



FCC PART 15.247  
TEST REPORT

For

**Legrand Home Systems**

301 Fulling Mill Road Suite G, Middletown, PA, 17057 United States

**FCC ID: YV8-202662**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Wireless Video Room Unit
<b>Test Engineer:</b> Leon Chen	<i>leon chen</i>
<b>Report Number:</b> R2DG130304001-00	
<b>Report Date:</b> 2013-04-12	
<b>Reviewed By:</b> Jerry Zhang EMC Manager	<i>Jerry Zhang</i>
<b>Test Laboratory:</b> Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industrial Zone, 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. This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP\*, or any agency of the Federal Government.

\* This report may contain data that are not covered by the NVLAP accreditation and shall be 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.....	5
<b>SYSTEM TEST CONFIGURATION</b> .....	<b>6</b>
DESCRIPTION OF TEST CONFIGURATION.....	6
EUT EXERCISE SOFTWARE.....	6
EQUIPMENT MODIFICATIONS.....	6
BLOCK DIAGRAM OF TEST SETUP.....	6
<b>SUMMARY OF TEST RESULTS</b> .....	<b>7</b>
<b>FCC §15.247 (i) &amp; §1.1307 (b) (1) &amp; §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)</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 §15.207 (a) – AC LINE CONDUCTED EMISSIONS</b> .....	<b>10</b>
APPLICABLE STANDARD.....	10
MEASUREMENT UNCERTAINTY.....	10
EUT SETUP.....	11
EMI TEST RECEIVER SETUP.....	11
TEST PROCEDURE.....	11
TEST EQUIPMENT LIST AND DETAILS.....	12
TEST RESULTS SUMMARY.....	12
TEST DATA.....	12
<b>FCC §15.209, §15.205 &amp; §15.247(d) - SPURIOUS EMISSIONS</b> .....	<b>17</b>
APPLICABLE STANDARD.....	17
MEASUREMENT UNCERTAINTY.....	17
EUT SETUP.....	17
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP.....	18
TEST PROCEDURE.....	18
TEST EQUIPMENT LIST AND DETAILS.....	19
CORRECTED AMPLITUDE & MARGIN CALCULATION.....	19
TEST RESULTS SUMMARY.....	19
TEST DATA.....	19
<b>FCC §15.247(a) (1) - CHANNEL SEPARATION TEST</b> .....	<b>23</b>
APPLICABLE STANDARD.....	23
TEST EQUIPMENT LIST AND DETAILS.....	23
TEST PROCEDURE.....	23
TEST DATA.....	23
<b>FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING</b> .....	<b>26</b>
APPLICABLE STANDARD.....	26
TEST PROCEDURE.....	26

TEST EQUIPMENT LIST AND DETAILS.....26  
 TEST DATA .....26

**FCC §15.247(a) (1) (iii) - QUANTITY OF HOPPING CHANNEL TEST .....29**

APPLICABLE STANDARD .....29  
 TEST PROCEDURE .....29  
 TEST EQUIPMENT LIST AND DETAILS.....29  
 TEST DATA .....29

**FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME).....31**

APPLICABLE STANDARD .....31  
 TEST PROCEDURE .....31  
 TEST EQUIPMENT LIST AND DETAILS.....31  
 TEST DATA .....31

**FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT .....33**

APPLICABLE STANDARD .....33  
 TEST PROCEDURE .....33  
 TEST EQUIPMENT LIST AND DETAILS.....33  
 TEST DATA .....33

**FCC §15.247(d) - BAND EDGES TESTING .....36**

APPLICABLE STANDARD .....36  
 TEST PROCEDURE .....36  
 TEST EQUIPMENT LIST AND DETAILS.....36  
 TEST DATA .....36

## GENERAL INFORMATION

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

The *Legrand Home Systems*'s product, model number: 202662(FCC ID: YV8-202662) or ("EUT") in this report is a *Wireless Video Room Unit*, which was measured approximately: 14.0 cm (L) x 14.0 cm (H) x 3.0 cm (W), rated input voltage: DC5V or DC5.5V from adapter.

Adapter Information (5V):  
 MODEL NO: SHB0501000PU  
 INPUT: 100-240V, 50/60Hz, 300mA  
 OUTPUT: 5V, 1000mA

Adapter Information (5.5V):  
 MODEL NO: SHB0550850PU  
 INPUT: 100-240V, 50/60Hz, 300mA  
 OUTPUT: 5.5V, 850mA

\* All measurement and test data in this report was gathered from production sample serial number: 130304001 (Assigned by BA CL, Dongguan). The EUT was received on 2013-03-05.

### Objective

This report is prepared on behalf of *Legrand Home Systems* 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 the EUT 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)

F qqt "wplk/qh'Rctv'370469'F UU'kpi 'y kj 'HEE'K <[ X: /424872.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, 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. (Dongguan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

The uncertainty of any RF tests which use conducted method measurement is  $\pm 0.96$  dB, the uncertainty of any radiation on emissions measurement is: 30M~200MHz: 5.0 dB; 200M~1GHz: 6.2 dB; 1G~6GHz: 4.45 dB; 6G~18GHz: 5.23 dB.

## 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 Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) 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 February 02, 2012. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. 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. (Dongguan) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 500069-0).



The current scope of accreditations can be found at <http://ts.nist.gov/standards/scopes/5000690.htm>

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

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

15 hopping channels are provided by manufacturer, and EUT was tested with channel 1, 9 and 16.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2411MHz	9	2437MHz
2	2414MHz	10	2440MHz
3	2418MHz	11	2443MHz
4	2421MHz	12	2446MHz
5	2424MHz	13	2450MHz
6	2427MHz	14	2453MHz
7	2430MHz	15	2456MHz
8	2434MHz	16	2459MHz

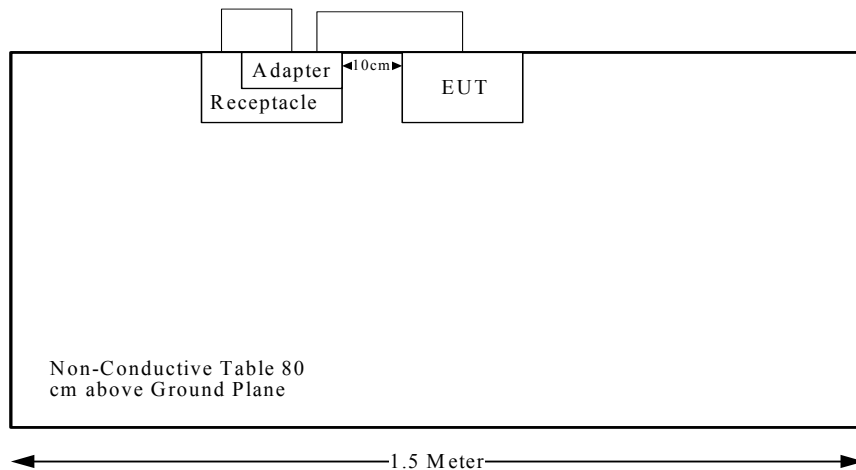
### EUT Exercise Software

No EUT exercise software was used.

### Equipment Modifications

No modification was made to the EUT tested.

### Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
§15.247 (i), §1.1307,§2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated 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) & §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### Applicable Standard

According to subpart 15.247(i) and subpart §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.

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

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.

### Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$  = 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 (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
	(dBi)	(numeric)	(dBm)	(mW)			
2411	0	1	16.58	45.50	20	0.01	1.0

**Result:** The device meet 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 two printed antennas, which were permanently attached on the PCB, one for TX function another one for RX function, which complied with 15.203, the maximum gain is 0 dBi, please refer to the internal photos.

**Result:** Compliance.

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

### Applicable Standard

FCC§15.207

### Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If  $U_{lab}$  is less than or equal to  $U_{cispr}$  of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If  $U_{lab}$  is greater than  $U_{cispr}$  of Table 1, then:

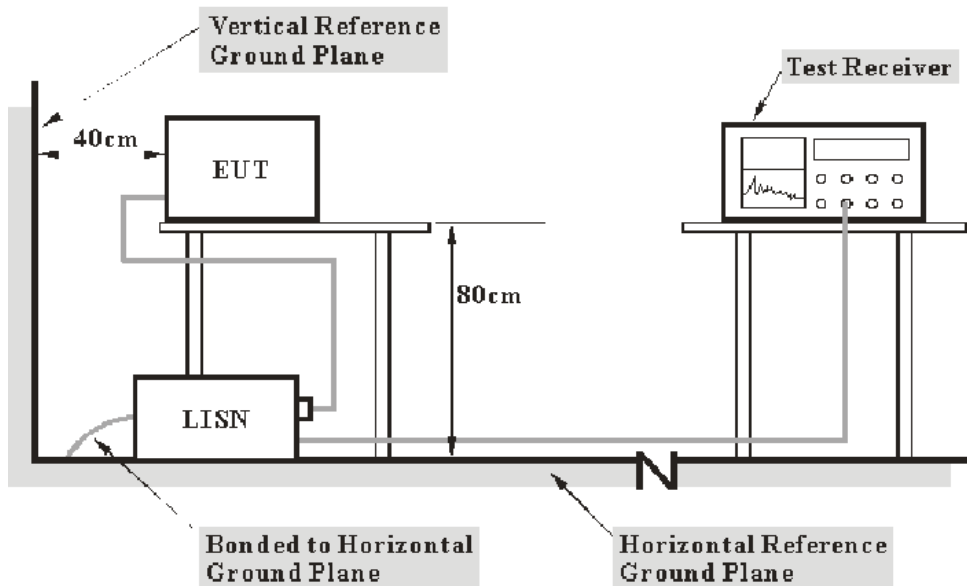
- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.

Based on CISPR 16-4-2: 2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Dongguan) is 3.46 dB (150 kHz to 30 MHz).

Table 1 – Values of  $U_{cispr}$

Measurement	$U_{cispr}$
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	3.4 dB

## 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 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2012-11-29	2013-11-28
R&S	LISN1	ESH3-Z5	843331/015	2012-09-17	2013-09-16
R&S	LISN2	ESH3-Z5	100113	2012-11-29	2013-11-28
BACL	Test Software	BACL-EMC	V1.0-2010	N/A	N/A

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

### 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:

**15.07 dB** at **27.120 MHz** in the **Line** conducted mode for adapter 5V

**18.91 dB** at **0.435 MHz** in the **Line** conducted mode for adapter 5.5V

### Test Data

#### Environmental Conditions

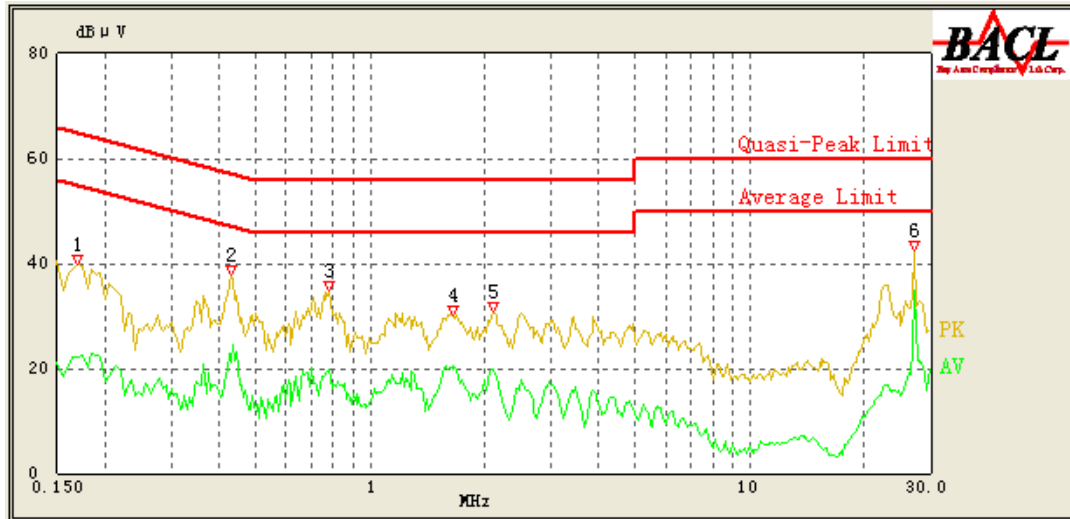
<b>Temperature:</b>	24.9 ° C
<b>Relative Humidity:</b>	51 %
<b>ATM Pressure:</b>	100.9 kPa

*The testing was performed by Leon Chen on 2013-03-11.*

*Test Mode: Transmitting*

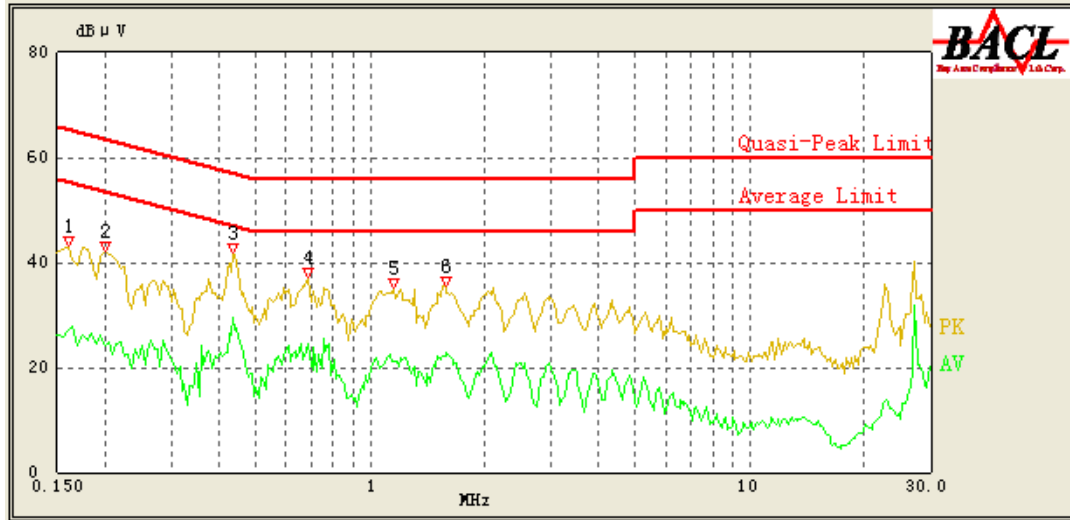
**Adapter 5V:**

**AC 120V/60 Hz, Line**



Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/ QP/Ave.)
0.170	35.33	1.03	65.43	30.10	QP
0.170	22.26	1.03	55.43	33.17	AV
0.430	34.14	0.63	58.00	23.86	QP
0.430	21.22	0.63	48.00	26.78	AV
0.780	31.10	0.41	56.00	24.90	QP
0.780	19.98	0.41	46.00	26.02	AV
1.645	26.82	0.34	56.00	29.18	QP
1.645	19.84	0.34	46.00	26.16	AV
2.120	24.66	0.36	56.00	31.34	QP
2.100	19.74	0.36	46.00	26.26	AV
27.120	39.00	2.33	60.00	21.00	QP
27.120	34.93	2.33	50.00	15.07	AV

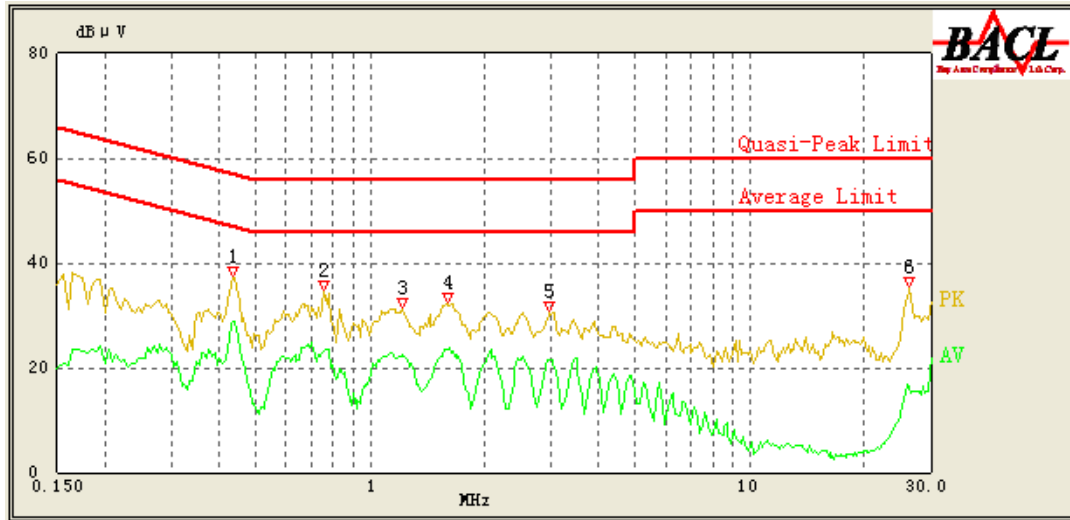
**AC 120V/60 Hz, Neutral**



Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/ QP/Ave.)
0.160	37.48	1.79	65.71	28.23	QP
0.160	27.11	1.79	55.71	28.60	AV
0.200	36.74	1.58	64.57	27.83	QP
0.200	24.33	1.58	54.57	30.24	AV
0.435	38.53	0.72	57.86	19.33	QP
0.435	29.56	0.72	47.86	18.30	AV
0.685	33.99	0.43	56.00	22.01	QP
0.685	24.38	0.43	46.00	21.62	AV
1.155	30.08	0.24	56.00	25.92	QP
1.155	21.01	0.24	46.00	24.99	AV
1.580	31.23	0.25	56.00	24.77	QP
1.580	22.27	0.25	46.00	23.73	AV

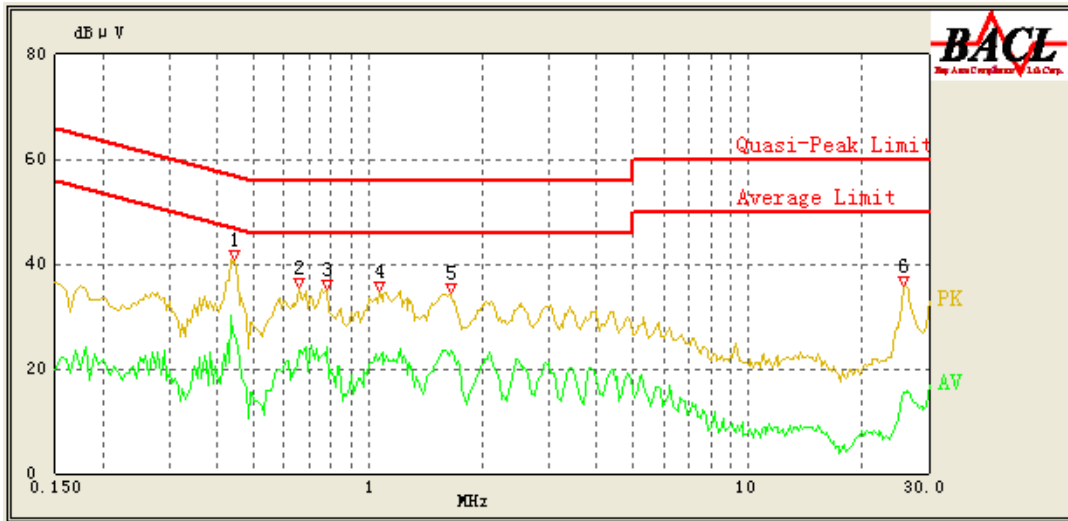
**Adapter 5.5V:**

**AC 120V/60 Hz, Line**



Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/ QP/Ave.)
0.435	34.55	0.62	57.86	23.31	QP
0.435	28.95	0.62	47.86	18.91	AV
0.755	31.63	0.42	56.00	24.37	QP
0.755	23.28	0.42	46.00	22.72	AV
1.210	27.00	0.33	56.00	29.00	QP
1.215	22.56	0.33	46.00	23.44	AV
1.600	28.19	0.34	56.00	27.81	QP
1.600	23.40	0.34	46.00	22.60	AV
2.970	26.32	0.39	56.00	29.68	QP
2.980	21.54	0.39	46.00	24.46	AV
26.395	26.41	2.36	60.00	33.59	QP
26.280	16.47	2.36	50.00	33.53	AV

AC 120V/60 Hz, Neutral



Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/ QP/Ave.)
0.445	36.28	0.69	57.57	21.29	QP
0.445	26.41	0.69	47.57	21.16	AV
0.660	32.02	0.45	56.00	23.98	QP
0.660	23.57	0.45	46.00	22.43	AV
0.780	31.33	0.37	56.00	24.67	QP
0.780	24.23	0.37	46.00	21.77	AV
1.070	29.44	0.23	56.00	26.56	QP
1.070	21.69	0.23	46.00	24.31	AV
1.645	31.46	0.26	56.00	24.54	QP
1.630	22.45	0.26	46.00	23.55	AV
25.620	26.35	2.18	60.00	33.65	QP
25.855	15.45	2.20	50.00	34.55	AV



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

**Applicable Standard**

FCC §15.247 (d); §15.209; §15.205;

**Measurement Uncertainty**

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If  $U_{lab}$  is less than or equal to  $U_{cispr}$  of Table 2, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If  $U_{lab}$  is greater than  $U_{cispr}$  of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.

Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:

30M~200MHz: 5.0 dB

200M~1GHz: 6.2 dB

1G~6GHz: 4.45 dB

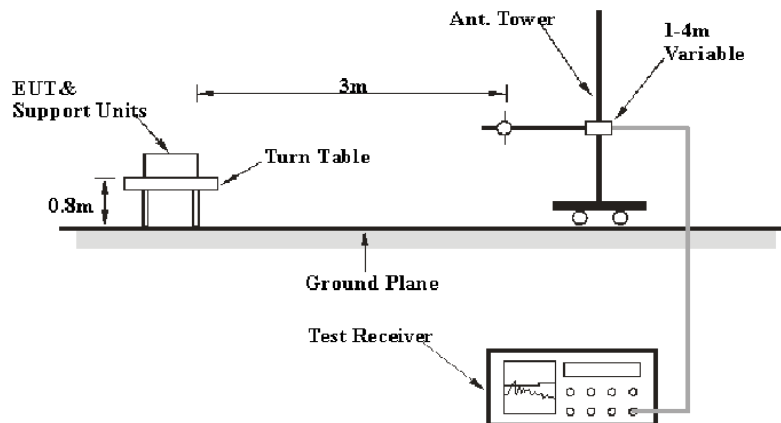
6G~18GHz: 5.23 dB

Table 2 – Values of  $U_{cispr}$

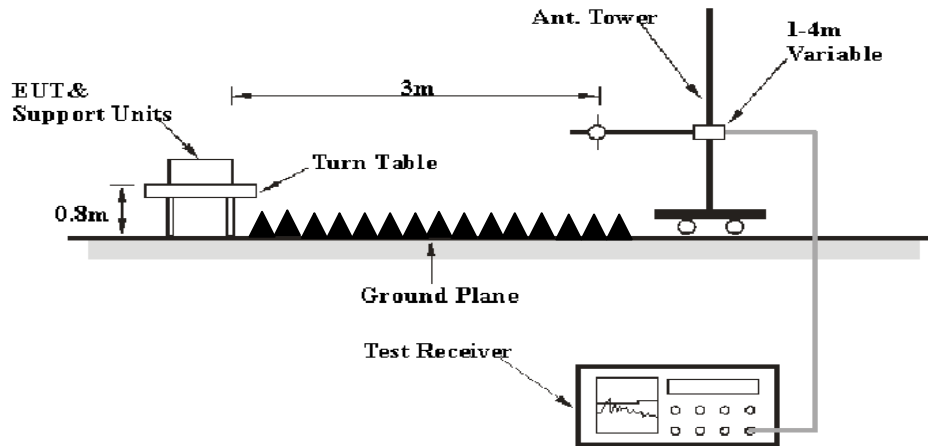
Measurement	$U_{cispr}$
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

**EUT Setup**

**Below 1GHz:**



**Above 1GHz:**



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.4-2003. 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.

**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>Frequency Range</i>	<i>RBW</i>	<i>Video BW</i>	<i>Detector</i>
30 MHz – 1000 MHz	100 kHz	300 kHz	QP
1000 MHz – 25 GHz	1 MHz	3 MHz	PK
1000 MHz – 25 GHz	1 MHz	10 Hz	Ave.

**Test Procedure**

For the radiated emissions test, the adapter was connected to the first AC floor outlet.

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

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

**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2012-05-14	2013-05-13
Sunol Sciences	Hybrid Antennas	JB3	A060611-1	2011-09-06	2013-09-05
HP	Pre-amplifier	8447E	2434A02181	2012-10-08	2013-10-07
R&S	Spectrum analyzer	FSEM 30	849016/001	2012-9-4	2013-9-3
ETS-LINDGREN	Horn Antenna	3115	000 527 35	2012-09-06	2014-09-05
Mini-Circuits	Amplifier	ZVA-213-S+	054201245	N/A	N/A

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, 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 Results Summary**

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

**3.35 dB at 2390 MHz in the Horizontal polarization**

**Test Data**

**Environmental Conditions**

<b>Temperature:</b>	22.4-22.5°C
<b>Relative Humidity:</b>	68 %
<b>ATM Pressure:</b>	101 kPa

*The testing was performed by Leon Chen from 2013-04-10 to 2013-04-11.*

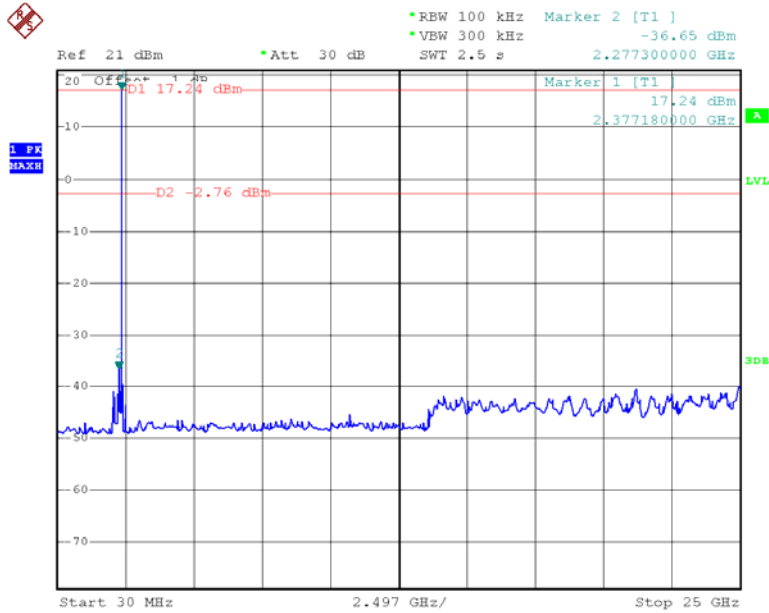
*Test Mode: Transmitting*

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	FCC 15.247	
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBµV/m)	Margin (dB)
Low Channel: 2411(MHz)									
2411	78.54	PK	H	25.67	3.92	0.00	108.13	N/A	N/A
2411	19.5	AV	H	25.67	3.92	0.00	49.09	N/A	N/A
2411	76.87	PK	V	25.67	3.92	0.00	106.46	N/A	N/A
2411	19.36	AV	V	25.67	3.92	0.00	48.95	N/A	N/A
2390	41.2	PK	H	25.61	3.84	0.00	70.65	74.00	3.35 *
2390	14.14	AV	H	25.61	3.84	0.00	43.59	54.00	10.41
4822	45.69	PK	H	30.64	4.72	27.26	53.79	74.00	20.21
4822	19.16	AV	H	30.64	4.72	27.26	27.26	54.00	26.74
7233	35.45	PK	V	34.16	6.55	26.36	49.80	74.00	24.20
7233	18.59	AV	V	34.16	6.55	26.36	32.94	54.00	21.06
9644	33.28	PK	V	36.05	8.71	26.08	51.96	74.00	22.04
9644	18.24	AV	V	36.05	8.71	26.08	36.92	54.00	17.08
2315.83	32.09	PK	H	25.42	3.95	27.18	34.28	74.00	39.72
2315.83	20.27	AV	H	25.42	3.95	27.18	22.46	54.00	31.54
38.73	41.1	QP	V	15.39	0.80	21.42	35.87	40.00	4.13*
Middle Channel: 2437(MHz)									
2437	78.33	PK	H	25.74	3.98	0.00	108.05	N/A	N/A
2437	19.26	AV	H	25.74	3.98	0.00	48.98	N/A	N/A
2437	76.44	PK	V	25.74	3.98	0.00	106.16	N/A	N/A
2437	19.23	AV	V	25.74	3.98	0.00	48.95	N/A	N/A
4874	44.28	PK	H	30.77	4.76	27.26	52.55	74.00	21.45
4874	19.02	AV	H	30.77	4.76	27.26	27.29	54.00	26.71
7311	35.16	PK	V	34.35	6.70	26.51	49.70	74.00	24.30
7311	18.49	AV	V	34.35	6.70	26.51	33.03	54.00	20.97
9748	33.08	PK	V	36.30	8.60	25.68	52.30	74.00	21.70
9748	18.11	AV	V	36.30	8.60	25.68	37.33	54.00	16.67
1306.25	32.58	PK	V	23.10	2.59	27.19	31.08	74.00	42.92
1306.25	18.11	AV	V	23.10	2.59	27.19	16.61	54.00	37.39
2316.49	32.16	PK	H	25.42	3.95	27.18	34.35	74.00	39.65
2316.49	20.34	AV	H	25.42	3.95	27.18	22.53	54.00	31.47
38.52	41	QP	V	15.55	0.80	21.42	35.93	40.00	4.07*
High Channel: 2459(MHz)									
2459	78.03	PK	H	25.79	3.95	0.00	107.78	N/A	N/A
2459	19.14	AV	H	25.79	3.95	0.00	48.89	N/A	N/A
2459	76.05	PK	V	25.79	3.95	0.00	105.80	N/A	N/A
2459	18.97	AV	V	25.79	3.95	0.00	48.72	N/A	N/A
2483.5	37.39	PK	H	25.86	3.80	0.00	67.05	74.00	6.95
2483.5	13.56	AV	H	25.86	3.80	0.00	43.22	54.00	10.78
4918	43.97	PK	H	30.89	4.71	27.27	52.30	74.00	21.70
4918	19.24	AV	H	30.89	4.71	27.27	27.57	54.00	26.43
7377	37.02	PK	V	34.50	6.83	26.64	51.71	74.00	22.29
7377	18.36	AV	V	34.50	6.83	26.64	33.05	54.00	20.95
9836	33.23	PK	V	36.51	8.50	25.49	52.75	74.00	21.25
9836	18.27	AV	V	36.51	8.50	25.49	37.79	54.00	16.21
2312.55	33.64	PK	H	25.41	3.99	27.19	35.85	74.00	38.15
2312.55	20.57	AV	H	25.41	3.99	27.19	22.78	54.00	31.22
38.64	40.9	QP	V	15.46	0.80	21.42	35.74	40.00	4.26 *

\*Within measurement uncertainty!

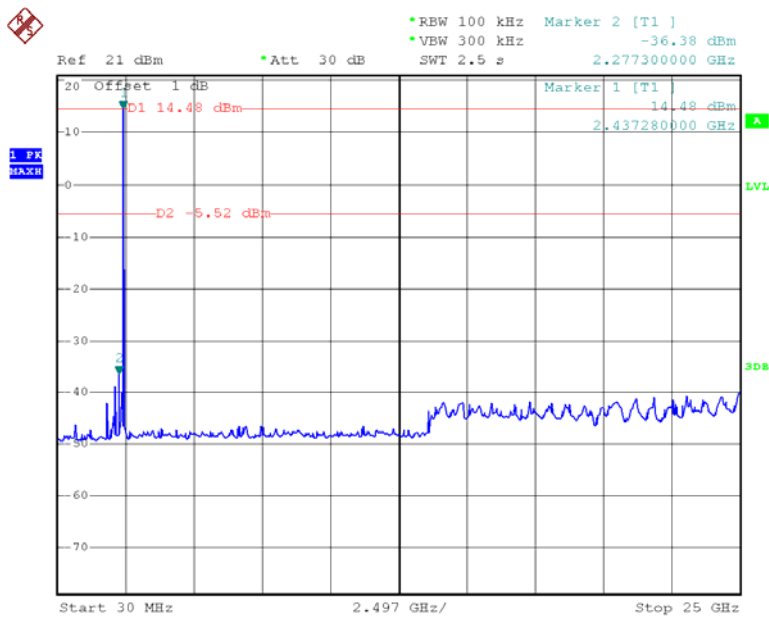
### Conducted Spurious Emissions at Antenna Port

#### Low Channel



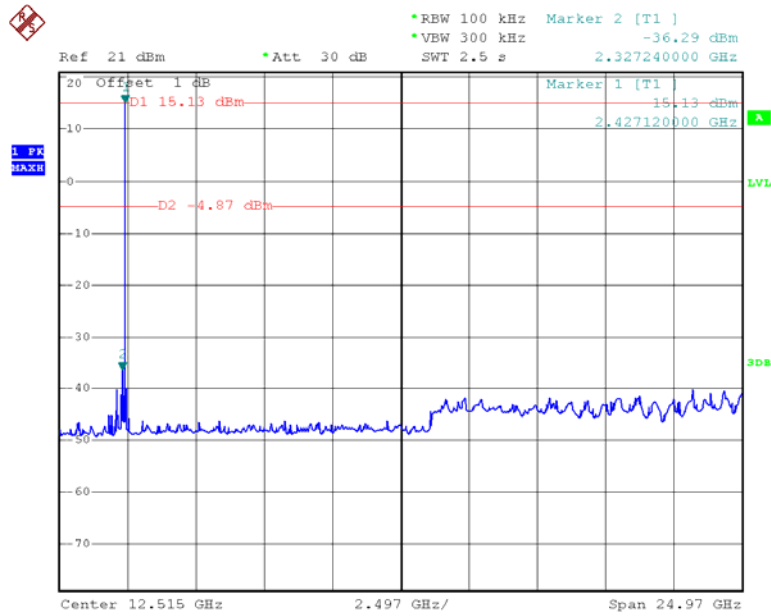
Date: 10.APR.2013 11:44:14

#### Middle Channel



Date: 11.APR.2013 10:22:53

### High Channel



Date: 10.APR.2013 11:56:40

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

### Applicable Standard

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

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSP38	100478	2012-5-14	2013-5-13

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, 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 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>	24.7°C
<b>Relative Humidity:</b>	60 %
<b>ATM Pressure:</b>	101 kPa

*The testing was performed by Leon Chen on 2013-04-10.*

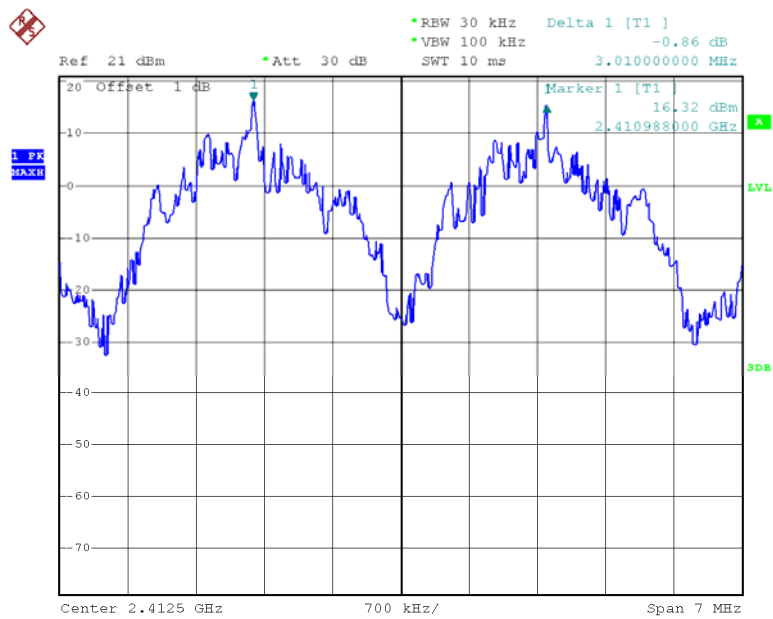
**Test Result:** Compliance.

Please refer to following tables and plots

*Test Mode: Transmitting*

Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low	2411	3.010	1.39	Pass
Adjacent	2414			
Middle	2434	3.024	1.39	Pass
Adjacent	2437			
High	2456	3.010	1.39	Pass
Adjacent	2459			

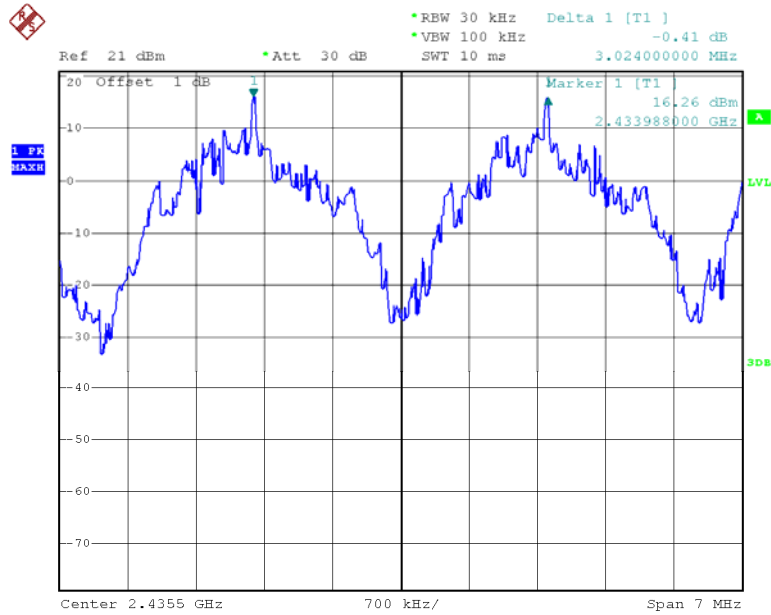
**Low Channel**



Date: 10.APR.2013 15:09:45

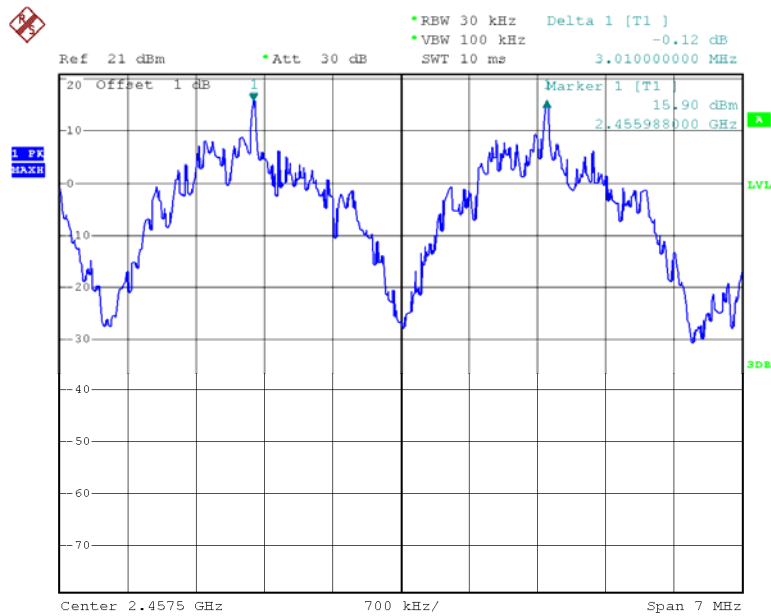


### Middle Channel



Date: 10.APR.2013 15:13:13

### High Channel



Date: 10.APR.2013 15:16:23

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

### Applicable Standard

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

### Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSP38	100478	2012-5-14	2013-5-13

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

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	23.9-24.7°C
<b>Relative Humidity:</b>	60-65 %
<b>ATM Pressure:</b>	101 kPa

*The testing was performed by Leon Chen from 2013-04-10 to 2013-04-11.*

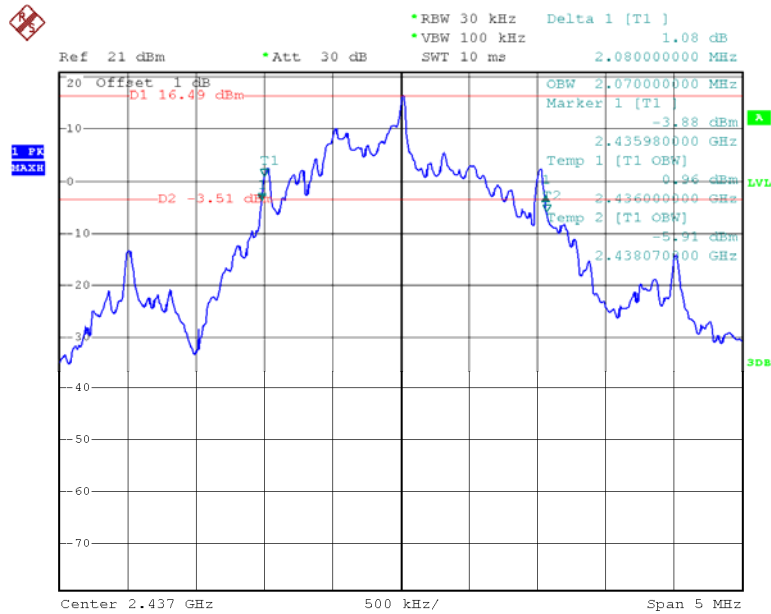
**Test Result:** Compliance.

Please refer to following tables and plots

*Test Mode: Transmitting*

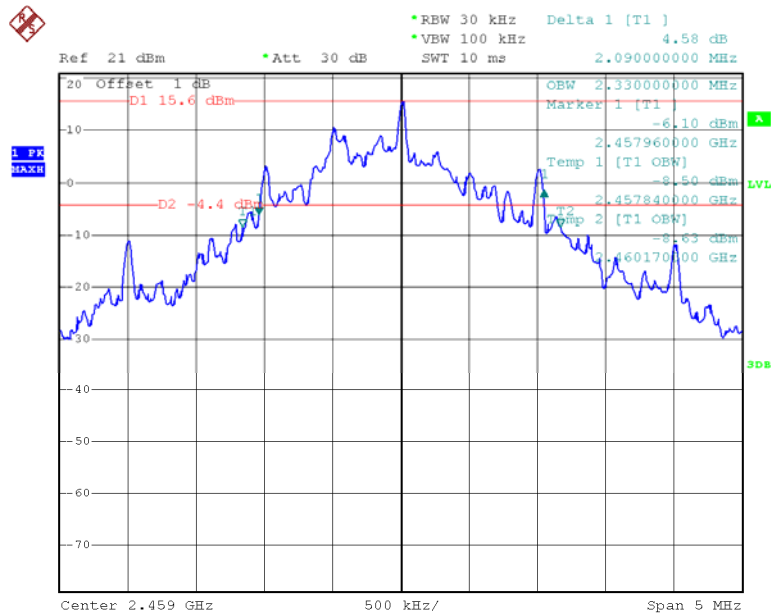


### Middle Channel



Date: 11.APR.2013 10:19:41

### High Channel



Date: 10.APR.2013 11:58:00

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

### **Applicable Standard**

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

### **Test Procedure**

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

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

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Rohde & Schwarz	Spectrum Analyzer	FSP38	100478	2012-5-14	2013-5-13

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

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	24.7°C
<b>Relative Humidity:</b>	60 %
<b>ATM Pressure:</b>	101kPa

*The testing was performed by Leon Chen on 2013-04-10.*

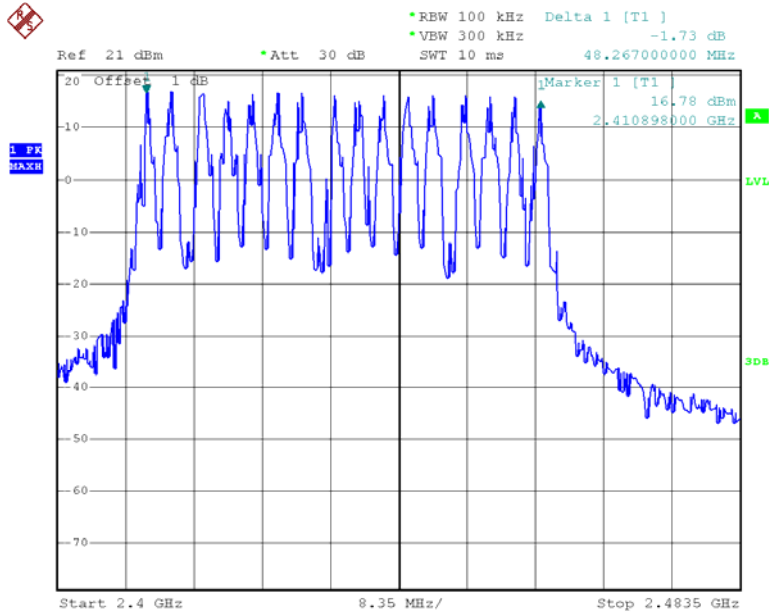
**Test Result:** Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

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

Number of Hopping Channels



Date: 10.APR.2013 15:19:36

## **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; Spectrum SPAN was set as 0. Sweep was set as  $0.4 * \text{channel no. (s)}$ , 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. \* 0.4s

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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSP38	100478	2012-5-14	2013-5-13

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

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	24.7°C
<b>Relative Humidity:</b>	60 %
<b>ATM Pressure:</b>	101kPa

*The testing was performed by Leon Chen on 2013-04-10.*

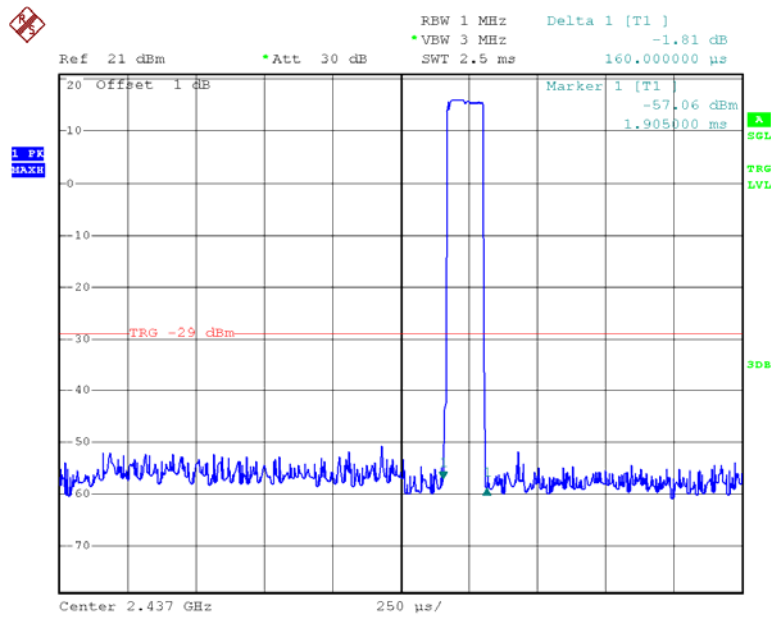
**Test Result:** Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
Middle	0.160	0.051	0.4	Pass
Note: Dwell time= time slot length(s)*(500/16)*16 * 0.4				

Note: The EUT hopping 500 times per second, which was declared by manufacturer.



Date: 10.APR.2013 15:22:19



## **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 an EMI test receiver.
3. Add a correction factor to the display.

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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSP38	100478	2012-5-14	2013-5-13

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

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	23.9 ~ 24.7°C
<b>Relative Humidity:</b>	60 ~ 65 %
<b>ATM Pressure:</b>	101 kPa

*The testing was performed by Leon Chen from 2013-04-10 to 2013-04-11.*

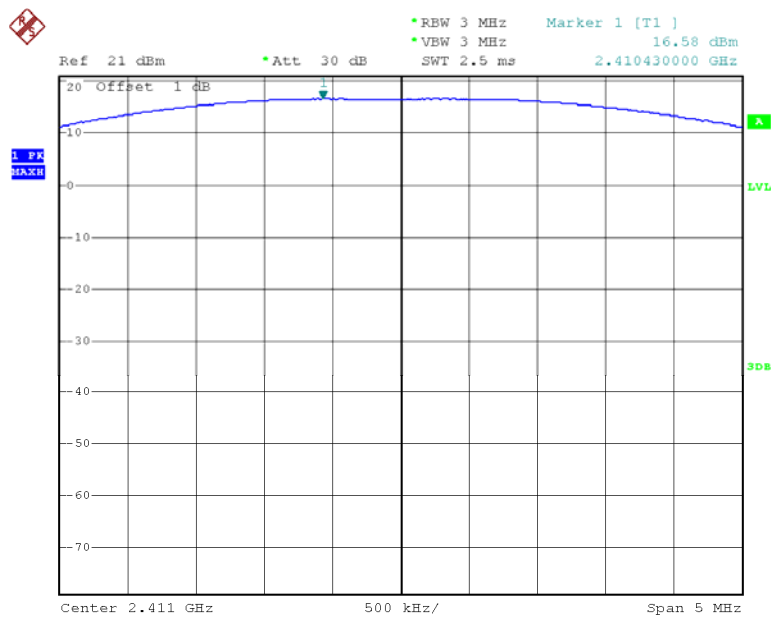
**Test Result:** Compliance.

Test Mode: Transmitting

Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
Low	2411	16.58	21
Middle	2437	16.44	21
High	2459	15.83	21

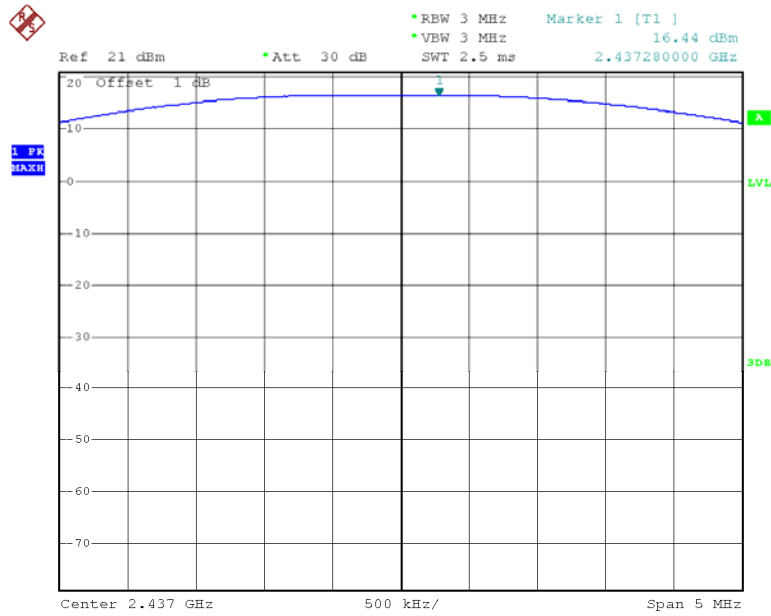
Note: The data above was tested in conducted mode.

Low Channel



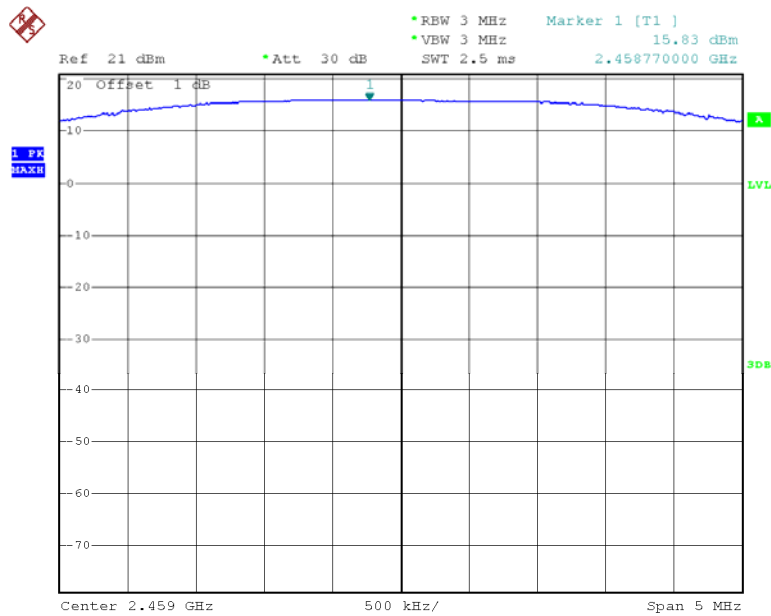
Date: 10.APR.2013 11:40:13

### Middle Channel



Date: 11.APR.2013 10:20:28

### High Channel



Date: 10.APR.2013 11:52:14

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

### Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 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
Rohde & Schwarz	Spectrum Analyzer	FSP38	100478	2012-5-14	2013-5-13

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

### Test Data

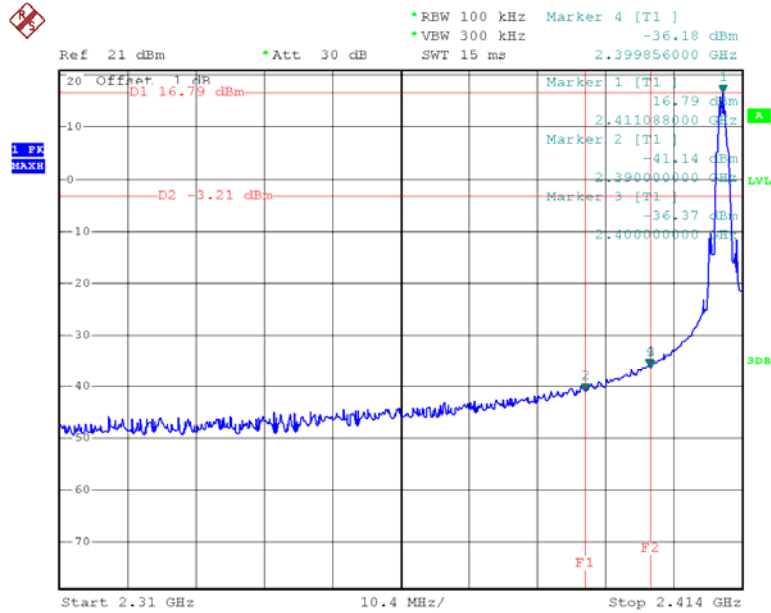
#### Environmental Conditions

Temperature:	24.7°C
Relative Humidity:	60 %
ATM Pressure:	101 kPa

*The testing was performed by Leon Chen on 2013-04-10.*

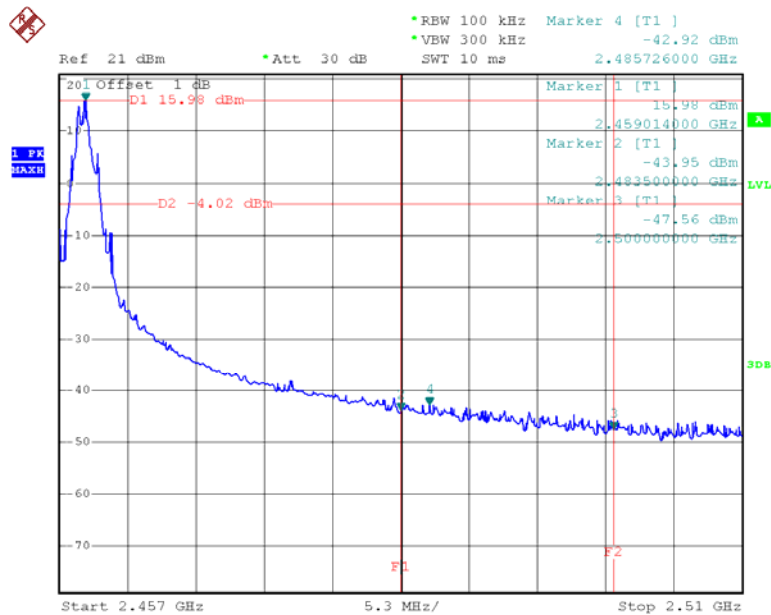
**Test Result: Compliance**

**Band Edge, Left Side**



Date: 10.APR.2013 11:42:29

**Band Edge, Right Side**



Date: 10.APR.2013 11:54:57

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