FCC PART 15, SUBPART C
TEST REPORT
For

Nectar, Inc.

517 Byron Street, Palo Alto, CA 94301, USA

FCC ID: 2AVAD0003A

Report Type:	Product Type:
Original Report	Wi-Fi Gateway

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Report Number:	R1911184-247 (DTS)
Report Date:	2020-02-19
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ACCREDITED
CERTIFICATE #3297.02

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1911184-247 (DTS)	Original Report	2020-02-19

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Nectar, Inc.*, and their product model: Nectar BaseStation, FCC ID: 2AVAD0003A or the "EUT" as referred to in this report. It is a Wi-Fi gateway receives BLE packets and send the data to cloud via Wi-Fi.

The EUT product measures approximately 100 mm (L) x 100 mm (W) x 60 mm (H) and weighs approximately 1 kg.

1.2 Objective

This report is prepared on behalf of *Nectar, Inc.*, in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commission's rules.

The objective is to determine compliance with FCC Part 15.247 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)

N/A

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 v05r2: 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 º 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 & Fixed Radio Services;
  - 4 All Scope 4-Licensed Maritime & 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 & 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: (Innovation, Science and Economic development Canada - ISEDC) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & 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 2014/30/EU US-EU EMC & Telecom MRA CAB (NB)
    - Radio Equipment (RE) Directive 2014/53/EU US-EU EMC & Telecom MRA CAB (NB)
    - Low Voltage Directive (LVD) 2014/35/EU
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Media Development Authority - IMDA) APEC Tel MRA -Phase I & 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;
    - Nationally Recognized Test Laboratory (NRTL) – US OSHA
- 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 v05r02.

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 software was provided by *Nectar, Inc.*, the software is compliant with the standard requirements being tested against.

Modulation	Frequency (MHz)	Power Setting
802.11b	2412	5
	2437	5
	2462	5
802.11g	2412	5
	2437	5
	2462	5
BLE	2402	-4
	2440	-4
	2480	-4

Data Rates Tested:
802.11b mode: 1Mbps
802.11g mode: 6Mbps
BLE: 1Mbps

2.3 Duty Cycle Correction Factor

According to KDB 558074 D01 DTS Meas Guidance v05r02 section 6.0:

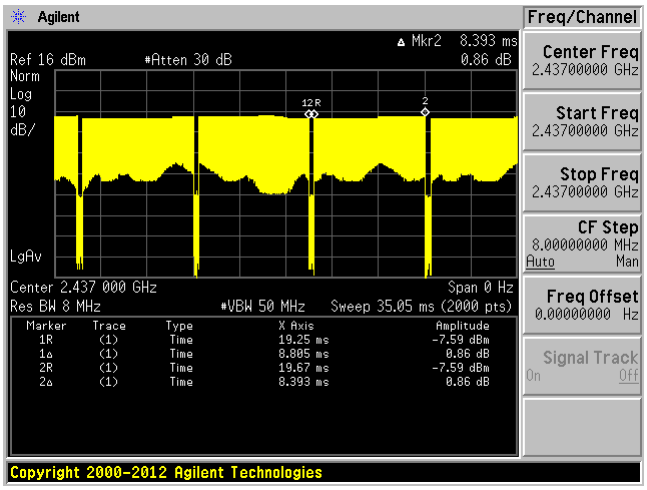
Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be utilized 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	8.393	8.805	95.32	0.21
802.11g	1.394	1.552	89.82	0.47
BLE	2.123	2.229	95.24	0.21

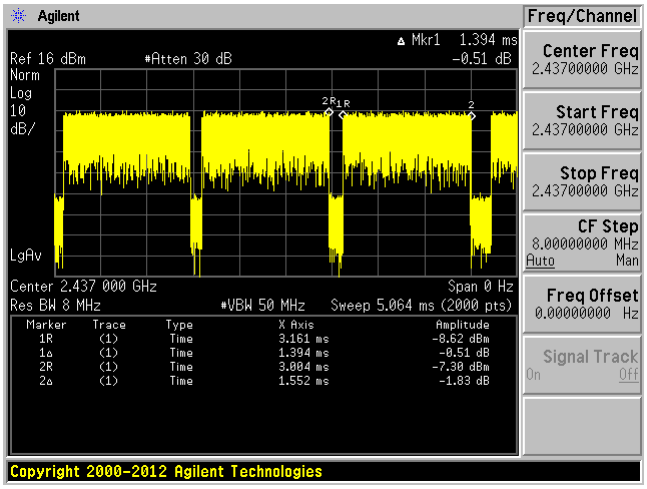
Duty Cycle = On Time (ms)/ Period (ms)
Duty Cycle Correction Factor (dB) = 10*log(1/Duty Cycle)

Please refer to the following plots.

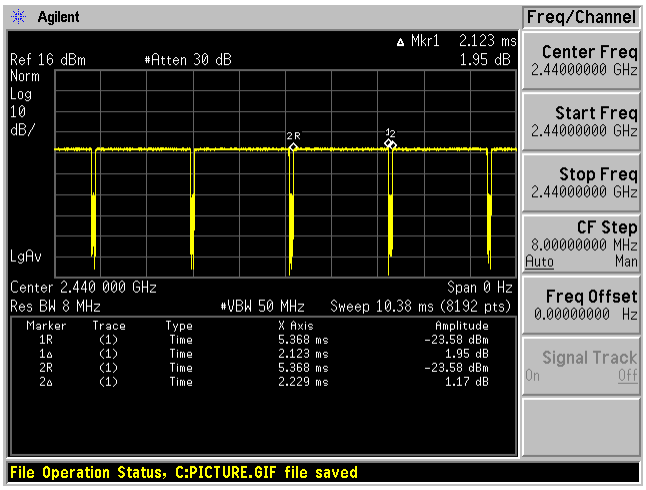
802.11b mode



802.11g mode



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	unknown

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
Micro 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 Rules	Description of Test	Results
§15.203	Antenna Requirement	Compliant
§15.207	AC Line Conducted Emissions	Compliant
§2.1091, §15.247(i)	RF Exposure	Compliant
§2.1051, §15.247 (d)	Spurious Emissions at Antenna Port	Compliant
§2.1053, §15.205, §15.209, §15.247 (d)	Radiated Spurious Emissions	Compliant
§15.247(a)(2)	6 dB and 99% Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum Peak Output Power	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

4 FCC §15.203 - 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.

4.2 Antenna Description

The antennas used by the EUT are permanent attached antennas.

Antenna usage	Frequency Range (MHz)	Maximum Antenna Gain (dBi)	Antenna Type
2.4GHz Wi-Fi	2400-2483.5	1.9	lopsided spherical
BLE	2400-2483.5	1.5	spherical

5 FCC §2.1091 & §15.247(i) - RF Exposure

5.1 Applicable Standards

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 (minute)
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

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

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 Test Results

WLAN 2.4 GHz Radio

Maximum peak output power at antenna input terminal (dBm):	10.81
Maximum peak output power at antenna input terminal (mW):	12.05
Prediction distance (cm):	20
Predication frequency (MHz):	2437
Maximum Antenna Gain, typical (dBi):	1.90
Maximum Antenna Gain (numeric):	1.55
Power density of prediction frequency at prediction distance (mW/cm^2):	0.0037
FCC limit (mW/cm^2):	1.00

The device is compliant with the requirement MPE limit for uncontrolled exposure. The tuned up power density at the distance of 20 cm is 0.0037 mW/cm^2. Limit is 1.0 mW/cm^2.

BLE

Maximum peak output power at antenna input terminal (dBm):	-5.37
Maximum peak output power at antenna input terminal (mW):	0.29
Prediction distance (cm):	20
Predication frequency (MHz):	2402
Maximum Antenna Gain, typical (dBi):	1.50
Maximum Antenna Gain (numeric):	1.41
Power density of prediction frequency at prediction distance (mW/cm^2):	0.0001
FCC limit (mW/cm^2):	1.00

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0001 mW/cm^2. Limit is 1.0 mW/cm^2.

Note: Client declares that Bluetooth and 2.4 GHz Wi-Fi cannot transmit simultaneously.

6 FCC §15.207 - AC Line Conducted Emissions

6.1 Applicable Standards

As per FCC §15.207 Conducted limits:

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

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 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 limits.

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

The EUT was connected with LISN-1 which provided 120 V/60 Hz AC power source.

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:

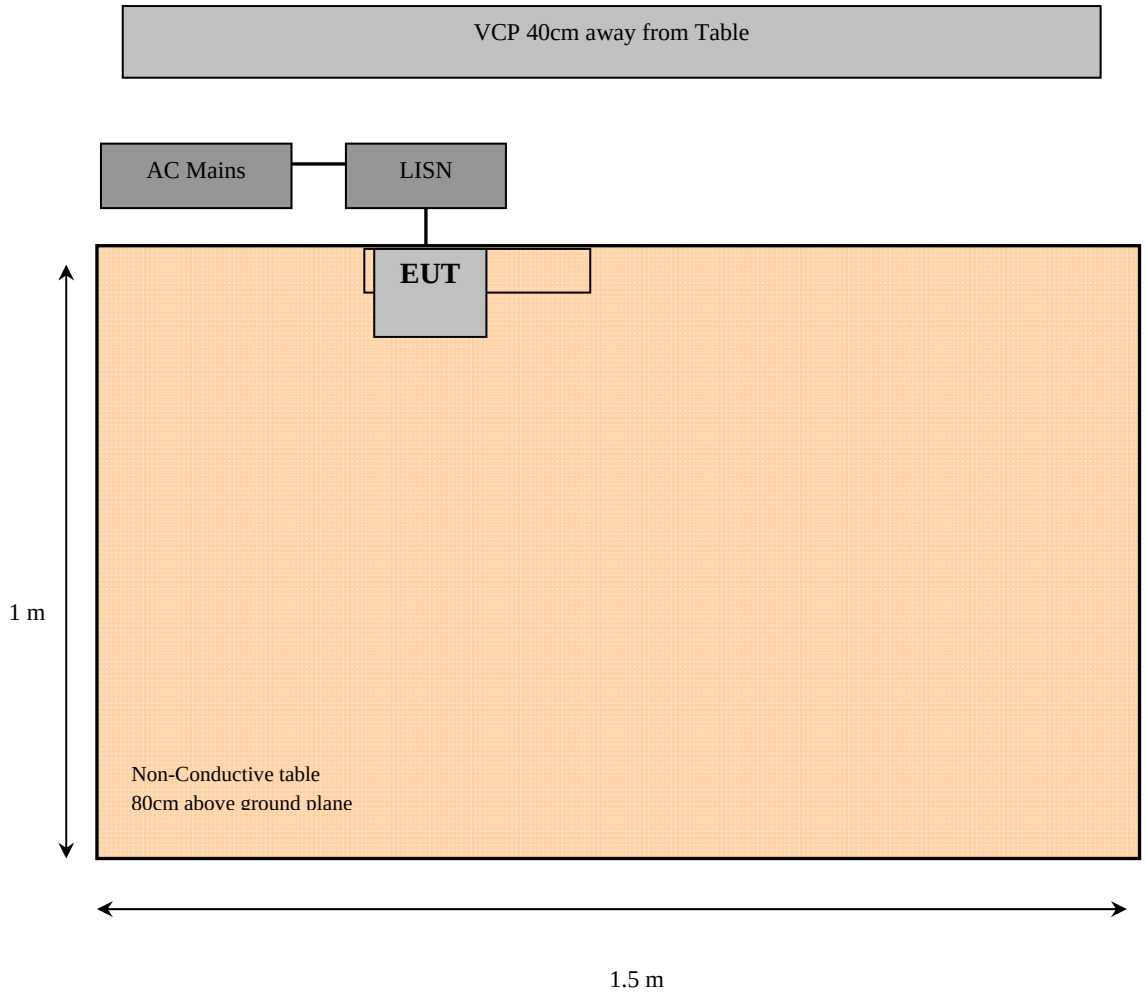
CA = Ai + CL + Atten

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 & Schwarz	Impulse Limiter	ESH3-Z2	101964	2019-07-31	1 year
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150202	2019-02-25	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	N/R	N/A
FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160129	2019-04-11	1 year
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R
Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950.03	100338	2018-07-05	2 years

Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 02 October 2018) "A2LA Policy on Metrological Traceability".*

6.7 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	101.9 KPa

The testing was performed by Zhao Zhao on 2019-11-27 at ground panel area.

6.8 Summary of Test Results

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

2.4 GHz Wi-Fi

Connection: Connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-18.84	0.542555	Line	0.15-30

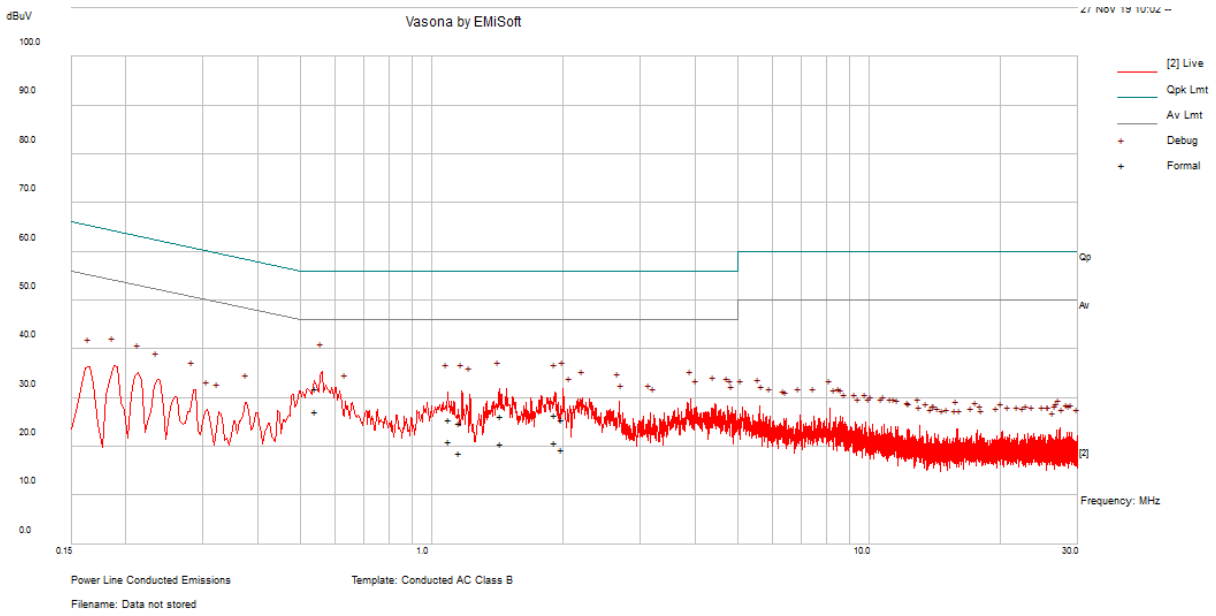
BLE

Connection: Connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-20.33	0.560338	Neutral	0.15-30

6.9 Conducted Emissions Test Plots and Data

2.4 GHz Wi-Fi b mode 2437 MHz

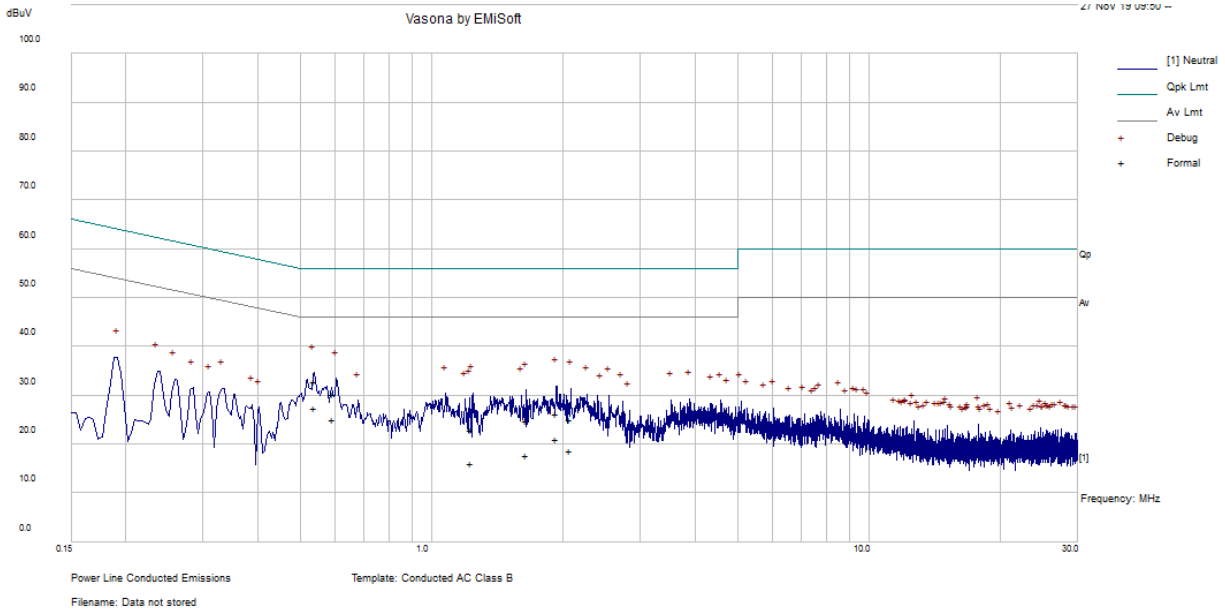
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.542555	31.85	Line	56	-24.15	QP
1.437639	26.29	Line	56	-29.71	QP
1.981937	25.51	Line	56	-30.49	QP
1.161505	24.75	Line	56	-31.25	QP
1.096021	25.58	Line	56	-30.42	QP
1.918942	26.38	Line	56	-29.62	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.542555	27.16	Line	46	-18.84	Ave.
1.437639	20.58	Line	46	-25.42	Ave.
1.981937	19.39	Line	46	-26.61	Ave.
1.161505	18.78	Line	46	-27.22	Ave.
1.096021	20.96	Line	46	-25.04	Ave.
1.918942	20.92	Line	46	-25.08	Ave.

120 V, 60 Hz – Neutral

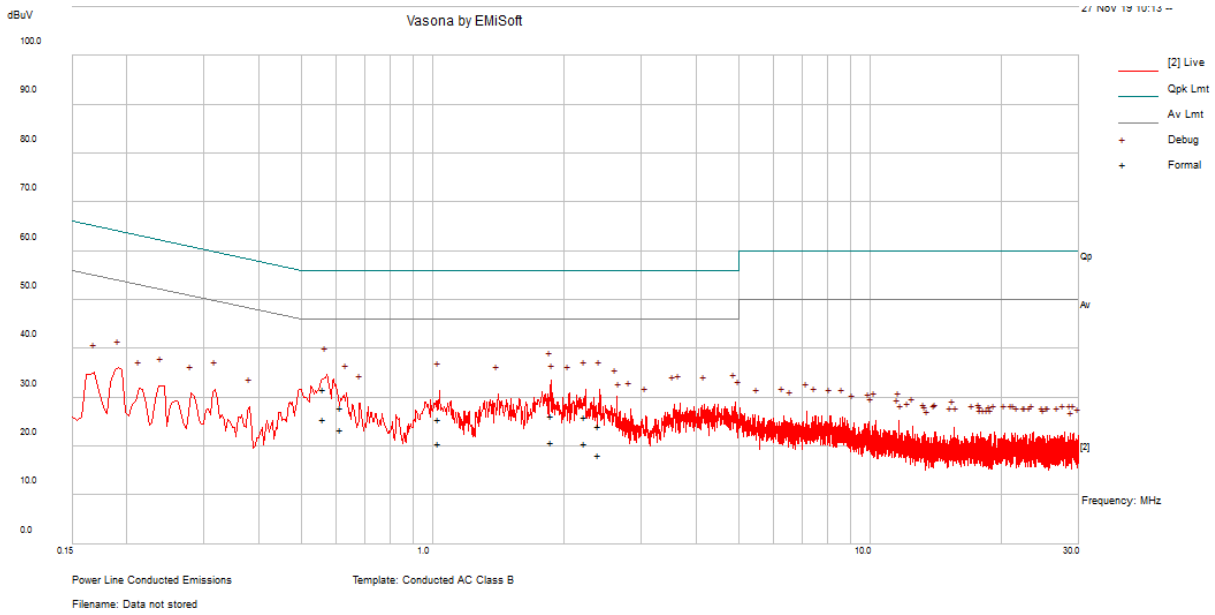


Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.54074	32.77	Neutral	56	-23.23	QP
0.593579	30.29	Neutral	56	-25.71	QP
1.9247	26.15	Neutral	56	-29.85	QP
2.068085	24.95	Neutral	56	-31.05	QP
1.64764	24.8	Neutral	56	-31.2	QP
1.233964	22.94	Neutral	56	-33.06	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.54074	27.4	Neutral	46	-18.6	Ave.
0.593579	25.06	Neutral	46	-20.94	Ave.
1.9247	20.95	Neutral	46	-25.05	Ave.
2.068085	18.75	Neutral	46	-27.25	Ave.
1.64764	17.82	Neutral	46	-28.18	Ave.
1.233964	16.04	Neutral	46	-29.96	Ave.

BLE 2402 MHz

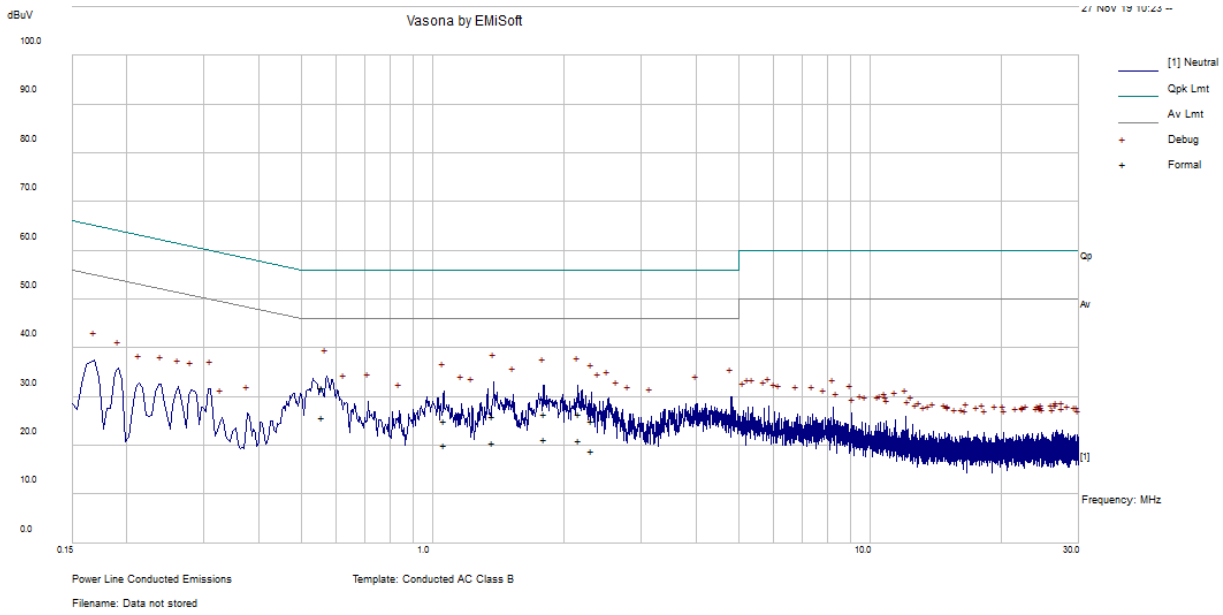
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.562588	31.72	Line	56	-24.28	QP
1.867745	26.19	Line	56	-29.81	QP
2.234589	26.07	Line	56	-29.93	QP
2.403675	24.2	Line	56	-31.8	QP
1.033646	25.44	Line	56	-30.56	QP
0.617095	27.98	Line	56	-28.02	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.562588	25.57	Line	46	-20.43	Ave.
1.867745	20.82	Line	46	-25.18	Ave.
2.234589	20.64	Line	46	-25.36	Ave.
2.403675	18.15	Line	46	-27.85	Ave.
1.033646	20.67	Line	46	-25.33	Ave.
0.617095	23.39	Line	46	-22.61	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.560338	31.98	Neutral	56	-24.02	QP
1.371994	26.02	Neutral	56	-29.98	QP
2.162756	26.49	Neutral	56	-29.51	QP
1.800896	26.53	Neutral	56	-29.47	QP
1.061566	25.17	Neutral	56	-30.83	QP
2.315393	24.96	Neutral	56	-31.04	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.560338	25.67	Neutral	46	-20.33	Ave.
1.371994	20.62	Neutral	46	-25.38	Ave.
2.162756	20.95	Neutral	46	-25.05	Ave.
1.800896	21.17	Neutral	46	-24.83	Ave.
1.061566	20.11	Neutral	46	-25.89	Ave.
2.315393	18.94	Neutral	46	-27.06	Ave.

7 FCC §15.209 & §15.247(d) - 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 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).

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 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 or 1/T / 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	2018-07-05	2 years
Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2019-11-07	2 years
Sunol Sciences	System Controller	SC99V	011003-1	N/R	N/A
Sunol Sciences	Antenna, Biconi-Log	JB1	A013105-3	2018-02-26	2 years
Sunol Sciences	Antenna, Horn	DRH-118	A052704	2019-04-02	2 years
HP/Agilent	Amplifier, Pre	8449B OPT HO2	3008A0113	2019-09-30	1 year
Insulated Wire INC	157 Series 2.92 SM (x2) Armored 33 ft. Cable	KPS-1571AN-3960-KPS	DC 1917	2019-05-08	1 year
-	SMA cable	-	C0002	Each time[1]	N/A
Agilent	Pre-Amplifier	8447D	2944A10187	2019-04-11	1 year
AH Systems	Preamplifier	PAM 1840 VH	170	2019-09-24	1 year
Wisewave	Antenna, Horn	ARH-4223-02	10555-02	2017-12-15	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 Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 02 October 2018) "A2LA Policy on Metrological Traceability".*

7.6 Test Environmental Conditions

Temperature:	20-22 ºC
Relative Humidity:	42-50 %
ATM Pressure:	101.9 -102.7 kPa

The testing was performed by Zhao Zhao, Frank Wang and Matthew Riego de Dios 2019-11-26 to 2019-11-27 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 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**
-1.57	34.06075	Vertical	b mode, mid channel

BLE

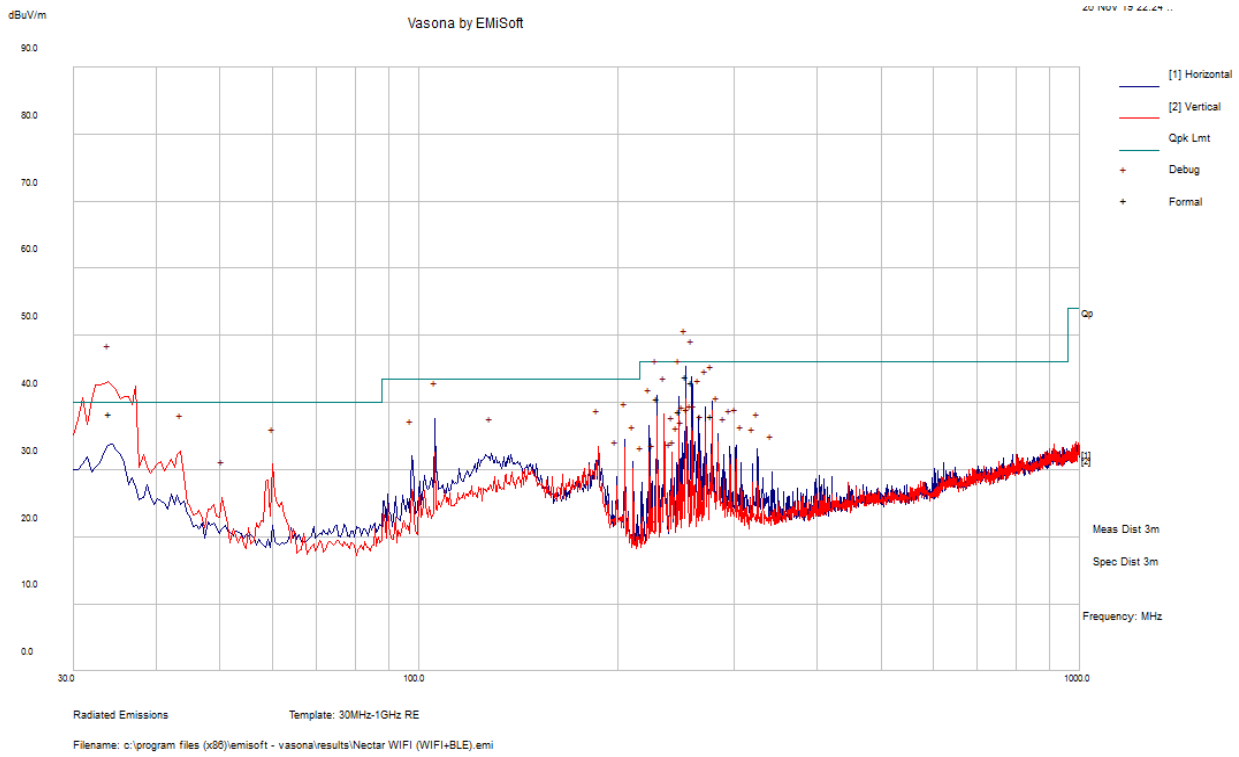
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**channel**
-2.69	4880	Horizontal	low channel

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

7.8 Radiated Emissions Test Results

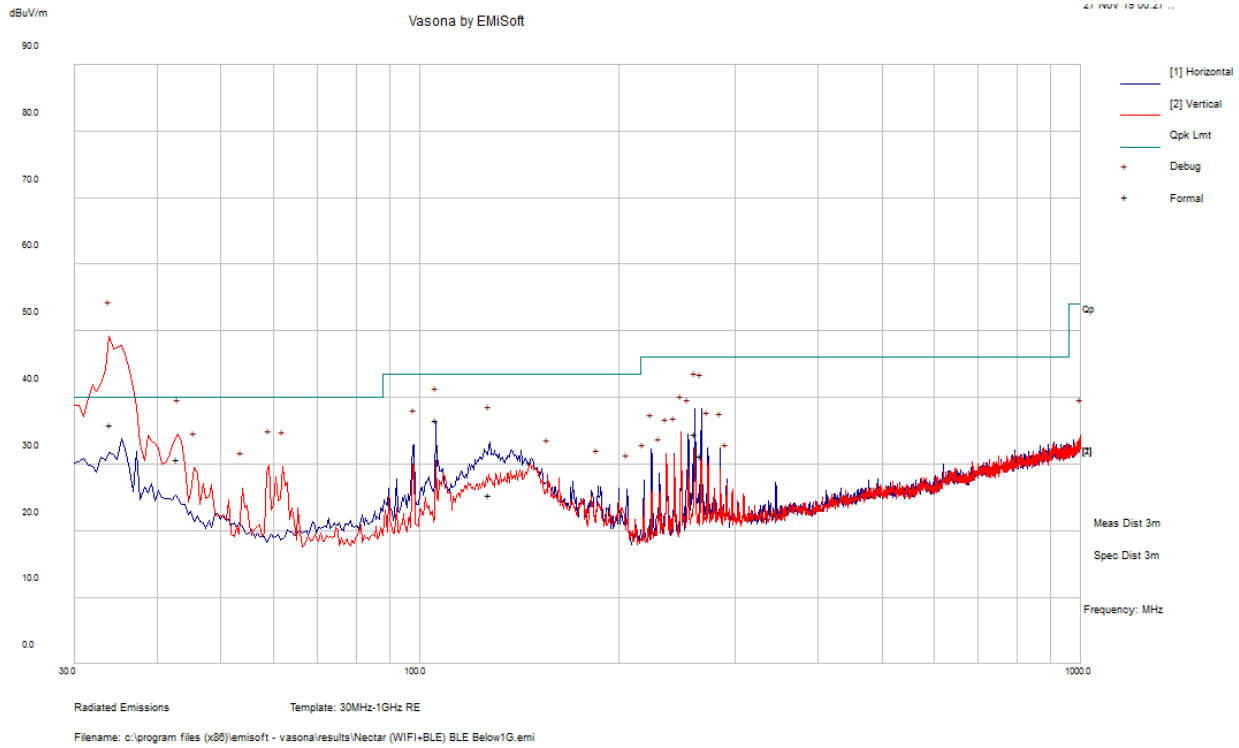
1) 30 MHz – 1 GHz Worst Case b mode 2437MHz, Measured at 3 meters

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
34.06075	38.43	236	V	203	40	-1.57	QP
253.19275	43.83	129	H	254	46	-2.17	QP
259.15325	42.97	147	H	234	46	-3.03	QP
229.04	40.62	186	H	245	46	-5.38	QP
247.2485	38.64	152	H	236	46	-7.36	QP
277.2105	38.04	118	H	253	46	-7.96	QP

BLE 2402 MHz



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
34.0395	36.02	271	V	307	40	-3.98	QP
42.9655	30.83	115	V	191	40	-9.17	QP
105.7695	36.64	162	H	136	43.5	-6.86	QP
260.62175	34.54	105	H	244	46	-11.46	QP
266.6235	31.29	121	H	55	46	-14.71	QP
127.29875	25.36	281	H	250	43.5	-18.14	QP

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2) 1–25 GHz Measured at 3 meters

802.11b mode, Power Setting 5

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
2390	62.18	288	148	H	28.87	5.73	39.02	57.75	74.00	-16.25	PK
2390	51.22	288	148	H	28.87	5.73	39.02	46.79	54.00	-7.21	AV
2390	58.46	292	106	V	28.89	5.73	39.02	54.06	74.00	-19.95	PK
2390	45.26	292	106	V	28.89	5.73	39.02	40.86	54.00	-13.15	AV
4020	51.32	331	199	H	33.01	7.34	37.50	54.17	74.00	-19.83	PK
4020	45.58	331	199	H	33.01	7.34	37.50	48.43	54.00	-5.57	AV
4020	53.72	9	198	V	32.19	7.34	37.50	55.75	74.00	-18.25	PK
4020	47.12	9	198	V	32.19	7.34	37.50	49.15	54.00	-4.85	AV
4824	48.28	298	159	H	32.46	8.40	37.60	51.54	74.00	-22.47	PK
4824	35.27	298	159	H	32.46	8.40	37.60	38.53	54.00	-15.48	AV
4824	46.83	0	100	V	32.45	8.40	37.60	50.08	74.00	-23.92	PK
4824	33.95	0	100	V	32.45	8.40	37.60	37.20	54.00	-16.80	AV
Middle Channel 2437 MHz											
4874	48.77	270	145	H	32.67	8.62	37.60	52.46	74.00	-21.54	PK
4874	34.03	270	145	H	32.67	8.62	37.60	37.72	54.00	-16.28	AV
4874	47.15	270	145	V	32.73	8.62	37.60	50.91	74.00	-23.09	PK
4874	33.35	270	145	V	32.73	8.62	37.60	37.11	54.00	-16.89	AV
4060	52.47	287	196	H	32.86	7.45	37.50	55.28	74.00	-18.72	PK
4060	44.13	287	196	H	32.86	7.45	37.50	46.94	54.00	-7.06	AV
4060	53.70	3	198	V	32.98	7.45	37.50	56.63	74.00	-17.37	PK
4060	46.20	3	198	V	32.98	7.45	37.50	49.13	54.00	-4.87	AV
High Channel 2462 MHz											
2483.5	52.99	288	149	H	29.17	5.85	39.02	48.98	74.00	-25.02	PK
2483.5	39.62	288	149	H	29.17	5.85	39.02	35.61	54.00	-18.39	AV
2483.5	50.95	324	169	V	29.10	5.85	39.02	46.87	74.00	-27.13	PK
2483.5	36.51	324	169	V	29.10	5.85	39.02	32.43	54.00	-21.57	AV
4102	52.60	227	227	H	32.79	7.45	37.50	55.34	74.00	-18.66	PK
4102	44.50	227	227	H	32.79	7.45	37.50	47.24	54.00	-6.76	AV
4102	52.25	8	213	V	32.76	7.45	37.50	54.96	74.00	-19.04	PK
4102	44.62	8	213	V	32.76	7.45	37.50	47.33	54.00	-6.67	AV
4924	47.93	259	166	H	32.67	8.62	37.60	51.62	74.00	-22.38	PK
4924	35.37	259	166	H	32.67	8.62	37.60	39.06	54.00	-14.94	AV
4924	49.90	87	131	V	32.73	8.62	37.60	53.66	74.00	-20.34	PK
4924	40.34	87	131	V	32.73	8.62	37.60	44.10	54.00	-9.90	AV

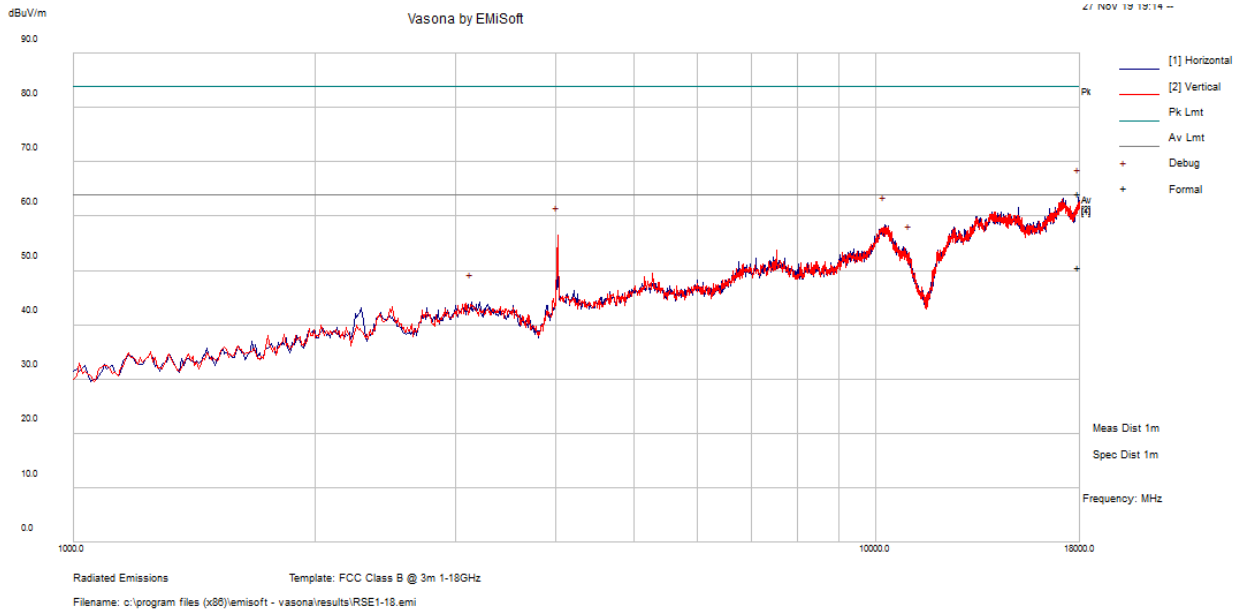
802.11g mode, Power Setting: 0

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
2390	65.95	165	173	H	28.87	5.73	39.02	61.52	74.00	-12.48	PK
2390	47.10	165	173	H	28.87	5.73	39.02	42.67	54.00	-11.33	AV
2390	67.50	152	157	V	28.89	5.73	39.02	63.10	74.00	-10.91	PK
2390	52.20	152	157	V	28.89	5.73	39.02	47.80	54.00	-6.21	AV
4020	55.58	73	209	H	33.01	7.34	37.845	58.08	74.00	-15.92	PK
4020	43.69	73	209	H	33.01	7.34	37.845	46.19	54.00	-7.81	AV
4020	56.23	167	213	V	32.19	7.34	37.845	57.91	74.00	-16.09	PK
4020	45.21	167	213	V	32.19	7.34	37.845	46.89	54.00	-7.11	AV
4824	47.21	0	100	H	32.46	8.40	37.60	50.47	74.00	-23.54	PK
4824	33.65	0	100	H	32.46	8.40	37.60	36.91	54.00	-17.10	AV
4824	46.83	0	100	V	32.45	8.40	37.60	50.08	74.00	-23.92	PK
4824	33.95	0	100	V	32.45	8.40	37.60	37.20	54.00	-16.80	AV
Middle Channel 2437 MHz											
4874	47.44	0	100	H	32.67	8.62	37.60	51.13	74.00	-22.87	PK
4874	33.35	0	100	H	32.67	8.62	37.60	37.04	54.00	-16.96	AV
4874	47.05	0	100	V	32.73	8.62	37.60	50.81	74.00	-23.19	PK
4874	33.54	0	100	V	32.73	8.62	37.60	37.30	54.00	-16.70	AV
4060	53.39	197	204	H	32.86	7.45	37.50	56.20	74.00	-17.80	PK
4060	42.90	197	204	H	32.86	7.45	37.50	45.71	54.00	-8.29	AV
4060	54.08	205	225	V	32.98	7.45	37.50	57.01	74.00	-16.99	PK
4060	43.17	205	225	V	32.98	7.45	37.50	46.10	54.00	-7.90	AV
High Channel 2462 MHz											
2483.5	61.69	200	176	H	29.17	5.85	39.02	57.68	74.00	-16.32	PK
2483.5	44.96	200	176	H	29.17	5.85	39.02	40.95	54.00	-13.05	AV
2483.5	66.87	207	169	V	29.10	5.85	39.02	62.79	74.00	-11.21	PK
2483.5	48.94	207	169	V	29.10	5.85	39.02	44.86	54.00	-9.14	AV
4924	46.93	0	100	H	32.67	8.62	37.60	50.62	74.00	-23.38	PK
4924	33.72	0	100	H	32.67	8.62	37.60	37.41	54.00	-16.59	AV
4924	46.99	0	100	H	32.73	8.62	37.60	50.75	74.00	-23.25	PK
4924	33.38	0	100	H	32.73	8.62	37.60	37.14	54.00	-16.86	AV
4102	54.15	202	204	H	32.79	7.45	37.50	56.89	74.00	-17.11	PK
4102	43.40	202	204	H	32.79	7.45	37.50	46.14	54.00	-7.86	AV
4102	54.83	205	192	V	32.76	7.45	37.50	57.54	74.00	-16.46	PK
4102	43.42	205	192	V	32.76	7.45	37.50	46.13	54.00	-7.87	AV

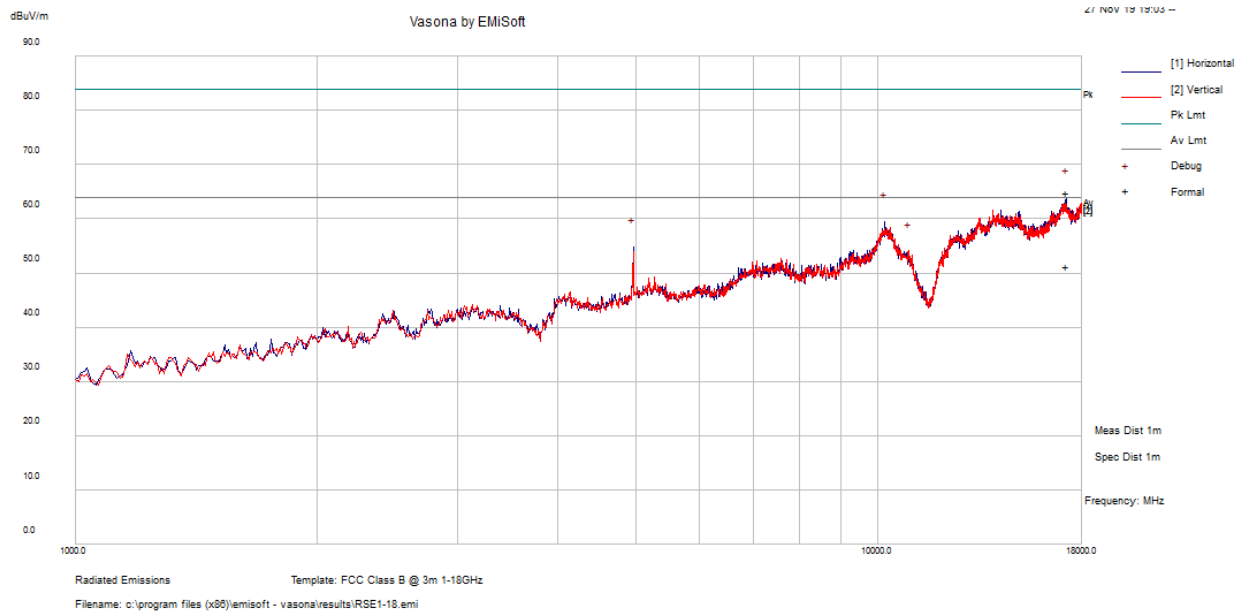
BLE

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2402 MHz											
2383	60.73	276	186	H	28.87	5.73	39.02	56.30	74.00	-17.70	PK
2383	38.74	276	186	H	28.87	5.73	39.02	34.31	54.00	-19.69	AV
2383	56.48	235	150	V	28.89	5.73	39.02	52.08	74.00	-21.93	PK
2383	38.92	235	150	V	28.89	5.73	39.02	34.52	54.00	-19.49	AV
4804	52.02	0	253	H	32.46	8.40	37.60	55.28	74.00	-18.73	PK
4804	45.25	0	253	H	32.46	8.40	37.60	48.51	54.00	-5.50	AV
4804	53.12	0	146	V	32.45	8.40	37.60	56.37	74.00	-17.63	PK
4804	47.55	0	146	V	32.45	8.40	37.60	50.80	54.00	-3.20	AV
Middle Channel 2440 MHz											
4880	52.13	240	243	H	32.67	8.62	37.60	55.82	74.00	-18.18	PK
4880	47.62	240	243	H	32.67	8.62	37.60	51.31	54.00	-2.69	AV
4880	52.05	11	264	V	32.73	8.62	37.60	55.81	74.00	-18.19	PK
4880	47.12	11	264	V	32.73	8.62	37.60	50.88	54.00	-3.12	AV
High Channel 2480 MHz											
2483.5	57.70	270	175	H	28.47	5.85	39.27	52.75	74.00	-21.25	PK
2483.5	40.37	270	175	H	28.47	5.85	39.27	35.42	54.00	-18.58	AV
2483.5	56.01	239	128	V	28.64	5.85	39.27	51.23	74.00	-22.77	PK
2483.5	39.51	48	290	V	28.64	5.85	39.27	34.73	54.00	-19.27	AV
4960	50.42	48	290	H	32.73	8.81	37.598	54.37	74.00	-19.63	PK
4960	44.20	48	290	H	32.73	8.81	37.598	48.15	54.00	-5.85	AV
4960	48.99	0	150	V	32.73	8.81	37.598	52.94	74.00	-21.06	PK
4960	43.10	0	150	V	32.73	8.81	37.598	47.05	54.00	-6.95	AV

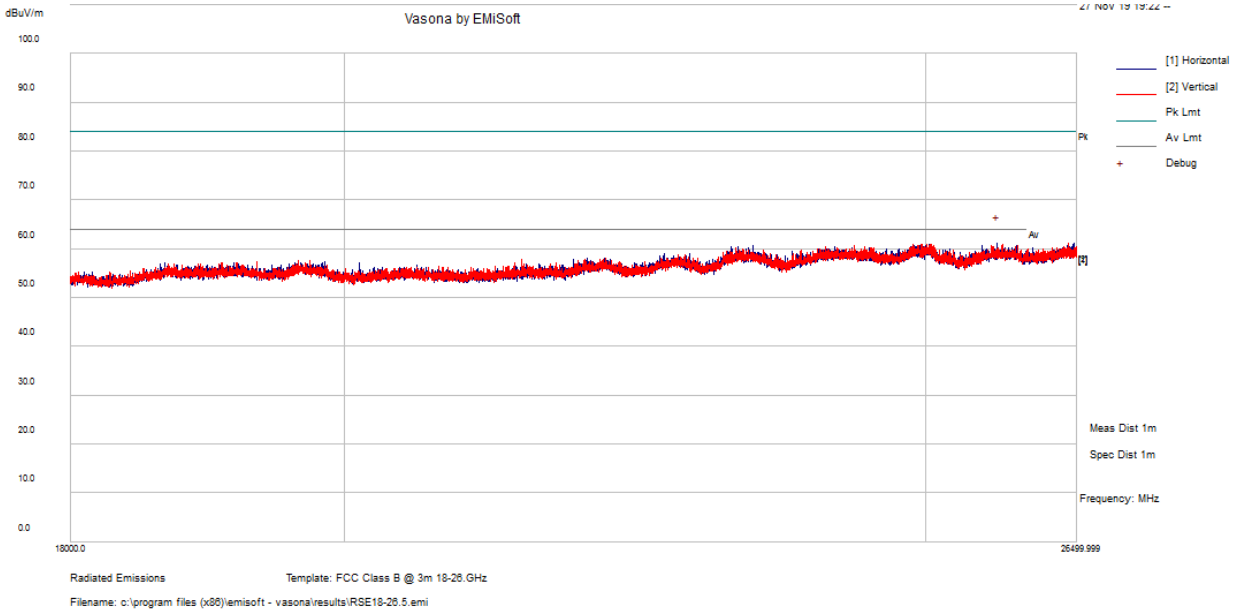
1 GHz – 18 GHz 2.4 GHz Wi-Fi Worst Case Scan at 1 Meter



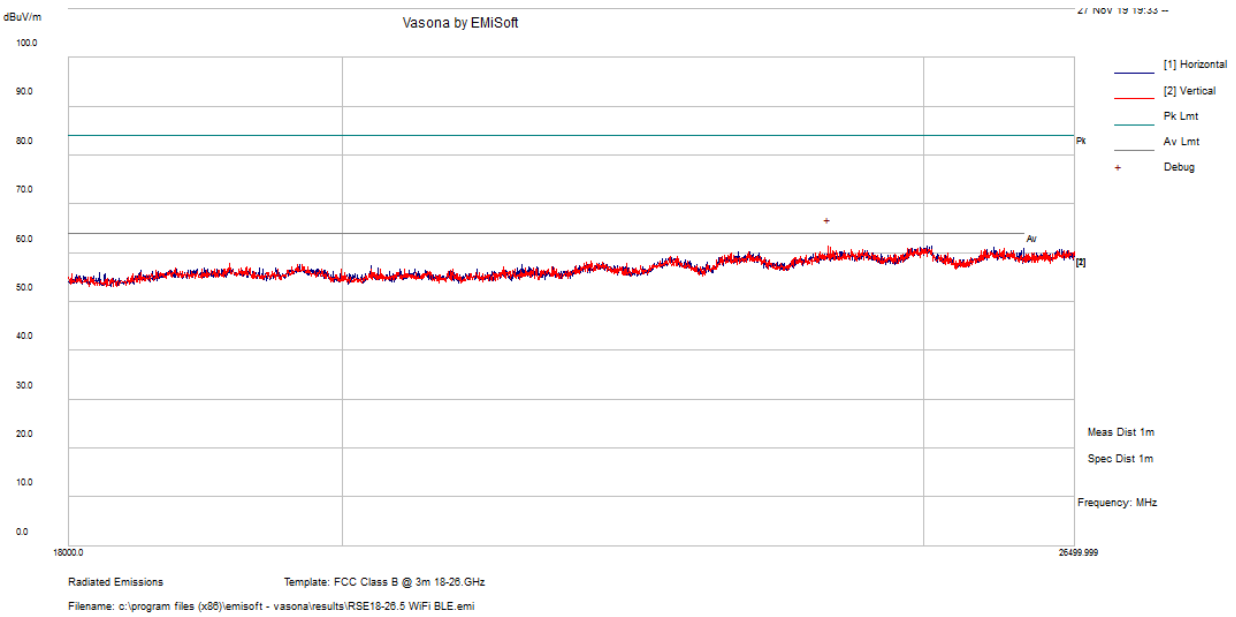
1 GHz – 18 GHz BLE Worst Case Scan at 1 Meter



18 GHz – 26.5 2.4 GHz Wi-Fi Worst Case GHz Scan at 1 Meter



18 GHz – 26.5 BLE Worst Case GHz Scan at 1 Meter



Note: No emission found above 18 GHz

8 FCC §15.247(a) (2) - Emission Bandwidth

8.1 Applicable Standards

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

8.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v05r02: 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	2019-06-26	1 year
-	RF cable	-	-	Each time[1]	N/A
-	20dB 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 of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 02 October 2018) "A2LA Policy on Metrological Traceability".*

8.4 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	101.9 KPa

The testing was performed by Zhao Zhao on 2019-11-27 in RF site.

8.5 Test Results

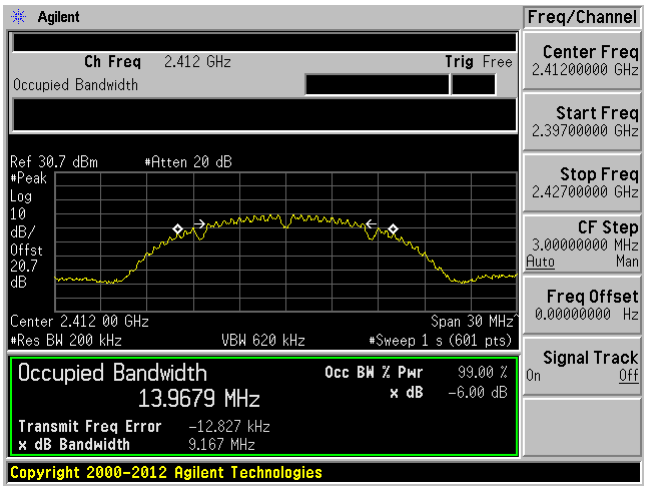
Channel	Frequency (MHz)	99% OBW (kHz)	6 dB BW (kHz)	6 dB OBW Limit (kHz)
802.11b mode				
Low	2412	13697.9	9035	500
Middle	2437	13975.5	9527	500
High	2462	13989.1	9514	500
802.11g mode				
Low	2412	16506.6	15108	500
Middle	2437	16670.7	15114	500
High	2462	16510.4	15122	500
BLE				
Low	2402	985.6954	620.324	500
Middle	2440	989.7636	617.682	500
High	2480	966.5087	633.208	500

Please refer to the following plots for detailed test results.

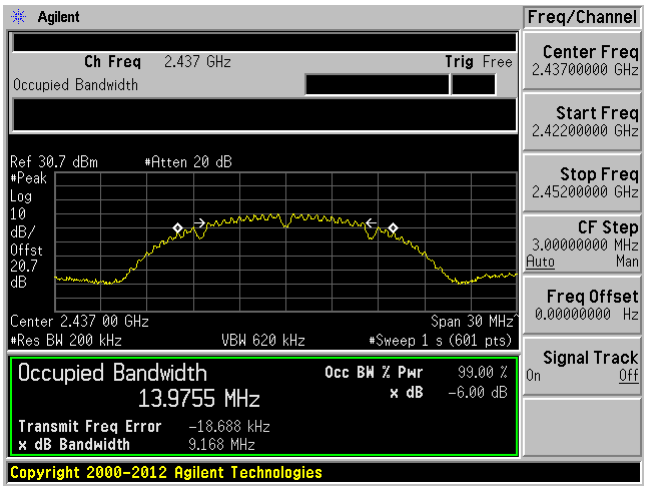
99% OBW

802.11b mode

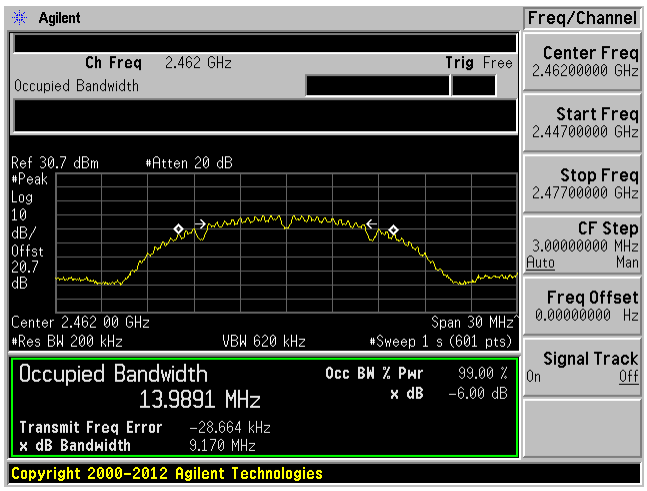
Low Channel 2412 MHz



Middle Channel 2437 MHz

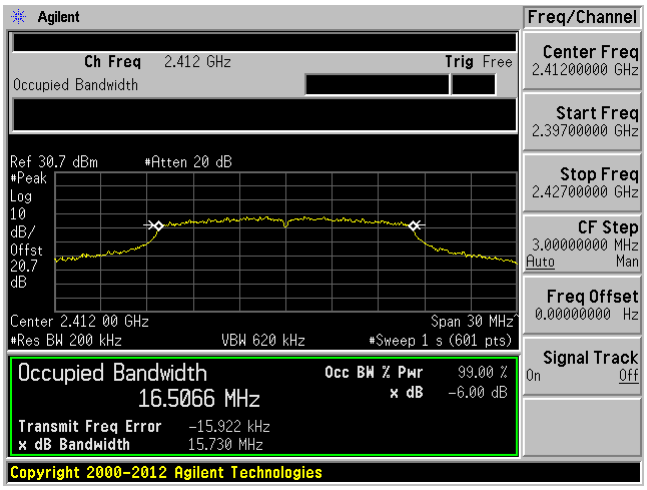


High Channel 2462 MHz

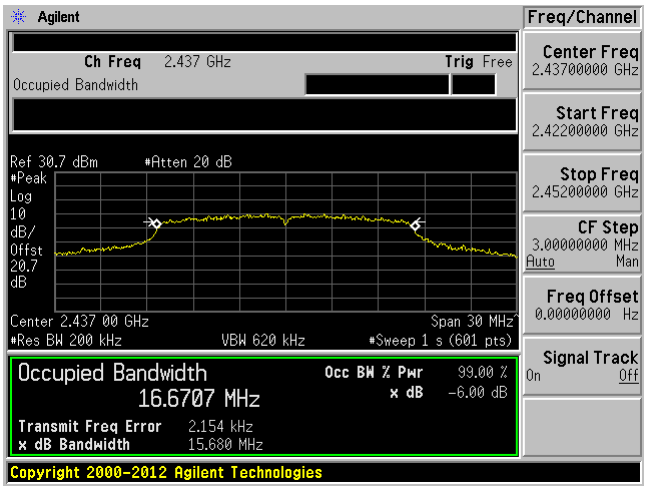


802.11g mode

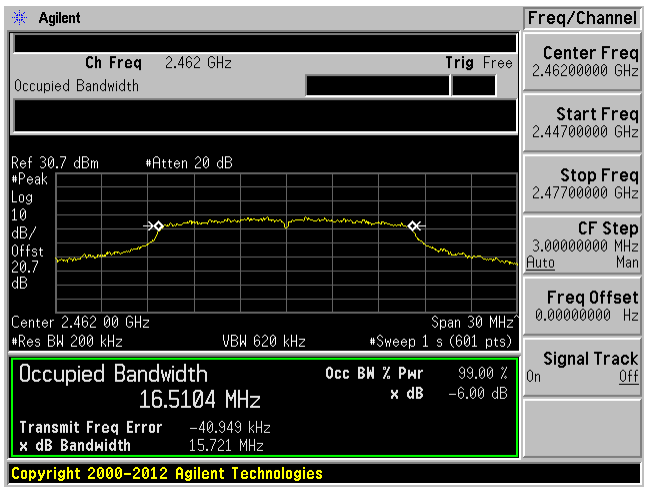
Low Channel 2412 MHz



Middle Channel 2437 MHz

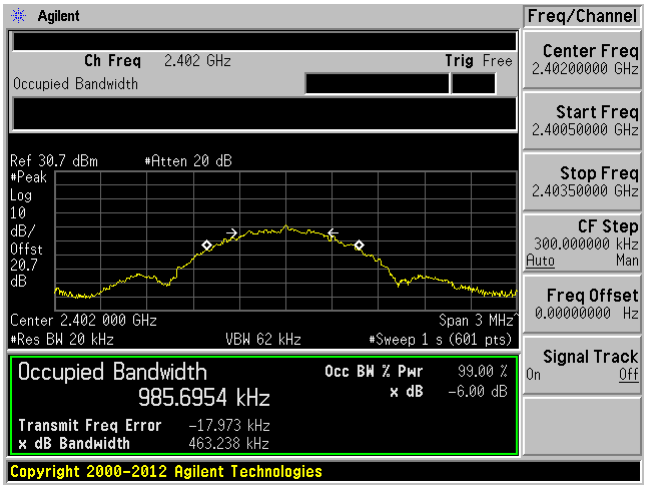


High Channel 2462 MHz

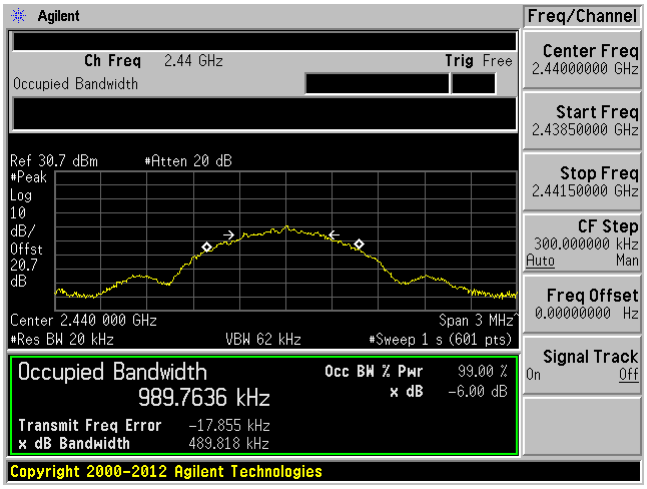


BLE

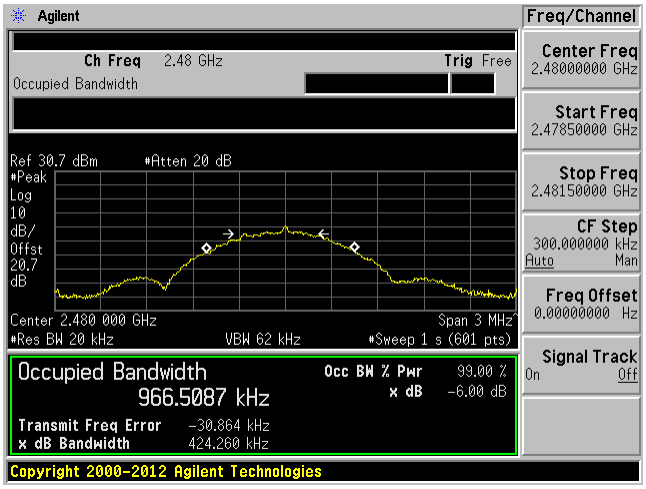
Low Channel 2402 MHz



Middle Channel 2440 MHz



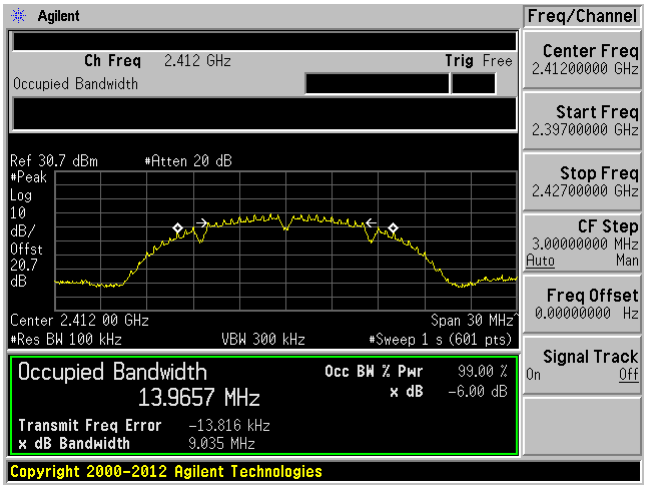
High Channel 2480 MHz



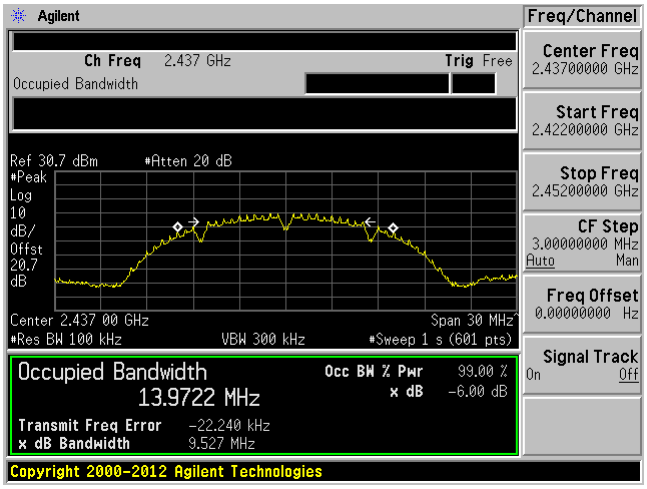
6 dB OBW

802.11b mode

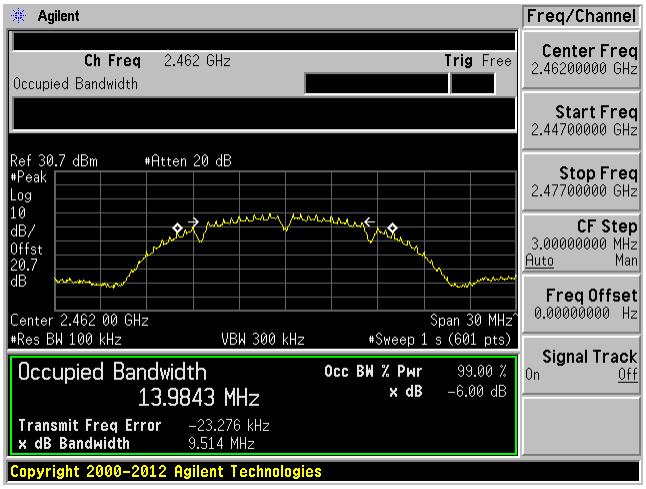
Low Channel 2412 MHz



Middle Channel 2437 MHz

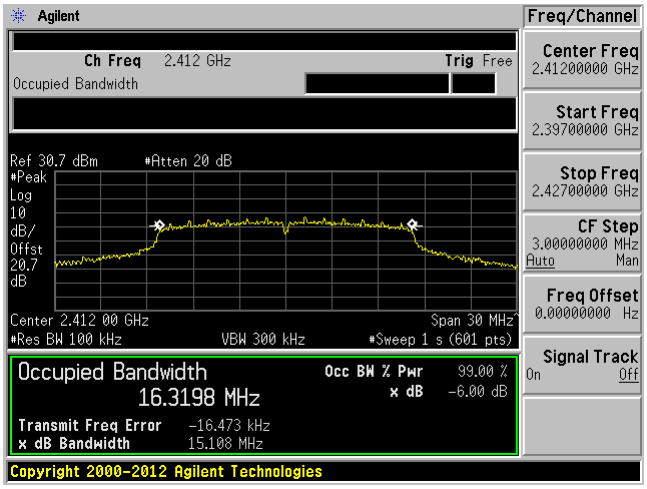


High Channel 2462 MHz

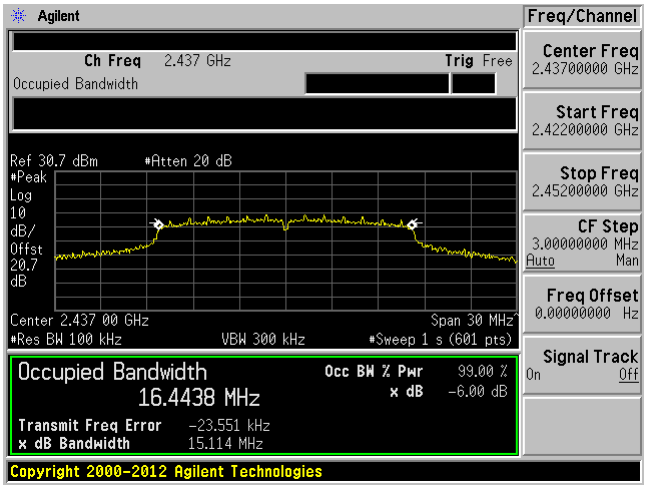


802.11g mode

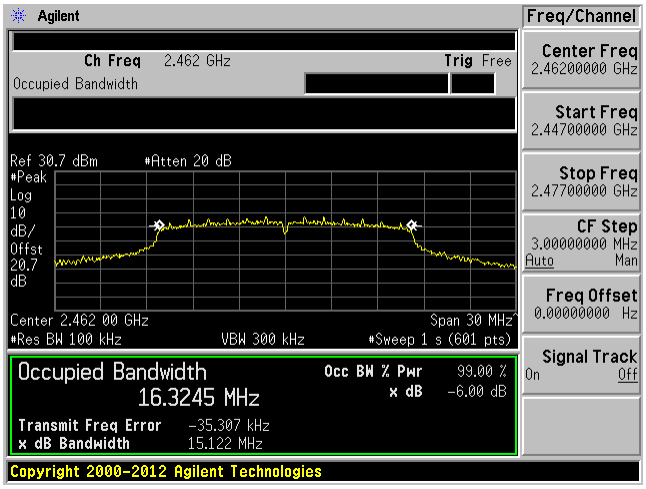
Low Channel 2412 MHz



Middle Channel 2437 MHz

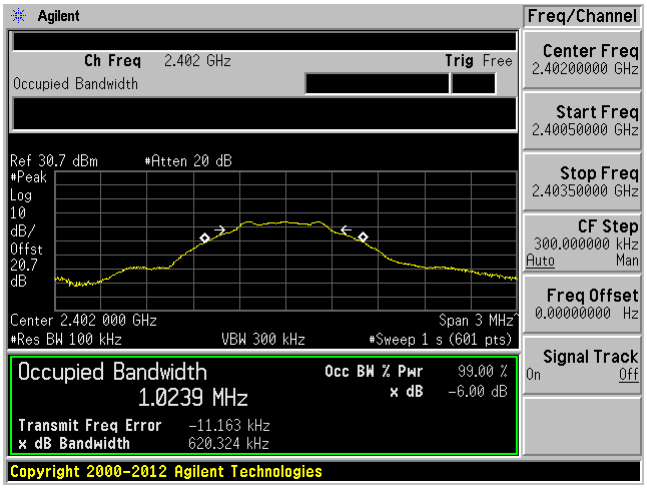


High Channel 2462 MHz

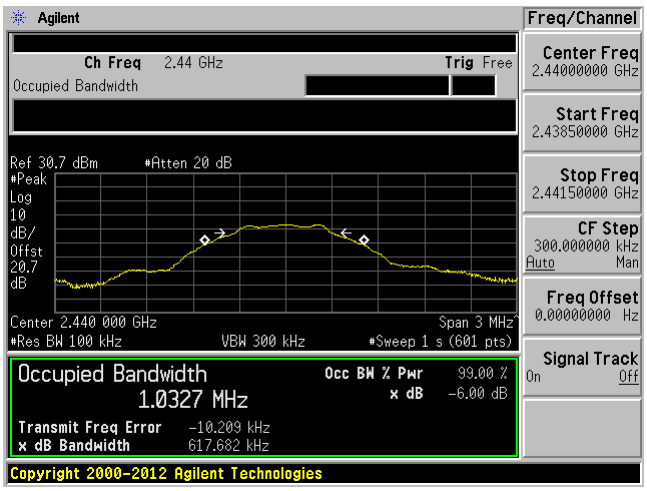


BLE

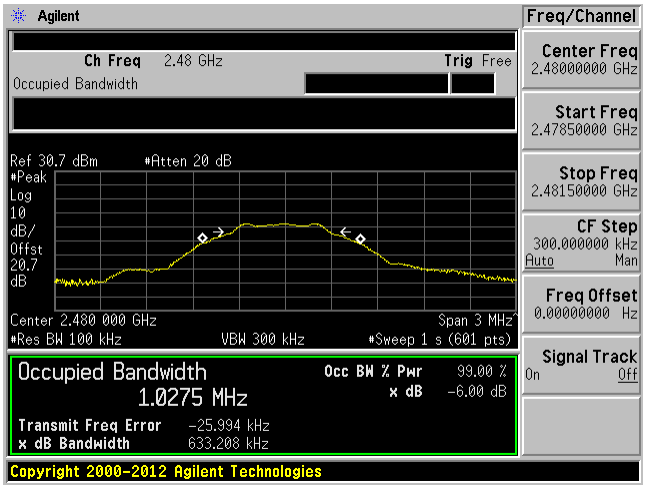
Low Channel 2402 MHz



Middle Channel 2440 MHz



High Channel 2480 MHz



9 FCC §15.247(b) (3) - Output Power Measurement

9.1 Applicable Standards

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

9.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v05r02: 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	2019-06-26	1 year
ETS- Lingerin	Power Sensor	7002-006	160097	2018-12-31	2 years
-	RF Cable	-	-	Each time[1]	N/A
-	20dB 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 of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 02 October 2018) "A2LA Policy on Metrological Traceability".*

9.4 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	101.9 KPa

The testing was performed by Zhao Zhao 2019-11-27- in RF site.

9.5 Test Results

Channel	Frequency (MHz)	Conducted Average Power (dBm)	Limit (dBm)
802.11b mode			
Low	2412	9.87	30
Mid	2437	10.81	30
High	2462	9.81	30
802.11g mode			
Low	2412	9.41	30
Mid	2437	10.28	30
High	2462	9.56	30

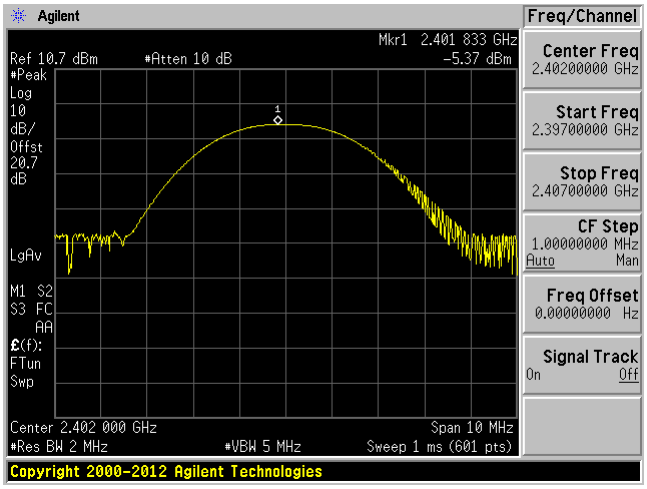
Note: Duty Cycle correction factor has already been added to the measurement.

Channel	Frequency (MHz)	Conducted Peak Power (dBm)	Limit (dBm)
BLE			
Low	2402	-5.37	30
Middle	2440	-6.05	30
High	2480	-6.82	30

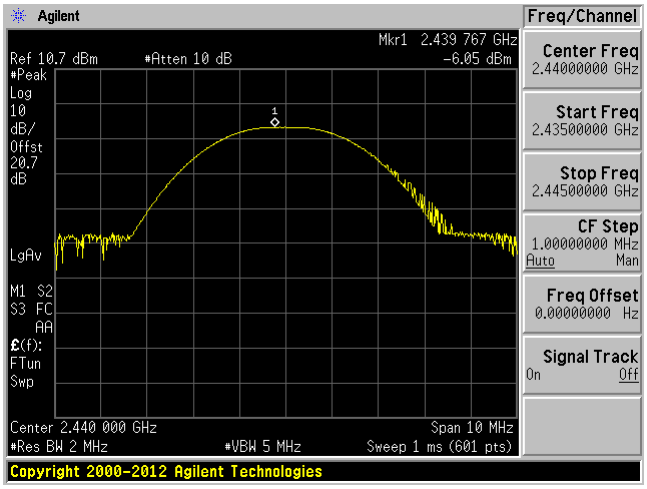
Please refer to the following plots for detailed test results.

BLE

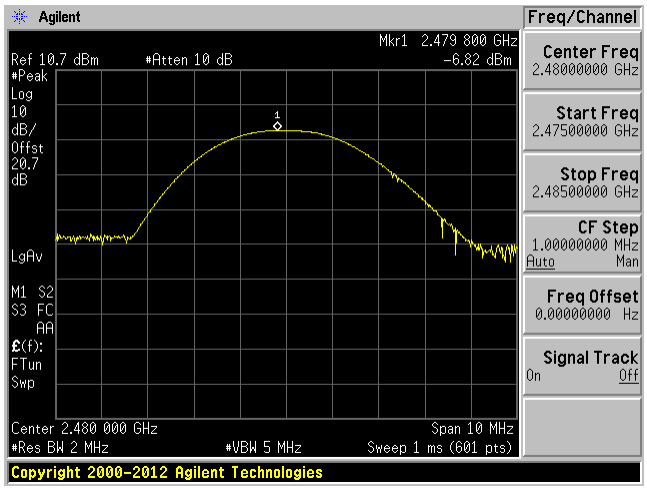
Low Channel 2402 MHz



Middle Channel 2440 MHz



High Channel 2480 MHz



10 FCC §15.247(d) - 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).

10.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v05r02: 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	Analyzer, Spectrum	E4446A	MY48250238	2019-06-26	1 year
-	RF Cable	-	-	Each time[1]	N/A
-	20dB 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 of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 02 October 2018) "A2LA Policy on Metrological Traceability".*

10.4 Test Environmental Conditions

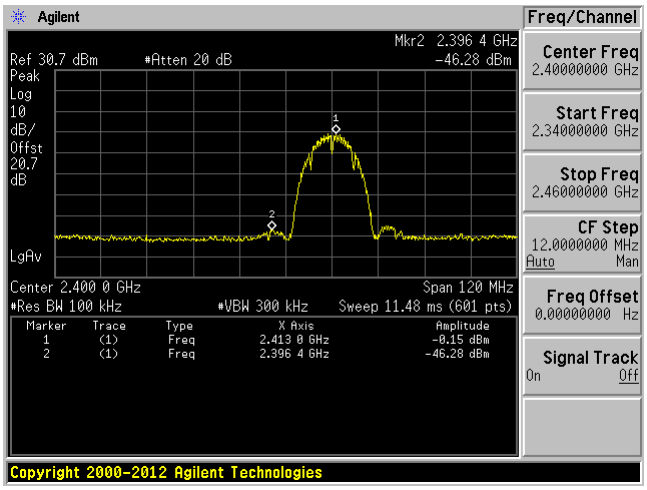
Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	101.9 KPa

The testing was performed by Zhao Zhao 2019-11-27 in RF site.

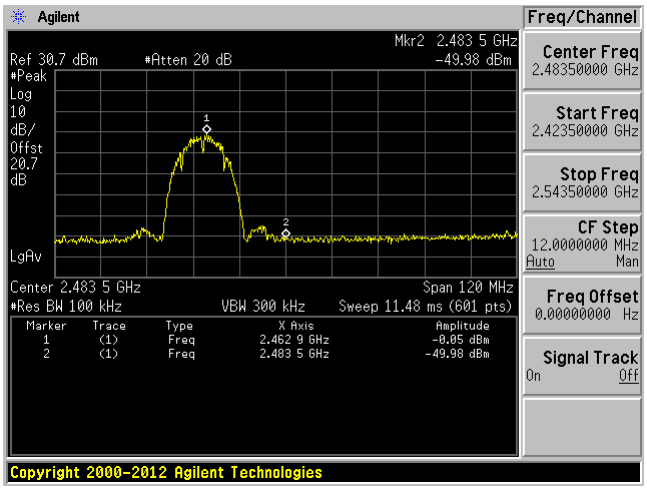
10.5 Test Results

802.11b mode

Low Channel 2412 MHz

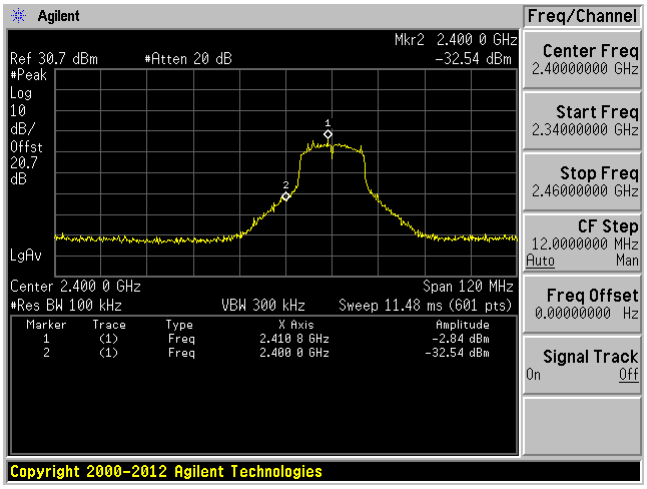


High Channel 2462 MHz

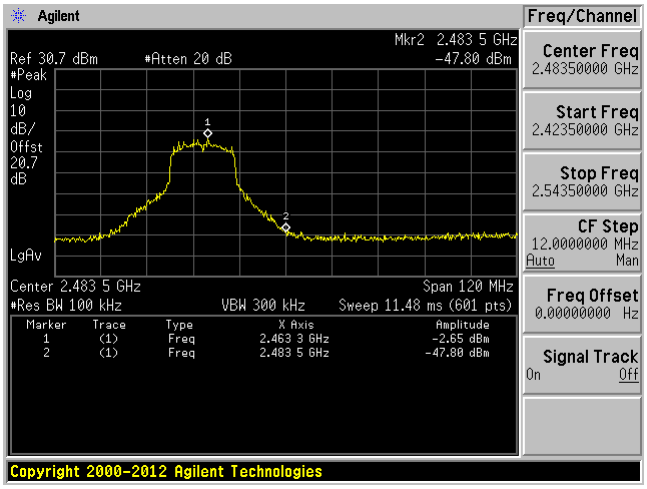


802.11g mode

Low Channel 2412 MHz

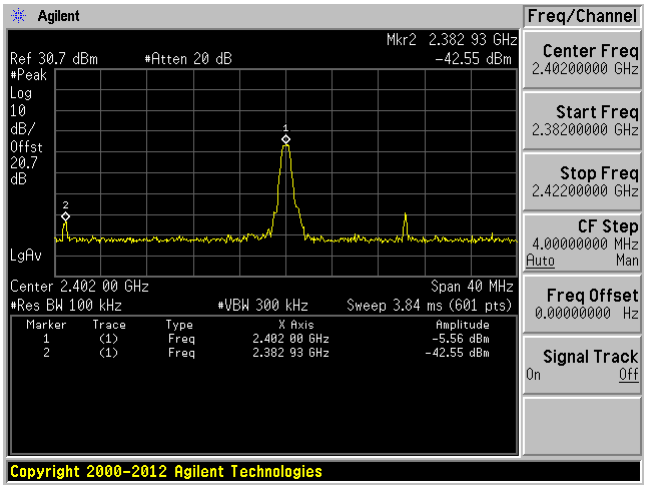


High Channel 2462 MHz

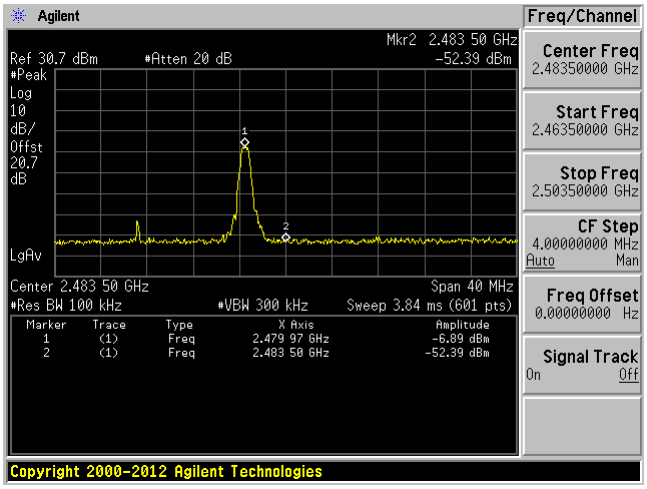


BLE

Low Channel 2402 MHz



High Channel 2480 MHz



11 FCC §15.247(e) - Power Spectral Density

11.1 Applicable Standards

According to ECFR §15.247(e), 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 v05r02: 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	2019-06-26	1 year
-	RF Cable	-	-	Each time[1]	N/A
-	20dB 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 of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 02 October 2018) "A2LA Policy on Metrological Traceability".*

11.4 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	101.9 KPa

The testing was performed by Zhao Zhao on 2019-11-27 in RF site.

11.5 Test Results

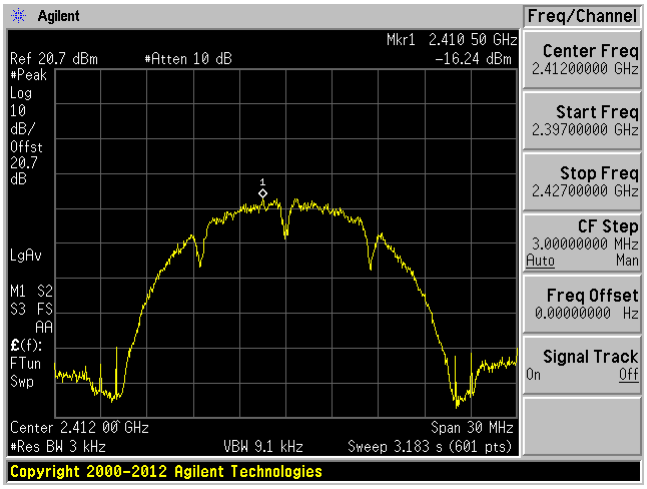
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode			
Low	2412	-16.24	8
Middle	2437	-15.97	8
High	2462	-16.04	8
802.11g mode			
Low	2412	-19.20	8
Middle	2437	-17.51	8
High	2462	-18.33	8

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
BLE			
Low	2402	-17.56	8
Middle	2440	-18.72	8
High	2480	-19.56	8

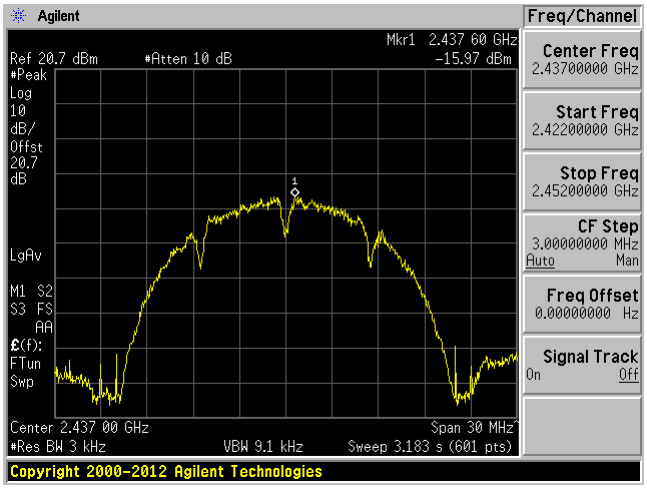
Please refer to the following plots for detailed test results

802.11b mode

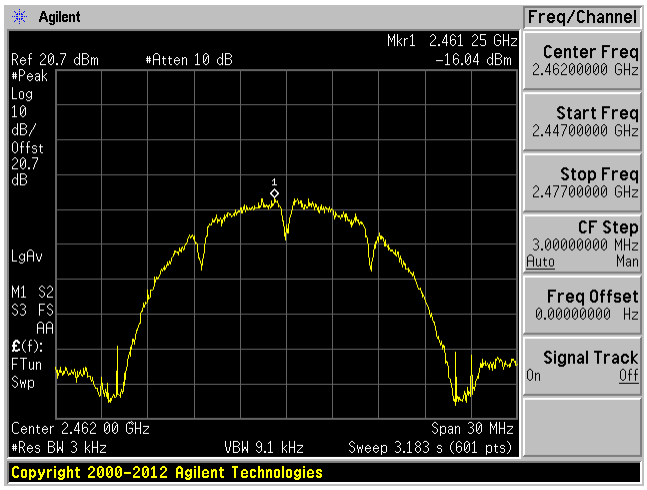
Low Channel 2412 MHz



Middle Channel 2437 MHz

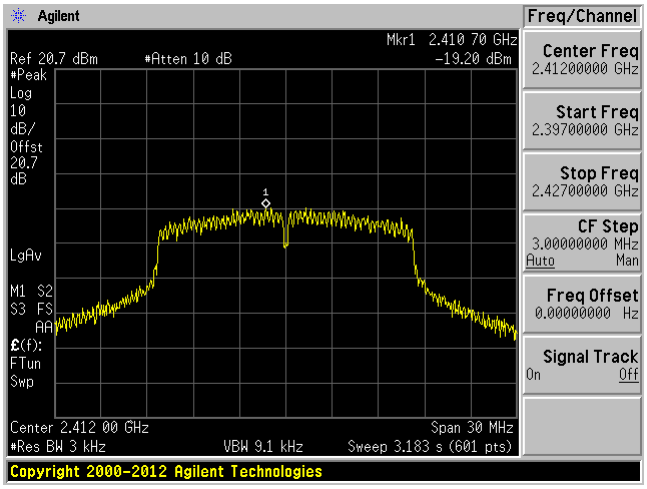


High Channel 2462 MHz

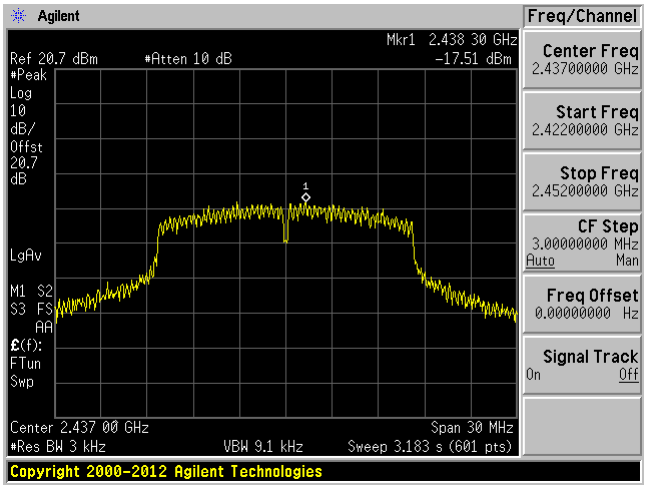


802.11g mode

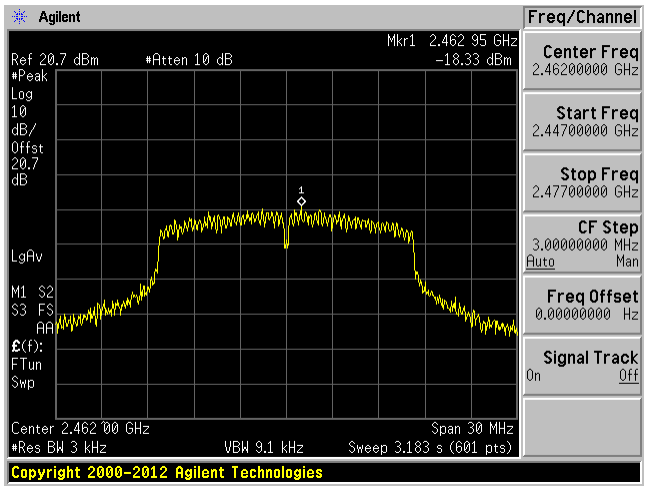
Low Channel 2412 MHz



Middle Channel 2437 MHz

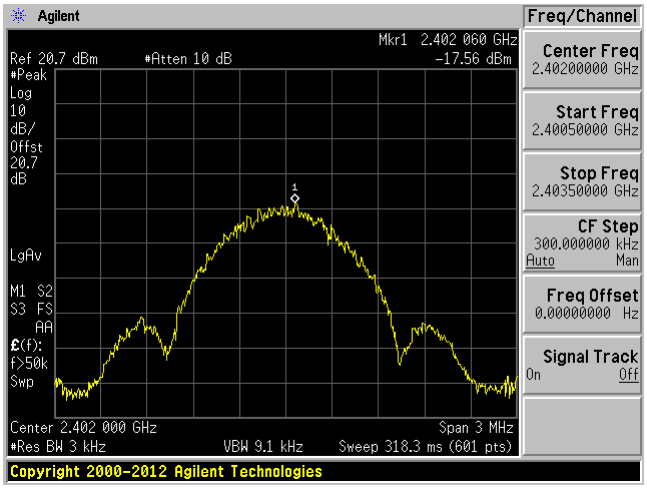


High Channel 2462 MHz

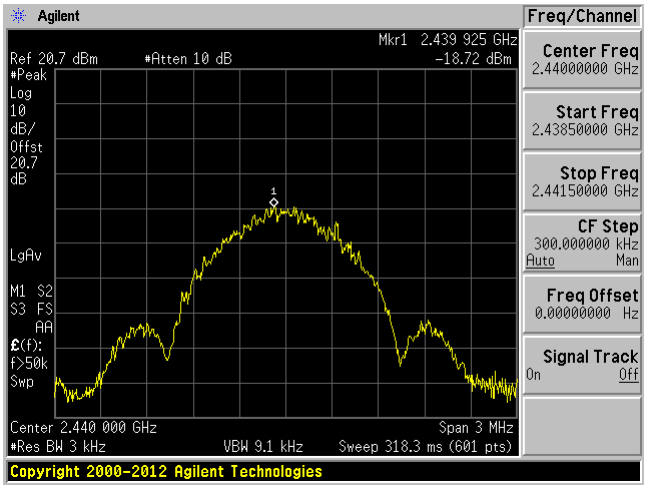


BLE

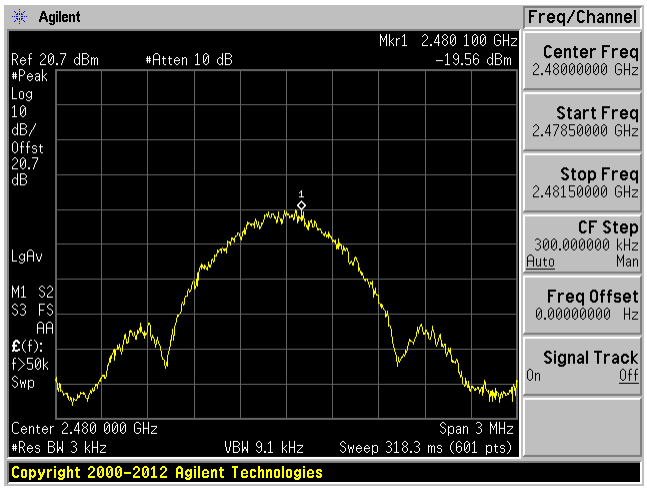
Low Channel 2402 MHz



Middle Channel 2440 MHz



High Channel 2480 MHz



12 FCC §15.247(d) - 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)).

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	E4446A	MY48250238	2019-06-26	1 year
-	RF Cable	-	-	Each time[1]	N/A
-	20dB 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 of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 02 October 2018) "A2LA Policy on Metrological Traceability".*

12.4 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	101.9 KPa

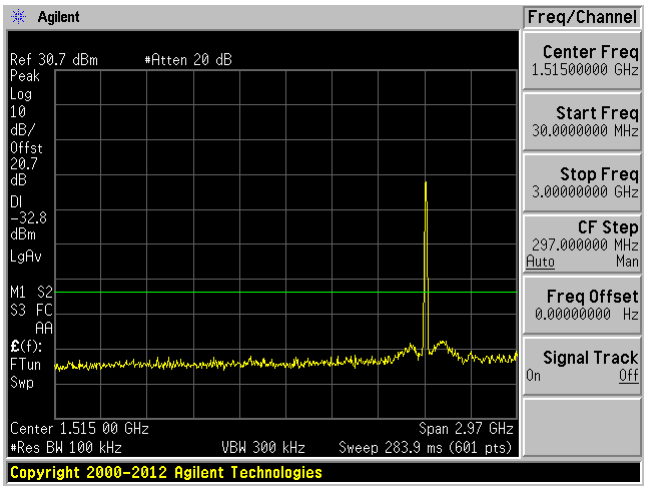
The testing was performed by Zhao Zhao on 2019-11-27 in RF site.

12.5 Test Results

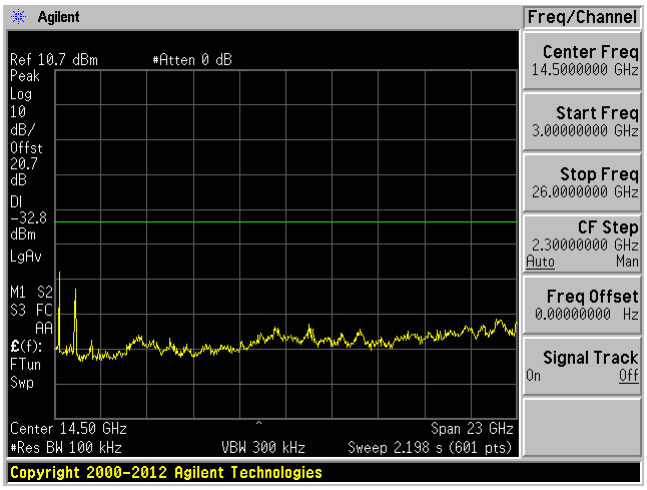
Please refer to following plots.

802.11b mode

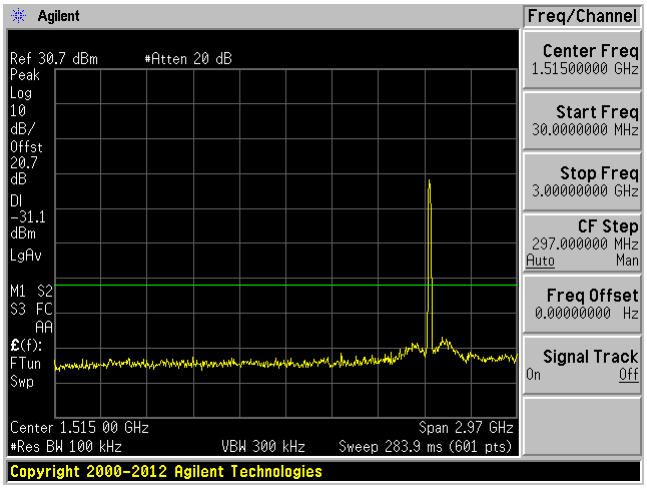
Low Channel 30MHz – 3 GHz



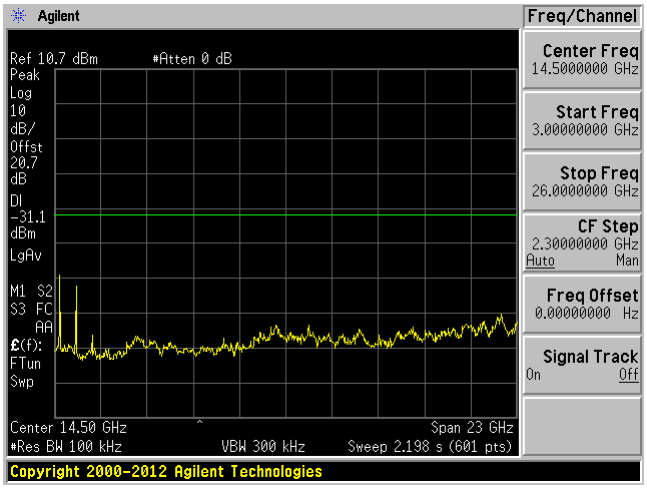
Low Channel 3 GHz – 26 GHz



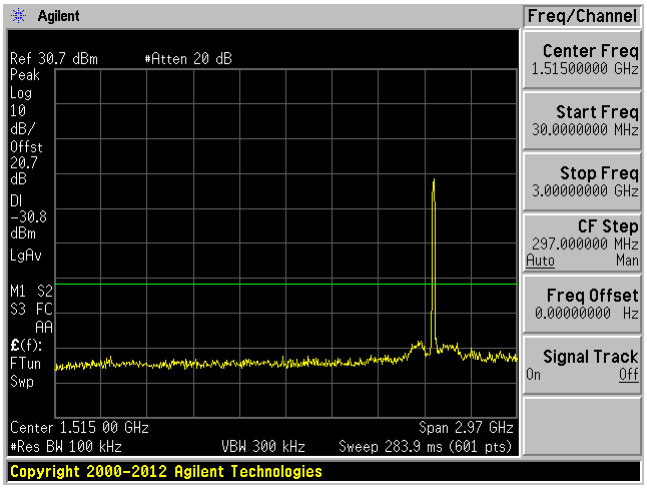
Middle Channel 30 MHz – 3 GHz



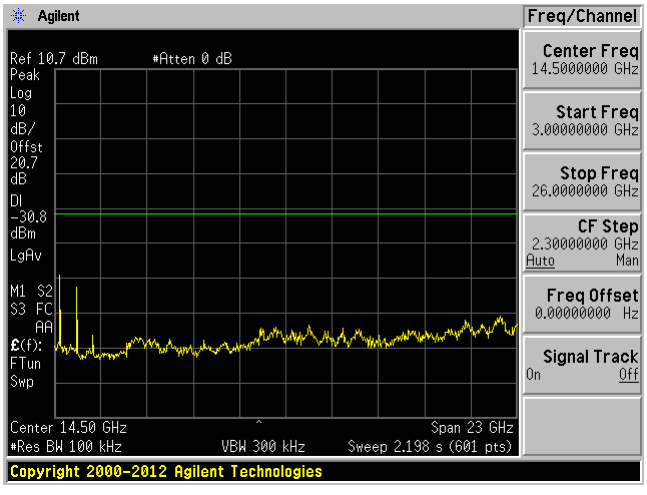
Middle Channel 3 GHz – 26 GHz



High Channel 30 MHz – 3 GHz

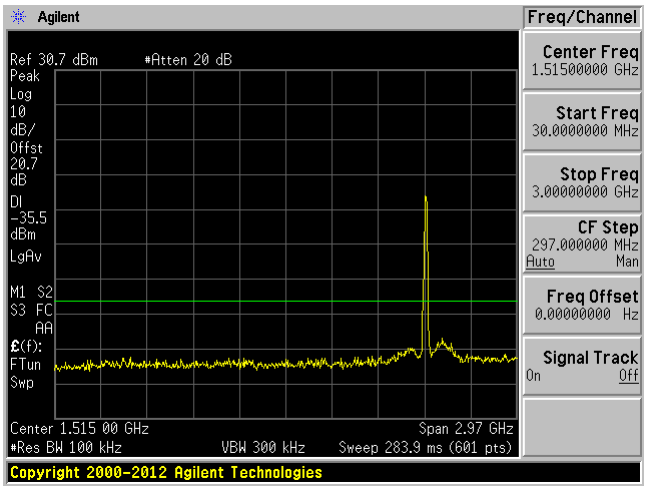


High Channel 3 GHz – 26 GHz

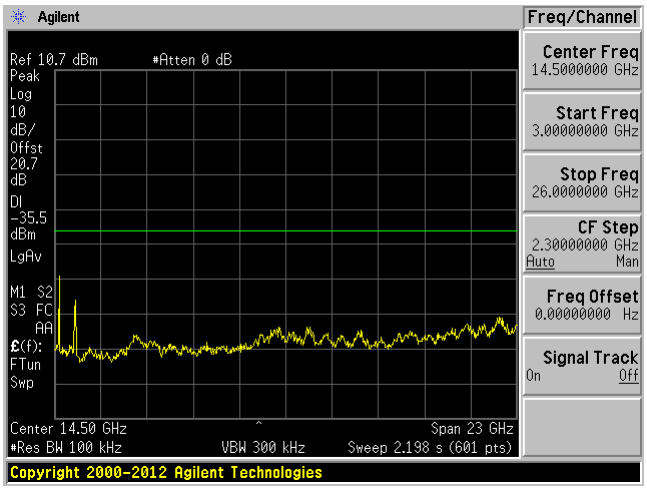


802.11g mode

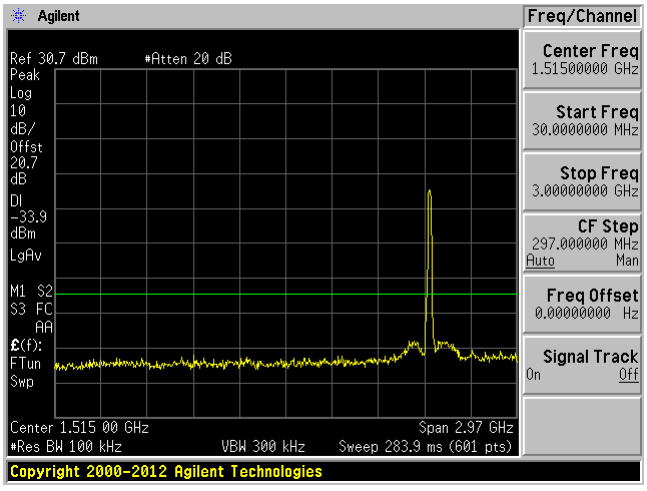
Low Channel 30 MHz – 3 GHz



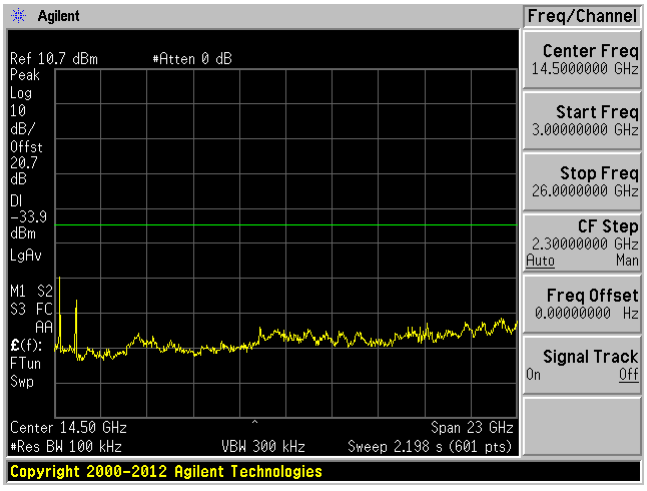
Low Channel 3 GHz – 26 GHz



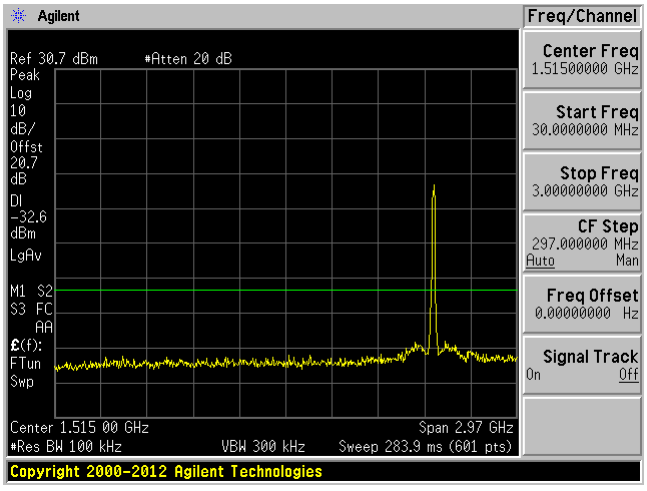
Middle Channel 30 MHz – 3 GHz



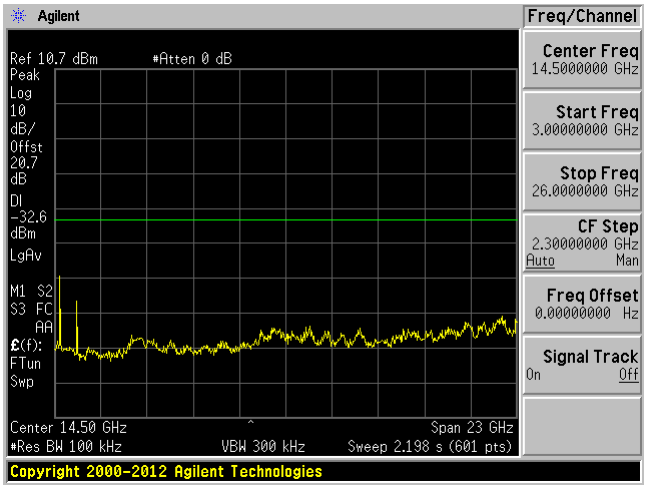
Middle Channel 3 GHz – 26 GHz



High Channel 30 MHz – 3 GHz

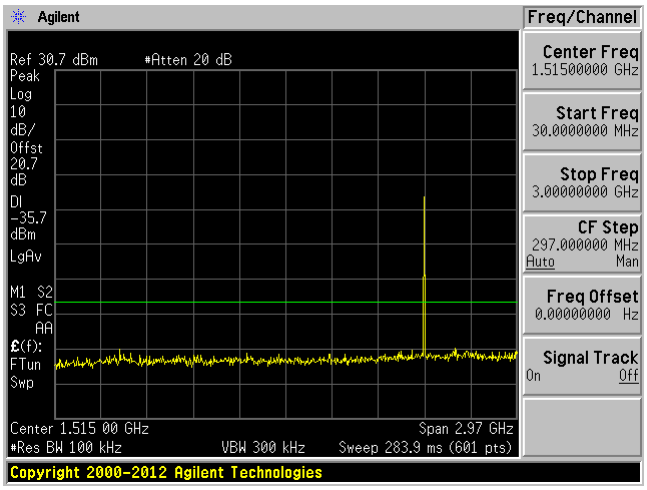


High Channel 3 GHz – 26 GHz

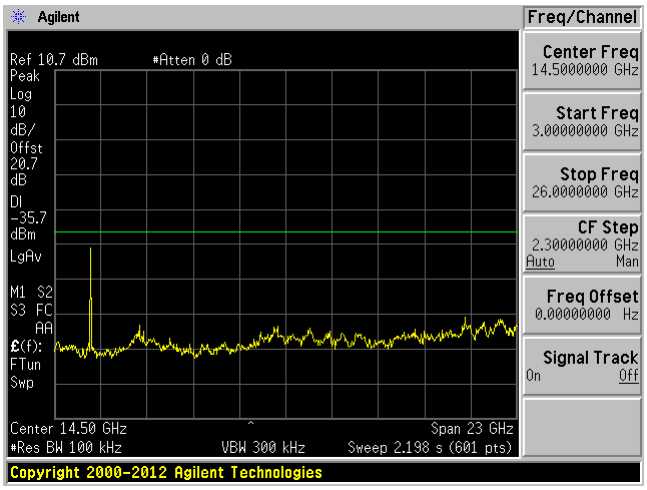


BLE

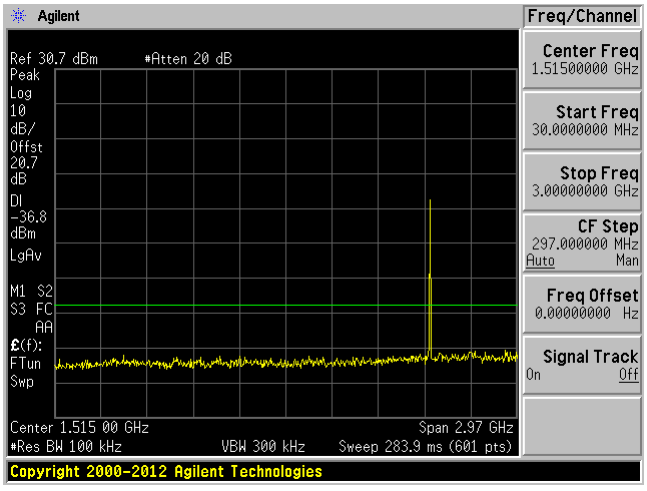
Low Channel 30 MHz – 3 GHz



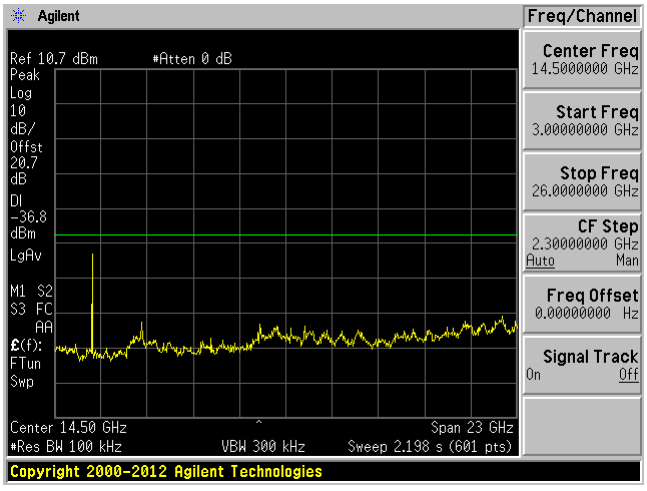
Low Channel 3 GHz – 26 GHz



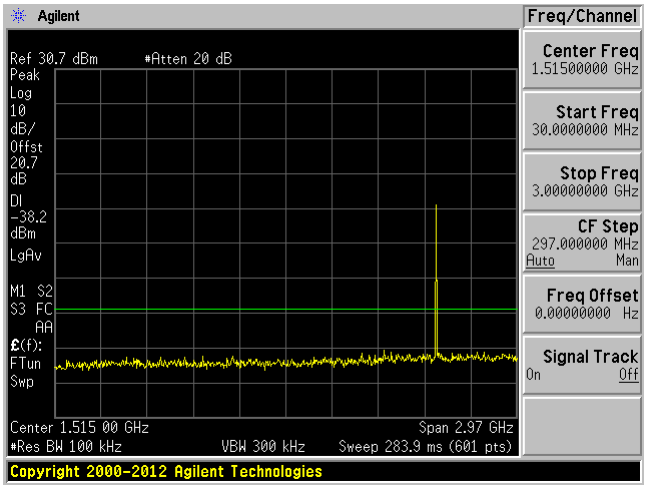
Middle Channel 30 MHz – 3 GHz



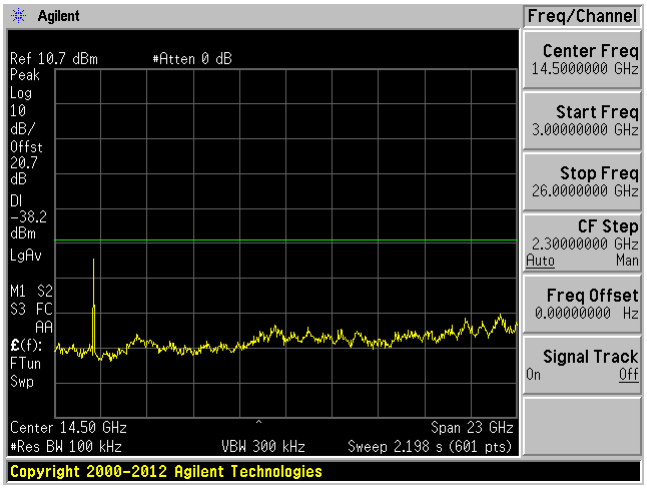
Middle Channel 3 GHz – 26 GHz



High Channel 30 MHz – 3 GHz



High Channel 3 GHz – 26 GHz



13 Annex A (Normative) – EUT Test Setup Photographs

Please refer to the attachment.

14 Annex B (Normative) – EUT External Photographs

Please refer to the attachment.

15 Annex C (Normative) – EUT Internal Photographs

Please refer to the attachment.

16 Annex D (Normative) - 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 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 April 2017*).

Presented this 2nd day of October 2018.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2020
Revised June 5, 2019

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

Please follow the web link below for a full ISO 17025 scope

https://www.a2la.org/scopepdf/3297-02.pdf

--- END OF REPORT ---