

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.

TABLE OF CONTENTS

Administrative Information	3
Test Report Information	3
Revision History	3
Report Authorization	3
Test Facility Information	4
Software Versions	4
Site Registration & Accreditation Information	4
Summary of Results	5
Modifications During Testing	5
Conditions During Testing	5
Equipment Under Test	6
General Product Information	7
FCC Part 15 Subpart C	8
15.247(a)(2) 6dB Bandwidth	8
15.247(b)(3) Output Power	11
15.247(e) Power Spectral Density	15
15.247(d) RF Conducted Emissions & Band Edge	19
15.247(d) Radiated Emissions & Band Edge	24
15.207 AC Conducted Emissions	37
Supplemental Information	44
Measurement Uncertainty	44
Emissions Test Details	44

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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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:

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

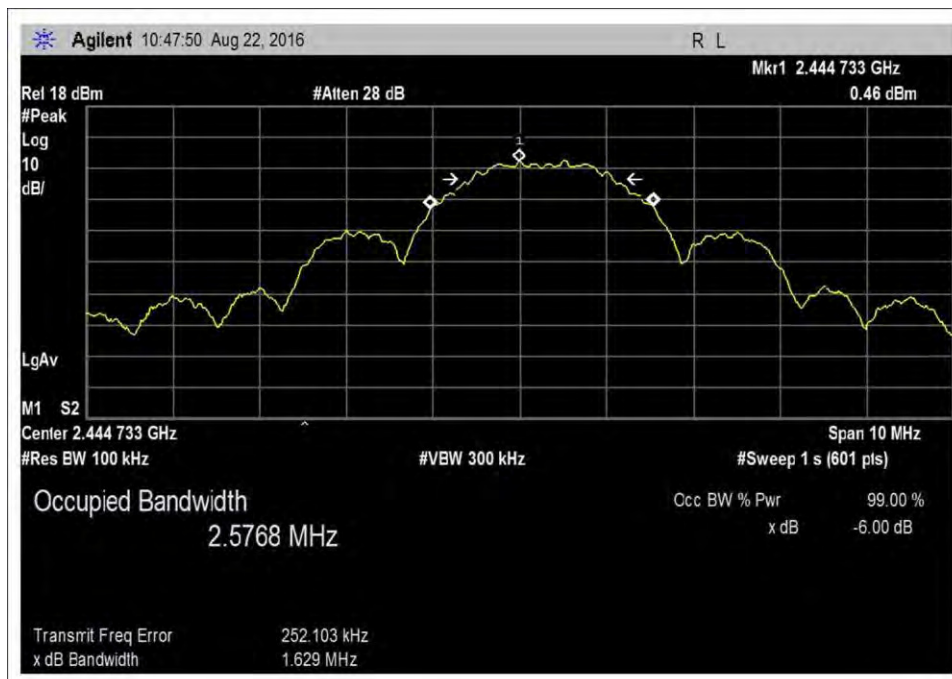
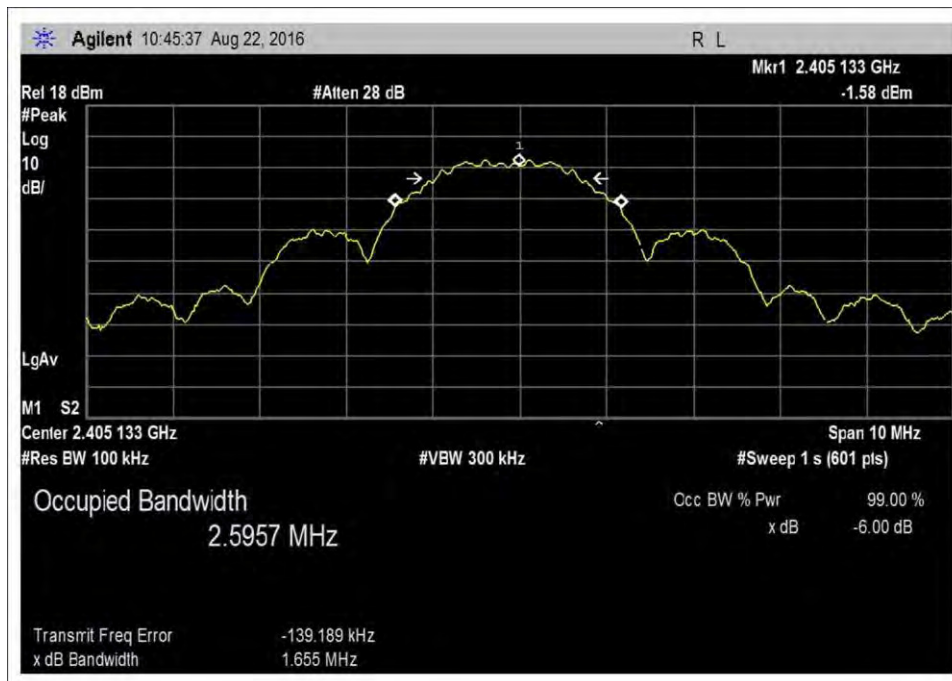
Test Setup/Conditions			
Test Location:	Mariposa Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	8/22/2016
Configuration:	2		
Test Setup:	The RF characteristic of the signal is measured at the antenna port. Freq 2400-2483.5 Tx freq:2405MHz, 2444MHz, 2480MHz Protocol: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

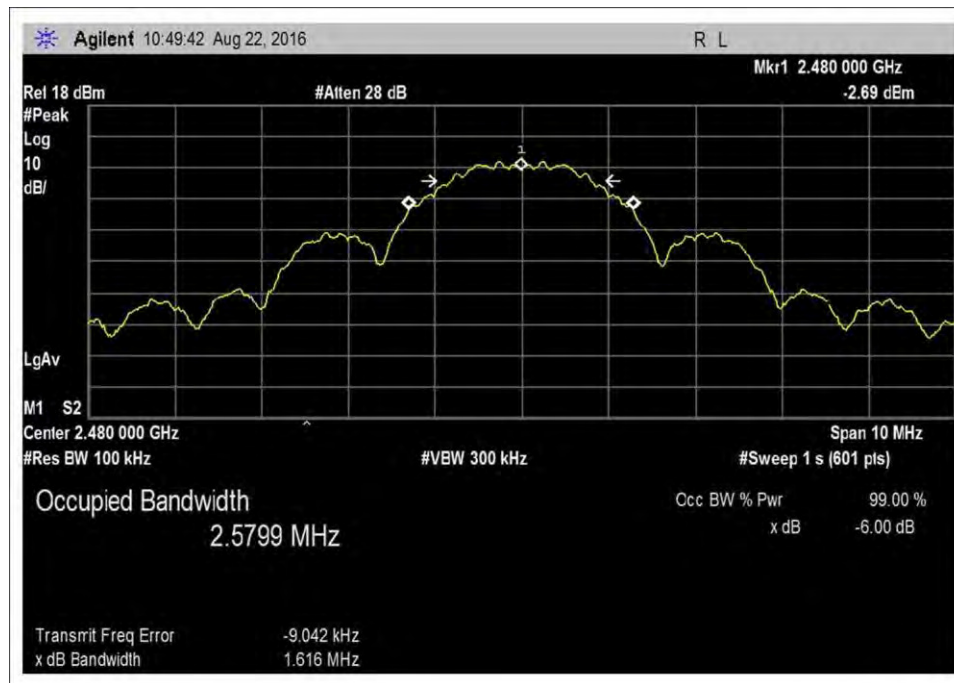
Environmental Conditions			
Temperature (°C)	28	Relative Humidity (%):	50

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

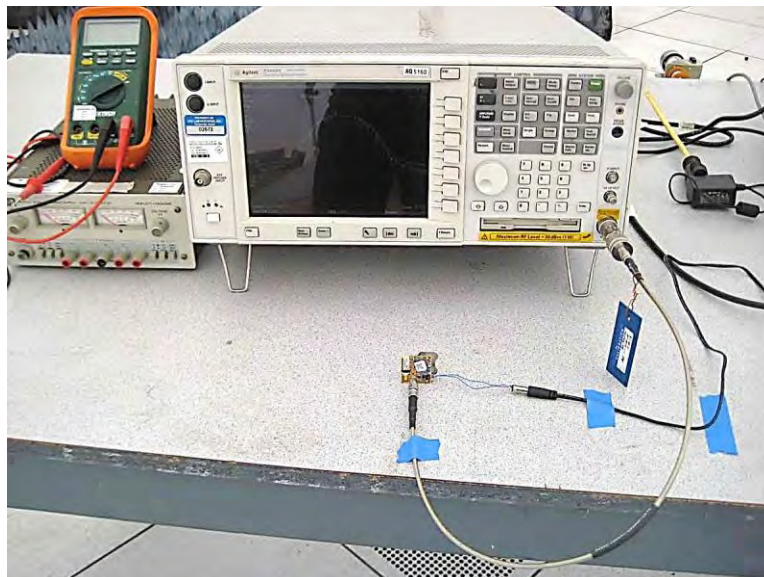
Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
2405	1	OQPSK	1655	≥500	Pass
2444	1	OQPSK	1629	≥500	Pass
2480	1	OQPSK	1616	≥500	Pass

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 _{Minimum} (dBm)	V _{Nominal} (dBm)	V _{Maximum} (dBm)	Max Deviation from V _{Nominal} (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 _{Nominal} :	3.3
V _{Minimum} :	2.7
V _{Maximum} :	3.6

Test Data Summary - Voltage Variations

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

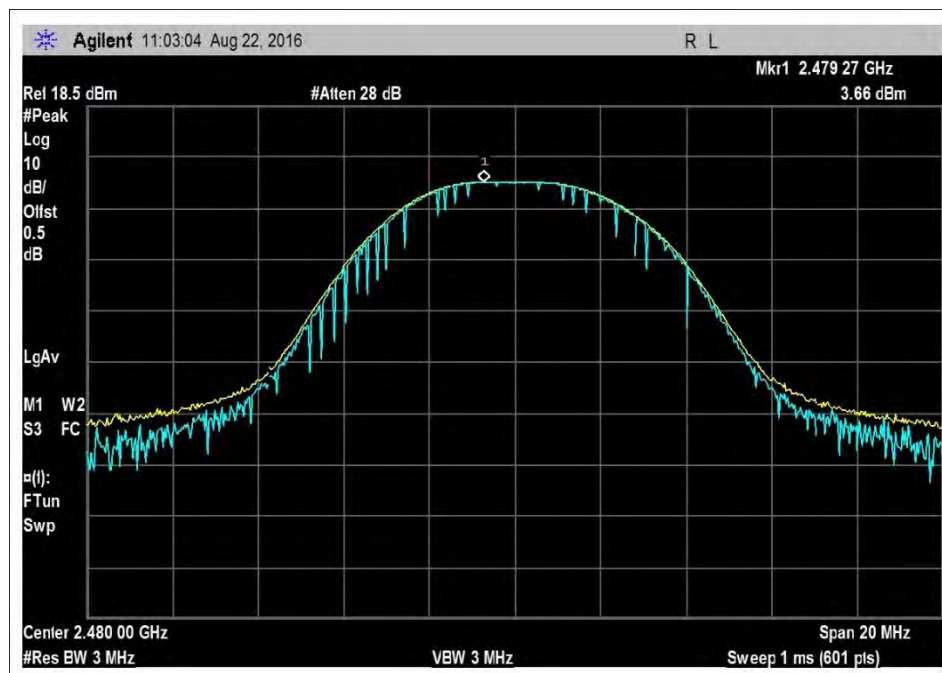
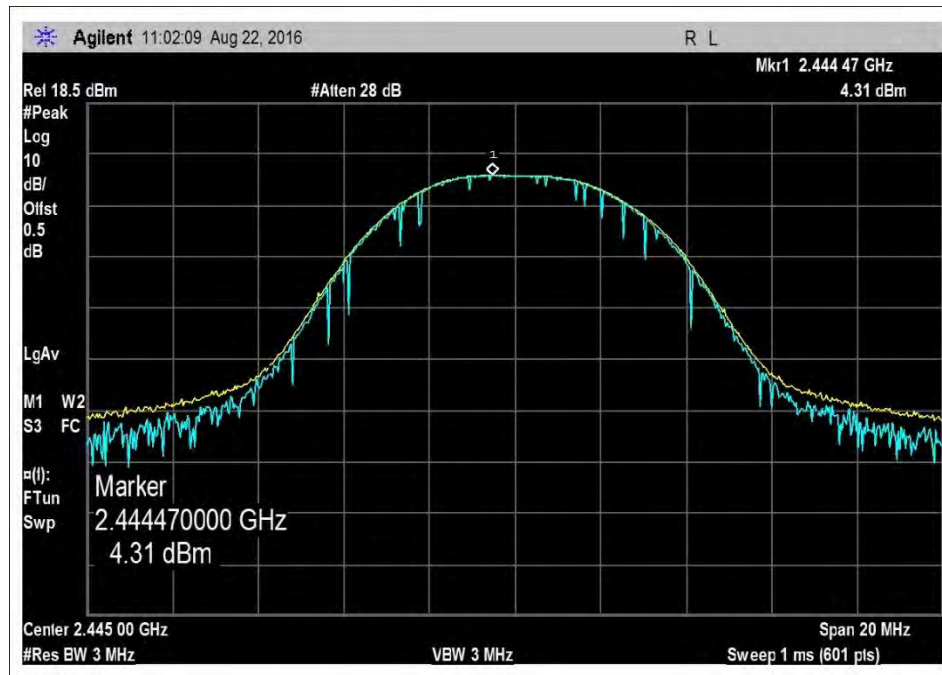
Power Output Test Data Summary - RF Conducted Measurement

Measurement Option: RBW > DTS Bandwidth

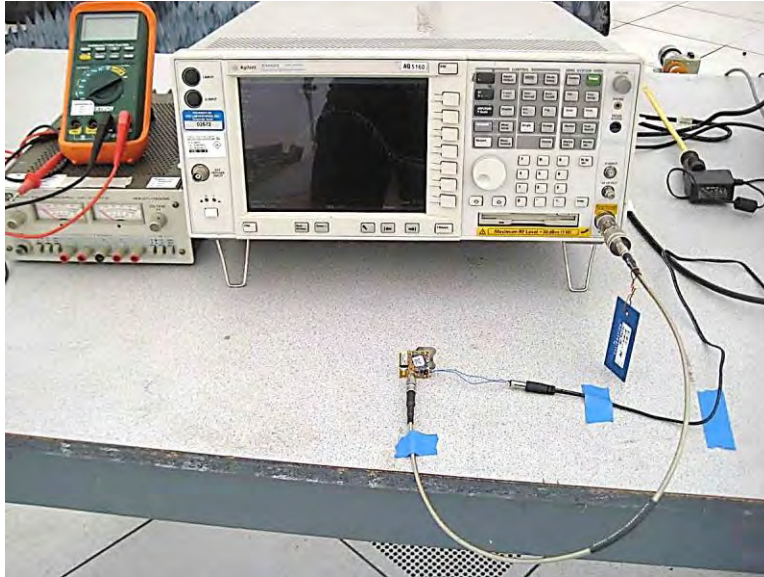
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm/ W)	Limit (dBm)	Results
2405	OQPSK	Integral, trace, 3.3	4.4/ 0.0028	≤30	Pass
2444	OQPSK	Integral, trace, 3.3	4.31/ 0.0027	≤30	Pass
2480	OQPSK	Integral, trace, 3.3	3.66/ 0.0023	≤30	Pass

Plot(s)





Test Setup Photo(s)



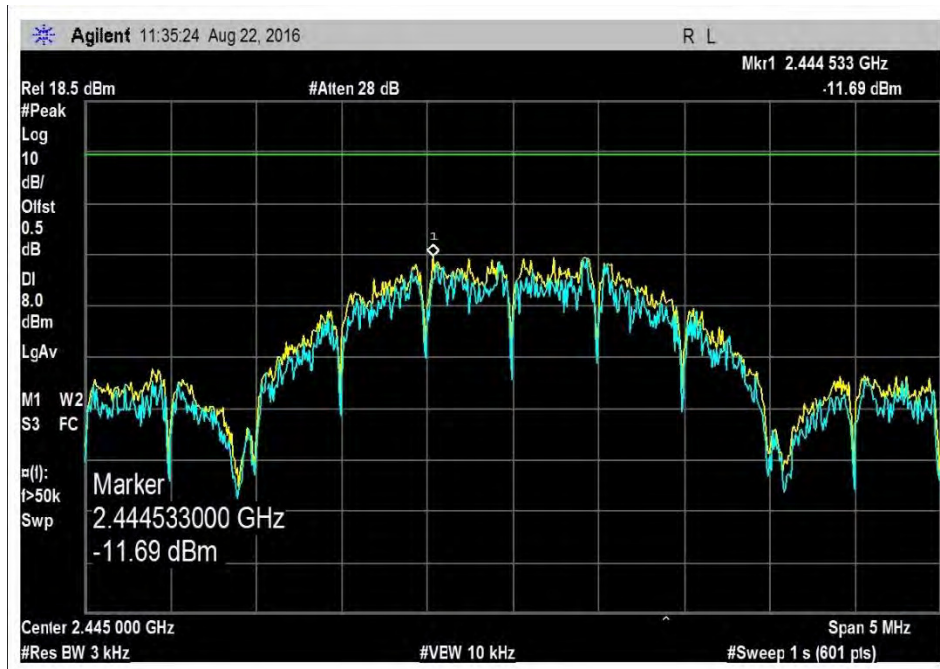
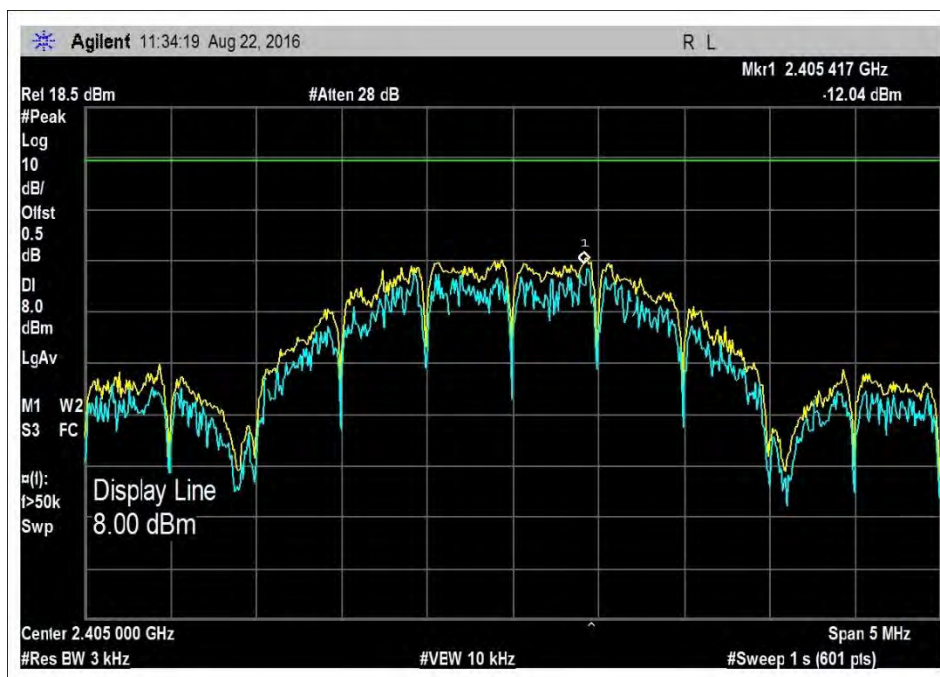
15.247(e) Power Spectral Density

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

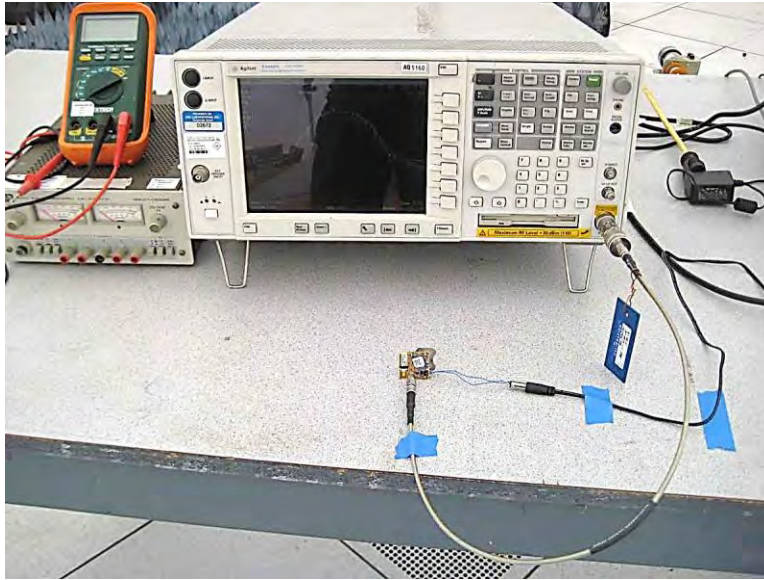
PSD Test Data Summary - RF Conducted Measurement				
Measurement Method: PKPSD				
Frequency (MHz)	Modulation	Measured (dBm/3kHz)	Limit (dBm/3kHz)	Results
2405	OQPSK	-12.04	≤8	Pass
2444	OQPSK	-11.69	≤8	Pass
2480	OQPSK	-11.95	≤8	Pass

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

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:

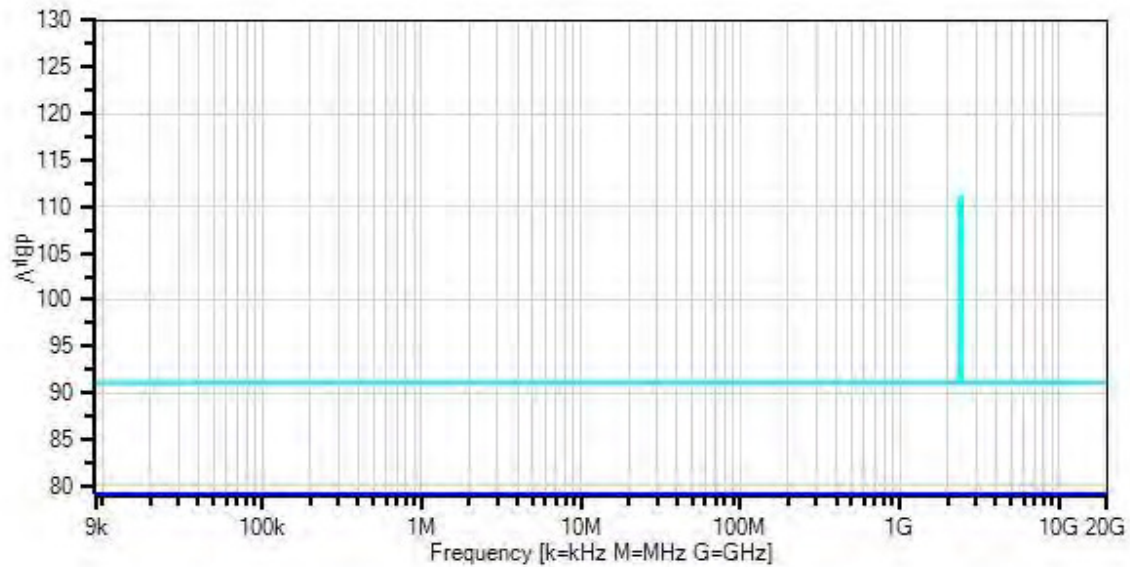
The RF characteristic of the signal is measured at the antenna port.
 Freq 2400-2483.5
 Tx freq:2405MHz, 2444MHz, 2480MHz
 Protocol: 802.15.4, Modulation: OQPSK
 Duty Cycle:100 %

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



— Sweep Data
 ○ Peak Readings
 * Average Readings
 Software Version: 5.03.02

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

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			Dist Table	Corr dB μ V	Spec dB μ 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

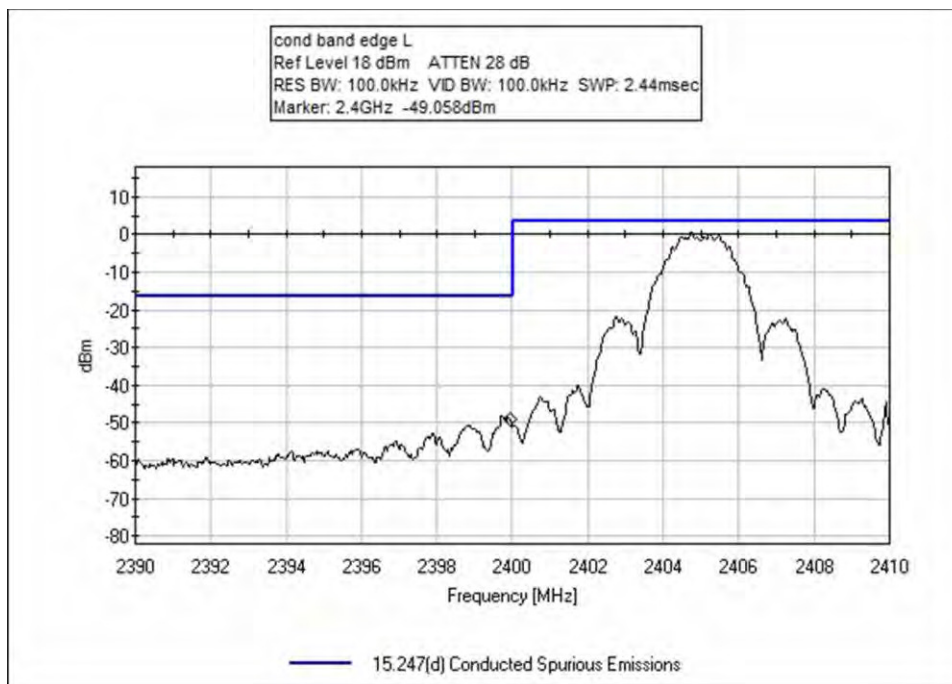
Band Edge Summary

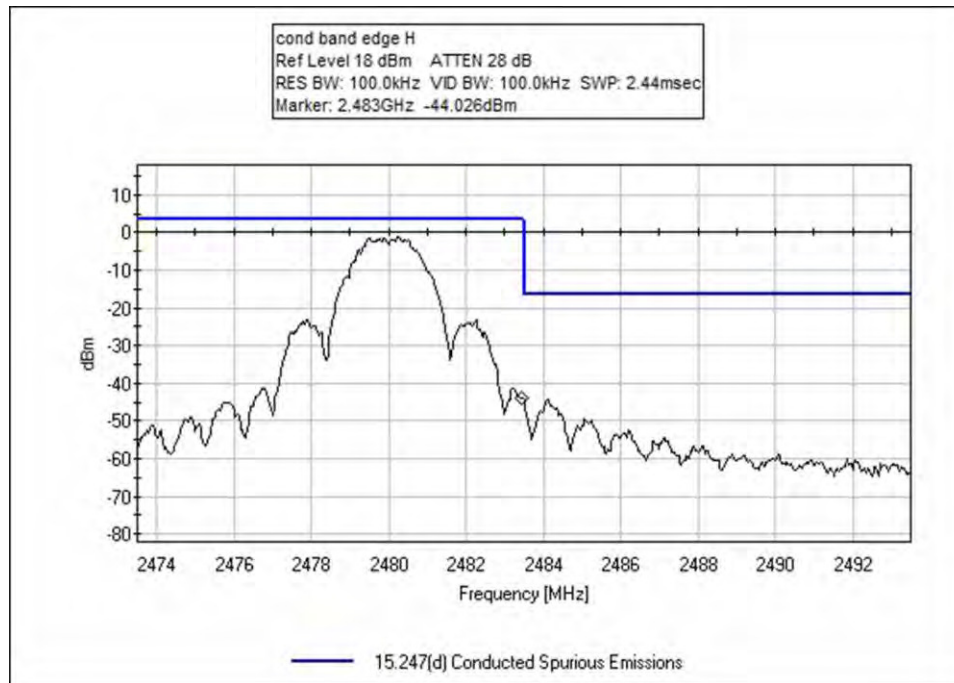
Limit applied: Max Power/100kHz - 20dB.

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

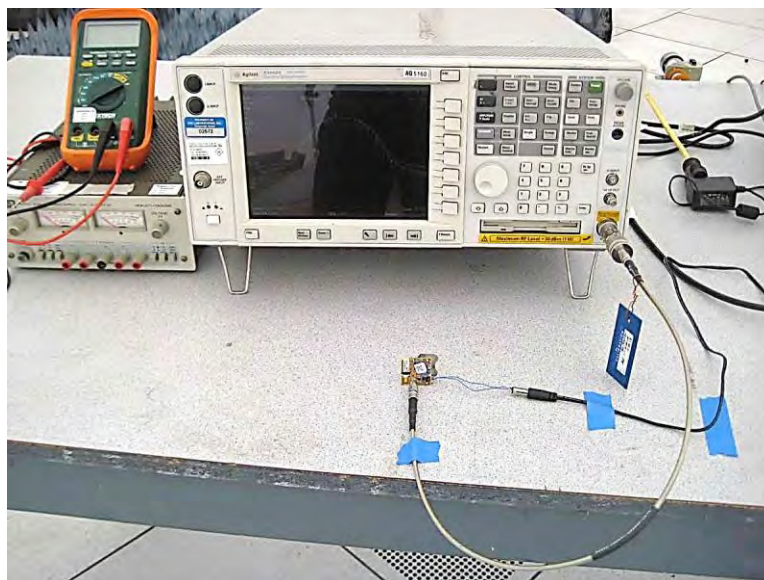
Note: corrected factor applied to measured reading, limit calculated from -20dBc of peak power.

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

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 worst 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

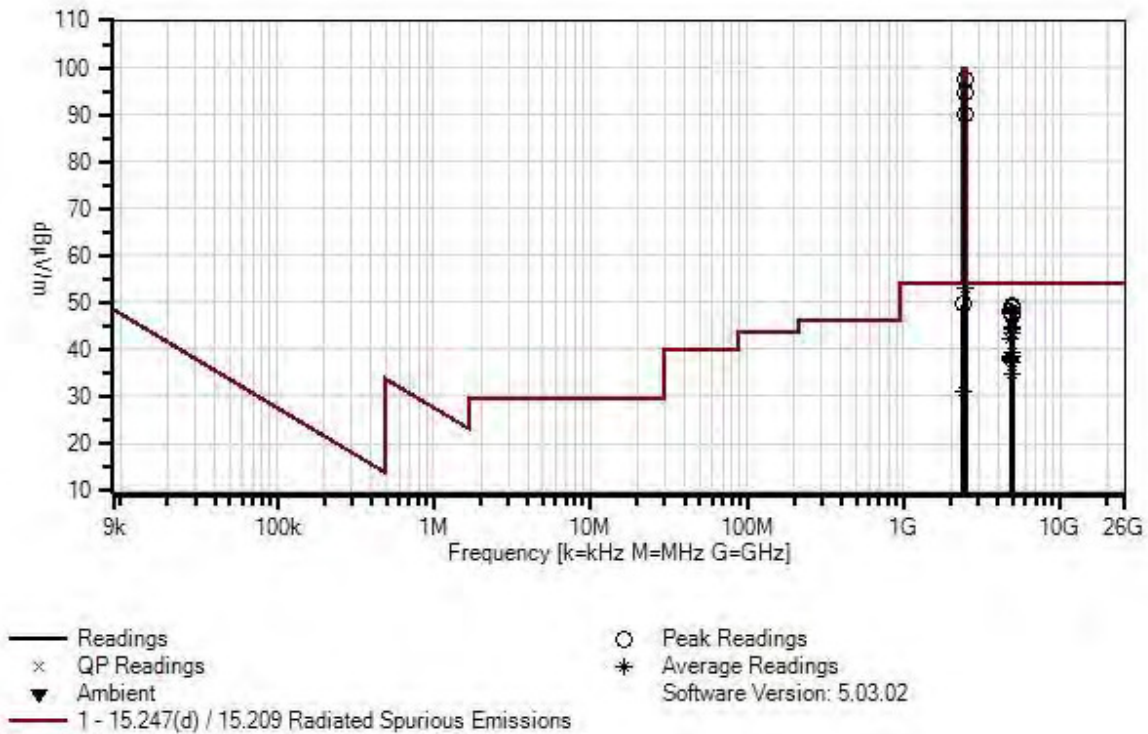
DC power was provided by support DC power source.

558074 D01 DTS Meas Guidance v03r05, April 8, 2016

ANSI 63.10 2013

Mariposa A

VeriSolutions LLC WD#: 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	Preamplifier	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	Preamplifier-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	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/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			Y		
			+0.0	+0.0	+0.0	+0.0					
			+0.0								

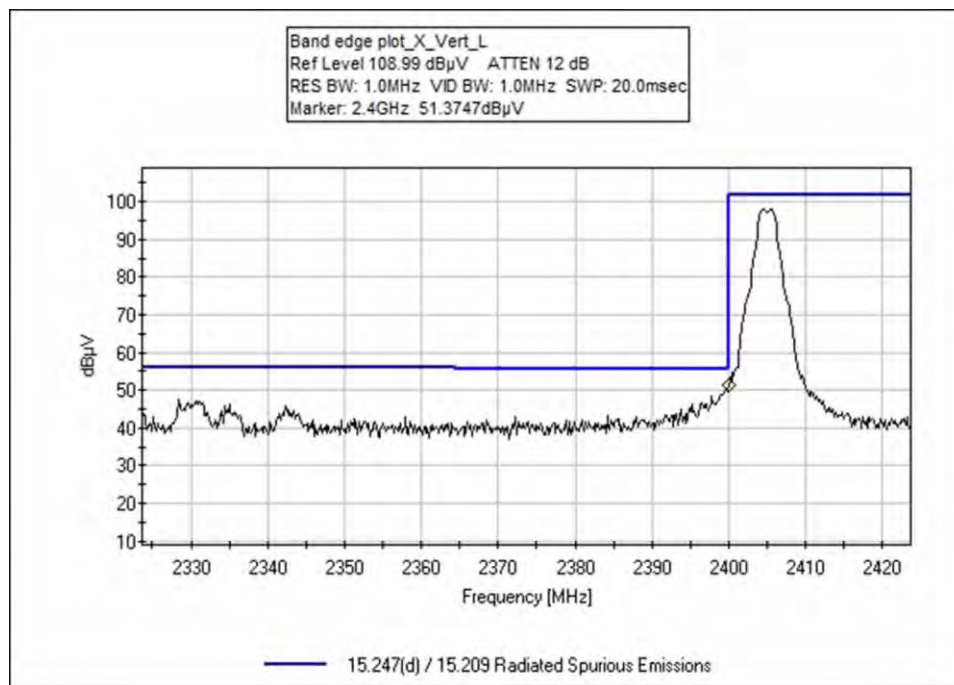
5	4888.967M	43.1	+0.0 -32.7 +0.0 +0.0	+30.7 +1.2 +0.0 +0.0	+3.4 +0.0 +0.0 +0.0	+3.4 +0.0 +0.0 +0.0	+0.0	49.1	54.0 Y	-4.9	Vert
6	4810.967M	42.4	+0.0 -32.8 +0.0 +0.0	+30.5 +1.2 +0.0 +0.0	+3.4 +0.0 +0.0 +0.0	+3.4 +0.0 +0.0 +0.0	+0.0	48.1	54.0 Y	-5.9	Vert
7	4960.000M	41.7	+0.0 -32.7 +0.0 +0.0	+30.8 +1.2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

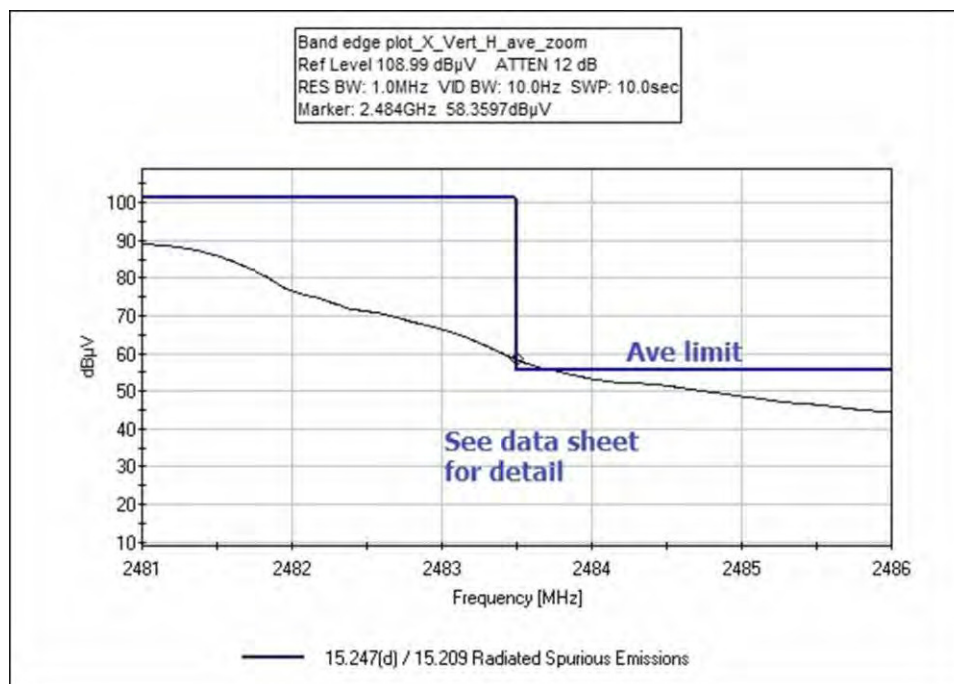
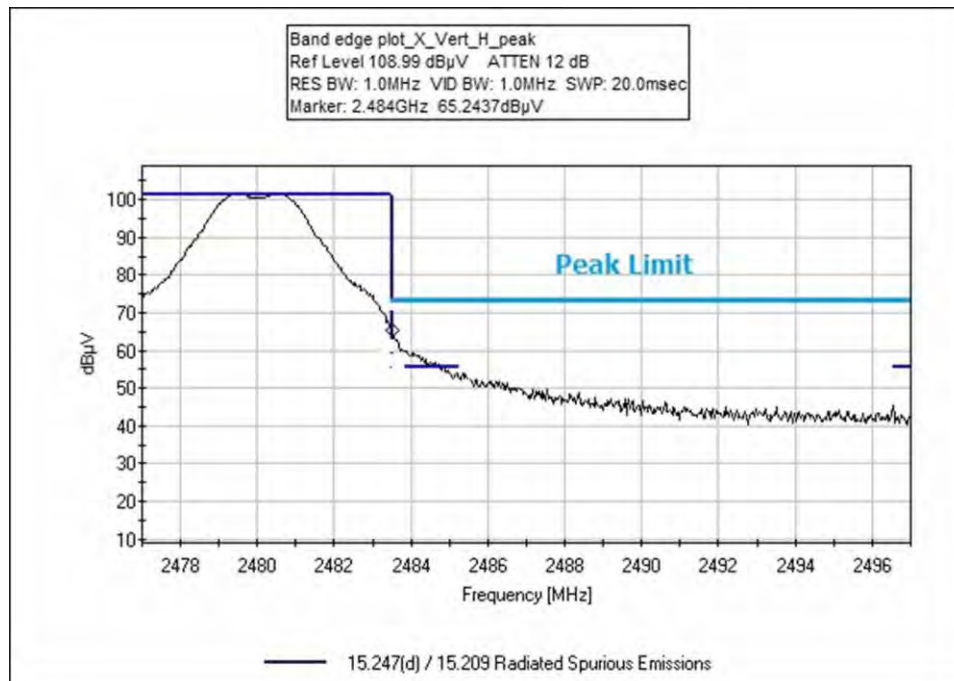
18	4809.100M Ave	32.8	+0.0 -32.8 +0.0 +0.0	+30.5 +1.2 +0.0 +0.0	+3.4 +0.0 +0.0 +0.0	+3.4 +0.0 +0.0 +0.0	+0.0	38.5 X	54.0	-15.5	Horiz
^	4809.100M	45.3	+0.0 -32.8 +0.0 +0.0	+30.5 +1.2 +0.0 +0.0	+3.4 +0.0 +0.0 +0.0	+3.4 +0.0 +0.0 +0.0	+0.0	51.0 X	54.0	-3.0	Horiz
20	4959.033M Ave	32.3	+0.0 -32.7 +0.0 +0.0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

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

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



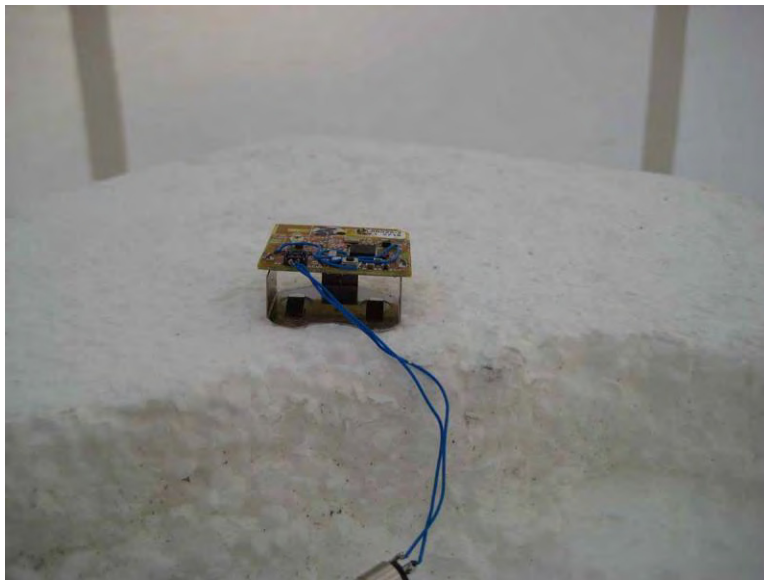


Test Setup Photo(s)





X Axis



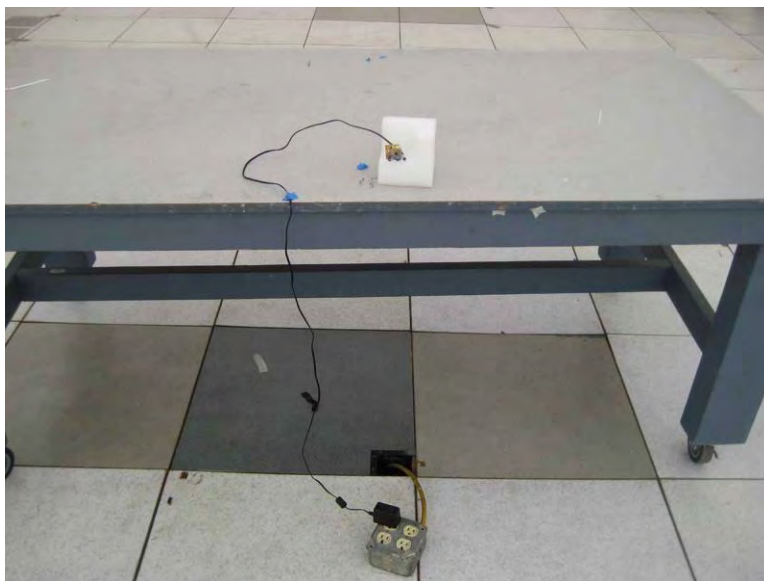
Y Axis



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.

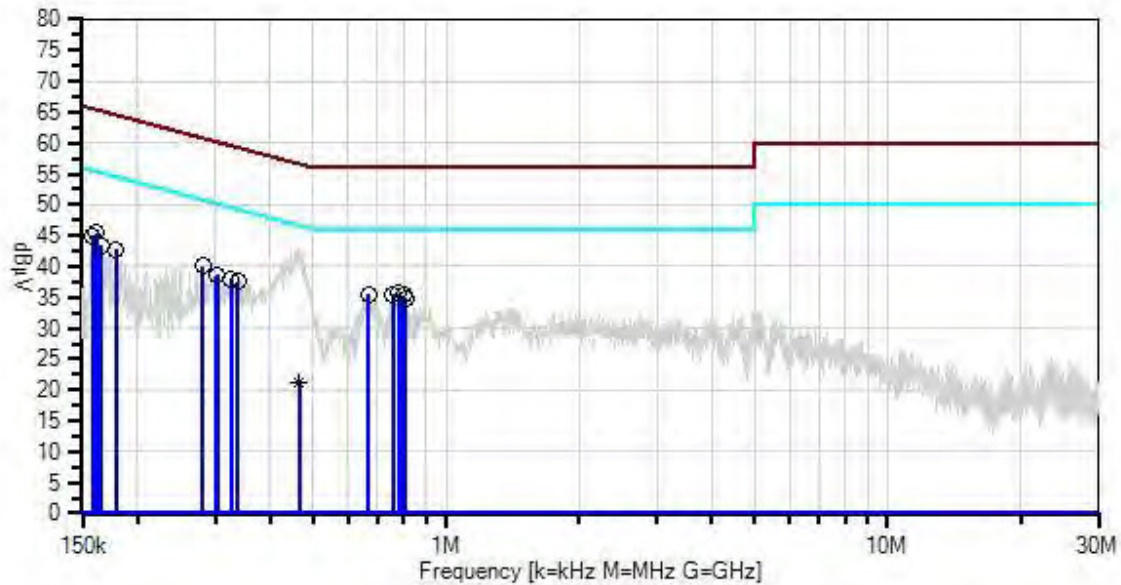
Freq 2400-2483.5
 Tx freq:2444MHz.
 Protocol: 802.15.4, Modulation OQPSK

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



— Sweep Data
x QP Readings
Software Version: 5.03.02

— Readings
* Average Readings
— 1 - 15.207 AC Mains - Average

○ Peak Readings
▼ Ambient
— 2 - 15.207 AC Mains - Quasi-peak

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
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

Measurement Data:

Reading listed by margin.

Test Lead: L1-Line

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

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			

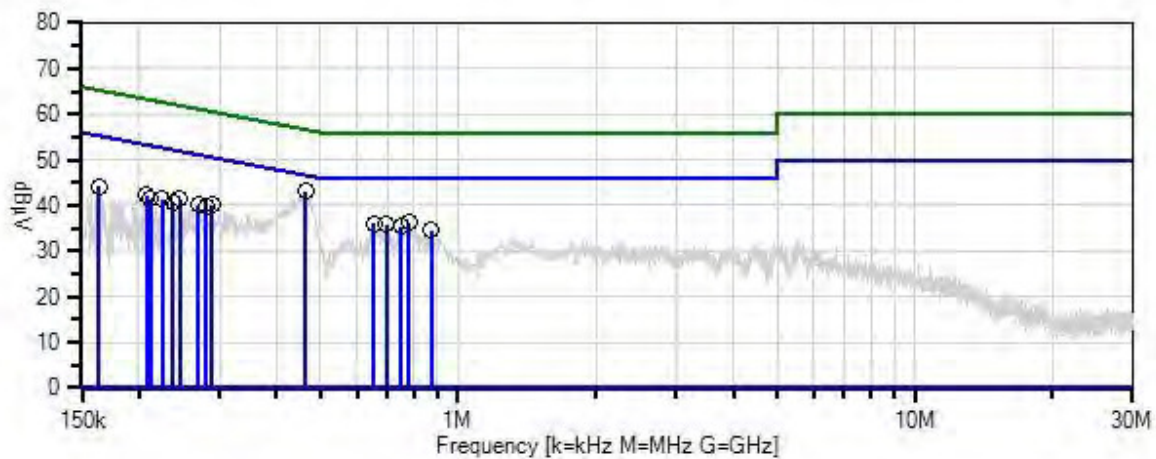
Support Equipment:

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
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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



- Sweep Data
- Readings
- Peak Readings
- × QP Readings
- * Average Readings
- ▼ Ambient
- Software Version: 5.03.02
- 1 - RSS GEN 8.8 AC Power Line Conducted Emission Limit - Average
- 2 - RSS GEN 8.8 AC Power Line Conducted Emission Limit - Quasi-peak

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

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	(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.