

## FCC Test Report

### (PART 24)

**Report No.:** RF180704C01-1

**FCC ID:** ZMOL850GLD

**Test Model:** L850-GL

**Received Date:** Jul. 04, 2018

**Test Date:** Jul. 10, 2018 ~ Jul. 17, 2018

**Issued Date:** Jul. 19, 2018

**Applicant:** Fibocom Wireless Inc.

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**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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( R.O.C )

**Test Location:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil, Kwei Shan Dist., Taoyuan City  
33383, Taiwan (R.O.C)

**FCC Registration /  
Designation Number:** 788550 / TW0003



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### Release Control Record

| Issue No.     | Description      | Date Issued   |
|---------------|------------------|---------------|
| RF180704C01-1 | Original Release | Jul. 19, 2018 |

## 1 Certificate of Conformity

**Product:** LTE module

**Brand:** Fibocom

**Test Model:** L850-GL

**Sample Status:** Identical Prototype

**Applicant:** Fibocom Wireless Inc.

**Test Date:** Jul. 10, 2018 ~ Jul. 17, 2018

**Standards:** FCC Part 24, Subpart E

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

**Prepared by :** Rona Chen, **Date:** Jul. 19, 2018  
Rona Chen / Specialist

**Approved by :** Dylan Chiou, **Date:** Jul. 19, 2018  
Dylan Chiou / Project Engineer

## 2 Summary of Test Results

| Applied Standard: FCC Part 24 & Part 2 |                                    |        |                                                                                     |
|----------------------------------------|------------------------------------|--------|-------------------------------------------------------------------------------------|
| FCC Clause                             | Test Item                          | Result | Remarks                                                                             |
| 2.1046<br>24.232                       | Effective Isotropic Radiated Power | Pass   | Meet the requirement of limit.                                                      |
| 2.1047                                 | Modulation Characteristics         | Pass   | Meet the requirement.                                                               |
| 2.1046<br>24.232(d)                    | Peak to Average Ratio              | Pass   | Meet the requirement of limit.                                                      |
| 2.1055<br>24.235                       | Frequency Stability                | Pass   | Meet the requirement of limit.                                                      |
| 2.1049<br>24.238(b)                    | Occupied Bandwidth                 | Pass   | Meet the requirement of limit.                                                      |
| 24.238(b)                              | Band Edge Measurements             | Pass   | Meet the requirement of limit.                                                      |
| 2.1051<br>24.238                       | Conducted Spurious Emissions       | Pass   | Meet the requirement of limit.                                                      |
| 2.1053<br>24.238                       | Radiated Spurious Emissions        | Pass   | Meet the requirement of limit.<br>Minimum passing margin is -30.29 dB at 40.67 MHz. |

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| Measurement                    | Frequency          | Expanded Uncertainty (k=2) (±) |
|--------------------------------|--------------------|--------------------------------|
| Radiated Emissions up to 1 GHz | 30 MHz ~ 200 MHz   | 2.93 dB                        |
|                                | 200 MHz ~ 1000 MHz | 2.95 dB                        |
| Radiated Emissions above 1 GHz | 1 GHz ~ 18 GHz     | 2.26 dB                        |
|                                | 18 GHz ~ 40 GHz    | 1.94 dB                        |

## 2.2 Test Site and Instruments

| Description & Manufacturer                     | Model No.                  | Serial No.                    | Date of Calibration | Due Date of Calibration |
|------------------------------------------------|----------------------------|-------------------------------|---------------------|-------------------------|
| Test Receiver<br>Agilent                       | N9038A                     | MY51210203                    | Mar. 16, 2018       | Mar. 15, 2019           |
| Spectrum Analyzer<br>Agilent                   | N9010A                     | MY52220314                    | Nov. 24, 2017       | Nov. 23, 2018           |
| Spectrum Analyzer<br>ROHDE & SCHWARZ           | FSU43                      | 101261                        | Jan. 11, 2018       | Jan. 10, 2019           |
| Double Ridge Guide Horn<br>Antenna EMCO        | 3115                       | 5619                          | Nov. 30, 2017       | Nov. 29, 2018           |
| BILOG Antenna<br>SCHWARZBECK                   | VULB 9168                  | 9168-153                      | Dec. 06, 2017       | Dec. 05, 2018           |
| Fixed Attenuator<br>Mini-Circuits              | MDCS18N-10                 | MDCS18N-10-01                 | Apr. 16, 2018       | Apr. 15, 2019           |
| Preamplifier<br>EMCI                           | EMC 012645                 | 980115                        | Oct. 20, 2017       | Oct. 19, 2018           |
| Preamplifier<br>EMCI                           | EMC 184045                 | 980116                        | Oct. 20, 2017       | Oct. 19, 2018           |
| Preamplifier<br>EMCI                           | EMC 330H                   | 980112                        | Oct. 13, 2017       | Oct. 12, 2018           |
| Power Meter<br>Anritsu                         | ML2495A                    | 1012010                       | Aug. 15, 2017       | Aug. 14, 2018           |
| Power Sensor<br>Anritsu                        | MA2411B                    | 1315050                       | Aug. 15, 2017       | Aug. 14, 2018           |
| RF Coaxial Cable<br>HUBER+SUHNNER              | EMC104-SM-SM-800<br>0&3000 | 140811+170717                 | Oct. 20, 2017       | Oct. 19, 2018           |
| RF Coaxial Cable<br>HUBER+SUHNNER              | SUCOFLEX 104               | EMC104-SM-SM-<br>1000(140807) | Oct. 20, 2017       | Oct. 19, 2018           |
| RF Coaxial Cable<br>Worken                     | 8D-FB                      | Cable-Ch10-01                 | Oct. 20, 2017       | Oct. 19, 2018           |
| Software<br>BV ADT                             | E3<br>6.120103             | NA                            | NA                  | NA                      |
| Antenna Tower<br>MF                            | MFA-440H                   | NA                            | NA                  | NA                      |
| Turn Table<br>MF                               | MFT-201SS                  | NA                            | NA                  | NA                      |
| Antenna Tower & Turn<br>Table Controller<br>MF | MF-7802                    | NA                            | NA                  | NA                      |
| Radio Communication<br>Analyzer                | MT8820C                    | 6201300640                    | Aug. 16, 2017       | Aug. 15, 2019           |
| Temperature & Humidity<br>Chamber              | GTH-120-40-CP-AR           | MAA1306-019                   | Sep. 08, 2017       | Sep. 07, 2018           |
| DC Power Supply<br>Topward                     | 33010D                     | 807748                        | Oct. 25, 2016       | Oct. 24, 2018           |
| Digital Multimeter<br>Fluke                    | 87-III                     | 70360742                      | Jun. 29, 2018       | Jun. 28, 2019           |

- Note: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 10.
3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The IC Site Registration No. is IC7450F-10.

### 3 General Information

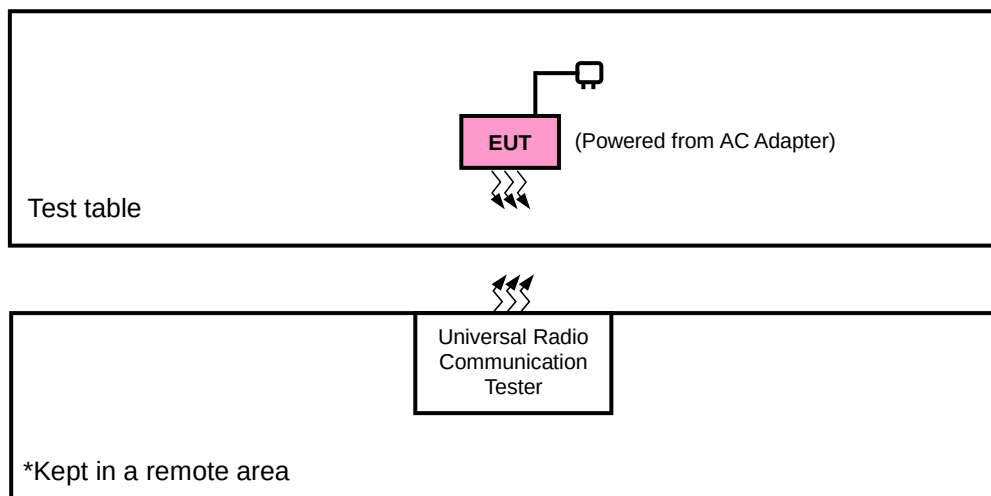
#### 3.1 General Description of EUT

|                            |                                         |                     |
|----------------------------|-----------------------------------------|---------------------|
| <b>Product</b>             | LTE module                              |                     |
| <b>Brand</b>               | Fibocom                                 |                     |
| <b>Test Model</b>          | L850-GL                                 |                     |
| <b>Status of EUT</b>       | Identical Prototype                     |                     |
| <b>Power Supply Rating</b> | 3.3 Vdc (Host equipment)                |                     |
| <b>Modulation Type</b>     | WCDMA                                   | QPSK                |
|                            | LTE                                     | QPSK, 16QAM         |
| <b>Frequency Range</b>     | WCDMA                                   | 1852.4 ~ 1907.6 MHz |
|                            | LTE Band 2 (Channel Bandwidth: 1.4 MHz) | 1850.7 ~ 1909.3 MHz |
|                            | LTE Band 2 (Channel Bandwidth: 3 MHz)   | 1851.5 ~ 1908.5 MHz |
|                            | LTE Band 2 (Channel Bandwidth: 5 MHz)   | 1852.5 ~ 1907.5 MHz |
|                            | LTE Band 2 (Channel Bandwidth: 10 MHz)  | 1855.0 ~ 1905.0 MHz |
|                            | LTE Band 2 (Channel Bandwidth: 15 MHz)  | 1857.5 ~ 1902.5 MHz |
|                            | LTE Band 2 (Channel Bandwidth: 20 MHz)  | 1860.0 ~ 1900.0 MHz |
| <b>Max. EIRP Power</b>     | WCDMA                                   | 594.29 mW           |
|                            | LTE Band 2 (Channel Bandwidth: 1.4 MHz) | 605.34 mW           |
|                            | LTE Band 2 (Channel Bandwidth: 3 MHz)   | 610.94 mW           |
|                            | LTE Band 2 (Channel Bandwidth: 5 MHz)   | 622.30 mW           |
|                            | LTE Band 2 (Channel Bandwidth: 10 MHz)  | 623.73 mW           |
|                            | LTE Band 2 (Channel Bandwidth: 15 MHz)  | 632.41 mW           |
|                            | LTE Band 2 (Channel Bandwidth: 20 MHz)  | 639.73 mW           |
| <b>Emission Designator</b> | WCDMA                                   | 4M08F9W             |
|                            | LTE Band 2 (Channel Bandwidth: 1.4 MHz) | 1M09G7D             |
|                            | LTE Band 2 (Channel Bandwidth: 3 MHz)   | 2M71G7D             |
|                            | LTE Band 2 (Channel Bandwidth: 5 MHz)   | 4M50W7D             |
|                            | LTE Band 2 (Channel Bandwidth: 10 MHz)  | 9M90G7D             |
|                            | LTE Band 2 (Channel Bandwidth: 15 MHz)  | 13M49W7D            |
|                            | LTE Band 2 (Channel Bandwidth: 20 MHz)  | 18M00G7D            |
| <b>Antenna Type</b>        | External Antenna with 5.0 dBi gain      |                     |
| <b>Accessory Device</b>    | N/A                                     |                     |
| <b>Data Cable Supplied</b> | N/A                                     |                     |

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

### 3.2 Configuration of System under Test



#### 3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

### 3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis, and antenna ports.

The worst case was found when positioned as the table below. Following channel(s) was (were) selected for the final test as listed below:

| Band       | Radiated Emission |
|------------|-------------------|
| WCDMA      | Z-axis            |
| LTE Band 2 | Z-axis            |

#### WCDMA

| EUT Configure Mode | Test Item                  | Available Channel | Tested Channel   | Mode  |
|--------------------|----------------------------|-------------------|------------------|-------|
| -                  | EIRP                       | 9262 to 9538      | 9262, 9400, 9538 | WCDMA |
| -                  | Modulation Characteristics | 9262 to 9538      | 9400             | WCDMA |
| -                  | Frequency Stability        | 9262 to 9538      | 9262, 9538       | WCDMA |
| -                  | Occupied Bandwidth         | 9262 to 9538      | 9262, 9400, 9538 | WCDMA |
| -                  | Band Edge                  | 9262 to 9538      | 9262, 9538       | WCDMA |
| -                  | Peak to Average Ratio      | 9262 to 9538      | 9262, 9400, 9538 | WCDMA |
| -                  | Conducted Emission         | 9262 to 9538      | 9262, 9400, 9538 | WCDMA |
| -                  | Radiated Emission          | 9262 to 9538      | 9262, 9400, 9538 | WCDMA |

#### LTE Band 2

| EUT Configure Mode | Test Item                  | Available Channel | Tested Channel      | Channel Bandwidth | Modulation  | Mode                |
|--------------------|----------------------------|-------------------|---------------------|-------------------|-------------|---------------------|
| -                  | EIRP                       | 18607 to 19193    | 18607, 18900, 19193 | 1.4 MHz           | QPSK, 16QAM | 1 RB / 0 RB Offset  |
|                    |                            | 18615 to 19185    | 18615, 18900, 19185 | 3 MHz             | QPSK, 16QAM | 1 RB / 0 RB Offset  |
|                    |                            | 18625 to 19175    | 18625, 18900, 19175 | 5 MHz             | QPSK, 16QAM | 1 RB / 0 RB Offset  |
|                    |                            | 18650 to 19150    | 18650, 18900, 19150 | 10 MHz            | QPSK, 16QAM | 1 RB / 0 RB Offset  |
|                    |                            | 18675 to 19125    | 18675, 18900, 19125 | 15 MHz            | QPSK, 16QAM | 1 RB / 0 RB Offset  |
|                    |                            | 18700 to 19100    | 18700, 18900, 19100 | 20 MHz            | QPSK, 16QAM | 1 RB / 0 RB Offset  |
| -                  | Modulation Characteristics | 18700 to 19100    | 18900               | 5 MHz             | QPSK, 16QAM | 25 RB / 0 RB Offset |
| -                  | Frequency Stability        | 18607 to 19193    | 18607, 19193        | 1.4 MHz           | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            | 18615 to 19185    | 18615, 19185        | 3 MHz             | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            | 18625 to 19175    | 18625, 19175        | 5 MHz             | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            | 18650 to 19150    | 18650, 19150        | 10 MHz            | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            | 18675 to 19125    | 18675, 19125        | 15 MHz            | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            | 18700 to 19100    | 18700, 19100        | 20 MHz            | QPSK        | 1 RB / 0 RB Offset  |

## LTE Band 2

| EUT Configure Mode | Test Item             | Available Channel | Tested Channel      | Channel Bandwidth | Modulation  | Mode                 |
|--------------------|-----------------------|-------------------|---------------------|-------------------|-------------|----------------------|
| -                  | Occupied Bandwidth    | 18607 to 19193    | 18607, 18900, 19193 | 1.4 MHz           | QPSK, 16QAM | 6 RB / 0 RB Offset   |
|                    |                       | 18615 to 19185    | 18615, 18900, 19185 | 3 MHz             | QPSK, 16QAM | 15 RB / 0 RB Offset  |
|                    |                       | 18625 to 19175    | 18625, 18900, 19175 | 5 MHz             | QPSK, 16QAM | 25 RB / 0 RB Offset  |
|                    |                       | 18650 to 19150    | 18650, 18900, 19150 | 10 MHz            | QPSK, 16QAM | 50 RB / 0 RB Offset  |
|                    |                       | 18675 to 19125    | 18675, 18900, 19125 | 15 MHz            | QPSK, 16QAM | 75 RB / 0 RB Offset  |
|                    |                       | 18700 to 19100    | 18700, 18900, 19100 | 20 MHz            | QPSK, 16QAM | 100 RB / 0 RB Offset |
| -                  | Peak to Average Ratio | 18607 to 19193    | 18607, 18900, 19193 | 1.4 MHz           | QPSK, 16QAM | 1 RB / 0 RB Offset   |
|                    |                       | 18615 to 19185    | 18615, 18900, 19185 | 3 MHz             | QPSK, 16QAM | 1 RB / 0 RB Offset   |
|                    |                       | 18625 to 19175    | 18625, 18900, 19175 | 5 MHz             | QPSK, 16QAM | 1 RB / 0 RB Offset   |
|                    |                       | 18650 to 19150    | 18650, 18900, 19150 | 10 MHz            | QPSK, 16QAM | 1 RB / 0 RB Offset   |
|                    |                       | 18675 to 19125    | 18675, 18900, 19125 | 15 MHz            | QPSK, 16QAM | 1 RB / 0 RB Offset   |
|                    |                       | 18700 to 19100    | 18700, 18900, 19100 | 20 MHz            | QPSK, 16QAM | 1 RB / 0 RB Offset   |
| -                  | Band Edge             | 18607 to 19193    | 18607               | 1.4 MHz           | QPSK        | 1 RB / 0 RB Offset   |
|                    |                       |                   |                     |                   |             | 6 RB / 0 RB Offset   |
|                    |                       |                   | 19193               | 1.4 MHz           | QPSK        | 1 RB / 5 RB Offset   |
|                    |                       |                   |                     |                   |             | 6 RB / 0 RB Offset   |
|                    |                       | 18615 to 19185    | 18615               | 3 MHz             | QPSK        | 1 RB / 0 RB Offset   |
|                    |                       |                   |                     |                   |             | 15 RB / 0 RB Offset  |
|                    |                       |                   | 19185               | 3 MHz             | QPSK        | 1 RB / 14 RB Offset  |
|                    |                       |                   |                     |                   |             | 15 RB / 0 RB Offset  |
|                    |                       | 18625 to 19175    | 18625               | 5 MHz             | QPSK        | 1 RB / 0 RB Offset   |
|                    |                       |                   |                     |                   |             | 25 RB / 0 RB Offset  |
|                    |                       |                   | 19175               | 5 MHz             | QPSK        | 1 RB / 24 RB Offset  |
|                    |                       |                   |                     |                   |             | 25 RB / 0 RB Offset  |
|                    |                       | 18650 to 19150    | 18650               | 10 MHz            | QPSK        | 1 RB / 0 RB Offset   |
|                    |                       |                   |                     |                   |             | 50 RB / 0 RB Offset  |
|                    |                       |                   | 19150               | 10 MHz            | QPSK        | 1 RB / 49 RB Offset  |
|                    |                       |                   |                     |                   |             | 50 RB / 0 RB Offset  |
| -                  | Conducted Emission    | 18607 to 19193    | 18607, 18900, 19193 | 1.4 MHz           | QPSK        | 1 RB / 0 RB Offset   |
|                    |                       | 18615 to 19185    | 18615, 18900, 19185 | 3 MHz             | QPSK        | 1 RB / 0 RB Offset   |
|                    |                       | 18625 to 19175    | 18625, 18900, 19175 | 5 MHz             | QPSK        | 1 RB / 0 RB Offset   |
|                    |                       | 18650 to 19150    | 18650, 18900, 19150 | 10 MHz            | QPSK        | 1 RB / 0 RB Offset   |
|                    |                       | 18675 to 19125    | 18675, 18900, 19125 | 15 MHz            | QPSK        | 1 RB / 0 RB Offset   |
|                    |                       | 18700 to 19100    | 18700, 18900, 19100 | 20 MHz            | QPSK        | 1 RB / 0 RB Offset   |
| -                  | Radiated Emission     | 18700 to 19100    | 18700, 18900, 19100 | 20 MHz            | QPSK        | 1 RB / 0 RB Offset   |

**Note:** This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

### **Test Condition:**

| Test Item                  | Environmental Conditions | Input Power    | Tested By  |
|----------------------------|--------------------------|----------------|------------|
| EIRP                       | 26 deg. C, 58 % RH       | 3.3 Vdc        | Getaz Yang |
| Modulation Characteristics | 26 deg. C, 58 % RH       | 3.3 Vdc        | Getaz Yang |
| Frequency Stability        | 26 deg. C, 58 % RH       | 3.3 Vdc        | Getaz Yang |
| Occupied Bandwidth         | 26 deg. C, 58 % RH       | 3.3 Vdc        | Getaz Yang |
| Band Edge                  | 26 deg. C, 58 % RH       | 3.3 Vdc        | Getaz Yang |
| Peak to Average Ratio      | 26 deg. C, 58 % RH       | 3.3 Vdc        | Getaz Yang |
| Conducted Emission         | 26 deg. C, 58 % RH       | 3.3 Vdc        | Getaz Yang |
| Radiated Emission          | 25 deg. C, 65 % RH       | 120 Vac, 60 Hz | Thomas Wei |

### **3.4 EUT Operating Conditions**

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

### **3.5 General Description of Applied Standards**

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 24**

**KDB 971168 D01 Power Meas License Digital Systems v03r01**

**ANSI/TIA/EIA-603-E 2016**

**ANSI 63.26-2015**

**NOTE:** All test items have been performed and recorded as per the above standards.

## 4 Test Types and Results

### 4.1 Output Power Measurement

#### 4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 2 watts e.i.r.p.

#### 4.1.2 Test Procedures

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

The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA, CDMA, and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

##### **EIRP / ERP Measurement:**

- EIRP = Conducted Output power level + Antenna gain.
- ERP power can be calculated from EIRP power by subtracting the gain of dipole, ERP power = EIRP power - 2.15dBi.
- ERP = Conducted Output power level + Antenna gain (dBi) - Isotropically Factor (2.15dB)

#### 4.1.3 Test Setup



#### 4.1.4 Test Results

##### Conducted Output Power (dBm)

| Band            | WCDMA II |        |        |
|-----------------|----------|--------|--------|
| Channel         | 9262     | 9400   | 9538   |
| Frequency (MHz) | 1852.4   | 1880.0 | 1907.6 |
| RMC 12.2K       | 22.61    | 22.71  | 22.74  |
| HSDPA Subtest-1 | 20.95    | 21.05  | 20.98  |
| HSDPA Subtest-2 | 20.87    | 21.06  | 21.01  |
| HSDPA Subtest-3 | 20.89    | 21.02  | 21.06  |
| HSDPA Subtest-4 | 20.90    | 21.00  | 21.05  |
| HSUPA Subtest-1 | 18.85    | 18.90  | 18.86  |
| HSUPA Subtest-2 | 18.69    | 18.63  | 18.67  |
| HSUPA Subtest-3 | 18.84    | 18.76  | 18.81  |
| HSUPA Subtest-4 | 18.63    | 18.59  | 18.55  |
| HSUPA Subtest-5 | 18.71    | 18.66  | 18.59  |

| Band / BW | RB Size | RB Offset | QPSK         |              |               | 3GPP MPR (dB) | 16QAM        |              |               | 3GPP MPR (dB) |
|-----------|---------|-----------|--------------|--------------|---------------|---------------|--------------|--------------|---------------|---------------|
|           |         |           | Low Ch 18607 | Mid Ch 18900 | High Ch 19193 |               | Low Ch 18607 | Mid Ch 18900 | High Ch 19193 |               |
|           |         |           | 1850.7 MHz   | 1880.0 MHz   | 1909.3 MHz    |               | 1850.7 MHz   | 1880.0 MHz   | 1909.3 MHz    |               |
| 2 / 1.4M  | 1       | 0         | 22.82        | 22.68        | 22.57         | 0             | 21.70        | 21.65        | 21.62         | 1             |
|           | 1       | 2         | 22.66        | 22.63        | 22.43         | 0             | 21.67        | 21.54        | 21.53         | 1             |
|           | 1       | 5         | 22.46        | 22.47        | 22.24         | 0             | 21.36        | 21.33        | 21.30         | 1             |
|           | 3       | 0         | 21.63        | 21.63        | 21.45         | 0             | 20.60        | 20.56        | 20.44         | 1             |
|           | 3       | 1         | 21.47        | 21.46        | 21.33         | 0             | 20.43        | 20.44        | 20.21         | 1             |
|           | 3       | 3         | 21.31        | 21.30        | 21.23         | 0             | 20.41        | 20.20        | 20.20         | 1             |
|           | 6       | 0         | 21.66        | 21.60        | 21.51         | 1             | 20.59        | 20.49        | 20.34         | 2             |

| Band / BW | RB Size | RB Offset | QPSK         |              |               | 3GPP MPR (dB) | 16QAM        |              |               | 3GPP MPR (dB) |
|-----------|---------|-----------|--------------|--------------|---------------|---------------|--------------|--------------|---------------|---------------|
|           |         |           | Low Ch 18615 | Mid Ch 18900 | High Ch 19185 |               | Low Ch 18615 | Mid Ch 18900 | High Ch 19185 |               |
|           |         |           | 1851.5 MHz   | 1880.0 MHz   | 1908.5 MHz    |               | 1851.5 MHz   | 1880.0 MHz   | 1908.5 MHz    |               |
| 2 / 3M    | 1       | 0         | 22.86        | 22.74        | 22.64         | 0             | 21.67        | 21.45        | 21.27         | 1             |
|           | 1       | 7         | 22.69        | 22.66        | 22.54         | 0             | 21.61        | 21.59        | 21.44         | 1             |
|           | 1       | 14        | 22.47        | 22.33        | 22.38         | 0             | 21.51        | 21.42        | 21.29         | 1             |
|           | 8       | 0         | 21.65        | 21.64        | 21.54         | 1             | 20.54        | 20.47        | 20.36         | 2             |
|           | 8       | 3         | 21.49        | 21.45        | 21.27         | 1             | 20.54        | 20.26        | 20.25         | 2             |
|           | 8       | 7         | 21.48        | 21.39        | 21.30         | 1             | 20.37        | 20.22        | 20.19         | 2             |
|           | 15      | 0         | 21.62        | 21.71        | 21.49         | 1             | 20.55        | 20.61        | 20.41         | 2             |

| Band / BW | RB Size | RB Offset | QPSK         |              |               | 3GPP MPR (dB) | 16QAM        |              |               | 3GPP MPR (dB) |
|-----------|---------|-----------|--------------|--------------|---------------|---------------|--------------|--------------|---------------|---------------|
|           |         |           | Low Ch 18625 | Mid Ch 18900 | High Ch 19175 |               | Low Ch 18625 | Mid Ch 18900 | High Ch 19175 |               |
|           |         |           | 1852.5 MHz   | 1880.0 MHz   | 1907.5 MHz    |               | 1852.5 MHz   | 1880.0 MHz   | 1907.5 MHz    |               |
| 2 / 5M    | 1       | 0         | 22.94        | 22.82        | 22.68         | 0             | 21.56        | 21.70        | 21.43         | 1             |
|           | 1       | 12        | 22.71        | 22.67        | 22.57         | 0             | 21.64        | 21.48        | 21.56         | 1             |
|           | 1       | 24        | 22.61        | 22.48        | 22.33         | 0             | 21.59        | 21.52        | 21.44         | 1             |
|           | 12      | 0         | 21.77        | 21.73        | 21.57         | 1             | 20.72        | 20.48        | 20.51         | 2             |
|           | 12      | 6         | 21.52        | 21.44        | 21.33         | 1             | 20.49        | 20.55        | 20.34         | 2             |
|           | 12      | 13        | 21.44        | 21.40        | 21.29         | 1             | 20.43        | 20.43        | 20.23         | 2             |
|           | 25      | 0         | 21.74        | 21.73        | 21.65         | 1             | 20.57        | 20.61        | 20.46         | 2             |

| Band / BW | RB Size | RB Offset | QPSK         |              |               | 3GPP MPR (dB) | 16QAM        |              |               | 3GPP MPR (dB) |
|-----------|---------|-----------|--------------|--------------|---------------|---------------|--------------|--------------|---------------|---------------|
|           |         |           | Low Ch 18650 | Mid Ch 18900 | High Ch 19150 |               | Low Ch 18650 | Mid Ch 18900 | High Ch 19150 |               |
|           |         |           | 1855.0 MHz   | 1880.0 MHz   | 1905.0 MHz    |               | 1855.0 MHz   | 1880.0 MHz   | 1905.0 MHz    |               |
| 2 / 10M   | 1       | 0         | 22.95        | 22.90        | 22.81         | 0             | 21.77        | 21.75        | 21.50         | 1             |
|           | 1       | 24        | 22.83        | 22.80        | 22.64         | 0             | 21.75        | 21.64        | 21.65         | 1             |
|           | 1       | 49        | 22.65        | 22.56        | 22.41         | 0             | 21.54        | 21.39        | 21.48         | 1             |
|           | 25      | 0         | 21.85        | 21.78        | 21.68         | 1             | 20.65        | 20.66        | 20.45         | 2             |
|           | 25      | 12        | 21.67        | 21.57        | 21.52         | 1             | 20.62        | 20.51        | 20.44         | 2             |
|           | 25      | 25        | 21.65        | 21.46        | 21.37         | 1             | 20.48        | 20.42        | 20.38         | 2             |
|           | 50      | 0         | 21.88        | 21.70        | 21.64         | 1             | 20.74        | 20.59        | 20.51         | 2             |

| Band / BW | RB Size | RB Offset | QPSK         |              |               | 3GPP MPR (dB) | 16QAM        |              |               | 3GPP MPR (dB) |
|-----------|---------|-----------|--------------|--------------|---------------|---------------|--------------|--------------|---------------|---------------|
|           |         |           | Low Ch 18675 | Mid Ch 18900 | High Ch 19125 |               | Low Ch 18675 | Mid Ch 18900 | High Ch 19125 |               |
|           |         |           | 1857.5 MHz   | 1880.0 MHz   | 1902.5 MHz    |               | 1857.5 MHz   | 1880.0 MHz   | 1902.5 MHz    |               |
| 2 / 15M   | 1       | 0         | 23.01        | 22.89        | 22.79         | 0             | 21.89        | 21.81        | 21.73         | 1             |
|           | 1       | 37        | 22.85        | 22.74        | 22.69         | 0             | 21.79        | 21.70        | 21.58         | 1             |
|           | 1       | 74        | 22.62        | 22.58        | 22.54         | 0             | 21.69        | 21.59        | 21.52         | 1             |
|           | 36      | 0         | 21.88        | 21.80        | 21.65         | 1             | 20.82        | 20.68        | 20.52         | 2             |
|           | 36      | 19        | 21.66        | 21.59        | 21.44         | 1             | 20.66        | 20.55        | 20.48         | 2             |
|           | 36      | 39        | 21.58        | 21.53        | 21.41         | 1             | 20.59        | 20.47        | 20.33         | 2             |
|           | 75      | 0         | 21.88        | 21.69        | 21.58         | 1             | 20.75        | 20.70        | 20.55         | 2             |

| Band / BW | RB Size | RB Offset | QPSK         |              |               | 3GPP MPR (dB) | 16QAM        |              |               | 3GPP MPR (dB) |
|-----------|---------|-----------|--------------|--------------|---------------|---------------|--------------|--------------|---------------|---------------|
|           |         |           | Low Ch 18700 | Mid Ch 18900 | High Ch 19100 |               | Low Ch 18700 | Mid Ch 18900 | High Ch 19100 |               |
|           |         |           | 1860.0 MHz   | 1880.0 MHz   | 1900.0 MHz    |               | 1860.0 MHz   | 1880.0 MHz   | 1900.0 MHz    |               |
| 2 / 20M   | 1       | 0         | 23.06        | 22.97        | 22.87         | 0             | 22.01        | 21.94        | 21.80         | 1             |
|           | 1       | 50        | 22.91        | 22.84        | 22.78         | 0             | 21.83        | 21.76        | 21.75         | 1             |
|           | 1       | 99        | 22.76        | 22.62        | 22.58         | 0             | 21.73        | 21.64        | 21.56         | 1             |
|           | 50      | 0         | 21.97        | 21.87        | 21.75         | 1             | 20.73        | 20.85        | 20.60         | 2             |
|           | 50      | 25        | 21.75        | 21.65        | 21.53         | 1             | 20.67        | 20.69        | 20.53         | 2             |
|           | 50      | 50        | 21.65        | 21.58        | 21.42         | 1             | 20.66        | 20.58        | 20.42         | 2             |
|           | 100     | 0         | 21.96        | 21.84        | 21.71         | 1             | 20.90        | 20.74        | 20.69         | 2             |

## EIRP Power (dBm)

Note: EIRP (dBm) = Max. Conducted Power (dBm) + Gain (dBi)

| Band                   | WCDMA II  |        |        |
|------------------------|-----------|--------|--------|
|                        | RMC 12.2K |        |        |
| Channel                | 9262      | 9400   | 9538   |
| Frequency (MHz)        | 1852.4    | 1880.0 | 1907.6 |
| Max. Cond. Power (dBm) | 22.61     | 22.71  | 22.74  |
| Max. EIRP Power (dBm)  | 27.61     | 27.71  | 27.74  |
| Max. EIRP Power (mW)   | 576.77    | 590.20 | 594.29 |

| Band 2 / 1.4M, 1RB#0   |                 |                 |                  |                 |                 |                  |
|------------------------|-----------------|-----------------|------------------|-----------------|-----------------|------------------|
| Test Mode              | QPSK            |                 |                  | 16QAM           |                 |                  |
|                        | Low Ch<br>18607 | Mid Ch<br>18900 | High Ch<br>19193 | Low Ch<br>18607 | Mid Ch<br>18900 | High Ch<br>19193 |
|                        | 1850.7<br>MHz   | 1880.0<br>MHz   | 1909.3<br>MHz    | 1850.7<br>MHz   | 1880.0<br>MHz   | 1909.3<br>MHz    |
| Max. Cond. Power (dBm) | 22.82           | 22.68           | 22.57            | 21.70           | 21.65           | 21.62            |
| Max. EIRP Power (dBm)  | 27.82           | 27.68           | 27.57            | 26.70           | 26.65           | 26.62            |
| Max. EIRP Power (mW)   | 605.34          | 586.14          | 571.48           | 467.74          | 462.38          | 459.20           |

| Band 2 / 3M, 1RB#0     |                 |                 |                  |                 |                 |                  |
|------------------------|-----------------|-----------------|------------------|-----------------|-----------------|------------------|
| Test Mode              | QPSK            |                 |                  | 16QAM           |                 |                  |
|                        | Low Ch<br>18615 | Mid Ch<br>18900 | High Ch<br>19185 | Low Ch<br>18615 | Mid Ch<br>18900 | High Ch<br>19185 |
|                        | 1851.5<br>MHz   | 1880.0<br>MHz   | 1908.5<br>MHz    | 1851.5<br>MHz   | 1880.0<br>MHz   | 1908.5<br>MHz    |
| Max. Cond. Power (dBm) | 22.86           | 22.74           | 22.64            | 21.67           | 21.45           | 21.27            |
| Max. EIRP Power (dBm)  | 27.86           | 27.74           | 27.64            | 26.67           | 26.45           | 26.27            |
| Max. EIRP Power (mW)   | 610.94          | 594.29          | 580.76           | 464.52          | 441.57          | 423.64           |

| Band 2 / 5M, 1RB#0     |                 |                 |                  |                 |                 |                  |
|------------------------|-----------------|-----------------|------------------|-----------------|-----------------|------------------|
| Test Mode              | QPSK            |                 |                  | 16QAM           |                 |                  |
|                        | Low Ch<br>18625 | Mid Ch<br>18900 | High Ch<br>19175 | Low Ch<br>18625 | Mid Ch<br>18900 | High Ch<br>19175 |
|                        | 1852.5<br>MHz   | 1880.0<br>MHz   | 1907.5<br>MHz    | 1852.5<br>MHz   | 1880.0<br>MHz   | 1907.5<br>MHz    |
| Max. Cond. Power (dBm) | 22.94           | 22.82           | 22.68            | 21.56           | 21.70           | 21.43            |
| Max. EIRP Power (dBm)  | 27.94           | 27.82           | 27.68            | 26.56           | 26.70           | 26.43            |
| Max. EIRP Power (mW)   | 622.30          | 605.34          | 586.14           | 452.90          | 467.74          | 439.54           |

| Band 2 / 10M, 1RB#0    |                 |                 |                  |                 |                 |                  |
|------------------------|-----------------|-----------------|------------------|-----------------|-----------------|------------------|
| Test Mode              | QPSK            |                 |                  | 16QAM           |                 |                  |
|                        | Low Ch<br>18650 | Mid Ch<br>18900 | High Ch<br>19150 | Low Ch<br>18650 | Mid Ch<br>18900 | High Ch<br>19150 |
|                        | 1855.0<br>MHz   | 1880.0<br>MHz   | 1905.0<br>MHz    | 1855.0<br>MHz   | 1880.0<br>MHz   | 1905.0<br>MHz    |
| Max. Cond. Power (dBm) | 22.95           | 22.90           | 22.81            | 21.77           | 21.75           | 21.50            |
| Max. EIRP Power (dBm)  | 27.95           | 27.90           | 27.81            | 26.77           | 26.75           | 26.50            |
| Max. EIRP Power (mW)   | 623.73          | 616.60          | 603.95           | 475.34          | 473.15          | 446.68           |

| Band 2 / 15M, 1RB#0    |                 |                 |                  |                 |                 |                  |
|------------------------|-----------------|-----------------|------------------|-----------------|-----------------|------------------|
| Test Mode              | QPSK            |                 |                  | 16QAM           |                 |                  |
|                        | Low Ch<br>18675 | Mid Ch<br>18900 | High Ch<br>19125 | Low Ch<br>18675 | Mid Ch<br>18900 | High Ch<br>19125 |
|                        | 1857.5<br>MHz   | 1880.0<br>MHz   | 1902.5<br>MHz    | 1857.5<br>MHz   | 1880.0<br>MHz   | 1902.5<br>MHz    |
| Max. Cond. Power (dBm) | 23.01           | 22.89           | 22.79            | 21.89           | 21.81           | 21.73            |
| Max. EIRP Power (dBm)  | 28.01           | 27.89           | 27.79            | 26.89           | 26.81           | 26.73            |
| Max. EIRP Power (mW)   | 632.41          | 615.18          | 601.17           | 488.65          | 479.73          | 470.98           |

| Band 2 / 20M, 1RB#0    |                 |                 |                  |                 |                 |                  |
|------------------------|-----------------|-----------------|------------------|-----------------|-----------------|------------------|
| Test Mode              | QPSK            |                 |                  | 16QAM           |                 |                  |
|                        | Low Ch<br>18700 | Mid Ch<br>18900 | High Ch<br>19100 | Low Ch<br>18700 | Mid Ch<br>18900 | High Ch<br>19100 |
|                        | 1860.0<br>MHz   | 1880.0<br>MHz   | 1900.0<br>MHz    | 1860.0<br>MHz   | 1880.0<br>MHz   | 1900.0<br>MHz    |
| Max. Cond. Power (dBm) | 23.06           | 22.97           | 22.87            | 22.01           | 21.94           | 21.80            |
| Max. EIRP Power (dBm)  | 28.06           | 27.97           | 27.87            | 27.01           | 26.94           | 26.80            |
| Max. EIRP Power (mW)   | 639.73          | 626.61          | 612.35           | 502.34          | 494.31          | 478.63           |

## 4.2 Modulation Characteristics Measurement

### 4.2.1 Limits of Modulation Characteristics

N/A

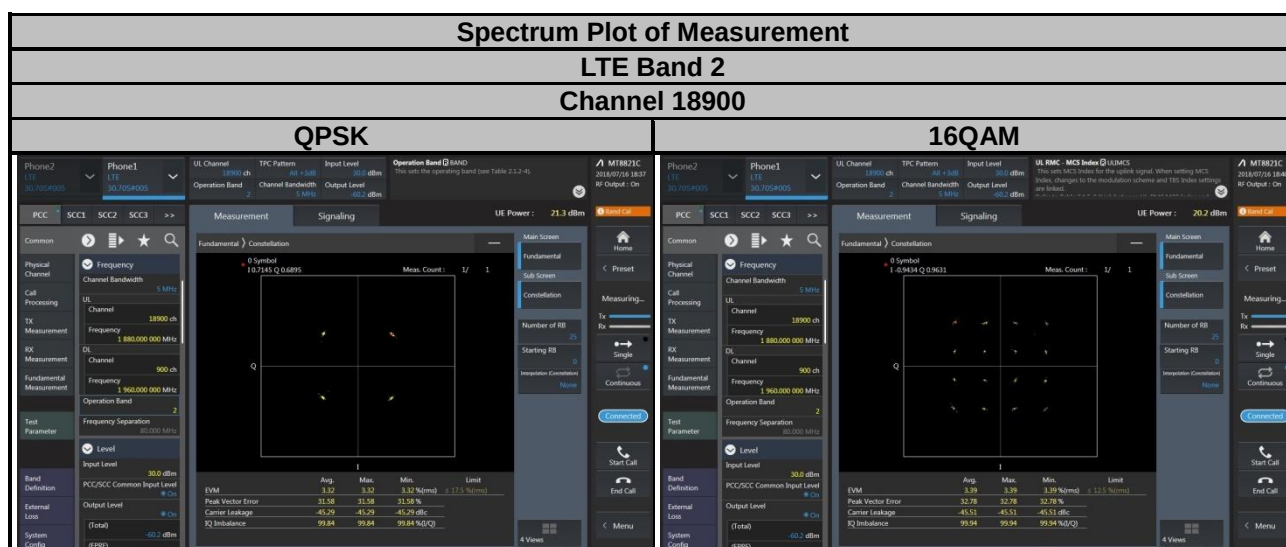
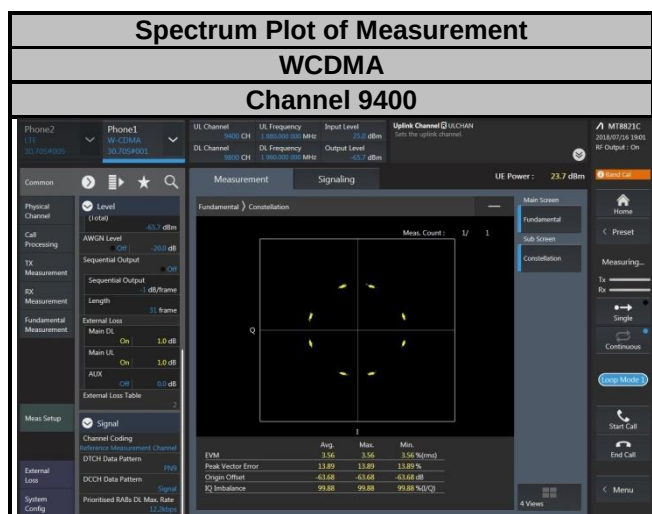
### 4.2.2 Test Setup



### 4.2.3 Test Procedure

Connect the EUT to Communication Simulator via the antenna connector. The frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

## 4.2.4 Test Results



### 4.3 Frequency Stability Measurement

#### 4.3.1 Limits of Frequency Stability Measurement

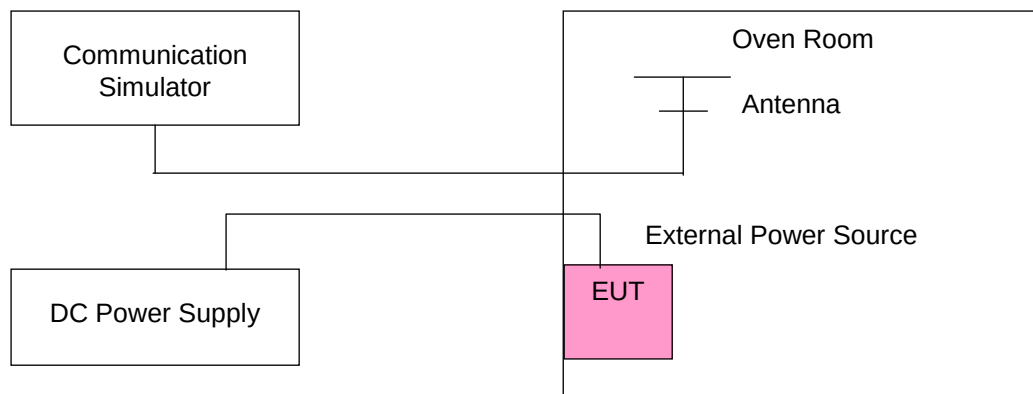
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

#### 4.3.2 Test Procedure

- Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the  $\pm 0.5$  °C during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

**NOTE:** The frequency error was recorded frequency error from the communication simulator.

#### 4.3.3 Test Setup



#### 4.3.4 Test Results

##### Frequency Error vs. Voltage

| Voltage<br>(Volts) | WCDMA           |                       |                 |                       | Limit (ppm) |
|--------------------|-----------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Low Channel     |                       | High Channel    |                       |             |
|                    | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.3                | 1852.400004     | 0.002                 | 1907.600004     | 0.002                 | 2.5         |
| 3.135              | 1852.400004     | 0.002                 | 1907.600003     | 0.002                 | 2.5         |
| 4.4                | 1852.400003     | 0.002                 | 1907.600002     | 0.001                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.135 Vdc to 4.4 Vdc.

##### Frequency Error vs. Temperature

| Temp. (°C) | WCDMA           |                       |                 |                       | Limit (ppm) |
|------------|-----------------|-----------------------|-----------------|-----------------------|-------------|
|            | Low Channel     |                       | High Channel    |                       |             |
|            | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 1852.400003     | 0.002                 | 1907.600003     | 0.002                 | 2.5         |
| -20        | 1852.400003     | 0.001                 | 1907.600001     | 0.001                 | 2.5         |
| -10        | 1852.400002     | 0.001                 | 1907.600002     | 0.001                 | 2.5         |
| 0          | 1852.400003     | 0.002                 | 1907.600003     | 0.002                 | 2.5         |
| 10         | 1852.400003     | 0.002                 | 1907.600001     | 0.001                 | 2.5         |
| 20         | 1852.399998     | -0.001                | 1907.599998     | -0.001                | 2.5         |
| 30         | 1852.399997     | -0.002                | 1907.599996     | -0.002                | 2.5         |
| 40         | 1852.399997     | -0.002                | 1907.599997     | -0.002                | 2.5         |
| 50         | 1852.399998     | -0.001                | 1907.599999     | -0.001                | 2.5         |
| 55         | 1852.399997     | -0.002                | 1907.599998     | -0.001                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 2                 |                       |                 |                       | Limit (ppm) |
|--------------------|----------------------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Channel Bandwidth: 1.4 MHz |                       |                 |                       |             |
|                    | Low Channel                |                       | High Channel    |                       |             |
|                    | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.3                | 1850.700001                | 0.001                 | 1909.300002     | 0.001                 | 2.5         |
| 3.135              | 1850.700002                | 0.001                 | 1909.300003     | 0.001                 | 2.5         |
| 4.4                | 1850.700003                | 0.002                 | 1909.300002     | 0.001                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.135 Vdc to 4.4 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 2                 |                       |                 |                       | Limit (ppm) |
|------------|----------------------------|-----------------------|-----------------|-----------------------|-------------|
|            | Channel Bandwidth: 1.4 MHz |                       |                 |                       |             |
|            | Low Channel                |                       | High Channel    |                       |             |
|            | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 1850.700003                | 0.002                 | 1909.300002     | 0.001                 | 2.5         |
| -20        | 1850.700003                | 0.002                 | 1909.300002     | 0.001                 | 2.5         |
| -10        | 1850.700002                | 0.001                 | 1909.300003     | 0.001                 | 2.5         |
| 0          | 1850.700003                | 0.001                 | 1909.300003     | 0.002                 | 2.5         |
| 10         | 1850.700003                | 0.001                 | 1909.300003     | 0.002                 | 2.5         |
| 20         | 1850.699999                | -0.001                | 1909.299998     | -0.001                | 2.5         |
| 30         | 1850.699998                | -0.001                | 1909.299999     | -0.001                | 2.5         |
| 40         | 1850.699998                | -0.001                | 1909.299997     | -0.001                | 2.5         |
| 50         | 1850.699998                | -0.001                | 1909.299999     | -0.001                | 2.5         |
| 55         | 1850.699996                | -0.002                | 1909.299999     | -0.001                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 2               |                       |                 |                       | Limit (ppm) |
|--------------------|--------------------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Channel Bandwidth: 3 MHz |                       |                 |                       |             |
|                    | Low Channel              |                       | High Channel    |                       |             |
|                    | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.3                | 1851.500002              | 0.001                 | 1908.500002     | 0.001                 | 2.5         |
| 3.135              | 1851.500003              | 0.002                 | 1908.500002     | 0.001                 | 2.5         |
| 4.4                | 1851.500001              | 0.001                 | 1908.500002     | 0.001                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.135 Vdc to 4.4 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 2               |                       |                 |                       | Limit (ppm) |
|------------|--------------------------|-----------------------|-----------------|-----------------------|-------------|
|            | Channel Bandwidth: 3 MHz |                       |                 |                       |             |
|            | Low Channel              |                       | High Channel    |                       |             |
|            | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 1851.500003              | 0.002                 | 1908.500003     | 0.001                 | 2.5         |
| -20        | 1851.500001              | 0.001                 | 1908.500002     | 0.001                 | 2.5         |
| -10        | 1851.500001              | 0.001                 | 1908.500001     | 0.001                 | 2.5         |
| 0          | 1851.500004              | 0.002                 | 1908.500002     | 0.001                 | 2.5         |
| 10         | 1851.500003              | 0.001                 | 1908.500004     | 0.002                 | 2.5         |
| 20         | 1851.499996              | -0.002                | 1908.499999     | -0.001                | 2.5         |
| 30         | 1851.499997              | -0.002                | 1908.499998     | -0.001                | 2.5         |
| 40         | 1851.499998              | -0.001                | 1908.499997     | -0.001                | 2.5         |
| 50         | 1851.499997              | -0.002                | 1908.499998     | -0.001                | 2.5         |
| 55         | 1851.499999              | -0.001                | 1908.499997     | -0.002                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 2               |                       |                 |                       | Limit (ppm) |
|--------------------|--------------------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Channel Bandwidth: 5 MHz |                       |                 |                       |             |
|                    | Low Channel              |                       | High Channel    |                       |             |
|                    | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.3                | 1852.500002              | 0.001                 | 1907.500002     | 0.001                 | 2.5         |
| 3.135              | 1852.500003              | 0.002                 | 1907.500004     | 0.002                 | 2.5         |
| 4.4                | 1852.500002              | 0.001                 | 1907.500001     | 0.001                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.135 Vdc to 4.4 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 2               |                       |                 |                       | Limit (ppm) |
|------------|--------------------------|-----------------------|-----------------|-----------------------|-------------|
|            | Channel Bandwidth: 5 MHz |                       |                 |                       |             |
|            | Low Channel              |                       | High Channel    |                       |             |
|            | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 1852.500001              | 0.001                 | 1907.500001     | 0.001                 | 2.5         |
| -20        | 1852.500003              | 0.002                 | 1907.500002     | 0.001                 | 2.5         |
| -10        | 1852.500004              | 0.002                 | 1907.500003     | 0.002                 | 2.5         |
| 0          | 1852.500004              | 0.002                 | 1907.500003     | 0.001                 | 2.5         |
| 10         | 1852.500002              | 0.001                 | 1907.500004     | 0.002                 | 2.5         |
| 20         | 1852.499998              | -0.001                | 1907.499999     | -0.001                | 2.5         |
| 30         | 1852.499998              | -0.001                | 1907.499998     | -0.001                | 2.5         |
| 40         | 1852.499996              | -0.002                | 1907.499999     | -0.001                | 2.5         |
| 50         | 1852.499997              | -0.002                | 1907.499997     | -0.002                | 2.5         |
| 55         | 1852.499996              | -0.002                | 1907.499997     | -0.001                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 2                |                       |                 |                       | Limit (ppm) |
|--------------------|---------------------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Channel Bandwidth: 10 MHz |                       |                 |                       |             |
|                    | Low Channel               |                       | High Channel    |                       |             |
|                    | Frequency (MHz)           | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.3                | 1855.000002               | 0.001                 | 1905.000002     | 0.001                 | 2.5         |
| 3.135              | 1855.000002               | 0.001                 | 1905.000002     | 0.001                 | 2.5         |
| 4.4                | 1855.000003               | 0.001                 | 1905.000003     | 0.001                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.135 Vdc to 4.4 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 2                |                       |                 |                       | Limit (ppm) |
|------------|---------------------------|-----------------------|-----------------|-----------------------|-------------|
|            | Channel Bandwidth: 10 MHz |                       |                 |                       |             |
|            | Low Channel               |                       | High Channel    |                       |             |
|            | Frequency (MHz)           | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 1855.000002               | 0.001                 | 1905.000002     | 0.001                 | 2.5         |
| -20        | 1855.000003               | 0.002                 | 1905.000003     | 0.002                 | 2.5         |
| -10        | 1855.000002               | 0.001                 | 1905.000002     | 0.001                 | 2.5         |
| 0          | 1855.000002               | 0.001                 | 1905.000001     | 0.001                 | 2.5         |
| 10         | 1855.000001               | 0.001                 | 1905.000003     | 0.001                 | 2.5         |
| 20         | 1854.999997               | -0.002                | 1904.999998     | -0.001                | 2.5         |
| 30         | 1854.999998               | -0.001                | 1904.999998     | -0.001                | 2.5         |
| 40         | 1854.999999               | -0.001                | 1904.999996     | -0.002                | 2.5         |
| 50         | 1854.999997               | -0.001                | 1904.999999     | -0.001                | 2.5         |
| 55         | 1854.999996               | -0.002                | 1904.999997     | -0.001                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 2                |                       |                 |                       | Limit (ppm) |
|--------------------|---------------------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Channel Bandwidth: 15 MHz |                       |                 |                       |             |
|                    | Low Channel               |                       | High Channel    |                       |             |
|                    | Frequency (MHz)           | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.3                | 1857.500003               | 0.002                 | 1902.500002     | 0.001                 | 2.5         |
| 3.135              | 1857.500003               | 0.002                 | 1902.500003     | 0.002                 | 2.5         |
| 4.4                | 1857.500003               | 0.002                 | 1902.500004     | 0.002                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.135 Vdc to 4.4 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 2                |                       |                 |                       | Limit (ppm) |
|------------|---------------------------|-----------------------|-----------------|-----------------------|-------------|
|            | Channel Bandwidth: 15 MHz |                       |                 |                       |             |
|            | Low Channel               |                       | High Channel    |                       |             |
|            | Frequency (MHz)           | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 1857.500004               | 0.002                 | 1902.500004     | 0.002                 | 2.5         |
| -20        | 1857.500003               | 0.001                 | 1902.500003     | 0.001                 | 2.5         |
| -10        | 1857.500002               | 0.001                 | 1902.500002     | 0.001                 | 2.5         |
| 0          | 1857.500004               | 0.002                 | 1902.500001     | 0.001                 | 2.5         |
| 10         | 1857.500001               | 0.001                 | 1902.500002     | 0.001                 | 2.5         |
| 20         | 1857.499998               | -0.001                | 1902.499998     | -0.001                | 2.5         |
| 30         | 1857.499996               | -0.002                | 1902.499997     | -0.002                | 2.5         |
| 40         | 1857.499996               | -0.002                | 1902.499997     | -0.002                | 2.5         |
| 50         | 1857.499999               | -0.001                | 1902.499997     | -0.001                | 2.5         |
| 55         | 1857.499998               | -0.001                | 1902.499996     | -0.002                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 2                |                       |                 |                       | Limit (ppm) |
|--------------------|---------------------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Channel Bandwidth: 20 MHz |                       |                 |                       |             |
|                    | Low Channel               |                       | High Channel    |                       |             |
|                    | Frequency (MHz)           | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.3                | 1860.000001               | 0.001                 | 1900.000003     | 0.002                 | 2.5         |
| 3.135              | 1860.000002               | 0.001                 | 1900.000003     | 0.002                 | 2.5         |
| 4.4                | 1860.000003               | 0.002                 | 1900.000002     | 0.001                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.135 Vdc to 4.4 Vdc.

### Frequency Error vs. Temperature

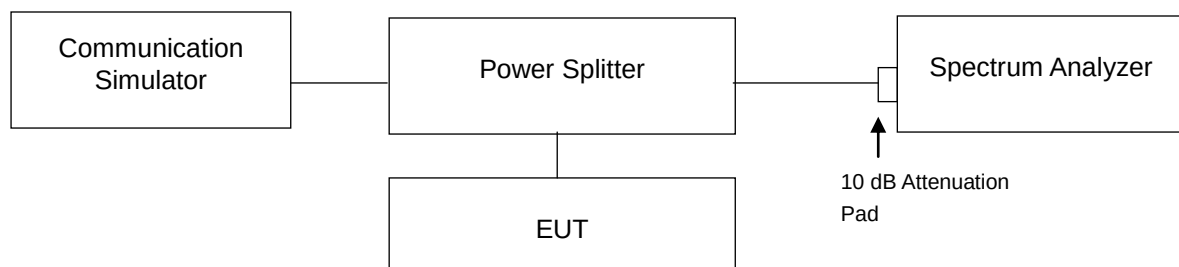
| Temp. (°C) | LTE Band 2                |                       |                 |                       | Limit (ppm) |
|------------|---------------------------|-----------------------|-----------------|-----------------------|-------------|
|            | Channel Bandwidth: 20 MHz |                       |                 |                       |             |
|            | Low Channel               |                       | High Channel    |                       |             |
|            | Frequency (MHz)           | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 1860.000003               | 0.002                 | 1900.000002     | 0.001                 | 2.5         |
| -20        | 1860.000001               | 0.001                 | 1900.000003     | 0.001                 | 2.5         |
| -10        | 1860.000003               | 0.002                 | 1900.000002     | 0.001                 | 2.5         |
| 0          | 1860.000002               | 0.001                 | 1900.000003     | 0.001                 | 2.5         |
| 10         | 1860.000003               | 0.002                 | 1900.000001     | 0.001                 | 2.5         |
| 20         | 1859.999997               | -0.002                | 1899.999999     | -0.001                | 2.5         |
| 30         | 1859.999996               | -0.002                | 1899.999997     | -0.001                | 2.5         |
| 40         | 1859.999999               | -0.001                | 1899.999996     | -0.002                | 2.5         |
| 50         | 1859.999997               | -0.002                | 1899.999998     | -0.001                | 2.5         |
| 55         | 1859.999999               | -0.001                | 1899.999996     | -0.002                | 2.5         |

## 4.4 Occupied Bandwidth Measurement

### 4.4.1 Test Procedure

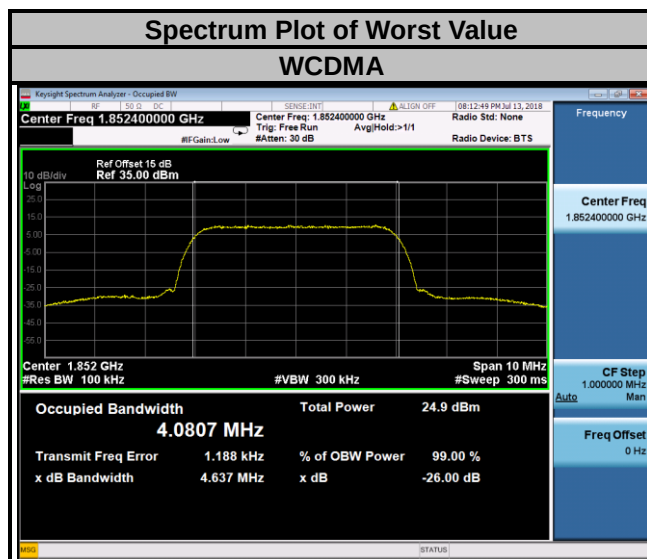
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

### 4.4.2 Test Setup

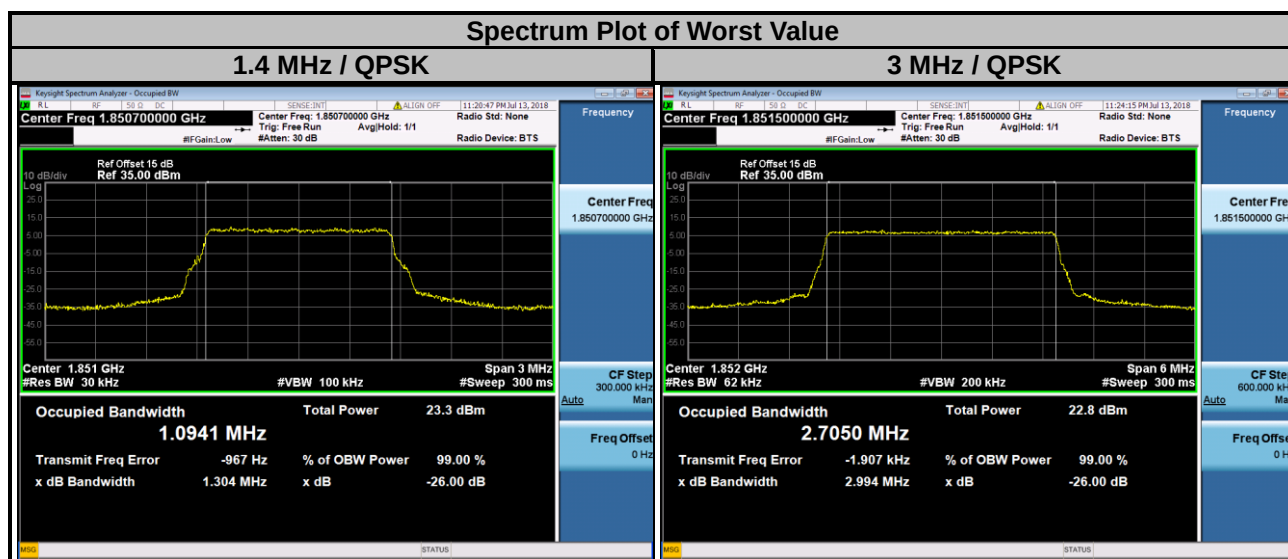


#### 4.4.3 Test Result

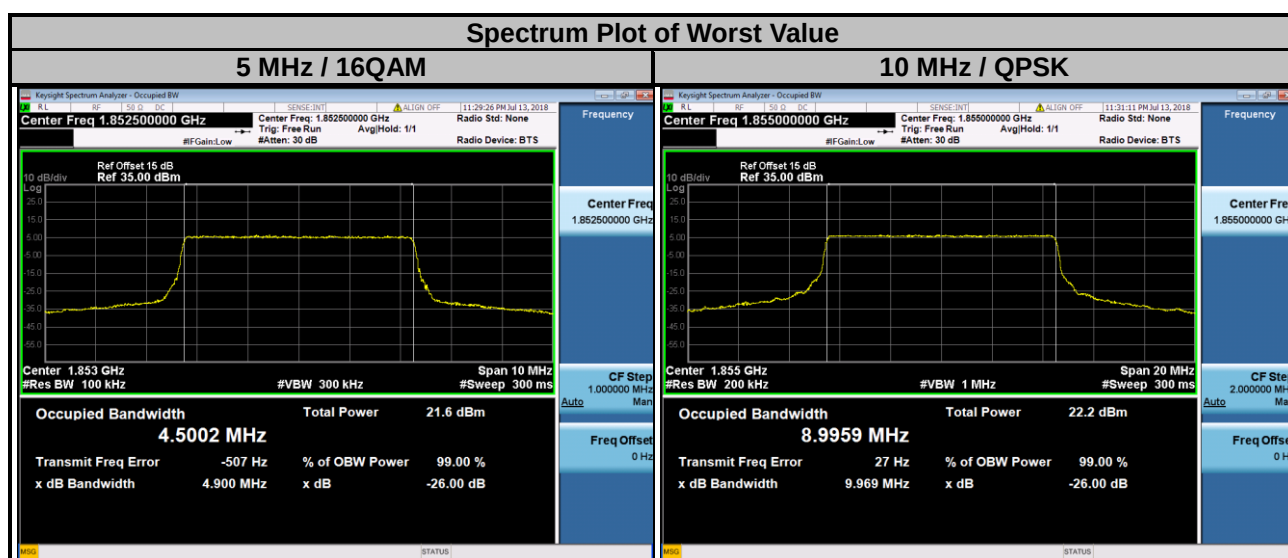
| Channel | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |
|---------|-----------------|-------------------------------|
|         |                 | WCDMA                         |
| 9262    | 1852.4          | 4.0807                        |
| 9400    | 1880.0          | 4.0799                        |
| 9538    | 1907.6          | 4.0775                        |



| LTE Band 2                 |                 |                               |       |                          |                 |                               |       |
|----------------------------|-----------------|-------------------------------|-------|--------------------------|-----------------|-------------------------------|-------|
| Channel Bandwidth: 1.4 MHz |                 |                               |       | Channel Bandwidth: 3 MHz |                 |                               |       |
| Channel                    | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |       | Channel                  | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |       |
|                            |                 | QPSK                          | 16QAM |                          |                 | QPSK                          | 16QAM |
| 18607                      | 1850.7          | 1.09                          | 1.09  | 18615                    | 1851.5          | 2.71                          | 2.70  |
| 18900                      | 1880.0          | 1.09                          | 1.09  | 18900                    | 1880.0          | 2.70                          | 2.70  |
| 19193                      | 1909.3          | 1.09                          | 1.09  | 19185                    | 1908.5          | 2.70                          | 2.70  |



| LTE Band 2               |                 |                               |       |                           |                 |                               |       |
|--------------------------|-----------------|-------------------------------|-------|---------------------------|-----------------|-------------------------------|-------|
| Channel Bandwidth: 5 MHz |                 |                               |       | Channel Bandwidth: 10 MHz |                 |                               |       |
| Channel                  | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |       | Channel                   | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |       |
|                          |                 | QPSK                          | 16QAM |                           |                 | QPSK                          | 16QAM |
| 18625                    | 1852.5          | 4.49                          | 4.50  | 18650                     | 1855.0          | 9.00                          | 8.99  |
| 18900                    | 1880.0          | 4.49                          | 4.50  | 18900                     | 1880.0          | 8.99                          | 8.98  |
| 19175                    | 1907.5          | 4.49                          | 4.50  | 19150                     | 1905.0          | 8.99                          | 8.98  |



## LTE Band 2

### Channel Bandwidth: 15 MHz

### Channel Bandwidth: 20 MHz

| Channel | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |       | Channel | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |       |
|---------|-----------------|-------------------------------|-------|---------|-----------------|-------------------------------|-------|
|         |                 | QPSK                          | 16QAM |         |                 | QPSK                          | 16QAM |
| 18675   | 1857.5          | 13.47                         | 13.49 | 18700   | 1860.0          | 18.00                         | 18.00 |
| 18900   | 1880.0          | 13.45                         | 13.48 | 18900   | 1880.0          | 17.95                         | 17.95 |
| 19125   | 1902.5          | 13.45                         | 13.46 | 19100   | 1900.0          | 17.96                         | 17.97 |

## Spectrum Plot of Worst Value

### 15 MHz / 16QAM

### 20 MHz / QPSK

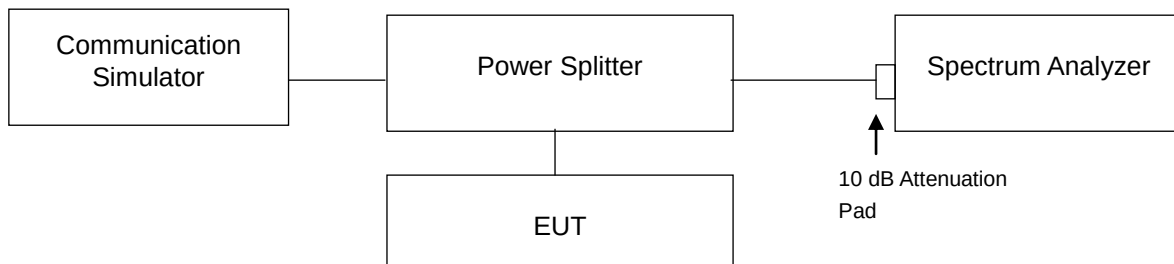


## 4.5 Band Edge Measurement

### 4.5.1 Limits of Band Edge Measurement

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. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

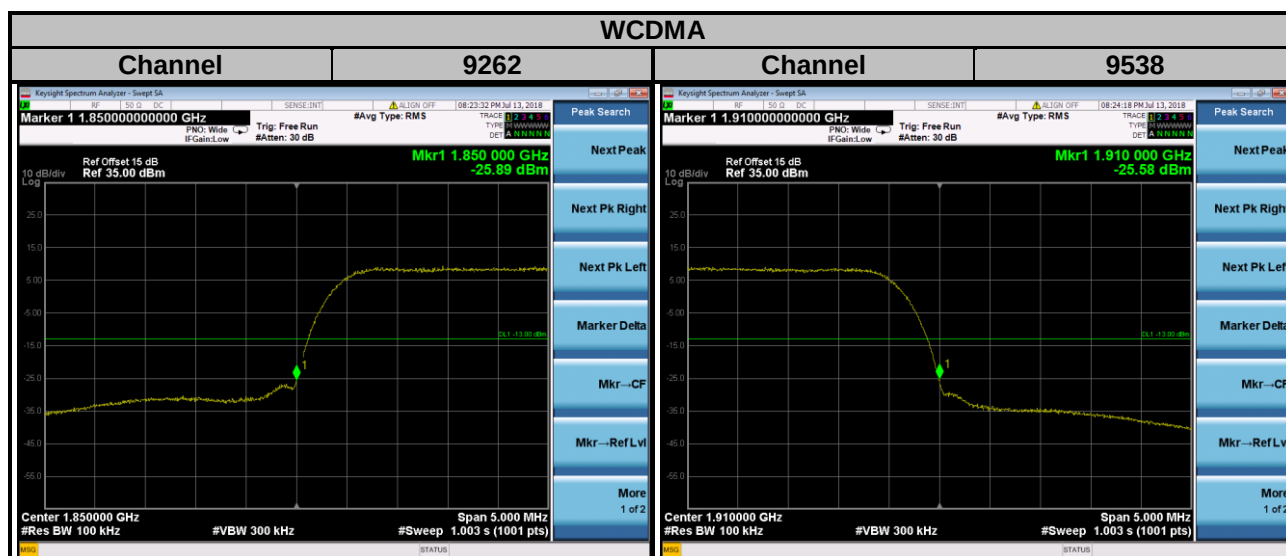
### 4.5.2 Test Setup



### 4.5.3 Test Procedures

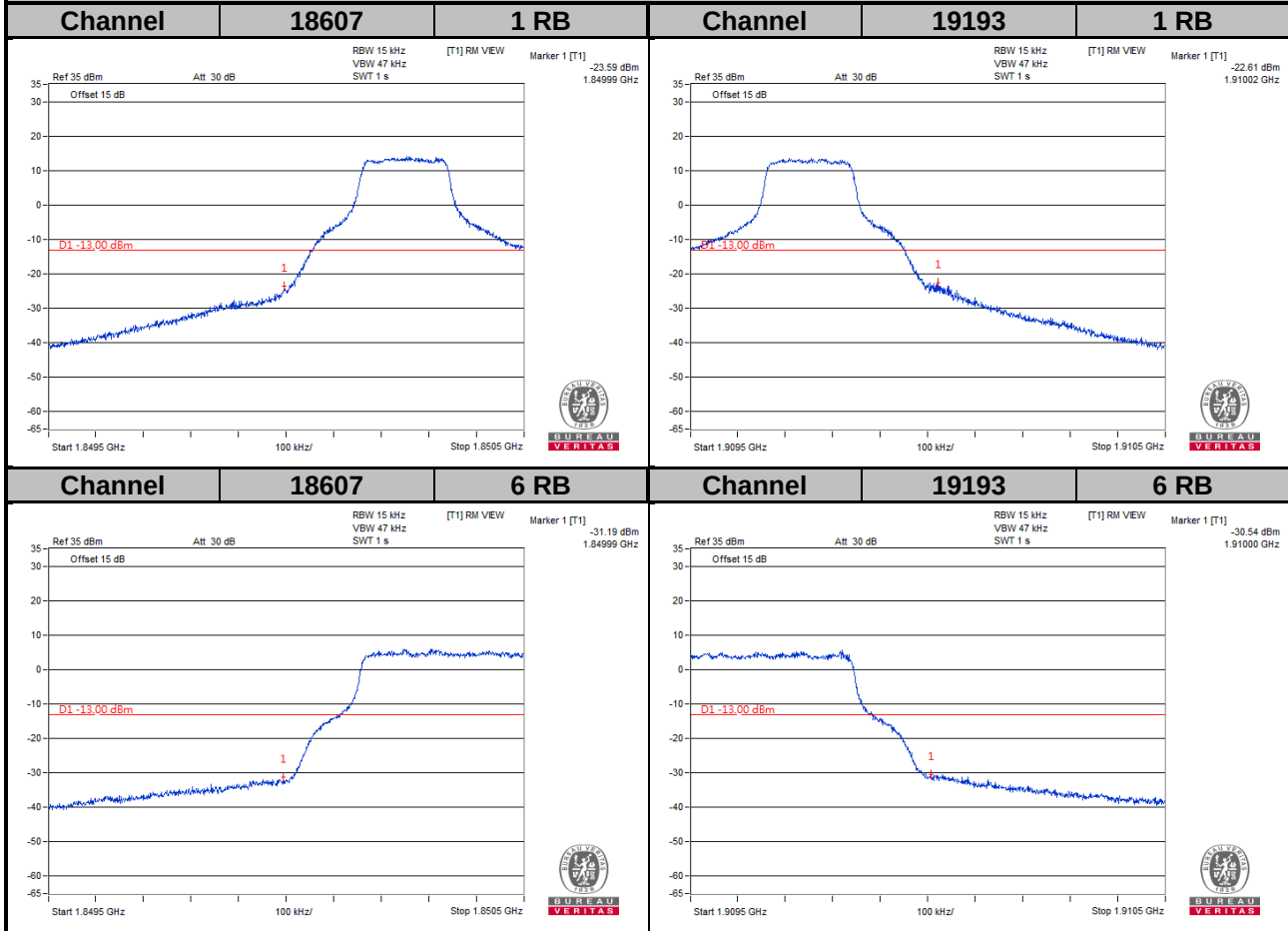
- All measurements were done at low and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (WCDMA).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 1.4 MHz).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 62 kHz and VB of the spectrum is 200 kHz (LTE Bandwidth 3 MHz).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (LTE Bandwidth 5 MHz).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 200 kHz and VB of the spectrum is 1 MHz (LTE Bandwidth 10 MHz).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 300 kHz and VB of the spectrum is 1 MHz (LTE Bandwidth 15 MHz).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 300 kHz and VB of the spectrum is 1 MHz (LTE Bandwidth 20 MHz).
- Record the max trace plot into the test report.

## 4.5.4 Test Results



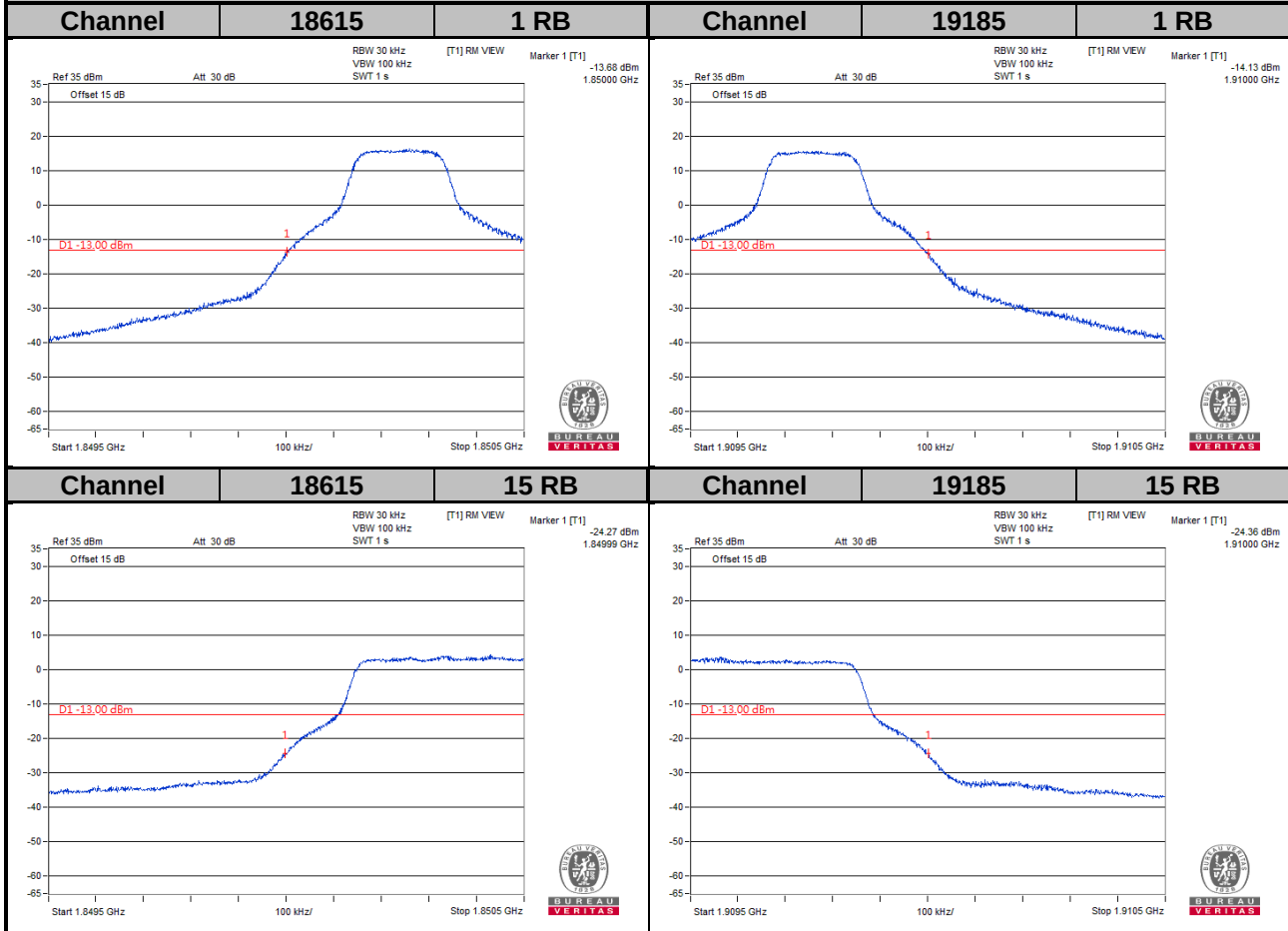
## LTE Band 2

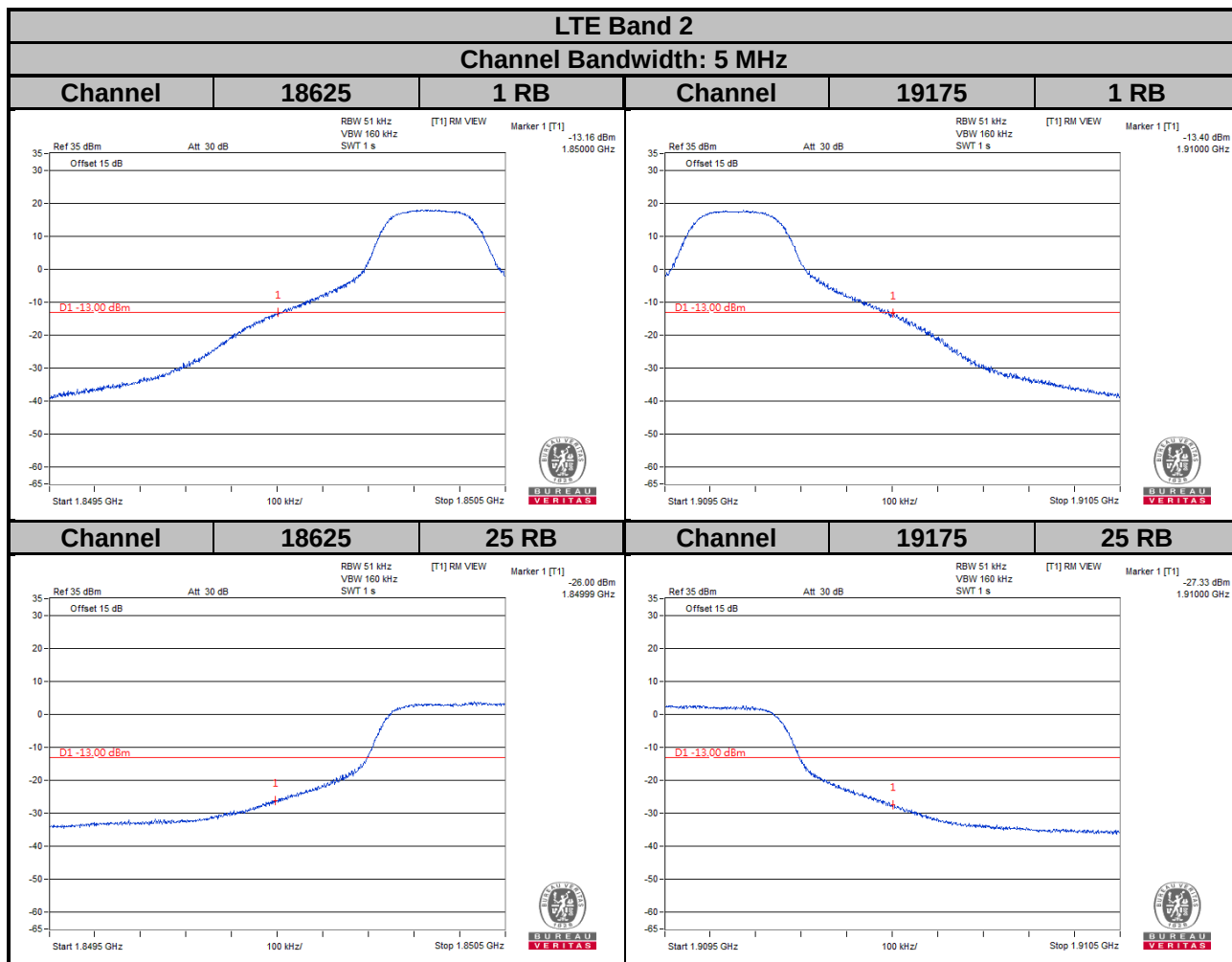
Channel Bandwidth: 1.4 MHz



## LTE Band 2

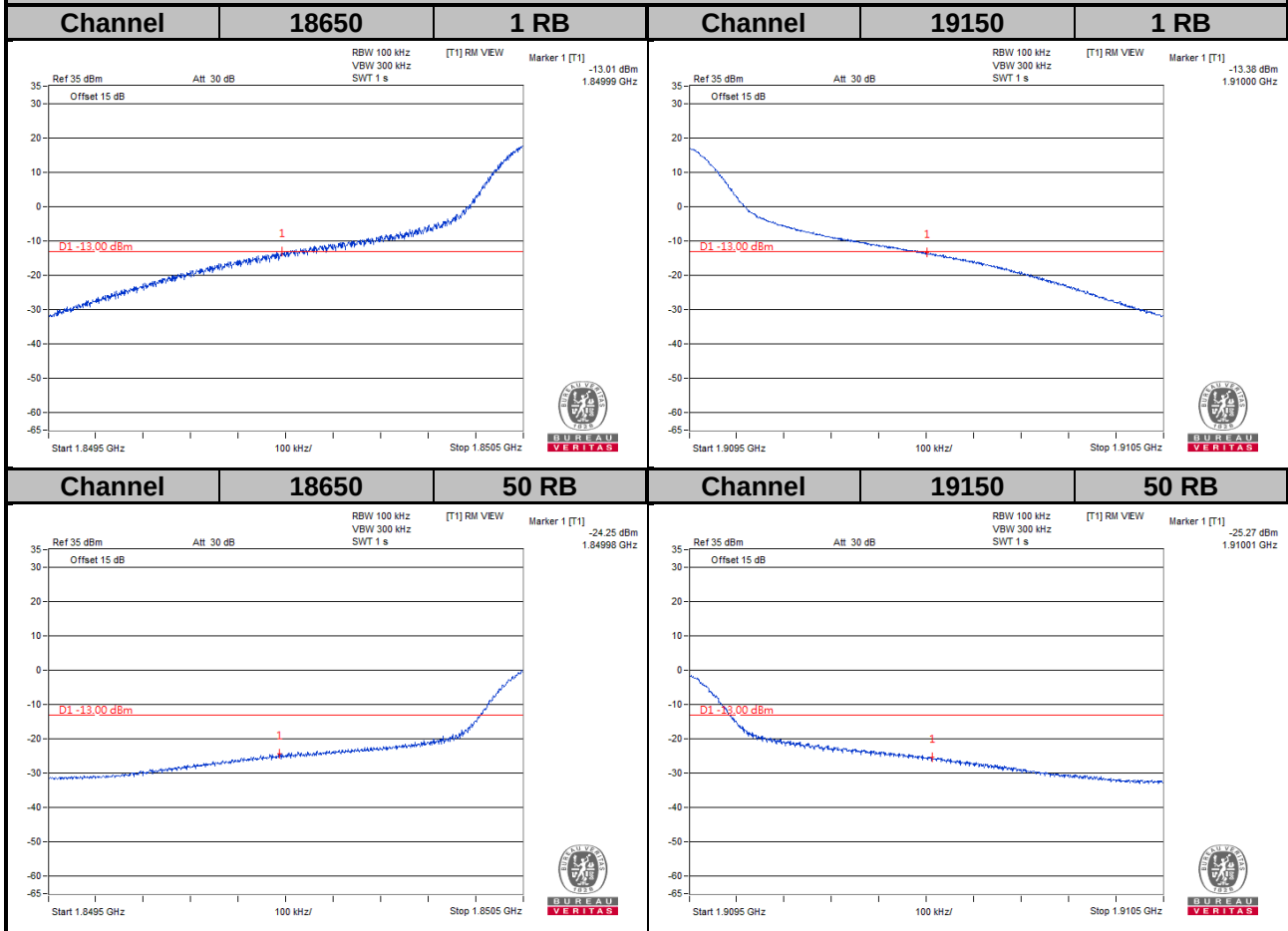
Channel Bandwidth: 3 MHz

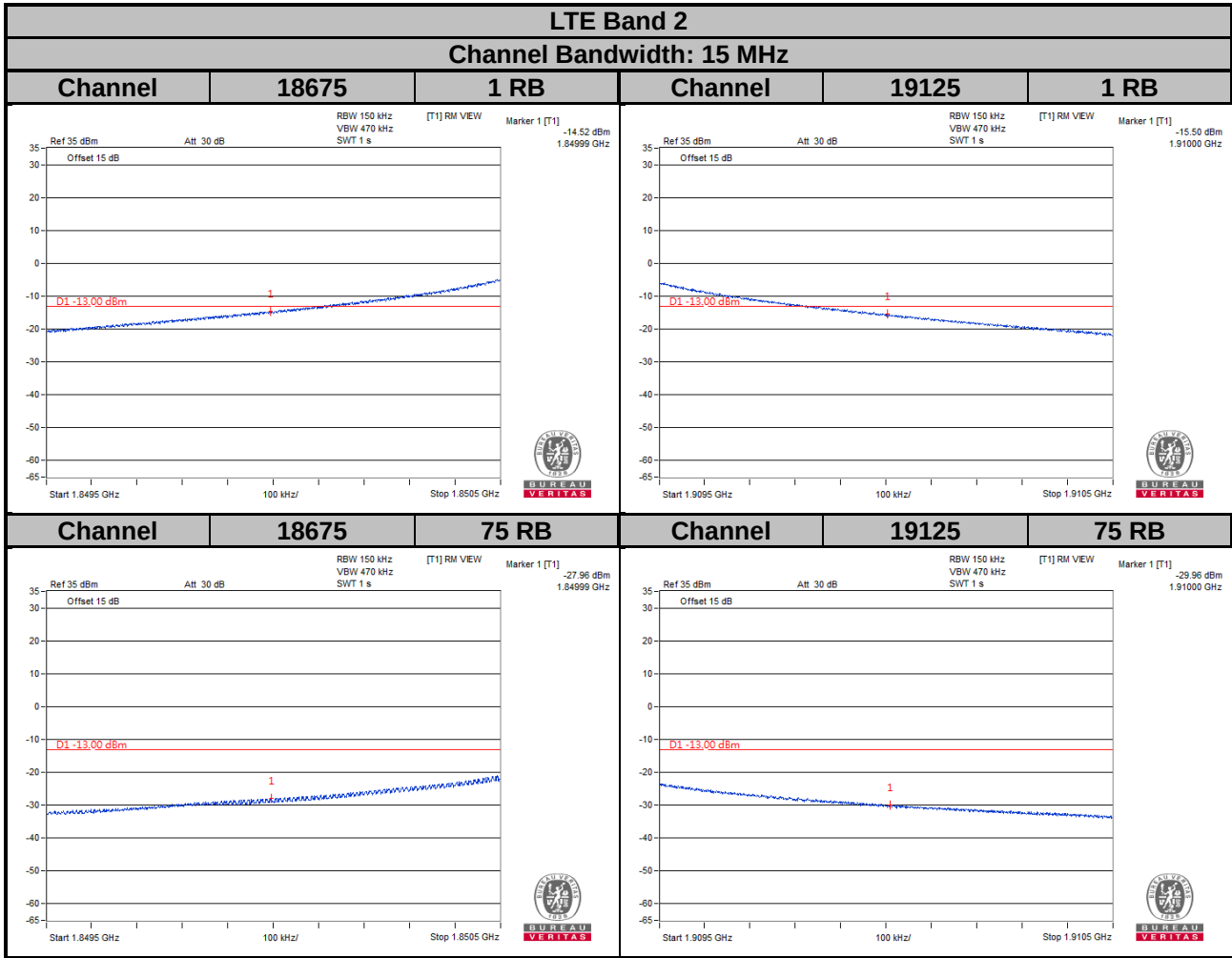


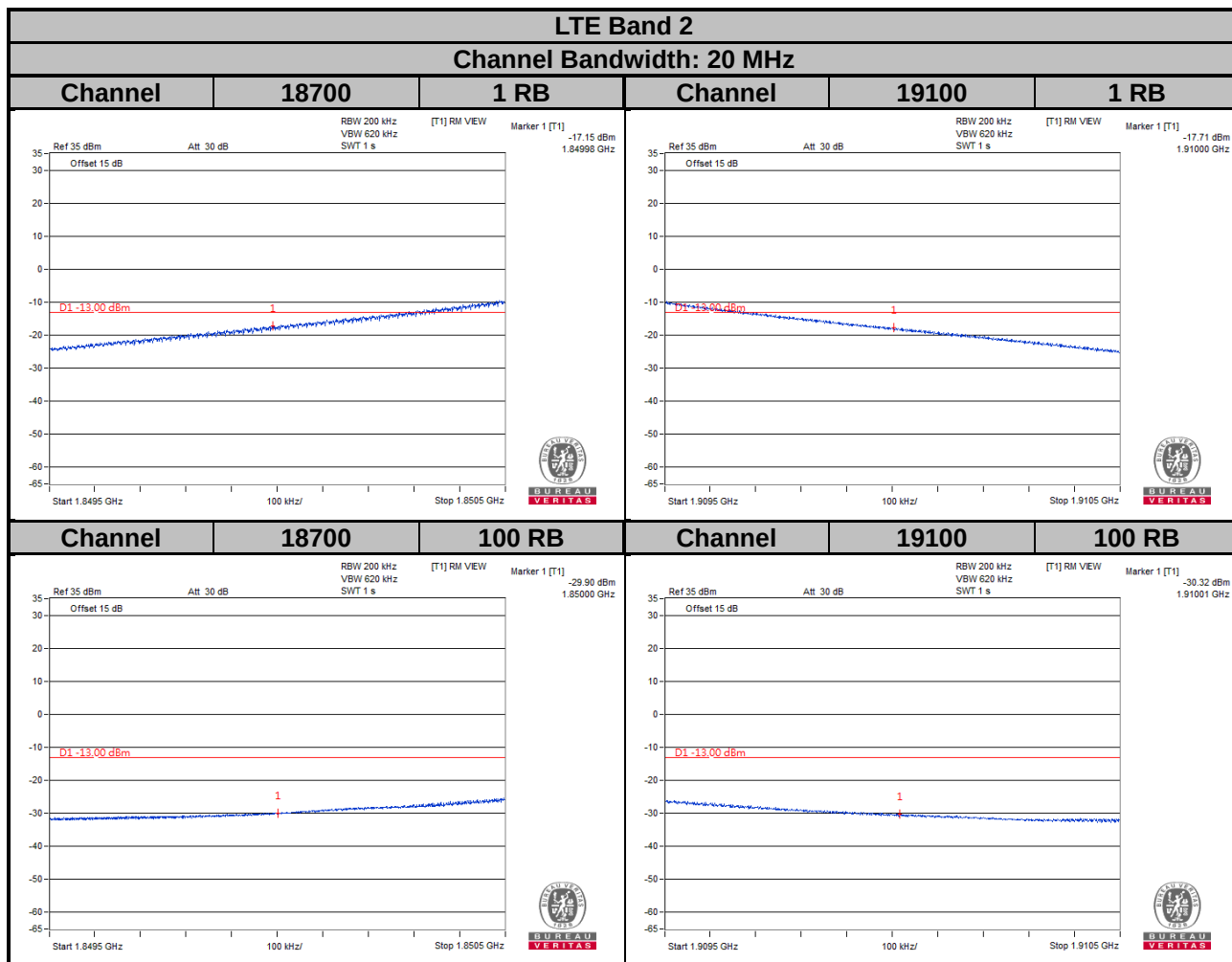


## LTE Band 2

Channel Bandwidth: 10 MHz





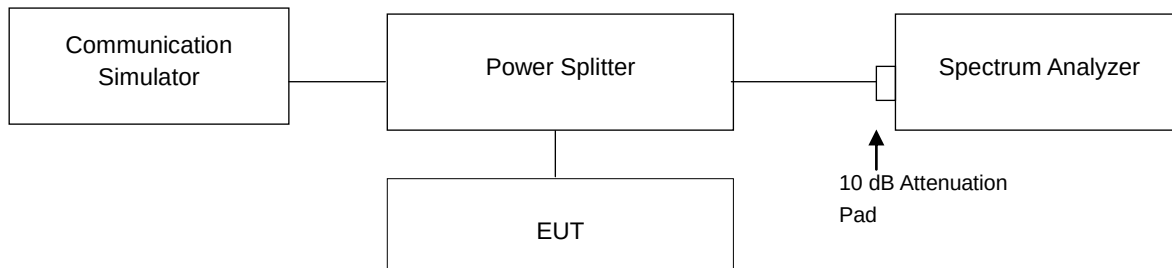


## 4.6 Peak to Average Ratio

### 4.6.1 Limits of Peak to Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

### 4.6.2 Test Setup

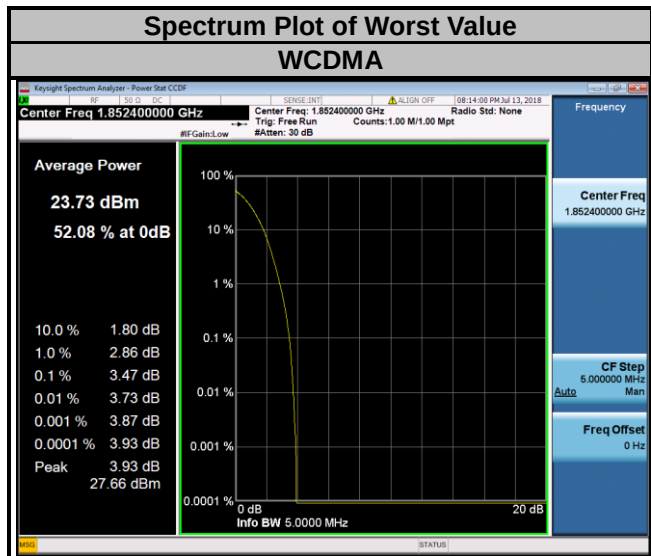


### 4.6.3 Test Procedures

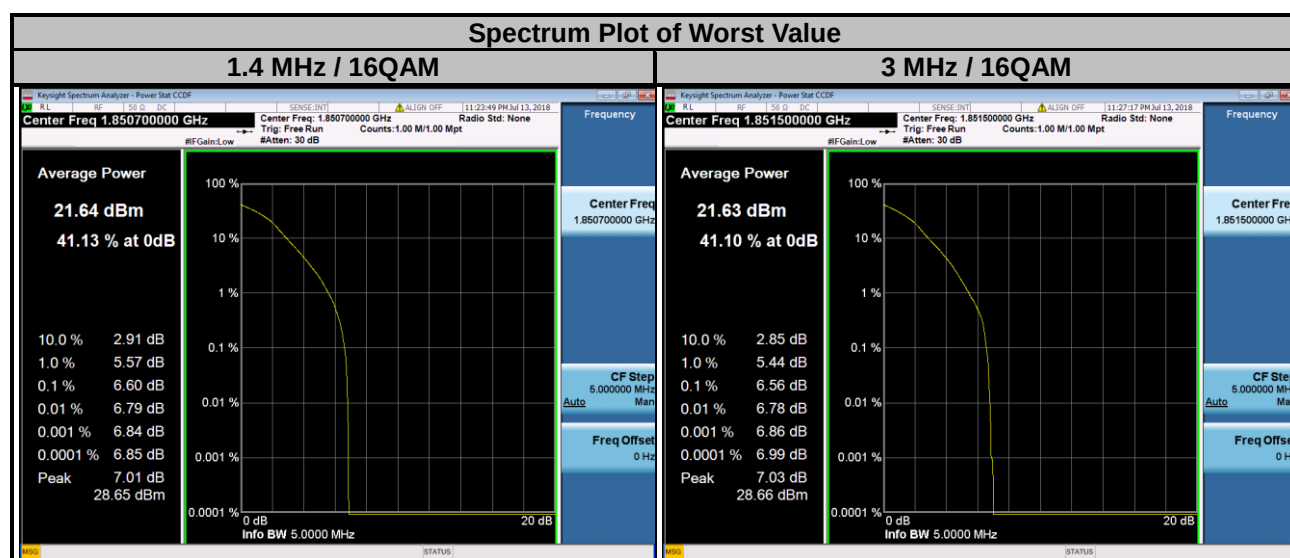
1. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

#### 4.6.4 Test Results

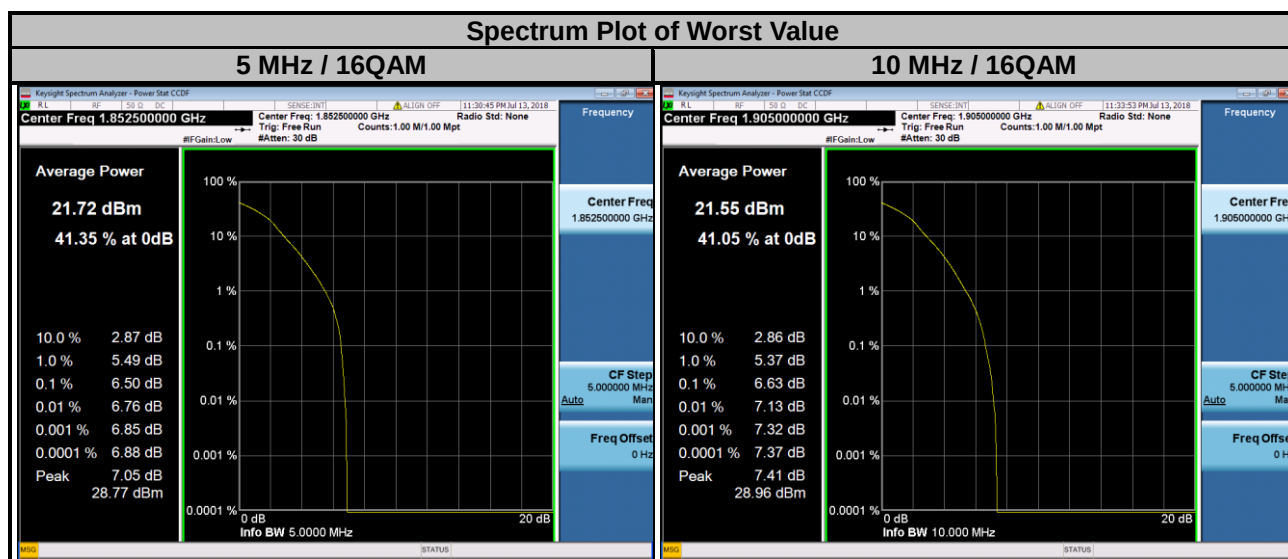
| Channel | Frequency (MHz) | Peak to Average Ratio (dB) |
|---------|-----------------|----------------------------|
|         |                 | WCDMA                      |
| 9262    | 1852.4          | 3.47                       |
| 9400    | 1880.0          | 3.45                       |
| 9538    | 1907.6          | 3.40                       |



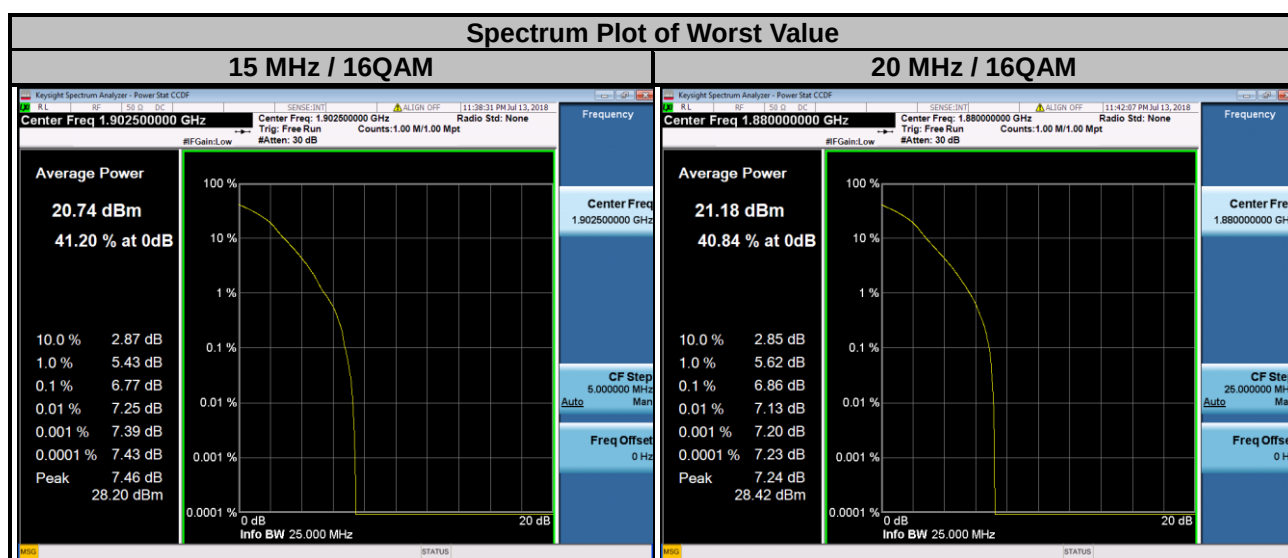
| LTE Band 2                 |                 |                            |       |                          |                 |                            |       |
|----------------------------|-----------------|----------------------------|-------|--------------------------|-----------------|----------------------------|-------|
| Channel Bandwidth: 1.4 MHz |                 |                            |       | Channel Bandwidth: 3 MHz |                 |                            |       |
| Channel                    | Frequency (MHz) | Peak to Average Ratio (dB) |       | Channel                  | Frequency (MHz) | Peak to Average Ratio (dB) |       |
|                            |                 | QPSK                       | 16QAM |                          |                 | QPSK                       | 16QAM |
| 18607                      | 1850.7          | 5.72                       | 6.60  | 18615                    | 1851.5          | 5.69                       | 6.56  |
| 18900                      | 1880.0          | 5.86                       | 5.86  | 18900                    | 1880.0          | 5.95                       | 5.93  |
| 19193                      | 1909.3          | 5.16                       | 5.81  | 19185                    | 1908.5          | 5.29                       | 5.96  |



| LTE Band 2               |                 |                            |       |                           |                 |                            |       |
|--------------------------|-----------------|----------------------------|-------|---------------------------|-----------------|----------------------------|-------|
| Channel Bandwidth: 5 MHz |                 |                            |       | Channel Bandwidth: 10 MHz |                 |                            |       |
| Channel                  | Frequency (MHz) | Peak to Average Ratio (dB) |       | Channel                   | Frequency (MHz) | Peak to Average Ratio (dB) |       |
|                          |                 | QPSK                       | 16QAM |                           |                 | QPSK                       | 16QAM |
| 18625                    | 1852.5          | 5.71                       | 6.50  | 18650                     | 1855.0          | 5.74                       | 6.52  |
| 18900                    | 1880.0          | 5.90                       | 5.87  | 18900                     | 1880.0          | 5.96                       | 5.88  |
| 19175                    | 1907.5          | 5.42                       | 6.23  | 19150                     | 1905.0          | 5.98                       | 6.63  |



| LTE Band 2                |                 |                            |       |                           |                 |                            |       |
|---------------------------|-----------------|----------------------------|-------|---------------------------|-----------------|----------------------------|-------|
| Channel Bandwidth: 15 MHz |                 |                            |       | Channel Bandwidth: 20 MHz |                 |                            |       |
| Channel                   | Frequency (MHz) | Peak to Average Ratio (dB) |       | Channel                   | Frequency (MHz) | Peak to Average Ratio (dB) |       |
|                           |                 | QPSK                       | 16QAM |                           |                 | QPSK                       | 16QAM |
| 18675                     | 1857.5          | 5.96                       | 6.66  | 18700                     | 1860.0          | 5.80                       | 6.46  |
| 18900                     | 1880.0          | 6.08                       | 6.03  | 18900                     | 1880.0          | 6.24                       | 6.86  |
| 19125                     | 1902.5          | 6.03                       | 6.77  | 19100                     | 1900.0          | 6.31                       | 6.78  |

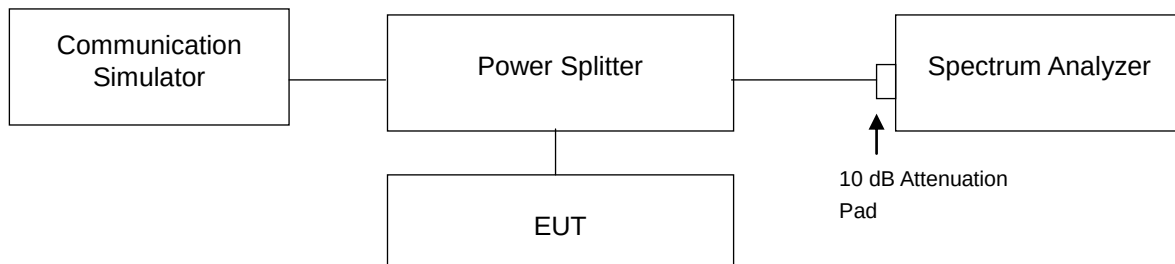


## 4.7 Conducted Spurious Emissions

### 4.7.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB. The emission limit equal to -13 dBm.

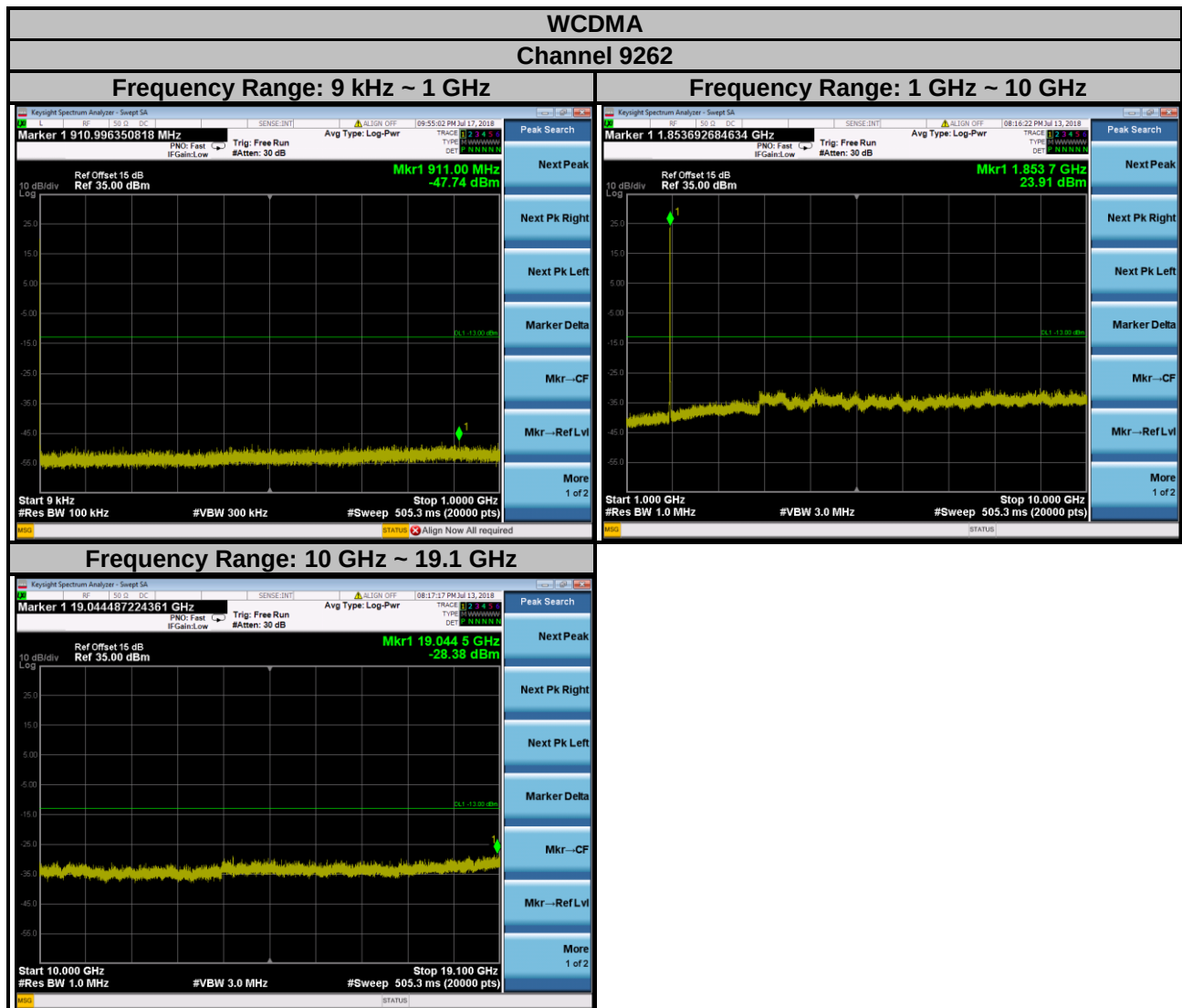
### 4.7.2 Test Setup



### 4.7.3 Test Procedure

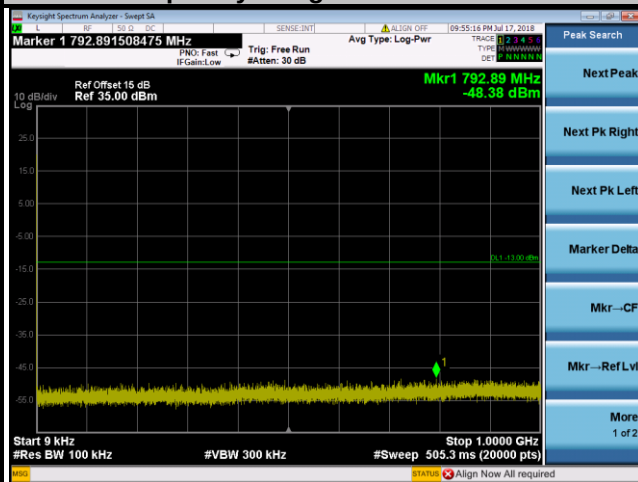
- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 9 kHz to 27 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 100 kHz and VBW = 300 kHz for 9 kHz to 1 GHz and RBW = 1 MHz and VBW = 3 MHz for 1 GHz to 27 GHz is used for conducted emission measurement.

#### 4.7.4 Test Results

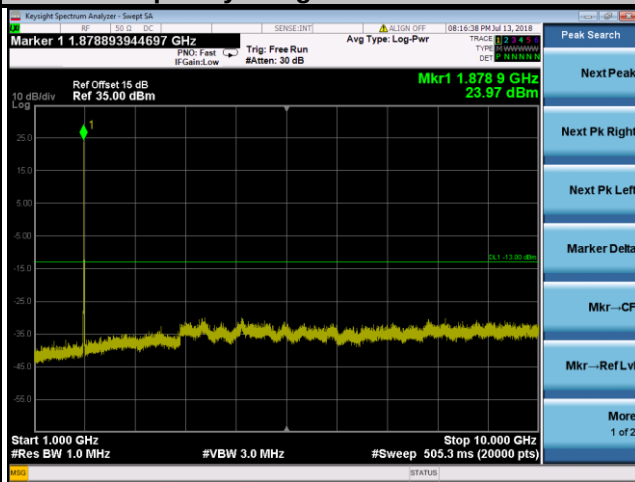


## WCDMA Channel 9400

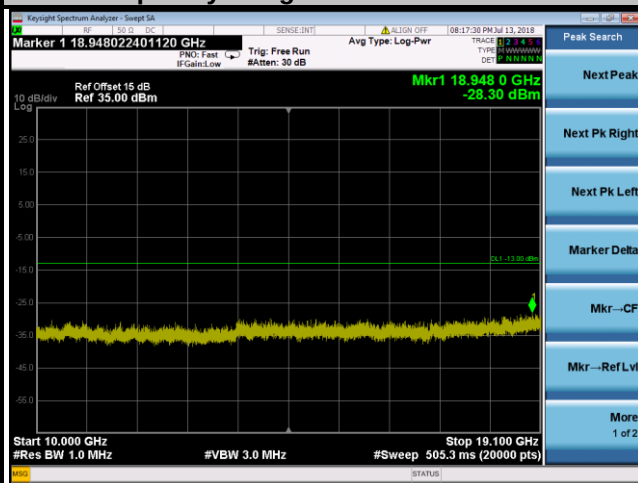
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



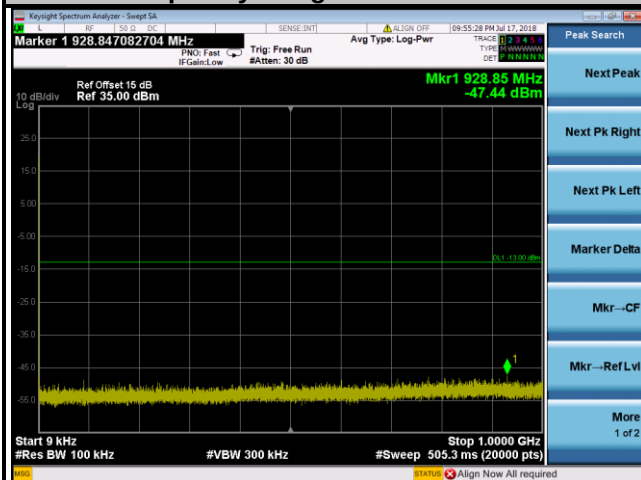
Frequency Range: 10 GHz ~ 19.1 GHz



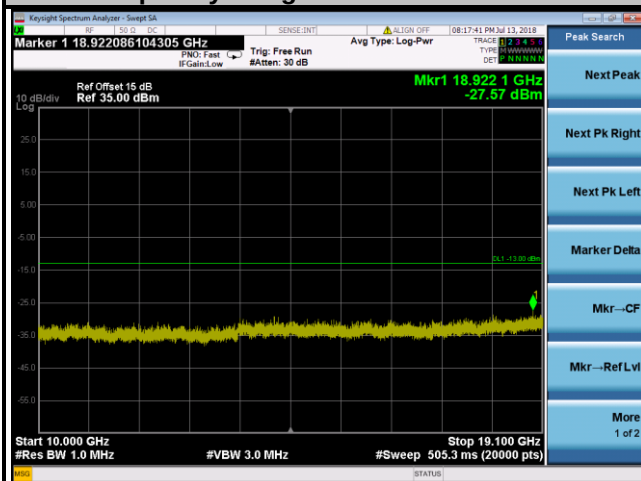
# WCDMA Channel 9538

Frequency Range: 9 kHz ~ 1 GHz

Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 19.1 GHz

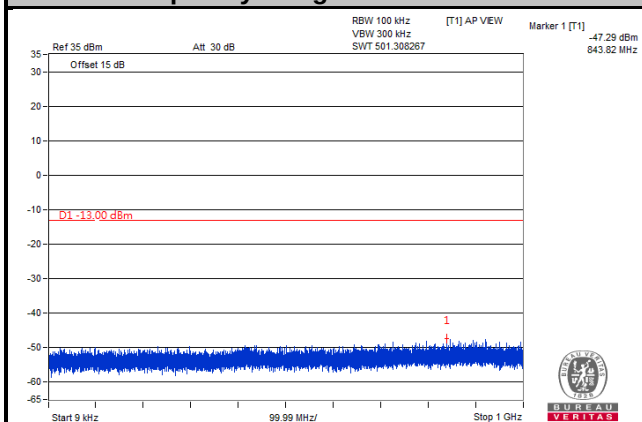


## LTE Band 2

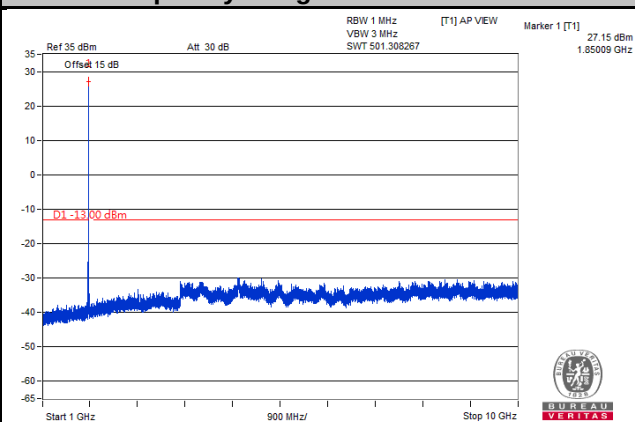
Channel Bandwidth: 1.4 MHz

Channel 18607

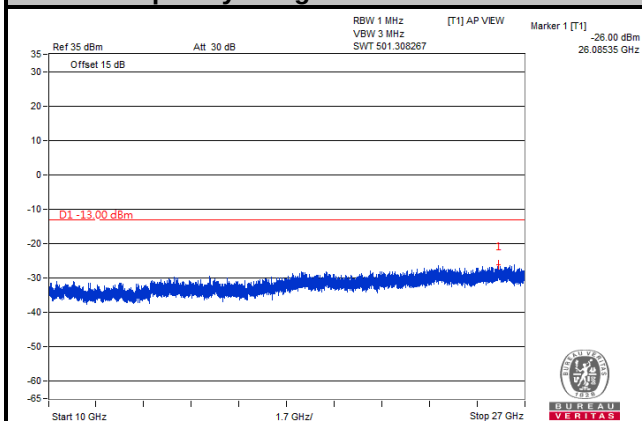
### Frequency Range: 9 kHz ~ 1 GHz



### Frequency Range: 1 GHz ~ 10 GHz



### Frequency Range: 10 GHz ~ 27 GHz

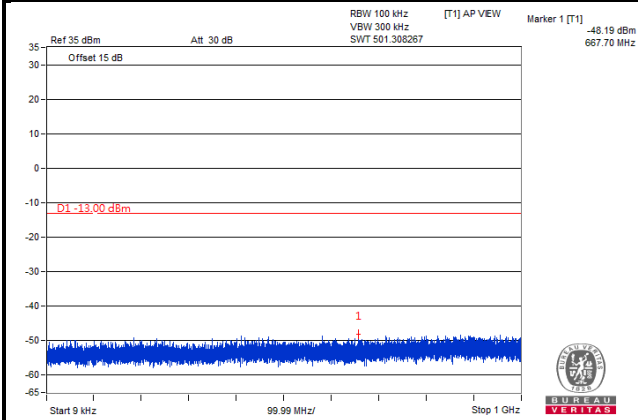


## LTE Band 2

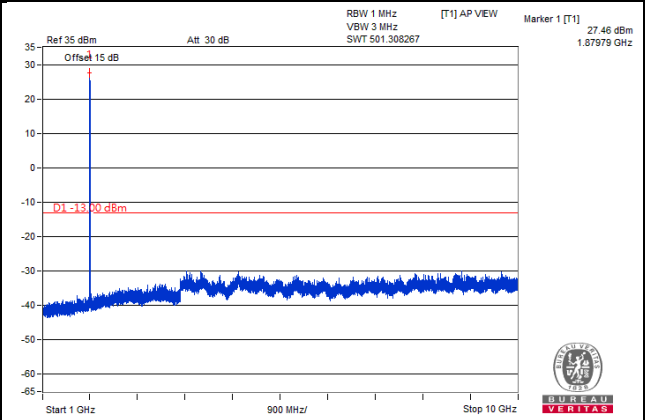
Channel Bandwidth: 1.4 MHz

Channel 18900

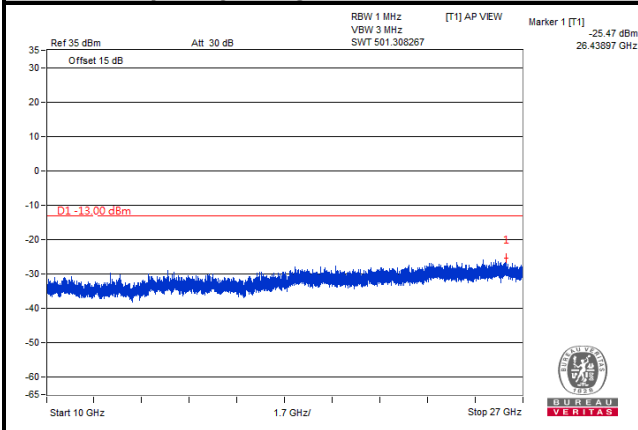
### Frequency Range: 9 kHz ~ 1 GHz



### Frequency Range: 1 GHz ~ 10 GHz



### Frequency Range: 10 GHz ~ 27 GHz

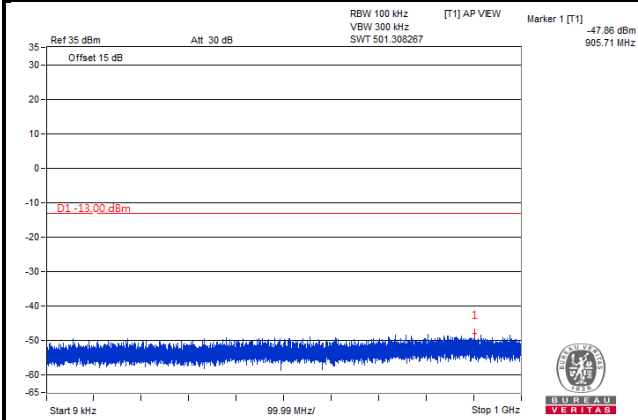


## LTE Band 2

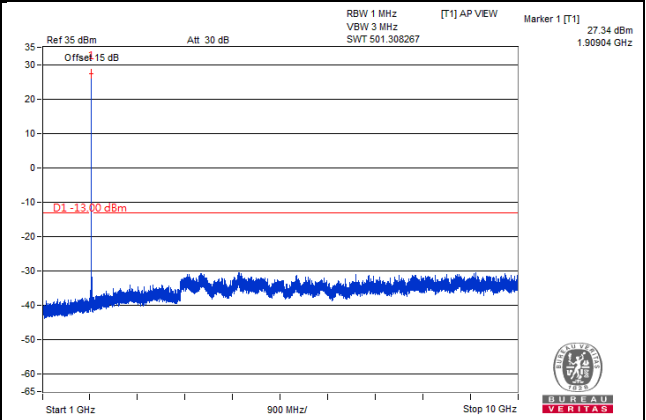
Channel Bandwidth: 1.4 MHz

Channel 19193

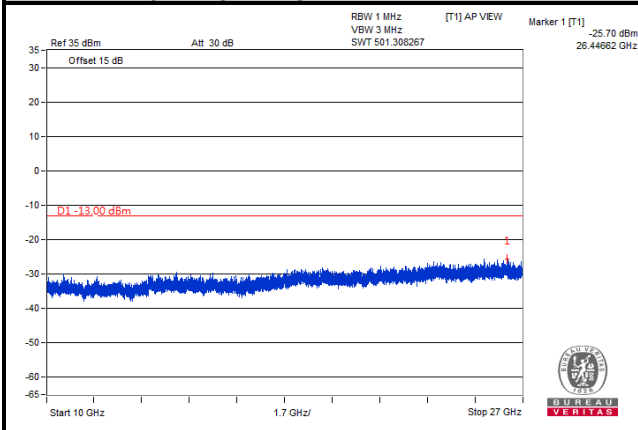
### Frequency Range: 9 kHz ~ 1 GHz



### Frequency Range: 1 GHz ~ 10 GHz



### Frequency Range: 10 GHz ~ 27 GHz

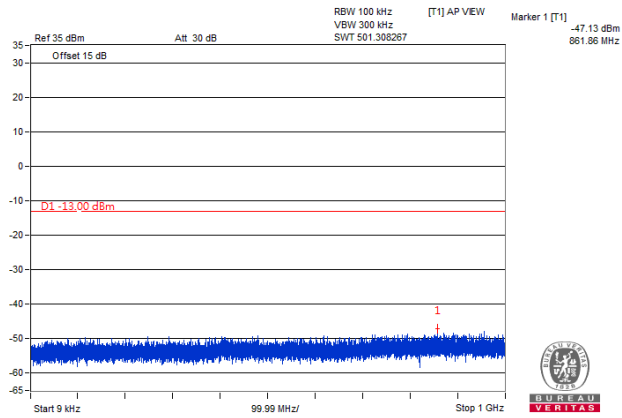


## LTE Band 2

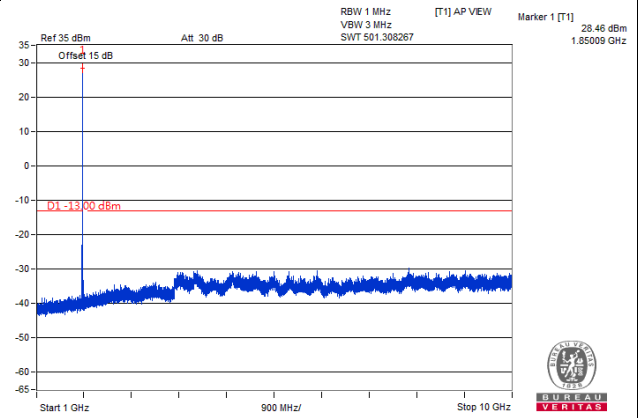
Channel Bandwidth: 3 MHz

Channel 18615

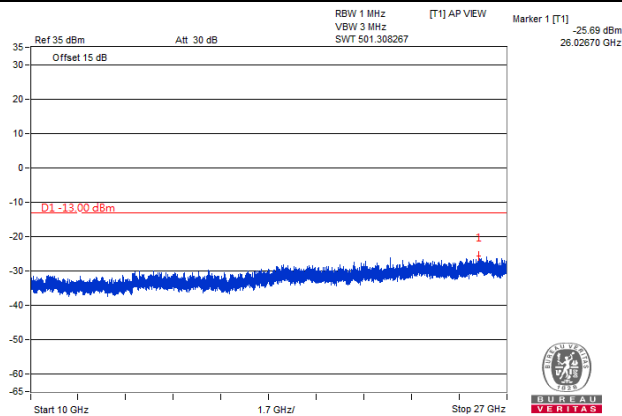
### Frequency Range: 9 kHz ~ 1 GHz



### Frequency Range: 1 GHz ~ 10 GHz



### Frequency Range: 10 GHz ~ 27 GHz

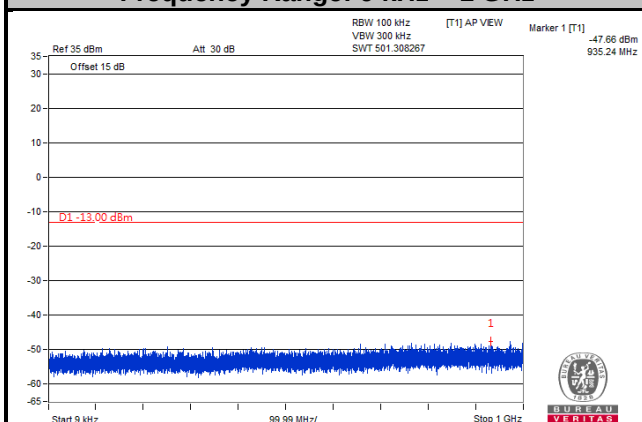


# LTE Band 2

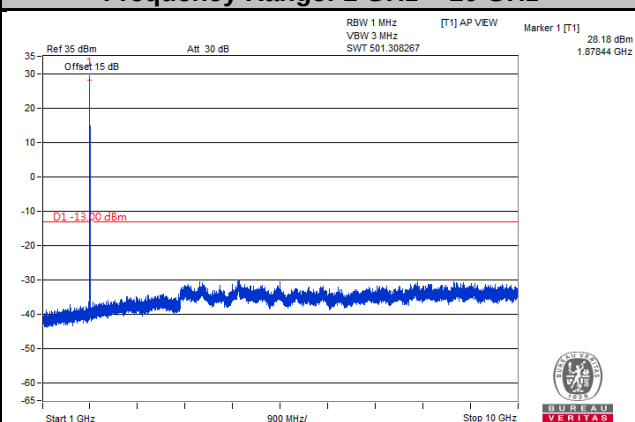
Channel Bandwidth: 3 MHz

Channel 18900

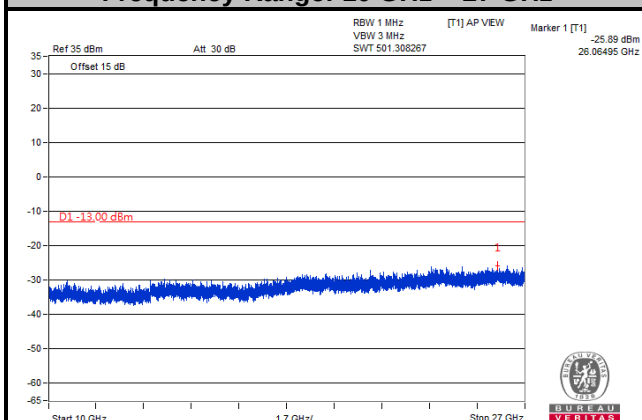
## Frequency Range: 9 kHz ~ 1 GHz



## Frequency Range: 1 GHz ~ 10 GHz



## Frequency Range: 10 GHz ~ 27 GHz

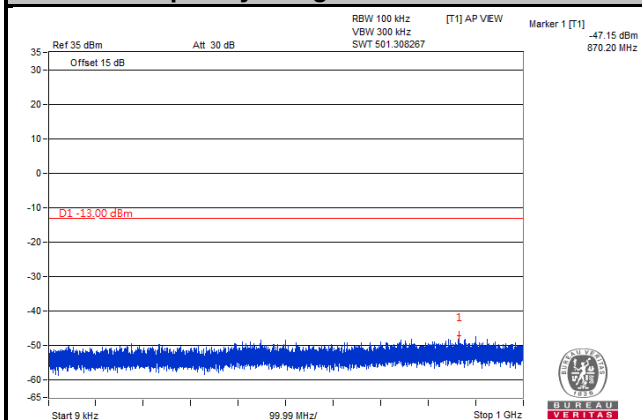


## LTE Band 2

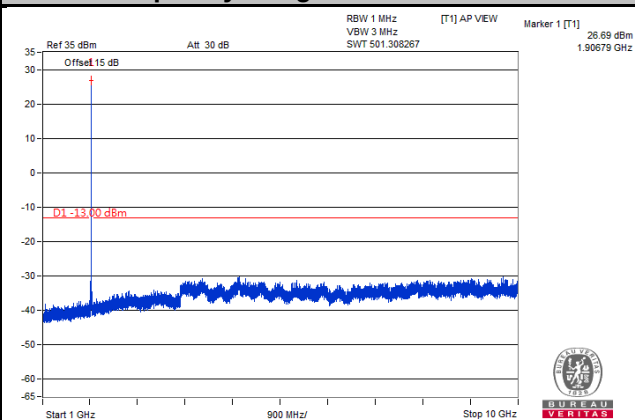
Channel Bandwidth: 3 MHz

Channel 19185

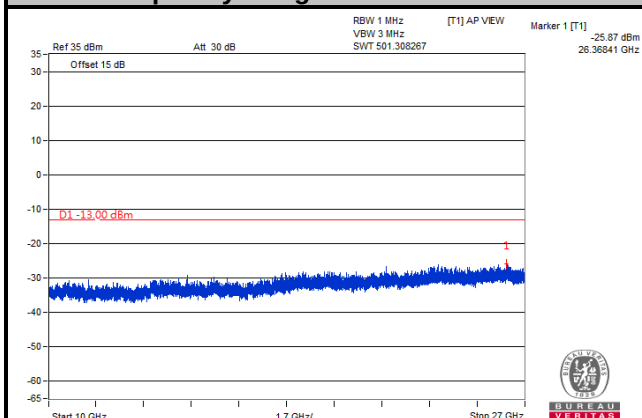
### Frequency Range: 9 kHz ~ 1 GHz



### Frequency Range: 1 GHz ~ 10 GHz



### Frequency Range: 10 GHz ~ 27 GHz

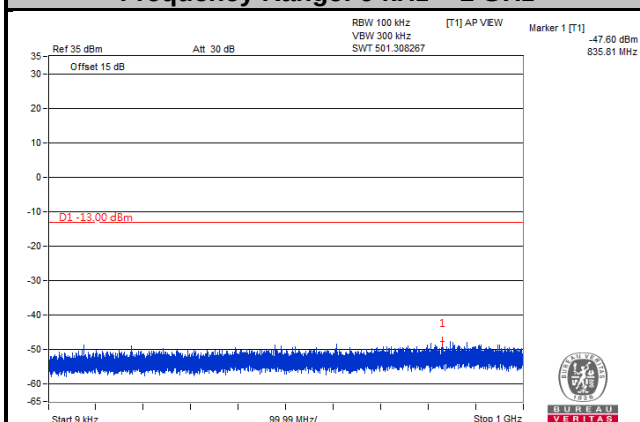


# LTE Band 2

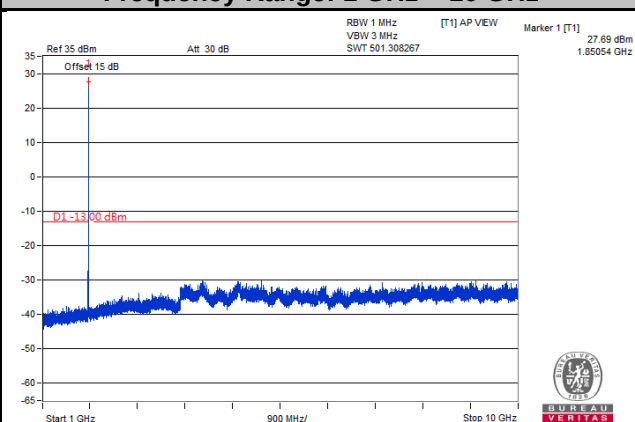
Channel Bandwidth: 5 MHz

Channel 18625

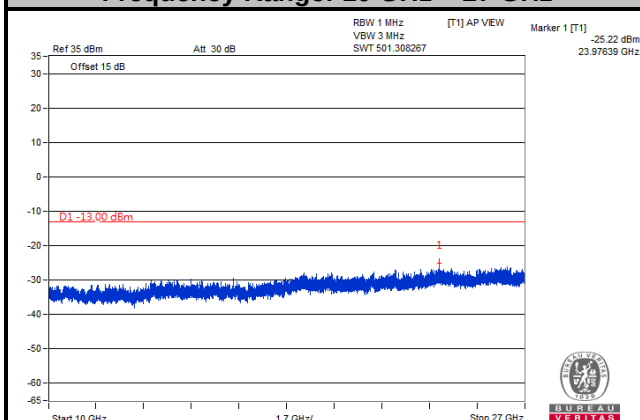
## Frequency Range: 9 kHz ~ 1 GHz



## Frequency Range: 1 GHz ~ 10 GHz



## Frequency Range: 10 GHz ~ 27 GHz

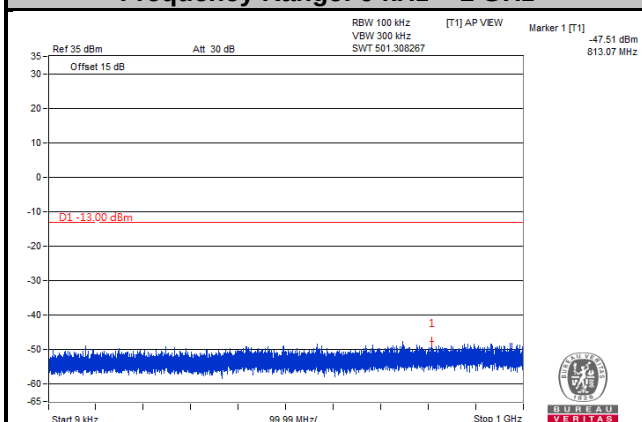


# LTE Band 2

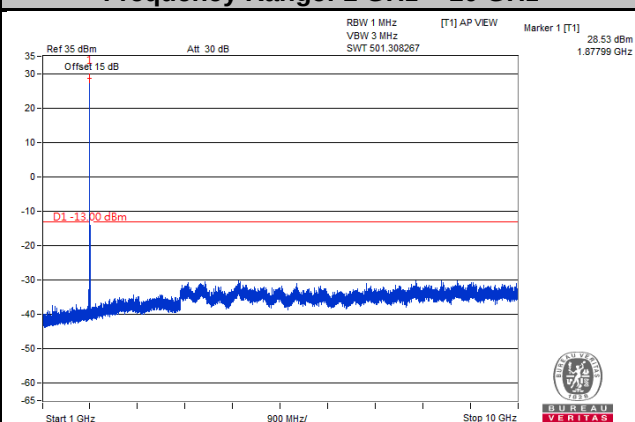
Channel Bandwidth: 5 MHz

Channel 18900

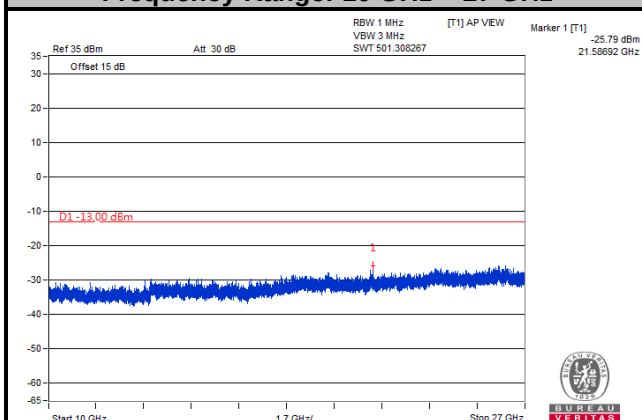
## Frequency Range: 9 kHz ~ 1 GHz



## Frequency Range: 1 GHz ~ 10 GHz



## Frequency Range: 10 GHz ~ 27 GHz

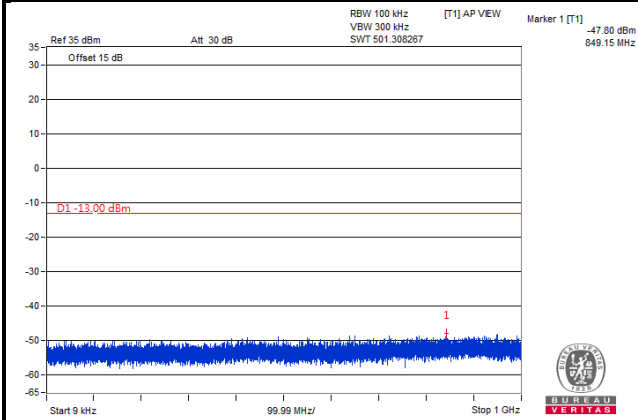


## LTE Band 2

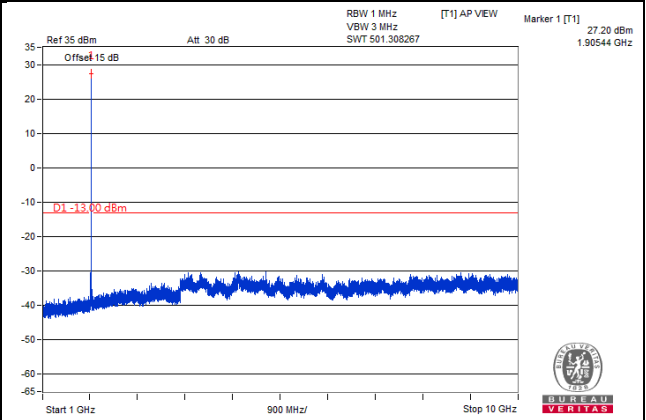
Channel Bandwidth: 5 MHz

Channel 19175

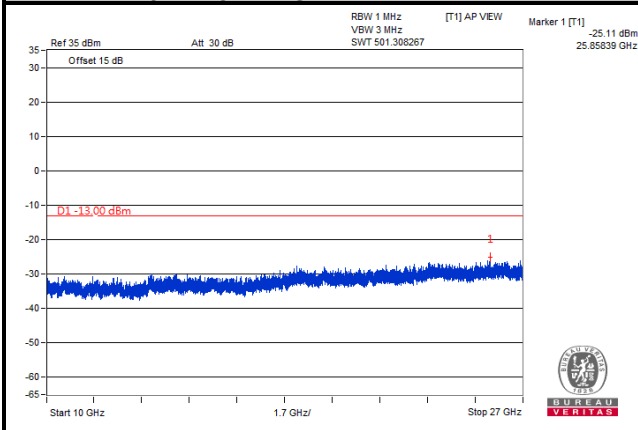
### Frequency Range: 9 kHz ~ 1 GHz



### Frequency Range: 1 GHz ~ 10 GHz



### Frequency Range: 10 GHz ~ 27 GHz

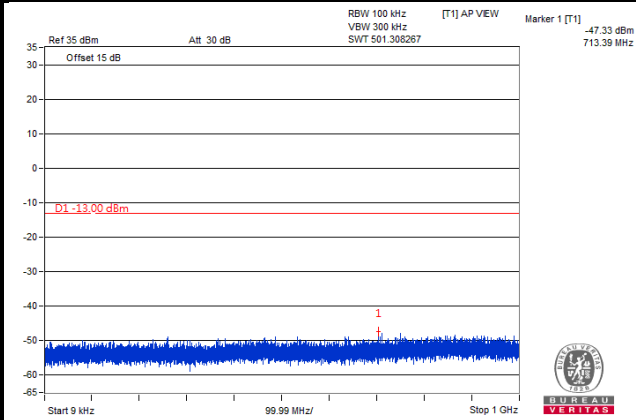


## LTE Band 2

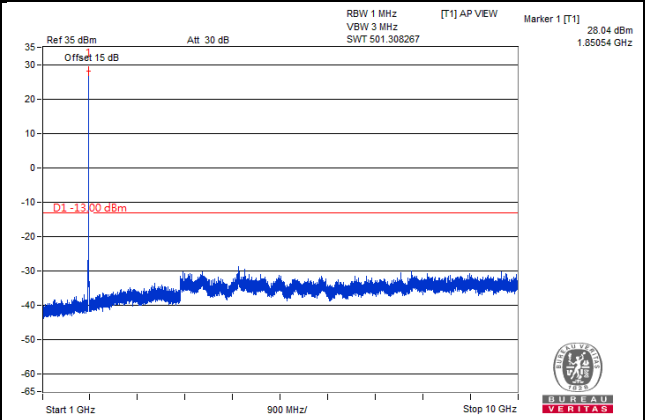
Channel Bandwidth: 10 MHz

Channel 18650

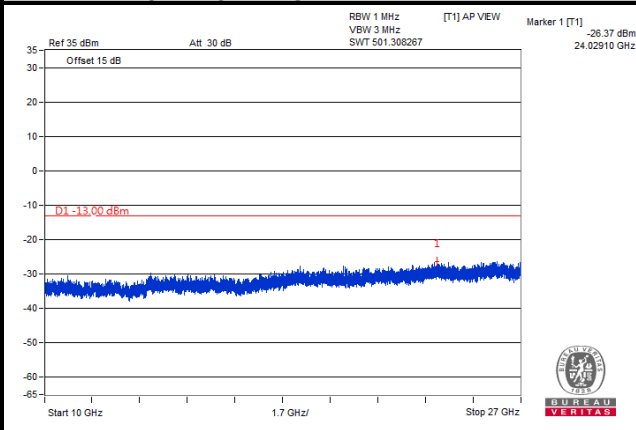
### Frequency Range: 9 kHz ~ 1 GHz



### Frequency Range: 1 GHz ~ 10 GHz



### Frequency Range: 10 GHz ~ 27 GHz

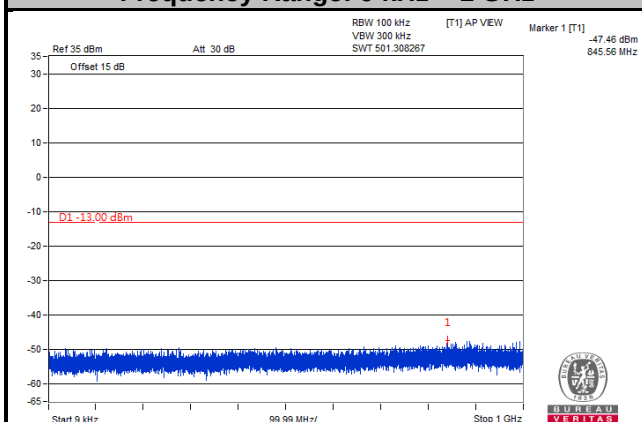


# LTE Band 2

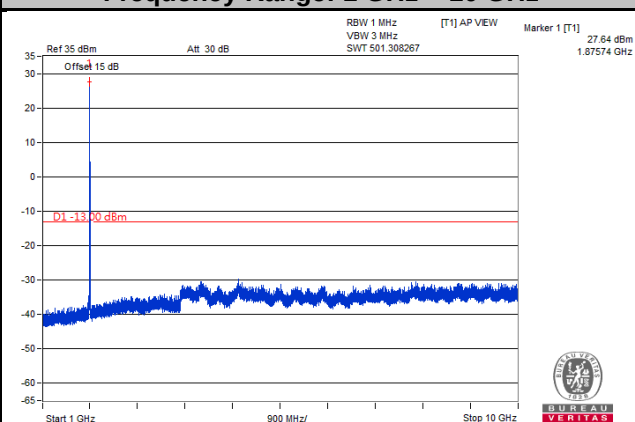
Channel Bandwidth: 10 MHz

Channel 18900

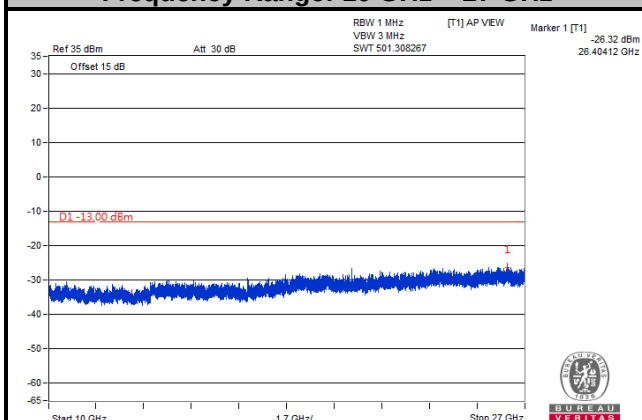
## Frequency Range: 9 kHz ~ 1 GHz



## Frequency Range: 1 GHz ~ 10 GHz



## Frequency Range: 10 GHz ~ 27 GHz

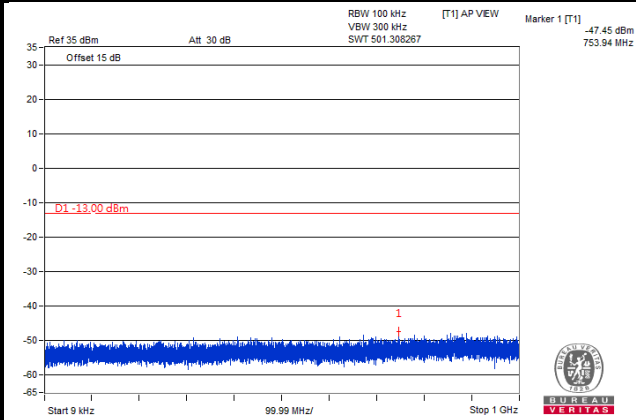


## LTE Band 2

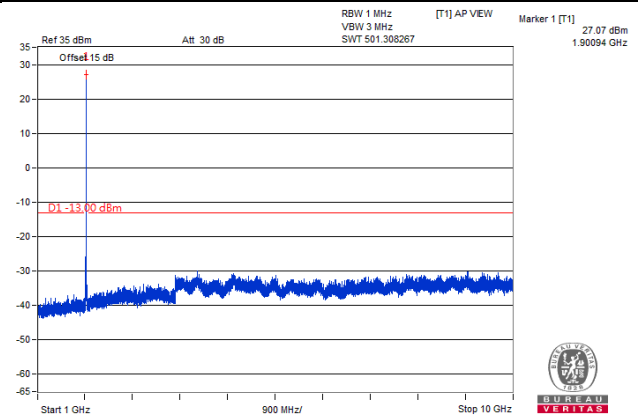
Channel Bandwidth: 10 MHz

Channel 19150

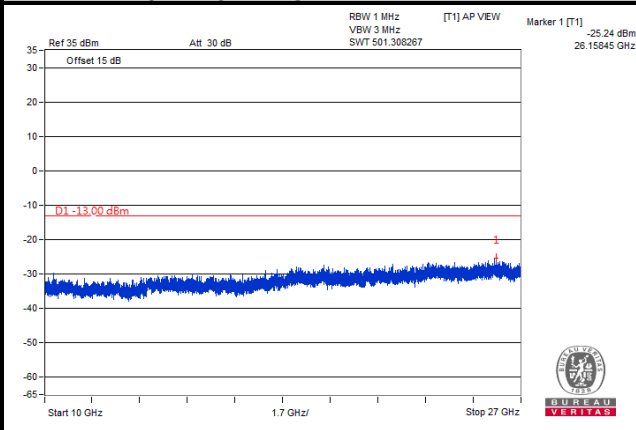
### Frequency Range: 9 kHz ~ 1 GHz



### Frequency Range: 1 GHz ~ 10 GHz



### Frequency Range: 10 GHz ~ 27 GHz

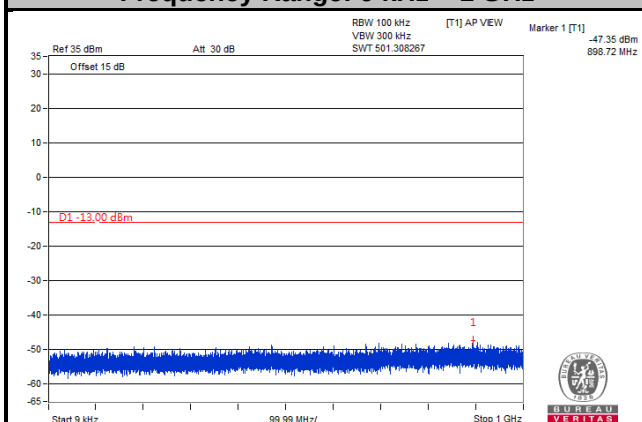


# LTE Band 2

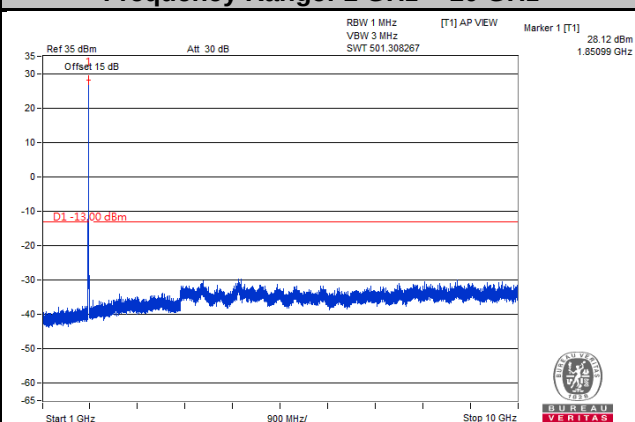
Channel Bandwidth: 15 MHz

Channel 18675

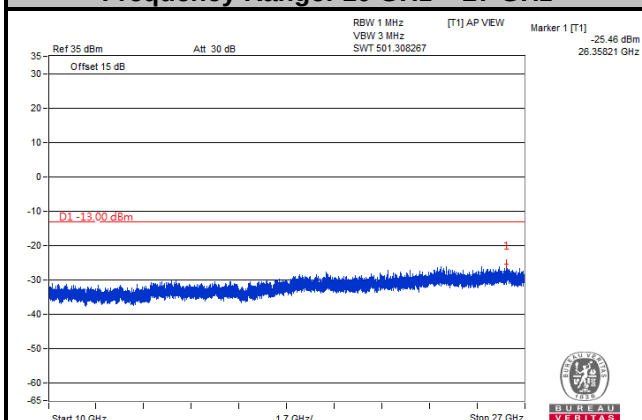
## Frequency Range: 9 kHz ~ 1 GHz



## Frequency Range: 1 GHz ~ 10 GHz



## Frequency Range: 10 GHz ~ 27 GHz

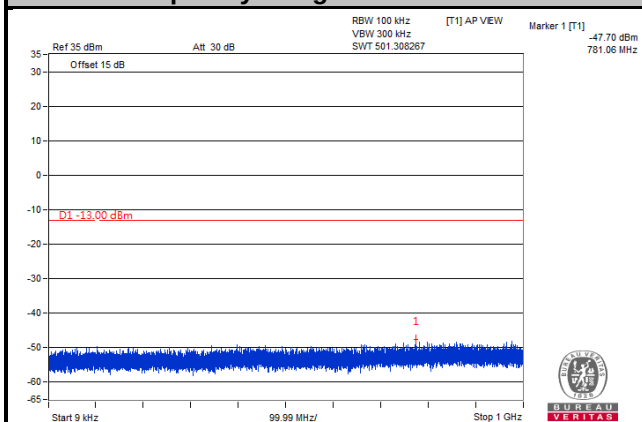


## LTE Band 2

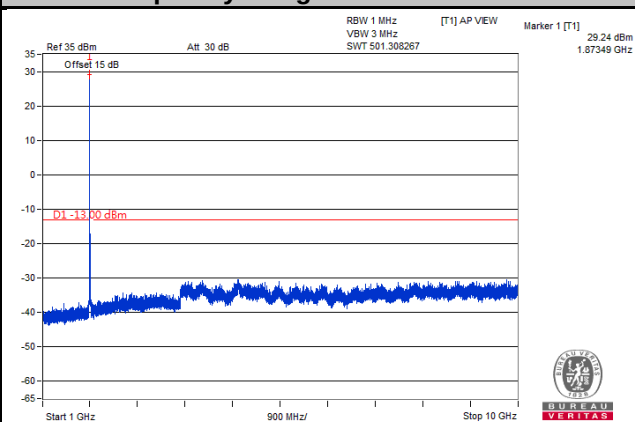
Channel Bandwidth: 15 MHz

Channel 18900

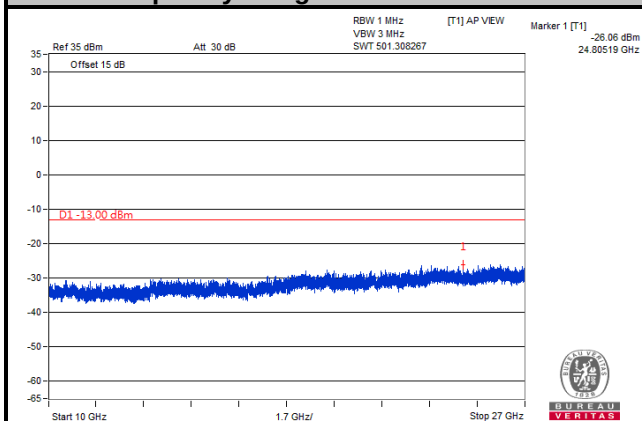
### Frequency Range: 9 kHz ~ 1 GHz



### Frequency Range: 1 GHz ~ 10 GHz



### Frequency Range: 10 GHz ~ 27 GHz

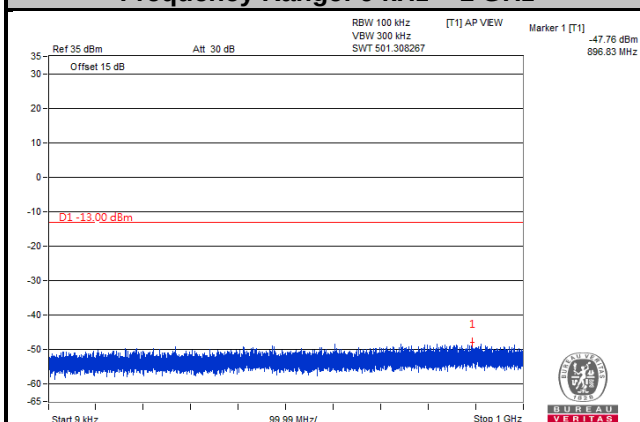


## LTE Band 2

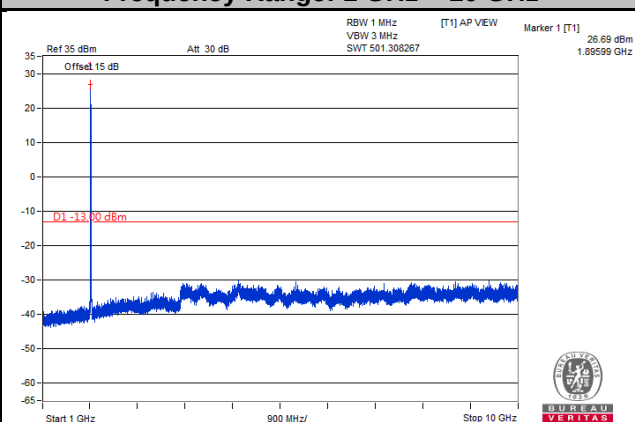
Channel Bandwidth: 15 MHz

Channel 19125

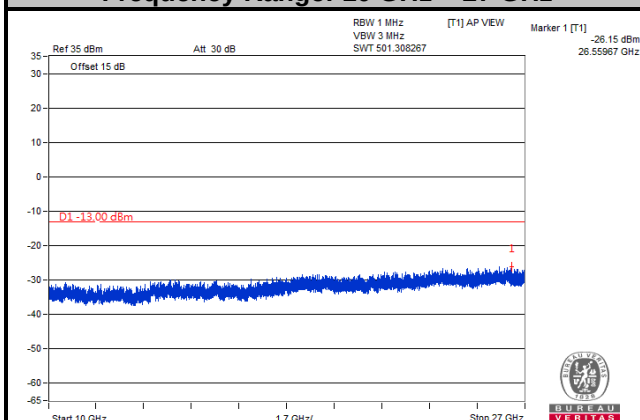
### Frequency Range: 9 kHz ~ 1 GHz



### Frequency Range: 1 GHz ~ 10 GHz



### Frequency Range: 10 GHz ~ 27 GHz

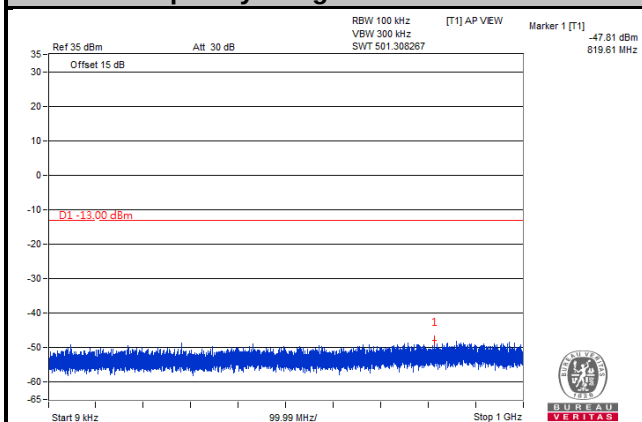


## LTE Band 2

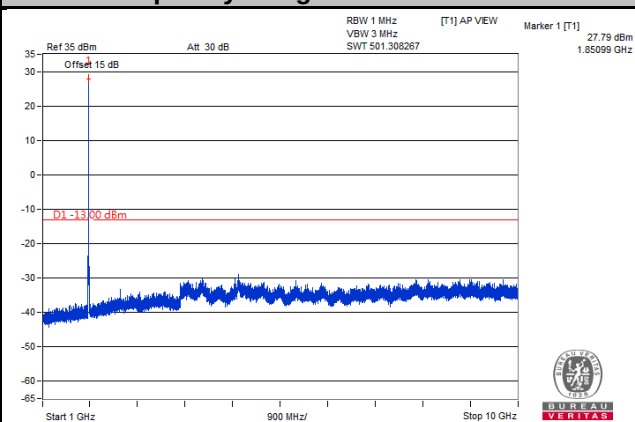
Channel Bandwidth: 20 MHz

Channel 18700

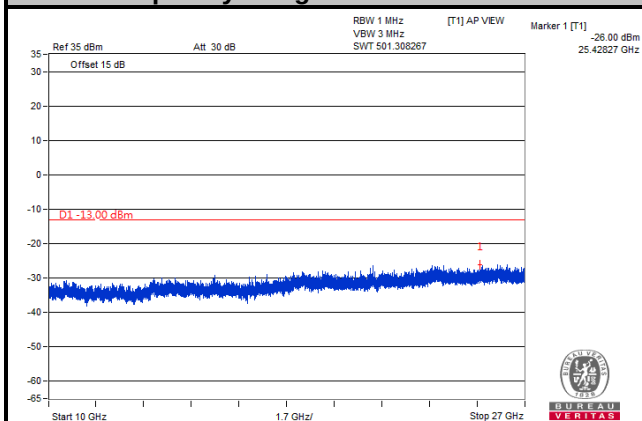
### Frequency Range: 9 kHz ~ 1 GHz



### Frequency Range: 1 GHz ~ 10 GHz



### Frequency Range: 10 GHz ~ 27 GHz

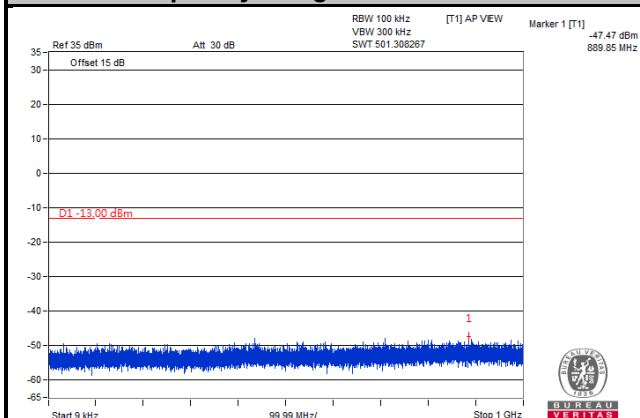


## LTE Band 2

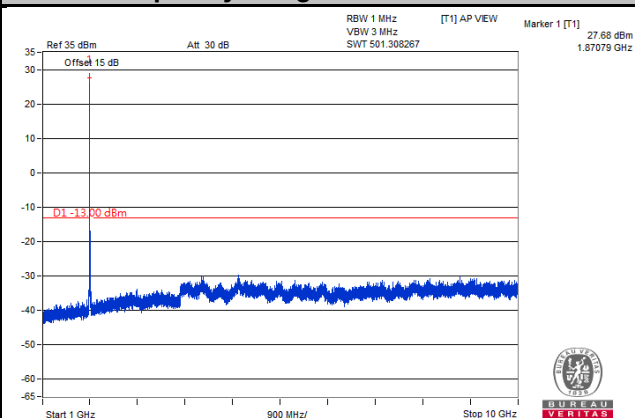
Channel Bandwidth: 20 MHz

Channel 18900

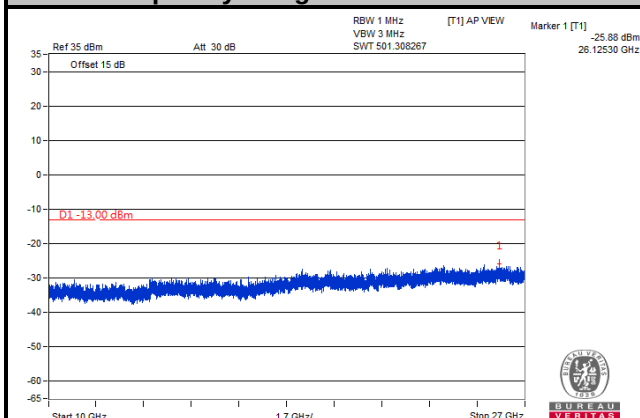
### Frequency Range: 9 kHz ~ 1 GHz



### Frequency Range: 1 GHz ~ 10 GHz



### Frequency Range: 10 GHz ~ 27 GHz

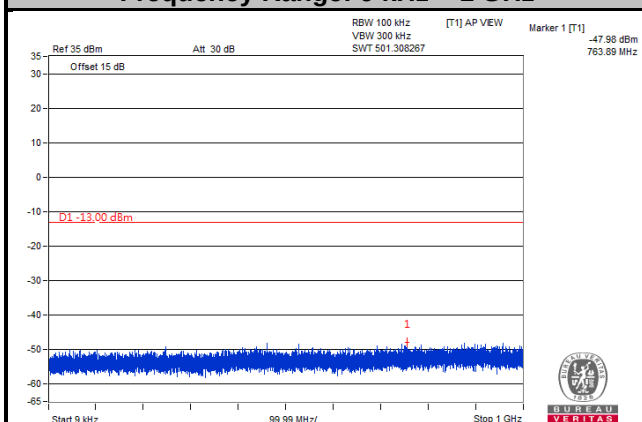


## LTE Band 2

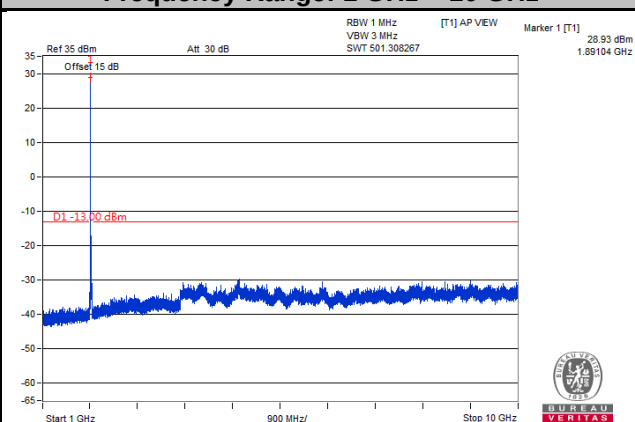
Channel Bandwidth: 20 MHz

Channel 19100

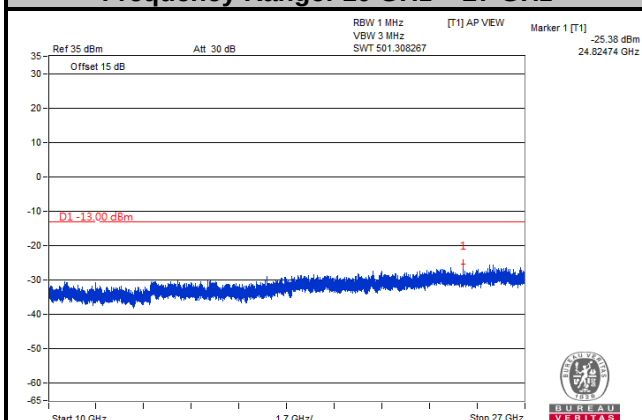
### Frequency Range: 9 kHz ~ 1 GHz



### Frequency Range: 1 GHz ~ 10 GHz



### Frequency Range: 10 GHz ~ 27 GHz



## 4.8 Radiated Emission Measurement

### 4.8.1 Limits of Radiated Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB. The emission limit is equal to -13 dBm.

### 4.8.2 Test Procedure

- Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step a. Record the power level of S.G.
- $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
- E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole,  $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}.$

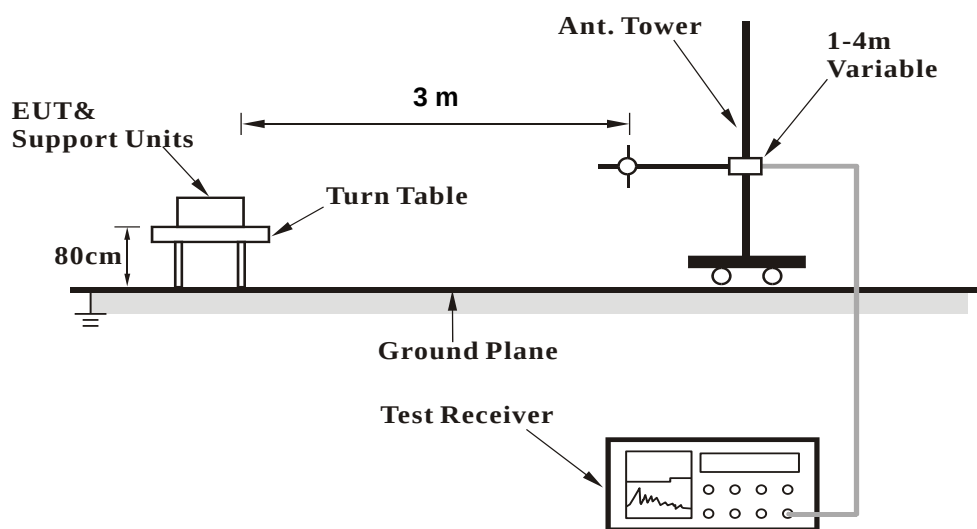
**NOTE:** The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

### 4.8.3 Deviation from Test Standard

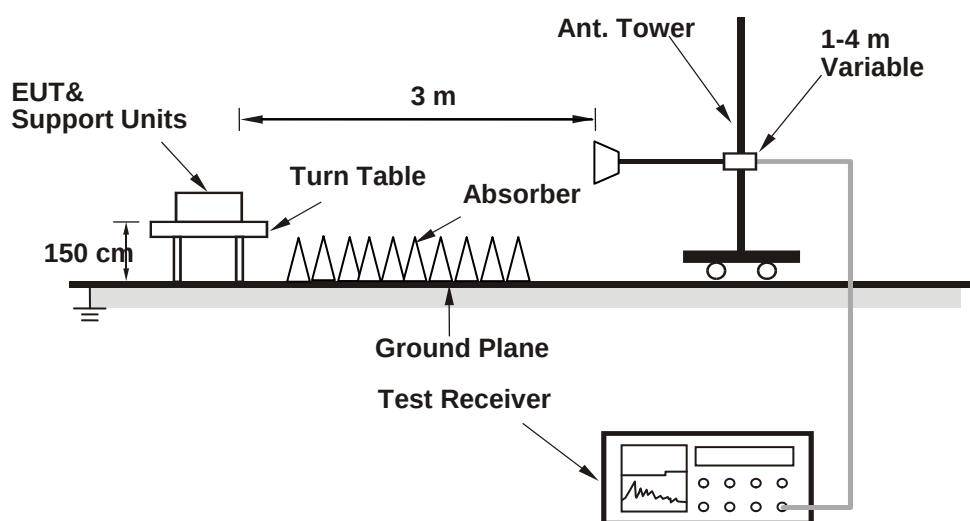
No deviation.

#### 4.8.4 Test Setup

##### <Radiated Emission below or equal 1 GHz>



##### <Radiated Emission above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.8.5 Test Results

WCDMA:

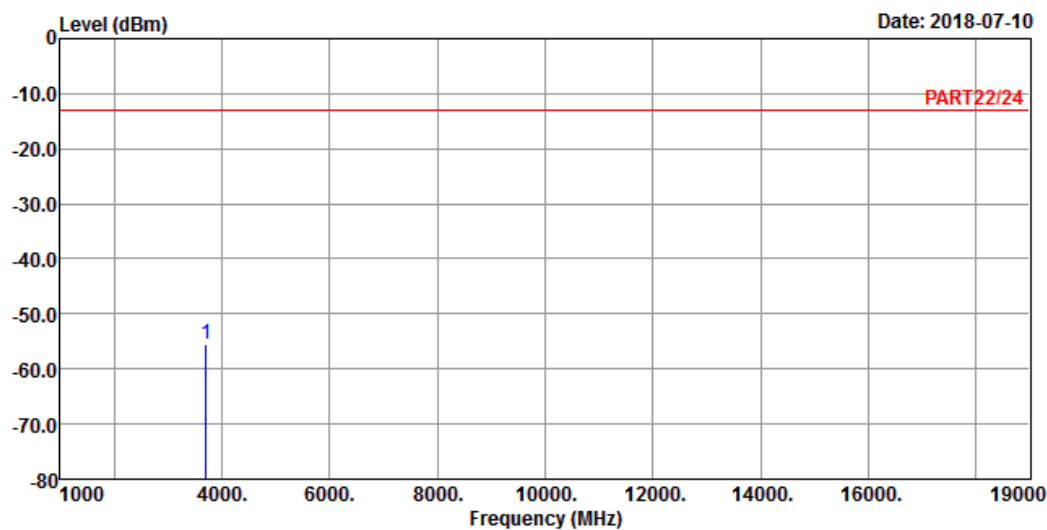
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : WCDMA Band II\_L-CH Link

Tested by: Jisyong Wang

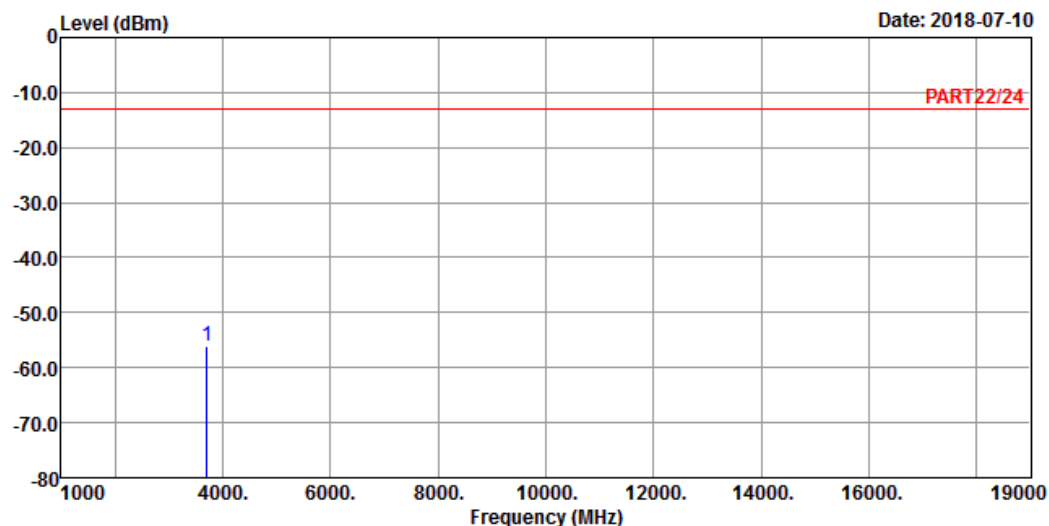
|              |        |        | Read   | Limit  | Over   |        |  |
|--------------|--------|--------|--------|--------|--------|--------|--|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |  |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |  |
| 1 pp 3704.80 | -55.50 | -48.57 | -13.00 | -42.50 | -6.93  | Peak   |  |



# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4



Site : 966 Chamber 5  
Condition: PART22/24 VERTICAL  
Remak : WCDMA Band II\_L-CH Link  
Tested by: Jisyong Wang

| Freq         | Level  | Read   | Limit  | Over   | Factor | Remark |
|--------------|--------|--------|--------|--------|--------|--------|
|              |        | Level  | Line   | Limit  |        |        |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 3704.80 | -56.16 | -49.23 | -13.00 | -43.16 | -6.93  | Peak   |

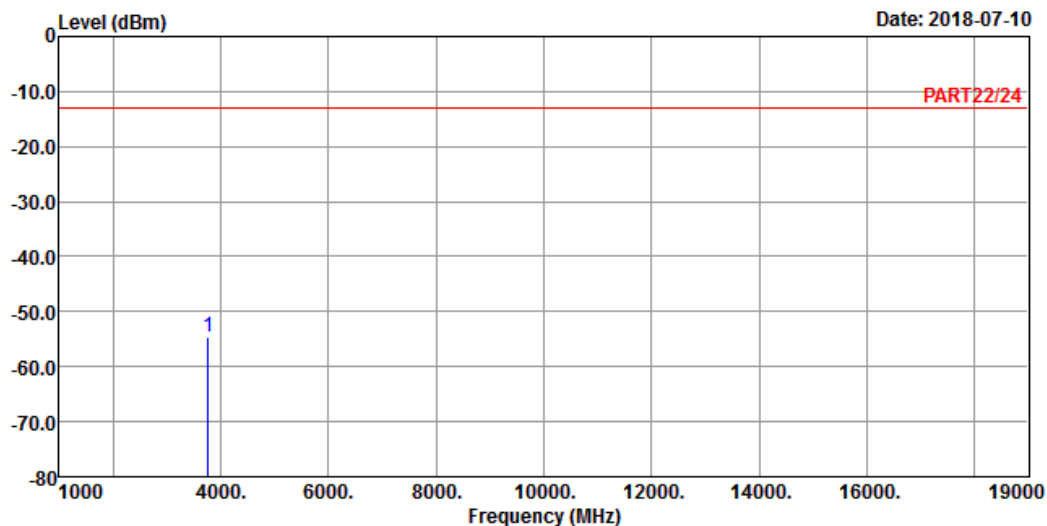
# Middle Channel



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A D T

Data: 3



Site : 966 Chamber 5  
Condition: PART22/24 HORIZONTAL  
Remak : WCDMA Band II\_M-CH Link  
Tested by: Jisyong Wang

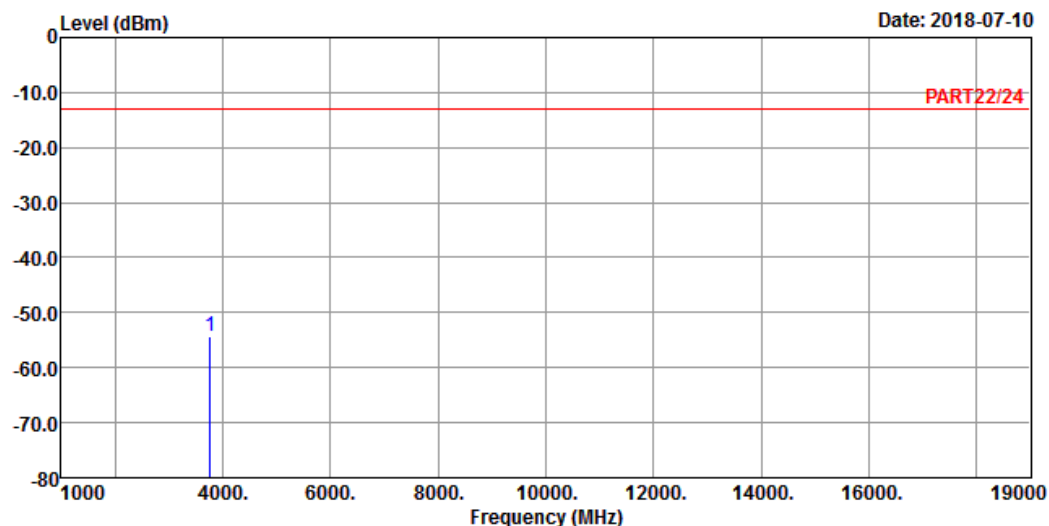
| Freq         | Level  | Read   | Limit  | Over   |        |      | Remark |
|--------------|--------|--------|--------|--------|--------|------|--------|
|              |        | Level  | Line   | Limit  | Factor |      |        |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |      |        |
| 1 pp 3760.00 | -54.75 | -48.10 | -13.00 | -41.75 | -6.65  | Peak |        |



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4



Site : 966 Chamber 5  
 Condition: PART22/24 VERTICAL  
 Remak : WCDMA Band II\_M-CH Link  
 Tested by: Jisyong Wang

| Freq         | Level  | Read   | Limit  | Over   | Factor | Remark |
|--------------|--------|--------|--------|--------|--------|--------|
|              |        | Level  | Line   | Limit  |        |        |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 3760.00 | -54.28 | -47.63 | -13.00 | -41.28 | -6.65  | Peak   |

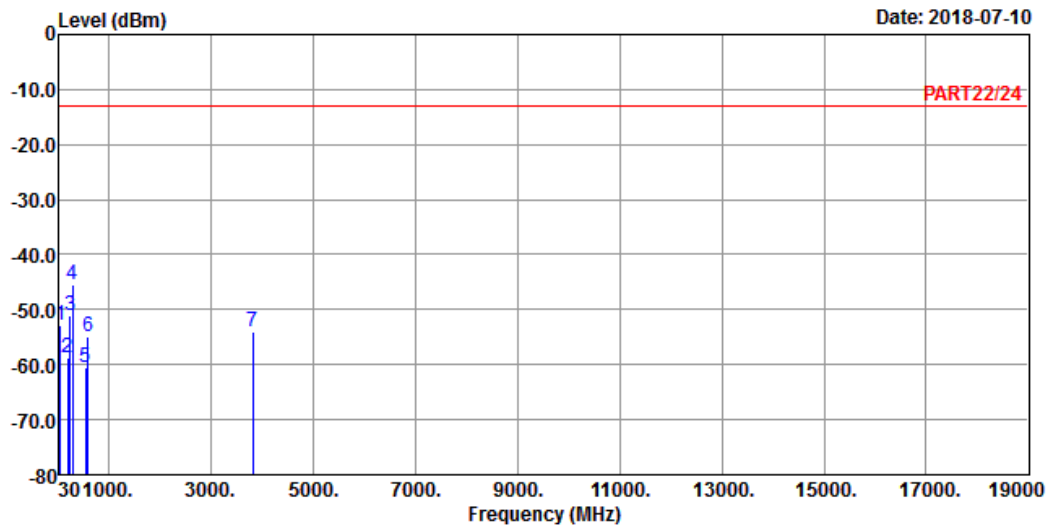
## High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5



Site : 966 Chamber 5  
 Condition: PART22/24 HORIZONTAL  
 Remak : WCDMA Band II\_H-CH Link  
 Tested by: Jisyong Wang

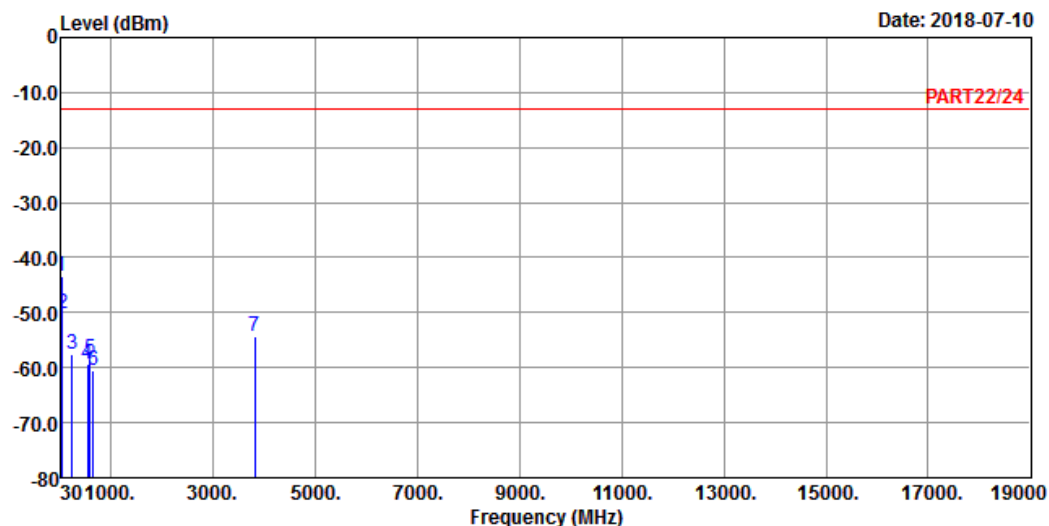
|      |         |        | Read   | Limit  | Over   |        |        |
|------|---------|--------|--------|--------|--------|--------|--------|
|      | Freq    | Level  | Level  | Line   | Limit  | Factor | Remark |
|      | MHz     | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1    | 44.55   | -52.75 | -50.76 | -13.00 | -39.75 | -1.99  | Peak   |
| 2    | 196.84  | -58.84 | -51.10 | -13.00 | -45.84 | -7.74  | Peak   |
| 3    | 233.70  | -51.19 | -44.53 | -13.00 | -38.19 | -6.66  | Peak   |
| 4 pp | 286.08  | -45.46 | -38.73 | -13.00 | -32.46 | -6.73  | Peak   |
| 5    | 546.04  | -60.58 | -57.59 | -13.00 | -47.58 | -2.99  | Peak   |
| 6    | 598.42  | -54.94 | -54.11 | -13.00 | -41.94 | -0.83  | Peak   |
| 7    | 3815.20 | -54.06 | -47.66 | -13.00 | -41.06 | -6.40  | Peak   |



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : WCDMA Band II\_H-CH Link

Tested by: Jisyong Wang

|      |         |        | Read   | Limit  | Over   |        |        |
|------|---------|--------|--------|--------|--------|--------|--------|
|      | Freq    | Level  | Level  | Line   | Limit  | Factor | Remark |
|      | MHz     | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp | 40.67   | -43.29 | -43.41 | -13.00 | -30.29 | 0.12   | Peak   |
| 2    | 46.49   | -50.30 | -47.30 | -13.00 | -37.30 | -3.00  | Peak   |
| 3    | 234.67  | -57.65 | -51.03 | -13.00 | -44.65 | -6.62  | Peak   |
| 4    | 546.04  | -59.34 | -56.35 | -13.00 | -46.34 | -2.99  | Peak   |
| 5    | 598.42  | -58.52 | -57.69 | -13.00 | -45.52 | -0.83  | Peak   |
| 6    | 650.80  | -60.52 | -59.65 | -13.00 | -47.52 | -0.87  | Peak   |
| 7    | 3815.20 | -54.22 | -47.82 | -13.00 | -41.22 | -6.40  | Peak   |

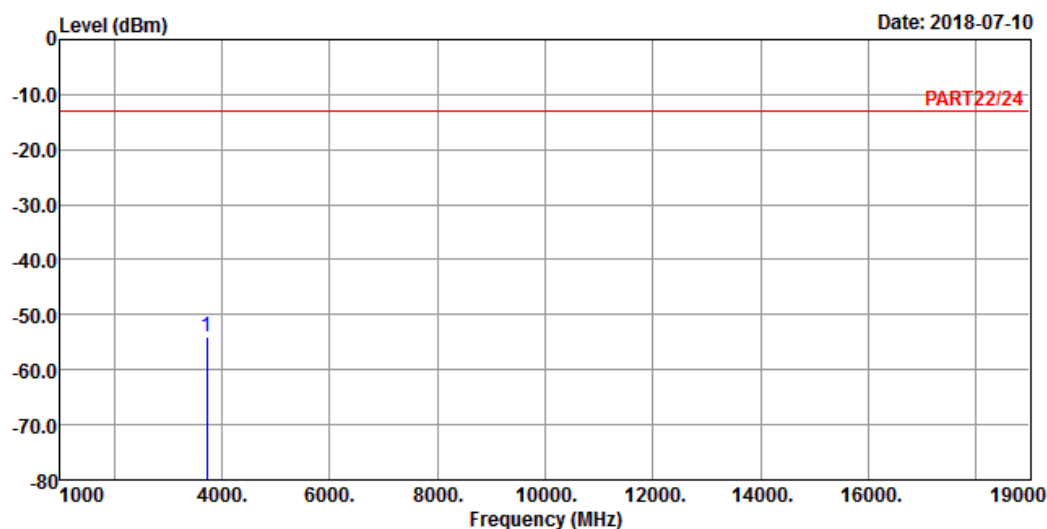
LTE Band 2  
Channel Bandwidth: 20 MHz / QPSK  
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1



Site : 966 Chamber 5  
Condition: PART22/24 HORIZONTAL  
Remak : LTE Band 2 QPSK\_20M Link\_L-CH  
Tested by: Thomas Wei

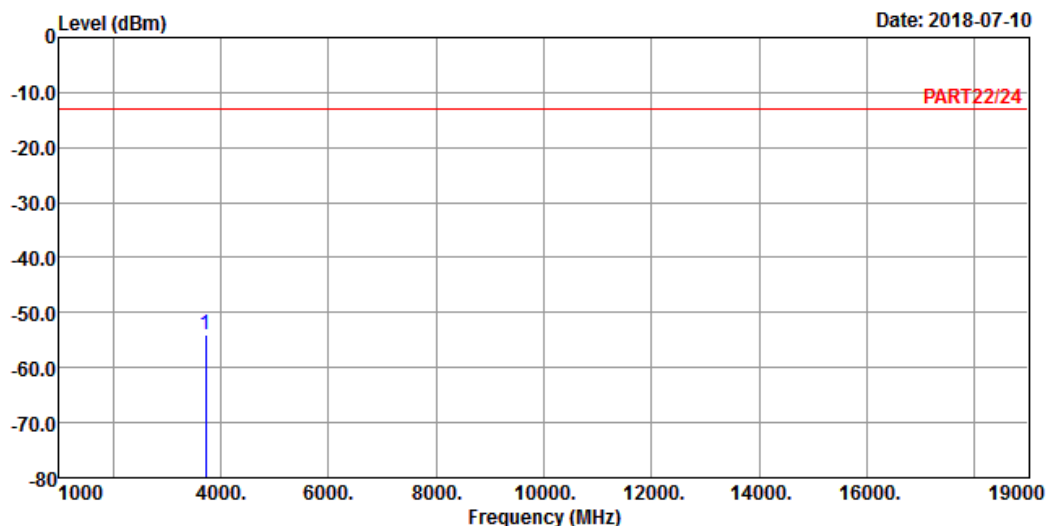
|              |        | Read   | Limit  | Over   |        |        |
|--------------|--------|--------|--------|--------|--------|--------|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 3720.00 | -54.03 | -47.21 | -13.00 | -41.03 | -6.82  | Peak   |



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 2



Site : 966 Chamber 5  
 Condition: PART22/24 VERTICAL  
 Remak : LTE Band 2 QPSK\_20M Link\_L-CH  
 Tested by: Thomas Wei

|              |        | Read   | Limit  | Over   |        |        |
|--------------|--------|--------|--------|--------|--------|--------|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 3720.00 | -54.15 | -47.33 | -13.00 | -41.15 | -6.82  | Peak   |

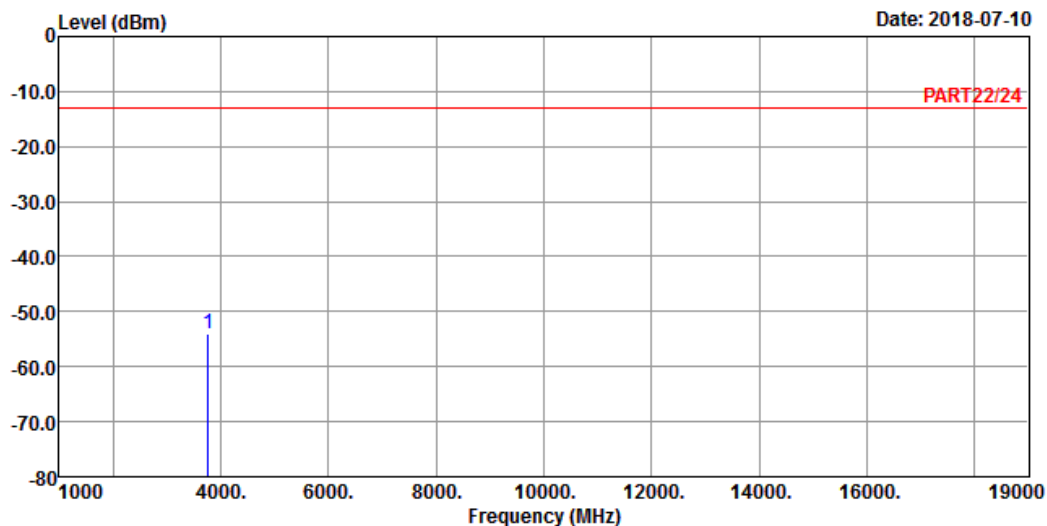
# Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1



Site : 966 Chamber 5  
Condition: PART22/24 HORIZONTAL  
Remak : LTE Band 2 QPSK\_20M Link\_M-CH  
Tested by: Thomas Wei

|      |       | Read  | Limit | Over  |        |        |
|------|-------|-------|-------|-------|--------|--------|
| Freq | Level | Level | Line  | Limit | Factor | Remark |
| MHz  | dBm   | dBm   | dBm   | dB    | dB     |        |

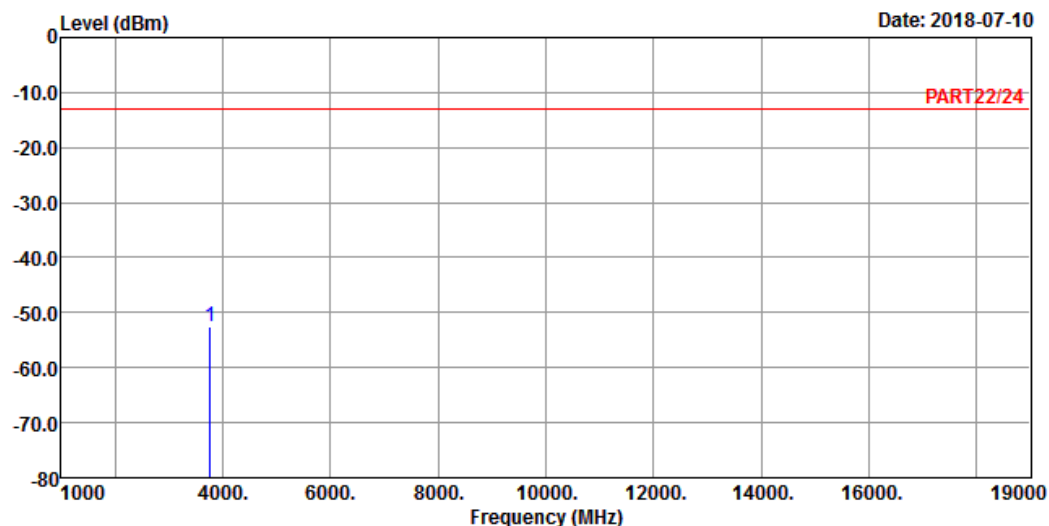
1 pp 3760.00 -53.92 -47.27 -13.00 -40.92 -6.65 Peak



# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 2



Site : 966 Chamber 5  
 Condition: PART22/24 VERTICAL  
 Remak : LTE Band 2 QPSK\_20M Link\_M-CH  
 Tested by: Thomas Wei

| Freq         | Level  | Read   | Limit  | Over   | Factor | Remark |
|--------------|--------|--------|--------|--------|--------|--------|
|              |        | Level  | Line   | Limit  |        |        |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 3760.00 | -52.51 | -45.86 | -13.00 | -39.51 | -6.65  | Peak   |

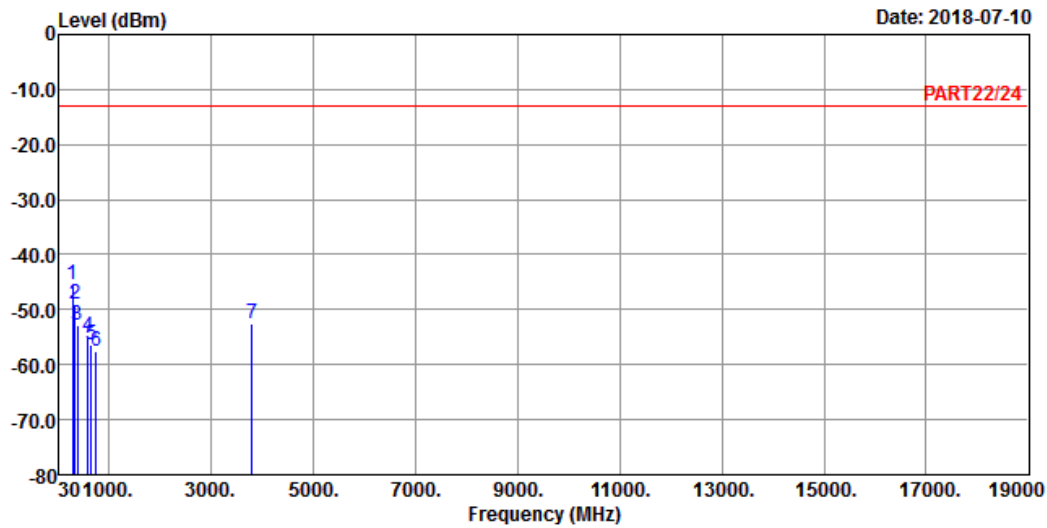
# High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5



Site : 966 Chamber 5  
Condition: PART22/24 HORIZONTAL  
Remak : LTE Band 2 QPSK\_20M Link\_H-CH  
Tested by: Thomas Wei

|      |         |        | Read   | Limit  | Over   |        |        |
|------|---------|--------|--------|--------|--------|--------|--------|
|      | Freq    | Level  | Level  | Line   | Limit  | Factor | Remark |
|      | MHz     | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp | 286.08  | -45.46 | -38.73 | -13.00 | -32.46 | -6.73  | Peak   |
| 2    | 338.46  | -49.04 | -42.62 | -13.00 | -36.04 | -6.42  | Peak   |
| 3    | 389.87  | -52.85 | -46.85 | -13.00 | -39.85 | -6.00  | Peak   |
| 4    | 598.42  | -54.94 | -54.11 | -13.00 | -41.94 | -0.83  | Peak   |
| 5    | 650.80  | -56.39 | -55.52 | -13.00 | -43.39 | -0.87  | Peak   |
| 6    | 754.59  | -57.59 | -58.46 | -13.00 | -44.59 | 0.87   | Peak   |
| 7    | 3800.00 | -52.69 | -46.26 | -13.00 | -39.69 | -6.43  | Peak   |

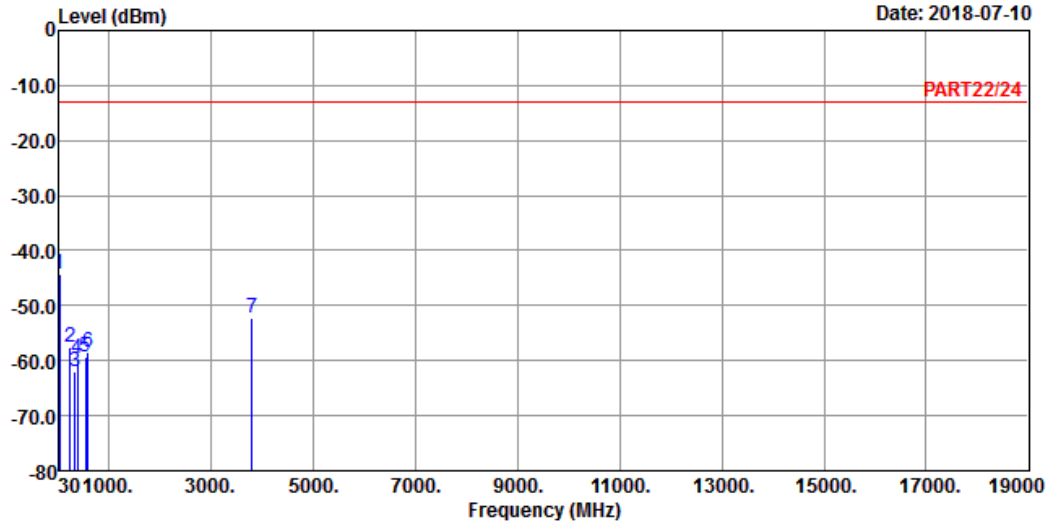


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-10



Site : 966 Chamber 5  
Condition: PART22/24 VERTICAL  
Remak : LTE Band 2 QPSK\_20M Link\_H-CH  
Tested by: Thomas Wei

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1 pp | 42.61   | -44.40 | -43.46     | -13.00     | -31.40     | -0.94  | Peak   |
| 2    | 234.67  | -57.65 | -51.03     | -13.00     | -44.65     | -6.62  | Peak   |
| 3    | 338.46  | -62.07 | -55.65     | -13.00     | -49.07     | -6.42  | Peak   |
| 4    | 390.84  | -59.76 | -53.76     | -13.00     | -46.76     | -6.00  | Peak   |
| 5    | 546.04  | -59.34 | -56.35     | -13.00     | -46.34     | -2.99  | Peak   |
| 6    | 598.42  | -58.52 | -57.69     | -13.00     | -45.52     | -0.83  | Peak   |
| 7    | 3800.00 | -52.32 | -45.89     | -13.00     | -39.32     | -6.43  | Peak   |

## 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

## Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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The address and road map of all our labs can be found in our web site also.

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