



## FCC PART 15 B TEST REPORT

For

### Shenzhen KVD Communication Equipment

Lenovo R&D Center 2F-B, South First Road, High-tech Park, Nanshan District, Shenzhen China

**FCC ID: 2ADTE-SHOOT2**

|                                                     |                                                                                                                                                                                                                                                 |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Report Type:</b><br>Original Report              | <b>Product Name:</b><br>Mobile phone                                                                                                                                                                                                            |
| <b>Test Engineer:</b> <u>Tom Tang</u>               | <i>Tom Tang</i>                                                                                                                                                                                                                                 |
| <b>Report Number:</b> <u>RDG170316801A</u>          |                                                                                                                                                                                                                                                 |
| <b>Report Date:</b> <u>2017-04-12</u>               |                                                                                                                                                                                                                                                 |
| <b>Reviewed By:</b> <u>Henry Ding</u><br>EMC Leader | <i>Henry Ding</i>                                                                                                                                                                                                                               |
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## GENERAL INFORMATION

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

The **Shenzhen KVD Communication Equipment**'s product, model number: **SHOOT 2 (FCC ID: 2ADTE-SHOOT2)** (the "EUT") in this report was a **Mobile phone**, which was measured approximately: 12.5 cm (L) × 6.4 cm (W) × 0.9 cm (H), rated input voltage: DC3.8V rechargeable Li-ion battery or DC5V from adapter. The highest operating frequency is 2480 MHz.

Switching Adapter information:

Model: HJ-0501000E1-US

Input: 100-240V~50/60Hz 0.2A

Output: DC 5V, 1000mA

*\*All measurement and test data in this report was gathered from final production sample, serial number: 170316801 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-03-16, and EUT conformed to test requirement.*

### Objective

This test report is prepared on behalf of **Shenzhen KVD Communication Equipment** in accordance with Part 2, Subpart J, and Part 15-Subparts A and B of the Federal Communications Commission's rules.

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

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

FCC Part 15C DSS submissions with FCC ID: 2ADTE-SHOOT2.

FCC Part 22H, 24E PCE submissions with FCC ID: 2ADTE-SHOOT2.

FCC Part 15C DTS submissions with FCC ID: 2ADTE-SHOOT2.

## Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2014, 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.

The uncertainty of conducted disturbance at mains port is  $\pm 3.17$  dB, the uncertainty of any radiation on emissions measurement is:

30M~200MHz:  $\pm 4.7$  dB;

200M~1GHz:  $\pm 6.0$  dB;

1G~6GHz:  $\pm 5.13$  dB;

6G~25GHz:  $\pm 5.47$  dB;

And the uncertainty will not be taken into consideration for all test data recorded in the report.

## Test Facility

The test site used by BACL to collect test data is located in the No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, China.

Test site at BACL 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 April 24, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332. 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

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### Description of Test Configuration

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

### EUT Exercise Software

The software "winthrax.exe" was used during test.

### Equipment Modifications

No modification was made to the EUT tested.

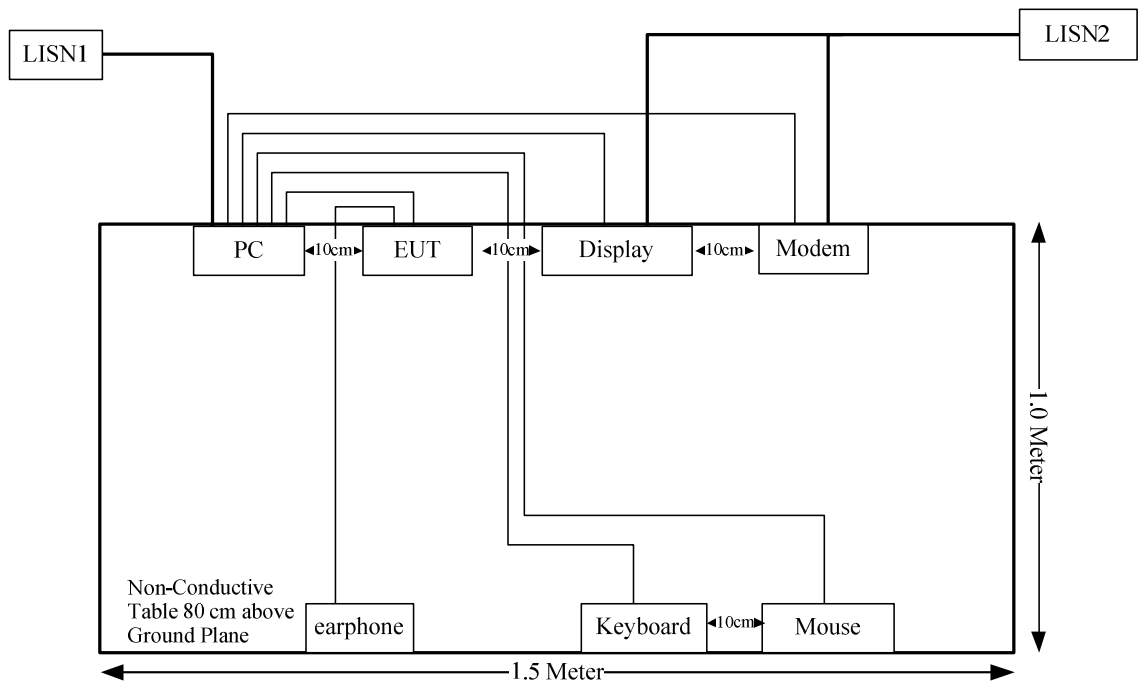
### Local Support Equipment List and Details

| Manufacturer | Description | Model     | Serial Number     |
|--------------|-------------|-----------|-------------------|
| IBM          | PC          | 8176      | 99Y7315           |
| DELL         | Display     | E157FPC   | 060229-11         |
| ANTER        | Modem       | EGW802    | 0508350054-1B     |
| Lenovo       | Keyboard    | KB-US19EB | IMHYX011071016460 |
| Lenovo       | Mouse       | MO-5013U  | IMJS011041409259  |

### Support Cable List and Details

| Cable Description | Shielding Type | Ferrite Core | Length (m) | From Port         | To       |
|-------------------|----------------|--------------|------------|-------------------|----------|
| Serial Cable      | yes            | No           | 1.6        | Serial Port of PC | Modem    |
| Mouse Cable       | yes            | No           | 1.4        | USB Port of PC    | Mouse    |
| USB Cable         | no             | no           | 1.0        | USB Port of PC    | EUT      |
| Keyboard Cable    | yes            | No           | 1.3        | USB Port of PC    | Keyboard |
| Earphone Cable    | no             | No           | 1.2        | Audio Port of EUT | Earphone |
| VGA Cable         | yes            | yes          | 1.5        | VGA port of PC    | Display  |

Configuration of Test Setup



## SUMMARY OF TEST RESULTS

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| FCC Rules | Description of Test | Results    |
|-----------|---------------------|------------|
| §15.107   | Conducted Emissions | Compliance |
| §15.109   | Radiated Emissions  | Compliance |





The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15 B 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 adapter was connected to a 120V/60Hz AC 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 | ESCS 30 | 836858/0016   | 2016-12-02       | 2017-12-01           |
| Rohde & Schwarz | L.I.S.N.          | ENV216  | 100018        | 2016-12-02       | 2017-12-01           |
| N/A             | Conducted Cable   | NO.5    | N/A           | 2016-11-10       | 2017-11-09           |
| Rohde & Schwarz | PULSE LIMITER     | ESH3Z2  | DE14781       | 2016-10-31       | 2017-10-30           |
| R&S             | Test Software     | EMC32   | Version8.53.0 | N/A              | N/A                  |

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Procedure

During the conducted emission test, the PC was connected to the outlet of the first LISN and the other support equipments were connected to the outlet of 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.

### Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

Herein,

$V_C$ : corrected voltage amplitude

$V_R$ : reading voltage amplitude

$A_C$ : attenuation caused by cable loss

VDF: voltage division factor of AMN or ISN

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

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

## Test Data

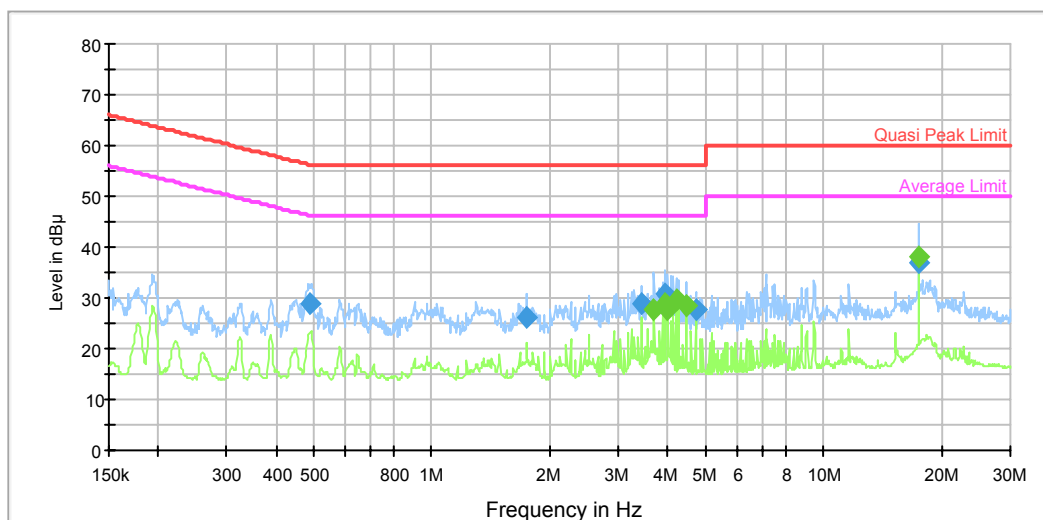
### Environmental Conditions

|                    |          |
|--------------------|----------|
| Temperature:       | 18.6 °C  |
| Relative Humidity: | 54 %     |
| ATM Pressure:      | 95.6 kPa |

*The testing was performed by Tom Tang on 2017-04-11.*

Test Mode: Downloading

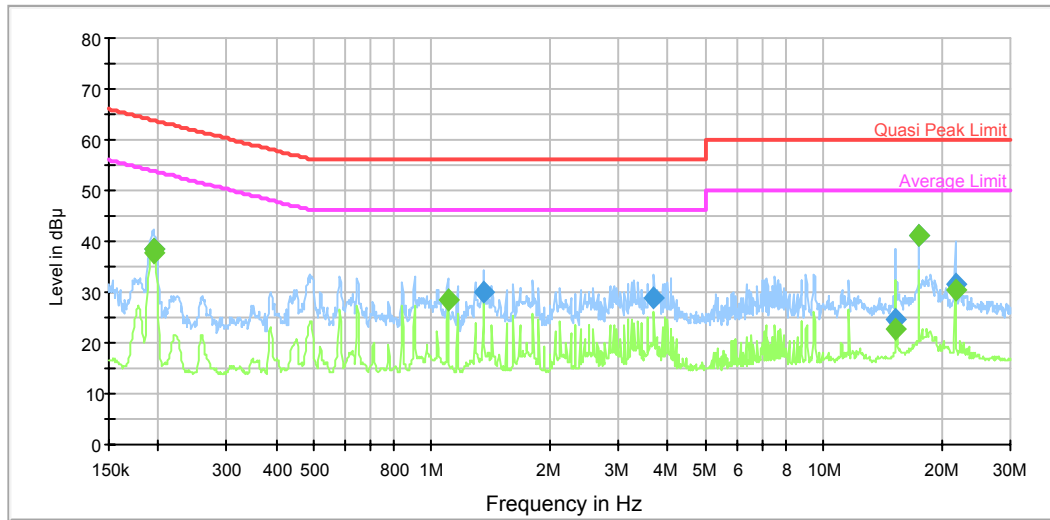
AC120V, 60Hz, Line:



| Frequency (MHz) | QuasiPeak (dBμV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment    |
|-----------------|------------------|-----------------|------|------------|-------------|--------------|------------|
| 0.490913        | 28.7             | 9.000           | L1   | 19.6       | 27.5        | 56.2         | Compliance |
| 1.747129        | 26.1             | 9.000           | L1   | 19.7       | 29.9        | 56.0         | Compliance |
| 3.430223        | 29.0             | 9.000           | L1   | 19.7       | 27.0        | 56.0         | Compliance |
| 3.944594        | 30.9             | 9.000           | L1   | 19.7       | 25.1        | 56.0         | Compliance |
| 4.720841        | 27.6             | 9.000           | L1   | 19.7       | 28.4        | 56.0         | Compliance |
| 17.485466       | 37.0             | 9.000           | L1   | 19.9       | 23.0        | 60.0         | Compliance |

| Frequency (MHz) | Average (dBμV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment    |
|-----------------|----------------|-----------------|------|------------|-------------|--------------|------------|
| 3.685778        | 27.8           | 9.000           | L1   | 19.7       | 18.2        | 46.0         | Compliance |
| 3.944594        | 28.7           | 9.000           | L1   | 19.7       | 17.3        | 46.0         | Compliance |
| 4.008087        | 27.6           | 9.000           | L1   | 19.7       | 18.4        | 46.0         | Compliance |
| 4.204765        | 29.7           | 9.000           | L1   | 19.7       | 16.3        | 46.0         | Compliance |
| 4.464239        | 28.3           | 9.000           | L1   | 19.7       | 17.7        | 46.0         | Compliance |
| 17.485466       | 38.2           | 9.000           | L1   | 19.9       | 11.8        | 50.0         | Compliance |

**AC120V, 60Hz, Neutral:**



| Frequency (MHz) | QuasiPeak (dB $\mu$ V) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dB $\mu$ V) | Comment    |
|-----------------|------------------------|-----------------|------|------------|-------------|--------------------|------------|
| 0.194439        | 38.6                   | 9.000           | N    | 19.7       | 25.2        | 63.8               | Compliance |
| 1.358629        | 30.1                   | 9.000           | N    | 19.7       | 25.9        | 56.0               | Compliance |
| 3.685778        | 29.0                   | 9.000           | N    | 19.7       | 27.0        | 56.0               | Compliance |
| 15.266201       | 24.5                   | 9.000           | N    | 20.1       | 35.5        | 60.0               | Compliance |
| 17.485466       | 41.3                   | 9.000           | N    | 20.1       | 18.7        | 60.0               | Compliance |
| 21.691906       | 31.7                   | 9.000           | N    | 20.1       | 28.3        | 60.0               | Compliance |

| Frequency (MHz) | Average (dB $\mu$ V) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dB $\mu$ V) | Comment    |
|-----------------|----------------------|-----------------|------|------------|-------------|--------------------|------------|
| 0.194439        | 38.4                 | 9.000           | N    | 19.7       | 15.4        | 53.8               | Compliance |
| 0.195997        | 37.5                 | 9.000           | N    | 19.7       | 16.2        | 53.8               | Compliance |
| 1.099548        | 28.5                 | 9.000           | N    | 19.7       | 17.5        | 46.0               | Compliance |
| 15.266201       | 22.5                 | 9.000           | N    | 20.1       | 27.5        | 50.0               | Compliance |
| 17.485466       | 41.3                 | 9.000           | N    | 20.1       | 8.7         | 50.0               | Compliance |
| 21.691906       | 30.2                 | 9.000           | N    | 20.1       | 19.8        | 50.0               | Compliance |

## FCC §15.109 - RADIATED SPURIOUS EMISSIONS

### Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If  $U_{lab}$  is less than or equal to  $U_{cispr}$  of Table 2 then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If  $U_{lab}$  is greater than  $U_{cispr}$  of Table 2, then:

- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.

Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Chengdu) is:

30M~200MHz:  $\pm 4.7$  dB;

200M~1GHz:  $\pm 6.0$  dB;

1G~6GHz:  $\pm 5.13$  dB;

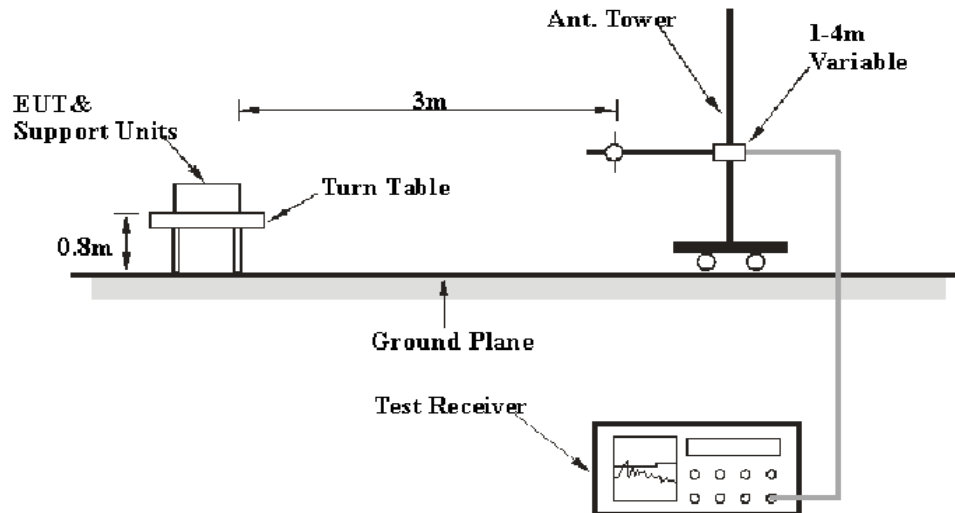
6G~25GHz:  $\pm 5.47$  dB;

Table 2 – Values of  $U_{cispr}$

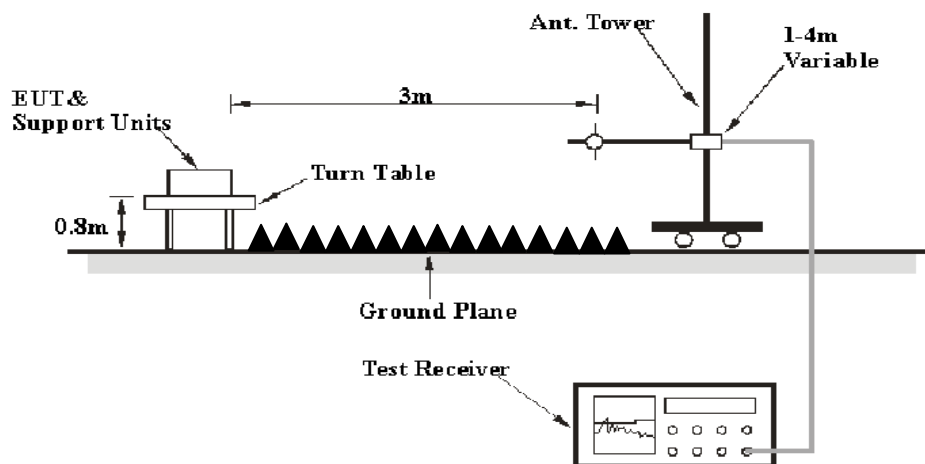
| Measurement                                                           |                      | $U_{cispr}$ |
|-----------------------------------------------------------------------|----------------------|-------------|
| Radiated disturbance (electric field strength at an OATS or in a SAC) | (30 MHz to 1000 MHz) | 6.3 dB      |
| Radiated disturbance (electric field strength in a FAR)               | (1 GHz to 6 GHz)     | 5.2 dB      |
| Radiated disturbance (electric field strength in a FAR)               | (6 GHz to 18 GHz)    | 5.5 dB      |

## EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed at the 3 meters distance in chamber, using the setup accordance with the ANSI C63.4-2014. The specification used was the FCC Part 15.109 Class B limits.

## EMI Test Receiver Setup

The system was investigated from 30 MHz to 13.0 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 | 120 kHz | 300 kHz   | 120 kHz | QP       |
| Above 1 GHz       | 1 MHz   | 3 MHz     | /       | Peak     |
|                   | 1 MHz   | 10 Hz     | /       | AVG      |

## Test Procedure

During the radiated emissions, the PC was connected to the first AC floor outlet and the other support equipments were connected to the second AC floor outlet.

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

The data was recorded in the Quasi-peak detection mode for below 1 GHz, peak and average detection mode above 1 GHz.

## Test Equipment List and Details

| Manufacturer    | Description           | Model      | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|-----------------------|------------|---------------|------------------|----------------------|
| Agilent         | Amplifier             | 8447D      | 2944A10442    | 2016-12-02       | 2017-12-01           |
| Rohde & Schwarz | EMI Test Receiver     | ESCI       | 100028        | 2016-12-02       | 2017-12-01           |
| Sunol Sciences  | Broadband Antenna     | JB3        | A121808       | 2016-04-10       | 2019-04-09           |
| Rohde & Schwarz | Spectrum Analyzer     | FSEM30     | 100018        | 2016-12-02       | 2017-12-01           |
| ETS             | Horn Antenna          | 3115       | 003-6076      | 2016-12-02       | 2017-12-01           |
| Mini-circuits   | Amplifier             | ZVA-183-S+ | 771001215     | 2016-05-20       | 2017-05-19           |
| EMCT            | Semi-Anechoic Chamber | 966        | N/A           | 2015-04-24       | 2018-04-23           |
| N/A             | RF Cable (below 1GHz) | NO.1       | N/A           | 2016-11-10       | 2017-11-09           |
| N/A             | RF Cable (below 1GHz) | NO.4       | N/A           | 2016-11-10       | 2017-11-09           |
| N/A             | RF Cable (above 1GHz) | NO.2       | N/A           | 2016-11-10       | 2017-11-09           |

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## 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 Data

### Environmental Conditions

|                           |          |
|---------------------------|----------|
| <b>Temperature:</b>       | 18.6 °C  |
| <b>Relative Humidity:</b> | 54 %     |
| <b>ATM Pressure:</b>      | 95.6 kPa |

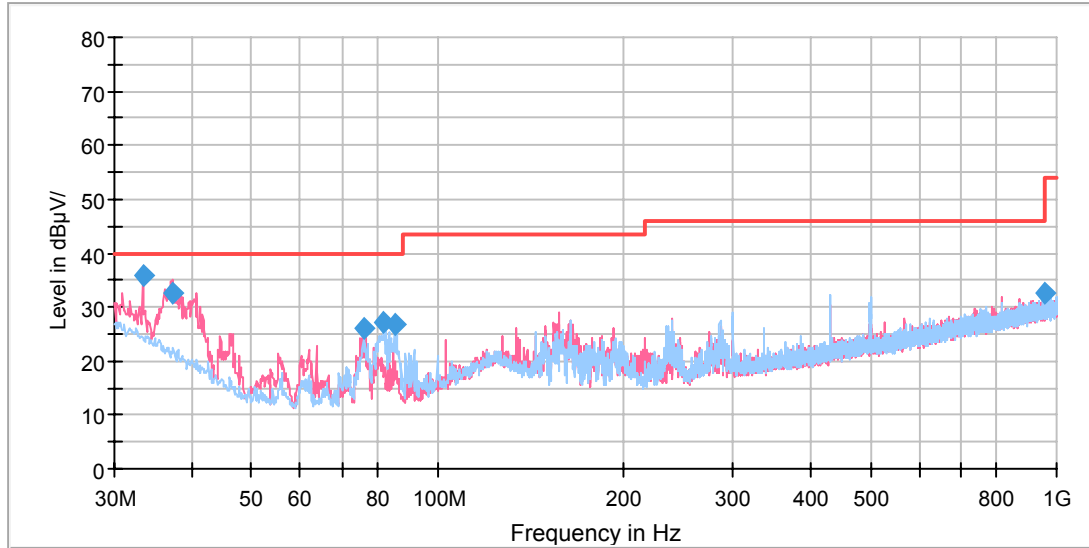
*\* The testing was performed by Tom Tang on 2017-04-11.*

*Test Result: Compliance*



Test Mode: Downloading

1) Below 1GHz:



| Frequency (MHz) | QuasiPeak (dBμV/m) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBμV/m) |
|-----------------|--------------------|-------------|--------------|---------------|------------|-------------|----------------|
| 33.395000       | 35.8               | 200.0       | V            | 308.0         | -1.1       | 4.2         | 40.0           |
| 37.275000       | 32.5               | 115.0       | V            | 284.0         | -4.2       | 7.5         | 40.0           |
| 75.953750       | 26.2               | 100.0       | V            | 178.0         | -13.3      | 13.8        | 40.0           |
| 81.895000       | 27.3               | 200.0       | H            | 60.0          | -12.8      | 12.7        | 40.0           |
| 85.047500       | 26.7               | 220.0       | H            | 95.0          | -12.8      | 13.3        | 40.0           |
| 958.290000      | 32.5               | 200.0       | V            | 264.0         | 5.1        | 13.5        | 46.0           |

2) 1GHz-13GHz:

| Frequency<br>(MHz) | Receiver          |          | Rx Antenna     |                | Cable<br>loss<br>(dB) | Amplifier<br>Gain<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|--------------------|-------------------|----------|----------------|----------------|-----------------------|---------------------------|------------------------------------|-------------------|----------------|
|                    | Reading<br>(dBμV) | Detector | Polar<br>(H/V) | Factor<br>(dB) |                       |                           |                                    |                   |                |
| 1080               | 42.02             | PK       | H              | 23.01          | 2.09                  | 26.73                     | 40.39                              | 74.00             | 33.61          |
| 1080               | 27.28             | AV       | H              | 23.01          | 2.09                  | 26.73                     | 25.65                              | 54.00             | 28.35          |
| 1591               | 41.34             | PK       | H              | 24.25          | 2.74                  | 26.42                     | 41.91                              | 74.00             | 32.09          |
| 1591               | 25.24             | AV       | H              | 24.25          | 2.74                  | 26.42                     | 25.81                              | 54.00             | 28.19          |
| 2393               | 46.06             | PK       | H              | 23.56          | 3.00                  | 26.88                     | 45.74                              | 74.00             | 28.26          |
| 2393               | 26.01             | AV       | H              | 23.56          | 3.00                  | 26.88                     | 25.69                              | 54.00             | 28.31          |
| 1220               | 45.15             | PK       | V              | 23.37          | 2.28                  | 26.60                     | 44.20                              | 74.00             | 29.80          |
| 1220               | 31.8              | AV       | V              | 23.37          | 2.28                  | 26.60                     | 30.85                              | 54.00             | 23.15          |
| 1721               | 55.35             | PK       | V              | 24.45          | 2.84                  | 26.55                     | 56.09                              | 74.00             | 17.91          |
| 1721               | 40.08             | AV       | V              | 24.45          | 2.84                  | 26.55                     | 40.82                              | 54.00             | 13.18          |
| 2182               | 41.72             | PK       | V              | 24.28          | 3.03                  | 26.85                     | 42.18                              | 74.00             | 31.82          |
| 2182               | 27.67             | AV       | V              | 24.28          | 3.03                  | 26.85                     | 28.13                              | 54.00             | 25.87          |

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