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# TEST REPORT

## FCC Part 24 Subpart E

Report Reference No. .... : **CTL1706302041-WF03**

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**Product Name** ..... : Android All Mode Wireless Module

**Model/Type reference** ..... : M100-QVCX-2G16G

**List Model(s)**..... : See next page

**Trade Mark**..... : Temolin

**FCC ID**..... : 2AM5I-TML-M100

**Applicant's name** ..... : **Temolin Technology Co., Ltd**

**Address of applicant**..... : Room 311, Building B, No.125 TianShan Road West, ChangNing District, Shanghai City, China

**Test Firm**..... : **Shenzhen CTL Testing Technology Co., Ltd.**

**Address of Test Firm** ..... : Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055

**Test specification** ..... :

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

TRF Originator ..... : Shenzhen CTL Testing Technology Co., Ltd.

Master TRF ..... : Dated 2011-01

**Date of Receipt**..... : Jun. 23, 2017

**Date of Test Date**..... : Jun. 24, 2017–Jul. 11, 2017

**Data of Issue**..... : Jul. 12, 2017

**Result**..... : Pass

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# TEST REPORT

|                   |                    |               |
|-------------------|--------------------|---------------|
| Test Report No. : | CTL1706302041-WF03 | Jul. 12, 2017 |
|                   |                    | Date of issue |

Equipment under Test : Android All Mode Wireless Module

Model /Type : M100-QVCX-2G16G

Listed Models : M100-OVCX-1G8G, M100-OVCX-2G16G,  
M100-OVWX-1G8G, M100-OVWX-2G16G,  
M100-OVTX-1G8G, M100-OVTX-2G16G,  
M100-QVCX-1G8G, M100-QVCX-2G16G,  
M100-QVWX-1G8G, M100-QVWX-2G16G,  
M100-QVTX-1G8G, M100-QVTX-2G16G,  
M100-OWNX-1G8G, M100-OWNX-2G16G,  
M100-QWNX-1G8G, M100-QWNX-2G16G

Applicant : Temolin Technology Co., Ltd

Address : Room 311, Building B, No.125 TianShan Road West,  
ChangNing District, Shanghai City, China

Manufacturer : Temolin Technology Co., Ltd

Address : Room 311, Building B, No.125 TianShan Road West,  
ChangNing District, Shanghai City, China

|             |        |
|-------------|--------|
| Test result | Pass * |
|-------------|--------|

\*In the configuration tested, the EUT complied with the standards specified page 5.

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.

**\*\* Modified History \*\***

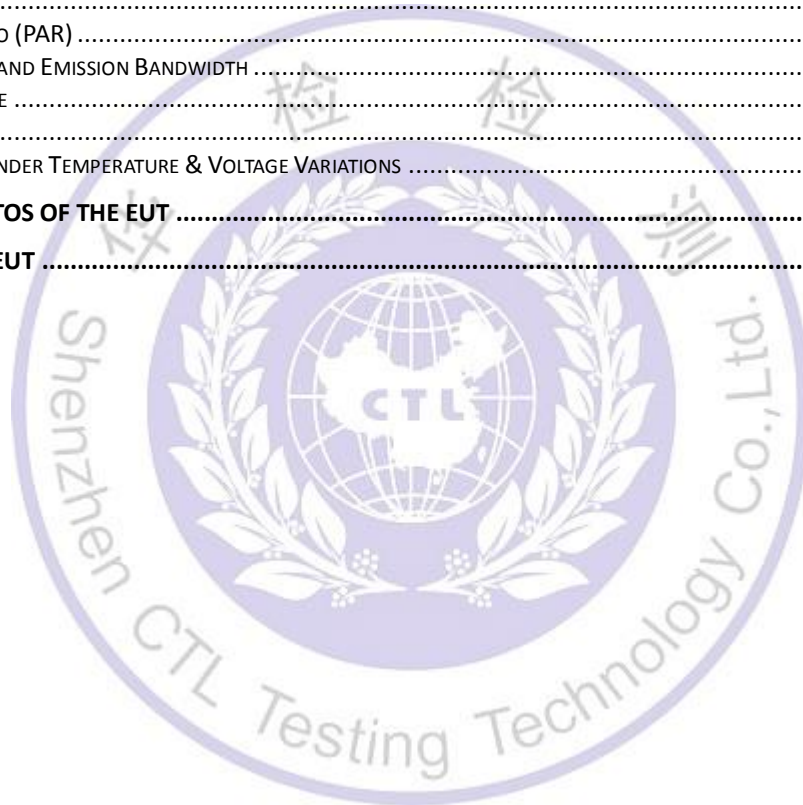
| Revisions   | Description                 | Issued Data | Report No.         | Remark   |
|-------------|-----------------------------|-------------|--------------------|----------|
| Version 1.0 | Initial Test Report Release | 2017-07-12  | CTL1706302041-WF03 | Tracy Qi |
|             |                             |             |                    |          |
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# 1. SUMMARY

## 1.1. TEST STANDARDS

The tests were performed according to following standards:

[FCC Part 24](#): PUBLIC MOBILE SERVICES

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

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

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

[ANSI C63.26-2015](#) American National Standard for Compliance Testing of Transmitters Used in Licensed Radio

## 1.2. Test Description

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



### 1.3. Test Facility

#### 1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

#### 1.3.2 Laboratory accreditation

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

##### IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

##### FCC-Registration No.: 970318

Shenzhen CTL Testing Technology 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 970318, December 19, 2013.

### 1.4. Statement of the measurement uncertainty

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

Hereafter the best measurement capability for CTL laboratory is reported:

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

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

## 2. GENERAL INFORMATION

### 2.1. Environmental conditions

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

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

### 2.2. General Description of EUT

|                       |   |
|-----------------------|---|
| Product Name:         | Android All Mode Wireless Module          |
| Model/Type reference: | M100-QVCX-2G16G                           |
| Power supply:         | DC 3.3V from host device                  |
| <b>LTE</b>            |   |
| Operation Band:       | FDD-LTE: Band 2/4/5/7<br>TDD-LTE: Band 41 |
| Modulation Type:      | QPSK, 16QAM                               |
| Release Version:      | Release 9                                 |
| Category:             | Cat 4                                     |
| Antenna Type:         | FPC antenna                               |

Note: For more details, refer to the user's manual of the EUT.

### 2.3. Description of Test Modes

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

### 2.4. Equipments Used during the Test

| Test Equipment      | Manufacturer         | Model No.          | Serial No. | Calibration Date | Calibration Due Date |
|---------------------|----------------------|--------------------|------------|------------------|----------------------|
| Bilog Antenna       | Sunol Sciences Corp. | JB1                | A061713    | 2017/06/02       | 2018/06/01           |
| Bilog Antenna       | Sunol Sciences Corp. | JB1                | A061714    | 2017/06/02       | 2018/06/01           |
| EMI Test Receiver   | R&S                  | ESCI               | 103710     | 2017/06/02       | 2018/06/01           |
| Spectrum Analyzer   | Agilent              | E4407B             | MY41440676 | 2017/05/21       | 2018/05/20           |
| Spectrum Analyzer   | Agilent              | N9020              | US46220290 | 2017/01/16       | 2018/01/17           |
| Controller          | EM Electronics       | Controller EM 1000 | N/A        | 2017/05/21       | 2018/05/20           |
| Horn Antenna        | Sunol Sciences Corp. | DRH-118            | A062013    | 2017/05/19       | 2018/05/18           |
| Horn Antenna        | Sunol Sciences Corp. | DRH-118            | A062014    | 2017/05/19       | 2018/05/18           |
| Active Loop Antenna | SCHWARZBEC K         | FMZB1519           | 1519-037   | 2017/05/19       | 2018/05/18           |
| Amplifier           | Agilent              | 8349B              | 3008A02306 | 2017/05/19       | 2018/05/18           |
| Amplifier           | Agilent              | 8447D              | 2944A10176 | 2017/05/19       | 2018/05/18           |

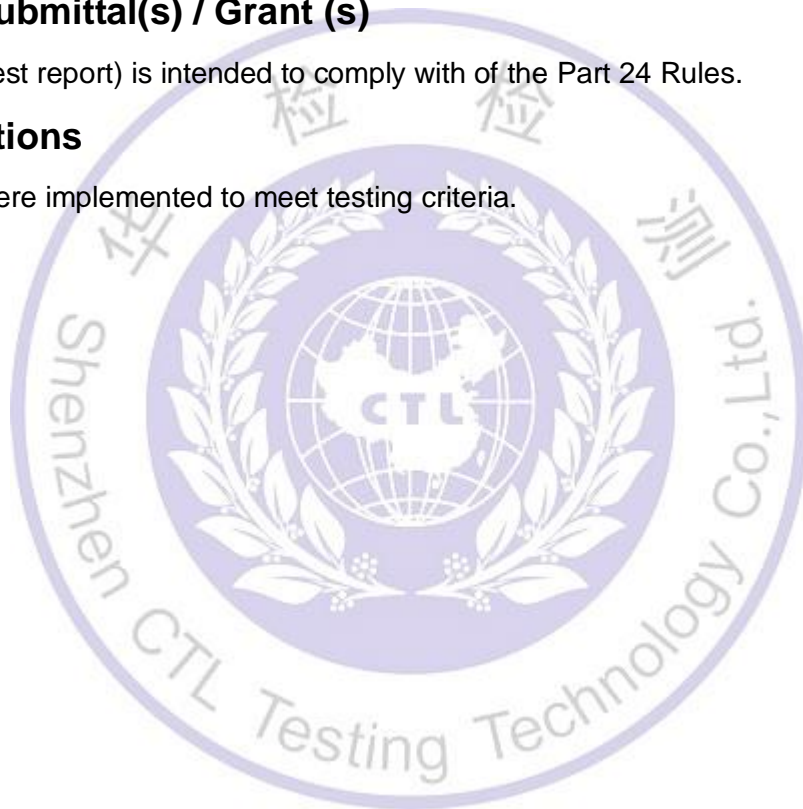
|                                     |              |                           |            |            |            |
|-------------------------------------|--------------|---------------------------|------------|------------|------------|
| Temperature/Humidity Meter          | Gangxing     | CTH-608                   | 02         | 2017/05/20 | 2018/05/19 |
| Wideband Radio Communication Tester | R&S          | CMW500                    | 101814     | 2016/11/21 | 2017/11/20 |
| High-Pass Filter                    | K&L          | 9SH10-2700/X1<br>2750-O/O | N/A        | 2017/05/20 | 2018/05/19 |
| High-Pass Filter                    | K&L          | 41H10-1375/U1<br>2750-O/O | N/A        | 2017/05/20 | 2018/05/19 |
| RF Cable                            | HUBER+SUHNER | RG214                     | N/A        | 2017/06/02 | 2018/06/01 |
| Climate Chamber                     | ESPEC        | EL-10KA                   | A20120523  | 2017/05/19 | 2018/05/18 |
| SIGNAL GENERATOR                    | Agilent      | E4421B                    | US40051744 | 2017/05/19 | 2018/05/18 |
| Directional Coupler                 | Agilent      | 87300B                    | 3116A03638 | 2017/05/19 | 2018/05/18 |

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

This submittal(s) (test report) is intended to comply with of the Part 24 Rules.

## 2.6. Modifications

No modifications were implemented to meet testing criteria.





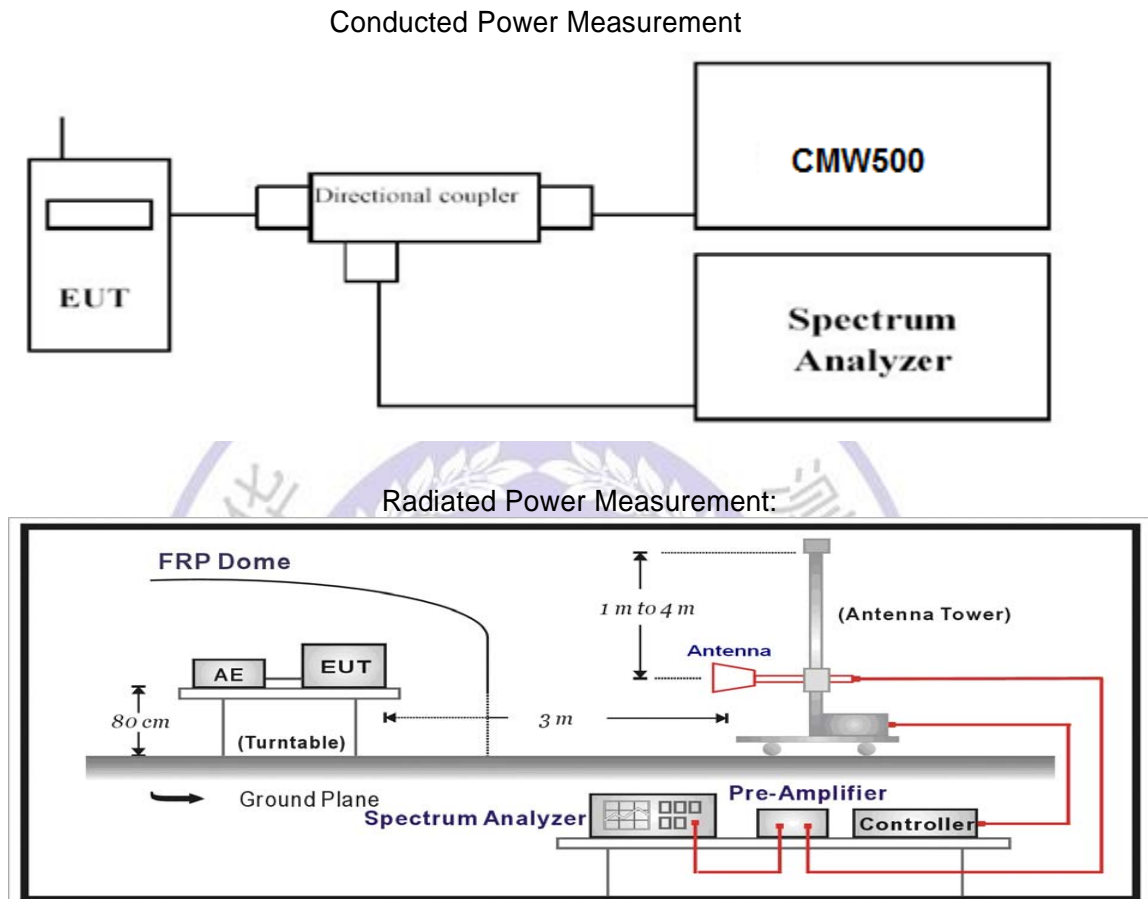
### 3. TEST CONDITIONS AND RESULTS

#### 3.1. Output Power

##### LIMIT

Rule Part 24.232(b) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p.

##### TEST CONFIGURATION



##### TEST PROCEDURE

The EUT was setup according to EIA/TIA 603D

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

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

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

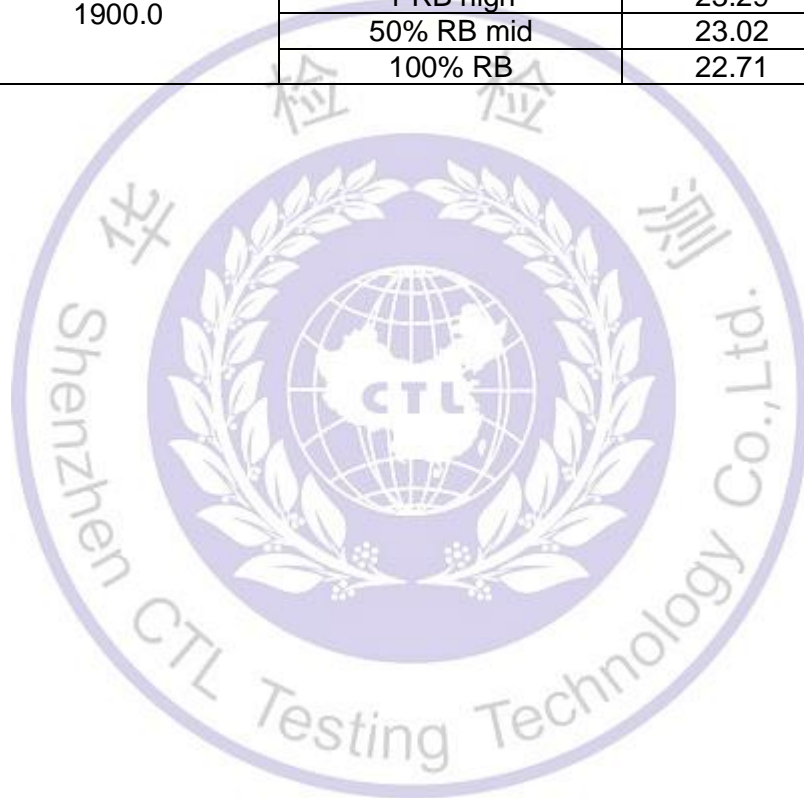
- The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
- The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
- The output of the test antenna shall be connected to the measuring receiver.

- d) The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- e) The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- f) The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- g) The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
- h) The maximum signal level detected by the measuring receiver shall be noted.
- i) The transmitter shall be replaced by a substitution antenna.
- j) The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
- k) The substitution antenna shall be connected to a calibrated signal generator.
- l) If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- m) The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
- n) The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
- o) The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
- p) The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
- q) Test site anechoic chamber refer to ANSI C63.4.

**TEST RESULTS****Conducted Measurement:**

| LTE FDD Band 2       |                 |                |                     |       |
|----------------------|-----------------|----------------|---------------------|-------|
| TX Channel Bandwidth | Frequency (MHz) | RB Size/Offset | Average Power [dBm] |       |
|                      |                 |                | QPSK                | 16QAM |
| 1.4 MHz              | 1850.7          | 1 RB low       | 21.90               | 21.07 |
|                      |                 | 1 RB high      | 21.75               | 21.09 |
|                      |                 | 50% RB mid     | 21.95               | 21.33 |
|                      |                 | 100% RB        | 23.37               | 22.62 |
|                      | 1880.0          | 1 RB low       | 23.39               | 22.87 |
|                      |                 | 1 RB high      | 22.24               | 21.72 |
|                      |                 | 50% RB mid     | 22.03               | 21.63 |
|                      |                 | 100% RB        | 23.39               | 22.98 |
|                      | 1909.3          | 1 RB low       | 22.28               | 21.87 |
|                      |                 | 1 RB high      | 22.71               | 22.12 |
|                      |                 | 50% RB mid     | 21.79               | 21.23 |
|                      |                 | 100% RB        | 22.01               | 21.63 |
| 3 MHz                | 1851.5          | 1 RB low       | 22.54               | 22.07 |
|                      |                 | 1 RB high      | 23.08               | 22.48 |
|                      |                 | 50% RB mid     | 21.72               | 21.36 |
|                      |                 | 100% RB        | 22.81               | 22.14 |
|                      | 1851.5          | 1 RB low       | 22.51               | 21.74 |
|                      |                 | 1 RB high      | 22.15               | 21.59 |
|                      |                 | 50% RB mid     | 22.29               | 21.86 |
|                      |                 | 100% RB        | 22.23               | 21.46 |
|                      | 1908.5          | 1 RB low       | 22.03               | 21.27 |
|                      |                 | 1 RB high      | 22.65               | 22.30 |
|                      |                 | 50% RB mid     | 23.26               | 22.59 |
|                      |                 | 100% RB        | 21.87               | 21.21 |
| 5 MHz                | 1852.5          | 1 RB low       | 21.79               | 20.97 |
|                      |                 | 1 RB high      | 23.17               | 22.56 |
|                      |                 | 50% RB mid     | 23.21               | 22.52 |
|                      |                 | 100% RB        | 22.85               | 22.17 |
|                      | 1880.0          | 1 RB low       | 23.17               | 22.62 |
|                      |                 | 1 RB high      | 21.75               | 21.29 |
|                      |                 | 50% RB mid     | 21.57               | 21.16 |
|                      |                 | 100% RB        | 21.93               | 21.48 |
|                      | 1907.5          | 1 RB low       | 23.29               | 22.54 |
|                      |                 | 1 RB high      | 21.50               | 20.82 |
|                      |                 | 50% RB mid     | 22.39               | 21.93 |
|                      |                 | 100% RB        | 22.96               | 22.41 |
| 10 MHz               | 1855.0          | 1 RB low       | 22.19               | 21.38 |
|                      |                 | 1 RB high      | 22.77               | 22.07 |
|                      |                 | 50% RB mid     | 23.15               | 22.67 |
|                      |                 | 100% RB        | 21.55               | 21.13 |
|                      | 1880.0          | 1 RB low       | 21.78               | 21.21 |
|                      |                 | 1 RB high      | 22.10               | 21.65 |
|                      |                 | 50% RB mid     | 23.04               | 22.22 |
|                      |                 | 100% RB        | 22.10               | 21.30 |
|                      | 1905.0          | 1 RB low       | 22.52               | 22.02 |
|                      |                 | 1 RB high      | 22.92               | 22.43 |
|                      |                 | 50% RB mid     | 22.20               | 21.84 |
|                      |                 | 100% RB        | 22.47               | 21.82 |
| 15 MHz               | 1857.5          | 1 RB low       | 23.14               | 22.69 |
|                      |                 | 1 RB high      | 22.39               | 21.59 |
|                      |                 | 50% RB mid     | 22.71               | 22.16 |
|                      |                 | 100% RB        | 22.68               | 22.21 |

|        |        |            |       |       |
|--------|--------|------------|-------|-------|
|        | 1880.0 | 1 RB low   | 22.52 | 21.68 |
|        |        | 1 RB high  | 22.32 | 21.54 |
|        |        | 50% RB mid | 22.90 | 22.29 |
|        |        | 100% RB    | 22.47 | 21.84 |
|        | 1902.5 | 1 RB low   | 22.52 | 21.80 |
|        |        | 1 RB high  | 23.43 | 22.67 |
|        |        | 50% RB mid | 22.48 | 22.09 |
|        |        | 100% RB    | 23.39 | 22.83 |
| 20 MHz | 1860.0 | 1 RB low   | 22.93 | 22.40 |
|        |        | 1 RB high  | 22.01 | 21.53 |
|        |        | 50% RB mid | 23.39 | 22.92 |
|        |        | 100% RB    | 23.05 | 22.61 |
|        | 1880.0 | 1 RB low   | 21.71 | 21.20 |
|        |        | 1 RB high  | 21.86 | 21.37 |
|        |        | 50% RB mid | 21.92 | 21.32 |
|        |        | 100% RB    | 21.84 | 21.30 |
|        | 1900.0 | 1 RB low   | 22.83 | 22.39 |
|        |        | 1 RB high  | 23.29 | 22.90 |
|        |        | 50% RB mid | 23.02 | 22.63 |
|        |        | 100% RB    | 22.71 | 22.09 |



**Radiated Measurement:**

Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2; recorded worst case for each Channel Bandwidth of LTE FDD Band 2.
2.  $EIRP = P_{Mea}(dBm) - P_{cl}(dB) + P_{Ag}(dB) + G_a(dBi)$

**LTE FDD Band 2\_Channel Bandwidth 1.4MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Ag</sub> (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|------------|-------------|-------------|--------------|
| 1850.7          | -18.27                 | 3.41                 | 10.23                           | 33.60                | 22.15      | 33.01       | 10.86       | V            |
| 1880.0          | -18.11                 | 3.49                 | 10.23                           | 33.60                | 22.23      | 33.01       | 10.78       | V            |
| 1909.3          | -17.89                 | 3.55                 | 10.25                           | 33.60                | 22.41      | 33.01       | 10.60       | V            |

**LTE FDD Band 2\_Channel Bandwidth 3MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Ag</sub> (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|------------|-------------|-------------|--------------|
| 1851.5          | -18.19                 | 3.41                 | 10.23                           | 33.60                | 22.23      | 33.01       | 10.78       | V            |
| 1880.0          | -17.56                 | 3.49                 | 10.23                           | 33.60                | 22.78      | 33.01       | 10.23       | V            |
| 1908.5          | -17.69                 | 3.55                 | 10.25                           | 33.60                | 22.61      | 33.01       | 10.40       | V            |

**LTE FDD Band 2\_Channel Bandwidth 5MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Ag</sub> (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|------------|-------------|-------------|--------------|
| 1852.5          | -18.31                 | 3.41                 | 10.23                           | 33.60                | 22.11      | 33.01       | 10.90       | V            |
| 1880.0          | -17.29                 | 3.49                 | 10.23                           | 33.60                | 23.05      | 33.01       | 9.96        | V            |
| 1907.5          | -18.05                 | 3.55                 | 10.25                           | 33.60                | 22.25      | 33.01       | 10.76       | V            |

**LTE FDD Band 2\_Channel Bandwidth 10MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Ag</sub> (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|------------|-------------|-------------|--------------|
| 1855.0          | -17.53                 | 3.41                 | 10.23                           | 33.60                | 22.89      | 33.01       | 10.12       | V            |
| 1880.0          | -17.80                 | 3.49                 | 10.23                           | 33.60                | 22.54      | 33.01       | 10.47       | V            |
| 1905.0          | -17.84                 | 3.55                 | 10.25                           | 33.60                | 22.46      | 33.01       | 10.55       | V            |

**LTE FDD Band 2\_Channel Bandwidth 15MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Ag</sub> (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|------------|-------------|-------------|--------------|
| 1857.5          | -17.79                 | 3.41                 | 10.23                           | 33.60                | 22.63      | 33.01       | 10.38       | V            |
| 1880.0          | -17.59                 | 3.49                 | 10.23                           | 33.60                | 22.75      | 33.01       | 10.26       | V            |
| 1902.5          | -17.74                 | 3.55                 | 10.25                           | 33.60                | 22.56      | 33.01       | 10.45       | V            |

**LTE FDD Band 2\_Channel Bandwidth 20MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Ag</sub> (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|------------|-------------|-------------|--------------|
| 1860.0          | -18.18                 | 3.41                 | 10.23                           | 33.60                | 22.24      | 33.01       | 10.77       | V            |
| 1880.0          | -17.78                 | 3.49                 | 10.23                           | 33.60                | 22.56      | 33.01       | 10.45       | V            |
| 1900.0          | -17.89                 | 3.55                 | 10.25                           | 33.60                | 22.41      | 33.01       | 10.60       | V            |



*LTE FDD Band 2\_Channel Bandwidth 1.4MHz\_16QAM*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Ag</sub> (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|------------|-------------|-------------|--------------|
| 1850.7          | -19.17                 | 3.41                 | 10.23                           | 33.60                | 21.25      | 33.01       | 11.76       | V            |
| 1880.0          | -18.89                 | 3.49                 | 10.23                           | 33.60                | 21.45      | 33.01       | 11.56       | V            |
| 1909.3          | -19.16                 | 3.55                 | 10.25                           | 33.60                | 21.14      | 33.01       | 11.87       | V            |

*LTE FDD Band 2\_Channel Bandwidth 3MHz\_16QAM*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Ag</sub> (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|------------|-------------|-------------|--------------|
| 1851.5          | -19.06                 | 3.41                 | 10.23                           | 33.60                | 21.36      | 33.01       | 11.65       | V            |
| 1880.0          | -18.89                 | 3.49                 | 10.23                           | 33.60                | 21.45      | 33.01       | 11.56       | V            |
| 1908.5          | -18.71                 | 3.55                 | 10.25                           | 33.60                | 21.59      | 33.01       | 11.42       | V            |

*LTE FDD Band 2\_Channel Bandwidth 5MHz\_16QAM*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Ag</sub> (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|------------|-------------|-------------|--------------|
| 1852.5          | -18.98                 | 3.41                 | 10.23                           | 33.60                | 21.44      | 33.01       | 11.57       | V            |
| 1880.0          | -18.76                 | 3.49                 | 10.23                           | 33.60                | 21.58      | 33.01       | 11.43       | V            |
| 1907.5          | -18.67                 | 3.55                 | 10.25                           | 33.60                | 21.63      | 33.01       | 11.38       | V            |

*LTE FDD Band 2\_Channel Bandwidth 10MHz\_16QAM*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Ag</sub> (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|------------|-------------|-------------|--------------|
| 1855.0          | -19.17                 | 3.41                 | 10.23                           | 33.60                | 21.25      | 33.01       | 11.76       | V            |
| 1880.0          | -18.30                 | 3.49                 | 10.23                           | 33.60                | 22.04      | 33.01       | 10.97       | V            |
| 1905.0          | -17.85                 | 3.55                 | 10.25                           | 33.60                | 22.45      | 33.01       | 10.56       | V            |

*LTE FDD Band 2\_Channel Bandwidth 15MHz\_16QAM*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Ag</sub> (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|------------|-------------|-------------|--------------|
| 1857.5          | -18.74                 | 3.41                 | 10.23                           | 33.60                | 21.68      | 33.01       | 11.33       | V            |
| 1880.0          | -18.76                 | 3.49                 | 10.23                           | 33.60                | 21.58      | 33.01       | 11.43       | V            |
| 1902.5          | -18.89                 | 3.55                 | 10.25                           | 33.60                | 21.41      | 33.01       | 11.60       | V            |

*LTE FDD Band 2\_Channel Bandwidth 20MHz\_16QAM*

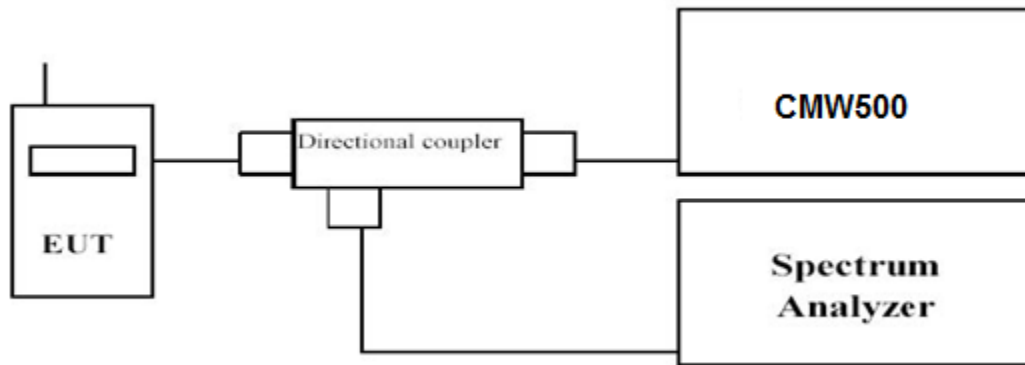
| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Ag</sub> (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|------------|-------------|-------------|--------------|
| 1860.0          | -19.19                 | 3.41                 | 10.23                           | 33.60                | 21.23      | 33.01       | 11.78       | V            |
| 1880.0          | -18.78                 | 3.49                 | 10.23                           | 33.60                | 21.56      | 33.01       | 11.45       | V            |
| 1900.0          | -18.82                 | 3.55                 | 10.25                           | 33.60                | 21.48      | 33.01       | 11.53       | V            |

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

#### LIMIT

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

#### TEST CONFIGURATION



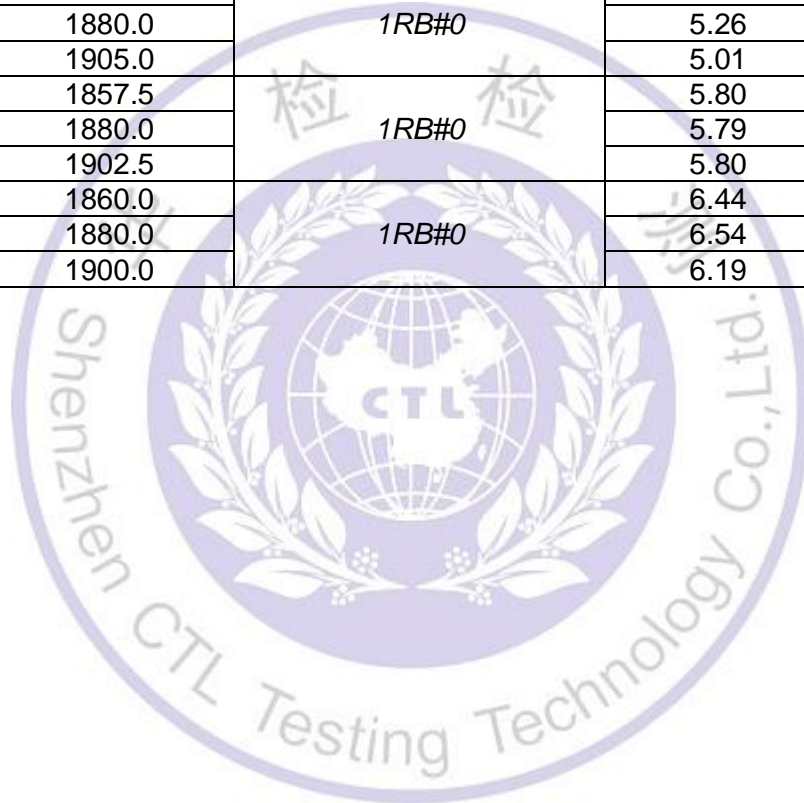
#### TEST PROCEDURE

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

**TEST RESULTS***Remark:*

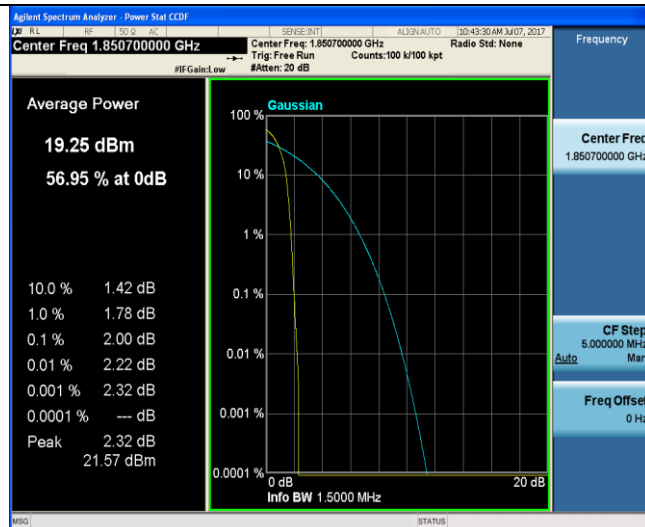
1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2; recorded worst case for each Channel Bandwidth of LTE FDD Band 2.

| LTE FDD Band 2       |                 |                |           |       |
|----------------------|-----------------|----------------|-----------|-------|
| TX Channel Bandwidth | Frequency (MHz) | RB Size/Offset | PAPR (dB) |       |
|                      |                 |                | QPSK      | 16QAM |
| 1.4 MHz              | 1850.7          | 1RB#0          | 2.00      | 2.36  |
|                      | 1880.0          |                | 2.35      | 2.46  |
|                      | 1909.3          |                | 2.09      | 2.51  |
| 3 MHz                | 1851.5          | 1RB#0          | 2.12      | 2.47  |
|                      | 1880.0          |                | 5.23      | 6.00  |
|                      | 1908.5          |                | 3.99      | 5.00  |
| 5 MHz                | 1852.5          | 1RB#0          | 3.77      | 4.70  |
|                      | 1880.0          |                | 4.89      | 5.80  |
|                      | 1907.5          |                | 3.78      | 4.86  |
| 10 MHz               | 1855.0          | 1RB#0          | 4.88      | 5.84  |
|                      | 1880.0          |                | 5.26      | 6.32  |
|                      | 1905.0          |                | 5.01      | 5.98  |
| 15 MHz               | 1857.5          | 1RB#0          | 5.80      | 6.67  |
|                      | 1880.0          |                | 5.79      | 6.87  |
|                      | 1902.5          |                | 5.80      | 6.55  |
| 20 MHz               | 1860.0          | 1RB#0          | 6.44      | 6.88  |
|                      | 1880.0          |                | 6.54      | 7.09  |
|                      | 1900.0          |                | 6.19      | 6.55  |

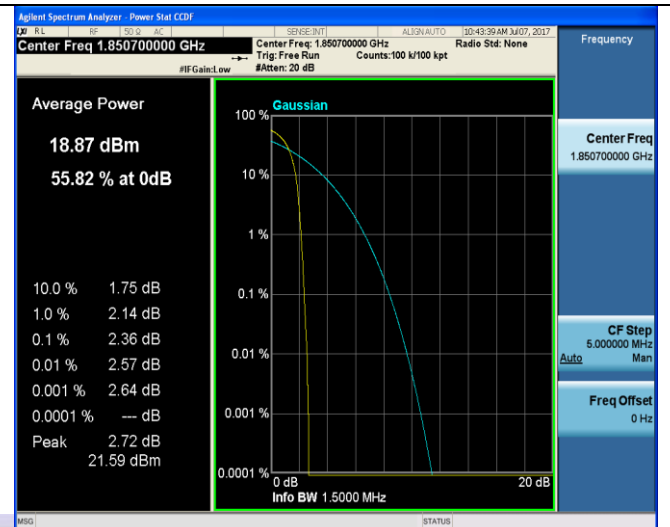


## LTE FDD Band 2-1.4MHz Channel Bandwidth PAPR

## QPSK



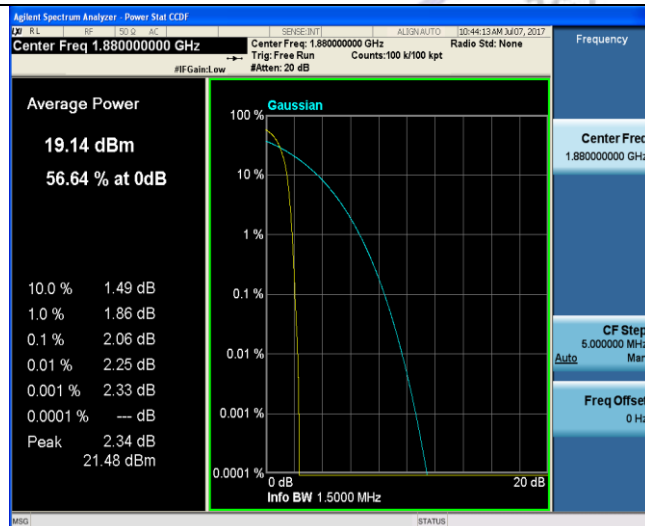
## 16QAM



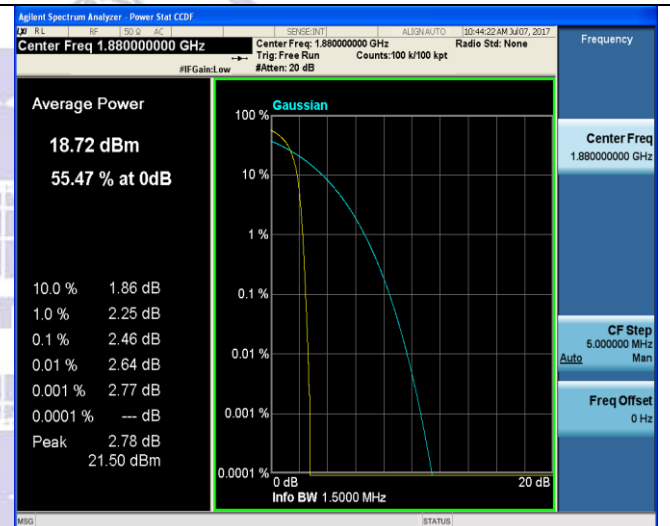
1RB#0

1RB#0

## Low Channel

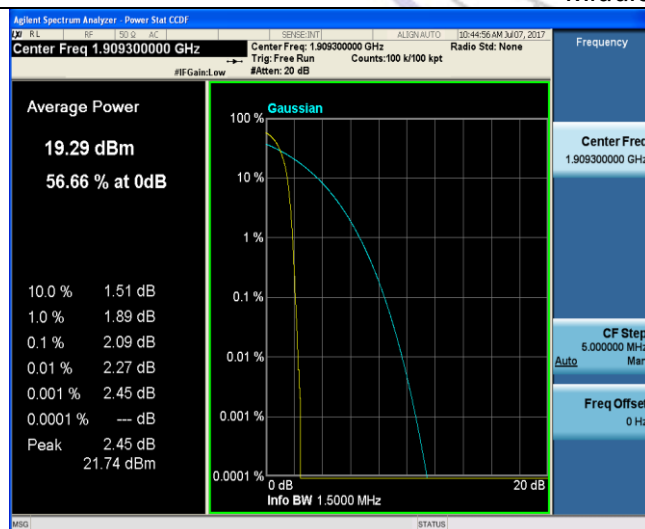


1RB#0

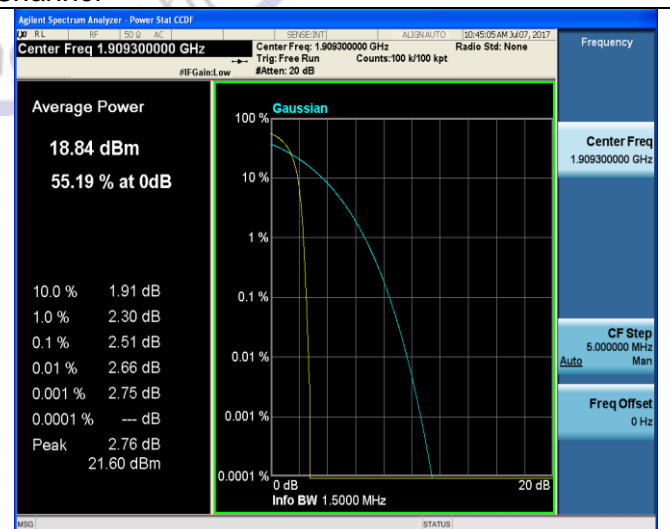


1RB#0

## Middle Channel

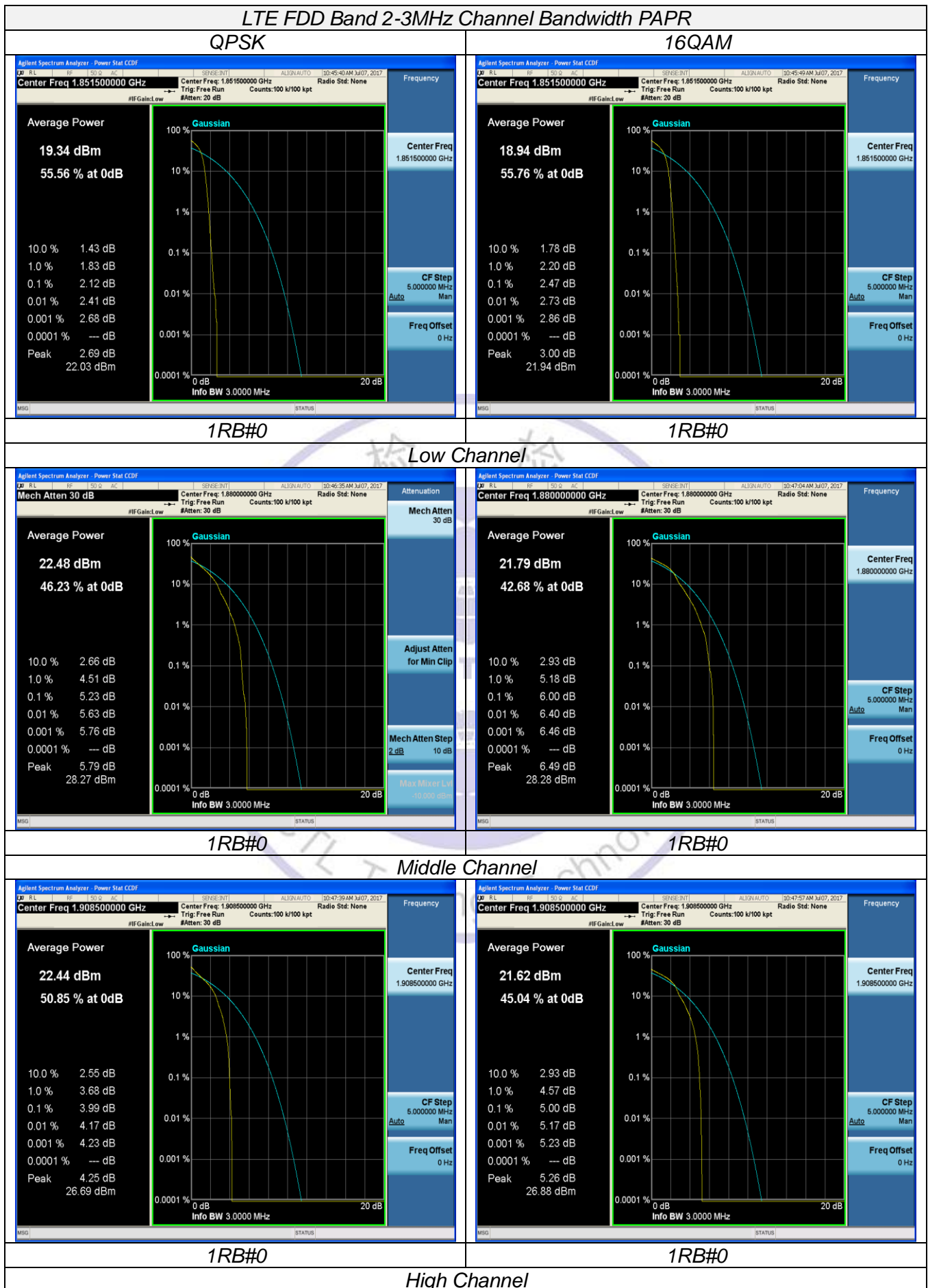


1RB#0



1RB#0

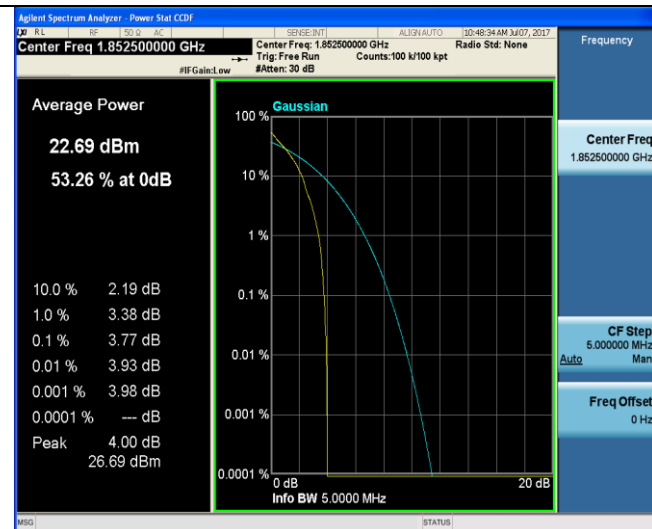
## High Channel



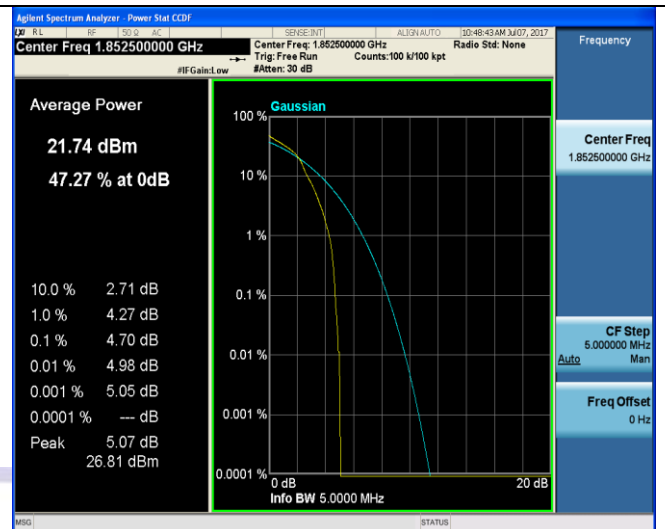


# LTE FDD Band 2-5MHz Channel Bandwidth PAPR

## QPSK



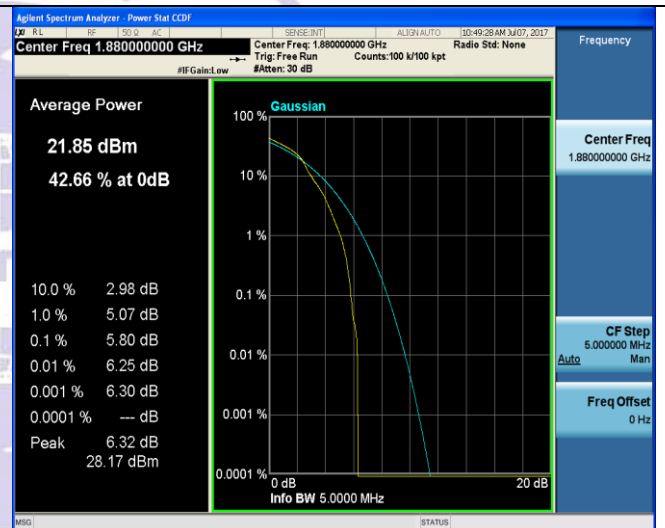
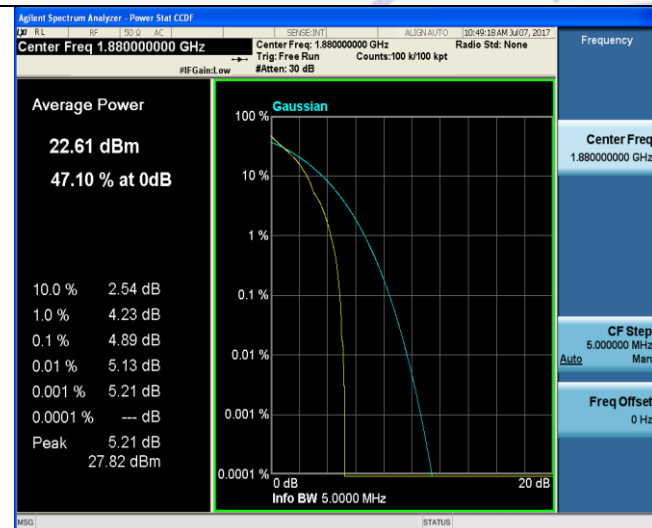
## 16QAM



## 1RB#0

## 1RB#0

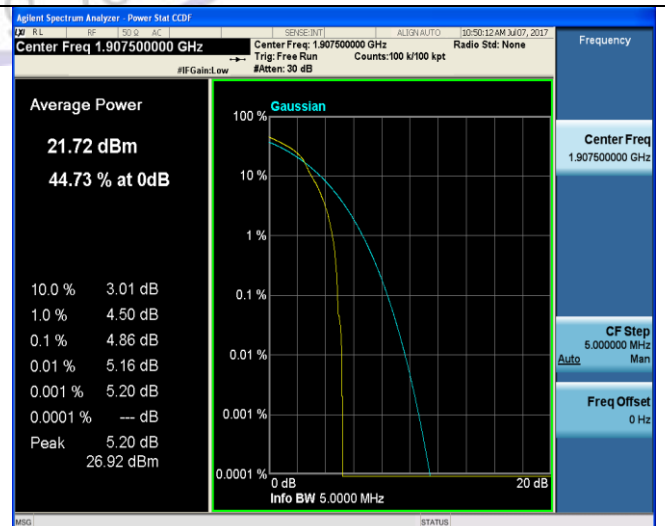
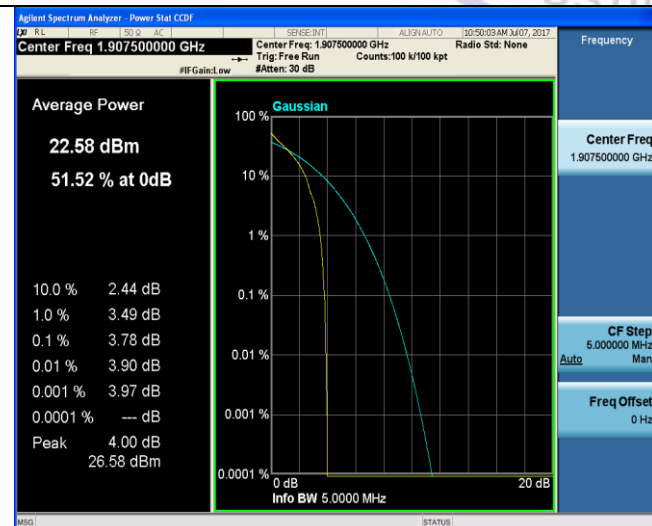
## Low Channel



## 1RB#0

## 1RB#0

## Middle Channel



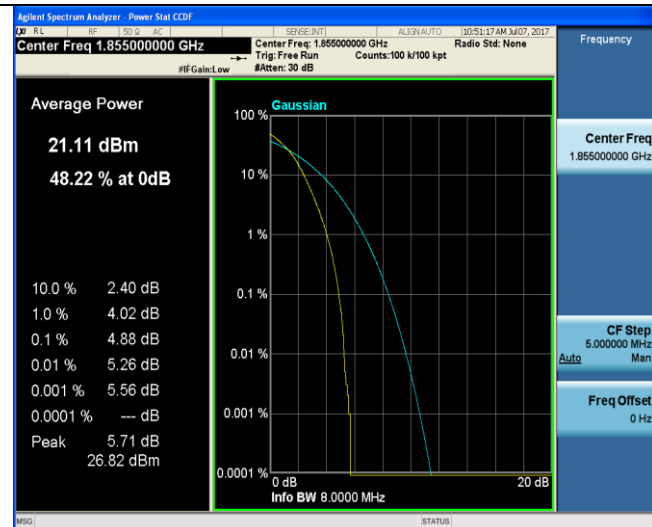
## 1RB#0

## 1RB#0

## High Channel

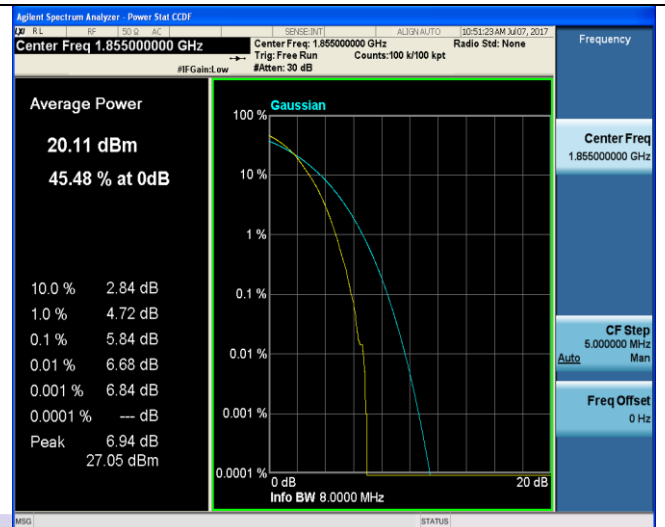
# LTE FDD Band 2-10MHz Channel Bandwidth PAPR

## QPSK



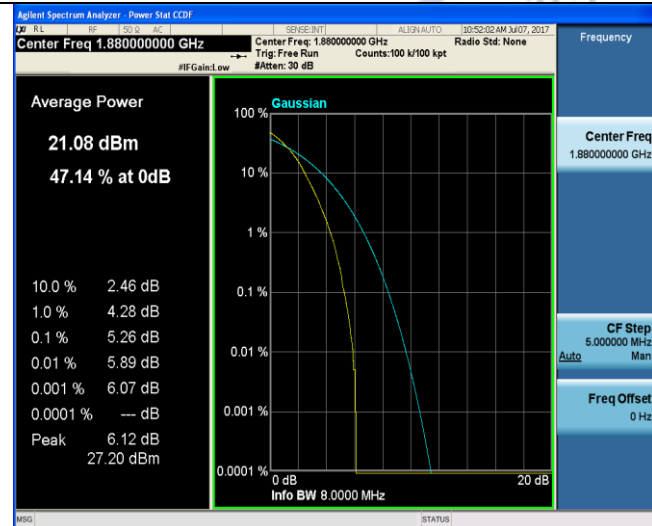
1RB#0

## 16QAM

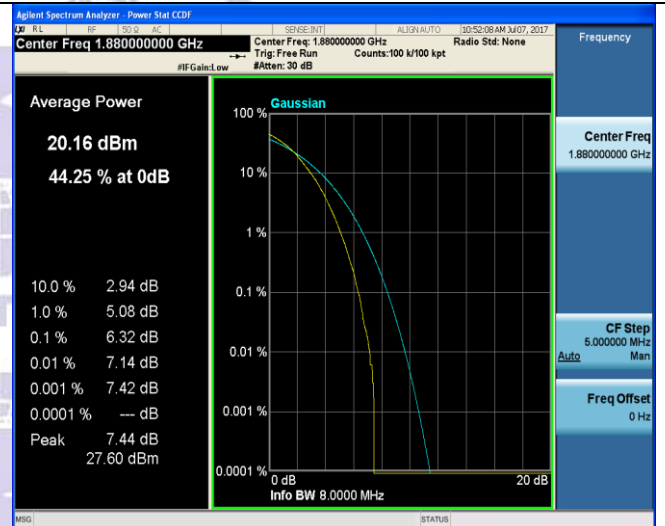


1RB#0

## Low Channel

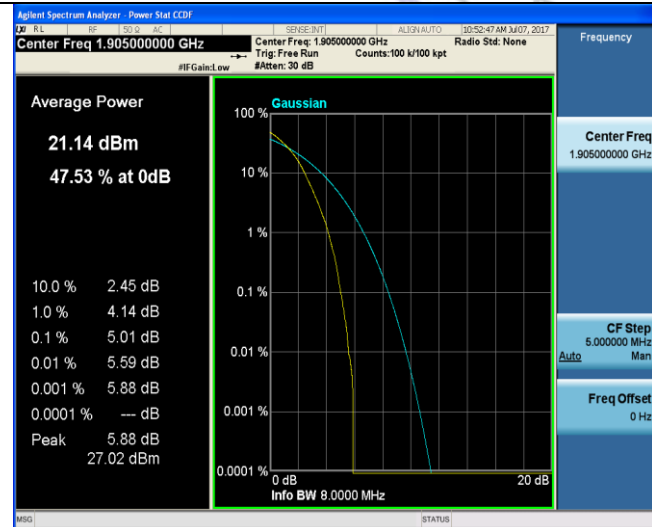


1RB#0

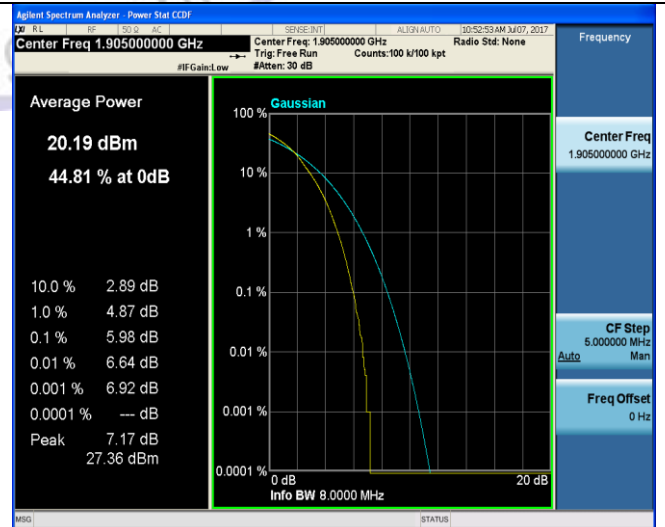


1RB#0

## Middle Channel



1RB#0

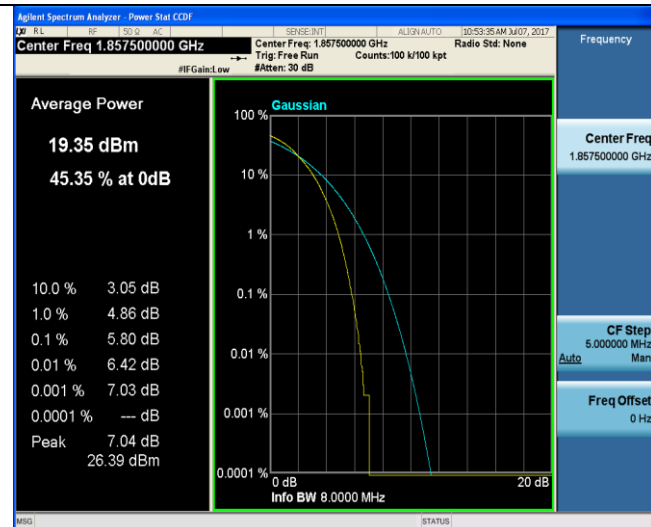


1RB#0

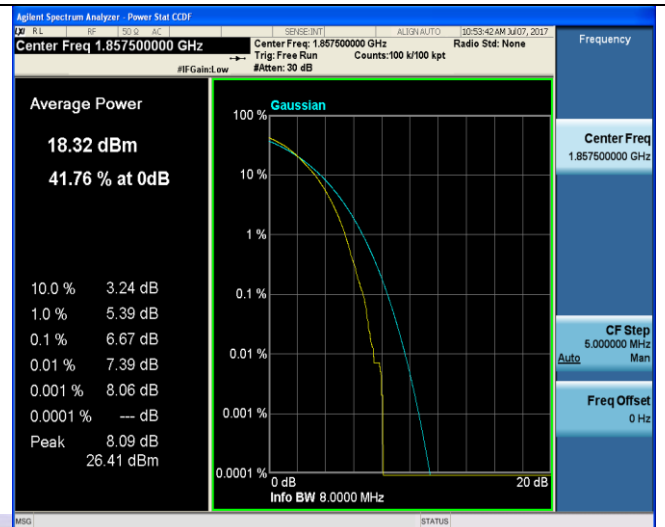
## High Channel

# LTE FDD Band 2-15MHz Channel Bandwidth PAPR

## QPSK



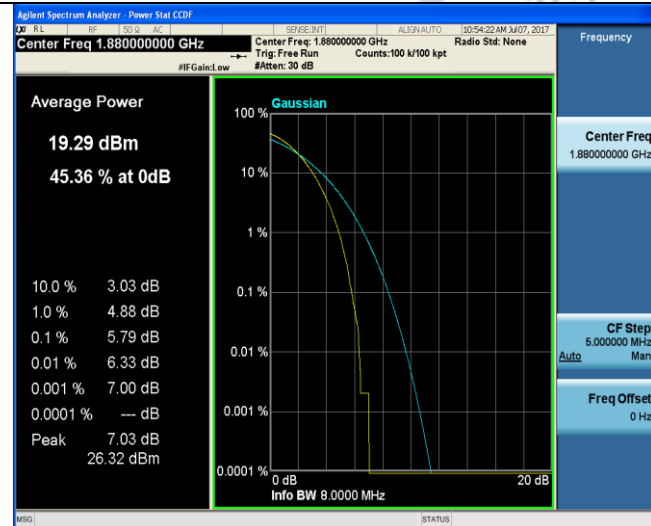
## 16QAM



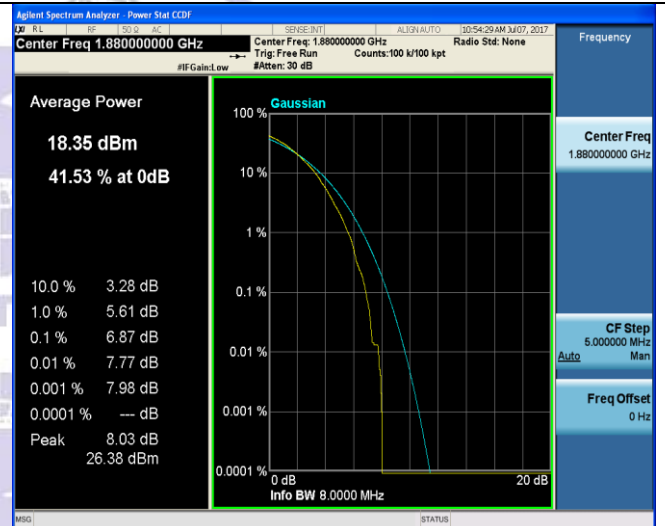
1RB#0

1RB#0

## Low Channel

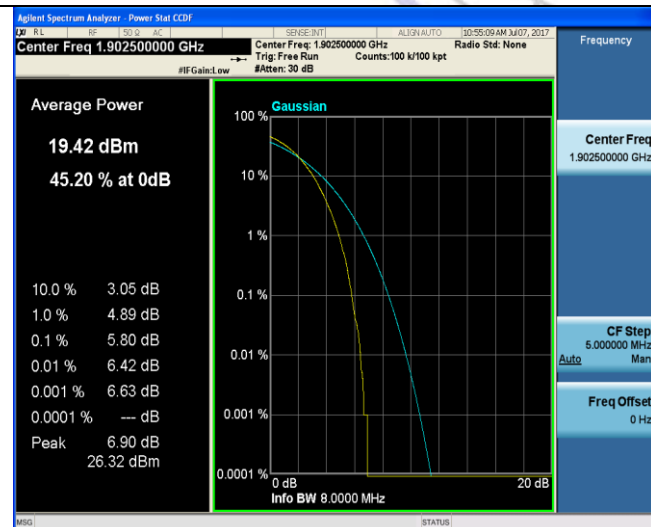


1RB#0

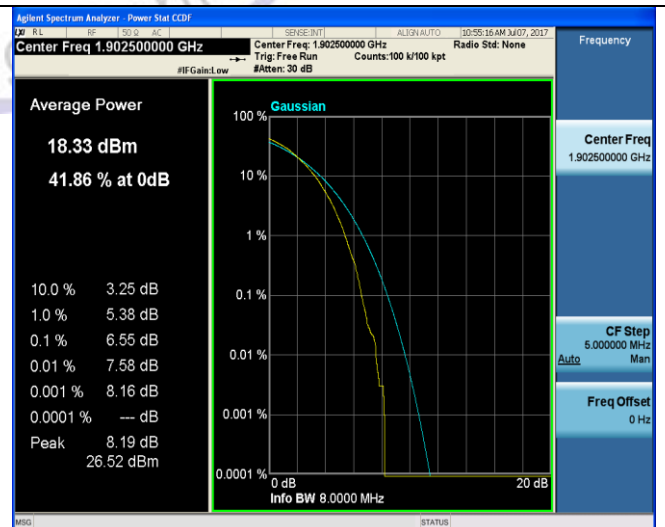


1RB#0

## Middle Channel



1RB#0

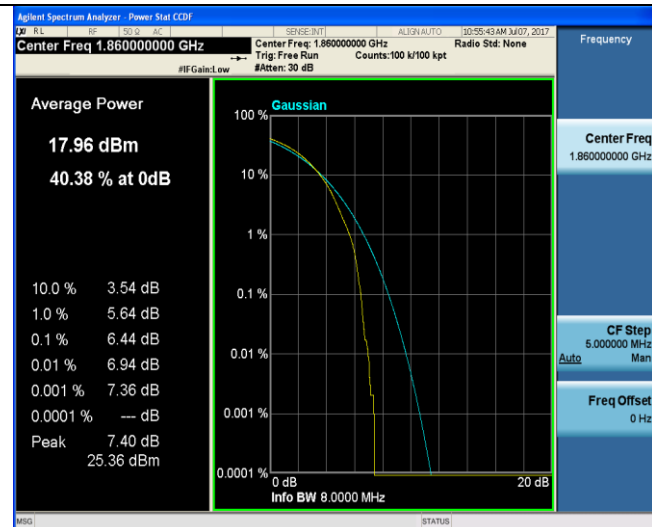


1RB#0

## High Channel

# LTE FDD Band 2-20MHz Channel Bandwidth PAPR

## QPSK



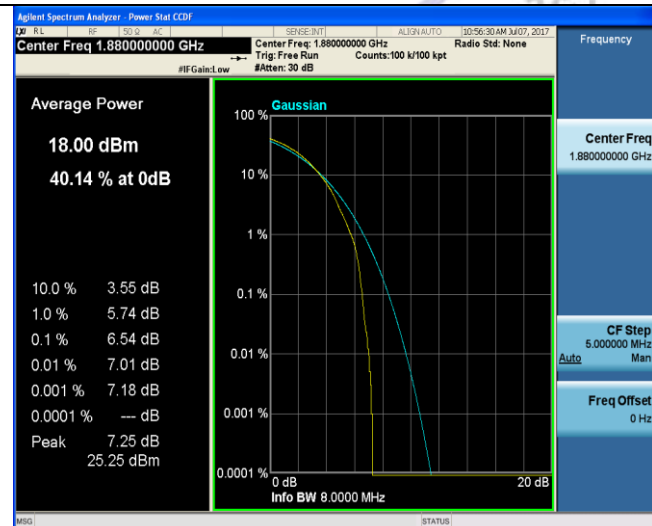
## 16QAM



1RB#0

1RB#0

## Low Channel

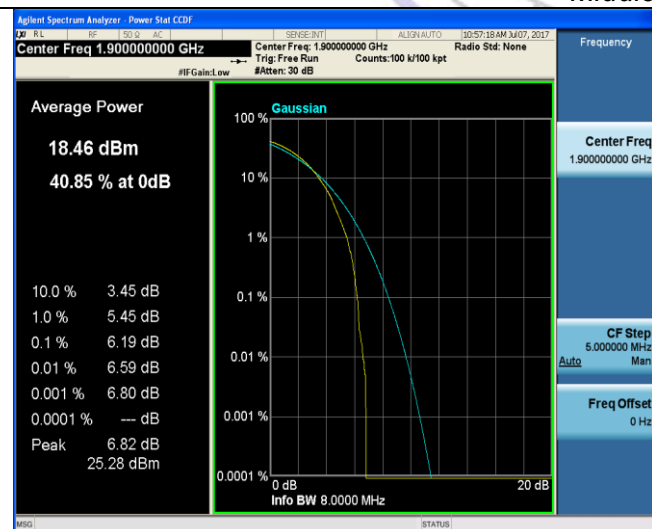


1RB#0

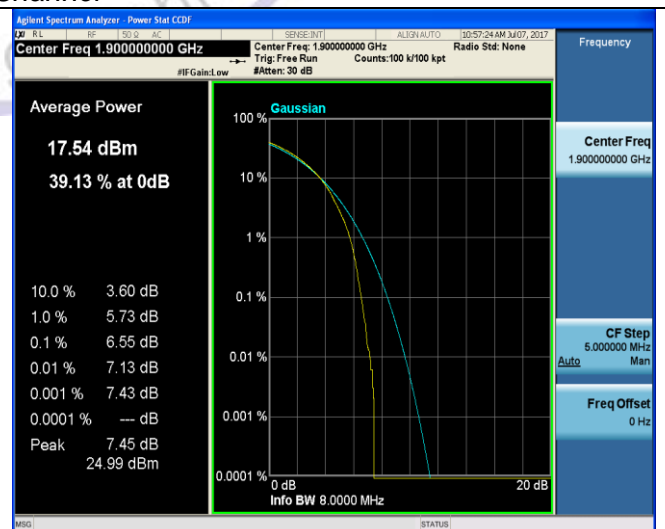


1RB#0

## Middle Channel



1RB#0



1RB#0

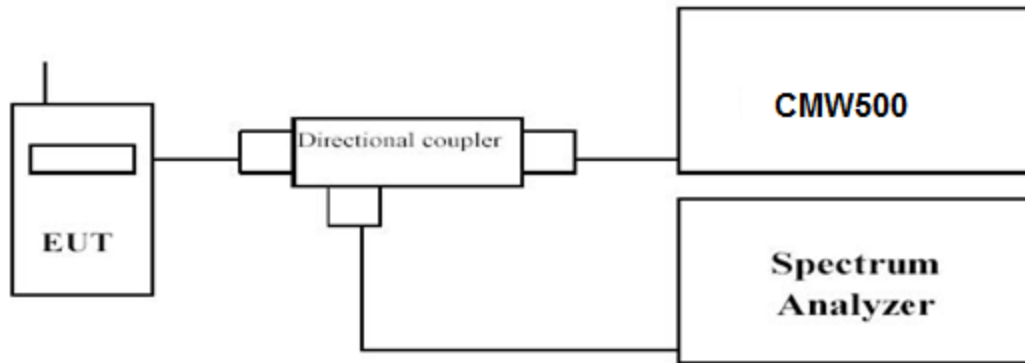
## High Channel

### 3.3. 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:

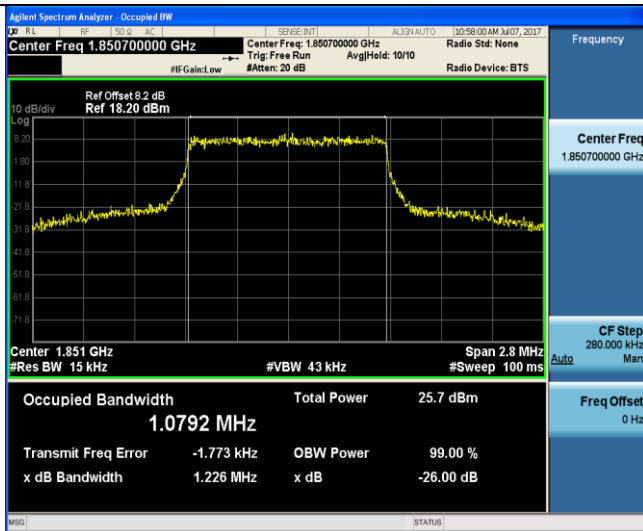
1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2; recorded worst case for each Channel Bandwidth of LTE FDD Band 2.

| LTE FDD Band 2       |                |                 |                                 |       |                              |        |
|----------------------|----------------|-----------------|---------------------------------|-------|------------------------------|--------|
| 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          | 1850.7          | 1.226                           | 1.245 | 1.0792                       | 1.0811 |
|                      |                | 1880.0          | 1.225                           | 1.224 | 1.0768                       | 1.0784 |
|                      |                | 1909.3          | 1.225                           | 1.221 | 1.0777                       | 1.0798 |
| 3 MHz                | 15RB#0         | 1851.5          | 2.884                           | 2.884 | 2.6845                       | 2.6840 |
|                      |                | 1880.0          | 2.865                           | 2.883 | 2.6819                       | 2.6842 |
|                      |                | 1908.5          | 2.865                           | 2.861 | 2.6819                       | 2.6805 |
| 5 MHz                | 25RB#0         | 1852.5          | 4.866                           | 4.847 | 4.4823                       | 4.4788 |
|                      |                | 1880.0          | 4.829                           | 4.823 | 4.4857                       | 4.4764 |
|                      |                | 1907.5          | 4.796                           | 4.837 | 4.4898                       | 4.4773 |
| 10 MHz               | 50RB#0         | 1855.0          | 9.480                           | 9.565 | 8.9409                       | 8.9418 |
|                      |                | 1880.0          | 9.415                           | 9.421 | 8.9436                       | 8.9388 |
|                      |                | 1905.0          | 9.439                           | 9.446 | 8.9426                       | 8.9352 |
| 15 MHz               | 75RB#0         | 1857.5          | 14.07                           | 14.03 | 13.415                       | 13.409 |
|                      |                | 1880.0          | 14.08                           | 14.05 | 13.407                       | 13.408 |
|                      |                | 1902.5          | 14.27                           | 14.18 | 13.445                       | 13.424 |
| 20 MHz               | 100RB#0        | 1860.0          | 18.61                           | 18.65 | 17.876                       | 17.878 |
|                      |                | 1880.0          | 18.65                           | 18.65 | 17.867                       | 17.883 |
|                      |                | 1900.0          | 19.11                           | 18.65 | 17.907                       | 17.894 |

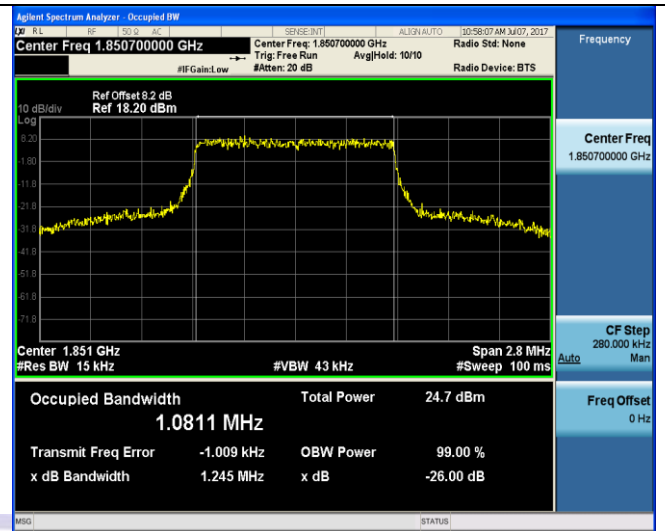


## LTE FDD Band 2-1.4MHz Channel Bandwidth

## QPSK



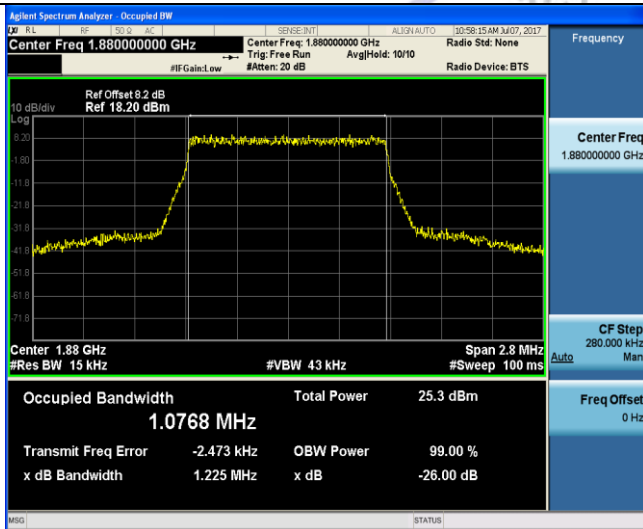
## 16QAM



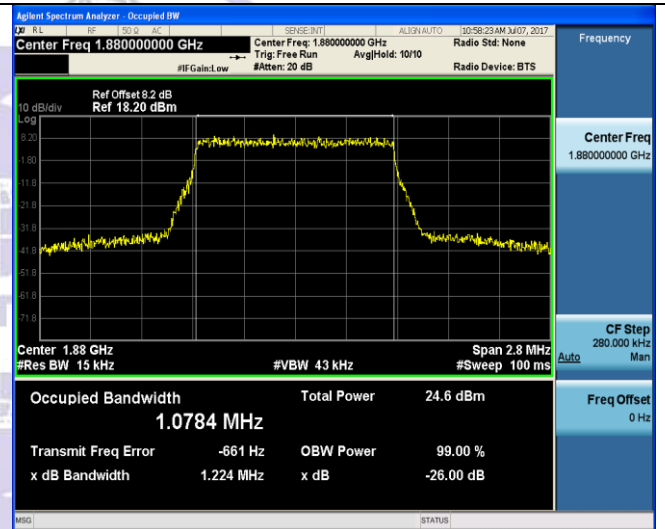
6RB#0

6RB#0

## Low Channel

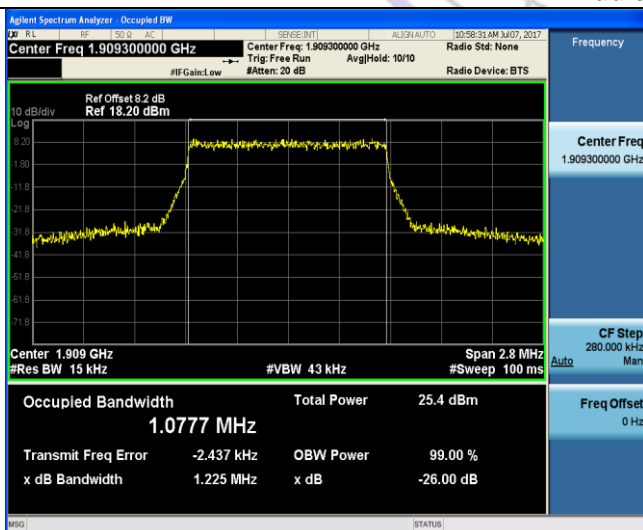


6RB#0

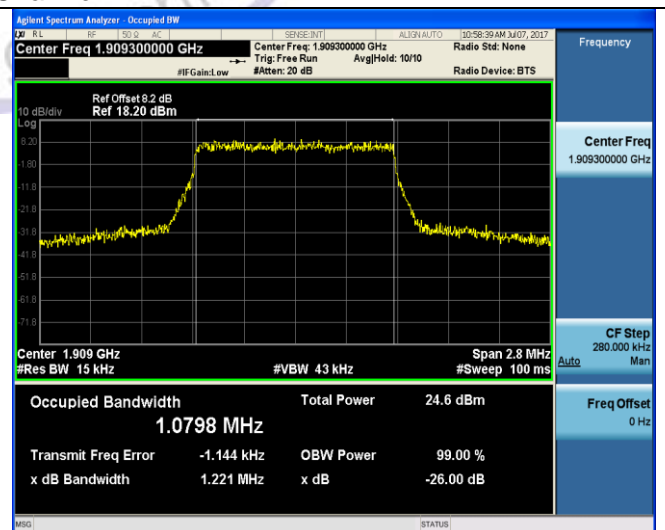


6RB#0

## Middle Channel



6RB#0

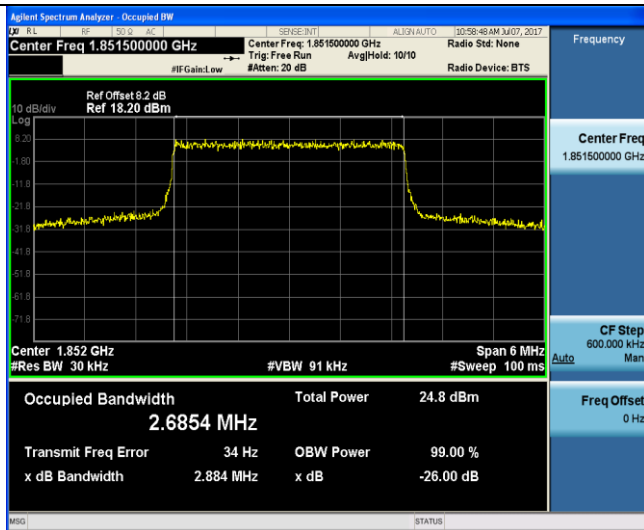


6RB#0

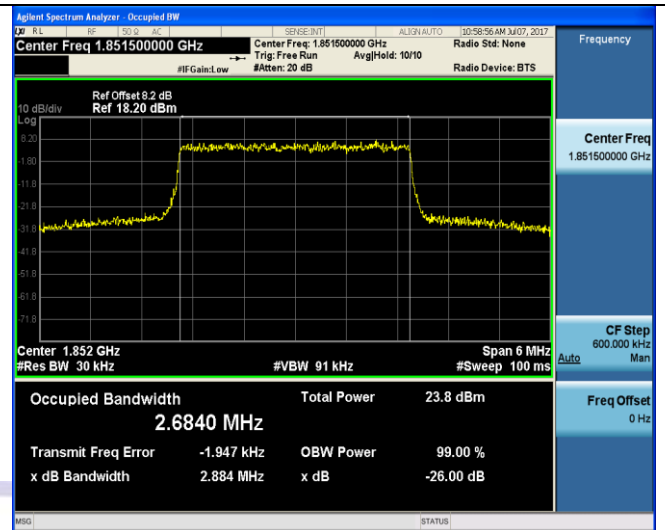
## High Channel

## LTE FDD Band 2-3MHz Channel Bandwidth

## QPSK



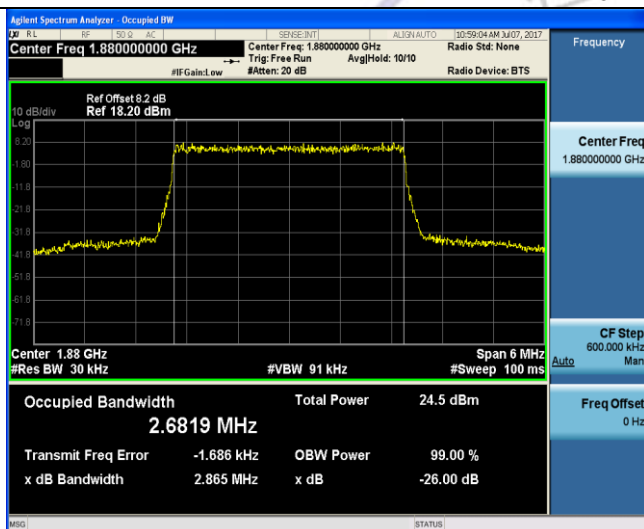
## 16QAM



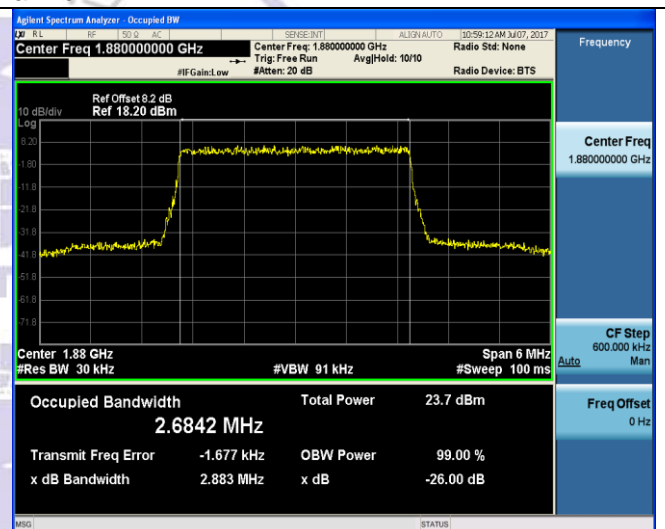
## 15RB#0

## 15RB#0

## Low Channel

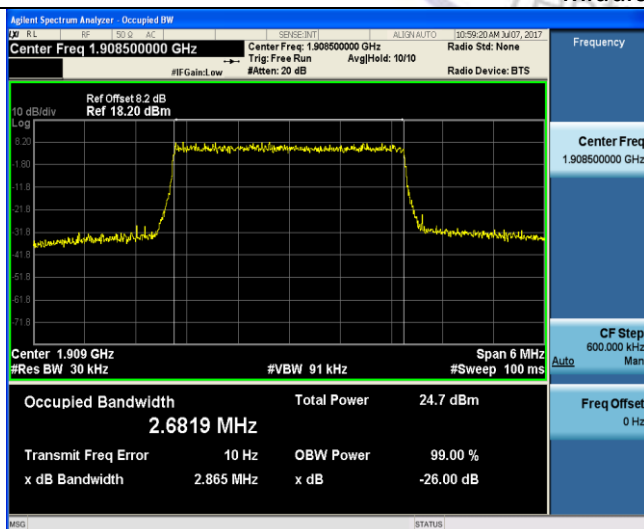


## 15RB#0

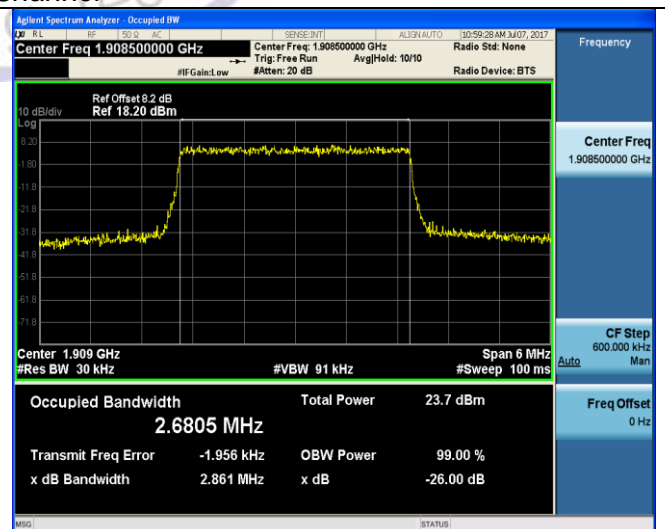


## 15RB#0

## Middle Channel



## 15RB#0

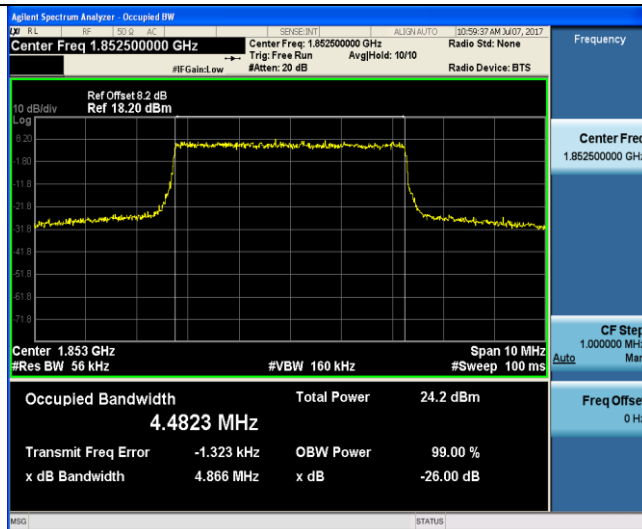


## 15RB#0

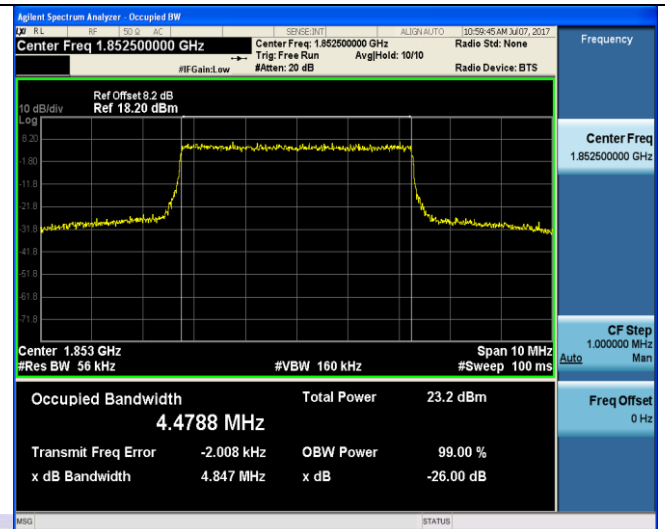
## High Channel

## LTE FDD Band 2-5MHz Channel Bandwidth

## QPSK



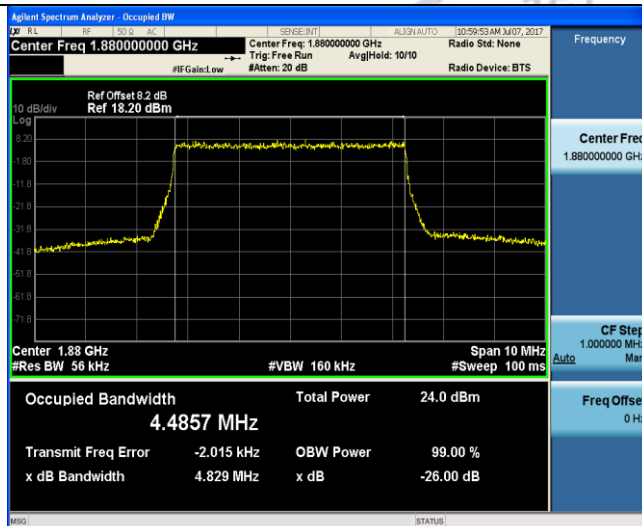
## 16QAM



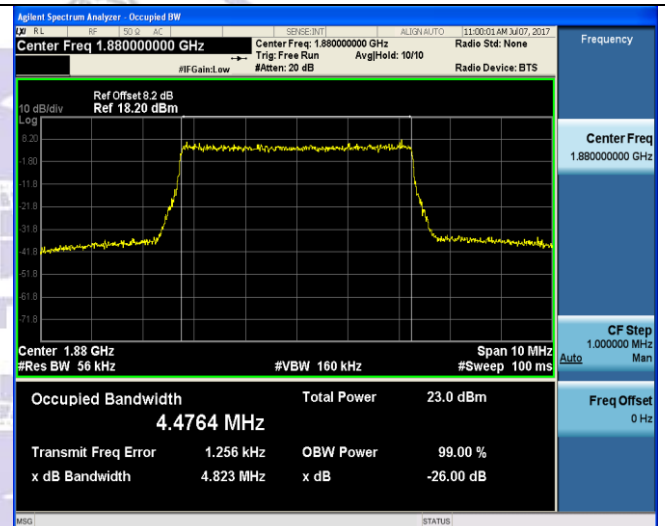
25RB#0

25RB#0

## Low Channel

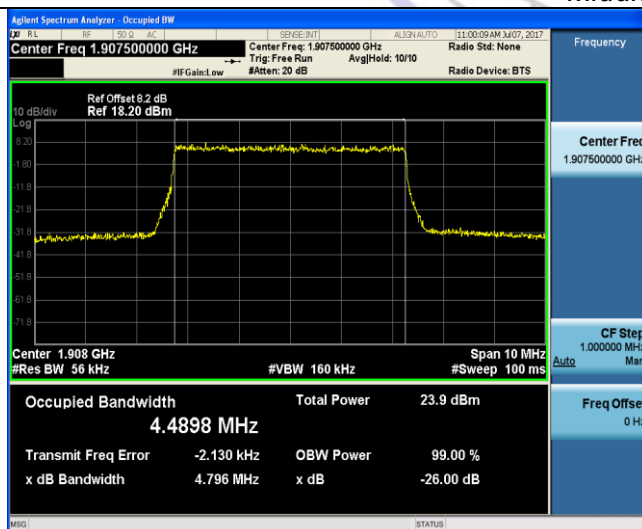


25RB#0

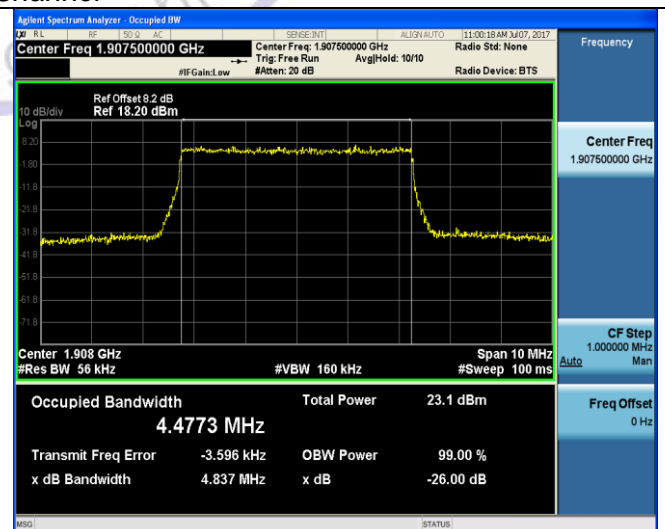


25RB#0

## Middle Channel



25RB#0

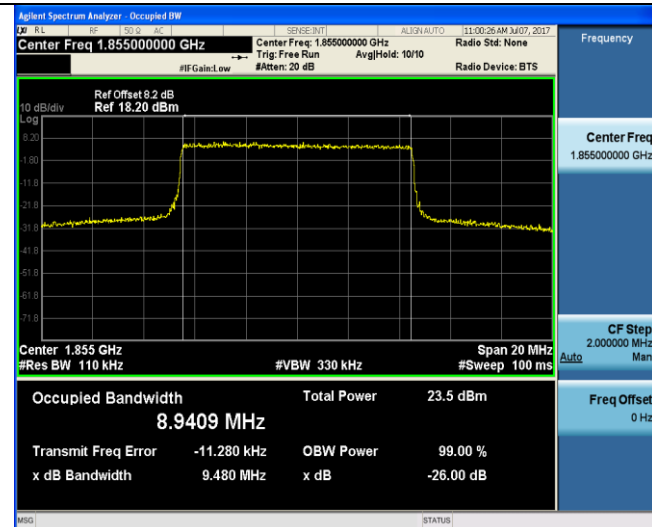


25RB#0

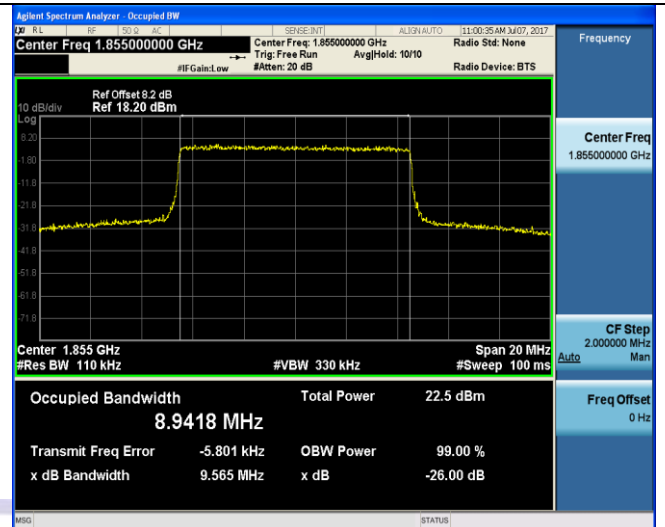
## High Channel

## LTE FDD Band 2-10MHz Channel Bandwidth

## QPSK



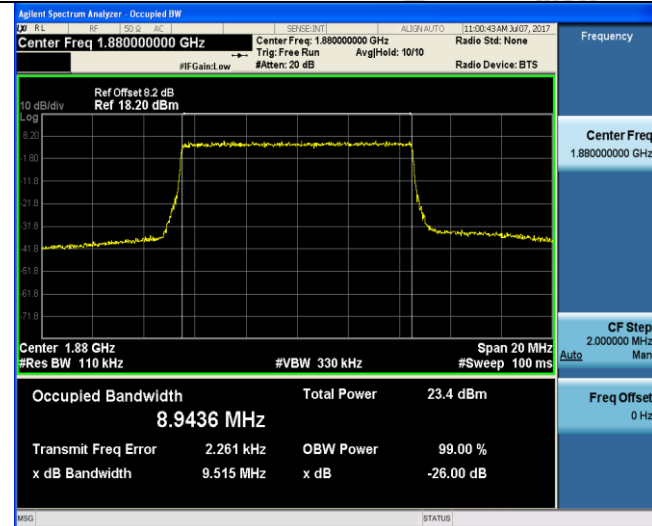
## 16QAM



50RB#0

50RB#0

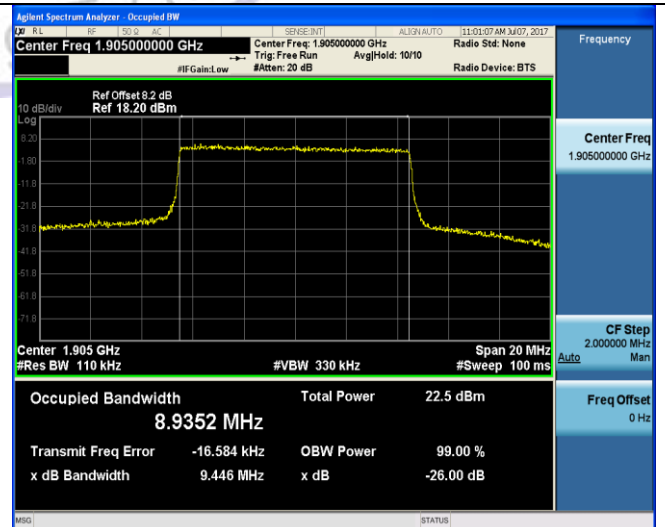
## Low Channel



50RB#0

50RB#0

## Middle Channel



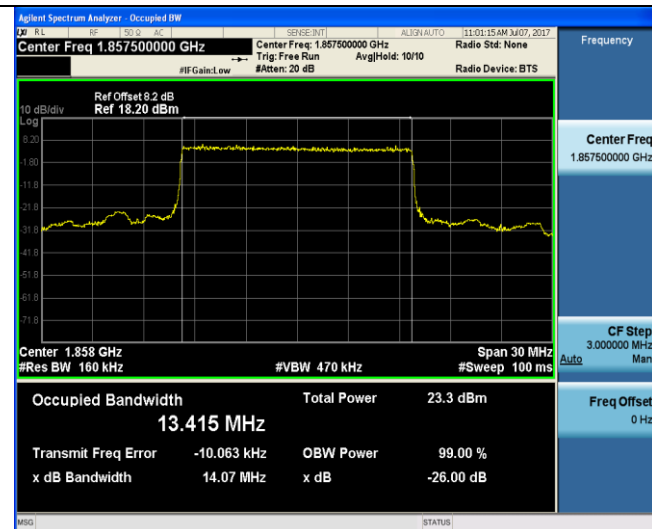
50RB#0

50RB#0

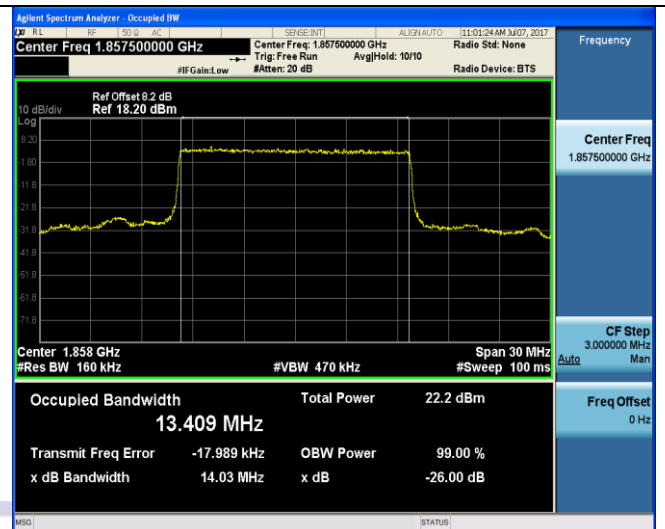
## High Channel

## LTE FDD Band 2-15MHz Channel Bandwidth

## QPSK



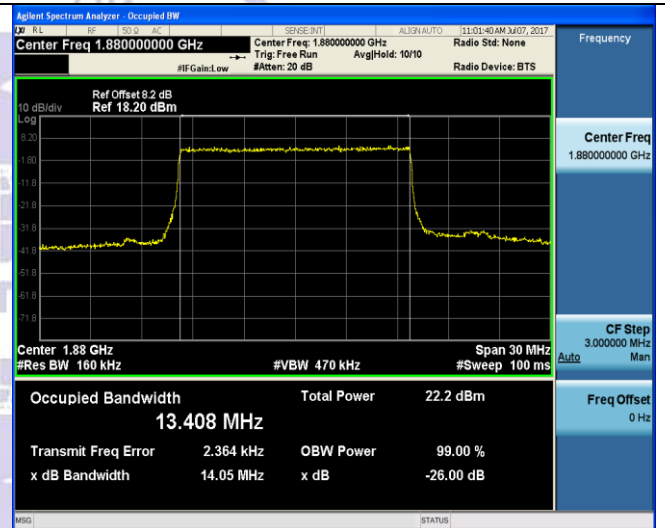
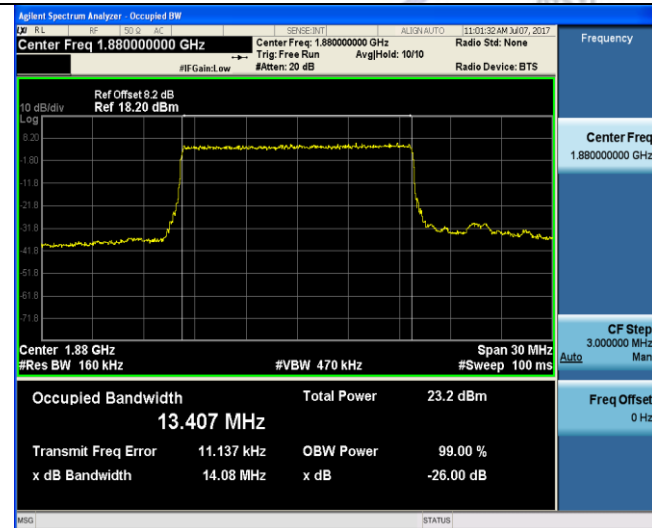
## 16QAM



75RB#0

75RB#0

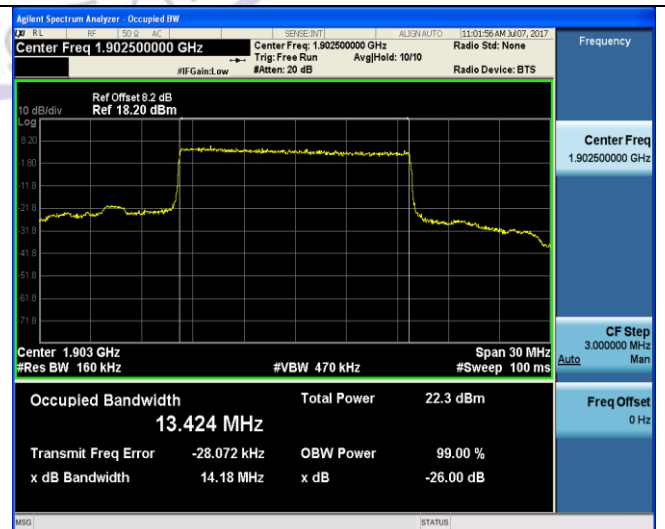
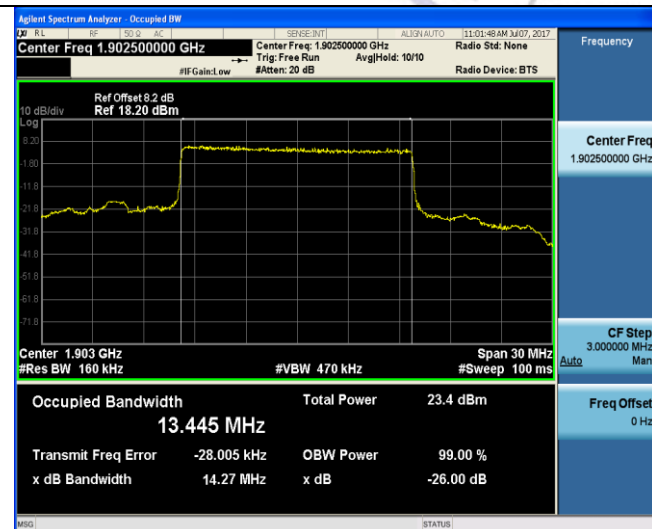
## Low Channel



75RB#0

75RB#0

## Middle Channel



75RB#0

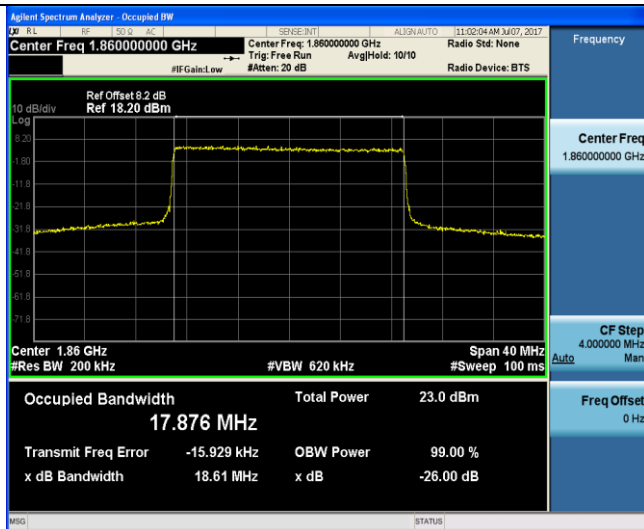
75RB#0

## High Channel

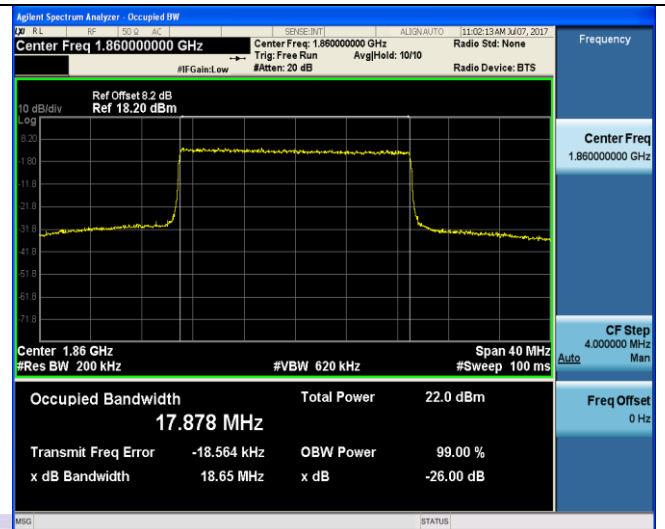


## LTE FDD Band 2-20MHz Channel Bandwidth

## QPSK



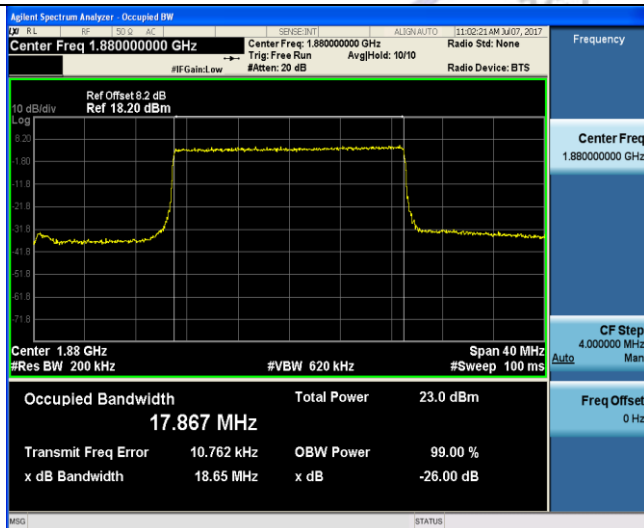
## 16QAM



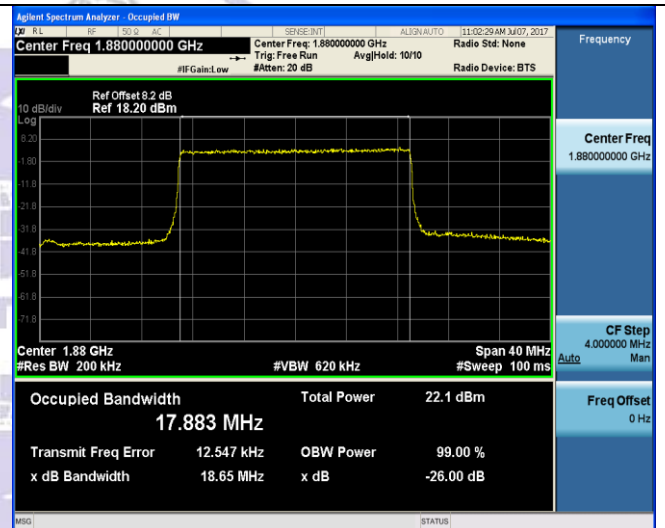
100RB#0

100RB#0

## Low Channel

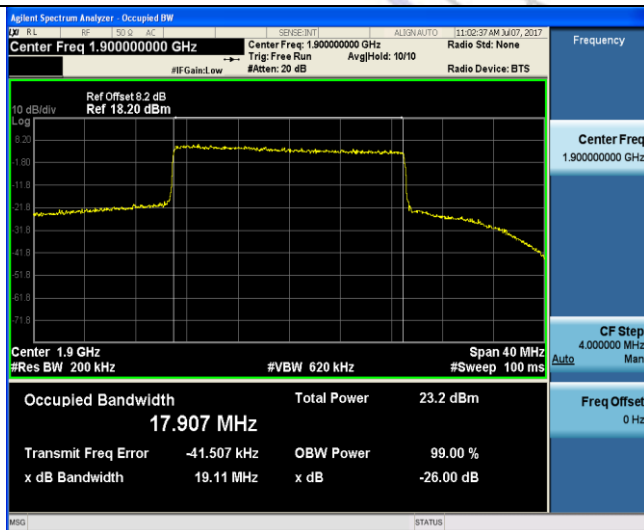


100RB#0



100RB#0

## Middle Channel



100RB#0



100RB#0

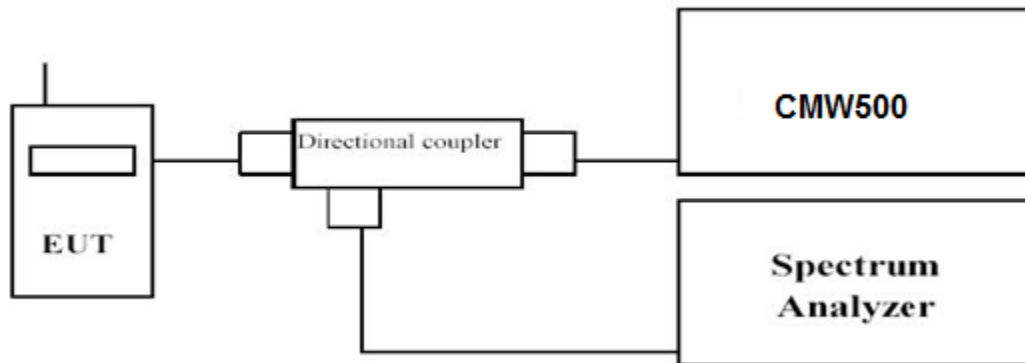
## High Channel

### 3.4. Band Edge compliance

#### LIMIT

Per FCC §24.238 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.

#### 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 2; recorded worst case for each Channel Bandwidth of LTE FDD Band 2.