

**Shenzhen Global Test Service Co.,Ltd.**

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

**FCC TEST REPORT****FCC Part 24E/27****Report Reference No.....: GTS20191217003-1-3****FCC ID.....: W9V-DS735-GP**Compiled by  
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Date of issue.....: Mar.05, 2020

**Representative Laboratory Name .: Shenzhen Global Test Service Co.,Ltd.**

Address.....: No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

**Applicant's name .....: Green Packet Berhad, Taiwan**

Address .....: 2F, NO.23, LANE 583 RUEIGUANG RD, NEIHU DISTRICT, Taipei City,Taiwan

**Test specification .....****FCC CFR Title 47 Part 2, Part 24E,Part 27****Standard .....: EIA/TIA 603-D: 2010****KDB 971168 D01**

TRF Originator .....: Shenzhen Global Test Service Co.,Ltd..

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**Test item description .....: LTE CPE**

Trade Mark .....: N/A

Manufacturer .....: Green Packet Berhad, Taiwan

Model/Type reference.....: DS-735

Listed Models .....: N/A

Modulation Type .....: QPSK, 16QAM

Rating .....: DC 12V/1.5A to Adapter

Hardware version .....: N/A

Software version .....: N/A

**Result.....: PASS**

**TEST REPORT**

|                          |                           |               |
|--------------------------|---------------------------|---------------|
| <b>Test Report No. :</b> | <b>GTS20191217003-1-3</b> | Mar.05, 2020  |
|                          |                           | Date of issue |

Equipment under Test : LTE CPE

Model /Type : DS-735

Listed Models : N/A

**Applicant** : **Green Packet Berhad, Taiwan**

Address : 2F, NO.23, LANE 583 RUEIGUANG RD, NEIHU  
DISTRICT, Taipei City,Taiwan

**Manufacturer** : **Green Packet Berhad, Taiwan**

Address : 2F, NO.23, LANE 583 RUEIGUANG RD, NEIHU  
DISTRICT, Taipei City,Taiwan

|                    |               |
|--------------------|---------------|
| <b>Test result</b> | <b>Pass *</b> |
|--------------------|---------------|

\* In the configuration tested, the EUT complied with the standards specified page 4.

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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# 1 SUMMARY

## 1.1 TEST STANDARDS

The tests were performed according to following standards:

[FCC Part 24](#) : PERSONAL COMMUNICATIONS SERVICES

[FCC Part 27](#) : MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

[TIA/EIA 603 D June 2010](#): Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

47 CFR FCC Part 15 Subpart B: - Unintentional Radiators

[FCC Part 2](#): FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

[KDB971168 D01: v02r02](#) MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS

[ANSI C63.4:2009](#): Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

## 1.2 Test Description

| Test Item                              | Section in CFR 47                                          | Result |
|----------------------------------------|------------------------------------------------------------|--------|
| RF Output Power                        | Part 2.1046<br>Part 24.232(c)<br>Part 27.50                | Pass   |
| Peak-to-Average Ratio                  | n/a                                                        | Pass   |
| 99% & -26 dB Occupied Bandwidth        | Part 2.1049                                                | Pass   |
| Spurious Emissions at Antenna Terminal | Part 2.1051<br>Part 24.238<br>Part 27.53                   | Pass   |
| Field Strength of Spurious Radiation   | Part 2.1053<br>Part 24.238<br>Part 27.53                   | Pass   |
| Out of band emission, Band Edge        | Part 2.1051<br>Part 22.917(b)<br>Part 24.238<br>Part 27.53 | Pass   |
| Frequency stability                    | Part 2.1055<br>Part 24.235<br>Part 27.54                   | Pass   |

## 1.3 Test Facility

### 1.3.1 Address of the test laboratory

#### **Shenzhen Global Test Service Co.,Ltd.**

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

### 1.3.2 Laboratory accreditation

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

CNAS (No. CNAS L8169)

Shenzhen Global Test Service Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2019 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA (Certificate No. 4758.01)

Shenzhen Global Test Service Co., Ltd. has been assessed by the American Association for Laboratory Accreditation (A2LA). Certificate No. 4758.01.

## 1.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Global Test Service Co.,Ltd.** quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for **Shenzhen Global Test Service Co.,Ltd.** is reported:

| Test                  | Range      | Measurement Uncertainty | Notes |
|-----------------------|------------|-------------------------|-------|
| Radiated Emission     | 30~1000MHz | 4.10dB                  | (1)   |
| Radiated Emission     | Above 1GHz | 4.32dB                  | (1)   |
| Conducted Disturbance | 0.15~30MHz | 3.20dB                  | (1)   |

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

## 2 GENERAL INFORMATION

### 2.1 General Remarks

|                                |   |              |
|--------------------------------|---|--------------|
| Date of receipt of test sample | : | Feb.20, 2019 |
|                                |   |              |
| Testing commenced on           | : | Feb.20, 2019 |
|                                |   |              |
| Testing concluded on           | : | Mar.05, 2020 |

### 2.2 Product Description

|                              |                                                                                                                                                                    |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name                 | LTE CPE                                                                                                                                                            |
| Trade Mark                   | N/A                                                                                                                                                                |
| Model/Type reference         | DS-735                                                                                                                                                             |
| List Models                  | N/A                                                                                                                                                                |
| Model Declaration            | N/A                                                                                                                                                                |
| Power supply:                | DC 12V/1.5A to Adapter                                                                                                                                             |
| WIFI(2.4G Band)              |                                                                                                                                                                    |
| Frequency Range              | 2412MHz ~ 2462MHz                                                                                                                                                  |
| Channel Spacing              | 5MHz                                                                                                                                                               |
| Channel Number               | 11 Channel for 20MHz bandwidth(2412~2462MHz)<br>7 channels for 40MHz bandwidth(2422~2452MHz)                                                                       |
| Modulation Type              | 802.11b: DSSS; 802.11g/n: OFDM                                                                                                                                     |
| Antenna Description          | Two same PCB Antenna, WLAN support MIMO technology<br>ANT0 used for WIFI TX/RX, 1.8dBi(Max.) for 2.4G Band<br>ANT1 used for WIFI TX/RX, 1.8dBi(Max.) for 2.4G Band |
| WIFI(5.2G Band)              |                                                                                                                                                                    |
| Frequency Range              | 5180MHz ~ 5240MHz                                                                                                                                                  |
| Channel Number               | 4 channels for 20MHz bandwidth(5180-5240MHz)<br>2 channels for 40MHz bandwidth(5190~5230MHz)<br>1 channels for 80MHz bandwidth(5210MHz)                            |
| Modulation Type              | 802.11a/n/ac: OFDM                                                                                                                                                 |
| WIFI (5.8G Band)             |                                                                                                                                                                    |
| Frequency Range              | 5745MHz ~ 5825MHz                                                                                                                                                  |
| Channel Number               | 5 channels for 20MHz bandwidth(5745-5825MHz)<br>2 channels for 40MHz bandwidth(5755~5795MHz)<br>1 channels for 80MHz bandwidth(5775MHz)                            |
| Modulation Type              | 802.11a/n/ac: OFDM                                                                                                                                                 |
| Antenna Description          | Two same PCB Antenna, WLAN support MIMO technology<br>ANT0 used for WIFI TX/RX, 2.5dBi(Max.) for 5G Band<br>ANT1 used for WIFI TX/RX, 2.5dBi(Max.) for 5G Band     |
| LTE                          |                                                                                                                                                                    |
| LTE Operation Frequency Band | LTE Band 2, 4, 66                                                                                                                                                  |
| LTE Release Version          | R9                                                                                                                                                                 |
| Type Of Modulation           | QPSK/16QAM                                                                                                                                                         |
| Antenna Description          | PCB Antenna;<br>3.0dBi (max.) For Band 2;2.5dBi (max.) For Band 4;<br>2.5dBi (max.) For Band 66;                                                                   |

## 2.3 Equipment Under Test

### Power supply system utilised

|                      |   |                                                        |                                   |
|----------------------|---|--------------------------------------------------------|-----------------------------------|
| Power supply voltage | : | <input type="radio"/> 230V / 50 Hz                     | <input type="radio"/> 120V / 60Hz |
|                      |   | <input checked="" type="radio"/> 12 V DC               | <input type="radio"/> 24 V DC     |
|                      |   | <input type="radio"/> Other (specified in blank below) |                                   |

DC 12V

## 2.4 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

|                     |         |
|---------------------|---------|
| Normal Temperature: | 25°C    |
| Relative Humidity:  | 55 %    |
| Air Pressure:       | 101 kPa |

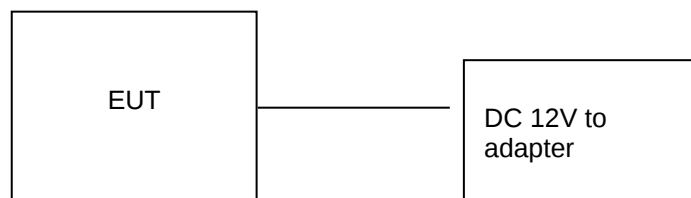
## 2.5 Description of Test Modes

The EUT has been tested under typical operating condition. The CMW500 used to control the EUT staying in continuous transmitting and receiving mode for testing. Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.

Note:

1. For the ERP/EIRP and radiated emission test, every axis (X, Y, Z) was verified, and show the worst result on this report.
2. Test method and refer to 3GPP TS136521.

## 2.6 Block Diagram of Test Setup



## 2.7 Special Accessories

| Manufacturer                  | Description | Model          | Serial Number | Certificate |
|-------------------------------|-------------|----------------|---------------|-------------|
| INDUSTRIAL(SHENZHEN) CO.,LTD. | Adapter     | ASSA53A-120150 | --            | SDOC        |

## 2.8 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is filing to comply with of the FCC Part 22,Part 24,Part 27,Part 90 Rules.

## 2.9 Modifications

No modifications were implemented to meet testing criteria.

## 2.10 Equipments Used during the Test

| Test Equipment                | Manufacturer                      | Model No.             | Serial No.      | Calibration Date | Calibration Due Date |
|-------------------------------|-----------------------------------|-----------------------|-----------------|------------------|----------------------|
| LISN                          | R&S                               | ENV216                | 3560.6550.08    | 2019/09/20       | 2020/09/19           |
| LISN                          | R&S                               | ESH2-Z5               | 893606/008      | 2019/09/20       | 2020/09/19           |
| EMI Test Receiver             | R&S                               | ESPI3                 | 101841-cd       | 2019/09/20       | 2020/09/19           |
| EMI Test Receiver             | R&S                               | ESCI7                 | 101102          | 2019/09/20       | 2020/09/19           |
| Spectrum Analyzer             | Agilent                           | N9020A                | MY48010425      | 2019/09/20       | 2020/09/19           |
| Spectrum Analyzer             | R&S                               | FSV40                 | 100019          | 2019/09/20       | 2020/09/19           |
| Vector Signal generator       | Agilent                           | N5181A                | MY49060502      | 2019/09/20       | 2020/09/19           |
| Signal generator              | Agilent                           | E4421B                | 3610AO1069      | 2019/09/20       | 2020/09/19           |
| Climate Chamber               | ESPEC                             | EL-10KA               | A20120523       | 2019/09/20       | 2020/09/19           |
| Controller                    | EM Electronics                    | Controller EM 1000    | N/A             | N/A              | N/A                  |
| Horn Antenna                  | Schwarzbeck                       | BBHA 9120D            | 01622           | 2019/09/23       | 2020/09/22           |
| Active Loop Antenna           | Beijing Da Ze Technology Co.,Ltd. | ZN30900C              | 15006           | 2019/10/12       | 2020/10/11           |
| Bilog Antenna                 | Schwarzbeck                       | VULB9163              | 000976          | 2019/05/26       | 2020/05/25           |
| Broadband Horn Antenna        | SCHWARZBECK                       | BBHA 9170             | 791             | 2019/09/20       | 2020/09/19           |
| Amplifier                     | Schwarzbeck                       | BBV 9743              | #202            | 2019/09/20       | 2020/09/19           |
| Amplifier                     | Schwarzbeck                       | BBV9179               | 9719-025        | 2019/09/20       | 2020/09/19           |
| Amplifier                     | EMCI                              | EMC051845B            | 980355          | 2019/09/20       | 2020/09/19           |
| Temperature/Humidity Meter    | Gangxing                          | CTH-608               | 02              | 2019/09/20       | 2020/09/19           |
| High-Pass Filter              | K&L                               | 9SH10-2700/X12750-O/O | KL142031        | 2019/09/20       | 2020/09/19           |
| High-Pass Filter              | K&L                               | 41H10-1375/U12750-O/O | KL142032        | 2019/09/20       | 2020/09/19           |
| RF Cable(below 1GHz)          | HUBER+SUHNER                      | RG214                 | RE01            | 2019/09/20       | 2020/09/19           |
| RF Cable(above 1GHz)          | HUBER+SUHNER                      | RG214                 | RE02            | 2019/09/20       | 2020/09/19           |
| Data acquisition card         | Agilent                           | U2531A                | TW53323507      | 2019/09/20       | 2020/09/19           |
| Power Sensor                  | Agilent                           | U2021XA               | MY5365004       | 2019/09/20       | 2020/09/19           |
| Test Control Unit             | Tonscend                          | JS0806-1              | 178060067       | 2019/06/20       | 2020/06/19           |
| Automated filter bank         | Tonscend                          | JS0806-F              | 19F8060177      | 2019/06/20       | 2020/06/19           |
| Universal Radio Communication | R&S                               | CMU200                | 114353          | 2019/09/20       | 2020/09/19           |
| Wireless Communication Tester | R&S                               | CMW500                | 125408          | 2019/09/20       | 2020/09/19           |
| EMI Test Software             | Tonscend                          | JS1120-1              | Ver 2.6.8.0518  | /                | /                    |
| EMI Test Software             | Tonscend                          | JS1120-3              | Ver 2.5.77.0418 | /                | /                    |
| EMI Test Software             | Tonscend                          | JS32-CE               | Ver 2.5         | /                | /                    |
| EMI Test Software             | Tonscend                          | JS32-RE               | Ver 2.5.1.8     | /                | /                    |

### 3 TEST CONDITIONS AND RESULTS

#### 3.1 Output Power

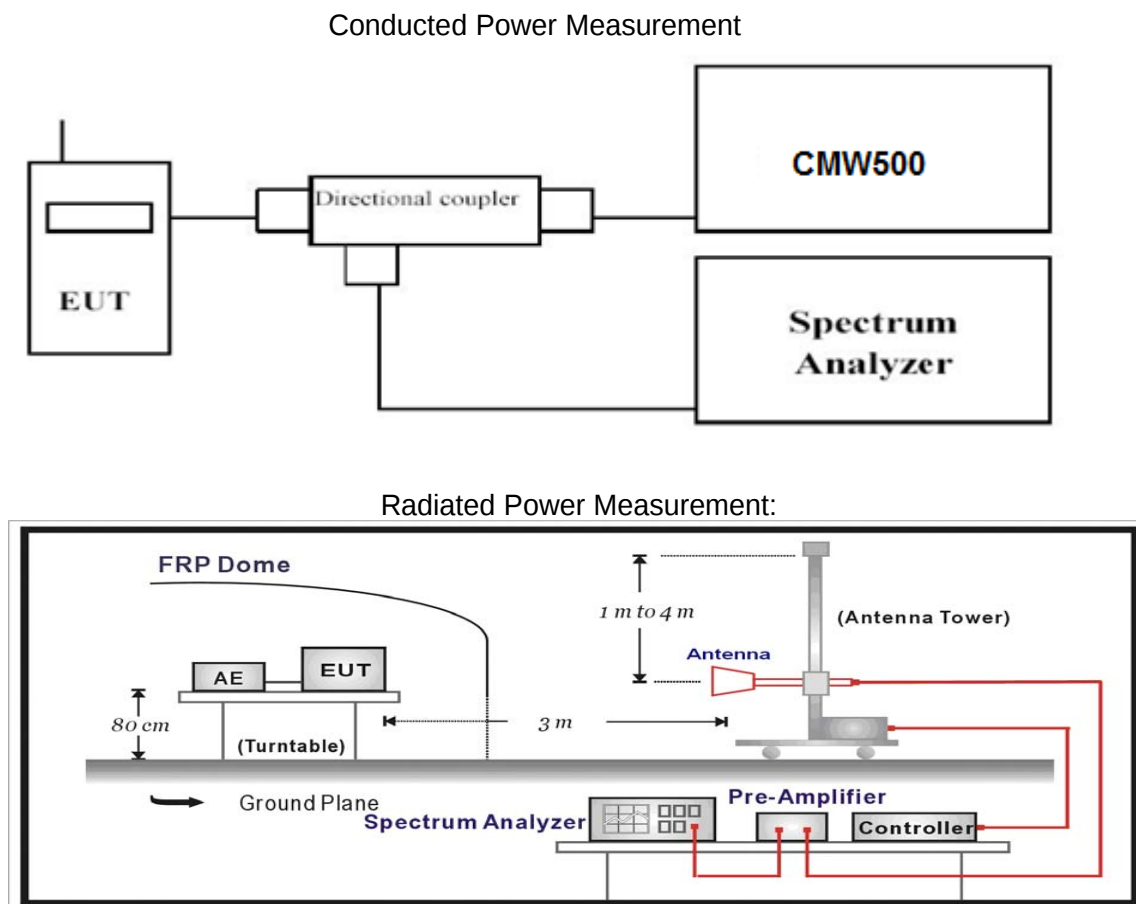
##### LIMIT

The EIRP of mobile transmitters must not exceed 2 Watts for LTE Band 2.

The EIRP of mobile transmitters must not exceed 1 Watts for LTE Band 4 .

The EIRP of mobile transmitters must not exceed 1 Watts for LTE Band 66 .

##### TEST CONFIGURATION



##### TEST PROCEDURE

The EUT was setup according to EIA/TIA 603D

##### **Conducted Power Measurement:**

- Place the EUT on a bench and set it in transmitting mode.
- Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Couple.
- EUT Communicate with CMW500, then select a channel for testing.
- Add a correction factor to the display of spectrum, and then test.

##### **Radiated Power Measurement:**

- The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
- The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
- The output of the test antenna shall be connected to the measuring receiver.
- The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.

- f. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- g. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
- h. The maximum signal level detected by the measuring receiver shall be noted.
- i. The transmitter shall be replaced by a substitution antenna.
- j. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
- k. The substitution antenna shall be connected to a calibrated signal generator.
- l. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- m. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
- n. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
- o. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
- p. The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
- q. Test site anechoic chamber refer to ANSI C63.26.

### **TEST RESULTS**

*Remark:*

*We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2, LTE FDD Band 4, LTE FDD Band 66; recorded worst case for each Channel Bandwidth of LTE FDD Band 2, LTE FDD Band 4, LTE FDD Band 66.*

#### **Conducted Measurement:**

| LTE FDD Band 2       |                |                 |                     |              |
|----------------------|----------------|-----------------|---------------------|--------------|
| TX Channel Bandwidth | RB Size/Offset | Frequency (MHz) | Average Power [dBm] |              |
|                      |                |                 | QPSK                | 16QAM        |
| 1.4 MHz              | 1 RB low       | 1850.7          | 22.37               | 21.88        |
|                      |                | 1880            | 22.68               | 21.57        |
|                      |                | 1909.3          | 22.88               | 21.38        |
|                      | 1 RB high      | 1850.7          | 22.29               | 21.82        |
|                      |                | 1880            | 22.02               | 21.08        |
|                      |                | 1909.3          | 22.92               | 21.88        |
|                      | 50% RB mid     | 1850.7          | 22.43               | 21.04        |
|                      |                | 1880            | 22.92               | 21.20        |
|                      |                | 1909.3          | 22.27               | 21.66        |
|                      | 100% RB        | 1850.7          | 22.35               | 21.20        |
|                      |                | 1880            | 22.96               | 21.43        |
|                      |                | 1909.3          | 22.13               | 21.11        |
| 3 MHz                | 1 RB low       | 1851.5          | 22.29               | 21.54        |
|                      |                | 1880            | 22.90               | 21.34        |
|                      |                | 1908.5          | 22.21               | 21.50        |
|                      | 1 RB high      | 1851.5          | 22.57               | 21.42        |
|                      |                | 1880            | 22.49               | 21.65        |
|                      |                | 1908.5          | 22.92               | 21.02        |
|                      | 50% RB mid     | 1851.5          | 22.04               | <b>22.00</b> |
|                      |                | 1880            | 22.36               | 21.82        |
|                      |                | 1908.5          | 22.20               | 21.12        |
|                      | 100% RB        | 1851.5          | 22.29               | 21.06        |
|                      |                | 1880            | 22.15               | 21.81        |
|                      |                | 1908.5          | <b>22.97</b>        | 21.07        |
| 5 MHz                | 1 RB low       | 1852.5          | 22.21               | 21.85        |
|                      |                | 1880            | 22.65               | 22.00        |
|                      |                | 1907.5          | 22.47               | 21.85        |
|                      | 1 RB high      | 1852.5          | 22.59               | 21.51        |
|                      |                | 1880            | 22.60               | 21.99        |
|                      |                | 1907.5          | 22.37               | 21.83        |

|        |            |        |       |       |
|--------|------------|--------|-------|-------|
|        | 50% RB mid | 1852.5 | 22.51 | 21.65 |
|        |            | 1880   | 22.88 | 21.45 |
|        |            | 1907.5 | 22.75 | 21.15 |
|        | 100% RB    | 1852.5 | 22.44 | 21.73 |
|        |            | 1880   | 22.65 | 21.42 |
|        |            | 1907.5 | 22.52 | 21.50 |
| 10 MHz | 1 RB low   | 1855   | 22.63 | 21.94 |
|        |            | 1880   | 22.04 | 21.89 |
|        |            | 1905   | 22.07 | 21.29 |
|        | 1 RB high  | 1855   | 22.20 | 21.17 |
|        |            | 1880   | 22.55 | 21.63 |
|        |            | 1905   | 22.53 | 21.11 |
|        | 50% RB mid | 1855   | 22.73 | 21.29 |
|        |            | 1880   | 22.52 | 21.87 |
|        |            | 1905   | 22.24 | 21.63 |
|        | 100% RB    | 1855   | 22.49 | 21.91 |
|        |            | 1880   | 22.90 | 21.32 |
|        |            | 1905   | 22.60 | 21.21 |
| 15 MHz | 1 RB low   | 1857.5 | 22.73 | 21.90 |
|        |            | 1880   | 22.41 | 21.13 |
|        |            | 1902.5 | 22.95 | 21.64 |
|        | 1 RB high  | 1857.5 | 22.70 | 21.94 |
|        |            | 1880   | 22.47 | 21.08 |
|        |            | 1902.5 | 22.62 | 21.97 |
|        | 50% RB mid | 1857.5 | 22.63 | 21.95 |
|        |            | 1880   | 22.28 | 21.06 |
|        |            | 1902.5 | 22.11 | 21.28 |
|        | 100% RB    | 1857.5 | 22.91 | 21.70 |
|        |            | 1880   | 22.91 | 21.37 |
|        |            | 1902.5 | 22.37 | 21.34 |
| 20 MHz | 1 RB low   | 1860   | 22.23 | 21.32 |
|        |            | 1880   | 22.45 | 21.05 |
|        |            | 1900   | 22.71 | 21.58 |
|        | 1 RB high  | 1860   | 22.78 | 21.76 |
|        |            | 1880   | 22.42 | 21.90 |
|        |            | 1900   | 22.18 | 21.68 |
|        | 50% RB mid | 1860   | 22.94 | 21.71 |
|        |            | 1880   | 22.41 | 21.63 |
|        |            | 1900   | 22.51 | 21.32 |
|        | 100% RB    | 1860   | 22.80 | 21.50 |
|        |            | 1880   | 22.22 | 21.35 |
|        |            | 1900   | 22.75 | 21.07 |

| LTE FDD Band 4       |                |                 |                     |              |
|----------------------|----------------|-----------------|---------------------|--------------|
| TX Channel Bandwidth | RB Size/Offset | Frequency (MHz) | Average Power [dBm] |              |
|                      |                |                 | QPSK                | 16QAM        |
| 1.4 MHz              | 1 RB low       | 1710.7          | 23.62               | 22.42        |
|                      |                | 1732.5          | <b>24.00</b>        | 22.87        |
|                      |                | 1754.3          | 23.05               | 22.94        |
|                      | 1 RB high      | 1710.7          | 23.42               | 22.44        |
|                      |                | 1732.5          | 23.63               | 22.33        |
|                      |                | 1754.3          | 23.30               | 22.21        |
|                      | 50% RB mid     | 1710.7          | 23.41               | 22.30        |
|                      |                | 1732.5          | 23.81               | 22.77        |
|                      |                | 1754.3          | 23.67               | 22.00        |
|                      | 100% RB        | 1710.7          | 23.39               | 22.21        |
|                      |                | 1732.5          | 23.88               | 22.54        |
|                      |                | 1754.3          | 23.42               | 22.16        |
| 3 MHz                | 1 RB low       | 1711.5          | 23.77               | 22.28        |
|                      |                | 1732.5          | 23.64               | 22.83        |
|                      |                | 1753.5          | 23.66               | 22.67        |
|                      | 1 RB high      | 1711.5          | 23.05               | 22.69        |
|                      |                | 1732.5          | 23.75               | 22.64        |
|                      |                | 1753.5          | 23.66               | 22.56        |
|                      | 50% RB mid     | 1711.5          | 23.64               | 22.44        |
|                      |                | 1732.5          | 23.11               | 22.43        |
|                      |                | 1753.5          | 23.08               | 22.00        |
|                      | 100% RB        | 1711.5          | 23.42               | 22.29        |
|                      |                | 1732.5          | 23.42               | 22.07        |
|                      |                | 1753.5          | 23.77               | 22.91        |
| 5 MHz                | 1 RB low       | 1712.5          | 23.58               | 22.02        |
|                      |                | 1732.5          | 23.54               | 22.97        |
|                      |                | 1752.5          | 23.76               | 22.52        |
|                      | 1 RB high      | 1712.5          | 23.48               | 22.59        |
|                      |                | 1732.5          | 23.49               | 22.50        |
|                      |                | 1752.5          | 23.22               | 22.25        |
|                      | 50% RB mid     | 1712.5          | 23.26               | 22.23        |
|                      |                | 1732.5          | 23.76               | 22.84        |
|                      |                | 1752.5          | 23.02               | <b>22.98</b> |
|                      | 100% RB        | 1712.5          | 23.36               | 22.88        |
|                      |                | 1732.5          | 23.05               | 22.26        |
|                      |                | 1752.5          | 23.64               | 22.09        |
| 10 MHz               | 1 RB low       | 1715            | 23.74               | 22.76        |
|                      |                | 1732.5          | 23.52               | 22.92        |
|                      |                | 1750            | 23.54               | 22.15        |
|                      | 1 RB high      | 1715            | 23.56               | 22.06        |
|                      |                | 1732.5          | 23.36               | 22.50        |
|                      |                | 1750            | 23.18               | 22.75        |
|                      | 50% RB mid     | 1715            | 23.83               | 22.67        |
|                      |                | 1732.5          | 23.33               | 22.94        |
|                      |                | 1750            | 23.95               | 22.85        |
|                      | 100% RB        | 1715            | 23.71               | 22.11        |
|                      |                | 1732.5          | 23.38               | 22.80        |
|                      |                | 1750            | 23.04               | 22.63        |
| 15 MHz               | 1 RB low       | 1707.5          | 23.89               | 22.89        |
|                      |                | 1732.5          | 23.52               | 22.82        |
|                      |                | 1747.5          | 23.74               | 22.82        |
|                      | 1 RB high      | 1707.5          | 23.05               | 22.47        |
|                      |                | 1732.5          | 23.37               | 22.93        |
|                      |                | 1747.5          | 23.37               | 22.00        |
|                      | 50% RB mid     | 1707.5          | 23.03               | 22.47        |
|                      |                | 1732.5          | 23.46               | 22.70        |
|                      |                | 1747.5          | 23.27               | 22.22        |
|                      | 100% RB        | 1707.5          | 23.27               | 22.26        |

|        |            |        |       |       |
|--------|------------|--------|-------|-------|
| 20 MHz | 1 RB low   | 1732.5 | 23.49 | 22.61 |
|        |            | 1747.5 | 23.86 | 22.64 |
|        |            | 1720   | 23.94 | 22.73 |
|        | 1 RB high  | 1732.5 | 23.53 | 22.14 |
|        |            | 1745   | 23.42 | 22.21 |
|        |            | 1720   | 23.04 | 22.80 |
|        | 50% RB mid | 1732.5 | 23.03 | 22.33 |
|        |            | 1745   | 23.12 | 22.75 |
|        |            | 1720   | 23.81 | 22.57 |
|        | 100% RB    | 1732.5 | 23.78 | 22.57 |
|        |            | 1745   | 23.83 | 22.82 |
|        |            | 1720   | 23.17 | 22.48 |
|        |            | 1732.5 | 23.09 | 22.63 |
|        |            | 1745   | 23.26 | 22.34 |

| LTE FDD Band 66      |                |                 |                     |              |
|----------------------|----------------|-----------------|---------------------|--------------|
| TX Channel Bandwidth | RB Size/Offset | Frequency (MHz) | Average Power [dBm] |              |
|                      |                |                 | QPSK                | 16QAM        |
| 1.4 MHz              | 1 RB low       | 1710.7          | 23.75               | 22.63        |
|                      |                | 1745.0          | 23.25               | 22.05        |
|                      |                | 1779.3          | 23.04               | 22.20        |
|                      | 1 RB high      | 1710.7          | 23.44               | 22.46        |
|                      |                | 1745.0          | 23.19               | 22.73        |
|                      |                | 1779.3          | 23.65               | 22.57        |
|                      | 50% RB mid     | 1710.7          | 23.42               | 22.18        |
|                      |                | 1745.0          | 23.39               | 22.12        |
|                      |                | 1779.3          | 23.37               | 22.26        |
|                      | 100% RB        | 1710.7          | 23.17               | 22.93        |
|                      |                | 1745.0          | 23.11               | 22.78        |
|                      |                | 1779.3          | 23.29               | 22.41        |
| 3 MHz                | 1 RB low       | 1711.5          | 23.97               | 22.41        |
|                      |                | 1745.0          | 23.74               | 22.70        |
|                      |                | 1778.5          | 23.32               | 22.39        |
|                      | 1 RB high      | 1711.5          | 23.82               | 22.07        |
|                      |                | 1745.0          | 23.68               | 22.74        |
|                      |                | 1778.5          | 23.32               | 22.09        |
|                      | 50% RB mid     | 1711.5          | 23.01               | 22.60        |
|                      |                | 1745.0          | 23.34               | 22.93        |
|                      |                | 1778.5          | 23.58               | 22.25        |
|                      | 100% RB        | 1711.5          | 23.64               | 22.67        |
|                      |                | 1745.0          | 23.65               | 22.34        |
|                      |                | 1778.5          | 23.84               | 22.42        |
| 5 MHz                | 1 RB low       | 1712.5          | 23.07               | 22.29        |
|                      |                | 1745.0          | 23.92               | 22.69        |
|                      |                | 1777.5          | 23.28               | 22.30        |
|                      | 1 RB high      | 1712.5          | 23.83               | 22.46        |
|                      |                | 1745.0          | 23.47               | 22.65        |
|                      |                | 1777.5          | 23.37               | <b>22.99</b> |
|                      | 50% RB mid     | 1712.5          | 23.97               | 22.09        |
|                      |                | 1745.0          | 23.45               | 22.89        |
|                      |                | 1777.5          | 23.99               | 22.17        |
|                      | 100% RB        | 1712.5          | 23.76               | 22.24        |
|                      |                | 1745.0          | 23.70               | 22.85        |
|                      |                | 1777.5          | 23.70               | 22.92        |
| 10 MHz               | 1 RB low       | 1715.0          | 23.62               | 22.68        |
|                      |                | 1745.0          | 23.76               | 22.48        |
|                      |                | 1775.0          | 23.62               | 22.93        |
|                      | 1 RB high      | 1715.0          | 23.95               | 22.17        |
|                      |                | 1745.0          | 23.55               | 22.66        |
|                      |                | 1775.0          | 23.98               | 22.39        |

|        |            |        |              |       |
|--------|------------|--------|--------------|-------|
|        | 50% RB mid | 1715.0 | 23.72        | 22.28 |
|        |            | 1745.0 | 23.83        | 22.98 |
|        |            | 1775.0 | 23.27        | 22.50 |
|        | 100% RB    | 1715.0 | 23.52        | 22.52 |
|        |            | 1745.0 | 23.99        | 22.07 |
|        |            | 1775.0 | 23.19        | 22.62 |
| 15 MHz | 1 RB low   | 1717.5 | 23.78        | 22.43 |
|        |            | 1745.0 | 23.06        | 22.33 |
|        |            | 1772.5 | 23.21        | 22.23 |
|        | 1 RB high  | 1717.5 | 23.62        | 22.84 |
|        |            | 1745.0 | 23.61        | 22.14 |
|        |            | 1772.5 | 23.77        | 22.49 |
|        | 50% RB mid | 1717.5 | 23.54        | 22.22 |
|        |            | 1745.0 | 23.88        | 22.65 |
|        |            | 1772.5 | 23.22        | 22.49 |
|        | 100% RB    | 1717.5 | 23.87        | 22.21 |
|        |            | 1745.0 | 23.66        | 22.68 |
|        |            | 1772.5 | 23.20        | 22.07 |
| 20 MHz | 1 RB low   | 1720.0 | 23.16        | 22.85 |
|        |            | 1745.0 | 23.74        | 22.19 |
|        |            | 1770.0 | 23.11        | 22.40 |
|        | 1 RB high  | 1720.0 | 23.47        | 22.23 |
|        |            | 1745.0 | <b>24.00</b> | 22.16 |
|        |            | 1770.0 | 23.73        | 22.33 |
|        | 50% RB mid | 1720.0 | 23.59        | 22.44 |
|        |            | 1745.0 | 23.10        | 22.12 |
|        |            | 1770.0 | 23.02        | 22.75 |
|        | 100% RB    | 1720.0 | 23.35        | 22.42 |
|        |            | 1745.0 | 23.41        | 22.50 |
|        |            | 1770.0 | 23.63        | 22.46 |

**Radiated Measurement:***Remark:*

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2, LTE FDD Band 4, LTE FDD Band 66; recorded worst case for each Channel Bandwidth of LTE FDD Band 2, LTE FDD Band 4, LTE FDD Band 66.
2.  $ERP = EIRP - 2.15\text{dBi}$  as EIRP by subtracting the gain of the dipole.

**LTE Band 2**

| Frequency<br>(MHz) | BW<br>(MHz) | Modulation | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                       | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|--------------------|-------------|------------|----------------|-------------------------------|-------------------------------|------------------------------|-----------------------|----------------------------|----------------|----------------|
|                    |             |            |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable<br>Loss<br>(dB) |                            |                |                |
| 1880.000           | 1.4         | QPSK       | H              | 85.36                         | 12.60                         | 11.66                        | 2.66                  | 21.60                      | 33.00          | 11.40          |
| 1880.000           |             |            | V              | 85.82                         | 12.81                         | 11.66                        | 2.66                  | 21.81                      | 33.00          | 11.19          |
| 1880.000           | 3           |            | H              | 86.44                         | 12.93                         | 11.66                        | 2.66                  | 21.93                      | 33.00          | 11.07          |
| 1880.000           |             |            | V              | 85.66                         | 12.09                         | 11.66                        | 2.66                  | 21.09                      | 33.00          | 11.91          |
| 1880.000           | 5           |            | H              | 87.63                         | 14.38                         | 11.66                        | 2.66                  | 23.38                      | 33.00          | 9.62           |
| 1880.000           |             |            | V              | 87.00                         | 12.96                         | 11.66                        | 2.66                  | 21.96                      | 33.00          | 11.04          |
| 1880.000           | 10          |            | H              | 86.10                         | 12.31                         | 11.66                        | 2.66                  | 21.31                      | 33.00          | 11.69          |
| 1880.000           |             |            | V              | 84.76                         | 13.60                         | 11.66                        | 2.66                  | 22.60                      | 33.00          | 10.40          |
| 1880.000           | 15          |            | H              | 85.30                         | 13.10                         | 11.66                        | 2.66                  | 22.10                      | 33.00          | 10.90          |
| 1880.000           |             |            | V              | 85.25                         | 13.71                         | 11.66                        | 2.66                  | 22.71                      | 33.00          | 10.29          |
| 1880.000           | 20          |            | H              | 86.52                         | 12.75                         | 11.66                        | 2.66                  | 21.75                      | 33.00          | 11.25          |
| 1880.000           |             |            | V              | 85.88                         | 14.21                         | 11.66                        | 2.66                  | 23.21                      | 33.00          | 9.79           |
| 1880.000           | 1.4         | 16QAM      | H              | 85.77                         | 11.81                         | 11.66                        | 2.66                  | 20.81                      | 33.00          | 12.19          |
| 1880.000           |             |            | V              | 85.74                         | 13.10                         | 11.66                        | 2.66                  | 22.10                      | 33.00          | 10.90          |
| 1880.000           | 3           |            | H              | 85.94                         | 12.09                         | 11.66                        | 2.66                  | 21.09                      | 33.00          | 11.91          |
| 1880.000           |             |            | V              | 86.03                         | 14.13                         | 11.66                        | 2.66                  | 23.13                      | 33.00          | 9.87           |
| 1880.000           | 5           |            | H              | 86.73                         | 11.40                         | 11.66                        | 2.66                  | 20.40                      | 33.00          | 12.60          |
| 1880.000           |             |            | V              | 85.62                         | 13.98                         | 11.66                        | 2.66                  | 22.98                      | 33.00          | 10.02          |
| 1880.000           | 10          |            | H              | 87.56                         | 12.07                         | 11.66                        | 2.66                  | 21.07                      | 33.00          | 11.93          |
| 1880.000           |             |            | V              | 85.70                         | 13.13                         | 11.66                        | 2.66                  | 22.13                      | 33.00          | 10.87          |
| 1880.000           | 15          |            | H              | 87.40                         | 12.59                         | 11.66                        | 2.66                  | 21.59                      | 33.00          | 11.41          |
| 1880.000           |             |            | V              | 86.98                         | 13.03                         | 11.66                        | 2.66                  | 22.03                      | 33.00          | 10.97          |
| 1880.000           | 20          |            | H              | 87.03                         | 12.26                         | 11.66                        | 2.66                  | 21.26                      | 33.00          | 11.74          |
| 1880.000           |             |            | V              | 86.65                         | 12.64                         | 11.66                        | 2.66                  | 21.64                      | 33.00          | 11.36          |

## LTE Band 4

| Frequency<br>(MHz) | BW<br>(MHz) | Modulation | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                       | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|--------------------|-------------|------------|----------------|-------------------------------|-------------------------------|------------------------------|-----------------------|----------------------------|----------------|----------------|
|                    |             |            |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable<br>Loss<br>(dB) |                            |                |                |
| 1732.500           | 1.4         | QPSK       | H              | 85.40                         | 13.53                         | 11.66                        | 2.66                  | 22.53                      | 30.00          | 7.47           |
| 1732.500           |             |            | V              | 85.05                         | 12.47                         | 11.66                        | 2.66                  | 21.47                      | 30.00          | 8.53           |
| 1732.500           | 3           |            | H              | 85.50                         | 13.22                         | 11.66                        | 2.66                  | 22.22                      | 30.00          | 7.78           |
| 1732.500           |             |            | V              | 85.27                         | 13.19                         | 11.66                        | 2.66                  | 22.19                      | 30.00          | 7.81           |
| 1732.500           | 5           |            | H              | 87.27                         | 13.82                         | 11.66                        | 2.66                  | 22.82                      | 30.00          | 7.18           |
| 1732.500           |             |            | V              | 85.98                         | 13.37                         | 11.66                        | 2.66                  | 22.37                      | 30.00          | 7.63           |
| 1732.500           | 10          |            | H              | 86.77                         | 13.44                         | 11.66                        | 2.66                  | 22.44                      | 30.00          | 7.56           |
| 1732.500           |             |            | V              | 85.64                         | 12.76                         | 11.66                        | 2.66                  | 21.76                      | 30.00          | 8.24           |
| 1732.500           | 15          |            | H              | 85.42                         | 11.86                         | 11.66                        | 2.66                  | 20.86                      | 30.00          | 9.14           |
| 1732.500           |             |            | V              | 86.90                         | 12.27                         | 11.66                        | 2.66                  | 21.27                      | 30.00          | 8.73           |
| 1732.500           | 20          |            | H              | 85.48                         | 11.46                         | 11.66                        | 2.66                  | 20.46                      | 30.00          | 9.54           |
| 1732.500           |             |            | V              | 87.11                         | 13.97                         | 11.66                        | 2.66                  | 22.97                      | 30.00          | 7.03           |
| 1732.500           | 1.4         | 16QAM      | H              | 86.24                         | 11.96                         | 11.66                        | 2.66                  | 20.96                      | 30.00          | 9.04           |
| 1732.500           |             |            | V              | 85.78                         | 12.81                         | 11.66                        | 2.66                  | 21.81                      | 30.00          | 8.19           |
| 1732.500           | 3           |            | H              | 86.84                         | 12.37                         | 11.66                        | 2.66                  | 21.37                      | 30.00          | 8.63           |
| 1732.500           |             |            | V              | 85.92                         | 12.39                         | 11.66                        | 2.66                  | 21.39                      | 30.00          | 8.61           |
| 1732.500           | 5           |            | H              | 86.12                         | 11.81                         | 11.66                        | 2.66                  | 20.81                      | 30.00          | 9.19           |
| 1732.500           |             |            | V              | 86.49                         | 13.56                         | 11.66                        | 2.66                  | 22.56                      | 30.00          | 7.44           |
| 1732.500           | 10          |            | H              | 85.84                         | 11.93                         | 11.66                        | 2.66                  | 20.93                      | 30.00          | 9.07           |
| 1732.500           |             |            | V              | 87.52                         | 13.82                         | 11.66                        | 2.66                  | 22.82                      | 30.00          | 7.18           |
| 1732.500           | 15          |            | H              | 87.11                         | 11.72                         | 11.66                        | 2.66                  | 20.72                      | 30.00          | 9.28           |
| 1732.500           |             |            | V              | 86.76                         | 12.13                         | 11.66                        | 2.66                  | 21.13                      | 30.00          | 8.87           |
| 1732.500           | 20          |            | H              | 85.90                         | 12.92                         | 11.66                        | 2.66                  | 21.92                      | 30.00          | 8.08           |
| 1732.500           |             |            | V              | 87.01                         | 12.54                         | 11.66                        | 2.66                  | 21.54                      | 30.00          | 8.46           |

## LTE Band 66

| Frequency<br>(MHz) | BW<br>(MHz) | Modulation | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                       | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|--------------------|-------------|------------|----------------|-------------------------------|-------------------------------|------------------------------|-----------------------|----------------------------|----------------|----------------|
|                    |             |            |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable<br>Loss<br>(dB) |                            |                |                |
| 1745.000           | 1.4         | QPSK       | H              | 85.67                         | 14.05                         | 11.66                        | 2.66                  | 23.05                      | 30.00          | 6.95           |
| 1745.000           |             |            | V              | 84.23                         | 11.72                         | 11.66                        | 2.66                  | 20.72                      | 30.00          | 9.28           |
| 1745.000           | 3           |            | H              | 86.27                         | 13.17                         | 11.66                        | 2.66                  | 22.17                      | 30.00          | 7.83           |
| 1745.000           |             |            | V              | 84.41                         | 12.01                         | 11.66                        | 2.66                  | 21.01                      | 30.00          | 8.99           |
| 1745.000           | 5           |            | H              | 87.35                         | 12.90                         | 11.66                        | 2.66                  | 21.90                      | 30.00          | 8.10           |
| 1745.000           |             |            | V              | 86.45                         | 12.46                         | 11.66                        | 2.66                  | 21.46                      | 30.00          | 8.54           |
| 1745.000           | 10          |            | H              | 85.49                         | 13.82                         | 11.66                        | 2.66                  | 22.82                      | 30.00          | 7.18           |
| 1745.000           |             |            | V              | 85.96                         | 13.13                         | 11.66                        | 2.66                  | 22.13                      | 30.00          | 7.87           |
| 1745.000           | 15          |            | H              | 85.55                         | 12.51                         | 11.66                        | 2.66                  | 21.51                      | 30.00          | 8.49           |
| 1745.000           |             |            | V              | 85.25                         | 13.82                         | 11.66                        | 2.66                  | 22.82                      | 30.00          | 7.18           |
| 1745.000           | 20          |            | H              | 86.50                         | 12.63                         | 11.66                        | 2.66                  | 21.63                      | 30.00          | 8.37           |
| 1745.000           |             |            | V              | 85.82                         | 12.34                         | 11.66                        | 2.66                  | 21.34                      | 30.00          | 8.66           |
| 1745.000           | 1.4         | 16QAM      | H              | 86.77                         | 12.47                         | 11.66                        | 2.66                  | 21.47                      | 30.00          | 8.53           |
| 1745.000           |             |            | V              | 86.66                         | 13.13                         | 11.66                        | 2.66                  | 22.13                      | 30.00          | 7.87           |
| 1745.000           | 3           |            | H              | 86.57                         | 12.38                         | 11.66                        | 2.66                  | 21.38                      | 30.00          | 8.62           |
| 1745.000           |             |            | V              | 87.34                         | 12.66                         | 11.66                        | 2.66                  | 21.66                      | 30.00          | 8.34           |
| 1745.000           | 5           |            | H              | 85.83                         | 12.83                         | 11.66                        | 2.66                  | 21.83                      | 30.00          | 8.17           |
| 1745.000           |             |            | V              | 86.69                         | 12.35                         | 11.66                        | 2.66                  | 21.35                      | 30.00          | 8.65           |
| 1745.000           | 10          |            | H              | 86.06                         | 11.40                         | 11.66                        | 2.66                  | 20.40                      | 30.00          | 9.60           |
| 1745.000           |             |            | V              | 85.69                         | 14.14                         | 11.66                        | 2.66                  | 23.14                      | 30.00          | 6.86           |
| 1745.000           | 15          |            | H              | 86.81                         | 13.60                         | 11.66                        | 2.66                  | 22.60                      | 30.00          | 7.40           |
| 1745.000           |             |            | V              | 87.29                         | 12.50                         | 11.66                        | 2.66                  | 21.50                      | 30.00          | 8.50           |
| 1745.000           | 20          |            | H              | 85.83                         | 13.56                         | 11.66                        | 2.66                  | 22.56                      | 30.00          | 7.44           |
| 1745.000           |             |            | V              | 86.47                         | 11.99                         | 11.66                        | 2.66                  | 20.99                      | 30.00          | 9.01           |

Note:

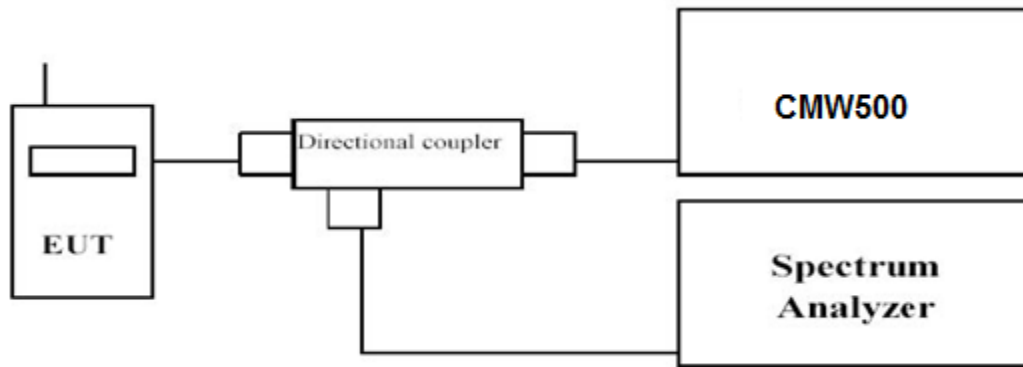
- 1) The unit of Antenna Gain is dBd for frequency below 1GHz, and the unit of Antenna Gain is dBi for frequency above 1GHz.
- 2) Absolute Level = Substituted Level - Cable loss + Antenna Gain
- 3) Margin = Limit-Absolute Level

### 3.2 Peak-to-Average Ratio (PAR)

#### LIMIT

The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

#### TEST CONFIGURATION



#### TEST PROCEDURE

1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
2. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
3. Set the number of counts to a value that stabilizes the measured CCDF curve;
4. Set the measurement interval as follows:
  - 1). for continuous transmissions, set to 1 ms,
  - 2). for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
5. Record the maximum PAPR level associated with a probability of 0.1%.

#### TEST RESULTS

*Remark:*

*We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2, LTE FDD Band 4, LTE FDD Band 66; recorded worst case for each Channel Bandwidth of LTE FDD Band 2, LTE FDD Band 4, LTE FDD Band 66.*

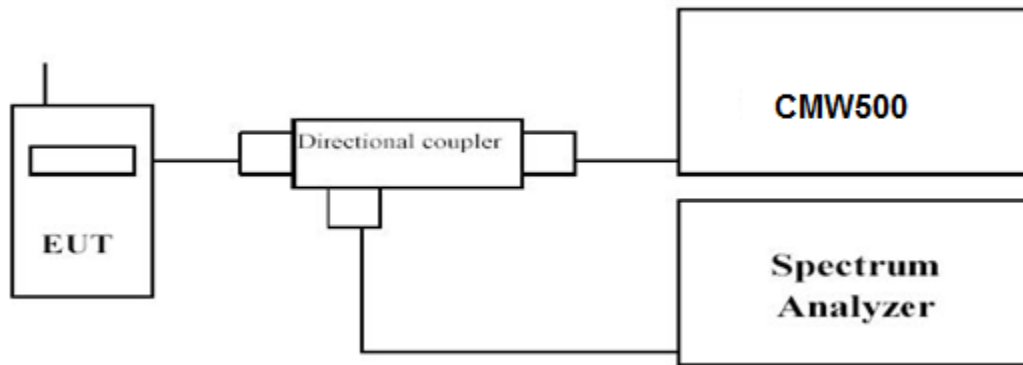
1. *For E-UTRA Band 2, please refer to Appendix Band 2: Section A;*
2. *For E-UTRA Band 4, please refer to Appendix Band 4: Section A;*
3. *For E-UTRA Band 66, please refer to Appendix Band 66: Section A;*

### 3.3 Occupied Bandwidth and Emission Bandwidth

#### LIMIT

FCC §2.1049, §24.238, §27.53

#### TEST CONFIGURATION



#### TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at low, middle and high channel in each band. The -26dBc Emission bandwidth was also measured and recorded.

Set RBW was set to about 1% of emission BW, VBW $\geq$ 3 times RBW.

-26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

#### TEST RESULTS

*Remark:*

*We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2, LTE FDD Band 4, LTE FDD Band 66; recorded worst case for each Channel Bandwidth of LTE FDD Band 2, LTE FDD Band 4, LTE FDD Band 66.*

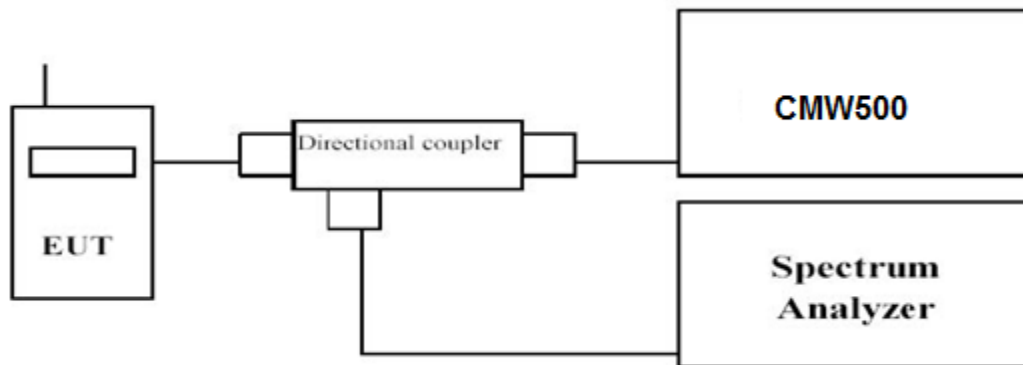
1. *For E-UTRA Band 2, please refer to Appendix Band 2: Section B;*
2. *For E-UTRA Band 4, please refer to Appendix Band 4: Section B;*
3. *For E-UTRA Band 66, please refer to Appendix Band 66: Section B;*

### 3.4 Band Edge compliance

#### LIMIT

FCC § 2.1053, § 24.238 and § 27.53.

#### TEST CONFIGURATION



#### TEST PROCEDURE

1. The transmitter output port was connected to base station.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement.
3. Set EUT at maximum power through base station.
4. Select lowest and highest channels for each band and different modulation.
5. Measure Band edge using RMS (Average) detector by spectrum

#### TEST RESULTS

*Remark:*

*We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2, LTE FDD Band 4, LTE FDD Band 66; recorded worst case for each Channel Bandwidth of LTE FDD Band 2, LTE FDD Band 4, LTE FDD Band 66.*

1. *For E-UTRA Band 2, please refer to Appendix Band 2: Section C;*
2. *For E-UTRA Band 4, please refer to Appendix Band 4: Section C;*
3. *For E-UTRA Band 66, please refer to Appendix Band 66: Section C;*

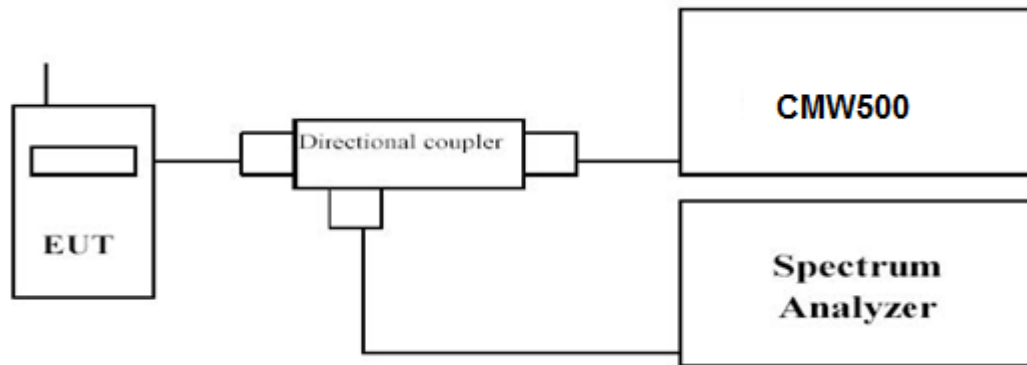
### 3.5 Spurious Emission

#### LIMIT

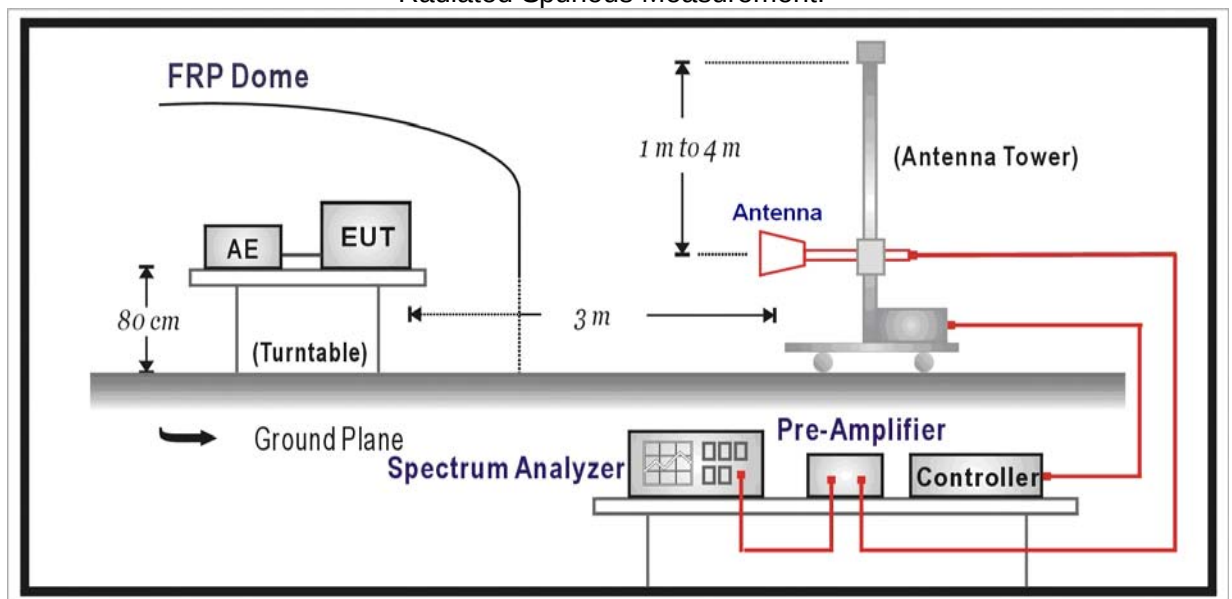
FCC § 2.1053, § 24.238 and § 27.53.

#### TEST CONFIGURATION

Conducted Spurious Measurement:



Radiated Spurious Measurement:



#### TEST PROCEDURE

The EUT was setup according to EIA/TIA 603D

##### **Conducted Spurious Measurement:**

- Place the EUT on a bench and set it in transmitting mode.
- Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Couple.
- EUT Communicate with CMW500, then select a channel for testing.
- Add a correction factor to the display of spectrum, and then test.
- The resolution bandwidth of the spectrum analyzer was set sufficient scans were taken to show the out of band Emission if any up to 10<sup>th</sup> harmonic.
- Please refer to following tables for test antenna conducted emissions.

| Working Frequency | Sub range (GHz)   | RBW   | VBW   | Sweep time (s) |
|-------------------|-------------------|-------|-------|----------------|
| LTE FDD Band 2    | 0.000009~0.000015 | 1KHz  | 3KHz  | Auto           |
|                   | 0.000015~0.03     | 10KHz | 30KHz | Auto           |
|                   | 0.03~26           | 1 MHz | 3 MHz | Auto           |
| LTE FDD Band 4    | 0.000009~0.000015 | 1KHz  | 3KHz  | Auto           |
|                   | 0.000015~0.03     | 10KHz | 30KHz | Auto           |
|                   | 0.03~26           | 1 MHz | 3 MHz | Auto           |
| LTE FDD Band 66   | 0.000009~0.000015 | 1KHz  | 3KHz  | Auto           |
|                   | 0.000015~0.03     | 10KHz | 30KHz | Auto           |
|                   | 0.03~26           | 1 MHz | 3 MHz | Auto           |

Remark:

1. Test results including cable loss;
2. Please refer to following plots;
3. Not reorded test plots from 9 KHz to 30 MHz as emission levels 20dB lower than emission limit;

#### Radiated Spurious Measurement:

- a. The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
- b. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
- c. The output of the test antenna shall be connected to the measuring receiver.
- d. The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- e. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- f. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- g. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
- h. The maximum signal level detected by the measuring receiver shall be noted.
- i. The transmitter shall be replaced by a substitution antenna.
- j. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
- k. The substitution antenna shall be connected to a calibrated signal generator.
- l. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- m. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
- n. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
- o. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
- p. The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
- q. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for Part 22 and 1MHz for Part 24. The frequency range was checked up to 10th harmonic.
- r. Test site anechoic chamber refer to ANSI C63.

#### TEST RESULTS

##### Conducted Measurement:

Remark:

We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2, LTE FDD Band 4, LTE FDD Band 66; recorded worst case for each Channel Bandwidth of LTE FDD Band 2, LTE FDD Band 4, LTE FDD Band 66.

1. For E-UTRA Band 2, please refer to Appendix Band 2: Section D;
2. For E-UTRA Band 4, please refer to Appendix Band 4: Section D;
3. For E-UTRA Band 66, please refer to Appendix Band 66: Section D;

**Radiated Measurement:****LTE Band 2 (30MHz-20GHz):**

| Frequency<br>(MHz)          | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                    | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|-----------------------------|----------------|-------------------------------|-------------------------------|------------------------------|--------------------|----------------------------|----------------|----------------|
|                             |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable Loss<br>(dB) |                            |                |                |
| QPSK,Frequency:1880.000 MHz |                |                               |                               |                              |                    |                            |                |                |
| 3760.00                     | H              | 49.04                         | 59.06                         | 13.76                        | 1.63               | 46.93                      | 13.00          | 33.93          |
| 3760.00                     | V              | 47.66                         | 60.46                         | 13.76                        | 1.63               | 48.33                      | 13.00          | 35.33          |
| 5640.00                     | H              | 54.97                         | 51.31                         | 14.02                        | 1.31               | 38.60                      | 13.00          | 25.60          |
| 5640.00                     | V              | 51.53                         | 53.89                         | 14.02                        | 1.31               | 41.18                      | 13.00          | 28.18          |
| 272.00                      | H              | 41.74                         | 66.25                         | 0.00                         | 0.51               | 66.76                      | 13.00          | 53.76          |
| 272.00                      | V              | 47.14                         | 65.94                         | 0.00                         | 0.51               | 66.45                      | 13.00          | 53.45          |

**LTE Band 4 (30MHz-20GHz):**

| Frequency<br>(MHz)          | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                    | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|-----------------------------|----------------|-------------------------------|-------------------------------|------------------------------|--------------------|----------------------------|----------------|----------------|
|                             |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable Loss<br>(dB) |                            |                |                |
| QPSK,Frequency:1732.500 MHz |                |                               |                               |                              |                    |                            |                |                |
| 3465.00                     | H              | 49.70                         | 60.24                         | 13.76                        | 1.63               | 48.11                      | 13.00          | 35.11          |
| 3465.00                     | V              | 47.29                         | 60.75                         | 13.76                        | 1.63               | 48.62                      | 13.00          | 35.62          |
| 5197.50                     | H              | 55.70                         | 50.05                         | 14.02                        | 1.31               | 37.34                      | 13.00          | 24.34          |
| 5197.50                     | V              | 53.19                         | 53.80                         | 14.02                        | 1.31               | 41.09                      | 13.00          | 28.09          |
| 357.00                      | H              | 41.83                         | 65.95                         | 0.00                         | 0.51               | 66.46                      | 13.00          | 53.46          |
| 357.00                      | V              | 46.75                         | 64.97                         | 0.00                         | 0.51               | 65.48                      | 13.00          | 52.48          |

**LTE Band 66 (30MHz-20GHz):**

| Frequency<br>(MHz)         | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                    | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|----------------------------|----------------|-------------------------------|-------------------------------|------------------------------|--------------------|----------------------------|----------------|----------------|
|                            |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable Loss<br>(dB) |                            |                |                |
| QPSK,Frequency:1745.00 MHz |                |                               |                               |                              |                    |                            |                |                |
| 3490.00                    | H              | 48.58                         | 60.51                         | 13.76                        | 1.63               | 48.38                      | 13.00          | 35.38          |
| 3490.00                    | V              | 47.55                         | 60.56                         | 13.76                        | 1.63               | 48.43                      | 13.00          | 35.43          |
| 5235.00                    | H              | 55.94                         | 51.28                         | 14.02                        | 1.31               | 38.57                      | 13.00          | 25.57          |
| 5235.00                    | V              | 51.65                         | 53.89                         | 14.02                        | 1.31               | 41.18                      | 13.00          | 28.18          |
| 413..00                    | H              | 42.22                         | 65.75                         | 0.00                         | 0.51               | 66.26                      | 13.00          | 53.26          |
| 413.00                     | V              | 45.49                         | 65.59                         | 0.00                         | 0.51               | 66.10                      | 13.00          | 53.10          |

**Note:**

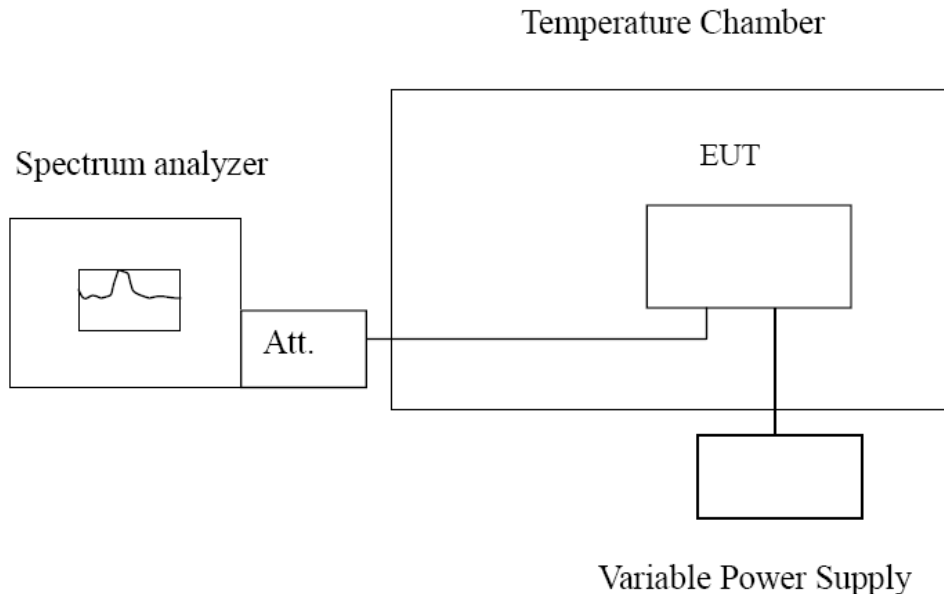
- 1) The unit of Antenna Gain is dBd for frequency below 1GHz, and the unit of Antenna Gain is dBi for frequency above 1GHz.
- 2) Absolute Level = Substituted Level - Cable loss + Antenna Gain
- 3) Margin = Limit - Absolute Level

### 3.6 Frequency Stability under Temperature & Voltage Variations

#### LIMIT

FCC § 2.1055 (a), § 2.1055 (d), §24.235, §27.54.

#### TEST CONFIGURATION



#### TEST PROCEDURE

The EUT was setup according to EIA/TIA 603D

##### **Frequency Stability Under Temperature Variations:**

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a "call mode". This is accomplished with the use of R&S CMW500 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30°C.
3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on middle channel for LTE band 2, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50°C.
7. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 °C increments from +50°C to -30°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

##### **Frequency Stability Under Voltage Variations:**

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

**TEST RESULTS**

Remark:

We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2, LTE FDD Band 4, LTE FDD Band 66; recorded worst case for each Channel Bandwidth of LTE FDD Band 2, LTE FDD Band 4, LTE FDD Band 66.

**LTE Band 2:**

| QPSK, Channel Bandwidth:10MHz Middle Channel, $f_c = 1880$ MHz |         |                 |                 |        |
|----------------------------------------------------------------|---------|-----------------|-----------------|--------|
| Temperature                                                    | Voltage | Frequency Error | Frequency Error | Result |
| °C                                                             | VDC     | Hz              | ppm             |        |
| -30                                                            | 12.0    | 22              | 0.012           | Pass   |
| -20                                                            |         | 16              | 0.009           |        |
| -10                                                            |         | 14              | 0.007           |        |
| 0                                                              |         | 50              | 0.027           |        |
| 10                                                             |         | 57              | 0.030           |        |
| 20                                                             |         | 89              | 0.047           |        |
| 30                                                             |         | 60              | 0.032           |        |
| 40                                                             |         | 20              | 0.011           |        |
| 50                                                             |         | 95              | 0.051           |        |
| 20                                                             | 13.2    | 81              | 0.043           |        |
| 20                                                             | 10.8    | 61              | 0.032           |        |

| 16QAM, Channel Bandwidth:10MHz Middle Channel, $f_c = 1880$ MHz |         |                 |                 |        |
|-----------------------------------------------------------------|---------|-----------------|-----------------|--------|
| Temperature                                                     | Voltage | Frequency Error | Frequency Error | Result |
| °C                                                              | VDC     | Hz              | ppm             |        |
| -30                                                             | 12.0    | 20              | 0.011           | Pass   |
| -20                                                             |         | 12              | 0.006           |        |
| -10                                                             |         | 31              | 0.016           |        |
| 0                                                               |         | 22              | 0.012           |        |
| 10                                                              |         | 73              | 0.039           |        |
| 20                                                              |         | 83              | 0.044           |        |
| 30                                                              |         | 77              | 0.041           |        |
| 40                                                              |         | 18              | 0.010           |        |
| 50                                                              |         | 97              | 0.052           |        |
| 20                                                              | 13.2    | 72              | 0.038           |        |
| 20                                                              | 10.8    | 30              | 0.016           |        |

## LTE Band 4:

| QPSK, Channel Bandwidth:10MHz Middle Channel, $f_c = 1732.5$ MHz |         |                 |                 |        |
|------------------------------------------------------------------|---------|-----------------|-----------------|--------|
| Temperature                                                      | Voltage | Frequency Error | Frequency Error | Result |
| °C                                                               | VDC     | Hz              | ppm             |        |
| -30                                                              | 12.0    | 39              | 0.022           | Pass   |
| -20                                                              |         | 27              | 0.015           |        |
| -10                                                              |         | 27              | 0.015           |        |
| 0                                                                |         | 67              | 0.038           |        |
| 10                                                               |         | 52              | 0.030           |        |
| 20                                                               |         | 12              | 0.007           |        |
| 30                                                               |         | 7               | 0.004           |        |
| 40                                                               |         | 41              | 0.023           |        |
| 50                                                               |         | 52              | 0.030           |        |
| 20                                                               | 13.2    | 73              | 0.042           |        |
| 20                                                               | 10.8    | 2               | 0.001           |        |

| 16QAM, Channel Bandwidth:10MHz Middle Channel, $f_c = 1732.5$ MHz |         |                 |                 |        |
|-------------------------------------------------------------------|---------|-----------------|-----------------|--------|
| Temperature                                                       | Voltage | Frequency Error | Frequency Error | Result |
| °C                                                                | VDC     | Hz              | ppm             |        |
| -30                                                               | 12.0    | 5               | 0.003           | Pass   |
| -20                                                               |         | 84              | 0.048           |        |
| -10                                                               |         | 33              | 0.019           |        |
| 0                                                                 |         | 67              | 0.038           |        |
| 10                                                                |         | 72              | 0.041           |        |
| 20                                                                |         | 37              | 0.021           |        |
| 30                                                                |         | 19              | 0.011           |        |
| 40                                                                |         | 26              | 0.015           |        |
| 50                                                                |         | 56              | 0.032           |        |
| 20                                                                | 13.2    | 74              | 0.042           |        |
| 20                                                                | 10.8    | 46              | 0.026           |        |

## LTE Band 66:

| QPSK, Channel Bandwidth:10MHz Middle Channel, $f_c = 1745.0$ MHz |         |                 |                 |        |
|------------------------------------------------------------------|---------|-----------------|-----------------|--------|
| Temperature                                                      | Voltage | Frequency Error | Frequency Error | Result |
| °C                                                               | VDC     | Hz              | ppm             |        |
| -30                                                              | 12.0    | 24              | 0.014           | Pass   |
| -20                                                              |         | 48              | 0.028           |        |
| -10                                                              |         | 19              | 0.011           |        |
| 0                                                                |         | 8               | 0.005           |        |
| 10                                                               |         | 73              | 0.042           |        |
| 20                                                               |         | 70              | 0.040           |        |
| 30                                                               |         | 63              | 0.036           |        |
| 40                                                               |         | 32              | 0.018           |        |
| 50                                                               |         | 84              | 0.048           |        |
| 20                                                               | 13.2    | 53              | 0.030           |        |
| 20                                                               | 10.8    | 27              | 0.015           |        |

| 16QAM, Channel Bandwidth:10MHz Middle Channel, $f_c = 1745.0$ MHz |         |                 |                 |        |
|-------------------------------------------------------------------|---------|-----------------|-----------------|--------|
| Temperature                                                       | Voltage | Frequency Error | Frequency Error | Result |
| °C                                                                | VDC     | Hz              | ppm             |        |
| -30                                                               | 12.0    | 65              | 0.037           | Pass   |
| -20                                                               |         | 23              | 0.013           |        |
| -10                                                               |         | 49              | 0.028           |        |
| 0                                                                 |         | 95              | 0.054           |        |
| 10                                                                |         | 78              | 0.045           |        |
| 20                                                                |         | 20              | 0.011           |        |
| 30                                                                |         | 10              | 0.006           |        |
| 40                                                                |         | 61              | 0.035           |        |
| 50                                                                |         | 43              | 0.025           |        |
| 20                                                                | 13.2    | 90              | 0.052           |        |
| 20                                                                | 10.8    | 19              | 0.011           |        |

#### 4 Test Setup Photos of the EUT



## **5 External and Internal Photos of the EUT**

Reference to the test report No. **GTS20191217003-1-1**

**.....End of Report.....**