

SmartLabs, Inc.

TEST REPORT FOR

**INSTEON Leak Sensor
Model: 2852-222**

Tested To The Following Standards:

FCC Part 15 Subpart C Sections 15.207, 15.249
and
RSS 210 Issue 8

Report No.: 93536-10

Date of issue: September 6, 2012



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: 12-3MC0817-01

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: 93536

August 21, 2012

August 21-30, 2012

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 #	Taiwan	Canada	FCC	Japan
Brea A	US0060	SL2-IN-E-1146R	3082D-1	90473	R-2945 C-3248 T-1572

SUMMARY OF RESULTS

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

Description	Test Procedure/Method	Results
Voltage Variation	FCC Part 15 Subpart C Section 15.31(e)	Pass
Conducted Emissions	FCC Part 15 Subpart C Section 15.207 / ANSI C63.4 (2009)	NA
RF Power Output	FCC Part 15 Subpart C Section 15.249 (a)(b)	Pass
-20dBc & 99% Occupied Bandwidth	FCC Part 15 Subpart C Section 15.249 / RSS 210 Issue 8	Pass
Bandedge	FCC Part 15 Subpart C	Pass
Field Strength of Spurious Emissions	FCC Part 15 Subpart C Section 15.249(d)	Pass

NA= Not applicable

Conditions During Testing

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

Summary of Conditions
Modification: Drop fundamental power by 9db.

EQUIPMENT UNDER TEST (EUT)

EQUIPMENT UNDER TEST

INSTEON Leak Sensor

Manuf: SmartLabs, Inc.

Model: 2852-222

Serial: NA

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.

15.31(e) Voltage Variations

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **SmartLabs, Inc.**

Specification: **15.31e**

Work Order #: **93536** Date: 8/29/2012

Test Type: **Maximized Emissions** Time: 10:48:15

Equipment: **INSTEON Leak Sensor** Sequence#: 5

Manufacturer: SmartLabs, Inc. Tested By: Don Nguyen

Model: 2852-222

S/N:

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00309	Preamp	8447D	3/29/2012	3/29/2014
T2	AN01995	Biconilog Antenna	CBL6111C	5/16/2012	5/16/2014
T3	ANP05050	Cable	RG223/U	3/21/2011	3/21/2013
T4	ANP05198	Cable	8268	12/21/2010	12/21/2012
	AN02869	Spectrum Analyzer	E4440A	2/12/2011	2/12/2013

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
INSTEON Leak Sensor*	SmartLabs, Inc.	2852-222	NA

Support Devices:

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

The EUT is placed on the wooden table lined with Styrofoam of 10 cm thickness. EUT is installed in fixed position.
 EUT is installed with fresh 1.5V battery.
 The EUT is set in constant transmit mode.
 TX freq = 914.5-915.5 MHz
 Frequency range of measurement = fundamental
 RBW=120 kHz, VBW=120 kHz,
15.31(e) A fresh battery was installed during the test.
 Test environment conditions: 21°C, 39% relative humidity, 100kPa
 Modification: Drop fundamental power by 9db.

Test Setup Photos



15.207 AC Conducted Emissions

Test Engineer:	Don Nguyen	Test Procedure:	ANSI C63.4 (2009)
Test Level:	NA		
Declarations: The manufacturer declares that the EUT is battery operated.			

15.249(a)(b) RF Power Output

Test Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **SmartLabs, Inc.**
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
 Work Order #: **93536** Date: 8/29/2012
 Test Type: **Maximized Emissions** Time: 10:48:15
 Equipment: **INSTEON Leak Sensor** Sequence#: 5
 Manufacturer: SmartLabs, Inc. Tested By: Don Nguyen
 Model: 2852-222
 S/N:

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00309	Preamp	8447D	3/29/2012	3/29/2014
T2	AN01995	Biconilog Antenna	CBL6111C	5/16/2012	5/16/2014
T3	ANP05050	Cable	RG223/U	3/21/2011	3/21/2013
T4	ANP05198	Cable	8268	12/21/2010	12/21/2012
	AN02869	Spectrum Analyzer	E4440A	2/12/2011	2/12/2013

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
INSTEON Leak Sensor*	SmartLabs, Inc.	2852-222	NA

Support Devices:

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

The EUT is placed on the wooden table lined with Styrofoam of 10 cm thickness. EUT is installed in fixed position.
 EUT is installed with fresh 1.5V battery.
 The EUT is set in constant transmit mode.
 TX freq = 914.5-915.5 MHz
 Frequency range of measurement = fundamental
 RBW=120 kHz, VBW=120 kHz,
 Test environment conditions: 21°C, 39% relative humidity, 100kPa
 Modification: Drop fundamental power by 9db.

Ext Attn: 0 dB

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

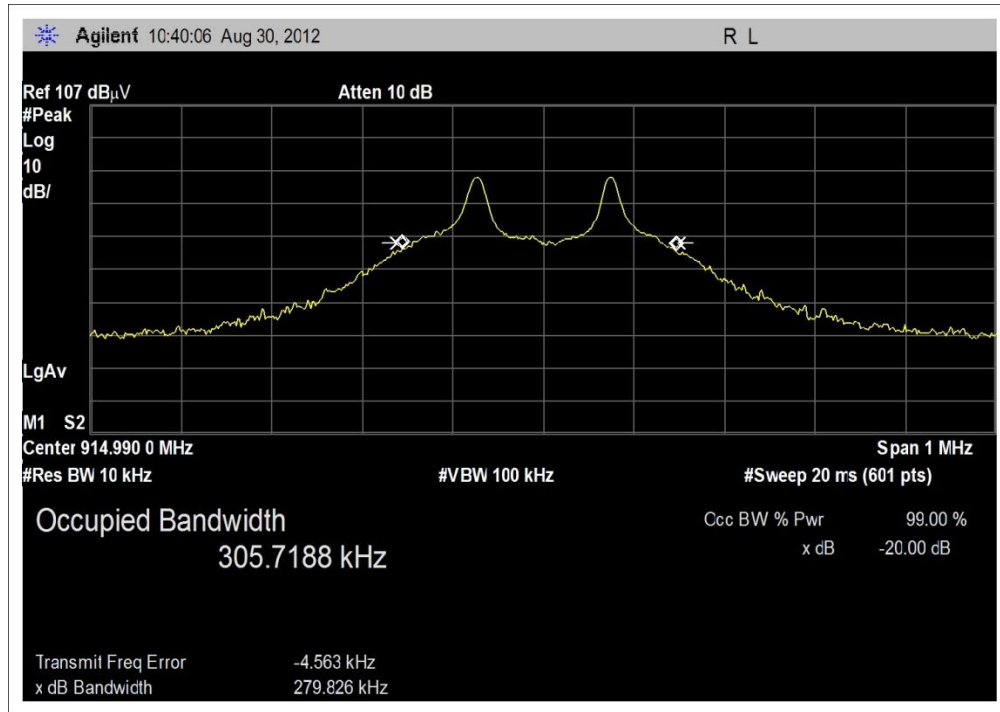
#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	915.065M QP	88.3	-27.2	+23.3	+0.5	+5.8	+0.0	90.7	94.0	-3.3	Vert
^	915.065M	88.5	-27.2	+23.3	+0.5	+5.8	+0.0	90.9	94.0	-3.1	Vert
3	914.915M QP	88.2	-27.2	+23.3	+0.5	+5.8	+0.0	90.6	94.0	-3.4	Vert
^	914.915M	88.3	-27.2	+23.3	+0.5	+5.8	+0.0	90.7	94.0	-3.3	Vert
5	914.915M	76.0	-27.2	+23.3	+0.5	+5.8	+0.0	78.4	94.0	-15.6	Horiz
6	915.070M	76.0	-27.2	+23.3	+0.5	+5.8	+0.0	78.4	94.0	-15.6	Horiz

Test Setup Photos





Test Plots



Test Setup Photos





Bandedge

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **SmartLabs, Inc.**
 Specification: **Band edge**
 Work Order #: **93536** Date: 8/29/2012
 Test Type: **Maximized Emissions** Time: 10:48:15
 Equipment: **INSTEON Leak Sensor** Sequence#: 5
 Manufacturer: SmartLabs, Inc. Tested By: Don Nguyen
 Model: 2852-222
 S/N:

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00309	Preamp	8447D	3/29/2012	3/29/2014
T2	AN01995	Biconilog Antenna	CBL6111C	5/16/2012	5/16/2014
T3	ANP05050	Cable	RG223/U	3/21/2011	3/21/2013
T4	ANP05198	Cable	8268	12/21/2010	12/21/2012
	AN02869	Spectrum Analyzer	E4440A	2/12/2011	2/12/2013

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
INSTEON Leak Sensor*	SmartLabs, Inc.	2852-222	NA

Support Devices:

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

The EUT is placed on the wooden table lined with Styrofoam of 10 cm thickness. EUT is installed in fixed position.
 EUT is installed with fresh 1.5V battery.
 The EUT is set in constant transmit mode.

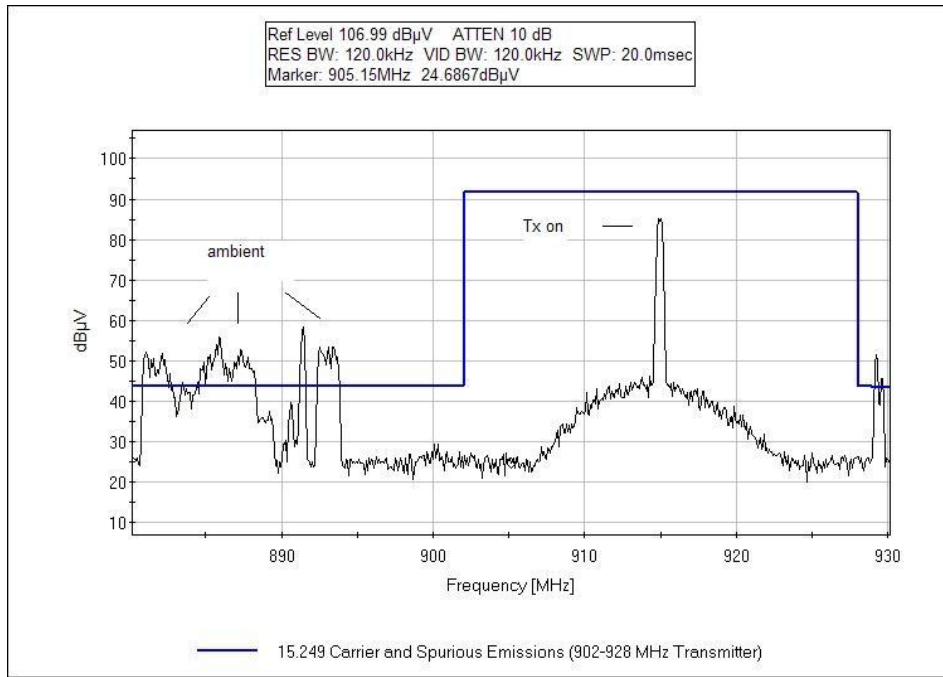
TX freq = 914.5-915.5 MHz

Frequency range of measurement = fundamental
 RBW=120 kHz, VBW=120 kHz,

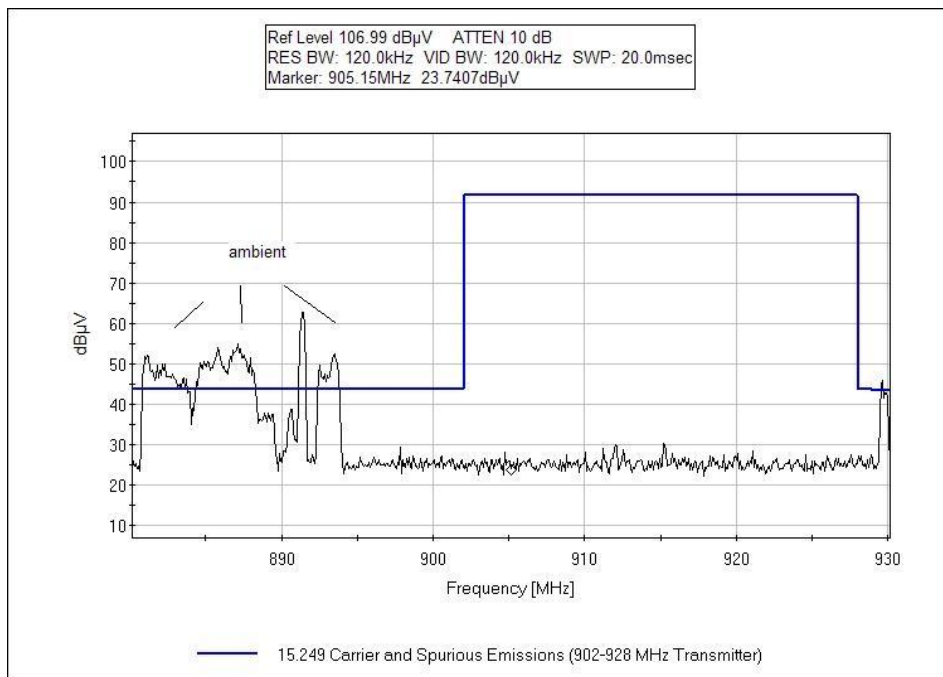
Test environment conditions: 21°C, 39% relative humidity, 100kPa

Modification: Drop fundamental power by 9db.

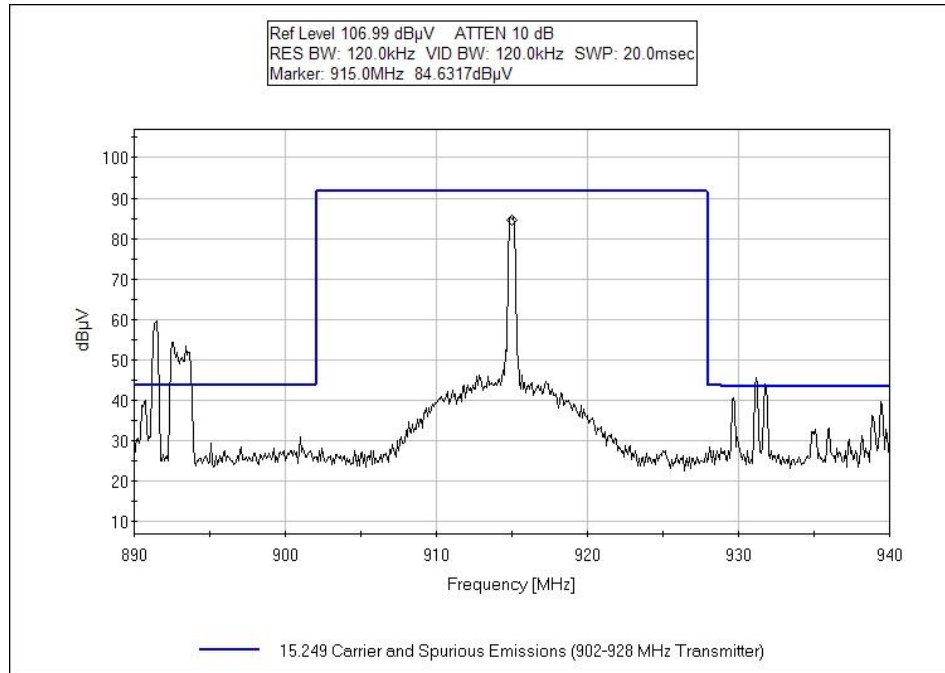
Test Plots



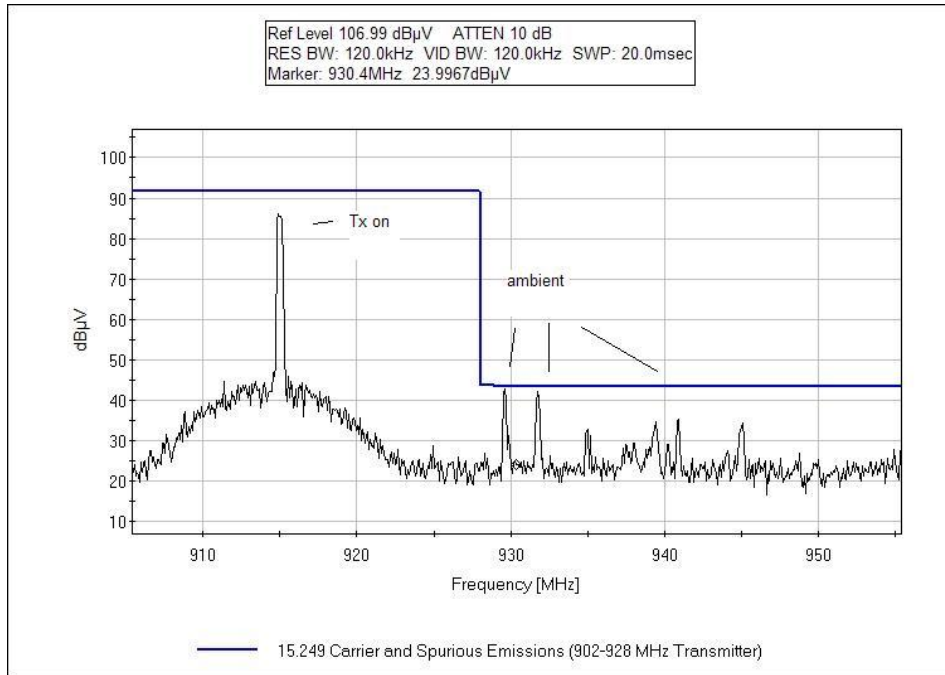
Tx ON, LEFT



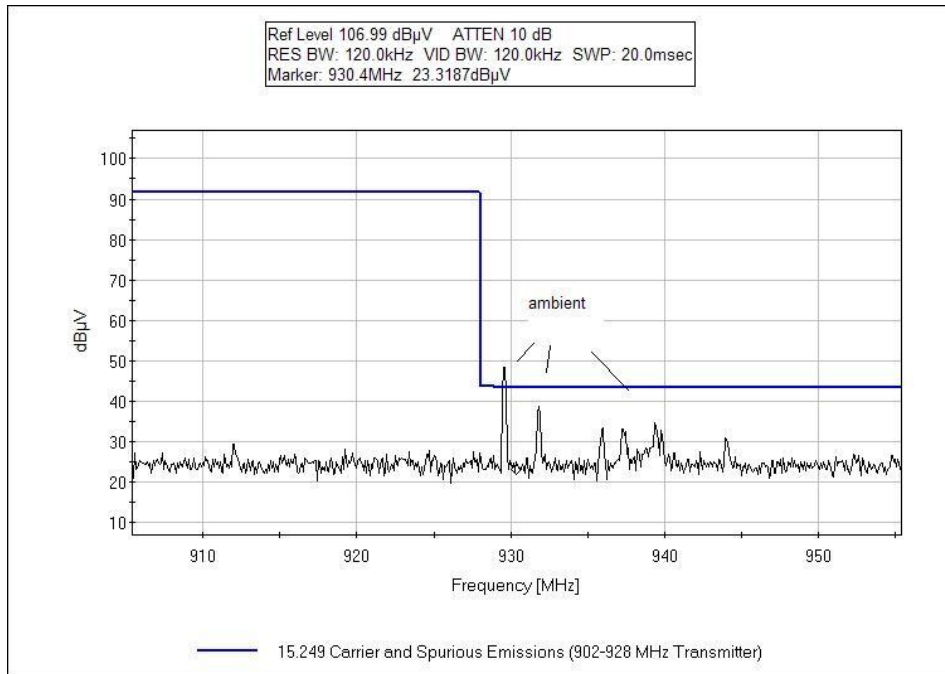
Tx OFF, LEFT



CENTER



Tx ON, RIGHT



Tx OFF, RIGHT

Test Setup Photos



15.249(d) Radiated Spurious Emissions

Test Data Sheets

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **SmartLabs, Inc.**
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
 Work Order #: **93536** Date: 8/29/2012
 Test Type: **Maximized Emissions** Time: 11:49:54
 Equipment: **INSTEON Leak Sensor** Sequence#: 4
 Manufacturer: SmartLabs, Inc. Tested By: Don Nguyen
 Model: 2852-222
 S/N:

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00309	Preamp	8447D	3/29/2012	3/29/2014
T2	AN01995	Biconilog Antenna	CBL6111C	5/16/2012	5/16/2014
T3	ANP05050	Cable	RG223/U	3/21/2011	3/21/2013
T4	ANP05198	Cable	8268	12/21/2010	12/21/2012
	AN00314	Loop Antenna	6502	6/29/2012	6/29/2014
	AN02869	Spectrum Analyzer	E4440A	2/12/2011	2/12/2013
T5	AN00786	Preamp	83017A	6/20/2012	6/20/2014
T6	AN03239	Cable	32022-2-29094K-24TC	8/30/2011	8/30/2013
T7	ANP05421	Cable	Sucoflex 104A	2/8/2012	2/8/2014
T8	AN03169	High Pass Filter	HM1155-11SS	9/22/2011	9/22/2013
T9	AN02113	Horn Antenna-ANSI C63.5	3115	1/17/2011	1/17/2013
T10	ANP05563	Cable	ANDL-1-PNMN-48	8/7/2012	8/7/2014

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
INSTEON Leak Sensor*	SmartLabs, Inc.	2852-222	NA

Support Devices:

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

The EUT is placed on the wooden table lined with Styrofoam of 10 cm thickness. EUT is installed in fixed position.
 EUT is installed with fresh 1.5V battery.
 The EUT is set in constant transmit mode.

TX freq = 914.5-915.5 MHz

Frequency range of measurement = 9kHz-10GHz
 9 kHz -150 kHz; RBW=200 Hz, VBW=200 Hz;
 150 kHz-30 MHz; RBW=9 kHz, VBW=9 kHz;
 30 MHz-1000 MHz; RBW=120 kHz, VBW=120 kHz,
 1000 MHz-10000 MHz; RBW=1 MHz, VBW=1 MHz.

Test environment conditions: 21°C, 39% relative humidity, 100kPa

Modification: Drop fundamental power by 9db.

Ext Attn: 0 dB

Measurement Data:

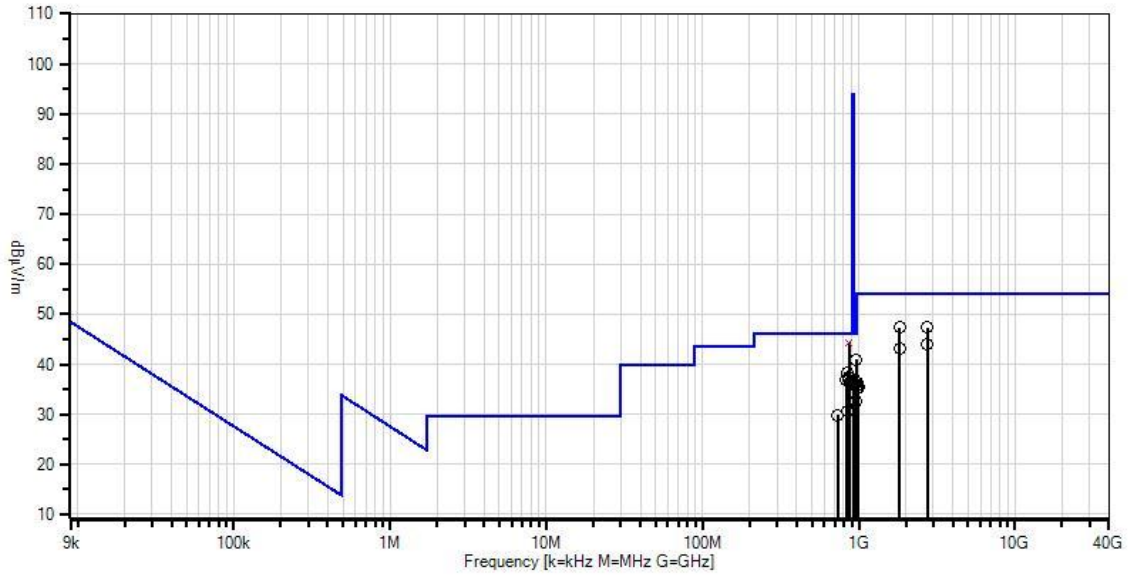
Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
	MHz	dBµV	T9	T10			Table	dBµV/m	dBµV/m	dB	Ant
1	864.925M QP	42.3	-27.2 +0.0 +0.0	+23.0 +0.0 +0.0	+0.5 +0.0 +0.0	+5.7 +0.0 +0.0	+0.0	44.3	46.0	-1.7	Vert
^	864.925M	42.5	-27.2 +0.0 +0.0	+23.0 +0.0 +0.0	+0.5 +0.0 +0.0	+5.7 +0.0 +0.0	+0.0	44.5	46.0	-1.5	Vert
3	2745.000M	51.6	+0.0 -38.7 +29.0	+0.0 +0.4 +3.4	+0.0 +1.4	+0.0 +0.3	+0.0	47.4	54.0	-6.6	Vert
4	1830.000M	55.5	+0.0 -38.5 +25.7	+0.0 +0.3 +2.8	+0.0 +1.1	+0.0 +0.4	+0.0	47.3	54.0	-6.7	Vert
5	845.075M	36.6	-27.2 +0.0 +0.0	+22.9 +0.0 +0.0	+0.5 +0.0 +0.0	+5.6 +0.0 +0.0	+0.0	38.4	46.0	-7.6	Vert
6	844.925M	36.4	-27.2 +0.0 +0.0	+22.9 +0.0 +0.0	+0.5 +0.0 +0.0	+5.6 +0.0 +0.0	+0.0	38.2	46.0	-7.8	Vert
7	855.075M	35.7	-27.2 +0.0 +0.0	+22.9 +0.0 +0.0	+0.5 +0.0 +0.0	+5.6 +0.0 +0.0	+0.0	37.5	46.0	-8.5	Vert
8	854.925M	35.2	-27.2 +0.0 +0.0	+22.9 +0.0 +0.0	+0.5 +0.0 +0.0	+5.6 +0.0 +0.0	+0.0	37.0	46.0	-9.0	Vert
9	945.045M	34.5	-27.3 +0.0 +0.0	+23.4 +0.0 +0.0	+0.5 +0.0 +0.0	+5.9 +0.0 +0.0	+0.0	37.0	46.0	-9.0	Vert
10	835.075M	35.3	-27.2 +0.0 +0.0	+22.8 +0.0 +0.0	+0.5 +0.0 +0.0	+5.5 +0.0 +0.0	+0.0	36.9	46.0	-9.1	Vert

11	834.925M	35.3	-27.2 +0.0 +0.0	+22.8 +0.0 +0.0	+0.5 +0.0 +0.0	+5.5 +0.0 +0.0	+0.0	36.9	46.0	-9.1	Vert
12	2745.000M	48.3	+0.0 -38.7 +29.0	+0.0 +0.4 +3.4	+0.0 +1.4	+0.0 +0.3	+0.0	44.1	54.0	-9.9	Horiz
13	934.920M	33.4	-27.3 +0.0 +0.0	+23.4 +0.0 +0.0	+0.5 +0.0 +0.0	+5.9 +0.0 +0.0	+0.0	35.9	46.0	-10.1	Vert
14	1830.000M	51.2	+0.0 -38.5 +25.7	+0.0 +0.3 +2.8	+0.0 +1.1	+0.0 +0.4	+0.0	43.0	54.0	-11.0	Horiz
15	964.920M	38.2	-27.3 +0.0 +0.0	+23.5 +0.0 +0.0	+0.5 +0.0 +0.0	+6.0 +0.0 +0.0	+0.0	40.9	54.0	-13.1	Vert
16	954.920M	30.0	-27.3 +0.0 +0.0	+23.5 +0.0 +0.0	+0.5 +0.0 +0.0	+5.9 +0.0 +0.0	+0.0	32.6	46.0	-13.4	Vert
17	844.915M	28.8	-27.2 +0.0 +0.0	+22.9 +0.0 +0.0	+0.5 +0.0 +0.0	+5.6 +0.0 +0.0	+0.0	30.6	46.0	-15.4	Horiz
18	736.055M	30.1	-27.2 +0.0 +0.0	+21.5 +0.0 +0.0	+0.4 +0.0 +0.0	+5.1 +0.0 +0.0	+0.0	29.9	46.0	-16.1	Horiz
19	985.070M	33.2	-27.3 +0.0 +0.0	+23.6 +0.0 +0.0	+0.6 +0.0 +0.0	+6.1 +0.0 +0.0	+0.0	36.2	54.0	-17.8	Vert
20	984.895M	32.7	-27.3 +0.0 +0.0	+23.6 +0.0 +0.0	+0.6 +0.0 +0.0	+6.1 +0.0 +0.0	+0.0	35.7	54.0	-18.3	Vert
21	995.070M	32.3	-27.3 +0.0 +0.0	+23.7 +0.0 +0.0	+0.6 +0.0 +0.0	+6.2 +0.0 +0.0	+0.0	35.5	54.0	-18.5	Vert
22	974.920M	32.3	-27.3 +0.0 +0.0	+23.6 +0.0 +0.0	+0.6 +0.0 +0.0	+6.1 +0.0 +0.0	+0.0	35.3	54.0	-18.7	Vert

CKC Laboratories, Inc. Date: 8/29/2012 Time: 11:49:54 SmartLabs, Inc. WO#: 93536
 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Sequence#: 4 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



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

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.

SAMPLE CALCULATIONS		
	Meter reading	(dB μ V)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dB μ 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. 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 carrot ("^") 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.