

# FCC PART 15.247

## MEASUREMENT AND TEST REPORT

For

### Sunitec Enterprise Co., Ltd.

3B-02, No. 5, Hsin-Yi Road, Sec. 5 Taipei, 110 Taiwan

**FCC ID: RA8-BC002**

<b>This Report Concerns:</b> <input checked="" type="checkbox"/> Original Report		<b>Equipment Type:</b> Bluetooth Speakerphone	
<b>Test Engineer:</b>	Vicent Kang <i>Vicent Kang</i>		
<b>Report No.:</b>	RSZ08022001		
<b>Test Date:</b>	2008-02-25 to 2008-03-06		
<b>Report Date:</b>	2008-03-06		
<b>Reviewed By:</b>	EMC Manager: Green Xu <i>Green Xu</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 for the customer shown above and their specific product only. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Shenzhen) 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.

## 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
SPECIAL ACCESSORIES .....	6
EQUIPMENT MODIFICATIONS .....	6
LOCAL SUPPORT EQUIPMENT LIST AND DETAILS .....	6
EXTERNAL I/O CABLE.....	6
CONFIGURATION OF TEST SETUP .....	7
BLOCK DIAGRAM OF TEST SETUP .....	7
<b>SUMMARY OF TEST RESULTS .....</b>	<b>8</b>
<b>§15.247 (i) and §1.1307(b) (1) - MAXIMUN PERMISSIBLE EXPOSURE.....</b>	<b>9</b>
STANDARD APPLICABLE .....	9
TEST DATA .....	9
<b>CFR47 §15.203 - ANTENNA REQUIREMENT.....</b>	<b>10</b>
STANDARD APPLICABLE .....	10
ANTENNA CONNECTOR CONSTRUCTION .....	10
<b>§15.207 (a) - CONDUCTED EMISSIONS.....</b>	<b>11</b>
MEASUREMENT UNCERTAINTY .....	11
EUT SETUP .....	11
EMI TEST RECEIVER SETUP.....	12
TEST EQUIPMENT LIST AND DETAILS.....	12
TEST PROCEDURE .....	12
TEST RESULTS SUMMARY .....	12
TEST DATA .....	13
PLOT(S) OF TEST DATA .....	13
<b>CFR47 §15.205, §15.209, §15.247 - RADIATED EMISSIONS.....</b>	<b>16</b>
APPLICABLE STANDARD .....	16
MEASUREMENT UNCERTAINTY .....	16
EUT SETUP.....	16
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP .....	17
TEST EQUIPMENT LIST AND DETAILS.....	17
TEST PROCEDURE .....	17
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	17
TEST RESULTS SUMMARY .....	18
TEST DATA .....	18
<b>CFR47 §15.247(a) (1)-CHANNEL SEPARATION TEST .....</b>	<b>21</b>
APPLICABLE STANDARD .....	21
TEST EQUIPMENT LIST AND DETAILS.....	21

TEST PROCEDURE .....	21
TEST DATA .....	21
<b>CFR47 §15.247(a) (1) – 20dB BANDWIDTH TESTING.....</b>	<b>26</b>
APPLICABLE STANDARD .....	26
TEST EQUIPMENT LIST AND DETAILS.....	26
TEST PROCEDURE .....	26
TEST DATA .....	26
<b>CFR47 §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST .....</b>	<b>30</b>
APPLICABLE STANDARD .....	30
TEST EQUIPMENT LIST AND DETAILS.....	30
TEST PROCEDURE .....	30
TEST DATA .....	30
<b>CFR47 §15.247(a) (1) (iii) -TIME OF OCCUPANCY (DWELL TIME).....</b>	<b>32</b>
APPLICABLE STANDARD .....	32
TEST EQUIPMENT LIST AND DETAILS.....	32
TEST PROCEDURE .....	32
TEST DATA .....	32
<b>CFR47 §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT .....</b>	<b>36</b>
APPLICABLE STANDARD .....	36
TEST EQUIPMENT LIST AND DETAILS.....	36
TEST PROCEDURE .....	36
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	36
TEST DATA .....	37
<b>CFR47 §15.247(d) - BAND EDGES TESTING .....</b>	<b>38</b>
APPLICABLE STANDARD .....	38
TEST EQUIPMENT LIST AND DETAILS.....	38
TEST PROCEDURE .....	38
TEST DATA .....	39

---

## GENERAL INFORMATION

---

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

The *Sunitec's* product, model number: *BC340* or the "EUT" as referred to in this report is a *Bluetooth Speakerphone*, which measures approximately: 12.5 cm L x 5.6 cm W x 2.2 cm H, input voltage: DC 3.7V Battery .

*\* All measurement and test data in this report was gathered from production sample serial number: 0802013 (Assigned by BAACL, Shenzhen). The EUT was received on 2008-02-20.*

### Objective

This Type approval report is prepared on behalf of *Sunitec* 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, 15.209 and 15.247 rules.

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

No related submittal(s).

### 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. (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 November 04, 2004. 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.: 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).



NVLAP 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 a typical fashion (as normally used by a typical user).

### EUT Exercise Software

N/A.

### Special Accessories

The special accessories were provided by Bay Area Compliance Laboratories Corp. (Shenzhen).

### Equipment Modifications

No modification was made to the unit tested.

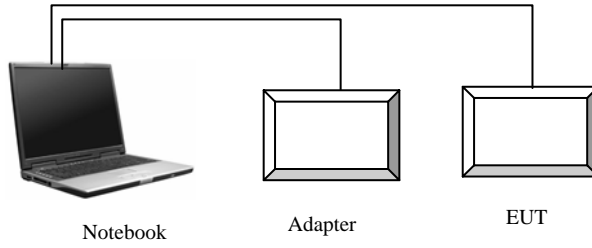
### Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
COMPAQ	Notebook	PP2040	N610Cp180X430VC250	DoC

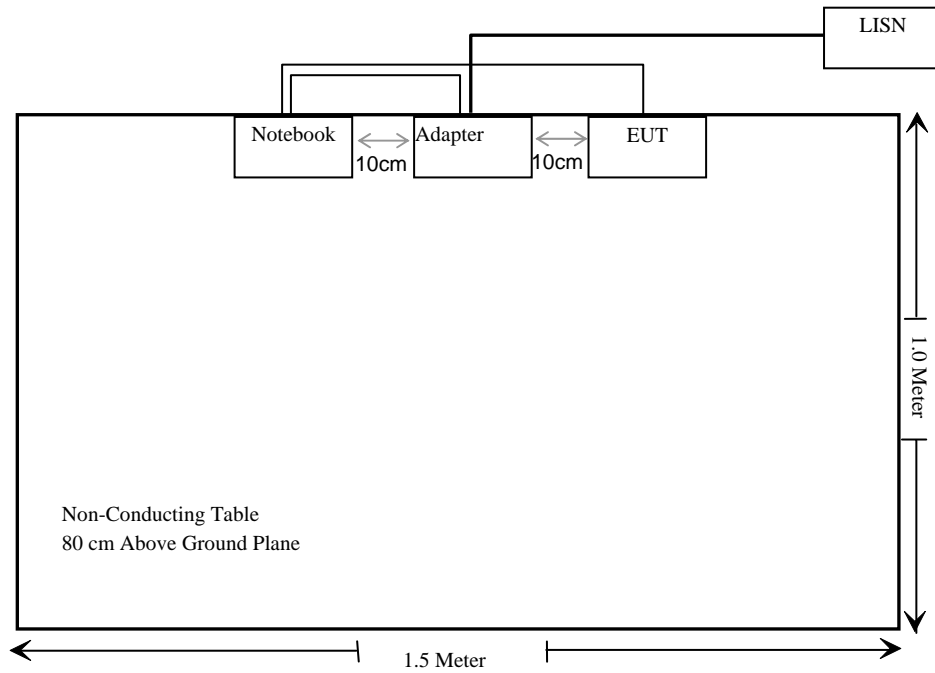
### External I/O Cable

Cable Description	Length (m)	From Port	To
Unshielded Detachable AC Cable	1.00	Adapter	PC
Unshielded Detachable USB Cable	1.10	EUT	PC

### Configuration of Test Setup



### Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
CFR47 §15.247 (i), §1.1307 (b)(1)	Maximun Permissible exposure	Compliant
CFR47 §15.203	Antenna Requirement	Compliant
CFR47 §15.207 (a)	Conducted Emissions	Compliant
CFR47 §15.205, §15.209, §15.247(d)	Radiated Emission	Compliant
CFR47 §15.247 (a)(1)	20 dB Bandwidth	Compliant
CFR47 §15.247(a)(1)	Channel Separation Test	Compliant
CFR47 §15.247(a)(1)(iii)	Time of occupancy (Dwell Time)	Compliant
CFR47 §15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant
CFR47 §15.247(b)(1)	Peak Output Power Measurement	Compliant
CFR47 §15.247(d)	Band edges	Compliant



## **§15.247 (i) and §1.1307(b) (1) - MAXIMUM PERMISSIBLE EXPOSURE**

### **Standard Applicable**

According to §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.

Radio frequency radiation exposure was calculated based on § 1.1310 limits.

Limits for General Population/Uncontrolled Exposure

<b>Frequency Range (MHz)</b>	<b>Electric Field Strength (V/m)</b>	<b>Magnetic Field Strength (A/m)</b>	<b>Power Density (mW/cm<sup>2</sup>)</b>	<b>Averaging Time (minute)</b>
<b>Limits for General Population/Uncontrolled Exposure</b>				
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

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

S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

EIRP = equivalent (or effective) isotropically radiated power

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

EIRP: -0.44 (dBm)

EIRP: 0.904 (mW)

Prediction distance: >20 (cm)

Predication frequency: 2441 (MHz)

The worst case is power density at predication frequency at 20 cm: 0.0002 (mW/cm<sup>2</sup>)

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

$$0.0002(\text{mW}/\text{cm}^2) < 1 (\text{mW}/\text{cm}^2)$$

**Result:** Compliant.

---

**CFR47 §15.203 - ANTENNA REQUIREMENT**

---

**Standard Applicable**

According to CFR47 § 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 printed antenna on PCB. The maximum gain is 2 dBi, please refer to the internal photos.

**Result:** Compliance.

Please refer to the EUT internal photos.

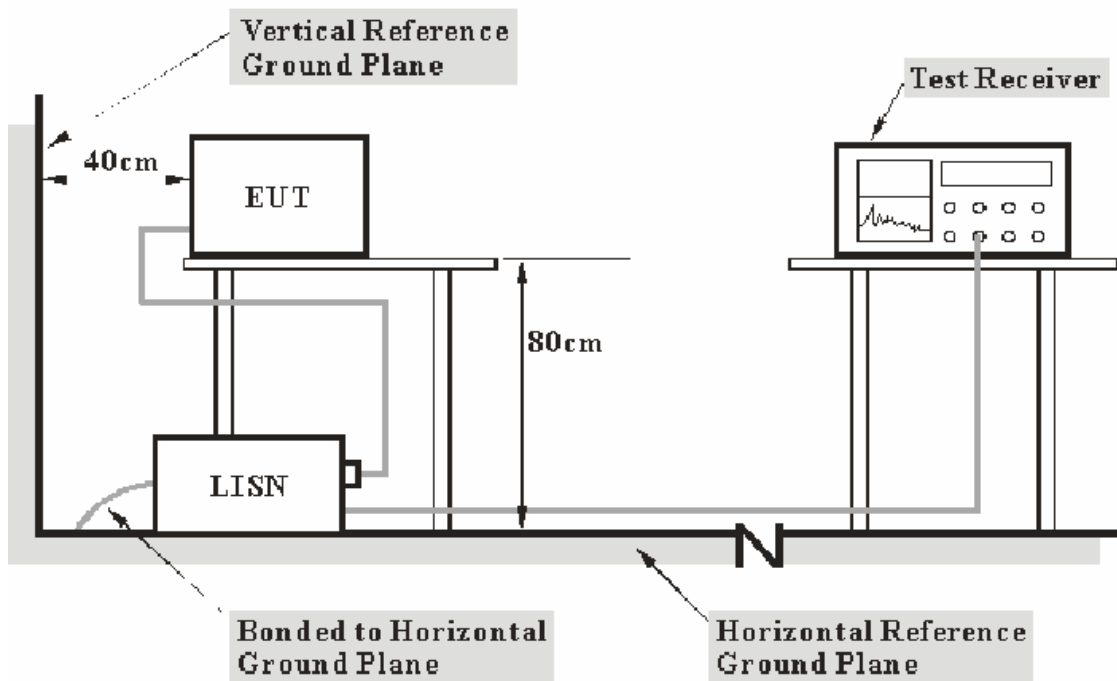
## §15.207 (a) - CONDUCTED EMISSIONS

### 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.

### 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 C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.207 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 EUT was connected to the host via the USB cable.

The adapter of host 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
Com-Power	L.I.S.N.	LI-200	12005	N/A	N/A
Com-Power	L.I.S.N.	LI-200	12008	N/A	N/A
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2007-10-16	2008-10-16
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2007-03-26	2008-03-26
Rohde&Schwarz	Spectrum Analyzer	FSEM30	849720/019	2007-05-09	2008-05-09

\* Com-Power's LISN were used as the supporting equipment.

\* **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 outlet of 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:

**9.7 dB at 1.120 MHz** in the **Neutral** conductor mode

**Test Data****Environmental Conditions**

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

*The testing was performed by Vicent Kang on 2008-03-04*

*Test Mode: Charging*

Line Conducted Emissions				FCC Part 15.207	
Frequency (MHz)	Amplitude (dB $\mu$ V)	Detector (QP/AV)	Conductor (Hot/Neutral)	Limit (dB $\mu$ V)	Margin (dB)
1.120	46.30	QP	Neutral	56.00	9.70
1.100	45.60	QP	Hot	56.00	10.40
1.125	34.70	AV	Neutral	46.00	11.30
1.100	34.10	AV	Hot	46.00	11.90
0.400	40.30	QP	Hot	57.85	17.55
0.400	40.00	QP	Neutral	57.85	17.85
0.275	41.70	QP	Neutral	60.97	19.27
0.275	31.70	AV	Neutral	50.97	19.27
0.400	28.50	AV	Neutral	47.85	19.35
0.400	28.40	AV	Hot	47.85	19.45
0.275	41.20	QP	Hot	60.97	19.77
0.190	34.10	AV	Neutral	54.04	19.94
0.190	43.70	QP	Neutral	64.04	20.34
0.275	30.60	AV	Hot	50.97	20.37
0.210	42.80	QP	Neutral	63.21	20.41
0.210	32.40	AV	Neutral	53.21	20.81
0.210	42.00	QP	Hot	63.21	21.21
0.190	32.80	AV	Hot	54.04	21.24
0.210	31.80	AV	Hot	53.21	21.41
0.190	42.30	QP	Hot	64.04	21.74
14.975	36.60	QP	Neutral	60.00	23.40
25.765	32.80	QP	Hot	60.00	27.20
15.205	17.90	AV	Neutral	50.00	32.10
26.235	8.50	AV	Hot	50.00	41.50

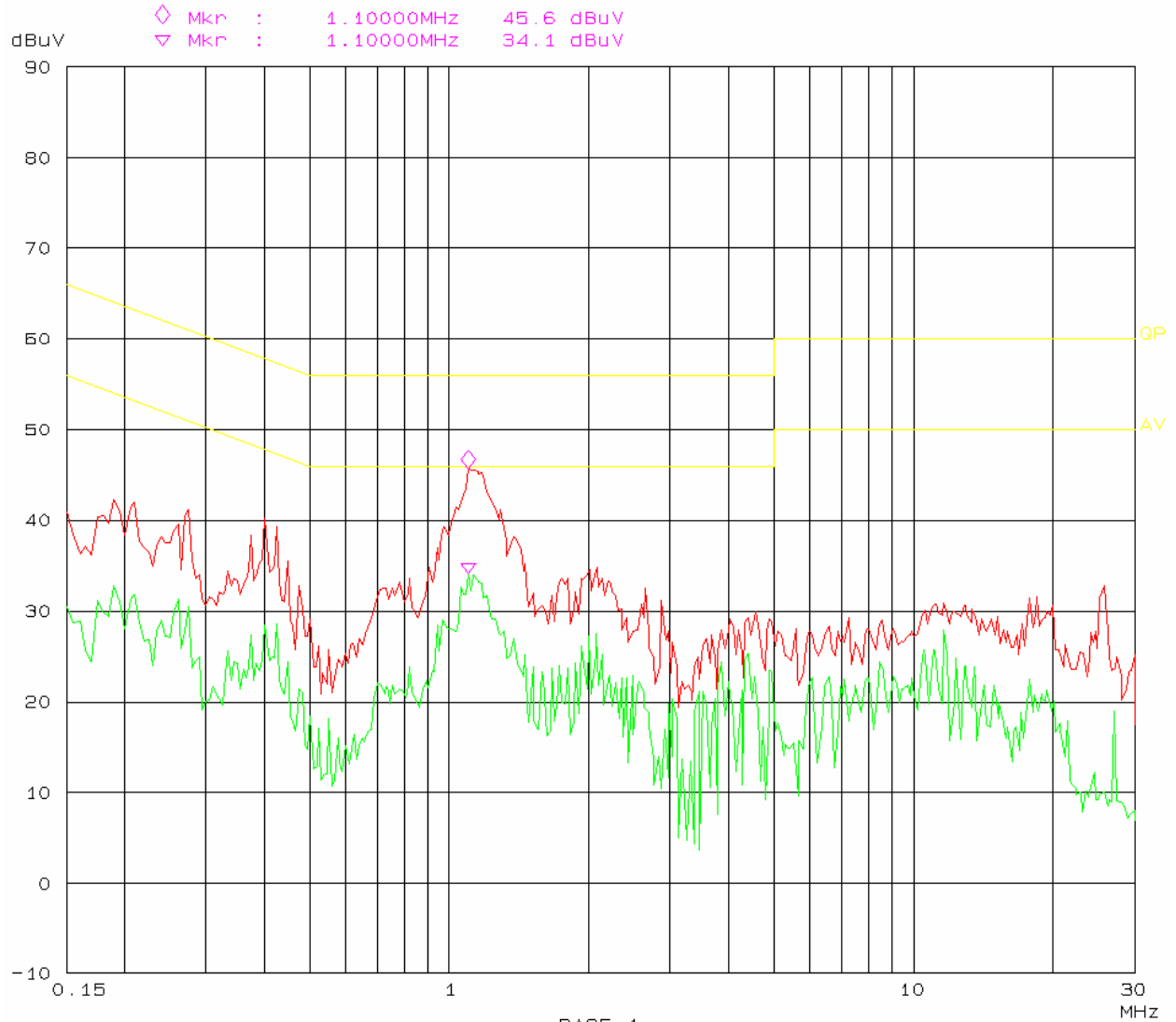
**Plot(s) of Test Data**

Plot(s) of Test Data is presented hereinafter as reference.

CONDUCTED EMISSION TEST  
FCC PART15 CLASS B

04. Mar 08 13: 45

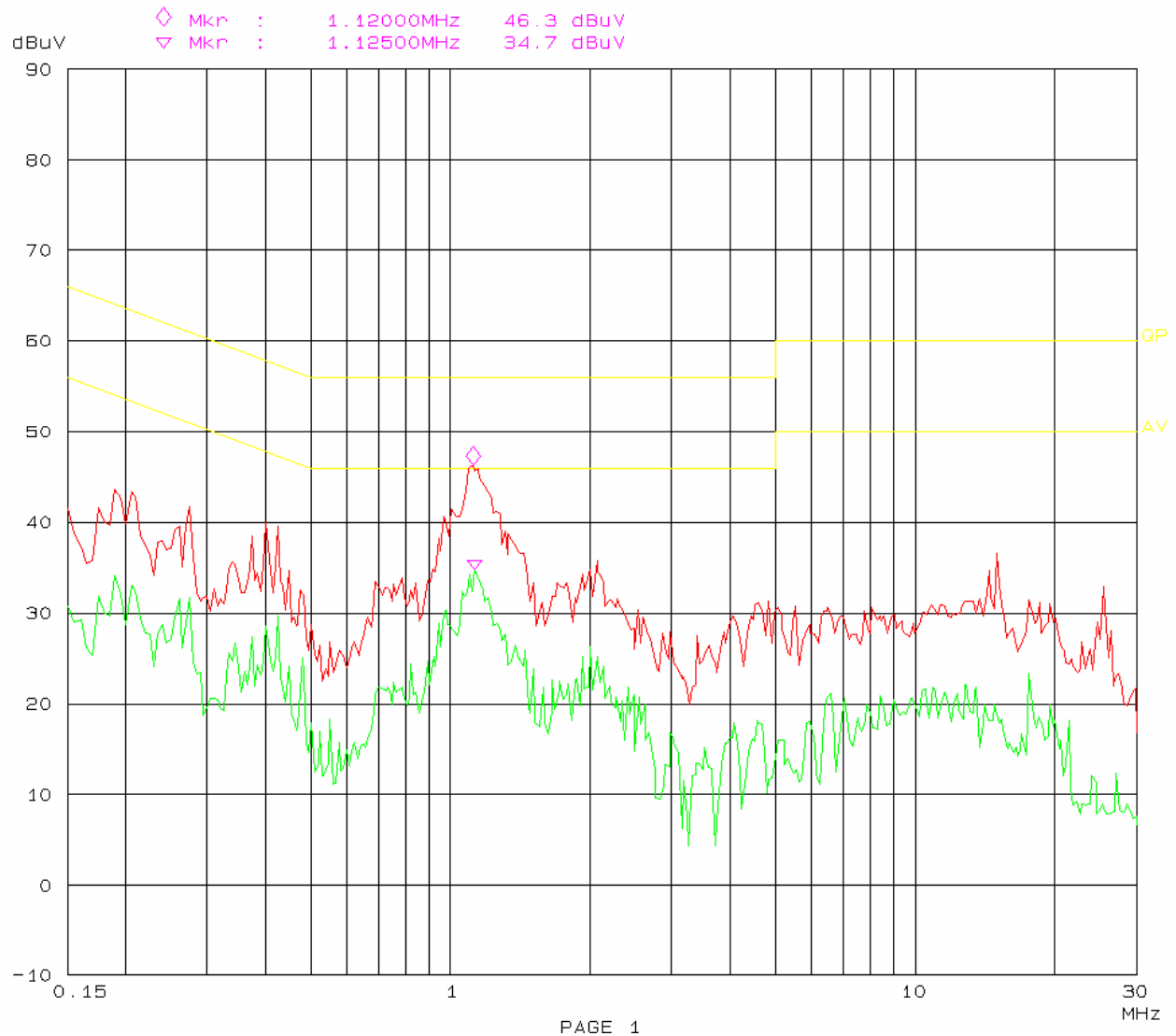
EUT: Bluetooth Speakerphone M/N: BC340  
Manuf: SUNITEC  
Op Cond: charging  
Operator: Vicent  
Test Spec: AC 120V/60Hz H  
Comment: Temp: 25 Humi: 56%



CONDUCTED EMISSION TEST  
FCC PART15 CLASS B

04. Mar 08 14:03

EUT: Bluetooth Speakerphone M/N: BC340  
Manuf: SUNITEC  
Op Cond: charging  
Operator: Vicent  
Test Spec: AC 120V/60Hz N  
Comment: Temp: 25 Humi: 56%



## CFR47 §15.205, §15.209, §15.247 - RADIATED EMISSIONS

### Applicable Standard

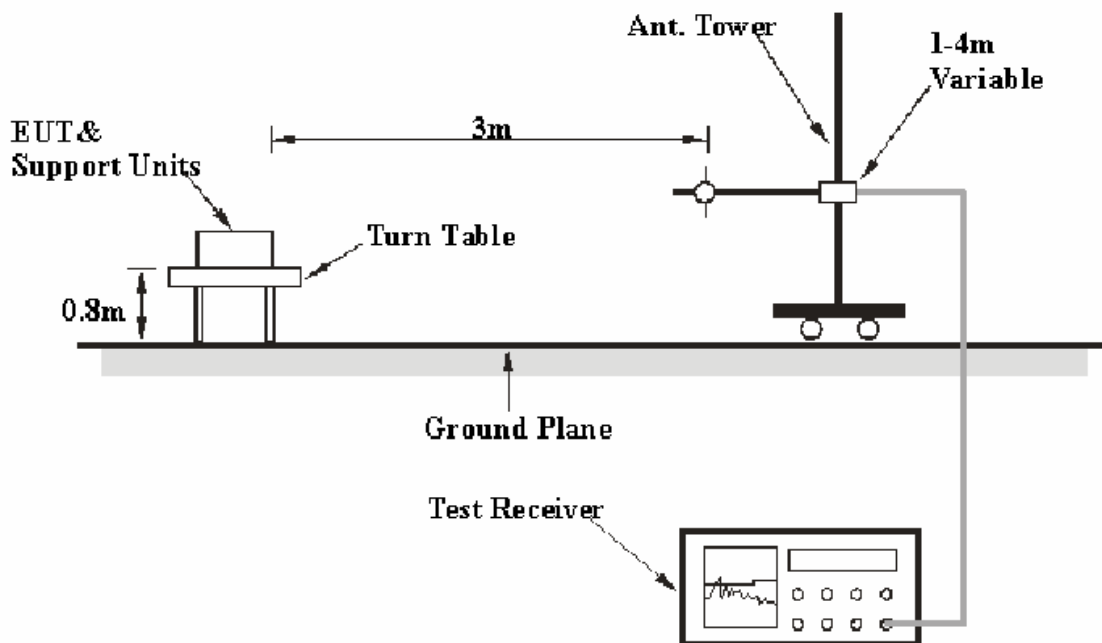
CFR47 §15.205; §15.209; §15.247 (d).

### 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.

### EUT Setup



The radiated emission tests were performed in the 3 meters chamber B test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.109, 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 of host 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>Frequency Range</i>	<i>RBW</i>	<i>Video B/W</i>
30MHz – 1000 MHz	100 kHz	300 kHz
1000 MHz – 25 GHz	1 MHz	3 MHz

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2007-11-15	2008-11-15
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2007-10-16	2008-10-16
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2007-08-14	2008-08-14
HP	Amplifier	8449B	3008A00277	2007-09-29	2008-09-29
Sunol Sciences	Horn Antenna	DRH-118	A052604	2007-09-25	2008-09-25
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2007-05-09	2008-05-09

\* **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, the adapter was connected to the 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-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 7dB means the emission is 7dB below the maximum 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 15.109, 15.205, 15.209, and 15.247, with the worst margin reading of:

### Transmitting mode (30 – 1000 MHz):

**1.8 dB** at 210.903425 MHz in the **Horizontal** polarization

### Transmitting mode (Above 1 GHz):

**9.72 dB** at 1602 MHz in the **Vertical** polarization (**Low Channel**)

**9.08 dB** at 4882 MHz in the **Vertical** polarization (**Middle Channel**)

**9.87 dB** at 1652.8 MHz in the **Horizontal** polarization (**High Channel**)

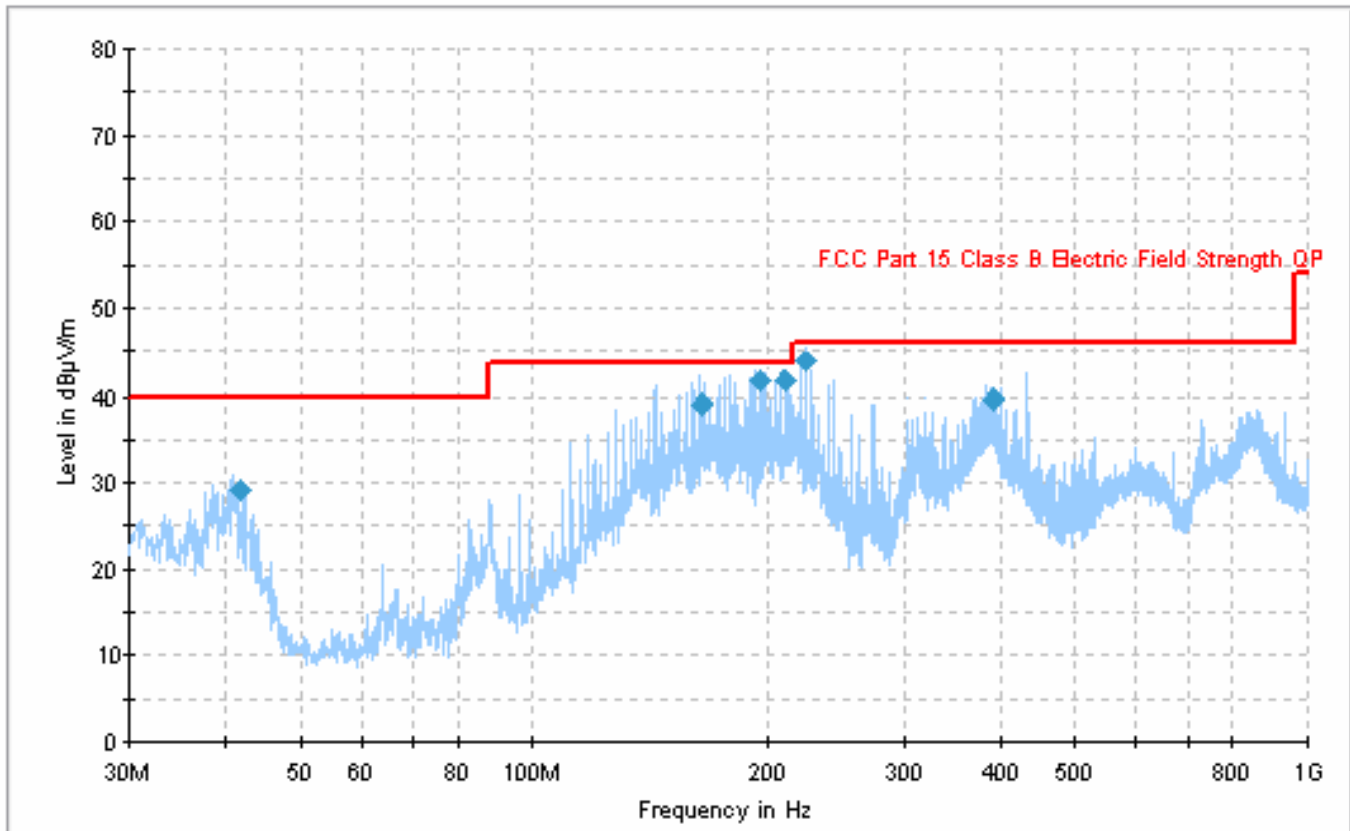
## Test Data

### Environmental Conditions

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

*The testing was performed by Vicent Kang on 2008-03-04*

Test Mode: Transmitting (30 – 1000 MHz)



Frequency (MHz)	Corrected Amp. (dBμV/m)	Antenna Height (cm)	Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dBμV/m)	Margin (dB)
210.903425	41.7	162.0	H	283.0	-12.9	43.5	1.8
194.908575	41.5	170.0	H	259.0	-12.2	43.5	2.0
223.997975	43.8	142.0	H	215.0	-12.6	46.0	2.2
163.981250	39.0	165.0	V	143.0	-11.9	43.5	4.5
390.355000	39.7	---168.0	H	280.0	-10.8	46.0	6.3
41.697500	29.2	134.0	V	135.0	-5.3	40.0	10.8

## Test Mode: Transmitting (Above 1GHz)

Freq. (MHz)	Meter Reading (dBuV)	Detector PK/QP/AV	Direction Degree	Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Corr. Amp. (dBuV/m)	FCC Part 15.247/209		
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBuV/m)	Margin (dB)	Remarks
<b>Low Channel (2402 MHz)</b>												
2402	87.52	PK	90	1.0	H	30.6	3.61	35	86.73			fundamental
2402	57.62	AV	45	1.0	H	30.6	3.61	35	56.83			fundamental
2402	93.54	PK	90	1.0	V	30.6	3.61	35	92.75			fundamental
2402	65.86	AV	45	1.0	V	30.6	3.61	35	65.07			fundamental
1602	50.51	AV	180	1.2	V	26.0	2.77	35.0	44.28	54	9.72	spurious
4804	37.39	AV	90	1.0	V	35.4	4.64	33.4	44.03	54	9.97	harmonic
4804	33.25	AV	90	1.0	H	36.6	4.64	33.4	41.09	54	12.91	harmonic
1602	45.28	AV	180	1.2	H	26.5	2.77	35.0	39.55	54	14.45	spurious
1602	62.31	PK	45	1.2	H	26.5	2.77	35.0	56.58	74	17.42	spurious
1602	61.99	PK	45	1.2	V	26.0	2.77	35.0	55.76	74	18.24	spurious
4804	45.66	PK	180	1.2	V	35.4	4.64	33.4	52.3	74	21.7	harmonic
4804	44.32	PK	180	1.2	H	36.6	4.64	33.4	52.16	74	21.84	harmonic
<b>Middle Channel (2441 MHz)</b>												
2441	87.51	PK	60	1.4	H	30.6	3.61	35	86.72			fundamental
2441	57.58	AV	152	1.3	H	30.6	3.61	35	56.79			fundamental
2441	94.83	PK	128	1.5	V	30.6	3.61	35	94.04			fundamental
2441	66.82	AV	156	1.2	V	30.6	3.61	35	66.03			fundamental
4882	37.08	AV	243	1.4	V	36.6	4.64	33.4	44.92	54	9.08	harmonic
1626.8	50.23	AV	85	1.5	V	26.5	2.77	36.0	43.5	54	10.5	spurious
4882	34.32	AV	142	1.6	H	35.4	4.64	33.4	40.96	54	13.04	harmonic
1626.8	44.60	AV	135	1.3	H	26.0	2.77	35.0	38.37	54	15.63	spurious
1626.8	62.34	PK	265	1.4	V	26.5	2.77	36.0	55.61	74	18.39	spurious
1626.8	61.59	PK	156	1.4	H	26.0	2.77	35.0	55.36	74	18.64	spurious
4882	45.28	PK	153	1.5	V	36.6	4.64	33.4	53.12	74	20.88	harmonic
4882	45.57	PK	234	1.8	H	35.4	4.64	33.4	52.21	74	21.79	harmonic
<b>High Channel (2480 MHz)</b>												
2480	87.77	PK	89	1.5	H	30.6	3.61	35	86.98			fundamental
2480	57.80	AV	65	1.5	H	30.6	3.61	35	57.01			fundamental
2480	94.89	PK	65	1.4	V	30.6	3.61	35	94.1			fundamental
2480	67.02	AV	65	1.6	V	30.6	3.61	35	66.23			fundamental
1652.8	49.86	AV	156	1.2	H	26.5	2.77	35.0	44.13	54	9.87	spurious
1652.8	48.57	AV	210	1.2	V	26.0	2.77	35.0	42.34	54	11.66	spurious
4960	34.21	AV	256	1.8	H	36.6	4.55	33.4	41.96	54	12.04	harmonic
4960	32.29	AV	142	1.5	V	35.4	4.55	33.4	38.84	54	15.16	harmonic
1652.8	61.17	PK	128	1.5	H	26.5	2.77	35.0	55.44	74	18.56	spurious
1652.8	61.17	PK	240	1.4	V	26.0	2.77	35.0	54.94	74	19.06	spurious
4960	45.32	PK	145	1.4	H	36.6	4.55	33.4	53.07	74	20.93	harmonic
4960	44.76	PK	142	1.4	V	35.4	4.55	33.4	51.31	74	22.69	harmonic

## CFR47 §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	2007-10-16	2008-10-16

\* **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>	27 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.9 kPa

*The testing was performed by Vicent Kang on 2008-02-25.*

*Test Mode: Transmitting*

Channel	Channel Frequency (MHz)	Channel Separation (kHz)	Limit (kHz)	Result
Low Channel	2402	1004	538.67	Pass
Adjacent Channel	2403			
Mid Channel	2441	1004	570.67	Pass
Adjacent Channel	2442			
High Channel	2480	1004	549.33	Pass
Adjacent Channel	2479			

**Test Result:** Compliance.

Please refer to following plots.

### Low Channel

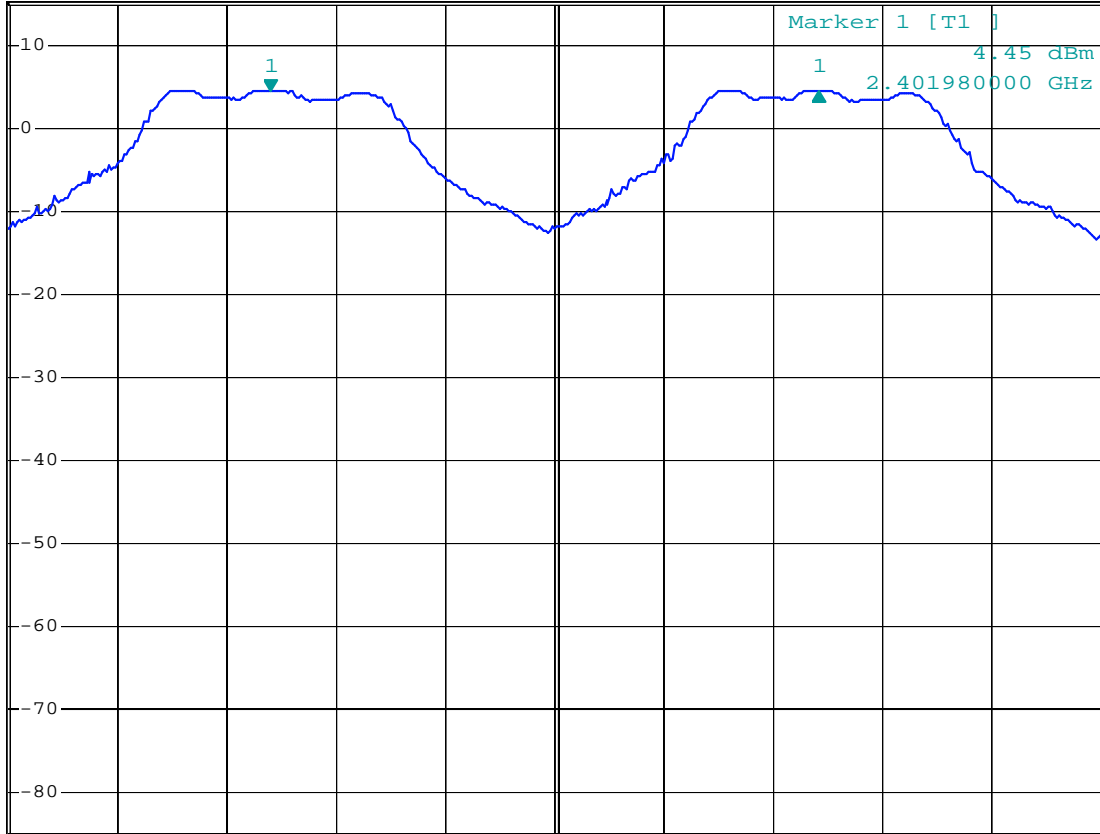


\*RBW 100 kHz Delta 1 [T1 ]  
VBW 300 kHz -0.00 dB  
SWT 2.5 ms 1.004000000 MHz

Ref 15 dBm

\*Att 45 dB

1 PK  
VIEW



Center 2.4025 GHz

200 kHz/

Span 2 MHz

channel separation low channel

Date: 25.FEB.2008 20:46:43

### Middle Channel

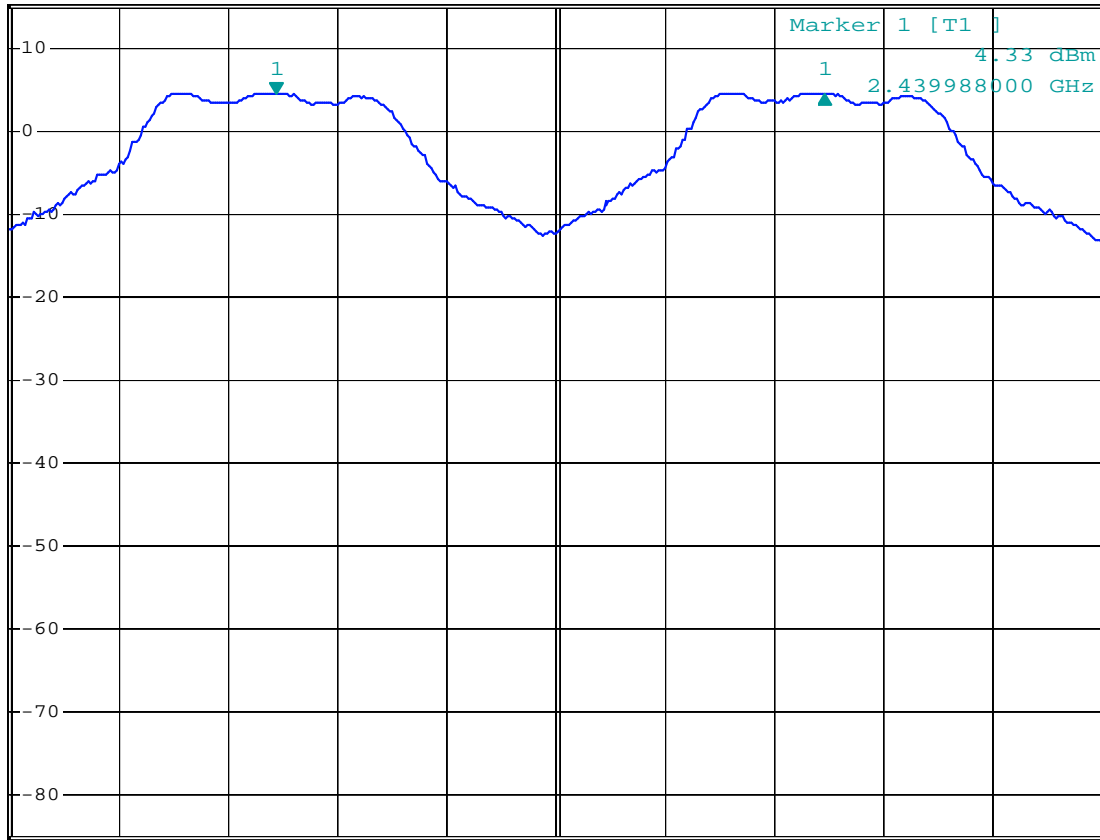


\*RBW 100 kHz    Delta 1 [T1 ]  
VBW 300 kHz                    0.03 dB  
SWT 2.5 ms                    1.004000000 MHz

Ref 15 dBm

\*Att 45 dB

1 PK  
MAXH



A

PS

Center 2.4405 GHz

200 kHz/

Span 2 MHz

channel separation middle channel

Date: 25.FEB.2008 20:48:19



### High Channel

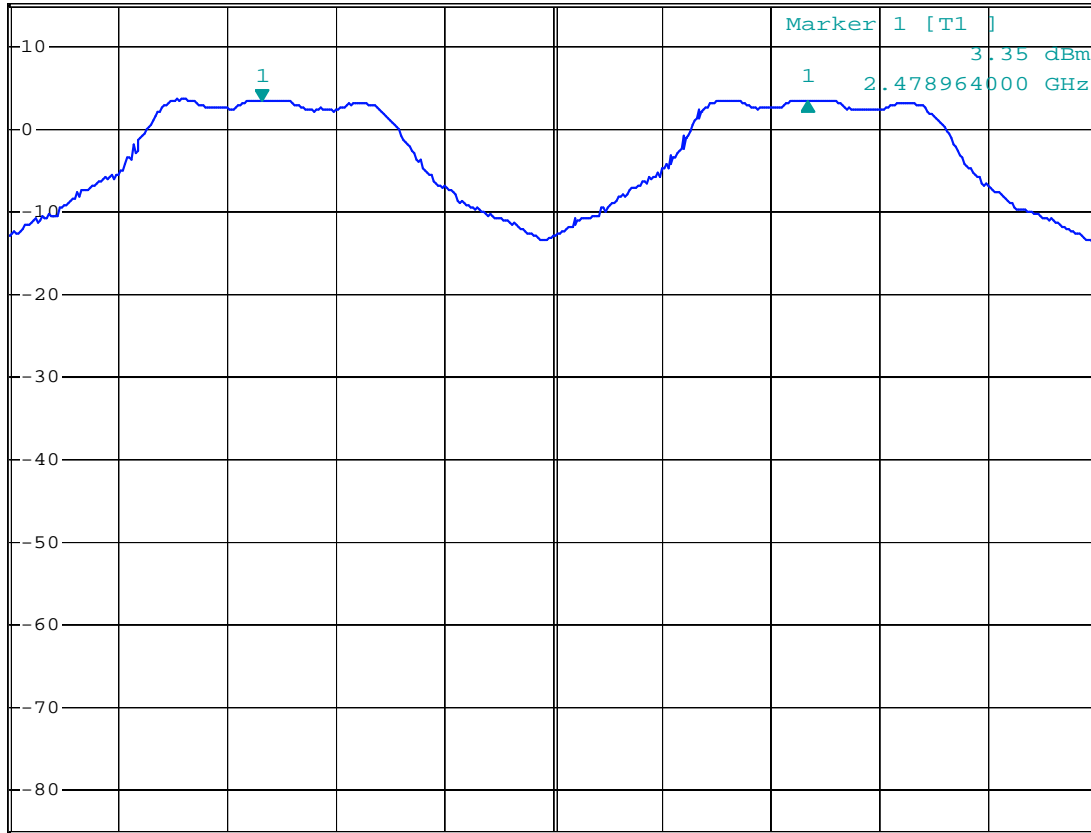


\*RBW 100 kHz    Delta 1 [T1 ]  
VBW 300 kHz                    0.03 dB  
SWT 2.5 ms                    1.004000000 MHz

Ref 15 dBm

\*Att 45 dB

1 PK  
MAXH



A

PS

Center 2.4795 GHz

200 kHz/

Span 2 MHz

channel separation high channel

Date: 25.FEB.2008 20:50:05

## CFR47 §15.247(a) (1) – 20dB 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	2007-10-16	2008-10-16

\* **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. Turn on the EUT and connect it to measurement instrument. 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

<b>Temperature:</b>	27 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.9 kPa

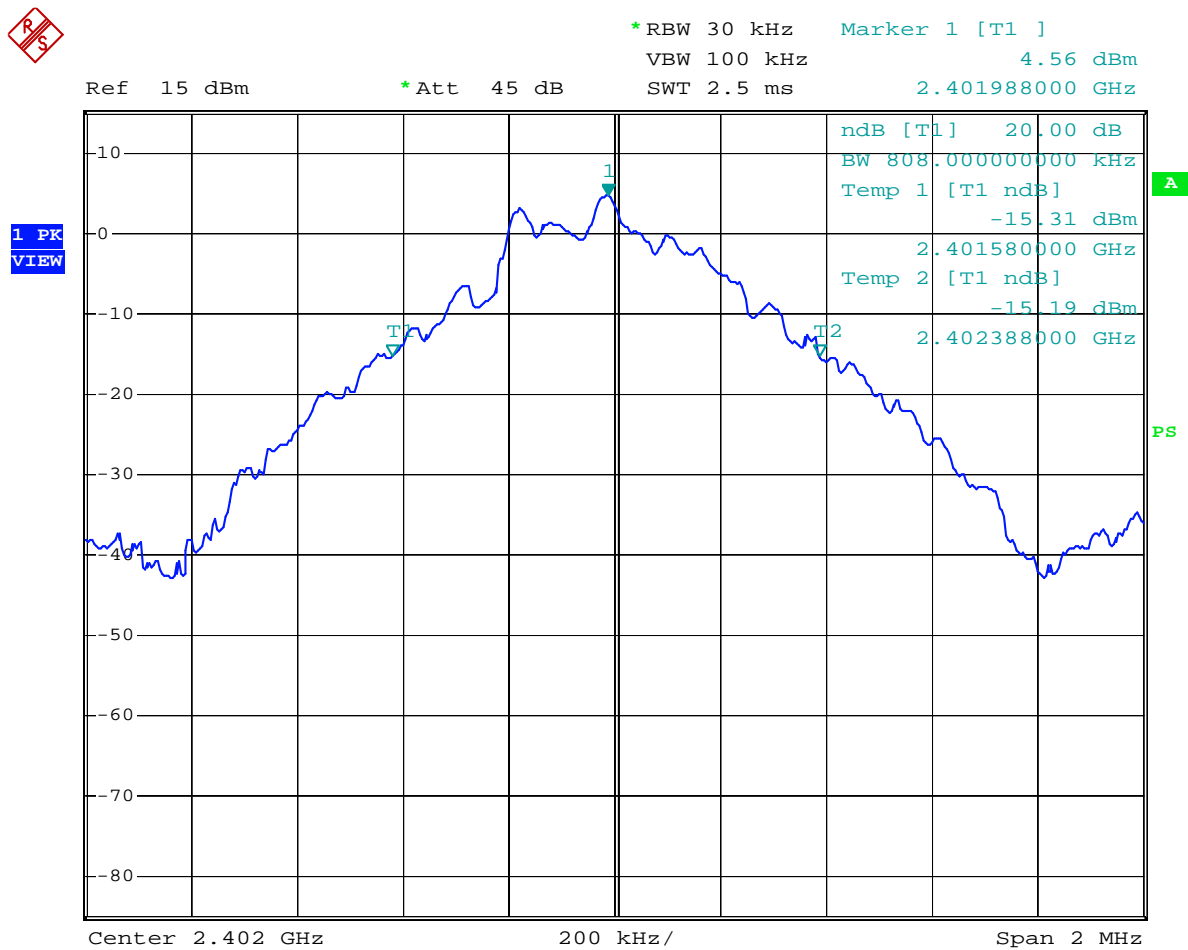
*The testing was performed by Vicent Kang on 2008-02-25.*

**Test Result:** Please refer to the following table and plots.

*Test Mode: Transmitting*

Channel	Channel Frequency (MHz)	20dB Bandwidth (kHz)
Low	2402	808
Middle	2441	856
High	2480	824

**Low Channel**



20dB bandwidth low channel

Date: 25.FEB.2008 20:34:39

### Middle Channel

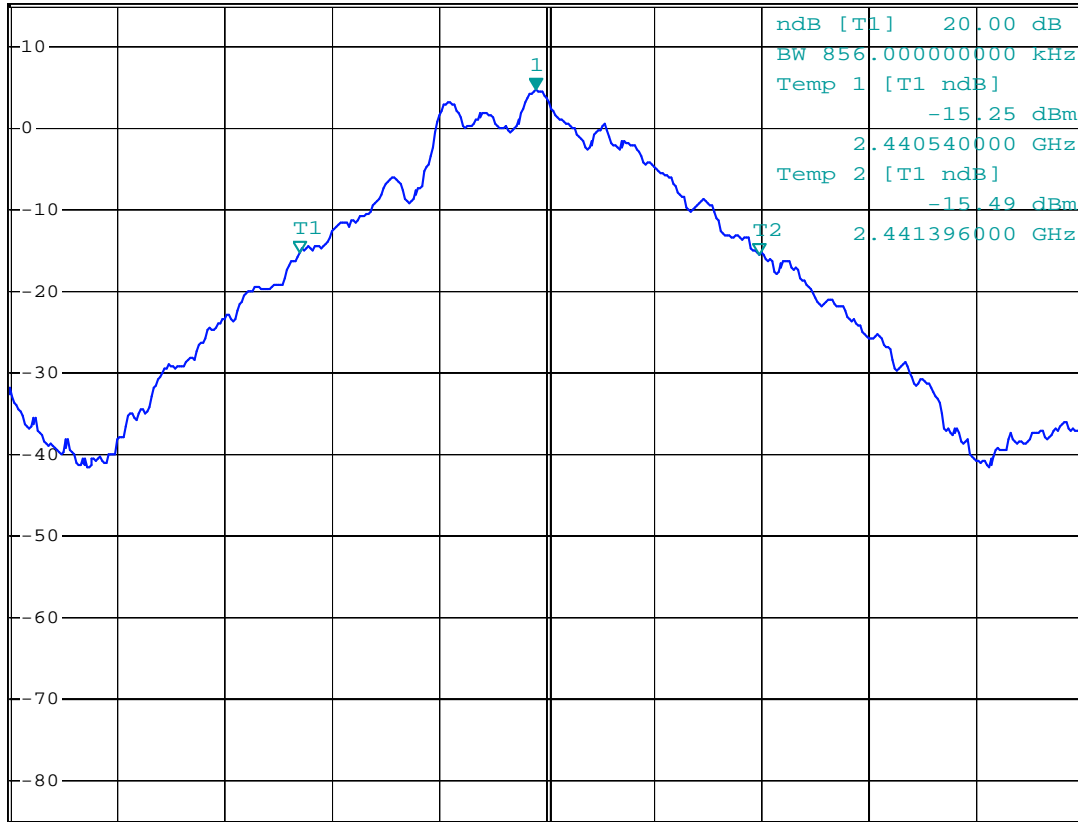


\*RBW 30 kHz    Marker 1 [T1 ]  
VBW 100 kHz                                    4.51 dBm  
SWT 2.5 ms                                    2.440980000 GHz

Ref 15 dBm

Att 45 dB

1 PK  
MAXH



A

PS

Center 2.441 GHz

200 kHz/

Span 2 MHz

20dB bandwidth middle channel

Date: 25.FEB.2008 20:32:22

### High Channel

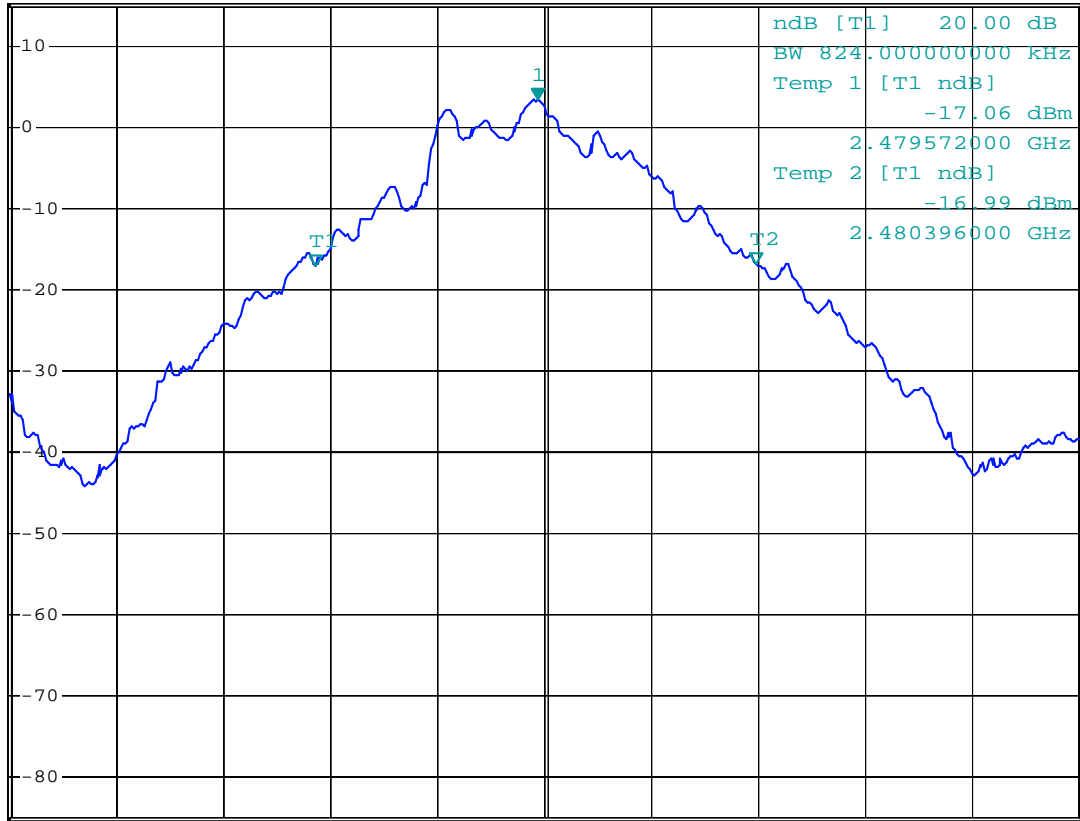


\*RBW 30 kHz    Marker 1 [T1 ]  
VBW 100 kHz    3.21 dBm  
SWT 2.5 ms    2.479988000 GHz

Ref 15 dBm

\*Att 45 dB

1 PK  
VIEW



Center 2.48 GHz

200 kHz/

Span 2 MHz

20dB bandwidth high channel

Date: 25.FEB.2008 20:35:38

## CFR47 §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	2007-10-16	2008-10-16

\* **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 transmitting mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	27 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.9 kPa

*The testing was performed by Vicent Kang on 2008-02-25.*

*Test Mode: Transmitting*

**Test Result:** Compliance.

Please refer to following plot.

Frequency Range (MHz)	Number of Hopping Channel	Limit
2402-2480	79	>15

### Number of Hopping Channels

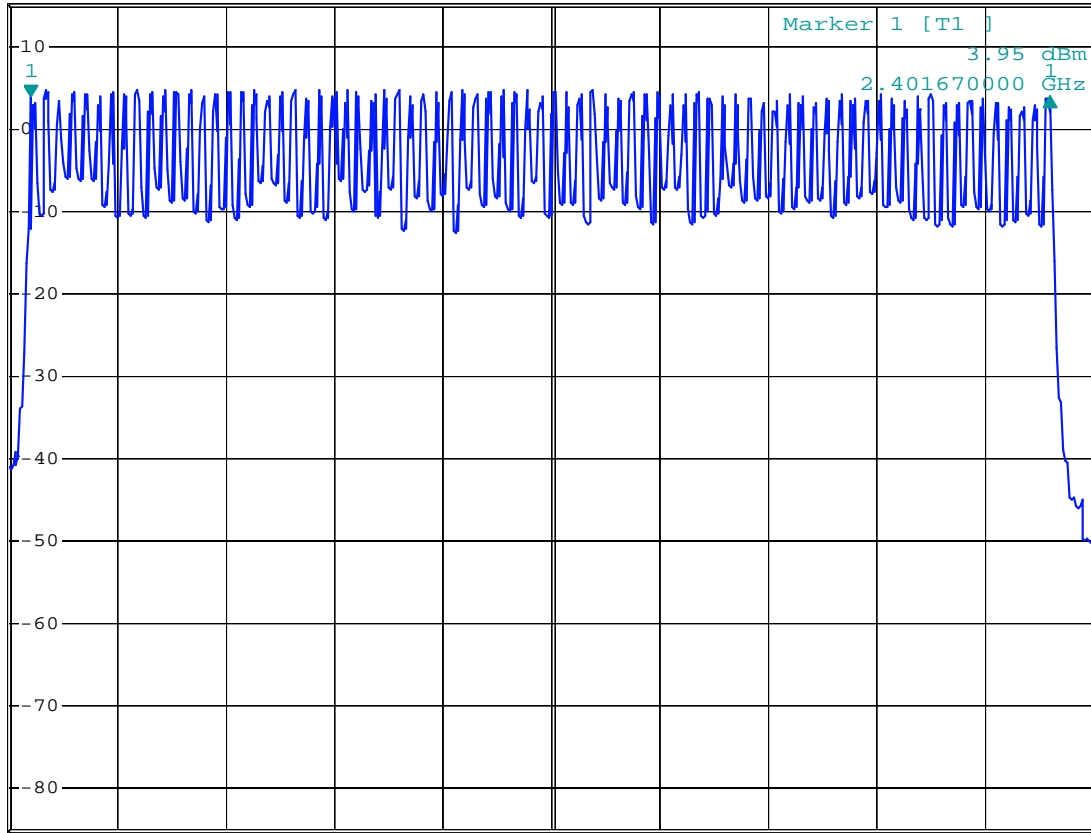


\*RBW 100 kHz Delta 1 [T1 ]  
VBW 300 kHz -0.21 dB  
SWT 10 ms 78.49000000 MHz

Ref 15 dBm

\*Att 45 dB

1 PK  
VIEW



Start 2.4 GHz 8.35 MHz/ Stop 2.4835 GHz

hopping channels

Date: 25.FEB.2008 20:38:40

**CFR47 §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	2007-10-16	2008-10-16

\* **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 \* 31.6s  
Hop rate=1600/s

**Test Data****Environmental Conditions**

<b>Temperature:</b>	27 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.9 kPa

*The testing was performed by Vicent Kang on 2008-02-25.*

*Test Mode: Transmitting*

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

Channel	Pulse width (msec)	Dwell time (sec)	Limit (sec)	Result
Low	0.540	0.1730	0.4	Pass
Middle	0.540	0.1730	0.4	Pass
High	0.540	0.1730	0.4	Pass

**NOTE:** Dwell time=Pulse width (ms) × (1600 ÷ 2 ÷ 79) × 31.6 Second



### Low Channel

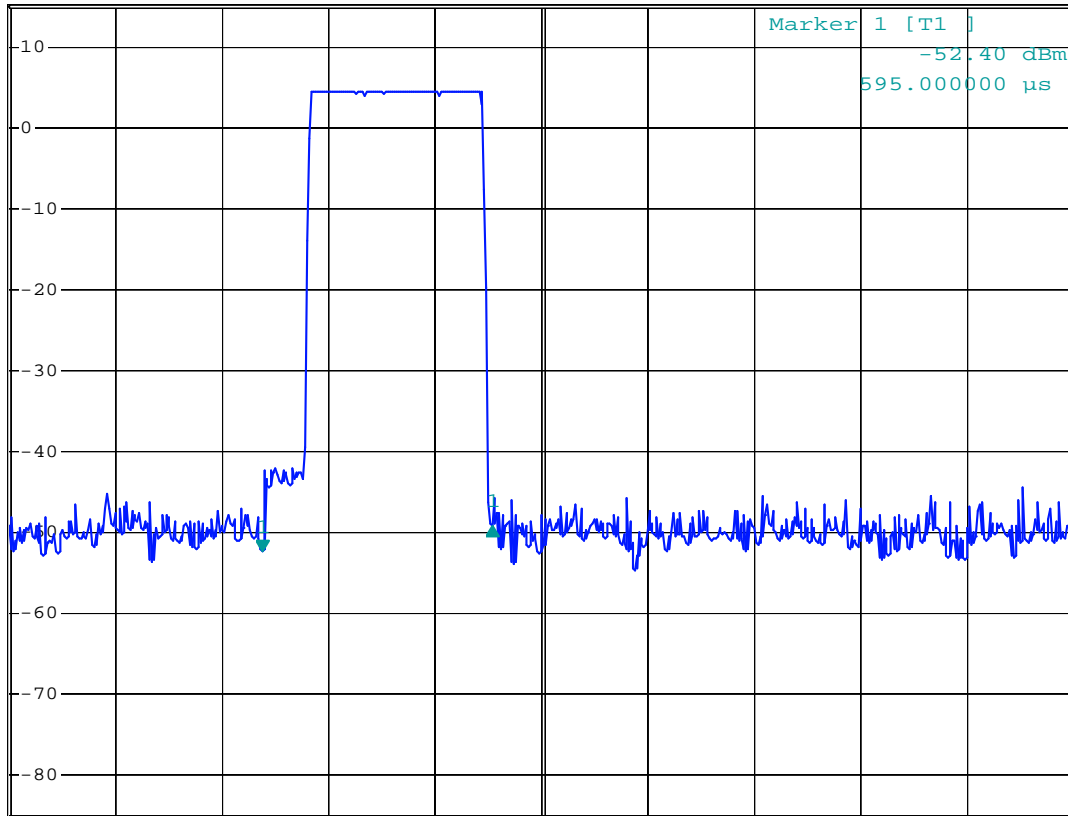


RBW 1 MHz      Delta 1 [T1 ]  
VBW 3 MHz      3.18 dB  
SWT 2.5 ms      540.000000  $\mu$ s

Ref 15 dBm

\*Att 45 dB

1 PK  
MAXH



Center 2.402 GHz

250  $\mu$ s/

dwlll time low channel

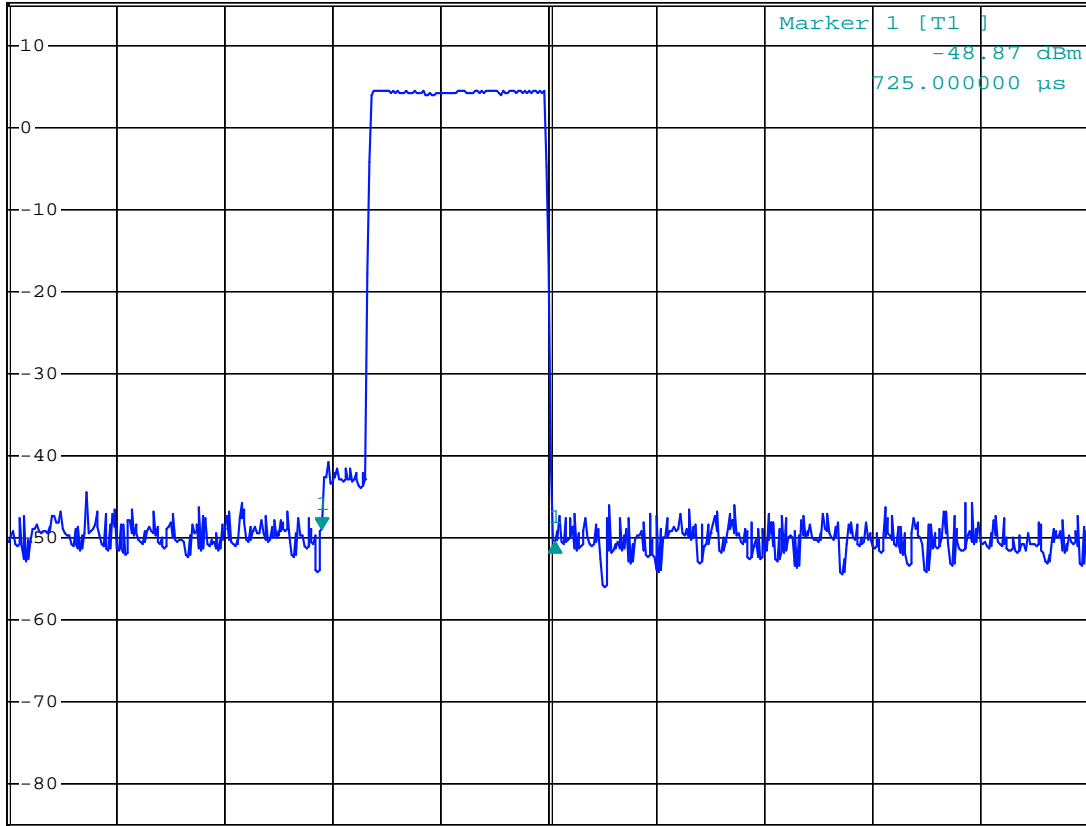
Date: 25.FEB.2008 20:40:49

### Middle Channel



Ref 15 dBm      \*Att 45 dB      RBW 1 MHz      Delta 1 [T1 ]  
VBW 3 MHz      -1.70 dB  
SWT 2.5 ms      540.000000 μs

1 PK  
MAXH



Center 2.441 GHz      250 μs/

dwll time middle channel

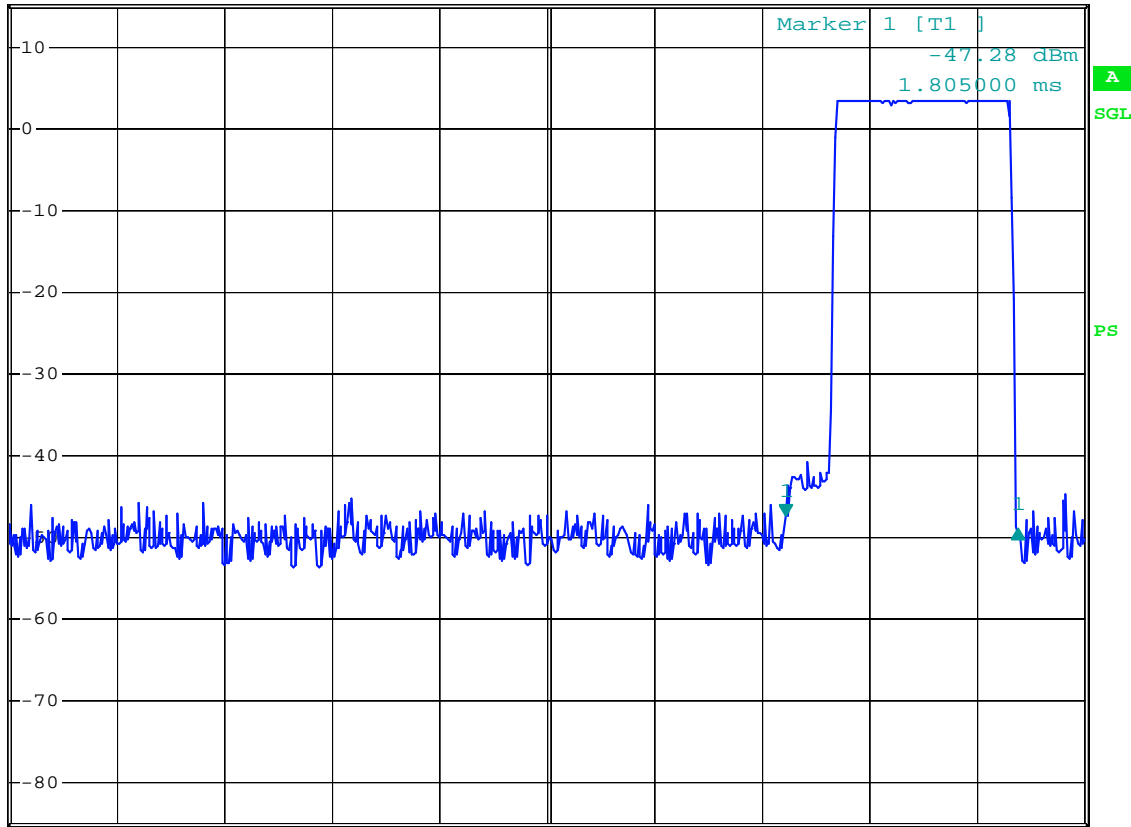
Date: 25.FEB.2008 20:42:15

### High Channel



RBW 1 MHz      Delta 1 [T1 ]  
VBW 3 MHz      -1.53 dB  
Ref 15 dBm      \*Att 45 dB      SWT 2.5 ms      540.000000  $\mu$ s

1 PK  
MAXH



Center 2.48 GHz      250  $\mu$ s/

dwll time high channel

Date: 25.FEB.2008 20:43:20

## CFR47 §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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2007-11-15	2008-11-15
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2007-10-16	2008-10-16
HP	Amplifier	8449B	3008A00277	2007-09-29	2008-09-29
Sunol Sciences	Horn Antenna	DRH-118	A052604	2007-09-25	2008-09-25
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2007-05-09	2008-05-09

\* **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, the adapter was connected to the 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 peak detection modes.

### 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:

$$\text{Corrected Amplitude.} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

**Test Data****Environmental Conditions**

<b>Temperature:</b>	27 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.9 kPa

The testing was performed by Vicent Kang on 2008-02-25.

Test Mode: Transmitting

**Test Result:** Compliance.

Freq. (MHz)	Receiver Reading (dB $\mu$ V)	Detector PK/AV	Table Direction Degree	Test Antenna		Cable Loss (dB)	Pre- Amp. (dB)	Cord. Amp. (dB $\mu$ V/m)	Tran. Factor (dB)	EIRP		FCC 15.247 Limit (mW)
				Height (m)	Factor (dB/m)					(dBm)	(mW)	
<b>Low Channel</b>												
2402	93.54	PK	90	1.0	30.6	3.61	35	92.75	95.27	-2.52	0.560	1000
<b>Middle Channel</b>												
2441	94.83	PK	128	1.5	30.6	3.61	35	94.04	95.27	-1.23	0.753	1000
<b>High Channel</b>												
2480	94.89	PK	65	1.4	30.6	3.61	35	94.1	95.27	-1.17	0.764	1000

**Note:** P (dBm) = E (dB $\mu$ V/m) – 95.27

## CFR47 §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	2007-10-16	2008-10-16

\* **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>	27 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.9 kPa

*The testing was performed by Vicent Kang on 2008-02-25.*

*Test Mode: Transmitting*

**Test Result:** Pass

Please refer to the following table and plots.

<b>Frequency (MHz)</b>	<b>Delta Peak to band emission (dBc)</b>	<b>Limit (dBc)</b>
<b>2399.528</b>	43.36	20
<b>2484.838</b>	52.74	20





