



# RF TEST REPORT

|                   |                                            |
|-------------------|--------------------------------------------|
| <b>Applicant</b>  | Quectel Wireless Solutions Company Limited |
| <b>FCC ID</b>     | XMR201708EC21E                             |
| <b>Product</b>    | LTE Module                                 |
| <b>Brand</b>      | Quectel                                    |
| <b>Model</b>      | EC21-E                                     |
| <b>Report No.</b> | RXA1707-0250RF01R1                         |
| <b>Issue Date</b> | August 17, 2017                            |

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2017)/ FCC CFR 47 Part 22H (2017)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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## TABLE OF CONTENT

|                                                      |    |
|------------------------------------------------------|----|
| 1. Test Laboratory .....                             | 4  |
| 1.1. Notes of the Test Report .....                  | 4  |
| 1.2. Test facility .....                             | 4  |
| 1.3. Testing Location .....                          | 5  |
| 2. General Description of Equipment under Test ..... | 6  |
| 3. Applied Standards .....                           | 7  |
| 4. Test Configuration .....                          | 8  |
| 5. Test Case Results .....                           | 10 |
| 5.1. RF Power Output .....                           | 10 |
| 5.2. Effective Radiated Power .....                  | 14 |
| 5.3. Occupied Bandwidth .....                        | 18 |
| 5.4. Band Edge Compliance .....                      | 25 |
| 5.5. Peak-to-Average Power Ratio (PAPR) .....        | 32 |
| 5.6. Frequency Stability .....                       | 35 |
| 5.7. Spurious Emissions at Antenna Terminals .....   | 39 |
| 5.8. Radiates Spurious Emission .....                | 45 |
| 6. Main Test Instruments .....                       | 56 |
| ANNEX A: EUT Appearance and Test Setup .....         | 57 |
| A.1 EUT Appearance .....                             | 57 |
| A.2 Test Setup .....                                 | 59 |

### Summary of measurement results

| No.                                                                                                                                                             | Test Type                               | Clause in FCC rules               | Verdict |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------------------------|---------|
| 1                                                                                                                                                               | RF power output                         | 2.1046                            | PASS    |
| 2                                                                                                                                                               | Effective Radiated Power                | 22.913(a)(2)                      | PASS    |
| 3                                                                                                                                                               | Occupied Bandwidth                      | 2.1049                            | PASS    |
| 4                                                                                                                                                               | Band Edge Compliance                    | 2.1051 / 22.917(a)                | PASS    |
| 5                                                                                                                                                               | Peak-to-Average Power Ratio             | 22.913(d)/<br>KDB 971168 D01(5.7) | PASS    |
| 6                                                                                                                                                               | Frequency Stability                     | 2.1055 / 22.355                   | PASS    |
| 7                                                                                                                                                               | Spurious Emissions at Antenna Terminals | 2.1051 / 22.917(a)                | PASS    |
| 8                                                                                                                                                               | Radiates Spurious Emission              | 2.1053 / 22.917 (a)               | PASS    |
| Date of Testing: August 4, 2017 ~ August 9, 2017                                                                                                                |                                         |                                   |         |
| Note: PASS: The EUT complies with the essential requirements in the standard.<br>FAIL: The EUT does not comply with the essential requirements in the standard. |                                         |                                   |         |



## 1. Test Laboratory

### 1.1. Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above. This report must not be used by the client to claim product certification, approval, or endorsement by any government agencies.

### 1.2. Test facility

#### **CNAS (accreditation number: L2264)**

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

#### **FCC (Designation number: CN1179, Test Firm Registration Number: 446626)**

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

#### **IC (recognition number is 8510A)**

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

#### **VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)**

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

#### **A2LA (Certificate Number: 3857.01)**

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.



### 1.3. Testing Location

Company: TA Technology (Shanghai) Co., Ltd.  
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## 2. General Description of Equipment under Test

### Client Information

|                      |                                                                                          |
|----------------------|------------------------------------------------------------------------------------------|
| Applicant            | Quectel Wireless Solutions Company Limited                                               |
| Applicant address    | 7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China |
| Manufacturer         | Quectel Wireless Solutions Company Limited                                               |
| Manufacturer address | 7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China |

### General Information

| EUT Description                                                   |                                                                                                                                 |           |           |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|
| Model:                                                            | EC21-E                                                                                                                          |           |           |
| SN                                                                | /                                                                                                                               |           |           |
| Hardware Version                                                  | R1.0                                                                                                                            |           |           |
| Software Version                                                  | EC21EFAR02A07M4G                                                                                                                |           |           |
| Power Supply                                                      | External power supply                                                                                                           |           |           |
| Antenna Type                                                      | The EUT don't have standard Antenna, The Antenna used for testing in this report is the after-market accessory (Dipole Antenna) |           |           |
| Test Mode(s)                                                      | WCDMA Band V;LTE Band 5                                                                                                         |           |           |
| Test Modulation                                                   | (WCDMA)QPSK; (LTE)QPSK 16QAM;                                                                                                   |           |           |
| HSDPA UE Category                                                 | 24                                                                                                                              |           |           |
| HSUPA UE Category                                                 | 6                                                                                                                               |           |           |
| LTE Release                                                       | 11 (Don't support CA)                                                                                                           |           |           |
| Maximum E.R.P.                                                    | WCDMA Band V:                                                                                                                   | 23.93dBm  |           |
|                                                                   | LTE Band 5:                                                                                                                     | 23.16dBm  |           |
| Rated Power Supply Voltage                                        | 3.8V                                                                                                                            |           |           |
| Extreme Voltage                                                   | Minimum: 3.3V     Maximum: 4.3V                                                                                                 |           |           |
| Extreme Temperature                                               | Lowest:-40°C     Highest: +85°C                                                                                                 |           |           |
| Operating Frequency Range(s)                                      | Band                                                                                                                            | Tx (MHz)  | Rx (MHz)  |
|                                                                   | WCDMA Band V                                                                                                                    | 824 ~ 849 | 869 ~ 894 |
|                                                                   | LTE Band 5                                                                                                                      | 824 ~ 849 | 869 ~ 894 |
| Note: The information of the EUT is declared by the manufacturer. |                                                                                                                                 |           |           |

| Accessory equipment |                         |
|---------------------|-------------------------|
| Evaluation Board    | RF Cable                |
| RS232-to-USB Cable  | Antenna: Dipole Antenna |
| Headset             | USB Cable               |



### **3. Applied Standards**

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC CFR47 Part 2 (2017)**

**FCC CFR 47 Part 22H (2017)**

**ANSI C63.26 (2015)**

**KDB 971168 D01 Power Meas License Digital Systems v02r02**

## 4. Test Configuration

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT stand-up position (Z axis), lie-down position (X, Y axis). Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (Z axis, vertical polarization) and the worst case was recorded.

All mode and data rates and positions were investigated. Subsequently, only the worst case emissions are reported.

The following testing in WCDMA/LTE is set based on the maximum RF Output Power.

Test modes are chosen to be reported as the worst case configuration below:

|                      | Test items                              | Modes/Modulation   |
|----------------------|-----------------------------------------|--------------------|
|                      |                                         | WCDMA Band V       |
| Conducted Test cases | RF power output                         | RMC<br>HSDPA/HSUPA |
|                      | Occupied Bandwidth                      | RMC                |
|                      | Band Edge Compliance                    | RMC                |
|                      | Peak-to-Average Power Ratio             | RMC                |
|                      | Frequency Stability                     | RMC                |
|                      | Spurious Emissions at Antenna Terminals | RMC                |
| Radiated Test cases  | Effective Radiated Power                | RMC                |
|                      | Radiates Spurious Emission              | RMC                |

Test modes are chosen as the worst case configuration below for LTE Band 5.

| Test items                         | Bandwidth (MHz) |   |   |    | Modulation |       | RB |     |      | Test Channel |   |   |
|------------------------------------|-----------------|---|---|----|------------|-------|----|-----|------|--------------|---|---|
|                                    | 1.4             | 3 | 5 | 10 | QPSK       | 16QAM | 1  | 50% | 100% | L            | M | H |
| RF power output                    | O               | O | O | O  | O          | O     | O  | O   | O    | O            | O | O |
| Effective Isotropic Radiated power | O               | O | O | O  | O          | O     | -  | -   | O    | O            | O | O |
| Occupied Bandwidth                 | O               | O | O | O  | O          | O     | -  | -   | O    | O            | O | O |
| Band Edge Compliance               | O               | O | O | O  | O          | O     | O  | -   | O    | O            | - | O |
| Peak-to-Average Power Ratio        | O               | O | O | O  | O          | O     | -  | -   | O    | O            | O | O |
| Frequency Stability                | O               | O | O | O  | O          | O     | -  | -   | O    | -            | O | - |



|                                         |                                                                                                                                       |   |   |   |   |   |   |   |   |   |   |   |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|
| Spurious Emissions at Antenna Terminals | O                                                                                                                                     | O | O | O | O | - | O | - | - | O | O | O |
| Radiates Spurious Emission              | O                                                                                                                                     | O | O | O | O | - | O | - | - | O | O | O |
| Note                                    | 1. The mark "O" means that this configuration is chosen for testing.<br>2. The mark "-" means that this configuration is not testing. |   |   |   |   |   |   |   |   |   |   |   |

## 5. Test Case Results

### 5.1. RF Power Output

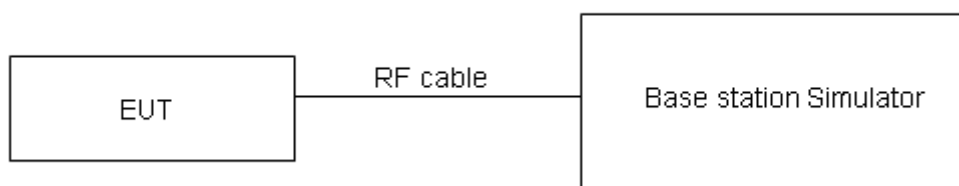
#### Ambient condition

| Temperature | Relative humidity | Pressure |
|-------------|-------------------|----------|
| 23°C ~25°C  | 45%~50%           | 101.5kPa |

#### Methods of Measurement

During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

#### Test Setup



The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

#### Limits

No specific RF power output requirements in part 2.1046.

#### Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ ,  $U = 0.4$  dB.

## Test Results

| WCDMA Band V |              | Conducted Power(dBm) |              |              |
|--------------|--------------|----------------------|--------------|--------------|
|              |              | Channel 4132         | Channel 4183 | Channel 4233 |
|              |              | 826.4(MHz)           | 836.6(MHz)   | 846.6(MHz)   |
| RMC          |              | 23.28                | 23.39        | 23.33        |
| HSDPA        | Sub - Test 1 | 23.18                | 23.22        | 23.17        |
|              | Sub - Test 2 | 23.12                | 23.23        | 23.16        |
|              | Sub - Test 3 | 22.61                | 22.83        | 22.74        |
|              | Sub - Test 4 | 22.62                | 22.82        | 22.76        |
| HSUPA        | Sub - Test 1 | 23.11                | 23.31        | 23.25        |
|              | Sub - Test 2 | 21.36                | 21.47        | 21.41        |
|              | Sub - Test 3 | 22.18                | 22.29        | 22.23        |
|              | Sub - Test 4 | 21.37                | 21.48        | 21.42        |
|              | Sub - Test 5 | 23.16                | 23.27        | 23.21        |

| LTE Band 5 |            |         |           | Conducted Power(dBm)   |             |             |
|------------|------------|---------|-----------|------------------------|-------------|-------------|
| BW         | Modulation | RB size | RB offset | Channel/Frequency(MHz) |             |             |
|            |            |         |           | 20407/824.7            | 20525/836.5 | 20643/848.3 |
| 1.4MHz     | QPSK       | 1       | 0         | 23.27                  | 22.98       | 23.13       |
|            |            | 1       | 2         | 23.25                  | 23.03       | 23.21       |
|            |            | 1       | 5         | 23.14                  | 23.07       | 23.08       |
|            |            | 3       | 0         | 23.10                  | 23.14       | 22.92       |
|            |            | 3       | 2         | 23.13                  | 23.13       | 23.07       |
|            |            | 3       | 3         | 23.24                  | 23.06       | 23.04       |
|            |            | 6       | 0         | 22.22                  | 22.14       | 22.13       |
|            | 16QAM      | 1       | 0         | 22.22                  | 22.07       | 21.96       |
|            |            | 1       | 2         | 22.54                  | 22.17       | 22.00       |
|            |            | 1       | 5         | 22.27                  | 22.02       | 21.73       |
|            |            | 3       | 0         | 21.98                  | 22.21       | 22.06       |
|            |            | 3       | 2         | 22.20                  | 22.29       | 22.18       |
|            |            | 3       | 3         | 22.18                  | 22.08       | 22.04       |
|            |            | 6       | 0         | 21.39                  | 21.49       | 21.44       |
| BW         | Modulation | RB size | RB offset | Channel/Frequency(MHz) |             |             |
|            |            |         |           | 20415/825.5            | 20525/836.5 | 20635/847.5 |
| 3MHz       | QPSK       | 1       | 0         | 23.29                  | 23.02       | 23.16       |
|            |            | 1       | 7         | 23.28                  | 23.08       | 23.25       |
|            |            | 1       | 14        | 23.17                  | 23.12       | 23.12       |
|            |            | 8       | 0         | 22.20                  | 22.26       | 22.05       |
|            |            | 8       | 4         | 22.25                  | 22.23       | 22.19       |
|            |            | 8       | 7         | 22.34                  | 22.17       | 22.14       |
|            |            | 15      | 0         | 22.25                  | 22.18       | 22.16       |
|            | 16QAM      | 1       | 0         | 22.25                  | 22.09       | 21.99       |
|            |            | 1       | 7         | 22.57                  | 22.22       | 22.04       |
|            |            | 1       | 14        | 22.29                  | 22.06       | 21.76       |
|            |            | 8       | 0         | 21.09                  | 21.34       | 21.18       |
|            |            | 8       | 4         | 21.31                  | 21.42       | 21.30       |
|            |            | 8       | 7         | 21.28                  | 21.20       | 21.17       |
|            |            | 15      | 0         | 21.42                  | 21.53       | 21.47       |
| BW         | Modulation | RB size | RB offset | Channel/Frequency(MHz) |             |             |
|            |            |         |           | 20425/826.5            | 20525/836.5 | 20625/846.5 |
| 5MHz       | QPSK       | 1       | 0         | 23.26                  | 23.00       | 23.12       |



|  |       |            |         |           |                        |             |
|--|-------|------------|---------|-----------|------------------------|-------------|
|  |       | 1          | 13      | 23.26     | 23.04                  | 23.22       |
|  |       | 1          | 24      | 23.14     | 23.07                  | 23.08       |
|  |       | 12         | 0       | 22.17     | 22.21                  | 22.01       |
|  |       | 12         | 6       | 22.23     | 22.19                  | 22.14       |
|  |       | 12         | 13      | 22.32     | 22.15                  | 22.10       |
|  |       | 25         | 0       | 22.23     | 22.17                  | 22.14       |
|  |       | 25         | 0       | 22.23     | 22.17                  | 22.14       |
|  | 16QAM | 1          | 0       | 22.22     | 22.05                  | 21.96       |
|  |       | 1          | 13      | 22.54     | 22.20                  | 22.01       |
|  |       | 1          | 24      | 22.26     | 22.04                  | 21.72       |
|  |       | 12         | 0       | 21.07     | 21.30                  | 21.15       |
|  |       | 12         | 6       | 21.28     | 21.37                  | 21.26       |
|  |       | 12         | 13      | 21.25     | 21.15                  | 21.13       |
|  |       | 25         | 0       | 21.40     | 21.49                  | 21.42       |
|  | BW    | Modulation | RB size | RB offset | Channel/Frequency(MHz) |             |
|  |       |            |         |           | 20450/829              | 20525/836.5 |
|  | 10MHz | QPSK       |         |           | 20600/844              |             |
|  |       |            |         |           | 20450/829              | 20525/836.5 |
|  |       |            |         |           | 20600/844              |             |
|  |       |            |         |           | 20450/829              | 20525/836.5 |
|  |       |            |         |           | 20600/844              |             |
|  |       |            |         |           | 20450/829              | 20525/836.5 |
|  |       |            |         |           | 20600/844              |             |
|  |       | 16QAM      |         |           | 20450/829              | 20525/836.5 |
|  |       |            |         |           | 20600/844              |             |
|  |       |            |         |           | 20450/829              | 20525/836.5 |
|  |       |            |         |           | 20600/844              |             |
|  |       |            |         |           | 20450/829              | 20525/836.5 |
|  |       |            |         |           | 20600/844              |             |
|  |       |            |         |           | 20450/829              | 20525/836.5 |
|  |       |            |         |           | 20600/844              |             |

## 5.2. Effective Radiated Power

### Ambient condition

| Temperature | Relative humidity | Pressure |
|-------------|-------------------|----------|
| 23°C ~25°C  | 45%~50%           | 101.5kPa |

### Methods of Measurement

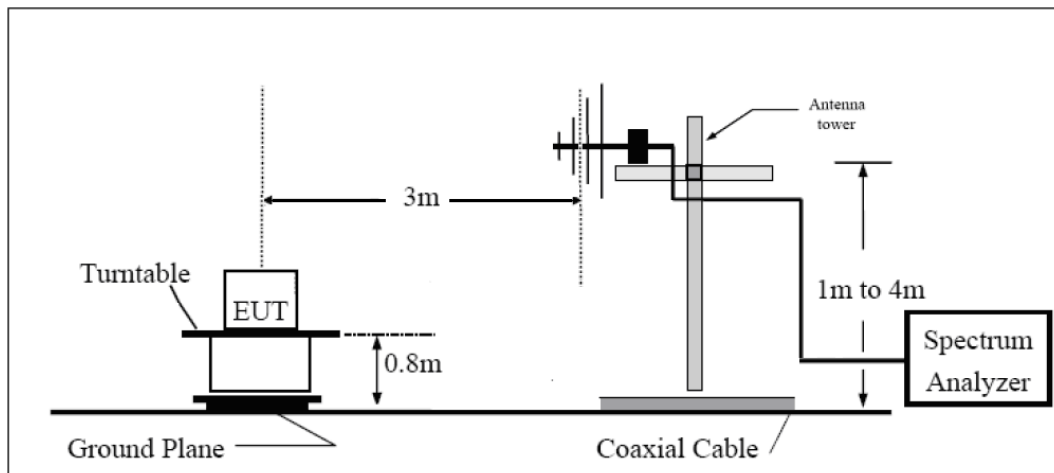
1. The testing follows ANSI C63.26 (2015) Section 5.5.2.3.
2. EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna between 1.0m and 4.0m. 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.
3. 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.
4. 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 for above 1GHz and RBW=100kHz, VBW=300kHz for 30MHz to 1GHz,, And the maximum value of the receiver should be recorded as (Pr).
5. 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 (PMea) 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 (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. 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 (Pcl), the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
7. The measurement results are obtained as described below:  

$$\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} + \text{Ga}$$
The measurement results are amend as described below:  

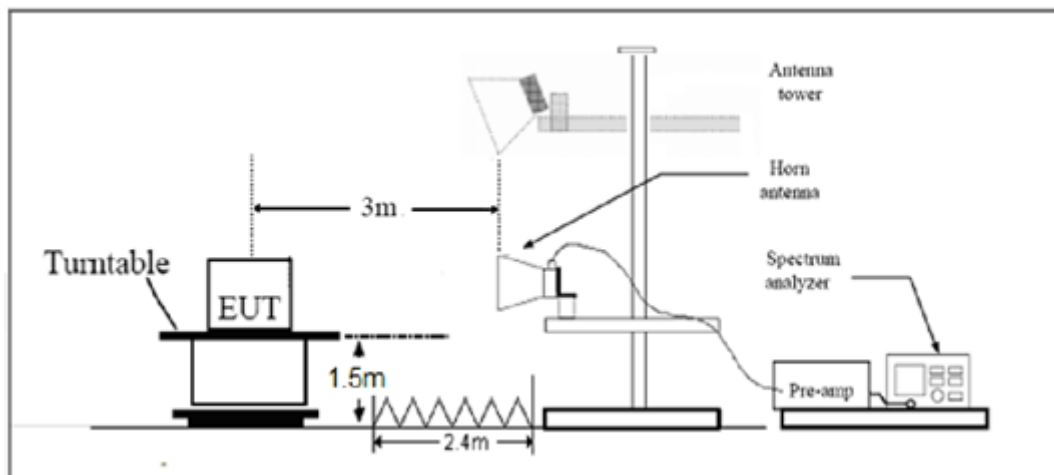
$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$$
8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$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

## Test configuration

### Below 1GHz:



### Above 1GHz:



## Limits

Rule Part 22.913(a) specifies that "Mobile/portable stations are limited to 7 watts ERP".

|       |                                |
|-------|--------------------------------|
| Limit | $\leq 7 \text{ W}$ (38.45 dBm) |
|-------|--------------------------------|

## Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ ,  $U = 1.19 \text{ dB}$



## Test Results:

| Mode            | Polarization | Frequency (MHz) | Rt (dBm) | Rs (dBm) | Ps (dBm) | Gs (dBd) | ERP (dBm) | Limit (dBm) | Conclusion |
|-----------------|--------------|-----------------|----------|----------|----------|----------|-----------|-------------|------------|
| WCDMA<br>Band V | H            | 826.4           | -23.28   | -45.44   | 0.00     | 1.13     | 23.29     | 38.45       | Pass       |
|                 | H            | 836.6           | -22.82   | -45.38   | 0.00     | 1.24     | 23.80     | 38.45       | Pass       |
|                 | H            | 846.6           | -22.80   | -45.38   | 0.00     | 1.35     | 23.93     | 38.45       | Pass       |
|                 | V            | 826.4           | -30.14   | -45.54   | 0.00     | 1.13     | 16.53     | 38.45       | Pass       |
|                 | V            | 836.6           | -29.66   | -45.46   | 0.00     | 1.24     | 17.04     | 38.45       | Pass       |
|                 | V            | 846.6           | -29.23   | -45.49   | 0.00     | 1.35     | 17.61     | 38.45       | Pass       |

| LTE Band 5         |              |                 |          |          |          |          |           |             |            |
|--------------------|--------------|-----------------|----------|----------|----------|----------|-----------|-------------|------------|
| bandwidth          | Polarization | Frequency (MHz) | Rt (dBm) | Rs (dBm) | Ps (dBm) | Gs (dBd) | ERP (dBm) | Limit (dBm) | Conclusion |
| 1.4 MHz<br>(QPSK)  | H            | 824.7           | -26.65   | -47.61   | 0.00     | 1.06     | 22.02     | 38.45       | Pass       |
|                    | H            | 836.5           | -27.07   | -47.75   | 0.00     | 1.24     | 21.92     | 38.45       | Pass       |
|                    | H            | 848.3           | -27.60   | -48.23   | 0.00     | 1.38     | 22.01     | 38.45       | Pass       |
|                    | V            | 824.7           | -31.05   | -47.29   | 0.00     | 1.06     | 17.31     | 38.45       | Pass       |
|                    | V            | 836.5           | -31.11   | -47.15   | 0.00     | 1.24     | 17.28     | 38.45       | Pass       |
|                    | V            | 848.3           | -31.63   | -47.48   | 0.00     | 1.38     | 17.23     | 38.45       | Pass       |
| 1.4 MHz<br>(16QAM) | H            | 824.7           | -26.97   | -47.61   | 0.00     | 1.06     | 21.70     | 38.45       | Pass       |
|                    | H            | 836.5           | -27.39   | -47.75   | 0.00     | 1.24     | 21.60     | 38.45       | Pass       |
|                    | H            | 848.3           | -27.91   | -48.23   | 0.00     | 1.38     | 21.70     | 38.45       | Pass       |
|                    | V            | 824.7           | -31.36   | -47.29   | 0.00     | 1.06     | 17.00     | 38.45       | Pass       |
|                    | V            | 836.5           | -31.41   | -47.15   | 0.00     | 1.24     | 16.98     | 38.45       | Pass       |
|                    | V            | 848.3           | -31.96   | -47.48   | 0.00     | 1.38     | 16.90     | 38.45       | Pass       |
| 3 MHz<br>(QPSK)    | H            | 825.5           | -26.53   | -47.59   | 0.00     | 1.06     | 22.13     | 38.45       | Pass       |
|                    | H            | 836.5           | -25.83   | -47.75   | 0.00     | 1.24     | 23.16     | 38.45       | Pass       |
|                    | H            | 847.5           | -26.54   | -48.18   | 0.00     | 1.38     | 23.02     | 38.45       | Pass       |
|                    | V            | 825.5           | -32.17   | -47.26   | 0.00     | 1.06     | 16.16     | 38.45       | Pass       |
|                    | V            | 836.5           | -31.21   | -47.15   | 0.00     | 1.24     | 17.18     | 38.45       | Pass       |
|                    | V            | 847.5           | -31.68   | -47.44   | 0.00     | 1.38     | 17.15     | 38.45       | Pass       |
| 3 MHz<br>(16QAM)   | H            | 825.5           | -26.84   | -47.59   | 0.00     | 1.06     | 21.82     | 38.45       | Pass       |
|                    | H            | 836.5           | -26.14   | -47.75   | 0.00     | 1.24     | 22.85     | 38.45       | Pass       |
|                    | H            | 847.5           | -26.94   | -48.18   | 0.00     | 1.38     | 22.62     | 38.45       | Pass       |
|                    | V            | 825.5           | -32.48   | -47.26   | 0.00     | 1.06     | 15.85     | 38.45       | Pass       |
|                    | V            | 836.5           | -31.51   | -47.15   | 0.00     | 1.24     | 16.88     | 38.45       | Pass       |
|                    | V            | 847.5           | -31.98   | -47.44   | 0.00     | 1.38     | 16.85     | 38.45       | Pass       |
| 5 MHz<br>(QPSK)    | H            | 826.5           | -25.85   | -47.60   | 0.00     | 1.13     | 22.88     | 38.45       | Pass       |
|                    | H            | 836.5           | -26.16   | -47.75   | 0.00     | 1.24     | 22.83     | 38.45       | Pass       |



| LTE Band 5     |              |                 |          |          |          |          |           |             |            |
|----------------|--------------|-----------------|----------|----------|----------|----------|-----------|-------------|------------|
| bandwidth      | Polarization | Frequency (MHz) | Rt (dBm) | Rs (dBm) | Ps (dBm) | Gs (dBd) | ERP (dBm) | Limit (dBm) | Conclusion |
|                | H            | 846.5           | -26.51   | -48.12   | 0.00     | 1.38     | 23.00     | 38.45       | Pass       |
|                | V            | 826.5           | -31.40   | -47.24   | 0.00     | 1.13     | 16.97     | 38.45       | Pass       |
|                | V            | 836.5           | -31.50   | -47.15   | 0.00     | 1.24     | 16.89     | 38.45       | Pass       |
|                | V            | 846.5           | -31.68   | -47.40   | 0.00     | 1.38     | 17.10     | 38.45       | Pass       |
| 5 MHz (16QAM)  | H            | 826.5           | -26.16   | -47.60   | 0.00     | 1.13     | 22.57     | 38.45       | Pass       |
|                | H            | 836.5           | -26.48   | -47.75   | 0.00     | 1.24     | 22.51     | 38.45       | Pass       |
|                | H            | 846.5           | -26.84   | -48.12   | 0.00     | 1.38     | 22.67     | 38.45       | Pass       |
|                | V            | 826.5           | -31.69   | -47.24   | 0.00     | 1.13     | 16.68     | 38.45       | Pass       |
|                | V            | 836.5           | -31.82   | -47.15   | 0.00     | 1.24     | 16.57     | 38.45       | Pass       |
|                | V            | 846.5           | -31.98   | -47.40   | 0.00     | 1.38     | 16.80     | 38.45       | Pass       |
| 10 MHz (QPSK)  | H            | 829             | -25.61   | -47.61   | 0.00     | 1.13     | 23.13     | 38.45       | Pass       |
|                | H            | 836.5           | -26.08   | -47.75   | 0.00     | 1.24     | 22.91     | 38.45       | Pass       |
|                | H            | 844             | -26.26   | -48.01   | 0.00     | 1.33     | 23.07     | 38.45       | Pass       |
|                | V            | 829             | -31.09   | -47.19   | 0.00     | 1.13     | 17.23     | 38.45       | Pass       |
|                | V            | 836.5           | -31.46   | -47.15   | 0.00     | 1.24     | 16.93     | 38.45       | Pass       |
|                | V            | 844             | -31.57   | -47.29   | 0.00     | 1.33     | 17.04     | 38.45       | Pass       |
| 10 MHz (16QAM) | H            | 829             | -25.92   | -47.61   | 0.00     | 1.13     | 22.82     | 38.45       | Pass       |
|                | H            | 836.5           | -26.39   | -47.75   | 0.00     | 1.24     | 22.60     | 38.45       | Pass       |
|                | H            | 844             | -26.66   | -48.01   | 0.00     | 1.33     | 22.67     | 38.45       | Pass       |
|                | V            | 829             | -31.12   | -47.19   | 0.00     | 1.13     | 17.20     | 38.45       | Pass       |
|                | V            | 836.5           | -31.77   | -47.15   | 0.00     | 1.24     | 16.62     | 38.45       | Pass       |
|                | V            | 844             | -31.88   | -47.29   | 0.00     | 1.33     | 16.73     | 38.45       | Pass       |

### 5.3. Occupied Bandwidth

#### Ambient condition

| Temperature | Relative humidity | Pressure |
|-------------|-------------------|----------|
| 23°C ~25°C  | 45%~50%           | 101.5kPa |

#### Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer.

RBW is set to 51kHz, VBW is set to 160kHz for WCDMA Band V,

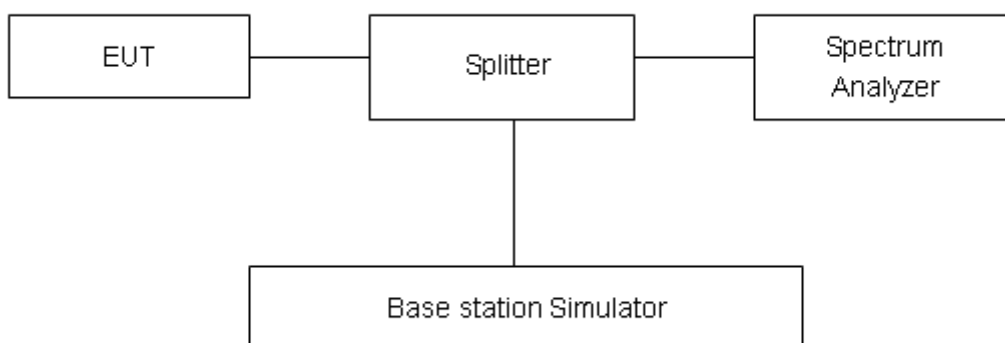
RBW is set to 51 kHz, VBW is set to 160 kHz for LTE Band 5 (1.4MHz),

RBW is set to 100 kHz, VBW is set to 300 kHz for LTE Band 5 (3MHz/5MHz),

RBW is set to 300 kHz, VBW is set to 1MHz for LTE Band 5 (10MHz),

99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages.

#### Test Setup



#### Limits

No specific occupied bandwidth requirements in part 2.1049.

#### Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ ,  $U = 624\text{Hz}$ .



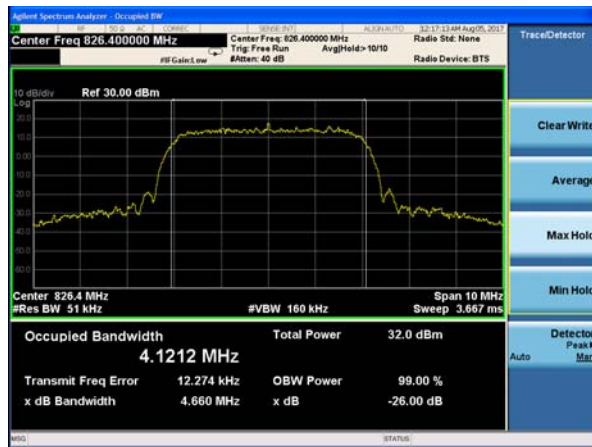
## Test Result

| Mode                     | Channel | Frequency (MHz) | 99% Power Bandwidth (MHz) | -26dBc Bandwidth(MHz) |
|--------------------------|---------|-----------------|---------------------------|-----------------------|
| WCDMA<br>Band V<br>(RMC) | 4132    | 826.4           | 4.1212                    | 4.660                 |
|                          | 4183    | 836.6           | 4.1204                    | 4.681                 |
|                          | 4233    | 846.6           | 4.1230                    | 4.667                 |

| LTE Band 5 |            |                 |         |                 |                          |                       |
|------------|------------|-----------------|---------|-----------------|--------------------------|-----------------------|
| RB         | Modulation | Bandwidth (MHz) | Channel | Frequency (MHz) | 99% Power Bandwidth(MHz) | -26dBc Bandwidth(MHz) |
| 100%       | QPSK       | 1.4             | 20407   | 824.7           | 1.1239                   | 1.339                 |
|            |            |                 | 20525   | 836.5           | 1.1226                   | 1.349                 |
|            |            |                 | 20643   | 848.3           | 1.1224                   | 1.338                 |
|            |            | 3               | 20415   | 825.5           | 2.7432                   | 3.058                 |
|            |            |                 | 20525   | 836.5           | 2.7526                   | 3.064                 |
|            |            |                 | 20635   | 847.5           | 2.7404                   | 3.064                 |
|            |            | 5               | 20425   | 826.5           | 4.5286                   | 5.031                 |
|            |            |                 | 20525   | 836.5           | 4.5189                   | 4.995                 |
|            |            |                 | 20625   | 846.5           | 4.5081                   | 5.017                 |
|            |            | 10              | 20450   | 829             | 9.0216                   | 10.10                 |
|            |            |                 | 20525   | 836.5           | 9.0187                   | 10.08                 |
|            |            |                 | 20600   | 844             | 9.0136                   | 9.991                 |
|            | 16QAM      | 1.4             | 20407   | 824.7           | 1.1296                   | 1.337                 |
|            |            |                 | 20525   | 836.5           | 1.1170                   | 1.314                 |
|            |            |                 | 20643   | 848.3           | 1.1205                   | 1.345                 |
|            |            | 3               | 20415   | 825.5           | 2.7611                   | 3.072                 |
|            |            |                 | 20525   | 836.5           | 2.7307                   | 3.065                 |
|            |            |                 | 20635   | 847.5           | 2.7336                   | 3.054                 |
|            |            | 5               | 20425   | 826.5           | 4.5097                   | 5.017                 |
|            |            |                 | 20525   | 836.5           | 4.5211                   | 5.003                 |
|            |            |                 | 20625   | 846.5           | 4.5308                   | 5.032                 |
|            |            | 10              | 20450   | 829             | 9.0074                   | 10.02                 |
|            |            |                 | 20525   | 836.5           | 9.0313                   | 9.996                 |
|            |            |                 | 20600   | 844             | 9.0324                   | 9.996                 |



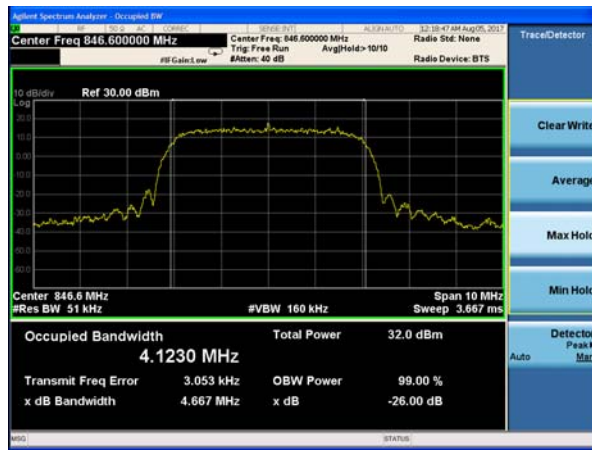
## WCDMA Band V CH-Low



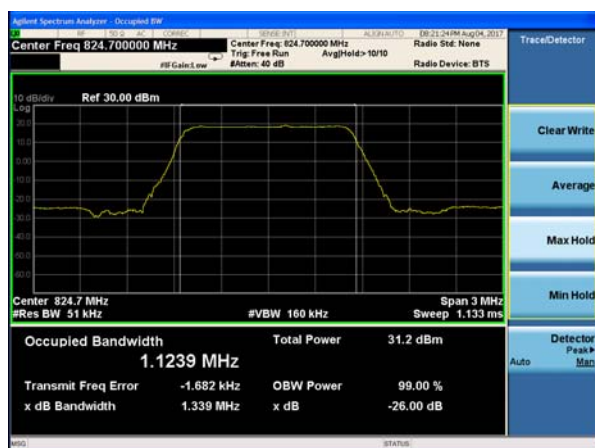
## WCDMA Band V CH-Middle



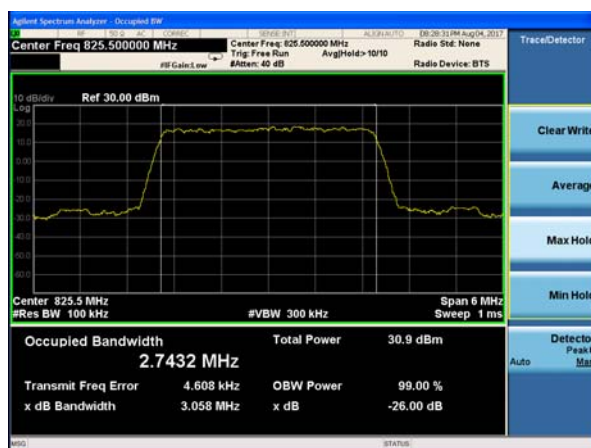
## WCDMA Band V CH-High



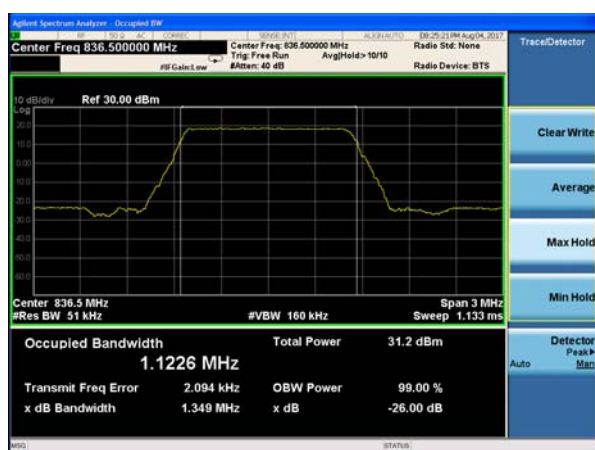
### LTE Band 5 QPSK 1.4MHz CH-Low



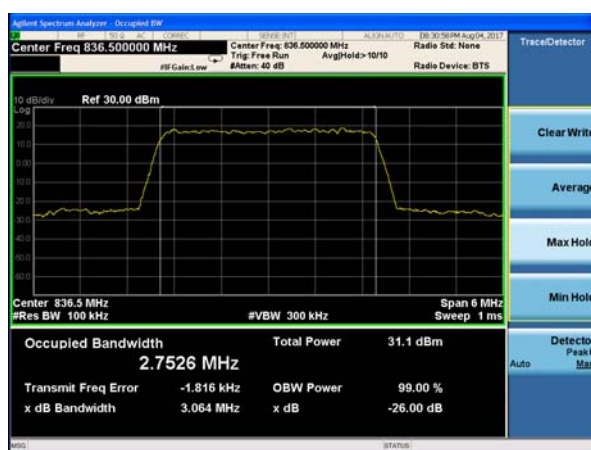
### LTE Band 5 QPSK 3MHz CH-Low



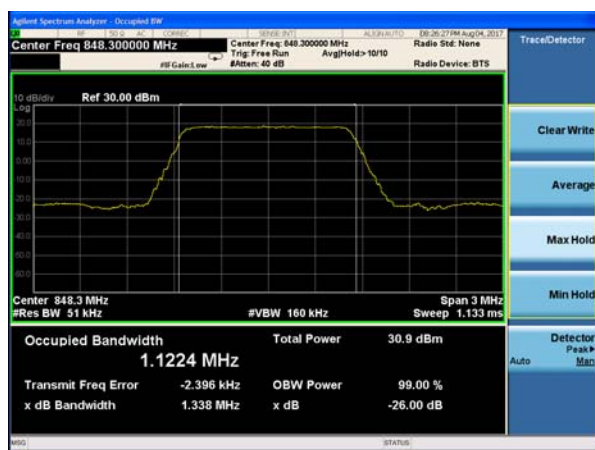
### LTE Band 5 QPSK 1.4MHz CH-Middle



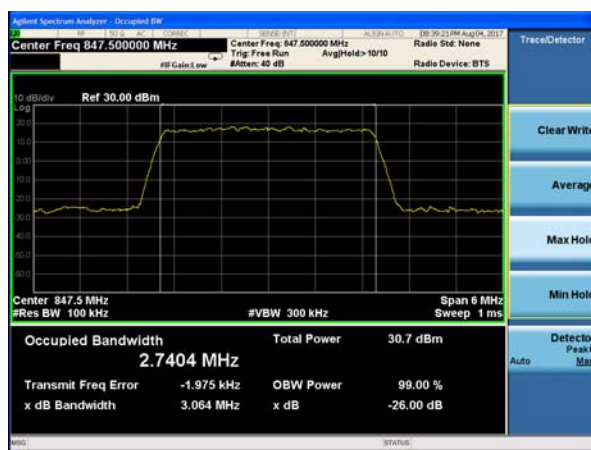
### LTE Band 5 QPSK 3MHz CH-Middle



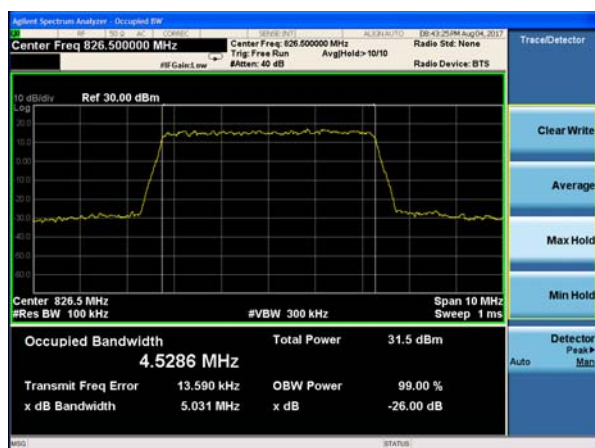
### LTE Band 5 QPSK 1.4MHz CH-High



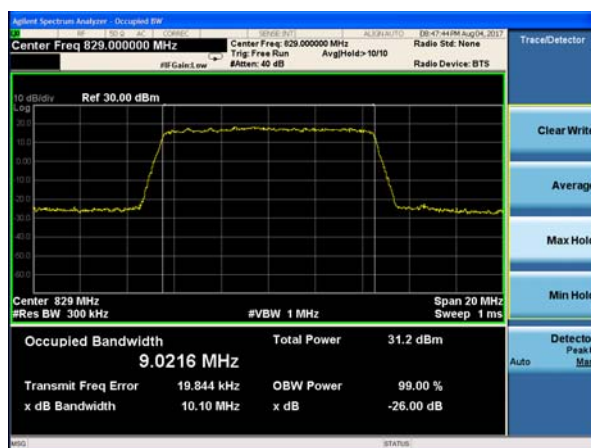
### LTE Band 5 QPSK 3MHz CH-High



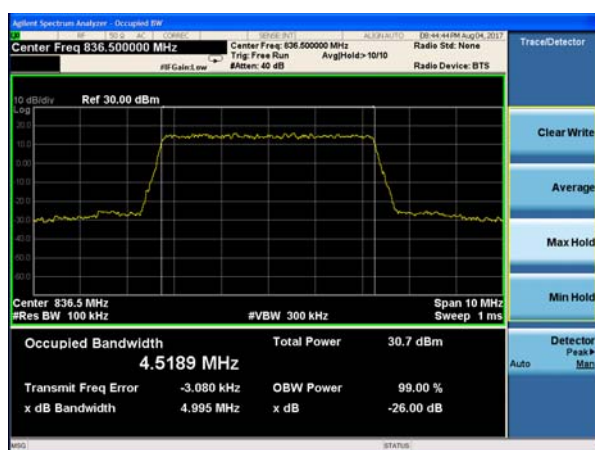
### LTE Band 5 QPSK 5MHz CH-Low



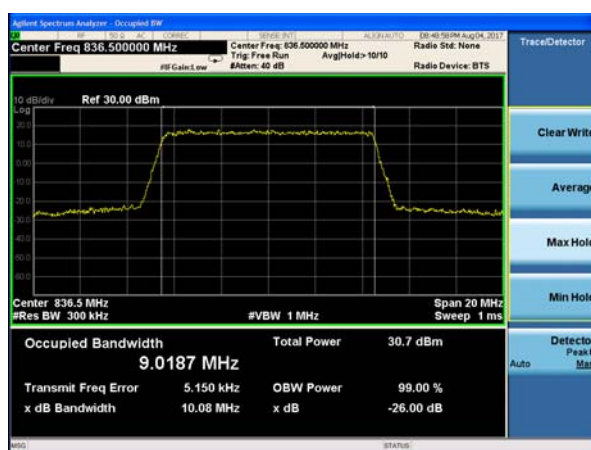
### LTE Band 5 QPSK 10MHz CH-Low



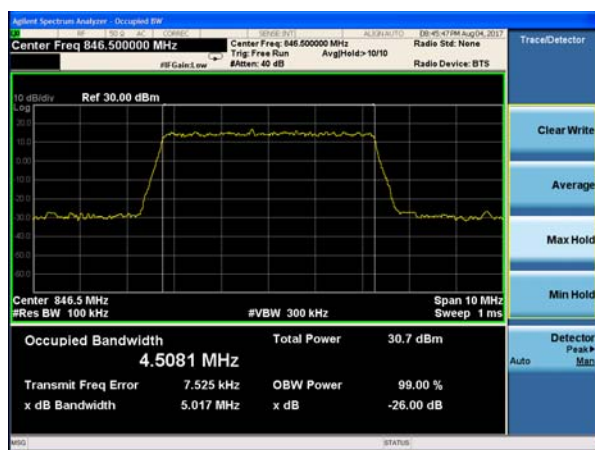
### LTE Band 5 QPSK 5MHz CH-Middle



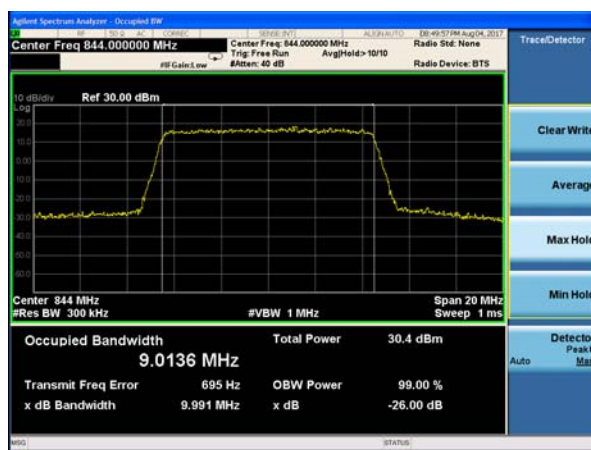
### LTE Band 5 QPSK 10MHz CH-Middle



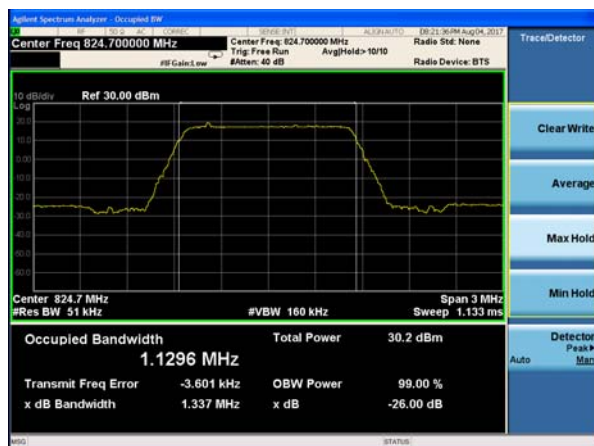
### LTE Band 5 QPSK 5MHz CH-High



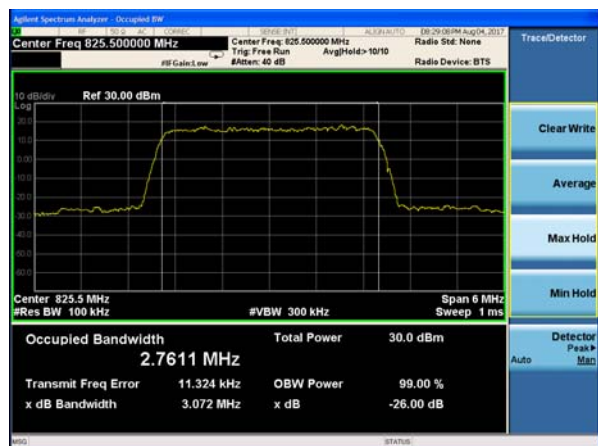
### LTE Band 5 QPSK 10MHz CH-High



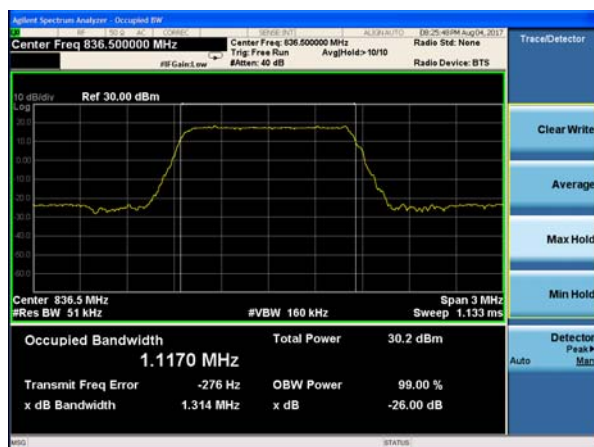
### LTE Band 5 16QAM 1.4MHz CH-Low



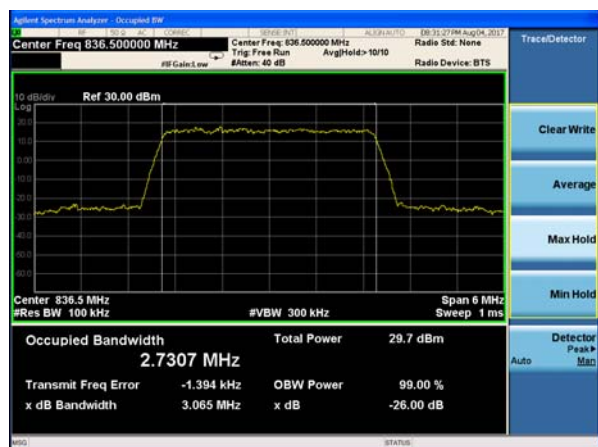
### LTE Band 5 16QAM 3MHz CH-Low



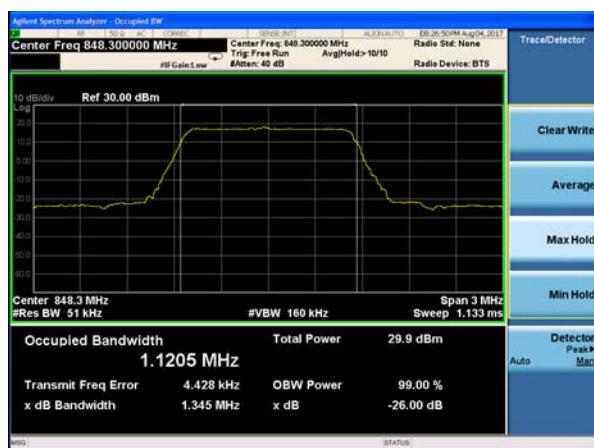
### LTE Band 5 16QAM 1.4MHz CH-Middle



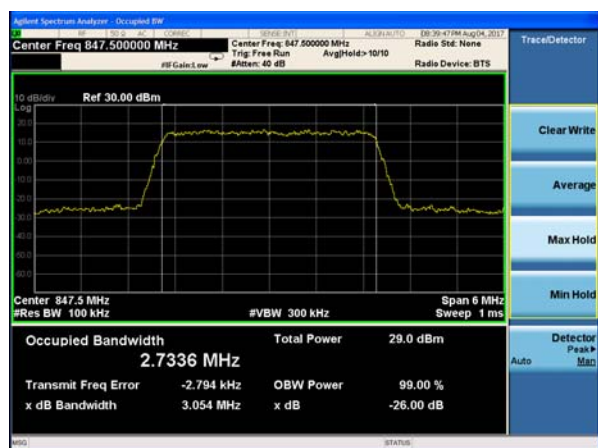
### LTE Band 5 16QAM 3MHz CH-Middle



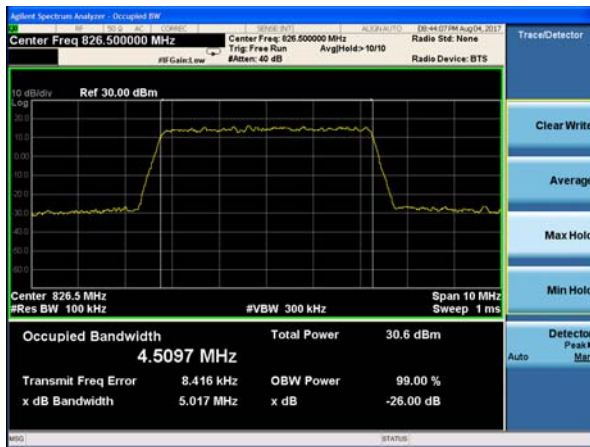
### LTE Band 5 16QAM 1.4MHz CH-High



### LTE Band 5 16QAM 3MHz CH-High



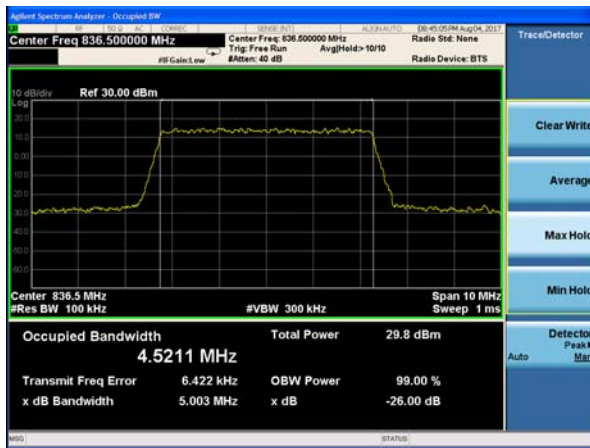
LTE Band 5 16QAM 5MHz CH-Low



LTE Band 5 16QAM 10MHz CH-Low



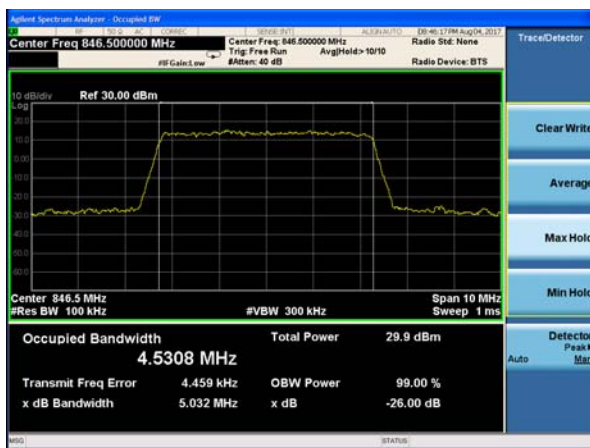
LTE Band 5 16QAM 5MHz CH-Middle



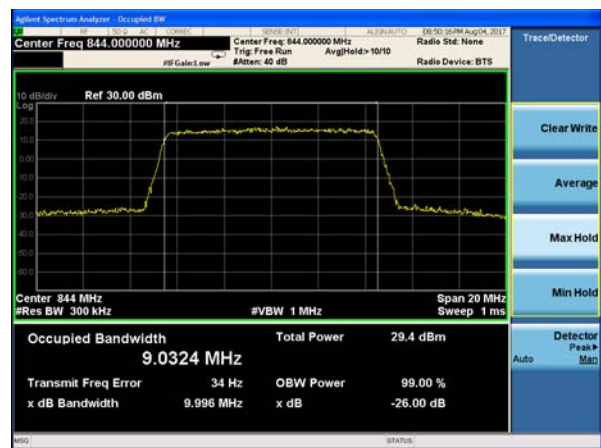
LTE Band 5 16QAM 10MHz CH-Middle



LTE Band 5 16QAM 5MHz CH-High



LTE Band 5 16QAM 10MHz CH-High



## 5.4. Band Edge Compliance

### Ambient condition

| Temperature | Relative humidity | Pressure |
|-------------|-------------------|----------|
| 23°C ~25°C  | 45%~50%           | 101.5kPa |

### Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The band edge of the lowest and highest channels were measured. The average detector is used.

RBW is set to 51kHz,VBW is set to 160kHz for WCDMA Band V,

RBW is set to 15 kHz, VBW is set to 51 kHz for LTE Band 5 (1.4MHz),

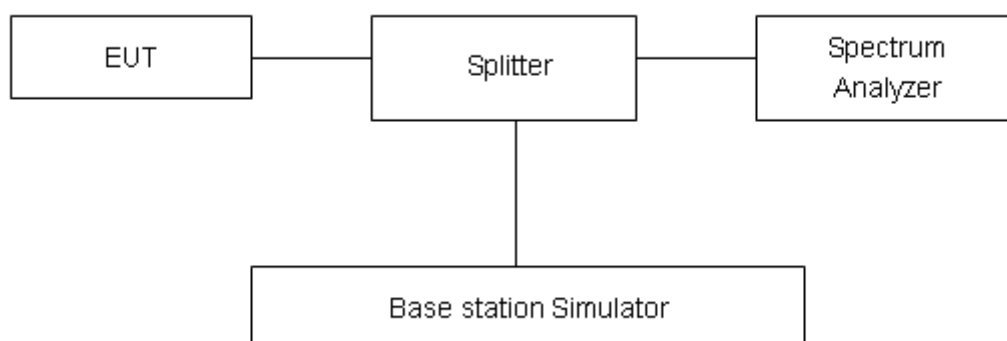
RBW is set to 30 kHz, VBW is set to 100 kHz for LTE Band 5 (3MHz),

RBW is set to 51 kHz, VBW is set to 160 kHz for LTE Band 5 (5MHz),

RBW is set to 100 kHz, VBW is set to 300 kHz for LTE Band 5 (10MHz),

Spectrum analyzer plots are included on the following pages.

### Test Setup



### Limits

Rule Part 22.917(a) specifies 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.”

|       |         |
|-------|---------|
| Limit | -13 dBm |
|-------|---------|

### Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 1.96$ ,  $U=0.684$ dB.



## Test Result:

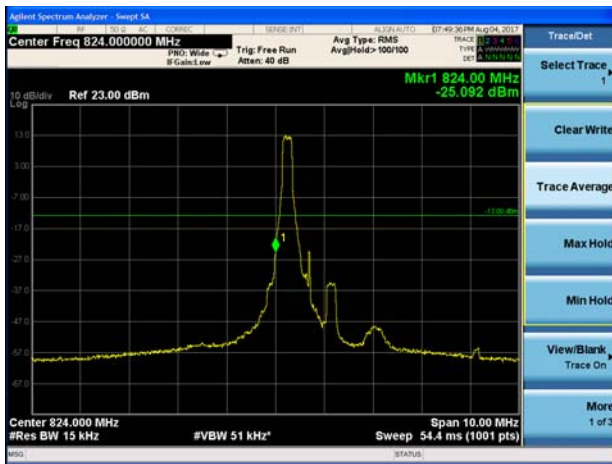
WCDMA Band V CH-Low



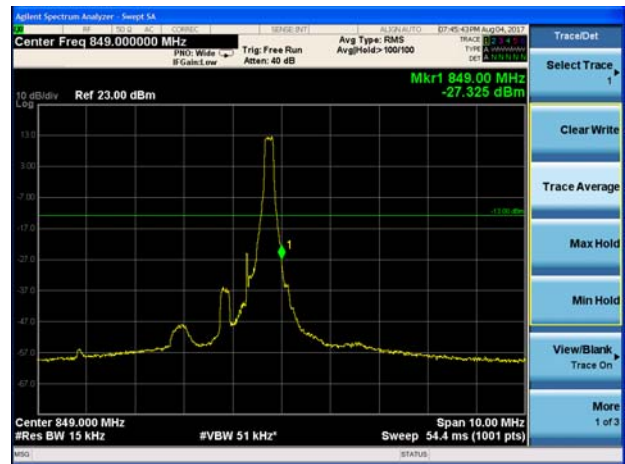
WCDMA Band V CH-High



LTE Band 5 QPSK 1.4MHz CH-Low 1RB



LTE Band 5 QPSK 1.4MHz CH-High 1RB



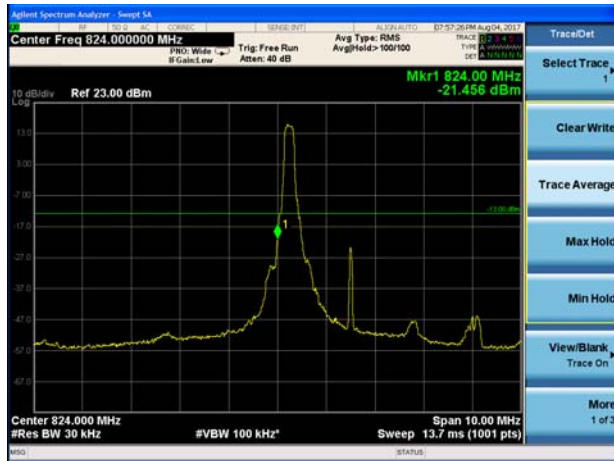
LTE Band 5 QPSK 1.4MHz CH-Low 100%RB



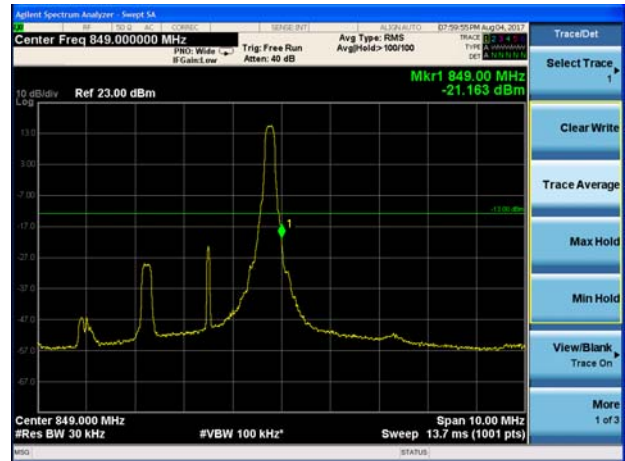
LTE Band 5 QPSK 1.4MHz CH-High 100%RB



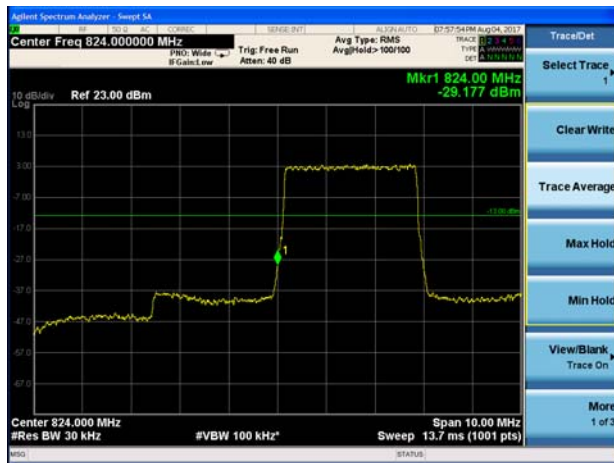
LTE Band 5 QPSK 3MHz CH-Low 1RB



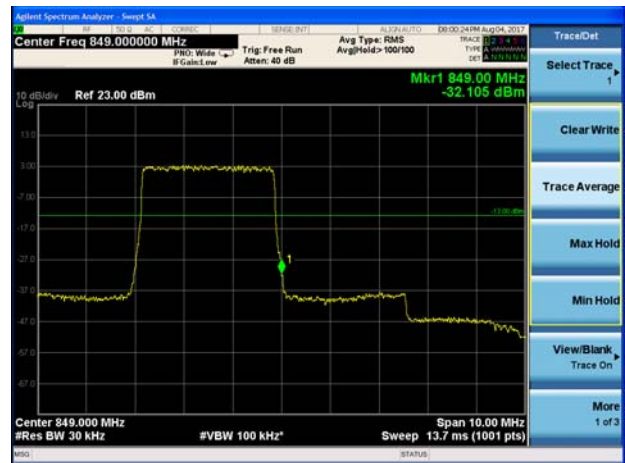
LTE Band 5 QPSK 3MHz CH-High 1RB



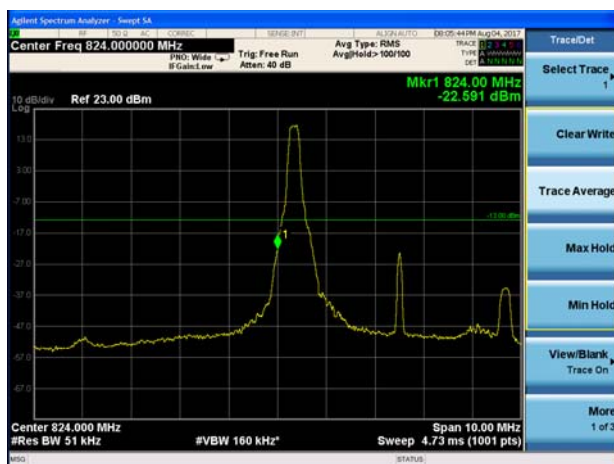
LTE Band 5 QPSK 3MHz CH-Low 100%RB



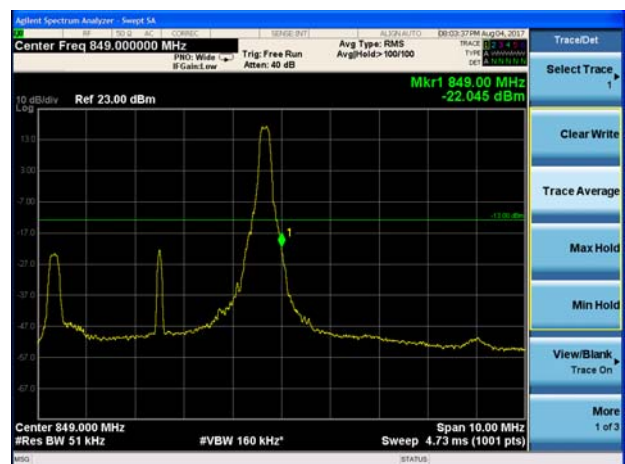
LTE Band 5 QPSK 3MHz CH-High 100%RB



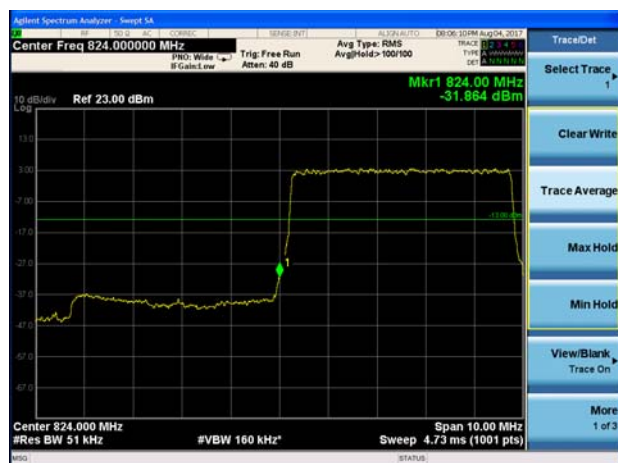
LTE Band 5 QPSK 5MHz CH-Low 1RB



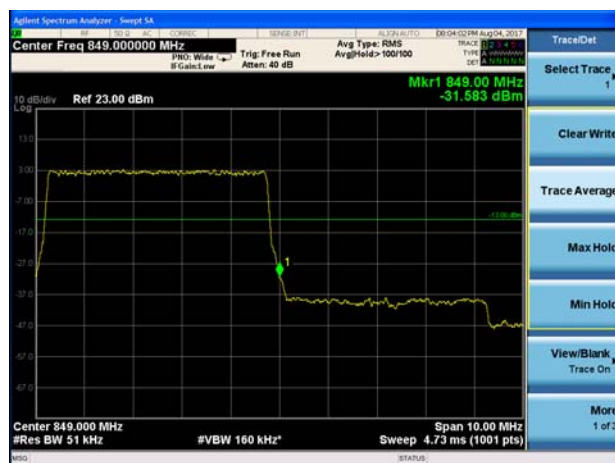
LTE Band 5 QPSK 5MHz CH-High 1RB



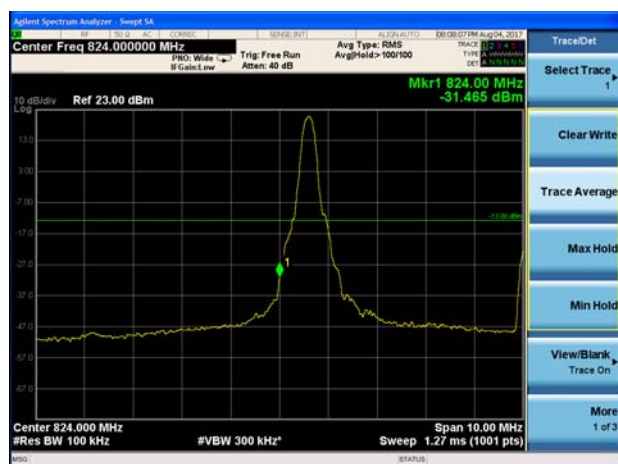
LTE Band 5 QPSK 5MHz CH-Low 100%RB



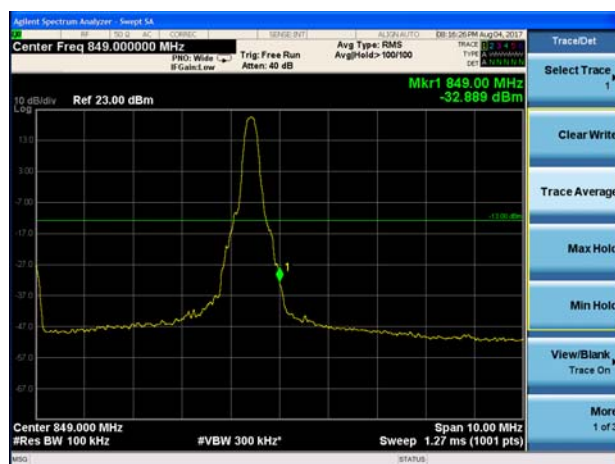
LTE Band 5 QPSK 5MHz CH-High 100%RB



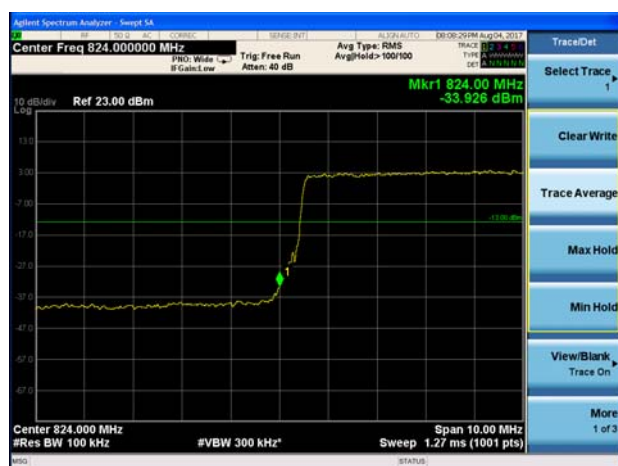
LTE Band 5 QPSK 10MHz CH-Low 1RB



LTE Band 5 QPSK 10MHz CH-High 1RB



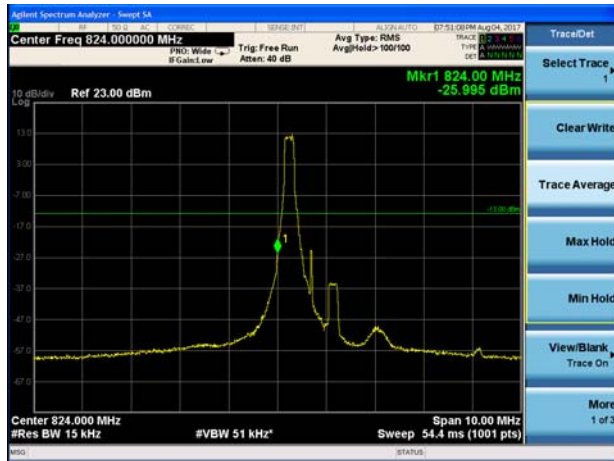
LTE Band 5 QPSK 10MHz CH-Low 100%RB



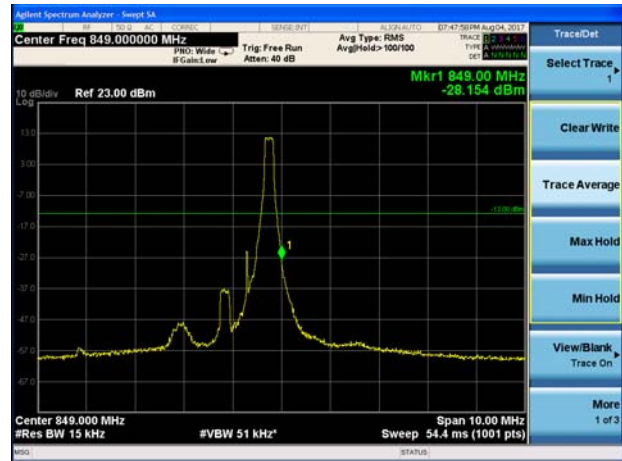
LTE Band 5 QPSK 10MHz CH-High 100%RB



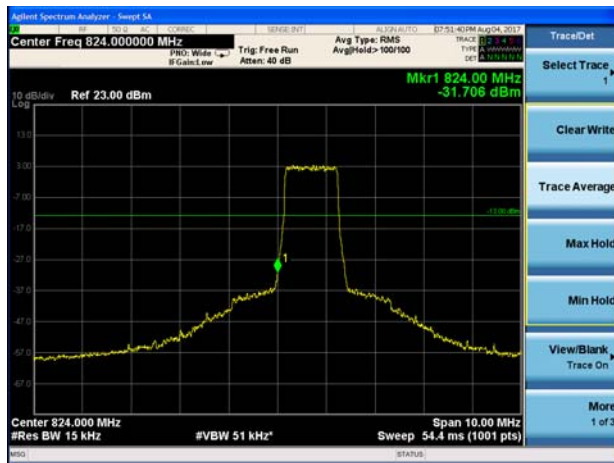
LTE Band 5 16QAM 1.4MHz CH-Low 1RB



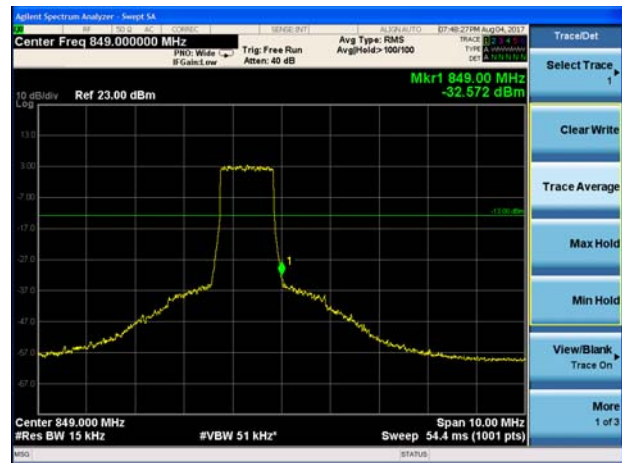
LTE Band 5 16QAM 1.4MHz CH-High 1RB



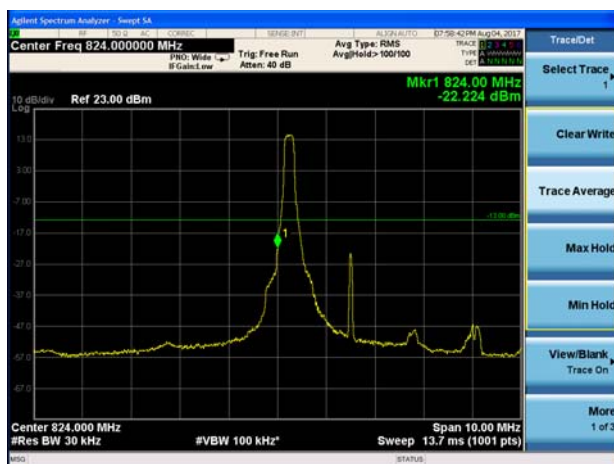
LTE Band 5 16QAM 1.4MHz CH-Low 100%RB



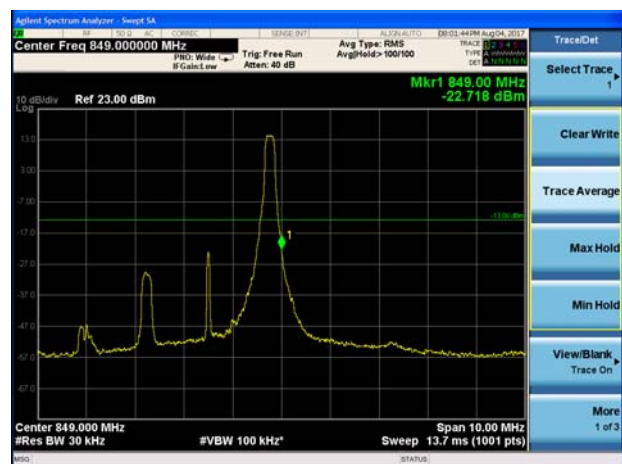
LTE Band 5 16QAM 1.4MHz CH-High 100%RB



LTE Band 5 16QAM 3MHz CH-Low 1RB



LTE Band 5 16QAM 3MHz CH-High 1RB



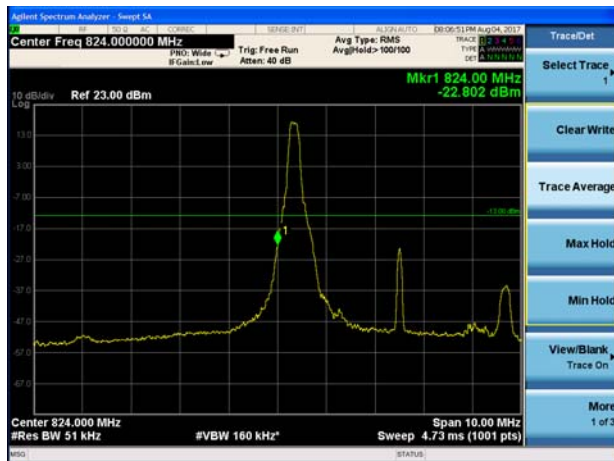
LTE Band 5 16QAM 3MHz CH-Low 100%RB



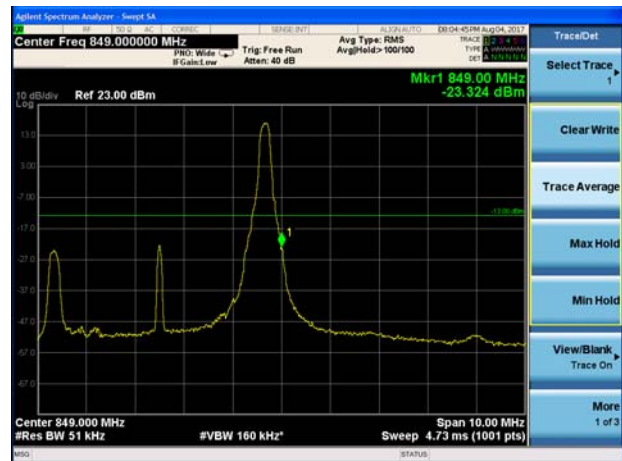
LTE Band 5 16QAM 3MHz CH-High 100%RB



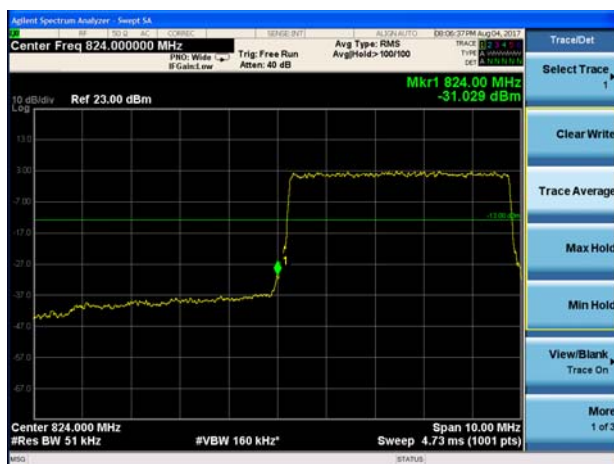
LTE Band 5 16QAM 5MHz CH-Low 1RB



LTE Band 5 16QAM 5MHz CH-High 1RB



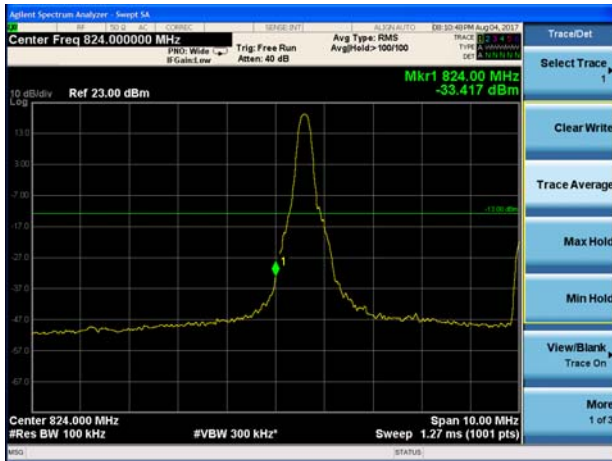
LTE Band 5 16QAM 5MHz CH-Low 100%RB



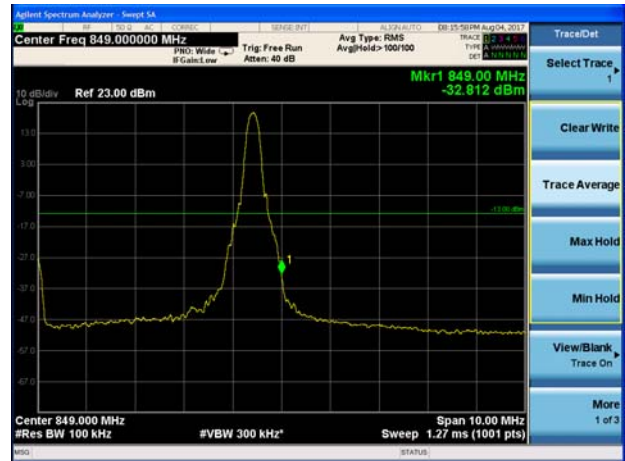
LTE Band 5 16QAM 5MHz CH-High 100%RB



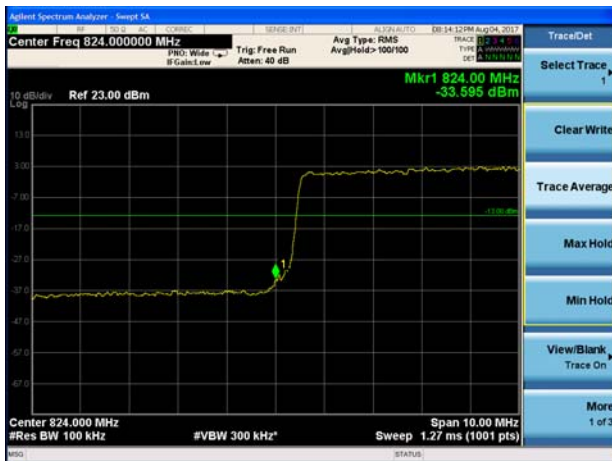
### LTE Band 5 16QAM 10MHz CH-Low 1RB



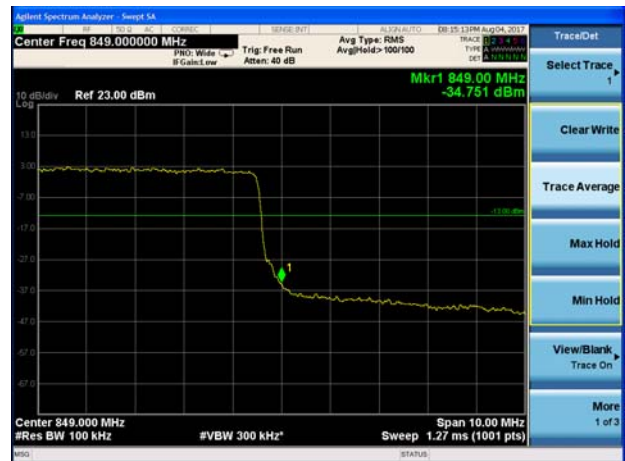
### LTE Band 5 16QAM 10MHz CH-High 1RB



### LTE Band 5 16QAM 10MHz CH-Low 100%RB



### LTE Band 5 16QAM 10MHz CH-High 100%RB



## 5.5. Peak-to-Average Power Ratio (PAPR)

### Ambient condition

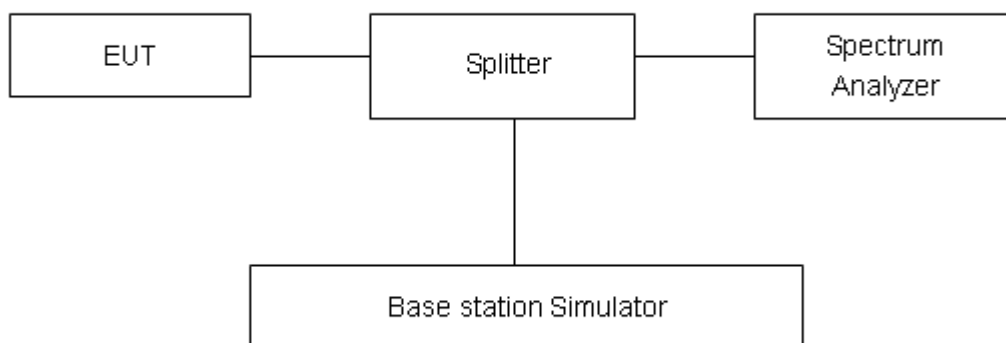
| Temperature | Relative humidity | Pressure |
|-------------|-------------------|----------|
| 23°C ~25°C  | 45%~50%           | 101.5kPa |

### Methods of Measurement

Measure the total peak power and record as  $P_{Pk}$ . And measure the total average power and record as  $P_{Avg}$ . Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

$$PAPR (dB) = P_{Pk} (dBm) - P_{Avg} (dBm).$$

### Test Setup



### Limits

According to the Sec. 22.913(d), The peak-to-average ratio (PAR) of the transmission must not exceed 13 dB.

### Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ ,  $U = 0.4$  dB.

**Test Results**

| Mode                              | Channel | Frequency (MHz) | Peak (dBm) | Avg (dBm) | PAPR (dB) | Limit (dB) | Conclusion |
|-----------------------------------|---------|-----------------|------------|-----------|-----------|------------|------------|
| <b>WCDMA<br/>Band V<br/>(RMC)</b> | 4132    | 826.4           | 26.52      | 23.28     | 3.24      | ≤13        | PASS       |
|                                   | 4183    | 836.6           | 26.65      | 23.39     | 3.26      | ≤13        | PASS       |
|                                   | 4233    | 846.6           | 26.54      | 23.33     | 3.21      | ≤13        | PASS       |

| LTE Band 5 |                 |         |                 |            |           |           |            |            |
|------------|-----------------|---------|-----------------|------------|-----------|-----------|------------|------------|
| Modulation | Bandwidth (MHz) | Channel | Frequency (MHz) | Peak (dBm) | Avg (dBm) | PAPR (dB) | Limit (dB) | Conclusion |
| QPSK       | 1.4             | 20407   | 824.7           | 27.50      | 22.22     | 5.28      | ≤13        | PASS       |
|            |                 | 20525   | 836.5           | 27.49      | 22.14     | 5.35      | ≤13        | PASS       |
|            |                 | 20643   | 848.3           | 27.36      | 22.13     | 5.23      | ≤13        | PASS       |
|            | 3               | 20415   | 825.5           | 27.59      | 22.25     | 5.34      | ≤13        | PASS       |
|            |                 | 20525   | 836.5           | 27.65      | 22.18     | 5.47      | ≤13        | PASS       |
|            |                 | 20635   | 847.5           | 27.46      | 22.16     | 5.30      | ≤13        | PASS       |
|            | 5               | 20425   | 826.5           | 27.62      | 22.23     | 5.39      | ≤13        | PASS       |
|            |                 | 20525   | 836.5           | 27.61      | 22.17     | 5.44      | ≤13        | PASS       |
|            |                 | 20625   | 846.5           | 27.43      | 22.14     | 5.29      | ≤13        | PASS       |
|            | 10              | 20450   | 829             | 27.63      | 22.26     | 5.37      | ≤13        | PASS       |
|            |                 | 20525   | 836.5           | 27.50      | 22.10     | 5.40      | ≤13        | PASS       |
|            |                 | 20600   | 844             | 27.41      | 22.09     | 5.32      | ≤13        | PASS       |
| 16QAM      | 1.4             | 20407   | 824.7           | 27.52      | 21.39     | 6.13      | ≤13        | PASS       |
|            |                 | 20525   | 836.5           | 27.62      | 21.49     | 6.13      | ≤13        | PASS       |
|            |                 | 20643   | 848.3           | 27.46      | 21.44     | 6.02      | ≤13        | PASS       |
|            | 3               | 20415   | 825.5           | 27.59      | 21.42     | 6.17      | ≤13        | PASS       |
|            |                 | 20525   | 836.5           | 27.76      | 21.53     | 6.23      | ≤13        | PASS       |
|            |                 | 20635   | 847.5           | 27.56      | 21.47     | 6.09      | ≤13        | PASS       |
|            | 5               | 20425   | 826.5           | 27.52      | 21.40     | 6.12      | ≤13        | PASS       |
|            |                 | 20525   | 836.5           | 27.64      | 21.49     | 6.15      | ≤13        | PASS       |
|            |                 | 20625   | 846.5           | 27.46      | 21.42     | 6.04      | ≤13        | PASS       |
|            | 10              | 20450   | 829             | 27.29      | 21.38     | 5.91      | ≤13        | PASS       |
|            |                 | 20525   | 836.5           | 27.36      | 21.45     | 5.91      | ≤13        | PASS       |
|            |                 | 20600   | 844             | 27.18      | 21.39     | 5.79      | ≤13        | PASS       |

## 5.6. Frequency Stability

### Ambient condition

| Temperature | Relative humidity | Pressure |
|-------------|-------------------|----------|
| 23°C ~25°C  | 45%~50%           | 101.5kPa |

### Method of Measurement

#### 1. Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from -40°C to +85°C in 10°C step size,

(1) With all power removed, the temperature was decreased to 0°C and permitted to stabilize for three hours.

(2) Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.

(3) Repeat the above measurements at 10°C increments from -40°C to +85°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements. Frequency Stability (Voltage Variation)

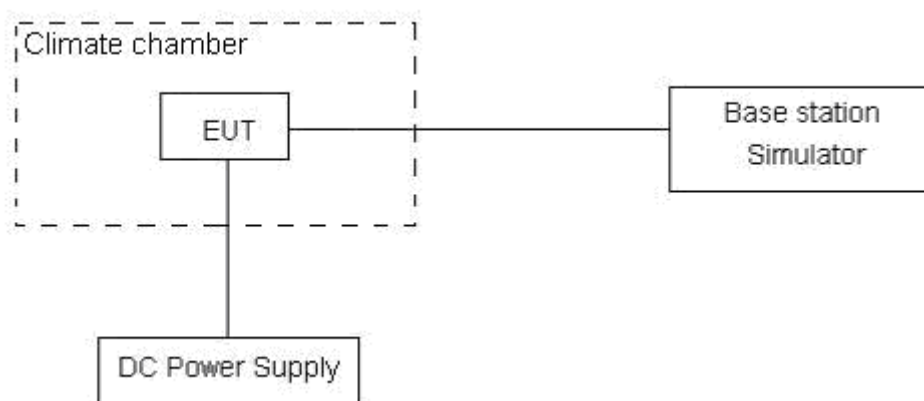
The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.

This transceiver is specified to operate with an input voltage of between 3.3 V and 4.3 V, with a nominal voltage of 3.8V.

### Test setup



## Limits

According to the Sec. 22.355, the frequency stability of the carrier shall be accurate to within 2.5 ppm of the received frequency for mobile stations.

|        |                |
|--------|----------------|
| Limits | $\leq 2.5$ ppm |
|--------|----------------|

## Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75% confidence level for the normal distribution is with the coverage factor  $k = 3$ ,  $U = 0.01$ ppm.

## Test Result

| Mode                              | Test status          | Test Results (ppm) | Limit (ppm) | Conclusion |
|-----------------------------------|----------------------|--------------------|-------------|------------|
|                                   |                      | RMC                |             |            |
| WCDMA<br>Band V<br>Middle Channel | -40°C/Normal Voltage | 0.00033            | 2.5         | PASS       |
|                                   | -30°C/Normal Voltage | -0.00029           | 2.5         | PASS       |
|                                   | -20°C/Normal Voltage | -0.00018           | 2.5         | PASS       |
|                                   | -10°C/Normal Voltage | -0.00032           | 2.5         | PASS       |
|                                   | 0°C/Normal Voltage   | 0.00006            | 2.5         | PASS       |
|                                   | 10°C/Normal Voltage  | 0.00002            | 2.5         | PASS       |
|                                   | 20°C/Normal Voltage  | 0.00011            | 2.5         | PASS       |
|                                   | 30°C/Normal Voltage  | 0.00047            | 2.5         | PASS       |
|                                   | 40°C/Normal Voltage  | 0.00022            | 2.5         | PASS       |
|                                   | 50°C/Normal Voltage  | -0.00017           | 2.5         | PASS       |
|                                   | 60°C/Normal Voltage  | 0.00015            | 2.5         | PASS       |
|                                   | 70°C/Normal Voltage  | -0.00096           | 2.5         | PASS       |
|                                   | 80°C/Normal Voltage  | -0.00079           | 2.5         | PASS       |
|                                   | 85°C/Normal Voltage  | 0.00017            | 2.5         | PASS       |
|                                   | 20°C/Minimum Voltage | -0.00055           | 2.5         | PASS       |
|                                   | 20°C/Maximum Voltage | -0.00015           | 2.5         | PASS       |



| Bandwidth | Test status          | LTE Band 5 Middle Channel Test Results (ppm) |          |             |            |
|-----------|----------------------|----------------------------------------------|----------|-------------|------------|
|           |                      | QPSK                                         | 16QAM    | Limit (ppm) | Conclusion |
| 1.4MHz    | -40°C/Normal Voltage | -0.00253                                     | -0.00106 | 2.5         | PASS       |
|           | -30°C/Normal Voltage | -0.00099                                     | -0.00176 | 2.5         | PASS       |
|           | -20°C/Normal Voltage | -0.00188                                     | -0.00053 | 2.5         | PASS       |
|           | -10°C/Normal Voltage | -0.00230                                     | -0.00234 | 2.5         | PASS       |
|           | 0°C/Normal Voltage   | -0.00255                                     | -0.00106 | 2.5         | PASS       |
|           | 10°C/Normal Voltage  | -0.00082                                     | 0.00274  | 2.5         | PASS       |
|           | 20°C/Normal Voltage  | -0.00265                                     | -0.00416 | 2.5         | PASS       |
|           | 30°C/Normal Voltage  | -0.00039                                     | -0.00175 | 2.5         | PASS       |
|           | 40°C/Normal Voltage  | -0.00417                                     | 0.00191  | 2.5         | PASS       |
|           | 50°C/Normal Voltage  | -0.00241                                     | -0.00179 | 2.5         | PASS       |
|           | 60°C/Normal Voltage  | -0.00108                                     | -0.00049 | 2.5         | PASS       |
|           | 70°C/Normal Voltage  | -0.00094                                     | -0.00032 | 2.5         | PASS       |
|           | 80°C/Normal Voltage  | -0.00005                                     | 0.00044  | 2.5         | PASS       |
|           | 85°C/Normal Voltage  | 0.00163                                      | 0.00016  | 2.5         | PASS       |
|           | 20°C/Minimum Voltage | 0.00001                                      | -0.00135 | 2.5         | PASS       |
|           | 20°C/Maximum Voltage | -0.00074                                     | -0.00234 | 2.5         | PASS       |
| 3MHz      | -40°C/Normal Voltage | -0.00123                                     | -0.00103 | 2.5         | PASS       |
|           | -30°C/Normal Voltage | -0.00023                                     | -0.00241 | 2.5         | PASS       |
|           | -20°C/Normal Voltage | -0.00218                                     | -0.00118 | 2.5         | PASS       |
|           | -10°C/Normal Voltage | -0.00024                                     | -0.00027 | 2.5         | PASS       |
|           | 0°C/Normal Voltage   | -0.00071                                     | -0.00337 | 2.5         | PASS       |
|           | 10°C/Normal Voltage  | -0.00400                                     | 0.00087  | 2.5         | PASS       |
|           | 20°C/Normal Voltage  | -0.00378                                     | -0.00086 | 2.5         | PASS       |
|           | 30°C/Normal Voltage  | -0.00132                                     | -0.00068 | 2.5         | PASS       |
|           | 40°C/Normal Voltage  | -0.00051                                     | -0.00050 | 2.5         | PASS       |
|           | 50°C/Normal Voltage  | 0.00117                                      | -0.00269 | 2.5         | PASS       |
|           | 60°C/Normal Voltage  | 0.00048                                      | -0.00310 | 2.5         | PASS       |
|           | 70°C/Normal Voltage  | 0.00147                                      | -0.00275 | 2.5         | PASS       |
|           | 80°C/Normal Voltage  | 0.00080                                      | -0.00412 | 2.5         | PASS       |
|           | 85°C/Normal Voltage  | -0.00115                                     | -0.00226 | 2.5         | PASS       |
|           | 20°C/Minimum Voltage | -0.00154                                     | -0.00608 | 2.5         | PASS       |
|           | 20°C/Maximum Voltage | -0.00212                                     | -0.00148 | 2.5         | PASS       |
| 5MHz      | -40°C/Normal Voltage | 0.00318                                      | -0.00489 | 2.5         | PASS       |
|           | -30°C/Normal Voltage | -0.00044                                     | 0.00004  | 2.5         | PASS       |
|           | -20°C/Normal Voltage | 0.00158                                      | -0.00521 | 2.5         | PASS       |



|       |                      |          |          |     |      |
|-------|----------------------|----------|----------|-----|------|
|       | -10°C/Normal Voltage | -0.00337 | -0.00330 | 2.5 | PASS |
|       | 0°C/Normal Voltage   | -0.00239 | -0.00146 | 2.5 | PASS |
|       | 10°C/Normal Voltage  | 0.00017  | -0.00286 | 2.5 | PASS |
|       | 20°C/Normal Voltage  | -0.00111 | -0.00409 | 2.5 | PASS |
|       | 30°C/Normal Voltage  | -0.00049 | 0.00059  | 2.5 | PASS |
|       | 40°C/Normal Voltage  | 0.00029  | 0.00311  | 2.5 | PASS |
|       | 50°C/Normal Voltage  | 0.00091  | -0.00221 | 2.5 | PASS |
|       | 60°C/Normal Voltage  | -0.00087 | -0.00059 | 2.5 | PASS |
|       | 70°C/Normal Voltage  | -0.00135 | -0.00079 | 2.5 | PASS |
|       | 80°C/Normal Voltage  | -0.00270 | -0.00338 | 2.5 | PASS |
|       | 85°C/Normal Voltage  | -0.00016 | -0.00166 | 2.5 | PASS |
|       | 20°C/Minimum Voltage | -0.00065 | 0.00017  | 2.5 | PASS |
|       | 20°C/Maximum Voltage | -0.00226 | 0.00171  | 2.5 | PASS |
| 10MHz | -40°C/Normal Voltage | -0.00074 | -0.00250 | 2.5 | PASS |
|       | -30°C/Normal Voltage | 0.00007  | -0.00007 | 2.5 | PASS |
|       | -20°C/Normal Voltage | -0.00219 | -0.00065 | 2.5 | PASS |
|       | -10°C/Normal Voltage | -0.00151 | -0.00197 | 2.5 | PASS |
|       | 0°C/Normal Voltage   | 0.00139  | -0.00234 | 2.5 | PASS |
|       | 10°C/Normal Voltage  | -0.00120 | -0.00074 | 2.5 | PASS |
|       | 20°C/Normal Voltage  | -0.00320 | 0.00047  | 2.5 | PASS |
|       | 30°C/Normal Voltage  | -0.00270 | -0.00011 | 2.5 | PASS |
|       | 40°C/Normal Voltage  | -0.00140 | -0.00200 | 2.5 | PASS |
|       | 50°C/Normal Voltage  | -0.00027 | 0.00008  | 2.5 | PASS |
|       | 60°C/Normal Voltage  | -0.00013 | -0.00311 | 2.5 | PASS |
|       | 70°C/Normal Voltage  | -0.00282 | -0.00135 | 2.5 | PASS |
|       | 80°C/Normal Voltage  | 0.00065  | 0.00148  | 2.5 | PASS |
|       | 85°C/Normal Voltage  | 0.00143  | 0.00214  | 2.5 | PASS |
|       | 20°C/Minimum Voltage | 0.00106  | 0.00061  | 2.5 | PASS |
|       | 20°C/Maximum Voltage | -0.00429 | 0.00080  | 2.5 | PASS |

## 5.7. Spurious Emissions at Antenna Terminals

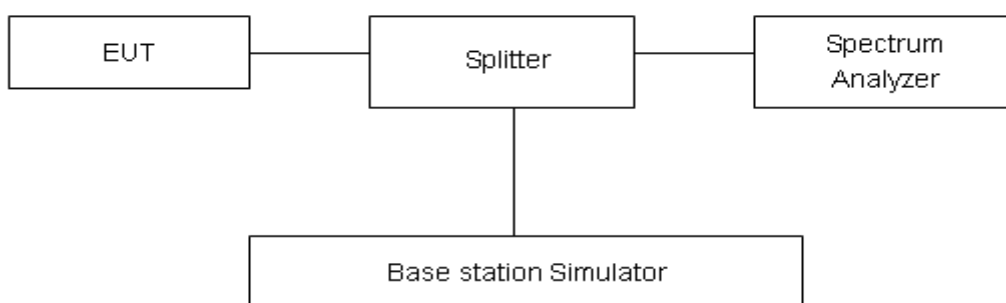
### Ambient condition

| Temperature | Relative humidity | Pressure |
|-------------|-------------------|----------|
| 23°C ~25°C  | 45%~50%           | 101.5kPa |

### Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 9kHz to the 10th harmonic of the carrier. The peak detector is used. RBW are set to 100 kHz and VBW are set to 300 kHz for below 1G, RBW are set to 1MHz and VBW are set to 3MHz for above 1G, Sweep is set to ATUO.

### Test setup



### Limits

Rule Part 22.917(a) specifies 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.”

| Limit | -13 dBm |
|-------|---------|
|-------|---------|

### Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75% confidence level for the normal distribution is with the coverage factor  $k = 1.96$ .

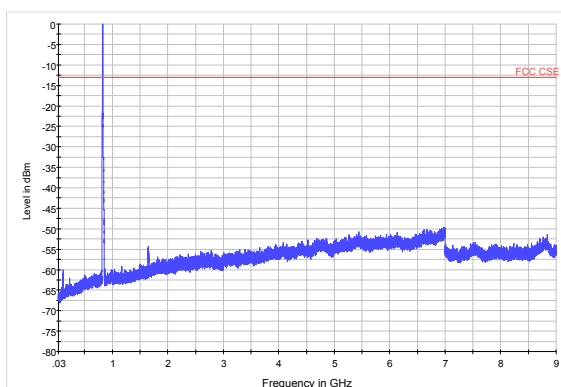
| Frequency     | Uncertainty |
|---------------|-------------|
| 100kHz-2GHz   | 0.684 dB    |
| 2GHz-12.75GHz | 1.407 dB    |

## Test Result

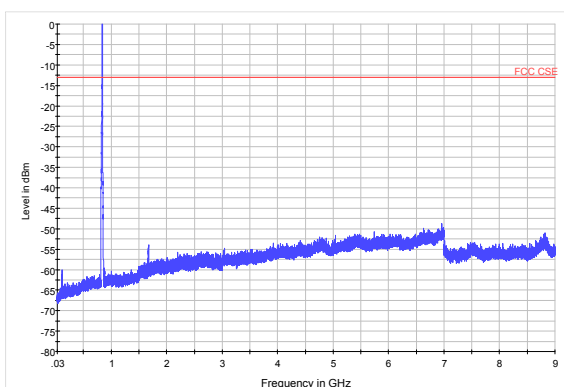
Sweep from 9 kHz to 30MHz, and the emissions more than 20 dB below the permissible value are not reported.

If disturbances were found more than 20dB below limit line, the mark is not required for the EUT.  
The signal beyond the limit is carrier.

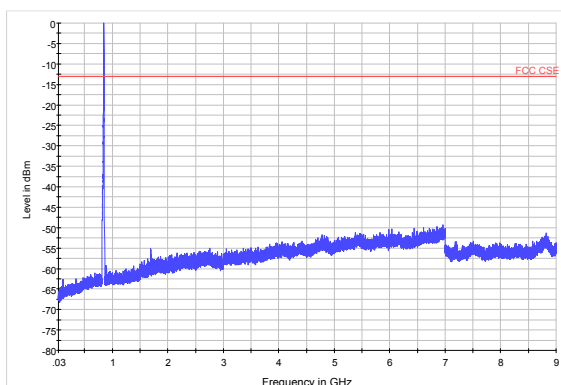
WCDMA Band V CH-Low 30MHz ~ 9GHz



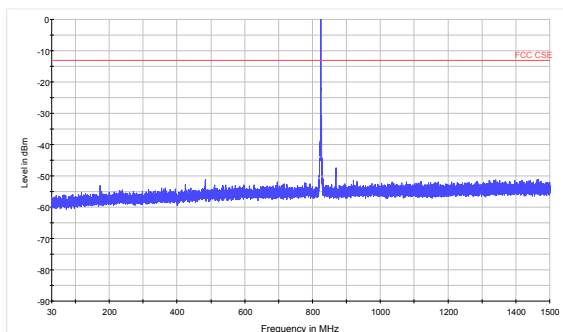
WCDMA Band V CH-Middle 30MHz ~ 9GHz



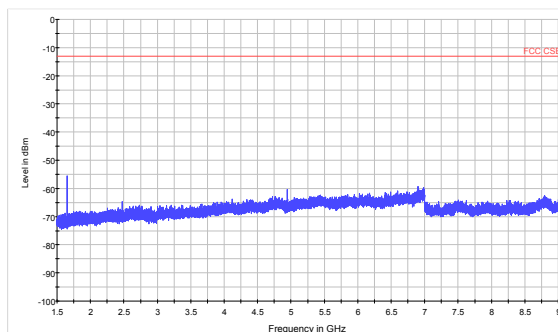
WCDMA Band V CH-High 30MHz ~ 9GHz



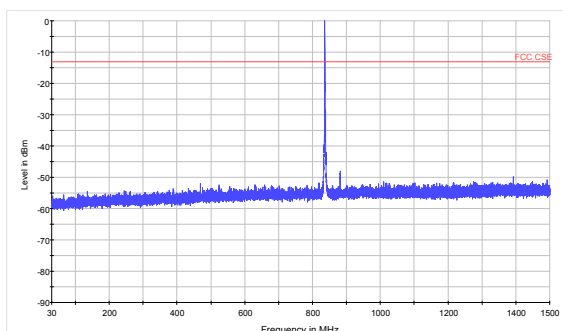
LTE Band 5 1.4MHz CH-Low 30MHz~1.5GHz



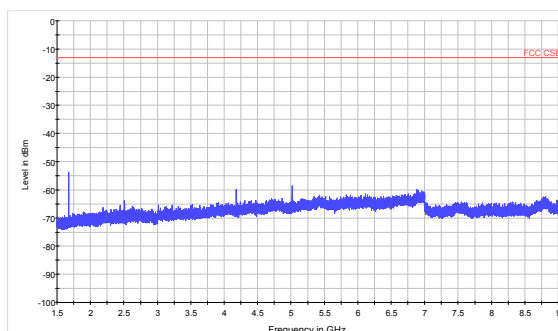
LTE Band 5 1.4MHz CH-Low 1.5GHz~9GHz



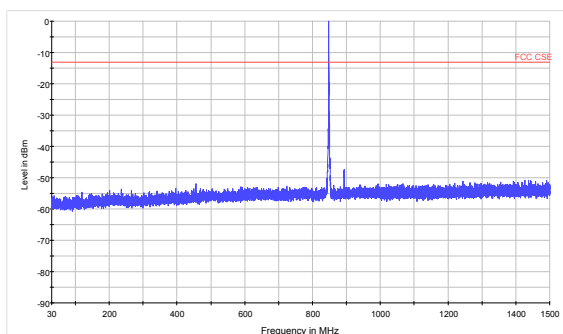
LTE Band 5 1.4MHz CH-Middle 30MHz~1.5GHz



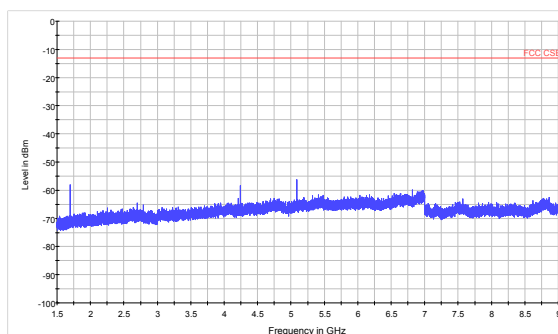
LTE Band 5 1.4MHz CH-Middle 1.5GHz~9GHz



LTE Band 5 1.4MHz CH-High 30MHz~1.5GHz

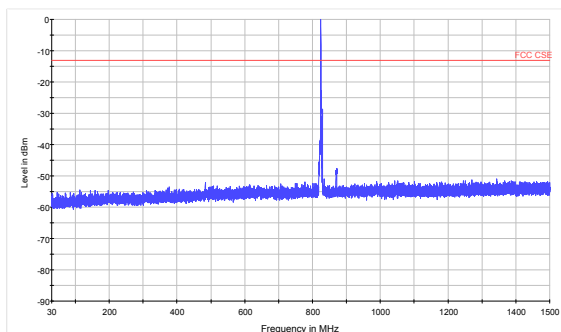


LTE Band 5 1.4MHz CH-High 1.5GHz~9GHz

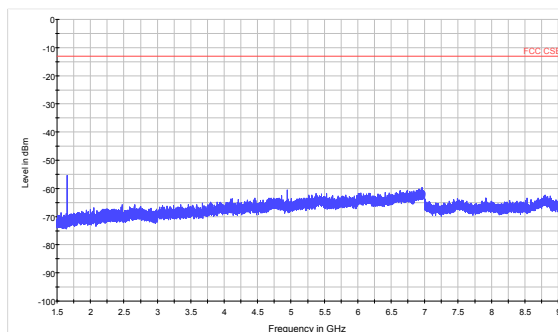




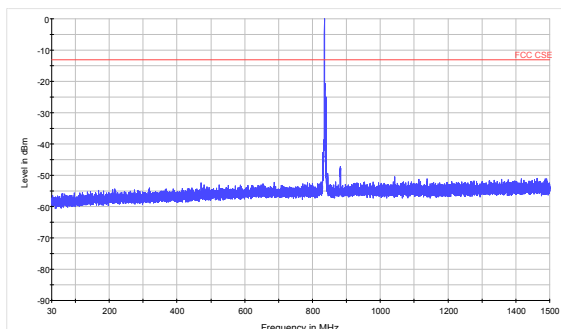
LTE Band 5 3MHz CH-Low 30MHz~1.5GHz



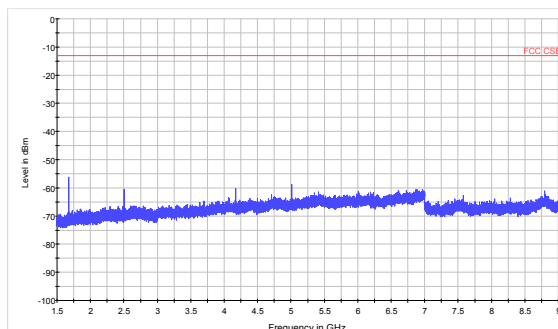
LTE Band 5 3MHz CH-Low 1.5GHz~9GHz



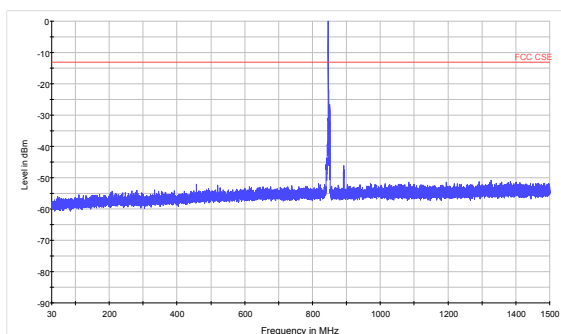
LTE Band 5 3MHz CH-Middle 30MHz~1.5GHz



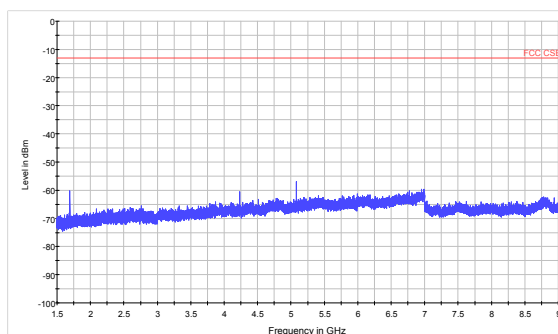
LTE Band 5 3MHz CH-Middle 1.5GHz~9GHz



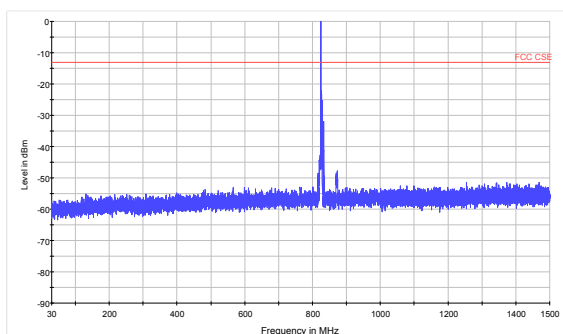
LTE Band 5 3MHz CH-High 30MHz~1.5GHz



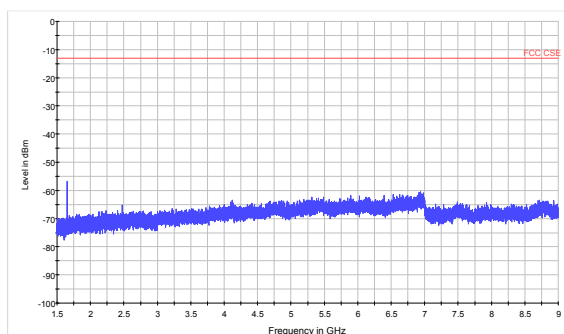
LTE Band 5 3MHz CH-High 1.5GHz~9GHz



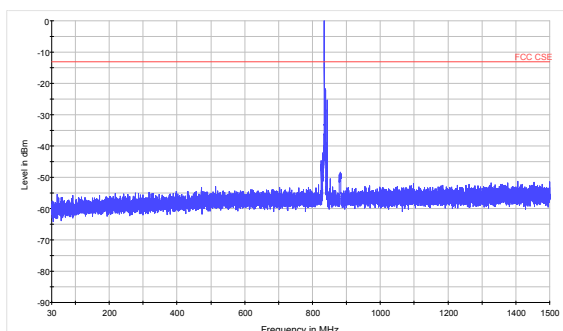
LTE Band 5 5MHz CH-Low 30MHz~1.5GHz



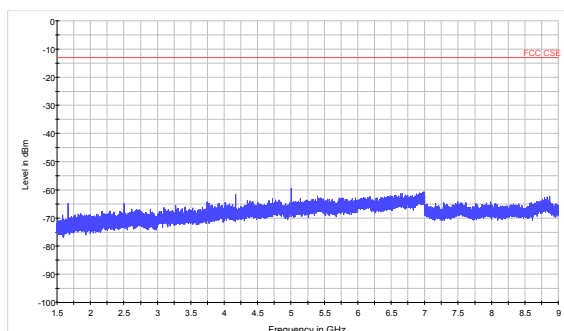
LTE Band 5 5MHz CH-Low 1.5GHz~9GHz



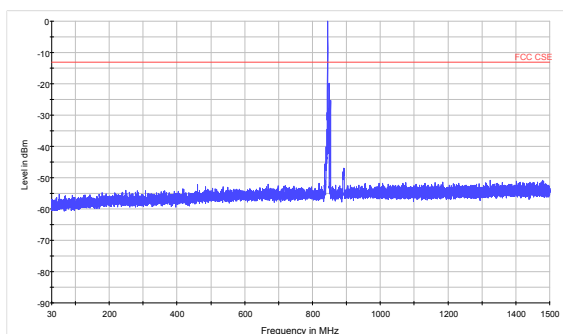
LTE Band 5 5MHz CH-Middle 30MHz~1.5GHz



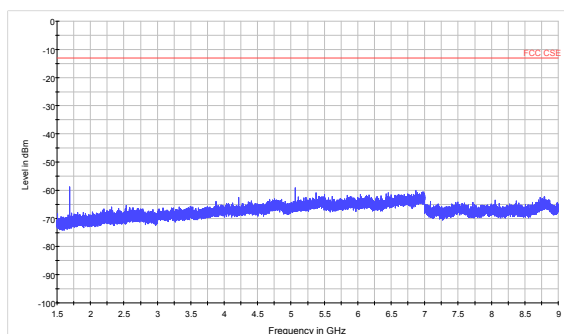
LTE Band 5 5MHz CH-Middle 1.5GHz~9GHz



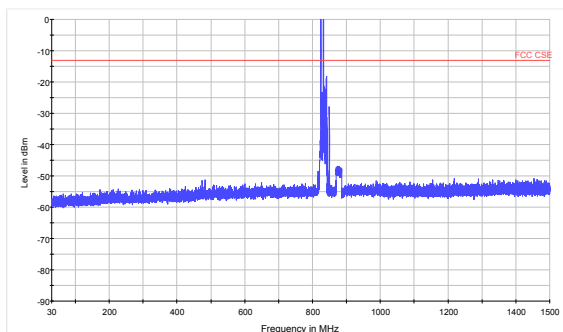
LTE Band 5 5MHz CH-High 30MHz~1.5GHz



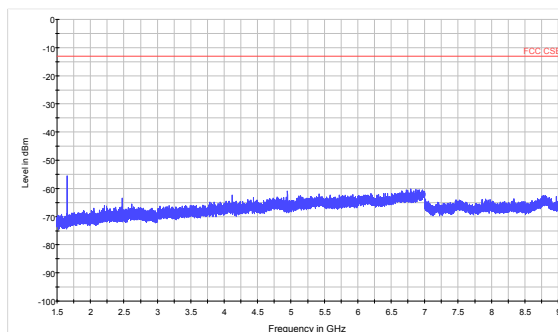
LTE Band 5 5MHz CH-High 1.5GHz~9GHz



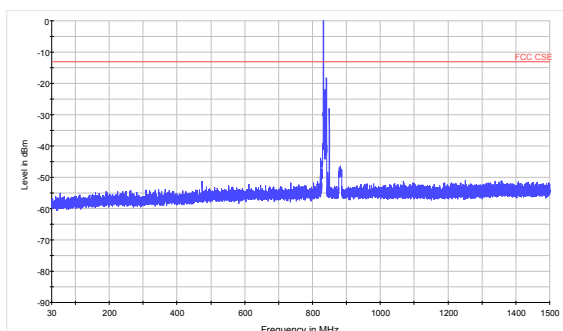
LTE Band 5 10MHz CH-Low 30MHz~1.5GHz



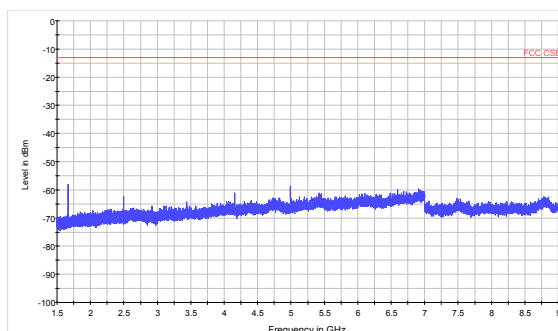
LTE Band 5 10MHz CH-Low 1.5GHz~9GHz



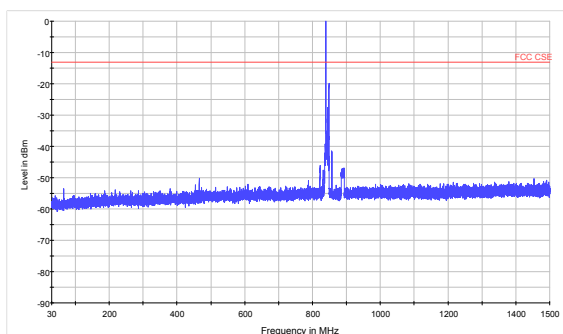
LTE Band 5 10MHz CH-Middle 30MHz~1.5GHz



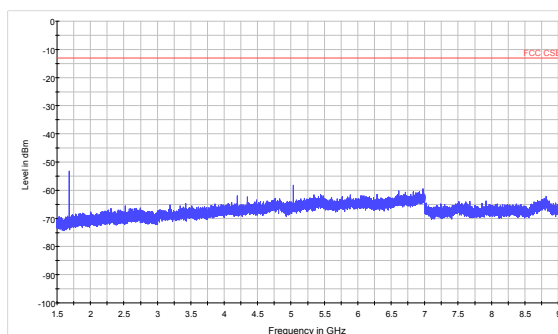
LTE Band 5 10MHz CH-Middle 1.5GHz~9GHz



LTE Band 5 10MHz CH-High 30MHz~1.5GHz



LTE Band 5 10MHz CH-High 1.5GHz~9GHz



## 5.8. Radiates Spurious Emission

### Ambient condition

| Temperature | Relative humidity | Pressure |
|-------------|-------------------|----------|
| 23°C ~25°C  | 45%~50%           | 101.5kPa |

### Method of Measurement

1. The testing follows ANSI C63.26 (2015) Section 5.5.2.3.
2. Above 30MHz: The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H). Above 1GHz: (Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.) The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).
3. 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.
4. 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 for above 1GHz and RBW=100kHz, VBW=300kHz for 30MHz to 1GHz,, And the maximum value of the receiver should be recorded as (Pr).
5. 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 (PMea) 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 (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. 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 (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAG) should be recorded after test.
7. The measurement results are obtained as described below:  

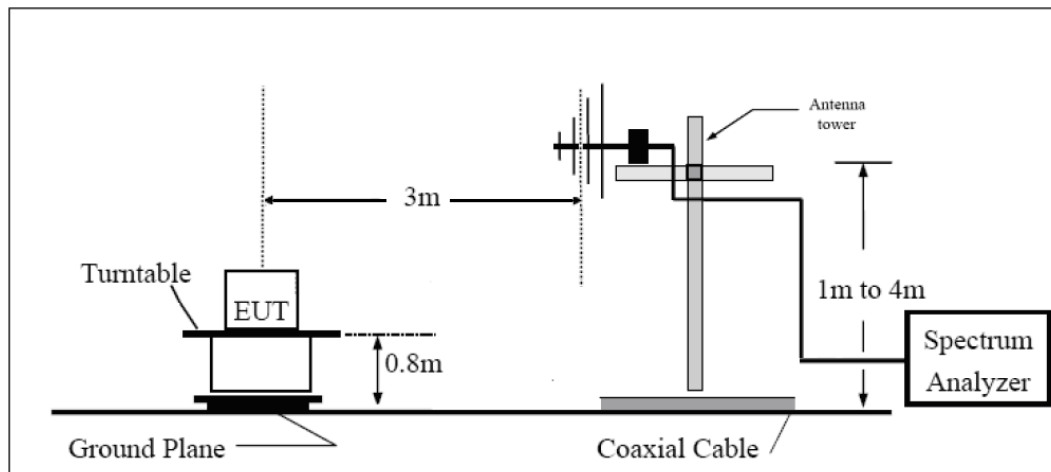
$$\text{Power(EIRP)} = \text{PMea} - \text{PAG} - \text{Pcl} + \text{Ga}$$
The measurement results are amend as described below:  

$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$$
8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi)

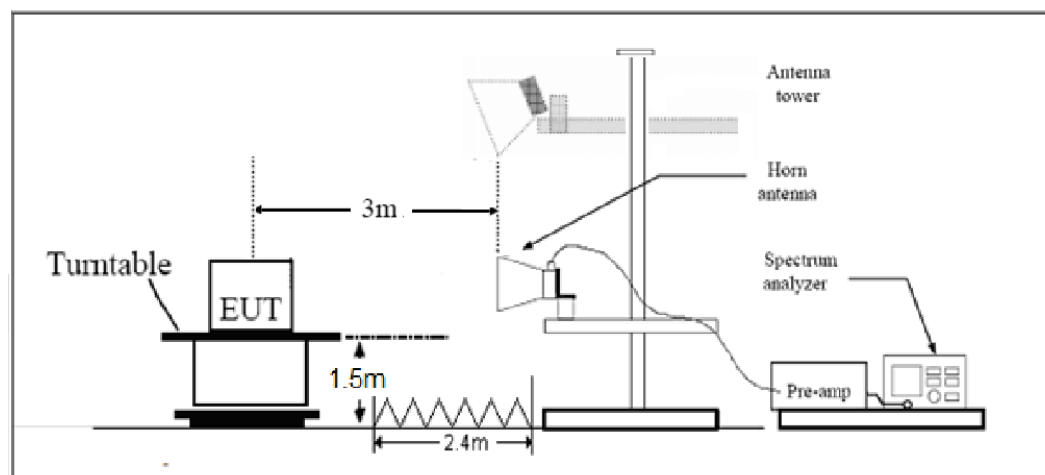
and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$ .

## Test setup

30MHz~~~ 1GHz



Above 1GHz



Note: Area side: 2.4mX3.6m

## Limits



Rule Part 22.917(a) specifies 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."

|       |         |
|-------|---------|
| Limit | -13 dBm |
|-------|---------|

### Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 1.96$ ,  $U = 3.55$  dB.

**Test Result**

## WCDMA Band V CH-Low

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1652.8          | -60.40   | 2               | 10.15      | Vertical             | -54.4           | -13.0       | 41.4        | 45            |
| 3        | 2479.2          | -58.49   | 2.51            | 11.35      | Vertical             | -51.8           | -13.0       | 38.8        | 225           |
| 4        | 3305.6          | -55.50   | 4.2             | 10.85      | Vertical             | -51.0           | -13.0       | 38.0        | 225           |
| 5        | 4132.0          | -51.80   | 5.2             | 11.35      | Vertical             | -47.8           | -13.0       | 34.8        | 270           |
| 6        | 4958.4          | -50.00   | 5.5             | 11.95      | Vertical             | -45.7           | -13.0       | 32.7        | 90            |
| 7        | 5784.8          | -50.60   | 5.7             | 13.55      | Vertical             | -44.9           | -13.0       | 31.9        | 45            |
| 8        | 6611.2          | -49.10   | 6.3             | 13.75      | Vertical             | -43.8           | -13.0       | 30.8        | 90            |
| 9        | 7437.6          | -46.10   | 6.8             | 13.85      | Vertical             | -41.2           | -13.0       | 28.2        | 45            |
| 10       | 8264.0          | -46.20   | 6.9             | 14.25      | Vertical             | -41.0           | -13.0       | 28.0        | 0             |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

## WCDMA Band V CH-Middle

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1673.2          | -62.20   | 2               | 10.75      | Vertical             | -55.6           | -13.0       | 42.6        | 270           |
| 3        | 2509.8          | -59.79   | 2.51            | 11.05      | Vertical             | -53.4           | -13.0       | 40.4        | 90            |
| 4        | 3346.4          | -56.20   | 4.2             | 11.15      | Vertical             | -51.4           | -13.0       | 38.4        | 225           |
| 5        | 4183.0          | -51.50   | 5.2             | 11.15      | Vertical             | -47.7           | -13.0       | 34.7        | 270           |
| 6        | 5019.6          | -49.60   | 5.5             | 11.95      | Vertical             | -45.3           | -13.0       | 32.3        | 90            |
| 7        | 5856.2          | -50.60   | 5.7             | 13.55      | Vertical             | -44.9           | -13.0       | 31.9        | 45            |
| 8        | 6692.8          | -49.50   | 6.3             | 13.75      | Vertical             | -44.2           | -13.0       | 31.2        | 90            |
| 9        | 7529.4          | -46.80   | 6.8             | 13.85      | Vertical             | -41.9           | -13.0       | 28.9        | 45            |
| 10       | 8366.0          | -46.60   | 6.9             | 14.25      | Vertical             | -41.4           | -13.0       | 28.4        | 0             |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

## WCDMA Band V CH-High

| Harmonic                                                                                                                                                   | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2                                                                                                                                                          | 1673.2          | -61.80   | 2               | 10.15      | Vertical             | -55.8           | -13.0       | 42.8        | 45            |
| 3                                                                                                                                                          | 2509.8          | -59.39   | 2.51            | 11.05      | Vertical             | -53.0           | -13.0       | 40.0        | 90            |
| 4                                                                                                                                                          | 3346.4          | -55.70   | 4.2             | 11.15      | Vertical             | -50.9           | -13.0       | 37.9        | 315           |
| 5                                                                                                                                                          | 4183.0          | -53.30   | 5.2             | 11.15      | Vertical             | -49.5           | -13.0       | 36.5        | 270           |
| 6                                                                                                                                                          | 5019.6          | -50.50   | 5.5             | 11.95      | Vertical             | -46.2           | -13.0       | 33.2        | 45            |
| 7                                                                                                                                                          | 5856.2          | -53.00   | 5.7             | 13.55      | Vertical             | -47.3           | -13.0       | 34.3        | 225           |
| 8                                                                                                                                                          | 6692.8          | -50.90   | 6.3             | 13.75      | Vertical             | -45.6           | -13.0       | 32.6        | 270           |
| 9                                                                                                                                                          | 7529.4          | -46.20   | 6.8             | 13.85      | Vertical             | -41.3           | -13.0       | 28.3        | 90            |
| 10                                                                                                                                                         | 8366.0          | -46.30   | 6.9             | 14.25      | Vertical             | -41.1           | -13.0       | 28.1        | 45            |
| Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.<br>2.The worst emission was found in the antenna is vertical position. |                 |          |                 |            |                      |                 |             |             |               |

## LTE Band 5 1.4MHz CH-Low

| Harmonic                                                                                                                                                   | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2                                                                                                                                                          | 1649.4          | -54.20   | 2.00            | 10.75      | vertical             | -48.2           | -13.0       | 35.2        | 270           |
| 3                                                                                                                                                          | 2474.1          | -52.99   | 2.51            | 11.05      | vertical             | -46.3           | -13.0       | 33.3        | 135           |
| 4                                                                                                                                                          | 3298.8          | -59.40   | 4.20            | 11.15      | vertical             | -54.9           | -13.0       | 41.9        | 180           |
| 5                                                                                                                                                          | 4123.5          | -55.90   | 5.20            | 11.15      | vertical             | -51.9           | -13.0       | 38.9        | 270           |
| 6                                                                                                                                                          | 4948.2          | -57.00   | 5.50            | 11.95      | vertical             | -52.7           | -13.0       | 39.7        | 45            |
| 7                                                                                                                                                          | 5772.9          | -56.90   | 5.70            | 13.55      | vertical             | -51.2           | -13.0       | 38.2        | 180           |
| 8                                                                                                                                                          | 6597.6          | -54.50   | 6.30            | 13.75      | vertical             | -49.2           | -13.0       | 36.2        | 90            |
| 9                                                                                                                                                          | 7422.3          | -55.20   | 6.80            | 13.85      | vertical             | -50.3           | -13.0       | 37.3        | 0             |
| 10                                                                                                                                                         | 8247.0          | -54.80   | 6.90            | 14.25      | vertical             | -49.6           | -13.0       | 36.6        | 45            |
| Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.<br>2.The worst emission was found in the antenna is vertical position. |                 |          |                 |            |                      |                 |             |             |               |

## LTE Band 5 1.4MHz CH-Middle

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1673.0          | -54.00   | 2.00            | 10.75      | vertical             | -47.4           | -13.0       | 34.4        | 45            |
| 3        | 2509.5          | -52.89   | 2.51            | 11.05      | vertical             | -46.5           | -13.0       | 33.5        | 0             |
| 4        | 3346.0          | -58.30   | 4.20            | 11.15      | vertical             | -53.5           | -13.0       | 40.5        | 45            |
| 5        | 4182.5          | -56.70   | 5.20            | 11.15      | vertical             | -52.9           | -13.0       | 39.9        | 315           |
| 6        | 5019.0          | -57.20   | 5.50            | 11.95      | vertical             | -52.9           | -13.0       | 39.9        | 270           |
| 7        | 5855.5          | -56.50   | 5.70            | 13.55      | vertical             | -50.8           | -13.0       | 37.8        | 180           |
| 8        | 6692.0          | -54.80   | 6.30            | 13.75      | vertical             | -49.5           | -13.0       | 36.5        | 270           |
| 9        | 7528.5          | -55.50   | 6.80            | 13.85      | vertical             | -50.6           | -13.0       | 37.6        | 270           |
| 10       | 8365.0          | -53.80   | 6.90            | 14.25      | vertical             | -48.6           | -13.0       | 35.6        | 135           |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

## LTE Band 5 1.4MHz CH-High

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1696.6          | -55.30   | 2.00            | 10.75      | vertical             | -48.7           | -13.0       | 35.7        | 135           |
| 3        | 2544.9          | -52.79   | 2.51            | 11.05      | vertical             | -46.4           | -13.0       | 33.4        | 45            |
| 4        | 3393.2          | -59.90   | 4.20            | 11.15      | vertical             | -55.1           | -13.0       | 42.1        | 45            |
| 5        | 4241.5          | -52.90   | 5.20            | 11.15      | vertical             | -49.1           | -13.0       | 36.1        | 315           |
| 6        | 5089.8          | -55.50   | 5.50            | 11.95      | vertical             | -51.2           | -13.0       | 38.2        | 270           |
| 7        | 5938.1          | -58.10   | 5.70            | 13.55      | vertical             | -52.4           | -13.0       | 39.4        | 180           |
| 8        | 6786.4          | -55.20   | 6.30            | 13.75      | vertical             | -49.9           | -13.0       | 36.9        | 270           |
| 9        | 7634.7          | -54.30   | 6.80            | 13.85      | vertical             | -49.4           | -13.0       | 36.4        | 45            |
| 10       | 8483.0          | -54.50   | 6.90            | 14.25      | vertical             | -49.3           | -13.0       | 36.3        | 180           |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

## LTE Band 5 3MHz CH-Low

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1651.0          | -55.10   | 2.00            | 10.75      | vertical             | -48.5           | -13.0       | 35.5        | 45            |
| 3        | 2476.5          | -52.59   | 2.51            | 11.05      | vertical             | -46.2           | -13.0       | 33.2        | 90            |
| 4        | 3302.0          | -60.50   | 4.20            | 11.15      | vertical             | -55.7           | -13.0       | 42.7        | 45            |
| 5        | 4127.5          | -56.40   | 5.20            | 11.15      | vertical             | -52.6           | -13.0       | 39.6        | 0             |
| 6        | 4953.0          | -56.80   | 5.50            | 11.95      | vertical             | -52.5           | -13.0       | 39.5        | 45            |
| 7        | 5778.5          | -56.70   | 5.70            | 13.55      | vertical             | -51.0           | -13.0       | 38.0        | 90            |
| 8        | 6604.0          | -55.10   | 6.30            | 13.75      | vertical             | -49.8           | -13.0       | 36.8        | 135           |
| 9        | 7429.5          | -55.00   | 6.80            | 13.85      | vertical             | -50.1           | -13.0       | 37.1        | 45            |
| 10       | 8255.0          | -53.20   | 6.90            | 14.25      | vertical             | -48.0           | -13.0       | 35.0        | 315           |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

## LTE Band 5 3MHz CH-Middle

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1673.0          | -53.60   | 2.00            | 10.75      | vertical             | -47.0           | -13.0       | 34.0        | 315           |
| 3        | 2509.5          | -52.19   | 2.51            | 11.05      | vertical             | -45.8           | -13.0       | 32.8        | 270           |
| 4        | 3346.0          | -59.30   | 4.20            | 11.15      | vertical             | -54.5           | -13.0       | 41.5        | 45            |
| 5        | 4182.5          | -57.80   | 5.20            | 11.15      | vertical             | -54.0           | -13.0       | 41.0        | 225           |
| 6        | 5019.0          | -56.30   | 5.50            | 11.95      | vertical             | -52.0           | -13.0       | 39.0        | 135           |
| 7        | 5855.5          | -56.90   | 5.70            | 13.55      | vertical             | -51.2           | -13.0       | 38.2        | 45            |
| 8        | 6692.0          | -54.40   | 6.30            | 13.75      | vertical             | -49.1           | -13.0       | 36.1        | 0             |
| 9        | 7528.5          | -54.00   | 6.80            | 13.85      | vertical             | -49.1           | -13.0       | 36.1        | 45            |
| 10       | 8365.0          | -55.00   | 6.90            | 14.25      | vertical             | -49.8           | -13.0       | 36.8        | 90            |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

## LTE Band 5 3MHz CH-High

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1695.0          | -54.80   | 2.00            | 10.75      | vertical             | -48.2           | -13.0       | 35.2        | 270           |
| 3        | 2542.5          | -53.09   | 2.51            | 11.05      | vertical             | -46.7           | -13.0       | 33.7        | 135           |
| 4        | 3390.0          | -59.70   | 4.20            | 11.15      | vertical             | -54.9           | -13.0       | 41.9        | 135           |
| 5        | 4237.5          | -53.50   | 5.20            | 11.15      | vertical             | -49.7           | -13.0       | 36.7        | 225           |
| 6        | 5085.0          | -54.80   | 5.50            | 11.95      | vertical             | -50.5           | -13.0       | 37.5        | 135           |
| 7        | 5932.5          | -57.10   | 5.70            | 13.55      | vertical             | -51.4           | -13.0       | 38.4        | 45            |
| 8        | 6780.0          | -54.40   | 6.30            | 13.75      | vertical             | -49.1           | -13.0       | 36.1        | 0             |
| 9        | 7627.5          | -54.50   | 6.80            | 13.85      | vertical             | -49.6           | -13.0       | 36.6        | 45            |
| 10       | 8475.0          | -54.70   | 6.90            | 14.25      | vertical             | -49.5           | -13.0       | 36.5        | 90            |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

## LTE Band 5 5MHz CH-Low

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1653.0          | -55.70   | 2.00            | 10.75      | vertical             | -49.1           | -13.0       | 36.1        | 180           |
| 3        | 2479.5          | -52.89   | 2.51            | 11.05      | vertical             | -46.5           | -13.0       | 33.5        | 90            |
| 4        | 3306.0          | -60.00   | 4.20            | 11.15      | vertical             | -55.2           | -13.0       | 42.2        | 315           |
| 5        | 4132.5          | -56.60   | 5.20            | 11.15      | vertical             | -52.8           | -13.0       | 39.8        | 270           |
| 6        | 4959.0          | -57.20   | 5.50            | 11.95      | vertical             | -52.9           | -13.0       | 39.9        | 180           |
| 7        | 5785.5          | -57.00   | 5.70            | 13.55      | vertical             | -51.3           | -13.0       | 38.3        | 270           |
| 8        | 6612.0          | -55.20   | 6.30            | 13.75      | vertical             | -49.9           | -13.0       | 36.9        | 270           |
| 9        | 7438.5          | -54.60   | 6.80            | 13.85      | vertical             | -49.7           | -13.0       | 36.7        | 135           |
| 10       | 8265.0          | -54.80   | 6.90            | 14.25      | vertical             | -49.6           | -13.0       | 36.6        | 225           |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

## LTE Band 5 5MHz CH-Middle

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1673.0          | -59.80   | 2.00            | 10.75      | vertical             | -53.2           | -13.0       | 40.2        | 225           |
| 3        | 2509.5          | -52.89   | 2.51            | 11.05      | vertical             | -46.5           | -13.0       | 33.5        | 135           |
| 4        | 3346.0          | -58.90   | 4.20            | 11.15      | vertical             | -54.1           | -13.0       | 41.1        | 315           |
| 5        | 4182.5          | -56.30   | 5.20            | 11.15      | vertical             | -52.5           | -13.0       | 39.5        | 270           |
| 6        | 5019.0          | -56.00   | 5.50            | 11.95      | vertical             | -51.7           | -13.0       | 38.7        | 180           |
| 7        | 5855.5          | -57.30   | 5.70            | 13.55      | vertical             | -51.6           | -13.0       | 38.6        | 270           |
| 8        | 6692.0          | -55.30   | 6.30            | 13.75      | vertical             | -50.0           | -13.0       | 37.0        | 45            |
| 9        | 7528.5          | -55.30   | 6.80            | 13.85      | vertical             | -50.4           | -13.0       | 37.4        | 180           |
| 10       | 8365.0          | -54.80   | 6.90            | 14.25      | vertical             | -49.6           | -13.0       | 36.6        | 90            |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

## LTE Band 5 5MHz CH-High

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1693.0          | -57.40   | 2.00            | 10.75      | vertical             | -50.8           | -13.0       | 37.8        | 45            |
| 3        | 2539.5          | -52.89   | 2.51            | 11.05      | vertical             | -46.5           | -13.0       | 33.5        | 90            |
| 4        | 3386.0          | -59.70   | 4.20            | 11.15      | vertical             | -54.9           | -13.0       | 41.9        | 90            |
| 5        | 4232.5          | -54.00   | 5.20            | 11.15      | vertical             | -50.2           | -13.0       | 37.2        | 135           |
| 6        | 5079.0          | -55.20   | 5.50            | 11.95      | vertical             | -50.9           | -13.0       | 37.9        | 45            |
| 7        | 5925.5          | -57.90   | 5.70            | 13.55      | vertical             | -52.2           | -13.0       | 39.2        | 315           |
| 8        | 6772.0          | -55.80   | 6.30            | 13.75      | vertical             | -50.5           | -13.0       | 37.5        | 270           |
| 9        | 7618.5          | -54.50   | 6.80            | 13.85      | vertical             | -49.6           | -13.0       | 36.6        | 180           |
| 10       | 8465.0          | -54.40   | 6.90            | 14.25      | vertical             | -49.2           | -13.0       | 36.2        | 270           |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

## LTE Band 5 10MHz CH-Low

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1673.0          | -56.40   | 2.00            | 10.75      | vertical             | -49.8           | -13.0       | 36.8        | 135           |
| 3        | 2509.5          | -52.09   | 2.51            | 11.05      | vertical             | -45.7           | -13.0       | 32.7        | 45            |
| 4        | 3316.0          | -60.10   | 4.20            | 11.15      | vertical             | -55.3           | -13.0       | 42.3        | 270           |
| 5        | 4145.0          | -57.30   | 5.20            | 11.15      | vertical             | -53.5           | -13.0       | 40.5        | 180           |
| 6        | 4974.0          | -57.90   | 5.50            | 11.95      | vertical             | -53.6           | -13.0       | 40.6        | 270           |
| 7        | 5803.0          | -56.10   | 5.70            | 13.55      | vertical             | -50.4           | -13.0       | 37.4        | 45            |
| 8        | 6632.0          | -55.00   | 6.30            | 13.75      | vertical             | -49.7           | -13.0       | 36.7        | 180           |
| 9        | 7461.0          | -55.60   | 6.80            | 13.85      | vertical             | -50.7           | -13.0       | 37.7        | 45            |
| 10       | 8290.0          | -53.60   | 6.90            | 14.25      | vertical             | -48.4           | -13.0       | 35.4        | 90            |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

## LTE Band 5 10MHz CH-Middle

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1673.0          | -56.40   | 2.00            | 10.75      | vertical             | -49.8           | -13.0       | 36.8        | 135           |
| 3        | 2509.5          | -52.09   | 2.51            | 11.05      | vertical             | -45.7           | -13.0       | 32.7        | 45            |
| 4        | 3346.0          | -59.90   | 4.20            | 11.15      | vertical             | -55.1           | -13.0       | 42.1        | 135           |
| 5        | 4182.5          | -55.90   | 5.20            | 11.15      | vertical             | -52.1           | -13.0       | 39.1        | 225           |
| 6        | 5019.0          | -56.20   | 5.50            | 11.95      | vertical             | -51.9           | -13.0       | 38.9        | 135           |
| 7        | 5855.5          | -57.20   | 5.70            | 13.55      | vertical             | -51.5           | -13.0       | 38.5        | 45            |
| 8        | 6692.0          | -55.50   | 6.30            | 13.75      | vertical             | -50.2           | -13.0       | 37.2        | 0             |
| 9        | 7528.5          | -54.10   | 6.80            | 13.85      | vertical             | -49.2           | -13.0       | 36.2        | 45            |
| 10       | 8365.0          | -54.60   | 6.90            | 14.25      | vertical             | -49.4           | -13.0       | 36.4        | 90            |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

## LTE Band 5 10MHz CH-High

| Harmonic | Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|----------|-----------------|----------|-----------------|------------|----------------------|-----------------|-------------|-------------|---------------|
| 2        | 1688.0          | -51.90   | 2.00            | 10.75      | vertical             | -45.3           | -13.0       | 32.3        | 90            |
| 3        | 2532.0          | -52.49   | 2.51            | 11.05      | vertical             | -46.1           | -13.0       | 33.1        | 135           |
| 4        | 3376.0          | -59.90   | 4.20            | 11.15      | vertical             | -55.1           | -13.0       | 42.1        | 180           |
| 5        | 4220.0          | -56.90   | 5.20            | 11.15      | vertical             | -53.1           | -13.0       | 40.1        | 45            |
| 6        | 5064.0          | -56.10   | 5.50            | 11.95      | vertical             | -51.8           | -13.0       | 38.8        | 90            |
| 7        | 5908.0          | -58.10   | 5.70            | 13.55      | vertical             | -52.4           | -13.0       | 39.4        | 135           |
| 8        | 6752.0          | -54.80   | 6.30            | 13.75      | vertical             | -49.5           | -13.0       | 36.5        | 45            |
| 9        | 7596.0          | -55.10   | 6.80            | 13.85      | vertical             | -50.2           | -13.0       | 37.2        | 315           |
| 10       | 8440.0          | -55.90   | 6.90            | 14.25      | vertical             | -50.7           | -13.0       | 37.7        | 270           |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

## 6. Main Test Instruments

| Name                                 | Manufacturer | Type         | Serial Number | Calibration Date | Expiration Time |
|--------------------------------------|--------------|--------------|---------------|------------------|-----------------|
| Base Station Simulator               | R&S          | CMW500       | 113645        | 2017-05-14       | 2018-05-13      |
| Power Splitter                       | Hua Xiang    | SHX-GF2-2-13 | 10120101      | 2017-05-14       | 2018-05-13      |
| Spectrum Analyzer                    | Agilent      | N9010A       | MY47191109    | 2017-05-20       | 2018-05-19      |
| Universal Radio Communication Tester | Agilent      | E5515C       | MY48367192    | 2017-05-20       | 2018-05-19      |
| Signal Analyzer                      | R&S          | FSV30        | 100815        | 2016-12-16       | 2017-12-15      |
| EMI Test Receiver                    | R&S          | ESCI         | 100948        | 2017-05-20       | 2018-05-19      |
| Signal generator                     | R&S          | SMB 100A     | 102594        | 2017-05-14       | 2018-05-13      |
| Signal generator                     | R&S          | SMR27        | 100365        | 2017-05-14       | 2018-05-13      |
| Trilog Antenna                       | SCHWARZBECK  | VUBL 9163    | 9163-201      | 2014-12-06       | 2017-12-05      |
| Horn Antenna                         | R&S          | HF907        | 100126        | 2014-12-06       | 2017-12-05      |
| Horn Antenna                         | ETS-Lindgren | 3160-09      | 00102644      | 2015-01-30       | 2018-01-29      |
| Climatic Chamber                     | Re Ce        | PT-30B       | 20101891      | 2015-07-18       | 2018-07-17      |
| RF Cable                             | Agilent      | SMA 15cm     | 0001          | 2017-08-04       | 2018-02-03      |
| Preamplifier                         | R&S          | SCU18        | 102327        | 2017-06-18       | 2018-06-17      |

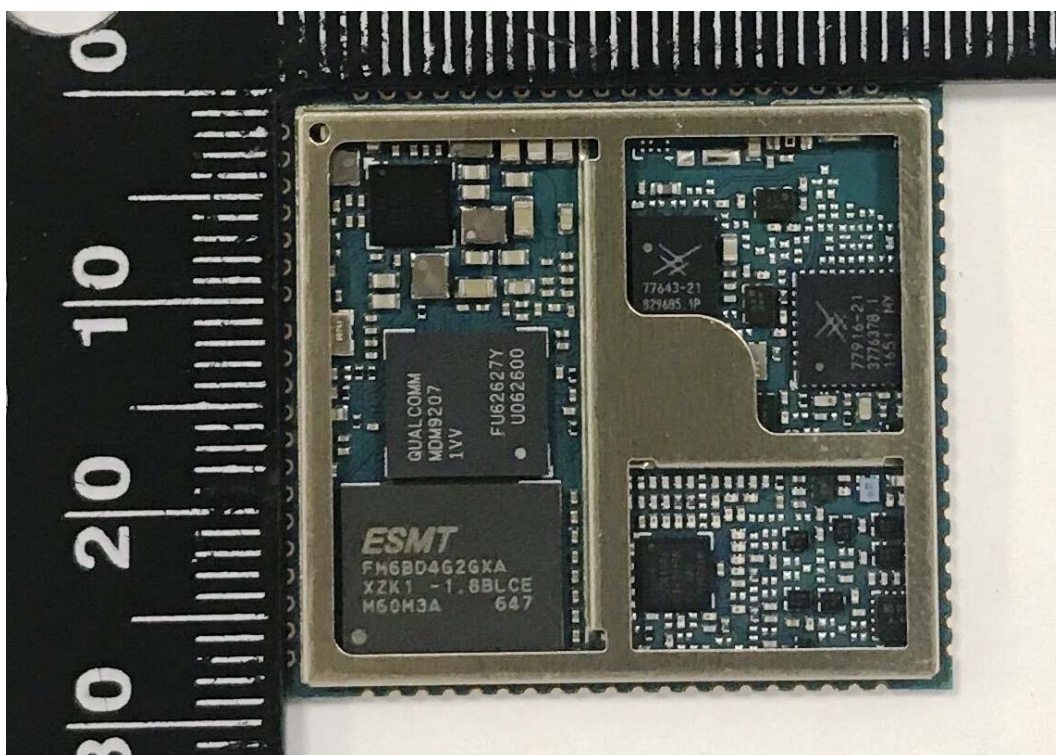
\*\*\*\*\*END OF REPORT \*\*\*\*\*

## ANNEX A: EUT Appearance and Test Setup

### A.1 EUT Appearance

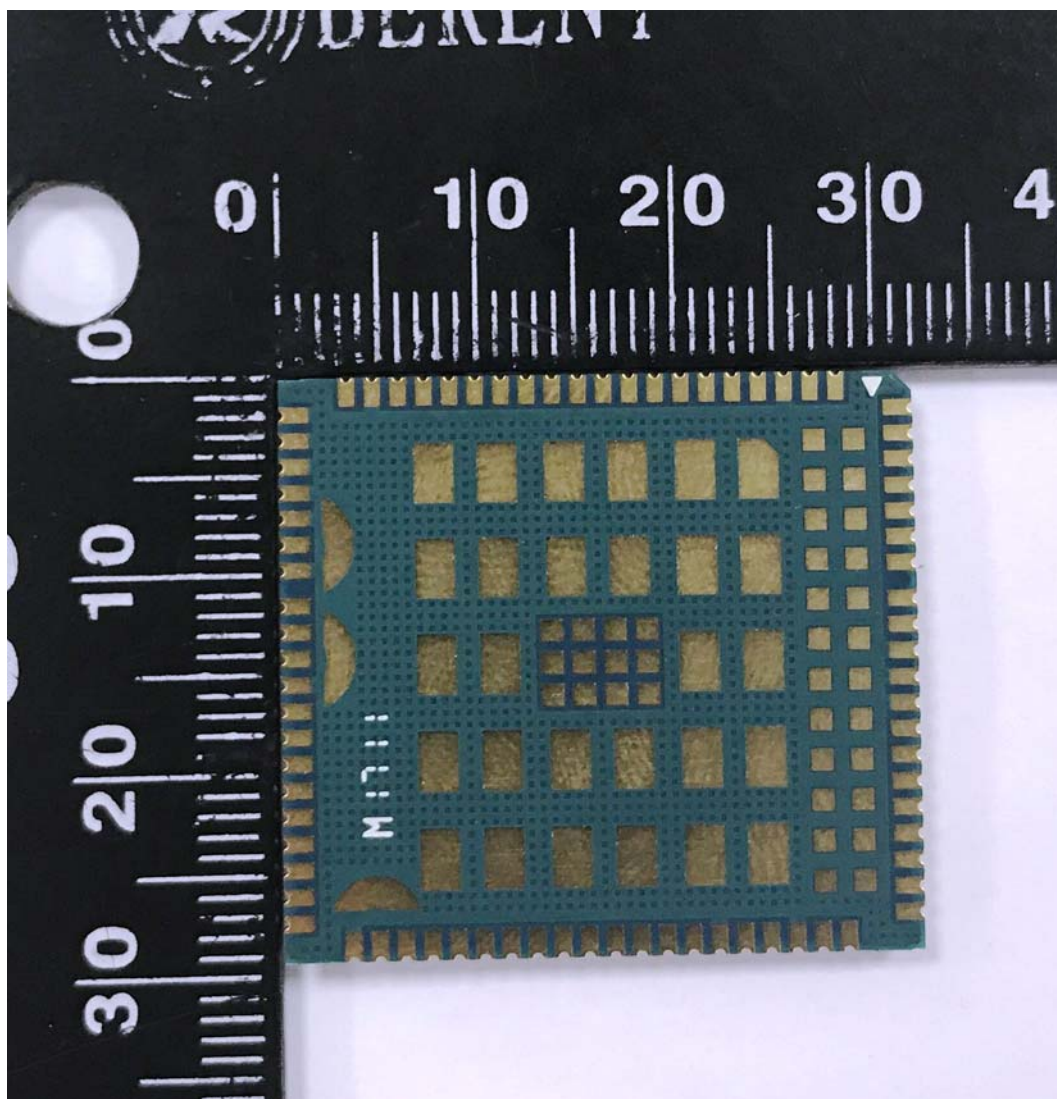


Shielding



No shielding

Front Side

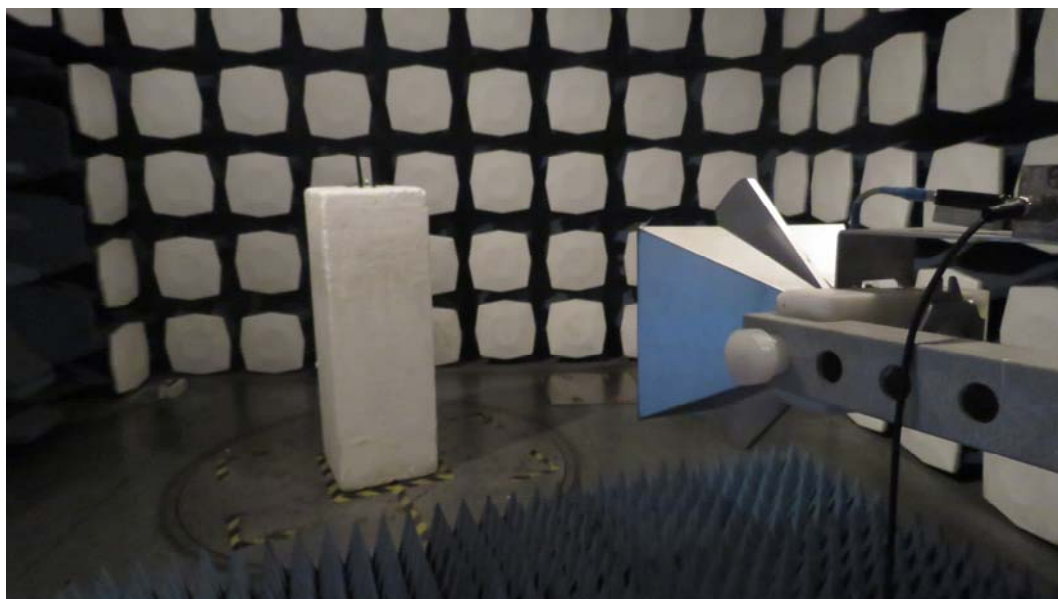
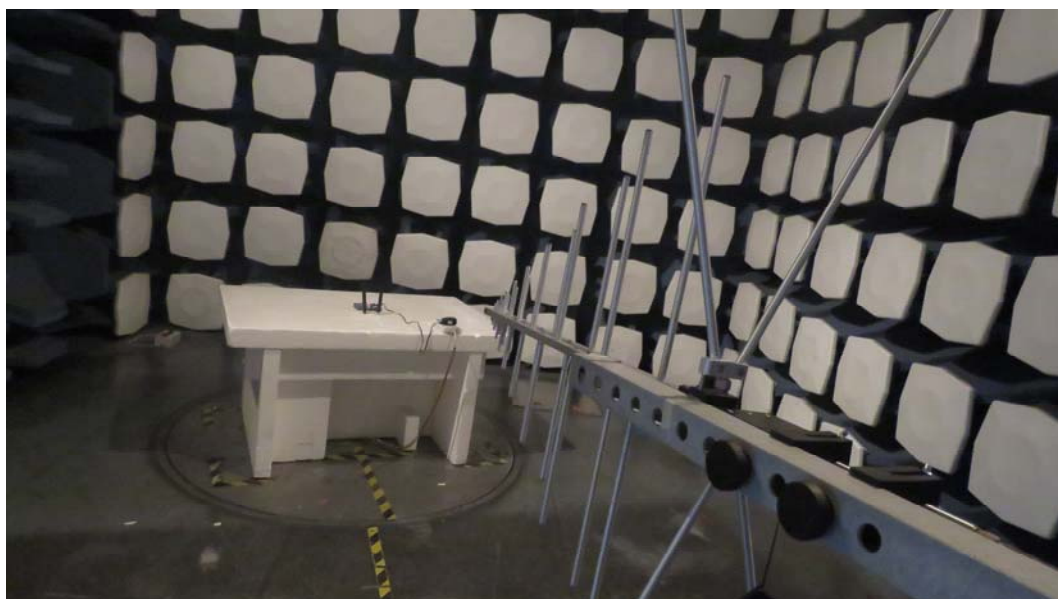


Back Side

a: EUT

**Picture 1 EUT and Accessory**

## A.2 Test Setup



Picture 2: Radiated Spurious Emissions Test setup