



**TEST REPORT**

|                          |                     |               |
|--------------------------|---------------------|---------------|
| <b>Test Report No. :</b> | <b>MWR150900609</b> | Sep. 22, 2015 |
|                          |                     | Date of issue |

Equipment under Test : Mobile Phone

Model /Type : L445

Listed Models : /

**Applicant** : **HYUNDAI CORPORATION**

Address : 140-2, Kye-dong, Chongro-ku, Seoul, South Korea

**Manufacturer** : **Skycom Telecommunications Co., Limited**

Address : Rm604, East Block, Shengtang Bldg., No.1, Tairan 9 Rd.,  
Chegongmiao, Futian District, Shenzhen, China

|                     |             |
|---------------------|-------------|
| <b>Test Result:</b> | <b>PASS</b> |
|---------------------|-------------|

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.

## Contents

|           |  |           |
|-----------|--|-----------|
| <b>1.</b> | <b><u>TEST STANDARDS</u></b>                               | <b>4</b>  |
| <b>2.</b> | <b><u>SUMMARY</u></b>                                      | <b>5</b>  |
| 2.1.      | General Remarks  | 5         |
| 2.2.      | Product Description  | 5         |
| 2.3.      | Equipment under Test                                       | 6         |
| 2.4.      | Short description of the Equipment under Test (EUT)        | 6         |
| 2.5.      | Internal Identification of AE used during the test         | 6         |
| 2.6.      | Normal Accessory setting                                   | 6         |
| 2.7.      | EUT configuration  | 6         |
| 2.8.      | Related Submittal(s) / Grant (s)                           | 6         |
| 2.9.      | Modifications  | 7         |
| 2.10.     | General Test Conditions/Configurations                     | 7         |
| <b>3.</b> | <b><u>TEST ENVIRONMENT</u></b>                             | <b>8</b>  |
| 3.1.      | Address of the test laboratory                             | 8         |
| 3.2.      | Test Facility  | 8         |
| 3.3.      | Environmental conditions                                   | 8         |
| 3.4.      | Test Description   | 8         |
| 3.5.      | Equipments Used during the Test                            | 9         |
| <b>4.</b> | <b><u>TEST CONDITIONS AND RESULTS</u></b>                  | <b>10</b> |
| 4.1.      | Output Power   | 10        |
| 4.2.      | Peak-to-Average Ratio (PAR)                                | 15        |
| 4.3.      | Occupied Bandwidth and Emission Bandwidth                  | 20        |
| 4.4.      | Band Edge compliance                                       | 25        |
| 4.5.      | Spurious Emssion on Antenna Port                           | 30        |
| 4.6.      | Radiated Spurious Emssion                                  | 43        |
| 4.7.      | Frequency Stability under Temperature & Voltage Variations | 49        |
| <b>5.</b> | <b><u>TEST SETUP PHOTOS OF THE EUT</u></b>                 | <b>51</b> |
| <b>6.</b> | <b><u>EXTERNAL PHOTOS OF THE EUT</u></b>                   | <b>51</b> |
| <b>7.</b> | <b><u>INTERNAL PHOTOS OF THE EUT</u></b>                   | <b>51</b> |

## **1. TEST STANDARDS**

The tests were performed according to following standards:

[FCC Part 22 \(10-1-12 Edition\)](#): PRIVATE LAND MOBILE RADIO 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

[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

[FCCKDB971168D01](#) Power Meas License Digital Systems

## 2. SUMMARY

### 2.1. General Remarks

|                                |   |              |
|--------------------------------|---|--------------|
| Date of receipt of test sample | : | Aug 20, 2015 |
|                                |   |              |
| Testing commenced on           | : | Aug 21, 2015 |
|                                |   |              |
| Testing concluded on           | : | Sep 22, 2015 |

### 2.2. Product Description

The **HYUNDAI CORPORATION** 's Model: L445 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

|  |   |
|--|---|
| Name of EUT                            | Mobile Phone  |
| Model Number                           | L445  |
| Modulation Type                        | GMSK for GSM/GPRS, 8-PSK for EDGE, QPSK for UMTS, QPSK, 16QAM for LTE   |
| Antenna Type                           | Internal  |
| UMTS Operation Frequency Band          | Device supported UMTS FDD Band II/IV/V  |
| WLAN FCC Operation frequency           | IEEE 802.11b:2412-2462MHz<br>IEEE 802.11g:2412-2462MHz<br>IEEE 802.11n HT20:2412-2462MHz<br>IEEE 802.11n HT40:2422-2452MHz  |
| BT FCC Operation frequency             | 2402MHz-2480MHz   |
| HSDPA Release Version                  | Release 10  |
| HSUPA Release Version                  | Release 6   |
| DC-HSUPA Release Version               | Not Supported   |
| WCDMA Release Version                  | R99   |
| LTE Release Version                    | R8  |
| UMTS Operation Frequency Band          | Device supported FDD band 2, FDD band 4, FDD band 5, FDD band 7, FDD band 17  |
| WLAN FCC Modulation Type               | IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)<br>IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)<br>IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK)<br>IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK) |
| BT Modulation Type                     | GFSK (BT 4.0)/GFSK,8DPSK, $\pi$ /4DQPSK(BT 3.0+EDR)   |
| Hardware version                       | 5096SF_MM1_V01  |
| Software version                       | HYUNDAI_L445_V5.0.2_20150907  |
| Android version                        | Android 4.4.2   |
| GPS function                           | Supported   |
| WLAN                                   | Supported 802.11b/802.11g/802.11n   |
| Bluetooth                              | Supported BT 4.0/BT 3.0+EDR   |
| GSM/EDGE/GPRS                          | Supported GSM/GPRS/EDGE   |
| GSM/EDGE/GPRS Power Class              | GSM900:Power Class 4/DCS1800:Power Class 1  |
| GSM/EDGE/GPRS Operation Frequency      | GSM900 :880MHz-915MHz/DCS1800:1710MHz-1785MHz   |
| GSM/EDGE/GPRS Operation Frequency Band | GSM900/DCS1800/GPRS900/ GPRS 1800/EDGE900/EDGE1800  |
| GSM Release Version                    | R99   |
| GPRS/EDGE Multislot Class              | GPRS/EDGE: Multi-slot Class 12  |
| Extreme temp. Tolerance                | -30°C to +50°C  |
| Extreme vol. Limits                    | 3.40VDC to 4.20VDC (nominal: 3.70VDC)   |
| GPRS operation mode                    | Class B   |

## 2.3. Equipment under Test

### Power supply system utilised

|                      |   |   |                                   |
|----------------------|---|---|-----------------------------------|
| Power supply voltage | : | <input type="radio"/> 120V / 60 Hz                                | <input type="radio"/> 115V / 60Hz |
|                      |   | <input type="radio"/> 12 V DC                                     | <input type="radio"/> 24 V DC     |
|                      |   | <input checked="" type="radio"/> Other (specified in blank below) |                                   |

DC 3.70V

## 2.4. Short description of the Equipment under Test (EUT)

### 2.4.1 General Description

L445 is subscriber equipment in the WCDMA/GSM /LTE system. The HSPA/UMTS frequency band is Band II, Band IV and Band V, LTE frequency band is band 2,band 4,band 5,band 7,band 17; The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only Band II and Band V and GSM850 and PCS1900 bands test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, HSPA/UMTS ,LTE and GSM/GPRS/EDGE protocol processing, voice, video MMS service, GPS and WIFI etc. Externally it provides micro SD card interface, earphone port (to provide voice service) and SIM card interface. It also provides Bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

## 2.5. Internal Identification of AE used during the test

| AE ID* | Description |
|--------|-------------|
| AE1    | Battery     |
| AE2    | Charger     |

AE1

Model: TPA-5950100UU

INPUT: 100-240V 50/60Hz 0.2A

OUTPUT: DC 5.0V,1000mAh

\*AE ID: is used to identify the test sample in the lab internally.

## 2.6. Normal Accessory setting

Fully charged battery was used during the test.

## 2.7. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- supplied by the manufacturer

- supplied by the lab

|                                   |                |   |
|-----------------------------------|----------------|---|
| <input type="radio"/> Power Cable | Length (m) :   | / |
|                                   | Shield :       | / |
|                                   | Detachable :   | / |
| <input type="radio"/> Multimeter  | Manufacturer : | / |
|                                   | Model No. :    | / |

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

This submittal(s) (test report) is intended for FCC ID: RQQLT-L40SCL filing to comply with FCC Part 22, Rules.

## 2.9. Modifications

No modifications were implemented to meet testing criteria.

## 2.10. General Test Conditions/Configurations

### 2.10.1 Test Environment

| Environment Parameter | Selected Values During Tests |         |
|-----------------------|------------------------------|---------|
| Relative Humidity     | Ambient                      |         |
| Temperature           | TN                           | Ambient |
| Voltage               | VL                           | 3.4V    |
|                       | VN                           | 3.7V    |
|                       | VH                           | 4.2V    |

NOTE: VL=lower extreme test voltage VN=nominal voltage  
VH=upper extreme test voltage TN=normal temperature

### 3. TEST ENVIRONMENT

#### 3.1. Address of the test laboratory

**CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.**

Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055, P. R. China  
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2003) and CISPR Publication 22.

#### 3.2. Test Facility

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

##### **FCC-Registration No.: 406086**

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 406086, valid time is until October 28, 2017.

#### 3.3. Environmental conditions

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

|                       |              |
|-----------------------|--------------|
| Temperature:          | 15-35 ° C    |
| Humidity:             | 30-60 %      |
| Atmospheric pressure: | 950-1050mbar |

#### 3.4. Test Description

##### 3.4.1 Cellular Band (824-849MHz paired with 869-894MHz)

| Test Item                                   | FCC Rule No.     | Requirements   | Verdict |
|---|------------------|--|---------|
| Effective (Isotropic) Radiated Output Power | §2.1046, §22.913 | FCC: ERP ≤ 7W.   | Pass    |
| Modulation Characteristics                  | §2.1047          | Digital modulation   | N/A     |
| Bandwidth                                   | §2.1049          | OBW: No limit.<br>EBW: No limit.   | Pass    |
| Band Edges Compliance                       | §2.1051, §22.917 | ≤-13dBm/1%*EBW, in 1MHz bands immediately outside and adjacent to The frequency block.               | Pass    |
| Spurious Emission at Antenna Terminals      | §2.1051, §22.917 | FCC: ≤ -13dBm/100kHz, from 9kHz to 10th harmonics but outside authorized operating frequency ranges. | Pass    |
| Field Strength of Spurious Radiation        | §2.1053, §22.917 | FCC: ≤ -13dBm/100kHz.  | Pass    |
| Frequency Stability                         | §2.1055, §22.355 | ≤ ±2.5ppm.   | Pass    |

NOTE 1: For the verdict, the "N/A" denotes "not applicable", the "N/T" de notes "not tested".



### 3.5. Equipments Used during the Test

| Description                    | Manufacturer | Model                       | Serial No.        | Test Date   | Due Date   |
|--------------------------------|--------------|-----------------------------|-------------------|-------------|------------|
| EMI Test Receiver              | R&S          | ESIB26                      | A0304218          | 2015.06.02  | 2016.06.01 |
| Full-Anechoic Chamber          | Albatross    | 12.8m*6.8m<br>*6.4m         | A0412372          | 2015.01.05  | 2016.01.04 |
| Loop Antenna                   | Schwarz beck | HFH2-Z2                     | 100047            | 2015.06.02  | 2016.06.01 |
| Bilog Antenna                  | Schwarzbeck  | VULB 9163                   | 9163-274          | 2015.06.02  | 2016.06.01 |
| Bilog Antenna                  | Schwarzbeck  | VULB 9163                   | 9163-276          | 2015.06.02  | 2016.06.01 |
| Double ridge horn antenna      | R&S          | HF960                       | 100150            | 2015.06.02  | 2016.06.01 |
| Double ridge horn antenna      | R&S          | HF960                       | 100155            | 2015.06.02  | 2016.06.01 |
| Ultra-wideband antenna         | R&S          | HL562                       | 100089            | 2015.06.02  | 2016.06.01 |
| Ultra-wideband antenna         | R&S          | HL562                       | 100090            | 2015.06.02  | 2016.06.01 |
| Test Antenna – Horn (18-25GHz) | ETS          | UG-596A/U                   | A0902607          | 2015.06.02  | 2016.06.01 |
| Test Antenna – Horn (18-25GHz) | ETS          | UG-596A/U                   | A0902611          | 2015.06.02  | 2016.06.01 |
| Amplifier 20M~3GHz             | R&S          | PAP-0203H                   | 22018             | 2015.06.02  | 2016.06.01 |
| Ampilier 1G~18GHz              | R&S          | MITEQ<br>AFS42-<br>00101800 | 25-S-42           | 2015.06.02  | 2016.06.01 |
| Ampilier 18G~40GHz             | R&S          | JS42-<br>18002600-<br>28-5A | 12111.0980.<br>00 | 2015.06.02  | 2016.06.01 |
| System Simulator               | R&S          | CMW500                      | A130101034        | 2015.06.010 | 2016.06.09 |
| Signal Generator               | R&S          | SMF100A                     | A0304267          | 2015.06.010 | 2016.06.09 |
| Signal Analyzer                | Agilent      | N9030A                      | MY49430428        | 2015.06.010 | 2016.06.09 |

The calibration interval was one year.

## 4. TEST CONDITIONS AND RESULTS

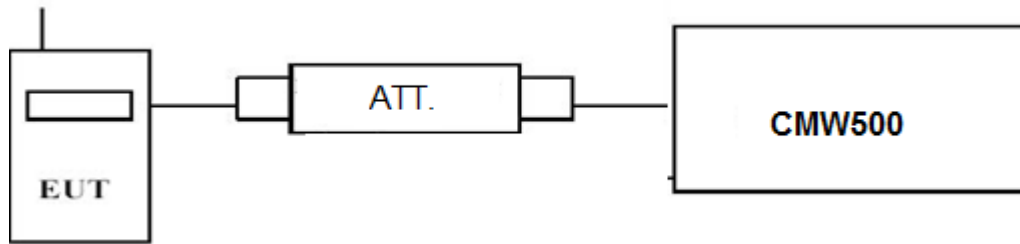
### 4.1. Output Power

#### 4.1.1 Conducted Output Power

##### TEST APPLICABLE

During the process of testing, the EUT was controlled via R&S Digital Radio Communication tester (CMW500) to ensure max power transmission and proper modulation. This result contains output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

##### TEST CONFIGURATION



##### TEST PROCEDURE

###### 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 CMW500 by an Att.
- EUT Communicate with CMW500 then selects a channel for testing.
- Add a correction factor to the display CMW500, and then test.

##### TEST RESULTS

Remark:

- We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5;

| LTE FDD Band 5       |                |                 |                     |       |
|----------------------|----------------|-----------------|---------------------|-------|
| TX Channel Bandwidth | RB Size/Offset | Frequency (MHz) | Average Power [dBm] |       |
|                      |                |                 | QPSK                | 16QAM |
| 1.4 MHz              | 1 RB low       | 824.7           | 22.40               | 21.77 |
|                      |                | 836.5           | 22.23               | 21.59 |
|                      |                | 848.3           | 22.24               | 21.44 |
|                      | 1 RB high      | 824.7           | 21.40               | 20.45 |
|                      |                | 836.5           | 21.96               | 21.21 |
|                      |                | 848.3           | 21.77               | 21.17 |
|                      | 50% RB mid     | 824.7           | 21.87               | 21.11 |
|                      |                | 836.5           | 21.02               | 20.03 |
|                      |                | 848.3           | 21.96               | 21.18 |
|                      | 100% RB        | 824.7           | 21.92               | 21.19 |
|                      |                | 836.5           | 21.99               | 21.13 |
|                      |                | 848.3           | 21.00               | 19.99 |
| 3 MHz                | 1 RB low       | 825.5           | 22.50               | 21.81 |
|                      |                | 836.5           | 22.33               | 21.64 |
|                      |                | 847.5           | 21.40               | 20.49 |
|                      | 1 RB high      | 825.5           | 21.44               | 20.45 |
|                      |                | 836.5           | 21.90               | 21.19 |
|                      |                | 847.5           | 21.25               | 20.64 |
|                      | 50% RB mid     | 825.5           | 20.87               | 20.07 |
|                      |                | 836.5           | 20.99               | 19.99 |
|                      |                | 847.5           | 21.90               | 21.13 |

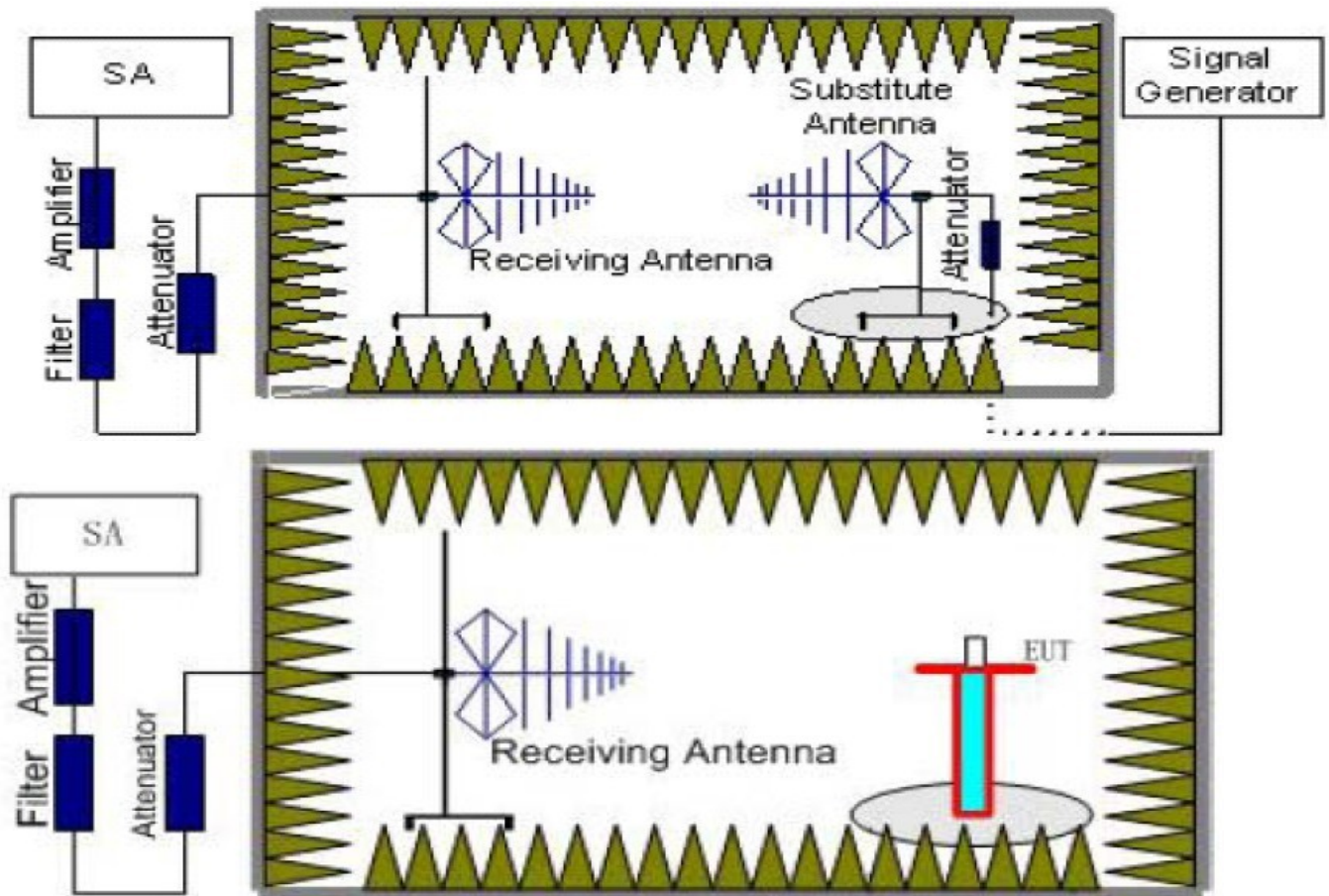
|        |            |       |       |       |
|--------|------------|-------|-------|-------|
|        | 100% RB    | 825.5 | 21.86 | 21.07 |
|        |            | 836.5 | 20.98 | 20.05 |
|        |            | 847.5 | 20.97 | 19.98 |
| 5 MHz  | 1 RB low   | 826.5 | 22.78 | 22.19 |
|        |            | 836.5 | 22.46 | 21.89 |
|        |            | 846.5 | 21.61 | 20.82 |
|        | 1 RB high  | 826.5 | 21.65 | 20.71 |
|        |            | 836.5 | 22.11 | 21.52 |
|        |            | 846.5 | 21.64 | 21.08 |
|        | 50% RB mid | 826.5 | 20.82 | 20.13 |
|        |            | 836.5 | 21.04 | 20.12 |
|        |            | 846.5 | 22.07 | 21.49 |
|        | 100% RB    | 826.5 | 22.00 | 21.40 |
|        |            | 836.5 | 21.06 | 20.25 |
|        |            | 846.5 | 21.02 | 20.08 |
| 10 MHz | 1 RB low   | 829.0 | 22.74 | 22.07 |
|        |            | 836.5 | 22.16 | 21.48 |
|        |            | 844.0 | 21.51 | 20.54 |
|        | 1 RB high  | 829.0 | 21.48 | 20.52 |
|        |            | 836.5 | 22.26 | 21.58 |
|        |            | 844.0 | 20.98 | 20.33 |
|        | 50% RB mid | 829.0 | 21.04 | 20.11 |
|        |            | 836.5 | 21.10 | 20.12 |
|        |            | 844.0 | 21.27 | 20.63 |
|        | 100% RB    | 829.0 | 21.96 | 21.27 |
|        |            | 836.5 | 21.06 | 20.07 |
|        |            | 844.0 | 21.03 | 20.08 |

#### 4.1.2. Radiated Output Power

##### LIMIT

According to § 22.913(a) specifies " The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

##### TEST CONFIGURATION



##### TEST PROCEDURE

1. EUT was placed on a 0.80 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 0.80m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as ( $P_r$ ).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test.

The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{\text{Mea}} - P_{\text{Ag}} - P_{\text{cl}} + G_a$$

We used SMF100A microwave signal generator which signal level can up to 33dBm, so we not used power Amplifier for substitution test; The measurement results are amend as described below:

$$\text{Power(EIRP)} = P_{\text{Mea}} - P_{\text{cl}} + G_a$$

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

## TEST RESULTS

Note: We test the H direction and V direction and V direction is worse.

Remark:

- We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case for each Channel Bandwidth of LTE FDD Band 5.
- $\text{EIRP} = P_{\text{Mea}}(\text{dBm}) - P_{\text{cl}}(\text{dB}) + P_{\text{Ag}}(\text{dB}) + G_a(\text{dBi})$
- $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$  as EIRP by subtracting the gain of the dipole.

### LTE FDD Band 5\_Channel Bandwidth 1.4MHz\_QPSK

| Frequency (MHz) | $P_{\text{Mea}}$ (dBm) | $P_{\text{cl}}$ (dB) | $G_a$ Antenna Gain(dB) | Correction (dB) | $P_{\text{Ag}}$ (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|------------------------|-----------------|----------------------|-----------|-------------|-------------|--------------|
| 824.7           | -22.18                 | 2.42                 | 8.45                   | 2.15            | 36.82                | 18.52     | 38.45       | 19.93       | V            |
| 836.5           | -20.02                 | 2.46                 | 8.45                   | 2.15            | 36.82                | 20.64     | 38.45       | 17.81       | V            |
| 848.3           | -21.26                 | 2.53                 | 8.36                   | 2.15            | 36.82                | 19.24     | 38.45       | 19.21       | V            |

### LTE FDD Band 5\_Channel Bandwidth 3MHz\_QPSK

| Frequency (MHz) | $P_{\text{Mea}}$ (dBm) | $P_{\text{cl}}$ (dB) | $G_a$ Antenna Gain(dB) | Correction (dB) | $P_{\text{Ag}}$ (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|------------------------|-----------------|----------------------|-----------|-------------|-------------|--------------|
| 825.5           | -22.07                 | 2.42                 | 8.45                   | 2.15            | 36.82                | 18.63     | 38.45       | 19.82       | V            |
| 836.5           | -20.32                 | 2.46                 | 8.45                   | 2.15            | 36.82                | 20.34     | 38.45       | 18.11       | V            |
| 847.5           | -21.33                 | 2.53                 | 8.36                   | 2.15            | 36.82                | 19.17     | 38.45       | 19.28       | V            |

### LTE FDD Band 5\_Channel Bandwidth 5MHz\_QPSK

| Frequency (MHz) | $P_{\text{Mea}}$ (dBm) | $P_{\text{cl}}$ (dB) | $G_a$ Antenna Gain(dB) | Correction (dB) | $P_{\text{Ag}}$ (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|------------------------|-----------------|----------------------|-----------|-------------|-------------|--------------|
| 826.5           | -22.07                 | 2.42                 | 8.45                   | 2.15            | 36.82                | 18.63     | 38.45       | 19.82       | V            |
| 836.5           | -19.95                 | 2.46                 | 8.45                   | 2.15            | 36.82                | 20.71     | 38.45       | 17.74       | V            |
| 846.5           | -21.03                 | 2.53                 | 8.36                   | 2.15            | 36.82                | 19.47     | 38.45       | 18.98       | V            |

### LTE FDD Band 5\_Channel Bandwidth 10MHz\_QPSK

| Frequency (MHz) | $P_{\text{Mea}}$ (dBm) | $P_{\text{cl}}$ (dB) | $G_a$ Antenna Gain(dB) | Correction (dB) | $P_{\text{Ag}}$ (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|------------------------|-----------------|----------------------|-----------|-------------|-------------|--------------|
| 829.0           | -21.91                 | 2.42                 | 8.45                   | 2.15            | 36.82                | 18.79     | 38.45       | 19.66       | V            |
| 836.5           | -19.93                 | 2.46                 | 8.45                   | 2.15            | 36.82                | 20.73     | 38.45       | 17.72       | V            |
| 844.0           | -20.97                 | 2.53                 | 8.36                   | 2.15            | 36.82                | 19.53     | 38.45       | 18.92       | V            |

### LTE FDD Band 5\_Channel Bandwidth 1.4MHz\_16QAM

| Frequency (MHz) | $P_{\text{Mea}}$ (dBm) | $P_{\text{cl}}$ (dB) | $G_a$ Antenna Gain(dB) | Correction (dB) | $P_{\text{Ag}}$ (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|------------------------|-----------------|----------------------|-----------|-------------|-------------|--------------|
| 824.7           | -22.72                 | 2.42                 | 8.45                   | 2.15            | 36.82                | 17.98     | 38.45       | 20.47       | V            |
| 836.5           | -20.97                 | 2.46                 | 8.45                   | 2.15            | 36.82                | 19.69     | 38.45       | 18.76       | V            |
| 848.3           | -21.94                 | 2.53                 | 8.36                   | 2.15            | 36.82                | 18.56     | 38.45       | 19.89       | V            |

*LTE FDD Band 5\_Channel Bandwidth 3MHz\_16QAM*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | Correction (dB) | P <sub>Ag</sub> (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|-----------------|----------------------|-----------|-------------|-------------|--------------|
| 825.5           | -21.91                 | 2.42                 | 8.45                            | 2.15            | 36.82                | 18.79     | 38.45       | 19.66       | V            |
| 836.5           | -20.95                 | 2.46                 | 8.45                            | 2.15            | 36.82                | 19.71     | 38.45       | 18.74       | V            |
| 847.5           | -22.00                 | 2.53                 | 8.36                            | 2.15            | 36.82                | 18.50     | 38.45       | 19.95       | V            |

*LTE FDD Band 5\_Channel Bandwidth 5MHz\_16QAM*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | Correction (dB) | P <sub>Ag</sub> (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|-----------------|----------------------|-----------|-------------|-------------|--------------|
| 826.5           | -21.92                 | 2.42                 | 8.45                            | 2.15            | 36.82                | 18.78     | 38.45       | 19.67       | V            |
| 836.5           | -21.50                 | 2.46                 | 8.45                            | 2.15            | 36.82                | 19.16     | 38.45       | 19.29       | V            |
| 846.5           | -22.20                 | 2.53                 | 8.36                            | 2.15            | 36.82                | 18.30     | 38.45       | 20.15       | V            |

*LTE FDD Band 5\_Channel Bandwidth 10MHz\_16QAM*

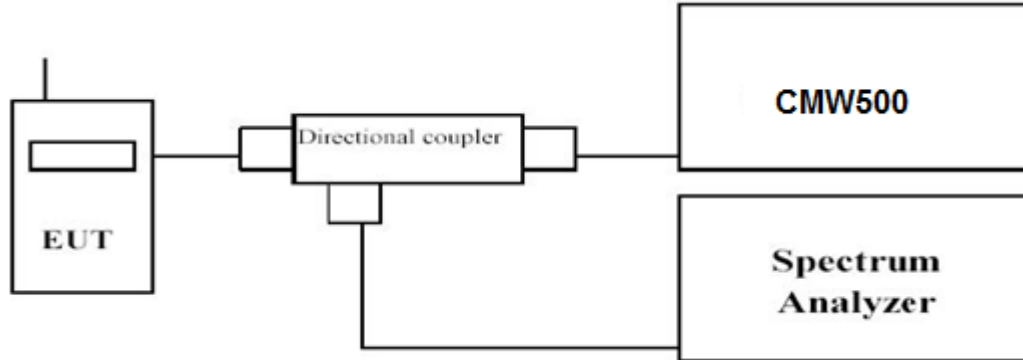
| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | Correction (dB) | P <sub>Ag</sub> (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|-----------------|----------------------|-----------|-------------|-------------|--------------|
| 829.0           | -21.11                 | 2.42                 | 8.45                            | 2.15            | 36.82                | 19.59     | 38.45       | 18.86       | V            |
| 836.5           | -20.87                 | 2.46                 | 8.45                            | 2.15            | 36.82                | 19.79     | 38.45       | 18.66       | V            |
| 844.0           | -22.01                 | 2.53                 | 8.36                            | 2.15            | 36.82                | 18.49     | 38.45       | 19.96       | V            |

## 4.2. 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:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case for each Channel Bandwidth of LTE FDD Band 5.

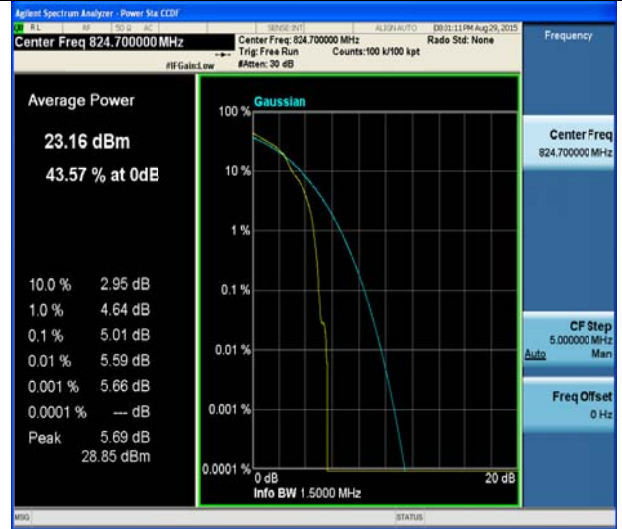
| LTE FDD Band 5       |                 |                |           |       |
|----------------------|-----------------|----------------|-----------|-------|
| TX Channel Bandwidth | Frequency (MHz) | RB Size/Offset | PAPR (dB) |       |
|                      |                 |                | QPSK      | 16QAM |
| 1.4 MHz              | 824.7           | 1RB#0          | 4.05      | 5.01  |
|                      | 836.5           |                | 5.09      | 6.10  |
|                      | 848.3           |                | 4.90      | 5.94  |
| 3 MHz                | 825.5           | 1RB#0          | 4.71      | 5.67  |
|                      | 836.5           |                | 5.11      | 6.02  |
|                      | 847.5           |                | 5.20      | 6.13  |
| 5 MHz                | 826.5           | 1RB#0          | 4.55      | 5.62  |
|                      | 836.5           |                | 4.99      | 5.83  |
|                      | 846.5           |                | 5.02      | 6.11  |
| 10 MHz               | 829.0           | 1RB#0          | 5.18      | 6.27  |
|                      | 836.5           |                | 5.35      | 6.29  |
|                      | 844.0           |                | 5.18      | 6.37  |



LTE FDD Band 5-1.4MHz Channel Bandwidth PAPR

QPSK

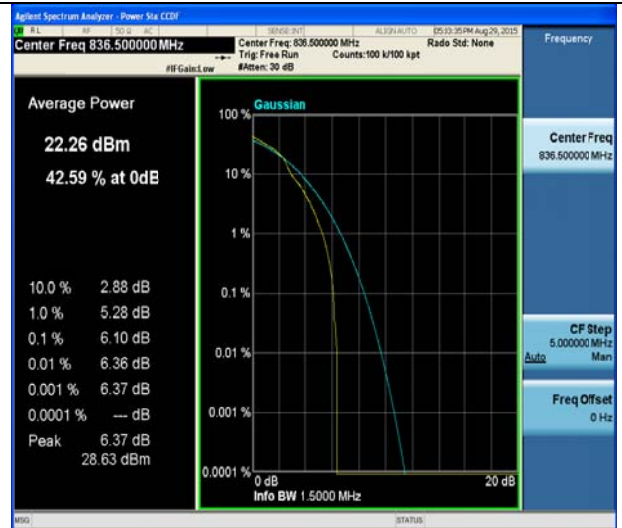
16QAM



1RB#0

1RB#0

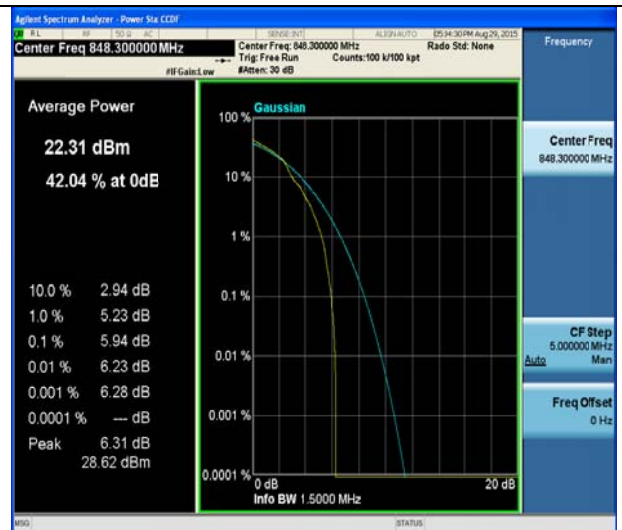
Low Channel



1RB#0

1RB#0

Middle Channel



1RB#0

1RB#0

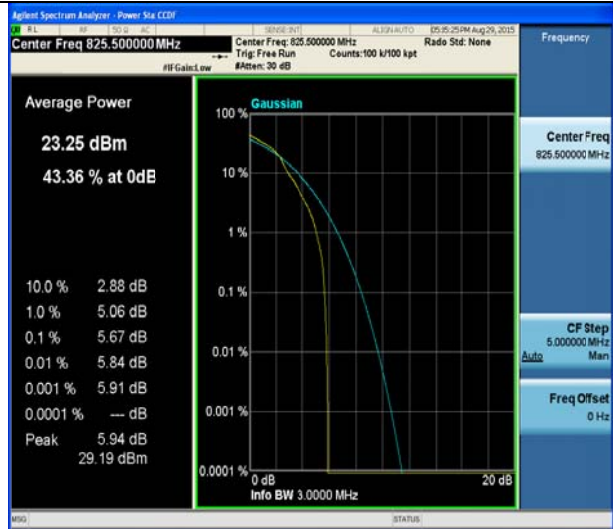
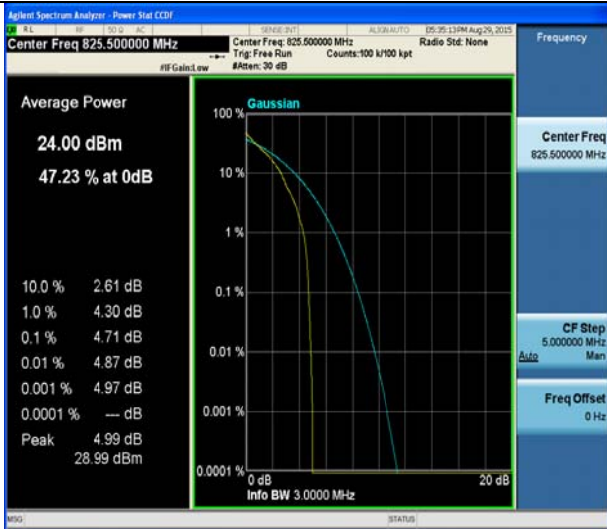
High Channel



LTE FDD Band 5-3MHz Channel Bandwidth PAPR

QPSK

16QAM



1RB#0

1RB#0

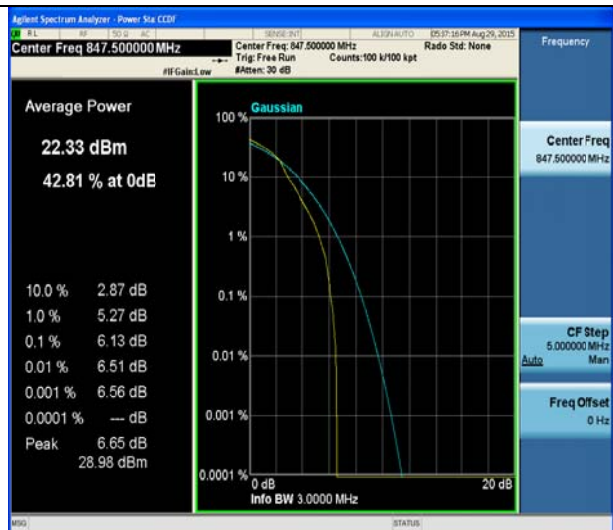
Low Channel



1RB#0

1RB#0

Middle Channel



1RB#0

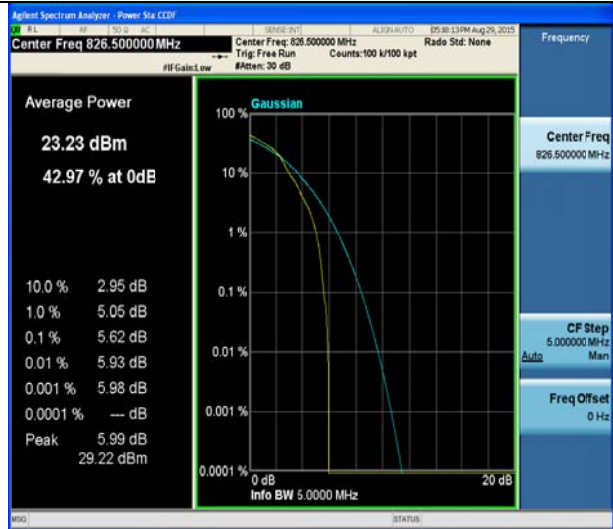
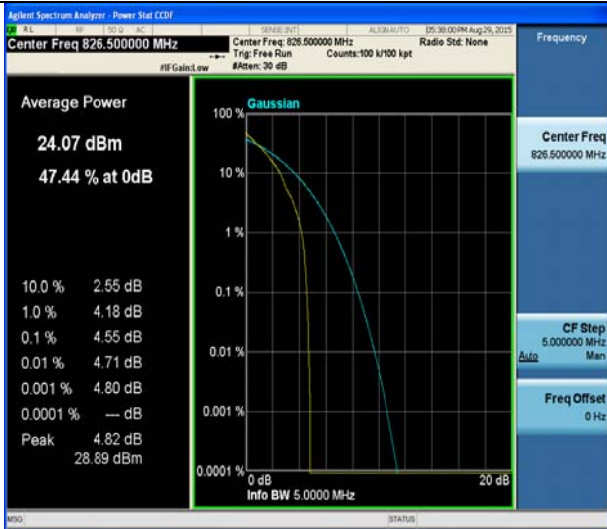
1RB#0

High Channel

LTE FDD Band 5-5MHz Channel Bandwidth PAPR

QPSK

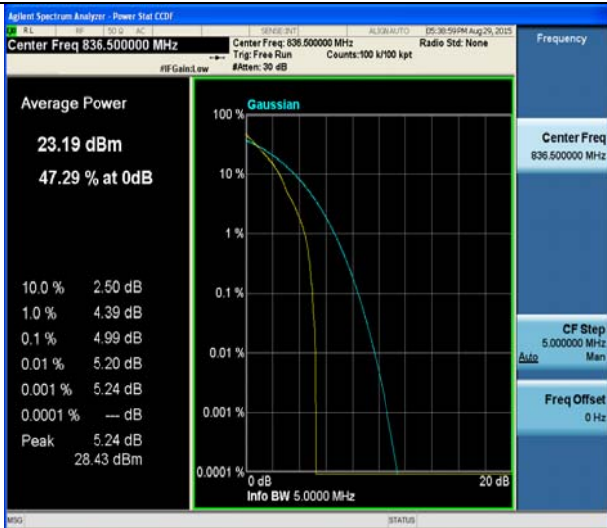
16QAM



1RB#0

1RB#0

Low Channel



1RB#0

1RB#0

Middle Channel



1RB#0

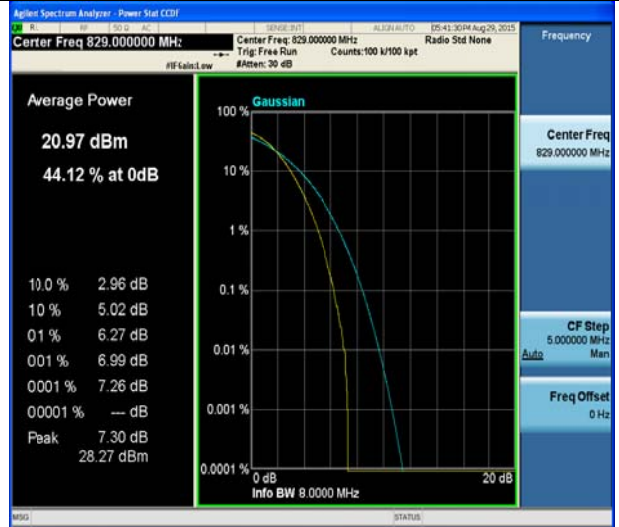
1RB#0

High Channel

LTE FDD Band 5-10MHz Channel Bandwidth PAPR

QPSK

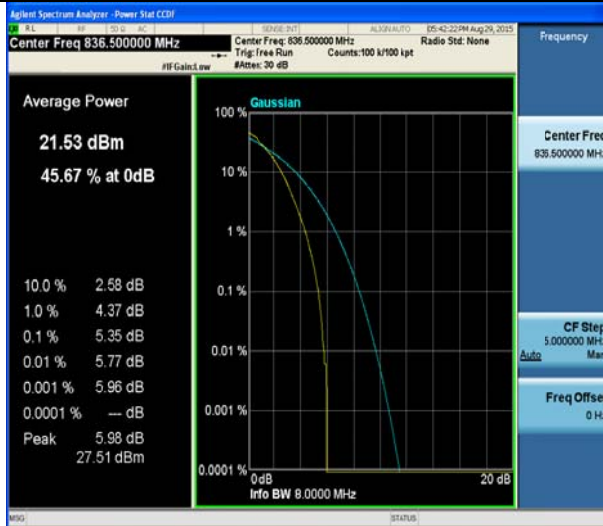
16QAM



1RB#0

1RB#0

Low Channel



1RB#0

1RB#0

Middle Channel



1RB#0

1RB#0

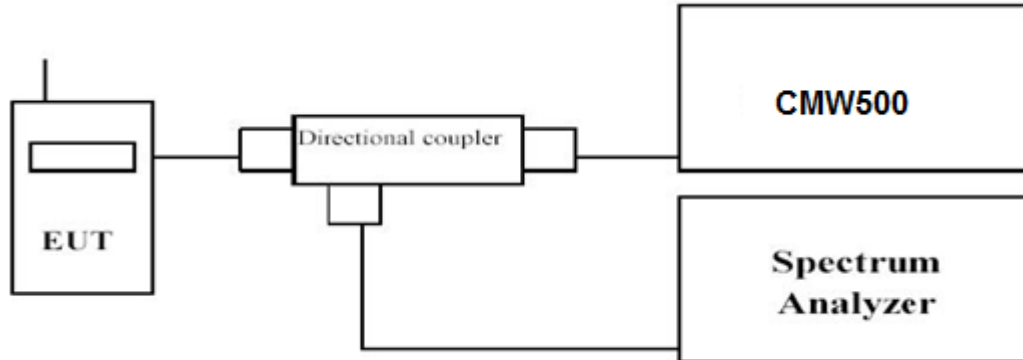
High Channel

### 4.3. Occupied Bandwidth and Emission Bandwidth

#### LIMIT

N/A

#### 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:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case for each Channel Bandwidth of LTE FDD Band 5.

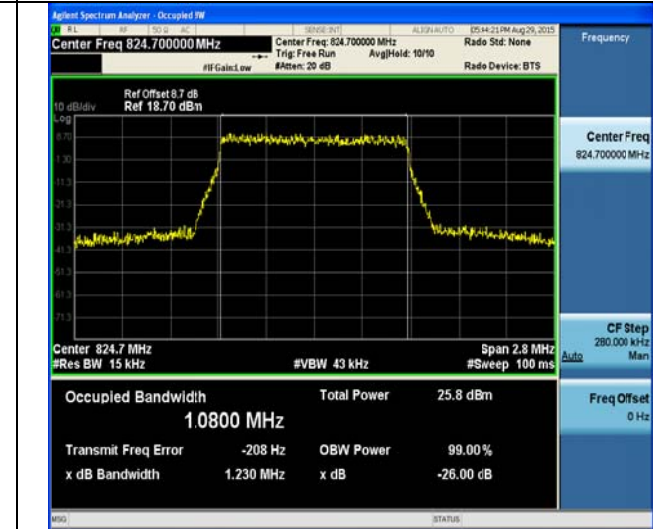
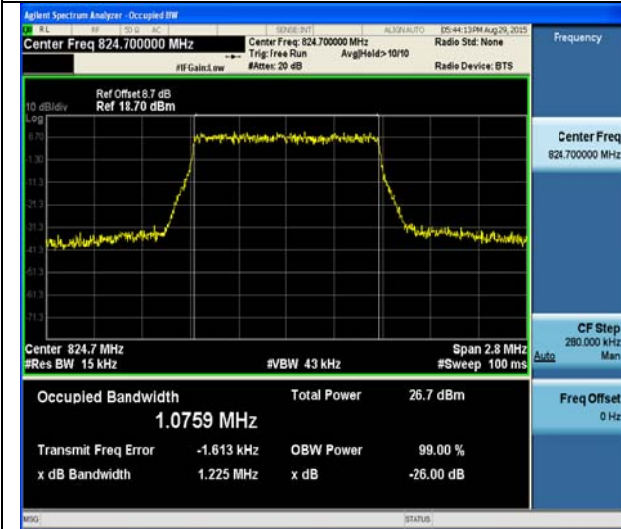
| LTE FDD Band 5       |                |                 |                                 |       |                              |        |
|----------------------|----------------|-----------------|---------------------------------|-------|------------------------------|--------|
| TX Channel Bandwidth | RB Size/Offset | Frequency (MHz) | -26dBc Emission bandwidth (MHz) |       | 99% Occupied bandwidth (MHz) |        |
|                      |                |                 | QPSK                            | 16QAM | QPSK                         | 16QAM  |
| 1.4 MHz              | 6RB#0          | 824.7           | 1.225                           | 1.225 | 1.0759                       | 1.0759 |
|                      |                | 836.5           | 1.210                           | 1.210 | 1.0783                       | 1.0783 |
|                      |                | 848.3           | 1.223                           | 1.223 | 1.0752                       | 1.0752 |
| 3 MHz                | 15RB#0         | 825.5           | 2.867                           | 2.891 | 2.6861                       | 2.6881 |
|                      |                | 836.5           | 2.846                           | 2.886 | 2.6835                       | 2.6807 |
|                      |                | 847.5           | 2.874                           | 2.845 | 2.6851                       | 2.6781 |
| 5 MHz                | 25RB#0         | 826.5           | 4.839                           | 4.781 | 4.4841                       | 4.4802 |
|                      |                | 836.5           | 4.816                           | 4.823 | 4.4813                       | 4.4794 |
|                      |                | 846.5           | 4.791                           | 4.768 | 4.4832                       | 4.4745 |
| 10 MHz               | 50RB#0         | 829.0           | 9.456                           | 9.432 | 8.9471                       | 8.9307 |
|                      |                | 836.5           | 9.463                           | 9.447 | 8.9445                       | 8.9422 |
|                      |                | 844.0           | 9.409                           | 9.456 | 8.9553                       | 8.9452 |



LTE FDD Band 5-1.4MHz Channel Bandwidth

QPSK

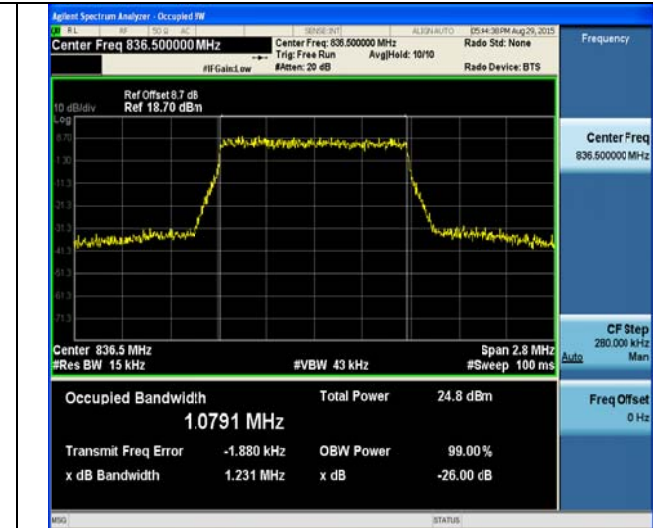
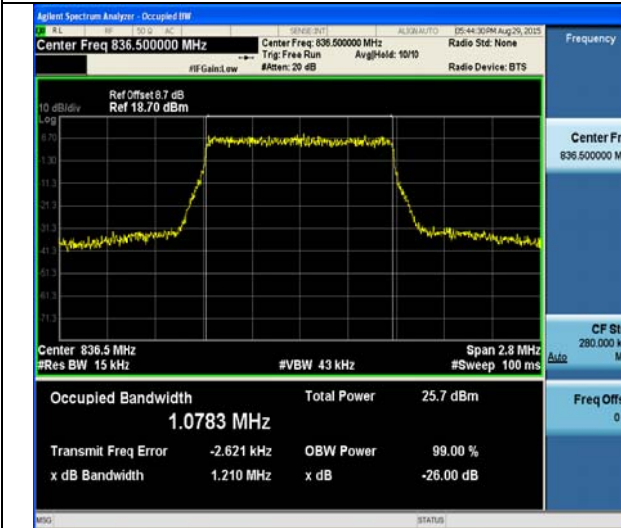
16QAM



6RB#0

6RB#0

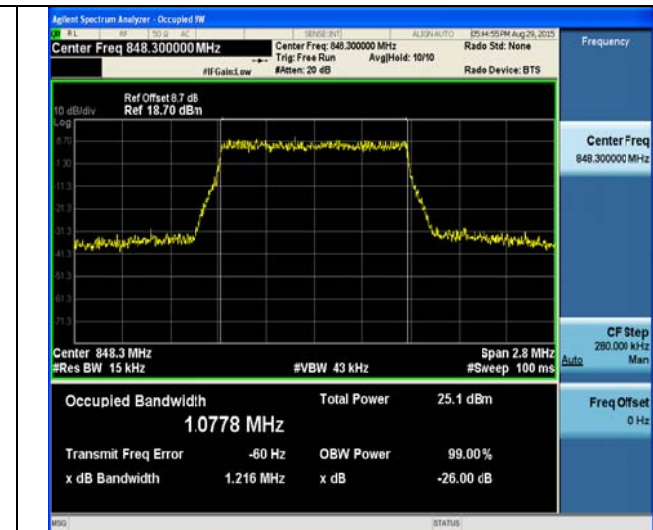
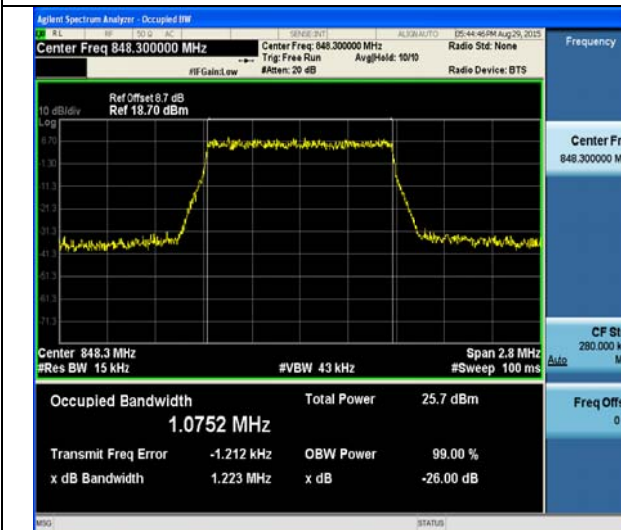
Low Channel



6RB#0

6RB#0

Middle Channel



6RB#0

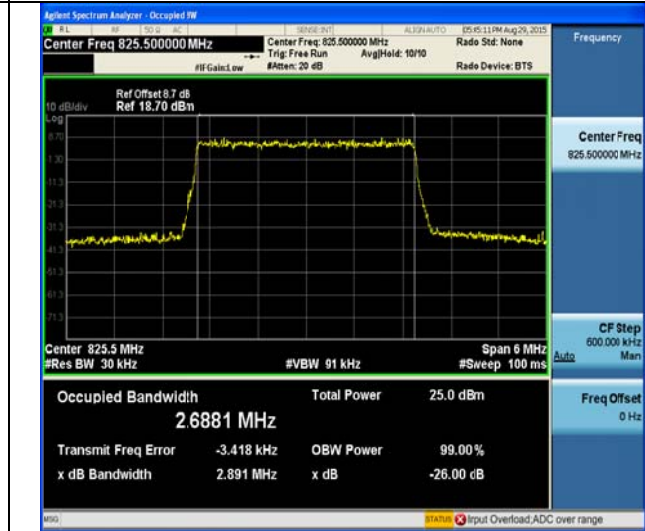
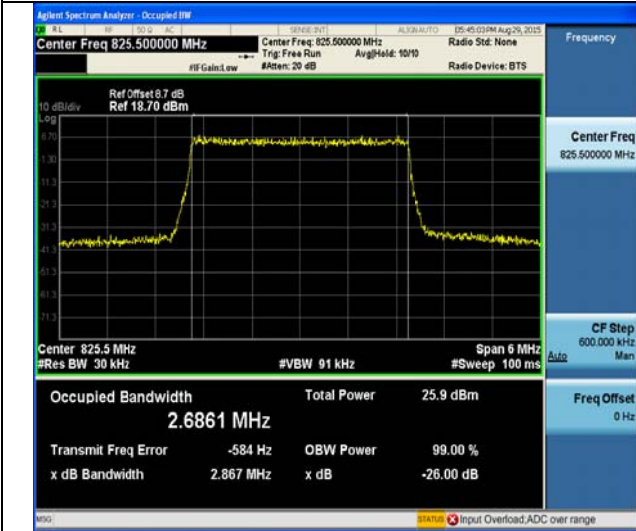
6RB#0

High Channel

LTE FDD Band 5-3MHz Channel Bandwidth

QPSK

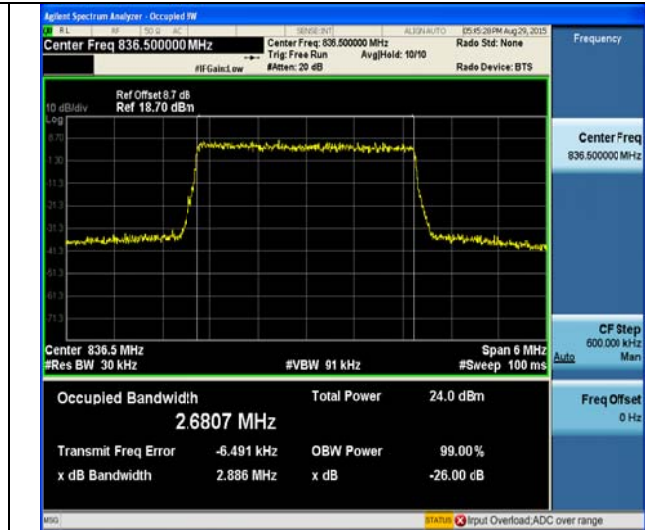
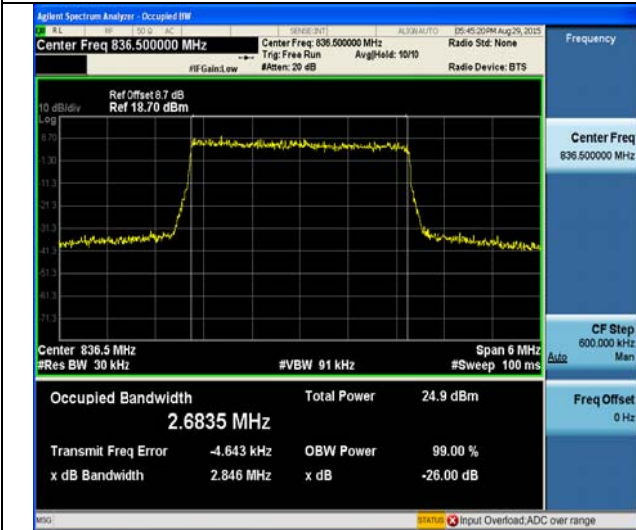
16QAM



15RB#0

15RB#0

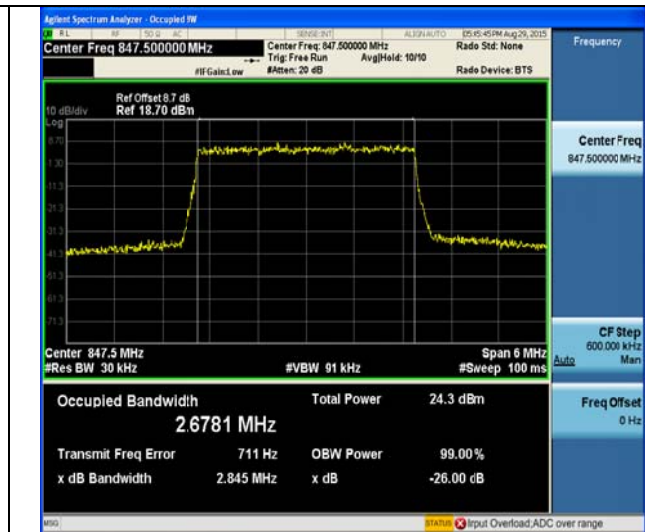
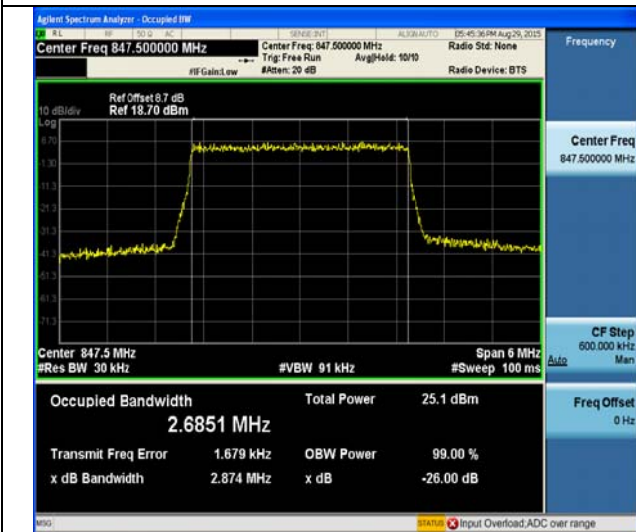
Low Channel



15RB#0

15RB#0

Middle Channel



15RB#0

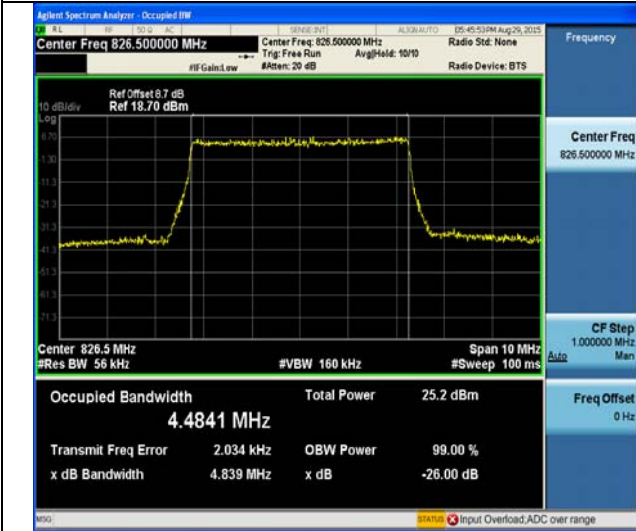
15RB#0

High Channel

LTE FDD Band 5-5MHz Channel Bandwidth

QPSK

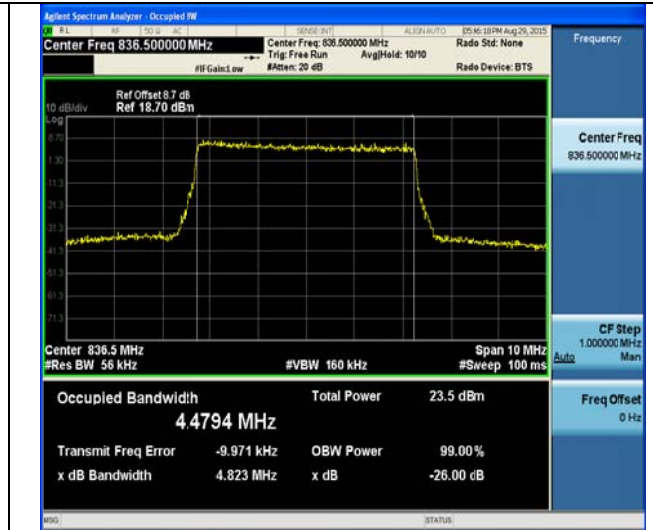
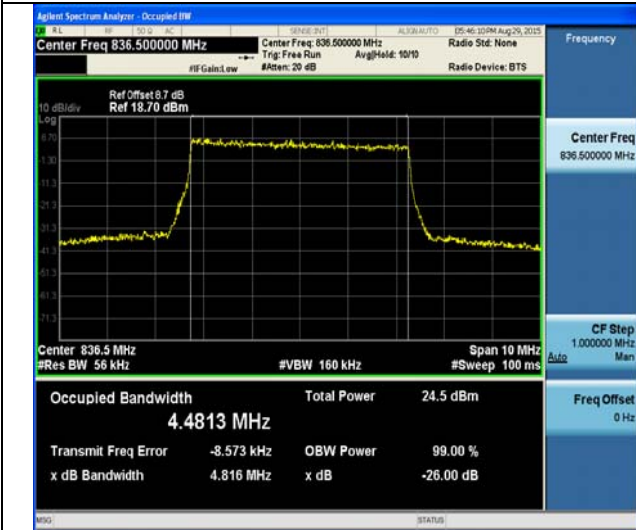
16QAM



25RB#0

25RB#0

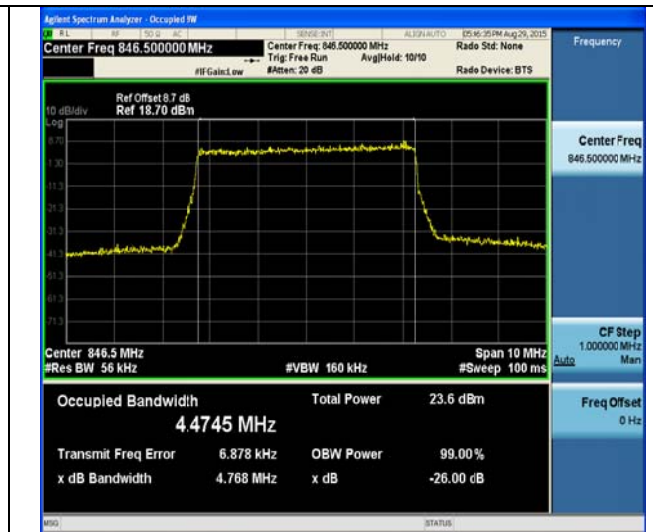
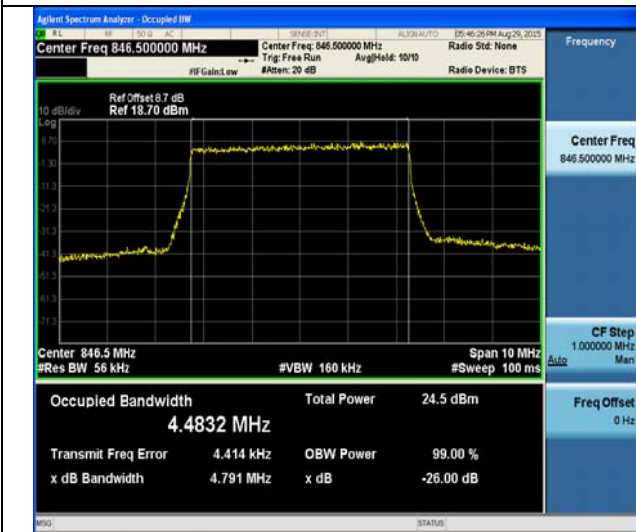
Low Channel



25RB#0

25RB#0

Middle Channel



25RB#0

25RB#0

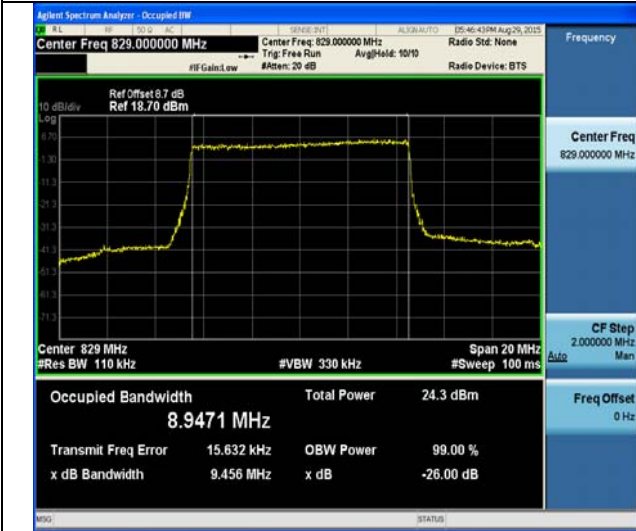
High Channel



LTE FDD Band 5-10MHz Channel Bandwidth

QPSK

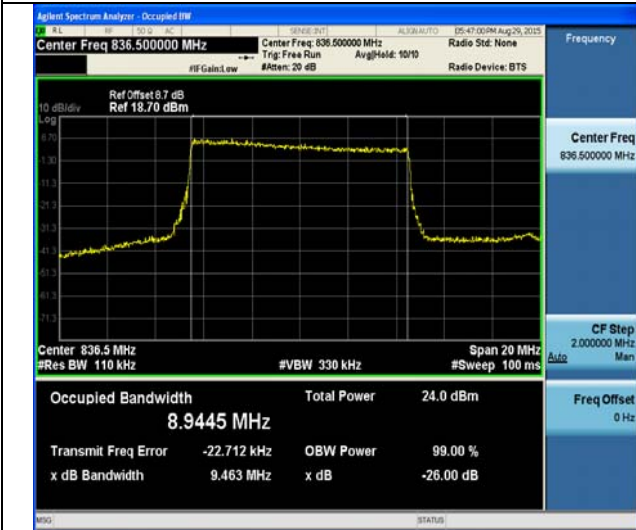
16QAM



50RB#0

50RB#0

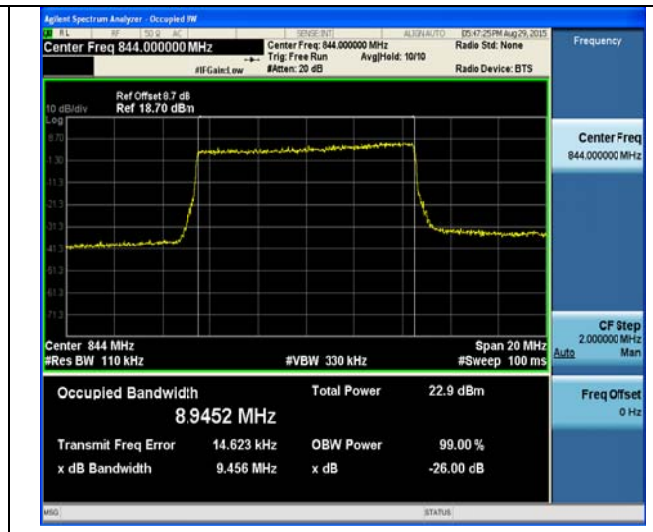
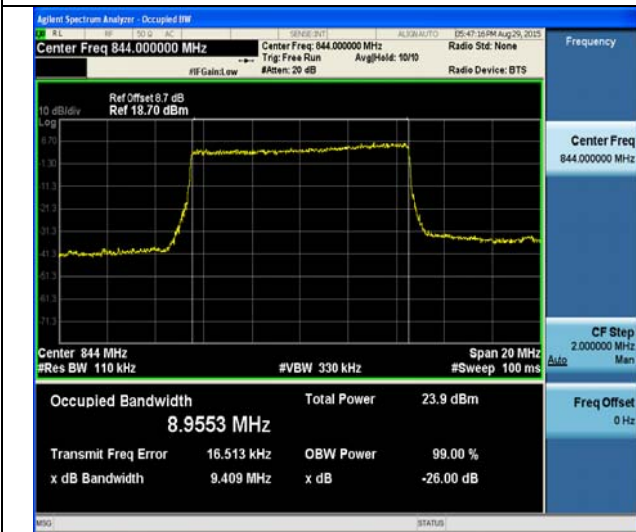
Low Channel



50RB#0

50RB#0

Middle Channel



50RB#0

50RB#0

High Channel



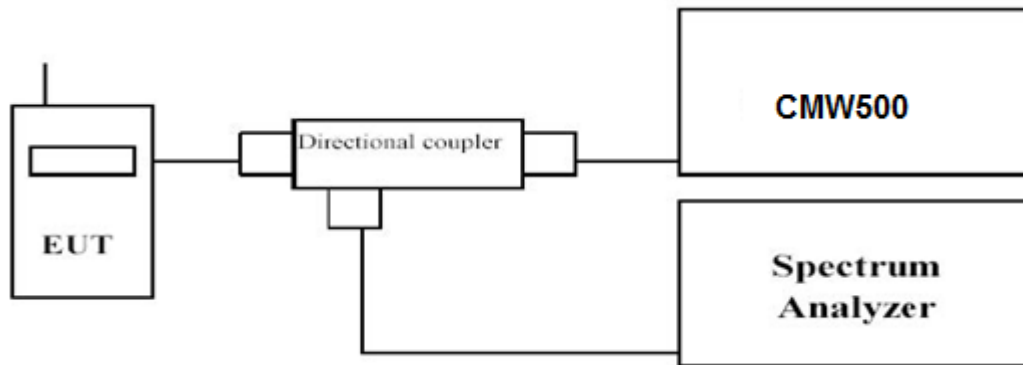
#### 4.4. Band Edge compliance

##### LIMIT

According to Part §22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

##### 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

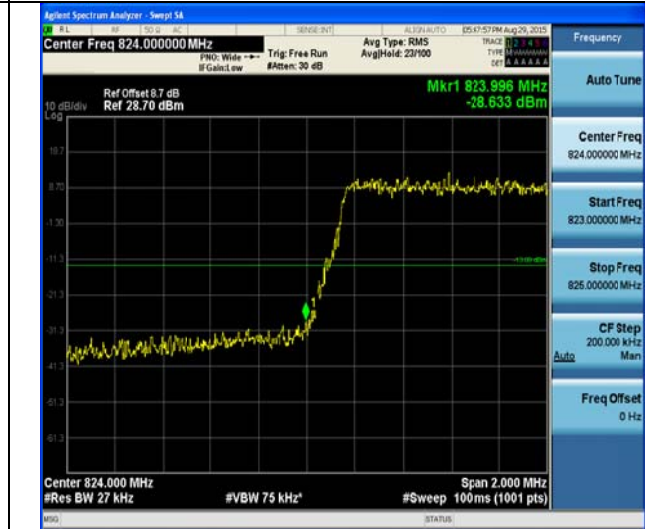
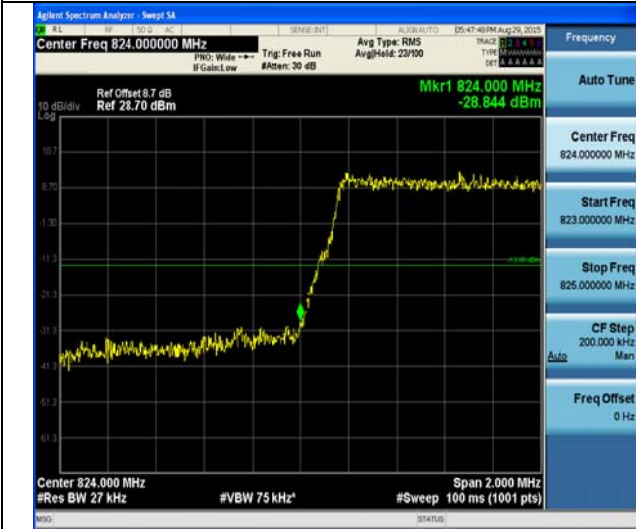
Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case for each Channel Bandwidth of LTE FDD Band 5.

LTE FDD Band 5-1.4MHz Channel Bandwidth Band Edge Compliance

QPSK

16QAM



1RB#0

1RB#0

Low Channel



1RB#0

1RB#0

High Channel

LTE FDD Band 5-3MHz Channel Bandwidth Band Edge Compliance

QPSK

16QAM



1RB#0

1RB#0

Low Channel



1RB#0

1RB#0

High Channel

LTE FDD Band 5-5MHz Channel Bandwidth Band Edge Compliance

QPSK

16QAM



1RB#0

1RB#0

Low Channel



1RB#0

1RB#0

High Channel

LTE FDD Band 5-10MHz Channel Bandwidth Band Edge Compliance

QPSK

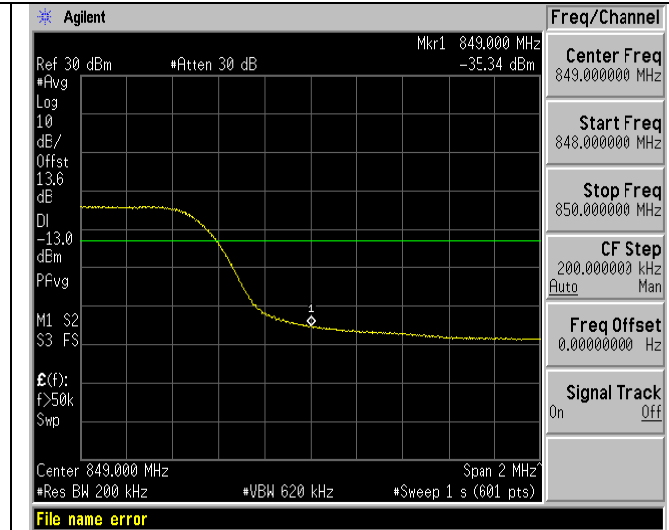
16QAM



1RB#0

1RB#0

Low Channel



1RB#0

1RB#0

High Channel



### 4.5. Spurious Emission on Antenna Port

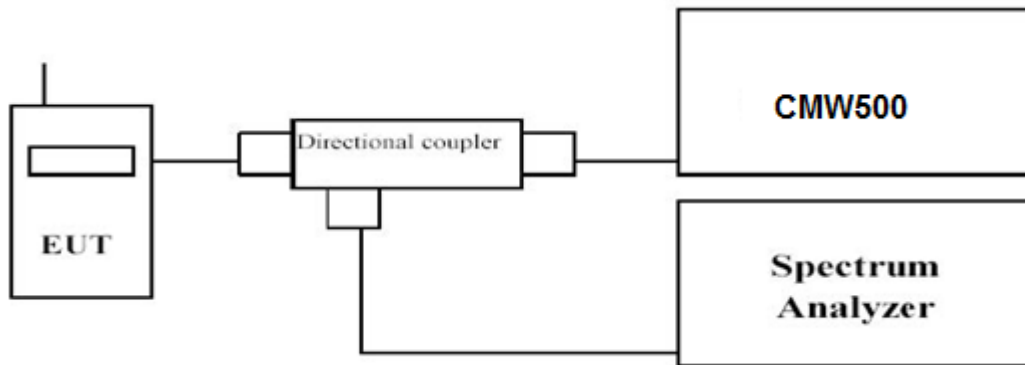
#### LIMIT

According to Part §22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

#### TEST CONFIGURATION

Conducted 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 5    | 0.000009~0.000015 | 1KHz  | 3KHz  | Auto           |
|                   | 0.000015~0.03     | 10KHz | 30KHz | Auto           |
|                   | 0.03~26.5         | 1 MHz | 3 MHz | Auto           |

#### TEST RESULTS

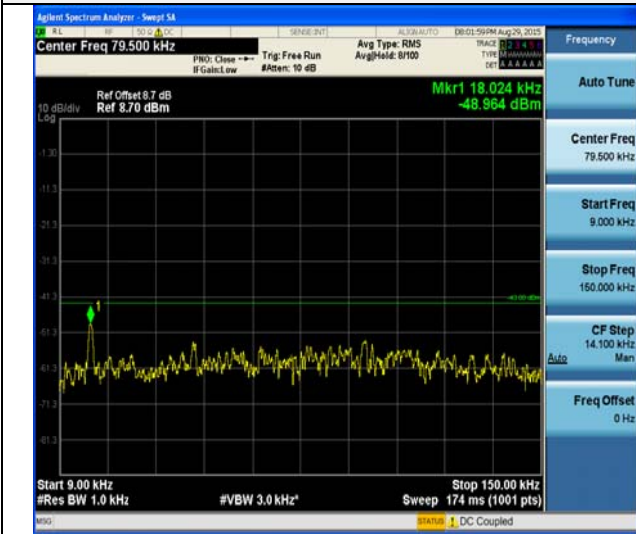
Remark:

- We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case for each Channel Bandwidth of LTE FDD Band 5.

LTE FDD Band 5-1.4MHz Channel Bandwidth  
Low Channel

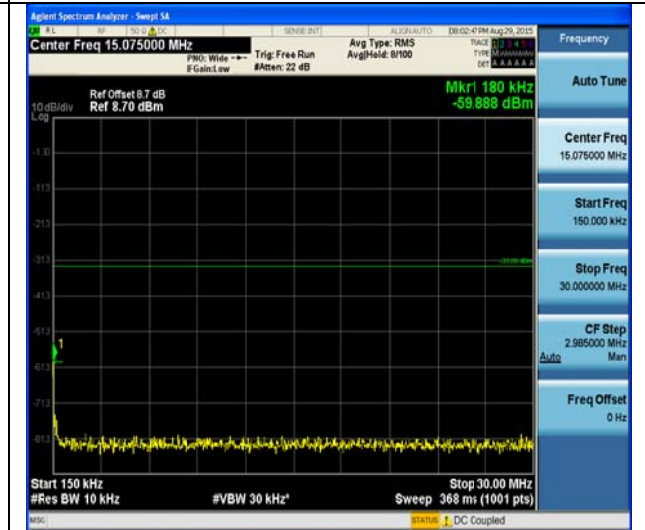
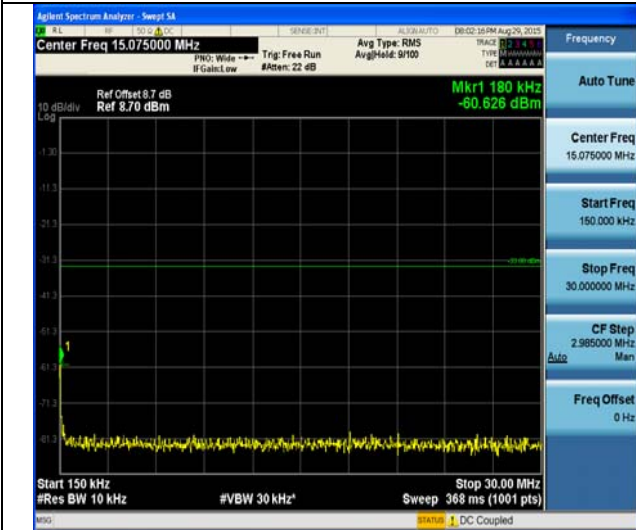
QPSK

16QAM



9KHz~150KHz

9KHz~150KHz



150KHz~30MHz

150KHz~30MHz



30MHz~26.5GHz

30MHz~26.5GHz

1RB#0

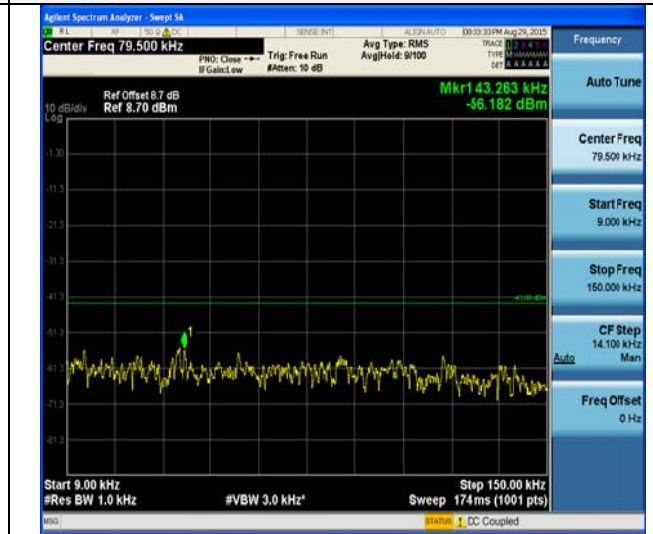
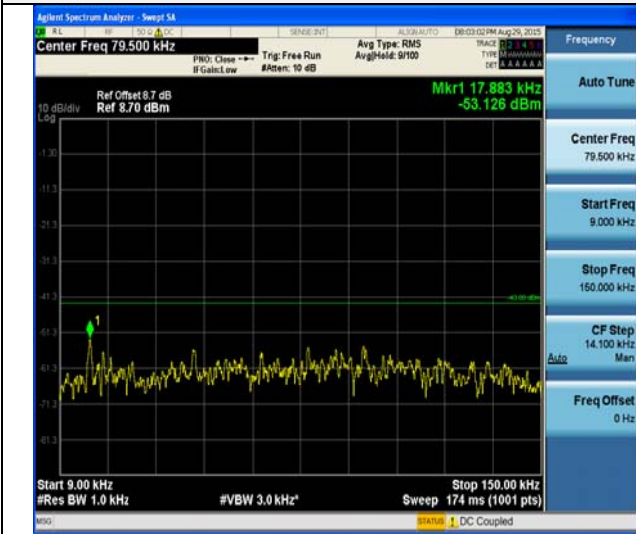
1RB#0

LTE FDD Band 5-1.4MHz Channel Bandwidth

Middle Channel

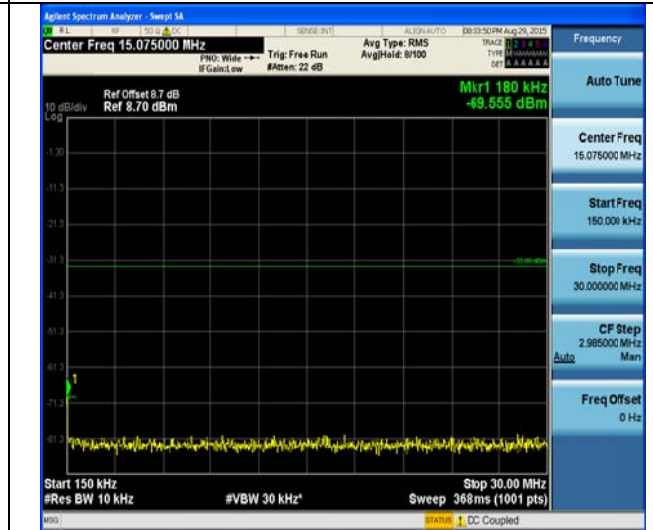
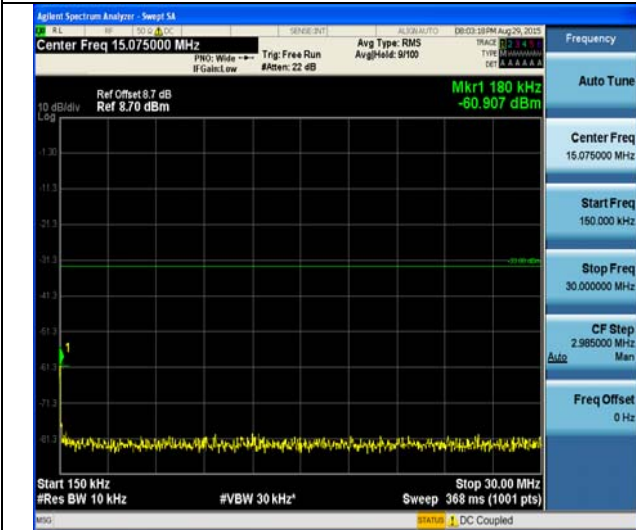
QPSK

16QAM



9KHz~150KHz

9KHz~150KHz



150KHz~30MHz

150KHz~30MHz



30MHz~26.5GHz

30MHz~26.5GHz

1RB#0

1RB#0



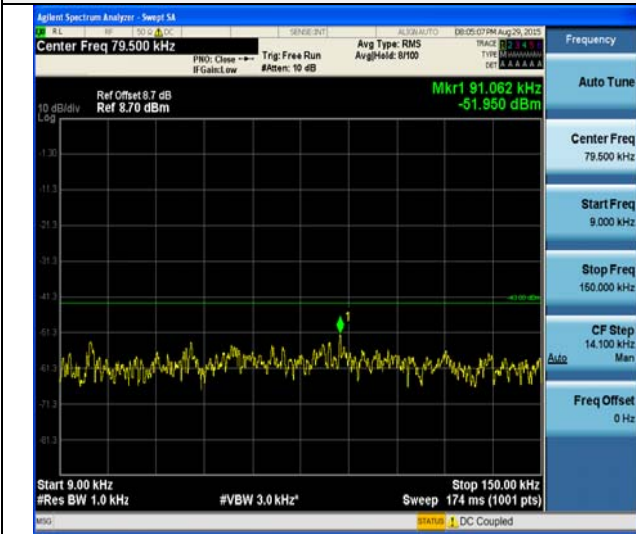
LTE FDD Band 5-1.4MHz Channel Bandwidth  
High Channel

| QPSK  | 16QAM   |
|---|---|
| <p>Agilent Spectrum Analyzer - Swept SA<br/>Center Freq 79.500 kHz<br/>Mkr1 90.639 kHz<br/>-56.553 dBm<br/>Start 9.00 kHz<br/>#Res BW 1.0 kHz<br/>#VBW 3.0 kHz*<br/>Sweep 174 ms (1001 pts)</p>     | <p>Agilent Spectrum Analyzer - Swept SA<br/>Center Freq 79.500 kHz<br/>Mkr1 18.165 kHz<br/>-41.913 dBm<br/>Start 9.00 kHz<br/>#Res BW 1.0 kHz<br/>#VBW 3.0 kHz*<br/>Sweep 174 ms (1001 pts)</p>     |
| 9KHz~150KHz   | 9KHz~150KHz   |
| <p>Agilent Spectrum Analyzer - Swept SA<br/>Center Freq 15.075000 MHz<br/>Mkr1 150 kHz<br/>-69.268 dBm<br/>Start 150 kHz<br/>#Res BW 10 kHz<br/>#VBW 30 kHz*<br/>Sweep 368 ms (1001 pts)</p>        | <p>Agilent Spectrum Analyzer - Swept SA<br/>Center Freq 15.075000 MHz<br/>Mkr1 150 kHz<br/>-69.877 dBm<br/>Start 150 kHz<br/>#Res BW 10 kHz<br/>#VBW 30 kHz*<br/>Sweep 368 ms (1001 pts)</p>        |
| 150KHz~30MHz  | 150KHz~30MHz  |
| <p>Agilent Spectrum Analyzer - Swept SA<br/>Center Freq 13.01500000 GHz<br/>Mkr2 25.247 GHz<br/>-29.188 dBm<br/>Start 30 MHz<br/>#Res BW 1.0 MHz<br/>#VBW 3.0 MHz*<br/>Sweep 64.9 ms (1001 pts)</p> | <p>Agilent Spectrum Analyzer - Swept SA<br/>Center Freq 13.01500000 GHz<br/>Mkr2 25.299 GHz<br/>-29.666 dBm<br/>Start 30 MHz<br/>#Res BW 1.0 MHz<br/>#VBW 3.0 MHz*<br/>Sweep 64.9 ms (1001 pts)</p> |
| 30MHz~26.5GHz   | 30MHz~26.5GHz   |
| 1RB#0   | 1RB#0   |

LTE FDD Band 5-3MHz Channel Bandwidth  
Low Channel

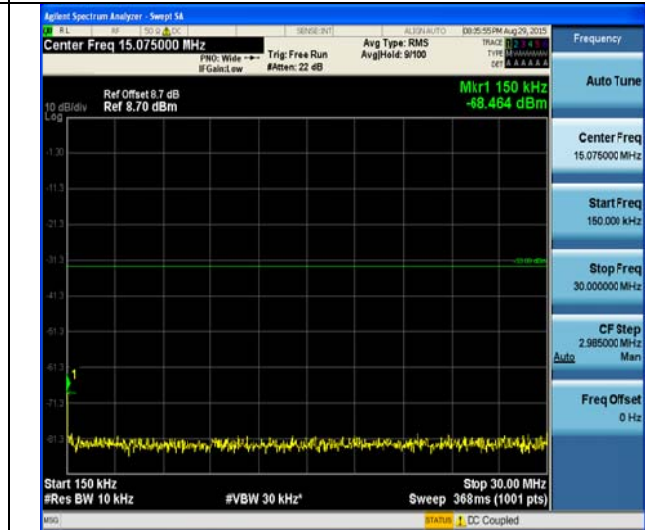
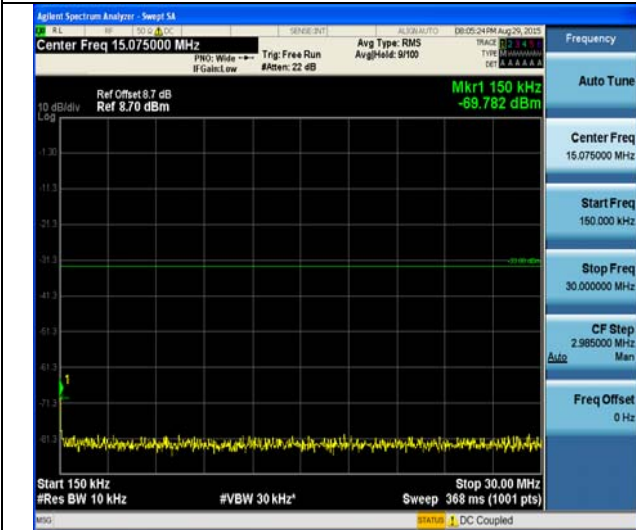
QPSK

16QAM



9KHz~150KHz

9KHz~150KHz



150KHz~30MHz

150KHz~30MHz



30MHz~26.5GHz

30MHz~26.5GHz

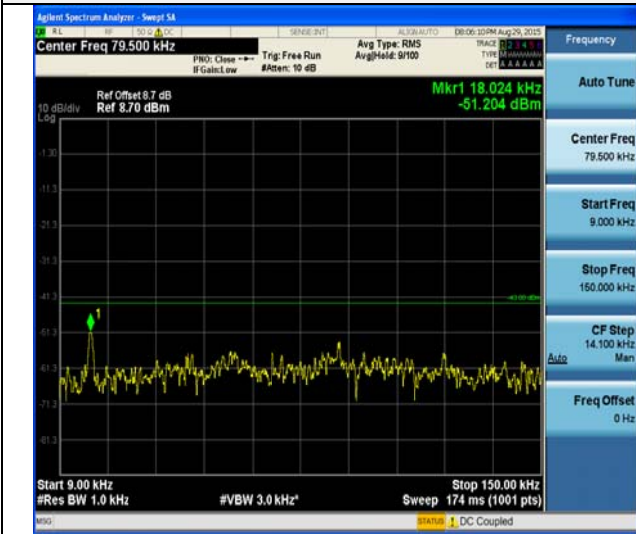
1RB#0

1RB#0

LTE FDD Band 5-3MHz Channel Bandwidth  
Middle Channel

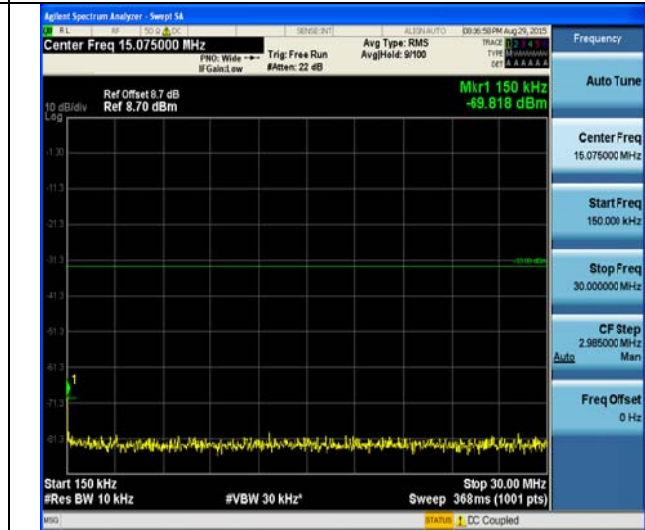
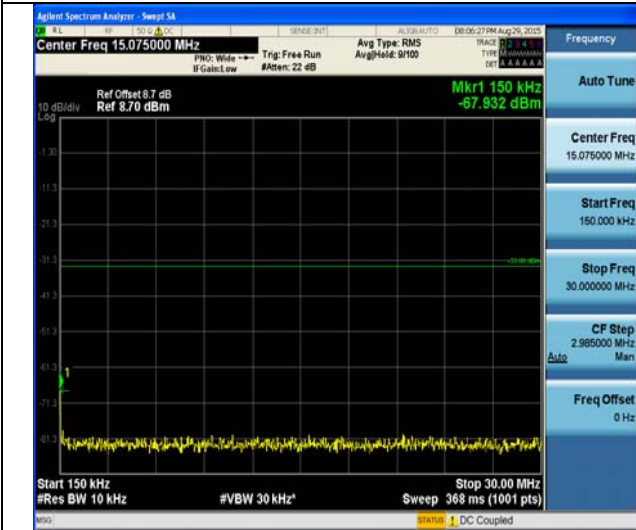
QPSK

16QAM



9KHz~150KHz

9KHz~150KHz



150KHz~30MHz

150KHz~30MHz



30MHz~26.5GHz

30MHz~26.5GHz

1RB#0

1RB#0



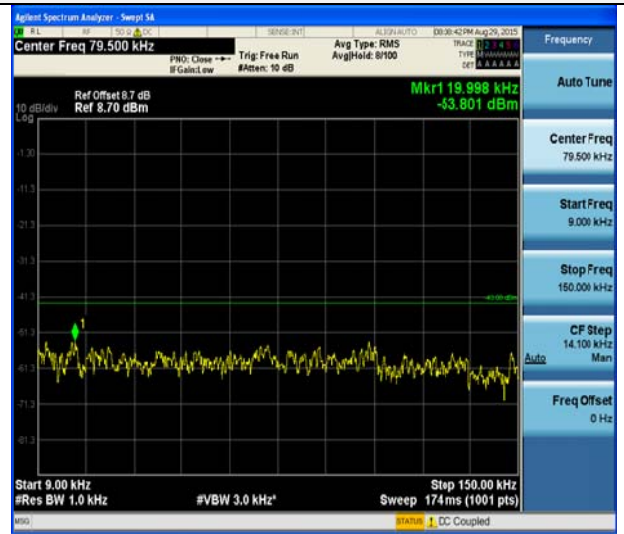
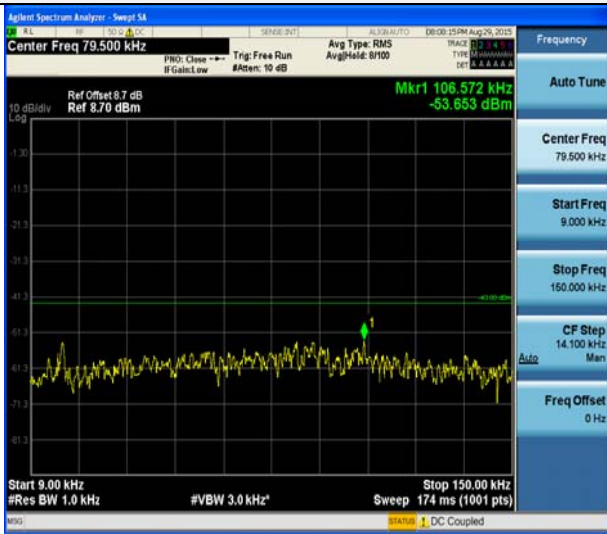
LTE FDD Band 5-3MHz Channel Bandwidth  
High Channel

| QPSK   | 16QAM  |
|--|--|
| <p>Agilent Spectrum Analyzer - Swept SA<br/>Center Freq 79.500 kHz<br/>Mkr1 91.767 kHz<br/>-55.094 dBm<br/>Start 9.00 kHz<br/>#Res BW 1.0 kHz<br/>#VBW 3.0 kHz*<br/>Stop 150.00 kHz<br/>Sweep 174 ms (1001 pts)</p>    | <p>Agilent Spectrum Analyzer - Swept SA<br/>Center Freq 79.500 kHz<br/>Mkr1 17.601 kHz<br/>-55.312 dBm<br/>Start 9.00 kHz<br/>#Res BW 1.0 kHz<br/>#VBW 3.0 kHz*<br/>Stop 150.00 kHz<br/>Sweep 174 ms (1001 pts)</p>    |
| 9KHz~150KHz  | 9KHz~150KHz  |
| <p>Agilent Spectrum Analyzer - Swept SA<br/>Center Freq 15.075000 MHz<br/>Mkr1 150 kHz<br/>-69.645 dBm<br/>Start 150 kHz<br/>#Res BW 10 kHz<br/>#VBW 30 kHz*<br/>Stop 30.000 MHz<br/>Sweep 368 ms (1001 pts)</p>       | <p>Agilent Spectrum Analyzer - Swept SA<br/>Center Freq 15.075000 MHz<br/>Mkr1 150 kHz<br/>-68.065 dBm<br/>Start 150 kHz<br/>#Res BW 10 kHz<br/>#VBW 30 kHz*<br/>Stop 30.000 MHz<br/>Sweep 368 ms (1001 pts)</p>       |
| 150KHz~30MHz   | 150KHz~30MHz   |
| <p>Agilent Spectrum Analyzer - Swept SA<br/>Center Freq 13.01500000 GHz<br/>Mkr2 25.273 GHz<br/>-28.687 dBm<br/>Start 30 MHz<br/>#Res BW 1.0 MHz<br/>#VBW 3.0 MHz*<br/>Stop 26.00 GHz<br/>Sweep 64.9 ms (1001 pts)</p> | <p>Agilent Spectrum Analyzer - Swept SA<br/>Center Freq 13.01500000 GHz<br/>Mkr2 25.533 GHz<br/>-28.969 dBm<br/>Start 30 MHz<br/>#Res BW 1.0 MHz<br/>#VBW 3.0 MHz*<br/>Stop 26.00 GHz<br/>Sweep 64.9 ms (1001 pts)</p> |
| 30MHz~26.5GHz  | 30MHz~26.5GHz  |
| 1RB#0  | 1RB#0  |

LTE FDD Band 5-5MHz Channel Bandwidth  
Low Channel

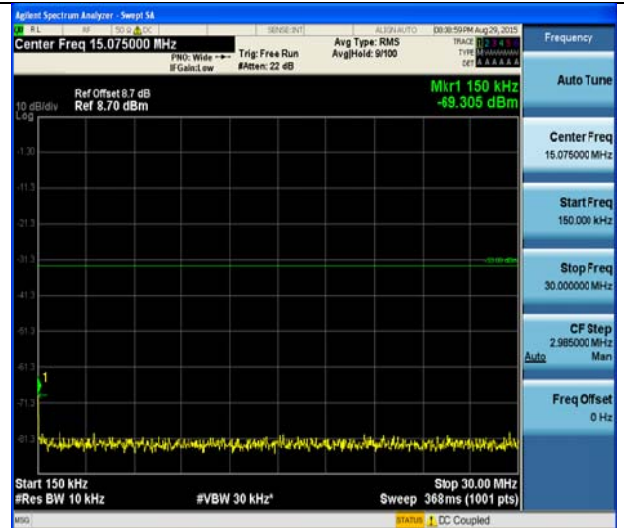
QPSK

16QAM



9KHz~150KHz

9KHz~150KHz



150KHz~30MHz

150KHz~30MHz



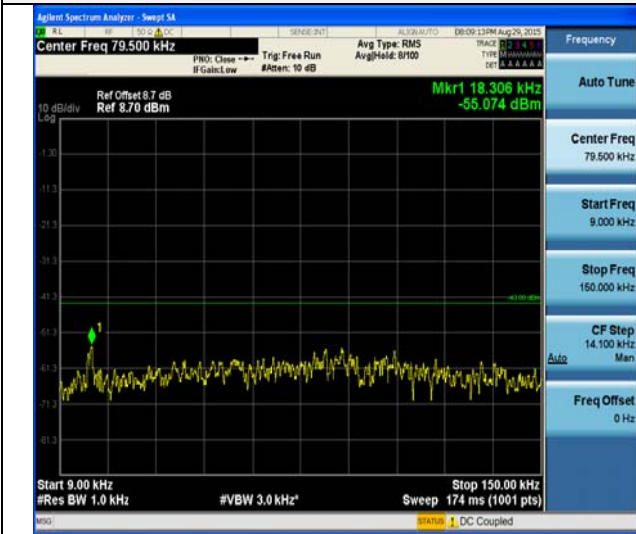
30MHz~26.5GHz  
1RB#0

30MHz~26.5GHz  
1RB#0

LTE FDD Band 5-5MHz Channel Bandwidth  
Middle Channel

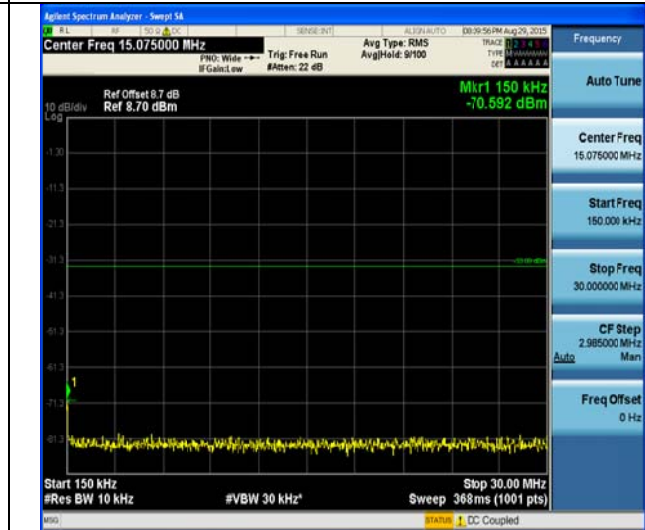
QPSK

16QAM



9KHz~150KHz

9KHz~150KHz



150KHz~30MHz

150KHz~30MHz



30MHz~26.5GHz

30MHz~26.5GHz

1RB#0

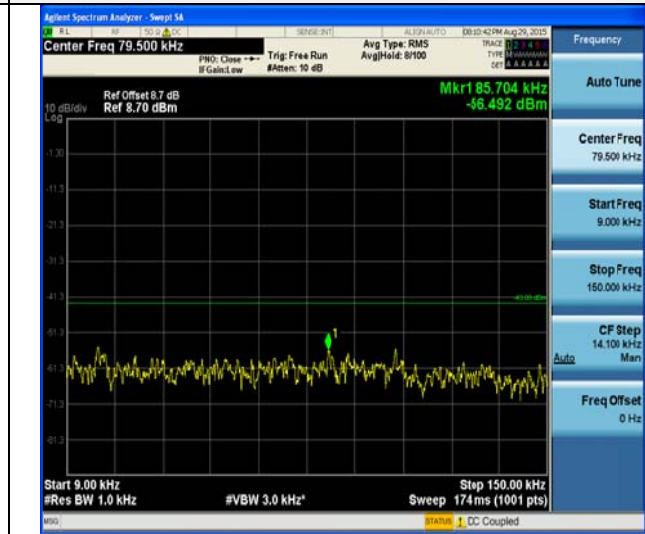
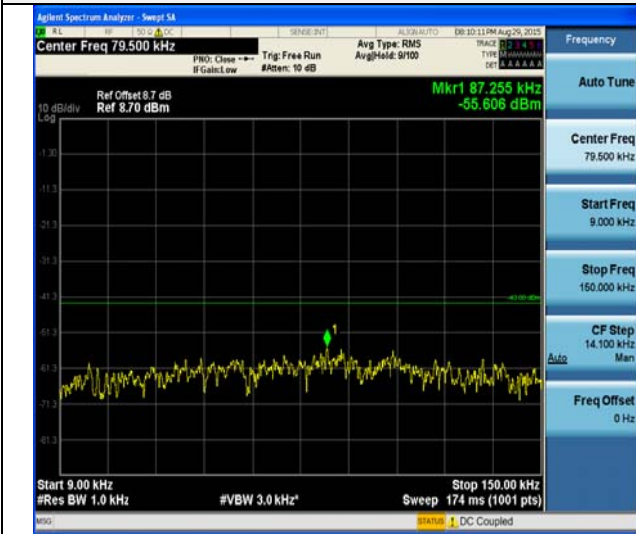
1RB#0



LTE FDD Band 5-5MHz Channel Bandwidth  
High Channel

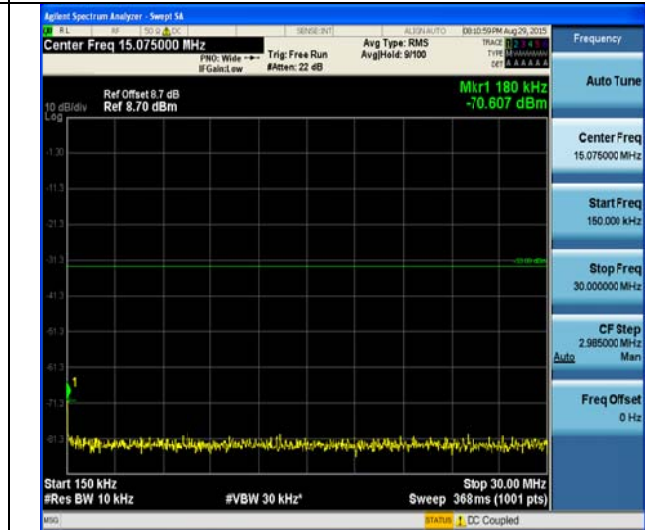
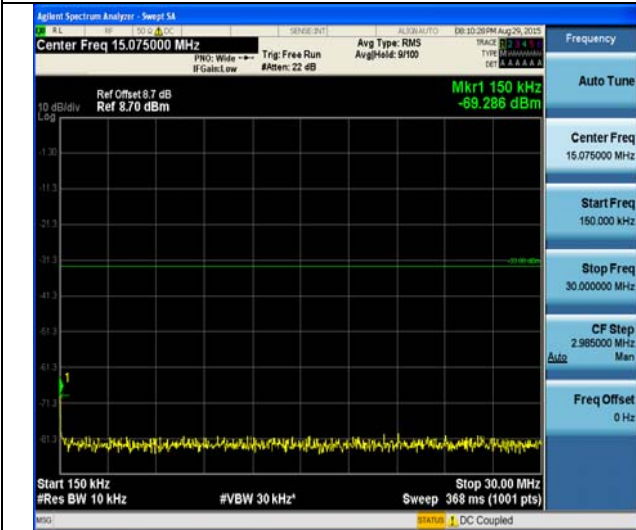
QPSK

16QAM



9KHz~150KHz

9KHz~150KHz



150KHz~30MHz

150KHz~30MHz



30MHz~26.5GHz

30MHz~26.5GHz

1RB#0

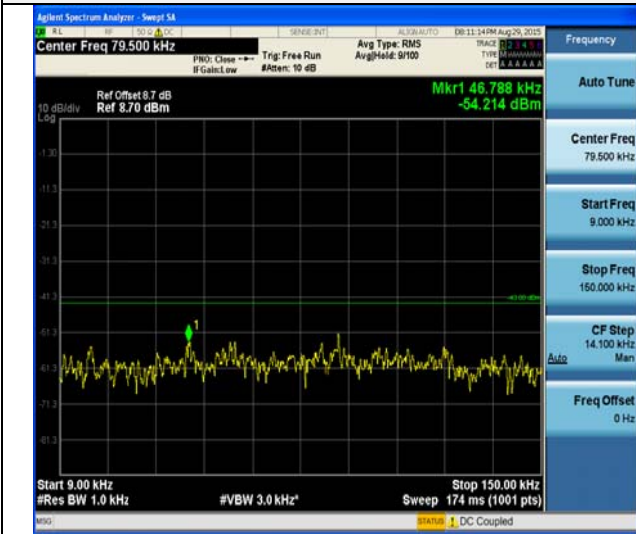
1RB#0

LTE FDD Band 5-10MHz Channel Bandwidth

Low Channel

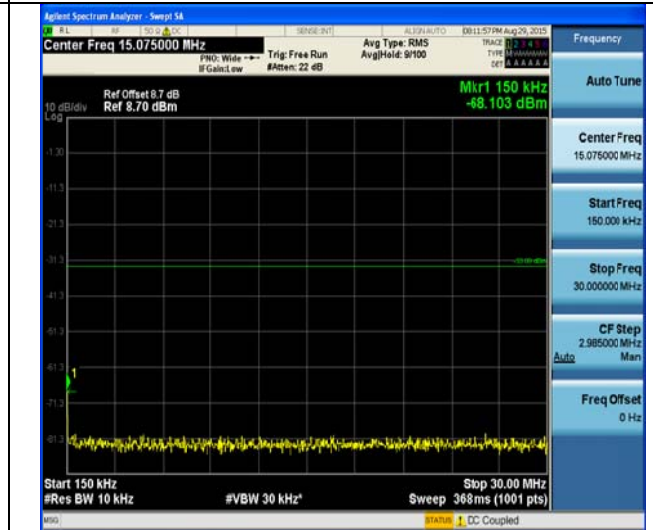
QPSK

16QAM



9KHz~150KHz

9KHz~150KHz



150KHz~30MHz

150KHz~30MHz



30MHz~26.5GHz

30MHz~26.5GHz

1RB#0

1RB#0

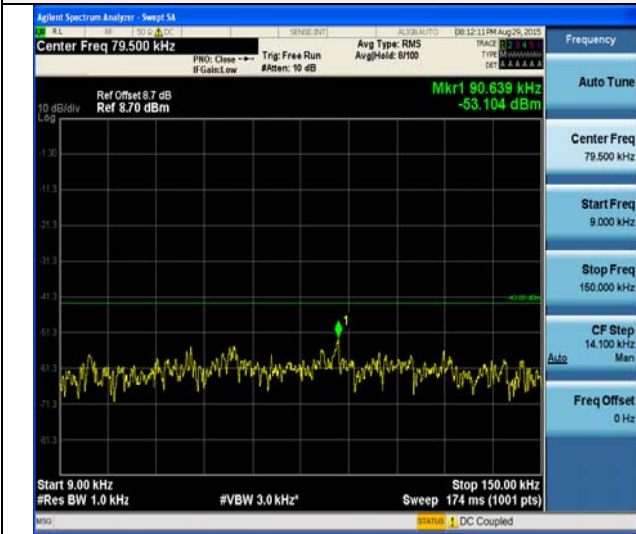


LTE FDD Band 5-10MHz Channel Bandwidth

Middle Channel

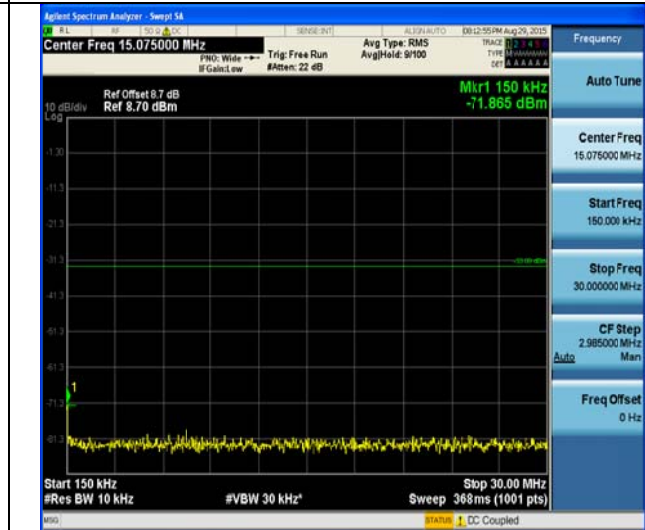
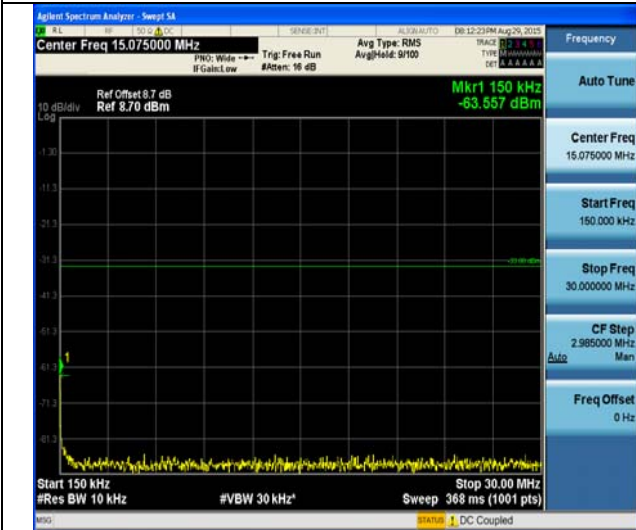
QPSK

16QAM



9KHz~150KHz

9KHz~150KHz



150KHz~30MHz

150KHz~30MHz



30MHz~26.5GHz

30MHz~26.5GHz

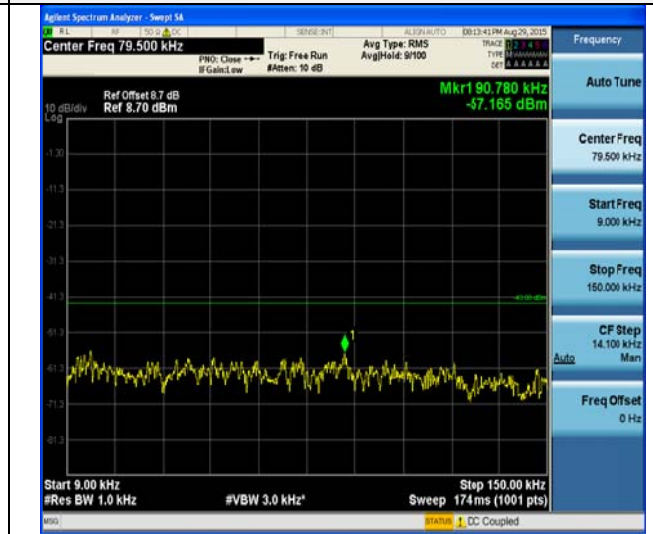
1RB#0

1RB#0

LTE FDD Band 5-10MHz Channel Bandwidth  
High Channel

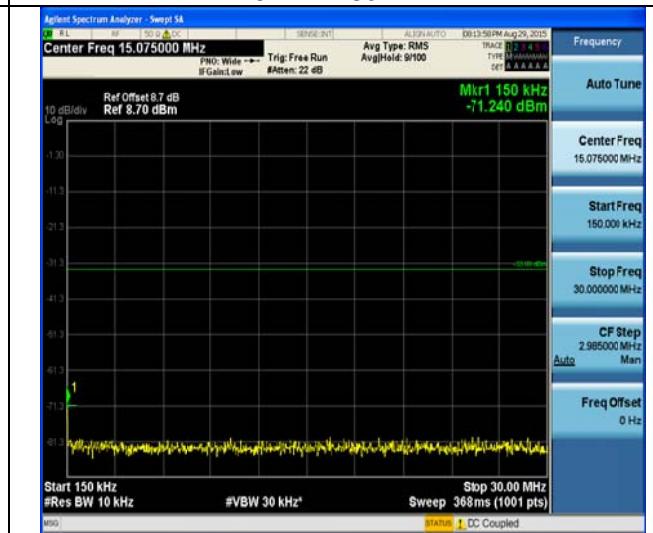
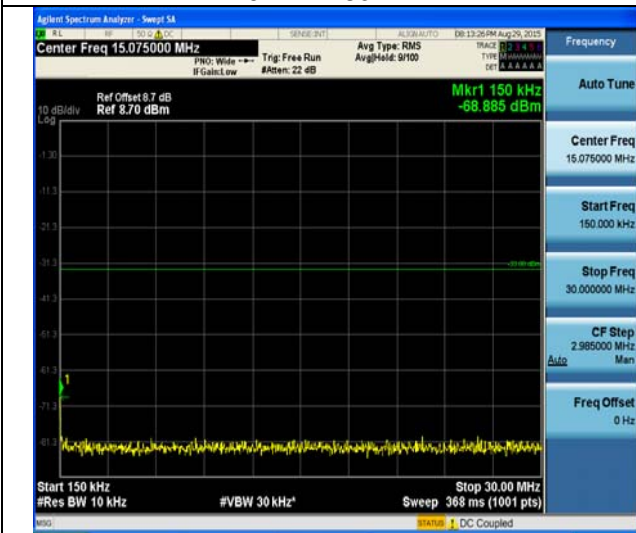
QPSK

16QAM



9KHz~150KHz

9KHz~150KHz



150KHz~30MHz

150KHz~30MHz



30MHz~26.5GHz

30MHz~26.5GHz

1RB#0

1RB#0



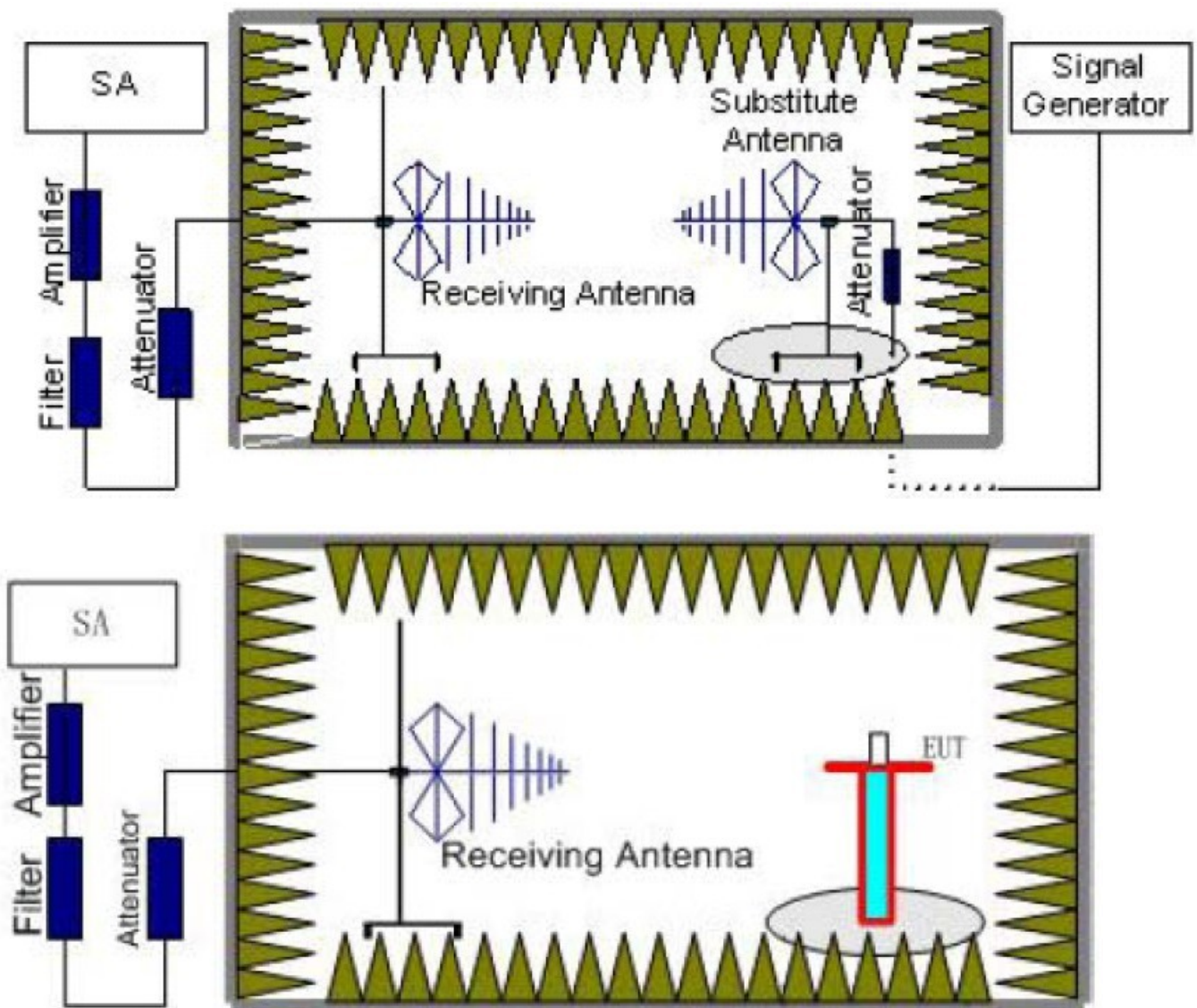
## 4.6. Radiated Spurious Emission

### TEST APPLICABLE

According to Part §22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

### TEST CONFIGURATION



### TEST PROCEDURE

1. EUT was placed on a 0.80 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 0.80m. Detected emissions were maximized at each frequency by rotating the EUT through  $360^\circ$  and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated

through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz, And the maximum value of the receiver should be recorded as (P<sub>r</sub>).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P<sub>Mea</sub>) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P<sub>r</sub>). The power of signal source (P<sub>Mea</sub>) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P<sub>cl</sub>), the Substitution Antenna Gain (G<sub>a</sub>) and the Amplifier Gain (P<sub>Ag</sub>) should be recorded after test.  
The measurement results are obtained as described below:  
Power(EIRP)=P<sub>Mea</sub>- P<sub>Ag</sub> - P<sub>cl</sub> + G<sub>a</sub>
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.
8. In order to make sure test results more clearly,we set frequency range and sweep time for difference frequency range as follows table:

| Working Frequency | Subrange (GHz) | RBW    | VBW    | Sweep time (s) |
|-------------------|----------------|--------|--------|----------------|
| LTE FDD Band 5    | 0.00009~0.15   | 1KHz   | 3KHz   | 30             |
|                   | 0.00015~0.03   | 10KHz  | 30KHz  | 10             |
|                   | 0.03~1         | 100KHz | 300KHz | 10             |
|                   | 1~2            | 1 MHz  | 3 MHz  | 2              |
|                   | 2~5            | 1 MHz  | 3 MHz  | 3              |
|                   | 5~8            | 1 MHz  | 3 MHz  | 3              |
|                   | 8~9            | 1 MHz  | 3 MHz  | 3              |

**TEST LIMITS**

According to 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

| Frequency      | Channel | Frequency Range | Verdict |
|----------------|---------|-----------------|---------|
| LTE FDD Band 5 | Low     | 9KHz -9GHz      | PASS    |
|                | Middle  | 9KHz -9GHz      | PASS    |
|                | High    | 9KHz -9GHz      | PASS    |

Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case for each Channel Bandwidth of LTE FDD Band 5.
2. EIRP=P<sub>Mea</sub>(dBm)-P<sub>cl</sub>(dB) +G<sub>a</sub>(dBi)
3. We were not recorded other points as values lower than limits.
4. Margin = Limit - EIRP

LTE FDD Band 5\_Channel Bandwidth 1.4MHz\_QPSK\_Low Channel

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|-----------------|-------------|-------------|--------------|
| 1649.4          | -38.28     | 3.00     | 3.00     | 9.58                | -31.70          | -13.00      | 18.70       | H            |
| 2474.1          | -43.22     | 3.03     | 3.00     | 10.72               | -35.53          | -13.00      | 22.53       | H            |
| 1649.4          | -47.67     | 3.00     | 3.00     | 9.68                | -40.99          | -13.00      | 27.99       | V            |
| 2474.1          | -51.04     | 3.03     | 3.00     | 10.72               | -43.35          | -13.00      | 30.35       | V            |

*LTE FDD Band 5\_Channel Bandwidth 1.4MHz\_QPSK\_Middle Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1673.0          | -35.82     | 3.00     | 3.00     | 9.58                | -29.24     | -13.00      | 16.24       | H            |
| 2509.5          | -40.15     | 3.03     | 3.00     | 10.72               | -32.46     | -13.00      | 19.46       | H            |
| 1673.0          | -46.54     | 3.00     | 3.00     | 9.68                | -39.86     | -13.00      | 26.86       | V            |
| 2509.5          | -48.96     | 3.03     | 3.00     | 10.72               | -41.27     | -13.00      | 28.27       | V            |

*LTE FDD Band 5\_Channel Bandwidth 1.4MHz\_QPSK\_High Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1696.6          | -41.45     | 3.00     | 3.00     | 9.58                | -34.87     | -13.00      | 21.87       | H            |
| 2544.9          | -46.05     | 3.03     | 3.00     | 10.72               | -38.36     | -13.00      | 25.36       | H            |
| 1696.6          | -51.24     | 3.00     | 3.00     | 9.68                | -44.56     | -13.00      | 31.56       | V            |
| 2544.9          | -54.71     | 3.03     | 3.00     | 10.72               | -47.02     | -13.00      | 34.02       | V            |

*LTE FDD Band 5\_Channel Bandwidth 3MHz\_QPSK\_Low Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|-----------------|-------------|-------------|--------------|
| 1651.0          | -37.70     | 3.00     | 3.00     | 9.58                | -31.12          | -13.00      | 18.12       | H            |
| 2476.5          | -42.14     | 3.03     | 3.00     | 10.72               | -34.45          | -13.00      | 21.45       | H            |
| 1651.0          | -46.37     | 3.00     | 3.00     | 9.68                | -39.69          | -13.00      | 26.69       | V            |
| 2476.5          | -50.55     | 3.03     | 3.00     | 10.72               | -42.86          | -13.00      | 29.86       | V            |

*LTE FDD Band 5\_Channel Bandwidth 3MHz\_QPSK\_Middle Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1673.0          | -36.04     | 3.00     | 3.00     | 9.58                | -29.46     | -13.00      | 16.46       | H            |
| 2509.5          | -40.52     | 3.03     | 3.00     | 10.72               | -32.83     | -13.00      | 19.83       | H            |
| 1673.0          | -46.65     | 3.00     | 3.00     | 9.68                | -39.97     | -13.00      | 26.97       | V            |
| 2509.5          | -49.64     | 3.03     | 3.00     | 10.72               | -41.95     | -13.00      | 28.95       | V            |

*LTE FDD Band 5\_Channel Bandwidth 3MHz\_QPSK\_High Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1695.0          | -41.17     | 3.00     | 3.00     | 9.58                | -34.59     | -13.00      | 21.59       | H            |
| 2542.5          | -45.95     | 3.03     | 3.00     | 10.72               | -38.26     | -13.00      | 25.26       | H            |
| 1695.0          | -50.79     | 3.00     | 3.00     | 9.68                | -44.11     | -13.00      | 31.11       | V            |
| 2542.5          | -54.30     | 3.03     | 3.00     | 10.72               | -46.61     | -13.00      | 33.61       | V            |

*LTE FDD Band 5\_Channel Bandwidth 5MHz\_QPSK\_Low Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|-----------------|-------------|-------------|--------------|
| 1653.0          | -37.54     | 3.00     | 3.00     | 9.58                | -30.96          | -13.00      | -37.54      | H            |
| 2479.5          | -42.03     | 3.03     | 3.00     | 10.72               | -34.34          | -13.00      | -42.03      | H            |
| 1653.0          | -45.90     | 3.00     | 3.00     | 9.68                | -39.22          | -13.00      | -45.90      | V            |
| 2479.5          | -50.12     | 3.03     | 3.00     | 10.72               | -42.43          | -13.00      | -50.12      | V            |

*LTE FDD Band 5\_Channel Bandwidth 5MHz\_QPSK\_Middle Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1673.0          | -35.35     | 3.00     | 3.00     | 9.58                | -28.77     | -13.00      | 15.77       | H            |
| 2509.5          | -38.73     | 3.03     | 3.00     | 10.72               | -31.04     | -13.00      | 18.04       | H            |
| 1673.0          | -46.21     | 3.00     | 3.00     | 9.68                | -39.53     | -13.00      | 26.53       | V            |
| 2509.5          | -48.87     | 3.03     | 3.00     | 10.72               | -41.18     | -13.00      | 28.18       | V            |

*LTE FDD Band 5\_Channel Bandwidth 5MHz\_QPSK\_High Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1693.0          | -40.74     | 3.00     | 3.00     | 9.58                | -34.16     | -13.00      | 21.16       | H            |
| 2539.5          | -45.71     | 3.03     | 3.00     | 10.72               | -38.02     | -13.00      | 25.02       | H            |
| 1693.0          | -50.47     | 3.00     | 3.00     | 9.68                | -43.79     | -13.00      | 30.79       | V            |
| 2539.5          | -53.95     | 3.03     | 3.00     | 10.72               | -46.26     | -13.00      | 33.26       | V            |

*LTE FDD Band 5\_Channel Bandwidth 10MHz\_QPSK\_Low Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|-----------------|-------------|-------------|--------------|
| 1658.0          | -37.12     | 3.00     | 3.00     | 9.58                | -30.54          | -13.00      | 17.54       | H            |
| 2487.0          | -41.80     | 3.03     | 3.00     | 10.72               | -34.11          | -13.00      | 21.11       | H            |
| 1658.0          | -45.84     | 3.00     | 3.00     | 9.68                | -39.16          | -13.00      | 26.16       | V            |
| 2487.0          | -50.02     | 3.03     | 3.00     | 10.72               | -42.33          | -13.00      | 29.33       | V            |

*LTE FDD Band 5\_Channel Bandwidth 10MHz\_QPSK\_Middle Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1673.0          | -36.51     | 3.00     | 3.00     | 9.58                | -29.93     | -13.00      | 16.93       | H            |
| 2509.5          | -39.98     | 3.03     | 3.00     | 10.72               | -32.29     | -13.00      | 19.29       | H            |
| 1673.0          | -49.03     | 3.00     | 3.00     | 9.68                | -42.35     | -13.00      | 29.35       | V            |
| 2509.5          | -53.35     | 3.03     | 3.00     | 10.72               | -45.66     | -13.00      | 32.66       | V            |

*LTE FDD Band 5\_Channel Bandwidth 10MHz\_QPSK\_High Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1688.0          | -40.40     | 3.00     | 3.00     | 9.58                | -33.82     | -13.00      | 20.82       | H            |
| 2532.0          | -45.00     | 3.03     | 3.00     | 10.72               | -37.31     | -13.00      | 24.31       | H            |
| 1688.0          | -50.07     | 3.00     | 3.00     | 9.68                | -43.39     | -13.00      | 30.39       | V            |
| 2532.0          | -53.31     | 3.03     | 3.00     | 10.72               | -45.62     | -13.00      | 32.62       | V            |

*LTE FDD Band 5\_Channel Bandwidth 1.4MHz\_16QAM\_Low Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|-----------------|-------------|-------------|--------------|
| 1649.4          | -38.69     | 3.00     | 3.00     | 9.58                | -32.11          | -13.00      | 19.11       | H            |
| 2474.1          | -43.65     | 3.03     | 3.00     | 10.72               | -35.96          | -13.00      | 22.96       | H            |
| 1649.4          | -44.72     | 3.00     | 3.00     | 9.68                | -38.04          | -13.00      | 25.04       | V            |
| 2474.1          | -50.64     | 3.03     | 3.00     | 10.72               | -42.95          | -13.00      | 29.95       | V            |

*LTE FDD Band 5\_Channel Bandwidth 1.4MHz\_16QAM\_Middle Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1673.0          | -36.58     | 3.00     | 3.00     | 9.58                | -30.00     | -13.00      | 17.00       | H            |
| 2509.5          | -40.02     | 3.03     | 3.00     | 10.72               | -32.33     | -13.00      | 19.33       | H            |
| 1673.0          | -47.33     | 3.00     | 3.00     | 9.68                | -40.65     | -13.00      | 27.65       | V            |
| 2509.5          | -49.93     | 3.03     | 3.00     | 10.72               | -42.24     | -13.00      | 29.24       | V            |

*LTE FDD Band 5\_Channel Bandwidth 1.4MHz\_16QAM\_High Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1696.6          | -41.84     | 3.00     | 3.00     | 9.58                | -35.26     | -13.00      | 22.26       | H            |
| 2544.9          | -46.61     | 3.03     | 3.00     | 10.72               | -38.92     | -13.00      | 25.92       | H            |
| 1696.6          | -51.67     | 3.00     | 3.00     | 9.68                | -44.99     | -13.00      | 31.99       | V            |
| 2544.9          | -54.31     | 3.03     | 3.00     | 10.72               | -46.62     | -13.00      | 33.62       | V            |

*LTE FDD Band 5\_Channel Bandwidth 3MHz\_16QAM\_ Low Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|-----------------|-------------|-------------|--------------|
| 1651.0          | -38.42     | 3.00     | 3.00     | 9.58                | -31.84          | -13.00      | 18.84       | H            |
| 2476.5          | -41.81     | 3.03     | 3.00     | 10.72               | -34.12          | -13.00      | 21.12       | H            |
| 1651.0          | -47.35     | 3.00     | 3.00     | 9.68                | -40.67          | -13.00      | 27.67       | V            |
| 2476.5          | -51.01     | 3.03     | 3.00     | 10.72               | -43.32          | -13.00      | 30.32       | V            |

*LTE FDD Band 5\_Channel Bandwidth 3MHz\_16QAM\_ Middle Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1673.0          | -35.92     | 3.00     | 3.00     | 9.58                | -29.34     | -13.00      | 16.34       | H            |
| 2509.5          | -39.73     | 3.03     | 3.00     | 10.72               | -32.04     | -13.00      | 19.04       | H            |
| 1673.0          | -46.06     | 3.00     | 3.00     | 9.68                | -39.38     | -13.00      | 26.38       | V            |
| 2509.5          | -49.27     | 3.03     | 3.00     | 10.72               | -41.58     | -13.00      | 28.58       | V            |

*LTE FDD Band 5\_Channel Bandwidth 3MHz\_16QAM\_ High Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1695.0          | -41.82     | 3.00     | 3.00     | 9.58                | -35.24     | -13.00      | 22.24       | H            |
| 2542.5          | -46.79     | 3.03     | 3.00     | 10.72               | -39.10     | -13.00      | 26.10       | H            |
| 1695.0          | -50.09     | 3.00     | 3.00     | 9.68                | -43.41     | -13.00      | 30.41       | V            |
| 2542.5          | -54.74     | 3.03     | 3.00     | 10.72               | -47.05     | -13.00      | 34.05       | V            |

*LTE FDD Band 5\_Channel Bandwidth 5MHz\_16QAM\_ Low Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|-----------------|-------------|-------------|--------------|
| 1653.0          | -37.89     | 3.00     | 3.00     | 9.58                | -31.31          | -13.00      | 18.31       | H            |
| 2479.5          | -42.75     | 3.03     | 3.00     | 10.72               | -35.06          | -13.00      | 22.06       | H            |
| 1653.0          | -46.42     | 3.00     | 3.00     | 9.68                | -39.74          | -13.00      | 26.74       | V            |
| 2479.5          | -49.90     | 3.03     | 3.00     | 10.72               | -42.21          | -13.00      | 29.21       | V            |

*LTE FDD Band 5\_Channel Bandwidth 5MHz\_16QAM\_ Middle Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1673.0          | -36.30     | 3.00     | 3.00     | 9.58                | -29.72     | -13.00      | 16.72       | H            |
| 2509.5          | -39.19     | 3.03     | 3.00     | 10.72               | -31.50     | -13.00      | 18.50       | H            |
| 1673.0          | -46.68     | 3.00     | 3.00     | 9.68                | -40.00     | -13.00      | 27.00       | V            |
| 2509.5          | -49.26     | 3.03     | 3.00     | 10.72               | -41.57     | -13.00      | 28.57       | V            |

*LTE FDD Band 5\_Channel Bandwidth 5MHz\_16QAM\_ High Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1693.0          | -41.20     | 3.00     | 3.00     | 9.58                | -34.62     | -13.00      | 21.62       | H            |
| 2539.5          | -46.10     | 3.03     | 3.00     | 10.72               | -38.41     | -13.00      | 25.41       | H            |
| 1693.0          | -50.87     | 3.00     | 3.00     | 9.68                | -44.19     | -13.00      | 31.19       | V            |
| 2539.5          | -53.85     | 3.03     | 3.00     | 10.72               | -46.16     | -13.00      | 33.16       | V            |

*LTE FDD Band 5\_Channel Bandwidth 10MHz\_16QAM\_ Low Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|-----------------|-------------|-------------|--------------|
| 1658.0          | -36.70     | 3.00     | 3.00     | 9.58                | -30.12          | -13.00      | 17.12       | H            |
| 2487.0          | -42.14     | 3.03     | 3.00     | 10.72               | -34.45          | -13.00      | 21.45       | H            |
| 1658.0          | -46.58     | 3.00     | 3.00     | 9.68                | -39.90          | -13.00      | 26.90       | V            |
| 2487.0          | -50.43     | 3.03     | 3.00     | 10.72               | -42.74          | -13.00      | 29.74       | V            |

*LTE FDD Band 5\_Channel Bandwidth 10MHz\_16QAM\_ Middle Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1673.0          | -37.45     | 3.00     | 3.00     | 9.58                | -30.87     | -13.00      | 17.87       | H            |
| 2509.5          | -40.35     | 3.03     | 3.00     | 10.72               | -32.66     | -13.00      | 19.66       | H            |
| 1673.0          | -49.60     | 3.00     | 3.00     | 9.68                | -42.92     | -13.00      | 29.92       | V            |
| 2509.5          | -53.59     | 3.03     | 3.00     | 10.72               | -45.90     | -13.00      | 32.90       | V            |

*LTE FDD Band 5\_Channel Bandwidth 10MHz\_16QAM\_ High Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Diatance | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------|----------|----------|---------------------|------------|-------------|-------------|--------------|
| 1688.0          | -40.44     | 3.00     | 3.00     | 9.58                | -33.86     | -13.00      | 20.86       | H            |
| 2532.0          | -45.35     | 3.03     | 3.00     | 10.72               | -37.66     | -13.00      | 24.66       | H            |
| 1688.0          | -50.48     | 3.00     | 3.00     | 9.68                | -43.80     | -13.00      | 30.80       | V            |
| 2532.0          | -53.52     | 3.03     | 3.00     | 10.72               | -45.83     | -13.00      | 32.83       | V            |

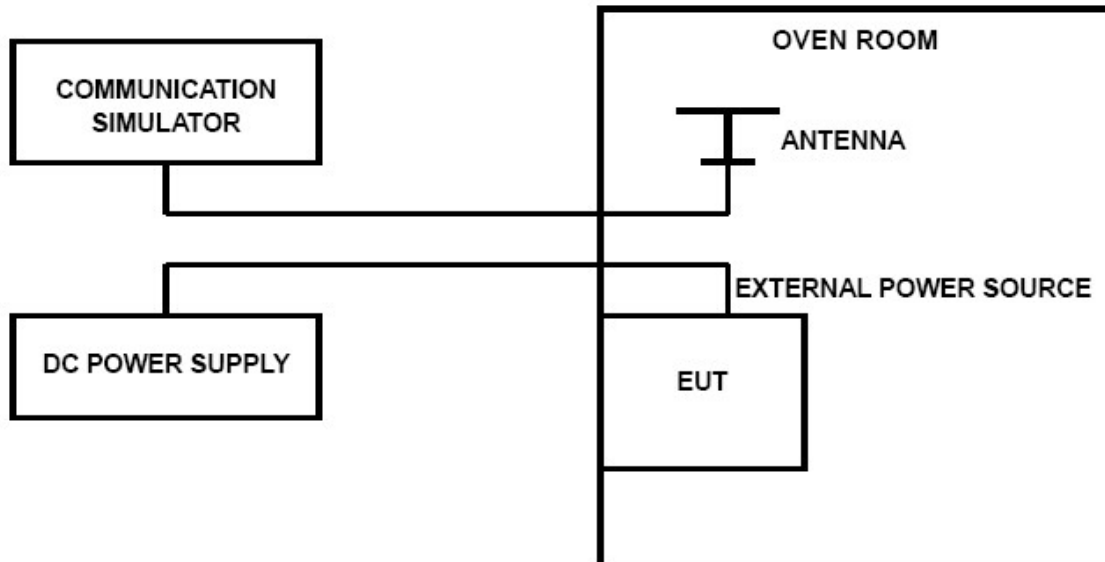


## 4.7. Frequency Stability under Temperature & Voltage Variations

### LIMIT

According to §22.917, §2.1055 requirement, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation and should not exceed 2.5ppm.

### 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 5, 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:*

1. We tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case.

LTE Band 5, 1.4MHz bandwidth (worst case of all bandwidths)

***Frequency Error vs Voltage***

| Voltage<br>(V) | Frequency error (Hz) |       | Frequency error (ppm) |           | Limit<br>(ppm) |
|----------------|----------------------|-------|-----------------------|-----------|----------------|
|                | QPSK                 | 16QAM | QPSK                  | 16QAM     |                |
| 3.40           | 6.72                 | 1.30  | 0.008035              | 0.001552  | 2.50           |
| 3.70           | 9.61                 | -1.01 | 0.011493              | -0.001205 | 2.50           |
| 4.20           | 7.98                 | -5.23 | 0.009539              | -0.006255 | 2.50           |

***Frequency Error vs Temperature***

| Temperature<br>(°C) | Frequency error (Hz) |       | Frequency error (ppm) |           | Limit<br>(ppm) |
|---------------------|----------------------|-------|-----------------------|-----------|----------------|
|                     | QPSK                 | 16QAM | QPSK                  | 16QAM     |                |
| -30°                | -7.05                | -8.40 | -0.008427             | -0.010040 | 2.50           |
| -20°                | 6.73                 | -6.48 | 0.008048              | -0.007743 | 2.50           |
| -10°                | -3.01                | 9.37  | -0.003596             | 0.011196  | 2.50           |
| 0°                  | -7.45                | 8.16  | -0.008908             | 0.009752  | 2.50           |
| 10°                 | -4.19                | -5.95 | -0.005005             | -0.007111 | 2.50           |
| 20°                 | 5.19                 | 2.31  | 0.006207              | 0.002761  | 2.50           |
| 30°                 | -7.55                | -2.60 | -0.009022             | -0.003110 | 2.50           |
| 40°                 | -1.11                | 1.17  | -0.001325             | 0.001394  | 2.50           |
| 50°                 | 6.70                 | -4.12 | 0.008013              | -0.002376 | 2.50           |

**5. Test Setup Photos of the EUT**

Please refer to separated files for Test Setup Photos of the EUT.

**6. External Photos of the EUT**

Please refer to separated files for External Photos of the EUT.

**7. Internal Photos of the EUT**

Please refer to separated files for Internal Photos of the EUT.

\*\*\*\*\* **End of Report** \*\*\*\*\*