

# FCC Test Report

**Applicant** : Shenzhen Vanpowers Intelligent Technology Co., Ltd

**Address** : 901A9, No. 6, Kangli City, No. 66, Pingji Avenue, Lilang, Nanwan, Longgang, Shenzhen, China

**Product Name** : Intelligent Terminal

**Report Date** : Mar. 08, 2024

**Shenzhen Anbotek Compliance Laboratory Limited**



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# TEST REPORT

Applicant : Shenzhen Vanpowers Intelligent Technology Co., Ltd  
Manufacturer : Shenzhen Vanpowers Intelligent Technology Co., Ltd  
Product Name : Intelligent Terminal  
Test Model No. : YFWL000115\_4\_C  
Reference Model No. : N/A  
Trade Mark : N/A  
Rating(s) : Input: 48V $\Rightarrow$  1A(with DC 3.7V, 1250mAh battery inside)  
Test Standard(s) : FCC PART 2, FCC Part 24(E), FCC Part 27(C)  
Test Method(s) : ANSI C63.26-2015  
KDB 971168 D01 Power Meas License Digital Systems v03r01

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 24, FCC Part 27 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Receipt

Dec. 05, 2023

Date of Test :

Dec. 05, 2023 to Mar. 08, 2024

Prepared by :

Ella Liang

(Ella Liang)

Approved & Authorized Signer :

Edward Pan

(Edward Pan)



Revision History

| Report Version | Description     | Issued Date   |
|----------------|-----------------|---------------|
| R00            | Original Issue. | Mar. 08, 2024 |
|                |                 |               |
|                |                 |               |



## 1. General Information

### 1.1. Client Information

|              |   |                                                                                             |
|--------------|---|---------------------------------------------------------------------------------------------|
| Applicant    | : | Shenzhen Vanpowers Intelligent Technology Co., Ltd                                          |
| Address      | : | 901A9, No. 6, Kangli City, No. 66, Pingji Avenue, Lilang, Nanwan, Longgang, Shenzhen, China |
| Manufacturer | : | Shenzhen Vanpowers Intelligent Technology Co., Ltd                                          |
| Address      | : | 901A9, No. 6, Kangli City, No. 66, Pingji Avenue, Lilang, Nanwan, Longgang, Shenzhen, China |

### 1.2. Description of Device (EUT)

|                         |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name            | : | Intelligent Terminal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Test Model No.          | : | YFWL000115_4_C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Reference Model No.     | : | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Trade Mark              | : | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Test Power Supply       | : | DV 3.7V battery inside                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Test Sample No.         | : | 1-2-1(Normal Sample), 1-2-2(Engineering Sample)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Adapter                 | : | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>RF Specification</b> |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Support Band            | : | <input checked="" type="checkbox"/> FDD Band 2 <input checked="" type="checkbox"/> FDD Band 4 <input type="checkbox"/> FDD Band 5 <input type="checkbox"/> FDD Band 7<br><input checked="" type="checkbox"/> FDD Band 12 <input checked="" type="checkbox"/> FDD Band 13 <input type="checkbox"/> FDD Band 14 <input checked="" type="checkbox"/> FDD Band 17<br><input type="checkbox"/> FDD Band 25 <input type="checkbox"/> FDD Band 26 <input type="checkbox"/> TDD Band 38 <input type="checkbox"/> TDD Band 41<br><input type="checkbox"/> FDD Band 66 <input type="checkbox"/> FDD Band 71 |
| Transmit Frequency      | : | FDD Band 2: 1850.7 MHz – 1909.3 MHz<br>FDD Band 4: 1710.7 MHz – 1754.3 MHz<br>FDD Band 12: 699.7 MHz – 715.3 MHz<br>FDD Band 13: 779.5 MHz – 784.5 MHz<br>FDD Band 17: 706.5 MHz – 713.5 MHz                                                                                                                                                                                                                                                                                                                                                                                                      |
| Receive Frequency       | : | FDD Band 2: 1930.7 MHz – 1989.3 MHz<br>FDD Band 4: 2110.7 MHz – 2154.3 MHz<br>FDD Band 12: 729.7 MHz – 745.3 MHz<br>FDD Band 13: 748.5 MHz – 753.5 MHz<br>FDD Band 17: 736.5 MHz – 743.5 MHz                                                                                                                                                                                                                                                                                                                                                                                                      |
| Modulation Type         | : | QPSK, 16QAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Power Class             | : | Class 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |



|                                                                                                                                                                                              |   |                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------------------------------------------------------------------------------------------------------------|
| Antenna Type                                                                                                                                                                                 | : | FPC Antenna                                                                                                        |
| Antenna Gain(Peak):                                                                                                                                                                          | : | FDD Band 2: 1.72dBi<br>FDD Band 4: -0.4dBi<br>FDD Band 12: 0.81dBi<br>FDD Band 13: 1.51dBi<br>FDD Band 17: 3.00dBi |
| <b>Remark:</b> 1) All of the RF specification are provided by customer. 2) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. |   |                                                                                                                    |



### 1.3. Auxiliary Equipment Used During Test

| Title | Manufacturer | Model No. | Serial No. |
|-------|--------------|-----------|------------|
| /     | /            | /         | /          |

### 1.4. Operation State

#### Test frequency list:

| Band       | Frequency (MHz)   |                                                    |                 |                           |                 |                             |
|------------|-------------------|----------------------------------------------------|-----------------|---------------------------|-----------------|-----------------------------|
| FDD Band 2 | Test Frequency ID | Bandwidth [MHz]                                    | N <sub>UL</sub> | Frequency of Uplink [MHz] | N <sub>DL</sub> | Frequency of Downlink [MHz] |
|            | Low Range         | 1.4                                                | 18607           | 1850.7                    | 607             | 1930.7                      |
|            |                   | 3                                                  | 18615           | 1851.5                    | 615             | 1931.5                      |
|            |                   | 5                                                  | 18625           | 1852.5                    | 625             | 1932.5                      |
|            |                   | 10                                                 | 18650           | 1855                      | 650             | 1935                        |
|            |                   | 15 <sup>[1]</sup>                                  | 18675           | 1857.5                    | 675             | 1937.5                      |
|            | Mid Range         | 20 <sup>[1]</sup>                                  | 18700           | 1860                      | 700             | 1940                        |
|            |                   | 1.4/3/5/10<br>15 <sup>[1]</sup> /20 <sup>[1]</sup> | 18900           | 1880                      | 900             | 1960                        |
|            | High Range        | 1.4                                                | 19193           | 1909.3                    | 1193            | 1989.3                      |
|            |                   | 3                                                  | 19185           | 1908.5                    | 1185            | 1988.5                      |
|            |                   | 5                                                  | 19175           | 1907.5                    | 1175            | 1987.5                      |
|            |                   | 10                                                 | 19150           | 1905                      | 1150            | 1985                        |
|            |                   | 15 <sup>[1]</sup>                                  | 19125           | 1902.5                    | 1125            | 1982.5                      |
|            |                   | 20 <sup>[1]</sup>                                  | 19100           | 1900                      | 1100            | 1980                        |
| FDD Band 4 | Test Frequency ID | Bandwidth [MHz]                                    | N <sub>UL</sub> | Frequency of Uplink [MHz] | N <sub>DL</sub> | Frequency of Downlink [MHz] |
|            | Low Range         | 1.4                                                | 19957           | 1710.7                    | 1957            | 2110.7                      |
|            |                   | 3                                                  | 19965           | 1711.5                    | 1965            | 2111.5                      |
|            |                   | 5                                                  | 19975           | 1712.5                    | 1975            | 2112.5                      |
|            |                   | 10                                                 | 20000           | 1715                      | 2000            | 2115                        |
|            |                   | 15                                                 | 20025           | 1717.5                    | 2025            | 2117.5                      |
|            | Mid Range         | 20                                                 | 20050           | 1720                      | 2050            | 2120                        |
|            |                   | 1.4/3/5/10/15/20                                   | 20175           | 1732.5                    | 2175            | 2132.5                      |
|            | High Range        | 1.4                                                | 20393           | 1754.3                    | 2393            | 2154.3                      |
|            |                   | 3                                                  | 20385           | 1753.5                    | 2385            | 2153.5                      |
|            |                   | 5                                                  | 20375           | 1752.5                    | 2375            | 2152.5                      |
|            |                   | 10                                                 | 20350           | 1750                      | 2350            | 2150                        |
|            |                   | 15                                                 | 20325           | 1747.5                    | 2325            | 2147.5                      |
|            |                   | 20                                                 | 20300           | 1745                      | 2300            | 2145                        |



| FDD Band 12 | Test Frequency ID | Bandwidth [MHz] | N <sub>UL</sub> | Frequency of Uplink [MHz] | N <sub>DL</sub> | Frequency of Downlink [MHz] |
|-------------|-------------------|-----------------|-----------------|---------------------------|-----------------|-----------------------------|
|             | Low Range         | 1.4             | 23017           | 699.7                     | 5017            | 729.7                       |
|             |                   | 3               | 23025           | 700.5                     | 5025            | 730.5                       |
|             |                   | 5 [1]           | 23035           | 701.5                     | 5035            | 731.5                       |
|             |                   | 10 [1]          | 23060           | 704                       | 5060            | 734                         |
|             | Mid Range         | 1.4/3           | 23095           | 707.5                     | 5095            | 737.5                       |
|             |                   | 5 [1]/10 [1]    |                 |                           |                 |                             |
|             | High Range        | 1.4             | 23173           | 715.3                     | 5173            | 745.3                       |
|             |                   | 3               | 23165           | 714.5                     | 5165            | 744.5                       |
|             |                   | 5 [1]           | 23155           | 713.5                     | 5155            | 743.5                       |
|             |                   | 10 [1]          | 23130           | 711                       | 5130            | 741                         |

| FDD Band 13 | Test Frequency ID | Bandwidth [MHz] | N <sub>UL</sub> | Frequency of Uplink [MHz] | N <sub>DL</sub> | Frequency of Downlink [MHz] |
|-------------|-------------------|-----------------|-----------------|---------------------------|-----------------|-----------------------------|
|             | Low Range         | 5 [1]           | 23205           | 779.5                     | 5205            | 748.5                       |
|             |                   | 10 [1]          | 23230           | 782                       | 5230            | 751                         |
|             | Mid Range         | 5 [1]/10 [1]    | 23230           | 782                       | 5230            | 751                         |
|             | High Range        | 5 [1]           | 23255           | 784.5                     | 5255            | 753.5                       |
|             |                   | 10 [1]          | 23230           | 782                       | 5230            | 751                         |

| FDD Band 17 | Test Frequency ID | Bandwidth [MHz] | N <sub>UL</sub> | Frequency of Uplink [MHz] | N <sub>DL</sub> | Frequency of Downlink [MHz] |
|-------------|-------------------|-----------------|-----------------|---------------------------|-----------------|-----------------------------|
|             | Low Range         | 5 [1]           | 23755           | 706.5                     | 5755            | 736.5                       |
|             |                   | 10 [1]          | 23780           | 709                       | 5780            | 739                         |
|             | Mid Range         | 5 [1]/10 [1]    | 23790           | 710                       | 5790            | 740                         |
|             | High Range        | 5 [1]           | 23825           | 713.5                     | 5825            | 743.5                       |
|             |                   | 10 [1]          | 23800           | 711                       | 5800            | 741                         |

### 1.5. Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature range: | 21-25°C   |
| Humidity range:    | 40-75%    |
| Pressure range:    | 86-106kPa |



## 1.6. Test Equipment List

| Item | Equipment                             | Manufacturer                  | Model No.             | Serial No.  | Last Cal.     | Cal. Interval |
|------|---------------------------------------|-------------------------------|-----------------------|-------------|---------------|---------------|
| 1.   | EMI Preamplifier                      | SKET Electronic               | LNPA-0118G-45         | SKET-PA-002 | Oct. 12, 2023 | 1 Year        |
| 2.   | EMI Test Receiver                     | Rohde & Schwarz               | ESR26                 | 101481      | Oct. 12, 2023 | 1 Year        |
| 3.   | Double Ridged Horn Antenna            | SCHWARZBECK                   | BBHA 9120D            | 02555       | Oct. 16, 2022 | 3 Year        |
| 4.   | Bilog Broadband Antenna               | Schwarzbeck                   | VULB9163              | 345         | Oct. 23, 2022 | 3 Year        |
| 5.   | Pre-amplifier                         | SONOMA                        | 310N                  | 186860      | Oct. 12, 2023 | 1 Year        |
| 6.   | EMI Test Software EZ-EMC              | SHURPLE                       | N/A                   | N/A         | N/A           | N/A           |
| 7.   | MXA Spectrum Analysis                 | Agilent                       | N9020A                | MY51170037  | Oct. 12, 2023 | 1 Year        |
| 8.   | DC Power Supply                       | LW                            | TPR-6420D             | 374470      | Oct. 20, 2023 | 1 Year        |
| 9.   | Constant Temperature Humidity Chamber | ZHONGJIAN                     | ZJ-KHWS80B            | N/A         | Oct. 16, 2023 | 1 Year        |
| 10.  | Wideband Radio Communication Tester   | Rohde & Schwarz               | CMW 500               | 167336      | Feb. 23, 2023 | 1 Year        |
| 11.  | High-Pass Filter                      | CDKMV                         | ZHPF-BM1100-4000-0730 | B2015094550 | Oct. 20, 2023 | 1 Year        |
| 12.  | High-Pass Filter                      | CDKMV                         | ZHPF-M3.5-18G-3834    | 1307006523  | Oct. 20, 2023 | 1 Year        |
| 13.  | Bilog Broadband Antenna               | SCHWARZBECK                   | VULB 9163             | 01109       | Oct. 16, 2022 | 3 Year        |
| 14.  | Double Ridged Horn Antenna            | Chengyi Electronics Co., Ltd. | GTH-0118              | 351600      | Nov. 02, 2022 | 2 Year        |
| 15.  | Signal Generator                      | Anritsu                       | MG3690A               | MY48180749  | Oct. 12, 2023 | 1 Year        |



### 1.7. Measurement Uncertainty

| Parameter                                                                                                                                                                                                                       | Uncertainty                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Occupied Bandwidth                                                                                                                                                                                                              | 925Hz                                |
| Conducted Output Power                                                                                                                                                                                                          | 0.76dB                               |
| Conducted Spurious Emission                                                                                                                                                                                                     | 1.24dB                               |
| Radiated spurious emissions (30MHz~1GHz)                                                                                                                                                                                        | Horizontal: 3.92dB; Vertical: 4.52dB |
| Radiated spurious emissions (above 1GHz)                                                                                                                                                                                        | 1G-6GHz: 4.78dB;<br>6G-18GHz: 4.88dB |
| The measurement uncertainty and decision risk evaluated according to AB/WI-RF-F-032.<br>This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. |                                      |

### 1.8. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

#### FCC-Registration No.: 434132

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 434132.

#### ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

#### Test Location

Shenzhen Anbotek Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.



**1.9. Disclaimer**

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

The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.



## 2. Summary of Test

### 2.1. Summary of test result

| Description of Test                      | FCC Rules                                                                        | Requirements                                                                                                       | Result     |
|------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------|
| Conducted Output Power                   | Part 2.1046<br>Part 24.232(b)<br>Part 27.50(b)<br>Part 27.50(c)<br>Part 27.50(d) | N/A                                                                                                                | Compliance |
| Peak-Average Ratio                       | Part 24.232<br>Part 27.50                                                        | ≤13dB                                                                                                              | Compliance |
| Modulation Characteristics               | § 2.1047                                                                         | Digital modulation                                                                                                 | N/A        |
| 99% Occupied Bandwidth & 26 dB Bandwidth | Part 2.1049                                                                      | OBW: No limit<br>EBW: No limit                                                                                     | Compliance |
| Conducted Spurious Emission              | Part 2.1051<br>Part 24.238<br>Part 27.53(c)(f)<br>Part 27.53(g)<br>Part 27.53(h) | ≤ -13dBm(LTE Band 2)<br>Refer to clause 7.1 for LTE Band 13<br>≤ -13dBm(LTE Band 12,17)<br>≤ -13dBm(LTE Band 4)    | Compliance |
| Band Edge                                | Part 2.1051<br>Part 24.238<br>Part 27.53(c)(f)<br>Part 27.53(g)<br>Part 27.53(h) | ≤ -13dBm (LTE Band 2)<br>Refer to clause 8.1 for LTE Band 13<br>≤ -13dBm (LTE Band 12,17)<br>≤ -13dBm (LTE Band 4) | Compliance |
| Frequency stability VS. temperature      | Part 2.1055(a)(1)(b)<br>Part 24.235<br>Part 27.54                                | ≤ ±2.5ppm                                                                                                          | Compliance |
| Frequency stability VS. voltage          | Part 2.1055(d)(1)(2)<br>Part 24.235<br>Part 27.54                                | ≤ ±2.5ppm                                                                                                          | Compliance |
| ERP and EIRP                             | Part 2.1046<br>Part 24.232(c)<br>Part 27.50(b)<br>Part 27.50(c)<br>Part 27.50(d) | EIRP≤ 2W(LTE Band 2)<br>ERP≤ 3W(LTE Band 13)<br>ERP≤ 3W(LTE Band 12,17)<br>EIRP≤ 1W(LTE Band 4)                    | Compliance |



|                               |                  |                                             |            |
|-------------------------------|------------------|---------------------------------------------|------------|
| Radiated Spurious<br>Emission | Part 2.1053      |                                             | Compliance |
|                               | Part 24.238      | $\leq -13\text{dBm}(\text{LTE Band 2})$     |            |
|                               | Part 27.53(c)(f) | Refer to clause 9.1 for LTE Band 13         |            |
|                               | Part 27.53(g)    | $\leq -13\text{dBm}(\text{LTE Band 12,17})$ |            |
|                               | Part 27.53(h)    | $\leq -13\text{dBm}(\text{LTE Band 4})$     |            |

## Note:

1. "N/A" is an abbreviation for Not Applicable.

2. Testing was performed by configuring EUT to maximum output power status, the declared output power class for different

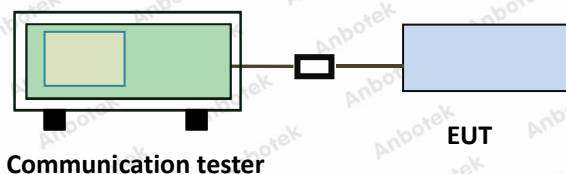


### 3. Conducted Output Power Test

#### 3.1. Test Standard and Limit

|                      |                                                                                  |
|----------------------|----------------------------------------------------------------------------------|
| Applicable Standard: | Part 2.1046<br>Part 24.232(b)<br>Part 27.50(b)<br>Part 27.50(c)<br>Part 27.50(d) |
| Limit:               | N/A                                                                              |

#### 3.2. Test Setup



#### 3.3. Test Procedure

1. The EUT output port was connected to communication tester.
2. Set EUT at maximum power through communication tester.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power.

#### 3.4. Test Data

Pass

Please refer to Appendix A of the Appendix Test Data.

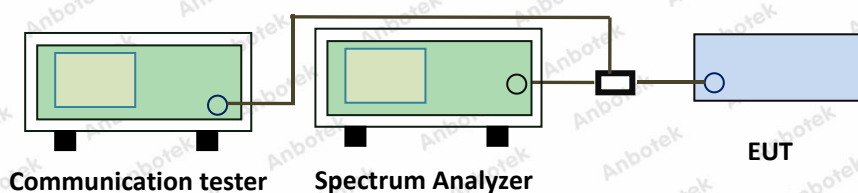


## 4. Peak-Average Ratio

### 4.1. Test Standard and Limit

|                      |                           |
|----------------------|---------------------------|
| Applicable Standard: | Part 24.232<br>Part 27.50 |
| Limit:               | ≤13dB                     |

### 4.2. Test Setup



### 4.3. Test Procedure

#### According with KDB 971168 D01 Section 5.7:

1. The EUT was connected to the spectrum analyzer and communication tester via a power splitter.
2. Set EUT in maximum power output.
3. Center Frequency = Carrier frequency, RBW > Emission bandwidth of signal.
4. The signal analyzer was set to collect one million samples to generate the CCDF curve.
5. The measurement interval was set depending on the type of signal analyzed.
  - i. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms.
  - ii. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power
6. Record the maximum PAPR level associated with a probability of 0.1%.

### 4.4. Test Data

Pass

Please refer to Appendix B of the Appendix Test Data.



## 5. Modulation Characteristic

According to FCC § 2.1047, Part 24E, Part 27C there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

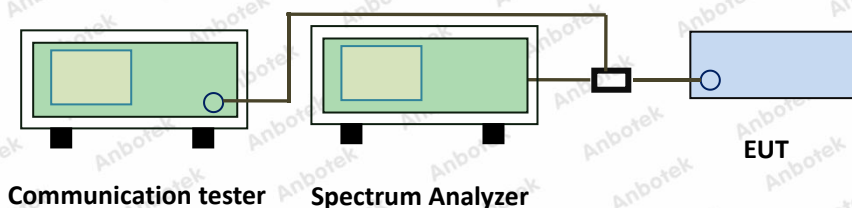


## 6. 99% Occupied Bandwidth & 26 dB Bandwidth

### 6.1. Test Standard and Limit

|                      |             |
|----------------------|-------------|
| Applicable Standard: | Part 2.1049 |
| Limit:               | N/A         |

### 6.2. Test Setup



### 6.3. Test Procedure

1. The EUT was connected to the spectrum analyzer and communication tester via a power splitter.
2. Set EUT in maximum power output.
3. Spectrum analyzer setting as follow:  
Center Frequency= Carrier frequency, RBW=1% to 5% of anticipated OBW, VBW= 3 \*  
RBW, Detector=Peak,  
Trace maximum hold.
4. Record the value of 99% Occupied bandwidth and -26dB bandwidth.

### 6.4. Test Data

Pass

Please refer to Appendix C of the Appendix Test Data.

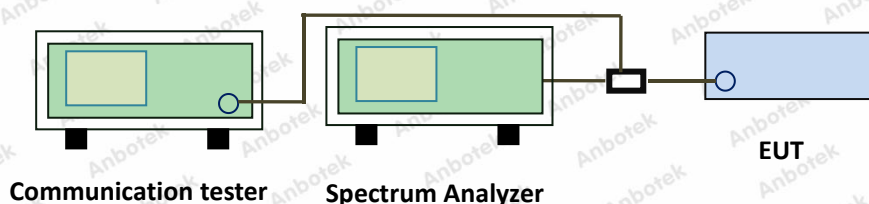


## 7. Conducted Spurious Emission

### 7.1. Test Standard and Limit

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applicable Standard: | Part 2.1051<br>Part 24.238<br>Part 27.53(c)(f)<br>Part 27.53(g)<br>Part 27.53(h)                                                                                                                                                                                                                                                                                                                                                                                                           |
| Limit:               | $\leq -13\text{dBm}$ (LTE Band 2)<br>$\leq -13\text{dBm}$ (LTE Band 12,17)<br>$\leq -13\text{dBm}$ (LTE Band 4)<br><br>For LTE Band 13:<br>(1) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;<br>(2) For operations in the 775-788 MHz, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz. The limit of emissions is equal to -40 dBm. |

### 7.2. Test Setup



### 7.3. Test Procedure

1. The EUT was connected to the spectrum analyzer and communication tester via a power splitter.
2. Set EUT in maximum power output.
3. Spectrum analyzer setting as follow:  
Below 1GHz, RBW=100KHz, VBW = 300KHz, Detector=Peak, Sweep time= Auto  
Above 1GHz, RBW=1MHz, VBW=3MHz, Detector=Peak, Sweep time= Auto  
Scan frequency range up to 10<sup>th</sup> harmonic.
4. Record the test plot.

### 7.4. Test Data

Pass

Please refer to Appendix E of the Appendix Test Data.

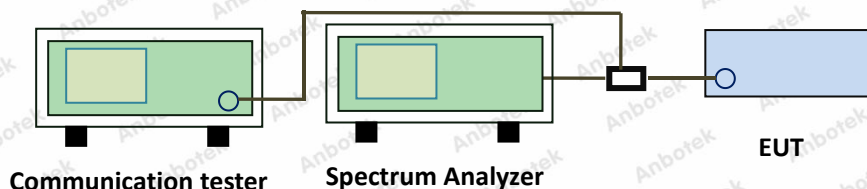


## 8. Band Edge

### 8.1. Test Standard and Limit

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applicable Standard: | Part 2.1051<br>Part 24.238<br>Part 27.53(c)(f)<br>Part 27.53(g)<br>Part 27.53(h)                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Limit:               | $\leq -13\text{dBm}$ (LTE Band 2)<br>$\leq -13\text{dBm}$ (LTE Band 12,17)<br>$\leq -13\text{dBm}$ (LTE Band 4)<br><br>For LTE Band 13:<br>(1) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;<br>(2) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations. |

### 8.2. Test Setup



### 8.3. Test Procedure

1. The EUT was connected to the spectrum analyzer and communication tester via a power splitter.
2. Set EUT in maximum power output.
3. The band edges of low and high channels were measured.
4. Spectrum analyzer setting as follow:  
RBW=1%\*OCW, not less than 10KHz, VBW = 3\*RBW, Sweep time= Auto
5. Record the test plot.

### 8.4. Test Data

Pass

Please refer to Appendix D of the Appendix Test Data.

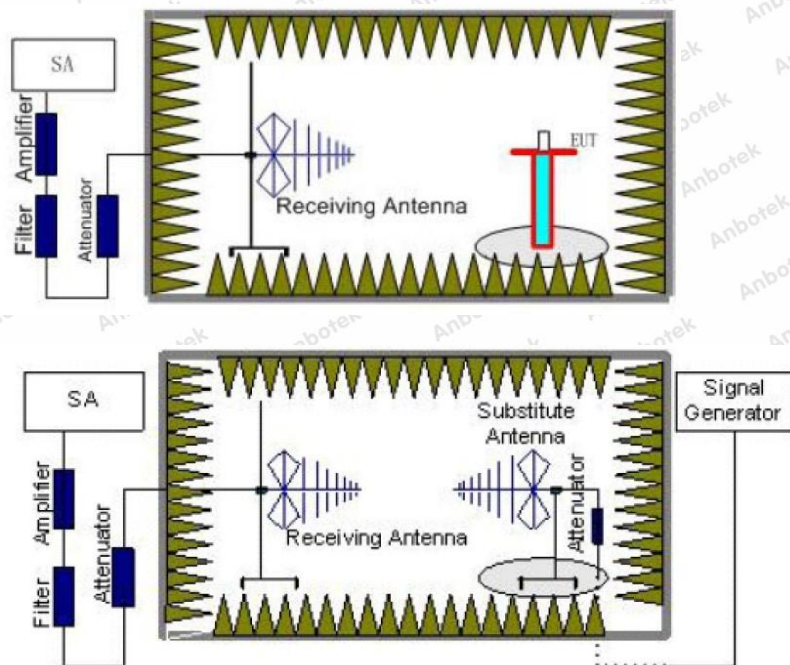


## 9. Radiated Spurious Emission

### 9.1. Test Standard and Limit

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applicable Standard: | Part 2.1053<br>Part 24.238<br>Part 27.53(c)(f)<br>Part 27.53(g)<br>Part 27.53(h)                                                                                                                                                                                                                                                                                                                                                                                                           |
| Limit:               | $\leq -13\text{dBm}$ (LTE Band 2)<br>$\leq -13\text{dBm}$ (LTE Band 12,17)<br>$\leq -13\text{dBm}$ (LTE Band 4)<br><br>For LTE Band 13:<br>(1) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;<br>(2) For operations in the 775-788 MHz, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz. The limit of emissions is equal to -40 dBm. |

### 9.2. Test Setup



### 9.3. Test Procedure

1. Place the EUT in the center of the turntable.
  - a) For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT shall be placed on a RF-transparent table at a nominal height of 80 cm above the



reference ground plane

- b) For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table at a nominal height of 1.5 m above the ground plane.
2. Unless the EUT uses an integral antenna, the EUT shall be terminated with a non-radiating transmitter load. In cases where the EUT uses an adjustable antenna, the antenna shall be adjusted through typical positions and lengths to maximize emissions levels.
3. The EUT shall be tested while operating on the frequency per manufacturer specification. Set the transmitter to operate in continuous transmit mode.
4. Receiver or Spectrum set as follow:  
Below 1GHz, RBW=100kHz, VBW=300kHz, Detector=Peak, Sweep time=Auto  
Above 1GHz, RBW=1MHz, VBW=3MHz, Detector=Peck, Sweep time=Auto
5. Each emission under consideration shall be evaluated:
  - a) Raise and lower the measurement antenna from 1 m to 4 m, as necessary to enable detection of the maximum emission amplitude relative to measurement antenna height.
  - b) Rotate the EUT through 360° to determine the maximum emission level relative to the axial position.
  - c) Return the turntable to the azimuth where the highest emission amplitude level was observed.
  - d) Vary the measurement antenna height again through 1 m to 4 m again to find the height associated with the maximum emission amplitude.
  - e) Record the measured emission amplitude level and frequency
6. Repeat step 5 for each emission frequency with the measurement antenna oriented in both the horizontal and vertical polarizations to determine the orientation that gives the maximum emissions amplitude.
7. Set-up the substitution measurement with the reference point of the substitution antenna located as near as possible to where the center of the EUT radiating element was located during the initial EUT measurement.
8. Maintain the previous measurement instrument settings and test set-up, with the exception that the EUT is removed and replaced by the substitution antenna.
9. Connect a signal generator to the substitution antenna; locate the signal generator so as to minimize any potential influences on the measurement results. Set the signal generator to the frequency where emissions are detected, and set an output power level such that the radiated signal can be detected by the measurement instrument, with sufficient dynamic range relative to the noise floor.
10. For each emission that was detected and measured in the initial test
  - a) Vary the measurement antenna height between 1 m to 4 m to maximize the received (measured) signal amplitude.
  - b) Adjust the signal generator output power level until the amplitude detected by the measurement instrument equals the amplitude level of the emission previously measured directly in step 5 and step 6.
  - c) Record the output power level of the signal generator when equivalence is achieved in step b).
11. Repeat step 8 through step 10 with the measurement antenna oriented in the opposite polarization.
12. Calculate the emission power in dBm referenced to a half-wave dipole using the following equation:  
$$P_e = P_s(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dBd)}$$

where

$P_e$  = equivalent emission power in dBm



$P_s$  = source (signal generator) power in dBm

*NOTE—dBd refers to the measured antenna gain in decibels relative to a half-wave dipole.*

13. Correct the antenna gain of the substitution antenna if necessary to reference the emission power to a half-wave dipole. When using measurement antennas with the gain specified in dBi, the equivalent dipole-referenced gain can be determined from:

gain (dBd) = gain (dBi) – 2.15 dB.

If necessary, the antenna gain can be calculated from calibrated antenna factor information

14. Provide the complete measurement results as a part of the test report.

#### 9.4. Test Data

Pass

Please see the following pages

Note: All modes are tested, and the report only shows the worst mode of QPSK.



| LTE Band 2 |         |                    |                   |                  |                |                |                |        |
|------------|---------|--------------------|-------------------|------------------|----------------|----------------|----------------|--------|
| Bandwidth  | Channel | Frequency<br>(MHz) | Spurious Emission |                  |                |                | Limit<br>(dBm) | Result |
|            |         |                    | Polarization      | reading<br>(dBm) | factor<br>(dB) | Level<br>(dBm) |                |        |
| 1.4MHz     | Low     | 3701.40            | Vertical          | -49.17           | 13.21          | -35.96         | -13.00         | PASS   |
|            |         | 5552.10            | V                 | -56.30           | 16.61          | -39.69         |                |        |
|            |         | 7402.80            | V                 | -58.68           | 18.03          | -40.65         |                |        |
|            |         | 3701.40            | Horizontal        | -50.23           | 13.21          | -37.02         | -13.00         | PASS   |
|            |         | 5552.10            | H                 | -57.30           | 16.61          | -40.69         |                |        |
|            |         | 7402.80            | H                 | -59.53           | 18.03          | -41.50         |                |        |
|            | Mid     | 3760.00            | Vertical          | -47.52           | 12.36          | -35.16         | -13.00         | PASS   |
|            |         | 5640.00            | V                 | -55.97           | 17.03          | -38.94         |                |        |
|            |         | 7520.00            | V                 | -57.80           | 17.85          | -39.95         |                |        |
|            |         | 3760.00            | Horizontal        | -48.41           | 12.36          | -36.05         | -13.00         | PASS   |
|            |         | 5640.00            | H                 | -56.93           | 17.03          | -39.90         |                |        |
|            |         | 7520.00            | H                 | -58.60           | 17.85          | -40.75         |                |        |
|            | High    | 3818.60            | Vertical          | -46.58           | 12.78          | -33.80         | -13.00         | PASS   |
|            |         | 5727.90            | V                 | -55.56           | 17.86          | -37.70         |                |        |
|            |         | 7637.20            | V                 | -57.34           | 18.56          | -38.78         |                |        |
|            |         | 3818.60            | Horizontal        | -48.35           | 12.78          | -35.57         | -13.00         | PASS   |
|            |         | 5727.90            | H                 | -57.31           | 17.86          | -39.45         |                |        |
|            |         | 7637.20            | H                 | -58.93           | 18.56          | -40.37         |                |        |
| 3MHz       | Low     | 3703.00            | Vertical          | -45.70           | 12.78          | -32.92         | -13.00         | PASS   |
|            |         | 5554.50            | V                 | -51.91           | 16.69          | -35.22         |                |        |
|            |         | 7406.00            | V                 | -55.15           | 18.18          | -36.97         |                |        |
|            |         | 3703.00            | Horizontal        | -46.20           | 12.78          | -33.42         | -13.00         | PASS   |
|            |         | 5554.50            | H                 | -53.59           | 16.69          | -36.90         |                |        |
|            |         | 7406.00            | H                 | -57.22           | 18.18          | -39.04         |                |        |
|            | Mid     | 3760.00            | Vertical          | -43.28           | 12.79          | -30.49         | -13.00         | PASS   |
|            |         | 5640.00            | V                 | -49.65           | 16.72          | -32.93         |                |        |
|            |         | 7520.00            | V                 | -52.69           | 18.22          | -34.47         |                |        |
|            |         | 3760.00            | Horizontal        | -44.18           | 12.79          | -31.39         | -13.00         | PASS   |
|            |         | 5640.00            | H                 | -52.20           | 16.72          | -35.48         |                |        |
|            |         | 7520.00            | H                 | -55.63           | 18.22          | -37.41         |                |        |
|            | High    | 3817.00            | Vertical          | -41.20           | 12.93          | -28.27         | -13.00         | PASS   |
|            |         | 5725.50            | V                 | -48.33           | 17.01          | -31.32         |                |        |



|       |      |         |            |        |       |               |        |      |
|-------|------|---------|------------|--------|-------|---------------|--------|------|
|       |      | 7634.00 | V          | -51.83 | 18.41 | -33.42        | -13.00 | PASS |
|       |      | 3817.00 | Horizontal | -42.19 | 12.93 | -29.26        |        |      |
|       |      | 5725.50 | H          | -50.87 | 17.01 | -33.86        |        |      |
|       |      | 7634.00 | H          | -52.96 | 18.41 | -34.55        |        |      |
| 5MHz  | Low  | 3705.00 | Vertical   | -39.13 | 13.25 | <b>-25.88</b> | -13.00 | PASS |
|       |      | 5557.50 | V          | -44.28 | 16.59 | -27.69        |        |      |
|       |      | 7410.00 | V          | -48.82 | 18.12 | -30.70        |        |      |
|       |      | 3705.00 | Horizontal | -44.33 | 13.25 | -31.08        | -13.00 | PASS |
|       |      | 5557.50 | H          | -53.68 | 16.59 | -37.09        |        |      |
|       |      | 7410.00 | H          | -54.26 | 18.12 | -36.14        |        |      |
|       | Mid  | 3760.00 | Vertical   | -39.36 | 12.31 | -27.05        | -13.00 | PASS |
|       |      | 5640.00 | V          | -47.00 | 17.14 | -29.86        |        |      |
|       |      | 7520.00 | V          | -50.53 | 17.96 | -32.57        |        |      |
|       |      | 3760.00 | Horizontal | -46.09 | 12.31 | -33.78        | -13.00 | PASS |
|       |      | 5640.00 | H          | -56.06 | 17.14 | -38.92        |        |      |
|       |      | 7520.00 | H          | -55.50 | 17.96 | -37.54        |        |      |
|       | High | 3815.00 | Vertical   | -42.77 | 12.77 | -30.00        | -13.00 | PASS |
|       |      | 5722.50 | V          | -49.78 | 17.82 | -31.96        |        |      |
|       |      | 7630.00 | V          | -52.97 | 18.59 | -34.38        |        |      |
|       |      | 3815.00 | Horizontal | -48.66 | 12.77 | -35.89        | -13.00 | PASS |
|       |      | 5722.50 | H          | -58.70 | 17.82 | -40.88        |        |      |
|       |      | 7630.00 | H          | -57.62 | 18.59 | -39.03        |        |      |
| 10MHz | Low  | 3710.00 | Vertical   | -40.63 | 12.59 | -28.04        | -13.00 | PASS |
|       |      | 5565.00 | V          | -47.51 | 16.61 | -30.90        |        |      |
|       |      | 7420.00 | V          | -51.46 | 18.35 | -33.11        |        |      |
|       |      | 3710.00 | Horizontal | -51.48 | 12.59 | -38.89        | -13.00 | PASS |
|       |      | 5565.00 | H          | -59.54 | 16.61 | -42.93        |        |      |
|       |      | 7420.00 | H          | -59.74 | 18.35 | -41.39        |        |      |
|       | Mid  | 3760.00 | Vertical   | -43.07 | 12.71 | -30.36        | -13.00 | PASS |
|       |      | 5640.00 | V          | -49.50 | 16.65 | -32.85        |        |      |
|       |      | 7520.00 | V          | -53.72 | 18.27 | -35.45        |        |      |
|       |      | 3760.00 | Horizontal | -53.13 | 12.71 | -40.42        | -13.00 | PASS |
|       |      | 5640.00 | H          | -61.86 | 16.65 | -45.21        |        |      |
|       |      | 7520.00 | H          | -61.46 | 18.27 | -43.19        |        |      |
|       | High | 3810.00 | Vertical   | -44.13 | 12.91 | -31.22        | -13.00 | PASS |
|       |      | 5715.00 | V          | -52.02 | 17.23 | -34.79        |        |      |



|       |      |         |            |        |       |        |        |      |
|-------|------|---------|------------|--------|-------|--------|--------|------|
|       |      | 7620.00 | V          | -56.29 | 18.59 | -37.70 | -13.00 | PASS |
|       |      | 3810.00 | Horizontal | -51.48 | 12.91 | -38.57 |        |      |
|       |      | 5715.00 | H          | -61.36 | 17.23 | -44.13 |        |      |
|       |      | 7620.00 | H          | -60.35 | 18.59 | -41.76 |        |      |
| 15MHz | Low  | 3715.00 | Vertical   | -42.85 | 13.21 | -29.64 | -13.00 | PASS |
|       |      | 5572.50 | V          | -50.02 | 16.65 | -33.37 |        |      |
|       |      | 7430.00 | V          | -54.47 | 18.29 | -36.18 |        |      |
|       |      | 3715.00 | Horizontal | -53.27 | 13.21 | -40.06 | -13.00 | PASS |
|       |      | 5572.50 | H          | -62.18 | 16.65 | -45.53 |        |      |
|       |      | 7430.00 | H          | -61.24 | 18.29 | -42.95 |        |      |
|       | Mid  | 3760.00 | Vertical   | -43.15 | 12.39 | -30.76 | -13.00 | PASS |
|       |      | 5640.00 | V          | -51.60 | 17.18 | -34.42 |        |      |
|       |      | 7520.00 | V          | -55.16 | 17.99 | -37.17 |        |      |
|       |      | 3760.00 | Horizontal | -51.03 | 12.39 | -38.64 | -13.00 | PASS |
|       |      | 5640.00 | H          | -61.24 | 17.18 | -44.06 |        |      |
|       |      | 7520.00 | H          | -60.11 | 17.99 | -42.12 |        |      |
|       | High | 3805.00 | Vertical   | -42.45 | 12.86 | -29.59 | -13.00 | PASS |
|       |      | 5707.50 | V          | -50.12 | 17.89 | -32.23 |        |      |
|       |      | 7610.00 | V          | -53.69 | 18.69 | -35.00 |        |      |
|       |      | 3805.00 | Horizontal | -53.36 | 12.86 | -40.50 | -13.00 | PASS |
|       |      | 5707.50 | H          | -64.96 | 17.89 | -47.07 |        |      |
|       |      | 7610.00 | H          | -63.90 | 18.69 | -45.21 |        |      |
| 20MHz | Low  | 3720.00 | Vertical   | -44.00 | 12.57 | -31.43 | -13.00 | PASS |
|       |      | 5580.00 | V          | -50.91 | 16.59 | -34.32 |        |      |
|       |      | 7440.00 | V          | -55.25 | 18.67 | -36.58 |        |      |
|       |      | 3720.00 | Horizontal | -53.51 | 12.57 | -40.94 | -13.00 | PASS |
|       |      | 5580.00 | H          | -64.08 | 16.59 | -47.49 |        |      |
|       |      | 7440.00 | H          | -64.23 | 18.67 | -45.56 |        |      |
|       | Mid  | 3760.00 | Vertical   | -44.52 | 12.76 | -31.76 | -13.00 | PASS |
|       |      | 5640.00 | V          | -51.32 | 16.69 | -34.63 |        |      |
|       |      | 7520.00 | V          | -55.25 | 18.38 | -36.87 |        |      |
|       |      | 3760.00 | Horizontal | -53.99 | 12.76 | -41.23 | -13.00 | PASS |
|       |      | 5640.00 | H          | -64.42 | 16.69 | -47.73 |        |      |
|       |      | 7520.00 | H          | -64.16 | 18.38 | -45.78 |        |      |
|       | High | 3800.00 | Vertical   | -43.39 | 12.97 | -30.42 | -13.00 | PASS |
|       |      | 5700.00 | V          | -50.02 | 17.19 | -32.83 |        |      |



|  |  |         |            |        |       |        |        |      |
|--|--|---------|------------|--------|-------|--------|--------|------|
|  |  | 7600.00 | V          | -53.85 | 18.28 | -35.57 |        |      |
|  |  | 3800.00 | Horizontal | -54.51 | 12.97 | -41.54 |        |      |
|  |  | 5700.00 | H          | -65.21 | 17.19 | -48.02 | -13.00 | PASS |
|  |  | 7600.00 | H          | -64.31 | 18.28 | -46.03 |        |      |

| LTE Band 4 |         |                 |                   |               |             |               |             |        |
|------------|---------|-----------------|-------------------|---------------|-------------|---------------|-------------|--------|
| Bandwidth  | Channel | Frequency (MHz) | Spurious Emission |               |             |               | Limit (dBm) | Result |
|            |         |                 | Polarization      | reading (dBm) | factor (dB) | Level (dBm)   |             |        |
| 1.4MHz     | Low     | 3421.40         | Vertical          | -46.54        | 12.89       | -33.65        | -13.00      | PASS   |
|            |         | 5132.10         | V                 | -54.84        | 15.86       | -38.98        |             |        |
|            |         | 6842.80         | V                 | -57.69        | 18.92       | -38.77        |             |        |
|            |         | 3421.40         | Horizontal        | -47.74        | 12.89       | -34.85        | -13.00      | PASS   |
|            |         | 5132.10         | H                 | -55.97        | 15.86       | -40.11        |             |        |
|            |         | 6842.80         | H                 | -58.65        | 18.92       | -39.73        |             |        |
|            | Mid     | 3465.00         | Vertical          | -45.24        | 12.49       | -32.75        | -13.00      | PASS   |
|            |         | 5197.50         | V                 | -53.84        | 15.71       | -38.13        |             |        |
|            |         | 6930.00         | V                 | -56.23        | 18.26       | -37.97        |             |        |
|            |         | 3465.00         | Horizontal        | -46.24        | 12.49       | -33.75        | -13.00      | PASS   |
|            |         | 5197.50         | H                 | -54.93        | 15.71       | -39.22        |             |        |
|            |         | 6930.00         | H                 | -57.14        | 18.26       | -38.88        |             |        |
|            | High    | 3508.60         | Vertical          | -44.22        | 13.01       | <b>-31.21</b> | -13.00      | PASS   |
|            |         | 5262.90         | V                 | -52.62        | 15.89       | -36.73        |             |        |
|            |         | 7017.20         | V                 | -55.31        | 18.67       | -36.64        |             |        |
|            |         | 3508.60         | Horizontal        | -45.50        | 13.01       | -32.49        | -13.00      | PASS   |
|            |         | 5262.90         | H                 | -53.91        | 15.89       | -38.02        |             |        |
|            |         | 7017.20         | H                 | -56.41        | 18.67       | -37.74        |             |        |
| 3MHz       | Low     | 3423.00         | Vertical          | -45.88        | 12.74       | -33.14        | -13.00      | PASS   |
|            |         | 5134.50         | V                 | -54.13        | 15.68       | -38.45        |             |        |
|            |         | 6846.00         | V                 | -56.93        | 18.59       | -38.34        |             |        |
|            |         | 3423.00         | Horizontal        | -46.76        | 12.74       | -34.02        | -13.00      | PASS   |
|            |         | 5134.50         | H                 | -56.13        | 15.68       | -40.45        |             |        |
|            |         | 6846.00         | H                 | -58.18        | 18.59       | -39.59        |             |        |
|            | Mid     | 3465.00         | Vertical          | -47.65        | 12.49       | -35.16        | -13.00      | PASS   |
|            |         | 5197.50         | V                 | -56.35        | 15.89       | -40.46        |             |        |
|            |         | 6930.00         | V                 | -58.56        | 18.66       | -39.90        |             |        |



|       |      |         |            |        |       |        |        |      |
|-------|------|---------|------------|--------|-------|--------|--------|------|
|       |      | 3465.00 | Horizontal | -50.38 | 12.49 | -37.89 | -13.00 | PASS |
|       |      | 5197.50 | H          | -59.07 | 15.89 | -43.18 |        |      |
|       |      | 6930.00 | H          | -61.42 | 18.66 | -42.76 |        |      |
|       | High | 3507.00 | Vertical   | -49.95 | 13.44 | -36.51 | -13.00 | PASS |
|       |      | 5260.50 | V          | -57.58 | 15.89 | -41.69 |        |      |
|       |      | 7014.00 | V          | -59.46 | 18.39 | -41.07 |        |      |
|       |      | 3507.00 | Horizontal | -53.20 | 13.44 | -39.76 | -13.00 | PASS |
|       |      | 5260.50 | H          | -61.18 | 15.89 | -45.29 |        |      |
|       |      | 7014.00 | H          | -62.69 | 18.39 | -44.30 |        |      |
| 5MHz  | Low  | 3425.00 | Vertical   | -46.90 | 12.87 | -34.03 | -13.00 | PASS |
|       |      | 5137.50 | V          | -55.72 | 15.85 | -39.87 |        |      |
|       |      | 6850.00 | V          | -57.54 | 18.93 | -38.61 |        |      |
|       |      | 3425.00 | Horizontal | -51.64 | 12.87 | -38.77 | -13.00 | PASS |
|       |      | 5137.50 | H          | -62.07 | 15.85 | -46.22 |        |      |
|       |      | 6850.00 | H          | -62.44 | 18.93 | -43.51 |        |      |
|       | Mid  | 3465.00 | Vertical   | -47.24 | 12.47 | -34.77 | -13.00 | PASS |
|       |      | 5197.50 | V          | -54.87 | 15.7  | -39.17 |        |      |
|       |      | 6930.00 | V          | -57.56 | 18.29 | -39.27 |        |      |
|       |      | 3465.00 | Horizontal | -52.11 | 12.47 | -39.64 | -13.00 | PASS |
|       |      | 5197.50 | H          | -61.22 | 15.7  | -45.52 |        |      |
|       |      | 6930.00 | H          | -61.59 | 18.29 | -43.30 |        |      |
|       | High | 3505.00 | Vertical   | -46.99 | 13.29 | -33.70 | -13.00 | PASS |
|       |      | 5257.50 | V          | -56.00 | 15.86 | -40.14 |        |      |
|       |      | 7010.00 | V          | -56.97 | 18.63 | -38.34 |        |      |
|       |      | 3505.00 | Horizontal | -52.23 | 13.29 | -38.94 | -13.00 | PASS |
|       |      | 5257.50 | H          | -60.72 | 15.86 | -44.86 |        |      |
|       |      | 7010.00 | H          | -61.37 | 18.63 | -42.74 |        |      |
| 10MHz | Low  | 3430.00 | Vertical   | -44.53 | 12.72 | -31.81 | -13.00 | PASS |
|       |      | 5145.00 | V          | -56.91 | 15.61 | -41.30 |        |      |
|       |      | 6860.00 | V          | -56.26 | 18.62 | -37.64 |        |      |
|       |      | 3430.00 | Horizontal | -51.92 | 12.72 | -39.20 | -13.00 | PASS |
|       |      | 5145.00 | H          | -60.71 | 15.61 | -45.10 |        |      |
|       |      | 6860.00 | H          | -61.57 | 18.62 | -42.95 |        |      |
|       | Mid  | 3465.00 | Vertical   | -44.41 | 12.41 | -32.00 | -13.00 | PASS |
|       |      | 5197.50 | V          | -57.40 | 15.92 | -41.48 |        |      |
|       |      | 6930.00 | V          | -56.80 | 18.63 | -38.17 |        |      |



|       |      |         |            |        |       |        |        |      |
|-------|------|---------|------------|--------|-------|--------|--------|------|
|       |      | 3465.00 | Horizontal | -51.82 | 12.41 | -39.41 | -13.00 | PASS |
|       |      | 5197.50 | H          | -61.19 | 15.92 | -45.27 |        |      |
|       |      | 6930.00 | H          | -61.74 | 18.63 | -43.11 |        |      |
|       | High | 3500.00 | Vertical   | -45.67 | 13.41 | -32.26 | -13.00 | PASS |
|       |      | 5250.00 | V          | -57.31 | 15.59 | -41.72 |        |      |
|       |      | 7000.00 | V          | -56.71 | 18.31 | -38.40 |        |      |
|       |      | 3500.00 | Horizontal | -53.02 | 13.41 | -39.61 | -13.00 | PASS |
|       |      | 5250.00 | H          | -61.05 | 15.59 | -45.46 |        |      |
|       |      | 7000.00 | H          | -61.58 | 18.31 | -43.27 |        |      |
|       |      |         |            |        |       |        |        |      |
|       |      |         |            |        |       |        |        |      |
| 15MHz | Low  | 3435.00 | Vertical   | -45.84 | 12.89 | -32.95 | -13.00 | PASS |
|       |      | 5152.50 | V          | -56.88 | 15.86 | -41.02 |        |      |
|       |      | 6870.00 | V          | -57.90 | 18.95 | -38.95 |        |      |
|       |      | 3435.00 | Horizontal | -50.99 | 12.89 | -38.10 | -13.00 | PASS |
|       |      | 5152.50 | H          | -62.74 | 15.86 | -46.88 |        |      |
|       |      | 6870.00 | H          | -59.60 | 18.95 | -40.65 |        |      |
|       | Mid  | 3465.00 | Vertical   | -47.91 | 12.49 | -35.42 | -13.00 | PASS |
|       |      | 5197.50 | V          | -54.43 | 15.73 | -38.70 |        |      |
|       |      | 6930.00 | V          | -59.44 | 18.31 | -41.13 |        |      |
|       |      | 3465.00 | Horizontal | -48.67 | 12.49 | -36.18 | -13.00 | PASS |
|       |      | 5197.50 | H          | -64.16 | 15.73 | -48.43 |        |      |
|       |      | 6930.00 | H          | -57.48 | 18.31 | -39.17 |        |      |
|       | High | 3495.00 | Vertical   | -50.56 | 13.32 | -37.24 | -13.00 | PASS |
|       |      | 5242.50 | V          | -52.93 | 15.88 | -37.05 |        |      |
|       |      | 6990.00 | V          | -58.21 | 18.65 | -39.56 |        |      |
|       |      | 3495.00 | Horizontal | -47.79 | 13.32 | -34.47 | -13.00 | PASS |
|       |      | 5242.50 | H          | -61.00 | 15.88 | -45.12 |        |      |
|       |      | 6990.00 | H          | -56.99 | 18.65 | -38.34 |        |      |
| 20MHz | Low  | 3440.00 | Vertical   | -47.35 | 12.74 | -34.61 | -13.00 | PASS |
|       |      | 5160.00 | V          | -52.10 | 15.65 | -36.45 |        |      |
|       |      | 6880.00 | V          | -57.69 | 18.64 | -39.05 |        |      |
|       |      | 3440.00 | Horizontal | -48.93 | 12.74 | -36.19 | -13.00 | PASS |
|       |      | 5160.00 | H          | -62.13 | 15.65 | -46.48 |        |      |
|       |      | 6880.00 | H          | -57.38 | 18.64 | -38.74 |        |      |
|       | Mid  | 3465.00 | Vertical   | -47.48 | 12.44 | -35.04 | -13.00 | PASS |
|       |      | 5197.50 | V          | -52.59 | 15.93 | -36.66 |        |      |
|       |      | 6930.00 | V          | -57.88 | 18.64 | -39.24 |        |      |



|  |      |         |            |        |       |        |        |      |
|--|------|---------|------------|--------|-------|--------|--------|------|
|  |      | 3465.00 | Horizontal | -48.90 | 12.44 | -36.46 | -13.00 | PASS |
|  |      | 5197.50 | H          | -62.69 | 15.93 | -46.76 |        |      |
|  |      | 6930.00 | H          | -60.17 | 18.64 | -41.53 |        |      |
|  | High | 3490.00 | Vertical   | -50.27 | 13.43 | -36.84 | -13.00 | PASS |
|  |      | 5235.00 | V          | -53.73 | 15.61 | -38.12 |        |      |
|  |      | 6980.00 | V          | -58.91 | 18.34 | -40.57 |        |      |
|  |      | 3490.00 | Horizontal | -51.15 | 13.43 | -37.72 | -13.00 | PASS |
|  |      | 5235.00 | H          | -62.69 | 15.61 | -47.08 |        |      |
|  |      | 6980.00 | H          | -61.01 | 18.34 | -42.67 |        |      |

| LTE Band 12 |         |                 |                   |               |             |             |             |        |
|-------------|---------|-----------------|-------------------|---------------|-------------|-------------|-------------|--------|
| Bandwidth   | Channel | Frequency (MHz) | Spurious Emission |               |             |             | Limit (dBm) | Result |
|             |         |                 | Polarization      | reading (dBm) | factor (dB) | Level (dBm) |             |        |
| 1.4MHz      | Low     | 1399.40         | Vertical          | -40.13        | 4.21        | -35.92      | -13.00      | PASS   |
|             |         | 2099.10         | V                 | -48.69        | 9.12        | -39.57      |             |        |
|             |         | 2798.80         | V                 | -51.92        | 11.36       | -40.56      |             |        |
|             |         | 1399.40         | Horizontal        | -41.27        | 4.21        | -37.06      | -13.00      | PASS   |
|             |         | 2099.10         | H                 | -49.77        | 9.12        | -40.65      |             |        |
|             |         | 2798.80         | H                 | -52.83        | 11.36       | -41.47      |             |        |
|             | Mid     | 1415.00         | Vertical          | -39.32        | 4.26        | -35.06      | -13.00      | PASS   |
|             |         | 2122.50         | V                 | -47.91        | 9.15        | -38.76      |             |        |
|             |         | 2830.00         | V                 | -51.19        | 11.39       | -39.80      |             |        |
|             |         | 1415.00         | Horizontal        | -40.27        | 4.26        | -36.01      | -13.00      | PASS   |
|             |         | 2122.50         | H                 | -48.95        | 9.15        | -39.80      |             |        |
|             |         | 2830.00         | H                 | -52.05        | 11.39       | -40.66      |             |        |
|             | High    | 1430.60         | Vertical          | -37.88        | 4.29        | -33.59      | -13.00      | PASS   |
|             |         | 2145.90         | V                 | -46.54        | 9.11        | -37.43      |             |        |
|             |         | 2861.20         | V                 | -49.84        | 11.31       | -38.53      |             |        |
|             |         | 1430.60         | Horizontal        | -39.79        | 4.29        | -35.50      | -13.00      | PASS   |
|             |         | 2145.90         | H                 | -48.43        | 9.11        | -39.32      |             |        |
|             |         | 2861.20         | H                 | -51.56        | 11.31       | -40.25      |             |        |
| 3MHz        | Low     | 1401.00         | Vertical          | -36.96        | 4.32        | -32.64      | -13.00      | PASS   |
|             |         | 2101.50         | V                 | -43.91        | 9.16        | -34.75      |             |        |
|             |         | 2802.00         | V                 | -47.93        | 11.35       | -36.58      |             |        |
|             |         | 1401.00         | Horizontal        | -37.50        | 4.32        | -33.18      | -13.00      | PASS   |



|       |      |         |            |        |       |               |        |      |
|-------|------|---------|------------|--------|-------|---------------|--------|------|
| 5MHz  |      | 2101.50 | H          | -45.73 | 9.16  | -36.57        |        |      |
|       |      | 2802.00 | H          | -50.16 | 11.35 | -38.81        |        |      |
|       | Mid  | 1415.00 | Vertical   | -34.28 | 4.26  | -30.02        | -13.00 | PASS |
|       |      | 2122.50 | V          | -41.43 | 9.15  | -32.28        |        |      |
|       |      | 2830.00 | V          | -45.27 | 11.39 | -33.88        |        |      |
|       |      | 1415.00 | Horizontal | -35.25 | 4.26  | -30.99        | -13.00 | PASS |
|       |      | 2122.50 | H          | -44.19 | 9.15  | -35.04        |        |      |
|       |      | 2830.00 | H          | -48.44 | 11.39 | -37.05        |        |      |
|       | High | 1429.00 | Vertical   | -32.04 | 4.42  | -27.62        | -13.00 | PASS |
|       |      | 2143.50 | V          | -39.79 | 9.25  | -30.54        |        |      |
|       |      | 2858.00 | V          | -44.20 | 11.46 | -32.74        |        |      |
|       |      | 1429.00 | Horizontal | -33.11 | 4.42  | -28.69        | -13.00 | PASS |
|       |      | 2143.50 | H          | -42.54 | 9.25  | -33.29        |        |      |
|       |      | 2858.00 | H          | -45.42 | 11.46 | -33.96        |        |      |
|       | Low  | 1403.00 | Vertical   | -29.17 | 4.13  | <b>-25.04</b> | -13.00 | PASS |
|       |      | 2104.50 | V          | -35.69 | 9.06  | -26.63        |        |      |
|       |      | 2806.00 | V          | -41.07 | 11.27 | -29.80        |        |      |
|       |      | 1403.00 | Horizontal | -34.78 | 4.13  | -30.65        | -13.00 | PASS |
|       |      | 2104.50 | H          | -45.84 | 9.06  | -36.78        |        |      |
|       |      | 2806.00 | H          | -46.95 | 11.27 | -35.68        |        |      |
|       | Mid  | 1415.00 | Vertical   | -30.56 | 4.26  | -26.30        | -13.00 | PASS |
|       |      | 2122.50 | V          | -38.12 | 9.15  | -28.97        |        |      |
|       |      | 2830.00 | V          | -43.21 | 11.39 | -31.82        |        |      |
|       |      | 1415.00 | Horizontal | -37.83 | 4.26  | -33.57        | -13.00 | PASS |
|       |      | 2122.50 | H          | -47.91 | 9.15  | -38.76        |        |      |
|       |      | 2830.00 | H          | -48.58 | 11.39 | -37.19        |        |      |
|       | High | 1427.00 | Vertical   | -33.70 | 4.22  | -29.48        | -13.00 | PASS |
|       |      | 2140.50 | V          | -40.39 | 9.16  | -31.23        |        |      |
|       |      | 2854.00 | V          | -45.09 | 11.32 | -33.77        |        |      |
|       |      | 1427.00 | Horizontal | -40.07 | 4.22  | -35.85        | -13.00 | PASS |
|       |      | 2140.50 | H          | -50.04 | 9.16  | -40.88        |        |      |
|       |      | 2854.00 | H          | -50.12 | 11.32 | -38.80        |        |      |
| 10MHz | Low  | 1408.00 | Vertical   | -31.65 | 4.29  | -27.36        | -13.00 | PASS |
|       |      | 2112.00 | V          | -39.28 | 9.19  | -30.09        |        |      |
|       |      | 2816.00 | V          | -43.75 | 11.35 | -32.40        |        |      |
|       |      | 1408.00 | Horizontal | -43.37 | 4.29  | -39.08        | -13.00 | PASS |



|  |      |         |            |        |       |        |        |      |
|--|------|---------|------------|--------|-------|--------|--------|------|
|  |      | 2112.00 | H          | -52.28 | 9.19  | -43.09 |        |      |
|  |      | 2816.00 | H          | -52.69 | 11.35 | -41.34 |        |      |
|  | Mid  | 1415.00 | Vertical   | -34.13 | 4.26  | -29.87 | -13.00 | PASS |
|  |      | 2122.50 | V          | -41.34 | 9.15  | -32.19 |        |      |
|  |      | 2830.00 | V          | -46.32 | 11.39 | -34.93 |        |      |
|  |      | 1415.00 | Horizontal | -44.99 | 4.26  | -40.73 | -13.00 | PASS |
|  |      | 2122.50 | H          | -54.70 | 9.15  | -45.55 |        |      |
|  |      | 2830.00 | H          | -54.68 | 11.39 | -43.29 |        |      |
|  | High | 1422.00 | Vertical   | -35.16 | 4.36  | -30.80 | -13.00 | PASS |
|  |      | 2133.00 | V          | -43.55 | 9.27  | -34.28 |        |      |
|  |      | 2844.00 | V          | -48.75 | 11.39 | -37.36 |        |      |
|  |      | 1422.00 | Horizontal | -43.09 | 4.36  | -38.73 | -13.00 | PASS |
|  |      | 2133.00 | H          | -53.66 | 9.27  | -44.39 |        |      |
|  |      | 2844.00 | H          | -53.13 | 11.39 | -41.74 |        |      |

| LTE Band 13 |         |                    |                   |                  |                |                |                |        |
|-------------|---------|--------------------|-------------------|------------------|----------------|----------------|----------------|--------|
| Bandwidth   | Channel | Frequency<br>(MHz) | Spurious Emission |                  |                |                | Limit<br>(dBm) | Result |
|             |         |                    | Polarization      | reading<br>(dBm) | factor<br>(dB) | Level<br>(dBm) |                |        |
| 5MHz        | Low     | 1559.00            | Vertical          | -59.48           | 4.98           | -54.50         | -40.00         | PASS   |
|             |         | 2338.50            | V                 | -49.15           | 9.12           | -40.03         | -13.00         |        |
|             |         | 3118.00            | V                 | -53.17           | 12.46          | -40.71         |                |        |
|             |         | 1559.00            | Horizontal        | -60.60           | 4.98           | -55.62         | -40.00         | PASS   |
|             |         | 2338.50            | H                 | -50.20           | 9.12           | -41.08         | -13.00         |        |
|             |         | 3118.00            | H                 | -54.06           | 12.46          | -41.60         |                |        |
|             | Mid     | 1564.00            | Vertical          | -58.69           | 5.03           | -53.66         | -40.00         | PASS   |
|             |         | 2346.00            | V                 | -48.43           | 9.19           | -39.24         | -13.00         |        |
|             |         | 3128.00            | V                 | -52.44           | 12.47          | -39.97         |                |        |
|             |         | 1564.00            | Horizontal        | -59.63           | 5.03           | -54.60         | -40.00         | PASS   |
|             |         | 2346.00            | H                 | -49.44           | 9.19           | -40.25         | -13.00         |        |
|             |         | 3128.00            | H                 | -53.28           | 12.47          | -40.81         |                |        |
|             | High    | 1569.00            | Vertical          | -57.32           | 5.09           | -52.23         | -40.00         | PASS   |
|             |         | 2353.50            | V                 | -47.16           | 9.22           | -37.94         | -13.00         |        |
|             |         | 3138.00            | V                 | -51.26           | 12.53          | -38.73         |                |        |
|             |         | 1569.00            | Horizontal        | -59.19           | 5.09           | -54.10         | -40.00         | PASS   |
|             |         | 2353.50            | H                 | -49.00           | 9.22           | -39.78         | -13.00         |        |



|       |     |         |            |        |       |        |        |      |
|-------|-----|---------|------------|--------|-------|--------|--------|------|
|       |     | 3138.00 | H          | -52.94 | 12.53 | -40.41 |        |      |
| 10MHz | Mid | 1564.00 | Vertical   | -56.34 | 5.03  | -51.31 | -40.00 | PASS |
|       |     | 2346.00 | V          | -44.51 | 9.19  | -35.32 | -13.00 |      |
|       |     | 3128.00 | V          | -49.29 | 12.47 | -36.82 |        |      |
|       |     | 1564.00 | Horizontal | -56.87 | 5.03  | -51.84 | -40.00 | PASS |
|       |     | 2346.00 | H          | -46.28 | 9.19  | -37.09 | -13.00 |      |
|       |     | 3128.00 | H          | -51.47 | 12.47 | -39.00 |        |      |

| LTE Band 17 |         |                 |                   |               |             |             |             |        |
|-------------|---------|-----------------|-------------------|---------------|-------------|-------------|-------------|--------|
| Bandwidth   | Channel | Frequency (MHz) | Spurious Emission |               |             |             | Limit (dBm) | Result |
|             |         |                 | Polarization      | reading (dBm) | factor (dB) | Level (dBm) |             |        |
| 5MHz        | Low     | 1413.00         | Vertical          | -40.09        | 4.26        | -35.83      | -13.00      | PASS   |
|             |         | 2119.50         | V                 | -48.43        | 8.72        | -39.71      |             |        |
|             |         | 2826.00         | V                 | -52.04        | 11.36       | -40.68      |             |        |
|             |         | 1413.00         | Horizontal        | -41.18        | 4.26        | -36.92      | -13.00      | PASS   |
|             |         | 2119.50         | H                 | -49.45        | 8.72        | -40.73      |             |        |
|             |         | 2826.00         | H                 | -52.91        | 11.36       | -41.55      |             |        |
|             | Mid     | 1420.00         | Vertical          | -39.22        | 4.21        | -35.01      | -13.00      | PASS   |
|             |         | 2130.00         | V                 | -48.20        | 9.26        | -38.94      |             |        |
|             |         | 2840.00         | V                 | -51.34        | 11.38       | -39.96      |             |        |
|             |         | 1420.00         | Horizontal        | -40.13        | 4.21        | -35.92      | -13.00      | PASS   |
|             |         | 2130.00         | H                 | -49.18        | 9.26        | -39.92      |             |        |
|             |         | 2840.00         | H                 | -52.16        | 11.38       | -40.78      |             |        |
|             | High    | 1427.00         | Vertical          | -37.88        | 4.26        | -33.62      | -13.00      | PASS   |
|             |         | 2140.50         | V                 | -46.80        | 9.13        | -37.67      |             |        |
|             |         | 2854.00         | V                 | -50.11        | 11.35       | -38.76      |             |        |
|             |         | 1427.00         | Horizontal        | -39.69        | 4.26        | -35.43      | -13.00      | PASS   |
|             |         | 2140.50         | H                 | -48.59        | 9.13        | -39.46      |             |        |
|             |         | 2854.00         | H                 | -51.74        | 11.35       | -40.39      |             |        |
| 10MHz       | Low     | 1418.00         | Vertical          | -36.85        | 4.13        | -32.72      | -13.00      | PASS   |
|             |         | 2127.00         | V                 | -44.36        | 9.23        | -35.13      |             |        |
|             |         | 2836.00         | V                 | -48.76        | 11.85       | -36.91      |             |        |
|             |         | 1418.00         | Horizontal        | -37.36        | 4.13        | -33.23      | -13.00      | PASS   |
|             |         | 2127.00         | H                 | -46.08        | 9.23        | -36.85      |             |        |
|             |         | 2836.00         | H                 | -50.87        | 11.85       | -39.02      |             |        |



|  |      |         |            |        |       |               |        |      |
|--|------|---------|------------|--------|-------|---------------|--------|------|
|  | Mid  | 1420.00 | Vertical   | -34.44 | 4.21  | -30.23        | -13.00 | PASS |
|  |      | 2130.00 | V          | -42.05 | 9.26  | -32.79        |        |      |
|  |      | 2840.00 | V          | -45.73 | 11.38 | -34.35        |        |      |
|  |      | 1420.00 | Horizontal | -35.37 | 4.21  | -31.16        | -13.00 | PASS |
|  |      | 2130.00 | H          | -44.66 | 9.26  | -35.40        |        |      |
|  |      | 2840.00 | H          | -48.73 | 11.38 | -37.35        |        |      |
|  | High | 1422.00 | Vertical   | -32.13 | 4.18  | <b>-27.95</b> | -13.00 | PASS |
|  |      | 2133.00 | V          | -40.38 | 9.24  | -31.14        |        |      |
|  |      | 2844.00 | V          | -45.09 | 11.82 | -33.27        |        |      |
|  |      | 1422.00 | Horizontal | -33.16 | 4.18  | -28.98        | -13.00 | PASS |
|  |      | 2133.00 | H          | -42.98 | 9.24  | -33.74        |        |      |
|  |      | 2844.00 | H          | -46.24 | 11.82 | -34.42        |        |      |

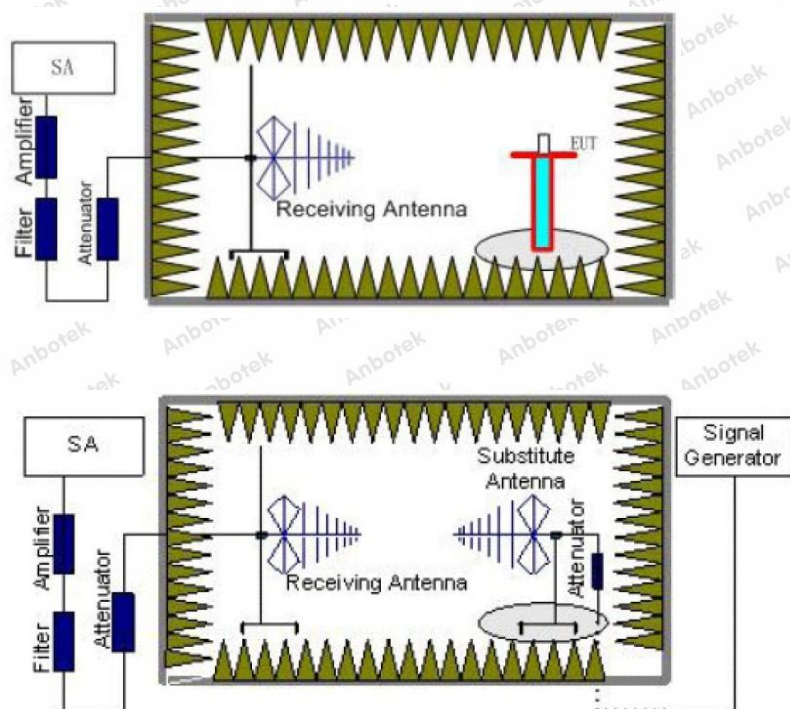


## 10. ERP and EIRP

### 10.1. Test Standard and Limit

|                      |                                                                                                                                                                     |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applicable Standard: | Part 2.1046<br>Part 24.232(c)<br>Part 27.50(b)<br>Part 27.50(c)<br>Part 27.50(d)                                                                                    |
| Limit:               | $EIRP \leq 2W(33.00dBm)$ (LTE Band 2)<br>$ERP \leq 3W(34.77dBm)$ (LTE Band 13)<br>$ERP \leq 3W(34.77dBm)$ (LTE Band 12,17)<br>$EIRP \leq 1W(30.00dBm)$ (LTE Band 4) |

### 10.2. Test Setup



### 10.3. Test Procedure

- Place the EUT in the center of the turntable.
  - For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT shall be placed on a RF-transparent table at a nominal height of 80 cm above the reference ground plane
  - For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table at a nominal height of 1.5 m above the ground plane.
- Unless the EUT uses an integral antenna, the EUT shall be terminated with a non-radiating



transmitter load. In cases where the EUT uses an adjustable antenna, the antenna shall be adjusted through typical positions and lengths to maximize emissions levels.

3. The EUT shall be tested while operating on the frequency per manufacturer specification. Set the transmitter to operate in continuous transmit mode.
4. Receiver or Spectrum set as follow:  
Below 1GHz, RBW=100kHz, VBW=300kHz, Detector=Peak, Sweep time=Auto  
Above 1GHz, RBW=1MHz, VBW=3MHz, Detector=Peck, Sweep time=Auto
5. Each emission under consideration shall be evaluated:
  - a) Raise and lower the measurement antenna from 1 m to 4 m, as necessary to enable detection of the maximum emission amplitude relative to measurement antenna height.
  - b) Rotate the EUT through 360° to determine the maximum emission level relative to the axial position.
  - c) Return the turntable to the azimuth where the highest emission amplitude level was observed.
  - d) Vary the measurement antenna height again through 1 m to 4 m again to find the height associated with the maximum emission amplitude.
  - e) Record the measured emission amplitude level and frequency
6. Repeat step 5 for each emission frequency with the measurement antenna oriented in both the horizontal and vertical polarizations to determine the orientation that gives the maximum emissions amplitude.
7. Set-up the substitution measurement with the reference point of the substitution antenna located as near as possible to where the center of the EUT radiating element was located during the initial EUT measurement.
8. Maintain the previous measurement instrument settings and test set-up, with the exception that the EUT is removed and replaced by the substitution antenna.
9. Connect a signal generator to the substitution antenna; locate the signal generator so as to minimize any potential influences on the measurement results. Set the signal generator to the frequency where emissions are detected, and set an output power level such that the radiated signal can be detected by the measurement instrument, with sufficient dynamic range relative to the noise floor.
10. For each emission that was detected and measured in the initial test
  - a) Vary the measurement antenna height between 1 m to 4 m to maximize the received (measured) signal amplitude.
  - b) Adjust the signal generator output power level until the amplitude detected by the measurement instrument equals the amplitude level of the emission previously measured directly in step 5 and step 6.
  - c) Record the output power level of the signal generator when equivalence is achieved in step b).
11. Repeat step 8 through step 10 with the measurement antenna oriented in the opposite polarization.
12. Calculate the emission power in dBm referenced to a half-wave dipole using the following equation:

$$Pe = Ps(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dBd)}$$

where

Pe = equivalent emission power in dBm

Ps = source (signal generator) power in dBm

*NOTE—dBd refers to the measured antenna gain in decibels relative to a half-wave dipole.*



13. Correct the antenna gain of the substitution antenna if necessary to reference the emission power to a half-wave dipole. When using measurement antennas with the gain specified in dBi, the equivalent dipole-referenced gain can be determined from:

gain (dBd) = gain (dBi) - 2.15 dB.

If necessary, the antenna gain can be calculated from calibrated antenna factor information

14. Provide the complete measurement results as a part of the test report.

#### 10.4. Test Data

Pass

Please to see the following pages



| LTE Band 2 |            |         |            |            |             |        |
|------------|------------|---------|------------|------------|-------------|--------|
| Bandwidth  | Modulation | Channel | EIRP (dBm) |            | Limit (dBm) | Result |
|            |            |         | Vertical   | Horizontal |             |        |
| 1.4MHz     | QPSK       | Low     | 21.38      | 18.81      | 33.00       | PASS   |
|            |            | Mid     | 21.65      | 18.73      |             |        |
|            |            | High    | 21.45      | 18.82      |             |        |
|            | 16QAM      | Low     | 19.06      | 16.76      |             | PASS   |
|            |            | Mid     | 19.42      | 16.92      |             |        |
|            |            | High    | 19.10      | 17.14      |             |        |
| 3MHz       | QPSK       | Low     | 21.09      | 18.27      | 33.00       | PASS   |
|            |            | Mid     | 21.46      | 18.71      |             |        |
|            |            | High    | 21.15      | 18.61      |             |        |
|            | 16QAM      | Low     | 19.82      | 17.54      |             | PASS   |
|            |            | Mid     | 19.84      | 17.31      |             |        |
|            |            | High    | 19.14      | 17.31      |             |        |
| 5MHz       | QPSK       | Low     | 22.33      | 19.45      | 33.00       | PASS   |
|            |            | Mid     | 22.58      | 19.26      |             |        |
|            |            | High    | 22.59      | 19.41      |             |        |
|            | 16QAM      | Low     | 20.13      | 17.37      |             | PASS   |
|            |            | Mid     | 20.33      | 17.47      |             |        |
|            |            | High    | 19.95      | 17.64      |             |        |
| 10MHz      | QPSK       | Low     | 22.29      | 19.55      | 33.00       | PASS   |
|            |            | Mid     | 22.54      | 19.37      |             |        |
|            |            | High    | 22.53      | 19.63      |             |        |
|            | 16QAM      | Low     | 20.08      | 17.53      |             | PASS   |
|            |            | Mid     | 20.28      | 17.71      |             |        |
|            |            | High    | 19.91      | 17.81      |             |        |
| 15MHz      | QPSK       | Low     | 21.88      | 18.92      | 33.00       | PASS   |
|            |            | Mid     | 22.23      | 19.27      |             |        |
|            |            | High    | 22.09      | 19.32      |             |        |
|            | 16QAM      | Low     | 20.70      | 18.21      |             | PASS   |
|            |            | Mid     | 20.59      | 18.00      |             |        |
|            |            | High    | 19.85      | 17.89      |             |        |
| 20MHz      | QPSK       | Low     | 22.09      | 19.11      | 33.00       | PASS   |
|            |            | Mid     | 22.56      | 19.52      |             |        |
|            |            | High    | 22.42      | 19.53      |             |        |
|            | 16QAM      | Low     | 21.02      | 18.64      |             | PASS   |
|            |            | Mid     | 20.86      | 18.22      |             |        |
|            |            | High    | 20.10      | 18.00      |             |        |



| LTE Band 4 |            |         |              |            |             |        |
|------------|------------|---------|--------------|------------|-------------|--------|
| Bandwidth  | Modulation | Channel | EIRP (dBm)   |            | Limit (dBm) | Result |
|            |            |         | Vertical     | Horizontal |             |        |
| 1.4MHz     | QPSK       | Low     | 21.82        | 20.12      | 30.00       | PASS   |
|            |            | Mid     | 22.15        | 20.42      |             |        |
|            |            | High    | 22.11        | 20.12      |             |        |
|            | 16QAM      | Low     | 20.70        | 19.31      |             | PASS   |
|            |            | Mid     | 21.01        | 19.62      |             |        |
|            |            | High    | 20.90        | 19.39      |             |        |
| 3MHz       | QPSK       | Low     | 22.03        | 20.12      | 30.00       | PASS   |
|            |            | Mid     | 22.11        | 20.30      |             |        |
|            |            | High    | 21.95        | 20.04      |             |        |
|            | 16QAM      | Low     | 20.85        | 19.52      |             | PASS   |
|            |            | Mid     | 21.12        | 19.37      |             |        |
|            |            | High    | 21.05        | 19.49      |             |        |
| 5MHz       | QPSK       | Low     | 22.33        | 20.38      | 30.00       | PASS   |
|            |            | Mid     | <b>22.56</b> | 20.67      |             |        |
|            |            | High    | 22.51        | 20.39      |             |        |
|            | 16QAM      | Low     | 21.08        | 19.50      |             | PASS   |
|            |            | Mid     | 21.34        | 20.07      |             |        |
|            |            | High    | 21.18        | 19.53      |             |        |
| 10MHz      | QPSK       | Low     | 22.11        | 20.31      | 30.00       | PASS   |
|            |            | Mid     | 22.39        | 20.59      |             |        |
|            |            | High    | 22.34        | 20.29      |             |        |
|            | 16QAM      | Low     | 20.92        | 19.46      |             | PASS   |
|            |            | Mid     | 21.20        | 19.75      |             |        |
|            |            | High    | 21.06        | 19.50      |             |        |
| 15MHz      | QPSK       | Low     | 22.33        | 20.28      | 30.00       | PASS   |
|            |            | Mid     | 22.36        | 20.45      |             |        |
|            |            | High    | 22.19        | 20.20      |             |        |
|            | 16QAM      | Low     | 21.08        | 19.63      |             | PASS   |
|            |            | Mid     | 21.32        | 19.64      |             |        |
|            |            | High    | 21.22        | 19.58      |             |        |
| 20MHz      | QPSK       | Low     | 22.36        | 20.31      | 30.00       | PASS   |
|            |            | Mid     | 22.47        | 20.50      |             |        |
|            |            | High    | 22.29        | 20.23      |             |        |
|            | 16QAM      | Low     | 21.07        | 19.67      |             | PASS   |
|            |            | Mid     | 21.43        | 19.61      |             |        |
|            |            | High    | 21.34        | 19.66      |             |        |



| LTE Band 12 |            |         |           |            |             |        |
|-------------|------------|---------|-----------|------------|-------------|--------|
| Bandwidth   | Modulation | Channel | ERP (dBm) |            | Limit (dBm) | Result |
|             |            |         | Vertical  | Horizontal |             |        |
| 1.4MHz      | QPSK       | Low     | 22.25     | 19.62      | 34.77       | PASS   |
|             |            | Mid     | 22.43     | 19.50      |             |        |
|             |            | High    | 22.62     | 19.65      |             |        |
|             | 16QAM      | Low     | 18.09     | 15.95      |             | PASS   |
|             |            | Mid     | 18.43     | 16.25      |             |        |
|             |            | High    | 18.40     | 16.62      |             |        |
| 3MHz        | QPSK       | Low     | 21.74     | 18.65      | 34.77       | PASS   |
|             |            | Mid     | 22.10     | 19.47      |             |        |
|             |            | High    | 22.07     | 19.26      |             |        |
|             | 16QAM      | Low     | 19.45     | 17.34      |             | PASS   |
|             |            | Mid     | 19.18     | 16.96      |             |        |
|             |            | High    | 18.46     | 16.94      |             |        |
| 5MHz        | QPSK       | Low     | 23.97     | 20.77      | 34.77       | PASS   |
|             |            | Mid     | 24.11     | 20.46      |             |        |
|             |            | High    | 24.66     | 20.71      |             |        |
|             | 16QAM      | Low     | 20.01     | 17.05      |             | PASS   |
|             |            | Mid     | 20.06     | 17.25      |             |        |
|             |            | High    | 19.94     | 17.51      |             |        |
| 10MHz       | QPSK       | Low     | 23.88     | 20.96      | 34.77       | PASS   |
|             |            | Mid     | 24.03     | 20.65      |             |        |
|             |            | High    | 24.56     | 21.11      |             |        |
|             | 16QAM      | Low     | 19.92     | 17.34      |             | PASS   |
|             |            | Mid     | 19.98     | 17.68      |             |        |
|             |            | High    | 19.86     | 17.82      |             |        |



| LTE Band 13 |            |         |              |            |             |        |
|-------------|------------|---------|--------------|------------|-------------|--------|
| Bandwidth   | Modulation | Channel | ERP (dBm)    |            | Limit (dBm) | Result |
|             |            |         | Vertical     | Horizontal |             |        |
| 5MHz        | QPSK       | Low     | 21.21        | 19.59      | 34.77       | PASS   |
|             |            | Mid     | <b>21.40</b> | 19.55      |             |        |
|             |            | High    | 21.17        | 19.60      |             |        |
|             | 16QAM      | Low     | 19.33        | 17.93      |             | PASS   |
|             |            | Mid     | 19.59        | 18.08      |             |        |
|             |            | High    | 19.26        | 18.23      |             |        |
| 10MHz       | QPSK       | Mid     | 20.98        | 19.15      | 34.77       | PASS   |
|             | 16QAM      | Mid     | 21.25        | 19.53      |             |        |

| LTE Band 17 |            |         |              |            |             |        |
|-------------|------------|---------|--------------|------------|-------------|--------|
| Bandwidth   | Modulation | Channel | ERP (dBm)    |            | Limit (dBm) | Result |
|             |            |         | Vertical     | Horizontal |             |        |
| 5MHz        | QPSK       | Low     | 21.67        | 19.54      | 34.77       | PASS   |
|             |            | Mid     | <b>22.07</b> | 19.56      |             |        |
|             |            | High    | 21.50        | 19.88      |             |        |
|             | 16QAM      | Low     | 19.76        | 18.11      |             | PASS   |
|             |            | Mid     | 20.21        | 18.44      |             |        |
|             |            | High    | 19.85        | 18.36      |             |        |
| 10MHz       | QPSK       | Low     | 21.62        | 19.12      | 34.77       | PASS   |
|             |            | Mid     | 22.01        | 19.39      |             |        |
|             |            | High    | 21.46        | 19.19      |             |        |
|             | 16QAM      | Low     | 19.81        | 18.19      |             | PASS   |
|             |            | Mid     | 20.24        | 18.49      |             |        |
|             |            | High    | 19.89        | 18.39      |             |        |

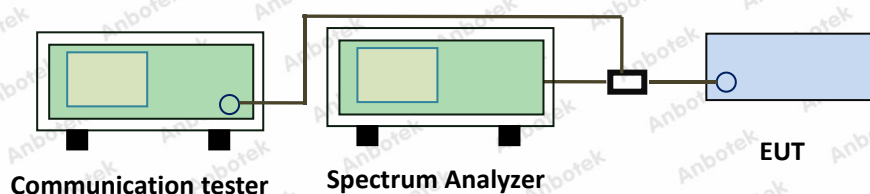


## 11. Frequency stability VS Voltage measurement

### 11.1. Test Standard and Limit

|                      |                                                   |
|----------------------|---------------------------------------------------|
| Applicable Standard: | Part 2.1055(d)(1)(2)<br>Part 24.235<br>Part 27.54 |
| Limit:               | $\leq \pm 2.5\text{ppm}$                          |

### 11.2. Test Setup



### 11.3. Test Procedure

1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. The EUT output port was connected to communication tester.
3. The EUT was placed inside the temperature chamber at 25°C.
4. The power supply voltage to the EUT was varied  $\pm 15\%$  of the nominal value measured at the input to the EUT.
5. Record the maximum frequency change.

### 11.4. Test Data

Pass

Please refer to Appendix F of the Appendix Test Data.

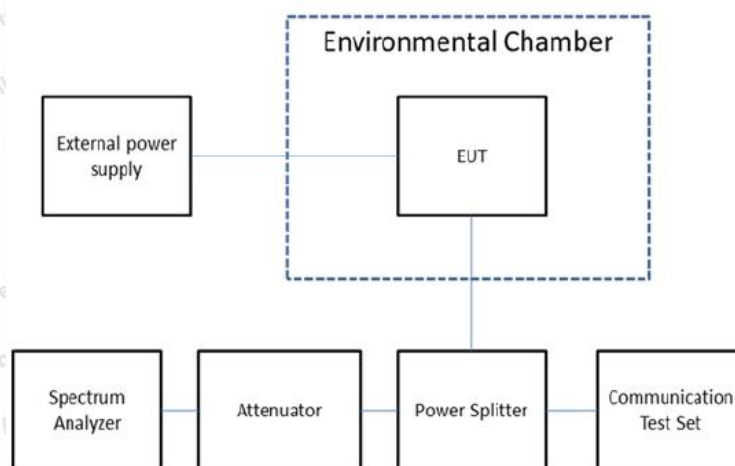


## 12. Frequency stability VS Temperature measurement

### 12.1. Test Standard and Limit

|                      |                                                   |
|----------------------|---------------------------------------------------|
| Applicable Standard: | Part 2.1055(a)(1)(b)<br>Part 24.235<br>Part 27.54 |
| Limit:               | $\leq \pm 2.5\text{ppm}$                          |

### 12.2. Test Setup



### 12.3. Test Procedure

1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. The EUT output port was connected to communication tester.
3. The EUT was placed inside the temperature chamber.
4. Turn EUT off and set the chamber temperature to  $-30^{\circ}\text{C}$ . After the temperature stabilized for approximately 30 minutes recorded the frequency.
5. Repeat step 4 measure with  $10^{\circ}\text{C}$  increased per stage until the highest temperature of  $+50^{\circ}\text{C}$  reached.

### 12.4. Test Data

Pass

Please refer to Appendix F of the Appendix Test Data.



## **APPENDIX I -- TEST SETUP PHOTOGRAPH**

Please refer to separated files Appendix I -- Test Setup Photograph\_Licensed

## **APPENDIX II -- EXTERNAL PHOTOGRAPH**

Please refer to separated files Appendix II -- External Photograph

## **APPENDIX III -- INTERNAL PHOTOGRAPH**

Please refer to separated files Appendix III -- Internal Photograph

----- End of Report -----

