FCC PART 15, SUBPART C
IC RSS-247, ISSUE 1, MAY 2015

TEST AND MEASUREMENT REPORT

For

Next Thing Company

1940 Union Street, Ste. 32,
Oakland, CA 94607, USA

FCC ID: 2AF9F-HELLA1337
IC: 20863-HELLA1337

Report Type:	**Product Type:**
Original Report	C.H.I.P Computer

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Report Number:	R15101413-247 DSS
Report Date:	2015-12-08
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R15101413-247	Original Report	2015-12-08

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Next Thing Company*, and their product model: HELLA1337, FCC ID: 2AF9F-HELLA1337; IC: 20863-HELLA1337 or the "EUT" as referred to in this report. It is a module which contains 2.4 GHz 802.11b/g/n and Bluetooth, BLE capability.

1.2 Mechanical Description of EUT

The EUT measures approximately 60 mm (L) x 41 mm (W) x 10 mm (H) and weighs 23.5 g.

The test data gathered are from typical production sample, serial number: R15101413-01 assigned by BACL.

1.3 Objective

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

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

1.4 Related Submittal(s)/Grant(s)

FCC Part 15, Subpart C, Equipment DSS with FCC ID: 2AF9F-HELLA1337

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and FCC KDB 558074 D01 DTS Meas Guidance v03r03: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

1.6 Measurement Uncertainty

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

Based on CISPR16-4-2:2011, The Treatment of Uncertainty in EMC Measurements, the values ranging from $\pm$2.0 dB for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 Test Facility

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

2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of 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 C63.10-2013, ANSI C63.4-2014, TIA/EIA-603 & CISPR 24:2010.

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

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

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

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v03r03.

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

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

2.2 EUT Exercise Software

The test utility used is *UART Terminal (RS-232)* provided by *Next Thing, Co.*, the software was verified by *Jin Yang* to comply with the standard requirements being tested against.

2.3 Equipment Modifications

A SMA port was attached to the output signal before the antenna of the EUT to perform conducted measurements.

2.4 Local Support Equipment

Manufacturer	Description	Model
Acer	Laptop	ZHK

2.5 EUT Internal Configuration Details

Manufacturer	Description	Model
Realtek Semiconductor Corp	WIFI/BT Module	RTL8723BS
Allwinner Technology	Soc	R8

2.6 Support Equipment

Manufacturer	Description	Model
Apple	USB Power Adapter	A1357
Asian Power Devices, Inc	AC Adapter	WB-10E05FU

2.7 Interface Ports and Cabling

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

3 Summary of Test Results

Results reported relate only to the product tested.

FCC & IC Rules	Description of Test	Results
FCC §15.203 IC RSS-Gen §8.3	Antenna Requirement	Compliant
FCC §15.207 IC RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
FCC §15.247(i) IC RSS-102	RF Exposure	Compliant
FCC §15.247 (d) IC RSS-247 §5.5	Spurious Emissions at Antenna Port	Compliant
FCC §15.205 IC RSS-Gen §8.10	Restricted Bands	Compliant
FCC §15.209, §15.247 (d) IC RSS-247 §5.5, RSS-Gen §8.9	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) IC RSS-247 §5.2	6 dB&99% Emission Bandwidth	Compliant
FCC §15.247(b)(3) IC RSS-247 §5.4	Maximum Peak Output Power	Compliant
FCC §15.247(d) IC RSS-247 §5.5	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §15.247(e) IC RSS-247 §5.2	Power Spectral Density	Compliant

4 FCC §15.203 & IC RSS-Gen §8.3 – Antenna Requirements

4.1 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 license-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

License-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).

4.2 Antenna Description

Antenna Type	Antenna Gain (dBi) @ 2.4 GHz
Chip Antenna	2.5

5 FCC §15.247(i) & IC RSS-102 – RF Exposure

5.1 Applicable Standards

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

Limits for General Population/Uncontrolled Exposure

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

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

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

According to IC RSS-102 Issue 5:

2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz[6] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

5.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

5.3 MPE Results

2.4 GHz Wi-Fi

Maximum peak output power at antenna input terminal (dBm):	12.7
Maximum peak output power at antenna input terminal (mW):	18.621
Prediction distance (cm):	20
Prediction frequency (MHz):	2462
Maximum Antenna Gain, typical (dBi):	2.5
Maximum Antenna Gain (numeric):	1.778
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0066
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0066 mW/cm^2. Limit is 1.0 mW/cm^2.

BLE

Maximum peak output power at antenna input terminal (dBm):	4.28
Maximum peak output power at antenna input terminal (mW):	2.6792
Prediction distance (cm):	20
Prediction frequency (MHz):	2440
Maximum Antenna Gain, typical (dBi):	2.5
Maximum Antenna Gain (numeric):	1.778
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.00095
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.00095 mW/cm^2. Limit is 1.0 mW/cm^2.

RF exposure evaluation exemption for IC

2.4 GHz Wi-Fi: 12.7 + 2.5 dBi = 15.2 dBm < $1.31\times10^{-2}f^{0.6834}$ = 2.7219 W = 34.3488 dBm

BLE: 4.28 + 2.5 dBi = 6.78 dBm < $1.31\times10^{-2}f^{0.6834}$ = 2.7053 W = 34.32214 dBm

Therefore the RF exposure is not required.

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

6.1 Applicable Standards

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

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

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note1	56 to 46 Note2
0.5-5	56	46
5-30	60	50

Note1: Decreases with the logarithm of the frequency.
Note2: A linear average detector is required

6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2014 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:

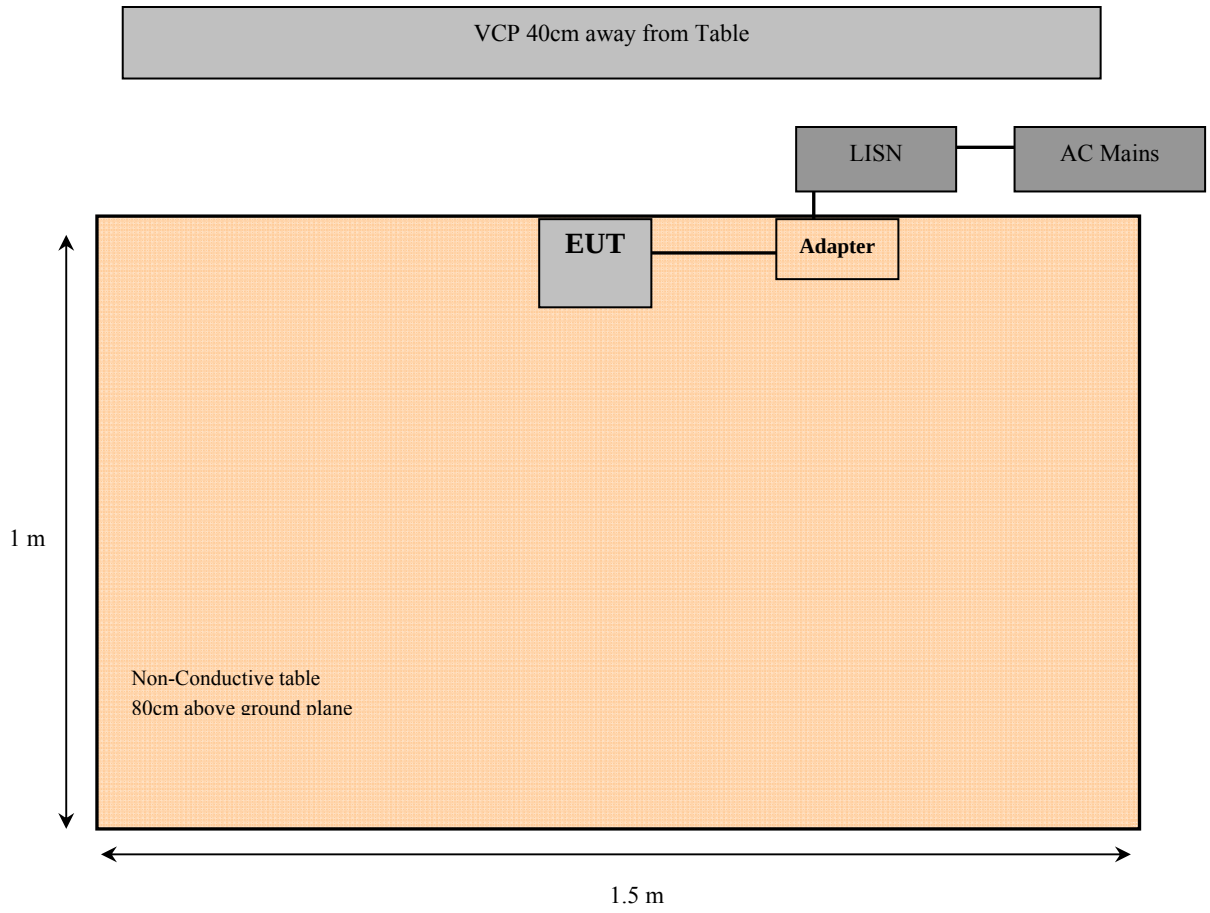
CA = Ai + CL + Atten

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	Receiver, EMI Test	ESCI 1166.5950K03	100337	2015-06-18	1 year
FCC	LISN	FCC-LISN-50-2-10-CISPR16 1PA ANSI 14	160130	2015-04-07	1 year
TTE INCORPORATED	High Pass Filter	H985-150k-50-720N	H 886	2015-01-09	1 year
Ericsson	Pulse Limiter	ESH 3-Z2	101964	N/A	N/A
Suirong	30 ft conductive emission cable	LMR 400	-	2015-03-05	1 year
Hewlett-Packard	5 ft N-type RF cable	-	1268	2015-05-15	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:	15º C
Relative Humidity:	42%
ATM Pressure:	101.31kPa

The testing was performed by Jin Yang on 2015-10-25 in 5 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 (Live/Neutral)**	**Range (MHz)**
-11.81	0.15102	Live	0.15-30

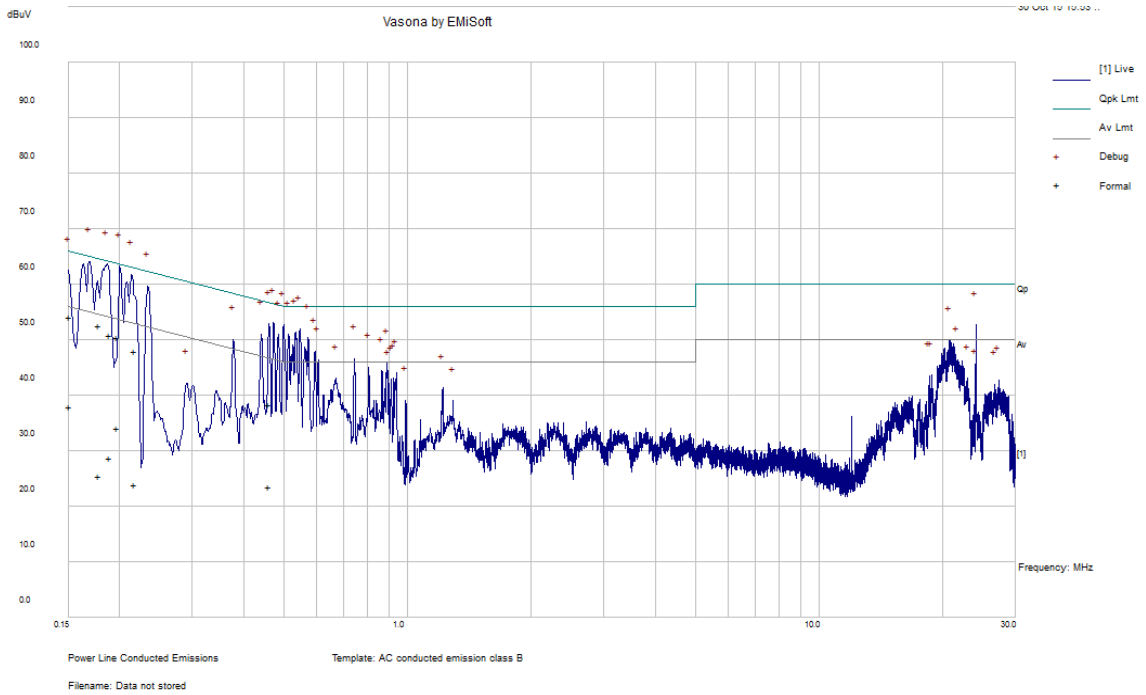
BLE:

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Live/Neutral)**	**Range (MHz)**
-8.86	0.181863	Neutral	0.15-30

6.9 Conducted Emissions Test Plots and Data

2.4 GHz Wi-Fi

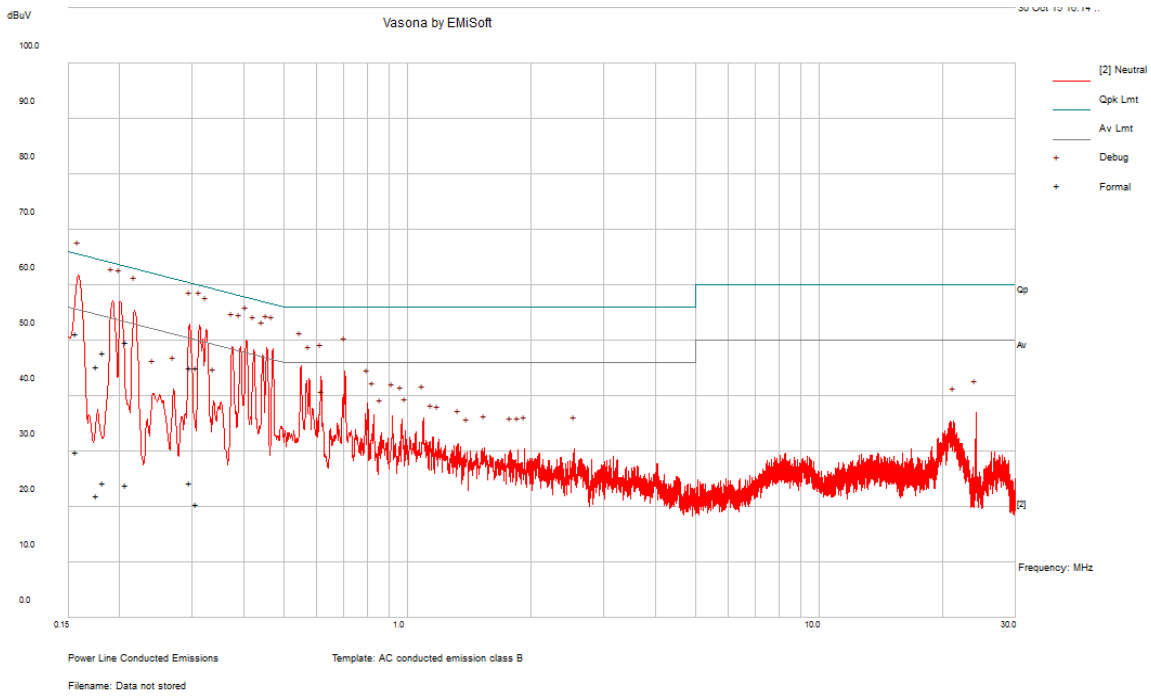
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave)
0.189027	50.84	Line	64.08	-13.24	QP
0.178647	52.56	Line	64.55	-11.99	QP
0.15102	54.13	Line	65.94	-11.81	QP
0.198018	50.49	Line	63.69	-13.2	QP
0.216888	48.06	Line	62.94	-14.88	QP
0.460794	38.41	Line	56.68	-18.26	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave)
0.189027	28.86	Line	54.08	-25.22	Ave.
0.178647	25.57	Line	54.55	-28.98	Ave.
0.15102	38.02	Line	55.94	-17.93	Ave.
0.198018	34.18	Line	53.69	-19.52	Ave.
0.216888	23.95	Line	52.94	-28.99	Ave.
0.460794	23.64	Line	46.68	-23.03	Ave.

120 V, 60 Hz – Neutral

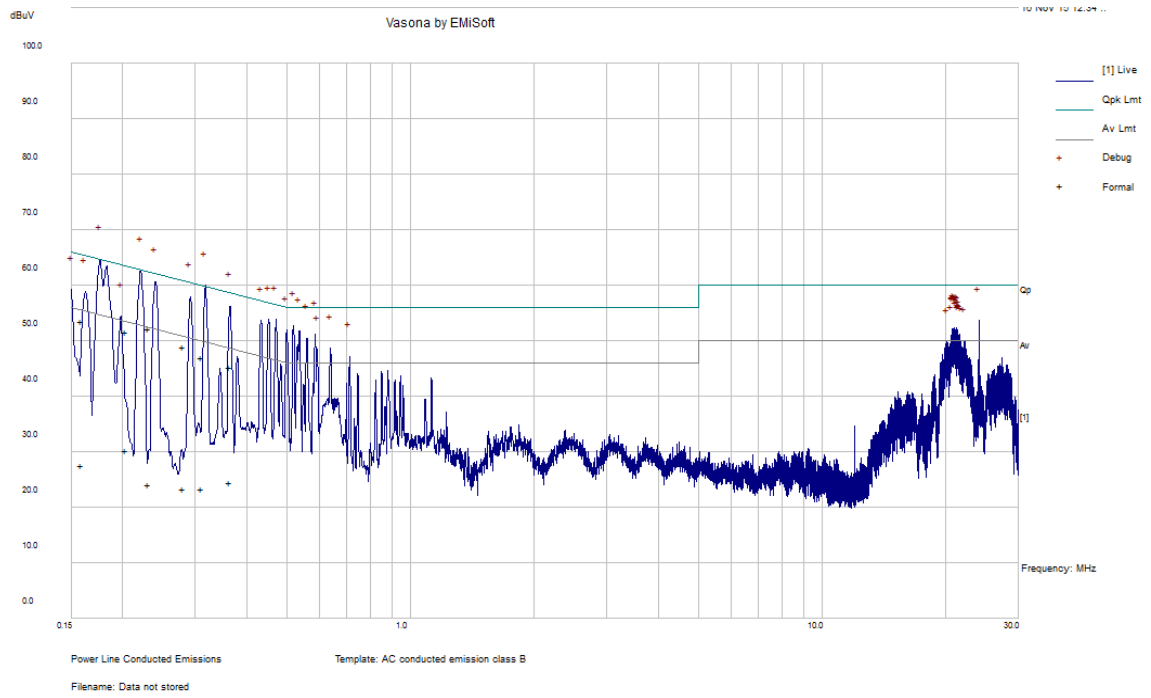


Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave)
0.156543	51.29	Neutral	65.65	-14.36	QP
0.182706	47.75	Neutral	64.36	-16.62	QP
0.175551	45.4	Neutral	64.69	-19.3	QP
0.295998	45.04	Neutral	60.35	-15.32	QP
0.207078	49.74	Neutral	63.32	-13.58	QP
0.308076	45.2	Neutral	60.02	-14.83	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave)
0.156543	29.85	Neutral	55.65	-25.8	Ave.
0.182706	24.31	Neutral	54.36	-30.05	Ave.
0.175551	22.1	Neutral	54.69	-32.59	Ave.
0.295998	24.45	Neutral	50.35	-25.9	Ave.
0.207078	23.97	Neutral	53.32	-29.35	Ave.
0.308076	20.58	Neutral	50.02	-29.44	Ave.

BLE

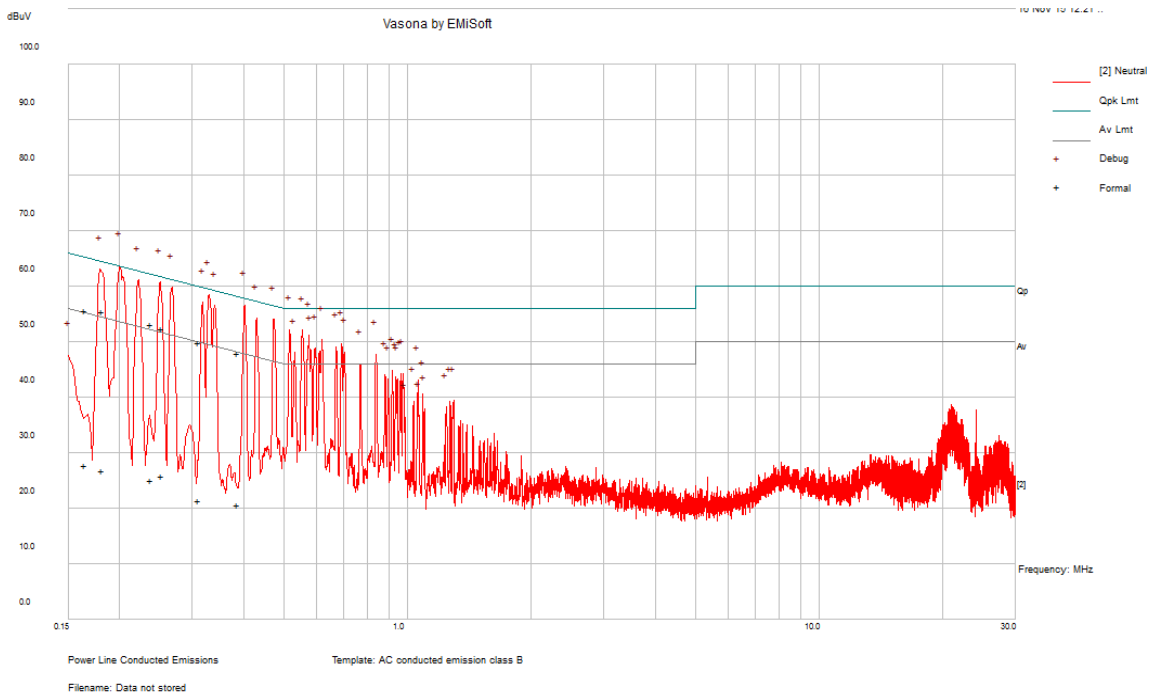
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave)
0.311229	47.02	Line	59.94	-12.91	QP
0.159222	53.56	Line	65.5	-11.94	QP
0.203502	51.57	Line	63.47	-11.89	QP
0.230478	52.19	Line	62.43	-10.24	QP
0.363564	45.29	Line	58.65	-13.36	QP
0.28071	49.05	Line	60.79	-11.75	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave)
0.311229	23.36	Line	49.94	-26.58	Ave.
0.159222	27.62	Line	55.5	-27.89	Ave.
0.203502	30.36	Line	53.47	-23.11	Ave.
0.230478	24.26	Line	52.43	-28.17	Ave.
0.363564	24.49	Line	48.65	-24.16	Ave.
0.28071	23.46	Line	50.79	-27.34	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave)
0.181863	55.54	Neutral	64.4	**-8.86**	QP
0.311874	49.94	Neutral	59.92	-9.98	QP
0.238326	53.11	Neutral	62.15	-9.04	QP
0.386898	47.92	Neutral	58.13	-10.21	QP
0.25287	52.46	Neutral	61.66	-9.2	QP
0.164847	55.75	Neutral	65.22	-9.47	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave)
0.181863	26.78	Neutral	54.4	-27.62	Ave.
0.311874	21.55	Neutral	49.92	-28.37	Ave.
0.238326	25.05	Neutral	52.15	-27.1	Ave.
0.386898	20.81	Neutral	48.13	-27.32	Ave.
0.25287	25.84	Neutral	51.66	-25.82	Ave.
0.164847	27.75	Neutral	55.22	-27.47	Ave.

7 FCC §15.209, §15.247(d) & IC RSS-247 §5.5, 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): 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) and RSS-Gen except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

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

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

As per IC RSS-Gen 8.9,

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

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

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

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

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

As per IC RSS-247 §5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

7.2 Test Setup

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

The spacing between the peripherals was 10 centimeters.

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

7.3 Test Procedure

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

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

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 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	2015-06-18	1 year
Agilent	Spectrum Analyzer	E4440A	MY44303352	2015-06-22	1 year
Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-3	2015-07-11	1 year
EMCO	Horn Antenna	3115	9511-4627	2015-01-15	1 year
Agilent	Pre-amplifier	8447D	2944A10187	2015-03-20	1 year
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	2015-09-23	1 year
Hewlett-Packard	5 ft N-type RF cable	-	1268	2015-05-15	1 year
Hewlett	Pre-Amplifier	8449B	3008A01978	2015-03-11	1year
BK Precision	Source, DC	1740	26502000233	N/A	N/A
Fluke Corp	Multimeter, Digital	233	23790031	2015-07-06	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:	22º C
Relative Humidity:	42 %
ATM Pressure:	102.7 kPa

The testing was performed by Jin Yang on 2015-10-29 in 5m chamber 3.

7.7 Summary of Test Results

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

30 MHz – 25 GHz: 2.4 GHz Wi-Fi

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode**
-1.1	549.994	Horizontal	Wi-Fi

30 MHz – 25 GHz: BLE

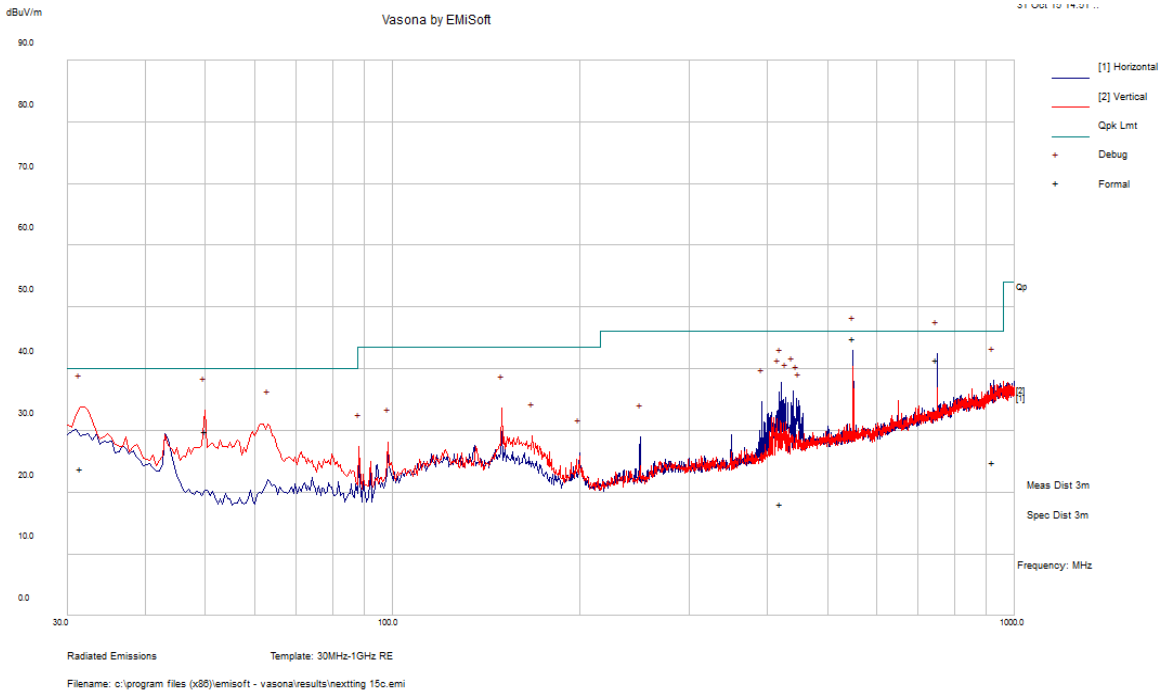
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode**
-0.47	549.9543	Horizontal	BLE

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

7.8 Radiated Emissions Test Results

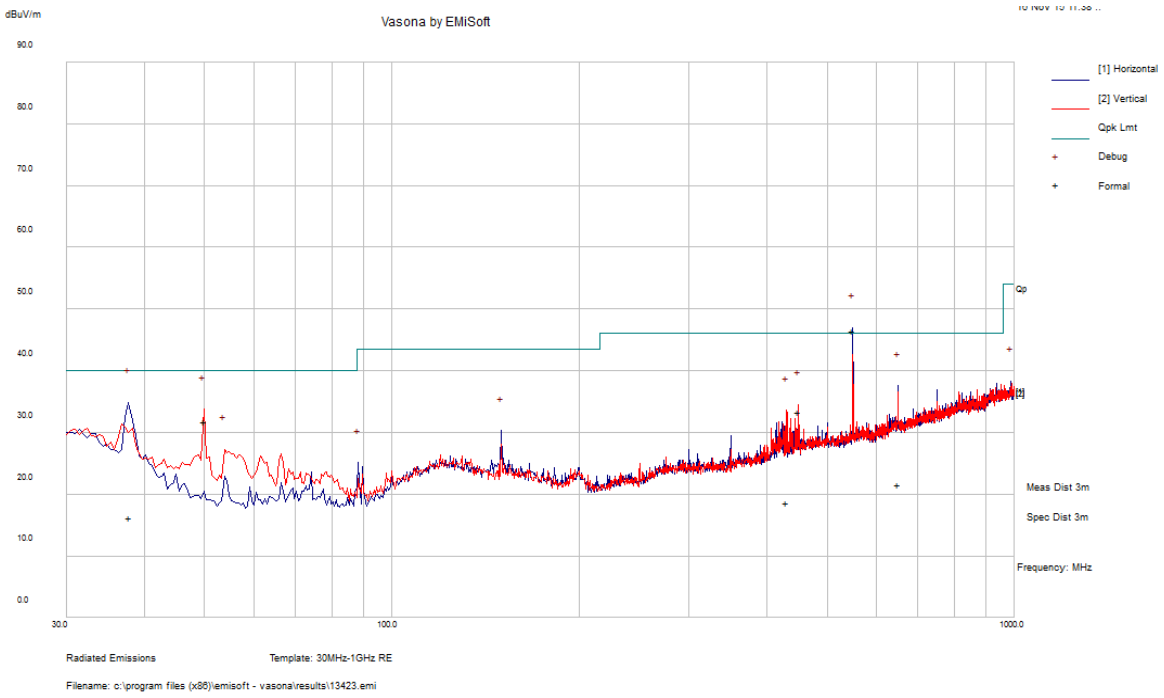
1) 30 MHz – 1 GHz Worst Case, Measured at 3 meters

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)	Detector (PK/QP/Ave)
549.994	44.9	154	H	129	46	-1.1	QP
749.9823	41.4	102	H	200	46	-4.6	QP
31.4725	27.83	151	V	268	40	-12.17	QP
50.0075	29.84	117	V	23	40	-10.16	QP
923.4673	32.94	161	H	284	46	-13.06	QP
420.7268	29.11	104	H	188	46	-16.89	QP

BLE



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector (PK/QP/Ave)
549.9543	45.53	165	H	130	46	**-0.47**	QP
37.92825	19.2	132	H	249	40	-20.8	QP
50.00975	31.87	100	V	25	40	-8.13	QP
650.1575	33.53	162	H	89	46	-12.47	QP
450.0163	33.37	100	V	170	46	-12.63	QP
430.6908	18.72	100	V	130	46	-27.28	QP

2) 1–25 GHz Measured at 3 meters

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, measured at 3 meters											
2412	51.29	208	100	V	28.174	3.43	-	82.894	-	-	Peak
2412	59.97	62	154	H	28.197	3.43	-	91.597	-	-	Peak
2412	47.2	208	100	V	28.174	3.43	-	78.804	-	-	Ave
2412	55.96	62	124	H	28.197	3.43	-	87.587	-	-	Ave
2390	26.59	208	100	V	28.174	3.43	-	58.194	74	-15.806	Peak
2390	26.25	62	124	H	28.197	3.43	-	57.877	74	-16.123	Peak
2390	12.34	208	100	V	28.174	3.43	-	43.944	54	-10.056	Ave
2390	12.47	62	124	H	28.197	3.43	-	44.097	54	-9.903	Ave
4824	45.76	0	100	V	33.119	5.34	33.72	50.499	74	-23.501	Peak
4824	45.96	30	194	H	33.182	5.34	33.72	50.762	74	-23.238	Peak
4824	31.02	0	100	V	33.119	5.34	33.72	35.759	54	-18.241	Ave
4824	34.03	30	194	H	33.182	5.34	33.72	38.832	54	-15.168	Ave
7236	45.2	0	100	V	37.444	6.33	33.93	55.044	74	-18.956	Peak
7236	44.91	0	100	H	37.442	6.33	33.93	54.752	74	-19.248	Peak
7236	30.25	0	100	V	37.444	6.33	33.93	40.094	54	-13.906	Ave
7236	30.21	0	100	H	37.442	6.33	33.93	40.052	54	-13.948	Ave
9648	45.46	0	100	V	38.83	9.57	34.2	59.66	74	-14.34	Peak
9648	45.54	0	100	H	38.834	9.57	34.2	59.744	74	-14.256	Peak
9648	31.31	0	100	V	38.83	9.57	34.2	45.51	54	-8.49	Ave
9648	31.21	0	100	H	38.834	9.57	34.2	45.414	54	-8.586	Ave
Middle Channel 2437 MHz, measured at 3 meters											
2437	50.71	236	110	V	28.174	3.43	-	82.314	-	-	Peak
2437	59.68	64	154	H	28.197	3.43	-	91.307	-	-	Peak
2437	46.55	236	110	V	28.174	3.43	-	78.154	-	-	Ave
2437	55.71	64	154	H	28.197	3.43	-	87.337	-	-	Ave
4874	45.58	0	100	V	33.321	5.34	33.75	50.49	74	-23.51	Peak
4874	46.44	62	170	H	33.354	5.34	33.75	51.38	74	-22.62	Peak
4874	30.90	0	100	V	33.321	5.34	33.75	35.81	54	-18.19	Ave
4874	37.02	62	170	H	33.354	5.34	33.75	41.96	54	-12.04	Ave
7311	45.01	0	100	V	37.324	6.27	33.93	54.67	74	-19.33	Peak
7311	44.24	0	100	H	37.356	6.27	33.93	53.94	74	-20.06	Peak
7311	29.78	0	100	V	37.324	6.27	33.93	39.44	54	-14.56	Ave
7311	29.75	0	100	H	37.356	6.27	33.93	39.45	54	-14.55	Ave
9748	45.52	0	100	V	38.922	9.44	34.31	59.57	74	-14.43	Peak
9748	45.00	0	100	H	38.913	9.44	34.31	59.04	74	-14.96	Peak
9748	30.94	0	100	V	38.922	9.44	34.31	44.99	54	-9.01	Ave
9748	30.78	0	100	H	38.913	9.44	34.31	44.82	54	-9.18	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz, measured at 3 meters											
2462	49.23	237	100	V	29.009	3.43	-	81.669	-	-	Peak
2462	59.05	63	153	H	28.999	3.43	-	91.479	-	-	Peak
2462	45.07	237	100	V	29.009	3.43	-	77.509	-	-	Ave
2462	55.03	63	153	H	28.999	3.43	-	87.459	-	-	Ave
2483.5	26.71	237	100	V	29.009	3.43	-	59.149	74	-14.851	Peak
2483.5	26.96	63	153	H	28.999	3.43	-	59.389	74	-14.611	Peak
2483.5	12.7	237	100	V	29.009	3.43	-	45.139	54	-8.861	Ave
2483.5	12.89	63	153	H	28.999	3.43	-	45.319	54	-8.681	Ave
4924	45.62	0	100	V	33.531	5.25	33.73	50.67	74	-23.33	Peak
4924	46.51	65	151	H	33.556	5.25	33.73	51.59	74	-22.41	Peak
4924	30.39	0	100	V	33.531	5.25	33.73	35.44	54	-18.56	Ave
4924	35.55	65	151	H	33.556	5.25	33.73	40.63	54	-13.37	Ave
7386	44.18	0	100	V	37.242	6.27	33.99	53.70	74	-20.30	Peak
7386	44.34	0	100	H	37.238	6.27	33.99	53.86	74	-20.14	Peak
7386	29.88	0	100	V	37.242	6.27	33.99	39.40	54	-14.60	Ave
7386	29.86	0	100	H	37.238	6.27	33.99	39.38	54	-14.62	Ave
9848	44.02	0	100	V	39.036	9.71	34.39	58.38	74	-15.62	Peak
9848	44.05	0	100	H	39.052	9.71	34.39	58.42	74	-15.58	Peak
9848	30.27	0	100	V	39.036	9.71	34.39	44.63	54	-9.37	Ave
9848	29.81	0	100	H	39.052	9.71	34.39	44.18	54	-9.82	Ave

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, measured at 3 meters											
2412	57.88	210	100	V	28.174	3.43	-	89.484	-	-	Peak
2412	66.43	59	175	H	28.197	3.43	-	98.057	-	-	Peak
2412	47.61	210	100	V	28.174	3.43	-	79.214	-	-	Ave
2412	56.27	59	175	H	28.197	3.43	-	87.897	-	-	Ave
2390	26.51	210	100	V	28.174	3.43	-	58.114	74	-15.886	Peak
2390	26.38	59	175	H	28.197	3.43	-	58.007	74	-15.993	Peak
2390	12.46	210	100	V	28.174	3.43	-	44.064	54	-9.936	Ave
2390	12.57	59	175	H	28.197	3.43	-	44.197	54	-9.803	Ave
4824	45.39	0	100	V	33.119	5.34	33.72	50.129	74	-23.871	Peak
4824	49.41	61	158	H	33.182	5.34	33.72	54.212	74	-19.788	Peak
4824	30.94	0	100	V	33.119	5.34	33.72	35.679	54	-18.321	Ave
4824	35.69	61	158	H	33.182	5.34	33.72	40.492	54	-13.508	Ave
7236	44.19	0	100	V	37.444	6.33	33.93	54.034	74	-19.966	Peak
7236	45.02	0	100	H	37.442	6.33	33.93	54.862	74	-19.138	Peak
7236	30.07	0	100	V	37.444	6.33	33.93	39.914	54	-14.086	Ave
7236	30.11	0	100	H	37.442	6.33	33.93	39.952	54	-14.048	Ave
9648	43.87	0	100	V	38.83	9.57	34.2	58.07	74	-15.93	Peak
9648	43.68	0	100	H	38.834	9.57	34.2	57.884	74	-16.116	Peak
9648	29.63	0	100	V	38.83	9.57	34.2	43.83	54	-10.17	Ave
9648	29.61	0	100	H	38.834	9.57	34.2	43.814	54	-10.186	Ave
Middle Channel 2437 MHz, measured at 3 meters											
2437	54.16	301	153	V	28.174	3.43	-	85.764	-	-	Peak
2437	66.46	63	153	H	28.197	3.43	-	98.087	-	-	Peak
2437	43.66	301	153	V	28.174	3.43	-	75.264	-	-	Ave
2437	56.13	63	153	H	28.197	3.43	-	87.757	-	-	Ave
4874	45.25	0	100	V	33.321	5.34	33.75	50.16	74	-23.84	Peak
4874	52.18	65	153	H	33.354	5.34	33.75	57.12	74	-16.88	Peak
4874	30.69	0	100	V	33.321	5.34	33.75	35.60	54	-18.40	Ave
4874	37.39	65	153	H	33.354	5.34	33.75	42.33	54	-11.67	Ave
7311	44.34	0	100	V	37.324	6.27	33.93	54.00	74	-20.00	Peak
7311	44.53	0	100	H	37.356	6.27	33.93	54.23	74	-19.77	Peak
7311	29.84	0	100	V	37.324	6.27	33.93	39.50	54	-14.50	Ave
7311	29.85	0	100	H	37.356	6.27	33.93	39.55	54	-14.45	Ave
9748	43.98	0	100	V	38.922	9.44	34.31	58.03	74	-15.97	Peak
9748	45.50	0	100	H	38.913	9.44	34.31	59.54	74	-14.46	Peak
9748	30.15	0	100	V	38.922	9.44	34.31	44.20	54	-9.80	Ave
9748	30.13	0	100	H	38.913	9.44	34.31	44.17	54	-9.83	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz, measured at 3 meters											
2462	56.26	66	138	V	29.009	3.43	-	88.699	-	-	Peak
2462	66.14	60	147	H	28.999	3.43	-	98.569	-	-	Peak
2462	45.46	66	138	V	29.009	3.43	-	77.899	-	-	Ave
2462	56.49	60	147	H	28.999	3.43	-	88.919	-	-	Ave
2483.5	26.76	66	138	V	29.009	3.43	-	59.199	74	-14.801	Peak
2483.5	31.77	60	147	H	28.999	3.43	-	64.199	74	-9.801	Peak
2483.5	12.81	66	138	V	29.009	3.43	-	45.249	54	-8.751	Ave
2483.5	13.67	60	147	H	28.999	3.43	-	46.099	54	-7.901	Ave
4924	45.57	0	100	V	33.531	5.25	33.73	50.62	74	-23.38	Peak
4924	54.53	58	134	H	33.556	5.25	33.73	59.61	74	-14.39	Peak
4924	30.51	0	100	V	33.531	5.25	33.73	35.56	54	-18.44	Ave
4924	39.23	58	134	H	33.556	5.25	33.73	44.31	54	-9.69	Ave
7386	44.59	0	100	V	37.242	6.27	33.99	54.11	74	-19.89	Peak
7386	45.09	0	100	H	37.238	6.27	33.99	54.61	74	-19.39	Peak
7386	30.16	0	100	V	37.242	6.27	33.99	39.68	54	-14.32	Ave
7386	30.44	0	100	H	37.238	6.27	33.99	39.96	54	-14.04	Ave
9848	45.30	0	100	V	39.036	9.71	34.39	59.66	74	-14.34	Peak
9848	45.22	0	100	H	39.052	9.71	34.39	59.59	74	-14.41	Peak
9848	30.61	0	100	V	39.036	9.71	34.39	44.97	54	-9.03	Ave
9848	31.17	0	100	H	39.052	9.71	34.39	45.54	54	-8.46	Ave

Wi-Fi, 802.11n20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz, measured at 3 meters											
2412	56.7	211	100	V	28.174	3.43	-	88.304	-	-	Peak
2412	65.49	63	157	H	28.197	3.43	-	97.117	-	-	Peak
2412	46.54	211	100	V	28.174	3.43	-	78.144	-	-	Ave
2412	55.48	63	157	H	28.197	3.43	-	87.107	-	-	Ave
2390	26.51	211	100	V	28.174	3.43	-	58.114	74	-15.886	Peak
2390	26.62	63	157	H	28.197	3.43	-	58.247	74	-15.753	Peak
2390	12.33	211	100	V	28.174	3.43	-	43.934	54	-10.066	Ave
2390	12.51	63	157	H	28.197	3.43	-	44.137	54	-9.863	Ave
4824	45.04	0	100	V	33.119	5.34	33.72	49.779	74	-24.221	Peak
4824	49.62	62	158	H	33.182	5.34	33.72	54.422	74	-19.578	Peak
4824	30.69	0	100	V	33.119	5.34	33.72	35.429	54	-18.571	Ave
4824	34.28	62	158	H	33.182	5.34	33.72	39.082	54	-14.918	Ave
7236	44.44	0	100	V	37.444	6.33	33.93	54.284	74	-19.716	Peak
7236	44.09	0	100	H	37.442	6.33	33.93	53.932	74	-20.068	Peak
7236	30.07	0	100	V	37.444	6.33	33.93	39.914	54	-14.086	Ave
7236	30.41	0	100	H	37.442	6.33	33.93	40.252	54	-13.748	Ave
9648	43.61	0	100	V	38.83	9.57	34.2	57.81	74	-16.19	Peak
9648	43.84	0	100	H	38.834	9.57	34.2	58.044	74	-15.956	Peak
9648	30.32	0	100	V	38.83	9.57	34.2	44.52	54	-9.48	Ave
9648	30.07	0	100	H	38.834	9.57	34.2	44.274	54	-9.726	Ave
Middle Channel 2437 MHz, measured at 3 meters											
2437	56.6	211	100	V	28.174	3.43	-	88.204	-	-	Peak
2437	65.57	63	153	H	28.197	3.43	-	97.197	-	-	Peak
2437	46.55	211	100	V	28.174	3.43	-	78.154	-	-	Ave
2437	55.31	63	153	H	28.197	3.43	-	86.937	-	-	Ave
4874	44.87	0	100	V	33.321	5.34	33.75	49.78	74	-24.22	Peak
4874	52.55	63	153	H	33.354	5.34	33.75	57.49	74	-16.51	Peak
4874	31.36	0	100	V	33.321	5.34	33.75	36.27	54	-17.73	Ave
4874	36.64	63	153	H	33.354	5.34	33.75	41.58	54	-12.42	Ave
7311	44.04	0	100	V	37.324	6.27	33.93	53.70	74	-20.30	Peak
7311	47.12	0	100	H	37.356	6.27	33.93	56.82	74	-17.18	Peak
7311	30.19	0	100	V	37.324	6.27	33.93	39.85	54	-14.15	Ave
7311	31.02	0	100	H	37.356	6.27	33.93	40.72	54	-13.28	Ave
9748	44.68	0	100	V	38.922	9.44	34.31	58.73	74	-15.27	Peak
9748	44.07	0	100	H	38.913	9.44	34.31	58.11	74	-15.89	Peak
9748	31.37	0	100	V	38.922	9.44	34.31	45.42	54	-8.58	Ave
9748	30.66	0	100	H	38.913	9.44	34.31	44.70	54	-9.30	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz, measured at 3 meters											
2462	54.69	210	108	V	29.009	3.43	-	87.129	-	-	Peak
2462	64.63	63	153	H	28.999	3.43	-	97.059	-	-	Peak
2462	44.23	210	108	V	29.009	3.43	-	76.669	-	-	Ave
2462	54.36	63	153	H	28.999	3.43	-	86.789	-	-	Ave
2483.5	26.5	210	108	V	29.009	3.43	-	58.939	74	-15.061	Peak
2483.5	29.4	63	153	H	28.999	3.43	-	61.829	74	-12.171	Peak
2483.5	12.72	210	108	V	29.009	3.43	-	45.159	54	-8.841	Ave
2483.5	13.18	63	153	H	28.999	3.43	-	45.609	54	-8.391	Ave
4924	44.09	0	100	V	33.531	5.25	33.73	49.14	74	-24.86	Peak
4924	50.93	60	136	H	33.556	5.25	33.73	56.01	74	-17.99	Peak
4924	30.29	0	100	V	33.531	5.25	33.73	35.34	54	-18.66	Ave
4924	35.34	60	136	H	33.556	5.25	33.73	40.42	54	-13.58	Ave
7386	43.70	0	100	V	37.242	6.27	33.99	53.22	74	-20.78	Peak
7386	44.63	0	100	H	37.238	6.27	33.99	54.15	74	-19.85	Peak
7386	29.76	0	100	V	37.242	6.27	33.99	39.28	54	-14.72	Ave
7386	30.44	0	100	H	37.238	6.27	33.99	39.96	54	-14.04	Ave
9848	44.76	0	100	V	39.036	9.71	34.39	59.12	74	-14.88	Peak
9848	44.46	0	100	H	39.052	9.71	34.39	58.83	74	-15.17	Peak
9848	31.34	0	100	V	39.036	9.71	34.39	45.70	54	-8.30	Ave
9848	30.67	0	100	H	39.052	9.71	34.39	45.04	54	-8.96	Ave

Wi-Fi, 802.11n40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2422 MHz, measured at 3 meters											
2422	54.32	211	100	V	28.174	3.43	-	85.924	-	-	Peak
2422	62.14	64	154	H	28.197	3.43	-	93.767	-	-	Peak
2422	43.45	211	100	V	28.174	3.43	-	75.054	-	-	Ave
2422	52.13	64	154	H	28.197	3.43	-	83.757	-	-	Ave
2390	26.39	211	100	V	28.174	3.43	-	57.994	74	-16.006	Peak
2390	26.77	64	154	H	28.197	3.43	-	58.397	74	-15.603	Peak
2390	12.37	211	100	V	28.174	3.43	-	43.974	54	-10.026	Ave
2390	12.47	64	154	H	28.197	3.43	-	44.097	54	-9.903	Ave
4844	45.35	0	100	V	33.119	5.34	33.72	50.089	74	-23.911	Peak
4844	48.66	64	154	H	33.182	5.34	33.72	53.462	74	-20.538	Peak
4844	31.10	0	100	V	33.119	5.34	33.72	35.839	54	-18.161	Ave
4844	33.92	64	154	H	33.182	5.34	33.72	38.722	54	-15.278	Ave
7266	44.7	0	100	V	37.444	6.33	33.93	54.544	74	-19.456	Peak
7266	44.26	0	100	H	37.442	6.33	33.93	54.102	74	-19.898	Peak
7266	30.18	0	100	V	37.444	6.33	33.93	40.024	54	-13.976	Ave
7266	30.15	0	100	H	37.442	6.33	33.93	39.992	54	-14.008	Ave
9688	44.81	0	100	V	38.83	9.57	34.2	59.01	74	-14.99	Peak
9688	43.69	0	100	H	38.834	9.57	34.2	57.894	74	-16.106	Peak
9688	31.44	0	100	V	38.83	9.57	34.2	45.64	54	-8.36	Ave
9688	30.6	0	100	H	38.834	9.57	34.2	44.804	54	-9.196	Ave
Middle Channel 2437 MHz, measured at 3 meters											
2437	53.82	211	100	V	28.174	3.43	-	85.424	-	-	Peak
2437	61.82	64	156	H	28.197	3.43	-	93.447	-	-	Peak
2437	43.87	211	100	V	28.174	3.43	-	75.474	-	-	Ave
2437	51.75	64	156	H	28.197	3.43	-	83.377	-	-	Ave
4874	44.61	0	100	V	33.321	5.34	33.75	49.52	74	-24.48	Peak
4874	48.04	64	156	H	33.354	5.34	33.75	52.98	74	-21.02	Peak
4874	30.90	0	100	V	33.321	5.34	33.75	35.81	54	-18.19	Ave
4874	33.71	64	156	H	33.354	5.34	33.75	38.65	54	-15.35	Ave
7311	44.10	0	100	V	37.324	6.27	33.93	53.76	74	-20.24	Peak
7311	44.16	0	100	H	37.356	6.27	33.93	53.86	74	-20.14	Peak
7311	30.02	0	100	V	37.324	6.27	33.93	39.68	54	-14.32	Ave
7311	30.08	0	100	H	37.356	6.27	33.93	39.78	54	-14.22	Ave
9748	44.39	0	100	V	38.922	9.44	34.31	58.44	74	-15.56	Peak
9748	44.55	0	100	H	38.913	9.44	34.31	58.59	74	-15.41	Peak
9748	31.20	0	100	V	38.922	9.44	34.31	45.25	54	-8.75	Ave
9748	30.36	0	100	H	38.913	9.44	34.31	44.40	54	-9.60	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 2452 MHz, measured at 3 meters											
2452	53.29	211	100	V	29.009	3.43	-	85.729	-	-	Peak
2452	61.64	64	154	H	28.999	3.43	-	94.069	-	-	Peak
2452	42.76	211	100	V	29.009	3.43	-	75.199	-	-	Ave
2452	51.24	64	154	H	28.999	3.43	-	83.669	-	-	Ave
2483.5	26.83	211	100	V	29.009	3.43	-	59.269	74	-14.731	Peak
2483.5	27.44	64	154	H	28.999	3.43	-	59.869	74	-14.131	Peak
2483.5	12.28	211	100	V	29.009	3.43	-	44.719	54	-9.281	Ave
2483.5	13.16	64	154	H	28.999	3.43	-	45.589	54	-8.411	Ave
4904	44.42	0	100	V	33.531	5.25	33.73	49.47	74	-24.53	Peak
4904	47.02	63	153	H	33.556	5.25	33.73	52.10	74	-21.90	Peak
4904	30.04	0	100	V	33.531	5.25	33.73	35.09	54	-18.91	Ave
4904	32.21	63	153	H	33.556	5.25	33.73	37.29	54	-16.71	Ave
7356	44.55	0	100	V	37.242	6.27	33.99	54.07	74	-19.93	Peak
7356	44.46	0	100	H	37.238	6.27	33.99	53.98	74	-20.02	Peak
7356	29.67	0	100	V	37.242	6.27	33.99	39.19	54	-14.81	Ave
7356	29.87	0	100	H	37.238	6.27	33.99	39.39	54	-14.61	Ave
9808	43.69	0	100	V	39.036	9.71	34.39	58.05	74	-15.95	Peak
9808	44.47	0	100	H	39.052	9.71	34.39	58.84	74	-15.16	Peak
9808	30.58	0	100	V	39.036	9.71	34.39	44.94	54	-9.06	Ave
9808	29.64	0	100	H	39.052	9.71	34.39	44.01	54	-9.99	Ave

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, measured at 3 meters											
2402	57.33	214	100	V	28.174	3.43	-	88.934	-	-	Peak
2402	63.4	60	155	H	28.197	3.43	-	95.027	-	-	Peak
2402	41.04	214	100	V	28.174	3.43	-	72.644	-	-	Ave
2402	44.79	60	155	H	28.197	3.43	-	76.417	-	-	Ave
2390	26.52	214	100	V	28.174	3.43	-	58.124	74	-15.876	Peak
2390	26.09	60	155	H	28.197	3.43	-	57.717	74	-16.283	Peak
2390	12.22	214	100	V	28.174	3.43	-	43.824	54	-10.176	Ave
2390	12.27	60	155	H	28.197	3.43	-	43.897	54	-10.103	Ave
4804	44.23	0	100	V	33.119	5.34	33.72	48.969	74	-25.031	Peak
4804	45.35	0	100	H	33.182	5.34	33.72	50.152	74	-23.848	Peak
4804	30.53	0	100	V	33.119	5.34	33.72	35.269	54	-18.731	Ave
4804	30.95	0	100	H	33.182	5.34	33.72	35.752	54	-18.248	Ave
7206	43.95	0	100	V	37.444	6.33	33.93	53.794	74	-20.206	Peak
7206	43.99	0	100	H	37.442	6.33	33.93	53.832	74	-20.168	Peak
7206	29.88	0	100	V	37.444	6.33	33.93	39.724	54	-14.276	Ave
7206	29.94	0	100	H	37.442	6.33	33.93	39.782	54	-14.218	Ave
9608	44.43	0	100	V	38.83	9.57	34.2	58.63	74	-15.37	Peak
9608	44.47	0	100	H	38.834	9.57	34.2	58.674	74	-15.326	Peak
9608	30.36	0	100	V	38.83	9.57	34.2	44.56	54	-9.44	Ave
9608	30.45	0	100	H	38.834	9.57	34.2	44.654	54	-9.346	Ave
Middle Channel 2440 MHz, measured at 3 meters											
2440	55.28	205	100	V	28.174	3.43	-	86.884	-	-	Peak
2440	61.53	60	150	H	28.197	3.43	-	93.157	-	-	Peak
2440	39.39	205	100	V	28.174	3.43	-	70.994	-	-	Ave
2440	43.75	60	150	H	28.197	3.43	-	75.377	-	-	Ave
4880	44.42	0	100	V	33.321	5.34	33.75	49.33	74	-24.67	Peak
4880	45.52	0	100	H	33.354	5.34	33.75	50.46	74	-23.54	Peak
4880	30.67	0	100	V	33.321	5.34	33.75	35.58	54	-18.42	Ave
4880	31.42	0	100	H	33.354	5.34	33.75	36.36	54	-17.64	Ave
7320	43.85	0	100	V	37.324	6.27	33.93	53.51	74	-20.49	Peak
7320	44.16	0	100	H	37.356	6.27	33.93	53.86	74	-20.14	Peak
7320	29.93	0	100	V	37.324	6.27	33.93	39.59	54	-14.41	Ave
7320	30.05	0	100	H	37.356	6.27	33.93	39.75	54	-14.25	Ave
9760	45.18	0	100	V	38.922	9.44	34.31	59.23	74	-14.77	Peak
9760	45.07	0	100	H	38.913	9.44	34.31	59.11	74	-14.89	Peak
9760	30.93	0	100	V	38.922	9.44	34.31	44.98	54	-9.02	Ave
9760	31.03	0	100	H	38.913	9.44	34.31	45.07	54	-8.93	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, measured at 3 meters											
2480	55.87	225	100	V	29.009	3.43	-	88.309	-	-	Peak
2480	61.54	65	146	H	28.999	3.43	-	93.969	-	-	Peak
2480	39.77	225	100	V	29.009	3.43	-	72.209	-	-	Ave
2480	43.22	65	146	H	28.999	3.43	-	75.649	-	-	Ave
2483.5	26.51	225	100	V	29.009	3.43	-	58.949	74	-15.051	Peak
2483.5	26.84	65	146	H	28.999	3.43	-	59.269	74	-14.731	Peak
2483.5	12.61	225	100	V	29.009	3.43	-	45.049	54	-8.951	Ave
2483.5	12.65	65	146	H	28.999	3.43	-	45.079	54	-8.921	Ave
4960	44.36	0	100	V	33.531	5.25	33.73	49.41	74	-24.59	Peak
4960	45.34	65	146	H	33.556	5.25	33.73	50.42	74	-23.58	Peak
4960	30.84	0	100	V	33.531	5.25	33.73	35.89	54	-18.11	Ave
4960	32.30	65	146	H	33.556	5.25	33.73	37.38	54	-16.62	Ave
7440	44.63	0	100	V	37.242	6.27	33.99	54.15	74	-19.85	Peak
7440	44.27	0	100	H	37.238	6.27	33.99	53.79	74	-20.21	Peak
7440	30.23	0	100	V	37.242	6.27	33.99	39.75	54	-14.25	Ave
7440	30.16	0	100	H	37.238	6.27	33.99	39.68	54	-14.32	Ave
9920	45.57	0	100	V	39.036	9.71	34.39	59.93	74	-14.07	Peak
9920	45.32	0	100	H	39.052	9.71	34.39	59.69	74	-14.31	Peak
9920	31.57	0	100	V	39.036	9.71	34.39	45.93	54	-8.07	Ave
9920	31.47	0	100	H	39.052	9.71	34.39	45.84	54	-8.16	Ave

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

8.1 Applicable Standards

According to FCC §15.247(a)(2) and IC RSS-247 §5.2, systems using digital modulation techniques may operate in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz

8.2 Measurement Procedure

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

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2015-06-22	1 year
-	SMA cable	-	C0002	Each time[1]	N/A
-	10dB attenuator	-	-	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:	22º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

The testing was performed by Jin Yang on 2015-10-23 in RF site.

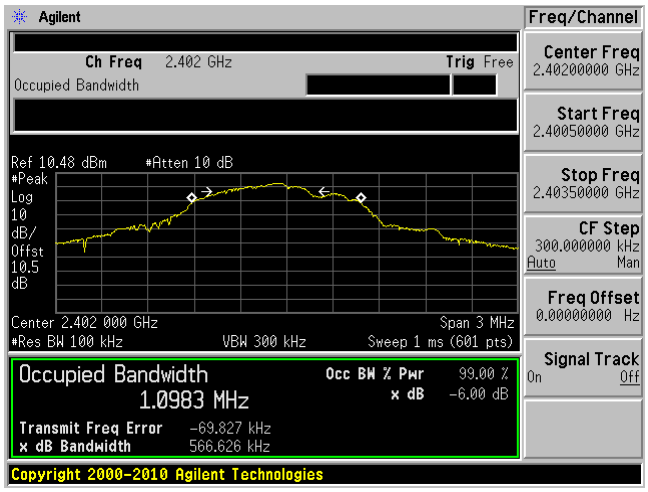
8.5 Test Results

Channel	Frequency (MHz)	99% OBW (MHz)	6 dB OBW (kHz)	6 dB OBW Limit (kHz)	Result
BLE					
Low	2402	1.0983	566.626	≥500	Pass
Middle	2440	1.1021	533.009	≥500	Pass
High	2480	1.1032	544.415	≥500	Pass
802.11b mode					
Low	2412	15.2281	9719	≥500	Pass
Middle	2437	15.2458	9741	≥500	Pass
High	2462	15.1821	10084	≥500	Pass
802.11g mode					
Low	2412	16.4888	16623	≥500	Pass
Middle	2437	16.4777	16584	≥500	Pass
High	2462	16.4914	16608	≥500	Pass
802.11n20 mode					
Low	2412	17.6959	17827	≥500	Pass
Middle	2437	17.6889	17856	≥500	Pass
High	2462	17.6972	17845	≥500	Pass
802.11n40 mode					
Low	2422	36.0814	36556	≥500	Pass
Middle	2437	36.0999	36561	≥500	Pass
High	2452	36.0980	36564	≥500	Pass

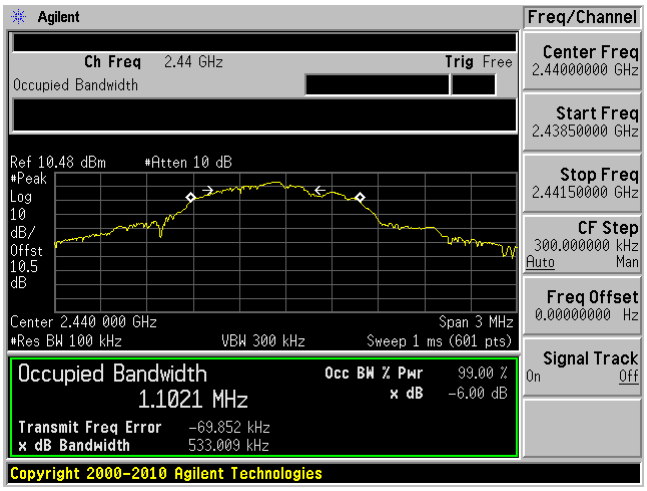
Please refer to the following plots for detailed test results

BLE

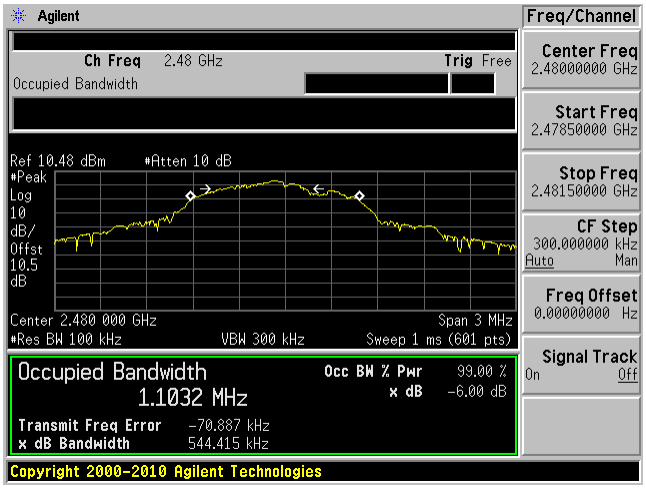
Low Channel 2402 MHz



Middle Channel 2440 MHz

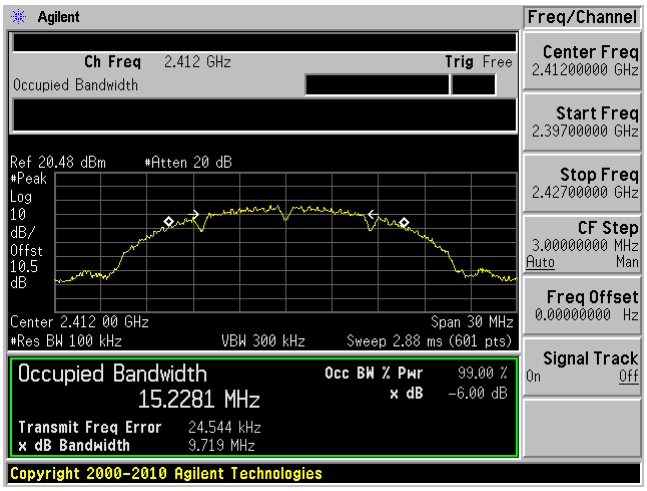


High Channel 2480 MHz

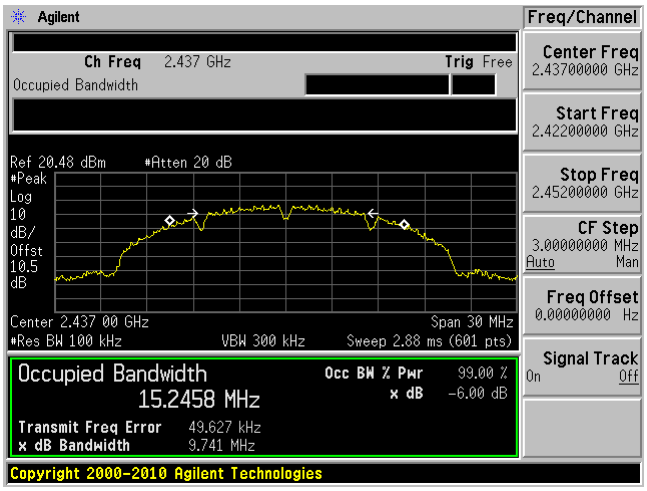


802.11b mode

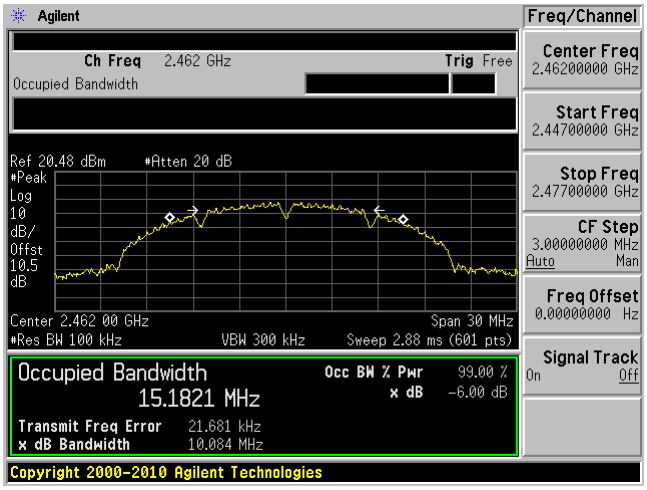
Low Channel 2412 MHz



Middle Channel 2437 MHz

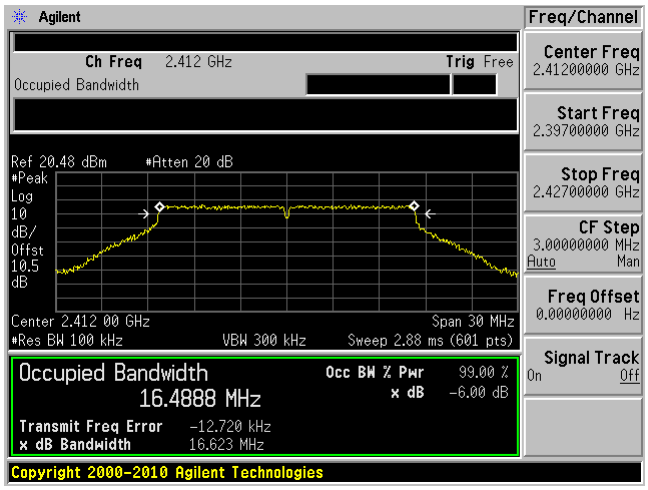


High Channel 2462 MHz

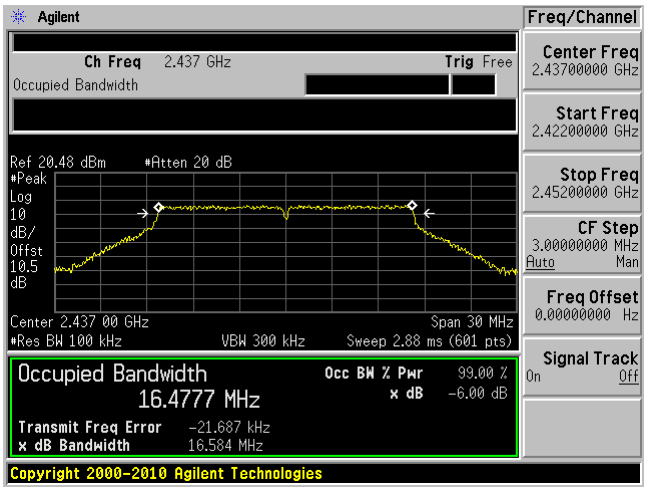


802.11g mode

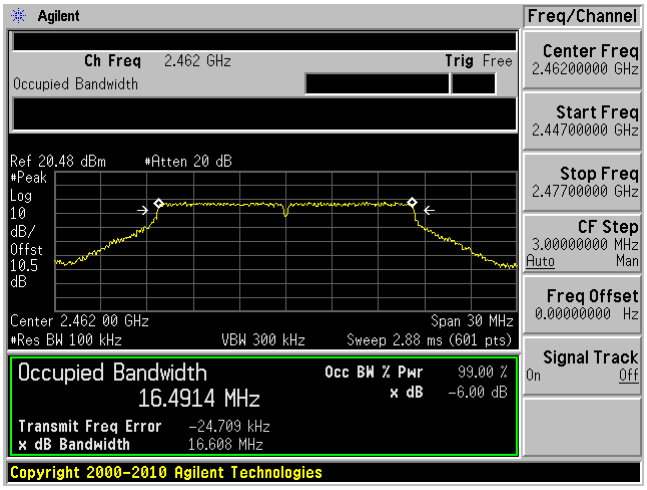
Low Channel 2412 MHz



Middle Channel 2437 MHz

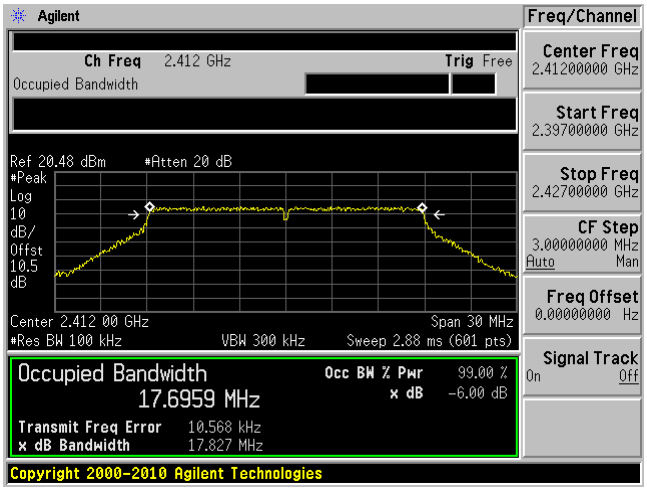


High Channel 2462 MHz

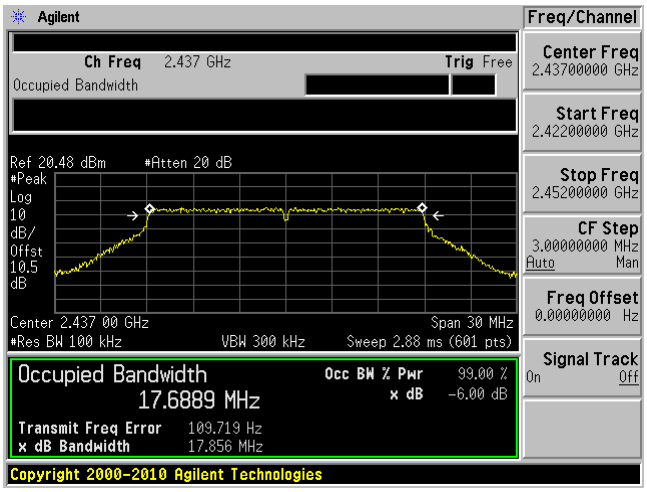


802.11n20 mode

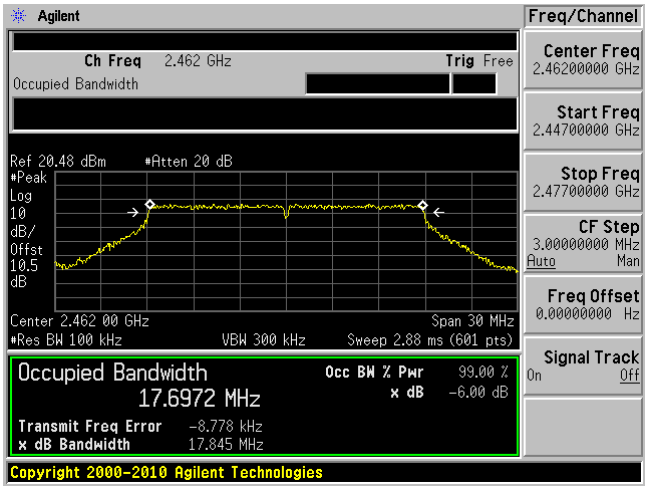
Low Channel 2412 MHz



Middle Channel 2437 MHz

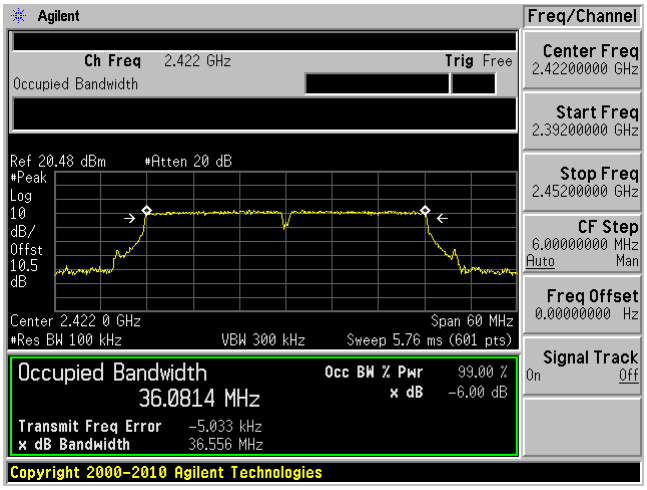


High Channel 2462 MHz

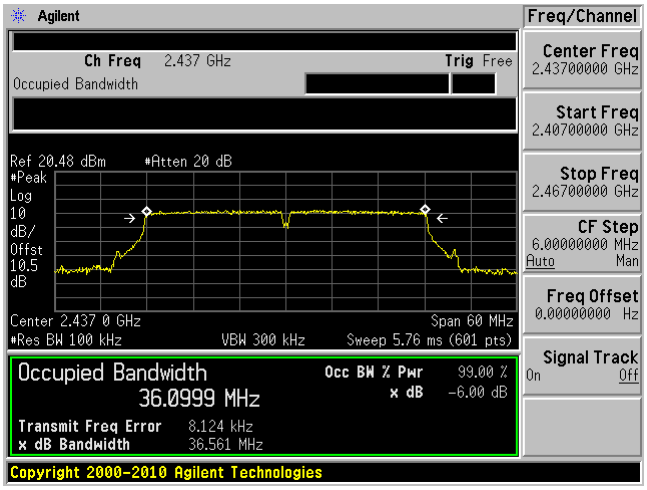


802.11n40 mode

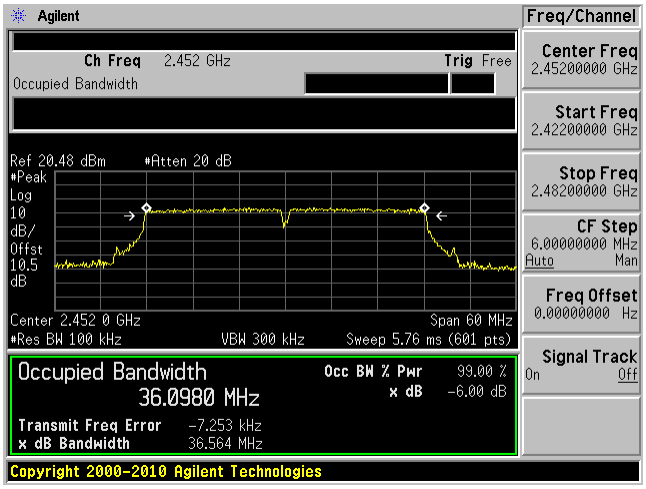
Low Channel 2422 MHz



Middle Channel 2437 MHz



High Channel 2452 MHz



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

9.1 Applicable Standards

According to FCC §15.247(b) and IC RSS-247 §5.4 (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 v03r03: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 9: Fundamental emission output power

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2015-06-22	1 year
-	SMA cable	-	C0002	Each time[1]	N/A
-	10dB attenuator	-	-	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:	22º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

The testing was performed by Jin Yang on 2015-10-23 at RF site.

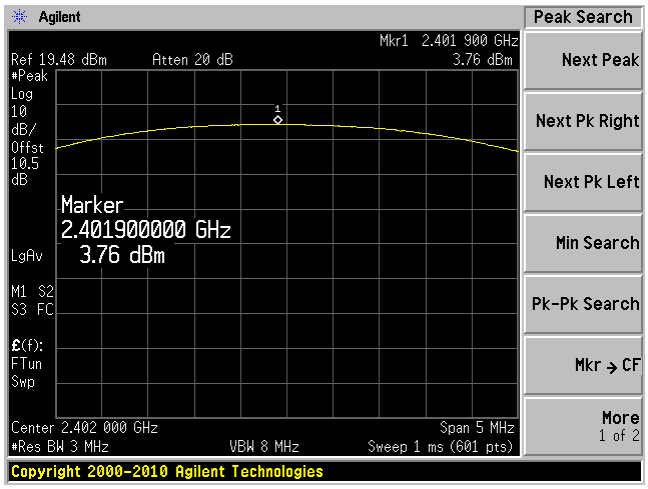
9.5 Test Results

Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Margin (dB)	Result
BLE				
2402	3.76	30	-26.24	Pass
2440	4.28	30	-25.72	Pass
2480	4.16	30	-25.84	Pass
802.11b mode				
2412	6.56	30	-23.44	Pass
2437	6.84	30	-23.16	Pass
2462	7.97	30	-22.03	Pass
802.11g mode				
2412	11.1	30	-18.9	Pass
2437	11.39	30	-18.61	Pass
2462	12.7	30	-17.3	Pass
802.11n20 mode				
2412	10.13	30	-19.87	Pass
2437	10.27	30	-19.73	Pass
2462	11.47	30	-18.53	Pass
802.11n40 mode				
2422	10.19	30	-19.81	Pass
2437	10.22	30	-19.78	Pass
2452	11.52	30	-18.48	Pass

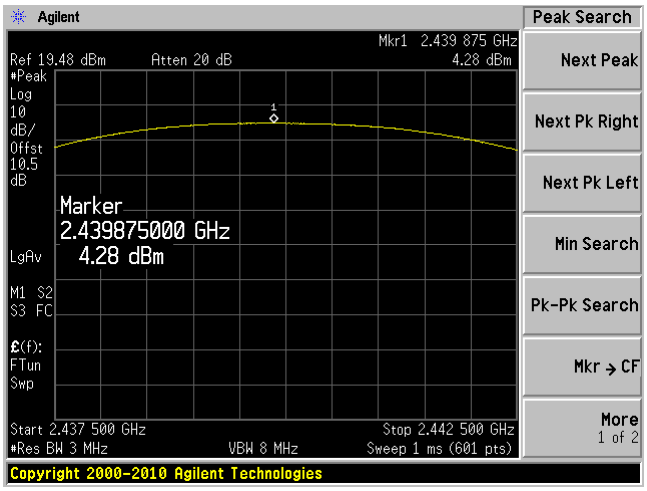
Please refer to the following plots for detailed test results

BLE

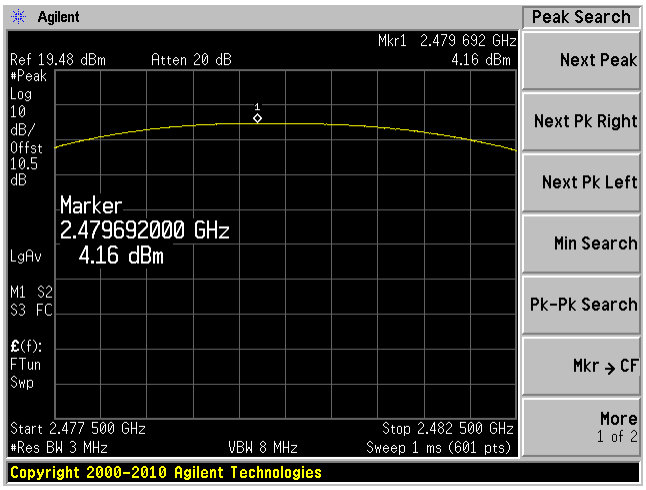
Low Channel 2402 MHz



Middle Channel 2440 MHz

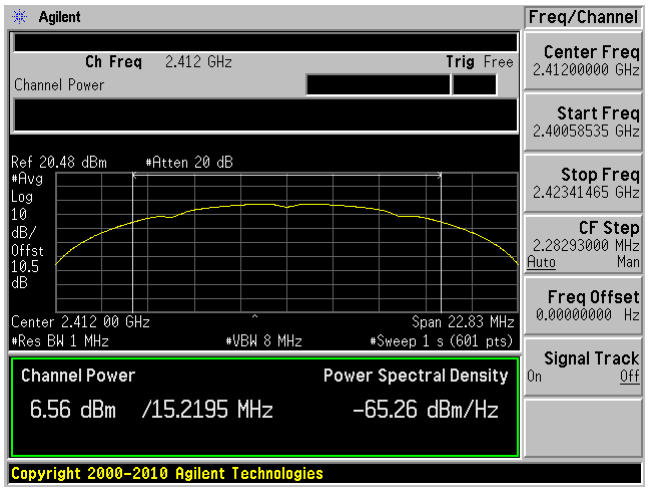


High Channel 2480 MHz

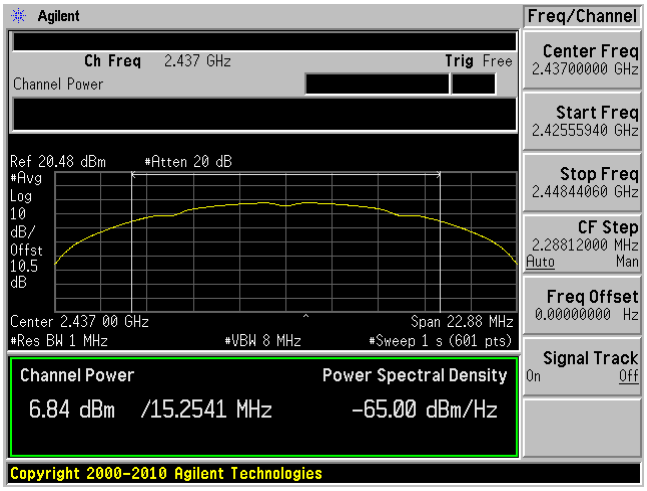


802.11b mode

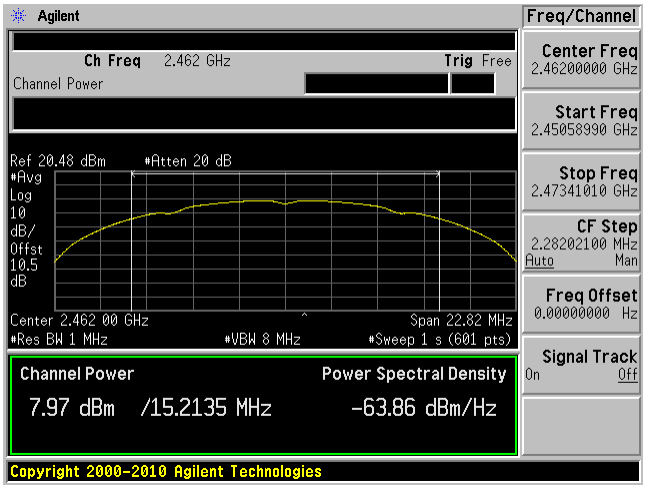
Low Channel 2412 MHz



Middle Channel 2437 MHz

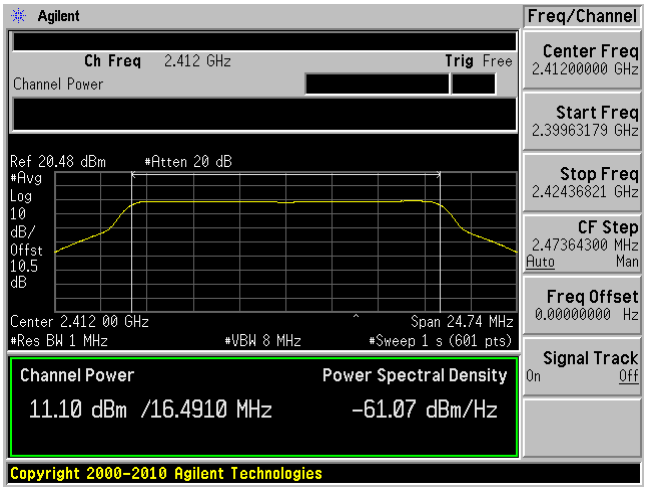


High Channel 2462 MHz

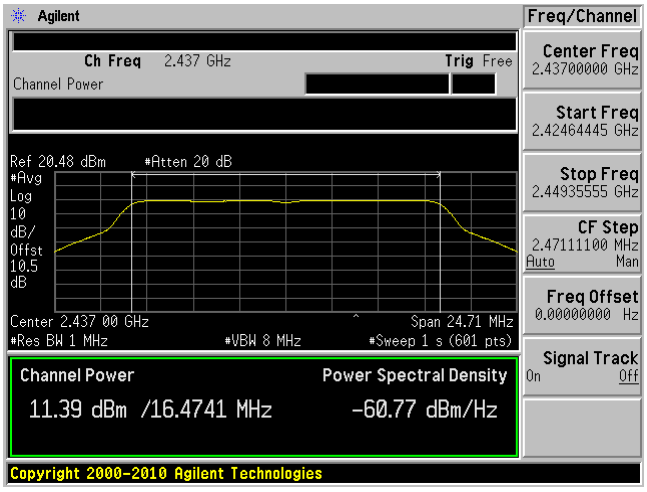


802.11g mode

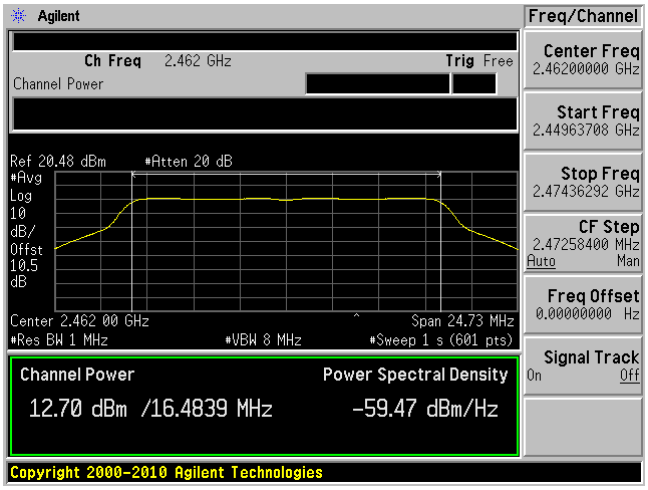
Low Channel 2412 MHz



Middle Channel 2437 MHz

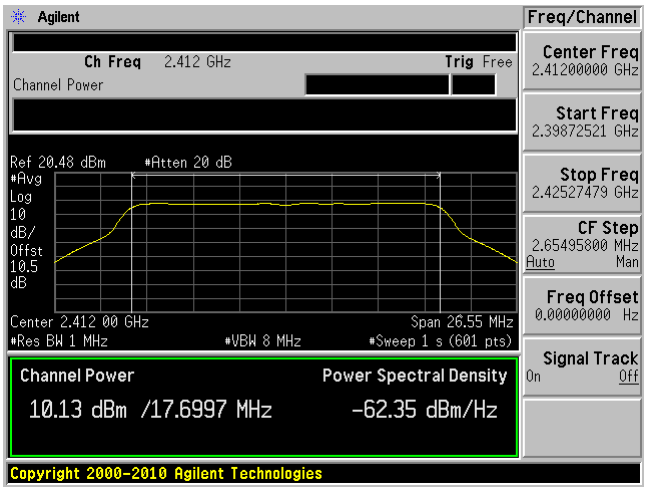


High Channel 2462 MHz

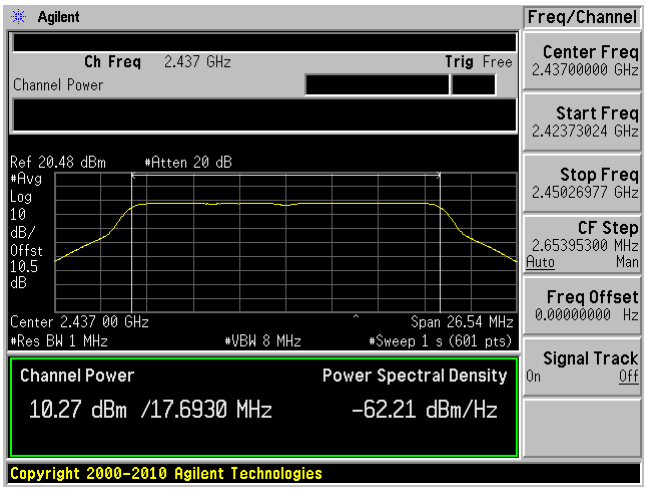


802.11n20 mode

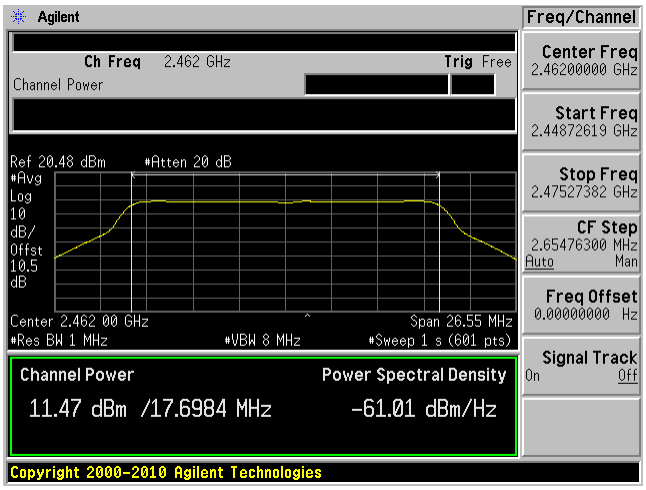
Low Channel 2412 MHz



Middle Channel 2437 MHz

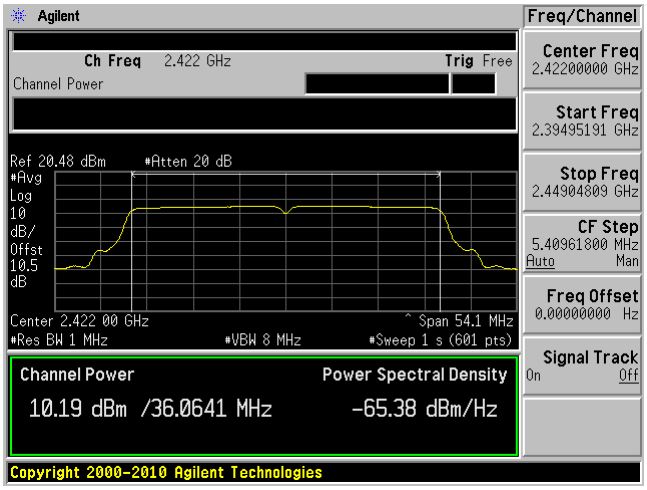


High Channel 2462 MHz

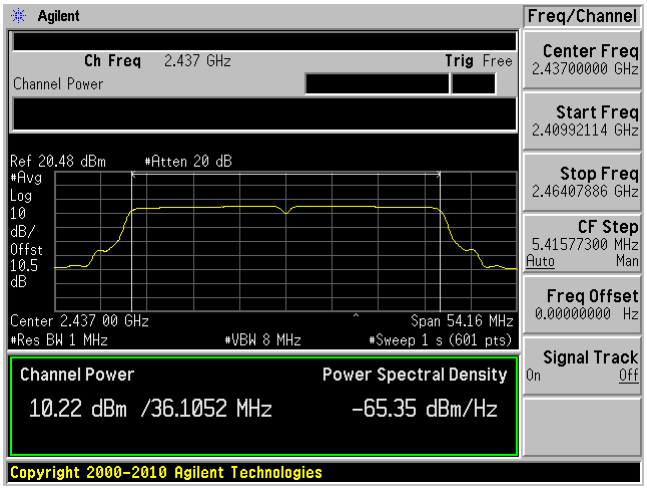


802.11n40 mode

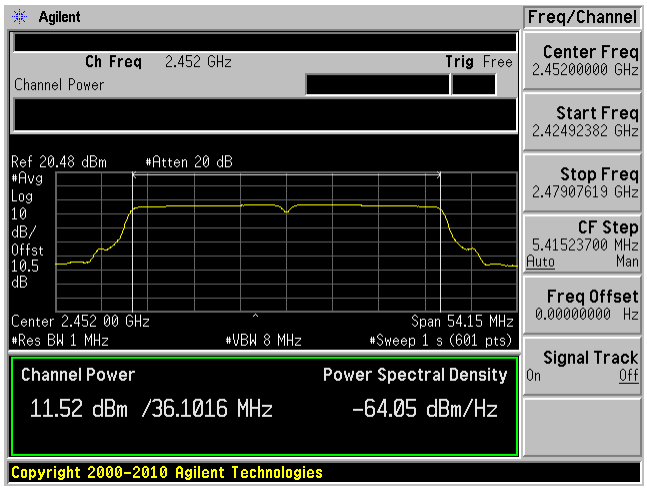
Low Channel 2422 MHz



Middle Channel 2437 MHz



High Channel 2452 MHz



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

10.1 Applicable Standards

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

According to IC RSS-247 §5.5.In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

10.2 Measurement Procedure

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

10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2015-06-22	1 year
-	SMA cable	-	C0002	Each time[1]	N/A
-	10dB attenuator	-	-	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:	22º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

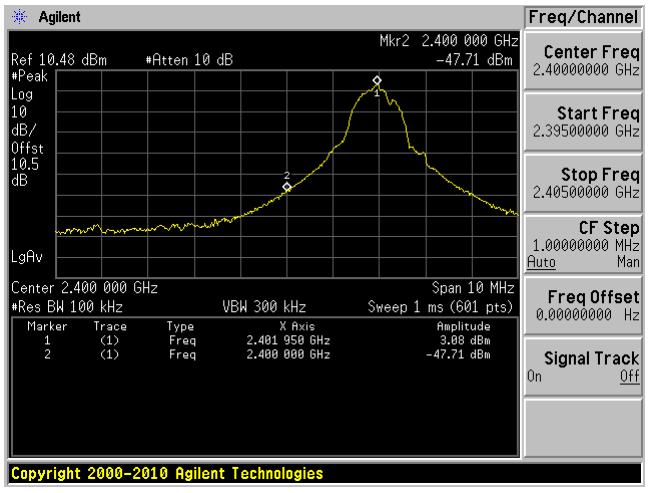
The testing was performed by Jin Yang on 2015-10-23 at RF site.

10.5 Test Results

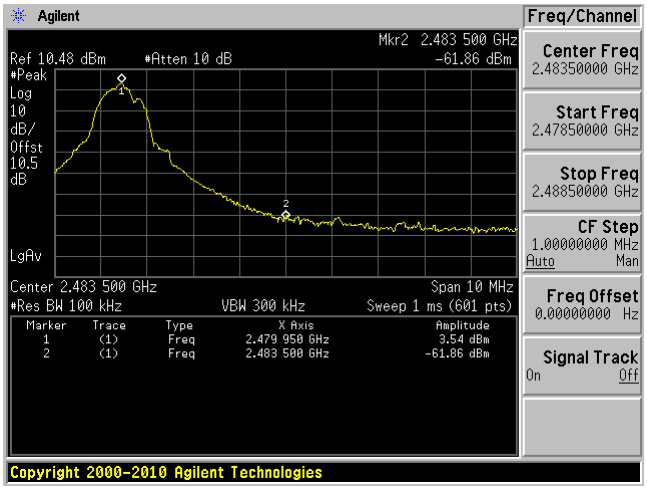
Please refer to the following plot for band edge.

BLE

Low Channel 2402 MHz

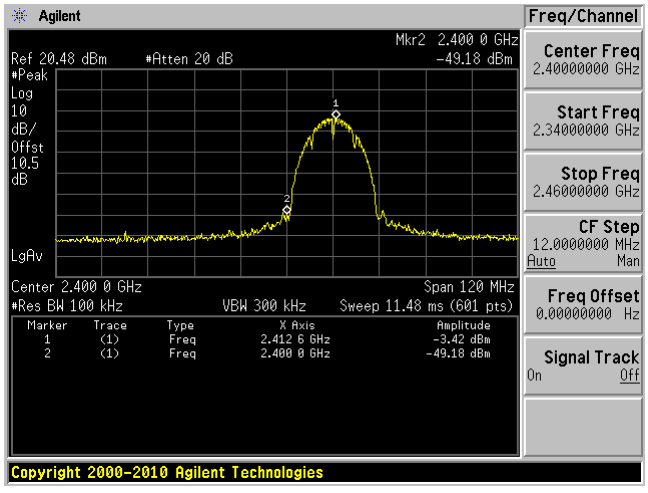


High Channel 2480 MHz

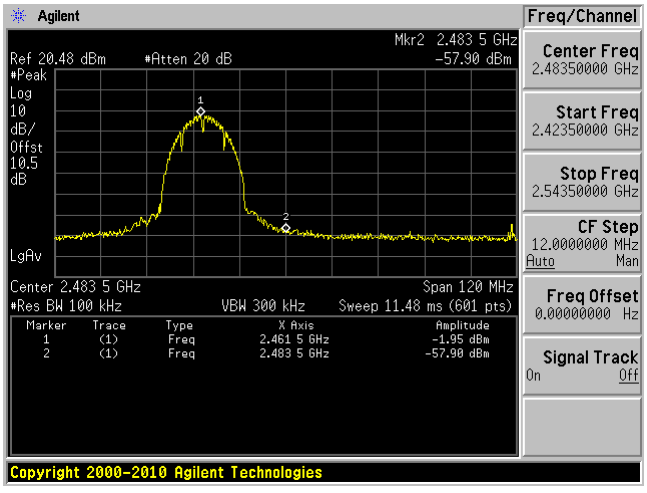


802.11b mode

Low Channel 2412 MHz

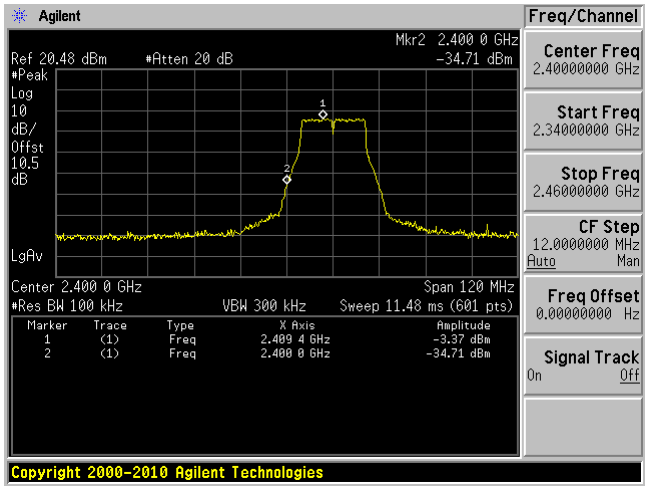


High Channel 2462 MHz

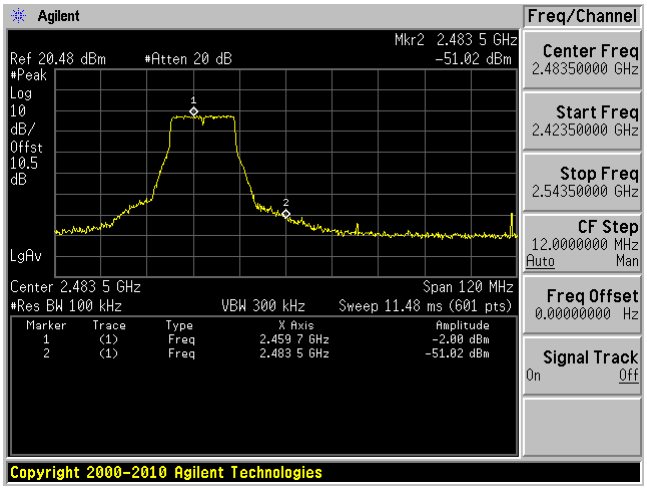


802.11g mode

Low Channel 2412 MHz

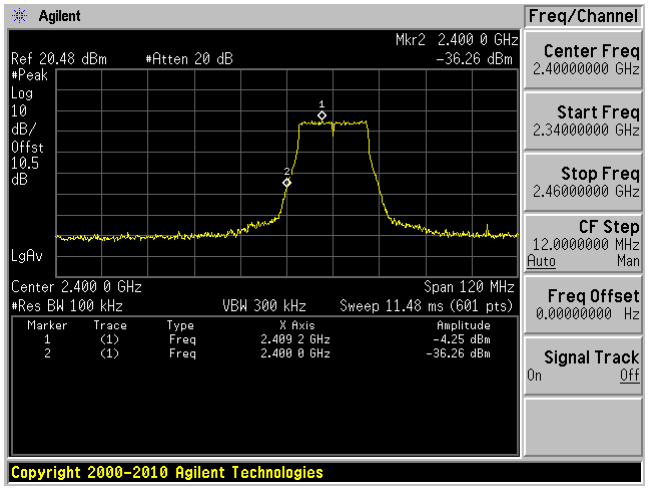


High Channel 2462 MHz

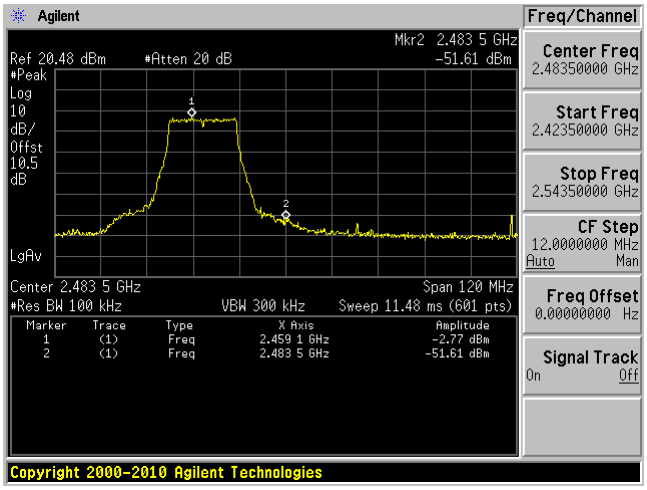


802.11n20 mode

Low Channel 2412 MHz

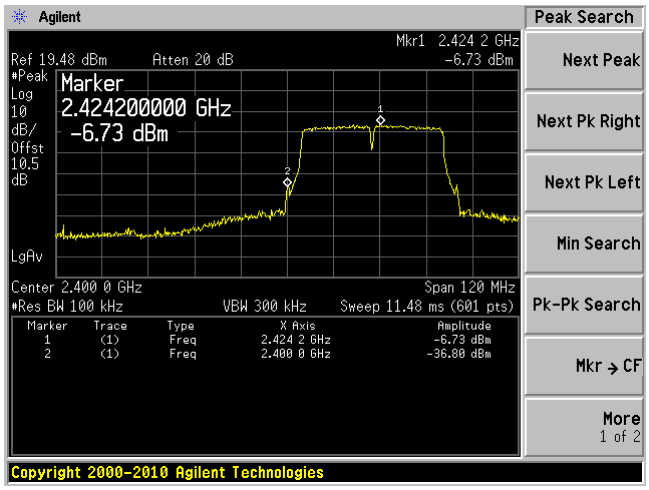


High Channel 2462 MHz

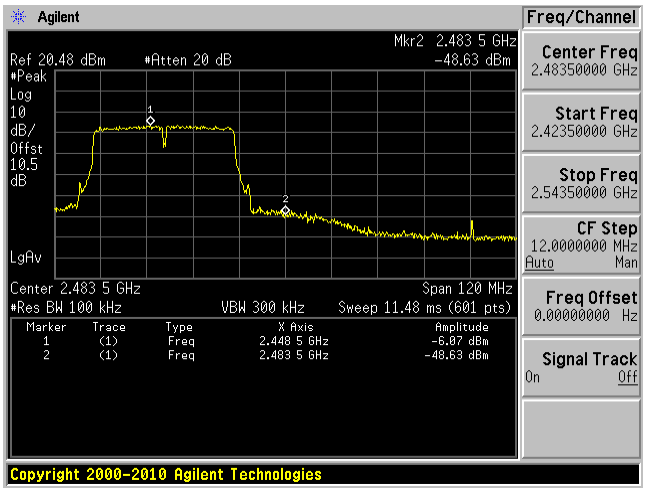


802.11n40 mode

Low Channel 2422 MHz



High Channel 2452 MHz



11 FCC §15.247(e) & IC RSS-247 §5.2(b) – Power Spectral Density

11.1 Applicable Standards

According to FCC §15.247(e) and RSS-247 §5.2 (b) , for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

11.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r03: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 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	E4440A	MY44303352	2015-06-22	1 year
-	SMA cable	-	C0002	Each time[1]	N/A
-	10dB attenuator	-	-	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:	22º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

The testing was performed by Jin Yang on 2015-10-23 at RF site.

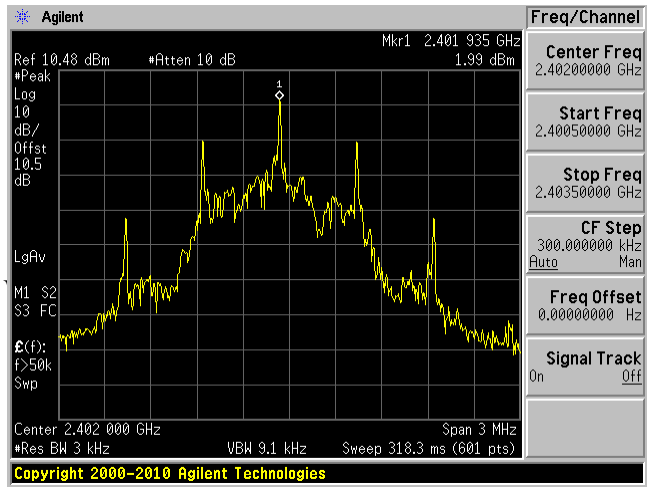
11.5 Test Results

Frequency (MHz)	PSD (dBm)	Limit (dBm)	Result
BLE			
2402	1.99	8	Pass
2440	2.57	8	Pass
2480	2.46	8	Pass
802.11b mode			
2412	-21.42	8	Pass
2437	-21.07	8	Pass
2462	-20.81	8	Pass
802.11g mode			
2412	-17.47	8	Pass
2437	-17.25	8	Pass
2462	-15.61	8	Pass
802.11n20 mode			
2412	-18.05	8	Pass
2437	-17.54	8	Pass
2462	-16.42	8	Pass
802.11n40 mode			
2422	-20.33	8	Pass
2437	-19.65	8	Pass
2452	-18.75	8	Pass

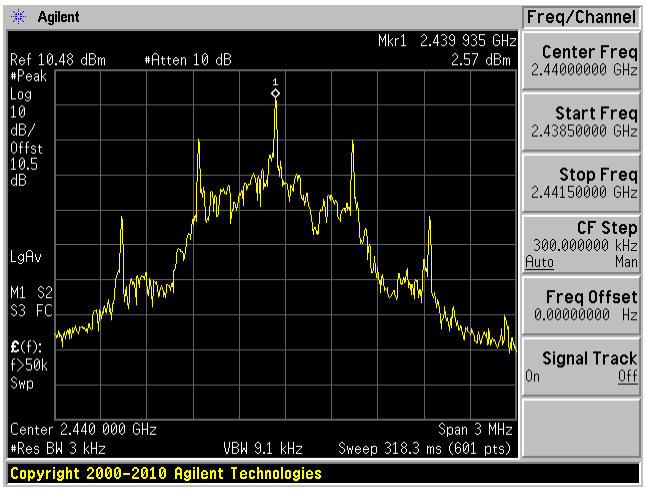
Please refer to the following plots for detailed test results

BLE

Low Channel 2402 MHz



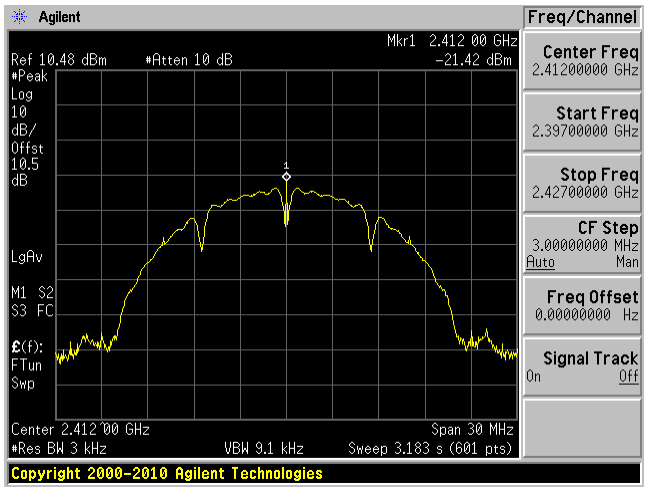
Middle Channel 2440 MHz



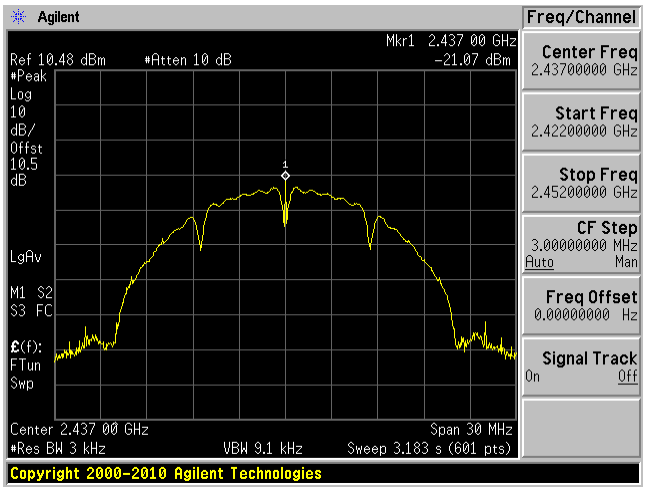
High Channel 2480 MHz

802.11b mode

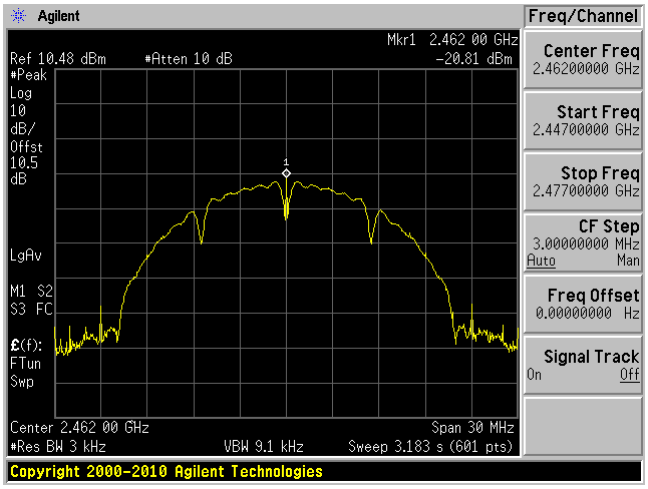
Low Channel 2412 MHz



Middle Channel 2437 MHz

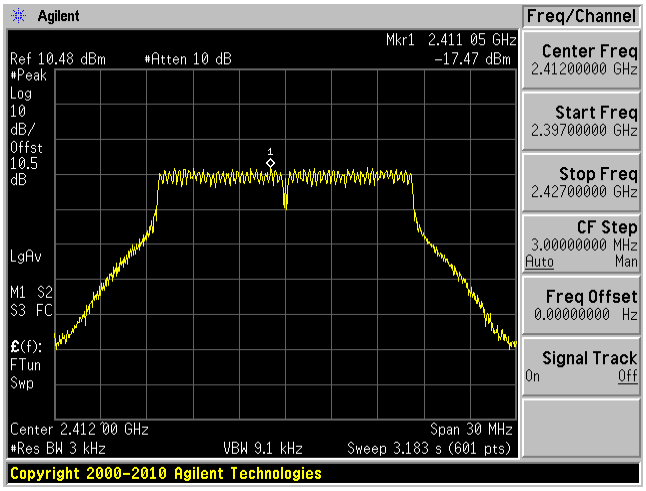


High Channel 2462 MHz

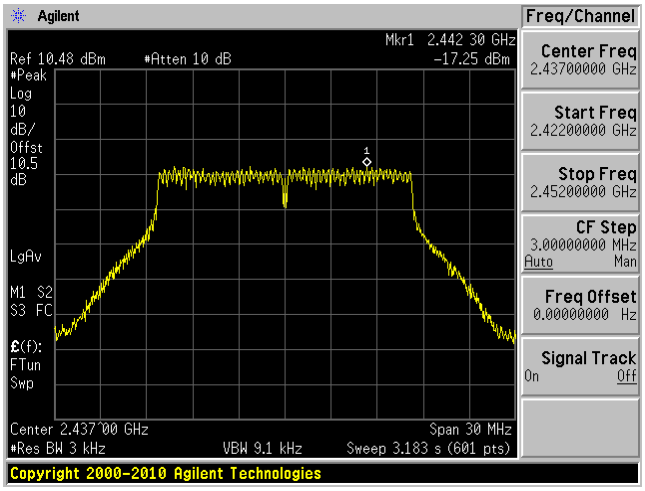


802.11g mode

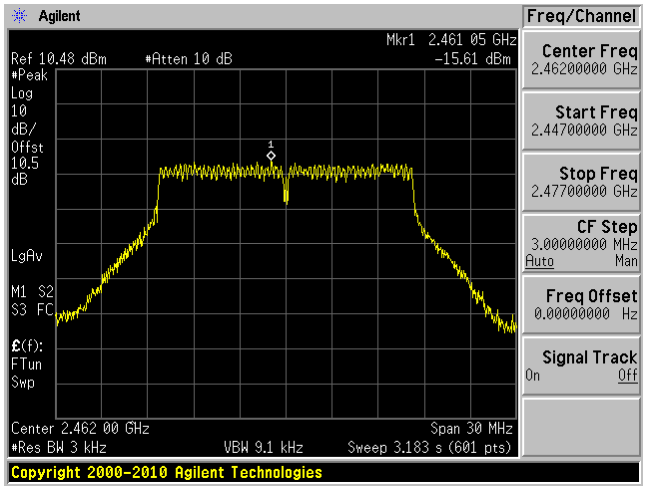
Low Channel 2412 MHz



Middle Channel 2437 MHz

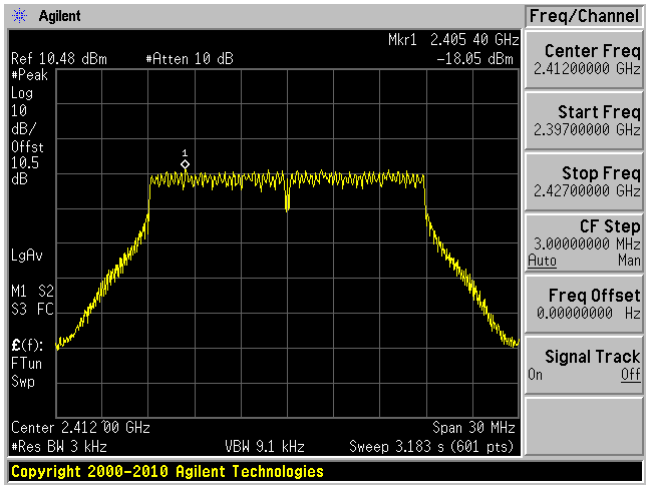


High Channel 2462 MHz

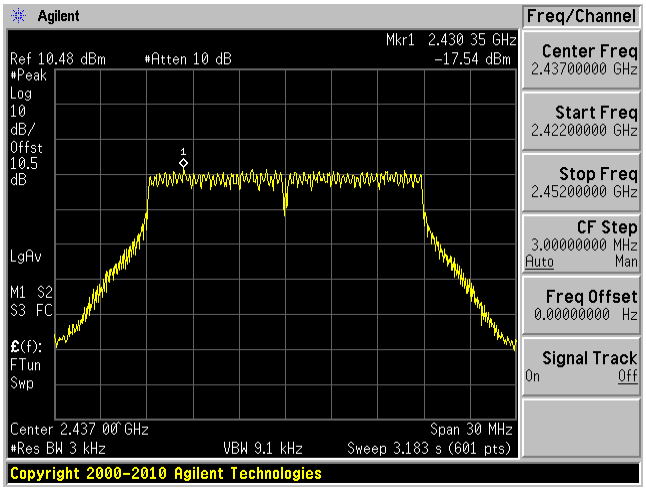


802.11n20 mode

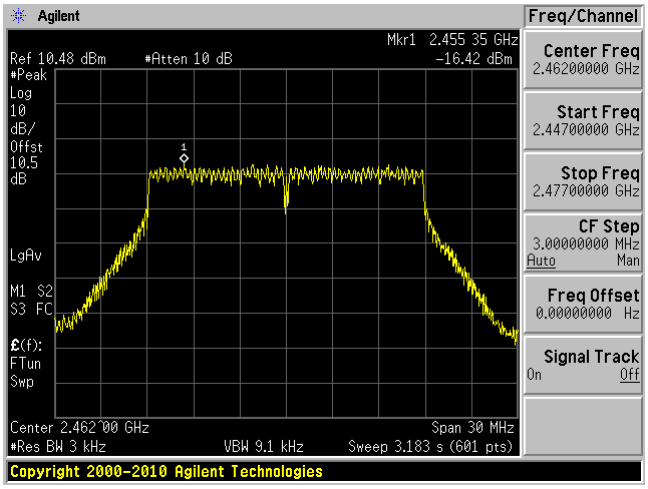
Low Channel 2412 MHz



Middle Channel 2437 MHz

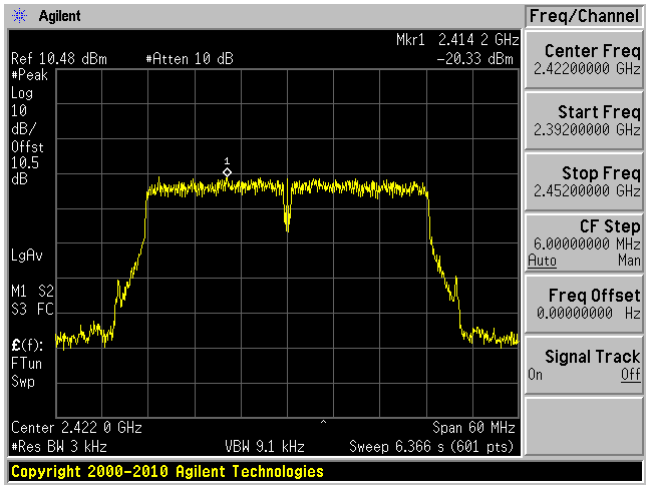


High Channel 2462 MHz

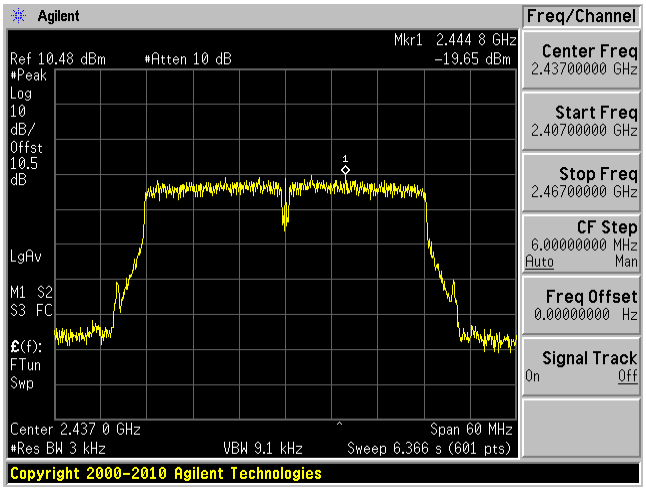


802.11n40 mode

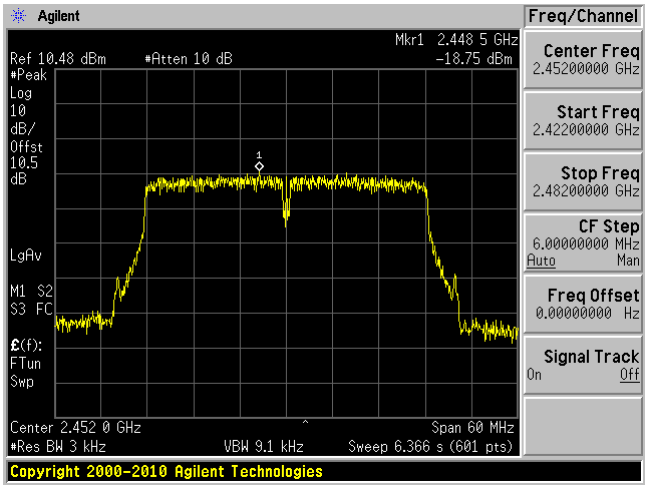
Low Channel 2422 MHz



Middle Channel 2437 MHz



High Channel 2452 MHz



12 FCC §15.247(d) & IC RSS-247 §5.5, RSS-GEN §8.9 – Spurious Emissions at Antenna Terminals

12.1 Applicable Standards

For 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-247 §5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

12.2 Test Procedure

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

12.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2015-06-22	1 year
-	SMA cable	-	C0002	Each time[1]	N/A
-	10dB attenuator	-	-	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.*

12.4 Test Environmental Conditions

Temperature:	22º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

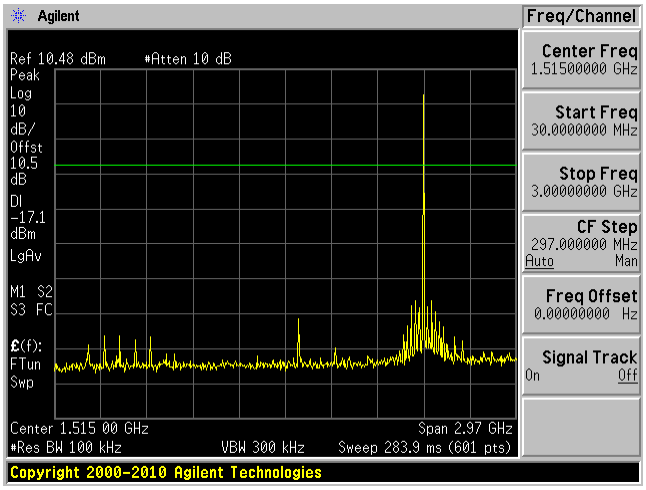
The testing was performed by Jin Yang on 2015-10-23 at RF site.

12.5 Test Results

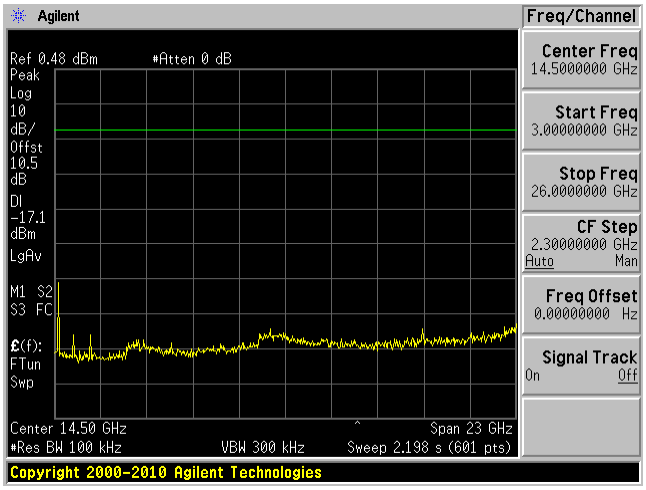
Please refer to following plots.

BLE

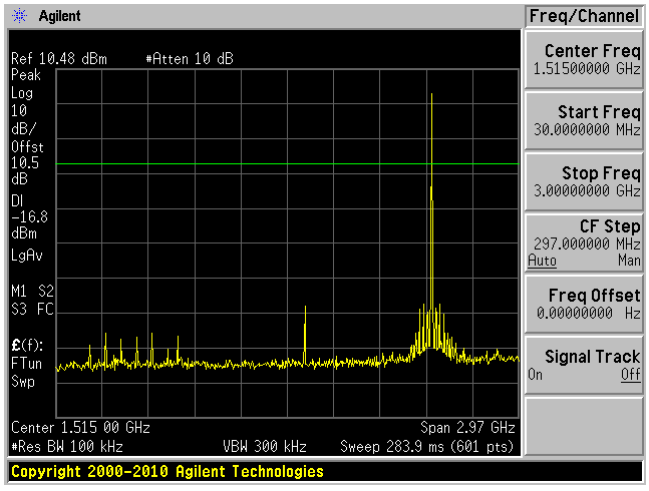
Low Channel 30 MHz – 3 GHz



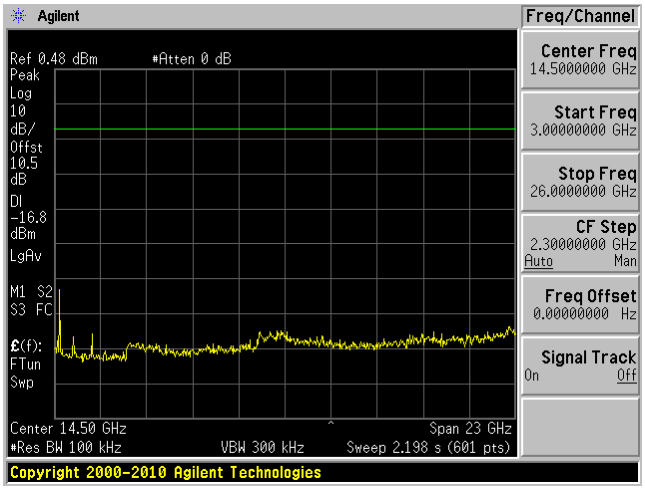
Low Channels 3 GHz – 26 GHz



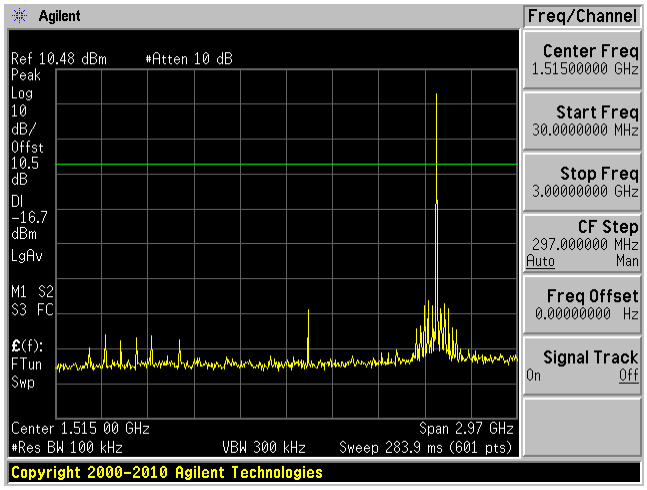
Middle Channel 30 MHz – 3 GHz



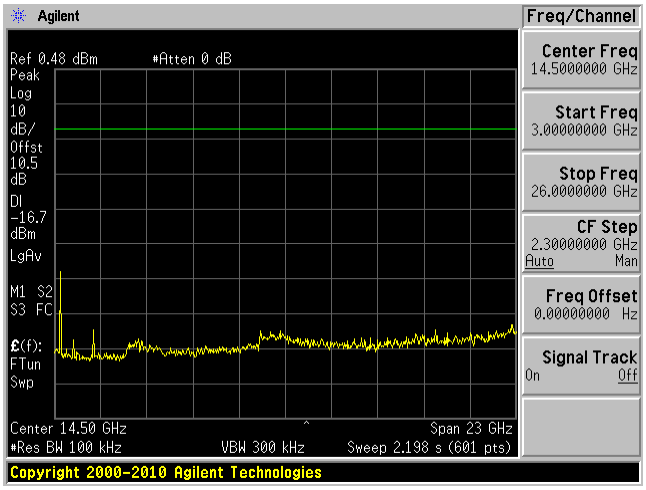
Middle Channels 3 GHz – 26 GHz



High Channel 30 MHz – 3 GHz

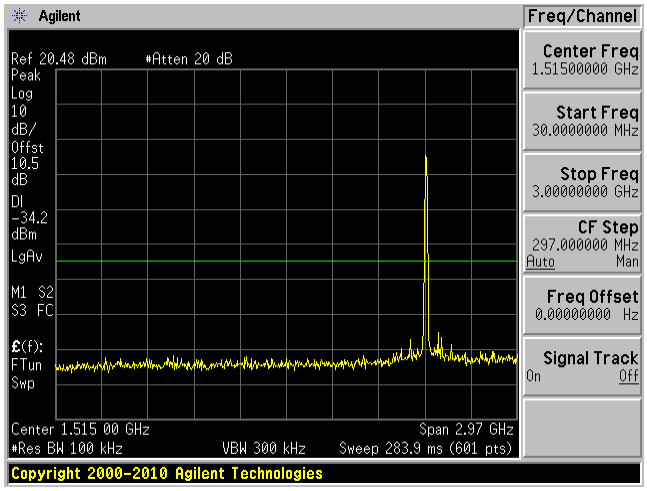


High Channels 3 GHz – 26 GHz

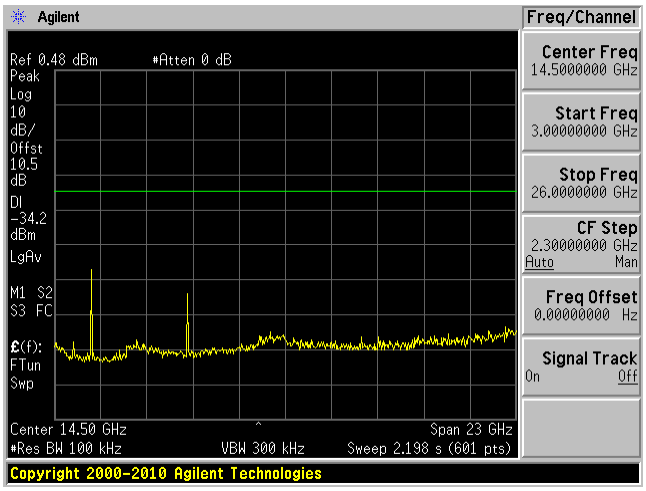


802.11b mode

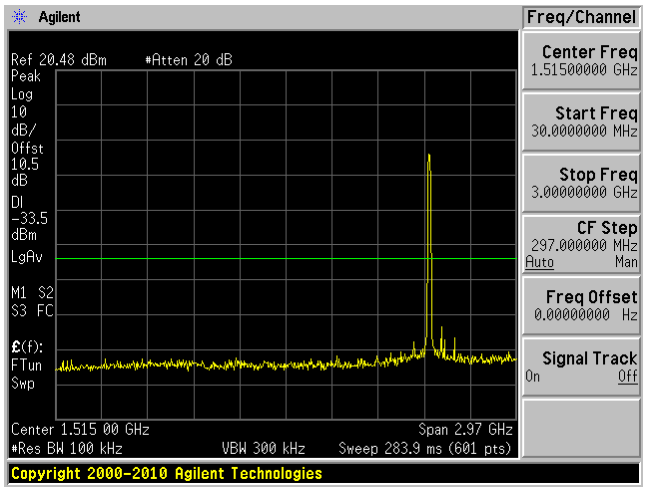
Low Channel 30 MHz – 3 GHz



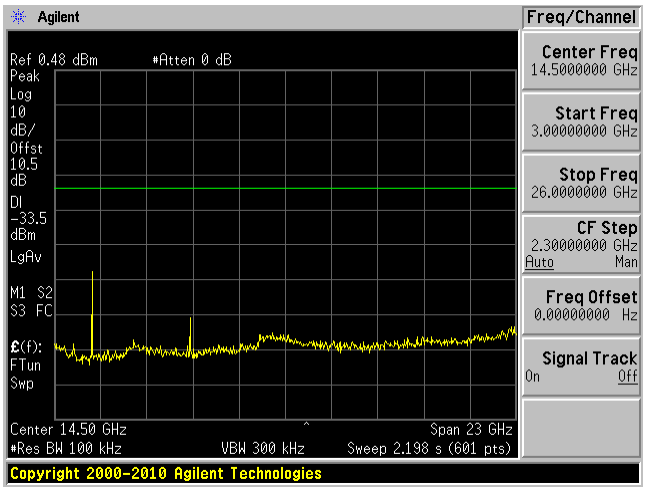
Low Channels 3 GHz – 26 GHz



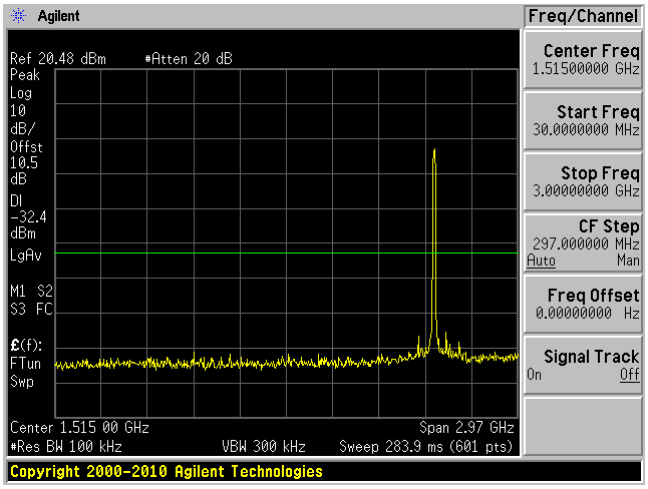
Middle Channel 30 MHz – 3 GHz



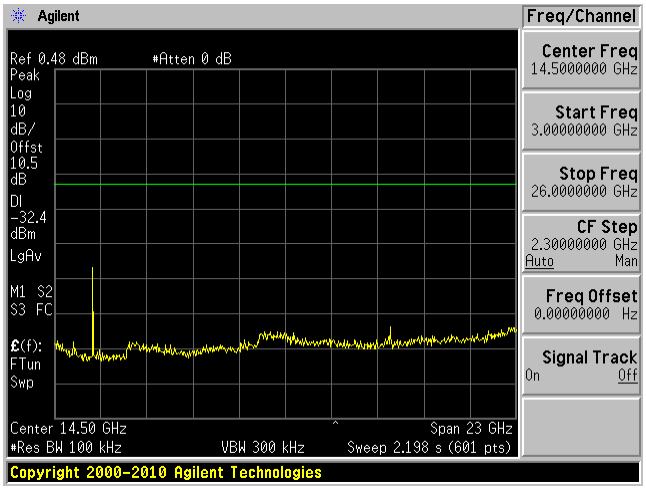
Middle Channels 3 GHz – 26 GHz



High Channel 30 MHz – 3 GHz

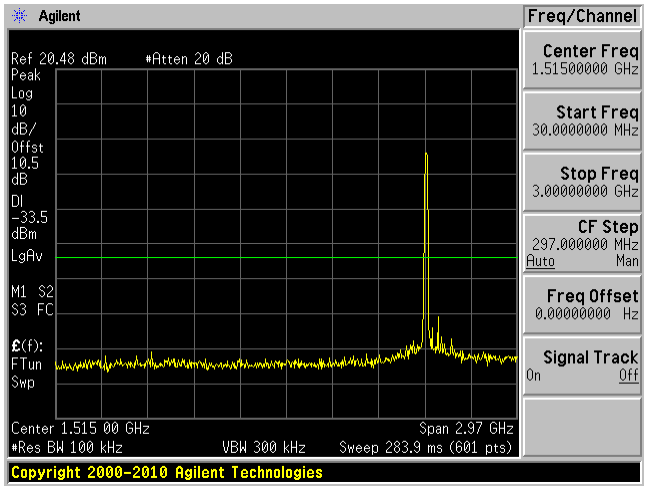


High Channels 3 GHz – 26 GHz

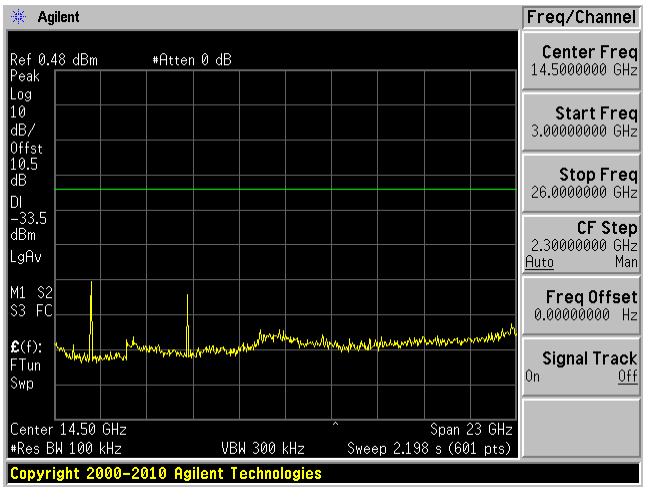


802.11g mode

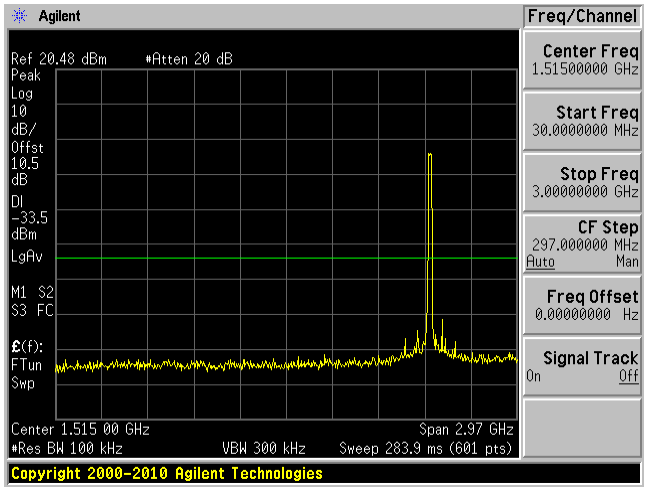
Low Channel 30 MHz – 3 GHz



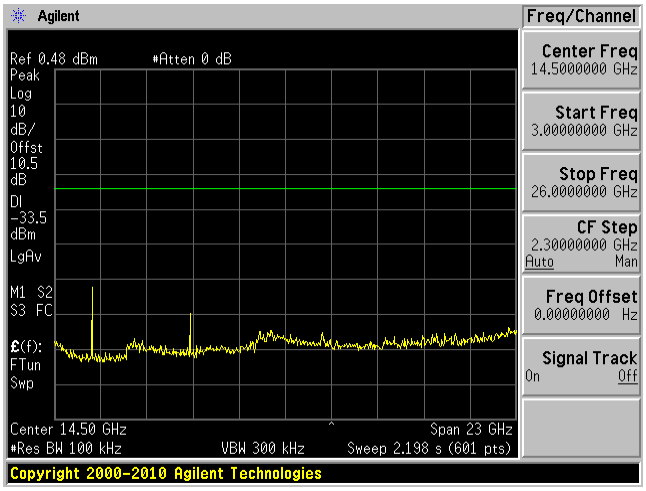
Low Channels 3 GHz – 26 GHz



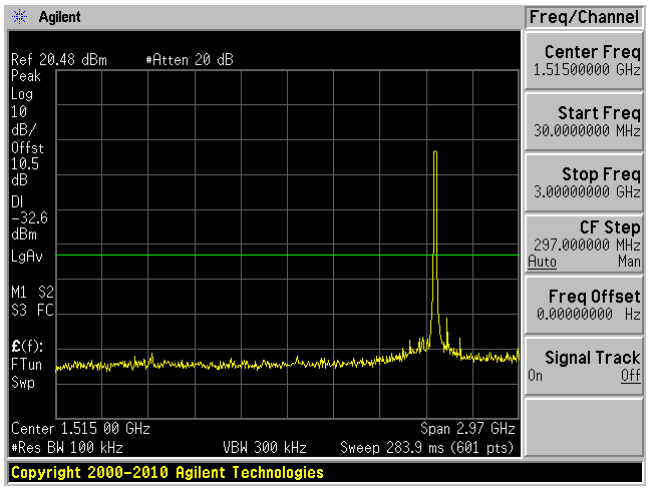
Middle Channel 30 MHz – 3 GHz



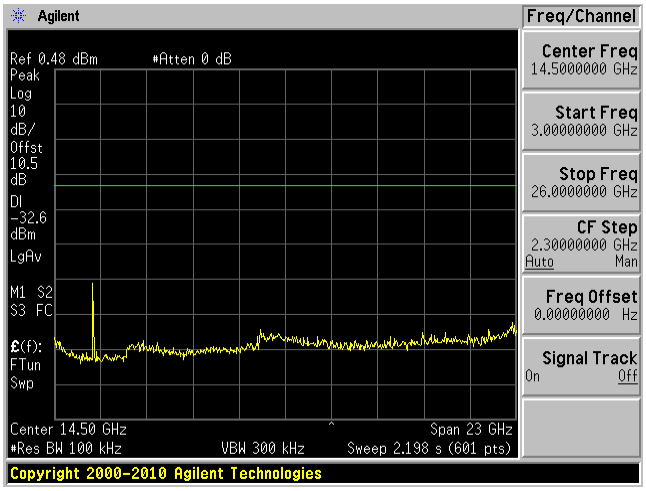
Middle Channels 3 GHz – 26 GHz



High Channel 30 MHz – 3 GHz

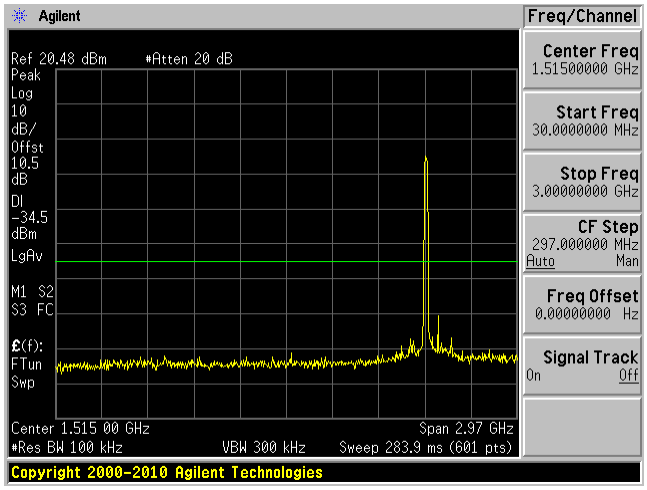


High Channels 3 GHz – 26 GHz

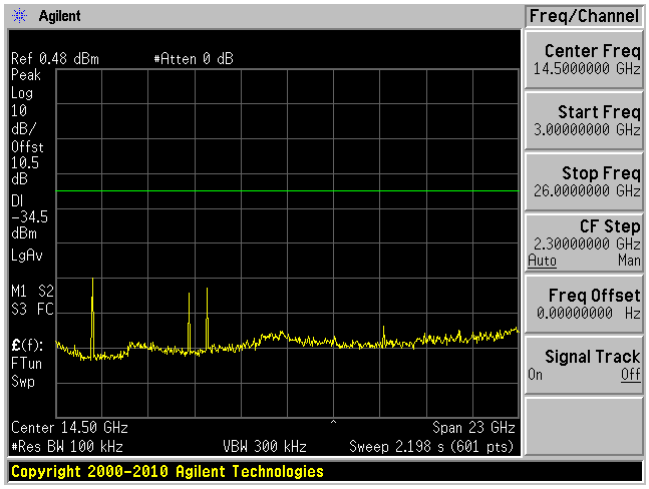


802.11n20 mode

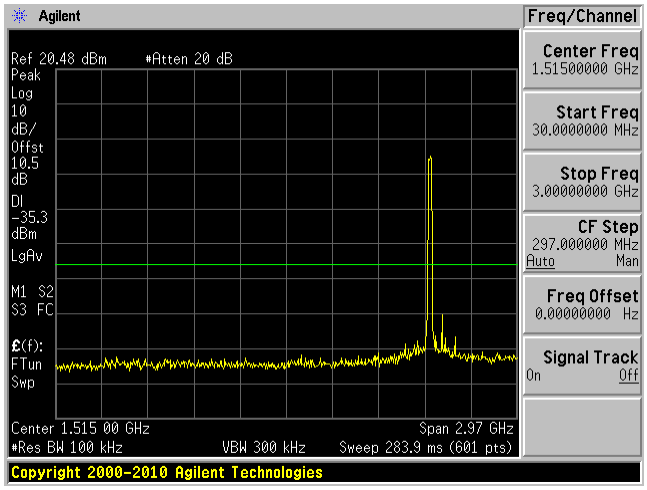
Low Channel 30 MHz – 3 GHz



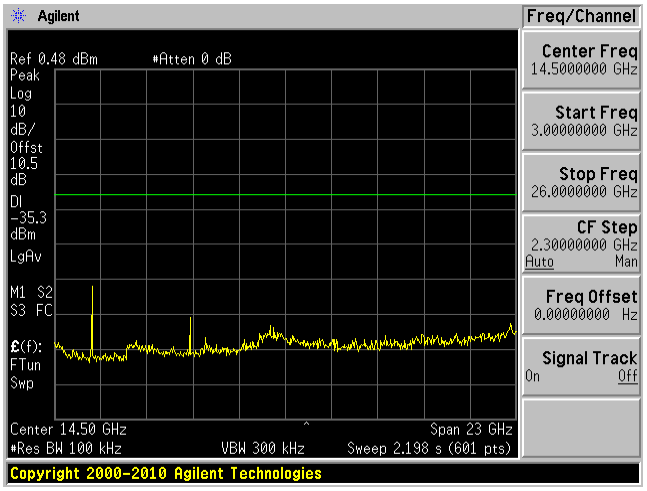
Low Channels 3 GHz – 26 GHz



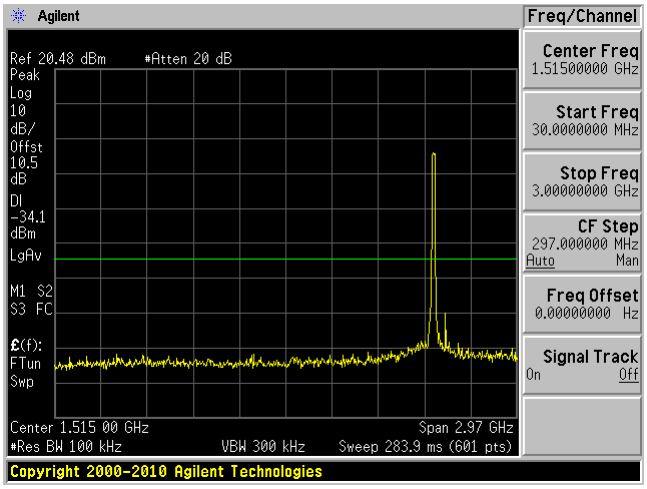
Middle Channel 30 MHz – 3 GHz



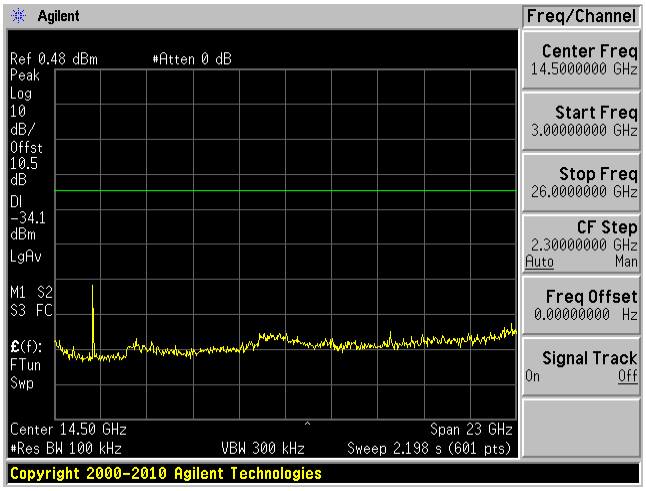
Middle Channels 3 GHz – 26 GHz



High Channel 30 MHz – 3 GHz

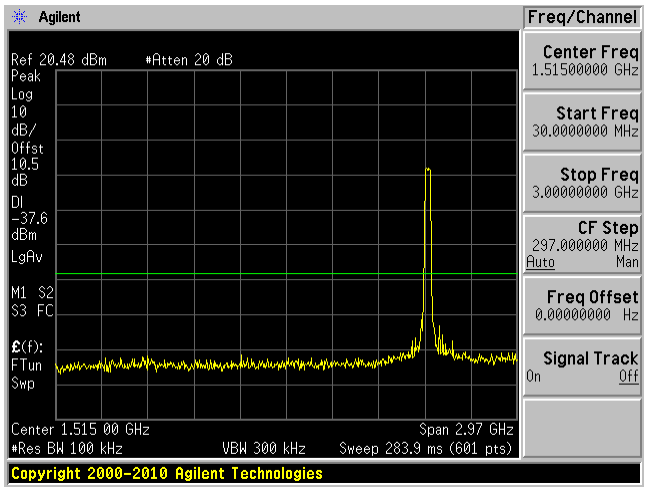


High Channels 3 GHz – 26 GHz

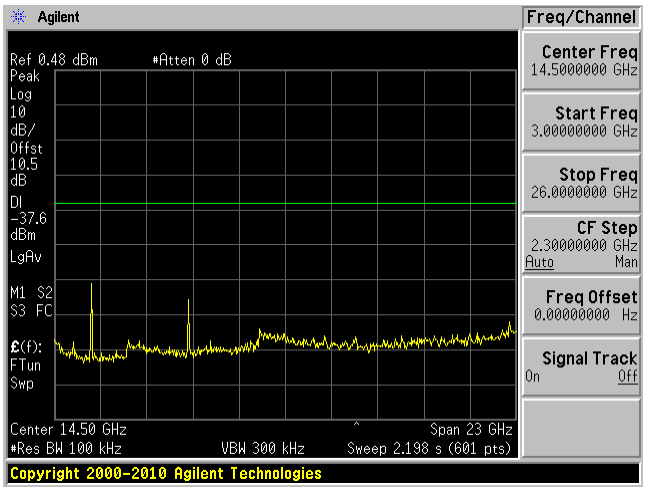


802.11n40 mode

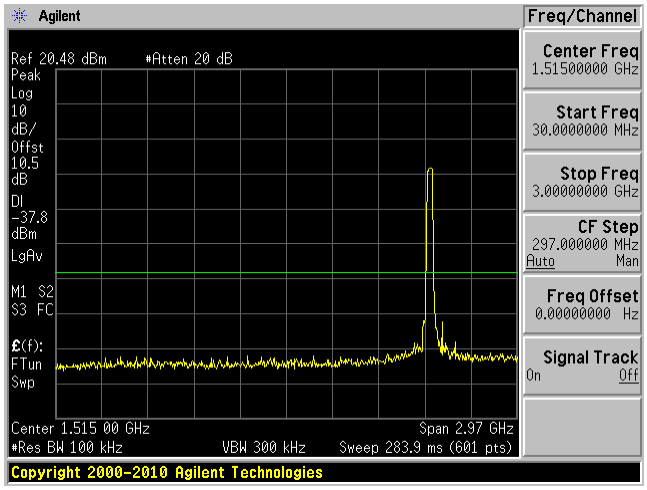
Low Channel 30 MHz – 3 GHz



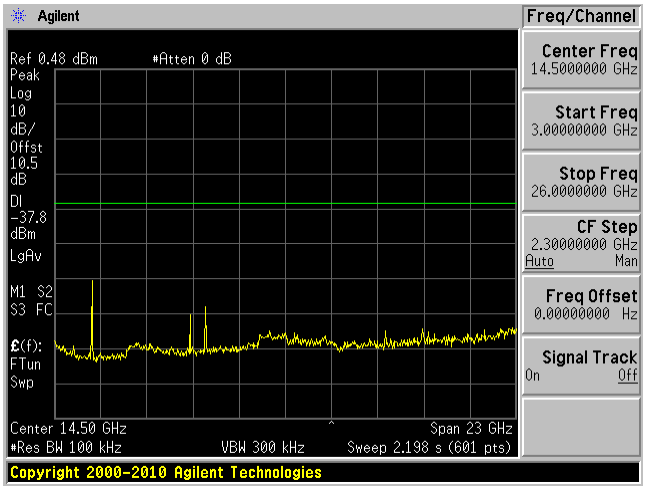
Low Channels 3 GHz – 26 GHz



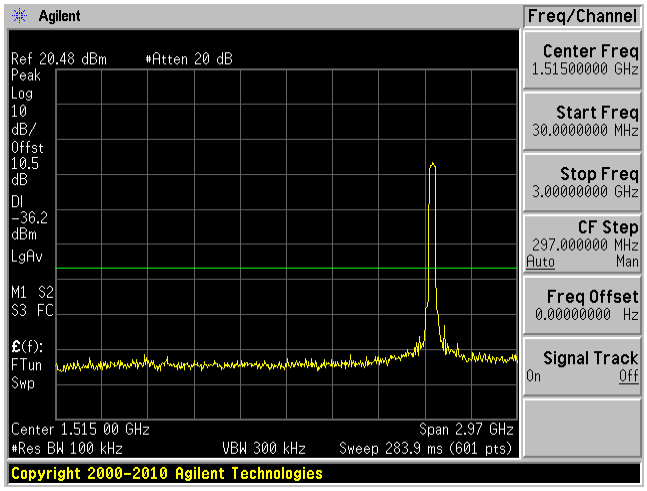
Middle Channel 30 MHz – 3 GHz



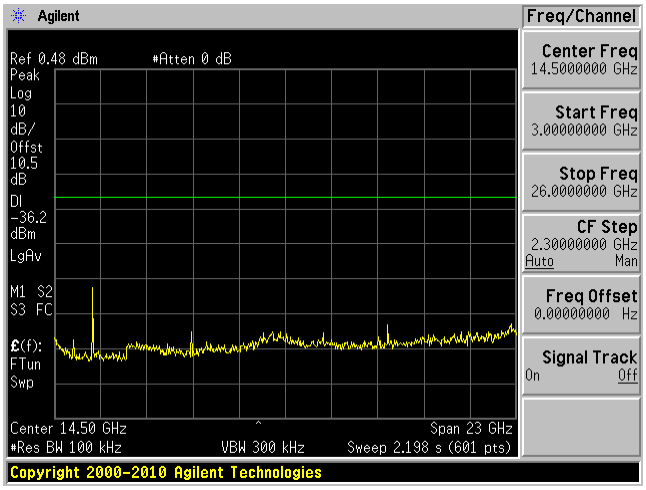
Middle Channels 3 GHz – 26 GHz



High Channel 30 MHz – 3 GHz



High Channels 3 GHz – 26 GHz



13 Exhibit A – FCC & IC Equipment Labeling Requirements

13.1 FCC ID Label Requirements

As per FCC §2.925,

(a) Each equipment covered in an application for equipment authorization shall bear a nameplate or label listing the following:

(1) FCC Identifier consisting of the two elements in the exact order specified in §2.926. The FCC Identifier shall be preceded by the term FCC ID in capital letters on a single line, and shall be of a type size large enough to be legible without the aid of magnification.

Example: FCC ID: XXX123

Where: XXX—Grantee Code, 123—Equipment Product Code

As per FCC §15.19,

(a) In addition to the requirements in part 2 of this chapter, a device subject to certification, or verification shall be labeled as follows:

(3) All other devices shall bear the following statement in a conspicuous location on the device:
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified above is required to be affixed only to the main control unit. If the EUT is integrated within another device then a label affixed to the host shall also state, “Contains FCC ID: XXXXXX”

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

13.2 IC Label Requirements

As per IC RSS-Gen §2.1, the certification number shall appear as follows:

IC: XXXXXX-YYYYYYYY

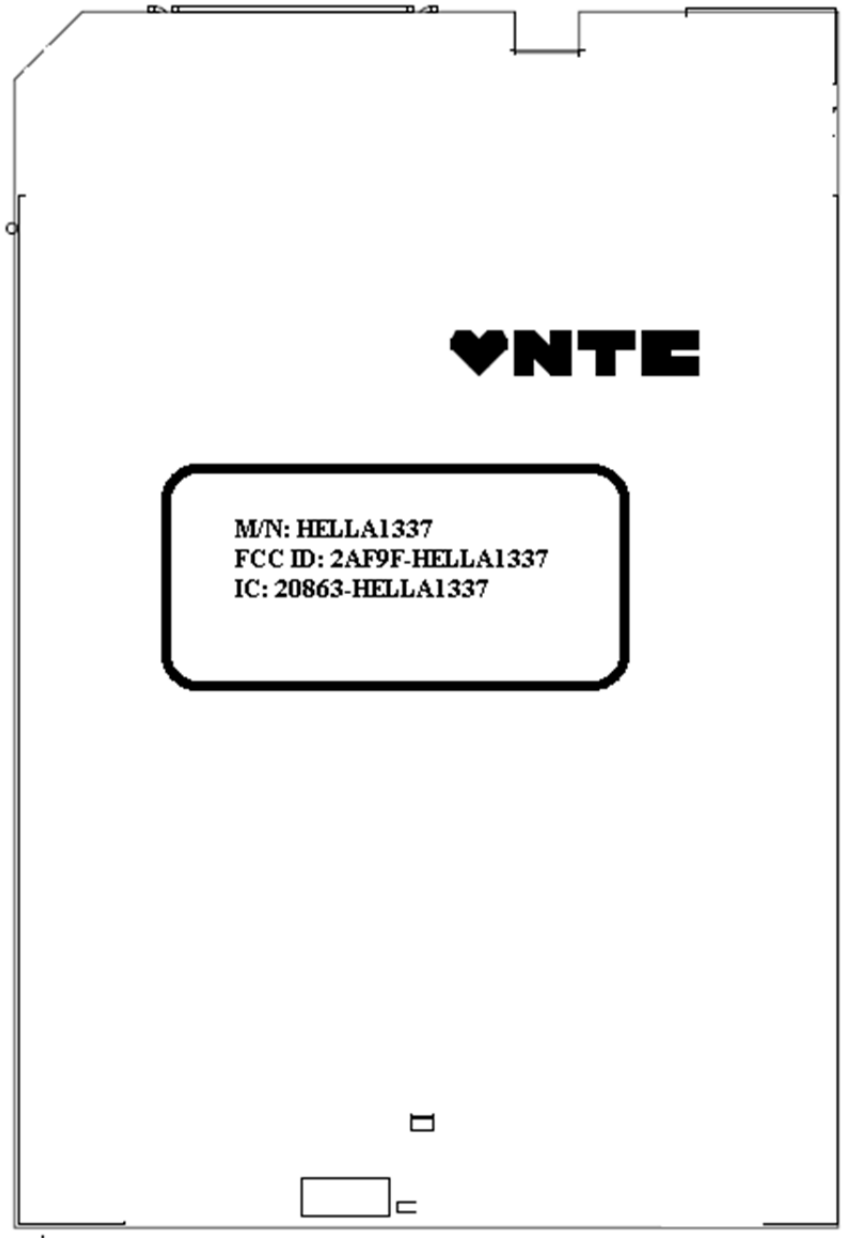
Where:

- "XXXXXX-YYYYYYYY" is the certification number
- "XXXXXX" is the Certificate Holder Number (CHN), made of at most 6 alphanumeric characters (A-Z, 0-9), assigned by Industry Canada; and
- "YYYYYYYY" is the Unique Product Number (UPN), made of at most 11 alphanumeric characters (A-Z, 0-9) assigned by the applicant.
- Note 1: The term "IC" before the equipment certification number only signifies that the Industry Canada technical specifications were met.
- Note 2: Note 1 shall be conspicuously placed in the equipment user manual.
- Note 3: Permitted alphanumeric characters used in the CHN and UPN are limited to capital letters (A-Z) and digits (0-9). Other characters, such as "#", "/" or "-", shall not be used.

As per RSS-Gen §2.1 Equipment Labeling:

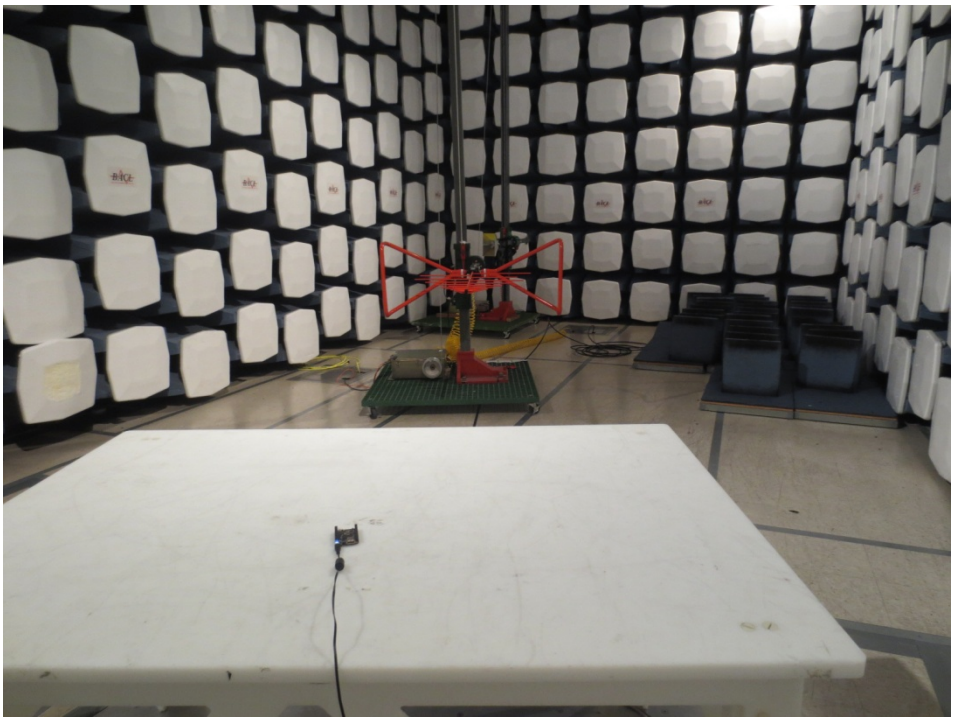
Equipment subject to certification under the applicable RSS, shall be permanently labeled on each item, or as an inseparable combination. The label must contain the following information for full compliance:
(a) the certification number, prefixed by the term “IC:”;
(b) the manufacturer's name, trade name or brand name; and
(c) a model name or number.
Equipment for which a certificate has been issued is not considered certified if it is not properly labeled.
The information on the Canadian label can be combined with the manufacturer’s other labeling requirements.
If the device size is too small to put a label, the label can be included in the user’s manual, upon agreement with Industry Canada.

13.3 FCC ID & IC Label Contents and Location

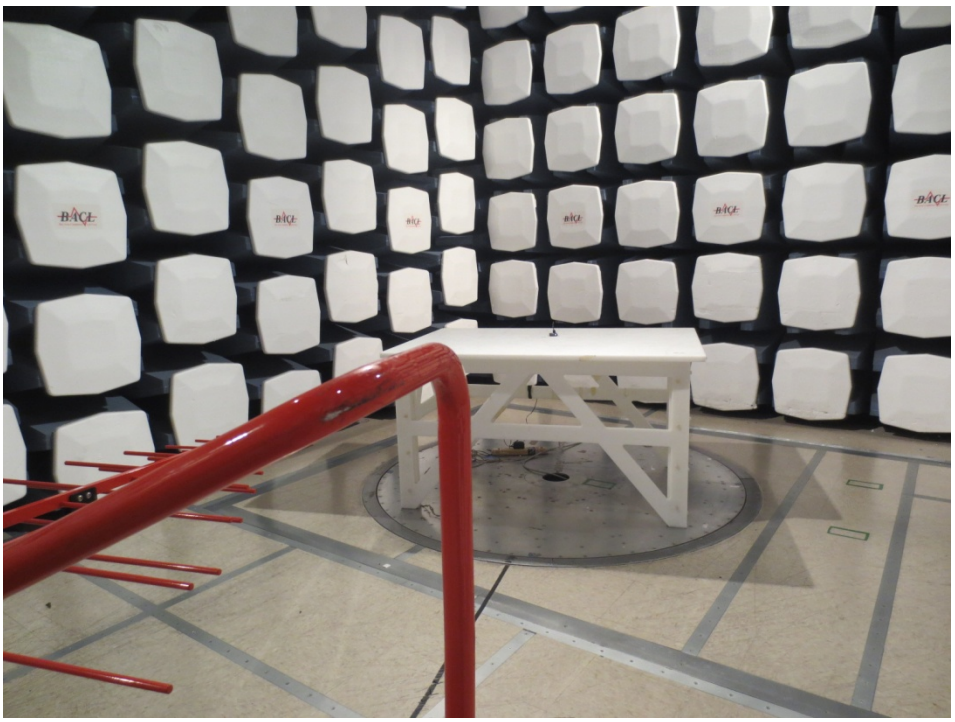


14 Exhibit B – Test Setup Photographs

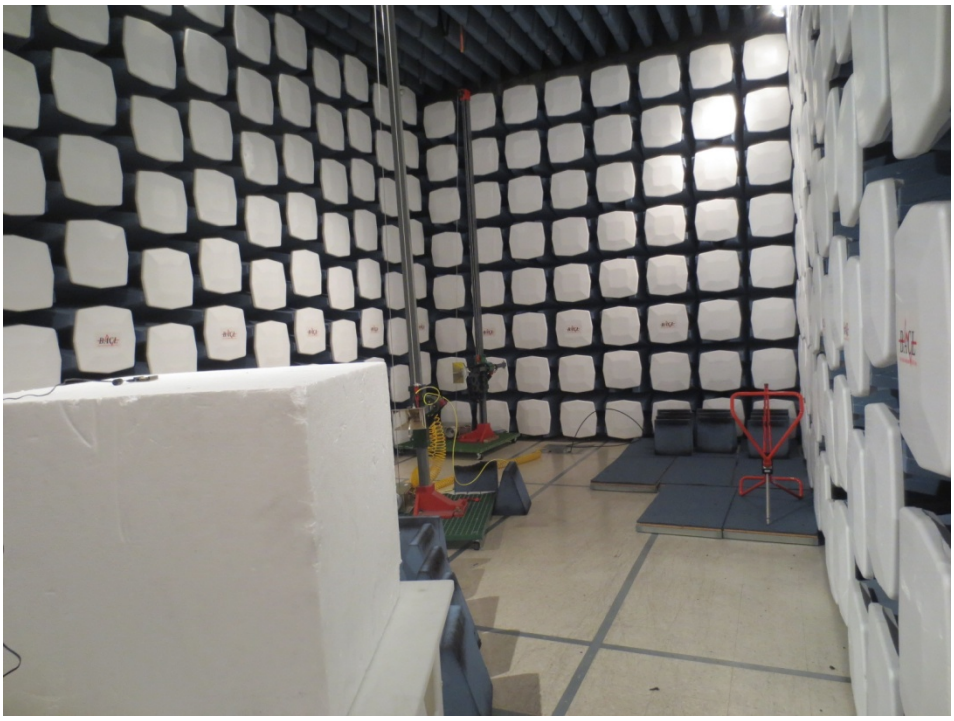
14.1 Radiated Emission below 1 GHz Front View



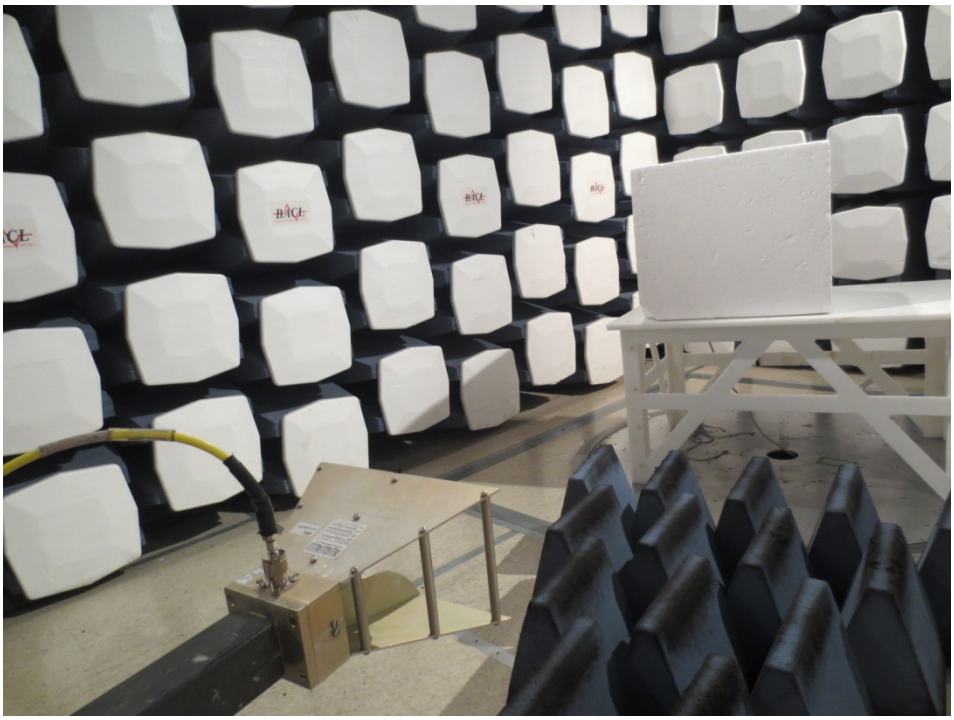
14.2 Radiated Emission below 1 GHz Rear View



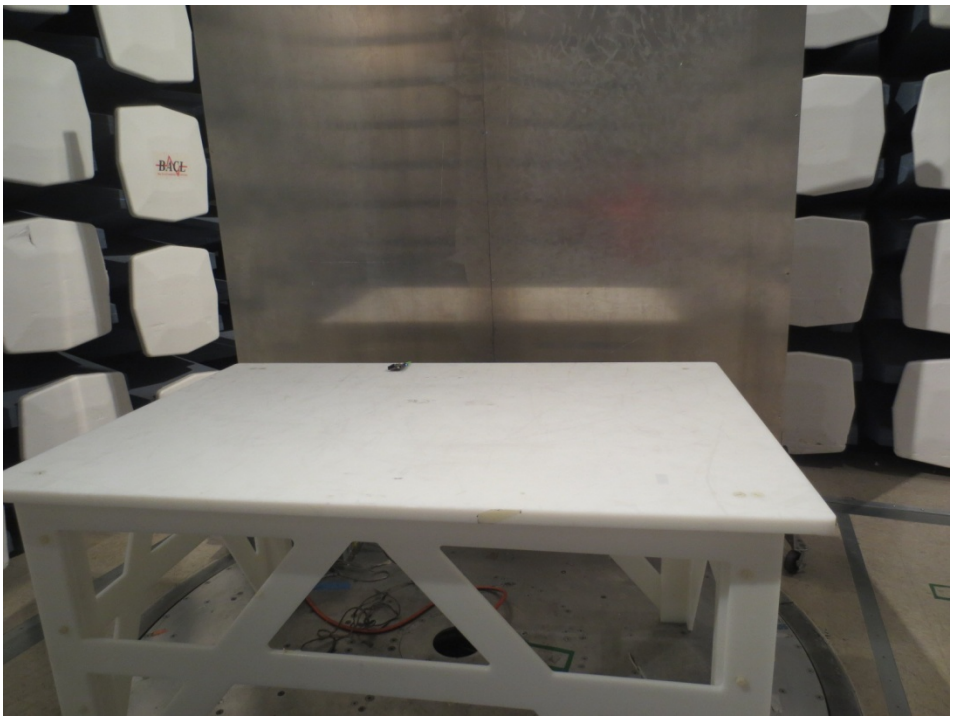
14.3 Radiated Emission above 1 GHz Front View



14.4 Radiated Emission above 1 GHz Rear View



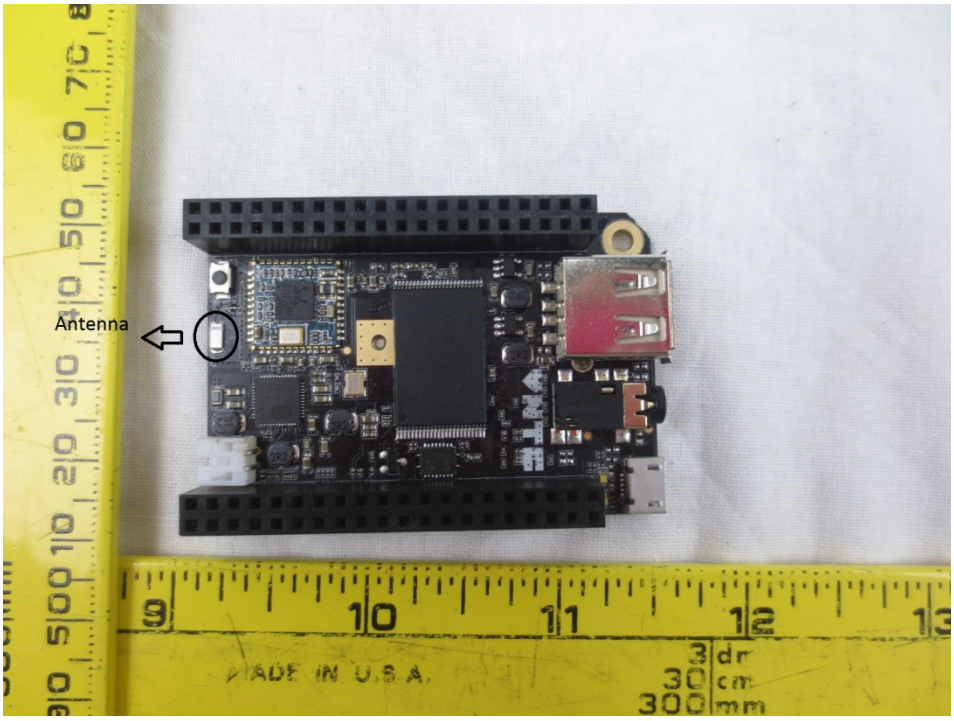
14.5 AC Line Conducted Emissions Front View



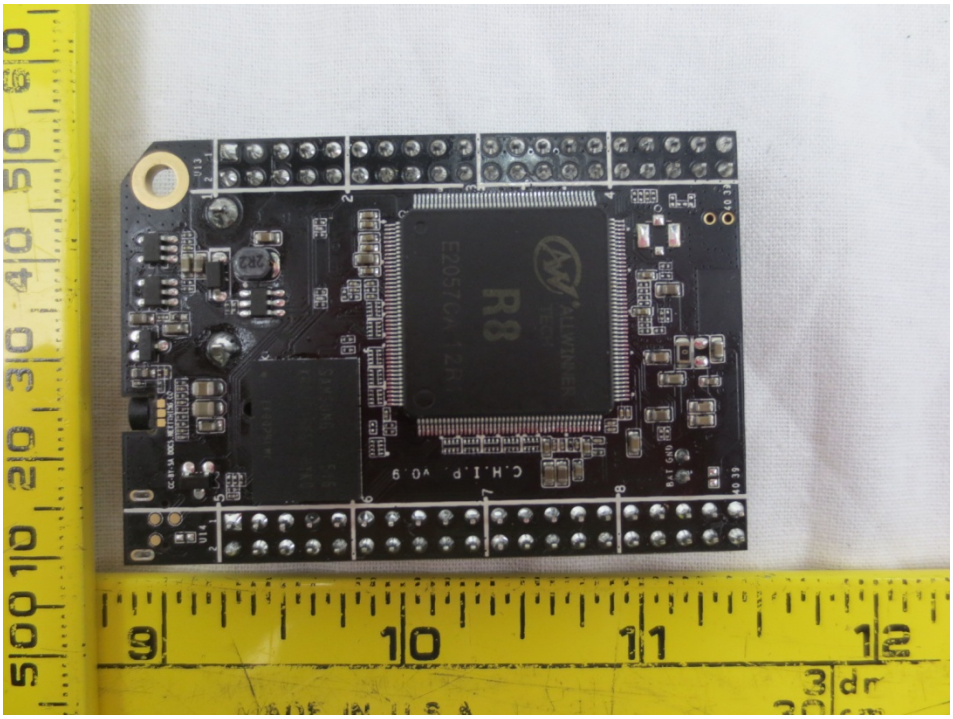
14.6 AC Line Conducted Emissions Side View

15 Exhibit C – EUT Photographs

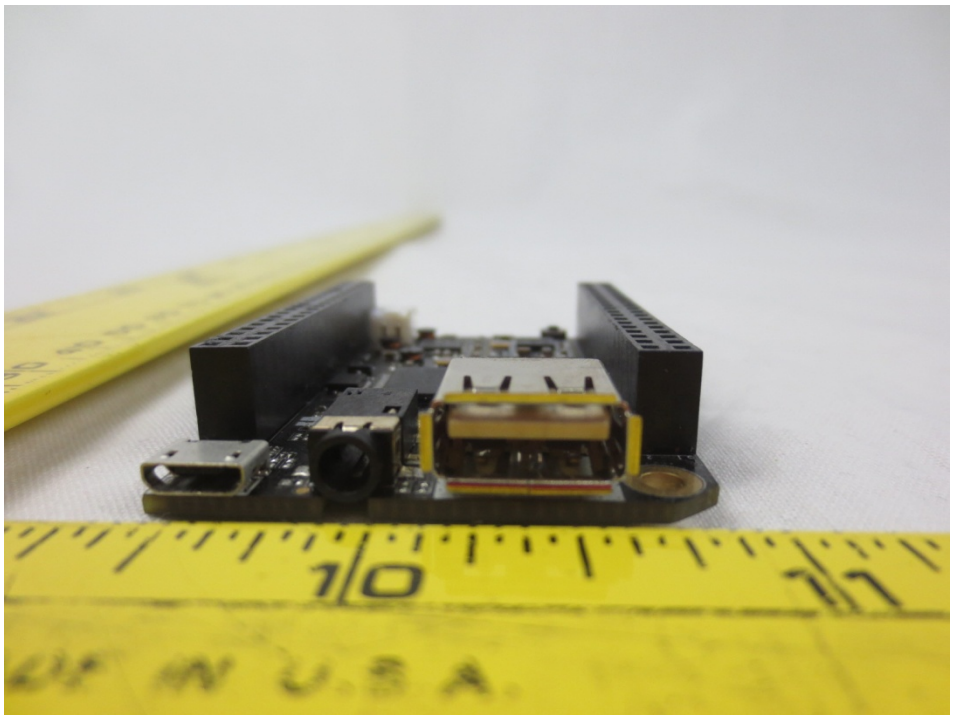
17.1 EUT Photo – Top View



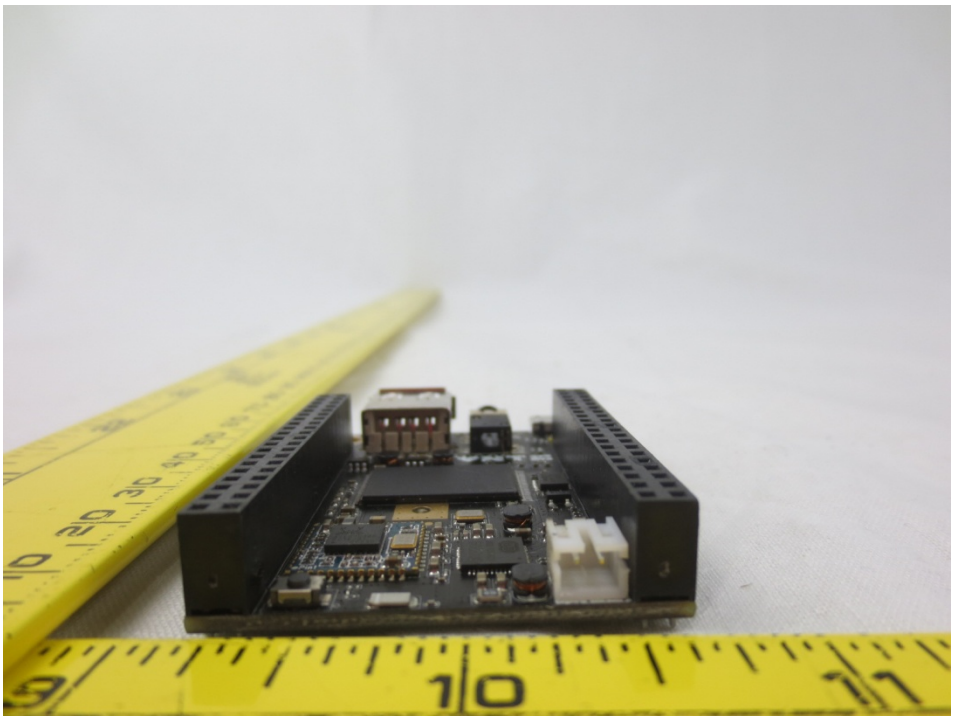
17.2 EUT Photo – Bottom View



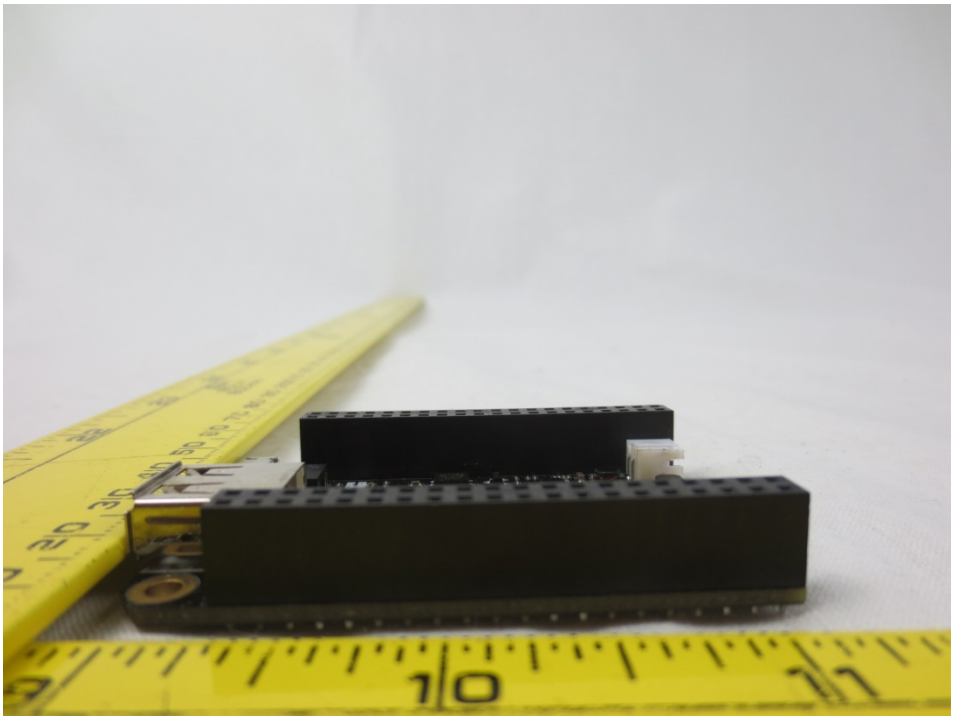
17.3 EUT Photo – Front View



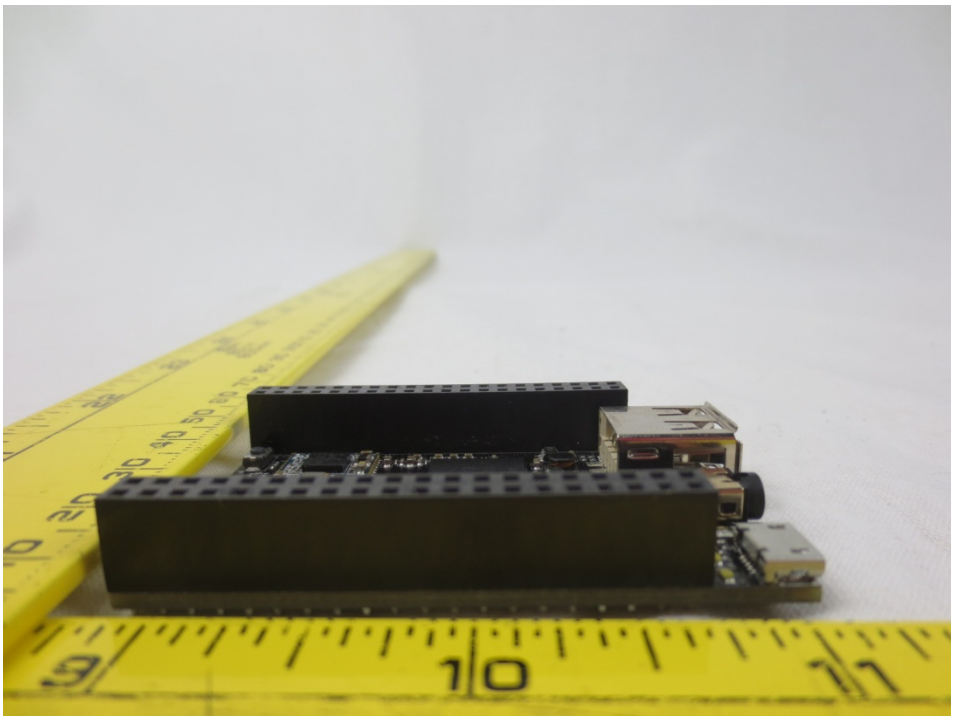
17.4 EUT Photo – Back View



17.5 EUT Photo – Right Side View



17.6 EUT Photo – Left Side View



17.7 AC/DC Power Adapter

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