

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: Y56QSLHD042A**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Wireless Gun TV Game Console
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<b>Report Number:</b> RSZ10122981-15.247	
<b>Report Date:</b> 2011-02-17	
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\* This report contains data that are not covered by the NVLAP accreditation and are marked with an asterisk "★" (Rev.2)

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## GENERAL INFORMATION

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

The *SHENZHEN QI SHENGLONG INDUSTRIALIST CO.,LTD.*'s product, model number: *HD-042RX* (FCC ID: Y56QSLHD042A) or the "EUT" as referred to in this report is a *Wireless Gun TV Game Console*, which measures approximately: 18.5 cm (L) x 5.6 cm (W) x 16.0 cm (H), rated input voltage: DC 6.0 V battery or 6.0 V from the adapter.

Adapter Information: T.EPOWER POWER SUPPLY

Model: FD35UD-6-200;

Input: AC 120V/60Hz 100 mA;

Output: DC 6.0 V 200 mA;

*\* All measurement and test data in this report was gathered from production sample serial number: 1012011 (Assigned by BACL, Shenzhen). The EUT was received on 2010-12-29.*

### 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: Y56QSLHD042B.

### 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.

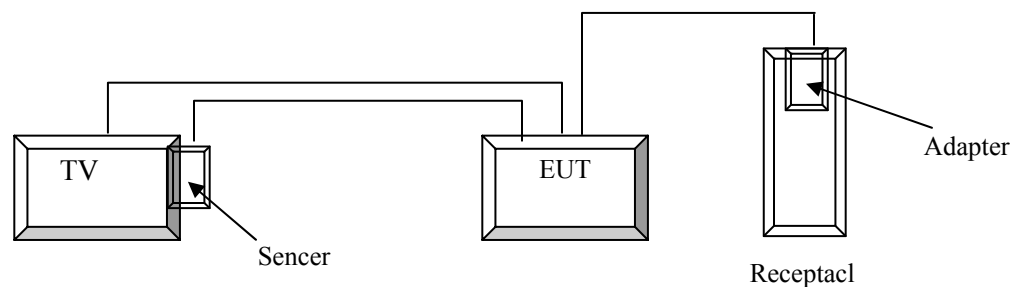
### Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Samsung	Color display unit	225MS	LS22CRWSB/XSF	N/A

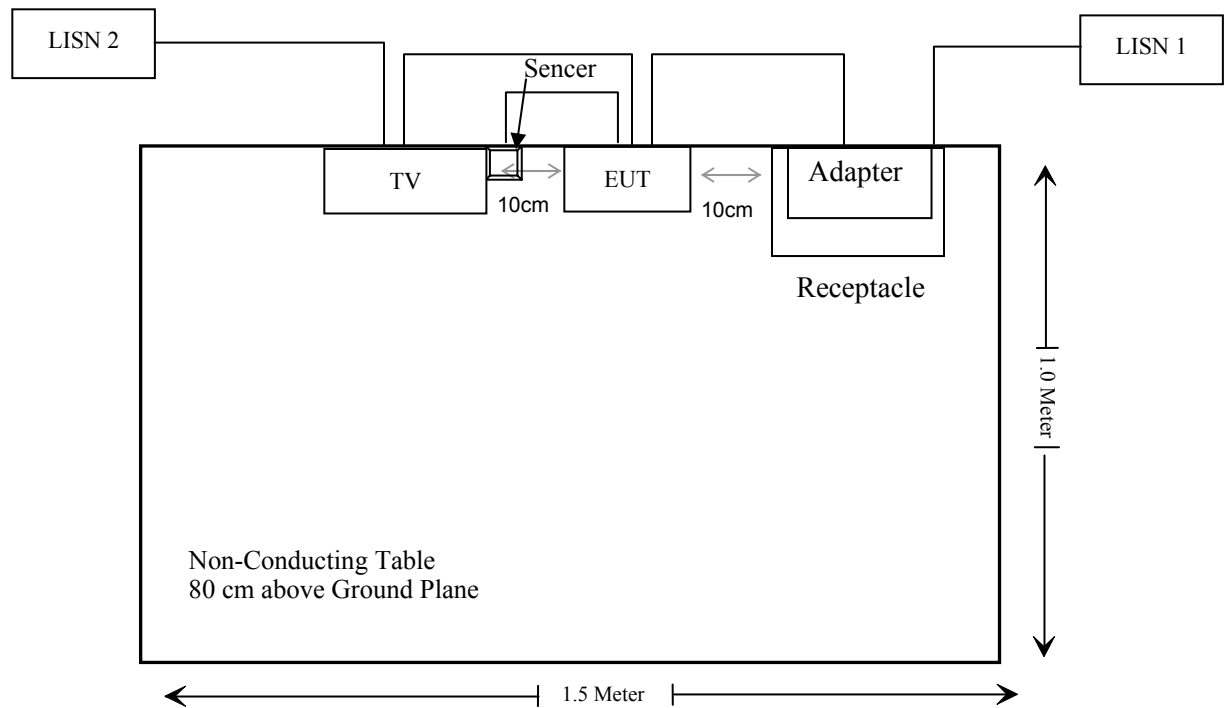
### External I/O Cable

Cable Description	Length (m)	From/Port	To
Unshielded Detachable DC power Cable	1.5	EUT	Adapter
Unshielded Detachable A/V Cabel	1.5	EUT	TV
Unshielded Detachable signal Cabel	1.5	EUT	Senser

### Configuration of Test Setup



Block Diagram of Test Setup



## SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §2.1091	RF Exposure Information	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§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



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

### 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 ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

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

Limits for General Population/Uncontrolled Exposure

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

### Test Data

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

Where: S = 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)

Maximum peak output power at antenna input terminal: 0.155 (mW)

Prediction distance: >20 (cm)

Predication frequency: 2404 (MHz)

Antenna Gain (typical): 0 (dBi)

Antenna Gain (typical): 1 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.00003085(mW/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 1 (mW/cm<sup>2</sup>)

**Result:** The EUT meets MPE limit at 20 cm distance.

## **FCC §15.203 – ANTENNA REQUIREMENT**

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### **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 a PCB antenna, the maximum gain is 0 dBi; which in accordance to section 15.203, please refer to the internal photos.

**Result:** Compliance.

## FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

### Applicable Standard

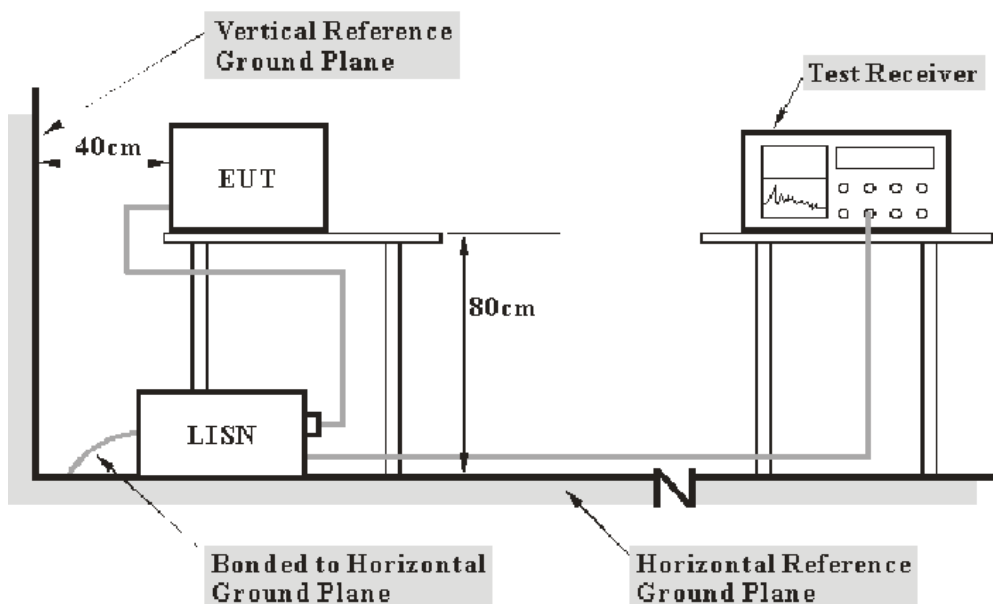
FCC §15.207

### Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Laboratory Corp. (Shenzhen) is  $\pm 2.4$  dB ( $k=2$ , 95% level of confidence).

### EUT Setup



- Note: 1. Support units were connected to second LISN.  
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.4-2009 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 VAC/60 Hz power source.

## EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

<u>Frequency Range</u>	<u>IF B/W</u>
150 kHz – 30 MHz	9 kHz

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	830245/006	2010-03-03	2011-03-02
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2010-03-09	2011-03-08

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

## Test Procedure

During the conducted emission test, the adapter was connected to the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

**16.83 dB at 27.000 MHz** in the **Line** conductor mode, Ave

## Test Data

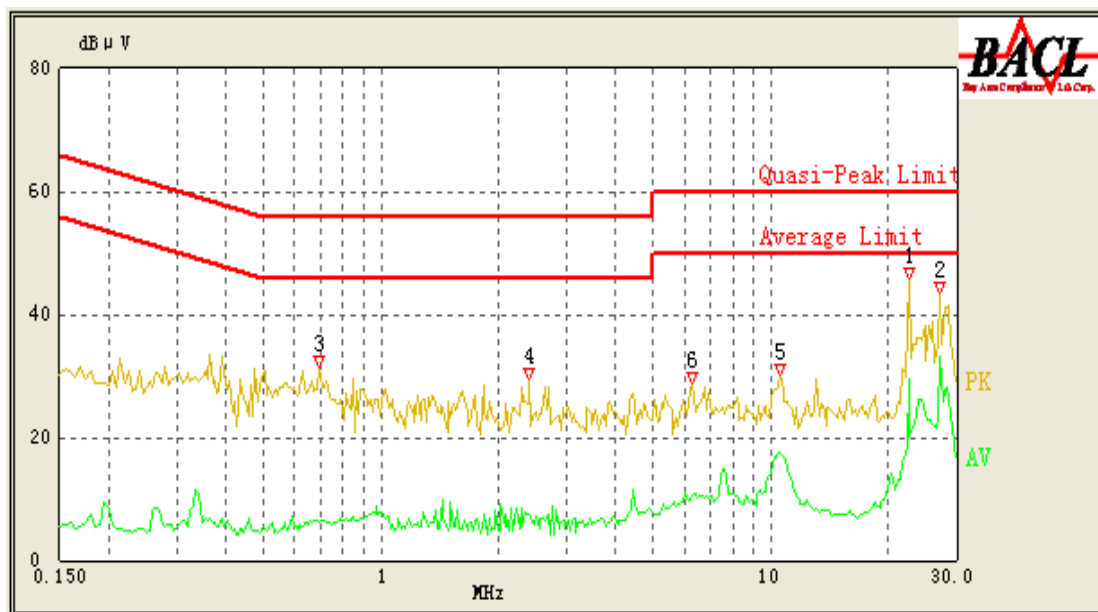
### Environmental Conditions

<b>Temperature:</b>	25 ° C
<b>Relative Humidity:</b>	48 %
<b>ATM Pressure:</b>	100.0 kPa

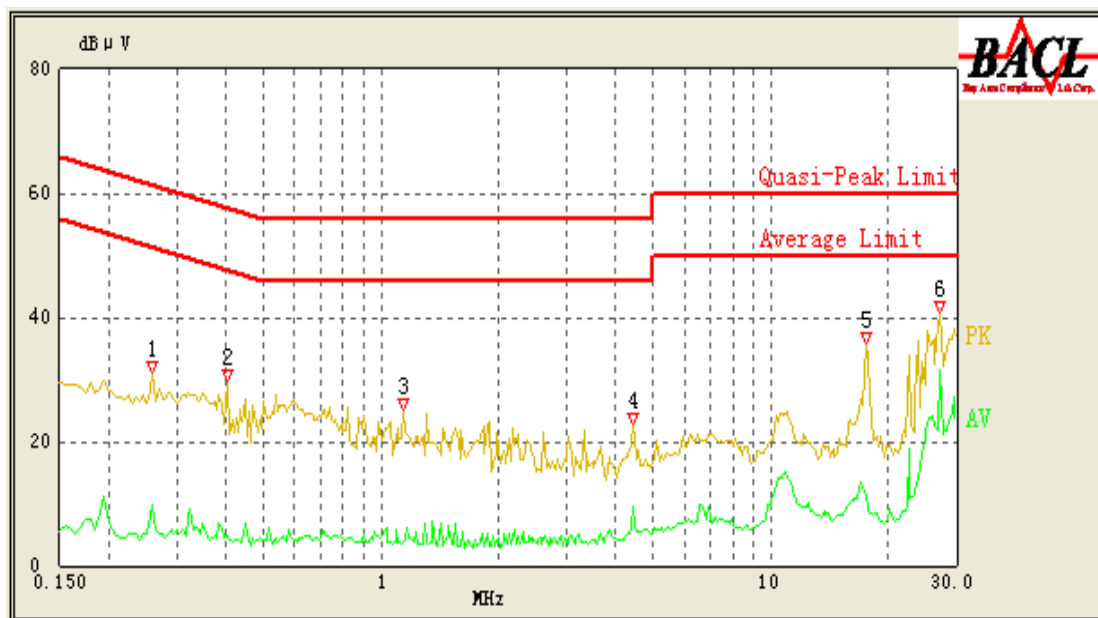
*The testing was performed by Phoenix Liu on 2011-02-17.*

Test Mode: Operating

120 V, 60 Hz, Line:



Conducted Emissions			FCC Part 15.207		
Frequency (MHz)	Cord. Result (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Remark (PK/QP/Ave.)
27.000	33.17	10.13	50.00	16.83	Ave.
22.560	40.88	10.17	60.00	19.12	QP
22.570	29.43	10.17	50.00	20.57	Ave.
27.000	39.36	10.13	60.00	20.64	QP
10.545	17.44	10.11	50.00	32.56	Ave.
0.695	20.40	10.16	56.00	35.60	QP
10.550	21.53	10.11	60.00	38.47	QP
2.420	7.31	10.18	46.00	38.69	Ave.
6.290	20.62	10.10	60.00	39.38	QP
6.290	10.40	10.10	50.00	39.60	Ave.
0.690	6.16	10.16	46.00	39.84	Ave.
2.395	12.70	10.18	56.00	43.30	QP

**120V, 60 Hz, Neutral:**

Conducted Emissions			FCC Part 15.207		
Frequency (MHz)	Cord. Result (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Remark (PK/QP/Ave.)
27.000	31.51	10.13	50.00	18.49	Ave.
27.000	40.81	10.13	60.00	19.19	PK
17.660	35.89	10.18	60.00	24.11	PK
0.405	29.68	10.10	58.71	29.03	PK
1.145	25.31	10.11	56.00	30.69	PK
0.260	31.28	10.03	62.86	31.58	PK
4.440	22.85	10.10	56.00	33.15	PK
4.440	9.50	10.10	46.00	36.50	Ave.
17.495	11.47	10.17	50.00	38.53	Ave.
1.150	4.28	10.12	46.00	41.72	Ave.
0.260	9.72	10.03	52.86	43.14	Ave.
0.405	4.79	10.10	48.71	43.92	Ave.

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

### Applicable Standard

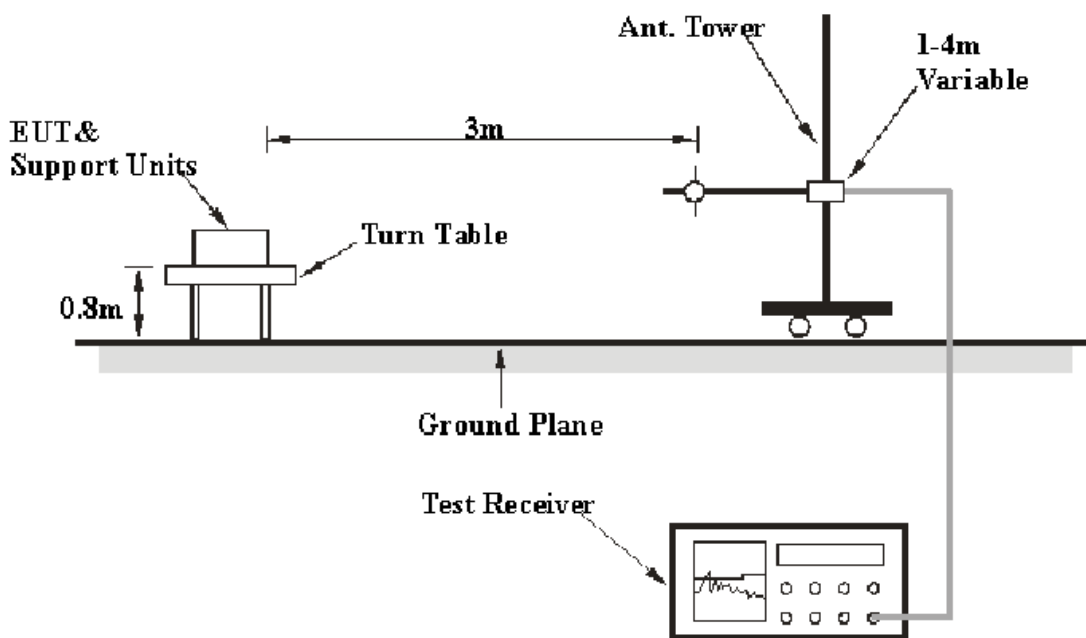
FCC §15.247 (d); §15.209; §15.205;

### 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.

The adapter was connected to a 120 VAC/60 Hz power source.

## 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:

### 30 -1000 MHz:

**3.7 dB** at **287.970500 MHz** in the **Horizontal** polarization, by battery  
**5.4 dB** at **192.059000 MHz** in the **Vertical** polarization, by adapter

### Above 1 GHz:

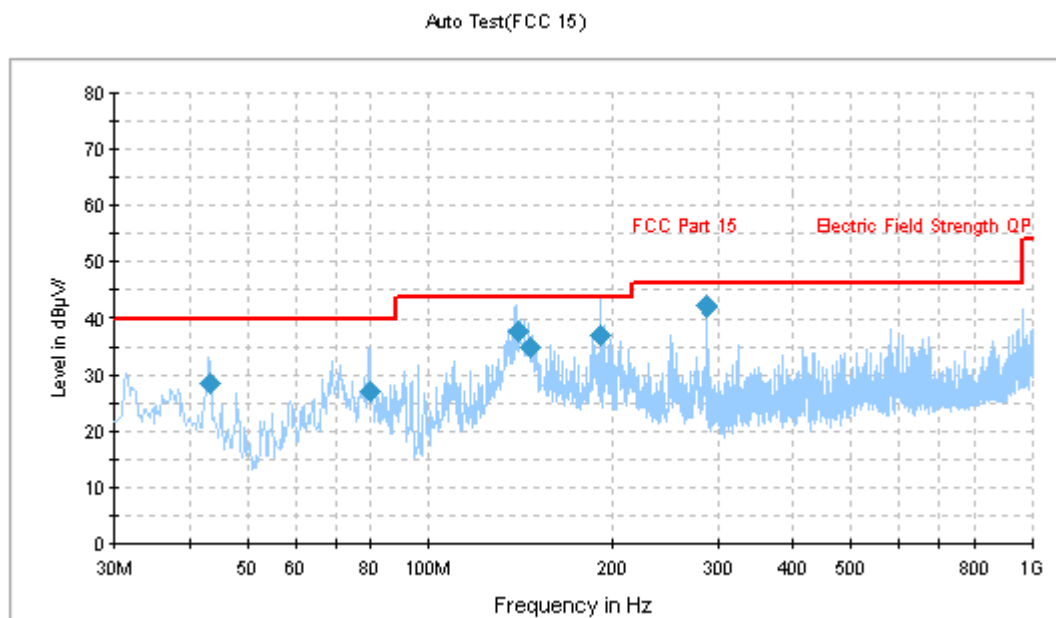
**7.45 dB** at **4882 MHz** in the **Horizontal** polarization at middle channel

## Test Data

### Environmental Conditions

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

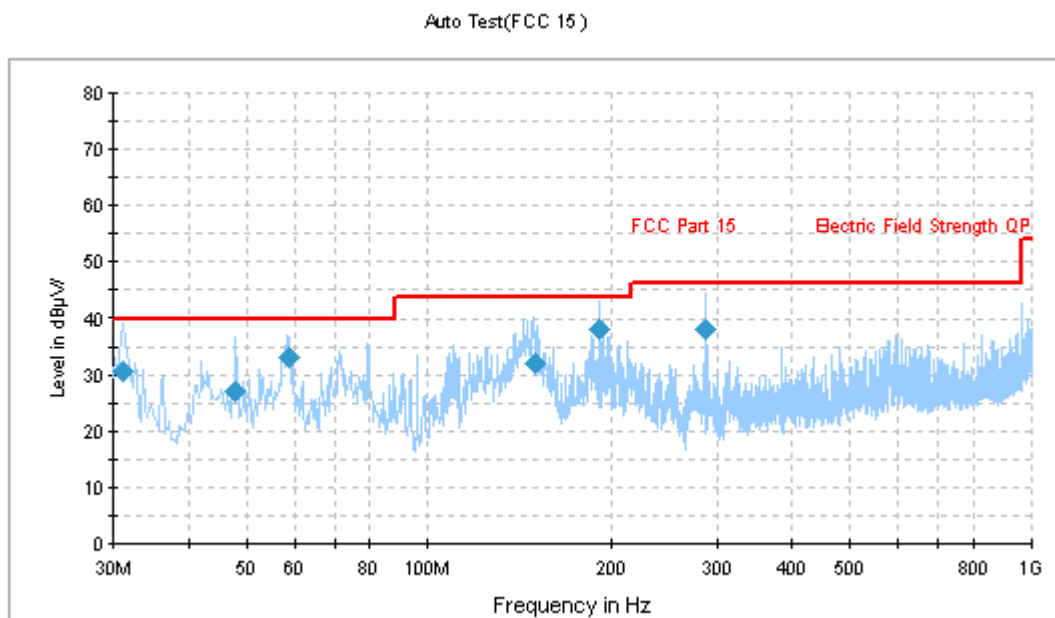
*The testing was performed by Phoenix Liu on 2011-02-10.*

**30-1000 MHz:***Test Mode: Transmitting 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 uncertainty.*

Test Mode: Transmitting by adapter



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Ant. Height (cm)	Ant. Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dBμV/m)	Margin (dB)
192.059000	38.1	97.0	V	233.0	-14.7	43.5	5.4
58.644000	33.3	100.0	V	198.0	-18.5	40.0	6.7
288.017750	38.3	97.0	H	206.0	-12.6	46.0	7.7
31.189250	30.8	108.0	V	40.0	-16.2	40.0	9.2
149.725750	32.0	103.0	V	110.0	-14.0	43.5	11.5
47.926000	27.1	102.0	V	25.0	-16.4	40.0	12.9

**Above 1 GHz:**

*Test mode: Baseds on the pre scan; the adapter mode is the worse case.*

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
Low Channel												
4808	31.2	Ave.	0	1.1	H	36.6	4.3	26.75	45.35	54	8.65	harmonic
4808	30.1	Ave.	15	1.5	V	35.4	4.3	26.75	43.05	54	10.95	harmonic
1180	32.6	Ave.	0	1.1	H	25.1	2.02	26.45	33.27	54	20.73	Spurious
4808	39.11	PK	0	1.1	H	36.6	4.3	26.75	53.26	74	20.74	harmonic
1180	33.4	Ave.	15	1.5	V	23.8	2.02	26.45	32.77	54	21.23	Spurious
4808	38.33	PK	15	1.5	V	35.4	4.3	26.75	51.28	74	22.72	harmonic
1188	44.38	PK	0	1.1	H	25.1	2.02	26.45	45.05	74	28.95	Spurious
1188	45	PK	15	1.5	V	23.8	2.02	26.45	44.37	74	29.63	Spurious
Middle Channel												
4882	32.40	Ave.	10	1.2	H	36.6	4.3	26.75	46.55	54	7.45	harmonic
4882	32.97	Ave.	0	1.6	V	35.4	4.3	26.75	45.92	54	8.08	harmonic
4882	38.75	PK	10	1.2	H	36.6	4.3	26.75	52.9	74	21.1	harmonic
1023	30.4	Ave.	10	1.2	H	25.1	2.02	26.45	31.07	54	22.93	Spurious
1023	31.5	Ave.	0	1.6	V	23.8	2.02	26.45	30.87	54	23.13	Spurious
4882	37.10	PK	0	1.6	V	35.4	4.3	26.75	50.05	74	23.95	harmonic
1120	44.67	PK	10	1.2	H	25.1	2.02	26.45	45.34	74	28.66	Spurious
1120	45.83	PK	0	1.6	V	23.8	2.02	26.45	45.2	74	28.8	Spurious
High Channel												
4950	31.49	Ave.	12	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
4950	39.50	PK	12	1.5	H	36.6	4.3	26.75	53.65	74	20.35	harmonic
1008	32.4	Ave.	25	1.4	V	23.8	2.02	26.45	31.77	54	22.23	Spurious
4950	38.17	PK	25	1.4	V	35.4	4.3	26.75	51.12	74	22.88	harmonic
1008	30.2	Ave.	12	1.5	H	25.1	2.02	26.45	30.87	54	23.13	Spurious
1022	46.87	PK	25	1.4	V	23.8	2.02	26.45	46.24	74	27.76	Spurious
1022	44.91	PK	12	1.5	H	25.1	2.02	26.45	45.58	74	28.42	Spurious

**Spurious emission in restricted band:**

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
2389.20	43.6	Ave	15	1.5	V	30.6	3.29	26.88	50.61	54	3.39*	Spurious
2389.20	43.1	Ave	0	1.1	H	30.6	3.29	26.88	50.11	54	3.89*	Spurious
2486.45	43.1	Ave	125	1.5	H	30.6	3.29	26.88	50.11	54	3.89*	Spurious
2486.45	42.0	Ave	25	1.4	V	30.6	3.29	26.88	49.01	54	4.99	Spurious
2389.20	52.67	PK	0	1.1	H	30.6	3.29	26.88	59.68	74	14.32	Spurious
2389.20	52.05	PK	15	1.5	V	30.6	3.29	26.88	59.06	74	14.94	Spurious
2486.45	51.50	PK	125	1.5	H	30.6	3.29	26.88	58.51	74	15.49	Spurious
2486.45	50.52	PK	25	1.4	V	30.6	3.29	26.88	57.53	74	16.47	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 Operating 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**

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

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

**Test Result:** Compliant.

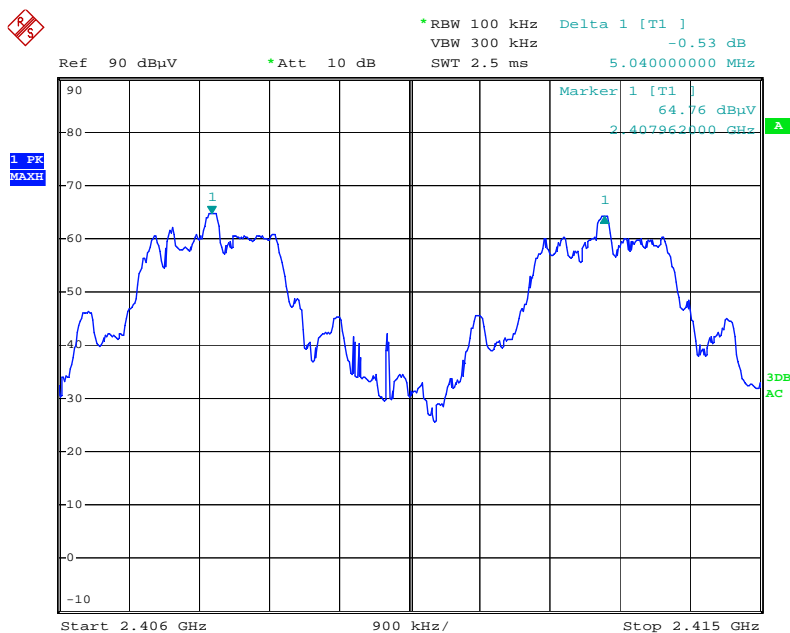
Please refer to following tables and plots

*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			

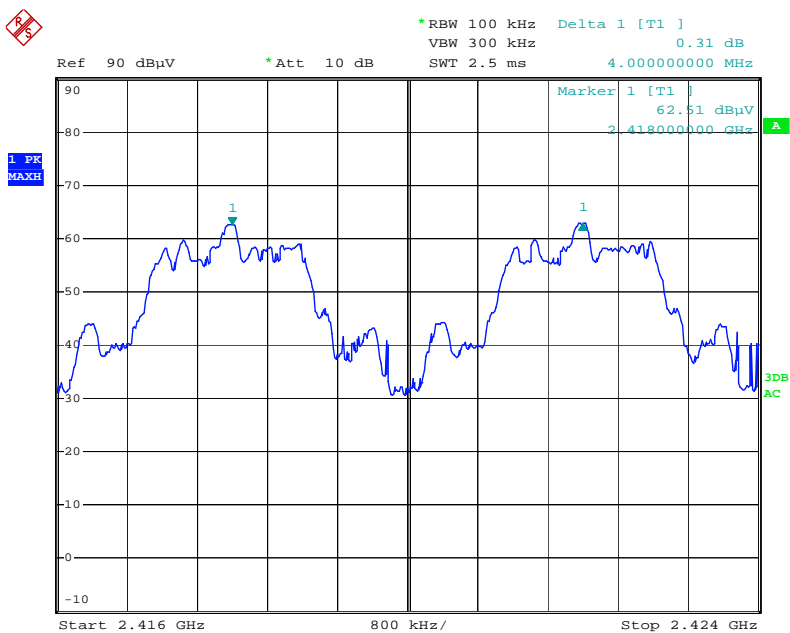
Please refer to the following plots.

### CH 1 & CH 2



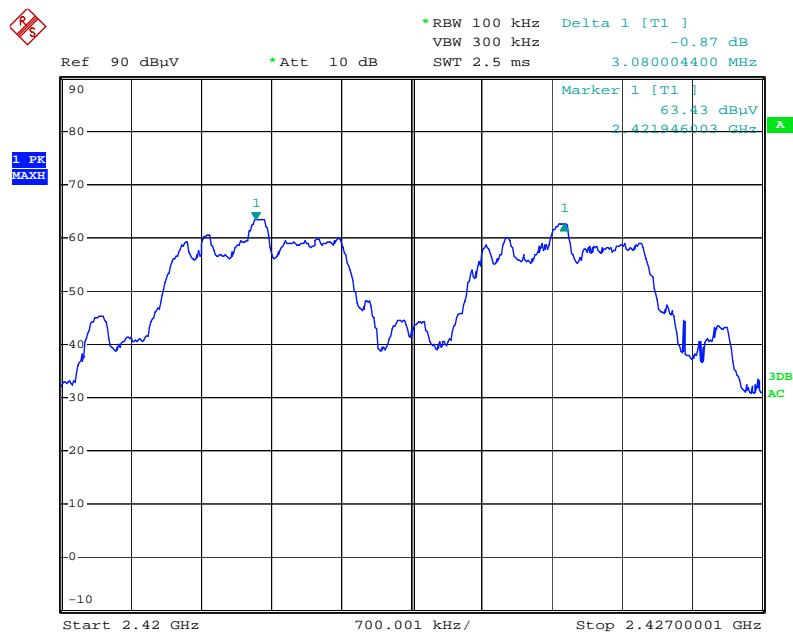
Date: 10.FEB.2011 17:53:02

### CH 2 & CH 3



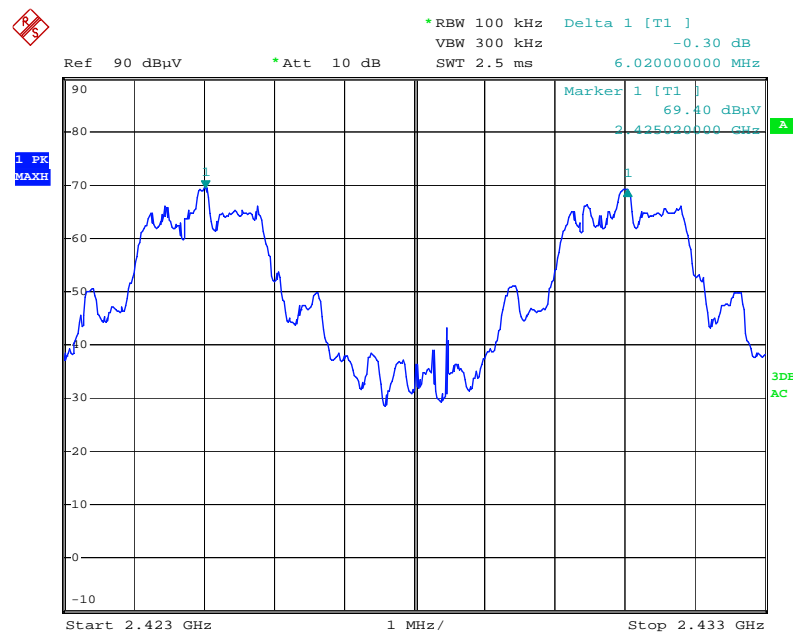
Date: 10.FEB.2011 17:54:37

## CH 4 &amp; CH 5



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

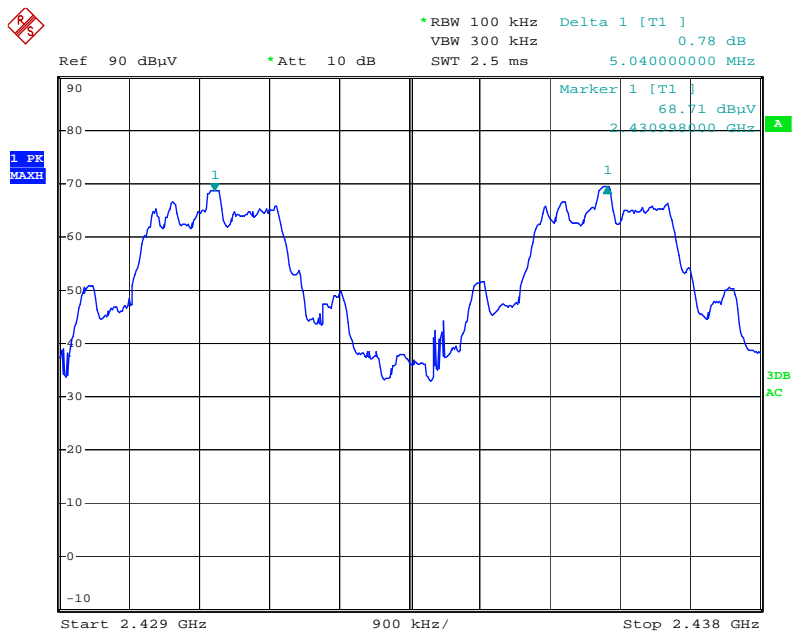
## CH 5 &amp; CH 6



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

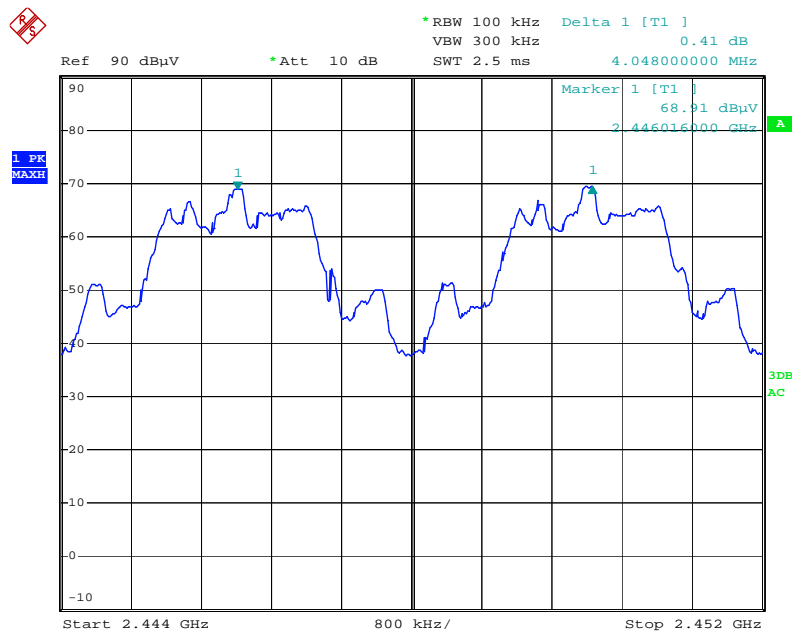


## CH 6 &amp; CH 7



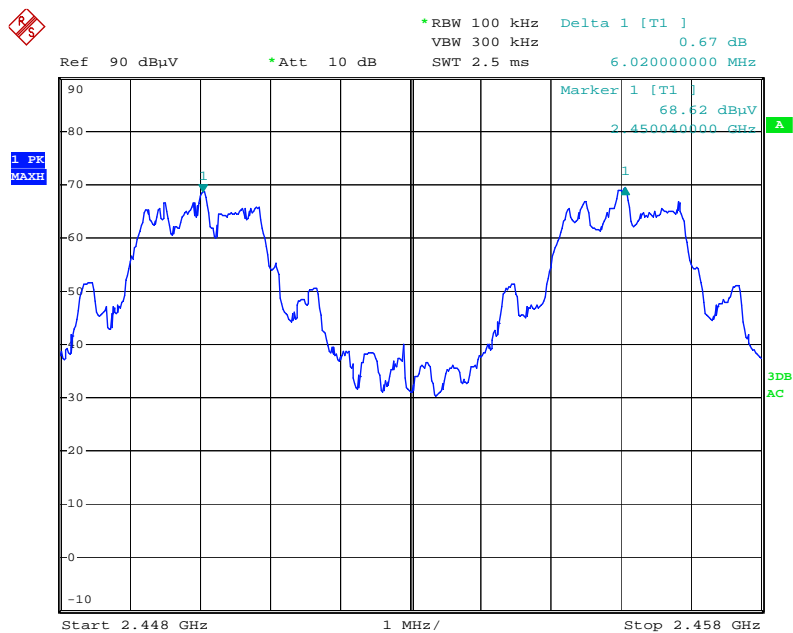
Date: 10.FEB.2011 18:00:24

## CH 7 &amp; CH 8



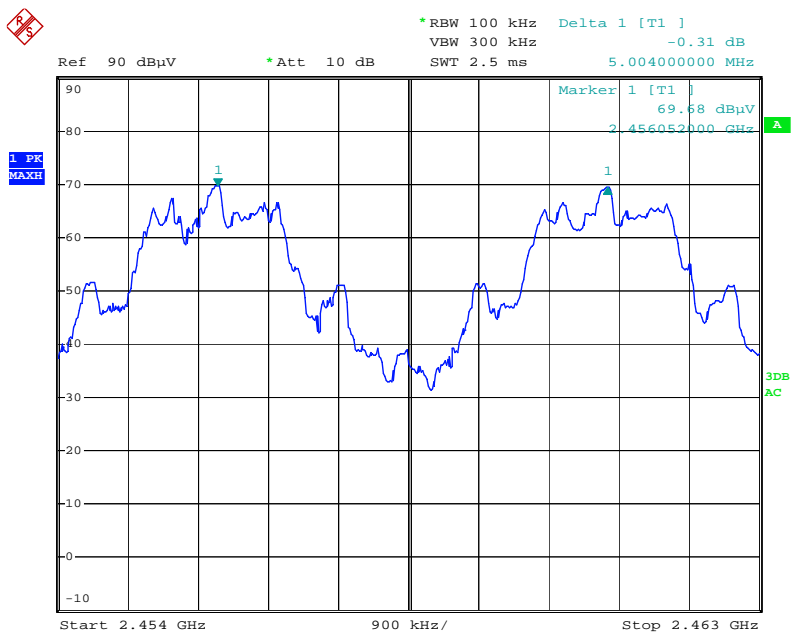
Date: 10.FEB.2011 18:02:40

## CH 10 &amp; CH 11



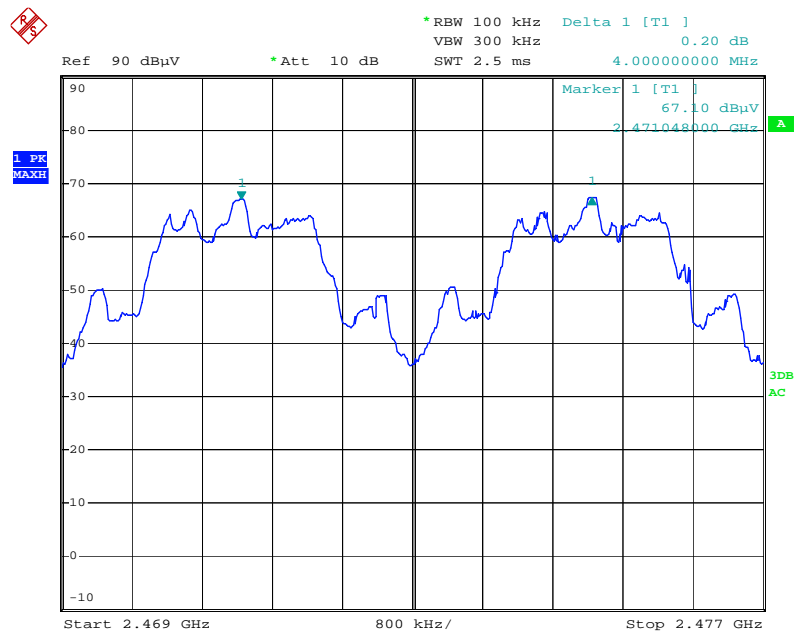
Date: 10.FEB.2011 18:05:36

## CH 11 &amp; CH 12



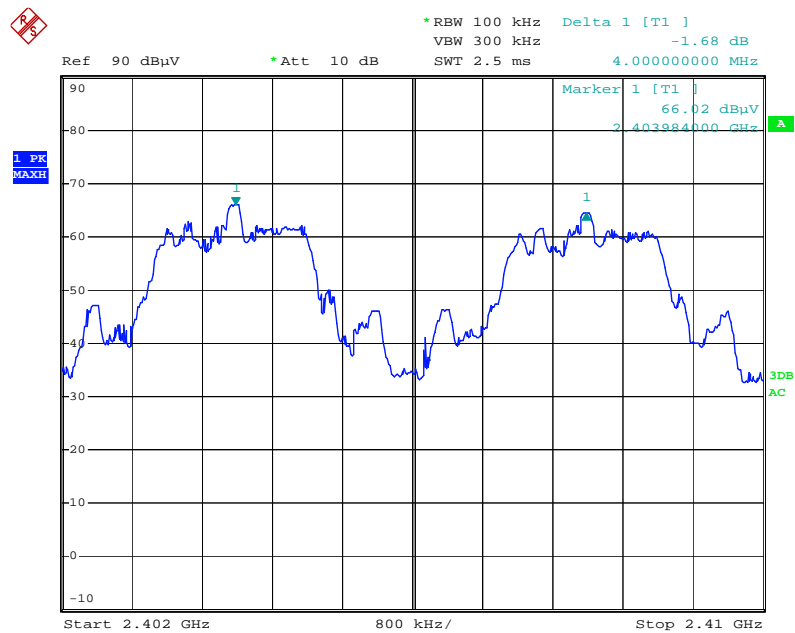
Date: 10.FEB.2011 18:07:10

## 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.

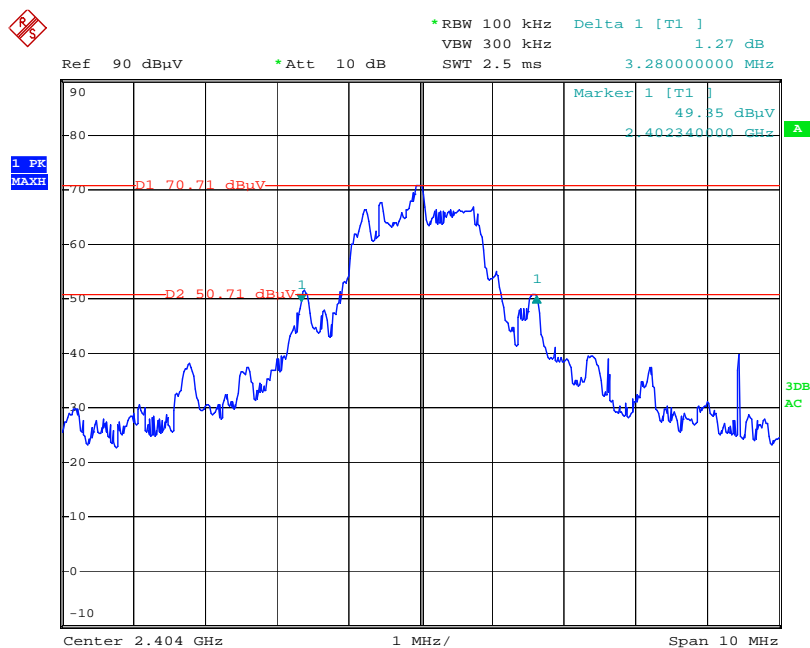
**Test Result:** Compliance.

Please refer to following tables and plots

*Test Mode: Transmitting*

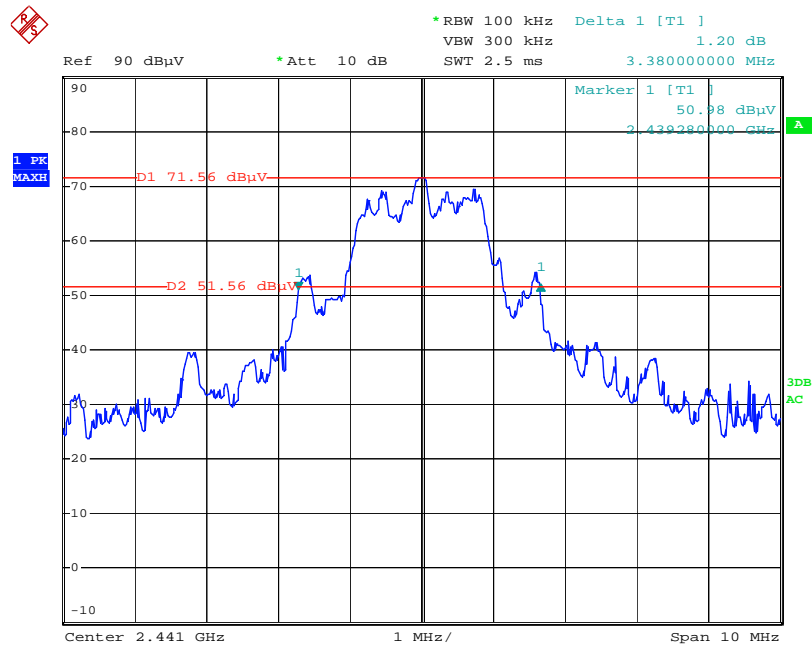
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2404	3.28
Middle	2441	3.38
High	2475	3.38

Please refer to the following plots.

**Low Channel**

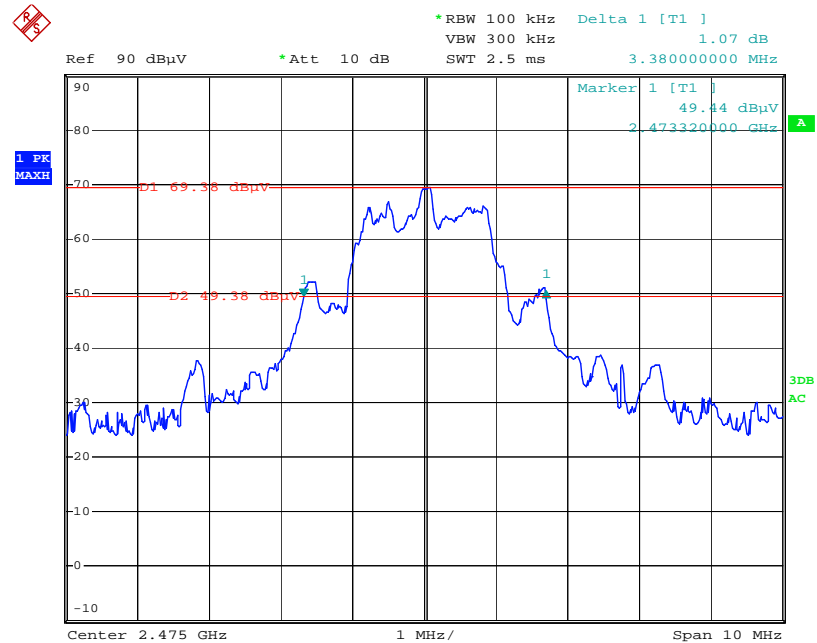
Date: 10.FEB.2011 17:47:42

## 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

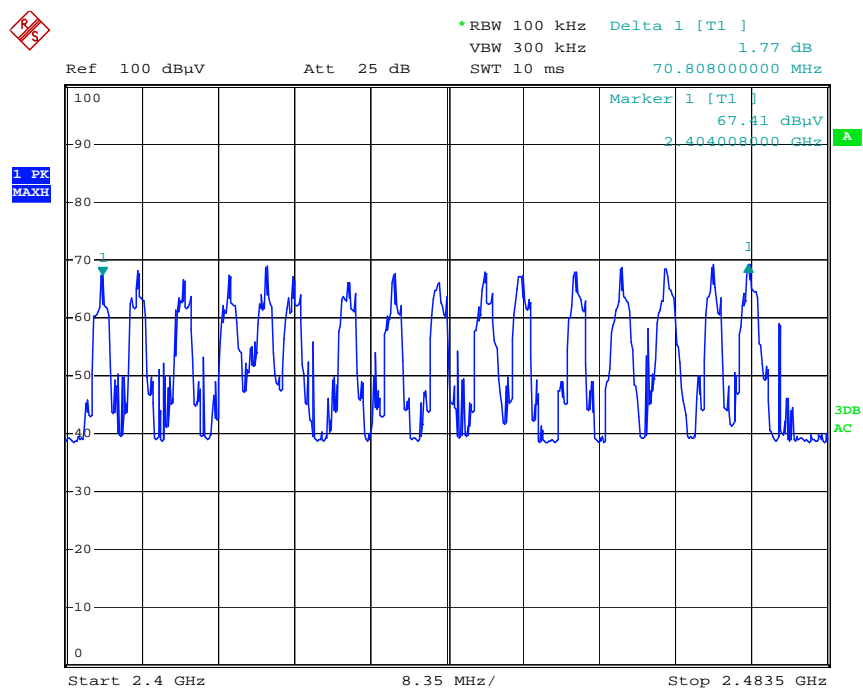
*The testing was performed by Phoenix Liu on 2011-02-10.*

**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.*

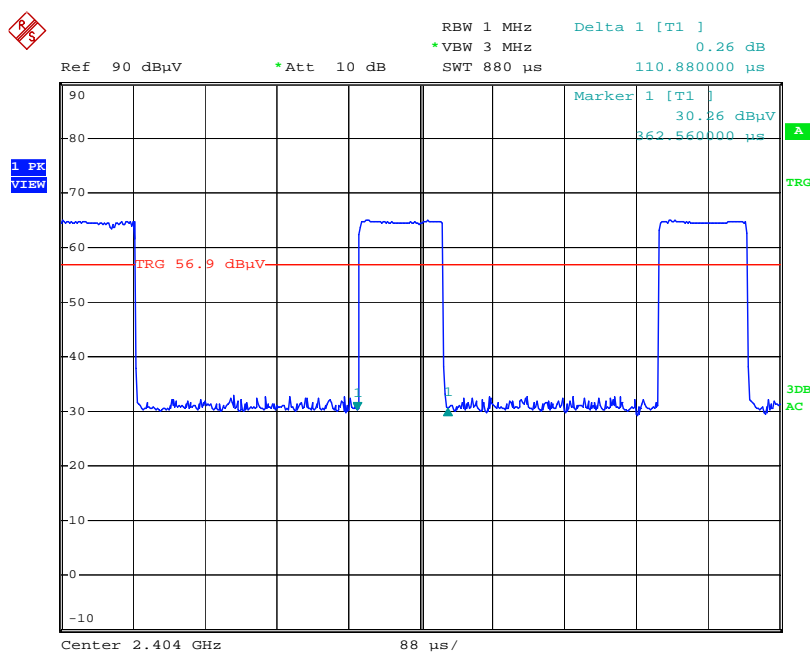
**Test Result:** Compliance.

Please refer to following tables and plots

*Test Mode: Transmitting*

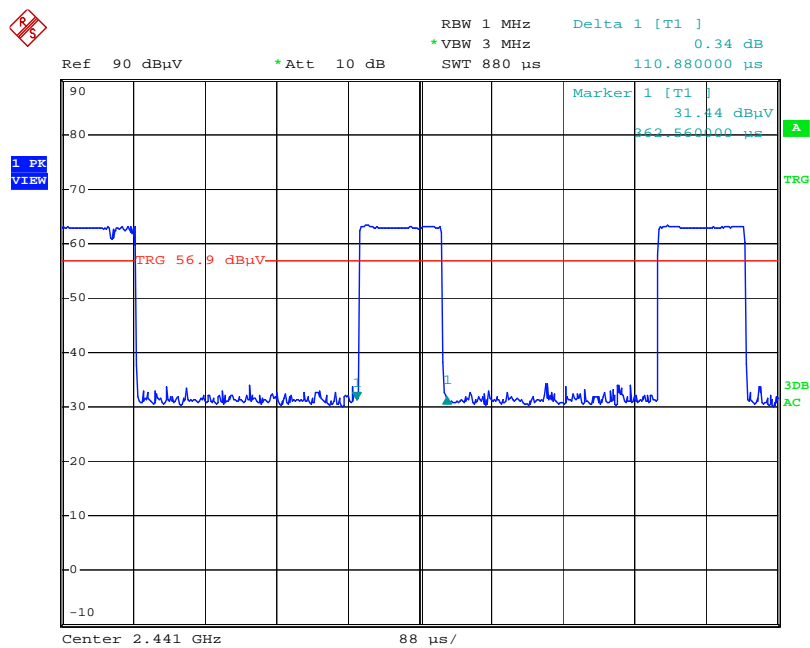
Channel	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
Low	110.88	0.1386	0.4	Pass
Middle	110.88	0.1386	0.4	Pass
High	110.88	0.1386	0.4	Pass
Note: Dwell time=Pulse time (ms) × (1000/160/2 /16) ×16*0.4 Second				

Please refer to the following plots.

**Low Channel**

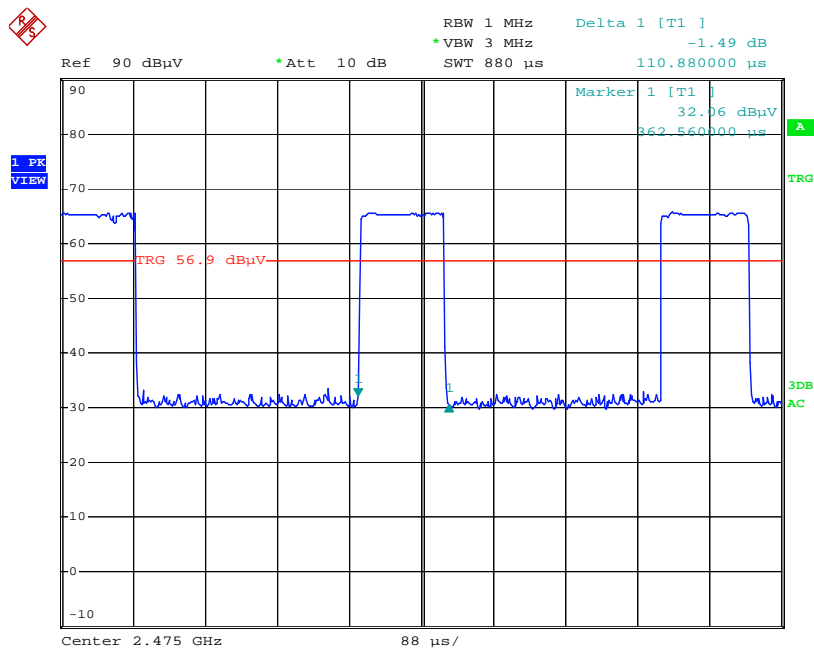
Date: 10.FEB.2011 18:18:49

## 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

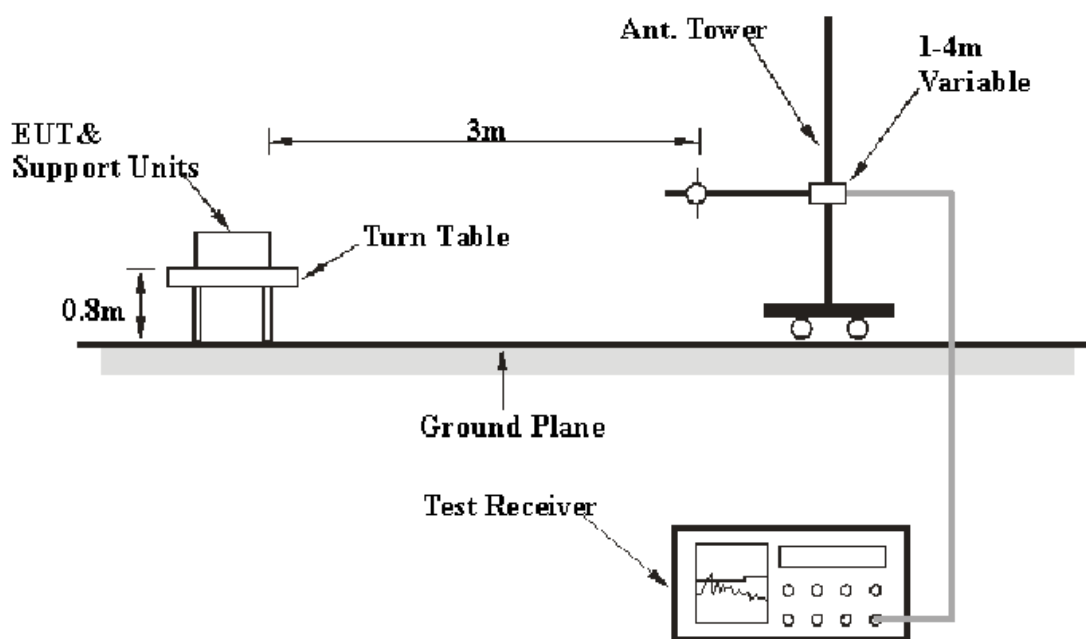
FCC §15.247 (d); §15.209; §15.205;

### 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.

The adapter was connected to a 120 VAC/60 Hz power source.

## 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 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 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				
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)	Cord. Amp. (dBm)	Cord. Amp. (mW)	Limit (mW)	Result
Low Channel (2404 MHz)													
2404	77.84	PK	35	1.2	V	30.6	3.11	26.88	84.67	-10.6	0.087	125	pass
2404	80.34	PK	220	1.5	H	30.6	3.11	26.88	87.17	-8.1	0.155	125	pass
Middle Channel (2441 MHz)													
2441	77	PK	30	1.2	V	30.6	3.11	26.88	83.83	-11.4	0.072	125	pass
2441	79.34	PK	210	1.5	H	30.6	3.11	26.88	86.17	-9.1	0.123	125	pass
High Channel (2475 MHz)													
2475	77.13	PK	30	1.2	V	30.6	3.11	26.88	83.96	-11.3	0.074	125	pass
2475	78.34	PK	220	1.5	H	30.6	3.11	26.88	85.17	-10.1	0.098	125	pass

Note: P (dBm) = E (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 Operating 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.*

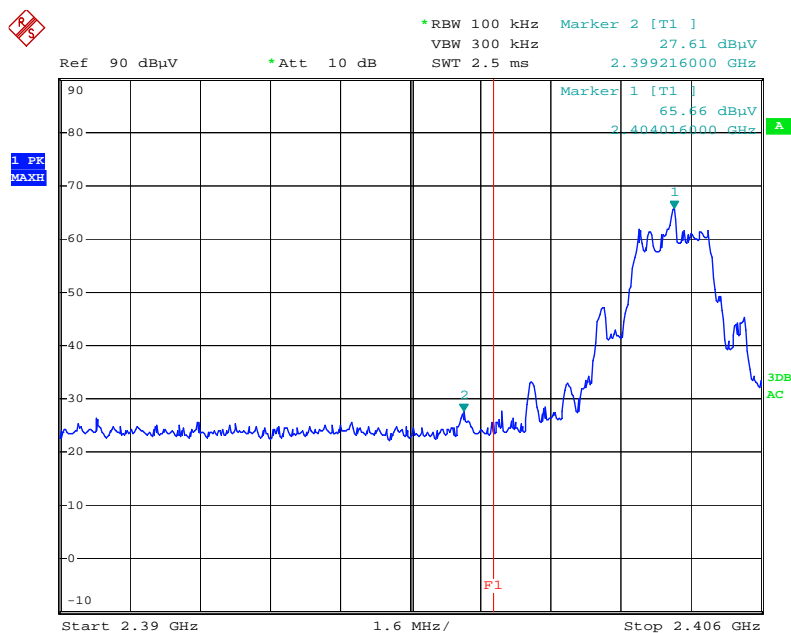
**Test Result: Compliant**

*Test Mode: Transmitting*

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

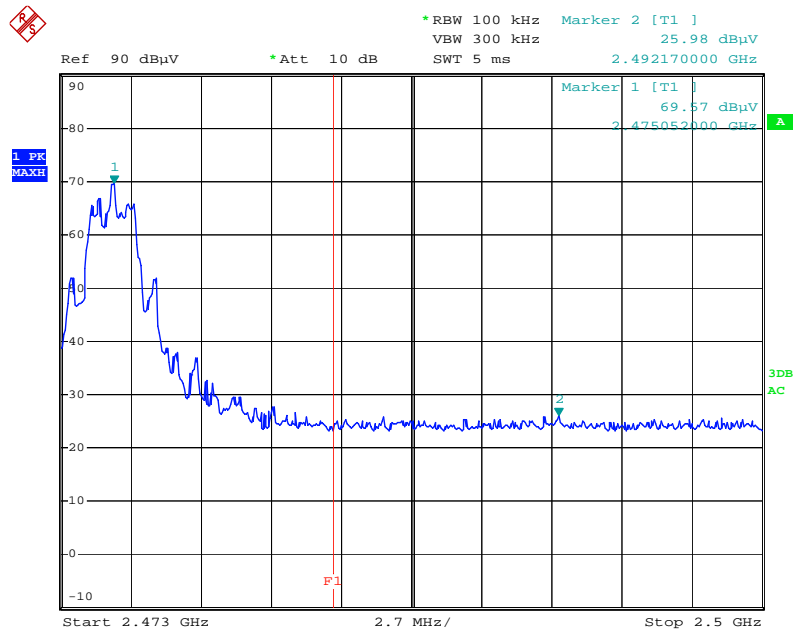
*Note: The point fall into the stricted band was in FCC 15.209, please refer to the restrict band testing.*

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 \*\*\*\*\***