

## FCC PART 15.247

## TEST REPORT

For

### **IDT Technology Limited**

9/F, Kaiser Estate, 41 Man Yue Street, Hung Hom, Kowloon, HongKong

**FCC ID: NMTRM660**

<b>Report Type:</b> Original Report	<b>Product Name:</b> SENSES Aroma Clock With Brain Music
<b>Report Number:</b>	RDG171010001-00B
<b>Report Date:</b>	2017-10-31
<b>Reviewed By:</b>	Jerry Zhang EMC Manager <i>Jerry Zhang</i>
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**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).

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## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The *IDT Technology Limited*'s product, model number: *RM660 (FCC ID: NMTRM660)* (the "EUT") in this report was a *SENSES Aroma Clock With Brain Music*, which was measured approximately: 10.95 cm (L) x 10.95 cm (W) x 8.88 cm (H), rated power: DC5.0V from adapter.

*Adapter information:*

*Model: YLS0241A-T050200*

*Input: AC 100-240V~50/60Hz 0.8A Max*

*Output: DC5.0V, 2.0A*

*All measurement and test data in this report was gathered from production sample serial number: 171010001 (Assigned by BACL). The EUT was received on 2017-10-10.*

### Objective

This report is prepared on behalf of *IDT Technology Limited* 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)

N/A.

### 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

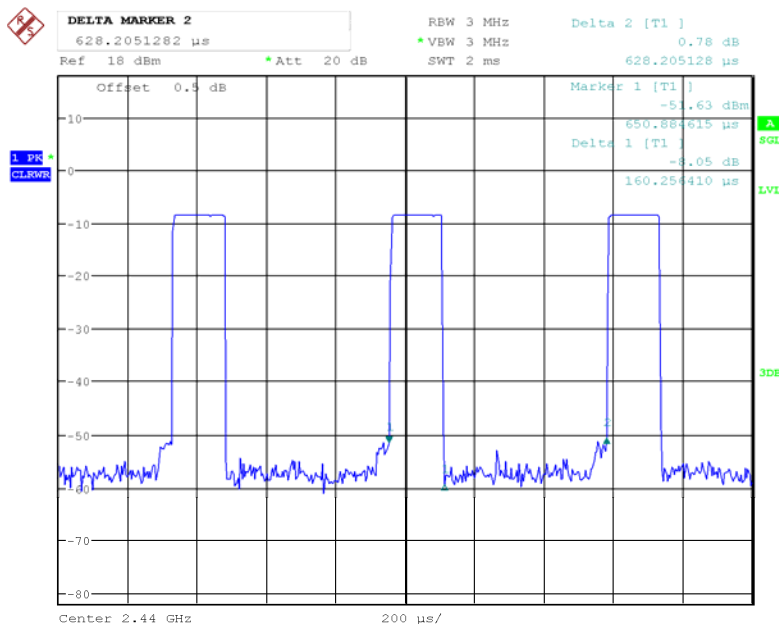
EUT was tested with channel 0, 19 and 39.

### EUT Exercise Software

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

The maximum duty cycle as following table:

T <sub>on</sub> (ms)	T <sub>on+off</sub> (ms)	Duty Cycle (%)
0.160	0.628	25.47



Date: 24.OCT.2017 14:16:45

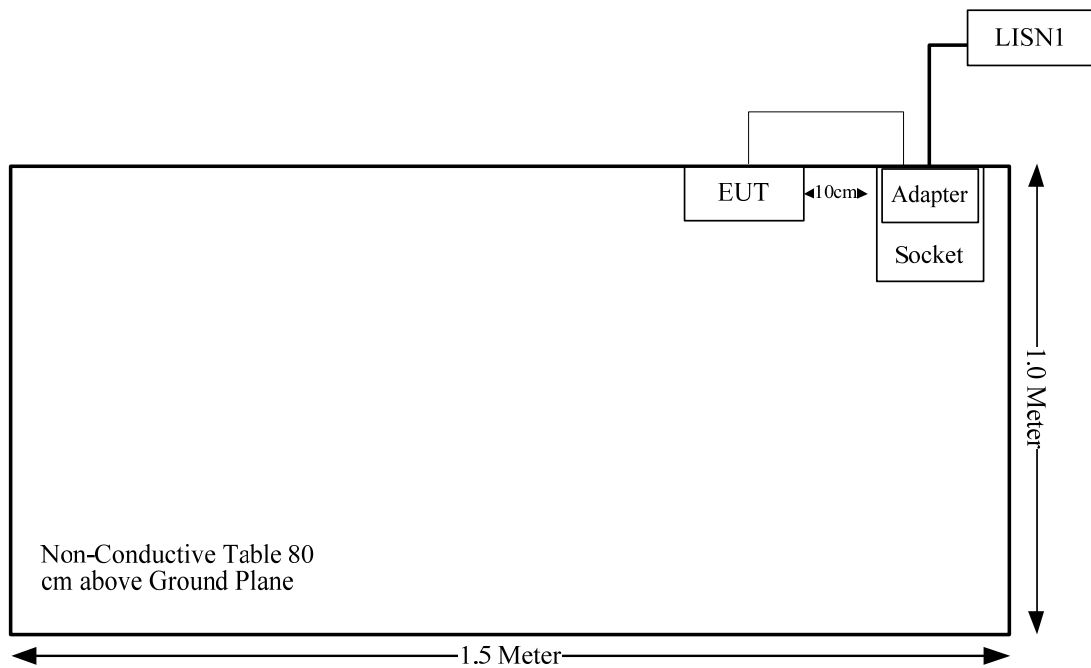
**Equipment Modifications**

No modification was made to the EUT.

**Support Cable List and Details**

Cable Description	Shielding Type	Ferrite Core	Length (m)	From	To
Adapter Cable	No	No	1.5	Adapter	EUT

**Block Diagram of Test Setup**



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	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 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

**Applicable Standard**

According to subpart 15.247(i) and subpart §1.1310, 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>(B) Limits for General Population/Uncontrolled Exposure</b>				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f <sup>2</sup> )	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 equivalent power density;

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

**Calculation formula:**

Prediction of power density at the distance of the applicable MPE limit

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

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:**

Frequency (MHz)	Antenna Gain		Conducted output power including Tune-up Tolerance		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
	(dBi)	(numeric)	(dBm)	(mW)			
2402-2480	0	1.00	0	1.00	20.00	0.0002	1.0

**Result:** The device meet FCC MPE at 20 cm distance

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## **FCC §15.203 - ANTENNA REQUIREMENT**

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### **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 Bluetooth LE mode, and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

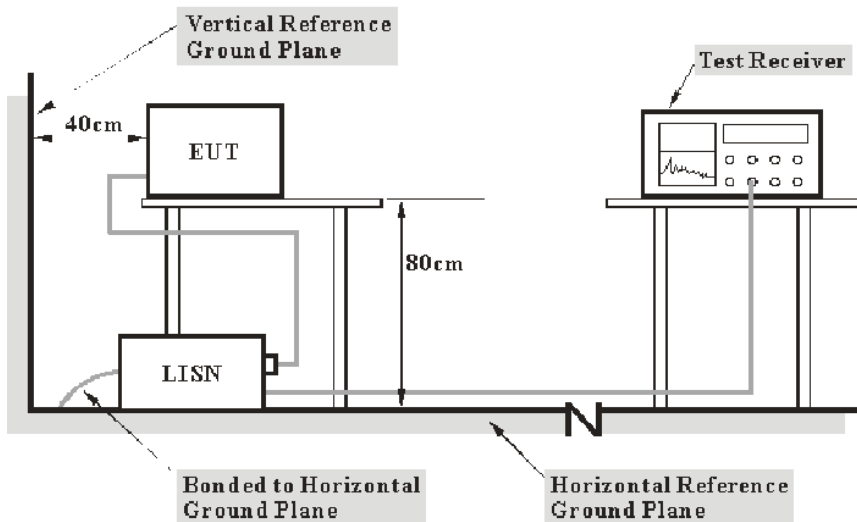
**Result:** Compliance.

**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	2017-09-25	2018-09-25
R&S	Two-line V-network	ENV 216	3560.6550.12	2017-09-25	2018-09-25
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
Unknown	Coaxial Cable	2m	Con-1	2017-09-25	2018-09-25

\* **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**

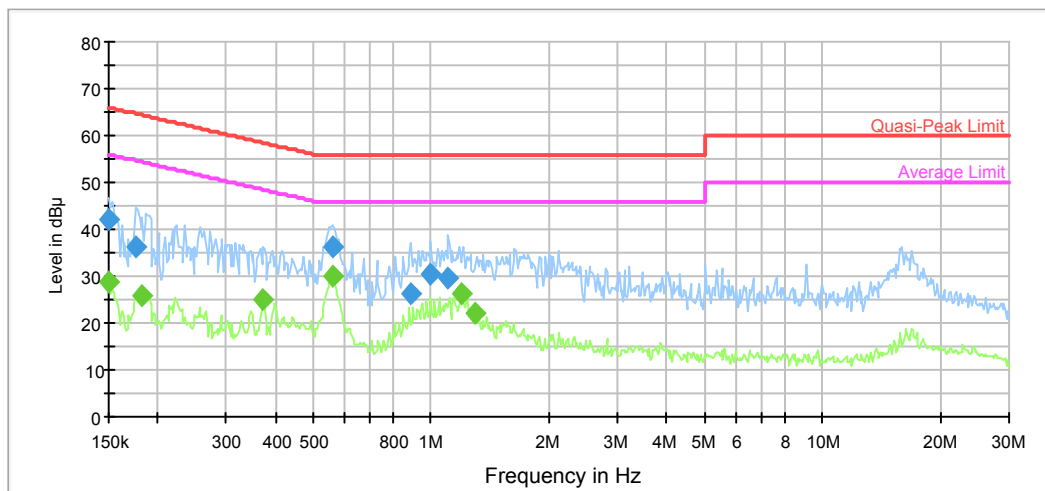
**Environmental Conditions**

<b>Temperature:</b>	27.1 °C
<b>Relative Humidity:</b>	43 %
<b>ATM Pressure:</b>	100.6 kPa

The testing was performed by Alex You on 2017-10-13.

**Test Mode:** Transmitting

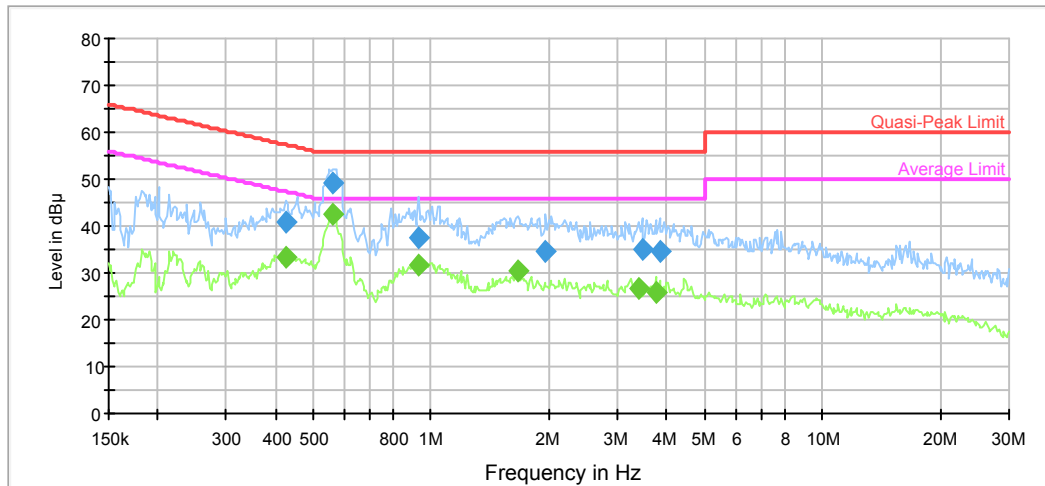
**AC120V, 60 Hz, Line:**



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	42.1	9.000	L1	11.2	23.9	66.0	Compliance
0.175915	36.2	9.000	L1	10.9	28.5	64.7	Compliance
0.558572	36.4	9.000	L1	9.9	19.6	56.0	Compliance
0.886728	26.4	9.000	L1	9.8	29.6	56.0	Compliance
0.999305	30.4	9.000	L1	9.8	25.6	56.0	Compliance
1.108371	29.7	9.000	L1	9.8	26.3	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	28.6	9.000	L1	11.2	27.4	56.0	Compliance
0.183065	25.9	9.000	L1	10.8	28.4	54.3	Compliance
0.372042	25.1	9.000	L1	10.0	23.4	48.5	Compliance
0.558572	30.1	9.000	L1	9.9	15.9	46.0	Compliance
1.190776	26.4	9.000	L1	9.8	19.6	46.0	Compliance
1.289541	22.2	9.000	L1	9.8	23.8	46.0	Compliance

**AC120V, 60 Hz, Neutral:**



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.426011	40.7	9.000	N	9.9	16.6	57.3	Compliance
0.558572	49.3	9.000	N	9.9	6.7	56.0	Compliance
0.930151	37.7	9.000	N	9.8	18.3	56.0	Compliance
1.967177	34.5	9.000	N	9.7	21.5	56.0	Compliance
3.463707	35.1	9.000	N	9.8	20.9	56.0	Compliance
3.841741	34.7	9.000	N	9.8	21.3	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.426011	33.2	9.000	N	9.9	14.1	47.3	Compliance
0.563041	42.4	9.000	N	9.8	3.6	46.0	Compliance
0.930151	31.8	9.000	N	9.8	14.2	46.0	Compliance
1.664073	30.2	9.000	N	9.7	15.8	46.0	Compliance
3.381891	26.7	9.000	N	9.8	19.3	46.0	Compliance
3.750995	25.7	9.000	N	9.8	20.3	46.0	Compliance

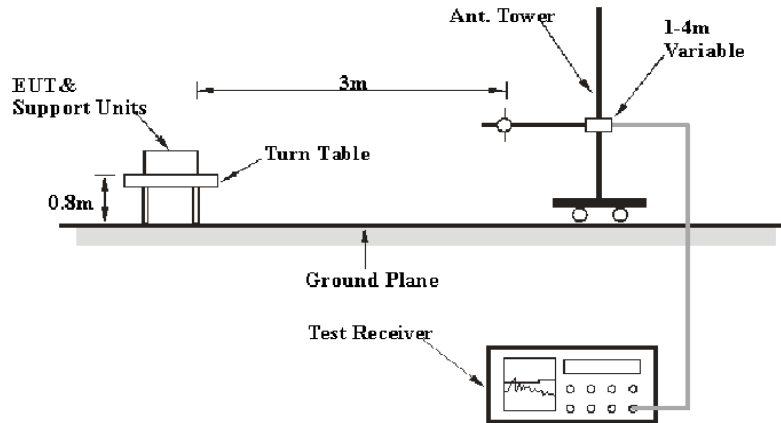
## FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

### Applicable Standard

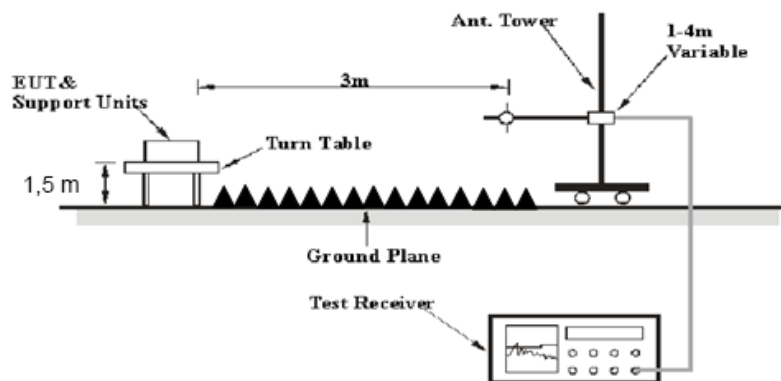
FCC §15.247 (d); §15.209; §15.205;

### 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:

Detector	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	8447D	2727A05902	2017-09-05	2018-09-05
unknown	Coaxial Cable	4m	C0400/01	2017-09-05	2018-09-05
unknown	Coaxial Cable	0.75m	C0075/01	2017-09-05	2018-09-05
unknown	Coaxial Cable	10m	C1000/01	2017-09-05	2018-09-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2016-12-08	2017-12-08
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-05
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-05	2018-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2017-06-27	2018-06-27
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-02 1304	2017-06-16	2020-06-15
unknown	Coaxial Cable	8m	C0800/01	2017-09-05	2018-09-05
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sinoscite	Bandstop Filters	BSF2400-2483.5MN-0899-002	002	2017-05-06	2018-05-06

\* **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**

<b>Temperature:</b>	27 °C
<b>Relative Humidity:</b>	29 %
<b>ATM Pressure:</b>	100.6 kPa

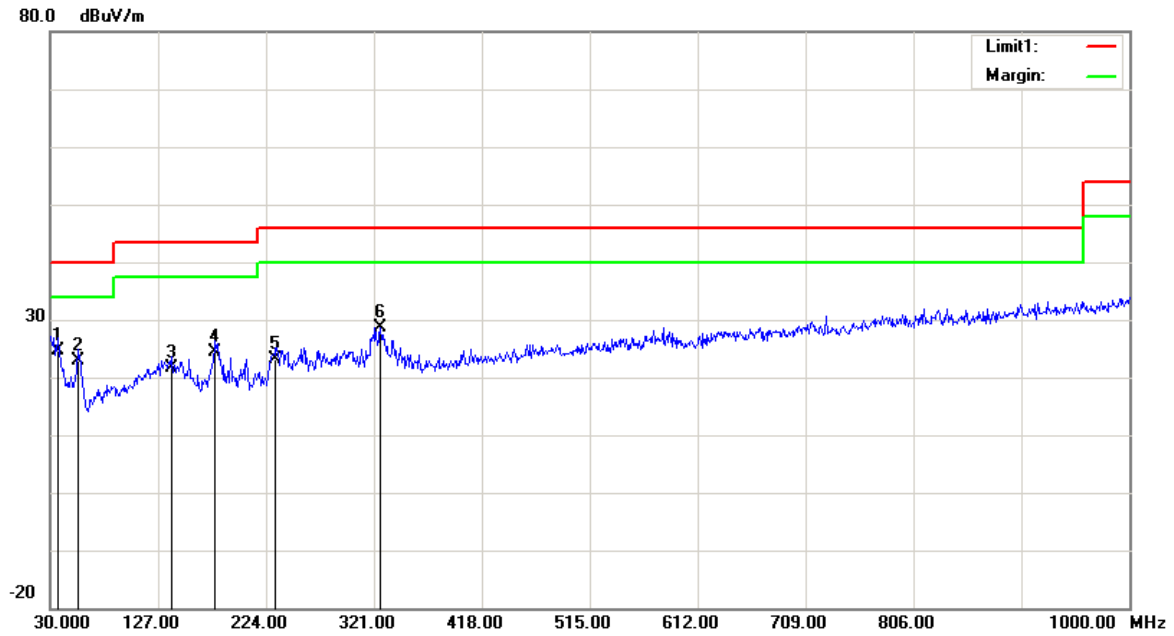
\* The testing was performed by Sunny Cen on 2017-10-13.

*Test Result: Compliance, please Refer to the following data*

*Test Mode: Transmitting*

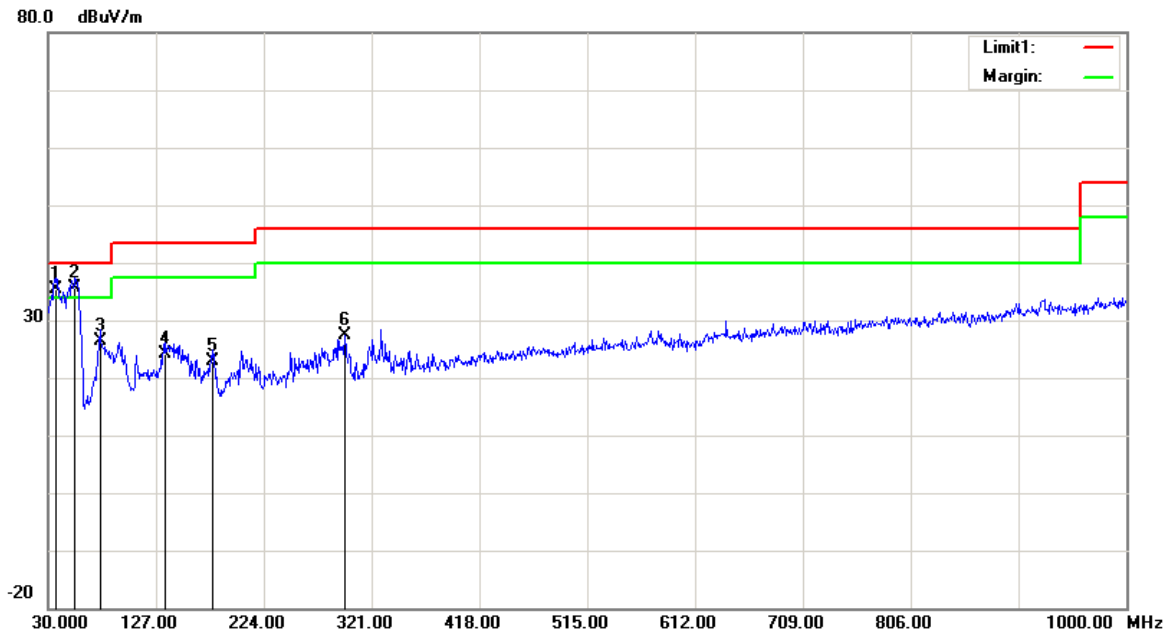
1) 30MHz-1GHz(Middle channel was the worst)

Horizontal:



Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
36.7900	28.53	QP	-3.83	24.70	40.00	15.30
55.2200	35.32	QP	-12.42	22.90	40.00	17.10
138.6400	27.57	QP	-5.97	21.60	43.50	21.90
178.4100	32.09	QP	-7.79	24.30	43.50	19.20
232.7300	29.60	QP	-6.50	23.10	46.00	22.90
326.8200	32.45	QP	-3.85	28.60	46.00	17.40

**Vertical:**

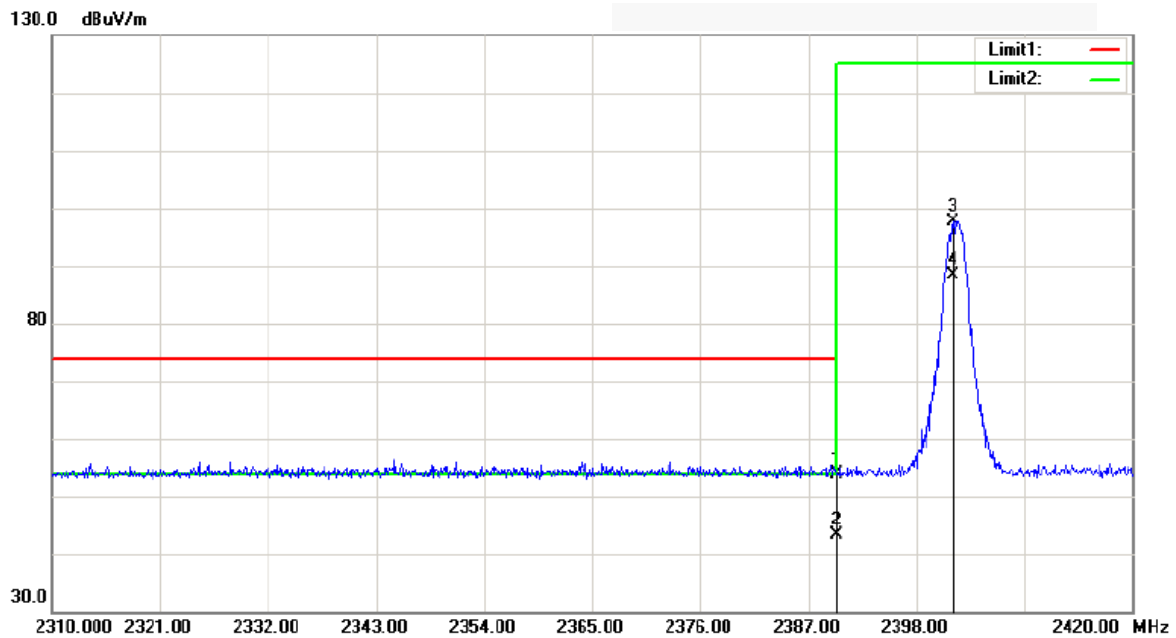


Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
36.7900	39.13	QP	-3.83	35.30	40.00	4.70
54.2500	47.97	QP	-12.37	35.60	40.00	4.40
76.5600	37.37	QP	-11.07	26.30	40.00	13.70
135.7300	29.66	QP	-5.56	24.10	43.50	19.40
178.4100	30.69	QP	-7.79	22.90	43.50	20.60
296.7500	31.59	QP	-4.27	27.32	46.00	18.68

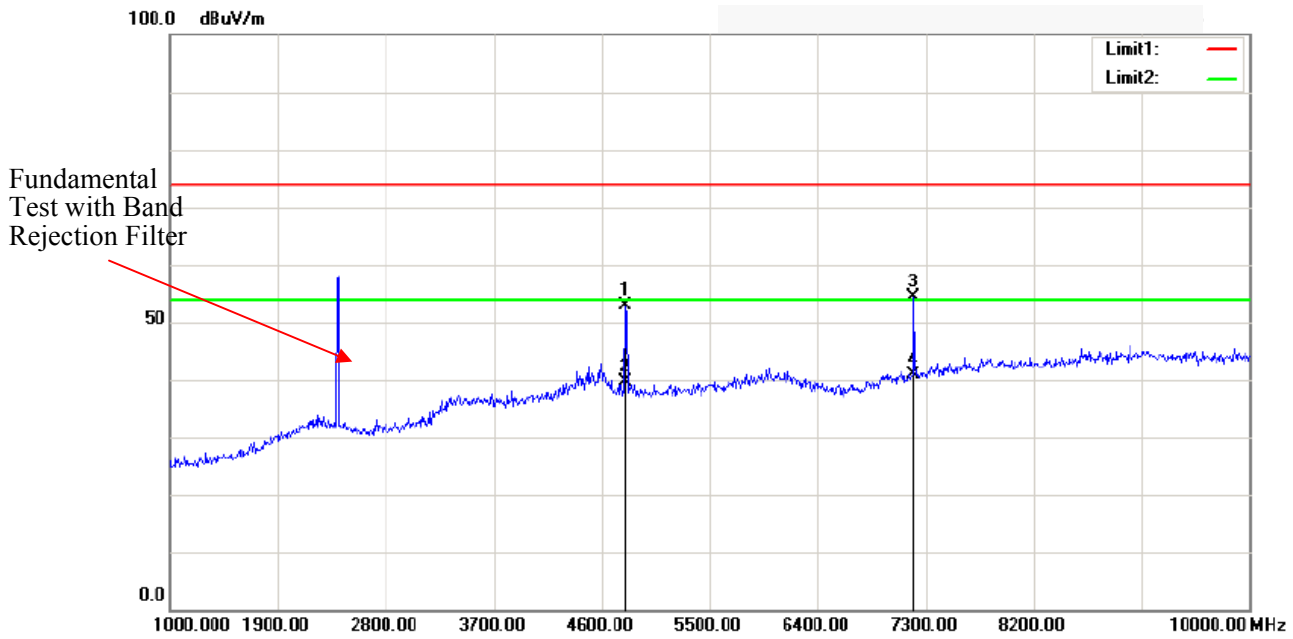
2) 1-25GHz:

BLE Mode:

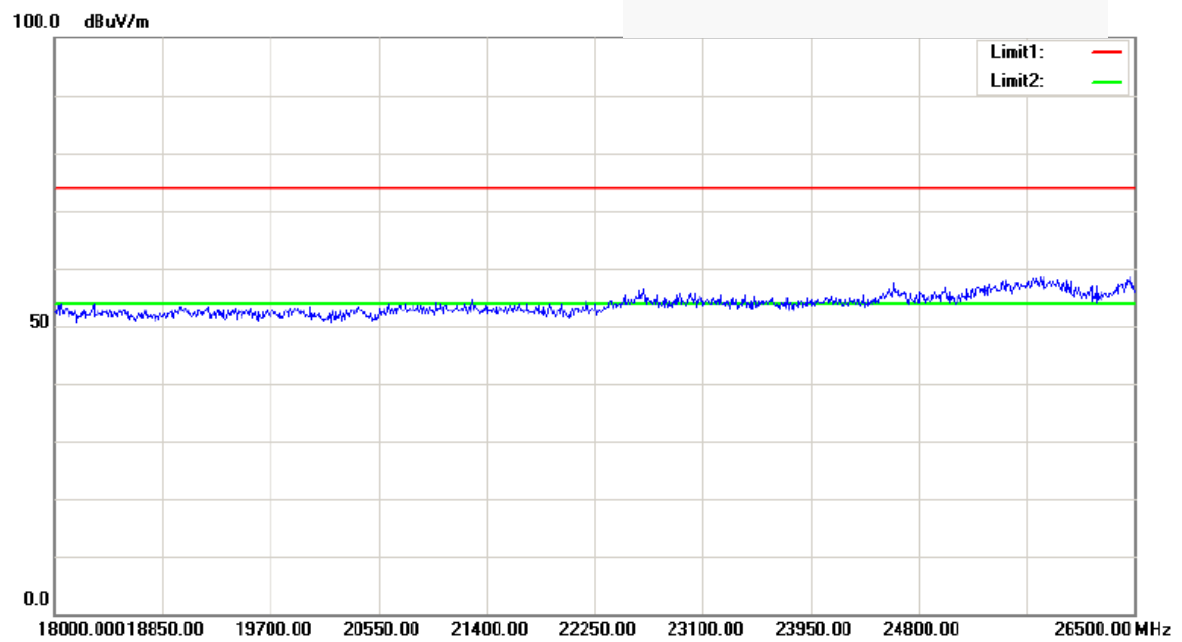
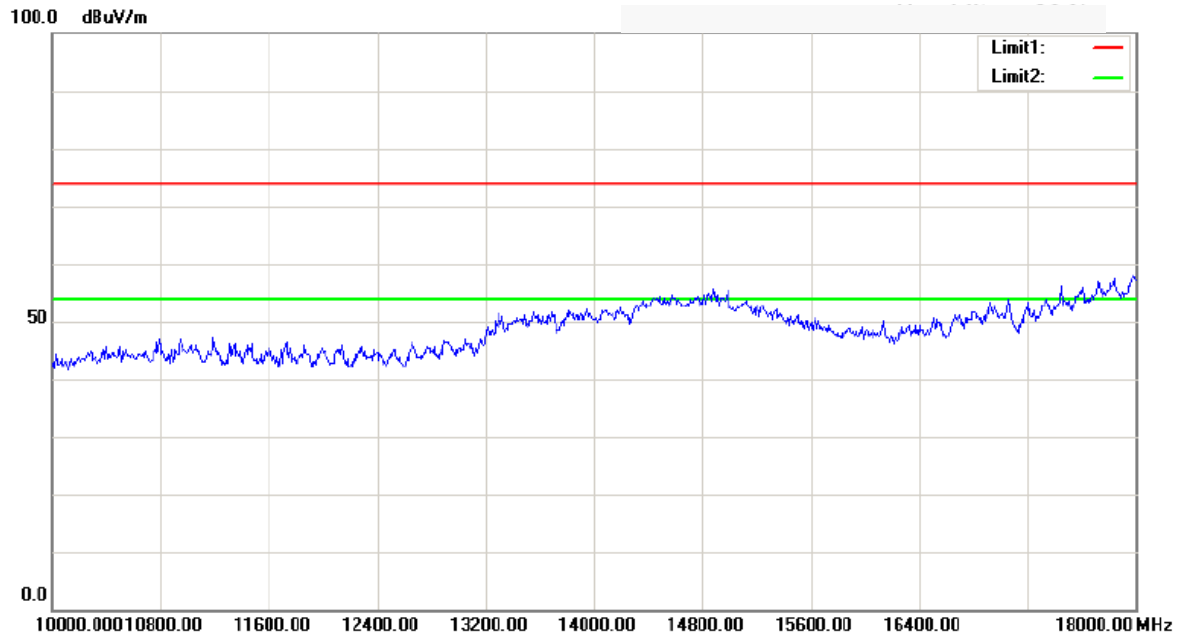
Low Channel, Horizontal:



Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	2390.000	23.89	peak	29.87	53.76	74.00	136	224	20.24	
*	2	2390.000	13.62	AVG	29.87	43.49	54.00	136	224	10.51	
	3	2401.795	67.75	peak	29.90	97.65	125.20	136	224	27.55	Fundamental
	4	2401.795	58.49	AVG	29.90	88.39	125.20	136	224	36.81	Fundamental

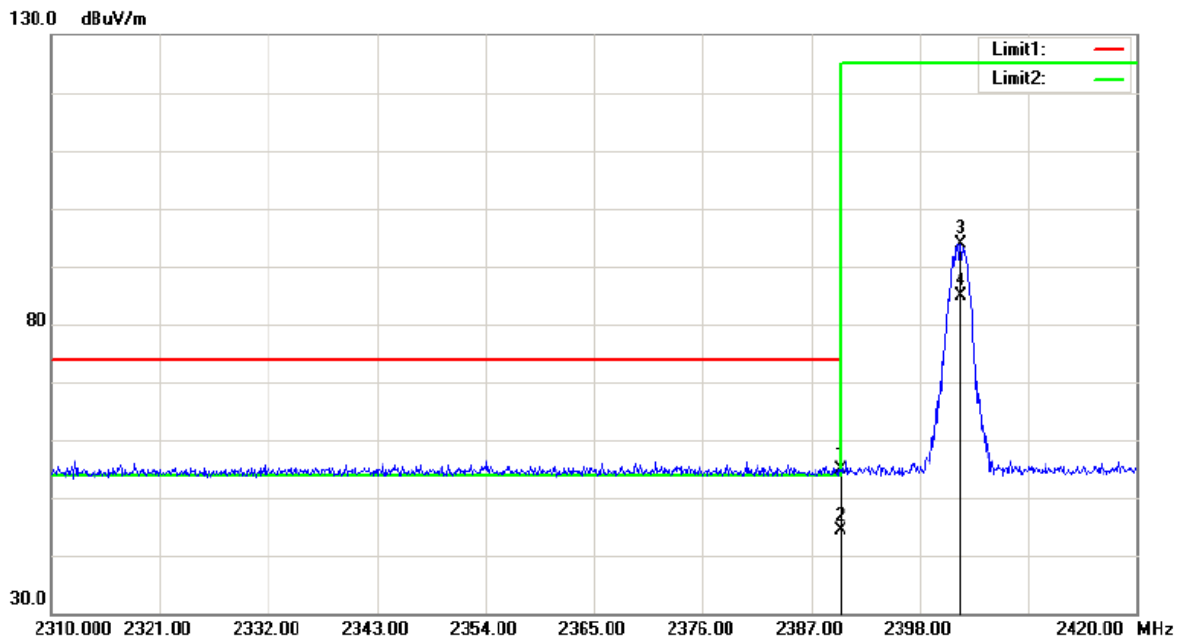


Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	4802.500	59.91	peak	-7.14	52.77	74.00	153	144	21.23	
	2	4802.500	46.87	AVG	-7.14	39.73	54.00	153	144	14.27	
	3	7205.500	56.94	peak	-2.68	54.26	74.00	153	144	19.74	
*	4	7205.500	43.68	AVG	-2.68	41.00	54.00	153	144	13.00	



*Note: No emission was detected in the range 10-25GHz.*

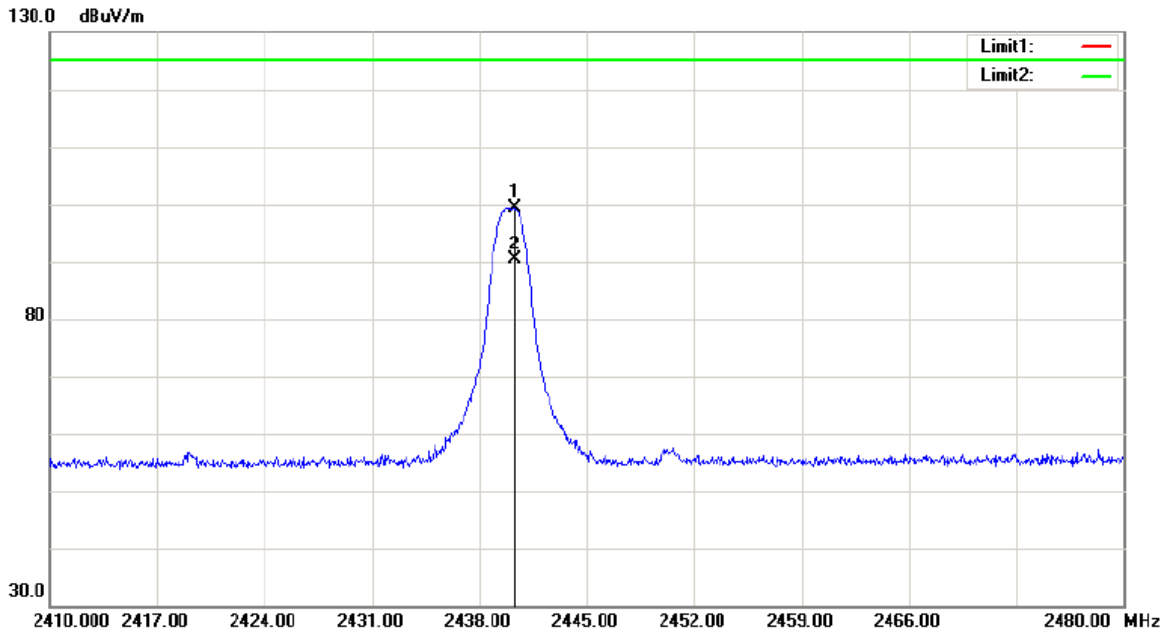
Vertical:



Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	2390.000	24.96	peak	29.88	54.84	74.00	153	22	19.16	
*	2	2390.000	14.56	AVG	29.88	44.44	54.00	153	22	9.56	
	3	2402.235	63.93	peak	29.90	93.83	125.20	153	22	31.37	Fundamental
	4	2402.235	54.86	AVG	29.90	84.76	125.20	153	22	40.44	Fundamental

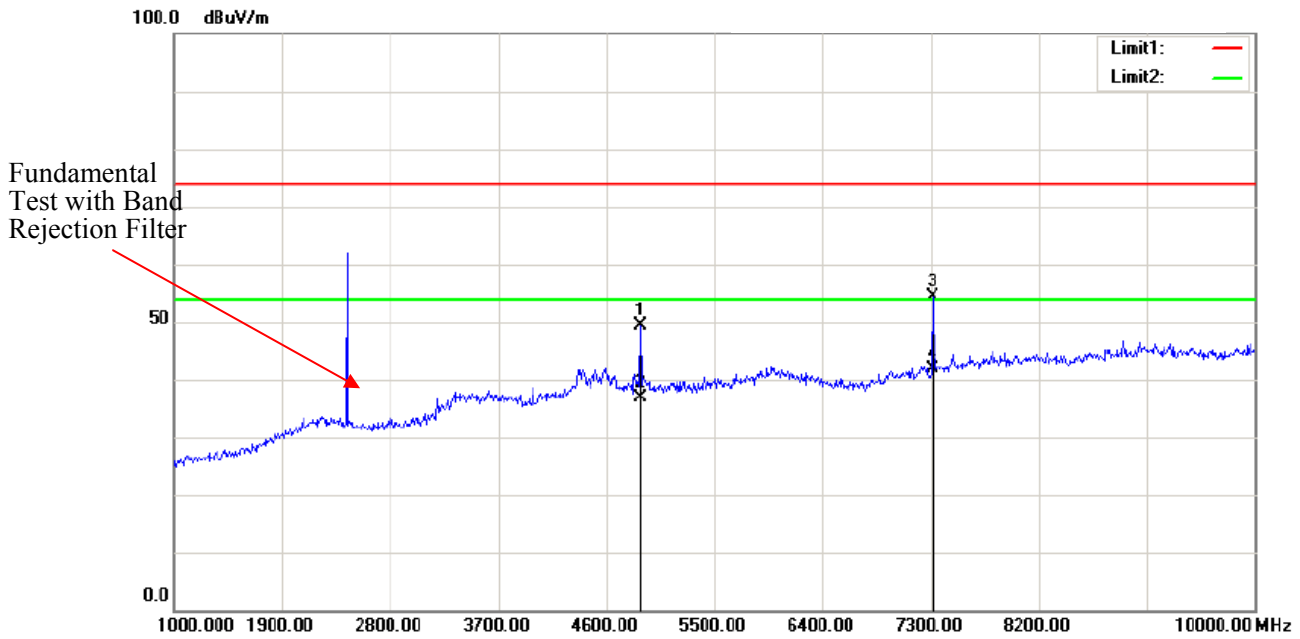
Middle Channel

Horizontal



Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	1	2440.310	69.31	peak	30.00	99.31	125.20	145	42	25.89	Fundamental
	2	2440.310	60.45	AVG	30.00	90.45	125.20	145	42	34.75	Fundamental

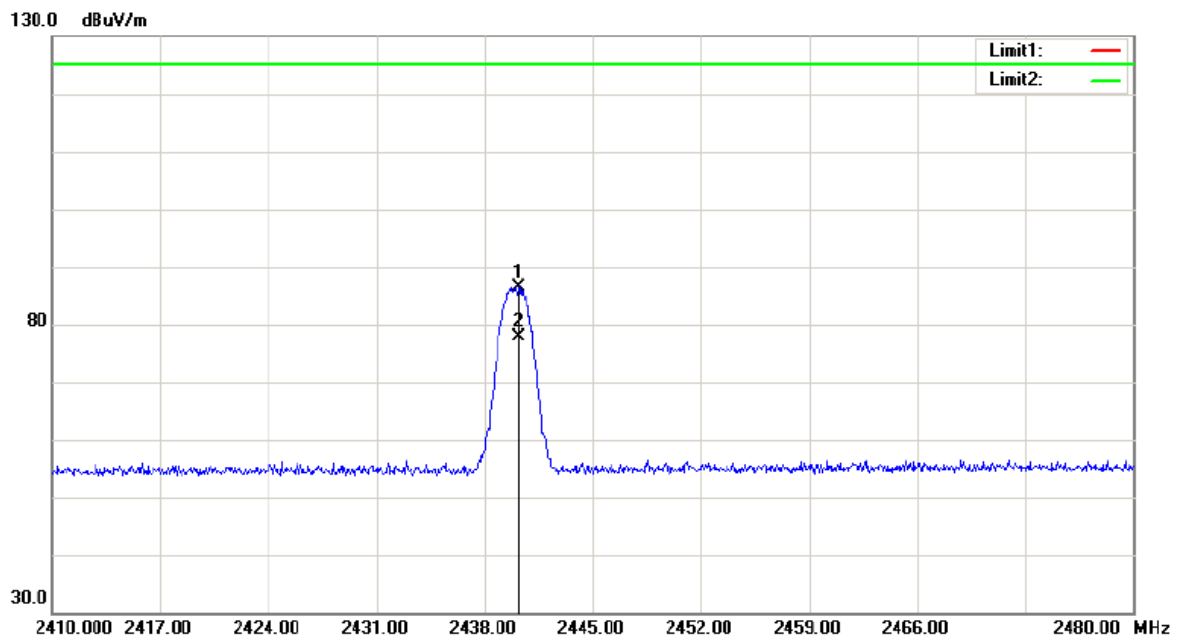




Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	4879.000	56.38	peak	-6.88	49.50	74.00	153	44	24.50	
	2	4879.000	43.67	AVG	-6.88	36.79	54.00	153	44	17.21	
	3	7318.000	57.01	peak	-2.71	54.30	74.00	153	44	19.70	
*	4	7318.000	44.52	AVG	-2.71	41.81	54.00	153	44	12.19	

Note: No emission was detected in the range 10-25GHz.

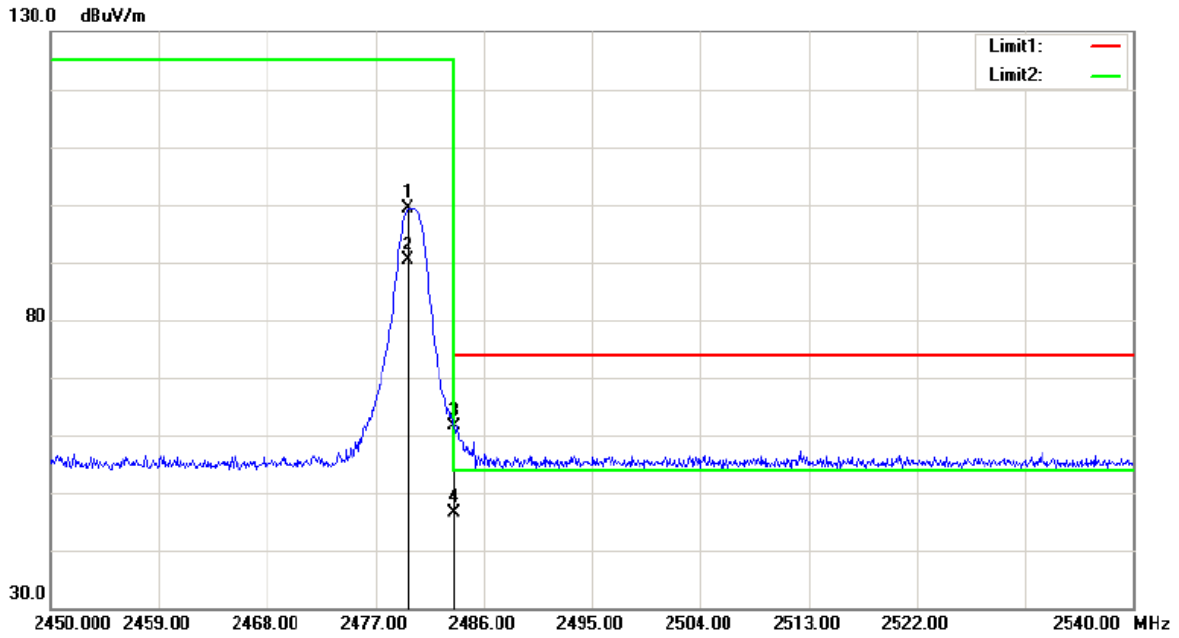
Vertical



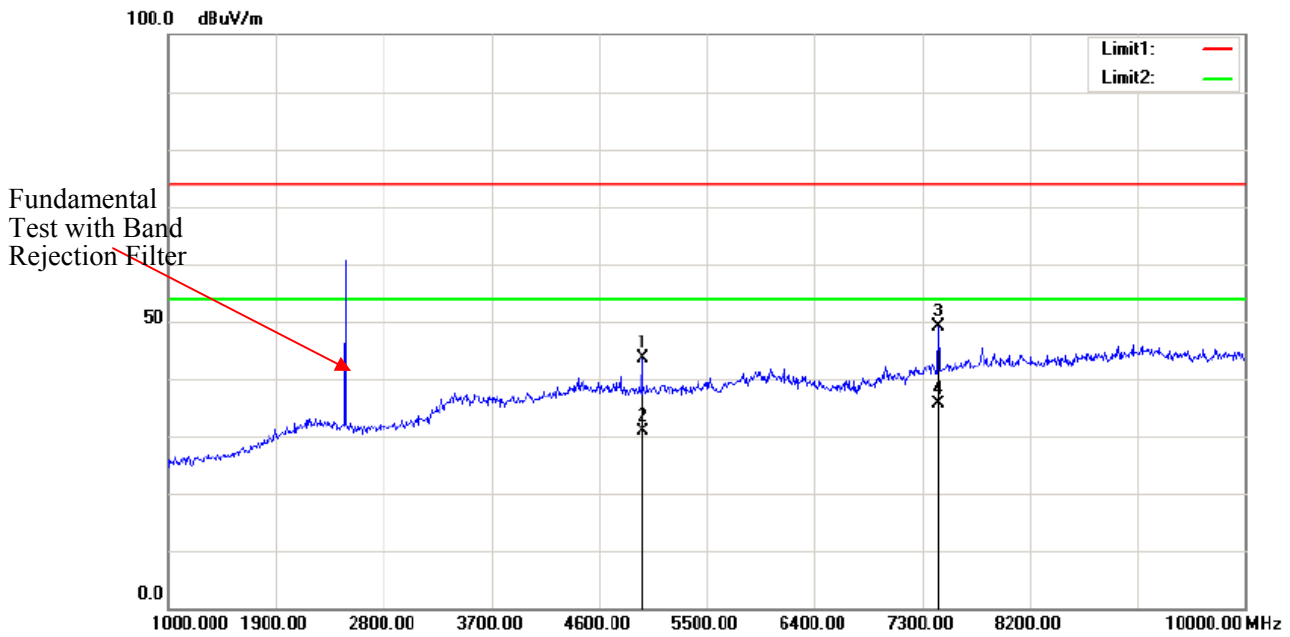
Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	1	2440.205	56.34	peak	30.00	86.34	125.20	169	78	38.86	Fundamental
	2	2440.205	47.82	AVG	30.00	77.82	125.20	169	78	47.38	Fundamental

High Channel

Horizontal



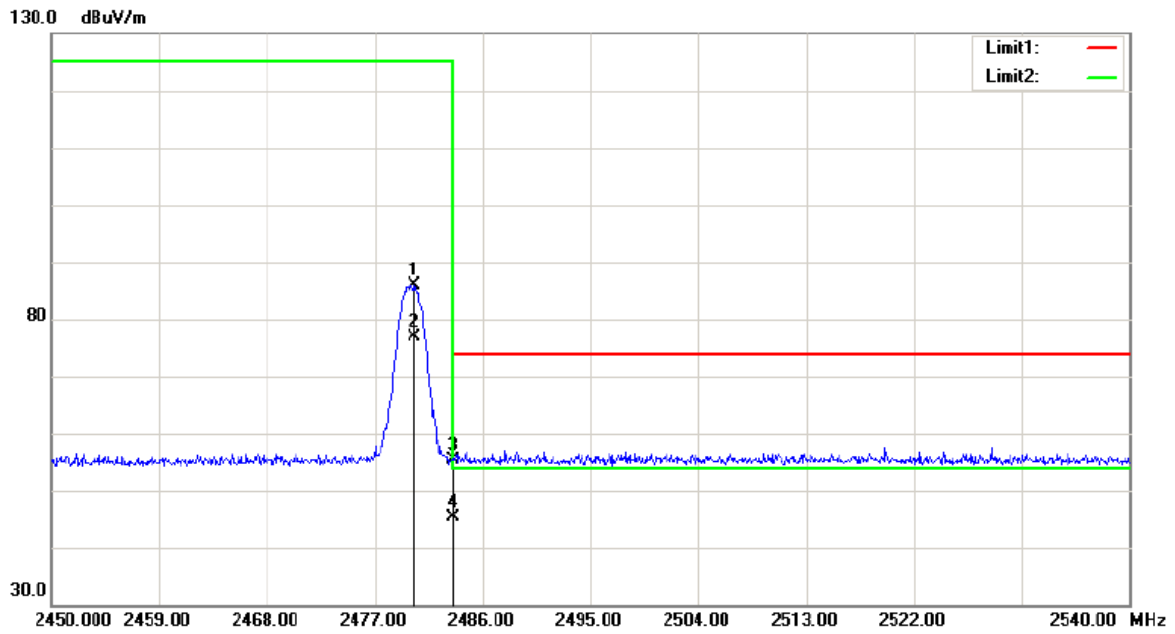
Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	2479.745	69.34	peak	30.10	99.44	125.20	166	153	25.76	Fundamental
	2	2479.745	60.16	AVG	30.10	90.26	125.20	166	153	34.94	Fundamental
	3	2483.500	31.44	peak	30.11	61.55	74.00	166	153	12.45	
*	4	2483.500	16.57	AVG	30.11	46.68	54.00	166	153	7.32	



Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	4960.000	50.54	peak	-6.80	43.74	74.00	156	224	30.26	
	2	4960.000	37.58	AVG	-6.80	30.78	54.00	156	224	23.22	
	3	7439.500	51.95	peak	-2.76	49.19	74.00	156	224	24.81	
*	4	7439.500	38.46	AVG	-2.76	35.70	54.00	156	224	18.30	

Note: No emission was detected in the range 10-25GHz.

Vertical



Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	2480.240	55.74	peak	30.10	85.84	125.20	143	224	39.36	Fundamental
	2	2480.240	46.83	AVG	30.10	76.93	125.20	143	224	48.27	Fundamental
	3	2483.500	25.23	peak	30.11	55.34	74.00	143	224	18.66	
*	4	2483.500	15.24	AVG	30.11	45.35	54.00	143	224	8.65	

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

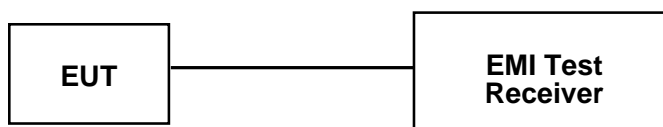
### Applicable Standard

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

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) 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	Spectrum Analyzer	FSU 26	200256	2016-12-08	2017-12-08
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

<b>Temperature:</b>	27.1 °C
<b>Relative Humidity:</b>	43 %
<b>ATM Pressure:</b>	101.7 kPa

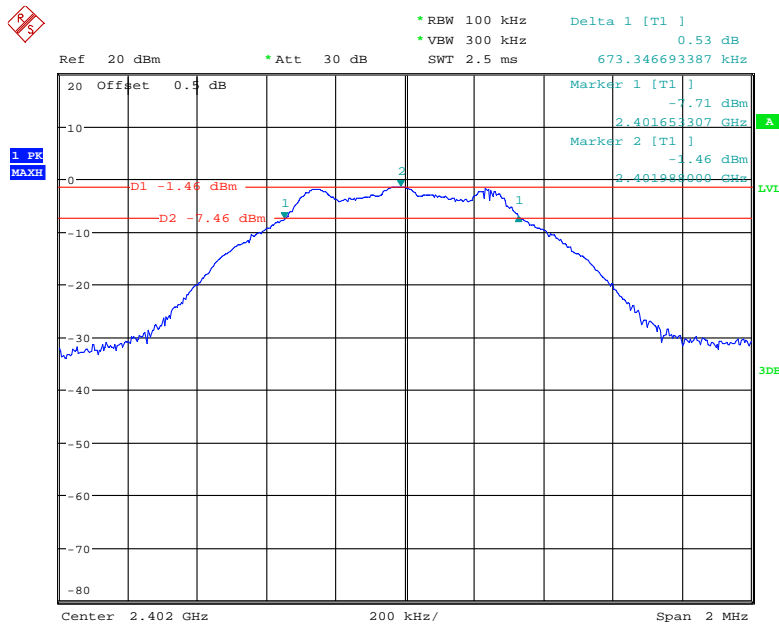
\* The testing was performed by Nami Quan on 2017-10-30.

Test Mode: Transmitting

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

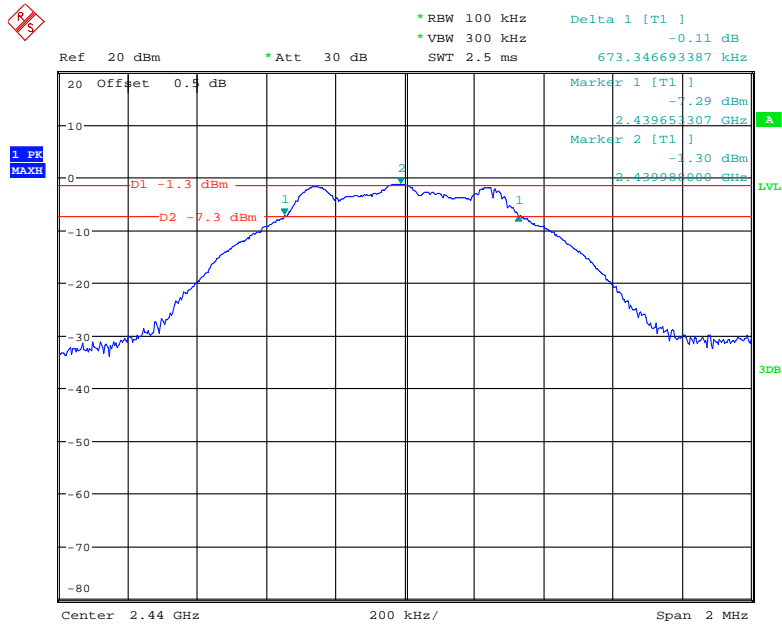
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
Low	2402	0.67	≥0.5
Middle	2440	0.67	≥0.5
High	2480	0.68	≥0.5

**BLE Low Channel**



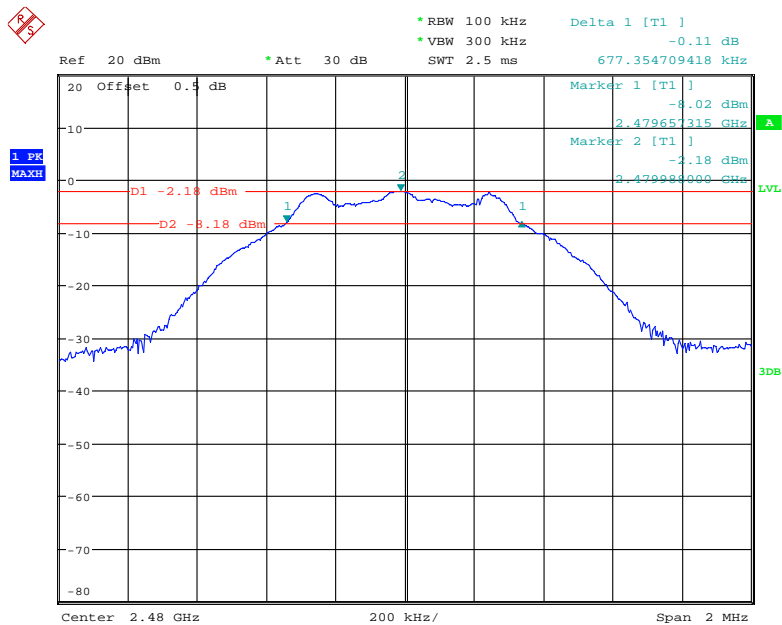
Date: 30.OCT.2017 11:35:18

### BLE Middle Channel



Date: 30.OCT.2017 11:36:13

### BLE High Channel



Date: 30.OCT.2017 11:37:40



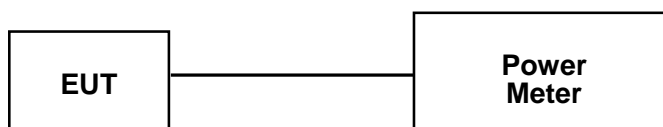
## **FCC §15.247(b) (3) - MAXIMUM PEAK CONDUCTED OUTPUT POWER**

### **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**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Agilent	Wideband Power Sensor	N1921A	MY54210016	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**

<b>Temperature:</b>	27.1 °C
<b>Relative Humidity:</b>	43 %
<b>ATM Pressure:</b>	101.7 kPa

\* The testing was performed by Nami Quan on 2017-10-30.

Test Mode: Transmitting

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

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Max Peak Conducted Output Power (dBm)</b>	<b>Limit (dBm)</b>
Low	2402	-0.53	30
Middle	2440	-0.46	30
High	2480	-1.12	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	Spectrum Analyzer	FSU 26	200256	2016-12-08	2017-12-08
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**

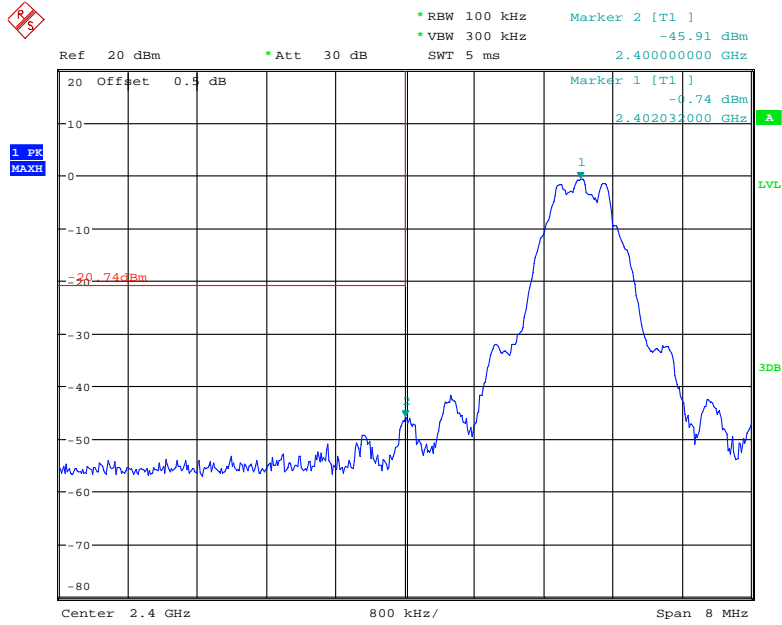
<b>Temperature:</b>	26.8 °C
<b>Relative Humidity:</b>	51 %
<b>ATM Pressure:</b>	101.3 kPa

\* The testing was performed by Nami Quan on 2017-10-24.

Test mode: Transmitting

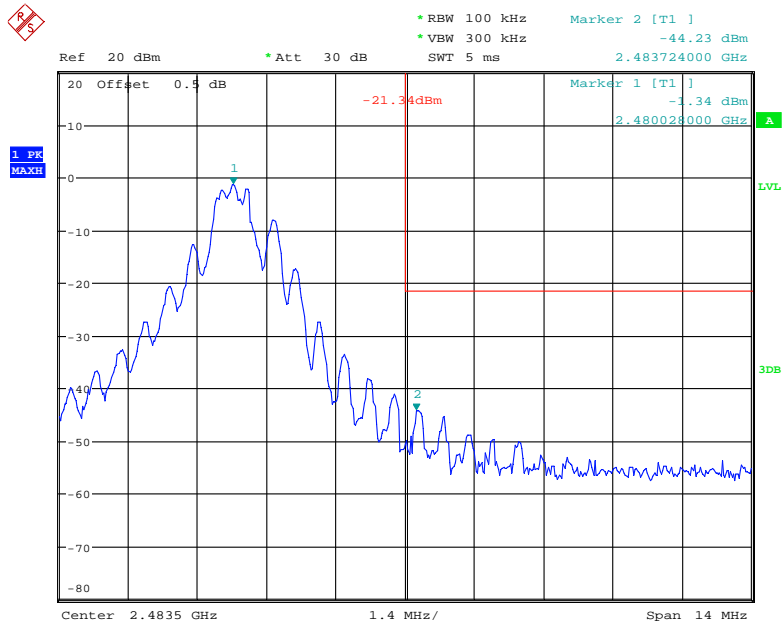
Test Result: Compliant. Please refer to following plots.

### BLE Band Edge , Left Side



Date: 24.OCT.2017 22:05:54

### BLE Band Edge, Right Side



Date: 24.OCT.2017 22:09:52

## 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	Spectrum Analyzer	FSU 26	200256	2016-12-08	2017-12-08
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

<b>Temperature:</b>	26.8 °C
<b>Relative Humidity:</b>	51 %
<b>ATM Pressure:</b>	101.3 kPa

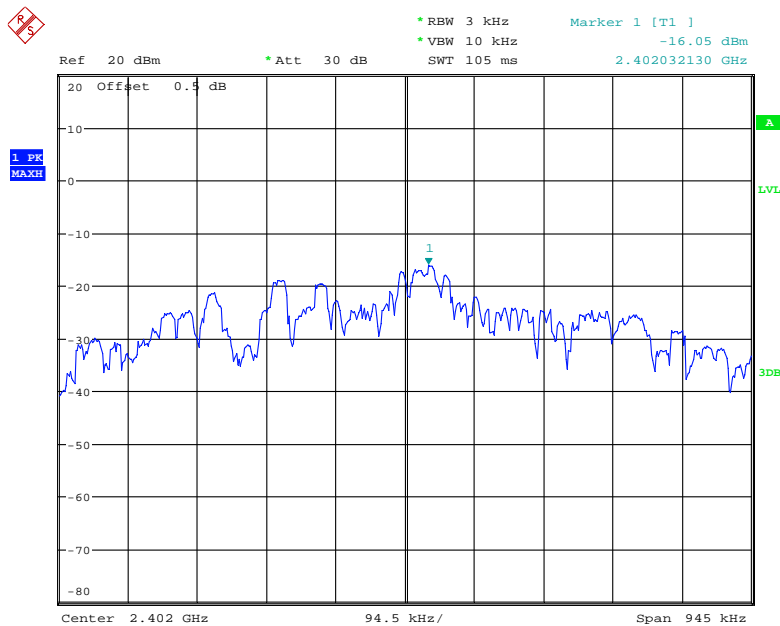
\* The testing was performed by Nami Quan on 2017-10-24.

Test Mode: Transmitting

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

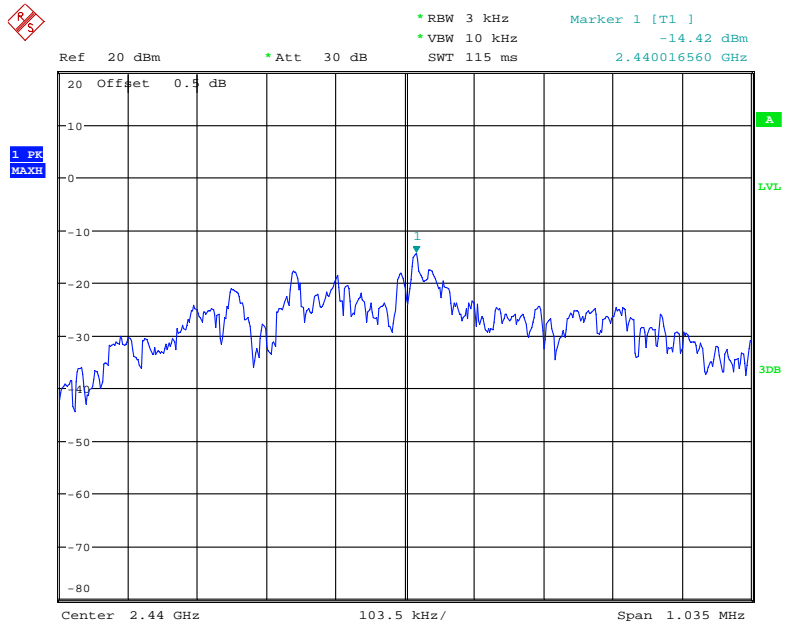
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
Low	2402	-16.05	≤8
Middle	2440	-14.42	≤8
High	2480	-15.38	≤8

**Power Spectral Density, BLE Low Channel**



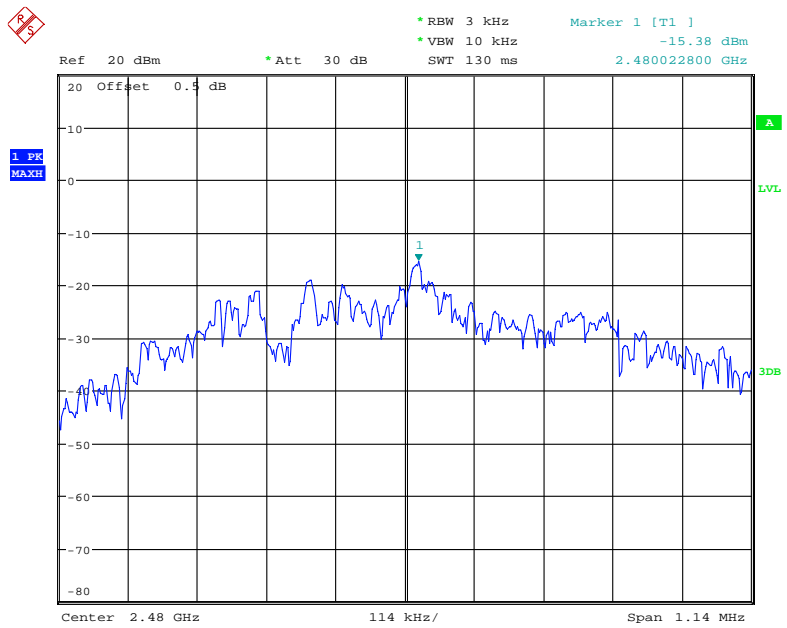
Date: 24.OCT.2017 22:05:15

### Power Spectral Density, BLE Middle Channel



Date: 24.OCT.2017 22:07:07

### Power Spectral Density, BLE High Channel



Date: 24.OCT.2017 22:09:05

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