

# FCC PART 15B, CLASS B TEST REPORT

For

**TRULY Semiconductors Ltd.**

North of Dong Chong Road, Truly Industrial Area, Shanwei, China

**FCC ID: OORZTONE-2W0003**

|                                                   |                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Report Type:</b><br>Class II Permissive Change | <b>Product Type:</b><br>Class B Personal Computer Peripheral                                                                                                                                                                                                                                |
| <b>Test Engineer:</b> Scott Lee                   | <i>Scott Lee</i>                                                                                                                                                                                                                                                                            |
| <b>Report Number:</b> RSZ150521B831-00            |                                                                                                                                                                                                                                                                                             |
| <b>Report Date:</b> 2015-05-28                    |                                                                                                                                                                                                                                                                                             |
| <b>Reviewed By:</b> RF Engineer                   | <i>Jimmy Xiao</i>                                                                                                                                                                                                                                                                           |
| <b>Prepared By:</b>                               | Bay Area Compliance Laboratories Corp. (Shenzhen)<br>6/F, the 3rd Phase of WanLi Industrial Building<br>ShiHua Road, FuTian Free Trade Zone<br>Shenzhen, Guangdong, China<br>Tel: +86-755-33320018<br>Fax: +86-755-33320008<br><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.....                                  | 5         |
| 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>12</b> |
| APPLICABLE STANDARD .....                                | 12        |
| MEASUREMENT UNCERTAINTY.....                             | 12        |
| EUT SETUP .....                                          | 12        |
| EMI TEST RECEIVER SETUP.....                             | 13        |
| TEST PROCEDURE .....                                     | 13        |
| TEST EQUIPMENT LIST AND DETAILS.....                     | 13        |
| CORRECTED AMPLITUDE & MARGIN CALCULATION .....           | 14        |
| TEST RESULTS SUMMARY .....                               | 14        |
| TEST DATA .....                                          | 14        |

## GENERAL INFORMATION

---

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

The *TRULY Semiconductors Ltd.*'s product, model number: *OEL2W0003-V1-E (FCC ID: OORZTONE-2W0003)* or the "EUT" in this report was a *Enterprise Zone Trusted Information Channel (Product Type: Class B Personal Computer Peripheral)*, which was measured approximately: 8.271 mm (L) × 3.391 mm (W) × 1.450 mm (H), rated input voltage: DC 5.0V from USB cable. The highest operating frequency is 84 MHz.

*\*All measurement and test data in this report was gathered from production sample serial number: 1505211 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2015-05-21.*

### Objective

This test report is prepared on behalf of *TRULY Semiconductors 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 15B, Class B.

This is the CIIPC application of the device. The difference between the original device and the current one is as follows:

1. Microcontroller has updated from "AT32UC3A3256S-CTUT" to "AT32UC3A3256S-CTUT SL940".
2. Crystal (12Mhz) has updated from "CX5032-12M-10-12050Q-50-TR" to "XTL571100-F98-020".
3. Crystal (32.768Khz) has updated from "XTL731-S999-291" to "XTL721-S999-286".
4. Level translator IC has updated from "ST2349AQTR" to "LSF0204RUTR".

For the changes made to the device, all the test items were performed.

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

No Related Submittal(s) /Grant(s).

### Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on 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.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

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

EUT operation mode: Lighting & Reading Card (data transfer with computer)

### EUT Exercise Software

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

### Special Accessories

No special accessory.

### Equipment Modifications

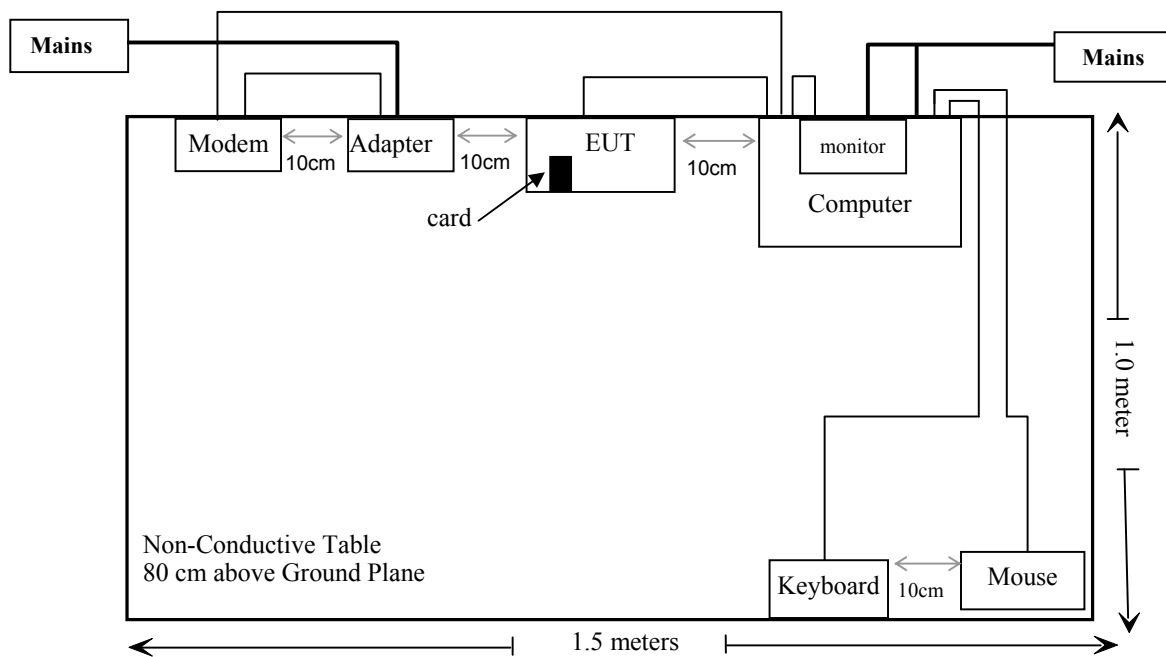
No modification was made to the EUT tested.

### Support Equipment List and Details

| Manufacturer | Description | Model          | Serial Number |
|--------------|-------------|----------------|---------------|
| DELL         | computer    | DCSCSF         | LE513565      |
| DELL         | monitor     | 225MS          | GB337         |
| DELL         | monitor     | E178FPc        | N51X2462      |
| DELL         | computer    | D11M           | NS2564813     |
| Microsoft    | Keyboard    | X823093-002    | 0200706128743 |
| Microsoft    | Mouse       | 2SJ-00004      | 0204608267209 |
| Longway      | Modem       | N/A            | LW157621      |
| Longway      | Adapter     | TYP60-1207000Z | LW516654      |
| N/A          | Card        | N/A            | N/A           |

**External I/O Cable**

| Cable Description                | Length (m) | From/Port | To       |
|----------------------------------|------------|-----------|----------|
| Shielded detachable RS232 cable  | 1.0        | computer  | modem    |
| shielded detachable VGA cable    | 1.0        | computer  | monitor  |
| Un-shield Un-detachable DC cable | 0.5        | Adapter   | modem    |
| Shielded Un-detachable USB cable | 1.2        | keyboard  | computer |
| Shielded Un-detachable USB cable | 1.2        | mouse     | computer |
| Un-shielded detachable AC cable  | 1.2        | monitor   | mains    |
| Un-shielded detachable AC cable  | 1.2        | computer  | mains    |
| Shielded detachable USB cable    | 1.0        | EUT       | computer |
| Un-shielded detachable AC cable  | 1.0        | Adapter   | mains    |

**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

### Applicable Standard

According to FCC §15.107

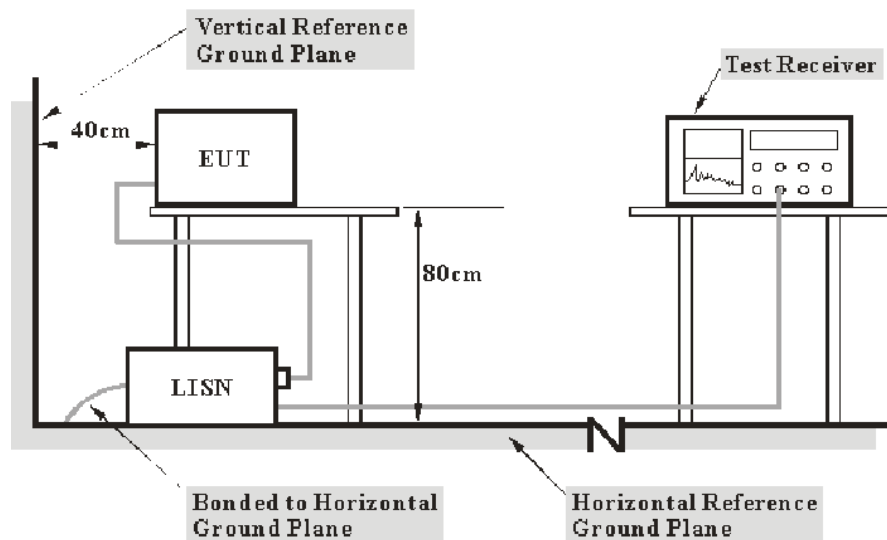
### Measurement Uncertainty

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. (Shenzhen) 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 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.

Final 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  | 100176        | 2014-06-03       | 2015-06-03           |
| Rohde & Schwarz | LISN              | ESH2-Z5 | 892107/021    | 2014-06-09       | 2015-06-09           |
| Rohde & Schwarz | Transient Limiter | ESH3Z2  | DE25985       | 2015-05-14       | 2016-05-14           |
| R&S             | L.I.S.N           | ESH3-Z5 | 100113        | NCR              | NCR                  |
| Rohde & Schwarz | CE Test software  | EMC 32  | V8.53         | NCR              | NCR                  |

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) 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:

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

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 recorded data in following table, the EUT complied with the FCC Part 15.107, the worst margin reading as below:

**6.4 at 8.849190 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

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

In BACL.,  $U_{(L_m)}$  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

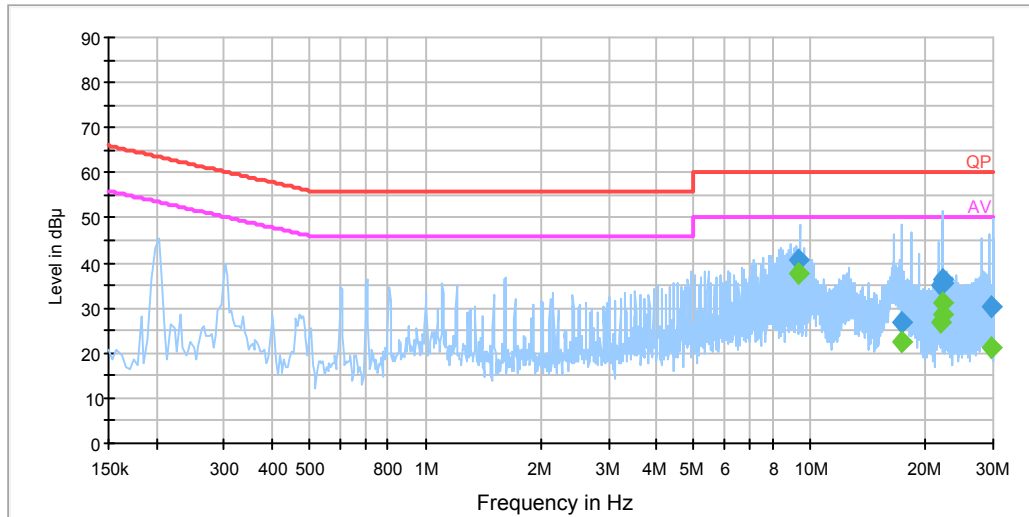
|                    |           |
|--------------------|-----------|
| Temperature:       | 22 °C     |
| Relative Humidity: | 47 %      |
| ATM Pressure:      | 101.0 kPa |

*The testing was performed by Scott Lee on 2015-05-28.*

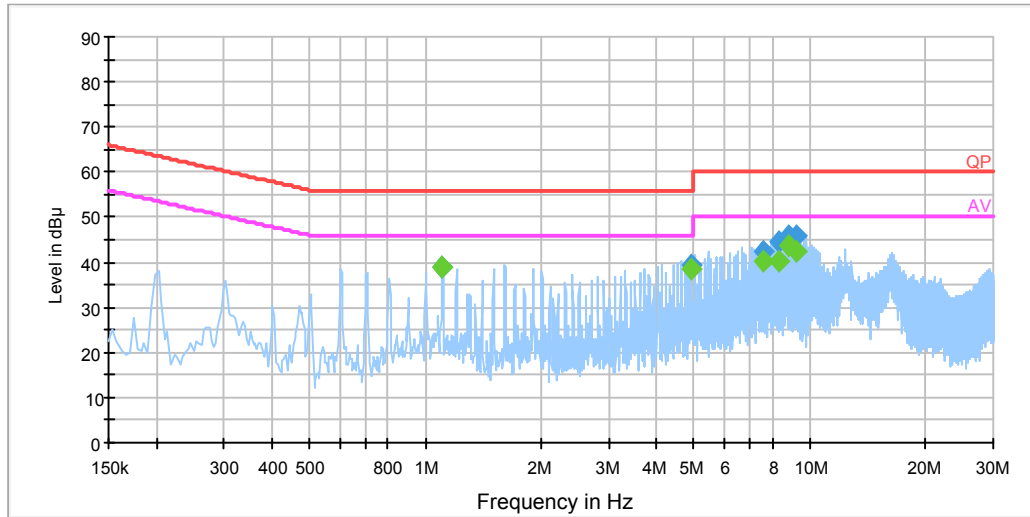
EUT Operation Mode: Lighting

### AC 120V/60 Hz, Line

EMI Auto Test L



| Frequency (MHz) | Corrected Amplitude (dBμV) | Correction Factor (dB) | Limit (dBμV) | Margin (dB) | Detector (PK/Ave./QP) |
|-----------------|----------------------------|------------------------|--------------|-------------|-----------------------|
| 9.357090        | 40.5                       | 20.1                   | 60.0         | 19.5        | QP                    |
| 9.357090        | 37.6                       | 20.1                   | 50.0         | 12.4        | Ave.                  |
| 17.401210       | 26.9                       | 20.1                   | 60.0         | 33.1        | QP                    |
| 17.401210       | 22.6                       | 20.1                   | 50.0         | 27.4        | Ave.                  |
| 21.834590       | 34.9                       | 20.1                   | 60.0         | 25.1        | QP                    |
| 21.834590       | 27.0                       | 20.1                   | 50.0         | 23.0        | Ave.                  |
| 22.130290       | 36.3                       | 20.1                   | 60.0         | 23.7        | QP                    |
| 22.130290       | 31.3                       | 20.1                   | 50.0         | 18.7        | Ave.                  |
| 22.134710       | 35.6                       | 20.1                   | 60.0         | 24.4        | QP                    |
| 22.134710       | 28.6                       | 20.1                   | 50.0         | 21.4        | Ave.                  |
| 29.553110       | 30.4                       | 20.2                   | 60.0         | 29.6        | QP                    |
| 29.553110       | 21.3                       | 20.2                   | 50.0         | 28.7        | Ave.                  |

**AC 120V/60 Hz, Neutral****EMI Auto Test N**

| Frequency (MHz) | Corrected Amplitude (dBμV) | Correction Factor (dB) | Limit (dBμV) | Margin (dB) | Detector (PK/Ave./QP) |
|-----------------|----------------------------|------------------------|--------------|-------------|-----------------------|
| 1.105410        | 38.9                       | 20.0                   | 56.0         | 17.1        | QP                    |
| 1.105410        | 39.1                       | 20.0                   | 46.0         | 6.9         | Ave.                  |
| 4.928110        | 39.5                       | 20.0                   | 56.0         | 16.5        | QP                    |
| 4.928110        | 38.5                       | 20.0                   | 46.0         | 7.5         | Ave.                  |
| 7.542430        | 42.5                       | 20.1                   | 60.0         | 17.5        | QP                    |
| 7.542430        | 40.2                       | 20.1                   | 50.0         | 9.8         | Ave.                  |
| 8.344810        | 44.6                       | 20.1                   | 60.0         | 15.4        | QP                    |
| 8.344810        | 40.3                       | 20.1                   | 50.0         | 9.7         | Ave.                  |
| 8.849190        | 45.9                       | 20.1                   | 60.0         | 14.1        | QP                    |
| 8.849190        | 43.6                       | 20.1                   | 50.0         | 6.4         | Ave.                  |
| 9.249690        | 45.9                       | 20.1                   | 60.0         | 14.1        | QP                    |
| 9.249690        | 42.6                       | 20.1                   | 50.0         | 7.4         | Ave.                  |

**Note:**

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

**FCC §15.109 - RADIATED SPURIOUS EMISSIONS****Applicable Standard**

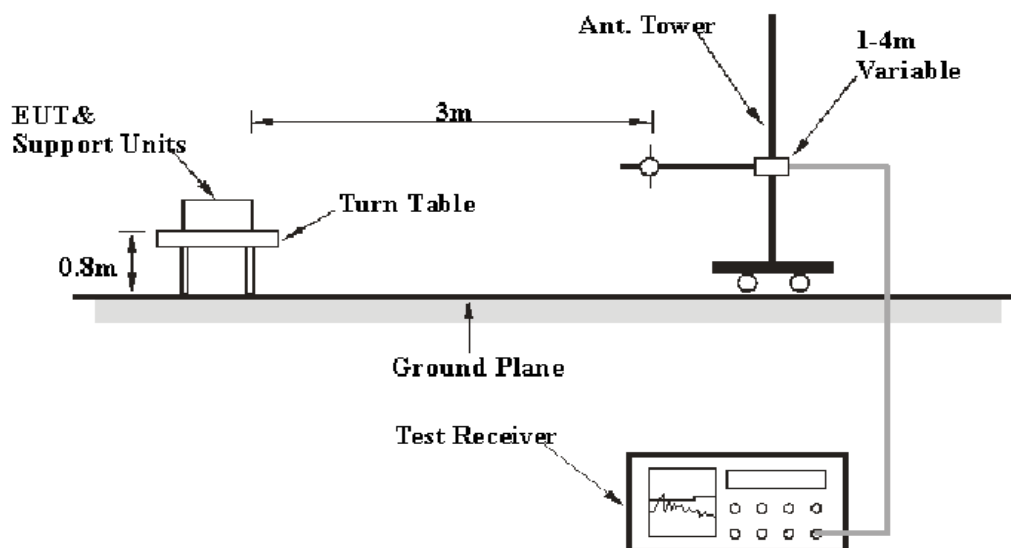
FCC §15.109

**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. (Shenzhen) 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 was connected to a 120 VAC/60 Hz power source.

### EMI Test Receiver Setup

The system was investigated from 30 MHz to 1 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       |

### Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final 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 |
|-----------------|--------------------|-----------|---------------|------------------|----------------------|
| HP              | Amplifier          | HP8447E   | 1937A01046    | 2014-09-30       | 2015-09-30           |
| Rohde & Schwarz | EMI Test Receiver  | ESCI      | 101120        | 2014-11-12       | 2015-11-12           |
| Sunol Sciences  | Broadband Antenna  | JB1       | A040904-2     | 2014-12-07       | 2017-12-06           |
| TDK             | Chamber            | Chamber A | 2#            | 2012-10-15       | 2015-10-15           |
| R&S             | Auto test Software | EMC32     | V9.10         | NCR              | NCR                  |

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

## 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 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, the worst margin reading as below:

**10.25 dB at 47.985250 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

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

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

## Test Data

### Environmental Conditions

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 22 °C     |
| <b>Relative Humidity:</b> | 47 %      |
| <b>ATM Pressure:</b>      | 101.0 kPa |

*The testing was performed by Scott Lee on 2015-05-26.*

*EUT Operation Mode: Reading card*

**30 MHz – 1 GHz**

| Frequency<br>(MHz) | Receiver          |                          | Turntable<br>Degree | Rx Antenna    |                | Corrected<br>Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part 15B      |                |
|--------------------|-------------------|--------------------------|---------------------|---------------|----------------|-------------------------------|------------------------------------|-------------------|----------------|
|                    | Reading<br>(dBμV) | Detector<br>(PK/QP/Ave.) |                     | Height<br>(m) | Polar<br>(H/V) |                               |                                    | Limit<br>(dBμV/m) | Margin<br>(dB) |
| 35.900875          | 17.26             | QP                       | 218.0               | 1.2           | V              | -10.8                         | 28.06                              | 40.00             | 11.94          |
| 36.532000          | 14.81             | QP                       | 66.0                | 1.0           | V              | -11.2                         | 26.01                              | 40.00             | 13.99          |
| 47.985250          | 11.15             | QP                       | 26.0                | 1.0           | V              | -18.6                         | 29.75                              | 40.00             | 10.25          |
| 53.591125          | 4.31              | QP                       | 17.0                | 1.2           | V              | -20.1                         | 24.41                              | 40.00             | 15.59          |
| 526.262375         | 15.20             | QP                       | 15.0                | 1.1           | V              | -8.5                          | 23.70                              | 46.00             | 22.30          |
| 799.670000         | 31.06             | QP                       | 115.0               | 1.2           | V              | -4.3                          | 35.36                              | 46.00             | 10.64          |

Note:

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

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