

# FCC TEST REPORT

## (PART 27)

|            |                                                                           |
|------------|---------------------------------------------------------------------------|
| Applicant: | Fibocom Wireless Inc.                                                     |
| Address:   | 5/F, Tower A, Technology Building II, 1057 Nanhai Avenue, Shenzhen, China |

|                          |                                                                           |
|--------------------------|---------------------------------------------------------------------------|
| Manufacturer or Supplier | Fibocom Wireless Inc.                                                     |
| Address                  | 5/F, Tower A, Technology Building II, 1057 Nanhai Avenue, Shenzhen, China |
| Product                  | LTE Module                                                                |
| Brand Name               | Fibocom                                                                   |
| Model Name               | L860-GL                                                                   |
| FCC ID                   | ZMOL860GLD                                                                |
| Date of tests            | Mar. 19, 2019 ~ Apr. 08, 2019                                             |

The tests have been carried out according to the requirements of the following standard:

- ☒ **FCC Part 27, Subpart C**
☒ **ANSI/TIA/EIA-603- D**  
☒ **FCC Part 2**
☒ **ANSI/TIA/EIA-603-E**
☒ **ANSI C63.26-2015**

**CONCLUSION:** The submitted sample was found to COMPLY with the test requirement

|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Prepared by Roger Li<br>Engineer / Mobile Department                                | Approved by Luke Lu<br>Manager / Mobile Department                                   |
|  |  |
| Date: Apr. 08, 2019                                                                 | Date: Apr. 08, 2019                                                                  |

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**BUREAU  
VERITAS**

**Test Report No.: RF190318W003-6**

|          |                                                                                                     |           |
|----------|-----------------------------------------------------------------------------------------------------|-----------|
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Test Report No.: RF190318W003-6

## RELEASE CONTROL RECORD

| ISSUE NO.      | REASON FOR CHANGE | DATE ISSUED   |
|----------------|-------------------|---------------|
| RF190318W003-6 | Original release  | Apr. 08, 2019 |

## 1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC Part 27 & Part 2 |                                         |        |                                                                                 |
|----------------------------------------|-----------------------------------------|--------|---------------------------------------------------------------------------------|
| STANDARD SECTION                       | TEST TYPE AND LIMIT                     | RESULT | REMARK                                                                          |
| 2.1046<br>27.50(a)(3)                  | Equivalent Isotropically Radiated Power | PASS   | Meet the requirement of limit.                                                  |
| 2.1055<br>27.54                        | Frequency Stability                     | N/A    | See Note                                                                        |
| 2.1049                                 | Occupied Bandwidth                      | N/A    | See Note                                                                        |
| --                                     | Peak to average ratio                   | N/A    | See Note                                                                        |
| 2.1051<br>27.53(a)(4)                  | Band Edge Measurements                  | N/A    | See Note                                                                        |
| 2.1051<br>27.53(a)(4)                  | Conducted Spurious Emissions            | N/A    | See Note                                                                        |
| 2.1053<br>27.53(a)(4)                  | Radiated Spurious Emissions             | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -6.65dB at 6930MHz. |

**Note:** Please refer to test report SZEM180500437001.

### 1.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| MEASUREMENT                | UNCERTAINTY |
|----------------------------|-------------|
| Maximum Peak Output Power  | ±1dB        |
| Frequency Stability        | ± 39.27Hz   |
| Radiated emissions         | ±4.48dB     |
| Conducted emissions        | ±2 dB       |
| Occupied Channel Bandwidth | ±21.7KHz    |
| Band Edge Measurements     | ±4.48dB     |
| Peak to average ratio      | ±0.76dB     |

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

## 1.2 TEST SITE AND INSTRUMENTS

| Equipment                                   | Manufacturer | Model No.                           | Serial No.                      | Last Cal.   | Next Cal.   |
|---------------------------------------------|--------------|-------------------------------------|---------------------------------|-------------|-------------|
| MXE EMI Receiver                            | KEYSIGHT     | N9038A-544                          | MY54450026                      | Feb. 26, 19 | Feb. 25, 20 |
| EXA Signal Analyzer                         | KEYSIGHT     | N9010A-526                          | MY54510322                      | Feb. 26, 19 | Feb. 25, 20 |
| Bilog Antenna 1                             | ETS-LINDGREN | 3143B                               | 00161964                        | Feb. 26, 19 | Feb. 25, 20 |
| Bilog Antenna 2                             | ETS-LINDGREN | 3143B                               | 00161965                        | Feb. 26, 19 | Feb. 25, 20 |
| Horn Antenna 1                              | ETS-LINDGREN | 3117                                | 00168728                        | Feb. 26, 19 | Feb. 25, 20 |
| Horn Antenna 2                              | ETS-LINDGREN | 3117                                | 00168692                        | Nov. 30, 18 | Nov. 29, 19 |
| Loop antenna                                | Daze         | ZN30900A                            | 0708                            | Oct. 23, 18 | Oct. 22, 19 |
| Horn Antenna<br>(18GHz-40GHz)               | N/A          | QWH-SL-18-40<br>-K-SG/QMS-00<br>361 | 15433                           | Nov. 21, 18 | Nov. 20, 19 |
| Radio<br>Communication<br>Analyzer          | ANRITSU      | MT8820C                             | 6201465426                      | Feb. 26, 19 | Feb. 25, 20 |
| Signal Pre-Amplifier                        | EMSI         | EMC 9135                            | 980249                          | Jul. 09, 18 | Jul. 08, 19 |
| Signal Pre-Amplifier                        | EMSI         | EMC 012645B                         | 980257                          | Jul. 09, 18 | Jul. 08, 19 |
| Signal Pre-Amplifier                        | EMSI         | EMC 184045B                         | 980259                          | Jul. 09, 18 | Jul. 08, 19 |
| 3m Semi-anechoic<br>Chamber                 | ETS-LINDGREN | 9m*6m*6m                            | Euroshieldpn-<br>CT0001143-1216 | Feb. 26, 19 | Feb. 25, 20 |
| Test Software                               | E3           | V 9.160323                          | N/A                             | N/A         | N/A         |
| Test Software                               | ADT          | ADT_Radiated<br>_V7.6.15.9.2        | N/A                             | N/A         | N/A         |
| 10dB Attenuator                             | JFW/USA      | 50HF-010-SM<br>A                    | 1505                            | Jul. 09, 18 | Jul. 08, 19 |
| Power Meter                                 | Anritsu      | ML2495A                             | 1506002                         | Feb. 26, 19 | Feb. 25, 20 |
| Power Sensor                                | Anritsu      | MA2411B                             | 1339352                         | Feb. 26, 19 | Feb. 25, 20 |
| Humid & Temp<br>Programmable Tester         | Juyi         | ITH-120-45-CP<br>-AR                | IAA1504-001                     | Jul. 09, 18 | Jul. 08, 19 |
| MXG Analog<br>Microwave<br>Signal Generator | KEYSIGHT     | N5183A                              | MY50143024                      | Feb. 26, 19 | Feb. 25, 20 |

- NOTE:**
1. The calibration interval of the above test instruments is 12 months or 24 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
  2. The test was performed in 3m Semi-anechoic Chamber and RF Oven Room.
  3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.
  4. The FCC Site Registration No. is 525120; The Designation No. is CN1171.

## 2 GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

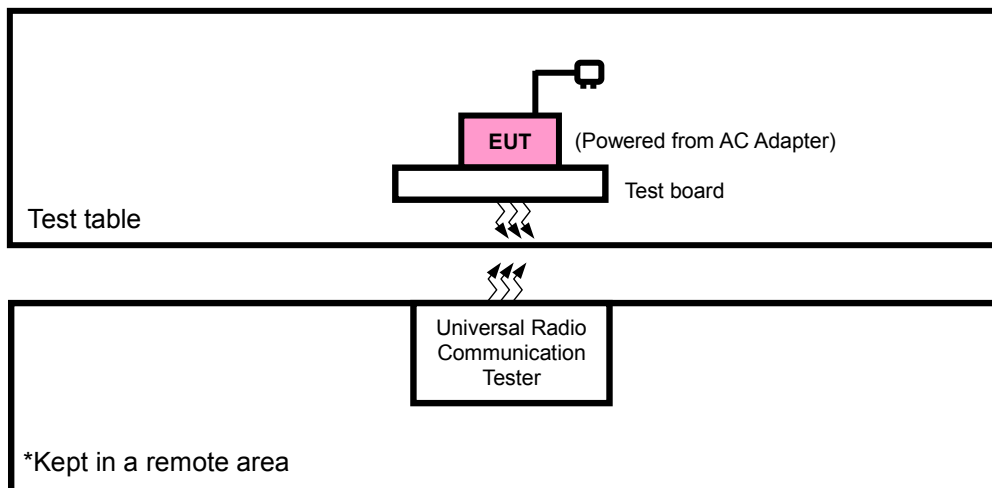
|                              |                                         |                         |
|------------------------------|-----------------------------------------|-------------------------|
| <b>PRODUCT</b>               | LTE Module                              |                         |
| <b>MODEL NAME</b>            | L860-GL                                 |                         |
| <b>POWER SUPPLY</b>          | DC 3.3V                                 |                         |
| <b>MODULATION TECHNOLOGY</b> | LTE                                     | QPSK, 16QAM, 64QAM      |
| <b>FREQUENCY RANGE</b>       | LTE Band 30<br>Channel Bandwidth: 5MHz  | 2307.5 MHz ~ 2312.5 MHz |
|                              | LTE Band 30<br>Channel Bandwidth: 10MHz | 2310 MHz                |
| <b>MAX. EIRP POWER</b>       | LTE Band 30<br>Channel Bandwidth: 5MHz  | 222mW                   |
|                              | LTE Band 30<br>Channel Bandwidth: 10MHz | 204mW                   |
| <b>ANTENNA TYPE</b>          | External Antenna with 3dBi gain         |                         |
| <b>HW VERSION</b>            | V1.2                                    |                         |
| <b>SW VERSION</b>            | 18600.5006.00.31.00.02                  |                         |
| <b>I/O PORTS</b>             | Refer to user's manual                  |                         |
| <b>DATA CABLE</b>            | N/A                                     |                         |

**NOTE:**

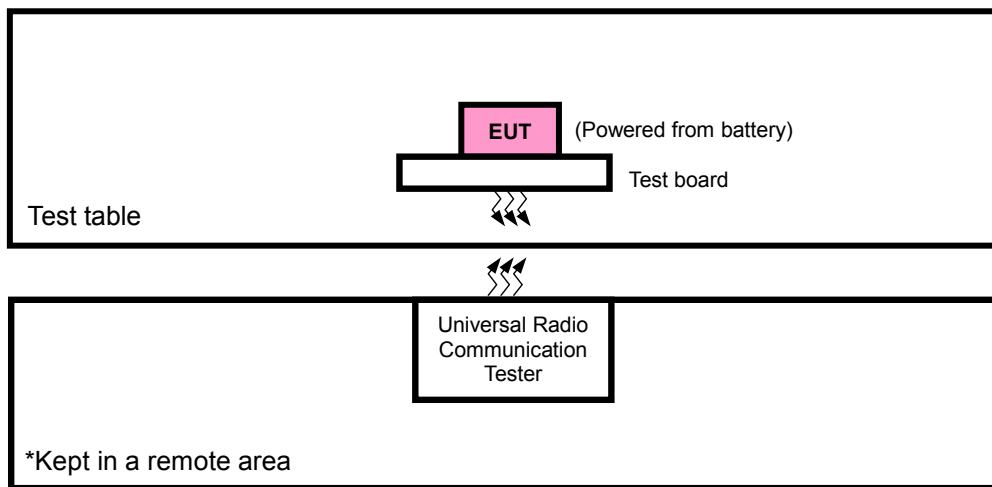
1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

## 2.2 CONFIGURATION OF SYSTEM UNDER TEST

### FOR RADIATION EMISSION TEST



### FOR CONDUCTED & E.R.P./E.I.R.P TEST





## 2.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| NO. | PRODUCT    | BRAND    | MODEL NO. | SERIAL NO. | FCC ID |
|-----|------------|----------|-----------|------------|--------|
| 1   | DC source  | LONG WEI | PS-6403D  | 010934269  | N/A    |
| 2   | PC         | HP       | A6608CN   | 3CR83825X3 | N/A    |
| 3   | Test board | N/A      | N/A       | N/A        | N/A    |

| NO. | SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS |
|-----|-----------------------------------------------------|
| 1   | DC Line: Unshielded, Detachable 1.0m                |
| 2   | AC Line: Unshielded, Detachable 1.5m                |
| 3   | N/A                                                 |

**NOTE:** All power cords of the above support units are non shielded (1.8m).

## 2.4 TEST ITEM AND TEST CONFIGURATION

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found when positioned on Y-plane for EIRP and X-axis for radiated emission. Following channel(s) was (were) selected for the final test as listed below:

| EUT CONFIGURE MODE | DESCRIPTION       |
|--------------------|-------------------|
| -                  | EUT with LTE link |

### LTE BAND 30

| TEST ITEM         | AVAILABLE CHANNEL | TESTED CHANNEL      | CHANNEL BANDWIDTH | MODULATION         | MODE               |
|-------------------|-------------------|---------------------|-------------------|--------------------|--------------------|
| EIRP              | 27685 to 27735    | 27685, 27710, 27735 | 5MHz              | QPSK, 16QAM, 64QAM | 1 RB / 0 RB Offset |
|                   | 27710             | 27710               | 10MHz             | QPSK, 16QAM, 64QAM | 1 RB / 0 RB Offset |
| RADIATED EMISSION | 27685 to 27735    | 27710               | 5MHz              | QPSK               | 1 RB / 0 RB Offset |
|                   | 27710             | 27710               | 10MHz             | QPSK               | 1 RB / 0 RB Offset |

**Note:** This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

**TEST CONDITION:**

| TEST ITEM         | ENVIRONMENTAL CONDITIONS | INPUT POWER | TESTED BY |
|-------------------|--------------------------|-------------|-----------|
| EIRP              | 24deg. C, 60%RH          | DC 3.3V     | Rose Ma   |
| RADIATED EMISSION | 23deg. C, 70%RH          | DC 3.3V     | Rose Ma   |

**2.5 GENERAL DESCRIPTION OF APPLIED STANDARDS**

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 27**

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

**ANSI/TIA/EIA-603-D**

**ANSI/TIA/EIA-603-E**

**ANSI C63.26-2015**

**NOTE:** All test items have been performed and recorded as per the above standards.

### 3 TEST TYPES AND RESULTS

#### 3.1 OUTPUT POWER MEASUREMENT

##### 3.1.1 LIMITS OF OUTPUT POWER MEASUREMENT

Mobile and portable stations. (i) For mobile and portable stations transmitting in the 2305-2315 MHz band or the 2350-2360 MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, except that for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth. For mobile and portable stations using time division duplexing (TDD) technology, the duty cycle must not exceed 38 percent in the 2305-2315 MHz and 2350-2360 MHz bands. Mobile and portable stations using FDD technology are restricted to transmitting in the 2305-2315 MHz band. Power averaging shall not include intervals in which the transmitter is off.

##### 3.1.2 TEST PROCEDURES

###### EIRP MEASUREMENT:

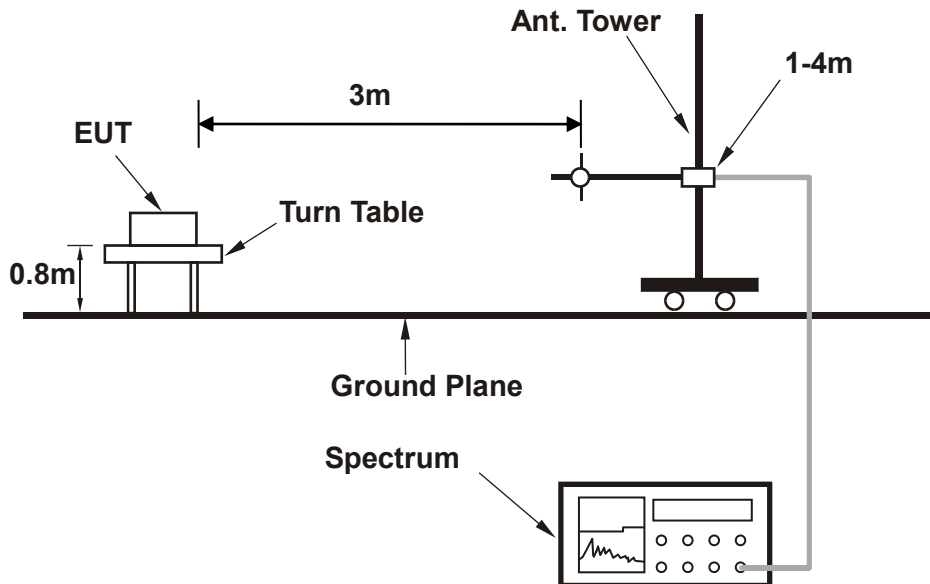
- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 10MHz for LTE mode.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G.
- d.  $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$

###### CONDUCTED POWER MEASUREMENT:

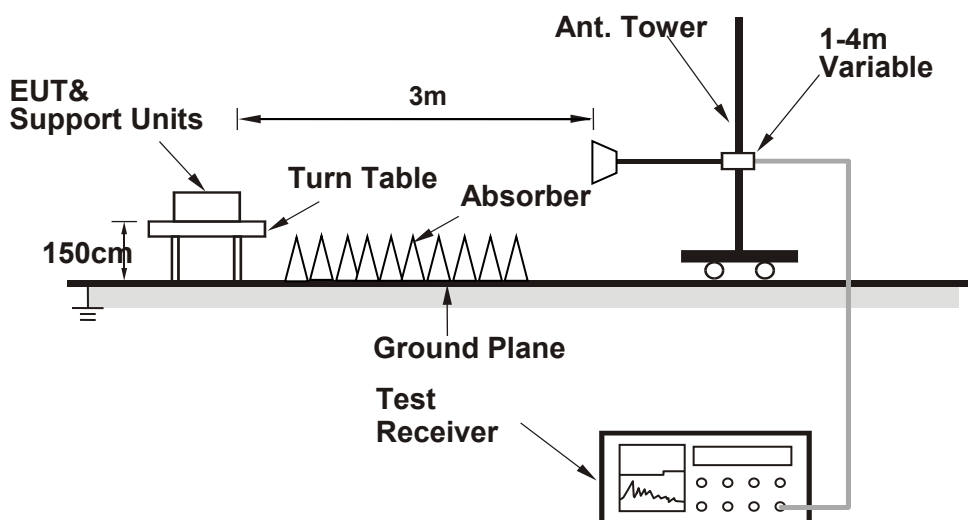
- a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
- b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

### 3.1.3 TEST SETUP

#### ERP MEASUREMENT:

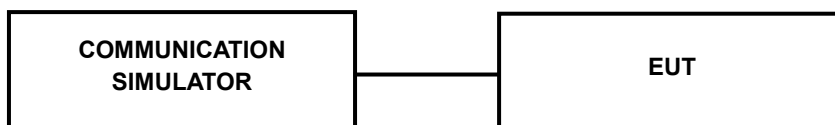


#### EIRP MEASUREMENT:



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### CONDUCTED POWER MEASUREMENT:



For the actual test configuration, please refer to the attached file (Test Setup Photo).

### 3.1.4 TEST RESULTS

#### AVERAGE CONDUCTED OUTPUT POWER (dBm)

| LTE Band 30 |            |         |           |                         |                         |                         |     |
|-------------|------------|---------|-----------|-------------------------|-------------------------|-------------------------|-----|
| BW          | Modulation | RB Size | RB Offset | Low CH<br>27685         | Mid CH<br>27710         | High CH<br>27735        | MPR |
|             |            |         |           | Frequency<br>2307.5 MHz | Frequency<br>2310.0 MHz | Frequency<br>2312.5 MHz |     |
| 5 MHz       | QPSK       | 1       | 0         | 22.38                   | 22.40                   | 22.36                   | 0   |
|             |            | 1       | 12        | 22.28                   | 22.30                   | 22.26                   | 0   |
|             |            | 1       | 24        | 22.13                   | 22.15                   | 22.11                   | 0   |
|             |            | 12      | 0         | 21.37                   | 21.39                   | 21.35                   | 1   |
|             |            | 12      | 6         | 21.29                   | 21.31                   | 21.27                   | 1   |
|             |            | 12      | 13        | 21.43                   | 21.45                   | 21.41                   | 1   |
|             |            | 25      | 0         | 21.24                   | 21.26                   | 21.22                   | 1   |
|             | 16QAM      | 1       | 0         | 21.63                   | 21.65                   | 21.61                   | 1   |
|             |            | 1       | 12        | 21.46                   | 21.48                   | 21.44                   | 1   |
|             |            | 1       | 24        | 21.28                   | 21.30                   | 21.26                   | 1   |
|             |            | 12      | 0         | 20.33                   | 20.35                   | 20.31                   | 2   |
|             |            | 12      | 6         | 20.28                   | 20.30                   | 20.26                   | 2   |
|             |            | 12      | 13        | 20.26                   | 20.28                   | 20.24                   | 2   |
|             |            | 25      | 0         | 20.23                   | 20.25                   | 20.21                   | 2   |
|             | 64QAM      | 1       | 0         | 20.56                   | 20.58                   | 20.54                   | 2   |
|             |            | 1       | 12        | 20.52                   | 20.54                   | 20.50                   | 2   |
|             |            | 1       | 24        | 20.47                   | 20.49                   | 20.45                   | 2   |
|             |            | 12      | 0         | 19.44                   | 19.46                   | 19.42                   | 3   |
|             |            | 12      | 6         | 19.41                   | 19.43                   | 19.39                   | 3   |
|             |            | 12      | 13        | 19.39                   | 19.41                   | 19.37                   | 3   |
|             |            | 25      | 0         | 19.34                   | 19.36                   | 19.32                   | 3   |

| LTE Band 30 |            |         |           |               |                      |               |     |
|-------------|------------|---------|-----------|---------------|----------------------|---------------|-----|
| BW          | Modulation | RB Size | RB Offset | CH            | CH 27710             | CH            | MPR |
|             |            |         |           | Frequency MHz | Frequency 2310.0 MHz | Frequency MHz |     |
| 10 MHz      | QPSK       | 1       | 0         | -             | 22.43                | -             | 0   |
|             |            | 1       | 24        | -             | 22.33                | -             | 0   |
|             |            | 1       | 49        | -             | 22.18                | -             | 0   |
|             |            | 25      | 0         | -             | 21.42                | -             | 1   |
|             |            | 25      | 12        | -             | 21.34                | -             | 1   |
|             |            | 25      | 25        | -             | 21.48                | -             | 1   |
|             |            | 50      | 0         | -             | 21.29                | -             | 1   |
|             | 16QAM      | 1       | 0         | -             | 21.68                | -             | 1   |
|             |            | 1       | 24        | -             | 21.51                | -             | 1   |
|             |            | 1       | 49        | -             | 21.33                | -             | 1   |
|             |            | 25      | 0         | -             | 20.38                | -             | 2   |
|             |            | 25      | 12        | -             | 20.33                | -             | 2   |
|             |            | 25      | 25        | -             | 20.31                | -             | 2   |
|             |            | 50      | 0         | -             | 20.28                | -             | 2   |
|             | 64QAM      | 1       | 0         | -             | 20.61                | -             | 2   |
|             |            | 1       | 24        | -             | 20.57                | -             | 2   |
|             |            | 1       | 49        | -             | 20.52                | -             | 2   |
|             |            | 25      | 0         | -             | 19.49                | -             | 3   |
|             |            | 25      | 12        | -             | 19.46                | -             | 3   |
|             |            | 25      | 25        | -             | 19.44                | -             | 3   |
|             |            | 50      | 0         | -             | 19.39                | -             | 3   |

**EIRP**

**LTE BAND 30**

**CHANNEL BANDWIDTH: 5MHz QPSK**

| Channel | Frequency (MHz) | SPA LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW)      | Polarization (H/V) |
|---------|-----------------|---------------|-----------------------|-----------|---------------|--------------------|
| 27685   | 2307.5          | -29.48        | 45.13                 | 15.50     | 35.48         | H                  |
| 27710   | 2310.0          | -29.37        | 45.17                 | 15.65     | 36.73         | H                  |
| 27735   | 2312.5          | -29.45        | 45.22                 | 15.62     | 36.48         | H                  |
| 27685   | 2307.5          | -23.62        | 46.21                 | 23.47     | <b>222.33</b> | V                  |
| 27710   | 2310.0          | -23.51        | 46.28                 | 23.24     | 210.86        | V                  |
| 27735   | 2312.5          | -23.59        | 46.33                 | 23.41     | 219.28        | V                  |

**CHANNEL BANDWIDTH: 5MHz 16QAM**

| Channel | Frequency (MHz) | SPA LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|---------|-----------------|---------------|-----------------------|-----------|----------|--------------------|
| 27685   | 2307.5          | -4.61         | 45.13                 | 15.14     | 32.66    | H                  |
| 27710   | 2310.0          | -28.09        | 45.17                 | 15.22     | 33.27    | H                  |
| 27735   | 2312.5          | -15.76        | 45.22                 | 15.18     | 32.96    | H                  |
| 27685   | 2307.5          | -21.45        | 46.21                 | 22.61     | 182.39   | V                  |
| 27710   | 2310.0          | -21.46        | 46.28                 | 22.67     | 184.93   | V                  |
| 27735   | 2312.5          | -21.83        | 46.33                 | 22.35     | 171.79   | V                  |

**CHANNEL BANDWIDTH: 5MHz 64QAM**

| Channel | Frequency (MHz) | SPA LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|---------|-----------------|---------------|-----------------------|-----------|----------|--------------------|
| 27685   | 2307.5          | -4.61         | 45.13                 | 15.06     | 32.06    | H                  |
| 27710   | 2310.0          | -28.09        | 45.17                 | 15.11     | 32.43    | H                  |
| 27735   | 2312.5          | -15.76        | 45.22                 | 15.07     | 32.14    | H                  |
| 27685   | 2307.5          | -21.45        | 46.21                 | 22.27     | 168.66   | V                  |
| 27710   | 2310.0          | -21.46        | 46.28                 | 22.18     | 165.20   | V                  |
| 27735   | 2312.5          | -21.83        | 46.33                 | 22.10     | 162.18   | V                  |

## LTE BAND 30

### CHANNEL BANDWIDTH: 10MHz QPSK

| Channel | Frequency (MHz) | SPA LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW)      | Polarization (H/V) |
|---------|-----------------|---------------|-----------------------|-----------|---------------|--------------------|
| 27710   | 2310.0          | -27.67        | 45.17                 | 15.35     | 34.28         | H                  |
| 27710   | 2310.0          | -21.04        | 46.28                 | 23.09     | <b>203.70</b> | V                  |

### CHANNEL BANDWIDTH: 10MHz 16QAM

| Channel | Frequency (MHz) | SPA LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|---------|-----------------|---------------|-----------------------|-----------|----------|--------------------|
| 27710   | 2310.0          | -28.74        | 45.17                 | 14.28     | 26.79    | H                  |
| 27710   | 2310.0          | -22.11        | 46.28                 | 22.02     | 159.22   | V                  |

### CHANNEL BANDWIDTH: 10MHz 64QAM

| Channel | Frequency (MHz) | SPA LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|---------|-----------------|---------------|-----------------------|-----------|----------|--------------------|
| 27710   | 2310.0          | -28.74        | 45.17                 | 13.98     | 25.00    | H                  |
| 27710   | 2310.0          | -22.11        | 46.28                 | 21.87     | 153.82   | V                  |

**REMARKS:** 1. EIRP Output Power (dBm) = SPA LVL (dBm) + Correction Factor (dB).

2. Correction factor (dB) = Free Space Loss + Antenna Factor + Cable Loss



## 3.2 FREQUENCY STABILITY MEASUREMENT

### 3.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

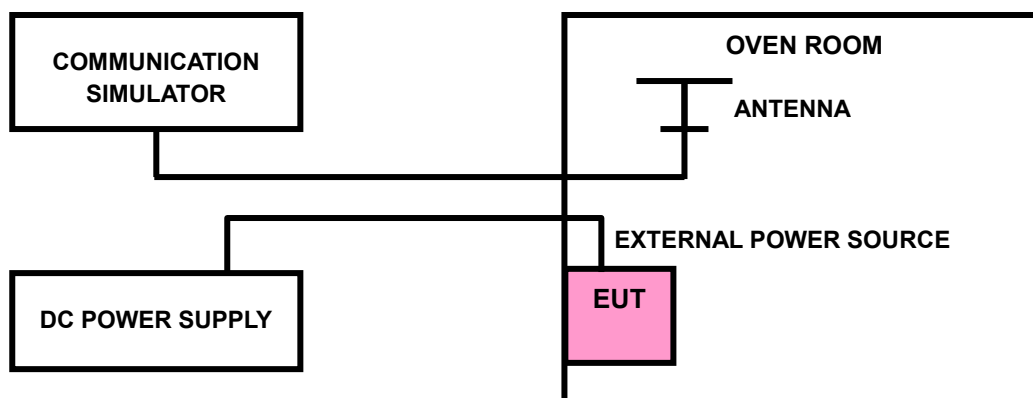
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

### 3.2.2 TEST PROCEDURE

- Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the  $\pm 0.5^{\circ}\text{C}$  during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

**NOTE:** The frequency error was recorded frequency error from the communication simulator.

### 3.2.3 TEST SETUP





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### 3.2.4 TEST RESULTS

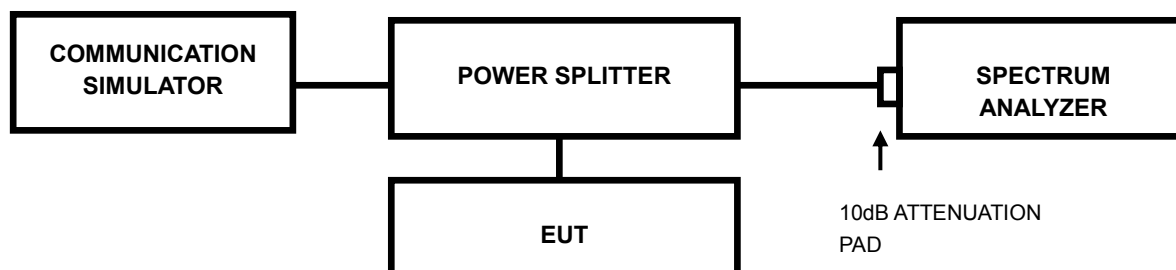
Please refer to section 8 of Appendix B in test report SZEM180500437001.

### 3.3 OCCUPIED BANDWIDTH MEASUREMENT

#### 3.3.1 LIMITS OF OCCUPIED BANDWIDTH MEASUREMENT

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

#### 3.3.2 TEST SETUP



#### 3.3.3 TEST PROCEDURES

- The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
- Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

#### 3.3.4 TEST RESULTS

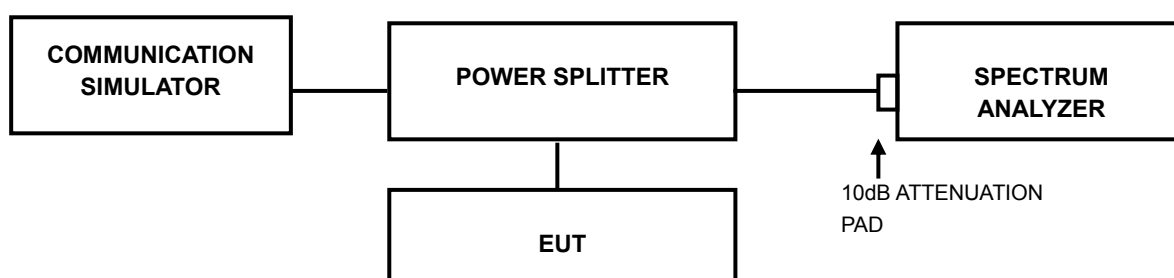
Please refer to section 4 of Appendix B in test report SZEM180500437001.

### 3.4 PEAK TO AVERAGE RATIO

#### 3.4.1 LIMITS OF PEAK TO AVERAGE RATIO MEASUREMENT

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

#### 3.4.2 TEST SETUP



#### 3.4.3 TEST PROCEDURES

1. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

#### 3.4.4 TEST RESULTS

Please refer to section 2 of Appendix B in test report SZEM180500437001.

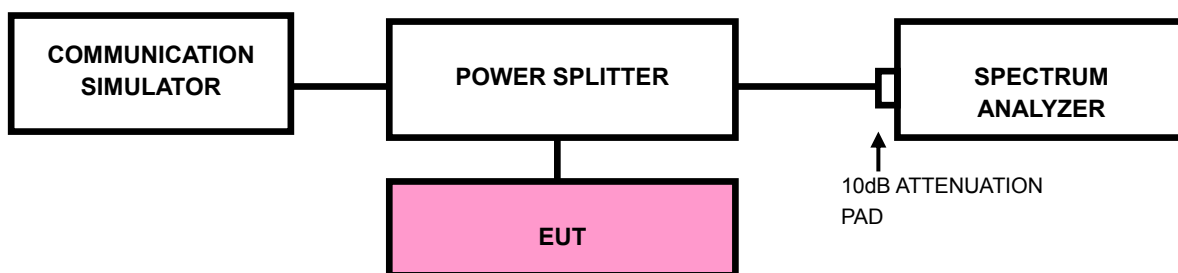
### 3.5 BAND EDGE MEASUREMENT

#### 3.5.1 LIMITS OF BAND EDGE MEASUREMENT

According to FCC 27.53(m) For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:

- (i) By a factor of not less than:  $43 + 10 \log (P)$  dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than  $55 + 10 \log (P)$  dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than  $61 + 10 \log (P)$  dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than  $67 + 10 \log (P)$  dB on all frequencies between 2328 and 2337 MHz;
- (ii) By a factor of not less than  $43 + 10 \log (P)$  dB on all frequencies between 2300 and 2305 MHz,  $55 + 10 \log (P)$  dB on all frequencies between 2296 and 2300 MHz,  $61 + 10 \log (P)$  dB on all frequencies between 2292 and 2296 MHz,  $67 + 10 \log (P)$  dB on all frequencies between 2288 and 2292 MHz, and  $70 + 10 \log (P)$  dB below 2288 MHz;
- (iii) By a factor of not less than  $43 + 10 \log (P)$  dB on all frequencies between 2360 and 2365 MHz, and not less than  $70 + 10 \log (P)$  dB above 2365 MHz.

#### 3.5.2 TEST SETUP



### 3.5.3 TEST PROCEDURES

- a. The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with R&S Spectrum Analyzer. All measurements were done at 2 channels (low and high operational frequency range.).
- b. The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
- c. Measuring frequency range is from 2305 MHz to 2315 MHz for LTE Band 30. 10 dB attenuation pad is connected with spectrum.  
RBW=1MHz and VBW=3MHz are used for conducted emission measurement.
- d. Record the max trace plot into the test report.

### 3.5.4 TEST RESULTS

Please refer to section 5 of Appendix B in test report SZEM180500437001.

### 3.6 CONDUCTED SPURIOUS EMISSIONS

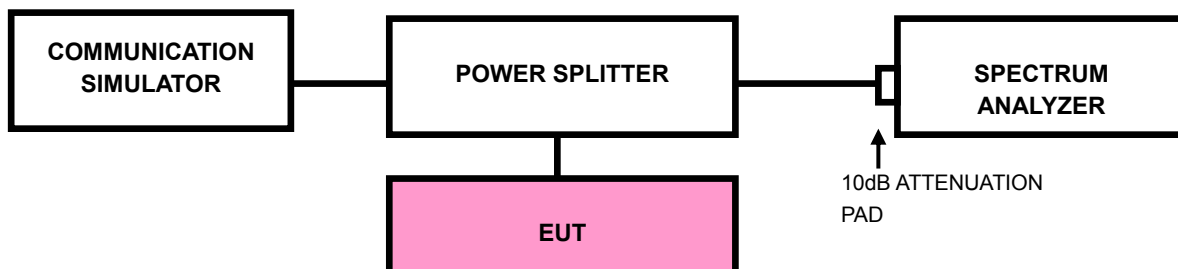
#### 3.6.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $70 + 10 \log_{10}(P)$  dB. The limit of emission is equal to -40dBm.

#### 3.6.2 TEST PROCEDURE

- a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- b. Measuring frequency range is from 30 MHz to 24GHz for LTE Band 30. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are used for conducted emission measurement.

#### 3.6.3 TEST SETUP



#### 3.6.4 TEST RESULTS

Please refer to section 6 of Appendix B in test report SZEM180500437001.

### 3.7 RADIATED EMISSION MEASUREMENT

#### 3.7.1 LIMITS OF RADIATED EMISSION MEASUREMENT

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $70 + 10 \log_{10}(P)$  dB. The limit of emission is equal to -40dBm.

#### 3.7.2 TEST PROCEDURES

- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value " of step a. Record the power level of S.G.
- c.  $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
- d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole,  
 $E.R.P \text{ power} = E.I.P.R \text{ power} - 2.15dBi.$

**NOTE:** The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

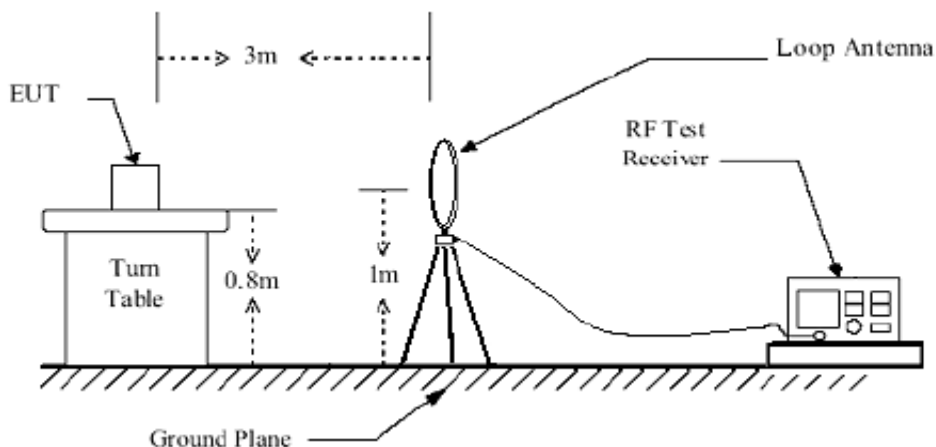
#### 3.7.3 DEVIATION FROM TEST STANDARD

No deviation

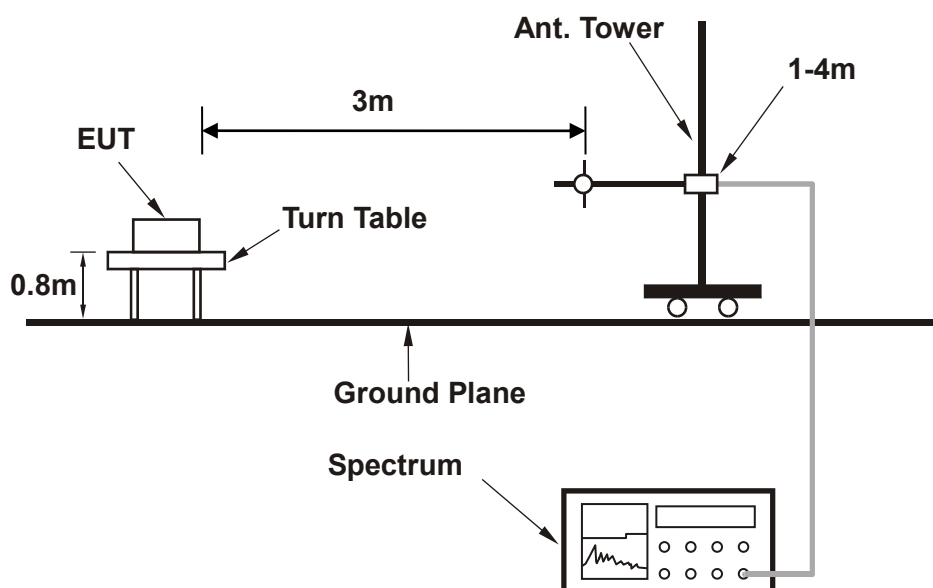


### 3.7.4 TEST SETUP

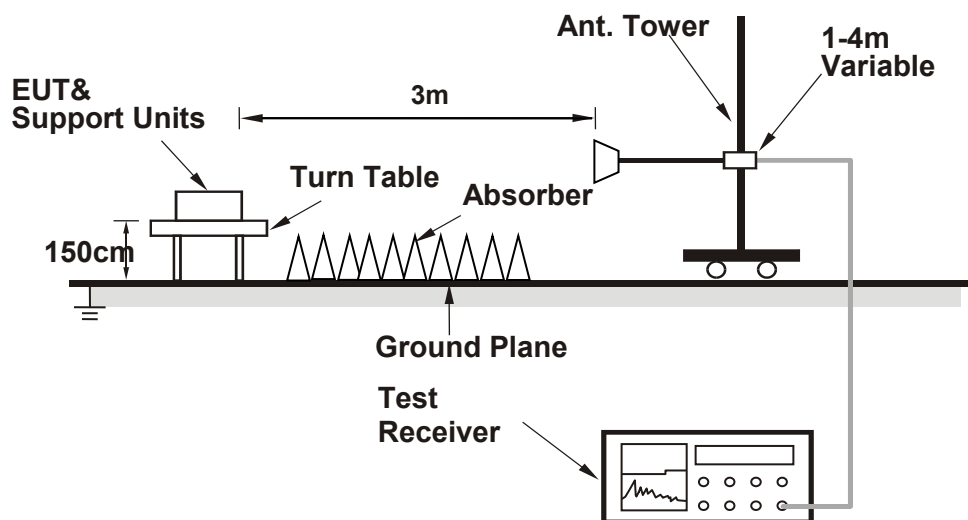
#### <Below 30MHz>



#### < Frequency Range 30MHz~1GHz >



< Frequency Range above 1GHz >



For the actual test configuration, please refer to the attached file (Test Setup Photo).

### 3.7.5 TEST RESULTS

#### BELOW 1GHz WORST-CASE DATA

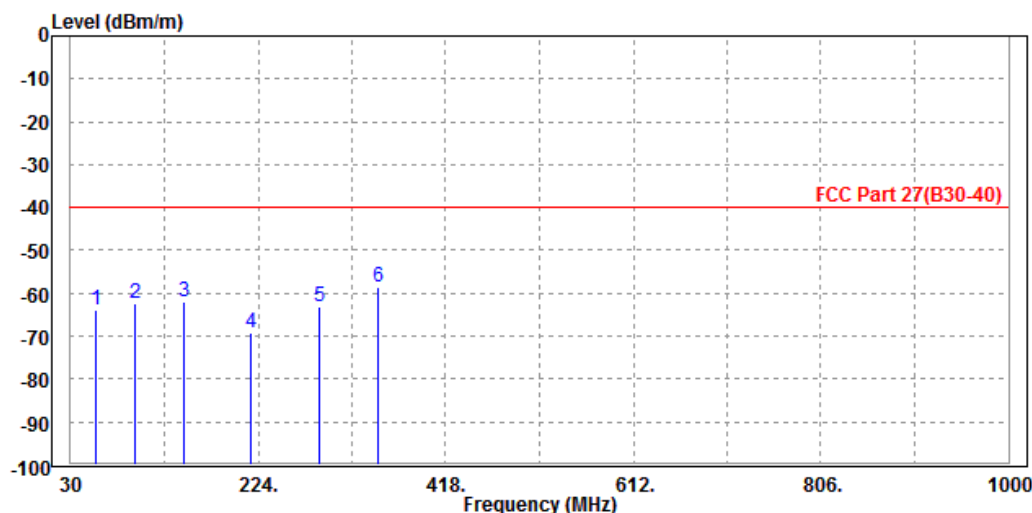
**9 KHz – 30 MHz data:** the amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

**30 MHz – 1GHz data:**

**LTE Band 30:**

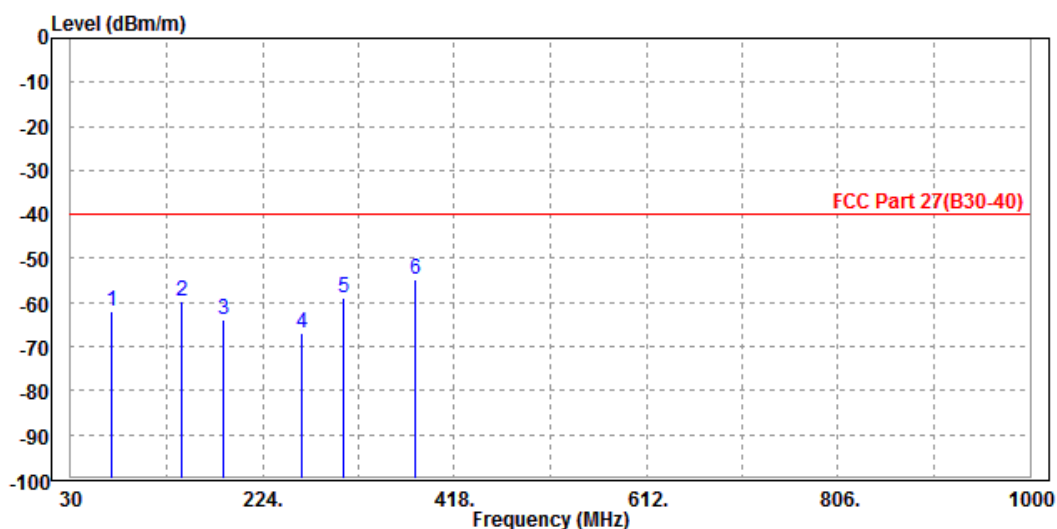
|                                                     |                  |                 |               |
|-----------------------------------------------------|------------------|-----------------|---------------|
| MODE                                                | TX channel 27710 | FREQUENCY RANGE | Below 1000MHz |
| ENVIRONMENTAL CONDITIONS                            | 23deg. C, 70%RH  | INPUT POWER     | DC 3.3V       |
| TESTED BY                                           | Rose Ma          |                 |               |
| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                  |                 |               |

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark | Pol/Phase  |
|------|---------|--------|------------|------------|------------|--------|--------|------------|
|      | MHz     | dBm/m  | dBm        | dBm/m      | dB         | dB/m   |        |            |
| 1    | 56.870  | -63.80 | -59.85     | -40.00     | -23.80     | -3.95  | Peak   | Horizontal |
| 2    | 96.430  | -62.53 | -52.13     | -40.00     | -22.53     | -10.40 | Peak   | Horizontal |
| 3    | 147.980 | -62.01 | -42.86     | -40.00     | -22.01     | -19.15 | Peak   | Horizontal |
| 4    | 216.140 | -69.36 | -52.43     | -40.00     | -29.36     | -16.93 | Peak   | Horizontal |
| 5    | 287.510 | -63.18 | -48.75     | -40.00     | -23.18     | -14.43 | Peak   | Horizontal |
| 6 PP | 348.490 | -58.46 | -46.28     | -40.00     | -18.46     | -12.18 | Peak   | Horizontal |



|                                                   |                  |                 |               |
|---------------------------------------------------|------------------|-----------------|---------------|
| MODE                                              | TX channel 27710 | FREQUENCY RANGE | Below 1000MHz |
| ENVIRONMENTAL CONDITIONS                          | 23deg. C, 70%RH  | INPUT POWER     | DC 3.3V       |
| TESTED BY                                         | Rose Ma          |                 |               |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M |                  |                 |               |

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark | Pol/Phase |
|------|---------|--------|------------|------------|------------|--------|--------|-----------|
|      | MHz     | dBm/m  | dBm        | dBm/m      | dB         | dB/m   |        |           |
| 1    | 71.370  | -61.92 | -47.07     | -40.00     | -21.92     | -14.85 | Peak   | Vertical  |
| 2    | 142.380 | -59.51 | -43.56     | -40.00     | -19.51     | -15.95 | Peak   | Vertical  |
| 3    | 184.530 | -64.04 | -51.45     | -40.00     | -24.04     | -12.59 | Peak   | Vertical  |
| 4    | 264.170 | -66.93 | -55.47     | -40.00     | -26.93     | -11.46 | Peak   | Vertical  |
| 5    | 306.320 | -58.76 | -47.49     | -40.00     | -18.76     | -11.27 | Peak   | Vertical  |
| 6 PP | 378.440 | -54.59 | -43.58     | -40.00     | -14.59     | -11.01 | Peak   | Vertical  |



### ABOVE 1GHz

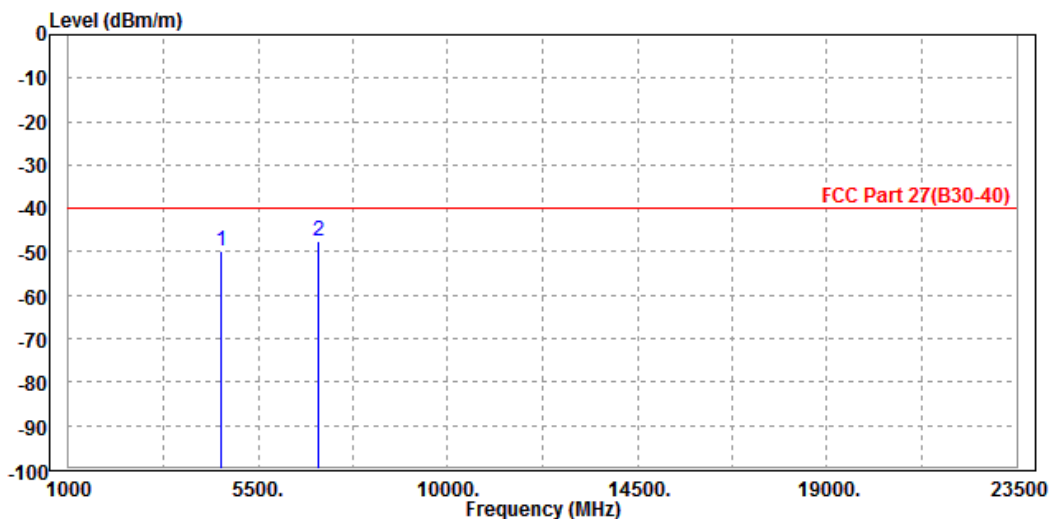
**Note:** For higher frequency, the emission is too low to be detected.

### LTE Band 30

### CHANNEL BANDWIDTH: 5MHz / QPSK

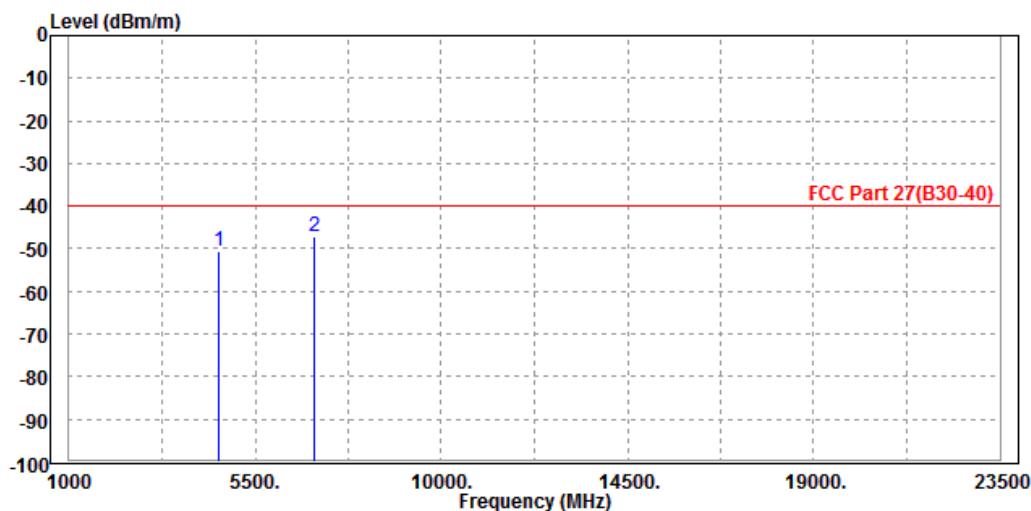
|                                                     |                  |                 |               |
|-----------------------------------------------------|------------------|-----------------|---------------|
| MODE                                                | TX channel 27710 | FREQUENCY RANGE | Above 1000MHz |
| ENVIRONMENTAL CONDITIONS                            | 23deg. C, 70%RH  | INPUT POWER     | DC 3.3V       |
| TESTED BY                                           | Rose Ma          |                 |               |
| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                  |                 |               |

|      | Freq     | Level  | Read Level | Limit Line | Over Limit | Factor | Remark | Pol/Phase  |
|------|----------|--------|------------|------------|------------|--------|--------|------------|
|      | MHz      | dBm/m  | dBm        | dBm/m      | dB         | dB/m   |        |            |
| 1    | 4620.000 | -49.85 | -56.63     | -40.00     | -9.85      | 6.78   | Peak   | Horizontal |
| 2 PP | 6930.000 | -47.40 | -58.96     | -40.00     | -7.40      | 11.56  | Peak   | Horizontal |



|                                                   |                  |                 |               |
|---------------------------------------------------|------------------|-----------------|---------------|
| MODE                                              | TX channel 27710 | FREQUENCY RANGE | Above 1000MHz |
| ENVIRONMENTAL CONDITIONS                          | 23deg. C, 70%RH  | INPUT POWER     | DC 3.3V       |
| TESTED BY                                         | Rose Ma          |                 |               |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M |                  |                 |               |

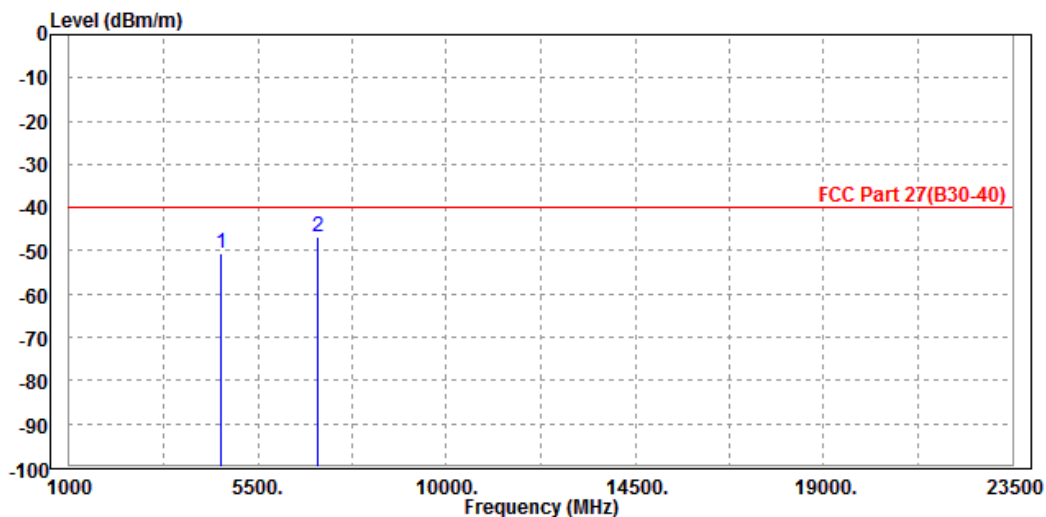
|      | Freq     | Level  | Read Level | Limit Line | Over Limit | Factor | Remark | Pol/Phase |
|------|----------|--------|------------|------------|------------|--------|--------|-----------|
|      | MHz      | dBm/m  | dBm        | dBm/m      | dB         | dB/m   |        |           |
| 1    | 4620.000 | -50.74 | -57.42     | -40.00     | -10.74     | 6.68   | Peak   | Vertical  |
| 2 PP | 6930.000 | -47.32 | -58.79     | -40.00     | -7.32      | 11.47  | Peak   | Vertical  |



**CHANNEL BANDWIDTH: 10MHz / QPSK**

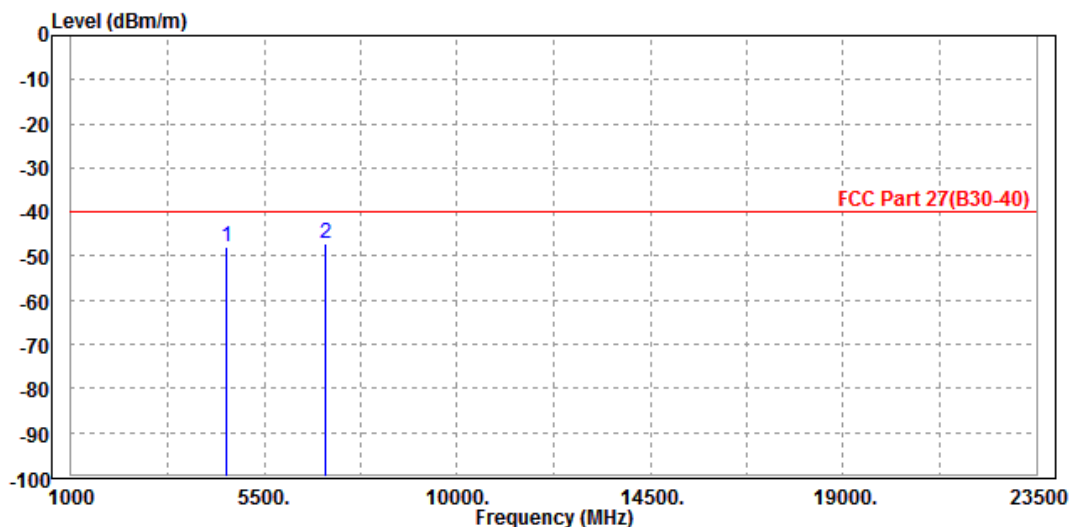
|                                                     |                  |                 |               |
|-----------------------------------------------------|------------------|-----------------|---------------|
| MODE                                                | TX channel 27710 | FREQUENCY RANGE | Above 1000MHz |
| ENVIRONMENTAL CONDITIONS                            | 23deg. C, 70%RH  | INPUT POWER     | DC 3.3V       |
| TESTED BY                                           | Rose Ma          |                 |               |
| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                  |                 |               |

|      | Freq     | Level  | Read Level | Limit Line | Over Limit | Factor | Remark | Pol/Phase  |
|------|----------|--------|------------|------------|------------|--------|--------|------------|
|      | MHz      | dBm/m  | dBm        | dBm/m      | dB         | dB/m   |        |            |
| 1    | 4620.000 | -50.63 | -57.41     | -40.00     | -10.63     | 6.78   | Peak   | Horizontal |
| 2 PP | 6930.000 | -46.65 | -58.21     | -40.00     | -6.65      | 11.56  | Peak   | Horizontal |



|                                                   |                  |                 |               |
|---------------------------------------------------|------------------|-----------------|---------------|
| MODE                                              | TX channel 27710 | FREQUENCY RANGE | Above 1000MHz |
| ENVIRONMENTAL CONDITIONS                          | 23deg. C, 70%RH  | INPUT POWER     | DC 3.3V       |
| TESTED BY                                         | Rose Ma          |                 |               |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M |                  |                 |               |

|      | Freq     | Level  | Read Level | Limit Line | Over Limit | Factor | Remark | Pol/Phase |
|------|----------|--------|------------|------------|------------|--------|--------|-----------|
|      | MHz      | dBm/m  | dBm        | dBm/m      | dB         | dB/m   |        |           |
| 1    | 4620.000 | -47.94 | -54.62     | -40.00     | -7.94      | 6.68   | Peak   | Vertical  |
| 2 PP | 6930.000 | -46.99 | -58.46     | -40.00     | -6.99      | 11.47  | Peak   | Vertical  |







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#### 4 INFORMATION ON THE TESTING LABORATORIES

We, BV 7LAYERS COMMUNICATIONS TECHNOLOGY (SHENZHEN) CO. LTD., were founded in 2015 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Fax: +86-755-88696577

Email: [customerservice.dg@cn.bureauveritas.com](mailto:customerservice.dg@cn.bureauveritas.com)

Web Site: [www.adt.com.tw](http://www.adt.com.tw)

The address and road map of all our labs can be found in our web site also.



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## 5 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---