

FCC PART 15.247 TEST REPORT

For

Klipsch L.L.C.

3502 Woodview Trace, Suite 200, Indianapolis, IN 46268, United States

FCC ID: STI-R5BT

Report Type: Original Report	Product Name: Bluetooth Headset
Report Number: RDG170825005-00B	
Report Date: 2017-09-05	
Jerry Zhang	
Reviewed By:	EMC Manager <i>Jerry Zhang</i>
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).

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
MEASUREMENT UNCERTAINTY	5
TEST FACILITY	5
SYSTEM TEST CONFIGURATION.....	6
DESCRIPTION OF TEST CONFIGURATION	6
EUT EXERCISE SOFTWARE	6
EQUIPMENT MODIFICATIONS	7
LOCAL SUPPORT EQUIPMENT LIST AND DETAILS	7
SUPPORT CABLE LIST AND DETAILS	7
BLOCK DIAGRAM OF TEST SETUP	8
SUMMARY OF TEST RESULTS	9
FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE	10
APPLICABLE STANDARD	10
FCC §15.203 - ANTENNA REQUIREMENT.....	11
APPLICABLE STANDARD	11
ANTENNA CONNECTOR CONSTRUCTION	11
FCC §15.207 (a)– AC LINE CONDUCTED EMISSIONS	12
APPLICABLE STANDARD	12
EUT SETUP	12
EMI TEST RECEIVER SETUP.....	12
TEST PROCEDURE	13
CORRECTED AMPLITUDE & MARGIN CALCULATION	13
TEST EQUIPMENT LIST AND DETAILS.....	13
TEST DATA	14
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS.....	16
APPLICABLE STANDARD	16
EUT SETUP	16
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	17
TEST PROCEDURE	17
CORRECTED AMPLITUDE & MARGIN CALCULATION	17
TEST EQUIPMENT LIST AND DETAILS.....	18
TEST DATA	18
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
FCC §15.247(b) (3) - MAXIMUM PEAK CONDUCTED OUTPUT POWER.....	25
APPLICABLE STANDARD	25
TEST PROCEDURE	25
TEST EQUIPMENT LIST AND DETAILS.....	25

TEST DATA	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	27
FCC §15.247(e) - POWER SPECTRAL DENSITY	29
APPLICABLE STANDARD	29
TEST PROCEDURE	29
TEST EQUIPMENT LIST AND DETAILS.....	29
TEST DATA	29

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **Klipsch L.L.C.**'s product, model number: **R5 NECKBAND WIRELESS (FCC ID: STI-R5BT)** (the "EUT") in this report was a **Bluetooth Headset**, which was measured approximately: 185 mm (L) x 155 mm (W) x 22 mm (H), *DC 3.7V from battery or DC 5V from USB port.*

**All measurement and test data in this report was gathered from production sample serial number: 170825005 (Assigned by BACL,Dongguan). The EUT was received on 2017-08-25.*

Objective

This report is prepared on behalf of **Klipsch L.L.C.** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules.

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

Related Submittal(s)/Grant(s)

FCC Part 15C DSS submissions with FCC ID: STI-R5BT.

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 and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical 1G~6GHz: 4.45 dB, 6G~26.5GHz: 5.23 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1 °C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China

Bay Area Compliance Laboratories Corp. (Dongguan) has been accredited to ISO 17025 by CNAS(Lab code: L5662). And accredited to ISO 17025 by NVLAP(Test Laboratory Accreditation Certificate Number 500069-0), the FCC Designation No. CN5002 under the KDB 974614 D01.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Bay Area Compliance Laboratories Corp. (Dongguan) was registered with ISED Canada under ISED Canada Registration Number 3062D.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in Engineer Mode, which was provided by the manufacturer.

For Bluetooth LE mode, 40 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404
...
...
..	...	38	2478
19	2440	39	2480

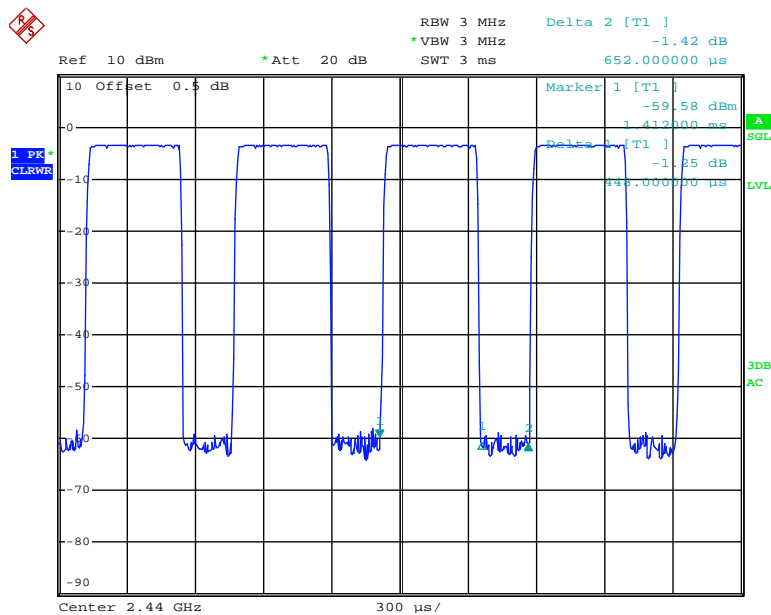
EUT was tested with channel 0, 19 and 39.

EUT Exercise Software

The system configured the maximum power level as default setting. The software 'Blue Test3' was used to change test modes and channels.

The maximum duty cycle as following table:

Test mode	T _{on} (ms)	T _{on+off} (ms)	Duty Cycle (%)
BLE	0.448	0.652	68.7%

BLE

Date: 31.AUG.2017 11:10:03

Equipment Modifications

No modification was made to the EUT.

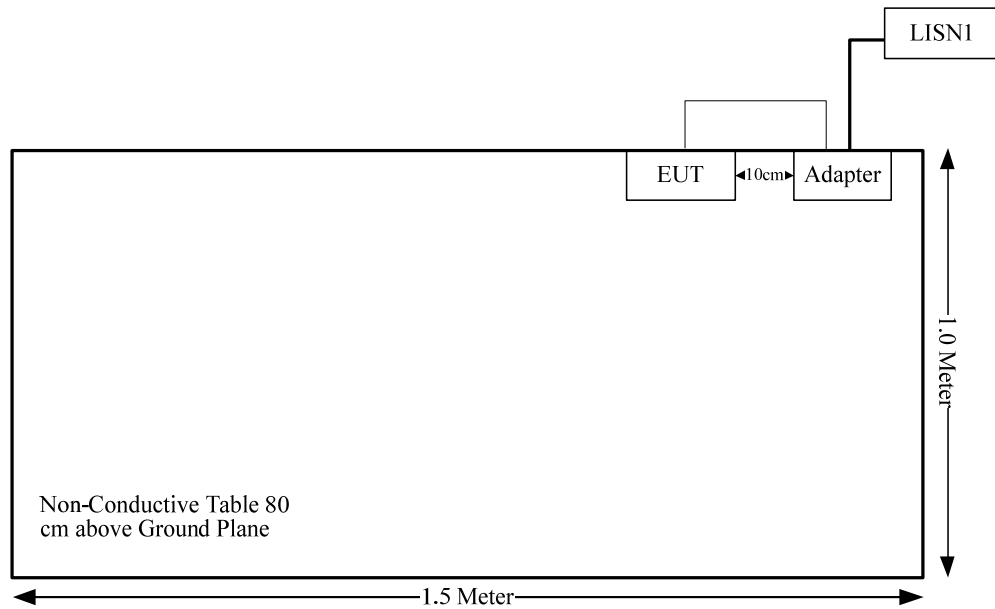
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
HuaJin Electronics CO.LTD	Adapter	HJ-0501000B3-EU	03051216d003510

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From	To
USB Cable	No	No	0.5	Adapter	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB 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) & §1.1310 & §2.1093- RF EXPOSURE

Applicable Standard

According to §15.247(i) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB447498 D01 General RF Exposure Guidance v06:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

Measurement Result

The max tune-up conducted power is -3.0 dBm (0.5 mW).

$[(\text{max. power of channel, mW})/(\text{min. test separation distance, mm})][\sqrt{f(\text{GHz})}]$
 $= 0.5/5 \cdot (\sqrt{2.48}) = 0.2 < 3.0$

So the stand-alone SAR evaluation for Bluetooth LE mode is not necessary.

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

Antenna Connector Construction

The EUT has one internal antenna arrangement for BT, and the antenna gain is 2 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

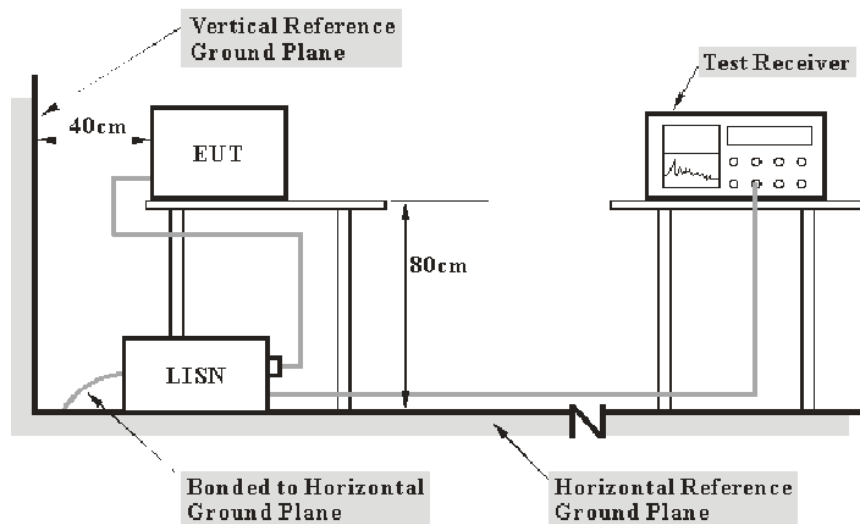
Result: Compliance.

FCC §15.207 (a)– AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a)

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.

The spacing between the peripherals was 10 cm.

The adapter was connected to the main LISN with a 120 V/60 Hz AC 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 first LISN.

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

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

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

$$C_f = A_C + VDF$$

Herein,

V_C (cord. Reading): corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF: voltage division factor of AMN

C_f : Correction Factor

The “**Margin**” column of the following data tables indicates the degree of compliance within 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2016-12-08	2017-12-08
R&S	L.I.S.N	ESH2-Z5	892107/021	2017-09-01	2018-09-01
R&S	Two-line V-network	ENV 216	3560.6550.12	2016-12-08	2017-12-08
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
Unknown	Coaxial Cable	2m	Con-1	2016-09-01	2017-09-01

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

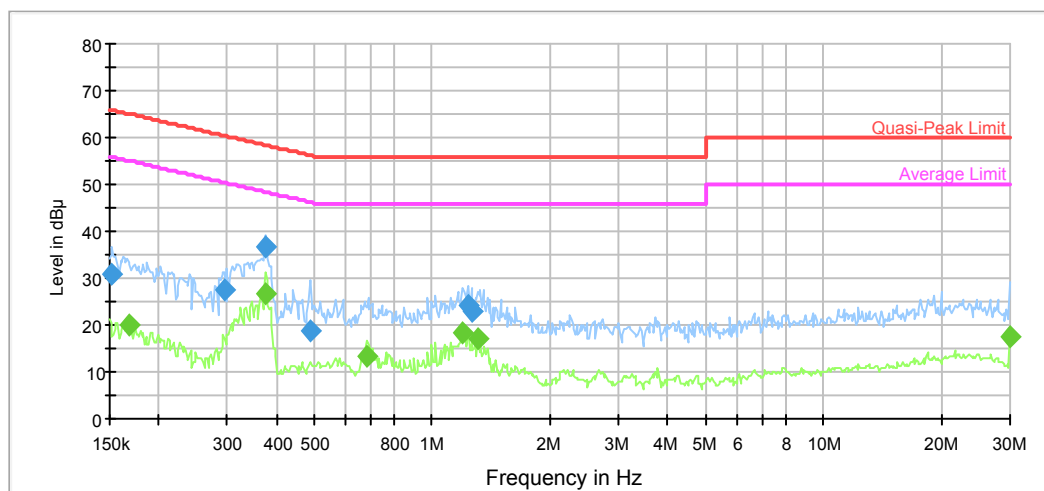
Test Data**Environmental Conditions**

Temperature:	27.1 °C
Relative Humidity:	43 %
ATM Pressure:	100.2 kPa

The testing was performed by Gaochao Gong on 2017-09-05.

Test Mode: Transmitting

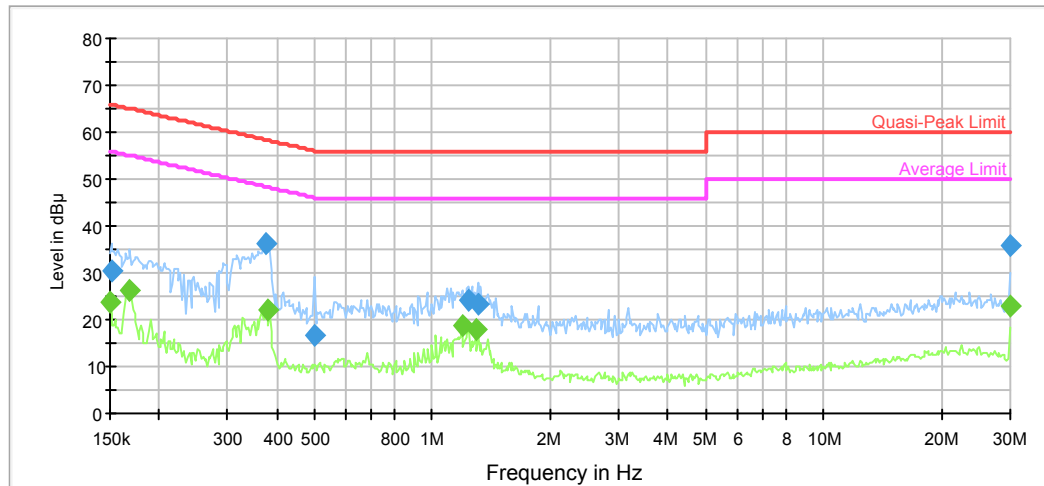
AC120V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.152410	30.7	9.000	L1	11.1	35.2	65.9	Compliance
0.295282	27.6	9.000	L1	10.2	32.8	60.4	Compliance
0.375019	36.7	9.000	L1	10.0	21.7	58.4	Compliance
0.487810	18.6	9.000	L1	9.9	37.6	56.2	Compliance
1.239175	24.1	9.000	L1	9.7	31.9	56.0	Compliance
1.259081	22.8	9.000	L1	9.7	33.2	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.169044	19.9	9.000	L1	10.9	35.1	55.0	Compliance
0.375019	26.6	9.000	L1	10.0	21.8	48.4	Compliance
0.681699	13.5	9.000	L1	9.8	32.5	46.0	Compliance
1.190776	18.4	9.000	L1	9.7	27.6	46.0	Compliance
1.310256	17.0	9.000	L1	9.7	29.0	46.0	Compliance
30.000000	17.5	9.000	L1	10.1	32.5	50.0	Compliance

AC120V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.151200	30.3	9.000	N	11.1	35.6	65.9	Compliance
0.375019	36.3	9.000	N	10.0	22.1	58.4	Compliance
0.499611	16.7	9.000	N	9.9	39.3	56.0	Compliance
1.239175	24.3	9.000	N	9.7	31.7	56.0	Compliance
1.310256	23.4	9.000	N	9.7	32.6	56.0	Compliance
30.000000	35.8	9.000	N	10.1	24.2	60.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.150000	23.6	9.000	N	11.2	32.4	56.0	Compliance
0.167702	26.3	9.000	N	10.9	28.8	55.1	Compliance
0.378019	22.1	9.000	N	10.0	26.2	48.3	Compliance
1.190776	18.8	9.000	N	9.7	27.2	46.0	Compliance
1.289541	17.9	9.000	N	9.7	28.1	46.0	Compliance
30.000000	23.0	120.000	N	10.1	27.0	50.0	Compliance

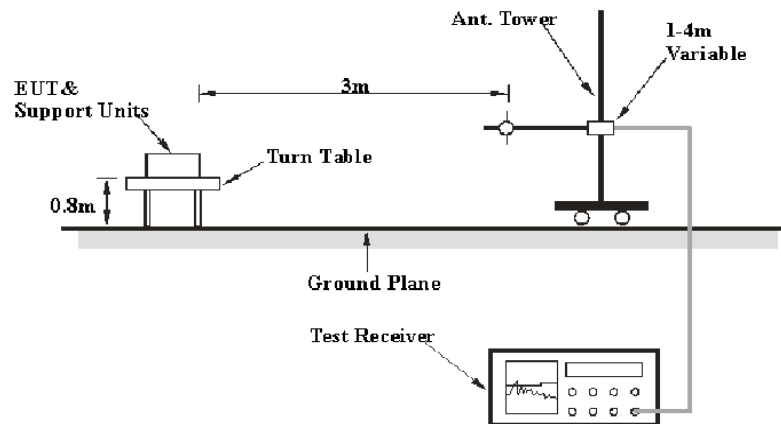
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

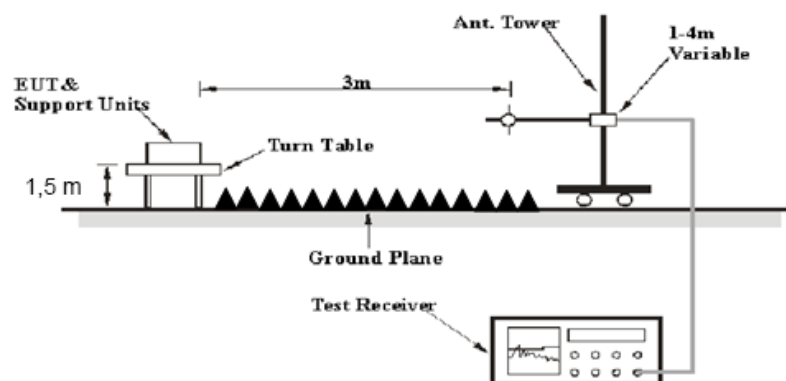
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1GHz:



Above 1GHz:



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

The spacing between the peripherals was 10 cm.

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:

30MHz-1000MHz:

Measurement	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 25GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
Ave.	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

Note: T is minimum transmission duration

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.

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2017-09-01	2018-09-01
Sunol Sciences	Antenna	JB3	A060611-1	2014-11-06	2017-11-05
HP	Amplifier	8447E	2434A02181	2016-09-01	2017-09-01
R&S	EMI Test Receiver	ESCI	101121	2017-03-02	2018-03-02
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-02 1304	2017-06-16	2020-06-15
MITEQ	Amplifier	AFS42-00101800- 25-S-42	2001271	2016-09-05	2017-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2016-09-06	2017-09-06
Unknown	Coaxial Cable	Chamber A-1	4m	2016-09-01	2017-09-01
Unknown	Coaxial Cable	Chamber B-1	0.75m	2016-09-01	2017-09-01
Unknown	Coaxial Cable	Chamber A-2	10m	2016-09-01	2017-09-01
Unknown	Coaxial Cable	Chamber B-2	8m	2016-09-01	2017-09-01
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A

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

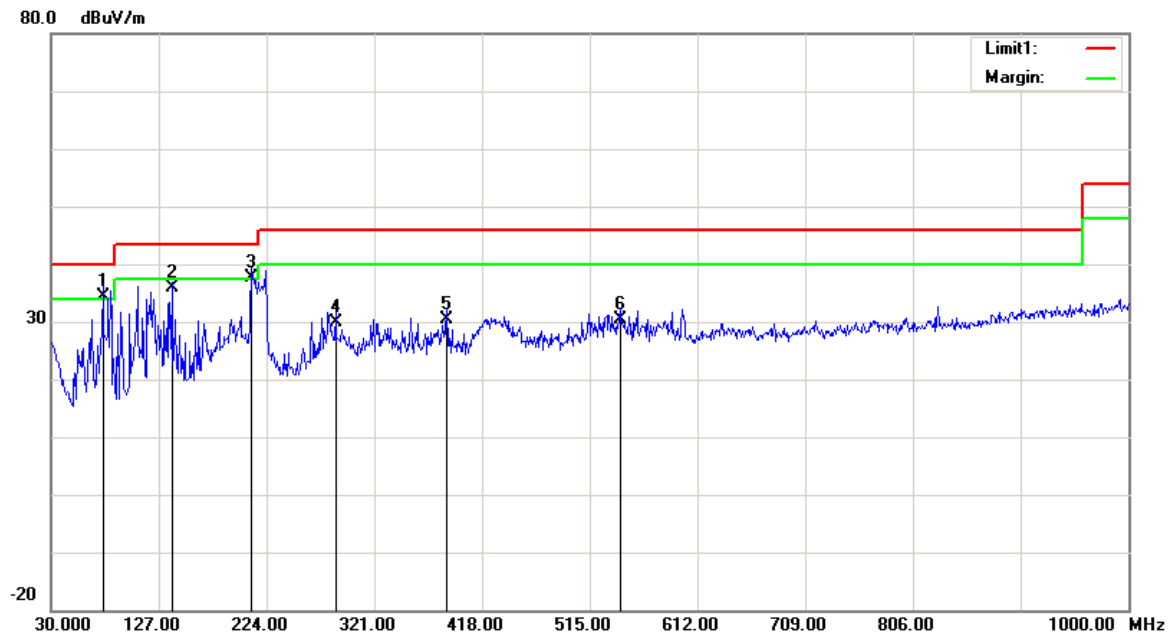
Test Data**Environmental Conditions**

Temperature:	28.4 °C
Relative Humidity:	30 %
ATM Pressure:	100 kPa

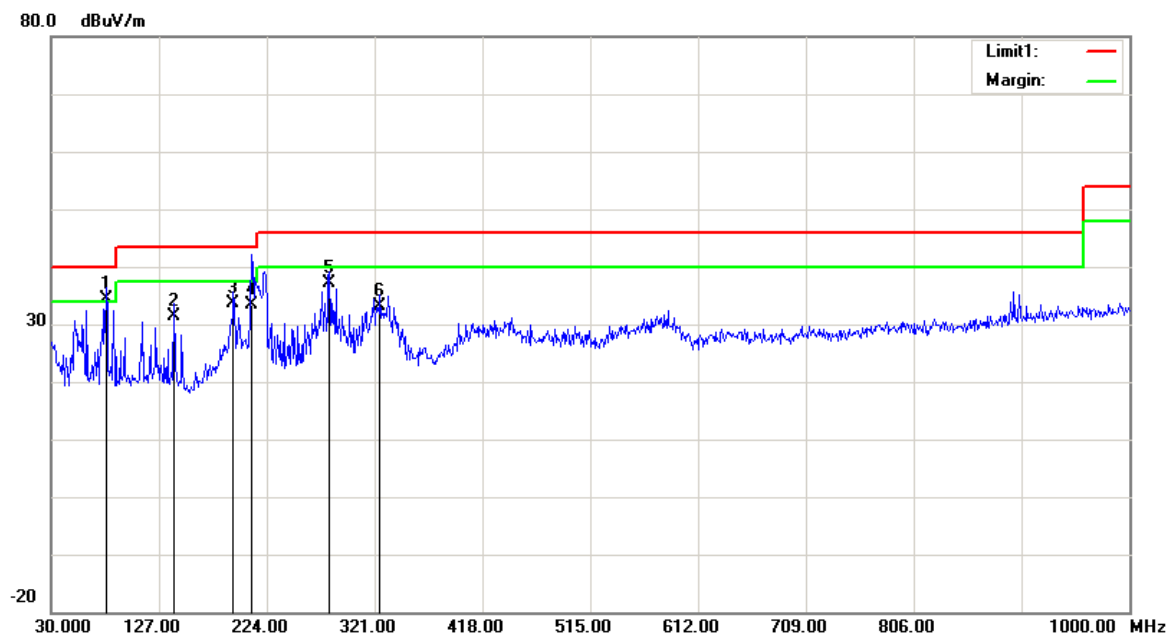
* The testing was performed by Blake Yang on 2017-09-01.

Test Result: Compliance, please Refer to the following data

Test Mode: Transmitting

1) 30MHz-1GHz(Middle channel was the worst)**Horizontal:**

Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
76.5600	45.72	QP	-11.22	34.50	40.00	5.50
138.6400	42.03	QP	-6.13	35.90	43.50	7.60
210.4200	45.22	QP	-7.62	37.60	43.50	5.90
286.0800	33.82	QP	-4.02	29.80	46.00	16.20
385.9900	33.23	QP	-2.73	30.50	46.00	15.50
542.1600	30.67	QP	-0.37	30.30	46.00	15.70

Vertical:

Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
79.4700	45.72	QP	-11.22	34.50	40.00	5.50
140.5800	37.85	QP	-6.35	31.50	43.50	12.00
193.9300	40.96	QP	-7.26	33.70	43.50	9.80
210.4200	40.92	QP	-7.62	33.30	43.50	10.20
280.2600	40.88	QP	-3.78	37.10	46.00	8.90
325.8500	37.24	QP	-4.04	33.20	46.00	12.80

2) 1-25GHz:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB)					
Low Channel: 2402 MHz									
2402	62.51	PK	H	28.10	3.11	0.00	93.72	N/A	N/A
2402	56.81	AV	H	28.10	3.11	0.00	88.02	N/A	N/A
2402	56.69	PK	V	28.10	3.11	0.00	87.90	N/A	N/A
2402	49.95	AV	V	28.10	3.11	0.00	81.16	N/A	N/A
2390	25.25	PK	H	28.08	3.10	0.00	56.43	74.00	17.57
2390	13.54	AV	H	28.08	3.10	0.00	44.72	54.00	9.28
4804	53.93	PK	H	32.91	4.30	35.48	55.66	74.00	18.34
4804	47.08	AV	H	32.91	4.30	35.48	48.81	54.00	5.19
7206	45.39	PK	H	35.74	5.45	35.97	50.61	74.00	23.39
7206	32.26	AV	H	35.74	5.45	35.97	37.48	54.00	16.52
3196	52.31	PK	H	30.57	3.54	35.20	51.22	74.00	22.78
3196	42.47	AV	H	30.57	3.54	35.20	41.38	54.00	12.62
Middle Channel: 2440 MHz									
2440	63.91	PK	H	28.18	3.11	0.00	95.20	N/A	N/A
2440	59.15	AV	H	28.18	3.11	0.00	90.44	N/A	N/A
2440	58.34	PK	V	28.18	3.11	0.00	89.63	N/A	N/A
2440	52.77	AV	V	28.18	3.11	0.00	84.06	N/A	N/A
4880	54.61	PK	H	33.06	4.40	35.54	56.53	74.00	17.47
4880	46.33	AV	H	33.06	4.40	35.54	48.25	54.00	5.75
7320	45.38	PK	H	36.03	5.52	35.98	50.95	74.00	23.05
7320	33.24	AV	H	36.03	5.52	35.98	38.81	54.00	15.19
3178	52.72	PK	H	30.53	3.52	35.21	51.56	74.00	22.44
3178	41.28	AV	H	30.53	3.52	35.21	40.12	54.00	13.88
2847	45.31	PK	H	29.55	3.30	35.36	42.80	74.00	31.20
2847	32.62	AV	H	29.55	3.30	35.36	30.11	54.00	23.89
High Channel: 2480 MHz									
2480	63.52	PK	H	28.26	3.10	0.00	94.88	N/A	N/A
2480	56.48	AV	H	28.26	3.10	0.00	87.84	N/A	N/A
2480	58.38	PK	V	28.26	3.10	0.00	89.74	N/A	N/A
2480	52.14	AV	V	28.26	3.10	0.00	83.50	N/A	N/A
2483.5	25.47	PK	H	28.27	3.10	0.00	56.84	74.00	17.16
2483.5	13.39	AV	H	28.27	3.10	0.00	44.76	54.00	9.24
4960	54.92	PK	H	33.22	4.42	35.60	56.96	74.00	17.04
4960	46.98	AV	H	33.22	4.42	35.60	49.02	54.00	4.98
7440	45.67	PK	H	36.34	5.60	35.99	51.62	74.00	22.38
7440	34.26	AV	H	36.34	5.60	35.99	40.21	54.00	13.79
3196	50.26	PK	H	30.57	3.54	35.20	49.17	74.00	24.83
3196	40.23	AV	H	30.57	3.54	35.20	39.14	54.00	14.86

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

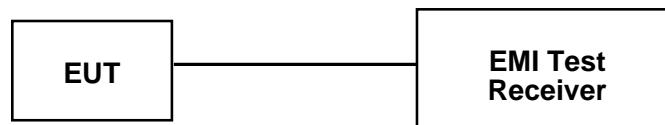
Applicable Standard

According to FCC §15.247(a) (2)

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

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	101121	2017-03-02	2018-03-02
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

Test Data

Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	53 %
ATM Pressure:	100.2 kPa

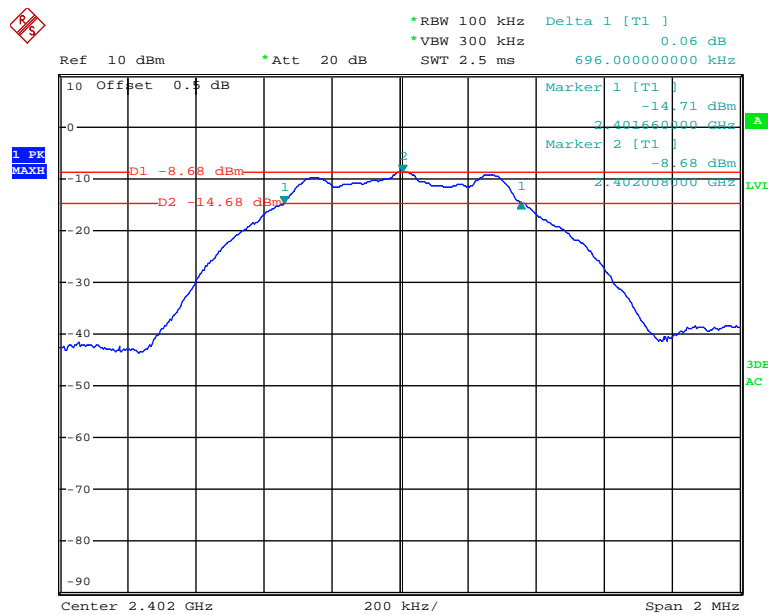
* The testing was performed by Nami Quan on 2017-08-31.

Test Mode: Transmitting

Test Result: Compliant. Please refer to the following table and plots.

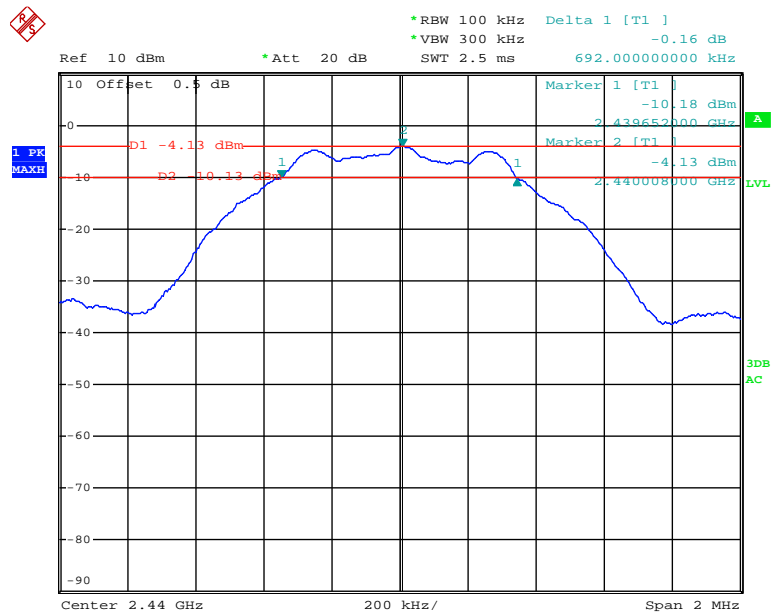
Test mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
BLE	Low	2402	0.7	≥ 0.5
	Middle	2440	0.69	≥ 0.5
	High	2480	0.69	≥ 0.5

BLE Low Channel



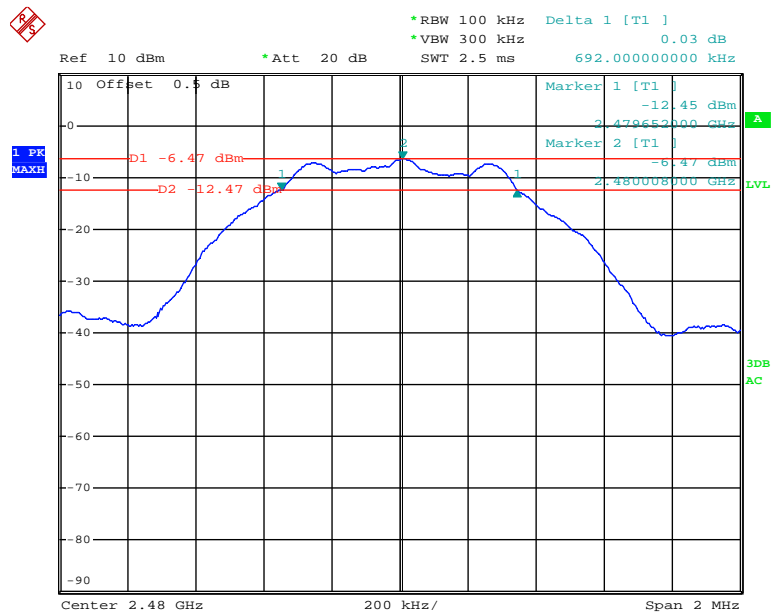
Date: 31.AUG.2017 10:25:59

BLE Middle Channel



Date: 31.AUG.2017 10:27:40

BLE High Channel



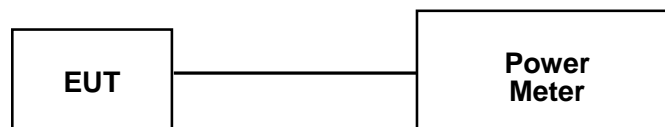
Date: 31.AUG.2017 10:30:35

FCC §15.247(b) (3) - MAXIMUM PEAK 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 test equipment.
3. Add a correction factor to the display.
4. Set the power Meter to test Peak output power, record the result as peak power.
5. Set the power meter to test average output power, record the result as average power.

**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Wideband Power Sensor	N1921A	MY54210016	2016-11-03	2017-11-03
Agilent	Wideband Power Sensor	N1921A	MY54170013	2016-11-03	2017-11-03
Agilent	P-Series Power Meter	N1912A	MY5000448	2016-11-03	2017-11-03
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

Test Data**Environmental Conditions**

Temperature:	27.6 °C
Relative Humidity:	53 %
ATM Pressure:	100.2 kPa

** The testing was performed by Nami Quan on 2017-08-31.*

Test Mode: Transmitting

Test Result: Compliant. Please refer to the following table.

Test mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Limit (dBm)
BLE	Low	2402	-4.16	30
	Middle	2440	-3.55	30
	High	2480	-3.93	30

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

Applicable Standard

According to FCC§15.247(d):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
R&S	EMI Test Receive	ESCI	101121	2017-03-02	2018-03-02
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

Test Data

Environmental Conditions

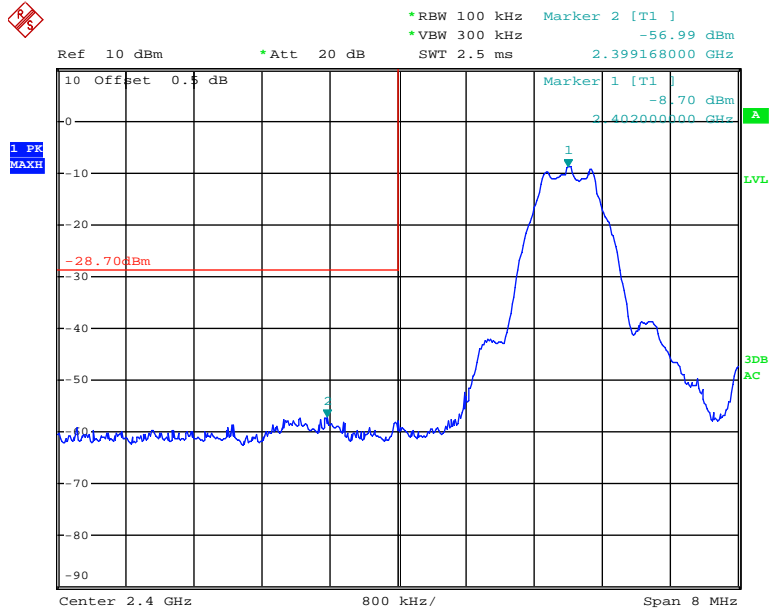
Temperature:	27.6 °C
Relative Humidity:	53 %
ATM Pressure:	100.2 kPa

* The testing was performed by Nami Quan on 2017-08-31.

Test mode: Transmitting

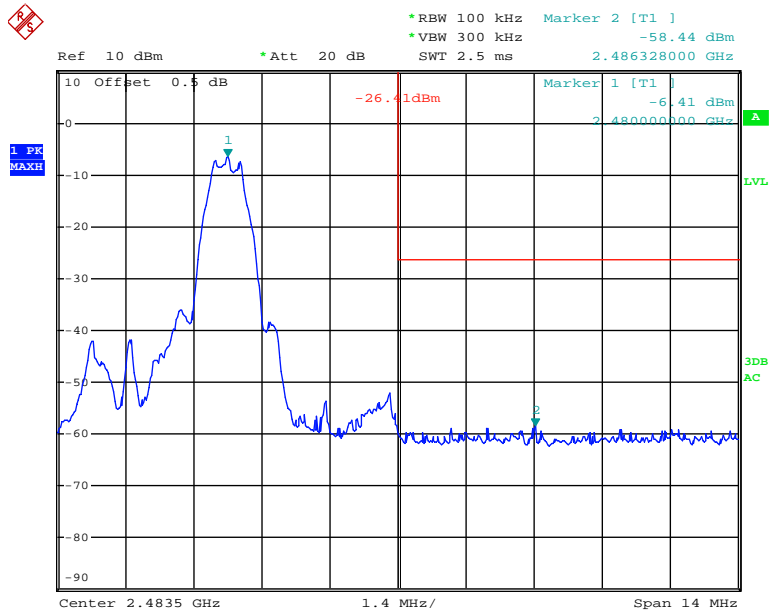
Test Result: Compliant. Please refer to following plots.

BLE Band Edge , Left Side



Date: 31.AUG.2017 10:26:42

BLE Band Edge, Right Side



Date: 31.AUG.2017 10:31:17

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

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 was set 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 the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS bandwidth.
4. Use the peak marker function to determine the maximum amplitude level.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	101121	2017-03-02	2018-03-02
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

Test Data

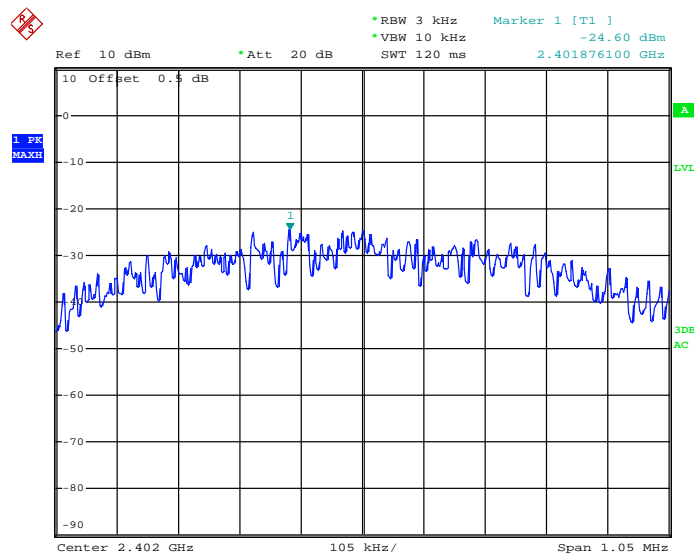
Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	53 %
ATM Pressure:	100.2 kPa

* The testing was performed by Nami Quan on 2017-08-31.

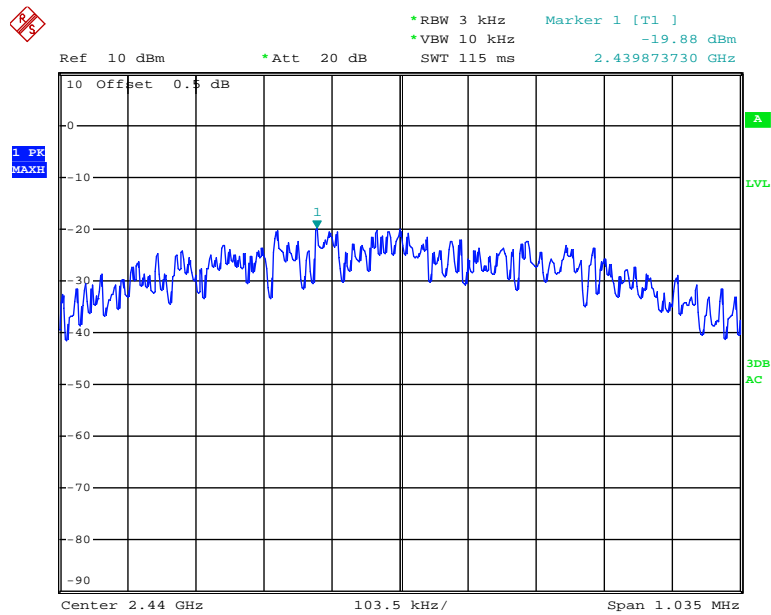
Test Result: Compliance*Test Mode: Transmitting**Test Result: Compliant. Please refer to the following table and plots*

Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
BLE	Low	2402	-24.6	≤8
	Middle	2440	-19.88	≤8
	High	2480	-22.2	≤8

Power Spectral Density, BLE Low Channel

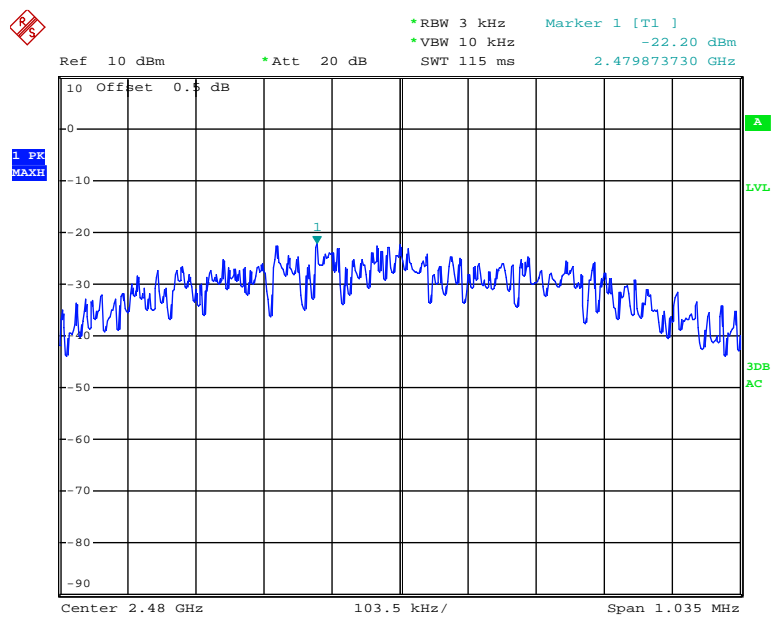
Date: 31.AUG.2017 10:26:27

Power Spectral Density, BLE Middle Channel



Date: 31.AUG.2017 10:28:07

Power Spectral Density, BLE High Channel



Date: 31.AUG.2017 10:31:02

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