



# RF TEST REPORT

|                   |                   |
|-------------------|-------------------|
| <b>Applicant</b>  | Spireon Inc       |
| <b>FCC ID</b>     | O9YWCM            |
| <b>Product</b>    | GPS Tracker       |
| <b>Model</b>      | WC-M              |
| <b>Report No.</b> | R2002A0067-R2     |
| <b>Issue Date</b> | February 25, 2020 |

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2019)/ FCC CFR47 Part 27C (2019)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

*Performed by: Peng Tao*

*Approved by: Kai Xu*

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## Summary of Measurement Results

| Number                                                                                                                                                                                                                                                                                                                                                                                                                                             | Test Case                                              | Clause in FCC rules                                                     | Verdict |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------------------|---------|
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                  | RF Power Output and Effective Isotropic Radiated Power | 2.1046<br>27.50(d)(4)<br>/27.50(b)(10)<br>/27.50(c)(10)<br>/27.50(h)(2) | PASS    |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Radiates Spurious Emission                             | 2.1053<br>/27.53(h)<br>/27.53(g)<br>/27.53(f) /27.53(c)                 | PASS    |
| Date of Testing: February 18, 2020~ February 24, 2020                                                                                                                                                                                                                                                                                                                                                                                              |                                                        |                                                                         |         |
| Note: PASS: The EUT complies with the essential requirements in the standard.<br>FAIL: The EUT does not comply with the essential requirements in the standard.<br>All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. |                                                        |                                                                         |         |

Conducted test items except for RF Power Output and Effective Isotropic Radiated Power refer to module(BG96, BG96 MINIPCIE) test report(Report No.: R1811A0536-R3).



# 1 Test Laboratory

## 1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

## 1.2. Test facility

### FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

### A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

## 1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.  
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## 2 General Description of Equipment under Test

### 2.1 Applicant and Manufacturer Information

|                             |                                                                                         |
|-----------------------------|-----------------------------------------------------------------------------------------|
| <b>Applicant</b>            | Spireon Inc                                                                             |
| <b>Applicant address</b>    | 9724 Kingston Pike, Suite 800, Knoxville                                                |
| <b>Manufacturer</b>         | Asiatelco Technologies Co.                                                              |
| <b>Manufacturer address</b> | No. 68 Huatuo Road, Building-8, Zhangjiang Hi-Tech Park, Pudong, Shanghai 201203, China |

### 2.2 General information

| EUT Description                                                                                                |                                                               |             |             |
|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|-------------|-------------|
| Model                                                                                                          | WC-M                                                          |             |             |
| SN                                                                                                             | 1#                                                            |             |             |
| Hardware Version                                                                                               | MM18_P1                                                       |             |             |
| Software Version                                                                                               | 1.0.54                                                        |             |             |
| Power Supply                                                                                                   | External Power Supply                                         |             |             |
| Antenna Type                                                                                                   | Internal Antenna                                              |             |             |
| Antenna Gain                                                                                                   | LTE Band 4:1.2dBi<br>LTE Band 12:0.2dBi<br>LTE Band 13:0.4dBi |             |             |
| Test Mode(s)                                                                                                   | LTE Band 4; LTE Band 12, LTE Band 13;                         |             |             |
| Test Modulation                                                                                                | (LTE)QPSK 16QAM;                                              |             |             |
| LTE Category                                                                                                   | M1                                                            |             |             |
| Maximum E.I.R.P./ E.R.P.                                                                                       | LTE Band 4:                                                   | 22.09dBm    |             |
|                                                                                                                | LTE Band 12:                                                  | 21.06dBm    |             |
|                                                                                                                | LTE Band 13:                                                  | 21.28dBm    |             |
| Rated Power Supply Voltage:                                                                                    | 12V                                                           |             |             |
| Extreme Voltage                                                                                                | Minimum: 8V     Maximum: 30V                                  |             |             |
| Extreme Temperature                                                                                            | Lowest: -30°C     Highest: +75°C                              |             |             |
| Operating Frequency Range(s)                                                                                   | Mode                                                          | Tx (MHz)    | Rx (MHz)    |
|                                                                                                                | LTE Band 4                                                    | 1710 ~ 1755 | 2110 ~ 2155 |
|                                                                                                                | LTE Band 12                                                   | 699 ~ 716   | 729 ~ 746   |
|                                                                                                                | LTE Band 13                                                   | 777 ~ 787   | 746 ~ 756   |
| Note: 1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant. |                                                               |             |             |



### **3 Applied Standards**

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**Test standards:**

**FCC CFR47 Part 27C (2019)**

**ANSI C63.26 (2015)**

**Reference standard:**

**FCC CFR47 Part 2 (2019)**

**KDB 971168 D01 Power Meas License Digital Systems v03r01**

## 4 Test Configuration

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT stand-up position (Z axis), lie-down position (X, Y axis). Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (Z axis, horizontal polarization) and the worst case was recorded.

All mode and data rates and positions and RB size and modulations were investigated.

Subsequently, only the worst case emissions are reported.

The following testing in LTE is set based on the maximum RF Output Power.

The following testing in different Bandwidth is set to detail in the following table:

Test modes are chosen to be reported as the worst case configuration below for LTE Band 4/12/13:

| Test items                                             | Modes                                                                                                                                 | Bandwidth (MHz) |   |   |    |    |    | Modulation |       | RB |     |      | Test Channel |   |   |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------|---|---|----|----|----|------------|-------|----|-----|------|--------------|---|---|
|                                                        |                                                                                                                                       | 1.4             | 3 | 5 | 10 | 15 | 20 | QPSK       | 16QAM | 1  | 50% | 100% | L            | M | H |
| RF Power Output and Effective Isotropic Radiated Power | LTE 4                                                                                                                                 | O               | O | O | O  | O  | O  | O          | O     | O  | O   | O    | O            | O | O |
|                                                        | LTE 12                                                                                                                                | O               | O | O | O  | -  | -  | O          | O     | O  | O   | O    | O            | O | O |
|                                                        | LTE 13                                                                                                                                | -               | - | O | O  | -  | -  | O          | O     | O  | O   | O    | O            | O | O |
| Radiates Spurious Emission                             | LTE 4                                                                                                                                 | O               | - | O | -  | -  | O  | O          | -     | O  | -   | -    | -            | O | - |
|                                                        | LTE 12                                                                                                                                | O               | - | O | O  | -  | -  | O          | -     | O  | -   | -    | -            | O | - |
|                                                        | LTE 13                                                                                                                                | -               | - | O | O  | -  | -  | O          | -     | O  | -   | -    | -            | O | - |
| Note                                                   | 1. The mark "O" means that this configuration is chosen for testing.<br>2. The mark "-" means that this configuration is not testing. |                 |   |   |    |    |    |            |       |    |     |      |              |   |   |

## 5 Test Case Results

### 5.1 RF Power Output and Effective Isotropic Radiated Power

#### Ambient condition

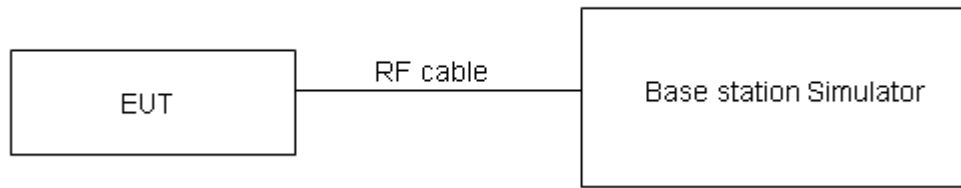
| Temperature | Relative humidity | Pressure |
|-------------|-------------------|----------|
| 23°C ~25°C  | 45%~50%           | 101.5kPa |

#### Methods of Measurement

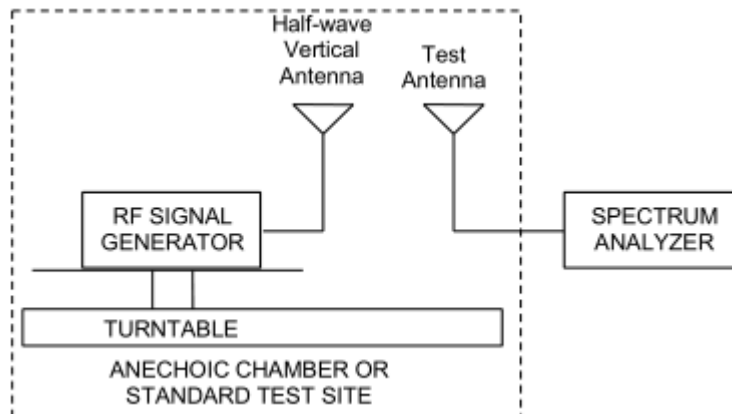
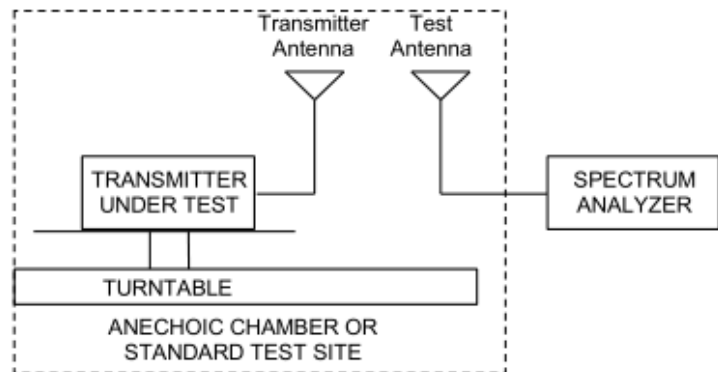
During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

1. The testing follows FCC KDB 971168 D01 v03r01 Section 5.8 and ANSI C63.26 (2015).
    - a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.
    - b) Key the transmitter, then rotate the EUT 360° azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).
    - c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.
    - d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading.  $LOSS = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}$
    - e) Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation:  $ERP \text{ (dBm)} = LVL \text{ (dBm)} + LOSS \text{ (dB)}$
    - f) The maximum ERP is the maximum value determined in the preceding step.
    - g) When calculating ERP, in addition to knowing the antenna radiation and matching characteristics, it is necessary to know the loss values of all elements (e.g. transmission line attenuation, mismatches, filters, combiners) interposed between the point where transmitter output power is measured, and the point where power is applied to the antenna. ERP can then be calculated as follows:  
 $EIRP \text{ (dBm)} = \text{Output Power (dBm)} - \text{Losses (dB)} + \text{Antenna Gain (dBi)}$   
 where: dBd refers to gain relative to an ideal dipole.  
 $EIRP \text{ (dBm)} = ERP \text{ (dBm)} + 2.15 \text{ (dB.)}$
- The RB allocation refers to section 5.1, using the maximum output power configuration.

## Test Setup



The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.



Note: Area side:2.4mX3.6m

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

## Limits

No specific RF power output requirements in part 2.1046.

Rule Part 27.50(b) (10) specifies that “Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP”

Rule Part 27.50(c) (10) specifies that “Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP”



Rule Part 27.50(d) (4) specifies that “Fixed, mobile and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP”

Rule Part 27.50(h) (2) specifies that “Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.”

|                        |                                |
|------------------------|--------------------------------|
| Part 27.50(b)(10)Limit | $\leq 3 \text{ W}$ (34.77 dBm) |
| Part 27.50(c)(10)Limit | $\leq 3 \text{ W}$ (34.77 dBm) |
| Part 27.50(d)(4)Limit  | $\leq 1 \text{ W}$ (30 dBm)    |

### Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ ,  $U=0.4 \text{ dB}$  for RF power output,  $k = 2$ ,  $U= 1.19 \text{ dB}$  for ERP/EIRP.



## Test Results

| Band4  | Channel/<br>Frequency(MHz) | Index | RB#<br>RBstart | Conducted Power<br>(dBm) |       | EIRP<br>(dBm) |       |
|--------|----------------------------|-------|----------------|--------------------------|-------|---------------|-------|
|        |                            |       |                | QPSK                     | 16QAM | QPSK          | 16QAM |
| 1.4MHz | 19957 1710.7               | 0     | 1#0            | 20.23                    | 20.27 | 21.43         | 21.47 |
|        |                            | 0     | 6#0            | 20.28                    | 20.26 | 21.48         | 21.46 |
|        | 20175/1732.5               | 0     | 1#0            | 19.85                    | 20.30 | 21.05         | 21.50 |
|        |                            | 0     | 6#0            | 20.12                    | 20.04 | 21.32         | 21.24 |
|        | 20393/1754.3               | 0     | 1#5            | 19.92                    | 20.62 | 21.12         | 21.82 |
|        |                            | 0     | 6#0            | 20.24                    | 20.10 | 21.44         | 21.30 |
| 3MHz   | 19965/1711.5               | 0     | 1#0            | 19.77                    | 20.42 | 20.97         | 21.62 |
|        |                            | 0     | 6#0            | 19.95                    | 19.83 | 21.15         | 21.03 |
|        | 20175/1732.5               | 0     | 1#0            | 19.83                    | 20.52 | 21.03         | 21.72 |
|        |                            | 0     | 6#0            | 20.18                    | 20.08 | 21.38         | 21.28 |
|        | 20385/1753.5               | 1     | 1#5            | 20.01                    | 20.56 | 21.21         | 21.76 |
|        |                            | 1     | 6#0            | 20.21                    | 20.09 | 21.41         | 21.29 |
| 5MHz   | 19975/1712.5               | 0     | 1#0            | 19.48                    | 20.58 | 20.68         | 21.78 |
|        |                            | 0     | 6#0            | 19.87                    | 20.22 | 21.07         | 21.42 |
|        | 20175/1732.5               | 0     | 1#0            | 19.78                    | 20.65 | 20.98         | 21.85 |
|        |                            | 0     | 6#0            | 20.05                    | 20.40 | 21.25         | 21.60 |
|        | 20375/1752.5               | 3     | 1#5            | 20.05                    | 20.31 | 21.25         | 21.51 |
|        |                            | 3     | 6#0            | 20.31                    | 20.48 | 21.51         | 21.68 |
| 10MHz  | 20000/1715                 | 0     | 1#0            | 19.62                    | 20.64 | 20.82         | 21.84 |
|        |                            | 0     | 4#0            | 19.97                    | 19.59 | 21.17         | 20.79 |
|        | 20175/1732.5               | 0     | 1#0            | 19.64                    | 20.69 | 20.84         | 21.89 |
|        |                            | 0     | 4#0            | 20.08                    | 19.69 | 21.28         | 20.89 |
|        | 20350/1750                 | 7     | 1#5            | 19.89                    | 20.22 | 21.09         | 21.42 |
|        |                            | 7     | 4#2            | 20.17                    | 19.85 | 21.37         | 21.05 |
| 15MHz  | 20025/1717.5               | 0     | 1#0            | 19.59                    | 20.59 | 20.79         | 21.79 |
|        |                            | 0     | 6#0            | 19.97                    | 20.13 | 21.17         | 21.33 |
|        | 20175/1732.5               | 0     | 1#0            | 19.65                    | 20.64 | 20.85         | 21.84 |
|        |                            | 0     | 6#0            | 20.00                    | 20.32 | 21.20         | 21.52 |
|        | 20325/1747.5               | 11    | 1#5            | 19.93                    | 20.40 | 21.13         | 21.60 |
|        |                            | 11    | 6#0            | 20.23                    | 20.29 | 21.43         | 21.49 |
| 20MHz  | 20050/1720                 | 0     | 1#0            | 19.56                    | 20.64 | 20.76         | 21.84 |
|        |                            | 0     | 6#0            | 19.92                    | 20.16 | 21.12         | 21.36 |
|        | 20175/1732.5               | 0     | 1#0            | 19.78                    | 20.89 | 20.98         | 22.09 |
|        |                            | 0     | 6#0            | 20.21                    | 20.22 | 21.41         | 21.42 |
|        | 20300/1745                 | 15    | 1#5            | 19.96                    | 20.32 | 21.16         | 21.52 |
|        |                            | 15    | 6#0            | 20.20                    | 20.32 | 21.40         | 21.52 |

| Band12 | Channel/<br>Frequency(MHz) | Index | RB#<br>RBstart | Conducted Power<br>(dBm) |       | ERP<br>(dBm) |       |
|--------|----------------------------|-------|----------------|--------------------------|-------|--------------|-------|
|        |                            |       |                | QPSK                     | 16QAM | QPSK         | 16QAM |
| 1.4MHz | 23017/699.7                | 0     | 1#0            | 22.03                    | 22.44 | 20.08        | 20.49 |
|        |                            | 0     | 6#0            | 22.29                    | 22.31 | 20.34        | 20.36 |
|        | 23095/707.5                | 0     | 1#0            | 22.00                    | 22.44 | 20.05        | 20.49 |
|        |                            | 0     | 6#0            | 22.20                    | 22.19 | 20.25        | 20.24 |
|        | 23173/715.3                | 0     | 1#5            | 22.05                    | 22.74 | 20.10        | 20.79 |
|        |                            | 0     | 6#0            | 22.30                    | 22.29 | 20.35        | 20.34 |
| 3MHz   | 23025/700.5                | 0     | 1#0            | 22.10                    | 22.78 | 20.15        | 20.83 |
|        |                            | 0     | 6#0            | 22.35                    | 22.24 | 20.40        | 20.29 |
|        | 23095/707.5                | 0     | 1#0            | 22.07                    | 22.73 | 20.12        | 20.78 |
|        |                            | 0     | 6#0            | 22.28                    | 22.26 | 20.33        | 20.31 |
|        | 23165/714.5                | 1     | 1#5            | 22.08                    | 22.73 | 20.13        | 20.78 |
|        |                            | 1     | 6#0            | 22.42                    | 22.33 | 20.47        | 20.38 |
| 5MHz   | 23035/701.5                | 3     | 1#0            | 21.94                    | 22.93 | 19.99        | 20.98 |
|        |                            | 0     | 6#0            | 22.32                    | 22.60 | 20.37        | 20.65 |
|        | 23095/707.5                | 0     | 1#0            | 22.02                    | 22.97 | 20.07        | 21.02 |
|        |                            | 0     | 6#0            | 22.38                    | 22.19 | 20.43        | 20.24 |
|        | 23155/713.5                | 0     | 1#5            | 22.09                    | 22.95 | 20.14        | 21.00 |
|        |                            | 3     | 6#0            | 22.32                    | 22.65 | 20.37        | 20.70 |
| 10MHz  | 23060/704                  | 3     | 1#0            | 21.91                    | 22.98 | 19.96        | 21.03 |
|        |                            | 0     | 4#0            | 22.34                    | 21.98 | 20.39        | 20.03 |
|        | 23095/707.5                | 0     | 1#0            | 22.05                    | 23.01 | 20.10        | 21.06 |
|        |                            | 0     | 4#0            | 22.44                    | 22.05 | 20.49        | 20.10 |
|        | 23130/711                  | 4     | 1#5            | 21.95                    | 22.95 | 20.00        | 21.00 |
|        |                            | 7     | 4#2            | 22.46                    | 21.99 | 20.51        | 20.04 |



| Band13 | Channel/<br>Frequency(MHz) | Index | RB#<br>RBstart | Conducted Power<br>(dBm) |       | ERP<br>(dBm) |       |
|--------|----------------------------|-------|----------------|--------------------------|-------|--------------|-------|
|        |                            |       |                | QPSK                     | 16QAM | QPSK         | 16QAM |
| 5MHz   | 23205/779.5                | 0     | 1#0            | 21.18                    | 20.92 | 19.43        | 19.17 |
|        |                            | 0     | 6#0            | 20.98                    | 21.27 | 19.23        | 19.52 |
|        | 23230/782                  | 0     | 1#0            | 20.65                    | 21.48 | 18.90        | 19.73 |
|        |                            | 0     | 6#0            | 21.01                    | 20.95 | 19.26        | 19.20 |
|        | 23255/784.5                | 3     | 1#5            | 20.65                    | 21.60 | 18.90        | 19.85 |
|        |                            | 3     | 6#0            | 21.21                    | 21.30 | 19.46        | 19.55 |
| 10MHz  | 23230/782                  | 0     | 1#0            | 22.21                    | 23.03 | 20.46        | 21.28 |
|        |                            | 0     | 4#0            | 22.54                    | 22.13 | 20.79        | 20.38 |

## 5.2 Radiates Spurious Emission

### Ambient condition

| Temperature | Relative humidity | Pressure |
|-------------|-------------------|----------|
| 23°C ~25°C  | 45%~50%           | 101.5kPa |

### Method of Measurement

1. The testing follows FCC KDB 971168 D01 v03r01 Section 5.8 and ANSI C63.26 (2015).
2. Below 1GHz: The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H). Above 1GHz: (Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.) The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).
3. A loop antenna, A log-periodic antenna or horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
4. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=200Hz,VBW=600Hz for 9kHz150kHz , RBW=10kHz, VBW=30kHz 150kHz-30MHz ,RBW=100kHz,VBW=300kHz for 30MHz to 1GHz and RBW=1MHz, VBW=3MHz for above 1GHz And the maximum value of the receiver should be recorded as (Pr).
5. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
7. The measurement results are obtained as described below:  

$$\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} + \text{Ga}$$
The measurement results are amend as described below:  

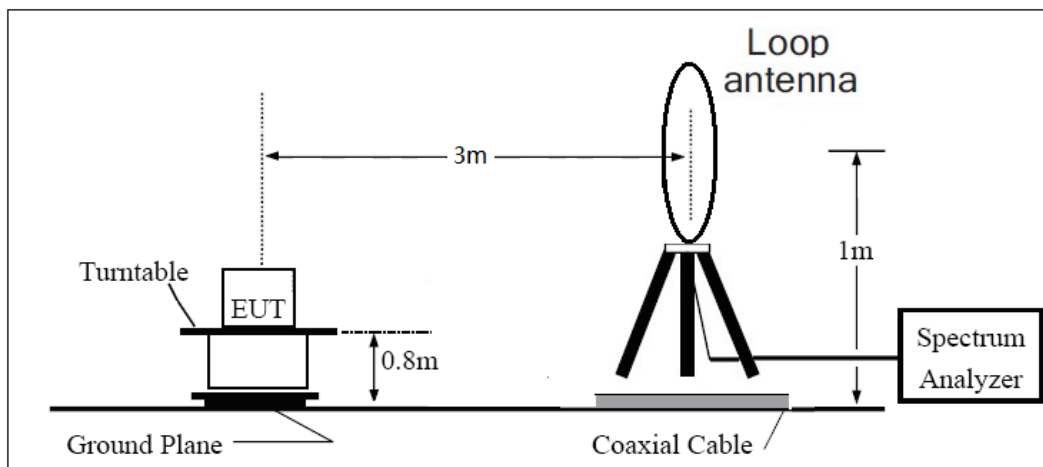
$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$$
8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP

= EIRP-2.15dBi.

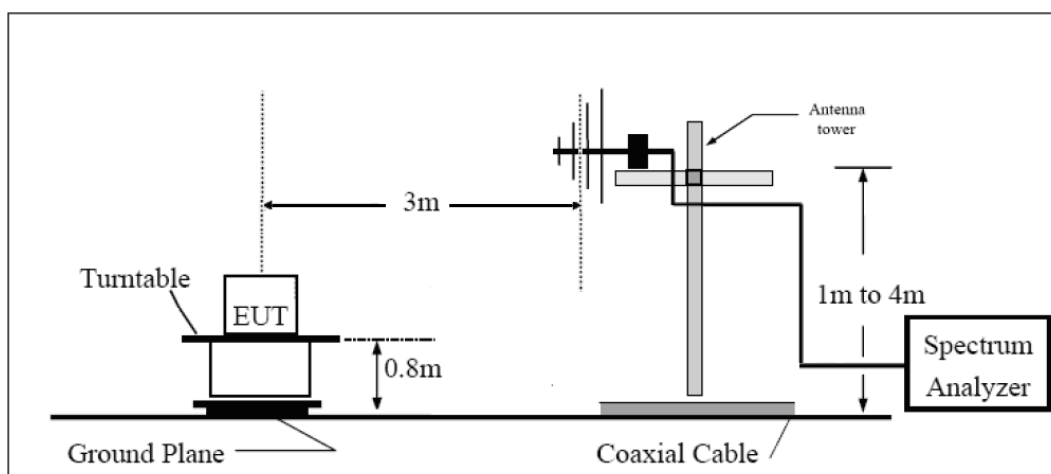
The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

### Test setup

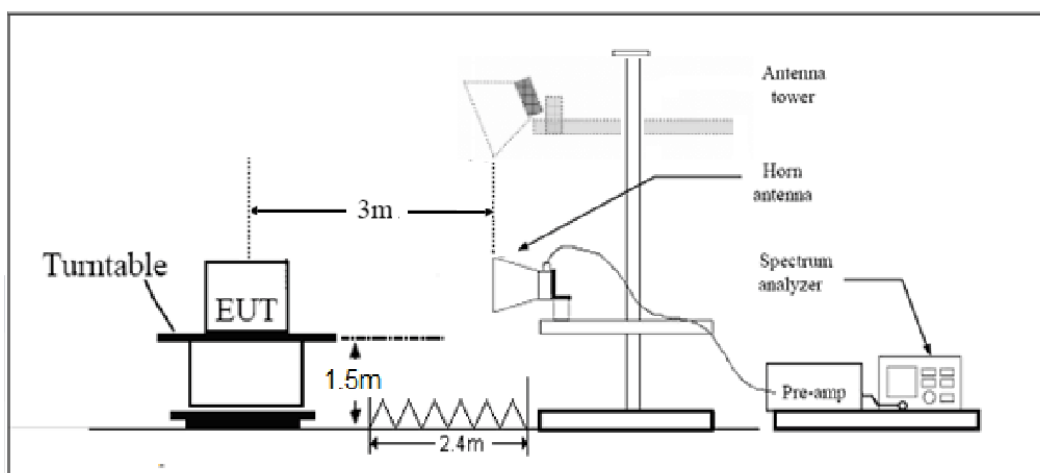
9KHz ~ 30MHz



30MHz ~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

## Limits

LTE -4 Rule Part 27.53(h) specifies that “for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10} (P)$  dB.”

LTE -12 Rule Part 27.53 (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log (P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

LTE -13 Rule Part 27.53(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

LTE 13- Part 27.53 (c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

- (1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB;
- (2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB;
- (3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than  $76 + 10 \log (P)$  dB in a 6.25 kHz band segment, for base and fixed stations;
- (4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations;
- (5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

|                             |                                     |         |
|-----------------------------|-------------------------------------|---------|
| Part 27.53(a)/(h)/(g) Limit |                                     | -13 dBm |
| Part 27.53(f) Limit         | Limit out of the band 1559-1610 MHz | -13 dBm |
|                             | Limit in the band 1559-1610 MHz     | -40 dBm |



## Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = \pm 1.96$ ,  $U = \pm 3.55$  dB.

## Test Result

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions below the noise floor will not be recorded in the report.

LTE Band 4 QPSK 1.4MHz CH-Middle, RB 1

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | EIRP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|------------------|-------------|-------------|---------------|
| 2        | 3464.3          | -49.14   | 2.6             | 10.75      | Horizontal           | -40.99           | -13.00      | 27.99       | 225           |
| 3        | 5197.5          | -62.95   | 2.4             | 11.05      | Horizontal           | -54.30           | -13.00      | 41.30       | 315           |
| 4        | 6930.0          | -57.75   | 4.5             | 11.15      | Horizontal           | -51.10           | -13.00      | 38.10       | 90            |
| 5        | 8662.5          | -55.65   | 5.1             | 11.35      | Horizontal           | -49.40           | -13.00      | 36.40       | 0             |
| 6        | 10395.0         | -53.65   | 5.3             | 11.95      | Horizontal           | -47.00           | -13.00      | 34.00       | 0             |
| 7        | 12127.5         | -54.05   | 5.5             | 13.55      | Horizontal           | -46.00           | -13.00      | 33.00       | 45            |
| 8        | 13860.0         | -50.82   | 6.3             | 13.75      | Horizontal           | -43.37           | -13.00      | 30.37       | 90            |
| 9        | 15592.5         | -53.55   | 6.7             | 13.85      | Horizontal           | -46.40           | -13.00      | 33.40       | 135           |
| 10       | 17325.0         | -49.15   | 6.8             | 14.25      | Horizontal           | -41.70           | -13.00      | 28.70       | 90            |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

LTE Band 4 QPSK 5MHz CH-Middle, RB 1

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | EIRP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|------------------|-------------|-------------|---------------|
| 2        | 3460.5          | -55.45   | 2.6             | 10.75      | Horizontal           | -47.30           | -13.00      | 34.30       | 180           |
| 3        | 5191.5          | -59.15   | 2.4             | 11.05      | Horizontal           | -50.50           | -13.00      | 37.50       | 225           |
| 4        | 6930.0          | -56.85   | 4.5             | 11.15      | Horizontal           | -50.20           | -13.00      | 37.20       | 90            |
| 5        | 8662.5          | -54.20   | 5.1             | 11.35      | Horizontal           | -47.95           | -13.00      | 34.95       | 0             |
| 6        | 10395.0         | -53.25   | 5.3             | 11.95      | Horizontal           | -46.60           | -13.00      | 33.60       | 45            |
| 7        | 12127.5         | -53.35   | 5.5             | 13.55      | Horizontal           | -45.30           | -13.00      | 32.30       | 90            |
| 8        | 13860.0         | -51.05   | 6.3             | 13.75      | Horizontal           | -43.60           | -13.00      | 30.60       | 135           |
| 9        | 15592.5         | -53.65   | 6.7             | 13.85      | Horizontal           | -46.50           | -13.00      | 33.50       | 270           |
| 10       | 17325.0         | -49.95   | 6.8             | 14.25      | Horizontal           | -42.50           | -13.00      | 29.50       | 90            |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.



## LTE Band 4 QPSK 20MHz CH-Middle, RB 1

| Harmonic                                                                                                                                                      | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | EIRP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|-----------------|------------|----------------------|------------------|-------------|-------------|---------------|
| 2                                                                                                                                                             | 3465.0          | -56.15   | 2.6             | 10.75      | Horizontal           | -48.00           | -13.00      | 35.00       | 270           |
| 3                                                                                                                                                             | 5170.9          | -58.05   | 2.4             | 11.05      | Horizontal           | -49.40           | -13.00      | 36.40       | 180           |
| 4                                                                                                                                                             | 6930.0          | -57.05   | 4.5             | 11.15      | Horizontal           | -50.40           | -13.00      | 37.40       | 135           |
| 5                                                                                                                                                             | 8662.5          | -55.35   | 5.1             | 11.35      | Horizontal           | -49.10           | -13.00      | 36.10       | 45            |
| 6                                                                                                                                                             | 10395.0         | -53.25   | 5.3             | 11.95      | Horizontal           | -46.60           | -13.00      | 33.60       | 90            |
| 7                                                                                                                                                             | 12127.5         | -53.85   | 5.5             | 13.55      | Horizontal           | -45.80           | -13.00      | 32.80       | 225           |
| 8                                                                                                                                                             | 13860.0         | -50.75   | 6.3             | 13.75      | Horizontal           | -43.30           | -13.00      | 30.30       | 45            |
| 9                                                                                                                                                             | 15592.5         | -53.45   | 6.7             | 13.85      | Horizontal           | -46.30           | -13.00      | 33.30       | 315           |
| 10                                                                                                                                                            | 17325.0         | -50.35   | 6.8             | 14.25      | Horizontal           | -42.90           | -13.00      | 29.90       | 90            |
| Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.<br>2. The worst emission was found in the antenna is Horizontal position. |                 |          |                 |            |                      |                  |             |             |               |

## LTE Band 12 QPSK 1.4MHz CH-Middle, RB 1

| Harmonic                                                                                                                                                      | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2                                                                                                                                                             | 1415.0          | -46.40   | 2.00            | 10.75      | Horizontal           | -39.80          | -13.00      | 26.80       | 90            |
| 3                                                                                                                                                             | 2122.5          | -51.89   | 2.51            | 11.05      | Horizontal           | -45.50          | -13.00      | 32.50       | 135           |
| 4                                                                                                                                                             | 2830.0          | -56.70   | 4.20            | 11.15      | Horizontal           | -51.90          | -13.00      | 38.90       | 45            |
| 5                                                                                                                                                             | 3537.5          | -52.90   | 5.20            | 11.15      | Horizontal           | -49.10          | -13.00      | 36.10       | 0             |
| 6                                                                                                                                                             | 4245.0          | -58.63   | 5.50            | 11.95      | Horizontal           | -54.33          | -13.00      | 41.33       | 90            |
| 7                                                                                                                                                             | 4952.5          | -60.70   | 5.70            | 13.55      | Horizontal           | -55.00          | -13.00      | 42.00       | 180           |
| 8                                                                                                                                                             | 5660.0          | -59.90   | 6.30            | 13.75      | Horizontal           | -54.60          | -13.00      | 41.60       | 135           |
| 9                                                                                                                                                             | 6367.5          | -57.80   | 6.80            | 13.85      | Horizontal           | -52.90          | -13.00      | 39.90       | 45            |
| 10                                                                                                                                                            | 7075.0          | -54.20   | 6.90            | 14.25      | Horizontal           | -49.00          | -13.00      | 36.00       | 225           |
| Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.<br>2. The worst emission was found in the antenna is Horizontal position. |                 |          |                 |            |                      |                 |             |             |               |



## LTE Band 12 QPSK 5MHz CH-Middle, RB 1

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1415.0          | -49.10   | 2.00            | 10.75      | Horizontal           | -42.50          | -13.00      | 29.50       | 45            |
| 3        | 2122.5          | -48.29   | 2.51            | 11.05      | Horizontal           | -41.90          | -13.00      | 28.90       | 315           |
| 4        | 2830.0          | -59.00   | 4.20            | 11.15      | Horizontal           | -54.20          | -13.00      | 41.20       | 270           |
| 5        | 3537.5          | -52.10   | 5.20            | 11.15      | Horizontal           | -48.30          | -13.00      | 35.30       | 45            |
| 6        | 4245.0          | -59.70   | 5.50            | 11.95      | Horizontal           | -55.40          | -13.00      | 42.40       | 135           |
| 7        | 4952.5          | -59.50   | 5.70            | 13.55      | Horizontal           | -53.80          | -13.00      | 40.80       | 0             |
| 8        | 5660.0          | -59.20   | 6.30            | 13.75      | Horizontal           | -53.90          | -13.00      | 40.90       | 90            |
| 9        | 6367.5          | -57.20   | 6.80            | 13.85      | Horizontal           | -52.30          | -13.00      | 39.30       | 270           |
| 10       | 7075.0          | -53.90   | 6.90            | 14.25      | Horizontal           | -48.70          | -13.00      | 35.70       | 180           |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

## LTE Band 12 QPSK 10MHz CH-Middle, RB 1

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1415.0          | -48.60   | 2.00            | 10.75      | Horizontal           | -42.00          | -13.00      | 29.00       | 135           |
| 3        | 2122.5          | -47.49   | 2.51            | 11.05      | Horizontal           | -41.10          | -13.00      | 28.10       | 270           |
| 4        | 2830.0          | -59.90   | 4.20            | 11.15      | Horizontal           | -55.10          | -13.00      | 42.10       | 45            |
| 5        | 3537.5          | -53.30   | 5.20            | 11.15      | Horizontal           | -49.50          | -13.00      | 36.50       | 90            |
| 6        | 4245.0          | -57.80   | 5.50            | 11.95      | Horizontal           | -53.50          | -13.00      | 40.50       | 135           |
| 7        | 4952.5          | -61.10   | 5.70            | 13.55      | Horizontal           | -55.40          | -13.00      | 42.40       | 45            |
| 8        | 5660.0          | -60.20   | 6.30            | 13.75      | Horizontal           | -54.90          | -13.00      | 41.90       | 225           |
| 9        | 6367.5          | -57.10   | 6.80            | 13.85      | Horizontal           | -52.20          | -13.00      | 39.20       | 315           |
| 10       | 7075.0          | -54.30   | 6.90            | 14.25      | Horizontal           | -49.10          | -13.00      | 36.10       | 90            |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.



## LTE Band 13 QPSK 5MHz CH-Middle, RB 1

| Harmonic                                                                                                                                                      | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | EIRP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|-----------------|------------|----------------------|------------------|-------------|-------------|---------------|
| 2                                                                                                                                                             | 1564.0          | -46.80   | 2.00            | 10.75      | Horizontal           | -40.20           | -40.00      | 0.20        | 225           |
| Harmonic                                                                                                                                                      | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm)  | Limit (dBm) | Margin (dB) | Azimuth (deg) |
| 3                                                                                                                                                             | 3128.0          | -46.89   | 2.51            | 11.05      | Horizontal           | -40.50           | -13.00      | 27.50       | 0             |
| 4                                                                                                                                                             | 3910.0          | -55.10   | 4.20            | 11.15      | Horizontal           | -50.30           | -13.00      | 37.30       | 45            |
| 5                                                                                                                                                             | 4692.0          | -58.80   | 5.20            | 11.15      | Horizontal           | -55.00           | -13.00      | 42.00       | 135           |
| 6                                                                                                                                                             | 5474.0          | -58.40   | 5.50            | 11.95      | Horizontal           | -54.10           | -13.00      | 41.10       | 180           |
| 7                                                                                                                                                             | 6256.0          | -59.30   | 5.70            | 13.55      | Horizontal           | -53.60           | -13.00      | 40.60       | 45            |
| 8                                                                                                                                                             | 7038.0          | -53.80   | 6.30            | 13.75      | Horizontal           | -48.50           | -13.00      | 35.50       | 90            |
| 9                                                                                                                                                             | 7820.0          | -53.60   | 6.80            | 13.85      | Horizontal           | -48.70           | -13.00      | 35.70       | 315           |
| 10                                                                                                                                                            | 3128.0          | -45.70   | 6.90            | 14.25      | Horizontal           | -40.50           | -13.00      | 27.50       | 0             |
| Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.<br>2. The worst emission was found in the antenna is Horizontal position. |                 |          |                 |            |                      |                  |             |             |               |

## LTE Band 13 QPSK 10MHz CH-Middle, RB 1

| Harmonic                                                                                                                                                      | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2                                                                                                                                                             | 1555.3          | -37.18   | 2.00            | 10.75      | Horizontal           | -30.58          | -13.00      | 17.58       | 90            |
| 3                                                                                                                                                             | 2346.0          | -42.79   | 2.51            | 11.05      | Horizontal           | -36.40          | -13.00      | 23.40       | 45            |
| 4                                                                                                                                                             | 3128.0          | -50.10   | 4.20            | 11.15      | Horizontal           | -45.30          | -13.00      | 32.30       | 270           |
| 5                                                                                                                                                             | 3910.0          | -57.50   | 5.20            | 11.15      | Horizontal           | -53.70          | -13.00      | 40.70       | 0             |
| 6                                                                                                                                                             | 4692.0          | -59.50   | 5.50            | 11.95      | Horizontal           | -55.20          | -13.00      | 42.20       | 45            |
| 7                                                                                                                                                             | 5474.0          | -60.80   | 5.70            | 13.55      | Horizontal           | -55.10          | -13.00      | 42.10       | 135           |
| 8                                                                                                                                                             | 6256.0          | -58.20   | 6.30            | 13.75      | Horizontal           | -52.90          | -13.00      | 39.90       | 315           |
| 9                                                                                                                                                             | 7038.0          | -54.00   | 6.80            | 13.85      | Horizontal           | -49.10          | -13.00      | 36.10       | 90            |
| 10                                                                                                                                                            | 7820.0          | -53.00   | 6.90            | 14.25      | Horizontal           | -47.80          | -13.00      | 34.80       | 45            |
| Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.<br>2. The worst emission was found in the antenna is Horizontal position. |                 |          |                 |            |                      |                 |             |             |               |



## 6 Main Test Instruments

| Name                   | Manufacturer | Type         | Serial Number | Calibration Date | Expiration Date |
|------------------------|--------------|--------------|---------------|------------------|-----------------|
| Base Station Simulator | R&S          | CMW500       | 113824        | 2019-05-19       | 2020-05-18      |
| Power Splitter         | Hua Xiang    | SHX-GF2-2-13 | 10120101      | /                | /               |
| Spectrum Analyzer      | Key sight    | N9010A       | MY50210259    | 2019-05-19       | 2020-05-18      |
| Spectrum Analyzer      | R&S          | FSV40        | 15195-01-00   | 2019-05-19       | 2020-05-18      |
| Loop Antenna           | SCHWARZBECK  | FMZB1519     | 1519-047      | 2017-09-26       | 2020-09-25      |
| Trilog Antenna         | SCHWARZBECK  | VUBL 9163    | 9163-201      | 2017-11-18       | 2020-11-17      |
| Horn Antenna           | R&S          | HF907        | 100126        | 2018-07-07       | 2020-07-06      |
| Horn Antenna           | ETS-Lindgren | 3160-09      | 00102643      | 2018-06-20       | 2020-06-19      |
| Signal generator       | R&S          | SMB 100A     | 102594        | 2019-05-19       | 2020-05-18      |
| Climatic Chamber       | ESPEC        | SU-242       | 93000506      | 2017-12-17       | 2020-12-16      |
| Preamplifier           | R&S          | SCU18        | 102327        | 2019-05-19       | 2020-05-18      |
| MOB COMMS DC SUPPLY    | Keysight     | 66319D       | MY43004105    | 2019-05-19       | 2020-05-18      |
| RF Cable               | Agilent      | SMA 15cm     | 0001          | 2019-12-13       | 2020-6-12       |
| Software               | R&S          | EMC32        | 9.26.0        | /                | /               |

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