



# FCC PART 15.247 TEST REPORT

For

## Hobbico Inc

2904 Research Road , Champaign, Illinois, United States

**FCC ID: IYFMR100B**

<b>Report Type:</b> Original Report	<b>Product Name:</b> VISTA UAV QUADCOPTER RTF
<b>Test Engineer:</b> <u>Kevin Hu</u>	<i>Kevin Hu</i>
<b>Report Number:</b> <u>RDG170428004</u>	
<b>Report Date:</b> <u>2017-06-10</u>	
<b>Reviewed By:</b> <u>Henry Ding</u> EMC Leader	<i>Henry Ding</i>
<b>Test Laboratory:</b>	Bay Area Compliance Laboratories Corp. (Chengdu) No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, China Tel: 028-65523123, Fax: 028-65525125 www.baclcorp.com

**Note:** This test report was 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. (Chengdu). Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. This report was valid only with a valid digital signature.

## TABLE OF CONTENTS

<b>GENERAL INFORMATION .....</b>	<b>4</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	4
OBJECTIVE .....	4
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY .....	4
TEST FACILITY.....	5
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>6</b>
DESCRIPTION OF TEST CONFIGURATION .....	6
EQUIPMENT MODIFICATIONS .....	6
EUT EXERCISE SOFTWARE.....	6
BLOCK DIAGRAM OF TEST SETUP .....	6
<b>SUMMARY OF TEST RESULTS.....</b>	<b>8</b>
<b>FCC §15.247 (i) &amp; §1.1310 &amp; §2.1093- RF EXPOSURE.....</b>	<b>9</b>
APPLICABLE STANDARD.....	9
<b>FCC §15.203 - ANTENNA REQUIREMENT .....</b>	<b>10</b>
APPLICABLE STANDARD.....	10
ANTENNA CONNECTOR CONSTRUCTION .....	10
<b>FCC §15.209, §15.205 &amp; §15.247(d) - SPURIOUS EMISSIONS.....</b>	<b>11</b>
APPLICABLE STANDARD.....	11
EUT SETUP.....	11
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP .....	12
TEST PROCEDURE .....	12
TEST EQUIPMENT LIST AND DETAILS .....	12
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	13
TEST DATA .....	13
<b>FCC §15.247(a) (1) - CHANNEL SEPARATION TEST .....</b>	<b>15</b>
APPLICABLE STANDARD.....	15
TEST EQUIPMENT LIST AND DETAILS .....	15
TEST PROCEDURE .....	15
TEST DATA .....	15
<b>FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING .....</b>	<b>17</b>
APPLICABLE STANDARD.....	17
TEST PROCEDURE .....	17
TEST EQUIPMENT LIST AND DETAILS .....	17
TEST DATA .....	17
<b>FCC §15.247(a) (1) (iii) - QUANTITY OF HOPPING CHANNEL TEST .....</b>	<b>20</b>
APPLICABLE STANDARD.....	20
TEST PROCEDURE .....	20
TEST EQUIPMENT LIST AND DETAILS .....	20
TEST DATA .....	20
<b>FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME).....</b>	<b>23</b>
APPLICABLE STANDARD.....	23
TEST PROCEDURE .....	23
TEST EQUIPMENT LIST AND DETAILS .....	23

TEST DATA .....23

**FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT .....25**

APPLICABLE STANDARD .....25

TEST PROCEDURE .....25

TEST EQUIPMENT LIST AND DETAILS .....25

TEST DATA .....25

**FCC §15.247(d) - BAND EDGES TESTING .....28**

APPLICABLE STANDARD .....28

TEST PROCEDURE .....28

TEST EQUIPMENT LIST AND DETAILS .....28

TEST DATA .....29

## GENERAL INFORMATION

---

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

The **Hobbico Inc**'s product, model number: **MR100 (FCC ID: IYFMR100B)** (the "EUT") in this report was a **VISTA UAV QUADCOPTER RTF**, which was measured approximately: 20 cm (L) x 19 cm (W) x 8 cm (H), rated input voltage: DC6V from battery.

*\*All measurement and test data in this report was gathered from final production sample, serial number: 170428004, the serial number assigned by the BAACL, Chengdu. It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-04-28, and EUT conformed to test requirement.*

### Objective

This report is prepared on behalf of **Hobbico Inc** 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 EUT compliance with FCC Rules Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.247 rules.

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

Part of system submissions with FCC ID: IYFZ1000.

### Test Methodology

All measurements detailed in this Test Report were performed in accordance with ANSI C63.10-2013 "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices".

All of the measurements detailed in this Test Report were performed by Bay Area Compliance Laboratories Corp. (Chengdu).

The Bay Area Compliance Laboratories Corp. Chengdu's measurement Uncertainties (calculated for a k=2 Coverage Factor corresponding to approximately 95% Coverage) were as follows:

-For all of the AC Line Conducted Emissions Tests reported herein:  $\pm 3.17$  dB.  
-For of all of the Direct Antenna Conducted Emissions Tests reported herein:  $\pm 0.56$  dB.

-For of all of the direct Radiated Emissions Tests reported herein are:  
30 MHz to 200 MHz:  $\pm 4.7$  dB;  
200 MHz to 1 GHz:  $\pm 6.0$  dB;  
1 GHz to 6 GHz:  $\pm 5.13$ dB; and,  
6 GHz to 40 GHz:  $\pm 5.47$ dB.

And the uncertainty will not be taken into consideration for all test data recorded in the report.

### **Test Facility**

The test site used by BACL to collect test data is located in the No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, 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 a testing mode provided by manufacturer.

The device employed 71 channels as below list, and 15 channels were selected randomly to use:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2403	25	2427	49	2451
2	2404	26	2428	50	2452
3	2405	27	2429	51	2453
~	~	~	~	~	~
21	2423	38	2440	69	2471
22	2424	39	2441	70	2472
23	2425	40	2442	71	2473
24	2426	41	2443	/	/

3 channels were tested: 2403MHz, 2440MHz and 2473MHz

### Equipment Modifications

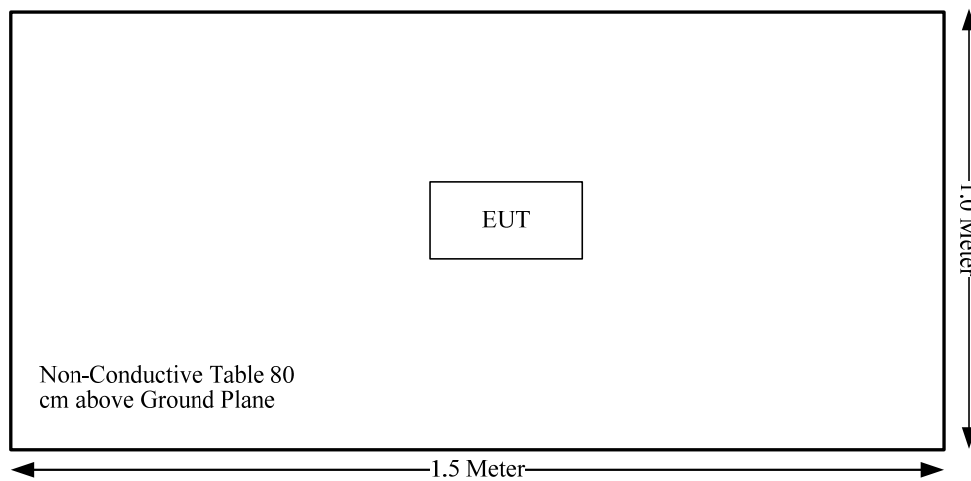
No modification was made to the EUT.

### EUT Exercise Software

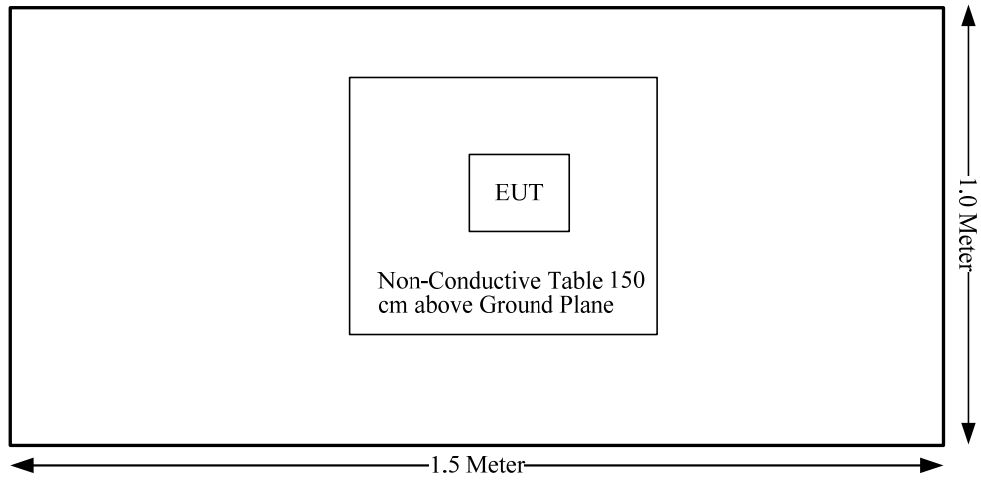
No software was used during testing. The maximum power was configured as default setting.

### Block Diagram of Test Setup

Radiation test below 1GHz:



Radiation test above 1GHz:



## **SUMMARY OF TEST RESULTS**

---

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
FCC §15.247 (i) & §1.1310 & §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Not Applicable
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(1)	20 dB Bandwidth	Compliance
§15.247(a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(1)	Peak Output Power Measurement	Compliance
§15.247(d)	Band Edges	Compliance

Note: Not Applicable: the device was powered by battery.



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

---

### **Applicable Standard**

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

According to KDB447498 D01 General RF Exposure Guidance v06

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  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 device is a hand-held use:**

The maximum tune-up power including tolerance is 8.6 dBm(7.24mW).

$[(\text{max. power of channel, mW}) / (\text{min. test separation distance, mm})] [\sqrt{f(\text{GHz})}]$   
 $= 7.24/5 \cdot (\sqrt{2.473}) = 2.3 < 7.5$

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

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

---

### **Applicable Standard**

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

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

### **Antenna Connector Construction**

The EUT has 1 internal antenna, the antenna gain is 0 dBi, that fulfill the requirement of the item. Please refer to the internal photos.

**Result:** Compliance.

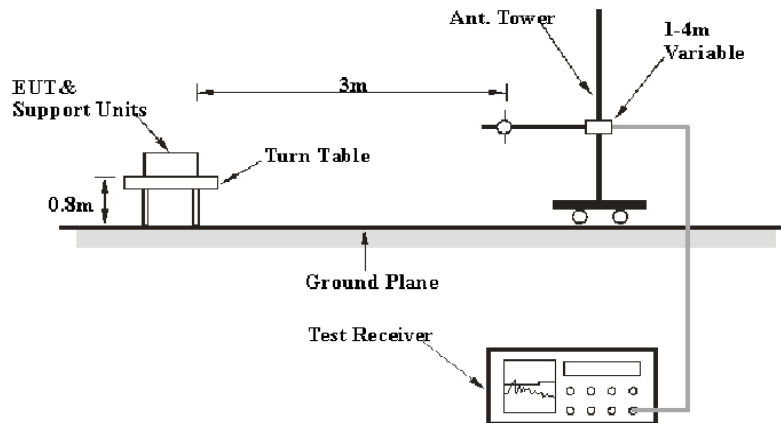
## FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

### Applicable Standard

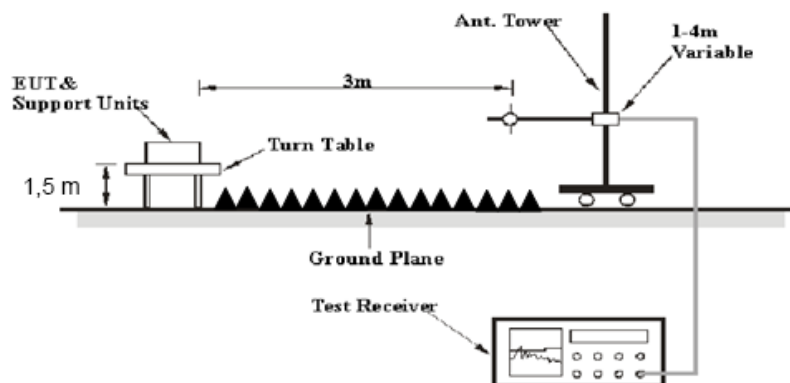
FCC §15.247 (d); §15.209; §15.205;

### EUT Setup

#### Below 1GHz:



#### Above 1GHz:



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

The 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:

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

## Test Procedure

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

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

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
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	A121808	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	966-1	2015-04-24	2018-04-23
Unknown	RF Cable (below 1GHz)	Unknown	NO.1	2016-11-10	2017-11-09
Unknown	RF Cable (below 1GHz)	Unknown	NO.4	2016-11-10	2017-11-09
Unknown	RF Cable (above 1GHz)	Unknown	NO.2	2016-11-10	2017-11-09

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

## 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 Data

### Environmental Conditions

<b>Temperature:</b>	24.8 °C
<b>Relative Humidity:</b>	55 %
<b>ATM Pressure:</b>	100.4 kPa

*\* The testing was performed by Kevin Hu on 2017-05-09.*

*Test Mode: Transmitting*

**30MHz to 25 GHz:**

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	FCC 15.247	
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBµV/m)	Margin (dB)
Low Channel: 2403 MHz									
2403	75.74	PK	H	23.53	3.00	0.00	102.27	N/A	N/A
2403	64.02	AV	H	23.53	3.00	0.00	90.55	N/A	N/A
2403	65.86	PK	V	23.53	3.00	0.00	92.39	N/A	N/A
2403	54.08	AV	V	23.53	3.00	0.00	80.61	N/A	N/A
2390	42.7	PK	H	23.57	3.00	0.00	69.27	74.00	4.73
2390	19.22	AV	H	23.57	3.00	0.00	45.79	54.00	8.21
4806	40.18	PK	H	30.78	5.12	26.87	49.21	74.00	24.79
4806	27.8	AV	H	30.78	5.12	26.87	36.83	54.00	17.17
7209	37.58	PK	H	34.72	6.17	26.35	52.12	74.00	21.88
7209	25.96	AV	H	34.72	6.17	26.35	40.50	54.00	13.50
1368	31.59	PK	H	23.76	2.49	26.46	31.38	74.00	42.62
1368	19.34	AV	H	23.76	2.49	26.46	19.13	54.00	34.87
62.98	44.7	QP	H	7.47	0.54	28.41	24.30	40.00	15.70
70.74	47.4	QP	H	7.70	0.56	28.42	27.24	40.00	12.76
Middle Channel: 2440 MHz									
2440	75.53	PK	H	23.40	3.00	0.00	101.93	N/A	N/A
2440	63.88	AV	H	23.40	3.00	0.00	90.28	N/A	N/A
2440	65.64	PK	V	23.40	3.00	0.00	92.04	N/A	N/A
2440	54.17	AV	V	23.40	3.00	0.00	80.57	N/A	N/A
4880	40.1	PK	H	31.02	5.09	26.87	49.34	74.00	24.66
4880	28.77	AV	H	31.02	5.09	26.87	38.01	54.00	15.99
7320	37.51	PK	H	34.94	6.22	26.40	52.27	74.00	21.73
7320	25.6	AV	H	34.94	6.22	26.40	40.36	54.00	13.64
1402	31.87	PK	H	23.85	2.53	26.42	31.83	74.00	42.17
1402	20.32	AV	H	23.85	2.53	26.42	20.28	54.00	33.72
2263	34.24	PK	H	24.01	3.02	26.86	34.41	74.00	39.59
2263	22.37	AV	H	24.01	3.02	26.86	22.54	54.00	31.46
62.98	44.5	QP	H	7.47	0.54	28.41	24.10	40.00	15.90
70.74	47.2	QP	H	7.70	0.56	28.42	27.04	40.00	12.96
High Channel: 2473 MHz									
2473	75.1	PK	H	23.29	2.99	0.00	101.38	N/A	N/A
2473	63.54	AV	H	23.29	2.99	0.00	89.82	N/A	N/A
2473	65	PK	V	23.29	2.99	0.00	91.28	N/A	N/A
2473	53.12	AV	V	23.29	2.99	0.00	79.40	N/A	N/A
2483.5	41.37	PK	H	23.26	2.99	0.00	67.62	74.00	6.38
2483.5	19.29	AV	H	23.26	2.99	0.00	45.54	54.00	8.46
4946	40.33	PK	H	31.23	5.06	26.88	49.74	74.00	24.26
4946	28.4	AV	H	31.23	5.06	26.88	37.81	54.00	16.19
7419	38.25	PK	H	35.14	6.26	26.44	53.21	74.00	20.79
7419	26.62	AV	H	35.14	6.26	26.44	41.58	54.00	12.42
1453	31.77	PK	H	23.98	2.61	26.38	31.98	74.00	42.02
1453	20	AV	H	23.98	2.61	26.38	20.21	54.00	33.79
62.98	44.4	QP	H	7.47	0.54	28.41	24.00	40.00	16.00
70.74	47.3	QP	H	7.70	0.56	28.42	27.14	40.00	12.86

## FCC §15.247(a) (1) - CHANNEL SEPARATION TEST

### Applicable Standard

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.50 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	C-2	Each Time	/

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

### Test Procedure

1. Set the EUT in transmitting mode, RBW was set at 30 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another trace.
3. Measure the channel separation.

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	28.8 °C
<b>Relative Humidity:</b>	62 %
<b>ATM Pressure:</b>	100.4 kPa

\* The testing was performed by Kevin Hu on 2017-05-09.

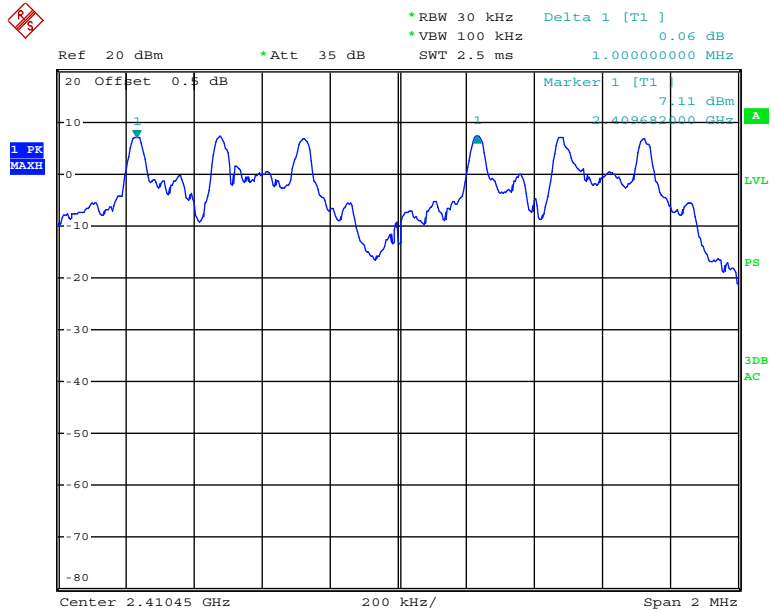
**Test Result:** Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
Worst	2410	1.000	0.526
Adjacent	2411		

Note: Limit= (2/3)x 20dB bandwidth



Date: 9.MAY.2017 17:10:22



## FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING

### Applicable Standard

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### 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 on the test table without connection to measurement instrument. Turn on the EUT. 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 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	C-2	Each Time	/

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	28.8 °C
<b>Relative Humidity:</b>	62 %
<b>ATM Pressure:</b>	100.4 kPa

\* The testing was performed by Kevin Hu on 2017-05-09.

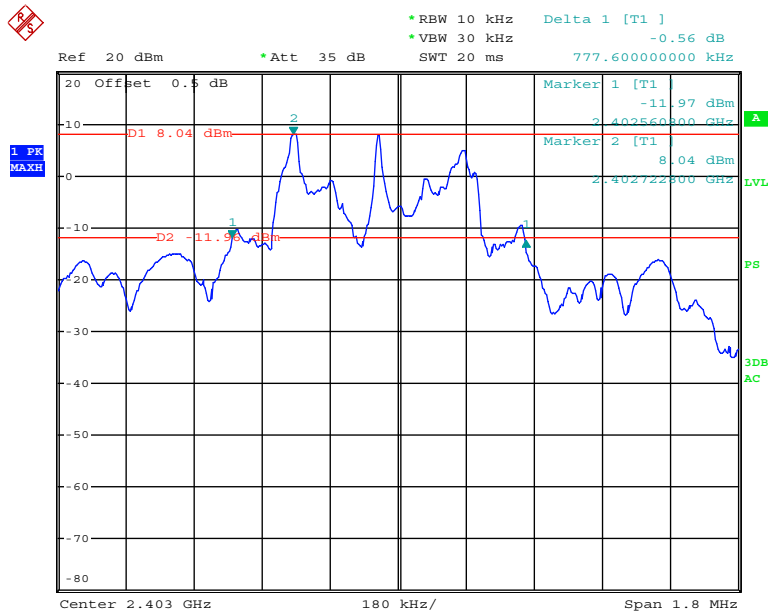
**Test Result:** Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

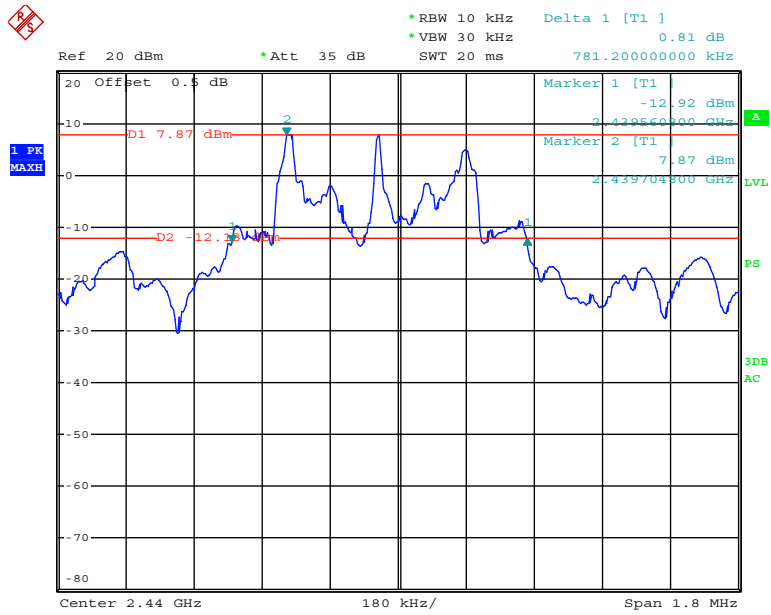
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2403	0.778
Middle	2440	0.781
High	2473	0.788

Low Channel



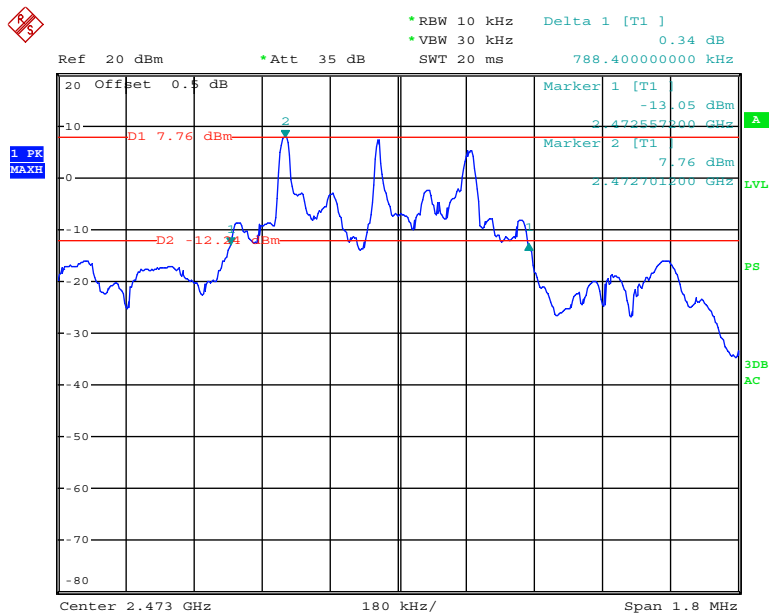
Date: 9.MAY.2017 16:25:54

### Middle Channel



Date: 9.MAY.2017 16:28:41

### High Channel



Date: 9.MAY.2017 16:30:16

## **FCC §15.247(a) (1) (iii) - QUANTITY OF HOPPING CHANNEL TEST**

### **Applicable Standard**

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### **Test Procedure**

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

### **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	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	C-2	Each Time	/
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	28.8~28.9 °C
<b>Relative Humidity:</b>	62~63 %
<b>ATM Pressure:</b>	100.2~100.4 kPa

\* The testing was performed by Kevin Hu on 2017-05-09 and 201706-10.

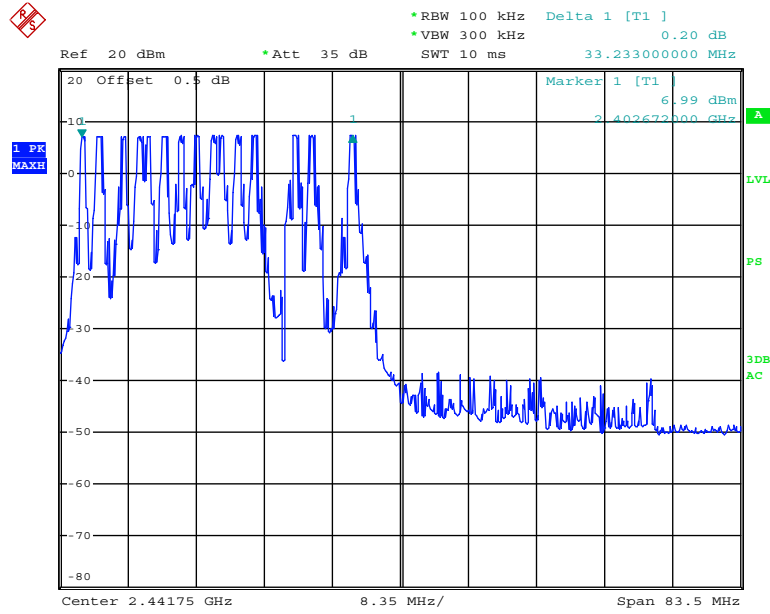
**Test Result:** Compliance.

Please refer to following tables and plots

*Test Mode: Transmitting*

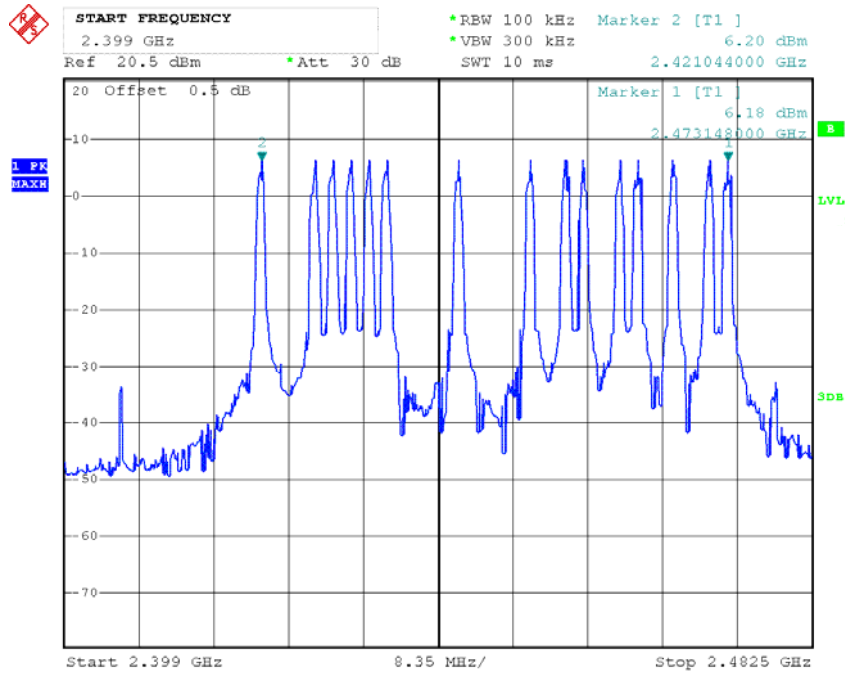
Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	15	≥15

### Number of Hopping Channels 1



Date: 9.MAY.2017 17:03:37

### Number of Hopping Channels 2



Date: 10.JUN.2017 13:46:00

## **FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)**

### **Applicable Standard**

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### **Test Procedure**

The EUT was worked in channel hopping; the time of single pulses was tested.

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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	C-2	Each Time	/

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	28.8 °C
<b>Relative Humidity:</b>	62 %
<b>ATM Pressure:</b>	100.4 kPa

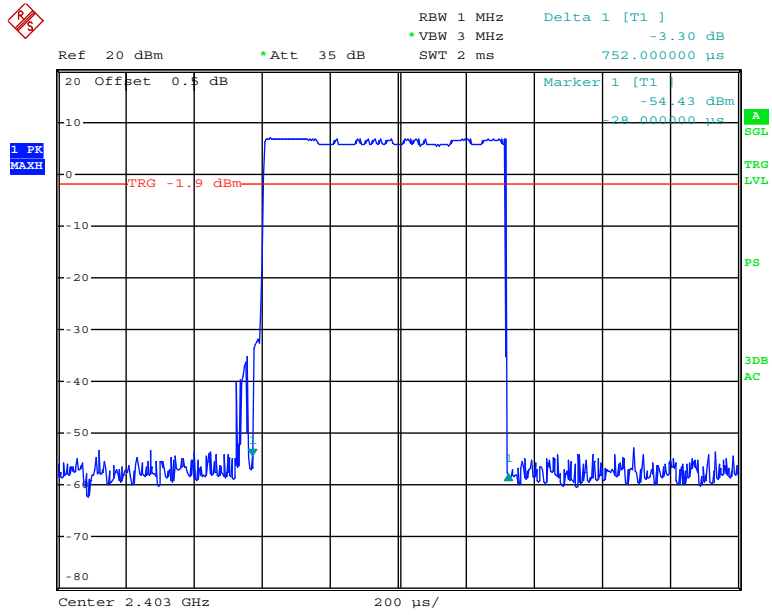
\* The testing was performed by Kevin Hu on 2017-05-09.

**Test Result:** Compliance.

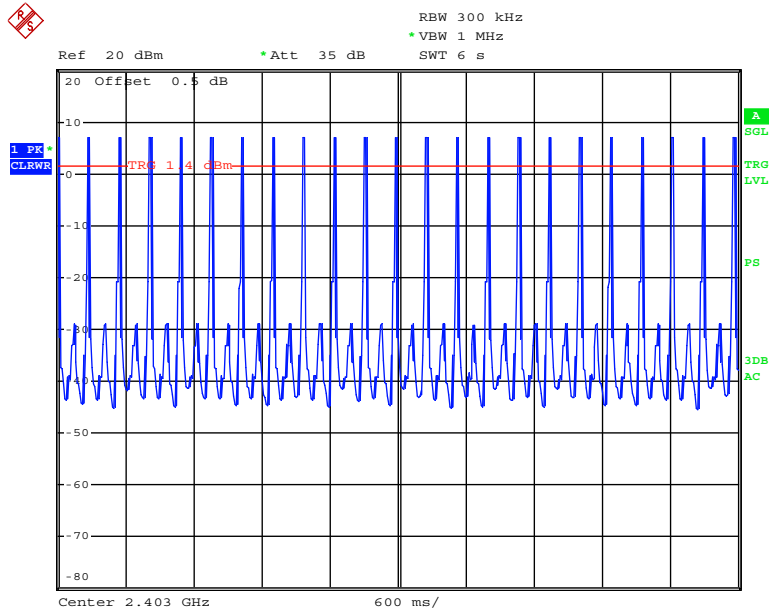
Please refer to following tables and plots

Test Mode: Transmitting

Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
Low	0.752	0.017	0.4	Compliance
Note: Dwell time=Pulse Width*Hopping number in observe period observe period=0.4s* hopping channels= 0.4*15=6s				



Date: 9.MAY.2017 17:13:50



Date: 9.MAY.2017 18:02:41



## FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

### Applicable Standard

According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts

### Test Procedure

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

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	C-2	Each Time	/

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

### Test Data

#### Environmental Conditions

Temperature:	28.8 °C
Relative Humidity:	62 %
ATM Pressure:	100.4 kPa

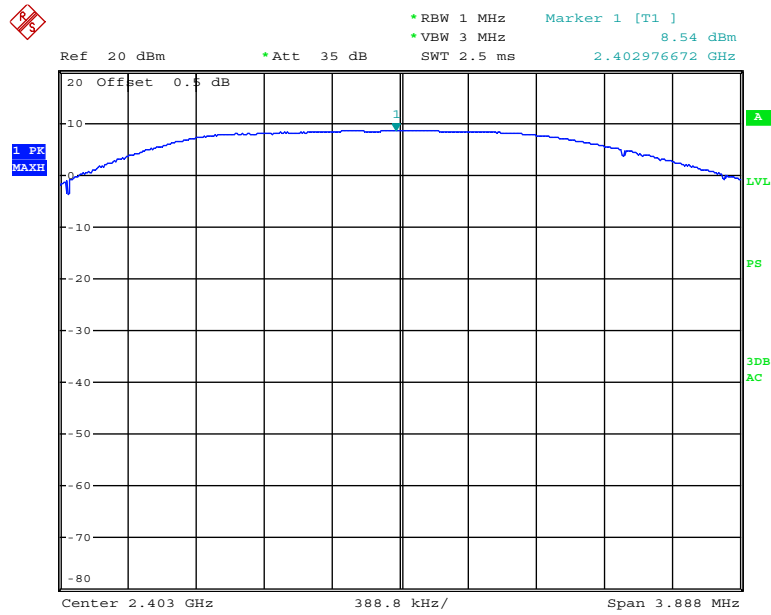
\* The testing was performed by Kevin Hu on 2017-05-09.

**Test Result:** Compliance.

Test Mode: Transmitting

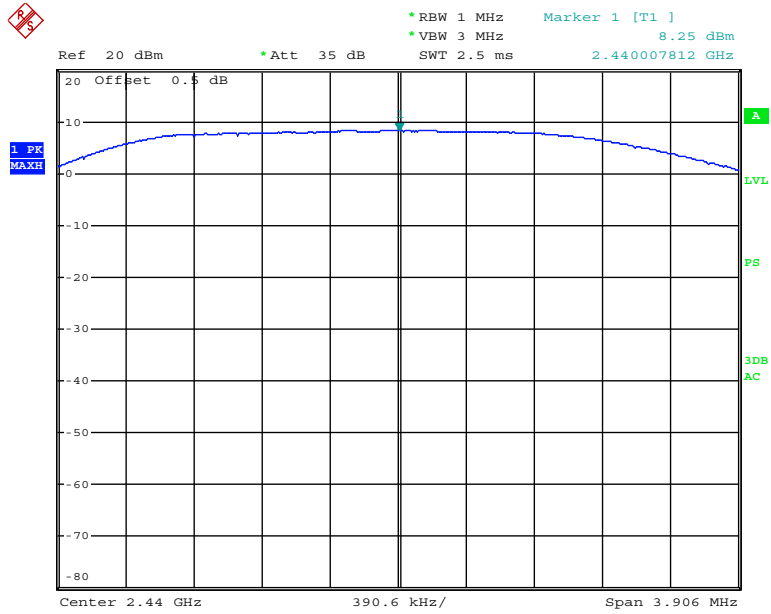
Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
Low	2403	8.54	21
Middle	2440	8.25	21
High	2473	7.92	21

### Output Power, Low Channel



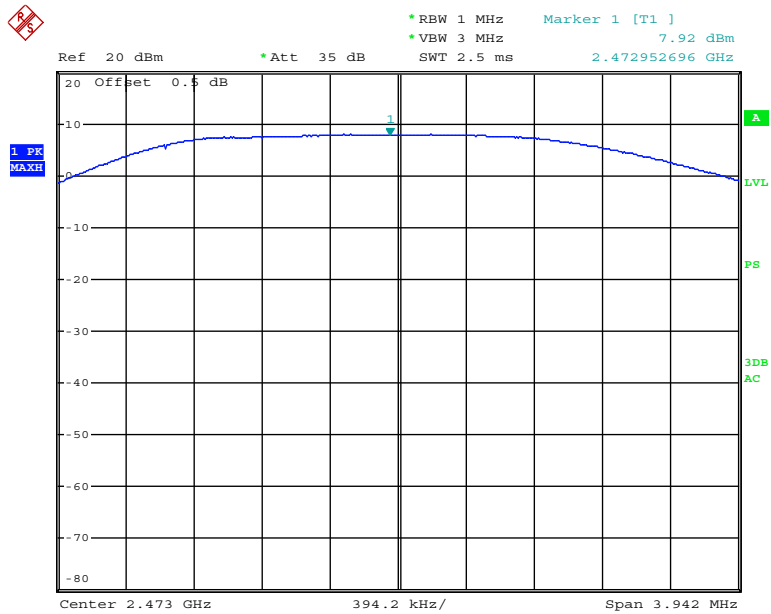
Date: 9.MAY.2017 16:43:24

### Output Power, Middle Channel



Date: 9.MAY.2017 16:45:35

### Output Power, High Channel



Date: 9.MAY.2017 16:47:22

## FCC §15.247(d) - BAND EDGES TESTING

### 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. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW/VBW=100/300kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	C-2	Each Time	/

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

### Test Data

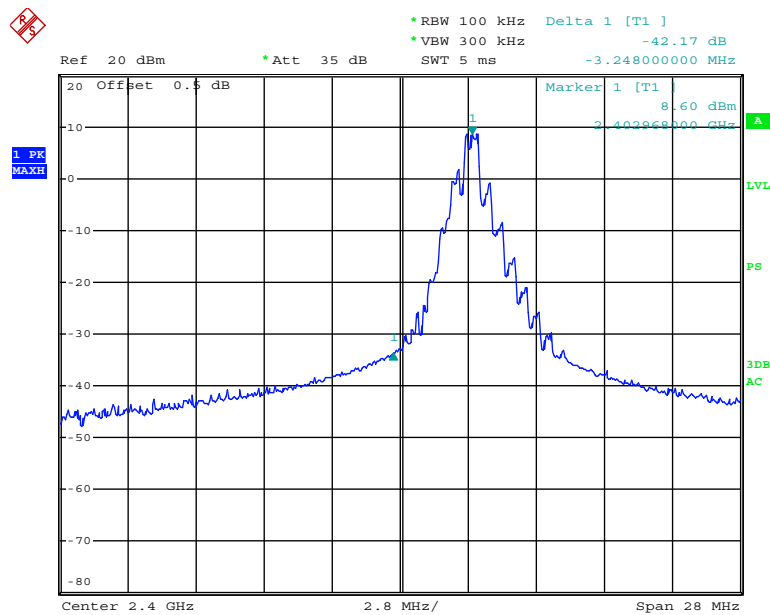
#### Environmental Conditions

Temperature:	28.8 °C
Relative Humidity:	62 %
ATM Pressure:	100.4 kPa

\* The testing was performed by Kevin Hu on 2017-05-09

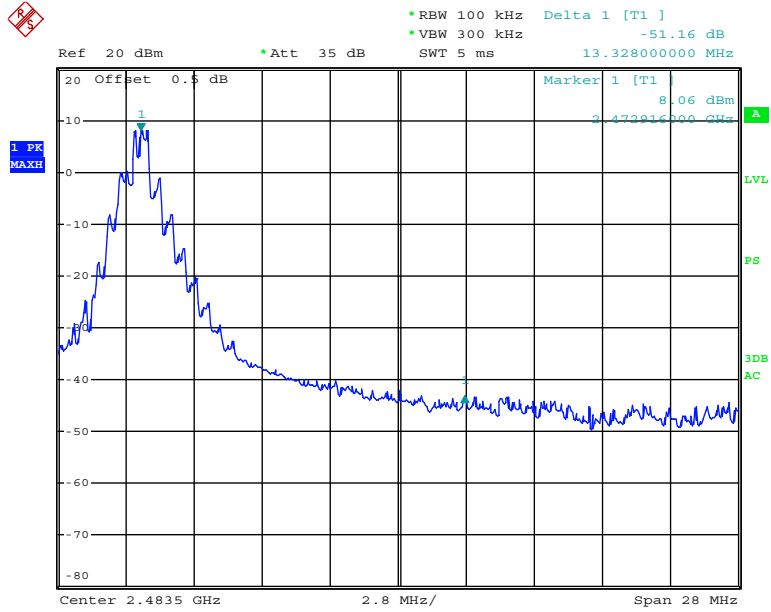
**Test Result:** Compliance(the emissions out of the operation band are more 20dB below than the highest level of the desired power)

#### Band Edge, Left Side



Date: 9.MAY.2017 16:39:24

### Band Edge, Right Side



Date: 9.MAY.2017 16:41:38

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