

# Enlighted, Inc.

## TEST REPORT FOR

**Sensor**  
**Model: FS-D2**

### Tested To The Following Standards:

**FCC Part 15 Subpart C Section(s)**  
**15.207 & 15.247**

**Report No.: 95962-12**

**Date of issue: October 9, 2014**



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

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

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## ADMINISTRATIVE INFORMATION

### Test Report Information

**REPORT PREPARED FOR:**

Enlighted, Inc.  
930 Benecia Ave.  
Sunnyvale, CA 94085

REPRESENTATIVE: Heber Alfaro  
Customer Reference Number: 0001452

**DATE OF EQUIPMENT RECEIPT:**

**DATE(S) OF TESTING:**

**REPORT PREPARED BY:**

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

Project Number: 95962

September 17, 2014

September 17 - 19, 2014

### Report Authorization

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



**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.  
1120 Fulton Place  
Fremont, CA 94539

## Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.00.14
Immunity	5.00.07

## Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Fremont	US0082	SL2-IN-E-1148R	3082B-1	958979	A-0149

## SUMMARY OF RESULTS

### Standard / Specification: FCC Part 15 Subpart C

Test Procedure/Method	Description	Modifications*	Results
15.207 / ANSI C63.4	Conducted Emissions	NA	Pass
15.247(b)(3) / DA 00-705	RF Power Output	NA	Pass
15.31(e)	Voltage Variation	NA	Pass
15.247(a)(2) / DA 00-705	-6dB Bandwidth	NA	Pass
15.247(d) / DA 00-705	Field Strength of Spurious Emissions and Band Edge	NA	Pass
15.247(e) / DA 00-705	Power Spectral Density	NA	Pass

### Modifications\*/Conditions During Testing

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

#### Summary of Conditions

No modifications were made during testing.

**\*Modifications listed above must be incorporated into all production units.**

## **EQUIPMENT UNDER TEST (EUT)**

### **EQUIPMENT UNDER TEST**

#### **Sensor**

Manuf: Enlighted, Inc.

Model: FS-D2

Serial: 02

### **PERIPHERAL DEVICES**

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

#### **DC Power Supply**

Manuf: Protek

Model: 3006B

Serial: AG4070

#### **USB adapter**

Manuf: Generic

Model: Generic

Serial: NSN

#### **Laptop Computer**

Manuf: Lenovo

Model: T430S

Serial: NSN

## FCC PART 15 SUBPART C

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) CFR 47 Section 15 Subpart C requirements for Intentional Radiators.

### 15.207 AC Conducted Emissions

#### Test Data

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **95962**  
 Test Type: **Conducted Emissions**  
 Equipment: **Sensor**  
 Manufacturer: **Enlighted, Inc.**  
 Model: **FS-D2**  
 S/N: **02**

Date: 9/17/2014  
 Time: 9:52:42 AM  
 Sequence#: 1  
 Tested By: Hieu Song Nguyenpham  
 120V 60Hz

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01211	Attenuator	PE7002-10	4/2/2013	4/2/2015
T2	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T3	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015
T4	AN00493	50uH LISN-L1 (L) Loss W/O European Adapter	3816/NM	3/4/2013	3/4/2015
	AN00493	50uH LISN-L(2) N Loss W/O European Adapter	3816/NM	3/4/2013	3/4/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T5	ANP05258	High Pass Filter	HE9615-150K- 50-720B	12/6/2012	12/6/2014

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Conducted Emission  
 Frequency Range: 150kHz to 30MHz

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa  
 Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz

Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application “PuTTY” for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting or receiving.

Note: TX Mode

Ext Attn: 0 dB

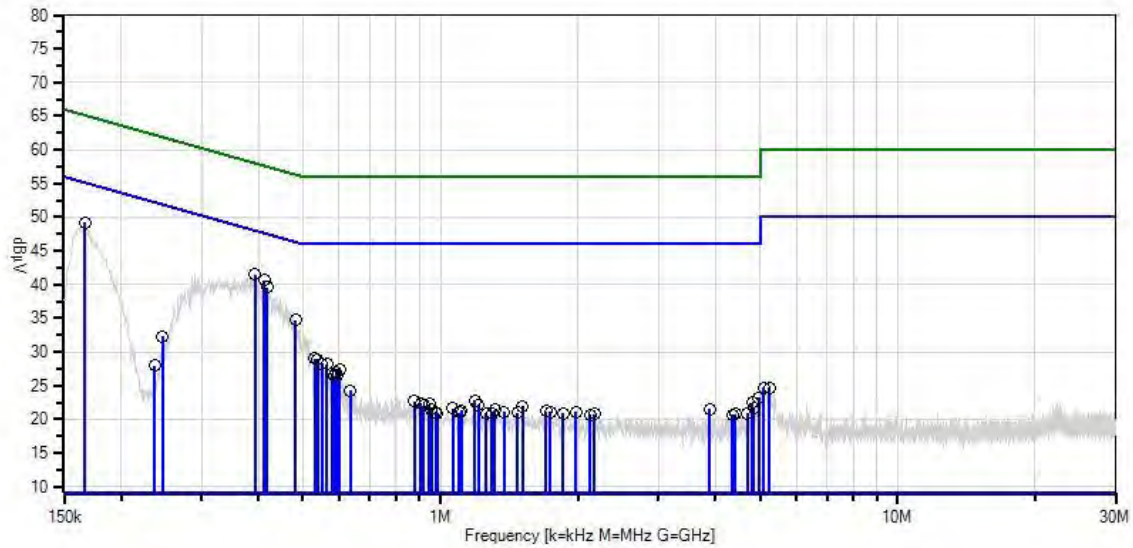
<b>Measurement Data:</b>		Reading listed by margin.						Test Lead: Black				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar	
	MHz	dBμV	T5				Table	dBμV	dBμV	dB	Ant	
1	166.726k	39.1	+9.6 +0.4	+0.0	+0.0	+0.1	+0.0	49.2	55.1	-5.9	Black	
2	392.160k	31.8	+9.6 +0.0	+0.0	+0.0	+0.1	+0.0	41.5	48.0	-6.5	Black	
3	411.794k	30.9	+9.6 +0.0	+0.0	+0.0	+0.1	+0.0	40.6	47.6	-7.0	Black	
4	416.885k	29.9	+9.6 +0.0	+0.0	+0.0	+0.1	+0.0	39.6	47.5	-7.9	Black	
5	482.333k	24.9	+9.6 +0.1	+0.0	+0.0	+0.1	+0.0	34.7	46.3	-11.6	Black	
6	530.329k	19.2	+9.6 +0.1	+0.0	+0.0	+0.1	+0.0	29.0	46.0	-17.0	Black	
7	537.601k	19.2	+9.5 +0.1	+0.0	+0.0	+0.1	+0.0	28.9	46.0	-17.1	Black	
8	549.236k	18.6	+9.5 +0.1	+0.0	+0.0	+0.1	+0.0	28.3	46.0	-17.7	Black	
9	563.780k	18.4	+9.6 +0.1	+0.0	+0.0	+0.1	+0.0	28.2	46.0	-17.8	Black	
10	602.322k	17.5	+9.7 +0.1	+0.0	+0.0	+0.1	+0.0	27.4	46.0	-18.6	Black	
11	590.687k	17.1	+9.6 +0.1	+0.0	+0.0	+0.1	+0.0	26.9	46.0	-19.1	Black	
12	579.052k	17.0	+9.6 +0.1	+0.0	+0.0	+0.1	+0.0	26.8	46.0	-19.2	Black	



13	587.778k	16.7	+9.6 +0.1	+0.0	+0.0	+0.1	+0.0	26.5	46.0	-19.5	Black
14	594.323k	16.6	+9.7 +0.1	+0.0	+0.0	+0.1	+0.0	26.5	46.0	-19.5	Black
15	246.718k	22.4	+9.6 +0.2	+0.0	+0.0	+0.1	+0.0	32.3	51.9	-19.6	Black
16	635.046k	14.4	+9.7 +0.1	+0.0	+0.0	+0.1	+0.0	24.3	46.0	-21.7	Black
17	4.977M	13.1	+9.5 +0.2	+0.2	+0.1	+0.1	+0.0	23.2	46.0	-22.8	Black
18	1.188M	12.9	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	22.8	46.0	-23.2	Black
19	877.205k	12.7	+9.6 +0.2	+0.1	+0.0	+0.1	+0.0	22.7	46.0	-23.3	Black
20	4.815M	12.4	+9.5 +0.2	+0.2	+0.1	+0.1	+0.0	22.5	46.0	-23.5	Black
21	906.974k	12.4	+9.6 +0.2	+0.1	+0.0	+0.1	+0.0	22.4	46.0	-23.6	Black
22	945.249k	12.3	+9.6 +0.2	+0.1	+0.0	+0.1	+0.0	22.3	46.0	-23.7	Black
23	1.209M	12.2	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	22.1	46.0	-23.9	Black
24	919.732k	12.0	+9.6 +0.2	+0.1	+0.0	+0.1	+0.0	22.0	46.0	-24.0	Black
25	1.511M	12.0	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	21.9	46.0	-24.1	Black
26	236.538k	18.1	+9.6 +0.2	+0.0	+0.0	+0.1	+0.0	28.0	52.2	-24.2	Black
27	1.064M	11.7	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	21.6	46.0	-24.4	Black
28	4.849M	11.5	+9.5 +0.2	+0.2	+0.1	+0.1	+0.0	21.6	46.0	-24.4	Black
29	3.875M	11.5	+9.6 +0.1	+0.1	+0.1	+0.1	+0.0	21.5	46.0	-24.5	Black
30	953.754k	11.5	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	21.4	46.0	-24.6	Black
31	1.315M	11.5	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	21.4	46.0	-24.6	Black
32	1.111M	11.4	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	21.3	46.0	-24.7	Black
33	1.702M	11.3	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	21.2	46.0	-24.8	Black
34	1.375M	11.2	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	21.1	46.0	-24.9	Black
35	975.018k	11.2	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	21.1	46.0	-24.9	Black
36	1.979M	11.2	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	21.1	46.0	-24.9	Black
37	1.741M	11.2	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	21.1	46.0	-24.9	Black
38	1.098M	11.1	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	21.0	46.0	-25.0	Black

39	1.473M	11.1	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	21.0	46.0	-25.0	Black
40	1.260M	11.0	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	20.9	46.0	-25.1	Black
41	983.523k	11.0	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	20.9	46.0	-25.1	Black
42	1.294M	11.0	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	20.9	46.0	-25.1	Black
43	4.688M	10.7	+9.6 +0.2	+0.2	+0.1	+0.1	+0.0	20.9	46.0	-25.1	Black
44	1.855M	11.0	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	20.9	46.0	-25.1	Black
45	2.174M	10.9	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	20.8	46.0	-25.2	Black
46	4.420M	10.8	+9.6 +0.1	+0.1	+0.1	+0.1	+0.0	20.8	46.0	-25.2	Black
47	4.360M	10.7	+9.6 +0.1	+0.1	+0.1	+0.1	+0.0	20.7	46.0	-25.3	Black
48	2.123M	10.8	+9.6 +0.1	+0.1	+0.0	+0.1	+0.0	20.7	46.0	-25.3	Black
49	5.247M	14.5	+9.6 +0.2	+0.2	+0.1	+0.1	+0.0	24.7	50.0	-25.3	Black
50	5.100M	14.5	+9.6 +0.2	+0.2	+0.1	+0.1	+0.0	24.7	50.0	-25.3	Black

CKC Laboratories, Inc Date: 9/17/2014 Time: 9:52:42 AM Enlighted, Inc WO#: 95962  
Test Lead: Black 120V 60Hz Sequence#: 1



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

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **95962**  
 Test Type: **Conducted Emissions**  
 Equipment: **Sensor**  
 Manufacturer: **Enlighted, Inc.**  
 Model: **FS-D2**  
 S/N: **02**

Date: 9/17/2014  
 Time: 9:56:05 AM  
 Sequence#: 2  
 Tested By: Hieu Song Nguyenpham  
 120V 60Hz

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01211	Attenuator	PE7002-10	4/2/2013	4/2/2015
T2	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T3	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015
	AN00493	50uH LISN-L1 (L) Loss W/O European Adapter	3816/NM	3/4/2013	3/4/2015
T4	AN00493	50uH LISN-L(2) N Loss W/O European Adapter	3816/NM	3/4/2013	3/4/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T5	ANP05258	High Pass Filter	HE9615-150K- 50-720B	12/6/2012	12/6/2014

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Conducted Emission  
 Frequency Range: 150kHz to 30MHz

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa  
 Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz

Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application “PuTTY” for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting or receiving.

Note: TX Mode

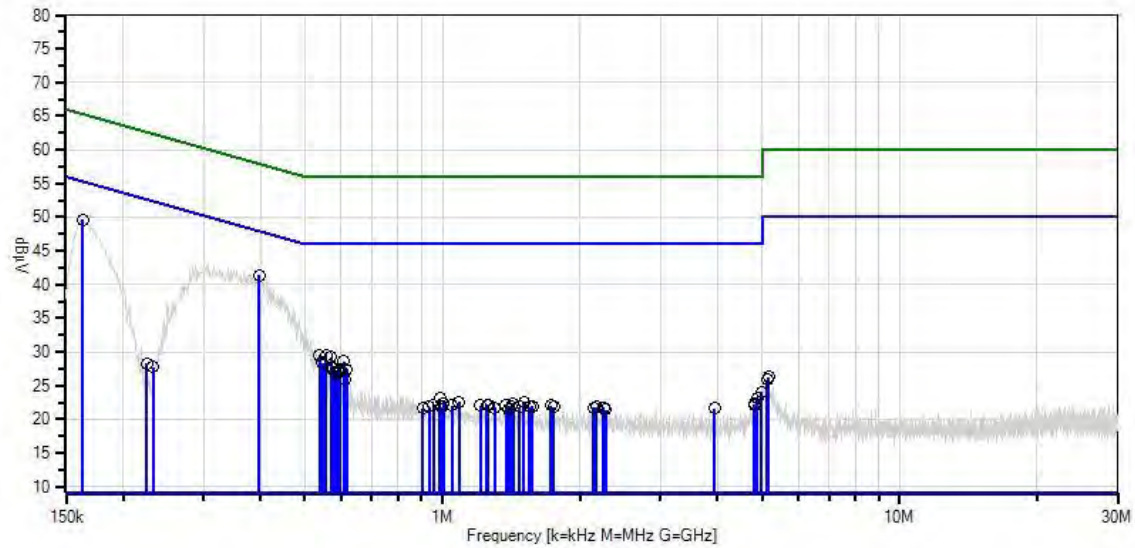
Ext Attn: 0 dB

<b>Measurement Data:</b>		Reading listed by margin.						Test Lead: White				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar	
	MHz	dBμV	T5				Table	dBμV	dBμV	dB	Ant	
1	163.090k	39.0	+9.6 +0.4	+0.0	+0.0	+0.6	+0.0	49.6	55.3	-5.7	White	
2	396.523k	31.2	+9.6 +0.0	+0.0	+0.0	+0.6	+0.0	41.4	47.9	-6.5	White	
3	538.328k	19.4	+9.5 +0.1	+0.0	+0.0	+0.6	+0.0	29.6	46.0	-16.4	White	
4	556.508k	19.3	+9.5 +0.1	+0.0	+0.0	+0.6	+0.0	29.5	46.0	-16.5	White	
5	570.325k	18.9	+9.6 +0.1	+0.0	+0.0	+0.6	+0.0	29.2	46.0	-16.8	White	
6	607.413k	18.2	+9.7 +0.1	+0.0	+0.0	+0.6	+0.0	28.6	46.0	-17.4	White	
7	547.054k	18.2	+9.5 +0.1	+0.0	+0.0	+0.6	+0.0	28.4	46.0	-17.6	White	
8	573.961k	17.3	+9.6 +0.1	+0.0	+0.0	+0.6	+0.0	27.6	46.0	-18.4	White	
9	578.324k	17.2	+9.6 +0.1	+0.0	+0.0	+0.6	+0.0	27.5	46.0	-18.5	White	
10	617.593k	17.0	+9.7 +0.1	+0.0	+0.0	+0.6	+0.0	27.4	46.0	-18.6	White	
11	597.959k	16.9	+9.7 +0.1	+0.0	+0.0	+0.6	+0.0	27.3	46.0	-18.7	White	
12	588.505k	16.9	+9.6 +0.1	+0.0	+0.0	+0.6	+0.0	27.2	46.0	-18.8	White	

13	583.415k	16.7	+9.6 +0.1	+0.0	+0.0	+0.6	+0.0	27.0	46.0	-19.0	White
14	592.141k	16.5	+9.7 +0.1	+0.0	+0.0	+0.6	+0.0	26.9	46.0	-19.1	White
15	611.776k	15.6	+9.7 +0.1	+0.0	+0.0	+0.6	+0.0	26.0	46.0	-20.0	White
16	4.990M	13.4	+9.5 +0.2	+0.2	+0.1	+0.7	+0.0	24.1	46.0	-21.9	White
17	4.875M	12.5	+9.5 +0.2	+0.2	+0.1	+0.7	+0.0	23.2	46.0	-22.8	White
18	987.776k	12.7	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	23.1	46.0	-22.9	White
19	1.086M	12.2	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	22.6	46.0	-23.4	White
20	1.507M	12.1	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	22.5	46.0	-23.5	White
21	1.005M	12.0	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	22.4	46.0	-23.6	White
22	1.426M	12.0	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	22.4	46.0	-23.6	White
23	4.811M	11.6	+9.5 +0.2	+0.2	+0.1	+0.7	+0.0	22.3	46.0	-23.7	White
24	5.166M	15.5	+9.6 +0.2	+0.2	+0.1	+0.7	+0.0	26.3	50.0	-23.7	White
25	1.260M	11.8	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	22.2	46.0	-23.8	White
26	953.754k	11.8	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	22.2	46.0	-23.8	White
27	1.251M	11.7	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	22.1	46.0	-23.9	White
28	1.379M	11.7	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	22.1	46.0	-23.9	White
29	1.209M	11.6	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	22.0	46.0	-24.0	White
30	1.047M	11.6	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	22.0	46.0	-24.0	White
31	4.832M	11.3	+9.5 +0.2	+0.2	+0.1	+0.7	+0.0	22.0	46.0	-24.0	White
32	1.723M	11.6	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	22.0	46.0	-24.0	White
33	1.413M	11.5	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	21.9	46.0	-24.1	White
34	1.575M	11.5	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	21.9	46.0	-24.1	White
35	1.477M	11.4	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	21.8	46.0	-24.2	White
36	996.281k	11.4	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	21.8	46.0	-24.2	White
37	936.743k	11.3	+9.6 +0.2	+0.1	+0.0	+0.6	+0.0	21.8	46.0	-24.2	White
38	1.549M	11.4	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	21.8	46.0	-24.2	White

39	5.126M	15.0	+9.6 +0.2	+0.2	+0.1	+0.7	+0.0	25.8	50.0	-24.2	White
40	2.174M	11.4	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	21.8	46.0	-24.2	White
41	1.753M	11.4	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	21.8	46.0	-24.2	White
42	1.298M	11.3	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	21.7	46.0	-24.3	White
43	225.629k	17.9	+9.6 +0.2	+0.0	+0.0	+0.6	+0.0	28.3	52.6	-24.3	White
44	2.251M	11.3	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	21.7	46.0	-24.3	White
45	2.140M	11.3	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	21.7	46.0	-24.3	White
46	906.974k	11.1	+9.6 +0.2	+0.1	+0.0	+0.6	+0.0	21.6	46.0	-24.4	White
47	3.939M	11.1	+9.6 +0.1	+0.1	+0.1	+0.6	+0.0	21.6	46.0	-24.4	White
48	232.901k	17.4	+9.6 +0.2	+0.0	+0.0	+0.6	+0.0	27.8	52.3	-24.5	White
49	1.396M	11.0	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	21.4	46.0	-24.6	White
50	2.276M	11.0	+9.6 +0.1	+0.1	+0.0	+0.6	+0.0	21.4	46.0	-24.6	White

CKC Laboratories, Inc Date: 9/17/2014 Time: 9:56:05 AM Enlighted, Inc WO#: 95962  
Test Lead: White 120V 60Hz Sequence#: 2



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



**Test Setup Photos**



## 15.247(b)(3) RF Power Output

### Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**

Specification: **15.247(b) Fundamental**

Work Order #: **95962**

Date: 9/17/2014

Test Type: **Radiated Scan**

Time: 14:55:32

Equipment: **Sensor**

Sequence#: 5

Manufacturer: Enlighted, Inc.

Tested By: Hieu Song Nguyenpham

Model: FS-D2

S/N: 02

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/23/2013	1/23/2015
T2	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
T3	ANP01210	Cable	FSJ1P-50A-4A	2/19/2013	2/19/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Fundamental of the EUT

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa  
 Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz

Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16

RBW=3MHz  
 VBW=8MHz

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting or receiving.

Note: X axis- Direct to Antenna

Ext Attn: 0 dB

**Measurement Data:** Reading listed by amplitude. Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	Dist Table dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	2404.500M	58.5	+28.6	+1.2	+2.7	+0.0	91.0	125.2	-34.2	Horiz
								X-axis ( Direct to Antenna)		
2	2439.472M	58.1	+28.7	+1.2	+2.7	+0.0	90.7	125.2	-34.5	Horiz
								X-axis ( Direct to Antenna)		
3	2479.304M	57.7	+28.9	+1.2	+2.7	+0.0	90.5	125.2	-34.7	Horiz
								X-axis ( Direct to Antenna)		
4	2404.500M	57.2	+28.6	+1.2	+2.7	+0.0	89.7	125.2	-35.5	Vert
								X axis ( Direct to Antenna)		
5	2439.472M	54.6	+28.7	+1.2	+2.7	+0.0	87.2	125.2	-38.0	Vert
								X axis ( Direct to Antenna)		
6	2479.304M	53.0	+28.9	+1.2	+2.7	+0.0	85.8	125.2	-39.4	Vert
								X axis ( Direct to Antenna)		

**Convert equivalent electric field strength to the resultant power level**

Frequency (MHz)	Measured Power in Watt	Power Limit in Watt	Pass/Fail
2404.500 Low Channel ( Horizontal)	3.7768E-04	1.00	Pass
2404.500 Low Channel ( Vertical)	2.7998E-04	1.00	Pass
2439.472 Middle Channel ( Horizontal)	3.5247E-04	1.00	Pass
2439.472 Middle Channel ( Vertical)	1.5744E-04	1.00	Pass
2479.304 High Channel (Horizontal)	3.3661E-04	1.00	Pass
2479.304 High Channel (Vertical)	1.1406E-04	1.00	Pass

A formula converts Radiated Method to Conducted Method

$$\text{dBm (conducted power)} = \text{dBuV/m} + 20 * \text{LOG D} - 104.77 - \text{Gain (dBi)}$$

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(b) Fundamental**  
 Work Order #: **95962** Date: 9/17/2014  
 Test Type: **Radiated Scan** Time: 14:00:00  
 Equipment: **Sensor** Sequence#: 6  
 Manufacturer: **Enlighted, Inc.** Tested By: **Hieu Song Nguyenpham**  
 Model: **FS-D2**  
 S/N: **02**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/23/2013	1/23/2015
T2	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
T3	ANP01210	Cable	FSJ1P-50A-4A	2/19/2013	2/19/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Fundamental of the EUT

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa  
 Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz

Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16

RBW=3MHz  
 VBW=8MHz

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting or receiving.

Note: Y axis- Upward to Ceiling

Ext Attn: 0 dB

**Measurement Data:** Reading listed by amplitude. Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	2404.284M	58.0	+28.6	+1.2	+2.7	+0.0	90.5	125.2 Y axis ( Upward to Ceiling)	-34.7	Horiz
2	2404.284M	57.8	+28.6	+1.2	+2.7	+0.0	90.3	125.2 Y axis ( Upward to Ceiling)	-34.9	Vert
3	2439.688M	57.4	+28.7	+1.2	+2.7	+0.0	90.0	125.2 Y axis ( Upward to Ceiling)	-35.2	Horiz
4	2479.460M	56.7	+28.9	+1.2	+2.7	+0.0	89.5	125.2 Y axis ( Upward to Ceiling)	-35.7	Vert
5	2439.688M	56.2	+28.7	+1.2	+2.7	+0.0	88.8	125.2 Y axis ( Upward to Ceiling)	-36.4	Vert
6	2479.460M	55.7	+28.9	+1.2	+2.7	+0.0	88.5	125.2 Y axis ( Upward to Ceiling)	-36.7	Horiz

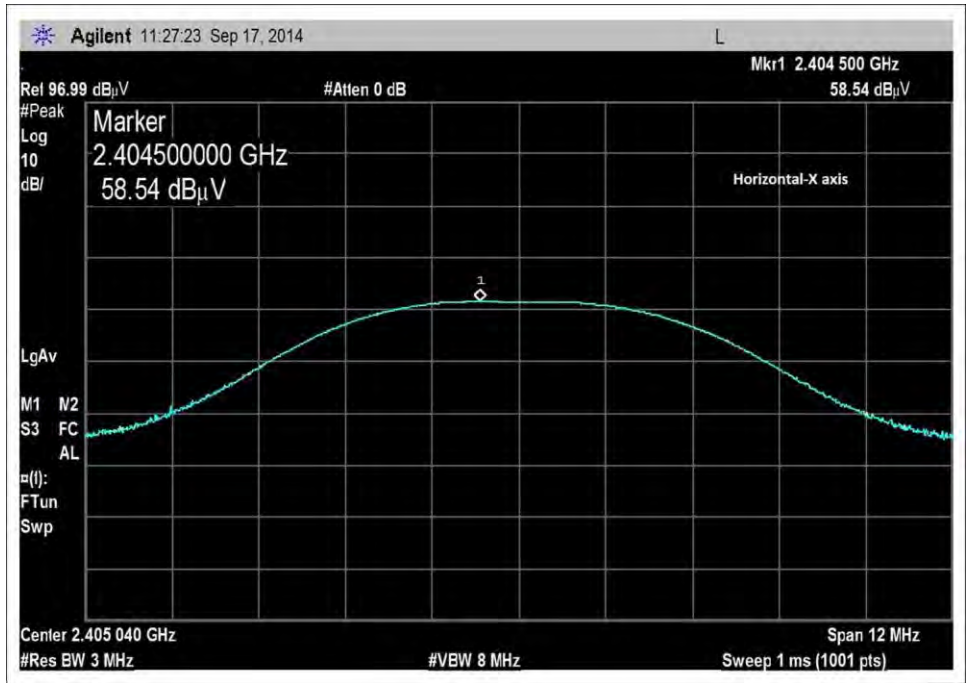
**Convert equivalent electric field strength to the resultant power level**

Frequency (MHz)	Measured Power in Watt	Power Limit in Watt	Pass/Fail
2404.284 Low Channel ( Horizontal)	3.3661E-04	1.00	Pass
2404.284 Low Channel ( Vertical)	3.2146E-04	1.00	Pass
2439.688 Middle Channel ( Horizontal)	3.0000E-04	1.00	Pass
2439.688 Middle Channel ( Vertical)	2.2757E-04	1.00	Pass
2479.460 High Channel ( Horizontal)	2.1238E-04	1.00	Pass
2479.460 High Channel ( Vertical)	2.6738E-04	1.00	Pass

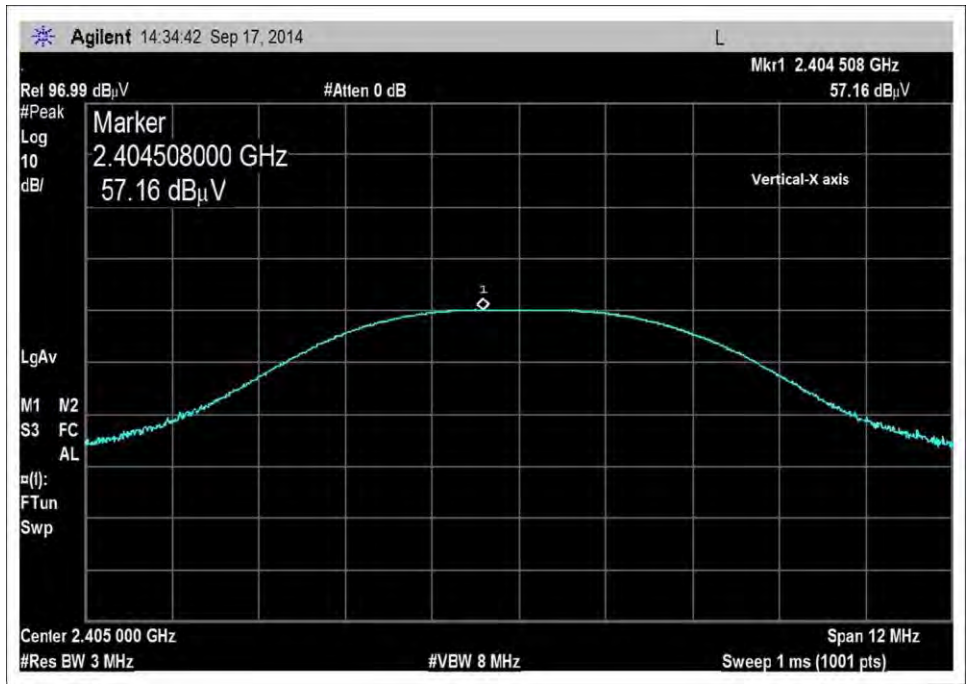
A formula converts Radiated Method to Conducted Method

$$\text{dBm (conducted power)} = \text{dBuV/m} + 20 * \text{LOG D} - 104.77 - \text{Gain (dBi)}$$

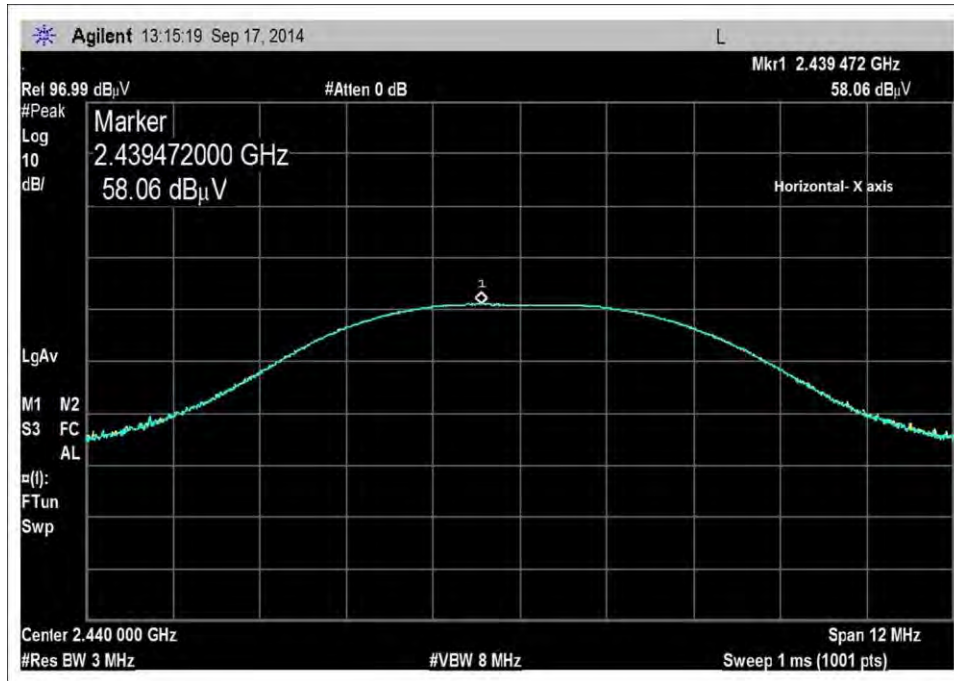
## Test Data



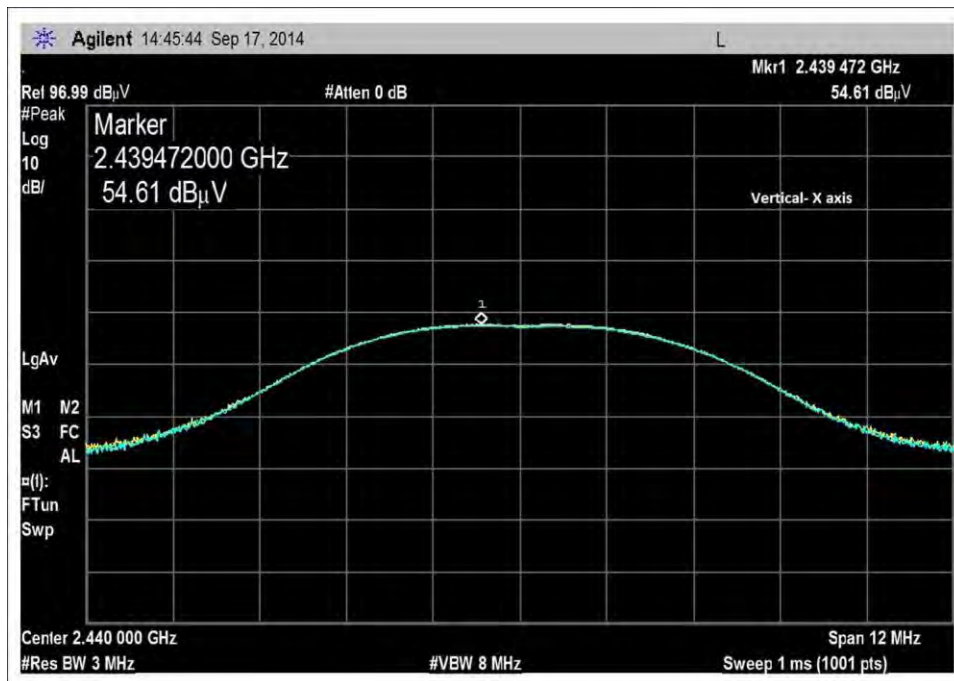
Low Channel, Horizontal-X-Axis



Low Channel, Vertical-X-Axis

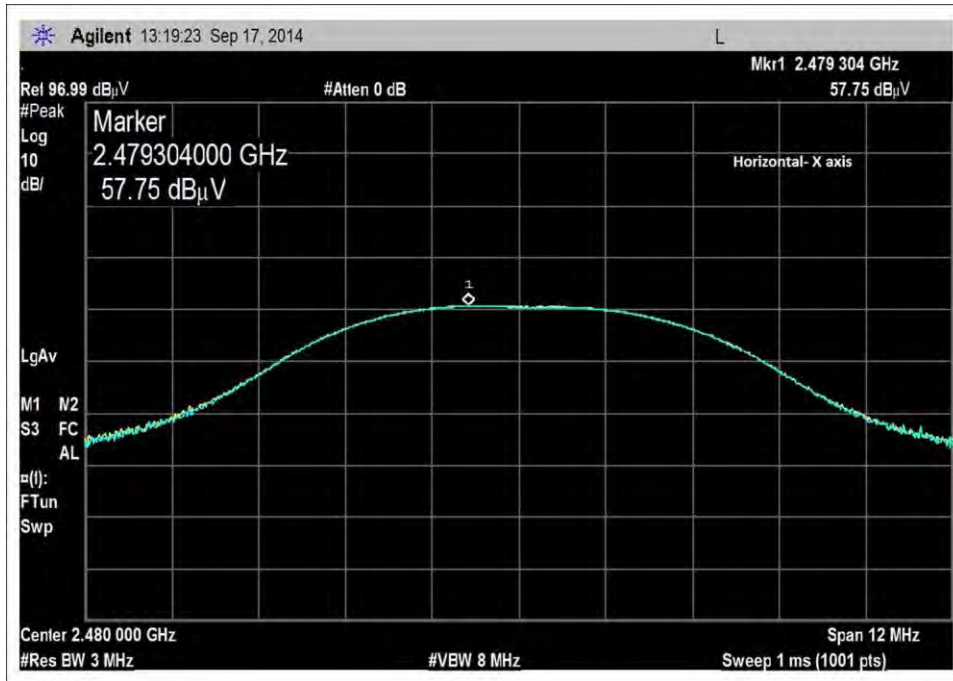


Middle Channel, Horizontal-X-Axis

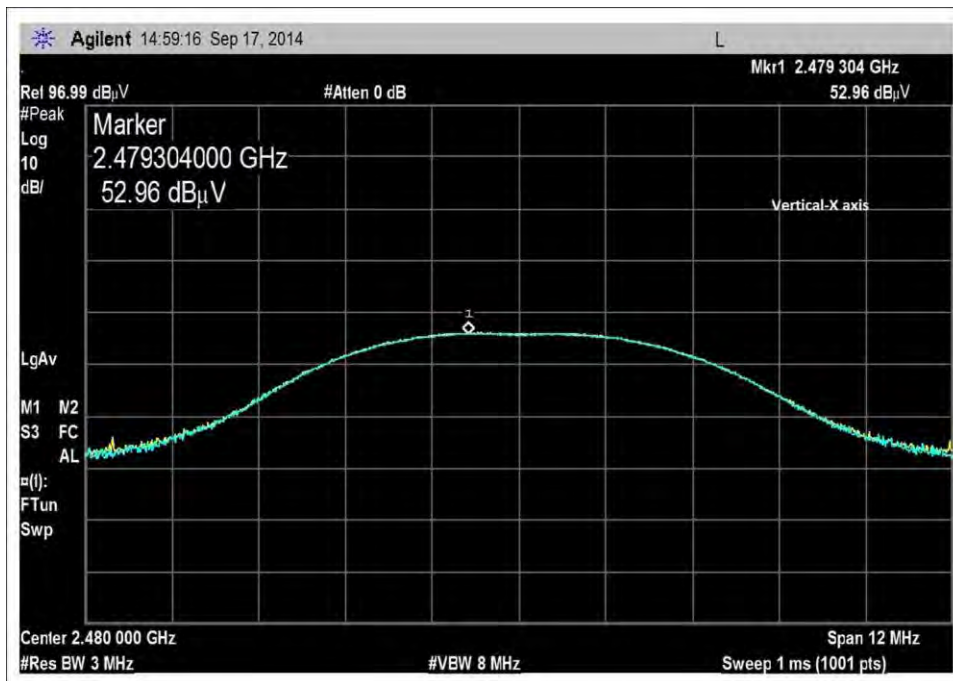


Middle Channel, Vertical-X-Axis

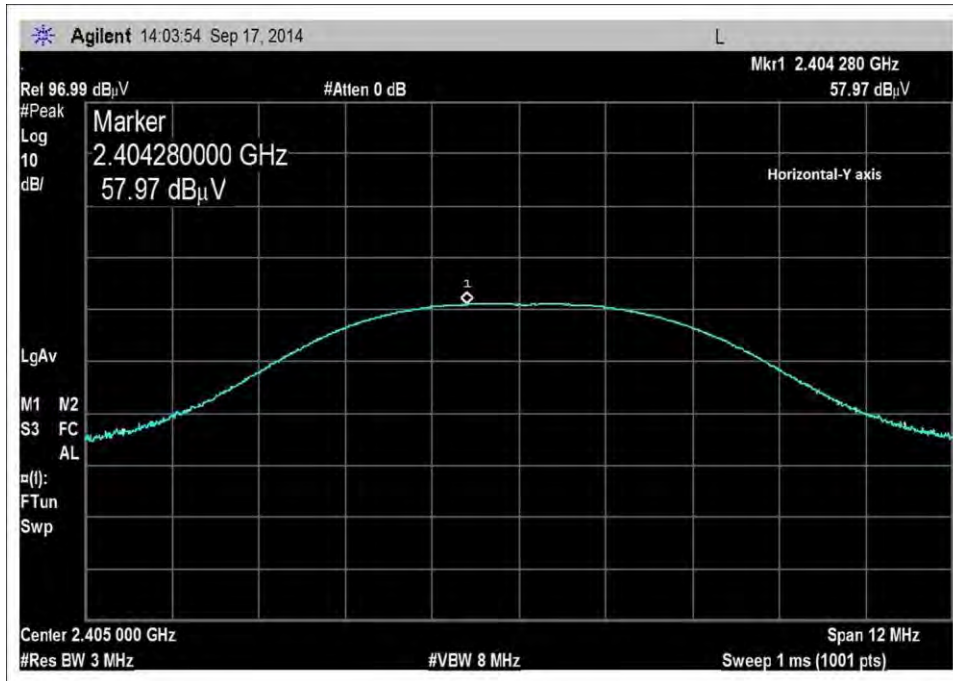




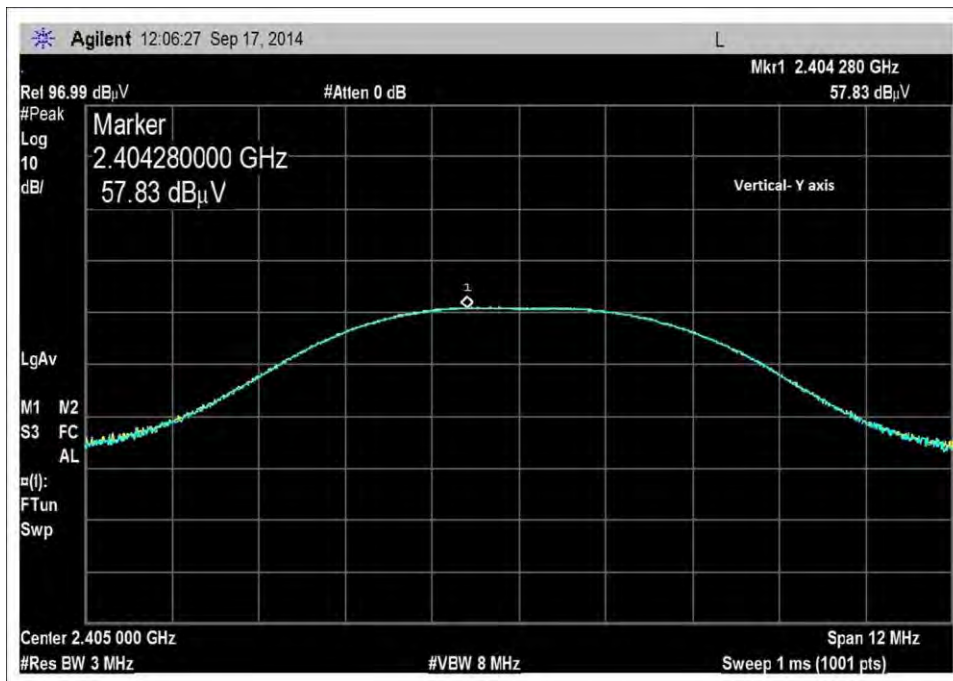
High Channel, Horizontal-X-Axis



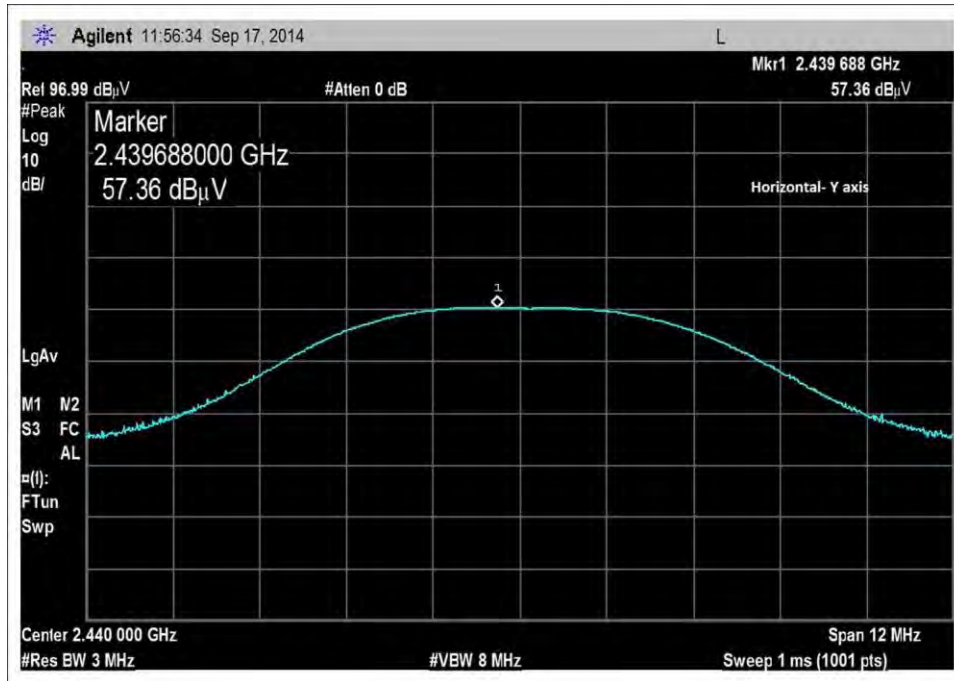
High Channel, Vertical-X-Axis



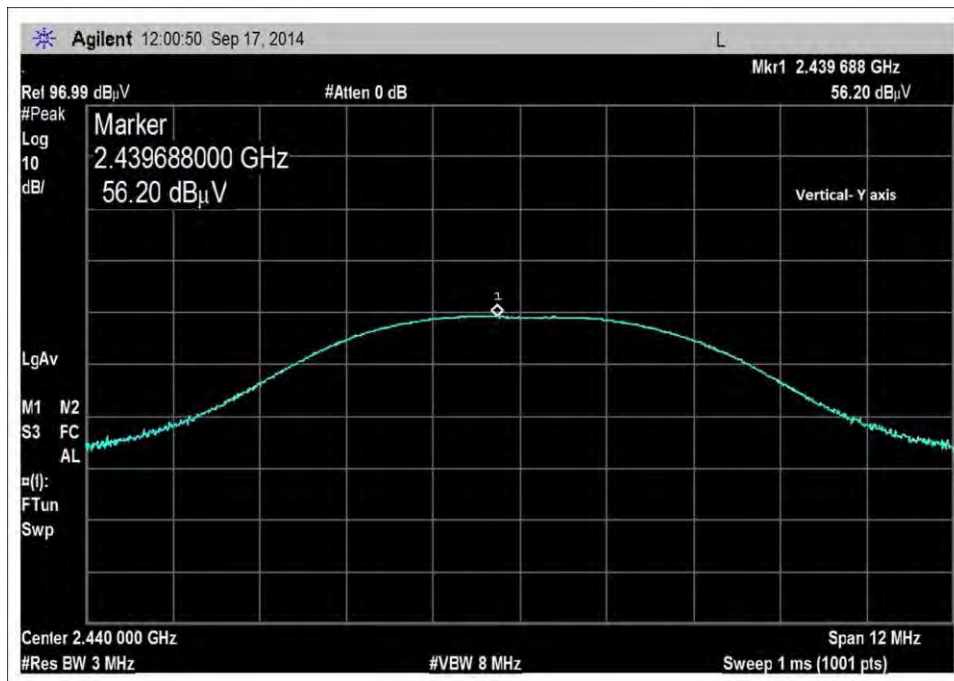
Low Channel, Horizontal-Y-Axis



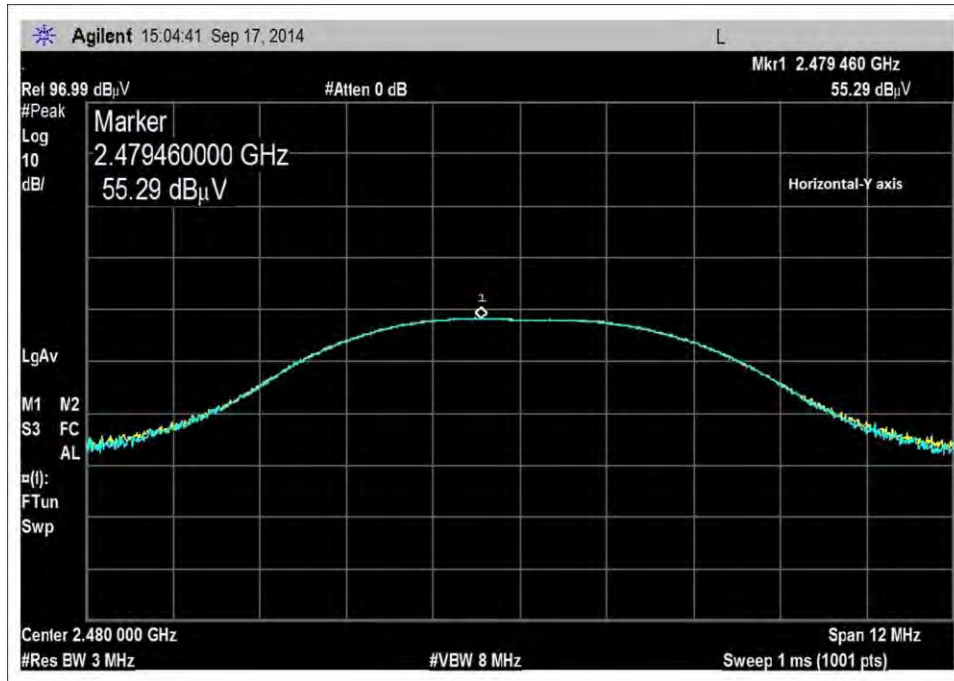
Low Channel, Vertical-Y-Axis



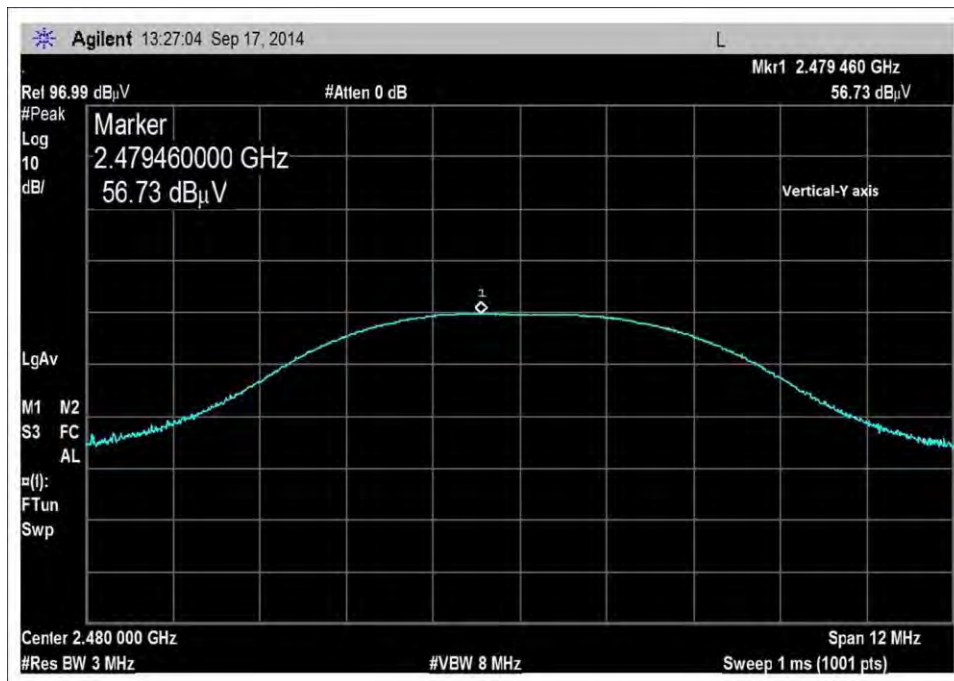
Middle Channel, Horizontal-Y-Axis



Middle Channel, Vertical-Y-Axis



High Channel, Horizontal-Y-Axis

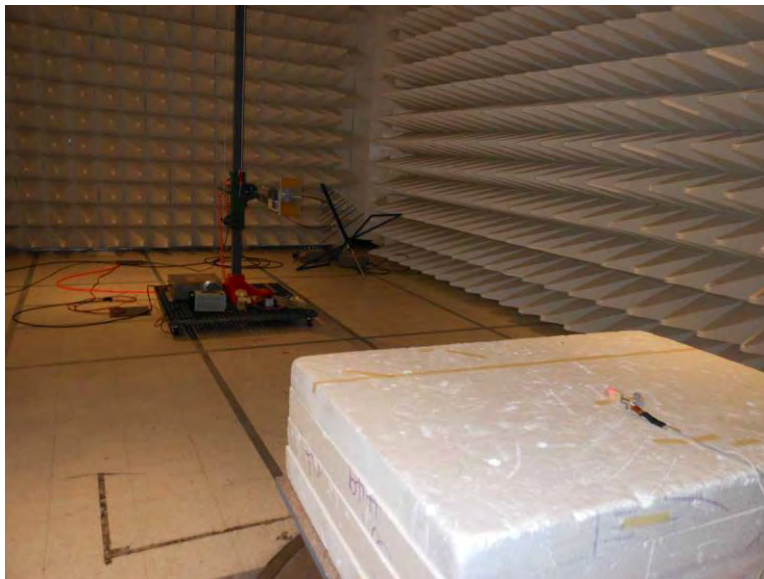


High Channel, Vertical-Y-Axis

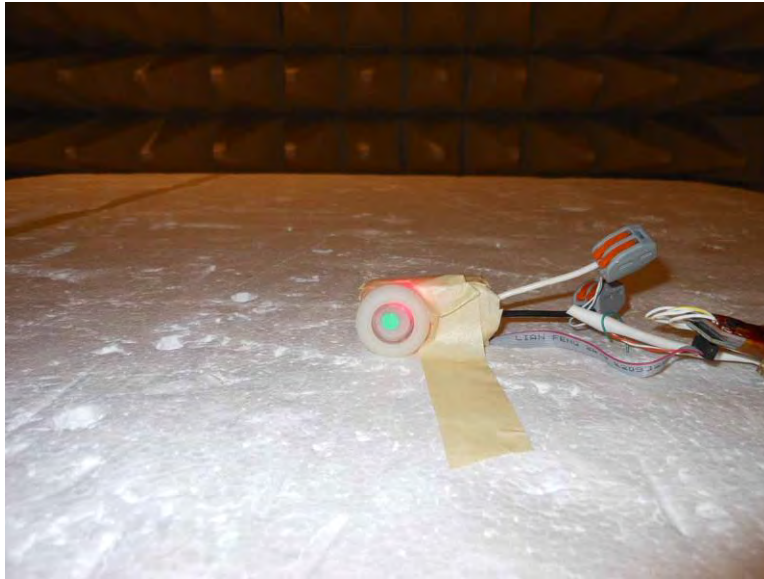
**Test Setup Photos**



Front View



Back View



X-Axis



Y-Axis

## 15.31(e) Voltage Variations

### Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**

Specification: **15.31e**

Work Order #: **95962**

Date: 9/17/2014

Test Type: **Radiated Scan**

Time: 14:56:58

Equipment: **Sensor**

Sequence#: 7

Manufacturer: Enlighted, Inc.

Tested By: Hieu Song Nguyenpham

Model: FS-D2

S/N: 02

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/23/2013	1/23/2015
T2	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
T3	ANP01210	Cable	FSJ1P-50A-4A	2/19/2013	2/19/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

***Test Conditions / Notes:***

15.31e Set up

Temperature: 23.7°C

Humidity: 45%

Atmospheric Pressure: 100.8kPa

Firmware Used: Version 2.6.2

Application: PuTTY

High Clock: 16MHz

Transmitting operating frequency= 2.4GHz Band

RF Output= 0dBm

Gain of the antenna= 0dBi

Number of Channel=16

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable.

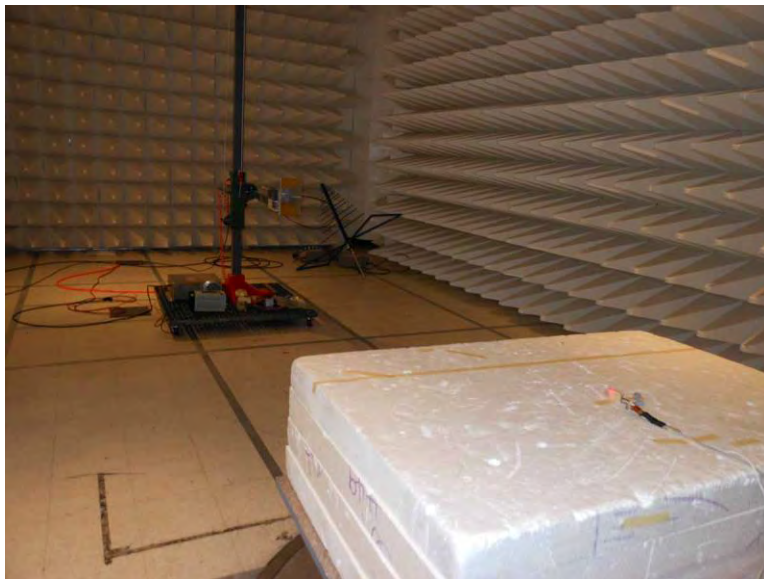
The EUT is set continuously transmitting.

15.31(e). Connect the EUT to DC power supply. Adjust the voltage +/- 15% (8.5VDC, 16.1VDC).

With voltage adjustments  $\pm 15\%$ , there were no observed changes in center frequency or amplitude of the fundamental emissions.



**Test Setup Photos**



**15.247(a)(2) -6dB Bandwidth**

**Test Conditions / Setup**

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer:	<b>Enlighted, Inc.</b>	Date:	9/17/2014
Specification:	<b>OBW</b>	Time:	14:56:58
Work Order #:	<b>95962</b>	Sequence#:	7
Test Type:	<b>Radiated Scan</b>	Tested By:	Hieu Song Nguyenpham
Equipment:	<b>Sensor</b>		
Manufacturer:	Enlighted, Inc.		
Model:	FS-D2		
S/N:	02		

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/23/2013	1/23/2015
T2	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
T3	ANP01210	Cable	FSJ1P-50A-4A	2/19/2013	2/19/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

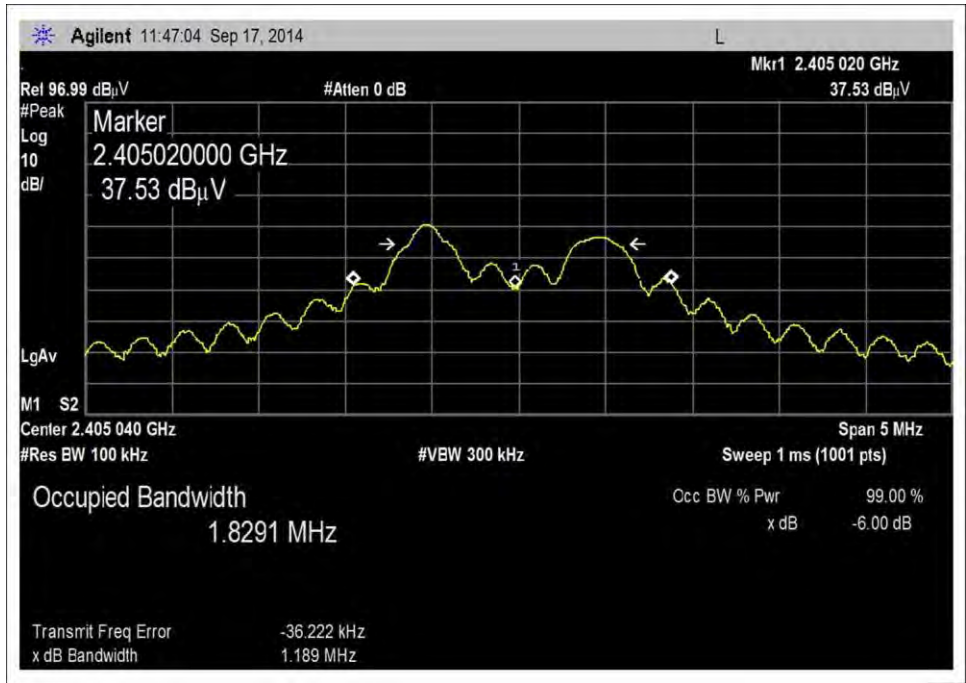
OBW Set up

Temperature: 23.7C  
Humidity: 45%  
Atmospheric Pressure: 100.8kPa

Firmware Used: Version 2.6.2  
Application: PuTTY  
High Clock: 16MHz  
Transmitting operating frequency= 2.4GHz Band  
RF Output= 0dBm  
Gain of the antenna= 0dBi  
Number of Channel=16

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

## Test Data



Low Channel

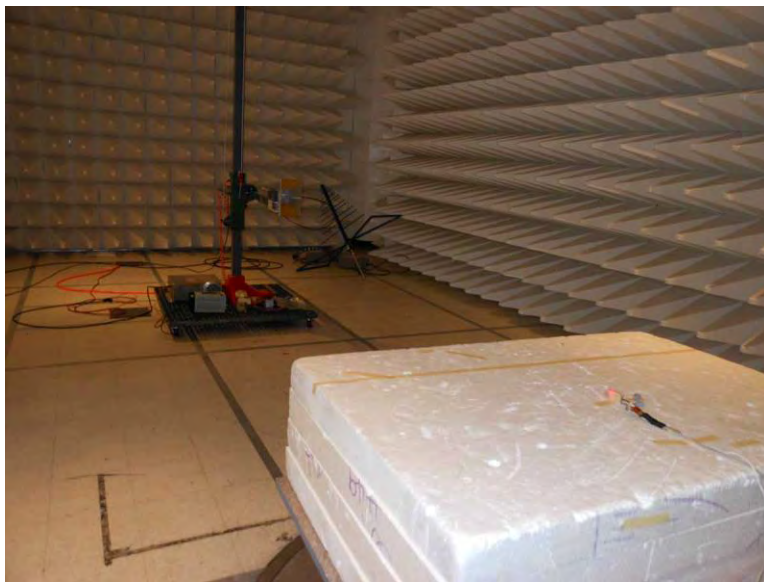


Middle Channel



High Channel

**Test Setup Photos**



**15.247(d) Field Strength of Spurious Emissions and Band Edge**

**Test Data**

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **95962** Date: 9/19/2014  
 Test Type: **Radiated Scan** Time: 10:14:50  
 Equipment: **Sensor** Sequence#: 56  
 Manufacturer: Enlighted, Inc. Tested By: Hieu Song Nguyenpham  
 Model: FS-D2  
 S/N: 02

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015
	AN00432	Loop Antenna	6502	4/2/2013	4/2/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

***Test Conditions / Notes:***

Radiated Spurious Emission  
Frequency Range: 9kHz to 30MHz

Temperature: 23.7°C  
Humidity: 45%  
Atmospheric Pressure: 100.8kPa  
Firmware Used: Version 2.6.2  
Application: PuTTY  
High Clock: 16MHz

Transmitting operating frequency= 2.4GHz Band  
RF Output= 0dBm  
Gain of the antenna= 0dBi  
Number of Channel=16

RBW=VBW=200Hz from 9kHz to 150kHz  
RBW=VBW=9kHz from 150kHz to 30MHz

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

Note:

X axis- Direct to Antenna ( Worst Case)  
Low Channel

**NO EUT EMISSION DETECTED WITHIN 20dB of THE LIMIT.**

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **95962** Date: 9/18/2014  
 Test Type: **Radiated Scan** Time: 15:24:29  
 Equipment: **Sensor** Sequence#: 44  
 Manufacturer: **Enlighted, Inc.** Tested By: Hieu Song Nguyenpham  
 Model: **FS-D2**  
 S/N: **02**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T1	AN00686	Preamp	8447D Opt 010	5/27/2014	5/27/2016
T2	AN00852	Biconilog Antenna	CBL 6111C	11/28/2012	11/28/2014
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP01183	Cable	CNT-195	9/3/2013	9/3/2015
T5	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN



**Test Conditions / Notes:**

Radiated Spurious Emission  
 Frequency Range: 30MHz to 1000MHz

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa

Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz  
 Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16  
 RBW=120kHz  
 VBW=120kHz

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

Note:  
 X axis- Direct to Antenna ( Worst Case)  
 Low Channel

Ext Attn: 0 dB

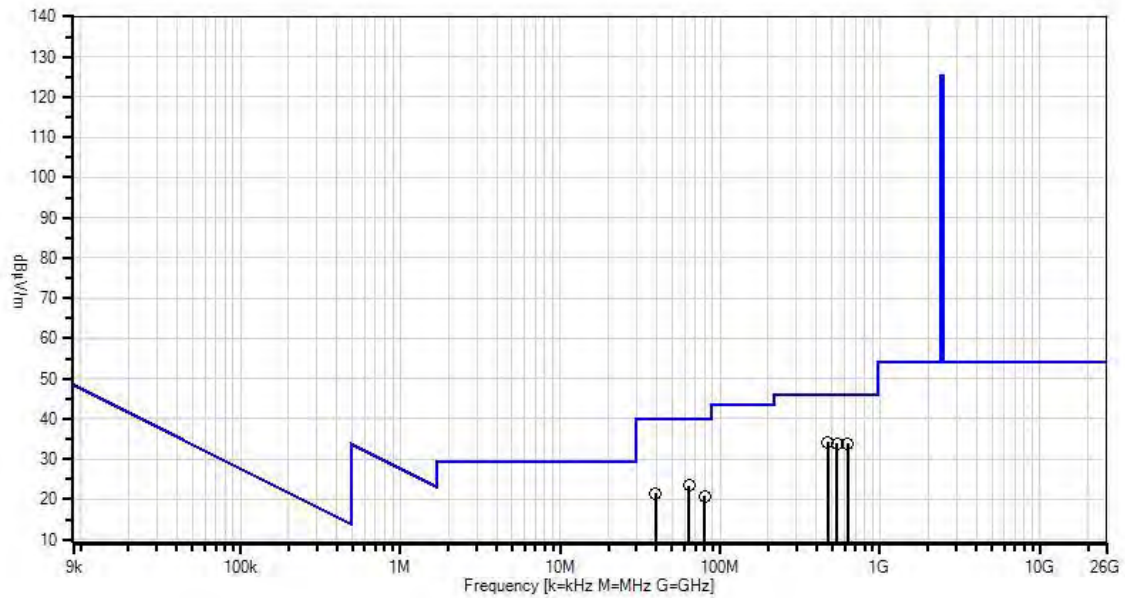
**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	470.002M	43.2	-29.5 +0.6	+17.0	+2.2	+0.8	+0.0	34.3	46.0	-11.7	Horiz
2	539.672M	41.3	-29.8 +0.7	+18.6	+2.3	+0.8	+0.0	33.9	46.0	-12.1	Horiz
3	628.200M	39.6	-29.8 +0.7	+19.8	+2.5	+1.0	+0.0	33.8	46.0	-12.2	Horiz
4	63.674M	45.6	-29.2 +0.2	+5.9	+0.7	+0.3	+0.0	23.5	40.0	-16.5	Vert
5	39.583M	36.3	-29.3 +0.2	+13.6	+0.5	+0.2	+0.0	21.5	40.0	-18.5	Vert
6	79.912M	41.0	-29.3 +0.2	+7.7	+0.8	+0.3	+0.0	20.7	40.0	-19.3	Vert

CKC Laboratories, Inc Date: 9/18/2014 Time: 15:24:29 Enlighted, Inc WO#: 95962  
 Test Distance: 3 Meters Sequence#: 44



— Readings  
 x QP Readings  
 ▼ Ambient  
 ○ Peak Readings  
 \* Average Readings  
 — 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **95962** Date: 9/17/2014  
 Test Type: **Radiated Scan** Time: 16:56:55  
 Equipment: **Sensor** Sequence#: 14  
 Manufacturer: **Enlighted, Inc.** Tested By: Hieu Song Nguyenpham  
 Model: **FS-D2**  
 S/N: **02**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/23/2013	1/23/2015
T2	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
T3	ANP01210	Cable	FSJ1P-50A-4A	2/19/2013	2/19/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T4	AN03114	Preamp	AMF-7D-00101800-30-10P	4/11/2013	4/11/2015
T5	AN03015	Cable	32022-2-29094K-24TC	5/6/2013	5/6/2015
T6	AN03309	High Pass Filter	11SH10-3000/T10000-O/O	4/2/2014	4/2/2016

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Radiated Spurious Emission  
 Frequency Range: 1000MHz to 12000MHz

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa  
 Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz

Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16  
 RBW=1MHz  
 VBW=1MHz

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

Note:  
 X axis- Direct to Antenna ( Worst Case)  
 Low Channel

Ext Attn: 0 dB

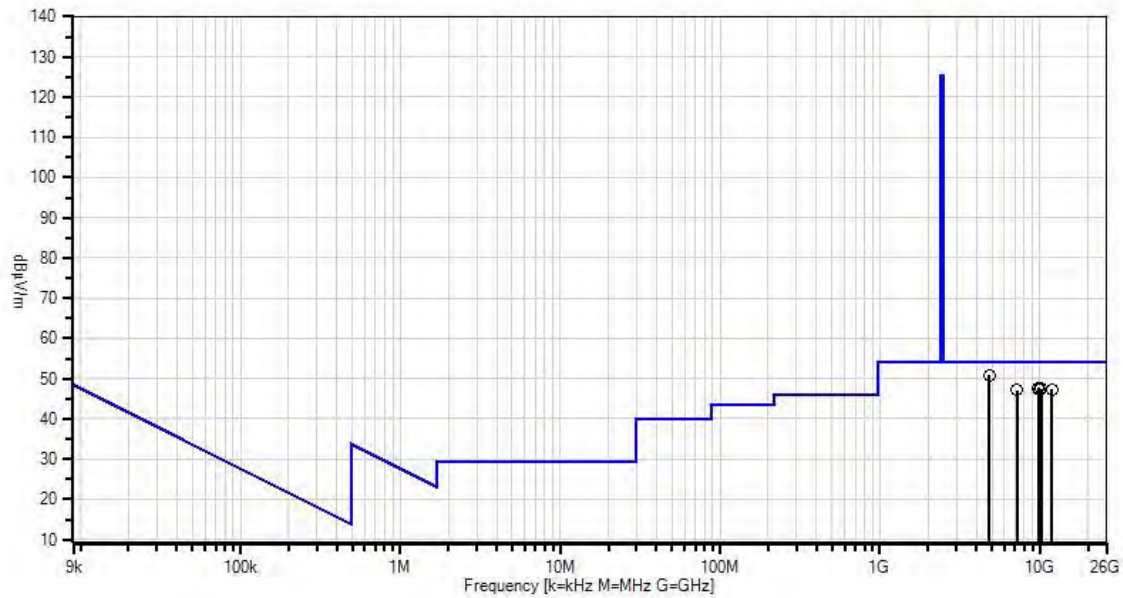
**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	4808.807M	69.5	+33.2 +0.7	+1.7 +0.2	+3.8	-58.3	+0.0	50.8	54.0	-3.2	Vert
2	9758.752M	56.0	+39.1 +1.3	+2.4 +0.2	+6.3	-57.6	+0.0	47.7	54.0	-6.3	Vert
3	10196.189 M	55.7	+39.7 +1.3	+2.5 +0.2	+6.3	-58.2	+0.0	47.5	54.0	-6.5	Vert
4	11822.432 M	53.4	+39.5 +1.4	+2.7 +0.3	+6.3	-56.2	+0.0	47.4	54.0	-6.6	Horiz
5	9857.851M	55.6	+39.5 +1.3	+2.4 +0.2	+6.2	-57.9	+0.0	47.3	54.0	-6.7	Horiz
6	7213.209M	61.9	+36.1 +1.0	+2.0 +0.2	+5.3	-59.3	+0.0	47.2	54.0	-6.8	Horiz

CKC Laboratories, Inc Date: 9/17/2014 Time: 16:56:55 Enlighted, Inc WO#: 95962  
 Test Distance: 3 Meters Sequence#: 14



Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **95962** Date: 9/18/2014  
 Test Type: **Radiated Scan** Time: 11:20:33  
 Equipment: **Sensor** Sequence#: 26  
 Manufacturer: **Enlighted, Inc.** Tested By: Hieu Song Nguyenpham  
 Model: **FS-D2**  
 S/N: **02**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T1	AN2693	Active Horn Antenna	AMFW-5F-18002650-20-10P	2/21/2013	2/21/2015
T2	ANP00928	Cable	various	1/23/2014	1/23/2016
T3	ANP06125	Cable	32022-29094K-29094K-72TC	6/4/2014	6/4/2016
T4	ANP06126	Cable	32022-29094K-29094K-168TC	7/12/2013	7/12/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Radiated Spurious Emission  
 Frequency Range: 12000MHz to 18000MHz

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa

Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz  
 Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16  
 RBW=1MHz  
 VBW=1MHz

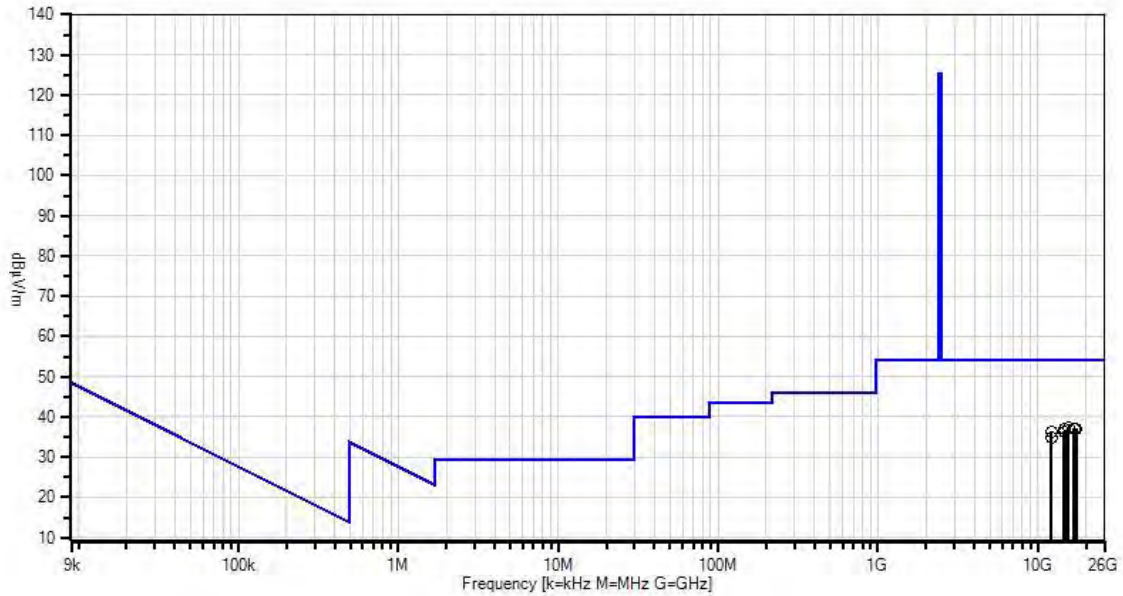
EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

Note:  
 X axis- Direct to Antenna ( Worst Case)  
 Low Channel

Ext Attn: 0 dB

#	Freq MHz	Reading listed by margin.					Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
		Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB					
1	15512.245 M	42.3	-15.8	+0.8	+2.9	+7.0	+0.0	37.2	54.0	-16.8	Vert
2	16755.887 M	42.2	-16.1	+0.7	+3.0	+7.3	+0.0	37.1	54.0	-16.9	Horiz
3	17304.199 M	40.6	-14.6	+0.7	+3.1	+7.3	+0.0	37.1	54.0	-16.9	Horiz
4	14711.050 M	42.1	-15.5	+0.8	+2.8	+6.7	+0.0	36.9	54.0	-17.1	Horiz
5	14548.179 M	41.5	-15.4	+0.8	+2.8	+6.6	+0.0	36.3	54.0	-17.7	Vert
6	12117.777 M	41.9	-15.1	+0.9	+2.5	+5.9	+0.0	36.1	54.0	-17.9	Vert
7	12076.811 M	40.5	-15.0	+0.9	+2.5	+5.8	+0.0	34.7	54.0	-19.3	Horiz

CKC Laboratories, Inc Date: 9/18/2014 Time: 11:20:33 Enlighted, Inc WO#: 95962  
 Test Distance: 3 Meters Sequence#: 26



Readings  
 x QP Readings  
 ▼ Ambient  
 ○ Peak Readings  
 \* Average Readings  
 1 - 15.247(d) / 15.209 Radiated Spurious Emissions



Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **95962** Date: 9/18/2014  
 Test Type: **Radiated Scan** Time: 13:48:08  
 Equipment: **Sensor** Sequence#: 35  
 Manufacturer: **Enlighted, Inc.** Tested By: Hieu Song Nguyenpham  
 Model: **FS-D2**  
 S/N: **02**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T1	ANP06125	Cable	32022-29094K-29094K-72TC	6/4/2014	6/4/2016
T2	ANP06126	Cable	32022-29094K-29094K-168TC	7/12/2013	7/12/2015
T3	AN02694	Horn Antenna-ANSI C63.5 Antenna Factors (dB)	AMFW-5F-18002650-20-10P	2/4/2013	2/4/2015
T4	ANP00929	Cable	various	1/23/2014	1/23/2016

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Radiated Spurious Emission  
 Frequency Range: 18000MHz to 25000MHz

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa

Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz  
 Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16  
 RBW=1MHz  
 VBW=1MHz

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

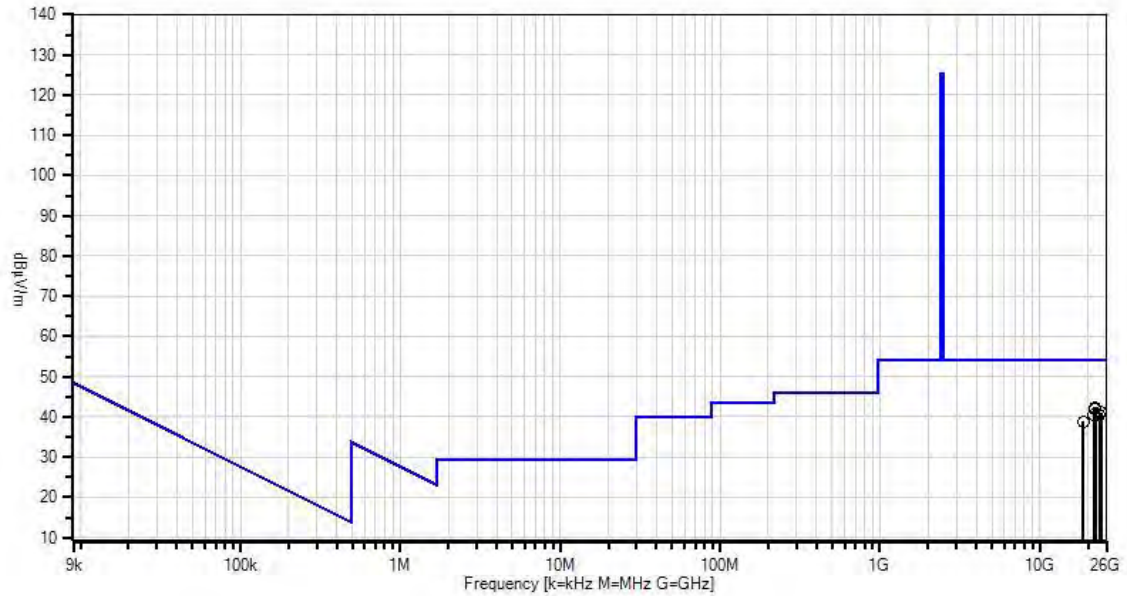
Note:  
 X axis- Direct to Antenna ( Worst Case)  
 Low Channel

Ext Attn: 0 dB

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

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	21992.136 M	44.9	+3.6	+8.2	-17.3	+3.0	+0.0	42.4	54.0	-11.6	Vert
2	22132.128 M	44.7	+3.6	+8.2	-17.4	+3.0	+0.0	42.1	54.0	-11.9	Horiz
3	22099.262 M	44.7	+3.6	+8.2	-17.4	+3.0	+0.0	42.1	54.0	-11.9	Vert
4	24162.281 M	43.5	+3.6	+8.6	-17.5	+3.0	+0.0	41.2	54.0	-12.8	Vert
5	23507.502 M	43.1	+3.7	+8.5	-17.7	+3.0	+0.0	40.6	54.0	-13.4	Horiz
6	21669.666 M	42.9	+3.5	+8.2	-17.2	+3.0	+0.0	40.4	54.0	-13.6	Horiz
7	18603.603 M	41.4	+3.2	+7.4	-16.6	+3.4	+0.0	38.8	54.0	-15.2	Horiz

CKC Laboratories, Inc Date: 9/18/2014 Time: 13:48:08 Enlighted, Inc WO#: 95962  
 Test Distance: 3 Meters Sequence#: 35



- Readings
- × QP Readings
- ▼ Ambient
- Peak Readings
- \* Average Readings
- 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **95962** Date: 9/19/2014  
 Test Type: **Radiated Scan** Time: 10:16:09  
 Equipment: **Sensor** Sequence#: 57  
 Manufacturer: **Enlighted, Inc.** Tested By: Hieu Song Nguyenpham  
 Model: **FS-D2**  
 S/N: **02**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015
	AN00432	Loop Antenna	6502	4/2/2013	4/2/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Radiated Spurious Emission  
 Frequency Range: 9kHz to 30MHz

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa

Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz  
 Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16  
 RBW=VBW=200Hz from 9kHz to 150kHz  
 RBW=VBW=9kHz from 150kHz to 30MHz

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

Note:  
 X axis- Direct to Antenna ( Worst Case)  
 Middle Channel

**NO EUT EMISSION DETECTED WITHIN 20dB of THE LIMIT.**

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**

Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**

Work Order #: **95962**

Date: 9/18/2014

Test Type: **Radiated Scan**

Time: 16:19:06

Equipment: **Sensor**

Sequence#: 47

Manufacturer: Enlighted, Inc.

Tested By: Hieu Song Nguyenpham

Model: FS-D2

S/N: 02

***Test Equipment:***

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T1	AN00686	Preamp	8447D Opt 010	5/27/2014	5/27/2016
T2	AN00852	Biconilog Antenna	CBL 6111C	11/28/2012	11/28/2014
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP01183	Cable	CNT-195	9/3/2013	9/3/2015
T5	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

***Support Devices:***

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Radiated Spurious Emission  
 Frequency Range: 30MHz to 1000MHz

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa

Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz  
 Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16  
 RBW=120kHz  
 VBW=120kHz

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

Note:  
 X axis- Direct to Antenna ( Worst Case)  
 Middle Channel

Ext Attn: 0 dB

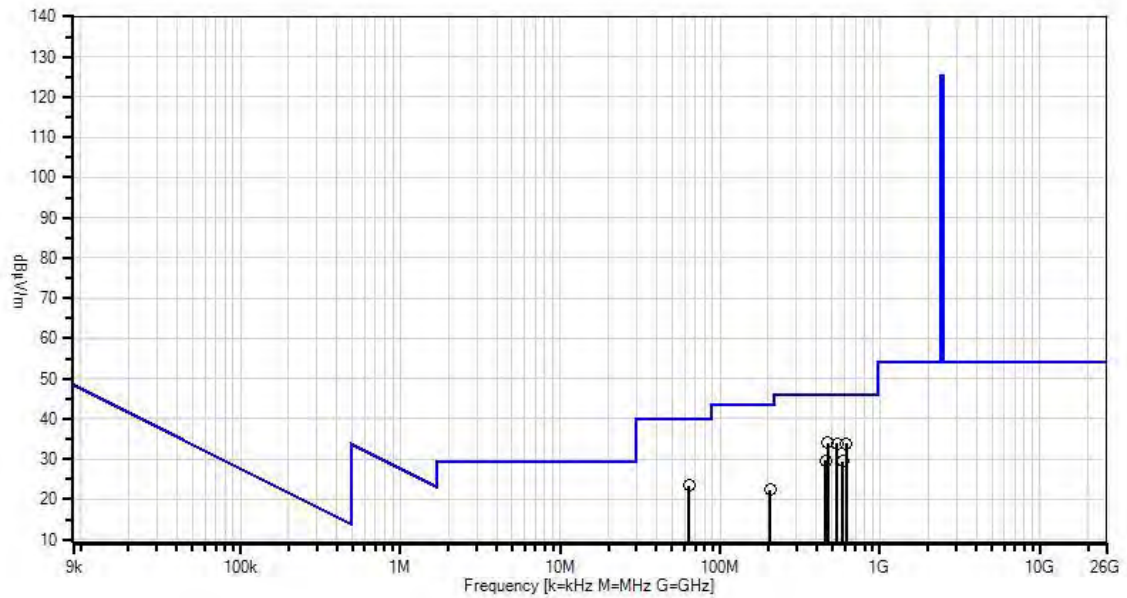
**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	470.482M	42.9	-29.5 +0.6	+17.0	+2.2	+0.8	+0.0	34.0	46.0	-12.0	Horiz
2	615.347M	39.6	-29.8 +0.7	+19.8	+2.5	+1.0	+0.0	33.8	46.0	-12.2	Horiz
3	539.191M	41.2	-29.8 +0.7	+18.6	+2.3	+0.8	+0.0	33.8	46.0	-12.2	Horiz
4	457.269M	38.8	-29.5 +0.6	+16.9	+2.1	+0.8	+0.0	29.7	46.0	-16.3	Vert
5	582.314M	35.5	-29.8 +0.7	+19.8	+2.4	+0.9	+0.0	29.5	46.0	-16.5	Vert
6	63.674M	45.6	-29.2 +0.2	+5.9	+0.7	+0.3	+0.0	23.5	40.0	-16.5	Vert
7	205.978M	39.9	-28.7 +0.4	+9.0	+1.3	+0.5	+0.0	22.4	43.5	-21.1	Vert

CKC Laboratories, Inc Date: 9/18/2014 Time: 16:19:06 Enlighted, Inc WO#: 95962  
Test Distance: 3 Meters Sequence#: 47



— Readings  
x QP Readings  
▼ Ambient  
○ Peak Readings  
\* Average Readings  
— 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **95962** Date: 9/18/2014  
 Test Type: **Radiated Scan** Time: 08:49:34  
 Equipment: **Sensor** Sequence#: 17  
 Manufacturer: **Enlighted, Inc.** Tested By: Hieu Song Nguyenpham  
 Model: **FS-D2**  
 S/N: **02**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/23/2013	1/23/2015
T2	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
T3	ANP01210	Cable	FSJ1P-50A-4A	2/19/2013	2/19/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T4	AN03114	Preamplifier	AMF-7D-00101800-30-10P	4/11/2013	4/11/2015
T5	AN03015	Cable	32022-2-29094K-24TC	5/6/2013	5/6/2015
T6	AN03309	High Pass Filter	11SH10-3000/T10000-O/O	4/2/2014	4/2/2016

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN



**Test Conditions / Notes:**

Radiated Spurious Emission  
 Frequency Range: 1000MHz to 12000MHz

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa  
 Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz

Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16  
 RBW=1MHz  
 VBW=1MHz

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

Note:  
 X axis- Direct to Antenna ( Worst Case)  
 Middle Channel

Ext Attn: 0 dB

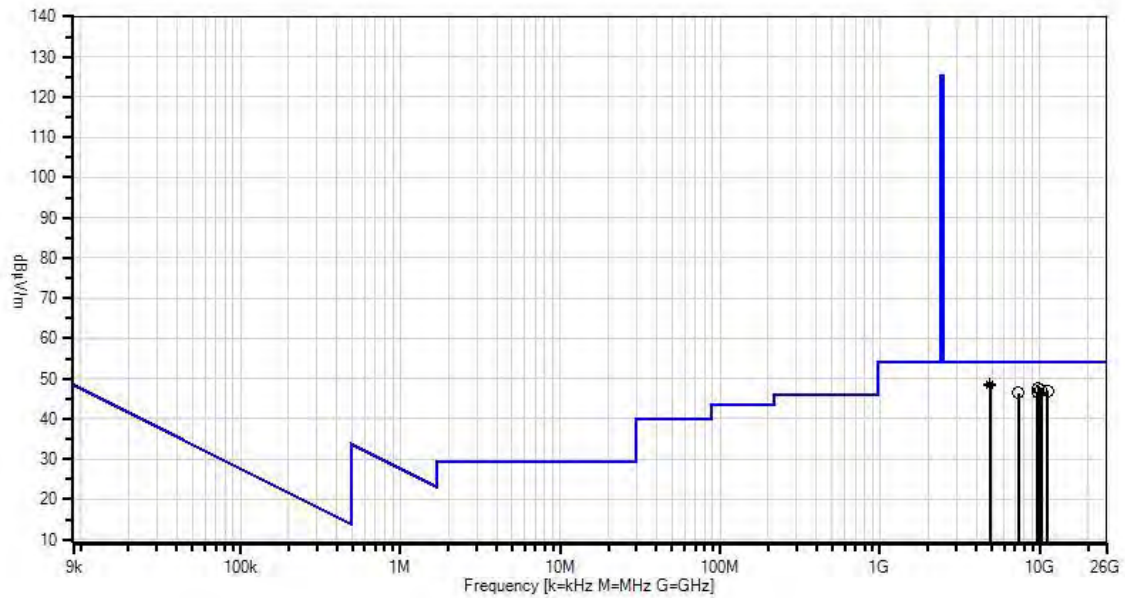
**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	4879.034M Ave	67.0	+33.4 +0.7	+1.7 +0.2	+3.8	-58.2	+0.0	48.6	54.0	-5.4	Vert
^	4879.034M	74.0	+33.4 +0.7	+1.7 +0.2	+3.8	-58.2	+0.0	55.6	54.0	+1.6	Vert
3	4881.069M Ave	66.7	+33.4 +0.7	+1.7 +0.2	+3.8	-58.2	+0.0	48.3	54.0	-5.7	Vert
^	4881.069M	73.8	+33.4 +0.7	+1.7 +0.2	+3.8	-58.2	+0.0	55.4	54.0	+1.4	Vert
5	9739.733M	55.9	+39.0 +1.3	+2.4 +0.2	+6.3	-57.5	+0.0	47.6	54.0	-6.4	Vert
6	10185.178 M	55.5	+39.7 +1.3	+2.5 +0.2	+6.3	-58.2	+0.0	47.3	54.0	-6.7	Vert
7	11130.016 M	55.3	+38.9 +1.2	+2.6 +0.2	+6.2	-57.5	+0.0	46.9	54.0	-7.1	Horiz
8	9639.633M	55.2	+38.7 +1.3	+2.4 +0.2	+6.2	-57.4	+0.0	46.6	54.0	-7.4	Horiz
9	7318.314M	60.5	+36.6 +1.0	+2.1 +0.2	+5.4	-59.3	+0.0	46.5	54.0	-7.5	Horiz

CKC Laboratories, Inc Date: 9/18/2014 Time: 08:49:34 Enlighted, Inc WO#: 95962  
 Test Distance: 3 Meters Sequence#: 17



— Readings  
 × QP Readings  
 ▼ Ambient  
 ○ Peak Readings  
 \* Average Readings  
 — 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **95962** Date: 9/18/2014  
 Test Type: **Radiated Scan** Time: 11:38:37  
 Equipment: **Sensor** Sequence#: 29  
 Manufacturer: **Enlighted, Inc.** Tested By: Hieu Song Nguyenpham  
 Model: **FS-D2**  
 S/N: **02**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T1	AN2693	Active Horn Antenna	AMFW-5F-18002650-20-10P	2/21/2013	2/21/2015
T2	ANP00928	Cable	various	1/23/2014	1/23/2016
T3	ANP06125	Cable	32022-29094K-29094K-72TC	6/4/2014	6/4/2016
T4	ANP06126	Cable	32022-29094K-29094K-168TC	7/12/2013	7/12/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Radiated Spurious Emission  
 Frequency Range: 12000MHz to 18000MHz

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa

Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz  
 Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16  
 RBW=1MHz  
 VBW=1MHz

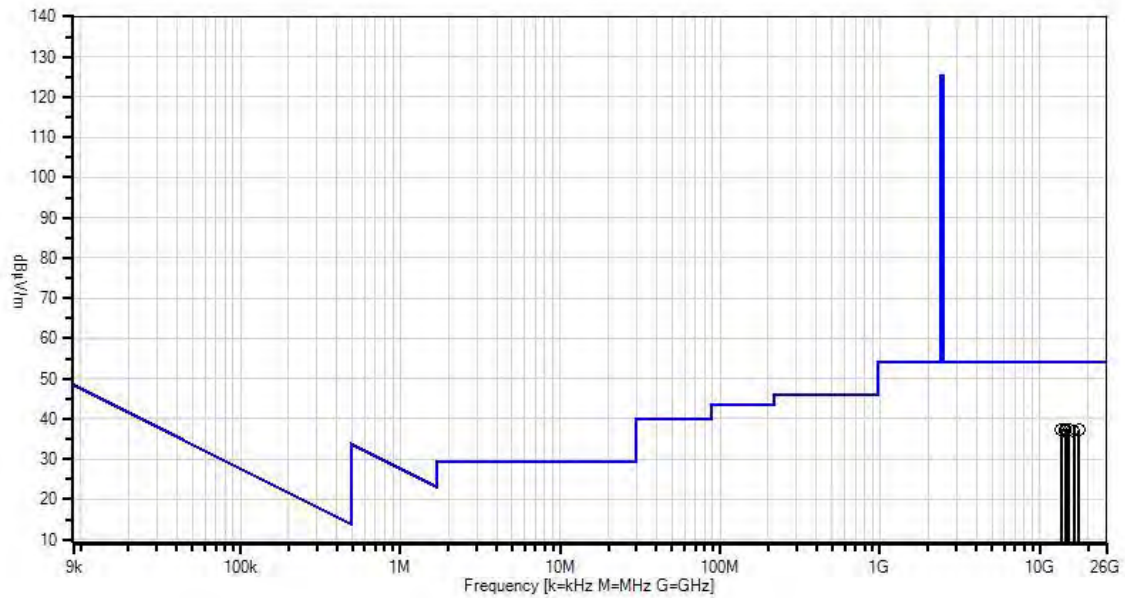
EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

Note:  
 X axis- Direct to Antenna ( Worst Case)  
 Middle Channel

Ext Attn: 0 dB

<b>Measurement Data:</b>		Reading listed by margin.					Test Distance: 3 Meters					
#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant	
1	15198.666 M	42.4	-15.5	+0.8	+2.9	+6.9	+0.0	37.5	54.0	-16.5	Vert	
2	13630.122 M	43.8	-16.2	+0.8	+2.7	+6.4	+0.0	37.5	54.0	-16.5	Horiz	
3	14458.924 M	42.7	-15.4	+0.8	+2.8	+6.5	+0.0	37.4	54.0	-16.6	Vert	
4	17554.063 M	40.4	-14.1	+0.7	+3.0	+7.3	+0.0	37.3	54.0	-16.7	Horiz	
5	14491.509 M	42.3	-15.4	+0.8	+2.8	+6.6	+0.0	37.1	54.0	-16.9	Horiz	
6	16334.243 M	43.0	-16.7	+0.7	+3.0	+7.1	+0.0	37.1	54.0	-16.9	Vert	

CKC Laboratories, Inc Date: 9/18/2014 Time: 11:38:37 Enlighted, Inc WO#: 95962  
Test Distance: 3 Meters Sequence#: 29



Readings  
x QP Readings  
▼ Ambient  
○ Peak Readings  
\* Average Readings  
1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **95962** Date: 9/18/2014  
 Test Type: **Radiated Scan** Time: 14:09:30  
 Equipment: **Sensor** Sequence#: 38  
 Manufacturer: **Enlighted, Inc.** Tested By: Hieu Song Nguyenpham  
 Model: **FS-D2**  
 S/N: **02**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T1	ANP06125	Cable	32022-29094K-29094K-72TC	6/4/2014	6/4/2016
T2	ANP06126	Cable	32022-29094K-29094K-168TC	7/12/2013	7/12/2015
T3	AN02694	Horn Antenna-ANSI C63.5 Antenna Factors (dB)	AMFW-5F-18002650-20-10P	2/4/2013	2/4/2015
T4	ANP00929	Cable	various	1/23/2014	1/23/2016

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Radiated Spurious Emission  
 Frequency Range: 18000MHz to 25000MHz

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa

Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz  
 Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16  
 RBW=1MHz  
 VBW=1MHz

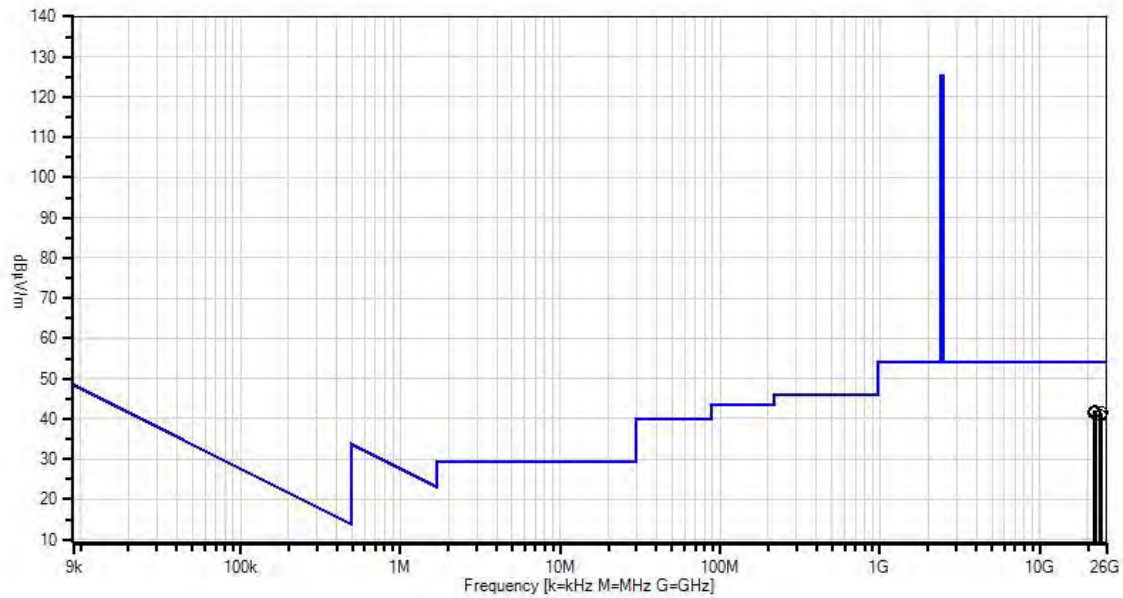
EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

Note:  
 X axis- Direct to Antenna ( Worst Case)  
 Middle Channel

Ext Attn: 0 dB

<b>Measurement Data:</b>		Reading listed by margin.					Test Distance: 3 Meters					
#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant	
1	22041.160 M	44.7	+3.6	+8.2	-17.4	+3.0	+0.0	42.1	54.0	-11.9	Horiz	
2	21923.920 M	44.6	+3.5	+8.2	-17.3	+3.0	+0.0	42.0	54.0	-12.0	Vert	
3	21843.249 M	44.3	+3.5	+8.2	-17.3	+3.0	+0.0	41.7	54.0	-12.3	Horiz	
4	22151.147 M	44.3	+3.6	+8.2	-17.5	+3.0	+0.0	41.6	54.0	-12.4	Vert	
5	24363.334 M	43.3	+3.7	+8.7	-17.3	+3.0	+0.0	41.4	54.0	-12.6	Horiz	
6	23892.887 M	43.5	+3.6	+8.5	-17.6	+3.0	+0.0	41.0	54.0	-13.0	Vert	

CKC Laboratories, Inc Date: 9/18/2014 Time: 14:09:30 Enlighted, Inc WO#: 95962  
 Test Distance: 3 Meters Sequence#: 38



- Readings
- × QP Readings
- ▼ Ambient
- Peak Readings
- \* Average Readings
- 1 - 15.247(d) / 15.209 Radiated Spurious Emissions



Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **95962** Date: 9/19/2014  
 Test Type: **Radiated Scan** Time: 10:16:38  
 Equipment: **Sensor** Sequence#: 58  
 Manufacturer: **Enlighted, Inc.** Tested By: Hieu Song Nguyenpham  
 Model: **FS-D2**  
 S/N: **02**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015
	AN00432	Loop Antenna	6502	4/2/2013	4/2/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Radiated Spurious Emission  
 Frequency Range: 9kHz to 30MHz

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa

Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz  
 Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16  
 RBW=VBW=200Hz from 9kHz to 150kHz  
 RBW=VBW=9kHz from 150kHz to 30MHz

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

Note:  
 X axis- Direct to Antenna ( Worst Case)  
 High Channel

**NO EUT EMISSION DETECTED WITHIN 20dB of THE LIMIT.**

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **95962** Date: 9/18/2014  
 Test Type: **Radiated Scan** Time: 17:01:09  
 Equipment: **Sensor** Sequence#: 50  
 Manufacturer: Enlighted, Inc. Tested By: Hieu Song Nguyenpham  
 Model: FS-D2  
 S/N: 02

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T1	AN00686	Preamp	8447D Opt 010	5/27/2014	5/27/2016
T2	AN00852	Biconilog Antenna	CBL 6111C	11/28/2012	11/28/2014
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP01183	Cable	CNT-195	9/3/2013	9/3/2015
T5	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Radiated Spurious Emission  
 Frequency Range: 30MHz to 1000MHz

Temperature: 23.7C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa

Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz  
 Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16  
 RBW=120kHz  
 VBW=120kHz

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

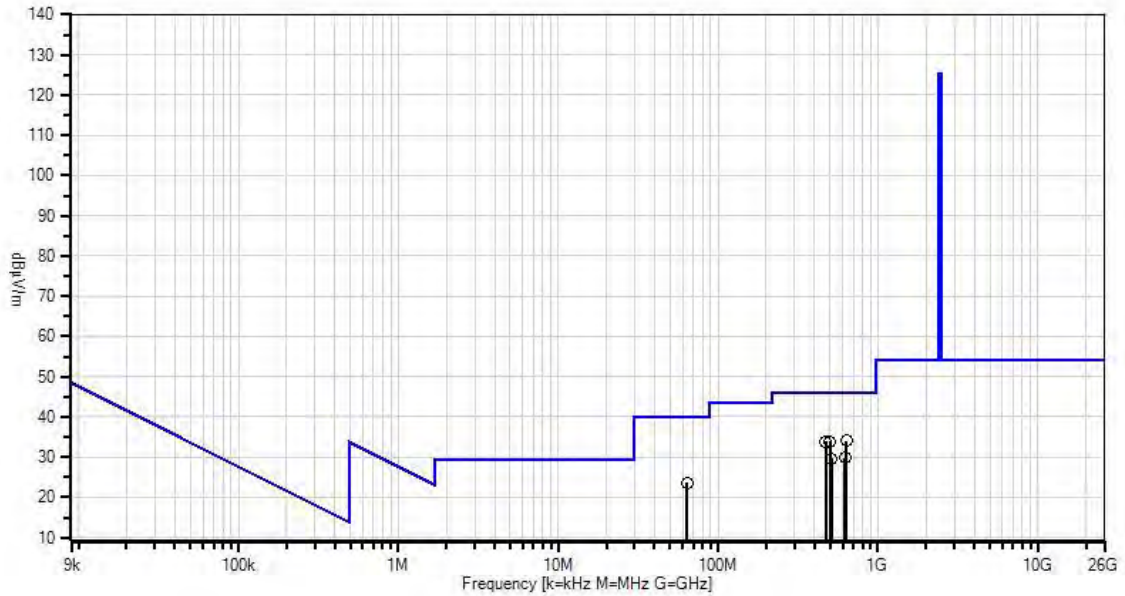
Note:  
 X axis- Direct to Antenna ( Worst Case)  
 High Channel

Ext Attn: 0 dB

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

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	634.807M	39.8	-29.8 +0.7	+19.7	+2.6	+1.0	+0.0	34.0	46.0	-12.0	Horiz
2	470.362M	42.7	-29.5 +0.6	+17.0	+2.2	+0.8	+0.0	33.8	46.0	-12.2	Horiz
3	500.032M	42.0	-29.7 +0.7	+17.7	+2.3	+0.8	+0.0	33.8	46.0	-12.2	Horiz
4	621.714M	35.3	-29.8 +0.7	+20.1	+2.5	+1.0	+0.0	29.8	46.0	-16.2	Vert
5	512.645M	37.4	-29.7 +0.7	+18.1	+2.3	+0.8	+0.0	29.6	46.0	-16.4	Vert
6	63.740M	45.6	-29.2 +0.2	+6.0	+0.7	+0.3	+0.0	23.6	40.0	-16.4	Vert

CKC Laboratories, Inc Date: 9/18/2014 Time: 17:01:09 Enlighted, Inc WO#: 95962  
 Test Distance: 3 Meters Sequence#: 50



Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **95962** Date: 9/18/2014  
 Test Type: **Radiated Scan** Time: 09:41:46  
 Equipment: **Sensor** Sequence#: 20  
 Manufacturer: **Enlighted, Inc.** Tested By: Hieu Song Nguyenpham  
 Model: **FS-D2**  
 S/N: **02**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/23/2013	1/23/2015
T2	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
T3	ANP01210	Cable	FSJ1P-50A-4A	2/19/2013	2/19/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T4	AN03114	Preamplifier	AMF-7D-00101800-30-10P	4/11/2013	4/11/2015
T5	AN03015	Cable	32022-2-29094K-24TC	5/6/2013	5/6/2015
T6	AN03309	High Pass Filter	11SH10-3000/T10000-O/O	4/2/2014	4/2/2016

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Radiated Spurious Emission  
 Frequency Range: 1000MHz to 12000MHz

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa  
 Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz  
 Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16

RBW=1MHz  
 VBW=1MHz

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

Note:  
 X axis- Direct to Antenna ( Worst Case)  
 High Channel

Ext Attn: 0 dB

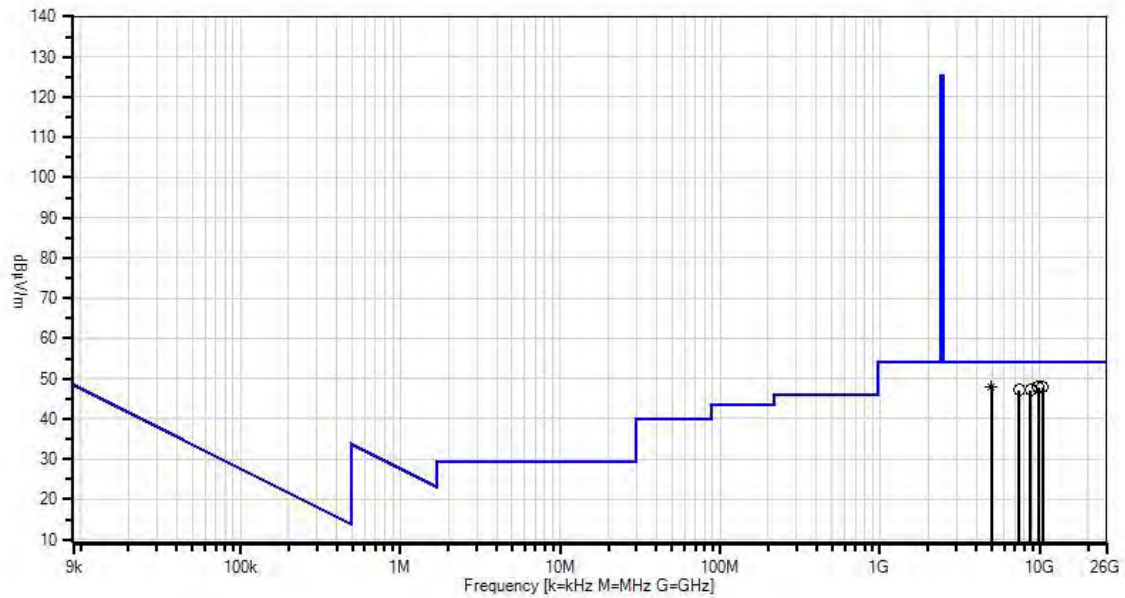
**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	4961.014M	65.9	+33.6 +0.7	+1.7 +0.2	+3.9	-57.9	+0.0	48.1	54.0	-5.9	Vert
^	4961.014M	73.0	+33.6 +0.7	+1.7 +0.2	+3.9	-57.9	+0.0	55.2	54.0	+1.2	Vert
3	4958.959M	65.8	+33.6 +0.7	+1.7 +0.2	+3.9	-57.9	+0.0	48.0	54.0	-6.0	Vert
^	4958.959M	72.8	+33.6 +0.7	+1.7 +0.2	+3.9	-57.9	+0.0	55.0	54.0	+1.0	Vert
5	9747.741M	56.1	+39.1 +1.3	+2.4 +0.2	+6.3	-57.5	+0.0	47.9	54.0	-6.1	Horiz
6	10364.357 M	56.8	+39.4 +1.3	+2.5 +0.2	+6.2	-58.6	+0.0	47.8	54.0	-6.2	Horiz
7	8691.686M	55.9	+37.8 +1.5	+2.3 +0.3	+5.7	-56.4	+0.0	47.1	54.0	-6.9	Vert
8	7441.437M	60.9	+36.8 +1.0	+2.1 +0.2	+5.4	-59.3	+0.0	47.1	54.0	-6.9	Horiz

CKC Laboratories, Inc Date: 9/18/2014 Time: 09:41:46 Enlighted, Inc WO#: 95962  
Test Distance: 3 Meters Sequence#: 20



Readings  
x QP Readings  
▼ Ambient  
○ Peak Readings  
\* Average Readings  
1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **95962** Date: 9/18/2014  
 Test Type: **Radiated Scan** Time: 11:55:08  
 Equipment: **Sensor** Sequence#: 32  
 Manufacturer: **Enlighted, Inc.** Tested By: Hieu Song Nguyenpham  
 Model: **FS-D2**  
 S/N: **02**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T1	AN2693	Active Horn Antenna	AMFW-5F-18002650-20-10P	2/21/2013	2/21/2015
T2	ANP00928	Cable	various	1/23/2014	1/23/2016
T3	ANP06125	Cable	32022-29094K-29094K-72TC	6/4/2014	6/4/2016
T4	ANP06126	Cable	32022-29094K-29094K-168TC	7/12/2013	7/12/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN



**Test Conditions / Notes:**

Radiated Spurious Emission  
 Frequency Range: 12000MHz to 18000MHz  
 Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa

Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz  
 Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16  
 RBW=1MHz  
 VBW=1MHz

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

Note:  
 X axis- Direct to Antenna ( Worst Case)  
 High Channel

Ext Attn: 0 dB

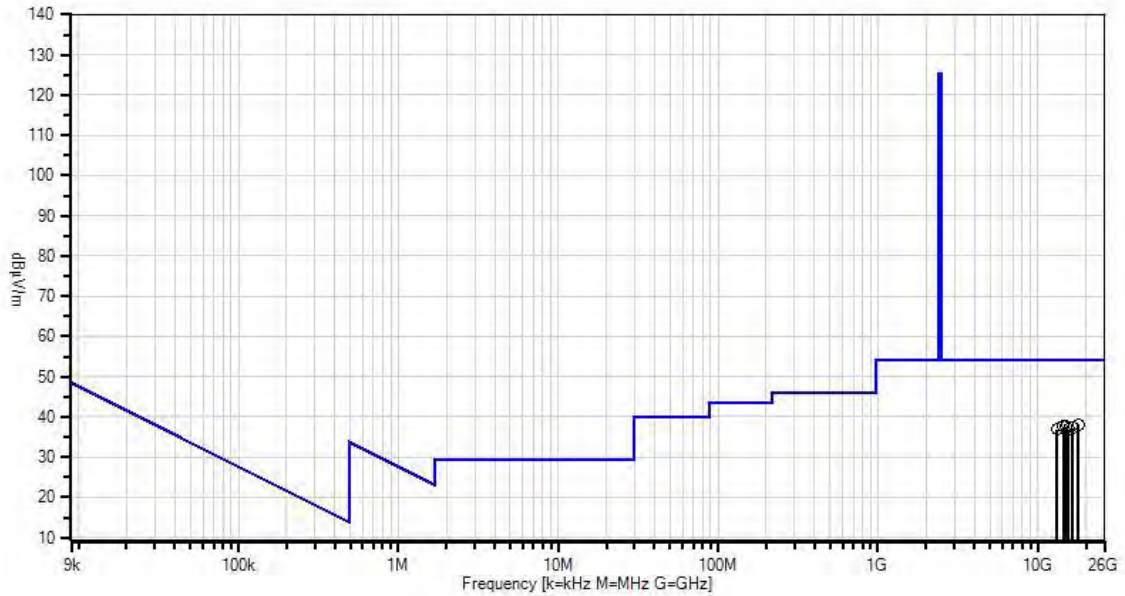
**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	17838.630 M	40.5	-13.4	+0.7	+3.0	+7.3	+0.0	38.1	54.0	-15.9	Vert
2	15043.444 M	42.4	-15.4	+0.8	+2.9	+6.9	+0.0	37.6	54.0	-16.4	Vert
3	14405.087 M	43.0	-15.5	+0.8	+2.8	+6.5	+0.0	37.6	54.0	-16.4	Vert
4	16475.471 M	43.0	-16.6	+0.7	+3.0	+7.1	+0.0	37.2	54.0	-16.8	Horiz
5	15508.505 M	42.0	-15.8	+0.8	+2.9	+7.0	+0.0	36.9	54.0	-17.1	Horiz
6	13120.119 M	43.1	-16.0	+0.8	+2.6	+6.3	+0.0	36.8	54.0	-17.2	Horiz

CKC Laboratories, Inc Date: 9/18/2014 Time: 11:55:08 Enlighted, Inc WO#: 95962  
 Test Distance: 3 Meters Sequence#: 32



Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **95962** Date: 9/18/2014  
 Test Type: **Radiated Scan** Time: 14:27:33  
 Equipment: **Sensor** Sequence#: 41  
 Manufacturer: **Enlighted, Inc.** Tested By: Hieu Song Nguyenpham  
 Model: **FS-D2**  
 S/N: **02**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T1	ANP06125	Cable	32022-29094K-29094K-72TC	6/4/2014	6/4/2016
T2	ANP06126	Cable	32022-29094K-29094K-168TC	7/12/2013	7/12/2015
T3	AN02694	Horn Antenna-ANSI C63.5 Antenna Factors (dB)	AMFW-5F-18002650-20-10P	2/4/2013	2/4/2015
T4	ANP00929	Cable	various	1/23/2014	1/23/2016

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

Radiated Spurious Emission  
 Frequency Range: 18000MHz to 25000MHz

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa

Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz  
 Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16  
 RBW=1MHz  
 VBW=1MHz

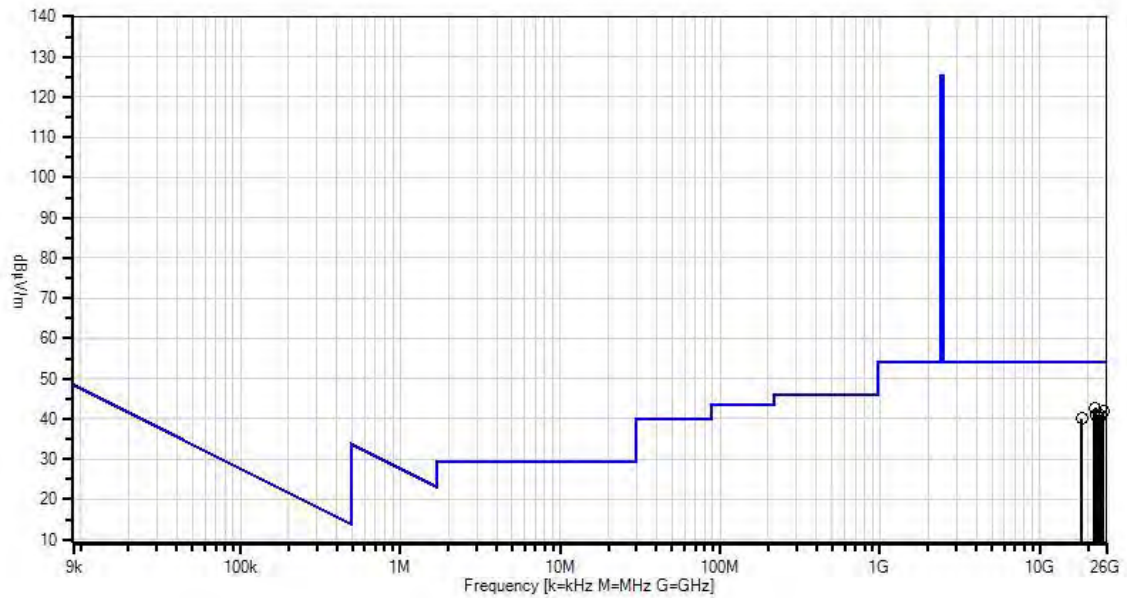
EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

Note:  
 X axis- Direct to Antenna ( Worst Case)  
 High Channel

Ext Attn: 0 dB

<b>Measurement Data:</b>		Reading listed by margin.					Test Distance: 3 Meters					
#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant	
1	22179.152 M	45.4	+3.6	+8.2	-17.5	+3.0	+0.0	42.7	54.0	-11.3	Horiz	
2	21961.269 M	45.1	+3.6	+8.2	-17.3	+3.0	+0.0	42.6	54.0	-11.4	Vert	
3	24830.485 M	43.2	+3.7	+8.9	-17.0	+3.1	+0.0	41.9	54.0	-12.1	Vert	
4	22638.523 M	43.7	+3.6	+8.3	-17.7	+3.0	+0.0	40.9	54.0	-13.1	Vert	
5	23911.951 M	43.2	+3.6	+8.5	-17.6	+3.0	+0.0	40.7	54.0	-13.3	Horiz	
6	18303.511 M	42.7	+3.2	+7.4	-16.8	+3.5	+0.0	40.0	54.0	-14.0	Horiz	

CKC Laboratories, Inc Date: 9/18/2014 Time: 14:27:33 Enlighted, Inc WO#: 95962  
 Test Distance: 3 Meters Sequence#: 41



— Readings  
 × QP Readings  
 ▼ Ambient  
 ○ Peak Readings  
 \* Average Readings  
 — 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

## Band Edge

### Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**

Specification: **Band edge**

Work Order #: **95962**

Test Type: **Radiated Scan**

Equipment: **Sensor**

Manufacturer: Enlighted, Inc.

Model: FS-D2

S/N: 02

Date: 9/17/2014

Time: 14:56:58

Sequence#: 7

Tested By: Hieu Song Nguyenpham

***Test Equipment:***

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/23/2013	1/23/2015
T2	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
T3	ANP01210	Cable	FSJ1P-50A-4A	2/19/2013	2/19/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

***Support Devices:***

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN

**Test Conditions / Notes:**

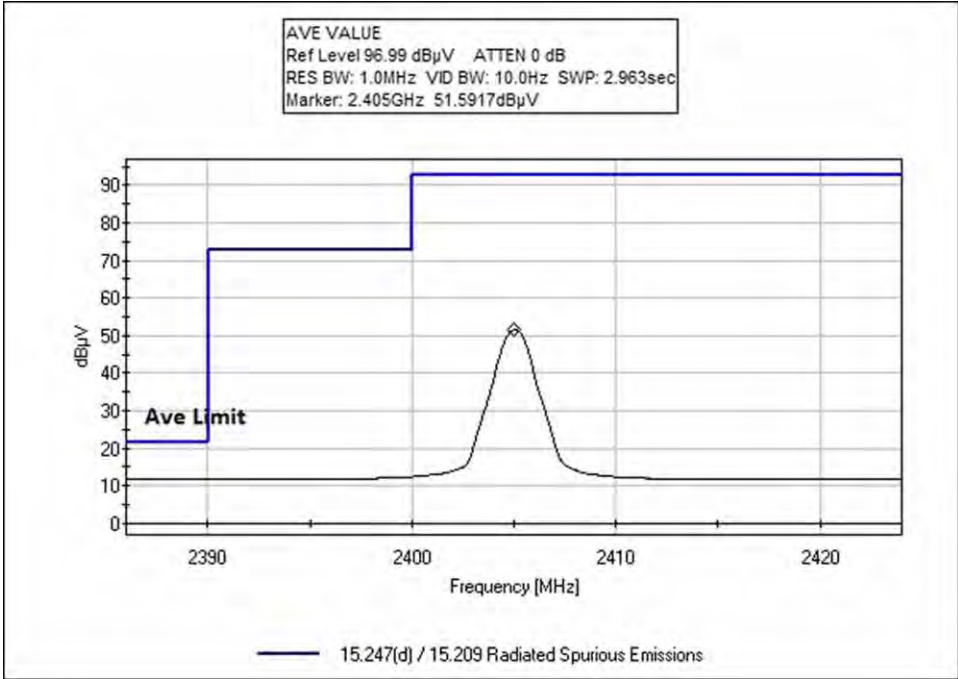
Band Edge Set up

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa

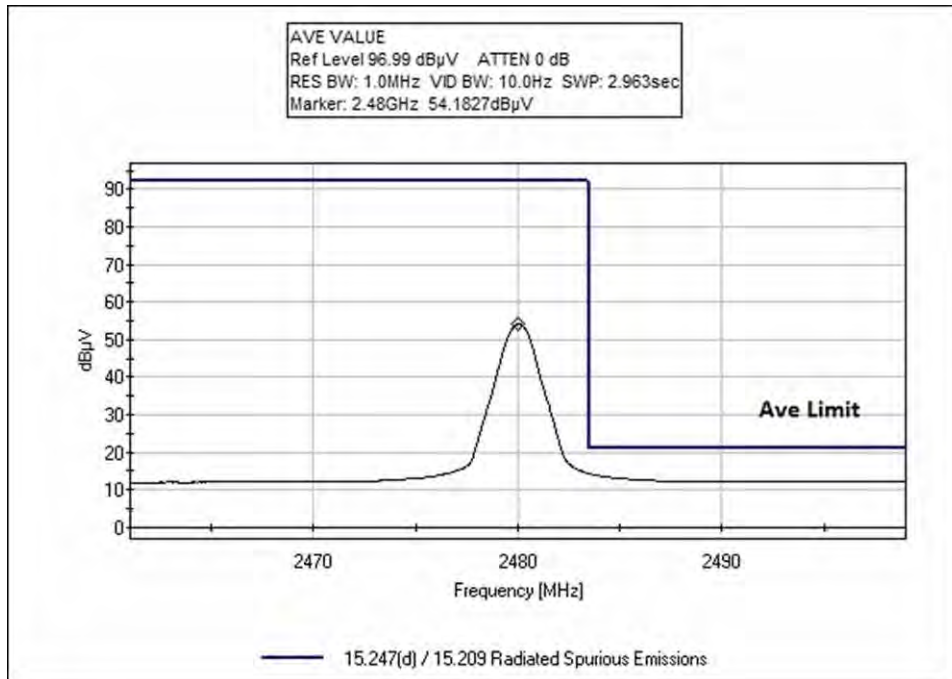
Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz  
 Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application “PuTTY” for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting.

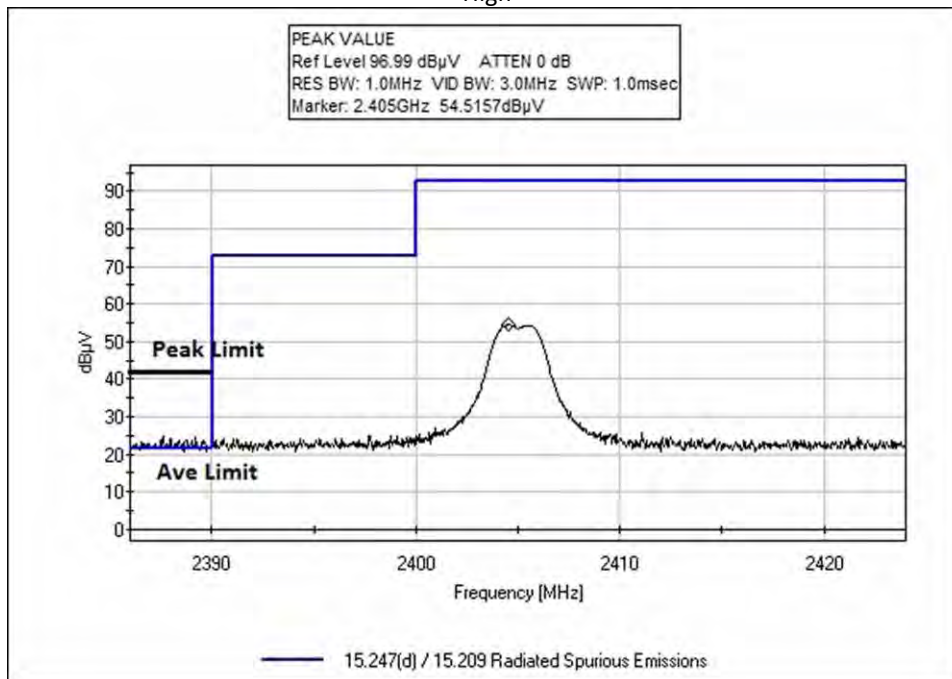
**Test Data**



Low

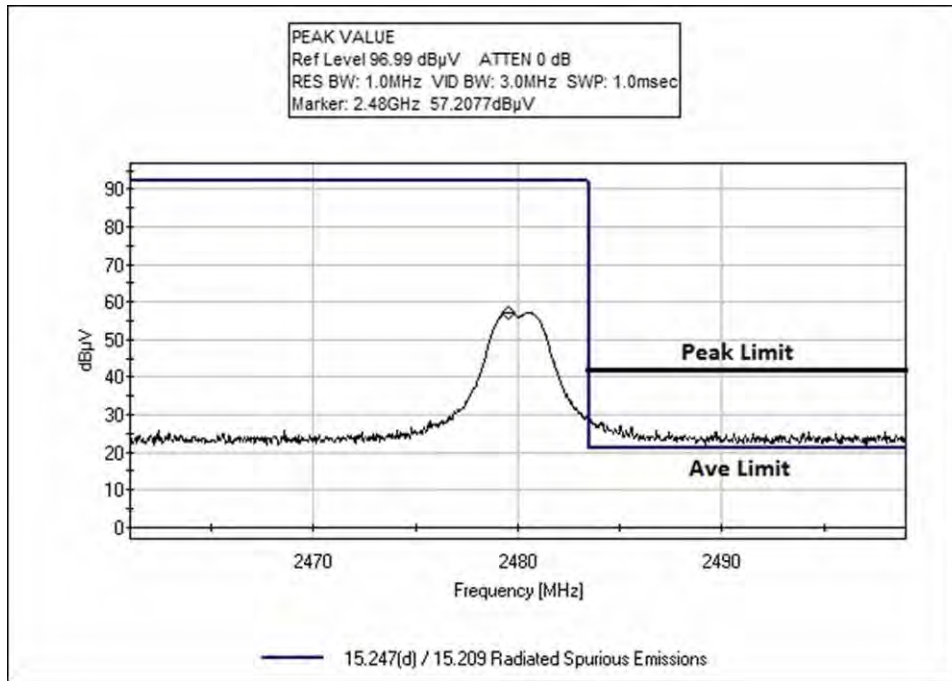


High



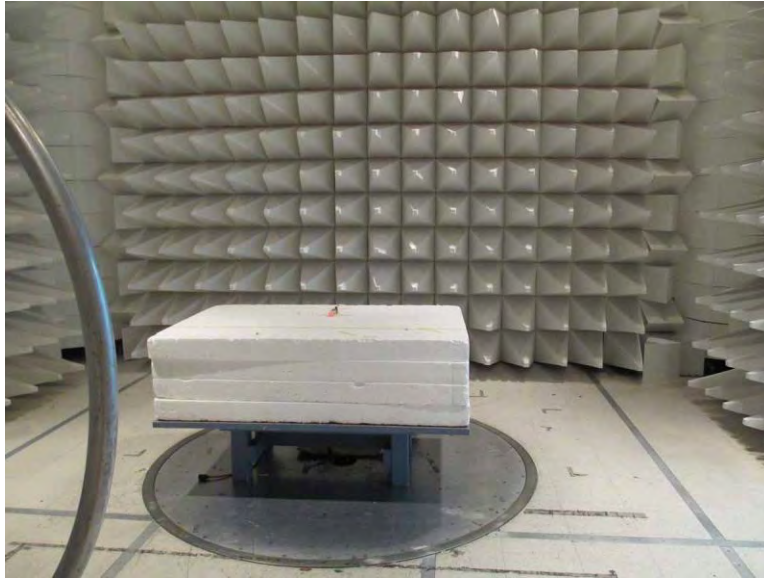
Low



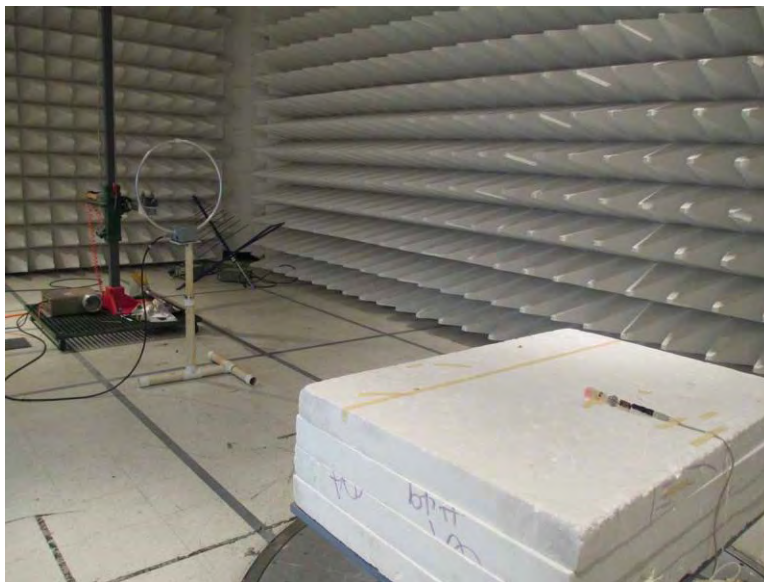


High

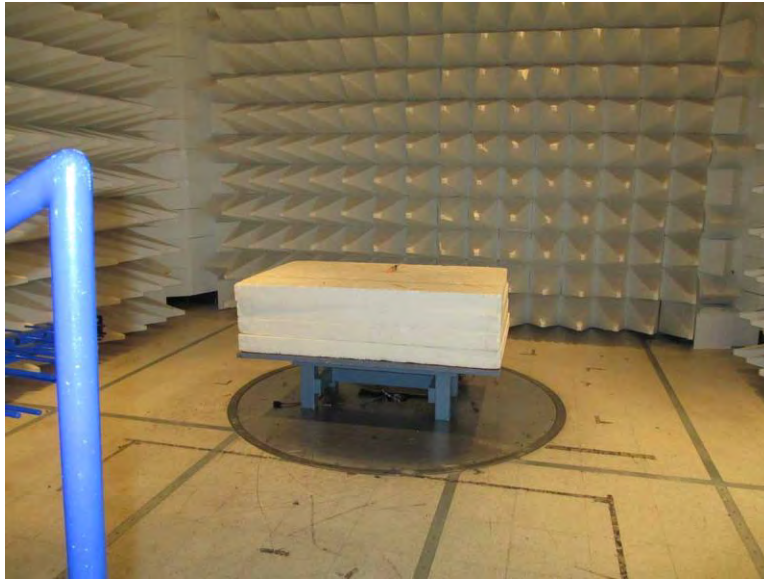
**Test Setup Photos**



9kHz – 30MHz, Radiated Spurious Emissions



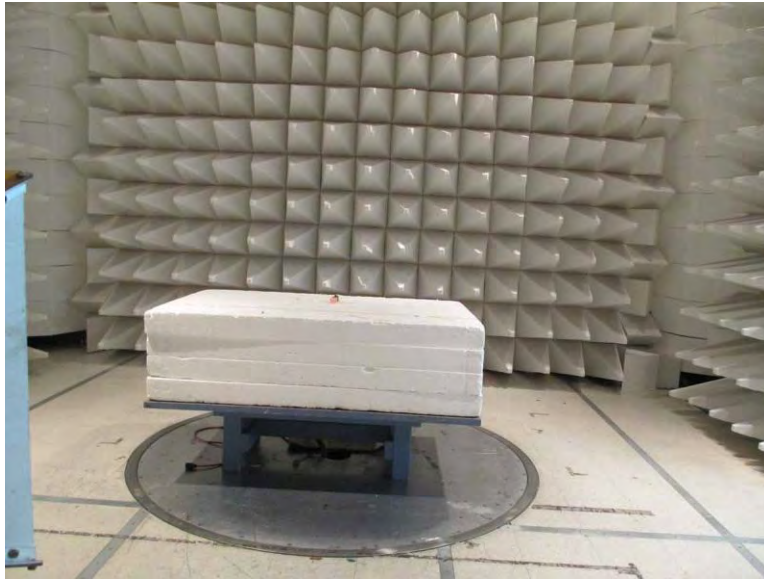
9kHz – 30MHz



30MHz – 1GHz



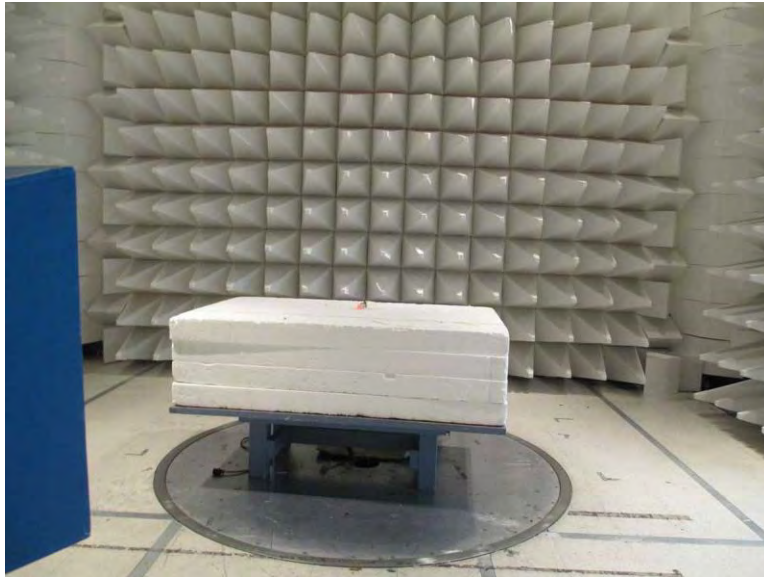
30MHz – 1GHz



1 – 12GHz



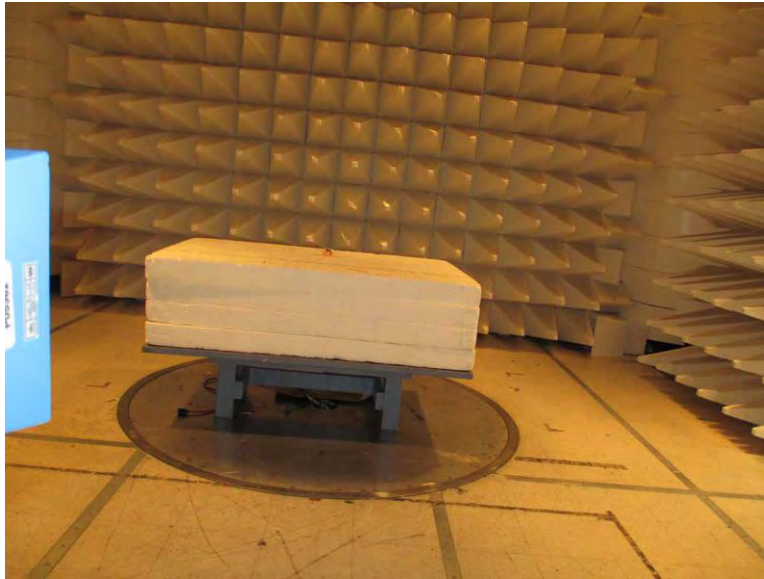
1-12GHz



12-18GHz



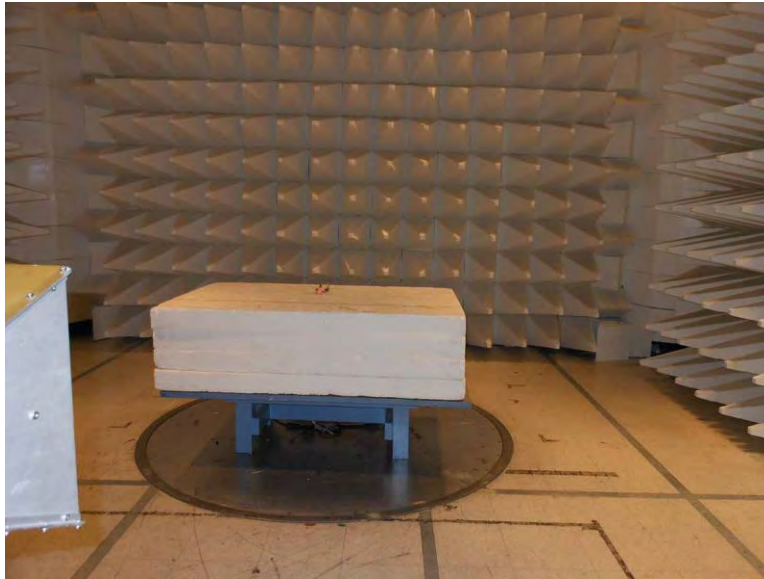
12-18GHz



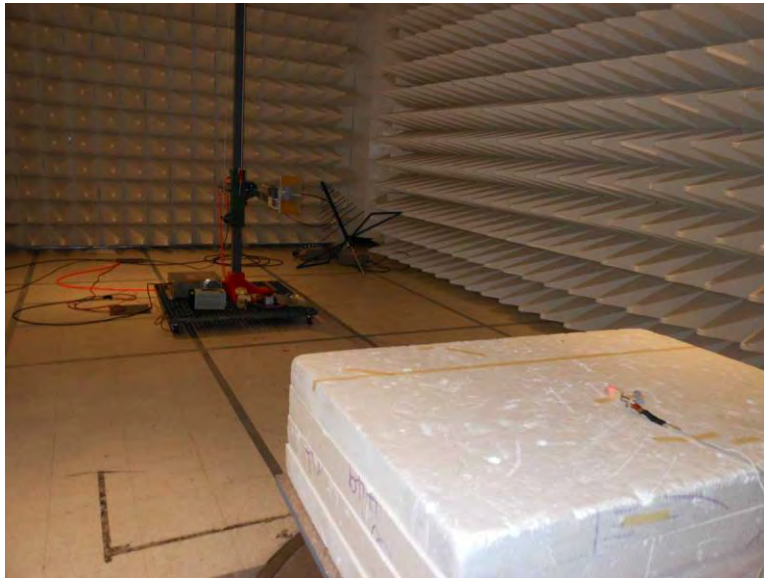
18-25GHz



18-25GHz



Front View, Band Edge



Back View

## 15. 247(e) Power Spectral Density

### Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Enlighted, Inc.**

Specification: **15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)**

Work Order #: **95962**

Date: 9/17/2014

Test Type: **Radiated Scan**

Time: 14:56:58

Equipment: **Sensor**

Sequence#: 7

Manufacturer: Enlighted, Inc.

Tested By: Hieu Song Nguyenpham

Model: FS-D2

S/N: 02

***Test Equipment:***

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/23/2013	1/23/2015
T2	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
T3	ANP01210	Cable	FSJ1P-50A-4A	2/19/2013	2/19/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015

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

Function	Manufacturer	Model #	S/N
Sensor*	Enlighted, Inc.	FS-D2	02

***Support Devices:***

Function	Manufacturer	Model #	S/N
DC Power Supply	Protek	3006B	AG4070
USB adapter	Generic	Generic	NSN
Laptop Computer	Lenovo	T430S	NSN



**Test Conditions / Notes:**

Power Spectral Density of the EUT

Temperature: 23.7°C  
 Humidity: 45%  
 Atmospheric Pressure: 100.8kPa  
 Firmware Used: Version 2.6.2  
 Application: PuTTY  
 High Clock: 16MHz

Transmitting operating frequency= 2.4GHz Band  
 RF Output= 0dBm  
 Gain of the antenna= 0dBi  
 Number of Channel=16

RBW=100kHz  
 VBW=300kHz

EUT is a ceiling-mounted Transmitter/Receiver that is part of the Enlighted Lighting System. The EUT is a Sensor. The EUT is powered at 12.5 VDC by DC power supply which sits next to it. The EUT is considered a component of the Enlighted system, and it acts as sensors for occupancy, ambient light, and temperature. In order to monitor the EUT and control the EUT by an application "PuTTY" for testing purpose, the EUT is connected to the laptop which is outside the chamber by USB cable. The EUT is set continuously transmitting or receive.

Note: X axis- Direct to Antenna ( Worst Case)

Ext Attn: 0 dB

<b>Measurement Data:</b>		Reading listed by amplitude.					Test Distance: 3 Meters					
#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant	
1	2404.518M	56.8	+28.6	+1.2	+2.7		+0.0	89.3	103.2	-13.9	Horiz	
									X axis ( Direct to Antenna)			
2	2439.513M	55.8	+28.7	+1.2	+2.7		+0.0	88.4	103.2	-14.8	Horiz	
									X axis ( Direct to Antenna)			
3	2479.520M	55.7	+28.9	+1.2	+2.7		+0.0	88.5	103.2	-14.7	Horiz	
									X axis ( Direct to Antenna)			
4	2404.518M	55.5	+28.6	+1.2	+2.7		+0.0	88.0	103.2	-15.2	Vert	
									X axis ( Direct to Antenna)			
5	2439.513M	52.7	+28.7	+1.2	+2.7		+0.0	85.3	103.2	-17.9	Vert	
									X axis ( Direct to Antenna)			
6	2479.520M	51.1	+28.9	+1.2	+2.7		+0.0	83.9	103.2	-19.3	Vert	
									X axis ( Direct to Antenna)			

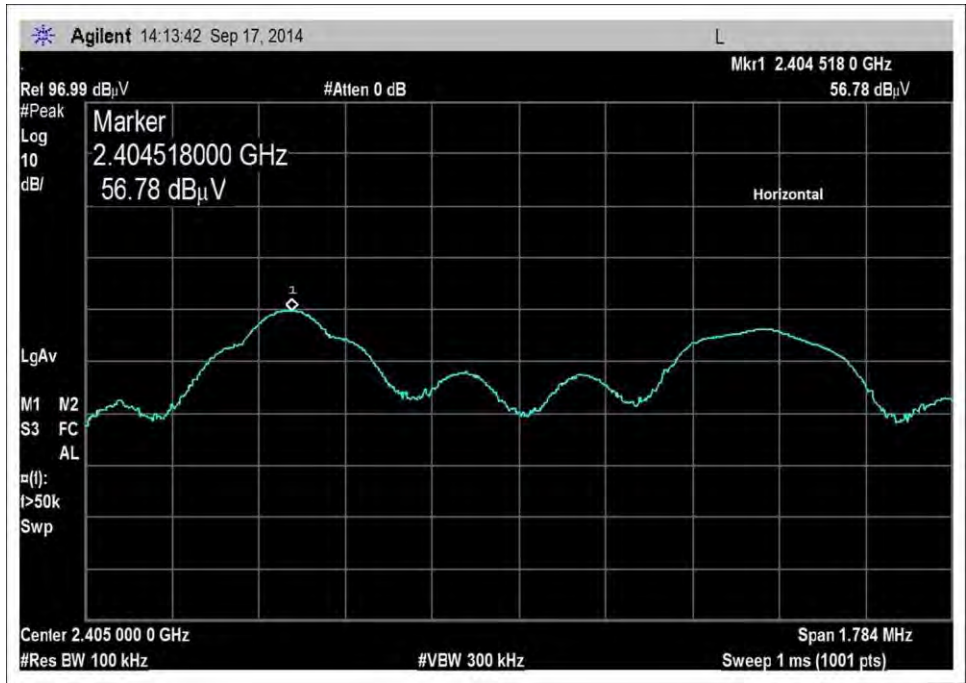
**Convert equivalent electric field strength to the resultant power level**

Frequency (MHz)	Measured Power in dBm	Power Limit in dBm	Pass/Fail
2404.518 Low Channel ( Horizontal)	-5.929	8.00	Pass
2404.518 Low Channel ( Vertical)	-7.229	8.00	Pass
2439.513 Middle Channel ( Horizontal)	-6.829	8.00	Pass
2439.513 Middle Channel ( Vertical)	-9.929	8.00	Pass
2479.520 High Channel ( Horizontal)	-6.729	8.00	Pass
2479.520 High Channel ( Vertical)	-11.329	8.00	Pass

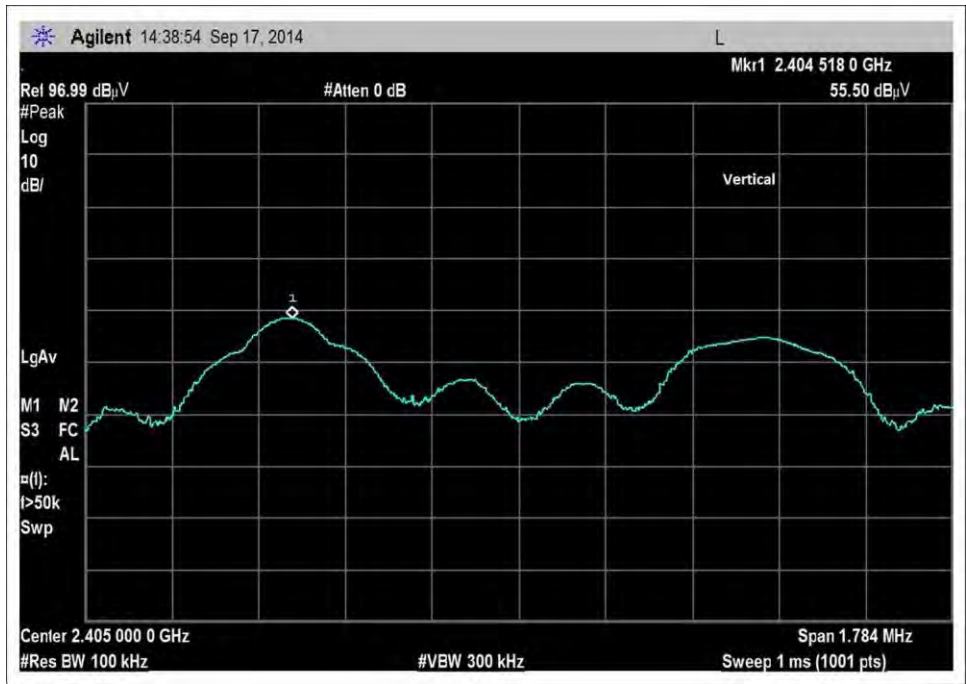
A formula converts Radiated Method to Conducted Method

$$\text{dBm (conducted power)} = \text{dBuV/m} + 20 * \text{LOG D} - 104.77 - \text{Gain (dBi)}$$

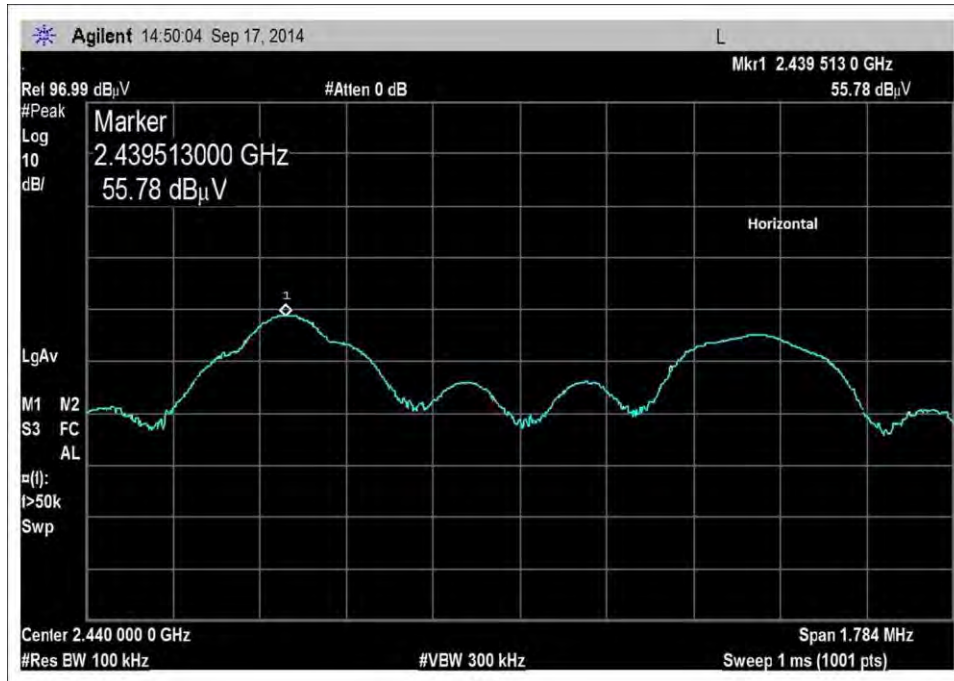
## Test Data



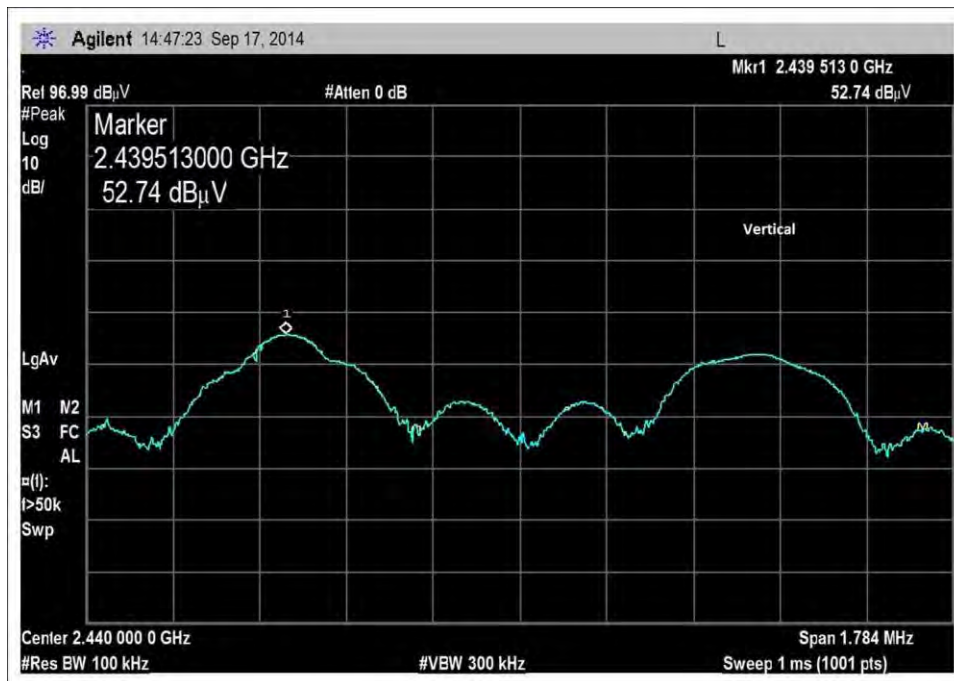
Low Channel, Horizontal



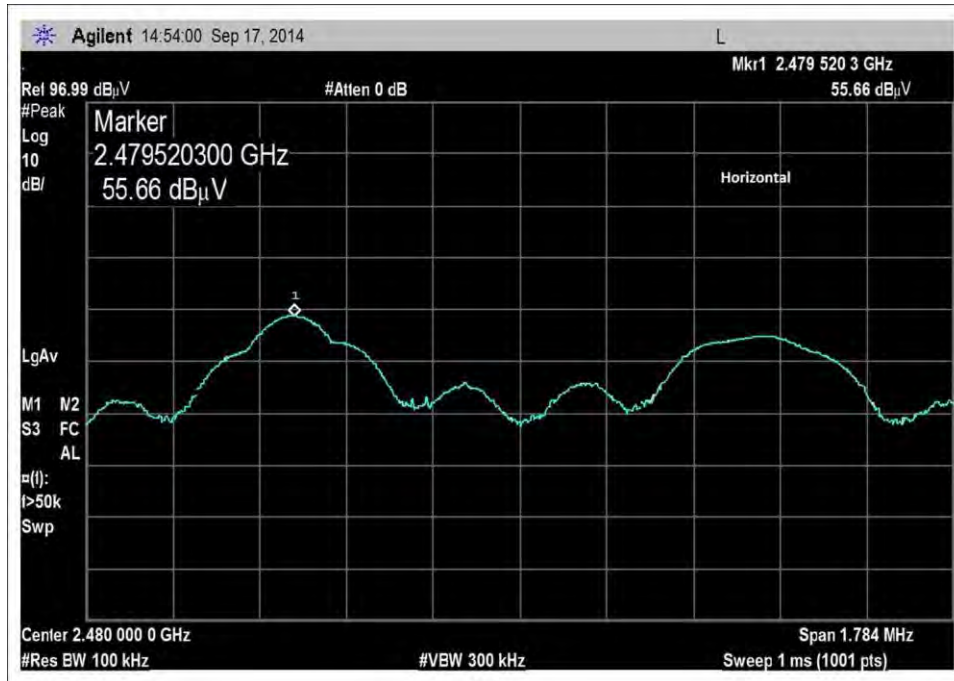
Low Channel, Vertical



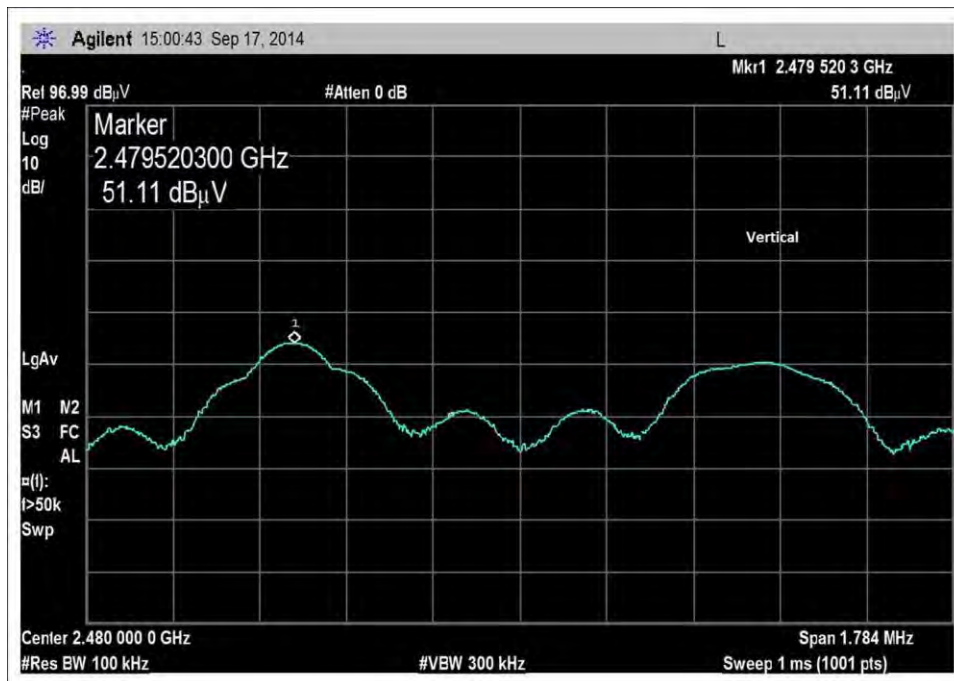
Middle Channel, Horizontal



Middle Channel, Vertical

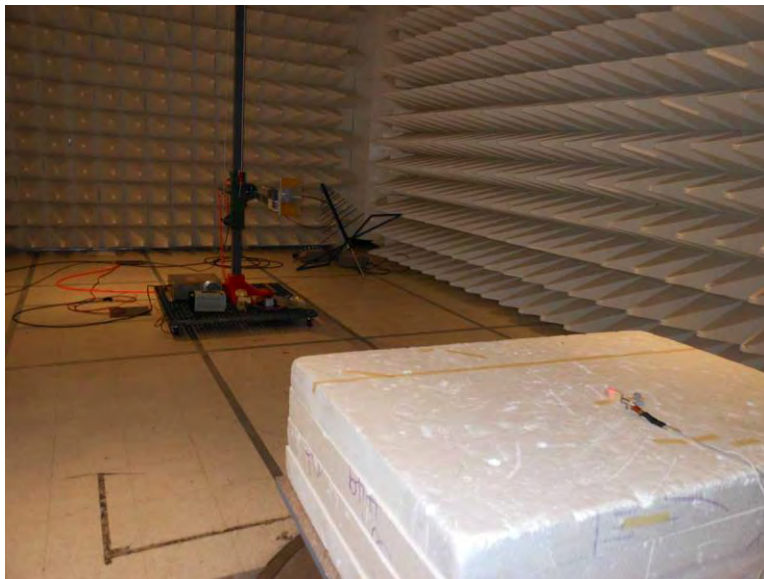


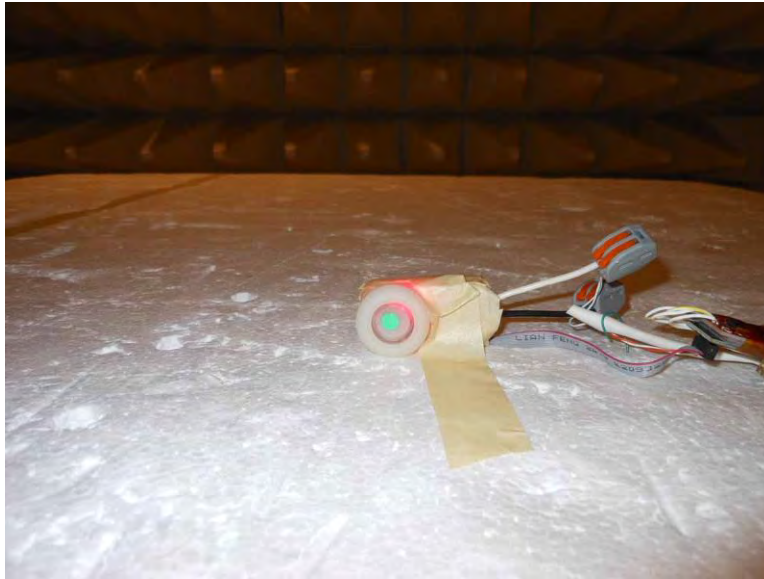
High Channel, Horizontal



High Channel, Vertical

**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  $\text{dB}\mu\text{V}/\text{m}$ , the spectrum analyzer reading in  $\text{dB}\mu\text{V}$  was corrected by using the following formula. This reading was then compared to the applicable specification limit.



SAMPLE CALCULATIONS		
	Meter reading	(dB $\mu$ V)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dB $\mu$ V/m)

### TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

### SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

#### **Peak**

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

#### **Quasi-Peak**

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

#### **Average**

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.