

FCC PART 15.247

TEST REPORT

For

Feit Electric Company

4901 Gregg Road Pico Rivera, California, United States

FCC ID: SYW-R5601

Report Type: Original Report	Product Type: LED Luminaire(with bluetooth)
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Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

TABLE OF CONTENTS

GENERAL INFORMATION.....	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	4
OBJECTIVE	4
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY	4
TEST FACILITY	5
SYSTEM TEST CONFIGURATION.....	6
DESCRIPTION OF TEST CONFIGURATION	6
EQUIPMENT MODIFICATIONS	6
SUPPORT DEVICES DESCRIPTION	7
EXTERNAL I/O CABLE.....	7
BLOCK DIAGRAM OF TEST SETUP	7
SUMMARY OF TEST RESULTS	8
FCC §15.247 (i) & §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE).....	9
APPLICABLE STANDARD	9
FCC §15.203 - ANTENNA REQUIREMENT	10
APPLICABLE STANDARD	10
ANTENNA CONNECTOR CONSTRUCTION	10
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS	11
APPLICABLE STANDARD	11
MEASUREMENT UNCERTAINTY	11
EUT SETUP	11
EMI TEST RECEIVER SETUP.....	12
TEST PROCEDURE	12
TEST EQUIPMENT LIST AND DETAILS.....	12
CORRECTED FACTOR & MARGIN CALCULATION	12
TEST RESULTS SUMMARY	13
TEST DATA	13
ENVIRONMENTAL CONDITIONS.....	13
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS.....	16
APPLICABLE STANDARD	16
MEASUREMENT UNCERTAINTY	16
EUT SETUP	16
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	17
TEST PROCEDURE	17
TEST EQUIPMENT LIST AND DETAILS.....	18
CORRECTED AMPLITUDE & MARGIN CALCULATION	18
TEST RESULTS SUMMARY	18
TEST DATA	19
ENVIRONMENTAL CONDITIONS.....	19
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH.....	22
APPLICABLE STANDARD	22
TEST PROCEDURE	22
TEST EQUIPMENT LIST AND DETAILS.....	22
TEST DATA	22
ENVIRONMENTAL CONDITIONS.....	22

FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER.....	25
APPLICABLE STANDARD	25
TEST PROCEDURE	25
TEST EQUIPMENT LIST AND DETAILS.....	25
TEST DATA	26
ENVIRONMENTAL CONDITIONS.....	26
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE.....	27
APPLICABLE STANDARD	27
TEST PROCEDURE	27
TEST EQUIPMENT LIST AND DETAILS.....	27
TEST DATA	28
ENVIRONMENTAL CONDITIONS.....	28
FCC §15.247(e) - POWER SPECTRAL DENSITY	30
APPLICABLE STANDARD	30
TEST PROCEDURE	30
TEST EQUIPMENT LIST AND DETAILS.....	30
TEST DATA	31
ENVIRONMENTAL CONDITIONS.....	31
PRODUCT SIMILARITY DECLARATION LETTER.....	33

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Feit Electric Company's* product, model number: *LEDR56/830/HBR (FCC ID: SYW-R5601)* or the "EUT" in this report was a *LED Luminaire(with bluetooth)*, which was measured approximately: 19 cm (L) x 19 cm (W) x 10 cm (H), rated with input voltage: AC 120V/60 Hz.

Note: the product, series model *LEDR56/830/HBR/CAN* is electrically identical with the same electromagnetic emissions, PCB layout and circuit as tested model *LEDR56/830/HBR*. Model *LEDR56/830/HBR* was selected for fully testing, which was explained in the attached product similarity declaration letter.

**All measurement and test data in this report was gathered from production sample serial number: 1507028 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2015-07-17.*

Objective

This report is prepared on behalf of *Feit Electric Company* in accordance with Part 2-Subpart J, Part 15-Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

No related grant

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement uncertainty with RF radiated emission is 5.91 dB for 30MHz-1GHz.and 4.92 dB for above 1GHz, 1.95dB for conducted measurement.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on October 31, 2013. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10-2013.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

For BLE mode, 40 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2402	21	2442
2	2404	22	2444
3	2406	23	2446
4	2408	24	2448
5	2410	25	2450
6	2412	26	2452
7	2414	27	2454
8	2416	28	2456
9	2418	29	2458
10	2420	30	2460
11	2422	31	2462
12	2424	32	2464
13	2426	33	2466
14	2428	34	2468
15	2430	35	2470
16	2432	36	2472
17	2434	37	2474
18	2436	38	2476
19	2438	39	2478
20	2440	40	2480

EUT was tested with Channel 1, 20 and 40.

Equipment Modifications

No modification was made to the EUT tested.

Support Devices Description

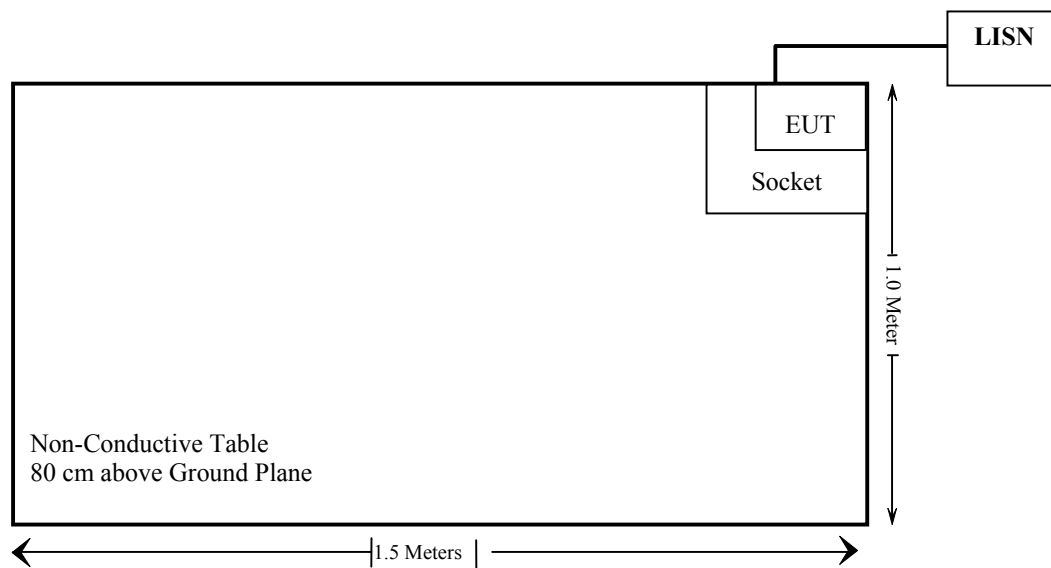
Manufacturer	Description	Model	Serial Number
N/A	Socket 1	N/A	DZ002

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielding Un-Detachable AC Cable	1.0	LISN	EUT

Block Diagram of Test Setup

For conducted emission



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (1)& §2.1091	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.247(d)	Spurious Emissions at Antenna Port	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Conducted Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

FCC §15.247 (i) & §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i) and subpart §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Ave. eraging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave.e equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Data:

Mode	Frequency (MHz)	Antenna Gain		Max tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
BLE	2480	1.5	1.41	6.40	4.37	20	0.0013	1.0

Note: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has an internal antenna arrangement which was permanently attached and the antenna gain is 1.5dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

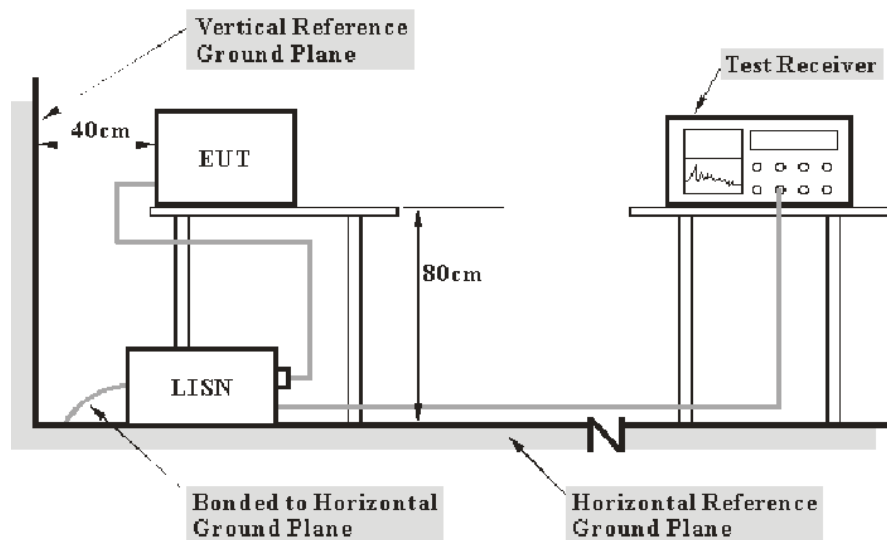
Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between LISN and receiver, LISN voltage division factor, LISN VDF frequency interpolation and receiver related input quantities, etc.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of conducted disturbance test at Bay Area Compliance Laboratories Corp. (Shenzhen) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report.

Port	Expanded Measurement uncertainty
AC Mains	3.26 dB (k=2, 95% level of confidence)
CAT 3	3.70 dB (k=2, 95% level of confidence)
CAT 5	3.86 dB (k=2, 95% level of confidence)
CAT 6	4.64 dB (k=2, 95% level of confidence)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The socket was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2015-06-03	2016-06-03
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2014-12-01	2015-12-01
Rohde & Schwarz	LISN	ESH2-Z5	892107/021	2015-06-09	2016-06-09
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2015-05-14	2016-05-13

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, the worst margin reading as below:

6.4 dB at 1.089590 MHz in the **Neutral** conducted

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

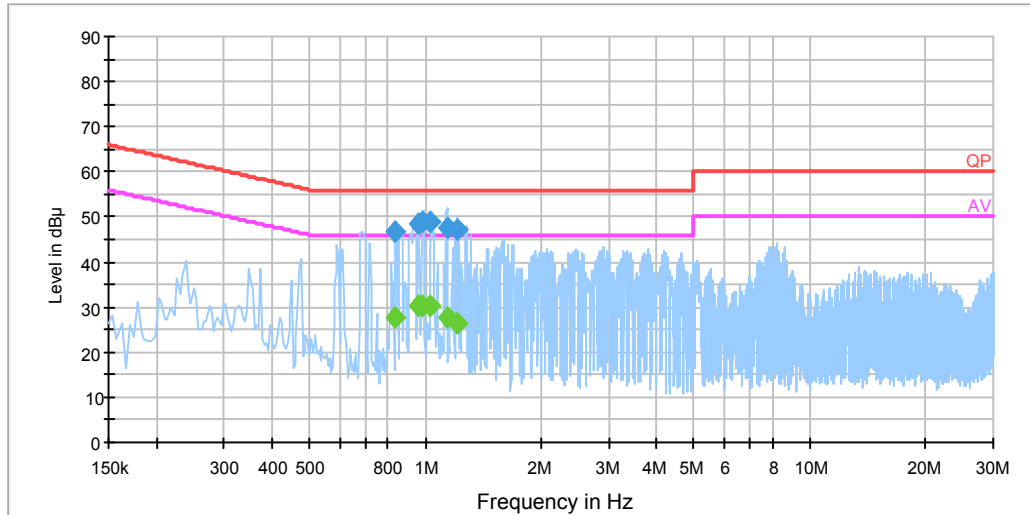
Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Liewei Liu on 2015-07-31.

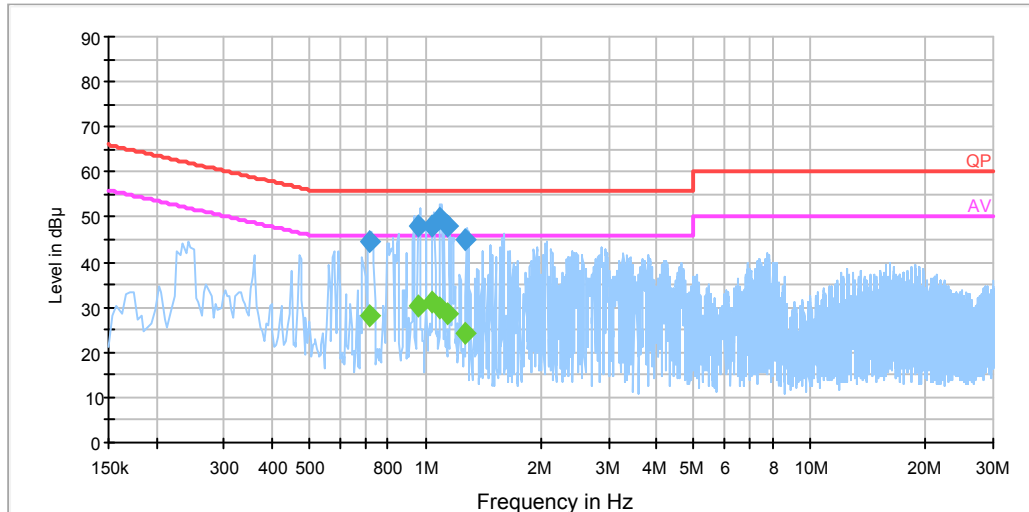
EUT operation mode: Transmitting

AC 120V/60 Hz, Line**EMI Auto Test L**

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.837430	46.8	19.9	56.0	9.2	QP
0.837430	27.7	19.9	46.0	18.3	Ave.
0.963570	48.3	20.0	56.0	7.7	QP
0.963570	30.4	20.0	46.0	15.6	Ave.
0.983150	49.0	20.0	56.0	7.0	QP
0.983150	30.2	20.0	46.0	15.8	Ave.
1.026430	48.9	20.0	56.0	7.1	QP
1.026430	30.2	20.0	46.0	15.8	Ave.
1.148870	47.8	20.0	56.0	8.2	QP
1.148870	27.6	20.0	46.0	18.4	Ave.
1.215790	47.0	20.0	56.0	9.0	QP
1.215790	26.6	20.0	46.0	19.4	Ave.

AC 120V/60 Hz, Neutral

EMI Auto Test N



Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.719170	44.6	19.9	56.0	11.4	QP
0.719170	28.3	19.9	46.0	17.7	Ave.
0.955450	48.2	20.0	56.0	7.8	QP
0.955450	30.4	20.0	46.0	15.6	Ave.
1.046190	48.1	20.0	56.0	7.9	QP
1.046190	31.0	20.0	46.0	15.0	Ave.
1.089590	49.6	20.0	56.0	6.4	QP
1.089590	30.0	20.0	46.0	16.0	Ave.
1.140630	48.2	20.0	56.0	7.8	QP
1.140630	28.4	20.0	46.0	17.6	Ave.
1.266830	45.0	20.0	56.0	11.0	QP
1.266830	24.1	20.0	46.0	21.9	Ave.

Note:

- 1) Corrected Amplitude = Reading + Correction Factor
- 2) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss
- 3) Margin = Limit – Corrected Amplitude

FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

Measurement Uncertainty

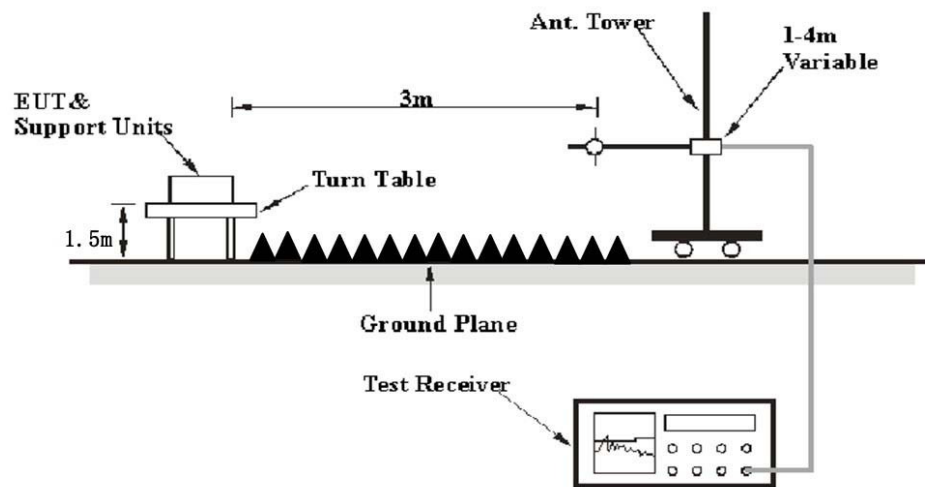
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expanded combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Shenzhen) is 5.91 dB for 30MHz-1GHz and 4.92 dB for above 1GHz, 1.95dB for conducted measurement at antenna port. And the uncertainty will not be taken into consideration for the test data recorded in the report

EUT Setup

Below 1 GHz:



Above 1GHz:

The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

The socket was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447E	1937A01046	2015-05-06	2016-05-06
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2014-11-03	2015-11-03
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-07	2017-12-06
Mini	Amplifier	ZVA-183-S+	5969001149	2015-04-23	2016-04-23
A.H. System	Horn Antenna	SAS-200/571	135	2015-02-10	2016-02-10
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2014-12-11	2015-12-11
the electro-Mechanics Co.	Horn Antenna	3116	9510-2270	2013-10-14	2016-10-13
TDK	Chamber	Chamber A	2#	2012-10-15	2015-10-15
TDK	Chamber	Chamber B	1#	2015-07-22	2016-07-22
DUCOMMUN	Pre-amplifier	ALN-22093530-01	991373-01	2014-08-03	2015-08-03
R&S	Auto test Software	EMC32	V9.10	NCR	NCR

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

8.63 dB at 2483.50 MHz in the Vertical polarization for High Channel

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Liewei Liu on 2015-07-24.

EUT operation mode: Transmitting

30 MHz-25 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2402 MHz)									
120.52	32.22	QP	56	2.5	H	-13.0	19.22	43.5	24.28
2402.00	85.39	PK	94	1.3	H	4.97	90.36	/	/
2402.00	75.21	Ave.	94	1.3	H	4.97	80.18	/	/
2402.00	90.70	PK	150	1.6	V	4.97	95.67	/	/
2402.00	80.27	Ave.	150	1.6	V	4.97	85.24	/	/
2383.58	39.61	PK	341	1.4	V	4.97	44.58	74	29.42
2383.58	21.43	Ave.	341	1.4	V	4.97	26.40	54	27.60
2389.78	41.18	PK	210	2.2	V	4.97	46.15	74	27.85
2389.78	20.52	Ave.	210	2.2	V	4.97	25.49	54	28.51
2497.96	34.01	PK	284	2.1	V	6.29	40.30	74	33.70
2497.96	18.96	Ave.	284	2.1	V	6.29	25.25	54	28.75
4804.00	36.49	PK	224	2.1	V	16.92	53.41	74	20.59
4804.00	22.26	Ave.	224	2.1	V	16.92	39.18	54	14.82
7206.00	35.69	PK	346	2.0	V	19.08	54.77	74	19.23
7206.00	19.56	Ave.	346	2.0	V	19.08	38.64	54	15.36
9608.00	34.97	PK	2	1.2	V	22.72	57.69	74	16.31
9608.00	20.18	Ave.	2	1.2	V	22.72	42.90	54	11.10
Middle Channel (2440 MHz)									
120.52	33.50	QP	56	2.5	H	-13.0	20.50	43.5	23.00
2440.00	81.94	PK	360	2.1	H	4.97	86.91	/	/
2440.00	71.85	Ave.	360	2.1	H	4.97	76.82	/	/
2440.00	90.89	PK	259	1.5	V	4.97	95.86	/	/
2440.00	80.68	Ave.	259	1.5	V	4.97	85.65	/	/
2389.52	37.51	PK	273	1.2	V	4.97	42.48	74	31.52
2389.52	19.36	Ave.	273	1.2	V	4.97	24.33	54	29.67
2484.87	36.43	PK	253	2.3	V	6.29	42.72	74	31.28
2484.87	20.52	Ave.	253	2.3	V	6.29	26.81	54	27.19
2487.05	37.92	PK	33	1.1	V	6.29	44.21	74	29.79
2487.05	20.37	Ave.	33	1.1	V	6.29	26.66	54	27.34
4880.00	36.03	PK	287	2.4	V	16.91	52.94	74	21.06
4880.00	19.53	Ave.	287	2.4	V	16.91	36.44	54	17.56
7320.00	36.78	PK	193	1.1	V	19.40	56.18	74	17.82
7320.00	21.43	Ave.	193	1.1	V	19.40	40.83	54	13.17
9760.00	35.29	PK	106	1.1	H	23.79	59.08	74	14.92
9760.00	20.36	Ave.	106	1.1	H	23.79	44.15	54	9.85

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
High Channel (2480 MHz)									
120.52	32.49	QP	56	2.5	H	-13.0	19.49	43.5	24.01
2480.00	85.69	PK	257	2.2	H	6.29	91.98	/	/
2480.00	76.04	Ave.	257	2.2	H	6.29	82.33	/	/
2480.00	90.62	PK	323	2.1	V	6.29	96.91	/	/
2480.00	80.66	Ave.	323	2.1	V	6.29	86.95	/	/
2389.36	38.37	PK	77	1.8	V	4.97	43.34	74	30.66
2389.36	19.53	Ave.	77	1.8	V	4.97	24.50	54	29.50
2483.50	59.08	PK	142	1.5	V	6.29	65.37	74	8.63
2483.50	31.54	Ave.	142	1.5	V	6.29	37.83	54	16.17
2484.26	56.71	PK	239	1.8	V	6.29	63.00	74	11.00
2484.26	29.04	Ave.	239	1.8	V	6.29	35.33	54	18.67
4960.00	37.77	PK	162	2.5	V	17.91	55.68	74	18.32
4960.00	18.36	Ave.	162	2.5	V	17.91	36.27	54	17.73
7440.00	36.88	PK	317	2.5	V	18.34	55.22	74	18.78
7440.00	23.02	Ave.	317	2.5	V	18.34	41.36	54	12.64
9920.00	34.06	PK	172	1.7	V	23.79	57.85	74	16.15
9920.00	20.62	Ave.	172	1.7	V	23.79	44.41	54	9.59

Note:

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

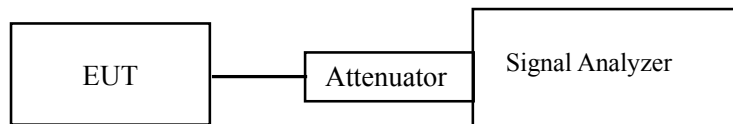
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2014-12-11	2015-12-11

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Liewei Liu on 2015-08-02.

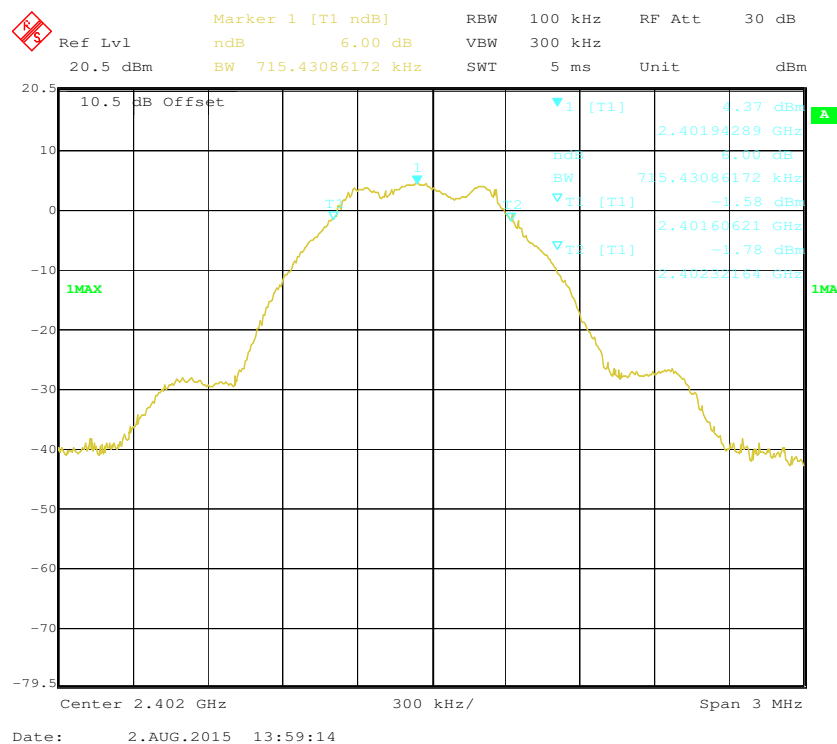
Test Result: Pass.

Please refer to the following tables and plots.

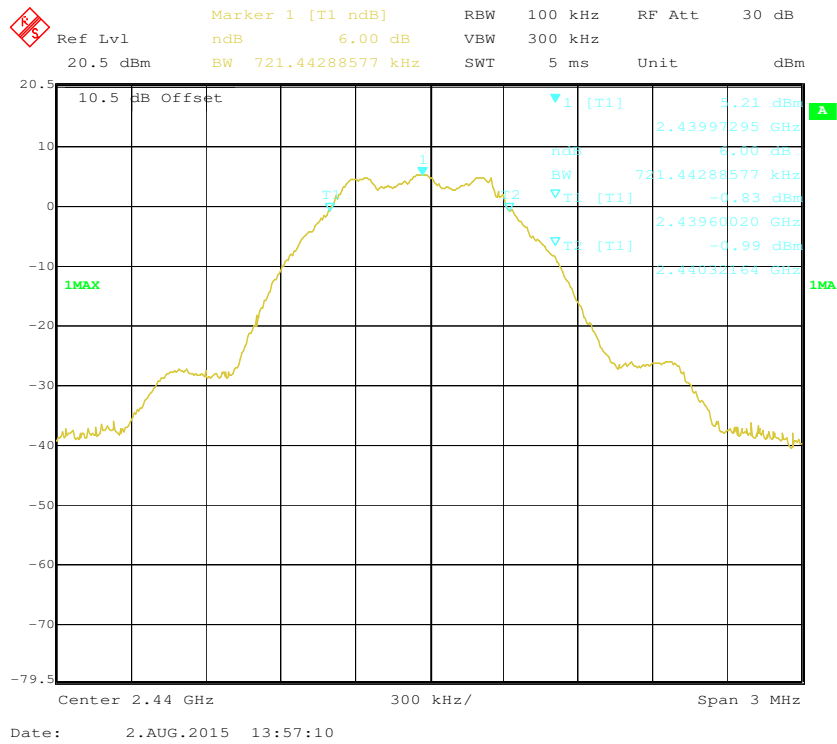
EUT operation mode: transmitting

Mode	Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)
BLE 4.0	Low	2402	0.715	500
	Middle	2440	0.721	500
	High	2480	0.739	500

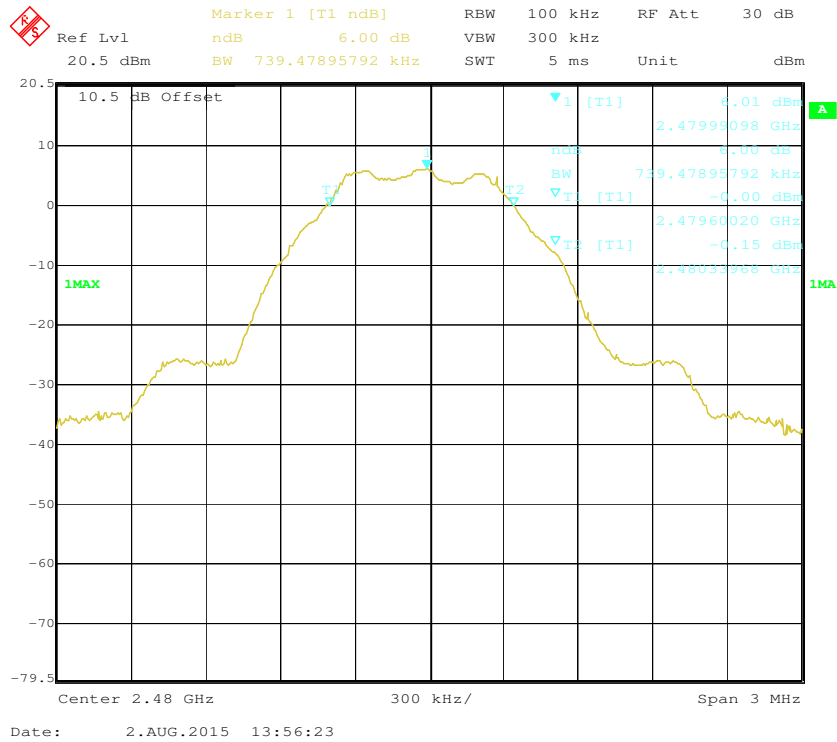
6 dB Emission Bandwidth, Low Channel



6 dB Emission Bandwidth, Middle Channel



6 dB Emission Bandwidth, High Channel



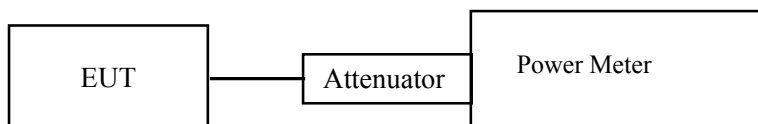
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Power Meter	N1912A	MY5000448	2014-11-03	2015-11-03
HP	Power Sensor	N1921A	MY54210016	2014-11-03	2015-11-03

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data**Environmental Conditions**

Temperature:	26 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Liewei Liu on 2015-08-02.

EUT operation mode: Transmitting

BLE mode

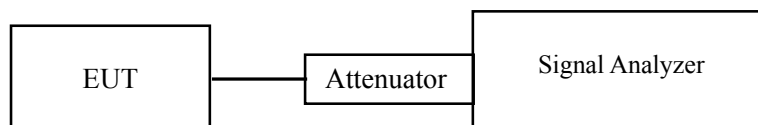
Mode	Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Result
BLE 4.0	Low	2402	4.71	30	Pass
	Middle	2440	5.46	30	Pass
	High	2480	6.38	30	Pass

FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE**Applicable Standard**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2014-12-11	2015-12-11

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data**Environmental Conditions**

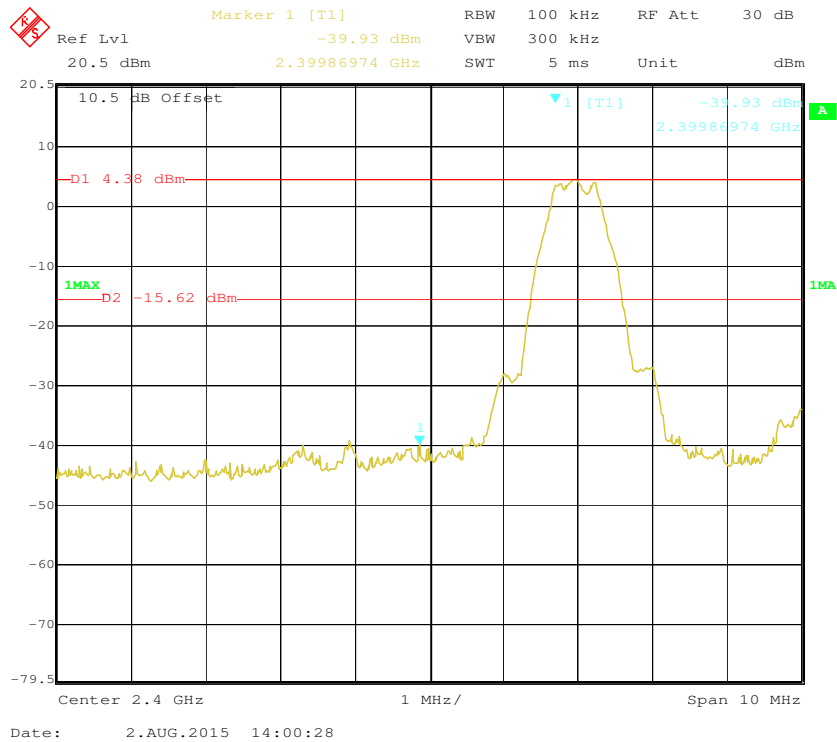
Temperature:	26 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Liewei Liu on 2015-08-02.

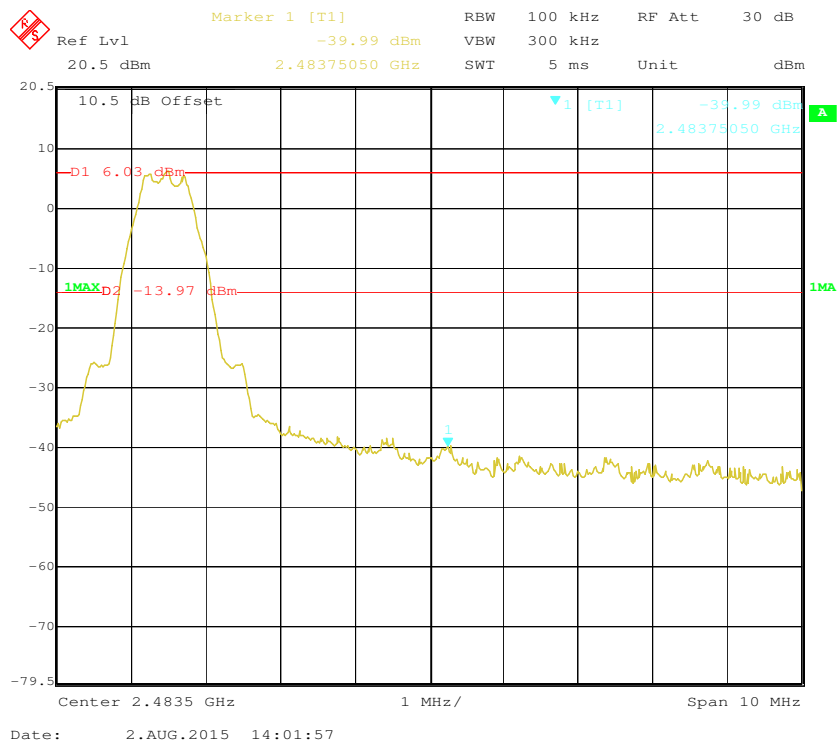
Test Result: *Compliance*

Please refer to the following tables and plots.

BLE: Band Edge, Left Side



BLE: Band Edge, Right Side



FCC §15.247(e) - POWER SPECTRAL DENSITY

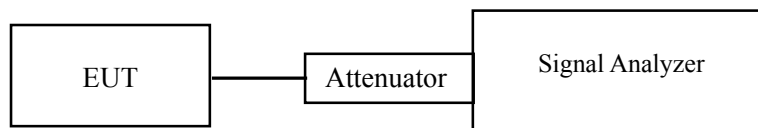
Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

According to KDB558074 D01 DTS Meas Guidance v03r03

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to: $3\text{kHz} \leq \text{RBW} \leq 100\text{ kHz}$.
3. Set the VBW $\geq 3 \times \text{RBW}$.
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2014-12-11	2015-12-11

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data**Environmental Conditions**

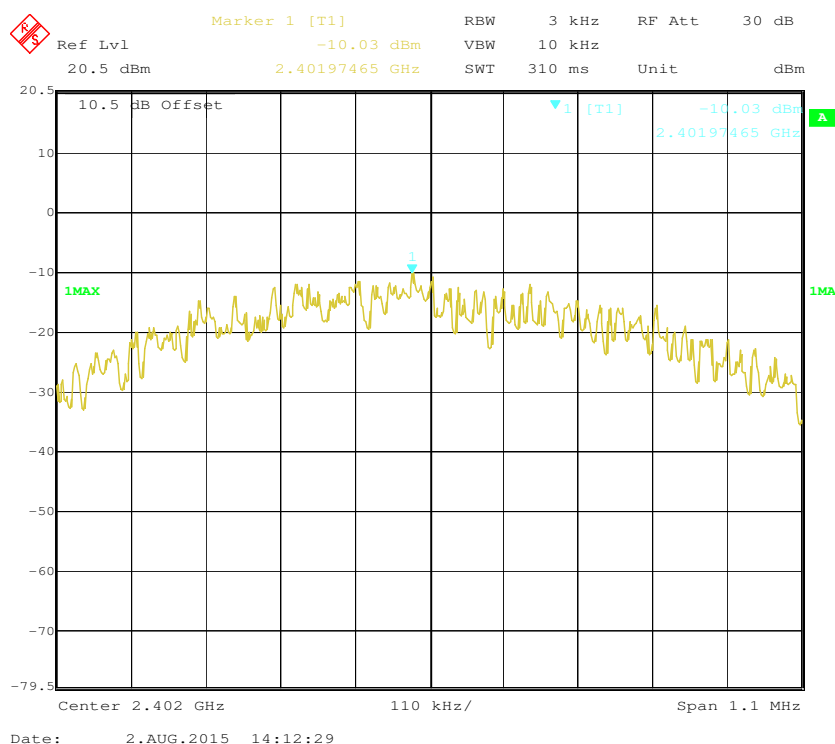
Temperature:	26 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Liewei Liu on 2015-08-02

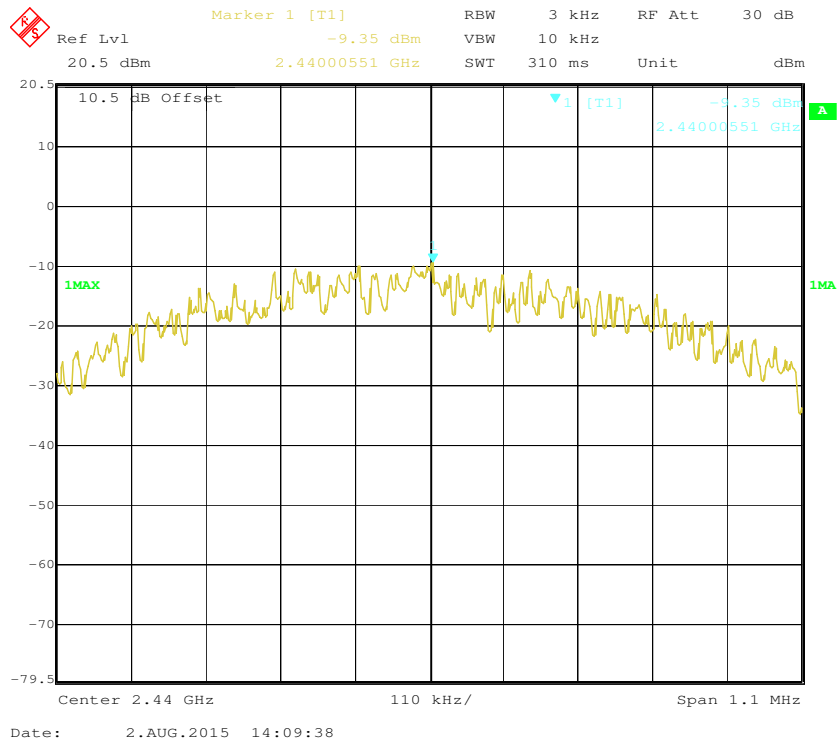
EUT operation mode: Transmitting

Test Result: Pass

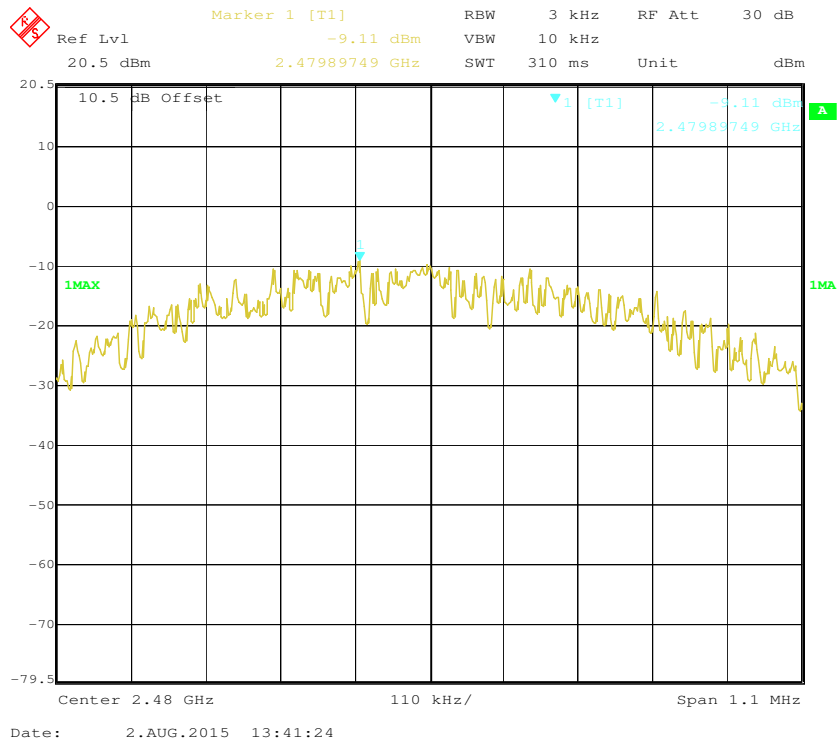
Mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
BLE	Low	2402	-10.03	≤8
	Middle	2440	-9.35	≤8
	High	2480	-9.11	≤8

Power Spectral Density, BLE Low Channel

Power Spectral Density, BLE Middle Channel



Power Spectral Density, BLE High Channel



PRODUCT SIMILARITY DECLARATION LETTER



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Fax: (562) 908-6360
E-mail: feitelectric@feit.com
www.feit.com

August 11, 2015

Feit Electric Company hereby declares that the listed model LEDR56/830/HBR/CAN and the tested model LEDR56/830/HBR are electrically identical with the same electromagnetic emissions, PCB layout and circuit.

The differences between the tested model and listed model, is the model number.

Let me know if you have any questions or require any additional information.

Best Regards,
Feit Electric Company

Aaron Feit

***** END OF REPORT *****