FCC PART 15.407
ISEDC RSS-248, ISSUE 1, NOVEMBER 2021

TEST REPORT

For

Cisco Systems, Inc.

125 West Tasman Drive
San Jose, CA 95134, USA

FCC ID: LDKIW9165E
IC: 2461A-IW9165E

Report Type:	**Product Type:**
Original Report	Wi-Fi 6E Outdoor Access Point

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Report Number:	R2211102-407-01
Report Date:	2023-07-27
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R2211102-407-01	Original Report	2023-07-27

1 General Description

1.1 Product Description for Equipment under Test (EUT)

This test report was prepared on behalf of *Cisco Systems, Inc.*, and their product model: *IW9165E-B (USA), IW9165E-A (Canada)*, FCC ID: LDKIW9165E, IC: 2461A-IW9165E, or the "EUT" as referred to in this report. It is a Wi-Fi 6E Outdoor Access Point.

1.2 Objective

This report was prepared on behalf of Cisco Systems, Inc. in accordance with FCC CFR47 §15.407 and ISEDC RSS-248 Issue 1, November 2021.

The objective was to determine compliance with FCC Part 15.407 and ISEDC RSS-248 rules for Radiated Spurious Emissions.

1.3 Related Submittal(s)/Grant(s)

FCC Part 15, Subpart E, Equipment DTS with FCC ID: LDKIW9165E, IC: 2461A-IW9165E
FCC Part 90 with FCC ID: LDKIW9165E, IC: 2461A-IW9165E

1.4 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.

1.5 Measurement Uncertainty

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

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

1.6 Test Facility Registrations

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

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

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

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

1.7 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- ***An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2017 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 17025:2017 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 17025:2017 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 EUT 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.

The worst-case data rates are determined by measuring the average power, peak power and PPSD across all data rates bandwidths, and modulations.

2.2 EUT Exercise Software

The test software used was Tera Term. The software is compliant with the standard requirements being tested against.

Please refer to the following power setting table.

Modulation	Frequency (MHz)	Power Setting for Antennas A and B
802.11ax20	5955	34
	6175	34
	6415	34
	6535	34
	6715	34
	6855	34
802.11ax160	6025	34
	6185	34
	6345	34
	6665	34

*Data rates tested:
802.11ax HE20: m0h1
802.11ax HE160: m0h1

2.3 Duty Cycle Correction Factor

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 section B:

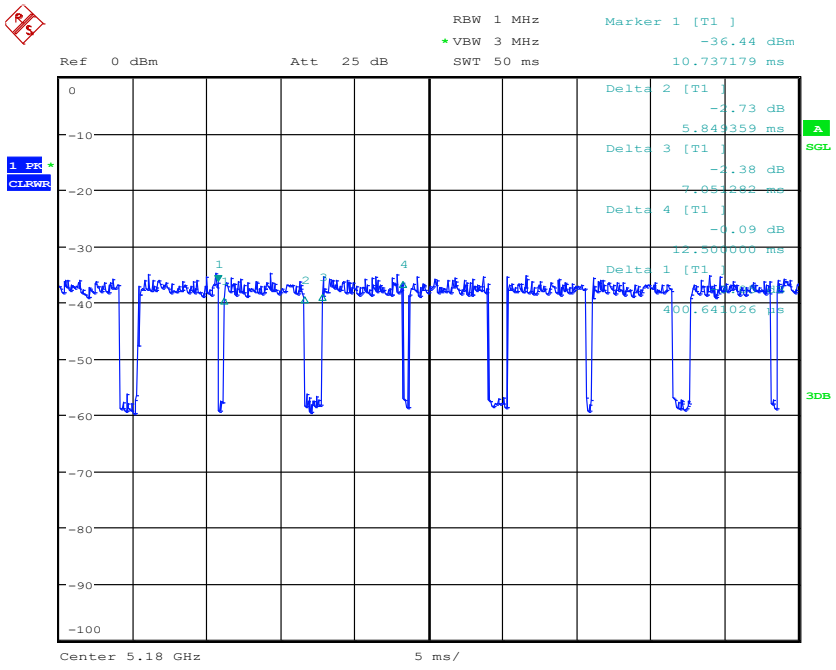
All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum-power transmission duration, T, are required for each tested mode of operation.

Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11ax20	5.45	6.65	82.0	0.86
802.11ax160	5.38	6.41	83.9	0.76

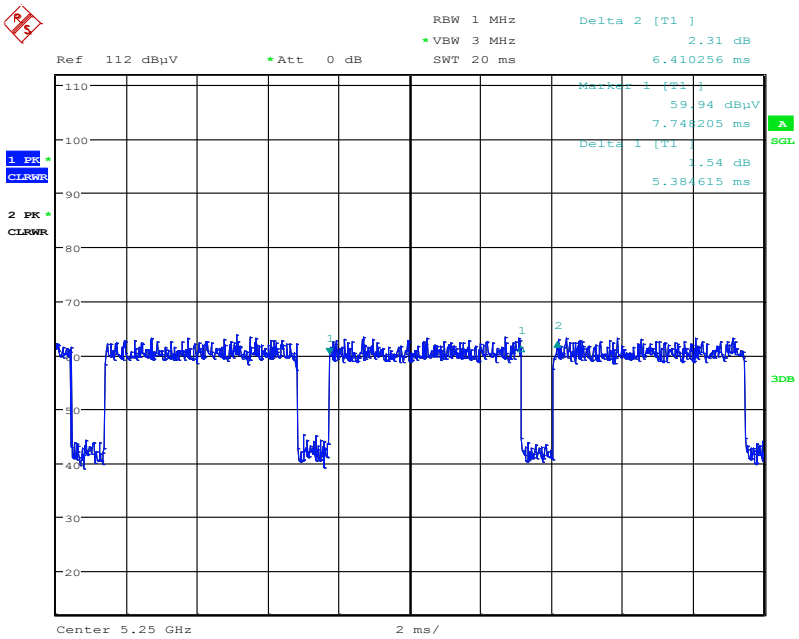
Note: Duty Cycle Correction Factor = 10*log(1/duty cycle)

Please refer to the following plots.

802.11ax20



802.11ax160


RBW 1 MHz
VBW 3 MHz
SWT 20 ms
Delta 2 [T1]
2.31 dB
6.410256 ms
Ref 112 dBµV
Att 0 dB
Marker 1 [T1]
59.94 dBµV
7.748205 ms
Delta 1 [T1]
1.54 dB
5.384615 ms
1 PK
CLRWR
2 PK
CLRWR
A
SGL
3DB
110
100
90
80
70
60
50
40
30
20
Center 5.25 GHz
2 ms/

2.4 Equipment Modifications

N/A

2.5 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude E6410

2.6 Remote Support Equipment

Manufacturer	Description	Model
LiteON	Power Supply	PA-1600-1C

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
USB A to RJ45	< 1 m	EUT	Laptop
Power Supply	< 1 m	EUT	Power

3 Summary of Test Results

FCC and ISEDC Rules	Description of Test	Result
FCC §2.1053, §15.205, §15.209, §15.247, §15.407(b), ISEDC RSS-248 §4.7	Spurious Radiated Emissions	Compliant

BACL is responsible for all the information provided in this report, except when information is provided by the customer as identified in this report. Information provided by the customer, e.g., antenna gain, can affect the validity of results.

4 FCC §15.209, §15.407(b) & ISEDC RSS-248 §4.7 - Spurious Radiated Emissions

4.1 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		
0.495 – 0.505	16.69475 – 16.69525		4. 5 – 5. 15
2.1735 – 2.1905	25.5 – 25.67	960 – 1240	5. 35 – 5. 46
4.125 – 4.128	37.5 – 38.25	1300 – 1427	7.25 – 7.75
4.17725 – 4.17775	73 – 74.6	1435 – 1626.5	8.025 – 8.5
4.20725 – 4.20775	74.8 – 75.2	1645.5 – 1646.5	9.0 – 9.2
6.215 – 6.218	108 – 121.94	1660 – 1710	9.3 – 9.5
6.26775 – 6.26825	123 – 138	1718.8 – 1722.2	10.6 – 12.7
6.31175 – 6.31225	149.9 – 150.05	2200 – 2300	13.25 – 13.4
8.291 – 8.294	156.52475 – 156.52525	2310 – 2390	14.47 – 14.5
8.362 – 8.366	156.7 – 156.9	2483.5 – 2500	15.35 – 16.2
8.37625 – 8.38675	162.0125 –167.17	2690 – 2900	17.7 – 21.4
8.41425 – 8.41475	167.72 – 173.2	3260 – 3267	22.01 – 23.12
12.29 – 12.293	240 – 285	3.332 – 3.339	23.6 – 24.0
12.51975 – 12.52025	322 – 335.4	3 3458 – 3 358	31.2 – 31.8
12.57675 – 12.57725	399.9 – 410	3.600 – 4.400	36.43 – 36.5
13.36 – 13.41	608 – 614		Above 38.6

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)

Except as shown in paragraph (7), the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(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 solely in the 5.725-5.850 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) For transmitters operating solely in the 5.850-5.895 GHz band or operating on a channel that spans across 5.725-5.895 GHz:

(i) For an indoor access point or subordinate device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of 15 dBm/MHz and shall decrease linearly to an e.i.r.p. of −7 dBm/MHz at or above 5.925 GHz.

(ii) For a client device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of −5 dBm/MHz and shall decrease linearly to an e.i.r.p. of −27 dBm/MHz at or above 5.925 GHz.

(iii) For a client device or indoor access point or subordinate device, all emissions below 5.725 GHz shall not exceed an e.i.r.p. of −27 dBm/MHz at 5.65 GHz increasing linearly to 10 dBm/MHz at 5.7 GHz, and from 5.7 GHz increasing linearly to a level of 15.6 dBm/MHz at 5.72 GHz, and from 5.72 GHz increasing linearly to a level of 27 dBm/MHz at 5.725 GHz.

(6) For transmitters operating within the 5.925-7.125 GHz band: Any emissions outside of the 5.925-7.125 GHz band must not exceed an e.i.r.p. of −27 dBm/MHz.

(7) For transmitters operating within the 5.925-7.125 GHz bands: Power spectral density must be suppressed by 20 dB at 1 MHz outside of channel edge, by 28 dB at one channel bandwidth from the channel center, and by 40 dB at one- and one-half times the channel bandwidth away from channel center. At frequencies between one megahertz outside an unlicensed device's channel edge and one channel bandwidth from the center of the channel, the limits must be linearly interpolated between 20 dB and 28 dB suppression, and at frequencies between one and one- and one-half times an unlicensed device's channel bandwidth, the limits must be linearly interpolated between 28 dB and 40 dB suppression. Emissions removed from the channel center by more than one- and one-half times the channel bandwidth must be suppressed by at least 40 dB.

(8) 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.

(9) 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.

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

(11) 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 ISEDC RSS-248 §4.7

4.7 Unwanted emissions
This section specifies the unwanted emission limits.

4.7.1 Measurement requirements
The power of the unwanted emissions shall be measured in terms of average value. Measurements shall employ a resolution bandwidth of 1 MHz. A narrower resolution bandwidth may be used, provided the measured power is integrated over 1 MHz. Measurements of the unwanted emissions shall be performed and reported using the lowest and highest channels that the device supports.

For purposes of this section, the channel bandwidth is identical to the occupied bandwidth, whereas the channel edges are the outermost frequency points that define the channel bandwidth.

If the transmission is in bursts, the provisions for pulsed operation in RSS-Gen shall apply.

4.7.2 Unwanted emission limits
The following unwanted emission limits shall apply:

Any emissions outside of the 5925-7125 MHz band shall not exceed –27 dBm/MHz e.i.r.p.;
The e.i.r.p. spectral density of unwanted emissions falling into the 5925-7125 MHz band shall be attenuated below the reference power spectral density by:
20 dB at 1 MHz away from the channel edges;
28 dB at 1 channel bandwidth away from the operating channel centre;
40 dB at 1.5 times the channel bandwidth away from the operating channel centre;
a minimum of 40 dB at frequencies that are further away than 1.5 times the channel bandwidth from the operating channel centre;
a linearly interpolated value between 20 dB and 28 dB at frequencies between 1 MHz outside of channel edges and 1 channel bandwidth away from the operating channel centre, respectively; and
a linearly interpolated value between 28 dB and 40 dB at frequencies between 1 channel bandwidth away from the operating channel centre and 1.5 times the channel bandwidth away from the operating channel centre, respectively;
Notwithstanding (a) and (b) above, the provisions of RSS-Gen that relate to emissions falling into restricted frequency bands shall apply;
Any emissions below 1000 MHz shall meet the general field strength limits specified in RSS-Gen; and
Devices designed to be connected to the public utility AC power network shall comply with the limits for AC power-line conducted emissions specified in RSS-Gen.

4.2 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 ISEDC RSS-248 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.

4.3 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 = 100ms
(2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

4.4 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

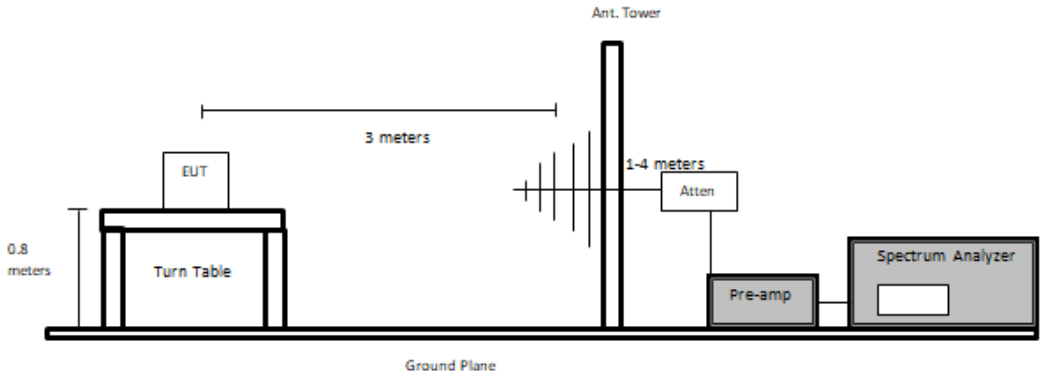
For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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 for Class A. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

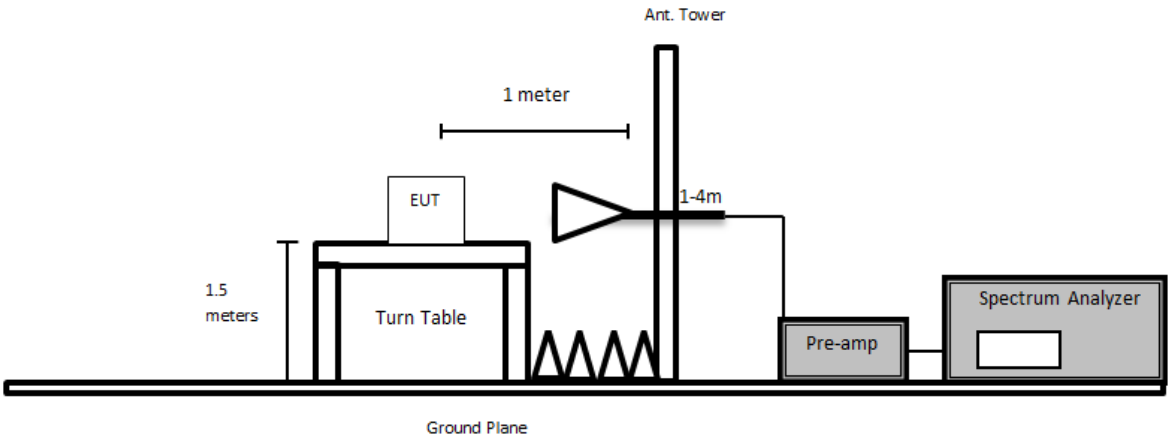
4.5 Test Setup Block Diagram

Below 1GHz:

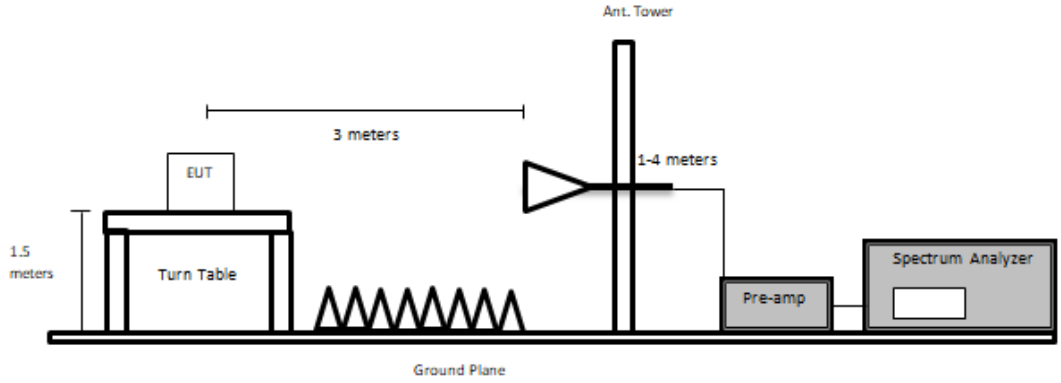


Above 1GHz:

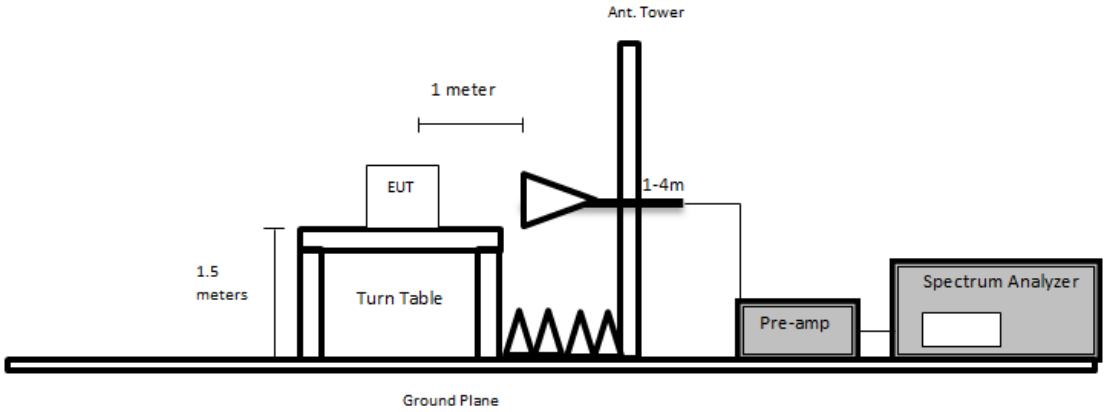
Using Asset #1192 at 1meter



Using Asset #1192 at 3meters



Using Asset #91, #92



4.6 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
655	Rhode & Schwarz	Signal Analyzer	FSQ26	200749	2022-02-07	2 years
287	Agilent	Spectrum Analyzer	E4446A	US44300386	2022-05-05	1 year
124	Rhode & Schwarz	EMI Test Receiver	ESCI 1166.5950 K03	100044	2021-05-14	2 years
-	Sunol Sciences	System Controller	SC99V	011003-1	N/R	N/A
321	Sunol Sciences	Biconilog Antenna	JB3	A020106-2	2021-11-22	2 years
1192	ETS Lindgren	Horn Antenna	3117	00218973	2022-09-29	2 years
91	Wisewave	Antenna, Horn	ARH-4223-02	10555-02	2022-03-08	2 years
92	Wisewave	Antenna, Horn	ARH-2823-02	10555-01	2022-03-17	2 years
-	-	SMA cable	-	-	Each time[1]	N/A
-	-	Notch Filter	-	-	Each time[1]	N/A
1228	Pasternack	Coaxial Cable, RG213	PE3496-800CM	2111301	2022-04-12	1 year
1295	Carlisle	10m Ultra Low Loss Coaxial Cable	UFB142A-1-3937-200200	64639890912-001	2022-10-28	6 months
827	AH Systems	Preamplifier	PAM 1840 VH	170	2022-06-21	1 year
658	Agilent	Pre-Amplifier	8449B	3008A01103	2022-07-22	1 year
459	HP	Pre Amplifier	8447D	2443A04374	2022-07-27	6 months
-	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 the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

4.7 Test Environmental Conditions

Temperature:	22-24 ºC
Relative Humidity:	40-41 %
ATM Pressure:	103.1-104.1 kPa

The testing was performed by Deepak Mishra from 2022-12-07 to 2022-12-15 in 5m chamber 3.

4.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15.407 and RSS-248 standards' radiated emissions limits, and had the worst margin of:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Configuration**
-2.22	39590.2	Horizontal	ax20 5955MHz

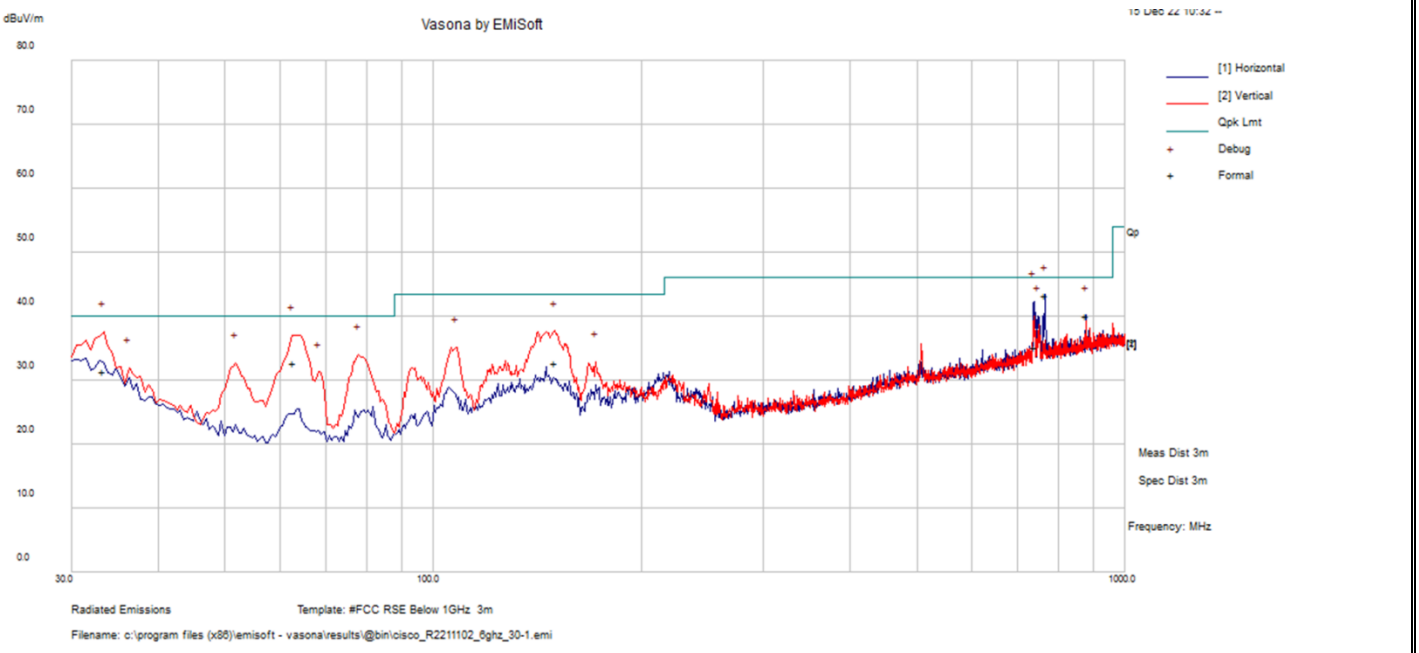
4.9 Radiated Emissions Test Result Data

Note: Pre-scan was performed in order to determine worst-case orientation of device [shown in Test Setup Photos] with respect to measurement antenna. Plots/data shown represent measurements made in worst-case orientation.

Note: For all Wifi measurements, EUT is transmitting MIMO.

1) 30 MHz – 1 GHz at 3 meters

ax20 5955



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
33.35325	34.24	-2.86	31.37	140	V	13	40	-8.63	Pass
766.1478	31.8	2.01	33.81	168	H	30	46	-12.19	Pass
62.725	46.07	-13.31	32.77	139	V	100	40	-7.23	Pass
738.678	33.58	1.61	35.19	268	H	338	46	-10.81	Pass
149.9195	41.28	-8.51	32.77	122	V	253	43.5	-10.73	Pass
878.6575	29.62	3.26	32.88	137	H	264	46	-13.12	Pass

FCC/IC Limits for 1 GHz to 40 GHz				
Applicablity	**(dBm)**	**(uV/m at 3meters)**	**(dBuV/m at 3meters)**	**(dBuV/m at 1meter)[2]**
Restricted Band Average Limit	-	500	54	64
Restricted Band Peak Limit[1]	-	-	74	84
FCC §15.407(b) & ISEDC RSS-248 §4.7 Defined Unwanted Emissions Limit	-27	-	68	78

Note[1]: Restricted Band Peak Limit is defined to be 20dB higher than Average Limit.
Note[2]: Limits at 1 meter are determined by applying a Distance correction factor accounts for extrapolation from 1 meters to 3 meters. Formula used is as follows: 20*log(3meters/1meter) = 9.54 (According to ANSI C63.10-2013 Section 9.4)
Note[3]: Where Restricted Band Peak Limit is replaced with stricter 78 dBµV/m at 1 meter, compliance is being shown for unwmated emissions per FCC §15.407(b) & ISEDC RSS-248 §4.7

2) 1-40 GHz measured at 3 meter

MIMO AX20 U-NII-5

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5955 MHz ax20											
11910	48.940	212	167	H	38.078	11.200	35.897	62.321	84	-21.679	Peak
11910	49.770	236	151	V	38.078	11.200	35.897	63.151	84	-20.849	Peak
11910	38.571	212	167	H	38.078	11.200	35.897	51.952	64	-12.048	Ave
11910	40.541	236	151	V	38.078	11.200	35.897	53.922	64	-10.078	Ave
Middle Channel 6175 MHz ax20											
12350	49.080	304	270	H	38.078	11.200	35.897	62.461	84	-21.539	Peak
12350	48.400	70	212	V	38.078	11.200	35.897	61.781	84	-22.219	Peak
12350	36.451	304	270	H	38.078	11.200	35.897	49.832	64	-14.168	Ave
12350	36.351	70	212	V	38.078	11.200	35.897	49.732	64	-14.268	Ave
High Channel 6415 MHz ax20											
12830	47.900	244	116	H	38.078	11.200	35.897	61.281	84	-22.719	Peak
12830	47.830	239	254	V	38.078	11.200	35.897	61.211	84	-22.789	Peak
12830	35.771	244	116	H	38.078	11.200	35.897	49.152	64	-14.848	Ave
12830	35.601	239	254	V	38.078	11.200	35.897	48.982	64	-15.018	Ave

MIMO AX20 U-NII-7

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 6535 MHz ax20											
13070	47.190	349	273	H	38.078	11.200	35.897	60.571	84	-23.429	Peak
13070	47.250	149	132	V	38.078	11.200	35.897	60.631	84	-23.369	Peak
13070	34.971	349	273	H	38.078	11.200	35.897	48.352	64	-15.648	Ave
13070	34.891	149	132	V	38.078	11.200	35.897	48.272	64	-15.728	Ave
Middle Channel 6715 MHz ax20											
13430	47.580	9	169	H	38.078	11.200	35.897	60.961	84	-23.039	Peak
13430	47.500	21	143	V	38.078	11.200	35.897	60.881	84	-23.119	Peak
13430	35.231	9	169	H	38.078	11.200	35.897	48.612	64	-15.388	Ave
13430	35.231	21	143	V	38.078	11.200	35.897	48.612	64	-15.388	Ave
High Channel 6855 MHz ax20											
13710	47.720	260	142	H	38.078	11.200	35.897	61.101	84	-22.899	Peak
13710	47.640	218	293	V	38.078	11.200	35.897	61.021	84	-22.979	Peak
13710	35.211	260	142	H	38.078	11.200	35.897	48.592	64	-15.408	Ave
13710	35.231	218	293	V	38.078	11.200	35.897	48.612	64	-15.388	Ave

MIMO AX160 U-NII-5

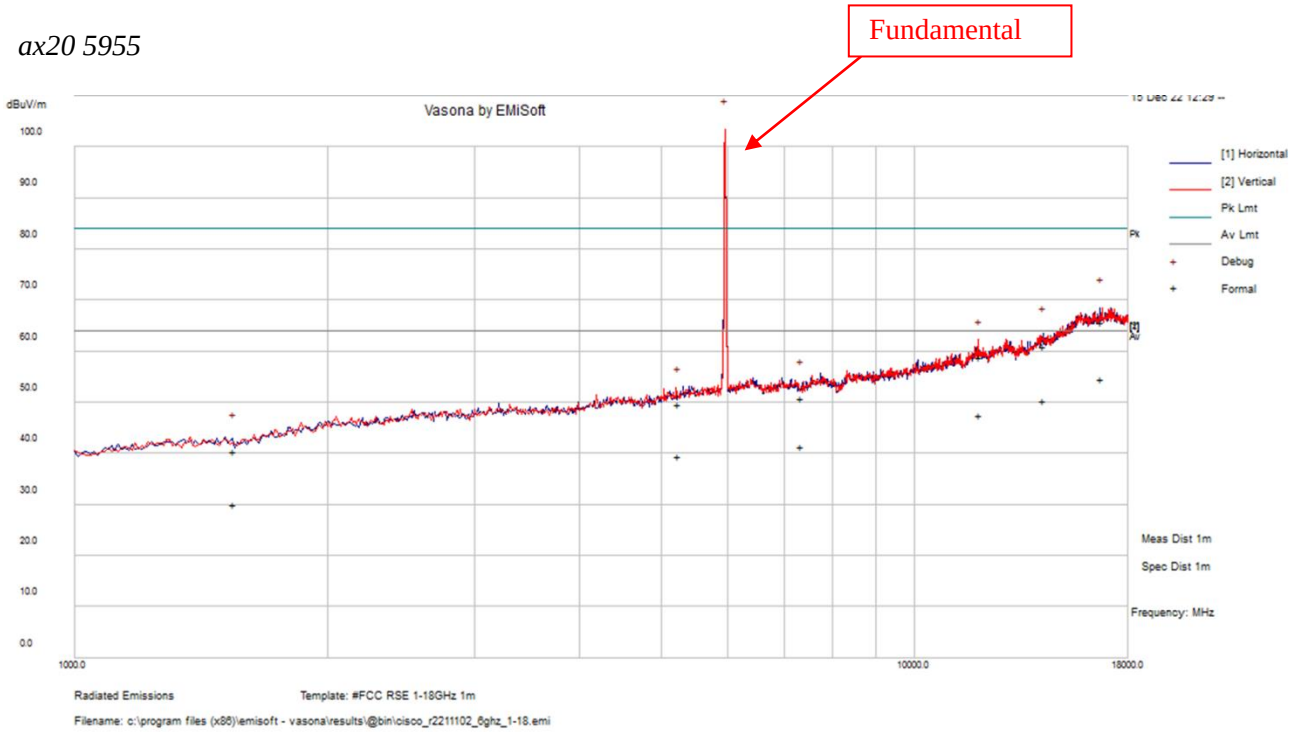
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 6025 MHz ax160											
12050	48.440	48.000	238	H	38.111	11.240	35.891	61.900	84	-22.100	Peak
12050	47.950	177.000	193	V	38.111	11.240	35.891	61.410	84	-22.590	Peak
12050	36.711	48.000	238	H	38.111	11.240	35.891	50.171	64	-13.829	Ave
12050	37.031	177.000	193	V	38.111	11.240	35.891	50.491	64	-13.509	Ave
Middle Channel 6185 MHz ax160											
12370	48.080	208.000	207	H	38.111	11.240	35.891	61.540	84	-22.460	Peak
12370	49.690	175.000	286	V	38.111	11.240	35.891	63.150	84	-20.850	Peak
12370	36.881	208.000	207	H	38.111	11.240	35.891	50.341	64	-13.659	Ave
12370	36.831	175.000	286	V	38.111	11.240	35.891	50.291	64	-13.709	Ave
High Channel 6345 MHz ax160											
12690	47.660	147.000	212	H	38.111	11.240	35.891	61.120	84	-22.880	Peak
12690	49.010	178.000	154	V	38.111	11.240	35.891	62.470	84	-21.530	Peak
12690	36.151	147.000	212	H	38.111	11.240	35.891	49.611	64	-14.389	Ave
12690	36.171	178.000	154	V	38.111	11.240	35.891	49.631	64	-14.369	Ave

MIMO AX160 U-NII-7

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)	
6665 MHz ax160											
13330	47.580	9	169	H	38.078	11.200	35.897	60.961	84	-23.039	Peak
13330	47.500	21	143	V	38.078	11.200	35.897	60.881	84	-23.119	Peak
13330	35.231	9	169	H	38.078	11.200	35.897	48.612	64	-15.388	Ave
13330	35.231	21	143	V	38.078	11.200	35.897	48.612	64	-15.388	Ave

3) 1 GHz – 18 GHz Worst Case Scan at 1 Meter

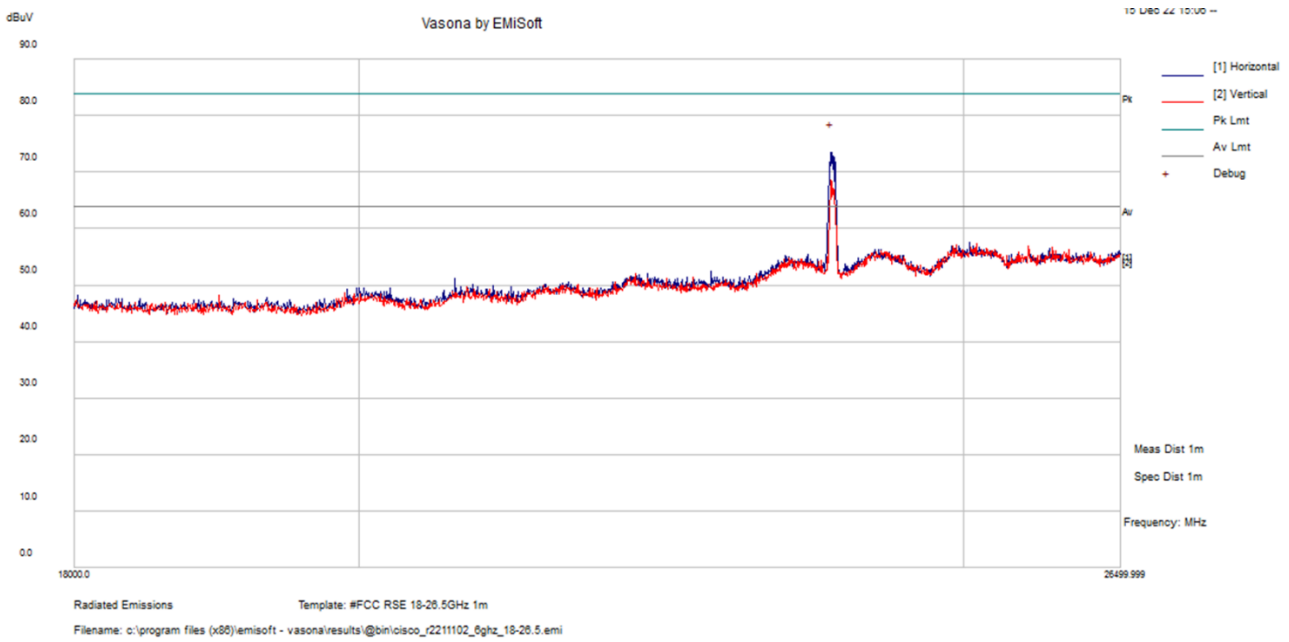
ax20 5955



Frequency (MHz)	S.A. Reading (dBµV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
16744.86	47.21	18.37	65.58	241	V	252	84	-18.42	Pass
14262.645	45.91	14.97	60.88	246	H	43	84	-23.12	Pass
11975.246	46.53	12.33	58.86	188	H	63	84	-25.14	Pass
7336.7055	43.73	7.1	50.83	241	H	278	84	-33.17	Pass
5239.794	45.3	4.41	49.7	130	H	109	84	-34.3	Pass
1547.094	48.53	-8.11	40.42	116	H	276	84	-43.58	Pass
16744.86	36.13	18.37	54.51	241	V	252	64	-9.49	Pass
14262.65	35.3	14.97	50.27	246	H	43	64	-13.73	Pass
11975.25	35.28	12.33	47.61	188	H	63	64	-16.39	Pass
7336.706	34.18	7.1	41.28	241	H	278	64	-22.72	Pass
5239.794	34.97	4.41	39.38	130	H	109	64	-24.62	Pass
1547.094	38.12	-8.11	30.01	116	H	276	64	-33.99	Pass

4) 18 GHz – 26.5 GHz Worst Case Scan at 1 Meter

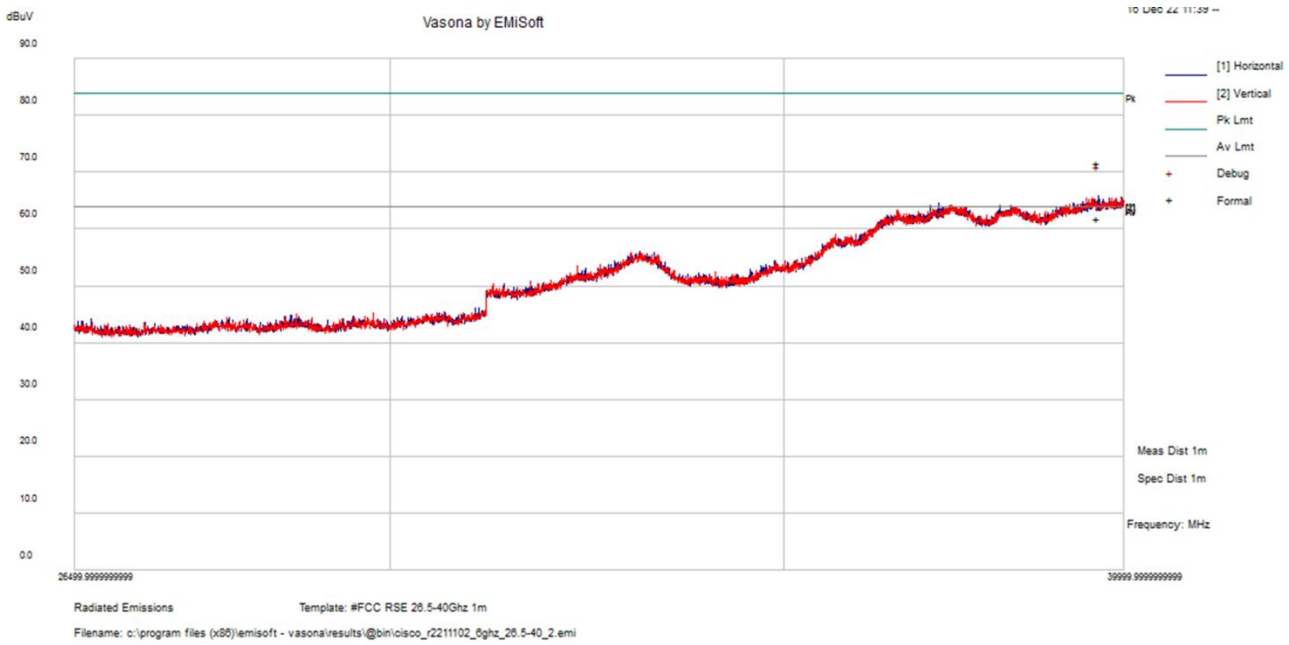
ax20 5955



Frequency (MHz)	S.A. Reading (dBµV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
23809.9	58.41	17.38	75.78	109	H	20	84	-8.22	Pass
23809.9	42.9	17.38	60.28	109	H	20	64	-3.72	Pass

5) 26.5 GHz – 40 GHz Worst Case Scan at 1 Meter

ax20 5955



Frequency (MHz)	S.A. Reading (dBµV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
39590.2	50.91	20.77	71.68	266	H	318	84	-12.32	Pass
39590.2	41.01	20.77	61.78	266	H	318	64	-2.22	Pass

5 Annex B (Normative) – EUT External Photographs

Please refer to annex.

6 Annex C (Normative) – EUT Internal Photographs

Please refer to annex.

7 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 21st day of December 2022.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2024

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 ---