

FCC

EMC

TEST REPORT

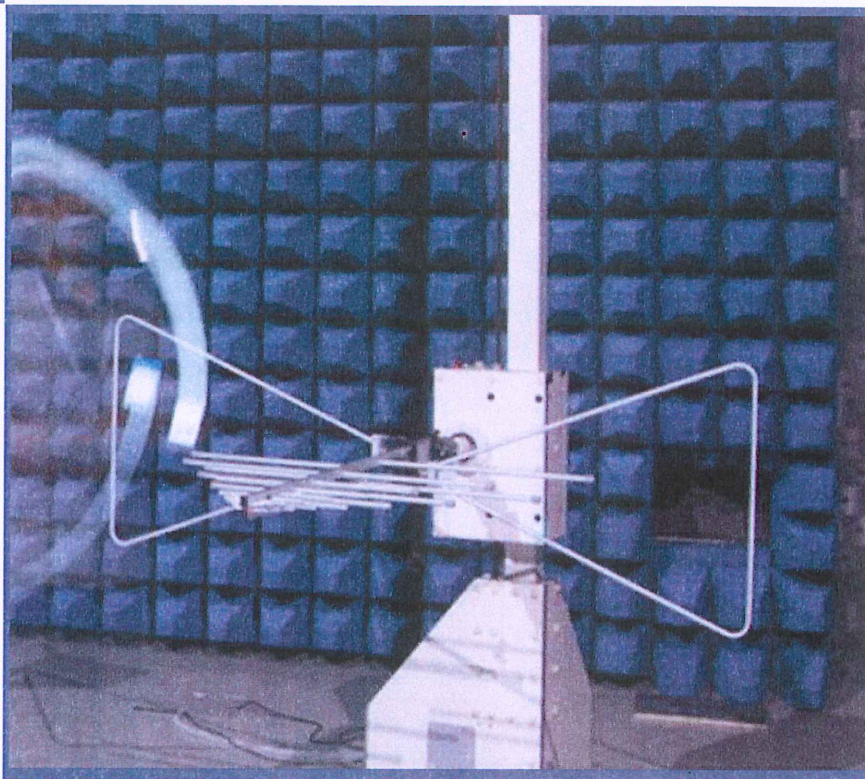
ISSUED BY  
Shenzhen BALUN Technology Co., Ltd.



FOR  
**Outdoor LoRa Gateway**

ISSUED TO  
Shenzhen RAKwireless Technology Co., Ltd.

Room 506, Bldg B, New Compark, Pingshan First Road, Taoyuan  
Street, XiLi town Nanshan District, Shenzhen, China



Tested by: Xia Long

(Engineer)

Date: Apr. 15, 2019

Approved by: Wei Yanquan

(Chief Engineer)

Date: Apr. 15, 2019

Report No.: BL-SZ1920035-401

EUT Name: Outdoor LoRa Gateway

Model Name: RAK7240(refer section 2.4)

Brand Name: RAK

Test Standard: 47 CFR Part 15 Subpart B

FCC ID: 2AF6B-RAK724X

Test Conclusion: Pass

Test Date: Feb. 18, 2019 ~ Mar. 12, 2019

Date of Issue: Apr. 15, 2019

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### Revision History

| Version        | Issue Date           | Revisions Content                               |
|----------------|----------------------|---|
| <u>Rev. 01</u> | <u>Apr. 03, 2019</u> | <u>Initial Issue</u>                            |
| <u>Rev. 02</u> | <u>Apr. 15, 2019</u> | <u>Updated model description in section 3.2</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 RAKwireless Technology Co.,Ltd.  |
| Address   | Room 506, Bldg B, New Compark, Pingshan First Road, Taoyuan Street, XiLi town Nanshan District, Shenzhen, China |

### 2.2 Manufacturer Information

|              |   |
|--------------|---|
| Manufacturer | Shenzhen RAKwireless Technology Co.,Ltd.  |
| Address      | Room 506, Bldg B, New Compark, Pingshan First Road, Taoyuan Street, XiLi town Nanshan District, Shenzhen, China |

### 2.3 Factory Information

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

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

|   |   |
|---|---|
| EUT Name                                  | Outdoor LoRa Gateway  |
| Model Name Under Test                     | RAK7240   |
| Series Model Name                         | RAK7249   |
| Description of Model name differentiation | Only differentiate is that RAK7240 and RAK7249 has different enclosure. |
| Hardware Version                          | VA  |
| Software Version                          | 1.1.0024_Release  |
| Dimensions (Approx.)                      | N/A   |
| Weight (Approx.)                          | N/A   |

## 2.5 Ancillary Equipment

Note: Not applicable.

## 2.6 Technical Information

|                                   |   |
|-----------------------------------|---|
| Network and Wireless connectivity | 3G Network WCDMA Band 2/4/5/8<br>4G Network FDD LTE Band 2/4/5/12/13<br>WIFI, GPS, Lora |
|-----------------------------------|---|

### 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   | ANSI C63.4-2014                                   | American National Standard for Methods of<br>Measurement of Radio-Noise Emissions from Low-<br>Voltage Electrical and Electronic Equipment in the<br>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: Both model RAK7240 and model RAK7249 were tested, but the report only showed the data of the worst model, and model RAK7240 has the worst data. |                              |          |              |            |

#### 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<br>Parameter                        | Selected Values During Tests |                            |                   |                    |
|---|------------------------------|----------------------------|-------------------|--------------------|
|   | Temperature                  | Voltage                    | Relative Humidity | Ambient Pressure   |
| Normal Temperature,<br>Normal Voltage<br>(NTNV) | 23°C to 25°C                 | DC 48V from<br>POE Adapter | 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&SCHWA<br>RZ          | ESRP          | 101036     | 2018.06.13 | 2019.06.12 | <input checked="" type="checkbox"/> |
| Test Antenna-<br>Bi-Log                          | SCHWARZBECK                | VULB 9163     | 9163-977   | 2017.07.22 | 2019.07.21 | <input checked="" type="checkbox"/> |
| Test Antenna-<br>Horn                            | SCHWARZBECK                | BBHA<br>9120D | 9120D-1600 | 2018.07.11 | 2020.07.10 | <input type="checkbox"/>            |
| Anechoic<br>Chamber                              | EMC Electronic<br>Co., Ltd | 9m*6m*6m      | N/A        | 2018.08.08 | 2019.08.07 | <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-<br>Bi-Log                          | SCHWARZBECK  | VULB 9163     | 9163-624   | 2017.07.22 | 2019.07.21 | <input type="checkbox"/>            |
| Test Antenna-<br>Horn                            | SCHWARZBECK  | BBHA<br>9120D | 9120D-1148 | 2018.07.11 | 2020.07.10 | <input checked="" type="checkbox"/> |
| Anechoic<br>Chamber                              | RAINFORD     | 9m*6m*6m      | N/A        | 2017.02.21 | 2020.02.20 | <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&SCHWA<br>RZ | ESRP      | 101036     | 2018.06.13 | 2019.06.12 | <input checked="" type="checkbox"/> |
| LISN                    | SCHWARZBECK       | NSLK 8127 | 8127-687   | 2018.06.13 | 2019.06.12 | <input checked="" type="checkbox"/> |
| ISN                     | TESEQ             | ISN T800  | 34449      | 2018.11.16 | 2019.11.15 | <input type="checkbox"/>            |
| Shielded<br>Enclosure   | ChangNing         | CN-130701 | 130703     | N/A        | N/A        | <input checked="" type="checkbox"/> |
| Test Software           | BALUN             | BL410_E   | V18.626    | --         | --         | <input checked="" type="checkbox"/> |



### 4.3 Test Enclosure list

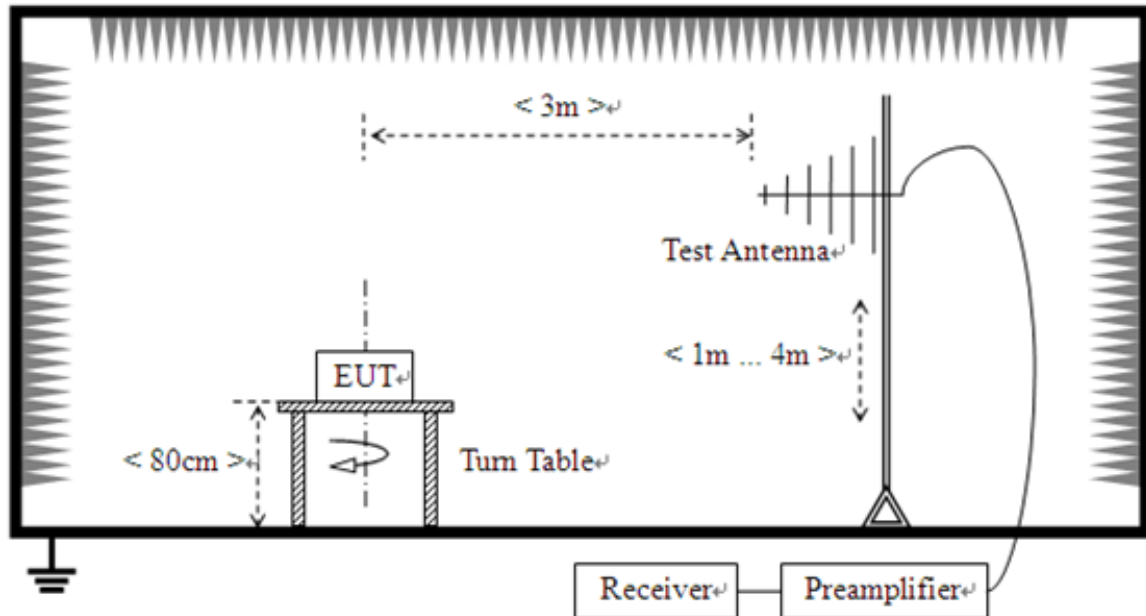
| Description                       | Manufacturer | Model        | Serial No.             | Length | Description         | Use                                 |
|-----------------------------------|--------------|--------------|------------------------|--------|---------------------|-------------------------------------|
| PC                                | Dell         | 015K3N       | N/A                    | N/A    | Special Handled     | <input type="checkbox"/>            |
| Laptop                            | Lenovo       | N/A          | 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 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"/>            |
| iPhone                            | Apple        | A1586        | N/A                    | N/A    | N/A                 | <input type="checkbox"/>            |
| Phone                             | MI           | M4           | N/A                    | N/A    | N/A                 | <input type="checkbox"/>            |
| Bluetooth Earphone                | SAMSUNG      | Gear Circle  | N/A                    | N/A    | N/A                 | <input type="checkbox"/>            |
| Wireless Communication s Test Set | R&S          | CMW500       | 142028                 | N/A    | Cal. Due 2019.06.14 | <input checked="" type="checkbox"/> |
| WIFI Router                       | TP-LINK      | TL-WDR7500   | N/A                    | N/A    | N/A                 | <input checked="" type="checkbox"/> |
| Earphone                          | N/A          | OPPO         | N/A                    | 1.1 m  | N/A                 | <input 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 checked="" type="checkbox"/> |
| POE Adapter                       | N/A          | N/A          | N/A                    | N/A    | N/A                 | <input checked="" type="checkbox"/> |
| LORA Antenna                      | N/A          | N/A          | N/A                    | N/A    | N/A                 | <input checked="" type="checkbox"/> |
| 3/4G Antenna                      | N/A          | N/A          | N/A                    | N/A    | N/A                 | <input checked="" type="checkbox"/> |
| GPS Antenna                       | N/A          | N/A          | N/A                    | N/A    | N/A                 | <input checked="" type="checkbox"/> |
| WIFI Antenna                      | N/A          | N/A          | N/A                    | N/A    | N/A                 | <input checked="" type="checkbox"/> |

## 4.4 Test Configurations

| Test Configurations (TC) No. | Description  |
|------------------------------|--|
| TC01                         | <u>The WCDMA Band 2 Test Mode</u><br>EUT + LORA Antenna + 3/4G Antenna + GPS Antenna + WIFI Antenna + POE Adapter + RJ45 Cable + Laptop + WIFI Link + GPS RX + WCDMA Band 2 Link   |
| TC02                         | <u>The WCDMA Band 4 Test Mode</u><br>EUT + LORA Antenna + 3/4G Antenna + GPS Antenna + WIFI Antenna + POE Adapter + RJ45 Cable + Laptop + WIFI Link + GPS RX + WCDMA Band 4 Link   |
| TC03                         | <u>The WCDMA Band 5 Test Mode</u><br>EUT + LORA Antenna + 3/4G Antenna + GPS Antenna + WIFI Antenna + POE Adapter + RJ45 Cable + Laptop + WIFI Link + GPS RX + WCDMA Band 5 Link   |
| TC04                         | <u>The FDD LTE Band 2 Test Mode</u><br>EUT + LORA Antenna + 3/4G Antenna + GPS Antenna + WIFI Antenna + POE Adapter + RJ45 Cable + Laptop + WIFI Link + GPS RX + LTE Band 2 Link   |
| TC05                         | <u>The FDD LTE Band 4 Test Mode</u><br>EUT + LORA Antenna + 3/4G Antenna + GPS Antenna + WIFI Antenna + POE Adapter + RJ45 Cable + Laptop + WIFI Link + GPS RX + LTE Band 4 Link   |
| TC06                         | <u>The FDD LTE Band 5 Test Mode</u><br>EUT + LORA Antenna + 3/4G Antenna + GPS Antenna + WIFI Antenna + POE Adapter + RJ45 Cable + Laptop + WIFI Link + GPS RX + LTE Band 5 Link   |
| TC07                         | <u>The FDD LTE Band 12 Test Mode</u><br>EUT + LORA Antenna + 3/4G Antenna + GPS Antenna + WIFI Antenna + POE Adapter + RJ45 Cable + Laptop + WIFI Link + GPS RX + LTE Band 12 Link |
| TC08                         | <u>The FDD LTE Band 13 Test Mode</u><br>EUT + LORA Antenna + 3/4G Antenna + GPS Antenna + WIFI Antenna + POE Adapter + RJ45 Cable + Laptop + WIFI Link + GPS RX + LTE Band 13 Link |
| TC09                         | <u>The LORA Test Mode</u><br>EUT + LORA Antenna + 3/4G Antenna + GPS Antenna + WIFI Antenna + POE Adapter + RJ45 Cable + Laptop + WIFI Link + GPS RX + LORA                        |

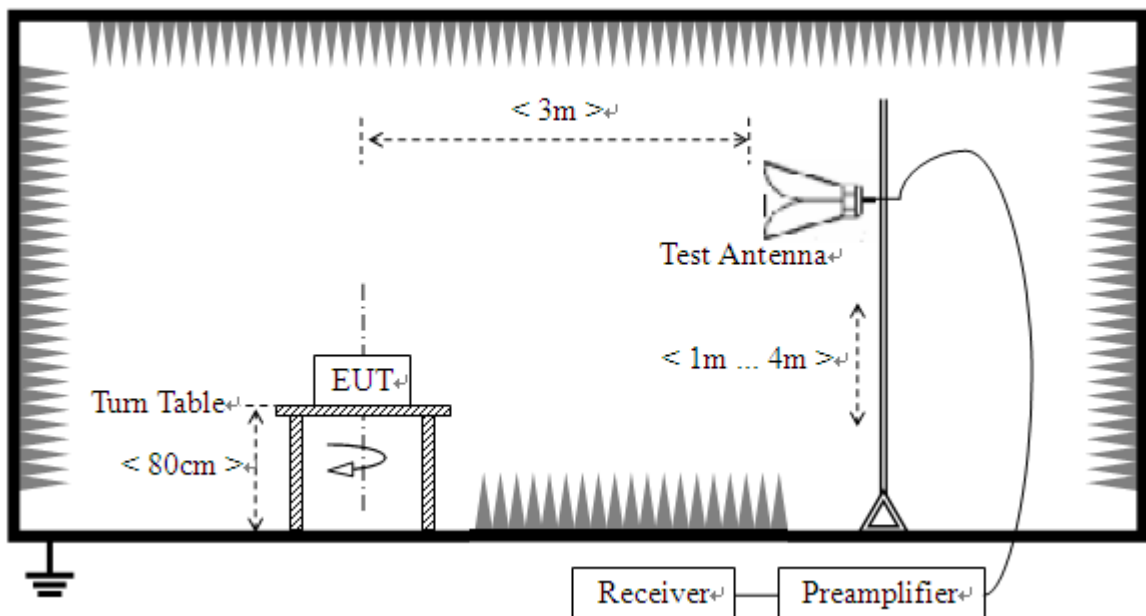
## 4.5 Test Setups

### Test Setup 1



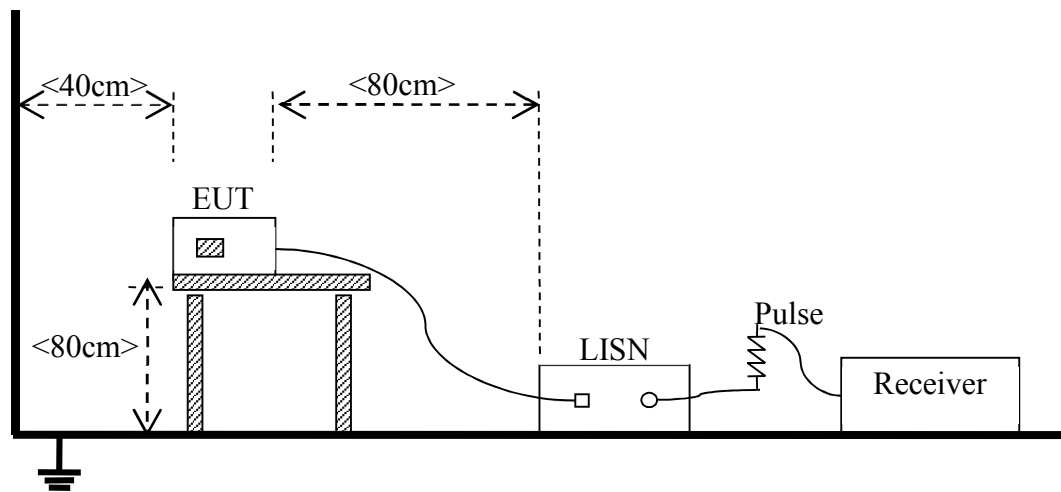
(For Radiated Emission Test (30 MHz-1 GHz))

### 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~TC09 <sup>Note</sup> |
| Conducted Emission, AC Ports   | Test Env.          | NTNV                      |
|  | Test Setup         | Test Setup 3              |
|  | Test Configuration | TC01~TC09 <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 WCDMA Band 2 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<br>(MHz) | Class B (at 3 m)                      |   | Class B (at 10 m)                       | Class A (at 10 m)                     |   |
|--------------------------|---------------------------------------|---|---|---------------------------------------|---|
|                          | Field Strength<br>( $\mu\text{V/m}$ ) | Field Strength<br>(dB $\mu\text{V/m}$ ) | Field Strength<br>(dB $\mu\text{V/m}$ ) | Field Strength<br>( $\mu\text{V/m}$ ) | Field Strength<br>(dB $\mu\text{V/m}$ ) |
| 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 (dB $\mu\text{V/m}$ ) =  $20 \times \log [\text{Field Strength } (\mu\text{V/m})]$ .
- 2) In the emission tables above, the tighter limit applies at the band edges.

##### 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

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 (dB $\mu\text{V/m}$ ) = Reading (dB $\mu\text{V}$ ) + 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 (dB $\mu$ V) | Average (dB $\mu$ V) |
| 0.15 - 0.50           | 79                      | 66                   |
| 0.50 - 30             | 73                      | 60                   |

| Frequency range (MHz) | Class B                 |                      |
|-----------------------|-------------------------|----------------------|
|                       | Quasi-peak (dB $\mu$ V) | Average (dB $\mu$ V) |
| 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  $\Omega$ /50  $\mu$ H 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:

$$1. \text{ Results (dB}\mu\text{V/m)} = \text{Reading (dB}\mu\text{V)} + \text{Factor (dB/m)}$$

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

$$2. \text{ Factor} = \text{Insertion loss} + \text{Cable loss}$$

$$3. \text{ Over limit} = \text{Results} - \text{Limit.}$$

## ANNEX A TEST RESULTS

### A.1 Radiated Emission

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

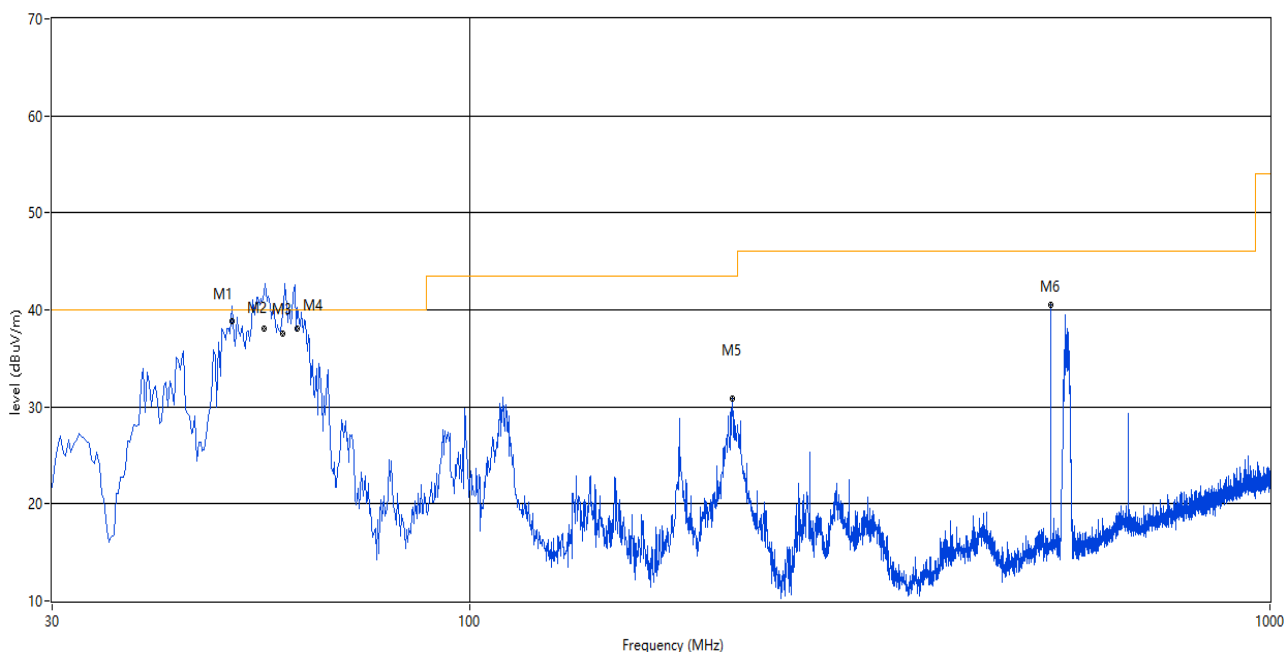
Note 2: For the test data above 1 GHz, according the ANSI C63.4-2014, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note 3: The marked spikes near 2400 MHz with circle should be ignored because they are WIFI carrier frequency.

#### Test Data and Plots

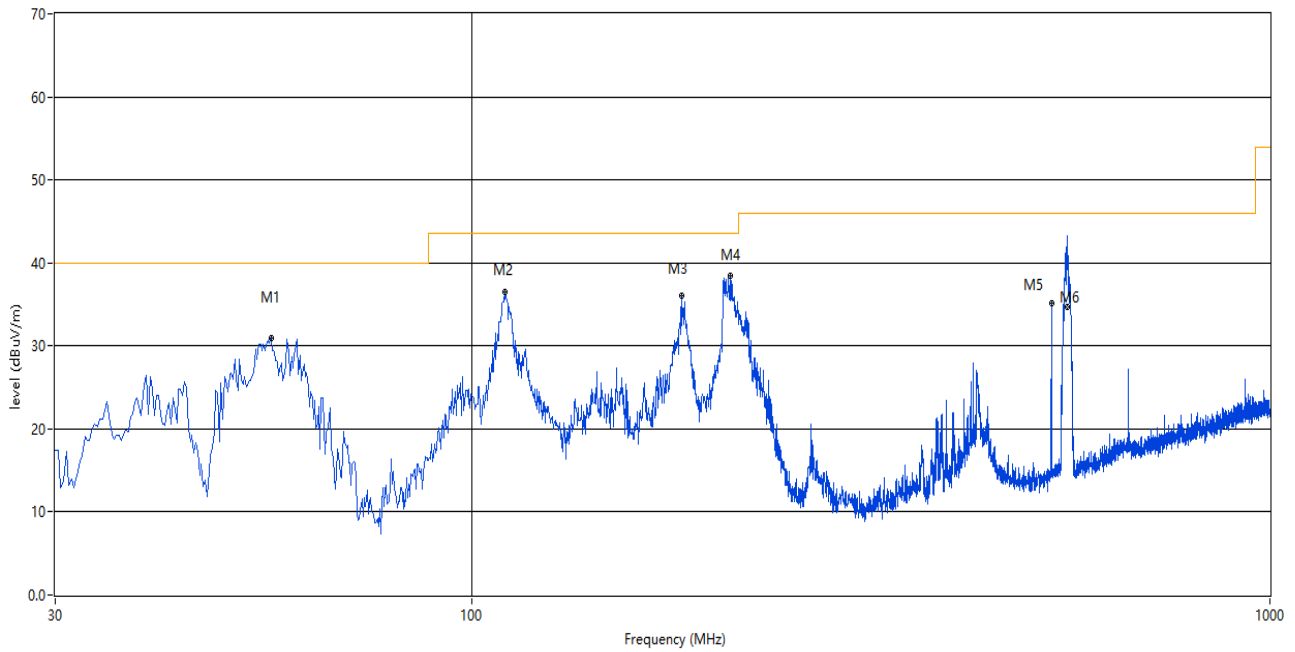
##### The WCDMA Band 2 Test Mode

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



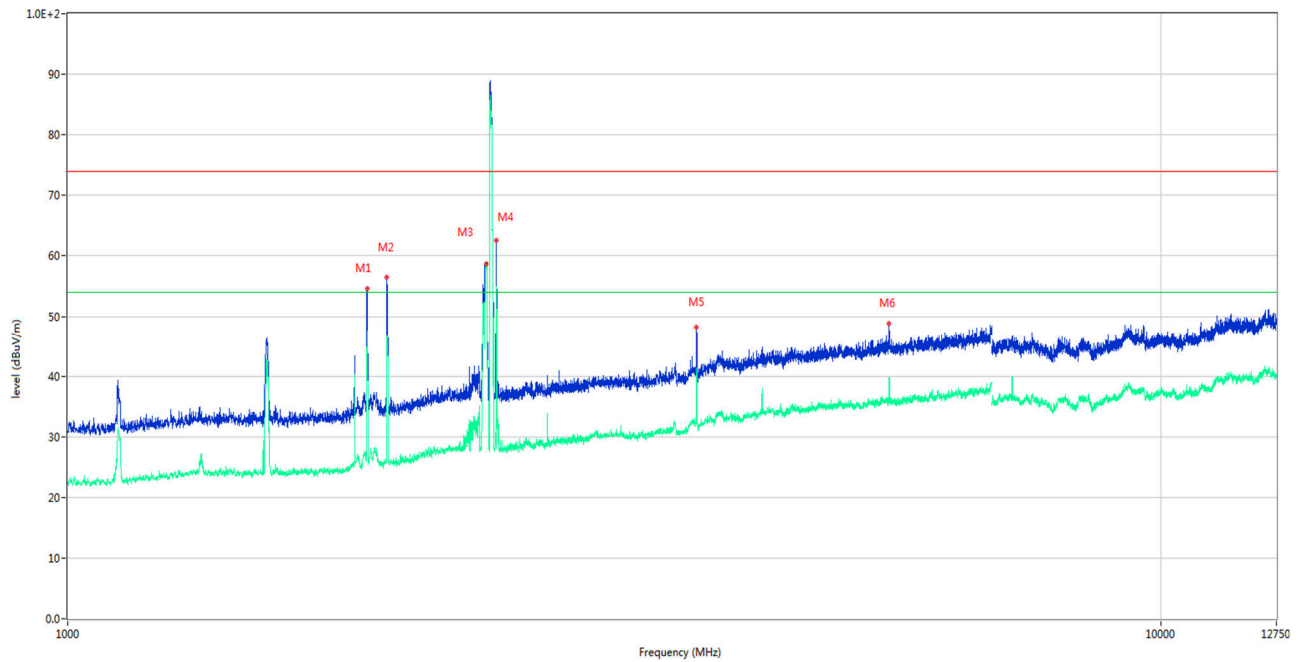
| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|-----|-----------------|------------------|-------------|----------------|-----------------|----------|-----------|-------------|-----|---------|
| 1   | 50.424          | 41.37            | -23.63      | 40.0           | 1.37            | Peak     | 230.00    | 100         | V   | N/A     |
| 1*  | 50.424          | 38.83            | -23.63      | 40.0           | -1.17           | QP       | 230.00    | 100         | V   | Pass    |
| 2   | 55.148          | 40.83            | -23.80      | 40.0           | 0.83            | Peak     | 180.00    | 121         | V   | N/A     |
| 2*  | 55.148          | 38.01            | -23.80      | 40.0           | -1.99           | QP       | 180.00    | 121         | V   | Pass    |
| 3   | 58.239          | 41.42            | -24.00      | 40.0           | 1.42            | Peak     | 184.00    | 100         | V   | N/A     |
| 3*  | 58.239          | 37.54            | -24.00      | 40.0           | -2.46           | QP       | 184.00    | 100         | V   | Pass    |
| 4   | 60.805          | 40.22            | -24.08      | 40.0           | 0.22            | Peak     | 226.00    | 100         | V   | N/A     |
| 4*  | 60.805          | 38.12            | -24.08      | 40.0           | -1.88           | QP       | 226.00    | 100         | V   | Pass    |
| 5   | 212.602         | 30.82            | -25.05      | 43.5           | -12.68          | Peak     | 242.00    | 200         | V   | Pass    |
| 6   | 531.975         | 40.52            | -15.04      | 46.0           | -5.48           | Peak     | 0.00      | 200         | V   | Pass    |

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



| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|-----|-----------------|------------------|-------------|----------------|-----------------|----------|-----------|-------------|-----|---------|
| 1   | 55.947          | 30.91            | -23.86      | 40.0           | -9.09           | Peak     | 270.00    | 100         | H   | Pass    |
| 2   | 109.783         | 36.54            | -25.47      | 43.5           | -6.96           | Peak     | 279.00    | 200         | H   | Pass    |
| 3   | 183.018         | 36.09            | -24.62      | 43.5           | -7.41           | Peak     | 279.00    | 200         | H   | Pass    |
| 4   | 210.905         | 38.52            | -25.31      | 43.5           | -4.98           | Peak     | 270.00    | 100         | H   | Pass    |
| 5   | 531.975         | 35.10            | -15.04      | 46.0           | -10.90          | Peak     | 279.00    | 200         | H   | Pass    |
| 6   | 556.873         | 43.58            | -14.23      | 46.0           | -2.42           | Peak     | 286.00    | 100         | H   | N/A     |
| 6*  | 556.873         | 34.64            | -14.23      | 46.0           | -11.36          | QP       | 286.00    | 100         | H   | Pass    |

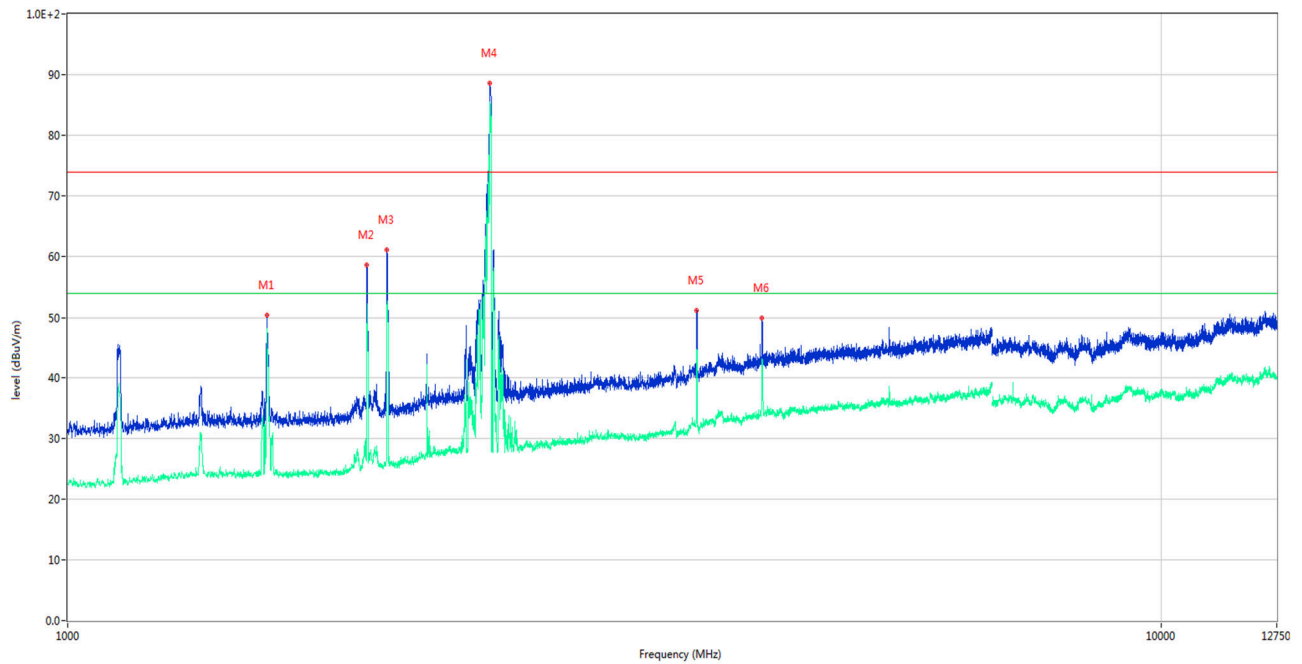
### A.1.3 Test Antenna Vertical, 1 GHz – 12.75 GHz



| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|-----|-----------------|------------------|-------------|----------------|-----------------|----------|-----------|-------------|-----|---------|
| 1** | 1878.500        | 46.54            | -15.79      | 54.0           | -7.46           | AV       | 319.40    | 100         | V   | N/A     |
| 1   | 1878.500        | 54.60            | -15.79      | 74.0           | -19.40          | Peak     | 319.40    | 100         | V   | N/A     |
| 2** | 1959.000        | 46.72            | -17.23      | 54.0           | -7.28           | AV       | 189.90    | 100         | V   | N/A     |
| 2   | 1959.000        | 56.43            | -17.23      | 74.0           | -17.57          | Peak     | 189.90    | 100         | V   | N/A     |
| 3** | 2406.500        | 53.42            | -14.73      | 54.0           | -0.58           | AV       | 161.00    | 100         | V   | N/A     |
| 3   | 2406.500        | 58.38            | -14.73      | 74.0           | -15.62          | Peak     | 161.00    | 100         | V   | N/A     |
| 4** | 2464.500        | 50.31            | -15.21      | 54.0           | -3.69           | AV       | 89.20     | 100         | V   | N/A     |
| 4   | 2464.500        | 62.47            | -15.21      | 74.0           | -11.53          | Peak     | 89.20     | 100         | V   | N/A     |
| 5** | 3760.000        | 41.40            | -6.79       | 54.0           | -12.60          | AV       | 320.70    | 100         | V   | Pass    |
| 5   | 3760.000        | 48.17            | -6.79       | 74.0           | -25.83          | Peak     | 320.70    | 100         | V   | Pass    |
| 6** | 5637.000        | 38.80            | -4.67       | 54.0           | -15.20          | AV       | 7.20      | 100         | V   | N/A     |
| 6   | 5637.000        | 48.81            | -4.67       | 74.0           | -25.19          | Peak     | 7.20      | 100         | V   | N/A     |



#### A.1.4 Test Antenna Horizontal, 1 GHz – 12.75 GHz



| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|-----|-----------------|------------------|-------------|----------------|-----------------|----------|-----------|-------------|-----|---------|
| 1** | 1520.500        | 41.39            | -19.21      | 54.0           | -12.61          | AV       | 58.00     | 100         | H   | Pass    |
| 1   | 1520.500        | 50.45            | -19.21      | 74.0           | -23.55          | Peak     | 58.00     | 100         | H   | Pass    |
| 2** | 1878.000        | 46.54            | -15.80      | 54.0           | -7.46           | AV       | 4.40      | 100         | H   | N/A     |
| 2   | 1878.000        | 58.63            | -15.80      | 74.0           | -15.37          | Peak     | 4.40      | 100         | H   | N/A     |
| 3** | 1958.500        | 51.47            | -17.26      | 54.0           | -2.53           | AV       | 193.90    | 100         | H   | N/A     |
| 3   | 1958.500        | 61.08            | -17.26      | 74.0           | -12.92          | Peak     | 193.90    | 100         | H   | N/A     |
| 4** | 2432.500        | 82.73            | -14.48      | 54.0           | 28.73           | AV       | 359.60    | 100         | H   | N/A     |
| 4   | 2432.500        | 88.64            | -14.48      | 74.0           | 14.64           | Peak     | 359.60    | 100         | H   | N/A     |
| 5** | 3760.000        | 44.36            | -6.79       | 54.0           | -9.64           | AV       | 118.60    | 100         | H   | Pass    |
| 5   | 3760.000        | 51.13            | -6.79       | 74.0           | -22.87          | Peak     | 118.60    | 100         | H   | Pass    |
| 6** | 4315.000        | 43.06            | -4.52       | 54.0           | -10.94          | AV       | 1.80      | 100         | H   | Pass    |
| 6   | 4315.000        | 49.93            | -4.52       | 74.0           | -24.07          | Peak     | 1.80      | 100         | H   | Pass    |

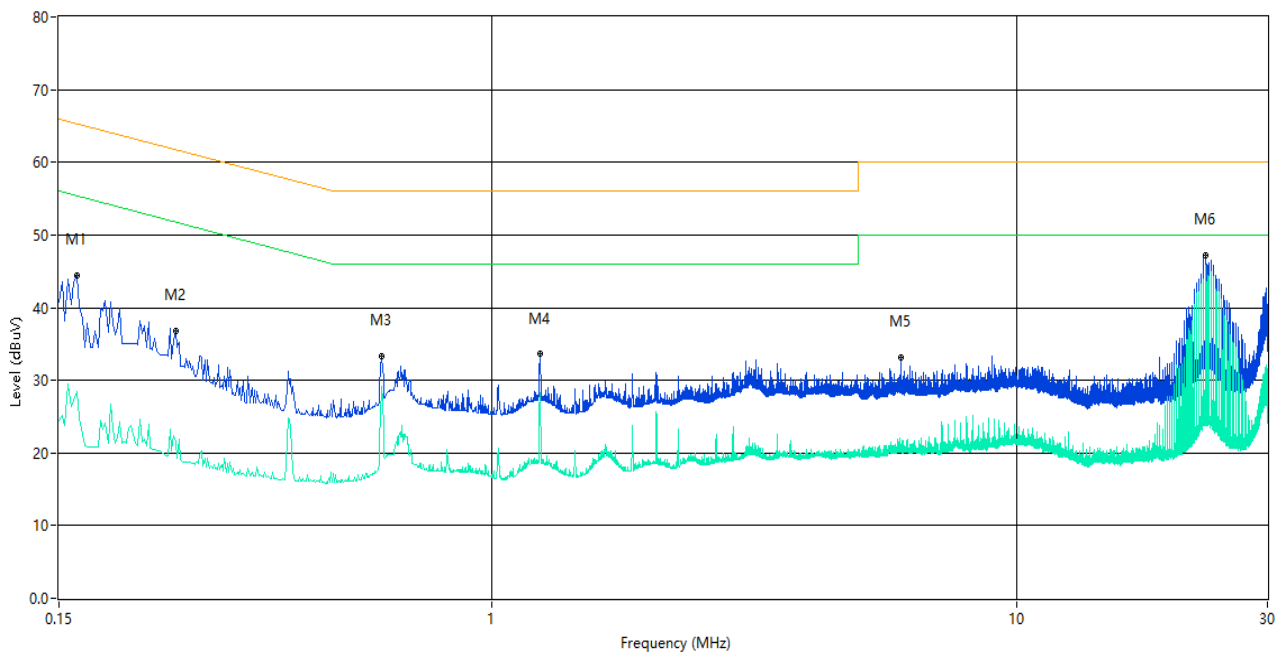
## A.2 Conducted Emission

### Test Data and Plots

#### The WCDMA Band 2 Test Mode

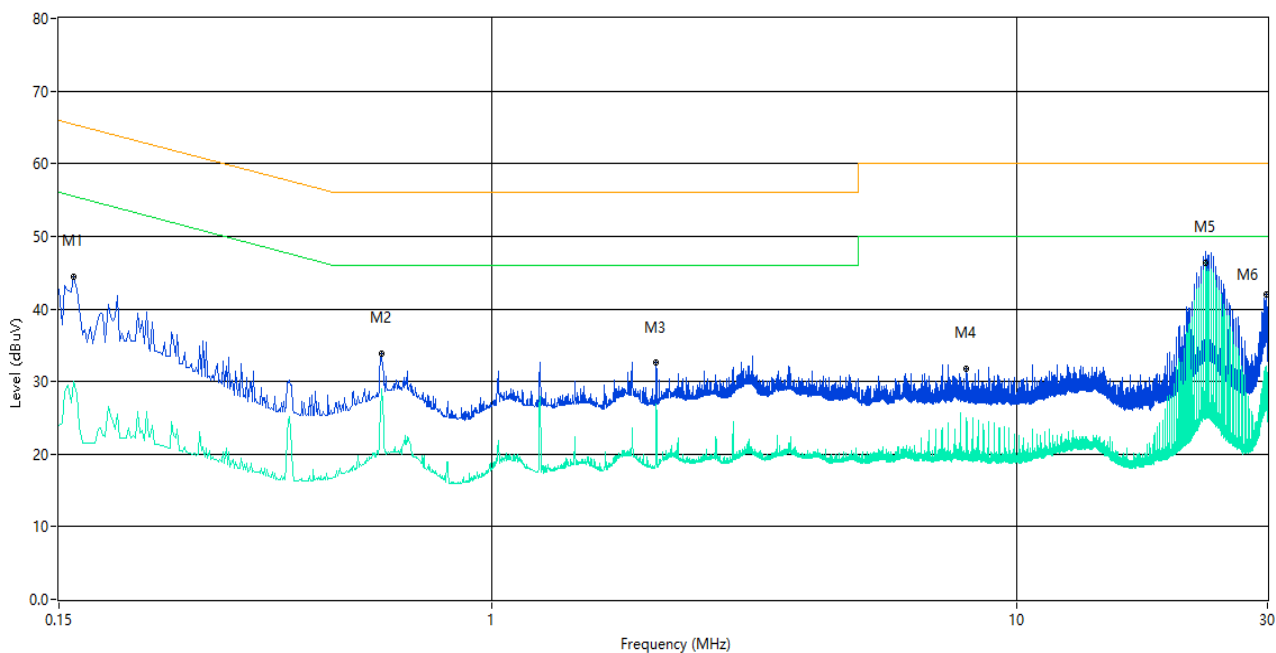
Note: Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration (120 VAC, 60 Hz ) shown here.

#### A.2.1 L Phase



| No. | Frequency (MHz) | Results (dBuV) | Factor (dB) | Limit (dBuV) | Over Limit (dB) | Detector | Line   | Verdict |
|-----|-----------------|----------------|-------------|--------------|-----------------|----------|--------|---------|
| 1   | 0.162           | 44.4           | 10.01       | 65.4         | -21.00          | Peak     | L Line | Pass    |
| 1** | 0.162           | 28.4           | 10.01       | 55.4         | -27.00          | AV       | L Line | Pass    |
| 2   | 0.250           | 36.8           | 10.00       | 61.8         | -25.00          | Peak     | L Line | Pass    |
| 2** | 0.250           | 21.5           | 10.00       | 51.8         | -30.30          | AV       | L Line | Pass    |
| 3   | 0.616           | 33.3           | 10.03       | 56.0         | -22.70          | Peak     | L Line | Pass    |
| 3** | 0.616           | 28.3           | 10.03       | 46.0         | -17.70          | AV       | L Line | Pass    |
| 4   | 1.234           | 33.6           | 10.05       | 56.0         | -22.40          | Peak     | L Line | Pass    |
| 4** | 1.234           | 28.2           | 10.05       | 46.0         | -17.80          | AV       | L Line | Pass    |
| 5   | 6.028           | 33.2           | 10.13       | 60.0         | -26.80          | Peak     | L Line | Pass    |
| 5** | 6.028           | 21.1           | 10.13       | 50.0         | -28.90          | AV       | L Line | Pass    |
| 6   | 22.844          | 47.2           | 10.28       | 60.0         | -12.80          | Peak     | L Line | Pass    |
| 6** | 22.844          | 45.8           | 10.28       | 50.0         | -4.20           | AV       | L Line | Pass    |

## A.2.2 N Phase



| No. | Frequency (MHz) | Results (dBuV) | Factor (dB) | Limit (dBuV) | Over Limit (dB) | Detector | Line   | Verdict |
|-----|-----------------|----------------|-------------|--------------|-----------------|----------|--------|---------|
| 1   | 0.160           | 44.5           | 10.01       | 65.5         | -21.00          | Peak     | N Line | Pass    |
| 1** | 0.160           | 30.1           | 10.01       | 55.5         | -25.40          | AV       | N Line | Pass    |
| 2   | 0.616           | 33.9           | 10.03       | 56.0         | -22.10          | Peak     | N Line | Pass    |
| 2** | 0.616           | 28.5           | 10.03       | 46.0         | -17.50          | AV       | N Line | Pass    |
| 3   | 2.058           | 32.6           | 10.07       | 56.0         | -23.40          | Peak     | N Line | Pass    |
| 3** | 2.058           | 27.0           | 10.07       | 46.0         | -19.00          | AV       | N Line | Pass    |
| 4   | 8.022           | 31.8           | 10.15       | 60.0         | -28.20          | Peak     | N Line | Pass    |
| 4** | 8.022           | 21.9           | 10.15       | 50.0         | -28.10          | AV       | N Line | Pass    |
| 5   | 22.846          | 47.7           | 10.28       | 60.0         | -12.30          | Peak     | N Line | Pass    |
| 5** | 22.846          | 46.3           | 10.28       | 50.0         | -3.70           | AV       | N Line | Pass    |
| 6   | 29.798          | 42.1           | 10.35       | 60.0         | -17.90          | Peak     | N Line | Pass    |
| 6** | 29.798          | 29.9           | 10.35       | 50.0         | -20.10          | AV       | N Line | Pass    |

## **ANNEX B TEST SETUP PHOTOS**

Please refer the document “BL-SZ1920035-AE.PDF”.

## **ANNEX C EUT EXTERNAL PHOTOS**

Please refer the document “BL-SZ1920035-AW.PDF”.

## **ANNEX D EUT INTERNAL PHOTOS**

Please refer the document “BL-SZ1920035-AI.PDF”.

--END OF REPORT--