

FCC PART 15.247

MEASUREMENT AND TEST REPORT

For

**Shenzhen Qi Shenglong Industrialist Co., Ltd.**

5F. Blk 6A, Jing Nan Industry, Bai Ge long, Buji,  
Shenzhen, Guangdong, China

**FCC ID: Y56QSLHD042B**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Wireless Gun TV Game
<b>Test Engineer:</b> Phoenix Liu	<i>Phoenix Liu</i>
<b>Report Number:</b> RSZ10122781-15.247	
<b>Report Date:</b> 2011-02-21	
<b>Reviewed By:</b> EMC Engineer	<i>Merry Zhao</i>
<b>Prepared By:</b>	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008

**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 **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP\*, NIST, or any agency of the Federal Government.

\* This report contains data that are not covered by the NVLAP accreditation and are marked with an asterisk "★" (Rev.2)

## **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 .....	4
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>6</b>
DESCRIPTION OF TEST CONFIGURATION .....	6
EUT EXERCISE SOFTWARE .....	6
EQUIPMENT MODIFICATIONS .....	6
LOCAL SUPPORT EQUIPMENT LIST AND DETAILS .....	6
EXTERNAL I/O CABLE.....	6
CONFIGURATION OF TEST SETUP .....	6
BLOCK DIAGRAM OF TEST SETUP .....	6
<b>SUMMARY OF TEST RESULTS .....</b>	<b>7</b>
<b>FCC §15.247 (i) &amp; §2.1093 – RF EXPOSURE INFORMATION.....</b>	<b>8</b>
APPLICABLE STANDARD .....	8
<b>FCC §15.203 - ANTENNA REQUIREMENT.....</b>	<b>9</b>
APPLICABLE STANDARD .....	9
ANTENNA CONNECTOR CONSTRUCTION .....	9
<b>FCC §15.209, §15.205 &amp; §15.247(d) – RADIATED SPURIOUS EMISSIONS.....</b>	<b>10</b>
APPLICABLE STANDARD .....	10
MEASUREMENT UNCERTAINTY .....	10
EUT SETUP .....	10
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP .....	11
TEST EQUIPMENT LIST AND DETAILS.....	11
TEST PROCEDURE .....	11
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	11
TEST RESULTS SUMMARY .....	12
TEST DATA .....	12
<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>22</b>
APPLICABLE STANDARD .....	22
TEST EQUIPMENT LIST AND DETAILS.....	22
TEST PROCEDURE .....	22
TEST DATA .....	22
<b>FCC §15.247(a) (1) (iii) - QUANTITY OF HOPPING CHANNEL TEST .....</b>	<b>25</b>
APPLICABLE STANDARD .....	25

TEST EQUIPMENT LIST AND DETAILS .....	25
TEST PROCEDURE .....	25
TEST DATA .....	25
<b>FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME).....</b>	<b>27</b>
APPLICABLE STANDARD .....	27
TEST EQUIPMENT LIST AND DETAILS.....	27
TEST PROCEDURE .....	27
TEST DATA .....	27
<b>FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT .....</b>	<b>30</b>
APPLICABLE STANDARD .....	30
MEASUREMENT UNCERTAINTY .....	30
EUT SETUP .....	30
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP .....	31
TEST EQUIPMENT LIST AND DETAILS.....	31
TEST PROCEDURE .....	31
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	31
TEST DATA .....	32
<b>FCC §15.247(d) - BAND EDGES TESTING .....</b>	<b>33</b>
APPLICABLE STANDARD .....	33
TEST EQUIPMENT LIST AND DETAILS.....	33
TEST PROCEDURE .....	33
TEST DATA .....	34

---

## GENERAL INFORMATION

---

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

The *SHENZHEN QI SHENGLONG INDUSTRIALIST CO.,LTD.*'s product, model number: *HD-042TX* (FCC ID: *Y56QSLHD042B*) or the "EUT" as referred to in this report is a *Wireless Gun TV Game*, which measures approximately: 90 cm (L) x 9.5cm (W) x 3.0 cm (H), rated input voltage: DC 6 V= 4\*AA battery.

*\* All measurement and test data in this report was gathered from production sample serial number: 1012009 (Assigned by BACL, Shenzhen). The EUT was received on 2010-12-27.*

### Objective

This Type approval report is prepared on behalf of *SHENZHEN QI SHENGLONG INDUSTRIALIST CO., LTD.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B 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, 15.207, 15.209 and 15.247 rules.

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

FCC Part 15.247 submission with FCC ID: Y56QSLHD042A.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

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

### Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located in the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) 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 December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2007070.htm>

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in an engineering mode which was selected by manufacturer.

### EUT Exercise Software

N/A.

### Equipment Modifications

No modification was made to the unit tested.

### Local Support Equipment List and Details

N/A

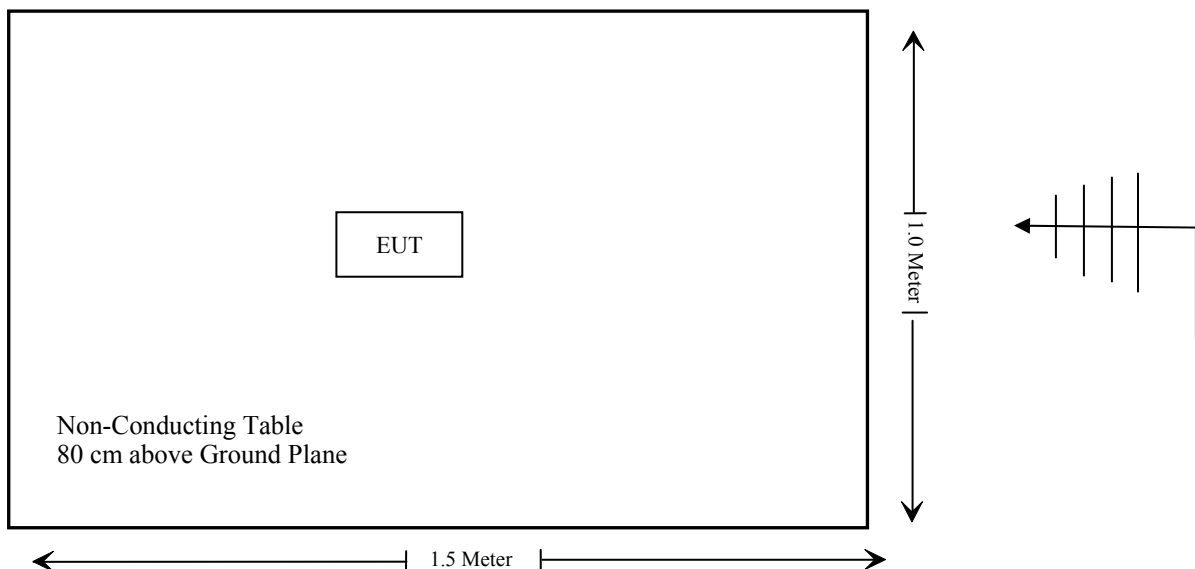
### External I/O Cable

N/A

### Configuration of Test Setup



### Block Diagram of Test Setup



## SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §2.1093	RF Exposure Information	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	N/A*
§15.205, §15.209, §15.247(d)	Radiated 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: \* battery operation.

---

**FCC §15.247 (i) & §2.1093 – RF EXPOSURE INFORMATION**

---

**Applicable Standard**

According to FCC §15.247(i) 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 KDB 447498 D01 Mobile Portable RF Exposure v03r03, no SAR required if power is lower than the flowing threshold:

When routine evaluation is required for SAR and the output power is  $\leq 60/f(\text{GHz})$  mW, the test reduction and test exclusion procedures given herein, or in KDB 616217 or KDB 648474, are applicable.

A device may be used in portable exposure conditions with no restrictions on host platforms when either the source-based time-averaged output power is  $\leq 60/f(\text{GHz})$  mW or all measured 1-g SAR are  $< 0.4$  W/kg.10 When SAR evaluation is required, the most conservative exposure conditions for all expected operating configurations must be tested.

**Measurement Result:**

Max Peak output power:

2404 MHz: 0.132 mW

$60/f_{\text{GHz}} = 60/2.404 = 24.96$  mW

Max Peak output power  $< 60/f_{\text{GHz}}$

So the SAR measurement is not necessary.



---

## 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 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: Antenna must be permanently attached to the unit.

a. 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, the gain is 0 dBi; which in accordance to section 15.203 please refer to the internal photos.

**Result:** Compliance.

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

### Applicable Standard

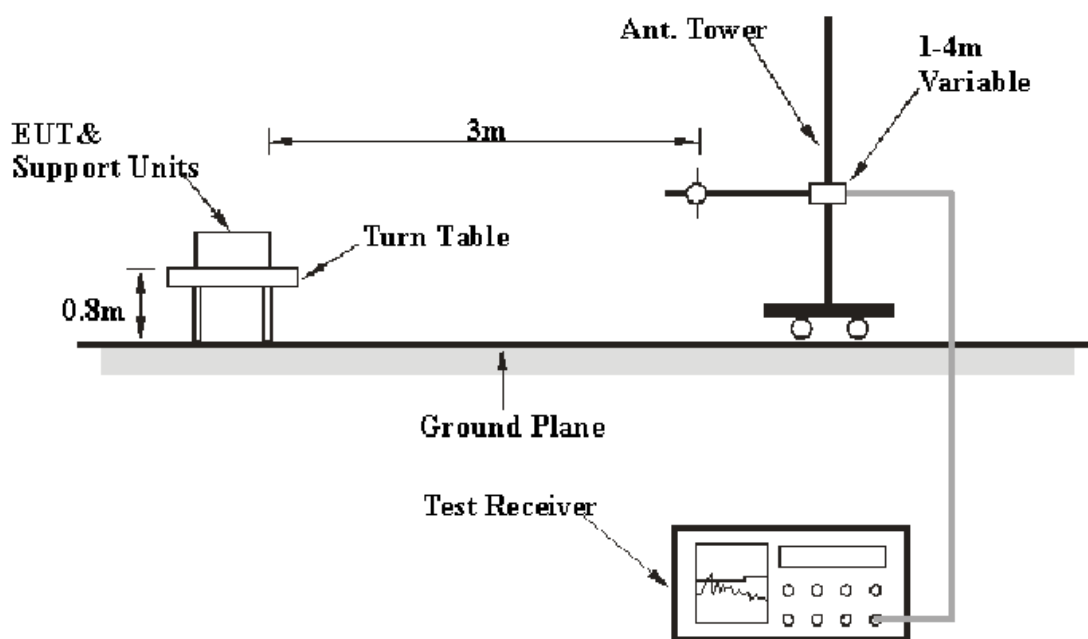
FCC §15.247 (d); §15.209; §15.205.

### Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is  $\pm 4.0$  dB ( $k=2$ , 95% level of confidence).

### EUT Setup



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.4-2009. 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:

<i><b>Frequency Range</b></i>	<i><b>RBW</b></i>	<i><b>Video B/W</b></i>
30MHz – 1000 MHz	100 kHz	300 kHz
1000 MHz – 25 GHz	1 MHz	3 MHz

## 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>
HP	Amplifier	HP8447D	2944A09795	2010-08-02	2011-08-02
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-24	2011-11-23
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2010-03-11	2011-03-11
HP	Amplifier	8449B	3008A00277	2010-09-12	2011-09-11
Sunol Sciences	Horn Antenna	DRH-118	A052604	2010-05-05	2011-05-04
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2010-07-08	2011-07-08

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

## Test Procedure

For the radiated emissions test, 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-1GHz and peak and Average detection modes for frequencies above 1GHz.

## 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 7 dB means the emission is 7 dB 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, with the worst margin reading of:

### Below 1 GHz:

**3.7 dB** at **287.970500 MHz** in the **Horizontal** polarization, by battery

### Above 1 GHz:

**6.48 dB** at **4808 MHz** in the **Horizontal** polarization at low channel

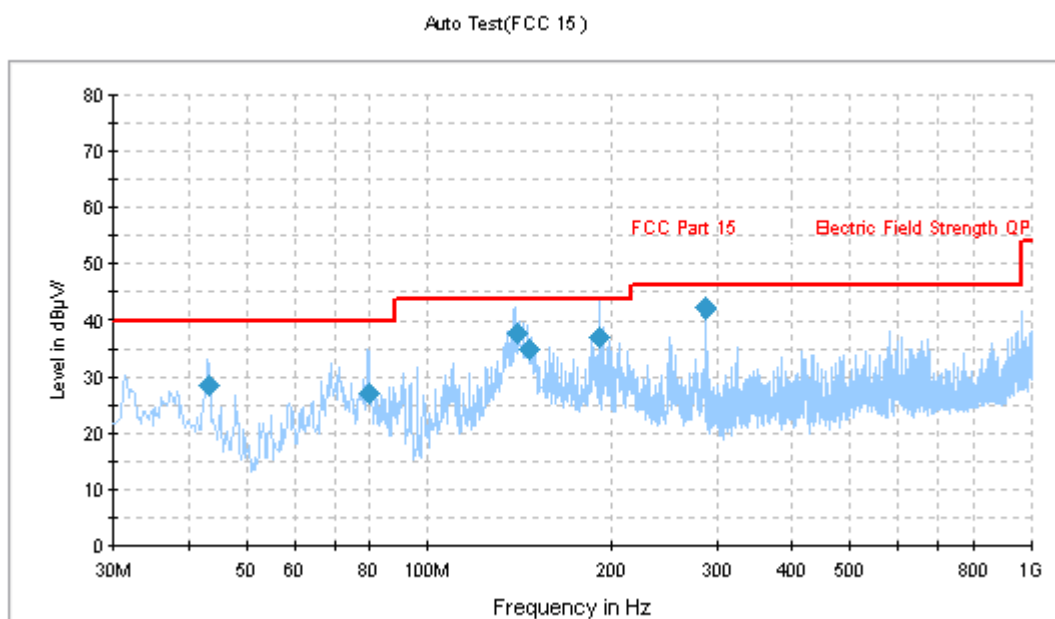
## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.0kPa

*The testing was performed by Phoenix Liu on 2011-02-10.*

Test Mode: by battey



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Ant. Height (cm)	Ant. Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dBμV/m)	Margin (dB)
287.970500	42.3	104.0	H	195.0	-12.6	46.0	3.7*
139.361250	37.8	305.0	H	9.0	-13.0	43.5	5.7
192.059750	37.1	103.0	V	224.0	-14.7	43.5	6.4
146.320750	35.0	205.0	H	158.0	-13.7	43.5	8.5
43.286000	28.6	105.0	V	293.0	-14.1	40.0	11.4
79.703000	27.2	102.0	V	130.0	-18.1	40.0	12.8

Note: \*within measurement uncertainly.

**Above 1 GHz:**

Indicated		Detector (PK/AV)	Table Angle Degree	Test Antenna		Correction Factor			FCC Part 15.247/15.209			
Frequency (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre- Amp. (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2404 MHz)												
4808	33.37	Ave	0	1.1	H	36.6	4.3	26.75	47.52	54	6.48	harmonic
4808	33	Ave	15	1.5	V	35.4	4.3	26.75	45.95	54	8.05	harmonic
1180	38.7	Ave	0	1.1	H	25.1	2.02	26.45	39.37	54	14.63	spurious
1180	39.2	Ave	15	1.5	V	23.8	2.02	26.45	38.57	54	15.43	spurious
4808	38.17	PK	0	1.1	H	36.6	4.3	26.75	52.32	74	21.68	harmonic
4808	39.23	PK	15	1.5	V	35.4	4.3	26.75	52.18	74	21.82	harmonic
1180	50.33	PK	15	1.5	V	23.8	2.02	26.45	49.7	74	24.3	spurious
1180	49.02	PK	0	1.1	H	25.1	2.02	26.45	49.69	74	24.31	spurious
Middle Channel (2441 MHz)												
4882	32.4	Ave	10	1.2	H	36.6	4.3	26.75	46.55	54	7.45	harmonic
4882	32.97	Ave	15	1.6	V	35.4	4.3	26.75	45.92	54	8.08	harmonic
1023	56.3	PK	10	1.2	H	25.1	2.02	26.45	56.97	74	17.03	spurious
4882	42.78	PK	10	1.2	H	36.6	4.3	26.75	56.93	74	17.07	harmonic
1023	36.2	Ave	10	1.2	H	25.1	2.02	26.45	36.87	54	17.13	spurious
1023	37.4	Ave	15	1.6	V	23.8	2.02	26.45	36.77	54	17.23	spurious
4882	43.38	PK	15	1.6	V	35.4	4.3	26.75	56.33	74	17.67	harmonic
1023	47.6	PK	15	1.6	V	23.8	2.02	26.45	46.97	74	27.03	spurious
High Channel (2475 MHz)												
4950	31.49	Ave	125	1.5	H	36.6	4.3	26.75	45.64	54	8.36	harmonic
4950	31.66	Ave	25	1.4	V	35.4	4.3	26.75	44.61	54	9.39	harmonic
1008	38.6	Ave	125	1.5	H	25.1	2.02	26.45	39.27	54	14.73	spurious
1008	39.1	Ave	25	1.4	V	23.8	2.02	26.45	38.47	54	15.53	spurious
4950	41.47	PK	125	1.5	H	36.6	4.3	26.75	55.62	74	18.38	harmonic
4950	41.67	PK	25	1.4	V	35.4	4.3	26.75	54.62	74	19.38	harmonic
1008	50.23	PK	125	1.5	H	25.1	2.02	26.45	50.9	74	23.1	spurious
1008	46.7	PK	25	1.4	V	23.8	2.02	26.45	46.07	74	27.93	spurious

**Spurious Emission in the Restricted Bands:**

Indicated		Detector (PK/Ave.)	Table Angle Degree	Test Antenna		Correction Factor			FCC Part 15.247/15.209			
Frequency (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre- Amp. (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
2483.56	46.3	Ave	25	1.4	V	30.6	3.29	26.88	53.31	54	0.69*	spurious
2483.56	43.3	Ave	125	1.5	H	30.6	3.29	26.88	50.31	54	3.69*	spurious
2483.56	58.2	PK	125	1.5	H	30.6	3.29	26.88	65.21	74	8.79	spurious
2483.56	60.17	PK	25	1.4	V	30.6	3.29	26.88	67.18	74	6.82	spurious
2386.53	35.8	Ave	0	1.1	H	30.6	3.29	26.88	42.81	54	11.19	spurious
2386.53	33.6	Ave	15	1.5	V	30.6	3.29	26.88	40.61	54	13.39	spurious
2386.53	47.67	PK	0	1.1	H	30.6	3.29	26.88	54.68	74	19.32	spurious
2386.53	45.7	PK	15	1.5	V	30.6	3.29	26.88	52.71	74	21.29	spurious

## 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 2400-2483.5 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	100035	2010-11-24	2011-11-23

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### Test Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 100 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another truce
3. Measure the channel separation.

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.9 kPa

\* The testing was performed by Phoenix Liu on 2011-02-10.

**Test Result:** Compliance.

Please refer to following tables and plots

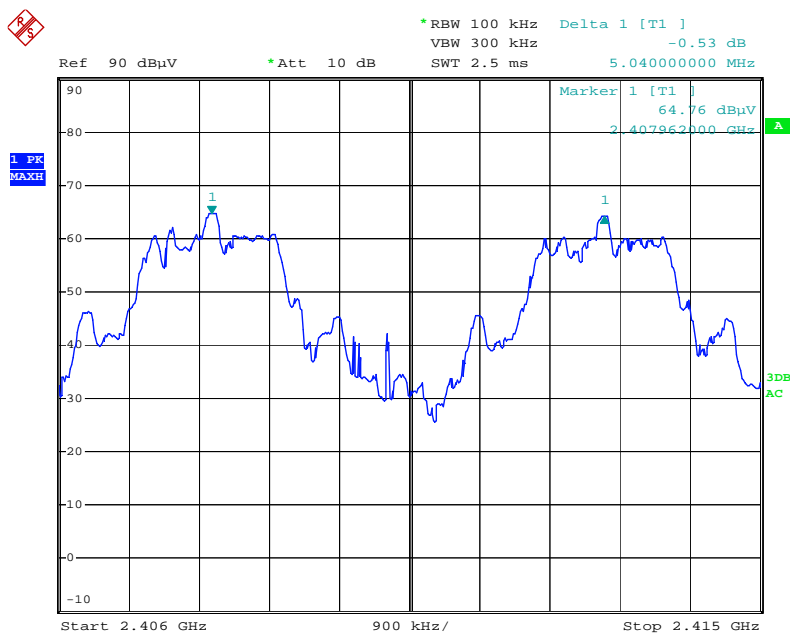
*Test Mode: Transmitting*

Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
channel	2404	4	2.253	Pass
Adjacent	2408			
channel	2408	5.04	2.253	Pass
Adjacent	2413			
channel	2418	4	2.253	Pass
Adjacent	2422			
channel	2422	3.08	2.253	Pass
Adjacent	2425			
channel	2425	6.02	2.253	Pass
Adjacent	2431			
channel	2431	5.04	2.253	Pass
Adjacent	2436			
channel	2446	4.048	2.253	Pass
Adjacent	2450			
channel	2450	6.02	2.253	Pass
Adjacent	2456			
channel	2456	5.004	2.253	Pass
Adjacent	2461			
channel	2471	4	2.253	Pass
Adjacent	2475			

Please refer to the following plots.

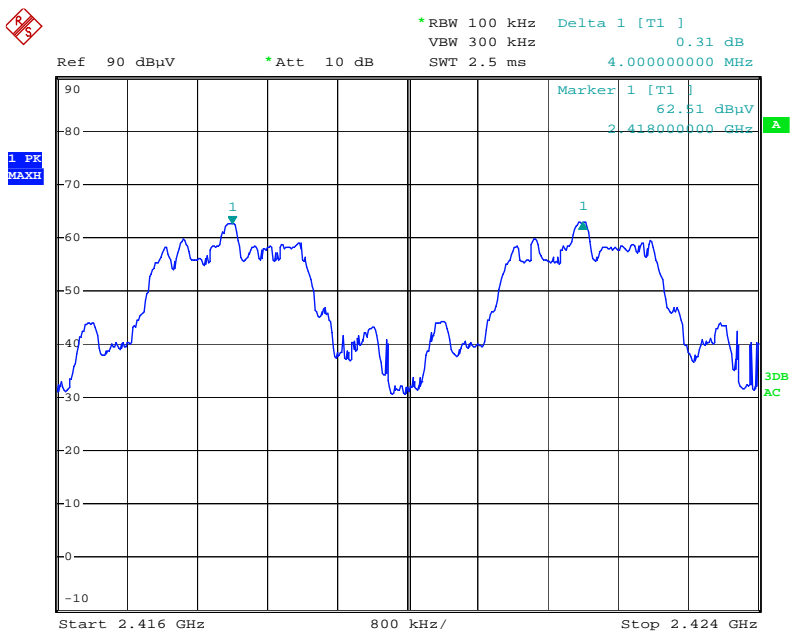


## CH 1 &amp; CH 2



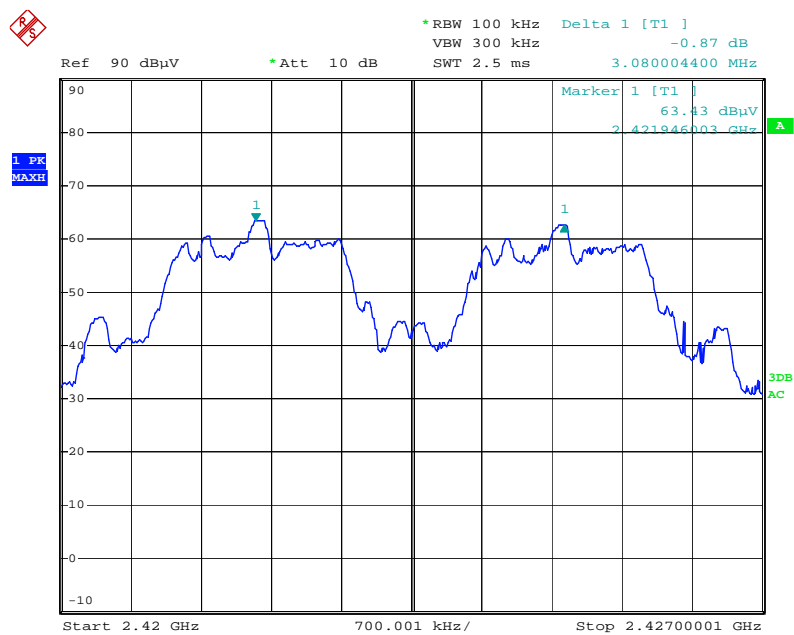
Date: 10.FEB.2011 17:53:02

## CH 2 &amp; CH 3



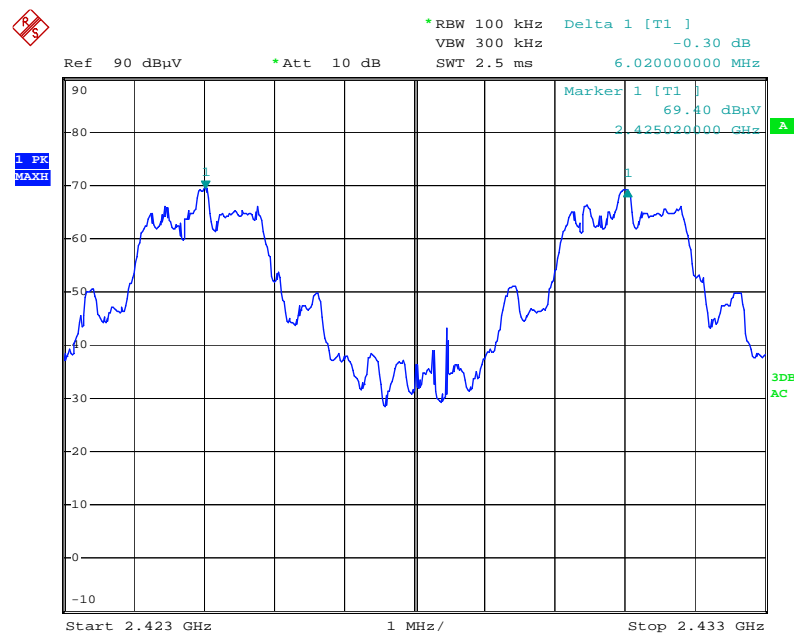
Date: 10.FEB.2011 17:54:37

## CH 4 &amp; CH 5



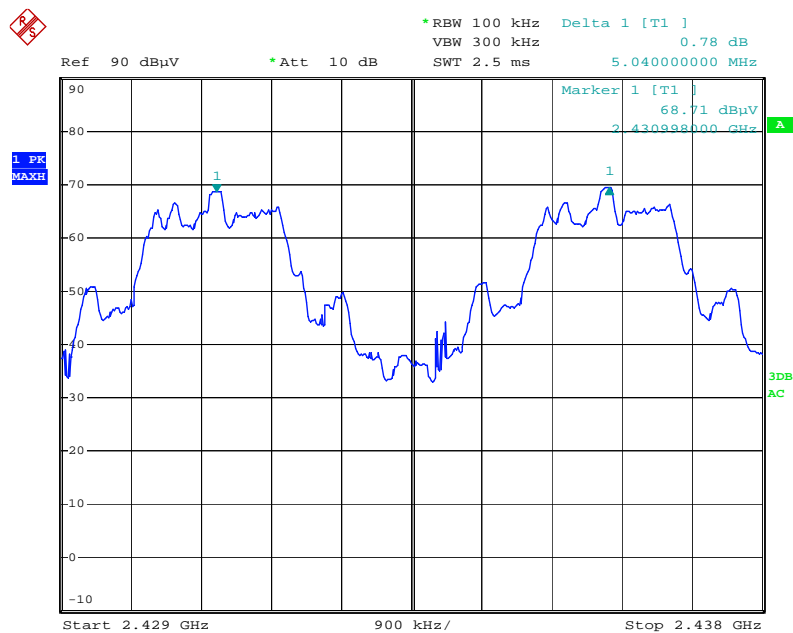
Date: 10.FEB.2011 17:56:14

## CH 5 &amp; CH 6



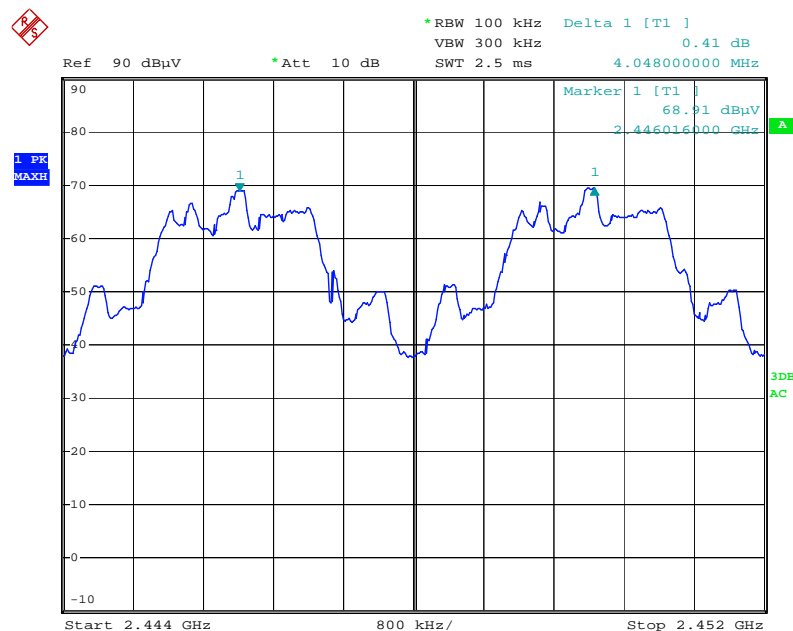
Date: 10.FEB.2011 17:57:44

## CH 6 &amp; CH 7



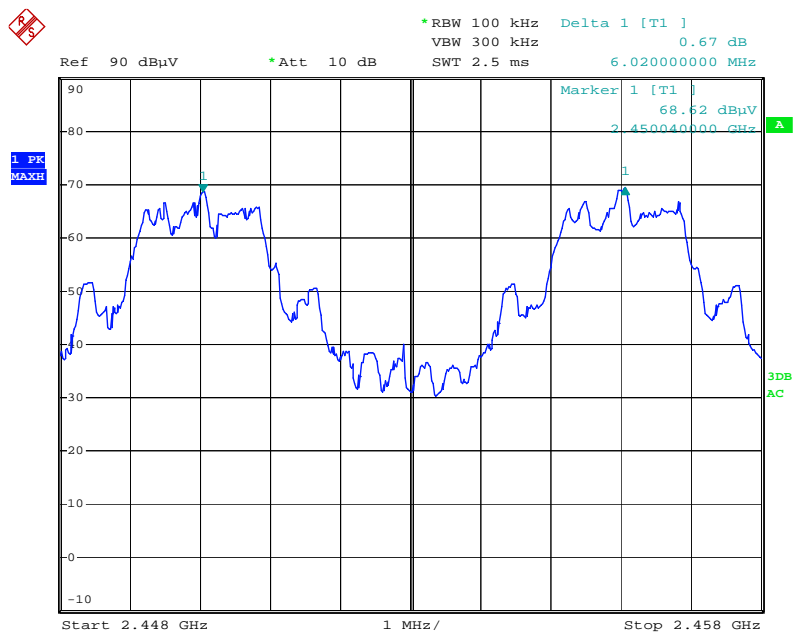
Date: 10.FEB.2011 18:00:24

## CH 7 &amp; CH 8



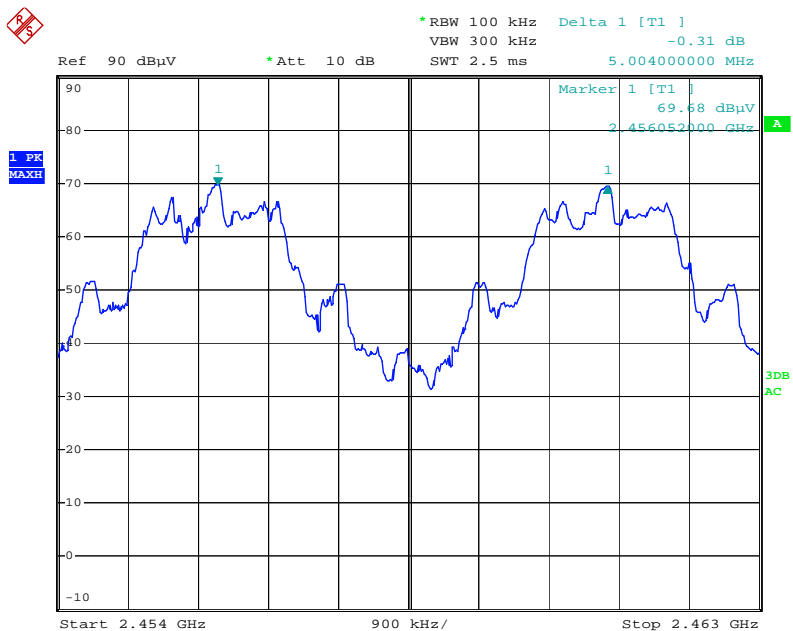
Date: 10.FEB.2011 18:02:40

## CH 10 &amp; CH 11



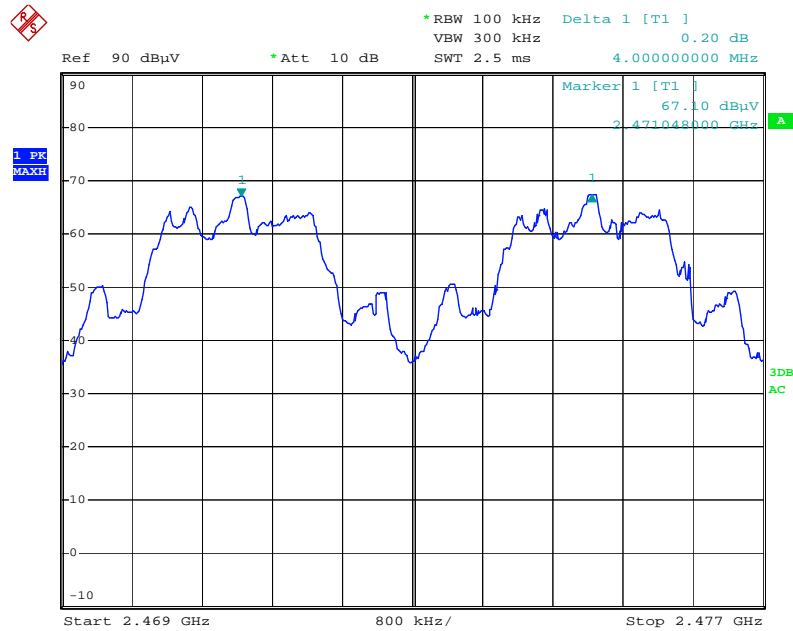
Date: 10.FEB.2011 18:05:36

## CH 11 &amp; CH 12



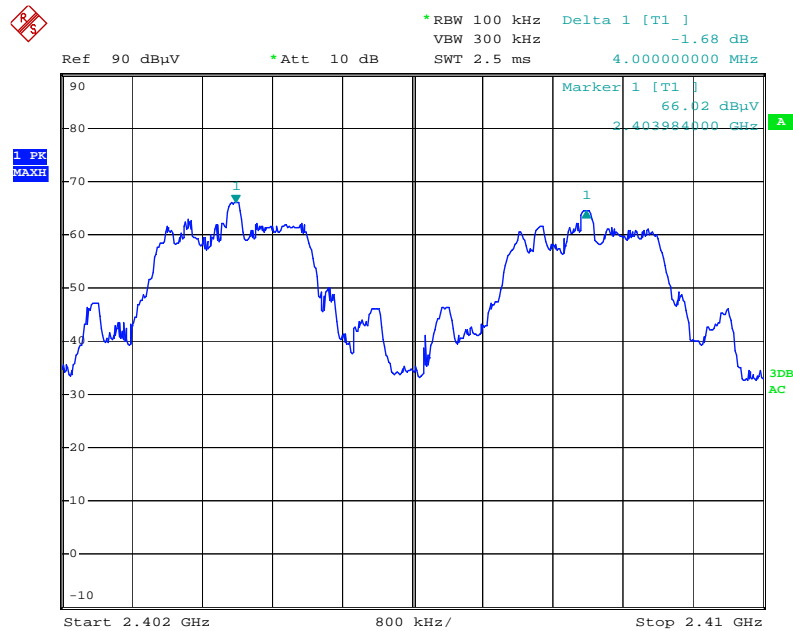
Date: 10.FEB.2011 18:07:10

## CH 12 &amp; CH 13



Date: 10.FEB.2011 18:08:53

## CH 15 &amp; CH 16



Date: 10.FEB.2011 17:51:38

## 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 125mW.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-24	2011-11-23

**\* Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### 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 Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9kPa

*\* The testing was performed by Phoenix Liu on 2011-02-10.*

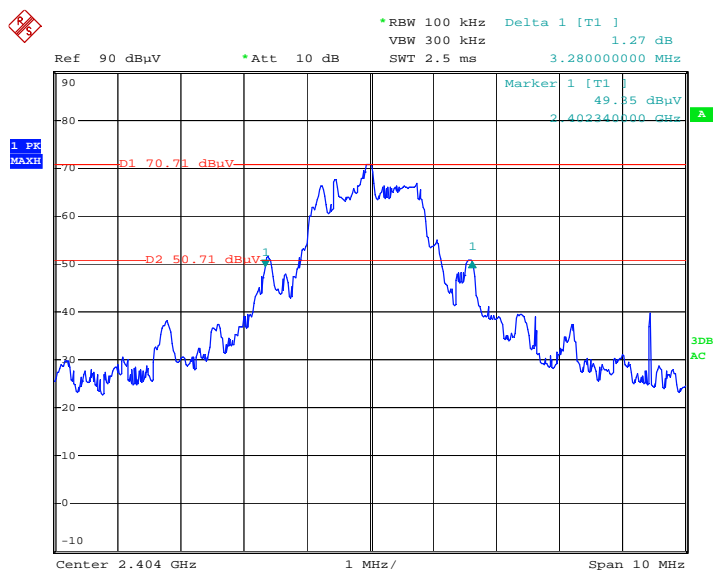
**Test Result:** Compliance.

Please refer to following tables and plots

*Test Mode: Transmitting*

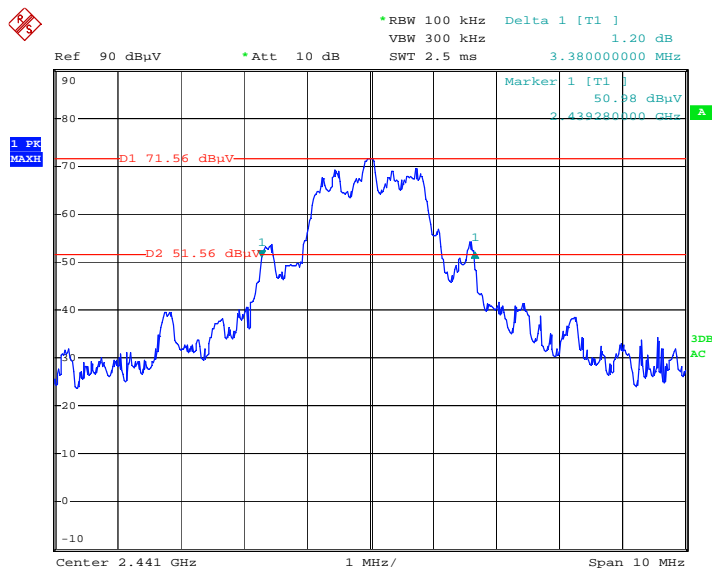
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2404	3.28
Middle	2441	3.38
High	2475	3.38

Please refer to the following plots.

**Low Channel**

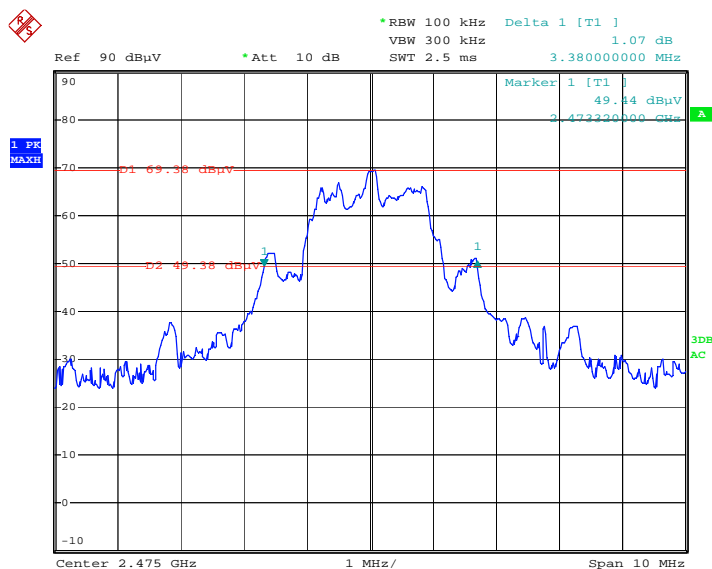
Date: 10.FEB.2011 17:47:42

## Middle Channel



Date: 10.FEB.2011 17:41:47

## High Channel



Date: 10.FEB.2011 17:45:49



## 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-24	2011-11-23

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### 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 Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9kPa

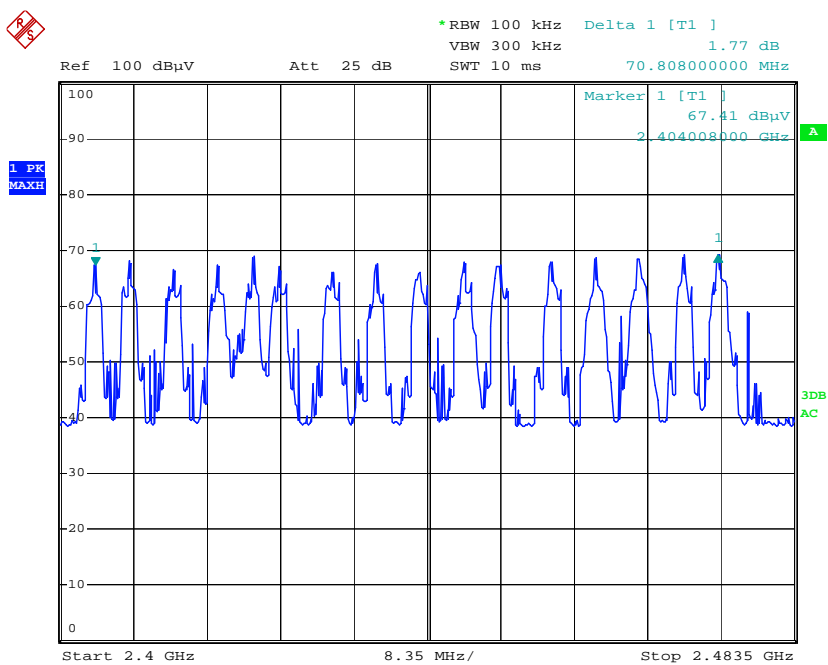
*The testing was performed by Phoenix Liu on 2011-02-10.*

**Test Result:** Compliant.

Please refer to following tables and plots

*Test Mode: Transmitting*

Frequency Range (MHz)	Number of Hopping Channel	Limit
2400~2483.5	16	$\geq 15$

**Number of Hopping Channels**

Date: 10.FEB.2011 12:22:12

## 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-24	2011-11-23

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### Test Procedure

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 X channel no. (s), the quantity of pulse was get from single sweep. In addition, the time of single pulses was tested.

Dwell Time= time slot length \* hope rate/ number of hopping channels \* hopping NO.\*0.4 s  
Hop rate=1000/160=6.25/s

### Test Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0kPa

*The testing was performed by Phoenix Liu on 2011-02-10.*

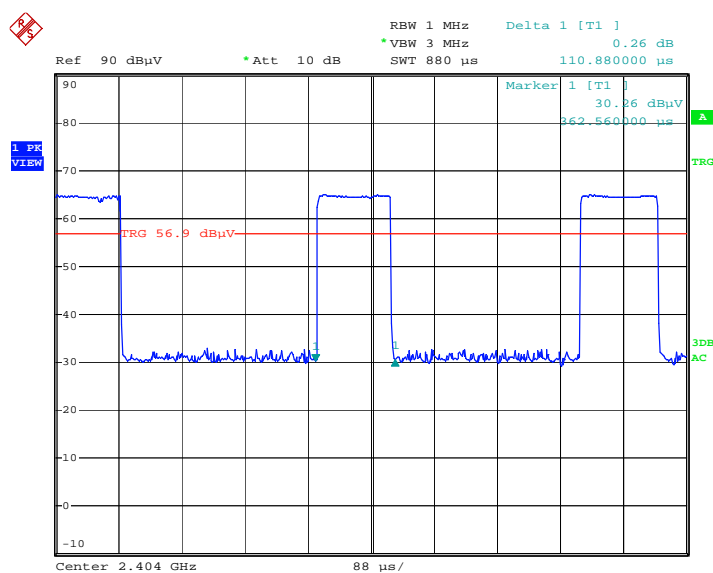
**Test Result:** Compliance.

Please refer to following tables and plots

*Test Mode: Transmitting*

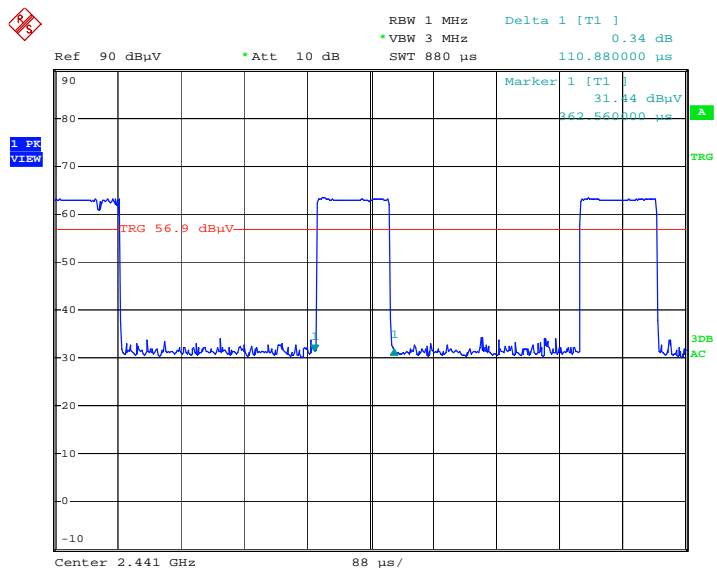
Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
Low	110.88	0.1386	0.4	Pass
Middle	110.88	0.1386	0.4	Pass
High	110.88	0.1386	0.4	Pass
<b>Note:</b> Dwell time=Pulse time (ms) × (1000/160/2 /16) ×16*0.4 Second				

Please refer to the following plots.

**Low Channel**

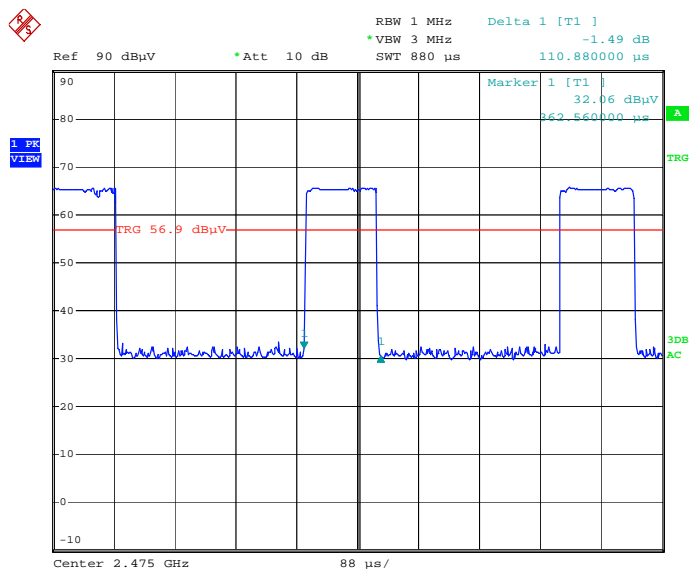
Date: 10.FEB.2011 18:18:49

### Middle Channel



Date: 10.FEB.2011 18:19:57

### High Channel



Date: 10.FEB.2011 18:20:53

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

### Applicable Standard

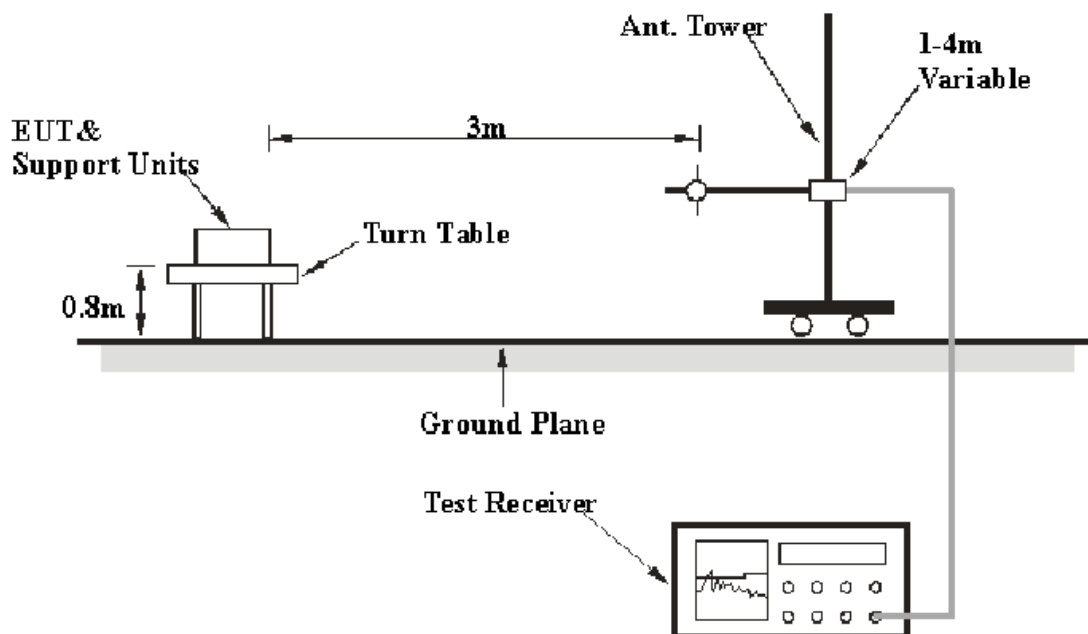
FCC §15.247 (d); §15.209; §15.205;

### Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is  $\pm 4.0$  dB ( $k=2$ , 95% level of confidence).

### EUT Setup



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.4-2009.

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

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

<i><b>Frequency Range</b></i>	<i><b>RBW</b></i>	<i><b>Video B/W</b></i>
30MHz – 1000 MHz	100 kHz	300 kHz
1000 MHz – 25 GHz	1 MHz	3 MHz

## 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>
HP	Amplifier	HP8447D	2944A09795	2010-08-02	2011-08-02
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-24	2011-11-23
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2010-03-11	2011-03-11
HP	Amplifier	8449B	3008A00277	2010-09-12	2011-09-11
Sunol Sciences	Horn Antenna	DRH-118	A052604	2010-05-05	2011-05-04
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2010-07-08	2011-07-08

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

## Test Procedure

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

## 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>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.9kPa

\* The testing was performed by Phoenix Liu on 2011-02-10.

**Test Result:** Compliance.

Indicated		Detector (PK/Ave)	Table Angle Degree	Test Antenna		Correction Factor			FCC Part 15.247				
Frequenc y (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre- Amp. (dB)	Cord. Amp. (dBμV/ m)	Cord. Amp. (dBm)	Cord. Amp. (mW)	Limit (mW)	Result
Low Channel (2404 MHz)													
2404	76.12	PK	30	1.2	V	30.6	3.11	26.88	82.95	-12.32	0.059	125	pass
2404	79.63	PK	180	1.5	H	30.6	3.11	26.88	86.46	-8.81	0.132	125	pass
Middle Channel (2441 MHz)													
2441	76.45	PK	30	1.2	V	30.6	3.11	26.88	83.28	-11.99	0.063	125	pass
2441	78.23	PK	210	1.5	H	30.6	3.11	26.88	85.06	-10.21	0.095	125	pass
High Channel (2475 MHz)													
2475	76.86	PK	30	1.2	V	30.6	3.11	26.88	83.69	-11.58	0.070	125	pass
2475	77.93	PK	220	1.5	H	30.6	3.11	26.88	84.76	-10.51	0.089	125	pass

Note:  $P \text{ (dBm)} = E \text{ (dBμV/m)} - 95.27$



## 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-24	2011-11-23

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### 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. Put it on the Rotated table and 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 and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz.
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>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.9kPa

*\*The testing was performed by Phoenix Liu on 2011-02-10.*

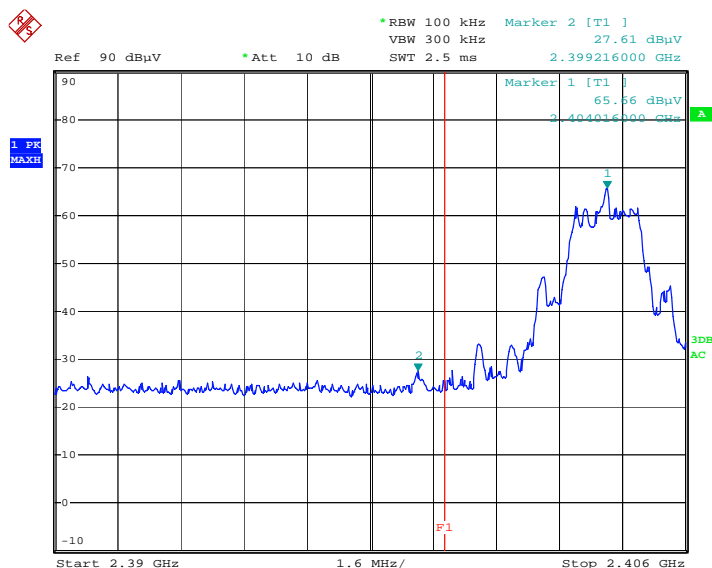
**Test Result:** Compliant

*Test Mode: Transmitting*

Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)
2399.216	38.05	20
2492.170	43.58	20

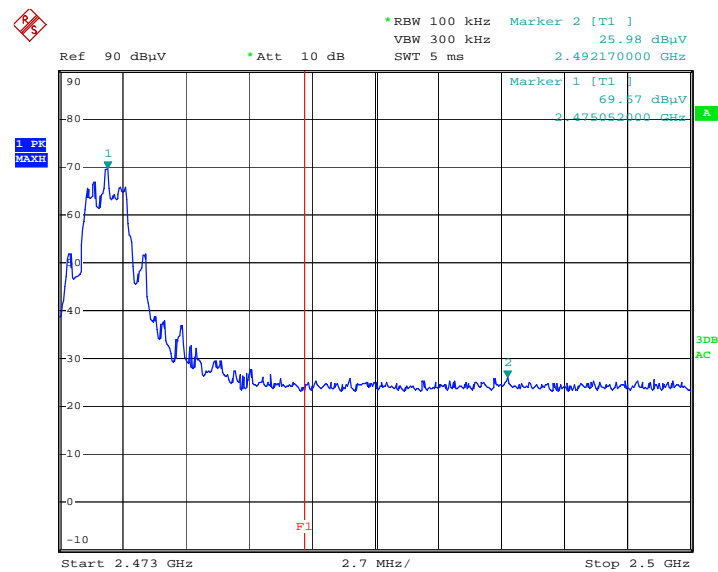
*Note: The point fall into the stricted band was in FCC 15.209, please refer to the restrict band testing.*

Please refer to follow plots:

**Band Edge: Left Side**

Date: 10.FEB.2011 18:14:14

Band Edge: Right Side



Date: 10.FEB.2011 18:11:40

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