

## FCC PART 15.247

## TEST REPORT

For

### Suzhou SvenTech Co., LTD

No. 77, Suhong Middle Road, SIP, Suzhou, Jiangsu Province, China

**FCC ID: 2ALU9-LUNA-P-S**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Luna play smart
<b>Test Engineer:</b> Ada Yu <i>Ada Yu</i>	
<b>Report Number:</b> RKS170401001-00B	
<b>Report Date:</b> 2017-06-14	
<b>Reviewed By:</b> Oscar Ye <i>Oscar Ye</i> RF Leader	
<b>Prepared By:</b> Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan, Jiangsu province, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>	

**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. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

## **TABLE OF CONTENTS**

<b>GENERAL INFORMATION.....</b>	<b>3</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	3
OBJECTIVE .....	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY .....	3
MEASUREMENT UNCERTAINTY .....	4
TEST FACILITY .....	4
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>5</b>
DESCRIPTION OF TEST CONFIGURATION .....	5
EQUIPMENT MODIFICATIONS .....	5
EUT EXERCISE SOFTWARE .....	5
SUPPORT EQUIPMENT LIST AND DETAILS .....	6
EXTERNAL I/O CABLE.....	6
BLOCK DIAGRAM OF TEST SETUP .....	7
<b>SUMMARY OF TEST RESULTS .....</b>	<b>8</b>
<b>TEST EQUIPMENT LIST .....</b>	<b>9</b>
<b>FCC§15.247 (i), §1.1310 &amp;§2.1093 –RF EXPOSURE .....</b>	<b>10</b>
APPLICABLE STANDARD .....	10
MEASUREMENT RESULT .....	10
<b>FCC §15.203 - ANTENNA REQUIREMENT.....</b>	<b>11</b>
APPLICABLE STANDARD .....	11
ANTENNA CONNECTOR CONSTRUCTION .....	11
<b>FCC §15.209, §15.205 &amp; §15.247(d) - SPURIOUS EMISSIONS.....</b>	<b>12</b>
APPLICABLE STANDARD .....	12
EUT SETUP .....	12
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP .....	13
TEST PROCEDURE .....	13
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	13
TEST RESULTS SUMMARY .....	13
TEST DATA .....	14
<b>FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH.....</b>	<b>18</b>
APPLICABLE STANDARD .....	18
TEST PROCEDURE .....	18
TEST DATA .....	18
<b>FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER.....</b>	<b>21</b>
APPLICABLE STANDARD .....	21
TEST PROCEDURE .....	21
TEST DATA .....	21
<b>FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE.....</b>	<b>24</b>
APPLICABLE STANDARD .....	24
TEST PROCEDURE .....	24
TEST DATA .....	24
<b>FCC §15.247(e) - POWER SPECTRAL DENSITY .....</b>	<b>26</b>
APPLICABLE STANDARD .....	26
TEST PROCEDURE .....	26
TEST DATA .....	26

## GENERAL INFORMATION

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

Applicant	Suzhou SvenTech Co., LTD
Tested Model	Luna play smart
Product Type	Personal handheld facial massager
Dimension	600 mm(L)×190mm(W)×570mm(H)
Power Supply	DC 3.0V from battery

*\*All measurement and test data in this report was gathered from production sample serial number: 20170401001.  
(Assigned by the BACL. The EUT supplied by the applicant was received on 2017-04-01)*

### Objective

This report is prepared on behalf of Suzhou SvenTech Co., LTD in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules.

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

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

No Related Submittal(s)/Grant(s).

### 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 and FCC KDB558074 D01 DTS Meas Guidance v04.

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

**Measurement Uncertainty**

Item		Uncertainty
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
Occupied Bandwidth		0.5kHz
Temperature		1.0°C
Humidity		6%

**Test Facility**

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road,Kunshan,Jiangsu province,China.

Test site at Bay Area Compliance Laboratories Corp. (Kunshan) 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 November 06, 2014. 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.: 815570. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

### Description of Test Configuration

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

## Equipment Modifications

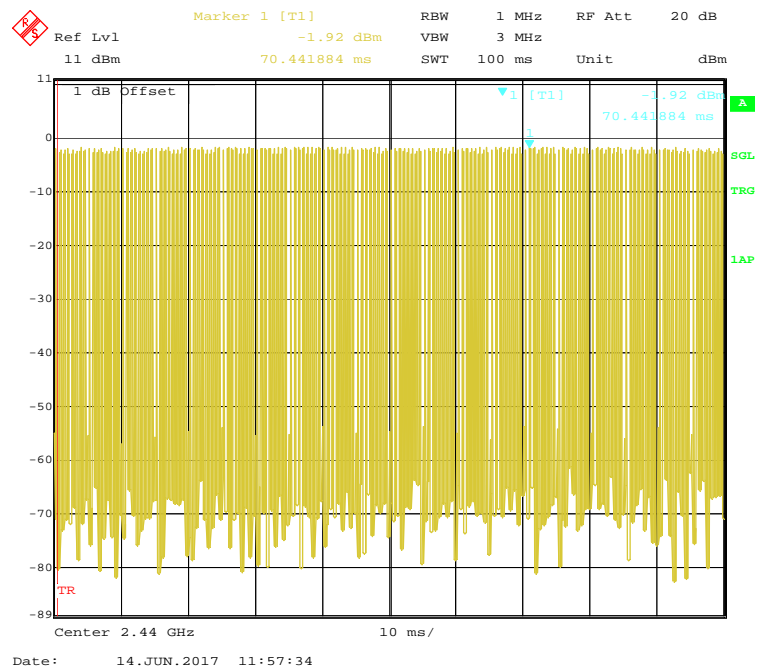
# EUT Exercise Software

The device was tested with 60.26% duty cycle and the worst case was performed as below:

### Middle Channel duty cycle



## Middle Channel duty cycle



Mode	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting	10log(1/x)
BLE	60.26%	0.377	2.653	3kHz	2.20

## Support Equipment List and Details

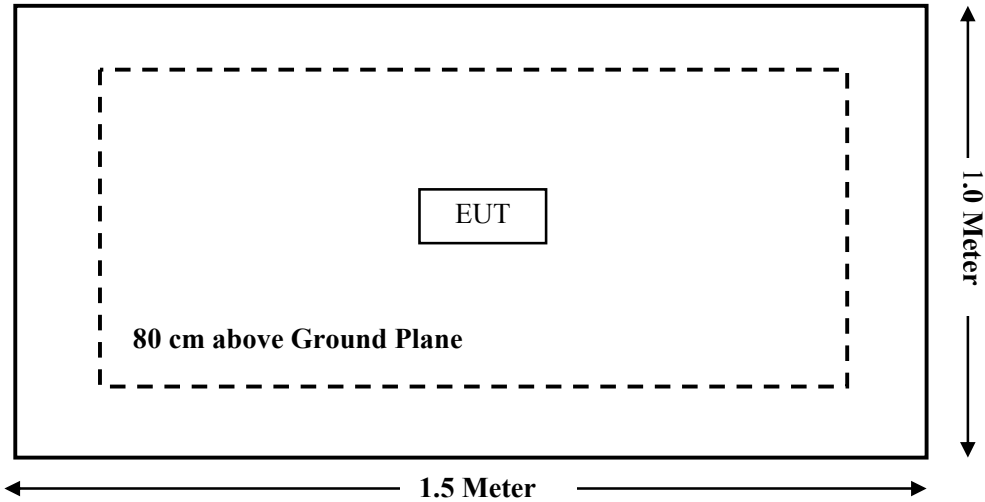
Manufacturer	Description	Model	Serial Number
/	/	/	/

## External I/O Cable

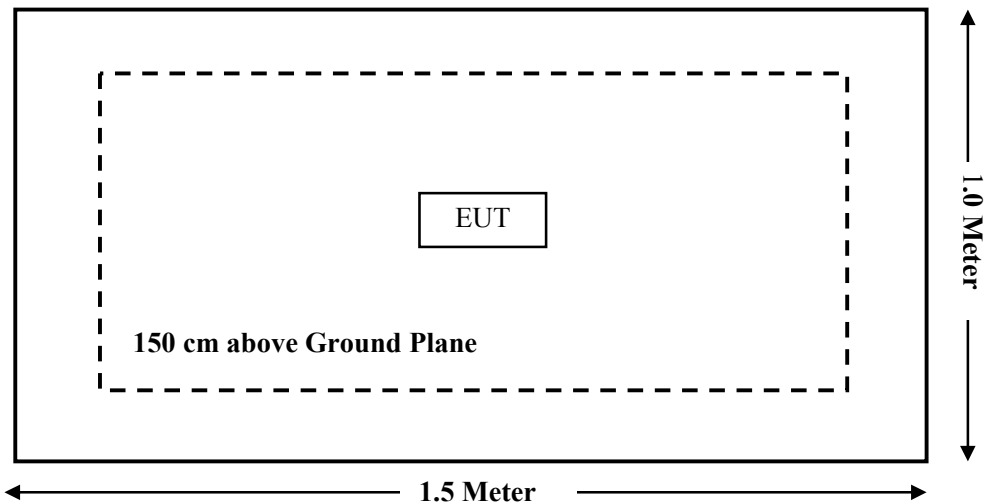
Cable Description	Length (m)	From Port	To
/	/	/	/

## Block Diagram of Test Setup

For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (1)& §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Not Applicable
§15.247(d)	Spurious Emissions at Antenna Port	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Conducted Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

Not Applicable: The EUT is only power by battery.



**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Radiated Emission Test</b>					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-24
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2016-11-25	2017-11-24
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2019-01-08
ETS	Horn Antenna	3115	6229	2016-01-11	2019-01-10
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-10-18	2019-10-17
Sonoma Instrunent	Pre-amplifier	330	171377	2016-12-12	2017-12-11
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-12-12	2017-12-11
R&S	Auto test Software	EMC32	100361	/	/
Haojintech	Coaxial Cable	Cable-1	001	2016-12-12	2017-12-11
Haojintech	Coaxial Cable	Cable-2	002	2016-12-12	2017-12-11
Haojintech	Coaxial Cable	Cable-3	003	2016-12-12	2017-12-11
MICRO-COAX	Coaxial Cable	Cable-4	004	2016-12-12	2017-12-11
MICRO-COAX	Coaxial Cable	Cable-5	005	2016-12-12	2017-12-11
<b>RF Conducted Test</b>					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2016-09-21	2017-09-20
Agilent	Power Meter	N1912A	MY5000492	2016-11-18	2017-11-17
Agilent	Power Sensor	N1921A	MY54210024	2016-11-18	2017-11-17
Seventech	RF Cable	N/A	N/A	2017-06-14	2018-06-13

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

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

### **Applicable Standard**

According to §2.1093 and §1.1307(b)(1), 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:

For 100 MHz to 6 GHz and test separation distances  $\leq 50$  mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

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

- $f(\text{GHz})$  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
- When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion

### **Measurement Result**

Frequency Range	Conducted Average power	Conducted Average power	Minimum test separation distance required for the exposure conditions
(MHz)	(dBm)	(mW)	(mm)
2402-2480	-5.20	0.30	5.00

#### **Note:**

Turn up power  $-6.7 \pm 1.5$  dBm, which is declared by the manufacturer.

**Result:**  $[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})]$

- $[\sqrt{f(\text{GHz})}] = 0.3/5 \cdot \sqrt{2.48} = \mathbf{0.09} < \mathbf{3}$ . So no SAR test is needed.

---

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

---

### **Applicable Standard**

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

- a. Antenna must be permanently attached to the unit.
  - b. Antenna must use a unique type of connector to attach to the EUT.
- Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

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

### **Antenna Connector Construction**

The EUT has a PCB antenna arrangement for BLE, which the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

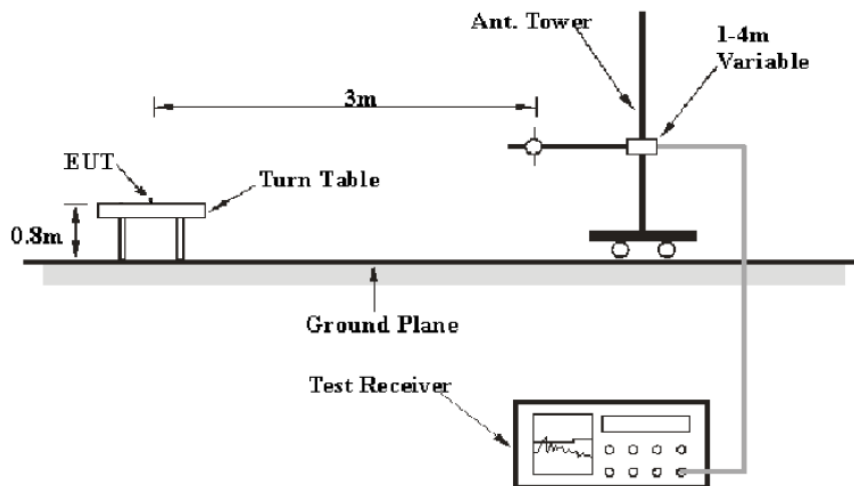
**Result:** Compliance.

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

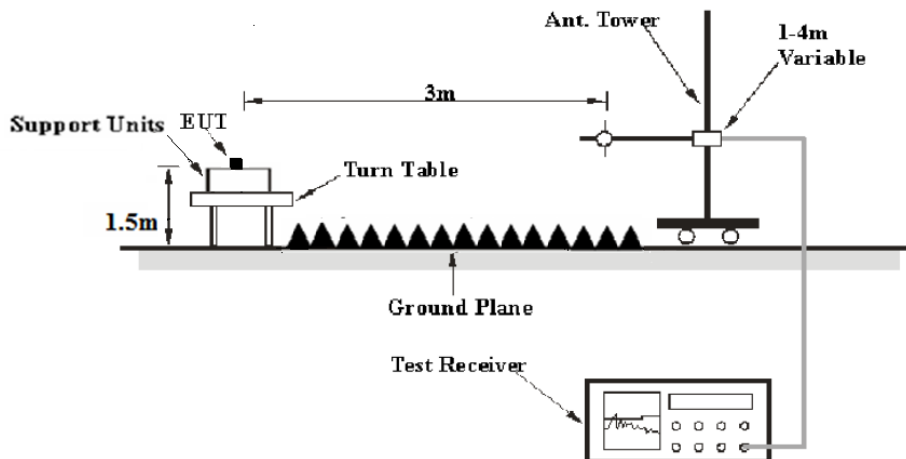
FCC §15.247 (d); §15.209; §15.205;

**EUT Setup**

**Below 1 GHz:**



**Above 1GHz:**



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

## EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP

Frequency Range	RBW	Video B/W	Duty cycle	Detector
1GHz – 25GHz	1MHz	3 MHz	Any	PK
	1MHz	10 Hz	>98%	Ave.
	1MHz	1/T	<98%	

## 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 Results Summary

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

**Test Data****Environmental Conditions**

<b>Temperature:</b>	24.1 °C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	101.3kPa

The testing was performed by Ada Yu on 2017-06-14.

EUT operation mode: Transmitting (Scan with X-Axis, Y-Axis and Z-Axis position, the worst case was recorded)

**30MHz-25GHz**

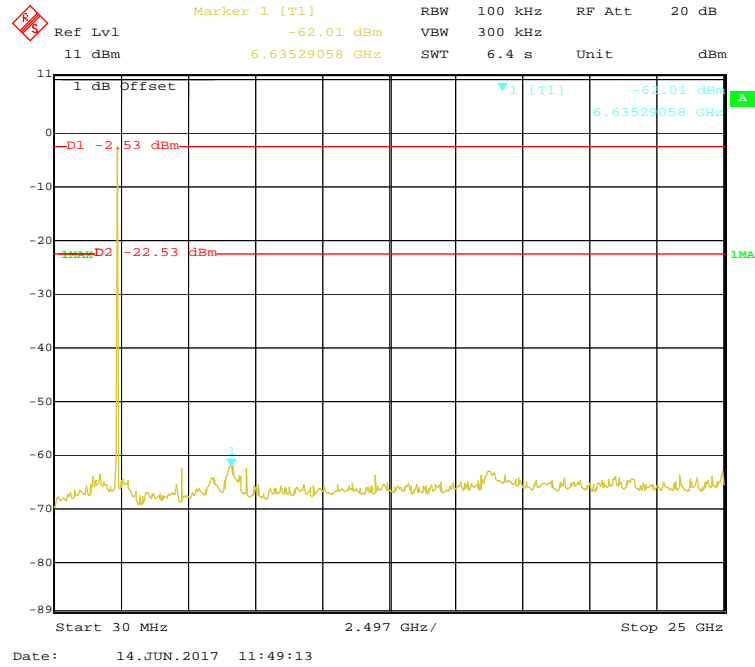
Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/205/209	
	Reading	Detector		Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave.)	Degree	(cm)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
Low Channel (2402 MHz)									
320.51	31.05	QP	35	169	V	1.33	32.38	46	13.62
2402.00	96.59	PK	133	174	V	-6.19	90.40	/	/
2402.00	82.54	Ave	133	174	V	-6.19	76.35	/	/
2402.00	98.93	PK	39	129	H	-6.19	92.74	/	/
2402.00	84.26	Ave	39	129	H	-6.19	78.07	/	/
2390.00	59.24	PK	347	131	H	-6.22	53.02	74	20.98
2390.00	39.64	Ave	347	131	H	-6.22	33.42	54	20.58
2400.00	66.81	PK	215	228	H	-6.19	60.62	74	13.38
2400.00	48.59	Ave	215	228	H	-6.19	42.40	54	11.60
3210.23	52.04	PK	77	203	V	-2.69	49.35	74	24.65
3210.23	35.61	Ave	77	203	V	-2.69	32.92	54	21.08
4804.00	50.24	PK	347	224	H	1.61	51.85	74	22.15
4804.00	32.18	Ave	347	224	H	1.61	33.79	54	20.21
7206.00	42.53	PK	46	204	H	7.55	50.08	74	23.92
7206.00	29.49	Ave	46	204	H	7.55	37.04	54	16.96

Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/205/209	
	Reading	Detector		Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave.)	Degree	(cm)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
Middle Channel (2440 MHz)									
320.51	31.10	QP	349	144	V	1.33	32.43	46	13.57
2440.00	95.77	PK	351	128	V	-6.17	89.60	/	/
2440.00	81.64	Ave	351	128	V	-6.17	75.47	/	/
2440.00	98.05	PK	221	163	H	-6.17	91.88	/	/
2440.00	83.38	Ave	221	163	H	-6.17	77.21	/	/
1604.23	51.26	PK	235	211	H	-8.99	42.27	74	31.73
1604.23	37.54	Ave	235	211	H	-8.99	28.55	54	25.45
3211.68	49.13	PK	321	217	H	-2.69	46.44	74	27.56
3211.68	35.21	Ave	321	217	H	-2.69	32.52	54	21.48
4880.00	51.23	PK	35	126	V	1.79	53.02	74	20.98
4880.00	34.78	Ave	35	126	V	1.79	36.57	54	17.43
6451.24	49.39	PK	258	241	H	5.73	55.12	74	18.88
6451.24	31.31	Ave	258	241	H	5.73	37.04	54	16.96
7320.00	41.66	PK	6	126	H	7.67	49.33	74	24.67
7320.00	28.62	Ave	6	126	H	7.67	36.29	54	17.71

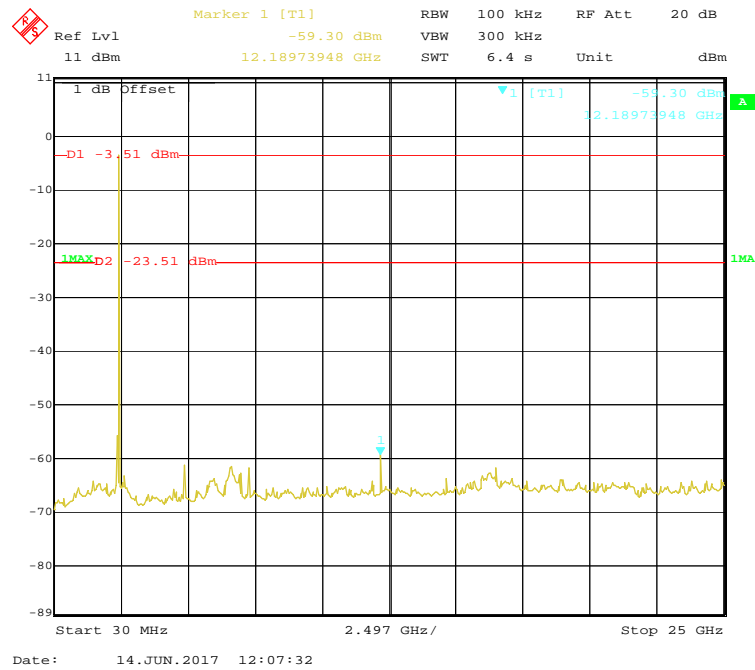
Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/205/209	
	Reading	Detector		Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave.)	Degree	(cm)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
High Channel (2480MHz)									
320.51	31.13	QP	8	120	V	1.33	32.46	46	13.54
2480.00	93.85	PK	82	104	V	-6.01	87.84	/	/
2480.00	79.68	Ave	82	104	V	-6.01	73.67	/	/
2480.00	96.15	PK	24	149	H	-6.01	90.14	/	/
2480.00	81.45	Ave	24	149	H	-6.01	75.44	/	/
2483.50	60.18	PK	158	145	H	-6.01	54.17	74	19.83
2483.50	45.83	Ave	158	145	H	-6.01	39.82	54	14.18
1605.22	47.14	PK	343	140	H	-8.99	38.15	74	35.85
1605.22	33.23	Ave	343	140	H	-8.99	24.24	54	29.76
4960.00	49.27	PK	33	128	V	1.97	51.24	74	22.76
4960.00	32.79	Ave	33	128	V	1.97	34.76	54	19.24
6454.87	47.48	PK	103	182	H	5.73	53.21	74	20.79
6454.87	29.38	Ave	103	182	H	5.73	35.11	54	18.89
7440.00	39.70	PK	258	187	H	7.79	47.49	74	26.51
7440.00	26.67	Ave	258	187	H	7.79	34.46	54	19.54

# Conducted Spurious Emissions at Antenna Port

## Low Channel

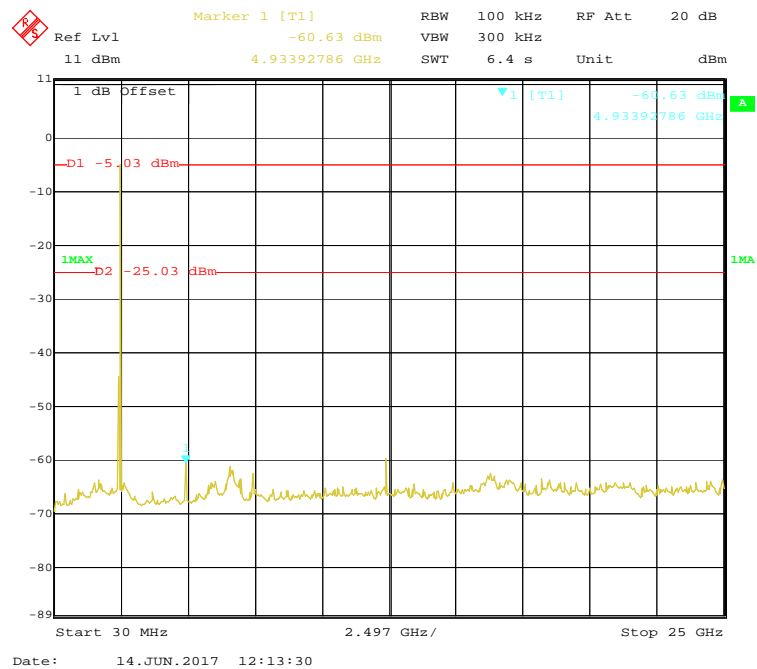


## Middle Channel





High Channel



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

### Applicable Standard

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

### Test Procedure

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



### Test Data

#### Environmental Conditions

<b>Temperature:</b>	24 °C
<b>Relative Humidity:</b>	55 %
<b>ATM Pressure:</b>	101.3 kPa

*The testing was performed by Ada Yu on 2017-06-14.*

**Test Result:** Pass.

Please refer to the following tables and plots.

*EUT operation mode: Transmitting*

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
Low	2402	0.741	≥0.5
Middle	2440	0.758	≥0.5
High	2480	0.762	≥0.5

Delta 1 [T1] 0.13 dB RBW 100 kHz RF Att 20 dB  
 Ref Lvl 11 dBm VBW 300 kHz  
 11 dBm 741.48296593 kHz SWT 5 ms Unit dBm

1 dB Offset

D1 -3.37 dBm

D2 -9.37 dBm

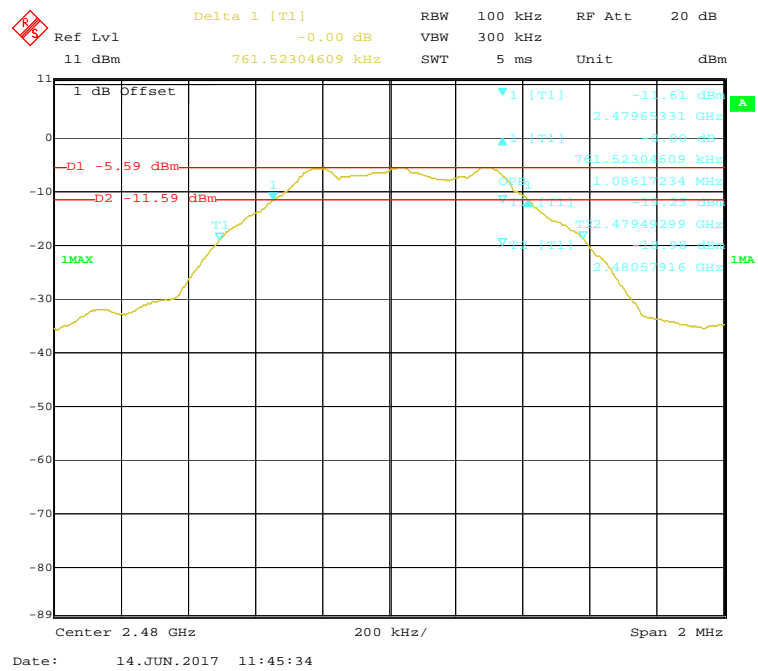
1MAX

Center 2.402 GHz 200 kHz/ Span 2 MHz

Delta 1 [T1] -0.04 dB  
 RBW 100 kHz  
 Ref Lvl 11 dBm  
 VBW 300 kHz  
 1 dB Offset  
 1 dBm  
 757.51503006 kHz  
 SWT 5 ms  
 Unit dBm  
 20 dB

1 dB Offset  
 D1 -2.43 dBm  
 D2 -8.43 dBm  
 1MAX  
 T1  
 T2  
 T3  
 T4  
 T5  
 T6  
 T7  
 T8  
 T9  
 T10  
 T11  
 T12  
 T13  
 T14  
 T15  
 T16  
 T17  
 T18  
 T19  
 T20  
 T21  
 T22  
 T23  
 T24  
 T25  
 T26  
 T27  
 T28  
 T29  
 T30  
 T31  
 T32  
 T33  
 T34  
 T35  
 T36  
 T37  
 T38  
 T39  
 T40  
 T41  
 T42  
 T43  
 T44  
 T45  
 T46  
 T47  
 T48  
 T49  
 T50  
 T51  
 T52  
 T53  
 T54  
 T55  
 T56  
 T57  
 T58  
 T59  
 T60  
 T61  
 T62  
 T63  
 T64  
 T65  
 T66  
 T67  
 T68  
 T69  
 T70  
 T71  
 T72  
 T73  
 T74  
 T75  
 T76  
 T77  
 T78  
 T79  
 T80  
 T81  
 T82  
 T83  
 T84  
 T85  
 T86  
 T87  
 T88  
 T89  
 T90  
 T91  
 T92  
 T93  
 T94  
 T95  
 T96  
 T97  
 T98  
 T99  
 T100  
 T101  
 T102  
 T103  
 T104  
 T105  
 T106  
 T107  
 T108  
 T109  
 T110  
 T111  
 T112  
 T113  
 T114  
 T115  
 T116  
 T117  
 T118  
 T119  
 T120  
 T121  
 T122  
 T123  
 T124  
 T125  
 T126  
 T127  
 T128  
 T129  
 T130  
 T131  
 T132  
 T133  
 T134  
 T135  
 T136  
 T137  
 T138  
 T139  
 T140  
 T141  
 T142  
 T143  
 T144  
 T145  
 T146  
 T147  
 T148  
 T149  
 T150  
 T151  
 T152  
 T153  
 T154  
 T155  
 T156  
 T157  
 T158  
 T159  
 T160  
 T161  
 T162  
 T163  
 T164  
 T165  
 T166  
 T167  
 T168  
 T169  
 T170  
 T171  
 T172  
 T173  
 T174  
 T175  
 T176  
 T177  
 T178  
 T179  
 T180  
 T181  
 T182  
 T183  
 T184  
 T185  
 T186  
 T187  
 T188  
 T189  
 T190  
 T191  
 T192  
 T193  
 T194  
 T195  
 T196  
 T197  
 T198  
 T199  
 T200  
 T201  
 T202  
 T203  
 T204  
 T205  
 T206  
 T207  
 T208  
 T209  
 T210  
 T211  
 T212  
 T213  
 T214  
 T215  
 T216  
 T217  
 T218  
 T219  
 T220  
 T221  
 T222  
 T223  
 T224  
 T225  
 T226  
 T227  
 T228  
 T229  
 T230  
 T231  
 T232  
 T233  
 T234  
 T235  
 T236  
 T237  
 T238  
 T239  
 T240  
 T241  
 T242  
 T243  
 T244  
 T245  
 T246  
 T247  
 T248  
 T249  
 T250  
 T251  
 T252  
 T253  
 T254  
 T255  
 T256  
 T257  
 T258  
 T259  
 T260  
 T261  
 T262  
 T263  
 T264  
 T265  
 T266  
 T267  
 T268  
 T269  
 T270  
 T271  
 T272  
 T273  
 T274  
 T275  
 T276  
 T277  
 T278  
 T279  
 T280  
 T281  
 T282  
 T283  
 T284  
 T285  
 T286  
 T287  
 T288  
 T289  
 T290  
 T291  
 T292  
 T293  
 T294  
 T295  
 T296  
 T297  
 T298  
 T299  
 T300  
 T301  
 T302  
 T303  
 T304  
 T305  
 T306  
 T307  
 T308  
 T309  
 T310  
 T311  
 T312  
 T313  
 T314  
 T315  
 T316  
 T317  
 T318  
 T319  
 T320  
 T321  
 T322  
 T323  
 T324  
 T325  
 T326  
 T327  
 T328  
 T329  
 T330  
 T331  
 T332  
 T333  
 T334  
 T335  
 T336  
 T337  
 T338  
 T339  
 T340  
 T341  
 T342  
 T343  
 T344  
 T345  
 T346  
 T347  
 T348  
 T349  
 T350  
 T351  
 T352  
 T353  
 T354  
 T355  
 T356  
 T357  
 T358  
 T359  
 T360  
 T361  
 T362  
 T363  
 T364  
 T365  
 T366  
 T367  
 T368  
 T369  
 T370  
 T371  
 T372  
 T373  
 T374  
 T375  
 T376  
 T377  
 T378  
 T379  
 T380  
 T381  
 T382  
 T383  
 T384  
 T385  
 T386  
 T387  
 T388  
 T389  
 T390  
 T391  
 T392  
 T393  
 T394  
 T395  
 T396  
 T397  
 T398  
 T399  
 T400  
 T401  
 T402  
 T403  
 T404  
 T405  
 T406  
 T407  
 T408  
 T409  
 T410  
 T411  
 T412  
 T413  
 T414  
 T415  
 T416  
 T417  
 T418  
 T419  
 T420  
 T421  
 T422  
 T423  
 T424  
 T425  
 T426  
 T427  
 T428  
 T429  
 T430  
 T431  
 T432  
 T433  
 T434  
 T435  
 T436  
 T437  
 T438  
 T439  
 T440  
 T441  
 T442  
 T443  
 T444  
 T445  
 T446  
 T447  
 T448  
 T449  
 T450  
 T451  
 T452  
 T453  
 T454  
 T455  
 T456  
 T457  
 T458  
 T459  
 T460  
 T461  
 T462  
 T463  
 T464  
 T465  
 T466  
 T467  
 T468  
 T469  
 T470  
 T471  
 T472  
 T473  
 T474  
 T475  
 T476  
 T477  
 T478  
 T479  
 T480  
 T481  
 T482  
 T483  
 T484  
 T485

# High Channel



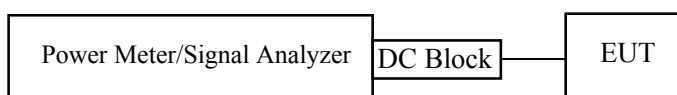
## FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

### Applicable Standard

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

### Test Procedure

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



Note: We use signal Analyzer for peak power test and power meter for average power test.

### Test Data

#### Environmental Conditions

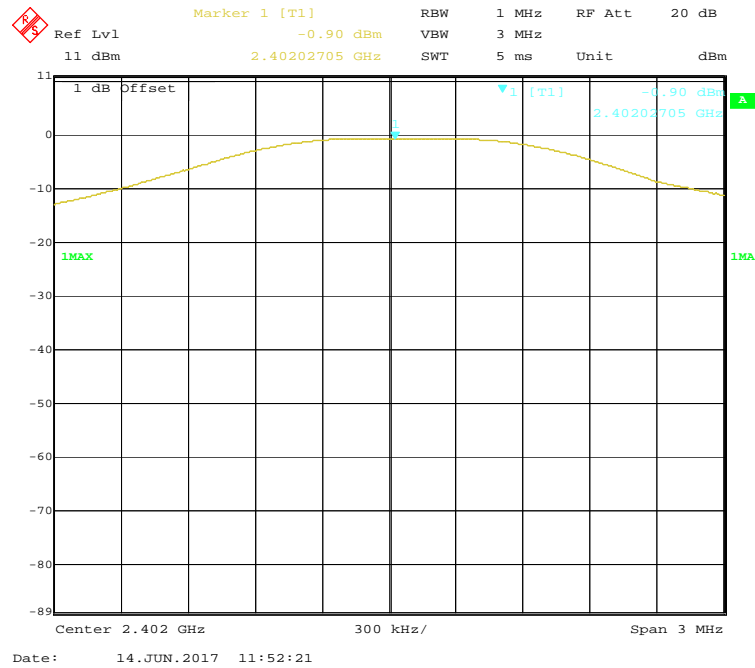
<b>Temperature:</b>	23.8°C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	101.3 kPa

The testing was performed by Ada Yu on 2017-06-14.

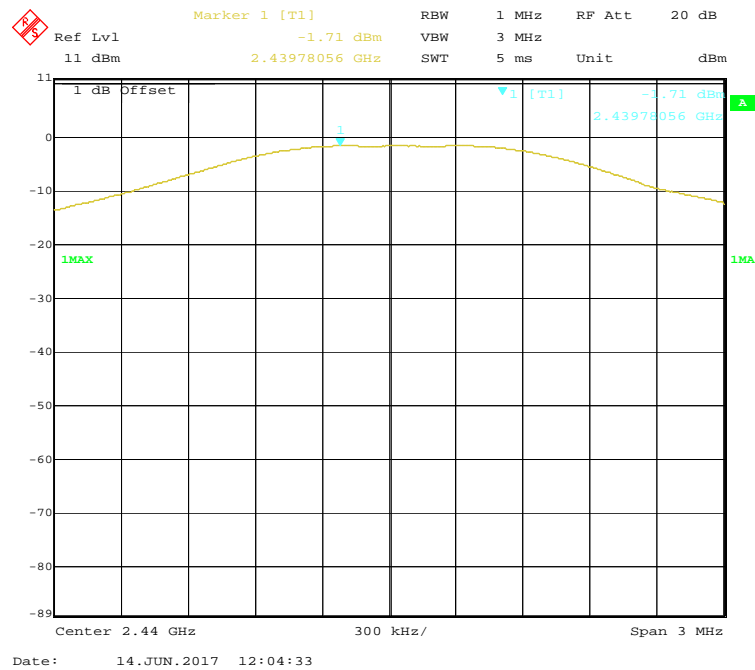
EUT operation mode: Transmitting

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Max Conducted Average Output Power (dBm)	Limit (dBm)	Result
Low	2402	-0.90	-5.29	30	Pass
Middle	2440	-1.71	-6.10	30	Pass
High	2480	-3.75	-8.14	30	Pass

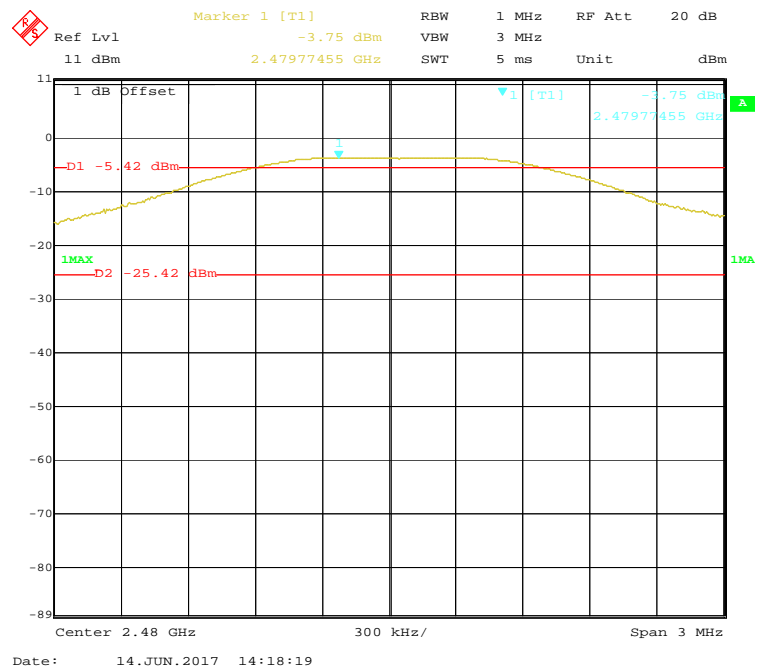
### Low Channel power



### Middle Channel power



High Channel power



**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 Data****Environmental Conditions**

<b>Temperature:</b>	24.3 °C
<b>Relative Humidity:</b>	55 %
<b>ATM Pressure:</b>	101.3 kPa

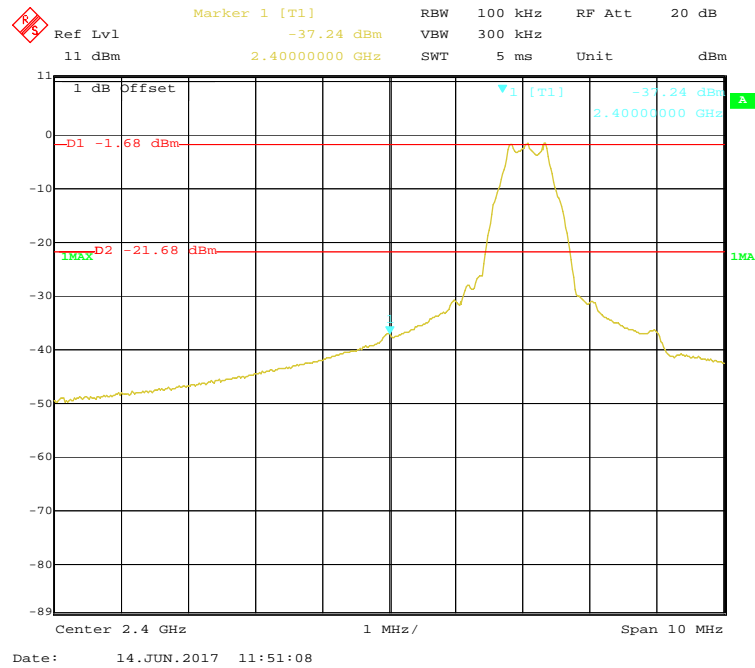
*The testing was performed by Ada Yu on 2017-06-14.*

**Test Result:** *Compliance*

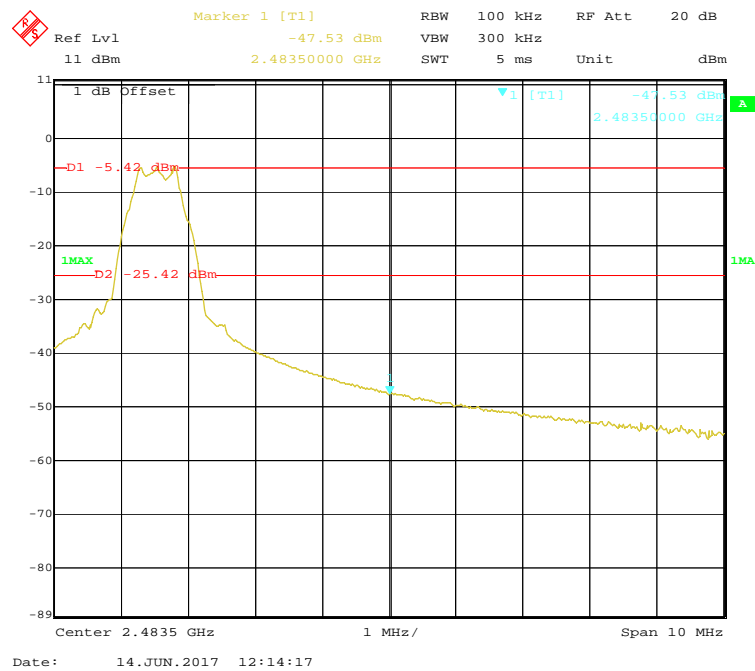
Please refer to the following table and plots.



### BLE: Band Edge, Left Side



### BLE: Band Edge, Right Side



## FCC §15.247(e) - POWER SPECTRAL DENSITY

### Applicable Standard

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

### Test Procedure

According to KDB558074 D01 DTS Meas Guidance v04.

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

### Test Data

#### Environmental Conditions

Temperature:	24.1 °C
Relative Humidity:	54 %
ATM Pressure:	101.3 kPa

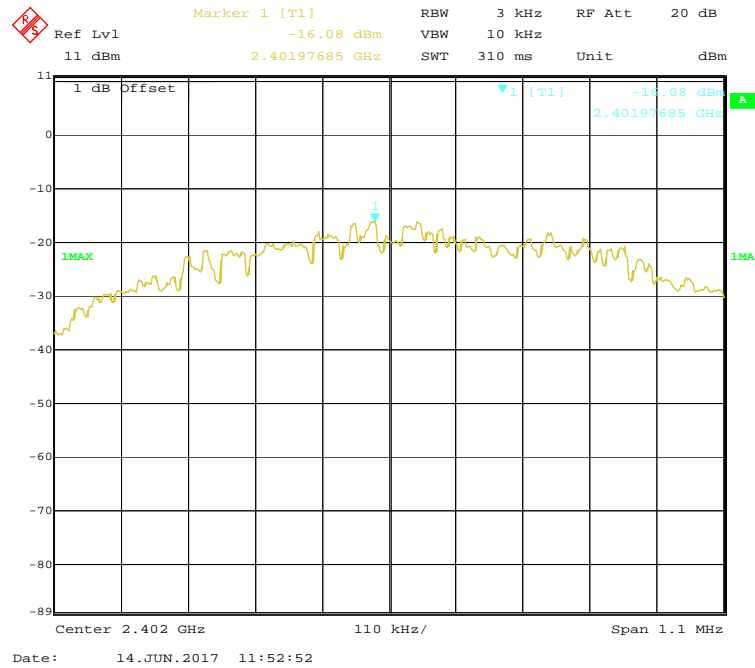
The testing was performed by Ada Yu on 2017-06-14.

EUT operation mode: Transmitting

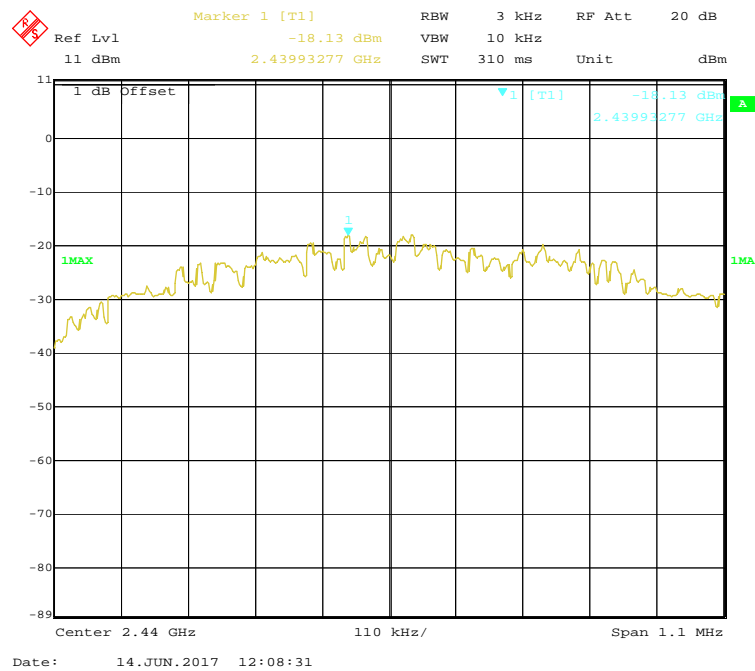
**Test Result:** Pass

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
Low	2402	-16.08	$\leq 8$
Middle	2440	-18.13	$\leq 8$
High	2480	-19.63	$\leq 8$

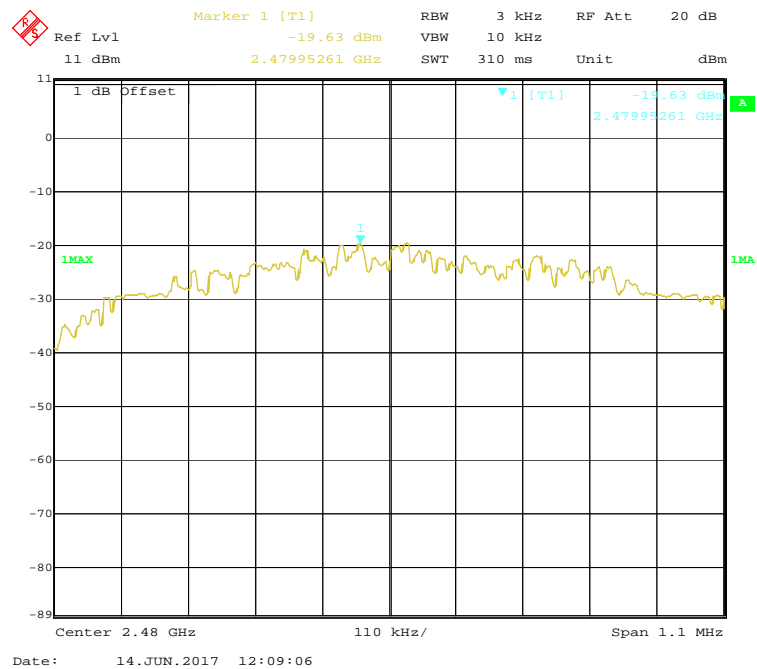
### Power Spectral Density , Low Channel



### Power Spectral Density , Middle Channel



Power Spectral Density , High Channel



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