

# SmartLabs, Inc.

## TEST REPORT FOR

**INSTEON Energy Display, 2448A2  
SMART Energy Display, 4734A1**

**Tested To The Following Standards:**

**FCC Part 15 Subpart C Sections 15.249 and RSS 210 Issue 8**

**Report No.: 91262-4**

**Date of issue: January 12, 2011**



**TESTING  
CERT #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.

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## ADMINISTRATIVE INFORMATION

### Test Report Information

**REPORT PREPARED FOR:**

SmartLabs, Inc.  
16542 Millikan Ave.  
Irvine, CA 92606

Representative: John Lockyer  
Customer Reference Number: 10-3J1222-01

**DATE OF EQUIPMENT RECEIPT:**

**DATE(S) OF TESTING:**

**REPORT PREPARED BY:**

Dianne Dudley  
CKC Laboratories, Inc.  
5046 Sierra Pines Drive  
Mariposa, CA 95338

Project Number: 91262

January 5, 2011

January 5-6, 2011

### 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.  
110 Olinda Place  
Brea, CA 92823

## Site Registration & Accreditation Information

Location	CB #	Japan	Canada	FCC
Brea D	US0060	R-1256, C-1319, T-1660 & G-255	3082D-2	100638

## SUMMARY OF RESULTS

**Standard / Specification: FCC Part 15 Subpart C 15.249 and RSS-210 Issue 8**

Description	Test Procedure/Method	Results
RF Power Output Field Strength of Harmonics	FCC Part 15 Subpart C Section 15.249(a) / ANSI C63.4 (2003)	Pass
Occupied Bandwidth	-20dBc Occupied Bandwidth	Pass
Bandedge Compliance	Bandedge Compliance	Pass
Field Strength of Spurious Emissions	FCC Part 15 Subpart C Section 15.249(d)	Pass
99% Bandwidth	RSS-210 Issue 8	Pass

## Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
None

## EQUIPMENT UNDER TEST (EUT)

### Equipment Under Test Description

The EUT is a Battery-operated table-top device that interacts with INSTEON-compatible products to display data for readout on a LCD display.

The following model has been tested by CKC Laboratories: **INSTEON Energy Display, 2448A2**

The manufacturer states that the following additional models are identical electrically to the one which was tested, or any differences between them do not affect their EMC characteristics, and therefore they meet the level of testing equivalent to the tested models. **SMART Energy Display, 4734A1**

### EQUIPMENT UNDER TEST

#### **INSTEON Energy Display**

Manuf: SmartLabs, Inc.

Model: 2448A2

Serial: 51

### PERIPHERAL DEVICES

The EUT was not tested with peripheral devices.

## FCC PART 15 SUBPART C

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) 47 CFR 15C requirements for Unlicensed Radio Frequency Devices, Subpart C - Intentional Radiators.

### 15.249(a) RF Power Output - Field Strength of Harmonics

#### Test Data Sheets

Test Location: CKC Laboratories • 110 Olinda Place • Brea, CA 92823 • 714-993-6112

Customer: **SmartLabs, Inc.**

Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**

Work Order #: **91262** Date: 1/5/2011

Test Type: **Maximized Emissions** Time: 13:57:36

Equipment: **INSTEON Energy Display** Sequence#: 2

Manufacturer: SmartLabs, Inc. Tested By: S. Yamamoto

Model: 2448A2

S/N: 51

***Test Equipment:***

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00851	Biconilog Antenna	CBL6111C	3/8/2010	3/8/2012
T2	ANP05569	Cable	RG-214/U	8/18/2010	8/18/2012
T3	ANP04382	Cable	LDF-50	9/3/2010	9/3/2012
T4	AN00010	Preamp	8447D	3/19/2010	3/19/2012
T5	ANP05555	Cable	RG223/U	8/18/2010	8/18/2012
T6	AN01437	Quasi Peak Adapter	85650A	3/17/2010	3/17/2012
T7	AN02462	Spectrum Analyzer	8568B	3/17/2010	3/17/2012
T8	AN02472	Spectrum Analyzer Display	84662A	3/17/2010	3/17/2012
	AN02672	Spectrum Analyzer	E4446A	8/9/2010	8/9/2012
T9	AN01646	Horn Antenna	3115	8/18/2010	8/18/2012
T10	AN02946	Cable	32022-2-2909K-36TC	9/14/2009	9/14/2011
T11	AN00787	Preamp	83017A	6/4/2009	6/4/2011
T12	ANP05988	Cable	LDF1-50	3/12/2010	3/12/2012

***Equipment Under Test (\* = EUT):***

Function	Manufacturer	Model #	S/N
INSTEON Energy Display*	SmartLabs, Inc.	2448A2	51

**Support Devices:**

Function	Manufacturer	Model #	S/N
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**Test Conditions / Notes:**

The equipment under test is an energy display. The EUT is stand alone on the table top. The EUT is powered from two new AAA batteries. The EUT is in test mode transmitting continuously at 915.0MHz. Test performed with EUT in all three axis. Frequency range of test 900MHz to 10GHz. 900MHz to 1000MHz, BW=120kHz; 1GHz to 10GHz, BW=1MHz. Temperature: 17°C, Humidity: 35%, Pressure: 100kPa.

Ext Attn: 0 dB

<b>Measurement Data:</b>		Reading listed by margin.						Test Distance: 3 Meters				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar	
	MHz	dB $\mu$ V	T5	T6	T7	T8	Table	dB $\mu$ V/m	dB $\mu$ V/m	dB	Ant	
			T9	T10	T11	T12						
1	1830.087M	55.2	+0.0	+0.0	+4.9	+0.0	+0.0	50.7	54.0	-3.3	Vert	
	Ave		+0.0	+0.0	+0.0	+0.0						
			+26.6	+0.5	-39.7	+3.2						
2	3659.662M	46.1	+0.0	+0.0	+7.0	+0.0	+0.0	50.2	54.0	-3.8	Vert	
			+0.0	+0.0	+0.0	+0.0						
			+31.5	+0.7	-40.2	+5.1						
3	3659.777M	45.6	+0.0	+0.0	+7.0	+0.0	+0.0	49.7	54.0	-4.3	Horiz	
			+0.0	+0.0	+0.0	+0.0						
			+31.5	+0.7	-40.2	+5.1						
4	1830.200M	54.2	+0.0	+0.0	+4.9	+0.0	+0.0	49.7	54.0	-4.3	Horiz	
	Ave		+0.0	+0.0	+0.0	+0.0						
			+26.6	+0.5	-39.7	+3.2						
5	3659.843M	45.2	+0.0	+0.0	+7.0	+0.0	+0.0	49.3	54.0	-4.7	Horiz	
			+0.0	+0.0	+0.0	+0.0						
			+31.5	+0.7	-40.2	+5.1						
6	1829.860M	53.5	+0.0	+0.0	+4.9	+0.0	+0.0	49.0	54.0	-5.0	Vert	
			+0.0	+0.0	+0.0	+0.0						
			+26.6	+0.5	-39.7	+3.2						
7	914.902M	85.1	+23.3	+4.1	+3.3	-27.5	+0.0	88.9	94.0	-5.1	Vert	
			+0.6	+0.0	+0.0	+0.0						
			+0.0	+0.0	+0.0	+0.0						
8	2744.760M	48.2	+0.0	+0.0	+6.3	+0.0	+0.0	48.8	54.0	-5.2	Vert	
			+0.0	+0.0	+0.0	+0.0						
			+29.3	+0.6	-39.9	+4.3						
9	915.058M	85.0	+23.3	+4.1	+3.3	-27.5	+0.0	88.8	94.0	-5.2	Vert	
			+0.6	+0.0	+0.0	+0.0						
			+0.0	+0.0	+0.0	+0.0						
10	2744.737M	47.6	+0.0	+0.0	+6.3	+0.0	+0.0	48.2	54.0	-5.8	Horiz	
			+0.0	+0.0	+0.0	+0.0						
			+29.3	+0.6	-39.9	+4.3						
11	1830.133M	52.5	+0.0	+0.0	+4.9	+0.0	+0.0	48.0	54.0	-6.0	Vert	
	Ave		+0.0	+0.0	+0.0	+0.0						
			+26.6	+0.5	-39.7	+3.2						
^	1830.087M	60.3	+0.0	+0.0	+4.9	+0.0	+0.0	55.8	54.0	+1.8	Vert	
			+0.0	+0.0	+0.0	+0.0						
			+26.6	+0.5	-39.7	+3.2						

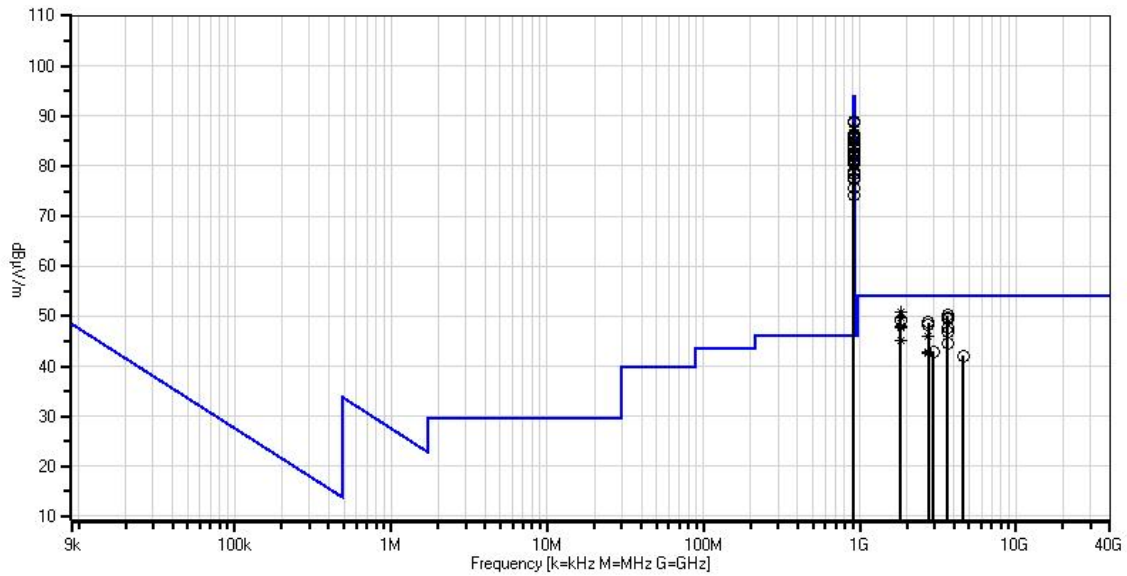


^	1830.133M	57.7	+0.0	+0.0	+4.9	+0.0	+0.0	53.2	54.0	-0.8	Vert
			+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
14	3660.320M	43.6	+0.0	+0.0	+7.0	+0.0	+0.0	47.7	54.0	-6.3	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+31.5	+0.7	-40.2	+5.1					
15	1830.207M Ave	52.1	+0.0	+0.0	+4.9	+0.0	+0.0	47.6	54.0	-6.4	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
16	3659.730M	42.8	+0.0	+0.0	+7.0	+0.0	+0.0	46.9	54.0	-7.1	Vert
			+0.0	+0.0	+0.0	+0.0					
			+31.5	+0.7	-40.2	+5.1					
17	914.942M	82.6	+23.3	+4.1	+3.3	-27.5	+0.0	86.4	94.0	-7.6	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
18	915.058M	82.4	+23.3	+4.1	+3.3	-27.5	+0.0	86.2	94.0	-7.8	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
19	914.906M	82.2	+23.3	+4.1	+3.3	-27.5	+0.0	86.0	94.0	-8.0	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
20	2745.217M Ave	45.3	+0.0	+0.0	+6.3	+0.0	+0.0	45.9	54.0	-8.1	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
21	915.055M	81.9	+23.3	+4.1	+3.3	-27.5	+0.0	85.7	94.0	-8.3	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
22	915.051M	81.7	+23.3	+4.1	+3.3	-27.5	+0.0	85.5	94.0	-8.5	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
23	915.000M	81.6	+23.3	+4.1	+3.3	-27.5	+0.0	85.4	94.0	-8.6	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
24	914.955M	81.2	+23.3	+4.1	+3.3	-27.5	+0.0	85.0	94.0	-9.0	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
25	1830.190M Ave	49.5	+0.0	+0.0	+4.9	+0.0	+0.0	45.0	54.0	-9.0	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
^	1830.200M	59.8	+0.0	+0.0	+4.9	+0.0	+0.0	55.3	54.0	+1.3	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
^	1830.207M	58.1	+0.0	+0.0	+4.9	+0.0	+0.0	53.6	54.0	-0.4	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
^	1830.190M	55.3	+0.0	+0.0	+4.9	+0.0	+0.0	50.8	54.0	-3.2	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
29	3660.250M	40.6	+0.0	+0.0	+7.0	+0.0	+0.0	44.7	54.0	-9.3	Vert
			+0.0	+0.0	+0.0	+0.0					
			+31.5	+0.7	-40.2	+5.1					

30	914.953M	80.2	+23.3	+4.1	+3.3	-27.5	+0.0	84.0	94.0	-10.0	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
31	915.058M	80.1	+23.3	+4.1	+3.3	-27.5	+0.0	83.9	94.0	-10.1	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
32	915.088M	79.6	+23.3	+4.1	+3.3	-27.5	+0.0	83.4	94.0	-10.6	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
33	2745.275M Ave	42.3	+0.0	+0.0	+6.3	+0.0	+0.0	42.9	54.0	-11.1	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
^	2745.217M	52.7	+0.0	+0.0	+6.3	+0.0	+0.0	53.3	54.0	-0.7	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
^	2745.275M	50.4	+0.0	+0.0	+6.3	+0.0	+0.0	51.0	54.0	-3.0	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
36	2964.813M	40.6	+0.0	+0.0	+6.9	+0.0	+0.0	42.9	54.0	-11.1	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+30.1	+0.7	-39.9	+4.5					
37	914.945M	79.0	+23.3	+4.1	+3.3	-27.5	+0.0	82.8	94.0	-11.2	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
38	915.000M	79.0	+23.3	+4.1	+3.3	-27.5	+0.0	82.8	94.0	-11.2	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
39	2745.303M Ave	42.1	+0.0	+0.0	+6.3	+0.0	+0.0	42.7	54.0	-11.3	Vert
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
^	2745.303M	50.8	+0.0	+0.0	+6.3	+0.0	+0.0	51.4	54.0	-2.6	Vert
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
^	2745.243M	48.8	+0.0	+0.0	+6.3	+0.0	+0.0	49.4	54.0	-4.6	Vert
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
42	915.000M	78.6	+23.3	+4.1	+3.3	-27.5	+0.0	82.4	94.0	-11.6	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
43	4576.703M	34.8	+0.0	+0.0	+8.4	+0.0	+0.0	42.1	54.0	-11.9	Vert
			+0.0	+0.0	+0.0	+0.0					
			+32.5	+0.8	-40.3	+5.9					
44	915.000M	77.9	+23.3	+4.1	+3.3	-27.5	+0.0	81.7	94.0	-12.3	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
45	914.908M	77.6	+23.3	+4.1	+3.3	-27.5	+0.0	81.4	94.0	-12.6	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
46	915.062M	77.3	+23.3	+4.1	+3.3	-27.5	+0.0	81.1	94.0	-12.9	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					

47	914.910M	77.3	+23.3	+4.1	+3.3	-27.5	+0.0	81.1	94.0	-12.9	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
48	915.053M	76.7	+23.3	+4.1	+3.3	-27.5	+0.0	80.5	94.0	-13.5	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
49	915.000M	75.2	+23.3	+4.1	+3.3	-27.5	+0.0	79.0	94.0	-15.0	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
50	915.000M	74.7	+23.3	+4.1	+3.3	-27.5	+0.0	78.5	94.0	-15.5	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
51	915.000M	74.5	+23.3	+4.1	+3.3	-27.5	+0.0	78.3	94.0	-15.7	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
52	914.903M	73.8	+23.3	+4.1	+3.3	-27.5	+0.0	77.6	94.0	-16.4	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
53	915.059M	73.6	+23.3	+4.1	+3.3	-27.5	+0.0	77.4	94.0	-16.6	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
54	915.000M	71.8	+23.3	+4.1	+3.3	-27.5	+0.0	75.6	94.0	-18.4	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
55	915.000M	70.4	+23.3	+4.1	+3.3	-27.5	+0.0	74.2	94.0	-19.8	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					

CKC Laboratories Date: 1/5/2011 Time: 13:57:36 SmartLabs, Inc. WO#: 91262  
 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Sequence#: 2 Ext  
 ATTN: 0 dB



— Readings  
 × QP Readings  
 ▼ Ambient  
 ○ Peak Readings  
 \* Average Readings  
 — 1 - 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)

**Test Setup Photos**



## -20dBc Occupied Bandwidth

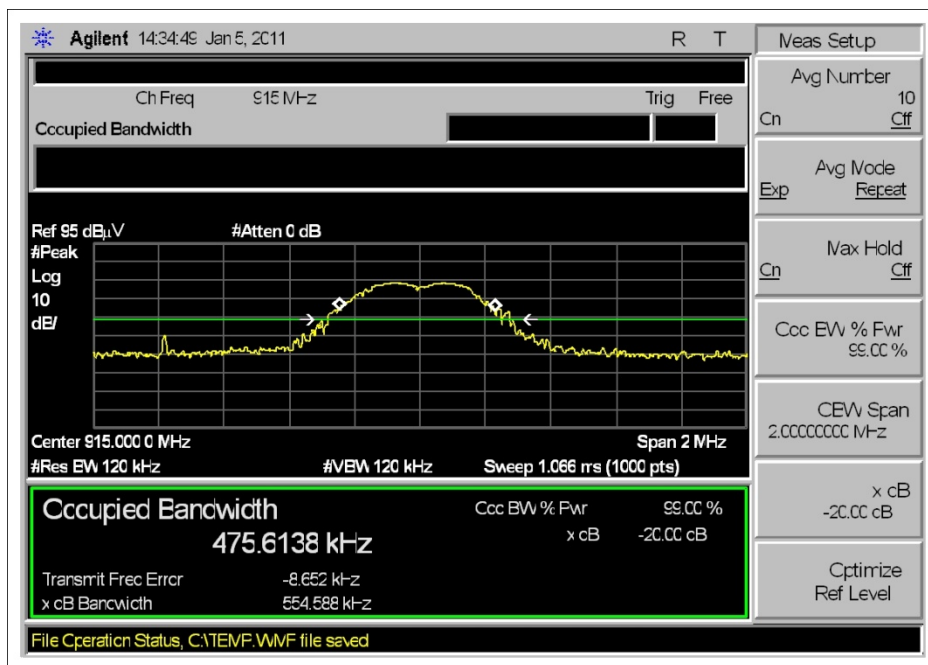
### Test Setup

The equipment under test is an energy display. The EUT is stand alone on the table top. The EUT is powered from two new AAA batteries. The EUT is in test mode transmitting continuously at 915.0MHz. Frequency range of test 914MHz to 916MHz. Temperature: 17°C, Relative Humidity: 35%, Pressure: 100kPa.

Engineer Name: S. Yamamoto

Test Equipment					
Asset/Serial #	Description	Model	Manufacturer	Cal Date	Cal Due
AN00851	Biconilog Antenna	CBL6111C	Schaffer	3/8/2010	3/8/2012
ANP05569	Cable	RG-214/U	Pasternack	8/18/2010	8/18/2012
ANP04382	Cable	LDF-50	Andrew	9/3/2010	9/3/2012
AN00010	Preamp	8447D	HP	3/19/2010	3/19/2012
ANP05555	Cable	RG223/U	Pasternack	8/18/2010	8/18/2012
AN02672	Spectrum Analyzer	E4446A	Agilent	8/9/2010	8/9/2012

### Test Plots



**Test Setup Photos**



## Bandedge

### Test Setup

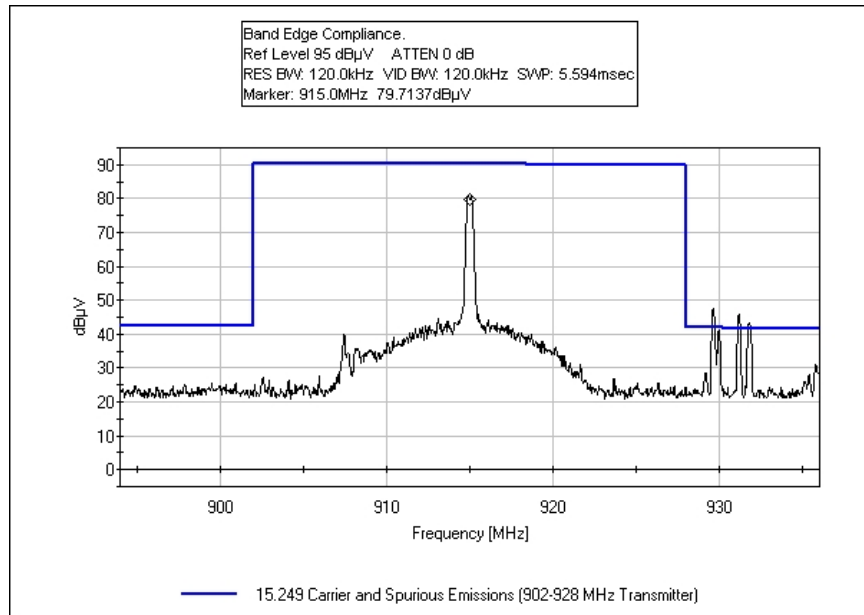
The equipment under test is an energy display. The EUT is stand alone on the table top. The EUT is powered from two new AAA batteries. The EUT is in test mode transmitting continuously at 915.0MHz. Frequency range of test 895MHz to 935MHz. Temperature: 17°C, Relative Humidity: 35%, Pressure: 100kPa.

Two plots included. One with the unit turned on and one with the unit turned off. Over limit emissions in the unit turned on plot are ambient.

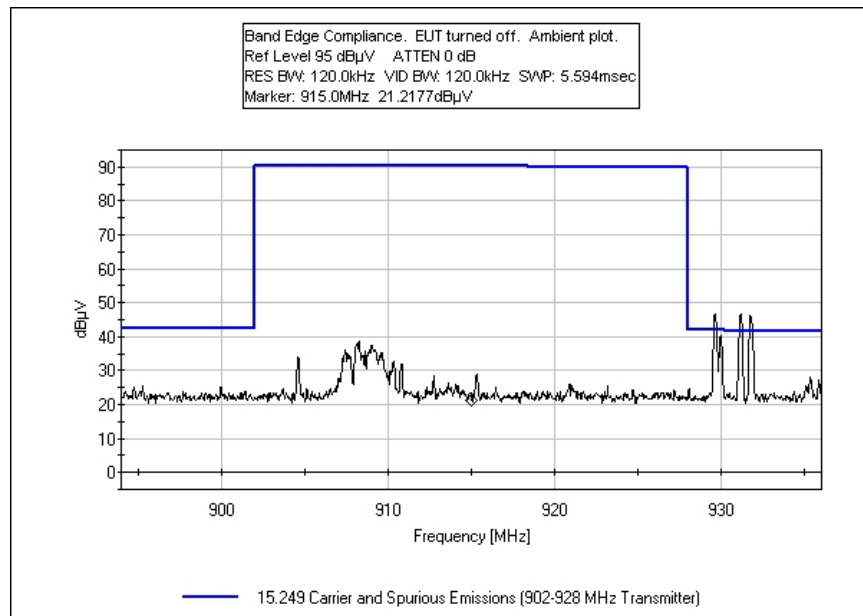
Engineer Name: S. Yamamoto

Test Equipment					
Asset/Serial #	Description	Model	Manufacturer	Cal Date	Cal Due
AN00851	Biconilog Antenna	CBL6111C	Schaffer	3/8/2010	3/8/2012
ANP05569	Cable	RG-214/U	Pasternack	8/18/2010	8/18/2012
ANP04382	Cable	LDF-50	Andrew	9/3/2010	9/3/2012
AN00010	Preamplifier	8447D	HP	3/19/2010	3/19/2012
ANP05555	Cable	RG223/U	Pasternack	8/18/2010	8/18/2012
AN02672	Spectrum Analyzer	E4446A	Agilent	8/9/2010	8/9/2012

### Test Plots







**Test Setup Photos**





## 15.249(d) Field Strength of Spurious Emissions

**Test Data Sheets**

Test Location: CKC Laboratories • 110 Olinda Place • Brea, CA 92823 • 714-993-6112

Customer: **SmartLabs, Inc.**  
 Specification: **15.209 Radiated Emissions**  
 Work Order #: **91262** Date: 1/5/2011  
 Test Type: **Maximized Emissions** Time: 16:39:02  
 Equipment: **INSTEON Energy Display** Sequence#: 3  
 Manufacturer: SmartLabs, Inc. Tested By: S. Yamamoto  
 Model: 2448A2  
 S/N: 51

***Test Equipment:***

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00851	Biconilog Antenna	CBL6111C	3/8/2010	3/8/2012
T2	ANP05569	Cable	RG-214/U	8/18/2010	8/18/2012
T3	ANP04382	Cable	LDF-50	9/3/2010	9/3/2012
T4	AN00010	Preamp	8447D	3/19/2010	3/19/2012
T5	ANP05555	Cable	RG223/U	8/18/2010	8/18/2012
T6	AN01437	Quasi Peak Adapter	85650A	3/17/2010	3/17/2012
T7	AN02462	Spectrum Analyzer	8568B	3/17/2010	3/17/2012
T8	AN02472	Spectrum Analyzer	84662A	3/17/2010	3/17/2012
		Display			
	AN02672	Spectrum Analyzer	E4446A	8/9/2010	8/9/2012
T9	AN01646	Horn Antenna	3115	8/18/2010	8/18/2012
T10	AN02946	Cable	32022-2-2909K-36TC	9/14/2009	9/14/2011
T11	AN00787	Preamp	83017A	6/4/2009	6/4/2011
T12	ANP05988	Cable	LDF1-50	3/12/2010	3/12/2012
	AN00314	Loop Antenna	6502	6/30/2010	6/30/2012

***Equipment Under Test (\* = EUT):***

Function	Manufacturer	Model #	S/N
INSTEON Energy Display*	SmartLabs, Inc.	2448A2	51

***Support Devices:***

Function	Manufacturer	Model #	S/N
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***Test Conditions / Notes:***

The equipment under test is an energy display. The EUT is stand alone on the table top. The EUT is powered from two new AAA batteries. The EUT is in test mode transmitting continuously at 915.0MHz. Test performed with EUT in all three axis. Frequency range of test 9kHz to 10GHz. 9kHz to 150kHz, BW=200Hz; 150kHz to 30MHz, BW=9kHz; 30MHz to 1000MHz, BW=120kHz; 1GHz to 10GHz, BW=1MHz. Temperature: 17°C, Humidity: 35%, Pressure: 100kPa.

Ext Attn: 0 dB

**Measurement Data:**

Reading listed by margin.

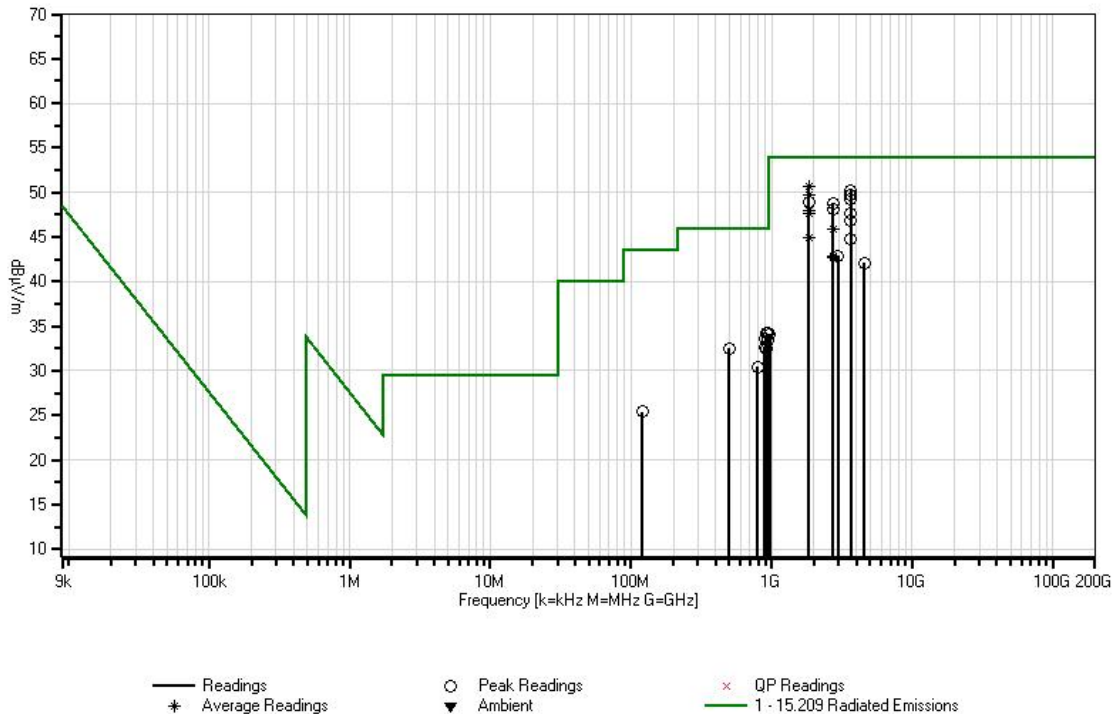
Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
	MHz	dB $\mu$ V	T9	T10	T11	T12	Table	dB $\mu$ V/m	dB $\mu$ V/m	dB	Ant
1	1830.087M	55.2	+0.0	+0.0	+4.9	+0.0	+0.0	50.7	54.0	-3.3	Vert
	Ave		+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
2	3659.662M	46.1	+0.0	+0.0	+7.0	+0.0	+0.0	50.2	54.0	-3.8	Vert
			+0.0	+0.0	+0.0	+0.0					
			+31.5	+0.7	-40.2	+5.1					
3	3659.777M	45.6	+0.0	+0.0	+7.0	+0.0	+0.0	49.7	54.0	-4.3	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+31.5	+0.7	-40.2	+5.1					
4	1830.200M	54.2	+0.0	+0.0	+4.9	+0.0	+0.0	49.7	54.0	-4.3	Horiz
	Ave		+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
5	3659.843M	45.2	+0.0	+0.0	+7.0	+0.0	+0.0	49.3	54.0	-4.7	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+31.5	+0.7	-40.2	+5.1					
6	1829.860M	53.5	+0.0	+0.0	+4.9	+0.0	+0.0	49.0	54.0	-5.0	Vert
			+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
7	2744.760M	48.2	+0.0	+0.0	+6.3	+0.0	+0.0	48.8	54.0	-5.2	Vert
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
8	2744.737M	47.6	+0.0	+0.0	+6.3	+0.0	+0.0	48.2	54.0	-5.8	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
9	1830.133M	52.5	+0.0	+0.0	+4.9	+0.0	+0.0	48.0	54.0	-6.0	Vert
	Ave		+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
^	1830.087M	60.3	+0.0	+0.0	+4.9	+0.0	+0.0	55.8	54.0	+1.8	Vert
			+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
^	1830.133M	57.7	+0.0	+0.0	+4.9	+0.0	+0.0	53.2	54.0	-0.8	Vert
			+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
12	3660.320M	43.6	+0.0	+0.0	+7.0	+0.0	+0.0	47.7	54.0	-6.3	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+31.5	+0.7	-40.2	+5.1					
13	1830.207M	52.1	+0.0	+0.0	+4.9	+0.0	+0.0	47.6	54.0	-6.4	Horiz
	Ave		+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
14	3659.730M	42.8	+0.0	+0.0	+7.0	+0.0	+0.0	46.9	54.0	-7.1	Vert
			+0.0	+0.0	+0.0	+0.0					
			+31.5	+0.7	-40.2	+5.1					
15	2745.217M	45.3	+0.0	+0.0	+6.3	+0.0	+0.0	45.9	54.0	-8.1	Horiz
	Ave		+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					

16	1830.190M Ave	49.5	+0.0	+0.0	+4.9	+0.0	+0.0	45.0	54.0	-9.0	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
^	1830.200M	59.8	+0.0	+0.0	+4.9	+0.0	+0.0	55.3	54.0	+1.3	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
^	1830.207M	58.1	+0.0	+0.0	+4.9	+0.0	+0.0	53.6	54.0	-0.4	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
^	1830.190M	55.3	+0.0	+0.0	+4.9	+0.0	+0.0	50.8	54.0	-3.2	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+26.6	+0.5	-39.7	+3.2					
20	3660.250M	40.6	+0.0	+0.0	+7.0	+0.0	+0.0	44.7	54.0	-9.3	Vert
			+0.0	+0.0	+0.0	+0.0					
			+31.5	+0.7	-40.2	+5.1					
21	2745.275M Ave	42.3	+0.0	+0.0	+6.3	+0.0	+0.0	42.9	54.0	-11.1	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
^	2745.217M	52.7	+0.0	+0.0	+6.3	+0.0	+0.0	53.3	54.0	-0.7	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
^	2745.275M	50.4	+0.0	+0.0	+6.3	+0.0	+0.0	51.0	54.0	-3.0	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
24	2964.813M	40.6	+0.0	+0.0	+6.9	+0.0	+0.0	42.9	54.0	-11.1	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+30.1	+0.7	-39.9	+4.5					
25	2745.303M Ave	42.1	+0.0	+0.0	+6.3	+0.0	+0.0	42.7	54.0	-11.3	Vert
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
^	2745.303M	50.8	+0.0	+0.0	+6.3	+0.0	+0.0	51.4	54.0	-2.6	Vert
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
^	2745.243M	48.8	+0.0	+0.0	+6.3	+0.0	+0.0	49.4	54.0	-4.6	Vert
			+0.0	+0.0	+0.0	+0.0					
			+29.3	+0.6	-39.9	+4.3					
28	924.925M	30.1	+23.5	+4.1	+3.4	-27.5	+0.0	34.2	46.0	-11.8	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
29	945.053M	29.7	+23.8	+4.2	+3.4	-27.5	+0.0	34.2	46.0	-11.8	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
30	4576.703M	34.8	+0.0	+0.0	+8.4	+0.0	+0.0	42.1	54.0	-11.9	Vert
			+0.0	+0.0	+0.0	+0.0					
			+32.5	+0.8	-40.3	+5.9					
31	904.957M	30.1	+23.1	+4.0	+3.3	-27.5	+0.0	33.6	46.0	-12.4	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
32	944.798M	29.0	+23.8	+4.2	+3.4	-27.5	+0.0	33.5	46.0	-12.5	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					

33	895.091M	29.3	+23.0	+4.0	+3.3	-27.5	+0.0	32.7	46.0	-13.3	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
34	499.968M	36.1	+18.3	+2.9	+2.6	-27.9	+0.0	32.5	46.0	-13.5	Vert
			+0.5	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
35	924.870M	28.4	+23.5	+4.1	+3.4	-27.5	+0.0	32.5	46.0	-13.5	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
36	794.982M	28.8	+22.0	+3.6	+3.1	-27.8	+0.0	30.4	46.0	-15.6	Vert
			+0.7	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
37	120.004M	37.9	+11.6	+1.4	+1.3	-27.0	+0.0	25.4	43.5	-18.1	Vert
			+0.2	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
38	964.908M	29.2	+24.1	+4.3	+3.4	-27.5	+0.0	34.1	54.0	-19.9	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
39	965.077M	29.2	+24.1	+4.3	+3.4	-27.5	+0.0	34.1	54.0	-19.9	Vert
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					

CKC Laboratories Date: 1/5/2011 Time: 16:39:02 SmartLabs, Inc. WO#: 91262  
 15.209 Radiated Emissions Test Distance: 3 Meters Sequence#: 3 Ext ATTN: 0 dB



**Test Setup Photos**



# RSS 210

## 99% Bandwidth

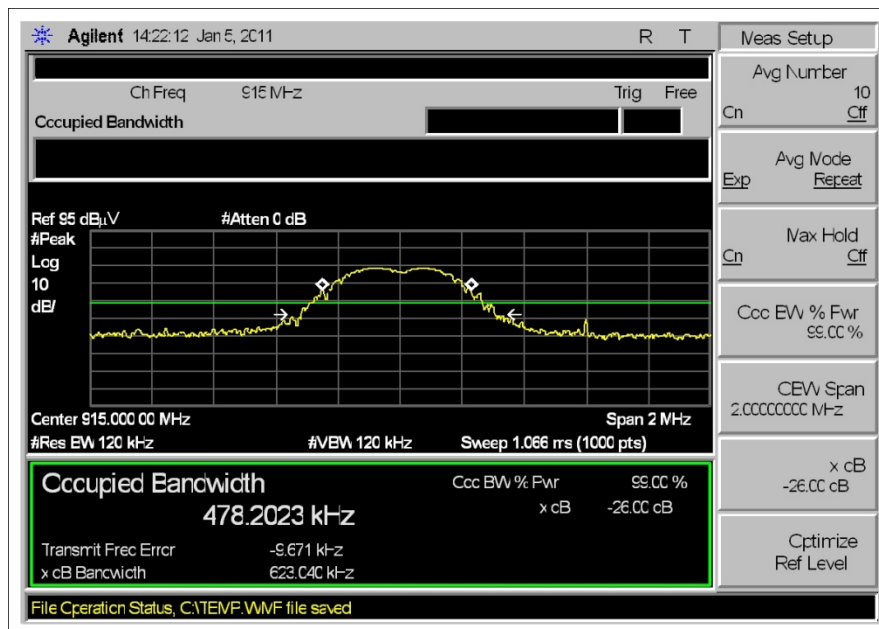
### Test Setup

The equipment under test is an energy display. The EUT is stand alone on the table top. The EUT is powered from two new AAA batteries. The EUT is in test mode transmitting continuously at 915.0MHz. Frequency range of test 914MHz to 916MHz. Temperature: 17°C, Humidity: 35%, Pressure: 100kPa.

Engineer Name: S. Yamamoto

Test Equipment					
Asset/Serial #	Description	Model	Manufacturer	Cal Date	Cal Due
AN00851	Biconilog Antenna	CBL6111C	Schaffer	3/8/2010	3/8/2012
ANP05569	Cable	RG-214/U	Pasternack	8/18/2010	8/18/2012
ANP04382	Cable	LDF-50	Andrew	9/3/2010	9/3/2012
AN00010	Preamp	8447D	HP	3/19/2010	3/19/2012
ANP05555	Cable	RG223/U	Pasternack	8/18/2010	8/18/2012
AN02672	Spectrum Analyzer	E4446A	Agilent	8/9/2010	8/9/2012

### Test Plots





**Test Setup Photos**



## SUPPLEMENTAL INFORMATION

### Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. 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**

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.

SAMPLE CALCULATIONS		
	Meter reading	(dB $\mu$ V)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dB $\mu$ V/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. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

### 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 "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the highest readings, this is indicated as a "QP" or an "Ave" on the appropriate rows of the data sheets. 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/receiver readings recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the measuring device called "peak hold," the measuring device had the ability to measure transients 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

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the quasi-peak detector.

#### Average

For certain frequencies, average measurements may be made using the spectrum analyzer/receiver. 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.