

FCC PART 15.249
EMI MEASUREMENT AND TEST REPORT

For

ESP Systems, LLC

401 N.Tryon St-10th Floor, Charlotte, NC

FCC ID: UGDKBPANELG2

July 26, 2006

This Report Concerns: ☒ Original Report	Equipment Type: ESP KB Panel
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Report No.: RSZ06071002	
Test Date: July 11, 2006	
Reviewed By: Boni Baniqued <i>Boni Baniqued</i>	
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It may not be duplicated without prior written consent of Bay Area Compliance Lab Corp.
(ShenZhen). This report must not be used by the client to claim product certification,
approval, or endorsement by NVLAP, NIST or any agency of the US Government.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *ESP Systems, LLC*'s product, model number: *ESP KB Panel Generation 2* or the "EUT" as referred to in this report is an *ESP KB Panel*. The EUT is measured approximately 23.0 cm L x 12.0 cm W x 7.0 cm H, rated input voltage: AC 120VC/60Hz.

Adapter: Manufacturer: Mountronix
Model: GFP051u-0610
Input: AC 120-240V, 50/60Hz 0.2A
Output: DC 6V 1A

** The test data gathered are from production sample, serial number: 0607010 provided by the manufacturer, we received EUT on 2006-7-10.*

Objective

This Type approval report is prepared on behalf of *ESP Systems, LLC* 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)

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 Lab 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 Lab Corp. (ShenZhen) to collect radiated and conducted emission measurement data is located in the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone, ShenZhen, Guangdong 518038, P.R.China.

Test site at Bay Area Compliance Lab 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 Lab 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/ts/htdocs/210/214/scopes/2007070.htm>

External I/O Cable

Cable Description	Length (M)	From/Port	To
DC Adapter Cable Detachable	1.8	EUT	Adapter

SYSTEM TEST CONFIGURATION

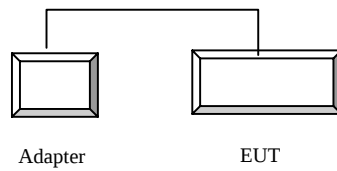
Justification

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

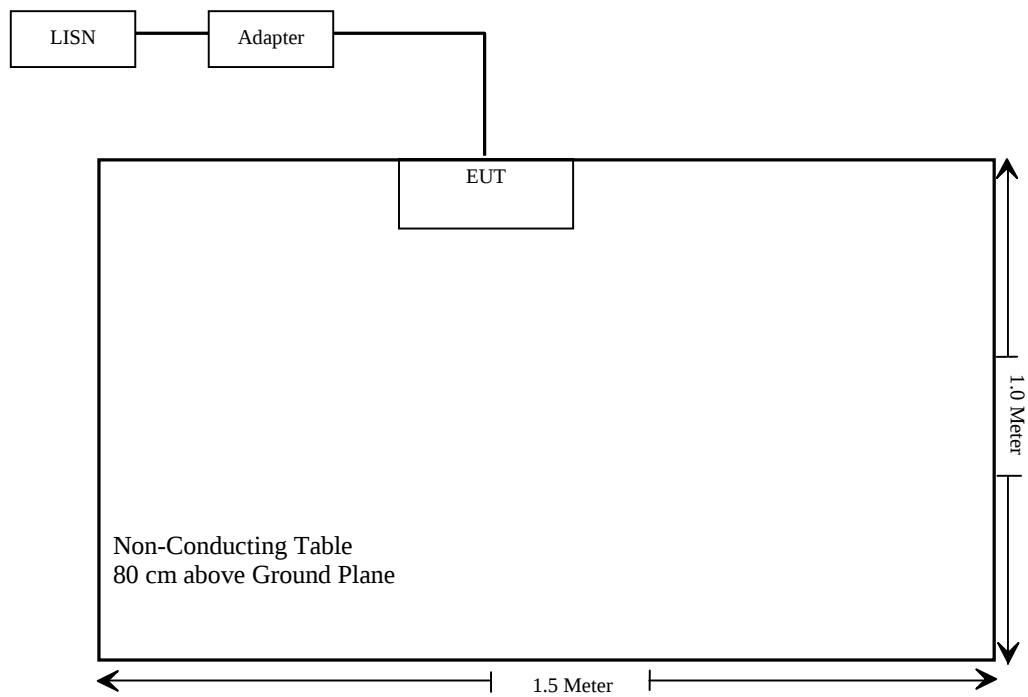
Equipment Modifications

Bay Area Compliance Lab Corp. (ShenZhen) has not done any modification on the EUT.

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 Emission	Compliant
§15.205(a), §15.209(a), §15.249(a)	Radiated Emission	Compliant*
§15.249(d)	Out of band emission	Compliant

* Within measurement uncertainty

§15.203 - ANTENNA REQUIREMENT

Standard Applicable

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 antenna was permanently attached antenna, which in accordance to section 15.203, is considered sufficient to comply with the provisions of this section.

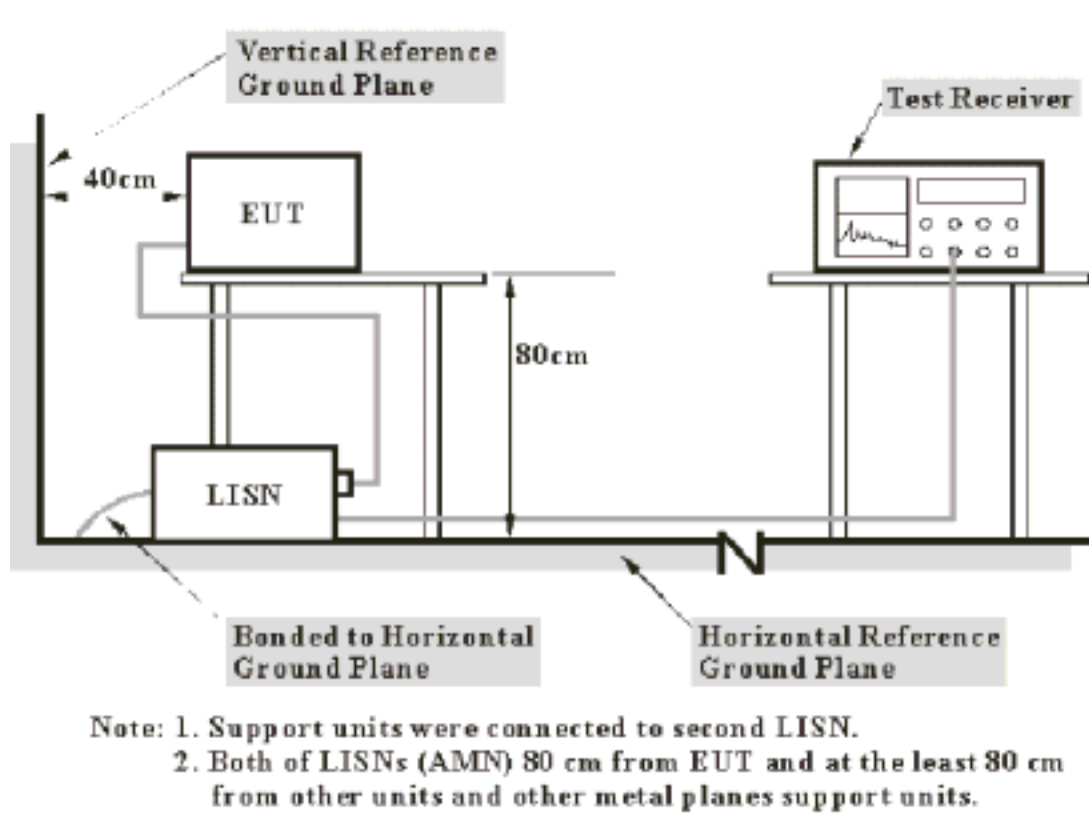
§15.207 - CONDUCTED EMISSION

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 Lab Corp. (ShenZhen) is ± 2.4 dB.

EUT Setup



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

EMI Test Receiver Setup

The 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>IFBW</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	ESCS30	DE25330 or 830245/006	2006-1-26	2007-1-26
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2006-3-1	2007-3-1

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

* **Statement of Traceability:** Bay Area Compliance Lab 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:

-7.58 dB at 0.380 MHz in the Live conductor mode.

Test Data**Environmental Conditions**

Temperature:	25 ° C
Relative Humidity:	55%
ATM Pressure:	1002mbar

The testing was performed by Louise Lu on 2006-7-11.

Test mode: Transmitting

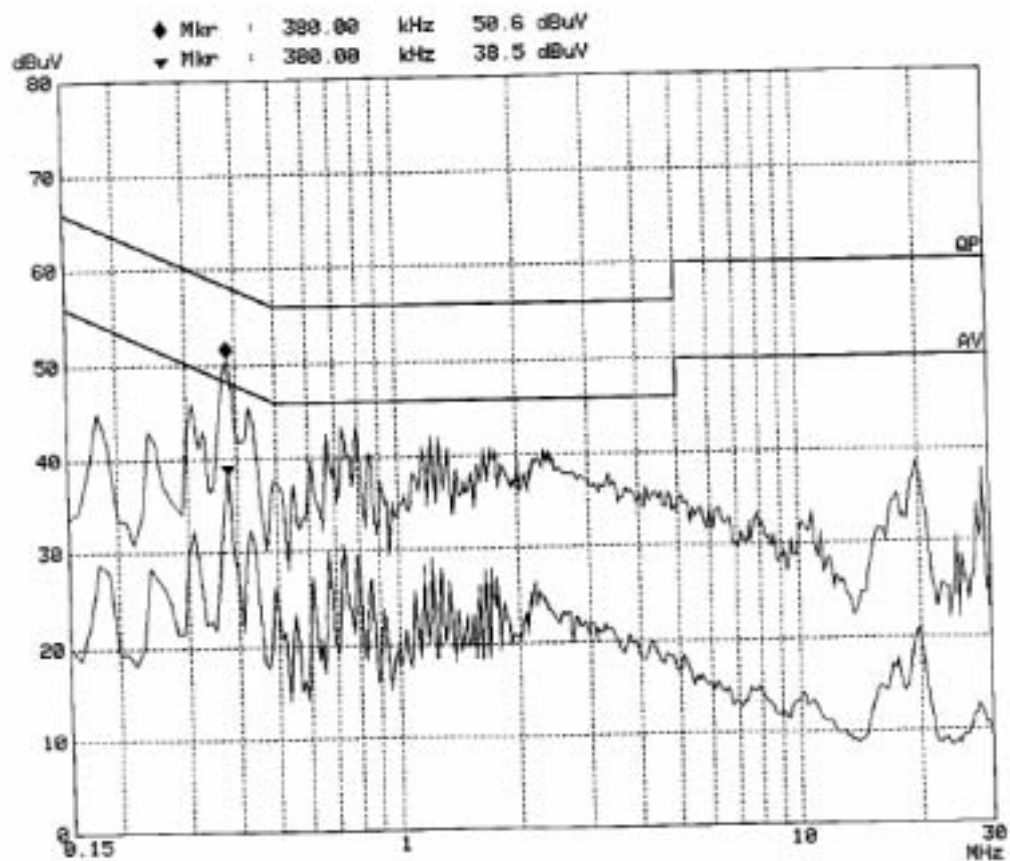
LINE CONDUCTED EMISSIONS				FCC PART 15.207	
Frequency MHz	Amplitude dBμV	Detector QP/AV	Phase Live/Neutral	Limit dBμV	Margin dB
0.380	50.70	QP	Live	58.28	-7.58
0.380	38.50	AV	Live	48.28	-9.78
26.400	49.20	QP	Neutral	60.00	-10.80
0.380	47.00	QP	Neutral	58.28	-11.28
0.730	43.40	QP	Live	56.00	-12.60
1.220	42.10	QP	Live	56.00	-13.90
0.310	45.90	QP	Live	59.97	-14.07
0.670	40.90	QP	Neutral	56.00	-15.10
0.730	30.60	AV	Live	46.00	-15.40
1.220	40.30	QP	Neutral	56.00	-15.70
0.310	43.70	QP	Neutral	59.97	-16.27
1.220	29.00	AV	Live	46.00	-17.00
0.310	32.40	AV	Live	49.97	-17.57
0.180	45.10	QP	Live	64.49	-19.39
0.180	44.20	QP	Neutral	64.49	-20.29
0.380	27.20	AV	Neutral	48.28	-21.08
19.680	38.60	QP	Live	60.00	-21.40
0.180	28.80	AV	Live	54.49	-25.69
0.670	20.10	AV	Neutral	46.00	-25.90
1.220	19.50	AV	Neutral	46.00	-26.50
0.310	22.90	AV	Neutral	49.97	-27.07
19.680	20.90	AV	Live	50.00	-29.10
0.180	20.20	AV	Neutral	54.49	-34.29
26.400	12.90	AV	Neutral	50.00	-37.10

Plot(s) of Test Data

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

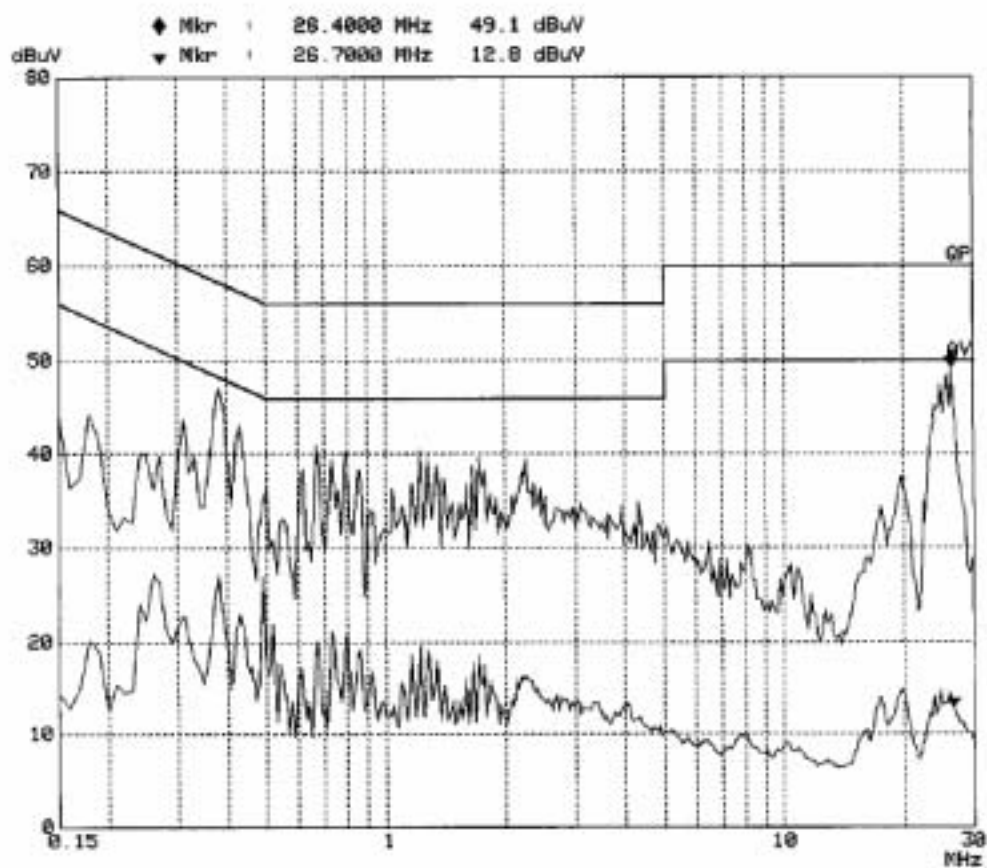
Conducted Emission FCC Part 15

EUT: ESP KB Panel M/N: ESPKB Panel Generation2
Manuf: ESP
Op Cond: Transmitting
Operator: Louise
Test Spec: 120V AC/60Hz L
Comment: Temp.: 25 Humi.: 53%
Date: 11. Jul 06 15:54



Conducted Emission FCC Part 15

EUT: ESP KB Panel M/N:ESPKB Panel Generation2
Manuf: ESP
Op Cond: Transmitting
Operator: Louise
Test Spec: 120V AC/60Hz N
Comment: Temp.:25 Humi.:53%
Date: 11. Jul 06 16:09



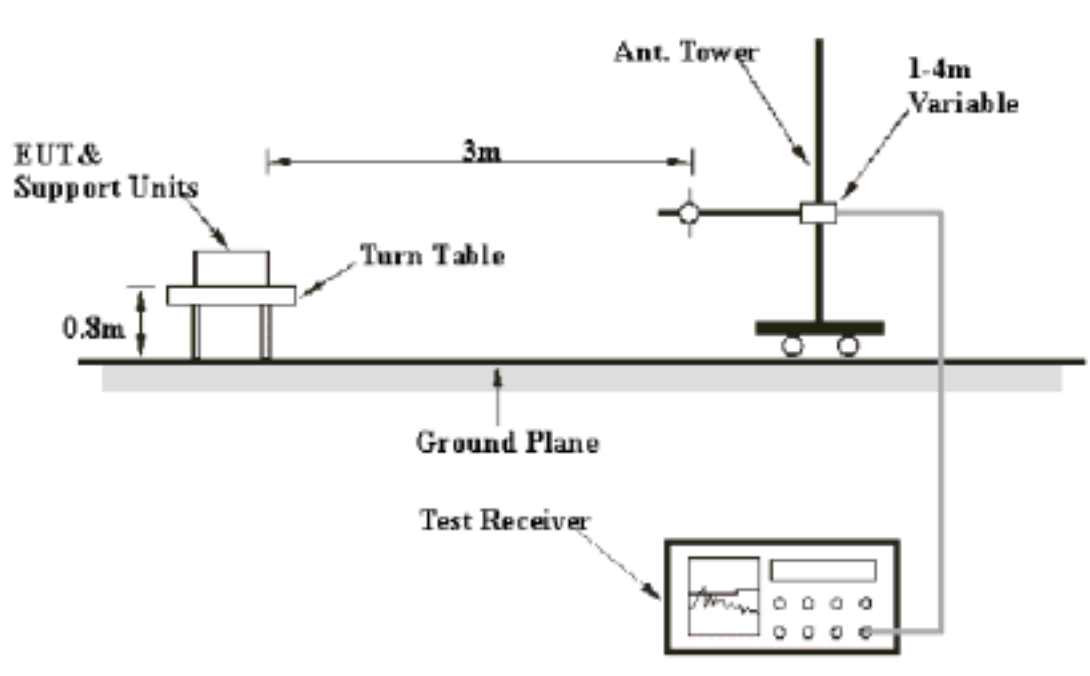
§15.205 §15.209(a) §15.249(a) - RADIATED EMISSION

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 Lab Corp. (ShenZhen) is ± 4.0 dB.

EUT Setup



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

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

EMI Test Receiver Setup

The system was investigated from 30 MHz to 25000 MHz.

During the radiated emission and out of band emission test, the test receiver was set with the following configurations:

<i>Frequency Range</i>	<i>RBW</i>	<i>Video B/W</i>
30 – 1000 MHz	100 kHz	300 kHz
1000 MHz – 25000 MHz	1MHz	3 MHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2005-8-17	2006-8-17
HP	Amplifier	HP8447E	1937A01046	2005-8-17	2006-8-17
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2006-4-28	2007-4-28
Agilent	Spectrum Analyzer	8564E	3943A01781	2005-12-8	2006-12-8
HP	Preamplifier	8449B	3008A00277	2005-8-17	2006-8-17
SUNOL SCIENCES	Horn Antenna	DRH-118	A052604	2005-7-20	2006-7-20

*** Statement of Traceability:** Bay Area Compliance Lab 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.

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

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

Test Results Summary

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

Transmitting Mode (Low channel): **-4.91 dB** at **902.30 MHz** in the **Vertical** polarization.
Transmitting Mode (Middle channel): **-2.91 dB** at **916.484 MHz** in the **Vertical** polarization.
Transmitting Mode (High channel): **-4.91 dB** at **927.543 MHz** in the **Horizontal** polarization.

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	53%
ATM Pressure:	1000mbar

The testing was performed by Deny Xiong on 2006-7-11.

Test mode: Transmitting (Low channel)

Frequency	Meter Reading dBuV/m	Detector	Direction	Height	Polar	Antenna Loss	Cable loss	Amplifier Gain	Corr. Ampl.	FCC Part 15.209 & 15.249		
MHz		PK/ AV	Degree	Meter	H / V	dB	dB	dB	dBuV/m	Limit dBuV/m	Margin dB	Comment
Low Channel: Channel 1												
902.30	89.24	PK	45	1.0	V	22.9	3.45	26.5	89.09	94	-4.91	Fundamental
1804.57	53.50	AV	180	1.6	V	27.1	2.82	35.0	48.42	54	-5.58	Harmonic
902.30	78.44	PK	263	1.4	H	22.9	3.45	26.5	78.29	94	-15.71	Fundamental
4511.50	31.67	AV	256	1.5	H	30.9	4.42	32.5	34.49	54	-19.51	Harmonic
4511.50	31.67	AV	354	1.6	V	30.9	4.42	32.5	34.49	54	-19.51	Harmonic
1804.57	39.50	AV	270	1.6	H	27.1	2.82	35.0	34.42	54	-19.58	Harmonic
3609.20	32.17	AV	178	1.8	V	30.3	4.04	32.5	34.01	54	-19.99	Harmonic
3609.20	32.00	AV	147	1.3	H	30.3	4.04	32.5	33.84	54	-20.16	Harmonic
2706.90	33.50	AV	261	1.0	H	28.3	4.02	33.4	32.42	54	-21.58	Harmonic
2706.90	33.50	AV	90	1.2	V	28.3	4.02	33.4	32.42	54	-21.58	Harmonic
1804.57	56.67	PK	250	1.0	V	27.1	2.82	35.0	51.59	74	-22.41	Harmonic
4511.50	45.17	PK	256	1.5	H	30.9	4.42	32.5	47.99	74	-26.01	Harmonic
4511.50	45.00	PK	354	1.6	V	30.9	4.42	32.5	47.82	74	-26.18	Harmonic
3609.20	45.33	PK	178	1.8	V	30.3	4.04	32.5	47.17	74	-26.83	Harmonic
3609.20	44.17	PK	147	1.3	H	30.3	4.04	32.5	46.01	74	-27.99	Harmonic
2706.90	46.83	PK	180	1.3	H	28.3	4.02	33.4	45.75	74	-28.25	Harmonic
2706.90	46.67	PK	180	1.0	V	28.3	4.02	33.4	45.59	74	-28.41	Harmonic
1804.57	49.50	PK	49	1.2	H	27.1	2.82	35.0	44.42	74	-29.58	Harmonic

Test mode: Transmitting (Middle channel)

Frequency	Meter Reading dBuV/m	Detector	Direction	Height	Polar	Antenna Loss	Cable loss	Amplifier Gain	Corr. Ampl.	FCC Part 15.209 & 15.249		
MHz		PK/ AV	Degree	Meter	H / V	dB	dB	dB	dBuV/m	Limit dBuV/m	Margin dB	Comment
Middle Channel: Channel 2												
916.484	91.02	PK	182	1.2	V	22.7	3.87	26.5	91.09	94	-2.91*	Fundamental
1832.568	53.17	AV	180	1.6	V	27.1	2.82	35.0	48.09	54	-5.91	Harmonic
916.484	76.52	PK	197	1.6	H	22.7	3.87	26.5	76.59	94	-17.41	Fundamental
4582.420	32.33	AV	90	1.2	V	30.9	4.42	32.5	35.15	54	-18.85	Harmonic
4582.420	32.17	AV	230	1.5	H	30.9	4.42	32.5	34.99	54	-19.01	Harmonic
1832.568	39.17	AV	109	1.2	H	27.1	2.82	35.0	34.09	54	-19.91	Harmonic
3665.936	32.00	AV	168	1.8	H	30.3	4.04	32.5	33.84	54	-20.16	Harmonic
3665.936	32.00	AV	57	1.5	V	30.3	4.04	32.5	33.84	54	-20.16	Harmonic
2749.400	33.50	AV	45	1.0	H	28.5	4.40	33.4	33.00	54	-21.00	Harmonic
2749.400	33.17	AV	90	1.2	V	28.5	4.40	33.4	32.67	54	-21.33	Harmonic
1832.568	56.33	PK	45	1.0	V	27.1	2.82	35.0	51.25	74	-22.75	Harmonic
4582.420	44.83	PK	90	1.2	V	30.9	4.42	32.5	47.65	74	-26.35	Harmonic
4582.420	44.33	PK	230	1.5	H	30.9	4.42	32.5	47.15	74	-26.85	Harmonic
3665.936	45.17	PK	168	1.8	H	30.3	4.04	32.5	47.01	74	-26.99	Harmonic
2749.400	47.50	PK	90	1.2	V	28.5	4.40	33.4	47.00	74	-27.00	Harmonic
3665.936	45.00	PK	57	1.5	V	30.3	4.04	32.5	46.84	74	-27.16	Harmonic
2749.400	46.00	PK	180	1.0	H	28.5	4.40	33.4	45.50	74	-28.50	Harmonic
1832.568	49.50	PK	109	1.2	H	27.1	2.82	35.0	44.42	74	-29.58	Harmonic

Test mode: Transmitting (High channel)

Frequency	Meter Reading dBuV/m	Detector	Direction	Height	Polar	Antenna Loss	Cable loss	Amplifier Gain	Corr. Ampl.	FCC Part 15.209 & 15.249		
MHz		PK/ AV	Degree	Meter	H / V	dB	dB	dB	dBuV/m	Limit dBuV/m	Margin dB	Comment
High Channel: Channel 3)												
927.543	88.46	PK	182	1.2	V	23.1	4.03	26.5	89.09	94	-4.91	Fundamental
1855.08	54.00	AV	180	1.3	V	27.1	2.82	35.0	48.92	54	-5.08	Harmonic
927.543	75.46	PK	125	1.6	H	23.1	4.03	26.5	76.09	94	-17.91	Fundamental
1855.08	40.83	AV	109	1.2	H	27.1	2.82	35.0	35.75	54	-18.25	Harmonic
3710.16	32.17	AV	154	1.4	H	31.2	4.04	32.5	34.91	54	-19.09	Harmonic
3710.16	32.00	AV	257	1.8	V	31.2	4.04	32.5	34.74	54	-19.26	Harmonic
4637.70	31.67	AV	230	1.6	V	30.9	4.42	33.4	33.59	54	-20.41	Harmonic
4637.70	31.58	AV	205	1.6	H	30.9	4.42	33.4	33.5	54	-20.50	Harmonic
2782.62	33.00	AV	108	1.8	H	28.5	4.40	33.4	32.5	54	-21.50	Harmonic
2782.62	33.00	AV	240	1.2	V	28.5	4.40	33.4	32.5	54	-21.50	Harmonic
1855.08	56.33	PK	45	1.3	V	27.1	2.82	35.0	51.25	74	-22.75	Harmonic
3710.16	44.67	PK	154	1.4	H	31.2	4.04	32.5	47.41	74	-26.59	Harmonic
3710.16	43.50	PK	257	1.8	V	31.2	4.04	32.5	46.24	74	-27.76	Harmonic
4637.70	44.17	PK	205	1.6	H	30.9	4.42	33.4	46.09	74	-27.91	Harmonic
2782.62	46.33	PK	108	1.8	H	28.5	4.40	33.4	45.83	74	-28.17	Harmonic
4637.70	43.67	PK	230	1.6	V	30.9	4.42	33.4	45.59	74	-28.41	Harmonic
1855.08	50.17	PK	109	1.2	H	27.1	2.82	35.0	45.09	74	-28.91	Harmonic
2782.62	45.50	PK	240	1.2	V	28.5	4.40	33.4	45	74	-29.00	Harmonic

* Within measurement uncertainty.

§15.249(d) – OUT OF BAND EMISSION**Standard Applicable**

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.

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 its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency 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.
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
Agilent	Spectrum Analyzer	8564E	3943A01781	2005-12-8	2006-12-8

* **Statement of Traceability:** Bay Area Compliance Lab 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:	55%
ATM Pressure:	1016mbar

The testing was performed by Deny Xiong on 2006-7-11.

Test Result: Pass

Test Mode: Charging & Transmitting

Frequency (MHz)	Emission (dBuV/m)	Limit (dBuV/m)
901.99	47.14	54
928.10	43.16	54

Test Mode: Transmitting

Frequency (MHz)	Emission (dBuV/m)	Limit (dBuV/m)
901.90	47.14	54
928.10	43.16	54

Test Result: Pass