



# FCC PART 15, SUBPART C ISED C RSS-247, ISSUE 3, AUGUST 2023

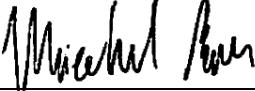
## TEST REPORT

For

### Blue Ocean Gear

440 Coloma St, Sausalito, CA 94965, USA

**FCC ID: 2AZJC-PLOTTERLINK  
IC: 27151-PLOTTERLINK**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Satellite and radio communication terminal for smart buoys
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<b>Report Number:</b> R2408021-247	
<b>Report Date:</b> 2024-12-11	
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Note: This test report was prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This test report shall not be used by the customer to claim product certification, approval, or endorsement by A2LA or any agency of the United States Government or any foreign government.

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

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## DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R2408021-247	Original Report	2024-12-11

## 1 General Description

### 1.1 Product Description for Equipment Under Test (EUT)

This test report is prepared on behalf of *Blue Ocean Gear*, and their product model: PLOTTERLINK, FCC ID: 2AZJC-PLOTTERLINK, IC: 27151-PLOTTERLINK, the “EUT” as referred to in this report. The EUT is a satellite and radio communications device that provides real time update from Farallon Smart Buoys. The EUT operates on a single frequency at 915 MHz. The EUT has an Iridium radio module with FCC ID: Q639603N.

<b>Model Number</b>	PLOTTERLINK
<b>FCC ID</b>	2AZJC-PLOTTERLINK
<b>IC</b>	27151-PLOTTERLINK
<b>Operating Frequency</b>	915 MHz

### 1.2 Mechanical Description of EUT

The UUT measures approximately 145 mm (L) x 145 mm (W) x 220 mm (H) and weighs approximately 1.65 kg.

*The data gathered was from a production sample provided by Blue Ocean Gear with S/N: R2408021-01 assigned by BACL.*

### 1.3 Objective

This report is prepared on behalf of *Blue Ocean Gear* in accordance with Part 2, Subpart J, and Part 15, Subpart C of the Federal Communication Commission’s rules and ISED RSS-247 Issue 3, August 2023.

The objective is to determine compliance with FCC Part 15.247 and ISED RSS-247 for Antenna Requirement, RF Exposure, Radiated & Conducted Spurious Emissions, Emission Bandwidth, Maximum Output Power, and Average Power Spectral Density.

In order to determine compliance, the manufacturer or a contracted laboratory makes measurements and takes the necessary steps to ensure that the equipment complies with the appropriate technical standards.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product maybe which result in lowering the immunity should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing and/or I/O cable changes, etc.).

#### 1.4 Related Submittal(s)/Grant(s)

None.

#### 1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and FCC KDB 558074 D01 DTS Meas Guidance v05r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

#### 1.6 Measurement Uncertainty

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

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

#### 1.7 Test Facility Registrations

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

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

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

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

## 1.8 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

**A- An independent, 3<sup>rd</sup>-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 17025:2005 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 - ISED) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
  - o BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - o NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - o EMC Directive 2014/30/EU US-EU EMC & Telecom MRA CAB (NB)
  - o Radio Equipment (RE) Directive 2014/53/EU US-EU EMC & Telecom MRA CAB (NB)
  - o Low Voltage Directive (LVD) 2014/35/EU
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Media Development Authority - IMDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
  - o ENERGY STAR Recognized Test Laboratory – US EPA
  - o Telecommunications Certification Body (TCB) – US FCC;
  - o Nationally Recognized Test Laboratory (NRTL) – US OSHA
- Vietnam: APEC Tel MRA -Phase I;

## 2 System Test Configuration

### 2.1 Justification

The EUT was configured for testing according to ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v05r02.

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

### 2.2 EUT Exercise Software

N/A

Spreading Factor, Chips/symbol	Frequency (MHz)	Power Setting
11, 2048	915	Default

## 2.3 Duty Cycle Correction Factor

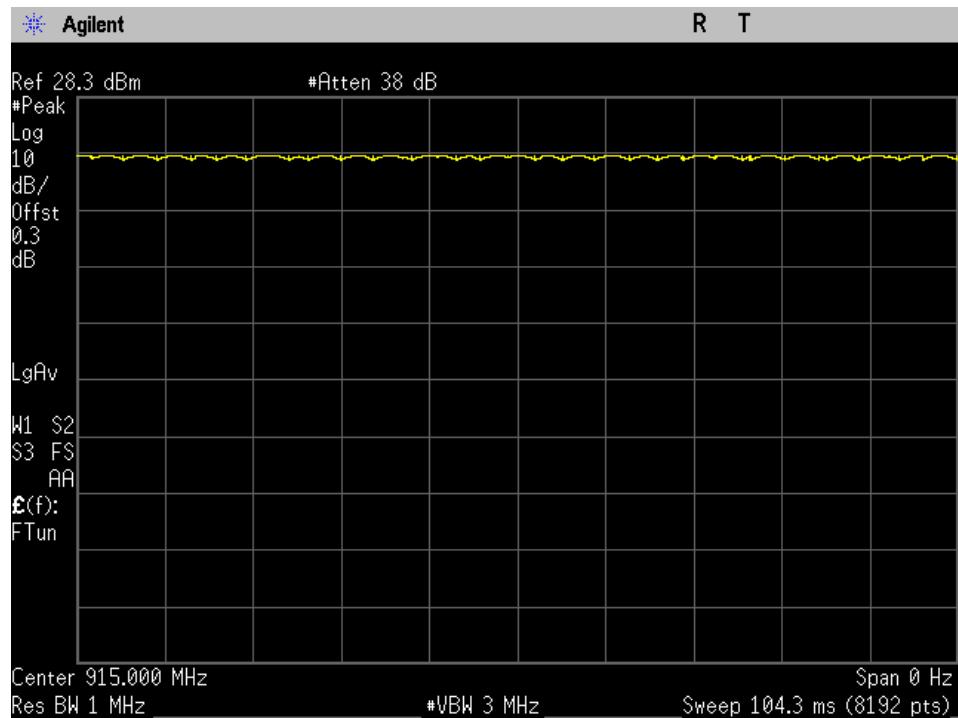
According to KDB 558074 D01 DTS Meas Guidance v05r02 section 6.0:

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.

On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
-	-	100	0

Note: Duty Cycle Correction Factor =  $10 \times \log(1/\text{duty cycle})$

Please refer to the following plot.



## 2.4 Equipment Modification

No modifications were made to the EUT during testing.

## 2.5 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude E6410

## 2.6 Remote Support Equipment

Manufacturer	Description	Model
Blue Ocean Gear	Fused, sealed lead-acid, 12V battery	-

## 2.7 Interface Ports and Cabling

N/A

### 3 Summary of Test Results

FCC & ISEDC Rules	Description of Test	Results
FCC §15.203 ISEDC RSS-Gen §6.8	Antenna Requirements	Compliant
FCC §2.1091, §15.247(i) ISEDC RSS-102	RF Exposure	Compliant
FCC §15.207 ISEDC RSS-Gen §8.8	AC Line Conducted Emissions	N/A <sup>1</sup>
FCC §2.1053, §15.35(b), §15.205, §15.209, §15.247(d) ISEDC RSS-247 §5.5 ISEDC RSS-Gen §8.9, §8.10	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) ISEDC RSS-247 §5.2 RSS-Gen §6.7	6 dB & 99% Emission Bandwidth	Compliant
FCC §15.247(b)(3) ISEDC RSS-247 §5.4	Maximum Output Power	Compliant
FCC §15.247(e) ISEDC RSS-247 §5.2(2)	Average Power Spectral Density	Compliant
FCC §2.1051, §15.247 (d) ISEDC RSS-247 §5.5	Spurious Emissions at Antenna Terminal (dBc)	Compliant

*Note<sup>1</sup>: Device is DC powered only with no connections to AC power source.*

*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 §15.203 & ISEDC RSS-Gen §6.8 – Antenna Requirements

### 4.1 Applicable Standards

According to FCC §15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to FCC §15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to ISEDC RSS-Gen §6.8: Transmitter Antenna

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For license-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

## 4.2 Antenna Description

External/Internal/ Integral	Antenna Type	Frequency Range (MHz)	Maximum Antenna Gain (dBi)	Report Naming Convention
External	Whip, Straight	902-928	3.5	Long Range Antenna
External	Terminal/Duck	900-935	-1.3	Short Range Antenna

*Note: The Antennas described in the table above uses a reverse SMA connector*

## 5 FCC §2.1091, FCC §15.247(i) & ISEDC RSS-102 – RF Exposure

### 5.1 Applicable Standards

According to FCC §15.247(i), Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

According to FCC §2.1091 and §1.1310(e)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

#### Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* (100)	30
1.34-30	824/f	2.19/f	* (180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

According to ISEDC RSS-102 Issue 6 Section 6.6: Field reference level exposure exemption limits

Field reference level (FRL) exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm (i.e. mobile devices), except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 1 W (adjusted for tune-up tolerance)
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than  $4.49/f0.5W$   $4.49/f0.5W$  (adjusted for tune-up tolerance), where  $f$  is in MHz
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance)
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than  $1.31 \times 10^{-2} f 0.6834 W$   $1.31 \times 10^{-2} f 0.6834 W$  (adjusted for tune-up tolerance), where  $f$  is in MHz
- at or above 6 GHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 5 W (adjusted for tune-up tolerance)

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the EIRP was derived.

## 5.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

## 5.3 MPE Result

*Note: The Maximum power measurements and Antenna gain for Iridium FCC ID: Q639603N were referenced from the test report: Document 75926443 Report 10 Issue 2 by TÜV SÜD Product Service, issued on 2014-08-06.*

Radio	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (mW)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)
LoRa	915	3.5	17.86	21.36	136.77	0.027	1.0
Iridium	1626.5	3	31.70	34.70	2951.21	0.587	1.0

### Worst Case Sum of Ratios:

**LoRa + Iridium:  $0.027/1.0 + 0.587/1.0 = 0.614 < 1$**

For the different combination of transmitters, a separation distance of 20 cm complies with the MPE simultaneous transmission limit of  $\leq 1.0$ .

## 5.4 IC Exemption

### LoRa:

The EIRP of this device is 21.36 dBm (136.77 mW) which is less than the exemption threshold, i.e.,  $1.31 \times 10^{-2} \times f^{0.6834} = 1.38$  W. Therefore, the RF exposure evaluation is exempt.

### Iridium:

The EIRP of this device is 24.34 dBm (271.64 mW) which is less than the exemption threshold, i.e.,  $1.31 \times 10^{-2} \times f^{0.6834} = 2.05$  W. Therefore, the RF exposure evaluation is exempt.

### Worst Case Sum of Ratios:

**LoRa + Iridium +:  $0.13677/1.38 + 0.27164/2.05 = 0.2316 < 1$**

## 6 FCC §15.35(b), §15.205, §15.209, §15.247(d) & ISED C RSS-247 §5.5, RSS-Gen §8.9, §8.10 – Spurious Radiated Emissions

### 6.1 Applicable Standards

As per FCC §15.35(b): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	960 – 1240	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5.35 – 5.46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 – 167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3.3458 – 3.358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC §15.247 (d),

in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

As per ISED RSS-247 §5.5,

in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

As per ISED RSS-Gen §8.9,

Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Field Strength ( $\mu$ V/m at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Magnetic Field Strength ( $\mu$ A/m)	Measurement Distance (m)
9 – 490 kHz <sup>Note 1</sup>	6.37/F (F in kHz)	300
490 – 1705 kHz	63.7/F (F in kHz)	30
1.705 – 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

As per ISED RSS-Gen §8.10(c),

Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

Table 7 – Restricted frequency bands<sup>Note 1</sup>

MHz	MHz	GHz
0.090 – 0.110	149.9 – 150.05	9.0 – 9.2
0.495 – 0.505	156.52475 – 156.52525	9.3 – 9.5
2.1735 – 2.1905	156.7 – 156.9	10.6 – 12.7
3.020 – 3.026	162.0125 – 167.17	13.25 – 13.4
4.125 – 4.128	167.72 – 173.2	14.47 – 14.5
4.17725 – 4.17775	240 – 285	15.35 – 16.2
4.20725 – 4.20775	322 – 335.4	17.7 – 21.4
5.677 – 5.683	399.9 – 410	22.01 – 23.12
6.215 – 6.218	608 – 614	23.6 – 24.0
6.26775 – 6.26825	960 – 1427	31.2 – 31.8
6.31175 – 6.31225	1435 – 1626.5	36.43 – 36.5
8.291 – 8.294	1645.5 – 1646.5	Above 38.6
8.362 – 8.366	1660 – 1710	
8.37625 – 8.38675	1718.8 – 1722.2	
8.41425 – 8.41475	2200 – 2300	
12.29 – 12.293	2310 – 2390	
12.51975 – 12.52025	2483.5 – 2500	
12.57675 – 12.57725	2655 – 2900	
13.36 – 13.41	3260 – 3267	
16.42 – 16.423	3332 – 3339	
16.69475 – 16.69525	3345.8 – 3358	
16.80425 – 16.80475	3500 – 4400	
25.5 – 25.67	4500 – 5150	
37.5 – 38.25	5350 – 5460	
73 – 74.6	7250 – 7750	
74.8 – 75.2	8025 – 8500	
108 – 138		

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

## 6.2 Test Setup

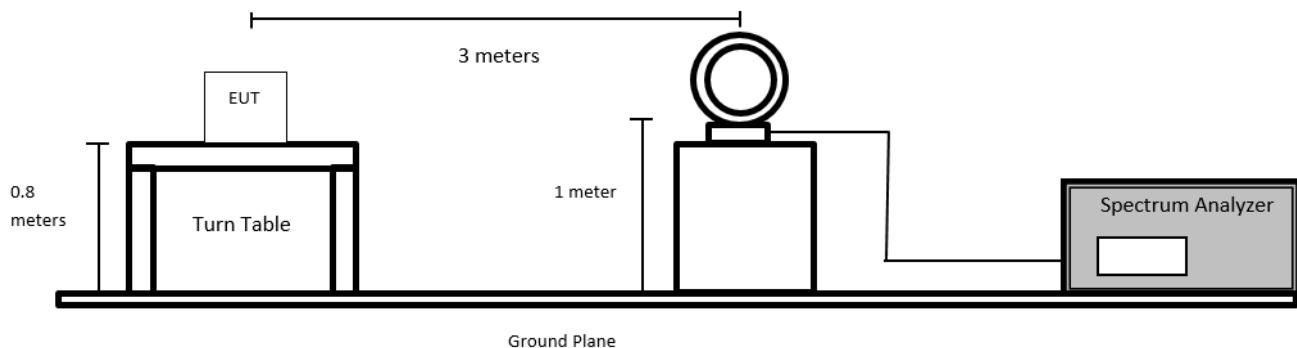
The radiated emissions tests were performed in the 5-meter chamber, using the setup in accordance with ANSI C63.10-2013. The specification used was the FCC §15.247 and ISEDC RSS-247 limits.

The spacing between the peripherals was 10 centimeters.

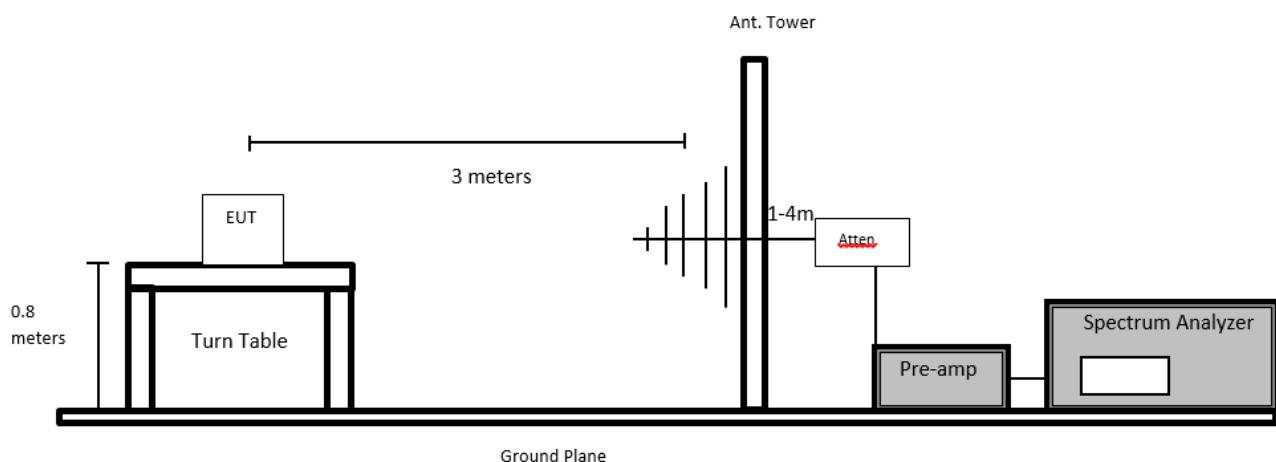
External I/O cables were draped along the edge of the test table and bundled when necessary.

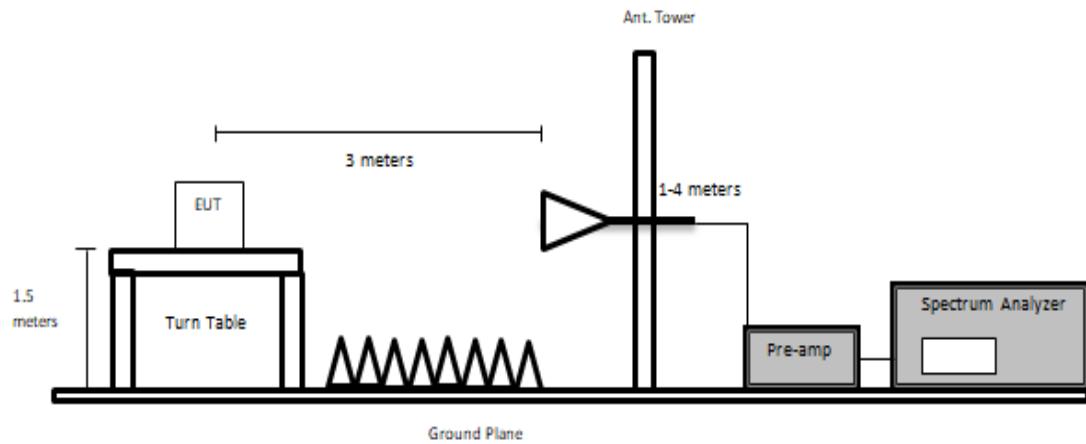
## 6.3 Test Setup Diagrams

9 kHz to 30 MHz



30 MHz to 1GHz



**Above 1 GHz****6.4 Test Procedure**

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT was set 3 meter away from the testing antenna, which was varied from 1-4 meters, and the EUT was placed on a turntable, which was 0.8 meters and 1.5 meters above the ground plane for below and above 1000 MHz measurements, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna's polarity should be changed between horizontal and vertical.

The spectrum analyzer or receiver was set as:

Below 1000 MHz:

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

Above 1000 MHz:

- (1) Peak:  $\text{RBW} = 1\text{MHz} / \text{VBW} = 1\text{MHz} / \text{Sweep} = \text{Auto}$
- (2) Average:  $\text{RBW} = 1\text{MHz} / \text{VBW} = 10\text{Hz} \text{ or } 1/T / \text{Sweep} = \text{Auto}$

## 6.5 Corrected Amplitude and Margin Calculation

For emissions below 1 GHz,

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

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

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

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

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

The “Margin” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

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

For emission above 1 GHz,

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

$$CA = Ai + AF + CL + Atten - Ga$$

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

The “Margin” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

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

## 6.6 Test Equipment List and Details

### Test Equipment for Above 30 MHz

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
310	Rhode & Schwarz	EMI Test Receiver	ESCI 1166.5950.03	100338	2024-05-29	1 year
424	Agilent	Spectrum Analyzer	E4440A	US45303156	2024-03-06	1 year
327	Sunol Science Corp	System Controller	SC110V	122303-1	N/R	N/A
1075	Sunol Sciences	Boresight Tower	TLT3	050119-7	N/R	N/A
1388	Sunol Sciences	Flush Mount Turntable	FM	112005-2	N/R	N/A
316	Sonoma Instruments	Preamplifier 10 kHz - 2.5 GHz	317	260406	2024-08-30	6 months
1192	ETS Lindgren	Horn Antenna	3117	00218973	2022-09-29	2 years
1449	BACL	Preamplifier	BACL131 3-A100M18 G	4052472	2024-08-19	6 months
1397	Mini Circuit	CBL ASSY 2.92MM PLUG TO PLUG 12"	FL086-12KM+	QN2318110-2318	2024-08-16	6 months
321	Sunol Sciences	Biconilog Antenna	JB3	A020106-2; 1504	2023-12-18	2 years
1248	Pasternack	RG214 COAX Cable	PE3062	-	2024-04-04	1 year
1249	Time Microwave	LMR-400 Cable Dc-3 Ghz	AE13684	2k80612-5 6fts	2024-04-09	1 year
1355	Megaphase	2.92mm 236in RF Cable DC to 40GHz	GC12-K1K1-236-H	1 GVT4 20554701 001	2024-02-27	1 year
1356	Pasternack	N 28ft RF Cable	RG213	062421	2023-12-11	1 year
1245	-	6dB Attenuator	PE7390-6	01182018A	2022-11-22	2 year
1246	HP	RF Limiter	11867A	01734	2024-04-09	1 year
1517	Micro -Tronics	Notch Filter, 902-928 MHz BAND	BRC50722	G038	2024-09-04	1 year

**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".

## Test Equipment for Below 30 MHz

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
1432	Keysight Technologies	MXE EMI Receiver, Multi-touch	N9038B	MY601800 08	2024-01-15	1 year
327	Sunol Science Corp	System Controller	SC110V	122303-1	N/R	N/A
1388	Sunol Sciences	Flush Mount Turntable	FM	112005-2	N/R	N/A
393	Com-Power	Active Loop Antenna	AL-130	17043	2023-05-26	2 years
1248	Pasternack	RG214 COAX Cable	PE3062	-	2024-04-04	1 year
1249	Time Microwave	LMR-400 Cable Dc- 3 Ghz	AE13684	2k80612-5 6fts	2024-04-09	1 year
1246	HP	RF Limiter	11867A	01734	2024-04-09	1 year

**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”.

## 6.7 Test Environmental Conditions

<b>Temperature:</b>	23.1 °C
<b>Relative Humidity:</b>	56.8 %
<b>ATM Pressure:</b>	101.3 kPa

Testing above 30MHz was performed by Michael Papa on 2024-09-24 in 5m chamber 3.  
Testing below 30MHz was performed by Michael Papa on 2024-12-11 in 5m chamber 3.

## 6.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15.209, 15.247 and ISED RSS-247 standards' radiated emissions limits, and had the worst margin of:

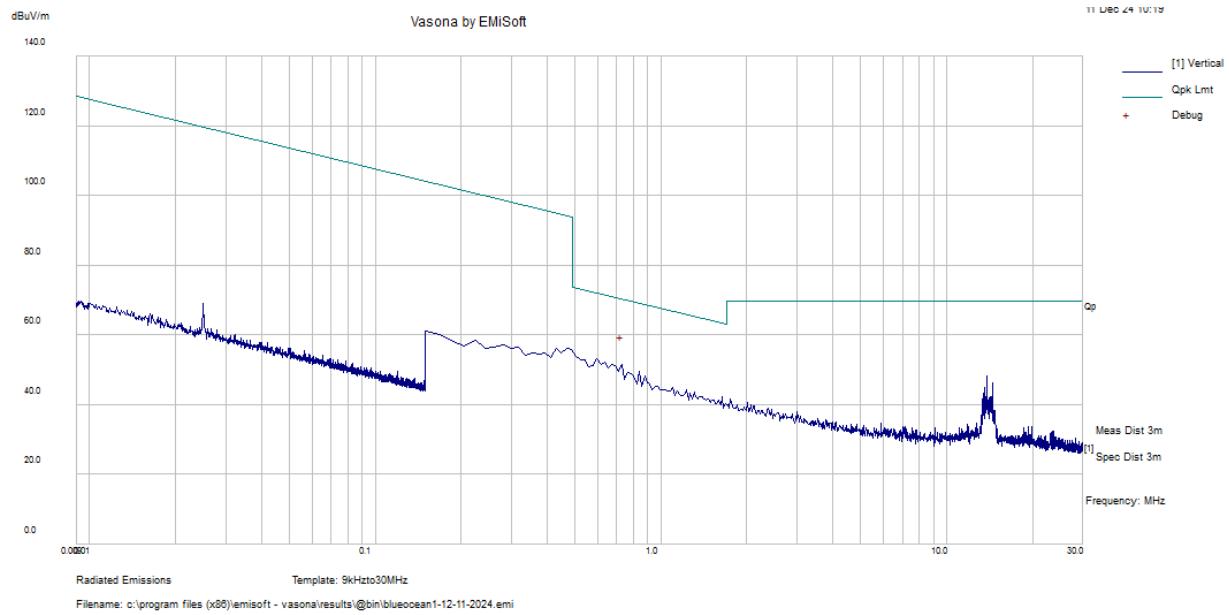
Worst Case – Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Configuration
-8.02	147.3633	Horizontal	colocation, short range antenna

Please refer to the tables and plots in the next section for detailed test results.

## 6.9 Radiated Emissions Test Results

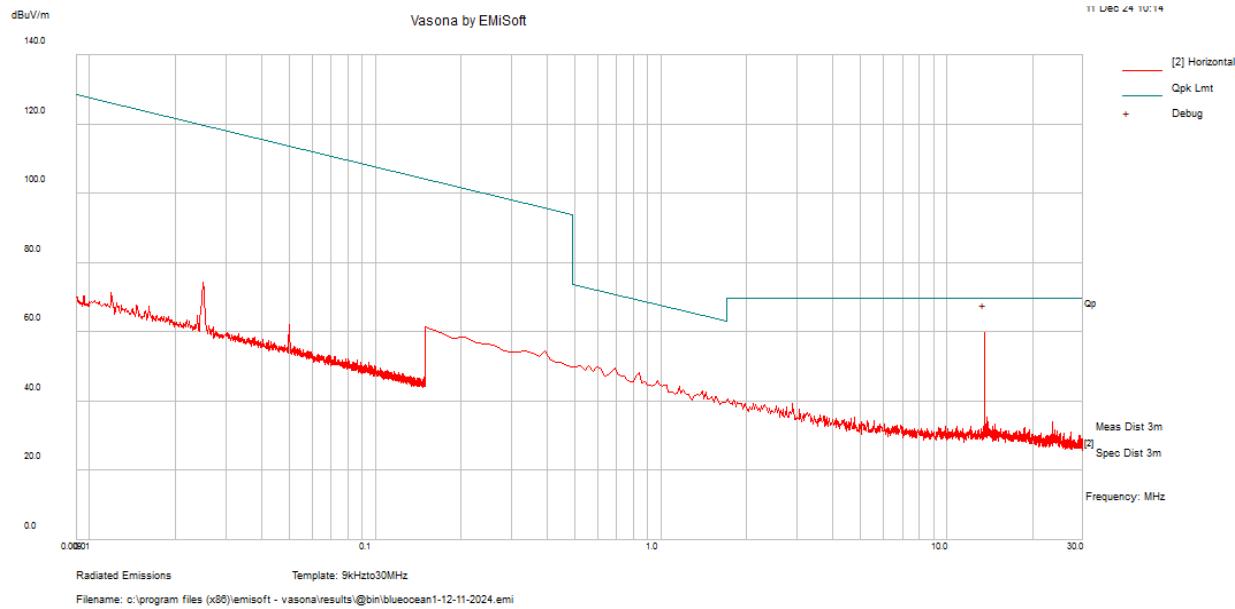
### 1) 9 kHz – 30 MHz, Measured at 3 meters

#### 915MHz, Parallel, Short Range Antenna



Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Correction Factor (dB/m)	Corrected Amplitude (dB $\mu$ V/m)	Antenna Height (cm)	Turntable Azimuth (degrees)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
0.728344	41.35	10.18	51.53	100	0	70.36	-18.83	Peak

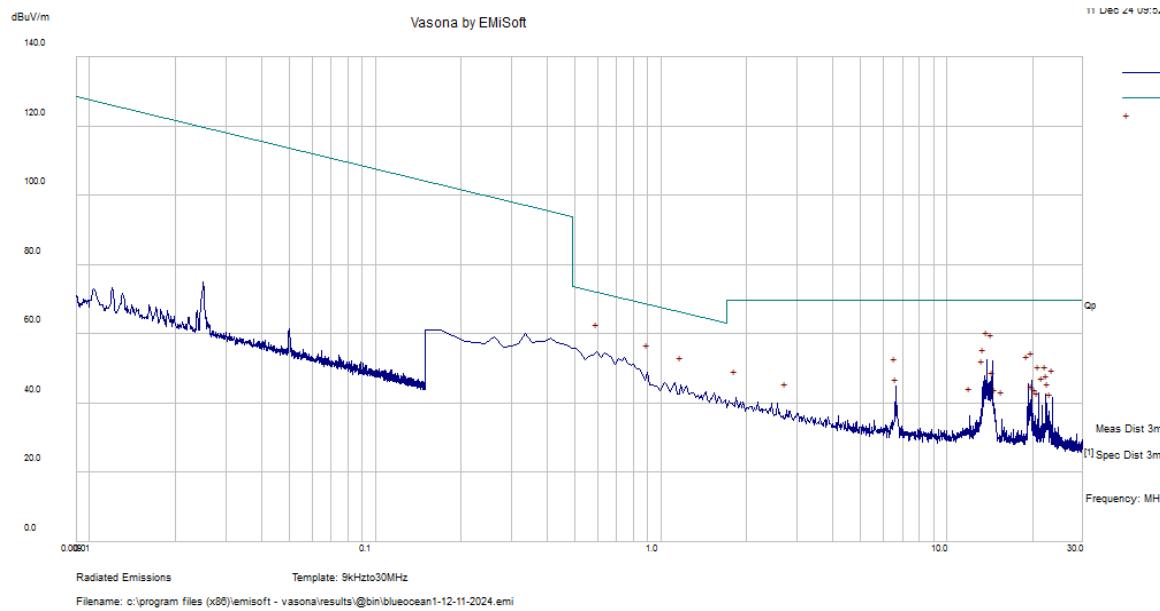
**Note:** A peak detector was used for the plot above, showing compliance for emissions below 30 MHz.

**915MHz, Perpendicular, Short Range Antenna**

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Correction Factor (dB/m)	Corrected Amplitude (dB $\mu$ V/m)	Antenna Height (cm)	Turntable Azimuth (degrees)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
13.5638	49.12	10.78	59.90	100	0	69.54	-9.64	Peak

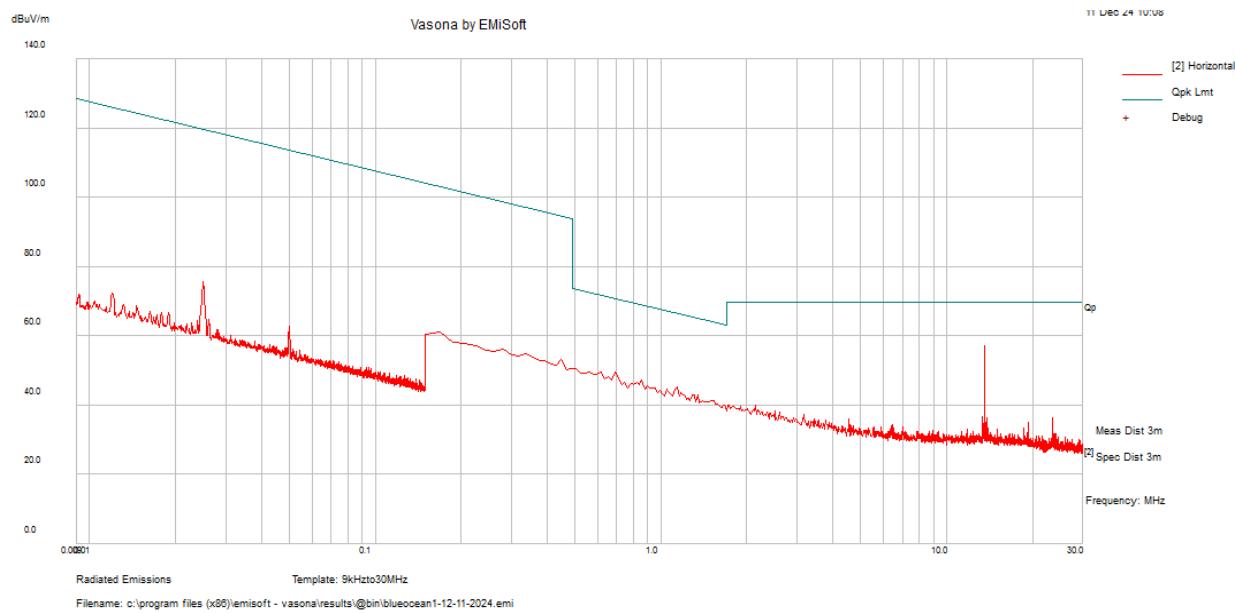
**Note:** A peak detector was used for the plot above, showing compliance for emissions below 30 MHz.

### 915MHz, Parallel, Long Range Antenna



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dB $\mu$ V/m)	Antenna Height (cm)	Turntable Azimuth (degrees)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
13.84369	41.71	10.76	52.47	100	0	69.54	-17.07	Peak
0.59775	44.67	10.22	54.89	100	0	72.08	-17.19	Peak
14.44069	41.3	10.71	52.01	100	0	69.54	-17.53	Peak
0.89625	38.75	10.13	48.88	100	0	68.56	-19.68	Peak
1.176094	35	10.2	45.2	100	0	66.2	-20.99	Peak
13.54519	36.92	10.79	47.71	100	0	69.54	-21.84	Peak

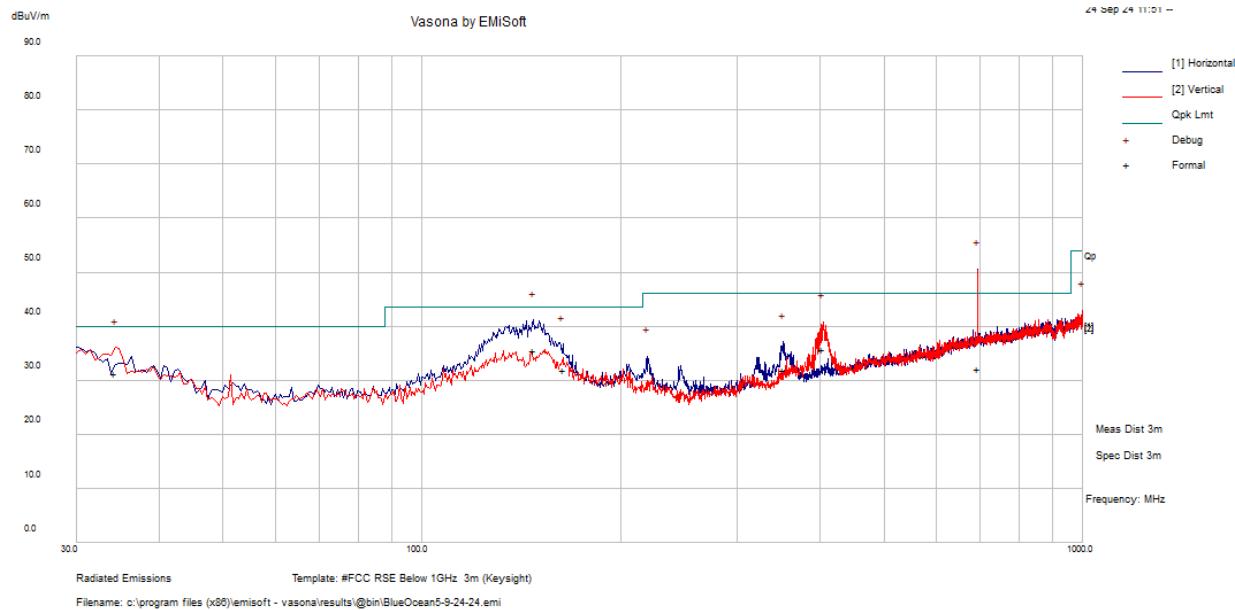
**Note:** A peak detector was used for the plot above, showing compliance for emissions below 30 MHz.

**915MHz, Perpendicular, Long Range Antenna**

**Note:** A peak detector was used for the plot above, showing compliance for emissions below 30 MHz.

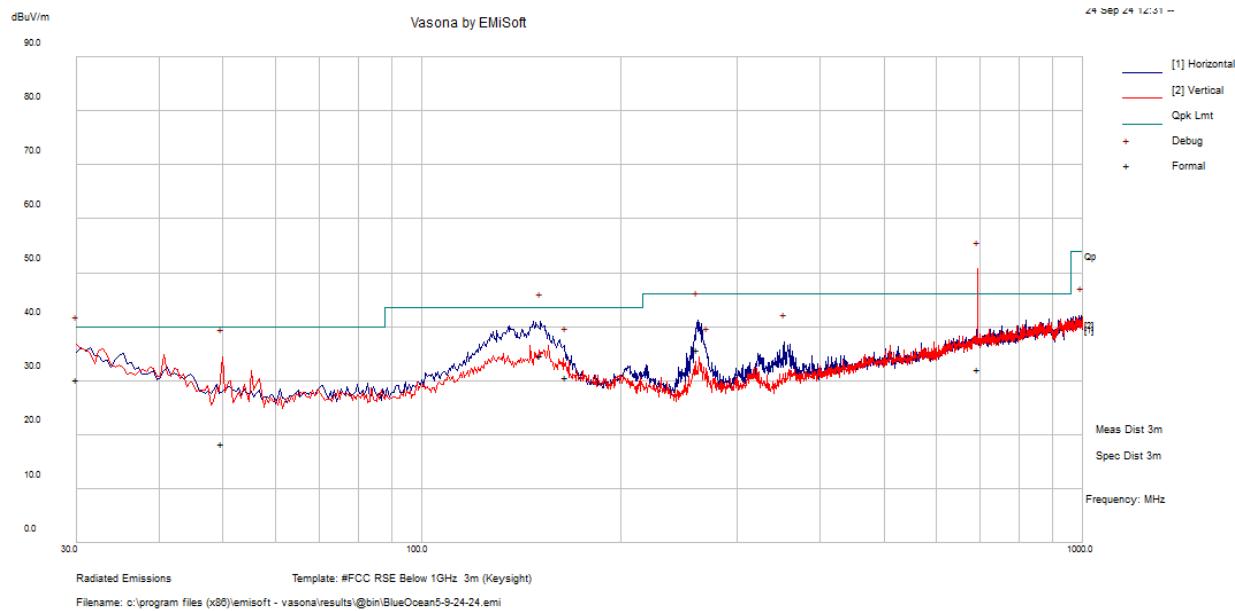
## 2) 30 MHz – 1 GHz, Measured at 3 meters

## 915MHz, Short Range Antenna



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dB $\mu$ V/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
692.8205	27.89	4.13	32.02	226	H	84	46	-13.98	QP
147.3633	42.94	-7.46	35.48	212	H	335	43.5	-8.02	QP
34.27375	34.78	-3.6	31.18	156	V	7	40	-8.82	QP
404.5188	38.6	-2.89	35.71	122	V	305	46	-10.29	QP
163.5433	39.7	-7.82	31.88	278	H	214	43.5	-11.62	QP
351.9555	36.18	-4.33	31.85	100	H	260	46	-14.15	QP

## 915MHz, Long Range Antenna



Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Correction Factor (dB/m)	Corrected Amplitude (dB $\mu$ V/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
692.8233	27.94	4.13	32.07	183	V	141	46	-13.93	QP
151.2455	42.25	-7.57	34.68	284	H	154	43.5	-8.82	QP
30	30.84	-0.6	30.24	290	V	14	40	-9.76	QP
261.4178	42.7	-7.01	35.69	105	H	119	46	-10.31	QP
49.84875	31.54	-13.22	18.32	165	V	265	40	-21.68	QP
165.295	38.59	-7.91	30.68	273	H	344	43.5	-12.82	QP

<b>FCC/IC Limits for 1 GHz to 18 GHz</b>			
<b>Applicability</b>	<b>(dBm)</b>	<b>(uV/m at 3meters)</b>	<b>(dBuV/m at 3meters)</b>
Restricted Band Average Limit	-	500	54 <sup>2</sup>
Restricted Band Peak Limit <sup>1</sup>	-	-	74

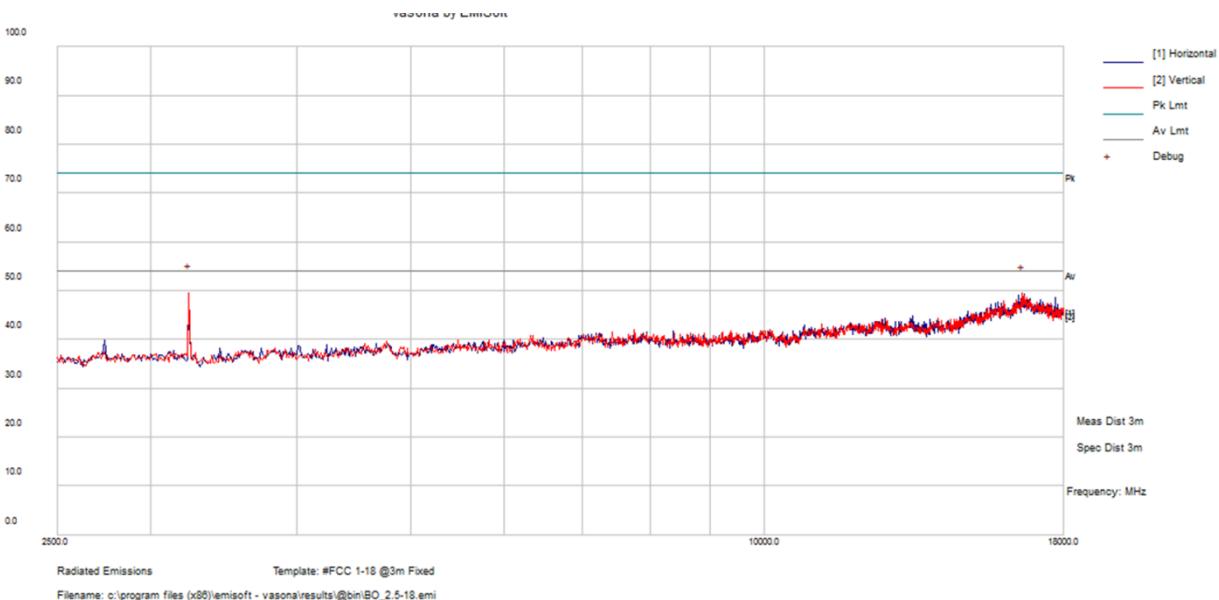
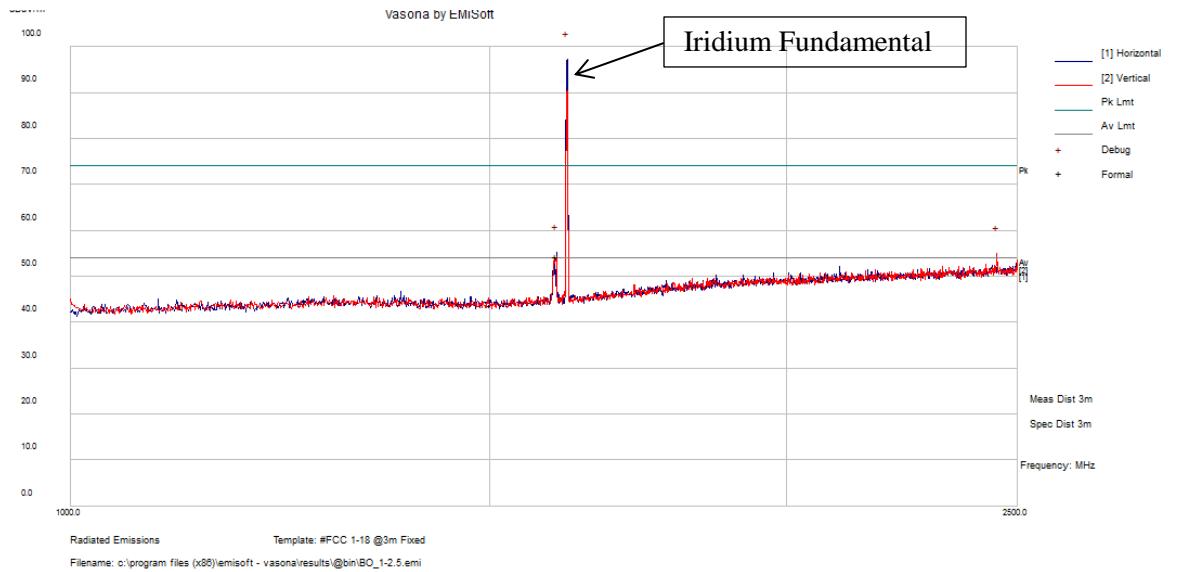
Note 1: Restricted Band Peak Limit is defined to be 20dB higher than Average Limit.

Note 2: Above 1GHz limit calculation:

$$\text{dBuV/m} = 20 * \log(\text{V/m}) + 120 = 20 * \log((500 \text{ [uV/m]}/1000000)) + 120 = 54 \text{ [dBuV/m]}$$

### 3) 1 GHz – 18 GHz, Measured at 3 meters

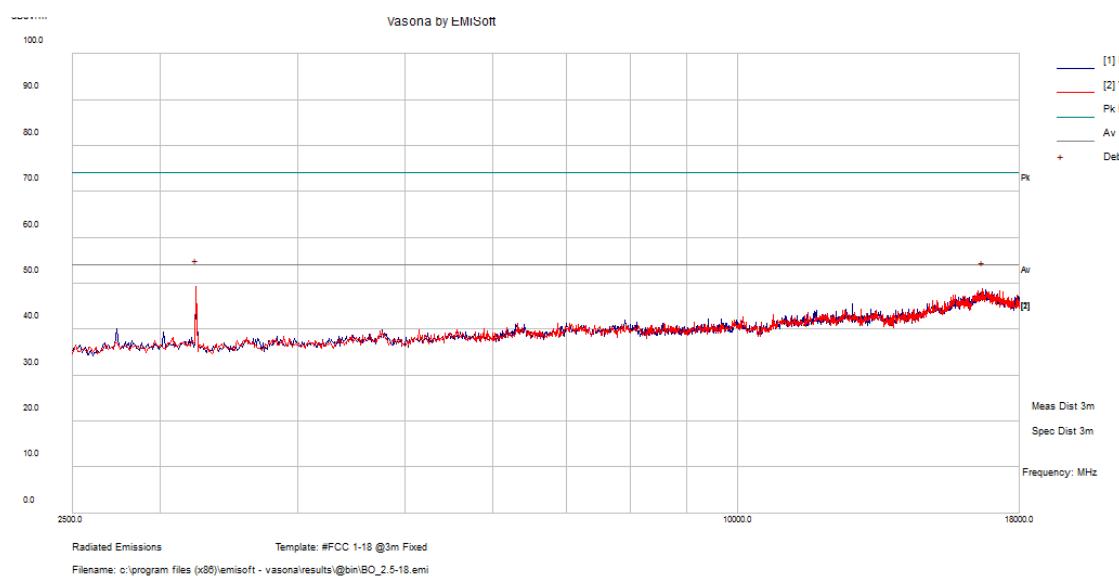
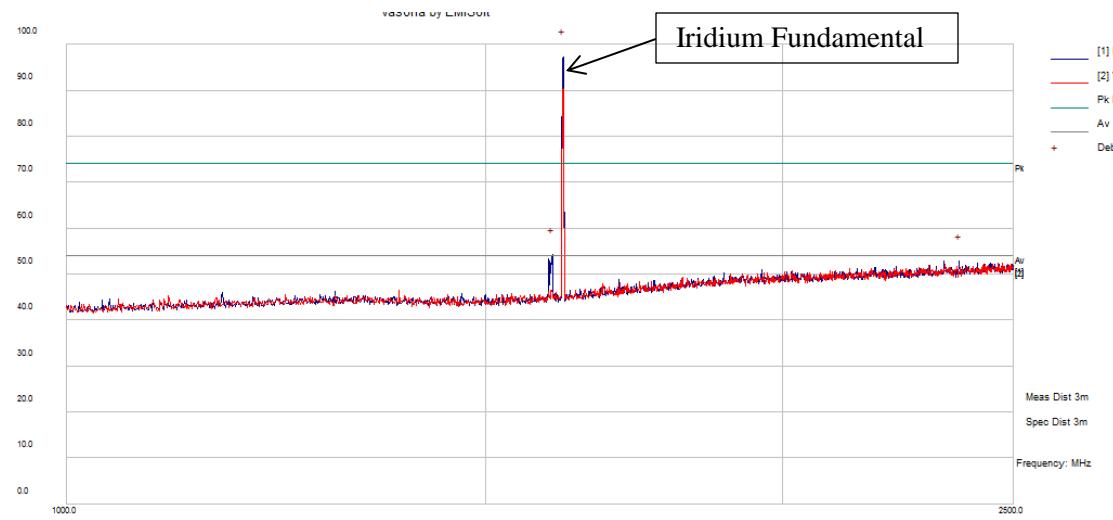
#### 915MHz, Short Range Antenna (1-2.5GHz + 2.5-18GHz)



Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Correction Factor (dB/m)	Corrected Amplitude (dB $\mu$ V/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
1599.695	25.05	32.92	57.97	268	H	14	74	-16.03	Peak
2452.255	18.58	38.08	56.66	236	V	157	74	-17.34	Peak
1599.695	9.11	32.92	42.03	268	H	14	54	-11.97	Avg
2452.255	14.6	38.09	42.69	236	V	157	54	-11.31	Avg

**Note:** The plot above shows that all peak emissions below 18GHz passed the average limits.

## 915MHz, Long Range Antenna(1-2.5GHz + 2.5-18GHz)



Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Correction Factor (dB/m)	Corrected Amplitude (dB $\mu$ V/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
1599.985	24.91	32.92	57.83	273	H	20	74	-16.17	Peak
1599.985	8.44	32.92	41.36	273	H	20	54	-12.64	Avg

**Note:** The plot above shows that all peak emissions below 18GHz passed the average limits.

## 7 FCC §15.247(a) (2) & ISEDC RSS-247 §5.2, RSS-Gen §6.7 – Emission Bandwidth

### 7.1 Applicable Standards

According to RSS-247 §6.7: The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs. In some cases, the “x dB bandwidth” is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

According to FCC §15.247(a) (2) and ISEDC RSS-247 §5.2: the minimum 6 dB bandwidth shall be 500 kHz.

### 7.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v05r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 8: DTS bandwidth.

As per ANSI C63.10 Clause 6.9.3: Occupied bandwidth—power bandwidth (99%) measurement procedure

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

The following procedure shall be used for measuring 99% power bandwidth:

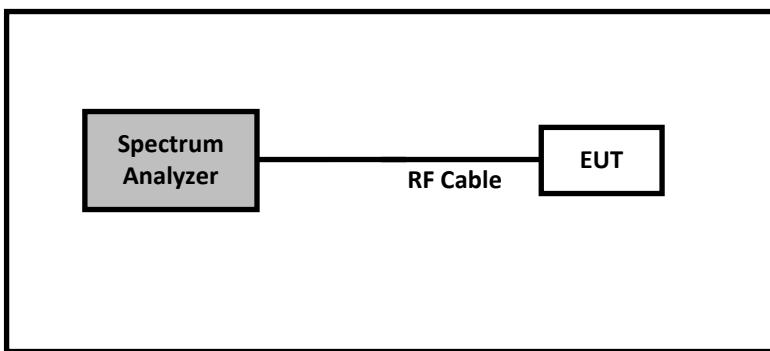
- a. The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
- b. The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
- c. Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than  $[10 \log (\text{OBW}/\text{RBW})]$  below the reference level. Specific guidance is given in 4.1.5.2.
- d. Step a) through step c) might require iteration to adjust within the specified range.
- e. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
- f. Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.
- g. If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.
- h. The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

As per ANSI C63.10 Clause 11.8: DTS bandwidth

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described in 11.8.1 (i.e.,  $RBW = 100$  kHz,  $VBW \geq 3 \times RBW$ , and peak detector with maximum hold) is implemented by the instrumentation function.

When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be  $\geq 6$  dB.

### 7.3 Test Setup Block Diagram



### 7.4 Test Equipment List and Details

BACL No	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Spectrum Analyzer	E4446A	MY48250238	2024-06-14	1 year
-	-	RF Cable	-	-	Each Time <sup>1</sup>	-

Note<sup>1</sup>: cables included in the test set-up were 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".

### 7.5 Test Environmental Conditions

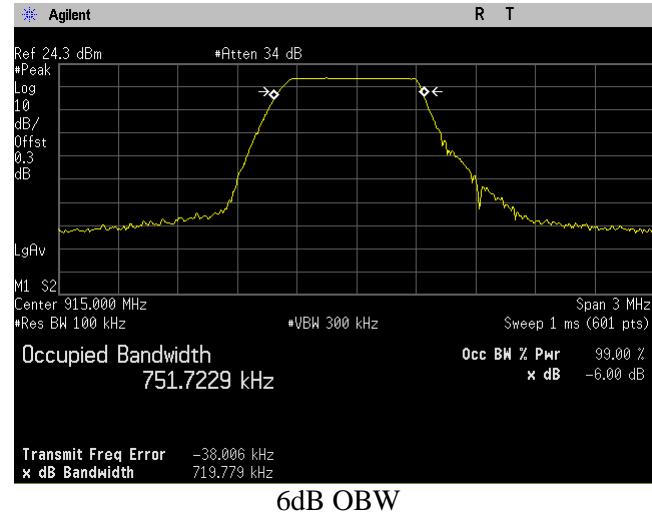
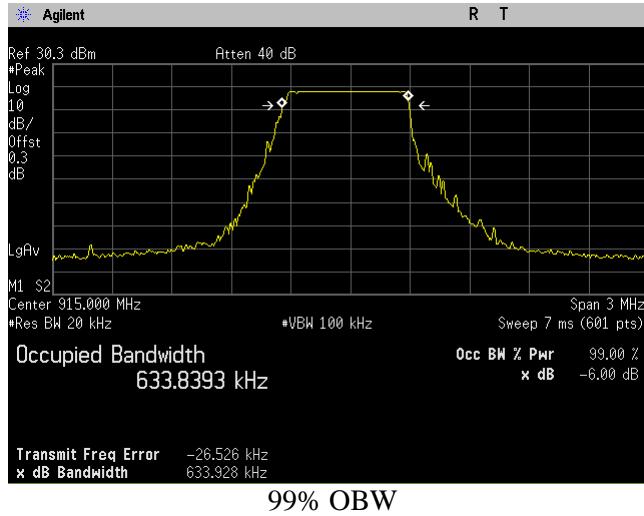
Temperature:	23.1 °C
Relative Humidity:	56.8 %
ATM Pressure:	101.3 kPa

The testing was performed by Michael Papa from 2024-09-05 RF test site.

## 7.6 Test Results

Frequency (MHz)	99% OBW (kHz)	6 dB OBW (kHz)	6 dB OBW Limit (kHz)	Result
915	633.839	719.779	$\geq 500$	Pass

Please refer to the following plots for detailed Emissions Bandwidth test results.



## 8 FCC §15.247(b)(3) & ISEDC RSS-247 §5.4 – Maximum Output Power

### 8.1 Applicable Standards

According to FCC §15.247(b)(3): For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to RSS-247 §5.4: For DTS employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

### 8.2 Measurement Procedure

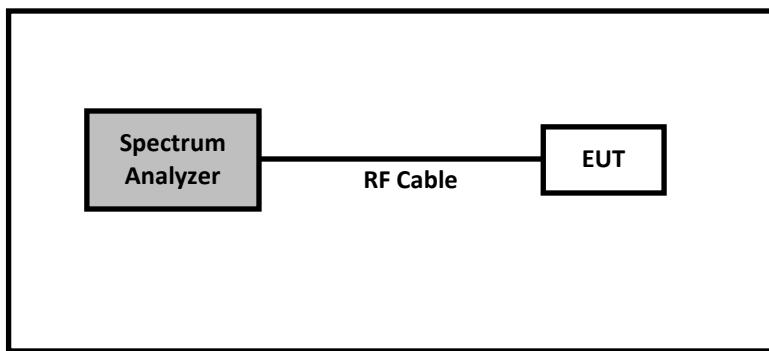
The measurements are based on ANSI C63.10-2013, Section 11.9.2.2.2.

#### 11.9.2.2.2 Method AVGSA-1

Method AVGSA-1 uses trace averaging with the EUT transmitting at full power throughout each sweep. The procedure for this method is as follows:

- a. Set span to at least 1.5 times the OBW.
- b. Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.
- c. Set VBW  $\geq [3 \times \text{RBW}]$ .
- d. Number of points in sweep  $\geq [2 \times \text{span} / \text{RBW}]$ . (This gives bin-to-bin spacing  $\leq \text{RBW} / 2$ , so that narrowband signals are not lost between frequency bins.)
- e. Sweep time = auto.
- f. Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
- g. If transmit duty cycle  $< 98\%$ , use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at the maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no OFF intervals) or at duty cycle  $\geq 98\%$ , and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run.”
- h. Trace average at least 100 traces in power averaging (rms) mode.
- i. Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

### 8.3 Test Setup Block Diagram



### 8.4 Test Equipment List and Details

BACL No	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Spectrum Analyzer	E4446A	MY48250238	2024-06-14	1 year
-	-	RF Cable	-	-	Each Time <sup>1</sup>	-

Note<sup>1</sup>: cables, attenuators and notch filters included in the test set-up were 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”.

### 8.5 Test Environmental Conditions

Temperature:	23.1 °C
Relative Humidity:	56.8 %
ATM Pressure:	101.3 kPa

The testing was performed by Michael Papa from 2024-09-24 at RF test site.

## 8.6 Test Results

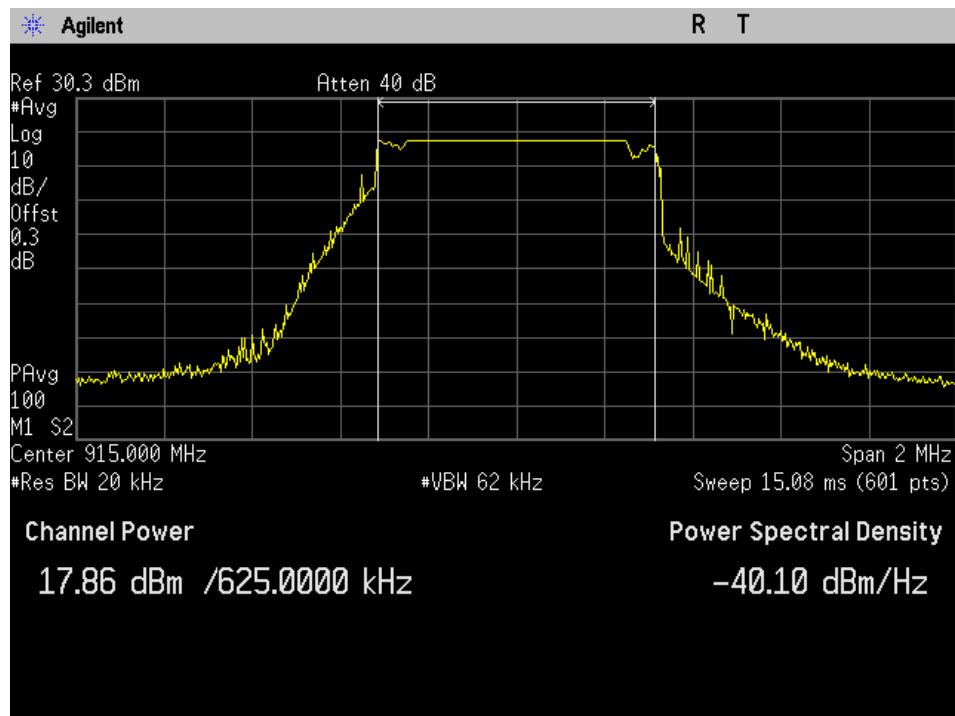
Frequency (MHz)	Maximum Antenna Gain (dBi)	Conducted Output Power (dBm)	Conducted Output Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)	Result
915	3.5	17.86	< 30	21.36	< 36	Pass

Note 1: EIRP [dBm] = Conducted Output Power [dBm] + Antenna Gain [dBi].

Note 2: Conducted Output Power Limit [dBm] =  $10 \log(Power[mW]/1mW) = 10 \log(1000mW/1mW) = 30 \text{ dBm}$

Note 3: EIRP Limit [dBm] =  $10 \log(Power[mW]/1mW) = 10 \log(4000mW/1mW) = 36 \text{ dBm}$

Please refer to the following plot for detailed Maximum Output Power test results.



## 9 FCC §15.247(e) & ISEDC RSS-247 §5.2(2) – Peak Power Spectral Density

### 9.1 Applicable Standards

According to ECFR §15.247(e) and RSS-247 §5.2 ( 2 ) , for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 9.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v05r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 8.4: Maximum power spectral density level in the fundamental emission.

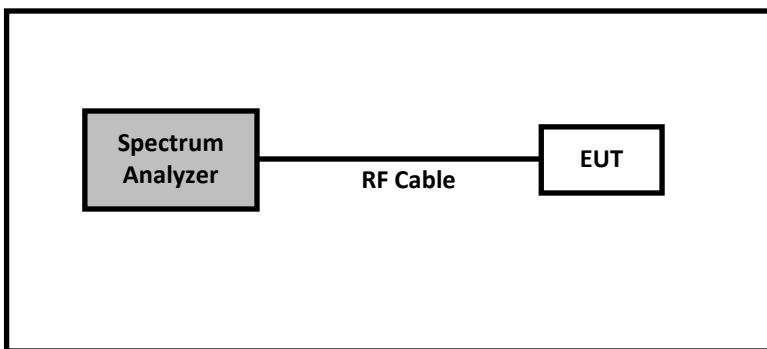
As per ANSI C63.10 Clause 11.10: Maximum power spectral density level in the fundamental emission

Some regulatory requirements specify a conducted PSD limit within the DTS bandwidth during any time interval of continuous transmission.<sup>88</sup> Such specifications require that the same method as used to determine the conducted output power shall be used to determine the power spectral density. If maximum peak conducted output power was measured, then the peak PSD procedure 11.10.2 (method PKPSD) shall be used. If maximum conducted output power was measured, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option):

**Method AVGPSD-1 (average PSD):** The following procedure may be used when the maximum (average) conducted output power was used to determine compliance to the fundamental output power limit. This is the baseline method for determining the maximum (average) conducted PSD level. If the instrument has a power averaging (rms) detector, then it must be used; otherwise, use the sample detector. The EUT must be configured to transmit continuously ( $D \geq 98\%$ ), or else sweep triggering/signal gating must be implemented to ensure that measurements are made only when the EUT is transmitting at its maximum power control level (no transmitter OFF time to be considered):

- a. Set analyzer center frequency to DTS channel center frequency.
- b. Set the span to 1.5 times the OBW
- c. Set the RBW to  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d. Set the VBW  $\geq [3 \times \text{RBW}]$ .
- e. Detector = power averaging (rms) or sample detector (when rms not available).
- f. Ensure that the number of measurement points in the sweep  $\geq [2 \times \text{span} / \text{RBW}]$ .
- g. Sweep time = auto couple.
- h. Employ trace averaging (rms) mode over a minimum of 100 traces.
- i. Use the peak marker function to determine the maximum amplitude level.
- j. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

### 9.3 Test Setup Block Diagram



### 9.4 Test Equipment List and Details

BACL No	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Spectrum Analyzer	E4446A	MY48250238	2024-06-14	1 year
-	-	RF Cable	-	-	Each Time <sup>1</sup>	-

Note<sup>1</sup>: cables included in the test set-up were 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”.

### 9.5 Test Environmental Conditions

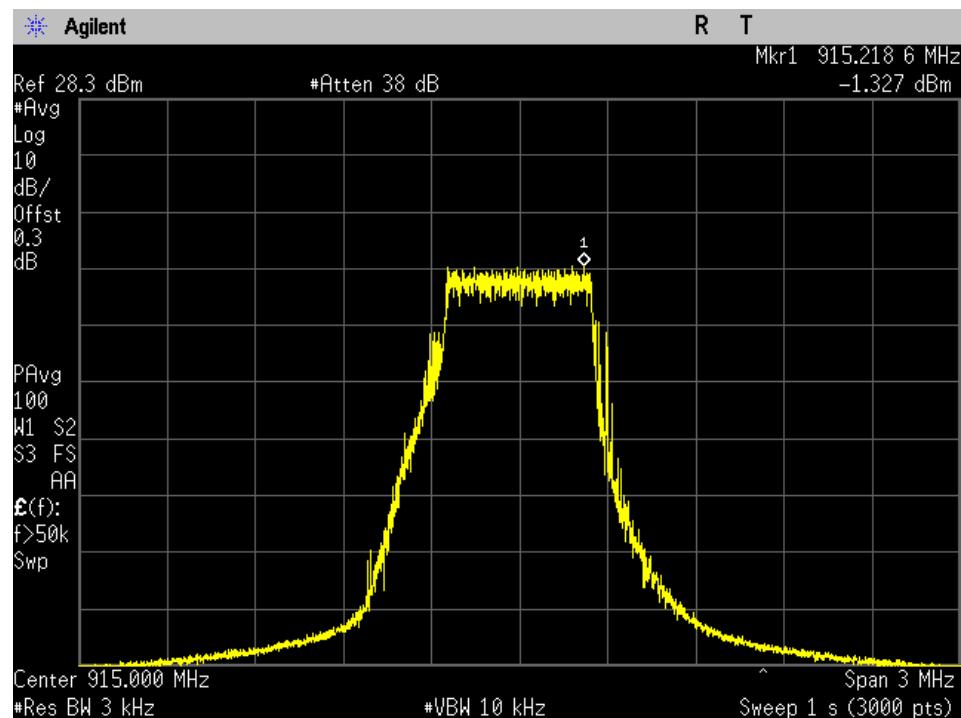
<b>Temperature:</b>	23.1 °C
<b>Relative Humidity:</b>	56.8 %
<b>ATM Pressure:</b>	101.3 kPa

The testing was performed by Michael Papa on 2024-09-24 at RF test site.

## 9.6 Test Results

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low	915	-1.327	< 8	Pass

Please refer to the following for detailed Peak Power Spectral Density test results.



## 10 FCC §15.247(d) & ISEDC RSS-247 §5.5 – 100 kHz Spurious Emissions at Antenna Terminal (dBc)

### 10.1 Applicable Standards

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

According to ISEDC RSS-247 §5.5. In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

### 10.2 Measurement Procedure

Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation

RBW = 100 kHz

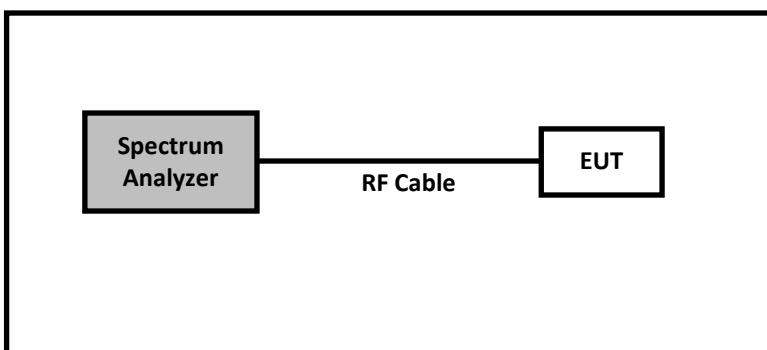
VBW = 300 kHz

Sweep = coupled

Detector function = peak

Trace = max hold

### 10.3 Test Setup Block Diagram



## 10.4 Test Equipment List and Details

BACL No	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Spectrum Analyzer	E4446A	MY48250238	2024-06-14	1 year
-	-	RF Cable	-	-	Each Time <sup>1</sup>	-

Note<sup>1</sup>: cables included in the test set-up were 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”.

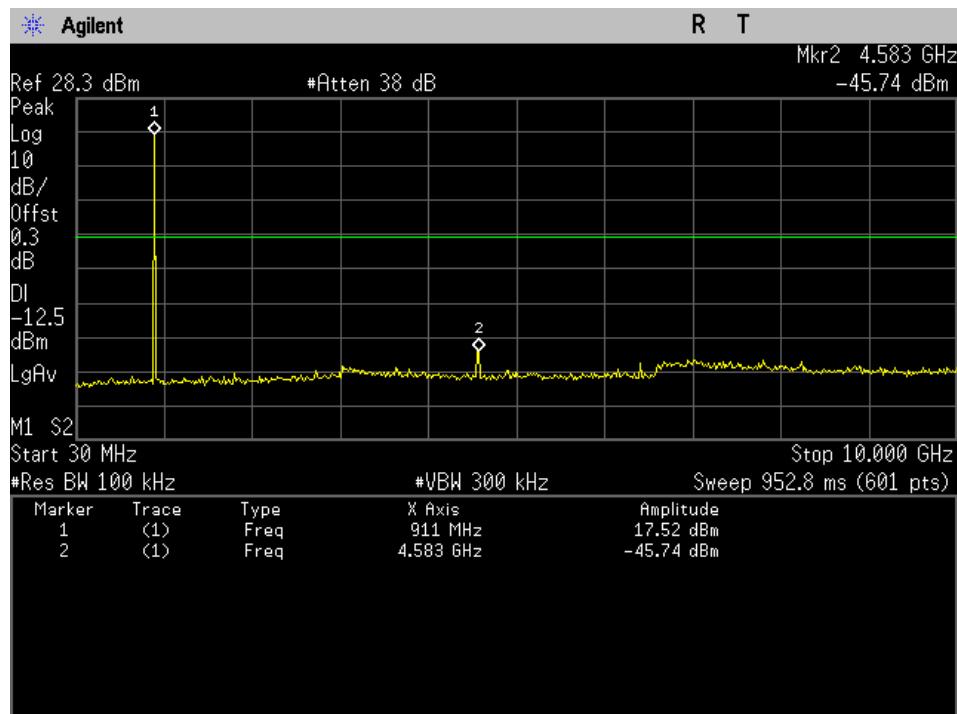
## 10.5 Test Environmental Conditions

<b>Temperature:</b>	23.1 °C
<b>Relative Humidity:</b>	56.8 %
<b>ATM Pressure:</b>	101.3 kPa

The testing was performed by Michael Papa on 2024-09-24 at RF test site.

## 10.6 Test Results

Please refer to the following plot for detailed 100 kHz Spurious Emissions at Antenna Terminal (dBc) test results.



## **11 Appendix A (Normative) – EUT Test Setup Photographs**

Please refer to the attachment.

## **12 Appendix B (Normative) – EUT External Photographs**

Please refer to the attachment

## **13 Appendix C (Normative) – EUT Internal Photographs**

## 14 Appendix 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 13<sup>th</sup> day of September 2024.

A handwritten signature in blue ink.

Mr. Trace McInturff, Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 3297.02  
Valid to September 30, 2026

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 ---