

# FCC TEST REPORT

## (PART 90)

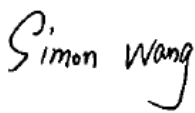
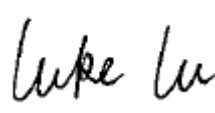
|            |                                                                                       |
|------------|---------------------------------------------------------------------------------------|
| Applicant: | Thundercomm Technology Co., Ltd                                                       |
| Address:   | No. 107, Middle Datagu Road, Xiantao Street, Yubei District, Chongqing, China, 401122 |

|                          |                                                                                       |
|--------------------------|---------------------------------------------------------------------------------------|
| Manufacturer or Supplier | Thundercomm Technology Co., Ltd                                                       |
| Address                  | No. 107, Middle Datagu Road, Xiantao Street, Yubei District, Chongqing, China, 401122 |
| Product                  | TurboX CM2290-NA                                                                      |
| Brand Name               | TURBOX                                                                                |
| Model Name               | TurboX CM2290-NA                                                                      |
| FCC ID                   | 2AOHHCM2290NA                                                                         |
| Date of tests            | Apr. 07, 2023 ~ Apr. 26, 2023                                                         |

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

☒ **FCC Part 90, Subpart R, S**    ☒ **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 Simon Wang<br>Engineer / Mobile Department                              | Approved by Luke Lu<br>Manager / Mobile Department                                    |
|  |  |
| Date: Apr. 26, 2023                                                                 | Date: Apr. 26, 2023                                                                   |

This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.



Test Report No.: W7L-P23030025RF08

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## RELEASE CONTROL RECORD

| ISSUE NO.         | REASON FOR CHANGE | DATE ISSUED   |
|-------------------|-------------------|---------------|
| W7L-P23030025RF08 | Original release  | Apr. 26, 2023 |

## 1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC Part 90 & Part 2 |                                      |        |           |
|----------------------------------------|--------------------------------------|--------|-----------|
| STANDARD SECTION                       | TEST TYPE AND LIMIT                  | RESULT | TEST LAB* |
| §2.1046<br>§90.635(b)                  | Conducted Output Power<br>(Band26)   | PASS   | A         |
| §90.541(d)                             | Effective Radiated Power<br>(Band14) | PASS   | A         |
| §2.1055<br>§90.213<br>§90.539          | Frequency Stability                  | PASS   | A         |
| §2.1049<br>§90.209                     | Occupied Bandwidth                   | PASS   | A         |
| §2.1051<br>§90.543(e)(f)<br>§90.691(a) | Emission Masks                       | PASS   | A         |
| §2.1051<br>§90.543(e)(f)<br>§90.691(a) | Conducted Spurious<br>Emissions      | PASS   | A         |
| §2.1053<br>§90.691                     | Radiated Spurious<br>Emissions       | PASS   | A         |

### \*Test Lab Information Reference

#### Lab A:

BV 7Layers Communications Technology (Shenzhen) Co., Ltd

#### Lab Address:

No.B102, Dazu Chuangxin Mansion, North of Beihuan Avenue, North Area, Hi-Tech Industrial Park,  
Nanshan District, Shenzhen, Guangdong, China

**Accredited Test Lab Cert 3939.01**

**The FCC Site Registration No. : 525120; Designation No. : CN1171;**

## 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         | FREQUENCY     | UNCERTAINTY |
|---------------------|---------------|-------------|
| Conducted emissions | 9kHz~30MHz    | 2.66dB      |
| Radiated emissions  | 9KHz ~ 30MHz  | 2.68dB      |
|                     | 30MHz ~ 1GHz  | 3.26dB      |
|                     | 1GHz ~ 18GHz  | 4.48dB      |
|                     | 18GHz ~ 40GHz | 4.12dB      |

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. 17,23 | Feb. 16,24 |
| EXA Signal Analyzer                         | KEYSIGHT      | N9010A-544                          | MY54510355                          | May.14,22  | May.13,23  |
| Loop Antenna                                | Schwarzbeck   | FMZB 1519B                          | 00173                               | Sep.03,22  | Sep.02,23  |
| Bilog Antenna                               | ETS-LINDGREN  | 3143B                               | 00161965                            | Mar. 05,23 | Mar. 04,24 |
| Horn Antenna                                | ETS-LINDGREN  | 3117                                | 00168692                            | Mar. 05,23 | Mar. 04,24 |
| Horn Antenna<br>(18GHz-40GHz)               | N/A           | QWH-SL-18-40-<br>K-SG/QMS-003<br>61 | 15433                               | Sep.04, 22 | Sep.03, 23 |
| Radio Communication<br>Analyzer             | ANRITSU       | MT8820C                             | 6201465426                          | Feb. 14,23 | Feb. 13,24 |
| Signal Pre-Amplifier                        | EMSI          | EMC 9135                            | 980249                              | May.12,22  | May.11,23  |
| Signal Pre-Amplifier                        | EMSI          | EMC 012645B                         | 980257                              | May.12,22  | May.11,23  |
| Signal Pre-Amplifier                        | EMSI          | EMC 184045B                         | 980259                              | Feb. 17,23 | Feb.16,24  |
| 3m<br>Semi-anechoic<br>Chamber              | ETS-LINDGREN  | 9m*6m*6m                            | Euroshieldpn-<br>CT0001143-121<br>6 | May. 19,20 | May. 18,23 |
| Test Software                               | E3            | V 9.160323                          | N/A                                 | N/A        | N/A        |
| Test Software                               | JS1120        | 3.1.36                              | N/A                                 | N/A        | N/A        |
| 10dB Attenuator                             | JFW/USA       | 50HF-010-SMA                        | N/A                                 | May. 12,22 | May. 11,23 |
| Power Meter                                 | Anritsu       | ML2495A                             | 1506002                             | Feb. 14,23 | Feb. 13,24 |
| Power Sensor                                | Anritsu       | MA2411B                             | 1339352                             | Feb. 14,23 | Feb. 13,24 |
| Temperature<br>Chamber                      | ESPEC         | SH-242                              | 93000855                            | May. 12,22 | May. 11,23 |
| MXG<br>Analog Microwave<br>Signal Generator | KEYSIGHT      | N5183A                              | MY50143024                          | Feb. 14,23 | Feb. 13,24 |
| Base station R&S<br>CMW500                  | Rohde&Schwarz | CMW500                              | 153085                              | May.12,22  | May.11,23  |
| DC Source                                   | Kikusui/JP    | PMX18-5A                            | N/A                                 | Aug. 12,22 | Aug. 11,23 |

- NOTE:**
1. The calibration interval of the above test instruments is 12 months or 36 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>               | TurboX CM2290-NA                                   |                     |
| <b>BRAND NAME</b>            | TURBOX                                             |                     |
| <b>MODEL NAME</b>            | TurboX CM2290-NA                                   |                     |
| <b>NOMINAL VOLTAGE</b>       | EUT 4.0V                                           |                     |
| <b>MODULATION TECHNOLOGY</b> | <b>LTE</b>                                         | QPSK, 16QAM, 64QAM  |
| <b>FREQUENCY RANGE</b>       | <b>LTE Band 14<br/>Channel Bandwidth: 5MHz</b>     | 790.5MHz ~ 795.5MHz |
|                              | <b>LTE Band 14<br/>Channel Bandwidth: 10MHz</b>    | 793MHz              |
|                              | <b>LTE Band 26<br/>(Channel Bandwidth: 1.4MHz)</b> | 814.7MHz ~ 823.3MHz |
|                              | <b>LTE Band 26<br/>(Channel Bandwidth: 3MHz)</b>   | 815.5MHz ~ 822.5MHz |
|                              | <b>LTE Band 26<br/>(Channel Bandwidth: 5MHz)</b>   | 816.5MHz ~ 821.5MHz |
|                              | <b>LTE Band 26<br/>(Channel Bandwidth: 10MHz)</b>  | 819MHz              |
| <b>EMISSION DESIGNATOR</b>   | <b>LTE Band 14<br/>Channel Bandwidth: 5MHz</b>     | QPSK: 4M50G7D       |
|                              |                                                    | 16QAM: 4M50W7D      |
|                              |                                                    | 64QAM: 4M50W7D      |
|                              | <b>LTE Band 14<br/>Channel Bandwidth: 10MHz</b>    | QPSK: 8M97G7D       |
|                              |                                                    | 16QAM: 8M95W7D      |
|                              |                                                    | 64QAM: 8M95W7D      |
|                              | <b>LTE Band 26<br/>(Channel Bandwidth: 1.4MHz)</b> | QPSK: 1M09G7D       |
|                              |                                                    | 16QAM: 1M09W7D      |
|                              |                                                    | 64QAM: 1M09W7D      |
|                              | <b>LTE Band 26<br/>(Channel Bandwidth: 3MHz)</b>   | QPSK: 2M70G7D       |
|                              |                                                    | 16QAM: 2M70W7D      |
|                              |                                                    | 64QAM: 2M70W7D      |
|                              | <b>LTE Band 26<br/>(Channel Bandwidth: 5MHz)</b>   | QPSK: 4M49G7D       |
|                              |                                                    | 16QAM: 4M50W7D      |
|                              |                                                    | 64QAM: 4M50W7D      |
|                              | <b>LTE Band 26<br/>(Channel Bandwidth: 10MHz)</b>  | QPSK: 8M98G7D       |
|                              |                                                    | 16QAM: 8M97W7D      |
|                              |                                                    | 64QAM: 8M96W7D      |

|                            |                                                                  |          |
|----------------------------|------------------------------------------------------------------|----------|
| <b>MAX. EIRP POWER</b>     | <b>LTE Band 14<br/>Channel Bandwidth: 5MHz</b>                   | 238.78mW |
|                            | <b>LTE Band 14<br/>Channel Bandwidth: 10MHz</b>                  | 239.33mW |
|                            | <b>LTE Band 26<br/>(Channel Bandwidth: 1.4MHz)</b>               | 241.55mW |
|                            | <b>LTE Band 26<br/>(Channel Bandwidth: 3MHz)</b>                 | 241.55mW |
|                            | <b>LTE Band 26<br/>(Channel Bandwidth: 5MHz)</b>                 | 242.1mW  |
|                            | <b>LTE Band 26<br/>(Channel Bandwidth: 10MHz)</b>                | 242.66mW |
| <b>ANTENNA TYPE</b>        | Flex Antenna                                                     |          |
| <b>ANTENNA GAIN</b>        | 2.5 dBi for LTE Band 14/ LTE Band 26                             |          |
| <b>HW VERSION</b>          | V06                                                              |          |
| <b>SW VERSION</b>          | FlatBuild_Turbox-CM2290_cm2290_la1.0.1.v.userdebug.20230301.1952 |          |
| <b>I/O PORTS</b>           | Refer to user's manual                                           |          |
| <b>DATA CABLE</b>          | N/A                                                              |          |
| <b>EXTREME TEMPERATURE</b> | -25-75 °C                                                        |          |
| <b>EXTREME VOLTAGE</b>     | 3.4V - 4.35V                                                     |          |

**NOTE:**

- For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

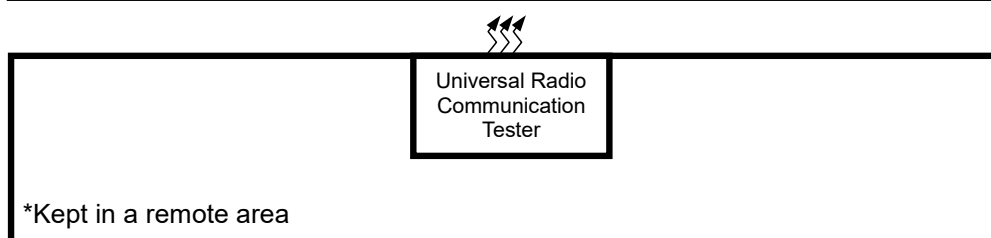
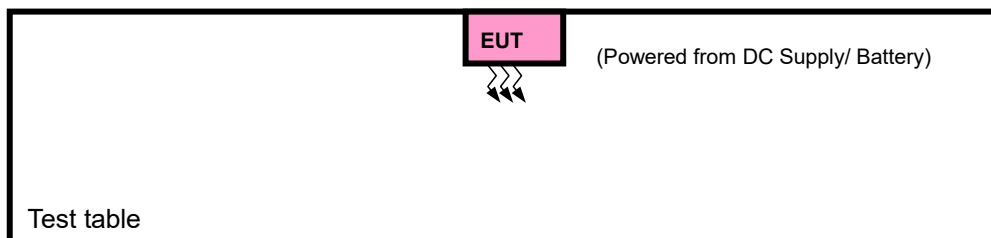
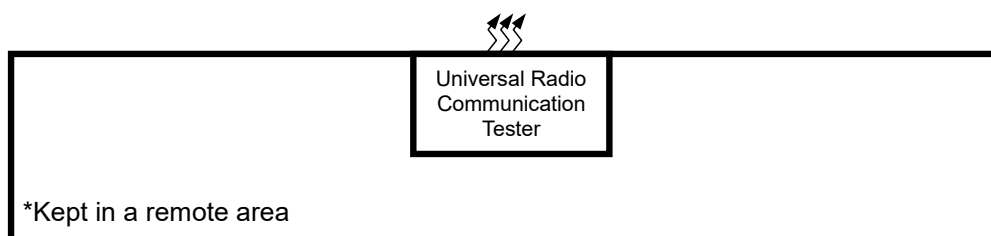
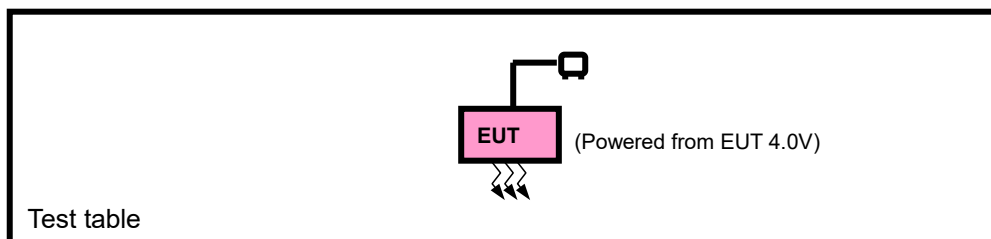
The EUT incorporates a SISO function. Physically, the EUT provides one completed transmitter and one receiver.

| MODULATION MODE | TX FUNCTION |
|-----------------|-------------|
| LTE             | 1TX/1RX     |

- 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



## 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    |

| NO. | SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS |
|-----|-----------------------------------------------------|
| 1   | DC Line: Unshielded, Detachable 1.8m                |

## 2.4 DESCRIPTION OF TEST MODES

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 in ERP/EIRP and radiated emission was found when positioned on X-plane for LTE. Following channel(s) was (were) selected for the final test as listed below:

| EUT<br>CONFIGURE<br>MODE | DESCRIPTION                   |
|--------------------------|-------------------------------|
| A                        | EUT + adapter with LTE link   |
| B                        | EUT + DC source with LTE link |

**LTE BAND 14 MODE**

| EUT CONFIGURE MODE | TEST ITEM             | AVAILABLE CHANNEL | TESTED CHANNEL      | CHANNEL BANDWIDTH | MODULATION        | MODE                                      |
|--------------------|-----------------------|-------------------|---------------------|-------------------|-------------------|-------------------------------------------|
| A                  | ERP                   | 23305 to 23355    | 23305, 23330, 23355 | 5MHz              | QPSK,16QAM,64QAM  | 1 RB / 0 RB Offset                        |
|                    |                       | 23330             | 23330               | 10MHz             | QPSK,16QAM,64QAM  | 1 RB / 0 RB Offset                        |
| B                  | FREQUENCY STABILITY   | 23330             | 23330               | 10MHz             | QPSK              | 50 RB / 0 RB Offset                       |
| A                  | OCCUPIED BANDWIDTH    | 23305 to 23355    | 23305, 23330, 23355 | 5MHz              | QPSK,16QAM,64QAM  | 25 RB / 0 RB Offset                       |
|                    |                       | 23330             | 23330               | 10MHz             | QPSK,16QAM,64QAM  | 50 RB / 0 RB Offset                       |
| A                  | BAND EDGE             | 23305 to 23355    | 23305               | 5MHz              | QPSK,16QAM, 64QAM | 1 RB / 0 RB Offset                        |
|                    |                       |                   |                     |                   |                   | 25 RB / 0 RB Offset                       |
|                    |                       |                   | 23355               | 5MHz              | QPSK,16QAM, 64QAM | 1 RB / 24 RB Offset                       |
|                    |                       |                   |                     |                   |                   | 25 RB / 0 RB Offset                       |
|                    |                       | 23300             | 23330               | 10MHz             | QPSK,16QAM, 64QAM | 1 RB / 0 RB Offset                        |
|                    |                       |                   |                     |                   |                   | 50 RB / 0 RB Offset                       |
|                    |                       |                   |                     |                   |                   | 1 RB / 49 RB Offset                       |
|                    |                       |                   |                     |                   |                   | /                                         |
| A                  | PEAK TO AVERAGE RATIO | 23300             | 23330               | 10MHz             | QPSK,16QAM, 64QAM | 1 RB / 0 RB Offset<br>50 RB / 0 RB Offset |
| A                  | CONDUCTED EMISSION    | 23305 to 23355    | 23305, 23330, 23355 | 5MHz              | QPSK,16QAM,64QAM  | 1 RB / 0 RB Offset                        |
|                    |                       | 23330             | 23330               | 10MHz             | QPSK,16QAM,64QAM  | 1 RB / 0 RB Offset                        |
| A                  | RADIATED EMISSION     | 23305 to 23355    | 23305, 23330, 23355 | 5MHz              | QPSK              | 1 RB / 0 RB Offset                        |
|                    |                       | 23330             | 23330               | 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.

### LTE BAND 26 MODE

| EUT CONFIGURE MODE | TEST ITEM             | AVAILABLE CHANNEL | TESTED CHANNEL      | CHANNEL BANDWIDTH | MODULATION         | MODE                |
|--------------------|-----------------------|-------------------|---------------------|-------------------|--------------------|---------------------|
| A                  | ERP                   | 26697 to 26783    | 26697, 26740, 26783 | 1.4MHz            | QPSK, 16QAM, 64QAM | 1 RB / 0 RB Offset  |
|                    |                       | 26705 to 26775    | 26705, 26740, 26775 | 3MHz              | QPSK, 16QAM, 64QAM | 1 RB / 0 RB Offset  |
|                    |                       | 26715 to 26765    | 26715, 26740, 26765 | 5MHz              | QPSK, 16QAM, 64QAM | 1 RB / 0 RB Offset  |
|                    |                       | 26740             | 26740               | 10MHz             | QPSK, 16QAM, 64QAM | 1 RB / 0 RB Offset  |
| B                  | FREQUENCY STABILITY   | 26740             | 26740               | 10MHz             | QPSK               | 50 RB / 0 RB Offset |
| A                  | OCCUPIED BANDWIDTH    | 26697 to 26783    | 26697, 26740, 26783 | 1.4MHz            | QPSK, 16QAM, 64QAM | 6 RB / 0 RB Offset  |
|                    |                       | 26705 to 26775    | 26705, 26740, 26775 | 3MHz              | QPSK, 16QAM, 64QAM | 15 RB / 0 RB Offset |
|                    |                       | 26715 to 26765    | 26715, 26740, 26765 | 5MHz              | QPSK, 16QAM, 64QAM | 25 RB / 0 RB Offset |
|                    |                       | 26740             | 26740               | 10MHz             | QPSK, 16QAM, 64QAM | 50 RB / 0 RB Offset |
| A                  | BAND EDGE             | 26697 to 26783    | 26697               | 1.4MHz            | QPSK, 16QAM, 64QAM | 1 RB / 0 RB Offset  |
|                    |                       |                   |                     |                   |                    | 6 RB / 0 RB Offset  |
|                    |                       |                   | 26783               | 1.4MHz            | QPSK, 16QAM, 64QAM | 1 RB / 5 RB Offset  |
|                    |                       |                   |                     |                   |                    | 6 RB / 0 RB Offset  |
|                    |                       | 26705 to 26775    | 26705               | 3MHz              | QPSK, 16QAM, 64QAM | 1 RB / 0 RB Offset  |
|                    |                       |                   |                     |                   |                    | 15 RB / 0 RB Offset |
|                    |                       |                   | 26775               | 3MHz              | QPSK, 16QAM, 64QAM | 1 RB / 14 RB Offset |
|                    |                       |                   |                     |                   |                    | 15 RB / 0 RB Offset |
|                    |                       | 26715 to 26765    | 26715               | 5MHz              | QPSK, 16QAM, 64QAM | 1 RB / 0 RB Offset  |
|                    |                       |                   |                     |                   |                    | 25 RB / 0 RB Offset |
|                    |                       |                   | 26765               | 5MHz              | QPSK, 16QAM, 64QAM | 1 RB / 24 RB Offset |
|                    |                       |                   |                     |                   |                    | 25 RB / 0 RB Offset |
|                    |                       | 26740             | 26740               | 10MHz             | QPSK, 16QAM, 64QAM | 1 RB / 0 RB Offset  |
|                    |                       |                   |                     |                   |                    | 50 RB / 0 RB Offset |
|                    |                       |                   | 26740               | 10MHz             | QPSK, 16QAM, 64QAM | 1 RB / 49 RB Offset |
|                    |                       |                   |                     |                   |                    | 50 RB / 0 RB Offset |
| A                  | PEAK TO AVERAGE RATIO | 26740             | 26740               | 10MHz             | QPSK, 16QAM, 64QAM | 1 RB / 0 RB Offset  |
|                    |                       |                   |                     |                   |                    | 50 RB / 0 RB Offset |
| A                  | CONDUCTED EMISSION    | 26697 to 26783    | 26697, 26740, 26783 | 1.4MHz            | QPSK               | 1 RB / 0 RB Offset  |
|                    |                       | 26705 to 26775    | 26705, 26740, 26775 | 3MHz              | QPSK               | 1 RB / 0 RB Offset  |
|                    |                       | 26715 to 26765    | 26715, 26740, 26765 | 5MHz              | QPSK               | 1 RB / 0 RB Offset  |
|                    |                       | 26740             | 26740               | 10MHz             | QPSK               | 1 RB / 0 RB Offset  |
| A                  | RADIATED EMISSION     | 26697 to 26783    | 26740               | 1.4MHz            | QPSK               | 1 RB / 0 RB Offset  |
|                    |                       | 26705 to 26775    | 26740               | 3MHz              | QPSK               | 1 RB / 0 RB Offset  |
|                    |                       | 26715 to 26765    | 26740               | 5MHz              | QPSK               | 1 RB / 0 RB Offset  |
|                    |                       | 26740             | 26740               | 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 Report No.: W7L-P23030025RF08

**TEST CONDITION:**

| TEST ITEM           | ENVIRONMENTAL CONDITIONS | INPUT POWER                   | TESTED BY |
|---------------------|--------------------------|-------------------------------|-----------|
| EIRP(ERP)           | 24deg. C, 60%RH          | EUT 4.0V                      | Jace Hu   |
| FREQUENCY STABILITY | 24deg. C, 61%RH          | DC 3.4/4.0/4.35V By DC Source | James Fu  |
| OCCUPIED BANDWIDTH  | 24deg. C, 61%RH          | EUT 4.0V                      | James Fu  |
| BAND EDGE           | 24deg. C, 61%RH          | EUT 4.0V                      | James Fu  |
| CONDUCTED EMISSION  | 24deg. C, 61%RH          | EUT 4.0V                      | James Fu  |
| RADIATED EMISSION   | 23deg. C, 70%RH          | EUT 4.0V                      | Jace Hu   |

## 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 90**

**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

Per FCC Part 90.541 (d):

The transmitting power of a portable (hand-held) unit must not exceed 3 watts ERP.

Per FCC Part 90.635 (b):

The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).

##### 3.1.2 TEST PROCEDURES

###### **EIRP / ERP MEASUREMENT:**

Per KDB 971168 D01 Power Meas License Digital Systems v03r01 or subclause 5.2.5.5 of ANSI C63.26-2015, the relevant equation for determining the ERP or EIRP from the conducted RF output power measured using the guidance provided above is:

$$\text{ERP or EIRP} = P_{\text{Meas}} + G_{\text{T}} - L_{\text{C}}$$

Where:

ERP or EIRP = effective radiated power or equivalent isotropically radiated power, respectively

(expressed in the same units as  $P_{\text{Meas}}$ , typically dBW or dBm);

$P_{\text{Meas}}$  = measured transmitter output power or PSD, in dBm or dBW;

$G_{\text{T}}$  = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

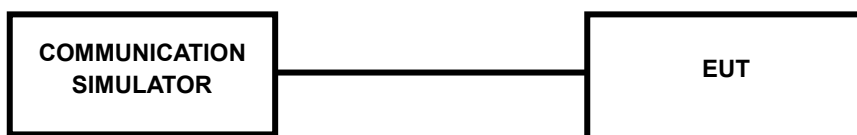
$L_{\text{C}}$  = signal attenuation in the connecting cable between the transmitter and antenna, in dB

###### **CONDUCTED POWER MEASUREMENT:**

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

### 3.1.3 TEST SETUP

#### 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 14

| Band/BW | Modulation | RB Size | RB Offset | Low CH<br>23305        | Mid CH<br>23330      | High CH<br>23355       |
|---------|------------|---------|-----------|------------------------|----------------------|------------------------|
|         |            |         |           | Frequency<br>790.5 MHz | Frequency<br>793 MHz | Frequency<br>795.5 MHz |
| 14/ 5   | QPSK       | 1       | 0         | 23.01                  | 23.08                | 23.04                  |
|         |            | 1       | 12        | 23.40                  | 23.39                | 23.43                  |
|         |            | 1       | 24        | 23.31                  | 23.35                | 23.32                  |
|         |            | 12      | 0         | 22.32                  | 22.34                | 22.37                  |
|         |            | 12      | 6         | 22.42                  | 22.48                | 22.45                  |
|         |            | 12      | 13        | 22.35                  | 22.29                | 22.35                  |
|         |            | 25      | 0         | 22.23                  | 22.25                | 22.23                  |
|         | 16QAM      | 1       | 0         | 22.20                  | 22.24                | 22.20                  |
|         |            | 1       | 12        | 22.15                  | 22.17                | 22.20                  |
|         |            | 1       | 24        | 21.74                  | 21.73                | 21.75                  |
|         |            | 12      | 0         | 21.29                  | 21.31                | 21.34                  |
|         |            | 12      | 6         | 21.44                  | 21.50                | 21.46                  |
|         |            | 12      | 13        | 21.32                  | 21.39                | 21.38                  |
|         |            | 25      | 0         | 21.27                  | 21.26                | 21.23                  |
|         | 64QAM      | 1       | 0         | 21.50                  | 21.57                | 21.56                  |
|         |            | 1       | 12        | 22.01                  | 22.00                | 21.97                  |
|         |            | 1       | 24        | 21.59                  | 21.63                | 21.62                  |
|         |            | 12      | 0         | 20.40                  | 20.42                | 20.45                  |
|         |            | 12      | 6         | 20.52                  | 20.58                | 20.55                  |
|         |            | 12      | 13        | 20.50                  | 20.44                | 20.50                  |
|         |            | 25      | 0         | 20.15                  | 20.17                | 20.15                  |

| Band/BW | Modulation | RB<br>Size | RB<br>Offset | / | Mid CH<br>23330      | / |
|---------|------------|------------|--------------|---|----------------------|---|
|         |            |            |              | / | Frequency<br>793 MHz | / |
| 14/ 10  | QPSK       | 1          | 0            | / | 23.09                | / |
|         |            | 1          | 24           | / | 23.44                | / |
|         |            | 1          | 49           | / | 23.37                | / |
|         |            | 25         | 0            | / | 22.39                | / |
|         |            | 25         | 12           | / | 22.50                | / |
|         |            | 25         | 25           | / | 22.37                | / |
|         |            | 50         | 0            | / | 22.31                | / |
|         | 16QAM      | 1          | 0            | / | 22.26                | / |
|         |            | 1          | 24           | / | 22.22                | / |
|         |            | 1          | 49           | / | 21.80                | / |
|         |            | 25         | 0            | / | 21.36                | / |
|         |            | 25         | 12           | / | 21.52                | / |
|         |            | 25         | 25           | / | 21.40                | / |
|         |            | 50         | 0            | / | 21.31                | / |
|         | 64QAM      | 1          | 0            | / | 21.58                | / |
|         |            | 1          | 24           | / | 22.05                | / |
|         |            | 1          | 49           | / | 21.65                | / |
|         |            | 25         | 0            | / | 20.47                | / |
|         |            | 25         | 12           | / | 20.60                | / |
|         |            | 25         | 25           | / | 20.52                | / |
|         |            | 50         | 0            | / | 20.23                | / |

**LTE Band 26**

| Band/BW | Modulation | RB<br>Size | RB<br>Offset | Low CHG<br>26697       | Mid CH<br>26740      | High CH<br>26783       |
|---------|------------|------------|--------------|------------------------|----------------------|------------------------|
|         |            |            |              | Frequency<br>814.7 MHz | Frequency<br>819 MHz | Frequency<br>823.3 MHz |
| 26/ 1.4 | QPSK       | 1          | 0            | 23.08                  | 23.12                | 23.11                  |
|         |            | 1          | 2            | 23.47                  | 23.44                | 23.48                  |
|         |            | 1          | 5            | 23.12                  | 23.07                | 23.09                  |
|         |            | 3          | 0            | 22.74                  | 22.72                | 22.78                  |
|         |            | 3          | 1            | 22.76                  | 22.75                | 22.69                  |
|         |            | 3          | 3            | 22.68                  | 22.65                | 22.67                  |
|         |            | 6          | 0            | 22.26                  | 22.21                | 22.25                  |
|         | 16QAM      | 1          | 0            | 22.32                  | 22.30                | 22.32                  |
|         |            | 1          | 2            | 22.00                  | 21.94                | 22.00                  |
|         |            | 1          | 5            | 21.70                  | 21.67                | 21.74                  |
|         |            | 3          | 0            | 21.81                  | 21.80                | 21.80                  |
|         |            | 3          | 1            | 21.75                  | 21.82                | 21.78                  |
|         |            | 3          | 3            | 21.68                  | 21.67                | 21.71                  |
|         |            | 6          | 0            | 21.32                  | 21.36                | 21.33                  |
|         | 64QAM      | 1          | 0            | 21.51                  | 21.53                | 21.56                  |
|         |            | 1          | 2            | 21.77                  | 21.83                | 21.80                  |
|         |            | 1          | 5            | 21.48                  | 21.42                | 21.48                  |
|         |            | 3          | 0            | 20.89                  | 20.91                | 20.89                  |
|         |            | 3          | 1            | 20.89                  | 20.93                | 20.89                  |
|         |            | 3          | 3            | 20.55                  | 20.52                | 20.59                  |
|         |            | 6          | 0            | 20.37                  | 20.36                | 20.36                  |

| Band/BW | Modulation | RB<br>Size | RB<br>Offset | Low CHG<br>26705       | Mid CH<br>26740      | High CH<br>26775       |
|---------|------------|------------|--------------|------------------------|----------------------|------------------------|
|         |            |            |              | Frequency<br>815.5 MHz | Frequency<br>819 MHz | Frequency<br>822.5 MHz |
| 26/ 3   | QPSK       | 1          | 0            | 23.10                  | 23.09                | 23.11                  |
|         |            | 1          | 7            | 23.43                  | 23.45                | 23.48                  |
|         |            | 1          | 14           | 23.06                  | 23.12                | 23.08                  |
|         |            | 8          | 0            | 22.22                  | 22.29                | 22.28                  |
|         |            | 8          | 3            | 22.23                  | 22.22                | 22.19                  |
|         |            | 8          | 7            | 22.15                  | 22.22                | 22.21                  |
|         |            | 15         | 0            | 22.22                  | 22.22                | 22.23                  |
|         | 16QAM      | 1          | 0            | 22.35                  | 22.29                | 22.36                  |
|         |            | 1          | 7            | 21.94                  | 21.98                | 21.97                  |
|         |            | 1          | 14           | 21.72                  | 21.69                | 21.73                  |
|         |            | 8          | 0            | 21.33                  | 21.28                | 21.30                  |
|         |            | 8          | 3            | 21.27                  | 21.25                | 21.31                  |
|         |            | 8          | 7            | 21.21                  | 21.20                | 21.14                  |
|         |            | 15         | 0            | 21.33                  | 21.30                | 21.32                  |
|         | 64QAM      | 1          | 0            | 21.57                  | 21.52                | 21.56                  |
|         |            | 1          | 7            | 21.80                  | 21.83                | 21.78                  |
|         |            | 1          | 14           | 21.48                  | 21.42                | 21.49                  |
|         |            | 8          | 0            | 20.39                  | 20.43                | 20.42                  |
|         |            | 8          | 3            | 20.43                  | 20.37                | 20.44                  |
|         |            | 8          | 7            | 20.02                  | 20.06                | 20.05                  |
|         |            | 15         | 0            | 20.39                  | 20.33                | 20.40                  |

| Band/BW | Modulation | RB<br>Size | RB<br>Offset | Low CHG<br>26715       | Mid CH<br>26740      | High CH<br>26765       |
|---------|------------|------------|--------------|------------------------|----------------------|------------------------|
|         |            |            |              | Frequency<br>816.5 MHz | Frequency<br>819 MHz | Frequency<br>821.5 MHz |
| 26/ 5   | QPSK       | 1          | 0            | 23.14                  | 23.09                | 23.11                  |
|         |            | 1          | 12           | 23.48                  | 23.42                | 23.49                  |
|         |            | 1          | 24           | 23.06                  | 23.10                | 23.09                  |
|         |            | 12         | 0            | 22.27                  | 22.24                | 22.28                  |
|         |            | 12         | 6            | 22.25                  | 22.20                | 22.22                  |
|         |            | 12         | 13           | 22.17                  | 22.15                | 22.21                  |
|         |            | 25         | 0            | 22.26                  | 22.25                | 22.19                  |
|         | 16QAM      | 1          | 0            | 22.30                  | 22.29                | 22.31                  |
|         |            | 1          | 12           | 21.99                  | 21.96                | 22.00                  |
|         |            | 1          | 24           | 21.73                  | 21.68                | 21.70                  |
|         |            | 12         | 0            | 21.29                  | 21.27                | 21.33                  |
|         |            | 12         | 6            | 21.31                  | 21.25                | 21.32                  |
|         |            | 12         | 13           | 21.14                  | 21.18                | 21.17                  |
|         |            | 25         | 0            | 21.36                  | 21.30                | 21.37                  |
|         | 64QAM      | 1          | 0            | 21.50                  | 21.54                | 21.53                  |
|         |            | 1          | 12           | 21.82                  | 21.79                | 21.83                  |
|         |            | 1          | 24           | 21.48                  | 21.43                | 21.45                  |
|         |            | 12         | 0            | 20.41                  | 20.39                | 20.45                  |
|         |            | 12         | 6            | 20.44                  | 20.43                | 20.37                  |
|         |            | 12         | 13           | 20.05                  | 20.02                | 20.04                  |
|         |            | 25         | 0            | 20.40                  | 20.35                | 20.39                  |

| Band/BW | Modulation | RB<br>Size | RB<br>Offset | / | Mid CH<br>26740      | / |
|---------|------------|------------|--------------|---|----------------------|---|
|         |            |            |              | / | Frequency<br>819 MHz | / |
| 26/ 10  | QPSK       | 1          | 0            | / | 23.16                | / |
|         |            | 1          | 24           | / | 23.50                | / |
|         |            | 1          | 49           | / | 23.14                | / |
|         |            | 25         | 0            | / | 22.30                | / |
|         |            | 25         | 12           | / | 22.27                | / |
|         |            | 25         | 25           | / | 22.23                | / |
|         |            | 50         | 0            | / | 22.27                | / |
|         | 16QAM      | 1          | 0            | / | 22.37                | / |
|         |            | 1          | 24           | / | 22.02                | / |
|         |            | 1          | 49           | / | 21.75                | / |
|         |            | 25         | 0            | / | 21.35                | / |
|         |            | 25         | 12           | / | 21.33                | / |
|         |            | 25         | 25           | / | 21.22                | / |
|         |            | 50         | 0            | / | 21.38                | / |
|         | 64QAM      | 1          | 0            | / | 21.58                | / |
|         |            | 1          | 24           | / | 21.85                | / |
|         |            | 1          | 49           | / | 21.50                | / |
|         |            | 25         | 0            | / | 20.47                | / |
|         |            | 25         | 12           | / | 20.45                | / |
|         |            | 25         | 25           | / | 20.10                | / |
|         |            | 50         | 0            | / | 20.41                | / |

**ERP**

**LTE BAND 14**

**CHANNEL BANDWIDTH: 5MHz QPSK**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>c</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| 23305   | 790.5           | 23.4                  | 2.5                                 | 23.75     | 237.14   | 100       |
| 23330   | 793             | 23.39                 | 2.5                                 | 23.74     | 236.59   | 100       |
| 23355   | 795.5           | 23.43                 | 2.5                                 | 23.78     | 238.78   | 100       |

**CHANNEL BANDWIDTH: 5MHz 16QAM**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>c</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| 23305   | 790.5           | 22.2                  | 2.5                                 | 22.55     | 179.89   | 100       |
| 23330   | 793             | 22.24                 | 2.5                                 | 22.59     | 181.55   | 100       |
| 23355   | 795.5           | 22.2                  | 2.5                                 | 22.55     | 179.89   | 100       |

**CHANNEL BANDWIDTH: 5MHz 64QAM**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>c</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| 23305   | 790.5           | 22.01                 | 2.5                                 | 22.36     | 172.19   | 100       |
| 23330   | 793             | 22                    | 2.5                                 | 22.35     | 171.79   | 100       |
| 23355   | 795.5           | 21.97                 | 2.5                                 | 22.32     | 170.61   | 100       |

**CHANNEL BANDWIDTH: 10MHz QPSK**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>c</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| -       | -               | -                     | -                                   | -         | -        | -         |
| 23330   | 793             | 23.44                 | 2.5                                 | 23.79     | 239.33   | 100       |
| -       | -               | -                     | -                                   | -         | -        | -         |

**CHANNEL BANDWIDTH: 10MHz 16QAM**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>c</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| -       | -               | -                     | -                                   | -         | -        | -         |
| 23330   | 793             | 22.26                 | 2.5                                 | 22.61     | 182.39   | 100       |
| -       | -               | -                     | -                                   | -         | -        | -         |

**CHANNEL BANDWIDTH: 10MHz 64QAM**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>c</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| -       | -               | -                     | -                                   | -         | -        | -         |
| 23330   | 793             | 22.05                 | 2.5                                 | 22.4      | 173.78   | 100       |
| -       | -               | -                     | -                                   | -         | -        | -         |

**REMARKS:** ERP Output Power (dBm) = ERP (dBm) -2.15(dB).

# **LTE BAND 26**

## **CHANNEL BANDWIDTH: 1.4MHz QPSK**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>C</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| 26697   | 814.7           | 23.47                 | 2.5                                 | 23.82     | 240.99   | 100       |
| 26740   | 819             | 23.44                 | 2.5                                 | 23.79     | 239.33   | 100       |
| 26783   | 823.3           | 23.48                 | 2.5                                 | 23.83     | 241.55   | 100       |

**REMARKS:** ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).

## **CHANNEL BANDWIDTH: 1.4MHz 16QAM**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>C</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| 26697   | 814.7           | 22.32                 | 2.5                                 | 22.67     | 184.93   | 100       |
| 26740   | 819             | 22.3                  | 2.5                                 | 22.65     | 184.08   | 100       |
| 26783   | 823.3           | 22.32                 | 2.5                                 | 22.67     | 184.93   | 100       |

**REMARKS:** ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).

## **CHANNEL BANDWIDTH: 1.4MHz 64QAM**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>C</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| 26697   | 814.7           | 21.77                 | 2.5                                 | 22.12     | 162.93   | 100       |
| 26740   | 819             | 21.83                 | 2.5                                 | 22.18     | 165.2    | 100       |
| 26783   | 823.3           | 21.8                  | 2.5                                 | 22.15     | 164.06   | 100       |

**REMARKS:** ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).

**LTE BAND 26**

**CHANNEL BANDWIDTH: 3MHz QPSK**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>C</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| 26705   | 815.5           | 23.43                 | 2.5                                 | 23.78     | 238.78   | 100       |
| 26740   | 819             | 23.45                 | 2.5                                 | 23.8      | 239.88   | 100       |
| 26775   | 822.5           | 23.48                 | 2.5                                 | 23.83     | 241.55   | 100       |

**REMARKS:** ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).

**CHANNEL BANDWIDTH: 3MHz 16QAM**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>C</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| 26705   | 815.5           | 22.35                 | 2.5                                 | 22.7      | 186.21   | 100       |
| 26740   | 819             | 22.29                 | 2.5                                 | 22.64     | 183.65   | 100       |
| 26775   | 822.5           | 22.36                 | 2.5                                 | 22.71     | 186.64   | 100       |

**REMARKS:** ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).

**CHANNEL BANDWIDTH: 3MHz 64QAM**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>C</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| 26705   | 815.5           | 21.8                  | 2.5                                 | 22.15     | 164.06   | 100       |
| 26740   | 819             | 21.83                 | 2.5                                 | 22.18     | 165.2    | 100       |
| 26775   | 822.5           | 21.78                 | 2.5                                 | 22.13     | 163.31   | 100       |

**REMARKS:** ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).

**LTE BAND 26**

**CHANNEL BANDWIDTH: 5MHz QPSK**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>C</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| 26715   | 816.5           | 23.48                 | 2.5                                 | 23.83     | 241.55   | 100       |
| 26740   | 819             | 23.42                 | 2.5                                 | 23.77     | 238.23   | 100       |
| 26765   | 821.5           | 23.49                 | 2.5                                 | 23.84     | 242.1    | 100       |

**REMARKS:** ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).

**CHANNEL BANDWIDTH: 5MHz 16QAM**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>C</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| 26715   | 816.5           | 22.3                  | 2.5                                 | 22.65     | 184.08   | 100       |
| 26740   | 819             | 22.29                 | 2.5                                 | 22.64     | 183.65   | 100       |
| 26765   | 821.5           | 22.31                 | 2.5                                 | 22.66     | 184.5    | 100       |

**REMARKS:** ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).

**CHANNEL BANDWIDTH: 5MHz 64QAM**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>C</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| 26715   | 816.5           | 21.82                 | 2.5                                 | 22.17     | 164.82   | 100       |
| 26740   | 819             | 21.79                 | 2.5                                 | 22.14     | 163.68   | 100       |
| 26765   | 821.5           | 21.83                 | 2.5                                 | 22.18     | 165.2    | 100       |

**REMARKS:** ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).

**LTE BAND 26**

**CHANNEL BANDWIDTH: 10MHz QPSK**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>C</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| -       | -               | -                     | -                                   | -         | -        | -         |
| 26740   | 819             | 23.5                  | 2.5                                 | 23.85     | 242.66   | 100       |
| -       | -               | -                     | -                                   | -         | -        | -         |

**REMARKS:** ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).

**CHANNEL BANDWIDTH: 10MHz 16QAM**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>C</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| -       | -               | -                     | -                                   | -         | -        | -         |
| 26740   | 819             | 22.37                 | 2.5                                 | 22.72     | 187.07   | 100       |
| -       | -               | -                     | -                                   | -         | -        | -         |

**REMARKS:** ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).

**CHANNEL BANDWIDTH: 10MHz 64QAM**

| Channel | Frequency (MHz) | Conducted Power (dBm) | G <sub>T</sub> -L <sub>C</sub> (dB) | ERP (dBm) | ERP (mW) | Limit (W) |
|---------|-----------------|-----------------------|-------------------------------------|-----------|----------|-----------|
| -       | -               | -                     | -                                   | -         | -        | -         |
| 26740   | 819             | 21.85                 | 2.5                                 | 22.2      | 165.96   | 100       |
| -       | -               | -                     | -                                   | -         | -        | -         |

**REMARKS:** ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).

## 3.2 FREQUENCY STABILITY MEASUREMENT

### 3.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

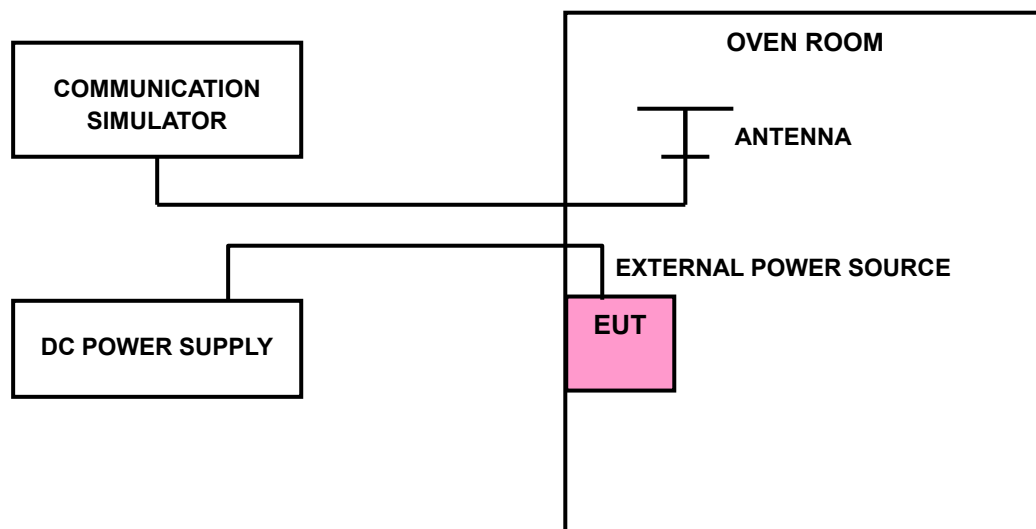
The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked

### 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





Test Report No.: W7L-P23030025RF08

### 3.2.4 TEST RESULTS

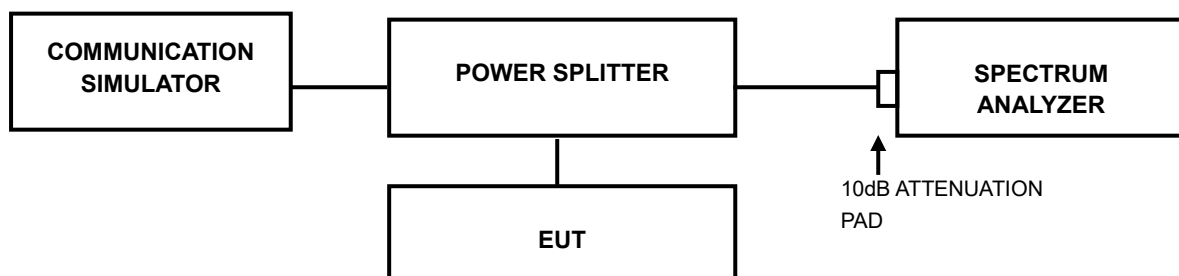
Please Refer to Appendix Of this test report.

### 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.



Test Report No.: W7L-P23030025RF08

### 3.3.4 TEST RESULTS

Please Refer to Appendix Of this test report.

### 3.4 EMISSION MASK MEASUREMENT

#### 3.4.1 LIMITS OF EMISSION MASK MEASUREMENT

##### LTE Band14:

According to FCC part 90.543(e) shall be tested the emission mask.

(e) For operations in the 758–768 MHz and the 788–798 MHz bands, 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:

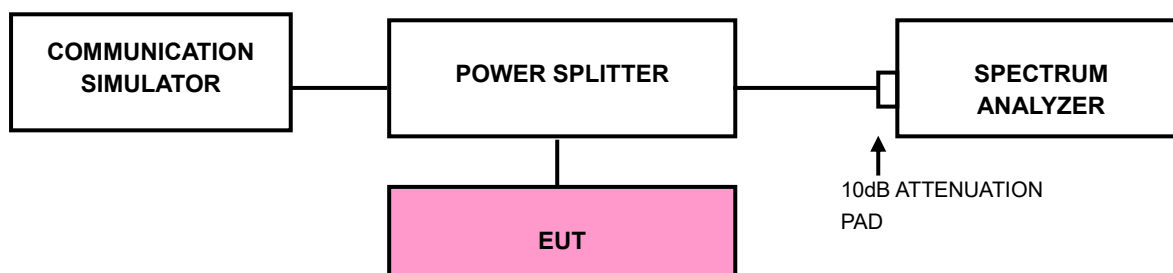
- (1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than  $76 + 10 \log (P)$  dB in a 6.25 kHz band segment, for base and fixed stations.
- (2) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations.
- (3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least  $43 + 10 \log (P)$  dB.
- (4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.
- (5) Compliance with the provisions of paragraph (e)(3) 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 30 kHz may be employed.

#### LTE Band26:

According to FCC part 90.691 shall be tested the emission mask. For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \log_{10}(f/6.1)$  decibels or  $50 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

#### 3.4.2 TEST SETUP



### 3.4.3 TEST PROCEDURES

- a) Connect the transmitter to the spectrum analyzer via coaxial cable while ensuring proper impedance matching.
- b) Tune the analyzer to the nominal center frequency of the emission bandwidth (EBW).
- c) Set the resolution bandwidth (RBW)  $\geq 1\%$  EBW in the 1MHz band immediately outside and adjacent to the band edge.
- d) Beyond the 1MHz band from the band edge, RBW=1MHz was used.
- e) Set the video bandwidth (VBW) to  $\geq 3 \times$  RBW.
- f) Select the average power (RMS) display detector.
- g) Set the number of measurement points to  $\geq 1001$ .
- h) Use auto-coupled sweep time.
- i) Perform the measurement over an interval of time when the transmission is continuous and at its maximum power level.
- j) The RF fundamental frequency should be excluded against the limit line in the operating frequency band and use RBW is 10KHz or 100KHz.
- k) Record the max trace plot into the test report.



Test Report No.: W7L-P23030025RF08

### 3.4.4 TEST RESULTS

Please Refer to Appendix Of this test report.

### 3.5 CONDUCTED SPURIOUS EMISSIONS

#### 3.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

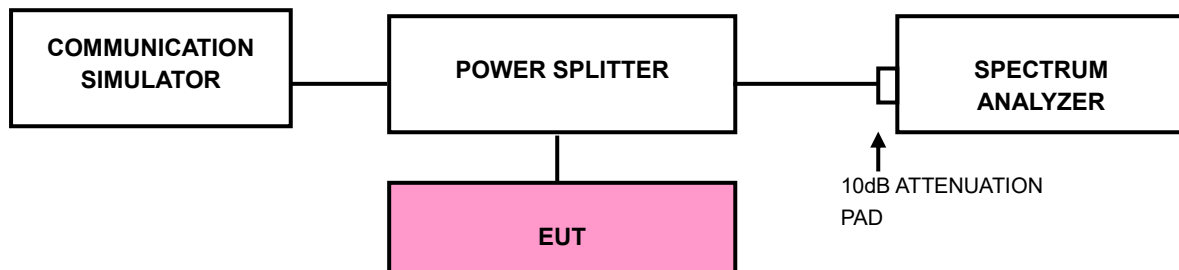
(1) The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB. The limit of emission equal to  $-13\text{dBm}$

(2) For operations in the 763–775 MHz and 793–805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to  $-70\text{ dBW/MHz}$  equivalent isotropically radiated power (EIRP) for wideband signals, and  $-80\text{ dBW}$  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.

#### 3.5.2 TEST PROCEDURE

- a. The EUT makes a phone call to the communication simulator. All measurements were done at middle operational frequency range.
- b. Measuring frequency range is from 9kHz up to a frequency including its 10<sup>th</sup> harmonic. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

#### 3.5.3 TEST SETUP





**Test Report No.: W7L-P23030025RF08**

### 3.5.4 TEST RESULTS

NOTE : The 9K~30MHz amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

Please Refer to Appendix Of this test report.

### 3.6 RADIATED EMISSION MEASUREMENT

#### 3.6.1 LIMITS OF RADIATED EMISSION MEASUREMENT

(1) The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB. The limit of emission equal to  $-13\text{dBm}$

(2) For operations in the 763–775 MHz and 793–805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to  $-70\text{ dBW/MHz}$  equivalent isotropically radiated power (EIRP) for wideband signals, and  $-80\text{ dBW}$  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.

#### 3.6.2 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.  $\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
- d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole,  $\text{E.R.P power} = \text{E.I.P.R power} - 2.15\text{dBi}.$

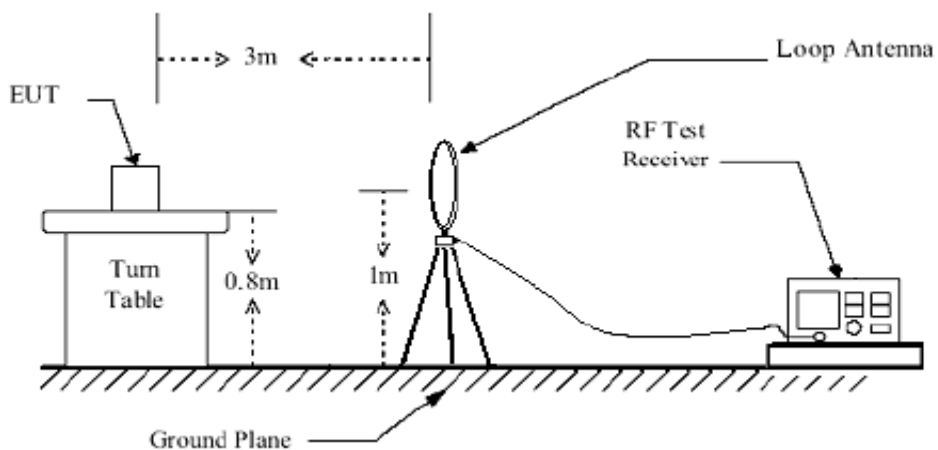
**NOTE:** The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

#### 3.6.3 DEVIATION FROM TEST STANDARD

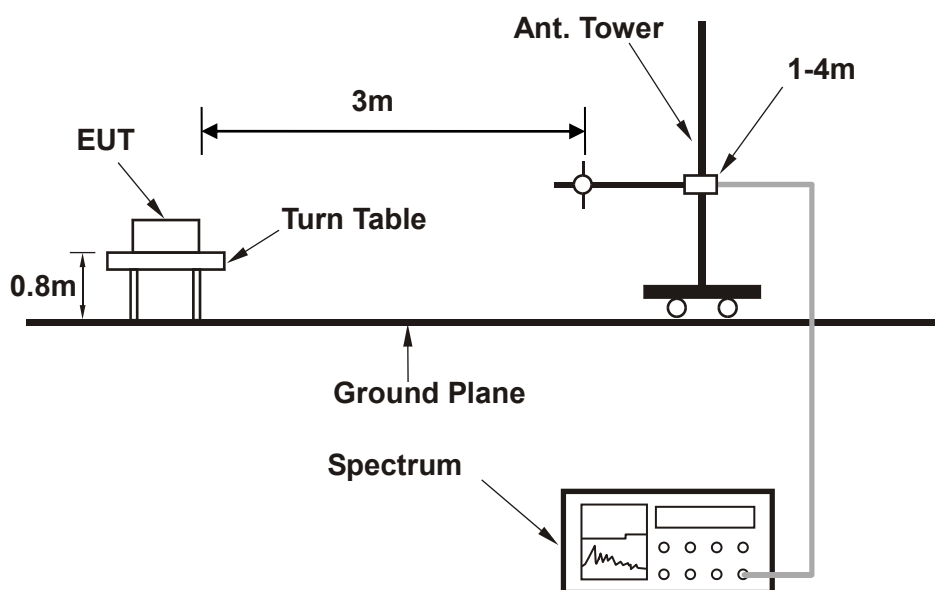
No deviation

### 3.6.4 TEST SETUP

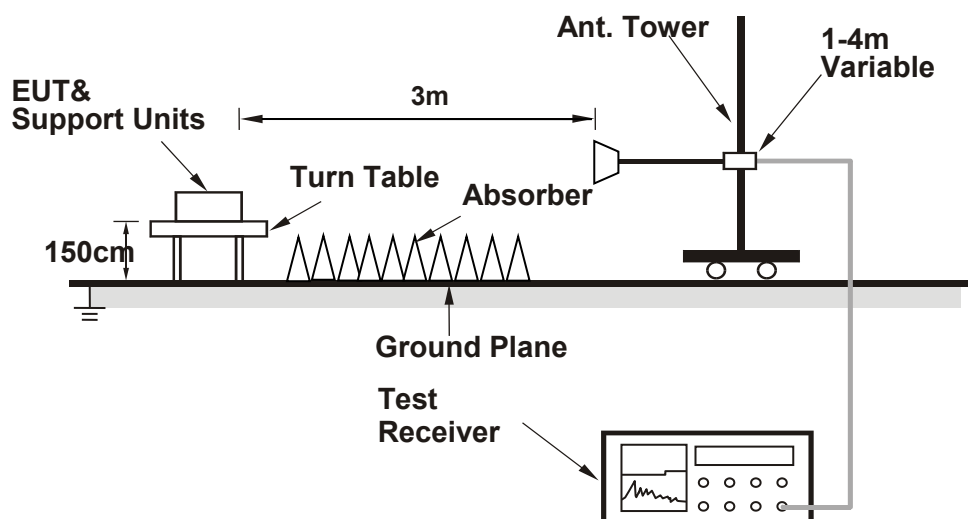
#### <Below 30MHz>



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



< Frequency Range above 1GHz >



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

### 3.6.5 TEST RESULTS

NOTE : The 9K~30MHz amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

#### BELOW 1GHz WORST-CASE DATA

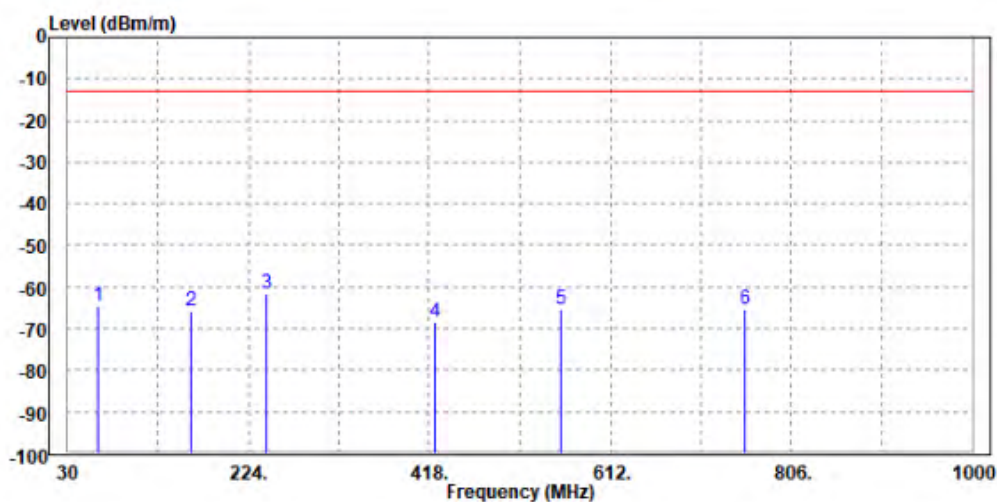
30 MHz – 1GHz data:

LTE Band 14:

CHANNEL BANDWIDTH: 5MHz / QPSK

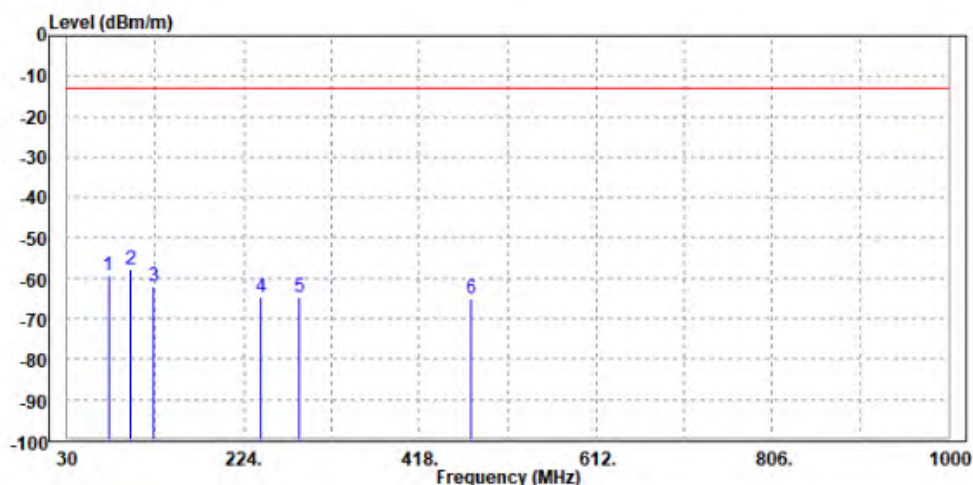
|                                                     |                  |                 |               |
|-----------------------------------------------------|------------------|-----------------|---------------|
| MODE                                                | TX channel 23355 | FREQUENCY RANGE | Below 1000MHz |
| ENVIRONMENTAL CONDITIONS                            | 23deg. C, 70%RH  | INPUT POWER     | EUT 4.0V      |
| TESTED BY                                           | Jace HU          |                 |               |
| 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    | 62.980  | -64.66 | -45.18     | -13.00     | -51.66     | -19.48 | Peak   | Horizontal |
| 2    | 162.890 | -65.66 | -49.65     | -13.00     | -52.66     | -16.01 | Peak   | Horizontal |
| 3 PP | 243.400 | -61.66 | -49.42     | -13.00     | -48.66     | -12.24 | Peak   | Horizontal |
| 4    | 423.820 | -68.62 | -59.02     | -13.00     | -55.62     | -9.60  | Peak   | Horizontal |
| 5    | 558.650 | -65.37 | -59.59     | -13.00     | -52.37     | -5.78  | Peak   | Horizontal |
| 6    | 756.530 | -65.53 | -61.84     | -13.00     | -52.53     | -3.69  | Peak   | Horizontal |



|                                                   |                  |                 |               |
|---------------------------------------------------|------------------|-----------------|---------------|
| MODE                                              | TX channel 23355 | FREQUENCY RANGE | Below 1000MHz |
| ENVIRONMENTAL CONDITIONS                          | 23deg. C, 70%RH  | INPUT POWER     | EUT 4.0V      |
| TESTED BY                                         | Jace HU          |                 |               |
| 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    | 75.590  | -59.35 | -38.64     | -13.00     | -46.35     | -20.71 | Peak   | Vertical  |
| 2 PP | 99.840  | -57.89 | -51.38     | -13.00     | -44.89     | -6.51  | Peak   | Vertical  |
| 3    | 125.060 | -62.00 | -47.50     | -13.00     | -49.00     | -14.50 | Peak   | Vertical  |
| 4    | 243.400 | -64.50 | -50.32     | -13.00     | -51.50     | -14.18 | Peak   | Vertical  |
| 5    | 286.080 | -64.73 | -53.14     | -13.00     | -51.73     | -11.59 | Peak   | Vertical  |
| 6    | 475.230 | -64.93 | -56.62     | -13.00     | -51.93     | -8.31  | Peak   | Vertical  |



**ABOVE 1GHz**

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

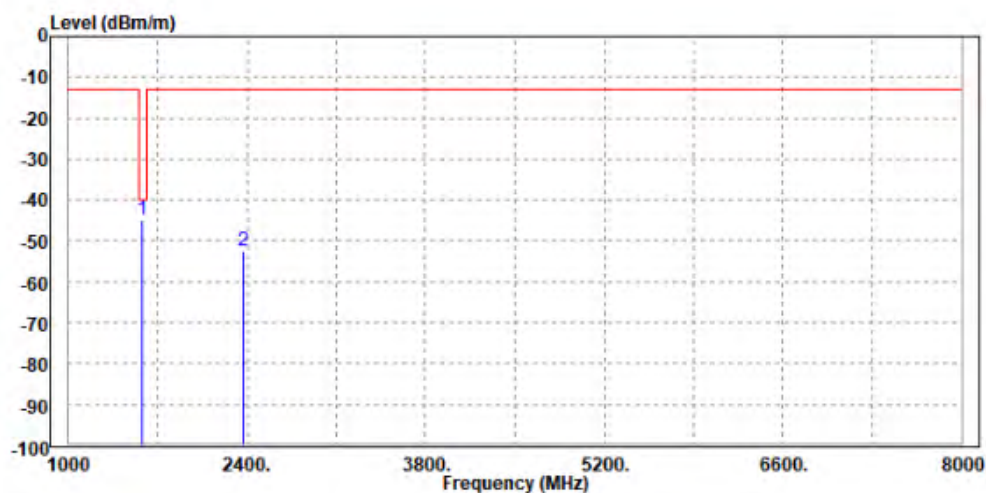
**LTE BAND 14**

**CHANNEL BANDWIDTH: 5MHz / QPSK**

**CH23305**

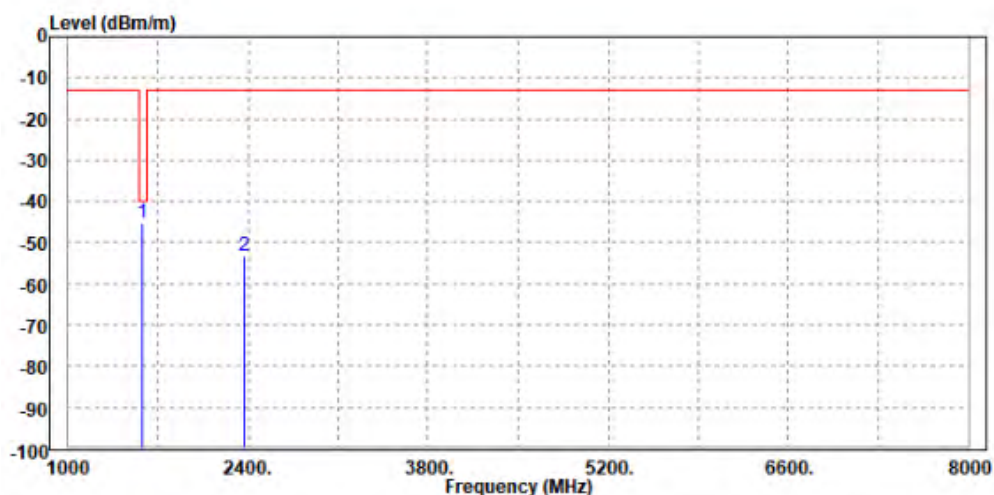
|                                                     |                  |                 |               |
|-----------------------------------------------------|------------------|-----------------|---------------|
| MODE                                                | TX channel 23305 | FREQUENCY RANGE | Above 1000MHz |
| ENVIRONMENTAL CONDITIONS                            | 23deg. C, 70%RH  | INPUT POWER     | EUT 4.0V      |
| TESTED BY                                           | Jace Hu          |                 |               |
| 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 | PP | 1581.000 | -44.88 | -45.11     | -40.00     | -4.88      | 0.23   | Peak   | Horizontal |
| 2 |    | 2372.000 | -52.54 | -57.51     | -13.00     | -39.54     | 4.97   | Peak   | Horizontal |



|                                                   |                  |                 |               |
|---------------------------------------------------|------------------|-----------------|---------------|
| MODE                                              | TX channel 23305 | FREQUENCY RANGE | Above 1000MHz |
| ENVIRONMENTAL CONDITIONS                          | 23deg. C, 70%RH  | INPUT POWER     | EUT 4.0V      |
| TESTED BY                                         | Jace Hu          |                 |               |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M |                  |                 |               |

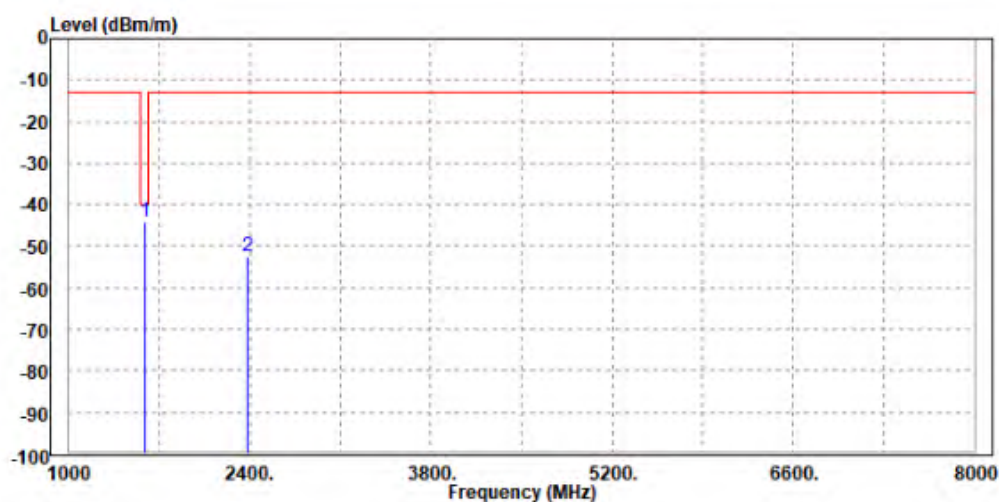
|      | Freq     | Level  | Read Level | Limit Line | Over Limit | Factor | Remark | Pol/Phase |
|------|----------|--------|------------|------------|------------|--------|--------|-----------|
|      | MHz      | dBm/m  | dBm        | dBm/m      | dB         | dB/m   |        |           |
| 1 PP | 1581.000 | -45.21 | -45.76     | -40.00     | -5.21      | 0.55   | Peak   | Vertical  |
| 2    | 2371.500 | -53.10 | -57.69     | -13.00     | -40.10     | 4.59   | Peak   | Vertical  |



CH23330

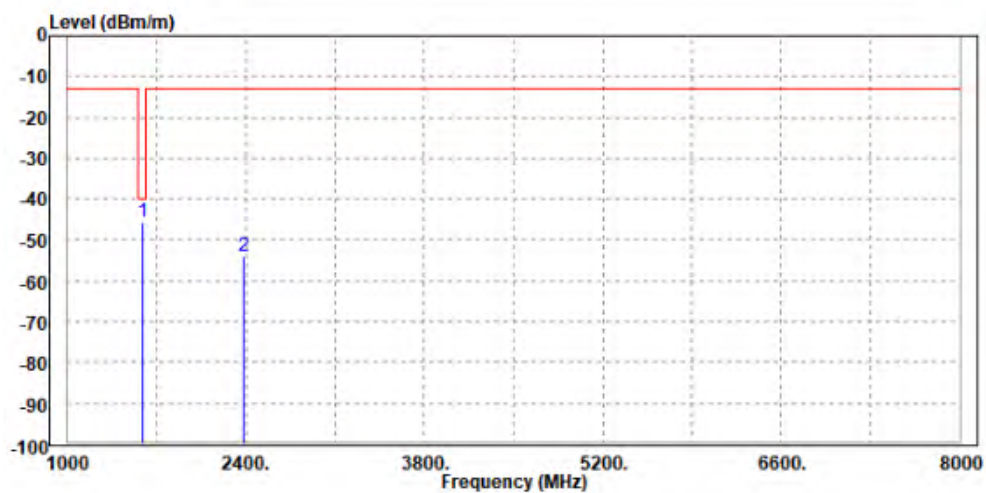
|                                                     |                  |                 |               |
|-----------------------------------------------------|------------------|-----------------|---------------|
| MODE                                                | TX channel 23330 | FREQUENCY RANGE | Above 1000MHz |
| ENVIRONMENTAL CONDITIONS                            | 23deg. C, 70%RH  | INPUT POWER     | EUT 4.0V      |
| TESTED BY                                           | Jace Hu          |                 |               |
| 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 | PP | 1588.000 | -44.28 | -44.57     | -40.00     | -4.28      | 0.29   | Peak   | Horizontal |
| 2 |    | 2379.000 | -52.31 | -57.31     | -13.00     | -39.31     | 5.00   | Peak   | Horizontal |



|                                                   |                  |                 |               |
|---------------------------------------------------|------------------|-----------------|---------------|
| MODE                                              | TX channel 23330 | FREQUENCY RANGE | Above 1000MHz |
| ENVIRONMENTAL CONDITIONS                          | 23deg. C, 70%RH  | INPUT POWER     | EUT 4.0V      |
| TESTED BY                                         | Jace Hu          |                 |               |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M |                  |                 |               |

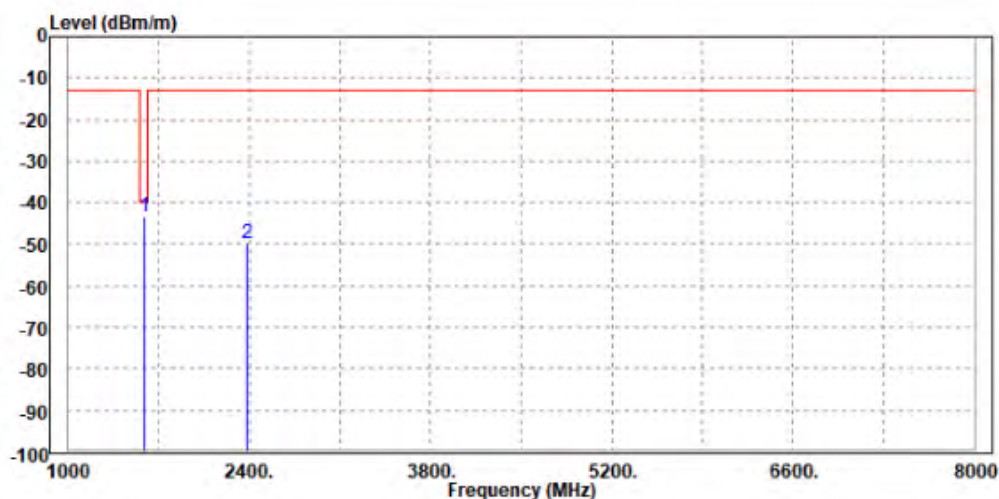
|      | Freq     | Level  | Read<br>Level | Limit<br>Line | Over<br>Limit | Factor | Remark | Pol/Phase |
|------|----------|--------|---------------|---------------|---------------|--------|--------|-----------|
|      | MHz      | dBm/m  | dBm           | dBm/m         | dB            | dB/m   |        |           |
| 1 PP | 1586.000 | -45.75 | -46.34        | -40.00        | -5.75         | 0.59   | Peak   | Vertical  |
| 2    | 2379.000 | -54.09 | -58.70        | -13.00        | -41.09        | 4.61   | Peak   | Vertical  |



CH23355

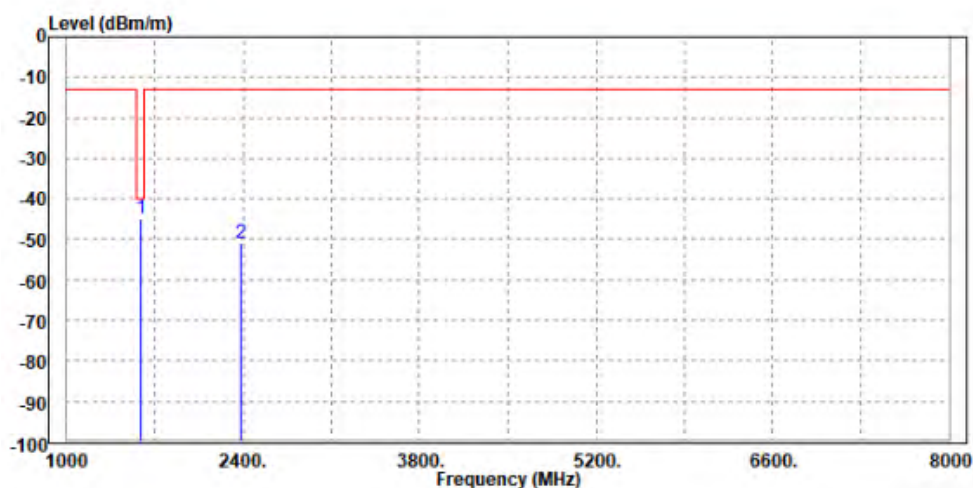
|                                                     |                  |                 |               |
|-----------------------------------------------------|------------------|-----------------|---------------|
| MODE                                                | TX channel 23355 | FREQUENCY RANGE | Above 1000MHz |
| ENVIRONMENTAL CONDITIONS                            | 23deg. C, 70%RH  | INPUT POWER     | EUT 4.0V      |
| TESTED BY                                           | Jace Hu          |                 |               |
| 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 | PP | 1588.000 | -43.31 | -43.60     | -40.00     | -3.31      | 0.29   | Peak   | Horizontal |
| 2 |    | 2386.500 | -49.71 | -54.74     | -13.00     | -36.71     | 5.03   | Peak   | Horizontal |



|                                                   |                  |                 |               |
|---------------------------------------------------|------------------|-----------------|---------------|
| MODE                                              | TX channel 23355 | FREQUENCY RANGE | Above 1000MHz |
| ENVIRONMENTAL CONDITIONS                          | 23deg. C, 70%RH  | INPUT POWER     | EUT 4.0V      |
| TESTED BY                                         | Jace Hu          |                 |               |
| 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 | PP | 1591.000 | -44.74 | -45.36     | -40.00     | -4.74      | 0.62   | Peak   | Vertical  |
| 2 |    | 2386.000 | -51.05 | -55.68     | -13.00     | -38.05     | 4.63   | Peak   | Vertical  |





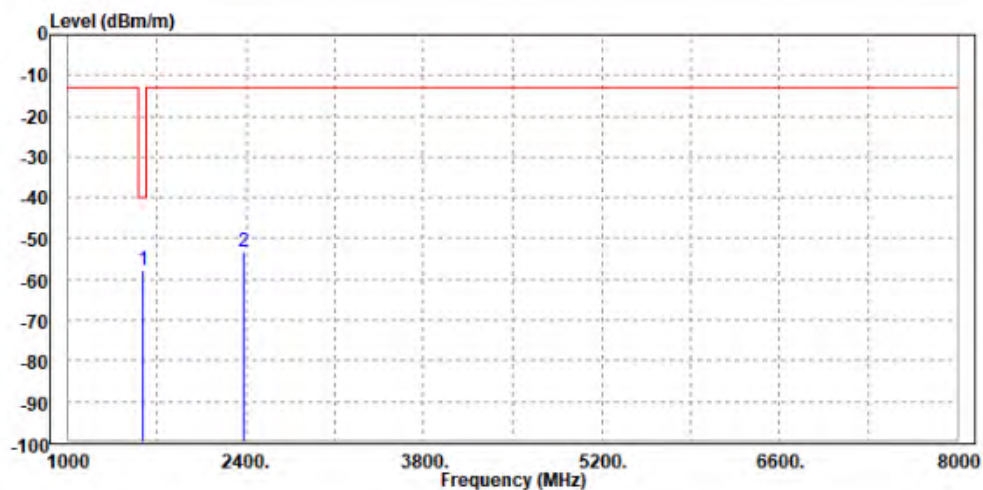
Test Report No.: W7L-P23030025RF08

CHANNEL BANDWIDTH: 10MHz / QPSK

CH23330

|                                                     |                  |                 |               |
|-----------------------------------------------------|------------------|-----------------|---------------|
| MODE                                                | TX channel 23330 | FREQUENCY RANGE | Above 1000MHz |
| ENVIRONMENTAL CONDITIONS                            | 23deg. C, 70%RH  | INPUT POWER     | EUT 4.0V      |
| TESTED BY                                           | Jace Hu          |                 |               |
| 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 | PP | 1586.000 | -57.89 | -58.16     | -40.00     | -17.89     | 0.27   | Peak   | Horizontal |
| 2 |    | 2379.000 | -53.32 | -58.32     | -13.00     | -40.32     | 5.00   | Peak   | Horizontal |



|                                                   |                  |                 |               |
|---------------------------------------------------|------------------|-----------------|---------------|
| MODE                                              | TX channel 23330 | FREQUENCY RANGE | Above 1000MHz |
| ENVIRONMENTAL CONDITIONS                          | 23deg. C, 70%RH  | INPUT POWER     | EUT 4.0V      |
| TESTED BY                                         | Jace Hu          |                 |               |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M |                  |                 |               |

|      | Freq     | Level  | Read Level | Limit  | Over Limit | Factor | Remark | Pol/Phase |
|------|----------|--------|------------|--------|------------|--------|--------|-----------|
|      | MHz      | dBm/m  | dBm        | dBm/m  | dB         | dB/m   |        |           |
| 1 PP | 1588.000 | -57.96 | -58.56     | -40.00 | -17.96     | 0.60   | Peak   | Vertical  |
| 2    | 2379.000 | -53.90 | -58.51     | -13.00 | -40.90     | 4.61   | Peak   | Vertical  |

