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: CNFHWRP1
IC: 10193A-HWRP1

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

Prepared By	Bo Li
Report Number	R1504031-247
Report Date	2015-05-06
Reviewed By	Simon Ma

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1504031-247	Original Report	2015-05-06

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: CNFHWRP1; IC: 10193A-HWRP1,* model number: *HWRP1*, 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 36 mm (L) x 37 mm (W) x 37mm (H) and weighs approximately 73 g.

The data gathered are from a typical production sample provided by the manufacturer with serial number: AD002857 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)

None

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2013American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices 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 C63.10-2013 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 Bo Li 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	Serial Number
Panasonic Energy (Wuxi) Co.,Ltd.	Rechargeable Li-ion Battery Pack	CHDHS-101	XX1507 XXXXX1 031467
Jabil	Main PCBA	656-06087-000 Rev. B	F35R3000F8
AT&S	Side PCBA	656-06092-000 Rev. A AT&S 1509	F3BR401GF
Jabil	FPCI/O PCBA	656-06093-000	F3BR401GF
Jabil	OLED Display	335-05857-000	F39R2 00MK
Jabil	Sensor PCBA	656-04816-000 Rev. B AT&S 1450	F3AR100Z9

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	1 m	EUT	Laptop
RF Cable	< 1 m	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[1]
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

Note[1]: please refer to SAR report R1504031-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: R1504031-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:

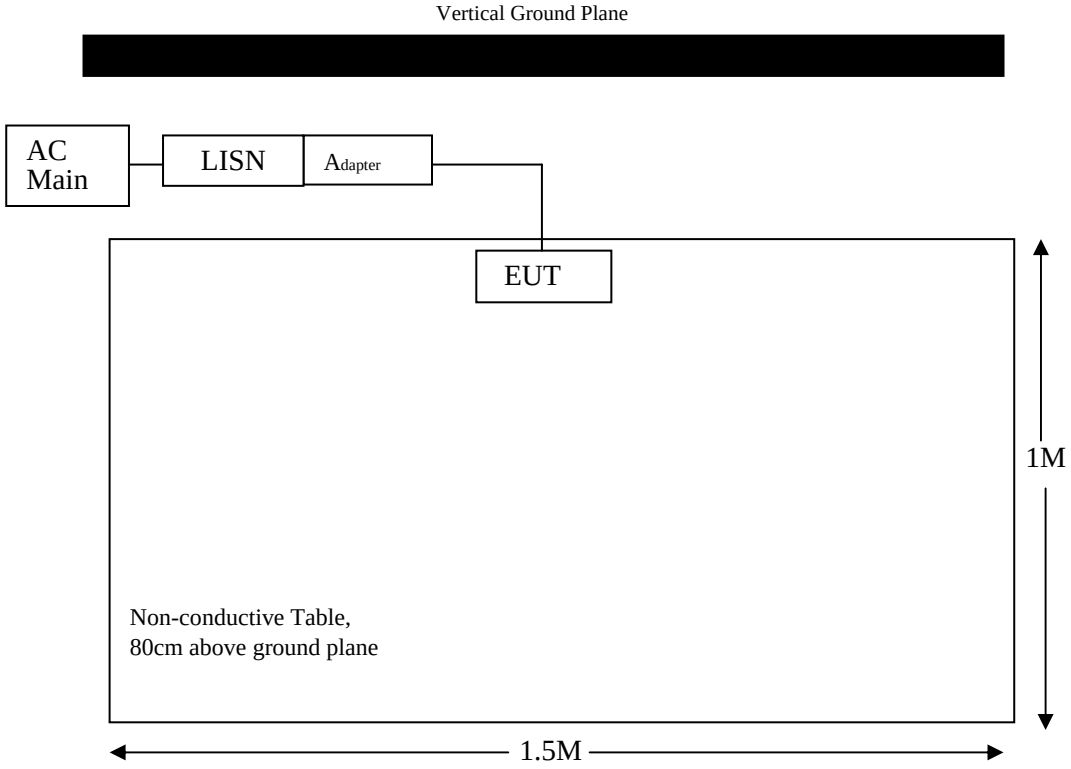
CA = Ai + CL + Atten

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:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.8 KPa

The testing was performed by Bo Li on 2015-05-03 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)**
-8.94	0.497382	Neutral	0.15-30

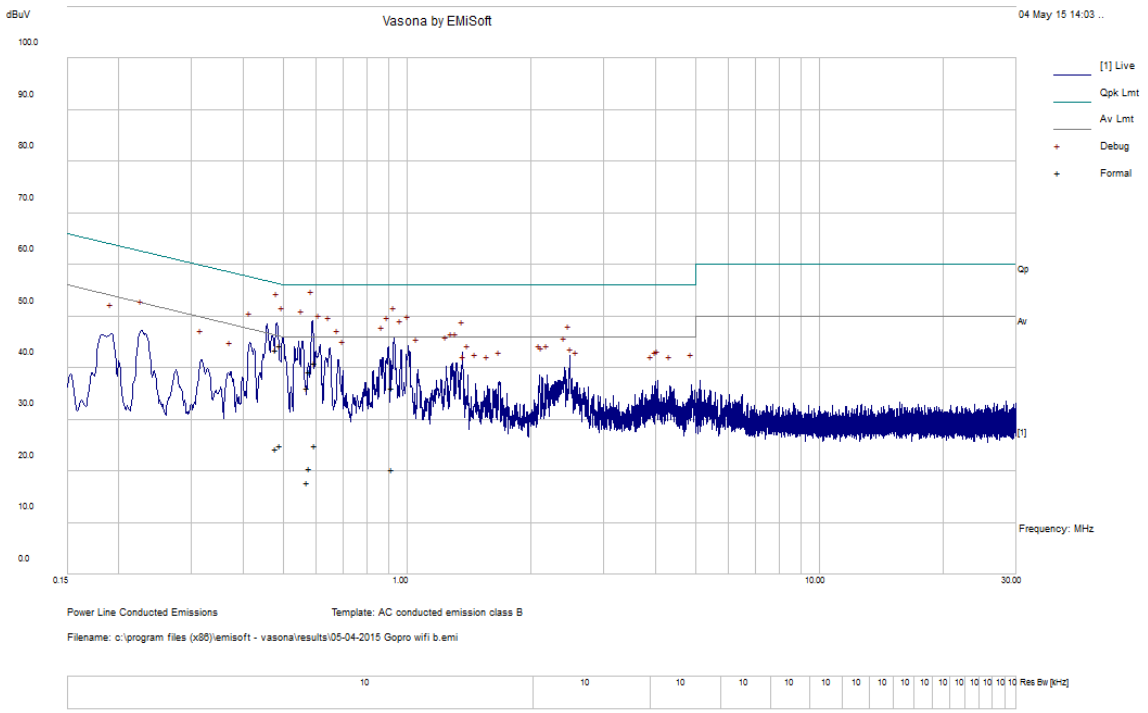
2.4 GHz BLE

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-11.17	0.479385	Neutral	0.15-30

6.9 Conducted Emissions Test Plots and Data

2.4 GHz Wi-Fi:

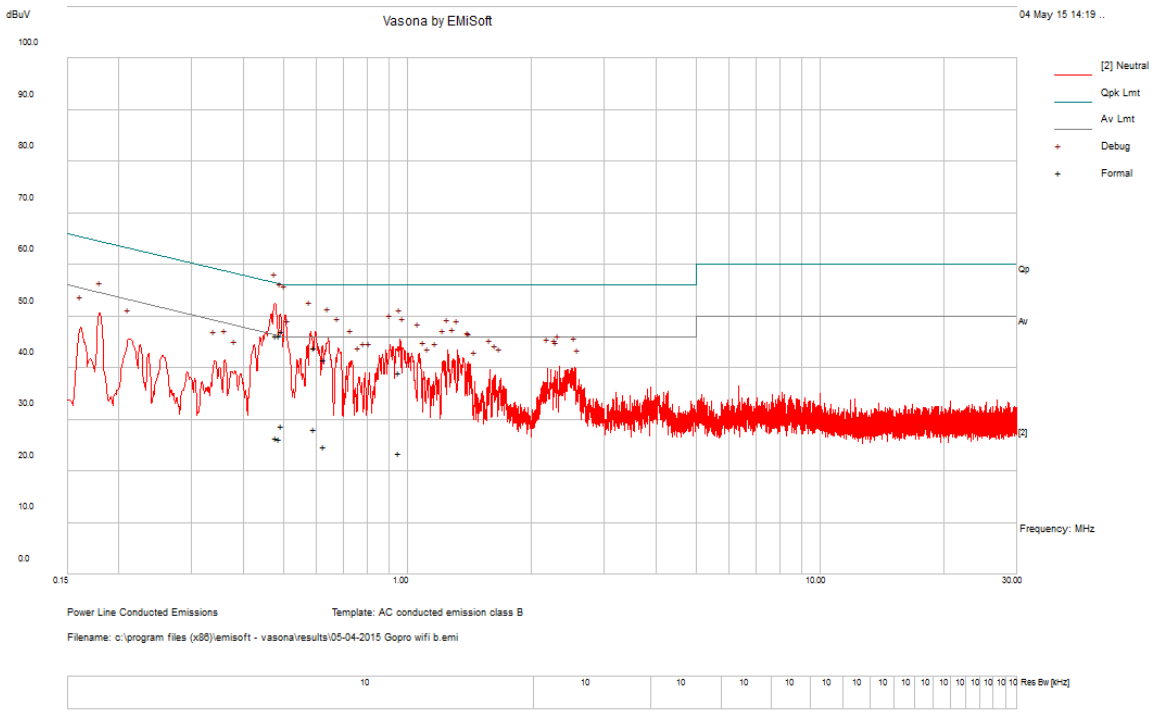
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.579564	39.47	Line	56	-16.53	QP
0.482415	43.67	Line	56.3	-12.63	QP
0.492804	44.49	Line	56.12	-11.63	QP
0.920667	36.2	Line	56	-19.8	QP
0.5745	36.14	Line	56	-19.86	QP
0.598884	41.07	Line	56	-14.93	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.579564	20.65	Line	46	-25.35	Ave.
0.482415	24.33	Line	46.3	-21.97	Ave.
0.492804	24.96	Line	46.12	-21.16	Ave.
0.920667	20.45	Line	46	-25.55	Ave.
0.5745	17.93	Line	46	-28.07	Ave.
0.598884	24.97	Line	46	-21.03	Ave.

120 V, 60 Hz – Neutral

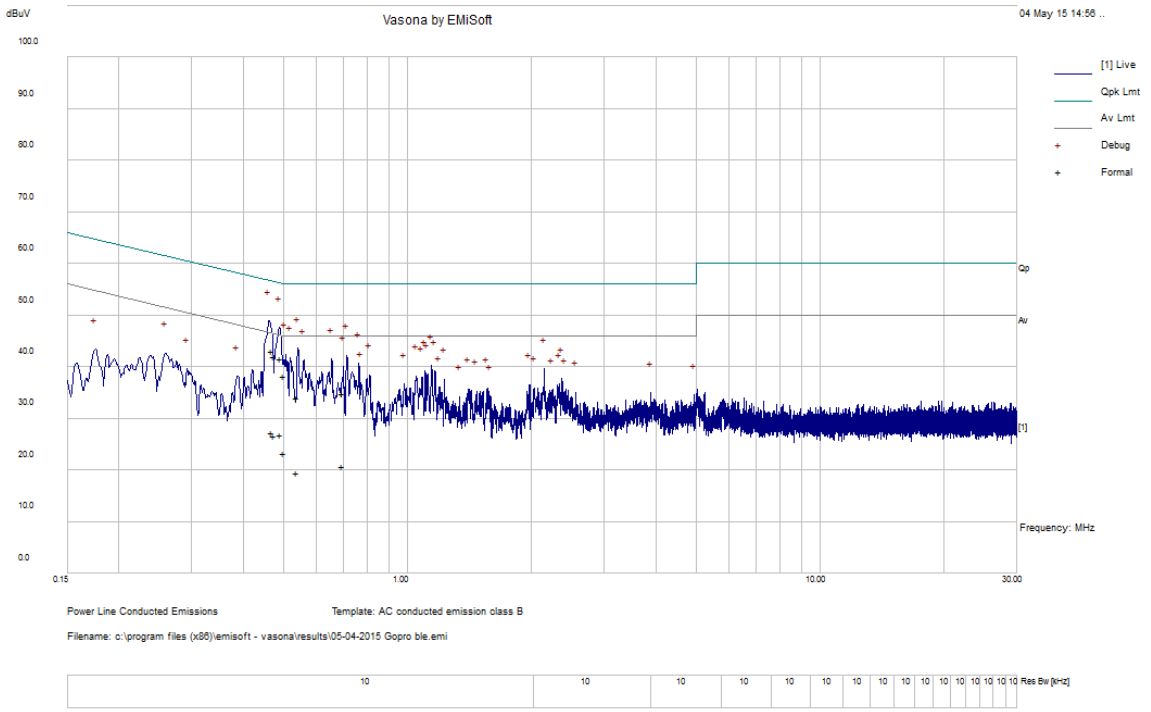


Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.48252	46.36	Neutral	56.3	-9.93	QP
0.497382	47.1	Neutral	56.04	-8.94	QP
0.49041	46.38	Neutral	56.16	-9.78	QP
0.595065	43.98	Neutral	56	-12.02	QP
0.628674	41.65	Neutral	56	-14.35	QP
0.955362	39.17	Neutral	56	-16.83	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.48252	26.53	Neutral	46.3	-19.77	Ave.
0.497382	28.81	Neutral	46.04	-17.23	Ave.
0.49041	26.37	Neutral	46.16	-19.79	Ave.
0.595065	28.13	Neutral	46	-17.87	Ave.
0.628674	24.77	Neutral	46	-21.23	Ave.
0.955362	23.63	Neutral	46	-22.37	Ave.

2.4 GHz BLE:

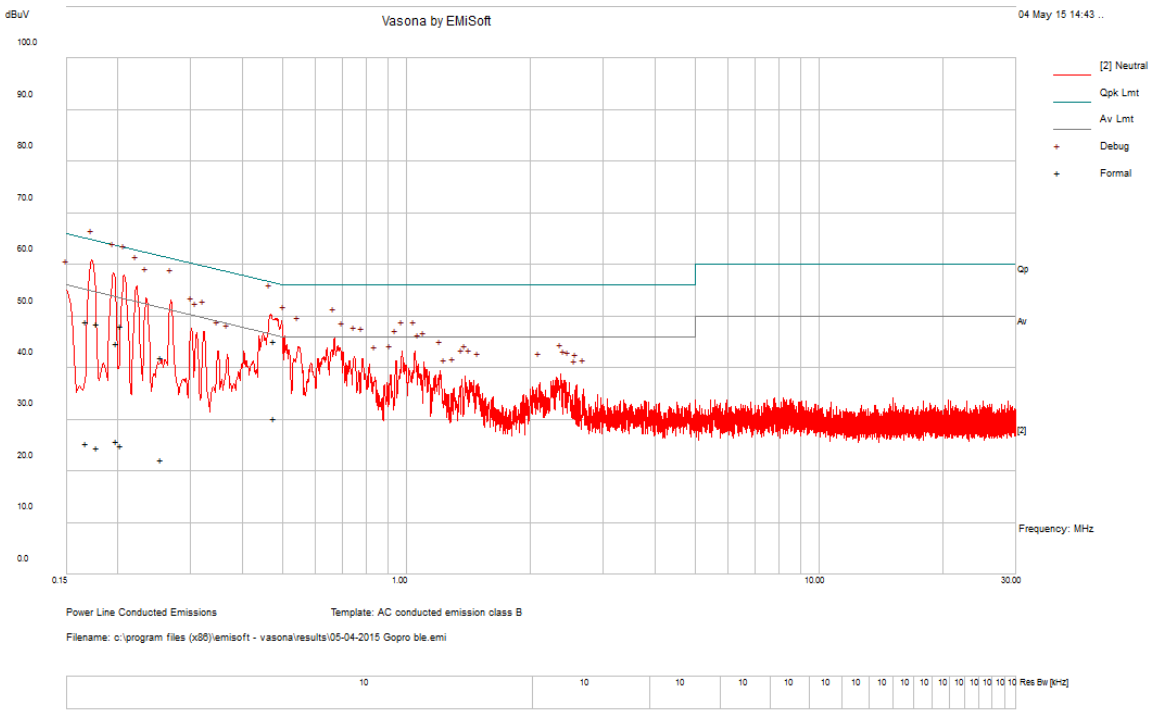
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.468876	43.12	Line	56.53	-13.41	QP
0.476166	42.04	Line	56.41	-14.36	QP
0.539643	34.14	Line	56	-21.86	QP
0.493824	41.77	Line	56.1	-14.33	QP
0.696525	35.04	Line	56	-20.96	QP
0.501612	38.24	Line	56	-17.76	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.468876	27.33	Line	46.53	-19.21	Ave.
0.476166	26.84	Line	46.41	-19.57	Ave.
0.539643	19.57	Line	46	-26.43	Ave.
0.493824	26.87	Line	46.1	-19.23	Ave.
0.696525	20.79	Line	46	-25.21	Ave.
0.501612	23.31	Line	46	-22.69	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.168036	49.01	Neutral	65.06	-16.05	QP
0.198237	44.93	Neutral	63.68	-18.76	QP
0.177702	48.56	Neutral	64.59	-16.03	QP
0.479385	45.18	Neutral	56.35	-11.17	QP
0.203895	48.3	Neutral	63.45	-15.15	QP
0.254415	42.09	Neutral	61.61	-19.52	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
25.51	49.01	Neutral	55.06	-29.55	Ave.
25.81	44.93	Neutral	53.68	-27.88	Ave.
24.63	48.56	Neutral	54.59	-29.96	Ave.
30.23	45.18	Neutral	46.35	-16.12	Ave.
25.14	48.3	Neutral	53.45	-28.31	Ave.
22.36	42.09	Neutral	51.61	-29.25	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	16.42 – 16.423	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

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

As per IC RSS-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 C63.10-2013. 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:	22-23º C
Relative Humidity:	40-42 %
ATM Pressure:	101.5-102.8 KPa

The testing was performed by Bo Li on 2015-04-30 and 2015-05-01 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:

30MHz – 25 GHz:

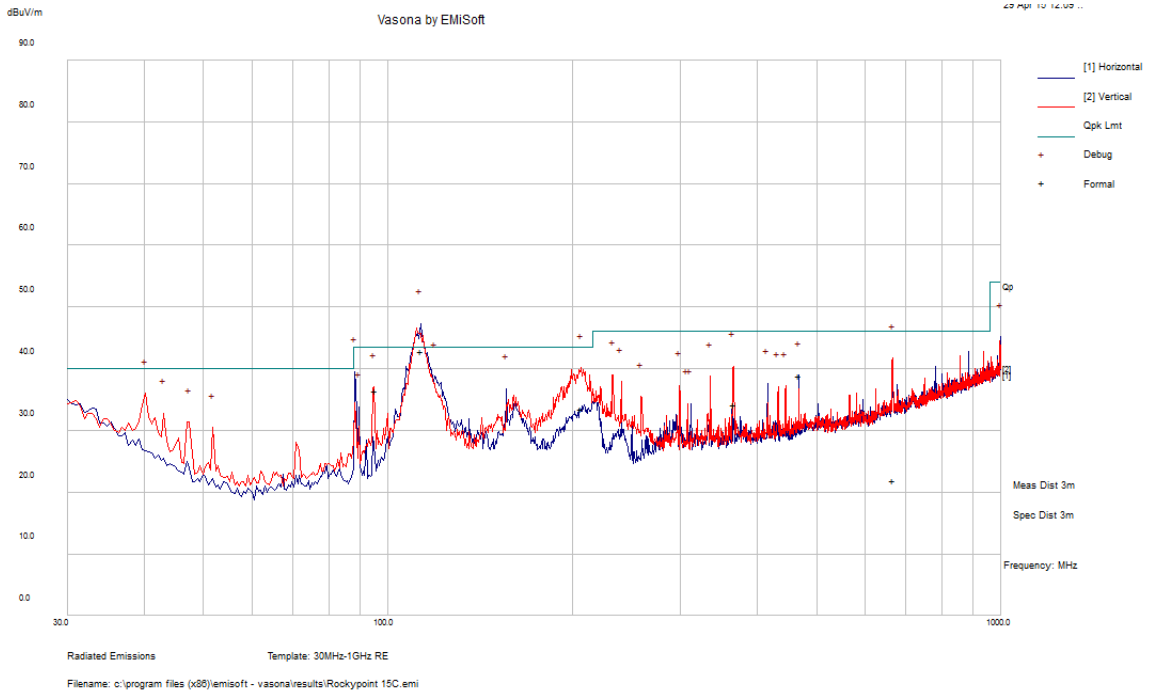
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-0.05	2390	Horizontal	802.11g mode Low Channel

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

7.8 Radiated Emissions Test Data and Plots

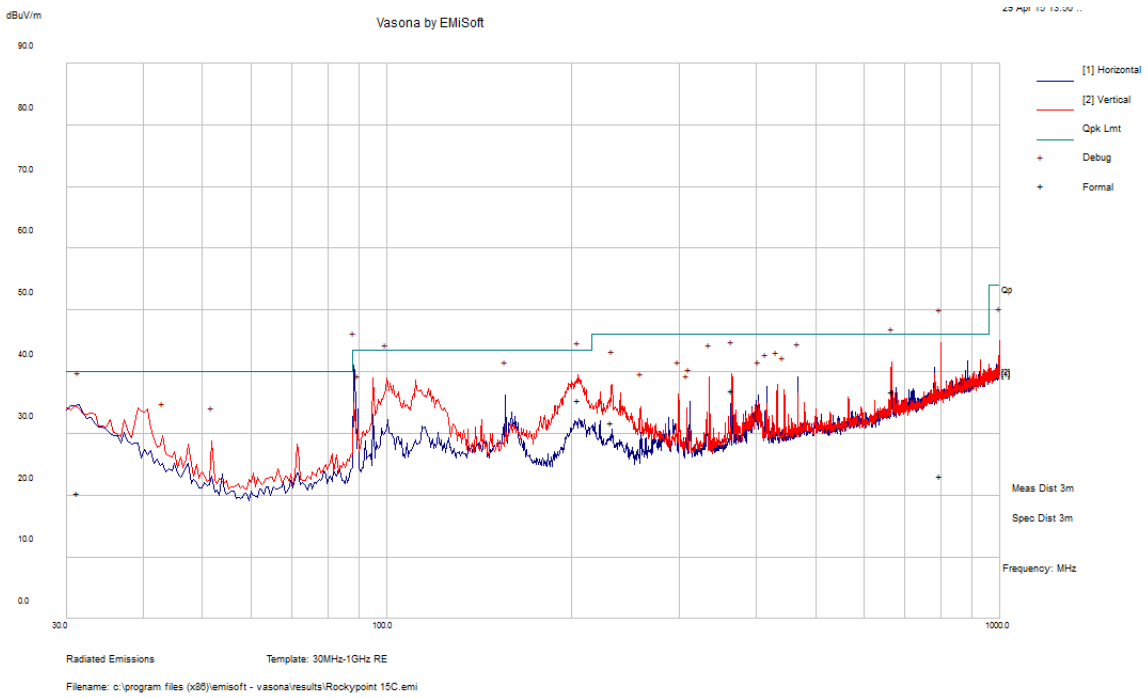
1) 30 MHz – 1 GHz

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
113.11975	42.78	286	H	263	43.5	-0.72	QP
206.73775	33.59	132	V	85	43.5	-9.91	QP
665.7705	21.85	299	V	80	46	-24.15	QP
366.3525	34.23	101	V	244	46	-11.77	QP
95.233	36.42	103	V	222	43.5	-7.08	QP
468.014	38.84	183	H	175	46	-7.16	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
800.11	23.13	281	V	359	46	-22.87	QP
204.85375	35.43	100	V	240	43.5	-8.07	QP
666.2095	36.79	113	V	191	46	-9.21	QP
31.2575	20.39	162	H	172	40	-19.61	QP
365.106	37.04	109	V	37	46	-8.96	QP
232.6835	31.74	146	V	172	46	-14.26	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	78.75	234	103	V	28.383	2.92	0	110.05	-	-	Peak
2412	79.08	235	105	H	28.417	2.92	0	110.42	-	-	Peak
2412	75.08	234	103	V	28.383	2.92	0	106.38	-	-	Ave
2412	75.36	235	105	H	28.417	2.92	0	106.70	-	-	Ave
2390	30.83	234	103	V	28.383	2.92	0	62.13	74	-11.87	Peak
2390	30.26	235	105	H	28.417	2.92	0	61.60	74	-12.40	Peak
2390	21.79	234	103	V	28.383	2.92	0	53.09	54	-0.91	Ave
2390	17.92	235	105	H	28.417	2.92	0	49.26	54	-4.74	Ave
4824	46.3	38	100	V	33.842	4.24	35.53	48.85	74	-25.15	Peak
4824	45.72	212	150	H	33.795	4.24	35.53	48.23	74	-25.77	Peak
4824	34.8	38	100	V	33.842	4.24	35.53	37.35	54	-16.65	Ave
4824	33.32	212	150	H	33.795	4.24	35.53	35.83	54	-18.17	Ave
7236	49.39	271	109	V	38.471	5.42	35.61	57.67	74	-16.33	Peak
7236	47.64	279	110	H	38.523	5.42	35.61	55.97	74	-18.03	Peak
7236	42.53	271	109	V	38.471	5.42	35.61	50.81	54	-3.19	Ave
7236	39.01	279	110	H	38.523	5.42	35.61	47.34	54	-6.66	Ave
9648	44.88	0	150	V	39.588	6.24	35.34	55.37	74	-18.63	Peak
9648	45.62	212	150	H	39.573	6.24	35.34	56.09	74	-17.91	Peak
9648	31.98	0	150	V	39.588	6.24	35.34	42.47	54	-11.53	Ave
9648	33.95	212	150	H	39.573	6.24	35.34	44.42	54	-9.58	Ave
Middle Channel 2437 MHz											
2437	73.91	123	133	V	28.444	2.92	0	105.27	-	-	Peak
2437	80.75	192	174	H	28.461	2.92	0	112.13	-	-	Peak
2437	70.18	123	133	V	28.444	2.92	0	101.54	-	-	Ave
2437	76.89	192	174	H	28.461	2.92	0	108.27	-	-	Ave
4874	44.5	0	150	V	33.873	4.30	35.58	47.09	74.00	-26.91	Peak
4874	44.58	263	150	H	33.888	4.30	35.58	47.19	74.00	-26.81	Peak
4874	29.61	0	150	V	33.873	4.30	35.58	32.20	54.00	-21.80	Ave
4874	31.43	263	150	H	33.888	4.30	35.58	34.04	54.00	-19.96	Ave
7311	48.41	120	223	V	38.299	5.50	35.61	56.60	74.00	-17.40	Peak
7311	47.48	261	100	H	38.314	5.50	35.61	55.68	74.00	-18.32	Peak
7311	39.02	120	223	V	38.299	5.50	35.61	47.21	54.00	-6.79	Ave
7311	36.83	261	100	H	38.314	5.50	35.61	45.03	54.00	-8.97	Ave
9748	44.46	0	150	V	39.726	6.27	35.3	55.16	85.27	-30.12	Peak
9748	44.38	271	150	H	39.73	6.27	35.3	55.08	92.13	-37.05	Peak
9748	29.87	0	150	V	39.726	6.27	35.3	40.57	81.54	-40.98	Ave
9748	32.34	271	150	H	39.73	6.27	35.3	43.04	88.27	-45.23	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	193	176	V	28.764	2.95	0	107.71	-	-	Peak
2462	82.54	210	155	H	28.785	2.95	0	114.28	-	-	Peak
2462	72.19	193	176	V	28.764	2.95	0	103.90	-	-	Ave
2462	78.77	210	155	H	28.785	2.95	0	110.51	-	-	Ave
2483.5	29.65	193	176	V	28.764	2.95	0	61.36	74.00	-12.64	Peak
2483.5	29.94	210	155	H	28.785	2.95	0	61.68	74.00	-12.33	Peak
2483.5	16.57	193	176	V	28.764	2.95	0	48.28	54.00	-5.72	Ave
2483.5	20.4	210	155	H	28.785	2.95	0	52.14	54.00	-1.86	Ave
4924	43.86	0	150	V	33.873	4.30	35.58	46.45	74.00	-27.55	Peak
4924	45.16	292	155	H	33.888	4.30	35.58	47.77	74.00	-26.23	Peak
4924	29.94	0	150	V	33.873	4.30	35.58	32.53	54.00	-21.47	Ave
4924	34.24	292	155	H	33.888	4.30	35.58	36.85	54.00	-17.15	Ave
7386	47.44	98	184	V	38.091	5.51	35.61	55.43	74.00	-18.57	Peak
7386	49.85	114	119	H	38.115	5.51	35.61	57.87	74.00	-16.14	Peak
7386	37.76	98	184	V	38.091	5.51	35.61	45.75	54.00	-8.25	Ave
7386	42.86	114	119	H	38.115	5.51	35.61	50.88	54.00	-3.13	Ave
9848	44.22	0	150	V	39.739	6.26	35.3	54.92	88.23	-33.31	Peak
9848	45.69	206	115	H	39.736	6.26	35.3	56.39	90.61	-34.22	Peak
9848	29.52	0	150	V	39.739	6.26	35.3	40.22	85.24	-45.02	Ave
9848	33.69	206	115	H	39.736	6.26	35.3	44.39	87.91	-43.52	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	70.32	297	193	V	28.444	2.92	0	101.68	-	-	Peak
2412	74.05	30	113	H	28.461	2.92	0	105.43	-	-	Peak
2412	58.86	297	193	V	28.444	2.92	0	90.22	-	-	Ave
2412	62.56	30	113	H	28.461	2.92	0	93.94	-	-	Ave
2390	34.08	297	193	V	28.444	2.92	0	65.44	74.00	-8.56	Peak
2390	37.84	30	113	H	28.461	2.92	0	69.22	74.00	-4.78	Peak
2390	19.7	297	193	V	28.444	2.92	0	51.06	54.00	-2.94	Ave
2390	22.57	30	113	H	28.461	2.92	0	53.95	54.00	-0.05	Ave
4824	43.56	0	150	V	33.842	4.24	35.53	46.11	74.00	-27.89	Peak
4824	42.94	0	150	H	33.795	4.24	35.53	45.45	74.00	-28.55	Peak
4824	29.55	0	150	V	33.842	4.24	35.53	32.10	54.00	-21.90	Ave
4824	29.6	0	150	H	33.795	4.24	35.53	32.11	54.00	-21.89	Ave
7236	42.91	0	150	V	38.471	5.42	35.61	51.19	81.68	-30.49	Peak
7236	43.49	0	150	H	38.523	5.42	35.61	51.82	85.43	-33.61	Peak
7236	29.27	0	150	V	38.471	5.42	35.61	37.55	70.22	-32.67	Ave
7236	29.4	0	150	H	38.523	5.42	35.61	37.73	73.94	-36.21	Ave
9648	43.01	0	150	V	39.588	6.24	35.34	53.50	81.68	-28.19	Peak
9648	44.01	0	150	H	39.573	6.24	35.34	54.48	85.43	-30.95	Peak
9648	29.87	0	150	V	39.588	6.24	35.34	40.36	70.22	-29.87	Ave
9648	29.93	0	150	H	39.573	6.24	35.34	40.40	73.94	-33.54	Ave
Middle Channel 2437 MHz											
2437	73.21	196	162	V	28.444	2.92	0	104.57	-	-	Peak
2437	78.45	188	124	H	28.461	2.92	0	109.83	-	-	Peak
2437	61.65	196	162	V	28.444	2.92	0	93.01	-	-	Ave
2437	66.88	188	124	H	28.461	2.92	0	98.26	-	-	Ave
4874	43.72	0	150	V	33.873	4.30	35.58	46.31	74.00	-27.69	Peak
4874	43.15	0	150	H	33.888	4.30	35.58	45.76	74.00	-28.24	Peak
4874	29.77	0	150	V	33.873	4.30	35.58	32.36	54.00	-21.64	Ave
4874	29.81	0	150	H	33.888	4.30	35.58	32.42	54.00	-21.58	Ave
7311	42.57	0	150	V	38.299	5.50	35.61	50.76	74.00	-23.24	Peak
7311	42.91	0	150	H	38.314	5.50	35.61	51.11	74.00	-22.89	Peak
7311	28.5	0	150	V	38.299	5.50	35.61	36.69	54.00	-17.31	Ave
7311	28.5	0	150	H	38.314	5.50	35.61	36.70	54.00	-17.30	Ave
9748	43.79	0	150	V	39.726	6.27	35.34	54.45	84.57	-30.13	Peak
9748	43.23	0	150	H	39.73	6.27	35.34	53.89	89.83	-35.94	Peak
9748	29.59	0	150	V	39.726	6.27	35.34	40.25	73.01	-32.77	Ave
9748	29.65	0	150	H	39.73	6.27	35.34	40.31	78.26	-37.95	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	69.46	123	209	V	29.12	2.95	0.00	101.53	-	-	Peak
2462	74.84	7	150	H	29.043	2.95	0.00	106.83	-	-	Peak
2462	57.99	123	209	V	29.12	2.95	0.00	90.06	-	-	Ave
2462	63.12	7	150	H	29.043	2.95	0.00	95.11	-	-	Ave
2483.5	33.5	123	209	V	29.12	2.95	0.00	65.57	74.00	-8.43	Peak
2483.5	36.74	7	150	H	29.043	2.95	0.00	68.73	74.00	-5.27	Peak
2483.5	17.92	123	209	V	29.12	2.95	0.00	49.99	54.00	-4.01	Ave
2483.5	21.13	7	150	H	29.043	2.95	0.00	53.12	54.00	-0.88	Ave
4924	43.65	0	150	V	33.873	4.30	35.58	46.24	74.00	-27.76	Peak
4924	43.82	0	150	H	33.888	4.30	35.58	46.43	74.00	-27.57	Peak
4924	29.61	0	150	V	33.873	4.30	35.58	32.20	54.00	-21.80	Ave
4924	29.62	0	150	H	33.888	4.30	35.58	32.23	54.00	-21.77	Ave
7386	42.96	0	150	V	38.091	5.51	35.61	50.95	74.00	-23.05	Peak
7386	42.8	0	150	H	38.115	5.51	35.61	50.82	74.00	-23.19	Peak
7386	29	0	150	V	38.091	5.51	35.61	36.99	54.00	-17.01	Ave
7386	29	0	150	H	38.115	5.51	35.61	37.02	54.00	-16.99	Ave
9848	43.81	0	150	V	39.739	6.26	35.30	54.51	81.53	-27.02	Peak
9848	44.29	0	150	H	39.736	6.26	35.30	54.99	86.83	-31.85	Peak
9848	29.45	0	150	V	39.739	6.26	35.30	40.15	70.06	-29.91	Ave
9848	29.52	0	150	H	39.736	6.26	35.30	40.22	75.11	-34.90	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	68.78	293	194	V	28.444	2.92	0.00	100.14	-	-	Peak
2412	72.58	360	114	H	28.461	2.92	0.00	103.96	-	-	Peak
2412	57.15	293	194	V	28.444	2.92	0.00	88.51	-	-	Ave
2412	60.75	360	114	H	28.461	2.92	0.00	92.13	-	-	Ave
2389.7	35.75	293	194	V	28.444	2.92	0.00	67.11	74.00	-6.89	Peak
2389.9	39.04	360	114	H	28.461	2.92	0.00	70.42	74.00	-3.58	Peak
2390	19.72	293	194	V	28.444	2.92	0.00	51.08	54.00	-2.92	Ave
2390	22.46	360	114	H	28.461	2.92	0.00	53.84	54.00	-0.16	Ave
4824	44.56	0	150	V	33.842	4.24	35.53	47.11	74.00	-26.89	Peak
4824	45.02	0	150	H	33.795	4.24	35.53	47.53	74.00	-26.47	Peak
4824	30.65	0	150	V	33.842	4.24	35.53	33.20	54.00	-20.80	Ave
4824	30.63	0	150	H	33.795	4.24	35.53	33.14	54.00	-20.86	Ave
7236	45.05	0	150	V	38.471	5.42	35.61	53.33	80.14	-26.81	Peak
7236	43.76	0	150	H	38.523	5.42	35.61	52.09	83.96	-31.87	Peak
7236	30.22	0	150	V	38.471	5.42	35.61	38.50	68.51	-30.01	Ave
7236	30.13	0	150	H	38.523	5.42	35.61	38.46	72.13	-33.67	Ave
9648	44.95	0	150	V	39.588	6.24	35.34	55.44	80.14	-24.71	Peak
9648	44.72	0	150	H	39.573	6.24	35.34	55.19	83.96	-28.77	Peak
9648	31.05	0	150	V	39.588	6.24	35.34	41.54	68.51	-26.98	Ave
9648	31.04	0	150	H	39.573	6.24	35.34	41.51	72.13	-30.62	Ave
Middle Channel 2437 MHz											
2437	71.65	147	144	V	28.444	2.92	0.00	103.01	-	-	Peak
2437	70.98	260	149	H	28.461	2.92	0.00	102.36	-	-	Peak
2437	57.76	147	144	V	28.444	2.92	0.00	89.12	-	-	Ave
2437	57.1	260	149	H	28.461	2.92	0.00	88.48	-	-	Ave
4874	44.07	0	150	V	33.873	4.30	35.58	46.66	74.00	-27.34	Peak
4874	43.92	0	150	H	33.888	4.30	35.58	46.53	74.00	-27.47	Peak
4874	30.04	0	150	V	33.873	4.30	35.58	32.63	54.00	-21.37	Ave
4874	30.11	0	150	H	33.888	4.30	35.58	32.72	54.00	-21.28	Ave
7311	43.11	0	150	V	38.299	5.50	35.61	51.30	74.00	-22.70	Peak
7311	42.52	0	150	H	38.314	5.50	35.61	50.72	74.00	-23.28	Peak
7311	28.91	0	150	V	38.299	5.50	35.61	37.10	54.00	-16.90	Ave
7311	28.9	0	150	H	38.314	5.50	35.61	37.10	54.00	-16.90	Ave
9748	44.08	0	150	V	39.726	6.27	35.34	54.74	83.01	-28.28	Peak
9748	44.04	0	150	H	39.73	6.27	35.34	54.70	82.36	-27.66	Peak
9748	30.25	0	150	V	39.726	6.27	35.34	40.91	69.12	-28.22	Ave
9748	30.23	0	150	H	39.73	6.27	35.34	40.89	68.48	-27.59	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	67.66	129	208	V	29.12	2.95	0.00	99.73	-	-	Peak
2462	72.87	4	150	H	29.043	2.95	0.00	104.86	-	-	Peak
2462	55.69	129	208	V	29.12	2.95	0.00	87.76	-	-	Ave
2462	61.08	4	150	H	29.043	2.95	0.00	93.07	-	-	Ave
2483.5	32.77	129	208	V	29.12	2.95	0.00	64.84	74.00	-9.16	Peak
2483.5	36.6	4	150	H	29.043	2.95	0.00	68.59	74.00	-5.41	Peak
2483.5	16.74	129	208	V	29.12	2.95	0.00	48.81	54.00	-5.19	Ave
2483.5	21.37	4	150	H	29.043	2.95	0.00	53.36	54.00	-0.64	Ave
4924	44.09	0	150	V	33.873	4.30	35.58	46.68	74.00	-27.32	Peak
4924	44.03	0	150	H	33.888	4.30	35.58	46.64	74.00	-27.36	Peak
4924	30	0	150	V	33.873	4.30	35.58	32.59	54.00	-21.41	Ave
4924	30	0	150	H	33.888	4.30	35.58	32.61	54.00	-21.39	Ave
7386	43.2	0	150	V	38.091	5.51	35.61	51.19	74.00	-22.81	Peak
7386	43.61	0	150	H	38.115	5.51	35.61	51.63	74.00	-22.38	Peak
7386	29.23	0	150	V	38.091	5.51	35.61	37.22	54.00	-16.78	Ave
7386	29.25	0	150	H	38.115	5.51	35.61	37.27	54.00	-16.74	Ave
9848	44.35	0	150	V	39.739	6.26	35.30	55.05	79.73	-24.68	Peak
9848	43.78	0	150	H	39.736	6.26	35.30	54.48	84.86	-30.39	Peak
9848	29.68	0	150	V	39.739	6.26	35.30	40.38	67.76	-27.38	Ave
9848	29.73	0	150	H	39.736	6.26	35.30	40.43	73.07	-32.65	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	71.97	159	146	V	28.444	2.92	0.00	103.33	-	-	Peak
2402	71.58	144	111	H	28.461	2.92	0.00	102.96	-	-	Peak
2402	67.1	159	146	V	28.444	2.92	0.00	98.46	-	-	Ave
2402	66.59	144	111	H	28.461	2.92	0.00	97.97	-	-	Ave
2390	28.98	159	146	V	28.444	2.92	0.00	60.34	74.00	-13.66	Peak
2390	21.67	144	111	H	28.461	2.92	0.00	53.05	74.00	-20.95	Peak
2390	18.3	159	146	V	28.444	2.92	0.00	49.66	54.00	-4.34	Ave
2390	18.54	144	111	H	28.461	2.92	0.00	49.92	54.00	-4.08	Ave
4804	52.2	210	147	V	33.842	4.24	35.53	54.75	74.00	-19.25	Peak
4804	51.16	326	103	H	33.795	4.24	35.53	53.67	74.00	-20.34	Peak
4804	43	210	147	V	33.842	4.24	35.53	45.55	54.00	-8.45	Ave
4804	14.77	326	103	H	33.795	4.24	35.53	17.28	54.00	-36.73	Ave
7206	43.98	0	150	V	38.471	5.42	35.61	52.26	83.33	-31.07	Peak
7206	43.19	0	150	H	38.523	5.42	35.61	51.52	82.96	-31.44	Peak
7206	29.39	0	150	V	38.471	5.42	35.61	37.67	78.46	-40.79	Ave
7206	29.41	0	150	H	38.523	5.42	35.61	37.74	77.97	-40.23	Ave
9608	44.58	0	150	V	39.588	6.24	35.34	55.07	83.33	-28.27	Peak
9608	44.97	0	150	H	39.573	6.24	35.34	55.44	82.96	-27.52	Peak
9608	30.45	0	150	V	39.588	6.24	35.34	40.94	78.46	-37.53	Ave
9608	30.48	0	150	H	39.573	6.24	35.34	40.95	77.97	-37.02	Ave
Middle Channel 2440 MHz											
2440	70.36	14	134	V	28.444	2.92	0.00	101.72	-	-	Peak
2440	69.27	258	148	H	28.461	2.92	0.00	100.65	-	-	Peak
2440	65.44	14	134	V	28.444	2.92	0.00	96.80	-	-	Ave
2440	64.2	258	148	H	28.461	2.92	0.00	95.58	-	-	Ave
4880	49.06	203	121	V	33.873	4.30	35.58	51.65	74.00	-22.35	Peak
4880	48.19	302	150	H	33.888	4.30	35.58	50.80	74.00	-23.20	Peak
4880	38.68	203	121	V	33.873	4.30	35.58	41.27	54.00	-12.73	Ave
4880	37.9	302	150	H	33.888	4.30	35.58	40.51	54.00	-13.49	Ave
7320	43.53	0	150	V	38.299	5.50	35.61	51.72	74.00	-22.28	Peak
7320	43.35	0	150	H	38.314	5.50	35.61	51.55	74.00	-22.45	Peak
7320	29.06	0	150	V	38.299	5.50	35.61	37.25	54.00	-16.75	Ave
7320	29.04	0	150	H	38.314	5.50	35.61	37.24	54.00	-16.76	Ave
9760	44.14	0	150	V	39.726	6.26	35.34	54.79	81.72	-26.94	Peak
9760	44.1	0	150	H	39.73	6.26	35.34	54.75	80.65	-25.90	Peak
9760	30.27	0	150	V	39.726	6.26	35.34	40.92	76.80	-35.89	Ave
9760	30.26	0	150	H	39.73	6.26	35.34	40.91	75.58	-34.67	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	70.74	21	151	V	29.12	3.00	0.00	102.86	-	-	Peak
2480	68.76	262	148	H	29.043	3.00	0.00	100.80	-	-	Peak
2480	65.55	21	151	V	29.12	3.00	0.00	97.67	-	-	Ave
2480	63.79	262	148	H	29.043	3.00	0.00	95.83	-	-	Ave
2483.5	27.92	21	151	V	29.12	3.00	0.00	60.04	74.00	-13.96	Peak
2483.5	28.75	262	148	H	29.043	3.00	0.00	60.79	74.00	-13.21	Peak
2483.5	16.05	21	151	V	29.12	3.00	0.00	48.17	54.00	-5.83	Ave
2483.5	15.96	262	148	H	29.043	3.00	0.00	48.00	54.00	-6.00	Ave
4960	49.71	160	149	V	34.727	4.36	35.58	53.22	74.00	-20.78	Peak
4960	49.74	310	113	H	34.283	4.36	35.58	52.80	74.00	-21.20	Peak
4960	39.04	160	149	V	34.272	4.36	35.58	42.09	54.00	-11.91	Ave
4960	39.57	310	113	H	34.283	4.36	35.58	42.63	54.00	-11.37	Ave
7440	43.18	0	150	V	38.091	5.51	35.61	51.17	74.00	-22.83	Peak
7440	43.77	0	150	H	38.115	5.51	35.61	51.79	74.00	-22.22	Peak
7440	29.23	0	150	V	38.091	5.51	35.61	37.22	54.00	-16.78	Ave
7440	29.22	0	150	H	38.115	5.51	35.61	37.24	54.00	-16.77	Ave
9920	43.04	0	150	V	38.849	6.34	35.30	52.93	82.86	-29.93	Peak
9920	43.07	0	150	H	39.844	6.34	35.30	53.95	80.80	-26.85	Peak
9920	28.77	0	150	V	38.849	6.34	35.30	38.66	77.67	-39.01	Ave
9920	28.78	0	150	H	39.844	6.34	35.30	39.66	75.83	-36.17	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
-	SMA cable	-	C0002	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:	23º C
Relative Humidity:	40 %
ATM Pressure:	102.5 KPa

The testing was performed by Bo Li on 2015-04-31 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	12.6864	> 0.5	Compliant
Middle	2437	7.153	12.36	> 0.5	Compliant
High	2462	7.141	12.5281	> 0.5	Compliant
802.11g mode					
Low	2412	16.341	16.4261	> 0.5	Compliant
Middle	2437	16.356	16.434	> 0.5	Compliant
High	2462	16.37	16.4386	> 0.5	Compliant
802.11n-HT20 mode					
Low	2412	16.99	17.612	> 0.5	Compliant
Middle	2437	17.346	17.5822	> 0.5	Compliant
High	2462	16.99	17.5895	> 0.5	Compliant

2.4 GHz BLE

Channel	Frequency (MHz)	6 dB Emission Bandwidth (kHz)	99% Occupied Bandwidth (kHz)	Limit (kHz)	Results
Low	2402	600.193	1074.1	> 500	Compliant
Middle	2440	626.52	1061.2	> 500	Compliant
High	2480	627.192	1060.4	> 500	Compliant

Please refer to the following plots for detailed test results

802.11b mode

Low channel: 2412 MHz

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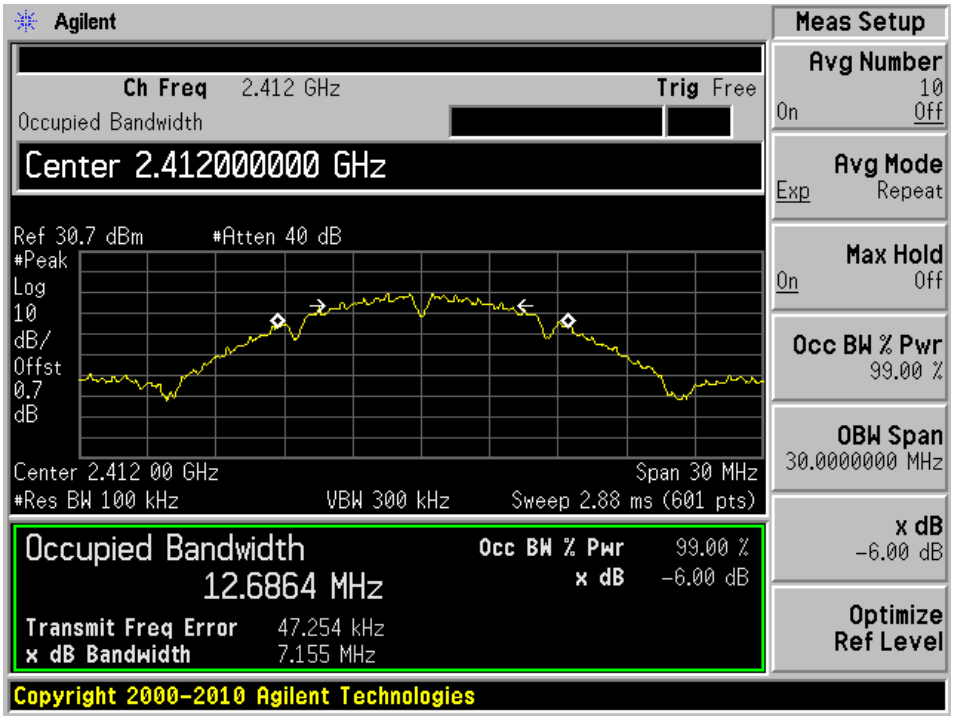
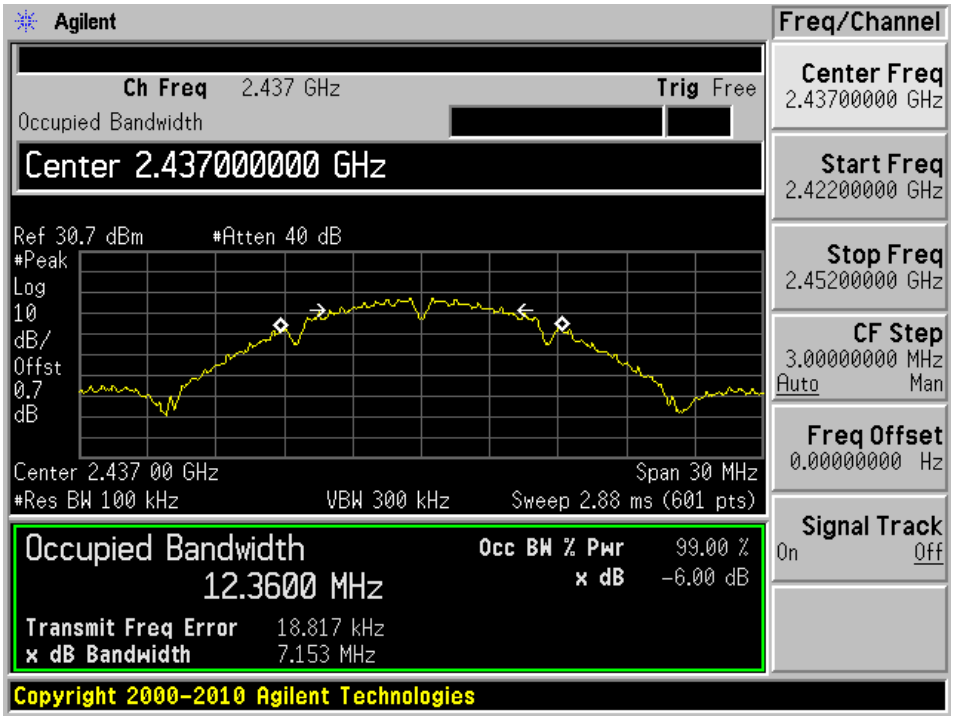
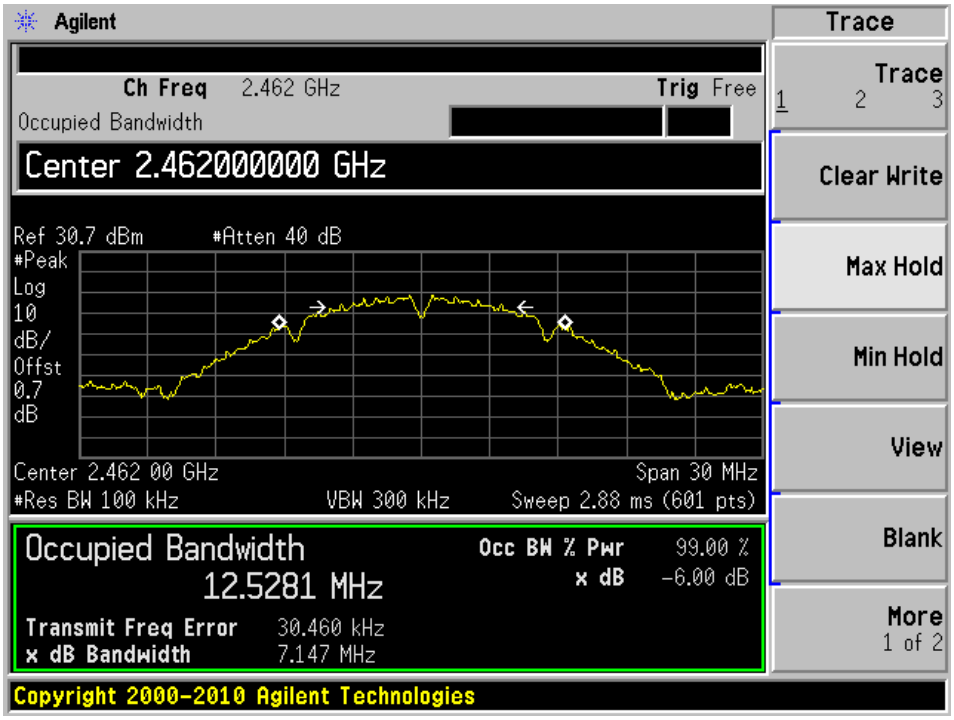


Middle channel: 2437 MHz

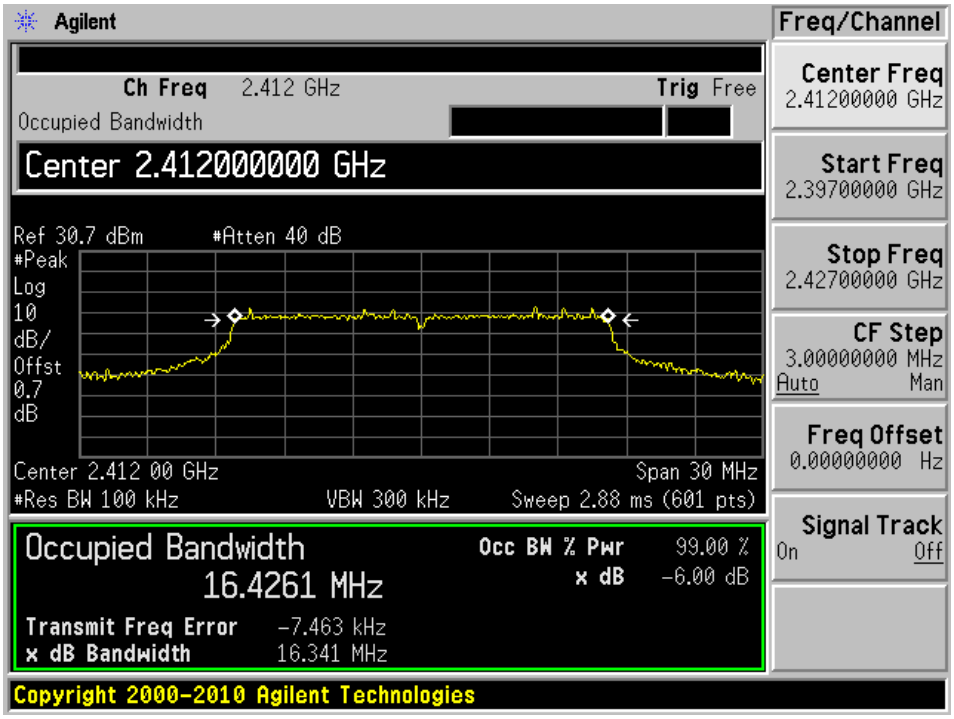


High channel: 2462 MHz

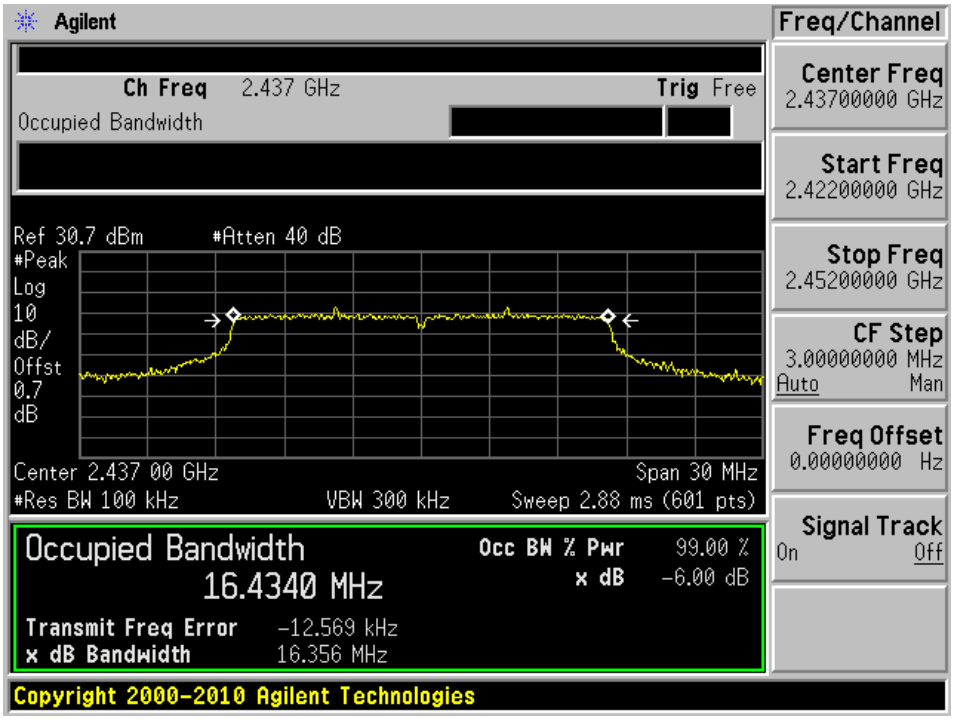


802.11g mode

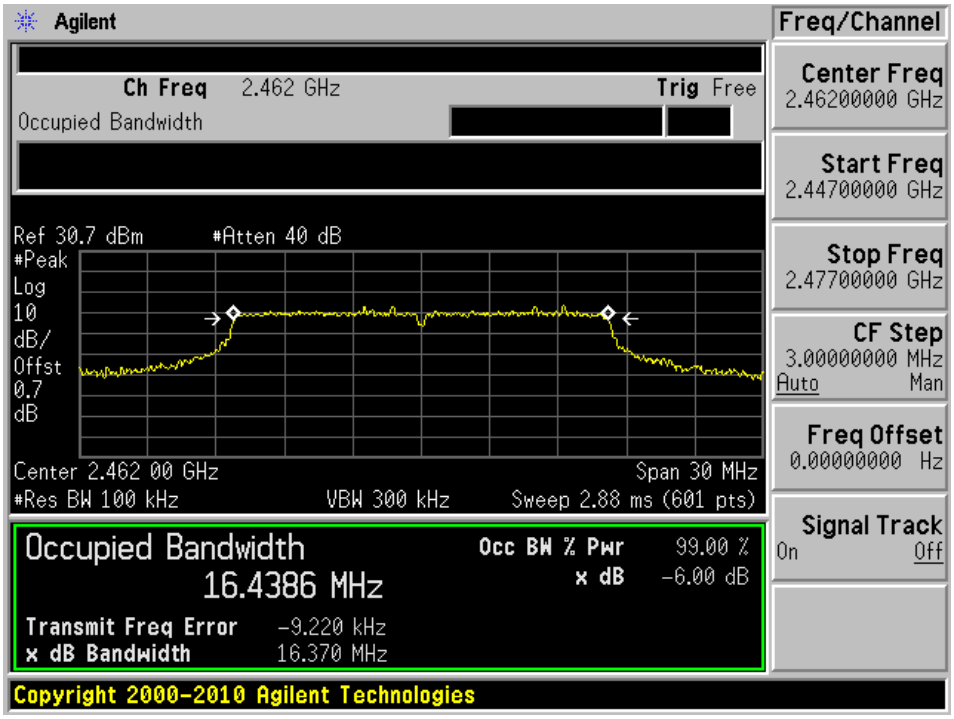
Low channel: 2412 MHz



Middle channel: 2437 MHz

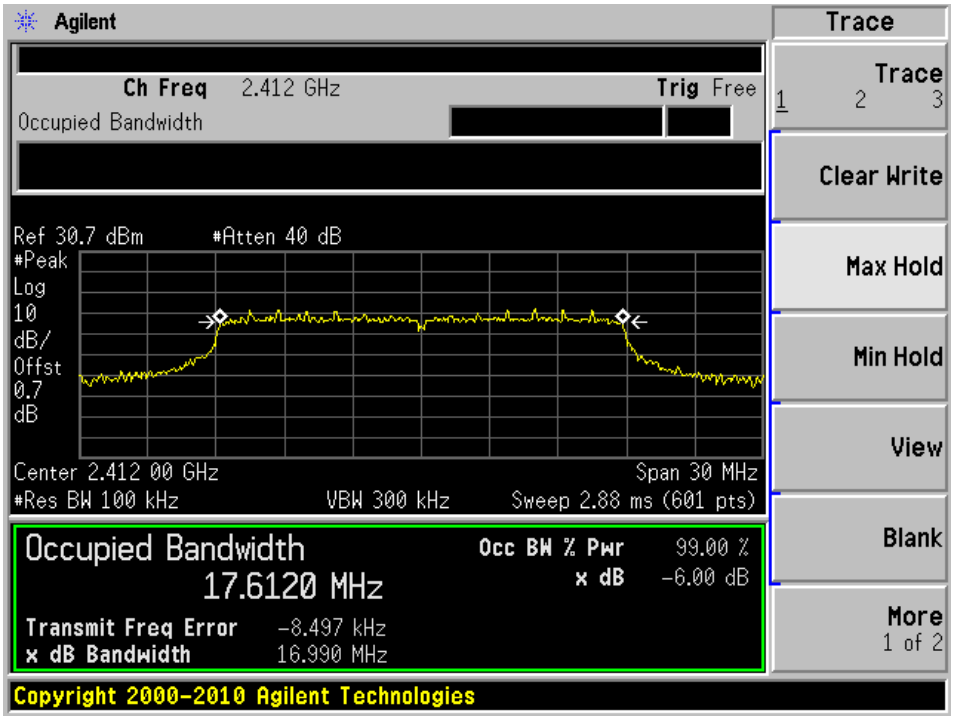


High channel: 2462 MHz

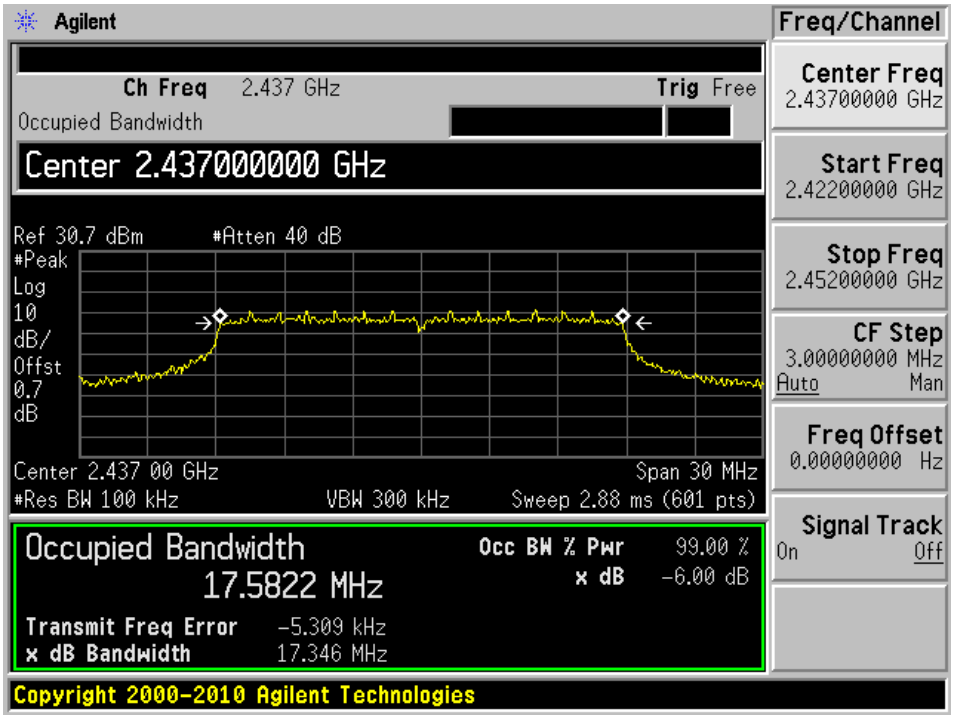


802.11n-HT20 mode

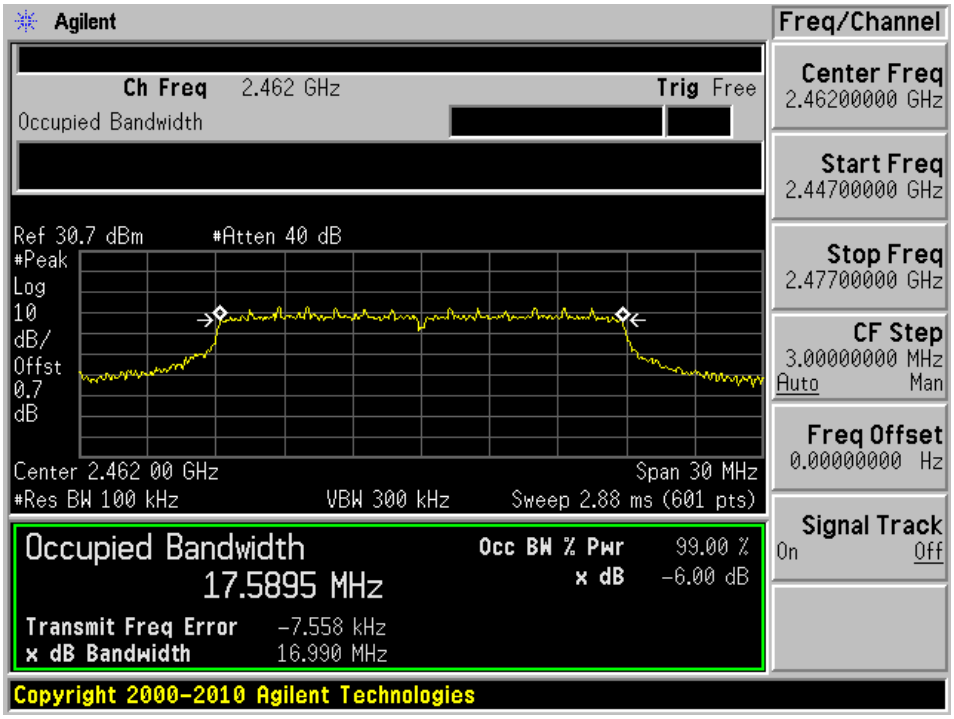
Low channel: 2412 MHz



Middle channel: 2437 MHz

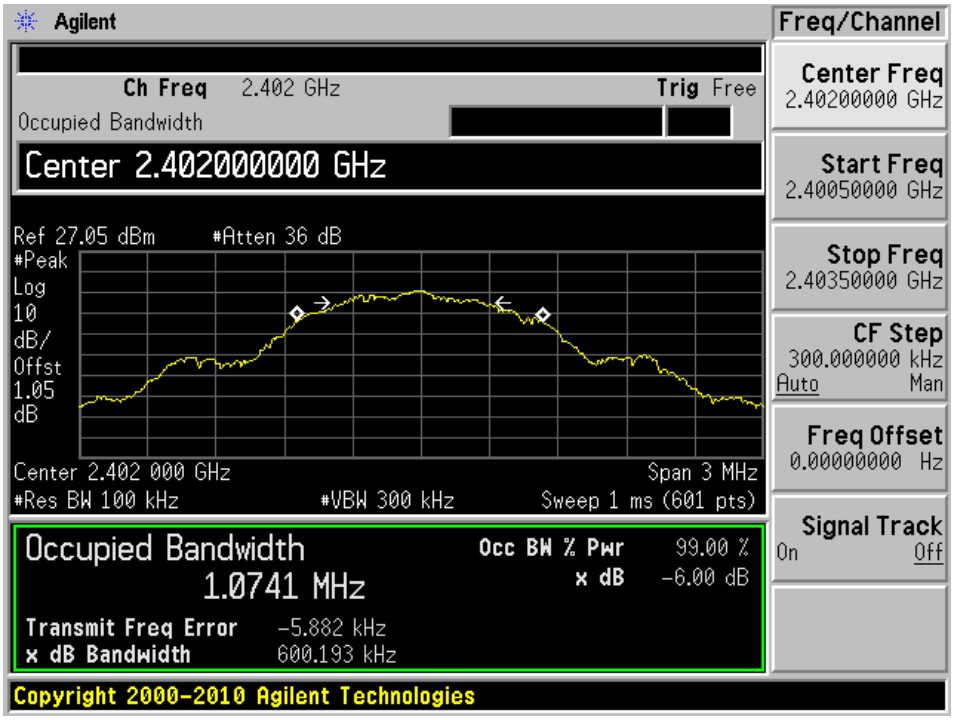


High channel: 2462 MHz

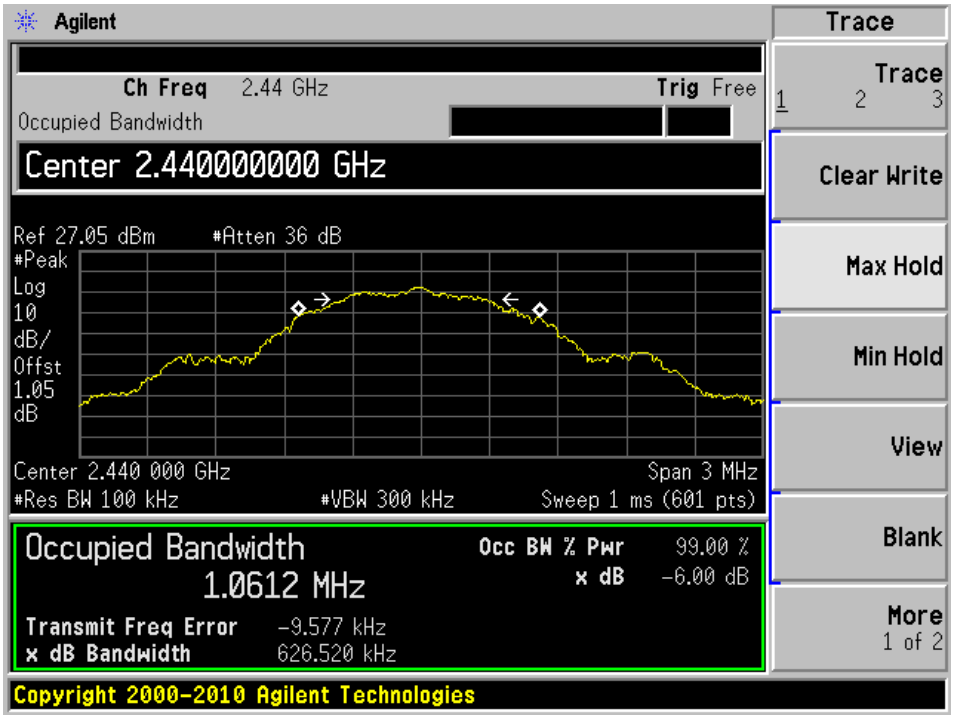


2.4 GHz, BLE

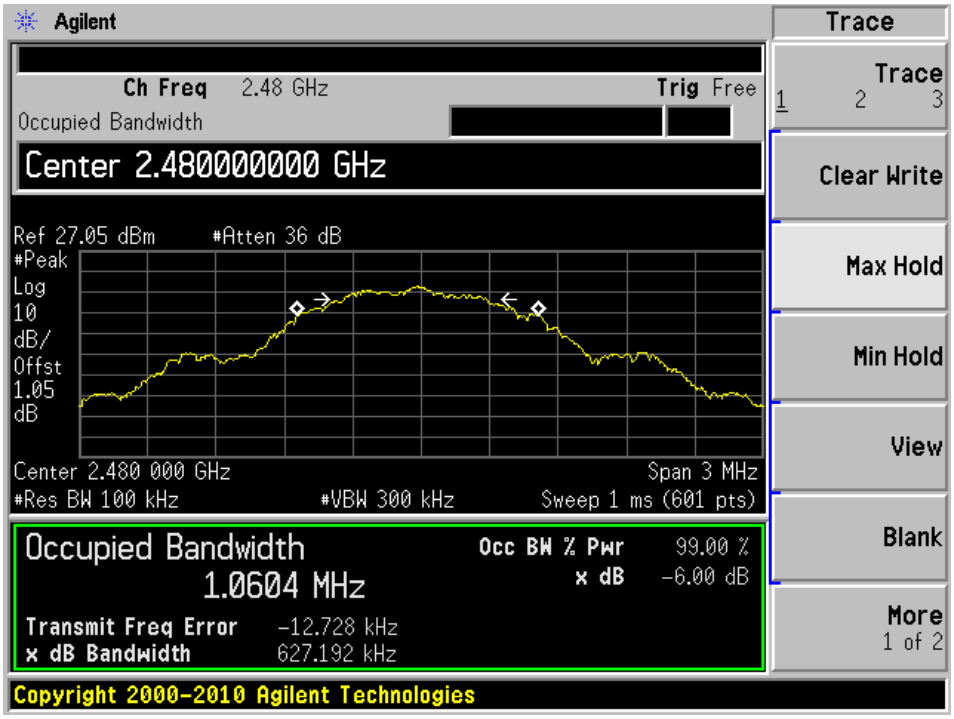
Low channel: 2402 MHz



Middle channel: 2440 MHz



High channel: 2480 MHz



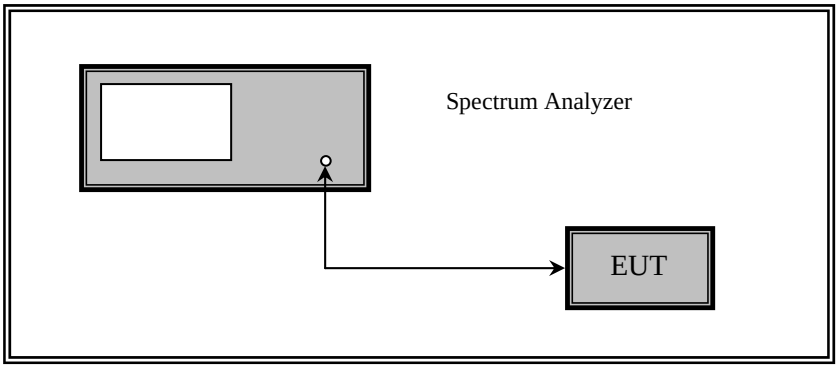
9 FCC §15.247(b) & IC RSS-210 §A8.4 – Output Power Measurement

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 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 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
-	SMA cable	-	C0003	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:	23º C
Relative Humidity:	40 %
ATM Pressure:	102.5 KPa

The testing was performed by Bo Li on 2015-04-31 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	18.77	30	-11.23
Middle	2437	17.09	30	-12.91
High	2462	16.75	30	-13.25
802.11g mode				
Low	2412	13.41	30	-16.59
Middle	2437	14.11	30	-15.89
High	2462	14.2	30	-15.8
802.11n-HT20 mode				
Low	2412	11.5	30	-18.5
Middle	2437	12.64	30	-17.36
High	2462	12.75	30	-17.25

2.4 GHz Wi-Fi (Peak)

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Margin
802.11b mode				
Low	2412	21.43	30	-8.57
Middle	2437	19.72	30	-10.28
High	2462	19.3	30	-10.7
802.11g mode				
Low	2412	16.98	30	-13.02
Middle	2437	17.65	30	-12.35
High	2462	17.63	30	-12.37
802.11n-HT20 mode				
Low	2412	14.91	30	-15.09
Middle	2437	16.04	30	-13.96
High	2462	16.5	30	-13.5

2.4 GHz BLE (Peak)

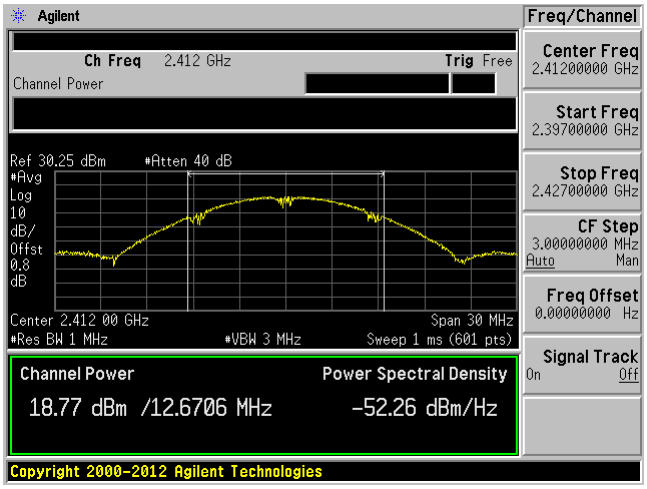
Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)
Low	2402	8.08	30
Middle	2440	9.21	30
High	2480	9.75	30

Please refer to following plots.

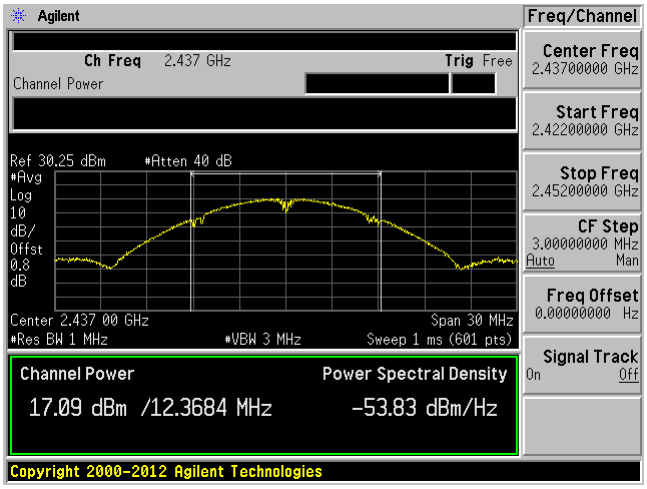
2.4 GHz Wi-Fi

802.11b mode

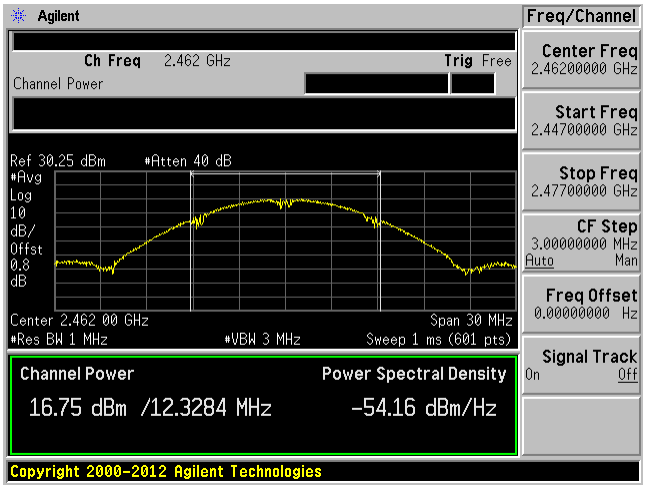
Low Channel



Middle Channel

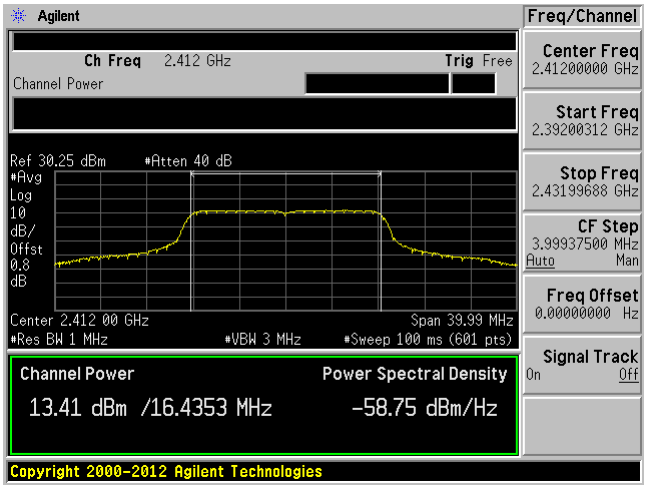


High Channel

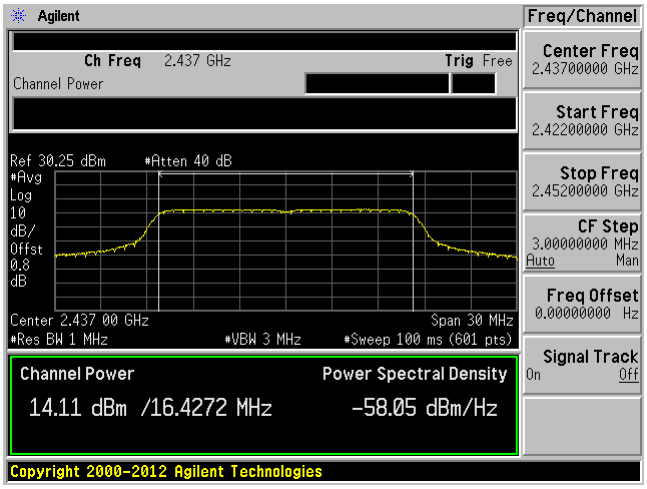


802.11g mode

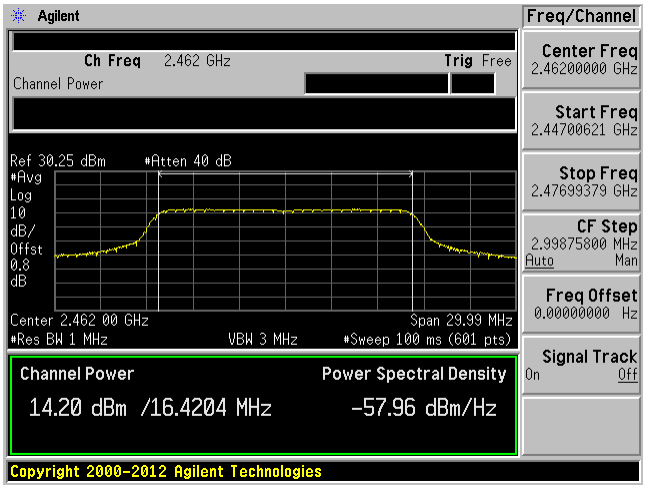
Low Channel



Middle Channel

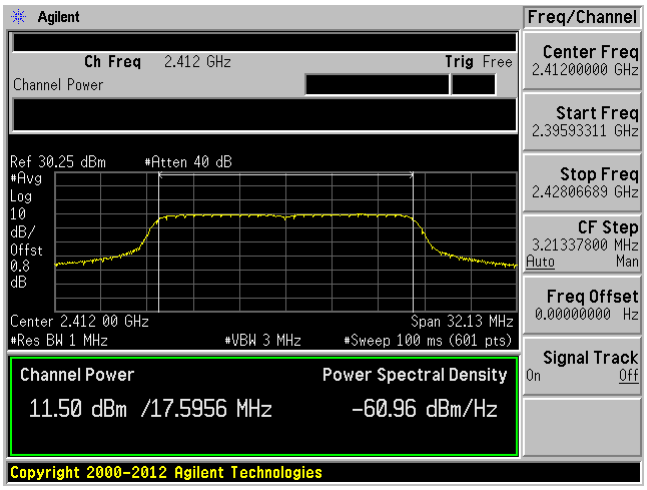


High channel

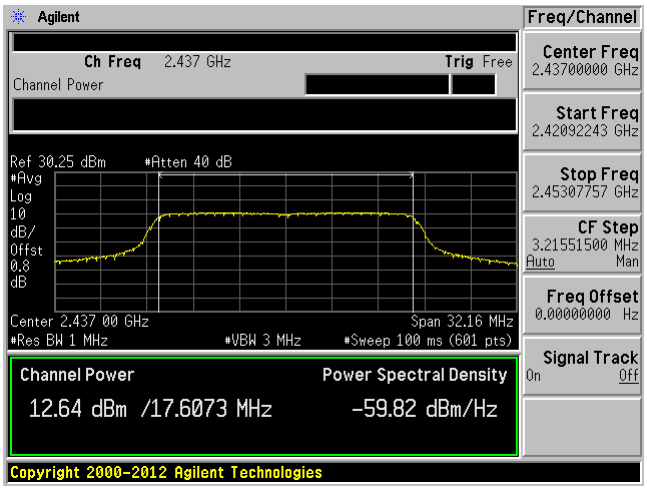


802.11n-HT20 mode

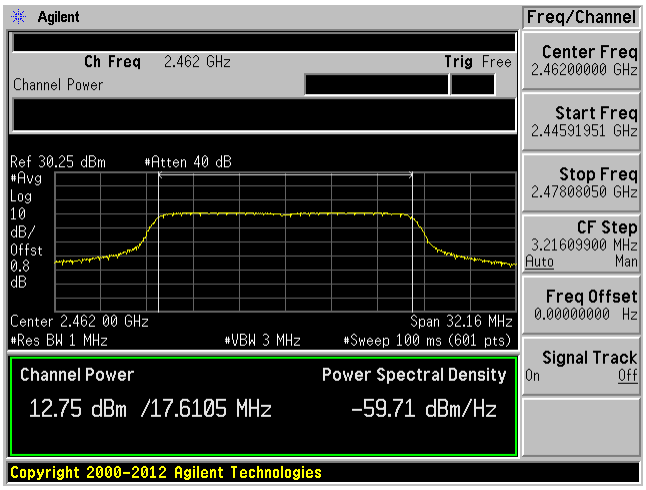
Low Channel



Middle Channel

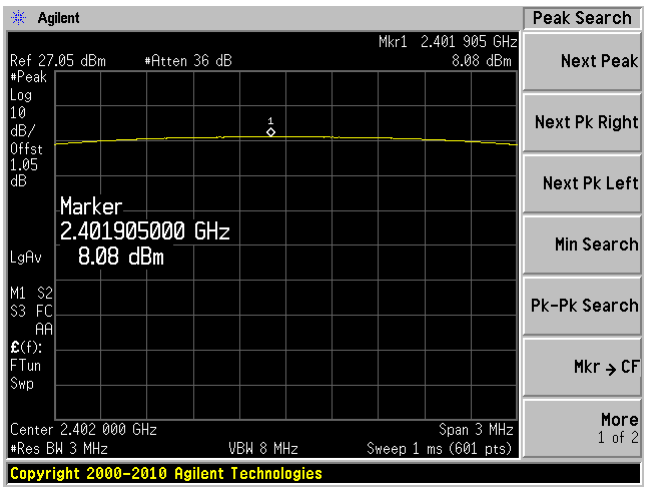


High Channel

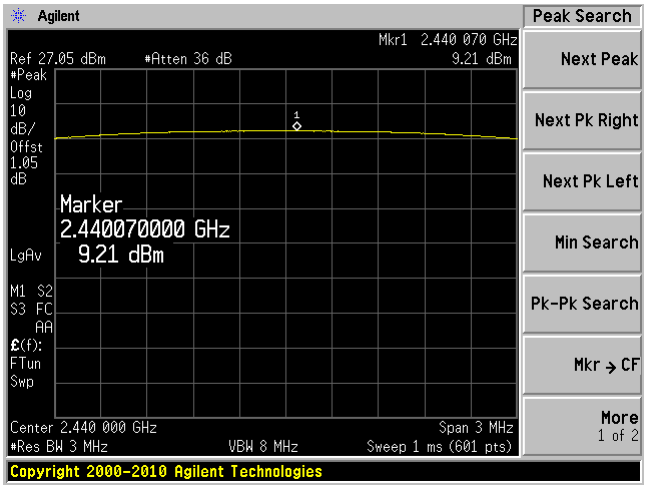


2.4 GHz, BLE

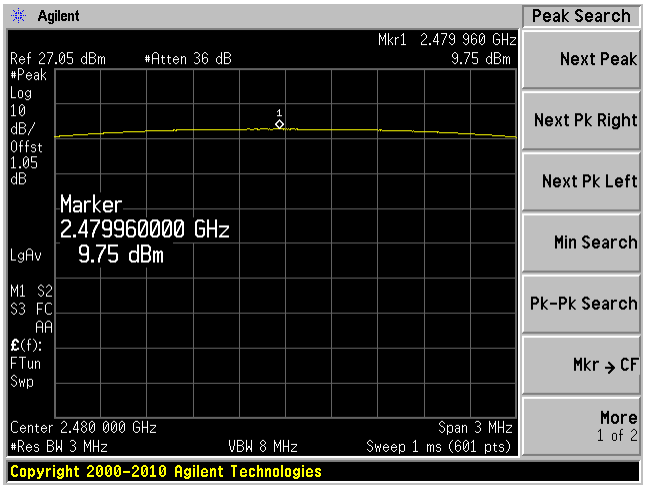
Low Channel



Middle Channel



High Channel



10 FCC §15.247(d) & IC RSS-210 §A8.5 – Antenna Conducted Spurious Emissions and 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 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 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
-	SMA cable	-	C0002	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:	23º C
Relative Humidity:	40 %
ATM Pressure:	102.5 KPa

The testing was performed by Bo Li on 2015-04-31 in RF site.

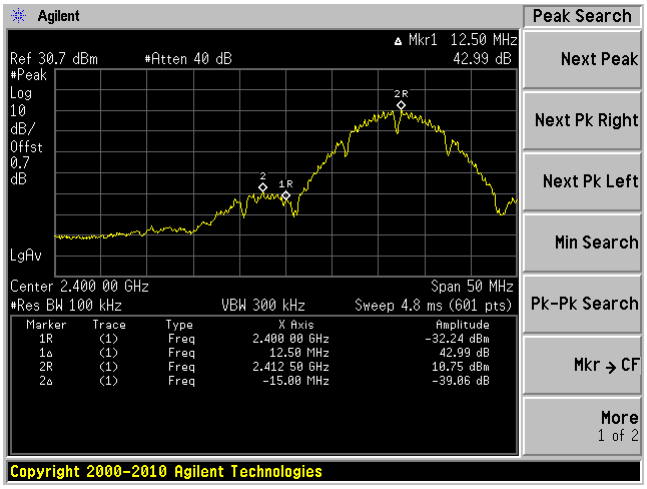
10.5 Test Results

Please refer to following pages for plots of band edge.

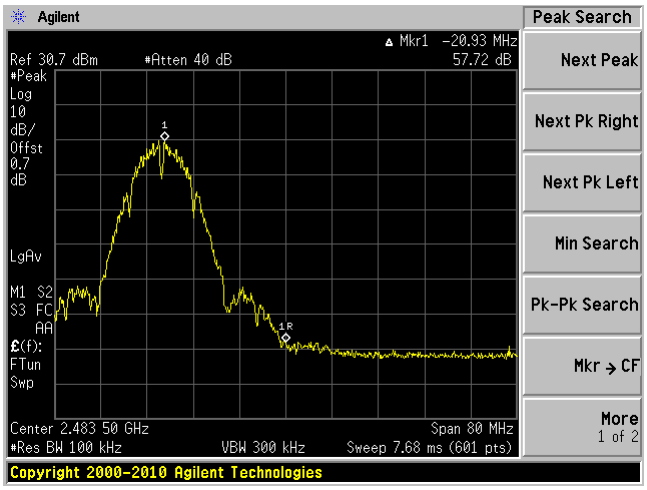
2.4 GHz Wi-Fi

802.11b mode

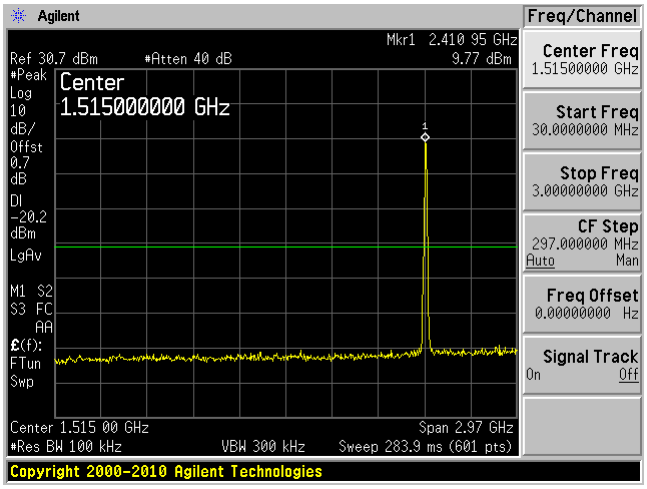
Low Band Edge



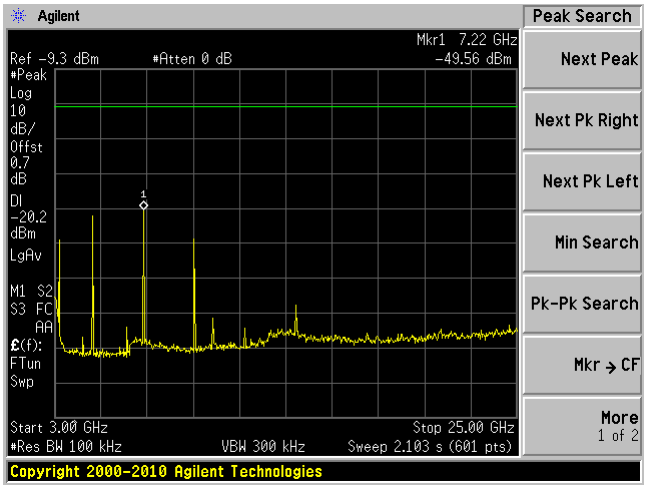
High Band Edge



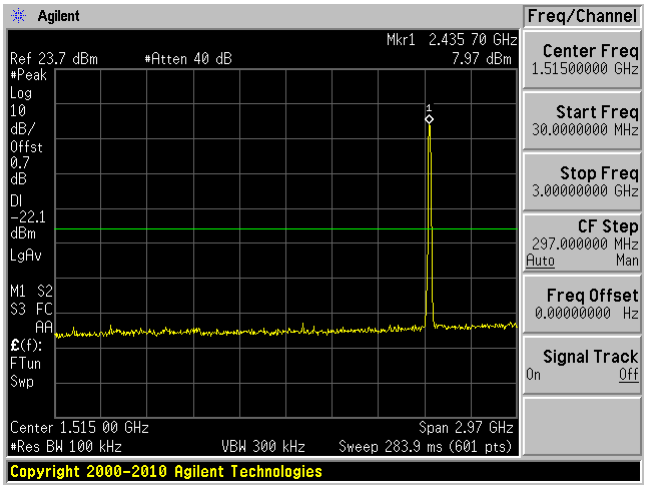
Low channel 30 MHz-3 GHz



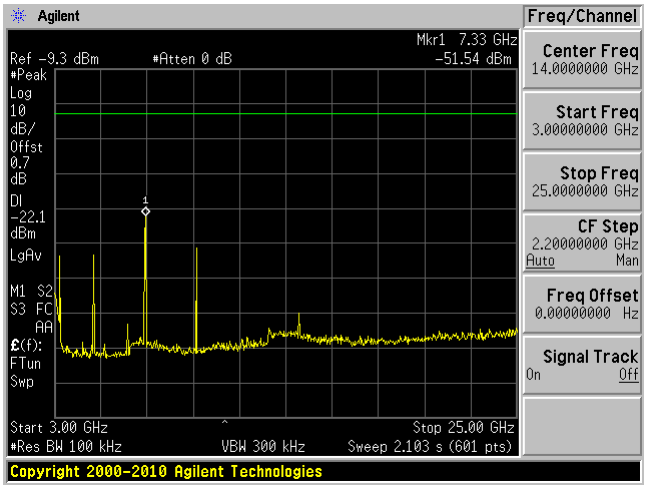
Low channel 3-25 GHz



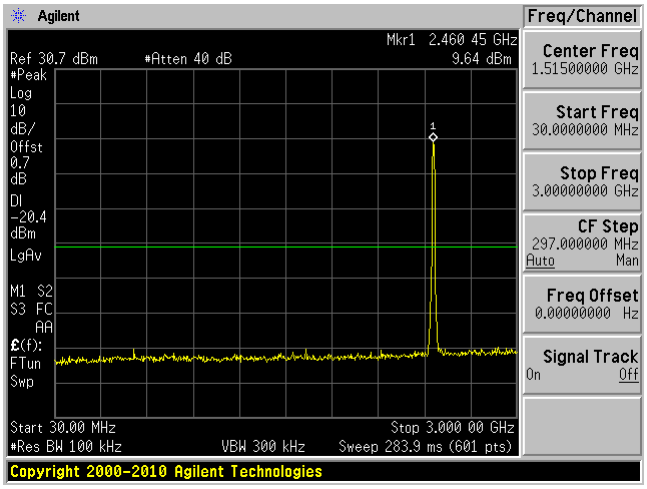
Middle channel 30 MHz-3 GHz



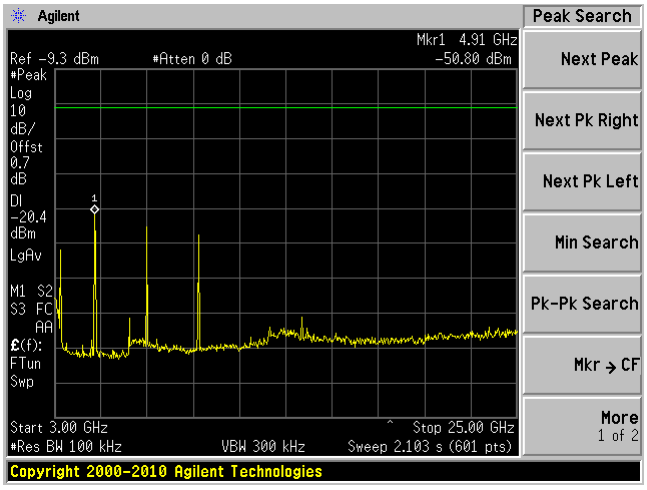
Middle channel 3-25 GHz



High channel 30 MHz-3 GHz

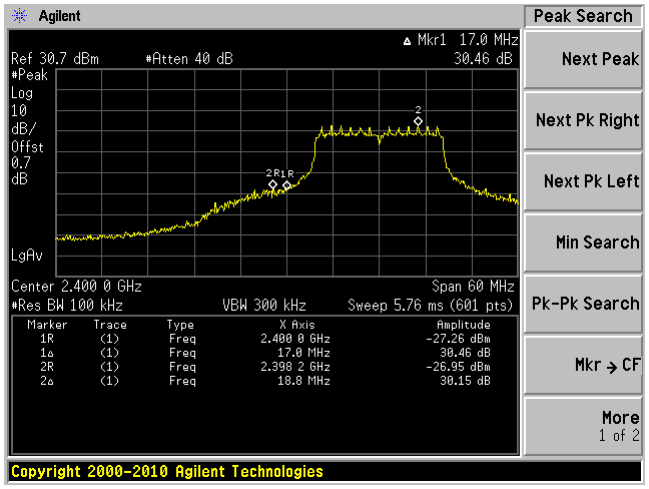


High channel 3-25 GHz

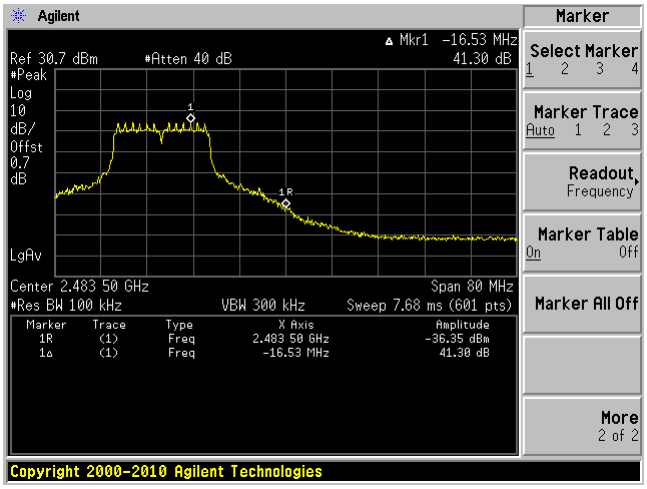


802.11g mode

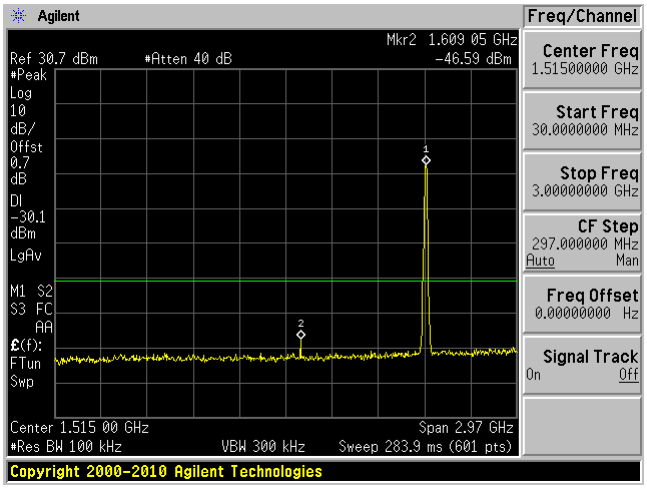
Low Band Edge



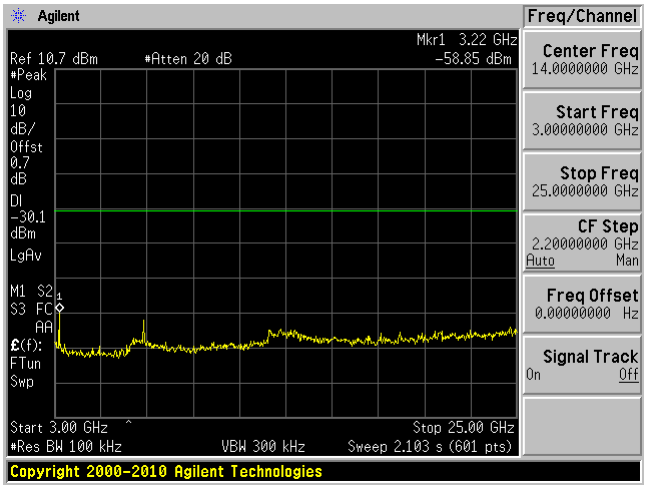
High Band Edge



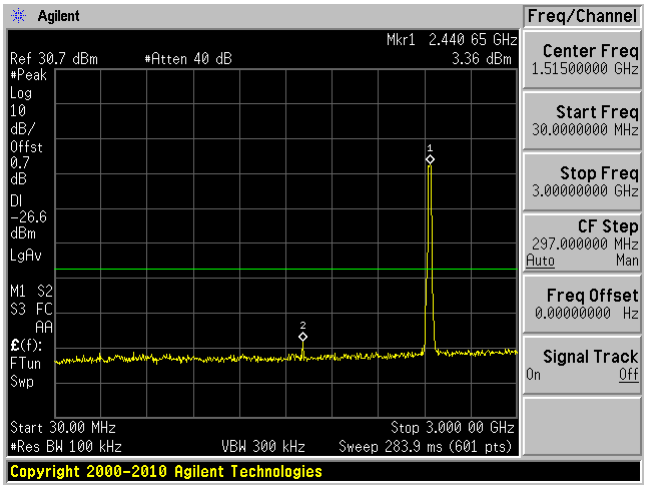
Low channel 30 MHz-3 GHz



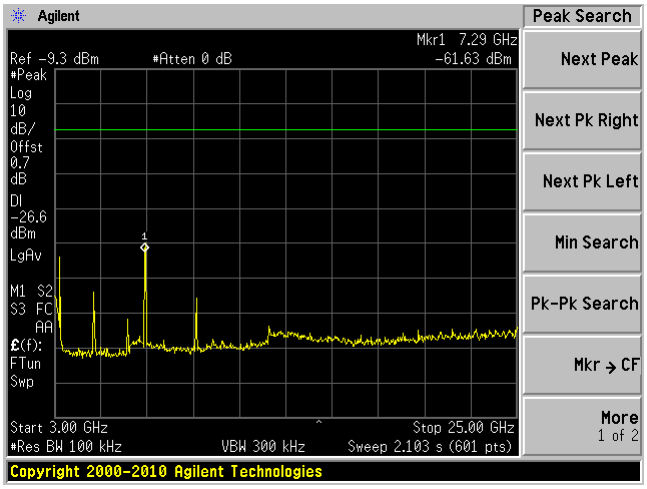
Low channel 3-25 GHz



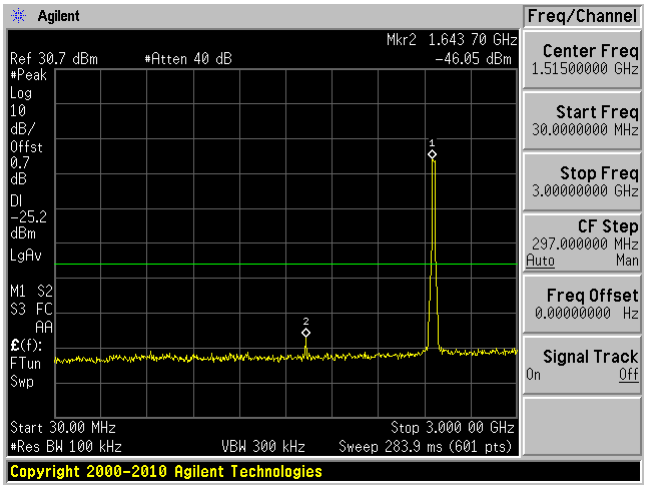
Middle channel 30 MHz-3 GHz



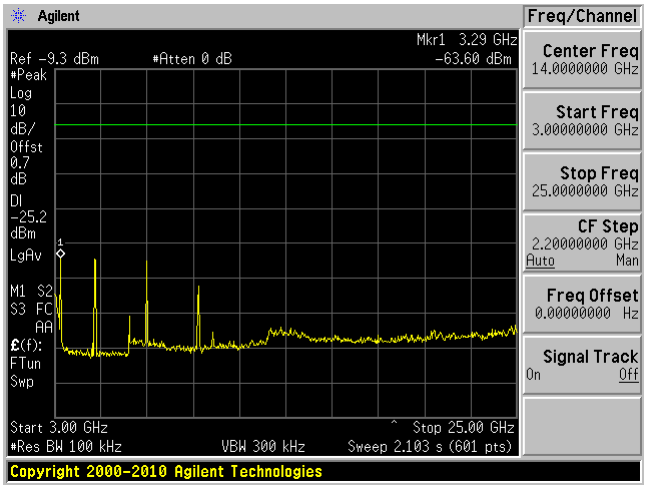
Middle channel 3-25 GHz



High channel 30 MHz-3 GHz

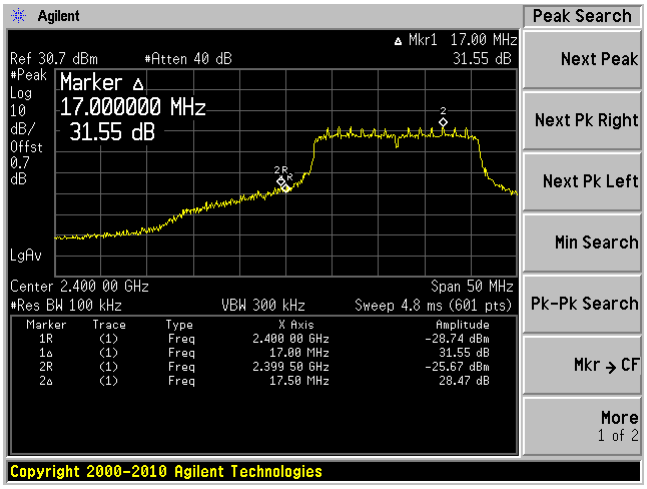


High channel 3-25 GHz

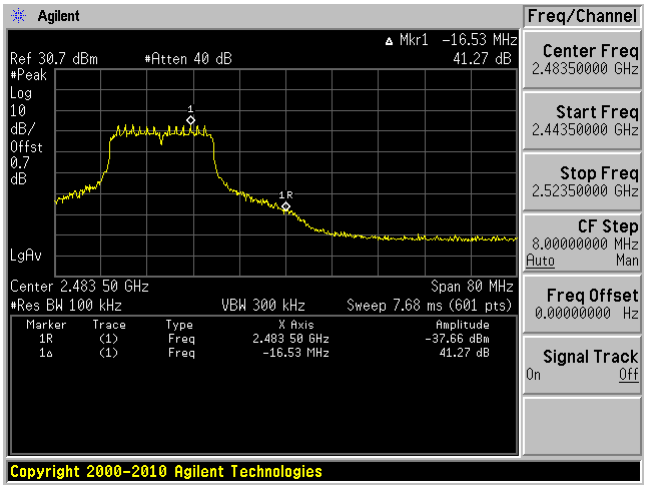


802.11n-HT20 mode

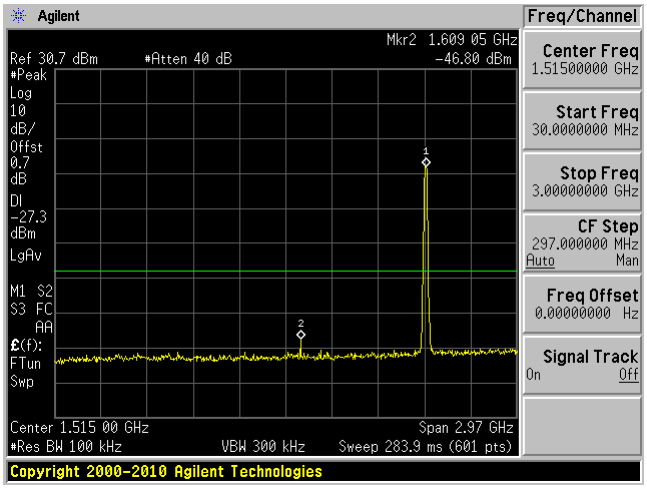
Low Band Edge



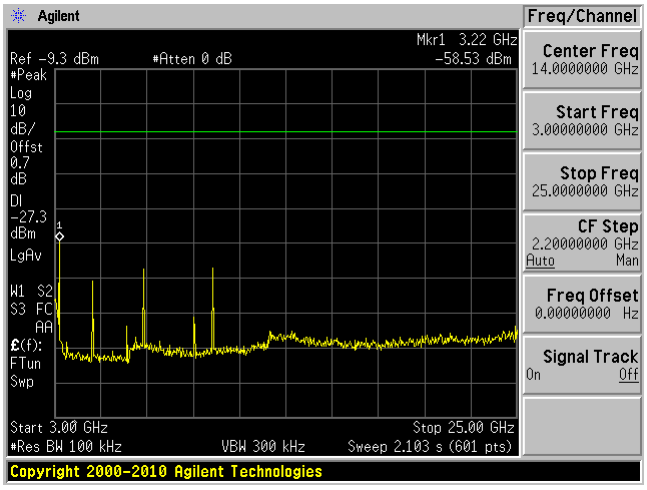
High Band Edge



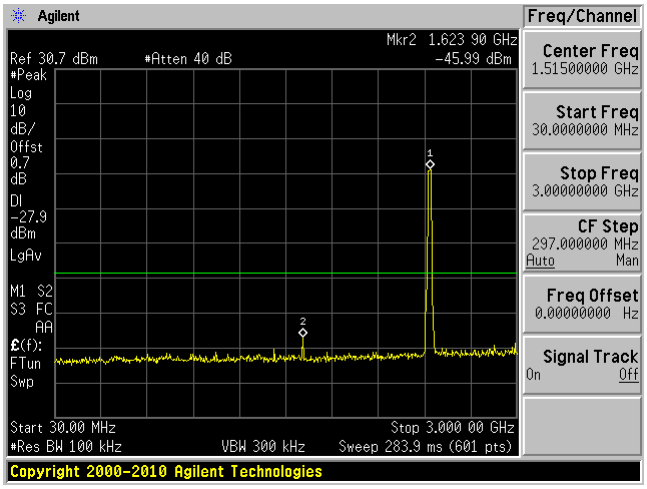
Low channel 30 MHz-3 GHz



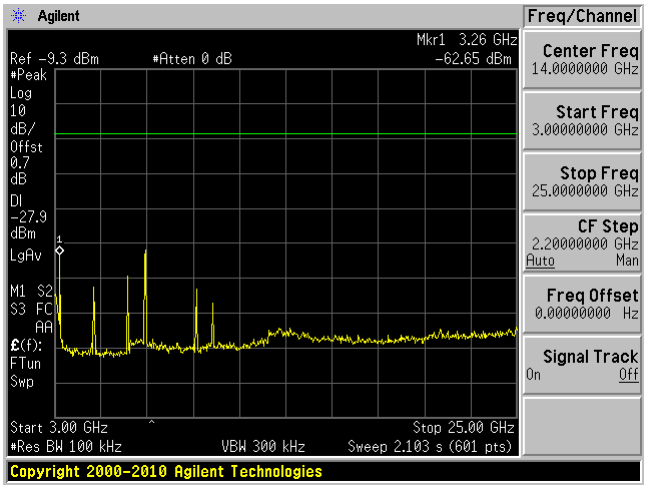
Low channel 3-25 GHz



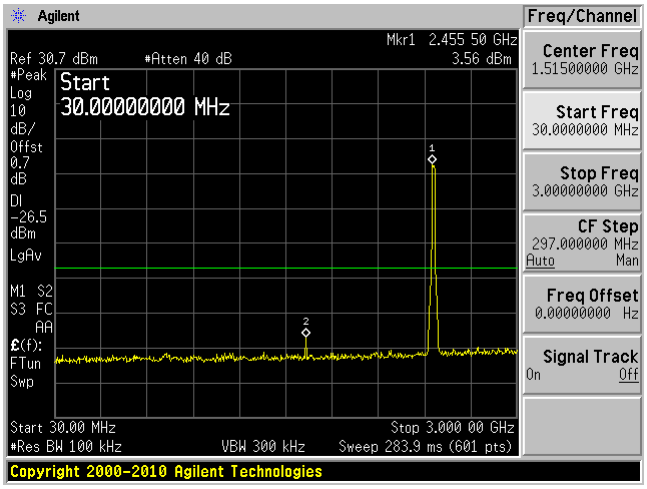
Middle channel 30 MHz-3 GHz



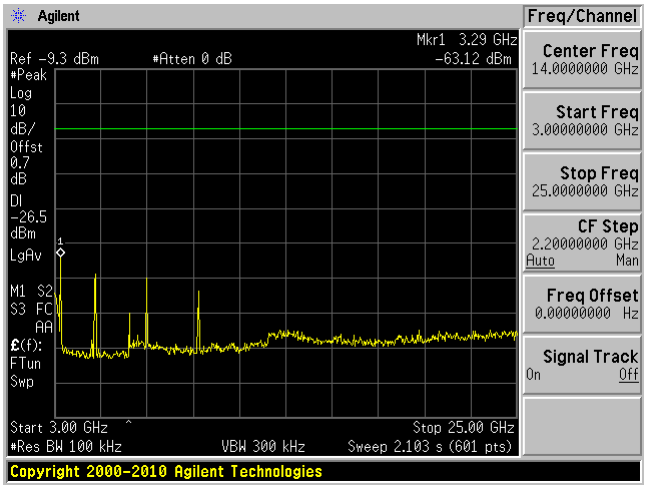
Middle channel 3-25 GHz



High channel 30 MHz-3 GHz

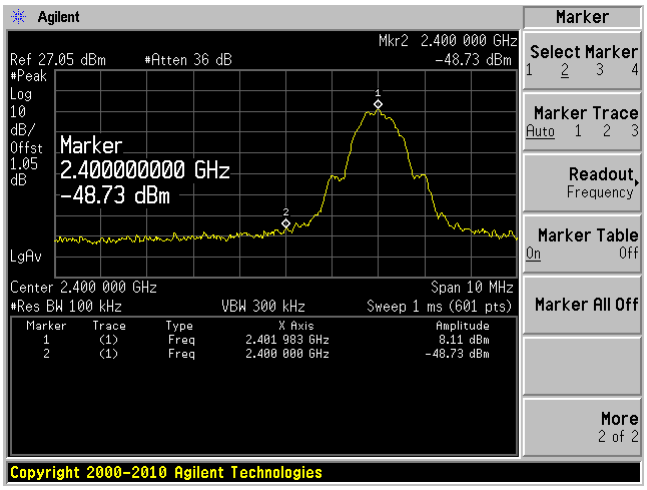


High channel 3-25 GHz

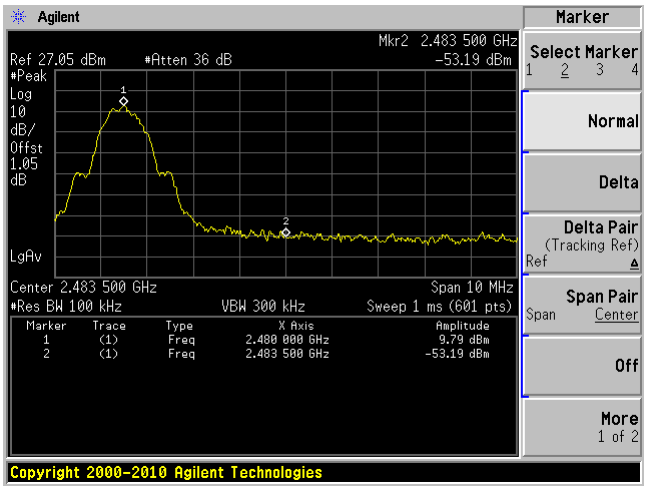


2.4 GHz, BLE

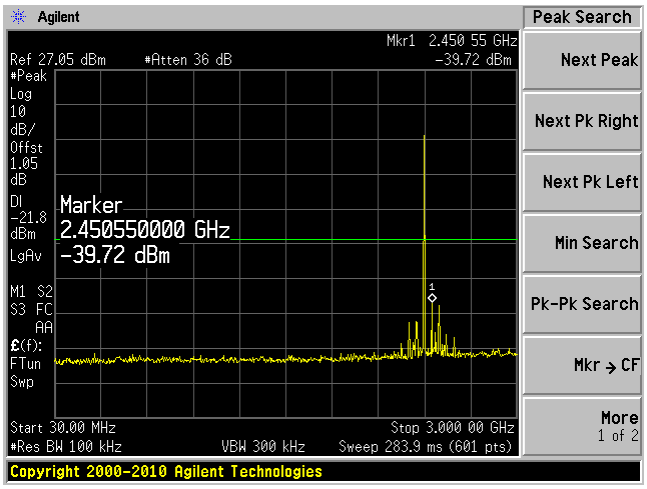
Low Band Edge



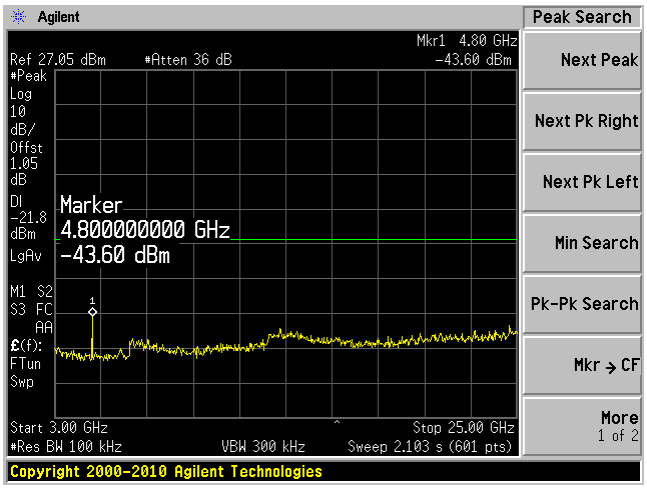
High Band Edge



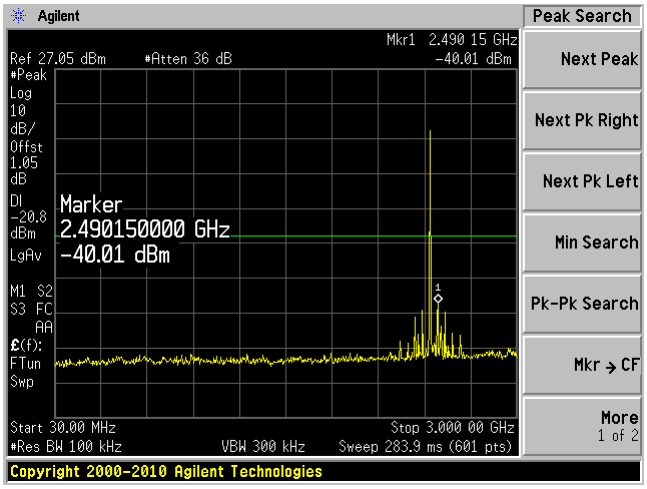
Low channel 30 MHz-3 GHz



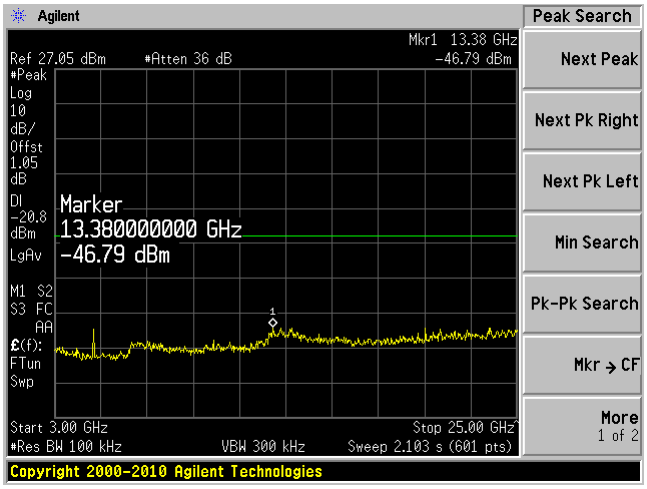
Low channel 3-25 GHz



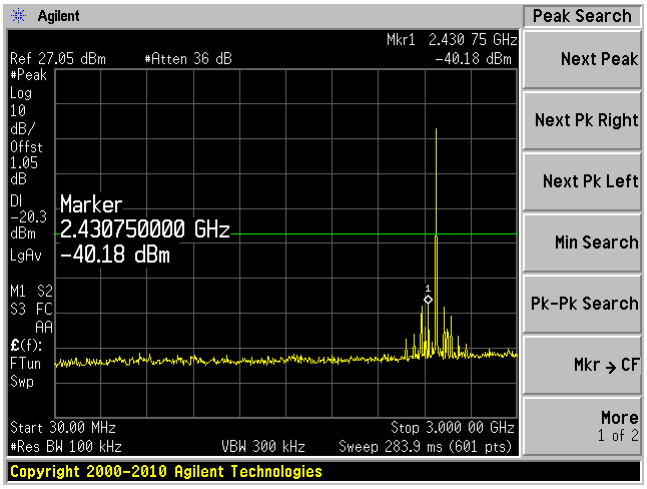
Middle channel 30 MHz-3 GHz



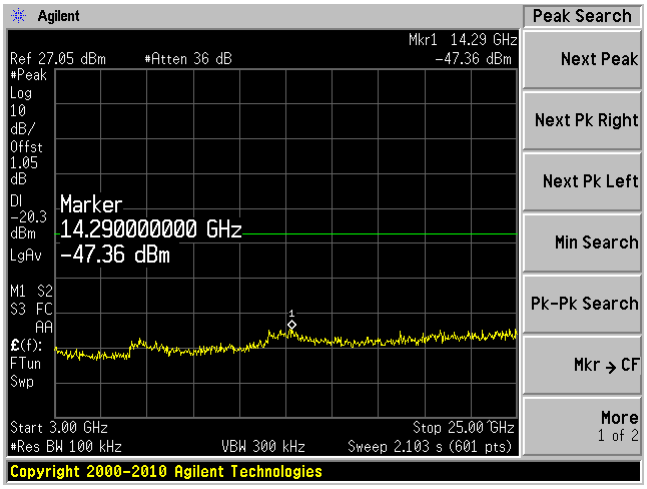
Middle channel 3-25 GHz



High channel 30 MHz-3 GHz



High channel 3-25 GHz



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
-	SMA cable	-	C0002	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:	23º C
Relative Humidity:	40 %
ATM Pressure:	102.5 KPa

The testing was performed by Bo Li on 2015-04-31 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	-6.11	8
Middle	2437	-7.87	8
High	2462	-5.91	8
802.11g mode			
Low	2412	-12.19	8
Middle	2437	-12.83	8
High	2462	-12.16	8
802.11n-HT20 mode			
Low	2412	-13.6	8
Middle	2437	-13.26	8
High	2462	-12.64	8

2.4 GHz BLE

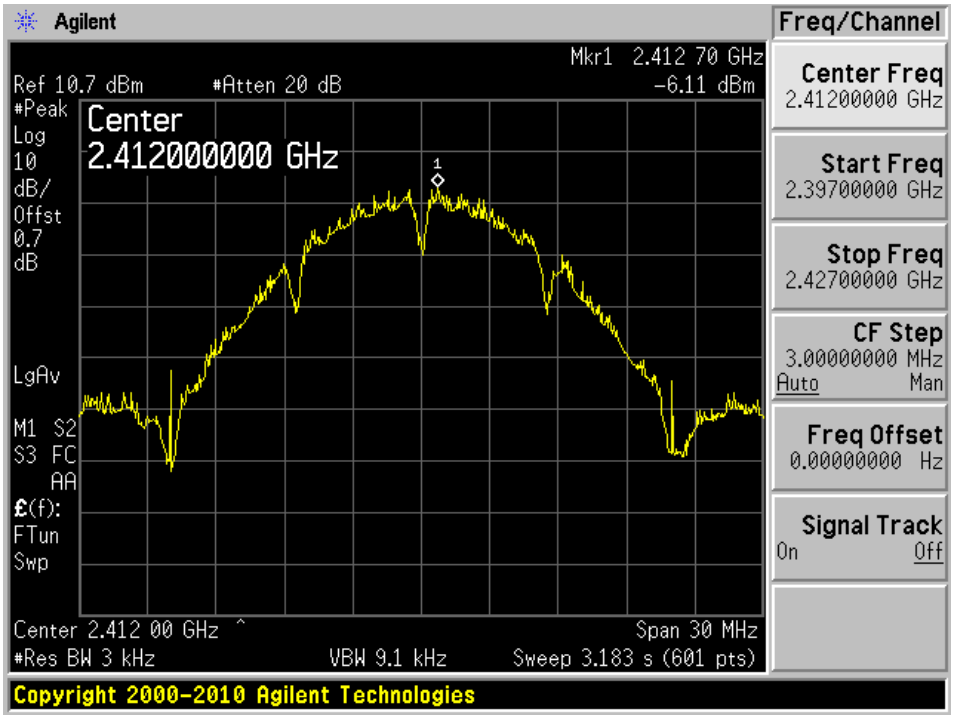
Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Low	2402	-4.45	8
Middle	2440	-4.87	8
High	2480	-4.28	8

Please refer to the following plots for detailed test results:

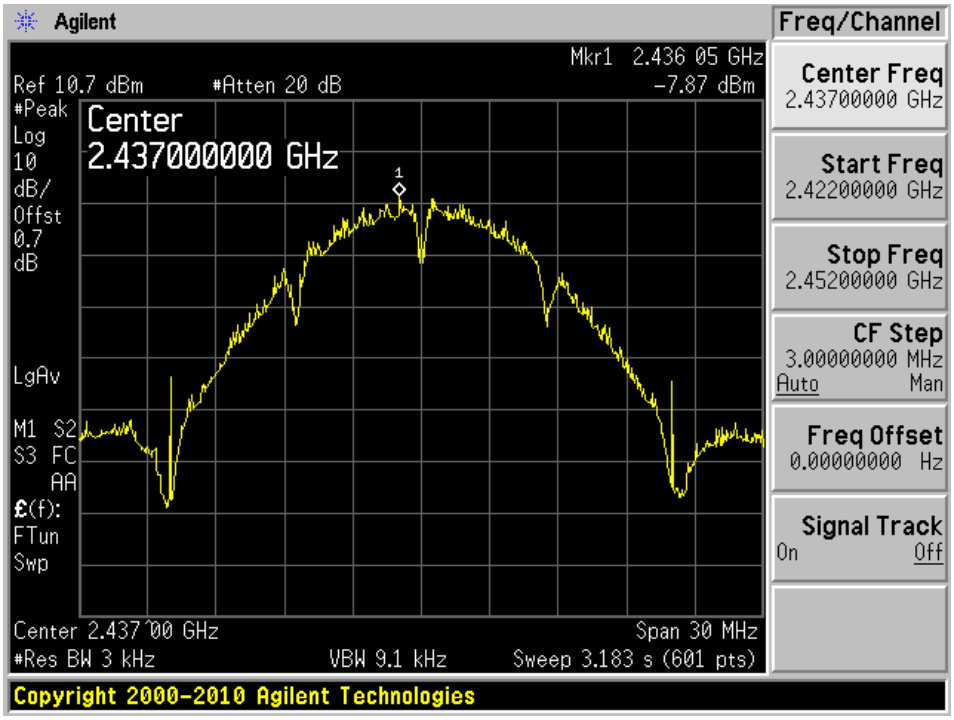
2.4 GHz Wi-Fi

802.11b mode

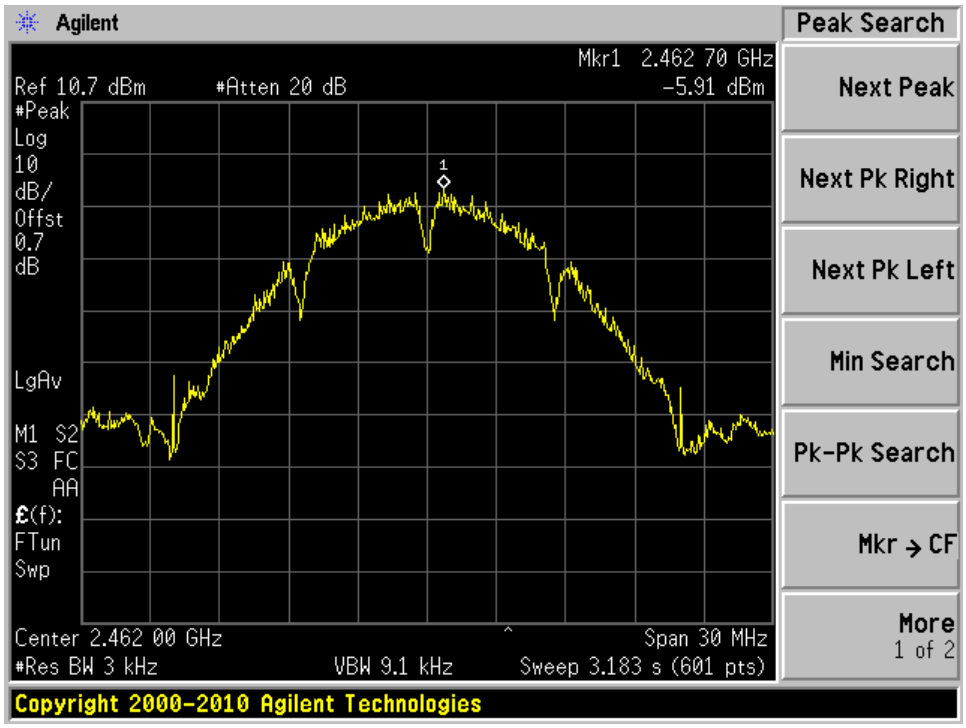
Low channel: 2412 MHz



Middle channel: 2437 MHz

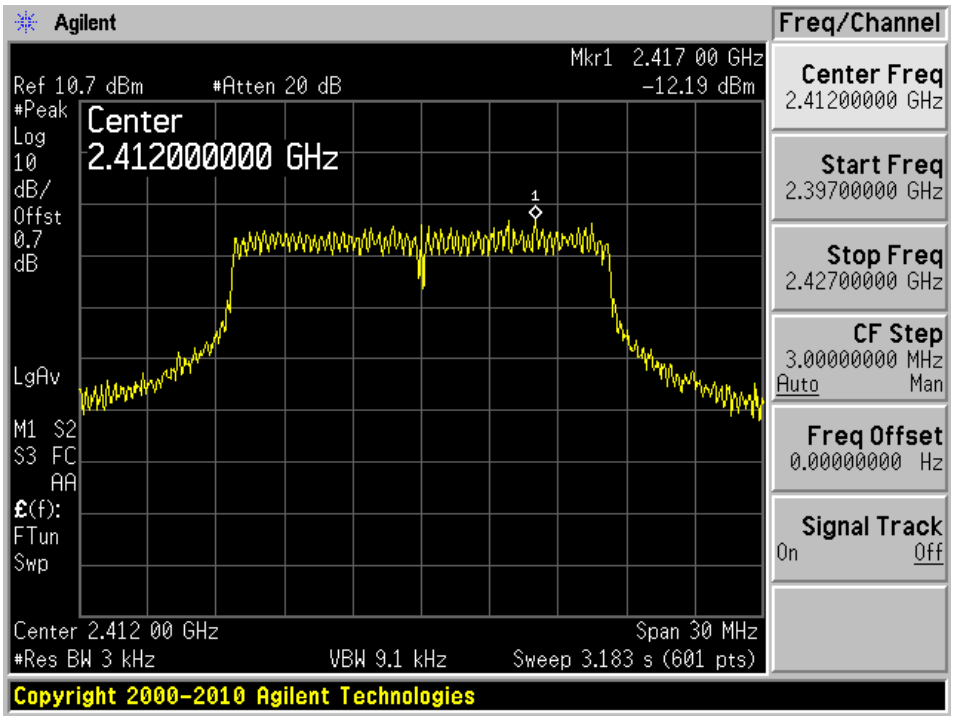


High channel: 2462 MHz

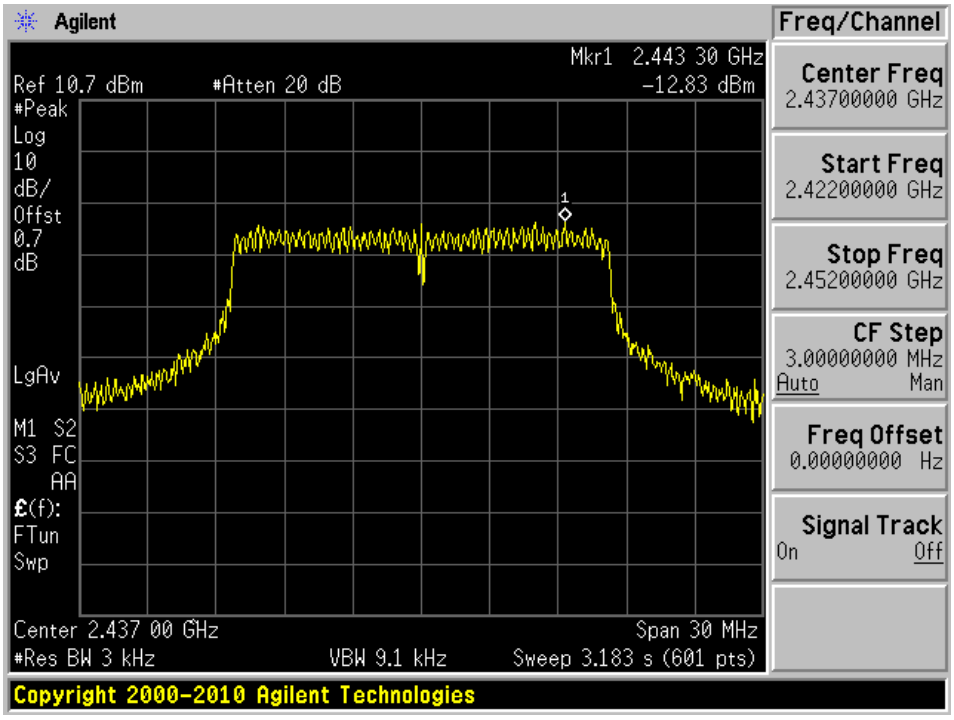


802.11g mode

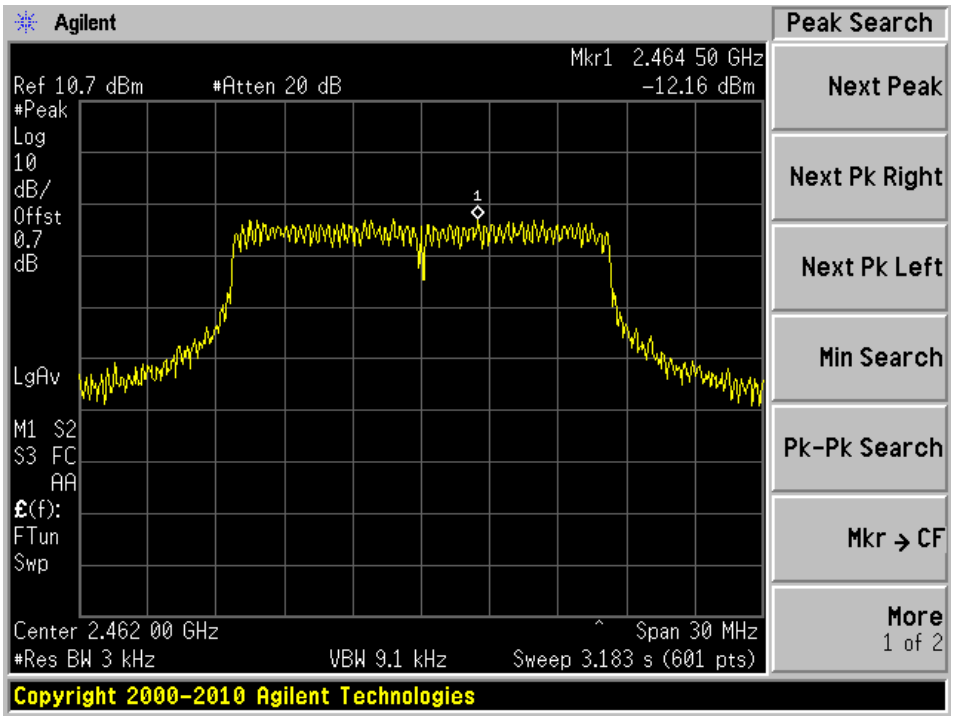
Low channel: 2412 MHz



Middle channel: 2437 MHz

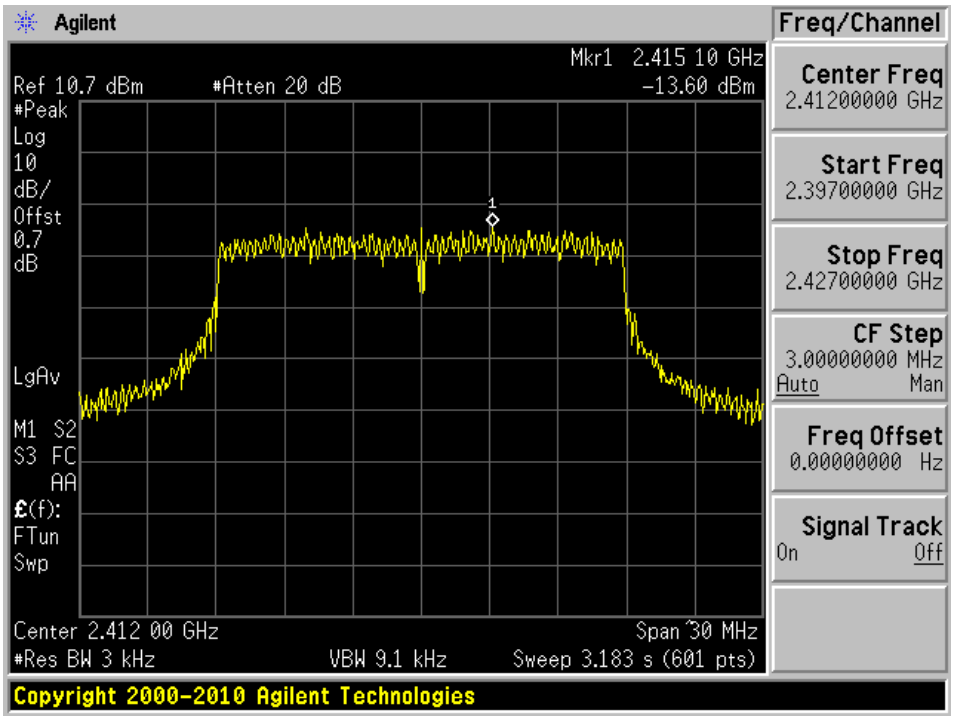


High channel: 2462 MHz

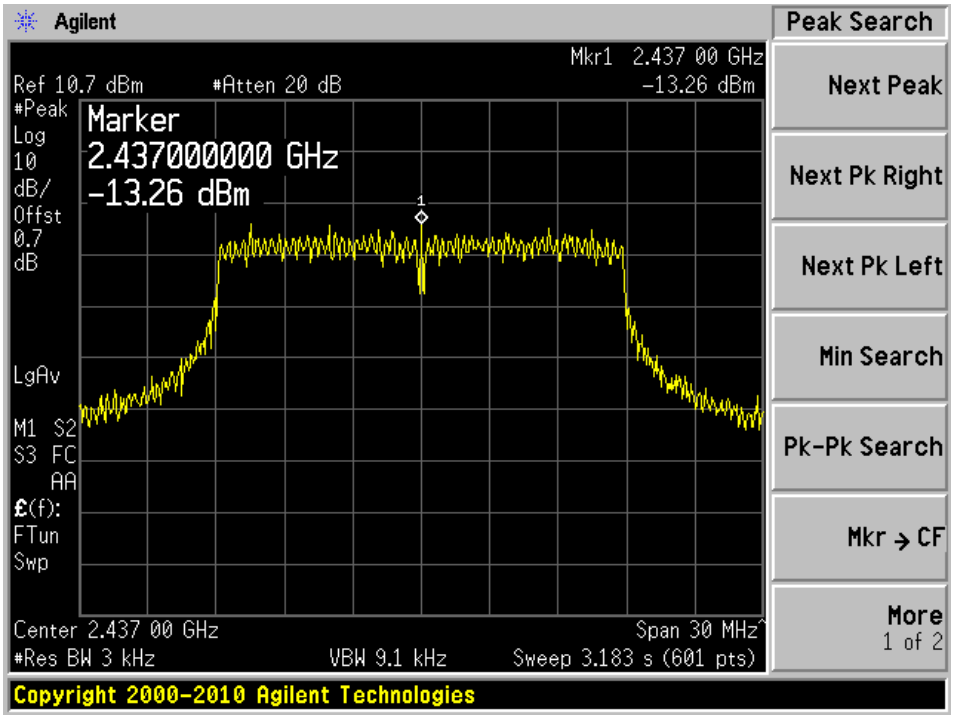


802.11n-HT20 mode

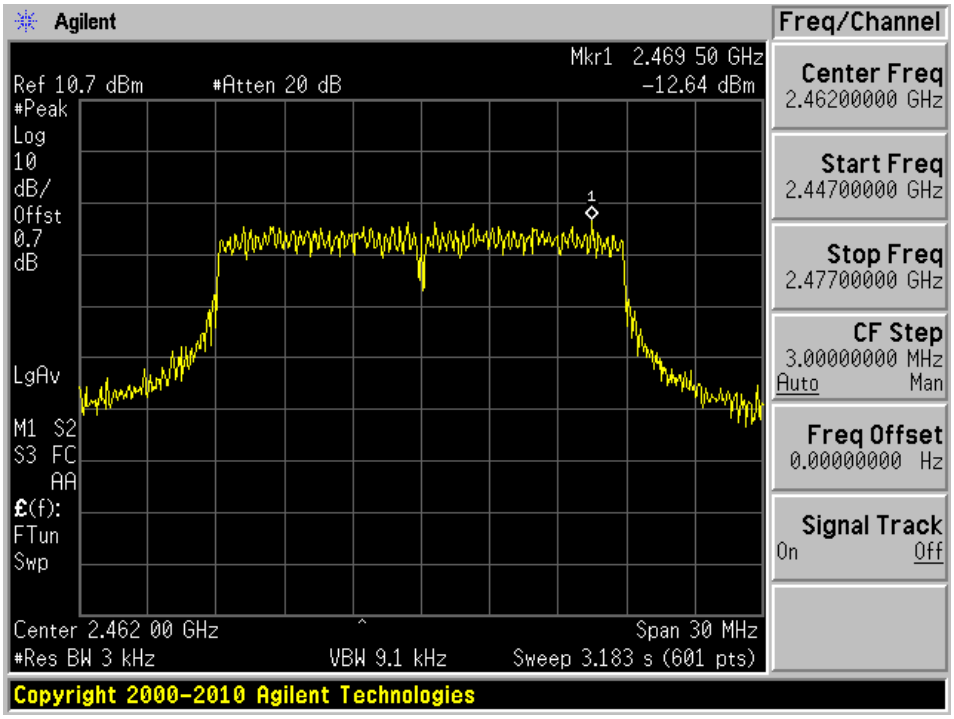
Low channel: 2412 MHz



Middle channel: 2437 MHz

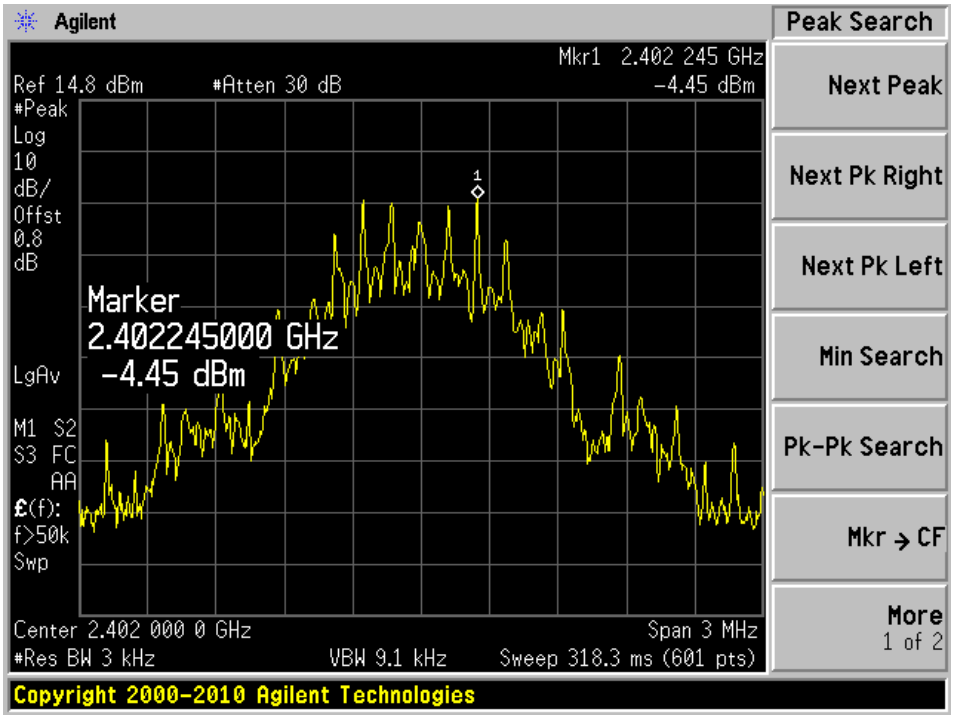


High channel: 2462 MHz

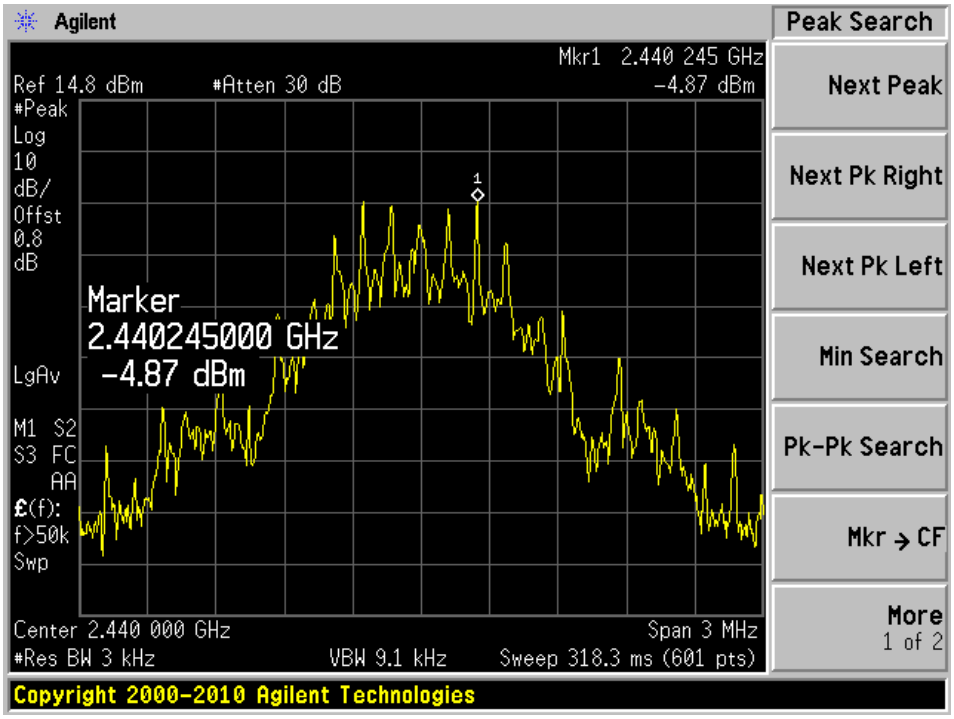


2.4 GHz BLE

Low channel: 2402 MHz



Middle channel: 2440 MHz



High channel: 2480 MHz