



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



TEST REPORT

For

Cisco Systems, Inc.

125 West Tasman Drive,
San Jose, CA 95134 USA

FCC ID: LDK-ETHIK2360
IC: 2461N-ETHIK2360

| | |
|--|--|
| Report Type: Original Report | Product type: Cisco Catalyst 9124AX Series Wi-Fi Outdoor Access Points |
| Prepared By: Giriraj Gurjar Test Engineer |  |
| Report Number: R2108135-247 | |
| Report Date: 2021-09-28 | |
| Reviewed By: Zhao Zhao RF Project Engineer |  |
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Note: This test report was prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This test report shall not be used by the customer to claim product certification, approval, or endorsement by A2LA or any agency of the United States Government or any foreign government.

* This test report may contain data and test methods that are not covered by BACL's scope of accreditation as of the test report date shown above. These items are marked within the test report text with an asterisk "***"

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DOCUMENT REVISION HISTORY

| Revision Number | Report Number | Description of Revision | Date of Revision |
|-----------------|---------------|-------------------------|------------------|
| 0 | R2108135-247 | Original Report | 2021-09-28 |

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 *FCC ID: LDK-ETHIK2360, IC: 2461N-ETHIK2360*, model: *C9124AXE-B (U.S.), C9124AXE-A (Canada)* as referred to as EUT in this report. The product is Outdoor Access Point, which supports 802.11 a/b/g/n/ac/ax and 20/40/80 MHz bandwidth and BLE configurations.

EUT Hardware Version: PP

1.2 Mechanical Description of EUT

| Length (cm) | Width (cm) | Height (cm) | Weight (kg) | S/N |
|-------------|------------|-------------|-------------|-----------------------------|
| 27 | 27 | 7 | 3.15 | FOC25042JHK, FOC252811QP |

1.3 Objective

This report was 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.

The objective is to determine compliance with FCC Part 15.247 and ISEDC RSS-247 rules for Antenna Requirements and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

Equipment Class: NII, FCC ID: LDK-ETHIK2360, IC: 2461N-ETHIK2360

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 v04: 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 3297.02), 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 3297.03) 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 3297.01) 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):
 - o BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
 - o NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
 - o EMC Directive 2014/30/EU US-EU EMC & Telecom MRA CAB (NB)
 - o Radio Equipment (RE) Directive 2014/53/EU US-EU EMC & Telecom MRA CAB (NB)
 - o 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:
 - o ENERGY STAR Recognized Test Laboratory – US EPA
 - o Telecommunications Certification Body (TCB) – US FCC;
 - o 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 v04.

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

To test the EUT cabinet radiation, the radio was configured to transmit its highest output power possible, which represents the worst case.

2.2 EUT Exercise Software

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

The EUT image version:

```
svn base: 7c4ceb1fb0c4c97832aec73e6fb4e33c06e995b5M
commit: d316b6d7ea98bc35b6ecef8323767796d90b35d0
tree 35954c42a71536db5761792ff1cf527a66e012d9
recent commit: 7c4ceb1fb0c4c97832aec73e6fb4e33c06e995b5
```

| Radio | Modulation | Frequency (MHz) | Power Setting |
|---------------|------------|-----------------|---------------|
| 2.4 GHz Wi-Fi | 802.11b | 2412 | 24 |
| 2.4 GHz Aux | 802.11g | 2412 | 19 |
| BLE | GFSK | 2402 | default |

Data Rates Tested:

802.11b mode: 1Mbps

802.11g mode: 6Mbps

BLE: default

2.3 Duty Cycle Correction Factor

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

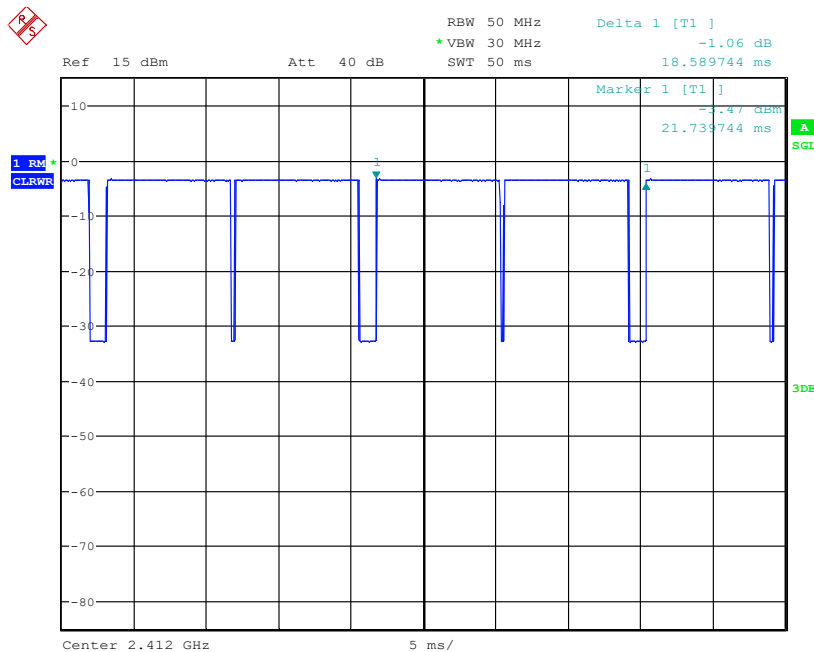
Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be utilized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

| Radio Mode | Total On Time (ms) | Period (ms) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) |
|-------------|--------------------|-------------|----------------|-----------------------------------|
| 802.11b | 17.076923 | 18.589744 | 91.86 | 0.369 |
| AUX 802.11g | 0.29141 | 0.30288 | 96.21 | 0.168 |
| BLE | 1 | 1 | 100 | 0 |

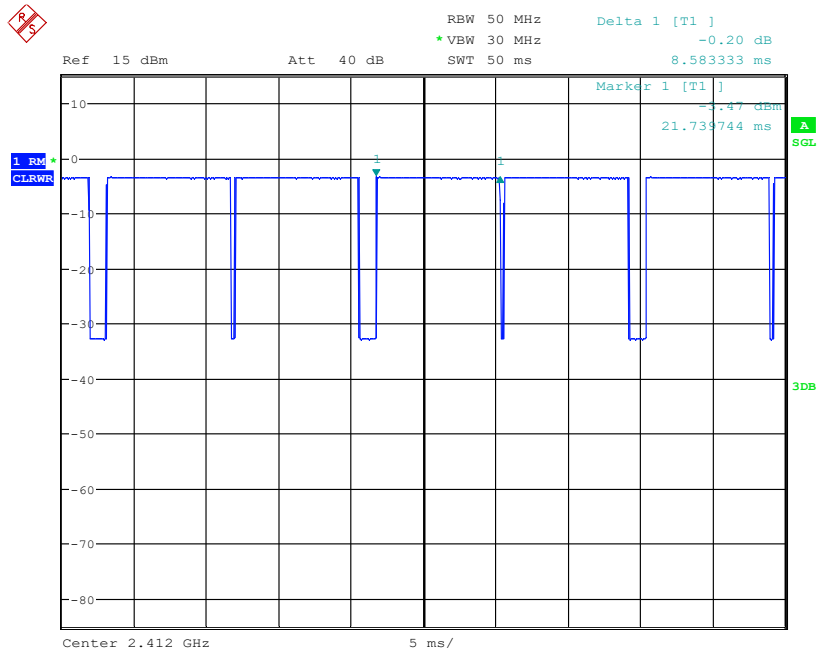
Duty Cycle = On Time (ms)/ Period (ms)
 Duty Cycle Correction Factor (dB) = 10*log(1/Duty Cycle)

Please refer to the following plots.

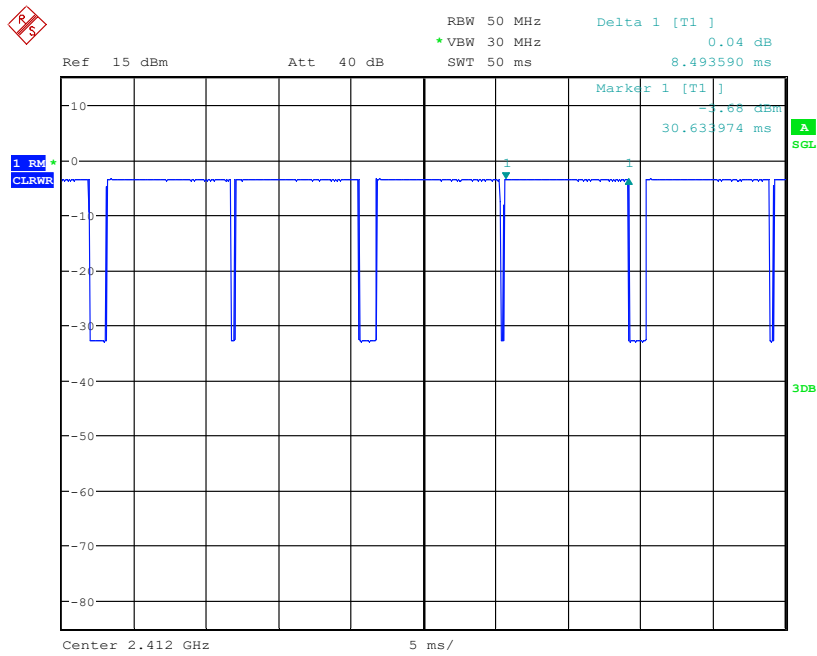
2.4 GHz Wi-Fi (802.11b)



Date: 15.JUN.2021 21:38:52

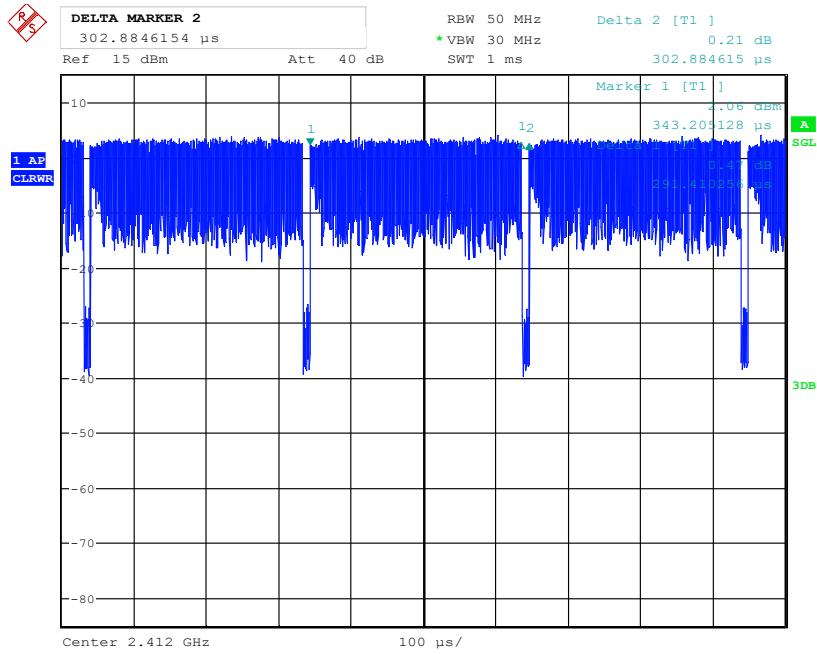


Date: 15.JUN.2021 21:40:01



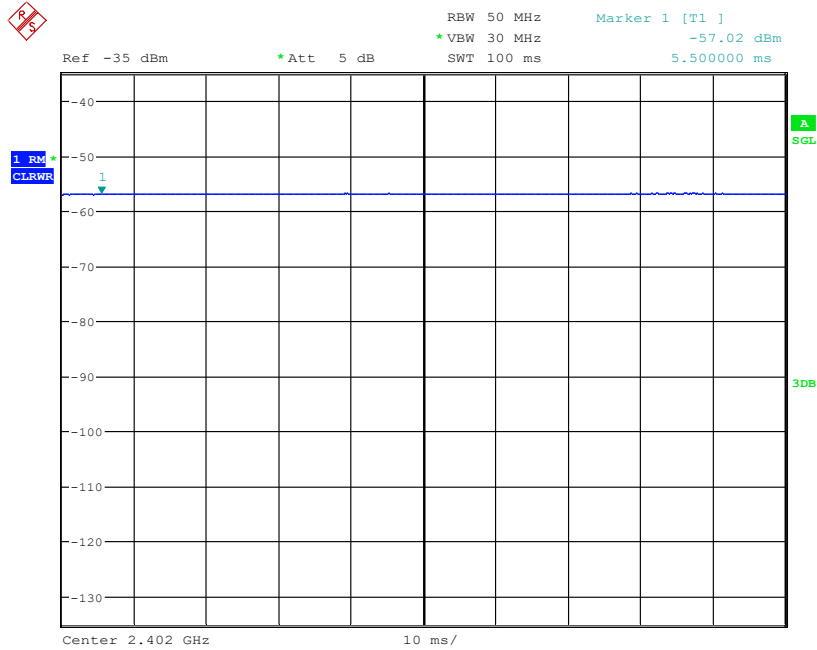
Date: 15.JUN.2021 21:40:55

2.4 GHz Aus (802.11g)



Date: 15.JUN.2021 20:59:21

BLE



Date: 15.JUN.2021 21:31:04

2.4 Equipment Modifications

No equipment modifications are made to the EUT

2.5 Local Support Equipment

| Manufacturer | Description | Model | Serial Number |
|--------------|-------------|----------------|---------------|
| Dell | Laptop | Latitude E6410 | 3CKRAQ1 |

2.6 Remote Support Equipment

| Manufacturer | Description | Model |
|--------------|--------------|-------------|
| Cisco | Power supply | SB-PWR-INJ2 |

2.7 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 and ISEDC Rules | Description of Test | Results |
|---|-----------------------------|-----------|
| FCC §15.207 ISEDC RSS-Gen §8.8 | AC 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 and §8.10 | Radiated Spurious Emissions | Compliant |

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

4.1 Applicable Standards

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

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/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

4.2 Test Setup

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

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

The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

4.3 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".

4.4 Corrected Amplitude and Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Correction Factor to the S.A. Reading. The basic equation is as follows:

$$CA = \text{S.A. Reading} + \text{Correction Factor}$$

For example, a corrected amplitude of 40.3 dBuV = S.A. Reading (32.5 dBuV) + Correction Factor (7.8 dB)

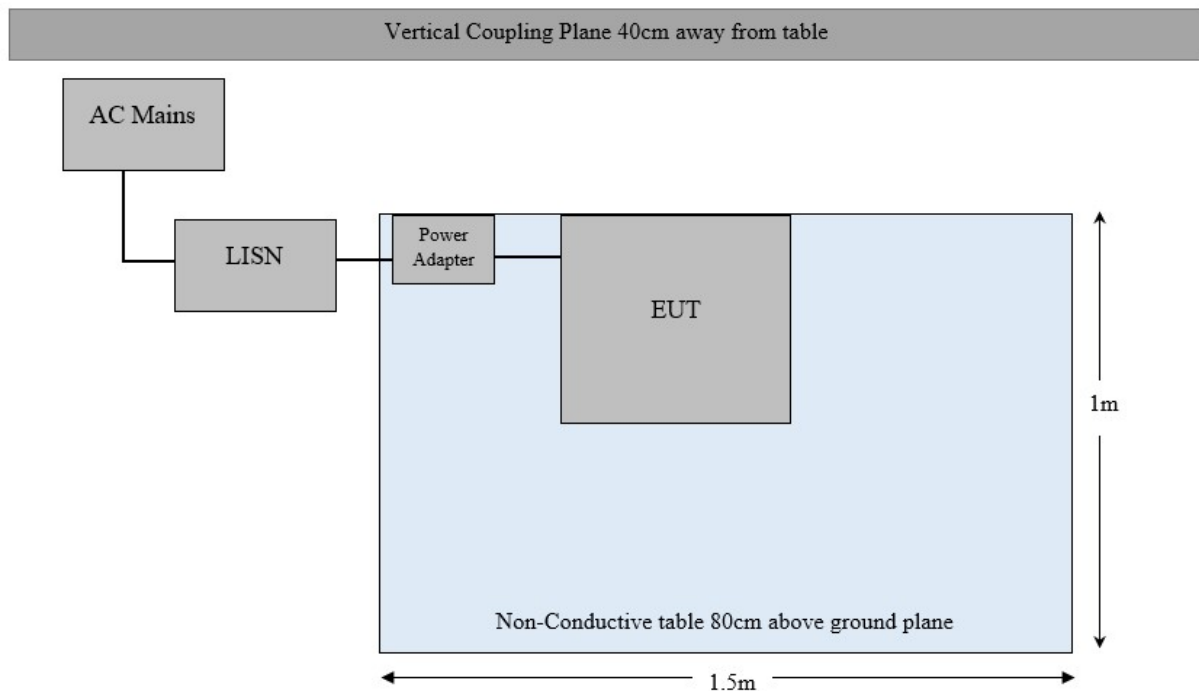
The Correction Factor is calculated by adding the Cable Loss (CL) and the Attenuator Factor (Atten) together. This calculation is done in the measurement software, and reported in the test result section. The basic equation is as follows:

$$\text{Correction Factor} = \text{CL} + \text{Atten}$$

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:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

4.5 Test Setup Block Diagram



4.6 Test Equipment List and Details

| Manufacturer | Description | Model No. | Serial No. | Calibration Date | Calibration Interval |
|---------------------------|--------------------|-----------------------------|------------|--------------------------|--------------------------|
| Rohde & Schwarz | Receiver, EMI Test | ESCI 1166.5950.03 | 100338 | 2020-03-17 | 1.5 years |
| Rohde & Schwarz | Impulse Limiter | ESH3-Z2 | 101963 | 2020-07-02 | 1 year |
| Solar Electronics Company | High Pass Filter | Type 7930-100 | 7930150203 | 2021-03-02 | 1 year |
| Fairview Microwave | Micro-Coax Cable | FMC0101223-240 | 1907181 | 2020-08-25 | 1 year |
| FCC | LISN | FCC-LISN-50-25-2-10-CISPR16 | 160129 | 2020-10-12 | 1 year |
| Vasona | Test software | V6.0 build 11 | 10400213 | N/R | N/R |
| California Instruments | AC Power Source | 5001ix-208 | 57079 | Calibration not Required | Calibration not Required |

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 "A2LA Policy on Metrological Traceability".

4.7 Test Environmental Conditions

| | |
|---------------------------|-----------|
| Temperature: | 20 °C |
| Relative Humidity: | 38 % |
| ATM Pressure: | 101.6 kPa |

The testing was performed by Giriraj Gurjar on 2021-06-10 on ground plane test site.

4.8 Summary of Test Results

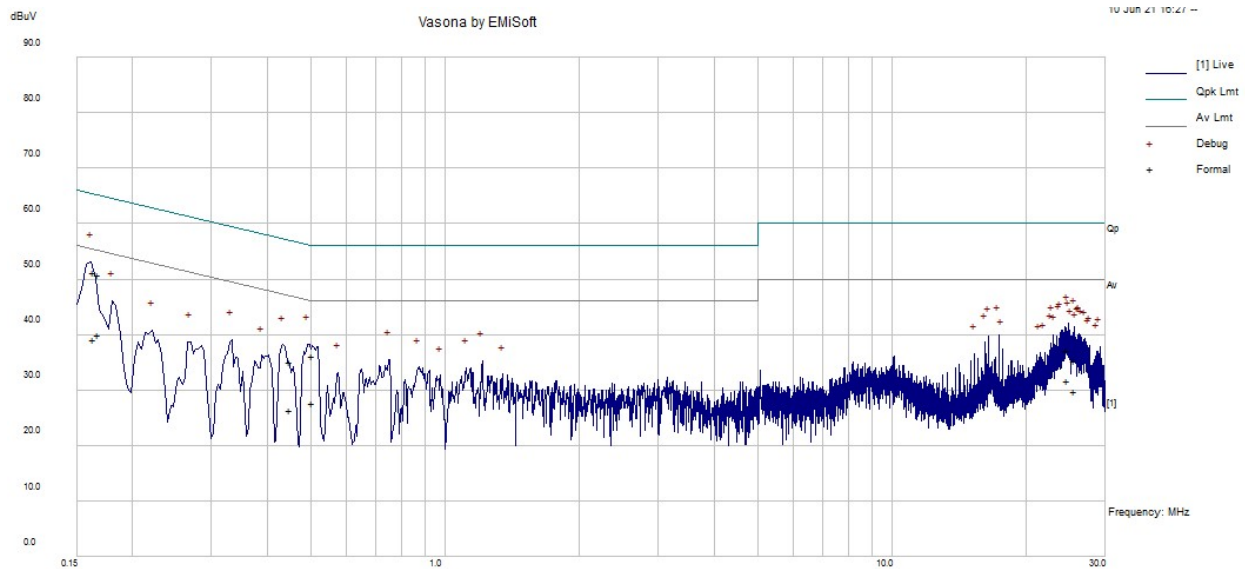
According to the recorded data in following table, the EUT complied with the FCC 15C and ISEDC RSS-Gen standard's conducted emissions limits, with the margin reading of:

| Connection: AC/DC adapter connected to 120 V/60 Hz, AC | | | |
|--|-----------------|-------------------------------|-------------|
| Margin (dB) | Frequency (MHz) | Conductor Mode (Line/Neutral) | Range (MHz) |
| -13.99 | 0.163787 | Line | 0.15-30 |

4.9 Conducted Emissions Test Plots and Data

EUT Configuration: 2.4 GHz Wi-Fi (4x4, 802.11b, 2412 MHz), 2.4 GHz Aux (802.11g, 2412 MHz), and BLE (2402 MHz)

AC Line: 120V/60Hz



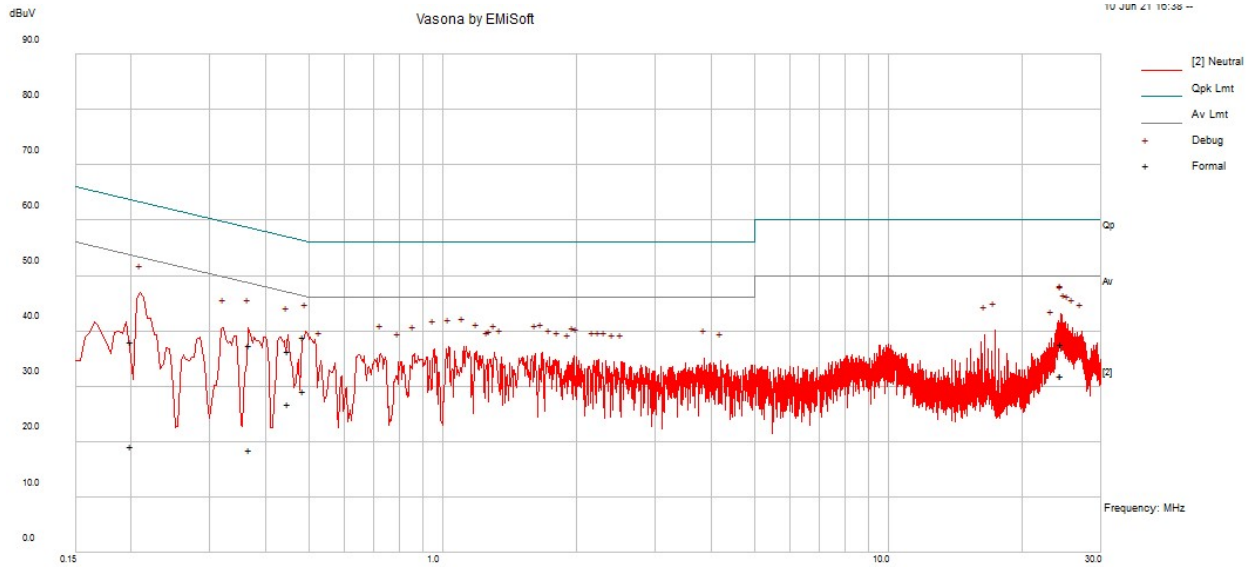
Quasi-peak Measurement:

| Frequency (MHz) | S.A. Reading (dBuV) | Correction Factor (dB) | Corrected Amplitude (dBuV) | Conductor (Line/Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|---------------------|------------------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.163787 | 40.59 | 10.69 | 51.28 | Line | 65.27 | -13.99 | QP |
| 0.167144 | 40.18 | 10.69 | 50.87 | Line | 65.1 | -14.23 | QP |
| 0.50624 | 25.81 | 10.27 | 36.08 | Line | 56 | -19.92 | QP |
| 0.450082 | 24.84 | 10.33 | 35.17 | Line | 56.87 | -21.7 | QP |
| 24.77063 | 26.41 | 10.72 | 37.12 | Line | 60 | -22.88 | QP |
| 25.61339 | 24.58 | 10.76 | 35.33 | Line | 60 | -24.67 | QP |

Average Measurement:

| Frequency (MHz) | S.A. Reading (dBuV) | Correction Factor (dB) | Corrected Amplitude (dBuV) | Conductor (Line/Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|---------------------|------------------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.167144 | 29.21 | 10.69 | 39.9 | Line | 55.1 | -15.2 | Ave. |
| 0.163787 | 28.41 | 10.69 | 39.1 | Line | 55.27 | -16.17 | Ave. |
| 24.77063 | 20.89 | 10.72 | 31.61 | Line | 50 | -18.39 | Ave. |
| 0.50624 | 17.28 | 10.27 | 27.56 | Line | 46 | -18.44 | Ave. |
| 25.61339 | 19.06 | 10.76 | 29.82 | Line | 50 | -20.18 | Ave. |
| 0.450082 | 16.03 | 10.33 | 26.36 | Line | 46.87 | -20.51 | Ave. |

AC Line: 120V/60Hz



Quasi-Peak Measurement:

| Frequency (MHz) | S.A. Reading (dBuV) | Correction Factor (dB) | Corrected Amplitude (dBuV) | Conductor (Line/ Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|---------------------|------------------------|----------------------------|---------------------------|--------------|-------------|--------------------|
| 0.487844 | 28.64 | 10.29 | 38.93 | Neutral | 56.2 | -17.27 | QP |
| 0.448952 | 25.99 | 10.33 | 36.31 | Neutral | 56.89 | -20.58 | QP |
| 0.368065 | 27.06 | 10.43 | 37.48 | Neutral | 58.54 | -21.07 | QP |
| 24.47813 | 27.01 | 10.71 | 37.72 | Neutral | 60 | -22.28 | QP |
| 24.36525 | 26.96 | 10.7 | 37.66 | Neutral | 60 | -22.34 | QP |
| 0.19939 | 27.5 | 10.64 | 38.14 | Neutral | 63.64 | -25.49 | QP |

Average Measurement:

| Frequency (MHz) | S.A. Reading (dBuV) | Correction Factor (dB) | Corrected Amplitude (dBuV) | Conductor (Line/ Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|---------------------|------------------------|----------------------------|---------------------------|--------------|-------------|--------------------|
| 0.487844 | 18.9 | 10.29 | 29.19 | Neutral | 46.2 | -17.01 | Ave. |
| 24.36525 | 21.26 | 10.7 | 31.96 | Neutral | 50 | -18.04 | Ave. |
| 24.47813 | 21.24 | 10.71 | 31.94 | Neutral | 50 | -18.06 | Ave. |
| 0.448952 | 16.46 | 10.33 | 26.79 | Neutral | 46.89 | -20.11 | Ave. |
| 0.368065 | 8.04 | 10.43 | 18.46 | Neutral | 48.54 | -30.09 | Ave. |
| 0.19939 | 8.54 | 10.64 | 19.18 | Neutral | 53.64 | -34.46 | Ave. |

5 FCC §15.209, §15.247(d) & ISEDC RSS-247 §5.5, RSS-Gen §8.9, §8.10 - 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 | 16.42 – 16.423 | 960 – 1240 | 4.5 – 5.15 |
| 0.495 – 0.505 | 16.69475 – 16.69525 | 1300 – 1427 | 5.35 – 5.46 |
| 2.1735 – 2.1905 | 25.5 – 25.67 | 1435 – 1626.5 | 7.25 – 7.75 |
| 4.125 – 4.128 | 37.5 – 38.25 | 1645.5 – 1646.5 | 8.025 – 8.5 |
| 4.17725 – 4.17775 | 73 – 74.6 | 1660 – 1710 | 9.0 – 9.2 |
| 4.20725 – 4.20775 | 74.8 – 75.2 | 1718.8 – 1722.2 | 9.3 – 9.5 |
| 6.215 – 6.218 | 108 – 121.94 | 2200 – 2300 | 10.6 – 12.7 |
| 6.26775 – 6.26825 | 123 – 138 | 2310 – 2390 | 13.25 – 13.4 |
| 6.31175 – 6.31225 | 149.9 – 150.05 | 2483.5 – 2500 | 14.47 – 14.5 |
| 8.291 – 8.294 | 156.52475 – 156.52525 | 2690 – 2900 | 15.35 – 16.2 |
| 8.362 – 8.366 | 156.7 – 156.9 | 3260 – 3267 | 17.7 – 21.4 |
| 8.37625 – 8.38675 | 162.0125 – 167.17 | 3332 – 3339 | 22.01 – 23.12 |
| 8.41425 – 8.41475 | 167.72 – 173.2 | 3345.8 – 3358 | 23.6 – 24.0 |
| 12.29 – 12.293 | 240 – 285 | 3.600 – 4.400 | 31.2 – 31.8 |
| 12.51975 – 12.52025 | 322 – 335.4 | | 36.43 – 36.5 |
| 12.57675 – 12.57725 | 399.9 – 410 | | Above 38.6 |
| 13.36 – 13.41 | 608 – 614 | | |

As per FCC §15.209(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)).

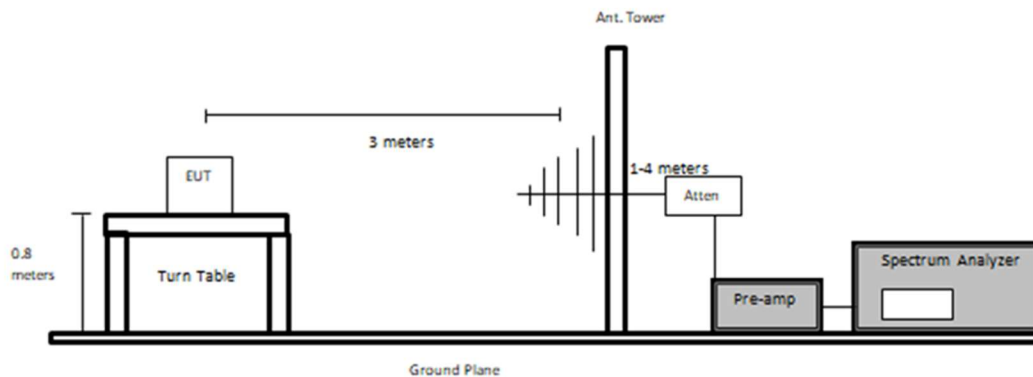
5.2 Test Setup

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.

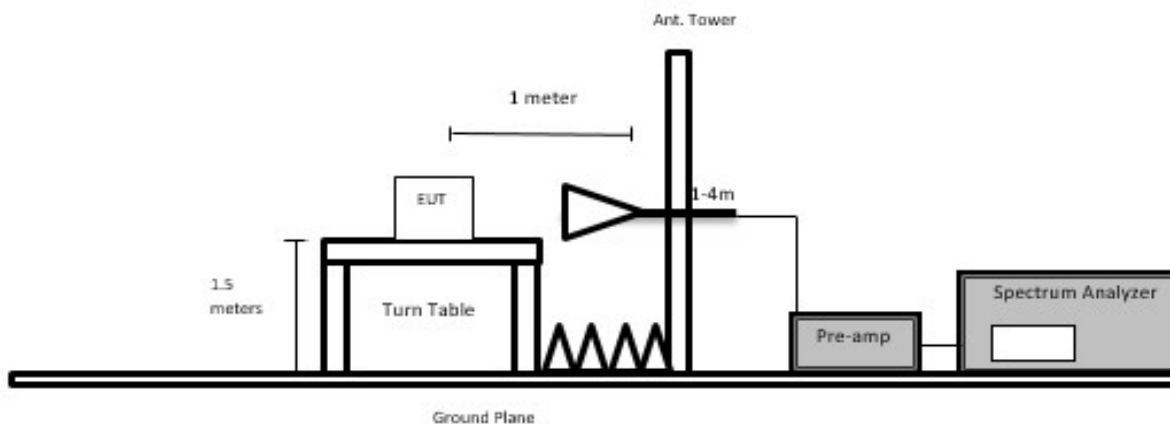
The spacing between the peripherals was 10 centimeters.

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

Below 1GHz:



Above 1GHz:



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:

$$\text{RBW} = 100 \text{ kHz} / \text{VBW} = 300 \text{ kHz} / \text{Sweep} = \text{Auto}$$

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

For emissions below 1 GHz and for above 1GHz scans.

The Corrected Amplitude (CA) is calculated by adding the Correction Factor to the S.A. Reading. The basic equation is as follows:

$$\text{CA} = \text{S.A. Reading} + \text{Correction Factor}$$

For example, a corrected amplitude of 40.3 dBuV/m = S.A. Reading (32.5 dBuV) + Correction Factor (7.8 dB/m)

The Correction Factor is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) together. This calculation is done in the measurement software, and reported in the test result section. The basic equation is as follows:

$$\text{Correction Factor} = \text{AF} + \text{CL} + \text{Atten} - \text{Ga}$$

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:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

For emission above 1 GHz,

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:

$$\text{CA} = \text{Ai} + \text{AF} + \text{CL} + \text{Atten} - \text{Ga}$$

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:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

5.5 Test Equipment List and Details

| Manufacturer | Description | Model No. | Serial No. | Calibration Date | Calibration Interval |
|-----------------------|---|-------------------------|-------------|------------------|----------------------|
| Rohde and Schwarz | Receiver, EMI Test | ESCI 1166.5950.03 | 100338 | 2020-03-17 | 18 months |
| Agilent | Analyzer, Spectrum | E4446A | MY48250238 | 2021-02-12 | 1 year |
| Sunol Sciences | System Controller | SC99V | 011003-1 | N/R | N/A |
| Sunol Sciences | Antenna, Biconi-Log | JB3 | A020106-2 | 2019-11-20 | 2 years |
| ETS Lindgren | Horn Antenna | 3117 | 00218973 | 2019-02-13 | 2.5 years |
| A.R.A. | Horn Antenna | DRG-118/A | 1132 | 2020-02-25 | 2 years |
| Wisewave | Antenna, Horn | ARH-4223-02 | 10555-02 | 2020-02-05 | 2 years |
| Agilent | Amplifier, Pre | 8447D | 2443A04374 | 2020-08-17 | 13 months |
| HP | Pre-Amplifier | 8449B | 3008A01978 | 2021-05-05 | 1 year |
| AH Systems | Preamplifier | PAM 1840 VH | 170 | 2020-11-09 | 1 year |
| BACL | 5m3 Sensitivity Box | 1 | 2 | 2020-10-27 | 1 year |
| IW Incorporated | 157 Series 2.92 SM (x2) Armored 33 ft. Cable | KPS-1571AN- 3960-KPS | DC 1917 | 2021-03-03 | 1 year |
| IW Incorporated | 157 Series Cable Armored with 2.92mm Male Plugs on Both Sides | KPS-1571AN- 2400 | DC 1922 | 2021-07-06 | 1 year |
| Keysight Technologies | RF Limiter | 11867A | MY42242932 | 2021-03-03 | 1 year |
| MDP Digital | Times Microwave LMR 400 UltraFex Coaxial Cable 35' | LMR400UF | BACL1904161 | 2020-05-20 | 18 Months |
| Vasona | Test software | V6.0 build 11 | 10400213 | N/R | N/R |

Note¹: 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 “A2LA Policy on Metrological Traceability”.

5.6 Test Environmental Conditions

| | |
|---------------------------|-----------|
| Temperature: | 20-24 °C |
| Relative Humidity: | 28-45 % |
| ATM Pressure: | 102.5 kPa |

The original testing was performed by Giriraj Gurjar from 2021-06-03 to 2021-06-10, and from 2021-09-09 to 2021-09-10 in 5m chamber 3.

5.7 Summary of Test Results

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

| Mode: Transmitting | | | |
|---------------------------|------------------------|---|----------------------|
| Margin (dB) | Frequency (MHz) | Polarization (Horizontal/Vertical) | Mode, channel |
| -3.15 | 4852 | Vertical | Radio co-location |

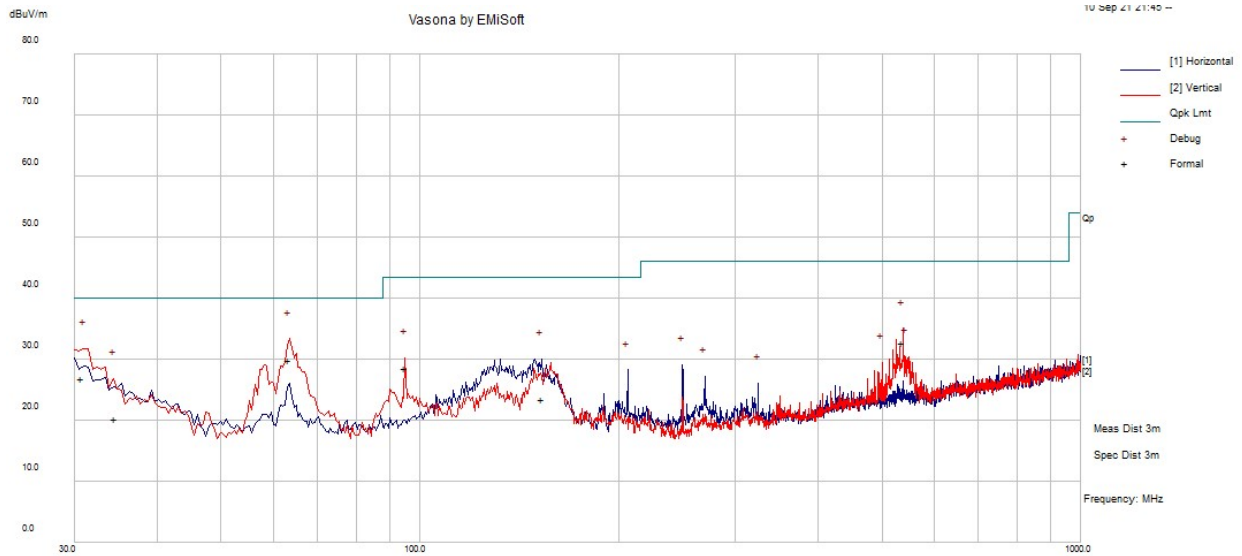
Please refer to the following table and plots for specific test result details

5.8 Spurious Emissions Test Results

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

Pre-scan was performed, and 802.11b 2412 MHz was the worst case 2.4 GHz Wi-Fi mode. Low channels were also the worst case mode for 2.4 GHz Aux and BLE. Radios were all set to transmit the highest power level that the EUT allows, and the antenna ports were terminated.

EUT Configuration: 2.4 GHz Wi-Fi (4x4, 802.11b, 2412 MHz), 2.4 GHz Aux (1x1, 802.11g, 2412 MHz), and BLE (2402 MHz)



| Frequency (MHz) | S.A. Reading (dBuV) | Correction Factor (dB/m) | Corrected Amplitude (dBμV/m) | Antenna Height (cm) | Antenna Polarity (H/V) | Turntable Azimuth (degrees) | Limit (dBμV/m) | Margin (dB) | Comment |
|-----------------|---------------------|--------------------------|------------------------------|---------------------|------------------------|-----------------------------|----------------|-------------|---------|
| 63.3785 | 40.61 | -10.81 | 29.81 | 104 | V | 341 | 40 | -10.19 | QP |
| 30.737 | 24.87 | 1.93 | 26.81 | 121 | V | 113 | 40 | -13.19 | QP |
| 537.491 | 32.41 | 0.29 | 32.7 | 104 | V | 344 | 46 | -13.3 | QP |
| 95.0655 | 37.87 | -9.27 | 28.59 | 103 | V | 212 | 43.5 | -14.91 | QP |
| 34.5955 | 21.34 | -1.08 | 20.26 | 176 | V | 41 | 40 | -19.74 | QP |
| 152.9013 | 29.3 | -5.81 | 23.49 | 186 | H | 60 | 43.5 | -20.01 | QP |

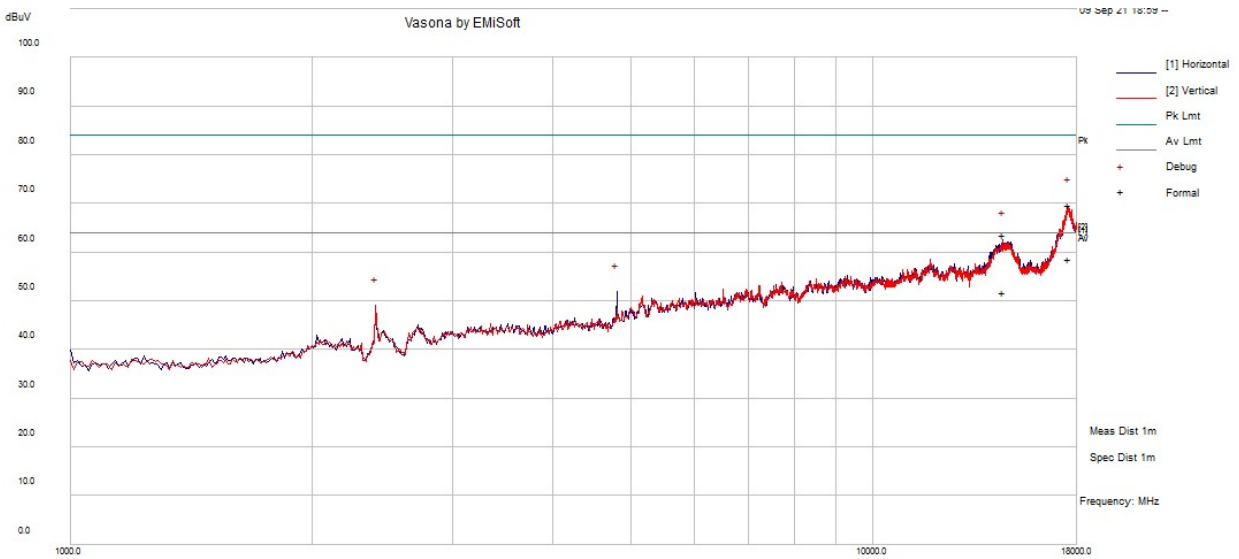
2) 1 GHz-18 GHz, manual measurement at 1 meter

Pre-scan was performed, and the following configurations were the worst case to be formally tested. Radios were all set to transmit the highest power level that the EUT allows, and the antenna ports were terminated. EUT Configuration: 2.4 GHz Wi-Fi (4x4, 802.11b, 2412 MHz), 2.4 GHz Aux (1x1, 802.11g, 2412 MHz), and BLE (2402 MHz)

| Frequency (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) | |
| 4803 | 53.26 | 0 | 111 | V | 28.90 | 4.99 | 35.12 | 52.03 | 84 | -31.97 | PK |
| 4803 | 49.77 | 0 | 111 | V | 28.90 | 4.99 | 35.12 | 48.54 | 64 | -15.46 | AVG |
| 4824 | 53.32 | 52 | 180 | H | 28.90 | 5.07 | 35.12 | 52.17 | 84 | -31.83 | PK |
| 4824 | 50.33 | 52 | 180 | H | 28.90 | 5.07 | 35.12 | 49.18 | 64 | -14.82 | AVG |
| 4852 | 42.46 | 136 | 150 | V | 35.20 | 9.23 | 30.42 | 56.47 | 84 | -27.53 | PK |
| 4852 | 30.40 | 136 | 150 | V | 35.20 | 9.23 | 13.98 | 60.85 | 64 | -3.15 | AVG |
| 4831 | 42.31 | 65 | 150 | H | 35.20 | 9.61 | 13.98 | 73.14 | 84 | -10.86 | PK |
| 4831 | 31.90 | 65 | 150 | H | 35.20 | 9.61 | 30.42 | 46.29 | 64 | -17.71 | AVG |
| 7236 | 43.30 | 132 | 150 | V | 36.10 | 10.85 | 28.44 | 61.81 | 84 | -22.19 | PK |
| 7236 | 31.01 | 132 | 150 | V | 36.10 | 10.85 | 28.44 | 49.52 | 64 | -14.48 | AVG |
| 7274 | 43.09 | 346 | 150 | H | 36.10 | 10.92 | 28.44 | 61.67 | 84 | -22.33 | PK |
| 7274 | 31.52 | 346 | 150 | H | 36.10 | 10.92 | 28.44 | 50.10 | 64 | -13.90 | AVG |

3) 1 GHz-18 GHz, Vasona scan graph at 1 meter

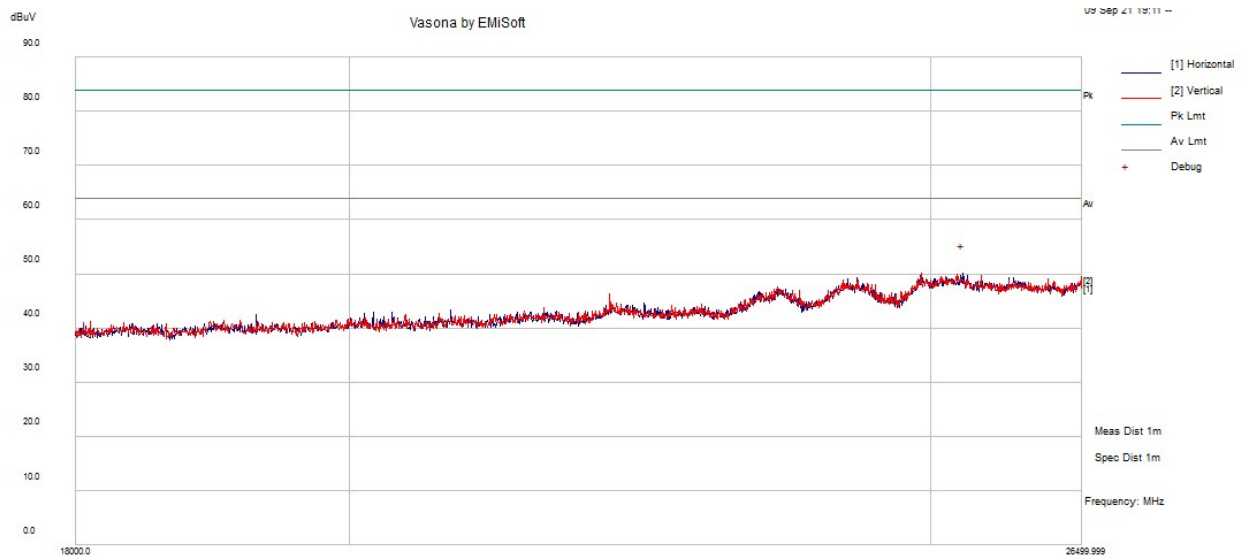
Pre-scan was performed, and the following configurations were the worst case to be formally tested. Radios were all set to transmit the highest power level that the EUT allows, and the antenna ports were terminated. EUT Configuration: 2.4 GHz Wi-Fi (4x4, 802.11b, 2412 MHz), 2.4 GHz Aux (1x1, 802.11g, 2412 MHz), and BLE (2402 MHz)



| Frequency (MHz) | S.A. Reading (dBuV) | Correction Factor (dB/m) | Corrected Amplitude (dBuV/m) | Antenna Height (cm) | Antenna Polarity (H/V) | Turntable Azimuth (degrees) | Limit (dBuV/m) | Margin (dB) | Comment |
|-----------------|---------------------|--------------------------|------------------------------|---------------------|------------------------|-----------------------------|----------------|-------------|---------|
| 17563.39 | 44.06 | 25.53 | 69.6 | 109 | V | 169 | 84 | -14.4 | PK |
| 14557.18 | 44.35 | 19.2 | 63.55 | 103 | H | 264 | 84 | -20.45 | PK |
| 17563.39 | 33.11 | 25.53 | 58.64 | 109 | V | 169 | 64 | -5.36 | Ave |
| 14557.18 | 32.56 | 19.2 | 51.76 | 103 | H | 264 | 64 | -12.24 | Ave |

4) 18 GHz-26.5 GHz, Vasona scan graph at 1 meter

Pre-scan was performed, and the following configurations were the worst case to be formally tested. Radios were all set to transmit the highest power level that the EUT allows, and the antenna ports were terminated. EUT Configuration: 2.4 GHz Wi-Fi (4x4, 802.11b, 2412 MHz), 2.4 GHz Aux (1x1, 802.11g, 2412 MHz), and BLE (2402 MHz)



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 17025:2017 *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 10th day of March 2021.

A blue ink signature of Trace McInturf.

Trace McInturf, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2022

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 ---