

# Ossia, Inc.

REVISED TEST REPORT TO 102778-12

**Cota Forever Tracker Client  
Model: Tracker Rx**

**Tested to The Following Standards:**

**FCC Part 15 Subpart C Section(s)**

**15.247  
(DTS 2400-2483.5 MHz)**

**Report No.: 102778-12A**

**Date of issue: August 30, 2019**



**Test Certificate # 803.01**

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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## ADMINISTRATIVE INFORMATION

### Test Report Information

**REPORT PREPARED FOR:**

Ossia, Inc.  
1100 112th Ave NE Suite 301  
Bellevue WA 98004

Representative: Bob McDonald  
Customer Reference Number: 13076

**DATE OF EQUIPMENT RECEIPT:****DATE(S) OF TESTING:****REPORT PREPARED BY:**

Darcy Thompson  
CKC Laboratories, Inc.  
5046 Sierra Pines Drive  
Mariposa, CA 95338

Project Number: 102778

July 1, 2019

July 1-2, 2019

### Revision History

**Original:** Testing of the Cota Forever Tracker Client, Model: Tracker Rx to FCC Part 15 Subpart C Section(s) 15.247 (DTS 2400-2483.5 MHz)

**Revision A:** Changed NA2 definition for Summary of Results table. Added Conditions During Testing description with block diagram. Changed 15.247(b)(3) Output Power Test Data Summary - Voltage Variations description. Replaced the 15.247(e) Power Spectral Density data table. Added statement to test conditions for 15.247(d) Radiated Emissions & Band Edge. Replaced the 15.247 Radiated Band Edge plots and data.

### Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



**Steve Behm**  
*Director of Quality Assurance & Engineering Services*  
CKC Laboratories, Inc.

## Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):  
CKC Laboratories, Inc.  
22116 23rd Drive S.E., Suite A  
Canyon Park, Bothell, WA 98021

## Software Versions

| CKC Laboratories Proprietary Software | Version |
|---------------------------------------|---------|
| EMITest Emissions                     | 5.03.12 |

## Site Registration & Accreditation Information

| Location                 | *NIST CB # | FCC    | Japan  |
|--------------------------|------------|--------|--------|
| Canyon Park, Bothell, WA | US0081     | US1022 | A-0136 |
| Brea, CA                 | US0060     | US1025 | A-0136 |
| Fremont, CA              | US0082     | US1023 | A-0136 |
| Mariposa, CA             | US0103     | US1024 | A-0136 |

\*CKC's list of NIST designated countries can be found at: <https://standards.gov/cabs/designations.html>

## SUMMARY OF RESULTS

### Standard / Specification: FCC Part 15 Subpart C - 15.247 (DTS)

| Test Procedure | Description                        | Modifications | Results |
|----------------|------------------------------------|---------------|---------|
| 15.247(a)(2)   | 6dB Bandwidth                      | NA            | Pass    |
| 15.247(b)(3)   | Output Power                       | NA            | Pass    |
| 15.247(e)      | Power Spectral Density             | NA            | Pass    |
| 15.247(d)      | RF Conducted Emissions & Band Edge | NA            | NA1     |
| 15.247(d)      | Radiated Emissions & Band Edge     | NA            | Pass    |
| 15.207         | AC Conducted Emissions             | NA            | NA2     |

NA = Not Applicable

NA1 = Not applicable because the EUT has an integral antenna.

NA2 = Not applicable because the manufacturer declares the EUT cannot transmit with the IEE802.15.4 radio while charging via the USB interface (wired charging).

#### ISO/IEC 17025 Decision Rule

The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

## Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

#### Summary of Conditions

No modifications were made during testing.

**Modifications listed above must be incorporated into all production units.**

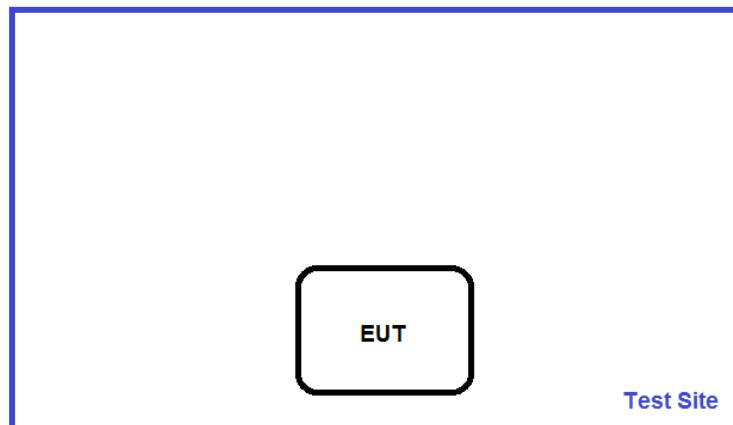
## Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

### Summary of Conditions

The manufacturer declares the EUT is a wireless power client with integrated battery that is capable of being charged wirelessly with a Part 18 device, or via USB charging. The EUT also consists of an IEEE802.15.4 radio and a beacon radio. The EUT cannot transmit while charging via USB interface (wired charging) so that configuration was not investigated for the radio emissions. The EUT was only tested as a standalone device (Configuration 1). The beacon radio emissions, unintentional emissions of the USB charging configuration, as well as the wireless charging functions are considered under the appropriate relevant standards separate reports. The manufacturer declares the radio under test was set to maximum output during testing.

## Test Setup Block Diagram



## EQUIPMENT UNDER TEST (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

### Configuration 1

#### Equipment Tested:

| Device                      | Manufacturer | Model #    | S/N  |
|-----------------------------|--------------|------------|------|
| Cota Forever Tracker Client | Ossia, Inc.  | Tracker Rx | 728B |

#### Support Equipment:

| Device | Manufacturer | Model # | S/N |
|--------|--------------|---------|-----|
| None   |              |         |     |

## General Product Information:

| Product Information                | Manufacturer-Provided Details |
|------------------------------------|-------------------------------|
| Equipment Type:                    | Stand-Alone Equipment         |
| Type of Wideband System:           | Zigbee 802.15.4               |
| Operating Frequency Range:         | 2405-2480MHz                  |
| Modulation Type(s):                | OQPSK                         |
| Maximum Duty Cycle:                | 100% tested as worst case     |
| Number of TX Chains:               | 1                             |
| Antenna Type(s) and Gain:          | Patch, 6dBi                   |
| Beamforming Type:                  | NA                            |
| Antenna Connection Type:           | Integral                      |
| Nominal Input Voltage:             | Battery (3.7 VDC)             |
| Firmware / Software used for Test: | 0.17_TC8                      |

## FCC Part 15 Subpart C

### 15.247(a)(2) 6dB Bandwidth

| Test Setup/Conditions |                                                                                                                                                                |                |             |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------|
| Test Location:        | Bothell Lab C3                                                                                                                                                 | Test Engineer: | M. Atkinson |
| Test Method:          | ANSI C63.10 (2013), KDB 558074 v05r02 (April 2, 2019)                                                                                                          | Test Date(s):  | 7/1/2019    |
| Configuration:        | 1                                                                                                                                                              |                |             |
| Test Setup:           | <p>Test mode: Continuously Modulated</p> <p>The EUT is operating with a fresh battery installed.</p> <p>The EUT is set 1.5 meters high on Styrofoam table.</p> |                |             |

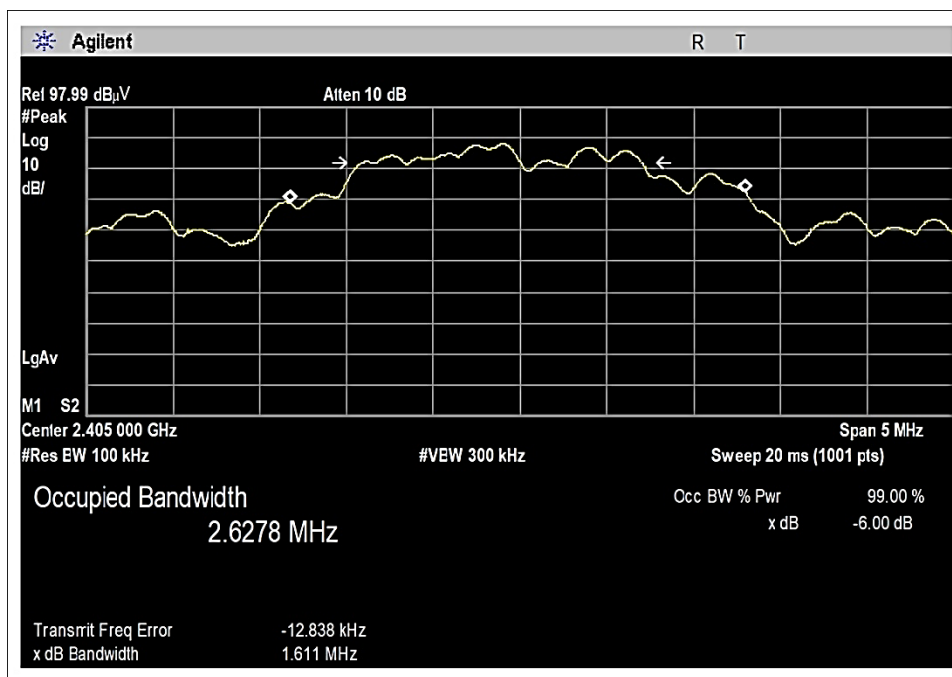
| Environmental Conditions |       |                        |       |
|--------------------------|-------|------------------------|-------|
| Temperature (°C)         | 21-23 | Relative Humidity (%): | 35-40 |

| Test Equipment |                   |              |                      |            |            |
|----------------|-------------------|--------------|----------------------|------------|------------|
| Asset#         | Description       | Manufacturer | Model                | Cal Date   | Cal Due    |
| 02871          | Spectrum Analyzer | Agilent      | E4440A               | 1/9/2019   | 1/9/2021   |
| P06540         | Cable             | Andrews      | Heliac               | 10/30/2017 | 10/30/2019 |
| P06515         | Cable             | Andrews      | Heliac               | 6/29/2018  | 6/29/2020  |
| 03540          | Preamplifier      | HP           | 83017A               | 5/13/2019  | 5/13/2021  |
| P06503         | Cable             | Astrolab     | 32026-29801-29801-36 | 3/13/2018  | 3/13/2020  |
| 01467          | Horn Antenna      | EMCO         | 3115                 | 7/21/2017  | 7/21/2019  |
| P07226         | Attenuator        | Pasternack   | PE7004-6             | 12/1/2017  | 12/1/2019  |

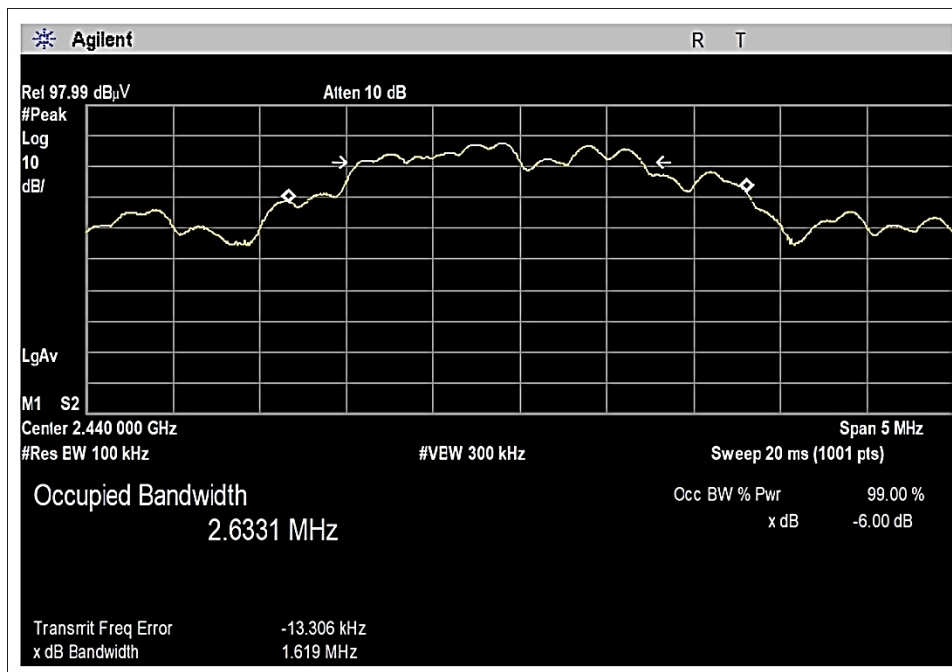
| Test Data Summary |              |            |                |             |         |
|-------------------|--------------|------------|----------------|-------------|---------|
| Frequency (MHz)   | Antenna Port | Modulation | Measured (kHz) | Limit (kHz) | Results |
| 2405              | 1            | OQPSK      | 1611           | ≥500        | Pass    |
| 2440              | 1            | OQPSK      | 1619           | ≥500        | Pass    |
| 2480              | 1            | OQPSK      | 1600           | ≥500        | Pass    |



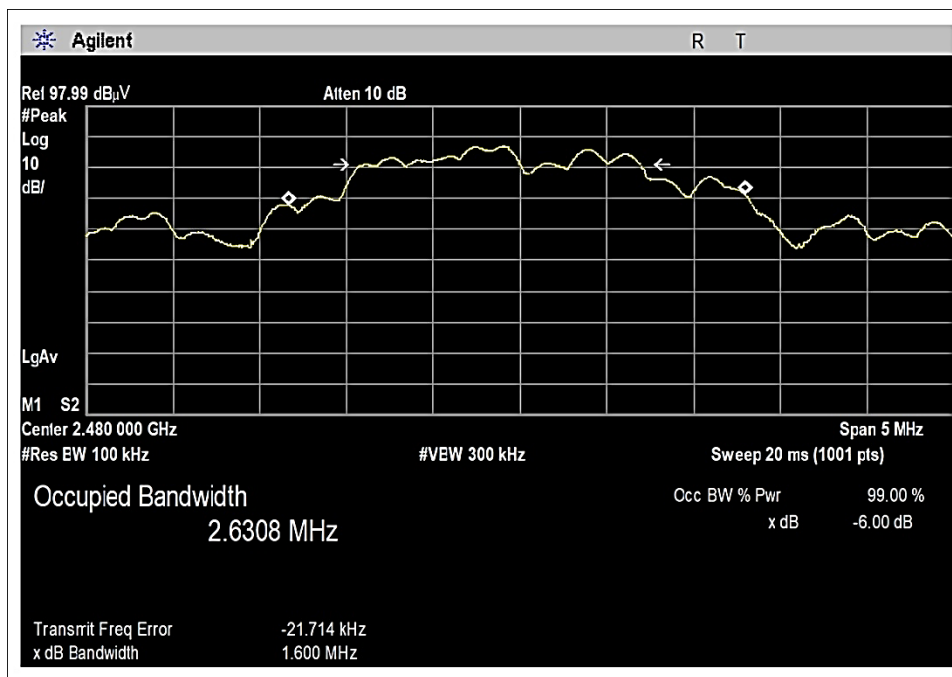
## Plot(s)



Low Channel



Middle Channel



High Channel

### Test Setup Photo(s)



## 15.247(b)(3) Output Power

### Test Data Summary - Voltage Variations

This equipment is battery powered and manufacturer declares the radio under test cannot operate while charging via USB. The manufacturer declares the voltage supplied to the radio circuitry from the battery is regulated. Power output tests were performed using a fresh battery.

### Test Data Summary - Radiated Measurement

Measurement Option: RBW > DTS Bandwidth

| Frequency (MHz) | Modulation | Ant. Type / Gain (dBi) | Field Strength (dBuV/m @3m) | Calculated EIRP (dBm) | Calculated Conducted Power (dBm) | Conducted Power Limit (dBm) | Results |
|-----------------|------------|------------------------|-----------------------------|-----------------------|----------------------------------|-----------------------------|---------|
| 2405            | OQPSK      | Integral / 6dBi        | 94.9                        | -0.33                 | -6.33                            | ≤30                         | Pass    |
| 2440            | OQPSK      | Integral / 6dBi        | 95.1                        | -0.13                 | -6.13                            | ≤30                         | Pass    |
| 2480            | OQPSK      | Integral / 6dBi        | 94.5                        | -0.73                 | -6.73                            | ≤30                         | Pass    |

For fixed point-to-point antennas, the limit is calculated in accordance with 15.247(c)(1):  $Limit = 30 - Roundup\left(\frac{G-6}{3}\right)$

For directional beamforming antennas, the limit is calculated in accordance with 15.247(c)(2) and KDB 662911.

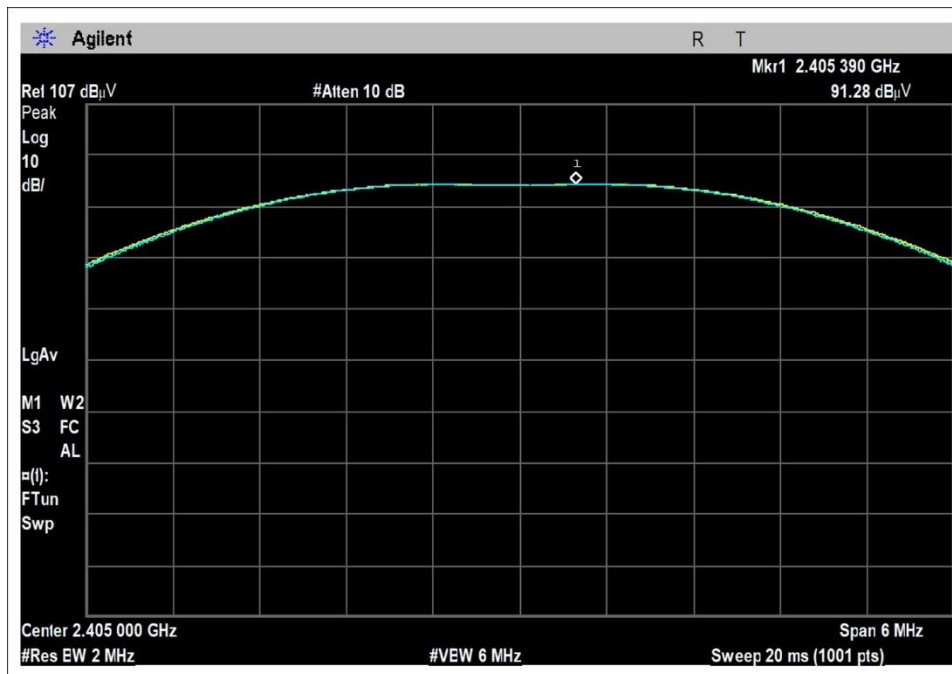
Conducted RF output power calculated in accordance with ANSI C63.10.

$$P(W) = \frac{(E \cdot d)^2}{30 G}$$

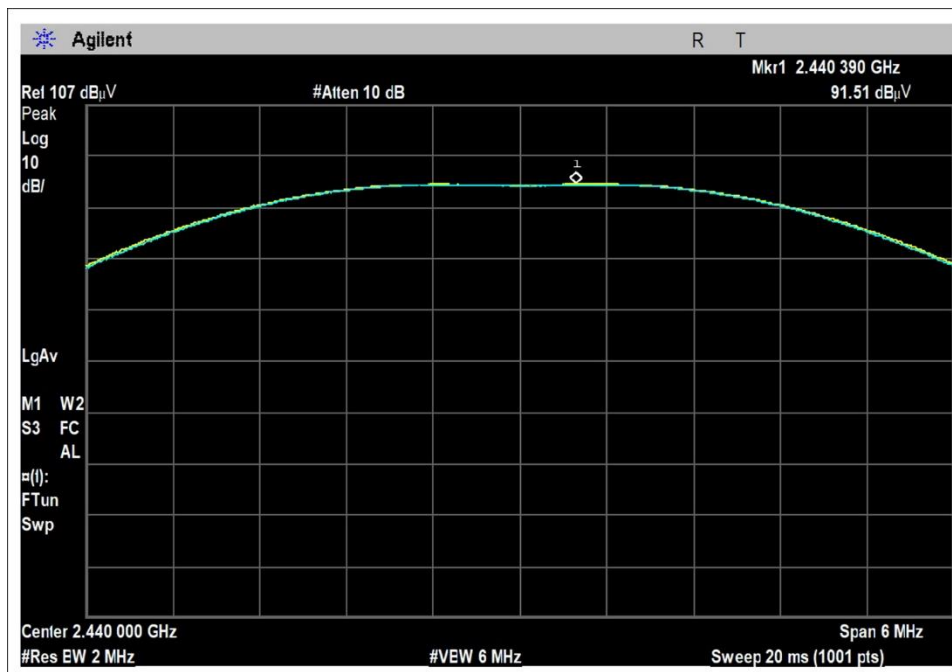
Or equivalently, in logarithmic form:

$$P(dBm) = E(dBuV/m) + 20LOG(d) - G - 104.77$$

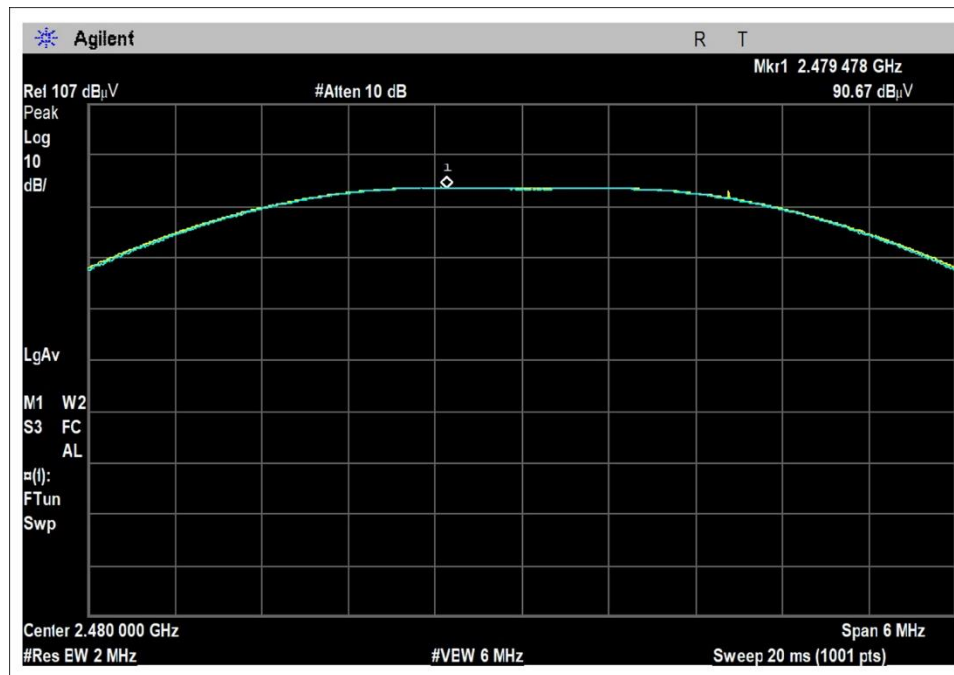
## Plots



Low Channel



Middle Channel



High Channel

### Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Ossia, Inc.**  
 Specification: **15.247(b) Power Output (2400-2483.5 MHz DTS)**  
 Work Order #: **102778** Date: 7/1/2019  
 Test Type: **Maximized Emissions** Time: 15:44:09  
 Tested By: Michael Atkinson Sequence#: 13  
 Software: EMITest 5.03.12

#### *Equipment Tested:*

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

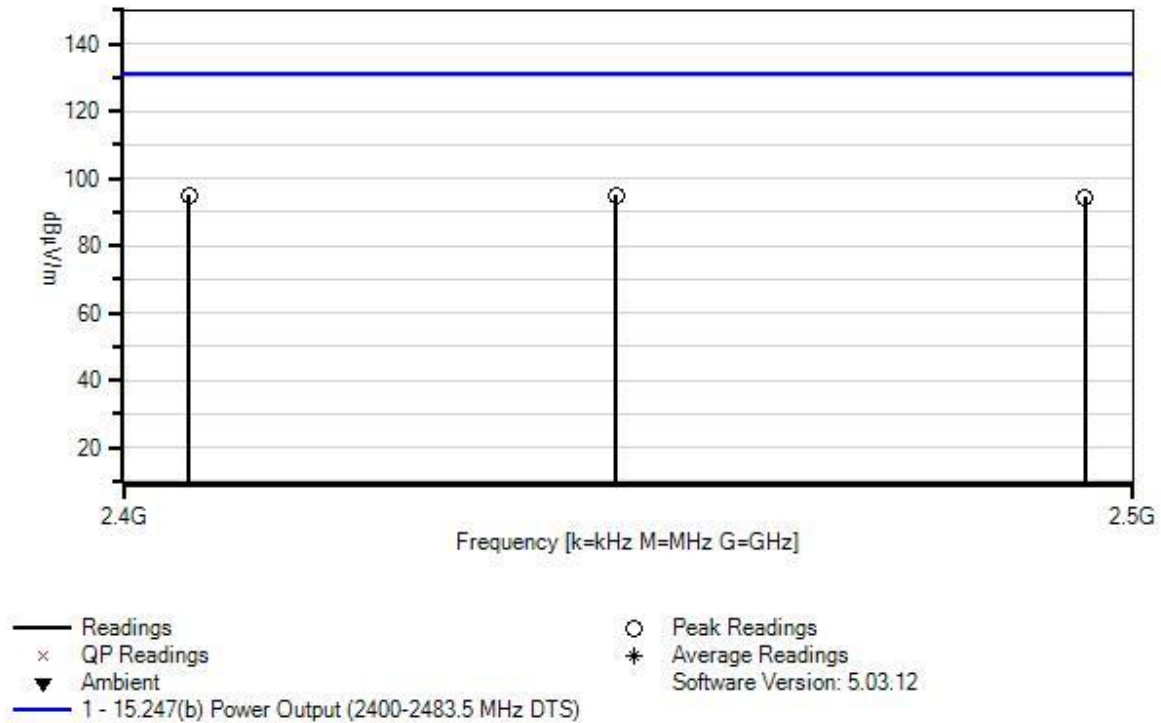
#### *Support Equipment:*

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

#### *Test Conditions / Notes:*

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature: 21-23°C<br>Humidity: 35-40%<br>Pressure: 101.5-103kPa<br><br>Test Method: ANSI 63.10 (2013)<br>KDB 558074 v05r02 (April 2, 2019)<br><br>Test mode: Continuously Modulated<br><br>The EUT is operating with a fresh battery installed.<br><br>The EUT is set 1.5 meters high on Styrofoam table.<br>X, Y, and Z axes investigated as well as horizontal and vertical antenna polarities investigated, worst case reported.<br>Low, Mid, and High channels investigated. |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Ossia, Inc. WO#: 102778 Sequence#: 13 Date: 7/1/2019  
 15.247(b) Power Output (2400-2483.5 MHz DTS) Test Distance: 3 Meters Vert



**Test Equipment:**

| ID | Asset #  | Description                         | Model                | Calibration Date | Cal Due Date |
|----|----------|-------------------------------------|----------------------|------------------|--------------|
|    | AN02871  | Spectrum Analyzer                   | E4440A               | 1/9/2019         | 1/9/2021     |
| T1 | ANP06540 | Cable                               | Heliac               | 10/30/2017       | 10/30/2019   |
| T2 | ANP07226 | Attenuator                          | PE7004-6             | 12/1/2017        | 12/1/2019    |
| T3 | ANP06515 | Cable                               | Heliac               | 6/29/2018        | 6/29/2020    |
| T4 | AN03540  | Preamp                              | 83017A               | 5/13/2019        | 5/13/2021    |
| T5 | ANP06503 | Cable                               | 32026-29801-29801-36 | 3/13/2018        | 3/13/2020    |
| T6 | AN01467  | Horn Antenna-ANSI C63.5 Calibration | 3115                 | 7/21/2017        | 7/21/2019    |

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

| # | Freq      | Rdng | T1<br>T5     | T2<br>T6      | T3   | T4    | Dist  | Corr   | Spec            | Margin | Polar |
|---|-----------|------|--------------|---------------|------|-------|-------|--------|-----------------|--------|-------|
|   | MHz       | dBμV | dB           | dB            | dB   | dB    | Table | dBμV/m | dBμV/m          | dB     | Ant   |
| 1 | 2440.390M | 91.5 | +0.4<br>+1.0 | +5.8<br>+28.1 | +2.6 | -34.3 | +0.0  | 95.1   | 131.2           | -36.1  | Vert  |
|   |           |      |              |               |      |       |       |        | Battery Powered |        |       |
| 2 | 2405.390M | 91.3 | +0.4<br>+1.0 | +5.8<br>+28.1 | +2.6 | -34.3 | +0.0  | 94.9   | 131.2           | -36.3  | Vert  |
|   |           |      |              |               |      |       |       |        | Battery Powered |        |       |
| 3 | 2479.478M | 90.7 | +0.4<br>+1.0 | +5.8<br>+28.1 | +2.7 | -34.2 | +0.0  | 94.5   | 131.2           | -36.7  | Vert  |
|   |           |      |              |               |      |       |       |        | Battery Powered |        |       |



Test Setup Photo(s)



X Axis



Y Axis



Z Axis

## 15.247(e) Power Spectral Density

### Test Data Summary - Radiated Measurement

Measurement Method: PKPSD

| Frequency (MHz) | Modulation | Ant. Type / Gain (dBi) | Non-corrected Value from Analyzer (dBuV) | Correction Factors of measurement system (dB) | Corrected Field Strength (dBuV/m @3m) | Calculated (dBm/3kHz) | Limit (dBm/3kHz) | Results |
|-----------------|------------|------------------------|------------------------------------------|-----------------------------------------------|---------------------------------------|-----------------------|------------------|---------|
| 2405            | OQPSK      | Integral / 6dBi        | 78.7                                     | 3.6                                           | 82.3                                  | -18.9                 | ≤8               | Pass    |
| 2440            | OQPSK      | Integral / 6dBi        | 78.6                                     | 3.6                                           | 82.2                                  | -19.0                 | ≤8               | Pass    |
| 2480            | OQPSK      | Integral / 6dBi        | 78.0                                     | 3.8                                           | 81.8                                  | -19.4                 | ≤8               | Pass    |

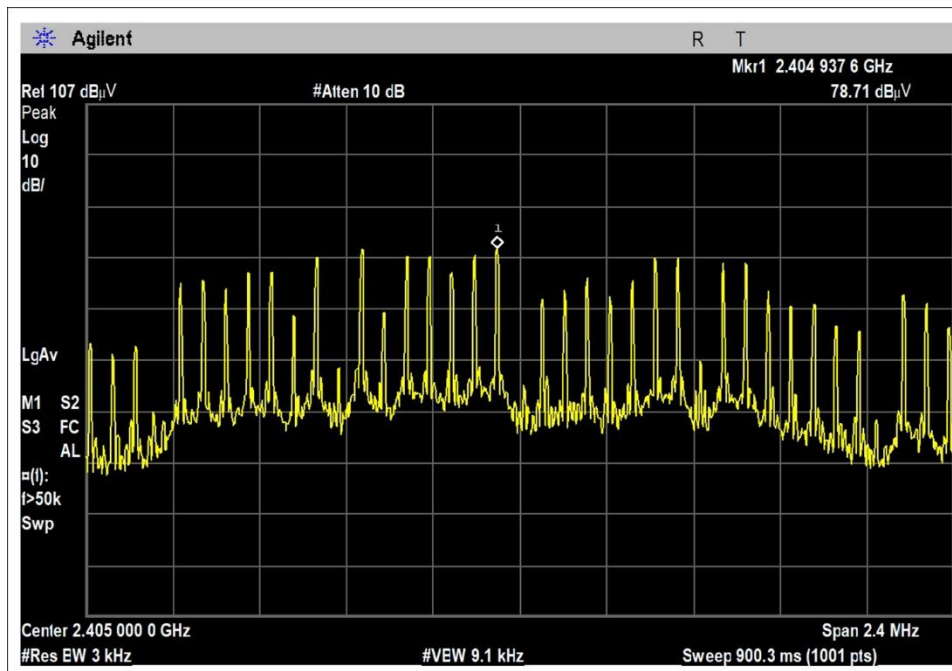
Conducted RF output power calculated in accordance with ANSI C63.10.

$$P(W) = \frac{(E \cdot d)^2}{30 G}$$

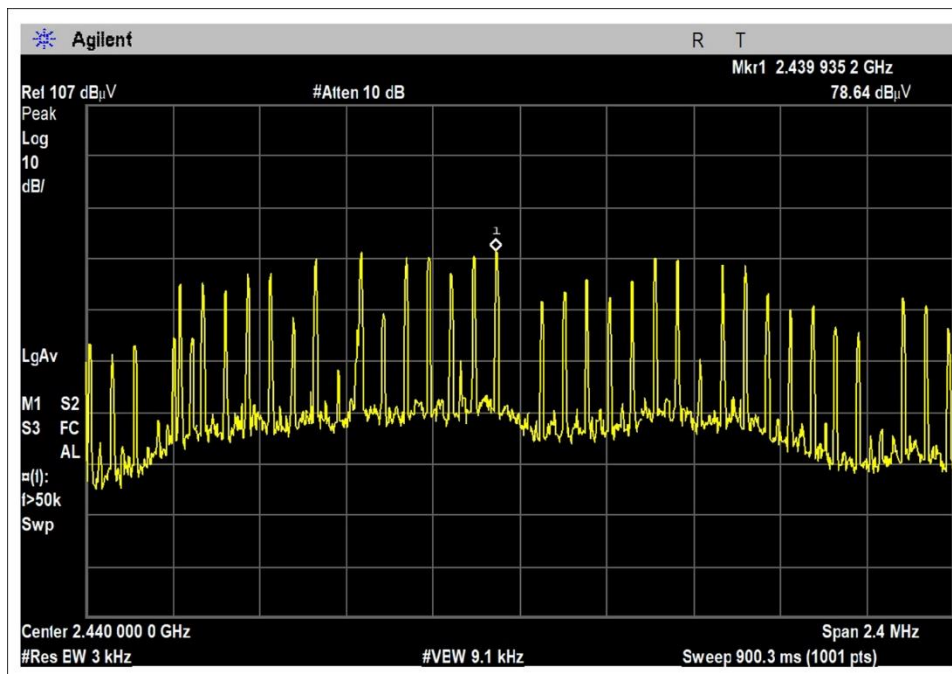
Or equivalently, in logarithmic form:

$$P(dBm) = E(dBuV/m) + 20LOG(d) - G - 104.77$$

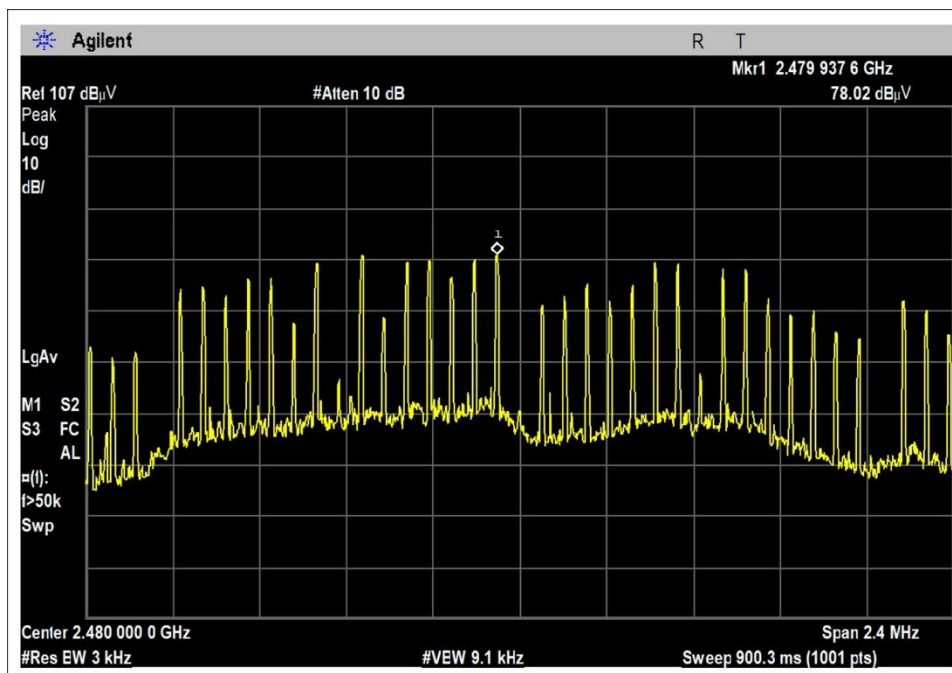
### Plots



Low Channel



Middle Channel



High Channel

### Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Ossia, Inc.**  
 Specification: **15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)**  
 Work Order #: **102778** Date: 7/1/2019  
 Test Type: **Maximized Emissions** Time: 15:55:31  
 Tested By: Michael Atkinson Sequence#: 14  
 Software: EMITest 5.03.12

#### Equipment Tested:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

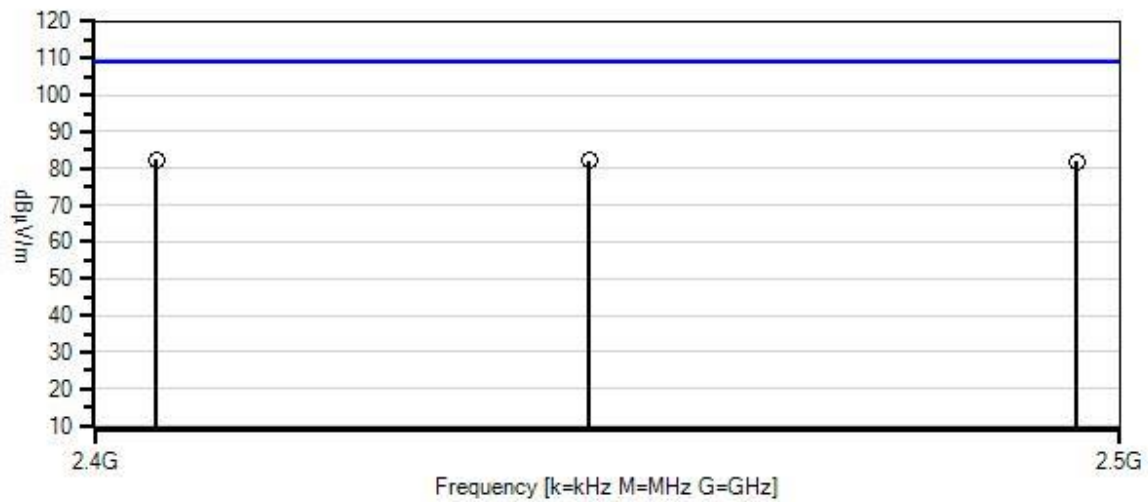
#### Support Equipment:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

#### Test Conditions / Notes:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature: 21-23°C<br>Humidity: 35-40%<br>Pressure: 101.5-103kPa<br><br>Test Method: ANSI 63.10 (2013)<br>KDB 558074 v05r02 (April 2, 2019)<br><br>Test mode: Continuously Modulated<br><br>The EUT is operating with a fresh battery installed.<br><br>The EUT is set 1.5 meters high on Styrofoam table.<br>X, Y, and Z axes investigated as well as horizontal and vertical antenna polarities investigated, worst case reported.<br>Low, Mid, and High channels investigated. |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Ossia, Inc. WO#: 102778 Sequence#: 14 Date: 7/1/2019  
 15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS) Test Distance: 3 Meters Vert



- Readings
- Peak Readings
- × QP Readings
- \* Average Readings
- ▼ Ambient
- Software Version: 5.03.12
- 1 - 15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)



**Test Equipment:**

| ID | Asset #  | Description                         | Model                | Calibration Date | Cal Due Date |
|----|----------|-------------------------------------|----------------------|------------------|--------------|
|    | AN02871  | Spectrum Analyzer                   | E4440A               | 1/9/2019         | 1/9/2021     |
| T1 | ANP06540 | Cable                               | Heliac               | 10/30/2017       | 10/30/2019   |
| T2 | ANP07226 | Attenuator                          | PE7004-6             | 12/1/2017        | 12/1/2019    |
| T3 | ANP06515 | Cable                               | Heliac               | 6/29/2018        | 6/29/2020    |
| T4 | AN03540  | Preamp                              | 83017A               | 5/13/2019        | 5/13/2021    |
| T5 | ANP06503 | Cable                               | 32026-29801-29801-36 | 3/13/2018        | 3/13/2020    |
| T6 | AN01467  | Horn Antenna-ANSI C63.5 Calibration | 3115                 | 7/21/2017        | 7/21/2019    |

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

| # | Freq      | Rdng | T1<br>T5     | T2<br>T6      | T3   | T4    | Dist  | Corr   | Spec   | Margin | Polar |
|---|-----------|------|--------------|---------------|------|-------|-------|--------|--------|--------|-------|
|   | MHz       | dBμV | dB           | dB            | dB   | dB    | Table | dBμV/m | dBμV/m | dB     | Ant   |
| 1 | 2404.938M | 78.7 | +0.4<br>+1.0 | +5.8<br>+28.1 | +2.6 | -34.3 | +0.0  | 82.3   | 109.2  | -26.9  | Vert  |
| 2 | 2439.935M | 78.6 | +0.4<br>+1.0 | +5.8<br>+28.1 | +2.6 | -34.3 | +0.0  | 82.2   | 109.2  | -27.0  | Vert  |
| 3 | 2479.938M | 78.0 | +0.4<br>+1.0 | +5.8<br>+28.1 | +2.7 | -34.2 | +0.0  | 81.8   | 109.2  | -27.4  | Vert  |

Test Setup Photo(s)



X Axis





Y Axis



Z Axis

## 15.247(d) Radiated Emissions & Band Edge

### Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Ossia, Inc.**  
 Specification: **15.209 Radiated Emissions**  
 Work Order #: **102778** Date: 7/2/2019  
 Test Type: **Maximized Emissions** Time: 11:08:01  
 Tested By: Michael Atkinson Sequence#: 8  
 Software: EMITest 5.03.12

#### Equipment Tested:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

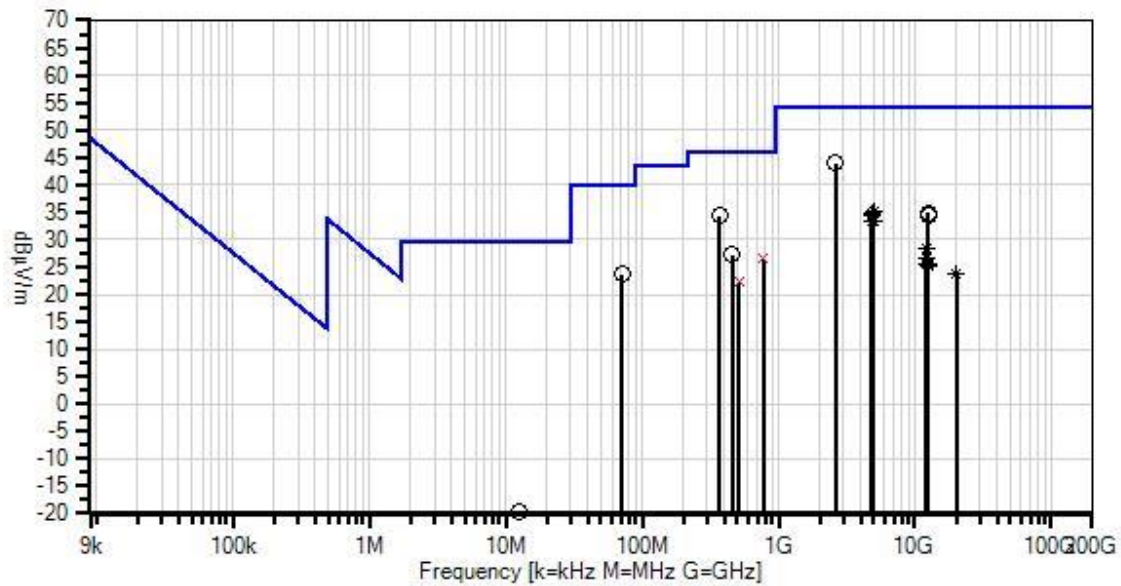
#### Support Equipment:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

#### Test Conditions / Notes:

Temperature: 21-23°C  
 Humidity: 35-40%  
 Pressure: 101.5-103kPa  
  
 Test Method: ANSI 63.10 (2013)  
 KDB 558074 v05r02 (April 2, 2019)  
  
 EUT is continuously transmitting.  
 Investigated L, M, H channels, worst case reported.  
 EUT is investigated in X, Y, & Z Axis with worst case reported.  
 Investigated 3 x orthogonal axes below 30MHz, investigated horizontal and vertical polarities above 30MHz, worst case reported.  
  
 For data collected below 30MHz an alternative test site (semi-anechoic chamber) was used instead of an open-field test site. The alternative test-site has been correlated to produce representative data compared to an open-field test site.

Ossia, Inc. WO#: 102778 Sequence#: 8 Date: 7/2/2019  
15.209 Radiated Emissions Test Distance: 3 Meters Various



— Readings  
\* Average Readings  
— 1 - 15.209 Radiated Emissions

○ Peak Readings  
▼ Ambient

× QP Readings  
Software Version: 5.03.12

**Test Equipment:**

| ID  | Asset #    | Description                         | Model                   | Calibration Date | Cal Due Date |
|-----|------------|-------------------------------------|-------------------------|------------------|--------------|
| T1  | AN02871    | Spectrum Analyzer                   | E4440A                  | 1/9/2019         | 1/9/2021     |
| T2  | ANP06540   | Cable                               | Helix                   | 10/30/2017       | 10/30/2019   |
| T3  | ANP05305   | Cable                               | ETSI-50T                | 10/24/2017       | 10/24/2019   |
| T4  | AN02307    | Preamp                              | 8447D                   | 1/15/2018        | 1/15/2020    |
| T5  | ANP05360   | Cable                               | RG214                   | 1/31/2018        | 1/31/2020    |
| T6  | ANP06123   | Attenuator                          | 18N-6                   | 4/5/2019         | 4/5/2021     |
| T7  | AN00851    | Biconilog Antenna                   | CBL6111C                | 5/1/2018         | 5/1/2020     |
| T8  | ANP07226   | Attenuator                          | PE7004-6                | 12/1/2017        | 12/1/2019    |
| T9  | ANP06515   | Cable                               | Helix                   | 6/29/2018        | 6/29/2020    |
| T10 | AN03540    | Preamp                              | 83017A                  | 5/13/2019        | 5/13/2021    |
| T11 | ANP06503   | Cable                               | 32026-29801-29801-36    | 3/13/2018        | 3/13/2020    |
| T12 | AN01467    | Horn Antenna-ANSI C63.5 Calibration | 3115                    | 7/21/2017        | 7/21/2019    |
| T13 | AN02741    | Active Horn Antenna                 | AMFW-5F-12001800-20-10P | 4/26/2019        | 4/26/2021    |
| T14 | AN03122    | Cable                               | 32026-2-29801-36        | 3/13/2018        | 3/13/2020    |
| T15 | AN02742    | Active Horn Antenna                 | AMFW-5F-18002650-20-10P | 10/16/2018       | 10/16/2020   |
| T16 | ANP06678   | Cable                               | 32026-29801-29801-144   | 3/13/2018        | 3/13/2020    |
| T17 | AN02763-69 | Waveguide                           | Multiple                | 4/23/2018        | 4/23/2020    |
| T18 | AN00052    | Loop Antenna                        | 6502                    | 5/7/2018         | 5/7/2020     |

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

| # | Freq      | Rdng | T1   | T2    | T3    | T4    | Dist  | Corr   | Spec   | Margin | Polar |
|---|-----------|------|------|-------|-------|-------|-------|--------|--------|--------|-------|
|   |           |      | T5   | T6    | T7    | T8    |       |        |        |        |       |
|   |           |      | T9   | T10   | T11   | T12   |       |        |        |        |       |
|   |           |      | T13  | T14   | T15   | T16   |       |        |        |        |       |
|   |           |      | T17  | T18   |       |       |       |        |        |        |       |
|   | MHz       | dBμV | dB   | dB    | dB    | dB    | Table | dBμV/m | dBμV/m | dB     | Ant   |
| 1 | 2630.000M | 39.6 | +0.0 | +0.5  | +0.0  | +0.0  | +0.0  | 43.9   | 54.0   | -10.1  | Horiz |
|   |           |      | +0.0 | +0.0  | +0.0  | +5.8  |       |        |        |        |       |
|   |           |      | +2.6 | -34.2 | +1.1  | +28.5 |       |        |        |        |       |
|   |           |      | +0.0 | +0.0  | +0.0  | +0.0  |       |        |        |        |       |
|   |           |      | +0.0 | +0.0  |       |       |       |        |        |        |       |
| 2 | 368.500M  | 38.2 | +0.0 | +0.2  | +1.0  | -27.4 | +0.0  | 34.3   | 46.0   | -11.7  | Horiz |
|   |           |      | +1.1 | +5.8  | +15.4 | +0.0  |       |        |        |        |       |
|   |           |      | +0.0 | +0.0  | +0.0  | +0.0  |       |        |        |        |       |
|   |           |      | +0.0 | +0.0  | +0.0  | +0.0  |       |        |        |        |       |
|   |           |      | +0.0 | +0.0  |       |       |       |        |        |        |       |

|   |                  |      |       |       |       |       |      |      |      |       |       |
|---|------------------|------|-------|-------|-------|-------|------|------|------|-------|-------|
| 3 | 71.700M          | 38.4 | +0.0  | +0.1  | +0.4  | -27.9 | +0.0 | 23.6 | 40.0 | -16.4 | Horiz |
|   |                  |      | +0.5  | +5.8  | +6.3  | +0.0  |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  | +0.0  | +0.0  |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  | +0.0  | +0.0  |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  |       |       |      |      |      |       |       |
| 4 | 457.800M         | 29.4 | +0.0  | +0.2  | +1.1  | -27.9 | +0.0 | 27.2 | 46.0 | -18.8 | Vert  |
|   |                  |      | +1.3  | +5.8  | +17.3 | +0.0  |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  | +0.0  | +0.0  |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  | +0.0  | +0.0  |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  |       |       |      |      |      |       |       |
| 5 | 4959.040M<br>Ave | 24.1 | +0.0  | +0.5  | +0.0  | +0.0  | +0.0 | 35.1 | 54.0 | -18.9 | Horiz |
|   |                  |      | +0.0  | +0.0  | +0.0  | +5.8  |      |      | High |       |       |
|   |                  |      | +4.2  | -33.6 | +1.6  | +32.5 |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  | +0.0  | +0.0  |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  |       |       |      |      |      |       |       |
| ^ | 4959.040M        | 34.9 | +0.0  | +0.5  | +0.0  | +0.0  | +0.0 | 45.9 | 54.0 | -8.1  | Horiz |
|   |                  |      | +0.0  | +0.0  | +0.0  | +5.8  |      |      | High |       |       |
|   |                  |      | +4.2  | -33.6 | +1.6  | +32.5 |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  | +0.0  | +0.0  |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  |       |       |      |      |      |       |       |
| 7 | 12397.420<br>M   | 39.8 | +0.0  | +1.1  | +0.0  | +0.0  | +0.0 | 34.9 | 54.0 | -19.1 | Horiz |
|   |                  |      | +0.0  | +0.0  | +0.0  | +0.0  |      |      |      |       |       |
|   |                  |      | +7.0  | +0.0  | +0.0  | +0.0  |      |      | High |       |       |
|   |                  |      | -13.0 | +0.0  | +0.0  | +0.0  |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  |       |       |      |      |      |       |       |
| 8 | 4881.108M<br>Ave | 23.9 | +0.0  | +0.5  | +0.0  | +0.0  | +0.0 | 34.8 | 54.0 | -19.2 | Vert  |
|   |                  |      | +0.0  | +0.0  | +0.0  | +5.8  |      |      | Mid  |       |       |
|   |                  |      | +4.2  | -33.6 | +1.6  | +32.4 |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  | +0.0  | +0.0  |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  |       |       |      |      |      |       |       |
| 9 | 4808.960M<br>Ave | 24.0 | +0.0  | +0.5  | +0.0  | +0.0  | +0.0 | 34.7 | 54.0 | -19.3 | Vert  |
|   |                  |      | +0.0  | +0.0  | +0.0  | +5.9  |      |      | Low  |       |       |
|   |                  |      | +4.1  | -33.6 | +1.5  | +32.3 |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  | +0.0  | +0.0  |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  |       |       |      |      |      |       |       |
| ^ | 4808.960M        | 34.9 | +0.0  | +0.5  | +0.0  | +0.0  | +0.0 | 45.6 | 54.0 | -8.4  | Vert  |
|   |                  |      | +0.0  | +0.0  | +0.0  | +5.9  |      |      | Low  |       |       |
|   |                  |      | +4.1  | -33.6 | +1.5  | +32.3 |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  | +0.0  | +0.0  |      |      |      |       |       |
|   |                  |      | +0.0  | +0.0  |       |       |      |      |      |       |       |

|    |                  |      |                                       |                                       |                                       |                                       |      |      |      |       |       |
|----|------------------|------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|------|------|------|-------|-------|
| 11 | 12397.380<br>M   | 39.5 | +0.0<br>+0.0<br>+7.0<br>-13.0<br>+0.0 | +1.1<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0 | 34.6 | 54.0 | -19.4 | Vert  |
|    |                  |      |                                       |                                       |                                       |                                       |      |      | High |       |       |
| 12 | 780.800M<br>QP   | 22.9 | +0.0<br>+1.8<br>+0.0<br>+0.0<br>+0.0  | +0.3<br>+5.8<br>+0.0<br>+0.0<br>+0.0  | +1.5<br>+22.1<br>+0.0<br>+0.0<br>+0.0 | -27.8<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | +0.0 | 26.6 | 46.0 | -19.4 | Vert  |
| ^  | 780.800M         | 28.9 | +0.0<br>+1.8<br>+0.0<br>+0.0<br>+0.0  | +0.3<br>+5.8<br>+0.0<br>+0.0<br>+0.0  | +1.5<br>+22.1<br>+0.0<br>+0.0<br>+0.0 | -27.8<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | +0.0 | 32.6 | 46.0 | -13.4 | Vert  |
| 14 | 4881.040M<br>Ave | 23.5 | +0.0<br>+0.0<br>+4.2<br>+0.0<br>+0.0  | +0.5<br>+0.0<br>-33.6<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+1.6<br>+0.0<br>+0.0  | +0.0<br>+5.8<br>+32.4<br>+0.0<br>+0.0 | +0.0 | 34.4 | 54.0 | -19.6 | Horiz |
|    |                  |      |                                       |                                       |                                       |                                       |      |      | Mid  |       |       |
| ^  | 4881.040M        | 34.6 | +0.0<br>+0.0<br>+4.2<br>+0.0<br>+0.0  | +0.5<br>+0.0<br>-33.6<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+1.6<br>+0.0<br>+0.0  | +0.0<br>+5.8<br>+32.4<br>+0.0<br>+0.0 | +0.0 | 45.5 | 54.0 | -8.5  | Horiz |
|    |                  |      |                                       |                                       |                                       |                                       |      |      | Mid  |       |       |
| 16 | 4959.220M<br>Ave | 22.5 | +0.0<br>+0.0<br>+4.2<br>+0.0<br>+0.0  | +0.5<br>+0.0<br>-33.6<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+1.6<br>+0.0<br>+0.0  | +0.0<br>+5.8<br>+32.5<br>+0.0<br>+0.0 | +0.0 | 33.5 | 54.0 | -20.5 | Vert  |
|    |                  |      |                                       |                                       |                                       |                                       |      |      | High |       |       |
| ^  | 4959.220M        | 34.7 | +0.0<br>+0.0<br>+4.2<br>+0.0<br>+0.0  | +0.5<br>+0.0<br>-33.6<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+1.6<br>+0.0<br>+0.0  | +0.0<br>+5.8<br>+32.5<br>+0.0<br>+0.0 | +0.0 | 45.7 | 54.0 | -8.3  | Vert  |
|    |                  |      |                                       |                                       |                                       |                                       |      |      | High |       |       |
| 18 | 4810.877M<br>Ave | 22.5 | +0.0<br>+0.0<br>+4.1<br>+0.0<br>+0.0  | +0.5<br>+0.0<br>-33.6<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+1.5<br>+0.0<br>+0.0  | +0.0<br>+5.9<br>+32.3<br>+0.0<br>+0.0 | +0.0 | 33.2 | 54.0 | -20.8 | Horiz |
|    |                  |      |                                       |                                       |                                       |                                       |      |      | Low  |       |       |
| ^  | 4810.900M        | 34.8 | +0.0<br>+0.0<br>+4.1<br>+0.0<br>+0.0  | +0.5<br>+0.0<br>-33.6<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+1.5<br>+0.0<br>+0.0  | +0.0<br>+5.9<br>+32.3<br>+0.0<br>+0.0 | +0.0 | 45.5 | 54.0 | -8.5  | Horiz |
|    |                  |      |                                       |                                       |                                       |                                       |      |      | Low  |       |       |

|    |                       |      |                                       |                                      |                                       |                                       |      |      |                             |       |       |
|----|-----------------------|------|---------------------------------------|--------------------------------------|---------------------------------------|---------------------------------------|------|------|-----------------------------|-------|-------|
| 20 | 516.000M<br>QP        | 23.3 | +0.0<br>+1.4<br>+0.0<br>+0.0<br>+0.0  | +0.3<br>+5.8<br>+0.0<br>+0.0<br>+0.0 | +1.2<br>+18.4<br>+0.0<br>+0.0<br>+0.0 | -28.2<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | +0.0 | 22.2 | 46.0                        | -23.8 | Horiz |
| ^  | 516.000M              | 38.3 | +0.0<br>+1.4<br>+0.0<br>+0.0<br>+0.0  | +0.3<br>+5.8<br>+0.0<br>+0.0<br>+0.0 | +1.2<br>+18.4<br>+0.0<br>+0.0<br>+0.0 | -28.2<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | +0.0 | 37.2 | 46.0                        | -8.8  | Horiz |
| 22 | 12022.533<br>M<br>Ave | 33.7 | +0.0<br>+0.0<br>+6.8<br>-13.0<br>+0.0 | +1.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0 | 28.5 | 54.0<br>Low                 | -25.5 | Horiz |
| ^  | 12022.533<br>M        | 44.4 | +0.0<br>+0.0<br>+6.8<br>-13.0<br>+0.0 | +1.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0 | 39.2 | 54.0<br>Low                 | -14.8 | Horiz |
| 24 | 12197.450<br>M<br>Ave | 31.5 | +0.0<br>+0.0<br>+6.9<br>-12.8<br>+0.0 | +1.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0 | 26.6 | 54.0<br>Mid                 | -27.4 | Horiz |
| 25 | 12197.530<br>M<br>Ave | 30.4 | +0.0<br>+0.0<br>+0.0<br>-12.8<br>+0.0 | +1.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | +7.1<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0 | 25.7 | 54.0<br>Mid, while charging | -28.3 | Horiz |
| ^  | 12197.450<br>M        | 41.7 | +0.0<br>+0.0<br>+6.9<br>-12.8<br>+0.0 | +1.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0 | 36.8 | 54.0<br>Mid                 | -17.2 | Horiz |
| ^  | 12197.530<br>M        | 40.1 | +0.0<br>+0.0<br>+0.0<br>-12.8<br>+0.0 | +1.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | +7.1<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0 | 35.4 | 54.0<br>Mid, while charging | -18.6 | Horiz |
| 28 | 12397.550<br>M<br>Ave | 30.5 | +0.0<br>+0.0<br>+7.0<br>-13.0<br>+0.0 | +1.1<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0 | 25.6 | 54.0<br>High                | -28.4 | Horiz |
| 29 | 12397.510<br>M<br>Ave | 30.0 | +0.0<br>+0.0<br>+7.0<br>-13.0<br>+0.0 | +1.1<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0 | 25.1 | 54.0<br>High                | -28.9 | Vert  |

|    |                       |      |                                      |                                      |                                       |                                      |       |       |      |       |       |
|----|-----------------------|------|--------------------------------------|--------------------------------------|---------------------------------------|--------------------------------------|-------|-------|------|-------|-------|
| 30 | 20016.000<br>M<br>Ave | 23.7 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+2.2 | +0.0<br>+0.0<br>+0.0<br>+2.3<br>+0.0 | +0.0<br>+0.0<br>+0.0<br>-13.1<br>+8.6 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | +0.0  | 23.7  | 54.0 | -30.3 | Vert  |
| ^  | 20016.000<br>M        | 36.7 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+2.2 | +0.0<br>+0.0<br>+0.0<br>+2.3<br>+0.0 | +0.0<br>+0.0<br>+0.0<br>-13.1<br>+8.6 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | +0.0  | 36.7  | 54.0 | -17.3 | Vert  |
| 32 | 12.380M               | 10.9 | +0.0<br>+0.0<br>+0.2<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+9.1 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | -40.0 | -19.8 | 29.5 | -49.3 | Perp  |
| 33 | 10.200M               | 10.2 | +0.0<br>+0.0<br>+0.2<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+9.2 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | -40.0 | -20.4 | 29.5 | -49.9 | Groun |
| 34 | 6.418M<br>QP          | 9.6  | +0.0<br>+0.0<br>+0.1<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+9.5 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | -40.0 | -20.8 | 29.5 | -50.3 | Para  |
| ^  | 6.418M                | 15.3 | +0.0<br>+0.0<br>+0.1<br>+0.0<br>+0.0 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+9.5 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | -40.0 | -15.1 | 29.5 | -44.6 | Para  |
| 36 | 24.400M               | 10.1 | +0.0<br>+0.0<br>+0.3<br>+0.0<br>+0.0 | +0.1<br>+0.0<br>+0.0<br>+0.0<br>+7.1 | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0<br>+0.0 | -40.0 | -22.4 | 29.5 | -51.9 | Groun |

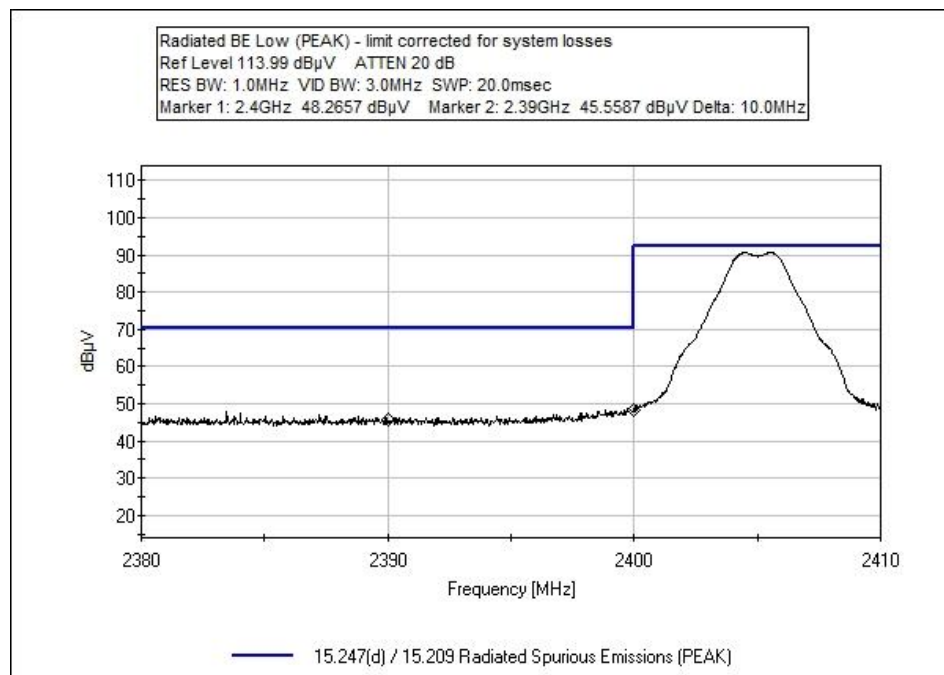


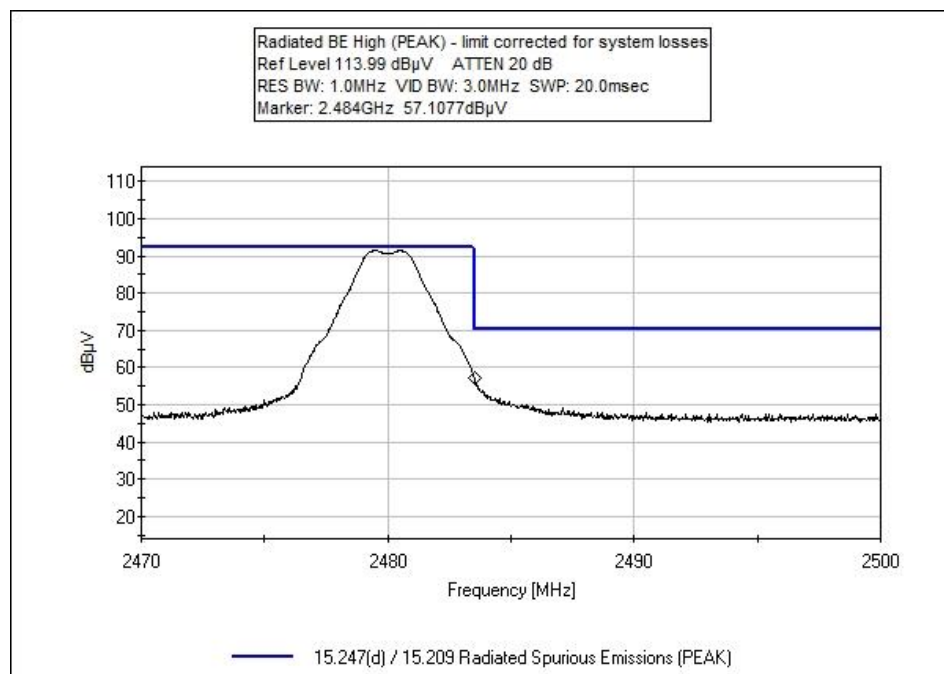
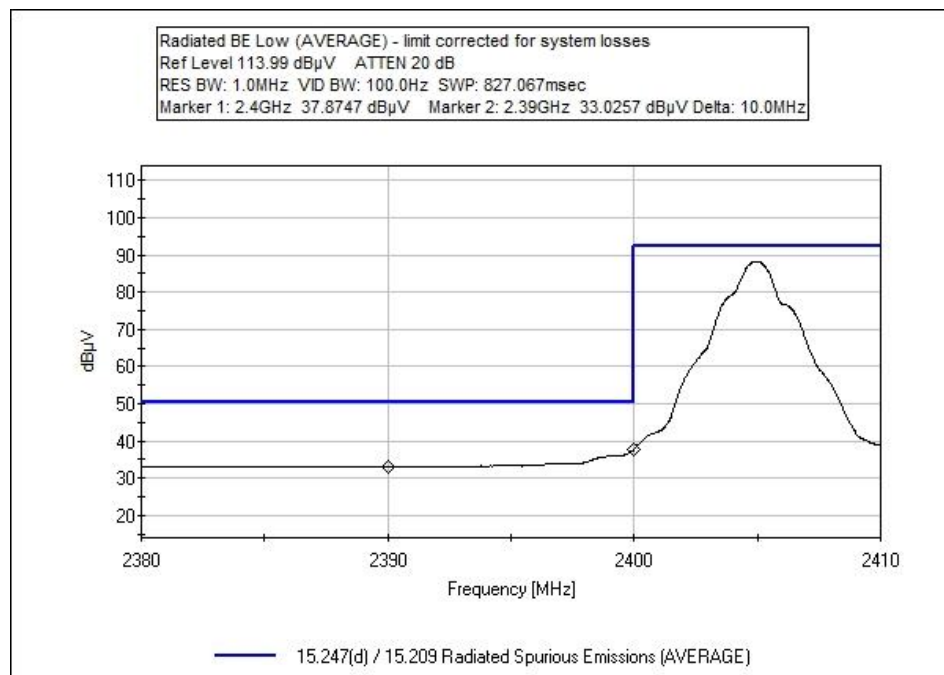
## Band Edge

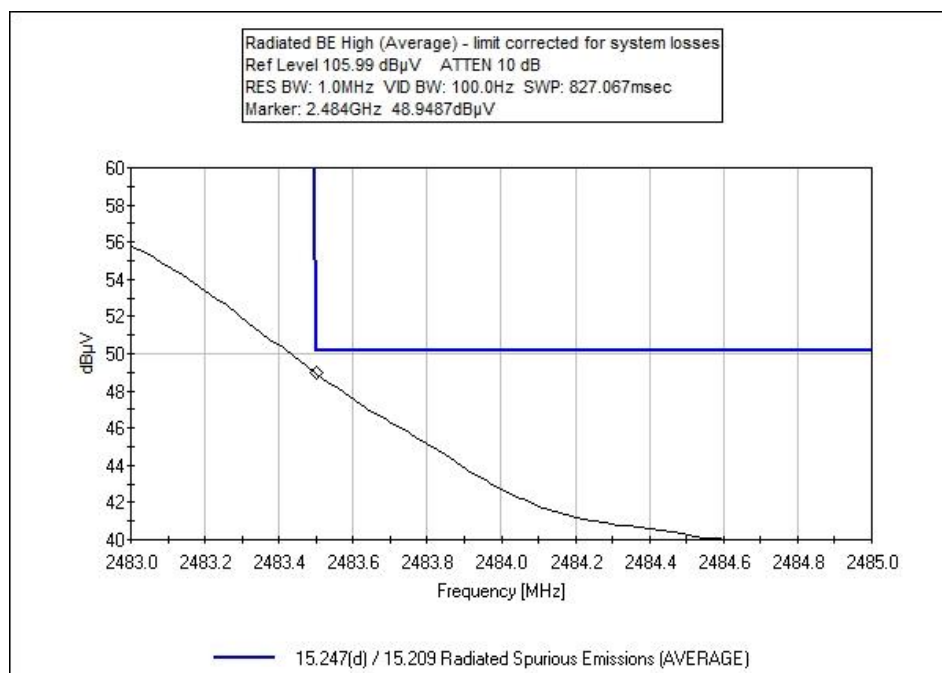
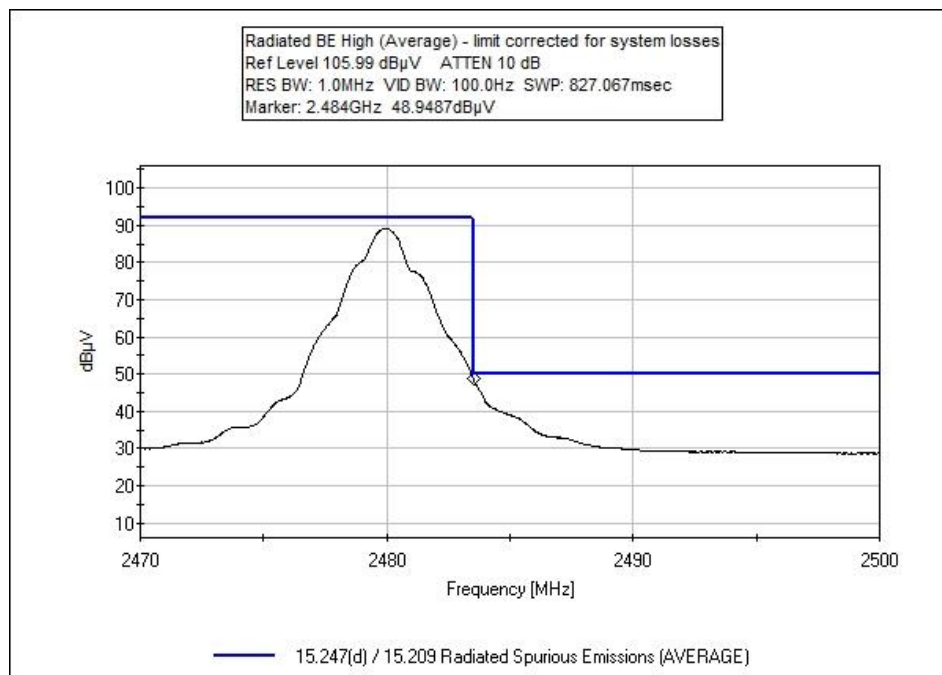
### Band Edge Summary

| Frequency (MHz)  | Modulation | Ant. Type  | Field Strength (dBuV/m @3m) | Limit (dBuV/m @3m) | Results |
|------------------|------------|------------|-----------------------------|--------------------|---------|
| 2390.0 (Peak)    | OQPSK      | Patch/6dBi | 49.2                        | <74                | Pass    |
| 2390.0 (Average) | OQPSK      | Patch/6dBi | 36.7                        | <54                | Pass    |
| 2400.0 (Peak)    | OQPSK      | Patch/6dBi | 51.9                        | <96                | Pass    |
| 2400.0 (Average) | OQPSK      | Patch/6dBi | 41.5                        | <76                | Pass    |
| 2483.5 (Peak)    | OQPSK      | Patch/6dBi | 60.8                        | <74                | Pass    |
| 2483.5 (Average) | OQPSK      | Patch/6dBi | 52.7                        | <54                | Pass    |

## Band Edge Plots







### Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Ossia, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions (AVERAGE)**  
 Work Order #: **102778** Date: 7/1/2019  
 Test Type: **Maximized Emissions** Time: 08:47:51  
 Tested By: Michael Atkinson Sequence#: 12  
 Software: EMITest 5.03.12

#### Equipment Tested:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

#### Support Equipment:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

#### Test Conditions / Notes:

|                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature: 21-23°C<br>Humidity: 35-40%<br>Pressure: 101.5-103kPa<br><br>Test Method: ANSI 63.10 (2013)<br><br>EUT is continuously transmitting with fresh battery installed. Investigated L and H channels, EUT is investigated in X, Y, & Z Axis, horizontal and vertical polarities investigated with worst case reported. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Ossia, Inc. WD#: 102778 Sequence#: 12 Date: 7/1/2019  
15.247(d) / 15.209 Radiated Spurious Emissions (AVERAGE) Test Distance: 3 Meters Vert



— Readings  
○ Peak Readings  
× QP Readings  
\* Average Readings  
▼ Ambient  
Software Version: 5.03.12  
— 1 - 15.247(d) / 15.209 Radiated Spurious Emissions (AVERAGE)

**Test Equipment:**

| ID | Asset #/Serial # | Description                         | Model                | Calibration Date | Cal Due Date |
|----|------------------|-------------------------------------|----------------------|------------------|--------------|
| T1 | AN02871          | Spectrum Analyzer                   | E4440A               | 1/9/2019         | 1/9/2021     |
| T2 | ANP06540         | Cable                               | Heliac               | 10/30/2017       | 10/30/2019   |
|    | ANP05305         | Cable                               | ETSI-50T             | 10/24/2017       | 10/24/2019   |
|    | AN02307          | Preamp                              | 8447D                | 1/15/2018        | 1/15/2020    |
|    | ANP05360         | Cable                               | RG214                | 1/31/2018        | 1/31/2020    |
|    | ANP06123         | Attenuator                          | 18N-6                | 4/5/2019         | 4/5/2021     |
|    | AN00851          | Biconilog Antenna                   | CBL6111C             | 5/1/2018         | 5/1/2020     |
| T3 | ANP07226         | Attenuator                          | PE7004-6             | 12/1/2017        | 12/1/2019    |
| T4 | ANP06515         | Cable                               | Heliac               | 6/29/2018        | 6/29/2020    |
| T5 | AN03540          | Preamp                              | 83017A               | 5/13/2019        | 5/13/2021    |
| T6 | ANP06503         | Cable                               | 32026-29801-29801-36 | 3/13/2018        | 3/13/2020    |
| T7 | AN01467          | Horn Antenna-ANSI C63.5 Calibration | 3115                 | 7/21/2017        | 7/21/2019    |

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

| # | Freq      | Rdng | T1       | T2       | T3       | T4   | Dist  | Corr   | Spec   | Margin | Polar |
|---|-----------|------|----------|----------|----------|------|-------|--------|--------|--------|-------|
|   | MHz       | dBμV | T5<br>dB | T6<br>dB | T7<br>dB | dB   | Table | dBμV/m | dBμV/m | dB     | Ant   |
| 1 | 2483.500M | 48.9 | +0.0     | +0.4     | +5.8     | +2.7 | +0.0  | 52.7   | 54.0   | -1.3   | Vert  |
|   | Ave       |      | -34.2    | +1.0     | +28.1    |      |       |        |        |        |       |
| ^ | 2483.500M | 57.0 | +0.0     | +0.4     | +5.8     | +2.7 | +0.0  | 60.8   | 74.0   | -13.2  | Vert  |
|   |           |      | -34.2    | +1.0     | +28.1    |      |       |        |        |        |       |
| 3 | 2400.000M | 37.9 | +0.0     | +0.4     | +5.8     | +2.6 | +0.0  | 41.5   | 54.0   | -12.5  | Vert  |
|   | Ave       |      | -34.3    | +1.0     | +28.1    |      |       |        |        |        |       |
| ^ | 2400.000M | 48.3 | +0.0     | +0.4     | +5.8     | +2.6 | +0.0  | 51.9   | 74.0   | -22.1  | Vert  |
|   |           |      | -34.3    | +1.0     | +28.1    |      |       |        |        |        |       |
| 5 | 2390.000M | 33.1 | +0.0     | +0.4     | +5.8     | +2.6 | +0.0  | 36.7   | 54.0   | -17.3  | Vert  |
|   | Ave       |      | -34.3    | +1.0     | +28.1    |      |       |        |        |        |       |
| ^ | 2390.000M | 45.6 | +0.0     | +0.4     | +5.8     | +2.6 | +0.0  | 49.2   | 74.0   | -24.8  | Vert  |
|   |           |      | -34.3    | +1.0     | +28.1    |      |       |        |        |        |       |

Test Setup Photo(s)



Below 1GHz



Above 1GHz





X Axis



Y Axis





Z Axis

## SUPPLEMENTAL INFORMATION

### Measurement Uncertainty

| Uncertainty Value | Parameter                 |
|-------------------|---------------------------|
| 4.73 dB           | Radiated Emissions        |
| 3.34 dB           | Mains Conducted Emissions |
| 3.30 dB           | Disturbance Power         |

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ . Compliance is deemed to occur provided measurements are below the specified limits.

### Emissions Test Details

#### TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

#### CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in  $\text{dB}\mu\text{V}/\text{m}$ , the spectrum analyzer reading in  $\text{dB}\mu\text{V}$  was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

| SAMPLE CALCULATIONS |                     |                                     |
|---------------------|---------------------|-------------------------------------|
|                     | Meter reading       | ( $\text{dB}\mu\text{V}$ )          |
| +                   | Antenna Factor      | ( $\text{dB}/\text{m}$ )            |
| +                   | Cable Loss          | ( $\text{dB}$ )                     |
| -                   | Distance Correction | ( $\text{dB}$ )                     |
| -                   | Preamplifier Gain   | ( $\text{dB}$ )                     |
| =                   | Corrected Reading   | ( $\text{dB}\mu\text{V}/\text{m}$ ) |

## TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

| MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE |                     |                  |                   |
|------------------------------------------------------------|---------------------|------------------|-------------------|
| TEST                                                       | BEGINNING FREQUENCY | ENDING FREQUENCY | BANDWIDTH SETTING |
| CONDUCTED EMISSIONS                                        | 150 kHz             | 30 MHz           | 9 kHz             |
| RADIATED EMISSIONS                                         | 9 kHz               | 150 kHz          | 200 Hz            |
| RADIATED EMISSIONS                                         | 150 kHz             | 30 MHz           | 9 kHz             |
| RADIATED EMISSIONS                                         | 30 MHz              | 1000 MHz         | 120 kHz           |
| RADIATED EMISSIONS                                         | 1000 MHz            | >1 GHz           | 1 MHz             |

## SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

### Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

### Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

### Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point, the measuring device is set into the linear mode and the scan time is reduced.