FCC PART 15 SUBPART B

CLASS A TEST REPORT

For

Verizon Smart Communities LLC

397 W Trimble Rd,
San Jose, CA 95131, USA

FCC ID: 2BCKAS80-0001230523

Report Type: Original Report	**Product Type:** IoT Smart Lighting Control Device
Prepared By	Kevin Nguyen Test Engineer
Report Number	R2307141
Report Date	2023-08-22
Reviewed By	Giriraj Gurjar EMC Department Lead
Bay Area Compliance Laboratories Corp. 1274 Anvilwood Ave Sunnyvale, CA 94089, USA Tel: (408) 732-9162, Fax: (408) 732 9164	

ACCREDITED
CERTIFICATE #3297.02

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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ATTESTATION OF TEST RESULTS

Date of Issue: 2023-08-22 Attestation Number: R2307141

Bay Area Compliance Laboratories Corp. (BACL) hereby declares that testing has been completed and is compliant for the product and standards below:

Product Name / Description:	IoT Smart Lighting Control Device
Model:	LSN
Manufactured by:	Verizon Smart Communities LLC
Project Number:	R2307141

Standard	**Test Result**
FCC PART 15 SUBPART B	Pass

BACL tested the above equipment in accordance with the requirement with the above Standards. The results were being documented in Test Report #R2307141 listed in above table apply only to the tested sample under the condition and modes of operation as described herein.

Attestation by: Giriraj Gurjar
EMC Department Lead

Signature Date: 2023-08-22

This document issued by Bay Area Compliance Laboratories Corp., ("BACL" or "Company"), is subject to its general conditions of service printed on the quotation, purchase order acknowledgement, or on the Product Certification Agreement and is available on request. We hereby notify you that those aforementioned documents contain details on the limitations of the liability, indemnification and jurisdiction issues defined therein. Anyone possessing this document is advised that information contained herein reflects the Company's results or findings at the conclusion of testing or services rendered only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of a duly authorized representative of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. The results, opinions or attestations shown in this document refer only to the sample(s) tested.

CI024-A

Document Revision History

Revision Number	Report Number	Description of Revision	Date
0	R2307141	Original Report	2023-08-22

1 General Information

1.1 General Statements

Bay Area Compliance Laboratory Corp. [BACL] hereby makes the following Statements:

- The Unit(s) described in this Test Report were received at BACL's facilities on 21 July 2023. Testing was performed on the Unit(s) described in this Test Report on 28 July 2023.
- The Test Results reported herein apply only to the Unit(s) actually tested, and to substantially identical Units.
- This Test Report must not be used to claim product endorsement by A2LA, or any agency of the U.S. Government, or by any other foreign government.
- This Test Report is the property of BACL, and shall not be reproduced, except in full, without prior written approval of BACL.

1.2 Purpose

This report was prepared on behalf of *Verizon Smart Communities LLC* and their product *IoT Smart Lighting Control Device*, FCC ID: 2BCKAS80-0001230523 in accordance with FCC Part 15B, Information Technology Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurements.

THE DATA CONTAINED IN THIS TEST REPORT WAS COLLECTED AND COMPILED BY:

Kevin Nguyen
[Test Engineer]

Xinhao Jiang
[Test Engineer]

1.3 Agent for the Responsible Party

Benchmark

1.4 Responsible Party

Company Name:	Verizon Smart Communities LLC
Contact:	License Manager
Street Address:	5055 North Point Pkwy
City/State/Zip:	Alpharetta, GA 30022
Country:	USA
Telephone:	+1 (770) 797-1070
Email:	licensingcompliance@verizonwireless.com
Web:	www.verizon.com

1.5 Product Description of the Equipment under Test (EUT)

The "EUT" (Equipment under Test) was a IoT Smart Lighting Control Device, Model: LSN. The highest frequency used and/or generated was 1.7 GHz.

1.6 Mechanical Description of the EUT

Dimensions: approximately 9.8 cm (L) x 9.8 cm (W) x 18.0 cm (H)
Weight: approximately 0.95 kg
Serial Number: 2326QK0062044
EUT Photos: See Annex A of this Test Report.

1.7 EUT Input Power

The EUT was connected to 120-277V, 60Hz AC power source.

1.8 Related Submittal(s)/Grant(s)

No related submittals.

1.9 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-0403.

1.10 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;

1.11 Measurement Uncertainties

All measurements involve uncertainties. In the case of EMC Emissions tests, the influence quantities (factors) that make a significant contribution to the measurement uncertainties for most types of Emissions measurements are detailed in the latest version of CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Measurement instrumentation uncertainty" (i.e., in CISPR 16-4-2:2011-06 + C1:2013-04 +A1:2014-02).

Based on the uncertainty models given in the latest version of CISPR 16-4-2, and, based on the calibration uncertainties of the specific instruments and facilities used at BACL to perform the measurements documented in this Test Report, the following estimates have been made of BACL's Measurement Uncertainties for the measurements documented in this Test Report.

(Note: the phrase "Typical U_{LAB} values" means that the U_{LAB} values presented are the Expanded Measurement Uncertainty values that resulted from the use of the ordinary test processes that are employed on a daily basis in our Test Laboratory. Note that he smaller the value of Expanded Measurement Uncertainty, the better (i.e., the "less uncertain") the measurement is.

Type of Measurement: **ANSI C63.4-2014 Conducted Emissions (on the BACL Ground Plane Test Site)** **Note: Measurements made using a n R&S ESCI EMI Receiver**	**BACL Typical U_{LAB} Value** **(for a k=2 Coverage Factor, equivalent to ~ 95% level of confidence)**	**U_{CISPR} Value** **worst-allowable values of the latest version of CISPR 16-4-2 (for a k=2 Coverage Factor, equivalent to ~ 95% level of confidence)**
Conducted Disturbance (Mains Port) **150 kHz to 30 MHz (i.e., AC/DC Line Conducted Emissions measurements made with a Fischer FCC-LISN-50-25-2-10 LISN)**	**2.26 dB**	**3.44 dB**

Type of Measurement: **ANSI C63.4-2014 Radiated Emissions (in the BACL 10 m - 1 SAC)** **Note: Measurements up to 1 GHz made using an R&S ESCI EMI Receiver; Measurements from 1 GHz to 40 GHz made using an Agilent E444xA Series analyzer**	**BACL Typical U_{LAB} Value** **(for a k=2 Coverage Factor, equivalent to ~ 95% level of confidence)**	**U_{CISPR} Value** **worst-allowable values of the latest version of CISPR 16-4-2 (for a k=2 Coverage Factor, equivalent to ~ 95% level of confidence)**
Radiated Electric Field Disturbance **– Horizontal Polarization, 30 MHz – 200 MHz (i.e., Radiated Emissions measured at 10 metres distance)**	**4.21 dB**	**5.05 dB**
Radiated Electric Field Disturbance **– Vertical Polarization, 30 MHz – 200 MHz (i.e., Radiated Emissions measured at 10 metres distance)**	**4.07 dB**	**5.03 dB**
Radiated Electric Field Disturbance **– Horizontal Polarization, 200 MHz – 1000 MHz (i.e., Radiated Emissions at 10 metres distance)**	**4.17 dB**	**5.21 dB**
Radiated Electric Field Disturbance **– Vertical Polarization, 200 MHz – 1000 MHz (i.e., Radiated Emissions measured at 10 metres distance)**	**4.46 dB**	**5.22 dB**
Radiated Electric Field Disturbance **Horizontal & Vertical Polarizations, 1 GHz – 6 GHz (i.e., Radiated Emissions measured at 3 metres distance)**	**4.62 dB (With Boresighting)**	**U_{CISPR} Value is Not Specified**
Radiated Electric Field Disturbance **Horizontal & Vertical Polarizations, 6 GHz – 18 GHz (i.e., Radiated Emissions measured at 3 metres distance)**	**4.67 dB (With Boresighting)**	**U_{CISPR} Value is Not Specified**

2 EUT Test Configuration

2.1 Justification

The EUT was configured for testing in accordance with requirements of the ANSI C63.4-2014.

2.2 EUT Exercising Software

There was no excersing software used during testing.

2.3 BACL EMI Measurement Software

The software used was EMISoft-Vasona 6.0 for EMI testing.

2.4 Equipment Modifications

No equipment modifications were made to the equipment during testing.

2.5 Special Equipment

No special equipment was used during testing.

2.6 EUT Mode of Operation

The EUT was tested on normal operating mode.

2.7 Method of Monitoring

The EUT was monitored visually through a blinking green LED. The EUT worked as intended as long as it didn’t lose power.

2.8 Local Support Equipment

None

2.9 Remote Support Equipment

None

2.10 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
Quectel	4G LTE radio	BG95-M6	-

2.11 External I/O Cabling List and Details

Cable Description	Length (m)	From	To
Power Cable	1.5	EUT	AC Power Source

2.12 EUT Power Supply List and Details

None

3 Summary of Test Results

Standards	Test Description	Result
FCC §15.107 (b)	Conducted Emissions	Compliant with Class A Limits
FCC §15.109 (b)	Radiated Emissions	Compliant with Class A Limits

4 FCC §15.107 – Conducted Emissions

4.1 Applicable Standards

As per FCC §15.107: Conducted Emission Limits

(b) For a Class A digital device 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 50µH/50 ohms 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 frequency ranges.

Limits for conducted disturbance at the mains ports of class A ITE

Frequency Range MHz	Limits dB(µV)	
	Quasi-peak	Average
0.15 to 0.50	79	66
0.50 to 30	73	60
NOTE: *The lower limit shall apply at the transition frequency.*		

4.2 EUT Setup

The conducted emissions tests were performed on the Ground Plane Test Site, using a test setup in accordance with ANSI 63.4-2014 measurement procedures. The specifications used were in accordance with FCC 15B and ICES-003 Class A limits.

The spacing between the peripherals (if any) was 10 cm.

The external I/O cables (if any) were draped along the test table and bundled as required.

The EUT was connected (via LISN) to an EMI-filtered AC power source.

4.3 Test Procedure

During the conducted emissions test, the power cord of the EUT was connected to the LISN.

The bandwidth on the receving device was set to as follows:

Below 1000 MHz, the Resolution Bandwidth was set to 120 kHz and the Video Bandwidth was set to 300 kHz for each sweep. The receiver automatically sets to these values.

4.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) values listed in the following data tables were calculated by adding the LISN Insertion Loss (LL) to the Cable Loss (CL) to the High Pass Filter and Impulse Limiter Loss (HPLA) to the "raw" measured Amplitude (Am) reading. The basic equation is as follows:

CA = Am + LL + CL + HPIL

The Corrected Amplitude (CA) is calculated by adding the Total Loss to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + Total Loss

For example, a corrected amplitude of 46 dBµV = Indicated Reading (32.5 dBµV) + Total Loss (13.5 dB)

The Cable Loss, Attenuation (High-pass Filters, Impulse Limiters, Attenuators, etc.), and LISN calibration factors are referred to as Total Loss in the equation above and tabular data below. The basic equation is as follows:

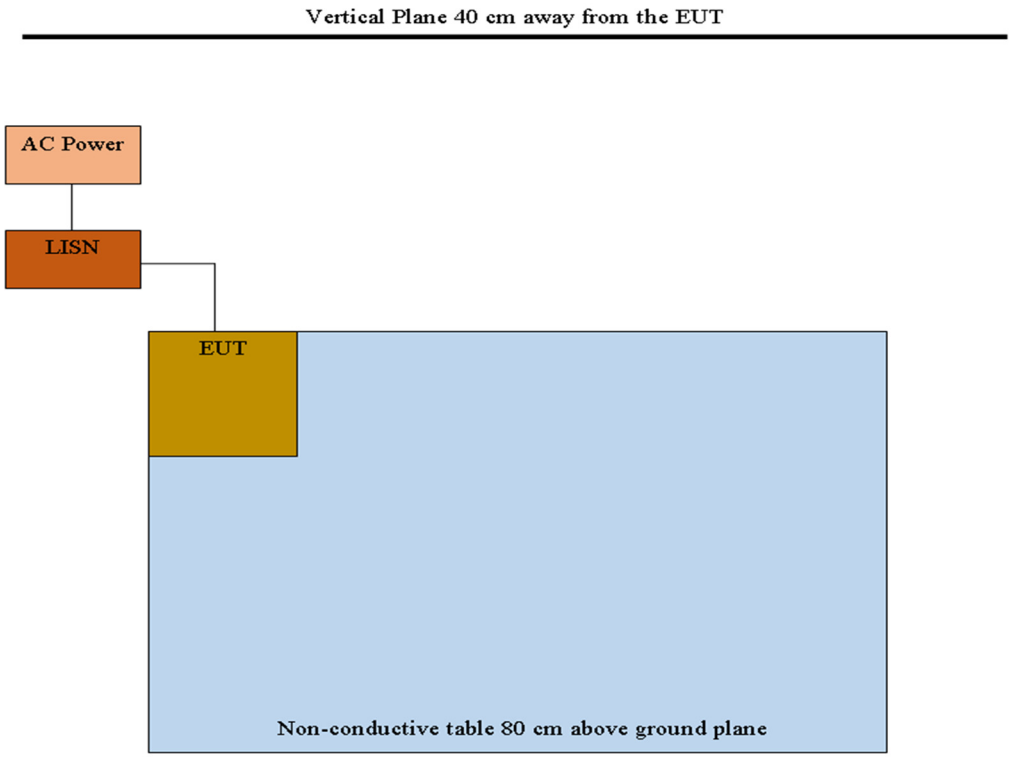
Total Loss (dB) = Cable Loss (dB) + Attenuation (dB) + LISN Factor (dB)

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 at the measured frequency. The equation for margin calculation is as follows:

Margin (dB) = Corrected Amplitude (dBµV) – Limit (dBµV)

4.5 Test Setup Block Diagram

AC Line



4.6 Test Equipment List and Details

BACL #	Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
00310	Rhode & Schwarz	EMI Test Receiver	ESCI 1166.5950.03	100338	2023-05-11	2024-05-11
00680	Rohde & Schwarz	Impulse Limiter	ESH3-Z2	101964	2023-06-20	2023-12-20
00724	Solar Electronics Company	High Pass Filter	Type 7930-100	7930150202	2023-06-28	2023-12-28
00732	FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160129	2022-09-01	2023-09-01
01226	Fairview Microwave	Coaxial Cable	PE3C2220-1250CM	2109241	2023-06-28	2023-12-28
00348	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 the latest version of A2LA Policy P102 "A2LA Policy on Metrological Traceability".

4.7 Environmental Conditions

Testing Date:	2023-07-28
Testing Site:	Ground Plane Test Site
Temperature:	23.1 ºC
Relative Humidity:	52.9 %
ATM Pressure:	101.8 kPa
Testing Personnel:	Kevin Nguyen

4.8 Summary of Test Results

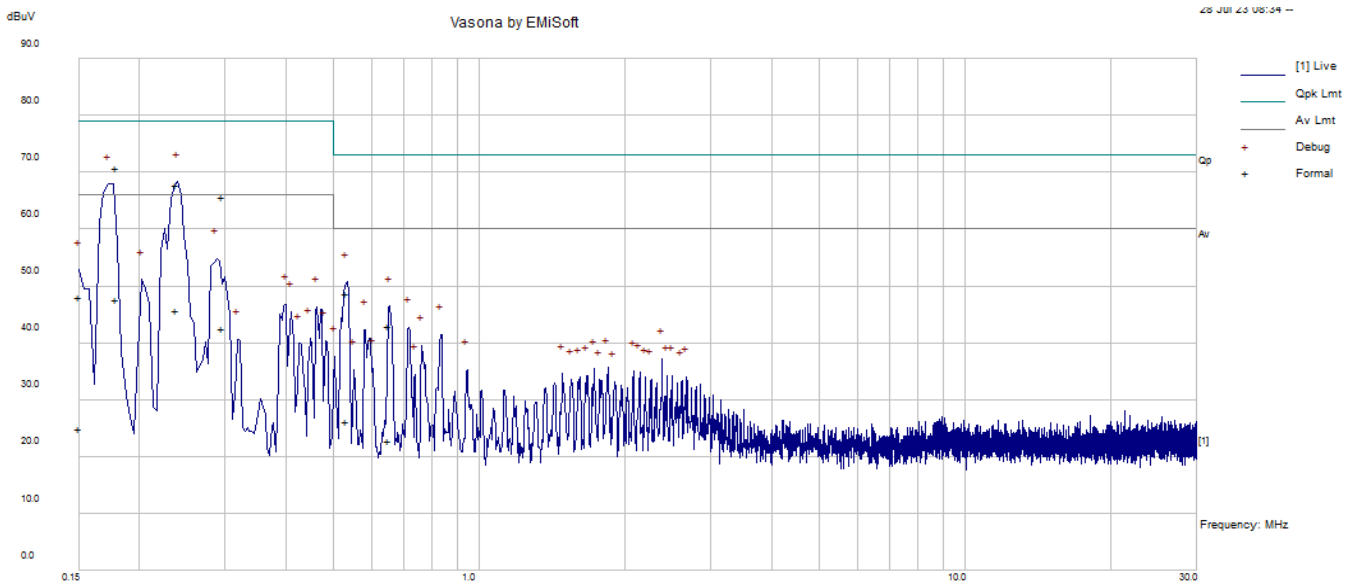
According to the recorded data, the EUT complied with FCC §15.107 Class A limits, and had the worst margin reading of:

Worst Case: AC Line: 120V/60Hz						
Conductor (Hot/Neutral)	**Quasi- Peak Frequency (MHz)**	**Highest Quasi-Peak Corrected Amplitude (dBµV)**	**Worst-Case Quasi-Peak Margin (dB)**	**Average Frequency (MHz)**	**Highest Average Corrected Amplitude (dBµV)**	**Worst-Case Average Margin (dB)**
Hot	0.178671	70.71	-8.29	0.178671	47.65	-18.35
Neutral	0.17811	70.42	-8.58	0.17811	47.28	-18.72

Worst Case: AC Line: 240V/60Hz						
Conductor (Hot/Neutral)	**Quasi- Peak Frequency (MHz)**	**Highest Quasi-Peak Corrected Amplitude (dBµV)**	**Worst-Case Quasi-Peak Margin (dB)**	**Average Frequency (MHz)**	**Highest Average Corrected Amplitude (dBµV)**	**Worst-Case Average Margin (dB)**
Hot	0.237907	65.65	-13.35	0.237907	47.36	-18.64
Neutral	0.236347	64.67	-14.33	0.236347	46.95	-19.05

4.9 Conducted Emissions Test Plots and Data

AC Line: 120V/60Hz – Hot Conductor



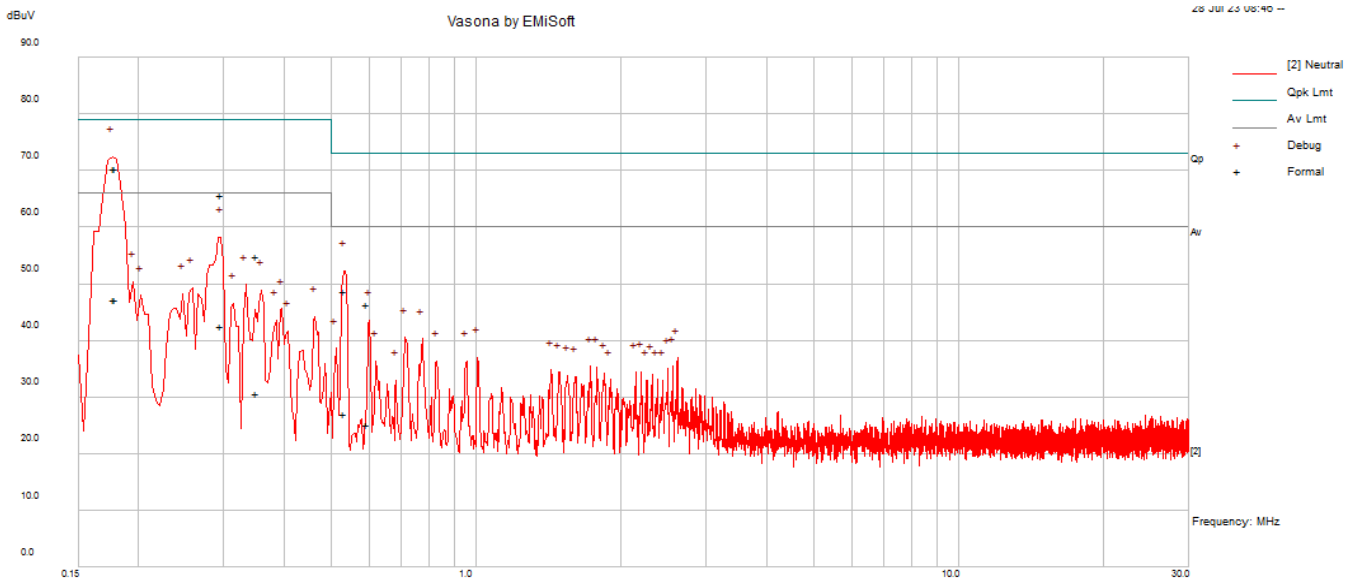
Quasi-Peak Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
0.178671	10.98	70.71	Hot	79	-8.29
0.23871	10.96	67.82	Hot	79	-11.18
0.296904	10.92	65.81	Hot	79	-13.19
0.534147	10.56	48.72	Hot	73	-24.28
0.652817	10.41	42.91	Hot	73	-30.09
0.150106	10.99	48.15	Hot	79	-30.85

Average Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
0.178671	10.98	47.65	Hot	66	-18.35
0.23871	10.96	45.63	Hot	66	-20.37
0.296904	10.92	42.53	Hot	66	-23.47
0.534147	10.56	26.1	Hot	60	-33.9
0.652817	10.41	22.87	Hot	60	-37.13
0.150106	10.99	24.9	Hot	66	-41.1

AC Line: 120V/60Hz – Neutral Conductor



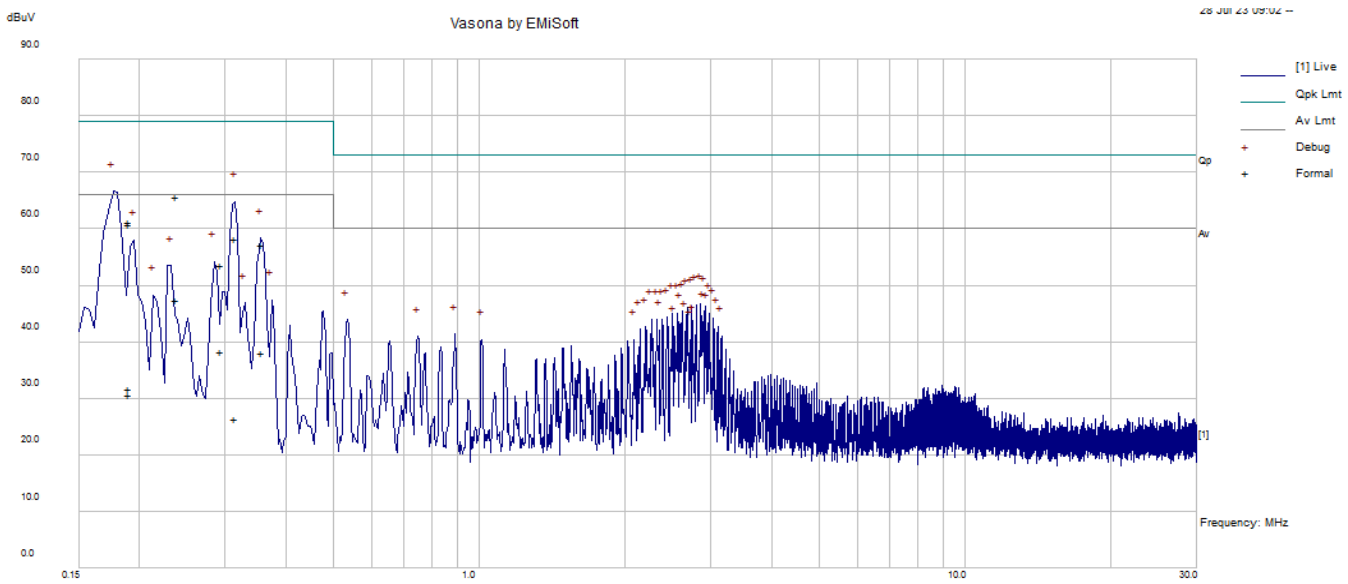
Quasi-Peak Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
0.17811	10.98	70.42	Neutral	79	-8.58
0.179091	10.98	70.33	Neutral	79	-8.67
0.297167	10.92	65.65	Neutral	79	-13.35
0.350664	10.84	54.96	Neutral	79	-24.04
0.534957	10.55	48.71	Neutral	73	-24.29
0.594096	10.48	46.3	Neutral	73	-26.7

Average Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
0.17811	10.98	47.28	Neutral	66	-18.72
0.179091	10.98	47.21	Neutral	66	-18.79
0.297167	10.92	42.49	Neutral	66	-23.51
0.534957	10.55	26.93	Neutral	60	-33.07
0.594096	10.48	25.2	Neutral	60	-34.8
0.350664	10.84	30.61	Neutral	66	-35.39

AC Line: 240V/60Hz – Hot Conductor



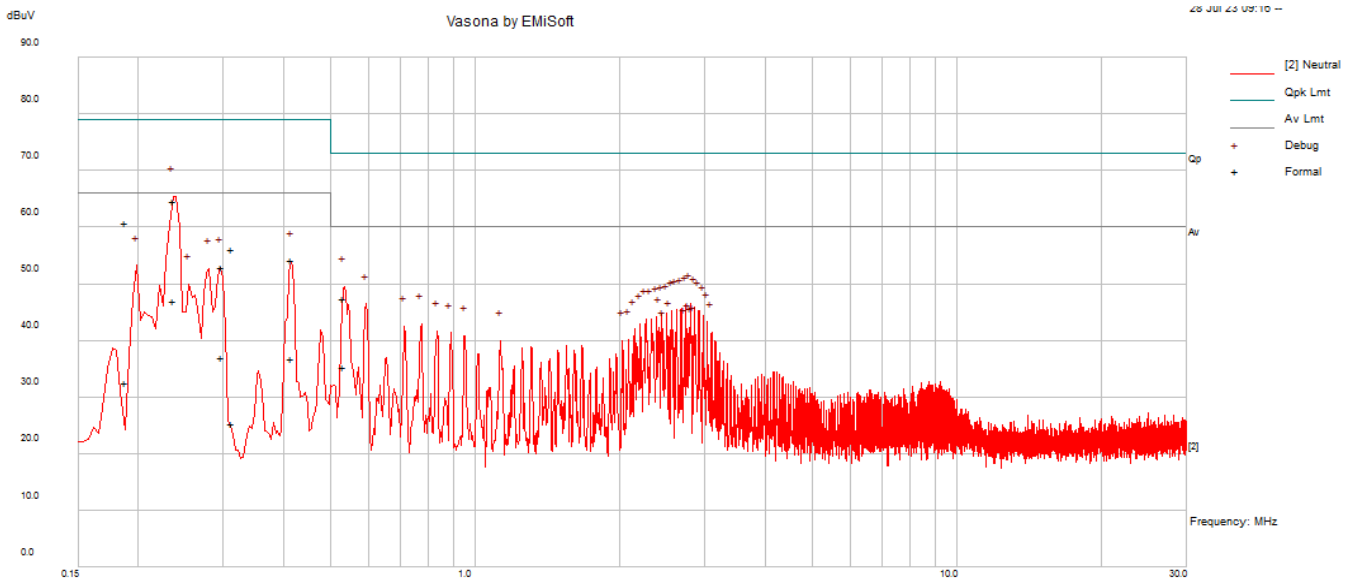
Quasi-Peak Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
0.237907	10.96	65.65	Hot	79	-13.35
0.190071	10.99	61.32	Hot	79	-17.68
0.190674	10.99	60.89	Hot	79	-18.11
0.3155	10.88	58.33	Hot	79	-20.67
0.357141	10.82	57.22	Hot	79	-21.78
0.294558	10.92	53.65	Hot	79	-25.35

Average Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
0.237907	10.96	47.36	Hot	66	-18.64
0.294558	10.92	38.3	Hot	66	-27.7
0.357141	10.82	38.09	Hot	66	-27.91
0.190071	10.99	31.65	Hot	66	-34.35
0.190674	10.99	30.53	Hot	66	-35.47
0.3155	10.88	26.35	Hot	66	-39.65

AC Line: 240V/60Hz – Neutral Conductor



Quasi-Peak Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
0.236347	10.96	64.67	Neutral	79	-14.33
0.188142	10.99	60.81	Neutral	79	-18.19
0.312197	10.89	56.11	Neutral	79	-22.89
0.416575	10.73	54.32	Neutral	79	-24.68
0.534687	10.55	47.39	Neutral	73	-25.61
0.297811	10.92	52.9	Neutral	79	-26.1

Average Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
0.236347	10.96	46.95	Neutral	66	-19.05
0.534687	10.55	35.28	Neutral	60	-24.72
0.297811	10.92	36.98	Neutral	66	-29.02
0.416575	10.73	36.83	Neutral	66	-29.17
0.188142	10.99	32.53	Neutral	66	-33.47
0.312197	10.89	25.38	Neutral	66	-40.62

5 FCC §15.109 – Radiated Emissions

5.1 Applicable Standards

As per FCC §15.109: Radiated Emission Limits

(b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

Frequency of Emission (MHz)	Field Strength (µV/m)
30 MHz to 88 MHz	90
88 MHz - 216 MHz	150
216 MHz - 960 MHz	210
Above 960 MHz	300

(g) As an alternative to the radiated emission limits shown in paragraphs (a) and (b) of this section, digital devices may be shown to comply with the standards contained in Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22: "Information Technology Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurement."

NOTE 1: The lower limit shall apply at the transition frequency.
NOTE 2: Additional provisions may be required for cases where interference occurs.

5.2 EUT Setup

The radiated emissions tests were performed in the 10-meter test chamber, using the setup in accordance with ANSI C63.4 measurement procedures. The specifications used were in accordance with FCC 15B and ICES-003 Class A limits.

If applicable, the spacing between the peripherals was 10 cm.

If applicable, the external I/O cables were draped along the test table and bundled as required.

The EUT was connected to an EMI-filtered AC power source.

5.3 Test Procedure

Maximization procedure was performed on the six (6) highest emissions readings to ensure the EUT is compliant with all installation combinations.

All data was recorded in the Quasi-Peak detection mode for below 1 GHz and Max Peak and Average detection mode for above 1 GHz.

The bandwidth on the receving device was set to as follows:

Below 1000 MHz, the Resolution Bandwidth was set to 120 kHz and the Video Bandwidth was set to 300 kHz for each sweep. The receiver automatically sets to these values.

Above 1000 MHz, the Resolution Bandwidth was set to 1 MHz and the Video Bandwidth was set to 3 MHz for the Max Peak. The Resolution Bandwidth was set to 1 MHz and the Video Bandwidth was set to 10 Hz for the Video Bandwidth. The receiver automatically sets to these values.

5.4 Corrected Amplitude and Margin Calculations

The Corrected Amplitude (CA) is calculated by adding the Correction Factor to the indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + Correction Factor

For example, the Corrected Amplitude (CA) of 40.3 dBµV/m = indicated Amplitude reading (Ai) 32.5 dBµV + 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). The calculation is done by the testing software, and the value is reported in the tabular results below. The basic equation is as follow,

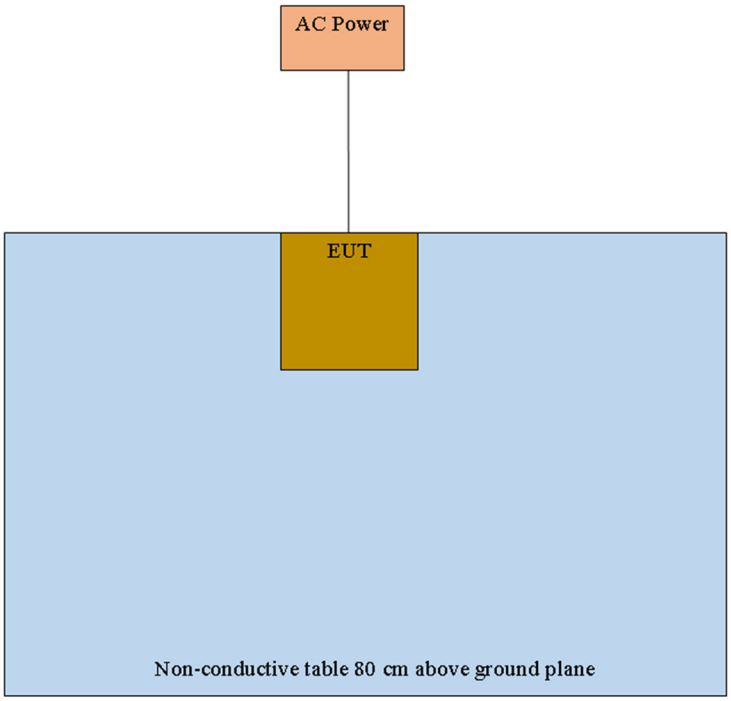
Correction Factor = AF + CL + Atten – Ga

For example, the Correction Factor of 7.8 dB/m = Antenna Factor (AF) 23.5 dB/m + Cable Loss (CL) 3.7 dB + Attenuator (Atten) 10 dB - Amplifier Gain (Ga) 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 at the measured frequency. The equation for margin calculation is as follows:

Margin (dB) = Corrected Amplitude (dBµV/m) - Limit (dBµV/m)

5.5 Test Setup Block Diagram



5.6 Test Equipment List and Details

BACL Asset #	Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
00310	Rhode & Schwarz	EMI Test Receiver	ESCI 1166.5950.03	100338	2023-05-11	2024-05-11
00311	Sunol Sciences	Controller, System	SC104V	113005-1	Calibration not Required	Calibration not Required
00445	SONOMA INSTRUMENT	Amplifier	315	303125	2022-07-29	2023-07-29
00714	Keysight Technologies	RF Limiter	11867A	MY42242932	2023-04-20	2024-04-20
00307	Sunol Sciences	Antenna, BiConiLog	JB3	A020106-2	2022-03-21	2024-03-21
01346	RFMW	2.92mm 10ft RF cable	KMSE-160SAW-240.0-KSME	-	2023-06-23	2023-12-23
01359	Pasternack	N 600in RF Cable	PE3496LF-600	NA	2023-07-25	2024-01-25
01297	Pasternack	10m1 Chamber cables	PE 360-12	1809042	2023-07-25	2024-01-25
01200	Pasternack	Chamber cables	LMR 400 Coaxial Cable	1809041	2023-03-28	2023-09-28
00624	Agilent	Spectrum Analyzer	E4446A	MY48250238	2023-05-12	2024-05-12
00187	ETS Lindgren	Antenna, Horn	DRG-118/A	1132	2022-03-17	2024-03-17
00105	HP	Pre-Amplifier	8449B	3008A01978	2023-05-10	2023-11-10
00344	Behlman	Generator, Variable Voltage	BL12000C-1	6867	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 the latest version of A2LA Policy P102 "A2LA Policy on Metrological Traceability".

5.7 Environmental Conditions

Testing Date:	2023-07-28
Testing Site:	Ground Plane Test Site
Temperature:	23.1 ºC
Relative Humidity:	52.9 %
ATM Pressure:	101.8 kPa
Testing Personnel:	Xinhao Jiang

5.9 Summary of Test Results

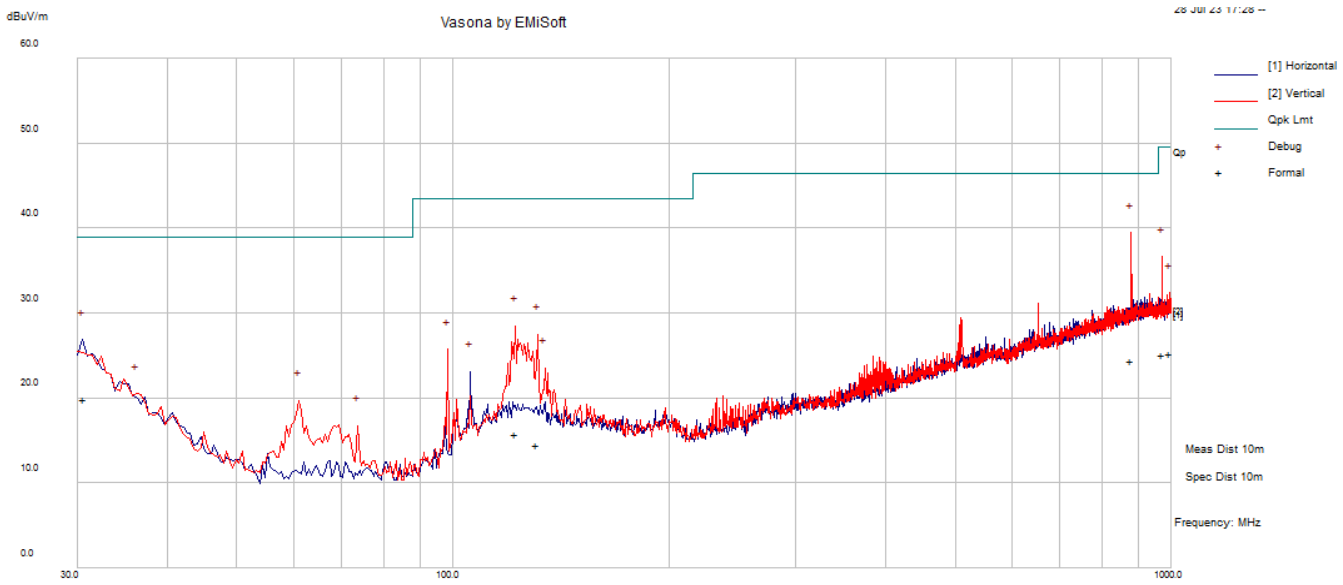
According to the recorded data, the EUT complied with FCC §15.109 Class A limits, and had the worst margin reading of:

FCC 15B & ICES-003 Radiated Emissions Worst Case (30 MHz to 1000 MHz)			
Frequency (MHz)	**Highest Quasi-Peak Corrected Amplitude (dBµV/m)**	**Polarization (Horizontal / Vertical)**	**Quasi-Peak Margin (dB)**
30.69975	19.84	Horizontal	-19.16

FCC 15B & ICES-003 Radiated Emissions Worst Case (1 GHz to 18 GHz)			
Frequency (MHz)	**Highest Peak Corrected Amplitude (dBµV/m)**	**Polarization (Horizontal / Vertical)**	**Peak Margin (dB)**
17506.276	68.4	Horizontal	-21.1
Frequency (MHz)	**Highest Average Corrected Amplitude (dBµV/m)**	**Polarization (Horizontal / Vertical)**	**Average Margin (dB)**
17506.276	57.88	Horizontal	-11.62

5.10 Radiated Emissions Test Plot and Data

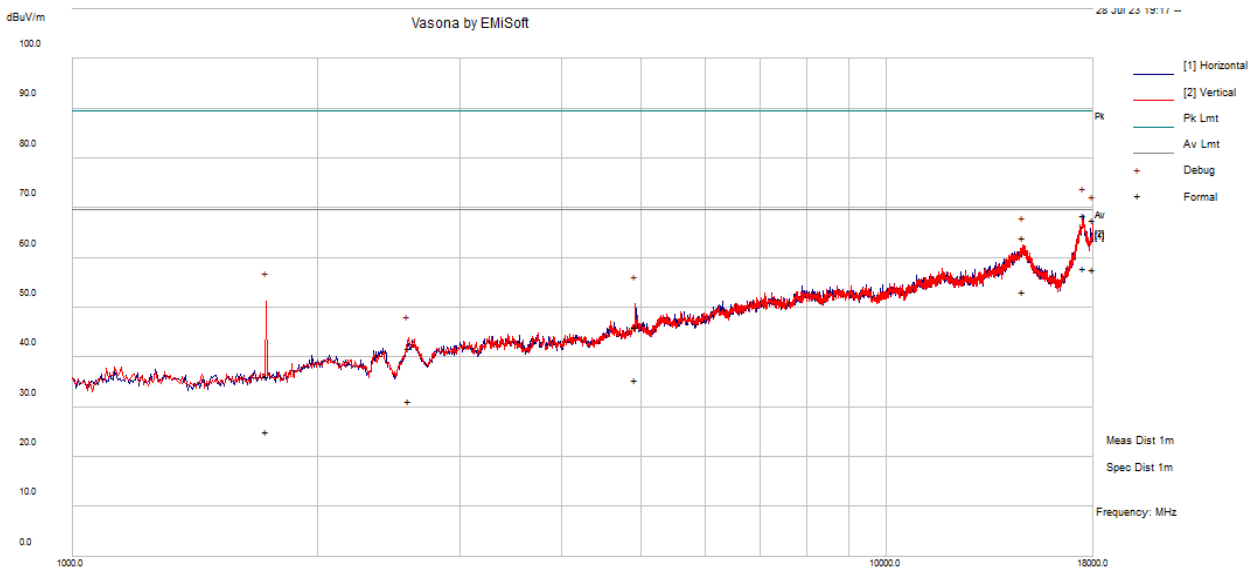
30 MHz to 1000 MHz Measured at 10m distance



Quasi-Peak Measurements

Frequency (MHz)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Antenna Height (cm)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
30.69975	-10.77	19.84	H	138	361	39	-19.16
879.50975	-2.54	24.45	V	386	46	46.4	-21.95
994.4885	-0.73	25.3	V	306	349	49.5	-24.2
970.3955	-1.09	25.12	V	190	36	49.5	-24.38
122.12325	-15.65	15.69	V	236	362	43.5	-27.81
131.15575	-15.84	14.49	V	199	204	43.5	-29.01

1 GHz to 18 GHz Measured at 1m distance



Peak Measurements

Frequency (MHz)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Antenna Height (cm)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
17506.276	26.3	68.4	H	104	77	89.5	-21.1
17993.726	25.05	67.52	H	152	85	89.5	-21.98
14757.788	20.51	64.04	V	183	0	89.5	-25.46
4920.3025	3.39	46.16	V	162	169	89.5	-43.34
2590.1075	-3.07	41.73	V	176	197	89.5	-47.77
1731.5125	-8.29	36.26	V	176	39	89.5	-53.24

Average Measurements

Frequency (MHz)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Antenna Height (cm)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
17506.276	26.3	57.88	H	104	77	69.5	-11.62
17993.726	25.05	57.55	H	152	85	69.5	-11.95
14757.788	20.51	53.07	V	183	0	69.5	-16.43
4920.3025	3.39	35.51	V	162	169	69.5	-33.99
2590.1075	-3.07	31.18	V	176	197	69.5	-38.32
1731.5125	-8.29	25.03	V	176	39	69.5	-44.47

6 Annex A (Normative) – EUT External Photographs

Please refer to the attachment.

7 Annex B (Normative) – EUT Internal Photographs

Please refer to the attachment.

8 Annex C (Normative) – Labeling Information

8.1 FCC Labeling Information

As per FCC §15.19: Labelling Requirements Paragraph 3

(3) All other devices shall bear the following statement in a conspicuous location on the device:

Trade Name
Model Number

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Specifications: Text is white in color and is left justified. Labels are printed in indelible ink on permanent adhesive backing or silk-screened and shall be affixed at a conspicuous location on the EUT.

As per FCC §15.105: Information to the User

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

9 Annex D (Normative) – Test Setup Photographs

Please refer to the attachment.

10 Annex E (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 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 ---