



## FCC PART 15.247

### TEST REPORT

For

**Hobbico, Inc.**

2904 Research Road, Champaign, Illinois, United States, 61821

**FCC ID: IYF0300**

<b>Report Type:</b> Original Report	<b>Product Name:</b> Archon
<b>Report Number:</b> RDG171031004-00A	
<b>Report Date:</b> 2018-01-09	
<b>Reviewed By:</b> Reviewed By:	Jerry Zhang EMC Manager <i>Jerry Zhang</i>
<b>Test Laboratory:</b>	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 <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. (Dongguan).

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## GENERAL INFORMATION

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

The **Hobbico, Inc.** 's product, model number: **RISE0300 (FCC ID: IYF0300 )** (the "EUT") in this report was a **Archon** , which was measured approximately: 48 cm (L) x 29 cm (W) x 10.5 cm (H), rated input voltage: DC7.4V from battery and the battery can be removed and charged by using USB charger cable or DC 12.0V from adapter.

Adapter Information:

AC Power Adapter

INPUT: AC 100-240V, 50/60Hz, 0.8A MAX

OUTPUT: DC 12.0V, 2.0A

*All measurement and test data in this report was gathered from production sample serial number: 171031004 (Assigned by BACL). The EUT was received on 2017-10-31.*

### 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, 15.207, 15.209 and 15.247 rules.

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

Part of system submissions with FCC ID: IYFJ2020.

### 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 emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

## Measurement Uncertainty

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

## Test Facility

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

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062D.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in an engineering mode. 16 channels are provided:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2414	9	2435
2	2417	10	2438
3	2420	11	2440
4	2423	12	2442
5	2425	13	2444
6	2428	14	2446
7	2430	15	2448
8	2433	16	2450

Channel 1, 8, 16 were selected to test.

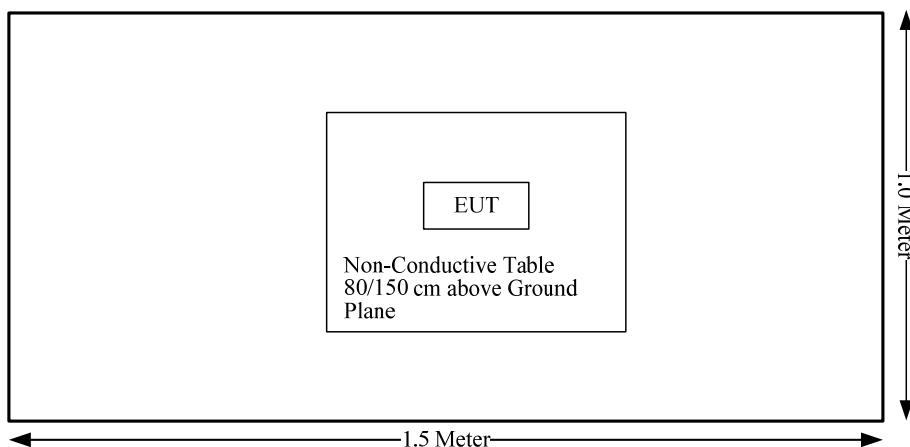
### EUT Exercise Software

No Software was used in test, the maximum power was configured as default setting by system.

### Equipment Modifications

No modification was made to the EUT.

### Block Diagram of Test Setup



## SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	No 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

No Applicable: the device was powered by battery.

## FCC §15.247 (i) , §1.1310 , §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### Applicable Standard

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

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; \* = Plane-wave equivalent power density;

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

### Calculation Formula:

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

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

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

### Calculated Data:

Frequency Range (MHz)	Antenna Gain		Maximum Power Including Tolerance		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
	(dBi)	(numeric)	(dBm)	(mW)			
2414-2450	2	1.58	14	25.12	20.00	0.0079	1.0

Note: The Maximum Power Including Tolerance was declared by manufacturer.

**Result: Compliance**, The device meets FCC MPE at 20 cm distance

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

### **Applicable Standard**

According to FCC § 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 use of a standard antenna jack or electrical connector is prohibited.

### **Antenna Connector Construction**

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

**Result:** Compliance.

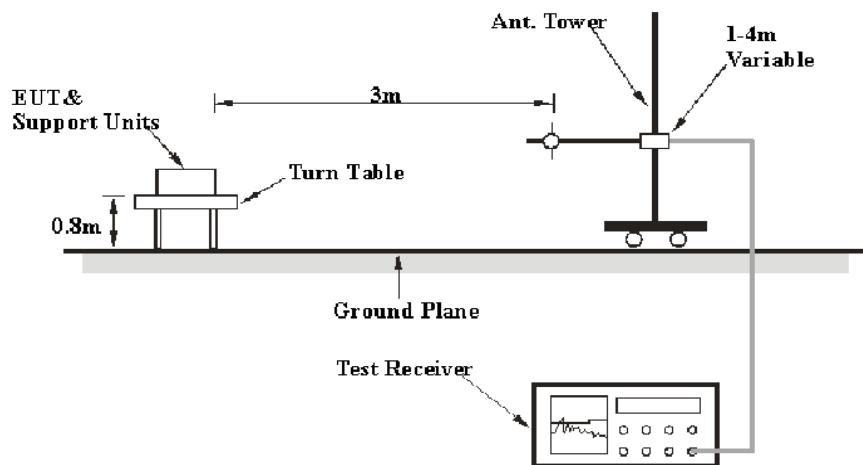
## FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

### Applicable Standard

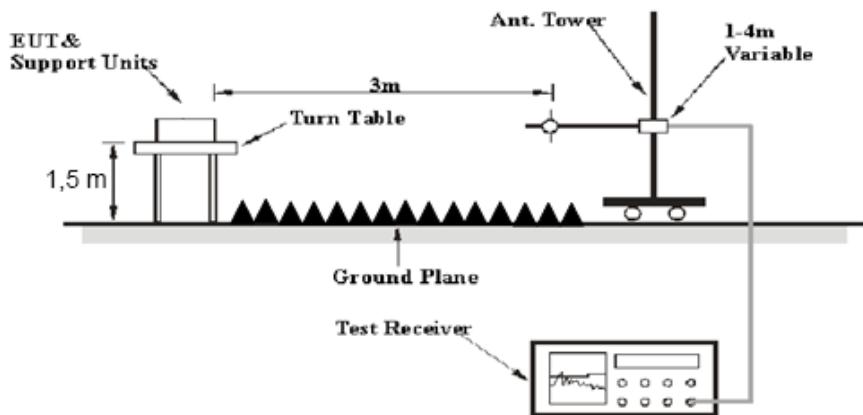
FCC §15.247 (d); §15.209; §15.205;

### EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission Below 1GHz tests were performed in the 3 meters chamber test site, above 1GHz 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:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
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.

All emissions under the noise floor have not been recoded.

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2017-09-01	2018-09-01
Sunol Sciences	Antenna	JB3	A060611-2	2017-08-25	2020-08-25
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2016-12-08	2017-12-08
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-05
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-02 1304	2017-06-16	2020-06-15
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-05	2018-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2017-06-27	2018-06-27
Unknown	Coaxial Cable	Chamber A-1	4m	2017-09-01	2018-09-01
Unknown	Coaxial Cable	Chamber B-1	0.75m	2017-09-01	2018-09-01
Unknown	Coaxial Cable	Chamber A-2	10m	2017-09-01	2018-09-01
Unknown	Coaxial Cable	Chamber B-2	8m	2017-09-01	2018-09-01
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A

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

## 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

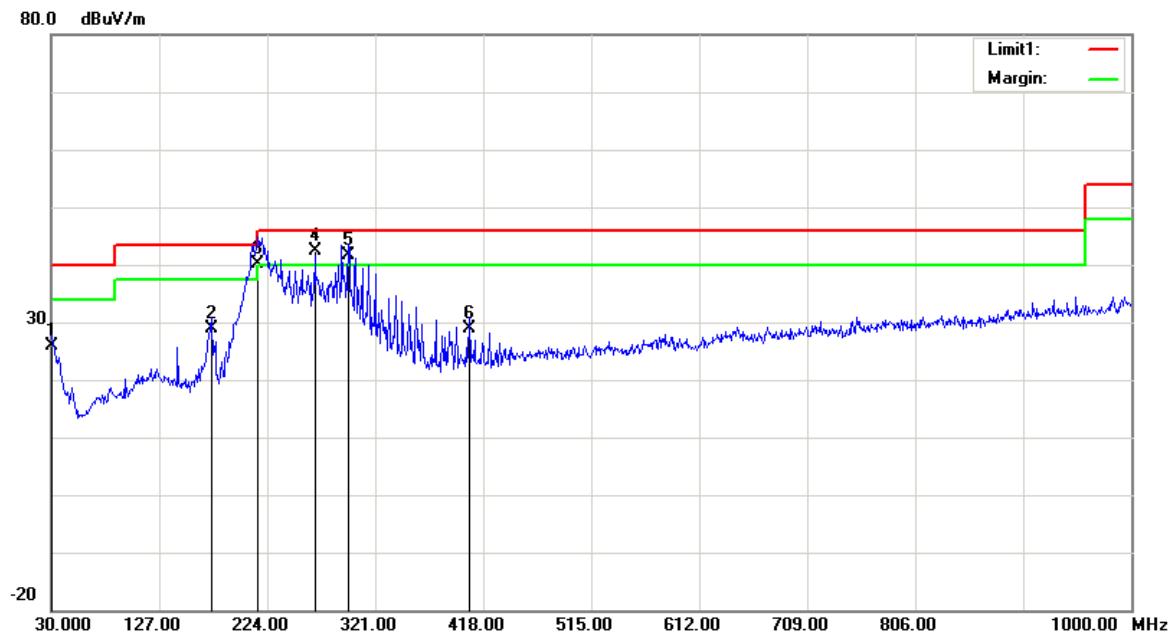
### Environmental Conditions

<b>Temperature:</b>	24.7 °C
<b>Relative Humidity:</b>	33 %
<b>ATM Pressure:</b>	101.9 kPa

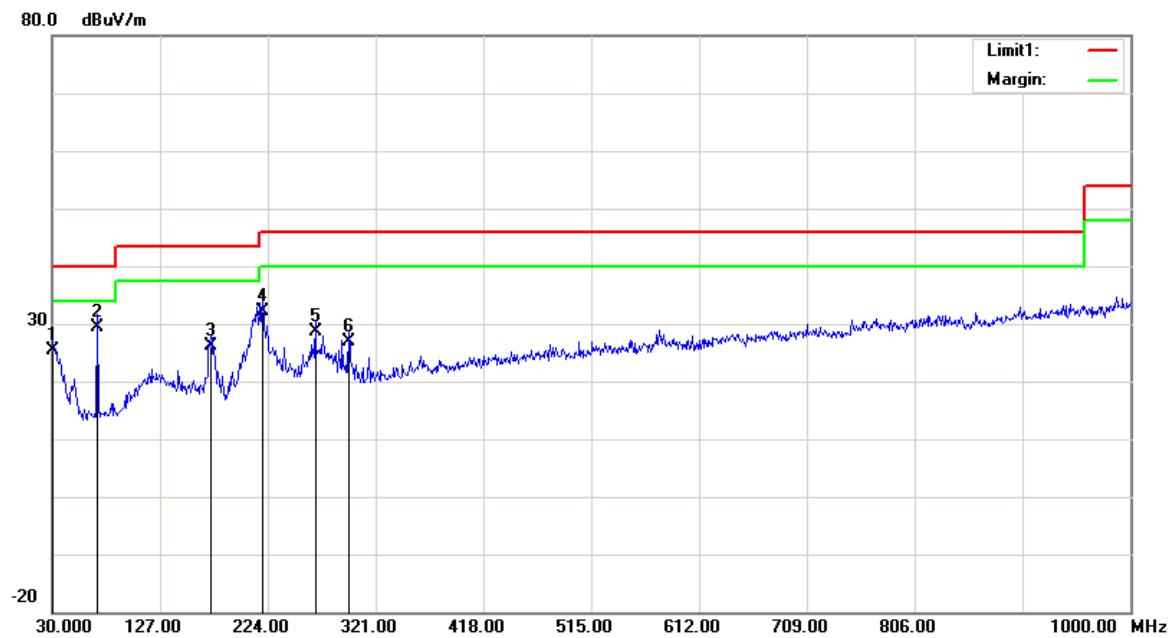
\* The testing was performed by Blake Yang on 2017-11-02.

Test Mode: Transmitting

## 1) 30MHz-1GHz(Low channel was the worst)

**Horizontal:**

Frequency (MHz)	Receiver Reading (dB $\mu$ V)	Detector	Correction Factor (dB/m)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
30.9700	25.55	QP	0.35	25.90	40.00	14.10
173.5600	36.54	QP	-7.64	28.90	43.50	14.60
215.2700	47.21	QP	-7.11	40.10	43.50	3.40
266.6800	46.60	QP	-4.30	42.30	46.00	3.70
296.7500	45.97	QP	-4.27	41.70	46.00	4.30
405.3900	30.97	QP	-2.17	28.80	46.00	17.20

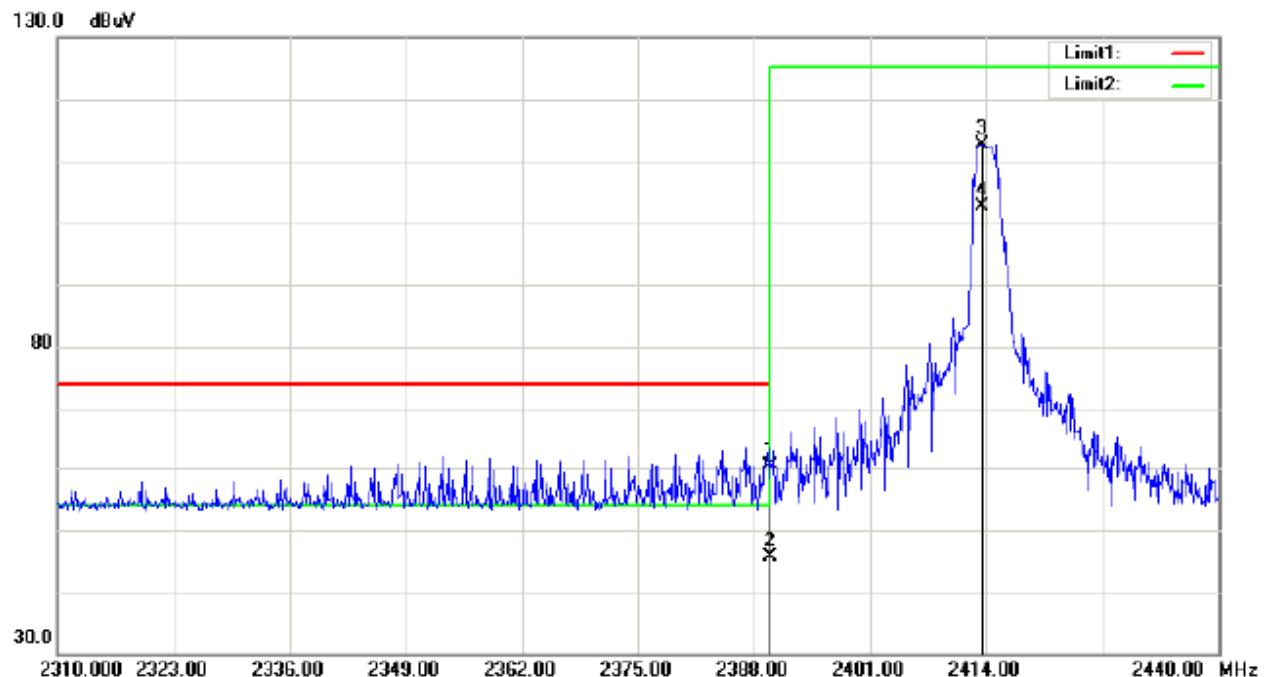
**Vertical:**

Frequency (MHz)	Receiver Reading (dB $\mu$ V)	Detector	Correction Factor (dB/m)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
30.000	24.42	QP	1.08	25.50	40.00	14.50
70.7400	40.78	QP	-11.28	29.50	40.00	10.50
172.5900	33.67	QP	-7.57	26.10	43.50	17.40
219.1500	38.97	QP	-6.87	32.10	46.00	13.90
266.6800	32.90	QP	-4.30	28.60	46.00	17.40
296.7500	31.17	QP	-4.27	26.90	46.00	19.10

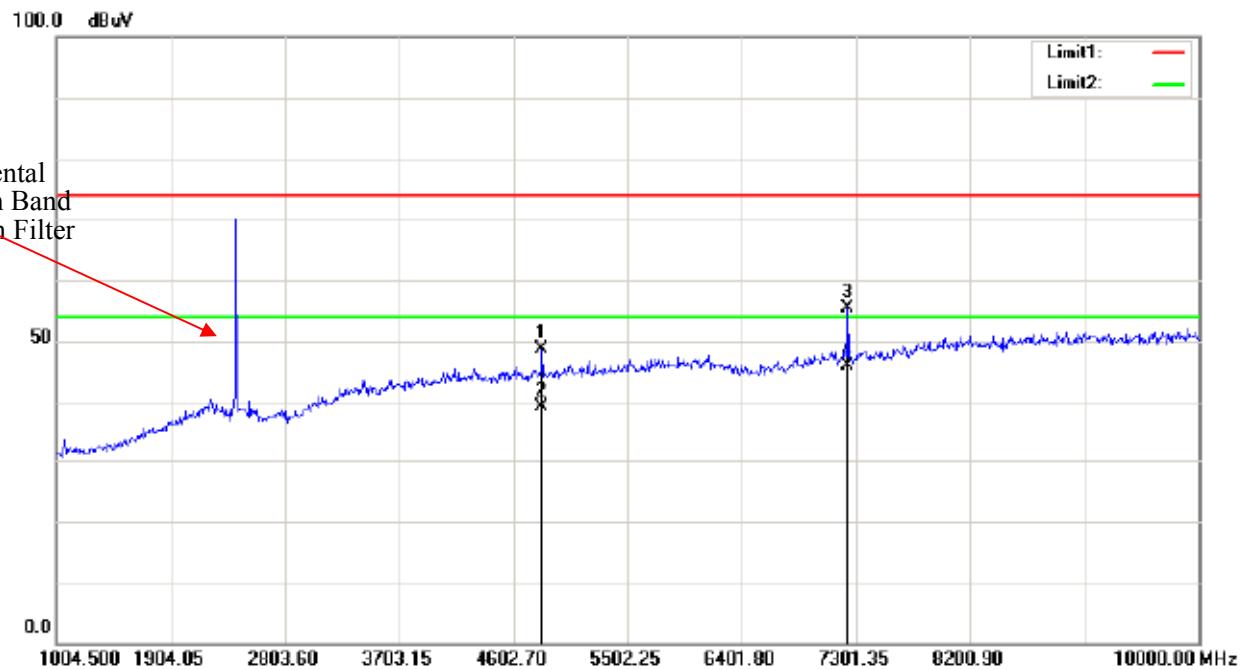
**2)1GHz-25GHz:**

Low Channel:

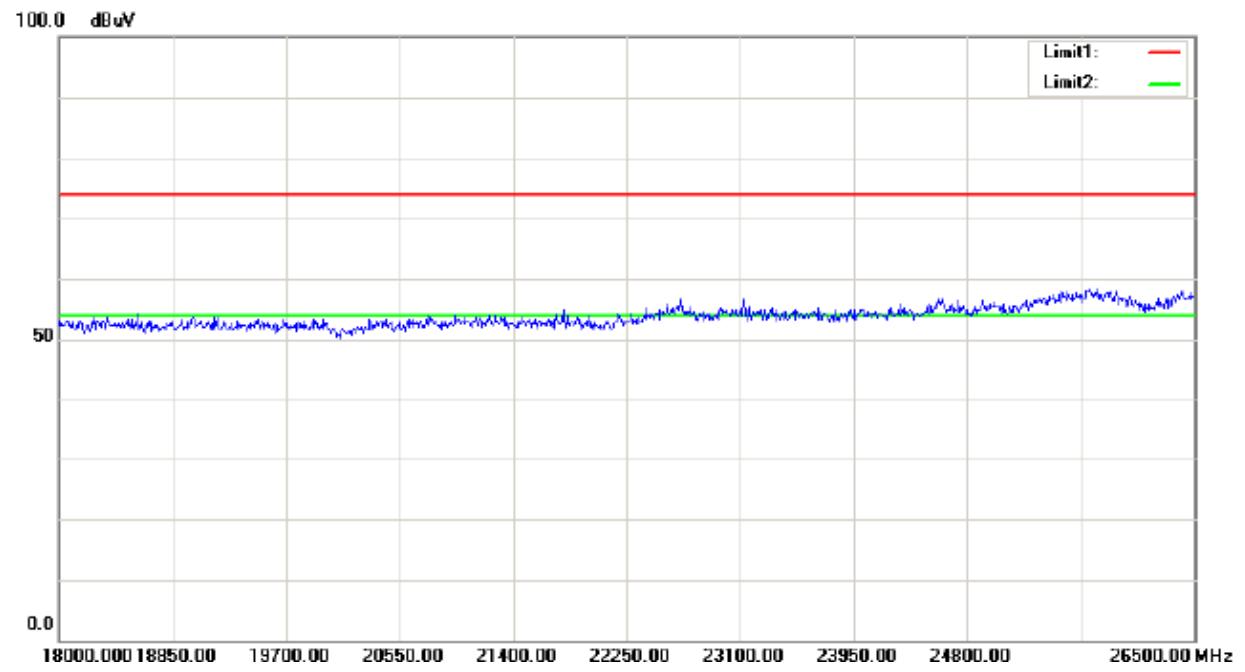
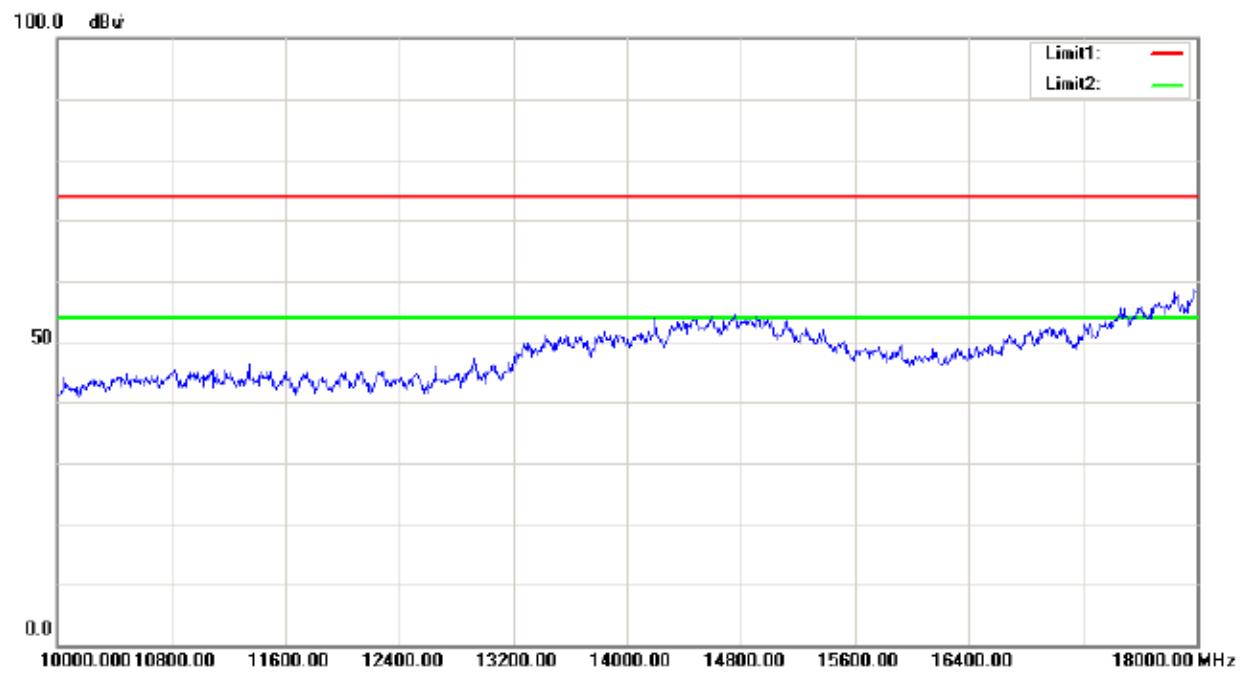
Horizontal:

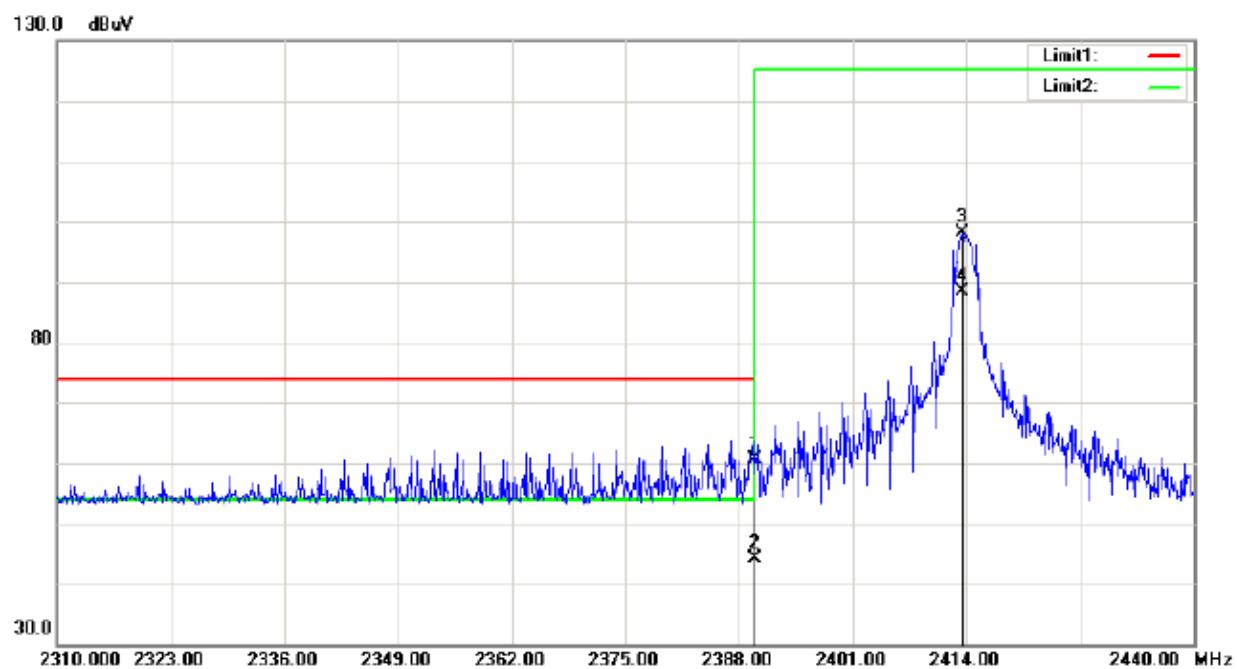


Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	2390.000	30.76	peak	29.87	60.63	74.00	156	25	13.37	
*	2	2390.000	15.69	AVG	29.87	45.56	54.00	156	25	8.44	
	3	2413.610	82.81	peak	29.94	112.75	125.20	156	25	12.45	Fundamental
	4	2413.610	72.63	AVG	29.94	102.57	125.20	156	25	22.63	Fundamental

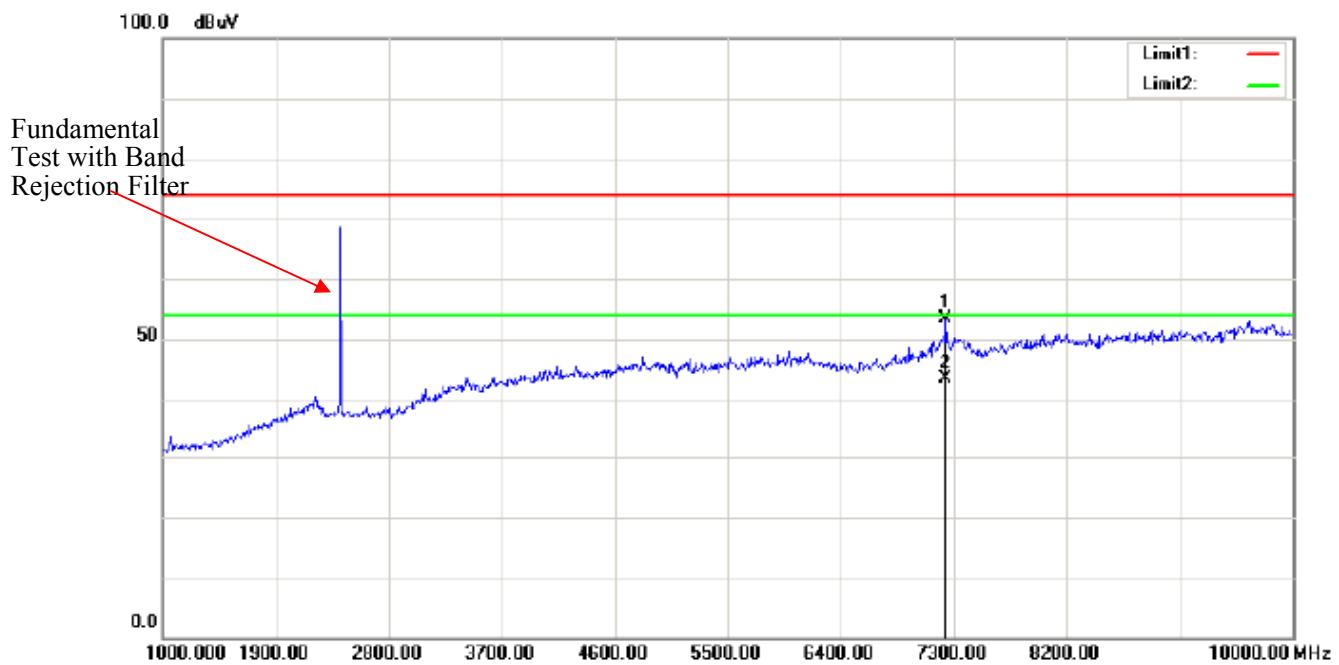


Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	4829.500	49.75	peak	-1.04	48.71	74.00	148	55	25.29	
	2	4829.500	40.16	AVG	-1.04	39.12	54.00	148	55	14.88	
	3	7241.500	52.01	peak	3.32	55.33	74.00	148	55	18.67	
*	4	7241.500	42.53	AVG	3.32	45.85	54.00	148	55	8.15	

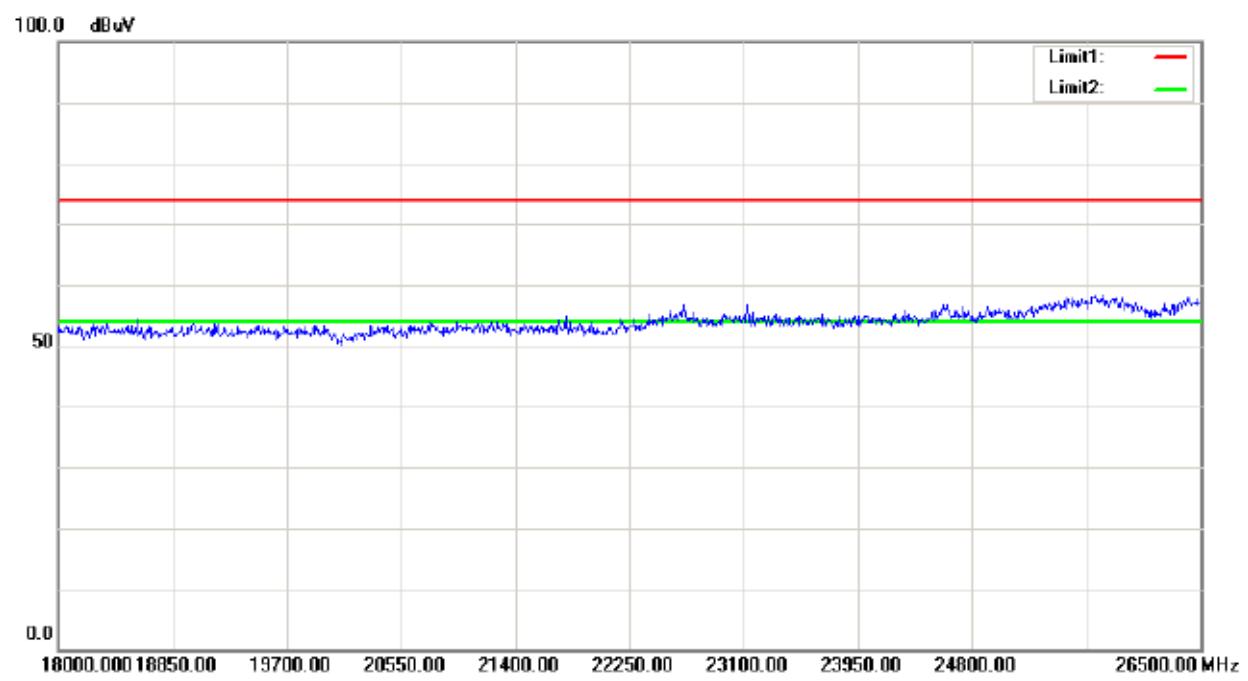
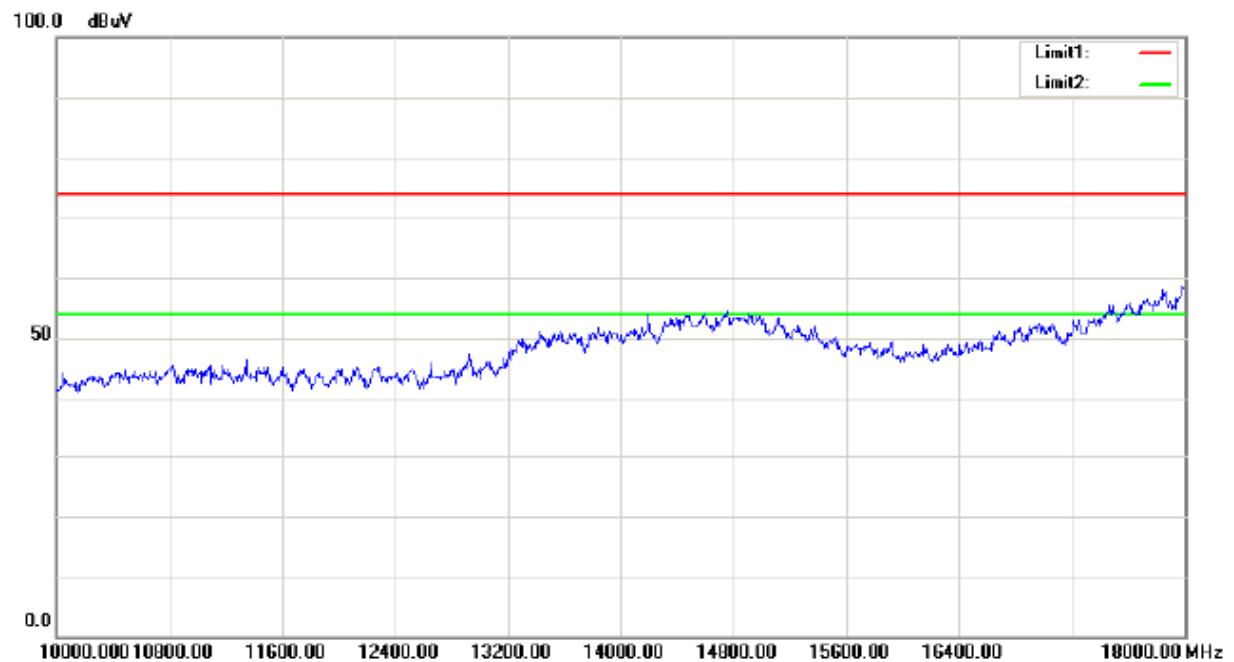


*Vertical*

Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	2390.000	30.76	peak	29.87	60.63	74.00	163	22	13.37	
*	2	2390.000	14.35	AVG	29.87	44.22	54.00	163	22	9.78	
	3	2413.610	68.31	peak	29.94	98.25	125.20	163	22	26.95	Fundamental
	4	2413.610	58.49	AVG	29.94	88.43	125.20	163	22	36.77	Fundamental

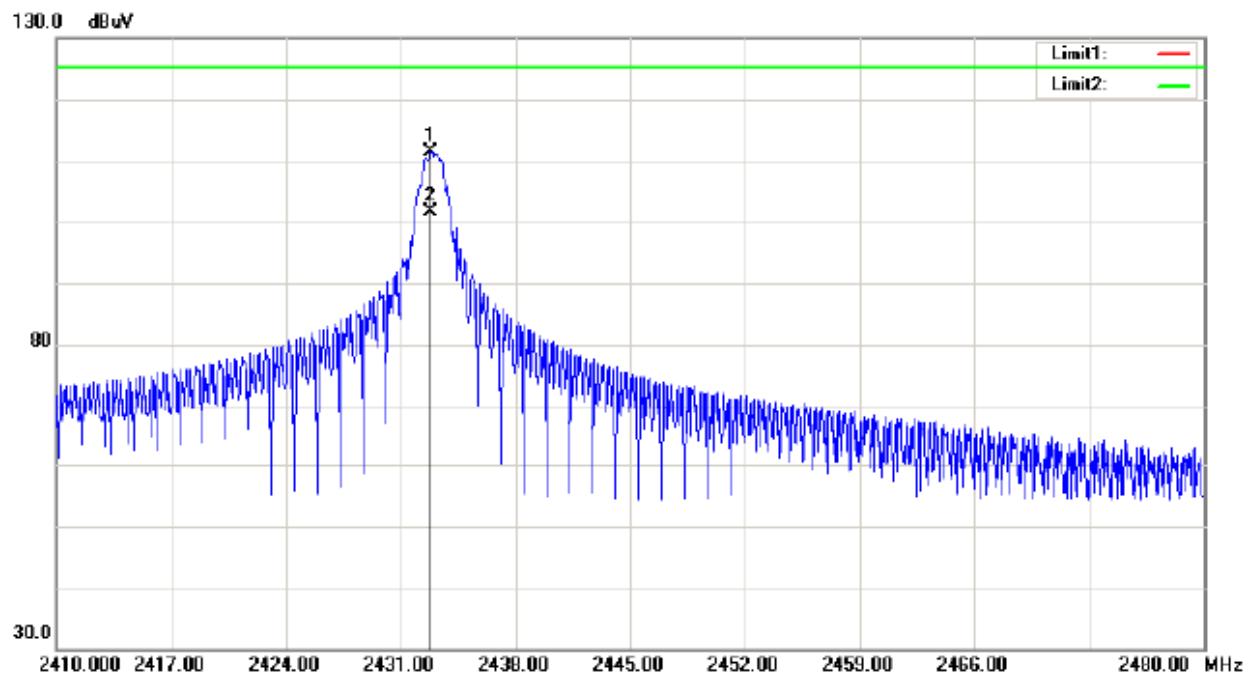


Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	7241.500	50.01	peak	3.32	53.33	74.00	146	227	20.67	
*	2	7241.500	40.16	AVG	3.32	43.48	54.00	146	227	10.52	

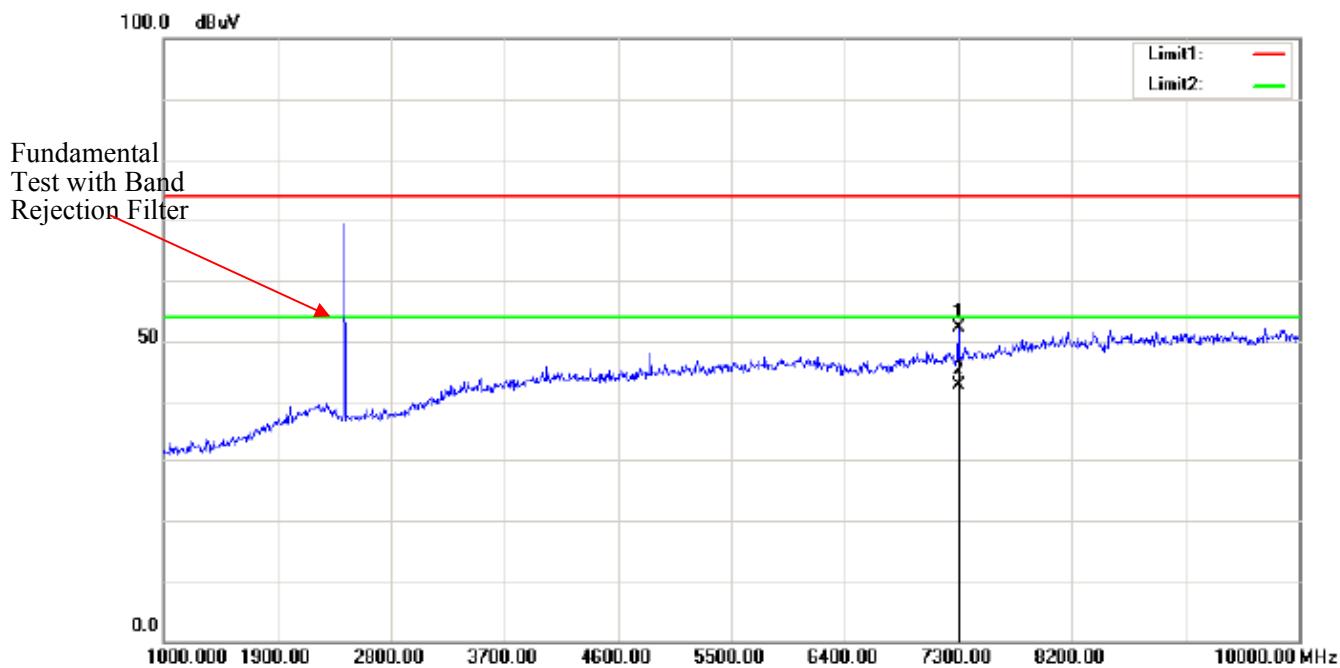


Middle Channel:

Horizontal:



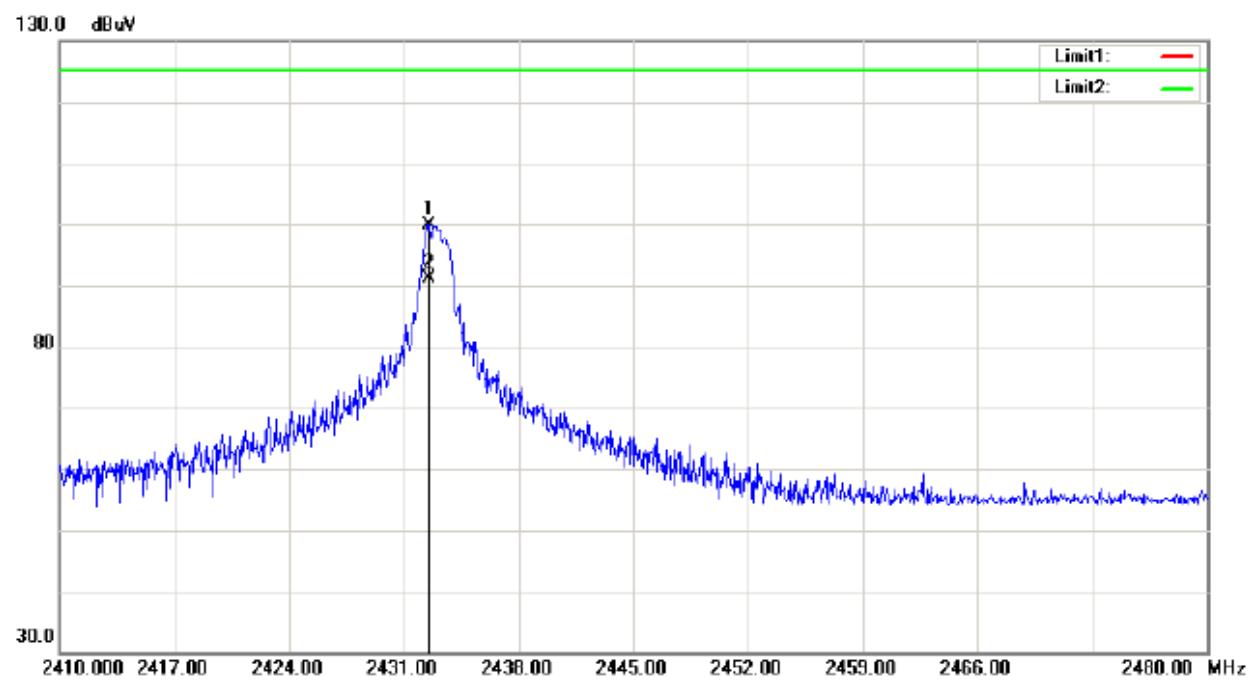
Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	1	2432.820	81.39	peak	29.99	111.38	125.20	138	46	13.82	Fundamental
	2	2432.820	71.56	AVG	29.99	101.55	125.20	138	46	23.65	Fundamental



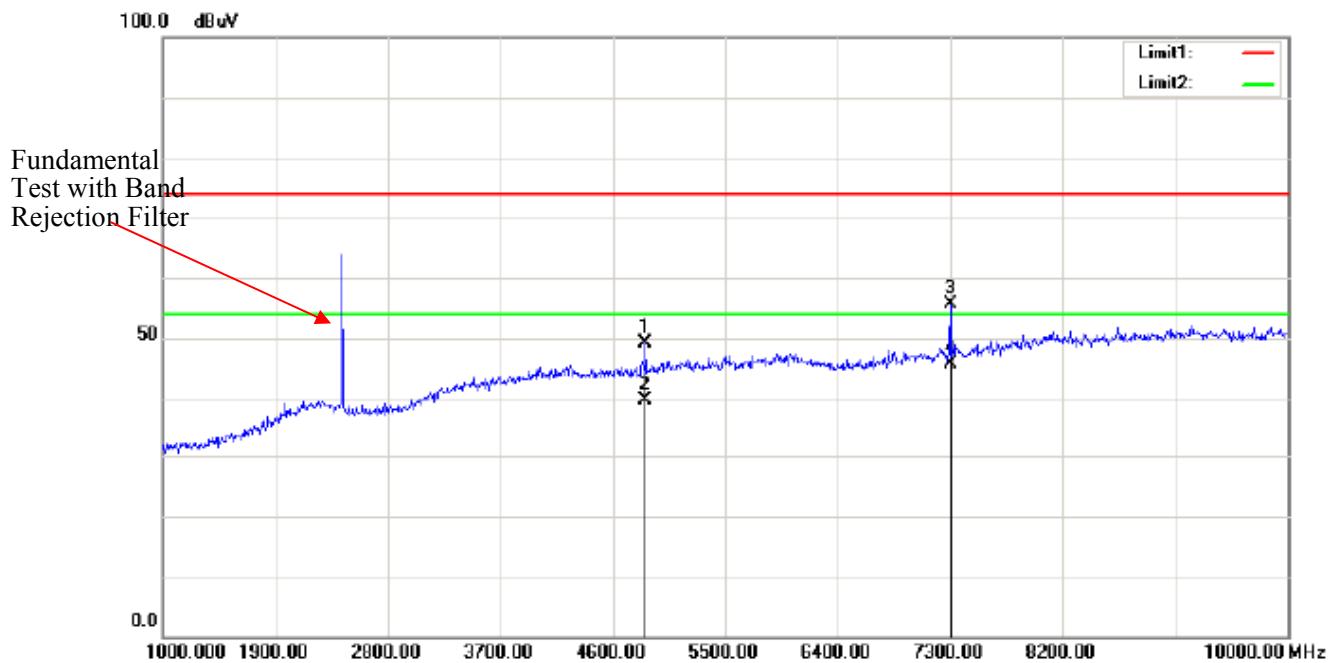
Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	7300.000	48.80	peak	3.29	52.09	74.00	157	226	21.91	
*	2	7300.000	39.46	AVG	3.29	42.75	54.00	157	226	11.25	

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

Vertical:



Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	1	2432.540	70.00	peak	29.99	99.99	125.20	152	78	25.21	Fundamental
	2	2432.540	61.25	AVG	29.99	91.24	125.20	152	78	33.96	Fundamental

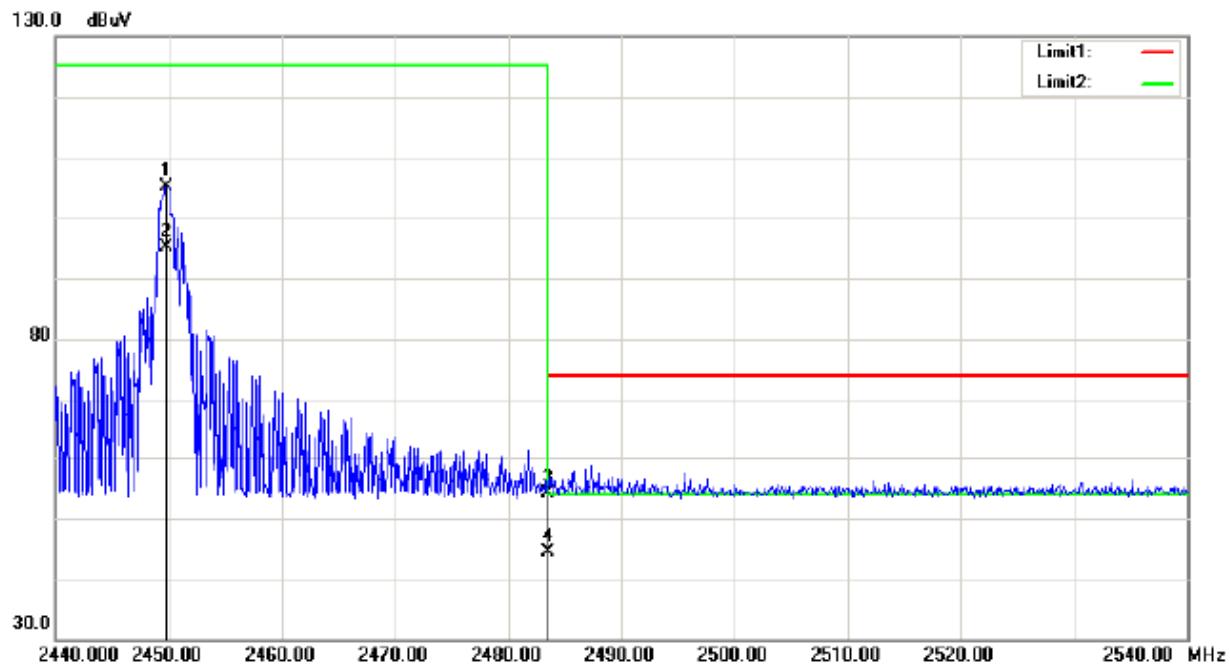


Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	4865.500	49.95	peak	-0.93	49.02	74.00	149	225	24.98	
	2	4865.500	40.62	AVG	-0.93	39.69	54.00	149	225	14.31	
	3	7300.000	52.36	peak	3.29	55.65	74.00	149	225	18.35	
*	4	7300.000	42.38	AVG	3.29	45.67	54.00	149	225	8.33	

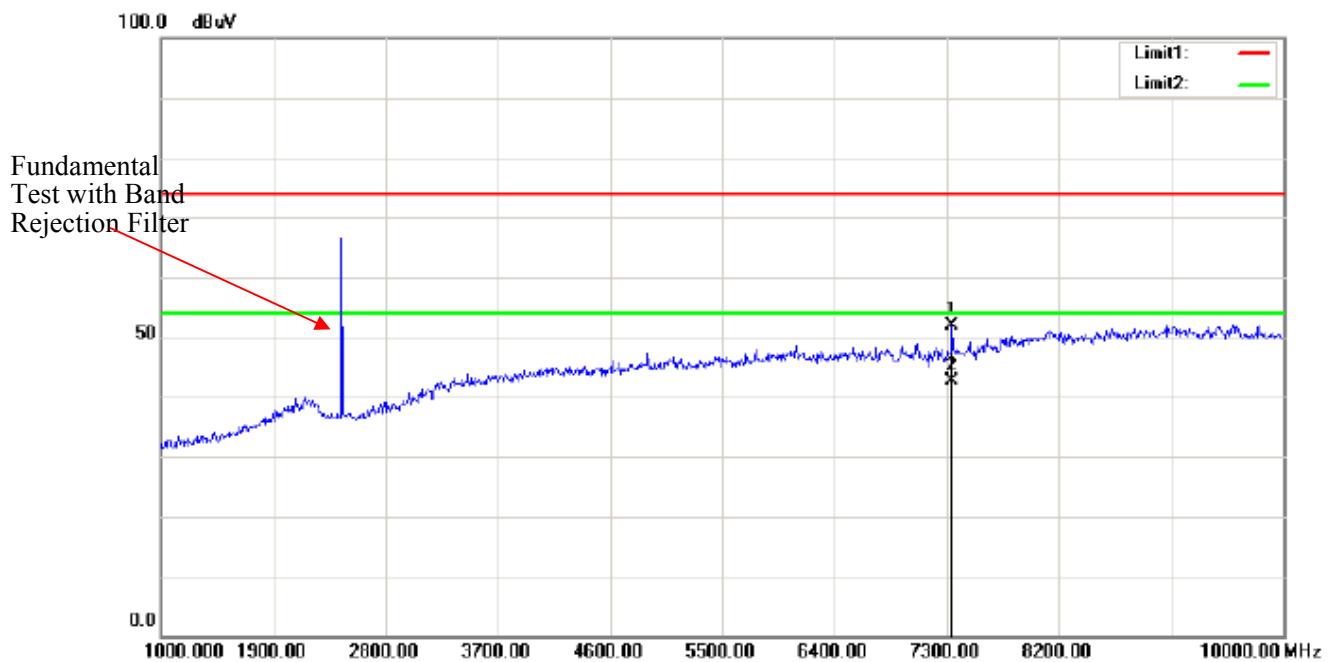
Note: No emission was detected in the range 10-25GHz

High Channel:

Horizontal:



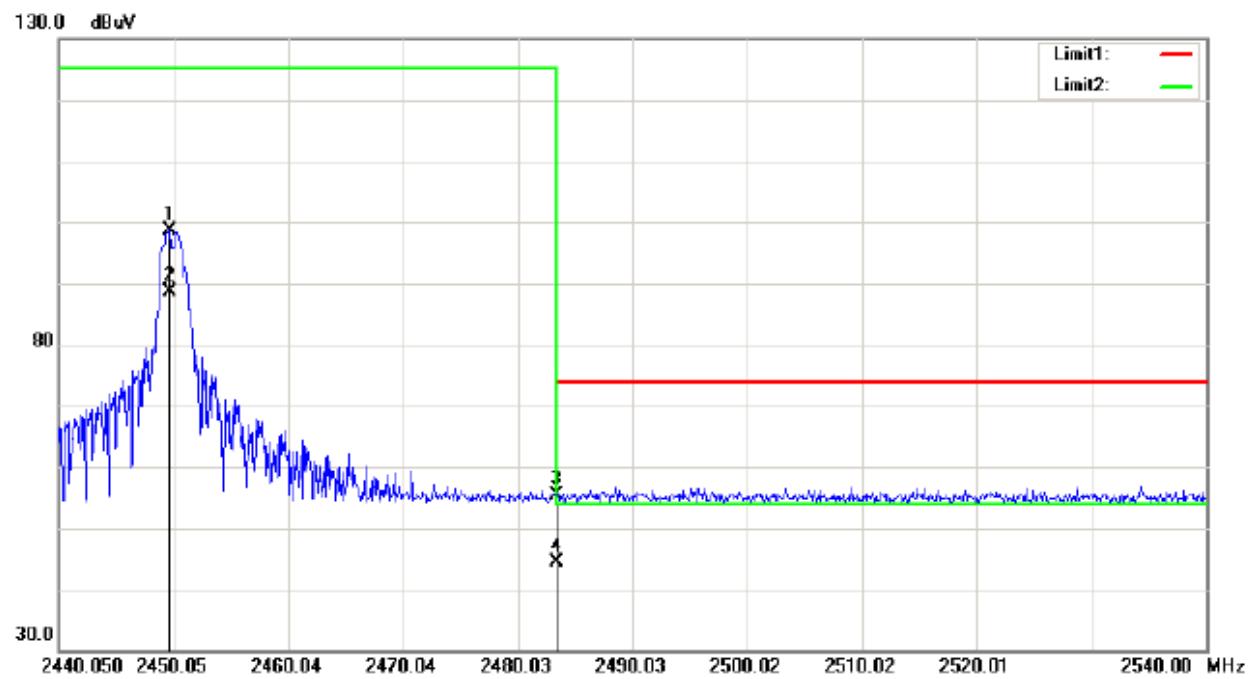
Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	2449.800	75.03	peak	30.02	105.05	125.20	148	224	20.15	Fundamental
	2	2449.800	65.15	AVG	30.02	95.17	125.20	148	224	30.03	Fundamental
	3	2483.500	24.06	peak	30.11	54.17	74.00	148	224	19.83	
*	4	2483.500	14.26	AVG	30.11	44.37	54.00	148	224	9.63	



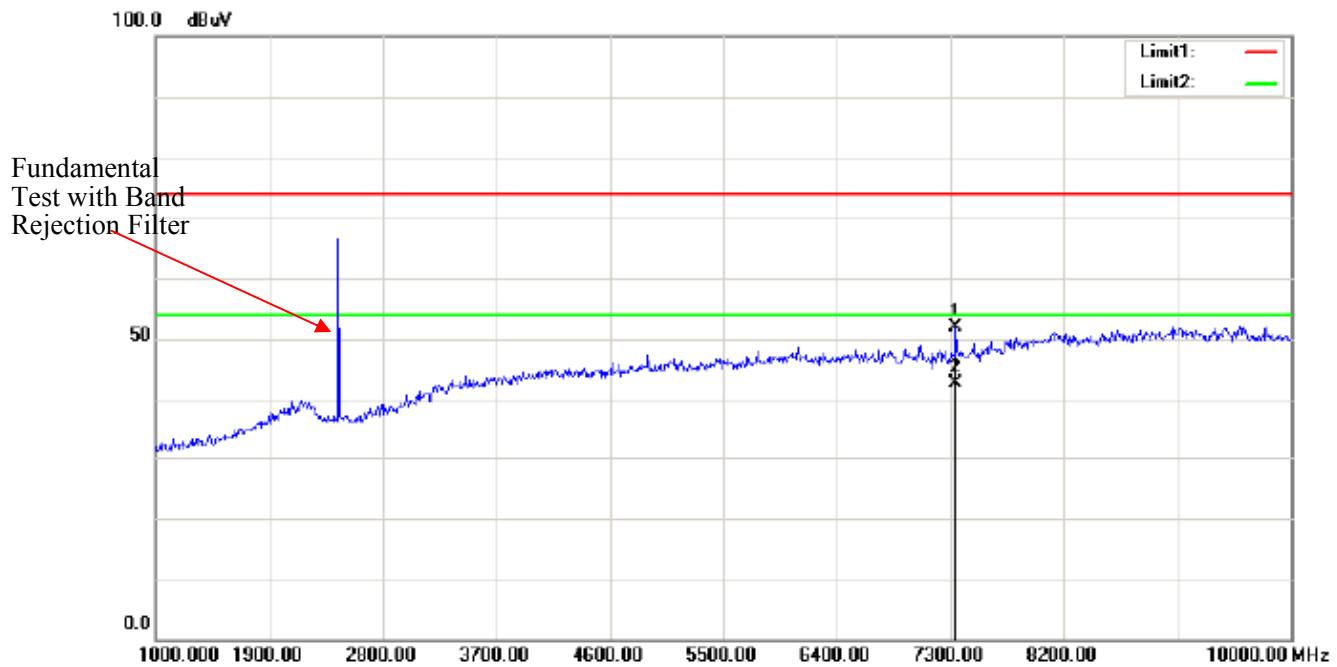
Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	7345.000	48.51	peak	3.28	51.79	74.00	142	35	22.21	
*	2	7345.000	39.38	AVG	3.28	42.66	54.00	142	35	11.34	

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

Vertical:



Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
1	2449.750	68.70	peak	30.02	98.72	125.20	156	37	26.48	Fundamental	
2	2449.750	58.65	AVG	30.02	88.67	125.20	156	37	36.53	Fundamental	
3	2483.500	25.17	peak	30.11	55.28	74.00	156	37	18.72		
*	4	2483.500	14.32	AVG	30.11	44.43	54.00	156	37	9.57	



Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	7345.000	48.51	peak	3.28	51.79	74.00	142	35	22.21	
*	2	7345.000	39.38	AVG	3.28	42.66	54.00	142	35	11.34	

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

## 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
R&S	EMI Test Receive	ESCI	101121	2017-03-02	2018-03-02
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

### Test Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth 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

Temperature:	27.6 °C
Relative Humidity:	53 %
ATM Pressure:	101.1 kPa

\* The testing was performed by Kira Liu on 2017-11-08.

**Test Result:** Compliance.

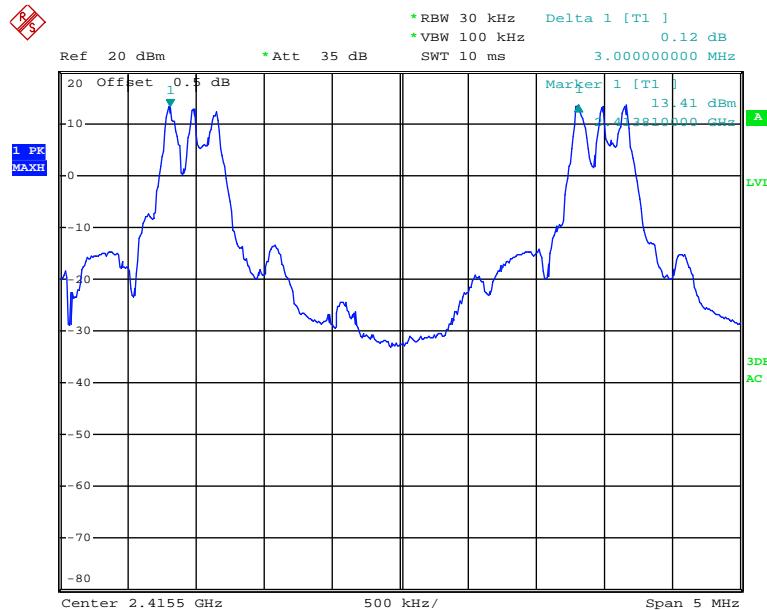
Please refer to following tables and plots

*Test Mode: Transmitting*

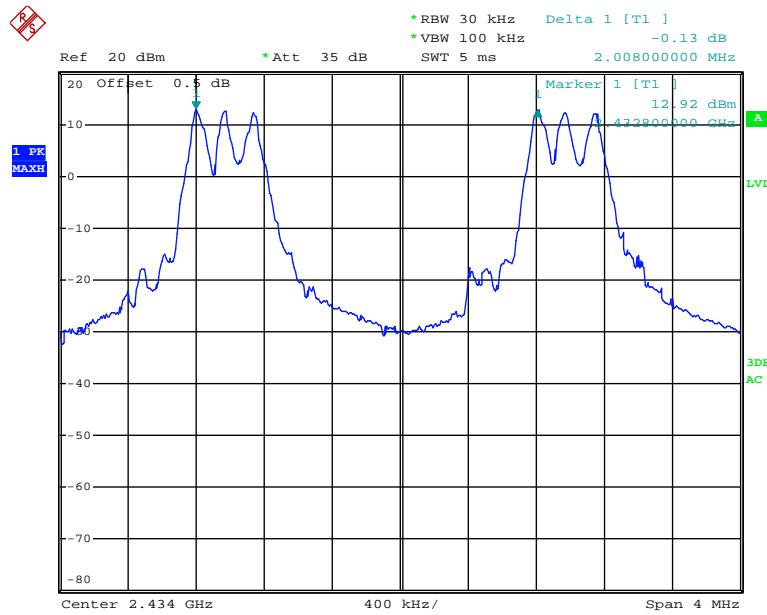
Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
Low	2414	3.00	0.35
Middle	2433	2.01	0.36
High	2450	2.00	0.36

*Note: Limit= (2/3) × 20dB bandwidth*

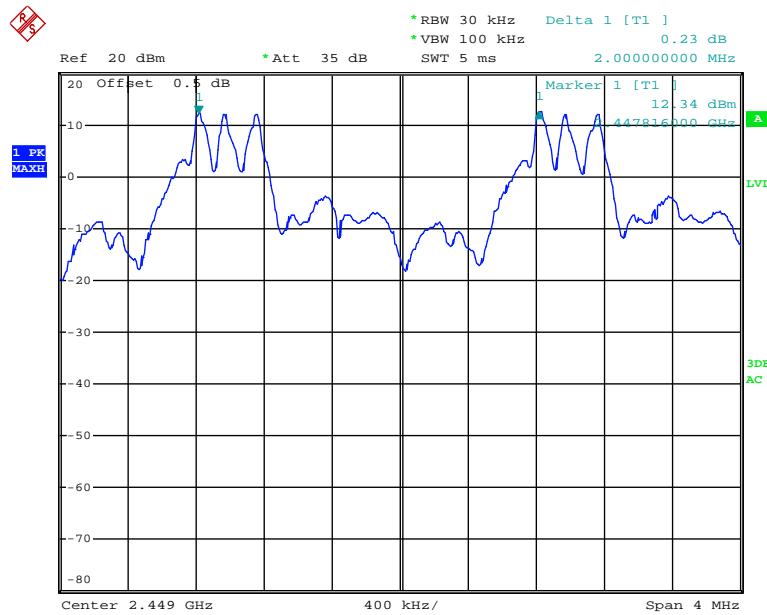
### Low Channel



Date: 8.NOV.2017 14:45:51

**Middle Channel**

Date: 8.NOV.2017 14:53:20

**High Channel**

Date: 8.NOV.2017 14:48:19

## 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
R&S	EMI Test Receive	ESCI	101121	2017-03-02	2018-03-02
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

### Test Data

#### Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	53 %
ATM Pressure:	101.6 kPa

\* The testing was performed by Kira Liu on 2017-11-07.

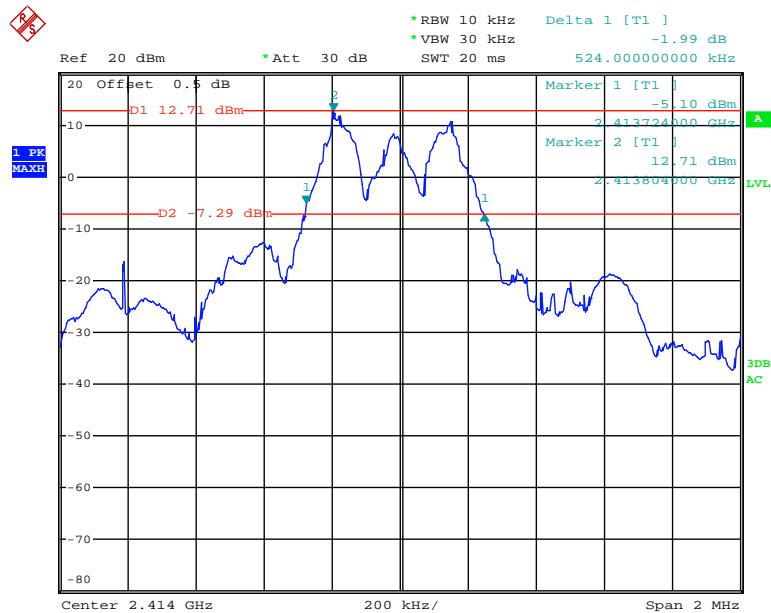
**Test Result:** Compliance.

Please refer to following tables and plots

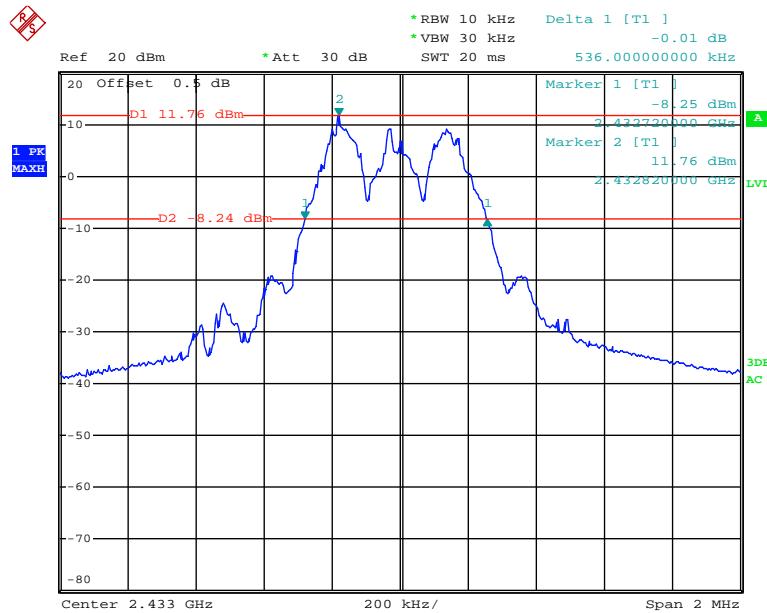
Test Mode: Transmitting

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2414	0.524
Middle	2433	0.536
High	2450	0.536

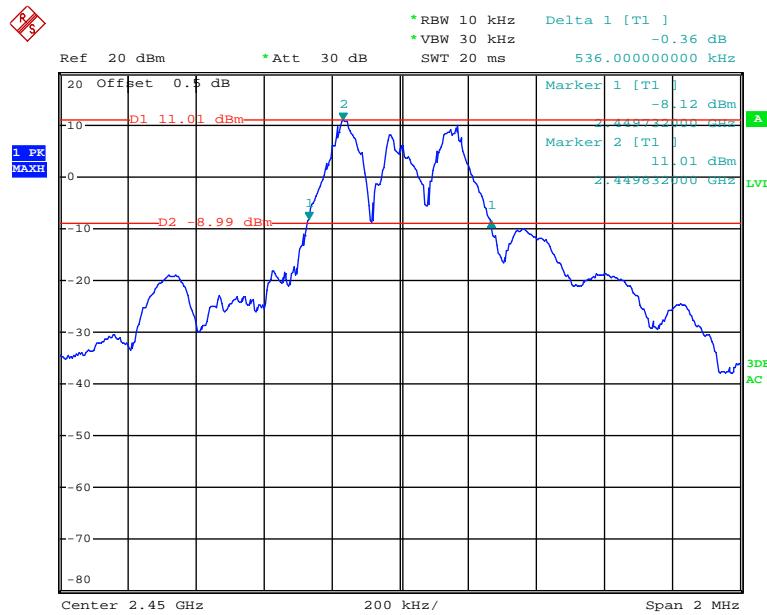
### Low Channel



Date: 7.NOV.2017 17:27:11

**Middle Channel**

Date: 7.NOV.2017 17:37:37

**High Channel**

Date: 7.NOV.2017 17:55:58

## **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**

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

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

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	27.6 °C
<b>Relative Humidity:</b>	53 %
<b>ATM Pressure:</b>	101.6 kPa

*\* The testing was performed by Kira Liu on 2017-11-07.*

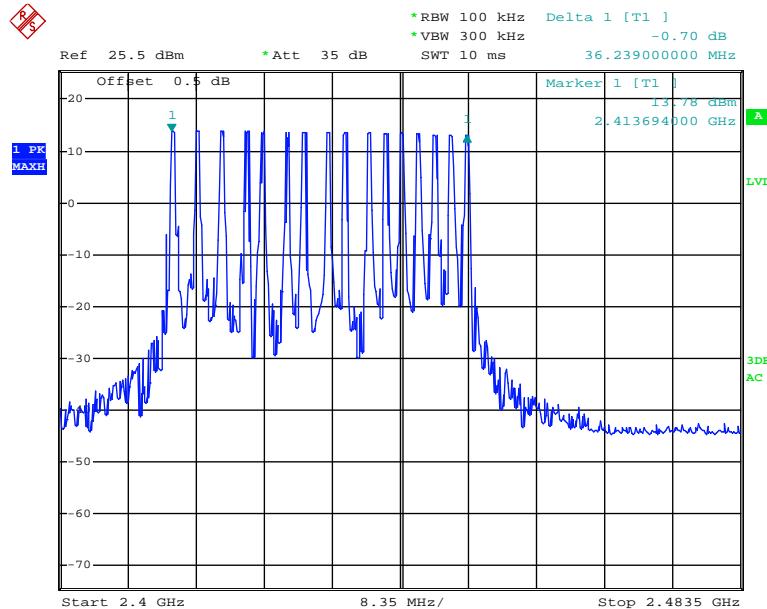
**Test Result:** Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	16	≥15

### Number of Hopping Channels



Date: 7.NOV.2017 18:04:32

## 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
R&S	EMI Test Receive	ESCI	101121	2017-03-02	2018-03-02
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

### Test Data

#### Environmental Conditions

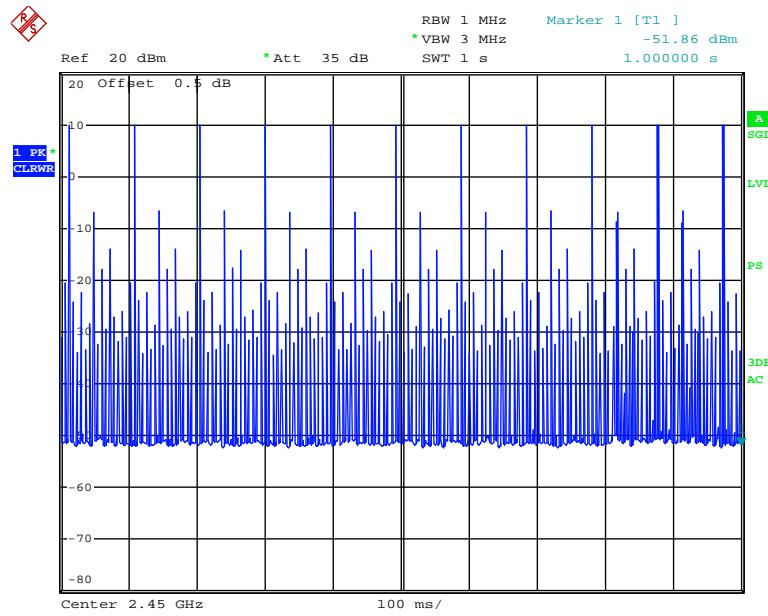
Temperature:	27.6 °C
Relative Humidity:	53 %
ATM Pressure:	101.6 kPa

\* The testing was performed by Kira Liu on 2017-11-07.

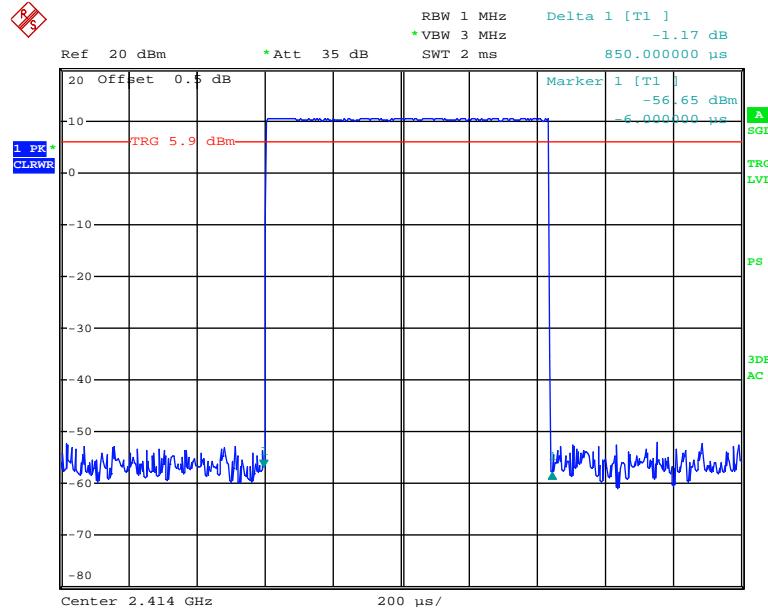
**Test Result:** Compliance. Please refer to following tables and plots

*Test Mode: Transmitting*

Channel	Occupancy Time For Single Hop (ms)	Hops in Observed 1s	Hops in Observed Period	Dwell time (s)	Limit (s)	Result
Low	0.85	11	70	0.059	0.4	Compliance
Middle	0.85	11	70	0.059	0.4	Compliance
High	0.85	11	70	0.059	0.4	Compliance
Dwell time=Pulse time (ms) × hopping number per channel in Observed Period Observed Period=0.4 × hopping numbers=0.4*16=6.4s Hops in Observed Period= Hops in Observed 1s* Observed Period						

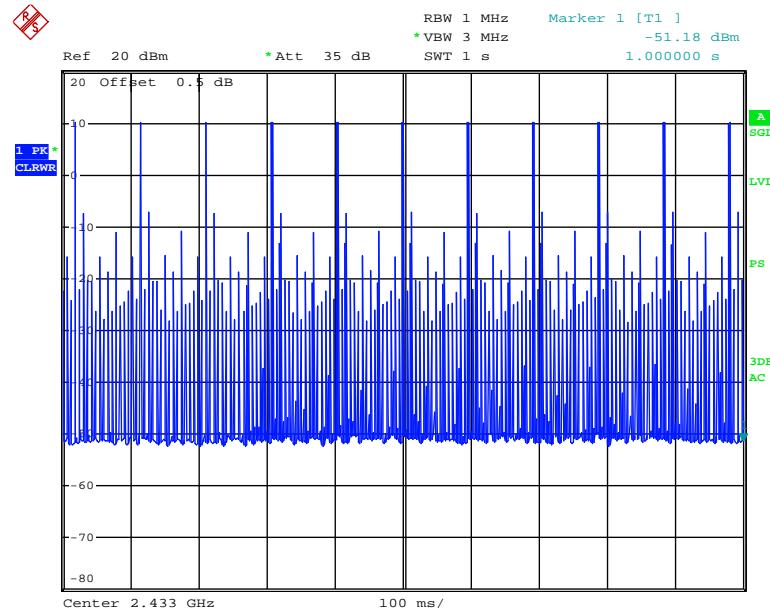
**Low Channel**

Date: 10.NOV.2017 16:36:14

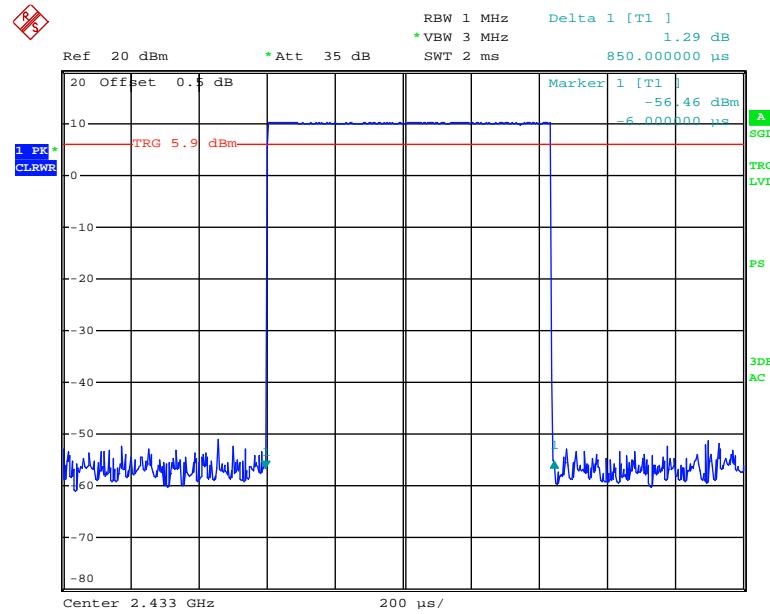


Date: 10.NOV.2017 16:39:33

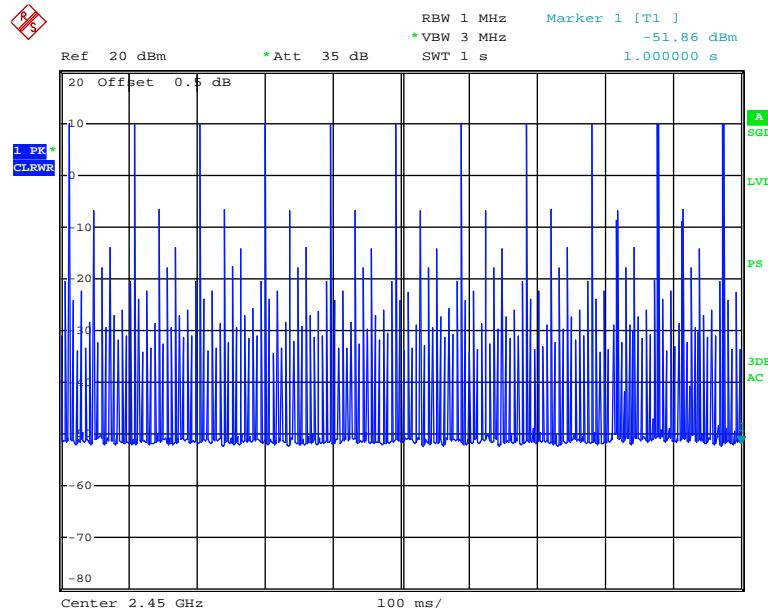
## Middle Channel



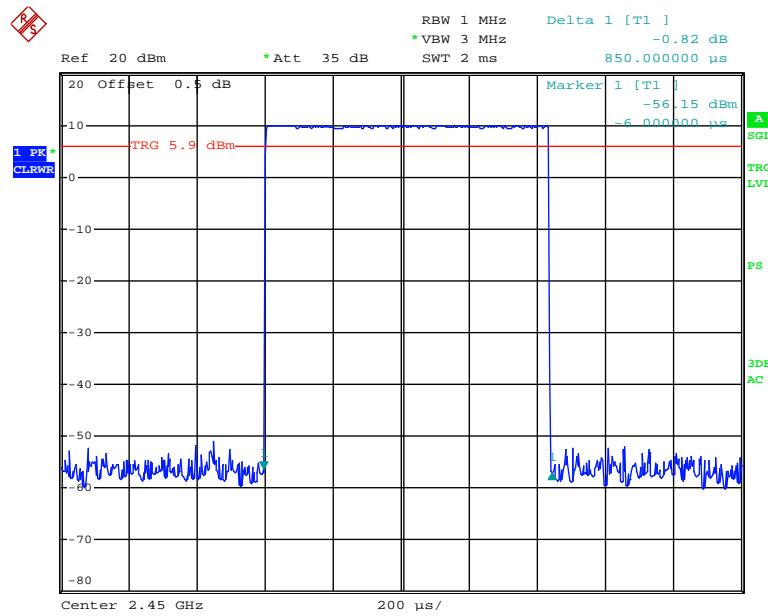
Date: 10.NOV.2017 16:36:51



Date: 10.NOV.2017 16:39:59

**High Channel**

Date: 10.NOV.2017 16:36:14



Date: 10.NOV.2017 16:40:25

## **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
R&S	EMI Test Receive	ESCI	101121	2017-03-02	2018-03-02
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	27.6 °C
<b>Relative Humidity:</b>	53 %
<b>ATM Pressure:</b>	101.6 kPa

*\* The testing was performed by Kira Liu on 2017-11-07.*

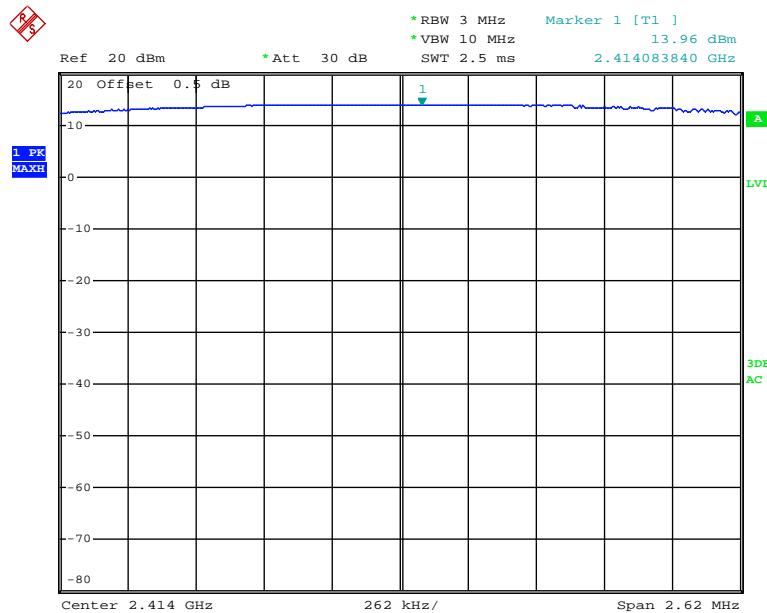
**Test Result:** Compliance.

*Test Mode: Transmitting*

Channel	Frequency (MHz)	Peak Conducted Output power (dBm)	Limit (dBm)
Low	2414	13.96	21
Middle	2433	13.56	21
High	2450	13.13	21

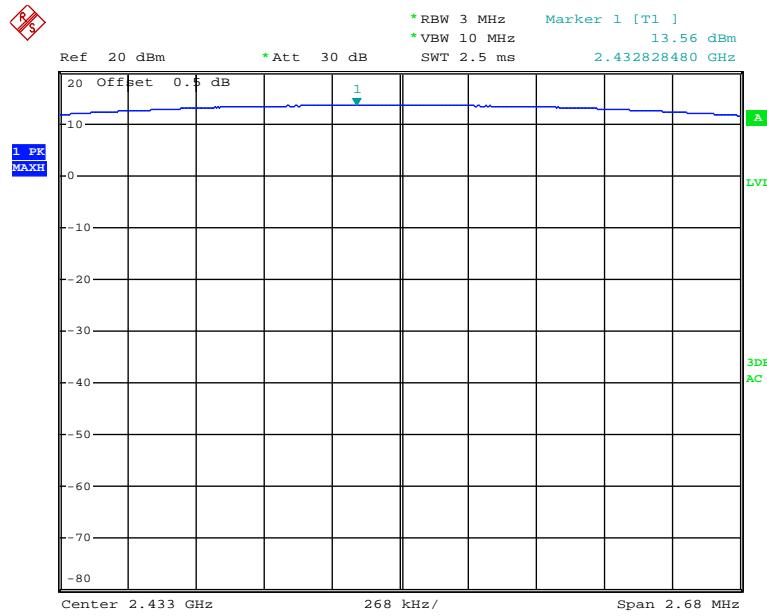
Note: The data above was tested in conducted mode.

### Low Channel



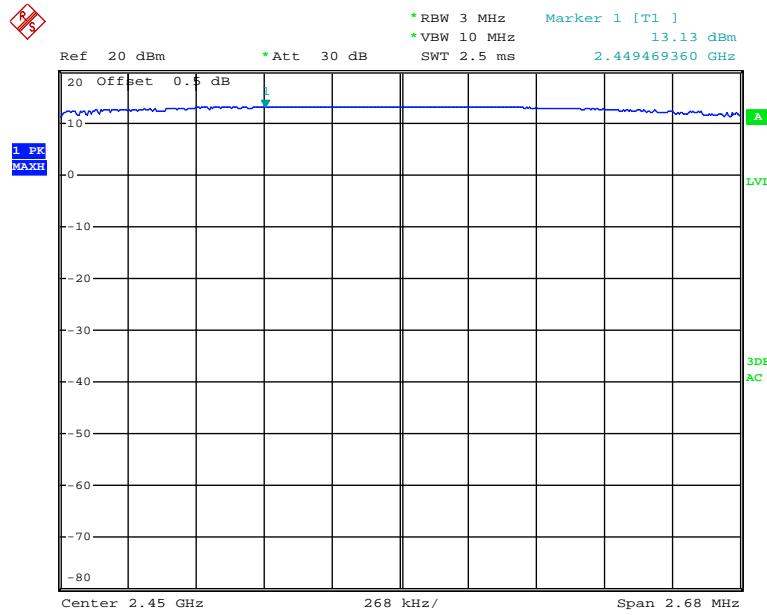
Date: 7.NOV.2017 17:29:55

### Middle Channel



Date: 7.NOV.2017 17:38:50

### High Channel



Date: 7.NOV.2017 17:58:08

## 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 RBW/ VBW of spectrum analyzer to 100/300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

### Test Equipment List and Details

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

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

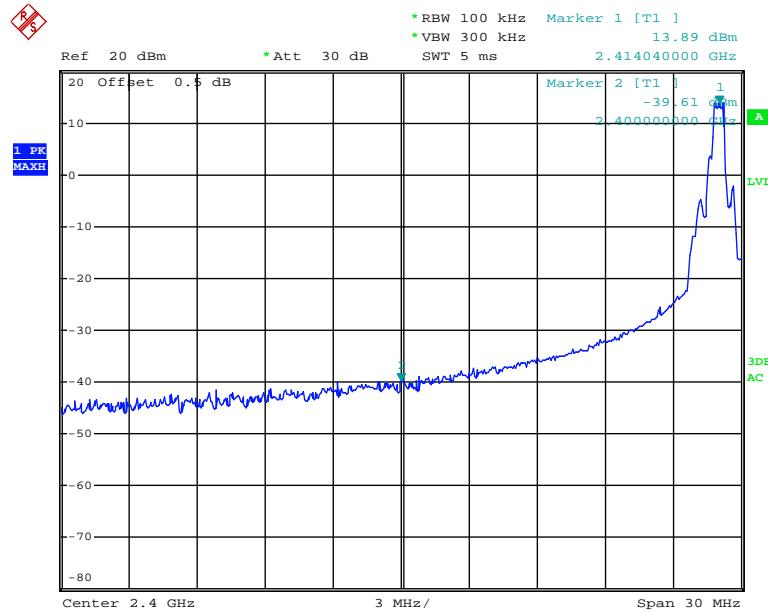
## Test Data

### Environmental Conditions

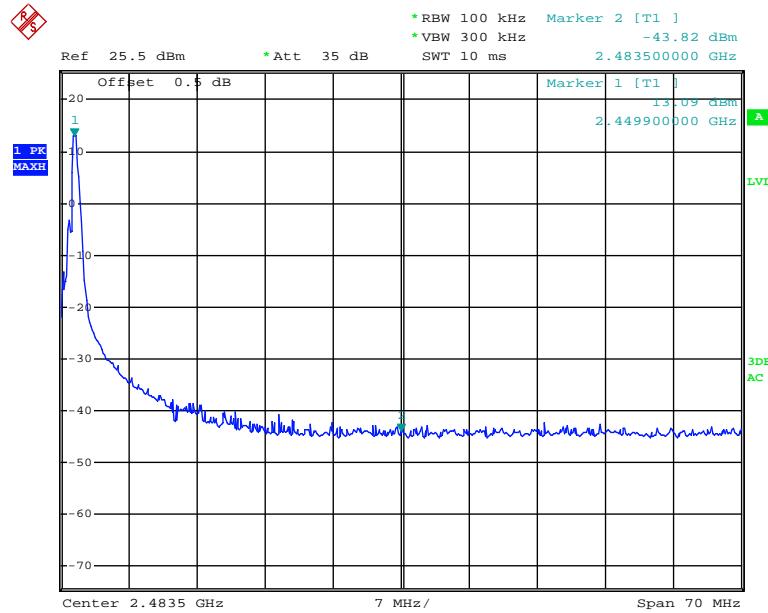
Temperature:	27.6 °C
Relative Humidity:	53 %
ATM Pressure:	101.6kPa

\* The testing was performed by Kira Liu on 2017-11-07.

**Test Result:** Compliance

**Band Edge, Left Side**

Date: 7.NOV.2017 17:31:28

**Band Edge, Right Side**

Date: 7.NOV.2017 18:00:32

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