SynapSense

ADDENDUM TEST REPORT TO 93248-9

Thermanode EZ
Model: 0944

Tested To The Following Standards:

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

Report No.: 93248-9A

Date of issue: August 16, 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.

TABLE OF CONTENTS

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

SynapSense
340 Palladio Parkway, Suite 540
Folsom, CA 95630

REPORT PREPARED BY:

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

Representative: Michele Clemente
Customer Reference Number: 10524

Project Number: 93248

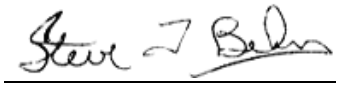
DATE OF EQUIPMENT RECEIPT: June 25, 2012
DATE(S) OF TESTING: June 25-27, 2012

Revision History

Original: Testing of the Thermanode EZ, Model: 0944 to FCC Part 15 Subpart C Sections 15.209, 15.247 and RSS-210 Issue 8.
Addendum A: To correct the information in the Power Output and Power Spectral Density sections.

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

Description	Test Procedure/Method	Results
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 GUIDEANCE V01	Pass
6dBc / 99% Occupied Bandwidth	FCC Part 15 Subpart C Section 15.247 (a)(2) / 558074 DO1 / DTS MEAS GUIDEANCE V01 / RSS 210 Issue 8	Pass
Bandedge	FCC Part 15 Subpart C / ITU-R-55/1 / 558074 DO1 / DTS MEAS GUIDEANCE V01	Pass
Power Spectral Density	FCC Part 15 Subpart C 15.247(e) / 558074 DO1 / DTS MEAS GUIDEANCE V01	Pass

Conditions During Testing

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

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

EQUIPMENT UNDER TEST

Thermanode EZ
Manuf: SynapSense
Model: 0944
Serial: 001

PERIPHERAL DEVICES

The EUT was not tested with peripheral devices.

FCC PART 15 SUBPART C

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

15.209 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 #: **93248** Date: 6/27/2012
Test Type: **Maximized Emissions** Time: 13:16:44
Equipment: **Thermanode EZ** Sequence#: 7
Manufacturer: SynapSense Corp. Tested By: Chuck Kendall
Model: 0944
S/N: 001

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02660	Spectrum Analyzer	E4446A	11/3/2011	11/3/2013
T2	AN03155	Preamp	83017A	8/3/2011	8/3/2013
T3	AN00327	Horn Antenna	3115	4/13/2012	4/13/2014
T4	AN03012	Cable	32022-2-29094K-36TC	2/28/2012	2/28/2014
T5	ANP01403	Cable	58758-23	6/22/2011	6/22/2013
T6	ANP05904	Cable	32022-2-29094K-144TC	6/22/2011	6/22/2013
T7	AN00062	Preamp	8447D	6/6/2012	6/6/2014
T8	AN01991	Biconilog Antenna	CBL6111C	3/14/2012	3/14/2014
T9	AN00226	Loop Antenna	6502	3/28/2012	3/28/2014
T10	ANP05686	Cable	RG214/U	1/24/2012	1/24/2014
	AN02046	Horn Antenna-ANSI C63.5 Antenna Factors (dB)	MWH-1826/B	11/10/2010	11/10/2012

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

Function	Manufacturer	Model #	S/N
Thermanode EZ*	SynapSense Corp.	0944	001

Support Devices:

Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

EUT is set up on Styrofoam foam some 80 cm from the ground plane. The sensor and cable is attached. A new set of batteries are installed.

CISPR bandwidths used.
Transmitter is transmitting at 100 % duty cycle on the following frequencies: 2405 MHz, 2445 MHz, or 2480 MHz.
Frequency range: 9 kHz to 25 MHz

Environmental Conditions:
Temperature = 20.4°C
Relative Humidity = 35%
Pressure = 97.7 kPa

Ext Attn: 0 dB

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

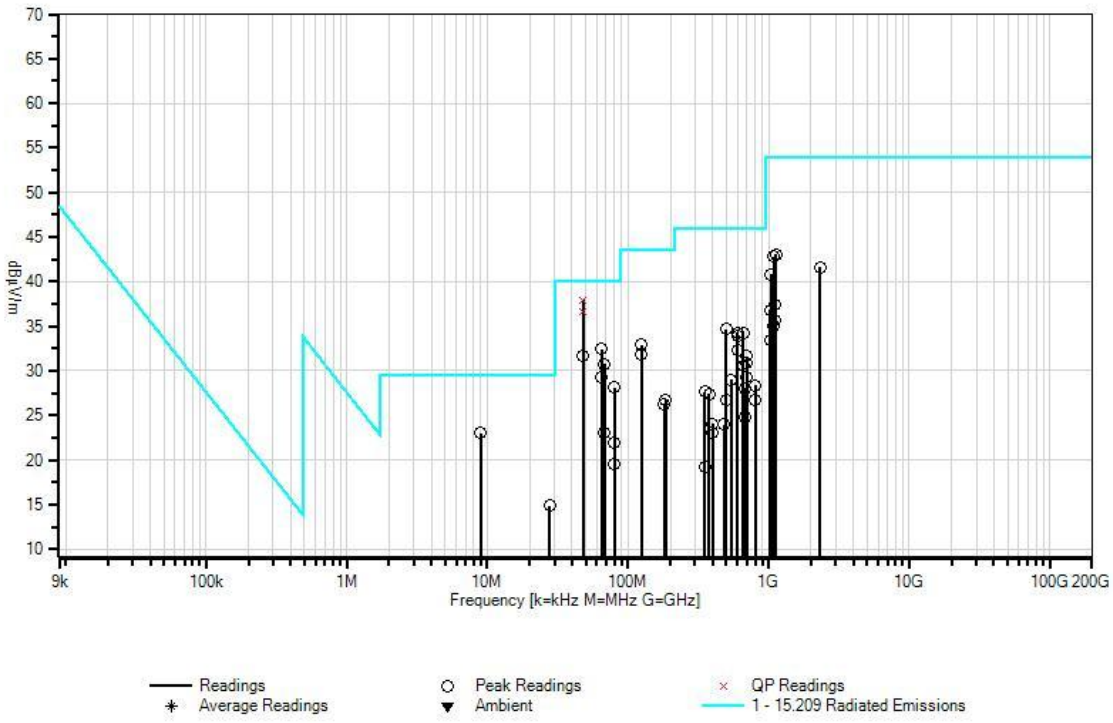
#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	47.805M	58.3	+0.0	+0.0	+0.0	+0.1	+0.0	37.9	40.0	-2.1	Horiz
	QP		+0.3	+0.4	-30.6	+9.4					
			+0.0	+0.0							
2	47.800M	57.0	+0.0	+0.0	+0.0	+0.1	+0.0	36.6	40.0	-3.4	Horiz
	QP		+0.3	+0.4	-30.6	+9.4					
			+0.0	+0.0							
^	47.807M	59.2	+0.0	+0.0	+0.0	+0.1	+0.0	38.8	40.0	-1.2	Horiz
			+0.3	+0.4	-30.6	+9.4					
			+0.0	+0.0							
^	47.803M	57.5	+0.0	+0.0	+0.0	+0.1	+0.0	37.1	40.0	-2.9	Horiz
			+0.3	+0.4	-30.6	+9.4					
			+0.0	+0.0							
5	8.986M	33.1	+0.0	+0.0	+0.0	+0.0	-20.0	23.0	29.5	-6.5	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+9.9	+0.0							
6	64.760M	55.1	+0.0	+0.0	+0.0	+0.1	+0.0	32.4	40.0	-7.6	Vert
			+0.3	+0.4	-30.4	+6.9					
			+0.0	+0.0							
7	47.820M	52.1	+0.0	+0.0	+0.0	+0.1	+0.0	31.7	40.0	-8.3	Vert
			+0.3	+0.4	-30.6	+9.4					
			+0.0	+0.0							
8	68.250M	53.6	+0.0	+0.0	+0.0	+0.1	+0.0	30.8	40.0	-9.2	Vert
			+0.3	+0.5	-30.3	+6.6					
			+0.0	+0.0							
9	125.022M	51.1	+0.0	+0.0	+0.0	+0.1	+0.0	32.9	43.5	-10.6	Vert
			+0.5	+0.6	-30.1	+10.7					
			+0.0	+0.0							
10	64.761M	52.0	+0.0	+0.0	+0.0	+0.1	+0.0	29.3	40.0	-10.7	Horiz
			+0.3	+0.4	-30.4	+6.9					
			+0.0	+0.0							
11	1121.920M	45.4	+0.0	-31.2	+24.7	+0.5	+0.0	43.0	54.0	-11.0	Horiz
			+1.8	+1.8	+0.0	+0.0					
			+0.0	+0.0							

12	1089.280M	45.2	+0.0 +1.7 +0.0	-31.2 +1.7 +0.0	+24.9 +0.0	+0.5 +0.0	+0.0	42.8	54.0	-11.2	Horiz
13	500.004M	44.7	+0.0 +1.0 +0.0	+0.0 +1.0 +0.0	+0.0 -30.0	+0.3 +17.7	+0.0	34.7	46.0	-11.3	Vert
14	124.995M	50.0	+0.0 +0.5 +0.0	+0.0 +0.6 +0.0	+0.0 -30.1	+0.1 +10.7	+0.0	31.8	43.5	-11.7	Horiz
15	659.996M	42.3	+0.0 +1.1 +0.0	+0.0 +1.2 +0.0	+0.0 -30.0	+0.4 +19.3	+0.0	34.3	46.0	-11.7	Vert
16	600.004M	42.6	+0.0 +1.1 +0.0	+0.0 +1.1 +0.0	+0.0 -30.1	+0.4 +19.2	+0.0	34.3	46.0	-11.7	Vert
17	80.020M	49.8	+0.0 +0.4 +0.0	+0.0 +0.5 +0.0	+0.0 -30.3	+0.1 +7.6	+0.0	28.1	40.0	-11.9	Vert
18	600.004M	42.1	+0.0 +1.1 +0.0	+0.0 +1.1 +0.0	+0.0 -30.1	+0.4 +19.2	+0.0	33.8	46.0	-12.2	Horiz
19	2322.291M	38.5	+0.0 +2.5 +0.0	-30.8 +2.6 +0.0	+28.1 +0.0	+0.7 +0.0	+0.0	41.6	54.0	-12.4	Horiz
20	1041.080M	43.6	+0.0 +1.5 +0.0	-31.4 +1.5 +0.0	+25.1 +0.0	+0.5 +0.0	+0.0	40.8	54.0	-13.2	Horiz
21	600.000M	40.7	+0.0 +1.1 +0.0	+0.0 +1.1 +0.0	+0.0 -30.1	+0.4 +19.2	+0.0	32.4	46.0	-13.6	Horiz
22	700.020M	39.5	+0.0 +1.2 +0.0	+0.0 +1.2 +0.0	+0.0 -29.9	+0.4 +19.3	+0.0	31.7	46.0	-14.3	Vert
23	27.744M	28.2	+0.0 +0.0 +6.6	+0.0 +0.0 +0.1	+0.0 +0.0	+0.0 +0.0	-20.0	14.9	29.5	-14.6	Horiz
24	700.400M	38.7	+0.0 +1.2 +0.0	+0.0 +1.2 +0.0	+0.0 -29.9	+0.4 +19.3	+0.0	30.9	46.0	-15.1	Vert
25	660.002M	38.6	+0.0 +1.1 +0.0	+0.0 +1.2 +0.0	+0.0 -30.0	+0.4 +19.3	+0.0	30.6	46.0	-15.4	Horiz
26	1099.940M	39.9	+0.0 +1.7 +0.0	-31.2 +1.8 +0.0	+24.8 +0.0	+0.5 +0.0	+0.0	37.5	54.0	-16.5	Horiz
27	700.014M	37.0	+0.0 +1.2 +0.0	+0.0 +1.2 +0.0	+0.0 -29.9	+0.4 +19.3	+0.0	29.2	46.0	-16.8	Horiz
28	184.860M	45.6	+0.0 +0.6 +0.0	+0.0 +0.7 +0.0	+0.0 -29.5	+0.2 +9.1	+0.0	26.7	43.5	-16.8	Vert

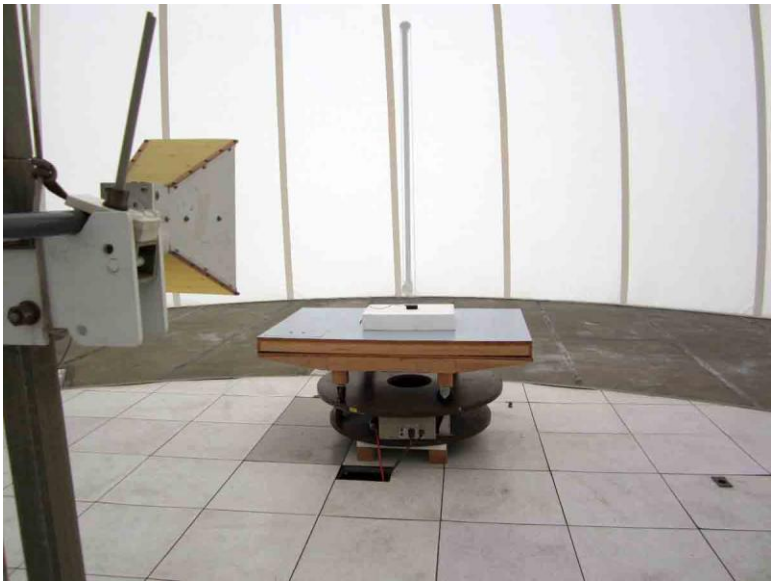
29	68.232M	45.9	+0.0 +0.3 +0.0	+0.0 +0.5 +0.0	+0.0 -30.3	+0.1 +6.6	+0.0	23.1	40.0	-16.9	Horiz
30	540.800M	38.5	+0.0 +1.0 +0.0	+0.0 +1.0 +0.0	+0.0 -30.1	+0.3 +18.3	+0.0	29.0	46.0	-17.0	Vert
31	1028.920M	39.8	+0.0 +1.4 +0.0	-31.4 +1.4 +0.0	+25.2 +0.0	+0.5 +0.0	+0.0	36.9	54.0	-17.1	Horiz
32	181.440M	45.2	+0.0 +0.5 +0.0	+0.0 +0.7 +0.0	+0.0 -29.5	+0.2 +9.2	+0.0	26.3	43.5	-17.2	Vert
33	800.008M	34.4	+0.0 +1.2 +0.0	+0.0 +1.2 +0.0	+0.0 -29.4	+0.4 +20.6	+0.0	28.4	46.0	-17.6	Vert
34	679.996M	35.9	+0.0 +1.1 +0.0	+0.0 +1.2 +0.0	+0.0 -29.9	+0.4 +19.3	+0.0	28.0	46.0	-18.0	Vert
35	80.006M	43.6	+0.0 +0.4 +0.0	+0.0 +0.5 +0.0	+0.0 -30.3	+0.1 +7.6	+0.0	21.9	40.0	-18.1	Horiz
36	350.004M	40.6	+0.0 +0.8 +0.0	+0.0 +1.0 +0.0	+0.0 -29.4	+0.3 +14.4	+0.0	27.7	46.0	-18.3	Vert
37	1099.940M	38.0	+0.0 +1.7 +0.0	-31.2 +1.8 +0.0	+24.8 +0.0	+0.5 +0.0	+0.0	35.6	54.0	-18.4	Vert
38	375.600M	39.7	+0.0 +0.9 +0.0	+0.0 +1.1 +0.0	+0.0 -29.6	+0.3 +15.0	+0.0	27.4	46.0	-18.6	Vert
39	1089.280M	37.5	+0.0 +1.7 +0.0	-31.2 +1.7 +0.0	+24.9 +0.0	+0.5 +0.0	+0.0	35.1	54.0	-18.9	Vert
40	800.006M	32.8	+0.0 +1.2 +0.0	+0.0 +1.2 +0.0	+0.0 -29.4	+0.4 +20.6	+0.0	26.8	46.0	-19.2	Horiz
41	500.004M	36.7	+0.0 +1.0 +0.0	+0.0 +1.0 +0.0	+0.0 -30.0	+0.3 +17.7	+0.0	26.7	46.0	-19.3	Horiz
42	1028.920M	36.4	+0.0 +1.4 +0.0	-31.4 +1.4 +0.0	+25.2 +0.0	+0.5 +0.0	+0.0	33.5	54.0	-20.5	Vert
43	80.006M	41.2	+0.0 +0.4 +0.0	+0.0 +0.5 +0.0	+0.0 -30.3	+0.1 +7.6	+0.0	19.5	40.0	-20.5	Horiz
44	679.996M	32.8	+0.0 +1.1 +0.0	+0.0 +1.2 +0.0	+0.0 -29.9	+0.4 +19.3	+0.0	24.9	46.0	-21.1	Horiz
45	400.004M	35.8	+0.0 +0.9 +0.0	+0.0 +1.1 +0.0	+0.0 -29.7	+0.3 +15.6	+0.0	24.0	46.0	-22.0	Vert

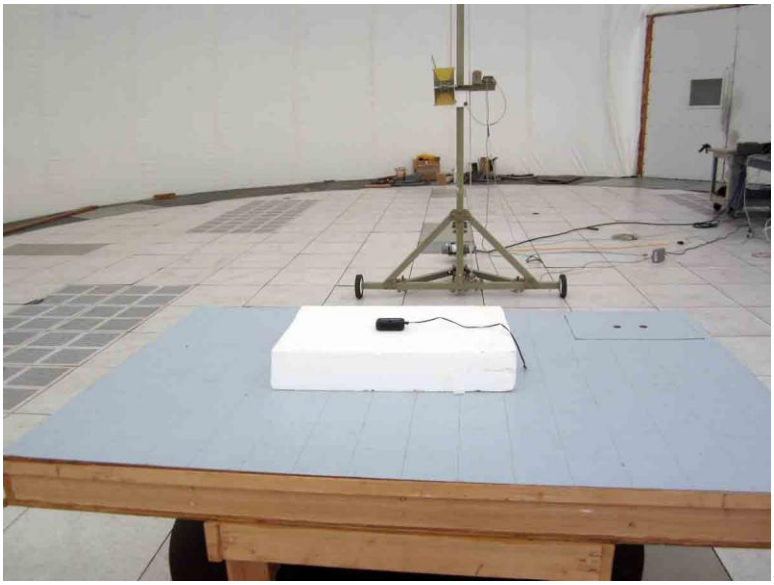
46	480.004M	34.5	+0.0 +0.9 +0.0	+0.0 +1.0 +0.0	+0.0 -30.0	+0.3 +17.3	+0.0	24.0	46.0	-22.0	Vert
47	479.996M	34.5	+0.0 +0.9 +0.0	+0.0 +1.0 +0.0	+0.0 -30.0	+0.3 +17.3	+0.0	24.0	46.0	-22.0	Horiz
48	399.996M	34.8	+0.0 +0.9 +0.0	+0.0 +1.1 +0.0	+0.0 -29.7	+0.3 +15.6	+0.0	23.0	46.0	-23.0	Horiz
49	350.003M	32.1	+0.0 +0.8 +0.0	+0.0 +1.0 +0.0	+0.0 -29.4	+0.3 +14.4	+0.0	19.2	46.0	-26.8	Horiz
50	999.990M	37.0	+0.0 +1.3 +0.0	-31.5 +1.3 +0.0	+0.0 +0.0	+0.5 +0.0	+0.0	8.6	54.0	-45.4	Horiz

CKC Laboratories Date: 6/27/2012 Time: 13:16:44 SynapSense Corporation WO#: 93248
15.209 Radiated Emissions Test Distance: 3 Meters Sequence#: 7 Ext ATTN: 0 dB



Test Setup Photos





15.247 RF Power Output

Test Data

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

Customer: **SynapSense Corporation**
Specification: **15.247(b)(3) Power Output (2400-2483.5 MHz DTS)**
Work Order #: **93248** Date: 6/26/2012
Test Type: **Maximized Emissions** Time: 09:04:20
Equipment: **Thermanode EZ** Sequence#: 2
Manufacturer: SynapSense Corp. Tested By: Chuck Kendall
Model: 0944
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	AN03155	Preamp	83017A	8/3/2011	8/3/2013
T2	AN00327	Horn Antenna	3115	4/13/2012	4/13/2014
T3	AN03012	Cable	32022-2-29094K-36TC	2/28/2012	2/28/2014
T4	ANP01403	Cable	58758-23	6/22/2011	6/22/2013
T5	ANP05904	Cable	32022-2-29094K-144TC	6/22/2011	6/22/2013

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

Function	Manufacturer	Model #	S/N
Thermanode EZ*	SynapSense Corp.	0944	001

Support Devices:

Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

EUT is set up on 10cm of Styrofoam foam some 80 cm from the ground plane. The sensor and cable is attached. A new set of batteries are installed.

RBW is set to 3MHz; VBW is set to 50 MHz and the span is 0 Hz.
Transmitter is transmitting at 100 % duty cycle on the following frequencies: 2405 MHz, 2445 MHz, or 2480 MHz.

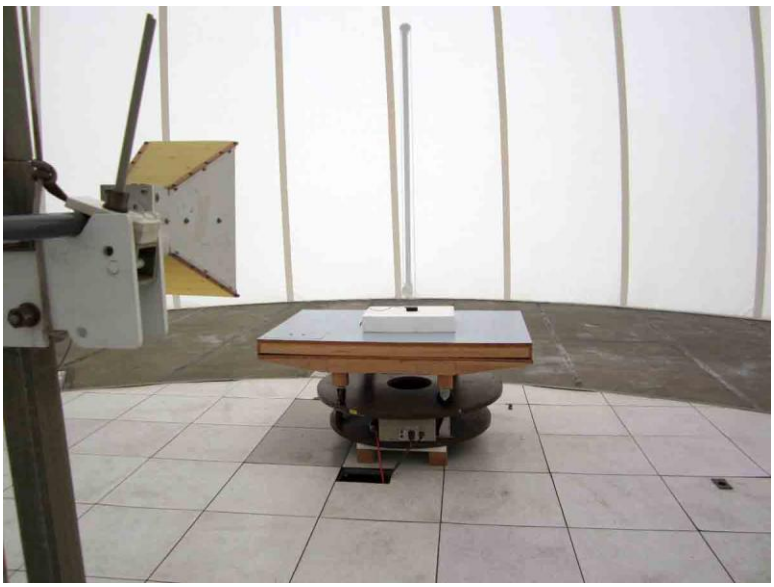
Measurements made IAW KDB558074, PK1 method.
Antenna Gain: 3.3dBi
Calculations used:
E(dB) = dBµV/m at 3m
P = (E*D)^2/30G

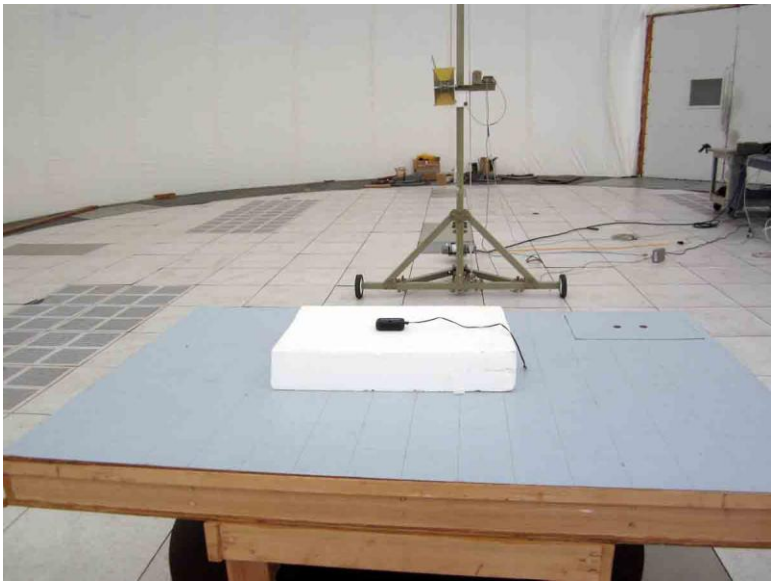
Environmental Conditions:
Temperature = 20.4°C
Relative Humidity = 35%
Pressure = 97.7 kPa

Antenna Gain: 3.3dBi

Frequency	Power in dBm	Limit in dBm
2405 MHz	2.9	30
2445 MHz	4.7	30
2480 MHz	3.8	30

Test Setup Photos





6dBc & 99% RSS 210 Occupied Bandwidth

Test Conditions / Setup

EUT is set up on Styrofoam foam some 80 cm from the ground plane. The sensor and cable is attached. A new set of batteries are installed.
Bandwidths as stated in the plots. RBW = 100kHz, VBW = 1 MHz, and a span of 10 MHz
Frequency range: 2400 MHz to 2483.5 MHz
Transmitter is transmitting at 100 % duty cycle on the following frequencies: 2405 MHz, 2445 MHz, or 2480 MHz.
Frequency range:
Environmental Conditions:
Temperature = 20.4°C
Relative Humidity = 35%
Pressure = 97.7 kPa

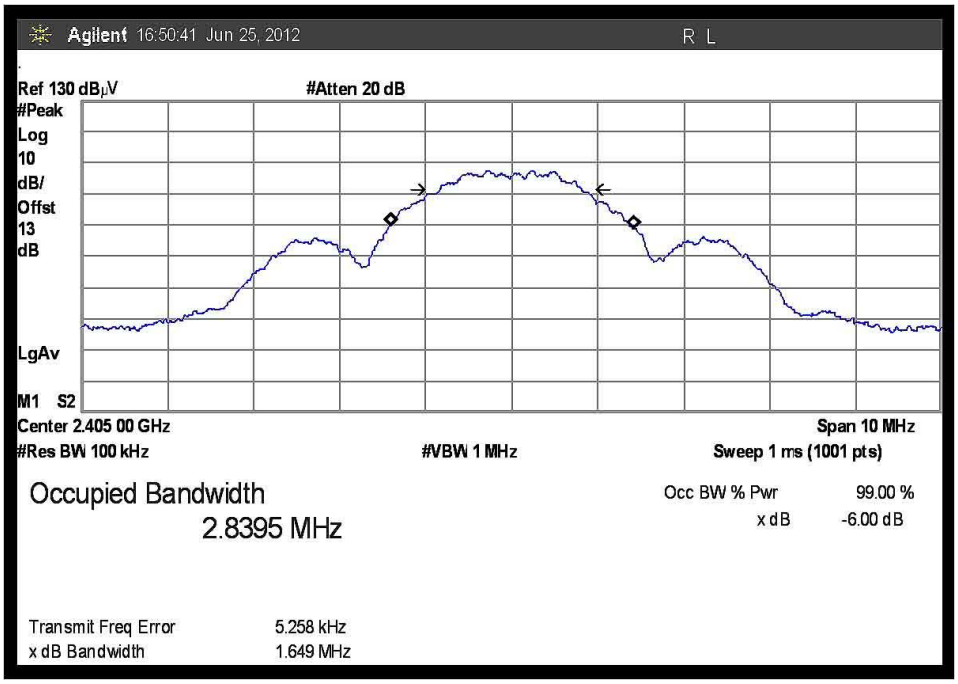
Engineer Name: C. Kendall

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
AN03012	Cable	32022-2-29094K-36TC	AstroLab	2/28/2012	2/28/2014
ANP01403	Cable	58758-23	Semflex	6/22/2011	6/22/2013
ANP05904	Cable	32022-2-29094K-144TC	AstroLab	6/22/2011	6/22/2013

Frequency in MHz	6dB EBW in MHz
2405	1649
2445	1645
2480	1648

Frequency in MHz	99% EBW in MHz
2405	2839.5
2445	2807.7
2480	2794.8

Test Plots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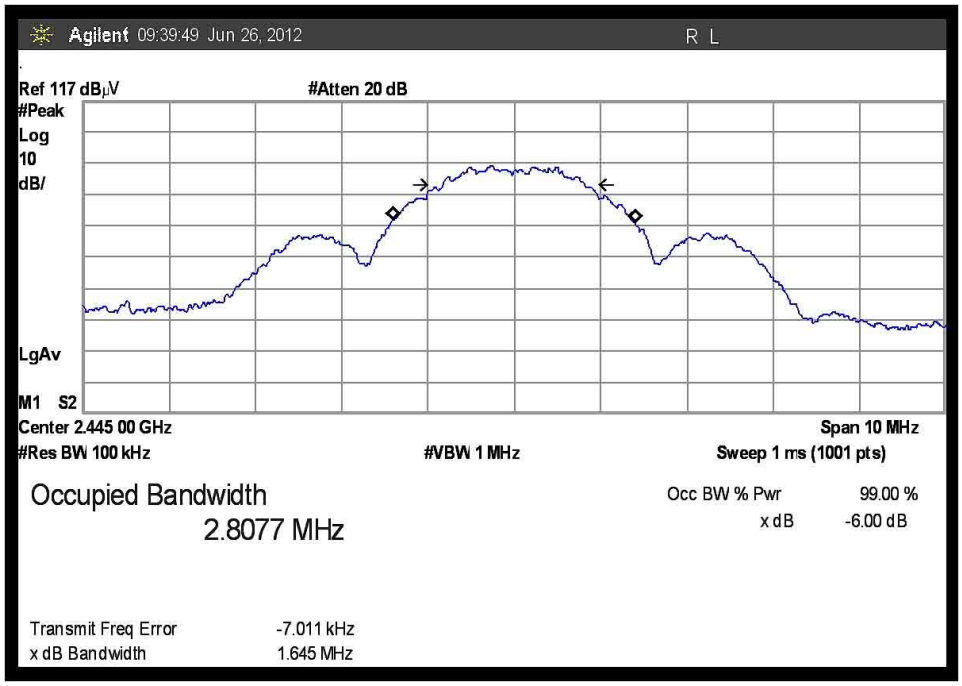
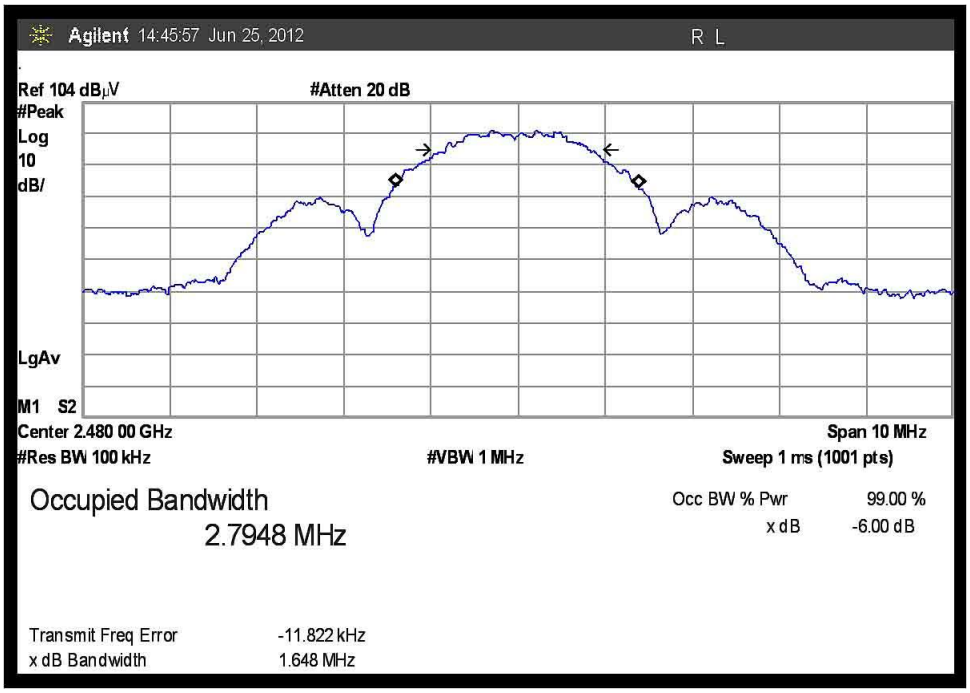
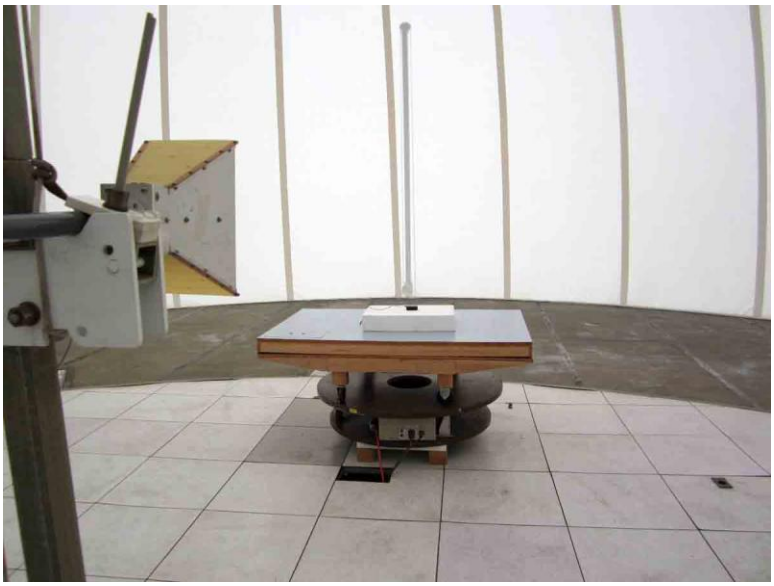
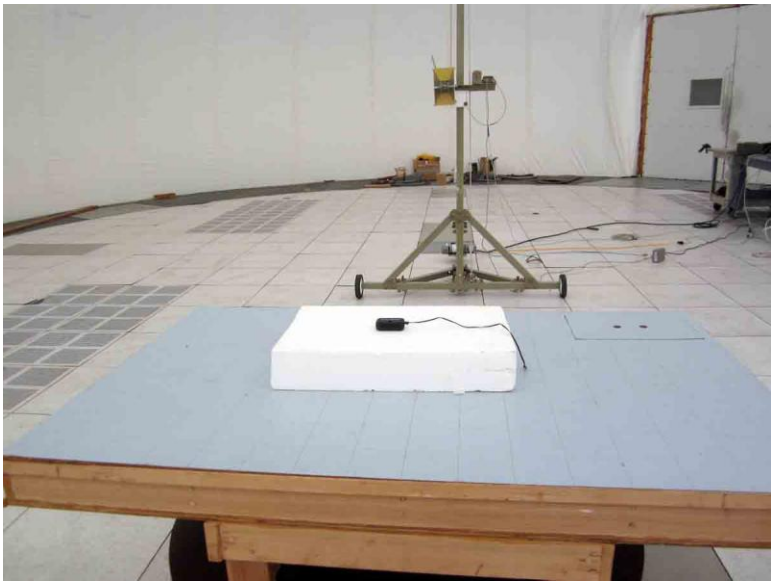
R L
Ref 130 dBµV
#Atten 20 dB
#Peak
Log
10
dB/
Offst
13
dB
LgAv
M1 S2
Center 2.405 00 GHz
Span 10 MHz
#Res BW 100 kHz
#VBW 1 MHz
Sweep 1 ms (1001 pts)
Occupied Bandwidth
2.8395 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error 5.258 kHz
x dB Bandwidth 1.649 MHz


Agilent 09:39:49 Jun 26, 2012
R L
Ref 117 dBµV
#Atten 20 dB
#Peak
Log
10
dB/
LgAv
M1 S2
Center 2.445 00 GHz
Span 10 MHz
#Res BW 100 kHz
#VBW 1 MHz
Sweep 1 ms (1001 pts)
Occupied Bandwidth
2.8077 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -7.011 kHz
x dB Bandwidth 1.645 MHz



Test Setup Photos





Bandedge

Test Conditions / Setup

EUT is set up on 10cm of Styrofoam foam some 80 cm from the ground plane. The sensor and cable is attached. A new set of batteries are installed.

RBW is set to 10 kHz; VBW is set to either 30kHz or 3 MHz and the span is 10MHz.
Transmitter is transmitting at 100 % duty cycle on the following frequencies: 2405 MHz, 2445 MHz, or 2480 MHz.
Frequencies of Interest: 2395 to 2488 MHz

Measurements made IAW Marker Delta method on the high frequency. Fundamental Peak was measured at 101.26 dBµV using 1 MHz Bandwidth: Changing the RBW/VBW bandwidths to 1%/3% of the span the delta was 48.98 dBµV. Subtracting this from 101.26 dBµV left a reading of 52.28 dBµV which is below the limit of 54 dBµV.

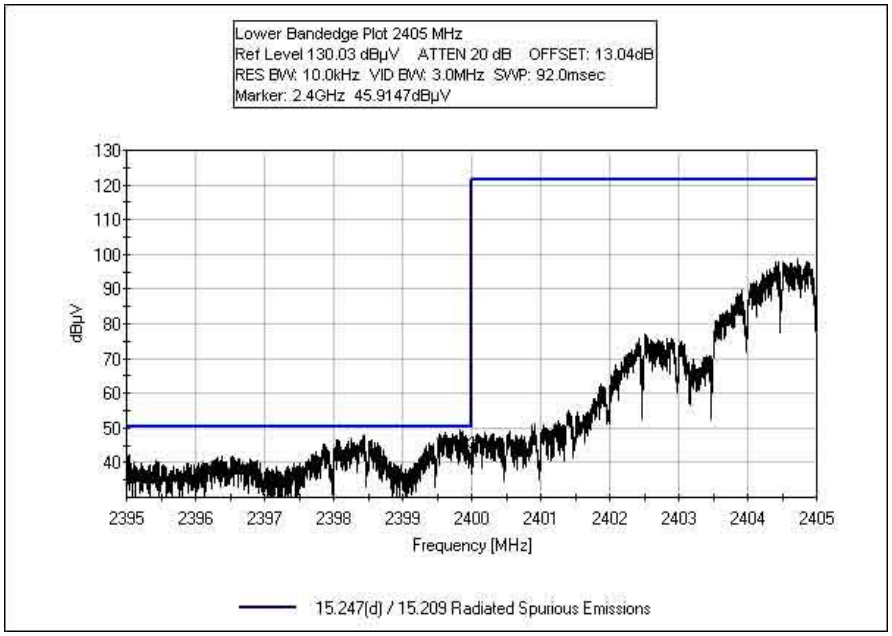
Environmental Conditions:
Temperature = 20.4°C
Relative Humidity = 35%
Pressure = 97.7 kPa

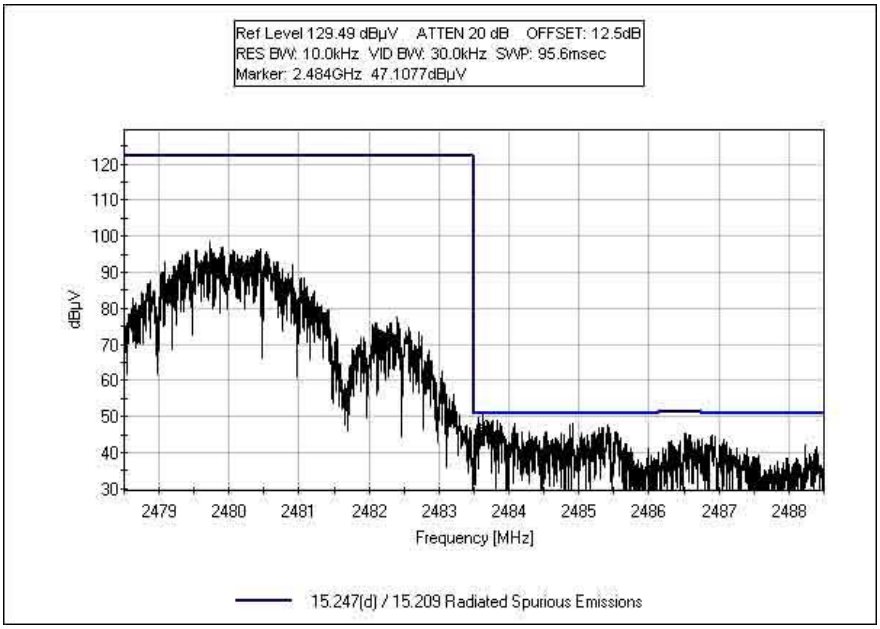
Engineer Name: C. Kendall

Test Equipment

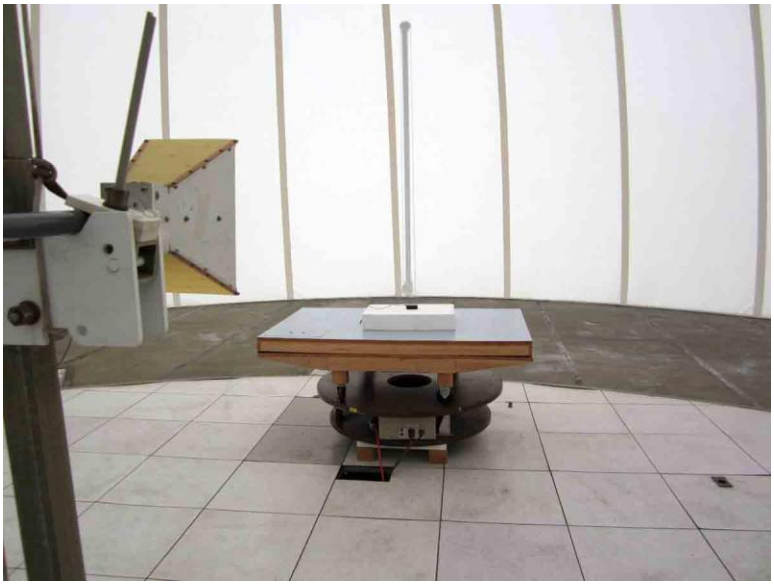
Asset/Serial #	Description	Model	Manufacturer	Cal Date	Cal Due
AN02660	Spectrum Analyzer	E4446A	Agilent	11/3/2011	11/3/2013
AN03155	Preamp	83017A	HP	8/3/2011	8/3/2013
AN00327	Horn Antenna	3115	EMCO	4/13/2012	4/13/2014
AN03012	Cable	32022-2-29094K-36TC	AstroLab	2/28/2012	2/28/2014
ANP01403	Cable	58758-23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

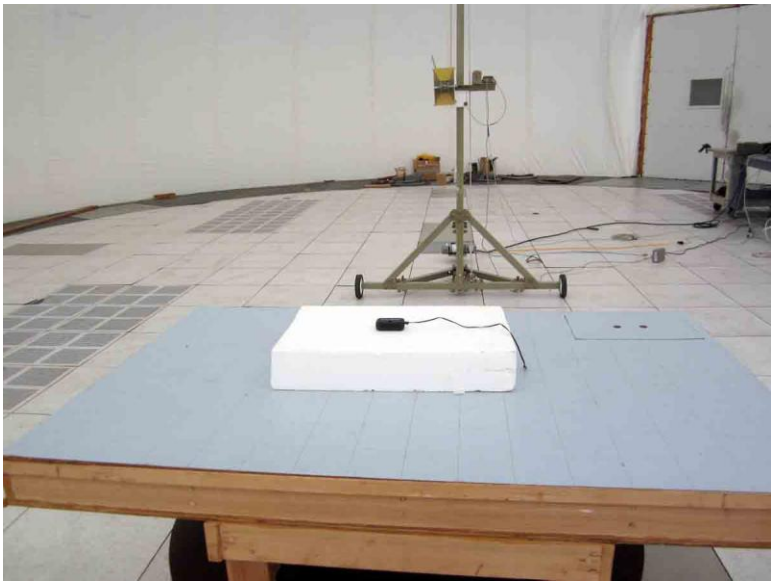
Test Data


Lower Bandedge Plot 2405 MHz
Ref Level 130.03 dBµV ATTEN 20 dB OFFSET: 13.04dB
RES BW: 10.0kHz VID BW: 3.0MHz SWP: 92.0msec
Marker: 2.4GHz 45.9147dBµV
dBµV
130
120
110
100
90
80
70
60
50
40
2395
2396
2397
2398
2399
2400
2401
2402
2403
2404
2405
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


Ref Level 129.49 dBµV ATTEN 20 dB OFFSET: 12.5dB
RES BW: 10.0kHz VID BW: 30.0kHz SWP: 95.6msec
Marker: 2.484GHz 47.1077dBµV
dBµV
120
110
100
90
80
70
60
50
40
30
2479
2480
2481
2482
2483
2484
2485
2486
2487
2488
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

Test Setup Photos





15.249 Power Spectral Density

Test Conditions / Setup

EUT is set up on 10cm of Styrofoam foam some 80 cm from the ground plane. The sensor and cable is attached. A new set of batteries are installed.
-15.2 dB correction used in accordance with KDB 558074.
EUT antenna gain is 3.3 dBi
Calculations used:
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.
RBW is set to 100 kHz; VBW is set to 300 kHz and the span is approximately 3.6 MHz.

Transmitter is transmitting at 100 % duty cycle on the following frequencies: 2405 MHz, 2445 MHz, or 2480 MHz

Environmental Conditions:
Temperature = 20.4°C
Relative Humidity = 35%
Pressure = 97.7 kPa

Engineer Name: C. 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
AN03012	Cable	32022-2-29094K-36TC	AstroLab	2/28/2012	2/28/2014
ANP01403	Cable	58758-23	Semflex	6/22/2011	6/22/2013
ANP05904	Cable	32022-2-29094K-144TC	AstroLab	6/22/2011	6/22/2013
ANPSDCORR	Test Data Adjustment	NA	NA	NCR	NCR

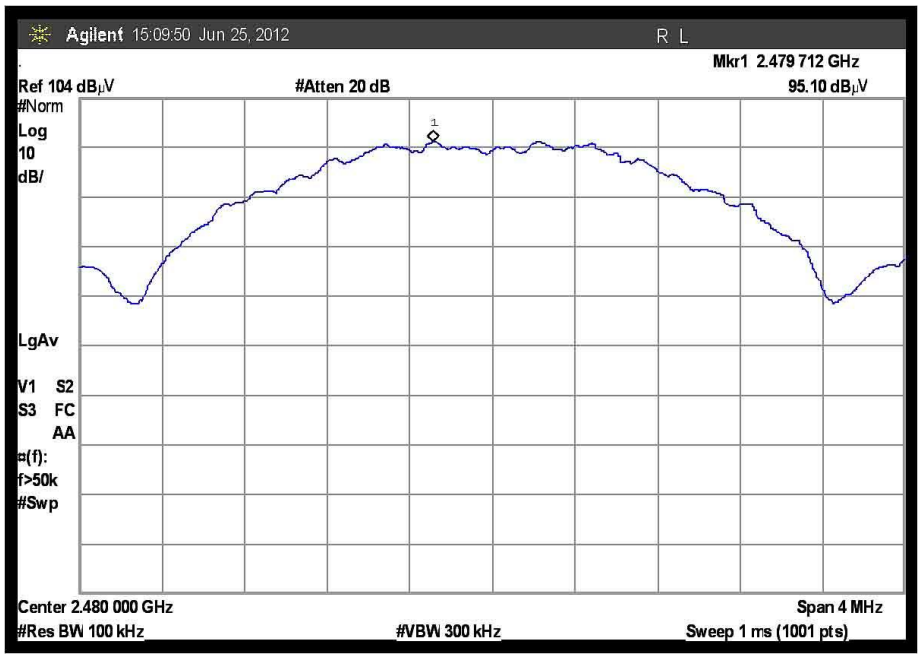
NCR = No calibration required; correction factor.

Frequency	Power in dBm	Limit in dBm
2405 MHz	-12.64	8
2445 MHz	-11.09	8
2480 MHz	-12.36	8

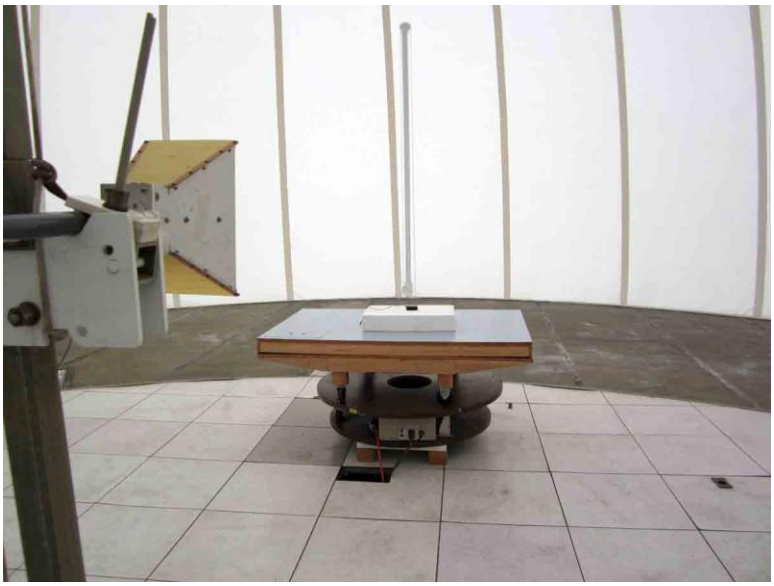
Test Data

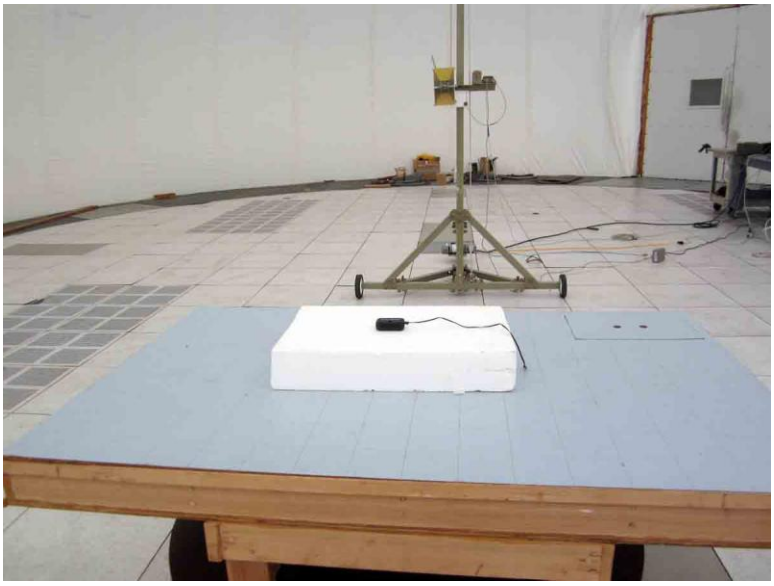

Agilent 17:09:57 Jun 25, 2012
R L
Mkr1 2.404 722 8 GHz
Ref 117 dBµV
#Atten 20 dB
94.32 dBµV
#Norm
Log
10
dB/
Marker
2.404722800 GHz
94.32 dBµV
LgAv
M1 S2
S3 FC
AA
¤(f):
f>50k
#Swp
Center 2.405 000 0 GHz
Span 3.6 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1 ms (1001 pts)


Agilent 09:48:36 Jun 26, 2012
R L
Mkr1 2.445 234 0 GHz
Ref 117 dBµV
#Atten 20 dB
96.07 dBµV
#Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
AA
¤(f):
f>50k
#Swp
Center 2.445 000 0 GHz
Span 3.6 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1 ms (1001 pts)



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.