FCC PART 15, SUBPART C
ISEDC RSS-247, ISSUE 2, FEBRUARY 2017
LP0002-2018

TEST REPORT

For

Cisco Systems Inc.

125 West Tasman Drive,

San Jose, CA 95134, USA

FCC ID: LDKSLTSP1905
IC: 2461N-SLTSP1905

Report Type: Permissive II Change Report	**Product Type:** Cisco 802.11ax Access Point
Prepared By:	Christian McCaig Test Technician
Report Number:	R1909094-247
Report Date:	2019-09-26
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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	R1909094-247	Permissive II Change Report	2019-09-26

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Cisco Systems Inc.,* and their product model: *C9115AXE-B (USA), A9115AXE-A V02 (Canada), C9115AXE-T (Taiwan),* as referred to as EUT in this report. The product is an 802.11ax Dual Band Access Point.

1.2 Mechanical Description of EUT

Length (cm)	Width (cm)	Height (cm)	Weight (g)
20	20	4	1700

1.3 Objective

This report is prepared on behalf of *Cisco Systems 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 on February 2017 and NCC LP0002-2018.

The objective is to determine compliance with FCC Part 15.247, ISEDC RSS-247 and NCC LP-0002 rules for AC Line Conducted Emissions and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

R1909094-407 Report FCC ID: LDKSLTSP2905, IC: 2461N-SLTSP1905

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and FCC KDB 558074 D01 DTS Meas Guidance v05r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

1.6 Measurement Uncertainty

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

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 %

1.7 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.

1.8 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 firmware used was Tera Term and test commands, provided by *Cisco Systems Inc.*, the software is compliant with the standard requirements being tested against.

Modulation	Frequency (MHz)	Power Setting
802.11b	2412	17
	2442	17
	2462	17
802.11g	2412	17
	2442	17
	2462	17
802.11n	2412	17
	2442	17
	2462	17
802.11ax	2412	17
	2442	17
	2462	17
BLE	2402	5
	2440	5
	2480	5

Data Rates Tested:
802.11b mode: 1Mbps
802.11g mode: 6Mbps
802.11n/ac mode: m0/m0x1
802.11ax mode: m0h1

2.3 Equipment Modifications

No equipment modifications are made to the EUT

2.4 Local Support Equipment

Manufacturer	Description	Model	Serial Number
Dell	Laptop	Latitude E6410	3CKRAQ1

2.5 Support Equipment

Manufacturer	Description	Model
Cisco	Power supply	AIR-PWRINJ6 V01

2.6 Interface Ports and Cabling

Cable Description	Length	To	From
Ethernet cable	2 m	PoE	EUT
Ethernet-serial-USB cable	2 m	EUT	Laptop

3 Summary of Test Results

Results reported relate only to the product tested.

FCC, ISEDC & LP0002 Rules	Description of Test	Results
FCC §15.207, ISEDC RSS GEN §8.8 LP0002-2018 §2.3	AC Power Line Conducted Emissions	Compliant
FCC §2.1053, §15.35(b), §15.205, §15.209, §15.247 (d) ISEDC RSS-247 §5.5 ISEDC RSS-Gen §8.9 & §8.10 LP0002-2018 §3.10	Radiated Spurious Emissions	Compliant

4 FCC §15.207, ISEDC RSS-Gen §8.8 & LP0002-2018 § 2.3 - AC Power Line Conducted Emissions

4.1 Applicable Standards

As per FCC §15.207, ISEDC RSS GEN §8.8 and LP0002-2018 §2.3

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 [1]	56 to 46 [2]
0.5-5	56	46
5-30	60	50

Note[1]: Decreases with the logarithm of the frequency.
Note[2]: A linear average detector is required.

4.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.10-2013 measurement procedure. The specification used was FCC §15.207 limits and ISEDC RSS GEN §8.8.

External I/O cables were draped along the edge of the test table and bundled when necessary.
The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

4.3 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the main 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 was recorded in the peak, quasi-peak, and average detection mode. Quasi-Peak readings are distinguished with “QP.” Average readings are distinguished with “Ave”.

4.4 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

4.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde and Schwarz	Receiver, EMI Test	ESCI 1166.5950.03	100338	2018-07-05	2 years
Rohde and Schwarz	Impulse Limiter	ESH3-Z2	101964	2019-07-31	1 year
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150204	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

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 09 June 2016) "A2LA Policy on Metrological Traceability".*

4.6 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	44 %
ATM Pressure:	101.31 kPa

The testing was performed by Matthew Riego de Dios on 2019-09-20 in Ground Test Site.

4.7 Summary of Test Results

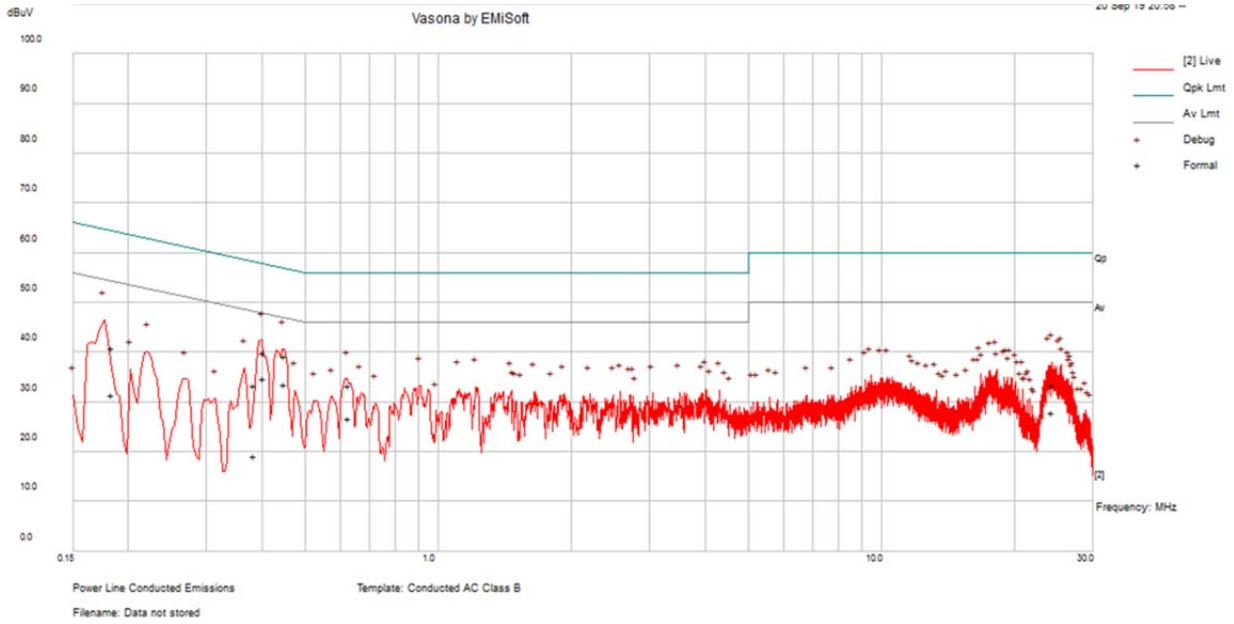
According to the recorded data in following table, the EUT complied with the FCC Part 15 and RSS-Gen standards' conducted emissions limits, with the margin reading of:

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Live/Neutral)**	**Range (MHz)**
-12.99	0.404403	Line	0.15-30

4.8 Conducted Emissions Test Plots and Data

Worst Case Colocation: BLE 2480 MHz, 2.4 GHz Wi-Fi HT/VHT mode 2412 MHz, and 5 GHz Wi-Fi VHT160 mode 5250 MHz

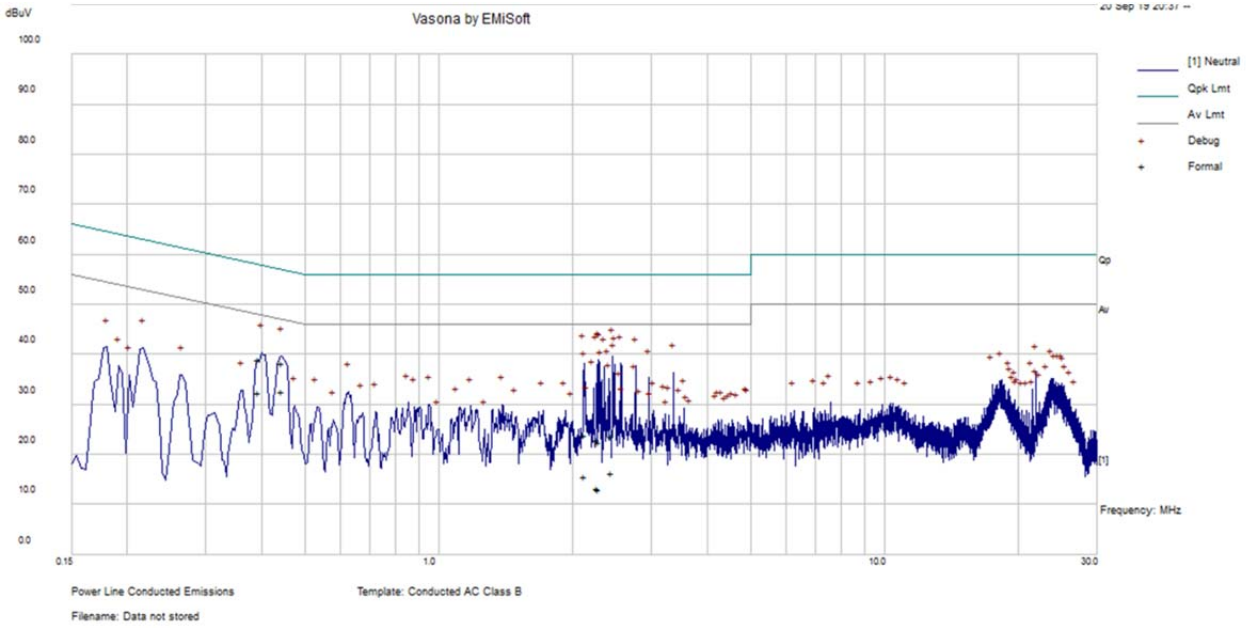
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.404403	40.02	Line	57.76	-17.75	QP
0.451112	39.34	Line	56.85	-17.52	QP
0.183735	40.93	Line	64.32	-23.39	QP
0.626403	33.33	Line	56	-22.67	QP
0.384103	33.38	Line	58.19	-24.81	QP
24.198585	33.29	Line	60	-26.71	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.404403	34.78	Line	47.76	-12.99	Ave.
0.451112	33.62	Line	46.85	-13.23	Ave.
0.183735	31.42	Line	54.32	-22.89	Ave.
0.626403	26.66	Line	46	-19.34	Ave.
0.384103	19.06	Line	48.19	-29.13	Ave.
24.198585	27.95	Line	50	-22.05	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
2.444223	23.54	Neutral	56	-32.46	QP
2.272941	22.95	Neutral	56	-33.05	QP
0.444249	38.25	Neutral	56.98	-18.73	QP
0.394665	39.09	Neutral	57.96	-18.88	QP
2.278315	22.47	Neutral	56	-33.53	QP
2.129023	23.9	Neutral	56	-32.1	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
2.444223	16.21	Neutral	46	-29.79	Ave.
2.272941	13.29	Neutral	46	-32.71	Ave.
0.444249	32.73	Neutral	46.98	-14.25	Ave.
0.394665	32.3	Neutral	47.96	-15.66	Ave.
2.278315	13.07	Neutral	46	-32.93	Ave.
2.129023	15.68	Neutral	46	-30.32	Ave.

5 FCC §15.209, §15.247(d), ISEDC RSS-247 §5.5, RSS-Gen §8.9, §8.10 & LP0002-2018 §3.10 - Spurious Radiated Emissions

5.1 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) 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).

5.2 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.

5.3 Test Procedure

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.

For radiated testing 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 = 3MHz / Sweep = 100 ms
(2) Average: RBW = 1MHz / VBW = 3MHz / Sweep = Auto

5.4 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

5.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde and Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100044	2018-10-26	2 years
Rohde and Schwarz	Analyzer, Spectrum	FSV40	1321.3008K39-101203-UW	2019-08-06	1 year
Sunol Sciences	System Controller	SC99V	011003-1	N/R	N/A
Sunol Sciences	Antenna, Biconi-Log	JB1	A013105-3	2018-02-26	2 years
EMCO	Antenna, Horn	3115	9511-4627	2018-03-28	2 years
Agilent	Amplifier, Pre	8447D	2944A10187	2019-04-11	1 year
Insulated Wire INC	157 Series 2.92 SM (x2) Armored 33 ft. Cable	KPS-1571AN-3960-KPS	DC 1917	2019-05-08	2 years
-	SMA cable	-	C0002	Each time[1]	N/A
Agilent	Pre-Amplifier	8449B	3147A00400	2019-05-20	1 year
Wisewave	Antenna, Horn	ARH-4223-02	10555-01	2018-02-14	2 years
Wisewave	Antenna, Horn	ARH-4223-02	10555-02	2018-02-14	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 9 June 2016) "A2LA Policy on Metrological Traceability".

5.6 Test Environmental Conditions

Temperature:	22-25 ºC
Relative Humidity:	42-48 %
ATM Pressure:	102.1 kPa

The testing was performed by Christian McCaig and Matthew Riego de Dios from 2019-09-10 to 2019-08-20 in 5m chamber 3.

5.7 Summary of Test Results

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

2.4GHz Wi-Fi/BLE

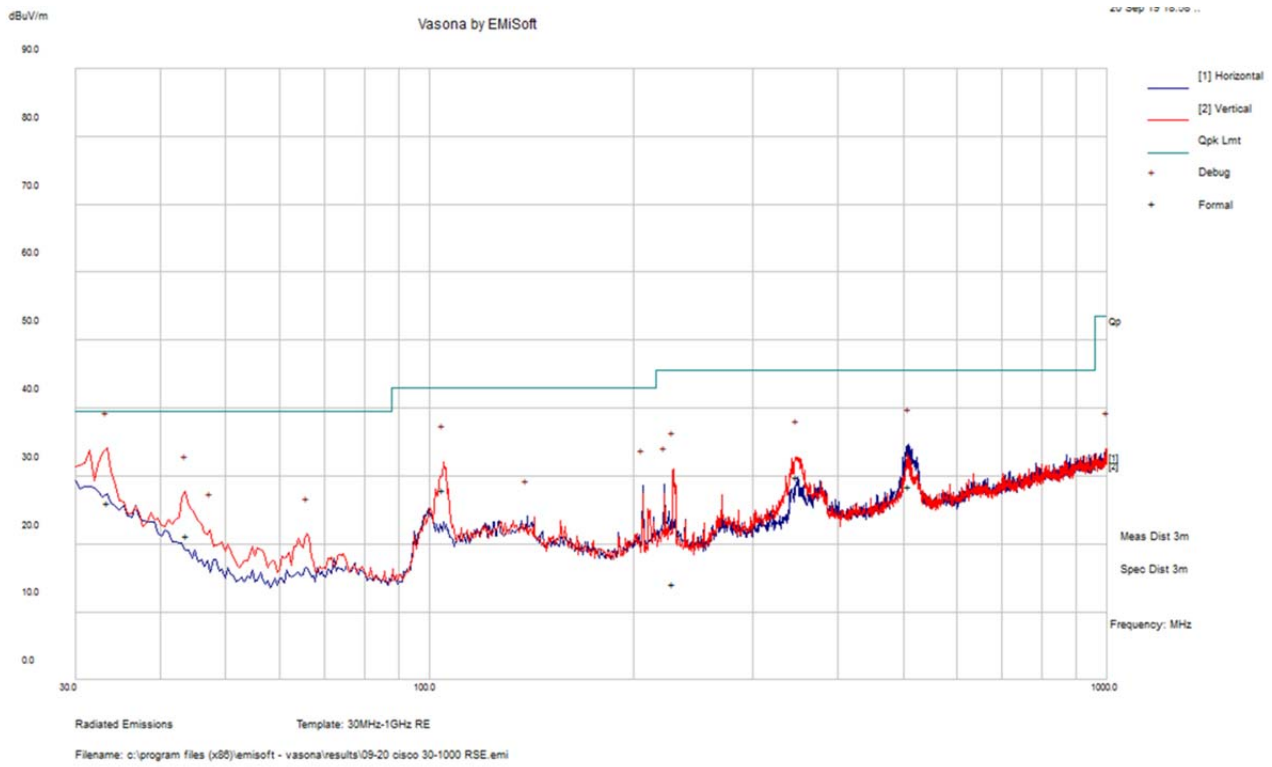
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, channel**
-13.4	33.4915	Vertical	2412 MHz, HT/VHT20 BLE, 2480MHz

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

5.8 Spurious Emissions Test Results

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

Worst Case Colocation: BLE 2480 MHz, 2.4 GHz Wi-Fi HT/VHT 20 mode 2412 MHz, and 5 GHz Wi-Fi VHT160 mode 5250 MHz



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
33.4915	26.1	226	V	52	39.5	-13.4	Pass
104.757	28	291	V	152	43	-15	Pass
509.358	28.57	227	H	194	45.5	-16.93	Pass
43.78775	21.31	100	V	41	39.5	-18.19	Pass
348.58975	29.84	188	V	233	45.5	-15.66	Pass
228.90325	14.07	173	V	128	45.5	-31.43	Pass

2) Above 1 GHz, measured at 3 meters

2.4 GHz Wi-Fi

Freq. (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISED		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz CCK mode power setting: 17											
4824	44.65	0	100	H	32.46	8.40	35.90	49.60	74	-24.40	PK
4824	32.17	0	100	H	32.46	8.40	35.90	37.12	54	-16.88	AV
4824	44.74	0	100	V	32.45	8.40	35.90	49.69	74	-24.31	PK
4824	31.27	0	100	V	32.45	8.40	35.90	36.22	54	-17.78	AV
Mid Channel 2437 MHz CCK mode power setting: 17											
4874	45.11	0	100	H	32.46	8.40	35.90	50.06	74	-23.94	PK
4874	31.89	0	100	H	32.46	8.40	35.90	36.84	54	-17.16	AV
4874	44.61	0	100	V	32.45	8.40	35.90	49.56	74	-24.44	PK
4874	31.82	0	100	V	32.45	8.40	35.90	36.77	54	-17.23	AV
High Channel 2462 MHz CCK mode power setting: 17											
4924	44.43	0	100	H	32.46	8.40	35.90	49.38	74	-24.62	PK
4924	30.88	0	100	H	32.46	8.40	35.90	35.83	54	-18.17	AV
4924	44.67	0	100	V	32.45	8.40	35.90	49.62	74	-24.38	PK
4924	30.61	0	100	V	32.45	8.40	35.90	35.56	54	-18.44	AV

Freq. (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISED		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz Non HT20 mode power setting: 17											
4824	44.87	0	100	H	32.46	8.40	35.90	49.82	74	-24.18	PK
4824	30.78	0	100	H	32.46	8.40	35.90	35.73	54	-18.27	AV
4824	44.80	0	100	V	32.45	8.40	35.90	49.75	74	-24.25	PK
4824	30.56	0	100	V	32.45	8.40	35.90	35.51	54	-18.49	AV
Mid Channel 2437 MHz Non HT20 mode power setting: 17											
4874	45.40	0	100	H	32.46	8.40	35.90	50.35	74	-23.65	PK
4874	31.66	0	100	H	32.46	8.40	35.90	36.61	54	-17.39	AV
4874	44.25	0	100	V	32.45	8.40	35.90	49.20	74	-24.80	PK
4874	30.75	0	100	V	32.45	8.40	35.90	35.70	54	-18.30	AV
High Channel 2462 MHz Non HT20 mode power setting: 17											
4924	45.38	0	100	H	32.46	8.40	35.90	50.33	74	-23.67	PK
4924	32.06	0	100	H	32.46	8.40	35.90	37.01	54	-16.99	AV
4924	45.64	110	273	V	32.45	8.40	35.90	50.59	74	-23.41	PK
4924	32.10	110	273	V	32.45	8.40	35.90	37.05	54	-16.95	AV

Freq. (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISED		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz HT/VHT20 mode power setting: 17											
4824	45.25	0	100	H	32.46	8.40	35.90	50.20	74	-23.80	PK
4824	32.21	0	100	H	32.46	8.40	35.90	37.16	54	-16.84	AV
4824	46.04	0	100	V	32.45	8.40	35.90	50.99	74	-23.01	PK
4824	32.29	0	100	V	32.45	8.40	35.90	37.24	54	-16.76	AV
Mid Channel 2437 MHz HT/VHT20 mode power setting: 17											
4874	45.04	0	100	H	32.46	8.40	35.90	49.99	74	-24.01	PK
4874	32.30	0	100	H	32.46	8.40	35.90	37.25	54	-16.75	AV
4874	44.85	0	100	V	32.45	8.40	35.90	49.80	74	-24.20	PK
4874	32.32	0	100	V	32.45	8.40	35.90	37.27	54	-16.73	AV
High Channel 2462 MHz HT/VHT20 mode power setting: 17											
4924	44.91	0	100	H	32.46	8.40	35.90	49.86	74	-24.14	PK
4924	31.02	0	100	H	32.46	8.40	35.90	35.97	54	-18.03	AV
4924	44.60	0	100	V	32.45	8.40	35.90	49.55	74	-24.45	PK
4924	31.85	0	100	V	32.45	8.40	35.90	36.80	54	-17.20	AV

Freq. (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISED		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz HE20 mode power setting: 17											
4824	45.78	0	100	H	32.46	8.40	35.90	50.73	74	-23.27	PK
4824	31.85	0	100	H	32.46	8.40	35.90	36.80	54	-17.20	AV
4824	45.44	0	100	V	32.45	8.40	35.90	50.39	74	-23.61	PK
4824	32.51	0	100	V	32.45	8.40	35.90	37.46	54	-16.54	AV
Mid Channel 2437 MHz HE20 mode power setting: 17											
4874	45.06	0	100	H	32.46	8.40	35.90	50.01	74	-23.99	PK
4874	30.99	0	100	H	32.46	8.40	35.90	35.94	54	-18.06	AV
4874	44.77	0	100	V	32.45	8.40	35.90	49.72	74	-24.28	PK
4874	32.12	0	100	V	32.45	8.40	35.90	37.07	54	-16.93	AV
High Channel 2462 MHz HE20 mode power setting: 17											
4924	44.38	0	100	H	32.46	8.40	35.90	49.33	74	-24.67	PK
4924	31.86	0	100	H	32.46	8.40	35.90	36.81	54	-17.19	AV
4924	44.61	0	100	V	32.45	8.40	35.90	49.56	74	-24.44	PK
4924	31.62	0	100	V	32.45	8.40	35.90	36.57	54	-17.43	AV

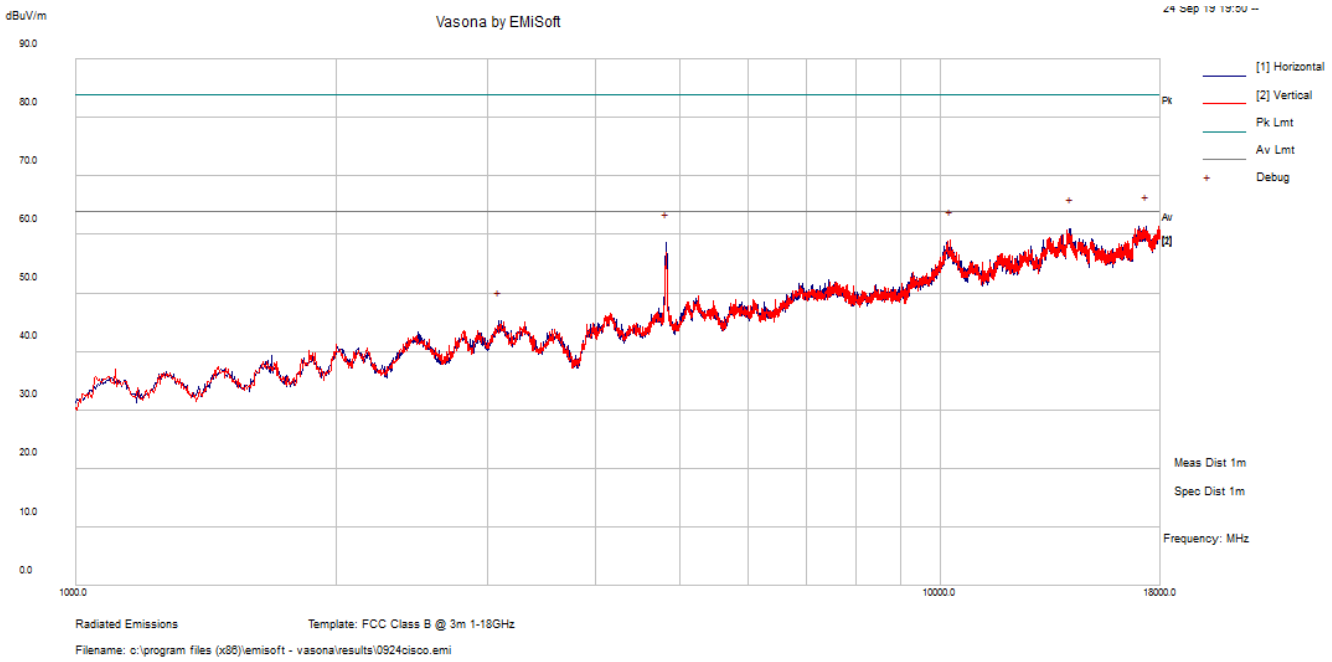
Measured at 1 meter

BLE

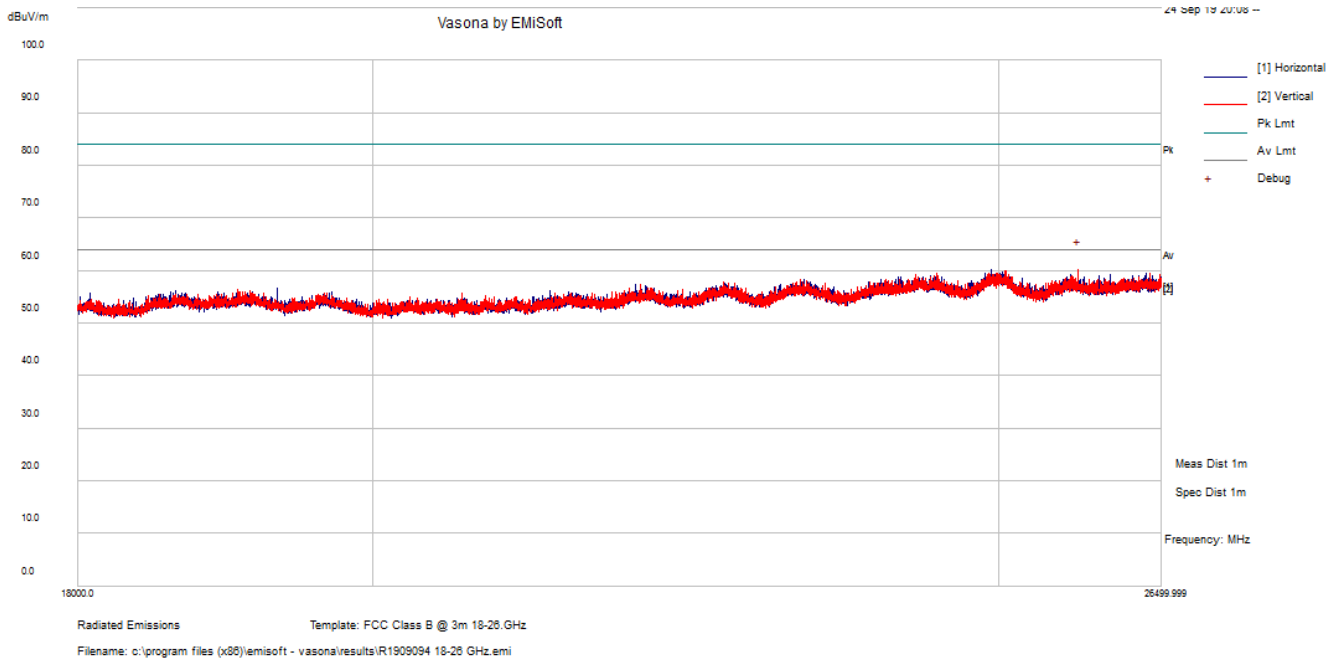
Freq. (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISED		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2402 MHz											
4804	47.22	75	235	H	33.12	8.40	35.90	52.83	84	-31.17	PK
4804	35.82	75	235	H	33.12	8.40	35.90	41.43	64	-22.57	AV
4804	47.12	120	205	V	33.17	8.40	35.90	52.78	84	-31.22	PK
4804	35.18	120	205	V	33.17	8.40	35.90	40.84	64	-23.16	AV
Mid Channel 2426 MHz											
4852	47.09	75	190	V	33.32	8.62	35.80	53.23	84	-30.77	PK
4852	34.97	75	190	V	33.32	8.62	35.80	41.11	64	-22.89	AV
4852	47.18	120	211	H	33.33	8.62	35.80	53.33	84	-30.67	PK
4852	35.15	120	211	H	33.33	8.62	35.80	41.30	64	-22.70	AV
High Channel 2480 MHz											
4960	46.17	76	200	V	33.80	8.62	35.73	52.86	84	-31.14	PK
4960	33.89	76	200	V	33.80	8.62	35.73	40.58	64	-23.42	AV
4960	46.58	108	204	H	33.79	8.62	35.73	53.25	84	-30.75	PK
4960	34.87	108	204	H	33.79	8.62	35.73	41.54	64	-22.46	AV

Worst Case Colocation: BLE 2480 MHz, 2.4 GHz Wi-Fi HT/VHT mode 2412 MHz, and 5 GHz Wi-Fi VHT160 mode 5250 MHz

1 GHz – 18 GHz Worst Case Scan at 1 meter



18 GHz – 26.5 GHz Worst Case Scan at 1 meter



6 Annex A – Test Setup Photographs

Please refer to the attachment

7 Annex B- EUT External Photographs

Please refer to the attachment

8 Annex C- EUT Internal Photographs

Please refer to the attachment

9 Annex D (Normative) - ISO/IEC 17025 Certificate and Scope of Accreditation

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 ---