



NVLAP LAB CODE 200707-0



FCC PART 15.249

MEASUREMENT AND TEST REPORT

For

Lantian Electronics (Shenzhen) Co., Limited

Building A2, Area 4, Fuqiao Industrial Park, Qiaotou,
Shenzhen, Guangdong, China

FCC ID: VXGR7802
Model: R-7802

Report Type: Original Report	Product Type: Receiver of Wireless Keyboard
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Report Number: <u>RSZ10031803</u>	
Report Date: <u>2010-04-22</u>	
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* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "*" (Rev.2)

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *LANTIAN ELECTRONICS (SHENZHEN) CO., LIMITED* 's product, model *R-7802 (FCC ID: VXGR7802)*, or the "EUT" as referred to in this report is a *Receiver* which measures approximately 1.9 cm L x 0.7 cm W x 1.4 cm H, rated input voltage: DC 5V from laptop.

Product information:

Parameters	Specifications
Modulation	GFSK
Frequency range	2405-2476 MHz
Transmission power	≤ 0 dBm
Transmission channel	64

* All measurement and test data in this report was gathered from production sample serial number: 1003055 (Assigned by BACL, Shenzhen). The EUT was received on 2010-03-18.

Objective

This Type approval report is prepared on behalf of *LANTIAN ELECTRONICS (SHENZHEN) CO., LIMITED* 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 and 15.249 rules.

Related Submittal(s)/Grant(s)

None

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.

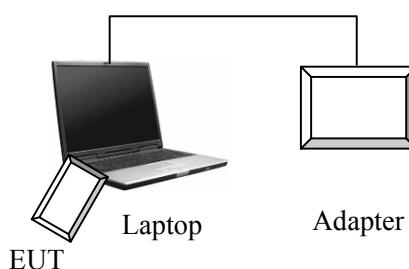
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
IBM	Laptop	T400	GTVQC-2KWCD-VXM8V-KPRM9-KKVDB	DOC

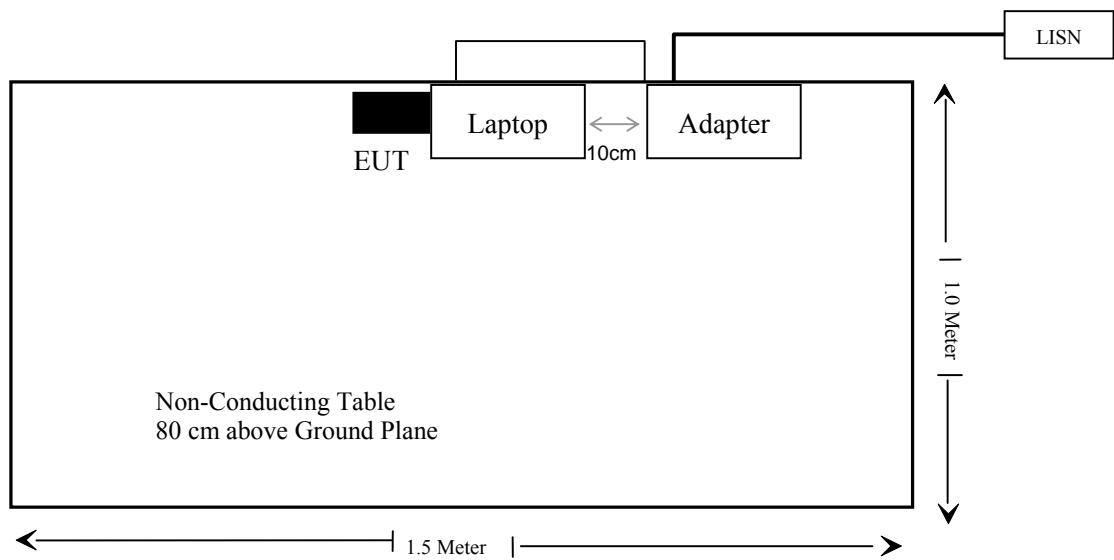
External I/O Cable

Cable Description	Length (m)	From Port	To
Unshielded Detachable AC Cable	1.5	AC Mains/AC Port	Adapter
Unshielded Undetachable AC Cable	1.0	AC Mains/DC Port	Laptop

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	Compliant
§15.205(a), §15.209(a), 15.249(a), §15.249(c)	Radiated Emissions	Compliant
§15.249(d)	Out of Band Emissions	Compliant

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

For intentional device, 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.

Antenna Connector Construction

The EUT has a printed 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 §15.207(a) - CONDUCTED EMISSIONS

Applicable Standard

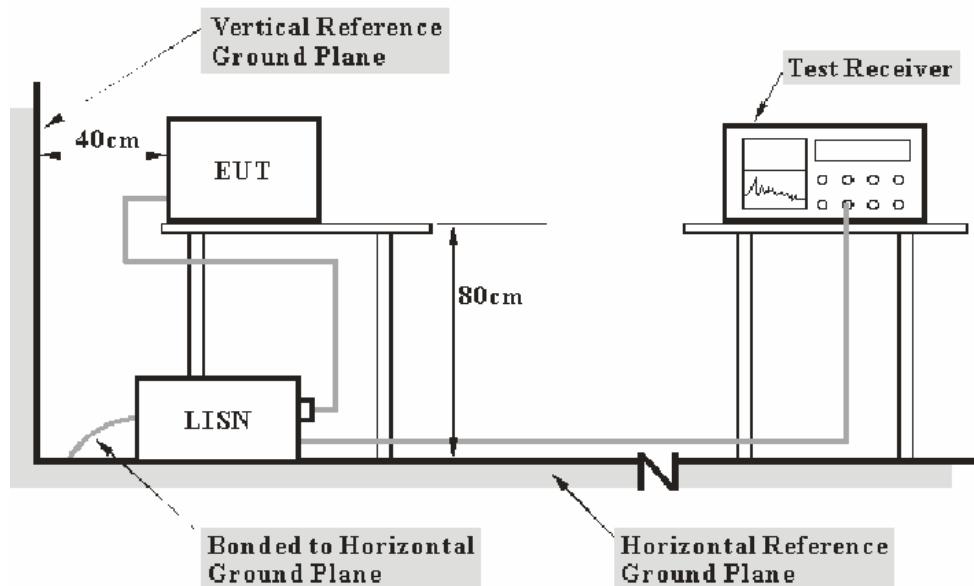
FCC §15.207

Measurement Uncertainty

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

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Laboratory Corp. (Shenzhen) is ± 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 adapter of laptop was connected to a 120V/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:

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	830245/006	2009-04-28	2010-04-27
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2010-03-09	2011-03-08

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

Test Procedure

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:

7.03 dB at 1.450 MHz in the **Line** conductor mode
7.86 dB at 1.450 MHz in the **Neutral** conductor mode

Test Data

Environmental Conditions

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

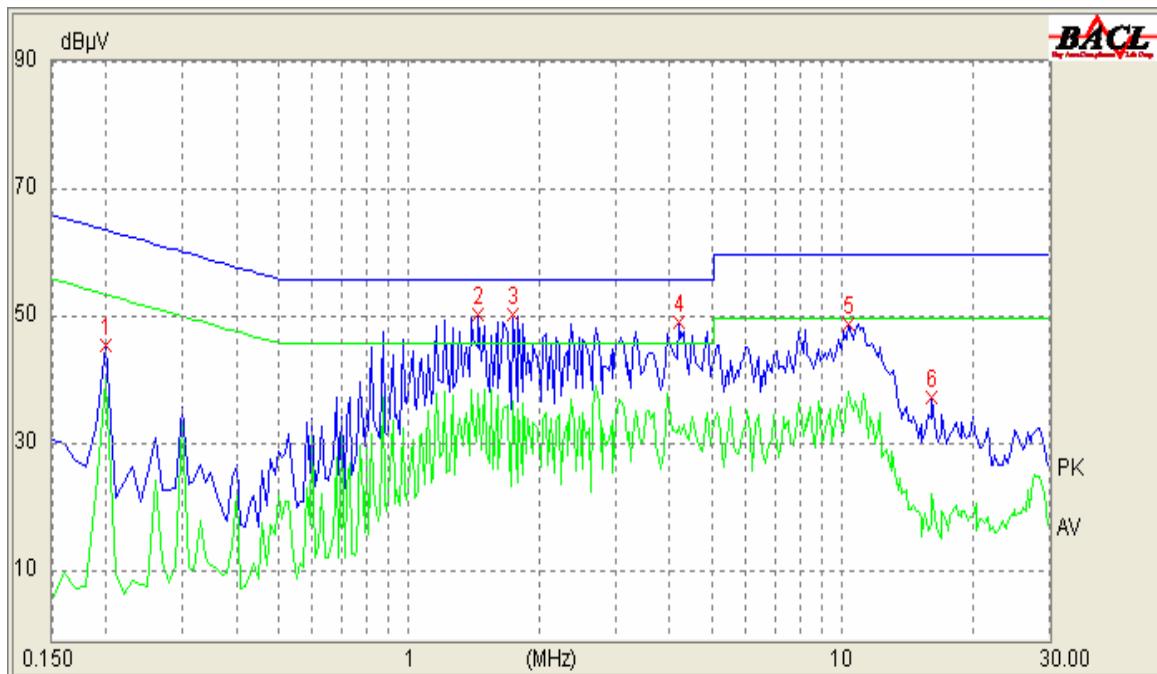
* The testing was performed by Alvin Huang on 2010-04-03.

Test Mode: Transmitting

120V/60 Hz, Line:



Conducted Emissions			FCC Part 15.207		
Frequency (MHz)	Correction Factor (dB)	Cord. Result (dBµV)	Limit (dBµV)	Margin (dB)	Detector (PK/AV/QP)
1.450	10.10	38.97	46.00	7.03	AV
1.790	10.10	47.56	56.00	8.44	QP
1.790	10.10	37.32	46.00	8.68	AV
1.450	10.10	46.36	56.00	9.64	QP
4.210	10.10	44.65	56.00	11.35	QP
4.210	10.10	34.33	46.00	11.67	AV
10.940	10.30	36.46	50.00	13.54	AV
10.940	10.30	44.85	60.00	15.15	QP
0.200	10.10	36.67	53.69	17.02	AV
27.830	10.30	30.38	50.00	19.62	AV
0.200	10.10	39.77	63.69	23.92	QP
27.830	10.30	32.57	60.00	27.43	QP

120 V/60 Hz, Neutral:

Conducted Emissions			FCC Part 15.207		
Frequency (MHz)	Correction Factor (dB)	Cord. Result (dBµV)	Limit (dBµV)	Margin (dB)	Detector (PK/AV/QP)
1.450	10.10	38.14	46.00	7.86	AV
1.740	10.10	36.99	46.00	9.01	AV
1.740	10.10	46.02	56.00	9.98	QP
1.450	10.10	45.29	56.00	10.71	QP
10.360	10.30	38.45	50.00	11.55	AV
4.210	10.10	33.29	46.00	12.71	AV
0.200	10.10	40.32	53.69	13.37	AV
4.210	10.10	42.49	56.00	13.51	QP
10.360	10.30	43.99	60.00	16.01	QP
0.200	10.10	43.48	63.69	20.21	QP
16.120	10.30	22.52	50.00	27.48	AV
16.120	10.30	30.92	60.00	29.08	QP

FCC §15.205(a) §15.209(a) §15.249(a) & §15.249(d) - RADIATED EMISSIONS**Applicable Standard**

As per FCC §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:

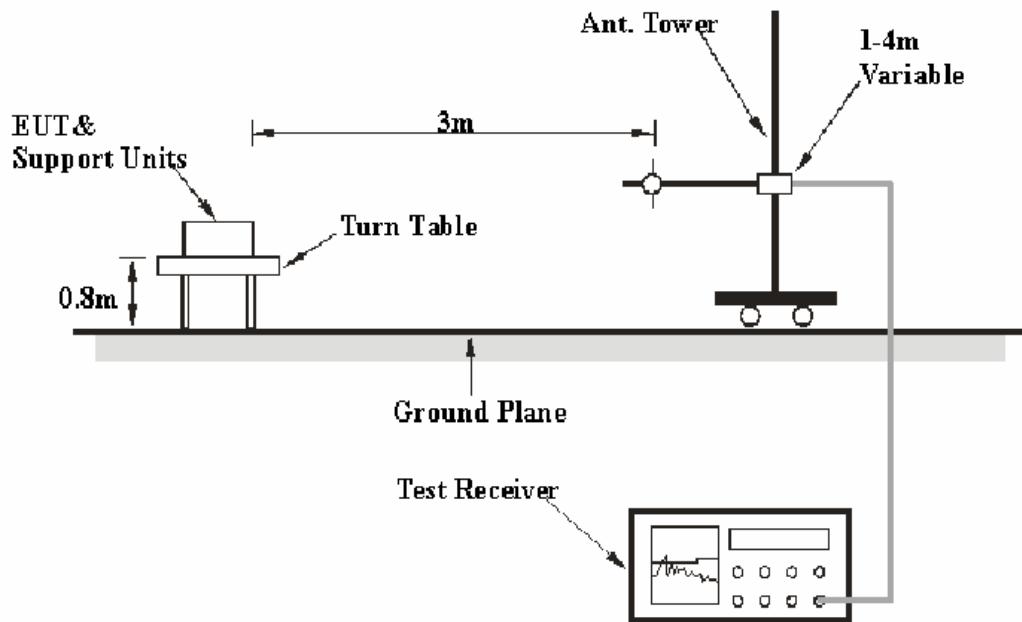
Below 1000 MHz:

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 and FCC §15.249 limits.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	8447E	1937A01046	2009-08-02	2010-08-02
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-24	2010-11-24
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2009-05-05	2010-05-04
HP	Amplifier	8449B	3008A00277	2009-09-12	2010-09-11
Sunol Sciences	Horn Antenna	DRH-118	A052604	2009-05-05	2010-05-04
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2009-07-08	2010-07-07

* **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.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, 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, 15.205& 15.249, with the worst margin reading of:

Below 1 GHz:

15.0 dB at 30.028750 MHz in the **Vertical** polarization.

Above 1 GHz:

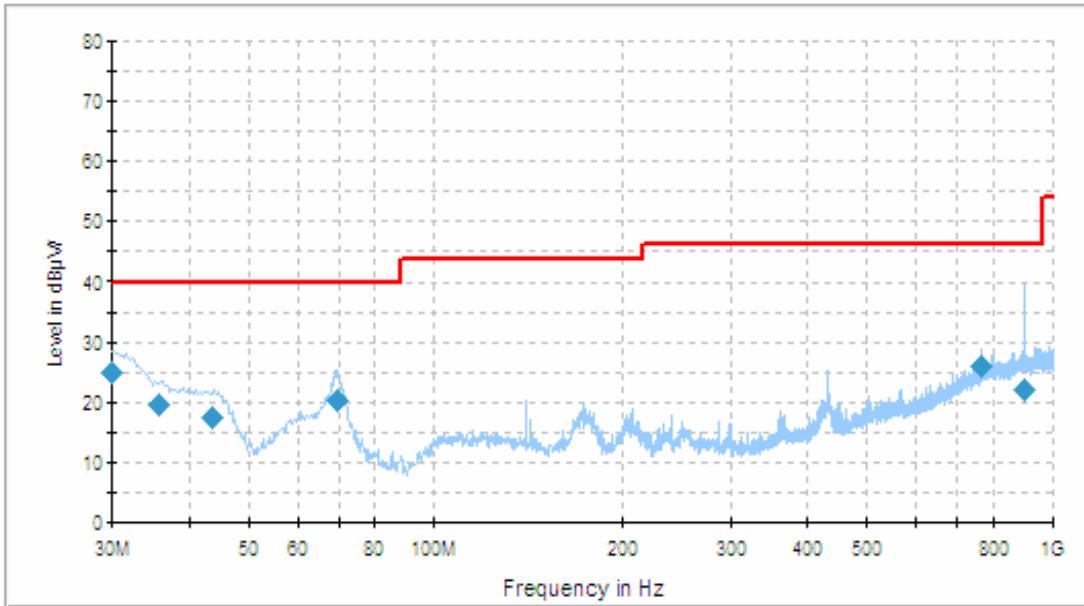
4.68 dB at 4810 MHz in the **Vertical** polarization, low channel
5.61dB at 4878 MHz in the **Vertical** polarization, middle channel
5.36dB at 4952 MHz in the **Vertical** polarization, high channel

Test Data

Environmental Conditions

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

The testing was performed by Alvin Huang on 2010-04-22.

Below 1 GHz:

Frequency (MHz)	Corrected Amplitude (dB μ V/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (degree)	Correction Factor (dB)	Limit (dB μ V/m)	Margin (dB)
30.028750	25.0	100.0	V	0.0	-5.9	40.0	15.0
69.800250	20.5	101.0	V	196.0	-19.4	40.0	19.5
766.298750	26.2	122.0	H	149.0	-2.4	46.0	19.8
35.776000	19.6	100.0	V	97.0	-10.4	40.0	20.4
43.765000	17.6	121.0	V	96.0	-15.6	40.0	22.4
897.864500	22.2	138.0	H	8.0	-0.3	46.0	23.8

Above 1 GHz:

Frequency (MHz)	S.A. Reading (dB μ V/m)	Detector PK/AV	Direction Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB μ V/m)	FCC 15.249/15.209		
				Height (m)	Polar (H/V)	Factor (dB)				Limit (dB μ V /m)	Margin (dB)	Comment
Low Channel (2405 MHz)												
4810	57.53	PK	190	1.85	V	35.0	4.30	27.51	69.32	74	4.68	harmonic
4810	52.24	PK	144	1.92	H	36.3	4.30	27.51	65.33	74	8.67	harmonic
4810	30.73	AV	190	1.85	V	35.0	4.30	27.51	42.52	54	11.48	harmonic
4810	27.45	AV	144	1.92	H	36.3	4.30	27.51	40.54	54	13.46	harmonic
2405	64.46	AV	205	1.25	V	30.3	3.03	27.54	70.25	94	23.75	Fund.
2405	62.17	AV	185	1.30	H	30.9	3.03	27.54	68.56	94	25.44	Fund.
2405	80.45	PK	205	1.25	V	30.3	3.03	27.54	86.24	114	27.76	Fund.
2405	78.96	PK	185	1.30	H	30.9	3.03	27.54	85.35	114	28.65	Fund.
Middle Channel (2439 MHz)												
4878	56.60	PK	324	1.67	V	35.0	4.30	27.51	68.39	74	5.61	harmonic
4878	53.25	PK	165	1.96	H	36.3	4.30	27.51	66.34	74	7.66	harmonic
4878	31.56	AV	324	1.67	V	35.0	4.30	27.51	43.35	54	10.65	harmonic
4878	29.69	AV	165	1.96	H	36.3	4.30	27.51	42.78	54	11.22	harmonic
2439	63.78	AV	176	1.60	V	30.3	3.03	27.54	69.57	94	24.43	Fund.
2439	62.64	AV	179	1.34	H	30.9	3.03	27.54	69.03	94	24.97	Fund.
2439	79.35	PK	176	1.60	V	30.3	3.03	27.54	85.14	114	28.86	Fund.
2439	77.75	PK	179	1.34	H	30.9	3.03	27.54	84.14	114	29.86	Fund.
High Channel (2476 MHz)												
4952	56.85	PK	189	1.35	V	35.0	4.30	27.51	68.64	74	5.36	harmonic
4952	54.45	PK	135	1.76	H	36.3	4.30	27.51	67.54	74	6.46	harmonic
4952	30.86	AV	135	1.76	H	36.3	4.30	27.51	43.95	54	10.05	harmonic
4952	30.89	AV	189	1.35	V	35.0	4.30	27.51	42.68	54	11.32	harmonic
2476	62.68	AV	176	1.65	V	30.3	3.03	27.54	68.47	94	25.53	Fund.
2476	60.96	AV	256	1.98	H	30.9	3.03	27.54	67.35	94	26.65	Fund.
2476	79.13	PK	176	1.65	V	30.3	3.03	27.54	84.92	114	29.08	Fund.
2476	77.89	PK	256	1.98	H	30.9	3.03	27.54	84.28	114	29.72	Fund.

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 meter, 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.

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-24	2010-11-24
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:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.2 kPa

*The testing was performed by Alvin Huang on 2010-04-22

Test Result: Compliant

Please refer to the following table.

Test Mode: Transmitting

Frequency (MHz)	S.A. Reading (dB μ V/m)	Detector PK/AV	Table Direction Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB μ V/m)	FCC 15.249/15.209	
				Height (m)	Polar (H/V)	Factor (dB)				Limit (dB μ V/m)	Margin (dB)
Out of left side band											
2399.8	57.55	PK	134	1.75	V	30.3	3.03	27.54	63.34	74	10.66
2399.8	35.54	AV	134	1.75	V	30.3	3.03	27.54	41.33	54	12.67
2399.95	54.11	PK	185	1.34	H	30.9	3.03	27.54	60.50	74	13.50
2399.95	32.18	AV	185	1.34	H	30.9	3.03	27.54	38.57	54	15.43
Out of right side band											
2493.22	25.46	AV	196	1.55	H	31.0	3.05	27.54	31.97	54	22.03
2495.65	24.46	AV	130	1.12	V	30.5	3.05	27.54	30.47	54	23.53
2495.65	39.45	PK	130	1.12	V	30.5	3.05	27.54	45.46	74	28.54
2493.22	37.88	PK	196	1.55	H	31.0	3.05	27.54	44.39	74	29.61

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