



SYNAPSENSE, INC. TEST REPORT

FOR THE

INDUSTRIAL WIRELESS MONITORING NETWORKS,
11-0067-001 AND 11-0067-011

FCC PART 15 SUBPART C SECTION 15.249 AND
SUBPART B SECTION 15.109 CLASS B

TESTING

DATE OF ISSUE: JUNE 7, 2007

PREPARED FOR:

SynapSense, Inc.
950 Iron Point Road, Suite 130
Folsom, CA 95630

P.O. No.: 151
W.O. No.: 86378

PREPARED BY:

Mary Ellen Clayton
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Date of test: April 23 - May 24, 2007

Report No.: FC07-043

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ADMINISTRATIVE INFORMATION

DATE OF TEST: April 23 - May 24, 2007

DATE OF RECEIPT: April 23, 2007

REPRESENTATIVE: Mathew Di Nocola

MANUFACTURER:

SynapSense, Inc.
950 Iron Point Road, Suite 130
Folsom, CA 95630

TEST LOCATION:

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

TEST METHOD: ANSI C63.4 (2003)

PURPOSE OF TEST: To perform the testing of the Industrial Wireless Monitoring Network, 11-0067-001 and 11-0067-011 with the requirements for FCC Part 15 Subpart C Section 15.249 and Subpart B Section 15.109 Class B devices.

APPROVALS

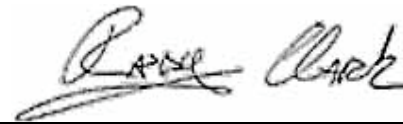
Steve Behm, Director of Engineering Services

QUALITY ASSURANCE:



Joyce Walker, Quality Assurance Administrative Manager

TEST PERSONNEL:



Randy Clark, EMC Engineer



Mike Wilkinson, EMC Engineer/Lab Manager

FCC TO CANADA STANDARD CORRELATION MATRIX

Canadian Standard	Canadian Section	FCC Standard	FCC Section	Test Description
RSS 210	2.1	47CFR	15.215(c)	Frequency Stability Recommendation
RSS 210	2.6	47CFR	15.209	General Radiated Emissions Requirement
RSS 210	2.7	47CFR	15.205	Restricted Bands of Operation
RSS 210	A2.9 (1)	47CFR	15.249(a)	Field Strength Limitations
RSS 210	A2.9 (1)	47CFR	15.249(c)	Test Distance Requirement
RSS 210	A2.9 (2)	47CFR	15.249(d)	Spurious Emissions Attenuation Requirement
RSS Gen	4.3	47CFR	15.35(c)	Pulsed Operation (N/A for 902-928MHz)
RSS Gen	7.2.2	47CFR	15.207	AC Mains Conducted Emissions Requirement
N/A	N/A	47CFR	15.249(b)	Point-to-Point Operations Limitations
N/A	N/A	47CFR	15.249(e)	Peak to Average Limit Requirement

Notes: Rule Sections for RSS 210 are taken from RSS 210 Issue 6
This table applies to 902-928, 2400-2483.5, 5275-5875MHz bands only.

SITE FILE REGISTRATION NUMBERS

Location	Japan	Canada	FCC
Brea A	R-301 & C-314	IC 3172-A	90473
Brea D	R-1256 & C-1319	IC 3172-D	100638
Fremont	R-2160 & C2332	IC 5933	958979
Mariposa A	R-563 & C-578	IC 3082-A	90477
Mariposa D	R-1827 & C-1960	IC 3082A-1	784962
Bothell	R-2296 & C-2506	IC 4653	318736

SUMMARY OF RESULTS

Test	Specification	Results
Radiated Emissions	FCC Part 15 Subpart B Section 15.109 Class B	Pass
Radiated Emissions	FCC Part 15 Subpart C Section 15.249	Pass

CONDITIONS DURING TESTING

No modifications to the EUT were necessary during testing.

FCC 15.31(e) Voltage Variations

Not applicable to this device because it is battery powered and fresh batteries were used.

FCC 15.31(m) Number Of Channels

This device was tested on three channels.

FCC 15.33(a) Frequency Ranges Tested

15.109 Radiated Emissions: 30 MHz – 1000 MHz

15.249 Radiated Emissions: 25 MHz – 25 GHz

FCC SECTION 15.35: ANALYZER 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	40 GHz	1 MHz

FCC 15.203 Antenna Requirements

The EUT has two separate antennas. One antenna is an integral part of the EUT and is non-removable; therefore the EUT complies with Section 15.203 of the FCC rules. The external antenna has an RPSMA unique connector; therefore the EUT complies with Section 15.203 of the FCC rules

EUT Operating Frequency

The EUT was operating at 2405 MHz – 2480 MHz

Temperature And Humidity During Testing

The temperature during testing was within +15°C and + 35°C.

The relative humidity was between 20% and 75%.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

The customer declares the EUT tested by CKC Laboratories was representative of a production unit. Equipment is a low power wireless sensor device operating on 2.4 GHz ISM frequency band.

EQUIPMENT UNDER TEST

Industrial Wireless Monitoring Network

Manuf: SynapSense, Inc
Model: 11-0067-001
Serial: 052107-002
FCC ID: pending

Industrial Wireless Monitoring Network

Manuf: SynapSense, Inc
Model: 11-0067-011
Serial: 052107-001
FCC ID: pending

PERIPHERAL DEVICES

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

Sensors (4 each)

Manuf: NK Technologies
Model: AT1-010-000-SP
Serial: 0635-3, 0635-2, 0635-1 & 007

REPORT OF EMISSIONS MEASUREMENTS

TESTING PARAMETERS

The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in 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	(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. 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. When conducted emissions testing was performed, a 10 dB external attenuator was used with internal offset correction in the analyzer.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED 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 "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the highest readings, this is indicated as a "QP" or an "Ave" on the appropriate rows of the data sheets. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer/receiver readings were recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the measuring device called "peak hold," the measuring device had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

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

Average

For certain frequencies, average measurements may be made using the spectrum analyzer/receiver. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.

FCC 15.109 RADIATED EMISSIONS

Test Setup Photos



Test Data Sheets

Test Location: CKC Laboratories • 4933 Sierra Pines Dr. • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **SynapSense, Inc.**

Specification: **15.109 CLASS B**

Work Order #: **86378**

Date: 5/24/2007

Test Type: **Maximized Emissions**

Time: 16:24:05

Equipment: **Industrial Wireless Monitoring Network**

Sequence#: 17

Manufacturer: SynapSense, Inc

Tested By: Randal Clark

Model: 11-0067-001

S/N: 052107-002

Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
Agilent E4446A SA	US44300407	01/03/2007	01/03/2009	02660
Chase CBL6111C Bilog	2456	12/30/2006	12/30/2008	01991
HP 8447D Preamp	1937A02604	03/14/2007	03/14/2009	00099

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Industrial Wireless Monitoring Network*	SynapSense, Inc	11-0067-001	052107-002

Support Devices:

Function	Manufacturer	Model #	S/N
Sensor	NK Technologies	AT1-010-000-SP	0707
Sensor	NK Technologies	AT1-010-000-SP	0635-3
Sensor	NK Technologies	AT1-010-000-SP	0635-2
Sensor	NK Technologies	AT1-010-000-SP	0635-1

Test Conditions / Notes:

Equipment is a low power wireless sensor device operating on 2.4 GHz ISM frequency band. The device is operating with a configuration representative of worst case emissions for both models. EUT ports are loaded with a representative configuration. All EUT ports are filled. Transmitter circuitry has been disabled for this test, however the digital circuitry remains active. Frequency Range Investigated: 30MHz - 1GHz. Temperature: 23°C, Relative Humidity: 41%. Bandwidths: CISPR. **No EUT Emissions detected within 20dB of the limit.**

Transducer Legend:

--

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV					Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
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FCC 15.249 RADIATED EMISSIONS

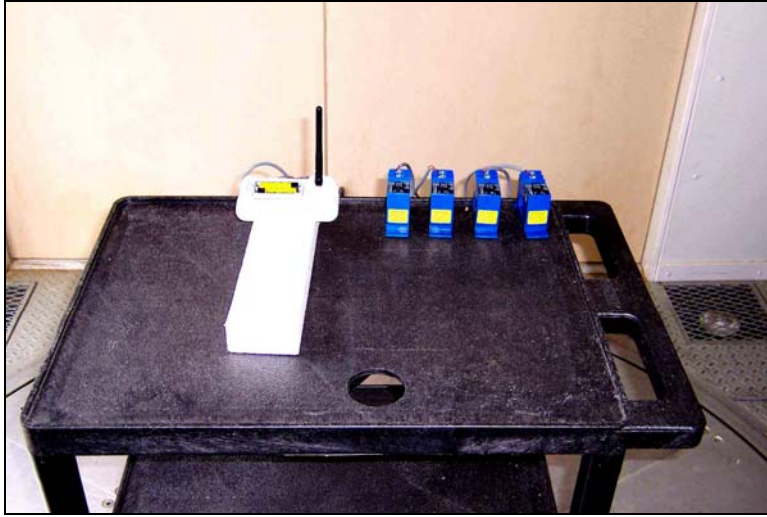
Test Setup Photos



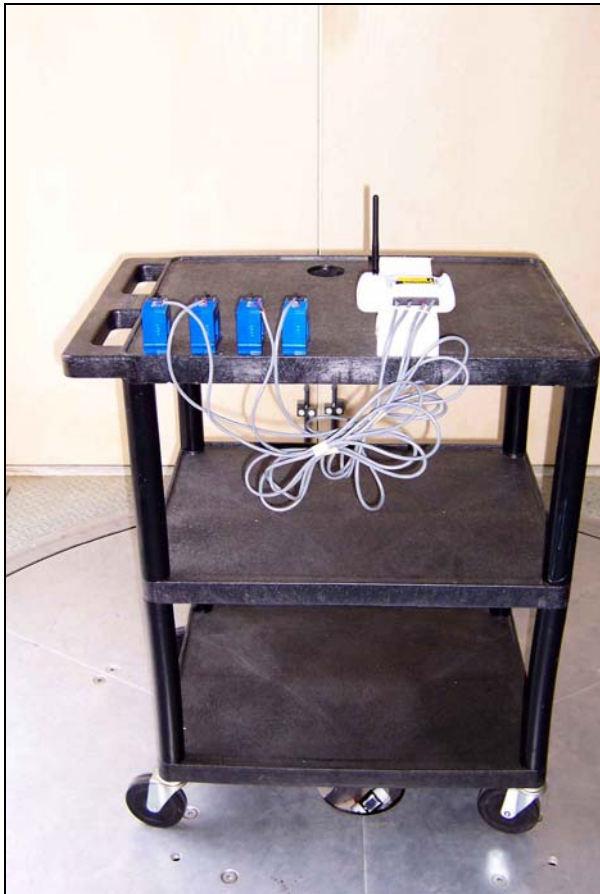
11-0067-001 configuration 1



11-0067-001 configuration 1



11-0067-001 configuration 2



11-0067-001 configuration 2



11-0067-011



11-0067-011

Test Data Sheets

Test Location: CKC Laboratories • 4933 Sierra Pines Dr. • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **SynapSense, Inc.**
 Specification: **FCC 15.249 (2400-2483.5MHz)**
 Work Order #: **86378** Date: 5/23/2007
 Test Type: **Maximized Emissions** Time: 14:15:17
 Equipment: **Industrial Wireless Monitoring Network** Sequence#: 9
 Manufacturer: SynapSense, Inc Tested By: Randal Clark
 Model: 11-0067-001
 S/N: 052107-002

Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
Agilent E4446A SA	US44300407	01/03/2007	01/03/2009	02660
EMCO 3115 Horn Antenna	8006-3413	03/17/2007	03/17/2009	00327
ARA MWH-1826/B Horn Antenna	1005	11/27/2006	11/27/2008	02046
Chase CBL6111C Bilog	2456	12/30/2006	12/30/2008	01991
EMCO Loop Antenna	1074	05/01/2007	05/01/2009	00226
HP 8447D Preamp	1937A02604	03/14/2007	03/14/2009	00099
HP 8449B Preamp	3008A00301	12/13/2006	12/13/2008	2010
Cable, Pasternack 36"	NA	04/24/2007	04/24/2009	P05202
Cable, Pasternack 48"	NA	04/24/2007	04/24/2009	P05203
Cable, Andrews Hardline	NA	05/27/2005	05/27/2007	P01012

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Industrial Wireless Monitoring Network*	SynapSense, Inc	11-0067-001	052107-002

Support Devices:

Function	Manufacturer	Model #	S/N
Sensor	NK Technologies	AT1-010-000-SP	0707
Sensor	NK Technologies	AT1-010-000-SP	0635-3
Sensor	NK Technologies	AT1-010-000-SP	0635-2
Sensor	NK Technologies	AT1-010-000-SP	0635-1

Test Conditions / Notes:

Equipment is a low power wireless sensor device operating on 2.4 GHz ISM frequency band. The device is operating with maximum duty cycle of 1.44%, a configuration representative of worst case emissions. EUT ports are loaded with a representative configuration. All EUT ports are filled. Channel tested: Low, Middle and High. Frequency Range Investigated: Carrier. Temperature: 23°C, Relative Humidity: 41%. Bandwidths: CISPR. Duty Cycle correction factor applied in accordance with 15.35. Maximum on time in 100ms is 3.16ms therefore, $20 \cdot \log(3.16/100) = -30\text{dB}$. --External 2.1dBi Antenna--

Transducer Legend:

T1=Amp HF - S/N 301	T2=ANT AN00327 900MHz-18.5GHz
T3=Cable 40 GHz 36"	T4=Cable 40 GHz 48"
T5=Cable P01012	T6=Cable - Site D 3m 9k - 20G
T7=DCCF	

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	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	2444.510M	95.2	-34.7 +2.3	+28.3 +4.7	+1.0 -30.0	+1.3	+0.0	68.1	94.0	-25.9	Verti 122
2	2480.480M	94.3	-34.7 +2.4	+28.4 +4.7	+1.0 -30.0	+1.4	+0.0	67.5	94.0	-26.5	Verti 120
3	2405.480M	93.3	-34.7 +2.3	+28.2 +4.7	+1.0 -30.0	+1.3	+0.0	66.1	94.0	-27.9	Verti 120
4	2445.360M	83.6	-34.7 +2.3	+28.3 +4.7	+1.0 -30.0	+1.3	+0.0	56.5	94.0	-37.5	Horiz 126
5	2405.410M	82.2	-34.7 +2.3	+28.2 +4.7	+1.0 -30.0	+1.3	+0.0	55.0	94.0	-39.0	Horiz 129
6	2480.410M	81.1	-34.7 +2.4	+28.4 +4.7	+1.0 -30.0	+1.4	+0.0	54.3	94.0	-39.7	Horiz 130

Test Location: CKC Laboratories • 4933 Sierra Pines Dr. • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: SynapSense, Inc.

Specification: FCC 15.249 (2400-2483.5MHz)

Work Order #: 86378

Date: 5/24/2007

Test Type: Maximized Emissions

Time: 10:43:27

Equipment: Industrial Wireless Monitoring Network

Sequence#: 11

Manufacturer: SynapSense, Inc

Tested By: Randal Clark

Model: 11-0067-011

S/N: 052107-001

Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
Agilent E4446A SA	US44300407	01/03/2007	01/03/2009	02660
EMCO 3115 Horn Antenna	8006-3413	03/17/2007	03/17/2009	00327
ARA MWH-1826/B Horn Antenna	1005	11/27/2006	11/27/2008	02046
Chase CBL6111C Bilog	2456	12/30/2006	12/30/2008	01991
EMCO Loop Antenna	1074	05/01/2007	05/01/2009	00226
HP 8447D Preamp	1937A02604	03/14/2007	03/14/2009	00099
HP 8449B Preamp	3008A00301	12/13/2006	12/13/2008	2010
Cable, Pasternack 36"	NA	04/24/2007	04/24/2009	P05202
Cable, Pasternack 48"	NA	04/24/2007	04/24/2009	P05203
Cable, Andrews Hardline	NA	05/27/2005	05/27/2007	P01012

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Industrial Wireless Monitoring Network*	SynapSense, Inc	11-0067-011	052107-001

Support Devices:

Function	Manufacturer	Model #	S/N
Sensor	NK Technologies	AT1-010-000-SP	0707
Sensor	NK Technologies	AT1-010-000-SP	0635-3
Sensor	NK Technologies	AT1-010-000-SP	0635-2
Sensor	NK Technologies	AT1-010-000-SP	0635-1

Test Conditions / Notes:

Equipment is a low power wireless sensor device operating on 2.4 GHz ISM frequency band. The device is operating with maximum duty cycle of 1.44%, a configuration representative of worst case emissions. EUT ports are loaded with a representative configuration. All EUT ports are filled. Channel tested: Low, Middle and High. Frequency Range Investigated: Carrier. Temperature: 23°C, Relative Humidity: 41%. Bandwidths: CISPR. Duty Cycle correction factor applied in accordance with 15.35. Maximum on time in 100ms is 3.16ms therefore, $20 \cdot \log(3.16/100) = -30\text{dB}$. --Internal Antenna--

Transducer Legend:

T1=Amp HF - S/N 301	T2=ANT AN00327 900MHz-18.5GHz
T3=Cable 40 GHz 36"	T4=Cable 40 GHz 48"
T5=Cable P01012	T6=Cable - Site D 3m 9k - 20G
T7=DCCF	

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1 T5 dB	T2 T6 dB	T3 T7 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	2480.480M	88.3	-34.7 +2.4	+28.4 +4.7	+1.0 -30.0	+1.4	+0.0	61.5	94.0	-32.5	Horiz 129
2	2405.475M	88.4	-34.7 +2.3	+28.2 +4.7	+1.0 -30.0	+1.3	+0.0	61.2	94.0	-32.8	Horiz 128
3	2445.480M	88.2	-34.7 +2.3	+28.3 +4.7	+1.0 -30.0	+1.3	+0.0	61.1	94.0	-32.9	Horiz 129
4	2445.435M	87.4	-34.7 +2.3	+28.3 +4.7	+1.0 -30.0	+1.3	+0.0	60.3	94.0	-33.7	Horiz 128
5	2404.425M	87.0	-34.7 +2.3	+28.2 +4.7	+1.0 -30.0	+1.3	+0.0	59.8	94.0	-34.2	Horiz 126
6	2479.585M	85.4	-34.7 +2.4	+28.4 +4.7	+1.0 -30.0	+1.4	+0.0	58.6	94.0	-35.4	Horiz 128
7	2405.490M	85.8	-34.7 +2.3	+28.2 +4.7	+1.0 -30.0	+1.3	+0.0	58.6	94.0	-35.4	Verti 127
8	2405.475M	85.4	-34.7 +2.3	+28.2 +4.7	+1.0 -30.0	+1.3	+0.0	58.2	94.0	-35.8	Verti 128
9	2445.410M	84.4	-34.7 +2.3	+28.3 +4.7	+1.0 -30.0	+1.3	+0.0	57.3	94.0	-36.7	Verti 128
10	2445.475M	83.6	-34.7 +2.3	+28.3 +4.7	+1.0 -30.0	+1.3	+0.0	56.5	94.0	-37.5	Verti 128
11	2445.490M	83.2	-34.7 +2.3	+28.3 +4.7	+1.0 -30.0	+1.3	+0.0	56.1	94.0	-37.9	Verti 126
12	2480.410M	82.0	-34.7 +2.4	+28.4 +4.7	+1.0 -30.0	+1.4	+0.0	55.2	94.0	-38.8	Verti 128
13	2480.520M	81.6	-34.7 +2.4	+28.4 +4.7	+1.0 -30.0	+1.4	+0.0	54.8	94.0	-39.2	Verti 124

Test Location: CKC Laboratories • 4933 Sierra Pines Dr. • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **SynapSense, Inc.**
 Specification: **FCC 15.249 (2400-2483.5MHz)**
 Work Order #: **86378**
 Test Type: **Maximized Emissions**
 Equipment: **Industrial Wireless Monitoring Network**
 Manufacturer: SynapSense, Inc
 Model: 11-0067-001
 S/N: 052107-002

Date: 5/24/2007
 Time: 14:52:36
 Sequence#: 10
 Tested By: Randal Clark

Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
Agilent E4446A SA	US44300407	01/03/2007	01/03/2009	02660
EMCO 3115 Horn Antenna	8006-3413	03/17/2007	03/17/2009	00327
ARA MWH-1826/B Horn Antenna	1005	11/27/2006	11/27/2008	02046
Chase CBL6111C Bilog	2456	12/30/2006	12/30/2008	01991
EMCO Loop Antenna	1074	05/01/2007	05/01/2009	00226
HP 8447D Preamp	1937A02604	03/14/2007	03/14/2009	00099
HP 8449B Preamp	3008A00301	12/13/2006	12/13/2008	2010
Cable, Pasternack 36"	NA	04/24/2007	04/24/2009	P05202
Cable, Pasternack 48"	NA	04/24/2007	04/24/2009	P05203
Cable, Andrews Hardline	NA	05/27/2005	05/27/2007	P01012

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Industrial Wireless Monitoring Network*	SynapSense, Inc	11-0067-001	052107-002

Support Devices:

Function	Manufacturer	Model #	S/N
Sensor	NK Technologies	AT1-010-000-SP	0707
Sensor	NK Technologies	AT1-010-000-SP	0635-3
Sensor	NK Technologies	AT1-010-000-SP	0635-2
Sensor	NK Technologies	AT1-010-000-SP	0635-1

Test Conditions / Notes:

Equipment is a low power wireless sensor device operating on 2.4 GHz ISM frequency band. The device is operating with maximum duty cycle of 1.44%, a configuration representative of worst case emissions. EUT ports are loaded with a representative configuration. All EUT ports are filled. Test setup is representative of a worst case configuration. Channel tested: Low, Middle and High. Frequency Range Investigated: 25MHz - 25GHz. Temperature: 23°C, Relative Humidity: 41%. Bandwidths: CISPR. Duty Cycle correction factor applied in accordance with 15.35. Maximum on time in 100ms is 3.16ms therefore, $20 \cdot \log(3.16/100) = -30\text{dB}$. --External 2.1dBi Antenna--

Transducer Legend:

T1=Bilog Site D	T2=AMP AN00099
T3=Amp HF - S/N 301	T4=ANT AN00327 900MHz-18.5GHz
T5=Cable 40 GHz 36"	T6=Cable 40 GHz 48"
T7=Cable P01012	T8=Cable - Site D 3m 9k - 20G
T9=DCCF	

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	2483.500M	62.8	+0.0 +1.0 -30.0	+0.0 +1.4	-34.7 +2.4	+28.4 +4.7	+0.0	36.0	54.0 Band Edge	-18.0	Verti 130
2	4889.030M	51.8	+0.0 +1.5 -30.0	+0.0 +2.0	-34.1 +3.3	+33.4 +7.4	+0.0	35.3	54.0	-18.7	Verti 103
3	120.009M	38.0	+10.9 +0.0 +0.0	-27.0 +0.0	+0.0 +0.5	+0.0 +1.0	+0.0	23.4	43.5	-20.1	Verti 131
4	192.009M	39.1	+8.3 +0.0 +0.0	-26.7 +0.0	+0.0 +0.7	+0.0 +1.3	+0.0	22.7	43.5	-20.8	Verti 131
5	2483.500M	59.9	+0.0 +1.0 -30.0	+0.0 +1.4	-34.7 +2.4	+28.4 +4.7	+0.0	33.1	54.0 Band Edge	-20.9	Horiz 130
6	120.009M	36.3	+10.9 +0.0 +0.0	-27.0 +0.0	+0.0 +0.5	+0.0 +1.0	+0.0	21.7	43.5	-21.8	Verti 131
7	504.004M	29.5	+17.5 +0.0 +0.0	-27.7 +0.0	+0.0 +1.2	+0.0 +2.0	+0.0	22.5	46.0	-23.5	Verti 131
8	2400.000M	57.5	+0.0 +1.0 -30.0	+0.0 +1.3	-34.7 +2.3	+28.2 +4.7	+0.0	30.3	54.0 Band Edge	-23.7	Verti 130
9	480.004M	29.6	+17.0 +0.0 +0.0	-27.6 +0.0	+0.0 +1.2	+0.0 +2.0	+0.0	22.2	46.0	-23.8	Verti 131
10	4958.875M	46.1	+0.0 +1.5 -30.0	+0.0 +2.0	-34.0 +3.3	+33.5 +7.4	+0.0	29.8	54.0	-24.2	Verti 117
11	288.010M	33.1	+12.6 +0.0 +0.0	-26.4 +0.0	+0.0 +0.8	+0.0 +1.6	+0.0	21.7	46.0	-24.3	Verti 131
12	496.004M	28.7	+17.3 +0.0 +0.0	-27.7 +0.0	+0.0 +1.2	+0.0 +2.0	+0.0	21.5	46.0	-24.5	Verti 131
13	480.004M	27.4	+17.0 +0.0 +0.0	-27.6 +0.0	+0.0 +1.2	+0.0 +2.0	+0.0	20.0	46.0	-26.0	Horiz 131

14	280.001M	30.9	+12.5 +0.0 +0.0	-26.4 +0.0	+0.0 +0.8	+0.0 +1.5	+0.0	19.3	46.0	-26.7	Verti 131
15	383.990M	28.5	+15.0 +0.0 +0.0	-27.1 +0.0	+0.0 +1.0	+0.0 +1.8	+0.0	19.2	46.0	-26.8	Verti 131
16	4809.185M	43.2	+0.0 +1.5 -30.0	+0.0 +1.9	-33.9 +3.3	+33.2 +7.2	+0.0	26.4	54.0	-27.6	Verti 103
17	224.001M	30.7	+10.2 +0.0 +0.0	-26.5 +0.0	+0.0 +0.7	+0.0 +1.4	+0.0	16.5	46.0	-29.5	Verti 131
18	2400.000M	48.2	+0.0 +1.0 -30.0	+0.0 +1.3	-34.7 +2.3	+28.2 +4.7	+0.0	21.0	54.0 Band Edge	-33.0	Horiz 130

Test Location: CKC Laboratories •4933 Sierra Pines Dr. • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **SynapSense, Inc.**
 Specification: **FCC 15.249 (2400-2483.5MHz)**
 Work Order #: **86378**
 Test Type: **Maximized Emissions**
 Equipment: **Industrial Wireless Monitoring Network**
 Manufacturer: SynapSense, Inc
 Model: 11-0067-011
 S/N: 052107-001

Date: 5/24/2007
 Time: 12:10:14
 Sequence#: 13
 Tested By: Randal Clark

Test Equipment:

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Industrial Wireless Monitoring Network*	SynapSense, Inc	11-0067-011	052107-001

Support Devices:

Function	Manufacturer	Model #	S/N
Sensor	NK Technologies	AT1-010-000-SP	0707
Sensor	NK Technologies	AT1-010-000-SP	0635-3
Sensor	NK Technologies	AT1-010-000-SP	0635-2
Sensor	NK Technologies	AT1-010-000-SP	0635-1

Test Conditions / Notes:

Equipment is a low power wireless sensor device operating on 2.4 GHz ISM frequency band. The device is operating with maximum duty cycle of 1.44%, a configuration representative of worst case emissions. EUT ports are loaded with a representative configuration. All EUT ports are filled. Channel tested: Low, Middle and High. Frequency Range Investigated: 25MHz - 25GHz. Temperature: 23°C, Relative Humidity: 41%. Bandwidths: CISPR Duty Cycle correction factor applied in accordance with 15.35. Maximum on time in 100ms is 3.16ms therefore, $20 \cdot \log(3.16/100) = -30\text{dB}$. --Internal Antenna--

Transducer Legend:

T1=Bilog Site D	T2=AMP AN00099
T3=Amp HF - S/N 301	T4=ANT AN00327 900MHz-18.5GHz
T5=Cable 40 GHz 36"	T6=Cable 40 GHz 48"
T7=Cable P01012	T8=Cable - Site D 3m 9k - 20G
T9=DCCF	

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	216.000M	42.6	+9.6 +0.0 +0.0	-26.6 +0.0	+0.0 +0.7	+0.0 +1.4	+0.0	27.7	43.5	-15.8	Horiz 128
2	176.012M	41.6	+8.4 +0.0 +0.0	-26.8 +0.0	+0.0 +0.7	+0.0 +1.2	+0.0	25.1	43.5	-18.4	Horiz 131

3	184.000M	41.0	+8.2 +0.0 +0.0	-26.8 +0.0	+0.0 +0.7	+0.0 +1.2	+0.0	24.3	43.5	-19.2	Horiz 128
4	160.007M	38.4	+10.1 +0.0 +0.0	-26.9 +0.0	+0.0 +0.5	+0.0 +1.1	+0.0	23.2	43.5	-20.3	Horiz 131
5	328.028M	36.0	+13.6 +0.0 +0.0	-26.6 +0.0	+0.0 +1.0	+0.0 +1.7	+0.0	25.7	46.0	-20.3	Horiz 131
6	320.024M	36.2	+13.4 +0.0 +0.0	-26.5 +0.0	+0.0 +0.8	+0.0 +1.6	+0.0	25.5	46.0	-20.5	Horiz 131
7	432.031M	32.9	+16.1 +0.0 +0.0	-27.4 +0.0	+0.0 +1.2	+0.0 +1.9	+0.0	24.7	46.0	-21.3	Horiz 131
8	312.002M	35.7	+13.2 +0.0 +0.0	-26.5 +0.0	+0.0 +0.7	+0.0 +1.6	+0.0	24.7	46.0	-21.3	Horiz 128
9	2483.500M	58.3	+0.0 +1.0 -30.0	+0.0 +1.4	-34.7 +2.4	+28.4 +4.7	+0.0	31.5	54.0 Band Edge	-22.5	Verti 128
10	168.007M	36.5	+9.2 +0.0 +0.0	-26.8 +0.0	+0.0 +0.7	+0.0 +1.2	+0.0	20.8	43.5	-22.7	Horiz 131
11	352.019M	33.0	+14.2 +0.0 +0.0	-26.7 +0.0	+0.0 +1.0	+0.0 +1.7	+0.0	23.2	46.0	-22.8	Horiz 131
12	384.010M	32.4	+15.0 +0.0 +0.0	-27.1 +0.0	+0.0 +1.0	+0.0 +1.8	+0.0	23.1	46.0	-22.9	Horiz 131
13	4890.000M	47.4	+0.0 +1.5 -30.0	+0.0 +2.0	-34.1 +3.3	+33.4 +7.4	+0.0	30.9	54.0	-23.1	Verti 124
14	359.997M	31.9	+14.4 +0.0 +0.0	-26.8 +0.0	+0.0 +1.0	+0.0 +1.7	+0.0	22.2	46.0	-23.8	Horiz 131
15	416.002M	30.6	+15.8 +0.0 +0.0	-27.4 +0.0	+0.0 +1.0	+0.0 +1.9	+0.0	21.9	46.0	-24.1	Horiz 131
16	391.990M	30.4	+15.2 +0.0 +0.0	-27.2 +0.0	+0.0 +1.0	+0.0 +1.9	+0.0	21.3	46.0	-24.7	Horiz 131
17	456.024M	29.2	+16.6 +0.0 +0.0	-27.5 +0.0	+0.0 +1.0	+0.0 +1.9	+0.0	21.2	46.0	-24.8	Horiz 131
18	4960.070M	45.3	+0.0 +1.5 -30.0	+0.0 +2.0	-34.0 +3.3	+33.5 +7.4	+0.0	29.0	54.0	-25.0	Horiz 128
19	4809.850M	44.7	+0.0 +1.5 -30.0	+0.0 +1.9	-33.9 +3.3	+33.2 +7.2	+0.0	27.9	54.0	-26.1	Verti 124

20	4890.085M	43.5	+0.0 +1.5 -30.0	+0.0 +2.0	-34.1 +3.3	+33.4 +7.4	+0.0	27.0	54.0	-27.0	Horiz 124
21	4811.035M	43.8	+0.0 +1.5 -30.0	+0.0 +1.9	-33.9 +3.3	+33.2 +7.2	+0.0	27.0	54.0	-27.0	Horiz 124
22	4960.070M	43.1	+0.0 +1.5 -30.0	+0.0 +2.0	-34.0 +3.3	+33.5 +7.4	+0.0	26.8	54.0	-27.2	Verti 130
23	2400.000M	53.0	+0.0 +1.0 -30.0	+0.0 +1.3	-34.7 +2.3	+28.2 +4.7	+0.0	25.8	54.0 Band Edge	-28.2	Verti 128

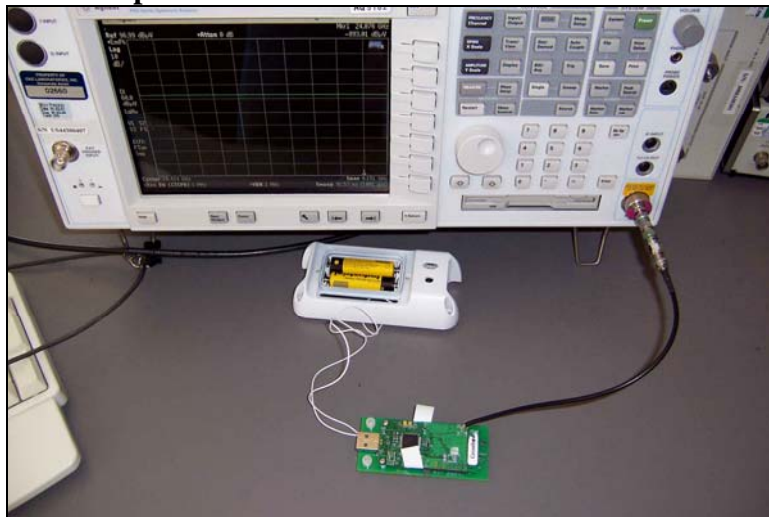
OCCUPIED BANDWIDTH

Test Equipment

Function	S/N	Calibration Date	Cal Due Date	Asset #
Agilent E4446A SA	US44300407	01/03/2007	01/03/2009	02660

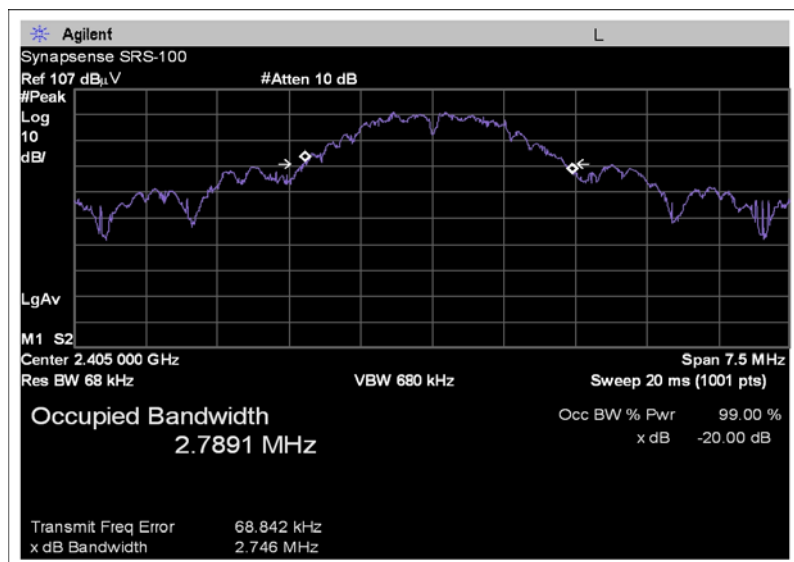
Test Conditions: Equipment is a low power wireless sensor device operating on 2.4 GHz ISM frequency band. The device is operating with maximum duty cycle of 1.44%, a configuration representative of worst case emissions. EUT ports are loaded with a representative configuration. All EUT ports are filled. Test setup is representative of a worst case configuration.

Test Setup Photos



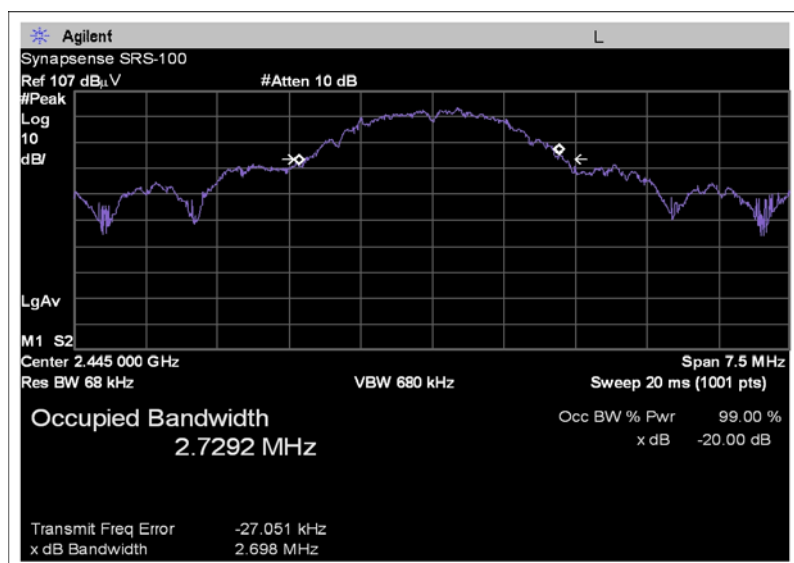
Plots

OCCUPIED BANDWIDTH 20dB LOW



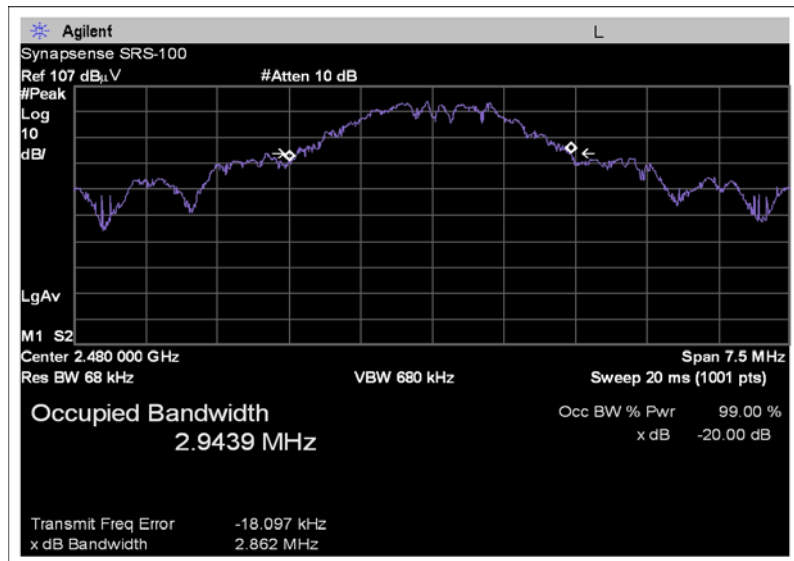
Tested by: Randal Clark

OCCUPIED BANDWIDTH 20dB MID



Tested by: Randal Clark

OCCUPIED BANDWIDTH 20dB HIGH



Tested by: Randal Clark

BAND EDGE

Test Equipment

Function	S/N	Calibration Date	Cal Due Date	Asset #
Agilent E4446A SA	US44300407	01/03/2007	01/03/2009	02660
EMCO 3115 Horn Antenna	8006-3413	03/17/2007	03/17/2009	00327
ARA MWH-1826/B Horn Antenna	1005	11/27/2006	11/27/2008	02046
Chase CBL6111C Bilog	2456	12/30/2006	12/30/2008	01991
EMCO Loop Antenna	1074	05/01/2007	05/01/2009	00226
HP 8447D Preamp	1937A02604	03/14/2007	03/14/2009	00099
HP 8449B Preamp	3008A00301	12/13/2006	12/13/2008	2010
Cable, Pasternack 36"	NA	04/24/2007	04/24/2009	P05202
Cable, Pasternack 48"	NA	04/24/2007	04/24/2009	P05203
Cable, Andrews Hardline	NA	05/27/2005	05/27/2007	P01012

Test Conditions: Equipment is a low power wireless sensor device operating on 2.4 GHz ISM frequency band. The device is operating with maximum duty cycle of 1.44%, a configuration representative of worst case emissions. EUT ports are loaded with a representative configuration. All EUT ports are filled. Test setup is representative of a worst case configuration.

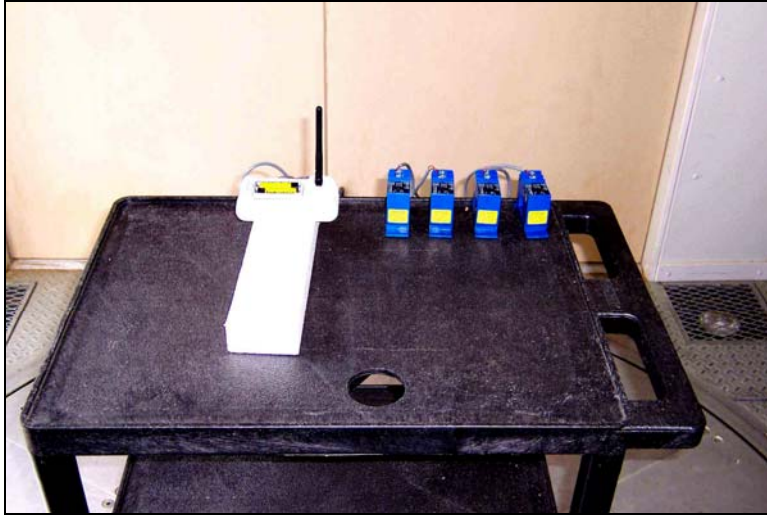
Test Setup Photos



11-0067-001 configuration 1



11-0067-001 configuration 1



11-0067-001 configuration 2



11-0067-001 configuration 2



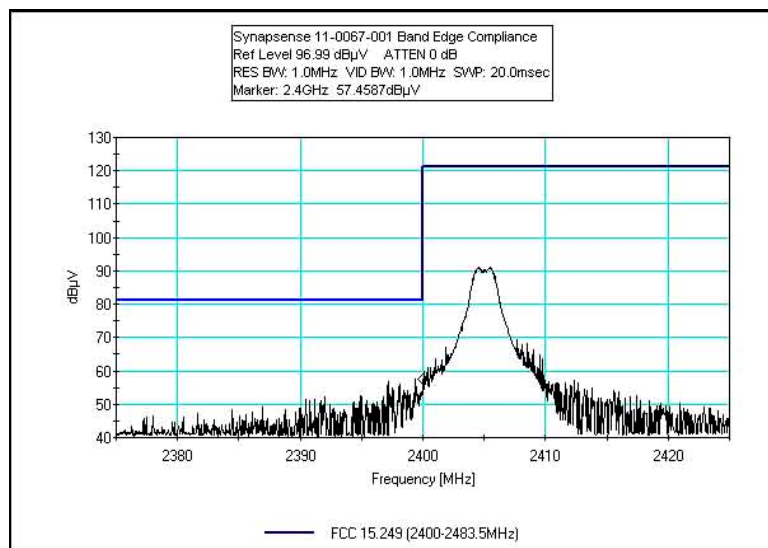
11-0067-011



11-0067-011

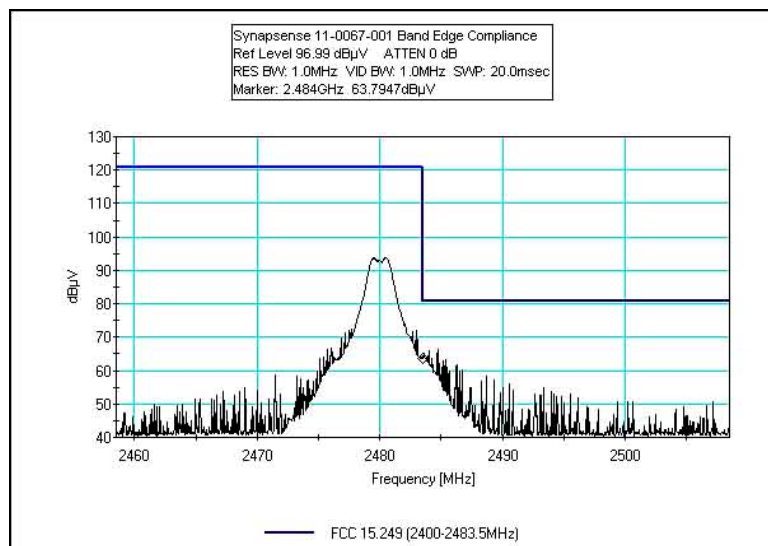
Plots

11-0067-001 BAND EDGE LOW



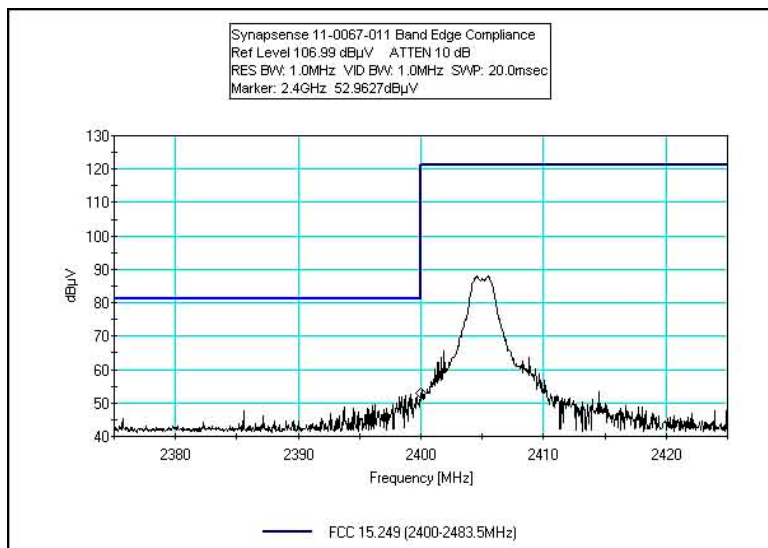
Tested by: Randal Clark

11-0067-001 BAND EDGE HIGH



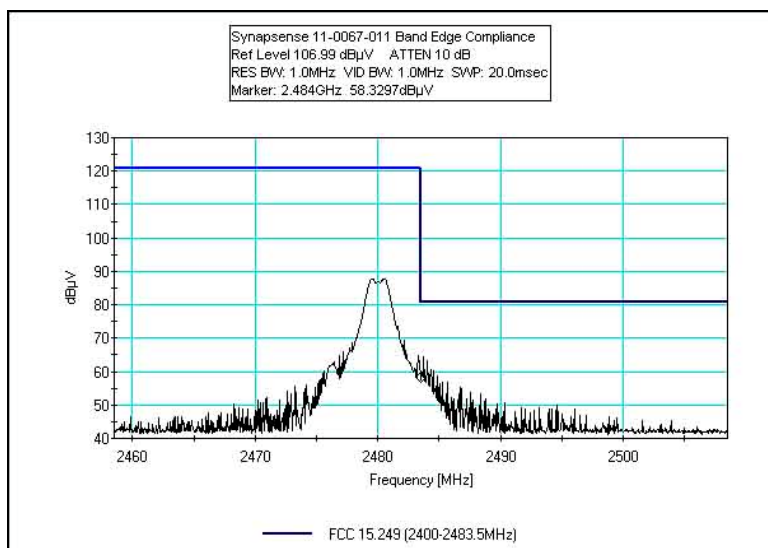
Tested by: Randal Clark

11-0067-011 BAND EDGE LOW



Tested by: Randal Clark

11-0067-011 BAND EDGE HIGH



Tested by: Randal Clark

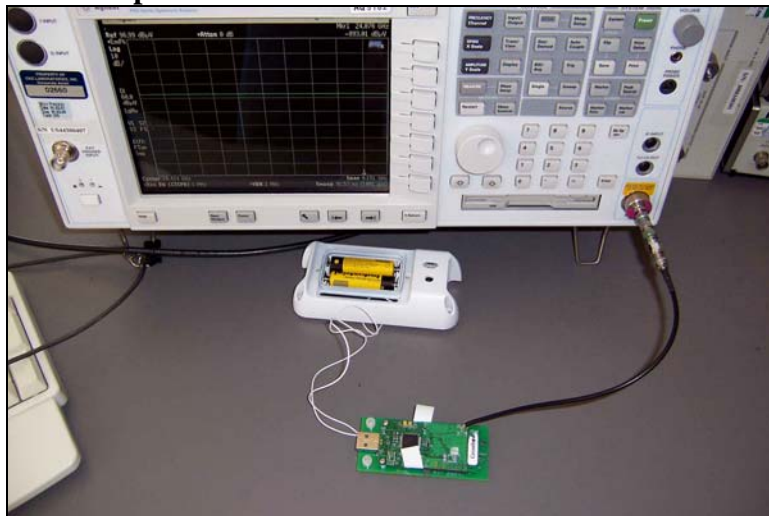
DUTY CYCLE

Test Equipment

Function	S/N	Calibration Date	Cal Due Date	Asset #
Agilent E4446A SA	US44300407	01/03/2007	01/03/2009	02660
EMCO 3115 Horn Antenna	8006-3413	03/17/2007	03/17/2009	00327
ARA MWH-1826/B Horn Antenna	1005	11/27/2006	11/27/2008	02046
Chase CBL6111C Bilog	2456	12/30/2006	12/30/2008	01991
EMCO Loop Antenna	1074	05/01/2007	05/01/2009	00226
HP 8447D Preamp	1937A02604	03/14/2007	03/14/2009	00099
HP 8449B Preamp	3008A00301	12/13/2006	12/13/2008	2010
Cable, Pasternack 36"	NA	04/24/2007	04/24/2009	P05202
Cable, Pasternack 48"	NA	04/24/2007	04/24/2009	P05203
Cable, Andrews Hardline	NA	05/27/2005	05/27/2007	P01012

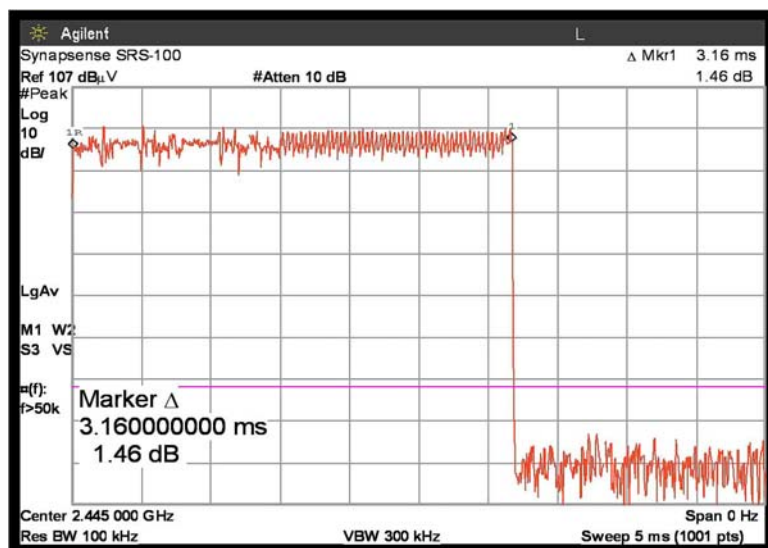
Test Conditions: Equipment is a low power wireless sensor device operating on 2.4 GHz ISM frequency band. The device is operating with maximum duty cycle of 1.44%, a configuration representative of worst case emissions. EUT ports are loaded with a representative configuration. All EUT ports are filled. Test setup is representative of a worst case configuration.

Test Setup Photos



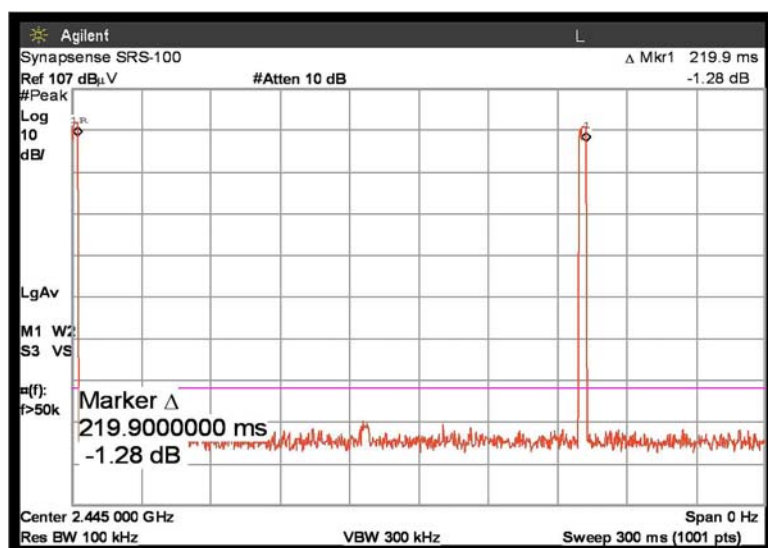
Plots

DUTY CYCLE 5ms 1.44%



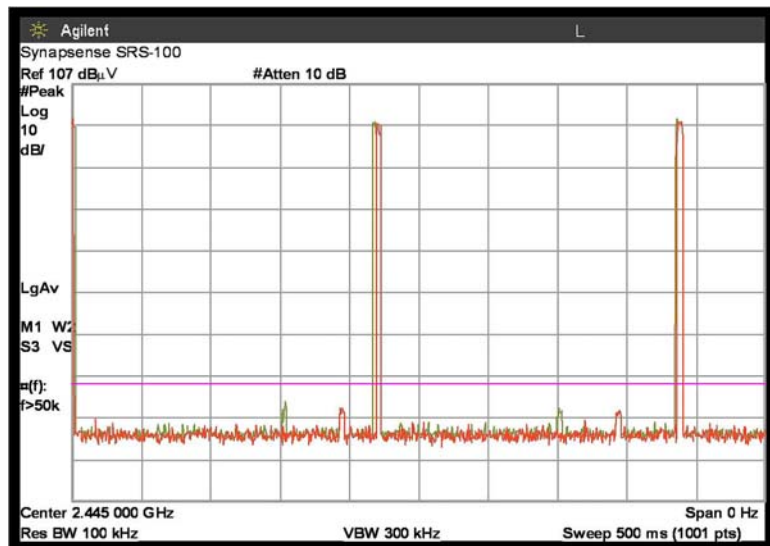
Tested by: Randal Clark

DUTY CYCLE 300ms



Tested by: Randal Clark

DUTY CYCLE 500ms



Tested by: Randal Clark