Lat-Lon, LLC

TEST REPORT FOR

Small Wireless Sensor
Model: X200

Tested To The Following Standards:

FCC Part 15 Subpart C Section(s)

15.247
(DTS 2400-2483.5 MHz)

Report No.: 98017-7

Date of issue: April 8, 2016

A2LA ACCREDITED
Testing Certificates:
803.01, 803.02, 803.05, 803.06

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.

Testing the Future
CKC LABORATORIES, INC.

TABLE OF CONTENTS

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Lat-Lon, LLC
2300 S Jason St.
Denver, CO 80223

Representative: Jonathan Bean
Customer Reference Number: 2834

REPORT PREPARED BY:

Morgan Tramontin
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 98017

DATE OF EQUIPMENT RECEIPT: February 16, 2016
DATE(S) OF TESTING: February 16 - April 1, 2016

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
Mariposa D	US0103	SL2-IN-E-1147R	3082A-1	784962	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	NA1
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	NA2

NA = Not Applicable
NA1 = Not applicable because the EUT is battery operated only.
NA2 = Not applicable because the EUT is battery operated with built in solar charger.

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
Small Wireless Sensor	Lat-Lon, LLC	X200	NA

Support Equipment:

Device	Manufacturer	Model #	S/N
None			

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	IEEE-802.15.4e
Operating Frequency Range:	2405 – 2475 MHz
Modulation Type(s):	OQPSK
Maximum Duty Cycle:	100%
Number of TX Chains:	15 channels
Antenna Type(s) and Gain:	PCB Trace/5dBi
Beamforming Type:	NA
Antenna Connection Type:	Integral
Nominal Input Voltage:	3.4 VDC from built-in solar charger/ 2.5 VDC internal battery
Firmware / Software used for Test:	SmartMesh IP

FCC Part 15 Subpart C

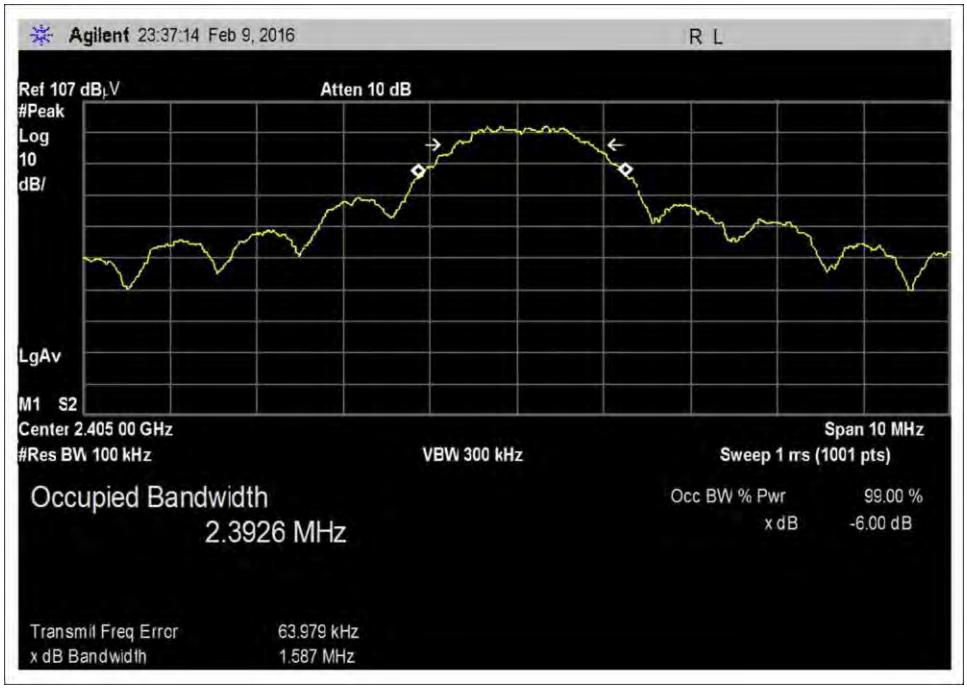
15.247(a)(2) 6dB Bandwidth

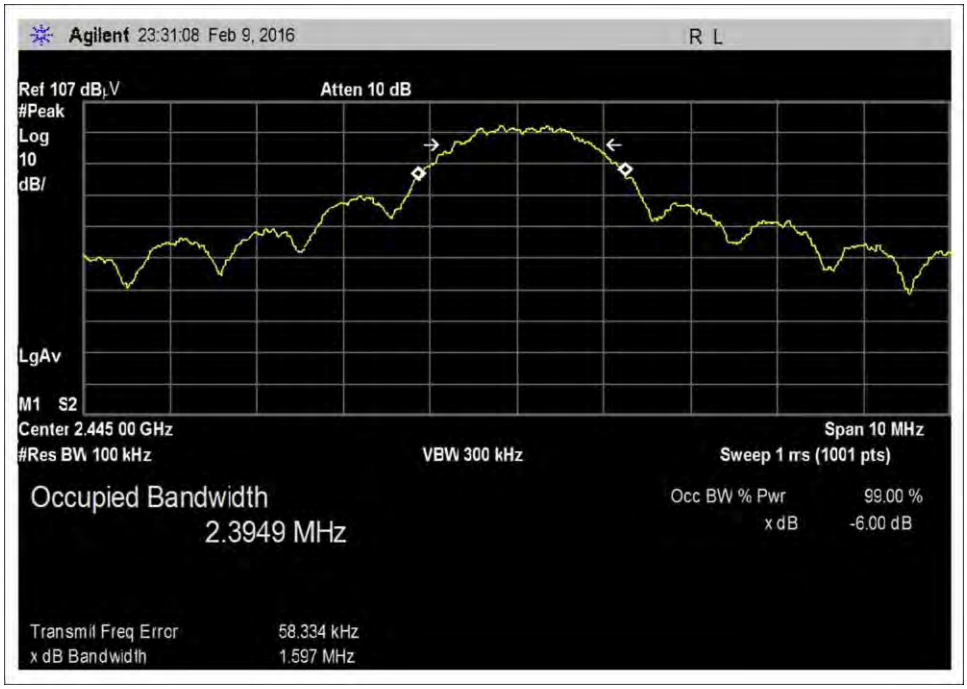
Test Setup/Conditions			
Test Location:	Mariposa Lab A	Test Engineer:	Chuck Kendall
Test Method:	ANSI C63.10 (2013), KDB 558074 v03r04	Test Date(s):	3/3/2016
Configuration:	1		
Test Setup:	The EUT is set up on Styrofoam insulation 1.5 m above the ground plane. The EUT is set to 2405/2445/2475 MHz respectively. Frequencies of Interest: 2405 MHz to 2475 MHz RBW = 100 kHz; VBW = 300 kHz Environmental Conditions: Temperature = 20°C Relative Humidity = 40% Atmospheric Pressure = 97.4 kPa		

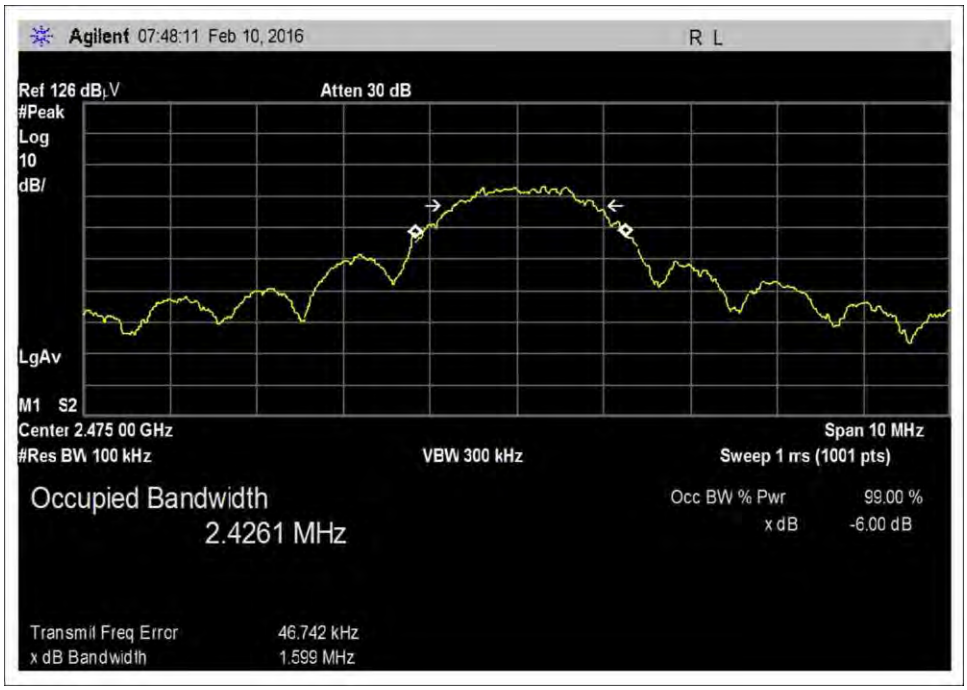
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02668	Spectrum Analyzer	Agilent	E4446A	8/14/2015	8/14/2016
03155	Preamp	HP	83017A	6/30/2015	6/30/2017
P01403	Cable	Semflex	58758-23	12/8/2014	12/8/2016
03355	Cable	AstroLab	32026-2-29094K-48TC	12/8/2014	12/8/2016
P05904	Cable	AstroLab	32022-2-29094K-144TC	12/8/2014	12/8/2016
01273	Horn Antenna	EMCO	3115	2/3/2015	2/3/2017
03362	Cable	Astrolab	32022-2-29094-48TC	12/8/2014	12/8/2016

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
2405	1	OQPSK	1587	≥500	Pass
2445	1	OQPSK	1597	≥500	Pass
2475	1	OQPSK	1599	≥500	Pass

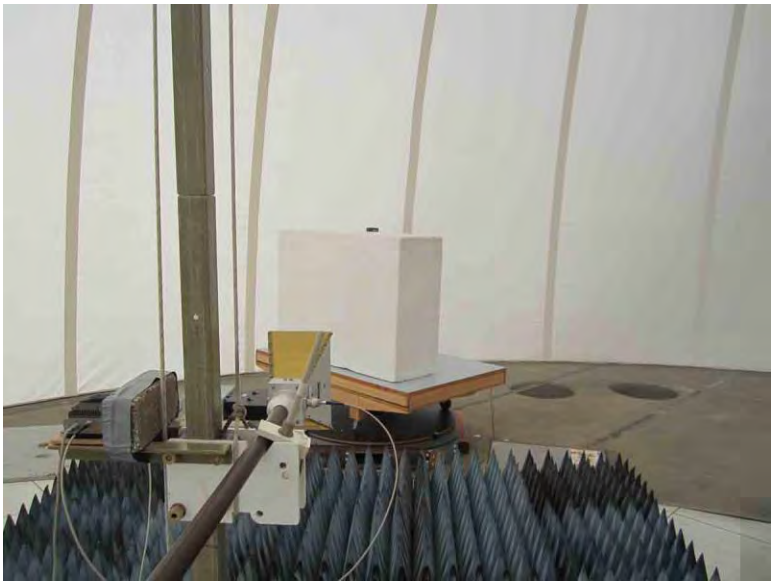
Plots


Agilent 23:37:14 Feb 9, 2016
R L
Ref 107 dBµV
Atten 10 dB
#Peak
Log
10
dB/
LgAv
M1 S2
Center 2.405 00 GHz
Span 10 MHz
#Res BW 100 kHz
VBW 300 kHz
Sweep 1 ms (1001 pts)
Occupied Bandwidth
2.3926 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error 63.979 kHz
x dB Bandwidth 1.587 MHz


Agilent 23:31:08 Feb 9, 2016
R L
Ref 107 dBµV
Atten 10 dB
#Peak
Log
10
dB/
LgAv
M1 S2
Center 2.445 00 GHz
Span 10 MHz
#Res BW 100 kHz
VBW 300 kHz
Sweep 1 ms (1001 pts)
Occupied Bandwidth
2.3949 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error 58.334 kHz
x dB Bandwidth 1.597 MHz



Test Setup Photo



15.247(b)(3) Output Power

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**Lat-Lon, LLC**		
Specification:	**15.247(b) Power Output (2400-2483.5 MHz DTS)**		
Work Order #:	**98017**	Date:	3/3/2016
Test Type:	**Maximized Emissions**	Time:	16:19:02
Tested By:	Chuck Kendall	Sequence#:	1
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

ANSI C63.10 2013

The EUT is set up on Styrofoam insulation 1.5 m above the ground plane.
The EUT is set to 2445 MHz.
Three orthogonal axes were investigated and the Z Axis was found to be the worst case.
This equipment is battery powered. Power output tests were performed using a fresh battery. A solar battery charger inputs a 3.4 VDC nominal input to charge the batteries and the unit can operate while the built-in solar charger is charging the batteries, so this 3.4 VDC input was were cut and an external dc power supply was applied to these leads and its voltage was varied Â± 15% while monitoring the output power. No changes in the output power were noted during this variation.

The EUT is fully modulated (100%) during testing at its full output power.

Frequencies of Interest: 2405 MHz to 2475 MHz
RBW = 3 MHz; VBW = 8 MHz

Environmental Conditions:
Temperature = 20°C
Relative Humidity = 40%
Atmospheric Pressure = 97.4 kPa

Highest Clock = 20 MHz
Highest frequency generated = 2475 MHz

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02668	Spectrum Analyzer	E4446A	8/14/2015	8/14/2016
T2	AN03155	Preamp	83017A	6/30/2015	6/30/2017
T3	ANP01403	Cable	58758-23	12/8/2014	12/8/2016
T4	AN03355	Cable	32026-2-29094K-48TC	12/8/2014	12/8/2016
T5	ANP05904	Cable	32022-2-29094K-144TC	12/8/2014	12/8/2016
T6	AN01273	Horn Antenna	3115	2/3/2015	2/3/2017
T7	AN03362	Cable	32022-2-29094-48TC	12/8/2014	12/8/2016

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	dBµV	dB	Ant
1	2405.050M	103.6	+0.0 +2.4	-33.3 +26.1	+2.3 +0.7	+0.8	+0.0	102.6	131.2 cw Z Axis	-28.6	Horiz
2	2475.720M	102.4	+0.0 +2.4	-33.3 +26.3	+2.4 +0.7	+0.8	+0.0	101.7	131.2 cm Z Axis	-29.5	Horiz
3	2445.550M	101.7	+0.0 +2.4	-33.3 +26.2	+2.3 +0.7	+0.8	+0.0	100.8	131.2 cm Z Axis	-30.4	Horiz

Test Data Summary - Voltage Variations

This equipment is battery powered. Power output tests were performed using a fresh battery. A solar battery charger inputs a 3.4 VDC nominal input to charge the batteries and the unit can operate while the solar charger is charging the batteries, so this 3.4 VDC input was varied ± 15% while monitoring the output power. There was no change in the output when the input power was varied.

Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
$V_{Nominal}$:	3.40 VDC
$V_{Minimum}$:	2.96 VDC
$V_{Maximum}$:	3.91 VDC

Power Output Test Data Summary - Radiated Measurement

Measurement Option: PKPM1

Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Field Strength (dBuV/m @3m)	Calculated (dBm)	Limit (dBm)	Results
2405	OQPSK	PCB/5	102.6	2.37	≤30	Pass
2445	OQPSK	PCB/5	100.8	0.57	≤30	Pass
2475	OQPSK	PCB/5	101.7	1.47	≤30	Pass

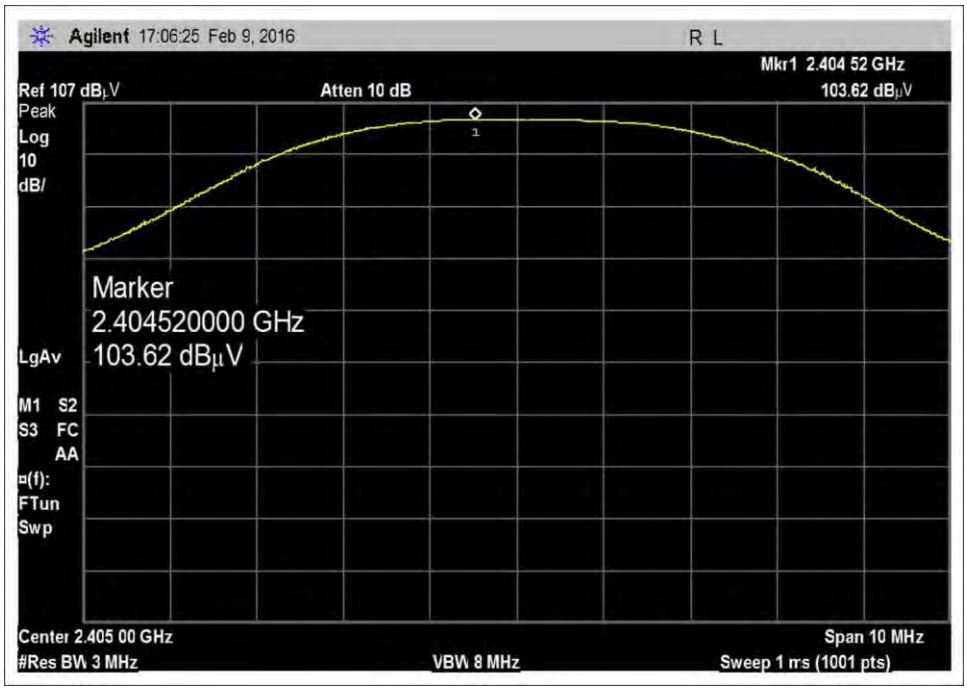
Conducted RF output power calculated in accordance with ANSI C63.10.

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

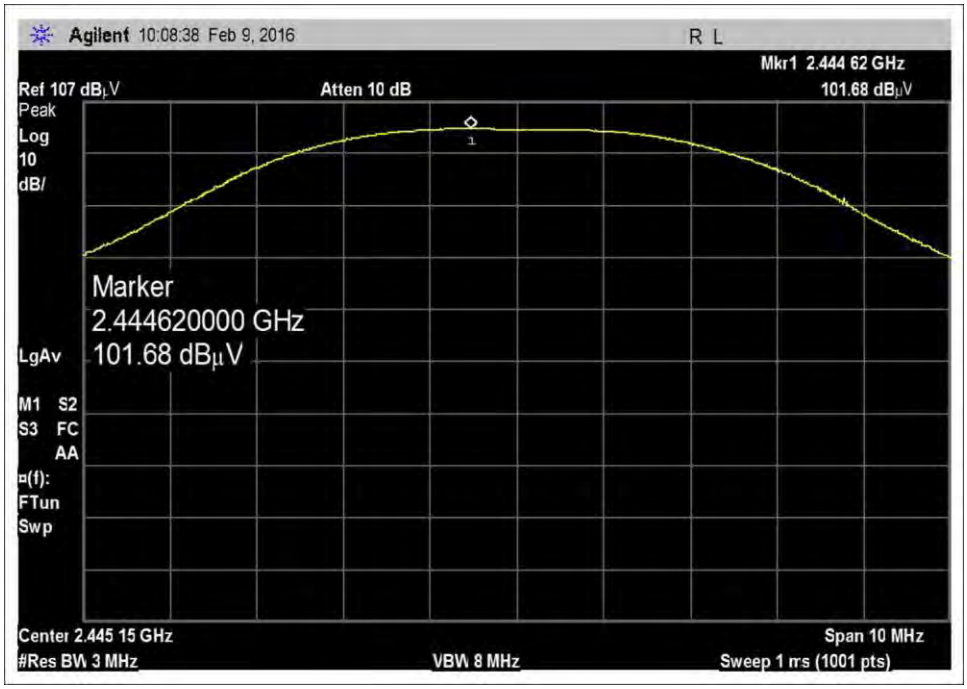
Or equivalently, in logarithmic form:

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

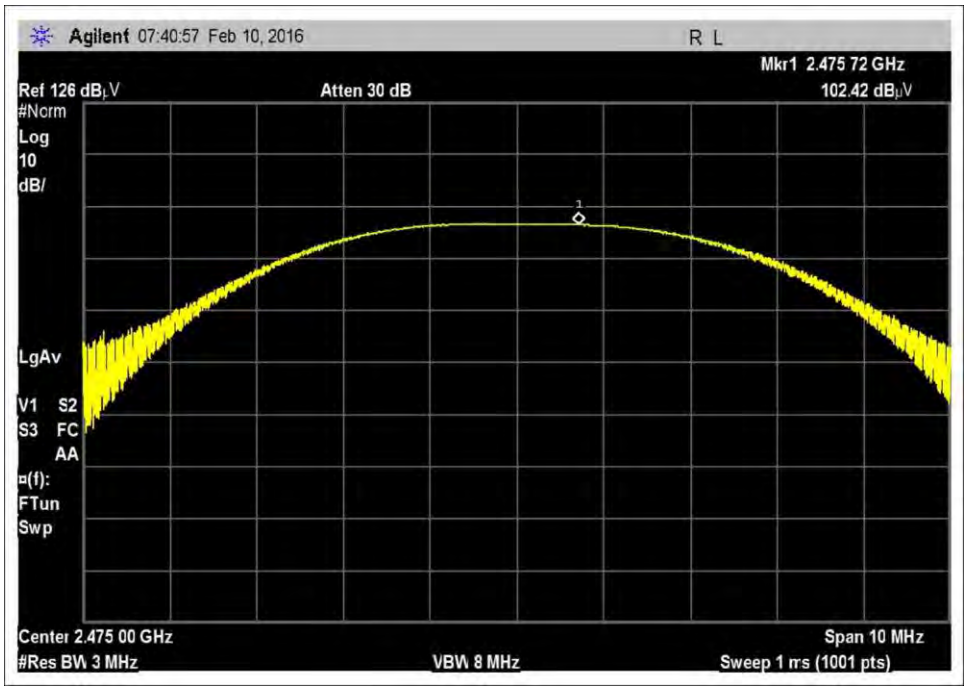
Plot Data



2405MHz

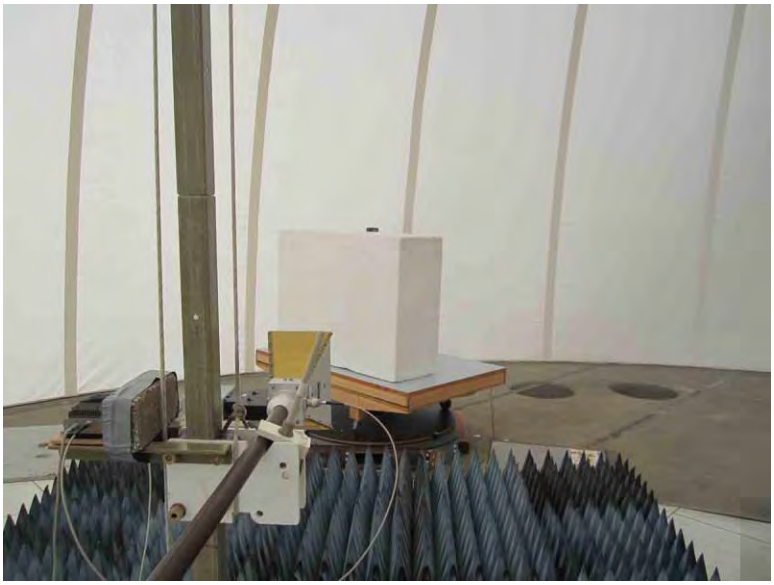


2445MHz


Agilent 07:40:57 Feb 10, 2016
R L
Mkr1 2.475 72 GHz
Ref 126 dBµV
Atten 30 dB
102.42 dBµV
#Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
AA
¤(f):
FTun
Swp
Center 2.475 00 GHz
Span 10 MHz
#Res BW 3 MHz
VBW 8 MHz
Sweep 1 ms (1001 pts)

2475MHz

Test Setup Photo



15.247(e) Power Spectral Density

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**Lat-Lon, LLC**		
Specification:	**15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)**		
Work Order #:	**98017**	Date:	3/3/2016
Test Type:	**Maximized Emissions**	Time:	16:31:54
Tested By:	Chuck Kendall	Sequence#:	1
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

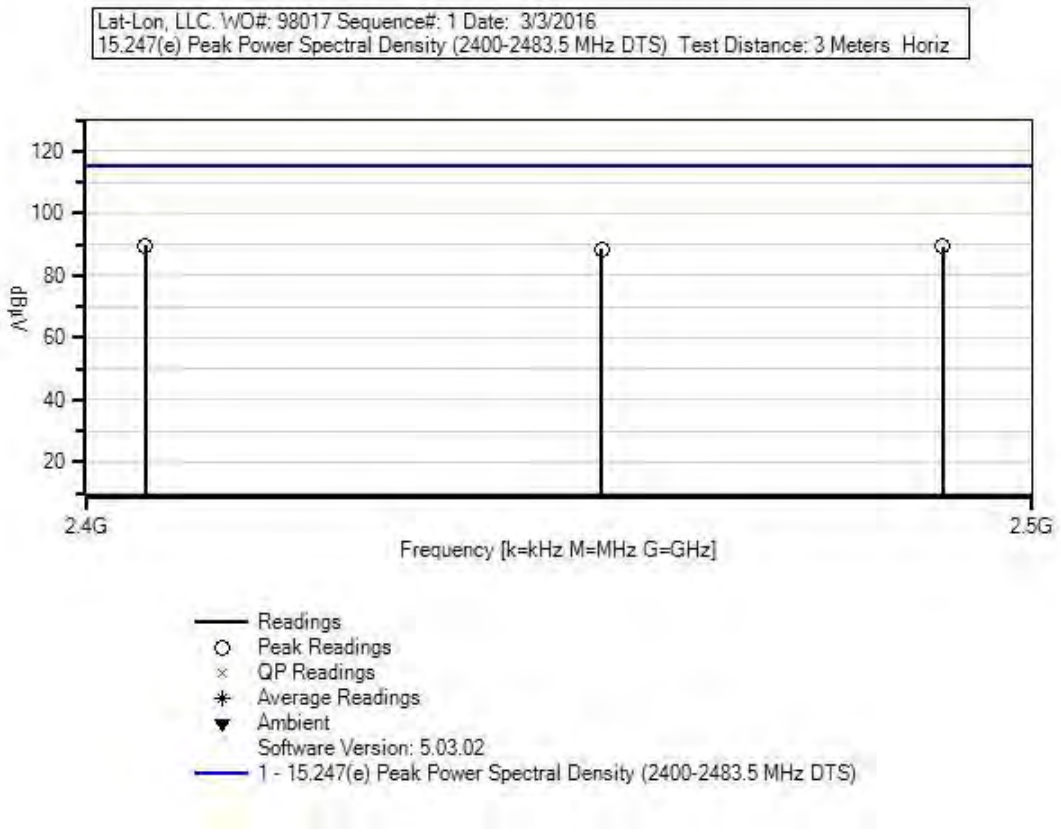
ANSI C63.10 2013

The EUT is set up on Styrofoam insulation 1.5 m above the ground plane.
The EUT is set to 2405/2445/2475 MHz respectively.
Three orthogonal axis were investigated but the Z axis was found to be worst case (flat on the foam).
Since there is a solar charger connected and it can operate while charging; the leads were removed and the nominal 3.4 VDC ± 15% power was applied via an external dc power supply to note the change in output power.
No change in the output was observed during the variation of input power.

Frequencies of Interest: 2405 MHz to 2475 MHz
RBW = 3 kHz; VBW = 9.1 kHz

Environmental Conditions:
Temperature = 20°C
Relative Humidity = 40%
Atmospheric Pressure = 97.4 kPa

Highest Clock =20 MHz
Highest frequency generated = 2475 MHz



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02668	Spectrum Analyzer	E4446A	8/14/2015	8/14/2016
T2	AN03155	Preamp	83017A	6/30/2015	6/30/2017
T3	ANP01403	Cable	58758-23	12/8/2014	12/8/2016
T4	AN03355	Cable	32026-2-29094K-48TC	12/8/2014	12/8/2016
T5	ANP05904	Cable	32022-2-29094K-144TC	12/8/2014	12/8/2016
T6	AN01273	Horn Antenna	3115	2/3/2015	2/3/2017
T7	AN03362	Cable	32022-2-29094-48TC	12/8/2014	12/8/2016

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	dBµV	dB	Ant
1	2405.166M	90.7	+0.0 +2.4	-33.3 +26.1	+2.3 +0.7	+0.8	+0.0	89.7	115.0 Z Axis 2405 MHz	-25.3	Horiz
2	2475.517M	89.9	+0.0 +2.4	-33.3 +26.3	+2.4 +0.7	+0.8	+0.0	89.2	115.0 Z Axis 2405 MHz	-25.8	Horiz
3	2445.172M	89.4	+0.0 +2.4	-33.3 +26.2	+2.3 +0.7	+0.8	+0.0	88.5	115.0 Z Axis 2405 MHz	-26.5	Horiz

PSD Test Data Summary - Radiated Measurement						
Measurement Method: PKPSD						
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Field Strength (dBuV/m @3m)	Calculated (dBm/3kHz)	Limit (dBm/3kHz)	Results
2405	OQPSK	PCB/5	89.7	-10.53	≤8	Pass
2445	OQPSK	PCB/5	88.5	-11.73	≤8	Pass
2475	OQPSK	PCB/5	89.2	-11.03	≤8	Pass

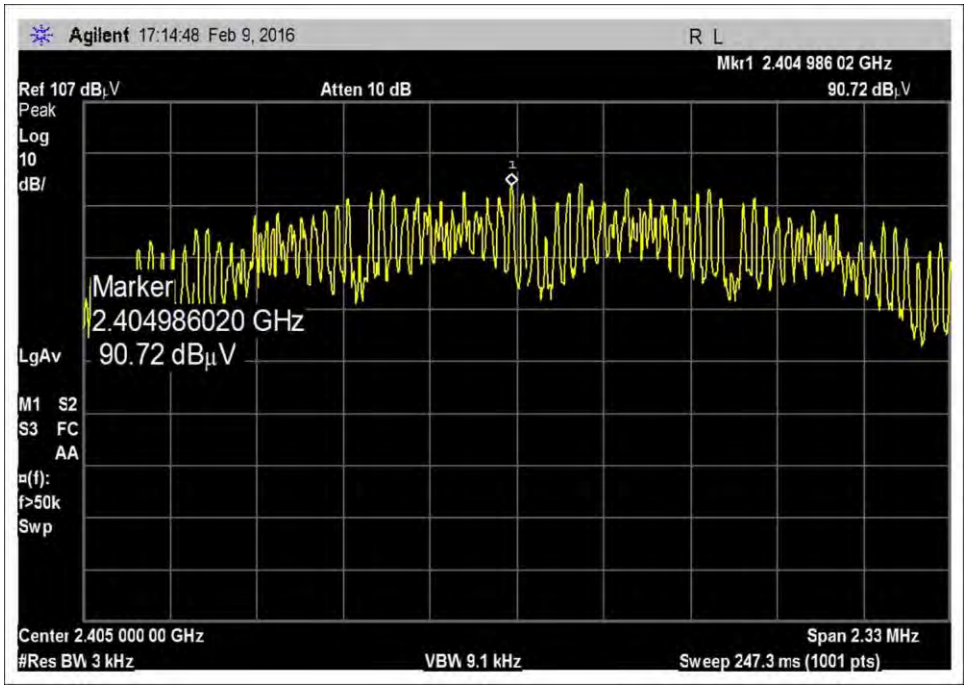
Conducted RF output power calculated in accordance with ANSI C63.10.

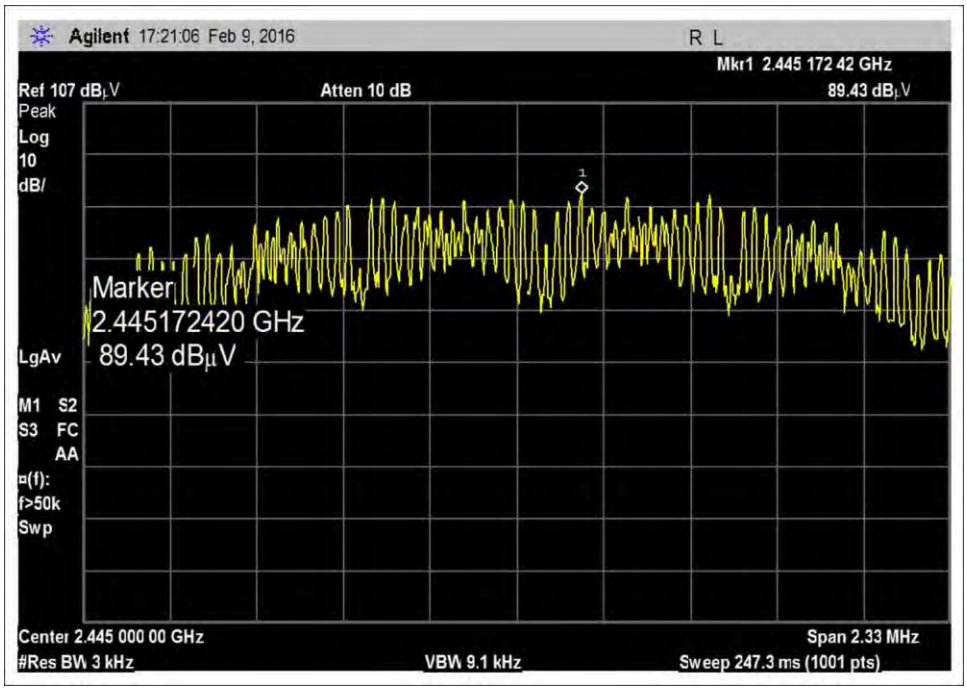
$$P(W) = \frac{(E \cdot d)^2}{30\ G}$$

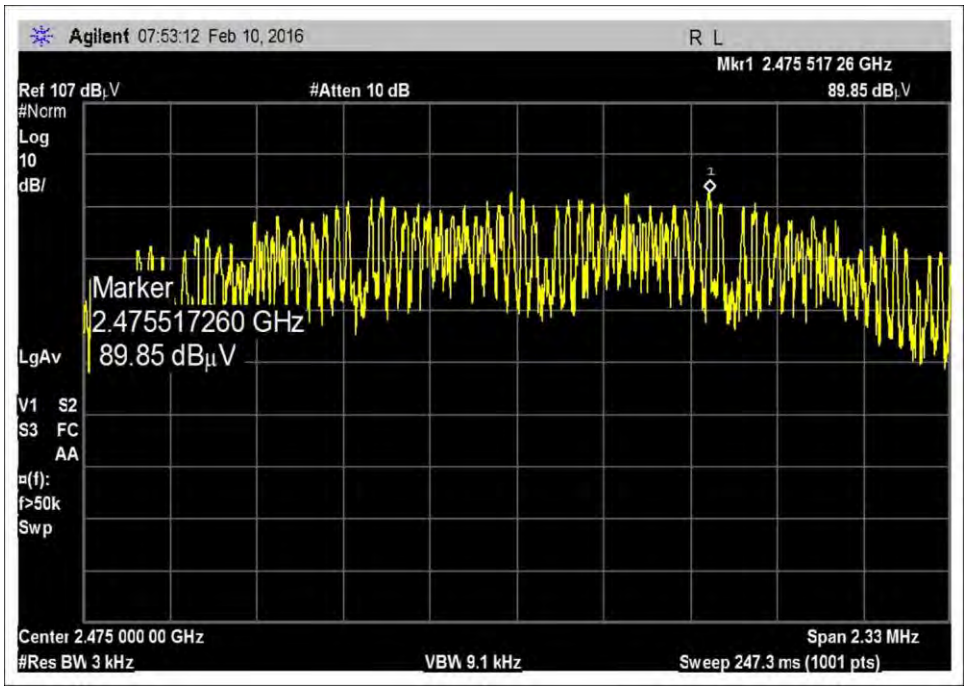
Or equivalently, in logarithmic form:

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

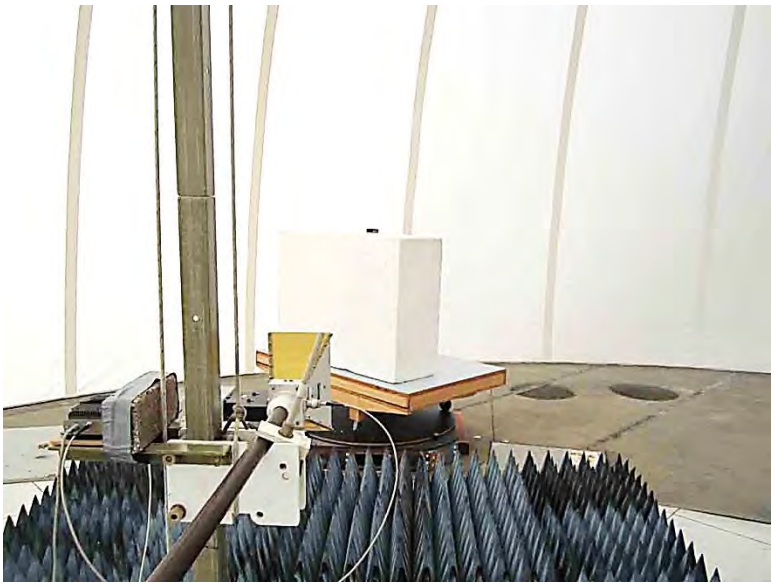
Plots




Agilent 17:21:06 Feb 9, 2016
R L
Mkr1 2.445 172 42 GHz
Ref 107 dBµV
Atten 10 dB
89.43 dBµV
Peak
Log
10
dB/
Marker 1
2.445172420 GHz
89.43 dBµV
LgAv
M1 S2
S3 FC
AA
¤(f):
f>50k
Swp
Center 2.445 000 00 GHz
Span 2.33 MHz
#Res BW 3 kHz
VBW 9.1 kHz
Sweep 247.3 ms (1001 pts)


Agilent 07:53:12 Feb 10, 2016
R L
Mkr1 2.475 517 26 GHz
Ref 107 dBµV
#Atten 10 dB
89.85 dBµV
#Norm
Log
10
dB/
Marker 1
2.475517260 GHz
89.85 dBµV
LgAv
V1 S2
S3 FC
AA
¤(f):
f>50k
Swp
Center 2.475 000 00 GHz
Span 2.33 MHz
#Res BW 3 kHz
VBW 9.1 kHz
Sweep 247.3 ms (1001 pts)

Test Setup Photo



15.247(d) Radiated Emissions & Band Edge

Test Data

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**Lat-Lon, LLC**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**98017**	Date:	2/16/2016
Test Type:	**Maximized Emissions**	Time:	16:11:37
Tested By:	Chuck Kendall	Sequence#:	2
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

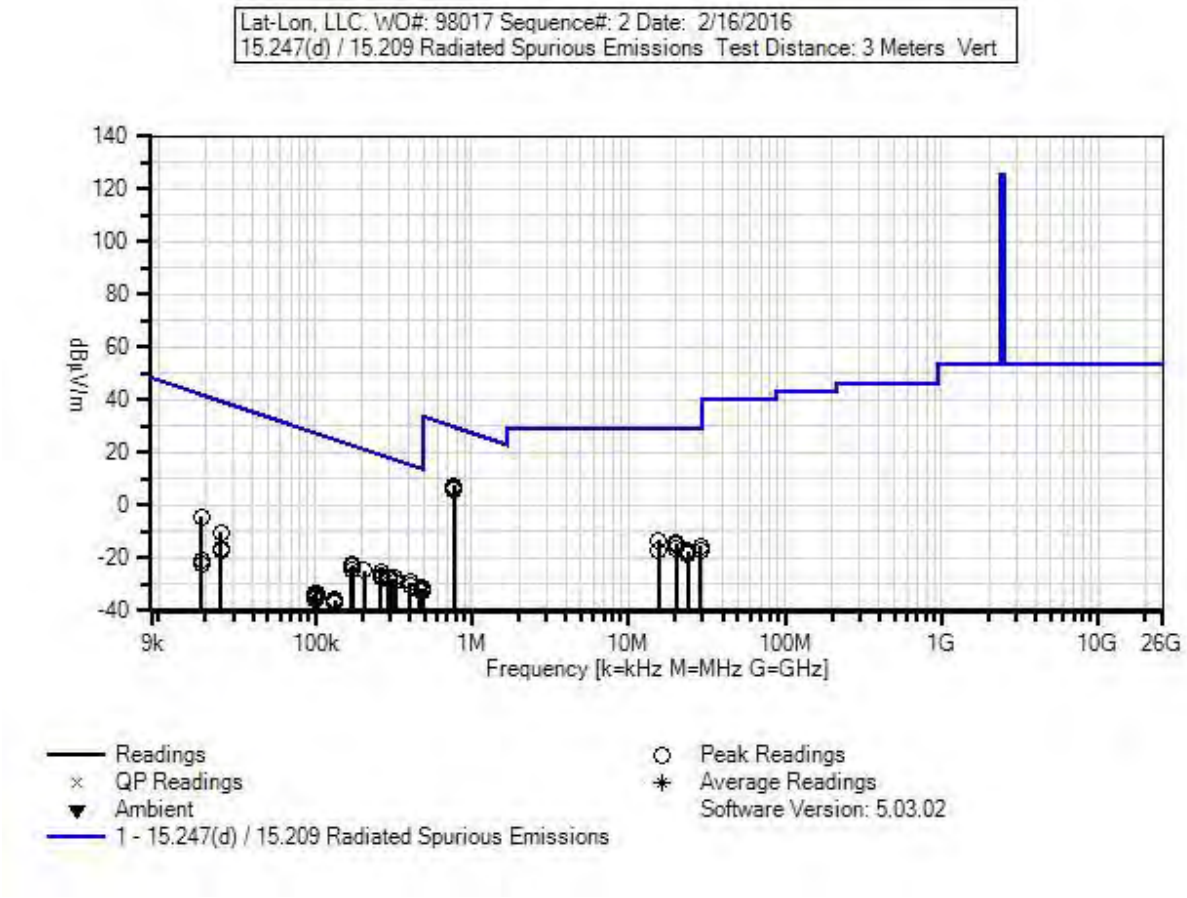
ANSI C63.10 2013
The EUT is setting atop a piece of Styrofoam insulation on a wooden test bench 80 cm atop a 3m diameter flush-mounted turntable.
The EUT is battery operated and will be investigated in three different axes; X, Y, & Z.
The EUT is transmitting on 2445MHz Preliminary investigation proved this to be the worst case frequency for these spurs.

Frequencies investigated are: 9 kHz to 30 MHz

From 9kHz to 150kHz
RBW= 200Hz; VBW = 600kHz
From 150kHz to 30MHz
RBW=9kHz; VBW = 27kHz

Environmental Conditions:
Temperature = 19.5°C
Relative Humidity = 40%
Atmospheric Pressure = 97.7kPa

Highest Clock = 20 MHz
Highest Frequency = 2475 MHz


Lat-Lon, LLC. WO#: 98017 Sequence#: 2 Date: 2/16/2016
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert
140
120
100
80
60
40
20
0
-20
-40
dBµV/m
9k
100k
1M
10M
100M
1G
10G
26G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02668	Spectrum Analyzer	E4446A	8/14/2015	8/14/2016
T2	ANP06885	Cable	P06885	10/27/2015	10/27/2017
T3	ANSITED 3M	Cable		11/15/2014	11/15/2016
T4	AN00226	Loop Antenna	6502	3/28/2014	3/28/2016

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	773.240k	36.7	+0.0	+0.0	+0.1	+10.8	-40.0	7.6	29.8	-22.2	Vert
									Tx at 2445 MHz Z axis		
2	773.040k	35.5	+0.0	+0.0	+0.1	+10.8	-40.0	6.4	29.9	-23.5	Vert
									Tx at 2445 MHz Y axis		
3	772.960k	34.7	+0.0	+0.0	+0.1	+10.8	-40.0	5.6	29.9	-24.3	Vert
									Tx at 2445 MHz X axis		
4	15.686M	16.6	+0.0	+0.1	+0.7	+9.4	-40.0	-13.2	29.5	-42.7	Vert
									Tx at 2445 MHz X axis		
5	20.263M	16.5	+0.0	+0.1	+0.8	+8.2	-40.0	-14.4	29.5	-43.9	Vert
									Tx at 2445 MHz Z axis		
6	261.720k	44.7	+0.0	+0.0	+0.1	+10.2	-80.0	-25.0	19.2	-44.2	Vert
									Tx at 2445 MHz Y axis		
7	20.265M	16.0	+0.0	+0.1	+0.8	+8.2	-40.0	-14.9	29.5	-44.4	Vert
									Tx at 2445 MHz X axis		
8	405.340k	40.5	+0.0	+0.0	+0.1	+10.2	-80.0	-29.2	15.4	-44.6	Vert
									Tx at 2445 MHz Y axis		
9	28.904M	16.8	+0.0	+0.1	+1.0	+6.8	-40.0	-15.3	29.5	-44.8	Vert
									Tx at 2445 MHz Y axis		
10	323.500k	42.1	+0.0	+0.0	+0.1	+10.2	-80.0	-27.6	17.4	-45.0	Vert
									Tx at 2445 MHz Y axis		
11	174.660k	47.2	+0.0	+0.0	+0.1	+10.3	-80.0	-22.4	22.8	-45.2	Vert
									Tx at 2445 MHz X axis		
12	319.480k	42.0	+0.0	+0.0	+0.1	+10.2	-80.0	-27.7	17.5	-45.2	Vert
									Tx at 2445 MHz Z axis		
13	484.620k	38.5	+0.0	+0.0	+0.1	+10.1	-80.0	-31.3	13.9	-45.2	Vert
									Tx at 2445 MHz Z axis		
14	20.265M	14.9	+0.0	+0.1	+0.8	+8.2	-40.0	-16.0	29.5	-45.5	Vert
									Tx at 2445 MHz Y axis		

15	296.620k	42.4	+0.0	+0.0	+0.1	+10.2	-80.0	-27.3	18.2	-45.5	Vert Tx at 2445 MHz X axis
16	297.440k	42.2	+0.0	+0.0	+0.1	+10.2	-80.0	-27.5	18.1	-45.6	Vert Tx at 2445 MHz Y axis
17	483.940k	37.9	+0.0	+0.0	+0.1	+10.1	-80.0	-31.9	13.9	-45.8	Vert Tx at 2445 MHz X axis
18	206.720k	45.0	+0.0	+0.0	+0.1	+10.3	-80.0	-24.6	21.3	-45.9	Vert Tx at 2445 MHz X axis
19	261.720k	43.0	+0.0	+0.0	+0.1	+10.2	-80.0	-26.7	19.2	-45.9	Vert Tx at 2445 MHz X axis
20	172.040k	46.6	+0.0	+0.0	+0.1	+10.3	-80.0	-23.0	22.9	-45.9	Vert Tx at 2445 MHz Y axis
21	458.480k	38.2	+0.0	+0.0	+0.1	+10.1	-80.0	-31.6	14.4	-46.0	Vert Tx at 2445 MHz X axis
22	406.700k	39.1	+0.0	+0.0	+0.1	+10.2	-80.0	-30.6	15.4	-46.0	Vert Tx at 2445 MHz X axis
23	323.840k	41.1	+0.0	+0.0	+0.1	+10.2	-80.0	-28.6	17.4	-46.0	Vert Tx at 2445 MHz X axis
24	28.903M	15.4	+0.0	+0.1	+1.0	+6.8	-40.0	-16.7	29.5	-46.2	Vert Tx at 2445 MHz Z axis
25	18.807k	61.8	+0.0	+0.0	+0.0	+14.1	-80.0	-4.1	42.1	-46.2	Vert Tx at 2445 MHz X axis
26	15.687M	13.1	+0.0	+0.1	+0.7	+9.4	-40.0	-16.7	29.5	-46.2	Vert Tx at 2445 MHz Y axis
27	405.060k	39.0	+0.0	+0.0	+0.1	+10.2	-80.0	-30.7	15.5	-46.2	Vert Tx at 2445 MHz Z axis
28	460.600k	37.9	+0.0	+0.0	+0.1	+10.1	-80.0	-31.9	14.3	-46.2	Vert Tx at 2445 MHz Z axis
29	459.560k	37.9	+0.0	+0.0	+0.1	+10.1	-80.0	-31.9	14.4	-46.3	Vert Tx at 2445 MHz Y axis
30	28.906M	15.1	+0.0	+0.1	+1.0	+6.8	-40.0	-17.0	29.5	-46.5	Vert Tx at 2445 MHz X axis
31	485.020k	37.1	+0.0	+0.0	+0.1	+10.1	-80.0	-32.7	13.9	-46.6	Vert Tx at 2445 MHz Y axis

32	296.680k	41.3	+0.0	+0.0	+0.1	+10.2	-80.0	-28.4	18.2	-46.6	Vert Tx at 2445 MHz Z axis
33	15.687M	12.7	+0.0	+0.1	+0.7	+9.4	-40.0	-17.1	29.5	-46.6	Vert Tx at 2445 MHz Z axis
34	23.985M	13.9	+0.0	+0.1	+0.9	+7.9	-40.0	-17.2	29.5	-46.7	Vert Tx at 2445 MHz X axis
35	261.180k	42.2	+0.0	+0.0	+0.1	+10.2	-80.0	-27.5	19.3	-46.8	Vert Tx at 2445 MHz Z axis
36	23.980M	13.6	+0.0	+0.1	+0.9	+7.9	-40.0	-17.5	29.5	-47.0	Vert Tx at 2445 MHz Y axis
37	171.520k	45.0	+0.0	+0.0	+0.1	+10.3	-80.0	-24.6	22.9	-47.5	Vert Tx at 2445 MHz Z axis
38	23.979M	12.9	+0.0	+0.1	+0.9	+7.9	-40.0	-18.2	29.5	-47.7	Vert Tx at 2445 MHz Z axis
39	25.182k	56.9	+0.0	+0.0	+0.0	+12.9	-80.0	-10.2	39.6	-49.8	Vert Tx at 2445 MHz X axis
40	25.182k	56.9	+0.0	+0.0	+0.0	+12.9	-80.0	-10.2	39.6	-49.8	Vert Tx at 2445 MHz X axis
41	25.167k	50.5	+0.0	+0.0	+0.0	+12.9	-80.0	-16.6	39.6	-56.2	Vert Tx at 2445 MHz Y axis
42	25.227k	49.8	+0.0	+0.0	+0.0	+12.9	-80.0	-17.3	39.6	-56.9	Vert Tx at 2445 MHz Z axis
43	102.761k	36.0	+0.0	+0.0	+0.1	+10.8	-80.0	-33.1	27.4	-60.5	Vert Tx at 2445 MHz Z axis
44	134.294k	33.5	+0.0	+0.0	+0.1	+10.7	-80.0	-35.7	25.0	-60.7	Vert Tx at 2445 MHz X axis
45	99.630k	35.7	+0.0	+0.0	+0.1	+10.7	-80.0	-33.5	27.6	-61.1	Vert Tx at 2445 MHz Y axis
46	134.664k	32.8	+0.0	+0.0	+0.1	+10.7	-80.0	-36.4	25.0	-61.4	Vert Tx at 2445 MHz Z axis
47	100.991k	35.2	+0.0	+0.0	+0.1	+10.8	-80.0	-33.9	27.5	-61.4	Vert Tx at 2445 MHz X axis
48	135.004k	32.2	+0.0	+0.0	+0.1	+10.7	-80.0	-37.0	25.0	-62.0	Vert Tx at 2445 MHz Y axis

49	103.321k	34.1	+0.0	+0.0	+0.1	+10.9	-80.0	-34.9	27.3	-62.2	Vert Tx at 2445 MHz Y axis
50	18.862k	45.3	+0.0	+0.0	+0.0	+14.1	-80.0	-20.6	42.1	-62.7	Vert Tx at 2445 MHz Y axis
51	98.935k	34.1	+0.0	+0.0	+0.1	+10.7	-80.0	-35.1	27.7	-62.8	Vert Tx at 2445 MHz Z axis
52	99.800k	33.9	+0.0	+0.0	+0.1	+10.7	-80.0	-35.3	27.6	-62.9	Vert Tx at 2445 MHz X axis
53	18.832k	43.8	+0.0	+0.0	+0.0	+14.1	-80.0	-22.1	42.1	-64.2	Vert Tx at 2445 MHz Z axis

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**Lat-Lon, LLC**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**98017**	Date:	2/16/2016
Test Type:	**Maximized Emissions**	Time:	15:15:45
Tested By:	Chuck Kendall	Sequence#:	1
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

ANSI C63.10 2013

The EUT is setting atop a piece of Styrofoam insulation on a wooden test bench 80 cm atop a 3m diameter flush-mounted turntable. The EUT is battery operated and will be investigated in three different axes; X, Y, & Z.

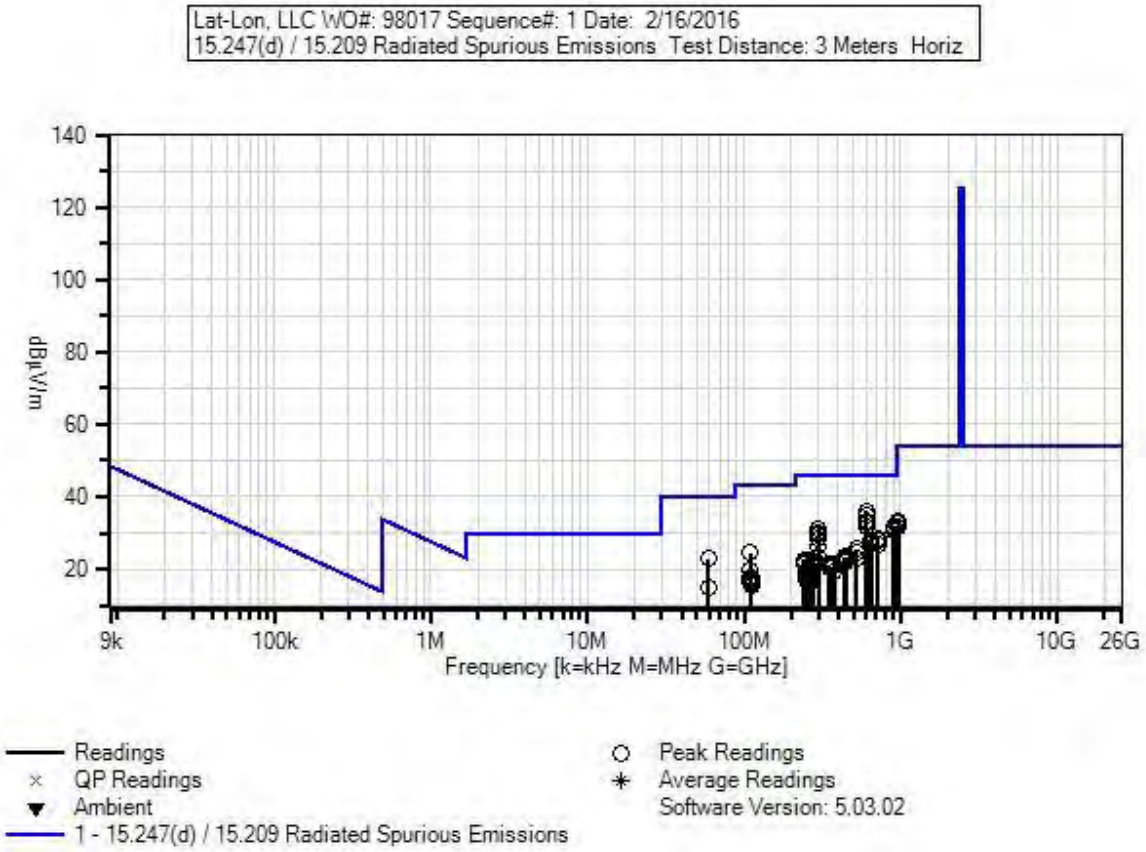
The EUT is transmitting on 2445 MHz which appears to be the worst case for these measurements.

Frequencies investigated are: 30 MHz to 1000 MHz

RBW= 120kHz; VBW = 300kHz

Environmental Conditions:
Temperature = 20°C
Relative Humidity = 40%
Atmospheric Pressure = 97.7kPa

Highest Clock = 20 MHz
Highest Frequency = 2475 MHz


Lat-Lon, LLC WO#: 98017 Sequence#: 1 Date: 2/16/2016
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz
140
120
100
80
60
40
20
dBµV/m
9k
100k
1M
10M
100M
1G
10G
26G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02668	Spectrum Analyzer	E4446A	8/14/2015	8/14/2016
T2	ANP06885	Cable	P06885	10/27/2015	10/27/2017
T3	AN01994	Biconilog Antenna	CBL6111C	3/7/2014	3/7/2016
T4	AN00282	Preamp	8447D	4/7/2014	4/7/2016
T5	ANP06884	Cable	LMR195-FR-4	10/27/2015	10/27/2017
T6	ANSITED 3M	Cable		11/15/2014	11/15/2016

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	600.011M	38.2	+0.0 +0.4	+0.5 +5.1	+20.2	-28.4	+0.0	36.0	46.0 Tx at 2445MHz X axis	-10.0	Horiz
2	600.027M	37.2	+0.0 +0.4	+0.5 +5.1	+20.2	-28.4	+0.0	35.0	46.0 Tx at 2445 MHz Z axis	-11.0	Vert
3	599.996M	35.7	+0.0 +0.4	+0.5 +5.1	+20.2	-28.4	+0.0	33.5	46.0 Tx at 2445MHz Y axis	-12.5	Vert
4	600.029M	35.4	+0.0 +0.4	+0.5 +5.1	+20.2	-28.4	+0.0	33.2	46.0 Tx at 2445MHz Y axis	-12.8	Horiz
5	600.027M	34.7	+0.0 +0.4	+0.5 +5.1	+20.2	-28.4	+0.0	32.5	46.0 Tx at 2445 MHz Z axis	-13.5	Horiz
6	913.643M	28.6	+0.0 +0.6	+0.6 +6.5	+23.6	-28.0	+0.0	31.9	46.0 Tx at 2445MHz Y axis	-14.1	Vert
7	913.550M	28.6	+0.0 +0.6	+0.6 +6.5	+23.6	-28.0	+0.0	31.9	46.0 Tx at 2445 MHz Z axis	-14.1	Vert
8	600.013M	34.0	+0.0 +0.4	+0.5 +5.1	+20.2	-28.4	+0.0	31.8	46.0 Tx at 2445MHz X axis	-14.2	Vert
9	913.688M	28.4	+0.0 +0.6	+0.6 +6.5	+23.6	-28.0	+0.0	31.7	46.0 Tx at 2445MHz X axis	-14.3	Vert
10	913.632M	28.4	+0.0 +0.6	+0.6 +6.5	+23.6	-28.0	+0.0	31.7	46.0 Tx at 2445MHz Y axis	-14.3	Horiz
11	913.738M	28.3	+0.0 +0.6	+0.6 +6.5	+23.6	-28.0	+0.0	31.6	46.0 Tx at 2445MHz X axis	-14.4	Horiz
12	898.220M	28.6	+0.0 +0.5	+0.6 +6.5	+23.4	-28.0	+0.0	31.6	46.0 Tx at 2445MHz Y axis	-14.4	Vert

13	898.315M	28.5	+0.0 +0.5	+0.6 +6.5	+23.4	-28.0	+0.0	31.5	46.0	-14.5	Horiz Tx at 2445MHz Y axis
14	898.201M	28.5	+0.0 +0.5	+0.6 +6.5	+23.4	-28.0	+0.0	31.5	46.0	-14.5	Horiz Tx at 2445MHz X axis
15	898.125M	28.5	+0.0 +0.5	+0.6 +6.5	+23.4	-28.0	+0.0	31.5	46.0	-14.5	Vert Tx at 2445MHz X axis
16	913.554M	28.2	+0.0 +0.6	+0.6 +6.5	+23.6	-28.0	+0.0	31.5	46.0	-14.5	Horiz Tx at 2445 MHz Z axis
17	898.359M	28.3	+0.0 +0.5	+0.6 +6.5	+23.4	-28.0	+0.0	31.3	46.0	-14.7	Horiz Tx at 2445 MHz Z axis
18	300.002M	40.6	+0.0 +0.4	+0.4 +3.5	+13.6	-27.2	+0.0	31.3	46.0	-14.7	Horiz Tx at 2445MHz X axis
19	898.420M	27.6	+0.0 +0.5	+0.6 +6.5	+23.4	-28.0	+0.0	30.6	46.0	-15.4	Vert Tx at 2445 MHz Z axis
20	300.004M	39.1	+0.0 +0.4	+0.4 +3.5	+13.6	-27.2	+0.0	29.8	46.0	-16.2	Vert Tx at 2445MHz Y axis
21	300.014M	38.9	+0.0 +0.4	+0.4 +3.5	+13.6	-27.2	+0.0	29.6	46.0	-16.4	Horiz Tx at 2445MHz Y axis
22	59.250M	43.0	+0.0 +0.1	+0.2 +1.5	+6.0	-28.0	+0.0	22.8	40.0	-17.2	Vert Tx at 2445 MHz Z axis
23	720.871M	29.3	+0.0 +0.5	+0.6 +5.6	+21.0	-28.4	+0.0	28.6	46.0	-17.4	Horiz Tx at 2445MHz Y axis
24	300.020M	37.8	+0.0 +0.4	+0.4 +3.5	+13.6	-27.2	+0.0	28.5	46.0	-17.5	Horiz Tx at 2445 MHz Z axis
25	720.616M	29.1	+0.0 +0.5	+0.6 +5.6	+21.0	-28.4	+0.0	28.4	46.0	-17.6	Horiz Tx at 2445MHz X axis
26	720.788M	28.8	+0.0 +0.5	+0.6 +5.6	+21.0	-28.4	+0.0	28.1	46.0	-17.9	Horiz Tx at 2445 MHz Z axis
27	637.489M	29.9	+0.0 +0.4	+0.5 +5.2	+20.4	-28.4	+0.0	28.0	46.0	-18.0	Horiz Tx at 2445 MHz Z axis
28	637.523M	29.9	+0.0 +0.4	+0.5 +5.2	+20.4	-28.4	+0.0	28.0	46.0	-18.0	Horiz Tx at 2445MHz Y axis
29	646.588M	29.6	+0.0 +0.5	+0.5 +5.3	+20.4	-28.4	+0.0	27.9	46.0	-18.1	Vert Tx at 2445MHz X axis

30	720.800M	28.5	+0.0 +0.5	+0.6 +5.6	+21.0	-28.4	+0.0	27.8	46.0	-18.2	Vert Tx at 2445MHz Y axis
31	720.707M	28.4	+0.0 +0.5	+0.6 +5.6	+21.0	-28.4	+0.0	27.7	46.0	-18.3	Vert Tx at 2445MHz X axis
32	637.528M	29.6	+0.0 +0.4	+0.5 +5.2	+20.4	-28.4	+0.0	27.7	46.0	-18.3	Horiz Tx at 2445MHz X axis
33	646.704M	29.4	+0.0 +0.5	+0.5 +5.3	+20.4	-28.4	+0.0	27.7	46.0	-18.3	Horiz Tx at 2445 MHz Z axis
34	646.685M	29.3	+0.0 +0.5	+0.5 +5.3	+20.4	-28.4	+0.0	27.6	46.0	-18.4	Vert Tx at 2445MHz Y axis
35	646.734M	29.3	+0.0 +0.5	+0.5 +5.3	+20.4	-28.4	+0.0	27.6	46.0	-18.4	Vert Tx at 2445 MHz Z axis
36	646.747M	29.3	+0.0 +0.5	+0.5 +5.3	+20.4	-28.4	+0.0	27.6	46.0	-18.4	Horiz Tx at 2445MHz Y axis
37	646.528M	29.2	+0.0 +0.5	+0.5 +5.3	+20.4	-28.4	+0.0	27.5	46.0	-18.5	Horiz Tx at 2445MHz X axis
38	637.502M	29.4	+0.0 +0.4	+0.5 +5.2	+20.4	-28.4	+0.0	27.5	46.0	-18.5	Vert Tx at 2445 MHz Z axis
39	637.566M	29.4	+0.0 +0.4	+0.5 +5.2	+20.4	-28.4	+0.0	27.5	46.0	-18.5	Vert Tx at 2445MHz X axis
40	109.985M	38.9	+0.0 +0.2	+0.3 +2.0	+10.9	-27.9	+0.0	24.4	43.5	-19.1	Vert Tx at 2445 MHz Z axis
41	637.481M	28.7	+0.0 +0.4	+0.5 +5.2	+20.4	-28.4	+0.0	26.8	46.0	-19.2	Vert Tx at 2445MHz Y axis
42	720.828M	27.4	+0.0 +0.5	+0.6 +5.6	+21.0	-28.4	+0.0	26.7	46.0	-19.3	Vert Tx at 2445 MHz Z axis
43	300.020M	35.8	+0.0 +0.4	+0.4 +3.5	+13.6	-27.2	+0.0	26.5	46.0	-19.5	Vert Tx at 2445 MHz Z axis
44	525.675M	29.8	+0.0 +0.4	+0.5 +4.7	+18.6	-28.4	+0.0	25.6	46.0	-20.4	Vert Tx at 2445MHz Y axis
45	974.410M	28.7	+0.0 +0.6	+0.7 +6.7	+24.3	-27.8	+0.0	33.2	54.0	-20.8	Horiz Tx at 2445MHz X axis
46	974.444M	28.5	+0.0 +0.6	+0.7 +6.7	+24.3	-27.8	+0.0	33.0	54.0	-21.0	Vert Tx at 2445MHz Y axis

47	974.313M	28.5	+0.0 +0.6	+0.7 +6.7	+24.3	-27.8	+0.0	33.0	54.0	-21.0	Vert Tx at 2445MHz X axis
48	525.691M	29.1	+0.0 +0.4	+0.5 +4.7	+18.6	-28.4	+0.0	24.9	46.0	-21.1	Vert Tx at 2445MHz X axis
49	525.638M	29.0	+0.0 +0.4	+0.5 +4.7	+18.6	-28.4	+0.0	24.8	46.0	-21.2	Horiz Tx at 2445MHz X axis
50	525.766M	28.9	+0.0 +0.4	+0.5 +4.7	+18.6	-28.4	+0.0	24.7	46.0	-21.3	Horiz Tx at 2445MHz Y axis
51	525.821M	28.8	+0.0 +0.4	+0.5 +4.7	+18.6	-28.4	+0.0	24.6	46.0	-21.4	Horiz Tx at 2445 MHz Z axis
52	974.452M	28.0	+0.0 +0.6	+0.7 +6.7	+24.3	-27.8	+0.0	32.5	54.0	-21.5	Horiz Tx at 2445 MHz Z axis
53	974.452M	28.0	+0.0 +0.6	+0.7 +6.7	+24.3	-27.8	+0.0	32.5	54.0	-21.5	Horiz Tx at 2445MHz Y axis
54	974.450M	27.4	+0.0 +0.6	+0.7 +6.7	+24.3	-27.8	+0.0	31.9	54.0	-22.1	Vert Tx at 2445 MHz Z axis
55	440.457M	29.1	+0.0 +0.4	+0.5 +4.3	+17.0	-28.0	+0.0	23.3	46.0	-22.7	Vert Tx at 2445MHz Y axis
56	299.992M	32.7	+0.0 +0.4	+0.4 +3.4	+13.6	-27.2	+0.0	23.3	46.0	-22.7	Vert Tx at 2445MHz X axis
57	446.870M	29.0	+0.0 +0.4	+0.5 +4.3	+17.1	-28.1	+0.0	23.2	46.0	-22.8	Horiz Tx at 2445MHz Y axis
58	440.500M	29.0	+0.0 +0.4	+0.5 +4.3	+17.0	-28.0	+0.0	23.2	46.0	-22.8	Vert Tx at 2445 MHz Z axis
59	446.779M	28.9	+0.0 +0.4	+0.5 +4.3	+17.1	-28.1	+0.0	23.1	46.0	-22.9	Horiz Tx at 2445 MHz Z axis
60	525.818M	27.1	+0.0 +0.4	+0.5 +4.7	+18.6	-28.4	+0.0	22.9	46.0	-23.1	Vert Tx at 2445 MHz Z axisv
61	446.830M	28.7	+0.0 +0.4	+0.5 +4.3	+17.1	-28.1	+0.0	22.9	46.0	-23.1	Vert Tx at 2445MHz X axis
62	280.004M	32.9	+0.0 +0.3	+0.4 +3.3	+13.2	-27.2	+0.0	22.9	46.0	-23.1	Vert Tx at 2445MHz Y axis
63	440.617M	28.5	+0.0 +0.4	+0.5 +4.3	+17.0	-28.0	+0.0	22.7	46.0	-23.3	Vert Tx at 2445MHz X axis

64	440.633M	28.5	+0.0 +0.4	+0.5 +4.3	+17.0	-28.0	+0.0	22.7	46.0	-23.3	Horiz Tx at 2445MHz X axis
65	446.834M	28.5	+0.0 +0.4	+0.5 +4.3	+17.1	-28.1	+0.0	22.7	46.0	-23.3	Horiz Tx at 2445MHz X axis
66	440.556M	28.5	+0.0 +0.4	+0.5 +4.3	+17.0	-28.0	+0.0	22.7	46.0	-23.3	Horiz Tx at 2445 MHz Z axis
67	240.010M	34.3	+0.0 +0.3	+0.4 +3.1	+11.9	-27.3	+0.0	22.7	46.0	-23.3	Vert Tx at 2445 MHz Z axis
68	446.850M	28.4	+0.0 +0.4	+0.5 +4.3	+17.1	-28.1	+0.0	22.6	46.0	-23.4	Vert Tx at 2445MHz Y axis
69	240.006M	34.0	+0.0 +0.3	+0.4 +3.1	+11.9	-27.3	+0.0	22.4	46.0	-23.6	Vert Tx at 2445MHz Y axis
70	109.988M	34.4	+0.0 +0.2	+0.3 +2.0	+10.9	-27.9	+0.0	19.9	43.5	-23.6	Horiz Tx at 2445 MHz Z axis
71	239.985M	34.0	+0.0 +0.3	+0.4 +3.1	+11.9	-27.3	+0.0	22.4	46.0	-23.6	Horiz Tx at 2445MHz Y axis
72	440.472M	28.2	+0.0 +0.4	+0.5 +4.3	+17.0	-28.0	+0.0	22.4	46.0	-23.6	Horiz Tx at 2445MHz Y axis
73	279.973M	32.1	+0.0 +0.3	+0.4 +3.3	+13.2	-27.2	+0.0	22.1	46.0	-23.9	Horiz Tx at 2445MHz Y axis
74	446.700M	27.8	+0.0 +0.4	+0.5 +4.3	+17.1	-28.1	+0.0	22.0	46.0	-24.0	Vert Tx at 2445 MHz Z axis
75	240.005M	33.5	+0.0 +0.3	+0.4 +3.1	+11.9	-27.3	+0.0	21.9	46.0	-24.1	Horiz Tx at 2445MHz X axis
76	239.990M	33.4	+0.0 +0.3	+0.4 +3.1	+11.9	-27.3	+0.0	21.8	46.0	-24.2	Horiz Tx at 2445 MHz Z axis
77	239.995M	33.2	+0.0 +0.3	+0.4 +3.1	+11.9	-27.3	+0.0	21.6	46.0	-24.4	Vert Tx at 2445MHz X axis
78	280.027M	31.5	+0.0 +0.3	+0.4 +3.3	+13.2	-27.2	+0.0	21.5	46.0	-24.5	Vert Tx at 2445 MHz Z axis
79	279.990M	31.5	+0.0 +0.3	+0.4 +3.3	+13.2	-27.2	+0.0	21.5	46.0	-24.5	Horiz Tx at 2445MHz X axis
80	375.348M	28.7	+0.0 +0.4	+0.4 +3.9	+15.6	-27.7	+0.0	21.3	46.0	-24.7	Horiz Tx at 2445 MHz Z axis

81	351.042M	29.2	+0.0 +0.4	+0.4 +3.8	+15.0	-27.5	+0.0	21.3	46.0	-24.7	Vert Tx at 2445 MHz Z axis
82	351.055M	29.1	+0.0 +0.4	+0.4 +3.8	+15.0	-27.5	+0.0	21.2	46.0	-24.8	Horiz Tx at 2445 MHz Z axis
83	59.245M	35.3	+0.0 +0.1	+0.2 +1.5	+6.0	-28.0	+0.0	15.1	40.0	-24.9	Horiz Tx at 2445 MHz Z axis
84	375.193M	28.4	+0.0 +0.4	+0.4 +3.9	+15.6	-27.7	+0.0	21.0	46.0	-25.0	Vert Tx at 2445MHz X axis
85	375.169M	28.2	+0.0 +0.4	+0.4 +3.9	+15.6	-27.7	+0.0	20.8	46.0	-25.2	Vert Tx at 2445MHz Y axis
86	280.010M	30.8	+0.0 +0.3	+0.4 +3.3	+13.2	-27.2	+0.0	20.8	46.0	-25.2	Horiz Tx at 2445 MHz Z axis
87	375.262M	28.2	+0.0 +0.4	+0.4 +3.9	+15.6	-27.7	+0.0	20.8	46.0	-25.2	Horiz Tx at 2445MHz Y axis
88	350.981M	28.7	+0.0 +0.4	+0.4 +3.8	+15.0	-27.5	+0.0	20.8	46.0	-25.2	Horiz Tx at 2445MHz Y axis
89	350.956M	28.7	+0.0 +0.4	+0.4 +3.8	+15.0	-27.5	+0.0	20.8	46.0	-25.2	Vert Tx at 2445MHz X axis
90	351.003M	28.6	+0.0 +0.4	+0.4 +3.8	+15.0	-27.5	+0.0	20.7	46.0	-25.3	Vert Tx at 2445MHz Y axis
91	359.800M	28.4	+0.0 +0.4	+0.4 +3.8	+15.2	-27.6	+0.0	20.6	46.0	-25.4	Vert Tx at 2445 MHz Z axis
92	375.101M	28.0	+0.0 +0.4	+0.4 +3.9	+15.6	-27.7	+0.0	20.6	46.0	-25.4	Horiz Tx at 2445MHz X axis
93	351.006M	28.3	+0.0 +0.4	+0.4 +3.8	+15.0	-27.5	+0.0	20.4	46.0	-25.6	Horiz Tx at 2445MHz X axis
94	279.964M	30.4	+0.0 +0.3	+0.4 +3.3	+13.2	-27.2	+0.0	20.4	46.0	-25.6	Vert Tx at 2445MHz X axis
95	110.075M	32.2	+0.0 +0.2	+0.3 +2.0	+10.9	-27.9	+0.0	17.7	43.5	-25.8	Vert Tx at 2445MHz Y axis
96	111.318M	32.1	+0.0 +0.2	+0.3 +2.0	+11.0	-27.9	+0.0	17.7	43.5	-25.8	Vert Tx at 2445 MHz Z axis
97	267.873M	30.3	+0.0 +0.3	+0.4 +3.2	+13.0	-27.2	+0.0	20.0	46.0	-26.0	Horiz Tx at 2445MHz Y axis

98	267.815M	30.1	+0.0 +0.3	+0.4 +3.2	+13.0	-27.2	+0.0	19.8	46.0	-26.2	Horiz Tx at 2445MHz X axis
99	110.051M	31.7	+0.0 +0.2	+0.3 +2.0	+10.9	-27.9	+0.0	17.2	43.5	-26.3	Horiz Tx at 2445MHz X axis
100	271.974M	29.8	+0.0 +0.3	+0.4 +3.3	+13.1	-27.2	+0.0	19.7	46.0	-26.3	Vert Tx at 2445MHz X axis
101	111.196M	31.6	+0.0 +0.2	+0.3 +2.0	+11.0	-27.9	+0.0	17.2	43.5	-26.3	Vert Tx at 2445MHz X axis
102	110.075M	31.3	+0.0 +0.2	+0.3 +2.0	+10.9	-27.9	+0.0	16.8	43.5	-26.7	Horiz Tx at 2445MHz Y axis
103	375.400M	26.7	+0.0 +0.4	+0.4 +3.9	+15.6	-27.7	+0.0	19.3	46.0	-26.7	Vert Tx at 2445 MHz Z axis
104	111.223M	31.2	+0.0 +0.2	+0.3 +2.0	+11.0	-27.9	+0.0	16.8	43.5	-26.7	Horiz Tx at 2445MHz Y axis
105	250.764M	30.1	+0.0 +0.3	+0.4 +3.1	+12.6	-27.3	+0.0	19.2	46.0	-26.8	Horiz Tx at 2445 MHz Z axis
106	267.793M	29.5	+0.0 +0.3	+0.4 +3.2	+13.0	-27.2	+0.0	19.2	46.0	-26.8	Vert Tx at 2445MHz Y axis
107	267.969M	29.3	+0.0 +0.3	+0.4 +3.2	+13.0	-27.2	+0.0	19.0	46.0	-27.0	Horiz Tx at 2445 MHz Z axis
108	267.835M	29.1	+0.0 +0.3	+0.4 +3.2	+13.0	-27.2	+0.0	18.8	46.0	-27.2	Vert Tx at 2445MHz X axis
109	110.125M	30.8	+0.0 +0.2	+0.3 +2.0	+10.9	-27.9	+0.0	16.3	43.5	-27.2	Vert Tx at 2445MHz X axis
110	111.194M	30.5	+0.0 +0.2	+0.3 +2.0	+11.0	-27.9	+0.0	16.1	43.5	-27.4	Vert Tx at 2445MHz Y axis
111	250.762M	29.4	+0.0 +0.3	+0.4 +3.1	+12.6	-27.3	+0.0	18.5	46.0	-27.5	Vert Tx at 2445 MHz Z axis
112	271.872M	28.2	+0.0 +0.3	+0.4 +3.3	+13.1	-27.2	+0.0	18.1	46.0	-27.9	Horiz Tx at 2445 MHz Z axis
113	272.003M	28.1	+0.0 +0.3	+0.4 +3.3	+13.1	-27.2	+0.0	18.0	46.0	-28.0	Horiz Tx at 2445MHz X axis
114	250.769M	28.8	+0.0 +0.3	+0.4 +3.1	+12.6	-27.3	+0.0	17.9	46.0	-28.1	Vert Tx at 2445MHz X axis

115	271.950M	28.0	+0.0 +0.3	+0.4 +3.3	+13.1	-27.2	+0.0	17.9	46.0	-28.1	Horiz Tx at 2445MHz Y axis
116	111.136M	29.8	+0.0 +0.2	+0.3 +2.0	+11.0	-27.9	+0.0	15.4	43.5	-28.1	Horiz Tx at 2445MHz X axis
117	250.773M	28.7	+0.0 +0.3	+0.4 +3.1	+12.6	-27.3	+0.0	17.8	46.0	-28.2	Horiz Tx at 2445MHz Y axis
118	111.318M	29.6	+0.0 +0.2	+0.3 +2.0	+11.0	-27.9	+0.0	15.2	43.5	-28.3	Horiz Tx at 2445 MHz Z axis
119	272.020M	27.8	+0.0 +0.3	+0.4 +3.3	+13.1	-27.2	+0.0	17.7	46.0	-28.3	Vert Tx at 2445MHz Y axis
120	250.669M	28.5	+0.0 +0.3	+0.4 +3.1	+12.6	-27.3	+0.0	17.6	46.0	-28.4	Horiz Tx at 2445MHz X axis
121	271.862M	27.4	+0.0 +0.3	+0.4 +3.3	+13.1	-27.2	+0.0	17.3	46.0	-28.7	Vert Tx at 2445 MHz Z axis
122	250.784M	28.2	+0.0 +0.3	+0.4 +3.1	+12.6	-27.3	+0.0	17.3	46.0	-28.7	Vert Tx at 2445MHz Y axis
123	267.962M	27.0	+0.0 +0.3	+0.4 +3.2	+13.0	-27.2	+0.0	16.7	46.0	-29.3	Vert Tx at 2445 MHz Z axis

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**Lat-Lon, LLC**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**98017**	Date:	3/17/2016
Test Type:	**Maximized Emissions**	Time:	13:23:49
Tested By:	Chuck Kendall	Sequence#:	1
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

ANSI C63.10 2013

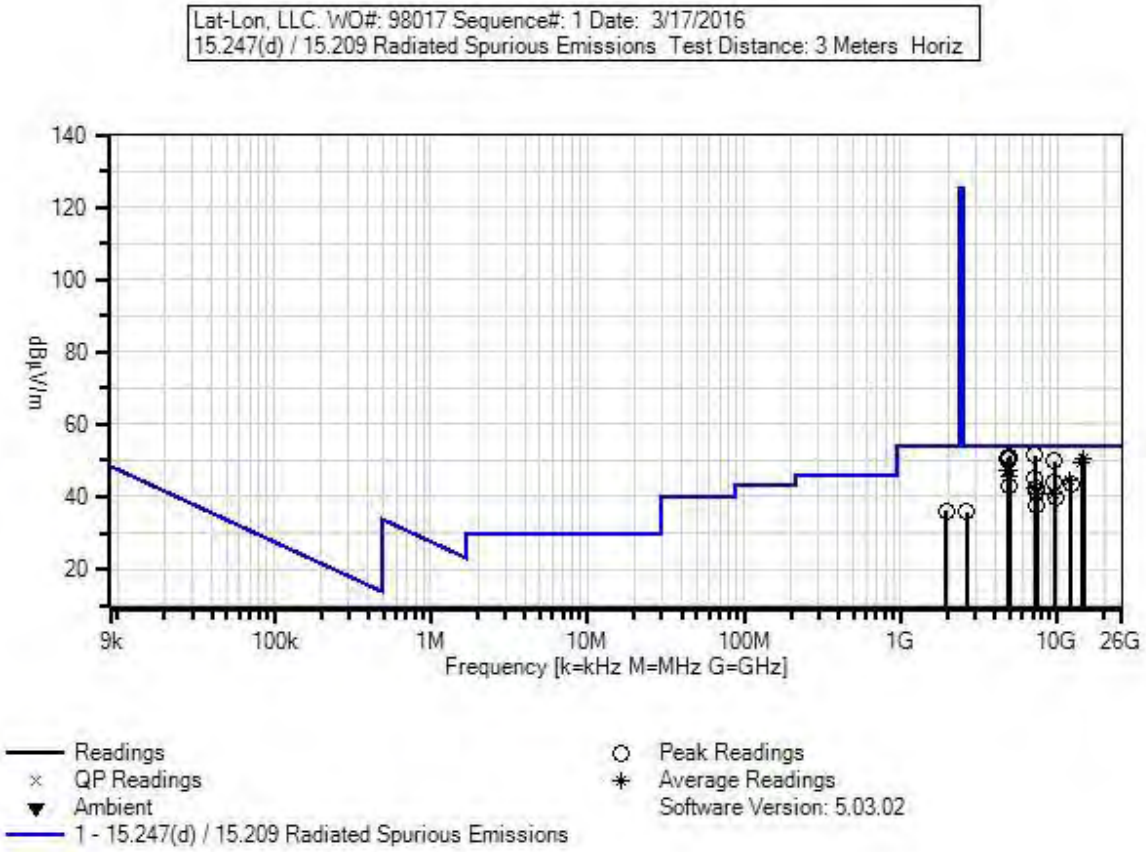
The EUT is set up on Styrofoam insulation 1.5 m above the ground plane. The EUT is set to either 2405, 2445, or 2475MHz. Three orthogonal axes were investigated and the Z Axis was found to be the worst case.

Frequencies of Interest: 1GHz to 25 GHz

RBW = 1 MHz; VBW = 3 MHz

Environmental Conditions:
Temperature = 20°C
Relative Humidity = 40%
Atmospheric Pressure = 97.4 kPa

Highest Clock =20 MHz
Highest frequency generated = 2475 MHz


Lat-Lon, LLC. WO#: 98017 Sequence#: 1 Date: 3/17/2016
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz
140
120
100
80
60
40
20
dBµV/m
9k
100k
1M
10M
100M
1G
10G
26G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02668	Spectrum Analyzer	E4446A	8/14/2015	8/14/2016
T2	AN03155	Preamp	83017A	6/30/2015	6/30/2017
T3	ANP01403	Cable	58758-23	12/8/2014	12/8/2016
T4	AN03355	Cable	32026-2-29094K-48TC	12/8/2014	12/8/2016
T5	ANP05904	Cable	32022-2-29094K-144TC	12/8/2014	12/8/2016
T6	AN01273	Horn Antenna	3115	2/3/2015	2/3/2017
T7	AN03362	Cable	32022-2-29094-48TC	12/8/2014	12/8/2016

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	7214.120M	40.5	+0.0 +4.2	-33.3 +32.9	+4.3 +1.3	+1.5	+0.0	51.4	54.0 Set to 2405 MHz Z Axis	-2.6	Horiz
2	4959.100M	43.9	+0.0 +3.4	-32.7 +30.8	+3.4 +1.1	+1.2	+0.0	51.1	54.0 Set to 2480 MHz Z Axis	-2.9	Horiz
3	4811.120M	43.9	+0.0 +3.4	-32.8 +30.5	+3.4 +1.1	+1.2	+0.0	50.7	54.0 Set at 2405 MHz Z Axis	-3.3	Horiz
4	14669.520 M Ave	28.3	+0.0 +6.3	-33.4 +38.4	+6.8 +1.9	+2.2	+0.0	50.5	54.0 Set to 2445 MHz Z Axis	-3.5	Horiz
5	4889.100M	43.2	+0.0 +3.4	-32.7 +30.7	+3.4 +1.1	+1.2	+0.0	50.3	54.0 Set to 2445 MHz Z Axis	-3.7	Horiz
6	14670.000 M Ave	28.1	+0.0 +6.3	-33.4 +38.4	+6.8 +1.9	+2.2	+0.0	50.3	54.0 Set to 2445 MHz Z Axis	-3.7	Horiz
^	14670.000 M	30.3	+0.0 +6.3	-33.4 +38.4	+6.8 +1.9	+2.2	+0.0	52.5	54.0 Set to 2445 MHz Z Axis	-1.5	Horiz
8	9619.120M	34.9	+0.0 +4.9	-33.0 +34.8	+5.1 +1.5	+1.7	+0.0	49.9	54.0 Set to 2405 MHz Z Axis	-4.1	Horiz
9	14432.025 M Ave	27.2	+0.0 +6.3	-33.4 +38.8	+6.6 +1.9	+2.2	+0.0	49.6	54.0 Set at 2405 MHz Z Axis	-4.4	Horiz

^	14431.985 M	30.7	+0.0 +6.3	-33.4 +38.8	+6.6 +1.9	+2.2	+0.0	53.1	54.0	-0.9	Set at 2405 MHz Z Axis	Horiz
11	4809.210M Ave	40.6	+0.0 +3.4	-32.8 +30.5	+3.4 +1.1	+1.2	+0.0	47.4	54.0	-6.6	Set to 2405 MHz Z Axis	Horiz
^	4809.120M	49.4	+0.0 +3.4	-32.8 +30.5	+3.4 +1.1	+1.2	+0.0	56.2	54.0	+2.2	Set to 2405 MHz Z Axis	Horiz
^	4809.175M	43.3	+0.0 +3.4	-32.8 +30.5	+3.4 +1.1	+1.2	+0.0	50.1	54.0	-3.9	Set at 2405 MHz Z Axis	Horiz
14	4959.202M Ave	40.0	+0.0 +3.4	-32.7 +30.8	+3.4 +1.1	+1.2	+0.0	47.2	54.0	-6.8	Set to 2475 MHz Z Axis	Horiz
15	4889.500M Ave	38.3	+0.0 +3.4	-32.7 +30.7	+3.4 +1.1	+1.2	+0.0	45.4	54.0	-8.6	Set to 2445 MHz Z Axis	Horiz
16	7216.535M	34.4	+0.0 +4.2	-33.4 +32.9	+4.3 +1.3	+1.5	+0.0	45.2	54.0	-8.8	Set at 2405 MHz Z Axis	Horiz
17	12024.431 M Ave	27.2	+0.0 +5.6	-33.7 +35.7	+6.0 +1.7	+2.0	+0.0	44.5	54.0	-9.5	Set to 2405 MHz Z Axis	Horiz
^	12024.430 M	30.0	+0.0 +5.6	-33.7 +35.7	+6.0 +1.7	+2.0	+0.0	47.3	54.0	-6.7	Set at 2405 MHz Z Axis	Horiz
19	9620.580M	28.9	+0.0 +4.9	-33.0 +34.8	+5.1 +1.5	+1.7	+0.0	43.9	54.0	-10.1	Set at 2405 MHz Z Axis	Horiz
20	12225.000 M	26.1	+0.0 +5.6	-33.6 +35.7	+6.1 +1.7	+2.0	+0.0	43.6	54.0	-10.4	Set to 2445 MHz Z Axis	Horiz
21	4890.000M	36.0	+0.0 +3.4	-32.7 +30.7	+3.4 +1.1	+1.2	+0.0	43.1	54.0	-10.9	Set to 2445 MHz Z Axis	Horiz
22	7438.600M	31.8	+0.0 +4.2	-33.5 +33.0	+4.3 +1.3	+1.5	+0.0	42.6	54.0	-11.4	Set to 2480 MHz Z Axis	Horiz
23	7213.812M Ave	31.4	+0.0 +4.2	-33.3 +32.9	+4.3 +1.3	+1.5	+0.0	42.3	54.0	-11.7	Set to 2405 MHz Z Axis	Horiz
24	7334.100M	30.2	+0.0 +4.2	-33.4 +33.0	+4.3 +1.3	+1.5	+0.0	41.1	54.0	-12.9	Set to 2445 MHz Z Axis	Horiz
25	9618.627M Ave	25.8	+0.0 +4.9	-33.0 +34.8	+5.1 +1.5	+1.7	+0.0	40.8	54.0	-13.2	Set to 2405 MHz Z Axis	Horiz

26	7439.034M Ave	29.8	+0.0 +4.2	-33.5 +33.0	+4.3 +1.3	+1.5	+0.0	40.6	54.0 Set tp 2475 MHz Z Axis	-13.4	Horiz
^	7439.000M	42.7	+0.0 +4.2	-33.5 +33.0	+4.3 +1.3	+1.5	+0.0	53.5	54.0 Set to 2475 MHz Z Axis	-0.5	Horiz
28	9780.000M	24.7	+0.0 +5.0	-33.1 +34.9	+5.1 +1.5	+1.8	+0.0	39.9	54.0 Set to 2445 MHz Z Axis	-14.1	Horiz
29	7335.000M	26.8	+0.0 +4.2	-33.4 +33.0	+4.3 +1.3	+1.5	+0.0	37.7	54.0 Set to 2445 MHz Z Axis	-16.3	Horiz
30	1967.150M	38.7	+0.0 +2.2	-33.5 +25.2	+2.1 +0.7	+0.7	+0.0	36.1	54.0 Set to 2405 MHz Z Axis	-17.9	Horiz
31	2655.000M	35.4	+0.0 +2.5	-33.3 +26.9	+2.5 +0.8	+0.9	+0.0	35.7	54.0 Set to 2405 MHz Z Axis	-18.3	Horiz

Band Edge

Band Edge Summary					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
2390.0	OQPSK	PCB trace	47.61 peak/30.23 avg	<54	Pass
2400.0	OQPSK	PCB trace	63.15 peak/45.8 avg	<54	Pass
2483.5	OQPSK	PCB trace	49.12 peak/38.42 avg	<54	Pass

Lower Band Edge readings were obtained using the "Marker Delta" method: Using CISPR bandwidth a peak reading of the fundamental was made (103.698 dBuV/m) and an average reading of the fundamental was also made (86.3107dBuV/m). Next a reduced bandwidth of 30kHz was taken showing both the fundamental and the reading at the band edge together. The relative difference in amplitude between the fundamental and the band edge reading at 2400 MHz was then obtained. This relative difference of 39.55dB was then subtracted from both initials readings of peak and average resulting in a peak reading of 64.15dBuV/m and an average reading of 46.76dBuV/m. A similar method was used for the band edge at 2390 MHz; the marker delta now being 55.08dB between the fundamental and the band edge. Subtracting this from the originally obtained peak and average readings provided us with a band edge peak reading of 48.61dBuV/m and an average reading of 31.23dBuV/m.
Upper band edge readings were obtained using CISPR bandwidths.

Band Edge Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**Lat-Lon, LLC**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**98017**	Date:	4/1/2016
Test Type:	**Maximized Emissions**	Time:	09:11:51
Tested By:	Chuck Kendall	Sequence#:	1
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

ANSI C63.10 2013

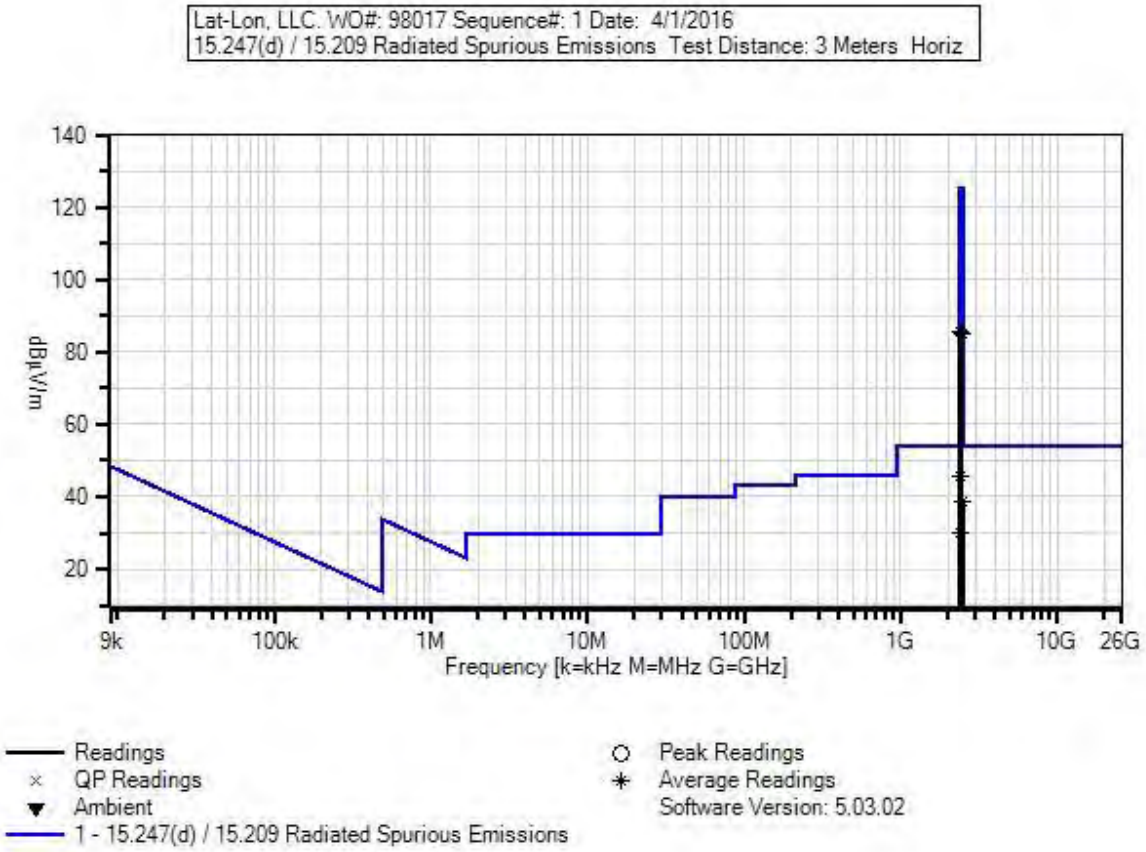
The EUT is set up on Styrofoam insulation 1.5 m above the ground plane.
The EUT is set to either 2405 or 2475 MHz.
Three axes were investigated which determined the worst case that was presented here.
Peak readings did not exceed 20 dB over the average limit.

The EUT is fully modulated at 100% and at its full output.
The EUT has a built-in PCB trace antenna with a 5 dBi gain.

Frequencies of Interest: 2.390 GHz to 2.4835 GHz
RBW = 1 MHz; VBW = 3 MHz

Environmental Conditions:
Temperature = 21.2°C
Relative Humidity = 43%
Atmospheric Pressure = 97.5 kPa

Highest clock: 20 MHz
Highest frequency: 2475 MHz


Lat-Lon, LLC. WO#: 98017 Sequence#: 1 Date: 4/1/2016
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz
140
120
100
80
60
40
20
dBµV/m
9k
100k
1M
10M
100M
1G
10G
26G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.02

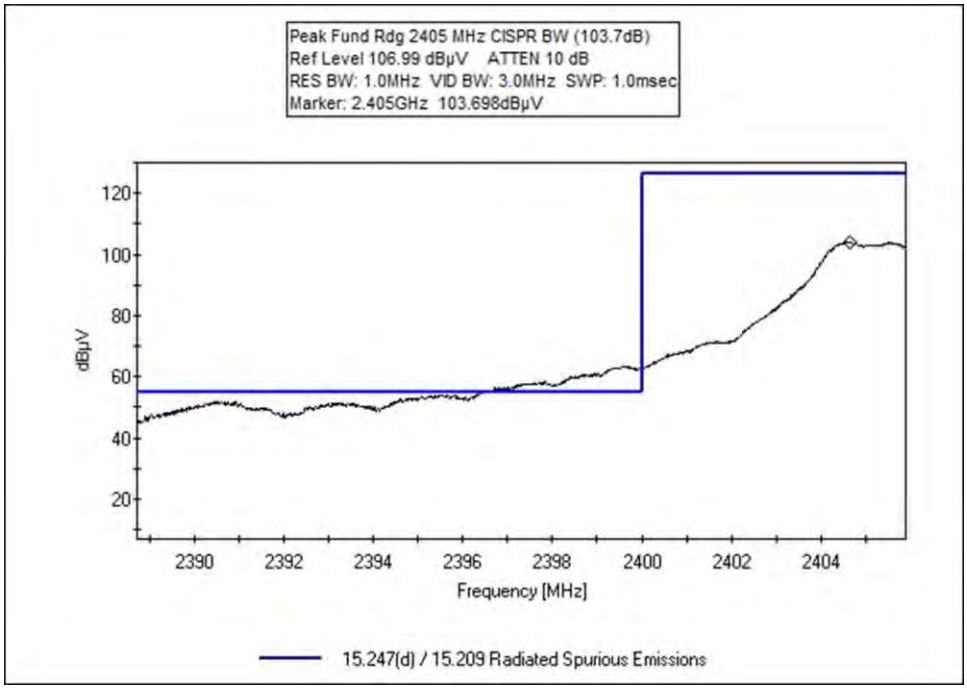
Test Equipment:

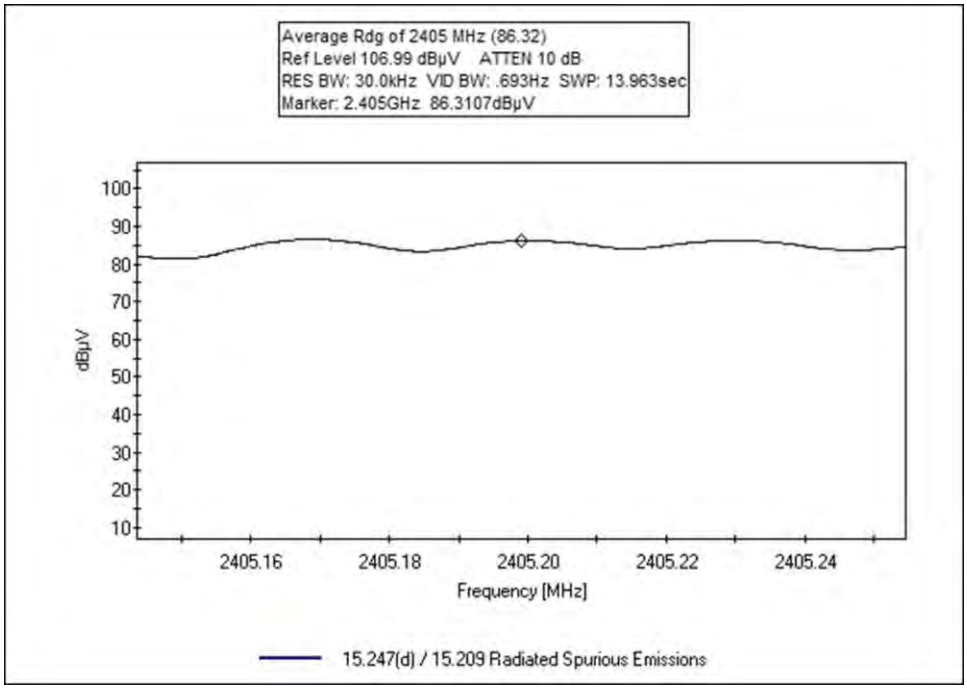
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02668	Spectrum Analyzer	E4446A	8/14/2015	8/14/2016
T2	AN03155	Preamp	83017A	6/30/2015	6/30/2017
T3	ANP01403	Cable	58758-23	12/8/2014	12/8/2016
T4	AN03355	Cable	32026-2-29094K-48TC	12/8/2014	12/8/2016
T5	ANP05904	Cable	32022-2-29094K-144TC	12/8/2014	12/8/2016
T6	AN01273	Horn Antenna	3115	2/3/2015	2/3/2017
T7	AN03362	Cable	32022-2-29094-48TC	12/8/2014	12/8/2016

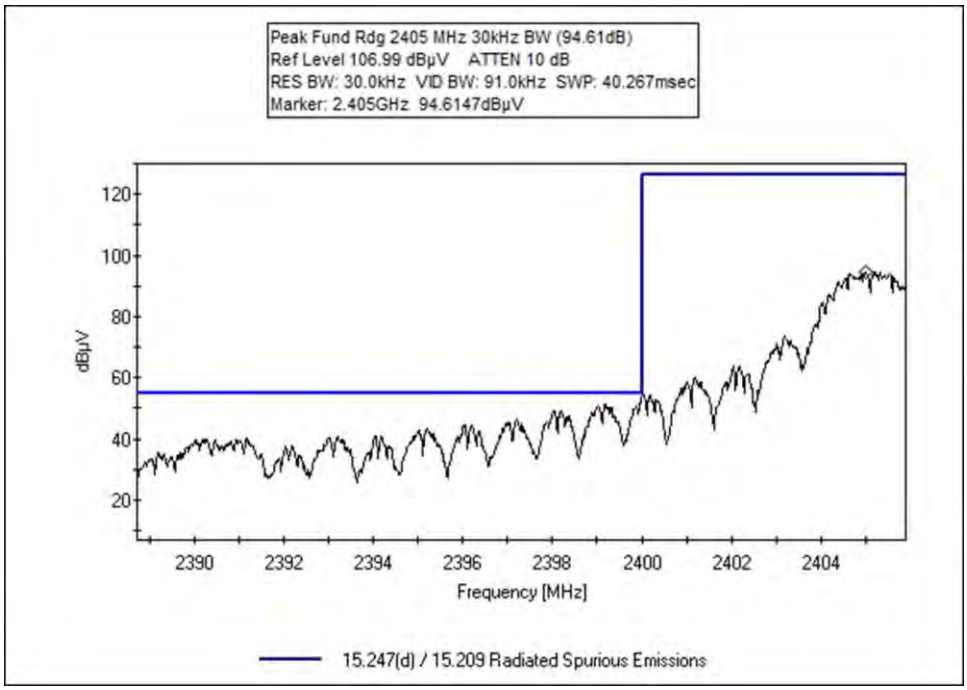
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

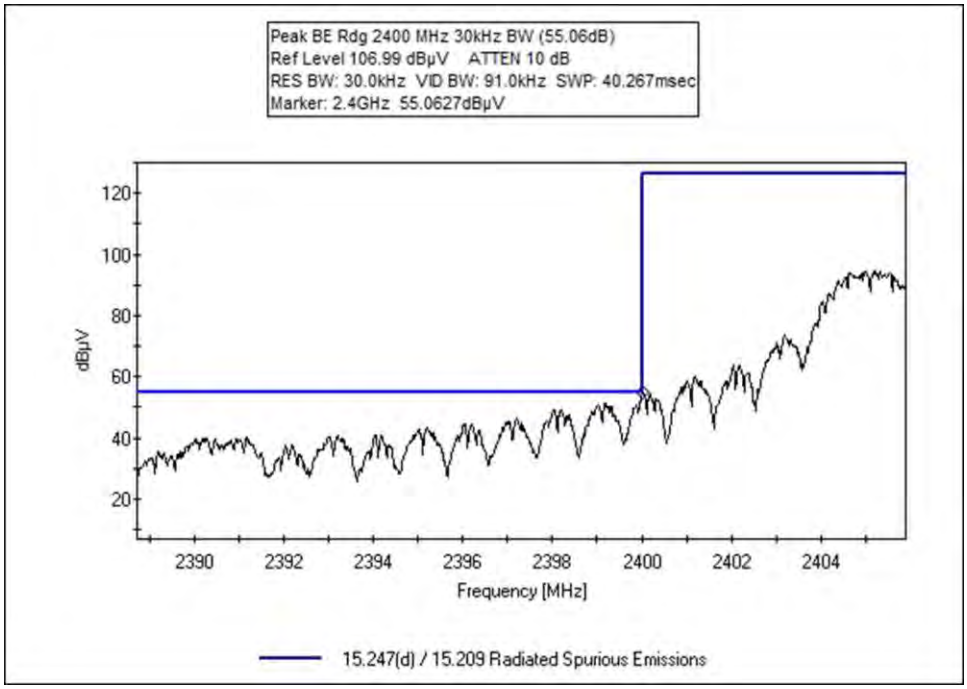
#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2400.000M	46.8	+0.0	-33.3	+2.3	+0.8	+0.0	45.8	54.0	-8.2	Horiz
	Ave		+2.4	+26.1	+0.7				Using Marker Delta of 39.552 dB		
^	2400.000M	64.1	+0.0	-33.3	+2.3	+0.8	+0.0	63.1	54.0	+9.1	Horiz
			+2.4	+26.1	+0.7				Using Marker Delta of 39.552 dB		
3	2483.500M	39.1	+0.0	-33.3	+2.4	+0.8	+0.0	38.4	54.0	-15.6	Horiz
	Ave		+2.4	+26.3	+0.7						
^	2483.500M	49.8	+0.0	-33.3	+2.4	+0.8	+0.0	49.1	54.0	-4.9	Horiz
			+2.4	+26.3	+0.7						
5	2390.000M	31.2	+0.0	-33.3	+2.3	+0.8	+0.0	30.2	54.0	-23.8	Horiz
	Ave		+2.4	+26.1	+0.7				Using Marker Delta of 55.082 dB		
^	2390.000M	48.6	+0.0	-33.3	+2.3	+0.8	+0.0	47.6	54.0	-6.4	Horiz
			+2.4	+26.1	+0.7				Using Marker Delta of 55.082 dB		
7	2405.000M	86.3	+0.0	-33.3	+2.3	+0.8	+0.0	85.3	125.2	-39.9	Horiz
	Ave		+2.4	+26.1	+0.7						
^	2405.000M	103.7	+0.0	-33.3	+2.3	+0.8	+0.0	102.7	125.2	-22.5	Horiz
			+2.4	+26.1	+0.7						
9	2475.000M	85.6	+0.0	-33.3	+2.4	+0.8	+0.0	84.9	125.2	-40.3	Horiz
	Ave		+2.4	+26.3	+0.7						
^	2475.000M	102.8	+0.0	-33.3	+2.4	+0.8	+0.0	102.1	125.2	-23.1	Horiz
			+2.4	+26.3	+0.7						

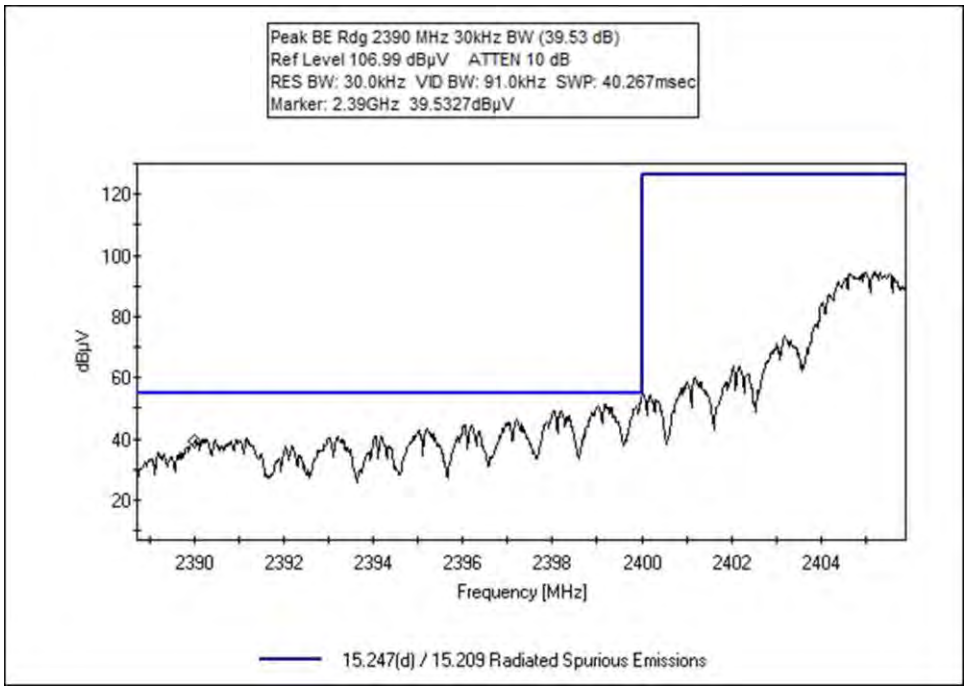
Band Edge Plots

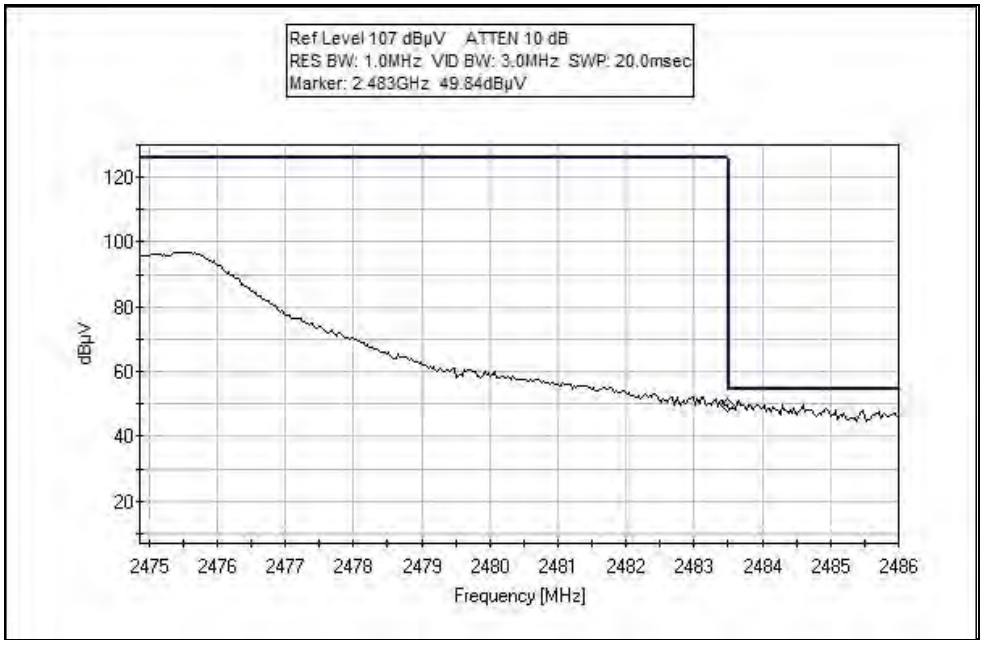





Peak Fund Rdg 2405 MHz 30kHz BW (94.61dB)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 40.267msec
Marker: 2.405GHz 94.6147dBµV
dBµV
120
100
80
60
40
20
2390
2392
2394
2396
2398
2400
2402
2404
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


Peak BE Rdg 2400 MHz 30kHz BW (55.06dB)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 40.267msec
Marker: 2.4GHz 55.0627dBµV
dBµV
120
100
80
60
40
20
2390
2392
2394
2396
2398
2400
2402
2404
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

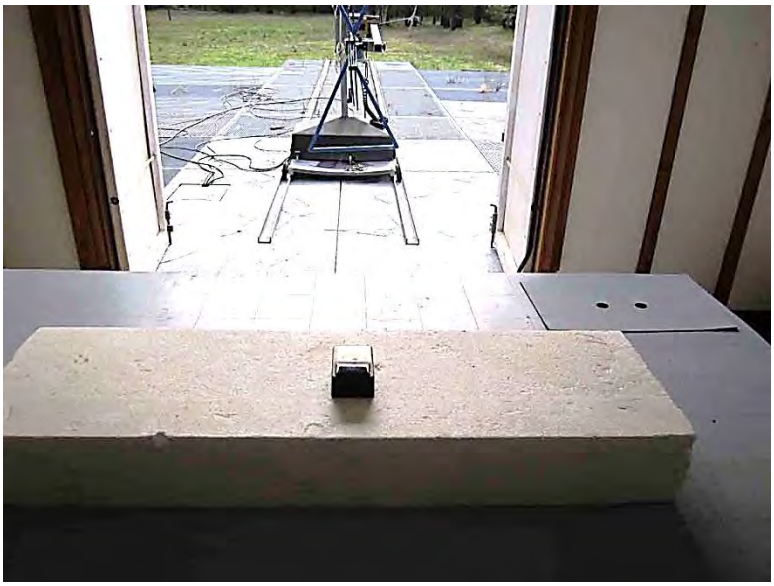

Peak BE Rdg 2390 MHz 30kHz BW (39.53 dB)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 40.267msec
Marker: 2.39GHz 39.5327dBµV
dBµV
120
100
80
60
40
20
2390
2392
2394
2396
2398
2400
2402
2404
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


Ref Level 107 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 2.483GHz 49.84dBµV
dBµV
120
100
80
60
40
20
2475
2476
2477
2478
2479
2480
2481
2482
2483
2484
2485
2486
Frequency [MHz]

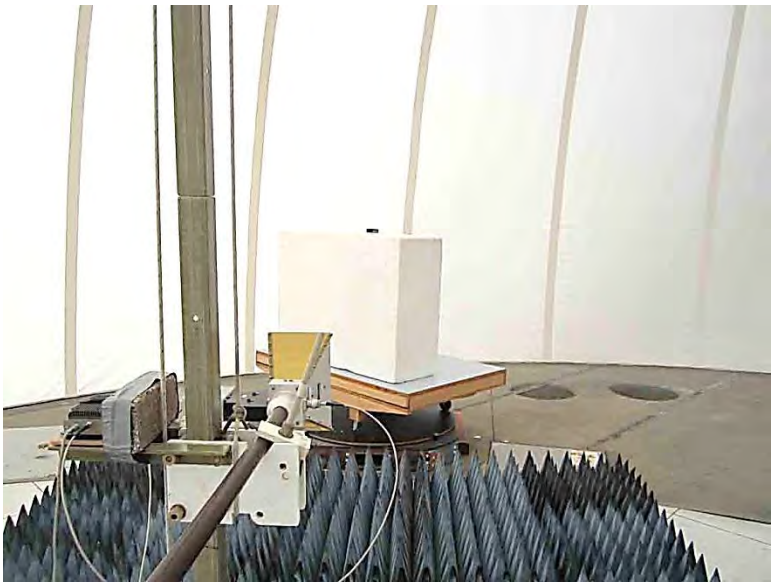
Test Setup Photos

Low Frequency

Low Frequency



Middle Frequency



High Frequency

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 dBµV/m, the spectrum analyzer reading in dBµV 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 the limit value subtracting the corrected measured value; a negative margin represents a measurement less than the limit while a positive margin represents a measurement exceeding the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/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.