

SmartLabs, Inc.

TEST REPORT FOR

Hub II
Model: 2245-222

Tested To The Following Standards:

FCC Part 15 Subpart C Section(s) 15.207 and 15.249

Report No.: 95716-7

Date of issue: May 19, 2014



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: Kylie Fortier
Customer Reference Number: 14-3KF0513-01

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: 95716

May 13, 2014

May 13, 2014

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.

A handwritten signature in black ink that reads "Steve Behm".

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

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.00.14
Immunity	5.00.07

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Brea A	US0060	SL2-IN-E-1146R	3082D-1	90473	A-0147

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C

Test Procedure/Method	Description	Results
15.207 / ANSI C63.4	Conducted Emissions	Pass
15.249(a)	RF Power Output & Harmonics	Pass
15.215(c)	Occupied Bandwidth	Pass
15.249(b)(d)	Field Strength of Spurious Emissions and Bandedge	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
Modification: 1 Grounded 25 MHz crystal. 2 R71 changed to 0 ohm. 3 Reoriented antenna 4 Reduced antenna length 5 Power setting = 42

EQUIPMENT UNDER TEST (EUT)

EQUIPMENT UNDER TEST

Hub II

Manuf: SmartLabs, Inc.

Model: 2245-222

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) CFR 47 Section 15 Subpart C requirements for Intentional Radiators.

15.207 AC Conducted Emissions

Test Data

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

Customer: **SmartLabs, Inc.**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **95716**
 Test Type: **Conducted Emissions**
 Equipment: **Hub II**
 Manufacturer: SmartLabs, Inc.
 Model: 2245-222
 S/N: NA

Date: 5/13/2014
 Time: 15:31:22
 Sequence#: 2
 Tested By: E. Wong
 110V 60Hz

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	2/6/2013	2/6/2015
T1	ANP06084	Attenuator	SA18N10W-06	12/14/2012	12/14/2014
T2	ANP04358	Cable	RG142	3/12/2014	3/12/2016
T3	AN02610	High Pass Filter	HE9615-150K-50-720B	9/25/2013	9/25/2015
T4	AN00848.1	50uH LISN-Line 1 (L1) (dB)	3816/2nm	3/14/2013	3/14/2015
	AN00848.1	50uH LISN-Line 2 (L2) (dB)	3816/2nm	3/14/2013	3/14/2015

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Hub II*	SmartLabs, Inc.	2245-222	NA

Support Devices:

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

The EUT is placed flat on the Styrofoam platform as intended in normal application. Connected to the EUT is a section of unterminated Ethernet cable. The EUT is set in operational mode, exercising the intended functionalities.

Freq = 915MHz.

Frequency range of measurement = 150kHz- 30MHz.

150 kHz-30 MHz; RBW=9 kHz, VBW=9kHz

Test environment conditions: 30°C, 22% Relative Humidity, 100kPa

Modification :

1 Grounded 25 MHz crystal.

2 R71 changed to 0 ohm.

3 Reoriented antenna

4 Reduced antenna length

5 Power setting = 42

Ext Attn: 0 dB

Measurement Data:

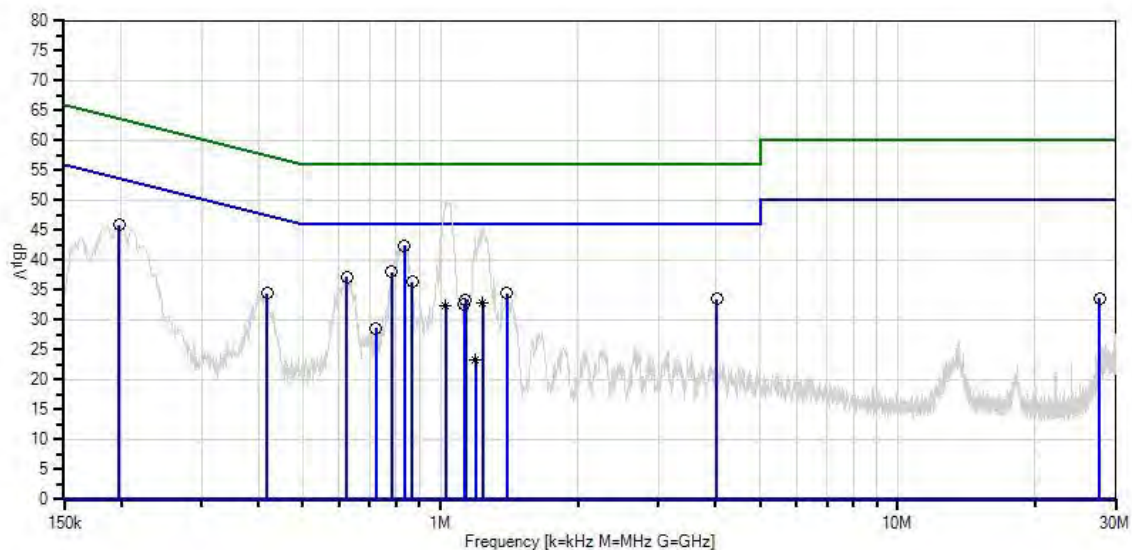
Reading listed by margin.

Test Lead: Black

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	832.845k	36.3	+5.8	+0.1	+0.2	+0.1	+0.0	42.5	46.0	-3.5	Black
2	197.995k	39.8	+5.8	+0.1	+0.2	+0.0	+0.0	45.9	53.7	-7.8	Black
3	780.487k	31.8	+5.8	+0.1	+0.2	+0.1	+0.0	38.0	46.0	-8.0	Black
4	624.137k	30.9	+5.8	+0.1	+0.3	+0.1	+0.0	37.2	46.0	-8.8	Black
5	867.751k	30.2	+5.8	+0.1	+0.2	+0.1	+0.0	36.4	46.0	-9.6	Black
6	1.396M	28.3	+5.8	+0.1	+0.2	+0.1	+0.0	34.5	46.0	-11.5	Black
7	4.016M	27.3	+5.8	+0.2	+0.1	+0.1	+0.0	33.5	46.0	-12.5	Black
8	1.137M	27.2	+5.8	+0.1	+0.2	+0.1	+0.0	33.4	46.0	-12.6	Black
9	417.611k	28.3	+5.8	+0.1	+0.3	+0.0	+0.0	34.5	47.5	-13.0	Black
10	1.239M	26.7	+5.8	+0.1	+0.2	+0.1	+0.0	32.9	46.0	-13.1	Black
Ave											
^	1.239M	39.4	+5.8	+0.1	+0.2	+0.1	+0.0	45.6	46.0	-0.4	Black
12	1.128M	26.5	+5.8	+0.1	+0.2	+0.1	+0.0	32.7	46.0	-13.3	Black
13	1.026M	26.3	+5.8	+0.1	+0.2	+0.1	+0.0	32.5	46.0	-13.5	Black
Ave											
^	1.026M	43.6	+5.8	+0.1	+0.2	+0.1	+0.0	49.8	46.0	+3.8	Black

15	27.650M	26.2	+5.8	+0.4	+0.2	+1.0	+0.0	33.6	50.0	-16.4	Black
16	722.310k	22.4	+5.8	+0.1	+0.2	+0.1	+0.0	28.6	46.0	-17.4	Black
17	1.192M	17.2	+5.8	+0.1	+0.2	+0.1	+0.0	23.4	46.0	-22.6	Black
Ave											
^	1.192M	38.0	+5.8	+0.1	+0.2	+0.1	+0.0	44.2	46.0	-1.8	Black

Date: 5/13/2014 Time: 15:31:22 SmartLabs, Inc. WO#: 95716
 15.207 AC Mains - Average Test Lead: Black 110V 60Hz Sequence#: 2 Ext ATTN: 0 dB



— Sweep Data	— Readings
○ Peak Readings	× QP Readings
* Average Readings	▼ Ambient
— 1 - 15.207 AC Mains - Average	— 2 - 15.207 AC Mains - Quasi-peak

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

Customer: **SmartLabs, Inc.**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **95716**
 Test Type: **Conducted Emissions**
 Equipment: **Hub II**
 Manufacturer: **SmartLabs, Inc.**
 Model: **2245-222**
 S/N: **NA**

Date: 5/13/2014
 Time: 15:36:16
 Sequence#: 3
 Tested By: E. Wong
 110V 60Hz

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	2/6/2013	2/6/2015
T1	ANP06084	Attenuator	SA18N10W-06	12/14/2012	12/14/2014
T2	ANP04358	Cable	RG142	3/12/2014	3/12/2016
T3	AN02610	High Pass Filter	HE9615-150K-50-720B	9/25/2013	9/25/2015
	AN00848.1	50uH LISN-Line 1 (L1) (dB)	3816/2nm	3/14/2013	3/14/2015
T4	AN00848.1	50uH LISN-Line 2 (L2) (dB)	3816/2nm	3/14/2013	3/14/2015

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Hub II*	SmartLabs, Inc.	2245-222	NA

Support Devices:

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

The EUT is placed flat on the Styrofoam platform as intended in normal application. Connected to the EUT is a section of unterminated Ethernet cable. The EUT is set in operational mode, exercising the intended functionalities.

Freq = 915MHz.

Frequency range of measurement = 150kHz- 30MHz.

150 kHz-30 MHz; RBW=9 kHz, VBW=9kHz

Test environment conditions: 30°C, 22% Relative Humidity, 100kPa

Modification :

1 Grounded 25 MHz crystal.

2 R71 changed to 0 ohm.

3 Reoriented antenna

4 Reduced antenna length

5 Power setting = 42

Ext Attn: 0 dB

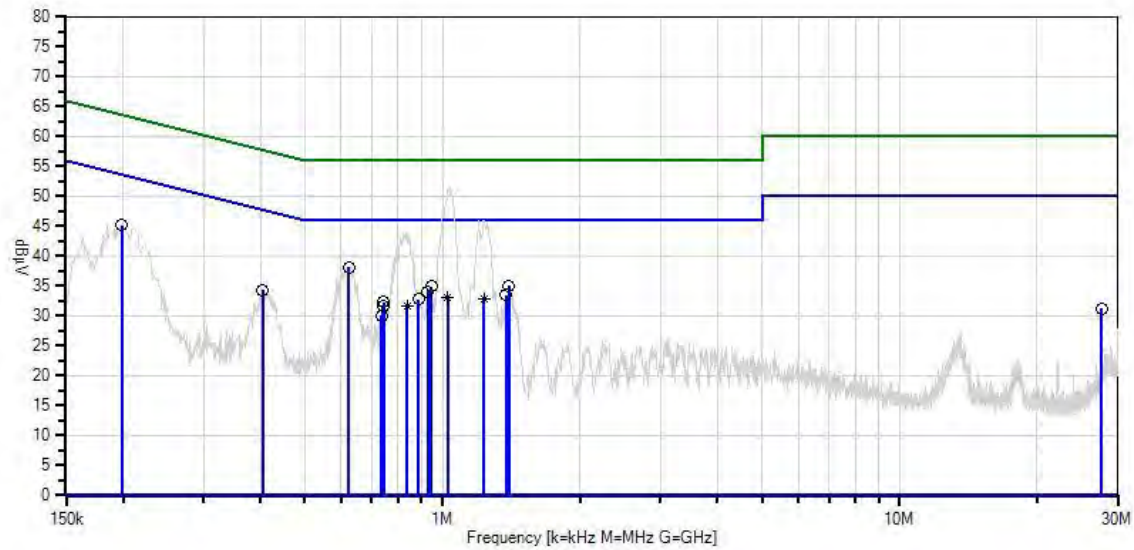
Measurement Data:

Reading listed by margin.

Test Lead: White

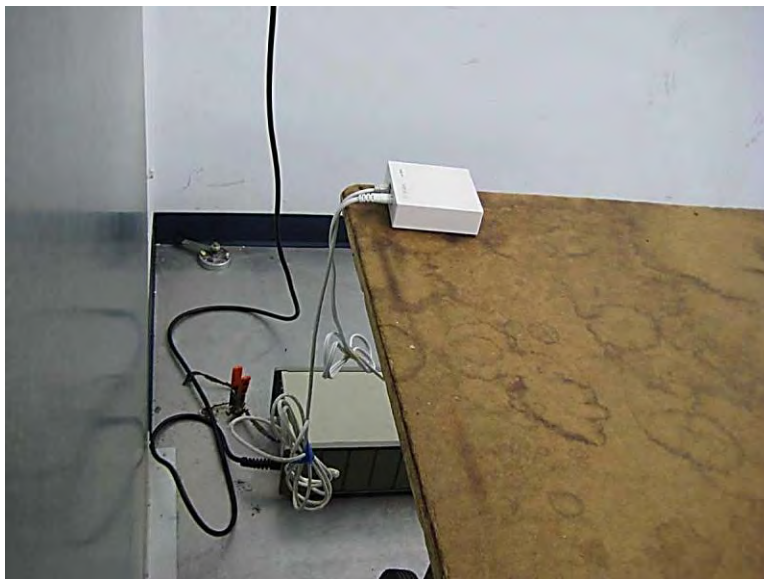
#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	622.683k	32.0	+5.8	+0.1	+0.3	+0.0	+0.0	38.2	46.0	-7.8	White
2	198.722k	39.1	+5.8	+0.1	+0.2	+0.0	+0.0	45.2	53.7	-8.5	White
3	1.396M	28.9	+5.8	+0.1	+0.2	+0.1	+0.0	35.1	46.0	-10.9	White
4	945.249k	28.8	+5.8	+0.1	+0.2	+0.0	+0.0	34.9	46.0	-11.1	White
5	928.238k	28.0	+5.8	+0.1	+0.2	+0.0	+0.0	34.1	46.0	-11.9	White
6	1.379M	27.3	+5.8	+0.1	+0.2	+0.1	+0.0	33.5	46.0	-12.5	White
7 Ave	1.026M	26.9	+5.8	+0.1	+0.2	+0.1	+0.0	33.1	46.0	-12.9	White
^	1.026M	45.4	+5.8	+0.1	+0.2	+0.1	+0.0	51.6	46.0	+5.6	White
9 Ave	1.230M	26.6	+5.8	+0.1	+0.2	+0.1	+0.0	32.8	46.0	-13.2	White
^	1.230M	39.9	+5.8	+0.1	+0.2	+0.1	+0.0	46.1	46.0	+0.1	White
11	885.710k	26.7	+5.8	+0.1	+0.2	+0.0	+0.0	32.8	46.0	-13.2	White
12	403.794k	28.1	+5.8	+0.1	+0.3	+0.0	+0.0	34.3	47.8	-13.5	White
13	744.126k	26.2	+5.8	+0.1	+0.2	+0.0	+0.0	32.3	46.0	-13.7	White
14 Ave	836.481k	25.6	+5.8	+0.1	+0.2	+0.0	+0.0	31.7	46.0	-14.3	White
^	836.481k	38.1	+5.8	+0.1	+0.2	+0.0	+0.0	44.2	46.0	-1.8	White
16	739.763k	25.6	+5.8	+0.1	+0.2	+0.0	+0.0	31.7	46.0	-14.3	White
17	735.400k	23.9	+5.8	+0.1	+0.2	+0.0	+0.0	30.0	46.0	-16.0	White
18	27.650M	23.8	+5.8	+0.4	+0.2	+1.0	+0.0	31.2	50.0	-18.8	White

Date: 5/13/2014 Time: 15:36:16 SmartLabs, Inc. WO#: 95716
15.207 AC Mains - Average Test Lead: White 110V 60Hz Sequence#: 3 Ext ATTN: 0 dB



— Sweep Data	— Readings
○ Peak Readings	× QP Readings
* Average Readings	▼ Ambient
— 1 - 15.207 AC Mains - Average	— 2 - 15.207 AC Mains - Quasi-peak

Test Setup Photo(s)



15.249(a) RF Power Output & Harmonics

Test Data

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

Customer: **SmartLabs, Inc.**

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

Work Order #: **95716**

Date: 5/13/2014

Test Type: **Radiated Scan**

Time: 14:58:57

Equipment: **Hub II**

Sequence#: 1

Manufacturer: SmartLabs, Inc.

Tested By: E. Wong

Model: 2245-222

S/N: NA

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	2/6/2013	2/6/2015
T2	AN00309	Preamp	8447D	3/12/2014	3/12/2016
T3	AN01995	Biconilog Antenna	CBL6111C	4/30/2014	4/30/2016
T4	ANP05050	Cable	RG223/U	1/21/2013	1/21/2015
T5	ANP05198	Cable-Amplitude 15 to 45degC (dB)	8268	12/11/2012	12/11/2014
T6	AN00314	Loop Antenna	6502	6/29/2012	6/29/2014
T7	AN00849	Horn Antenna	3115	3/18/2014	3/18/2016
T8	AN00786	Preamp	83017A	6/20/2012	6/20/2014
T9	AN02946	Cable	32022-2-2909K-36TC	7/31/2013	7/31/2015
T10	ANP05421	Cable	Sucoflex 104A	1/8/2014	1/8/2016
T11	ANP06661	Cable	LDF1-50	4/15/2014	4/15/2016
T12	AN03169	High Pass Filter	HM1155-11SS	7/30/2013	7/30/2015

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Hub II*	SmartLabs, Inc.	2245-222	NA

Support Devices:

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

The EUT is placed flat on the Styrofoam platform as intended in normal application. Connected to the EUT is a section of unterminated Ethernet cable. The EUT is set in operational mode, exercising the intended functionalities.

Freq = 915MHz.

Frequency range of measurement = 9 kHz -10 GHz.

9kHz -150 kHz; RBW=200Hz, 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: 30°C, 22% Relative Humidity, 100kPa

Emission profile with the EUT placed flat and upright was evaluate, worse case emission is with the EUT placed flat on the platform.

15.31(e) compliance: the supply voltage was varied between 85% and 115% of the nominal rated supply voltage, no change in the Fundamental signal level was observed.

Modification :

- 1 Grounded 25 MHz crystal.
- 2 R71 changed to 0 ohm.
- 3 Reoriented antenna
- 4 Reduced antenna length
- 5 Power setting = 42

Ext Attn: 0 dB

Measurement Data:

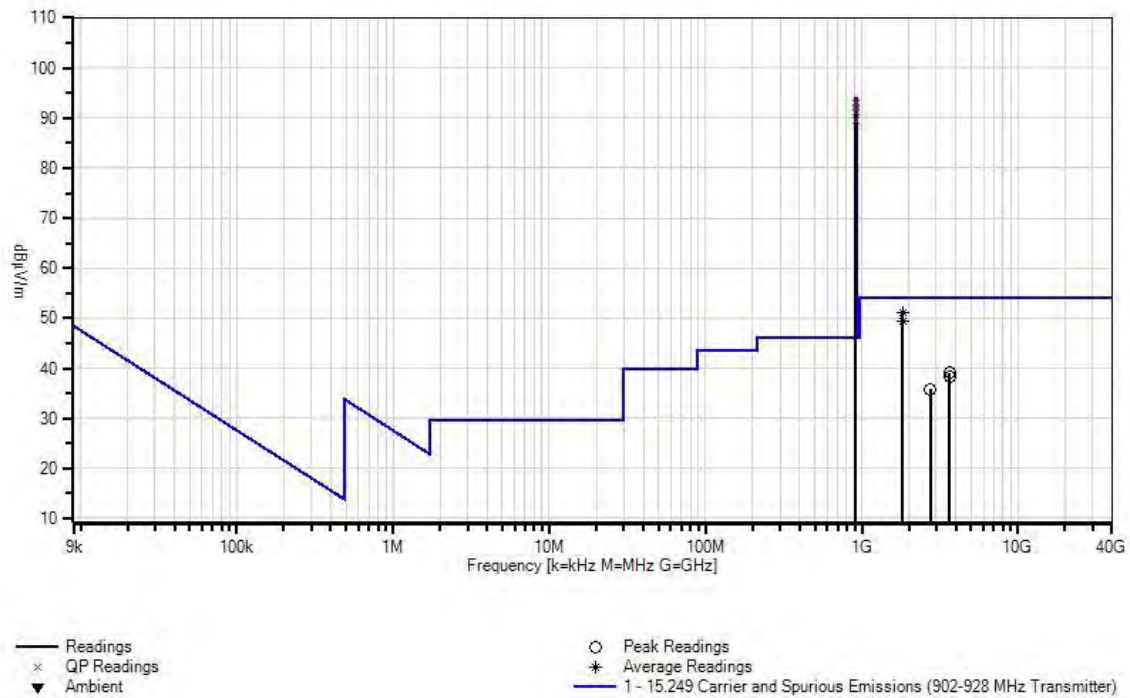
Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7 T11	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	914.904M	89.9	+0.0	-27.3	+23.7	+0.6	+0.0	92.8	94.0	-1.2	Vert
	QP		+5.9	+0.0	+0.0	+0.0			Fundamental_flat		
			+0.0	+0.0	+0.0	+0.0					
^	914.904M	90.3	+0.0	-27.3	+23.7	+0.6	+0.0	93.2	94.0	-0.8	Vert
			+5.9	+0.0	+0.0	+0.0			Fundamental_flat		
			+0.0	+0.0	+0.0	+0.0					
3	915.062M	89.2	+0.0	-27.3	+23.7	+0.6	+0.0	92.1	94.0	-1.9	Vert
	QP		+5.9	+0.0	+0.0	+0.0			Fundamental_uprig		
			+0.0	+0.0	+0.0	+0.0			ht		
^	915.062M	89.5	+0.0	-27.3	+23.7	+0.6	+0.0	92.4	94.0	-1.6	Vert
			+5.9	+0.0	+0.0	+0.0			Fundamental_uprig		
			+0.0	+0.0	+0.0	+0.0			ht		
5	914.902M	88.3	+0.0	-27.3	+23.7	+0.6	+0.0	91.2	94.0	-2.8	Horiz
	QP		+5.9	+0.0	+0.0	+0.0			Fundamental_uprig		
			+0.0	+0.0	+0.0	+0.0			ht		
6	1830.100M	60.0	+0.0	+0.0	+0.0	+0.0	+0.0	51.0	54.0	-3.0	Horiz
	Ave		+0.0	+0.0	+24.4	-38.5			Harmonics		
			+0.5	+0.8	+3.5	+0.3					
^	1830.100M	62.1	+0.0	+0.0	+0.0	+0.0	+0.0	53.1	54.0	-0.9	Horiz
			+0.0	+0.0	+24.4	-38.5			Harmonics		
			+0.5	+0.8	+3.5	+0.3					

8	914.899M	86.7	+0.0	-27.3	+23.7	+0.6	+0.0	89.6	94.0	-4.4	Horiz
	QP		+5.9	+0.0	+0.0	+0.0			Fundamental_Flat		
			+0.0	+0.0	+0.0	+0.0					
^	914.902M	88.4	+0.0	-27.3	+23.7	+0.6	+0.0	91.3	94.0	-2.7	Horiz
			+5.9	+0.0	+0.0	+0.0			Fundamental_uprig		
			+0.0	+0.0	+0.0	+0.0			ht		
^	914.899M	87.4	+0.0	-27.3	+23.7	+0.6	+0.0	90.3	94.0	-3.7	Horiz
			+5.9	+0.0	+0.0	+0.0			Fundamental_flat		
			+0.0	+0.0	+0.0	+0.0					
11	1830.017M	58.5	+0.0	+0.0	+0.0	+0.0	+0.0	49.5	54.0	-4.5	Vert
	Ave		+0.0	+0.0	+24.4	-38.5			Harmonics		
			+0.5	+0.8	+3.5	+0.3					
^	1830.017M	60.3	+0.0	+0.0	+0.0	+0.0	+0.0	51.3	54.0	-2.7	Vert
			+0.0	+0.0	+24.4	-38.5			Harmonics		
			+0.5	+0.8	+3.5	+0.3					
13	3660.050M	40.9	+0.0	+0.0	+0.0	+0.0	+0.0	39.1	54.0	-14.9	Vert
			+0.0	+0.0	+28.6	-38.2			Harmonics		
			+0.7	+1.6	+5.2	+0.3					
14	3660.000M	40.2	+0.0	+0.0	+0.0	+0.0	+0.0	38.4	54.0	-15.6	Horiz
			+0.0	+0.0	+28.6	-38.2			Harmonics		
			+0.7	+1.6	+5.2	+0.3					
15	2744.750M	41.3	+0.0	+0.0	+0.0	+0.0	+0.0	35.8	54.0	-18.2	Horiz
			+0.0	+0.0	+26.4	-38.7			Harmonics		
			+0.8	+1.4	+4.4	+0.2					

Date: 5/13/2014 Time: 14:58:57 SmartLabs, Inc. WO#: 95716
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Sequence#: 1 Ext
ATTN: 0 dB



Test Setup Photo(s)





15.215(c) Occupied Bandwidth

Test Conditions / Setup

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

Customer: **SmartLabs, Inc.**

Specification: **-20dB BW**

Work Order #: **95716**

Date: 5/13/2014

Test Type: **Radiated Scan**

Time: 14:58:57

Equipment: **Hub II**

Sequence#: 1

Manufacturer: SmartLabs, Inc.

Tested By: E. Wong

Model: 2245-222

S/N: NA

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	2/6/2013	2/6/2015
T2	AN00309	Preamp	8447D	3/12/2014	3/12/2016
T3	AN01995	Biconilog Antenna	CBL6111C	4/30/2014	4/30/2016
T4	ANP05050	Cable	RG223/U	1/21/2013	1/21/2015
T5	ANP05198	Cable-Amplitude 15 to 45degC (dB)	8268	12/11/2012	12/11/2014

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Hub II*	SmartLabs, Inc.	2245-222	NA

Support Devices:

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

The EUT is placed flat on the Styrofoam platform as intended in normal application. Connected to the EUT is a section of unterminated Ethernet cable. The EUT is set in operational mode, exercising the intended functionalities.

Freq = 915 MHz.

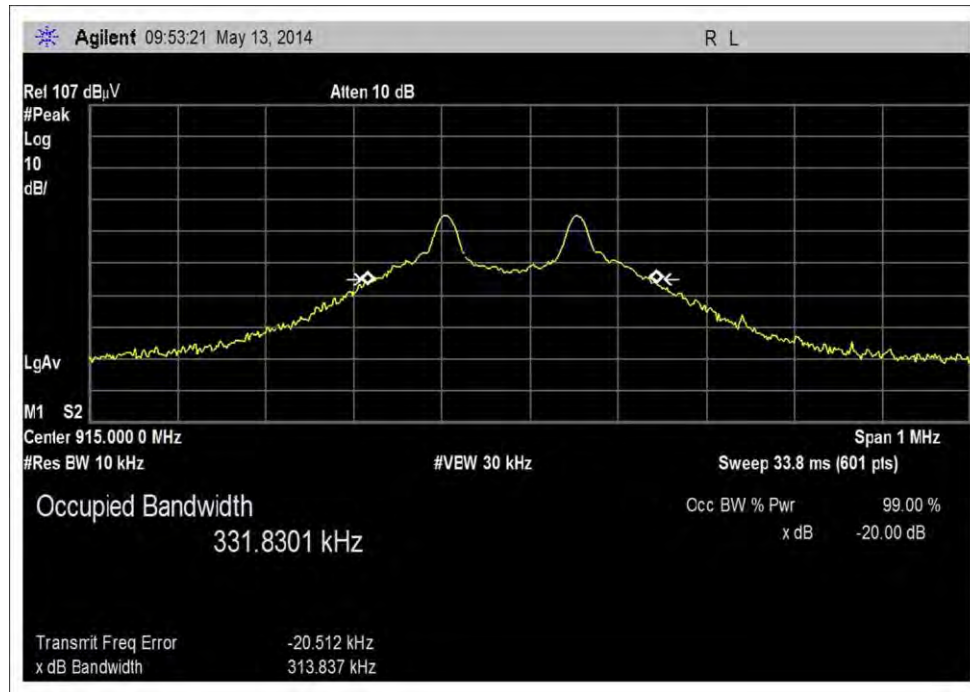
Frequency range of measurement = 9 kHz -10 GHz.

9kHz -150 kHz; RBW=200Hz, VBW=200 Hz; 150kHz-30MHz; RBW=9kHz, 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: 30°C, 22% Relative Humidity, 100kPa

Emission profile with the EUT placed flat and upright was evaluate, worse case emission is with the EUT placed flat on the platform.

Test Data



Test Setup Photo(s)



15.249(b)(d) Field Strength of Spurious Emissions and Bandedge

Test Setup / Data

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

Customer: **SmartLabs, Inc.**

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

Work Order #: **95716**

Date: 5/13/2014

Test Type: **Radiated Scan**

Time: 14:58:57

Equipment: **Hub II**

Sequence#: 1

Manufacturer: SmartLabs, Inc.

Tested By: E. Wong

Model: 2245-222

S/N: NA

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	2/6/2013	2/6/2015
T1	AN00309	Preamp	8447D	3/12/2014	3/12/2016
T2	AN01995	Biconilog Antenna	CBL6111C	4/30/2014	4/30/2016
T3	ANP05050	Cable	RG223/U	1/21/2013	1/21/2015
T4	ANP05198	Cable-Amplitude 15 to 45degC (dB)	8268	12/11/2012	12/11/2014
	AN00314	Loop Antenna	6502	6/29/2012	6/29/2014
T5	AN00849	Horn Antenna	3115	3/18/2014	3/18/2016
T6	AN00786	Preamp	83017A	6/20/2012	6/20/2014
T7	AN02946	Cable	32022-2-2909K-36TC	7/31/2013	7/31/2015
T8	ANP05421	Cable	Sucoflex 104A	1/8/2014	1/8/2016
T9	ANP06661	Cable	LDF1-50	4/15/2014	4/15/2016
T10	AN03169	High Pass Filter	HM1155-11SS	7/30/2013	7/30/2015

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Hub II*	SmartLabs, Inc.	2245-222	NA

Support Devices:

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

The EUT is placed flat on the Styrofoam platform as intended in normal application. Connected to the EUT is a section of unterminated Ethernet cable. The EUT is set in operational mode, exercising the intended functionalities.

Freq = 915MHz.

Frequency range of measurement = 9 kHz -10 GHz.

9kHz -150 kHz; RBW=200Hz, VBW=200 Hz; 150kHz-30MHz; RBW=9kHz, 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: 30°C, 22% Relative Humidity, 100kPa

Emission profile with the EUT placed flat and upright was evaluate, worse case emission is with the EUT placed flat on the platform.

Modification :

1 Grounded 25 MHz crystal.

2 R71 changed to 0 ohm.

3 Reoriented antenna

4 Reduced antenna length

5 Power setting = 42

Ext Attn: 0 dB

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

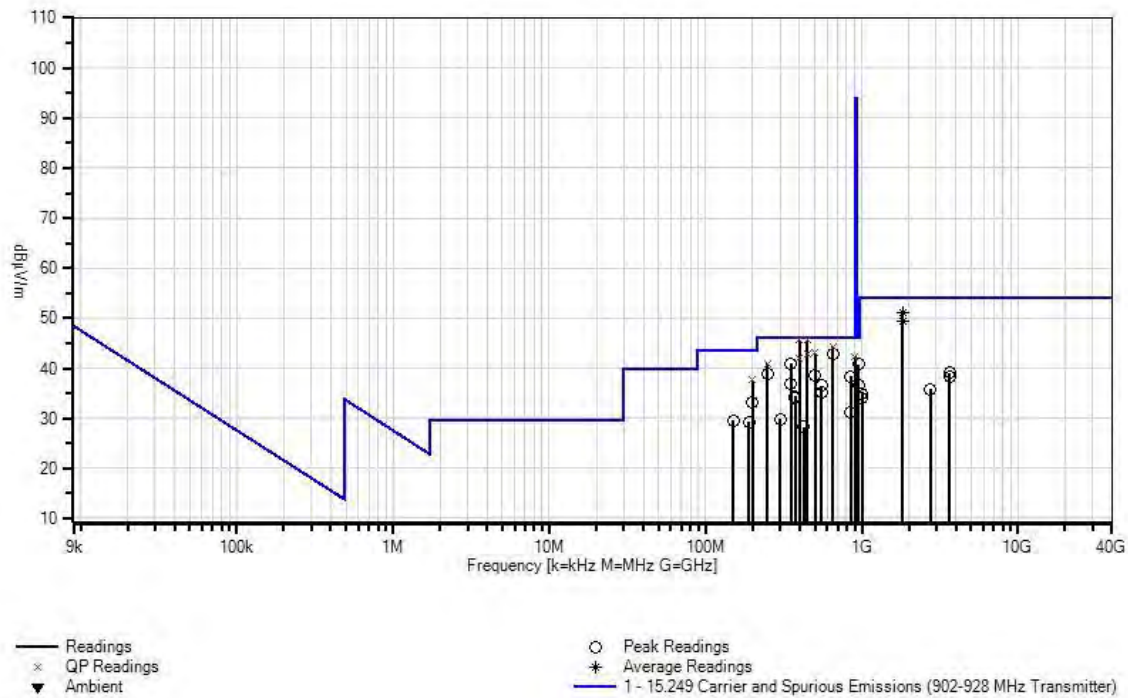
#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	400.013M	53.1	-27.9	+16.4	+0.4	+3.6	+0.0	45.6	46.0	-0.4	Horiz
	QP		+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
^	400.013M	54.5	-27.9	+16.4	+0.4	+3.6	+0.0	47.0	46.0	+1.0	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
3	449.991M	51.9	-27.9	+17.3	+0.4	+3.9	+0.0	45.6	46.0	-0.4	Vert
	QP		+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
^	449.991M	52.4	-27.9	+17.3	+0.4	+3.9	+0.0	46.1	46.0	+0.1	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
5	649.994M	46.0	-27.4	+20.5	+0.5	+4.8	+0.0	44.4	46.0	-1.6	Horiz
	QP		+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
^	649.994M	46.6	-27.4	+20.5	+0.5	+4.8	+0.0	45.0	46.0	-1.0	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
7	499.988M	48.3	-27.8	+18.1	+0.4	+4.1	+0.0	43.1	46.0	-2.9	Vert
	QP		+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
^	499.988M	48.9	-27.8	+18.1	+0.4	+4.1	+0.0	43.7	46.0	-2.3	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							

9	1830.100M Ave	60.0	+0.0 +24.4 +3.5	+0.0 -38.5 +0.3	+0.0 +0.5	+0.0 +0.8	+0.0	51.0	54.0	-3.0	Horiz
^	1830.100M	62.1	+0.0 +24.4 +3.5	+0.0 -38.5 +0.3	+0.0 +0.5	+0.0 +0.8	+0.0	53.1	54.0	-0.9	Horiz
11	449.985M QP	49.1	-27.9 +0.0 +0.0	+17.3 +0.0 +0.0	+0.4 +0.0	+3.9 +0.0	+0.0	42.8	46.0	-3.2	Horiz
^	449.985M	50.0	-27.9 +0.0 +0.0	+17.3 +0.0 +0.0	+0.4 +0.0	+3.9 +0.0	+0.0	43.7	46.0	-2.3	Horiz
13	649.983M	44.4	-27.4 +0.0 +0.0	+20.5 +0.0 +0.0	+0.5 +0.0	+4.8 +0.0	+0.0	42.8	46.0	-3.2	Vert
14	899.976M QP	39.6	-27.3 +0.0 +0.0	+23.6 +0.0 +0.0	+0.6 +0.0	+5.8 +0.0	+0.0	42.3	46.0	-3.7	Horiz
^	899.976M	40.5	-27.3 +0.0 +0.0	+23.6 +0.0 +0.0	+0.6 +0.0	+5.8 +0.0	+0.0	43.2	46.0	-2.8	Horiz
16	400.001M QP	49.4	-27.9 +0.0 +0.0	+16.4 +0.0 +0.0	+0.4 +0.0	+3.6 +0.0	+0.0	41.9	46.0	-4.1	Vert
^	400.001M	51.3	-27.9 +0.0 +0.0	+16.4 +0.0 +0.0	+0.4 +0.0	+3.6 +0.0	+0.0	43.8	46.0	-2.2	Vert
18	1830.017M Ave	58.5	+0.0 +24.4 +3.5	+0.0 -38.5 +0.3	+0.0 +0.5	+0.0 +0.8	+0.0	49.5	54.0	-4.5	Vert
^	1830.017M	60.3	+0.0 +24.4 +3.5	+0.0 -38.5 +0.3	+0.0 +0.5	+0.0 +0.8	+0.0	51.3	54.0	-2.7	Vert
20	250.005M QP	53.2	-28.0 +0.0 +0.0	+12.7 +0.0 +0.0	+0.3 +0.0	+2.8 +0.0	+0.0	41.0	46.0	-5.0	Vert
^	250.004M	54.3	-28.0 +0.0 +0.0	+12.7 +0.0 +0.0	+0.3 +0.0	+2.8 +0.0	+0.0	42.1	46.0	-3.9	Vert
22	350.000M	50.2	-27.9 +0.0 +0.0	+15.0 +0.0 +0.0	+0.3 +0.0	+3.4 +0.0	+0.0	41.0	46.0	-5.0	Horiz
23	949.976M	37.3	-27.3 +0.0 +0.0	+24.1 +0.0 +0.0	+0.7 +0.0	+6.0 +0.0	+0.0	40.8	46.0	-5.2	Horiz
24	199.994M QP	53.9	-28.0 +0.0 +0.0	+9.1 +0.0 +0.0	+0.2 +0.0	+2.5 +0.0	+0.0	37.7	43.5	-5.8	Horiz
^	199.994M	55.6	-28.0 +0.0 +0.0	+9.1 +0.0 +0.0	+0.2 +0.0	+2.5 +0.0	+0.0	39.4	43.5	-4.1	Horiz

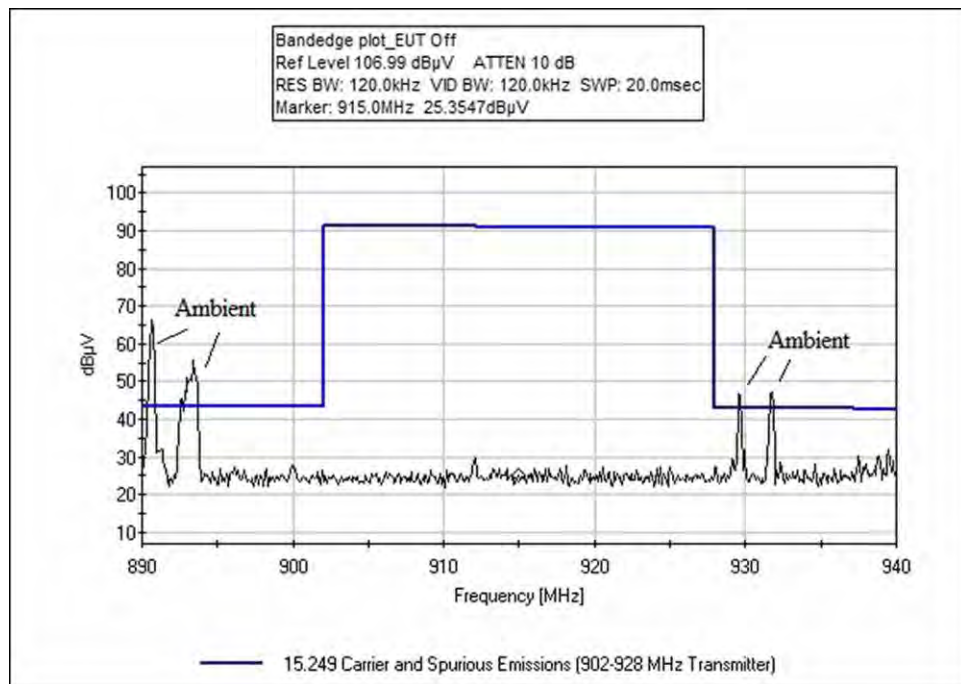
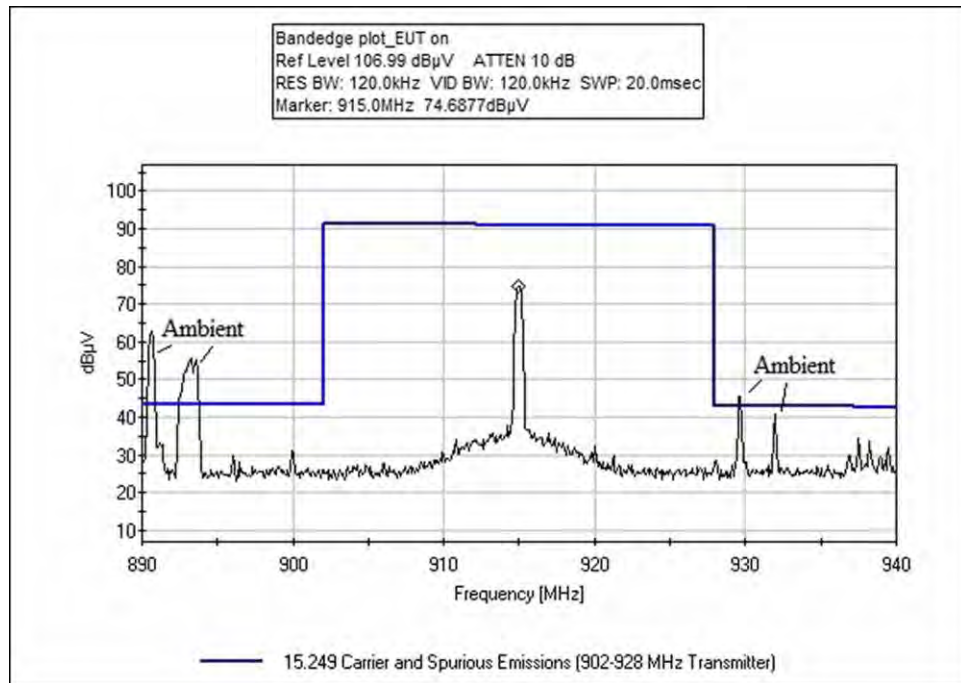
26	249.995M	51.2	-28.0 +0.0 +0.0	+12.7 +0.0 +0.0	+0.3 +0.0 +0.0	+2.8 +0.0 +0.0	+0.0	39.0	46.0	-7.0	Horiz
27	500.009M	43.7	-27.8 +0.0 +0.0	+18.1 +0.0 +0.0	+0.4 +0.0 +0.0	+4.1 +0.0 +0.0	+0.0	38.5	46.0	-7.5	Horiz
28	849.990M	36.1	-27.2 +0.0 +0.0	+23.2 +0.0 +0.0	+0.7 +0.0 +0.0	+5.6 +0.0 +0.0	+0.0	38.4	46.0	-7.6	Vert
29	350.003M	46.2	-27.9 +0.0 +0.0	+15.0 +0.0 +0.0	+0.3 +0.0 +0.0	+3.4 +0.0 +0.0	+0.0	37.0	46.0	-9.0	Vert
30	949.970M	33.2	-27.3 +0.0 +0.0	+24.1 +0.0 +0.0	+0.7 +0.0 +0.0	+6.0 +0.0 +0.0	+0.0	36.7	46.0	-9.3	Vert
31	550.002M	40.4	-27.7 +0.0 +0.0	+19.0 +0.0 +0.0	+0.4 +0.0 +0.0	+4.4 +0.0 +0.0	+0.0	36.5	46.0	-9.5	Horiz
32	200.022M	49.5	-28.0 +0.0 +0.0	+9.1 +0.0 +0.0	+0.2 +0.0 +0.0	+2.5 +0.0 +0.0	+0.0	33.3	43.5	-10.2	Vert
33	549.987M	39.1	-27.7 +0.0 +0.0	+19.0 +0.0 +0.0	+0.4 +0.0 +0.0	+4.4 +0.0 +0.0	+0.0	35.2	46.0	-10.8	Vert
34	374.970M	42.7	-27.9 +0.0 +0.0	+15.7 +0.0 +0.0	+0.4 +0.0 +0.0	+3.5 +0.0 +0.0	+0.0	34.4	46.0	-11.6	Vert
35	375.033M	42.2	-27.9 +0.0 +0.0	+15.7 +0.0 +0.0	+0.4 +0.0 +0.0	+3.5 +0.0 +0.0	+0.0	33.9	46.0	-12.1	Horiz
36	149.996M	44.3	-28.0 +0.0 +0.0	+11.0 +0.0 +0.0	+0.2 +0.0 +0.0	+2.1 +0.0 +0.0	+0.0	29.6	43.5	-13.9	Vert
37	189.998M	45.5	-28.0 +0.0 +0.0	+9.1 +0.0 +0.0	+0.2 +0.0 +0.0	+2.4 +0.0 +0.0	+0.0	29.2	43.5	-14.3	Horiz
38	849.980M	29.0	-27.2 +0.0 +0.0	+23.2 +0.0 +0.0	+0.7 +0.0 +0.0	+5.6 +0.0 +0.0	+0.0	31.3	46.0	-14.7	Horiz
39	3660.050M	40.9	+0.0 +28.6 +5.2	+0.0 -38.2 +0.3	+0.0 +0.7 +0.0	+0.0 +1.6 +0.0	+0.0	39.1	54.0	-14.9	Vert
40	3660.000M	40.2	+0.0 +28.6 +5.2	+0.0 -38.2 +0.3	+0.0 +0.7 +0.0	+0.0 +1.6 +0.0	+0.0	38.4	54.0	-15.6	Horiz
41	299.992M	41.0	-27.9 +0.0 +0.0	+13.4 +0.0 +0.0	+0.3 +0.0 +0.0	+3.1 +0.0 +0.0	+0.0	29.9	46.0	-16.1	Horiz
42	424.979M	35.1	-27.9 +0.0 +0.0	+16.9 +0.0 +0.0	+0.4 +0.0 +0.0	+3.8 +0.0 +0.0	+0.0	28.3	46.0	-17.7	Horiz

43	2744.750M	41.3	+0.0 +26.4 +4.4	+0.0 -38.7 +0.2	+0.0 +0.8	+0.0 +1.4	+0.0	35.8	54.0	-18.2	Horiz
44	999.963M	31.0	-27.5 +0.0 +0.0	+24.5 +0.0 +0.0	+0.6 +0.0	+6.3 +0.0	+0.0	34.9	54.0	-19.1	Vert
45	999.956M	30.1	-27.5 +0.0 +0.0	+24.5 +0.0 +0.0	+0.6 +0.0	+6.3 +0.0	+0.0	34.0	54.0	-20.0	Horiz

Date: 5/13/2014 Time: 14:58:57 SmartLabs, Inc. WO#: 95716
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Sequence#: 1 Ext
ATTN: 0 dB



Bandedge



Test Setup Photo(s)



SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

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 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.

SAMPLE CALCULATIONS		
	Meter reading	(dBμV)
+	Antenna Factor	(dB)
+	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 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.