

# VeriSolutions LLC

## ADDENDUM TO TEST REPORT 98844-6

**VeriRadio**  
**Model: 100**

**Tested to The Following Standards:**

**FCC Part 15 Subpart C**  
**Section(s): 15.207 & 15.247**  
**(DTS 2400-2483.5 MHz)**

**Report No.: 98844-6A**

**Date of issue: September 26, 2016**



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 EMC 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:**

VeriSolutions LLC  
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Atlanta, GA 30308

Representative: Abraham Fetcher

**REPORT PREPARED BY:**

Terri Rayle  
CKC Laboratories, Inc.  
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Mariposa, CA 95338

Project Number: 98844

**DATE OF EQUIPMENT RECEIPT:**

August 22, 2016

**DATE(S) OF TESTING:**

August 22-23, 2016

## Revision History

**Original:** Testing of VeriRadio, Model: 100 to FCC Part 15 Subpart C, Section(s): 15.207 & 15.247, (DTS 2400-2483.5 MHz).

**Addendum A:** To correct a typo of the Measured (dBm/ W) power value in section 15.247(b)(3) from 0.028W to 0.0028W.

## Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment 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.  
5046 Sierra Pines Drive  
Mariposa, CA 95338

## Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.02

## Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Mariposa A	US0103	SL2-IN-E-1147R	3082A-2	90477	A-0136

## 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	Pass
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	Pass

NA = Not Applicable

## 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

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
VeriRadio	VeriSolutions LLC	100	NA

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Power Supply	HP	6205C	2228A01775
Power Supply	CUI	SW16-3-3-N	NA

### Configuration 2

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
VeriRadio	VeriSolutions LLC	100	NA

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Power Supply	CUI	SW16-3-3-N	NA

## General Product Information:

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Product Information	Manufacturer-Provided Details
Equipment Type:	Radio Module
Type of Wideband System:	802.15.4
Operating Frequency Range:	2405-2480MHz
Modulation Type(s):	OQPSK
Maximum Duty Cycle:	99%
Number of TX Chains:	Single
Antenna Type(s) and Gain:	PCB trace, Inverted F, 3.3 dBi
Beamforming Type:	NA
Antenna Connection Type:	Integral
Nominal Input Voltage:	3.3V nominal, 2.7-3.6 V rated
Firmware / Software used for Test:	FCC Firmware

## FCC Part 15 Subpart C

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

#### Test Setup/Conditions

Test Location:	Mariposa Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	8/22/2016
Configuration:	2		
Test Setup:	The RF characteristic of the signal is measured at the antenna port. Freq 2400-2483.5 Tx freq:2405MHz, 2444MHz, 2480MHz Protocol: 802.15.4, Modulation: OQPSK Duty Cycle:100 % DC power was provided by support DC power source.		

#### Environmental Conditions

Temperature (°C)	28	Relative Humidity (%):	50
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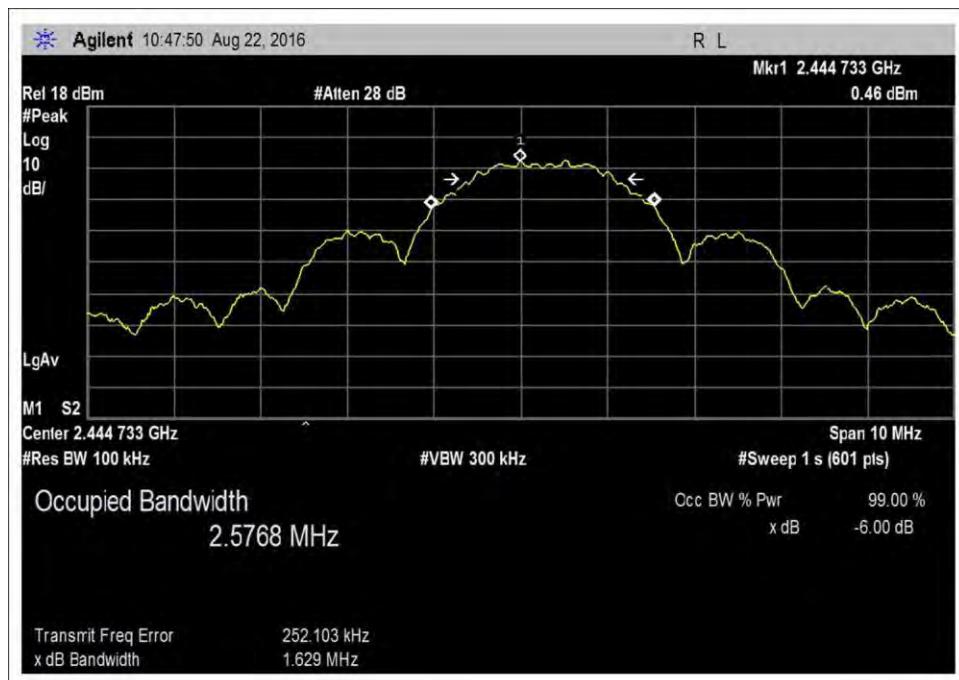
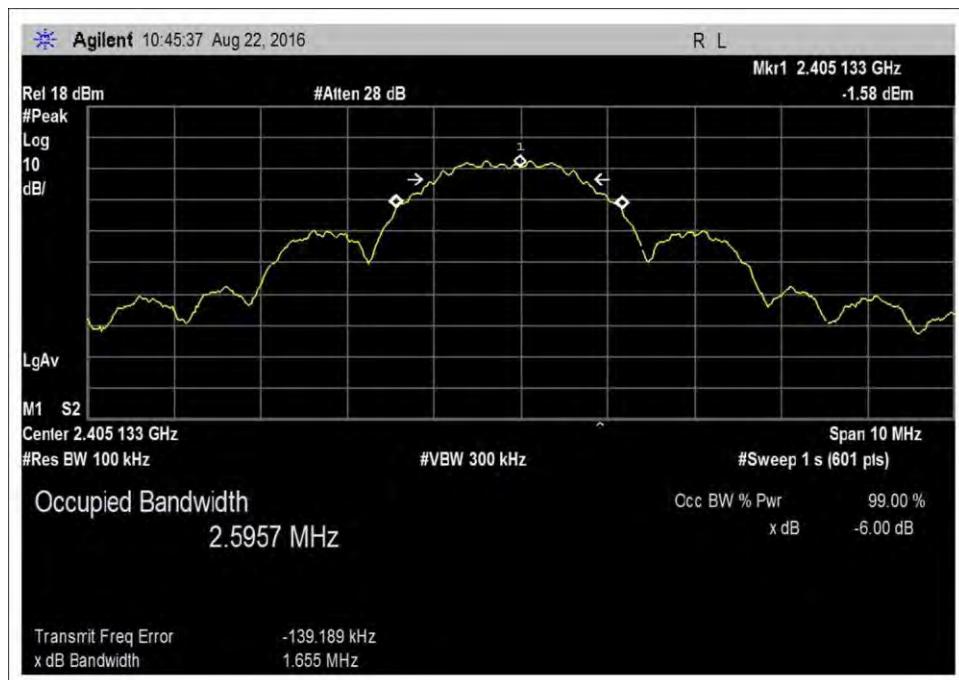
#### Test Equipment

Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02672	Spectrum Analyzer	Agilent	E4446A	9/30/2015	9/30/2017
P06554	Cable	Astrolab	32022-29094K-29094K-24TC	12/30/2015	12/30/2017

#### Test Data Summary

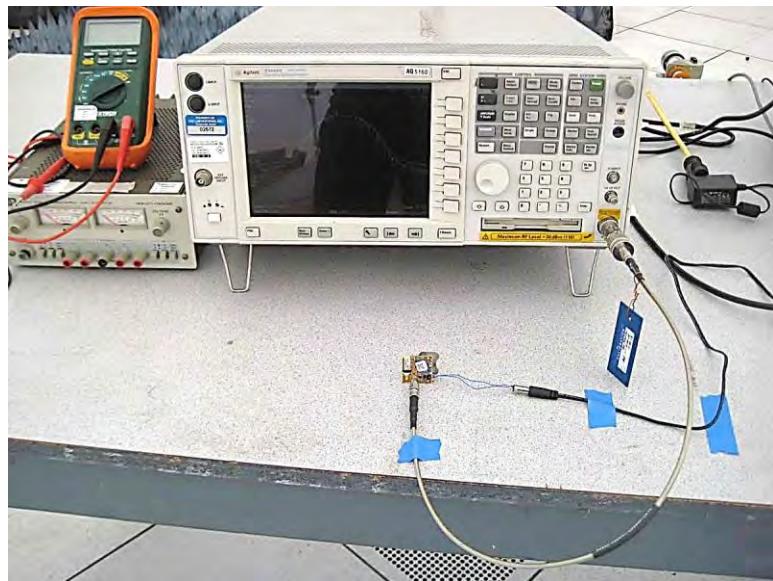
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
2405	1	OQPSK	1655	≥500	Pass
2444	1	OQPSK	1629	≥500	Pass
2480	1	OQPSK	1616	≥500	Pass

## Plot(s)





### Test Setup Photo(s)



## 15.247(b)(3) Output Power

Test Setup / Conditions			
Test Location:	Mariposa Lab A	Test Engineer:	Eddie Wong
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	8/22/2016
Configuration:	1		
Test Setup:	The RF characteristic of the signal is measured at the antenna port. Freq 2400-2483.5 Tx freq:2405MHz, 2444MHz, 2480MHz Protocol: 802.15.4, Modulation: OQPSK Duty Cycle:100 % DC power was provided by support DC power source.		

Environmental Conditions			
Temperature (°C)	28	Relative Humidity (%):	50

Test Equipment					
Asset# / Serial#	Description	Manufacturer	Model	Cal Date	Cal Due
02672	Spectrum Analyzer	Agilent	E4446A	9/30/2015	9/30/2017
P06554	Cable	Astrolab	32022-29094K-29094K-24TC	12/30/2015	12/30/2017

Test Data Summary - Voltage Variations					
Frequency (MHz)	Modulation / Ant Port	V <sub>Minimum</sub> (dBm)	V <sub>Nominal</sub> (dBm)	V <sub>Maximum</sub> (dBm)	Max Deviation from V <sub>Nominal</sub> (dB)
2405	OQPSK	4.41	4.41	4.41	0.0
2444	OQPSK	4.30	4.31	4.31	0.1
2480	OQPSK	3.65	3.66	3.66	0.0

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

### **Parameter Definitions:**

Measurements performed at input voltage according to manufacturer specification.

Parameter	Value
V <sub>Nominal</sub> :	3.3
V <sub>Minimum</sub> :	2.7
V <sub>Maximum</sub> :	3.6

### **Test Data Summary - Voltage Variations**

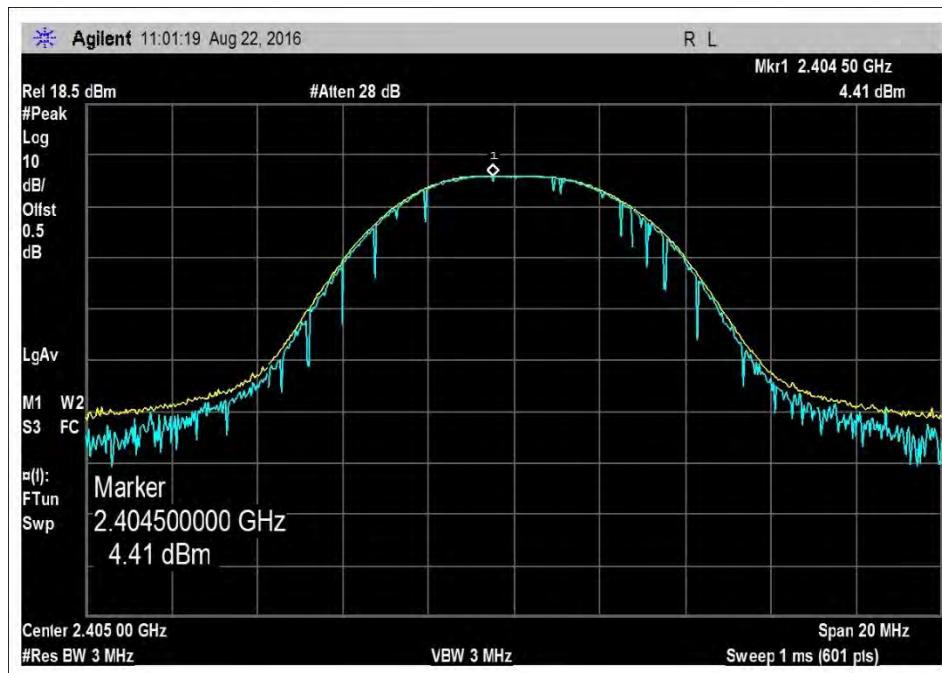
This equipment is battery powered. Power output tests were performed using a fresh battery.

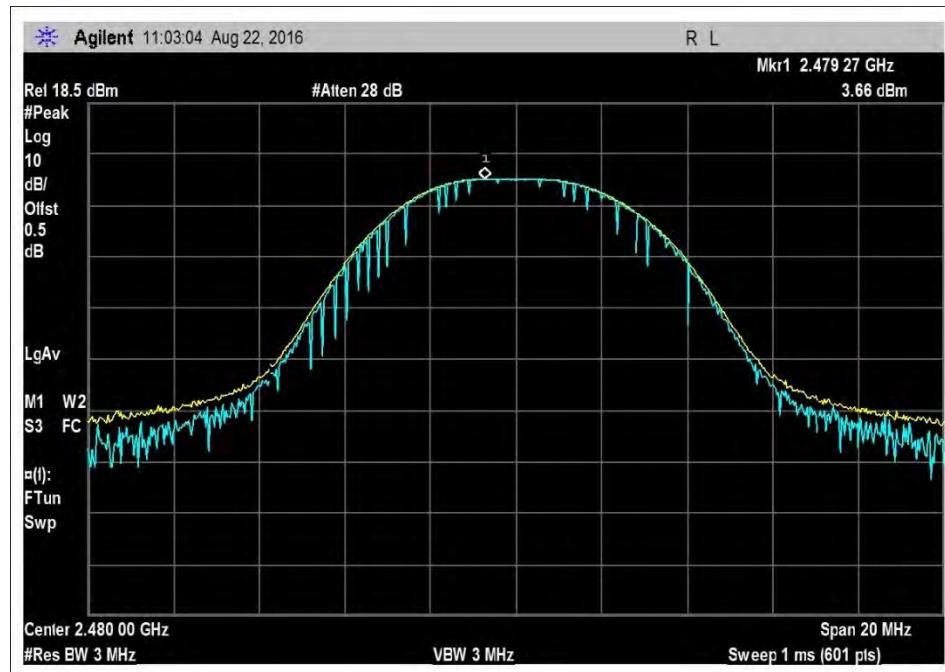
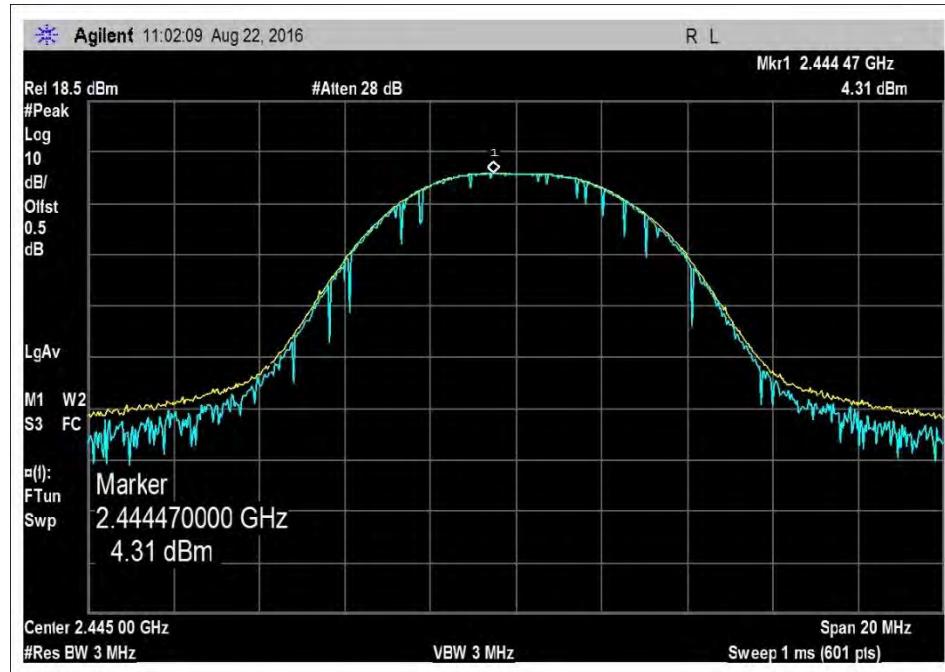
### Power Output Test Data Summary - RF Conducted Measurement

Measurement Option: RBW > DTS Bandwidth

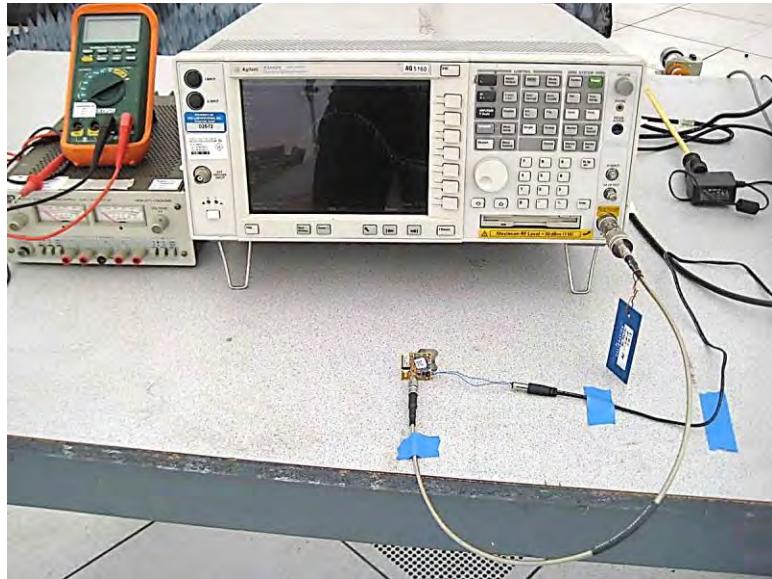
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm/ W)	Limit (dBm)	Results
2405	OQPSK	Integral, trace, 3.3	4.4/ 0.0028	≤30	Pass
2444	OQPSK	Integral, trace, 3.3	4.31/ 0.0027	≤30	Pass
2480	OQPSK	Integral, trace, 3.3	3.66/ 0.0023	≤30	Pass

### Plot(s)





**Test Setup Photo(s)**



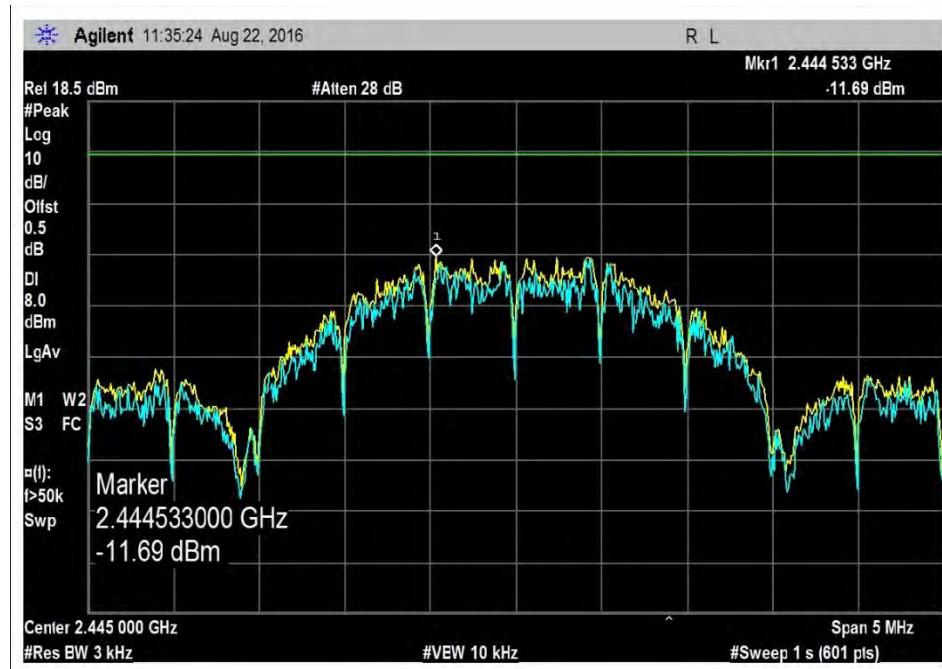
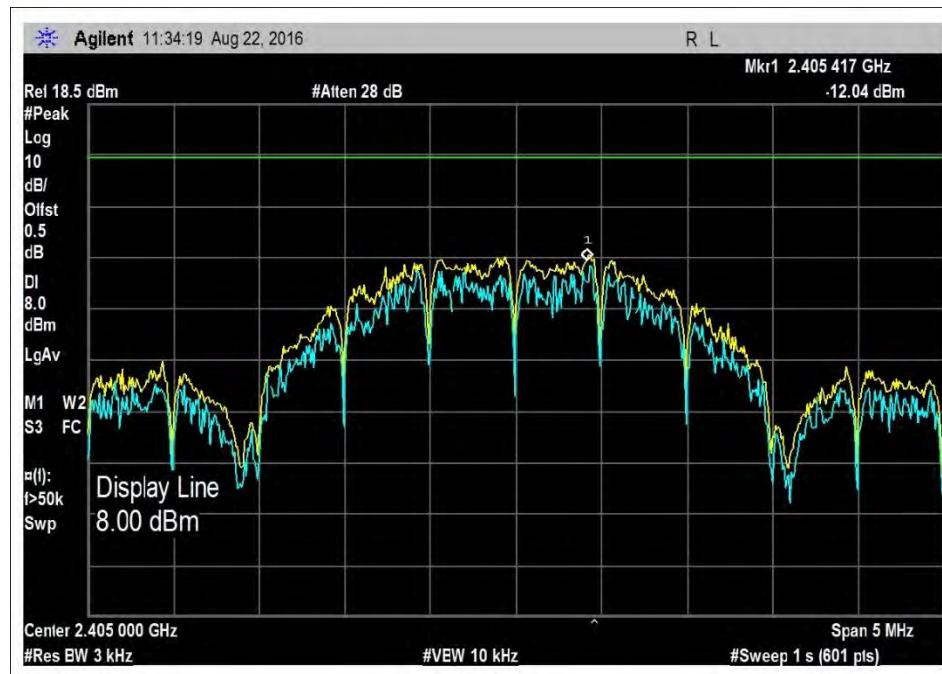
## 15.247(e) Power Spectral Density

Test Setup / Conditions / Data			
Test Location:	Mariposa Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	8/22/2016
Configuration:	2		
Test Setup:	The RF characteristic of the signal is measured at the antenna port. Freq 2400-2483.5 Tx freq:2405MHz, 2444MHz, 2480MHz Protocol: 802.15.4, Modulation: OQPSK Duty Cycle:100 % DC power was provided by support DC power source.		

Environmental Conditions			
Temperature (°C)	28	Relative Humidity (%):	50

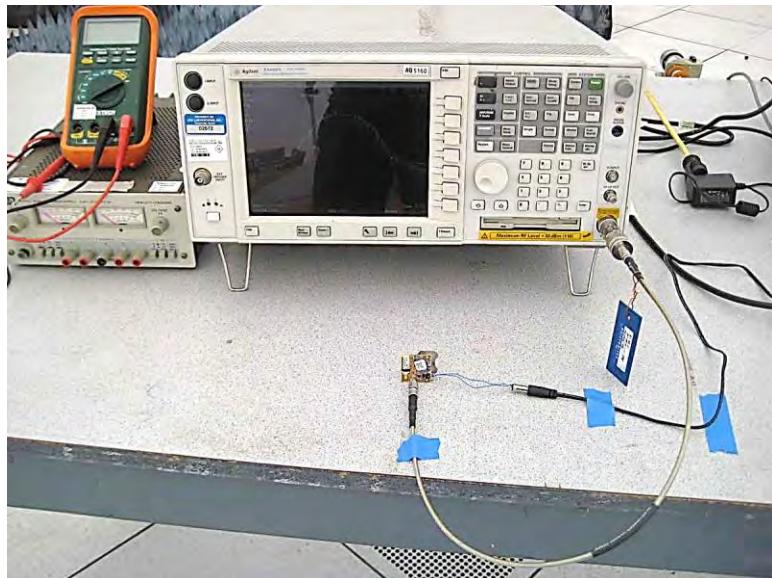
PSD Test Data Summary - RF Conducted Measurement				
Measurement Method: PKPSD				
Frequency (MHz)	Modulation	Measured (dBm/3kHz)	Limit (dBm/3kHz)	Results
2405	OQPSK	-12.04	≤8	Pass
2444	OQPSK	-11.69	≤8	Pass
2480	OQPSK	-11.95	≤8	Pass

## Plot(s)





**Test Setup Photo(s)**



## 15.247(d) RF Conducted Emissions & Band Edge

### Test Setup/Conditions

Test Location:	Mariposa Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	8/22/2016
Configuration:	2		

### Environmental Conditions

Temperature (°C)	28	Relative Humidity (%):	50
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See data sheets for test setup and test equipment.

### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112  
 Customer: **VeriSolutions LLC**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **98844** Date: 8/22/2016  
 Test Type: **Conducted Emissions** Time: 13:36:35  
 Tested by: E. Wong Sequence#: 2  
 Software: EMITest 5.03.02 3.3V DC

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Config2			

#### Support Equipment:

Device	Manufacturer	Model #	S/N
Config2			

#### Test Conditions / Notes:

The RF characteristic of the signal is measured at the antenna port.

Freq 2400-2483.5

Tx freq:2405MHz, 2444MHz, 2480MHz

Protocol: 802.15.4, Modulation: OQPSK

Duty Cycle:100 %

Frequency range of measurement = 9 kHz- 25GHz.

9 kHz -150 kHz; RBW=200 Hz, VBW=200 Hz;150 kHz-30 MHz; RBW=9 kHz, VBW=9 kHz;30 MHz-1000 MHz  
 RBW=120 kHz, VBW=120 kHz,1000 MHz-25000 MHz; RBW=1 MHz, VBW=1 MHz.

DC power was provided by support DC power source.

Conducted spur emission limit: 4dbm – 20 = -16dBm,  
 -16dBm+107 = 91dBuV

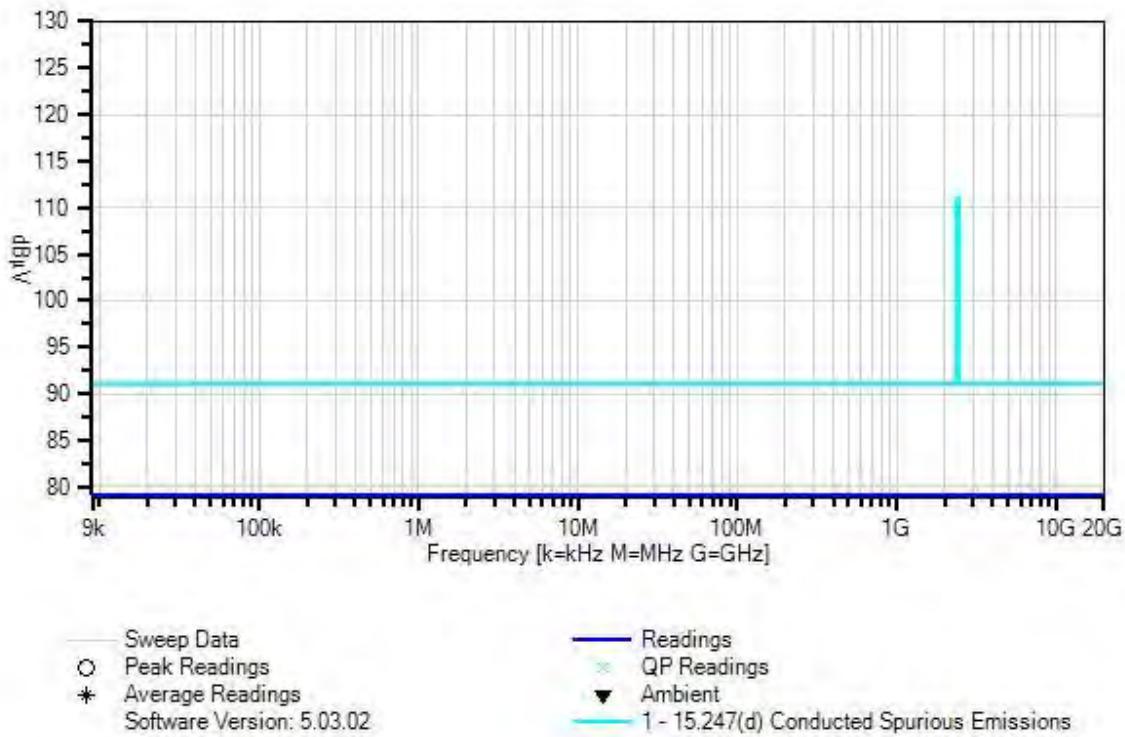
Test environment conditions

Temperature: 28°C

Relative Humidity: 50%

Atmospheric Pressure: 100kPa

VeriSolutions LLC WO#: 98844 Sequence#: 2 Date: 8/22/2016  
15.247(d) Conducted Spurious Emissions Test Lead: 3.3V DC Antenna port



**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	9/30/2015	9/30/2017
T1	ANP06554	Cable	32022-29094K-29094K-24TC	12/30/2015	12/30/2017
T2	ANdBm	Unit Conversion		7/20/2016	7/20/2018

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna port

#	Freq MHz	Rdng dBm	T1 dB	T2 dB	dB	Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	4790.000M	-58.4	+0.8	+107.0		+0.0	49.4	91.0	-41.6	Anten
2	4960.000M	-59.0	+0.8	+107.0		+0.0	48.8	91.0	-42.2	Anten
3	4880.000M	-60.4	+0.8	+107.0		+0.0	47.4	91.0	-43.6	Anten

## Band Edge

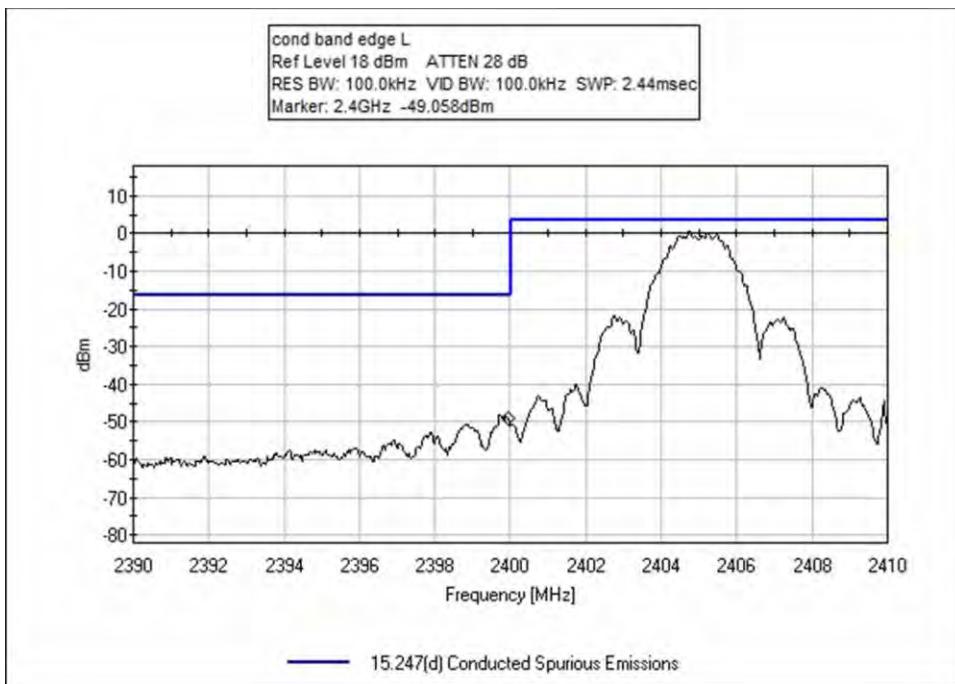
### Band Edge Summary

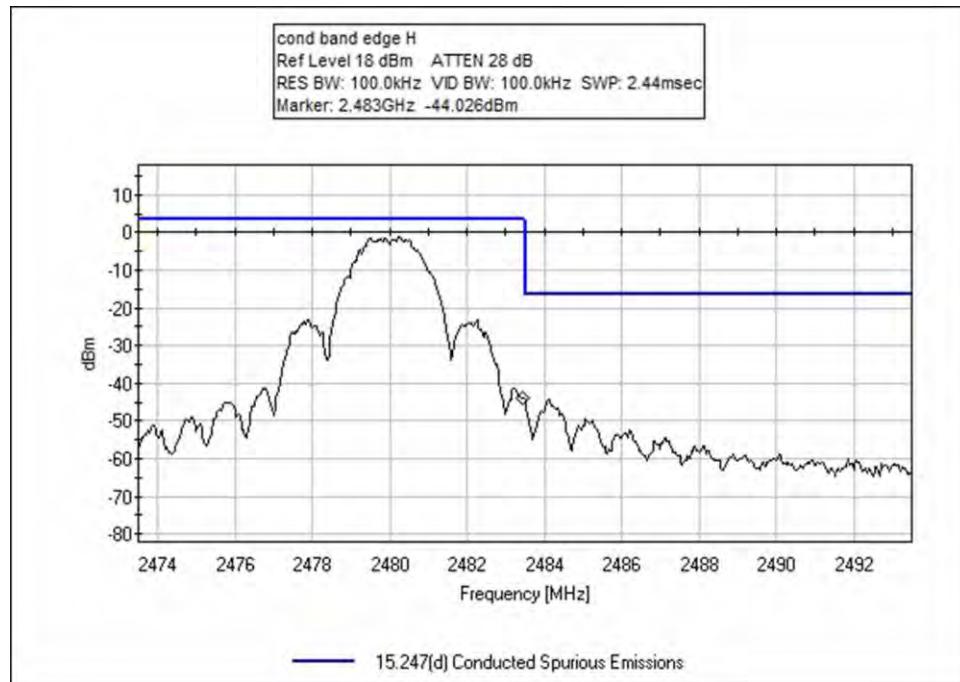
Limit applied: Max Power/100kHz - 20dB.

Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
2400.0	OQPSK	-48.55	< -16	Pass
2483.5	OQPSK	-43.53	< -16	Pass

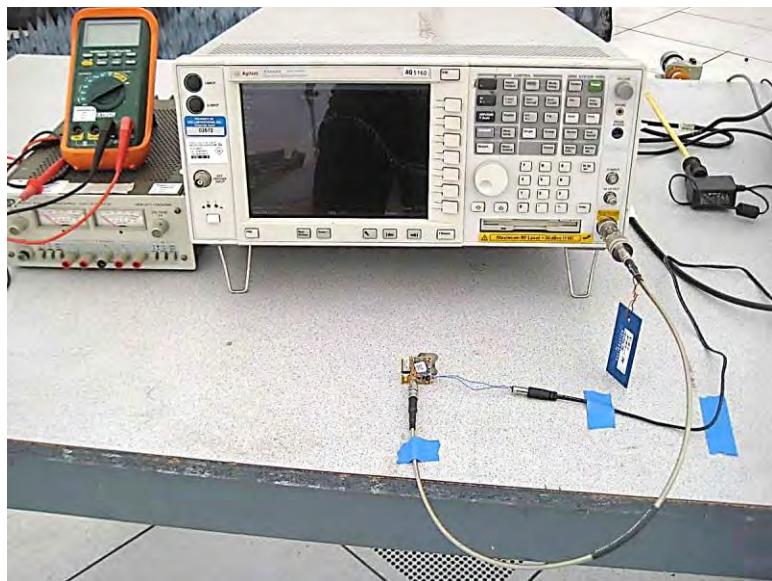
Note: corrected factor applied to measured reading, limit calculated from -20dBc of peak power.

### Band Edge Plots





### Test Setup Photo(s)



## 15.247(d) Radiated Emissions & Band Edge

### Test Setup/Conditions

Test Location:	Mariposa Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	8/22/2016
Configuration:	2		

### Environmental Conditions

Temperature (°C)	28	Relative Humidity (%):	50
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See data sheets for test setup and test equipment.

### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • 209-966-5240  
 Customer: **VeriSolutions LLC**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **98844** Date: 8/22/2016  
 Test Type: **Radiated Scan** Time: 18:20:02  
 Tested by: E. Wong Sequence#: 3  
 Software: EMITest 5.03.02

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Config2			

#### Support Equipment:

Device	Manufacturer	Model #	S/N
Config2			

#### Test Conditions / Notes:

The EUT seeking limited modular approval is placed on the Styrofoam block, transmitting via integrated trace antenna. Emission profile of the EUT rotated along three orthogonal axes was investigated. Recorded data represent worse case emission.

Freq 2400-2483.5

Tx freq:2405MHz, 2444MHz, 2480MHz

Protocol: 802.15.4, Modulation: OQPSK

Duty Cycle:100 %

Frequency range of measurement = 9 kHz- 25GHz.

9 kHz -150 kHz; RBW=200 Hz, VBW=200 Hz;150 kHz-30 MHz; RBW=9 kHz, VBW=9 kHz;30 MHz-1000 MHz  
 RBW=120 kHz, VBW=120 kHz,1000 MHz-25000 MHz; RBW=1 MHz, VBW=1 MHz.

Test environment conditions

Temperature: 28°C

Relative Humidity: 50%

Atmospheric Pressure: 100kPa

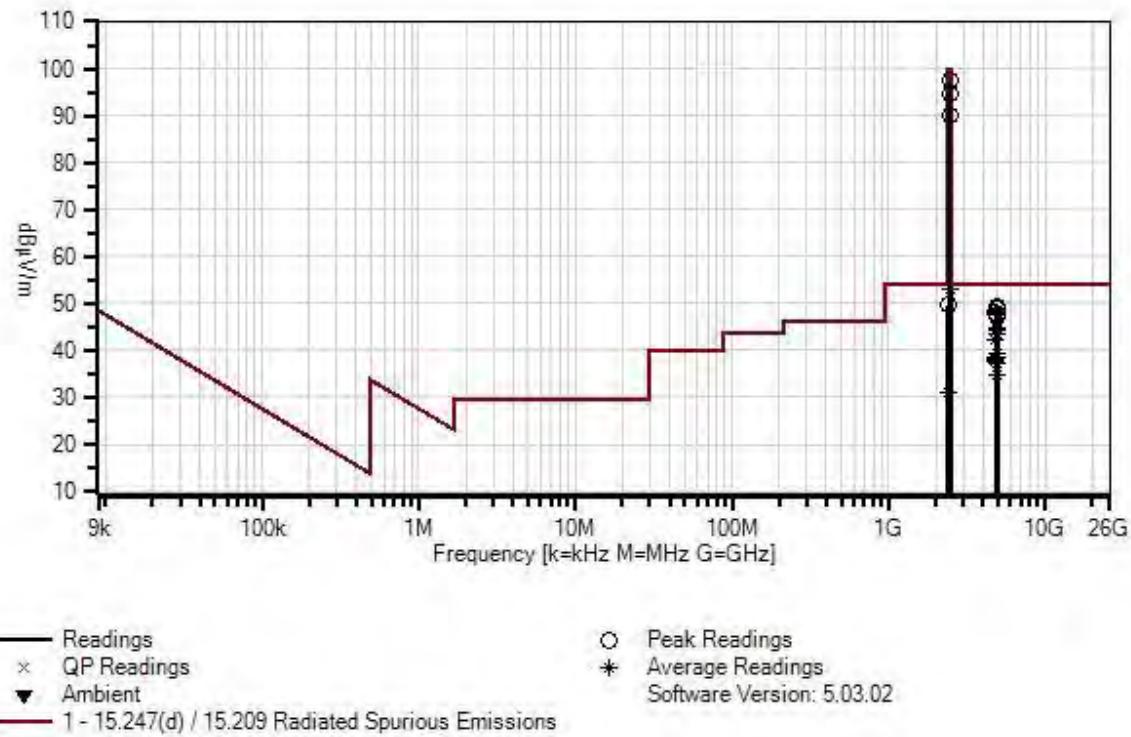
DC power was provided by support DC power source.

558074 D01 DTS Meas Guidance v03r05, April 8, 2016

ANSI 63.10 2013

Mariposa A

VeriSolutions LLC WO#: 98844 Sequence#: 3 Date: 8/22/2016  
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 10 Meters Vert



**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	9/30/2015	9/30/2017
T2	AN01273	Horn Antenna	3115	2/3/2015	2/3/2017
T3	ANP01403	Cable	58758-23	12/8/2014	12/8/2016
T4	ANP05904	Cable	32022-2- 29094K-144TC	12/8/2014	12/8/2016
T5	AN03155	Preamp	83017A	6/30/2015	6/30/2017
T6	AN03355	Cable	32026-2- 29094K-48TC	12/8/2014	12/8/2016
	AN03366	Horn Antenna- ANSI C63.5 Calibration	GH-62-25	2/9/2016	2/9/2018
T7	AN01993	Biconilog Antenna	CBL6111C	3/11/2016	3/11/2018
T8	ANP05656	Attenuator	PE7004-6	12/22/2015	12/22/2017
T9	ANP04249	Cable	CXTA04A-50	3/3/2016	3/3/2018
T10	ANP06230	Cable	CXTA04A-50	3/3/2016	3/3/2018
T11	ANP06847	Cable	LMR195-FR-6	7/9/2015	7/9/2017
T12	AN00449	Preamp-Top Amp (dB)	8447F	2/18/2016	2/18/2018
T13	ANP06884	Cable	LMR195-FR-4	10/27/2015	10/27/2017
	AN00226	Loop Antenna	6502	4/4/2016	4/4/2018
	AN02694	Horn Antenna- ANSI C63.5 3m	AMFW-5F- 18002650-20- 10P	5/7/2015	5/7/2017

**Measurement Data:**

Reading listed by margin.

Test Distance: 10 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
			T9	T10	T11	T12					
			T13								
	MHz	dB $\mu$ V	dB	dB	dB	dB	Table	dB $\mu$ V/m	dB $\mu$ V/m	dB	Ant
1	2483.500M	54.6	+0.0	+26.3	+2.4	+2.4	+0.0	53.2	54.0	-0.8	Vert
	Ave		-33.3	+0.8	+0.0	+0.0					Bandedge H_X
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	2483.500M	65.6	+0.0	+26.3	+2.4	+2.4	+0.0	64.2	54.0	+10.2	Vert
			-33.3	+0.8	+0.0	+0.0					Bandedge H_X
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
3	2400.000M	51.4	+0.0	+26.1	+2.3	+2.4	+0.0	49.7	54.0	-4.3	Vert
			-33.3	+0.8	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
4	4958.650M	43.3	+0.0	+30.8	+3.4	+3.4	+0.0	49.4	54.0	-4.6	Vert
			-32.7	+1.2	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								

5	4888.967M	43.1	+0.0	+30.7	+3.4	+3.4	+0.0	49.1	54.0	-4.9	Vert
			-32.7	+1.2	+0.0	+0.0			Y		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
6	4810.967M	42.4	+0.0	+30.5	+3.4	+3.4	+0.0	48.1	54.0	-5.9	Vert
			-32.8	+1.2	+0.0	+0.0			Y		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
7	4960.000M	41.7	+0.0	+30.8	+3.4	+3.4	+0.0	47.8	54.0	-6.2	Horiz
			-32.7	+1.2	+0.0	+0.0			X		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
8	4958.650M	41.3	+0.0	+30.8	+3.4	+3.4	+0.0	47.4	54.0	-6.6	Vert
			-32.7	+1.2	+0.0	+0.0			Y		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
9	4888.900M	38.7	+0.0	+30.7	+3.4	+3.4	+0.0	44.7	54.0	-9.3	Horiz
Ave			-32.7	+1.2	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
10	4889.050M	38.2	+0.0	+30.7	+3.4	+3.4	+0.0	44.2	54.0	-9.8	Horiz
Ave			-32.7	+1.2	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	4889.050M	47.9	+0.0	+30.7	+3.4	+3.4	+0.0	53.9	54.0	-0.1	Horiz
			-32.7	+1.2	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
12	4958.917M	37.5	+0.0	+30.8	+3.4	+3.4	+0.0	43.6	54.0	-10.4	Horiz
Ave			-32.7	+1.2	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	4958.917M	47.5	+0.0	+30.8	+3.4	+3.4	+0.0	53.6	54.0	-0.4	Horiz
			-32.7	+1.2	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
14	4809.000M	36.6	+0.0	+30.5	+3.4	+3.4	+0.0	42.3	54.0	-11.7	Vert
Ave			-32.8	+1.2	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	4809.000M	46.5	+0.0	+30.5	+3.4	+3.4	+0.0	52.2	54.0	-1.8	Vert
			-32.8	+1.2	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
16	4890.933M	33.4	+0.0	+30.7	+3.4	+3.4	+0.0	39.4	54.0	-14.6	Vert
Ave			-32.7	+1.2	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	4890.933M	44.9	+0.0	+30.7	+3.4	+3.4	+0.0	50.9	54.0	-3.1	Vert
			-32.7	+1.2	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								

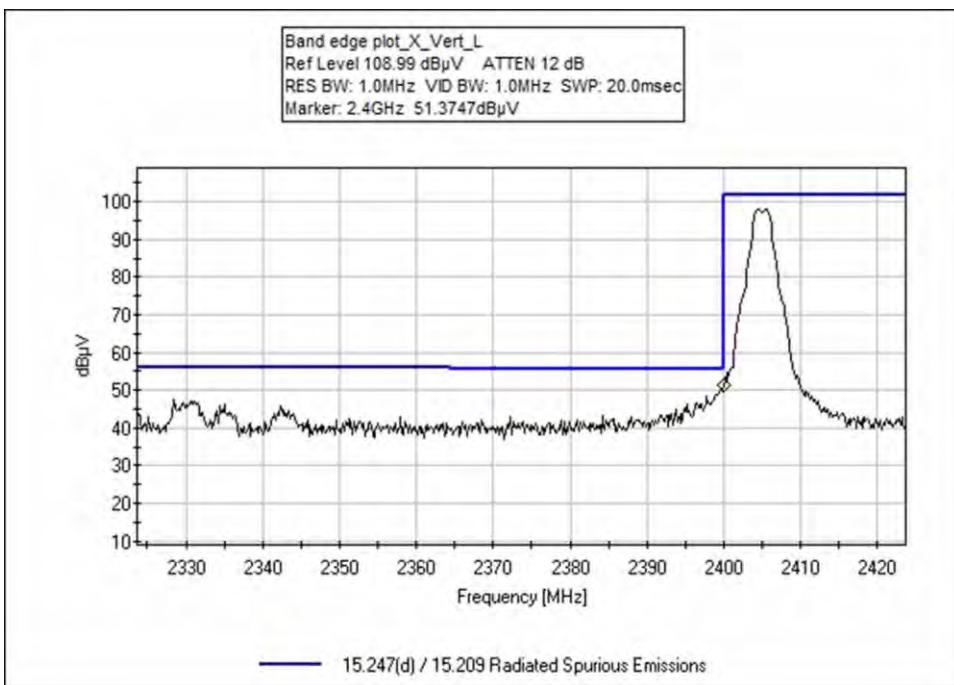
18	4809.100M	32.8	+0.0	+30.5	+3.4	+3.4	+0.0	38.5	54.0	-15.5	Horiz
	Ave		-32.8	+1.2	+0.0	+0.0			X		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	4809.100M	45.3	+0.0	+30.5	+3.4	+3.4	+0.0	51.0	54.0	-3.0	Horiz
			-32.8	+1.2	+0.0	+0.0		X			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
20	4959.033M	32.3	+0.0	+30.8	+3.4	+3.4	+0.0	38.4	54.0	-15.6	Vert
	Ave		-32.7	+1.2	+0.0	+0.0		Z			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	4959.033M	44.8	+0.0	+30.8	+3.4	+3.4	+0.0	50.9	54.0	-3.1	Vert
			-32.7	+1.2	+0.0	+0.0		Z			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
22	4810.667M	32.6	+0.0	+30.5	+3.4	+3.4	+0.0	38.3	54.0	-15.7	Vert
	Ave		-32.8	+1.2	+0.0	+0.0		X			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	4810.700M	42.8	+0.0	+30.5	+3.4	+3.4	+0.0	48.5	54.0	-5.5	Vert
			-32.8	+1.2	+0.0	+0.0		X			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
24	4811.067M	32.1	+0.0	+30.5	+3.4	+3.4	+0.0	37.8	54.0	-16.2	Horiz
	Ave		-32.8	+1.2	+0.0	+0.0		Y			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	4811.067M	43.5	+0.0	+30.5	+3.4	+3.4	+0.0	49.2	54.0	-4.8	Horiz
			-32.8	+1.2	+0.0	+0.0		Y			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
26	4888.933M	31.3	+0.0	+30.7	+3.4	+3.4	+0.0	37.3	54.0	-16.7	Horiz
	Ave		-32.7	+1.2	+0.0	+0.0		X			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	4888.900M	48.0	+0.0	+30.7	+3.4	+3.4	+0.0	54.0	54.0	+0.0	Horiz
			-32.7	+1.2	+0.0	+0.0		Z			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	4888.967M	43.7	+0.0	+30.7	+3.4	+3.4	+0.0	49.7	54.0	-4.3	Horiz
			-32.7	+1.2	+0.0	+0.0		Y			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	4888.930M	42.5	+0.0	+30.7	+3.4	+3.4	+0.0	48.5	54.0	-5.5	Horiz
			-32.7	+1.2	+0.0	+0.0		X			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								

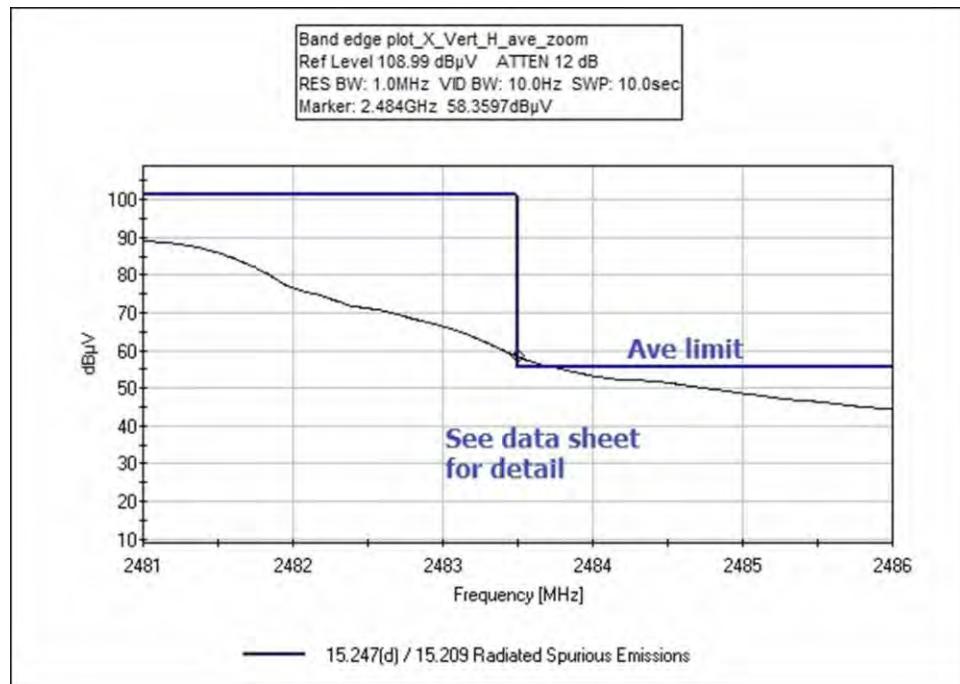
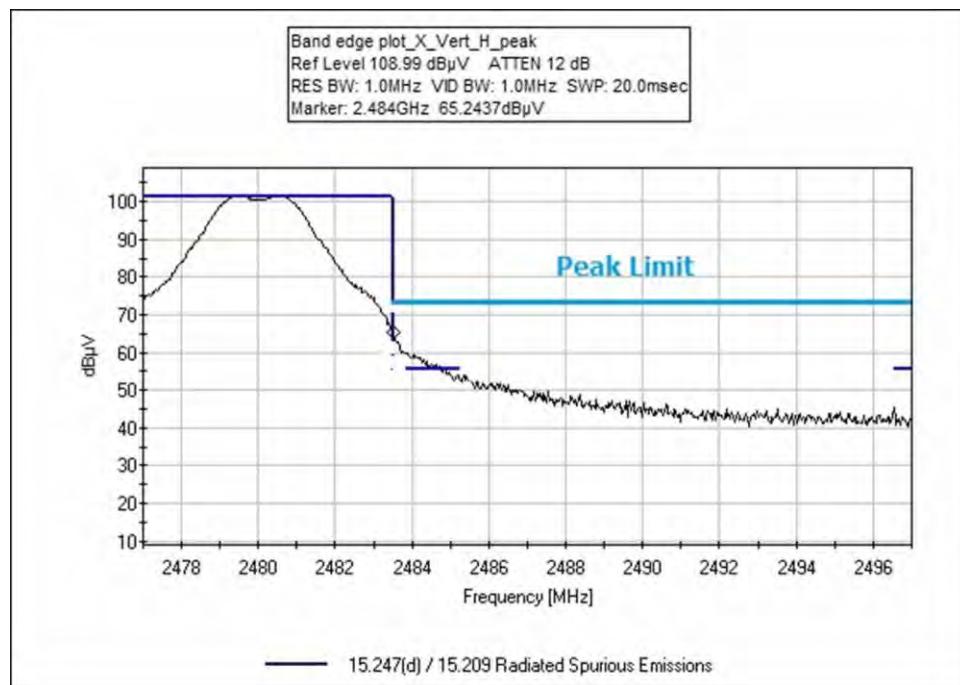
30	4960.000M	28.6	+0.0	+30.8	+3.4	+3.4	+0.0	34.7	54.0	-19.3	Vert
	Ave		-32.7	+1.2	+0.0	+0.0			X		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	4960.000M	43.0	+0.0	+30.8	+3.4	+3.4	+0.0	49.1	54.0	-4.9	Vert
			-32.7	+1.2	+0.0	+0.0		X			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
32	2390.000M	32.6	+0.0	+26.1	+2.3	+2.4	+0.0	30.9	54.0	-23.1	Vert
	Ave		-33.3	+0.8	+0.0	+0.0			Bandedge_L_X		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
^	2390.000M	44.5	+0.0	+26.1	+2.3	+2.4	+0.0	42.8	54.0	-11.2	Vert
			-33.3	+0.8	+0.0	+0.0			Bandedge_L_X		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
34	2445.330M	99.0	+0.0	+26.2	+2.3	+2.4	+0.0	97.4	125.2	-27.8	Vert
			-33.3	+0.8	+0.0	+0.0		X			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
35	2444.733M	96.3	+0.0	+26.2	+2.3	+2.4	+0.0	94.7	125.2	-30.5	Vert
			-33.3	+0.8	+0.0	+0.0		Z			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
36	2444.733M	91.6	+0.0	+26.2	+2.3	+2.4	+0.0	90.0	125.2	-35.2	Vert
			-33.3	+0.8	+0.0	+0.0		Y			
			+0.0	+0.0	+0.0	+0.0					
			+0.0								

### Band Edge Summary

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
2390.0	OQPSK	Integral 3.3dBi	32.6 ave	<54	Pass
2400.0	OQPSK	Integral 3.3dBi	49.7 pk	80<	Pass
2483.5	OQPSK	Integral 3.3dBi	53.2 ave*	<54	Pass

### Band Edge Plots



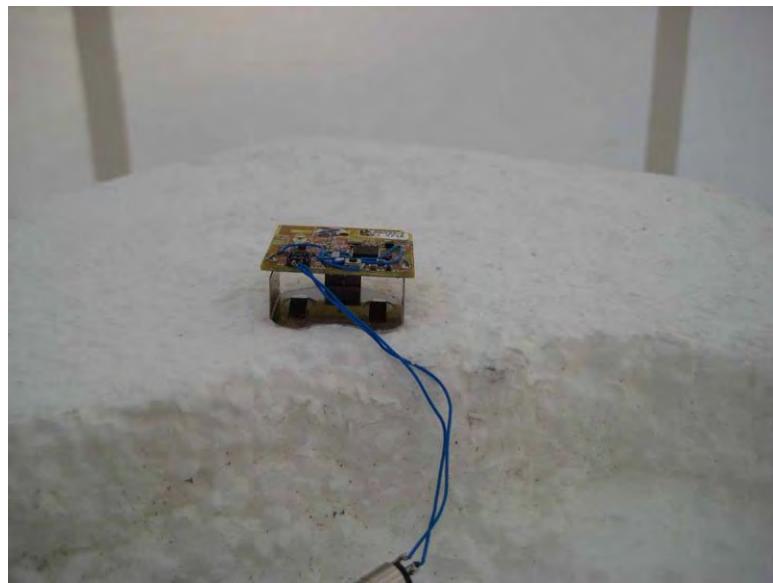


**Test Setup Photo(s)**





X Axis



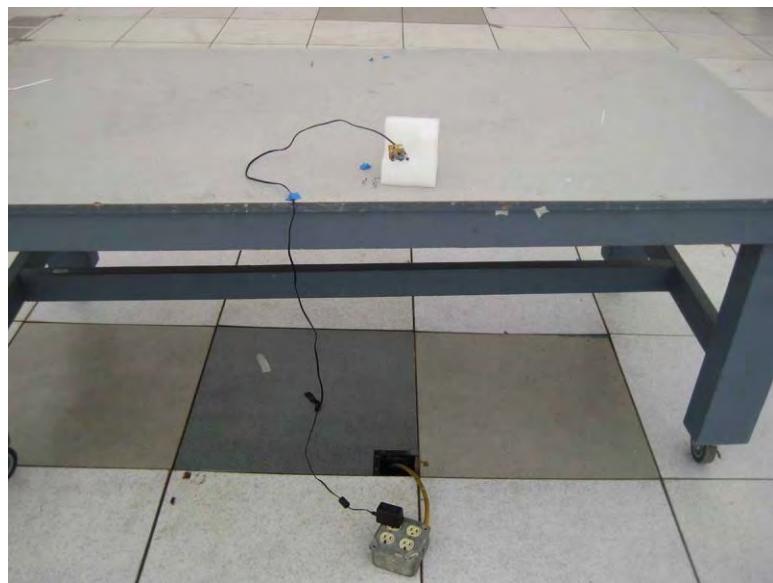
Y Axis



Z Axis



9kHz-1GHz



9kHz-1GHz



1-25GHz

## 15.207 AC Conducted Emissions

### Test Setup/Conditions

Test Location:	Mariposa Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013)	Test Date(s):	8/23/2016
Configuration:	2		

### Environmental Conditions

Temperature (°C)	28	Relative Humidity (%):	40
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See data sheets for test setup and test equipment.

### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • 209-966-5240  
 Customer: **VeriSolutions LLC**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **98844** Date: 8/23/2016  
 Test Type: **Conducted Emissions** Time: 14:56:37  
 Tested by: E. Wong Sequence#: 4  
 Software: EMITest 5.03.02 110V 60Hz

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Config2			

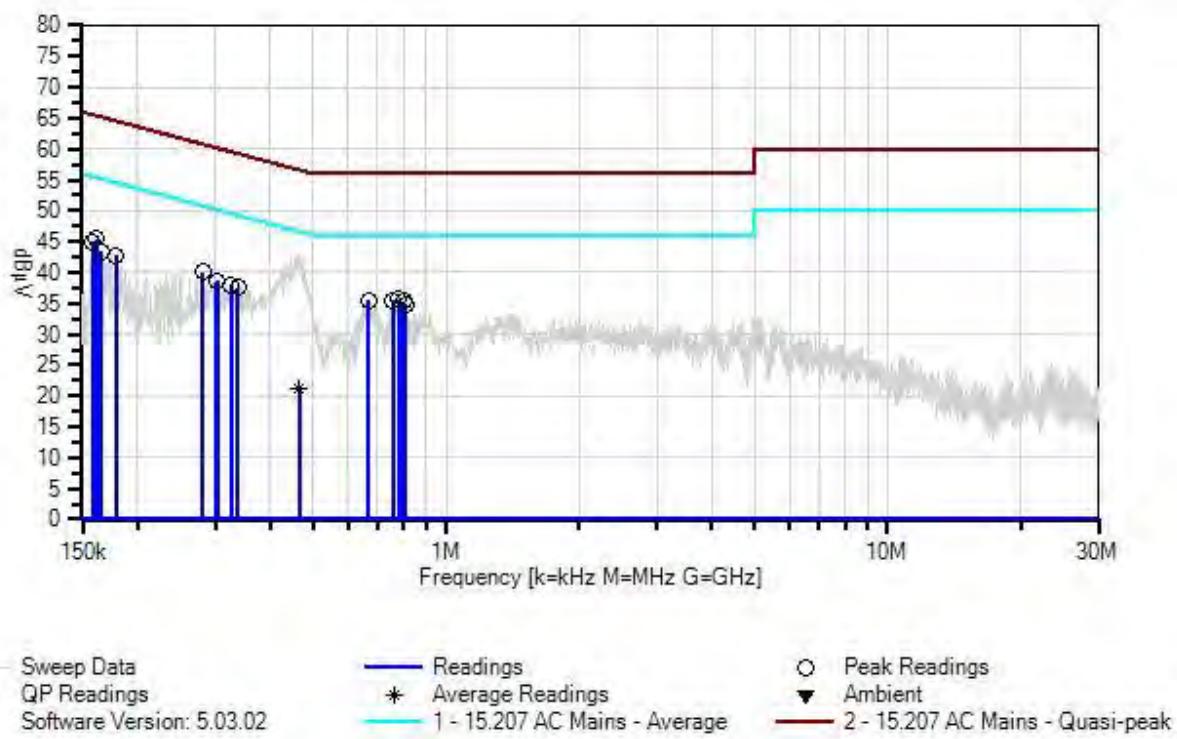
#### Support Equipment:

Device	Manufacturer	Model #	S/N
Config2			

#### Test Conditions / Notes:

The EUT seeking limited modular approval is placed on the wooden table, transmitting via integrated trace antenna.  
 Freq 2400-2483.5  
 Tx freq:2444MHz.  
 Protocol: 802.15.4, Modulation OQPSK  
 ANSI 63.10 2013  
 Mariposa A  
 Frequency range of measurement = 150kHz- 30MHz.  
 150 kHz-30 MHz; RBW=9 kHz, VBW=9 kHz  
 Test environment conditions:  
 Temperature: 28°C  
 Relative Humidity: 40%  
 Atmospheric Pressure: 100kPa

VeriSolutions LLC WO#: 98844 Sequence#: 4 Date: 8/23/2016  
15.207 AC Mains - Average Test Lead: 110V 60Hz L1-Line



**Test Equipment:**

<b>ID</b>	<b>Asset #</b>	<b>Description</b>	<b>Model</b>	<b>Calibration Date</b>	<b>Cal Due Date</b>
	AN02672	Spectrum Analyzer	E4446A	9/30/2015	9/30/2017
T1	AN02609	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
T2	ANP06884	Cable	LMR195-FR-4	10/27/2015	10/27/2017
T3	AN06231	Cable	CXTA04A-70	3/3/2016	3/3/2018
T4	ANP06232	Cable	CXTA04A-35	3/3/2016	3/3/2018
T5	ANP05624	Attenuator	PE7010-10	1/15/2015	1/15/2017
T6	AN00374	50uH LISN-Line (dB)	8028-TS-50-BNC	1/4/2016	1/4/2017
	AN00374	50uH LISN-Return (dB)	8028-TS-50-BNC	1/4/2016	1/4/2017

<b>Measurement Data:</b>			Reading listed by margin.				Test Lead: L1-Line				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz		T5	T6			Table	dB $\mu$ V	dB $\mu$ V		
1	161.635k	34.8	+0.6	+0.0	+0.0	+0.0	+0.0	45.4	55.4	-10.0	L1-Li
			+9.9	+0.1							
2	781.214k	25.3	+0.3	+0.0	+0.1	+0.0	+0.0	35.7	46.0	-10.3	L1-Li
			+9.9	+0.1							
3	667.770k	25.1	+0.3	+0.0	+0.1	+0.0	+0.0	35.5	46.0	-10.5	L1-Li
			+9.9	+0.1							
4	756.489k	25.2	+0.2	+0.0	+0.1	+0.0	+0.0	35.5	46.0	-10.5	L1-Li
			+9.9	+0.1							
5	157.999k	34.1	+0.9	+0.0	+0.0	+0.0	+0.0	45.0	55.6	-10.6	L1-Li
			+9.9	+0.1							
6	799.394k	24.9	+0.3	+0.0	+0.1	+0.0	+0.0	35.3	46.0	-10.7	L1-Li
			+9.9	+0.1							
7	281.624k	29.7	+0.2	+0.0	+0.1	+0.0	+0.0	40.0	50.8	-10.8	L1-Li
			+9.9	+0.1							
8	809.575k	24.4	+0.3	+0.0	+0.1	+0.0	+0.0	34.8	46.0	-11.2	L1-Li
			+9.9	+0.1							
9	303.440k	28.4	+0.2	+0.0	+0.1	+0.0	+0.0	38.7	50.1	-11.4	L1-Li
			+9.9	+0.1							
10	325.983k	27.7	+0.2	+0.0	+0.1	+0.0	+0.0	38.0	49.6	-11.6	L1-Li
			+9.9	+0.1							
11	301.258k	28.2	+0.2	+0.0	+0.1	+0.0	+0.0	38.5	50.2	-11.7	L1-Li
			+9.9	+0.1							
12	336.891k	27.3	+0.2	+0.0	+0.1	+0.0	+0.0	37.6	49.3	-11.7	L1-Li
			+9.9	+0.1							
13	165.271k	32.9	+0.5	+0.0	+0.0	+0.0	+0.0	43.4	55.2	-11.8	L1-Li
			+9.9	+0.1							
14	179.088k	32.4	+0.3	+0.0	+0.0	+0.0	+0.0	42.7	54.5	-11.8	L1-Li
			+9.9	+0.1							
15	464.153k	11.0	+0.2	+0.0	+0.1	+0.0	+0.0	21.3	46.6	-25.3	L1-Li
	Ave		+9.9	+0.1							
^	464.152k	32.8	+0.2	+0.0	+0.1	+0.0	+0.0	43.1	46.6	-3.5	L1-Li
			+9.9	+0.1							

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • 714-966-5240  
 Customer: **VeriSolutions LLC**  
 Specification: **RSS GEN 8.8 AC Power Line Conducted Emission Limit - Average**  
 Work Order #: **98844** Date: 8/23/2016  
 Test Type: **Conducted Emissions** Time: 3:00:41 PM  
 Tested by: E. Wong Sequence#: 5  
 Software: EMITest 5.03.02 110V 60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Config2			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Config2			

***Test Conditions / Notes:***

The EUT seeking limited modular approval is placed on the wooden table, transmitting via integrated trace antenna.

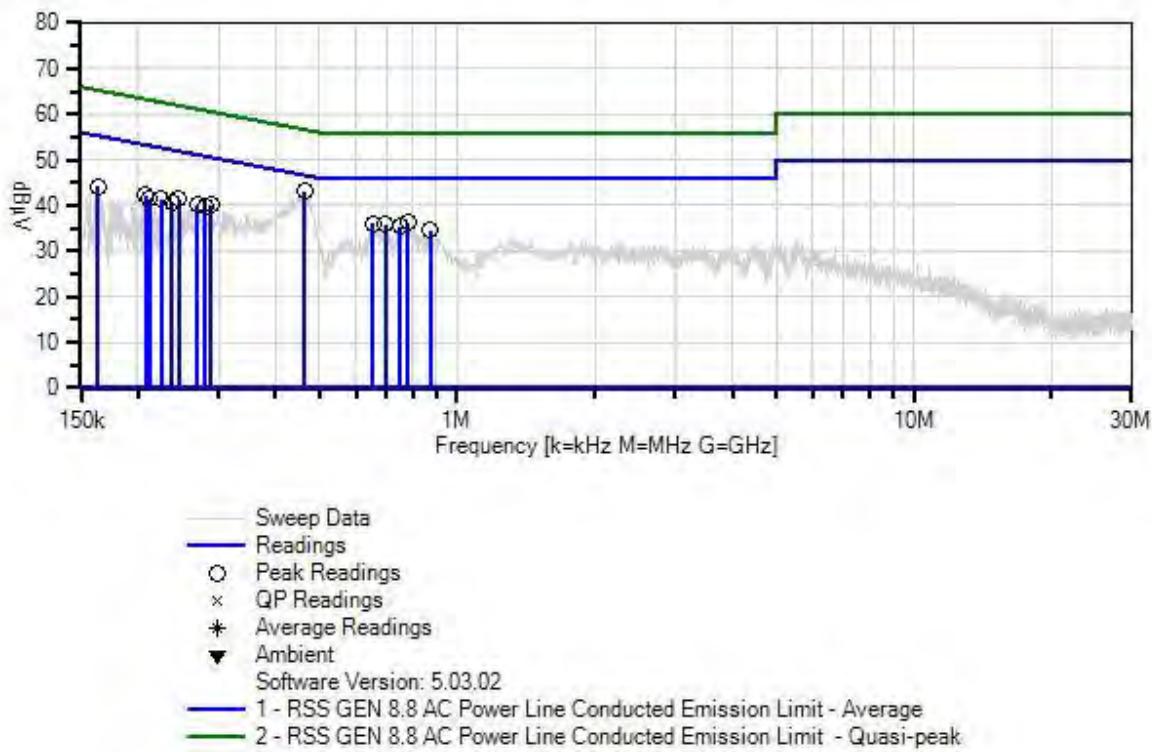
Freq 2400-2483.5  
 Tx freq: 2444MHz.  
 Protocol: 802.15.4, Modulation OQPSK

ANSI 63.10 2013  
 Mariposa A

Frequency range of measurement = 150kHz- 30MHz.  
 150 kHz-30 MHz; RBW=9 kHz, VBW=9 kHz; 30 MHz

Test environment conditions:  
 Temperature: 28°C  
 Relative Humidity: 40%  
 Atmospheric Pressure: 100kPa

VeriSolutions LLC WO#: 98844 Sequence#: 5 Date: 8/23/2016  
RSS GEN 8.8 AC Power Line Conducted Emission Limit - Average Test Lead: 110V 60Hz L2-Neutral



**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	9/30/2015	9/30/2017
T1	AN02609	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
T2	ANP06884	Cable	LMR195-FR-4	10/27/2015	10/27/2017
T3	AN06231	Cable	CXTA04A-70	3/3/2016	3/3/2018
T4	ANP06232	Cable	CXTA04A-35	3/3/2016	3/3/2018
T5	ANP05624	Attenuator	PE7010-10	1/15/2015	1/15/2017
	AN00374	50uH LISN-Line (dB)	8028-TS-50-BNC	1/4/2016	1/4/2017
T6	AN00374	50uH LISN-Return (dB)	8028-TS-50-BNC	1/4/2016	1/4/2017

**Measurement Data:**

Reading listed by margin.

Test Lead: L2-Neutral

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6			Table	dB $\mu$ V	dB $\mu$ V		
	MHz	dB $\mu$ V	dB	dB	dB	dB		dB	dB	Ant	
1	462.697k	32.8	+0.2	+0.0	+0.1	+0.0	+0.0	43.1	46.6	-3.5	L2-Ne
			+9.9	+0.1							
2	781.213k	25.9	+0.3	+0.0	+0.1	+0.0	+0.0	36.3	46.0	-9.7	L2-Ne
			+9.9	+0.1							
3	652.498k	25.6	+0.3	+0.0	+0.1	+0.0	+0.0	36.0	46.0	-10.0	L2-Ne
			+9.9	+0.1							
4	698.312k	25.5	+0.3	+0.0	+0.1	+0.0	+0.0	35.9	46.0	-10.1	L2-Ne
			+9.9	+0.1							
5	288.895k	29.9	+0.2	+0.0	+0.1	+0.0	+0.0	40.2	50.6	-10.4	L2-Ne
			+9.9	+0.1							
6	245.262k	31.0	+0.2	+0.0	+0.0	+0.0	+0.0	41.3	51.9	-10.6	L2-Ne
			+9.9	+0.2							
7	749.943k	25.0	+0.2	+0.0	+0.1	+0.0	+0.0	35.3	46.0	-10.7	L2-Ne
			+9.9	+0.1							
8	269.260k	29.7	+0.2	+0.0	+0.1	+0.0	+0.0	40.0	51.1	-11.1	L2-Ne
			+9.9	+0.1							
9	163.815k	33.6	+0.5	+0.0	+0.0	+0.0	+0.0	44.2	55.3	-11.1	L2-Ne
			+9.9	+0.2							
10	208.175k	31.9	+0.2	+0.0	+0.0	+0.0	+0.0	42.2	53.3	-11.1	L2-Ne
			+9.9	+0.2							
11	224.901k	31.1	+0.2	+0.0	+0.0	+0.0	+0.0	41.4	52.6	-11.2	L2-Ne
			+9.9	+0.2							
12	280.168k	29.3	+0.2	+0.0	+0.1	+0.0	+0.0	39.6	50.8	-11.2	L2-Ne
			+9.9	+0.1							
13	237.263k	30.4	+0.2	+0.0	+0.0	+0.0	+0.0	40.7	52.2	-11.5	L2-Ne
			+9.9	+0.2							
14	873.568k	24.2	+0.2	+0.0	+0.1	+0.0	+0.0	34.5	46.0	-11.5	L2-Ne
			+9.9	+0.1							
15	212.538k	31.1	+0.2	+0.0	+0.0	+0.0	+0.0	41.4	53.1	-11.7	L2-Ne
			+9.9	+0.2							

**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

Reported uncertainties 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	(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.