FCC PART 15.407
ISEDC 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:	R2108135-407
Report Date:	2021-09-28
Reviewed By:	Zhao Zhao RF Project Engineer

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

ACCREDITED
CERTIFICATE #3297.02

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R2108135-407	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 FCC CFR47 §15.407 and ISED RSS-247 Issue 2, February2017.

The objective was to determine compliance with FCC Part 15.407 and ISEDC RSS-247 rules for Antenna Requirements and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

Equipment Class: DTS, 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 for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz, and FCC KDB 789033 D02 General UNII Test Procedure New Rules v02r01.

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 º 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):
  - 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 789033 D02 General UNII Test Procedures New Rules v02r01.

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	Mode	Frequency (MHz)	Power Setting
5 GHz Wi-Fi	802.11a	5180	24
5 GHz Aux	802.11a	5180	19
BLE	GFSK	2402	default

Data Rates Tested:
802.11a mode: 6Mbps

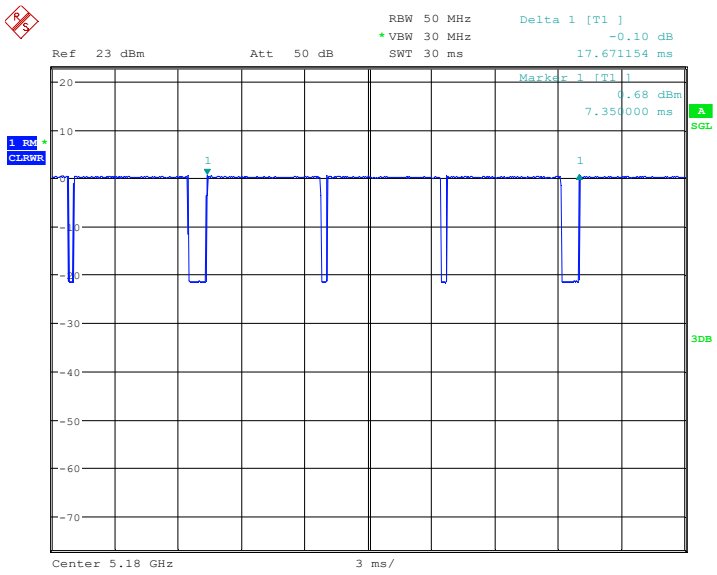
2.3 Duty Cycle Correction Factor

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 section B:
All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum-power transmission duration, T, are required for each tested mode of operation.

Radio	Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
5 GHz Wi-Fi	802.11a	16.153845	17.671154	91.41	0.390
5 GHz Aux	802.11a	291.628205	304.487179	95.78	0.187
BLE	GFSK	1	1	100	0

Note: Duty Cycle Correction Factor = 10*log(1/duty cycle)
Please refer to the following plots.

5 GHz Wi-Fi (802.11 a)



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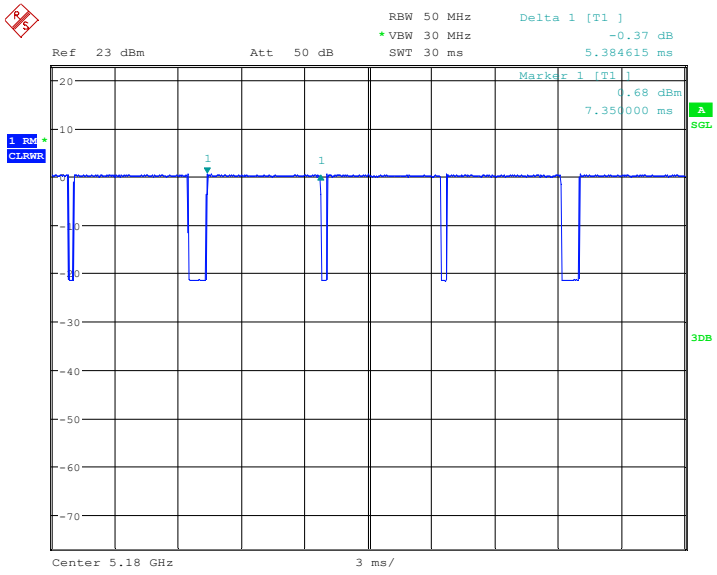

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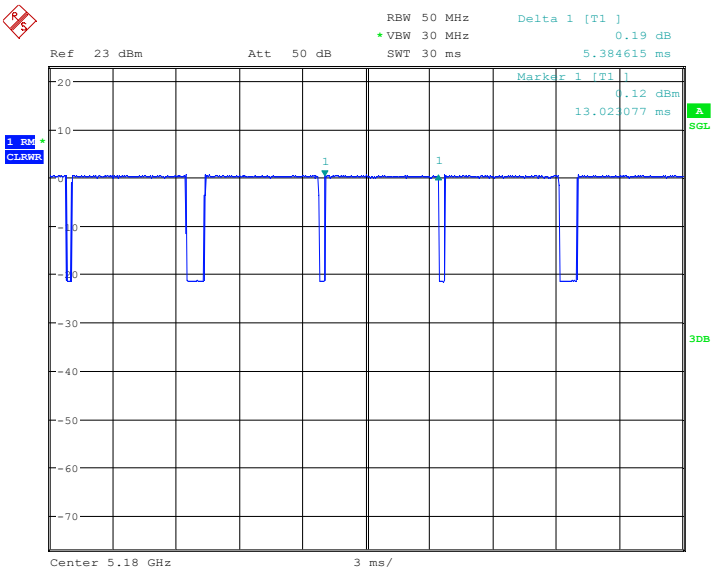

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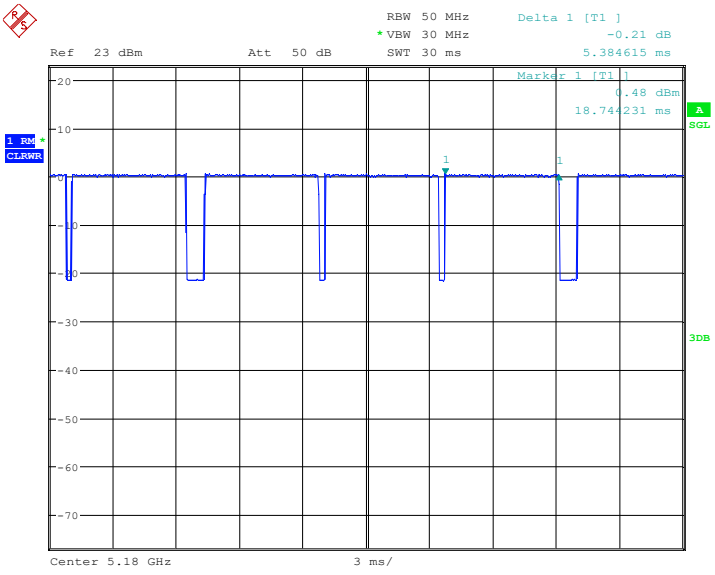

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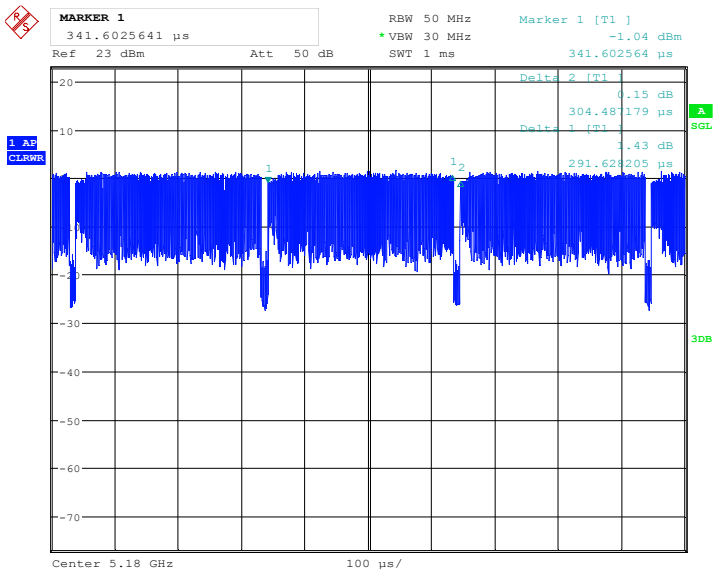
5 GHz Aux (802.11 a)



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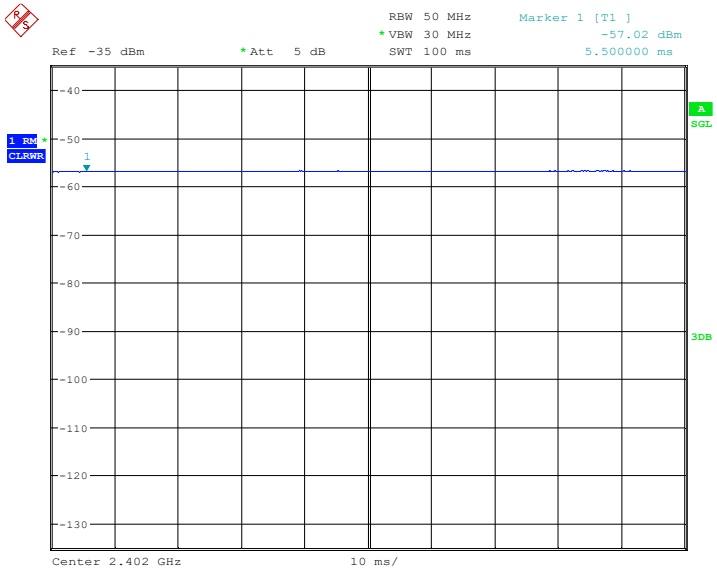
BLE



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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 (m)	To	From
Ethernet cable	2 m	PoE	EUT
Ethernet-Serial-USB cable	2 m	EUT	Laptop

3 Summary of Test Results

FCC and ISED Rules	Description of Test	Result
FCC §15.207 ISED RSS-Gen §8.8	AC Power Line Conducted Emissions	Compliant
FCC §2.1053, §15.205, §15.209, 15.407(b) ISED RSS-247 §6.2 ISEDC RSS-Gen §8.9 and §8.10	Spurious Radiated Emissions	Compliant

4 FCC §15.207 & ISED 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 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

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 = S.A. Reading + Correction Factor

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

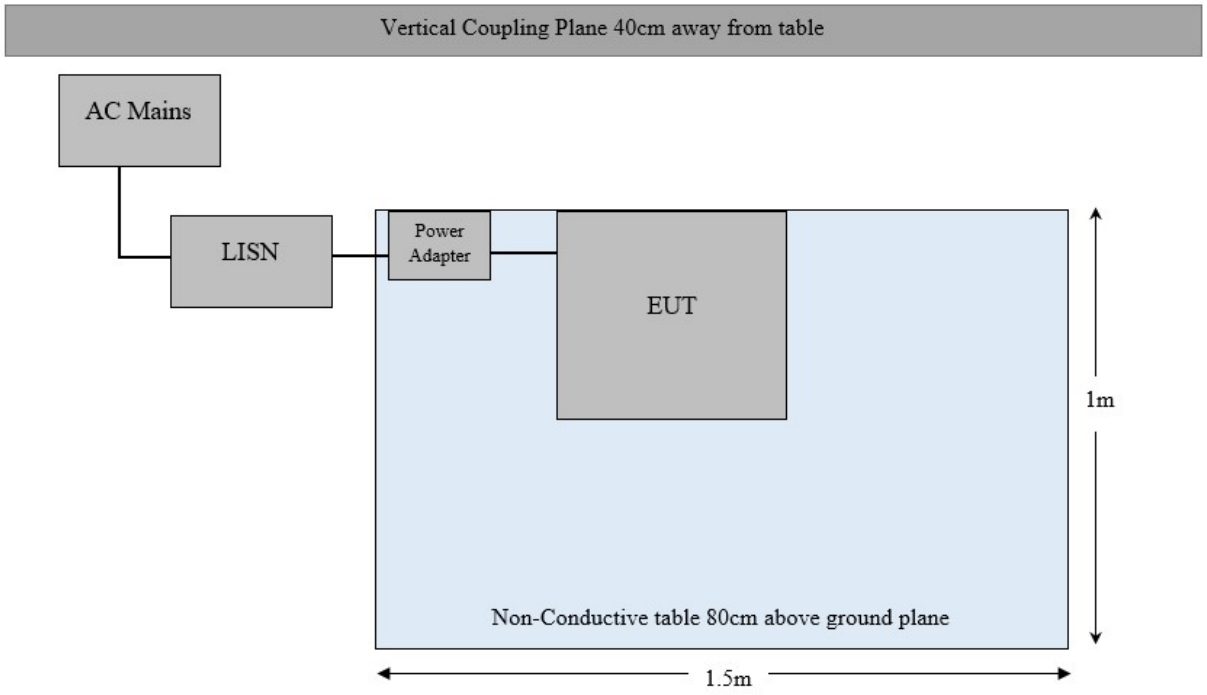
The Correction Factor is calculated by adding the Cable Loss (CL) and the Attenuator Factor (Atten) together. This calculation is done in the measurement software, and reported in the test result section. The basic equation is as follows:

Correction Factor = CL + 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:

Margin = Corrected Amplitude – 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 ºC
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

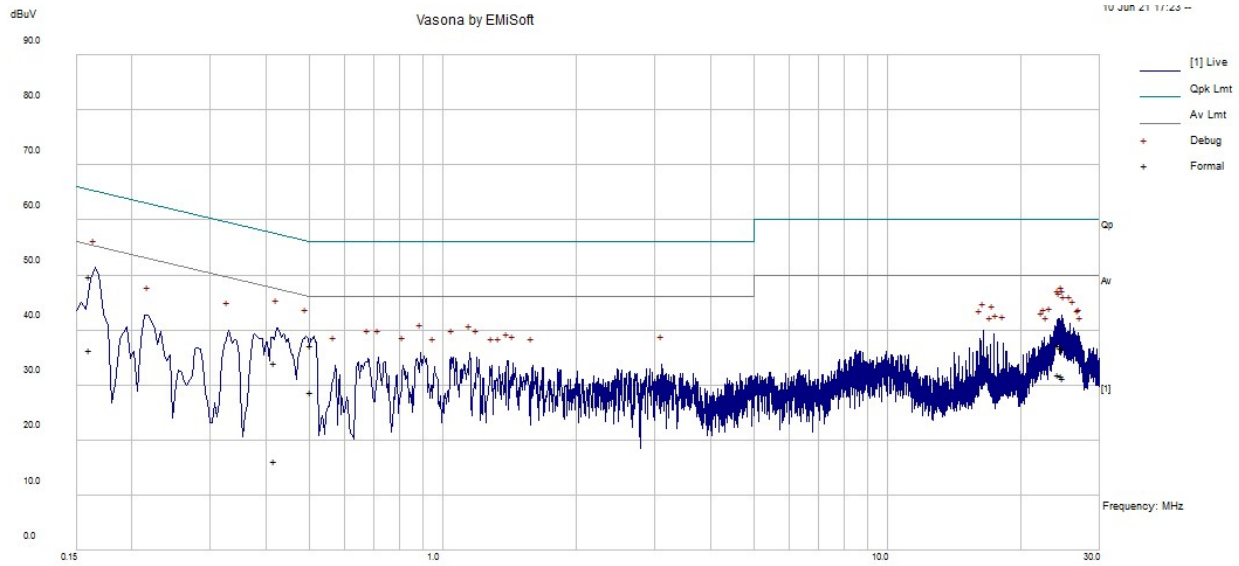
According to the recorded data in following table, the EUT complied with the FCC 15.207 and ISEDC RSS-Gen standard's conducted emissions limits, with the margin reading of:

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-14.05	0.16711	Neutral	0.15-30

4.9 Conducted Emissions Test Plots and Data

Worst Case EUT configuration: 5 GHz Radio 1 Wi-Fi (4x4, 802.11a, 5200 MHz)+5 GHz Radio 2 Wi-Fi (2x2, 802.11a, 5200 MHz) + 5 GHz Aux (1x1, 802.11a, 5200 MHz) + BLE (2402 MHz)

AC Line: 120V/60Hz



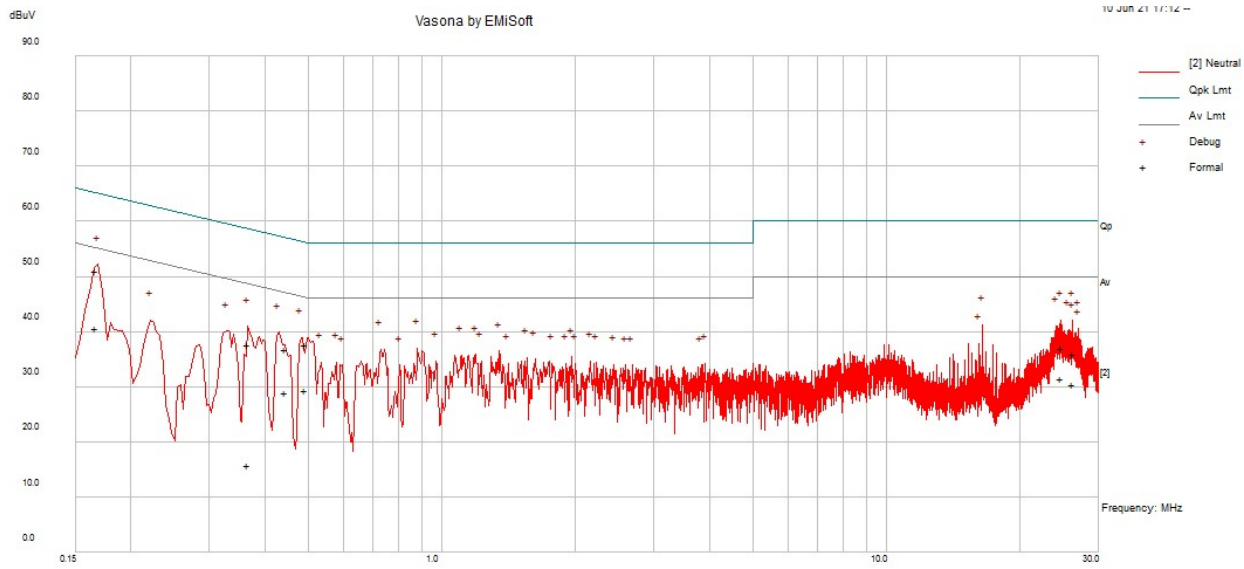
Quasi-peak Measurement:

Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB)	Corrected Amplitude (dBuV)	Conductor (Line/ Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.160768	39.1	10.7	49.81	Line	65.42	-15.62	QP
0.41907	23.67	10.36	34.03	Line	57.47	-23.43	QP
24.69677	26.13	10.72	36.84	Line	60	-23.16	QP
0.504458	26.96	10.27	37.23	Line	56	-18.77	QP
24.80865	25.83	10.72	36.55	Line	60	-23.45	QP
24.27589	26.57	10.7	37.27	Line	60	-22.73	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.)
0.160768	25.7	10.7	36.4	Line	55.42	-19.02	Ave.
0.41907	5.85	10.36	16.21	Line	47.47	-31.26	Ave.
24.69677	20.88	10.72	31.59	Line	50	-18.41	Ave.
0.504458	18.44	10.27	28.71	Line	46	-17.29	Ave.
24.80865	20.53	10.72	31.25	Line	50	-18.75	Ave.
24.27589	21.13	10.7	31.83	Line	50	-18.17	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.)
0.16711	40.36	10.69	51.05	Neutral	65.1	-14.05	QP
0.494182	27.38	10.28	37.66	Neutral	56.1	-18.44	QP
0.445649	26.47	10.33	36.8	Neutral	56.96	-20.16	QP
0.366049	27.29	10.43	37.71	Neutral	58.59	-20.88	QP
26.18657	25.22	10.78	36	Neutral	60	-24	QP
24.7185	26.2	10.72	36.92	Neutral	60	-23.08	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.)
0.16711	29.86	10.69	40.55	Neutral	55.1	-14.55	Ave.
0.494182	19.16	10.28	29.44	Neutral	46.1	-16.66	Ave.
0.445649	18.55	10.33	28.88	Neutral	46.96	-18.07	Ave.
0.366049	5.41	10.43	15.83	Neutral	48.59	-32.76	Ave.
26.18657	19.75	10.78	30.53	Neutral	50	-19.47	Ave.
24.7185	20.67	10.72	31.39	Neutral	50	-18.61	Ave.

5 FCC §15.209, §15.407(b) & ISEDC RSS-247 §6.2, RSS-Gen §8.9, §8.10 - Spurious Radiated Emissions

5.1 Applicable Standard

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	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	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: 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 Note 1	3
88 - 216	150 Note 1	3
216 - 960	200 Note 1	3
Above 960	500	3

Note 1: 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 Part 15.407 (b)

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.

(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(7) The provisions of §15.205 apply to intentional radiators operating under this section.

(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

As per ISED RSS-247 §6.2

For transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHzshall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth (i.e. 99% bandwidth), above 5250 MHz. The 26 dB bandwidth may fall into the 5250-5350 MHz band; however, if the occupied bandwidth also falls within the 5250-5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5250-5350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5250-5350 MHz band.

For devices with both operating frequencies and channel bandwidths contained within the band 5250-5350 MHz, the device shall comply with the following:

1. All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. if the equipment is intended for outdoor use; or
2. All emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. and any emissions within the band 5150-5250 MHz shall meet the power spectral density limits of Section 6.2.1. The device shall be labelled “for indoor use only.”

For devices with operating frequencies in the band 5250-5350 MHz but having a channel bandwidth that overlaps the band 5150-5250 MHz, the devices’ unwanted emission shall not exceed -27 dBm/MHz e.i.r.p. outside the band 5150-5350 MHz and its power shall comply with the spectral power density for operation within the band 5150-5250 MHz. The device shall be labelled “for indoor use only.”

For transmitters operating in the band 5470-5725 MHz, emissions outside the band shall not exceed -27 dBm/MHz e.i.r.p.

Devices operating in the band 5725-5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:

a. 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 Bm/MHz at 5 MHz above or below the band edges;
b. 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHzat 25 MHz above or below the band edges;
c. 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHzat 75 MHz above or below the band edges; and
d. -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

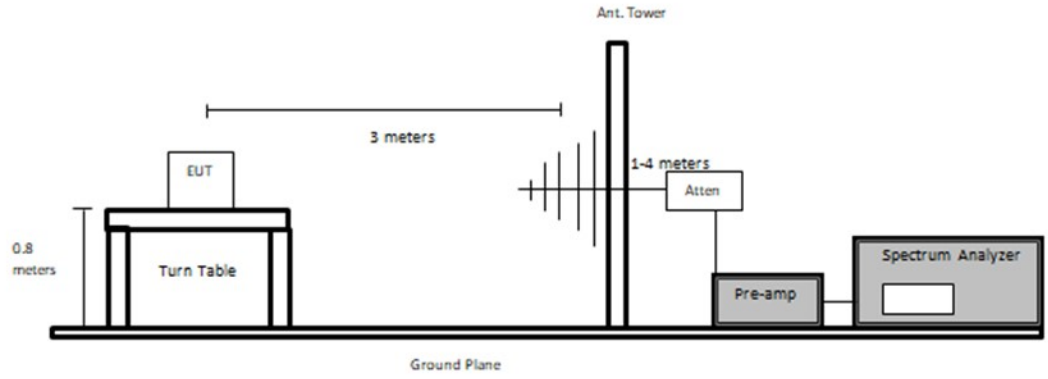
5.2 Test Setup

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 15.407 and ISED RSS-247 limits.

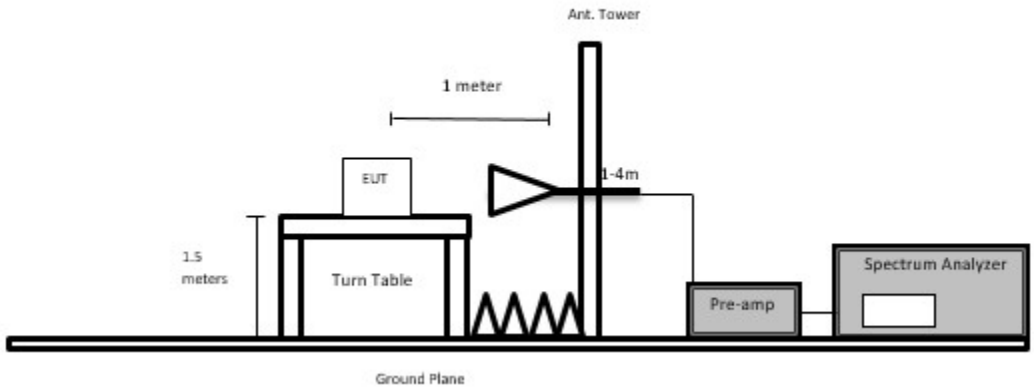
The spacing between the peripherals was 10 centimeters.

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

Below 1GHz:



Above 1GHz:



5.3 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 is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter or 1.5 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

(1) Peak: RBW = 1MHz / VBW = 3MHz / Sweep = 100 ms
(2) Average: RBW = 1MHz / VBW = 1 / T or 10 Hz / 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:

CA = S.A. Reading + 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:

Correction Factor = AF + CL + Atten – 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:

Margin = Corrected Amplitude – 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:

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 1166.5950.03	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
Wisewave	Antenna, Horn	ARH-2823-02	10555-02	2020-02-27	2 years
Agilent	Amplifier, Pre	8447D	2443A04374	2020-08-17	1 year
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

Note[1]: cables 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 ºC
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 the FCC Part 15.407 and RSS-247 standards' radiated emissions limits, and had the worst margin of:

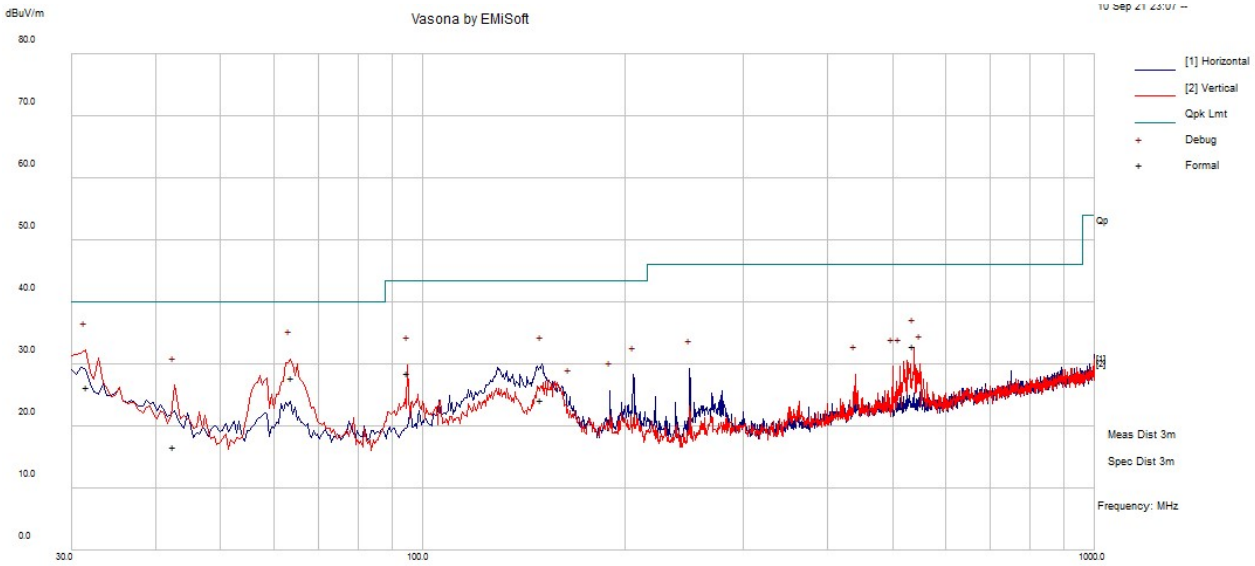
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-2.06	10570	Vertical	5580 MHz, 116

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

5.8 Radiated Emissions Test Result

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

Pre-scan was performed, and 802.11a 5200 MHz was selected as the worst case for formal testing. Radios were all set to transmit the highest power level that the EUT allows, and the antenna ports were terminated. Worst Case EUT configuration: 5 GHz Wi-Fi (4x4, 802.11a, 5200 MHz)+5 GHz Wi-Fi (2x2, 802.11a, 5200 MHz)+ 5 GHz Aux (1x1, 802.11a, 5200 MHz) + 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
63.91325	38.52	-10.74	27.77	122	V	352	40	-12.23	QP
537.516	32.61	0.29	32.9	104	V	7	46	-13.1	QP
31.66425	25.22	1.16	26.38	133	V	52	40	-13.62	QP
95.02625	37.76	-9.28	28.48	127	V	156	43.5	-15.02	QP
150.1553	29.94	-5.82	24.12	193	H	283	43.5	-19.38	QP
42.562	23.57	-7.01	16.56	193	H	28	40	-23.44	QP

2) 1 GHz–18 GHz, Manual Measurement at 1 meter

Pre-scan was performed, and 802.11a was selected as the worst case for formal testing. Radios were all set to transmit the highest power level that the EUT allows at the middle channel of each U-NII frequency band, and the antenna ports were terminated.
EUT configuration: 5 GHz Radio 1 Wi-Fi (4x4, 802.11a)+5 GHz Radio 2 Wi-Fi (2x2, 802.11a)+ 5 GHz Aux (1x1, 802.11a)

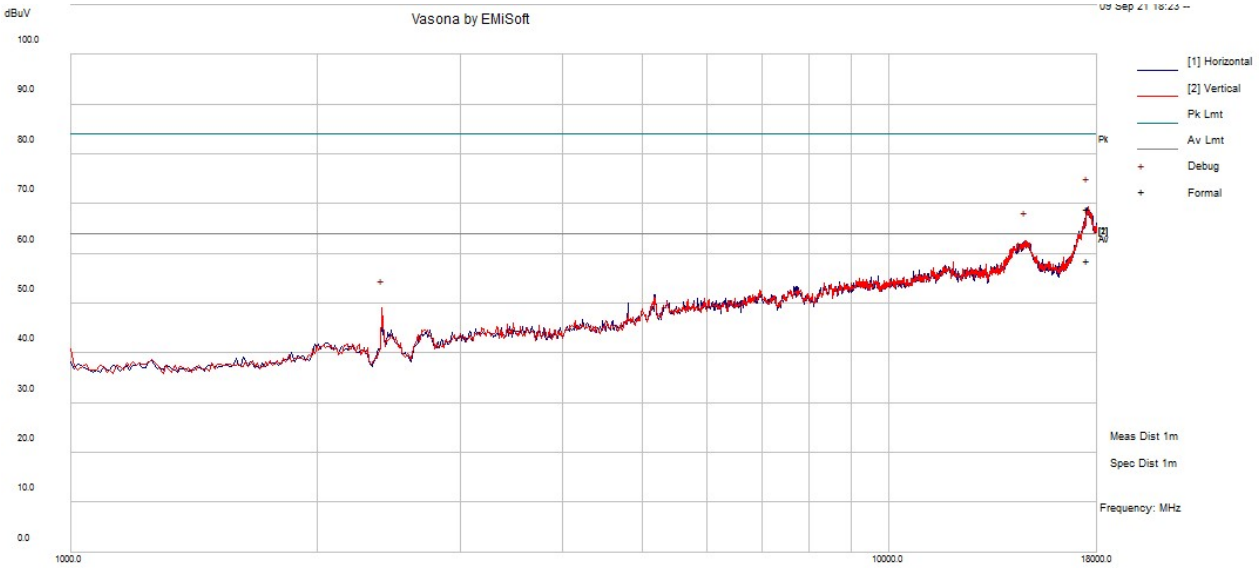
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Channel 40: 5200 MHz power setting: 24											
10400	42.98	0	150	V	35.20	8.65	30.42	56.41	84	-27.59	PK
10400	30.24	0	150	V	35.20	8.65	13.98	60.11	64	-3.89	AVG
10400	40.31	92	123	H	35.20	8.65	13.98	70.18	84	-13.82	PK
10400	30.60	92	123	H	35.20	8.65	30.42	44.03	64	-19.97	AVG
15591	43.56	0	150	V	36.10	14.64	28.44	65.86	84	-18.14	PK
15591	32.61	0	150	V	36.10	14.64	28.44	54.91	64	-9.09	AVG
15591	42.54	136	232	H	36.10	14.64	28.44	64.84	84	-19.16	PK
15591	32.75	136	232	H	36.10	14.64	28.44	55.05	64	-8.95	AVG
Channel 60: 5300 MHz power setting: 24											
10570	41.80	0	150	V	35.20	8.99	30.42	55.57	84	-28.43	PK
10570	30.06	0	150	V	35.20	8.99	13.98	60.27	64	-3.73	AVG
10568	41.43	0	150	H	35.20	8.97	13.98	71.62	84	-12.38	PK
10568	29.60	0	150	H	35.20	8.97	30.42	43.35	64	-20.65	AVG
15867	42.21	107	150	V	36.10	11.28	28.44	61.15	84	-22.85	PK
15867	30.42	107	150	V	36.10	11.28	28.44	49.36	64	-14.64	AVG
15862	42.48	253	150	H	36.10	11.24	28.44	61.38	84	-22.62	PK
15862	30.81	253	150	H	36.10	11.24	28.44	49.71	64	-14.29	AVG
Channel 116: 5580 MHz power setting: 24											
11206	43.58	0	150	V	35.20	8.99	30.42	57.35	84	-26.65	PK
11206	**31.73**	**0**	**150**	**V**	**35.20**	**8.99**	**13.98**	**61.94**	**64**	**-2.06**	**AVG**
11171	43.07	156	150	H	35.20	8.97	13.98	73.26	84	-10.74	PK
11171	31.60	156	150	H	35.20	8.97	30.42	45.35	64	-18.65	AVG
16749	42.67	0	150	V	36.10	11.28	28.44	61.61	84	-22.39	PK
16749	30.09	0	150	V	36.10	11.28	28.44	49.03	64	-14.97	AVG
16773	44.24	0	150	H	36.10	11.24	28.44	63.14	84	-20.86	PK
16773	30.41	0	150	H	36.10	11.24	28.44	49.31	64	-14.69	AVG

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Channel 157: 5785 MHz power setting: 24											
5237	43.33	54	150	H	28.90	5.49	35.12	42.60	84	-41.40	PK
5237	30.48	54	150	H	28.90	5.49	35.12	29.75	64	-34.25	AVG
11546	41.26	330	172	V	35.20	9.33	30.42	55.37	84	-28.63	PK
11546	29.21	330	172	V	35.20	9.33	13.98	59.76	64	-4.24	AVG
11547	41.43	0	150	H	35.20	9.31	13.98	71.96	84	-12.04	PK
11547	29.62	0	150	H	35.20	9.31	30.42	43.71	64	-20.29	AVG
17358	45.19	341	150	V	36.10	11.39	28.44	64.24	84	-19.76	PK
17358	33.42	341	150	V	36.10	11.39	28.44	52.47	64	-11.53	AVG
17356	46.51	0	150	H	36.10	11.36	28.44	65.53	84	-18.47	PK
17356	34.01	0	150	H	36.10	11.36	28.44	53.03	64	-10.97	AVG

3) 1 GHz–40GHz, Vasona scan graph at 1 meter.

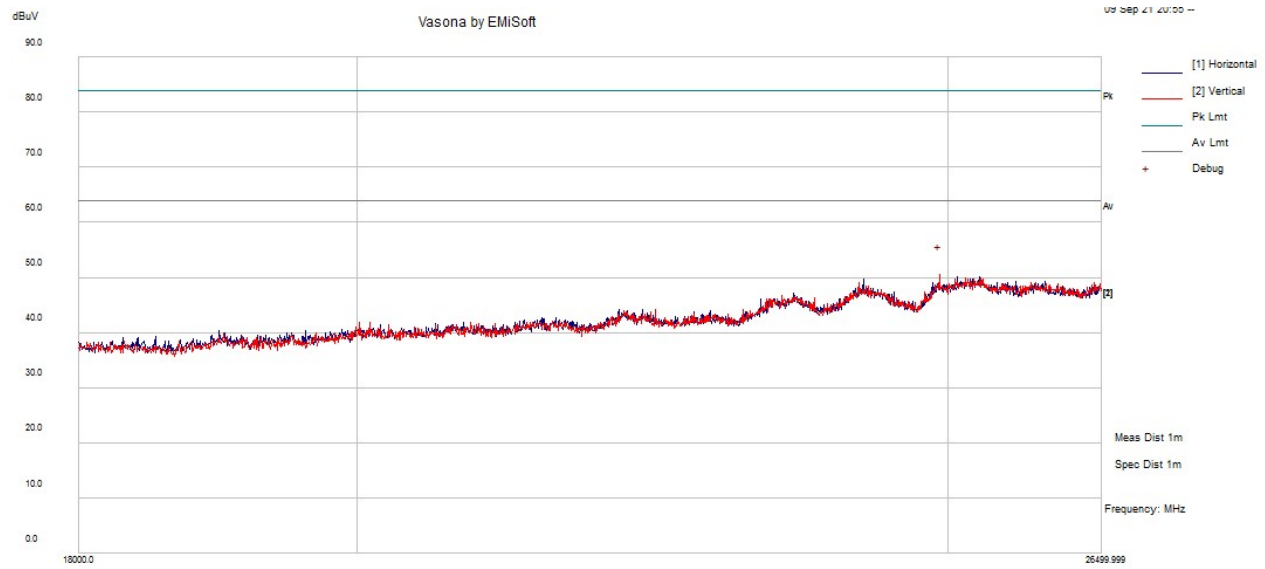
Pre-scan was performed, and 802.11a 5200 MHz was selected as the worst case for formal testing. Radios were all set to transmit the highest power level that the EUT allows, and the antenna ports were terminated. Worst Case EUT configuration: 5 GHz Radio 1 Wi-Fi (4x4, 802.11a, 5200 MHz)+5 GHz Radio 2 Wi-Fi (2x2, 802.11a, 5200 MHz)+ 5 GHz Aux (1x1, 802.11a, 5200 MHz) + BLE (2402 MHz)

1 GHz – 18 GHz

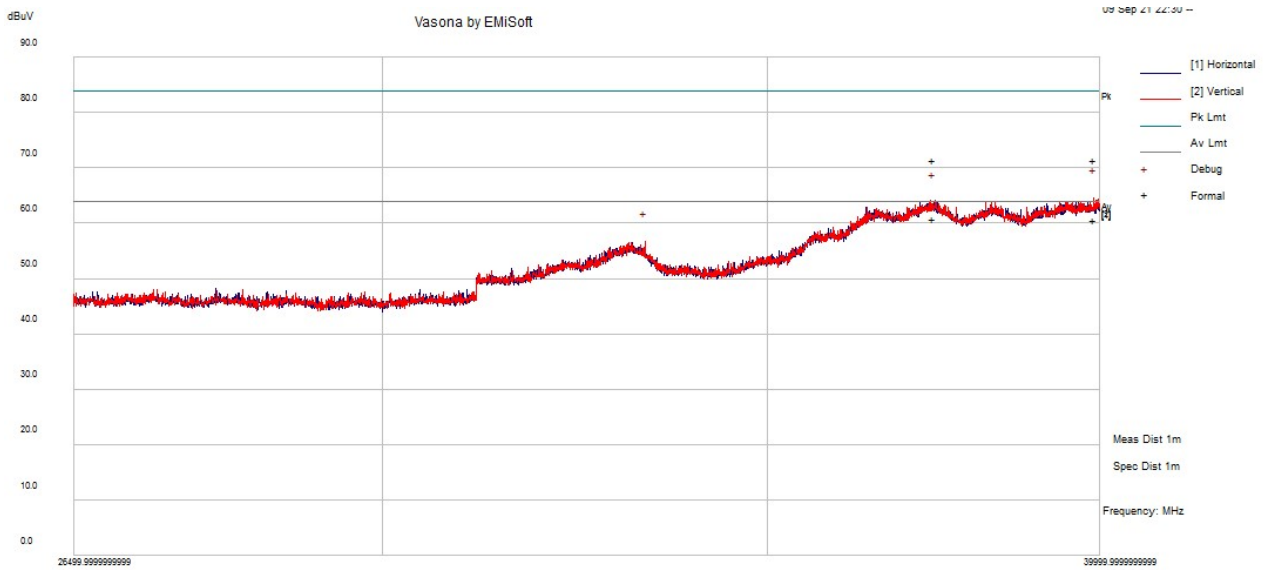


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
17552.61	43.45	25.56	69.01	284	V	96	84	-14.99	PK
17552.61	33.1	25.56	58.66	284	V	96	64	-5.34	Ave

18 GHz-26.5 GHz



26.5 GHz-40 GHz



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
39905.05	50.88	20.49	71.37	278	H	298	84	-12.63	PK
37420.82	54.72	16.8	71.52	150	V	251	84	-12.48	PK
39905.05	40.19	20.49	60.68	278	H	298	64	-3.32	Ave
37420.82	43.95	16.8	60.75	208	H	132	64	-3.25	Ave

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) - 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 17025:2017 *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.

Trace McInturff, 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 ---