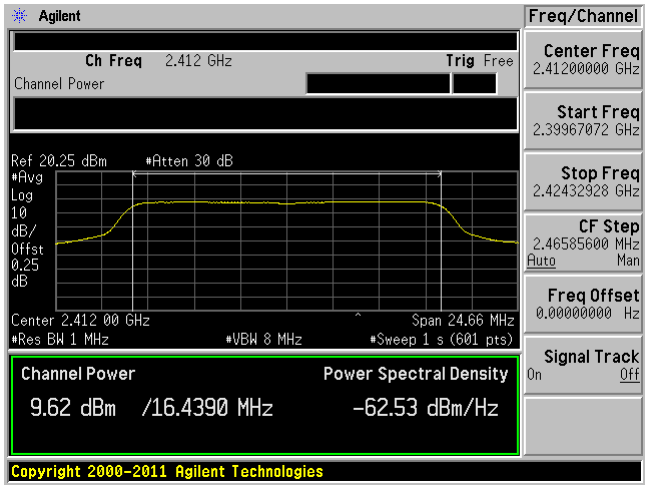


High Channel

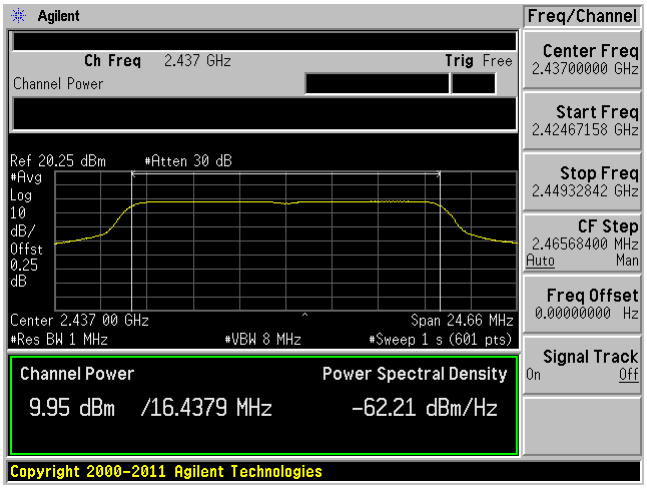


802.11g mode

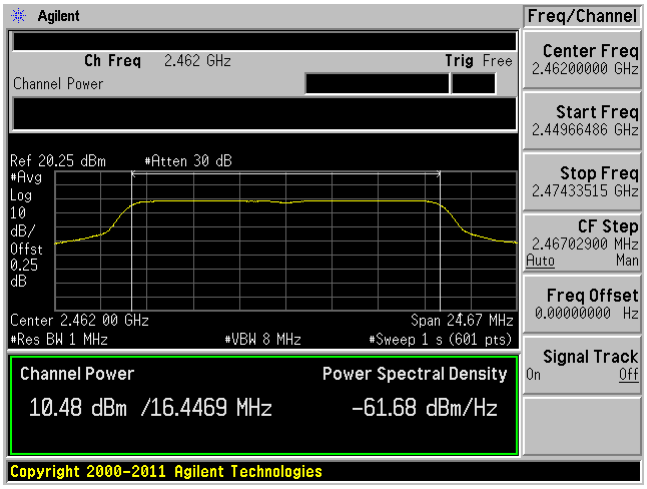
Low Channel



Middle Channel

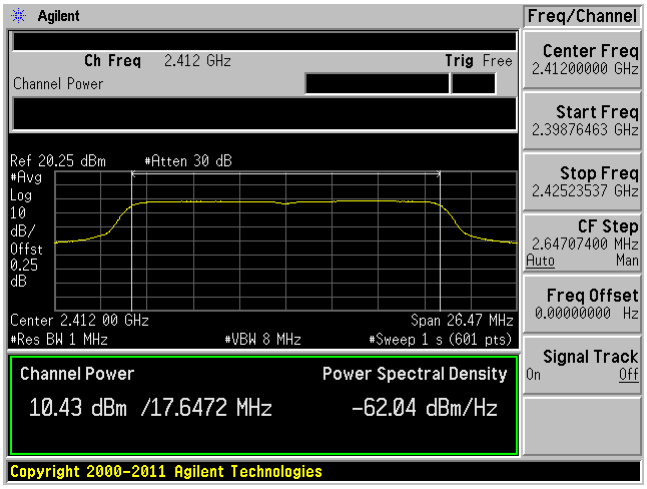


High channel

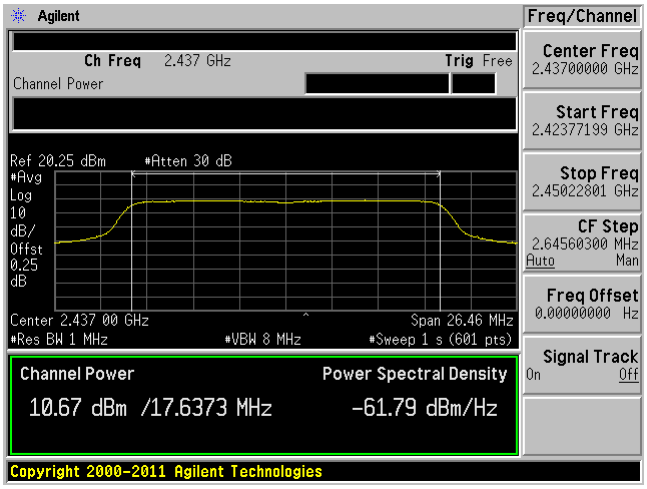


802.11n-HT20 mode

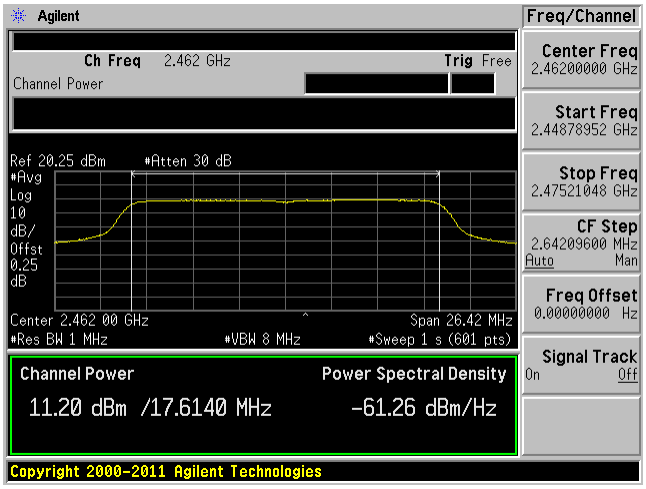
Low Channel



Middle Channel

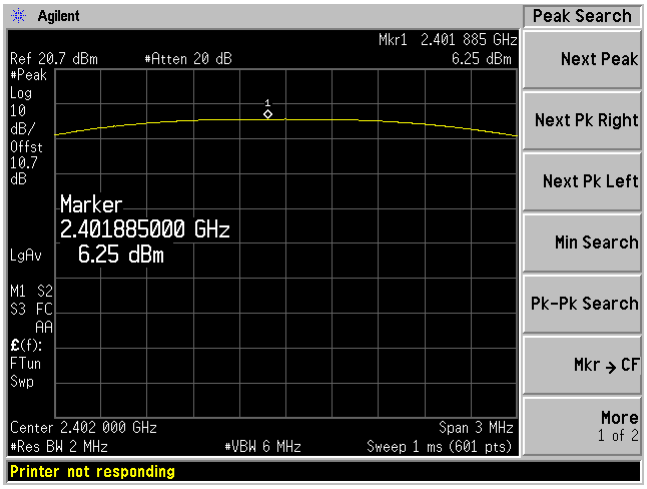


High Channel

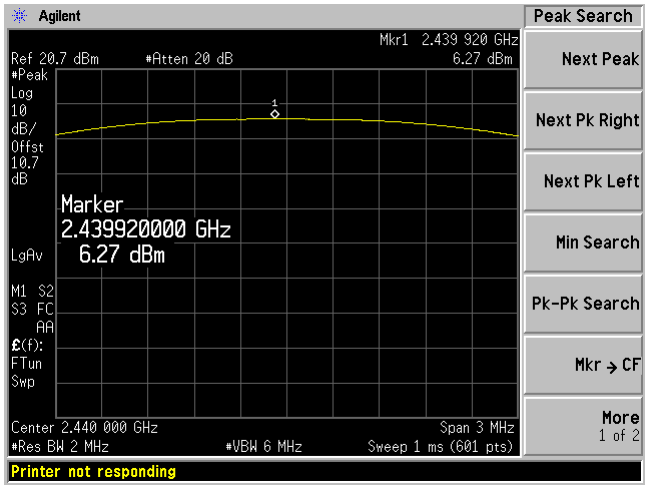


2.4 GHz, BLE

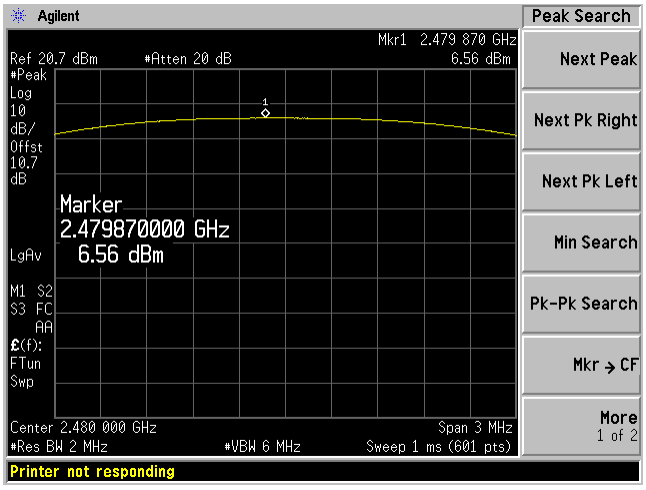
Low Channel



Middle Channel



High Channel



10 FCC §15.247(d) & IC RSS-210 §A8.5 – 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-210 §A8.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

10.2 Measurement Procedure

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 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	US44300386	2014-09-29	1 year
Mini Circuit	Precision Fixed Attenuator, 10 dB	BW-S10W5	-	Each Time[1]	N/A

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

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

The testing was performed by Chen Ge on 2015-03-11 in RF site.

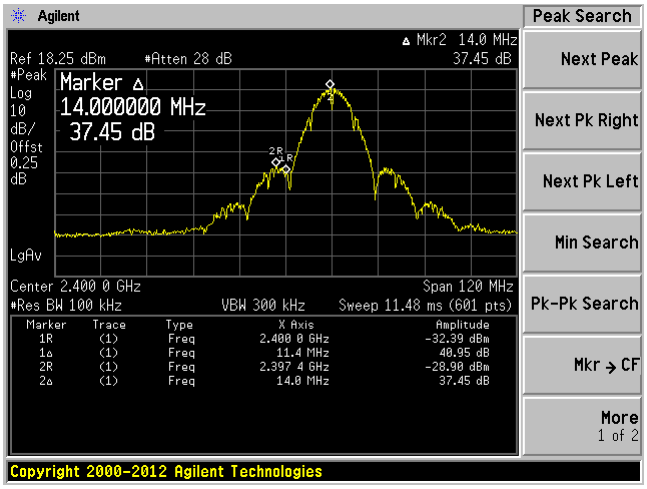
10.5 Test Results

Please refer to following pages for plots of band edge.

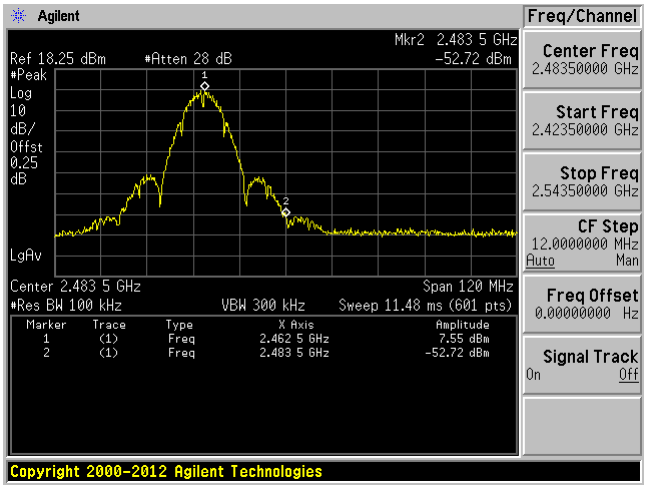
2.4 GHz Wi-Fi

802.11b mode

Low Band Edge

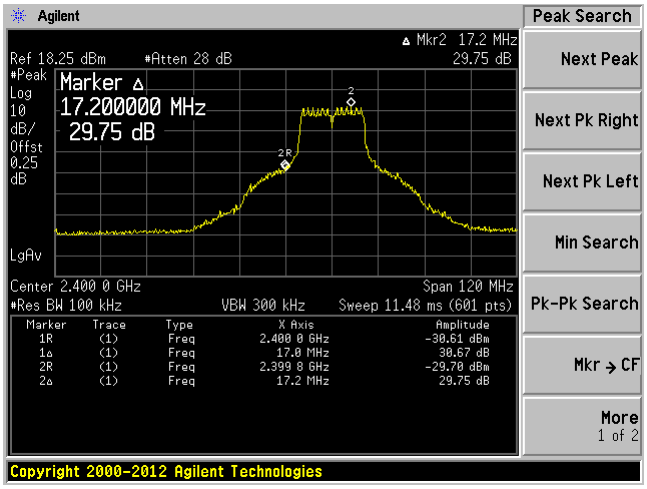


High Band Edge

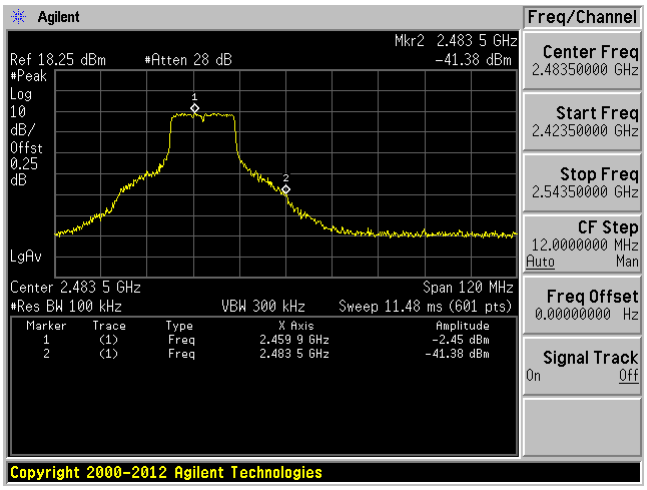


802.11g mode

Low Band Edge

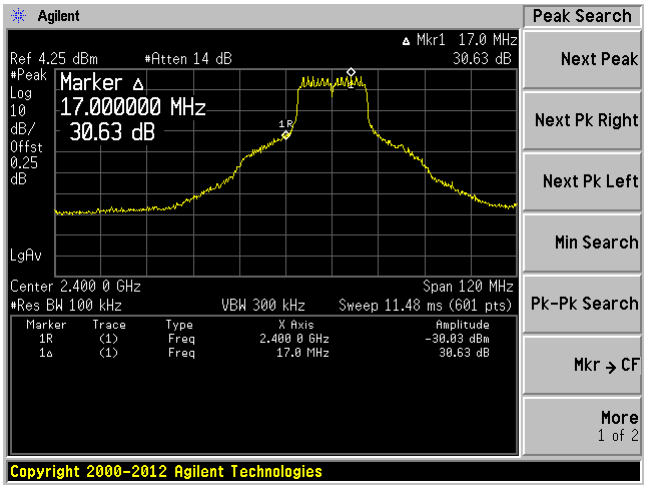


High Band Edge

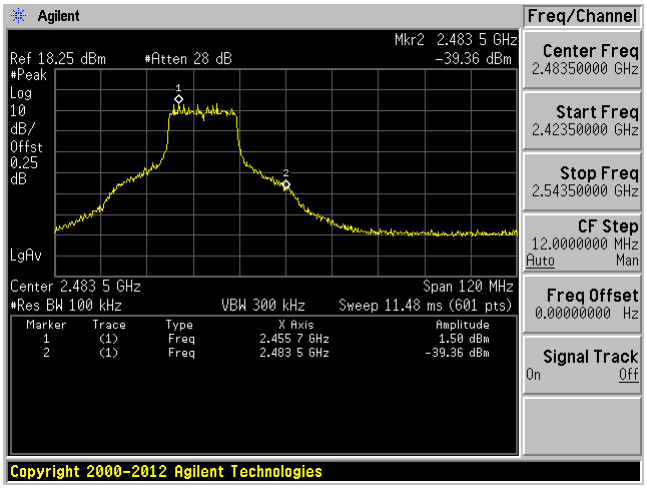


802.11n-HT20 mode

Low Band Edge

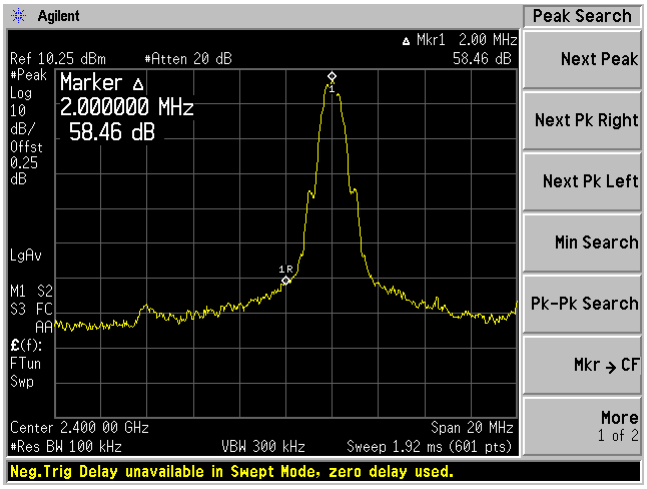


High Band Edge

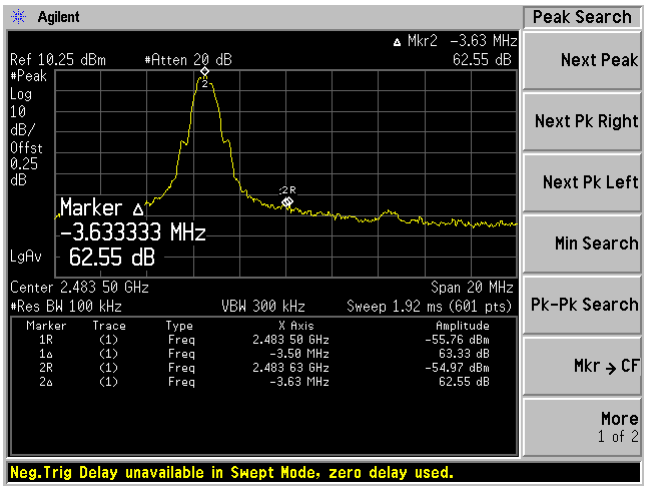


2.4 GHz BLE

Low Band Edge



High Band Edge



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

11.1 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.

11.2 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 10: Maximum power spectral density level in the fundamental emission

11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	US44300386	2014-09-29	1 year
Mini Circuit	Precision Fixed Attenuator, 10 dB	BW-S10W5	-	Each Time[1]	N/A

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

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

The testing was performed by Chen Ge on 2015-03-11 in RF site.

11.5 Test Results

2.4 GHz Wi-Fi

Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode			
Low	2412	-9.88	8
Middle	2437	-10.01	8
High	2462	-9.20	8
802.11g mode			
Low	2412	-16.26	8
Middle	2437	-16.77	8
High	2462	-15.11	8
802.11n-HT20 mode			
Low	2412	-15.98	8
Middle	2437	-16.12	8
High	2462	-15.12	8

2.4 GHz BLE

Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Low	2402	-4.42	8
Middle	2440	-2.20	8
High	2480	-1.16	8

Please refer to the following plots for detailed test results:

2.4 GH Wi-Fi

802.11b mode

Low channel: 2412 MHz

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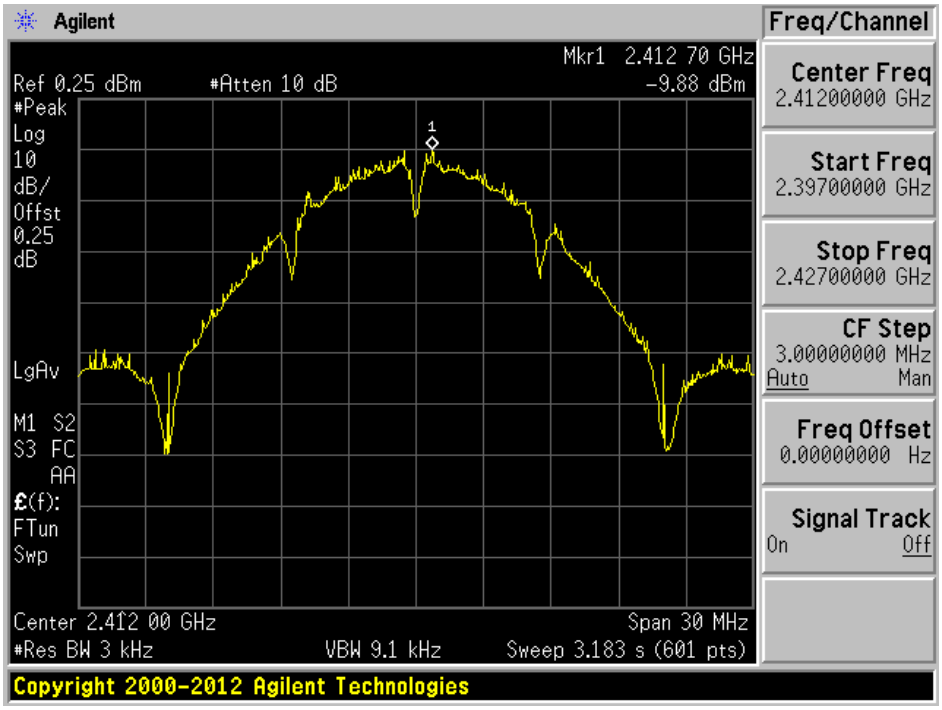
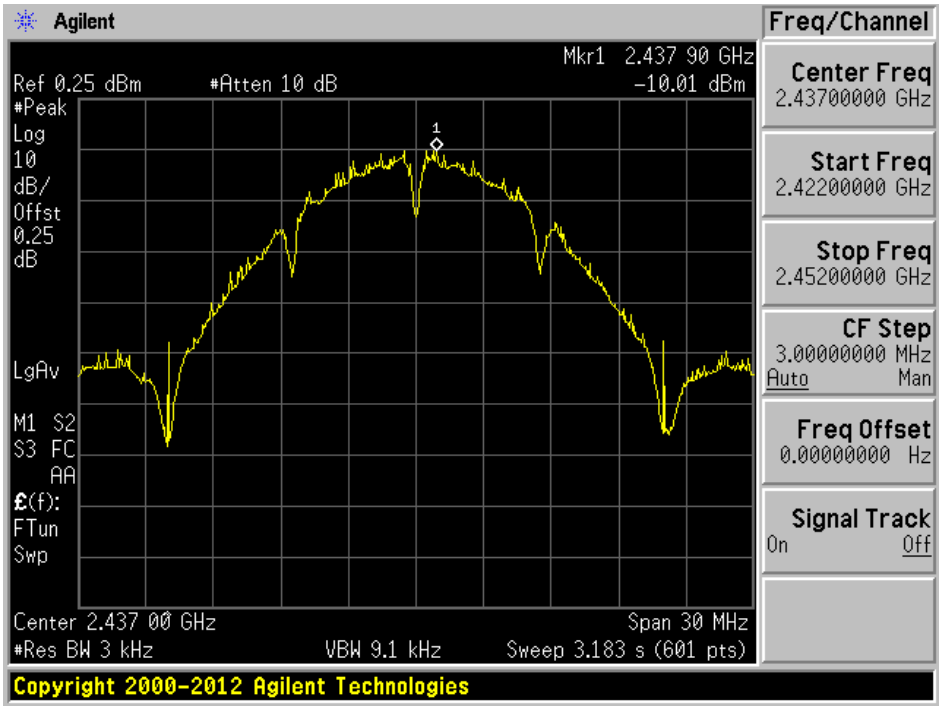
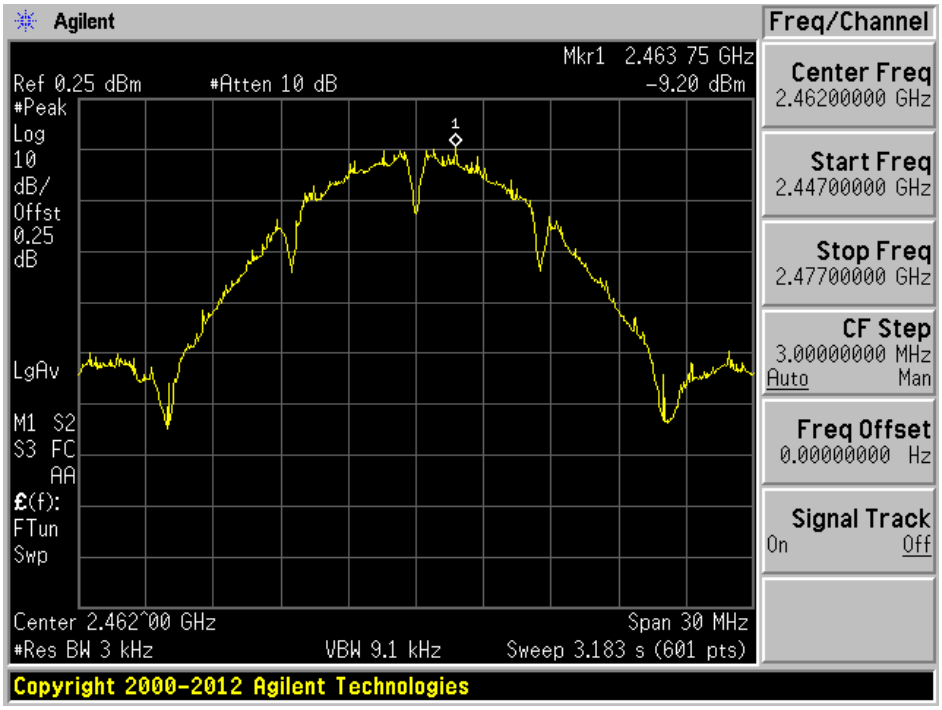


Middle channel: 2437 MHz

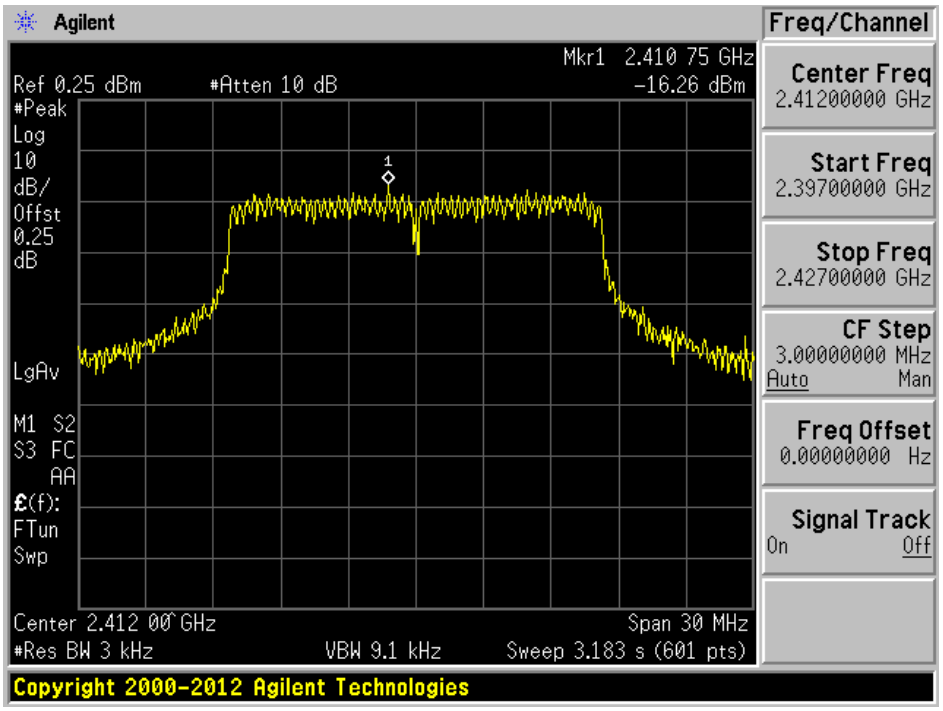


High channel: 2462 MHz

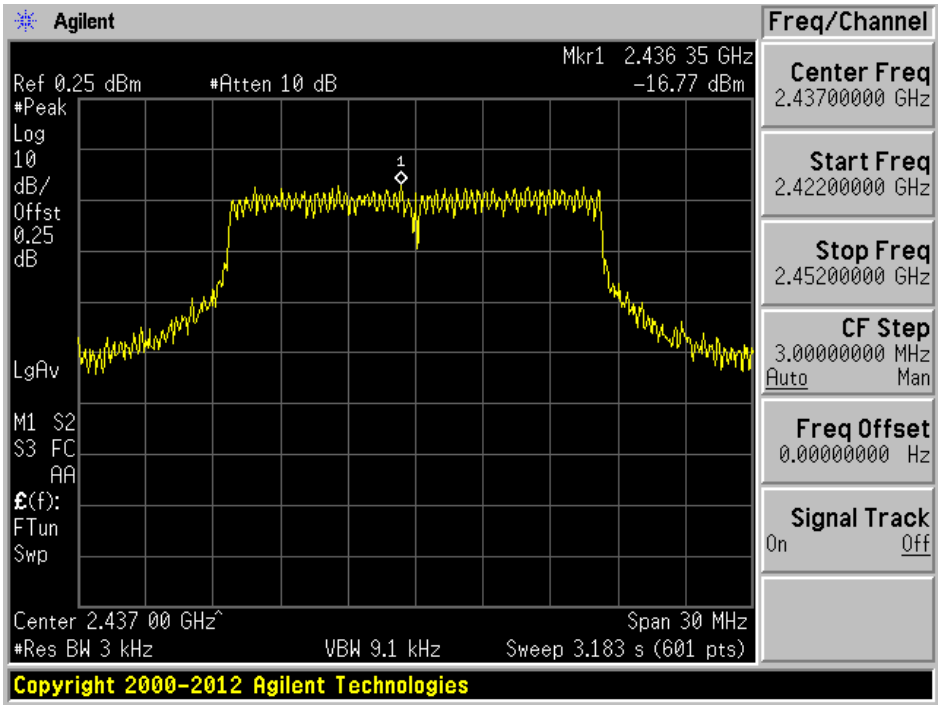


802.11g mode

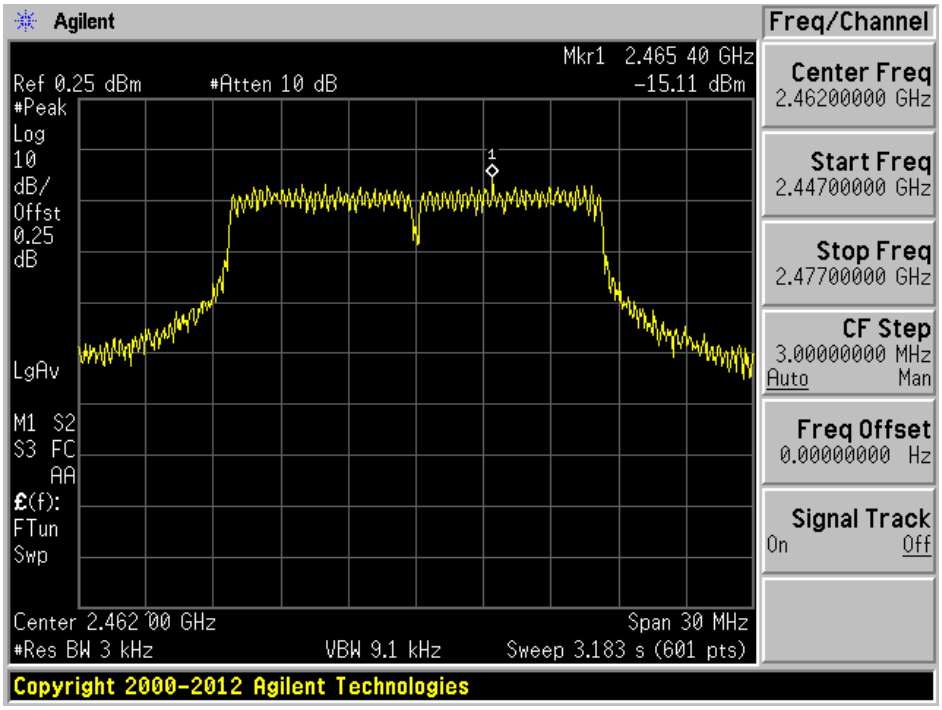
Low channel: 2412 MHz



Middle channel: 2437 MHz

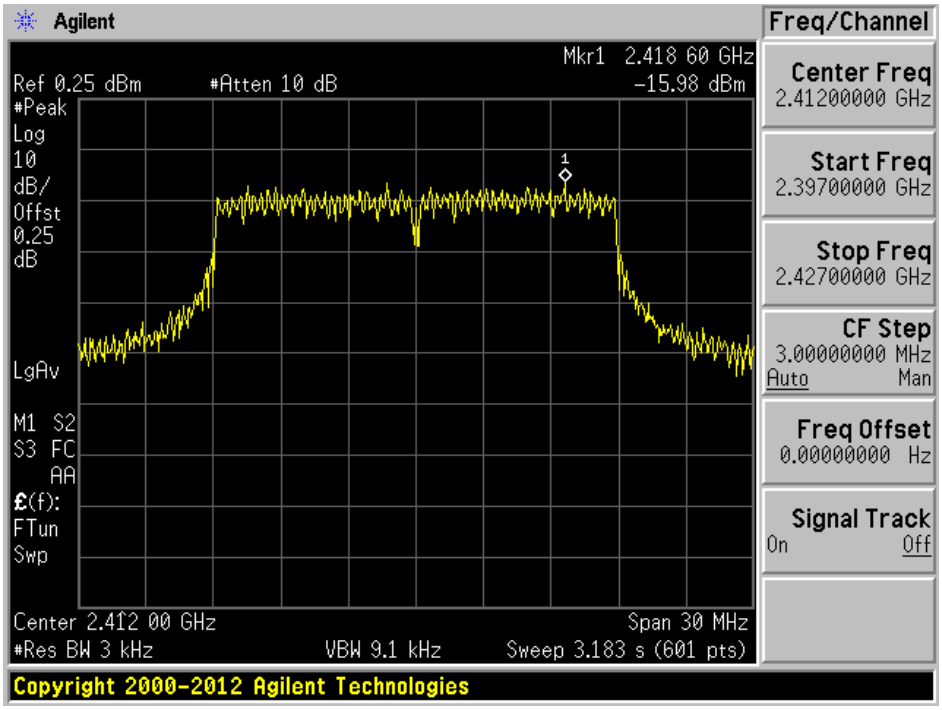


High channel: 2462 MHz

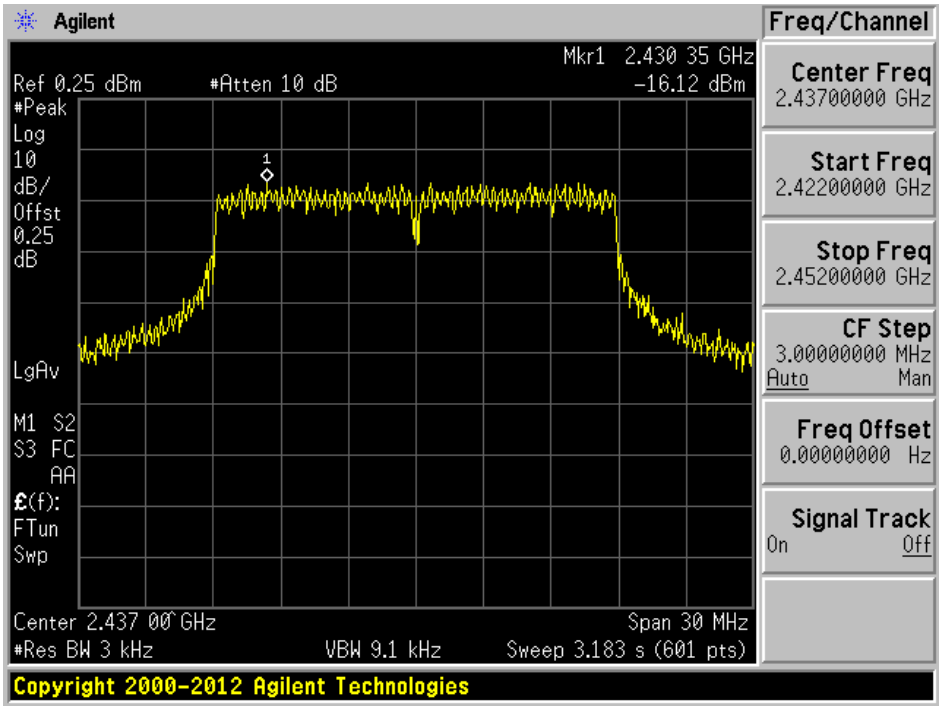


802.11n-HT20 mode

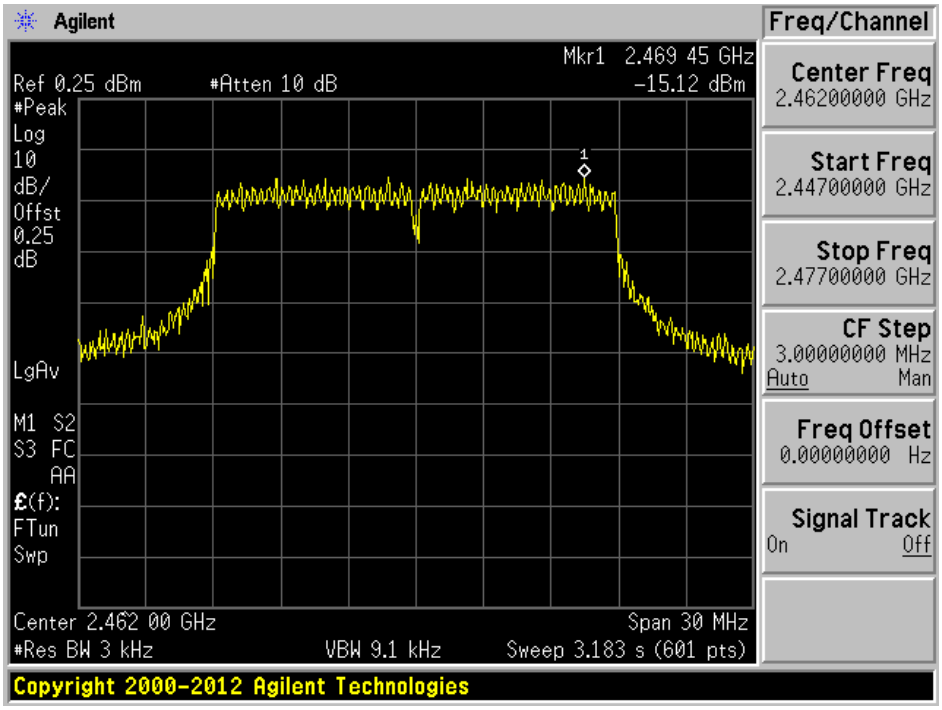
Low channel: 2412 MHz



Middle channel: 2437 MHz

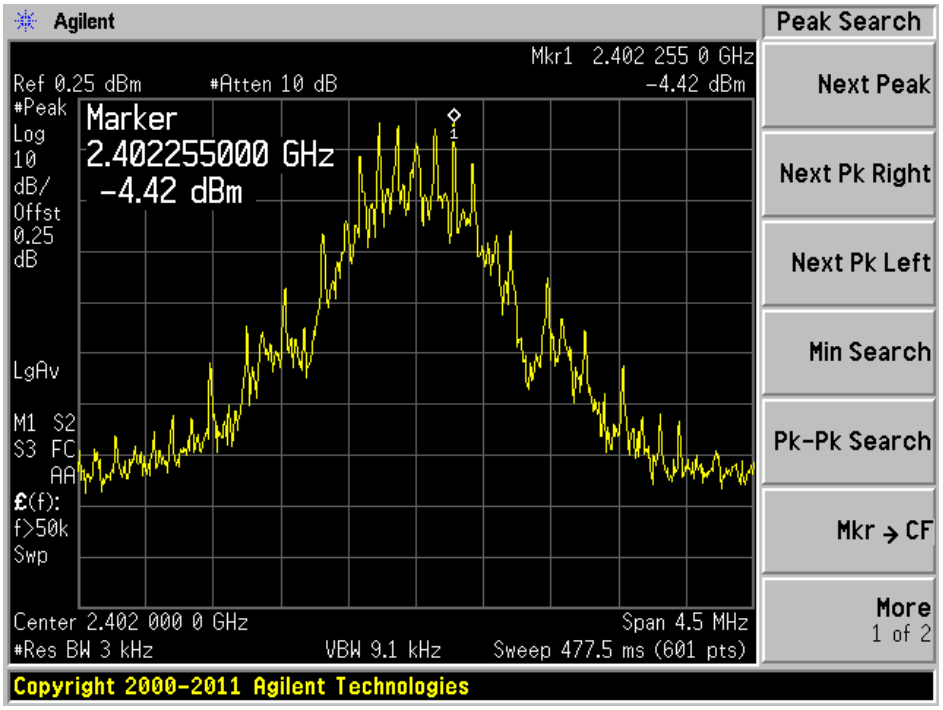


High channel: 2462 MHz

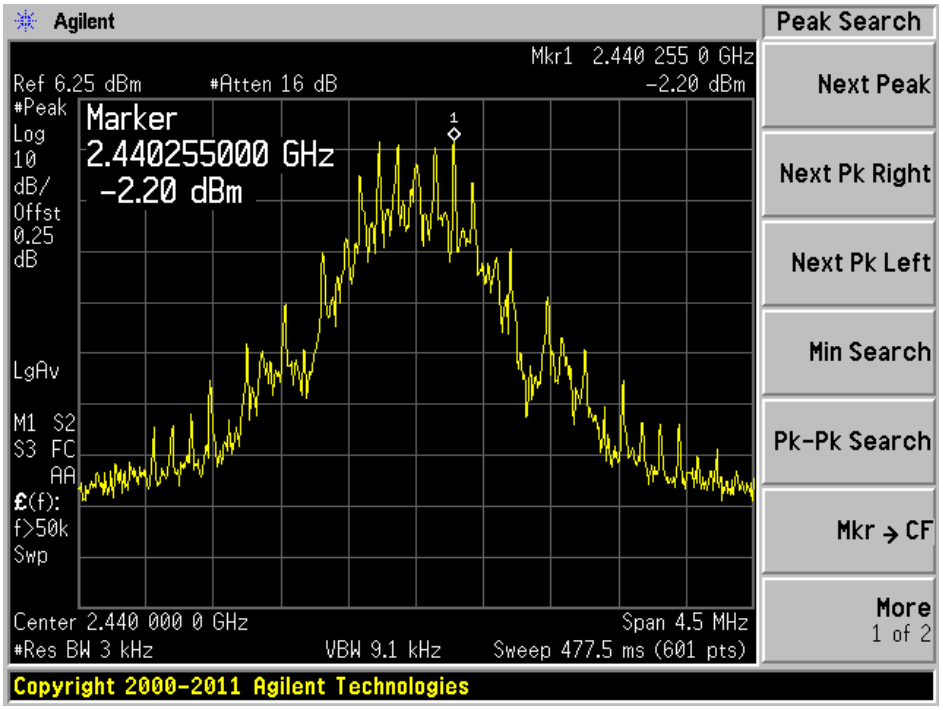


2.4 GHz BLE

Low channel: 2402 MHz



Middle channel: 2440 MHz



High channel: 2480 MHz