



# FCC PART 15.247 TEST REPORT

For

## WICKED AUDIO INC

875 WEST 325 NORTH, LINDON, Utah, United States

**FCC ID: 2AFM7WI-BT265X**

<b>Report Type:</b> Original Report	<b>Product Name:</b> Bluetooth earbuds
<b>Test Engineer:</b> <u>Kevin Hu</u>	<i>Kevin hu</i>
<b>Report Number:</b> <u>RDG170303802B</u>	
<b>Report Date:</b> <u>2017-03-28</u>	
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## **GENERAL INFORMATION**

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

The **WICKED AUDIO INC**'s product, model number: **WIBT2650 (FCC ID: 2AFM7WI-BT265X)** (the "EUT") in this report was a **Bluetooth earbuds**, which was measured approximately: 126 cm (L) x 1.5 cm (W) x 0.6 cm (H), rated input voltage: DC3.7V from battery or DC 5V charged from USB.

*Note: The series product, model WIBT2650, WIBT265X are electrically identical, the differences between them are the different model names and different colors, we selected WIBT2650 for fully testing, the details was explained in the attached declaration letter.*

*\*All measurement and test data in this report was gathered from final production sample, serial number: 170303802 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-03-07, and EUT conformed to test requirement.*

### **Objective**

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

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

### **Related Submittal(s)/Grant(s)**

FCC Part 15C DSS submissions with FCC ID: 2AFM7WI-BT265X.

### **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. (Chengdu). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

### Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.62dB
Unwanted Emissions, radiated	30M~200MHz: 4.7 dB for Horizontal, 4.7 dB for Vertical 200M~1GHz: 6.0 dB for Horizontal, 6.0 for Vertical 1G~6GHz: 5.13 dB, 6G~18GHz: 5.47 dB
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.17 dB (150 kHz to 30 MHz)

### Test Facility

The test site used by BACL to collect test data is located in the 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China.

Test site at BACL 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 April 24, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332. 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

The system was configured for testing in testing mode, which was provided by 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.

### Equipment Modifications

No modification was made to the EUT tested.

### EUT Exercise Software

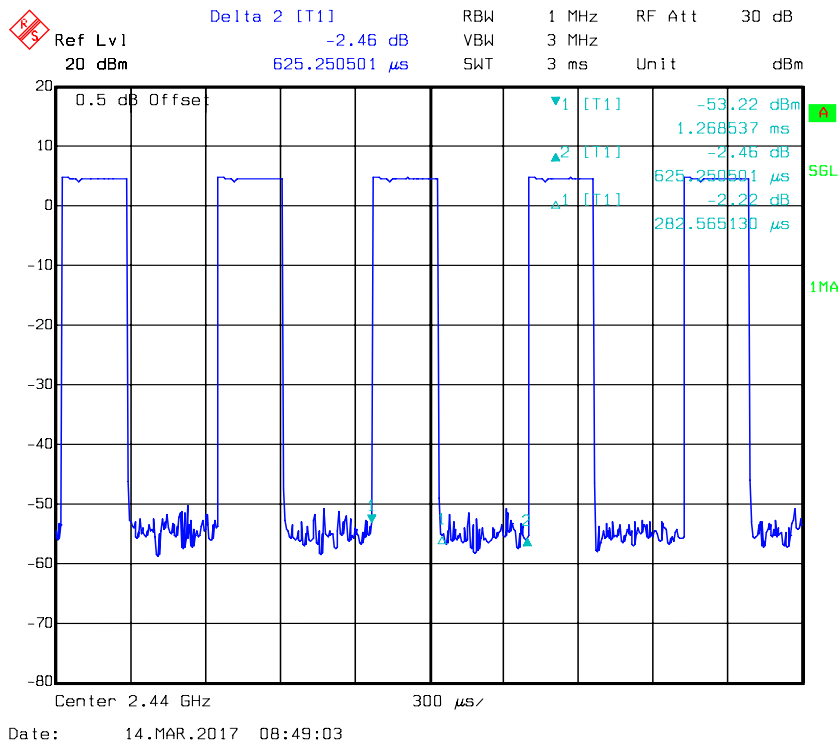
The software "Airoha.AB152x\_verC\_LabTestTool\_20160615\_2.1.0.11688\_Verifying" was used for testing, which was provided by manufacturer. the maximum power with maximum duty cycle was configured as below:

Test Software Version	Airoha.AB152x_verC_LabTestTool_20160615_2.1.0.11688_Verifying		
Test Frequency	2402MHz	2440MHz	2480MHz
BLE	63	63	63

The duty cycle as below:

Test mode	T <sub>on</sub> (ms)	T <sub>on+off</sub> (ms)	Duty Cycle (%)
BLE	0.283	0.625	45%

The minimum transmission duration(T) is 0.283ms for BLE mode.



### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Huntkey	Adapter	HKA01105021	0D1603003303

### External Cable

Cable Description	Shielding Type	Ferrite Core	Length (cm)	From Port	To
USB Cable	NO	NO	100	Adapter	EUT





## **SUMMARY OF TEST RESULTS**

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<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
FCC §15.247 (i) & §1.1310 & §2.1093	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum conducted output power	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

## **FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE**

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### **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  $\leq 50$  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  $\leq 7.5$  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  $\leq 50$  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 conducted power including tune-up tolerance is 5.5dBm (3.55mW).

$[(\text{max. power of channel, mW})/(\text{min. test separation distance, mm})][\sqrt{f(\text{GHz})}]$   
 $= 3.55/5 \cdot (\sqrt{2.480}) = 1.1 < 3.0$

**So the SAR evaluation is not necessary.**

## **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.

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 0dBi, 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

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If  $U_{lab}$  is less than or equal to  $U_{cispr}$  of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If  $U_{lab}$  is greater than  $U_{cispr}$  of Table 1, then:

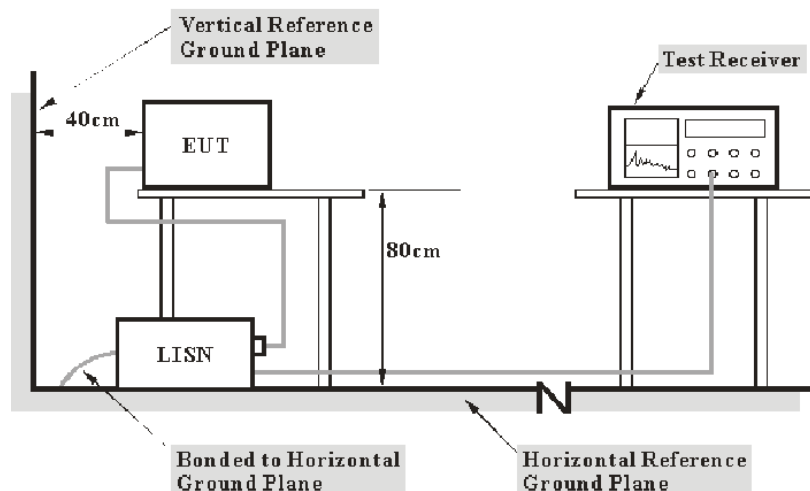
- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.

Based on CISPR 16-4-2:2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Chengdu) is  $\pm 3.17$  dB (150 kHz to 30 MHz).

Table 1 – Values of  $U_{cispr}$

Measurement	$U_{cispr}$
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	3.4 dB

### 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 was according to ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The power cables and external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

The adapter was connected to an AC120V/60Hz 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

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:

$$V_C = V_R + A_C + VDF$$

Herein,s

$V_C$ : corrected voltage amplitude

$V_R$ : reading voltage amplitude

$A_C$ : attenuation caused by cable loss

$VDF$ : voltage division factor of AMN or ISN

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 maximum limit. The equation for margin calculation is as follows:

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

### Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2016-12-02	2017-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.06	2016-12-02	2017-12-01
Rohde & Schwarz	PULSE LIMITER	ESH3Z2	357.8810.52	2016-10-31	2017-10-30
N/A	Conducted Cable	NO.5	N/A	2016-11-10	2017-11-09
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

### Test Data

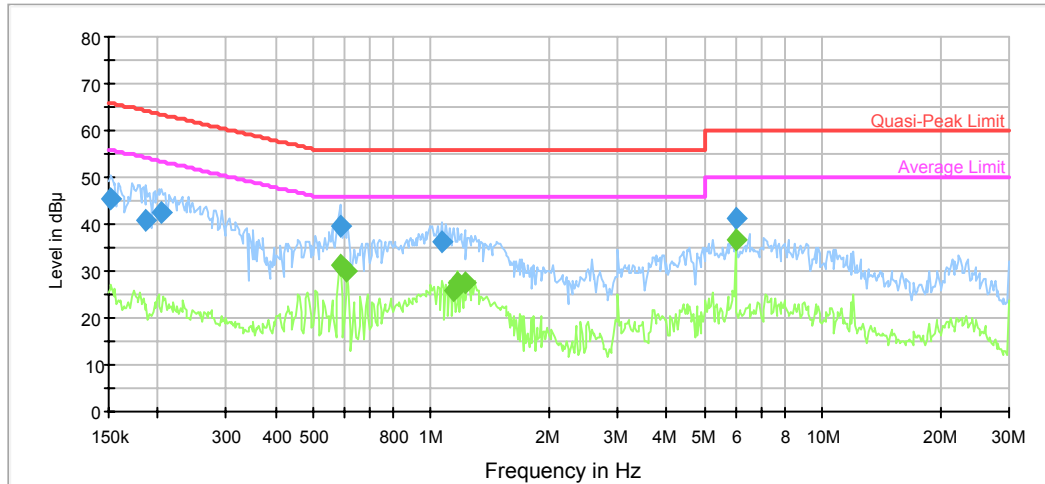
#### Environmental Conditions

Temperature:	25.6 °C
Relative Humidity:	57 %
ATM Pressure:	98.6 kPa

*The testing was performed by Kevin Hu on 2017-03-23.*

Test Mode: Transmitting

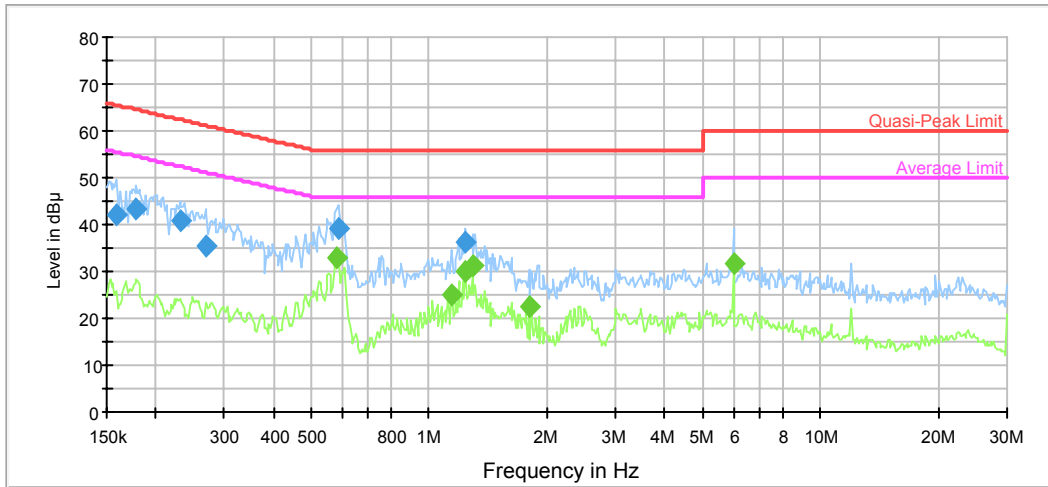
AC120V/60Hz, Line



Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.152410	45.6	9.000	L1	19.7	20.3	65.9	Compliance
0.187494	40.7	9.000	L1	19.7	23.4	64.1	Compliance
0.204669	42.4	9.000	L1	19.7	21.0	63.4	Compliance
0.585926	39.4	9.000	L1	19.8	16.6	56.0	Compliance
1.065081	36.3	9.000	L1	19.7	19.7	56.0	Compliance
6.002303	41.1	9.000	L1	19.8	18.9	60.0	Compliance

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.585926	31.2	9.000	L1	19.8	14.8	46.0	Compliance
0.609741	30.0	9.000	L1	19.8	16.0	46.0	Compliance
1.144267	25.9	9.000	L1	19.7	20.1	46.0	Compliance
1.171949	27.4	9.000	L1	19.7	18.6	46.0	Compliance
1.219583	27.3	9.000	L1	19.7	18.7	46.0	Compliance
6.002303	36.8	9.000	L1	19.8	13.2	50.0	Compliance

**AC120V/60Hz, Neutral**



Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.158604	42.2	9.000	N	19.7	23.3	65.5	Compliance
0.178741	43.3	9.000	N	19.7	21.2	64.5	Compliance
0.230654	40.7	9.000	N	19.6	21.7	62.4	Compliance
0.268355	35.2	9.000	N	19.6	26.0	61.2	Compliance
0.585926	39.2	9.000	N	19.6	16.8	56.0	Compliance
1.239175	36.1	9.000	N	19.6	19.9	56.0	Compliance

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.581275	32.9	9.000	N	19.6	13.1	46.0	Compliance
1.144267	24.8	9.000	N	19.7	21.2	46.0	Compliance
1.239175	30.1	9.000	N	19.6	15.9	46.0	Compliance
1.289541	31.2	9.000	N	19.6	14.8	46.0	Compliance
1.802095	22.7	9.000	N	19.7	23.3	46.0	Compliance
6.002303	31.9	9.000	N	19.8	18.1	50.0	Compliance



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

### **Applicable Standard**

FCC §15.247 (d); §15.209; §15.205;

### **Measurement Uncertainty**

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If  $U_{lab}$  is less than or equal to  $U_{cispr}$  of Table 2, then:

–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;  
–non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If  $U_{lab}$  is greater than  $U_{cispr}$  of Table 2, then:

–compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit;  
–non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.

Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Chengdu) is:

30M~200MHz: ±4.7 dB;

200M~1GHz: ±6.0 dB;

1G~6GHz: ±5.13dB;

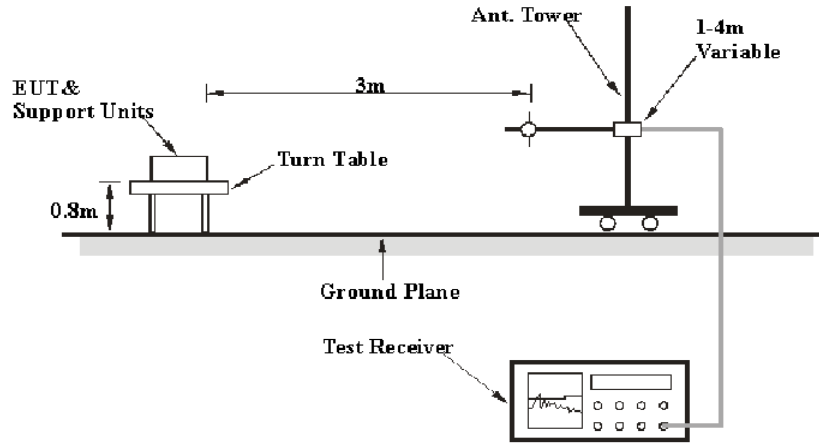
6G~25GHz: ±5.47 dB;

Table 2 – Values of  $U_{cispr}$

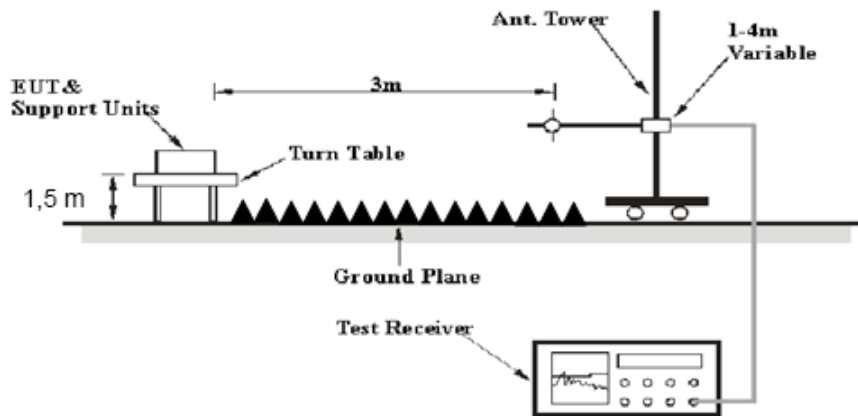
Measurement	$U_{cispr}$
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

## EUT Setup

### Below 1GHz:



### Above 1GHz:



The radiated emission tests were performed in the 3 meters chamber 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 external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

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:

Detector	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 Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

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

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
Agilent	Amplifier	8447D	2944A10442	2016-12-02	2017-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Sunol Sciences	Broadband Antenna	JB3	A101808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
ETS	Horn Antenna	3115	003-6076	2016-12-02	2017-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113024	2014-06-16	2017-06-15
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2016-05-20	2017-05-19
HP	Amplifier	8449B	3008A00277	2016-12-02	2017-12-01
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2016-11-10	2017-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2016-11-10	2017-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2016-11-10	2017-11-09

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Results Summary

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

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	17.8 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	95.4 kPa

\* The testing was performed by Kevin Hu on 2017-03-22.

Test Mode: Transmitting

**30MHz-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	73.37	PK	H	23.53	3.00	0.00	99.90	N/A	N/A
2402	62.79	AV	H	23.53	3.00	0.00	89.32	N/A	N/A
2402	62.26	PK	V	23.53	3.00	0.00	88.79	N/A	N/A
2402	52.13	AV	V	23.53	3.00	0.00	78.66	N/A	N/A
2390	29.96	PK	H	23.57	3.00	0.00	56.53	74.00	17.47
2390	17.67	AV	H	23.57	3.00	0.00	44.24	54.00	9.76
4804	42.47	PK	H	30.77	5.12	26.87	51.49	74.00	22.51
4804	31.28	AV	H	30.77	5.12	26.87	40.30	54.00	13.70
7206	24.37	PK	H	34.71	6.16	26.35	38.89	74.00	35.11
7206	13.74	AV	H	34.71	6.16	26.35	28.26	54.00	25.74
1335	41.47	PK	H	23.67	2.44	26.49	41.09	74.00	32.91
1335	31.12	AV	H	23.67	2.44	26.49	30.74	54.00	23.26
183.26	45.2	QP	H	11.43	0.91	27.88	29.66	43.50	13.84
445.16	37.3	QP	H	17.03	1.56	28.48	27.41	46.00	18.59
Middle Channel: 2440 MHz									
2440	73.12	PK	H	23.40	3.00	0.00	99.52	N/A	N/A
2440	62.44	AV	H	23.40	3.00	0.00	88.84	N/A	N/A
2440	63.31	PK	V	23.40	3.00	0.00	89.71	N/A	N/A
2440	52.78	AV	V	23.40	3.00	0.00	79.18	N/A	N/A
4880	45.96	PK	H	31.02	5.09	26.87	55.20	74.00	18.80
4880	35.18	AV	H	31.02	5.09	26.87	44.42	54.00	9.58
7320	30.59	PK	H	34.94	6.22	26.40	45.35	74.00	28.65
7320	20	AV	H	34.94	6.22	26.40	34.76	54.00	19.24
1362	41.75	PK	H	23.74	2.48	26.46	41.51	74.00	32.49
1362	31.79	AV	H	23.74	2.48	26.46	31.55	54.00	22.45
2206	39.7	PK	H	24.20	3.03	26.85	40.08	74.00	33.92
2206	28.84	AV	H	24.20	3.03	26.85	29.22	54.00	24.78
183.26	44.9	QP	H	11.43	0.91	27.88	29.36	43.50	14.14
445.16	37.2	QP	H	17.03	1.56	28.48	27.31	46.00	18.69
High Channel: 2480 MHz									
2480	75.54	PK	H	23.27	2.99	0.00	100.80	N/A	N/A
2480	64.19	AV	H	23.27	2.99	0.00	90.45	N/A	N/A
2480	64.86	PK	V	23.27	2.99	0.00	91.12	N/A	N/A
2480	54.13	AV	V	23.27	2.99	0.00	80.39	N/A	N/A
2483.5	30.65	PK	H	23.26	2.99	0.00	56.90	74.00	17.10
2483.5	17.66	AV	H	23.26	2.99	0.00	43.91	54.00	10.09
4960	47.14	PK	H	31.27	5.05	26.88	56.58	74.00	17.42
4960	35.36	AV	H	31.27	5.05	26.88	44.80	54.00	9.20
7440	30.19	PK	H	35.18	6.27	26.45	45.19	74.00	28.81
7440	20.32	AV	H	35.18	6.27	26.45	35.32	54.00	18.68
1421	39.97	PK	H	23.89	2.56	26.41	40.01	74.00	33.99
1421	28.39	AV	H	23.89	2.56	26.41	28.43	54.00	25.57
183.26	45	QP	H	11.43	0.91	27.88	29.46	43.50	14.04
445.16	36.8	QP	H	17.03	1.56	28.48	26.91	46.00	19.09

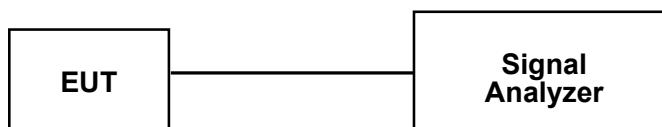
## FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

### 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

- 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
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
N/A	RF Cable	N/A	N/A	Each Time	/

\* **Statement of Traceability:** BAAC (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	19.3 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	95.4 kPa

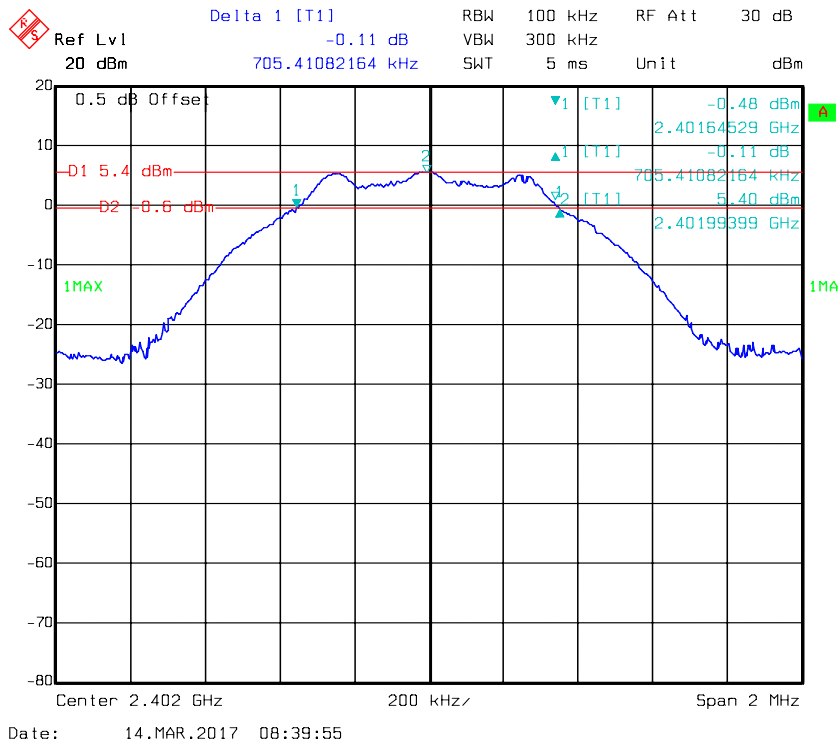
\* The testing was performed by Kevin Hu on 2017-03-14.

Test Mode: Transmitting

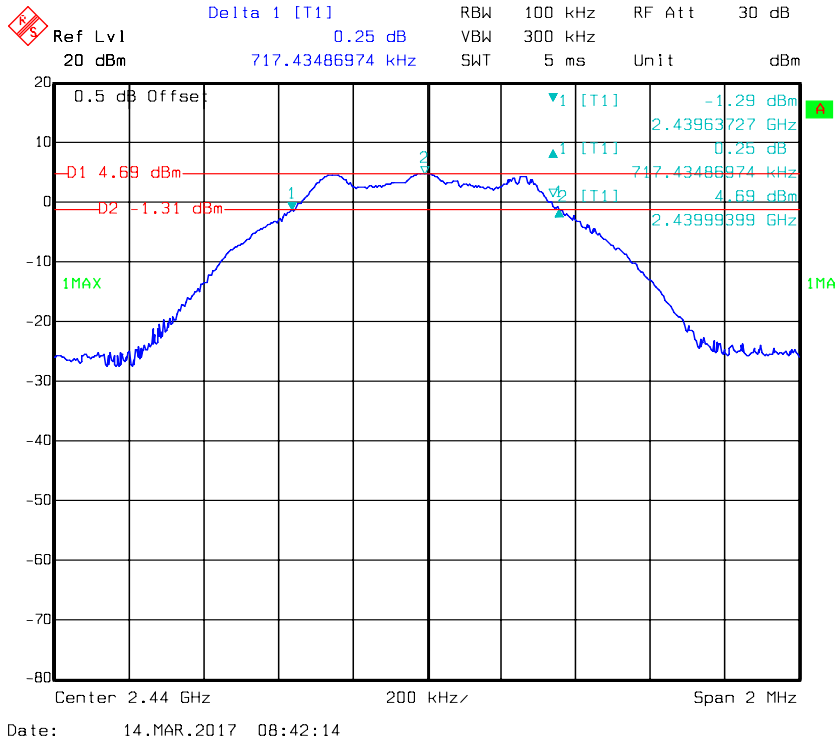
Test Result: Compliant. Please refer to the following table and plots.

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
Low	2402	0.71	≥0.5
Middle	2440	0.72	≥0.5
High	2480	0.70	≥0.5

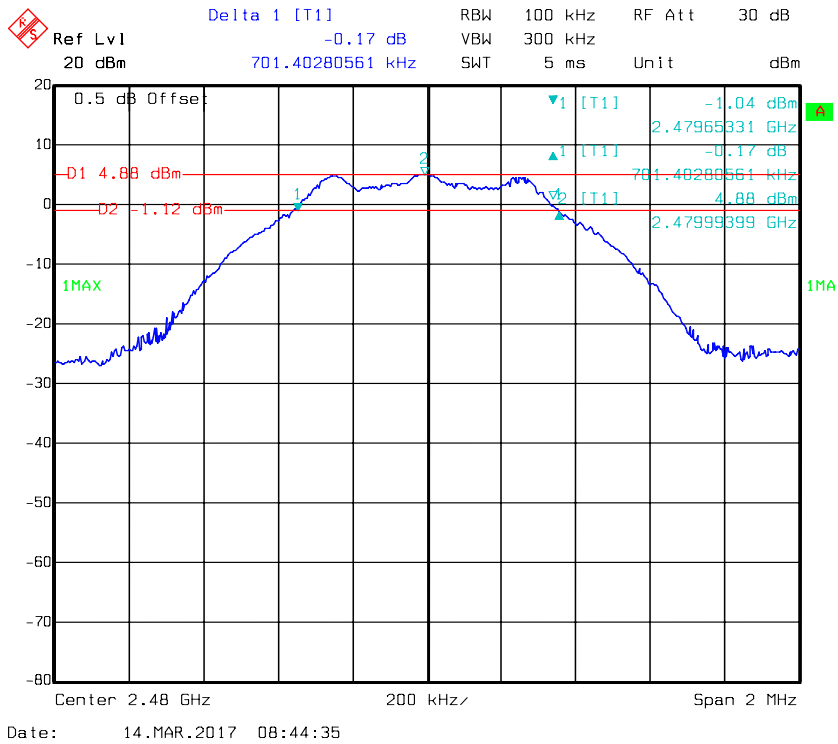
Low Channel



### Middle Channel



### High Channel





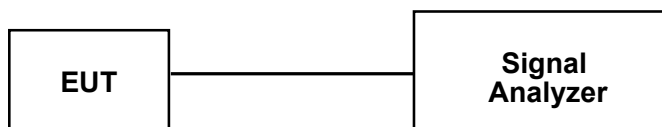
## **FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER**

### **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**

- a) Set the RBW  $\geq$  DTS bandwidth.
- b) Set VBW  $\geq$  3 RBW.
- c) Set span  $\geq$  3 x RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.



### **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
N/A	RF Cable	N/A	N/A	Each Time	/

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

<b>Temperature:</b>	19.3 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	95.4 kPa

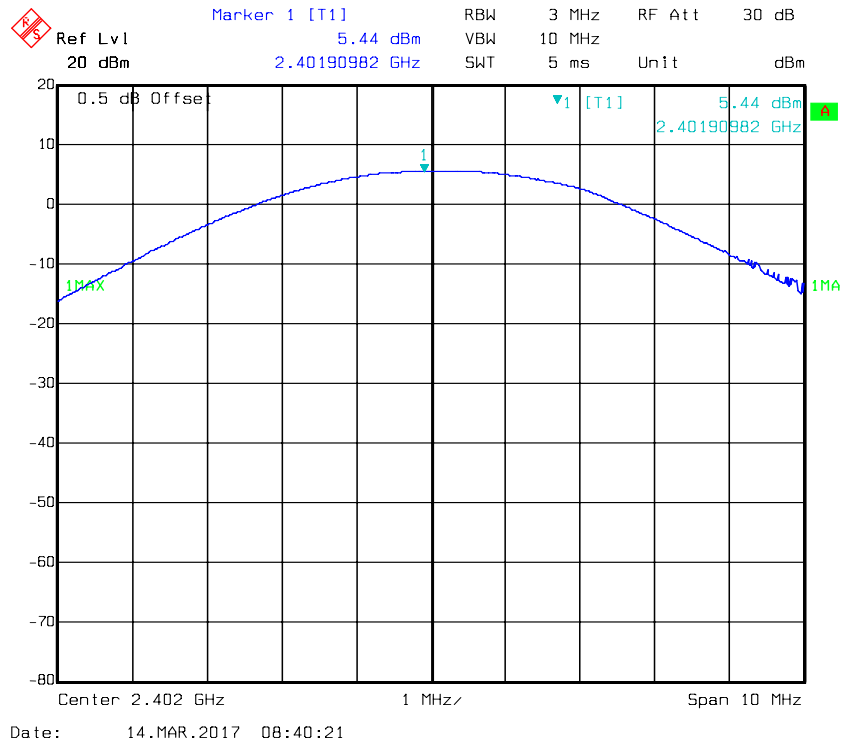
\* The testing was performed by Kevin Hu on 2017-03-14.

Test Mode: Transmitting

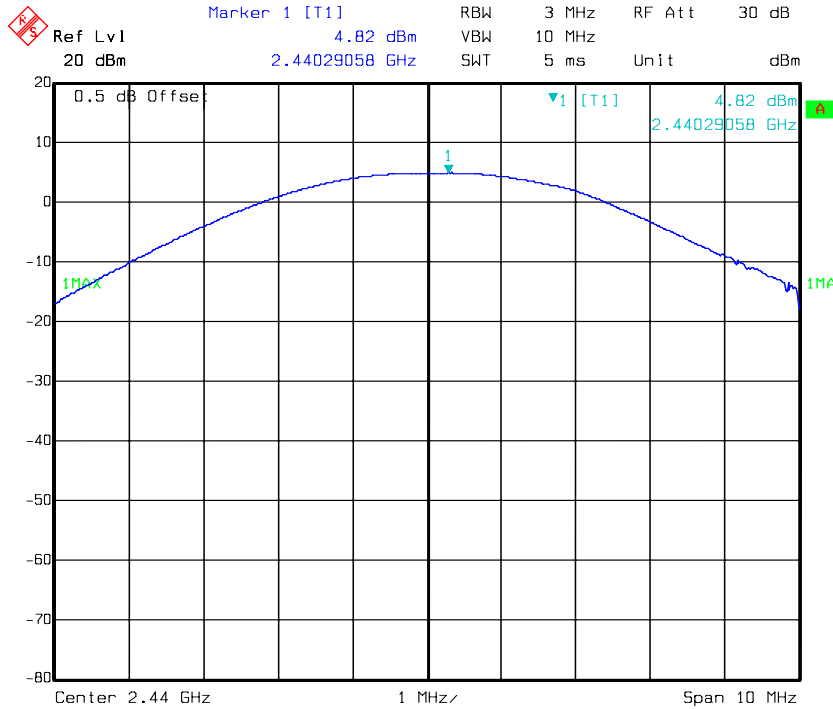
Test Result: Compliant. Please refer to the following table.

Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Limit (dBm)
Low	2402	5.44	30
Middle	2440	4.82	30
High	2480	4.95	30

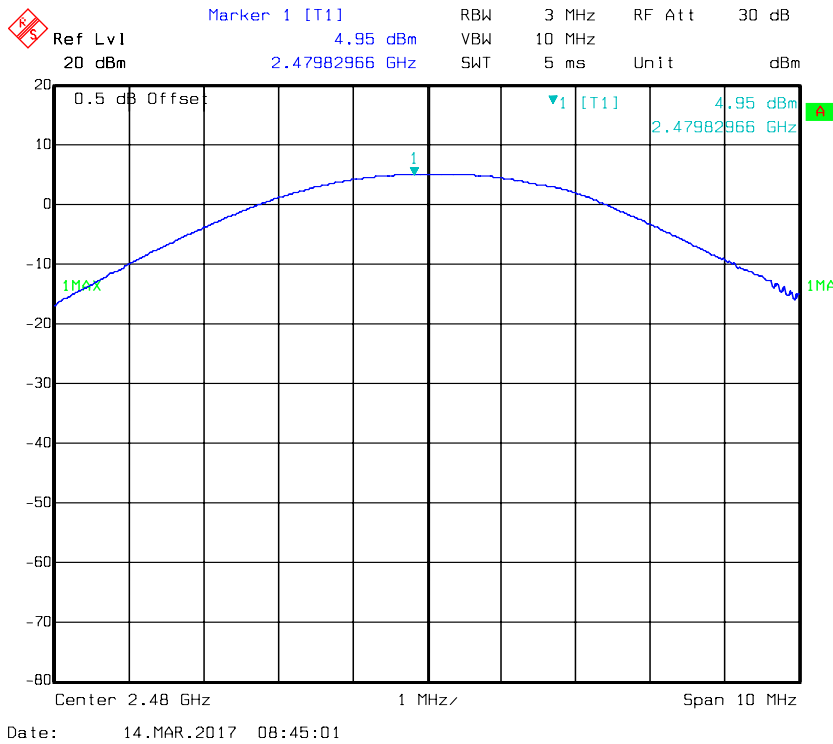
### Low Channel



### Middle Channel



### High Channel



## **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**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
N/A	RF Cable	N/A	N/A	Each Time	/

\* **Statement of Traceability:** BAAC (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

<b>Temperature:</b>	19.3 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	95.4 kPa

*\* The testing was performed by Kevin Hu on 2017-03-14.*

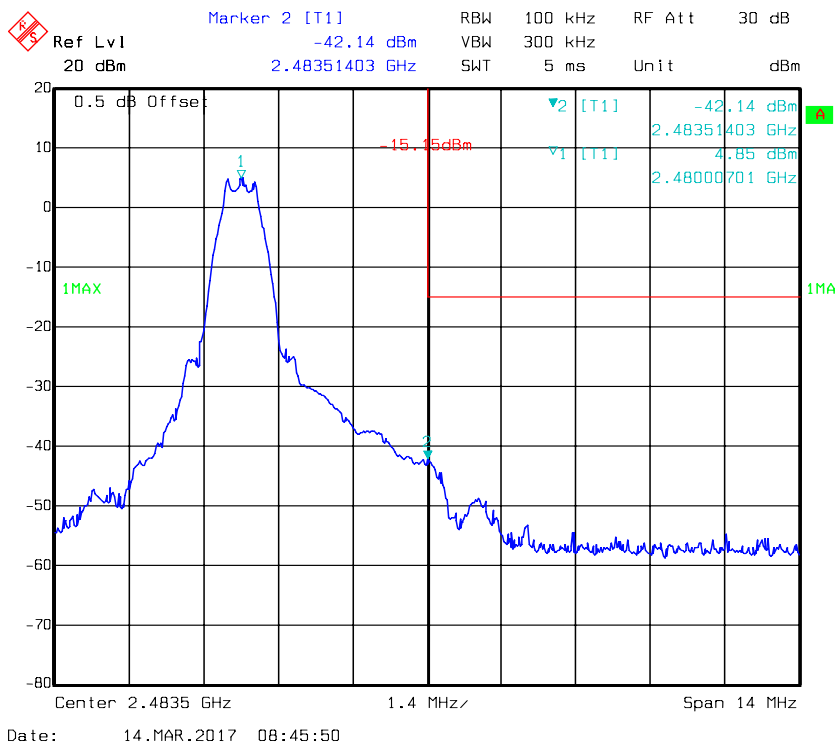
*Test mode: Transmitting*

*Test Result: Compliant. Please refer to following 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

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 channel bandwidth.
4. Use the peak marker function to determine the maximum power level in any 3 kHz band segment within the fundamental EBW.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
N/A	RF Cable	N/A	N/A	Each Time	/

\* **Statement of Traceability:** BAACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

Temperature:	19.3 °C
Relative Humidity:	56 %
ATM Pressure:	95.4 kPa

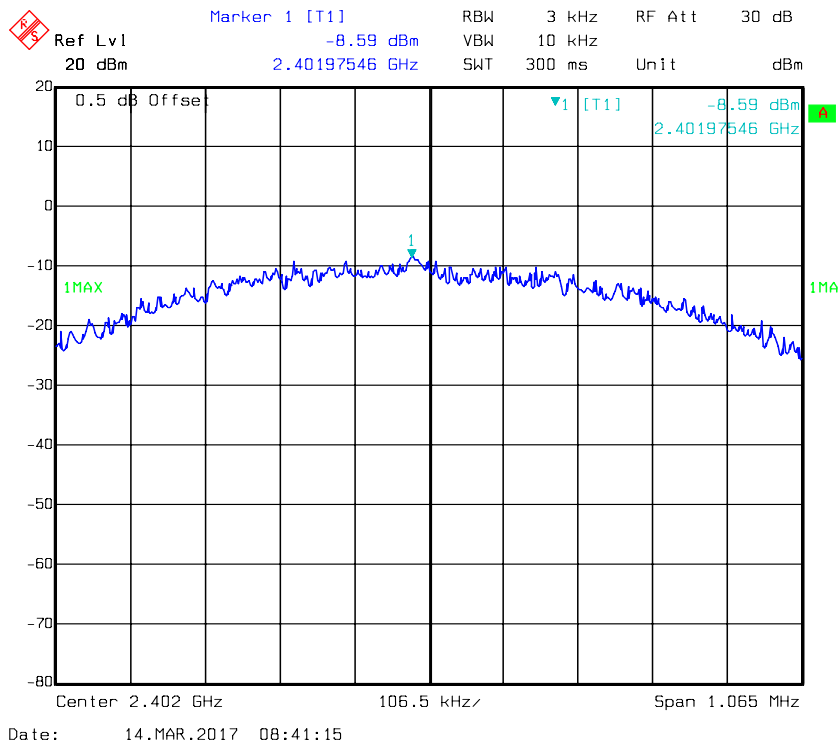
\* The testing was performed by Kevin Hu on 2017-03-14.

Test Mode: Transmitting

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

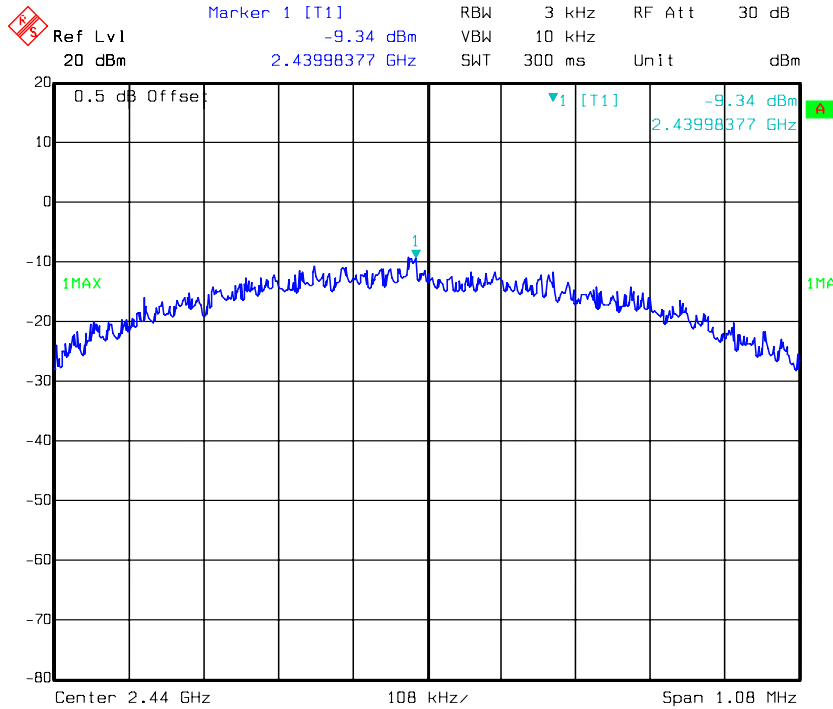
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
Low	2402	-8.59	≤8
Middle	2440	-9.34	≤8
High	2480	-8.89	≤8

Low Channel

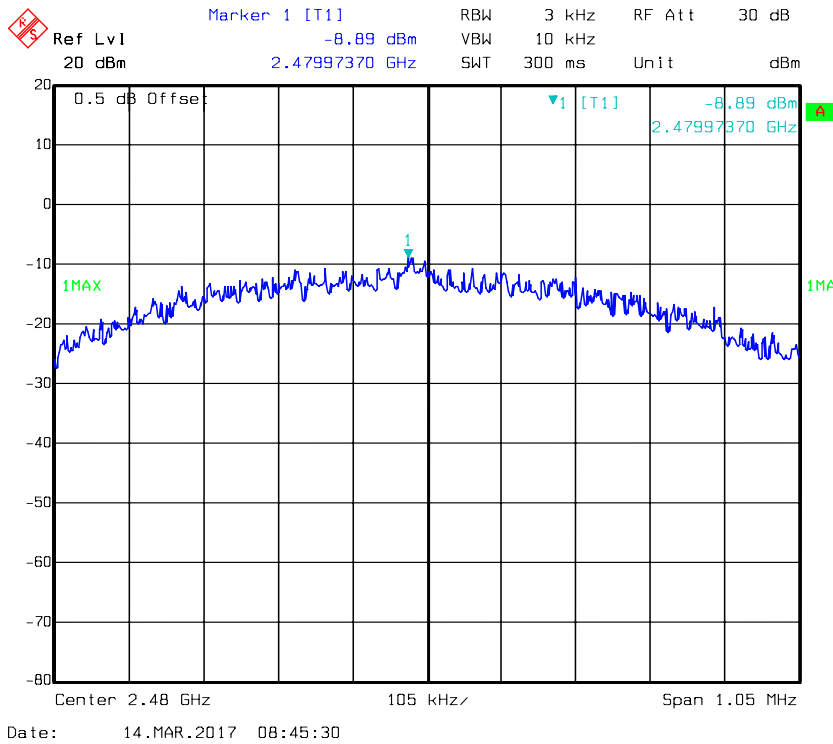




### Middle Channel



### High Channel



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