



FCC PART 15B

MEASUREMENT AND TEST REPORT

For

Cubic Transportation Systems, Inc.

5650 Kearny Mesa Road, San Diego, CA 92111, USA

FCC ID: LVC312

Report Type: Original Report	Product Type: Mobile Validator (MV)
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Report Number: <u>RSZ11022302</u>	
Report Date: <u>2011-06-12</u>	
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* This report contains 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 *Cubic Transportation Systems, Inc.*'s product, model number: 5300-10009-3 (FCC ID: LVC312) or the "EUT" as referred to in this report is a *Mobile Validator (MV)*, which measures approximately: 20.0 cm (L) x 12.2 cm (W) x 3.5 cm (H), Rated input voltage: DC 3.7V battery or DC 12V adapter.

Adapter information:

Model: SAW18-12.0-1500US

Input: AC 100-240V, 50/60 Hz, 900mA

Output: DC 12V, 1500mA.

** All measurement and test data in this report was gathered from production sample serial number: 00000000000010 (Assigned by applicant). The EUT was received on 2011-02-23.*

Objective

This Type approval report is prepared on behalf of *Cubic Transportation Systems, Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A and B of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine compliance with FCC Part 15 Class B.

Related Submittal(s)/Grant(s)

FCC Part 15.225 DXX, Part 15.247 DSS, DTS and Part 22H&24E PCB submissions with FCC ID: LVC312

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 December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

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 an ISO/IEC 17025 guide accredited laboratory, and is accredited by 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 manufacturer testing fashion.

EUT Exercise Software

RS485TestApp_PC RS485TestApp_WM

Equipment Modifications

No modification was made to the unit tested.

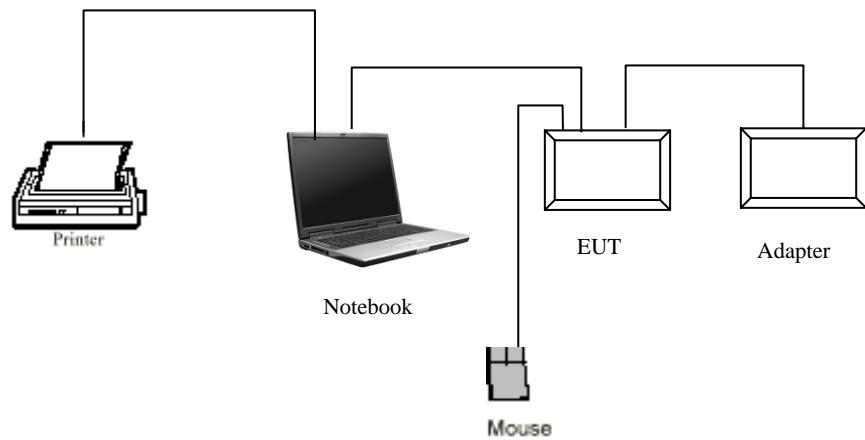
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	PP01L	S2-B001
DELL	Mouse	MOC5UO	G1B0096D
HP	Laser Jet5L	C3941A	JPTVOB2337
I.T.E	Power supply	SAW18-12.0-1500US	N/A
I.T.E	Power supply	SAW18-24.0-1500US	N/A

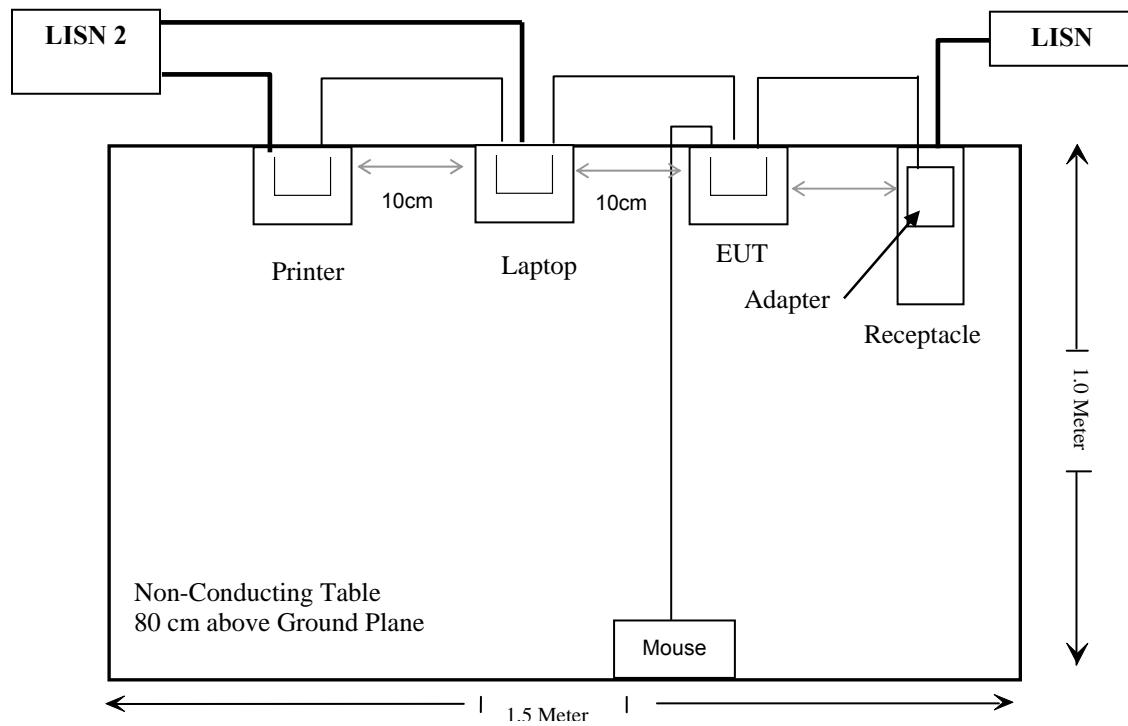
External I/O Cable

Cable Description	Length (M)	From/Port	To
Unshielded Undetachable Power Cable	1.8	Adapter	LISN
Unshielded Undetachable DC Cable	2.0	EUT	Adapter
Shielded Detachable K/B Cable	1.5	K/B Port/Host	K/B
Shielded Detachable Mouse Cable	1.5	Mouse Port/Host	Mouse
Shielded Detachable RS845 Cable	0.1	PC	EUT
Shielded Detachable RJ45 Cable	1.5	RJ45 Port/Host	EUT

Configuration of Test Setup



Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§15.107	AC Line Conducted Emissions	Compliance
§15.109	Radiated Spurious Emissions	Compliance

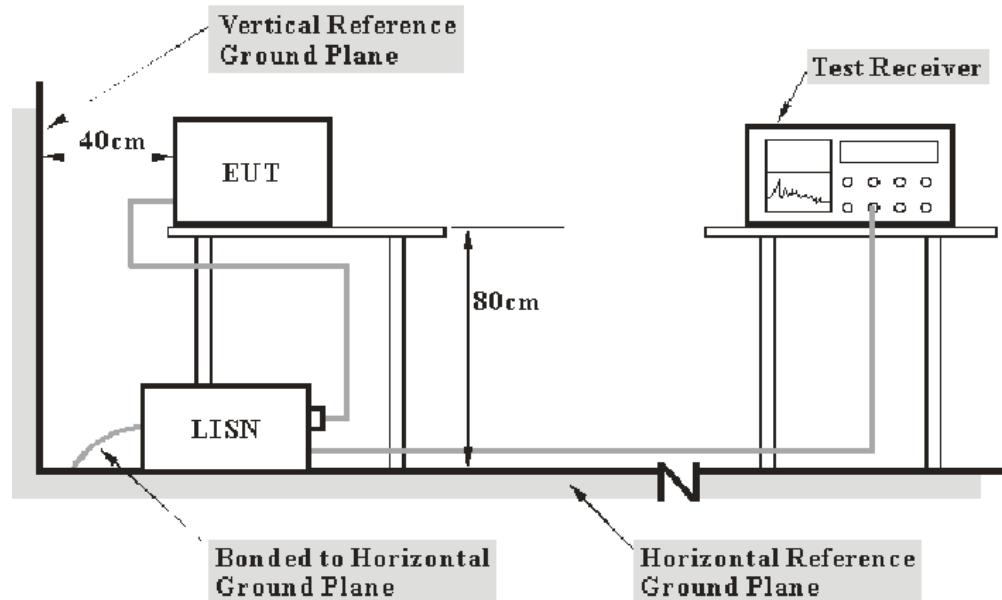
FCC §15.107 – AC LINE CONDUCTED EMISSIONS

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 Laboratories Corp. (Shenzhen) is ± 2.4 dB.(k=2, 95% level of confidence)

EUT Setup



Note:

1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.4-2009 measurement procedure. The specification used was with the FCC Part 15.107 Class B limits.

The spacing between the peripherals was 10 cm.

The 12V/24V adapters were connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

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

Test Procedure

During the conducted emission test, the adapter was connected to the 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	830245/006	2011-03-03	2012-03-02
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2011-03-09	2012-03-08

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

Test Results Summary

According to the recorded data in following table, the EUT complied with the [FCC Part 15.107](#), with the worst margin reading of:

14.62 dB at 0.320 MHz in the Neutral conducted mode

Test Data

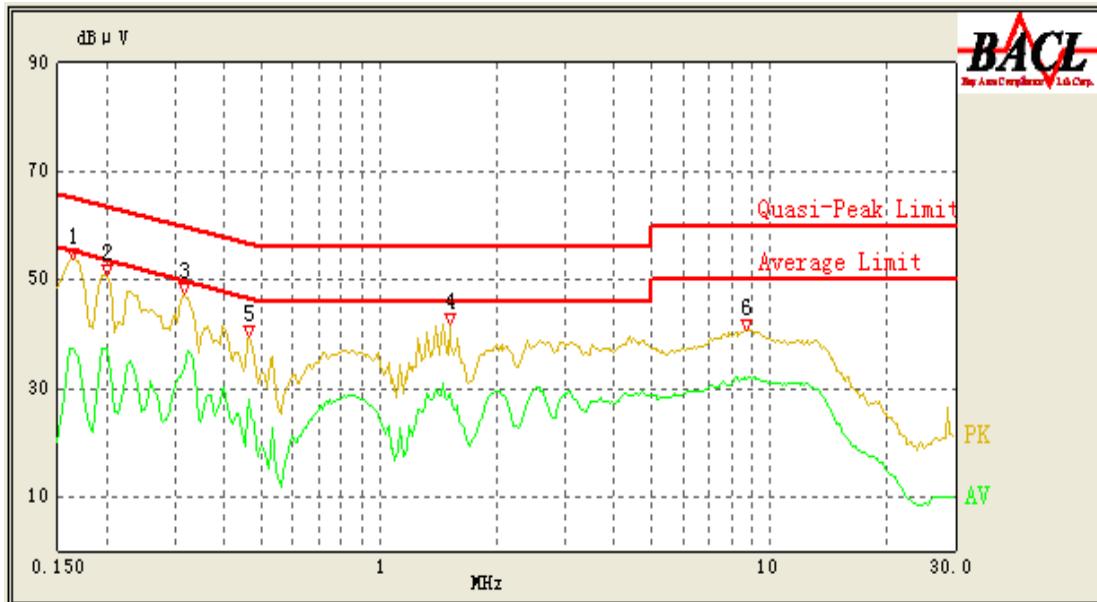
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	48 %
ATM Pressure:	100.0 kPa

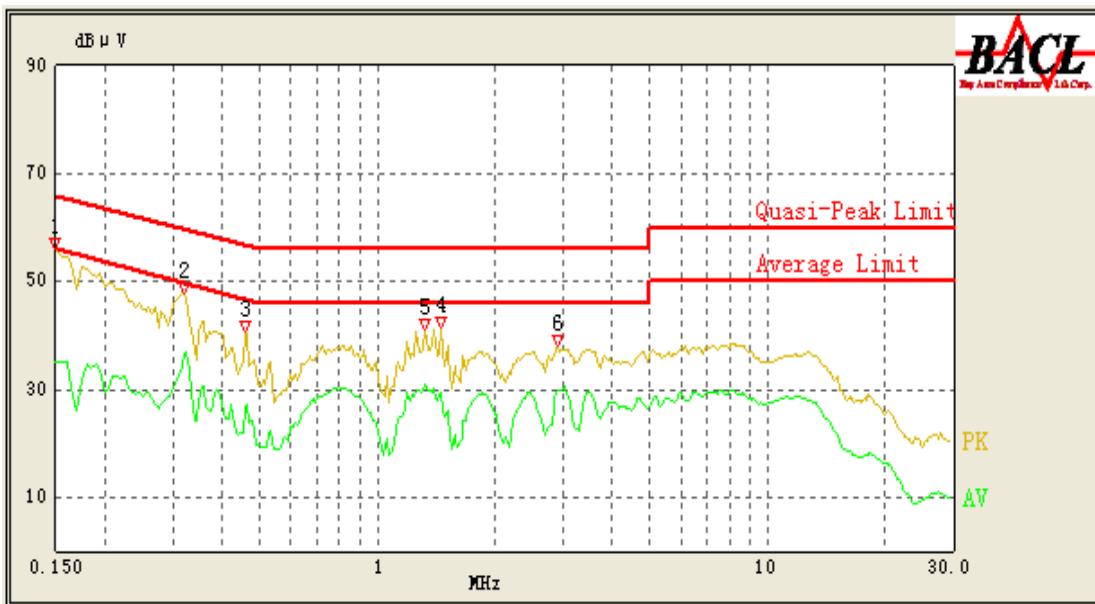
The testing was performed by Wayne Cheng on 2011-04-24.

Running (RS485 communication, Ping RJ45, USB port working)-(Worse case)

120 V, 60 Hz, Line (DC 12V adapter):

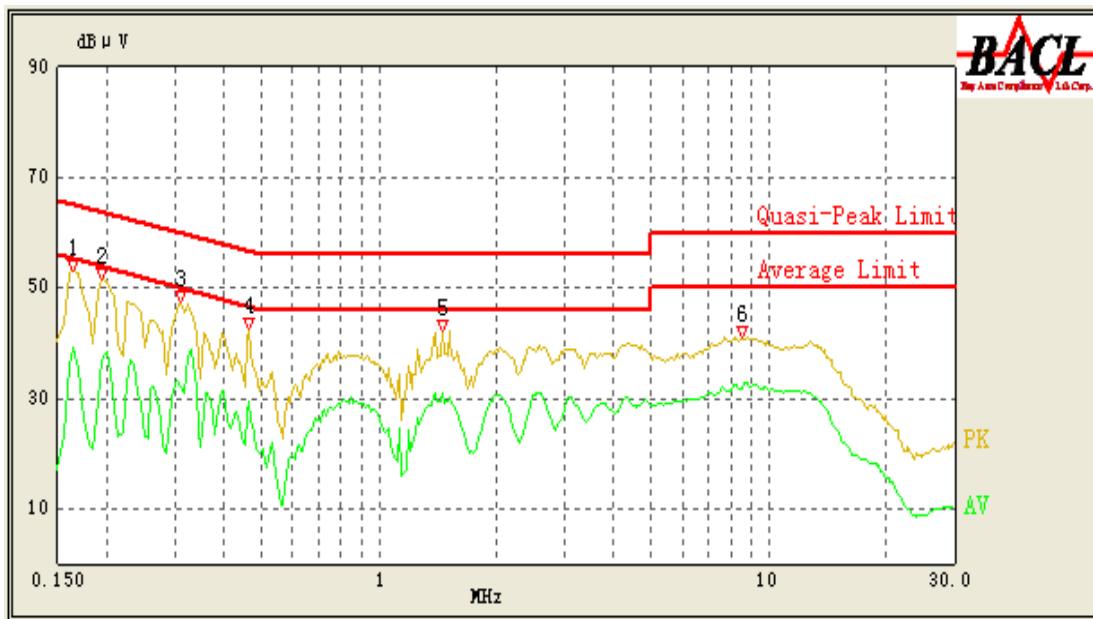


Conducted Emissions			FCC Part 15.107, Class B		
Frequency (MHz)	Corrected Result (dB μ V)	Correction Factor (dB)	Limit (dB μ V)	Margin (dB)	Remark (PK/ QP/Ave.)
0.165	50.36	10.09	65.57	15.21	QP
0.200	47.58	10.07	64.57	16.99	QP
1.520	28.95	10.15	46.00	17.05	Ave.
0.200	37.32	10.07	54.57	17.25	Ave.
0.315	33.68	10.02	51.29	17.61	Ave.
8.755	31.86	10.10	50.00	18.14	Ave.
0.165	37.24	10.09	55.57	18.33	Ave.
0.465	28.03	10.16	47.00	18.97	Ave.
1.520	36.53	10.15	56.00	19.47	QP
0.465	36.88	10.16	57.00	20.12	QP
0.315	41.01	10.02	61.29	20.28	QP
8.770	36.51	10.10	60.00	23.49	QP

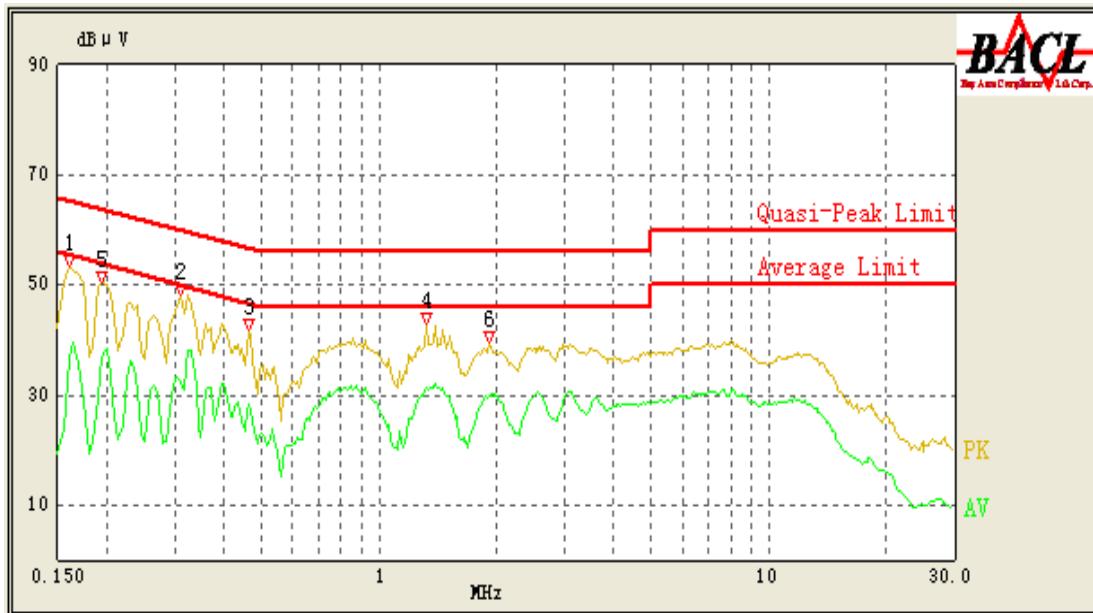
120 V, 60 Hz, Neutral (DC 12V adapter):

Conducted Emissions			FCC Part 15.107, Class B		
Frequency (MHz)	Corrected Result (dB μ V)	Correction Factor (dB)	Limit (dB μ V)	Margin (dB)	Remark (PK/ QP/Ave.)
0.320	36.52	10.02	51.14	14.62	Ave.
1.325	30.99	10.13	46.00	15.01	Ave.
2.905	29.63	10.15	46.00	16.37	Ave.
1.455	29.43	10.15	46.00	16.57	Ave.
0.320	43.94	10.02	61.14	17.20	QP
1.455	37.82	10.15	56.00	18.18	QP
1.325	36.98	10.13	56.00	19.02	QP
0.460	26.38	10.16	47.14	20.76	Ave.
0.150	35.13	10.10	56.00	20.87	Ave.
0.150	44.14	10.10	66.00	21.86	QP
0.460	35.06	10.16	57.14	22.08	QP
2.885	33.39	10.16	56.00	22.61	QP

120 V, 60 Hz, Line (DC 24V adapter):



Conducted Emissions			FCC Part 15.107, Class B		
Frequency (MHz)	Corrected Result (dB μ V)	Correction Factor (dB)	Limit (dB μ V)	Margin (dB)	Remark (PK/QP/Ave.)
1.455	31.10	10.15	46.00	14.90	Ave.
0.165	49.90	10.09	65.57	15.67	QP
0.165	39.25	10.09	55.57	16.32	Ave.
0.465	29.55	10.16	47.00	17.45	Ave.
0.195	46.91	10.07	64.71	17.80	QP
1.460	38.17	10.15	56.00	17.83	QP
0.195	36.76	10.07	54.71	17.95	Ave.
8.520	31.85	10.10	50.00	18.15	Ave.
0.310	42.96	10.01	61.43	18.47	QP
0.465	38.05	10.16	57.00	18.95	QP
0.310	32.09	10.01	51.43	19.34	Ave.
8.515	36.24	10.10	60.00	23.76	QP

120V, 60 Hz, Neutral (DC 24V adapter):

Conducted Emissions			FCC Part 15.107, Class B		
Frequency (MHz)	Corrected Result (dB μ V)	Correction Factor (dB)	Limit (dB μ V)	Margin (dB)	Remark (PK/QP/Ave.)
1.325	31.09	10.13	46.00	14.91	Ave.
1.930	29.83	10.19	46.00	16.17	Ave.
0.160	49.09	10.09	65.71	16.62	QP
0.195	47.10	10.07	64.71	17.61	QP
0.195	36.82	10.07	54.71	17.89	Ave.
1.325	37.95	10.13	56.00	18.05	QP
0.465	28.46	10.16	47.00	18.54	Ave.
0.465	38.26	10.16	57.00	18.74	QP
0.160	36.69	10.09	55.71	19.02	Ave.
0.310	32.26	10.01	51.43	19.17	Ave.
0.310	42.19	10.01	61.43	19.24	QP
1.925	35.03	10.19	56.00	20.97	QP

FCC §15.109 - RADIATED SPURIOUS EMISSIONS

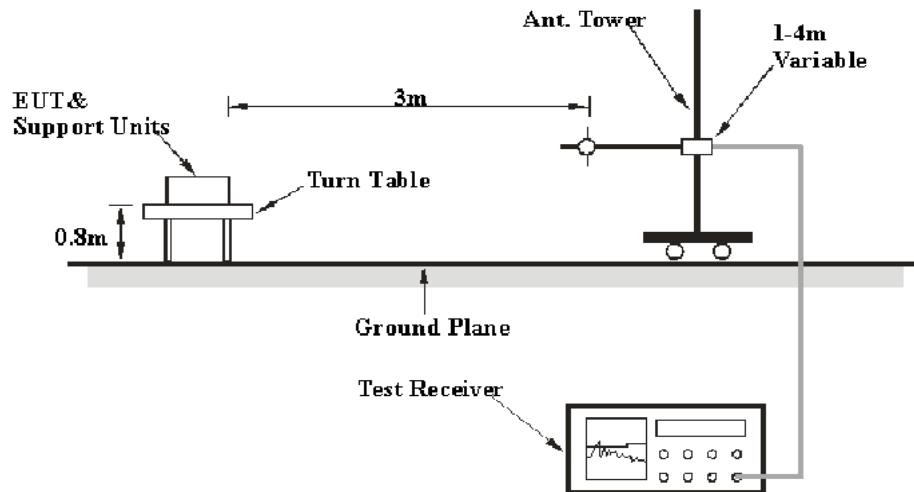
Measurement Uncertainty

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

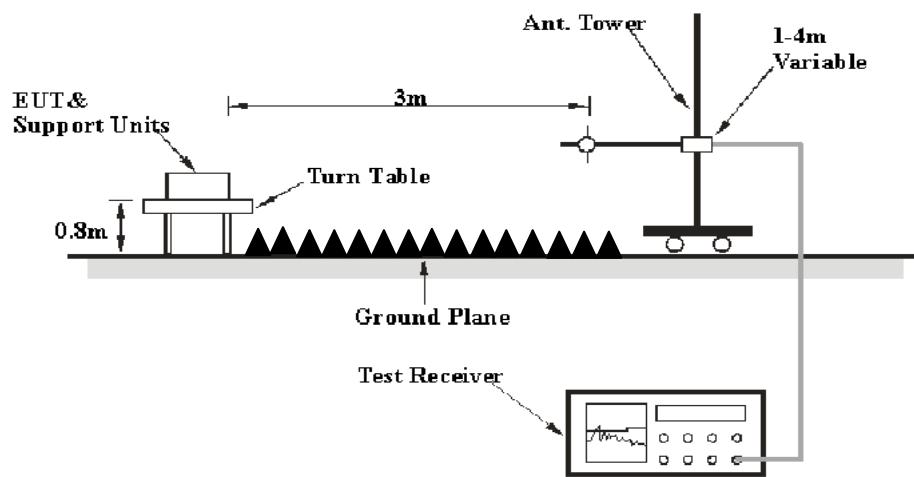
Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is ± 4.0 dB. ($k=2$, 95% level of confidence)

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2009. The specification used was the FCC Part 15.109, Class B 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 connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 6 GHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

<i>Frequency Range</i>	<i>RBW</i>	<i>Video B/W</i>	<i>Detector</i>
30MHz – 1000 MHz	100 kHz	300 kHz	QP
Above 1 GHz	1MHz	3 MHz	Peak
Above 1 GHz	1MHz	10 Hz	Ave

Test Procedure

For the radiated emissions test, the adapter was connected to 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 Quasi-peak detection mode from 30 MHz to 1 GHz, Peak and average detection mode above 1 GHz.

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:

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

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447E	1937A01046	2010-08-02	2011-08-02
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-11	2011-11-10
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2010-07-05	2011-07-04
Rohde&Schwarz	Spectrum Analyzer	FSEM30	849720/019	2010-07-08	2011-07-08
Mini-Circuits	Pre-amplifier	ZVA-213+	N/A	2010-09-12	2011-09-11
SUNOL SCIENCES	Horn Antenna	DRH-118	A052604	2011-05-05	2012-05-04

* **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 Results Summary

According to the data in the following table, the EUT complied with the FCC §15.109 Class B, with the worst margin reading of:

1.3 dB at 162.724000 MHz in the **Horizontal** polarization for GPS Receiver mode

Test Data

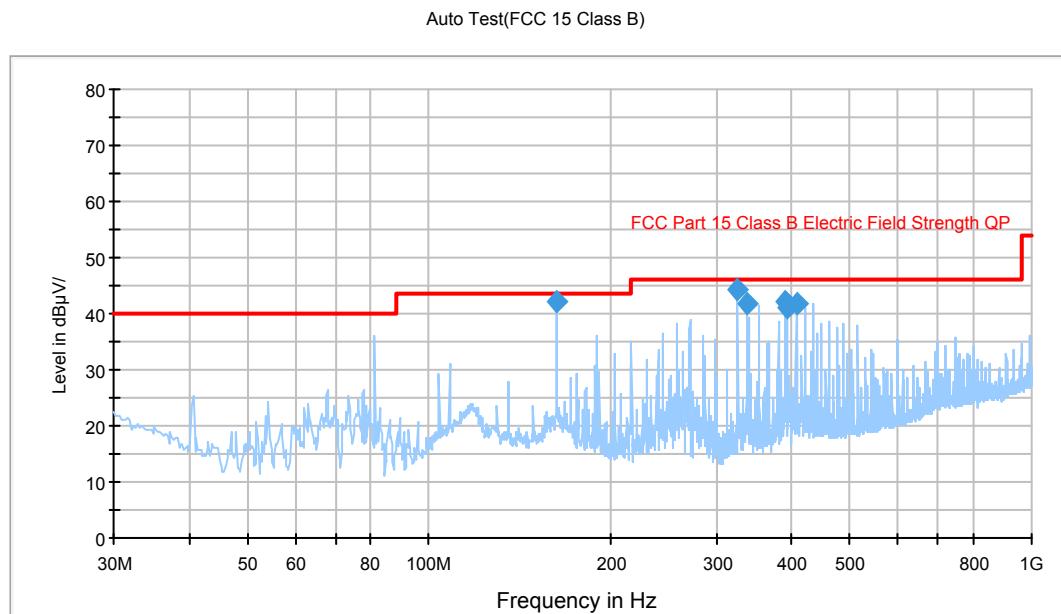
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	48 %
ATM Pressure:	100.0 kPa

The testing was performed by Wayne Cheng on 2011-05-05.

Test Mode: Running (RS485 communication, Ping RJ45, USB port working)-(Worse case)

1) Below 1 GHz:



Frequency (MHz)	Corrected Amplitude (dB μ V/m)	Test Antenna		Turntable Position (degree)	Correction Factor (dB)	Limit (dB μ V/m)	Margin (dB)
		Height (cm)	Polarity (H/V)				
162.724000	42.2	245.0	H	110.0	-14.5	43.5	1.3*
325.463750	44.2	103.0	H	75.0	-11.7	46.0	1.8*
389.987000	42.2	105.0	V	207.0	-10.2	46.0	3.8*
338.003750	42.0	138.0	V	195.0	-11.4	46.0	4.0
406.838250	41.9	102.0	H	57.0	-9.8	46.0	4.1
393.232250	41.2	104.0	H	58.0	-10.1	46.0	4.8

*Within measurement uncertainty!

2) Above 1 GHz:

Frequency (MHz)	S.A. Reading (dB μ V)	Detector (PK/QP/Ave.)	Turntable Direction (Degree)	Test Antenna			Cable Loss (dB)	Pre- Amp. (dB)	Cord. Amp (dB μ V/m)	FCC 15.109	
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dB μ V/m)	Margin (dB)
4725	28.41	Ave.	330	1.95	H	35.2	4.3	26.9	41.01	54	12.99
4725	27.74	Ave.	226	2.43	V	35.2	4.3	26.9	40.34	54	13.66
3150	29.78	Ave.	50	1.82	V	32.1	3.5	26.8	38.58	54	15.42
3150	28.41	Ave.	105	2.24	H	32.1	3.5	26.8	37.21	54	16.79
3150	46.26	PK	105	2.24	H	32.1	3.5	26.8	55.06	74	18.94
4725	41.85	PK	226	2.43	V	35.2	4.3	26.9	54.45	74	19.55
1143	31.84	Ave.	246	2.35	V	26.5	2.3	26.7	33.94	54	20.06
3150	44.56	PK	50	1.82	V	32.1	3.5	26.8	53.36	74	20.64
4725	40.13	PK	330	1.95	H	35.2	4.3	26.9	52.73	74	21.27
1143	30.53	Ave.	350	2.4	H	26.5	2.3	26.7	32.63	54	21.37
1143	46.33	PK	246	2.35	V	26.5	2.3	26.7	48.43	74	25.57
1143	45.56	PK	350	2.4	H	26.5	2.3	26.7	47.66	74	26.34

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