Lat-Lon, LLC

TEST REPORT FOR

Small Wireless Sensor Model: X200

Tested To The Following Standards:

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FCC Part 15 Subpart C Section(s)

15.247 (DTS 2400-2483.5 MHz)

Report No.: 98017-7

Date of issue: April 8, 2016



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

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

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Lat-Lon, LLC 2300 S Jason St. Denver, CO 80223 **REPORT PREPARED BY:**

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

Representative: Jonathan Bean Customer Reference Number: 2834

DATE OF EQUIPMENT RECEIPT: DATE(S) OF TESTING: Project Number: 98017

February 16, 2016 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 -7 Be

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	Test Date(s):	3/3/2016				
	v03r04						
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	32022-2-29094К- 144TС	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		













Test Setup Photo





15.247(b)(3) Output Power

Test Setup / Conditions / Data

		Manufa	cturer Mod	al #	S/N	
1:	nt Tested	ment Tested:				
EMITest		re: EMITest 5.03.02				
Chuck K	:	By: Chuck Kendall		Sequence#:	1	
Maximiz	:	pe: Maximized Emissi	ons	Time:	16:19:02	
98017	er #:	Order #: 98017		Date:	3/3/2016	
15.247(1	ion:	cation: 15.247(b) Power (Output (2400-2483.5 MHz	DTS)		
Lat-Lon,	:	ner: Lat-Lon, LLC				
CKC Lab	tion:	cation: CKC Laboratories,	Inc. • 5046 Sierra Pines Driv	ve • Mariposa,	CA 95338 • (209) 96	6-5240
CKC Lab	tion:	cation: CKC Laboratories,	Inc. • 5046 Sierra Pines Driv	ve • Maripos	sa,	sa, CA 95338 • (209) 96

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 $\hat{A} \pm 15\%$ 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



1 - 15.247(b) Power Output (2400-2483.5 MHz DTS)

Lat-Lon, LLC. WO#: 98017 Sequence#: 1 Date: 3/3/2016 15.247(b) Power Output (2400-2483.5 MHz DTS) Test Distance: 3 Meters Horiz



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
Т3	ANP01403	Cable	58758-23	12/8/2014	12/8/2016
T4	AN03355	Cable	32026-2-	12/8/2014	12/8/2016
			29094K-48TC		
T5	ANP05904	Cable	32022-2-	12/8/2014	12/8/2016
			29094K-144TC		
Т6	AN01273	Horn Antenna	3115	2/3/2015	2/3/2017
T7	AN03362	Cable	32022-2-29094-	12/8/2014	12/8/2016
			48TC		

Measu	urement Data:	Re	eading lis	ted by ma	argin.	Test Distance: 3 Meters					
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7						
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	2405.050M	103.6	+0.0	-33.3	+2.3	+0.8	+0.0	102.6	131.2	-28.6	Horiz
			+2.4	+26.1	+0.7				cw Z Axis		
2	2475.720M	102.4	+0.0	-33.3	+2.4	+0.8	+0.0	101.7	131.2	-29.5	Horiz
			+2.4	+26.3	+0.7				cm Z Axis		
3	2445.550M	101.7	+0.0	-33.3	+2.3	+0.8	+0.0	100.8	131.2	-30.4	Horiz
			+2.4	+26.2	+0.7				cm Z Axis		



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 \pm 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)											
2405	OQPSK	PCB/5	102.6	2.37	≤30	Pass					
2445 OQPSK PCB/5 100.8 0.57 ≤30											
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







2445MHz





2475MHz



Test Setup Photo





15.247(e) Power Spectral Density

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 5046 Si	erra Pines Drive • Maripo	sa, CA 95338 • (209) 966-5240	
Customer:	Lat-Lon, LLC			
Specification:	15.247(e) Peak Power Spectral	Density (2400-2483.5 N	IHz DTS)	
Work Order #:	98017	Dat	te: 3/3/2016	
Test Type:	Maximized Emissions	Tim	ie: 16:31:54	
Tested By:	Chuck Kendall	Sequence	e#: 1	
Software:	EMITest 5.03.02			
Equipment Test	ed:			
Device	Manufacturer	Model #	S/N	
Configuration 1				
Support Equipn	nent:			
Device	Manufacturer	Model #	S/N	
Configuration 1				
Test Conditions	/ Notes:			
ANSI C63.10 20	13			
The EUT is set u	p on Styrofoam insulation 1.5 m a	bove the ground plane.		
The EUT is set to	o 2405/2445/2475 MHz respective	ly.		
Three orthogona	l axis were investigated but the Z a	axis was found to be wor	st case (flat on the foam).	
Since there is a s	solar charger connected and it can	operate while charging;	the leads were removed and th	e nominal
$3.4 \text{ VDC} \pm 15\%$	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 v	ariation of input power.		
Frequencies of I	nterest: 2405 MHz to 2475 MHz			
RBW = 3 kHz: V	/BW = 9.1 kHz			
Environmental C	Conditions:			
Temperature =	20°C			
Relative Humidi	ty = 40%			
Atmospheric Pre	essure = 97.4 kPa			
Uli altrat Charler				
Highest Clock =	20 MHz			
righest frequence	y generated – 24/5 MHZ			



Lat-Lon, LLC. WO#: 98017 Sequence#: 1 Date: 3/3/2016 15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS) Test Distance: 3 Meters Horiz



Readings
Peak Readings
× QP Readings
★ Average Readings
▼ Ambient

- Software Version: 5.03.02
- 1 15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)

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
Т3	ANP01403	Cable	58758-23	12/8/2014	12/8/2016
T4	AN03355	Cable	32026-2-	12/8/2014	12/8/2016
			29094K-48TC		
T5	ANP05904	Cable	32022-2-	12/8/2014	12/8/2016
			29094K-144TC		
Т6	AN01273	Horn Antenna	3115	2/3/2015	2/3/2017
T7	AN03362	Cable	32022-2-29094-	12/8/2014	12/8/2016
			48TC		

Measu	rement Data:	Re	ading list	ted by ma	argin.	Test Distance: 3 Meters					
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7						
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	2405.166M	90.7	+0.0	-33.3	+2.3	+0.8	+0.0	89.7	115.0	-25.3	Horiz
			+2.4	+26.1	+0.7				Z Axis 240)5 MHz	
2	2475.517M	89.9	+0.0	-33.3	+2.4	+0.8	+0.0	89.2	115.0	-25.8	Horiz
			+2.4	+26.3	+0.7				Z Axis 240)5 MHz	
3	2445.172M	89.4	+0.0	-33.3	+2.3	+0.8	+0.0	88.5	115.0	-26.5	Horiz
			+2.4	+26.2	+0.7				Z Axis 240)5 MHz	



	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











Test Setup Photo





15.247(d) Radiated Emissions & Band Edge

Test Data

Test Location:	CKC Laboratories, Inc. • 5046 Si	ierra Pines Drive • Mariposa, (CA 95338 • (209) 966-5240
Customer:	Lat-Lon, LLC		
Specification:	15.247(d) / 15.209 Radiated Sp	ourious Emissions	2/45/2045
Work Order #:	98017	Date:	2/16/2016
Test Type:		lime:	16:11:37
Tested By:		Sequence#:	2
Software:	EMITEST 5.03.02		
Equipment Test	ed:		
Device	Manufacturer	Model #	S/N
Configuration 1			
Support Equipm	ent:		
Device	Manufacturer	Model #	S/N
Configuration 1			
Test Conditions	/Notes:		
ANSI C63.10 20	013		
The EUT is setting	ng atop a piece of Styrofoam insu	lation on a wooden test bei	nch 80 cm atop a 3m diameter flush-
mounted turntable	е.		
The EUT is batter	ry operated and will be investigated	ed in three different axes; X	, Y, & Z.
The EUT is tran	smitting on 2445MHz Prelimina	ry investigation proved this	s to be the worst case frequency for
these spurs.			
Frequencies inves	stigated are: 9 kHz to 30 MHz		
From 9kHz to 15	0kHz		
RBW= 200Hz; V	BW = 600 kHz		
From 150kHz to 2	30MHz		
RBW=9kHz; VB	W = 27 kHz		
Environmental C	onditions		
Temperature = 1°) 5°C		
Relative Humidit	v = 40%		
Atmospheric Pres	ssure = 97.7 kPa		
÷			
Highest $Clock = 2$	20 MHz		
Highest Frequence	cy = 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





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
Т3	ANSITED 3M	Cable		11/15/2014	11/15/2016
T4	AN00226	Loop Antenna	6502	3/28/2014	3/28/2016

Measur	rement Data:	Re	eading lis	ted by ma	argin.		Te	est Distanc	e: 3 Meters	: 3 Meters			
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar		
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	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			
	20.00414	16.0	.0.0	.0.1	.1.0	0	10.0	15.0	axis	11.0	X 7		
9	28.904M	16.8	+0.0	+0.1	+1.0	+6.8	-40.0	-15.3	29.5 T	-44.8	Vert		
									1 x at 2445	MHZ Y			
10	222 5001	40.1	.0.0	.0.0	.0.1	10.0	00.0	27.6	axis	45.0	X 7 (
10	323.500k	42.1	+0.0	+0.0	+0.1	+10.2	-80.0	-27.6	1/.4 T + 2445	-45.0	Vert		
									1 x at 2445	MHZ Y			
11	174 ((0)	47.0	.0.0	.0.0	.0.1	. 10.2	00.0	22.4	axis	15.0	X 7 /		
11	1/4.660k	47.2	+0.0	+0.0	+0.1	+10.3	-80.0	-22.4	22.8 Tri at 2445	-45.2	Vert		
									1 x at 2445	MHZ A			
10	210 4901	42.0	+0.0	+0.0	+0.1	+ 10.2	00.0	27.7	17.5	45.0	N. C. and		
12	319.480K	42.0	+0.0	+0.0	+0.1	+10.2	-80.0	-21.1	1/.5 Tru at 2445	-45.2 MU-7	vert		
									1 x at 2443	MITZZ			
12	494 6201-	20.5	10.0	10.0	+0.1	+ 10, 1	80.0	21.2	12.0	45.0	Mant		
15	484.020K	38.3	+0.0	+0.0	+0.1	+10.1	-80.0	-31.3	13.9 Tri at 2445	-45.2 MU-7	vert		
									1 X at 2443	MILL T			
1.4	20 26514	14.0		+0.1	10.0	100	40.0	16.0	20.5	15 5	Vont		
14	20.203M	14.9	+0.0	± 0.1	+0.8	±0.2	-40.0	-10.0	29.3 Ty at 2445	-43.3 MH7 V	ven		
									1 A at 2443	IVIIIZ I			
1									aa15				



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



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



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 D	rive • Mariposa, G	CA 95338 • (209) 966-5240
Customer:	Lat-Lon, LLC		
Specification:	15.247(d) / 15.209 Radiated Spurious Emi	issions	
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 flushmounted 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





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
Т3	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

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



13	898.315M	28.5	+0.0	+0.6	+23.4	-28.0	+0.0	31.5	46.0 -14.5	Horiz
			+0.5	+6.5					Tx at 2445MHz Y axis	
14	898.201M	28.5	+0.0	+0.6	+23.4	-28.0	+0.0	31.5	46.0 -14.5	Horiz
			+0.5	+6.5					Tx at 2445MHz X axis	
15	898.125M	28.5	+0.0	+0.6	+23.4	-28.0	+0.0	31.5	46.0 -14.5	Vert
			+0.5	+6.5					Tx at 2445MHz X axis	
16	913.554M	28.2	+0.0	+0.6	+23.6	-28.0	+0.0	31.5	46.0 -14.5	Horiz
			+0.6	+6.5					Tx at 2445 MHz Z	
17	200 250M	28.2	+0.0	10.6	122.4	28.0	+0.0	21.2	axis 46.0 14.7	Uoriz
17	898.339M	28.5	+0.0	+0.0	+23.4	-28.0	+0.0	51.5	40.0 -14.7 Tx at 2445 MHz Z	HOLIZ
			10.5	10.5					axis	
18	300.002M	40.6	+0.0	+0.4	+13.6	-27.2	+0.0	31.3	46.0 -14.7	Horiz
			+0.4	+3.5					Tx at 2445MHz X axis	
19	898.420M	27.6	+0.0	+0.6	+23.4	-28.0	+0.0	30.6	46.0 -15.4	Vert
			+0.5	+6.5					Tx at 2445 MHz Z	
20	300.004M	39.1	+0.0	+0.4	+13.6	-27.2	+0.0	29.8	46.0 -16.2	Vert
-			+0.4	+3.5					Tx at 2445MHz Y	
									axis	
21	300.014M	38.9	+0.0	+0.4	+13.6	-27.2	+0.0	29.6	46.0 -16.4	Horiz
			+0.4	+3.5					Tx at 2445MHz Y	
22	50 250M	42.0	10.0	10.2	16.0	28.0	10.0	22.8	ax1s	Vort
22	59.250M	43.0	+0.0	+0.2	+0.0	-28.0	+0.0	22.8	40.0 -17.2 Tx at 2445 MHz 7	vert
			10.1	1.5					axis	
23	720.871M	29.3	+0.0	+0.6	+21.0	-28.4	+0.0	28.6	46.0 -17.4	Horiz
			+0.5	+5.6					Tx at 2445MHz Y	
24	300.020M	37.8	+0.0	+0.4	+13.6	-27.2	+0.0	28.5	46.0 -17.5	Horiz
	200102011	0,10	+0.4	+3.5	1010			2010	Tx at 2445 MHz Z	110112
									axis	
25	720.616M	29.1	+0.0	+0.6	+21.0	-28.4	+0.0	28.4	46.0 -17.6	Horiz
			+0.5	+5.6					Tx at 2445MHz X	
26	720 788M	28.8	+0.0	+0.6	+21.0	-28.4	+0.0	28.1	46.0 -17.9	Horiz
20	720.7000	20.0	+0.0	+5.6	121.0	20.4	10.0	20.1	Tx at 2445 MHz Z	HOHZ
									axis	
27	637.489M	29.9	+0.0	+0.5	+20.4	-28.4	+0.0	28.0	46.0 -18.0	Horiz
			+0.4	+5.2					Tx at 2445 MHz Z	
20	(27 522) 4	20.0		105	100.4	20.4		20.0	axis	II.
28	037.323M	29.9	+0.0 +0.4	+0.5	+20.4	-28.4	+0.0	28.0	40.0 -18.0 Tx at 2445MHz V	HOriz
			· 0. -	10.2					axis	
29	646.588M	29.6	+0.0	+0.5	+20.4	-28.4	+0.0	27.9	46.0 -18.1	Vert
			+0.5	+5.3					Tx at 2445MHz X	
									axis	



30	720.800M	28.5	+0.0	+0.6	+21.0	-28.4	+0.0	27.8	46.0 -18.2	Vert
			+0.5	+5.6					Tx at 2445MHz Y	
		• • • •							axis	
31	720.707M	28.4	+0.0	+0.6	+21.0	-28.4	+0.0	27.7	46.0 -18.3	Vert
			+0.5	+5.6					Tx at 2445MHz X	
				~ ~	• • • •	· ·			axis	
32	637.528M	29.6	+0.0	+0.5	+20.4	-28.4	+0.0	27.7	46.0 -18.3	Horiz
			+0.4	+5.2					Tx at 2445MHz X	
		.				· ·			axis	
33	646.704M	29.4	+0.0	+0.5	+20.4	-28.4	+0.0	27.7	46.0 -18.3	Horiz
			+0.5	+5.3					Tx at 2445 MHz Z	
		• • •		~ ~	• • • •				axis	
34	646.685M	29.3	+0.0	+0.5	+20.4	-28.4	+0.0	27.6	46.0 -18.4	Vert
			+0.5	+5.3					Tx at 2445MHz Y	
									axis	
35	646.734M	29.3	+0.0	+0.5	+20.4	-28.4	+0.0	27.6	46.0 -18.4	Vert
			+0.5	+5.3					Tx at 2445 MHz Z	
									axis	
36	646.747M	29.3	+0.0	+0.5	+20.4	-28.4	+0.0	27.6	46.0 -18.4	Horiz
			+0.5	+5.3					Tx at 2445MHz Y	
									axis	
37	646.528M	29.2	+0.0	+0.5	+20.4	-28.4	+0.0	27.5	46.0 -18.5	Horiz
			+0.5	+5.3					Tx at 2445MHz X	
									axis	
38	637.502M	29.4	+0.0	+0.5	+20.4	-28.4	+0.0	27.5	46.0 -18.5	Vert
			+0.4	+5.2					Tx at 2445 MHz Z	
									axis	
39	637.566M	29.4	+0.0	+0.5	+20.4	-28.4	+0.0	27.5	46.0 -18.5	Vert
			+0.4	+5.2					Tx at 2445MHz X	
									axis	
40	109.985M	38.9	+0.0	+0.3	+10.9	-27.9	+0.0	24.4	43.5 -19.1	Vert
			+0.2	+2.0					Tx at 2445 MHz Z	
	(25 101) (20.5	0.0	0.7	20.4	2 0 4	0.0		axis	* *
41	637.481M	28.7	+0.0	+0.5	+20.4	-28.4	+0.0	26.8	46.0 -19.2	Vert
			+0.4	+5.2					Tx at 2445MHz Y	
									axis	
42	720.828M	27.4	+0.0	+0.6	+21.0	-28.4	+0.0	26.7	46.0 -19.3	Vert
			+0.5	+5.6					Tx at 2445 MHz Z	
									axis	
43	300.020M	35.8	+0.0	+0.4	+13.6	-27.2	+0.0	26.5	46.0 -19.5	Vert
			+0.4	+3.5					Tx at 2445 MHz Z	
		20.0	0.0	0.7	10.6	2 0 4	0.0		axis	* *
44	525.675M	29.8	+0.0	+0.5	+18.6	-28.4	+0.0	25.6	46.0 -20.4	Vert
			+0.4	+4.7					Tx at 2445MHz Y	
	0.7.4.44.63.5	<u> </u>							axis	
45	974.410M	28.7	+0.0	+0.7	+24.3	-27.8	+0.0	33.2	54.0 -20.8	Horiz
			+0.6	+6.7					Tx at 2445MHz X	
							0.5	a	axis	
46	974.444M	28.5	+0.0	+0.7	+24.3	-27.8	+0.0	33.0	54.0 -21.0	Vert
			+0.6	+6.7					Tx at 2445MHz Y	
									axis	



4	7 974.313N	1 28.5	+0.0	+0.7	+24.3	-27.8	+0.0	33.0	54.0 -21.0	Vert
			+0.6	+6.7					Tx at 2445MHz X	
									axis	
4	8 525.691N	1 29.1	+0.0	+0.5	+18.6	-28.4	+0.0	24.9	46.0 -21.1	Vert
			+0.4	+4.7					Tx at 2445MHz X	
									axis	
4	9 525.638N	1 29.0	+0.0	+0.5	+18.6	-28.4	+0.0	24.8	46.0 -21.2	Horiz
			+0.4	+4.7					Tx at 2445MHz X	
									axis	
5	0 525.766N	1 28.9	+0.0	+0.5	+18.6	-28.4	+0.0	24.7	46.0 -21.3	Horiz
c	0 0 2017 0 011		+0.4	+4 7	1010	2011			Tx at 2445MHz Y	TIOTIL
									axis	
5	1 525 821N	1 28.8	+0.0	+0.5	+18.6	-28.4	+0.0	24.6	46.0 -21.4	Horiz
5	1 525.6211	20.0	+0.0	+4.7	10.0	20.1	.0.0	21.0	Tx at 2445 MHz Z	HOHZ
			. 0. 1	• 1.7					avis	
5	2 974 4521	1 28.0	+0.0	+0.7	+24.3	-27.8	+0.0	32.5	54.0 -21.5	Horiz
5	2 774.4321	1 20.0	+0.0	+6.7	127.5	-27.0	10.0	52.5	Tx at 2445 MHz 7	TIOTIZ
			10.0	10.7					avis	
5	3 074 4521	1 280	+0.0	+0.7	±24.3	27.8	+0.0	32.5	54.0 21.5	Horiz
5	5 974.452IV	1 20.0	+0.0	+0.7	724.3	-27.0	+0.0	52.5	34.0 -21.3 Ty of $2445MH_2 V$	HOUL
			+0.0	+0.7					1 X at 244 JWIIIZ 1	
5	4 074 450)	1 27.4	10.0	107	124.2	27.0	10.0	21.0	54.0 22.1	Mart
5	4 974.450M	1 27.4	+0.0	+0.7	+24.3	-27.8	+0.0	31.9	54.0 -22.1 Tra at 2445 MILE 7	vert
			+0.6	+0./					TX at 2445 MHZ Z	
	- 440 457		. 0. 0	.0.5	. 17.0	20.0	.0.0		axis	X 7 .
5	5 440.457N	1 29.1	+0.0	+0.5	+17.0	-28.0	+0.0	23.3	46.0 -22.7	Vert
			+0.4	+4.3					Tx at 2445MHz Y	
									axis	
5	6 299.992N	1 32.7	+0.0	+0.4	+13.6	-27.2	+0.0	23.3	46.0 -22.7	Vert
			+0.4	+3.4					Tx at 2445MHz X	
									axis	
5	7 446.870N	1 29.0	+0.0	+0.5	+17.1	-28.1	+0.0	23.2	46.0 -22.8	Horiz
			+0.4	+4.3					Tx at 2445MHz Y	
									axis	
5	8 440.500N	1 29.0	+0.0	+0.5	+17.0	-28.0	+0.0	23.2	46.0 -22.8	Vert
			+0.4	+4.3					Tx at 2445 MHz Z	
									axis	
5	9 446.779N	1 28.9	+0.0	+0.5	+17.1	-28.1	+0.0	23.1	46.0 -22.9	Horiz
			+0.4	+4.3					Tx at 2445 MHz Z	
									axis	
6	0 525.818N	1 27.1	+0.0	+0.5	+18.6	-28.4	+0.0	22.9	46.0 -23.1	Vert
			+0.4	+4.7					Tx at 2445 MHz Z	
									axisv	
6	1 446.830N	1 28.7	+0.0	+0.5	+17.1	-28.1	+0.0	22.9	46.0 -23.1	Vert
			+0.4	+4.3					Tx at 2445MHz X	
									axis	
6	2 280.004N	1 32.9	+0.0	+0.4	+13.2	-27.2	+0.0	22.9	46.0 -23.1	Vert
			+0.3	+3.3					Tx at 2445MHz Y	
									axis	
6	3 440.617N	1 28.5	+0.0	+0.5	+17.0	-28.0	+0.0	22.7	46.0 -23.3	Vert
			+0.4	+4.3					Tx at 2445MHz X	
									axis	
L										



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 Tx at 2445MHz X axis	Horiz
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 Tx at 2445MHz X axis	Horiz
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 Tx at 2445 MHz Z axis	Horiz
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 Tx at 2445 MHz Z axis	Vert
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 Tx at 2445MHz Y axis	Vert
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 Tx at 2445MHz Y axis	Vert
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 Tx at 2445 MHz Z axis	Horiz
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 Tx at 2445MHz Y axis	Horiz
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 Tx at 2445MHz Y axis	Horiz
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 Tx at 2445MHz Y axis	Horiz
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 Tx at 2445 MHz Z axis	Vert
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 Tx at 2445MHz X axis	Horiz
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 Tx at 2445 MHz Z axis	Horiz
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 Tx at 2445MHz X axis	Vert
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 Tx at 2445 MHz Z axis	Vert
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 Tx at 2445MHz X axis	Horiz
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 Tx at 2445 MHz Z axis	Horiz



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



98	267.815M	30.1	+0.0	+0.4	+13.0	-27.2	+0.0	19.8	46.0 -26.2	Horiz
			+0.3	+3.2					Tx at 2445MHz X	
									axis	
99	110.051M	31.7	+0.0	+0.3	+10.9	-27.9	+0.0	17.2	43.5 -26.3	Horiz
			+0.2	+2.0					Tx at 2445MHz X	
									axis	
100	271.974M	29.8	+0.0	+0.4	+13.1	-27.2	+0.0	19.7	46.0 -26.3	Vert
			+0.3	+3.3					Tx at 2445MHz X	
									axis	
101	111.196M	31.6	+0.0	+0.3	+11.0	-27.9	+0.0	17.2	43.5 -26.3	Vert
			+0.2	+2.0					Tx at 2445MHz X	
									axis	
102	110.075M	31.3	+0.0	+0.3	+10.9	-27.9	+0.0	16.8	43.5 -26.7	Horiz
			+0.2	+2.0					Tx at 2445MHz Y	
100									axis	
103	375.400M	26.7	+0.0	+0.4	+15.6	-27.7	+0.0	19.3	46.0 -26.7	Vert
			+0.4	+3.9					Tx at 2445 MHz Z	
104	111 2223 4	21.2	.0.0	.0.0	. 11.0	27.0	.0.0	16.0	ax1s	
104	111.223M	31.2	+0.0	+0.3	+11.0	-27.9	+0.0	16.8	43.5 -26.7	Horiz
			+0.2	+2.0					I X at 2445MHZ Y	
105	250 76414	20.1	10.0	+0.4	+12.6	27.2	10.0	10.0		II!
105	250.764M	30.1	+0.0	+0.4	+12.0	-21.3	+0.0	19.2	40.0 - 20.8	Horiz
			+0.5	+3.1					1 X at 2445 MITZ Z	
106	267 702M	20.5	10.0	+0.4	+12.0	27.2	10.0	10.2	46.0 26.9	Vort
100	207.795IM	29.3	+0.0	+0.4	+15.0	-21.2	+0.0	19.2	40.0 -20.0 Ty at 2445MHz V	ven
			10.5	13.2					avis	
107	267 969M	20.3	+0.0	+0.4	+13.0	_27.2	+0.0	19.0	46.0 -27.0	Horiz
107	207.909101	29.5	+0.0	+3.2	15.0	-27.2	10.0	19.0	Tx at 2445 MHz Z	TIOTIZ
			10.5	10.2					axis	
108	267 835M	29.1	+0.0	+0.4	+13.0	-27.2	+0.0	18.8	46.0 -27.2	Vert
100	2071000011	_,	+0.3	+3.2	1010			1010	Tx at 2445MHz X	
									axis	
109	110.125M	30.8	+0.0	+0.3	+10.9	-27.9	+0.0	16.3	43.5 -27.2	Vert
			+0.2	+2.0					Tx at 2445MHz X	
									axis	
110	111.194M	30.5	+0.0	+0.3	+11.0	-27.9	+0.0	16.1	43.5 -27.4	Vert
			+0.2	+2.0					Tx at 2445MHz Y	
									axis	
111	250.762M	29.4	+0.0	+0.4	+12.6	-27.3	+0.0	18.5	46.0 -27.5	Vert
			+0.3	+3.1					Tx at 2445 MHz Z	
									axis	
112	271.872M	28.2	+0.0	+0.4	+13.1	-27.2	+0.0	18.1	46.0 -27.9	Horiz
			+0.3	+3.3					Tx at 2445 MHz Z	
									axis	
113	272.003M	28.1	+0.0	+0.4	+13.1	-27.2	+0.0	18.0	46.0 -28.0	Horiz
			+0.3	+3.3					Tx at 2445MHz X	
									axis	
114	250.769M	28.8	+0.0	+0.4	+12.6	-27.3	+0.0	17.9	46.0 -28.1	Vert
			+0.3	+3.1					Tx at 2445MHz X	
									axis	



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



Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines D	rive • Mariposa, 0	CA 95338 • (209) 966-5240
Customer:	Lat-Lon, LLC		
Specification:	15.247(d) / 15.209 Radiated Spurious Emi	ssions	
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





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-	12/8/2014	12/8/2016
			29094K-48TC		
T5	ANP05904	Cable	32022-2-	12/8/2014	12/8/2016
			29094K-144TC		
T6	AN01273	Horn Antenna	3115	2/3/2015	2/3/2017
T7	AN03362	Cable	32022-2-29094-	12/8/2014	12/8/2016
			48TC		

# Freq Rdng T1 T2 T3 T4 Dist Corr Spec Ma	gin Polar
T5 T6 T7	
MHz $dB\mu V$ dB dB dB dB Table $dB\mu V/m$ $dB\mu V/m$ $dB\mu V/m$	B Ant
1 7214.120M 40.5 +0.0 -33.3 +4.3 +1.5 +0.0 51.4 54.0 -	2.6 Horiz
+4.2 +32.9 +1.3 Set to 2405 MH	zΖ
Axis	
2 4959.100M 43.9 +0.0 -32.7 +3.4 +1.2 +0.0 51.1 54.0 -	2.9 Horiz
+3.4 +30.8 +1.1 Set to 2480 MH	zΖ
Axis	
3 4811.120M 43.9 +0.0 -32.8 +3.4 +1.2 +0.0 50.7 54.0 -	3.3 Horiz
+3.4 +30.5 +1.1 Set at 2405 MH	zΖ
Axis	
4 14669.520 28.3 +0.0 -33.4 +6.8 +2.2 +0.0 50.5 54.0 -	3.5 Horiz
M +6.3 +38.4 +1.9	
Ave Set to 2445 MH	zΖ
Axis	
5 4889.100M 43.2 +0.0 -32.7 +3.4 +1.2 +0.0 50.3 54.0 -	3.7 Horiz
+3.4 +30.7 +1.1 Set to 2445 MF	zZ
Axis	
6 14670.000 28.1 +0.0 -33.4 +6.8 +2.2 +0.0 50.3 54.0 -	3.7 Horiz
M +6.3 +38.4 +1.9	
Ave Set to 2445 MH	zΖ
Axis	
^ 14670.000 30.3 +0.0 -33.4 +6.8 +2.2 +0.0 52.5 54.0 -	.5 Horiz
M +6.3 +38.4 +1.9	
Set to 2445 MH	zΖ
Axis	
8 9619.120M 34.9 +0.0 -33.0 +5.1 +1.7 +0.0 49.9 54.0 -	4.1 Horiz
+4.9 +34.8 +1.5 Set to 2405 MH	zΖ
Axis	
9 14432.025 27.2 +0.0 -33.4 +6.6 +2.2 +0.0 49.6 54.0 -	4.4 Horiz
M +6.3 +38.8 +1.9	
Ave Set at 2405 MH	zΖ
Axis	



^ 14431.985	30.7	+0.0	-33.4	+6.6	+2.2	+0.0	53.1	54.0 -0.9	Horiz
М		+6.3	+38.8	+1.9					
								Set at 2405 MHz Z	
11 4900 210M	40.6	10.0	22.0	12.4	+1.0	10.0	17 1	AX18	II.a.r.i
11 4809.210M	40.6	+0.0	-32.8	+5.4	+1.2	+0.0	47.4	54.0 -0.0 Set to 2405 MHz 7	HOLIZ
Ave		+3.4	+30.5	±1.1				A vis	
^ 4809 120M	<u> 19 1</u>	+0.0	_32.8	+3.4	+1.2	+0.0	56.2	54.0 +2.2	Horiz
4007.120101	77.7	+3.4	+30.5	+1.1	1.2	10.0	50.2	Set to 2405 MHz Z	HOLL
			. 50.5					Axis	
^ 4809.175M	43.3	+0.0	-32.8	+3.4	+1.2	+0.0	50.1	54.0 -3.9	Horiz
		+3.4	+30.5	+1.1				Set at 2405 MHz Z	
								Axis	
14 4959.202M	40.0	+0.0	-32.7	+3.4	+1.2	+0.0	47.2	54.0 -6.8	Horiz
Ave		+3.4	+30.8	+1.1				Set to 2475 MHz Z	
								Axis	
15 4889.500M	38.3	+0.0	-32.7	+3.4	+1.2	+0.0	45.4	54.0 -8.6	Horiz
Ave		+3.4	+30.7	+1.1				Set to 2445 MHz Z	
								Axis	
16 7216.535M	34.4	+0.0	-33.4	+4.3	+1.5	+0.0	45.2	54.0 -8.8	Horiz
		+4.2	+32.9	+1.3				Set at 2405 MHz Z	
17 10004 421	27.2	10.0	22.7		12.0	10.0	445	AX18	II!
1/ 12024.431 M	21.2	+0.0	-33.1	+6.0	+2.0	+0.0	44.5	54.0 -9.5	Horiz
		+3.0	+33.7	+1.7				Set to 2405 MHz 7	
Ave								Axis	
^ 12024.430	30.0	+0.0	-33.7	+6.0	+2.0	+0.0	47.3	54.0 -6.7	Horiz
М		+5.6	+35.7	+1.7					
								Set at 2405 MHz Z	
								Axis	
19 9620.580M	28.9	+0.0	-33.0	+5.1	+1.7	+0.0	43.9	54.0 -10.1	Horiz
		+4.9	+34.8	+1.5				Set at 2405 MHz Z	
20 12225 000	26.1		22.6	16.1	12.0		12.0	AX15	II?
20 12225.000 M	26.1	+0.0	-33.0	+0.1	+2.0	+0.0	43.6	54.0 -10.4	Horiz
IVI		+3.0	+33.7	+1.7				Set to 2115 MHz 7	
								Axis	
21_4890.000M	36.0	+0.0	-32.7	+3.4	+1 2	+0.0	43.1	54.0 -10.9	Horiz
21 1090.00011	50.0	+3.4	+30.7	+1.1	• 1.2	.0.0	10.1	Set to 2445 MHz Z	HOHZ
								Axis	
22 7438.600M	31.8	+0.0	-33.5	+4.3	+1.5	+0.0	42.6	54.0 -11.4	Horiz
		+4.2	+33.0	+1.3				Set to 2480 MHz Z	
								Axis	
23 7213.812M	31.4	+0.0	-33.3	+4.3	+1.5	+0.0	42.3	54.0 -11.7	Horiz
Ave		+4.2	+32.9	+1.3				Set to 2405 MHz Z	
								Axis	
24 7334.100M	30.2	+0.0	-33.4	+4.3	+1.5	+0.0	41.1	54.0 -12.9	Horiz
		+4.2	+33.0	+1.3				Set to 2445 MHz Z	
			<u> </u>				10.0	Axis	
25 9618.627M	25.8	+0.0	-33.0	+5.1	+1.7	+0.0	40.8	54.0 -13.2	Horiz
Ave		+4.9	+34.8	+1.5				Set to 2405 MHz Z	
								AX1S	



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



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 Si	ierra 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





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-	12/8/2014	12/8/2016
			29094K-48TC		
T5	ANP05904	Cable	32022-2-	12/8/2014	12/8/2016
			29094K-144TC		
T6	AN01273	Horn Antenna	3115	2/3/2015	2/3/2017
T7	AN03362	Cable	32022-2-29094-	12/8/2014	12/8/2016
			48TC		

Measi	urement Data:	Re	eading lis	ted by ma	argin.		Te	est Distanc	e: 3 Meters		
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7						
	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 Mar	ker Delta	
									of 39.552 of	dΒ	
^	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 Mar	ker Delta	
									of 39.552 of	dΒ	
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 Mar	ker Delta	
									of 55.082 of	dΒ	
^	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 Mar	ker Delta	
									of 55.082 d	dΒ	
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





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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 dB μ V/m, the spectrum analyzer reading in dB μ 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 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.