FCC PART 15, SUBPART B
ICES-003, ISSUE 6 (JAN. 2016)

CLASS A TEST REPORT

For

SeaTel Inc.

4030 Nelson Avenue,
Concord, CA 94520, USA

FCC ID: 2ADHY-TRACKER-800W

Report Type: Original Report	**Product Type:** C-Band Satellite Antenna Tracker

Prepared By: Giriraj Gurjar, Test Engineer

Report Number: R2102092

Report Date: 2021-06-21

Reviewed By: Steven Lianto, Project Engineer

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ACCREDITED
CERTIFICATE #3297.02

TABLE OF CONTENTS

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ATTESTATION OF TEST RESULTS

Date of Issue: 2021-06-21 Attestation Number: R2102092

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:	C-Band Satellite Antenna Tracker
Model:	T6000 800W
Manufactured by:	SeaTel Inc.
Project Number:	R2102092

Standard	**Test Result**
FCC PART 15 SUBPART B ICES-003 ISSUE 7 (Oct. 2020)	Pass

BACL tested the above equipment in accordance with the requirement with the above Standards. The results were being documented in Test Report #R2102092 Rev. A listed in above table apply only to the tested sample under the condition and modes of operation as described herein.

Attestation by: Steven Lianto
Project Engineer

Signature 2021-06-21
Date

Document Revision History

Revision Number	Report Number	Description of Revision	Date
0	R2102092	Original Report	2021-06-21

1 General Information

1.1 General Statements

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

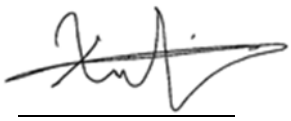
- The Unit(s) described in this Test Report were received at BACL's facilities on 1 March 2021. Testing was performed on the Unit(s) described in this Test Report during the period 14 through 19 April 2021.
- The Test Results reported herein apply only to the Unit(s) actually tested, and to substantially 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 *SeaTel Inc.* and their product *C-Band Satellite Antenna Tracker*, Model: *T6000 800W* in accordance with FCC Part 15B, Information Technology Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurements and Issue 7 of Innovation, Science, and Economic Development Canada ICES-003, Interference – Causing Equipment Standards for Digital Apparatus.

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

Giriraj Gurjar
[Test Engineer]



Xinhao Jiang
[Test Engineer]

1.3 Agent for the Responsible Party

None

1.4 Responsible Party

Company Name:	SeaTel Inc.
Contact:	Phil Cartaciano
Street Address:	4030 Nelson Avenue
City/State/Zip:	Concord, CA 94520
Country:	USA
Telephone:	+1 (925) 798-7979
Fax:	+1 (925)-798-7986
Email:	phil.cartaciano@cobham.com
Web:	www.cobham.com

1.5 Product Description of the Equipment under Test (EUT)

The "EUT" (Equipment under Test) was a C-Band Satellite Antenna Tracker, Model: T6000 800W. The highest frequency used and/or generated was 5249.12 MHz.

1.6 Mechanical Description of the EUT

Dimensions: approximately 800 cm (L) x 800 cm (W) x 745 cm (H)
Weight: approximately 1500 kg
Serial Number: None
EUT Photos: See Annex A of this Test Report.

1.7 EUT Input Power

The EUT was powered by 200-240 VAC, 50/60Hz three phase power supply.

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-0308.

1.10 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- ***An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2005 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;

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 CISPR16-4-2, 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 using the Narda PMM L3-100 4-Line LISN)	3.05 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 R&S ESU40 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)
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
Radiated Electric Field Disturbance Horizontal & Vertical Polarizations, 18 GHz – 26.5 GHz (i.e., Radiated Emissions measured at 1 metres distance)	4.81 dB (With Boresighting)	U_{CISPR} Value is Not Specified
Radiated Electric Field Disturbance Horizontal & Vertical Polarizations, 26.5 GHz – 40 GHz (i.e., Radiated Emissions at 1 metres distance)	5.00 dB (With Boresighting)	U_{CISPR} Value is Not Specified

Type of Measurement: **CISPR-type 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 R&S ESU40 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)**
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)	**4.94 dB (No Tilting)**	**5.18 dB (No Tilting)**

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

The exercising software used was RTU [Remote Terminal Unit] and IMA [Integrated Motor Assist] which was pre-installed by the customer on google chrome web browser.

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 static mode. Once powered, the EUT would initialized to full motion on three axis, azimuth, elevation, and cross level. After it finished calibrating itself, the EUT could be controlled using the exercising software.

2.7 Method of Monitoring

The EUT was connected to laptop for control and monitoring the antenna connection via Ethernet port. It was working as intended as long as it maintained its position (monitored from the exercising software) and its power in both of the IBUC R (monitored using a web browser) during the test.

2.8 Local Support Equipment

Manufacturer	Description	Model	Serial Number
ASUS	Monitoring Laptop	A53S	B5N0AS07125818E

2.9 Remote Support Equipment

None

2.10 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
Seatel	Antenna 6m, C-Band, Feed Assy	Tracker 6000	-
Seatel	Antenna Control Module	ICU3, A01	-
Terrasat	IBUC R C-band 800W	IBC050052-0ND800VSWW-0102	-
Seatel	Power Monitor Assy	PMA, A01	-
Seatel	Motor Driver Assy	FDM, A01	-
Blue Sea Systems	Circuit Breaker Fuse	7260	-
Seatel	IFL and 10MHz Distribution	IFL10M, A01	-

2.11 External I/O Cabling List and Details

Cable Description	Length (m)	From	To
SMA Cable	< 1	EUT (TXIF RHCP)	EUT (TXIF LHCP)
SMA Cable	5	EUT (TXIF LHCP)	Signal Generator
SMA Cable	5	EUT (10MHz Port)	Signal Generator
Power Cable	2	EUT (Antenna Pedestal)	AC Power Supply
Ethernet Cable	10	EUT (Antenna Pedestal)	Monitoring Laptop

2.12 EUT Power Supply List and Details

Manufacturer	Description	Model	Serial Number
XP Power	100-240AC to DC 48V	SHP650PS48-EF	-

3 Summary of Test Results

Standards	Test Description	Result
FCC §15.107 (b), ICES-003 Section 3.2.1 Table 1	Conducted Emissions	Compliant with Class A Limits
FCC §15.109 (b), ICES-003 Section 3.2.2 Table 2	Radiated Emissions	Compliant with Class A Limits

4 FCC §15.107 & ICES-003 - 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 (dBµV)	
	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.*		

As per the ISED ICES-003 Issue 7 (Oct. 2020) Section 3.2.1 Conducted emission limits:

The ITE or digital apparatus shall comply with the conducted emission limits specified in table 1 at its AC mains power terminals. The product under test shall comply with both the quasi-peak and the average limits.

Where the product under test is powered through an external device (for example, through an external power supply, or by means of a device providing power over Ethernet to the product under test), the conducted emission limits apply at the AC mains power terminals of the external device, while this is powering the product under test: see ICES-Gen.

Table 1: Conducted emissions limits (AC mains power terminals)

Frequency range (MHz)	Class A Quasi-peak (dBµV)	Class A Average (dBµV)	Class B Quasi-peak (dBµV)	Class B Average (dBµV)
0.15 – 0.5	79	66	66 to 56[i]	56 to 46[i]
0.5 – 5	73	60	56	46
5 – 30	73	60	60	50
Note: The more stringent limit applies at transition frequencies.				
i. The limit level in dBµV decreases linearly with the logarithm of 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 200-240VAC, 50/60Hz three phase 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:

$$CA = Ai + \text{Total Loss}$$

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:

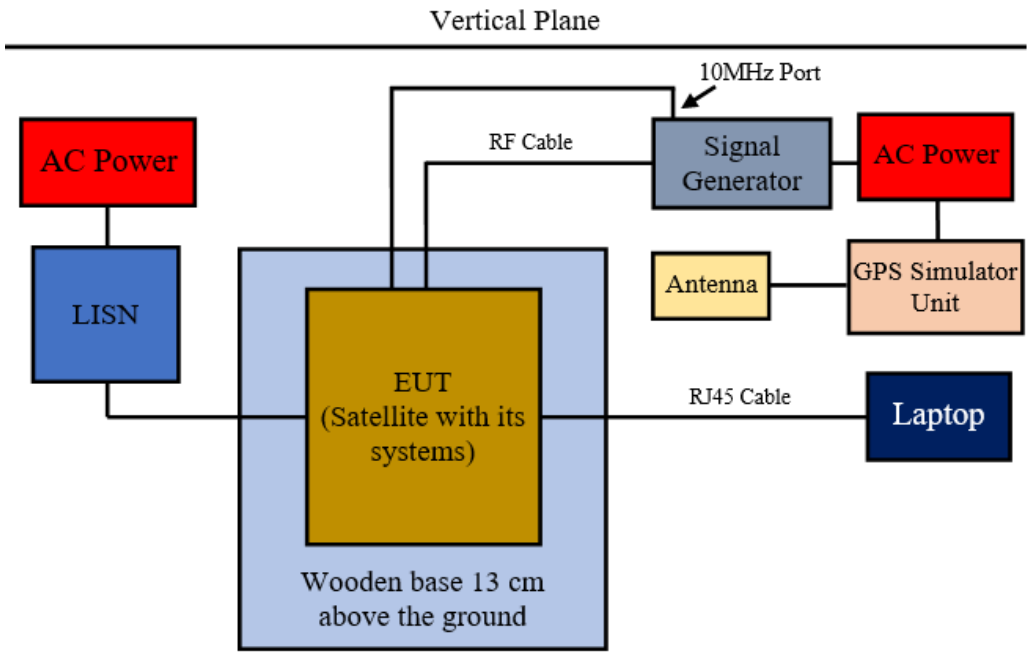
$$\text{Total Loss (dB)} = \text{Cable Loss (dB)} + \text{Attenuation (dB)} + \text{LISN Factor (dB)}$$

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:

$$\text{Margin (dB)} = \text{Corrected Amplitude (dBµV)} - \text{Limit (dBµV)}$$

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	Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950.03	100338	2020-03-17	2021-09-01
00679	Rohde & Schwarz	Impulse Limiter	ESH3-Z2	101963	2020-07-02	2021-07-02
00725	Solar Electronics Company	High Pass Filter	Type 7930-100	7930150203	2021-03-02	2022-03-02
00776	Narda	LISN	L3-100	110WT50602	2019-11-13	2021-05-13
00885	Fairview Microwave	Micro-Coax Cable	FMC0101223-240	1907181	2020-08-25	2021-08-25
01006	Spirent Communications	Signal Generator	GSS7000	0213	Calibration not Required	Calibration not Required
01007	Spirent Communications	Interface Signal Generator	GSS7725	0020	Calibration not Required	Calibration not Required
01008	Dell	Desktop Computer	OptiPlex 3050	JGWMPJ2	Calibration not Required	Calibration not Required
00343	HP	Signal Generator	8648C	3847M00143	2020-01-28	2021-07-28
00187	A.R.A	Antenna, Horn	DRG-118/A	1132	2020-02-25	2022-02-25

***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

Testing Date:	2021-04-16
Testing Site:	Ground Plane Test Site
Temperature:	23 ºC
Relative Humidity:	45 %
ATM Pressure:	101.6 kPa
Testing Personnel:	Xinhao Jiang

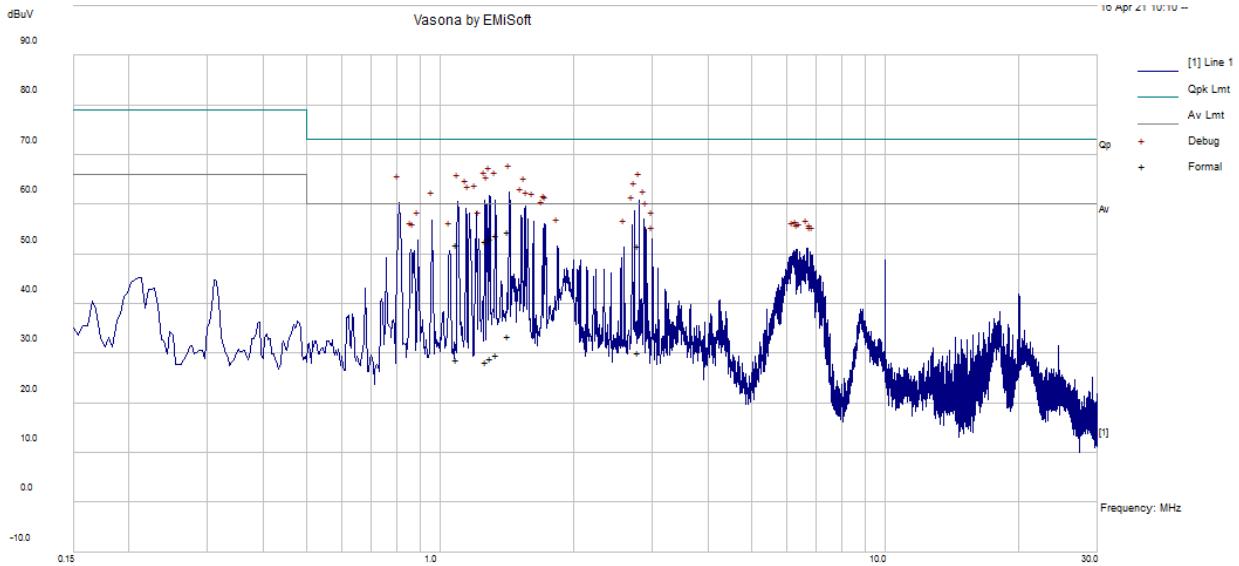
4.8 Summary of Test Results

According to the recorded data, the EUT complied with FCC §15.107 and ICES-003 Class A limits, and had the worst margin reading of:

Worst Case: AC Line: 208V/60Hz						
Conductor	**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)**
Line 1	1.425837	54.45	-18.55	1.425837	33.51	-26.49
Line 2	1.416808	55.11	-17.89	1.169526	49.1	-10.9
Line 3	0.808802	59.36	-13.64	0.808802	57.14	-2.86
Neutral	0.80522	18.04	-54.96	0.80522	13.02	-46.98

4.9 Conducted Emissions Test Plots and Data

AC Line: 208 V/60 Hz – Line 1



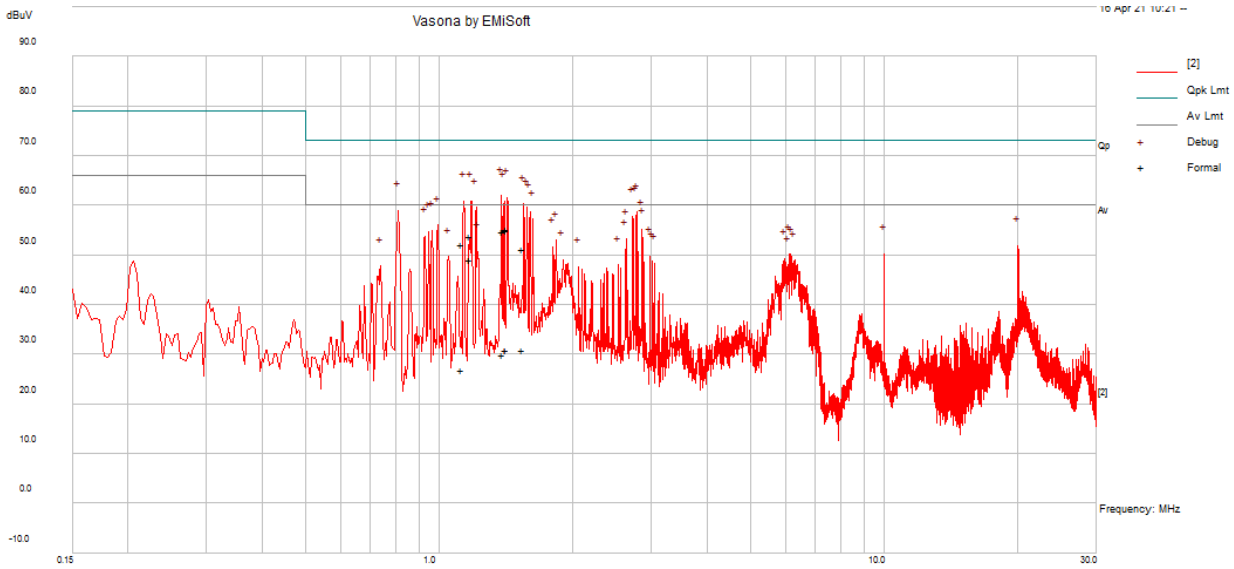
Quasi-Peak Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
1.425837	10.01	54.45	Line 1	73	-18.55
1.342474	10.03	53.69	Line 1	73	-19.31
1.303269	10.03	53.12	Line 1	73	-19.88
1.269254	10.03	52.7	Line 1	73	-20.3
1.09137	10.07	51.94	Line 1	73	-21.06
2.785097	9.96	51.63	Line 1	73	-21.37

Average Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
1.425837	10.01	33.51	Line 1	60	-26.49
2.785097	9.96	30.2	Line 1	60	-29.8
1.342474	10.03	29.73	Line 1	60	-30.27
1.303269	10.03	28.95	Line 1	60	-31.05
1.09137	10.07	28.73	Line 1	60	-31.27
1.269254	10.03	28.41	Line 1	60	-31.59

AC Line: 208 V/60 Hz – Line 2



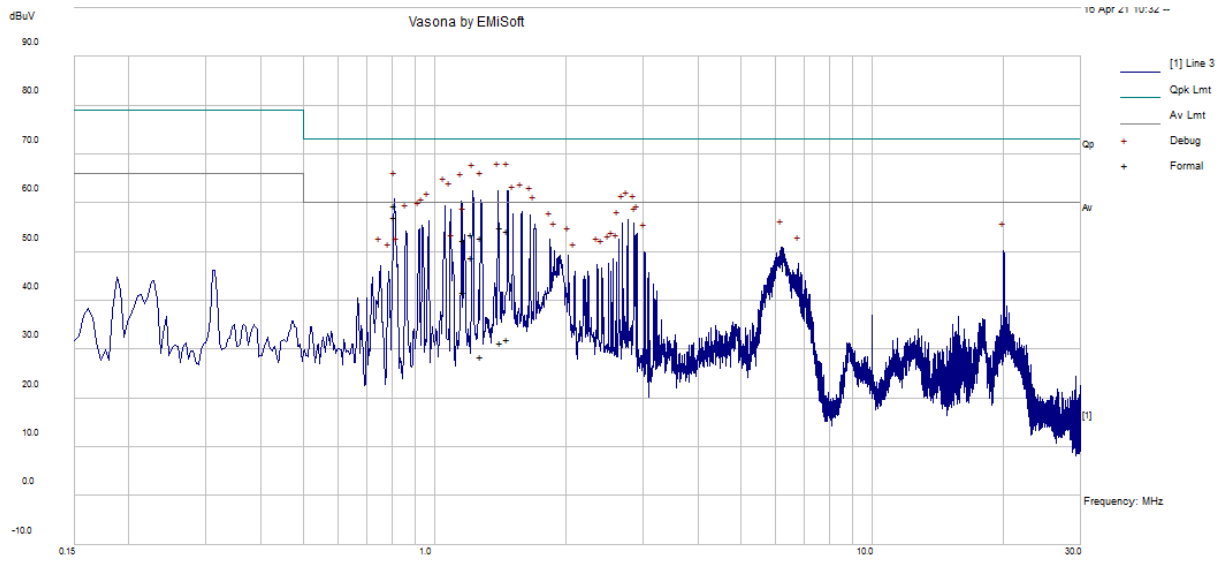
Quasi-Peak Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
1.416808	10.01	55.11	Line 2	73	-17.89
1.416955	10.01	55.04	Line 2	73	-17.96
1.392321	10.01	54.85	Line 2	73	-18.15
1.169526	10.06	53.87	Line 2	73	-19.13
1.121292	10.08	52.06	Line 2	73	-20.94
1.537055	10	51.21	Line 2	73	-21.79

Average Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
1.169526	10.06	49.1	Line 2	60	-10.9
1.416955	10.01	30.95	Line 2	60	-29.05
1.416808	10.01	30.92	Line 2	60	-29.08
1.537055	10	30.77	Line 2	60	-29.23
1.392321	10.01	30.06	Line 2	60	-29.94
1.121292	10.08	26.76	Line 2	60	-33.24

AC Line: 208 V/60 Hz – Line 3



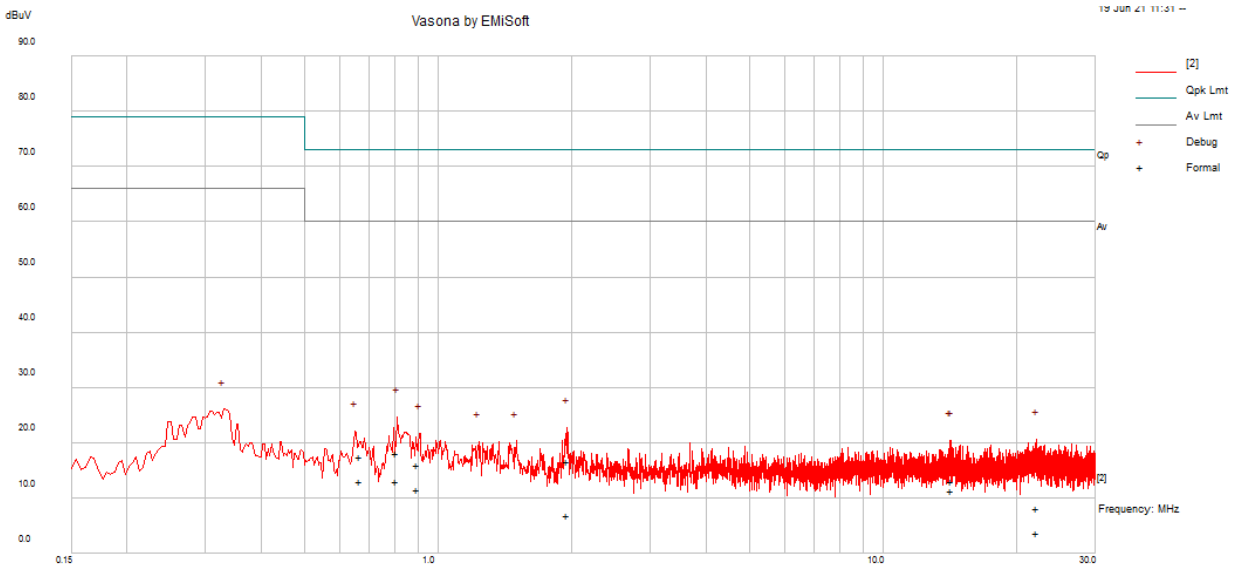
Quasi-Peak Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
0.808802	10.16	59.36	Line 3	73	-13.64
1.410883	10.01	54.98	Line 3	73	-18.02
1.465641	10.01	54.16	Line 3	73	-18.84
1.217971	10.05	53.66	Line 3	73	-19.34
1.279559	10.03	52.95	Line 3	73	-20.05
1.16455	10.06	52.33	Line 3	73	-20.67

Average Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
0.808802	10.16	57.14	Line 3	60	-2.86
1.217971	10.05	48.84	Line 3	60	-11.16
1.16455	10.06	41.69	Line 3	60	-18.31
1.465641	10.01	32.1	Line 3	60	-27.9
1.410883	10.01	31.28	Line 3	60	-28.72
1.279559	10.03	28.44	Line 3	60	-31.56

AC Line: 208 V/60 Hz – Neutral



Quasi-Peak Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
0.80522	10.08	18.04	Neutral	73	-54.96
0.667049	10.14	17.5	Neutral	73	-55.5
1.95585	9.89	16.7	Neutral	73	-56.3
0.900583	10.04	16.07	Neutral	73	-56.93
14.20976	9.93	12.89	Neutral	73	-60.11
22.14095	10.09	8.04	Neutral	73	-64.96

Average Measurements

Frequency (MHz)	Total Loss (dB)	Corrected Amplitude (dBµV)	Conductor	Limit (dBµV)	Margin (dB)
0.80522	10.08	13.02	Neutral	60	-46.98
0.667049	10.14	12.9	Neutral	60	-47.1
0.900583	10.04	11.49	Neutral	60	-48.51
14.20976	9.93	11.3	Neutral	60	-48.7
1.95585	9.89	6.84	Neutral	60	-53.16
22.140948	10.09	3.71	Neutral	60	-56.29

5 FCC §15.109 & ICES-003 - 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.

As per the ISED ICES-003 Issue 7 (Oct. 2020) Section 3.2.2 Radiated emission limits:

The quasi-peak limits for the electric component of the radiated field strength emitted from ITE or digital apparatus, within 30 MHz to 1 GHz, for a measurement distance of 3 m or 10 m, are presented in table 2.

Table 2: Radiated emissions limits (30 MHz to 1 GHz)

Frequency range (MHz)	Class A (3 m) Quasi-peak (dBµV/m)	Class A (10 m) Quasi-peak (dBµV/m)	Class B (3 m) Quasi-peak (dBµV/m)	Class B (10 m) Quasi-peak (dBµV/m)
30 – 88	50.0	40.0	40.0	30.0
88 – 216	54.0	43.5	43.5	33.1
216 – 230	56.9	46.4	46.0	35.6
230 – 960	57.0	47.0	47.0	37.0
960 – 1000	60.0	49.5	54.0	43.5
Note: The more stringent limit applies at transition frequencies.				

At and above 1 GHz, except for outdoor units of home satellite receiving systems, the ITE or digital apparatus shall comply with the limits specified in table 4 up to the frequency FM, which shall be determined as per table 3. The product under test shall comply with both the average and the peak limits.

Table 4: Radiated emission limits at 3 m distance (at and above 1 GHz)

Frequency range (GHz) [i]	Class A [ii, iii, iv] Average dB(µV/m)	Class A [ii, iii, iv] Peak dB(µV/m)	Class B [ii, iii, iv] Average dB(µV/m)	Class B [ii, iii, iv] Peak dB(µV/m)
1 – F_M	60	80	54	74

i. The highest measurement frequency, F_M, in GHz, shall be determined as per table 3.

ii. The measurement bandwidth shall be 1 MHz or greater.

iii. These limit levels apply for a measurement distance of 3 m. If using a different measurement distance, the measured levels shall be extrapolated to the 3 m limit distance using a factor of 20 dB per decade of distance. The measurement distance shall place the measurement antenna in the far field of the ITE or digital apparatus under test.

iv. The test site shall have been validated at the distance used for radiated emission measurements on the ITE or digital apparatus under test.

At and above 1 GHz, if the ITE or digital apparatus is an outdoor unit of home satellite receiving systems, it shall comply with the limits in Table A.7 in clause A.2 of CAN/CSA-CISPR 32:17 (in Annex A therein). For these types of ITE or digital apparatus, the highest measurement frequency shall be 18 GHz.

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 200-240VAC, 50/60Hz three phase 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,

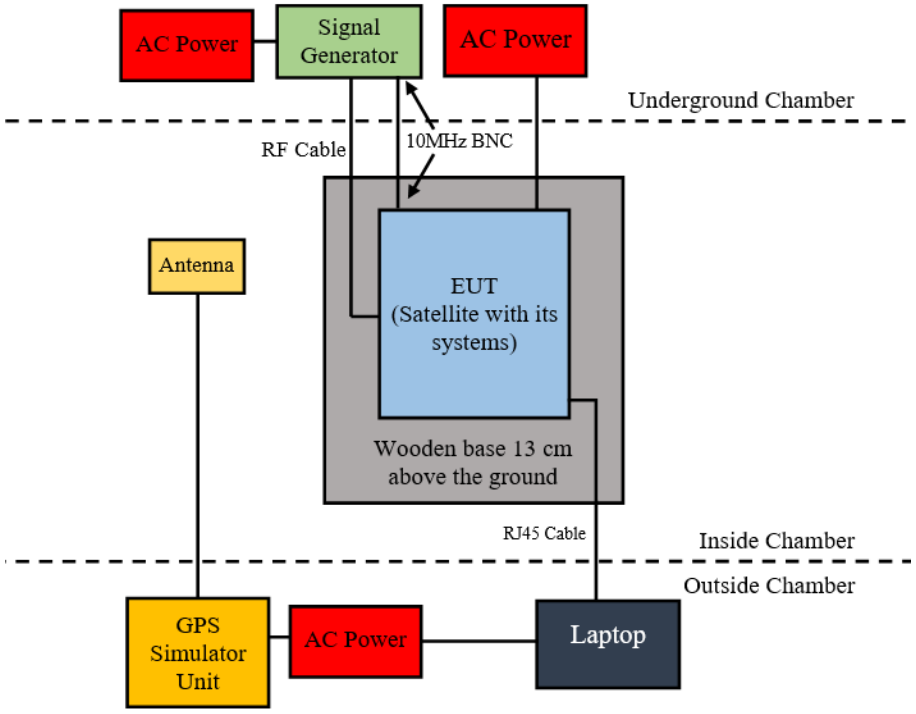
Correction Factor = AF + CL + Atten – Ga

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	Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950.03	100338	2020-03-17	2021-09-01
00311	Sunol Sciences	Controller, System	SC104V	113005-1	Calibration not Required	Calibration not Required
00445	SONOMA INSTRUMENT	Amplifier	315	303125	2020-07-20	2021-07-20
00811	Keysight Technologies	RF Limiter	11867A	MY42243052	2020-10-27	2021-10-27
00307	Sunol Sciences	Antenna, BiConiLog	JB3	A020106-3	2020-03-02	2022-03-02
00831	Rohde & Schwarz	EMI Test Receiver	ESU-40	100433	2020-04-28	2021-04-28
00827	A.H. System	Pre-amplifier	PAM-1840VH	170	2020-11-09	2021-11-09
00091	Wisewave	Antenna, Horn	ARH-4223-02	10555-02	2020-02-05	2022-02-05
00230	Wisewave	Antenna, Horn	ARH-2823-02	10555-02	2020-02-05	2022-02-05
00110	A.R.A.	Antenna, Horn	DRG-118/A	1132	2019-06-07	2021-06-07
00032	HP	Pre-Amplifier	8449B	3008A01978	2020-04-15	2021-05-15
01006	Spirent Communications	Signal Generator	GSS7000	0213	Calibration not Required	Calibration not Required
01007	Spirent Communications	Interface Signal Generator	GSS7725	0020	Calibration not Required	Calibration not Required
01008	Dell	Desktop Computer	OptiPlex 3050	JGWMPJ2	Calibration not Required	Calibration not Required
00343	HP	Signal Generator	8648C	3847M00143	2020-01-28	2021-07-28
00187	A.R.A	Antenna, Horn	DRG-118/A	1132	2020-02-25	2022-02-25
01185	Wireless Solutions	N-Type Coax Cable	LMR 400	1185	2020-07-10	2021-07-10
00601	UTiFLEX	High Frequency Cable	UFA147A-1-3600-200200	223458-001	2020-07-10	2021-07-10

***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 Test Environmental Conditions

Testing Date:	2021-04-19
Testing Site:	10m Chamber 1
Temperature:	25 ºC
Relative Humidity:	42 %
ATM Pressure:	101.3 kPa
Testing Personnel:	Giriraj Gurjar

5.9 Summary of Test Results

According to the recorded data, the EUT complied with FCC §15.109 and ICES-003 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)**
138.3285	33.36	Vertical	-6.64

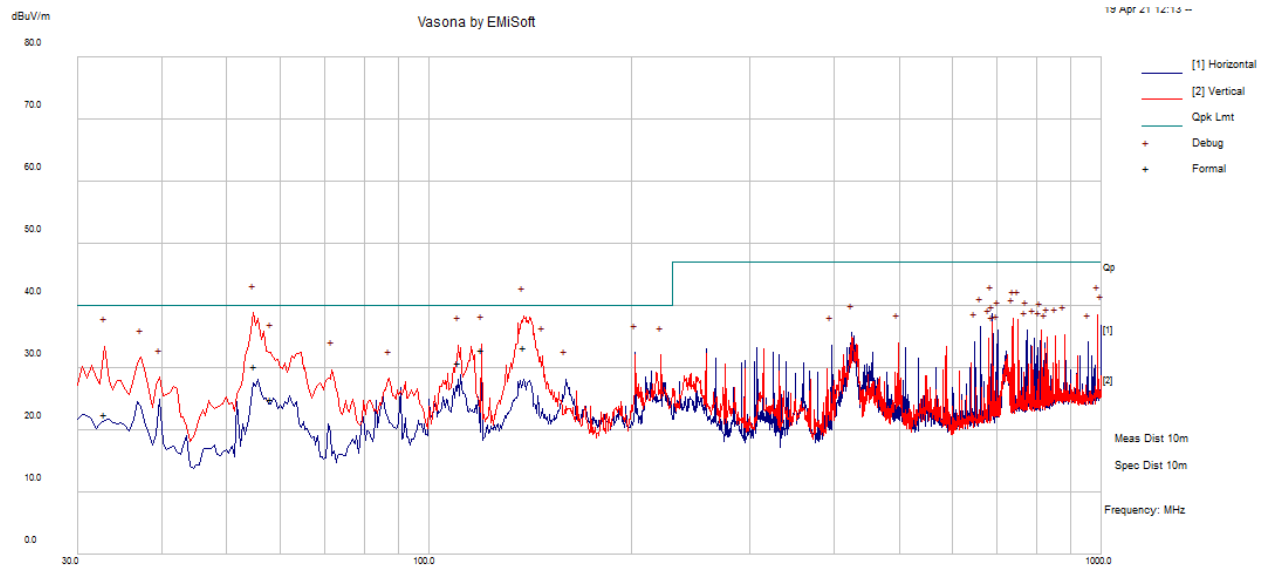
FCC 15B & ICES-003 Radiated Emissions Worst Case (1 GHz to 18 GHz)			
Frequency (MHz)	**Highest Peak Corrected Amplitude (dBµV/m)**	**Polarization (Horizontal / Vertical)**	**Peak Margin (dB)**
17260.73	60.51	Vertical	-18.99
Frequency (MHz)	**Highest Average Corrected Amplitude (dBµV/m)**	**Polarization (Horizontal / Vertical)**	**Average Margin (dB)**
17260.73	47.16	Vertical	-12.34

FCC 15B & ICES-003 Radiated Emissions Worst Case (18 GHz to 26.5 GHz)			
Frequency (MHz)	**Highest Peak Corrected Amplitude (dBµV/m)**	**Polarization (Horizontal / Vertical)**	**Peak Margin (dB)**
26455.78	57.15	Vertical	-22.35
Frequency (MHz)	**Highest Average Corrected Amplitude (dBµV/m)**	**Polarization (Horizontal / Vertical)**	**Average Margin (dB)**
26455.78	43.8	Vertical	-15.7

FCC 15B & ICES-003 Radiated Emissions Worst Case (26.5 GHz to 40 GHz)			
Frequency (MHz)	**Highest Peak Corrected Amplitude (dBµV/m)**	**Polarization (Horizontal / Vertical)**	**Peak Margin (dB)**
39778.711	71.02	Horizontal	-18.48
Frequency (MHz)	**Highest Average Corrected Amplitude (dBµV/m)**	**Polarization (Horizontal / Vertical)**	**Average Margin (dB)**
39778.71	57.17	Horizontal	-12.33

5.10 Radiated Emissions Test Plot and Data

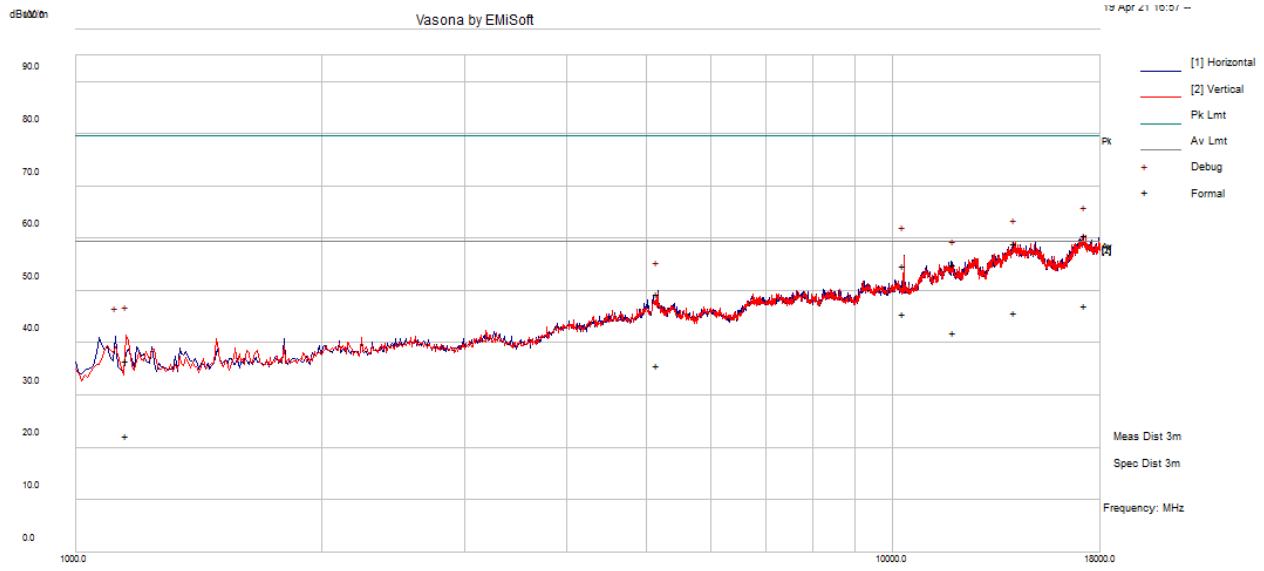
30 MHz to 1000 MHz



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)
138.3285	-19.43	33.36	V	140	176	40	-6.64
119.9735	-18.44	32.91	V	103	185	40	-7.09
110.57075	-19.86	30.75	V	168	355	40	-9.25
54.94625	-25.46	30.29	V	216	184	40	-9.71
58.15225	-25.57	25.01	V	107	126	40	-14.99
32.93975	-13.81	22.41	V	157	275	40	-17.59

1 GHz to 18 GHz



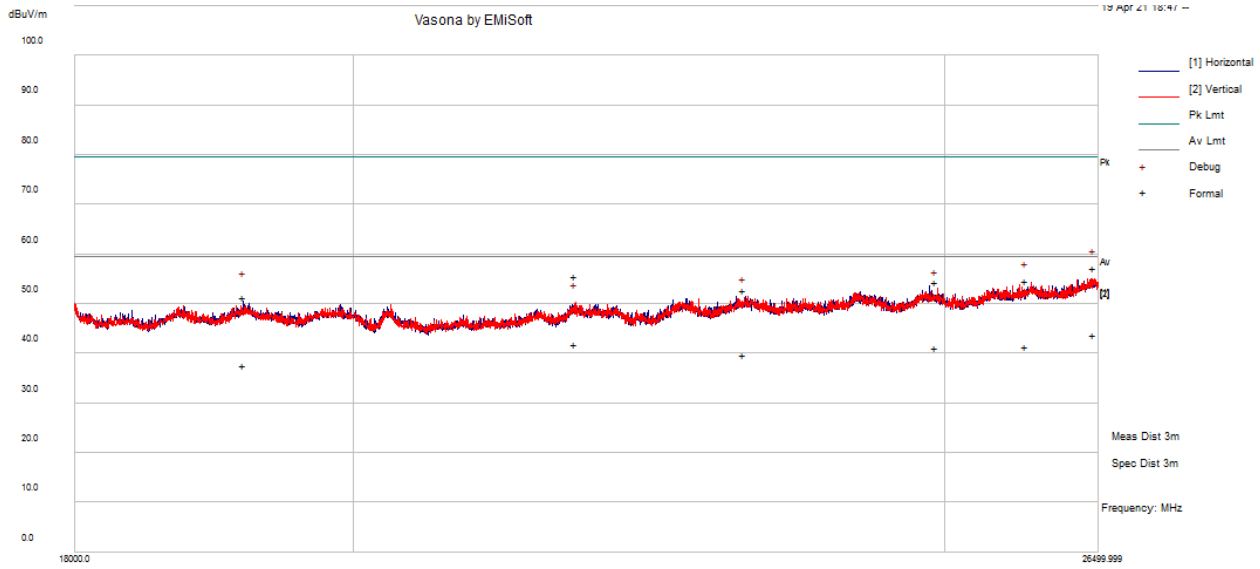
Peak Measurements

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)
17260.73	21.73	60.51	V	162	348	79.5	-18.99
14160.31	20.49	59.09	V	290	74	79.5	-20.41
11888.87	15.75	54.98	H	300	296	79.5	-24.52
10340.08	12.16	54.87	H	109	16	79.5	-24.63
5163.24	7.46	49.38	H	278	39	79.5	-30.12
1152.288	-9.67	36.52	V	132	175	79.5	-42.98

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)
17260.73	21.73	47.16	V	162	348	59.5	-12.34
14160.31	20.49	45.84	V	290	74	59.5	-13.66
10340.08	12.16	45.58	H	109	16	59.5	-13.92
11888.87	15.75	41.89	H	300	296	59.5	-17.61
5163.24	7.46	35.59	H	278	39	59.5	-23.91
1152.288	-9.67	22.18	V	132	175	59.5	-37.32

18 GHz to 26.5 GHz



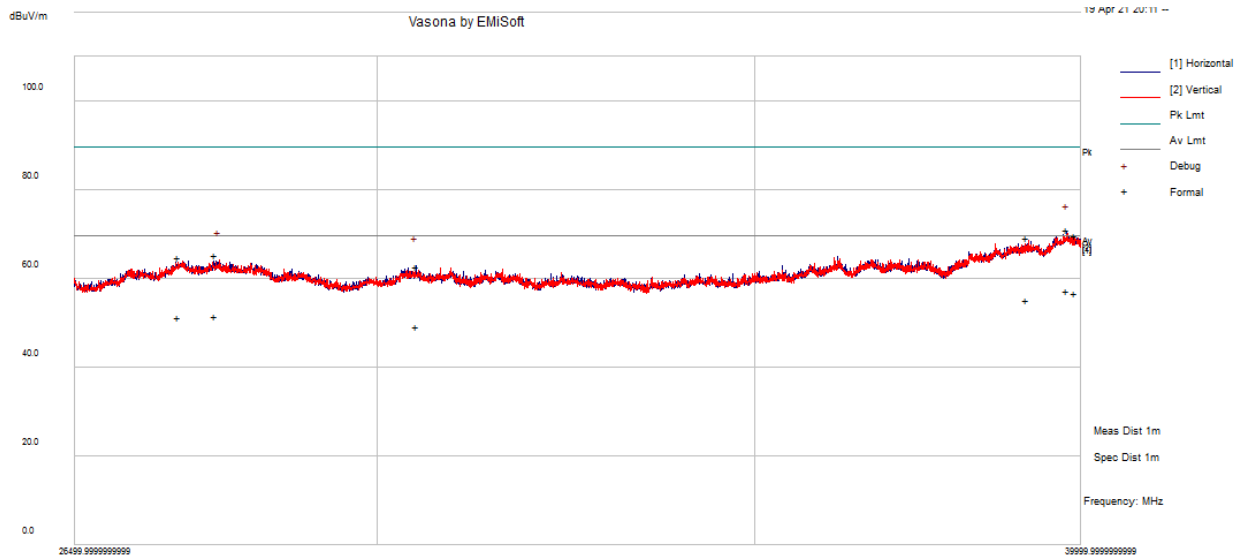
Peak Measurements

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)
26455.78	16.82	57.15	V	174	54	79.5	-22.35
21744.11	12.18	55.49	V	260	82	79.5	-24.01
25779.12	15.5	54.63	V	202	214	79.5	-24.87
24916.27	15.43	54.42	V	231	340	79.5	-25.08
23180.28	13.91	52.68	V	178	40	79.5	-26.82
19188.38	10.24	51.26	H	224	302	79.5	-28.24

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)
26455.78	16.82	43.8	V	174	54	59.5	-15.7
21744.114	12.18	41.76	V	260	82	59.5	-17.74
25779.123	15.5	41.32	V	202	214	59.5	-18.18
24916.267	15.43	41.11	V	231	340	59.5	-18.39
23180.28	13.91	39.64	V	178	40	59.5	-19.86
19188.375	10.24	37.65	H	224	302	59.5	-21.85

26.5 GHz to 40 GHz



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)
39778.711	27.6	71.02	H	181	232	89.5	-18.48
39900.532	27.25	69.69	H	164	264	89.5	-19.81
39121.567	25.9	69.09	H	182	314	89.5	-20.41
28067.133	21.41	65.28	H	197	220	89.5	-24.22
27656.875	21.35	64.68	H	109	14	89.5	-24.82
30476.342	20.17	62.56	H	117	100	89.5	-26.94

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)
39778.71	27.6	57.17	H	181	232	69.5	-12.33
39900.53	27.25	56.68	H	164	264	69.5	-12.82
39121.57	25.9	55.19	H	182	314	69.5	-14.31
28067.13	21.41	51.46	H	197	220	69.5	-18.04
27656.88	21.35	51.29	H	109	14	69.5	-18.21
30476.34	20.17	49.19	H	117	100	69.5	-20.31

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) – Test Setup Photographs

Please refer to the attachment

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

Accredited Laboratory

A2LA has accredited

BAY AREA COMPLIANCE LABORATORIES CORP.

Sunnyvale, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets A2LA *R222 - Specific Requirements EPA ENERGY STAR Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 10th day of March 2021.

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 ---