SynapSense Corporation

ADDENDUM TEST REPORT TO 92868-9A

Wireless Damper Controller, 0883

Tested To The Following Standards:

FCC Part 15 Subpart C Sections 15.207, 15.209, 15.247
and
RSS 210 Issue 8

Report No.: 92868-9B

Date of issue: July 25, 2012

ACCREDITED
Testing Certificates:
803.01, 803.02, 803.05, 803.06

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

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

Testing the Future
CKC LABORATORIES, INC.

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Test Report Information

REPORT PREPARED FOR:

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Folsom, CA 95630

Representative: Michele Clemente
Customer Reference Number: 10440

REPORT PREPARED BY:

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5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 92868

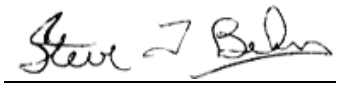
DATE OF EQUIPMENT RECEIPT: May 9,2012
DATE(S) OF TESTING: May 9-30,2012

Revision History

Original: Testing of the Wireless Damper Controller, 0883 to FCC Part 15 Subpart C Sections 15.207, 15.209, 15.247 and RSS-210 issue 8.
Addendum A: To correct an error in the test condition in section 15.209 with regards to the height the EUT was above the ground plane, change the test conditions in 15.247(e) and replace the Bandedge section with revised information.
Addendum B: To correct an error in the PSD test results.

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Site Registration & Accreditation Information

Location	CB #	Taiwan	Canada	FCC	Japan
Mariposa A	US0103	SL2-IN-E-1147R	3082A-2	90477	R-563 C-578 T-1492 G-87

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C 15.207, 15.247 and RSS 210 Issue 8

Description	Test Procedure/Method	Results
Conducted Emissions	FCC Part 15 Subpart C Section 15.207 / ANSI C63.4 (2003)	Pass
Radiated Emissions	FCC Part 15 Subpart C Section 15.209/ ANSI C63.4 (2003)	Pass
RF Power Output	FCC Part 15 Subpart C Section 15.247(b)(3) / 558074 DO1 DTS Meas Guidance V01	Pass
-6dBc Occupied Bandwidth	FCC Part 15 Subpart C Section 15.247(a)(2) / 558074 DO1 DTS Meas Guidance V01	Pass
Bandedge	FCC Part 15 Subpart C / ITU-R 55/1 558074 DO1 DTS Meas Guidance V01	Pass
Power Spectral Density	FCC Part 15 Subpart C 15.247(e) / 558074 DO1 DTS Meas Guidance V01	Pass
Radiated Spurious Emissions	FCC Part 15 Subpart C Section 15.247(d) / 558074 DO1 DTS Meas Guidance V01	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
The following modifications were made during testing: Constant load instead of cycling load on one LED. 1 1uF cap on pin 1 and U5. Wurth ferrite #742 792 42 was added on the positive power supply line at input. 4 turns of the input power (Wurth ferrite #74270103) was added. 1000pF cap across pins of input connector. Shielded IO cable added with its shield tied to logic ground on input connector.

EQUIPMENT UNDER TEST (EUT)

EQUIPMENT UNDER TEST

Wireless Damper Controller
Manuf: SynapSense Corporation
Model: 0883
Serial: 001

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

Simulator
Manuf: SynapSense Corporation
Model: Belimo
Serial: NA

AC Step Down Transformer
Manuf: NA
Model: DP-24-6-24
Serial: NA

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.

15.207 AC Conducted Emissions

Test Data Sheets

Test Location: CKC Laboratories • 5046 Sierra Pines Dr. • Mariposa, CA 95338 • (209) 966-5240

Customer: **SynapSense Corporation**
Specification: **15.207 AC Mains - Average**
Work Order #: **92868** Date: 5/23/2012
Test Type: **Conducted Emissions** Time: 01:35:44
Equipment: **Wireless Damper Control** Sequence#: 11
Manufacturer: SynapSense Corporation Tested By: Chuck Kendall
Model: 0883 120V 60Hz
S/N: 001

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	11/3/2011	11/3/2013
T1	ANP00082	Attenuator	PE7002-10	6/7/2011	6/7/2013
T2	AN02608	High Pass Filter	HE9615-150K-50-720B	3/15/2012	3/15/2014
T3	ANMA10M	Cable		5/10/2011	5/10/2013
T4	AN00374	50uH LISN-Black Lead Amplitude (dB)	8028-TS-50-BNC	10/31/2011	10/31/2013
	AN00374	50uH LISN-White Lead Amplitude (dB)	8028-TS-50-BNC	10/31/2011	10/31/2013

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

Function	Manufacturer	Model #	S/N
Wireless Damper Control*	SynapSense Corporation	0883	001

Support Devices:

Function	Manufacturer	Model #	S/N
Simulator	SynapSense Corporation	Belimo	NA
AC step down transformer	NA	DP-24-6-24	NA

Test Conditions / Notes:

Orientated in wall mounted position as intended, the EUT is placed on the wooden table lined with Styrofoam.
The I/O cables and AC/DC power cables are routed as designed.

Frequency Range Investigated: 150kHz-30MHz
CISPR Bandwidths used during testing.
Temperature: 22.9°C
Humidity: 38%
Atmospheric Pressure: 97.4 kPa

The EUT is in Xmit Mode at the highest frequency-2480MHz

Antenna gain=0dBi
Modulation: O-QPSK
Protocol: Zigbee (802.15)
Freq: 2400-2483.5MHz

Modifications:
Constant load instead of cycling load on one LED.
1 1uF cap on pin 1 and U5
Added Wurth ferrite #742 792 42 on the positive power supply line at input
Added 4 turns of the input power (Wurth ferrite #74270103).
1000pF cap across pins of input connector

Clocks: 32.768 kHz
Internal RC Osc 14.00 MHz

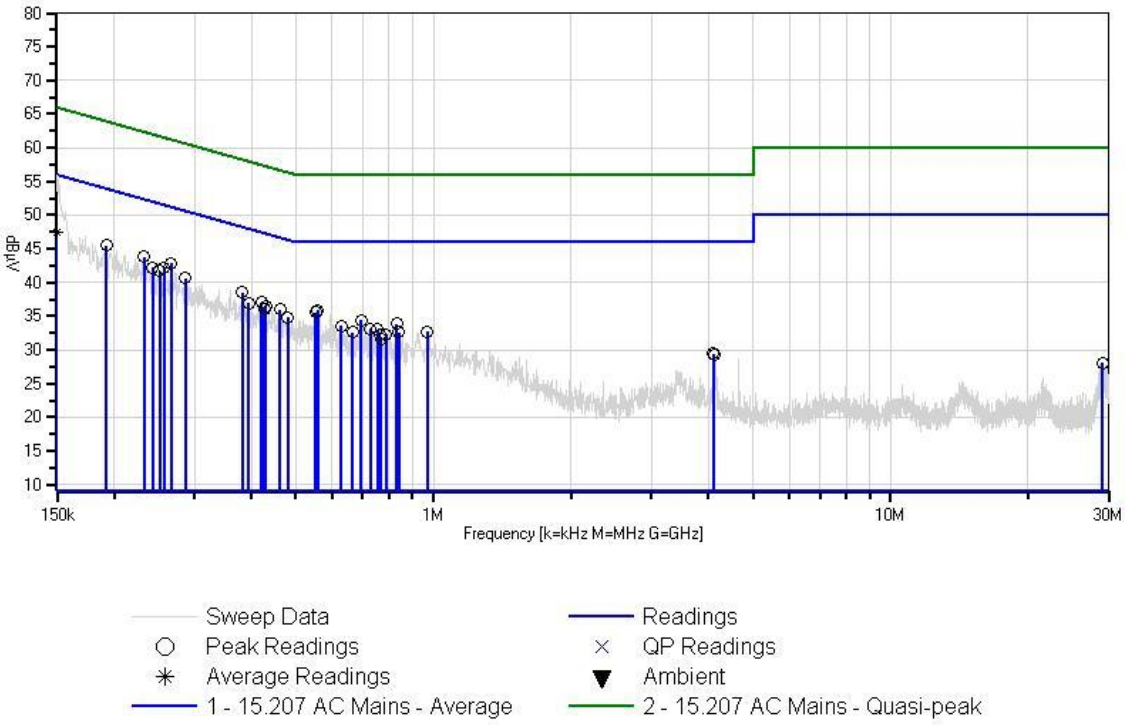
Ext Attn: 0 dB

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	266.353k	27.9	+10.0	+0.2	+0.2	+4.6	+0.0	42.9	51.2	-8.3	Black
2	192.178k	30.4	+10.0	+0.3	+0.1	+4.7	+0.0	45.5	53.9	-8.4	Black
3	232.901k	28.7	+10.0	+0.2	+0.2	+4.7	+0.0	43.8	52.3	-8.5	Black
4 Ave	150.000k	24.0	+10.0	+8.5	+0.1	+4.9	+0.0	47.5	56.0	-8.5	Black
^	150.000k	32.4	+10.0	+8.5	+0.1	+4.9	+0.0	55.9	56.0	-0.1	Black
6	256.899k	27.2	+10.0	+0.2	+0.2	+4.6	+0.0	42.2	51.5	-9.3	Black
7	381.979k	23.8	+10.0	+0.1	+0.2	+4.4	+0.0	38.5	48.2	-9.7	Black
8	243.082k	27.2	+10.0	+0.2	+0.2	+4.6	+0.0	42.2	52.0	-9.8	Black
9	251.809k	26.7	+10.0	+0.2	+0.2	+4.6	+0.0	41.7	51.7	-10.0	Black
10	285.988k	25.7	+10.0	+0.1	+0.2	+4.6	+0.0	40.6	50.6	-10.0	Black
11	557.963k	21.2	+10.0	+0.2	+0.2	+4.3	+0.0	35.9	46.0	-10.1	Black

12	420.521k	22.3	+10.0	+0.1	+0.2	+4.4	+0.0	37.0	47.4	-10.4	Black
13	552.145k	20.9	+10.0	+0.2	+0.2	+4.3	+0.0	35.6	46.0	-10.4	Black
14	461.244k	21.2	+10.0	+0.2	+0.2	+4.4	+0.0	36.0	46.7	-10.7	Black
15	429.974k	21.8	+10.0	+0.1	+0.2	+4.4	+0.0	36.5	47.3	-10.8	Black
16	394.341k	22.2	+10.0	+0.1	+0.2	+4.4	+0.0	36.9	48.0	-11.1	Black
17	426.338k	21.4	+10.0	+0.1	+0.2	+4.4	+0.0	36.1	47.3	-11.2	Black
18	480.152k	20.0	+10.0	+0.2	+0.2	+4.4	+0.0	34.8	46.3	-11.5	Black
19	695.404k	19.8	+10.0	+0.2	+0.2	+4.2	+0.0	34.4	46.0	-11.6	Black
20	829.938k	19.4	+10.0	+0.2	+0.2	+4.1	+0.0	33.9	46.0	-12.1	Black
21	628.502k	19.0	+10.0	+0.2	+0.2	+4.2	+0.0	33.6	46.0	-12.4	Black
22	728.129k	18.5	+10.0	+0.2	+0.2	+4.2	+0.0	33.1	46.0	-12.9	Black
23	752.854k	18.4	+10.0	+0.2	+0.2	+4.2	+0.0	33.0	46.0	-13.0	Black
24	970.765k	18.3	+10.0	+0.2	+0.2	+4.0	+0.0	32.7	46.0	-13.3	Black
25	664.135k	18.0	+10.0	+0.2	+0.2	+4.2	+0.0	32.6	46.0	-13.4	Black
26	839.391k	18.1	+10.0	+0.2	+0.2	+4.1	+0.0	32.6	46.0	-13.4	Black
27	788.487k	17.8	+10.0	+0.2	+0.2	+4.1	+0.0	32.3	46.0	-13.7	Black
28	762.307k	17.6	+10.0	+0.2	+0.2	+4.2	+0.0	32.2	46.0	-13.8	Black
29	767.398k	17.2	+10.0	+0.2	+0.2	+4.1	+0.0	31.7	46.0	-14.3	Black
30	4.101M	18.7	+10.0	+0.1	+0.5	+0.1	+0.0	29.4	46.0	-16.6	Black
31	4.109M	18.6	+10.0	+0.1	+0.5	+0.1	+0.0	29.3	46.0	-16.7	Black
32	29.102M	16.5	+10.1	+0.2	+1.1	+0.1	+0.0	28.0	50.0	-22.0	White

CKC Laboratories Date: 5/23/2012 Time: 01:35:44 SynapSense Corporation WO#: 92868
15.207 AC Mains - Average Test Lead: Black 120V 60Hz Sequence#: 11 Ext ATTN: 0 dB



Test Location: CKC Laboratories • 5046 Sierra Pines Dr. • Mariposa, CA 95338 • (209) 966-5240

Customer: **SynapSense Corporation**
Specification: **15.207 AC Mains - Average**
Work Order #: **92868** Date: 5/9/2012
Test Type: **Conducted Emissions** Time: 2:14:22 PM
Equipment: **Wireless Damper Control** Sequence#: 12
Manufacturer: SynapSense Corporation Tested By: Chuck Kendall
Model: 0883 120V 60Hz
S/N: 001

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	11/3/2011	11/3/2013
T1	ANP00082	Attenuator	PE7002-10	6/7/2011	6/7/2013
T2	AN02608	High Pass Filter	HE9615-150K-50-720B	3/15/2012	3/15/2014
T3	ANMA10M	Cable		5/10/2011	5/10/2013
	AN00374	50uH LISN-Black Lead Amplitude (dB)	8028-TS-50-BNC	10/31/2011	10/31/2013
T4	AN00374	50uH LISN-White Lead Amplitude (dB)	8028-TS-50-BNC	10/31/2011	10/31/2013

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

Function	Manufacturer	Model #	S/N
Wireless Damper Control*	SynapSense Corporation	0883	001

Support Devices:

Function	Manufacturer	Model #	S/N
Simulator	SynapSense Corporation	Belimo	NA
AC step down transformer	NA	DP-24-6-24	NA

Test Conditions / Notes:

Orientated in wall mounted position as intended, the EUT is placed on the wooden table lined with Styrofoam.
The I/O cables and AC/DC power cables are routed in conduits as designed.
Frequency Range investigated: 150 kHz to 30 MHz
CISPR Bandwidths used during testing.
Temperature: 22.9°C
Humidity: 38%
Atmospheric Pressure: 97.4 kPa
The EUT is in Xmit Mode at the highest frequency-2480MHz
Antenna gain=0dBi
Modulation: O-QPSK
Protocol: Zigbee (802.15)
Freq: 2400-2483.5MHz
Modification:
Constant load instead of cycling load on one LED.
Removed support transformer
1 1uF cap on pin 1 and U5, Wrapped AC lines with foil to simulate rigid conduit, Added Wurth ferrite #742 792 42 on the positive power supply line at input, Added 4 turns of the input power (Wurth ferrite #74270103).
1000pF cap across pins of input connector
Clocks: 32.768 kHz
Internal RC Osc 14.00 MHz

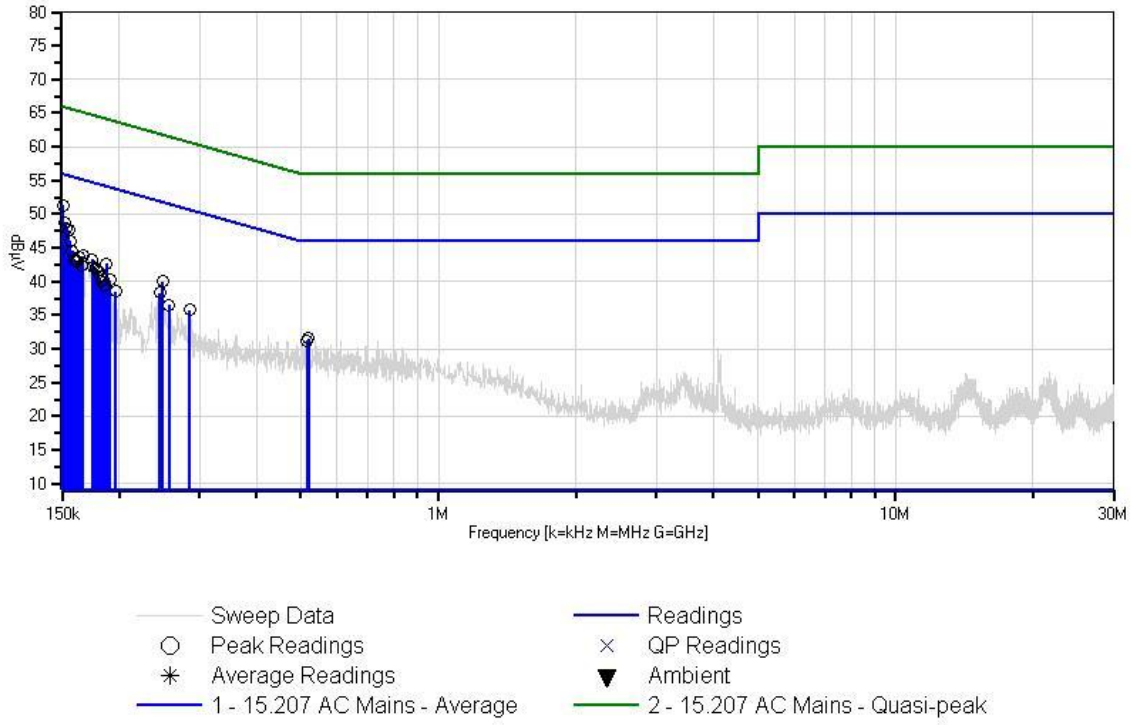
Ext Attn: 0 dB

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	150.727k	28.5	+10.0	+7.9	+0.1	+4.8	+0.0	51.3	56.0	-4.7	White
2	152.182k	27.1	+10.0	+6.7	+0.1	+4.8	+0.0	48.7	55.9	-7.2	White
3	153.636k	27.5	+10.0	+5.5	+0.1	+4.8	+0.0	47.9	55.8	-7.9	White
4	155.090k	28.4	+10.0	+4.3	+0.1	+4.8	+0.0	47.6	55.7	-8.1	White
5	156.545k	28.0	+10.0	+3.1	+0.1	+4.8	+0.0	46.0	55.6	-9.6	White
6	157.999k	27.8	+10.0	+1.9	+0.1	+4.8	+0.0	44.6	55.6	-11.0	White
7	166.726k	28.5	+10.0	+0.4	+0.1	+4.8	+0.0	43.8	55.1	-11.3	White
8	174.725k	28.0	+10.0	+0.4	+0.1	+4.8	+0.0	43.3	54.7	-11.4	White
9	187.815k	27.5	+10.0	+0.3	+0.1	+4.7	+0.0	42.6	54.1	-11.5	White
10	163.817k	28.4	+10.0	+0.4	+0.1	+4.8	+0.0	43.7	55.3	-11.6	White
11	248.900k	25.0	+10.0	+0.2	+0.2	+4.6	+0.0	40.0	51.8	-11.8	White
12	159.454k	27.6	+10.0	+0.8	+0.1	+4.8	+0.0	43.3	55.5	-12.2	White
13	162.363k	27.8	+10.0	+0.4	+0.1	+4.8	+0.0	43.1	55.3	-12.2	White
14	160.908k	27.8	+10.0	+0.4	+0.1	+4.8	+0.0	43.1	55.4	-12.3	White
15	176.179k	26.9	+10.0	+0.4	+0.1	+4.8	+0.0	42.2	54.7	-12.5	White
16	177.634k	26.7	+10.0	+0.4	+0.1	+4.7	+0.0	41.9	54.6	-12.7	White
17	165.271k	27.1	+10.0	+0.4	+0.1	+4.8	+0.0	42.4	55.2	-12.8	White
18	179.088k	26.4	+10.0	+0.3	+0.1	+4.7	+0.0	41.5	54.5	-13.0	White
19	180.543k	26.2	+10.0	+0.3	+0.1	+4.7	+0.0	41.3	54.5	-13.2	White
20	245.264k	23.3	+10.0	+0.2	+0.2	+4.6	+0.0	38.3	51.9	-13.6	White
21	181.997k	25.5	+10.0	+0.3	+0.1	+4.7	+0.0	40.6	54.4	-13.8	White
22	190.724k	25.1	+10.0	+0.3	+0.1	+4.7	+0.0	40.2	54.0	-13.8	White
23	184.906k	25.1	+10.0	+0.3	+0.1	+4.7	+0.0	40.2	54.3	-14.1	White
24	183.451k	25.0	+10.0	+0.3	+0.1	+4.7	+0.0	40.1	54.3	-14.2	White

25	520.148k	16.9	+10.0	+0.2	+0.2	+4.3	+0.0	31.6	46.0	-14.4	White
26	186.360k	24.3	+10.0	+0.3	+0.1	+4.7	+0.0	39.4	54.2	-14.8	White
27	516.512k	16.5	+10.0	+0.2	+0.2	+4.3	+0.0	31.2	46.0	-14.8	White
28	285.260k	20.9	+10.0	+0.1	+0.2	+4.6	+0.0	35.8	50.7	-14.9	White
29	256.899k	21.5	+10.0	+0.2	+0.2	+4.6	+0.0	36.5	51.5	-15.0	White
30	196.541k	23.5	+10.0	+0.2	+0.1	+4.7	+0.0	38.5	53.8	-15.3	White

CKC Laboratories Date: 5/9/2012 Time: 2:14:22 PM SynapSense Corporation WO#: 92868
15.207 AC Mains - Average Test Lead: White 120V 60Hz Sequence#: 12 Ext ATTN: 0 dB



Test Setup Photos

15.209 Radiated Emissions

Test Data Sheets

Test Location: CKC Laboratories • 5046 Sierra Pines Dr. • Mariposa, CA 95338 • (209) 966-5240

Customer: **SynapSense Corporation**
Specification: **15.209 Radiated Emissions**
Work Order #: **92868** Date: 5/23/2012
Test Type: **Maximized Emissions** Time: 07:39:50
Equipment: **Wireless Damper Control** Sequence#: 1
Manufacturer: SynapSense Corporation Tested By: Chuck Kendall
Model: 0883
S/N: 001

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01991	Biconilog Antenna	CBL6111C	3/14/2012	3/14/2014
T2	AN00099	Preamp	8447D	3/9/2011	3/9/2013
T3	ANP05904	Cable	32022-2-29094K-144TC	6/22/2011	6/22/2013
T4	ANP01403	Cable	58758-23	6/22/2011	6/22/2013
	AN02660	Spectrum Analyzer	E4446A	11/3/2011	11/3/2013
T5	AN03012	Cable	32022-2-29094K-36TC	2/28/2012	2/28/2014
T6	AN03155	Preamp	83017A	8/3/2011	8/3/2013
T7	AN00327	Horn Antenna	3115	4/13/2012	4/13/2014
	AN00226	Loop Antenna	6502	3/28/2012	3/28/2014
	ANP05686	Cable	RG214/U	No Cal Required	No Cal Required

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

Function	Manufacturer	Model #	S/N
Wireless Damper Control*	SynapSense Corporation	0883	001

Support Devices:

Function	Manufacturer	Model #	S/N
Simulator	SynapSense Corporation	Belimo	NA

Test Conditions / Notes:

Orientated in wall mounted position as intended, the EUT is placed on the wooden table lined with Styrofoam for a total height of 80cm above the ground plane. The I/O cables and AC/DC power cables are routed as designed. I/O cable is terminated into a simulated load.
The EUT is set in constant transmit mode at the rated power.
The Support AC step-down transformer is located on a lower shelf of the Styrofoam. .
Antenna gain=0dBi
Modulation: O-QPSK
Protocol: Zigbee (802.15)
Freq: 2400-2483.5MHz
Freq: 2405MHz, 2445MHz, 2480MHz

Frequency range of measurement = 9 kHz- 26 GHz.
CISPR bandwidths were used during testing.

Test environment conditions:
Temperature = 20.2°C
Relative humidity = 35%
Pressure = 97.5kPa

Modifications:
Constant load instead of cycling load on one LED.
1 1uF cap on pin 1 and U5
Added Wurth ferrite #742 792 42 on the positive power supply line at input
Added 4 turns of the input power (Wurth ferrite #74270103) adjacent to the PCB.
1000pF cap across pins of input connector
Shielded IO cable added with its shield tied to logic ground on input connector.

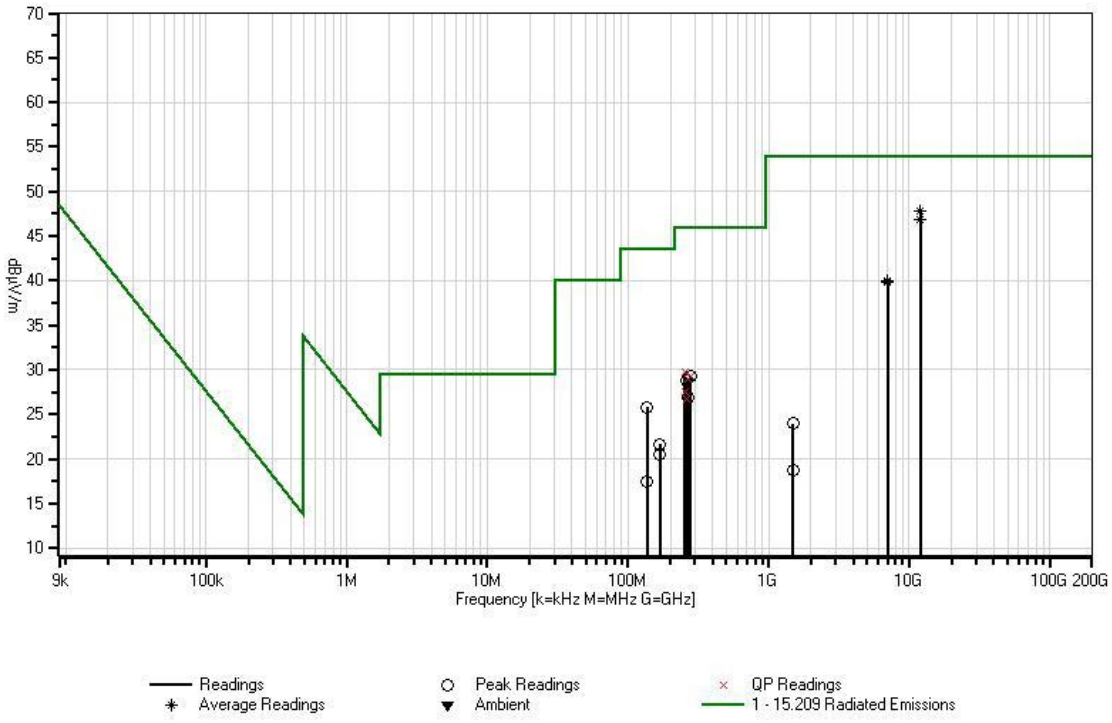
Ext Attn: 0 dB

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

#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	12000.000 M Ave	25.6	+0.0 +1.9	+0.0 -30.3	+4.9 +39.0	+6.7	+0.0	47.8	54.0	-6.2	Vert
^	12000.000 M	37.1	+0.0 +1.9	+0.0 -30.3	+4.9 +39.0	+6.7	+0.0	59.3	54.0	+5.3	Vert
3	12000.000 M Ave	24.7	+0.0 +1.9	+0.0 -30.3	+4.9 +39.0	+6.7	+0.0	46.9	54.0	-7.1	Horiz
^	12000.000 M	31.7	+0.0 +1.9	+0.0 -30.3	+4.9 +39.0	+6.7	+0.0	53.9	54.0	-0.1	Horiz
5	7010.000M Ave	26.5	+0.0 +1.3	+0.0 -29.3	+2.8 +34.1	+4.5	+0.0	39.9	54.0	-14.1	Vert
^	7010.000M	41.7	+0.0 +1.3	+0.0 -29.3	+2.8 +34.1	+4.5	+0.0	55.1	54.0	+1.1	Vert
7	7009.994M Ave	26.4	+0.0 +1.3	+0.0 -29.3	+2.8 +34.1	+4.5	+0.0	39.8	54.0	-14.2	Horiz
^	7009.994M	39.2	+0.0 +1.3	+0.0 -29.3	+2.8 +34.1	+4.5	+0.0	52.6	54.0	-1.4	Horiz

9	253.964M	41.8	+12.4	-26.0	+0.8	+0.7	+0.0	29.7	46.0	-16.3	Vert
	QP		+0.0	+0.0	+0.0						
^	253.964M	42.7	+12.4	-26.0	+0.8	+0.7	+0.0	30.6	46.0	-15.4	Vert
			+0.0	+0.0	+0.0						
11	279.987M	41.3	+12.7	-26.3	+0.9	+0.7	+0.0	29.3	46.0	-16.7	Horiz
			+0.0	+0.0	+0.0						
12	279.995M	41.3	+12.7	-26.3	+0.9	+0.7	+0.0	29.3	46.0	-16.7	Vert
	QP		+0.0	+0.0	+0.0						
^	279.999M	42.3	+12.7	-26.3	+0.9	+0.7	+0.0	30.3	46.0	-15.7	Vert
			+0.0	+0.0	+0.0						
14	264.400M	41.0	+12.5	-26.1	+0.8	+0.7	+0.0	28.9	46.0	-17.1	Vert
	QP		+0.0	+0.0	+0.0						
^	264.400M	43.1	+12.5	-26.1	+0.8	+0.7	+0.0	31.0	46.0	-15.0	Vert
			+0.0	+0.0	+0.0						
16	262.053M	40.9	+12.5	-26.1	+0.8	+0.7	+0.0	28.8	46.0	-17.2	Horiz
			+0.0	+0.0	+0.0						
17	137.450M	39.5	+12.0	-26.8	+0.6	+0.5	+0.0	25.8	43.5	-17.7	Vert
			+0.0	+0.0	+0.0						
18	253.857M	39.7	+12.4	-26.0	+0.8	+0.7	+0.0	27.6	46.0	-18.4	Horiz
	QP		+0.0	+0.0	+0.0						
^	253.864M	42.1	+12.4	-26.0	+0.8	+0.7	+0.0	30.0	46.0	-16.0	Horiz
			+0.0	+0.0	+0.0						
20	264.300M	39.0	+12.5	-26.1	+0.8	+0.7	+0.0	26.9	46.0	-19.1	Horiz
			+0.0	+0.0	+0.0						
21	262.204M	38.8	+12.5	-26.1	+0.8	+0.7	+0.0	26.7	46.0	-19.3	Vert
	QP		+0.0	+0.0	+0.0						
^	262.200M	43.9	+12.5	-26.1	+0.8	+0.7	+0.0	31.8	46.0	-14.2	Vert
			+0.0	+0.0	+0.0						
23	167.789M	37.4	+9.9	-26.8	+0.6	+0.5	+0.0	21.6	43.5	-21.9	Horiz
			+0.0	+0.0	+0.0						
24	167.999M	36.2	+9.9	-26.8	+0.6	+0.5	+0.0	20.4	43.5	-23.1	Vert
			+0.0	+0.0	+0.0						
25	137.188M	31.2	+12.0	-26.8	+0.6	+0.5	+0.0	17.5	43.5	-26.0	Horiz
			+0.0	+0.0	+0.0						
26	1485.200M	26.4	+0.0	+0.0	+2.7	+2.0	+0.0	24.0	54.0	-30.0	Horiz
			+0.5	-30.9	+23.3						
27	1485.700M	21.2	+0.0	+0.0	+2.7	+2.0	+0.0	18.7	54.0	-35.3	Vert
			+0.5	-30.9	+23.2						

CKC Laboratories Date: 5/23/2012 Time: 07:39:50 SynapSense Corporation WO#: 92868
15.209 Radiated Emissions Test Distance: 3 Meters Sequence#: 1 Ext ATTN: 0 dB



Test Setup Photos

LOW

MID

HIGH

15.247 RF Power Output

Test Conditions / Setup

Orientated in wall mounted position as intended, the EUT is placed on the wooden table lined with Styrofoam of 10 cm thickness. The I/O cables and AC/DC power cables are routed s as designed. Shielded I/O cable is terminated into a simulator. The EUT is set in constant transmit mode at the rated power. The Support AC step-down transformer is being used to provide the 24VAC.
Antenna gain=0dBi
Modulation: O-QPSK
Protocol: Zigbee (802.15)
Freq: 2400-2483.5MHz

Freq:	Power
2405MHz,	6.34dBm, 0.0043W
2445MHz	6.64dBm, 0.0046W
2480MHz	5.94dBm, 0.0039W

Power measurement was performed in accordance with 558074 D01 DTS Meas Guidance v01,
5.2.1.1 Measurement procedure PK1
Antenna gain =0dBi., linear gain =1
P=(ED)2/30G or P= E + 20log(d) - 104.8 or P= Corrected Reading + 9.54 - 104.8
Input power was varied In accordance with 15.31(e)

Modifications:
Constant load instead of cycling load on one LED.
1 1uF cap on pin 1 and U5
Added Wurth ferrite #742 792 42 on the positive power supply line at input
Added 4 turns of the input power (Wurth ferrite #74270103) adjacent to the PCB.
1000pF cap across pins of input connector
Shielded IO cable added with its shield tied to logic ground on input connector.

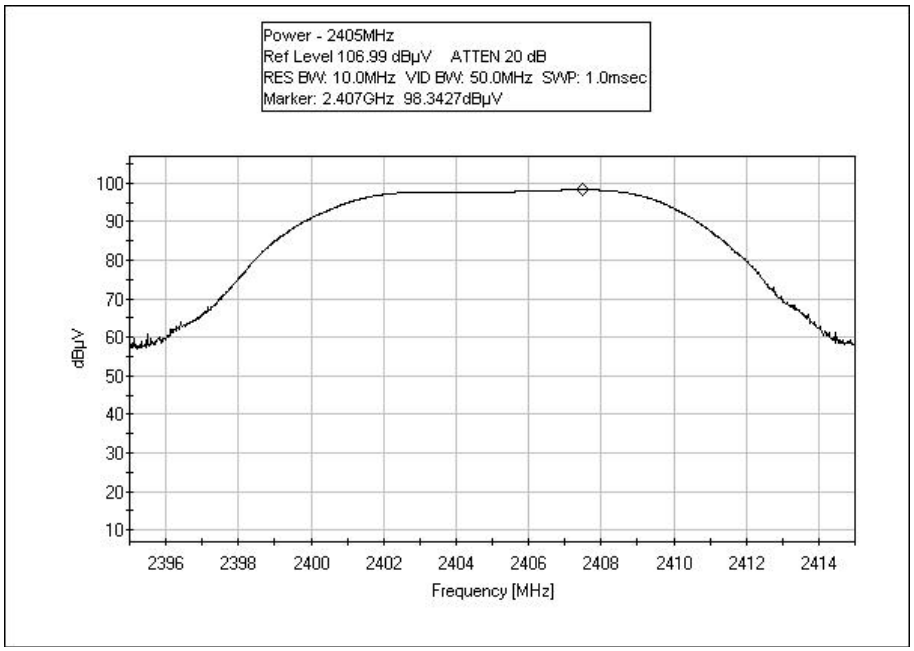
Environmental Conditions:
Temperature = 20.2°C
Relative Humidity = 35%
Pressure = 97.6 kPa

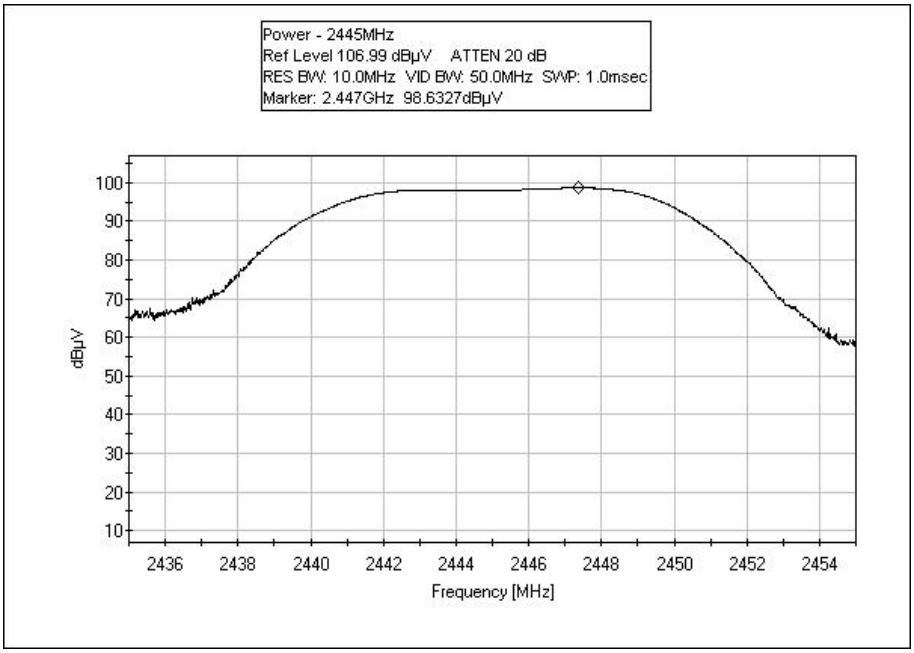
Engineer Name: Chuck Kendall

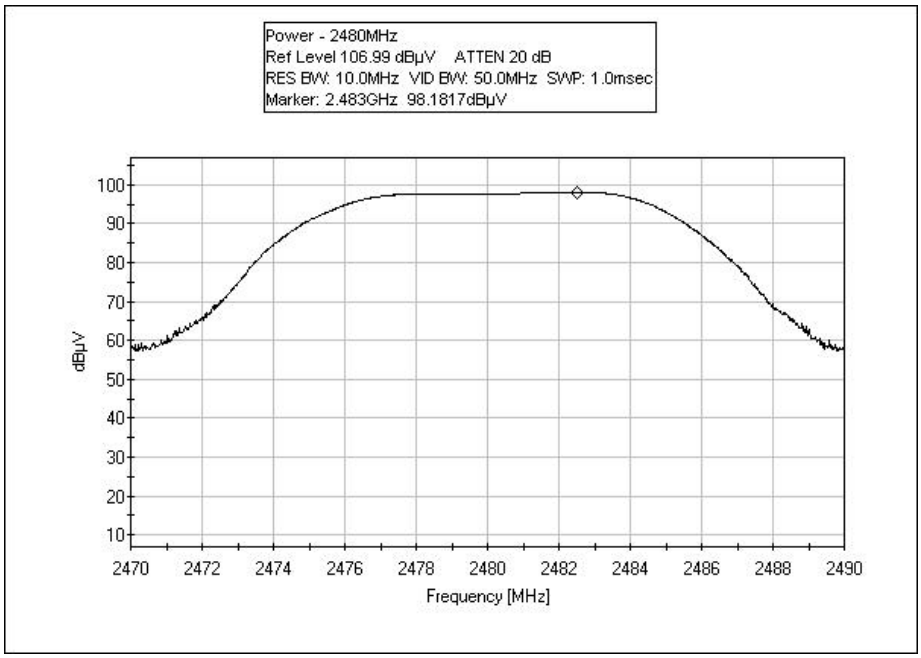
Test Equipment

Asset/Serial #	Description	Model	Manufacturer	Cal Date	Cal Due
AN02660	Spectrum Analyzer	E4446A	Agilent	11/3/2011	11/3/2013
AN03155	Preamp	83017A	HP	8/3/2011	8/3/2013
AN00327	Horn Antenna	3115	EMCO	4/13/2012	4/13/2014
ANP05904	Cable	32022-2-29094K-144TC	AstroLab	6/22/2011	6/22/2013
ANP01403	Cable	58758-23	Semflex	6/22/2011	6/22/2013
AN03012	Cable	32022-2-29094K-36TC	Astrolab	2/28/2012	2/28/2014

Test Data


Power - 2405MHz
Ref Level 106.99 dBµV ATTEN 20 dB
RES BW: 10.0MHz VID BW: 50.0MHz SWP: 1.0msec
Marker: 2.407GHz 98.3427dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2396
2398
2400
2402
2404
2406
2408
2410
2412
2414
Frequency [MHz]


Power - 2445MHz
Ref Level 106.99 dBµV ATTEN 20 dB
RES BW: 10.0MHz VID BW: 50.0MHz SWP: 1.0msec
Marker: 2.447GHz 98.6327dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2436
2438
2440
2442
2444
2446
2448
2450
2452
2454
Frequency [MHz]



Test Setup Photos

-6dBc Occupied Bandwidth

Test Conditions / Setup

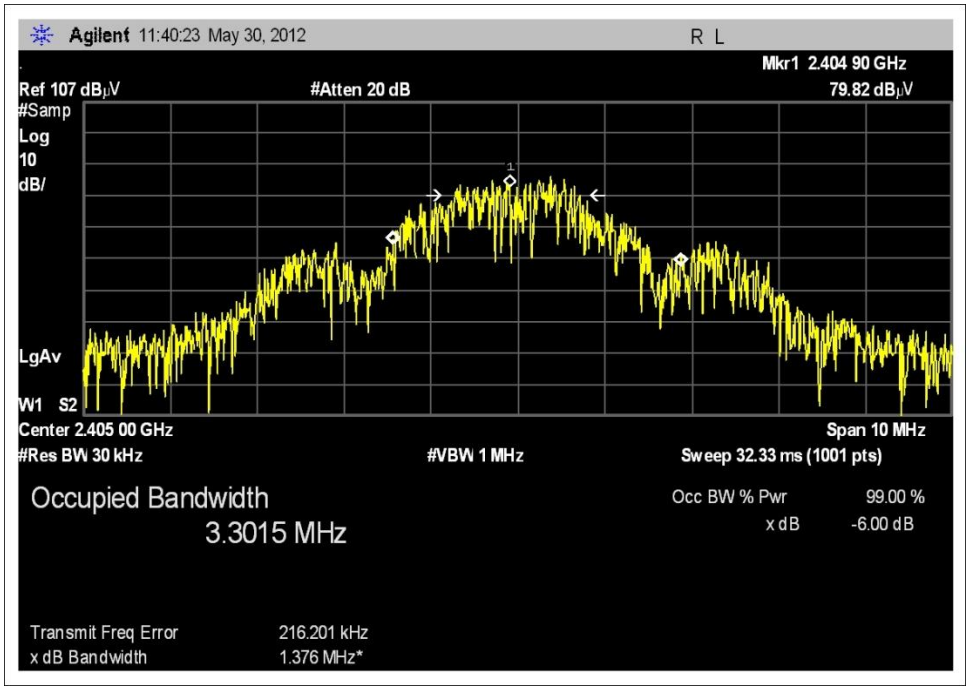
Orientated in a wall mounted position as intended, the EUT is placed on the wooden table lined with Styrofoam of 10 cm thickness. The I/O cable and AC/DC power cable are routed as designed. I/O cable is terminated into a simulator using a shielded cable.
CISPR Bandwidths used during testing.
The EUT is set in constant transmit mode at the rated power.
The Support AC step-down transformer is remotely located.
Antenna gain=0dBi
Modulation: O-QPSK
Protocol: Zigbee (802.15)
Freq: 2400-2483.5MHz
Test environment conditions: 20.2°C, 35% relative humidity, 97.5kPa

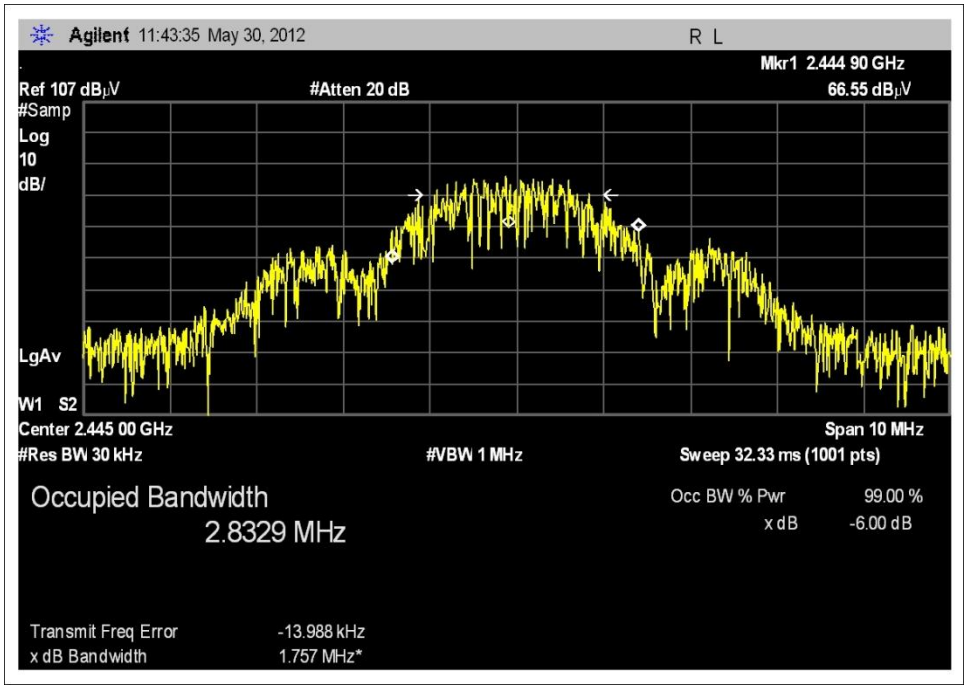
Modifications:
Constant load instead of cycling load on one LED.
1 1uF cap on pin 1 and U5.
Added Wurth ferrite #742 792 42 on the positive power supply line at input.
Added 4 turns of the input power (Wurth ferrite #74270103) adjacent to the PCB.
1000pF cap across pins of input connector.
Shielded IO cable added with its shield tied to logic ground on input connector.

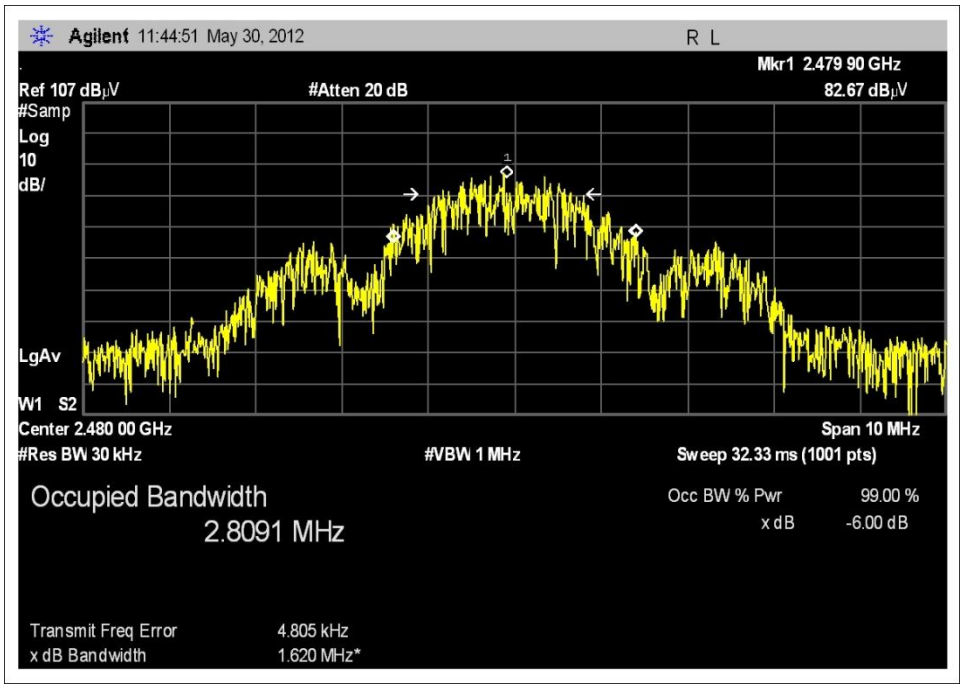
Engineer Name: Chuck Kendall

Test Equipment					
Asset/Serial #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
AN02660	Spectrum Analyzer	E4446A	Agilent	11/3/2011	11/3/2013
AN03155	Preamp	83017A	HP	8/3/2011	8/3/2013
AN00327	Horn Antenna	3115	EMCO	4/13/2012	4/13/2014
ANP05904	Cable	32022-2-29094K-144TC	AstroLab	6/22/2011	6/22/2013
ANP01403	Cable	58758-23	Semflex	6/22/2011	6/22/2013
AN03012	Cable	32022-2-29094K-36TC	Astrolab	2/28/2012	2/28/2014

Test Plots


Agilent 11:40:23 May 30, 2012
R L
Mkr1 2.404 90 GHz
Ref 107 dBµV
#Atten 20 dB
79.82 dBµV
#Samp
Log
10
dB/
LgAv
W1 S2
Center 2.405 00 GHz
Span 10 MHz
#Res BW 30 kHz
#VBW 1 MHz
Sweep 32.33 ms (1001 pts)
Occupied Bandwidth
3.3015 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error 216.201 kHz
x dB Bandwidth 1.376 MHz*


Agilent 11:43:35 May 30, 2012
R L
Mkr1 2.444 90 GHz
Ref 107 dBµV
#Atten 20 dB
66.55 dBµV
#Samp
Log
10
dB/
LgAv
W1 S2
Center 2.445 00 GHz
Span 10 MHz
#Res BW 30 kHz
#VBW 1 MHz
Sweep 32.33 ms (1001 pts)
Occupied Bandwidth
2.8329 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -13.988 kHz
x dB Bandwidth 1.757 MHz*



Test Setup Photos

Bandedge

Test Conditions / Setup

Orientated in wall mounted position as intended, the EUT is placed on the wooden table lined with Styrofoam of 10 cm thickness. The I/O cable and AC/DC power cable are routed s as designed. Shielded I/O cable is terminated into a simulator. Band Edge Plot was measured using the marker delta method and corrected for internal antenna factor and bandwidth. Bandwidths are as stated in KDB 550874 and noted in the plots.

Band edge readings were taken both at 100 kHz Resolution Bandwidths with the Video Bandwidths set to at least 3 times that of the Resolution Bandwidth. After correcting for marker delta (3.5dB at 2405 MHz and 3.0 dB at 2480 MHz) on the spec limit, the Marker-Delta Method was used. The Marker Delta was then added back into the spectrum analyzer as an offset. This was performed at both the upper and the lower band edges. When you make the corrections for the bandwidth, it appears to be compliant with the requirements of FCC 15.209 at the band edges.

The EUT is set in constant transmit mode at the rated power. The Support AC step-down transformer is being used to provide the 24VAC. 558074 D01 DTS Meas Guidance v01 used during testing. Test environment conditions: Temperature =20.2°C, relative humidity = 30%, Pressure = 97.7kPa

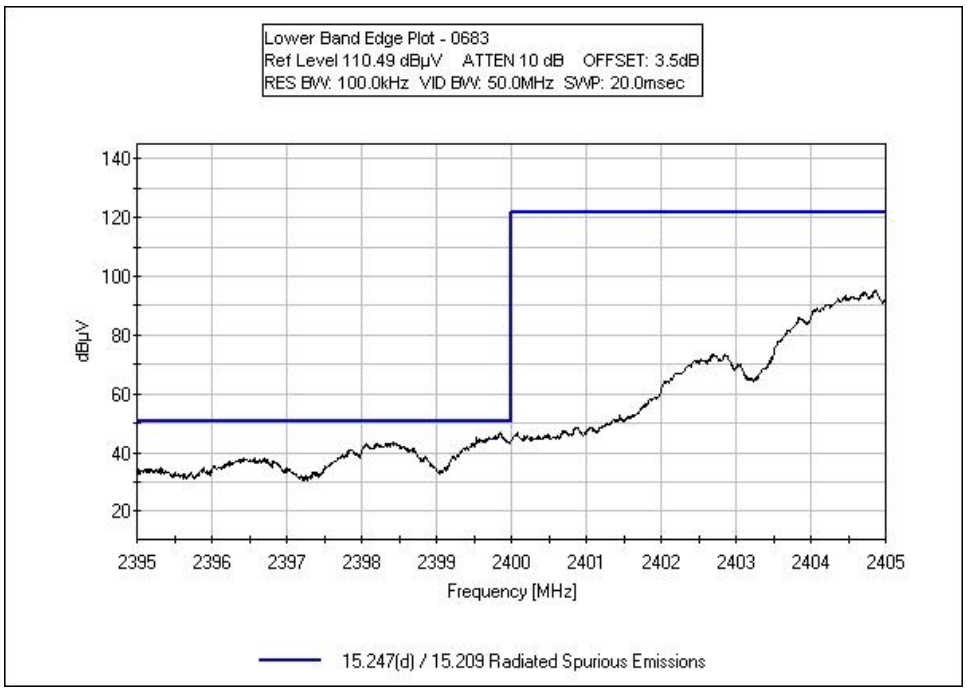
Antenna gain=0dBi
Modulation: O-QPSK ,
Protocol: Zigbee (802.15)
Freq: 2400-2483.5MHz

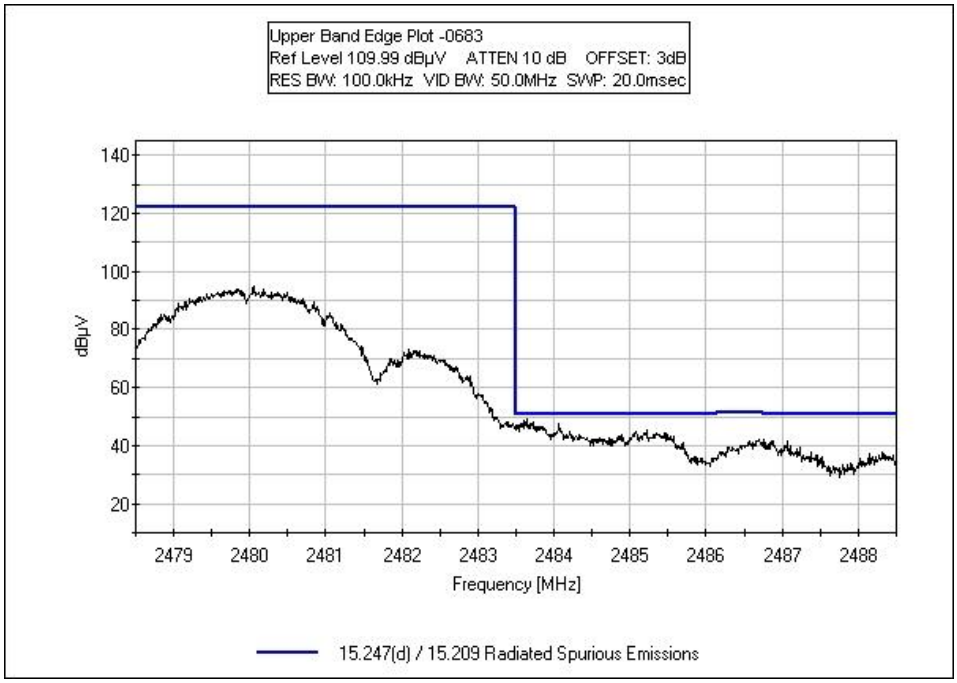
Modifications:
Constant load instead of cycling load on one LED.
1 1uF cap on pin 1 and U5
Added Wurth ferrite #742 792 42 on the positive power supply line at input
Added 4 turns of the input power (Wurth ferrite #74270103) adjacent to the PCB.
1000pF cap across pins of input connector
Shielded IO cable added with its shield tied to logic ground on input connector.

Engineer Name: Chuck Kendall

Test Equipment					
Asset/Serial #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
AN02660	SA	E4446A	Agilent	11/3/2011	11/3/2013
AN03155	Preamp	83017A	HP	8/3/2011	8/3/2013
AN00327	Horn Antenna	3115	EMCO	4/13/2012	4/13/2014
ANP05904	Cable	32022-2-29094K-144TC	AstroLab	6/22/2011	6/22/2013
ANP01403	Cable	58758-23	Semflex	6/22/2011	6/22/2013
AN03012	Cable	32022-2-29094K-36TC	Astrolab	2/28/2012	2/28/2014

Test Data


Lower Band Edge Plot - 0683
Ref Level 110.49 dBµV ATTEN 10 dB OFFSET: 3.5dB
RES BW: 100.0kHz VID BW: 50.0MHz SWP: 20.0msec
dBµV
140
120
100
80
60
40
20
2395
2396
2397
2398
2399
2400
2401
2402
2403
2404
2405
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


Upper Band Edge Plot -0683
Ref Level 109.99 dBµV ATTEN 10 dB OFFSET: 3dB
RES BW: 100.0kHz VID BW: 50.0MHz SWP: 20.0msec
dBµV
140
120
100
80
60
40
20
2479
2480
2481
2482
2483
2484
2485
2486
2487
2488
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

Test Setup Photos

15.247(e) Power Spectral Density

Test Conditions / Setup

Orientated in wall mounted position as intended, the EUT is placed on the wooden table lined with Styrofoam of 10 cm thickness. The I/O cable and AC/DC power cable are routed s as designed. Shielded I/O cable is terminated into a simulator.

The EUT is set in constant transmit mode at the rated power.
The Support AC step-down transformer is being used to provide the 24VAC.
Antenna gain=0dBi
Modulation: O-QPSK ,
Protocol: Zigbee (802.15)
Freq: 2400-2483.5MHz

558074 D01 DTS Meas Guidance v01
5.3.1. Measurement procedure PKPSD
Power Density(dBm) = E(dBuV) + 20log(d) - 104.8 +10Log (3kHz/100kHz)
where:

EIRP = the equivalent isotropic radiated power in dBm,
E = electric field strength in dBuV/m,
d = measurement distance in meters.

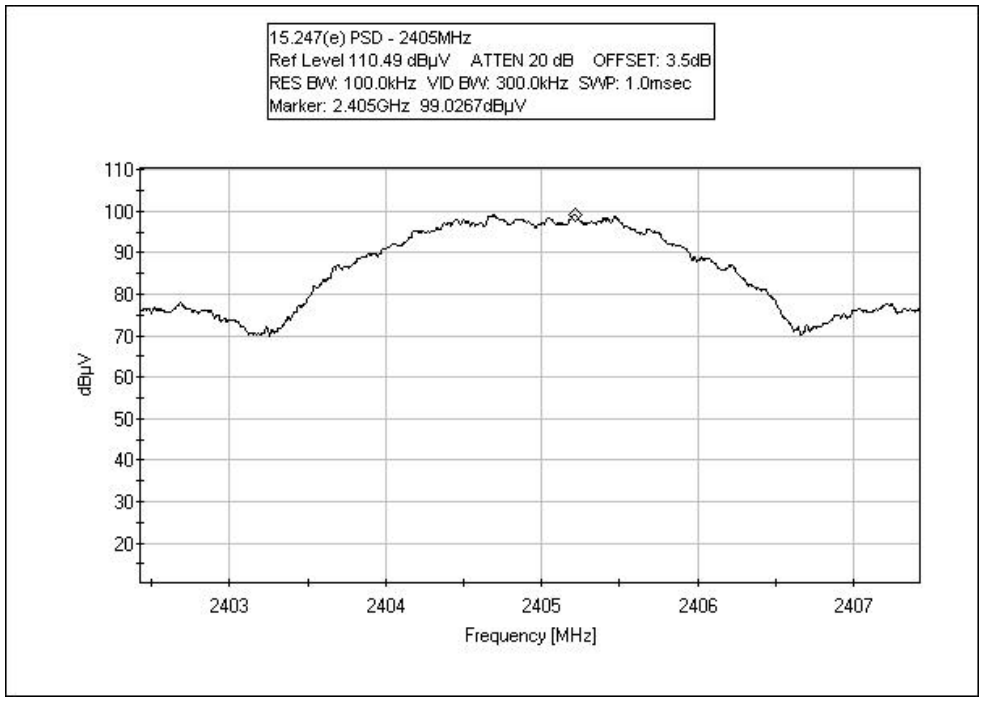
Freq:	PSD(dBm)
2405MHz,	-11.4 dBm/3kHz
2445MHz	-11.1 dBm/3kHz
2480MHz	-11.9 dBm/3kHz

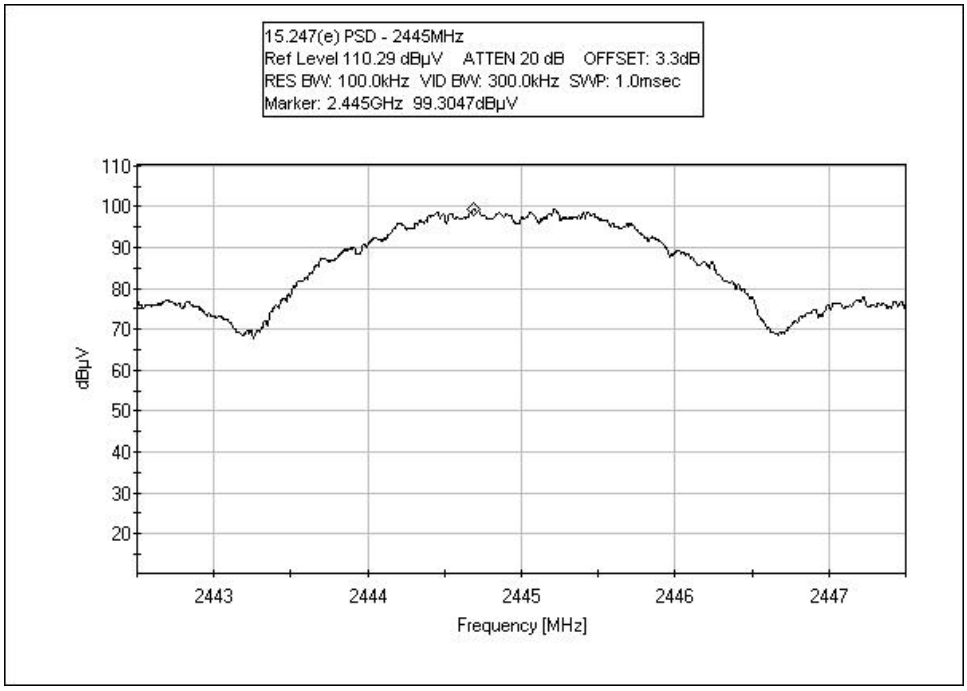
Modifications:
Constant load instead of cycling load on one LED
1 1uF cap on pin 1 and U5
Added Wurth ferrite #742 792 42 on the positive power supply line at input
Added 4 turns of the input power (Wurth ferrite #74270103) adjacent to the PCB.
1000pF cap across pins of input connector
Shielded IO cable added with its shield tied to logic ground on input connector.

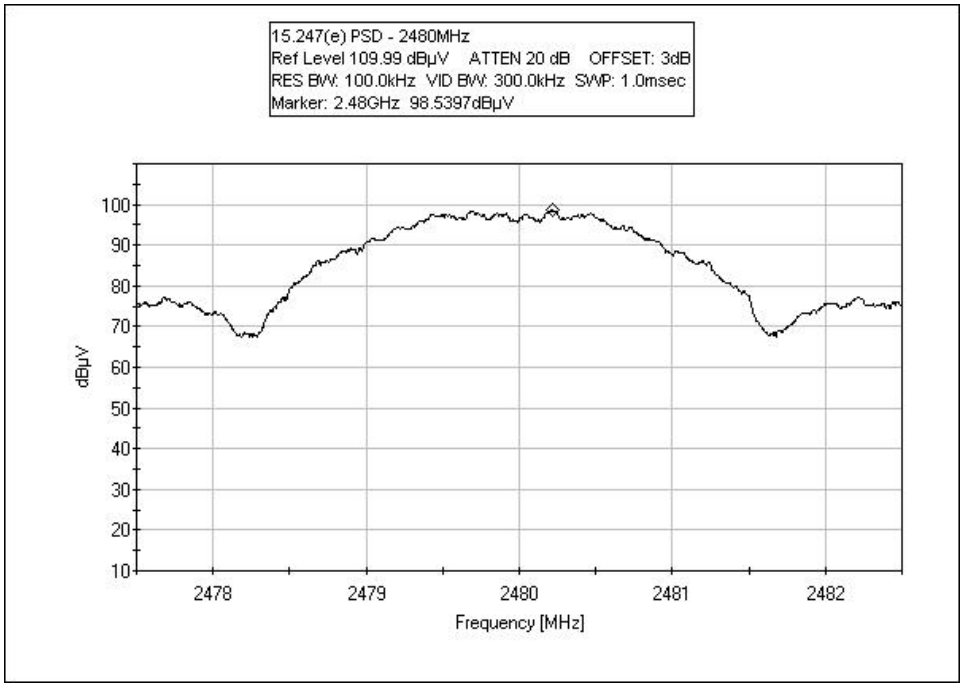
Engineer Name: Chuck Kendall

Test Equipment					
Asset/Serial #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
AN02660	Spectrum Analyzer	E4446A	Agilent	11/3/2011	11/3/2013
AN03155	Preamp	83017A	HP	8/3/2011	8/3/2013
AN00327	Horn Antenna	3115	EMCO	4/13/2012	4/13/2014
ANP05904	Cable	32022-2-29094K-144TC	AstroLab	6/22/2011	6/22/2013
ANP01403	Cable	58758-23	Semflex	6/22/2011	6/22/2013
AN03012	Cable	32022-2-29094K-36TC	Astrolab	2/28/2012	2/28/2014

Test Data




15.247(e) PSD - 2445MHz
Ref Level 110.29 dBµV ATTEN 20 dB OFFSET: 3.3dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 1.0msec
Marker: 2.445GHz 99.3047dBµV
dBµV
110
100
90
80
70
60
50
40
30
20
2443
2444
2445
2446
2447
Frequency [MHz]


15.247(e) PSD - 2480MHz
Ref Level 109.99 dBµV ATTEN 20 dB OFFSET: 3dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 1.0msec
Marker: 2.48GHz 98.5397dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2478
2479
2480
2481
2482
Frequency [MHz]

Test Setup Photos

15.247(d) Radiated Spurious Emissions

Test Data Sheets

Test Location: CKC Laboratories • 5046 Sierra Pines Dr. • Mariposa, CA 95338 • (209) 966-5240

Customer: **SynapSense Corporation**
Specification: **15.209 Radiated Emissions**
Work Order #: **92868** Date: 5/23/2012
Test Type: **Maximized Emissions** Time: 07:39:50
Equipment: **Wireless Damper Control** Sequence#: 1
Manufacturer: SynapSense Corporation Tested By: Chuck Kendall
Model: 0883
S/N: 001

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01991	Biconilog Antenna	CBL6111C	3/14/2012	3/14/2014
T2	AN00099	Preamp	8447D	3/9/2011	3/9/2013
T3	ANP05904	Cable	32022-2-29094K-144TC	6/22/2011	6/22/2013
T4	ANP01403	Cable	58758-23	6/22/2011	6/22/2013
	AN02660	Spectrum Analyzer	E4446A	11/3/2011	11/3/2013
T5	AN03012	Cable	32022-2-29094K-36TC	2/28/2012	2/28/2014
T6	AN03155	Preamp	83017A	8/3/2011	8/3/2013
T7	AN00327	Horn Antenna	3115	4/13/2012	4/13/2014
	AN00226	Loop Antenna	6502	3/28/2012	3/28/2014
	ANP05686	Cable	RG214/U	No Cal Required	No Cal Required

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

Function	Manufacturer	Model #	S/N
Wireless Damper Control*	SynapSense Corporation	0883	001

Support Devices:

Function	Manufacturer	Model #	S/N
Simulator	SynapSense Corporation	Belimo	NA

Test Conditions / Notes:

Orientated in wall mounted position as intended, the EUT is placed on the wooden table lined with Styrofoam for a total height of 80cm above the ground plane. The I/O cables and AC/DC power cables are routed as designed. I/O cable is terminated into a simulated load.

The EUT is set in constant transmit mode at the rated power.
The Support AC step-down transformer is located on a lower shelf of the Styrofoam. .
Antenna gain=0dBi
Modulation: O-QPSK
Protocol: Zigbee (802.15)
Freq: 2400-2483.5MHz
Freq: 2405MHz, 2445MHz, 2480MHz

Frequency range of measurement = 9 kHz- 26 GHz.
CISPR bandwidths were used during testing.

Test environment conditions:
Temperature = 20.2° C
Relative humidity = 35%
Pressure = 97.5kPa

Modifications:
Constant load instead of cycling load on one LED.
1 1uF cap on pin 1 and U5
Added Wurth ferrite #742 792 42 on the positive power supply line at input
Added 4 turns of the input power (Wurth ferrite #74270103) adjacent to the PCB.
1000pF cap across pins of input connector
Shielded IO cable added with its shield tied to logic ground on input connector.

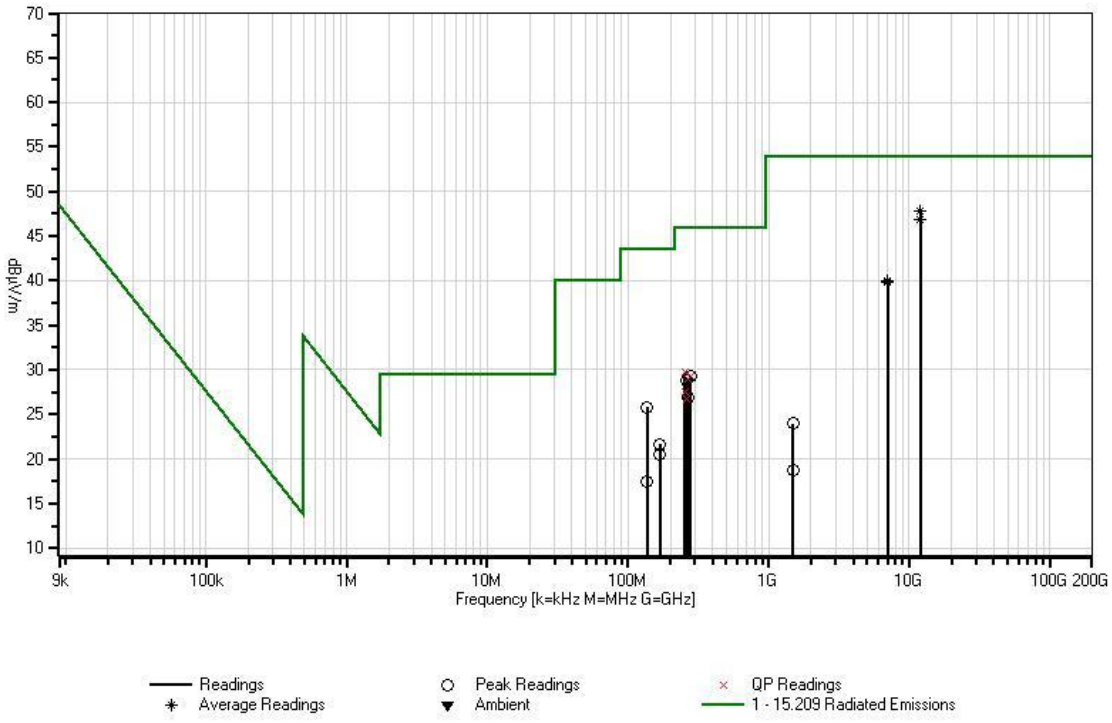
Ext Attn: 0 dB

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

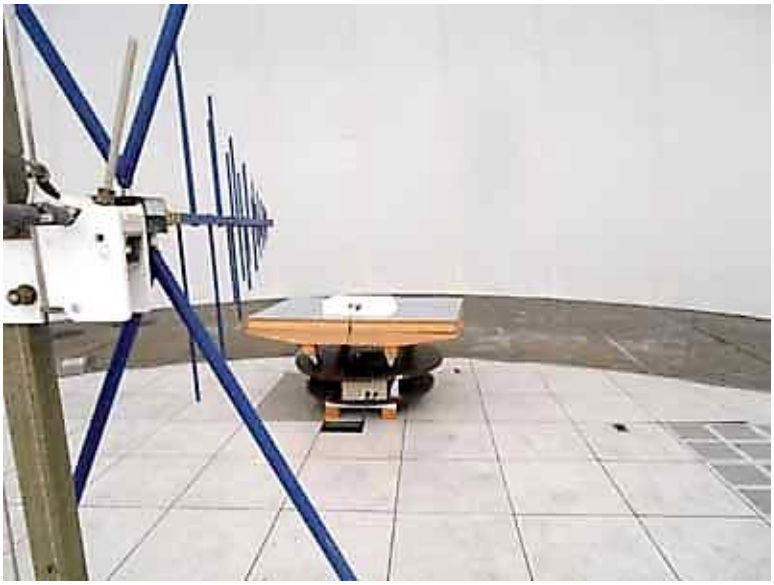
#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	12000.000 M Ave	25.6	+0.0 +1.9	+0.0 -30.3	+4.9 +39.0	+6.7	+0.0	47.8	54.0	-6.2	Vert
^	12000.000 M	37.1	+0.0 +1.9	+0.0 -30.3	+4.9 +39.0	+6.7	+0.0	59.3	54.0	+5.3	Vert
3	12000.000 M Ave	24.7	+0.0 +1.9	+0.0 -30.3	+4.9 +39.0	+6.7	+0.0	46.9	54.0	-7.1	Horiz
^	12000.000 M	31.7	+0.0 +1.9	+0.0 -30.3	+4.9 +39.0	+6.7	+0.0	53.9	54.0	-0.1	Horiz
5	7010.000M Ave	26.5	+0.0 +1.3	+0.0 -29.3	+2.8 +34.1	+4.5	+0.0	39.9	54.0	-14.1	Vert
^	7010.000M	41.7	+0.0 +1.3	+0.0 -29.3	+2.8 +34.1	+4.5	+0.0	55.1	54.0	+1.1	Vert
7	7009.994M Ave	26.4	+0.0 +1.3	+0.0 -29.3	+2.8 +34.1	+4.5	+0.0	39.8	54.0	-14.2	Horiz

^	7009.994M	39.2	+0.0 +1.3	+0.0 -29.3	+2.8 +34.1	+4.5	+0.0	52.6	54.0	-1.4	Horiz
9	253.964M QP	41.8	+12.4 +0.0	-26.0 +0.0	+0.8 +0.0	+0.7	+0.0	29.7	46.0	-16.3	Vert
^	253.964M	42.7	+12.4 +0.0	-26.0 +0.0	+0.8 +0.0	+0.7	+0.0	30.6	46.0	-15.4	Vert
11	279.987M	41.3	+12.7 +0.0	-26.3 +0.0	+0.9 +0.0	+0.7	+0.0	29.3	46.0	-16.7	Horiz
12	279.995M QP	41.3	+12.7 +0.0	-26.3 +0.0	+0.9 +0.0	+0.7	+0.0	29.3	46.0	-16.7	Vert
^	279.999M	42.3	+12.7 +0.0	-26.3 +0.0	+0.9 +0.0	+0.7	+0.0	30.3	46.0	-15.7	Vert
14	264.400M QP	41.0	+12.5 +0.0	-26.1 +0.0	+0.8 +0.0	+0.7	+0.0	28.9	46.0	-17.1	Vert
^	264.400M	43.1	+12.5 +0.0	-26.1 +0.0	+0.8 +0.0	+0.7	+0.0	31.0	46.0	-15.0	Vert
16	262.053M	40.9	+12.5 +0.0	-26.1 +0.0	+0.8 +0.0	+0.7	+0.0	28.8	46.0	-17.2	Horiz
17	137.450M	39.5	+12.0 +0.0	-26.8 +0.0	+0.6 +0.0	+0.5	+0.0	25.8	43.5	-17.7	Vert
18	253.857M QP	39.7	+12.4 +0.0	-26.0 +0.0	+0.8 +0.0	+0.7	+0.0	27.6	46.0	-18.4	Horiz
^	253.864M	42.1	+12.4 +0.0	-26.0 +0.0	+0.8 +0.0	+0.7	+0.0	30.0	46.0	-16.0	Horiz
20	264.300M	39.0	+12.5 +0.0	-26.1 +0.0	+0.8 +0.0	+0.7	+0.0	26.9	46.0	-19.1	Horiz
21	262.204M QP	38.8	+12.5 +0.0	-26.1 +0.0	+0.8 +0.0	+0.7	+0.0	26.7	46.0	-19.3	Vert
^	262.200M	43.9	+12.5 +0.0	-26.1 +0.0	+0.8 +0.0	+0.7	+0.0	31.8	46.0	-14.2	Vert
23	167.789M	37.4	+9.9 +0.0	-26.8 +0.0	+0.6 +0.0	+0.5	+0.0	21.6	43.5	-21.9	Horiz
24	167.999M	36.2	+9.9 +0.0	-26.8 +0.0	+0.6 +0.0	+0.5	+0.0	20.4	43.5	-23.1	Vert
25	137.188M	31.2	+12.0 +0.0	-26.8 +0.0	+0.6 +0.0	+0.5	+0.0	17.5	43.5	-26.0	Horiz
26	1485.200M	26.4	+0.0 +0.5	+0.0 -30.9	+2.7 +23.3	+2.0	+0.0	24.0	54.0	-30.0	Horiz
27	1485.700M	21.2	+0.0 +0.5	+0.0 -30.9	+2.7 +23.2	+2.0	+0.0	18.7	54.0	-35.3	Vert

CKC Laboratories Date: 5/23/2012 Time: 07:39:50 SynapSense Corporation WO#: 92868
15.209 Radiated Emissions Test Distance: 3 Meters Sequence#: 1 Ext ATTN: 0 dB



Test Setup Photos



RSS-210

99 % Bandwidth

Test Conditions / Setup

Orientated in wall mounted position as intended, the EUT is placed on the wooden table lined with Styrofoam of 10 cm thickness. The I/O cable and AC/DC power cable are routed as designed. I/O cable is terminated into a simulator using a shielded cable.
CISPR Bandwidths used during testing.
The EUT is set in constant transmit mode at the rated power.
The Support AC step-down transformer is remotely located.
Antenna gain=0dBi
Modulation: O-QPSK
Protocol: Zigbee (802.15)
Freq: 2400-2483.5MHz
Test environment conditions: 20.2°C, 35% relative humidity, 97.5kPa

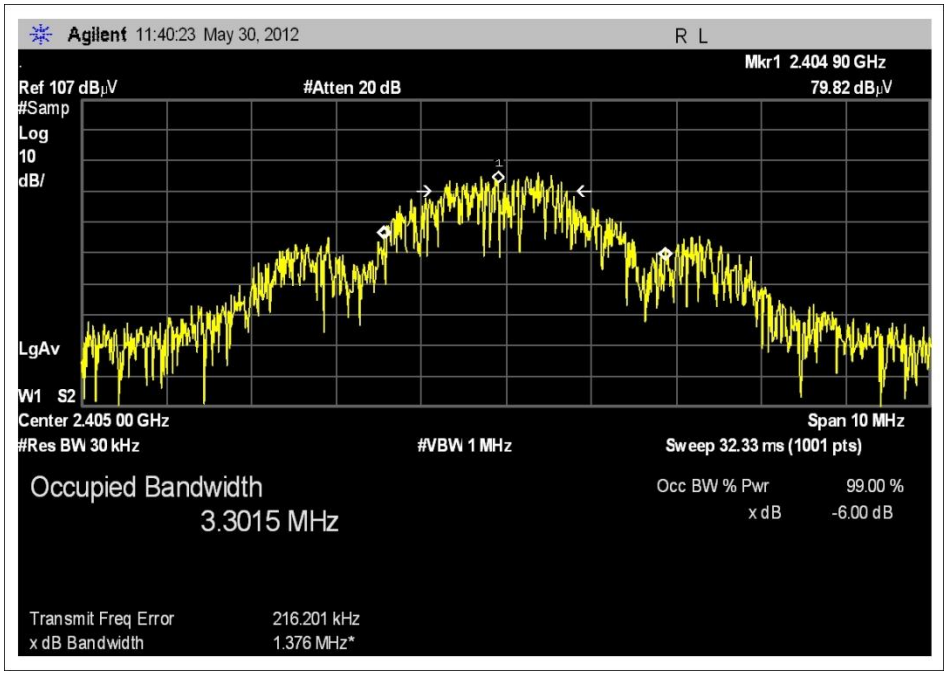
Modifications:
Constant load instead of cycling load on one LED.
1 1uF cap on pin 1 and U5
Added Wurth ferrite #742 792 42 on the positive power supply line at input.
Added 4 turns of the input power (Wurth ferrite #74270103) adjacent to the PCB.
1000pF cap across pins of input connector.
Shielded IO cable added with its shield tied to logic ground on input connector.

Engineer Name: Chuck Kendall

Test Equipment

Asset/Serial #	Description	Model	Manufacturer	Cal Date	Cal Due
AN02660	Spectrum Analyzer	E4446A	Agilent	11/3/2011	11/3/2013
AN03155	Preamp	83017A	HP	8/3/2011	8/3/2013
AN00327	Horn Antenna	3115	EMCO	4/13/2012	4/13/2014
ANP05904	Cable	32022-2-29094K-144TC	AstroLab	6/22/2011	6/22/2013
ANP01403	Cable	58758-23	Semflex	6/22/2011	6/22/2013
AN03012	Cable	32022-2-29094K-36TC	Astrolab	2/28/2012	2/28/2014

Test Data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Ref 107 dBµV
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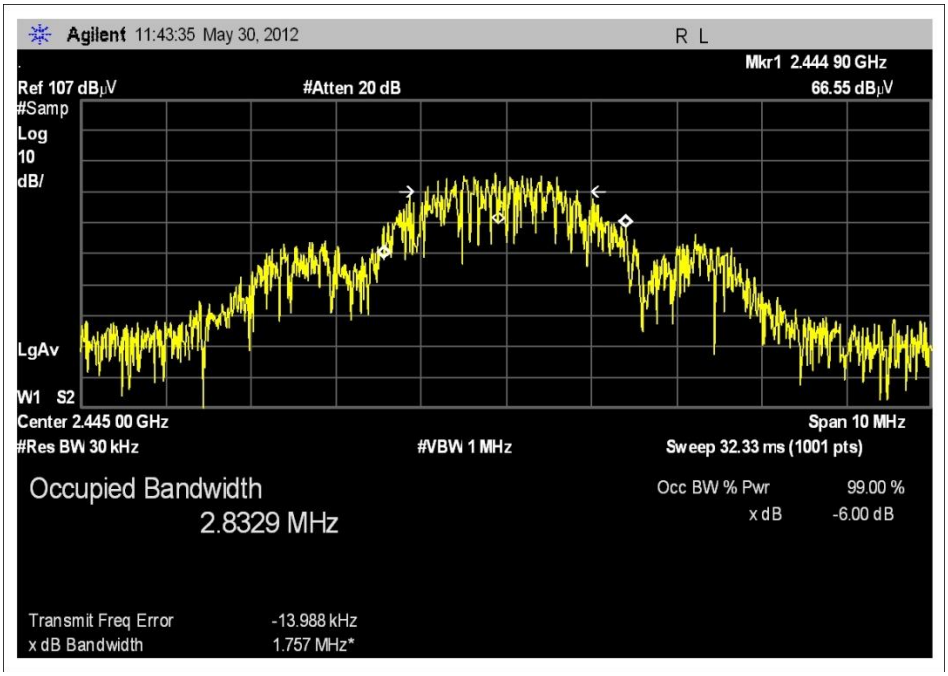
79.82 dBµV
#Samp
Log
10
dB/
LgAv
W1 S2
Center 2.405 00 GHz
Span 10 MHz
#Res BW 30 kHz
#VBW 1 MHz
Sweep 32.33 ms (1001 pts)
Occupied Bandwidth
3.3015 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error 216.201 kHz
x dB Bandwidth 1.376 MHz*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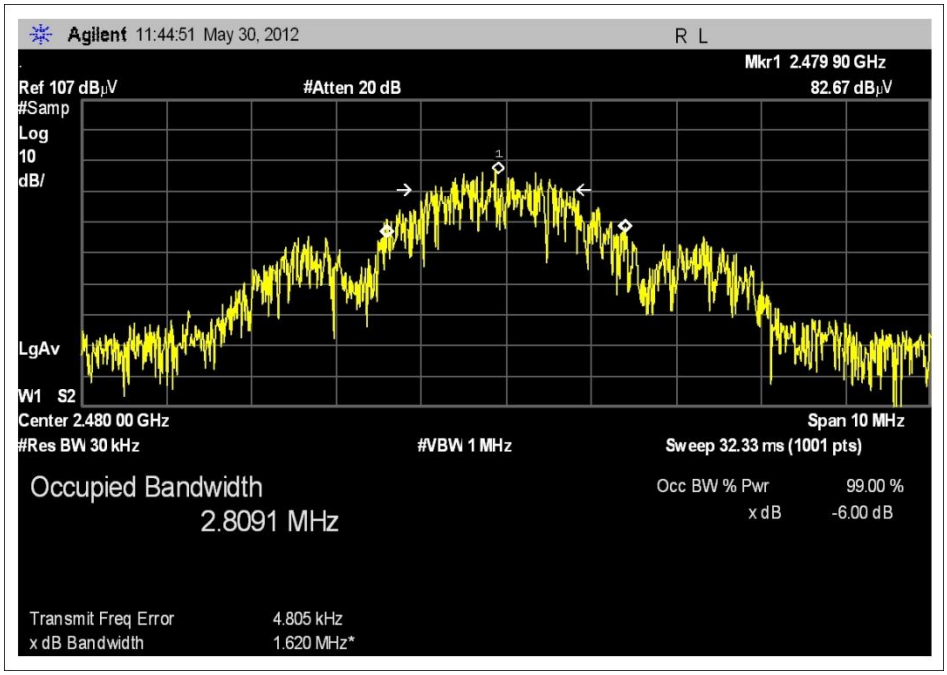
66.55 dBµV
#Samp
Log
10
dB/
LgAv
W1 S2
Center 2.445 00 GHz
Span 10 MHz
#Res BW 30 kHz
#VBW 1 MHz
Sweep 32.33 ms (1001 pts)
Occupied Bandwidth
2.8329 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -13.988 kHz
x dB Bandwidth 1.757 MHz*



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	(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.