FCC PART 15, SUBPART C
ISEDC RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

GoPro, Inc.

3000 Clearview Way,

San Mateo, CA 94402, USA

FCC ID: CNFSPCH1
IC: 10193A-SPCH1

Report Type:	**Product Type:**
Original Report	Wireless Video Camera

Prepared By:	Vincent Licata Test Engineer
Report Number:	R1704261-247 (WiFi+BLE)
Report Date:	2017-06-28
Reviewed By:	Jin Yang RF Engineer

Bay Area Compliance Laboratories Corp.
1274 Anvilwood Avenue,
Sunnyvale, CA 94089, USA
Tel: (408) 732-9162
Fax: (408) 732-9164

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1704261-247 (WiFi+BLE)	Original Report	2017-06-28

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *GoPro, Inc.*, and their product model: *SPCH1,* FCC ID: CNFSPCH1, IC: 10193A-SPCH1 or the "EUT" as referred to in this report. It is a Wireless video camera

1.2 Objective

This report is prepared on behalf of *GoPro, Inc.*, in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commission's rules and ISEDC RSS-247 Issue 2, February 2017.

The objective is to determine compliance with FCC Part 15.247 and ISEDC 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.

1.3 Related Submittal(s)/Grant(s)

FCC Part 15, Subpart C, Equipment DSS with FCC ID: CNFSPCH1
FCC Part 15, Subpart E, Equipment NII with FCC ID: CNFSPCH1

1.4 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 v04: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

1.5 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.

Parameter	Measurement uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.57 dB
Power Spectral Density, conducted	±1.48dB
Unwanted Emissions, conducted	±1.57dB
All emissions, radiated	±4.0 dB
AC power line Conducted Emission	±2.0 dB
Temperature	±2 ° C
Humidity	±5 %
DC and low frequency voltages	±1.0 %
Time	±2 %
Duty Cycle	±3 %

1.6 Test Facility Registrations

BACLs test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL's BSMI Lab Code Number is: SL2-IN-E-1002R

BACL's test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

1.7 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- ***An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2005 by A2LA (Test Laboratory Accreditation Certificate Number 3279.02),*** in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2005 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

B- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3279.03)*** to certify

- For the USA (Federal Communications Commission):
  - 1- All Unlicensed radio frequency devices within FCC Scopes A1, A2, A3, and A4;
  - 2- All Licensed radio frequency devices within FCC Scopes B1, B2, B3, and B4;
  - 3- All Telephone Terminal Equipment within FCC Scope C.
- For the Canada (Industry Canada):
  - 1 All Scope 1-Licence-Exempt Radio Frequency Devices;
  - 2 All Scope 2-Licensed Personal Mobile Radio Services;
  - 3 All Scope 3-Licensed General Mobile and Fixed Radio Services;
  - 4 All Scope 4-Licensed Maritime and Aviation Radio Services;
  - 5 All Scope 5-Licensed Fixed Microwave Radio Services
  - 6 All Broadcasting Technical Standards (BETS) in the Category I Equipment Standards List.
- For Singapore (Info-Communications Development Authority (IDA)):
  - 1 All Line Terminal Equipment: All Technical Specifications for Line Terminal Equipment – Table 1 of IDA MRA Recognition Scheme: 2011, Annex 2

2. All Radio-Communication Equipment: All Technical Specifications for Radio-Communication Equipment – Table 2 of IDA MRA Recognition Scheme: 2011, Annex 2

- For the Hong Kong Special Administrative Region:
  1 All Radio Equipment, per KHCA 10XX-series Specifications;
  2 All GMDSS Marine Radio Equipment, per HKCA 12XX-series Specifications;
  3 All Fixed Network Equipment, per HKCA 20XX-series Specifications.
- For Japan:
  1 MIC Telecommunication Business Law (Terminal Equipment):
  - All Scope A1 - Terminal Equipment for the Purpose of Calls;
  - All Scope A2 - Other Terminal Equipment
  2 Radio Law (Radio Equipment):
  - All Scope B1 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 1 of the Radio Law
  - All Scope B2 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 2 of the Radio Law
  - All Scope B3 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 3 of the Radio Law

C- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3279.01)*** to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:

1 Electronics and Office Equipment:
- for Telephony (ver. 3.0)
- for Audio/Video (ver. 3.0)
- for Battery Charging Systems (ver. 1.1)
- for Set-top Boxes and Cable Boxes (ver. 4.1)
- for Televisions (ver. 6.1)
- for Computers (ver. 6.0)
- for Displays (ver. 6.0)
- for Imaging Equipment (ver. 2.0)
- for Computer Servers (ver. 2.0)

2 Commercial Food Service Equipment
- for Commercial Dishwashers (ver. 2.0)
- for Commercial Ice Machines (ver. 2.0)
- for Commercial Ovens (ver. 2.1)
- for Commercial Refrigerators and Freezers

3 Lighting Products
- For Decorative Light Strings (ver. 1.5)
- For Luminaires (including sub-components) and Lamps (ver. 1.2)
- For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
- For Integral LED Lamps (ver. 1.4)

4 Heating, Ventilation, and AC Products
- for Residential Ceiling Fans (ver. 3.0)
- for Residential Ventilating Fans (ver. 3.2)

5 Other
- For Water Coolers (ver. 3.0)

D- ***A NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties:***

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Industry Canada - ISEDC) Foreign Certification Body – FCB – APEC Tel MRA -Phase I and Phase II;

- Chinese Taipei (Republic of China – Taiwan):
  - BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - EMC Directive 2004/108/EC US-EU EMC and Telecom MRA CAB
  - Radio and Teleterminal Equipment (RandTTE) Directive 1995/5/EC US -EU EMC and Telecom MRA CAB
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I and Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Development Authority - IDA) APEC Tel MRA -Phase I and Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
  - ENERGY STAR Recognized Test Laboratory – US EPA
  - Telecommunications Certification Body (TCB) – US FCC;
- Vietnam: APEC Tel MRA -Phase I;

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 v04.

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 firmware used was QRCT provided by *GoPro, Inc.*, the software is compliant with the standard requirements being tested against.

Modulation	Frequency (MHz)	Power Setting
802.11b	2412	17
	2437	17
	2462	17
8002.11g	2412	16
	2437	16
	2462	16
802.11n20	2412	16
	2437	16
	2462	16
802.11n40	2422	15
	2437	15
	2452	15
BLE	2402	default
	2440	default
	2480	default

Data Rates Tested:
802.11b mode: 1Mbps
802.11g mode: 6Mbps
802.11n HT20 mode: MCS0
802.11n HT40 mode: MCS0

2.3 Duty Cycle Correction Factor

According to KDB 558074 D01 DTS Meas Guidance v04 section 6.0:

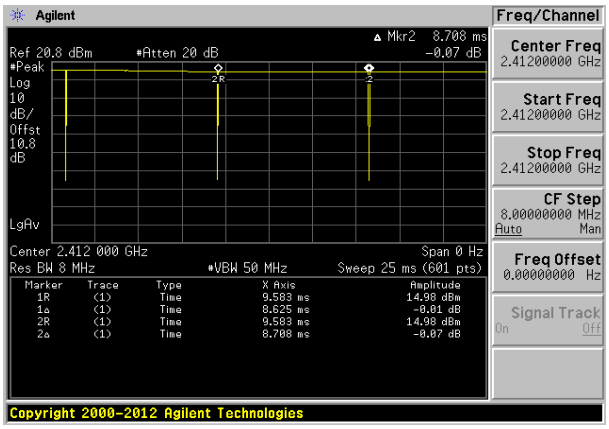
Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be utilized to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data is being acquired (i.e., no transmitter off-time is to be considered).

Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11b	8.625	8.708	99.05	0.04
802.11g	1.435	1.505	95.35	0.21
802.11n20	1.432	1.504	95.21	0.21
802.11n40	1.43	1.503	95.14	0.22
BLE	0.4053	0.6232	65.04	1.87

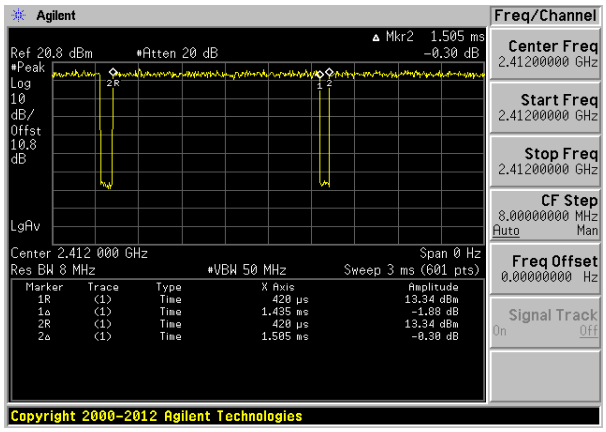
Duty Cycle = On Time (ms)/ Period (ms)
Duty Cycle Correction Factor (dB) = 10*log(1/Duty Cycle)

Please refer to the following plots.

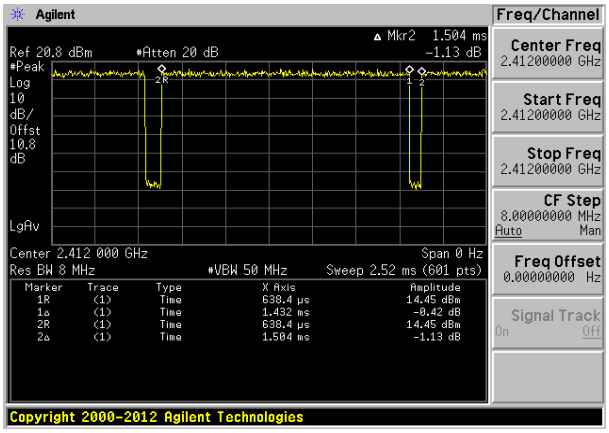
802.11b mode



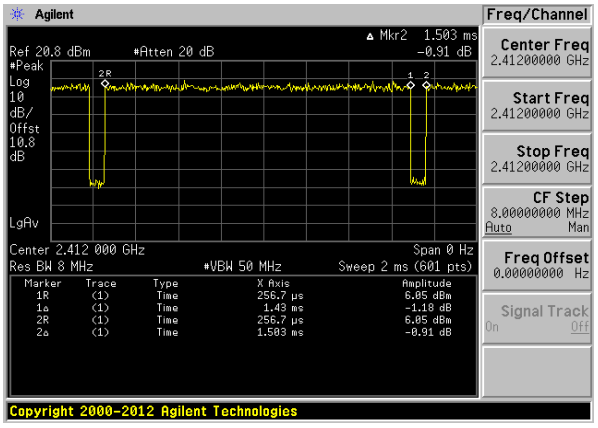
802.11g mode



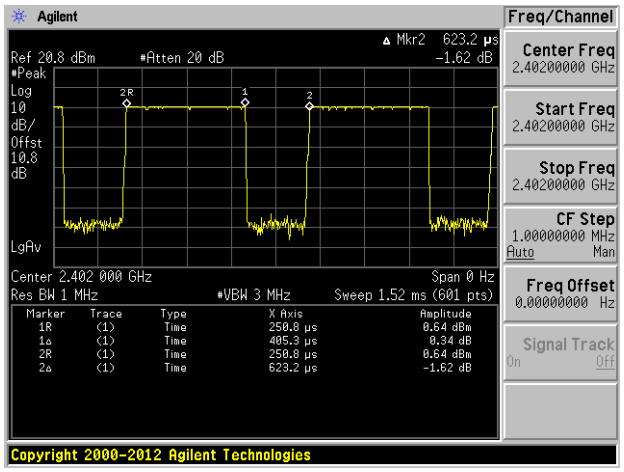
802.11n20 mode



802.11n40 mode



BLE



2.4 Equipment Modifications

A hole was cut in the side of the EUT with a RF cable coming out to connect antenna ports to power spectrum analyzer.

2.5 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude E7450

2.6 Support Equipment

There was no support equipment included, or intended for use with EUT during these tests.

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
USB Type C 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 and ISEDC Rules	Description of Test	Results
FCC §15.203 ISEDC RSS-Gen §8.3	Antenna Requirement	Compliant
FCC §15.207 ISEDC RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
FCC §2.1093, §15.247(i) ISEDC RSS-102	RF Exposure	Compliant[1]
FCC §2.1051, §15.247 (d) ISEDC RSS-247 §5.5	Spurious Emissions at Antenna Port	Compliant
FCC §2.1053, §15.205, §15.209, §15.247 (d) ISEDC RSS-247 §5.5 ISEDC RSS-Gen §8.9 and §8.10	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) ISEDC RSS-247 §5.2 (1)	6 dB and 99% Emission Bandwidth	Compliant
FCC §15.247(b)(3) ISEDC RSS-247 §5.4 (4)	Maximum Peak Output Power	Compliant
FCC §15.247(d) ISEDC RSS-247 §5.5	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §15.247(e) ISEDC RSS-247 §5.2 (2)	Power Spectral Density	Compliant

Note[1]: RF exposure analysis is covered in a separate report.

4 FCC §15.203 & ISEDC 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 ISEDC 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 isotopically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the license-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of license-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

The antennas used by the EUT are permanent attached antennas.

Antenna usage	Frequency Range (MHz)	Maximum Antenna Gain (dBi)
Wi-Fi/Bluetooth	2400-2500	-1.0
Wi-Fi	5180-5720	4.5
Wi-Fi	5745-5825	3.0

5 FCC §2.1093, §15.247(i) & ISEDC RSS-102 – RF Exposure

5.1 Applicable Standards

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

5.2 Test Results

Please refer to the SAR Report: R1704261- SAR.

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

6.1 Applicable Standards

As per FCC §15.207 and ISEDC 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 C63.10-2013 measurement procedure. The specification used were FCC §15.207 and ISEDC 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 cords of support equipment were connected to LISN-2.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data were recorded in the peak, quasi-peak, and average detection mode. Quasi-Peak readings are distinguished with a “QP.” Average readings are distinguished with an “Ave”.

6.4 Corrected Amplitude and 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:

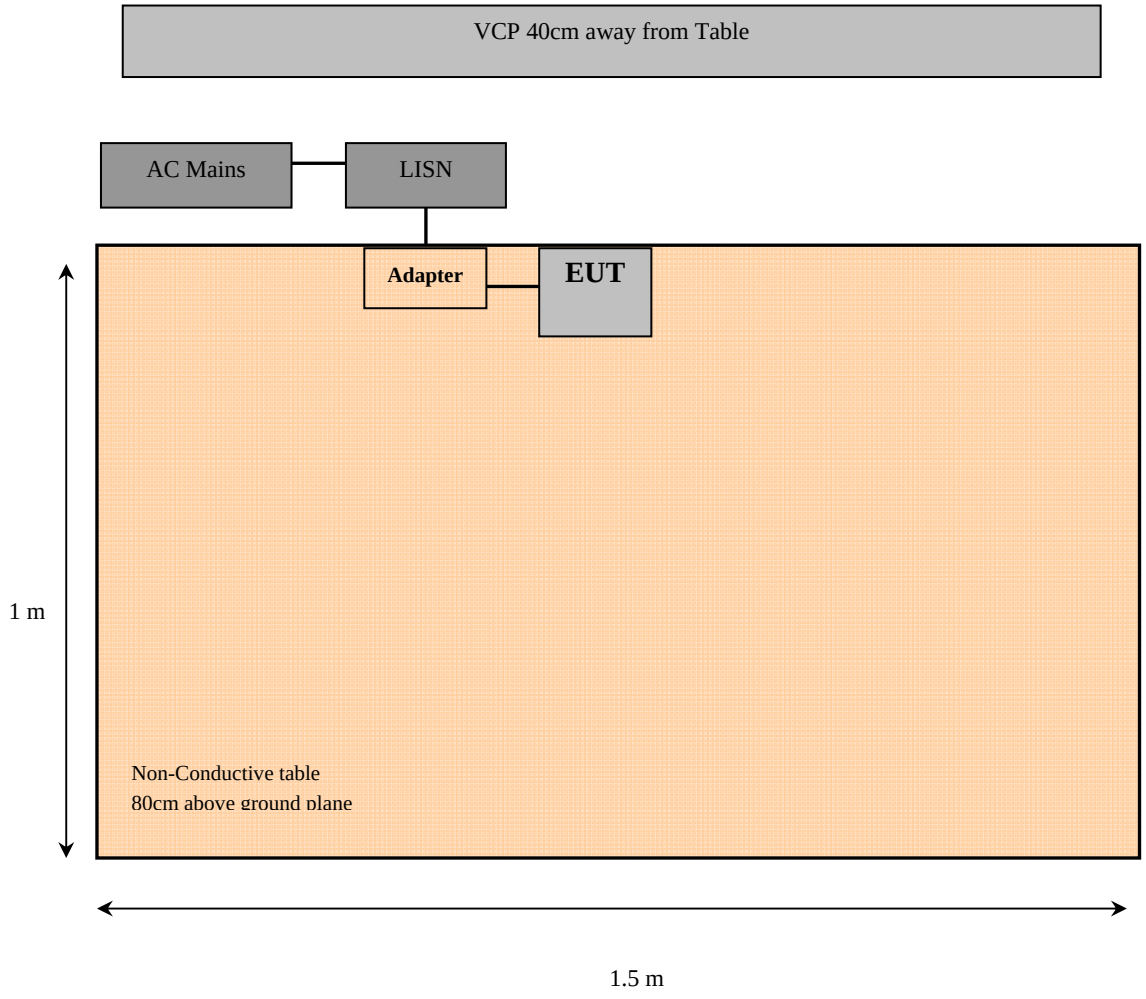
CA = Ai + CL + Atten

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 and Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100338	2016-02-04	2 years
Rohde and Schwarz	Impulse Limiter	ESH3-Z2	101964	2016-07-22	1 year
Keysight Technologies	RF Limiter	11867A	MY42242931	2017-01-12	1 year
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150204	2017-03-13	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	N/R	N/A
FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160129	2017-04-24	1 year
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

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

6.7 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	101.31 kPa

The testing was performed by Vincent Licata on 2017-05-25 in 5 chamber 3.

6.8 Summary of Test Results

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

2.4 GHz Wi-Fi

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-12.51	0.461396	Line	0.15-30

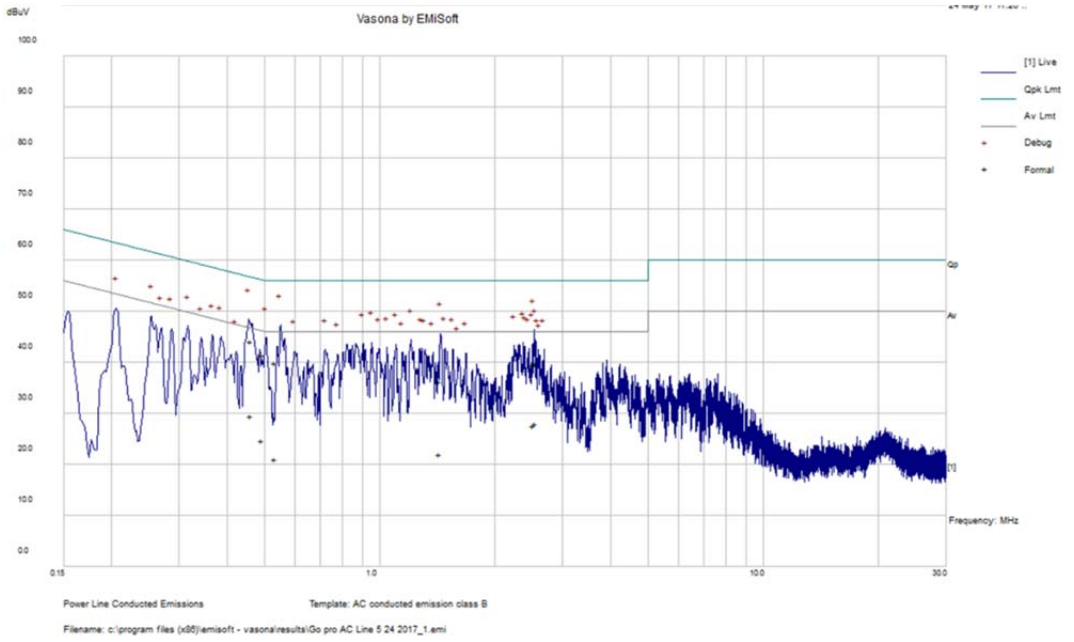
BLE

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-10.68	0.48907	Line	0.15-30

6.9 Conducted Emissions Test Plots and Data

2.4 GHz Wi-Fi

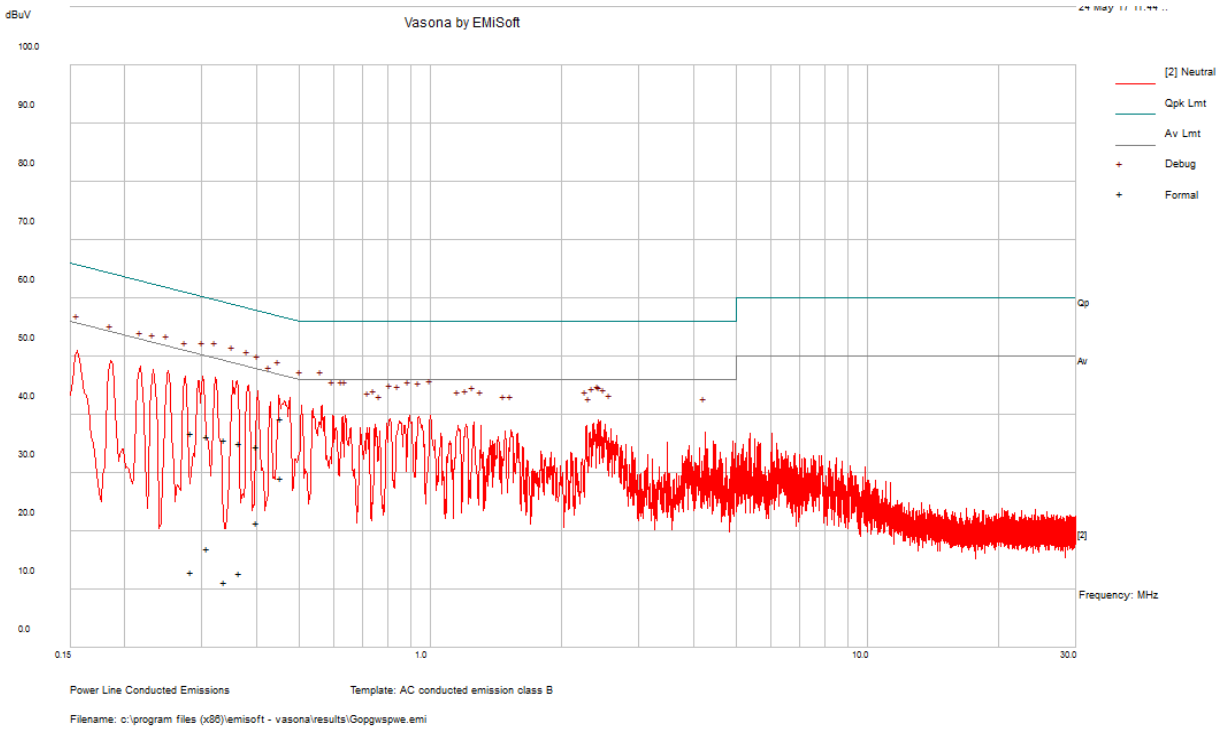
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.461396	44.16	Line	56.67	-12.51	QP
0.533587	39.91	Line	56	-16.09	QP
2.509261	39.56	Line	56	-16.44	QP
1.429845	36.33	Line	56	-19.67	QP
0.492253	41.47	Line	56.13	-14.66	QP
2.540112	39.67	Line	56	-16.33	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.461396	29.6	Line	46.67	-17.07	Ave.
0.533587	21.05	Line	46	-24.95	Ave.
2.509261	27.66	Line	46	-18.34	Ave.
1.429845	22.04	Line	46	-23.96	Ave.
0.492253	24.68	Line	46.13	-21.44	Ave.
2.540112	28.06	Line	46	-17.94	Ave.

120 V, 60 Hz – Neutral

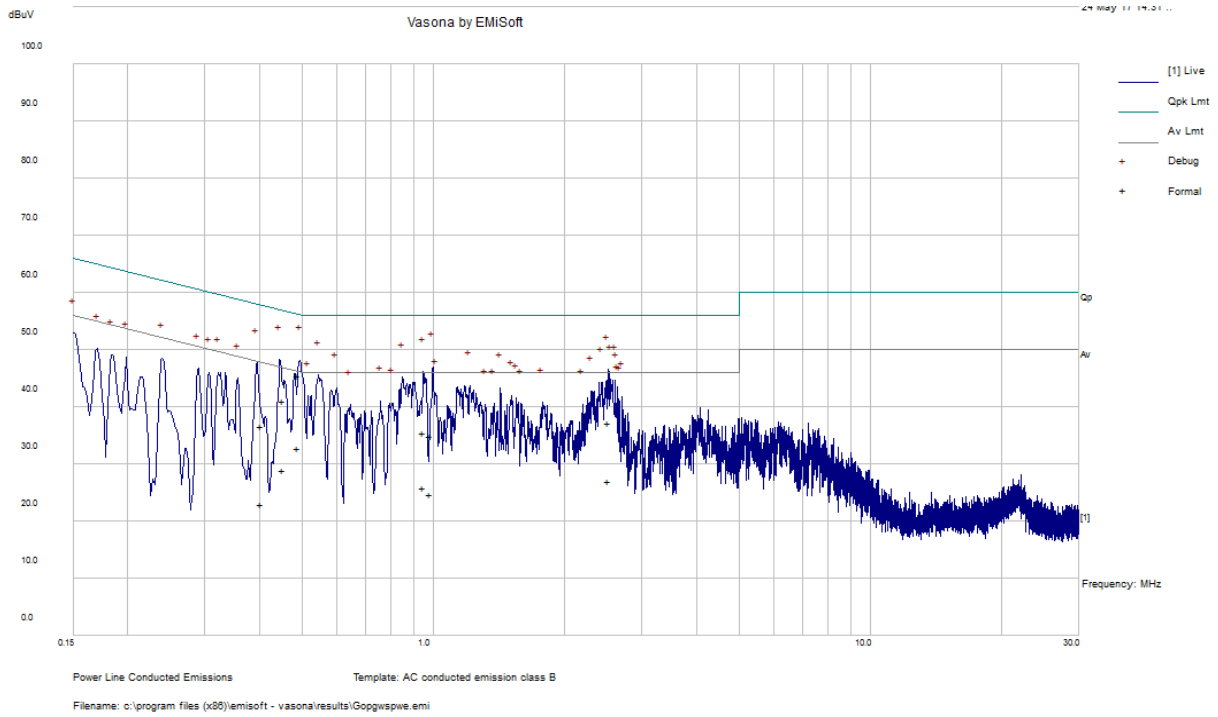


Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.33948	35.63	Neutral	59.22	-23.59	QP
0.309512	36.23	Neutral	59.98	-23.75	QP
0.365332	35.2	Neutral	58.61	-23.41	QP
0.455206	39.4	Neutral	56.78	-17.38	QP
0.400018	34.56	Neutral	57.85	-23.29	QP
0.28352	36.86	Neutral	60.71	-23.86	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.33948	11.24	Neutral	49.22	-37.97	Ave.
0.309512	16.99	Neutral	49.98	-32.99	Ave.
0.365332	12.78	Neutral	48.61	-35.82	Ave.
0.455206	29.08	Neutral	46.78	-17.7	Ave.
0.400018	21.44	Neutral	47.85	-26.42	Ave.
0.28352	12.94	Neutral	50.71	-37.77	Ave.

BLE

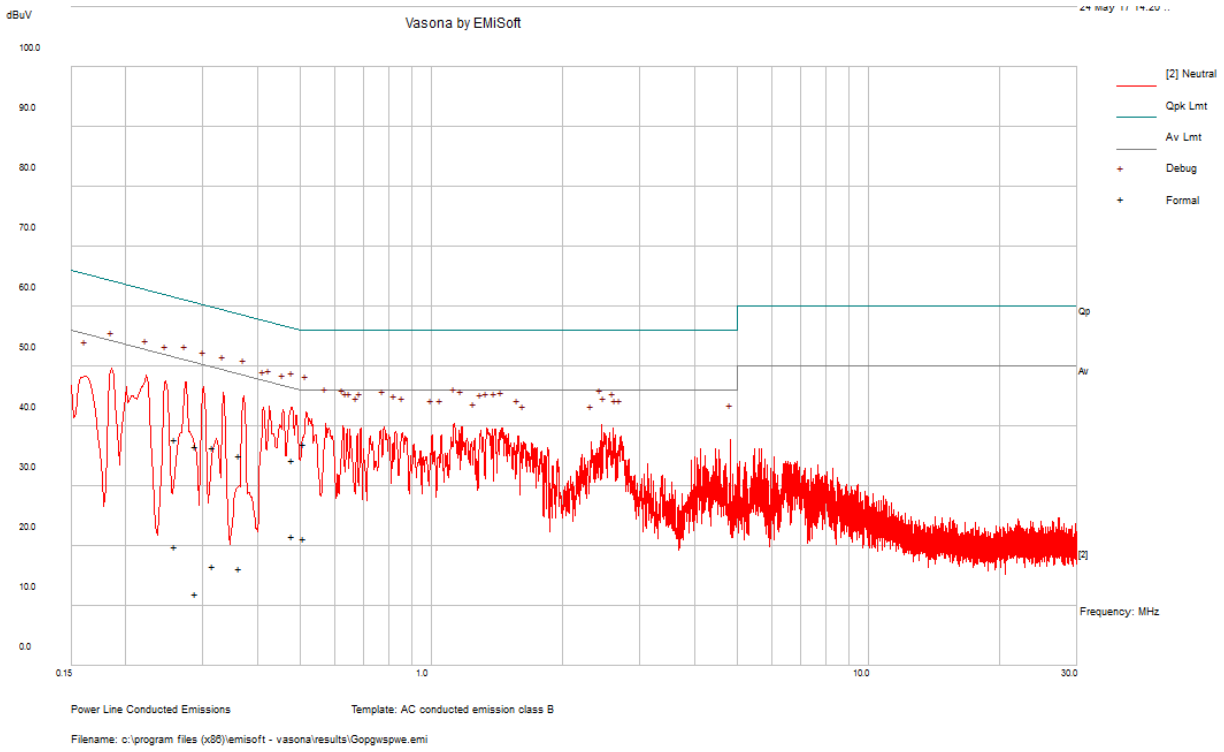
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.48907	45.5	Line	56.18	-10.68	QP
0.453515	41.12	Line	56.81	-15.69	QP
0.986155	35	Line	56	-21	QP
2.51638	37.26	Line	56	-18.74	QP
0.95072	35.47	Line	56	-20.53	QP
0.403237	36.73	Line	57.79	-21.06	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.48907	32.78	Line	46.18	-13.4	Ave.
0.453515	28.97	Line	46.81	-17.84	Ave.
0.986155	24.77	Line	46	-21.23	Ave.
2.51638	27.13	Line	46	-18.87	Ave.
0.95072	25.95	Line	46	-20.05	Ave.
0.403237	23.11	Line	47.79	-24.68	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.481274	34.32	Neutral	56.32	-21.99	QP
0.364111	35.04	Neutral	58.63	-23.59	QP
0.511402	36.96	Neutral	56	-19.04	QP
0.258849	37.81	Neutral	61.47	-23.66	QP
0.317567	36.4	Neutral	59.77	-23.37	QP
0.289172	36.62	Neutral	60.55	-23.93	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.481274	21.66	Neutral	46.32	-24.66	Ave.
0.364111	16.36	Neutral	48.63	-32.27	Ave.
0.511402	21.25	Neutral	46	-24.75	Ave.
0.258849	20.02	Neutral	51.47	-31.45	Ave.
0.317567	16.77	Neutral	49.77	-33	Ave.
0.289172	12.04	Neutral	50.55	-38.5	Ave.

7 FCC §15.209, §15.247(d) & ISEDC RSS-247 §5.5, RSS-Gen §8.9, §8.10 - 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 §15.205(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 §15.209(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 §15.247 (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 ISEDC 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 license-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 ISEDC 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 ISEDC 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 were 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 was set 3 meter away from the testing antenna, which was varied from 1-4 meter, and the EUT was placed on a turntable, which was 0.8 meter and 1.5 meter above the ground plane for below and above 1000 MHz measurements, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna's polarity should be changed between horizontal and vertical.

The spectrum analyzer or receiver was 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 and 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 and Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100338	2016-02-04	2 years
Agilent	Analyzer, Spectrum	E4440A	US44300386	2016-06-10	1 year
Sunol Sciences	System Controller	SC99V	011003-1	N/R	N/A
Sunol Sciences	Antenna, Biconi-Log	JB1	A013105-3	2015-07-11	2 years
EMCO	Antenna, Horn	3115	9511-4627	2016-01-28	2 years
Agilent	Amplifier, Pre	8447D	2944A06639	2016-06-28	1 year
IW	AOBOR Hi frequency Co AX Cable	DC 1531	KPS-1501A3960KPS	2016-08-05	1 year
-	SMA cable	-	C0002	Each time[1]	N/A
-	N-Type Cable	-	C00012	Each time[1]	N/A
-	N-Type Cable	-	C00014	Each time[1]	N/A
Agilent	Pre-Amplifier	8449B	3008A01978	2016-10-06	1 year
Sunol Sciences	Antenna, Horn	DRH-118	A052704	2017-03-27	2 years
A.R.A.	Antenna, Horn	DRG-118/A	1132	2015-09-21	2 years
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL *attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

7.6 Test Environmental Conditions

Temperature:	20-22 ºC
Relative Humidity:	42-50 %
ATM Pressure:	102.7 kPa

The testing was performed by Vincent Licata and Jose Martinez 2017-05-12 to 2017-05-14 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 ISEDC RSS-247 standard's radiated emissions limits, and had the worst margin of:

2.4 GHz Wi-Fi

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, channel**
-0.36	2390	Horizontal	n40 mode, low channel

BLE

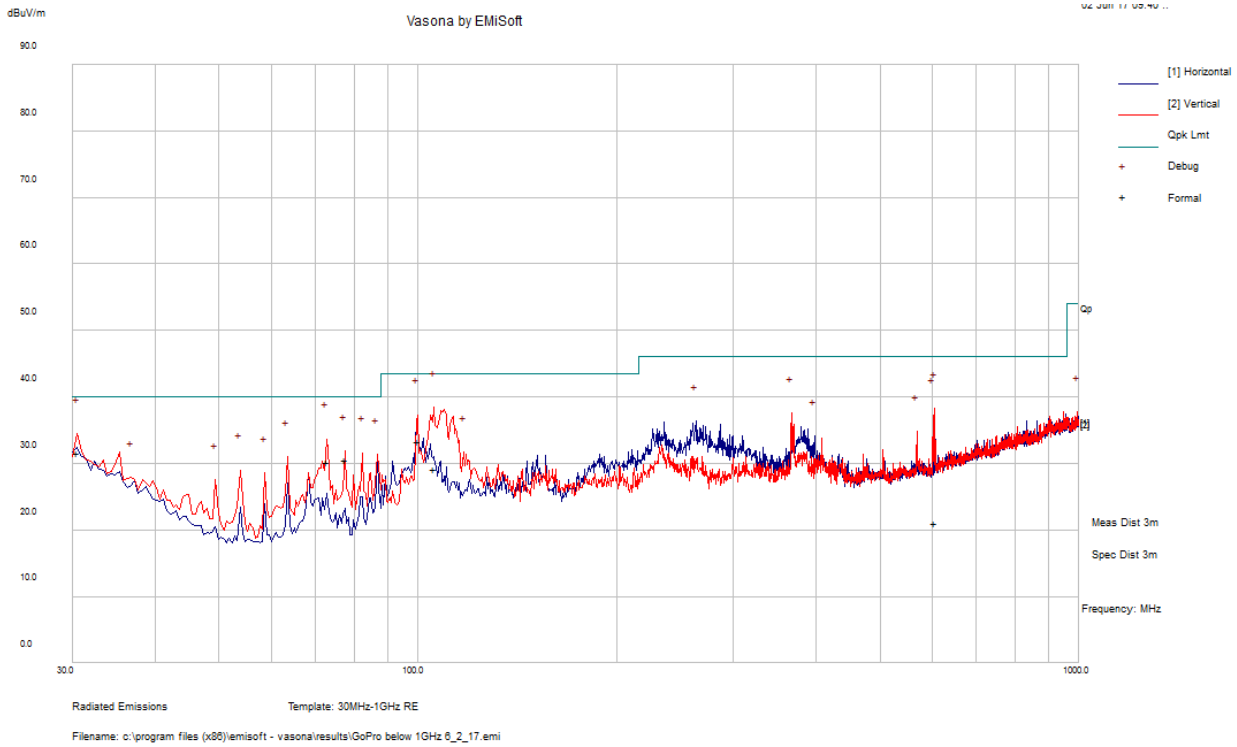
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**channel**
-1.877	2483.5	Horizontal	high channel

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

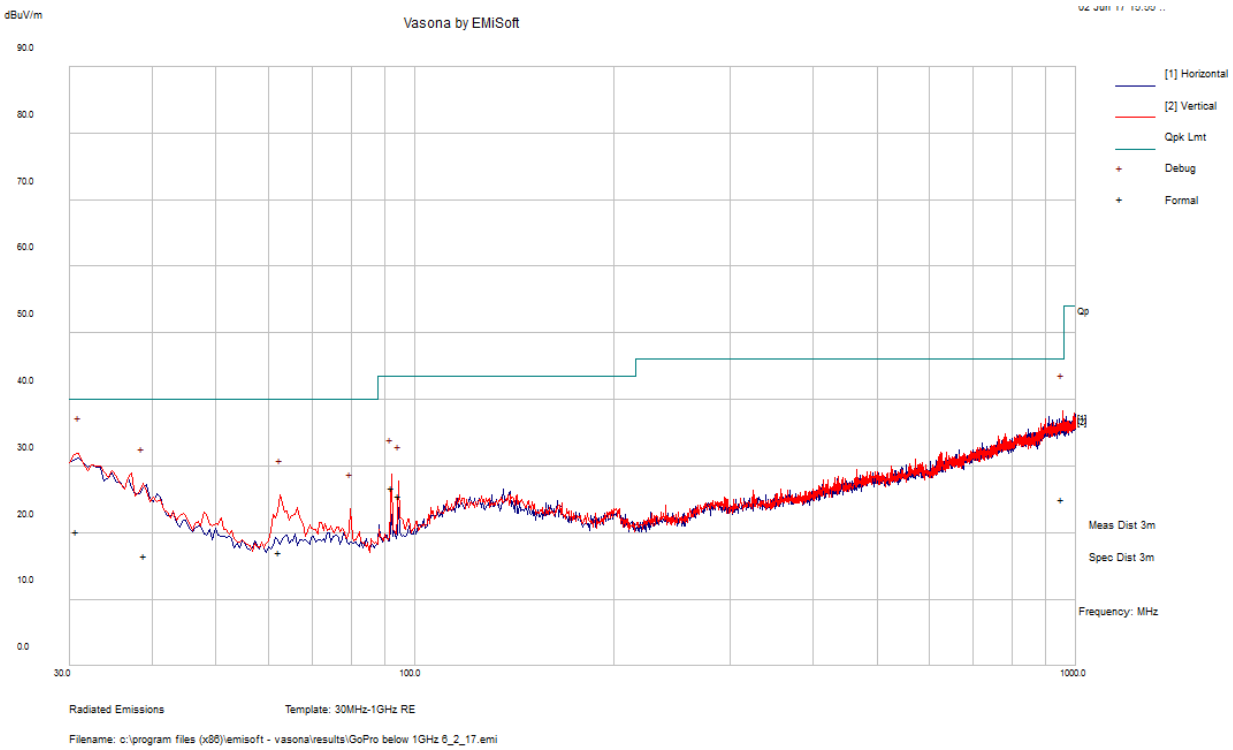
2.4 GHz Wi-Fi



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
105.8705	29.13	194	V	43	43.5	-14.37	QP
30.577	31.66	117	V	115	40	-8.34	QP
99.909	33.29	123	V	82	43.5	-10.21	QP
72.9195	30.2	148	V	9	40	-9.8	QP
605.459	21.03	133	V	214	46	-24.97	QP
77.6195	30.62	124	V	118	40	-9.38	QP

Note: Only 6 emissions were present because the other emissions were 20 dB below the limit.

BLE



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
953.729	25	242	V	225	46	-21	QP
30.7395	20.17	299	V	47	40	-19.83	QP
38.92	16.6	232	V	319	40	-23.4	QP
62.2575	17.11	149	V	67	40	-22.89	QP
92.306	26.76	165	V	183	43.5	-16.74	QP
94.49575	25.5	123	V	130	43.5	-18	QP

Note: Only 6emissions were present because the other emissions were 20 dB below the noise floor.

.

2) 1–25 GHz Measured at 3 meters

802.11b mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
2412	77.92	56	170	H	29.04	5.02	0	111.98	-	-	PK
2412	74.66	63	180	H	29.04	5.02	0	108.72	-	-	AV
2412	72.52	55	108	V	29.04	5.02	0	106.58	-	-	PK
2412	70.11	62	133	V	29.04	5.02	0	104.17	-	-	AV
2390	30.44	57	170	H	29.04	4.90	0	64.38	74.00	-9.62	PK
2390	18.53	59	170	H	29.04	4.90	0	52.47	54.00	-1.53	AV
2390	27.93	57	130	V	29.04	4.90	0	61.87	74.00	-12.13	PK
2390	16.50	59	131	V	29.04	4.90	0	50.44	54.00	-3.56	AV
4824	54.67	81	100	H	32.47	6.42	38.55	55.01	74.00	-18.99	PK
4824	50.69	80	100	H	32.47	6.42	38.55	51.03	54.00	-2.97	AV
4824	49.74	210	100	V	32.47	6.42	38.55	50.08	74.00	-23.92	PK
4824	43.29	210	100	V	32.47	6.42	38.55	43.63	54.00	-10.37	AV
7236	47.25	331	200	H	36.69	7.43	37.9	53.47	74.00	-20.53	PK
7236	35.97	320	140	H	36.69	7.43	37.9	42.19	54.00	-11.81	AV
7236	47.52	180	100	V	36.69	7.43	37.9	53.74	74.00	-20.26	PK
7236	39.02	45	252	V	36.69	7.43	37.9	45.24	54.00	-8.76	AV
9648	47.15	190	300	H	37.77	10.61	38.29	57.24	74.00	-16.76	PK
9648	34.47	0	100	H	37.77	10.61	38.29	44.56	54.00	-9.44	AV
Middle Channel 2437 MHz											
2437	67.87	193	100	H	29.34	6.29	0.00	103.50	-	-	PK
2437	65.39	193	100	H	29.34	6.29	0.00	101.02	-	-	AV
2437	67.76	9	100	V	29.34	6.29	0.00	103.39	-	-	PK
2437	65.26	10	100	V	29.34	6.29	0.00	100.89	-	-	AV
4874	52.99	80	100	H	32.64	6.42	38.55	53.50	74.00	-20.50	PK
4874	48.69	80	100	H	32.64	6.42	38.55	49.20	54.00	-4.80	AV
4874	48.89	130	100	V	32.64	9.26	38.55	52.24	74.00	-21.76	PK
4874	39.92	123	100	V	32.64	9.26	38.55	43.27	54.00	-10.73	AV
7311	46.85	0	100	H	37.15	12.13	37.90	58.23	74.00	-15.77	PK
7311	36.76	58	115	H	37.15	12.13	37.90	48.14	54.00	-5.86	AV
7311	47.53	288	100	V	37.15	12.13	37.90	58.91	74.00	-15.09	PK
7311	37.80	72	250	V	37.15	12.13	37.90	49.18	54.00	-4.82	AV
9748	47.19	180	100	H	37.87	13.81	38.30	60.57	74.00	-13.43	PK
9748	35.12	0	260	H	37.87	13.81	38.30	48.50	54.00	-5.50	AV
9748	47.45	210	100	V	37.87	13.81	38.30	60.83	74.00	-13.17	PK
9748	34.92	120	100	V	37.87	13.81	38.30	48.30	54.00	-5.70	AV

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz											
2462	71.75	31	280	H	29.41	6.35	0.00	107.51	-	-	PK
2462	69.25	30	264	H	29.41	6.35	0.00	105.01	-	-	AV
2462	69.34	3	161	V	29.41	6.35	0.00	105.10	-	-	PK
2462	64.92	0	100	V	29.41	6.35	0.00	100.68	-	-	AV
2483.5	29.69	60	190	H	29.41	5.02	0.00	64.12	74.00	-9.88	PK
2483.5	18.41	60	137	H	29.41	5.02	0.00	52.84	54.00	-1.16	AV
2483.5	28.24	0	100	V	29.41	5.02	0.00	62.67	74.00	-11.33	PK
2483.5	16.47	25	160	V	29.41	5.02	0.00	50.90	54.00	-3.10	AV
4924	52.42	80	100	H	32.64	5.95	38.54	52.47	74.00	-21.53	PK
4924	47.75	80	123	H	32.64	5.95	38.54	47.80	54.00	-6.20	AV
4924	48.59	197	100	V	32.64	9.32	38.54	52.01	74.00	-21.99	PK
4924	38.63	77	100	V	32.64	9.32	38.54	42.05	54.00	-11.95	AV
7386	46.98	216	100	H	37.14	12.13	37.89	58.36	74.00	-15.64	PK
7386	36.36	74	100	H	37.14	12.13	37.89	47.74	54.00	-6.26	AV
7386	46.54	163	100	V	37.14	12.13	37.89	57.92	74.00	-16.08	PK
7386	36.11	69	100	V	37.14	12.13	37.89	47.49	54.00	-6.51	AV
9848	46.12	0	100	H	37.95	13.30	38.09	59.27	74.00	-14.73	PK
9848	34.20	0	280	H	37.95	13.30	38.09	47.36	54.00	-6.64	AV
9848	46.40	50	100	V	37.95	13.30	38.09	59.56	74.00	-14.45	PK
9848	34.39	8	100	V	37.95	13.30	38.09	47.55	54.00	-6.46	AV

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/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
2412	72.17	194	100	H	29.04	6.29	0	107.50	-	-	PK
2412	64.97	195	155	H	29.04	6.29	0	100.30	-	-	AV
2412	71.09	349	142	V	29.04	6.29	0	106.42	-	-	PK
2412	62.88	350	140	V	29.04	6.29	0	98.21	-	-	AV
2390	30.11	60	100	H	29.04	4.90	0	64.05	74.00	-9.95	PK
2390	18.90	60	150	H	29.04	4.90	0	52.84	54.00	-1.16	AV
2390	28.86	20	100	V	29.04	4.90	0	62.80	74.00	-11.20	PK
2390	16.99	60	100	V	29.04	4.90	0	50.93	54.00	-3.07	AV
4824	49.51	100	100	H	32.47	6.42	38.55	49.85	74.00	-24.15	PK
4824	39.33	80	100	H	32.47	6.42	38.55	39.67	54.00	-14.33	AV
4824	48.18	123	100	V	32.47	9.37	38.55	51.47	74.00	-22.53	PK
4824	37.16	186	100	V	32.47	9.37	38.55	40.45	54.00	-13.55	AV
7236	47.04	184	100	H	36.69	11.87	37.9	57.70	74.00	-16.30	PK
7236	35.67	191	100	H	36.69	11.87	37.9	46.33	54.00	-7.67	AV
7236	47.27	298	100	V	36.69	11.87	37.9	57.93	74.00	-16.07	PK
7236	35.85	150	100	V	36.69	11.87	37.9	46.51	54.00	-7.49	AV
9648	47.79	61	100	H	37.83	14.56	38.29	61.89	74.00	-12.11	PK
9648	35.67	205	100	H	37.83	14.56	38.29	49.77	54.00	-4.23	AV
9648	47.92	144	300	V	37.83	14.56	38.29	62.02	74.00	-11.98	PK
9648	35.84	283	280	V	37.83	14.56	38.29	49.94	54.00	-4.06	AV
Middle Channel 2437 MHz											
2437	74.35	60	138	H	29.04	5.02	0.00	108.41	-	-	PK
2437	68.48	60	210	H	29.04	5.02	0.00	102.54	-	-	AV
2437	69.37	80	140	V	29.04	5.02	0.00	103.43	-	-	PK
2437	61.44	95	100	V	29.04	5.02	0.00	95.50	-	-	AV
4874	50.37	90	100	H	32.64	6.42	38.55	50.88	74.00	-23.12	PK
4874	38.84	85	100	H	32.64	6.42	38.55	39.35	54.00	-14.65	AV
4874	47.59	338	100	V	32.64	9.26	38.55	50.94	74.00	-23.06	PK
4874	36.26	208	100	V	32.64	9.26	38.55	39.61	54.00	-14.39	AV
7311	47.10	339	100	H	37.15	12.13	37.90	58.48	74.00	-15.52	PK
7311	35.27	0	100	H	37.15	12.13	37.90	46.65	54.00	-7.35	AV
7311	47.04	0	100	V	37.15	12.13	37.90	58.42	74.00	-15.58	PK
7311	35.36	355	210	V	37.15	12.13	37.90	46.74	54.00	-7.26	AV
9748	48.23	208	100	H	37.87	13.81	38.30	61.61	74.00	-12.39	PK
9748	35.93	347	100	H	37.87	13.81	38.30	49.31	54.00	-4.69	AV
9748	47.98	44	100	V	37.87	13.81	38.30	61.36	74.00	-12.64	PK
9748	36.06	157	100	V	37.87	13.81	38.30	49.44	54.00	-4.56	AV

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz											
2462	71.48	75	265	H	29.41	6.35	0.00	107.24	-	-	PK
2462	60.90	190	100	H	29.41	6.35	0.00	96.66	-	-	AV
2462	69.91	0	120	V	29.41	6.35	0.00	105.67	-	-	PK
2462	62.47	0	165	V	29.41	6.35	0.00	98.23	-	-	AV
2483.5	28.31	0	100	H	29.41	5.02	0.00	62.74	74.00	-11.26	PK
2483.5	17.38	70	140	H	29.41	5.02	0.00	51.81	54.00	-2.19	AV
2483.5	28.06	0	140	V	29.41	5.02	0.00	62.49	74.00	-11.51	PK
2483.5	16.20	102	110	V	29.41	5.02	0.00	50.63	54.00	-3.37	AV
4924	51.02	94	100	H	32.64	5.95	38.54	51.07	74.00	-22.93	PK
4924	40.21	81	100	H	32.64	5.95	38.54	40.26	54.00	-13.74	AV
4924	47.72	4	100	V	32.64	9.32	38.54	51.14	74.00	-22.86	PK
4924	36.38	199	100	V	32.64	9.32	38.54	39.80	54.00	-14.20	AV
7386	46.98	0	120	H	37.14	12.13	37.89	58.36	74.00	-15.64	PK
7386	35.06	287	100	H	37.14	12.13	37.89	46.44	54.00	-7.56	AV
7386	46.57	326	100	V	37.14	12.13	37.89	57.95	74.00	-16.05	PK
7386	35.08	173	100	V	37.14	12.13	37.89	46.46	54.00	-7.54	AV
9848	47.01	107	100	H	37.95	13.30	38.09	60.17	74.00	-13.84	PK
9848	35.27	22	100	H	37.95	13.30	38.09	48.43	54.00	-5.57	AV
9848	46.76	24	100	V	37.95	13.30	38.09	59.92	74.00	-14.09	PK
9848	35.16	313	100	V	37.95	13.30	38.09	48.31	54.00	-5.69	AV

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/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
2412	75.31	39	188	H	29.04	5.02	0	109.37	-	-	PK
2412	66.76	39	190	H	29.04	5.02	0	100.82	-	-	AV
2412	70.53	15	100	V	29.04	5.02	0	104.59	-	-	PK
2412	62.76	15	100	V	29.04	5.02	0	96.82	-	-	AV
2390	29.21	75	140	H	29.04	4.90	0	63.15	74.00	-10.85	PK
2390	17.77	73	180	H	29.04	4.90	0	51.71	54.00	-2.29	AV
2390	27.90	25	100	V	29.04	4.90	0	61.84	74.00	-12.16	PK
2390	16.47	20	100	V	29.04	4.90	0	50.41	54.00	-3.59	AV
4824	50.43	80	120	H	32.47	6.42	38.55	50.77	74.00	-23.23	PK
4824	38.60	84	100	H	32.47	6.42	38.55	38.94	54.00	-15.06	AV
4824	47.66	179	270	V	32.47	9.37	38.55	50.95	74.00	-23.05	PK
4824	36.61	181	100	V	32.47	9.37	38.55	39.89	54.00	-14.11	AV
7236	46.51	120	100	H	36.69	11.87	37.9	57.17	74.00	-16.83	PK
7236	34.92	72	100	H	36.69	11.87	37.9	45.58	54.00	-8.42	AV
7236	46.57	160	100	V	36.69	11.87	37.9	57.23	74.00	-16.77	PK
7236	34.89	163	100	V	36.69	11.87	37.9	45.55	54.00	-8.45	AV
9648	47.34	233	100	H	37.83	14.56	38.29	61.44	74.00	-12.56	PK
9648	35.59	66	110	H	37.83	14.56	38.29	49.69	54.00	-4.31	AV
9648	47.27	227	100	V	37.83	14.56	38.29	61.37	74.00	-12.63	PK
9648	35.71	0	100	V	37.83	14.56	38.29	49.81	54.00	-4.19	AV
Middle Channel 2437 MHz											
2437	71.52	194	100	H	29.34	6.29	0.00	107.15	-	-	PK
2437	61.52	194	178	H	29.34	6.29	0.00	97.15	-	-	AV
2437	70.69	3	155	V	29.34	6.29	0.00	106.32	-	-	PK
2437	61.33	10	138	V	29.34	6.29	0.00	96.96	-	-	AV
4874	50.52	80	100	H	32.64	6.42	38.55	51.03	74.00	-22.97	PK
4874	37.98	82	100	H	32.64	6.42	38.55	38.49	54.00	-15.51	AV
4874	47.54	0	100	V	32.64	9.26	38.55	50.89	74.00	-23.11	PK
4874	36.21	179	100	V	32.64	9.26	38.55	39.56	54.00	-14.44	AV
7311	46.63	330	100	H	37.15	12.13	37.90	58.01	74.00	-15.99	PK
7311	35.12	200	100	H	37.15	12.13	37.90	46.50	54.00	-7.50	AV
7311	47.78	145	100	V	37.15	12.13	37.90	59.16	74.00	-14.84	PK
7311	35.21	192	100	V	37.15	12.13	37.90	46.59	54.00	-7.41	AV
9748	47.72	0	100	H	37.87	13.81	38.30	61.10	74.00	-12.90	PK
9748	35.79	0	100	H	37.87	13.81	38.30	49.17	54.00	-4.83	AV
9748	47.58	0	160	V	37.87	13.81	38.30	60.96	74.00	-13.04	PK
9748	35.84	0	100	V	37.87	13.81	38.30	49.22	54.00	-4.78	AV

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz											
2462	69.65	194	100	H	29.41	6.35	0.00	105.41	-	-	PK
2462	60.72	188	215	H	29.41	6.35	0.00	96.48	-	-	AV
2462	69.46	0	100	V	29.41	6.35	0.00	105.22	-	-	PK
2462	60.65	0	140	V	29.41	6.35	0.00	96.41	-	-	AV
2483.5	29.39	20	100	H	29.41	5.02	0.00	63.82	74.00	-10.18	PK
2483.5	18.25	45	120	H	29.41	5.02	0.00	52.68	54.00	-1.32	AV
2483.5	29.09	25	100	V	29.41	5.02	0.00	63.52	74.00	-10.48	PK
2483.5	16.87	45	100	V	29.41	5.02	0.00	51.30	54.00	-2.70	AV
4924	50.24	77	100	H	32.64	5.95	38.54	50.29	74.00	-23.71	PK
4924	38.30	80	140	H	32.64	5.95	38.54	38.35	54.00	-15.65	AV
4924	46.78	0	100	V	32.64	9.32	38.54	50.20	74.00	-23.80	PK
4924	36.36	183	100	V	32.64	9.32	38.54	39.78	54.00	-14.22	AV
7386	46.53	233	100	H	37.14	12.13	37.89	57.91	74.00	-16.09	PK
7386	34.95	116	140	H	37.14	12.13	37.89	46.33	54.00	-7.67	AV
7386	46.62	128	100	V	37.14	12.13	37.89	58.00	74.00	-16.00	PK
7386	34.98	0	100	V	37.14	12.13	37.89	46.36	54.00	-7.64	AV
9848	46.70	242	100	H	37.95	13.30	38.09	59.86	74.00	-14.15	PK
9848	35.16	293	130	H	37.95	13.30	38.09	48.32	54.00	-5.69	AV
9848	47.07	180	100	V	37.95	13.30	38.09	60.23	74.00	-13.78	PK
9848	35.15	0	120	V	37.95	13.30	38.09	48.31	54.00	-5.70	AV

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/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2422 MHz											
2422	67.22	194	110	H	29.04	6.29	0.00	102.55	-	-	PK
2422	57.36	7	110	H	29.04	6.29	0.00	92.69	-	-	AV
2422	66.35	6	120	V	29.04	6.29	0.00	101.68	-	-	PK
2422	58.18	194	100	V	29.04	6.29	0.00	93.51	-	-	AV
2390	38.33	44	300	H	29.04	4.90	0.00	72.27	74.00	-1.73	PK
2390	19.70	40	170	H	29.04	4.90	0.00	53.64	54.00	**-0.36**	AV
2390	33.53	16	170	V	29.04	4.90	0.00	67.47	74.00	-6.53	PK
2390	17.26	20	170	V	29.04	4.90	0.00	51.20	54.00	-2.80	AV
4844	47.14	0	240	H	32.47	6.42	38.54	47.49	74.00	-26.51	PK
4844	36.09	45	260	H	32.47	6.42	38.54	36.44	54.00	-17.56	AV
7266	46.86	270	100	H	37.15	7.43	37.90	53.54	74.00	-20.46	PK
7266	35.54	0	100	H	37.15	7.43	37.90	42.22	54.00	-11.78	AV
9688	47.59	135	100	H	37.84	10.61	38.29	57.75	74.00	-16.25	PK
9688	36.11	0	100	H	37.84	10.61	38.29	46.27	54.00	-7.73	AV
Middle Channel 2437 MHz											
2437	66.01	200	100	H	29.34	6.29	0.00	101.64	-	-	PK
2437	57.94	199	190	H	29.34	6.29	0.00	93.57	-	-	AV
2437	65.91	0	140	V	29.34	6.29	0.00	101.54	-	-	PK
2437	57.14	0	120	V	29.34	6.29	0.00	92.77	-	-	AV
4874	48.05	80	100	H	32.64	6.42	38.55	48.56	74.00	-25.44	PK
4874	37.32	80	130	H	32.64	6.42	38.55	37.83	54.00	-16.17	AV
7311	47.07	208	100	H	37.15	7.61	37.90	53.93	74.00	-20.07	PK
7311	35.51	157	100	H	37.15	7.61	37.90	42.37	54.00	-11.63	AV
9748	47.21	108	100	H	37.84	10.67	38.30	57.42	74.00	-16.58	PK
9748	35.85	0	100	H	37.84	10.67	38.30	46.06	54.00	-7.94	AV
High Channel 2452 MHz											
2452	65.76	190	180	H	29.35	6.35	0.00	101.46	-	-	PK
2452	58.60	191	200	H	29.35	6.35	0.00	94.30	-	-	AV
2452	65.67	0	130	V	29.35	6.35	0.00	101.37	-	-	PK
2452	57.08	3	140	V	29.35	6.35	0.00	92.78	-	-	AV
2483.5	35.69	45	100	H	29.41	5.02	0.00	70.12	74.00	-3.88	PK
2483.5	18.92	45	125	H	29.41	5.02	0.00	53.35	54.00	-0.65	AV
2483.5	34.37	40	100	V	29.41	5.02	0.00	68.80	74.00	-5.20	PK
2483.5	16.93	45	150	V	29.41	5.02	0.00	51.36	54.00	-2.64	AV
4904	48.10	80	100	H	32.64	5.95	38.54	48.15	74.00	-25.85	PK
4904	37.15	85	100	H	32.64	5.95	38.54	37.20	54.00	-16.80	AV
7356	46.69	188	100	H	37.14	7.61	37.90	53.54	74.00	-20.46	PK
7356	35.45	119	100	H	37.14	7.61	37.90	42.30	54.00	-11.70	AV
9808	46.96	195	100	H	37.92	10.28	38.31	56.85	74.00	-17.15	PK
9808	35.84	355	200	H	37.92	10.28	38.31	45.73	54.00	-8.27	AV

BLE

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2402 MHz											
2402	59.85	55	278	V	29.04	6.25	0.00	95.142	-	-	Peak
2402	65.04	53	161	H	29.04	6.25	0.00	100.332	-	-	Peak
2402	57.95	50	280	V	29.04	6.25	0.00	93.242	-	-	Ave
2402	64.73	49	179	H	29.04	6.25	0.00	100.022	-	-	Ave
2390	27.5	0	100	V	29.04	6.24	0.00	62.782	74	-11.218	Peak
2390	28.07	55	158	H	29.04	6.24	0.00	63.352	74	-10.648	Peak
2390	16.17	0	100	V	29.04	6.24	0.00	51.452	54	-2.548	Ave
2390	16.02	70	100	H	29.04	6.24	0.00	51.302	54	-2.698	Ave
4804	48.01	75	100	V	32.47	8.42	38.56	50.338	74	-23.662	Peak
4804	51.05	75	100	H	32.47	8.42	38.56	53.378	74	-20.622	Peak
4804	38.15	75	174	V	32.47	8.42	38.56	40.478	54	-13.522	Ave
4804	43.62	67	120	H	32.47	8.42	38.56	45.948	54	-8.052	Ave
7206	47.08	0	100	V	36.69	10.21	37.90	56.075	74	-17.925	Peak
7206	47.23	0	100	H	36.69	10.21	37.90	56.225	74	-17.775	Peak
7206	36.08	0	100	V	36.69	10.21	37.90	45.075	54	-8.925	Ave
7206	36.08	0	100	H	36.69	10.21	37.90	45.075	54	-8.925	Ave
9608	48.20	0	240	V	37.77	11.62	38.29	59.299	74	-14.701	Peak
9608	48.00	0	100	H	37.77	11.62	38.29	59.099	74	-14.901	Peak
9608	36.74	0	100	V	37.77	11.62	38.29	47.839	54	-6.161	Ave
9608	36.70	0	100	H	37.77	11.62	38.29	47.799	54	-6.201	Ave
Middle Channel 2440 MHz											
2440	60.2	54	300	V	29.347	6.22	0.00	95.767	-	-	Peak
2440	65.38	50	159	H	29.347	6.22	0.00	100.947	-	-	Peak
2440	59.74	53	300	V	29.347	6.22	0.00	95.307	-	-	Ave
2440	64.86	49	159	H	29.347	6.22	0.00	100.427	-	-	Ave
4880	48.52	71	100	V	32.638	10.24	38.564	52.834	74	-21.166	Peak
4880	51.67	68	100	H	32.638	8.39	38.564	54.134	74	-19.866	Peak
4880	39.17	71	100	V	32.638	10.24	38.564	43.484	54	-10.516	Ave
4880	44.71	68	100	H	32.638	10.24	38.564	49.024	54	-4.976	Ave
7320	47.54	71	100	V	37.148	10.35	37.907	57.131	74	-16.869	Peak
7320	47.05	170	100	H	37.148	10.35	37.907	56.641	74	-17.359	Peak
7320	35.45	0	100	V	37.148	10.35	37.907	45.041	54	-8.959	Ave
7320	35.39	71	100	H	37.148	10.35	37.907	44.981	54	-9.019	Ave
9760	47.83	0	100	V	37.865	11.52	38.292	58.923	74	-15.077	Peak
9760	47.86	20	100	H	37.865	11.52	38.292	58.953	74	-15.047	Peak
9760	36.44	0	100	V	37.865	11.52	38.292	47.533	54	-6.467	Ave
9760	36.45	0	100	H	37.865	11.52	38.292	47.543	54	-6.457	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2480 MHz											
2480	57.99	115	100	V	29.413	6.18	0.00	93.583	-	-	Peak
2480	62.87	74	120	H	29.413	6.18	0.00	98.463	-	-	Peak
2480	57.55	115	100	V	29.413	6.18	0.00	93.143	-	-	Ave
2480	62.1	74	120	H	29.413	6.18	0.00	97.693	-	-	Ave
2483.5	27.6	0	100	V	29.413	6.24	0.00	63.253	74	-10.747	Peak
2483.5	27.78	0	100	H	29.413	6.24	0.00	63.433	74	-10.567	Peak
2483.5	16.35	274	120	V	29.413	6.24	0.00	52.003	54	-1.997	Ave
2483.5	16.47	74	100	H	29.413	6.24	0.00	52.123	54	**-1.877**	Ave
4960	53.87	100	100	H	32.738	8.31	38.535	56.383	74	-17.617	Peak
4960	47.07	87	120	H	32.738	8.31	38.535	49.583	54	-4.417	Ave
7440	47.96	0	100	H	37.034	10.38	37.89	57.484	74	-16.516	Peak
7440	35.70	0	100	H	37.034	10.38	37.89	45.224	54	-8.776	Ave
9920	47.82	0	100	H	37.985	11.45	38.326	58.929	74	-15.071	Peak
9920	36.43	340	120	H	37.985	11.45	38.326	47.539	54	-6.461	Ave

Note: Duty Cycle Correction Factor has been added to the measurements.

8 FCC §15.247(a) (2) & ISEDC RSS-247 §5.2 -Emission Bandwidth

8.1 Applicable Standards

According to ECFR §15.247(a) (2) and ISEDC 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 v04: 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	Analyzer, Spectrum	E4446A	MY48250238	2017-02-24	1 year
-	RF cable	-	-	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:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

The testing was performed by Vincent Licata and Chin Ming Lui on 2017-05-09 in RF site.

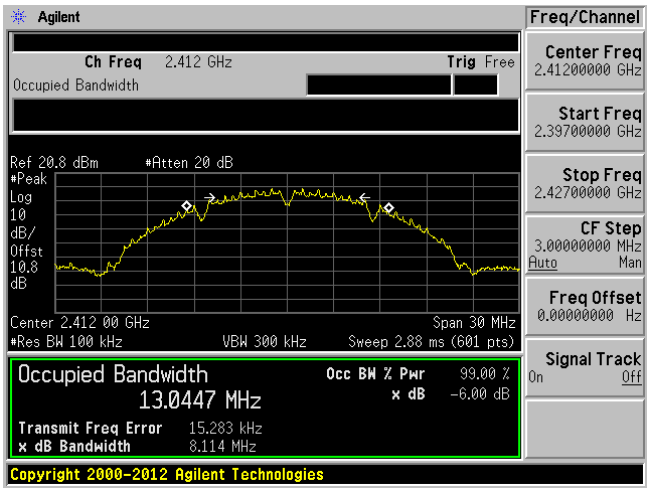
8.5 Test Results

Channel	Frequency (MHz)	99% OBW (kHz)	6 dB BW (kHz)	6 dB OBW limit (kHz)
802.11b mode				
Low	2412	13044.7	8114	500
Middle	2437	13035.4	7093	500
High	2462	13046.5	7180	500
802.11g mode				
Low	2412	16257.7	14738	500
Middle	2437	16270.6	14417	500
High	2462	16251.1	14279	500
802.11n-20 mode				
Low	2412	17456.9	15839	500
Middle	2437	17431.5	16855	500
High	2462	17418.2	14182	500
802.11n-40 mode				
Low	2422	35715.1	32619	500
Middle	2437	35730.5	33890	500
High	2452	35739.9	32899	500
BLE				
Low	2402	1086.2	811.129	500
Middle	2440	1093.5	672.326	500
High	2480	1102.1	705.198	500

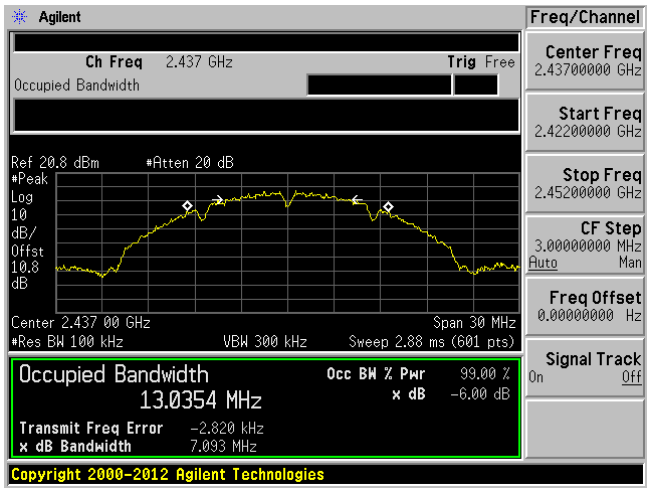
Please refer to the following plots for detailed test results.

802.11b mode

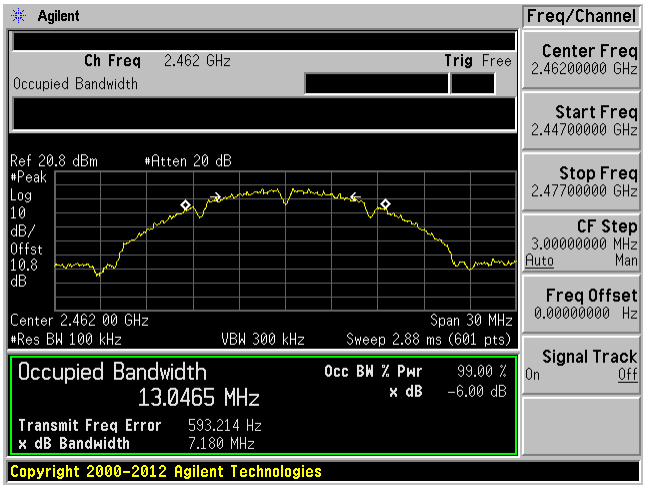
Low Channel 2412 MHz



Middle Channel 2437 MHz

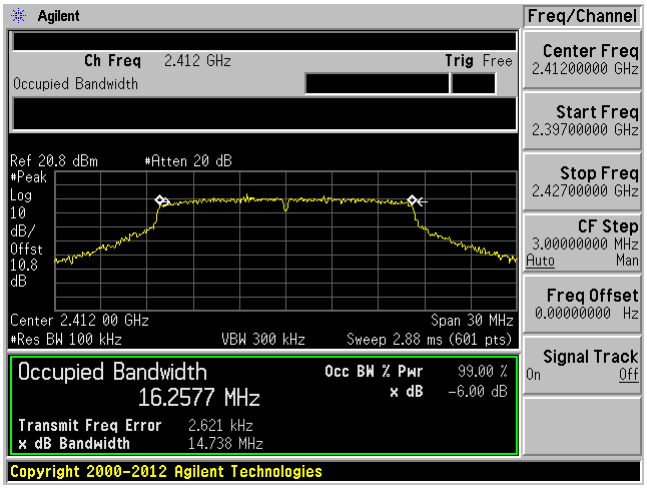


High Channel 2462 MHz

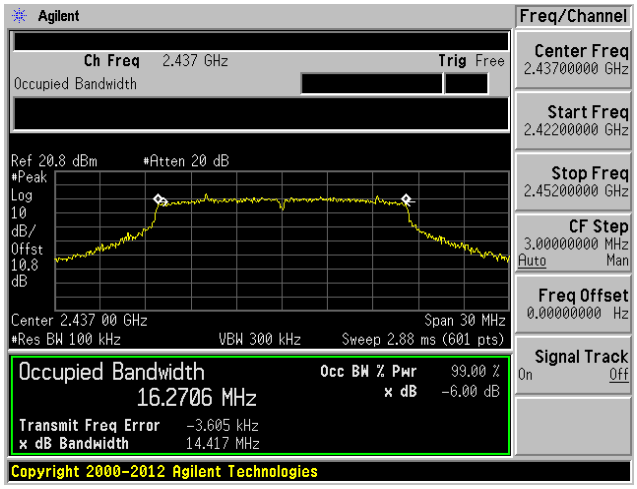


802.11g mode

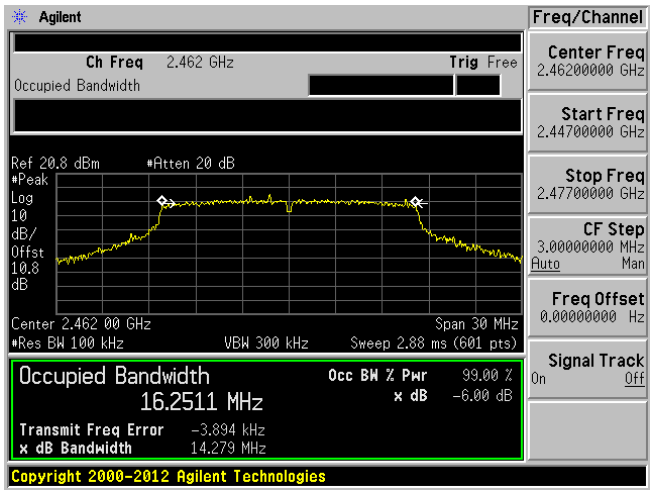
Low Channel 2412 MHz



Middle Channel 2437 MHz

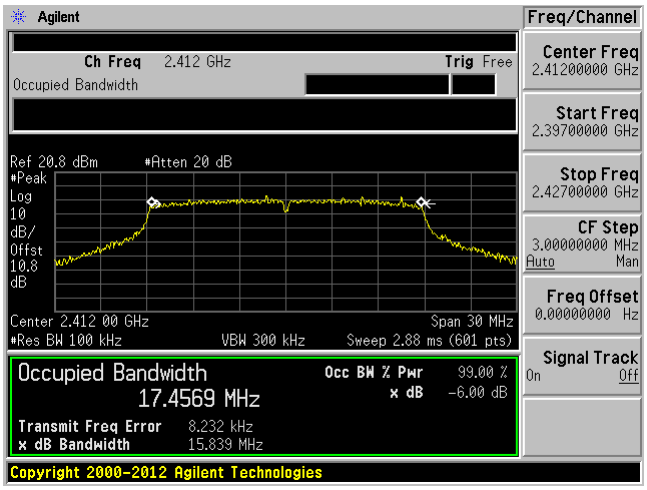


High Channel 2462 MHz

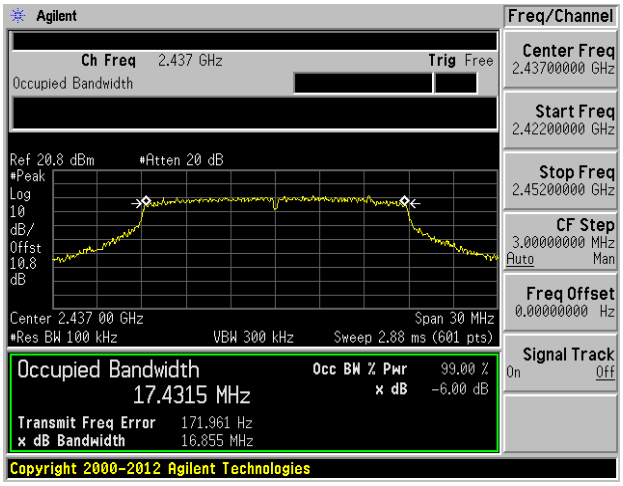


802.11n20 mode

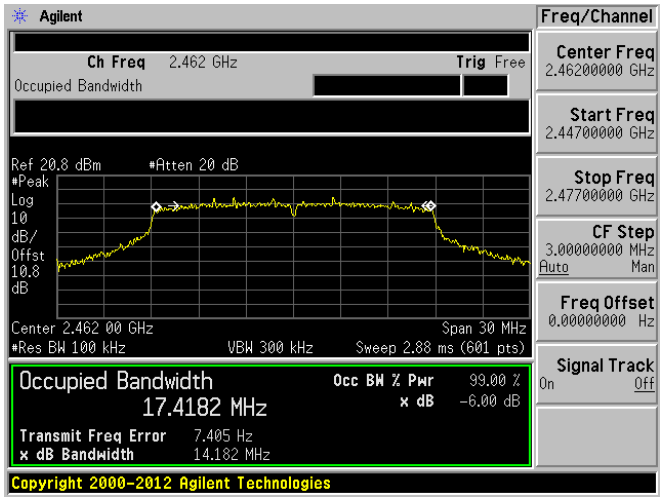
Low Channel 2412 MHz



Middle Channel 2437 MHz

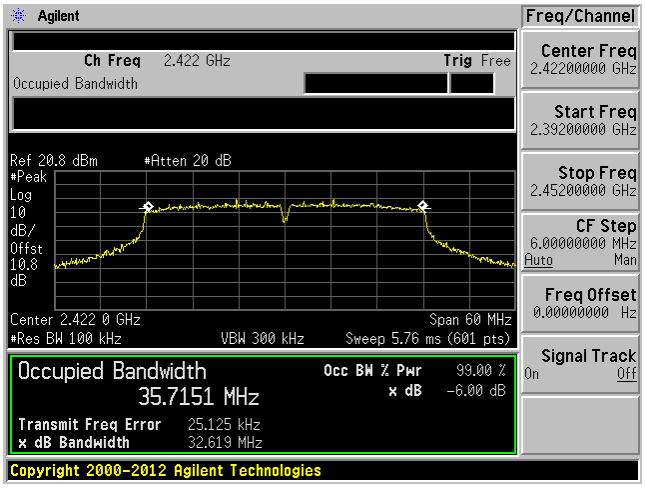


High Channel 2462 MHz

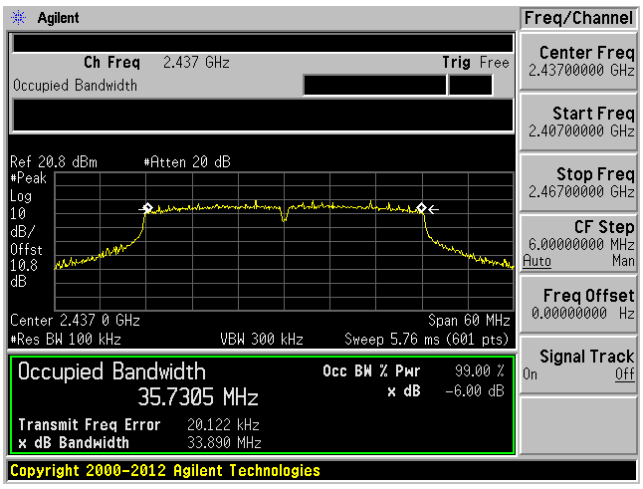


802.11n40 mode

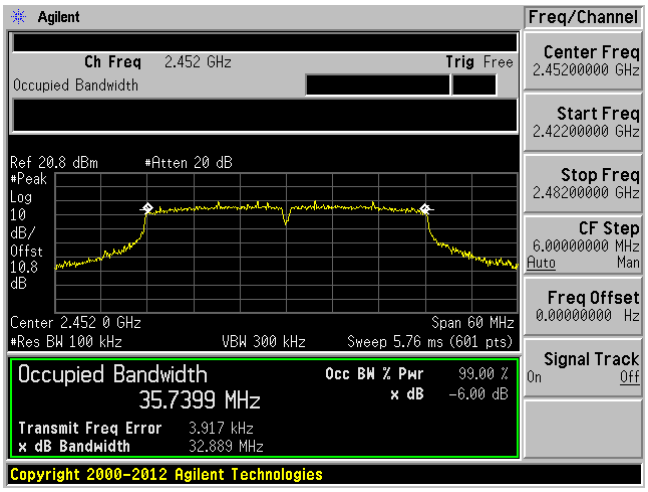
Low Channel 2422 MHz



Middle Channel 2437 MHz

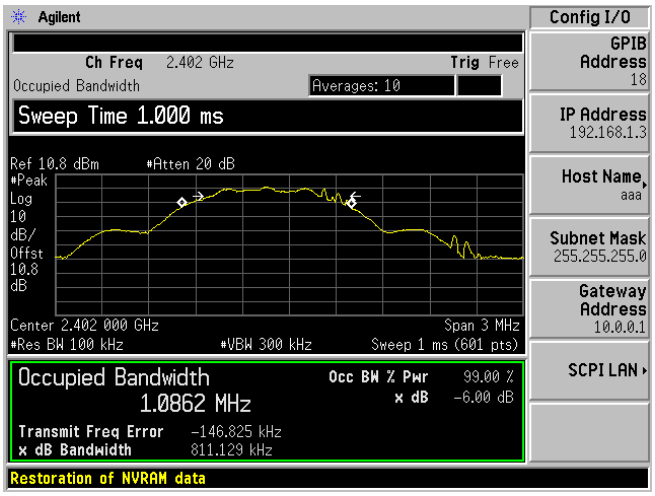


High Channel 2452 MHz

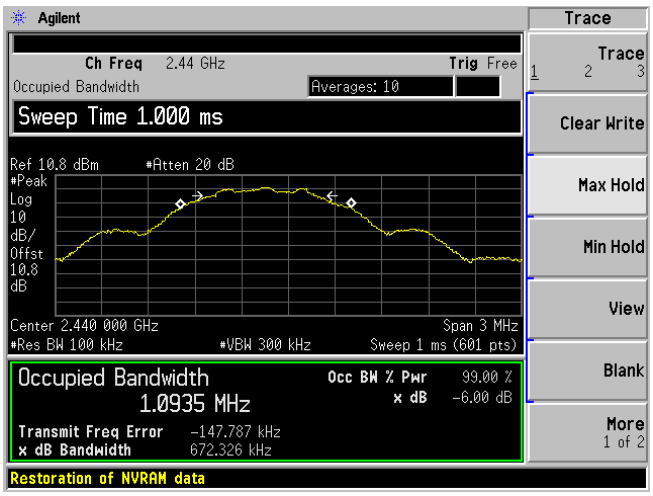


BLE

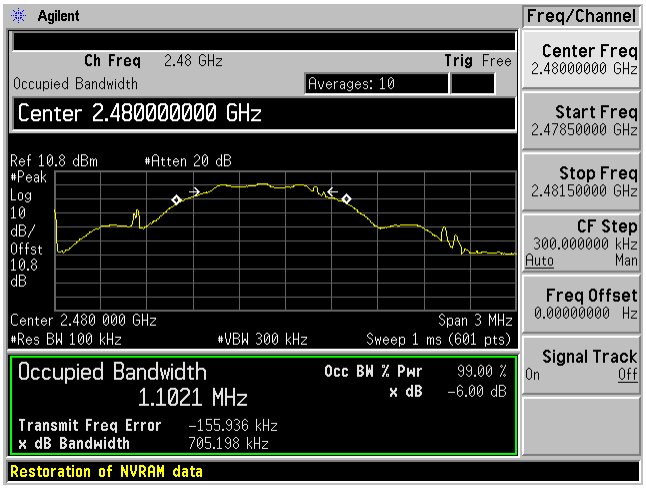
Low Channel 2402 MHz



Middle Channel 2440 MHz



High Channel 2480 MHz



9 FCC §15.247(b) (3) & ISEDC RSS-247 §5.4 (4) - Output Power Measurement

9.1 Applicable Standards

According to ECFR §15.247(b) (3) and ISEDC 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 v04: 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	Analyzer, Spectrum	E4446A	MY48250238	2017-02-24	1 year
ETS- Lingerin	Power Sensor	7002-006	160097	2016-12-05	2 years
-	RF Cable	-	-	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:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

The testing was performed by Xiao Lin on 2017-05-05 in RF site.

9.5 Test Results

Average Output Power

Channel	Frequency (MHz)	Conducted Average Power (dBm)	Limit (dBm)
802.11b mode			
1	2412	18.05	30
6	2437	17.82	30
11	2462	18.3	30
802.11g mode			
1	2412	16.02	30
6	2437	15.79	30
11	2462	16.16	30
802.11n-HT20 mode			
1	2412	16.01	30
6	2437	15.83	30
11	2462	16.36	30
802.11n-HT40 mode			
3	2422	14.46	30
6	2437	14.36	30
9	2452	14.8	30

Note: Duty Cycle correction factor has already been added to the measurement.

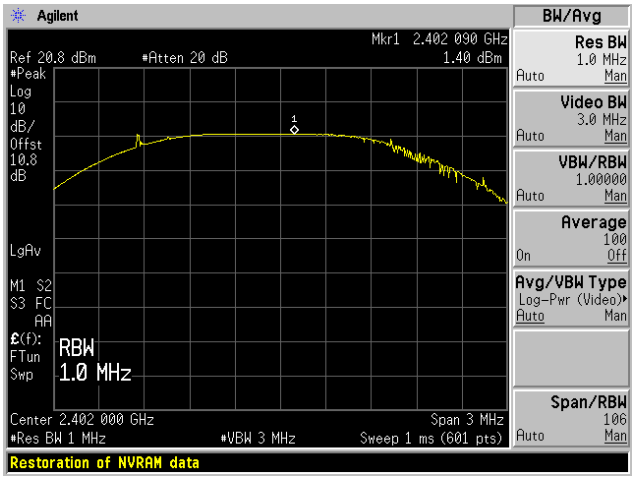
Peak Output Power

Channel	Frequency (MHz)	Conducted Peak Power (dBm)	Limit (dBm)
BLE			
Low	2402	1.40	30
Middle	2440	1.89	30
High	2480	2.15	30

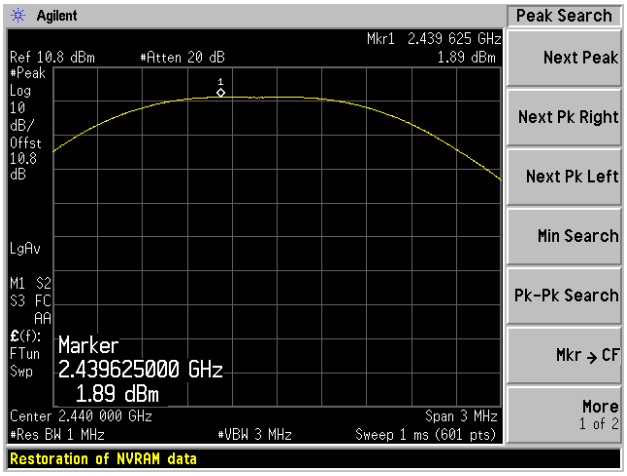
Please refer to the following plots for detailed test results.

BLE

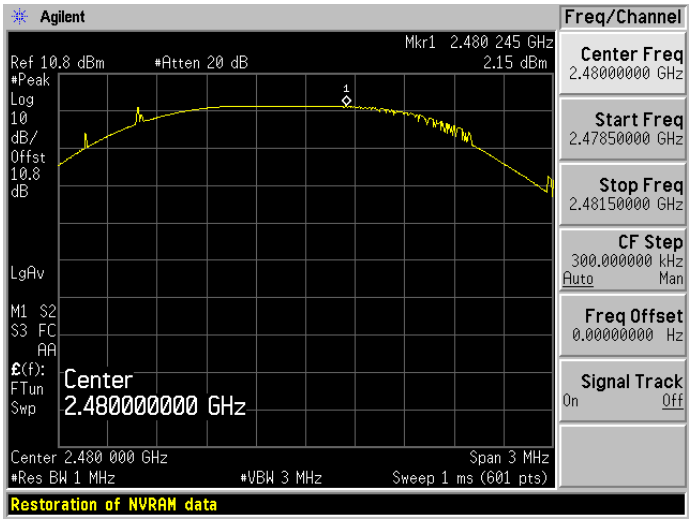
Low Channel 2402 MHz



Middle Channel 2440 MHz



High Channel 2480 MHz



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

10.1 Applicable Standards

According to ECFR §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 ISEDC 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 v04: 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
	Analyzer, Spectrum	E4440A	US45303156	2016-06-10	1 year
-	U. FL to SMA pigtail	-	-	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

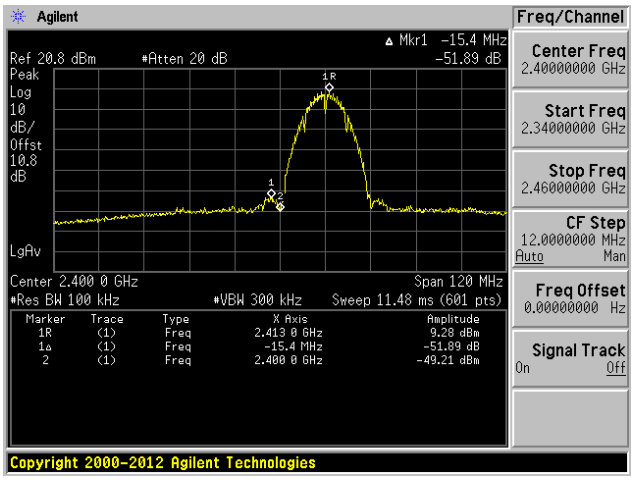
Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

The testing was performed by Vincent Licata and Chin Ming Lui on 2017-05-09 in RF site.

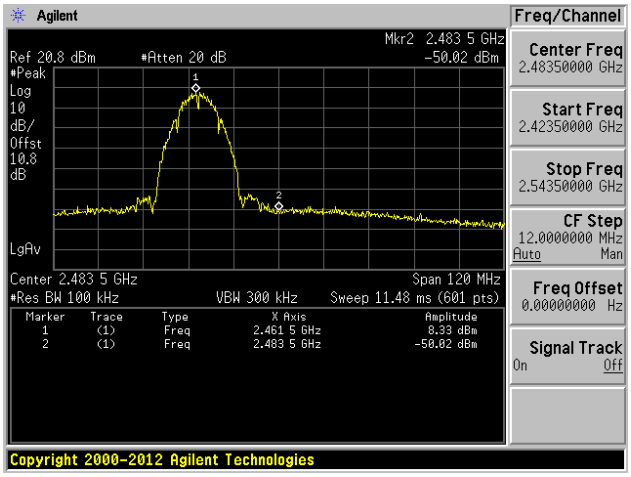
10.5 Test Results

802.11b mode

Low Channel 2412 MHz

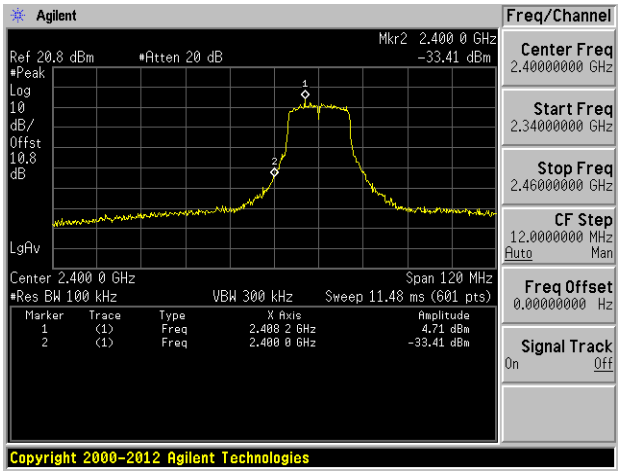


High Channel 2462 MHz

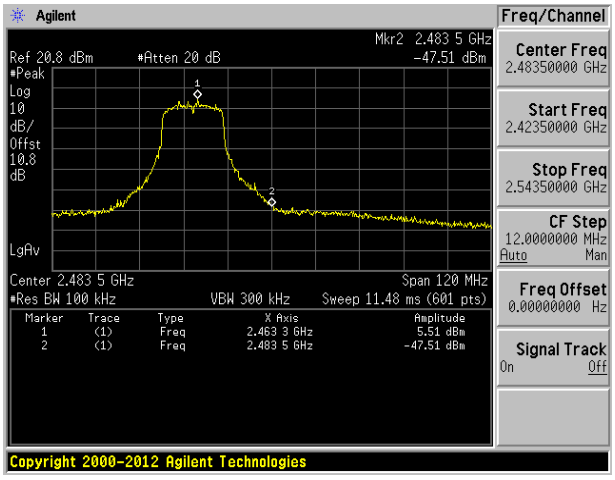


802.11g mode

Low Channel 2412 MHz

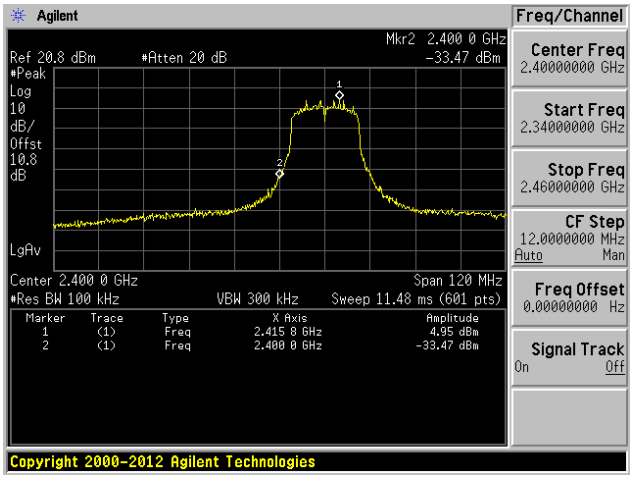


High Channel 2462 MHz

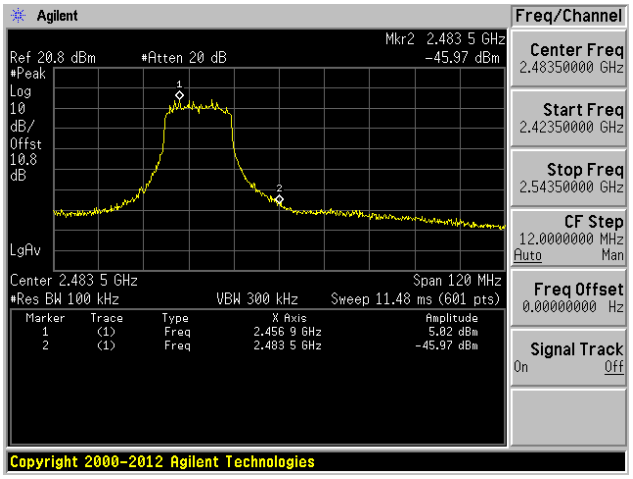


802.11n20 mode

Low Channel 2412 MHz

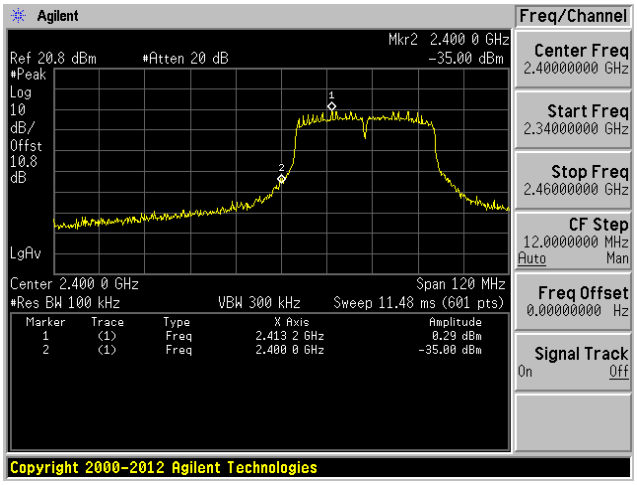


High Channel 2462 MHz

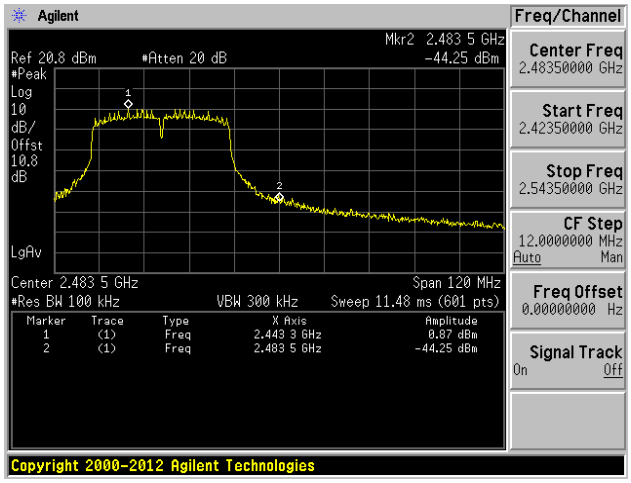


802.11n40 mode

Low Channel 2422 MHz

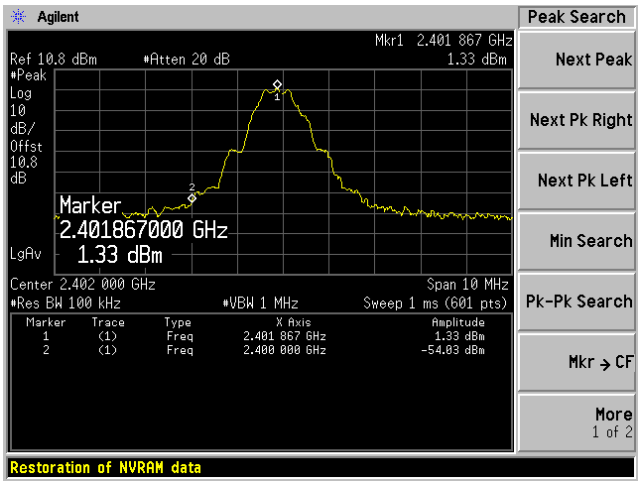


High Channel 2452 MHz

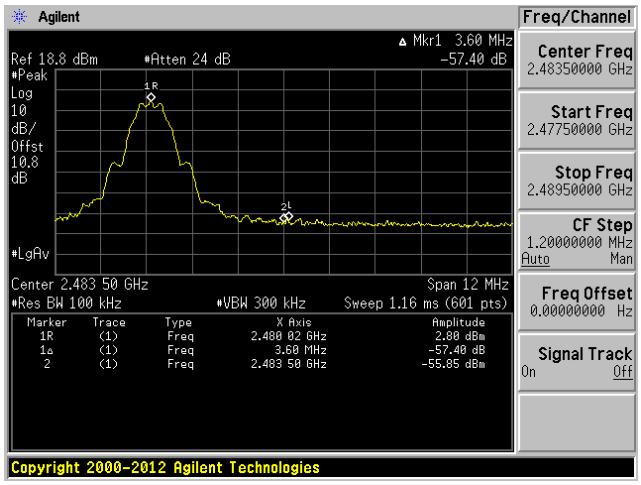


BLE

Low Channel 2402 MHz



High Channel 2480 MHz



11 FCC §15.247(e) & ISEDC RSS-247 §5.2(2) – Power Spectral Density

11.1 Applicable Standards

According to ECFR §15.247(e) and RSS-247 §5.2 (2) , 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 v04: 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	Analyzer, Spectrum	E4446A	MY48250238	2017-02-24	1 year
-	RF Cable	-	-	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:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

The testing was performed by Vincent Licata and Chin Ming Lui on 2017-05-09 in RF site.

11.5 Test Results

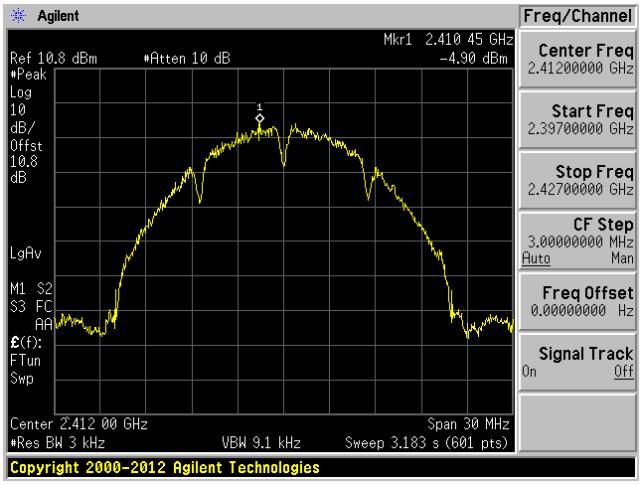
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode			
Low	2412	-4.90	8
Middle	2437	-5.42	8
High	2462	-4.14	8
802.11g mode			
Low	2412	-11.29	8
Middle	2437	-11.70	8
High	2462	-11.70	8
802.11n-HT20 mode			
Low	2412	-11.60	8
Middle	2437	-12.39	8
High	2462	-12.12	8
802.11n-HT40 mode			
Low	2422	-14.95	8
Middle	2437	-15.02	8
High	2452	-15.02	8

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
BLE			
Low	2402	-12.74	8
Middle	2440	-13.25	8
High	2480	-12.59	8

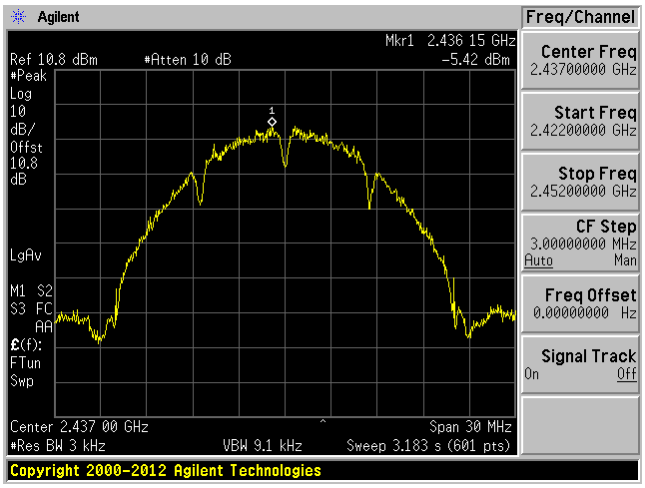
Please refer to the following plots for detailed test results

802.11b mode

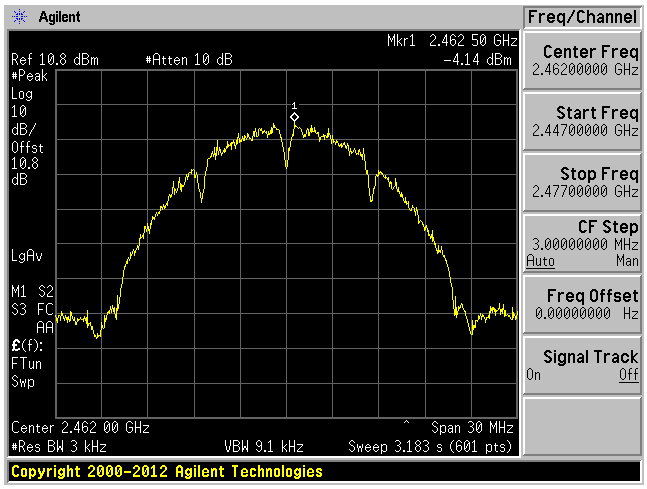
Low Channel 2412 MHz



Middle Channel 2437 MHz

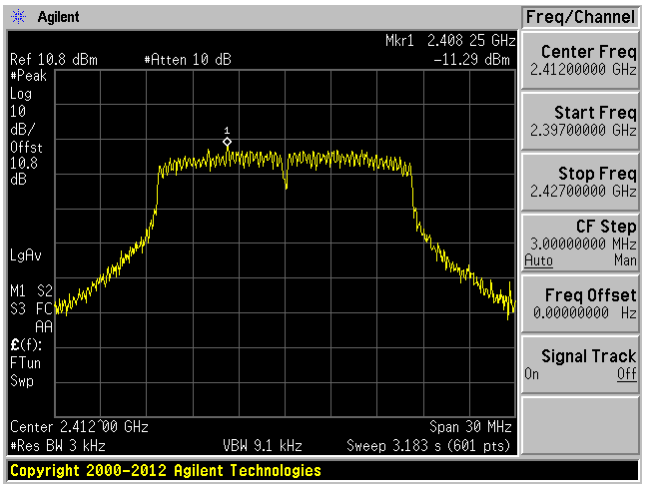


High Channel 2462 MHz

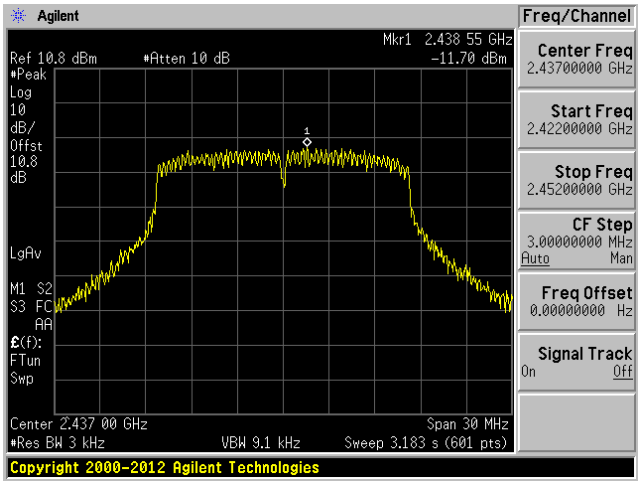


802.11g mode

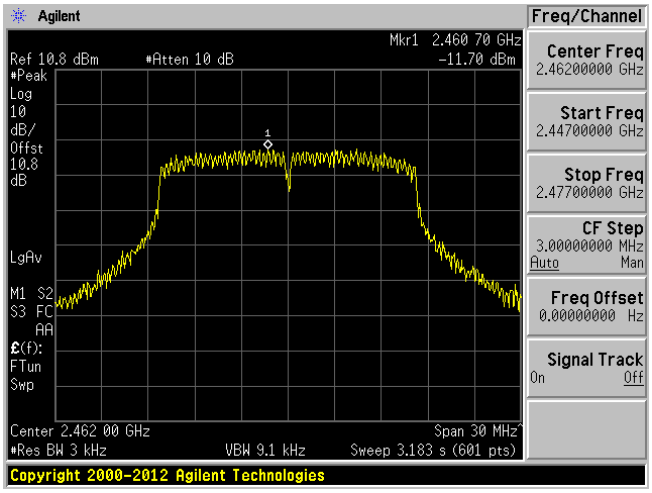
Low Channel 2412 MHz



Middle Channel 2437 MHz

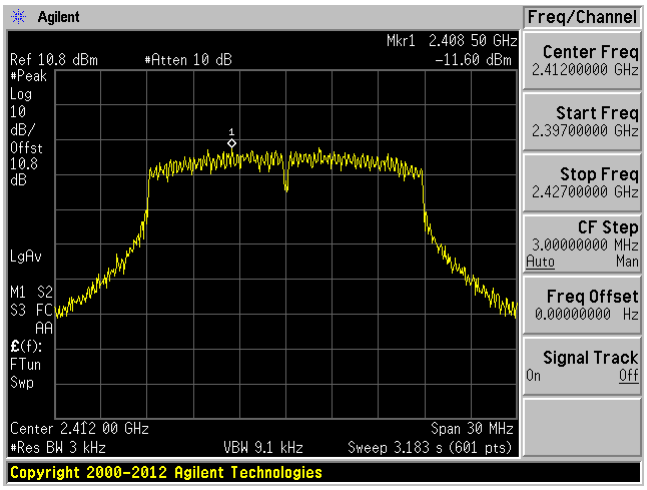


High Channel 2462 MHz

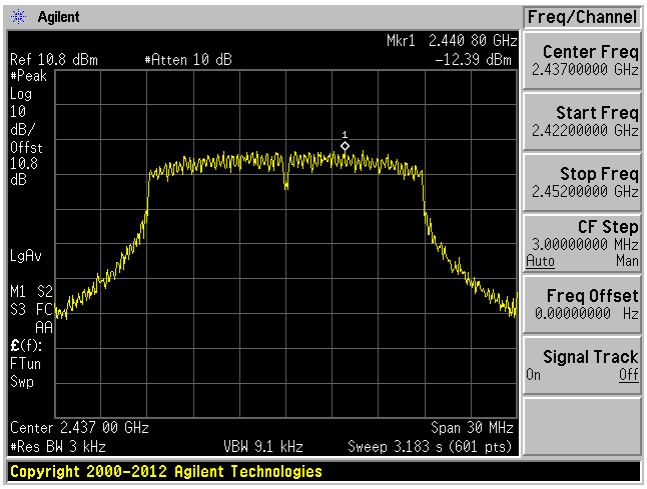


802.11n20 mode

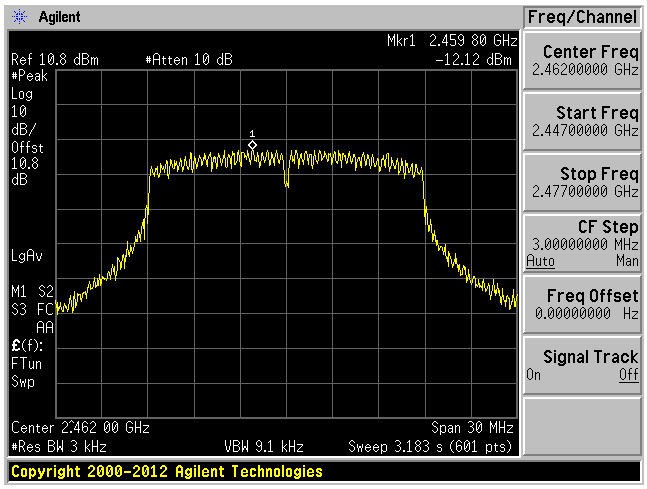
Low Channel 2412 MHz



Middle Channel 2437 MHz

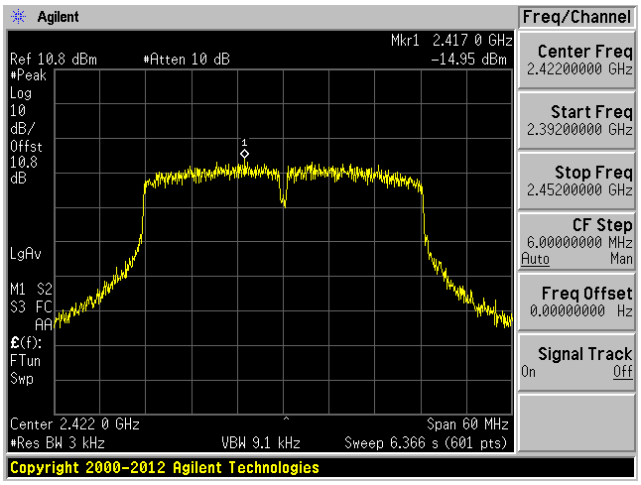


High Channel 2462 MHz

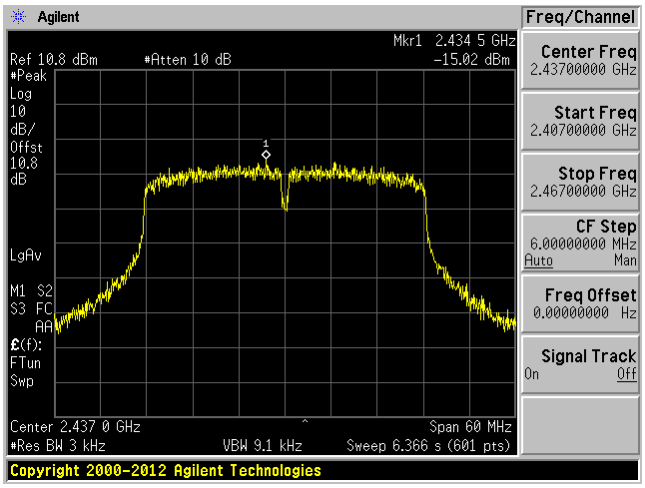


802.11n40 mode

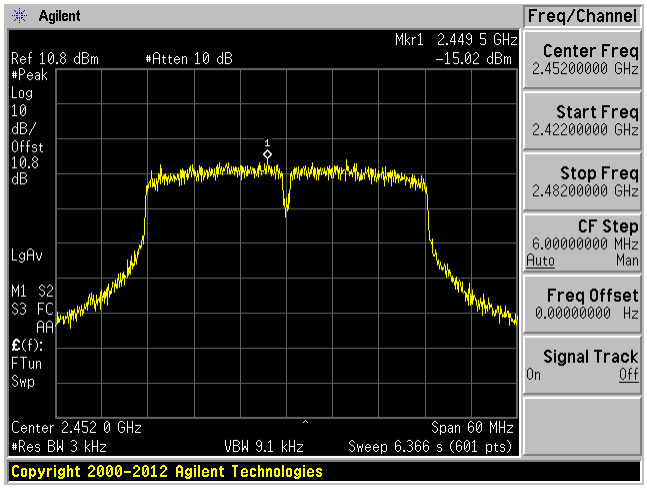
Low Channel 2422 MHz



Middle Channel 2437 MHz

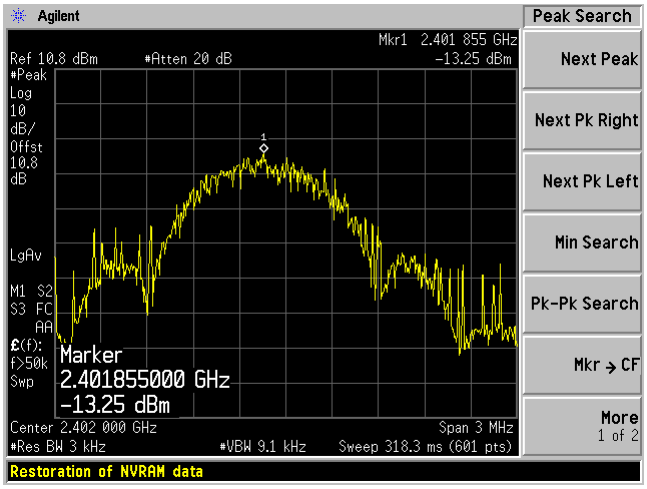


High Channel 2452 MHz

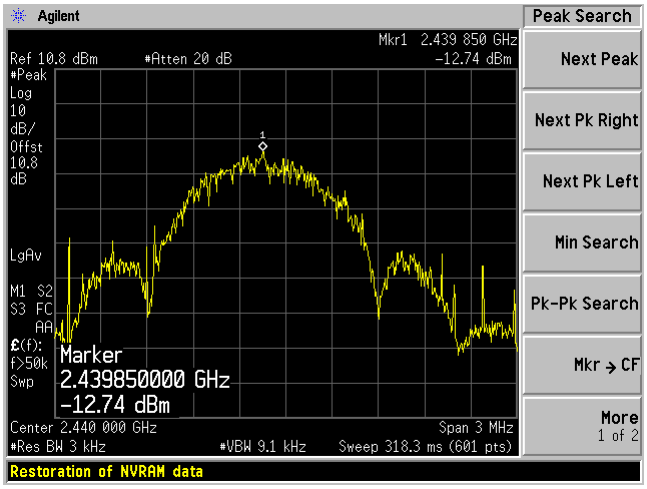


BLE

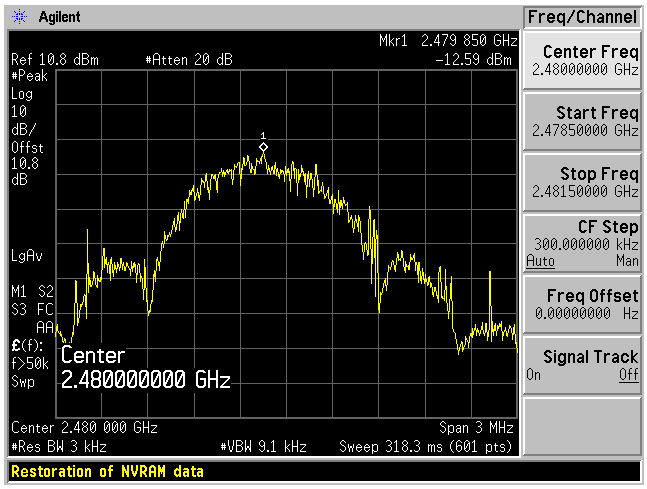
Low Channel 2402 MHz



Middle Channel 2440 MHz



High Channel 2480 MHz



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

12.1 Applicable Standards

For ECFR §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 ISEDC 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	Analyzer, Spectrum	E4440A	US453156	2016-06-10	1 year
-	RF cable	-	-	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:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

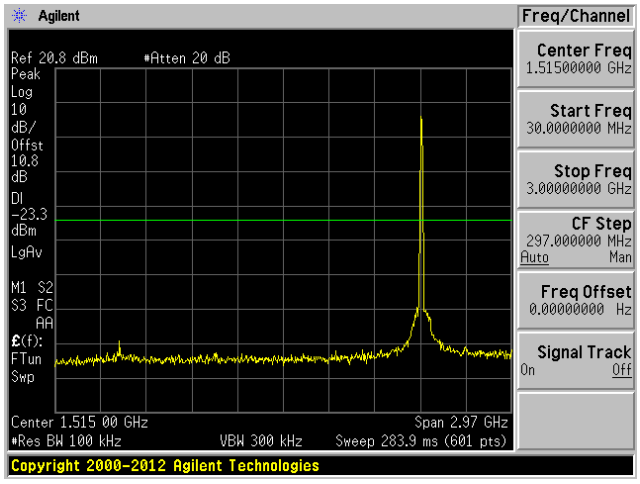
The testing was performed by Vincent Licata and Chin Ming Lui on 2017-05-09 in RF site.

12.5 Test Results

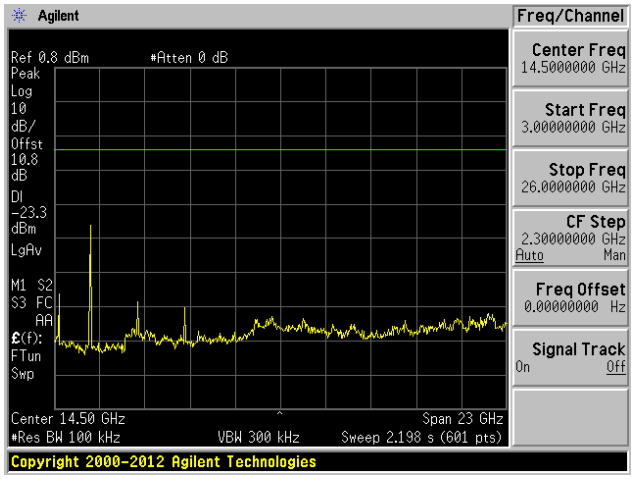
Please refer to following plots.

802.11b mode

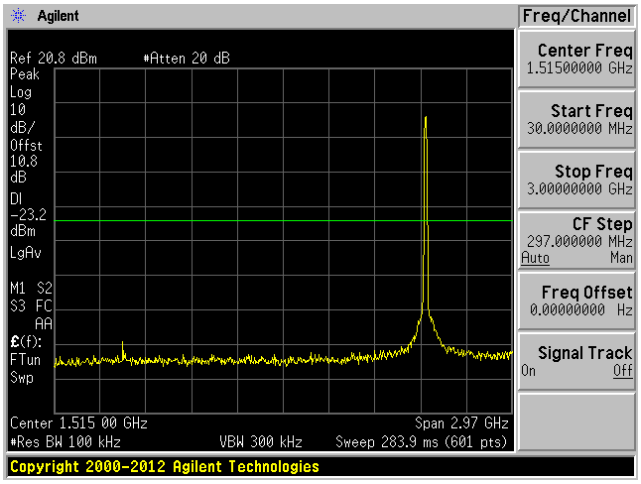
Low Channel 30MHz – 3 GHz



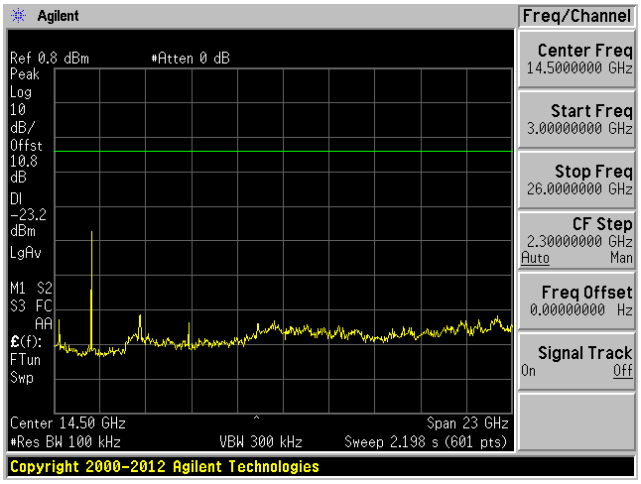
Low Channel 3 GHz – 26 GHz



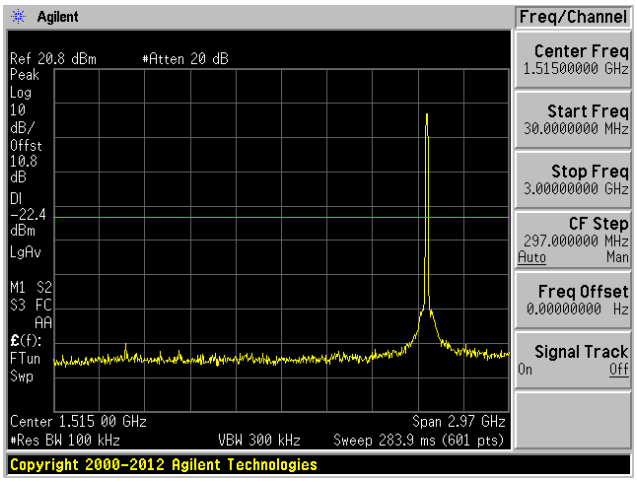
Middle Channel 30 MHz – 3 GHz



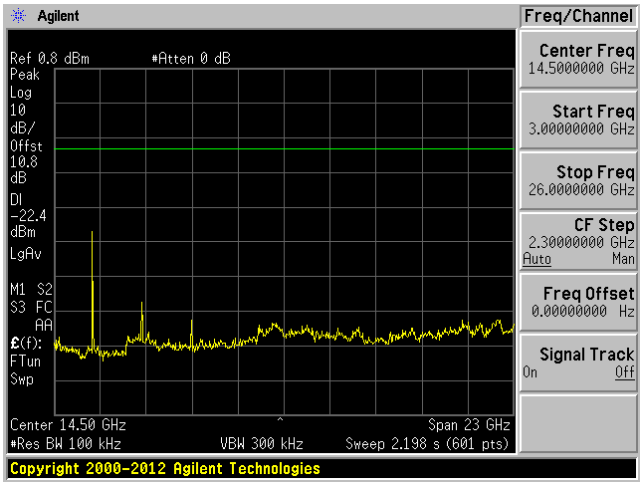
Middle Channel 3 GHz – 26 GHz



High Channel 30 MHz – 3 GHz

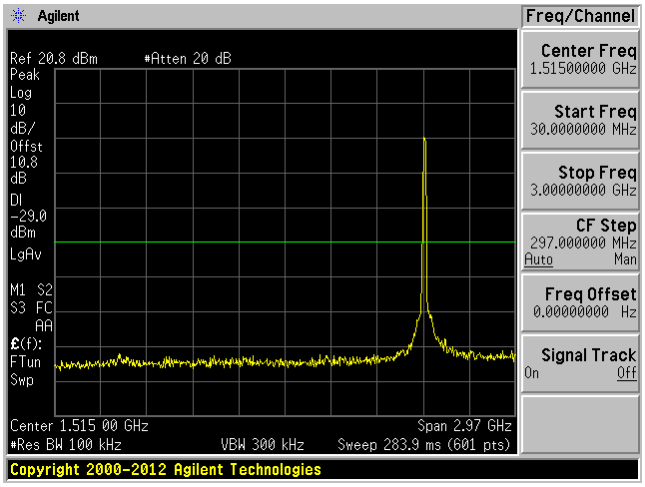


High Channel 3 GHz – 26 GHz

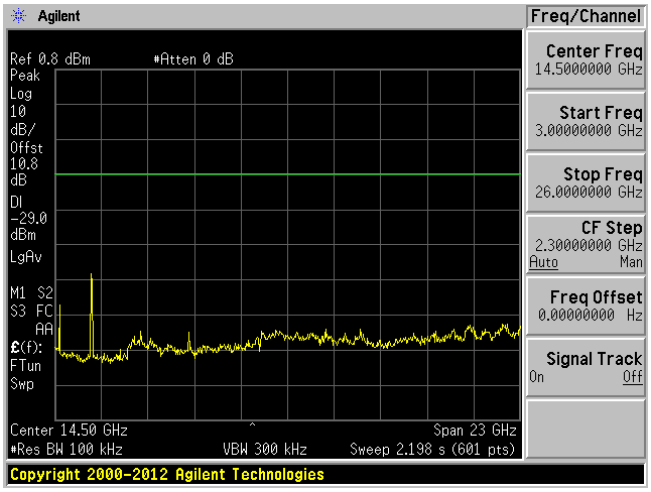


802.11g mode

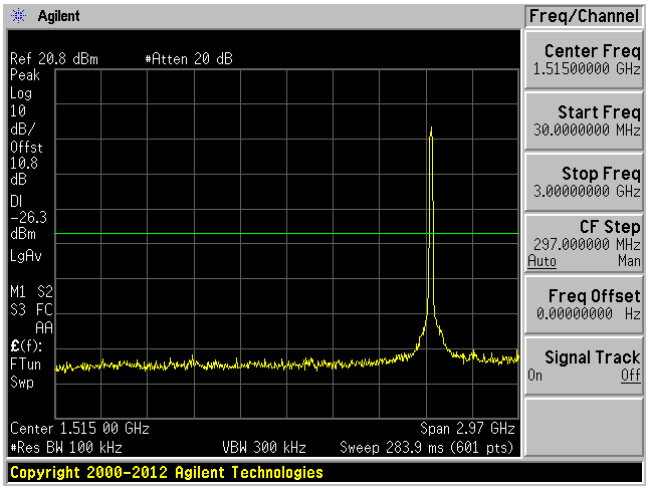
Low Channel 30 MHz – 3 GHz



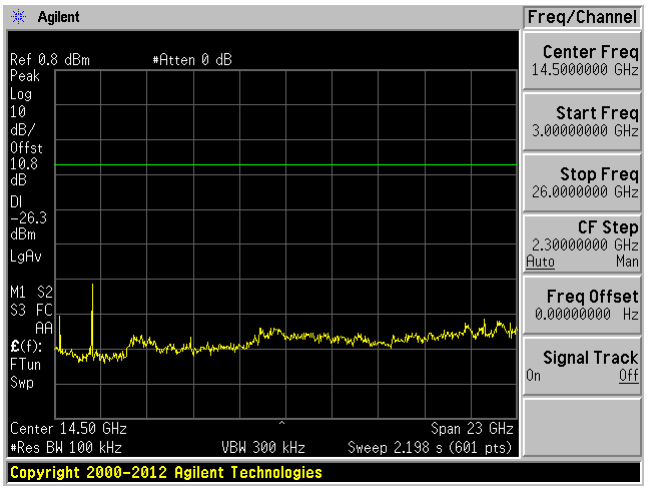
Low Channel 3 GHz – 26 GHz



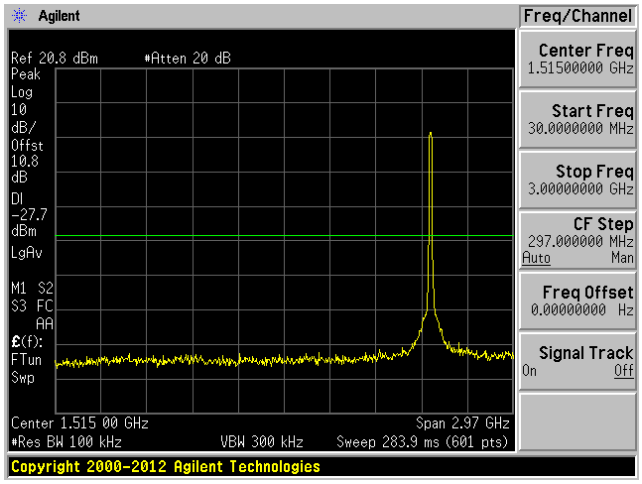
Middle Channel 30 MHz – 3 GHz



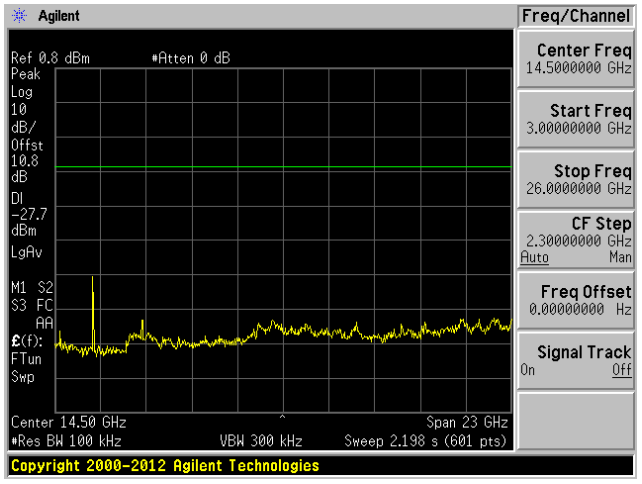
Middle Channel 3 GHz – 26 GHz



High Channel 30 MHz – 3 GHz

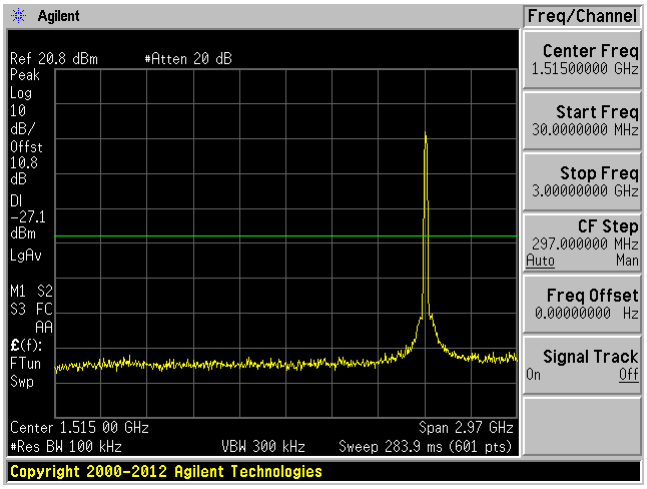


High Channel 3 GHz – 26 GHz

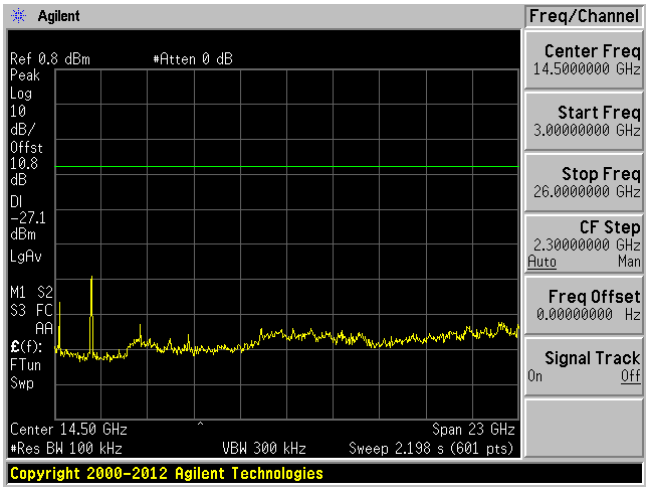


802.11n20 mode

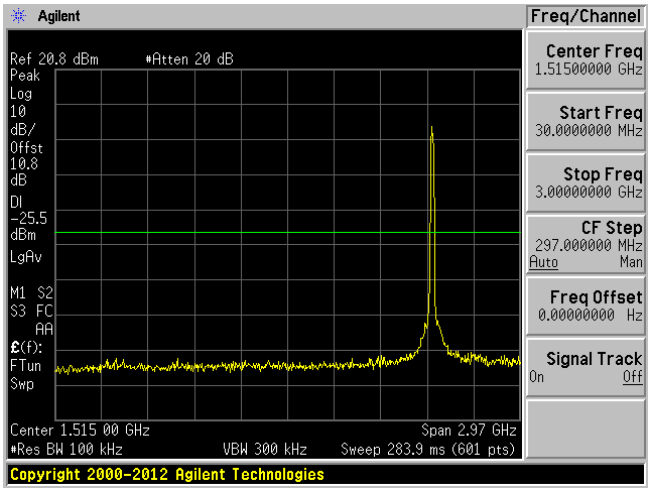
Low Channel 30 MHz – 3 GHz



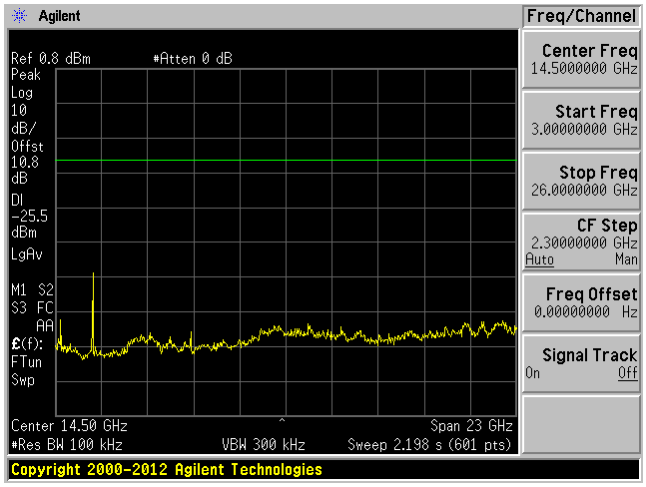
Low Channel 3 GHz – 26 GHz



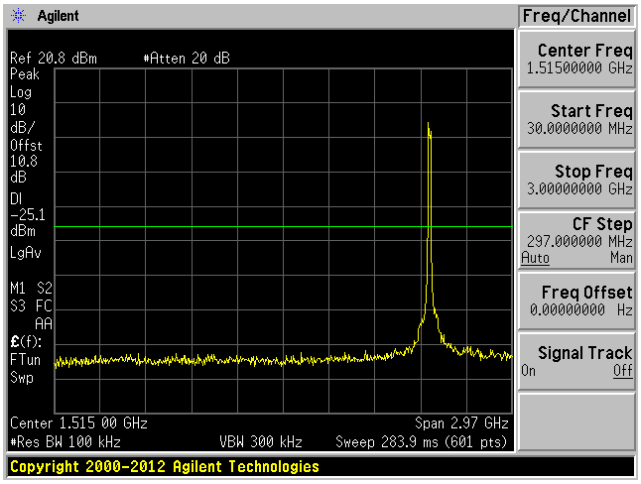
Middle Channel 30 MHz – 3 GHz



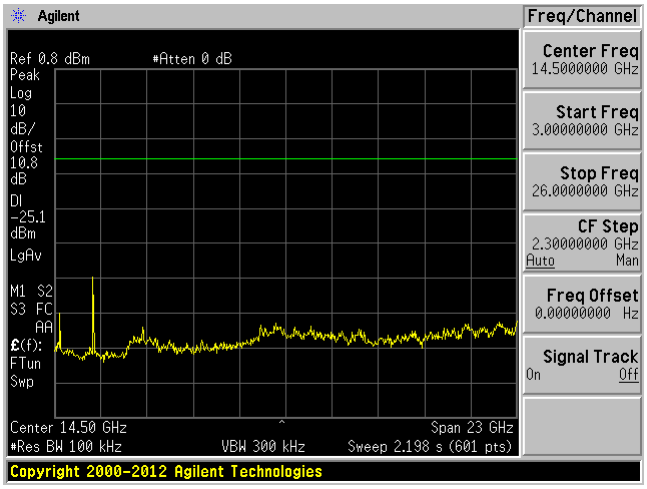
Middle Channel 3 GHz – 26 GHz



High Channel 30 MHz – 3 GHz

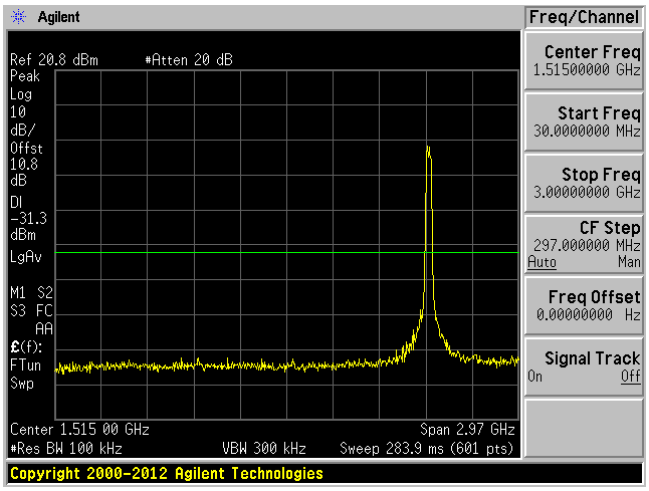


High Channel 3 GHz – 26 GHz

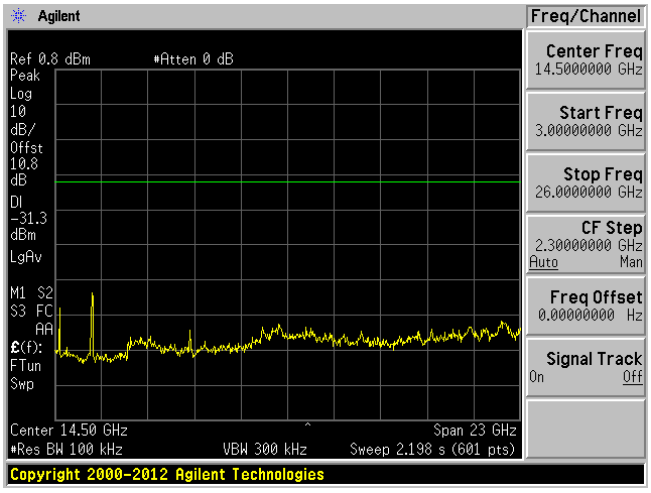


802.11n40 mode

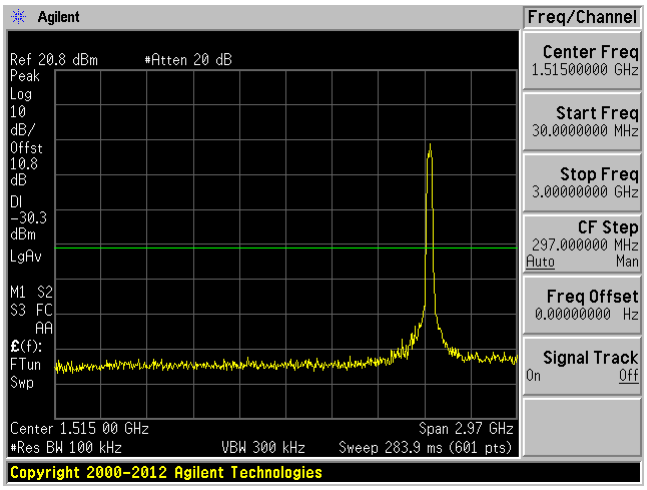
Low Channel 30 MHz – 3 GHz



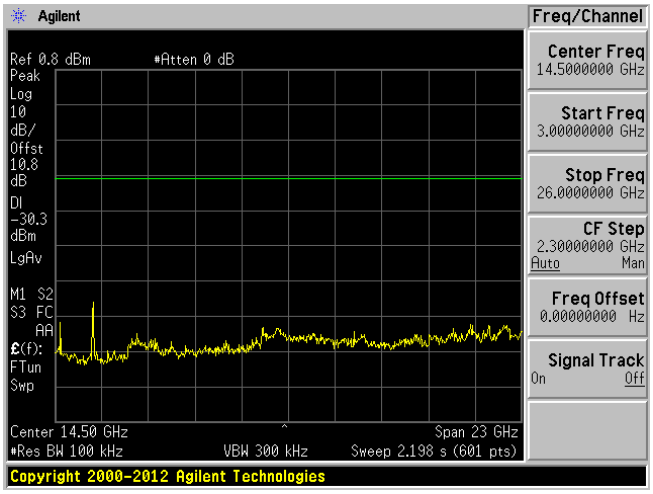
Low Channel 3 GHz – 26 GHz



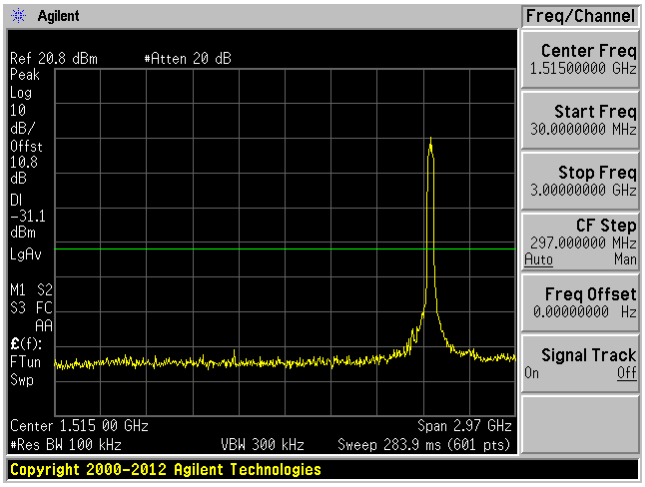
Middle Channel 30 MHz – 3 GHz



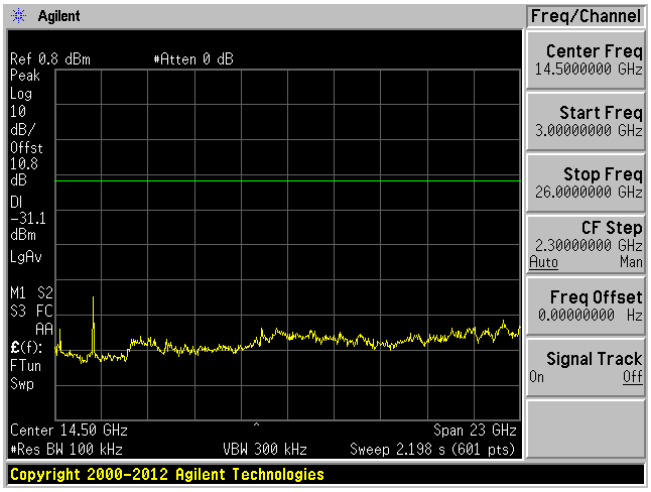
Middle Channel 3 GHz – 26 GHz



High Channel 30 MHz – 3 GHz

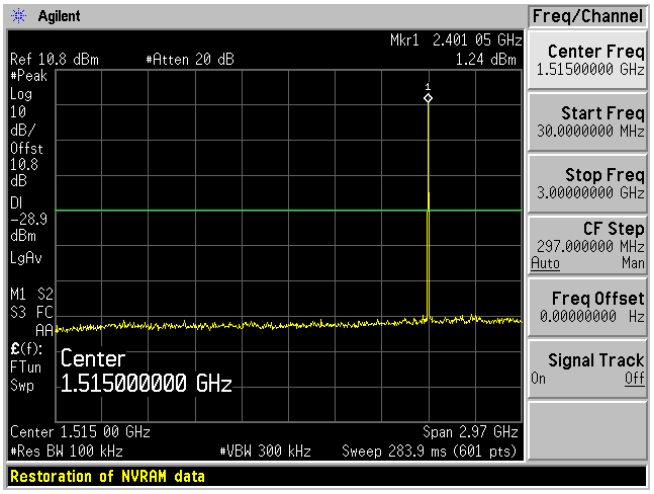


High Channel 3 GHz – 26 GHz

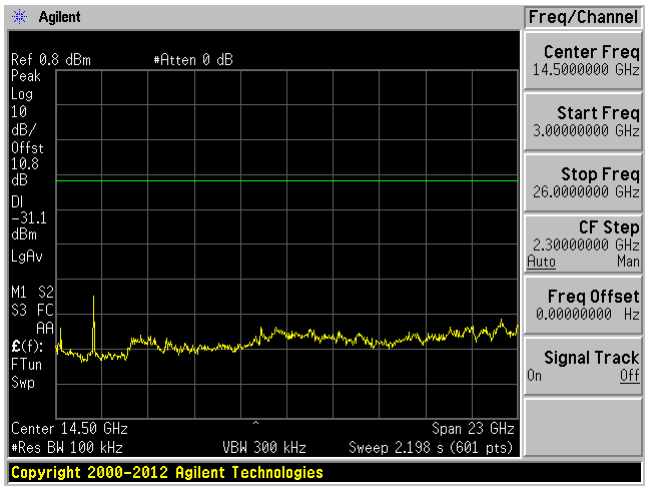


BLE

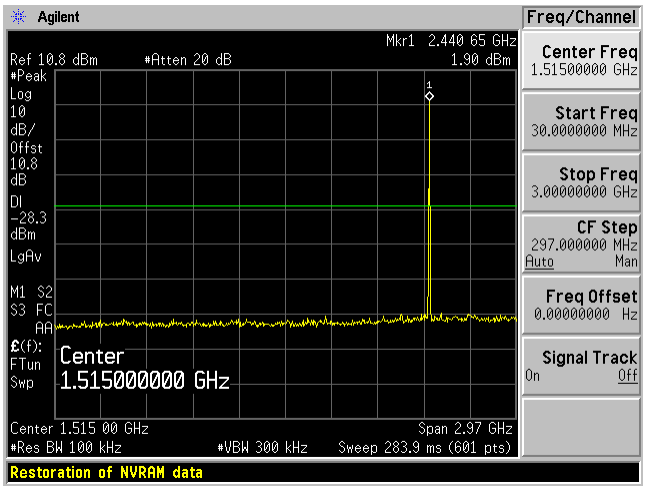
Low Channel 30 MHz – 3 GHz



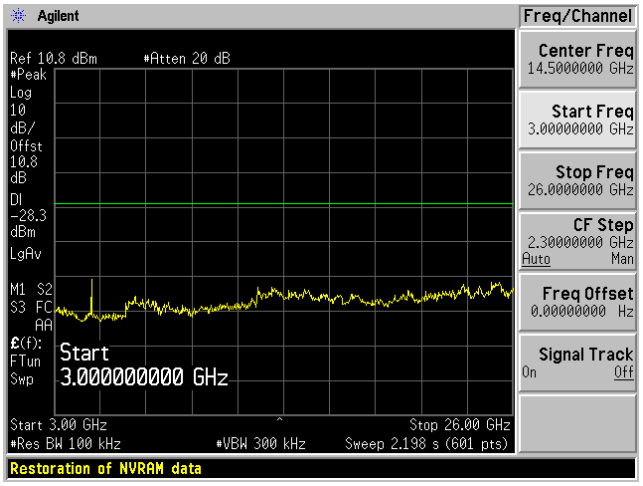
Low Channel 3 GHz – 26 GHz



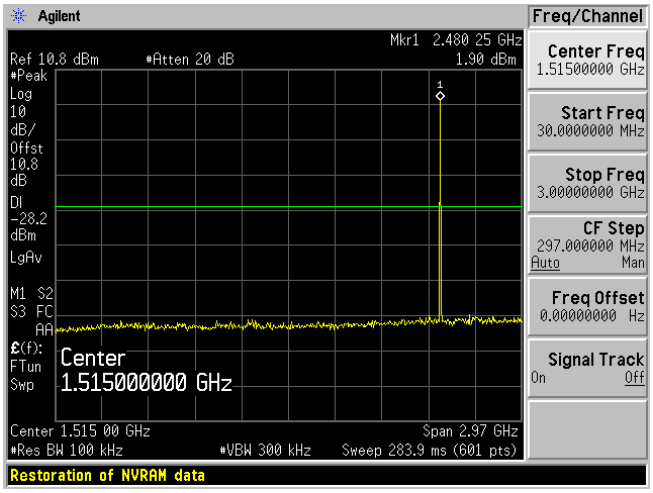
Middle Channel 30 MHz – 3 GHz



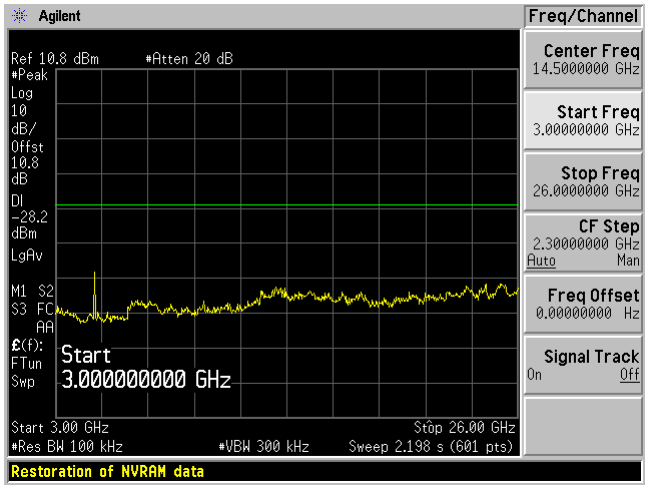
Middle Channel 3 GHz – 26 GHz



High Channel 30 MHz – 3 GHz



High Channel 3 GHz – 26 GHz



13 Annex A (Informative) - A2LA Electrical Testing Certificate

Accredited Laboratory

A2LA has accredited

BAY AREA COMPLIANCE LABORATORIES CORP.

Sunnyvale, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of A2LA *R222 - Specific Requirements - EPA ENERGY STAR Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 30th day of August 2016.

Senior Director of Quality & Communications
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2018

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

----- END OF REPORT -----