

FCC/ISED

EMC

TEST REPORT

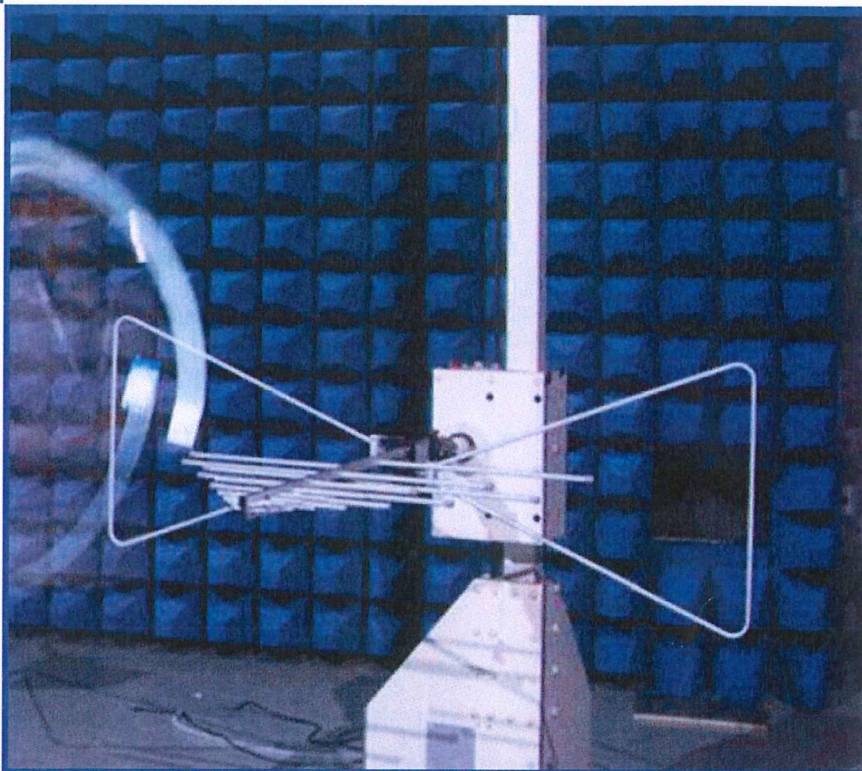
ISSUED BY  
Shenzhen BALUN Technology Co., Ltd.



FOR  
**Rugged Smart Phone**

ISSUED TO  
Shenzhen UniStrong Science & Technology Co., Ltd.

B,4-4Factory, Zhengcheng Road, FuyongBaoan District, Shenzhen,  
China



Tested by:

*Xia Long*  
Xia Long  
(Engineer)

Date

*Nov. 8, 2018*

Approved by:

*Wei Yanquan*  
Wei Yanquan  
(Chief Engineer)

Date

*Nov. 28, 2018*

Report No.: BL-EC18B0146-401

EUT Name: Rugged Smart Phone

Model Name: UT12

Brand Name: UniStrong

Test Standard: 47 CFR Part 15 Subpart B  
ICES-003 (Issue 6, January 2016)

Test Conclusion: Pass

Test Date: Oct. 25, 2018 ~ Nov. 09, 2018

Date of Issue: Nov. 28, 2018

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**Revision History**

| Version        | Issue Date           | Revisions Content                  |
|----------------|----------------------|------------------------------------|
| <u>Rev. 01</u> | <u>Nov. 20, 2018</u> | <u>Initial Issue</u>               |
| <u>Rev. 02</u> | <u>Nov. 28, 2018</u> | <u>Fixed data title on page 28</u> |

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## 1 GENERAL INFORMATION

### 1.1 Identification of the Testing Laboratory

|              |                                                                                                                                 |
|--------------|---------------------------------------------------------------------------------------------------------------------------------|
| Company Name | Shenzhen BALUN Technology Co.,Ltd.                                                                                              |
| Address      | Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China |
| Phone Number | +86 755 6685 0100                                                                                                               |
| Fax Number   | +86 755 6182 4271                                                                                                               |

### 1.2 Identification of the Responsible Testing Location

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Location             | Shenzhen BALUN Technology Co.,Ltd.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Address                   | Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Accreditation Certificate | <p>The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1.</p> <p>The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.</p> <p>The laboratory is a testing organization accredited by American Association for Laboratory Accreditation(A2LA) according to ISO/IEC 17025.The accreditation certificate is 4344.01.</p> <p>The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.</p> |
| Description               | All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

### 1.3 Laboratory Condition

|                           |                    |
|---------------------------|--------------------|
| Ambient Temperature       | 20°C to 25°C       |
| Ambient Relative Humidity | 45% to 55%         |
| Ambient Pressure          | 100 kPa to 102 kPa |

### 1.4 Announce

- (1) The test report refer to the BALUN report mode v6.7.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.
- (6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

## 2 PRODUCT INFORMATION

### 2.1 Applicant Information

|           |                                                                      |
|-----------|----------------------------------------------------------------------|
| Applicant | Shenzhen UniStrong Science & Technology Co.,Ltd.                     |
| Address   | B,4-4Factory, Zhengcheng Road, FuyongBaoan District, Shenzhen, China |

### 2.2 Manufacturer Information

|              |                                                                      |
|--------------|----------------------------------------------------------------------|
| Manufacturer | Shenzhen UniStrong Science & Technology Co.,Ltd.                     |
| Address      | B,4-4Factory, Zhengcheng Road, FuyongBaoan District, Shenzhen, China |

### 2.3 Factory Information

|         |     |
|---------|-----|
| Factory | N/A |
| Address | N/A |

### 2.4 General Description for Equipment under Test (EUT)

|                                           |                    |
|-------------------------------------------|--------------------|
| EUT Name                                  | Rugged Smart Phone |
| Model Name Under Test                     | UT12               |
| Series Model Name                         | N/A                |
| Description of Model name differentiation | N/A                |
| Hardware Version                          | N/A                |
| Software Version                          | N/A                |
| Dimensions (Approx.)                      | N/A                |
| Weight (Approx.)                          | N/A                |

## 2.5 Ancillary Equipment

|                       |                      |                             |
|-----------------------|----------------------|-----------------------------|
| Ancillary Equipment 1 | Battery              |                             |
|                       | Brand Name           | SJYEnergy                   |
|                       | Model No.            | BA7800                      |
|                       | Serial No.           | N/A                         |
|                       | Capacity             | 8000 mAh                    |
|                       | Rated Voltage        | 3.8 V                       |
|                       | Limit Charge Voltage | 4.35 V                      |
| Ancillary Equipment 2 | Adapter              |                             |
|                       | Brand Name           | N/A                         |
|                       | Model No.            | ASUC71W                     |
|                       | Serial No.           | N/A                         |
|                       | Rated Input          | 100-240 V~, 0.7 A, 50/60 Hz |
|                       | Rated Output         | 5 V= 3 A                    |
| Ancillary Equipment 3 | USB Cable            |                             |
|                       | Model No.            | N/A                         |
|                       | Length (Approx.)     | 1 m                         |

## 2.6 Technical Information

|                                   |                                                                                                                                                                                                                                                           |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Network and Wireless connectivity | GSM/GPRS/EGPRS 850/900/1800/1900 MHz;<br>CDMA Band Class 0;<br>EVDO Rel. 0/Rev. A Band Class 0;<br>WCDMA/HSDPA/HSUPA Band 1/2/5/8;<br>LTE FDD Band 1/2/3/4/5/7/8/17/20/28;<br>LTE TDD Band 38/40/41;<br>Bluetooth, WIFI, GPS, GLONASS, NFC, BDS, 5.8G SRD |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 3 SUMMARY OF TEST RESULTS

#### 3.1 Test Standards

| No. | Identity                                          | Document Title                                                                                                                                                      |
|-----|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | FCC 47 CFR Part 15<br>Subpart B (10-1-17 Edition) | Unintentional Radiators                                                                                                                                             |
| 2   | ICES-003 (Issue 6,<br>January 2016)               | Information Technology Equipment (Including Digital Apparatus) — Limits and Methods of Measurement                                                                  |
| 3   | 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 |

#### 3.2 Verdict

| No. | Description                  | FCC Rule | Test Verdict | Result     |
|-----|------------------------------|----------|--------------|------------|
| 1   | Radiated Emission            | 15.109   | Pass         | Annex A .1 |
| 2   | Conducted Emission, AC Ports | 15.107   | Pass         | Annex A .2 |

Note: The only difference between the EUT (test samples in this report) and test sample in report BL-EC17C0360-401, which was issued by Shenzhen BALUN Technology Co., Ltd. on Mar. 20, 2018, is product information. Just changed the information as below:

1. Difference WIFI and 4G antenna;
2. Difference size of shell and appearance;
3. Difference camera;
4. Difference LCD screen;

And others hardware circuit and software were all the same. So just Radiated Emission was retested in this report, Other test items please refer to the BL-EC17C0360-401, which was issued by Shenzhen BALUN Technology Co., Ltd. on Mar. 20, 2018.

#### 3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

| Measurement                        | Value   |
|------------------------------------|---------|
| Conducted emissions (9 kHz-30 MHz) | 3.23 dB |
| Radiated emissions (30 MHz-1 GHz)  | 4.30 dB |
| Radiated emissions (1 GHz-18 GHz)  | 4.81 dB |
| Radiated emissions (18 GHz-40 GHz) | 5.71 dB |

## 4 GENERAL TEST CONFIGURATIONS

### 4.1 Test Environments

| Environment Parameter                           | Selected Values During Tests |                                            |                   |                    |
|-------------------------------------------------|------------------------------|--------------------------------------------|-------------------|--------------------|
|                                                 | Temperature                  | Voltage                                    | Relative Humidity | Ambient Pressure   |
| Normal Temperature,<br>Normal Voltage<br>(NTNV) | 23°C to 25°C                 | AC 120 V/60 Hz<br>or DC 3.7 V from Battery | 50% to 55%        | 100 kPa to 102 kPa |

### 4.2 Test Equipment List

| Radiated Emission Test For Frequency Below 1 GHz |                         |            |            |            |            |                                     |
|--------------------------------------------------|-------------------------|------------|------------|------------|------------|-------------------------------------|
| Description                                      | Manufacturer            | Model      | Serial No. | Cal. Date  | Cal. Due   | Use                                 |
| EMI Receiver                                     | ROHDE&SCHWARZ           | ESRP       | 101036     | 2018.06.13 | 2019.06.12 | <input checked="" type="checkbox"/> |
| Test Antenna-Bi-Log                              | SCHWARZBECK             | VULB 9163  | 9163-977   | 2017.07.22 | 2019.07.21 | <input checked="" type="checkbox"/> |
| Test Antenna-Horn                                | SCHWARZBECK             | BBHA 9120D | 9120D-1600 | 2018.07.11 | 2020.07.10 | <input type="checkbox"/>            |
| Anechoic Chamber                                 | EMC Electronic Co., Ltd | 9m*6m*6m   | N/A        | 2017.02.21 | 2019.02.20 | <input checked="" type="checkbox"/> |
| Test Software                                    | BALUN                   | BL410_E    | V18.626    | --         | --         | <input checked="" type="checkbox"/> |

| Radiated Emission Test For Frequency Above 1 GHz |              |            |            |            |            |                                     |
|--------------------------------------------------|--------------|------------|------------|------------|------------|-------------------------------------|
| Description                                      | Manufacturer | Model      | Serial No. | Cal. Date  | Cal. Due   | Use                                 |
| EMI Receiver                                     | KEYSIGHT     | N9038A     | MY53220118 | 2018.11.07 | 2019.11.06 | <input checked="" type="checkbox"/> |
| Test Antenna-Bi-Log                              | SCHWARZBECK  | VULB 9163  | 9163-624   | 2017.07.22 | 2019.07.21 | <input type="checkbox"/>            |
| Test Antenna-Horn                                | SCHWARZBECK  | BBHA 9120D | 9120D-1148 | 2018.07.11 | 2020.07.10 | <input checked="" type="checkbox"/> |
| Anechoic Chamber                                 | RAINFORD     | 9m*6m*6m   | N/A        | 2017.02.21 | 2019.02.20 | <input checked="" type="checkbox"/> |
| Test Software                                    | BALUN        | BL410_E    | V18.626    | --         | --         | <input checked="" type="checkbox"/> |

| Conducted Emission Test |               |           |            |            |            |                          |
|-------------------------|---------------|-----------|------------|------------|------------|--------------------------|
| Description             | Manufacturer  | Model     | Serial No. | Cal. Date  | Cal. Due   | Use                      |
| EMI Receiver            | ROHDE&SCHWARZ | ESRP      | 101036     | 2018.06.13 | 2019.06.12 | <input type="checkbox"/> |
| LISN                    | SCHWARZBECK   | NSLK 8127 | 8127-687   | 2018.06.13 | 2019.06.12 | <input type="checkbox"/> |
| LISN                    | SCHWARZBECK   | NNLK 8129 | 8129-462   | 2018.11.07 | 2019.11.06 | <input type="checkbox"/> |
| ISN                     | TESEQ         | ISN T800  | 34449      | 2017.12.05 | 2019.12.04 | <input type="checkbox"/> |
| Shielded Enclosure      | ChangNing     | CN-130701 | 130703     | N/A        | N/A        | <input type="checkbox"/> |
| Test Software           | BALUN         | BL410_E   | V18.626    | --         | --         | <input type="checkbox"/> |



### 4.3 Test Enclosure list

| Description                         | Manufacturer | Model        | Serial No.             | Length | Description         | Use                                 |
|-------------------------------------|--------------|--------------|------------------------|--------|---------------------|-------------------------------------|
| PC                                  | N/A          | N/A          | N/A                    | N/A    | Special Handled     | <input type="checkbox"/>            |
| Laptop                              | Apple        | A1465        | N/A                    | N/A    | N/A                 | <input checked="" type="checkbox"/> |
| Printer                             | HP           | DESKJET 1000 | N/A                    | N/A    | N/A                 | <input type="checkbox"/>            |
| Keyboard                            | Logitech     | Y-BP62a      | N/A                    | N/A    | N/A                 | <input type="checkbox"/>            |
| Mouse                               | Logitech     | M100         | N/A                    | N/A    | N/A                 | <input type="checkbox"/>            |
| USB disk                            | Kingston     | N/A          | N/A                    | N/A    | N/A                 | <input type="checkbox"/>            |
| TF Card                             | Kingston     | N/A          | N/A                    | N/A    | N/A                 | <input checked="" type="checkbox"/> |
| VGA Cable                           | N/A          | N/A          | N/A                    | 1.5 m  | Shielded with core  | <input type="checkbox"/>            |
| HDMI Cable                          | N/A          | N/A          | N/A                    | 1.5 m  | Shielded with core  | <input type="checkbox"/>            |
| DVI Cable                           | N/A          | N/A          | N/A                    | 1.5 m  | Shielded with core  | <input type="checkbox"/>            |
| Coaxial video cable                 | N/A          | N/A          | N/A                    | 2.0 m  | Shielded with core  | <input type="checkbox"/>            |
| Audio Cable                         | N/A          | N/A          | N/A                    | 0.5 m  | Shielded with core  | <input type="checkbox"/>            |
| iPhone                              | Apple        | A1586        | N/A                    | N/A    | N/A                 | <input type="checkbox"/>            |
| Bluetooth Earphone                  | SAMSUNG      | Gear Circle  | N/A                    | N/A    | N/A                 | <input checked="" type="checkbox"/> |
| Wireless Communications Test Set    | R&S          | CMW500       | 142028                 | N/A    | Cal. Due 2018.06.11 | <input checked="" type="checkbox"/> |
| WIFI Router                         | TP-LINK      | TL-WDR7500   | N/A                    | N/A    | N/A                 | <input checked="" type="checkbox"/> |
| GPS/GLONASS Vector signal generator | R&S          | N5172B EXG   | N/A                    | N/A    | N/A                 | <input checked="" type="checkbox"/> |
| Car Battery                         | Camel        | 55530        | N/A                    | N/A    | 12 V/55 Ah          | <input type="checkbox"/>            |
| Artificial load                     | N/A          | N/A          | N/A                    | N/A    | 2.5 $\Omega$ /100 W | <input type="checkbox"/>            |
| Artificial load                     | N/A          | N/A          | N/A                    | N/A    | 5 $\Omega$ /100 W   | <input type="checkbox"/>            |
| Electronic Load                     | ITECH        | IT8511       | N/A                    | N/A    | N/A                 | <input type="checkbox"/>            |
| USB Cable                           | N/A          | N/A          | N/A                    | 1.5 m  | Shielded with core  | <input type="checkbox"/>            |
| DC Power Supply                     | ITECH        | IT6863A      | 60001401068<br>7210006 | N/A    | N/A                 | <input type="checkbox"/>            |
| LCD Monitor                         | SAMSUNG      | UA32C4000P   | N/A                    | N/A    | N/A                 | <input type="checkbox"/>            |
| RJ45 Cable                          | N/A          | N/A          | N/A                    | 1.5 m  | Shielded with core  | <input type="checkbox"/>            |
| IC Card                             | N/A          | N/A          | N/A                    | N/A    | N/A                 | <input checked="" type="checkbox"/> |

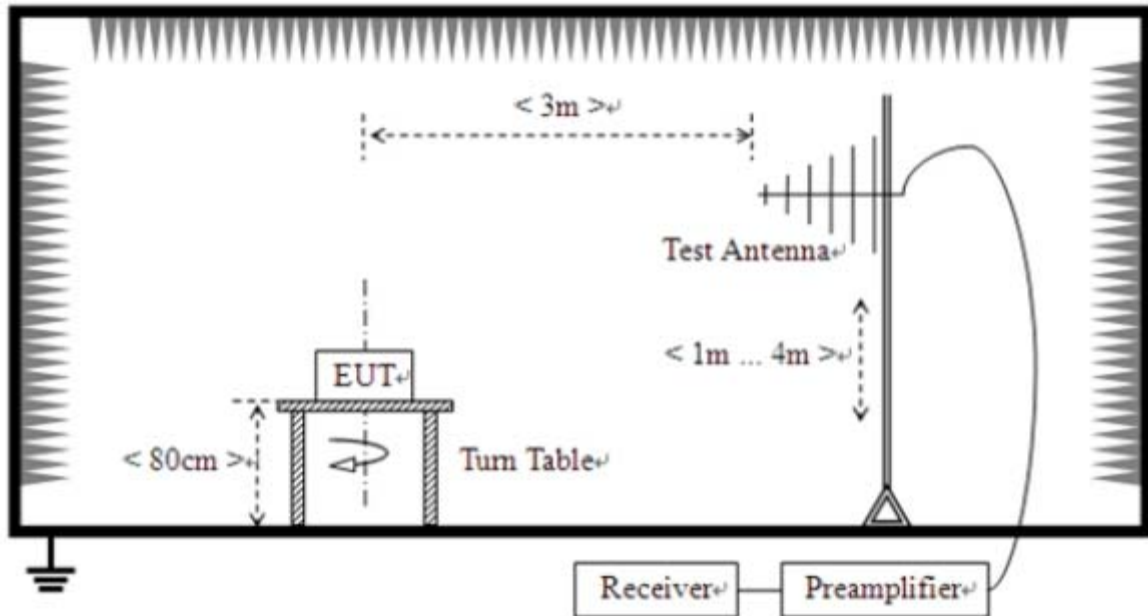
## 4.4 Test Configurations

| Test Configurations (TC) No. | Description                                                                                                                        |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Traffic Test Mode            |                                                                                                                                    |
| TC01                         | <u>The GSM 850 MHz Test Mode</u><br>GSM 850 Link + Adapter + USB Cable + Battery + Bluetooth Link + WIFI Link + GPS RX             |
| TC02                         | <u>The EDGE 850 MHz Test Mode</u><br>EDGE 850 Link + Adapter + USB Cable + Battery + Bluetooth Link + WIFI Link + GLONASS RX       |
| TC03                         | <u>The GSM 1900 Test Mode</u><br>GSM 1900 Link + Adapter + USB Cable + Battery + Bluetooth Link + WIFI Link + GPS RX               |
| TC04                         | <u>The EDGE 1900 MHz Test Mode</u><br>EDGE 1900 Link + Adapter + USB Cable + Battery + Bluetooth Link + WIFI Link + GLONASS RX     |
| TC05                         | <u>The WCDMA Band 2 Test Mode</u><br>WCDMA Band 2 + Adapter + USB Cable + Battery + Bluetooth Link + WIFI Link + GPS RX            |
| TC06                         | <u>The WCDMA Band 5 Test Mode</u><br>WCDMA Band 5 + Adapter + USB Cable + Battery + Bluetooth Link + WIFI Link + GLONASS RX        |
| TC07                         | <u>The CDMA Test Mode</u><br>CDMA + Adapter + USB Cable + Battery + Bluetooth Link + WIFI Link + GPS RX                            |
| TC08                         | <u>The EVDO Test Mode</u><br>EVDO + Adapter + USB Cable + Battery + Bluetooth Link + WIFI Link + GLONASS RX                        |
| TC09                         | <u>The FDD LTE Band 2 Test Mode</u><br>LTE Band 2 Link + Adapter + USB Cable + Battery + Bluetooth Link + WIFI Link + GPS RX       |
| TC10                         | <u>The FDD LTE Band 4 Test Mode</u><br>LTE Band 4 Link + Adapter + USB Cable + Battery + Bluetooth Link + WIFI Link + GLONASS RX   |
| TC11                         | <u>The FDD LTE Band 5 Test Mode</u><br>LTE Band 5 Link + Adapter + USB Cable + Battery + Bluetooth Link + WIFI Link + GPS RX       |
| TC12                         | <u>The FDD LTE Band 7 Test Mode</u><br>LTE Band 7 Link + Adapter + USB Cable + Battery + Bluetooth Link + WIFI Link + GLONASS RX   |
| TC13                         | <u>The FDD LTE Band 17 Test Mode</u><br>LTE Band 17 Link + Adapter + USB Cable + Battery + Bluetooth Link + WIFI Link + GPS RX     |
| TC14                         | <u>The FDD LTE Band 41 Test Mode</u><br>LTE Band 41 Link + Adapter + USB Cable + Battery + Bluetooth Link + WIFI Link + GLONASS RX |
| TC15                         | <u>The BDS Test Mode</u><br>EUT+ Adapter + USB Cable + Battery + BDS RX                                                            |
| TC16                         | <u>The Idle Test Mode</u><br>GSM 850(Idle) + Adapter + Battery + USB Cable                                                         |
| Amusement Test Mode          |                                                                                                                                    |
| TC17                         | <u>The Camera Test Mode</u>                                                                                                        |

|      |                                                                                    |
|------|------------------------------------------------------------------------------------|
|      | EUT + Adapter + USB Cable + Battery + TF Card                                      |
| TC18 | <u>The Video Play Test Mode</u><br>EUT + Adapter + USB Cable + Battery + TF Card   |
| TC19 | <u>The USB Test Mode</u><br>EUT + USB Cable + Battery + Laptop+ TF Card            |
| TC20 | <u>The NFC Test Mode</u><br>EUT + Adapter + Battery + USB Cable+ NFC Link+ IC Card |

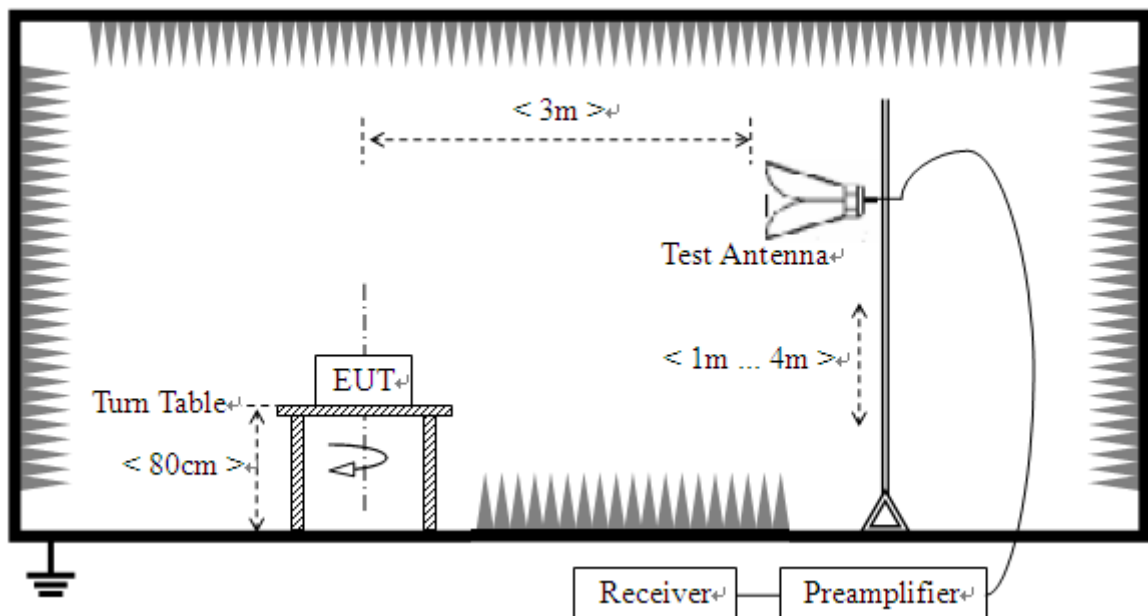
## 4.5 Test Setups

### Test Setup 1



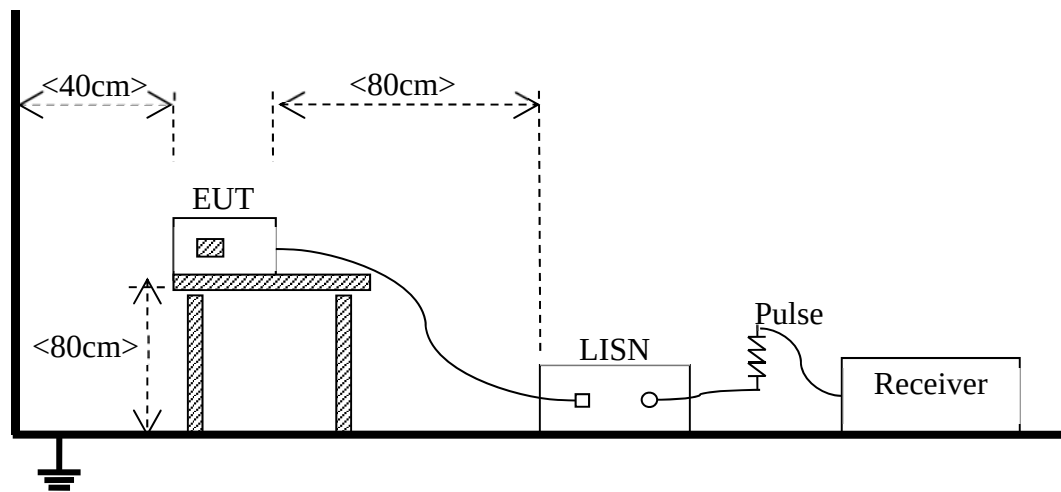
(For Radiated Emission Test (30 MHz-1 GHz))

### Test Setup 2



(For Radiated Emission Test (above 1 GHz))

### Test Setup 3



(For Conducted Emission, AC Ports Test)



## 4.6 Test Conditions

| Test Case                                                                                                                                                                                                                       | Test Conditions    |                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------|
| Radiated Emission                                                                                                                                                                                                               | Test Env.          | NTNV                      |
|                                                                                                                                                                                                                                 | Test Setup         | Test Setup 1&2            |
|                                                                                                                                                                                                                                 | Test Configuration | TC01~TC20 <sup>Note</sup> |
| Note: Based on client request, all normal using modes of the normal function were tested but only the worst test data of the worst mode is reported by this report. The GSM 850 MHz Test Mode is the worst mode in this report. |                    |                           |

## 5 TEST ITEMS

### 5.1 Emission Tests

#### 5.1.1 Radiated Emission

##### 5.1.1.1 Limit

| Frequency range (MHz) | Class B (at 3 m)      |                         | Class B (at 10 m)       | Class A (at 10 m)     |                         |
|-----------------------|-----------------------|-------------------------|-------------------------|-----------------------|-------------------------|
|                       | Field Strength (μV/m) | Field Strength (dBμV/m) | Field Strength (dBμV/m) | Field Strength (μV/m) | Field Strength (dBμV/m) |
| 30 - 88               | 100                   | 40                      | 30                      | 90                    | 39                      |
| 88 - 216              | 150                   | 43.5                    | 33.5                    | 150                   | 43.5                    |
| 216 - 960             | 200                   | 46                      | 36                      | 210                   | 46.4                    |
| Above 960             | 500                   | 54                      | 44                      | 300                   | 49.5                    |

NOTE:

- 1) Field Strength (dBμV/m) =  $20 \cdot \log$  [Field Strength (μV/m)].
- 2) In the emission tables above, the tighter limit applies at the band edges.
- 3) The limits using ANSI C63.4.

##### 5.1.1.2 Test Setup

Refer to 4.5 section (test setup 1 to test setup 2) for radiated emission test, the photo of test setup please refer to ANNEX B.

##### 5.1.1.3 Test Procedure

The test employing the methods of measurement described in the publication referenced in Section 3(b) (ANSI C63.4);

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

##### 5.1.1.4 Test Result

Please refer to ANNEX A.1.

NOTE:

1. Results (dBuV/m) = Reading (dBuV) + Factor (dB/m)

The reading level is calculated by software which is not shown in the sheet

2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain (dB)

3. Over limit = Results – Limit.

## 5.1.2 Conducted Emission

### 5.1.2.1 Test Limit

| Frequency range (MHz) | Class A           |                |
|-----------------------|-------------------|----------------|
|                       | Quasi-peak (dBμV) | Average (dBμV) |
| 0.15 - 0.50           | 79                | 66             |
| 0.50 - 30             | 73                | 60             |

| Frequency range (MHz) | Class B           |                |
|-----------------------|-------------------|----------------|
|                       | Quasi-peak (dBμV) | Average (dBμV) |
| 0.15 - 0.50           | 66 to 56          | 56 to 46       |
| 0.50 - 5              | 56                | 46             |
| 5 - 30                | 60                | 50             |

#### NOTE:

- 1) The lower limit shall apply at the band edges.
- 2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

### 5.1.2.2 Test Setup

Refer to 4.5 section test (test setup 3) for conducted emission, the photo of test setup please refer to ANNEX B.

### 5.1.2.3 Test Procedure

The EUT is connected to the power mains through a LISN which provides 50 Ω/50 μH of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30 MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

### 5.1.2.4 Test Result

Please refer to ANNEX A.2.

#### NOTE:

1. Results (dBuV/m) = Reading (dBuV) + Factor (dB/m)

The reading level is calculated by software which is not shown in the sheet

2. Factor = Insertion loss + Cable loss

3. Over limit = Results – Limit.

## ANNEX A TEST RESULTS

### A.1 Radiated Emission

Note 1: The symbol of “--” in the table which means not application.

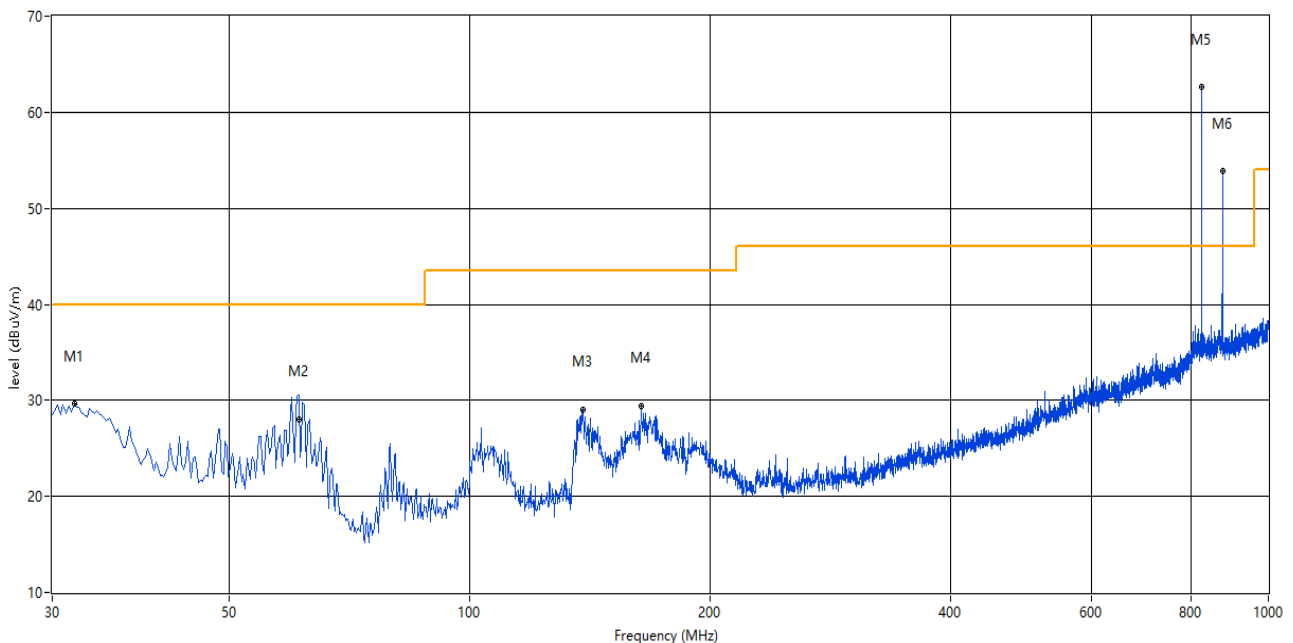
Note 2: For the test data above 1 GHz, according the ANSI C63.4-2014, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note 3: This frequency which near 850 MHz with circle should be ignored because they are MS and SS carrier frequency, the marked spikes near 2400 MHz with circle should be ignored because they are Bluetooth or WIFI carrier frequency.

#### Test Data and Plots

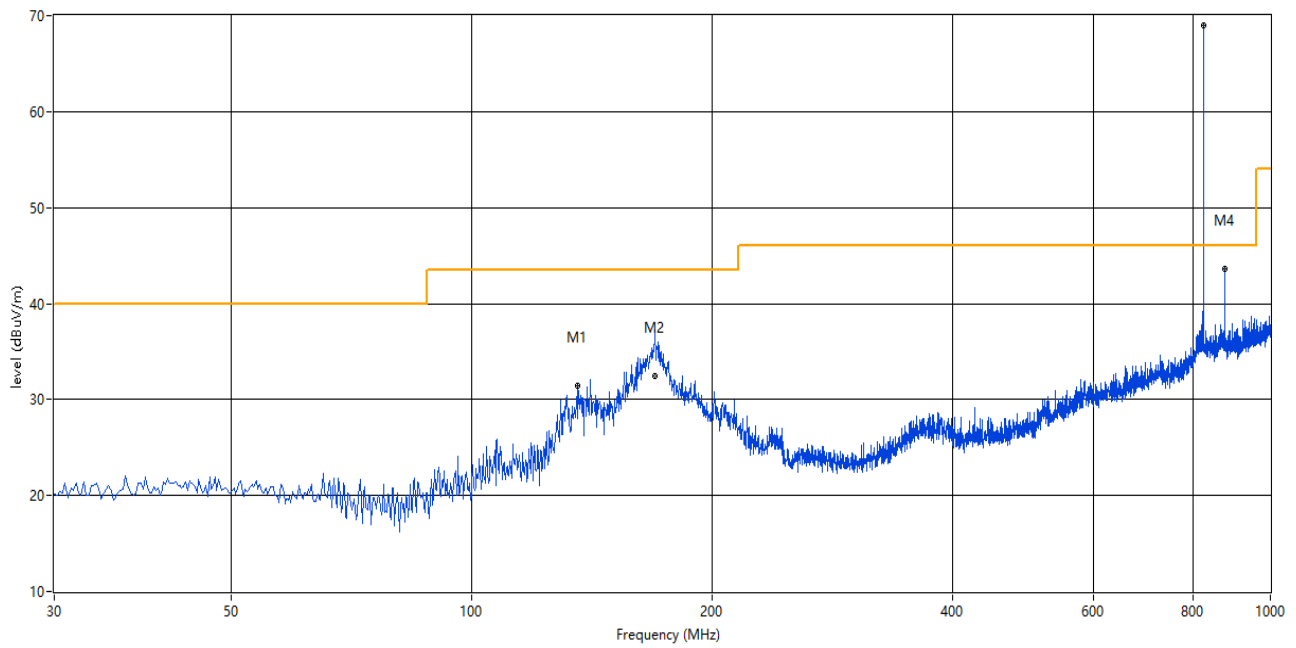
##### The GSM 850 MHz Test Mode

##### A.1.1 Test Antenna Vertical, 30 MHz – 1 GHz



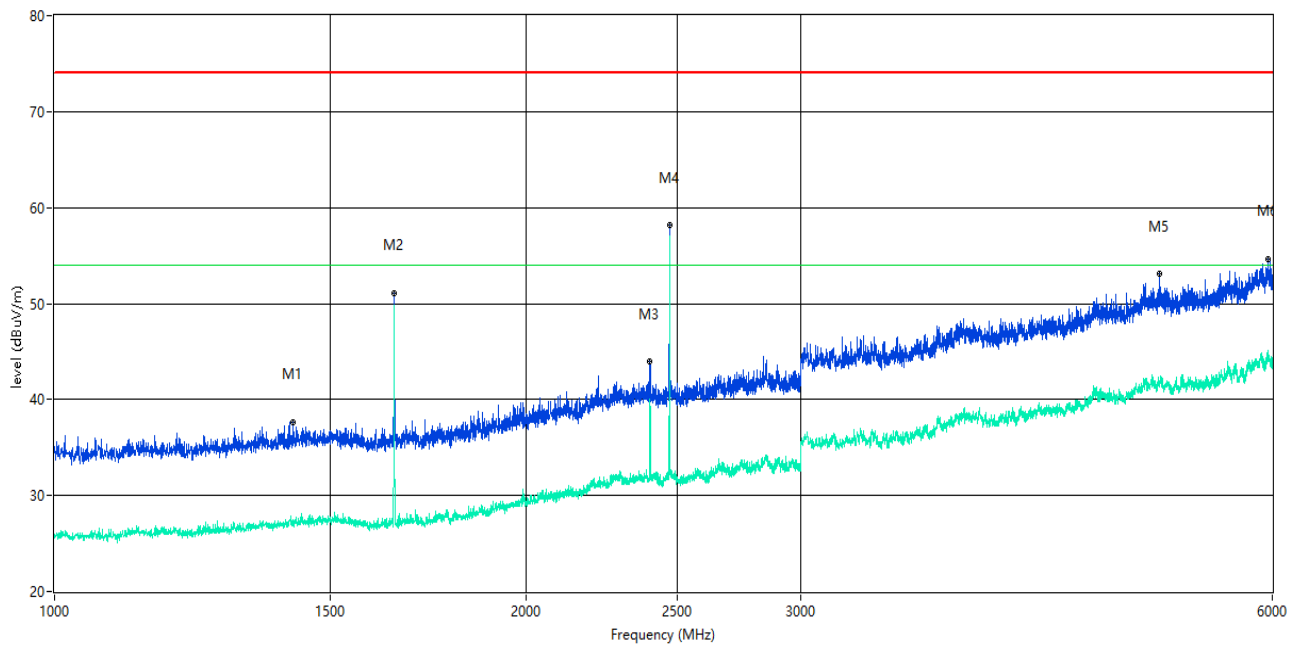
| Frequency<br>(MHz) | Peak<br>Level<br>(dBuV/m) | Q-peak<br>Level<br>(dBuV/m) | Average<br>Level<br>(dBuV/m) | Factor<br>(dB) | PK Limit<br>(dBuV/m) | QP Limit<br>(dBuV/m) | AV Limit<br>(dBuV/m) | Margin<br>(dB) | Table (o) | Height<br>(cm) | ANT      | Verdict |
|--------------------|---------------------------|-----------------------------|------------------------------|----------------|----------------------|----------------------|----------------------|----------------|-----------|----------------|----------|---------|
| 31.940             | 29.61                     | --                          | --                           | -28.85         | --                   | 40.0                 | --                   | 10.39          | 360.00    | 200            | Vertical | Pass    |
| 61.032             | 30.52                     | 28.07                       | --                           | -28.23         | --                   | 40.0                 | --                   | 11.93          | 360.00    | 200            | Vertical | Pass    |
| 138.613            | 29.04                     | --                          | --                           | -31.76         | --                   | 43.5                 | --                   | 14.46          | 360.00    | 200            | Vertical | Pass    |
| 163.827            | 29.47                     | --                          | --                           | -30.92         | --                   | 43.5                 | --                   | 14.03          | 111.70    | 200            | Vertical | Pass    |
| 823.989            | 62.69                     | --                          | --                           | -13.10         | --                   | 46.0                 | --                   | -16.69         | 270.40    | 100            | Vertical | N.A     |
| 875.871            | 53.87                     | --                          | --                           | -13.29         | --                   | 46.0                 | --                   | -7.87          | 141.00    | 100            | Vertical | N.A     |

## A.1.2 Test Antenna Horizontal, 30 MHz – 1 GHz



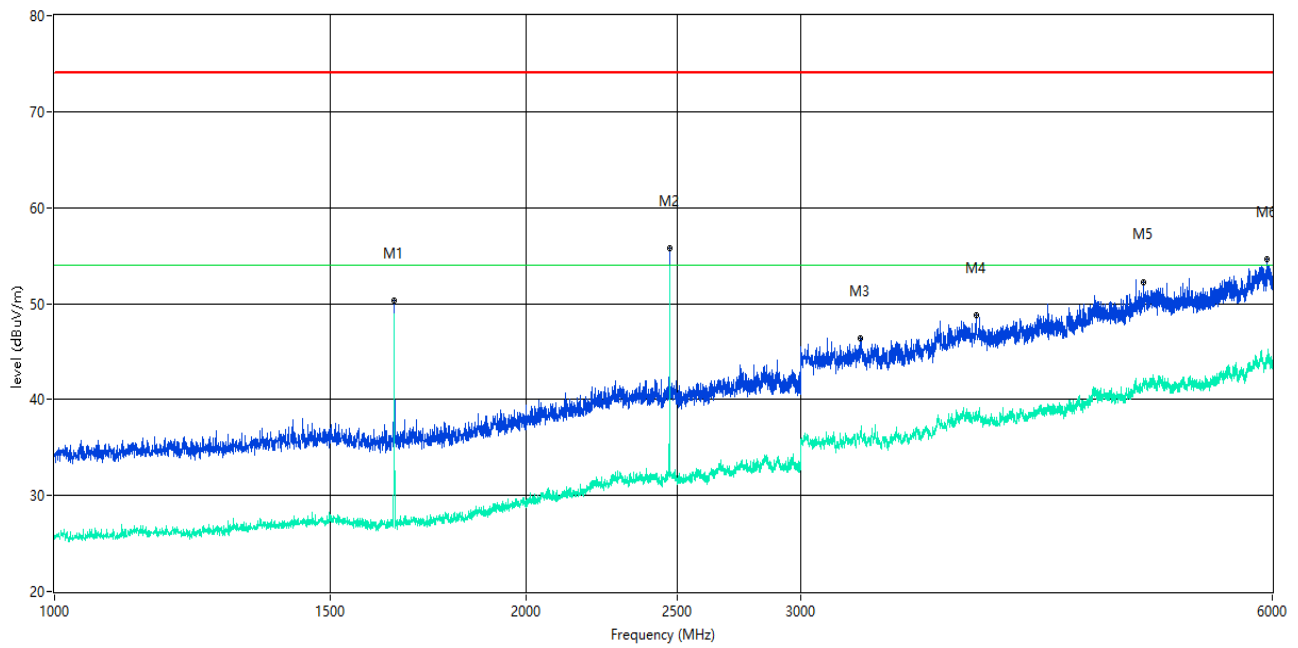
| Frequency<br>(MHz) | Peak<br>Level<br>(dBuV/m) | Q-peak<br>Level<br>(dBuV/m) | Average<br>Level<br>(dBuV/m) | Factor<br>(dB) | PK Limit<br>(dBuV/m) | QP Limit<br>(dBuV/m) | AV Limit<br>(dBuV/m) | Margin<br>(dB) | Table (o) | Height<br>(cm) | ANT        | Verdict |
|--------------------|---------------------------|-----------------------------|------------------------------|----------------|----------------------|----------------------|----------------------|----------------|-----------|----------------|------------|---------|
| 135.461            | 31.47                     | --                          | --                           | -31.60         | --                   | 43.5                 | --                   | 12.03          | 30.20     | 200            | Horizontal | Pass    |
| 169.668            | 36.64                     | 32.43                       | --                           | -30.83         | --                   | 43.5                 | --                   | 11.07          | 54.20     | 163            | Horizontal | Pass    |
| 823.989            | 68.99                     | --                          | --                           | -13.10         | --                   | 46.0                 | --                   | -22.99         | 311.80    | 100            | Horizontal | N.A     |
| 875.871            | 43.63                     | --                          | --                           | -13.29         | --                   | 46.0                 | --                   | 2.37           | 336.00    | 100            | Horizontal | N.A     |

### A.1.3 Test Antenna Vertical, 1 GHz – 6 GHz



| Frequency<br>(MHz) | Peak<br>Level<br>(dBuV/m) | Q-peak<br>Level<br>(dBuV/m) | Average<br>Level<br>(dBuV/m) | Factor<br>(dB) | PK Limit<br>(dBuV/m) | QP Limit<br>(dBuV/m) | AV Limit<br>(dBuV/m) | Margin<br>(dB) | Table (o) | Height<br>(cm) | ANT      | Verdict |
|--------------------|---------------------------|-----------------------------|------------------------------|----------------|----------------------|----------------------|----------------------|----------------|-----------|----------------|----------|---------|
| 1420.895           | 37.67                     | --                          | 27.2                         | -14.76         | 74.0                 | --                   | 54.0                 | 26.80          | 309.40    | 100            | Vertical | Pass    |
| 1648.338           | 51.11                     | --                          | 49.5                         | -14.76         | 74.0                 | --                   | 54.0                 | 4.50           | 3.20      | 100            | Vertical | N/A     |
| 2401.650           | 43.96                     | --                          | 40.0                         | -9.07          | 74.0                 | --                   | 54.0                 | 14.00          | 318.30    | 100            | Vertical | N/A     |
| 2472.132           | 58.17                     | --                          | 57.0                         | -8.83          | 74.0                 | --                   | 54.0                 | -3.00          | 309.40    | 100            | Vertical | N/A     |
| 5085.979           | 53.07                     | --                          | 41.7                         | 1.36           | 74.0                 | --                   | 54.0                 | 12.30          | 62.60     | 100            | Vertical | Pass    |
| 5958.010           | 54.66                     | --                          | 44.6                         | 4.56           | 74.0                 | --                   | 54.0                 | 9.40           | 298.10    | 100            | Vertical | Pass    |

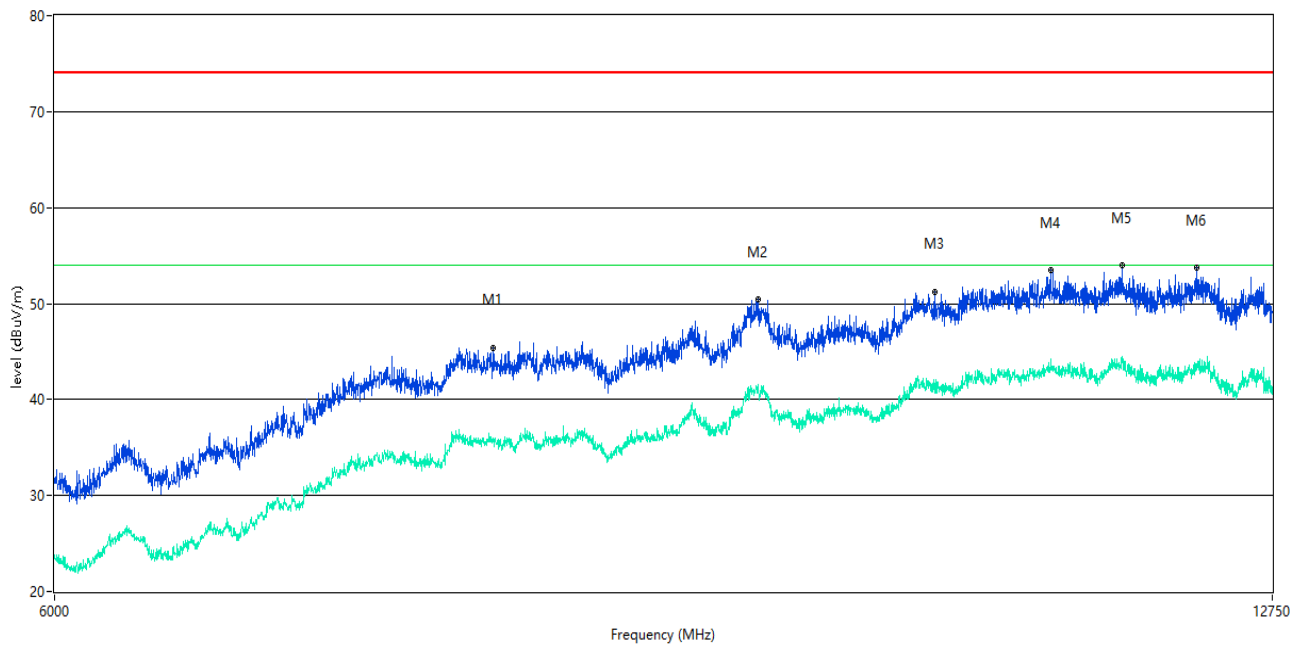
#### A.1.4 Test Antenna Horizontal, 1 GHz – 6 GHz



| Frequency<br>(MHz) | Peak<br>Level<br>(dBuV/m) | Q-peak<br>Level<br>(dBuV/m) | Average<br>Level<br>(dBuV/m) | Factor<br>(dB) | PK Limit<br>(dBuV/m) | QP Limit<br>(dBuV/m) | AV Limit<br>(dBuV/m) | Margin<br>(dB) | Table (o) | Height<br>(cm) | ANT        | Verdict |
|--------------------|---------------------------|-----------------------------|------------------------------|----------------|----------------------|----------------------|----------------------|----------------|-----------|----------------|------------|---------|
| 1648.338           | 50.27                     | --                          | 48.9                         | -14.76         | 74.0                 | --                   | 54.0                 | 5.10           | 107.20    | 100            | Horizontal | N/A     |
| 2472.632           | 50.05                     | --                          | 48.2                         | -8.81          | 74.0                 | --                   | 54.0                 | 5.80           | 15.30     | 100            | Horizontal | N/A     |
| 3272.932           | 46.36                     | --                          | 36.6                         | -3.85          | 74.0                 | --                   | 54.0                 | 17.40          | 238.30    | 100            | Horizontal | Pass    |
| 3879.530           | 48.77                     | --                          | 38.7                         | -2.95          | 74.0                 | --                   | 54.0                 | 15.30          | 266.00    | 100            | Horizontal | Pass    |
| 4966.758           | 52.24                     | --                          | 41.4                         | 1.27           | 74.0                 | --                   | 54.0                 | 12.60          | 231.40    | 100            | Horizontal | Pass    |
| 5955.761           | 54.59                     | --                          | 44.4                         | 4.10           | 74.0                 | --                   | 54.0                 | 9.60           | 119.70    | 100            | Horizontal | Pass    |

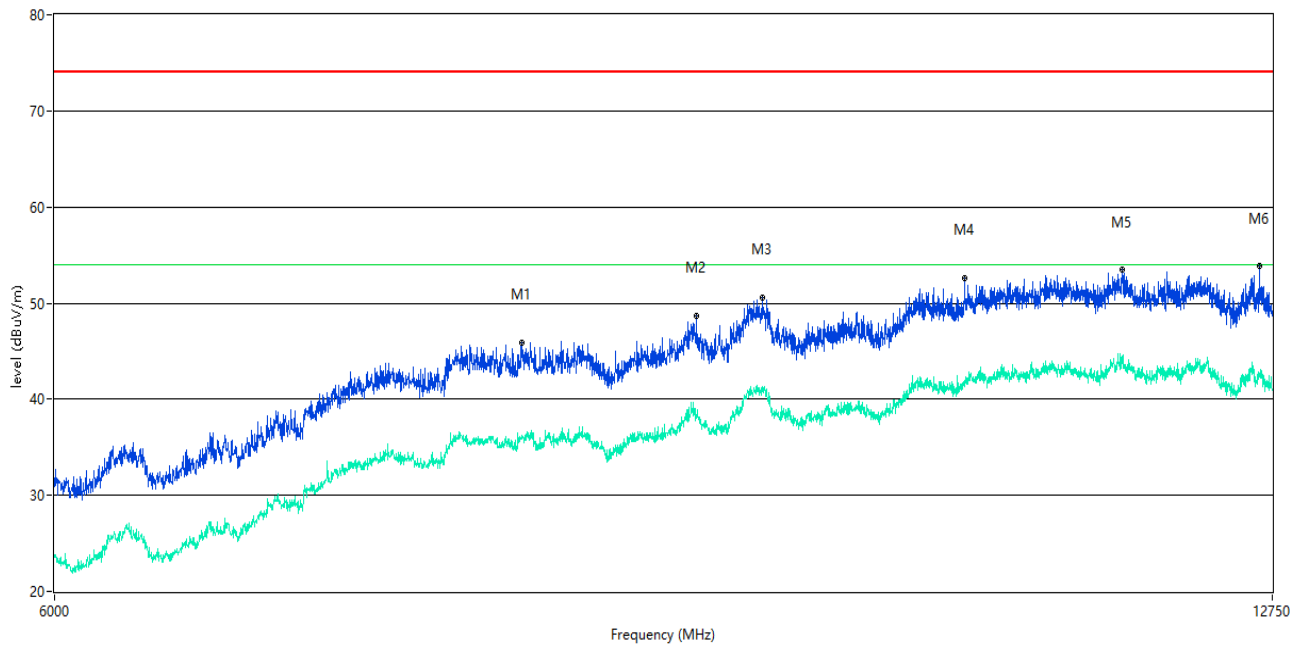


### A.1.5 Test Antenna Vertical, 6 GHz – 12.75 GHz



| Frequency<br>(MHz) | Peak<br>Level<br>(dBuV/m) | Q-peak<br>Level<br>(dBuV/m) | Average<br>Level<br>(dBuV/m) | Factor<br>(dB) | PK Limit<br>(dBuV/m) | QP Limit<br>(dBuV/m) | AV Limit<br>(dBuV/m) | Margin<br>(dB) | Table (o) | Height<br>(cm) | ANT      | Verdict |
|--------------------|---------------------------|-----------------------------|------------------------------|----------------|----------------------|----------------------|----------------------|----------------|-----------|----------------|----------|---------|
| 7870.970           | 45.42                     | --                          | 35.6                         | -3.82          | 74.0                 | --                   | 54.0                 | 18.40          | 66.00     | 100            | Vertical | Pass    |
| 9276.306           | 50.42                     | --                          | 41.1                         | 1.59           | 74.0                 | --                   | 54.0                 | 12.90          | 204.90    | 100            | Vertical | Pass    |
| 10345.914          | 51.24                     | --                          | 41.5                         | 4.56           | 74.0                 | --                   | 54.0                 | 12.50          | 26.00     | 100            | Vertical | Pass    |
| 11115.221          | 53.44                     | --                          | 43.6                         | 6.11           | 74.0                 | --                   | 54.0                 | 10.40          | 153.50    | 100            | Vertical | Pass    |
| 11617.971          | 54.00                     | --                          | 43.9                         | 7.21           | 74.0                 | --                   | 54.0                 | 10.10          | 33.90     | 100            | Vertical | Pass    |
| 12166.271          | 53.70                     | --                          | 43.2                         | 6.50           | 74.0                 | --                   | 54.0                 | 10.80          | 332.60    | 100            | Vertical | Pass    |

### A.1.6 Test Antenna Horizontal, 6 GHz – 12.75 GHz

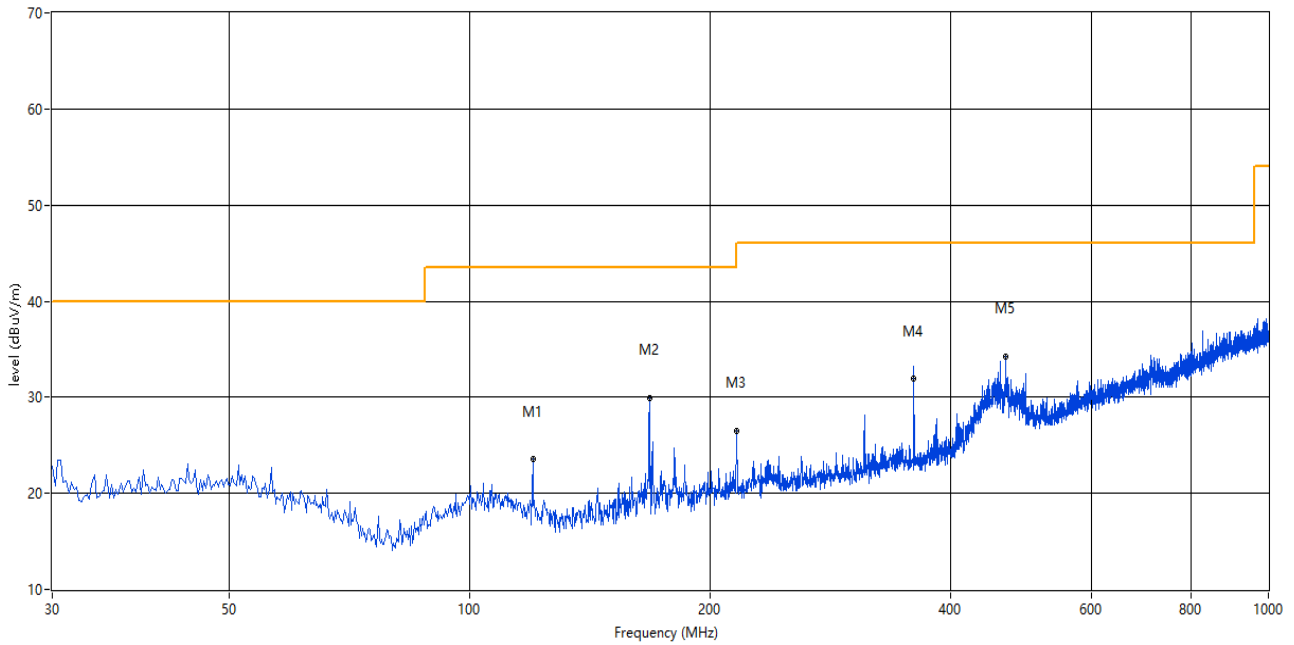


| Frequency<br>(MHz) | Peak<br>Level<br>(dBuV/m) | Q-peak<br>Level<br>(dBuV/m) | Average<br>Level<br>(dBuV/m) | Factor<br>(dB) | PK Limit<br>(dBuV/m) | QP Limit<br>(dBuV/m) | AV Limit<br>(dBuV/m) | Margin<br>(dB) | Table (o) | Height<br>(cm) | ANT        | Verdict |
|--------------------|---------------------------|-----------------------------|------------------------------|----------------|----------------------|----------------------|----------------------|----------------|-----------|----------------|------------|---------|
| 8010.997           | 45.89                     | --                          | 35.9                         | -3.94          | 74.0                 | --                   | 54.0                 | 18.10          | 183.10    | 100            | Horizontal | Pass    |
| 8927.081           | 48.71                     | --                          | 38.4                         | -0.79          | 74.0                 | --                   | 54.0                 | 15.60          | 79.00     | 100            | Horizontal | Pass    |
| 9301.612           | 50.61                     | --                          | 41.3                         | 1.71           | 74.0                 | --                   | 54.0                 | 12.70          | 47.20     | 100            | Horizontal | Pass    |
| 10538.240          | 52.66                     | --                          | 41.5                         | 5.09           | 74.0                 | --                   | 54.0                 | 12.50          | 246.80    | 100            | Horizontal | Pass    |
| 11621.345          | 53.47                     | --                          | 43.7                         | 7.09           | 74.0                 | --                   | 54.0                 | 10.30          | 154.90    | 100            | Horizontal | Pass    |
| 12647.088          | 53.82                     | --                          | 42.3                         | 6.89           | 74.0                 | --                   | 54.0                 | 11.70          | 123.00    | 100            | Horizontal | Pass    |

## Test Data and Plots

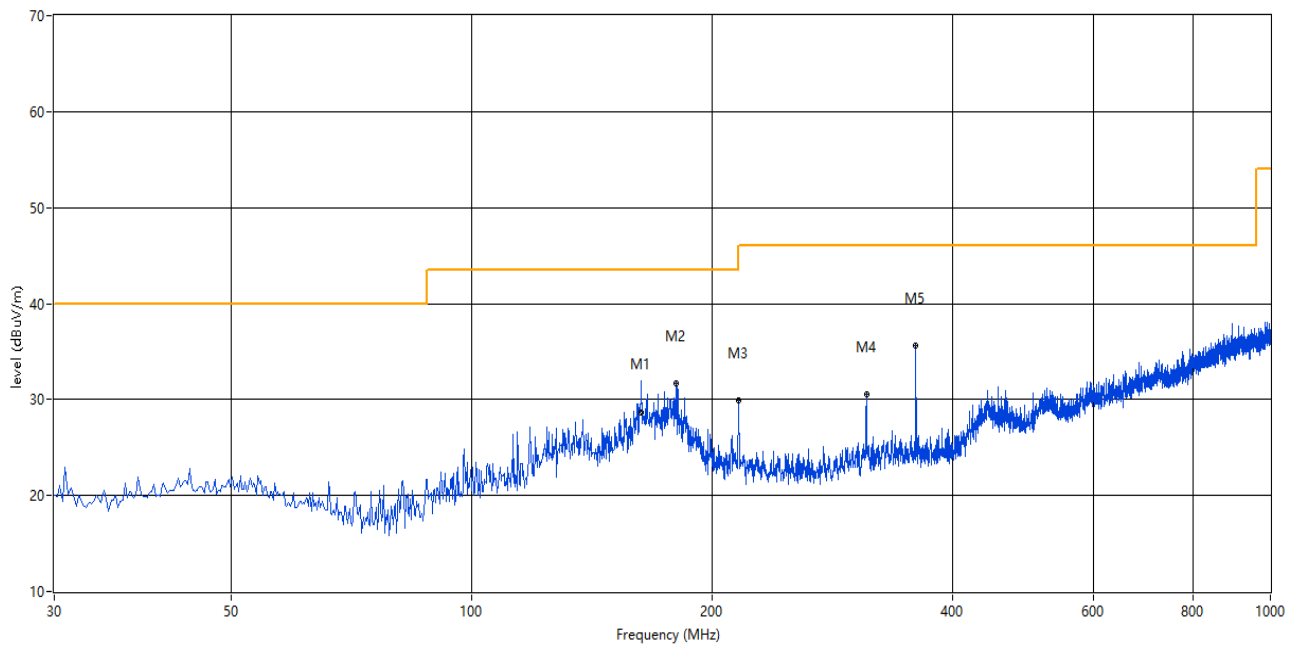
### The USB Test Mode

#### A.1.7 Test Antenna Vertical, 30 MHz – 1 GHz



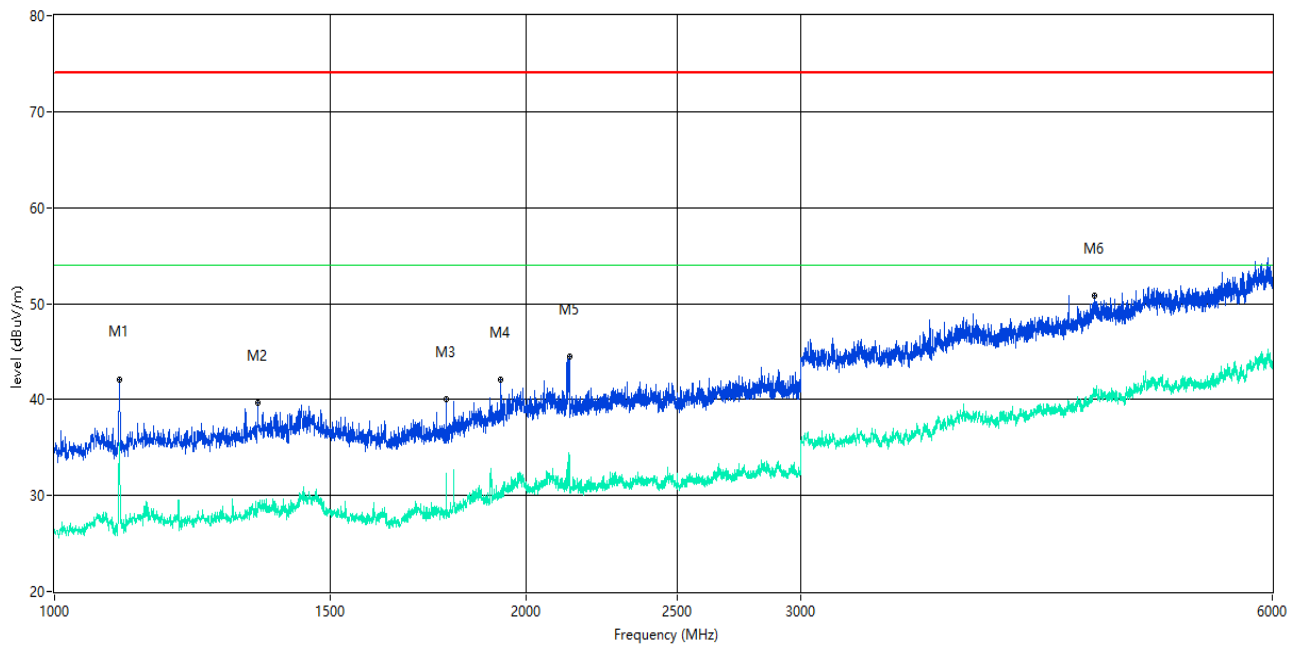
| Frequency<br>(MHz) | Peak<br>Level<br>(dBuV/m) | Q-peak<br>Level<br>(dBuV/m) | Average<br>Level<br>(dBuV/m) | Factor<br>(dB) | PK Limit<br>(dBuV/m) | QP Limit<br>(dBuV/m) | AV Limit<br>(dBuV/m) | Margin<br>(dB) | Table (o) | Height<br>(cm) | ANT      | Verdict |
|--------------------|---------------------------|-----------------------------|------------------------------|----------------|----------------------|----------------------|----------------------|----------------|-----------|----------------|----------|---------|
| 119.945            | 23.52                     | --                          | --                           | -30.30         | --                   | 43.5                 | --                   | 19.98          | 240.60    | 100            | Vertical | Pass    |
| 167.948            | 29.97                     | --                          | --                           | -31.22         | --                   | 43.5                 | --                   | 13.53          | 278.40    | 100            | Vertical | Pass    |
| 215.951            | 26.55                     | --                          | --                           | -28.38         | --                   | 43.5                 | --                   | 16.95          | 235.40    | 100            | Vertical | Pass    |
| 360.000            | 33.19                     | 31.92                       | --                           | -25.15         | --                   | 46.0                 | --                   | 14.08          | 0.00      | 159            | Vertical | Pass    |
| 468.815            | 34.27                     | --                          | --                           | -22.50         | --                   | 46.0                 | --                   | 11.73          | 146.70    | 100            | Vertical | Pass    |

### A.1.8 Test Antenna Horizontal, 30 MHz – 1 GHz



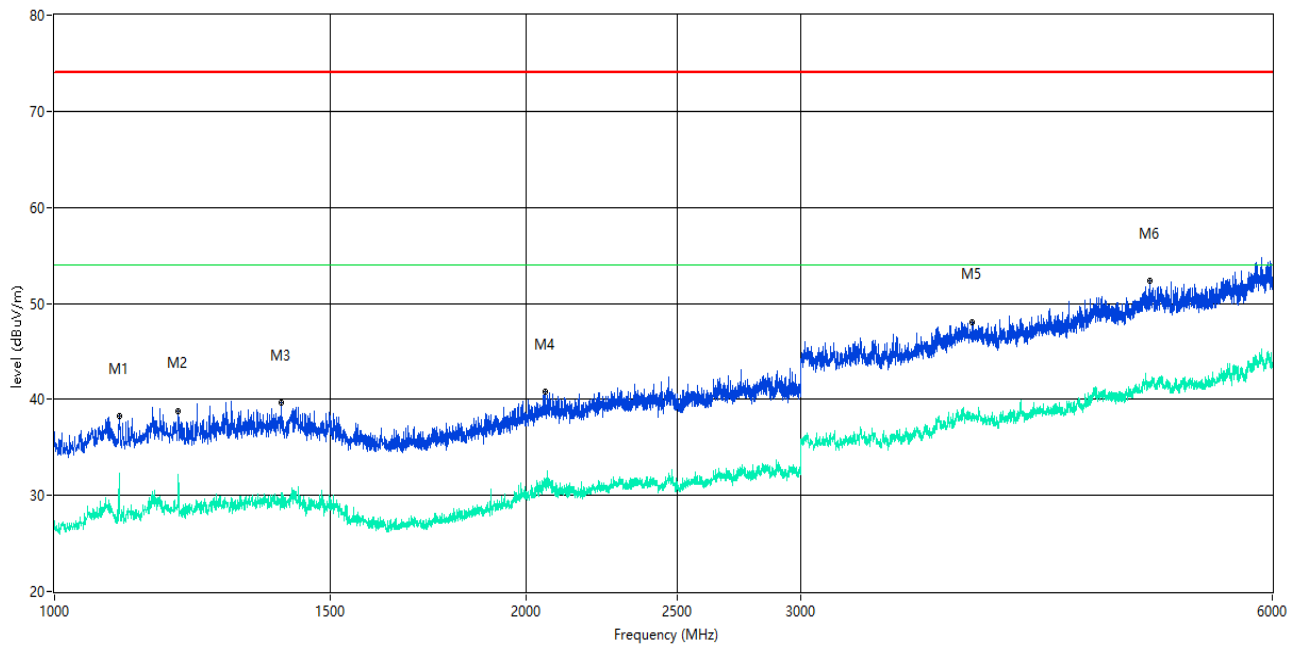
| Frequency<br>(MHz) | Peak<br>Level<br>(dBuV/m) | Q-peak<br>Level<br>(dBuV/m) | Average<br>Level<br>(dBuV/m) | Factor<br>(dB) | PK Limit<br>(dBuV/m) | QP Limit<br>(dBuV/m) | AV Limit<br>(dBuV/m) | Margin<br>(dB) | Table (o) | Height<br>(cm) | ANT        | Verdict |
|--------------------|---------------------------|-----------------------------|------------------------------|----------------|----------------------|----------------------|----------------------|----------------|-----------|----------------|------------|---------|
| 162.968            | 30.12                     | 28.60                       | --                           | -31.41         | --                   | 43.5                 | --                   | 14.90          | 360.00    | 173            | Horizontal | Pass    |
| 180.312            | 31.65                     | --                          | --                           | -30.53         | --                   | 43.5                 | --                   | 11.85          | 6.50      | 200            | Horizontal | Pass    |
| 215.951            | 29.91                     | --                          | --                           | -28.38         | --                   | 43.5                 | --                   | 13.59          | 59.10     | 100            | Horizontal | Pass    |
| 311.957            | 30.49                     | --                          | --                           | -26.44         | --                   | 46.0                 | --                   | 15.51          | 80.40     | 100            | Horizontal | Pass    |
| 359.960            | 35.60                     | --                          | --                           | -25.15         | --                   | 46.0                 | --                   | 10.40          | 104.60    | 100            | Horizontal | Pass    |

### A.1.9 Test Antenna Vertical, 1 GHz – 6 GHz



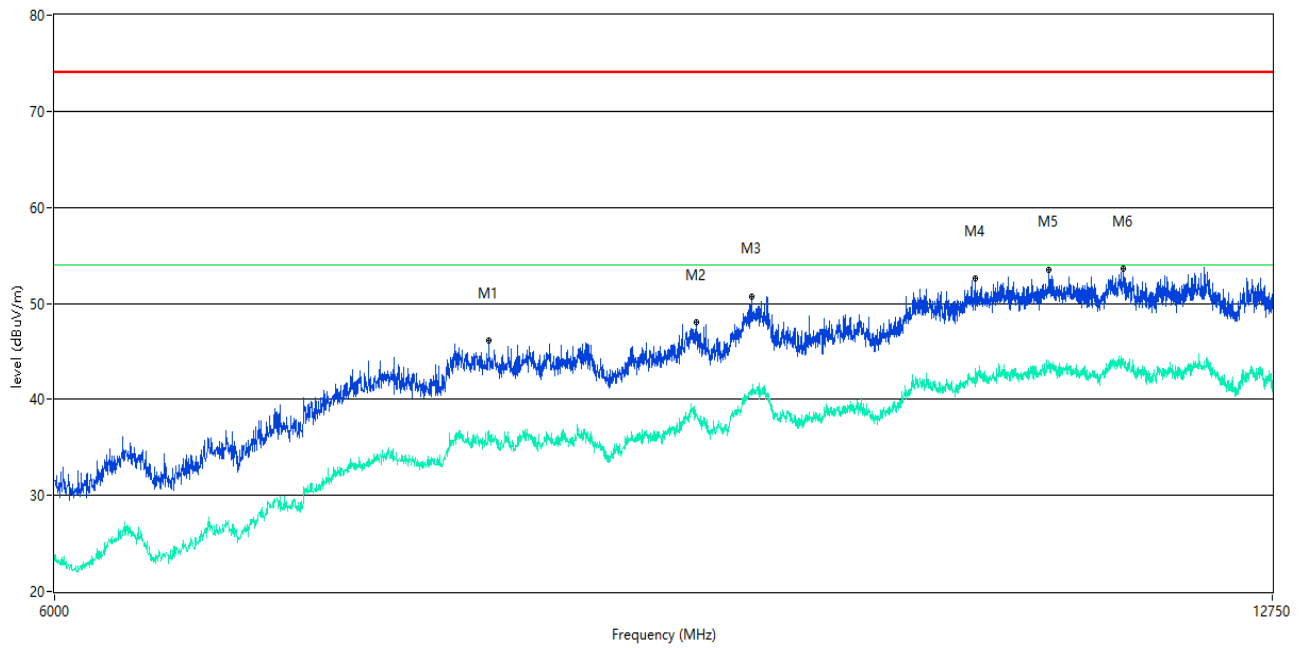
| Frequency<br>(MHz) | Peak<br>Level<br>(dBuV/m) | Q-peak<br>Level<br>(dBuV/m) | Average<br>Level<br>(dBuV/m) | Factor<br>(dB) | PK Limit<br>(dBuV/m) | QP Limit<br>(dBuV/m) | AV Limit<br>(dBuV/m) | Margin<br>(dB) | Table (o) | Height<br>(cm) | ANT      | Verdict |
|--------------------|---------------------------|-----------------------------|------------------------------|----------------|----------------------|----------------------|----------------------|----------------|-----------|----------------|----------|---------|
| 1099.975           | 42.08                     | --                          | 34.9                         | -14.67         | 74.0                 | --                   | 54.0                 | 19.10          | 185.40    | 100            | Vertical | Pass    |
| 1348.913           | 39.62                     | --                          | 28.4                         | -15.32         | 74.0                 | --                   | 54.0                 | 25.60          | 42.80     | 100            | Vertical | Pass    |
| 1778.805           | 39.99                     | --                          | 32.4                         | -14.75         | 74.0                 | --                   | 54.0                 | 21.60          | 2.40      | 100            | Vertical | Pass    |
| 1928.768           | 42.05                     | --                          | 30.4                         | -13.36         | 74.0                 | --                   | 54.0                 | 23.60          | 0.50      | 100            | Vertical | Pass    |
| 2132.717           | 44.43                     | --                          | 34.2                         | -11.57         | 74.0                 | --                   | 54.0                 | 19.80          | 185.40    | 100            | Vertical | Pass    |
| 4621.845           | 50.83                     | --                          | 40.7                         | 0.25           | 74.0                 | --                   | 54.0                 | 13.30          | 196.60    | 100            | Vertical | Pass    |

### A.1.10 Test Antenna Horizontal, 1 GHz – 6 GHz



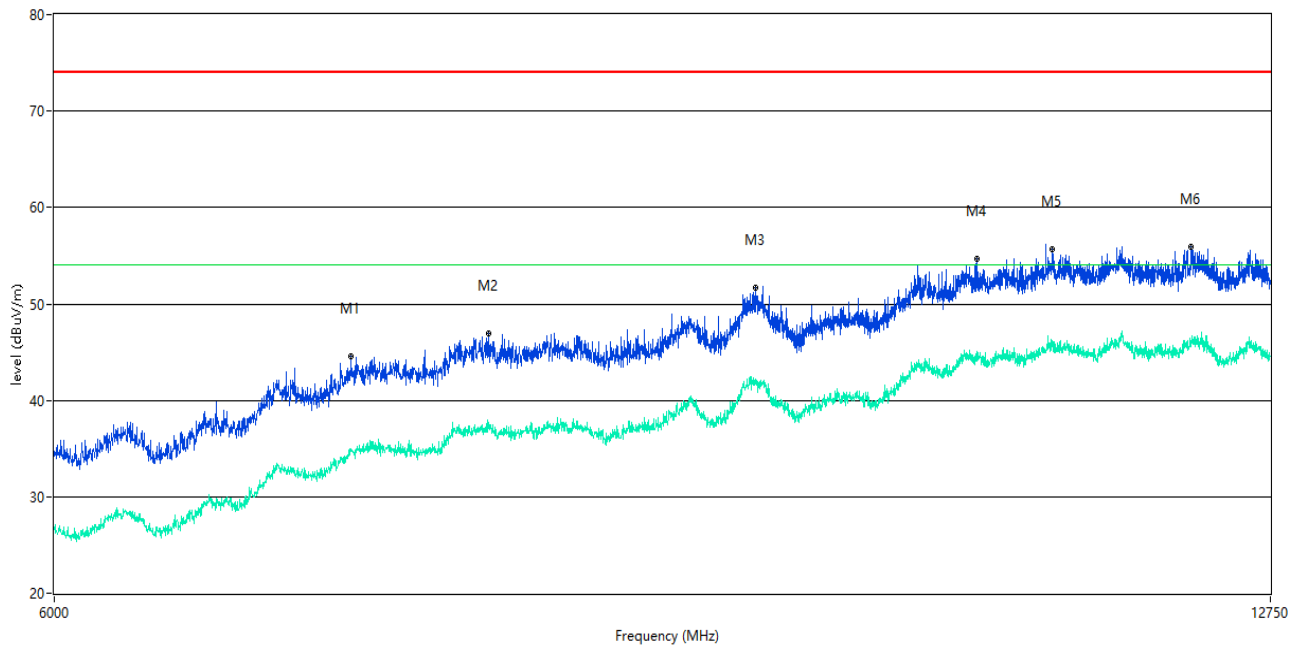
| Frequency<br>(MHz) | Peak<br>Level<br>(dBuV/m) | Q-peak<br>Level<br>(dBuV/m) | Average<br>Level<br>(dBuV/m) | Factor<br>(dB) | PK Limit<br>(dBuV/m) | QP Limit<br>(dBuV/m) | AV Limit<br>(dBuV/m) | Margin<br>(dB) | Table (o) | Height<br>(cm) | ANT        | Verdict |
|--------------------|---------------------------|-----------------------------|------------------------------|----------------|----------------------|----------------------|----------------------|----------------|-----------|----------------|------------|---------|
| 1099.475           | 38.27                     | --                          | 32.3                         | -14.68         | 74.0                 | --                   | 54.0                 | 21.70          | 23.70     | 100            | Horizontal | Pass    |
| 1199.950           | 38.82                     | --                          | 32.2                         | -15.15         | 74.0                 | --                   | 54.0                 | 21.80          | 8.90      | 100            | Horizontal | Pass    |
| 1395.401           | 39.62                     | --                          | 30.3                         | -15.23         | 74.0                 | --                   | 54.0                 | 23.70          | 53.10     | 100            | Horizontal | Pass    |
| 2059.235           | 40.76                     | --                          | 31.7                         | -12.21         | 74.0                 | --                   | 54.0                 | 22.30          | 47.20     | 100            | Horizontal | Pass    |
| 3859.285           | 48.09                     | --                          | 37.9                         | -3.11          | 74.0                 | --                   | 54.0                 | 16.10          | 263.50    | 100            | Horizontal | Pass    |
| 5011.747           | 52.32                     | --                          | 41.5                         | 0.79           | 74.0                 | --                   | 54.0                 | 12.50          | 1.00      | 100            | Horizontal | Pass    |

### A.1.11 Test Antenna Vertical, 6 GHz – 12.75 GHz



| Frequency<br>(MHz) | Peak<br>Level<br>(dBuV/m) | Q-peak<br>Level<br>(dBuV/m) | Average<br>Level<br>(dBuV/m) | Factor<br>(dB) | PK Limit<br>(dBuV/m) | QP Limit<br>(dBuV/m) | AV Limit<br>(dBuV/m) | Margin<br>(dB) | Table (o) | Height<br>(cm) | ANT      | Verdict |
|--------------------|---------------------------|-----------------------------|------------------------------|----------------|----------------------|----------------------|----------------------|----------------|-----------|----------------|----------|---------|
| 7850.725           | 46.07                     | --                          | 36.7                         | -3.73          | 74.0                 | --                   | 54.0                 | 17.30          | 184.60    | 100            | Vertical | Pass    |
| 8928.768           | 48.04                     | --                          | 38.2                         | -0.84          | 74.0                 | --                   | 54.0                 | 15.80          | 144.80    | 100            | Vertical | Pass    |
| 9237.503           | 50.74                     | --                          | 40.7                         | 1.06           | 74.0                 | --                   | 54.0                 | 13.30          | 264.70    | 100            | Vertical | Pass    |
| 10612.472          | 52.56                     | --                          | 43.2                         | 5.89           | 74.0                 | --                   | 54.0                 | 10.80          | 129.00    | 100            | Vertical | Pass    |
| 11105.099          | 53.55                     | --                          | 43.2                         | 6.21           | 74.0                 | --                   | 54.0                 | 10.80          | 308.40    | 100            | Vertical | Pass    |
| 11624.719          | 53.61                     | --                          | 44.3                         | 7.02           | 74.0                 | --                   | 54.0                 | 9.70           | 77.40     | 100            | Vertical | Pass    |

### A.1.12 Test Antenna Horizontal, 6 GHz – 12.75 GHz



| Frequency<br>(MHz) | Peak<br>Level<br>(dBuV/m) | Q-peak<br>Level<br>(dBuV/m) | Average<br>Level<br>(dBuV/m) | Factor<br>(dB) | PK Limit<br>(dBuV/m) | QP Limit<br>(dBuV/m) | AV Limit<br>(dBuV/m) | Margin<br>(dB) | Table (o) | Height<br>(cm) | ANT        | Verdict |
|--------------------|---------------------------|-----------------------------|------------------------------|----------------|----------------------|----------------------|----------------------|----------------|-----------|----------------|------------|---------|
| 7211.322           | 44.61                     | --                          | 35.0                         | -5.55          | 74.0                 | --                   | 54.0                 | 19.00          | 281.50    | 100            | Horizontal | Pass    |
| 7855.786           | 46.91                     | --                          | 37.8                         | -3.77          | 74.0                 | --                   | 54.0                 | 16.20          | 59.10     | 100            | Horizontal | Pass    |
| 9267.871           | 51.66                     | --                          | 42.2                         | 1.57           | 74.0                 | --                   | 54.0                 | 11.80          | 360.00    | 100            | Horizontal | Pass    |
| 10629.343          | 54.62                     | --                          | 44.9                         | 5.84           | 74.0                 | --                   | 54.0                 | 9.10           | 360.00    | 100            | Horizontal | Pass    |
| 11135.466          | 55.62                     | --                          | 46.2                         | 5.98           | 74.0                 | --                   | 54.0                 | 7.80           | 147.00    | 100            | Horizontal | Pass    |
| 12137.591          | 55.88                     | --                          | 45.6                         | 6.26           | 74.0                 | --                   | 54.0                 | 8.40           | 344.70    | 100            | Horizontal | Pass    |



## A.2 Conducted Emission

Note: Conducted Emission result reference from original test report: BL-EC17C0360-401 (issued by Shenzhen BALUN Technology Co., Ltd. On Mar. 20, 2018) A.2 Conducted Emission.

## **ANNEX B TEST SETUP PHOTOS**

Please refer the document “BL-EC18B0146-AE.PDF”.

## **ANNEX C EUT EXTERNAL PHOTOS**

Please refer the document “BL-EC18B0146-AW.PDF”.

## **ANNEX D EUT INTERNAL PHOTOS**

Please refer the document “BL-EC18B0146-AI.PDF”.

--END OF REPORT--