

Ossia, Inc.

REVISED TEST REPORT TO 102450-1A

**Cota WPT Source
Model: Venus v2**

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

**15.207 & 15.247
(DTS 2400-2483.5 MHz)**

Report No.: 102450-1B

Date of issue: May 31, 2019



Test Certificate # 803.05

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: 13042

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

Terri Rayle
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 102450

April 1, 2019

April 1 – 5, 2019

Revision History

Original: Testing of the Cota WPT Source, Model: Venus v2 to FCC Part 15 Subpart C Section(s) 15.207 & 15.247 (DTS 2400-2483.5 MHz).

Revision A: To update the customer address.

Revision B: To correct the reference to the monopole antenna to dipole in all instances, correct the units in the tabular data from dBuV to dBm in section 15.247(b)(3) Output Power, and removed the PSD data replacing with a statement.

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-0148

*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	Mod #1, 2, and 3	Pass
15.247(b)(3)	Output Power	Mod #1 and 3	Pass
15.247(e)	Power Spectral Density	Mod #1, 2, and 3	Pass
15.247(d)	RF Conducted Emissions & Band Edge	Mod #1 and 3	Pass
15.247(d)	Radiated Emissions & Band Edge		
	Below 1GHz	Mod #1 and 3	Pass
	Above 1GHz	NA	Pass
15.207	AC Conducted Emissions	Mod #1, 2, and 3	Pass

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

Modification #1: Ferrite added On DC power lines internal to EUT.

Modification #2: Ferrite added to AC power line at EUT.

Modification #3: Internal WiFi router removed.

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

None

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 WPT Source	Ossia, Inc.	Venus v2	33

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop (Programming)	Apple	MacBook Pro A1398	NA
USB Charger	Belkin	F8M670	NA

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:	External Dipole 2 dBi
Beamforming Type:	NA
Antenna Connection Type:	External Connector
Nominal Input Voltage:	120VAC, 60Hz
Firmware / Software used for Test:	0xBEBF797

FCC Part 15 Subpart C

15.247(a)(2) 6dB Bandwidth

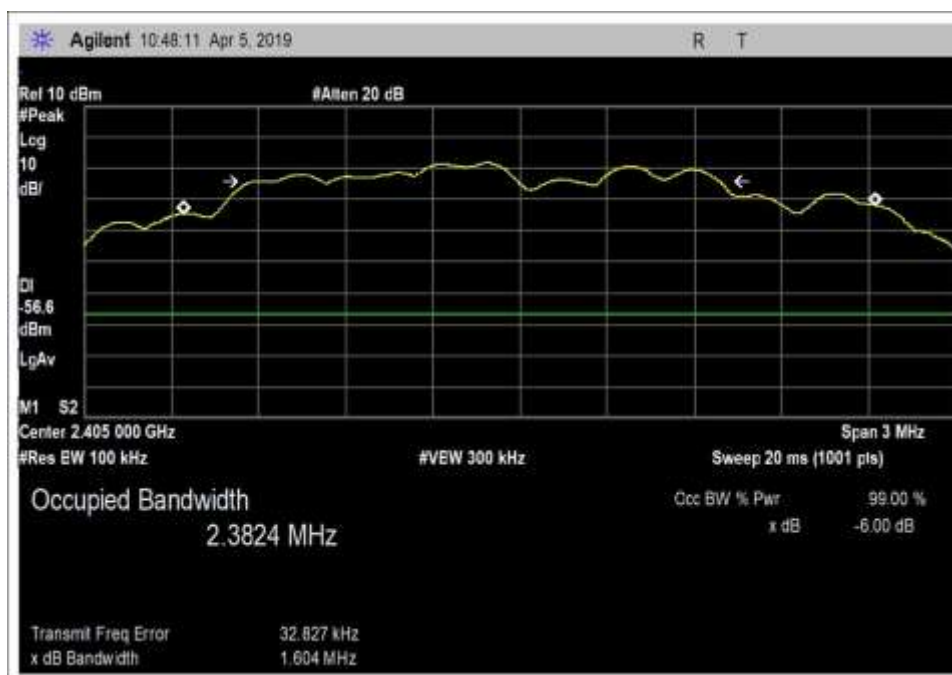
Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2013), KDB 558074 v05r02	Test Date(s):	4/5/2019
Configuration:	1		
Test Setup:	Test Mode: Continuously Modulated The EUT's antenna port is connected directly to the spectrum analyzer through a RF cable. Modifications #1, 2, and 3 were in place during testing.		

Environmental Conditions			
Temperature (°C)	20	Relative Humidity (%):	35

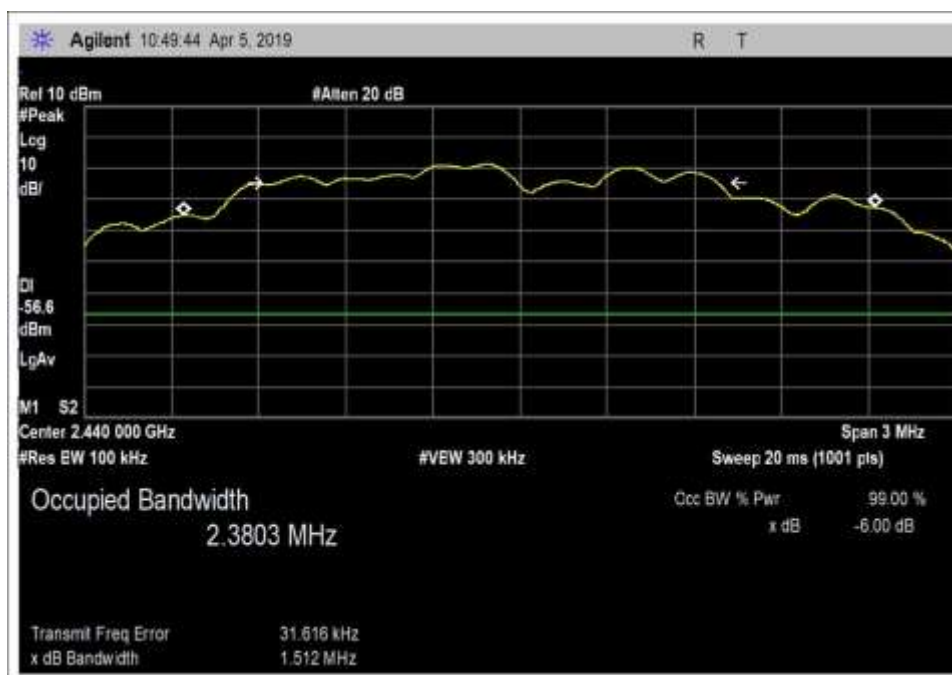
Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
P06678	Cable	Astrolab	32026-29801-29801-144	3/13/2018	3/13/2020
02871	Spectrum Analyzer	Agilent	E4440A	1/9/2019	1/9/2021

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
2405	1	OQPSK	1604	≥500	Pass
2440	1	OQPSK	1512	≥500	Pass
2480	1	OQPSK	1617	≥500	Pass

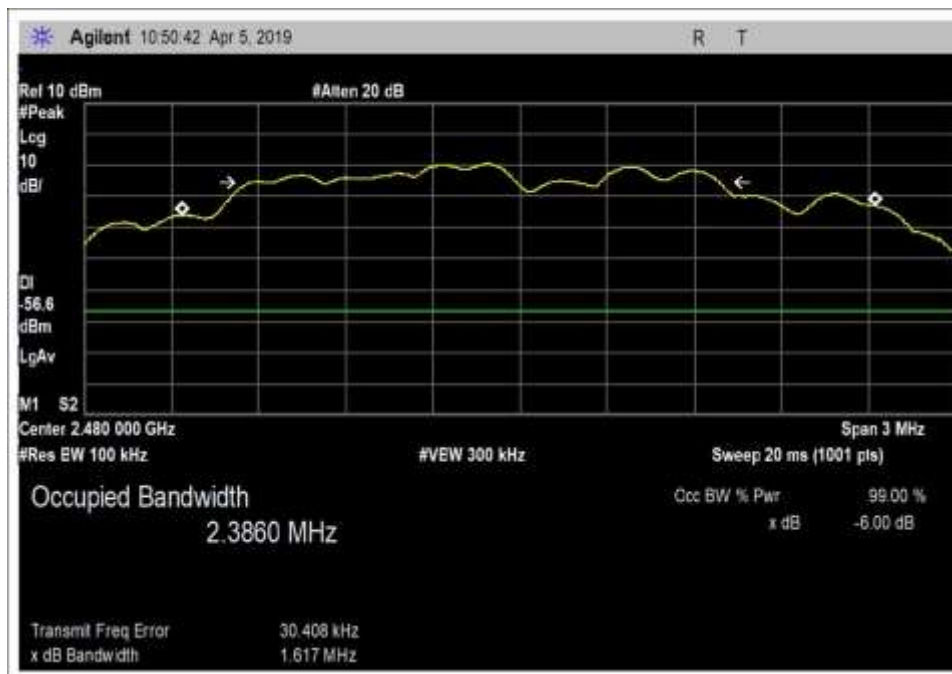
Plot(s)



Low Channel



Middle Channel



High Channel

Test Setup Photo(s)



15.247(b)(3) Output Power

Test Data Summary - Voltage Variations					
Frequency (MHz)	Modulation / Ant Port	V _{Minimum} (dBm)	V _{Nominal} (dBm)	V _{Maximum} (dBm)	Max Deviation from V _{Nominal} (dB)
2405	OQPSK/Antenna Port	-0.3	-0.3	-0.3	0.0
2440	OQPSK/Antenna Port	-0.8	-0.8	-0.8	0.0
2480	OQPSK/Antenna Port	-1.5	-1.5	-1.5	0.0

Test performed using operational mode with the highest output power, representing worst case.

Parameter Definitions:

Measurements performed at input voltage V_{Nominal} ± 15%.

Parameter	Value
V _{Nominal} :	120VAC
V _{Minimum} :	102VAC
V _{Maximum} :	138VAC

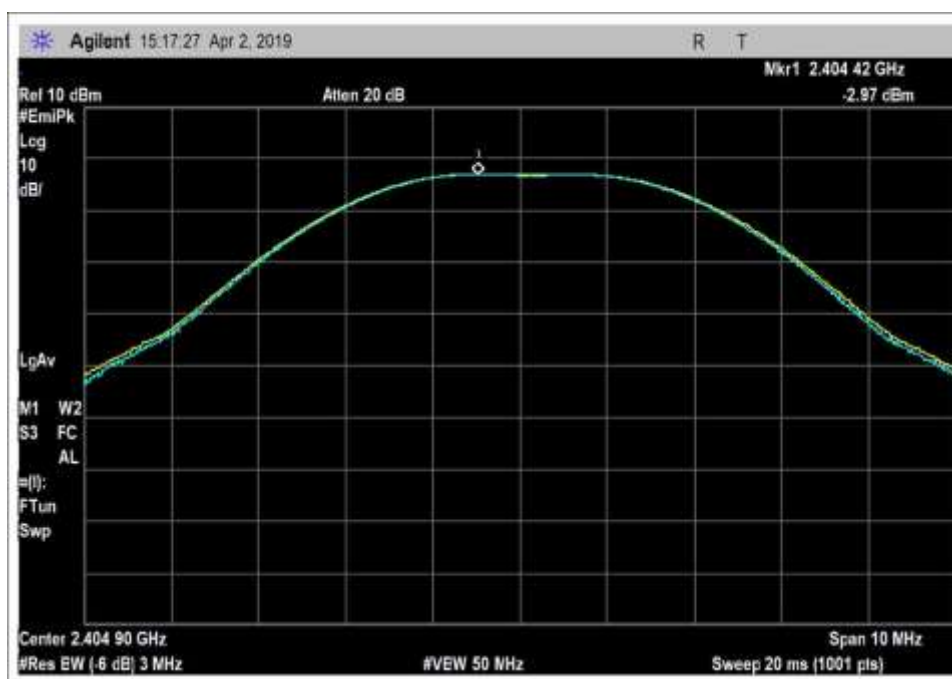
Power Output Test Data Summary - RF Conducted Measurement					
Measurement Option: RBW > DTS Bandwidth					
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
2405	OQPSK	External Dipole/ 2dBi	-0.3	≤30	Pass
2440	OQPSK	External Dipole/ 2dBi	-0.8	≤30	Pass
2480	OQPSK	External Dipole/ 2dBi	-1.5	≤30	Pass

For fixed point-to-point antennas, the limit is calculated in accordance with 15.247(c)(1):

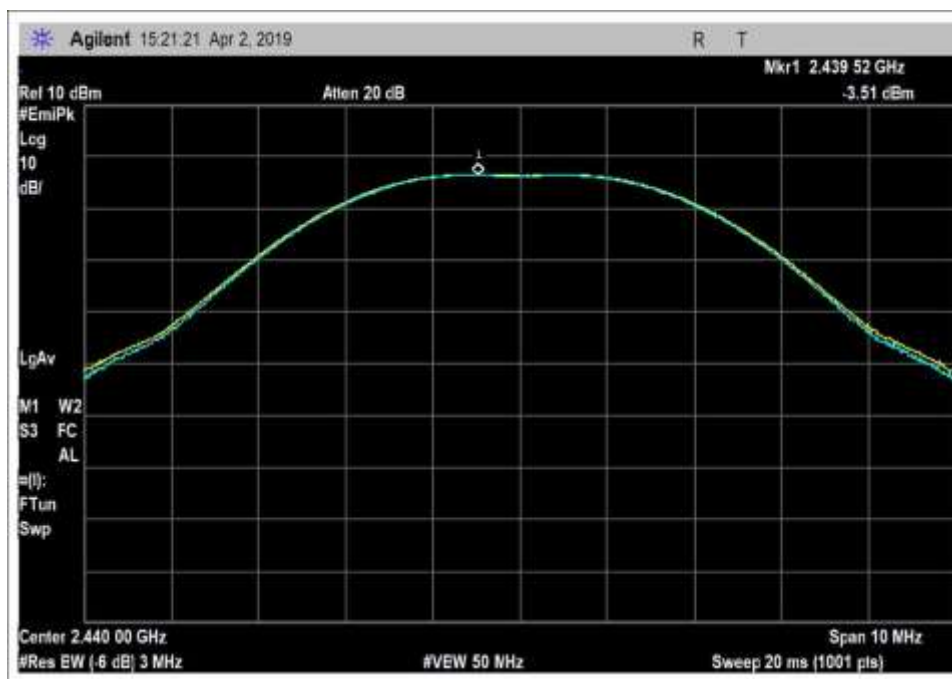
$$Limit = 30 - Roundup\left(\frac{G-6}{3}\right)$$

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

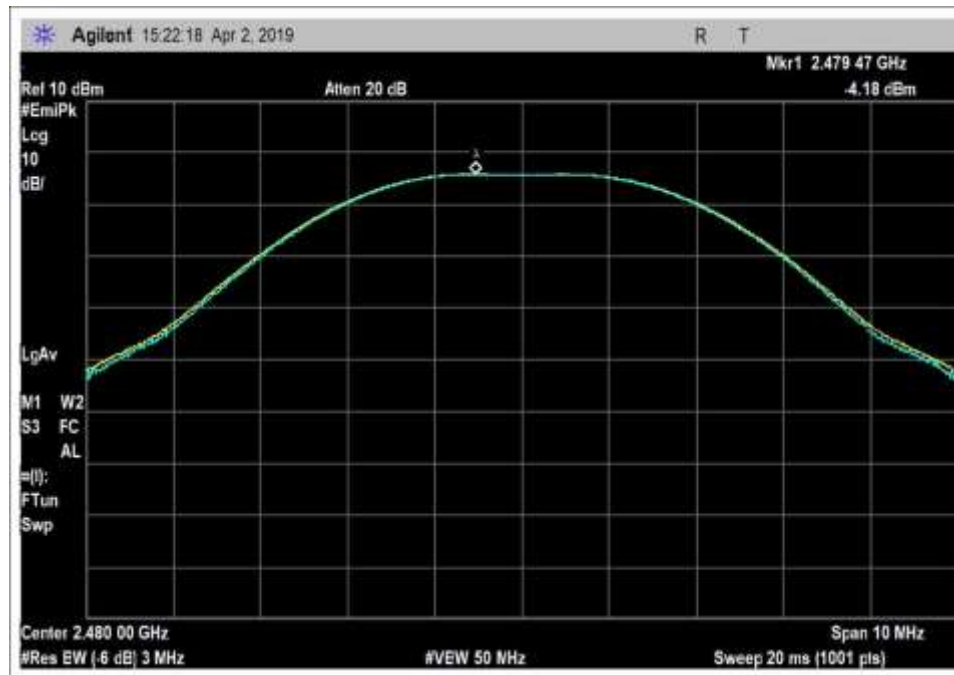
Plots



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 #: **102450** Date: 4/2/2019
 Test Type: **Conducted Emissions** Time: 15:22:34
 Tested By: Steven Pittsford Sequence#: 8
 Software: EMITest 5.03.12 115V 60Hz

Equipment Tested:

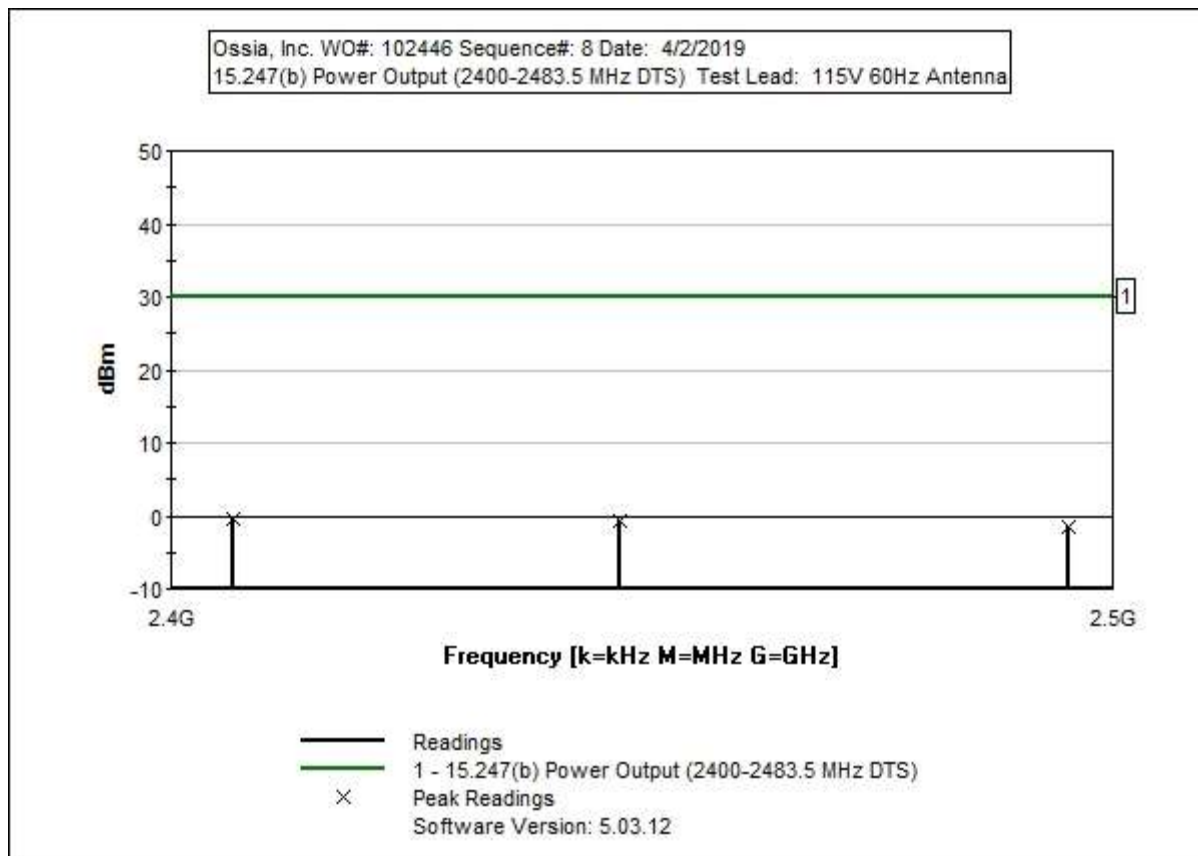
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 2.4-2.4835GHz Temperature: 20-21°C Relative Humidity: 28% Test Method: ANSI C63.10 (2013), KDB 558074 v05r02 Test Mode: Continuously Modulated The EUT's antenna port is connected directly to the spectrum analyzer through a RF cable. Plots show uncorrected data. See tabular data for corrected readings. Modifications #1 and 3 were in place during the time of testing.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06678	Cable	32026-29801- 29801-144	3/13/2018	3/13/2020

Measurement Data:

Reading listed by margin.

Test Lead: Antenna

#	Freq MHz	Rdng dBm	T1 dB				Dist Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
1	2405.496M	-3.0	+2.7				+0.0	-0.3	30.0	-30.3	Anten
2	2439.520M	-3.5	+2.7				+0.0	-0.8	30.0	-30.8	Anten
3	2479.470M	-4.2	+2.7				+0.0	-1.5	30.0	-31.5	Anten

Test Setup Photo



15.247(e) Power Spectral Density

Since the fundamental output power is below the PSD limits and passes the PSD limits this section is omitted.

15.247(d) RF Conducted 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: **15.247(d) Conducted Spurious Emissions Low**
 Work Order #: **102450** Date: 4/2/2019
 Test Type: **Conducted Emissions** Time: 3:41:02 PM
 Tested By: Steven Pittsford Sequence#: 11
 Software: EMITest 5.03.12 115V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

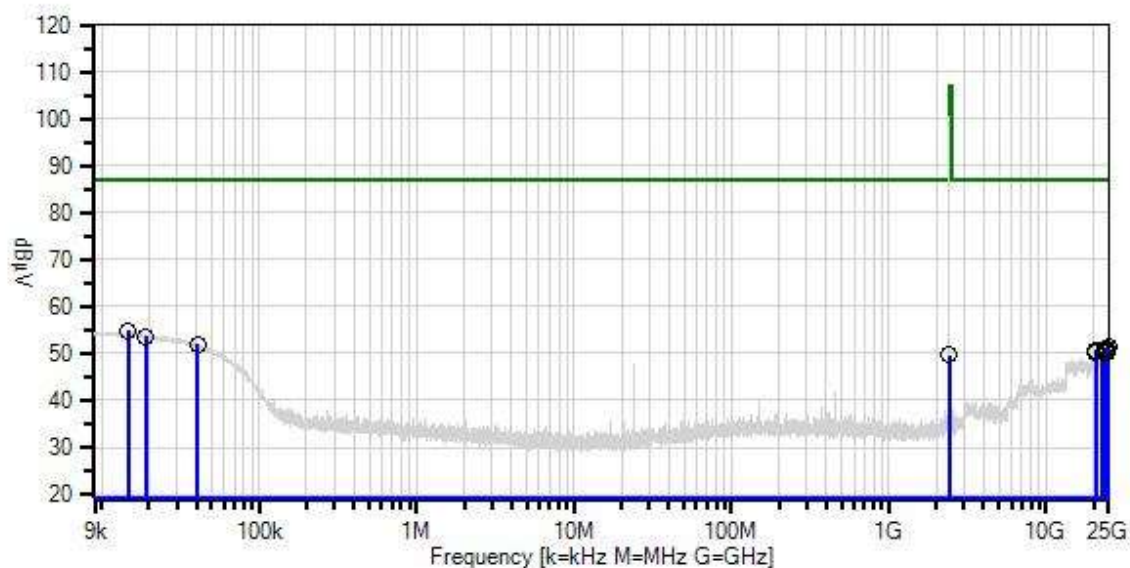
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 9k-25GHz Temperature: 20-21°C Relative Humidity: 28-35% Test Method: ANSI C63.10 (2013), KDB 558074 v05r02 Test Mode: Continuously Modulated The EUT is transmitting on Low channel. The EUT's antenna port is connected directly to the spectrum analyzer through a RF cable. Modifications #1 and 3 were in place during testing.

Ossia, Inc. WO#: 102446 Sequence#: 11 Date: 4/2/2019
15.247(d) Conducted Spurious Emissions Low Test Lead: 115V 60Hz Antenna



— Sweep Data
○ Peak Readings
* Average Readings
Software Version: 5.03.12

— Readings
x QP Readings
▼ Ambient
— 1 - 15.247(d) Conducted Spurious Emissions Low

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06678	Cable	32026-29801-29801-144	3/13/2018	3/13/2020

Measurement Data:

Reading listed by margin.

Test Lead: Antenna

#	Freq MHz	Rdng dBμV	T1 dB				Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	14.801k	54.8	+0.0				+0.0	54.8	87.0	-32.2	Anten
2	19.065k	53.6	+0.1				+0.0	53.7	87.0	-33.3	Anten
3	40.382k	52.0	+0.0				+0.0	52.0	87.0	-35.0	Anten
4	24934.529 M	41.5	+9.9				+0.0	51.4	87.0	-35.6	Anten
5	24319.097 M	41.6	+9.6				+0.0	51.2	87.0	-35.8	Anten
6	24489.323 M	41.5	+9.7				+0.0	51.2	87.0	-35.8	Anten
7	23572.722 M	41.7	+9.4				+0.0	51.1	87.0	-35.9	Anten
8	23664.382 M	41.4	+9.4				+0.0	50.8	87.0	-36.2	Anten
9	20757.449 M	41.7	+8.8				+0.0	50.5	87.0	-36.5	Anten
10	23978.645 M	41.0	+9.5				+0.0	50.5	87.0	-36.5	Anten
11	24017.928 M	40.8	+9.5				+0.0	50.3	87.0	-36.7	Anten
12	20469.374 M	41.4	+8.7				+0.0	50.1	87.0	-36.9	Anten
13	22773.970 M	41.1	+9.0				+0.0	50.1	87.0	-36.9	Anten
14	2398.898M	47.0	+2.7				+0.0	49.7	87.0	-37.3	Anten



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) Conducted Spurious Emissions Mid**
Work Order #: **102450** Date: 4/2/2019
Test Type: **Conducted Emissions** Time: 3:38:41 PM
Tested By: Steven Pittsford Sequence#: 10
Software: EMITest 5.03.12 115V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

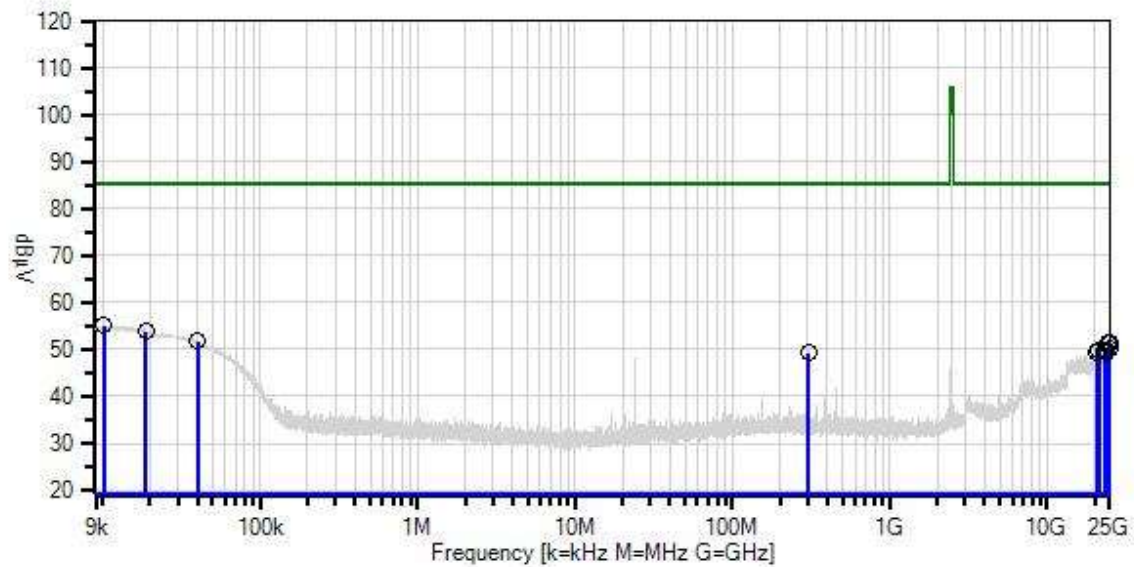
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 9k-25GHz Temperature: 20-21°C Relative Humidity: 28-35% Test Method: ANSI C63.10 (2013), KDB 558074 v05r02 Test Mode: Continuously Modulated The EUT is transmitting on Mid channel. The EUT's antenna port is connected directly to the spectrum analyzer through a RF cable. Modifications #1 and 3 were in place during testing.

Ossia, Inc. WD#: 102446 Sequence#: 10 Date: 4/2/2019
 15.247(d) Conducted Spurious Emissions Mid Test Lead: 115V 60Hz Antenna



— Sweep Data
 ○ Peak Readings
 * Average Readings
 Software Version: 5.03.12

— Readings
 × QP Readings
 ▼ Ambient
 — 1 - 15.247(d) Conducted Spurious Emissions Mid

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06678	Cable	32026-29801-29801-144	3/13/2018	3/13/2020

Measurement Data:

Reading listed by margin.

Test Lead: Antenna

#	Freq MHz	Rdng dBμV	T1 dB				Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	10.207k	55.0	+0.0				+0.0	55.0	85.5	-30.5	Anten
2	18.919k	53.7	+0.1				+0.0	53.8	85.5	-31.7	Anten
3	40.033k	51.8	+0.0				+0.0	51.8	85.5	-33.7	Anten
4	24358.380 M	42.0	+9.6				+0.0	51.6	85.5	-33.9	Anten
5	24921.434 M	41.5	+9.9				+0.0	51.4	85.5	-34.1	Anten
6	24960.717 M	41.5	+9.9				+0.0	51.4	85.5	-34.1	Anten
7	24803.586 M	40.5	+9.8				+0.0	50.3	85.5	-35.2	Anten
8	21110.995 M	41.0	+8.8				+0.0	49.8	85.5	-35.7	Anten
9	23494.156 M	40.4	+9.4				+0.0	49.8	85.5	-35.7	Anten
10	22970.384 M	40.7	+9.0				+0.0	49.7	85.5	-35.8	Anten
11	23035.856 M	40.6	+9.0				+0.0	49.6	85.5	-35.9	Anten
12	20705.071 M	40.7	+8.7				+0.0	49.4	85.5	-36.1	Anten
13	305.100M	48.3	+1.0				+0.0	49.3	85.5	-36.2	Anten
14	23821.513 M	39.8	+9.5				+0.0	49.3	85.5	-36.2	Anten



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) Conducted Spurious Emissions High**
Work Order #: **102450** Date: 4/2/2019
Test Type: **Conducted Emissions** Time: 15:36:20
Tested By: Steven Pittsford Sequence#: 9
Software: EMITest 5.03.12 115V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

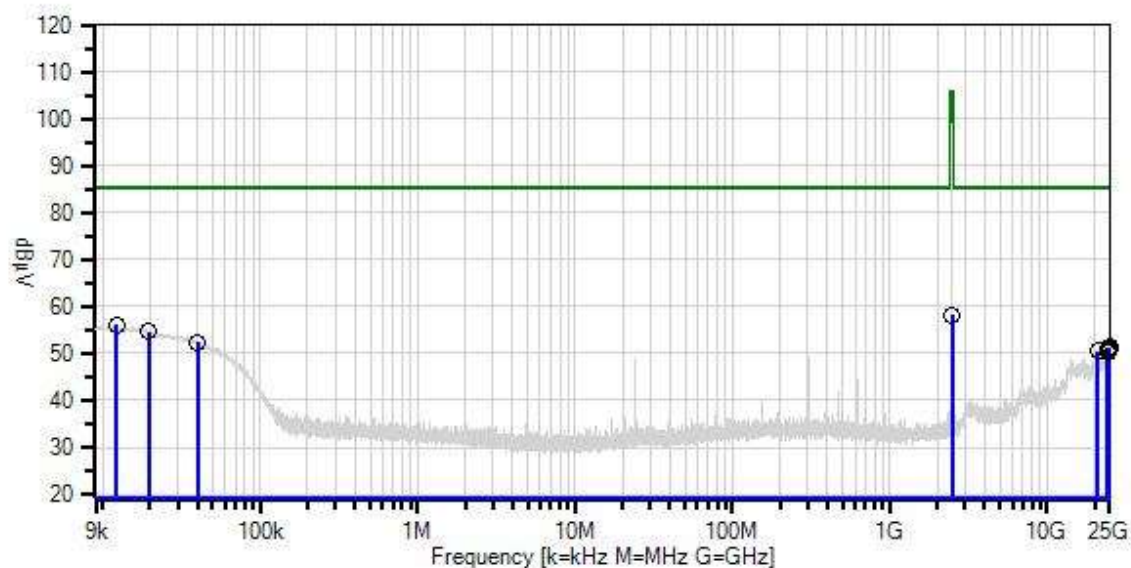
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 9k-25GHz Temperature: 20-21°C Relative Humidity: 28-35% Test Method: ANSI C63.10 (2013), KDB 558074 v05r02 Test Mode: Continuously Modulated The EUT is transmitting on High channel. The EUT's antenna port is connected directly to the spectrum analyzer through a RF cable. Modifications #1 and 3 were in place during testing.
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Ossia, Inc. W/O#: 102446 Sequence#: 9 Date: 4/2/2019
15.247(d) Conducted Spurious Emissions High Test Lead: 115V 60Hz Antenna



— Sweep Data
○ Peak Readings
* Average Readings
Software Version: 5.03.12

— Readings
× QP Readings
▼ Ambient
— 1 - 15.247(d) Conducted Spurious Emissions High

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06678	Cable	32026-29801-29801-144	3/13/2018	3/13/2020

Measurement Data:

Reading listed by margin.

Test Lead: Antenna

#	Freq MHz	Rdng dBμV	T1 dB				Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	2483.754M	55.5	+2.7				+0.0	58.2	85.5	-27.3	Anten
2	12.168k	56.0	+0.0				+0.0	56.0	85.5	-29.5	Anten
3	19.605k	54.5	+0.1				+0.0	54.6	85.5	-30.9	Anten
4	40.338k	52.3	+0.0				+0.0	52.3	85.5	-33.2	Anten
5	24882.151 M	41.5	+9.9				+0.0	51.4	85.5	-34.1	Anten
6	24515.511 M	41.4	+9.7				+0.0	51.1	85.5	-34.4	Anten
7	24947.623 M	41.0	+9.9				+0.0	50.9	85.5	-34.6	Anten
8	24266.720 M	41.1	+9.6				+0.0	50.7	85.5	-34.8	Anten
9	24345.285 M	41.0	+9.6				+0.0	50.6	85.5	-34.9	Anten
10	20770.543 M	41.7	+8.8				+0.0	50.5	85.5	-35.0	Anten
11	24017.928 M	40.9	+9.5				+0.0	50.4	85.5	-35.1	Anten
12	23965.551 M	40.8	+9.5				+0.0	50.3	85.5	-35.2	Anten
13	24148.871 M	40.7	+9.6				+0.0	50.3	85.5	-35.2	Anten
14	24240.531 M	40.6	+9.6				+0.0	50.2	85.5	-35.3	Anten

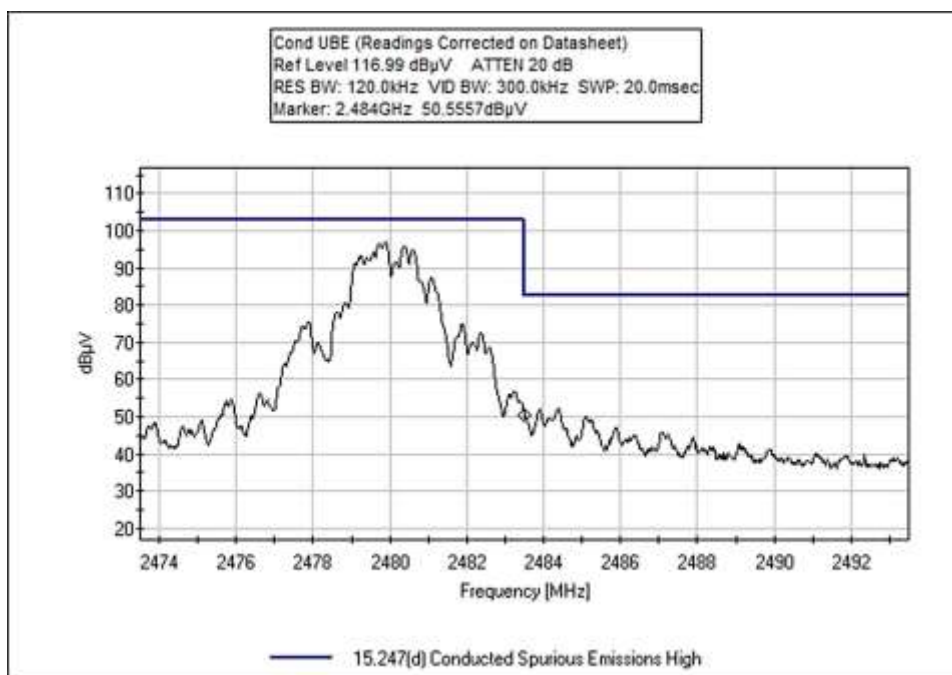
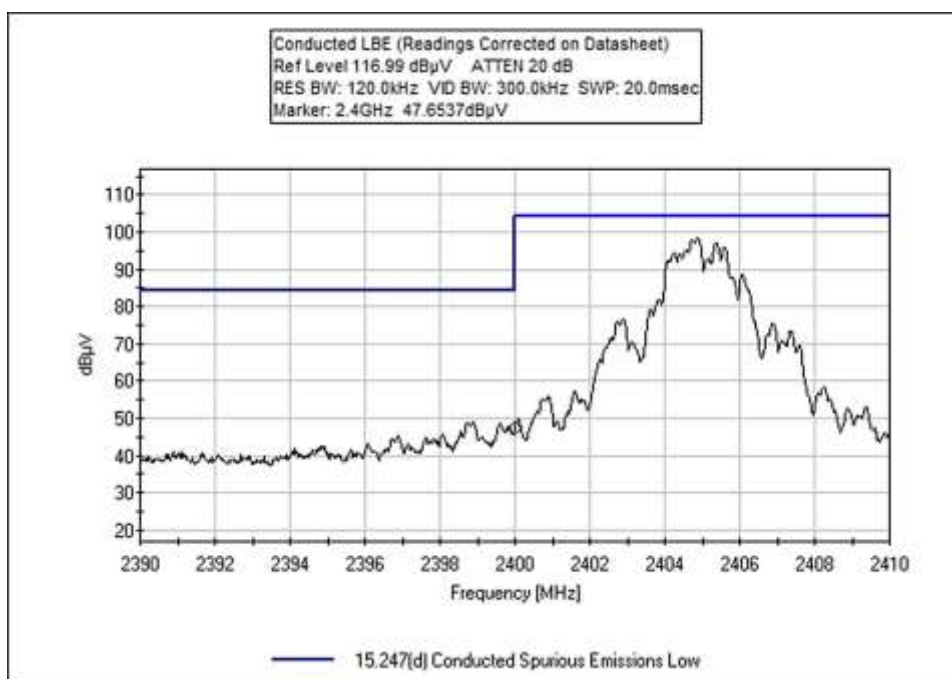
Band Edge

Band Edge Summary

Limit applied: Max Power/100kHz - 20dB.

Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
2400.0	OQPSK	-56.6	<-20	Pass
2483.5	OQPSK	-54.3	<-21.5	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) Conducted Spurious Emissions Low**
 Work Order #: **102450** Date: 4/5/2019
 Test Type: **Conducted Emissions** Time: 11:18:02
 Tested By: Matthew Harrison Sequence#: 8
 Software: EMITest 5.03.12 115V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 2.3-2.5GHz
Temperature: 20-21°C
Relative Humidity: 28-35%
Test Method: ANSI C63.10 (2013), KDB 558074 v05r02
Test Mode: Continuously Modulated
The EUT's antenna port is connected directly to the spectrum analyzer through a RF cable.
Plots show uncorrected data. See tabular data for corrected readings. dBm = dBuV – 107
Modifications #1 and 3 were in place during testing.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06678	Cable	32026-29801-29801-144	3/13/2018	3/13/2020

Measurement Data:

Reading listed by margin.

Test Lead: Antenna

#	Freq MHz	Rdng dBμV	T1 dB				Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	2483.500M	50.0	+2.7				+0.0	52.7	85.5	-32.8	Anten
2	2400.000M	47.7	+2.7				+0.0	50.4	87.0	-36.6	Anten

Test Setup Photo(s)



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: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **102446** Date: 4/5/2019
 Test Type: **Maximized Emissions** Time: 08:15:42
 Tested By: Matthew Harrison Sequence#: 7
 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:

Frequency Range: 9k-25GHz
 Temperature: 20-23°C
 Relative Humidity: 25-40%
 Test Method: ANSI C63.10 (2013), KDB 558074 v05r02

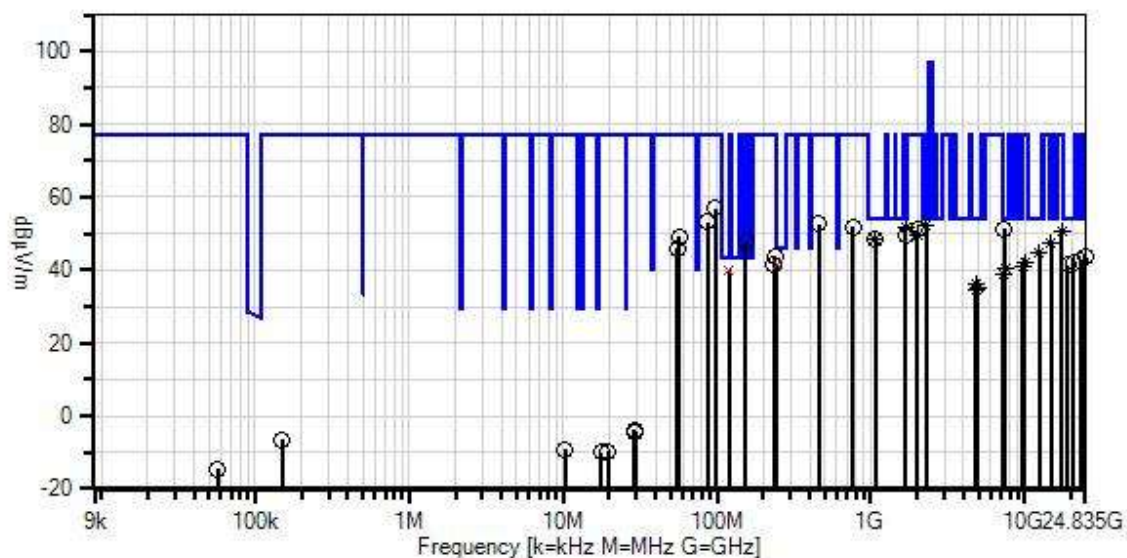
 Test Mode: Continuously Modulated

 The EUT is on a 1.5Meter high styrofoam test bench.

 The EUT is investigated in Low, Middle, and High Channels, X, Y, & Z Axis with only the worst case reported.
 Vertical and Horizontal polarities investigated

 Modifications #1 and 3 were in place during testing below 1GHz.

Ossia, Inc. WO#: 102446 Sequence#: 7 Date: 4/5/2019
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



— Readings
× QP Readings
▼ Ambient
○ Peak Readings
* Average Readings
Software Version: 5.03.12

1 - 15.247(d) / 15.209 Radiated Spurious Emissions

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	Heliac	10/30/2017	10/30/2019
T3	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T4	AN03540	Preamp	83017A	3/25/2019	3/25/2021
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
T7	ANP07226	Attenuator	PE7004-6	12/1/2017	12/1/2019
T8	AN00052	Loop Antenna	6502	5/7/2018	5/7/2020
T9	AN02307	Preamp	8447D	1/15/2018	1/15/2020
T10	AN03628	Biconilog Antenna	3142E	6/7/2017	6/7/2019
T11	ANP06123	Attenuator	18N-6	5/5/2017	5/5/2019
T12	ANP05305	Cable	ETSI-50T	10/24/2017	10/24/2019
T13	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T14	AN02742	Active Horn Antenna	AMFW-5F-18002650-20-10P	10/16/2018	10/16/2020
T15	AN02763-69	Waveguide	Multiple	4/23/2018	4/23/2020
T16	ANP06503	Cable	32026-29801-29801-36	3/13/2018	3/13/2020
T17	ANP06678	Cable	32026-29801-29801-144	3/13/2018	3/13/2020

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								
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	2296.901M	48.7	+0.0	+0.4	+2.5	-34.2	+0.0	52.2	54.0	-1.8	Horiz
	Ave		+0.9	+28.1	+5.8	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	2296.901M	49.3	+0.0	+0.4	+2.5	-34.2	+0.0	52.8	54.0	-1.2	Horiz
			+0.9	+28.1	+5.8	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								

3	1684.403M Ave	51.3	+0.0 +0.7 +0.0 +0.0 +0.0	+0.5 +25.8 +0.0 +0.0 +0.0	+2.2 +5.9 +0.0 +0.0 +0.0	-34.7 +0.0 +0.0 +0.0 +0.0	+0.0	51.7	54.0	-2.3	Horiz
^	1684.403M	51.7	+0.0 +0.7 +0.0 +0.0 +0.0	+0.5 +25.8 +0.0 +0.0 +0.0	+2.2 +5.9 +0.0 +0.0 +0.0	-34.7 +0.0 +0.0 +0.0 +0.0	+0.0	52.1	54.0	-1.9	Horiz
5	7320.000M	35.0	+0.0 +2.1 +0.0 +0.0 +0.0	+0.9 +36.5 +0.0 +0.0 +0.0	+5.4 +6.0 +0.0 +0.0 +0.0	-34.6 +0.0 +0.0 +0.0 +0.0	+0.0	51.3	54.0	-2.7	Horiz
6	120.010M QP	53.0	+0.0 +0.0 -27.6 +0.6 +0.0	+0.2 +0.0 +7.3 +0.0 +0.0	+0.0 +0.0 +5.9 +0.0 +0.0	+0.0 +0.0 +0.6 +0.0 +0.0	+0.0	40.0	43.5	-3.5	Vert
^	120.010M	58.3	+0.0 +0.0 -27.6 +0.6 +0.0	+0.2 +0.0 +7.3 +0.0 +0.0	+0.0 +0.0 +5.9 +0.0 +0.0	+0.0 +0.0 +0.6 +0.0 +0.0	+0.0	45.3	43.5	+1.8	Vert
8	243.009M QP	48.5	+0.0 +0.0 -27.1 +0.9 +0.0	+0.2 +0.0 +12.3 +0.0 +0.0	+0.0 +0.0 +5.9 +0.0 +0.0	+0.0 +0.0 +0.8 +0.0 +0.0	+0.0	41.5	46.0	-4.5	Horiz
^	243.009M	52.1	+0.0 +0.0 -27.1 +0.9 +0.0	+0.2 +0.0 +12.3 +0.0 +0.0	+0.0 +0.0 +5.9 +0.0 +0.0	+0.0 +0.0 +0.8 +0.0 +0.0	+0.0	45.1	46.0	-0.9	Horiz
10	1685.000M	49.0	+0.0 +0.7 +0.0 +0.0 +0.0	+0.5 +25.8 +0.0 +0.0 +0.0	+2.2 +5.9 +0.0 +0.0 +0.0	-34.7 +0.0 +0.0 +0.0 +0.0	+0.0	49.4	54.0	-4.6	Vert
11	1072.000M	52.6	+0.0 +0.5 +0.0 +0.0 +0.0	+0.4 +24.1 +0.0 +0.0 +0.0	+1.8 +5.8 +0.0 +0.0 +0.0	-36.5 +0.0 +0.0 +0.0 +0.0	+0.0	48.7	54.0	-5.3	Horiz
12	1071.878M Ave	52.4	+0.0 +0.5 +0.0 +0.0 +0.0	+0.4 +24.1 +0.0 +0.0 +0.0	+1.8 +5.8 +0.0 +0.0 +0.0	-36.5 +0.0 +0.0 +0.0 +0.0	+0.0	48.5	54.0	-5.5	Horiz

13	12399.840 M Ave	22.2	+0.0 +3.2 +0.0 +0.0 +0.0	+1.1 +39.4 +0.0 +0.0 +0.0	+7.0 +6.5 +0.0 +0.0 +0.0	-34.6 +0.0 +0.0 +0.0 +0.0	+0.0	44.8	54.0	-9.2	Horiz
^	12399.840 M	32.9	+0.0 +3.2 +0.0 +0.0 +0.0	+1.1 +39.4 +0.0 +0.0 +0.0	+7.0 +6.5 +0.0 +0.0 +0.0	-34.6 +0.0 +0.0 +0.0 +0.0	+0.0	55.5	54.0	+1.5	Horiz
15	22893.000 M	43.9	+0.0 +0.0 +0.0 +0.0 +9.0	+0.0 +0.0 +0.0 -16.0 +1.7	+0.0 +0.0 +0.0 +4.2 +0.0	+0.0 +0.0 +0.0 +0.0 +0.0	+0.0 360	42.8	54.0	-11.2	Horiz 136
16	20793.000 M	41.0	+0.0 +0.0 +0.0 +0.0 +8.8	+0.0 +0.0 +0.0 -14.0 +2.0	+0.0 +0.0 +0.0 +4.3 +0.0	+0.0 +0.0 +0.0 +0.0 +0.0	+0.0	42.1	54.0	-11.9	Horiz 130
17	19071.000 M	40.3	+0.0 +0.0 +0.0 +0.0 +8.2	+0.0 +0.0 +0.0 -13.0 +1.9	+0.0 +0.0 +0.0 +3.9 +0.0	+0.0 +0.0 +0.0 +0.0 +0.0	+0.0 360	41.3	54.0	-12.7	Horiz 157
18	7440.220M Ave	23.5	+0.0 +2.2 +0.0 +0.0 +0.0	+1.1 +36.8 +0.0 +0.0 +0.0	+5.5 +6.0 +0.0 +0.0 +0.0	-34.8 +0.0 +0.0 +0.0 +0.0	+0.0	40.3	54.0	-13.7	Horiz
^	7440.220M	34.4	+0.0 +2.2 +0.0 +0.0 +0.0	+1.1 +36.8 +0.0 +0.0 +0.0	+5.5 +6.0 +0.0 +0.0 +0.0	-34.8 +0.0 +0.0 +0.0 +0.0	+0.0	51.2	54.0	-2.8	Horiz
20	4809.000M Ave	25.1	+0.0 +1.5 +0.0 +0.0 +0.0	+0.5 +32.3 +0.0 +0.0 +0.0	+4.1 +5.9 +0.0 +0.0 +0.0	-33.3 +0.0 +0.0 +0.0 +0.0	+0.0	36.1	54.0	-17.9	Horiz
^	4809.000M	35.0	+0.0 +1.5 +0.0 +0.0 +0.0	+0.5 +32.3 +0.0 +0.0 +0.0	+4.1 +5.9 +0.0 +0.0 +0.0	-33.3 +0.0 +0.0 +0.0 +0.0	+0.0	46.0	54.0	-8.0	Horiz
22	4958.740M Ave	24.0	+0.0 +1.6 +0.0 +0.0 +0.0	+0.5 +32.5 +0.0 +0.0 +0.0	+4.2 +5.8 +0.0 +0.0 +0.0	-33.5 +0.0 +0.0 +0.0 +0.0	+0.0	35.1	54.0	-18.9	Horiz

^	4958.740M	36.6	+0.0	+0.5	+4.2	-33.5	+0.0	47.7	54.0	-6.3	Horiz
			+1.6	+32.5	+5.8	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
24	4881.110M Ave	23.6	+0.0	+0.5	+4.2	-33.4	+0.0	34.7	54.0	-19.3	Horiz
			+1.6	+32.4	+5.8	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	4881.110M	37.0	+0.0	+0.5	+4.2	-33.4	+0.0	48.1	54.0	-5.9	Horiz
			+1.6	+32.4	+5.8	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
26	96.900M	70.0	+0.0	+0.1	+0.0	+0.0	+0.0	57.0	77.0	-20.0	Vert
			+0.0	+0.0	+0.0	+0.0					
			-27.7	+7.7	+5.9	+0.5					
			+0.5	+0.0	+0.0	+0.0					
			+0.0								
27	86.300M	67.4	+0.0	+0.1	+0.0	+0.0	+0.0	53.2	77.0	-23.8	Vert
			+0.0	+0.0	+0.0	+0.0					
			-27.8	+6.6	+5.9	+0.5					
			+0.5	+0.0	+0.0	+0.0					
			+0.0								
28	459.700M	54.2	+0.0	+0.2	+0.0	+0.0	+0.0	52.6	77.0	-24.4	Vert
			+0.0	+0.0	+0.0	+0.0					
			-27.9	+17.8	+5.9	+1.1					
			+1.3	+0.0	+0.0	+0.0					
			+0.0								
29	765.300M	47.6	+0.0	+0.3	+0.0	+0.0	+0.0	51.7	77.0	-25.3	Vert
			+0.0	+0.0	+0.0	+0.0					
			-27.9	+22.7	+5.9	+1.4					
			+1.7	+0.0	+0.0	+0.0					
			+0.0								
30	1990.000M	47.9	+0.0	+0.3	+2.4	-34.4	+0.0	51.0	77.0	-26.0	Horiz
			+0.8	+28.1	+5.9	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
31	17359.840 M Ave	22.9	+0.0	+1.2	+8.6	-34.9	+0.0	50.7	77.0	-26.3	Horiz
			+3.7	+43.0	+6.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	17359.840 M	32.4	+0.0	+1.2	+8.6	-34.9	+0.0	60.2	77.0	-16.8	Horiz
			+3.7	+43.0	+6.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								

33	1990.619M Ave	46.6	+0.0 +0.8 +0.0 +0.0 +0.0	+0.3 +28.1 +0.0 +0.0 +0.0	+2.4 +5.9 +0.0 +0.0 +0.0	-34.4 +0.0 +0.0 +0.0 +0.0	+0.0	49.7	77.0	-27.3	Horiz
34	57.200M	63.6	+0.0 +0.0 -27.9 +0.4 +0.0	+0.1 +0.0 +6.6 +0.0 +0.0	+0.0 +0.0 +5.9 +0.0 +0.0	+0.0 +0.0 +0.4 +0.0 +0.0	+0.0	49.1	77.0	-27.9	Horiz
35	153.200M	58.1	+0.0 +0.0 -27.5 +0.7 +0.0	+0.2 +0.0 +9.9 +0.0 +0.0	+0.0 +0.0 +5.9 +0.0 +0.0	+0.0 +0.0 +0.6 +0.0 +0.0	+0.0	47.9	77.0	-29.1	Vert
36	14879.840 M Ave	22.6	+0.0 +3.8 +0.0 +0.0 +0.0	+0.5 +40.2 +0.0 +0.0 +0.0	+8.5 +6.3 +0.0 +0.0 +0.0	-34.7 +0.0 +0.0 +0.0 +0.0	+0.0	47.2	77.0	-29.8	Horiz
^	14879.840 M	32.5	+0.0 +3.8 +0.0 +0.0 +0.0	+0.5 +40.2 +0.0 +0.0 +0.0	+8.5 +6.3 +0.0 +0.0 +0.0	-34.7 +0.0 +0.0 +0.0 +0.0	+0.0	57.1	77.0	-19.9	Horiz
38	55.200M	60.6	+0.0 +0.0 -27.9 +0.4 +0.0	+0.1 +0.0 +6.5 +0.0 +0.0	+0.0 +0.0 +5.9 +0.0 +0.0	+0.0 +0.0 +0.4 +0.0 +0.0	+0.0	46.0	77.0	-31.0	Horiz
39	24825.000 M	39.7	+0.0 +0.0 +0.0 +0.0 +9.8	+0.0 +0.0 +0.0 +0.0 -12.0	+0.0 +0.0 +0.0 +0.0 +1.8	+0.0 +0.0 +0.0 +0.0 +4.4	+0.0	43.7	77.0	-33.3	Horiz 130
40	238.600M	50.5	+0.0 +0.0 -27.1 +0.9 +0.0	+0.2 +0.0 +12.2 +0.0 +0.0	+0.0 +0.0 +5.9 +0.0 +0.0	+0.0 +0.0 +0.8 +0.0 +0.0	+0.0	43.4	77.0	-33.6	Vert
41	9919.840M Ave	23.3	+0.0 +2.6 +0.0 +0.0 +0.0	+0.4 +37.7 +0.0 +0.0 +0.0	+6.3 +6.0 +0.0 +0.0 +0.0	-34.2 +0.0 +0.0 +0.0 +0.0	+0.0	42.1	77.0	-34.9	Horiz
^	9919.840M	35.0	+0.0 +2.6 +0.0 +0.0 +0.0	+0.4 +37.7 +0.0 +0.0 +0.0	+6.3 +6.0 +0.0 +0.0 +0.0	-34.2 +0.0 +0.0 +0.0 +0.0	+0.0	53.8	77.0	-23.2	Horiz

43	234.700M	49.0	+0.0	+0.2	+0.0	+0.0	+0.0	41.7	77.0	-35.3	Horiz
			+0.0	+0.0	+0.0	+0.0					
			-27.1	+12.0	+5.9	+0.8					
			+0.9	+0.0	+0.0	+0.0					
			+0.0								
44	9619.920M Ave	22.1	+0.0	+0.7	+6.2	-34.0	+0.0	41.1	77.0	-35.9	Horiz
			+2.6	+37.5	+6.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	9619.920M	34.9	+0.0	+0.7	+6.2	-34.0	+0.0	53.9	77.0	-23.1	Horiz
			+2.6	+37.5	+6.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
46	7213.880M Ave	22.9	+0.0	+0.8	+5.3	-34.5	+0.0	38.8	77.0	-38.2	Horiz
			+2.1	+36.2	+6.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	7213.880M	36.2	+0.0	+0.8	+5.3	-34.5	+0.0	52.1	77.0	-24.9	Horiz
			+2.1	+36.2	+6.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
48	29.164M	30.0	+0.0	+0.1	+0.3	+0.0	-40.0	-3.8	77.0	-80.8	Perp
			+0.0	+0.0	+0.0	+5.8					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
49	29.612M	29.5	+0.0	+0.1	+0.3	+0.0	-40.0	-4.4	77.0	-81.4	Perp
			+0.0	+0.0	+0.0	+5.7					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
50	150.000k	63.8	+0.0	+0.0	+0.0	+0.0	-80.0	-6.5	77.0	-83.5	Perp
			+0.0	+0.0	+0.0	+9.7					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
51	10.329M	21.5	+0.0	+0.0	+0.2	+0.0	-40.0	-9.1	77.0	-86.1	Perp
			+0.0	+0.0	+0.0	+9.2					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
52	19.523M	22.1	+0.0	+0.0	+0.2	+0.0	-40.0	-9.6	77.0	-86.6	Perp
			+0.0	+0.0	+0.0	+8.1					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								

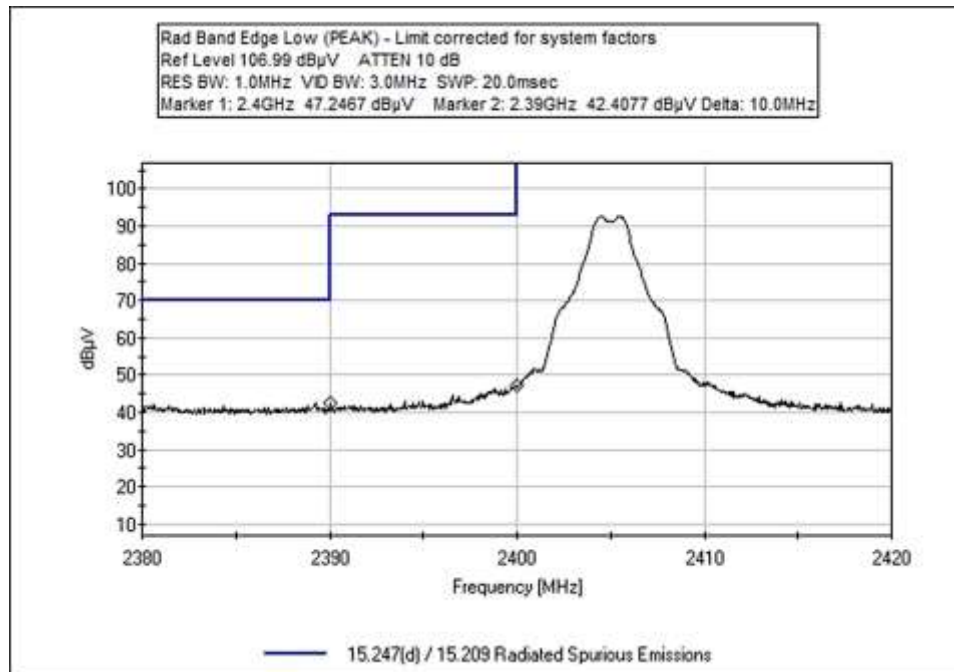
53	17.791M	21.5	+0.0	+0.0	+0.2	+0.0	-40.0	-9.9	77.0	-86.9	Perp
			+0.0	+0.0	+0.0	+8.4					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
54	56.744k	55.6	+0.0	+0.0	+0.0	+0.0	-80.0	-14.5	77.0	-91.5	Para
			+0.0	+0.0	+0.0	+9.9					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
55	114.359k	47.6	+0.0	+0.0	+0.0	+0.0	-80.0	-22.8	77.0	-99.8	Perp
			+0.0	+0.0	+0.0	+9.6					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								

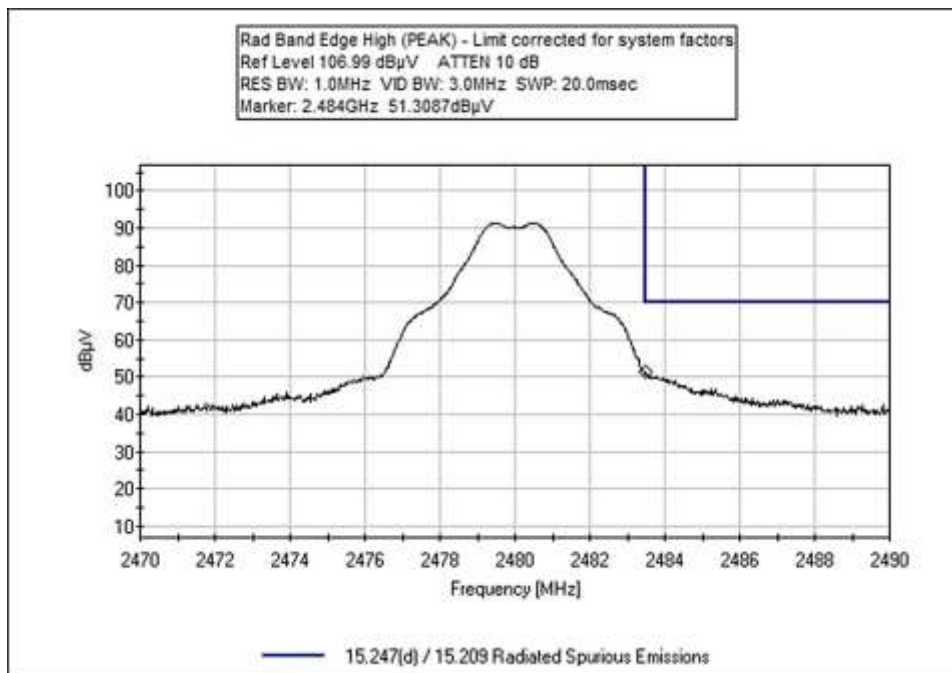
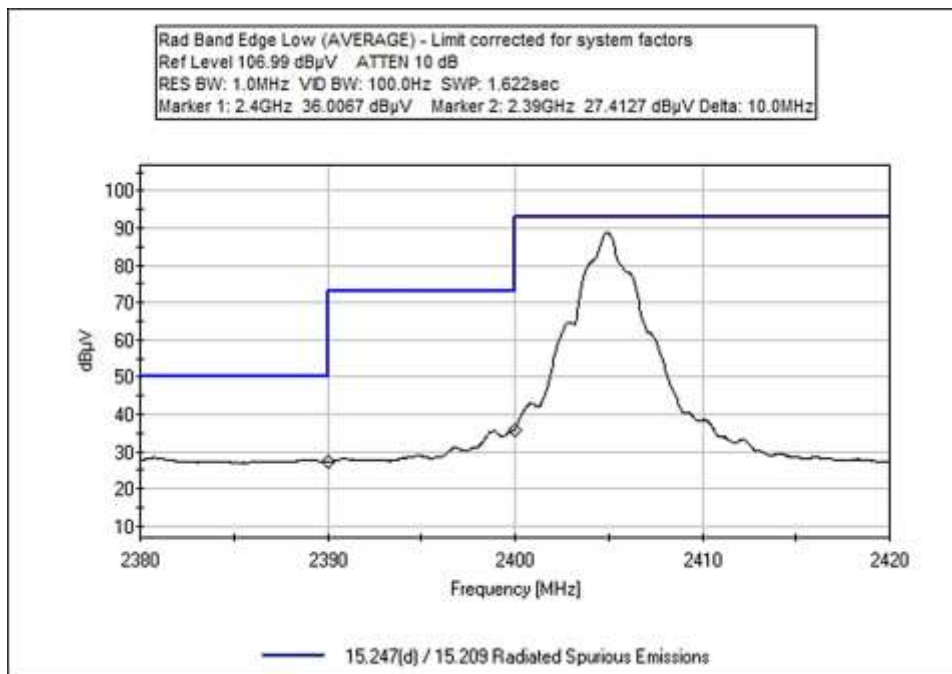
Band Edge

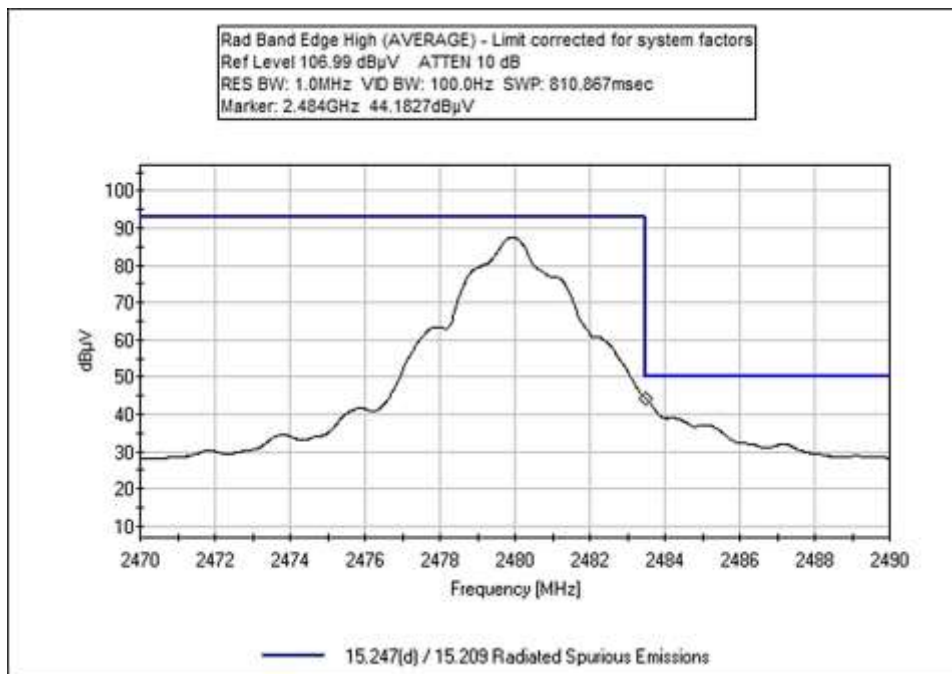
Band Edge Summary

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
2390.0 (PEAK)	OQPSK	External Dipole	46.2	<74	Pass
2390.0 (AVERAGE)	OQPSK	External Dipole	31.2	<54	Pass
2400.0 (PEAK)	OQPSK	External Dipole	51.0	<97	Pass
2400.0 (AVERAGE)	OQPSK	External Dipole	39.8	<77	Pass
2483.5 (PEAK)	OQPSK	External Dipole	53.9	<74	Pass
2483.5 (AVERAGE)	OQPSK	External Dipole	48.1	<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**
 Work Order #: **102450** Date: 4/1/2019
 Test Type: **Maximized Emissions** Time: 14:52:13
 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:

Frequency Range: 2.3-2.5GHz Temperature: 20-23°C Relative Humidity: 25-40% Test Method: ANSI C63.10 (2013), KDB 558074 v05r02 Test Mode: Continuously Modulated The EUT is on a 1.5Meter high styrofoam test bench. The EUT is investigated in Low, Middle, and High Channels, X, Y, & Z Axis with only the worst case reported. Vertical and Horizontal polarities investigated

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	Heliac	10/30/2017	10/30/2019
T3	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T4	AN03540	Preamp	83017A	3/25/2019	3/25/2021
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
T7	ANP07226	Attenuator	PE7004-6	12/1/2017	12/1/2019

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

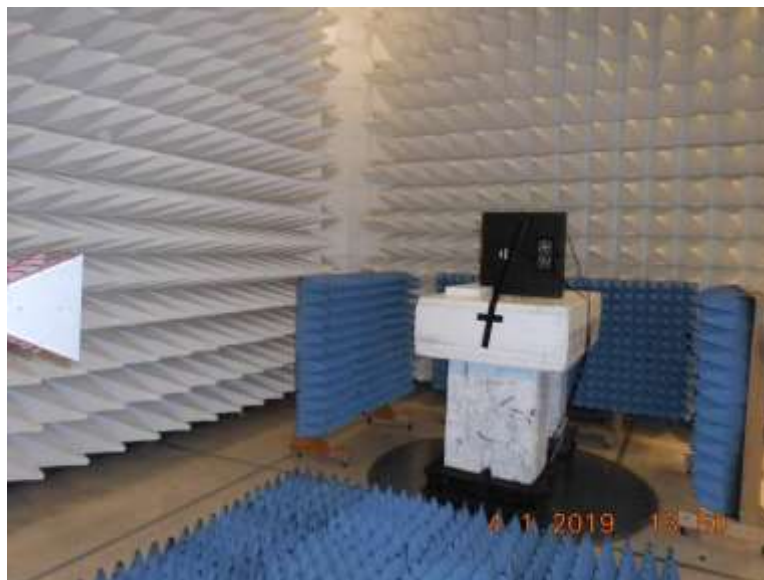
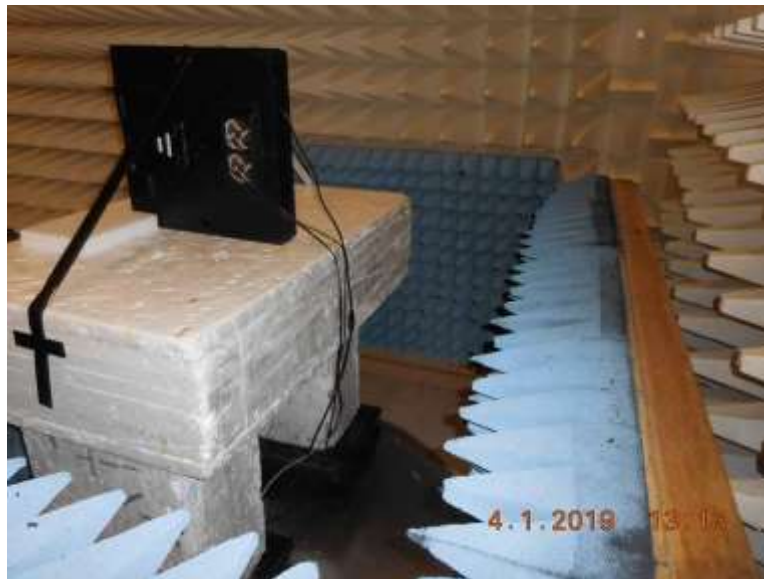
#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	2483.500M	50.0	+0.0	+0.4	+2.7	-34.1	+0.0	53.9	74.0	-20.1	Horiz
	Ave		+1.0	+28.1	+5.8						
^	2483.500M	44.2	+0.0	+0.4	+2.7	-34.1	+0.0	48.1	54.0	-5.9	Horiz
			+1.0	+28.1	+5.8						
3	2390.000M	27.4	+0.0	+0.4	+2.6	-34.1	+0.0	31.2	54.0	-22.8	Horiz
	Ave		+1.0	+28.1	+5.8						
^	2390.000M	42.4	+0.0	+0.4	+2.6	-34.1	+0.0	46.2	74.0	-27.8	Horiz
			+1.0	+28.1	+5.8						
5	2400.000M	36.0	+0.0	+0.4	+2.6	-34.1	+0.0	39.8	77.0	-37.2	Horiz
	Ave		+1.0	+28.1	+5.8						
^	2400.000M	47.2	+0.0	+0.4	+2.6	-34.1	+0.0	51.0	97.0	-46.0	Horiz
			+1.0	+28.1	+5.8						

Test Setup Photo(s)

Below 1GHz

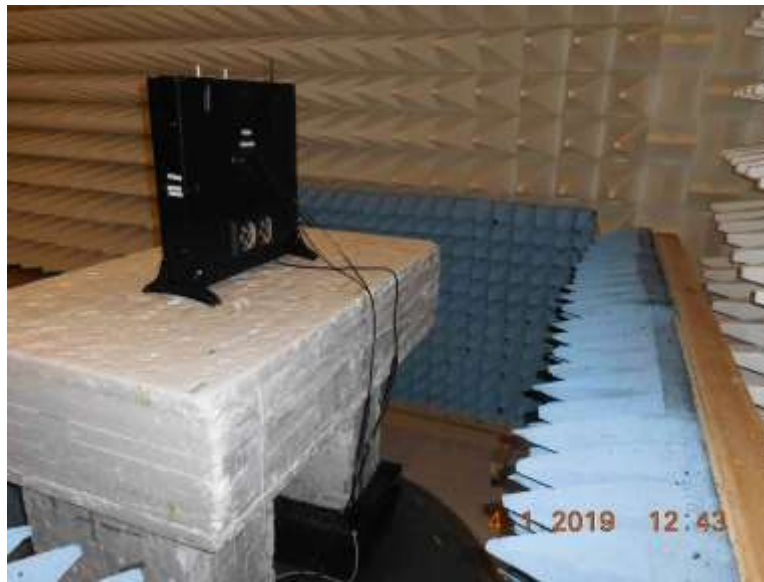


Above 1GHz





X-Axis



Y-Axis



Z-Axis

15.207 AC Conducted Emissions

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: **15.207 AC Mains - Average**
 Work Order #: **102450** Date: 4/5/2019
 Test Type: **Conducted Emissions** Time: 09:36:35
 Tested By: Matthew Harrison Sequence#: 17
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

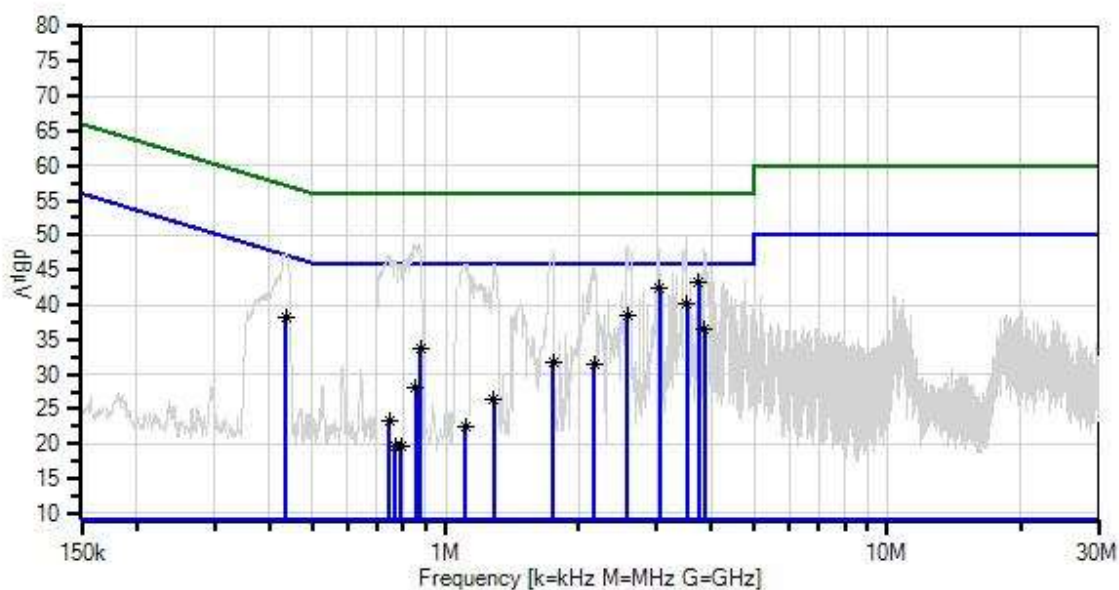
Pressure: 101.8kPa
 Frequency: 150kHz-30MHz
 Temperature: 20-21°C
 Relative Humidity: 28%
 Test Method: ANSI C63.10 (2013)

Low, Mid, and High channels investigated, worst case reported.

Router unplugged, light ring cable plugged in.

Modifications #1, 2, and 3 were in place during testing.

Ossia, Inc. WO#: 102446 Sequence#: 17 Date: 4/5/2019
15.207 AC Mains - Average Test Lead: 120V 60Hz Line



— Sweep Data	— Readings	○ Peak Readings
x QP Readings	* Average Readings	▼ Ambient
Software Version: 5.03.12	— 1 - 15.207 AC Mains - Average	— 2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
T2	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	10/30/2017	10/30/2019
T4	AN01311	50uH LISN-Line1 (L)	3816/2	3/16/2018	3/16/2020
	AN01311	50uH LISN-Line2 (N)	3816/2	3/16/2018	3/16/2020
	AN02871	Spectrum Analyzer	E4440A	1/9/2019	1/9/2021
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	1/15/2018	1/15/2020

Measurement Data:

Reading listed by margin.

Test Lead: Line

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV	dBμV	dB	Ant
1	3.748M	33.7	+9.1	+0.1	+0.0	+0.3	+0.0	43.3	46.0	-2.7	Line
Ave			+0.1								
^	3.748M	35.2	+9.1	+0.1	+0.0	+0.3	+0.0	44.8	46.0	-1.2	Line
			+0.1								
3	3.046M	32.8	+9.1	+0.1	+0.0	+0.3	+0.0	42.4	46.0	-3.6	Line
Ave			+0.1								
^	3.046M	38.5	+9.1	+0.1	+0.0	+0.3	+0.0	48.1	46.0	+2.1	Line
			+0.1								
5	3.510M	30.6	+9.1	+0.1	+0.0	+0.3	+0.0	40.2	46.0	-5.8	Line
Ave			+0.1								
^	3.510M	40.3	+9.1	+0.1	+0.0	+0.3	+0.0	49.9	46.0	+3.9	Line
			+0.1								
7	2.574M	29.0	+9.1	+0.1	+0.0	+0.3	+0.0	38.6	46.0	-7.4	Line
Ave			+0.1								
^	2.574M	38.9	+9.1	+0.1	+0.0	+0.3	+0.0	48.5	46.0	+2.5	Line
			+0.1								
9	435.791k	28.3	+9.1	+0.1	+0.0	+0.5	+0.0	38.2	47.1	-8.9	Line
Ave			+0.2								
^	435.790k	37.4	+9.1	+0.1	+0.0	+0.5	+0.0	47.3	47.1	+0.2	Line
			+0.2								
11	3.863M	27.0	+9.1	+0.1	+0.0	+0.3	+0.0	36.6	46.0	-9.4	Line
Ave			+0.1								
^	3.863M	38.5	+9.1	+0.1	+0.0	+0.3	+0.0	48.1	46.0	+2.1	Line
			+0.1								
13	877.205k	24.0	+9.1	+0.0	+0.0	+0.3	+0.0	33.6	46.0	-12.4	Line
Ave			+0.2								
^	877.205k	38.5	+9.1	+0.0	+0.0	+0.3	+0.0	48.1	46.0	+2.1	Line
			+0.2								
15	1.753M	22.1	+9.1	+0.1	+0.0	+0.3	+0.0	31.8	46.0	-14.2	Line
Ave			+0.2								
^	1.753M	37.9	+9.1	+0.1	+0.0	+0.3	+0.0	47.6	46.0	+1.6	Line
			+0.2								

17	2.166M	21.9	+9.1	+0.1	+0.0	+0.3	+0.0	31.5	46.0	-14.5	Line
	Ave		+0.1								
^	2.166M	35.8	+9.1	+0.1	+0.0	+0.3	+0.0	45.4	46.0	-0.6	Line
			+0.1								
19	855.389k	18.5	+9.1	+0.0	+0.0	+0.3	+0.0	28.1	46.0	-17.9	Line
	Ave		+0.2								
^	855.388k	39.1	+9.1	+0.0	+0.0	+0.3	+0.0	48.7	46.0	+2.7	Line
			+0.2								
21	1.285M	16.8	+9.1	+0.0	+0.0	+0.3	+0.0	26.4	46.0	-19.6	Line
	Ave		+0.2								
^	1.285M	36.2	+9.1	+0.0	+0.0	+0.3	+0.0	45.8	46.0	-0.2	Line
			+0.2								
23	744.854k	13.7	+9.1	+0.0	+0.0	+0.3	+0.0	23.3	46.0	-22.7	Line
	Ave		+0.2								
^	744.853k	37.6	+9.1	+0.0	+0.0	+0.3	+0.0	47.2	46.0	+1.2	Line
			+0.2								
25	1.107M	12.8	+9.1	+0.0	+0.0	+0.3	+0.0	22.4	46.0	-23.6	Line
	Ave		+0.2								
^	1.107M	36.4	+9.1	+0.0	+0.0	+0.3	+0.0	46.0	46.0	+0.0	Line
			+0.2								
27	795.031k	10.1	+9.1	+0.0	+0.0	+0.3	+0.0	19.7	46.0	-26.3	Line
	Ave		+0.2								
^	795.030k	36.2	+9.1	+0.0	+0.0	+0.3	+0.0	45.8	46.0	-0.2	Line
			+0.2								
29	771.033k	10.1	+9.1	+0.0	+0.0	+0.3	+0.0	19.7	46.0	-26.3	Line
	Ave		+0.2								
^	771.032k	36.8	+9.1	+0.0	+0.0	+0.3	+0.0	46.4	46.0	+0.4	Line
			+0.2								



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
Customer: **Ossia, Inc.**
Specification: **15.207 AC Mains - Average**
Work Order #: **102450** Date: 4/5/2019
Test Type: **Conducted Emissions** Time: 09:50:01
Tested By: Matthew Harrison Sequence#: 18
Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

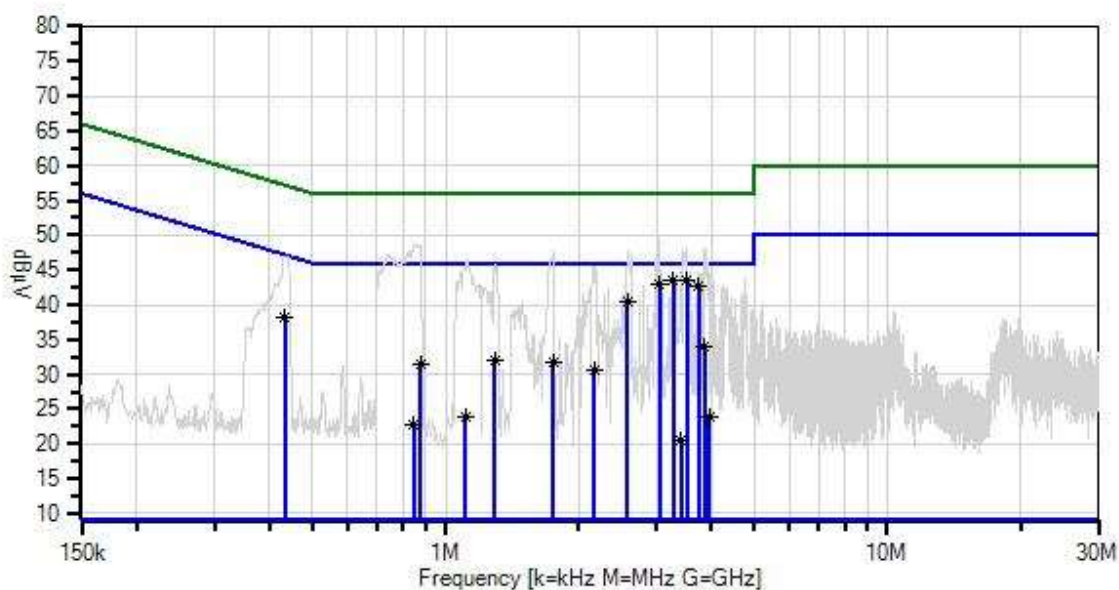
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Pressure: 101.8kPa Frequency: 150kHz-30MHz Temperature: 20-21°C Relative Humidity: 28% Test Method: ANSI C63.10 (2013) Low, Mid, and High channels investigated, worst case reported. Router unplugged, light ring cable plugged in.. Modifications #1, 2, and 3 were in place during testing.

Ossia, Inc. WO#: 102446 Sequence#: 18 Date: 4/5/2019
15.207 AC Mains - Average Test Lead: 120V 60Hz Neutral



— Sweep Data	— Readings	○ Peak Readings
x QP Readings	* Average Readings	▼ Ambient
Software Version: 5.03.12	— 1 - 15.207 AC Mains - Average	— 2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
T2	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	10/30/2017	10/30/2019
	AN01311	50uH LISN-Line1 (L)	3816/2	3/16/2018	3/16/2020
T4	AN01311	50uH LISN-Line2 (N)	3816/2	3/16/2018	3/16/2020
	AN02871	Spectrum Analyzer	E4440A	1/9/2019	1/9/2021
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	1/15/2018	1/15/2020

Measurement Data:

Reading listed by margin.

Test Lead: Neutral

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV	dBμV	dB	Ant
1	3.514M	34.0	+9.1	+0.1	+0.0	+0.3	+0.0	43.6	46.0	-2.4	Neutr
Ave			+0.1								
^	3.514M	38.4	+9.1	+0.1	+0.0	+0.3	+0.0	48.0	46.0	+2.0	Neutr
			+0.1								
3	3.280M	33.9	+9.1	+0.1	+0.0	+0.3	+0.0	43.5	46.0	-2.5	Neutr
Ave			+0.1								
^	3.280M	35.2	+9.1	+0.1	+0.0	+0.3	+0.0	44.8	46.0	-1.2	Neutr
			+0.1								
5	3.046M	33.3	+9.1	+0.1	+0.0	+0.3	+0.0	42.9	46.0	-3.1	Neutr
Ave			+0.1								
^	3.046M	39.9	+9.1	+0.1	+0.0	+0.3	+0.0	49.5	46.0	+3.5	Neutr
			+0.1								
7	3.748M	33.2	+9.1	+0.1	+0.0	+0.3	+0.0	42.8	46.0	-3.2	Neutr
Ave			+0.1								
^	3.748M	35.1	+9.1	+0.1	+0.0	+0.3	+0.0	44.7	46.0	-1.3	Neutr
			+0.1								
9	2.578M	30.8	+9.1	+0.1	+0.0	+0.3	+0.0	40.4	46.0	-5.6	Neutr
Ave			+0.1								
^	2.578M	38.1	+9.1	+0.1	+0.0	+0.3	+0.0	47.7	46.0	+1.7	Neutr
			+0.1								
11	432.883k	28.3	+9.1	+0.1	+0.0	+0.5	+0.0	38.2	47.2	-9.0	Neutr
Ave			+0.2								
^	432.883k	37.2	+9.1	+0.1	+0.0	+0.5	+0.0	47.1	47.2	-0.1	Neutr
			+0.2								
13	3.863M	24.5	+9.1	+0.1	+0.0	+0.3	+0.0	34.1	46.0	-11.9	Neutr
Ave			+0.1								
^	3.863M	38.6	+9.1	+0.1	+0.0	+0.3	+0.0	48.2	46.0	+2.2	Neutr
			+0.1								
15	1.290M	22.4	+9.1	+0.0	+0.0	+0.3	+0.0	32.0	46.0	-14.0	Neutr
Ave			+0.2								
^	1.290M	36.1	+9.1	+0.0	+0.0	+0.3	+0.0	45.7	46.0	-0.3	Neutr
			+0.2								

17	1.753M	22.0	+9.1	+0.1	+0.0	+0.3	+0.0	31.7	46.0	-14.3	Neutr
	Ave		+0.2								
^	1.753M	38.0	+9.1	+0.1	+0.0	+0.3	+0.0	47.7	46.0	+1.7	Neutr
			+0.2								
19	877.205k	21.8	+9.1	+0.0	+0.0	+0.3	+0.0	31.4	46.0	-14.6	Neutr
	Ave		+0.2								
^	877.205k	38.1	+9.1	+0.0	+0.0	+0.3	+0.0	47.7	46.0	+1.7	Neutr
			+0.2								
21	2.166M	21.1	+9.1	+0.1	+0.0	+0.3	+0.0	30.7	46.0	-15.3	Neutr
	Ave		+0.1								
^	2.166M	35.9	+9.1	+0.1	+0.0	+0.3	+0.0	45.5	46.0	-0.5	Neutr
			+0.1								
23	3.952M	14.4	+9.1	+0.1	+0.0	+0.3	+0.0	24.0	46.0	-22.0	Neutr
	Ave		+0.1								
^	3.952M	35.0	+9.1	+0.1	+0.0	+0.3	+0.0	44.6	46.0	-1.4	Neutr
			+0.1								
25	1.111M	14.3	+9.1	+0.0	+0.0	+0.3	+0.0	23.9	46.0	-22.1	Neutr
	Ave		+0.2								
^	1.111M	36.7	+9.1	+0.0	+0.0	+0.3	+0.0	46.3	46.0	+0.3	Neutr
			+0.2								
27	848.845k	13.1	+9.1	+0.0	+0.0	+0.3	+0.0	22.7	46.0	-23.3	Neutr
	Ave		+0.2								
^	848.844k	39.1	+9.1	+0.0	+0.0	+0.3	+0.0	48.7	46.0	+2.7	Neutr
			+0.2								
29	3.412M	10.8	+9.1	+0.1	+0.0	+0.3	+0.0	20.4	46.0	-25.6	Neutr
	Ave		+0.1								
^	3.412M	35.5	+9.1	+0.1	+0.0	+0.3	+0.0	45.1	46.0	-0.9	Neutr
			+0.1								

Test Setup Photo(s)



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	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(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.