

# FCC PART 15, CLASS B TEST REPORT

For

**Shanghai HowayGIS Co., Ltd**

Room 230, Focus building, Chunshe Road, Minhang Distract, Shanghai ,China

**FCC ID: 2AAZDS1XN2015**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Handheld GPS/GIS Data Collector
<b>Test Engineer:</b> Matt Yao	
<b>Report Number:</b> RKS150703001-00D	
<b>Report Date:</b> 2015-07-06	
<b>Reviewed By:</b> EMC Manager	Jesse Huang 
<b>Prepared By:</b>	Bay Area Compliance Laboratories Corp. (Kunshan) Chenghu Road, Kunshan Development Zone No.248, Kunshan, Jiangsu, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>



**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

## **TABLE OF CONTENTS**

<b>GENERAL INFORMATION.....</b>	<b>3</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	3
OBJECTIVE .....	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST FACILITY .....	3
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>4</b>
DESCRIPTION OF TEST CONFIGURATION .....	4
EUT EXERCISE SOFTWARE .....	4
SPECIAL ACCESSORIES.....	4
EQUIPMENT MODIFICATIONS .....	4
SUPPORT EQUIPMENT LIST AND DETAILS .....	4
EXTERNAL I/O CABLE.....	4
BLOCK DIAGRAM OF TEST SETUP .....	5
<b>SUMMARY OF TEST RESULTS .....</b>	<b>6</b>
<b>FCC §15.107 – AC LINE CONDUCTED EMISSIONS.....</b>	<b>7</b>
APPLICABLE STANDARD .....	7
MEASUREMENT UNCERTAINTY.....	7
EUT SETUP.....	7
EMI TEST RECEIVER SETUP.....	8
TEST PROCEDURE .....	8
TEST EQUIPMENT LIST AND DETAILS.....	8
CORRECTED FACTOR & MARGIN CALCULATION .....	8
TEST RESULTS SUMMARY .....	9
TEST DATA .....	9
<b>FCC §15.109 - RADIATED SPURIOUS EMISSIONS .....</b>	<b>14</b>
APPLICABLE STANDARD .....	14
MEASUREMENT UNCERTAINTY.....	14
EUT SETUP.....	14
EMI TEST RECEIVER SETUP.....	15
TEST PROCEDURE .....	15
TEST EQUIPMENT LIST AND DETAILS.....	15
CORRECTION FACTOR & MARGIN CALCULATION .....	16
TEST RESULTS SUMMARY .....	16
TEST DATA .....	16

---

## GENERAL INFORMATION

---

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

The Shanghai HowayGIS Co., Ltd's product, model number: S10 (FCC ID: 2AAZD S1XN2015) or the "EUT" in this report was a Handheld GPS/GIS Data Collector, which was measured approximately: 160mm (L) x95 mm (W) x 30 mm (H), rated with input voltage: DC 3.8 V rechargeable Li-ion battery.

*\*The product ' s series model number: S12,S16,S12B .They have the same appearance, structure, PCB, Material and function to the testing products, and only are different for model name and colour.*

*\*All measurement and test data in this report was gathered from production sample serial number: 150608 (Assigned by the BACL, Kunshan). The EUT supplied by the applicant was received on 2015-06-08.*

### Objective

This test report is prepared on behalf of Shanghai HowayGIS Co., Ltd. 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 the compliance of the EUT with FCC Part 15 B.

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

FCC Part 15.247 DTS&DSS with FCC ID: 2AAZDS1XN2014.

### Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the Chenghu Luke Road, Kunshan Development Zone No.248, Kunshan, Jiangsu, China

Test site at Bay Area Compliance Laboratories Corp. (Kunshan) 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 06, 2014. 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.: 815570. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in a manufacturer testing fashion.

EUT operation mode 1: Downloading

EUT operation mode 2: Charging

### EUT Exercise Software

“BurnIn test v5.3” exercise software was used.

### Special Accessories

No special accessory.

### Equipment Modifications

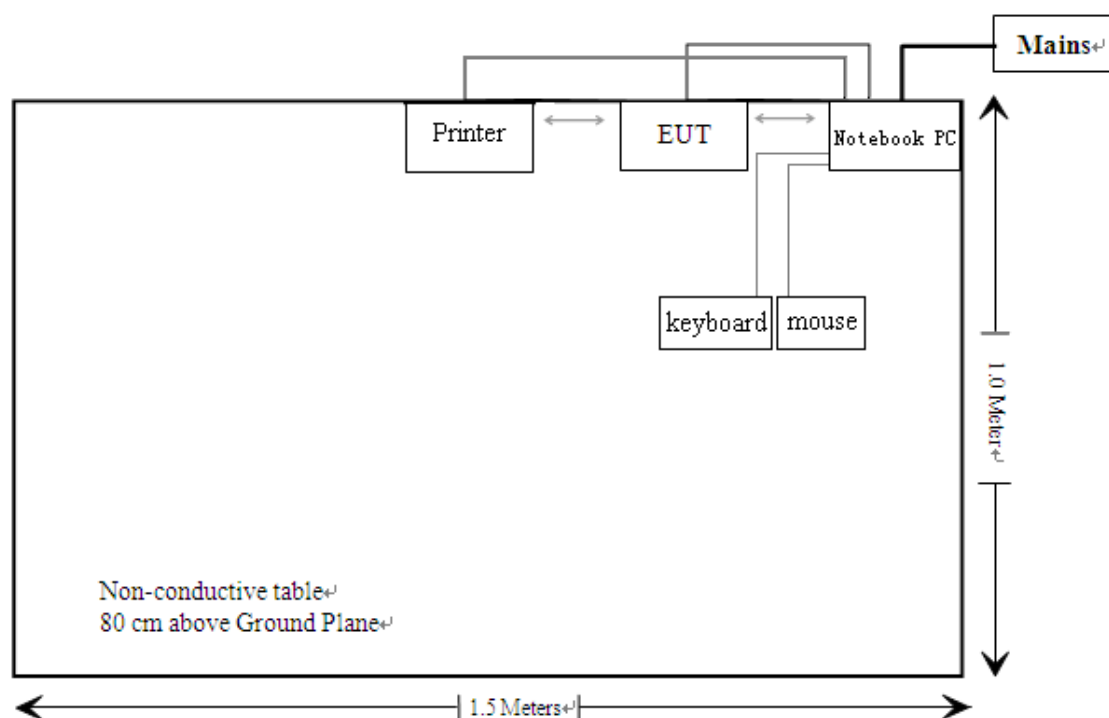
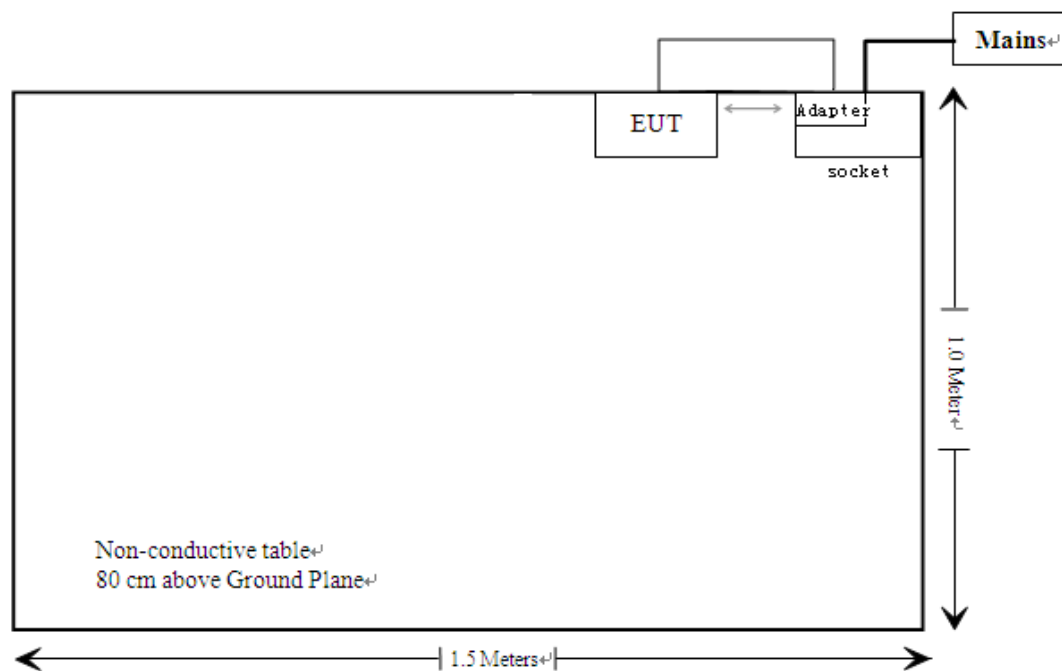
No modification was made to the EUT tested.

### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
LENOVO	Notebook PC	T400	127BP2X
Sandisk	TF Card	4G	N.A
Kyocera	Printer	FS-1125MFP GX	N.A
Dell	keyboard	SK-8120	N.A
Dell	mouse	MS111	N.A

### External I/O Cable

Cable Description	Length (m)	From/Port	To
Unshielding Detachable USB Cable	1.0	EUT	PC
Unshielding Detachable USB Cable	1.0	EUT	ADAPTER

**Block Diagram of Test Setup***EUT operation mode 1: Downloading**EUT operation mode 2: Charging*

**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

### Applicable Standard

According to FCC §15.107

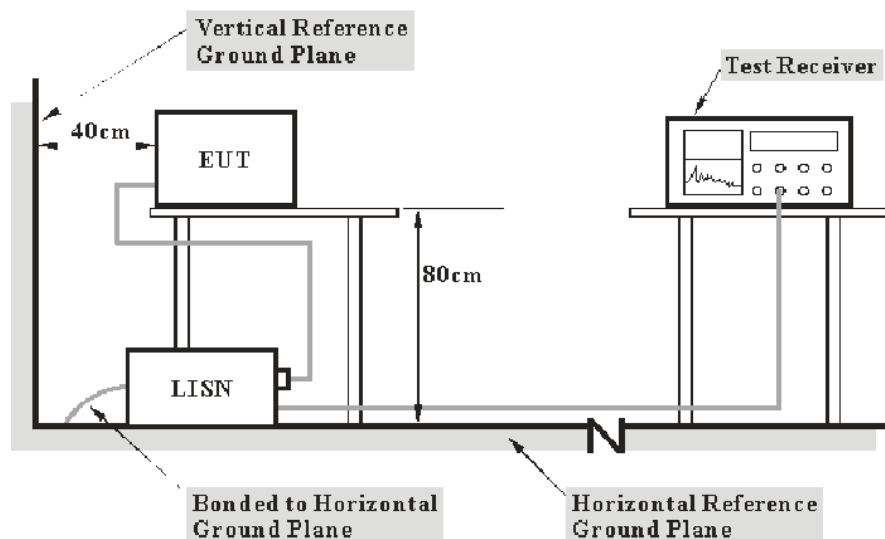
### Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between LISN/ISN and receiver, LISN/ISN voltage division factor, LISN/ISN VDF frequency interpolation and receiver related input quantities, etc.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of conducted disturbance test at Bay Area Compliance Laboratories Corp. (Kunshan) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report

Port	Expanded Measurement uncertainty
AC Mains	3.26 dB (k=2, 95% level of confidence)
CAT 3	3.70 dB (k=2, 95% level of confidence)
CAT 5	3.86 dB (k=2, 95% level of confidence)
CAT 6	4.64 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 measurement procedure of EUT setup is according with per ANSI C63.4-2009. The related limit was specified in FCC Part 15.107 Class B.

The spacing between the peripherals was 10 cm.

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

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

### 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 Procedure

During the conducted emission test, the host PC/Adapter was connected to the first LISN and the other relevant equipments were connected to the second 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	831294/005	2014-09-16	2015-09-16
Rohde & Schwarz	LISN	ESH3-Z5	12005	2014-09-16	2015-09-16
Rohde & Schwarz	LISN	ESH3-Z5	12008	2014-09-16	2015-09-16
Rohde & Schwarz	CE Test software	EMC 32	V 09.10.0	--	--

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

### Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss}$$

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:

$$\text{Margin} = \text{Limit} - (\text{QuasiPeak} \& \text{Average})$$



## 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:

**6.70 dB at 0.186 MHz** in the **Neutral** conducted mode

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

in BACL.,  $U_{(Lm)}$  is less than  $U_{cispr}$ , if  $L_m$  is less than  $L_{lim}$ , it implies that the EUT complies with the limit.

## Test Data

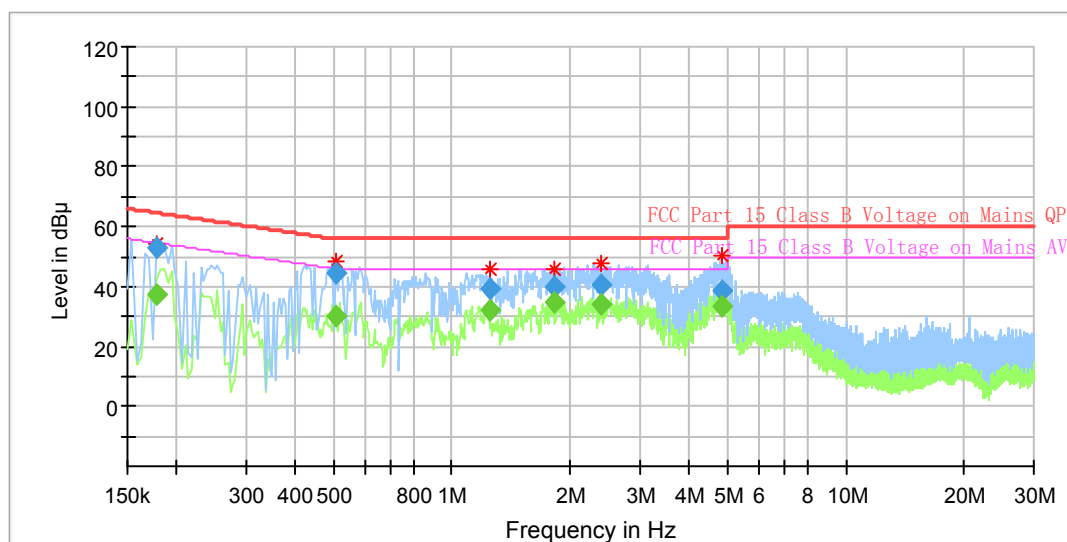
### Environmental Conditions

<b>Temperature:</b>	27°C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

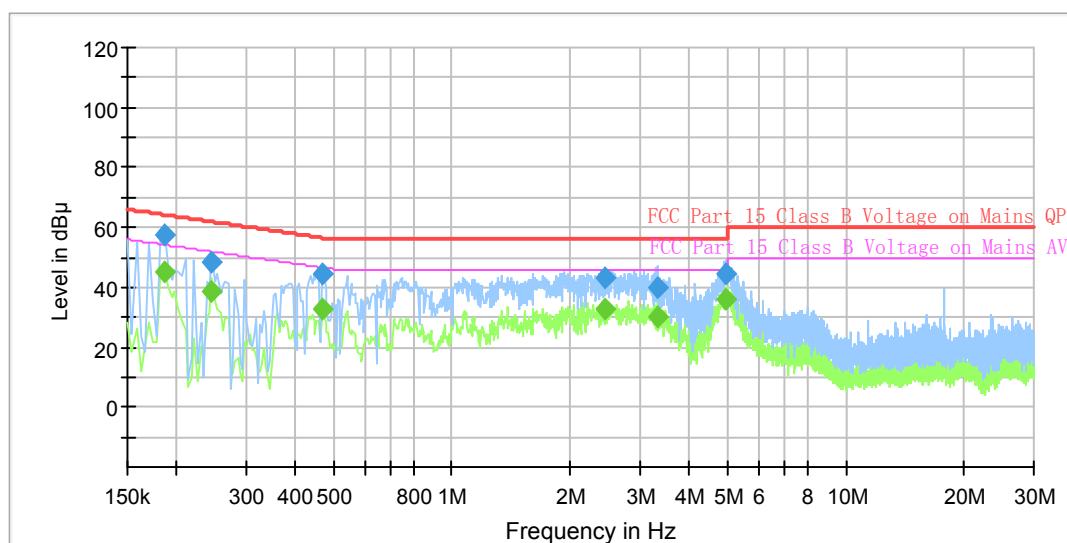
*The testing was performed by Matt.yao on 2015-7-6*

EUT Operation Mode: Downloading

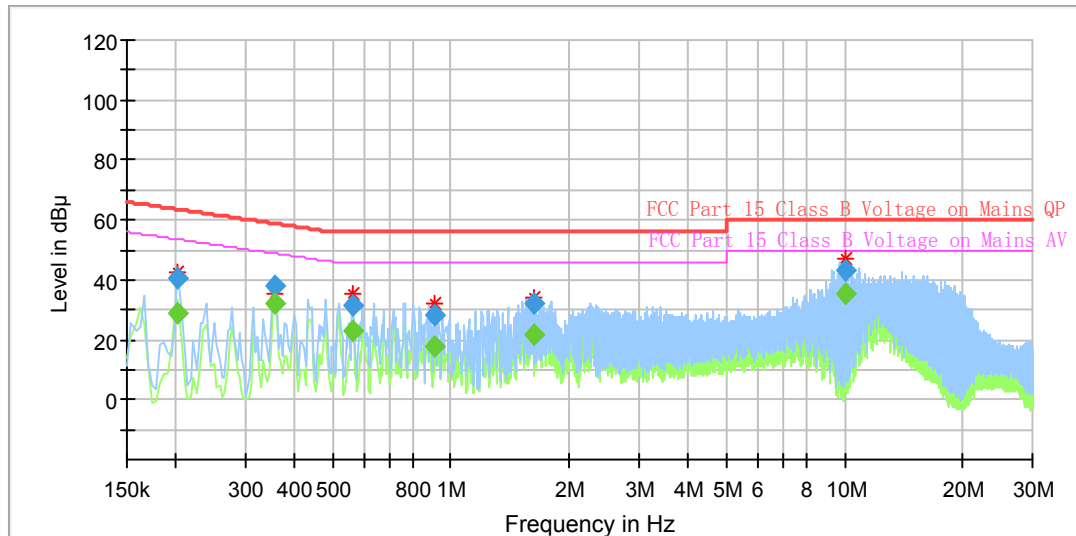
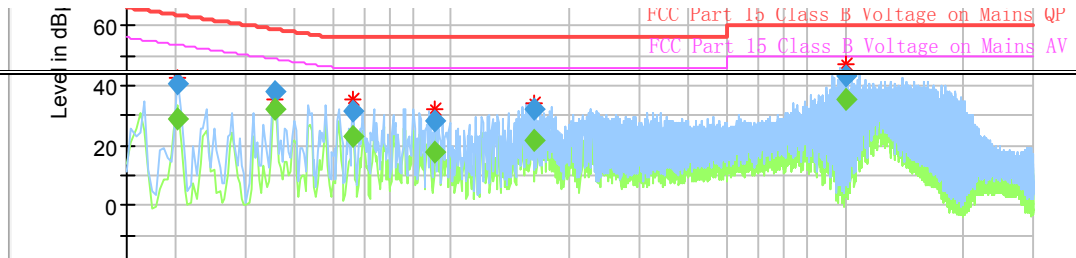
### AC 120V/60 Hz, Line



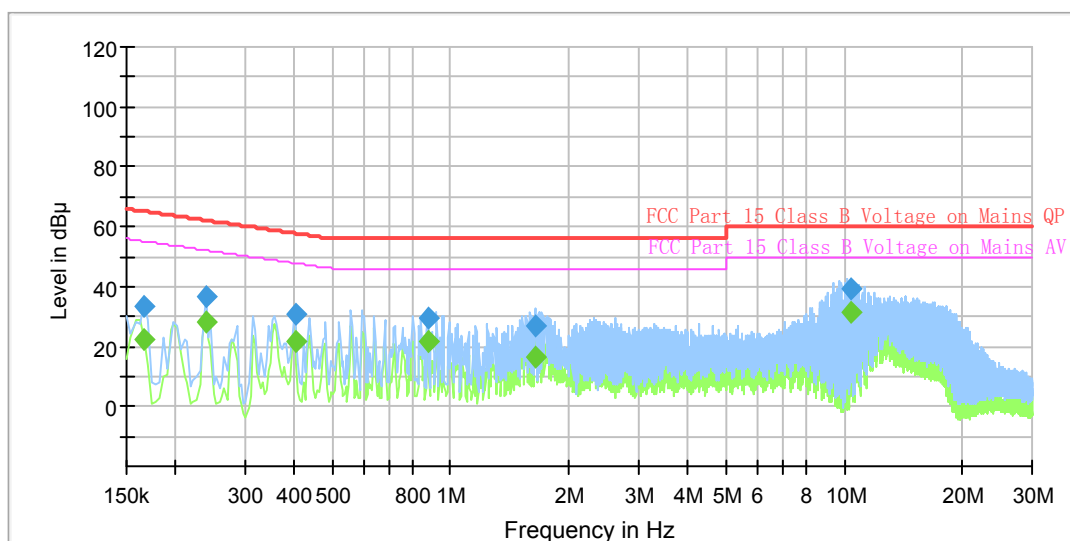
Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Average (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Line	Corr. (dB)
0.178000	---	37.23	54.58	17.35	L1	11.0
0.178000	53.10	---	64.58	11.48	L1	11.0
0.506000	---	30.02	46.00	15.98	L1	11.0
0.506000	44.24	---	56.00	11.76	L1	11.0
1.250000	---	31.83	46.00	14.17	L1	11.1
1.250000	39.07	---	56.00	16.93	L1	11.1
1.818000	---	34.76	46.00	11.24	L1	11.2
1.818000	40.00	---	56.00	16.00	L1	11.2
2.390000	---	34.29	46.00	11.71	L1	11.2
2.390000	40.84	---	56.00	15.16	L1	11.2
4.854000	---	33.68	46.00	12.32	L1	11.3
4.854000	38.66	---	56.00	17.34	L1	11.3

**AC 120V/60 Hz, Neutral**

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Line	Corr. (dB)
0.186000	---	45.24	54.21	8.97	N	11.0
0.186000	57.51	---	64.21	6.70	N	11.0
0.246000	---	38.83	51.89	13.06	N	11.0
0.246000	48.18	---	61.89	13.71	N	11.0
0.470000	---	33.04	46.51	13.47	N	11.0
0.470000	44.60	---	56.51	11.91	N	11.0
2.450000	---	32.51	46.00	13.49	N	11.3
2.450000	43.03	---	56.00	12.97	N	11.3
3.338000	---	30.02	46.00	15.98	N	11.3
3.338000	40.08	---	56.00	15.92	N	11.3
4.982000	---	36.00	46.00	10.00	N	11.4
4.982000	44.46	---	56.00	11.54	N	11.4



Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Average (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Line	Corr. (dB)
0.202000	---	28.80	53.53	24.73	L1	11.0
0.202000	40.39	---	63.53	23.14	L1	11.0
0.358000	---	32.17	48.77	16.60	L1	11.0
0.358000	38.00	---	58.77	20.77	L1	11.0
0.562000	---	22.85	46.00	23.15	L1	11.1
0.562000	31.55	---	56.00	24.45	L1	11.1
0.910000	---	17.80	46.00	28.20	L1	11.1
0.910000	28.51	---	56.00	27.49	L1	11.1
1.630000	---	21.72	46.00	24.28	L1	11.2
1.630000	32.13	---	56.00	23.87	L1	11.2
10.086000	---	35.19	50.00	14.81	L1	11.4
10.086000	42.90	---	60.00	17.10	L1	11.4

**AC 120V/60 Hz, Neutral**

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Line	Corr. (dB)
0.166000	---	22.20	55.16	32.96	N	11.0
0.166000	33.51	---	65.16	31.65	N	11.0
0.238000	---	28.34	52.17	23.83	N	11.0
0.238000	36.83	---	62.17	25.34	N	11.0
0.402000	---	21.65	47.81	26.16	N	11.0
0.402000	30.48	---	57.81	27.33	N	11.0
0.874000	---	21.57	46.00	24.43	N	11.1
0.874000	29.63	---	56.00	26.37	N	11.1
1.646000	---	16.53	46.00	29.47	N	11.2
1.646000	27.05	---	56.00	28.95	N	11.2
10.402000	---	31.54	50.00	18.46	N	11.4
10.402000	39.01	---	60.00	20.99	N	11.4

**Note:**

- 1) Corr.=LISN VDF (Voltage Division Factor) + Cable Loss
- 2) Corrected Amplitude = Reading + Corr.
- 3) Margin = Limit –Corrected Amplitude

## FCC §15.109 - RADIATED SPURIOUS EMISSIONS

### Applicable Standard

FCC §15.109

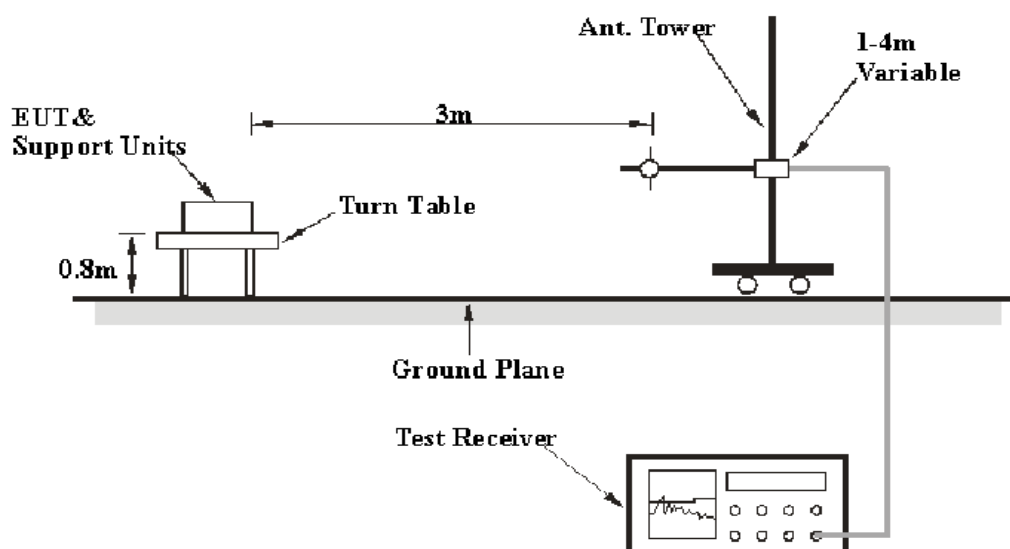
### Measurement Uncertainty

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 CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Kunshan) is shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report

Frequency	Polarity	Measurement uncertainty
30 MHz~200 MHz	Horizontal	4.62 dB (k=2, 95% level of confidence)
	Vertical	4.54 dB (k=2, 95% level of confidence)
200 MHz~1 GHz	Horizontal	4.84 dB (k=2, 95% level of confidence)
	Vertical	5.91 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	Horizontal/Vertical	4.68 dB (k=2, 95% level of confidence)
Above 6 GHz	Horizontal/Vertical	4.92 dB (k=2, 95% level of confidence)

### EUT Setup



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 host PC/Adapter was 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:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

### Test Procedure

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 detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sonoma Instrunent	Amplifier	330	171377	2014-09-16	2015-09-16
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2014-09-16	2015-09-16
Sunol Sciences	Broadband Antenna	JB3	A090314-1	2014.09.12	2015-09-12
ETS	Horn Antenna	3115	6229	2014.09.12	2015-09-12
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2014.09.16	2015-09-16
Mini	Pre-amplifier	ZVA-183-S+	857001418	2014-09-16	2015-09-16
champrotek	Chamber	Chamber A	1#	2014-09-17	2015-09-17
R&S	Auto test Software	EMC32	V 09.10.0	-	-

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## Correction Factor & Margin Calculation

The Correction Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

$$\text{Correction Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 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 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:

**9.21 dB at 44.79 MHz in the Vertical polarization mode**

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL,  $U_{(Lm)}$  is less than  $U_{cispr}$ , if  $L_m$  is less than  $L_{lim}$ , it implies that the EUT complies with the limit.

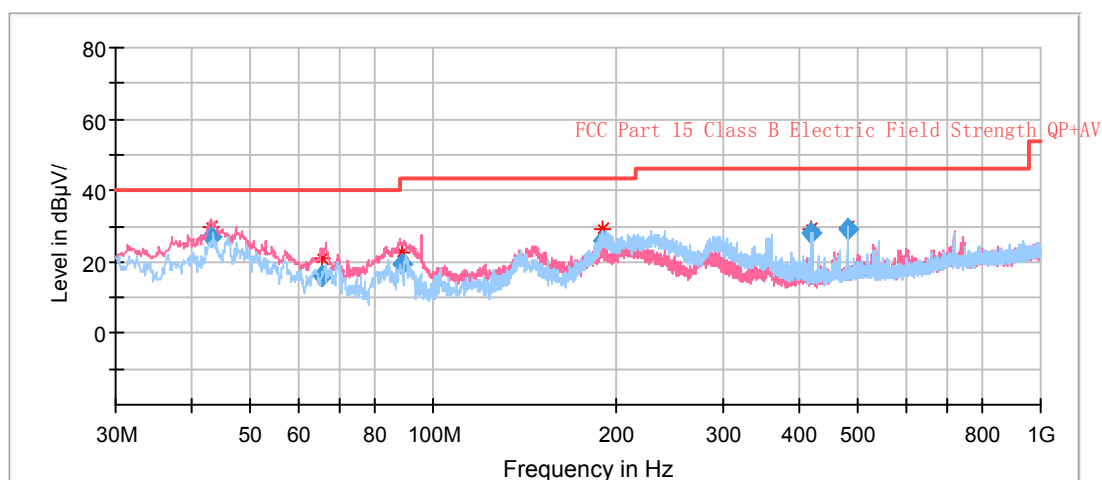
## Test Data

### Environmental Conditions

<b>Temperature:</b>	27 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

The testing was performed by Matt.yao on 2015-7-6

EUT Operation Mode: Downloading





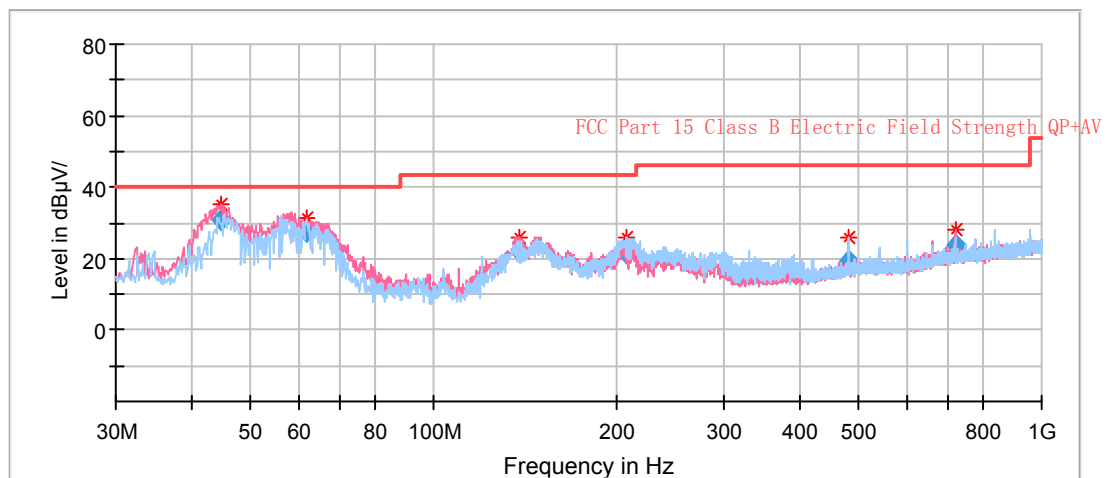
**30MHz ~ 1GHz**

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
43.161850	27.15	40.00	12.85	100.0	V	115.0	-12.2
65.622900	16.18	40.00	23.82	100.0	V	307.0	-16.9
88.756100	19.50	43.50	24.00	100.0	V	31.0	-17.1
190.003250	25.96	43.50	17.54	100.0	H	201.0	-12.1
419.980800	28.16	46.00	17.84	100.0	H	342.0	-7.8
479.982800	29.09	46.00	16.91	100.0	H	76.0	-6.0

**1GHz~8GHz**

Frequency (MHz)	MaxPeak (dB $\mu$ V/m)	Average (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1609.018036	26.39	---	73.90	47.51	100.0	V	316.0	-0.2
1609.018036	---	12.29	53.90	41.61	100.0	V	316.0	-0.2
2813.907815	---	19.70	53.90	34.20	100.0	V	268.0	5.3
2813.907815	33.11	---	73.90	40.79	100.0	V	268.0	5.3
4978.236473	38.43	---	73.90	35.47	100.0	V	107.0	11.9
4978.236473	---	24.37	53.90	29.53	100.0	V	107.0	11.9
5926.452905	45.35	---	73.90	28.55	100.0	V	127.0	14.8
5926.452905	---	31.48	53.90	22.42	100.0	V	127.0	14.8
6638.236473	48.41	---	73.90	25.49	100.0	H	27.0	16.0
6638.236473	---	35.56	53.90	18.34	100.0	H	27.0	16.0
6992.585170	---	35.34	53.90	18.56	200.0	V	58.0	16.8
6992.585170	48.76	---	73.90	25.14	200.0	V	58.0	16.8

EUT Operation Mode: Charging



30MHz ~ 1GHz

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
44.792500	30.79	40.00	9.21	100.0	V	63.0	-13.2
61.767500	27.61	40.00	12.39	100.0	V	30.0	-16.7
138.155000	22.03	43.50	21.47	100.0	V	115.0	-12.1
207.267500	21.51	43.50	21.99	200.0	H	288.0	-12.3
480.080000	19.60	46.00	26.40	100.0	H	52.0	-6.0
720.033750	23.67	46.00	22.33	100.0	V	222.0	-2.1

1GHz~8GHz

Frequency (MHz)	MaxPeak (dB $\mu$ V/m)	Average (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1774.709418	27.88	---	73.90	46.02	101.0	V	141.0	0.9
1774.709418	---	13.42	53.90	40.48	101.0	V	141.0	0.9
2804.609218	---	18.72	53.90	35.18	200.0	H	82.0	5.2
2804.609218	32.82	---	73.90	41.08	200.0	H	82.0	5.2
3438.036073	33.55	---	73.90	40.35	101.0	H	142.0	7.8
3438.036073	---	19.14	53.90	34.76	101.0	H	142.0	7.8
4272.545090	---	23.19	53.90	30.71	200.0	H	89.0	10.7
4272.545090	37.94	---	73.90	35.96	200.0	H	89.0	10.7
5237.675351	39.23	---	73.90	34.67	101.0	V	72.0	12.4
5237.675351	---	24.92	53.90	28.98	101.0	V	72.0	12.4

6633.226453	48.45	---	73.90	25.45	101.0	H	1.0	16.0
6633.226453	---	35.05	53.90	18.85	101.0	H	1.0	16.0

Note:

- 1) Correction Factor=Antenna factor (RX) + cable loss – amplifier factor
- 2) Margin = Limit - Limit – Corrected Amplitude

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