



NVLAP LAB CODE 200707-0

FCC PART 15.249



MEASUREMENT AND TEST REPORT

For

Chongqing Jinshan Science & Technology (Group) Co., Ltd.

No.18, Nishang Road, LiangLu Industrial City, Yubei District,
Chongqing, P.R. of China

FCC ID: XE8CJSMEC- II
Model: JS-MEC- II

Report Type: Original Report	Product Type: 2.4 GHz Transceiver (Smart Capsule)
Test Engineer: Cookies Bu	<i>Cookies Bu</i>
Report Number: RSC09052551 Rev. A	
Report Date: 2009-12-21	
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* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk “*”

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RSC09052551	Original Report	2009-07-09
A	RSC09052551 Rev. A	Updated Data	2009-12-21

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Chongqing Jinshan Science & Technology (Group) Co., Ltd.* 's product, model *JS-MEC-II* (FCC ID: *XE8CJSMEC-II*), or the "EUT" as referred to in this report is a *Smart Capsule* which measures approximately 1.32 cm L x 1.32 cm W x 2.81 cm H, rated input voltage: DC 3V Battery

Product information:

Parameters	Specifications	
	Transmitting	Receiving
Modulation	GFSK	GFSK
Frequency Range	2410~2420 MHz	
Transmission Power	≤ 0 dBm	

Transmission Channel (6CH)	Frequency (MHz)
1	2410
2	2412
3	2414
4	2416
5	2418
6	2420

* All measurement and test data in this report was gathered from production sample serial number: 0905012 (Assigned by BACL, Shenzhen). The EUT was received on 2009-05-25.

Objective

This Type approval report is prepared on behalf of *Chongqing Jinshan Science & Technology (Group) Co., Ltd.* in accordance with Part 2, Subpart J, and 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, 15.249 and 15.109 rules.

Related Submittal(s)/Grant(s)

No Related Submittals.

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 radiated and conducted emissions measurement was performed at 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 21, 2007. 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).



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

SYSTEM TEST CONFIGURATION

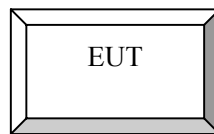
Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

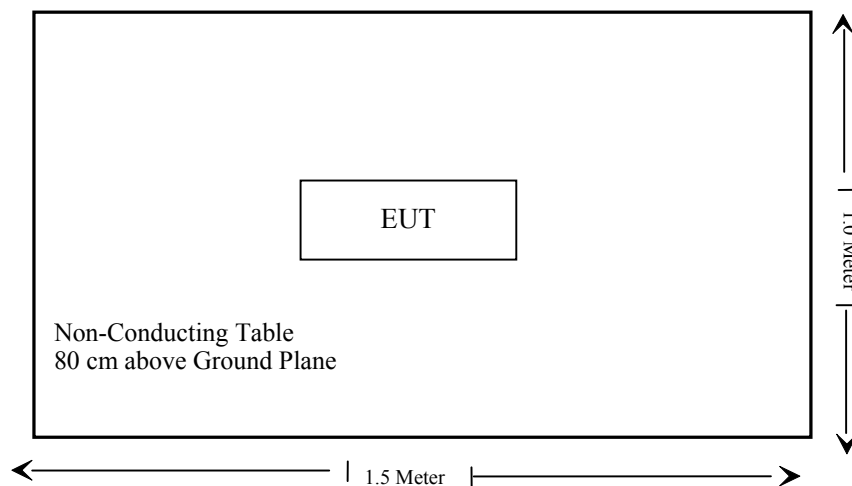
Equipment Modifications

No modifications were made to the unit tested.

Configuration of Test Setup



Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	Conduction Emissions	N/A *
§15.205(a), §15.209(a), 15.249(a), §15.249(c), §15.109	Radiated Emissions	Compliant**
§15.249(d)	Out of Band Emissions	Compliant

N/A: * The EUT was powered by battery only.

** Within measurement uncertainty

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

Antenna Connector Construction

The EUT has an integral antenna on PCB, which in accordance to section 15.203, is considered sufficient to comply with the provisions of this section.

Result: Compliant.

Please refer to the EUT internal photos.

FCC §15.205, §15.209, §15.109 & §15.249 - RADIATED EMISSIONS

Applicable Standard

As per §15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per §15.249 (c), Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

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 ± 4.0 dB.

Test Equipment Setup

The spectrum analyzer or receiver is set as:

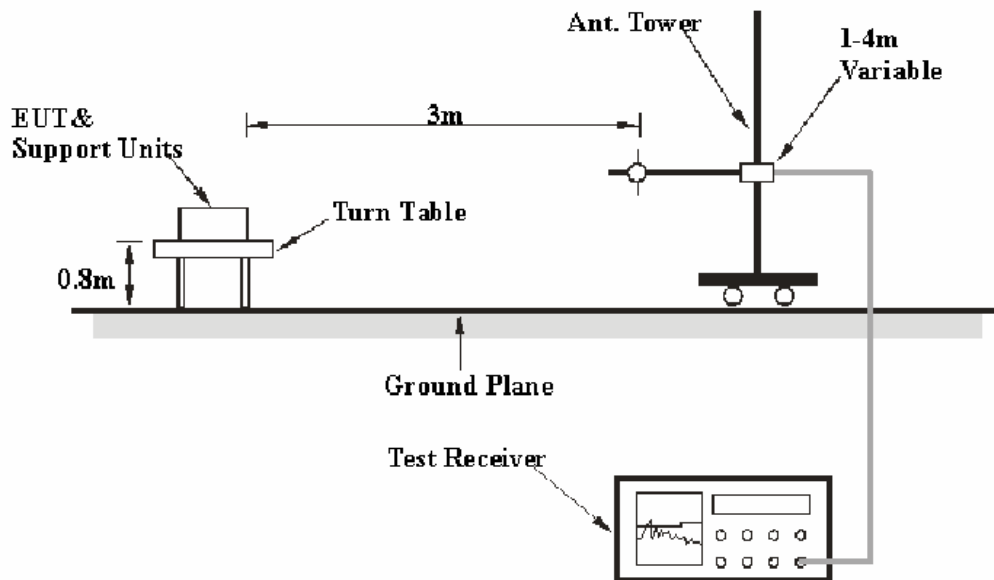
Below 1000 MHz:

Quasi-Peak: RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

- (1) Peak: RBW = 1MHz/VBW = 1MHz/Sweep = Auto
- (2) Average: RBW = 1MHz/VBW = 10Hz/Sweep = Auto

EUT Setup



The radiated emission and out of band emission tests were performed in the 3 meters chamber B, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209, FCC 15.249 and FCC 15.109 limits.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	8447E	1937A01046	2009-11-15	2010-11-15
Rohde & Schwarz	EMI Test Receiver	ESCI	100224	2009-10-16	2010-10-16
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2009-04-12	2010-04-12
HP	Amplifier	8449B	3008A00277	2009-09-29	2010-09-29
Sunol Sciences	Horn Antenna	DRH-118	A052604	2009-09-25	2010-09-25
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2009-08-28	2010-08-27

* **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 EUT, and all support equipment power cords 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.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

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 data in the following table, the EUT complied with the FCC Part 15.209& 15.109 & 15.249, with the worst margin reading of:

Below 1 GHz:

Transmitting Mode: **22.5 dB** at **938.323775 MHz** in the **Vertical** polarization.
Receiving Mode: **23.9 dB** at **907.035975 MHz** in the **Vertical** polarization.

Above 1GHz:

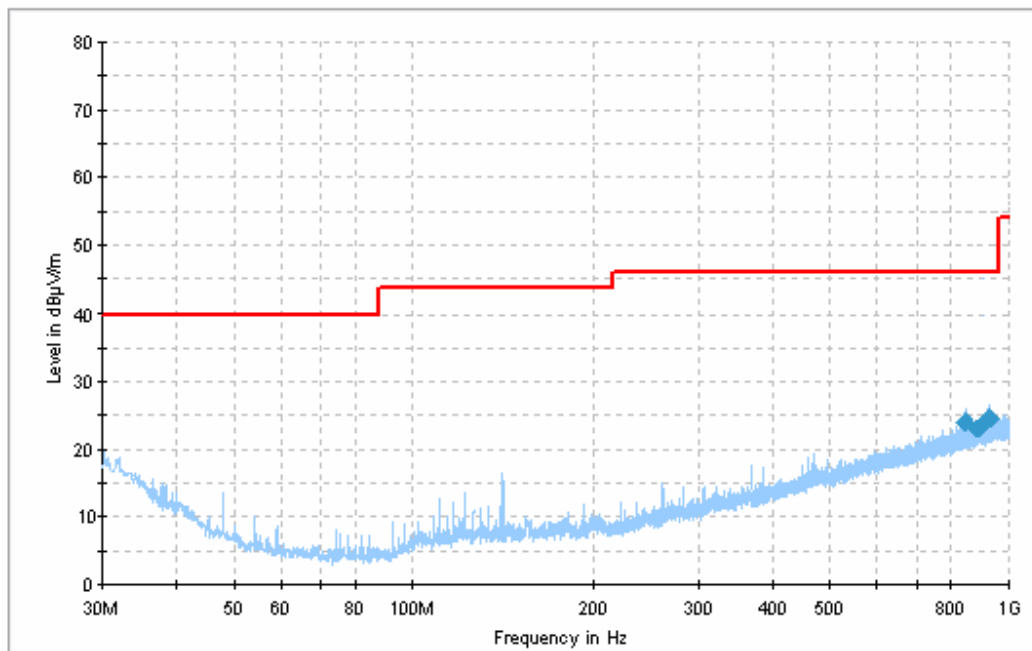
Transmitting Mode: **2.21 dB** at **4820.00 MHz** in the **Vertical** polarization, Low Channel (2410 MHz)
Transmitting Mode: **2.00 dB** at **4840.00 MHz** in the **Vertical** polarization, High channel (2420 MHz)
Receiving Mode: **10.24 dB** at **2939.24 MHz** in the **Horizontal** polarization

Test Data**Environmental Conditions**

Temperature:	22 °C
Relative Humidity:	50%
ATM Pressure:	100.1 kPa

* The testing was performed by Cookies Bu on 2009-12-18.

Test Mode: Transmitting

Below 1 GHz:

Frequency (MHz)	Corrected Amplitude (dBμV/m)	Test Antenna		Turntable Position (deg)	Correction Factor (dB)	Limit (dBμV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)				
938.323775	23.5	132.0	V	78.0	-3.5	46.0	22.5
881.329350	22.9	225.0	H	225.0	-3.9	46.0	23.1
907.202375	22.5	395.0	H	334.0	-3.6	46.0	23.5

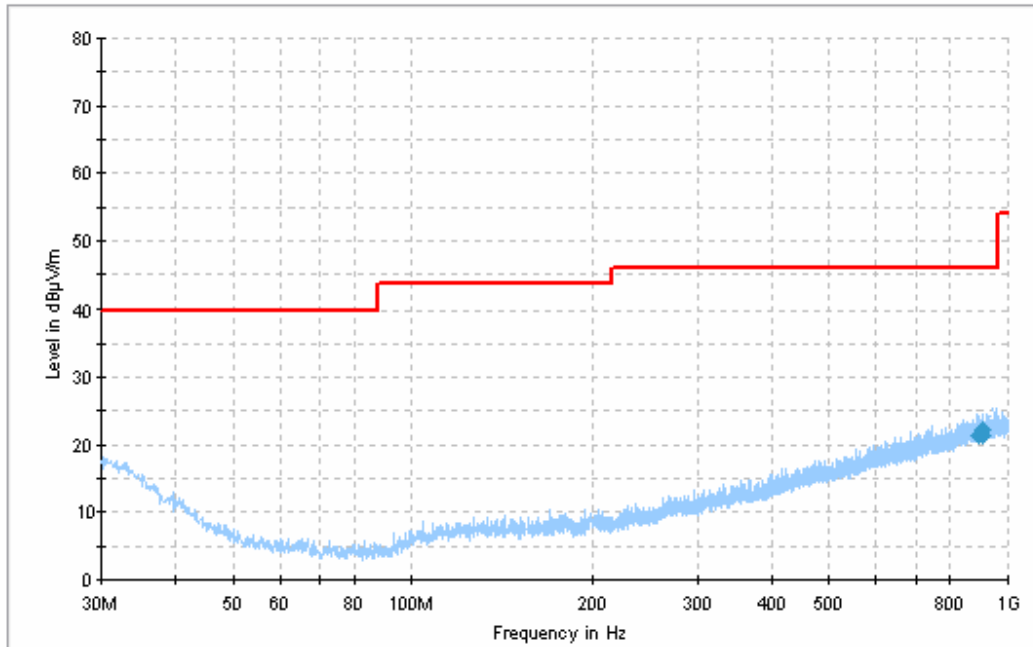
Above 1 GHz:

Frequency (MHz)	S.A. Reading (dBμV/m)	Detector (PK/AV)	Turntable Degree	Test Antenna			Cable Loss (dB)	Pre- Amp. Gain (dB)	Cord. Amp. (dBμV/m)	FCC 15.249/15.209		
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2410 MHz)												
4820.00	42.93	AV	68	1.8	V	35.00	7.56	33.70	51.79	54	2.21*	harmonic
4820.00	41.32	AV	232	2.0	H	36.30	7.56	33.70	51.48	54	2.52*	harmonic
7230.00	35.39	AV	326	1.5	H	39.20	9.12	33.60	50.11	54	3.89*	harmonic
7230.00	35.73	AV	87	1.5	V	38.00	9.12	33.60	49.25	54	4.75	harmonic
2410.00	84.88	AV	233	1.4	V	30.30	7.90	33.90	89.18	94	4.82	Fund.
7230.00	45.73	PK	326	1.5	H	39.20	9.12	33.60	60.45	74	13.55	harmonic
4820.00	51.39	PK	68	1.8	V	35.00	7.56	33.70	60.25	74	13.75	harmonic
4820.00	49.30	PK	232	2.0	H	36.30	7.56	33.70	59.46	74	14.54	harmonic
7230.00	44.41	PK	87	1.5	V	38.00	9.12	33.60	57.93	74	16.07	harmonic
2346.50	32.56	AV	125	1.0	H	30.70	7.90	33.90	37.26	54	16.74	spurious
2410.00	72.07	AV	158	1.0	H	30.90	7.90	33.90	76.97	94	17.03	Fund.
2388.05	31.90	AV	145	1.0	V	30.30	7.90	33.90	36.20	54	17.80	spurious
2410.00	89.15	PK	233	1.4	V	30.30	7.90	33.90	93.45	114	20.55	Fund.
2346.50	43.82	PK	125	1.0	H	30.70	7.90	33.90	48.52	74	25.48	spurious
2388.05	43.17	PK	145	1.0	V	30.30	7.90	33.90	47.47	74	26.53	spurious
2410.00	75.19	PK	158	1.0	H	30.90	7.90	33.90	80.09	114	33.91	Fund.
High Channel (2420 MHz)												
4840.00	43.14	AV	360	1.6	V	35.00	7.56	33.70	52.00	54	2.00*	harmonic
4840.00	41.53	AV	360	1.5	H	36.30	7.56	33.70	51.69	54	2.31*	harmonic
7260.00	36.15	AV	236	1.5	H	39.20	9.12	33.60	50.87	54	3.13*	harmonic
7260.00	35.10	AV	236	1.5	V	38.00	9.12	33.60	48.62	54	5.38	harmonic
2420.00	82.26	AV	273	1.4	V	30.30	7.90	33.90	86.56	94	7.44	Fund.
4840.00	50.37	PK	360	1.5	H	36.30	7.56	33.70	60.53	74	13.47	harmonic
4840.00	51.58	PK	360	1.6	V	35.00	7.56	33.70	60.44	74	13.56	harmonic
7260.00	45.19	PK	236	1.5	H	39.20	9.12	33.60	59.91	74	14.09	harmonic
2497.42	32.61	AV	125	1.5	H	31.50	8.09	33.90	38.30	54	15.70	spurious
7260.00	44.75	PK	236	1.5	V	38.00	9.12	33.60	58.27	74	15.73	harmonic
2484.45	31.71	AV	145	1.0	V	30.60	8.09	33.90	36.5	54	17.50	spurious
2420.00	70.02	AV	273	1.5	H	30.90	7.90	33.90	74.92	94	19.08	Fund.
2420.00	87.84	PK	273	1.4	V	30.30	7.90	33.90	92.14	114	21.86	Fund.
2497.42	43.85	PK	125	1.5	H	31.50	8.09	33.90	49.54	74	24.46	spurious
2484.45	43.06	PK	145	1.0	V	30.60	8.09	33.90	47.85	74	26.15	spurious
2420.00	72.88	PK	273	1.5	H	30.90	7.90	33.90	77.78	114	36.22	Fund.

Note: *Within measurement uncertainty

Test Mode: Receiving (Worst Case)

Below 1 GHz:



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Test Antenna		Turntable Position (deg)	Correction Factor (dB)	Limit (dBμV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)				
907.035975	22.1	180.0	V	87.0	-3.6	46.0	23.9
894.189325	21.3	104.0	H	123.0	-3.9	46.0	24.7
906.133600	21.3	113.0	V	179.0	-3.6	46.0	24.7

Above 1 GHz

Frequency (MHz)	S.A. Reading (dBμV/m)	Detector (PK/AV)	Turntable Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	FCC 15.109		
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	Comment
2939.24	36.89	AV	90	1.5	H	32.6	8.07	33.8	43.76	54	10.24	spurious
2723.45	38.20	AV	300	1.5	V	30.6	7.90	33.9	42.80	54	11.20	spurious
1849.69	39.45	AV	240	1.7	V	28.8	5.99	34.2	40.04	54	13.96	spurious
1833.65	38.50	AV	150	1.0	H	28.3	5.99	34.2	38.59	54	15.41	spurious
2939.87	47.10	PK	90	1.5	H	32.6	8.07	33.8	53.97	74	20.01	spurious
2723.45	47.15	PK	300	1.5	V	30.6	7.90	33.9	51.75	74	22.25	spurious
1849.69	49.50	PK	240	1.7	V	28.8	5.99	34.2	50.09	74	23.91	spurious
1833.67	48.41	PK	150	1.0	H	28.3	5.99	34.2	48.50	74	25.50	spurious

FCC §15.249(d) – OUT OF BAND EMISSIONS

Applicable Standard

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

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 ± 4.0 dB.

Test Equipment Setup

The spectrum analyzer or receiver is set as:

Above 1000 MHz:

- (1) Peak: RBW = 1MHz/VBW = 1MHz/Sweep = Auto
- (2) Average: RBW = 1MHz/VBW = 10Hz/Sweep = Auto

Test Procedure

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission at the band edge. The receiving antenna should be changed the polarization both of horizontal and vertical.

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100224	2009-11-07	2010-11-06
HP	Amplifier	8447E	1937A01046	2009-08-02	2010-08-02
A.H. System	Horn Antenna	SAS-200/571	135	2009-05-17	2010-05-17

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

Test Data**Environmental Conditions**

Temperature:	22 °C
Relative Humidity:	50%
ATM Pressure:	100.1 kPa

*The testing was performed by Cookies Bu on 2009-12-17.

Test Result: Compliant

Please refer to the following table.

Test Mode: Transmitting

Frequency (MHz)	S.A. Reading (dBuV/m)	Detector (PK/AV)	Direction Degree	Test Antenna			Cable Loss (dB)	Pre- Amp. Gain (dB)	Cord. Amp. (dBuV/m)	FCC Part 15.249/209		
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBuV/m)	Margin (dB)	Remarks
Out of left side band (2390~2400 MHz)												
2395.515	36.19	PK	125	1.0	H	30.70	7.90	33.90	40.89	74	33.11	/
2397.153	38.56	PK	145	1.0	V	30.30	7.90	33.90	42.86	74	31.14	/
Out of right side band (2483.5~2500 MHz)												
2496.508	36.10	PK	130	1.5	H	31.50	8.09	33.90	41.79	74	32.21	/
2486.481	33.82	PK	140	1.0	V	30.60	8.09	33.90	38.61	74	35.39	/

Note: The table is the worst case result.

The peak radiated emission level is below the Average limit 54 dBμV/m at 3 meter.

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