

## FCC Test Report (Part 90 – LTE B26)

**Report No.:** RFBFMG-WTW-P22010752-3

**FCC ID:** B32E2351

**Test Model:** e235-4G-1

**Received Date:** Jan. 24, 2022

**Test Date:** Mar. 20 ~ Mar. 25, 2022

**Issued Date:** Jul. 22, 2022

**Applicant:** Verifone, Inc.

**Address:** 1400 West Stanford Ranch Road Suite 150 Rocklin CA 95765 USA

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

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**Test Location(1):** No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City  
33383, Taiwan

**FCC Registration /  
Designation Number(1):** 788550 / TW0003

**Test Location(2):** B2F., No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan

**FCC Registration /  
Designation Number(2):** 427177 / TW0011



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### Release Control Record

| Issue No.              | Description      | Date Issued   |
|------------------------|------------------|---------------|
| RFBFMG-WTW-P22010752-3 | Original release | Jul. 22, 2022 |

## 1 Certificate of Conformity

**Product:** Point of Sale Terminal

**Brand:** Verifone

**Test Model:** e235-4G-1

**Sample Status:** Engineering sample

**Applicant:** Verifone, Inc.

**Test Date:** Mar. 20 ~ Mar. 25, 2022

**Standards:** FCC Part 90, Subpart I, S

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 :** Pettie Chen, **Date:** Jul. 22, 2022  
Pettie Chen / Senior Specialist

**Approved by :** Jeremy Lin, **Date:** Jul. 22, 2022  
Jeremy Lin / Project Engineer

## 2 Summary of Test Results

| Applied Standard: FCC Part 90 & Part 2 |                              |        |                                                                                     |
|----------------------------------------|------------------------------|--------|-------------------------------------------------------------------------------------|
| FCC Clause                             | Test Item                    | Result | Remarks                                                                             |
| 2.1046<br>90.635 (b)                   | Effective Radiated Power     | Pass   | Meet the requirement of limit.                                                      |
| 2.1047                                 | Modulation Characteristics   | Pass   | Meet the requirement of limit.                                                      |
| 2.1055<br>90.213                       | Frequency Stability          | Pass   | Meet the requirement of limit.                                                      |
| 2.1049<br>90.209                       | Occupied Bandwidth           | Pass   | Meet the requirement of limit.                                                      |
| 2.1051<br>90.691                       | Emission Masks               | Pass   | Meet the requirement of limit.                                                      |
| 2.1051<br>90.691                       | Conducted Spurious Emissions | Pass   | Meet the requirement of limit.                                                      |
| 2.1053<br>90.691                       | Radiated Spurious Emissions  | Pass   | Meet the requirement of limit.<br>Minimum passing margin is -38.00dB at 1638.00MHz. |

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

### 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) ( $\pm$ ) |
|--------------------------------|------------------|--------------------------------------|
| Radiated Emissions up to 1 GHz | 9kHz ~ 30MHz     | 3.04 dB                              |
|                                | 30MHz ~ 200MHz   | 2.0153 dB                            |
|                                | 200MHz ~ 1000MHz | 2.0224 dB                            |
| Radiated Emissions above 1 GHz | 1GHz ~ 18GHz     | 1.0121 dB                            |
|                                | 18GHz ~ 40GHz    | 1.1508 dB                            |

## 2.2 Test Site and Instruments

| Description & Manufacturer                     | Model No.                    | Serial No.                                            | Cal. Date     | Cal. Due      |
|------------------------------------------------|------------------------------|-------------------------------------------------------|---------------|---------------|
| Test Receiver<br>Agilent Technologies          | N9038A                       | MY52260177                                            | Sep. 01, 2021 | Aug. 31, 2022 |
| Spectrum Analyzer<br>ROHDE & SCHWARZ           | FSU43                        | 101261                                                | Apr. 12, 2021 | Apr. 11, 2022 |
| Loop Antenna<br>TESEQ                          | HLA 6121                     | 45745                                                 | Jul. 21, 2021 | Jul. 20, 2022 |
| HORN Antenna<br>ETS-Lindgren                   | 3117                         | 00143293                                              | Nov. 14, 2021 | Nov. 13, 2022 |
| BILOG Antenna<br>SCHWARZBECK                   | VULB 9168                    | 9168-616                                              | Oct. 27, 2021 | Oct. 26, 2022 |
| HORN Antenna<br>SCHWARZBECK                    | BBHA 9170                    | 9170-480                                              | Nov. 14, 2021 | Nov. 13, 2022 |
| Fixed Attenuator<br>Mini-Circuits              | MDCS18N-10                   | MDCS18N-10-01                                         | Apr. 13, 2021 | Apr. 12, 2022 |
| MXG Vector signal generator<br>Agilent         | N5182B                       | MY53050430                                            | Nov. 25, 2021 | Nov. 24, 2022 |
| Preamplifier<br>Agilent                        | 310N                         | 187226                                                | Jun. 17, 2021 | Jun. 16, 2022 |
| Preamplifier<br>Agilent                        | 83017A                       | MY39501357                                            | Jun. 17, 2021 | Jun. 16, 2022 |
| Preamplifier<br>EMCI                           | EMC 184045                   | 980116                                                | Oct. 05, 2021 | Oct. 04, 2022 |
| RF signal cable<br>ETS-LINDGREN                | 5D-FB                        | Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400) | Jun. 17, 2021 | Jun. 16, 2022 |
| RF signal cable<br>ETS-LINDGREN                | 8D-FB                        | Cable-CH1-02(RFC-SMS-100-SMS-24)                      | Jun. 17, 2021 | Jun. 16, 2022 |
| Boresight Antenna Fixture                      | FBA-01                       | FBA-SIP01                                             | NA            | NA            |
| Software<br>BV ADT                             | ADT_Radiated_V7.6.1<br>5.9.5 | NA                                                    | NA            | NA            |
| Antenna Tower<br>MF                            | NA                           | NA                                                    | NA            | NA            |
| Turn Table<br>MF                               | NA                           | NA                                                    | NA            | NA            |
| Antenna Tower & Turn Table<br>Controller<br>MF | MF-7802                      | NA                                                    | NA            | NA            |
| DC power supply<br>KEYSIGHT                    | U8002A                       | MY56330015                                            | NA            | NA            |
| Digital Multimeter<br>Fluke                    | 87-III                       | 70360755                                              | Jul. 08, 2021 | Jul. 07, 2022 |
| Radio Communication Analyzer<br>Anritsu        | MT8820C                      | 6201300640                                            | Aug. 26, 2021 | Aug. 25, 2022 |
| Radio Communication Analyzer<br>Anritsu        | MT8821C                      | 6201462755                                            | Mar. 03, 2022 | Mar. 02, 2023 |
| Temperature & Humidity<br>Chamber<br>TERCHY    | HRM-120RF                    | 931022                                                | Jan. 03, 2022 | Jan. 02, 2023 |
| Spectrum Analyzer<br>KEYSIGHT                  | N9030B                       | MY57140953                                            | Jul. 06, 2021 | Jul. 05, 2022 |

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. The test was performed in Xindian Chamber 6.

### 3 General Information

#### 3.1 General Description of EUT

|                     |                                        |                         |                         |
|---------------------|----------------------------------------|-------------------------|-------------------------|
| Product             | Point of Sale Terminal                 |                         |                         |
| Brand               | Verifone                               |                         |                         |
| Test Model          | e235-4G-1                              |                         |                         |
| Sample Status       | Engineering sample                     |                         |                         |
| Power Supply Rating | 5Vdc (From adapter)                    |                         |                         |
| Modulation Type     | QPSK, 16QAM                            |                         |                         |
| Operating Frequency | LTE Band 26 (Channel Bandwidth 1.4MHz) | 814.7MHz ~ 823.3MHz     |                         |
|                     | LTE Band 26 (Channel Bandwidth 3MHz)   | 815.5MHz ~ 822.5MHz     |                         |
|                     | LTE Band 26 (Channel Bandwidth 5MHz)   | 816.5MHz ~ 821.5MHz     |                         |
|                     | LTE Band 26 (Channel Bandwidth 10MHz)  | 819.0MHz                |                         |
| Max. ERP Power      |                                        | QPSK                    | 16QAM                   |
|                     | LTE Band 26 (Channel Bandwidth 1.4MHz) | 170.608mW<br>(22.32dBm) | 135.207mW<br>(21.31dBm) |
|                     | LTE Band 26 (Channel Bandwidth 3MHz)   | 160.325mW<br>(22.05dBm) | 133.660mW<br>(21.26dBm) |
|                     | LTE Band 26 (Channel Bandwidth 5MHz)   | 162.555mW<br>(22.11dBm) | 134.586mW<br>(21.29dBm) |
|                     | LTE Band 26 (Channel Bandwidth 10MHz)  | 160.694mW<br>(22.06dBm) | 131.826mW<br>(21.20dBm) |
|                     |                                        | QPSK                    | 16QAM                   |
| Emission Designator | LTE Band 26 (Channel Bandwidth 1.4MHz) | 1M09G7D                 | 1M09D7W                 |
|                     | LTE Band 26 (Channel Bandwidth 3MHz)   | 2M70G7D                 | 2M70D7W                 |
|                     | LTE Band 26 (Channel Bandwidth 5MHz)   | 4M50G7D                 | 4M49D7W                 |
|                     | LTE Band 26 (Channel Bandwidth 10MHz)  | 8M97G7D                 | 4M58D7W                 |
|                     |                                        |                         |                         |
| Antenna Type        | Refer to Note as below                 |                         |                         |
| Accessory Device    | NA                                     |                         |                         |
| Cable Supplied      | 0.93m non-shielded USB cable           |                         |                         |

Note:

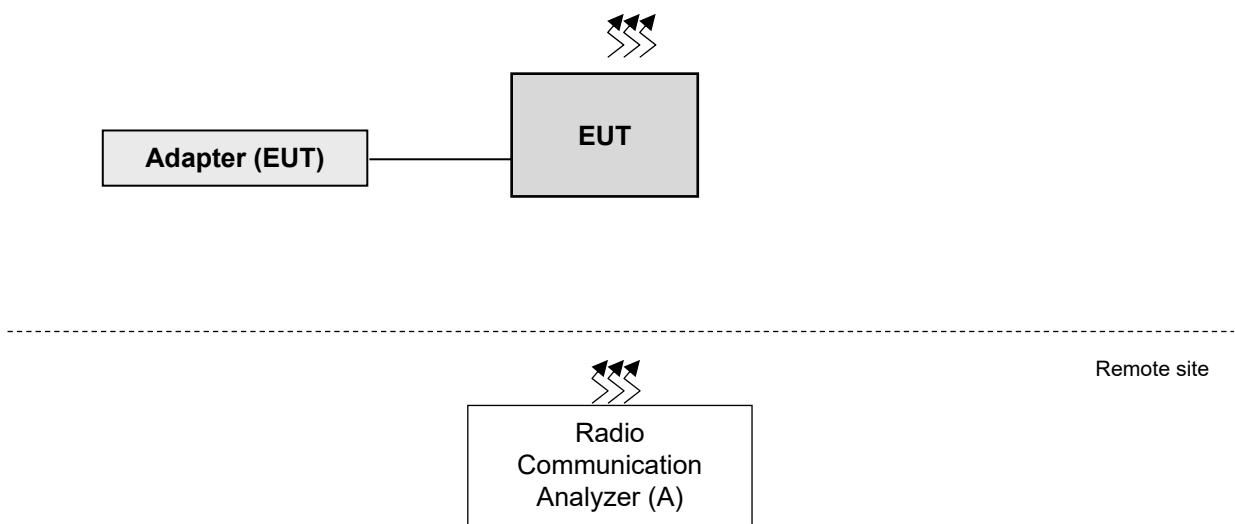
1. The antenna information is listed as below.

| Type     | Gain (dBi) |          |          |          |          |        |        |        |        |         |         |         |         |         |         |
|----------|------------|----------|----------|----------|----------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|
|          | GSM 850    | GSM 1900 | WCDMA B2 | WCDMA B4 | WCDMA B5 | LTE B2 | LTE B4 | LTE B5 | LTE B7 | LTE B12 | LTE B13 | LTE B25 | LTE B26 | LTE B38 | LTE B41 |
| monopole | 1.1        | 2.2      | 2.2      | 2.0      | 1.1      | 2.2    | 2.0    | 1.1    | 2.5    | -0.5    | 0.6     | 2.2     | 1.1     | 2.7     | 3.3     |

\* The above Antenna information refers to the manufacturer's antenna specifications, the laboratory shall not be held responsible.

2. EUT WWAN equipment specification, 16QAM modulation with bandwidth exceeding 10MHz only supports 25RB.

### 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. The following support units or accessories were used to form a representative test configuration during the tests.

| ID | Product                      | Brand   | Model No. | Serial No. | FCC ID | Remarks |
|----|------------------------------|---------|-----------|------------|--------|---------|
| A. | Radio Communication Analyzer | Anritsu | MT8820C   | 6201240432 | NA     | For LTE |

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

### 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 |
|-------------|-------------------|
| LTE Band 26 | Y-plane           |

#### LTE Band 26

| EUT Configure Mode | Test item                  | Available channel | Tested channel                                             | Channel Bandwidth | Modulation   | Mode              |
|--------------------|----------------------------|-------------------|------------------------------------------------------------|-------------------|--------------|-------------------|
| -                  | ERP                        | 26697 to 26783    | 26697 (814.7MHz),<br>26740 (819.0MHz),<br>26783 (823.3MHz) | 1.4MHz            | QPSK / 16QAM | 1<br>Half<br>Full |
|                    |                            | 26705 to 26775    | 26705 (815.5MHz),<br>26740 (819.0MHz),<br>26775 (822.5MHz) | 3MHz              | QPSK / 16QAM | 1<br>Half<br>Full |
|                    |                            | 26715 to 26765    | 26715 (816.5MHz),<br>26740 (819.0MHz),<br>26765 (821.5MHz) | 5MHz              | QPSK / 16QAM | 1<br>Half<br>Full |
|                    |                            | 26740             | 26740 (819.0MHz)                                           | 10MHz             | QPSK / 16QAM | 1<br>Half<br>Full |
| -                  | Modulation Characteristics | 26740             | 26740 (819.0MHz)                                           | 10MHz             | QPSK / 16QAM | Full              |
| -                  | Frequency Stability        | 26697 to 26783    | 26697 (814.7MHz),<br>26783 (823.3MHz)                      | 1.4MHz            | QPSK         | Full              |
|                    |                            | 26705 to 26775    | 26705 (815.5MHz),<br>26775 (822.5MHz)                      | 3MHz              | QPSK         | Full              |
|                    |                            | 26715 to 26765    | 26715 (816.5MHz),<br>26765 (821.5MHz)                      | 5MHz              | QPSK         | Full              |
|                    |                            | 26740             | 26740 (819.0MHz)                                           | 10MHz             | QPSK         | Full              |

| EUT Configure Mode | Test item                    | Available channel | Tested channel                                             | Channel Bandwidth | Modulation   | Mode              |
|--------------------|------------------------------|-------------------|------------------------------------------------------------|-------------------|--------------|-------------------|
| -                  | Occupied Bandwidth           | 26697 to 26783    | 26697 (814.7MHz),<br>26740 (819.0MHz),<br>26783 (823.3MHz) | 1.4MHz            | QPSK / 16QAM | Full              |
|                    |                              | 26705 to 26775    | 26705 (815.5MHz),<br>26740 (819.0MHz),<br>26775 (822.5MHz) | 3MHz              | QPSK / 16QAM | Full              |
|                    |                              | 26715 to 26765    | 26715 (816.5MHz),<br>26740 (819.0MHz),<br>26765 (821.5MHz) | 5MHz              | QPSK / 16QAM | Full              |
|                    |                              | 26740             | 26740 (819.0MHz)                                           | 10MHz             | QPSK / 16QAM | Full              |
| -                  | Emission Masks               | 26697 to 26783    | 26697 (814.7MHz),<br>26783 (823.3MHz)                      | 1.4MHz            | QPSK         | 1<br>Half<br>Full |
|                    |                              | 26705 to 26775    | 26705 (815.5MHz),<br>26775 (822.5MHz)                      | 3MHz              | QPSK         | 1<br>Half<br>Full |
|                    |                              | 26715 to 26765    | 26715 (816.5MHz),<br>26765 (821.5MHz)                      | 5MHz              | QPSK         | 1<br>Half<br>Full |
|                    |                              | 26740             | 26740 (819.0MHz)                                           | 10MHz             | QPSK         | 1<br>Half<br>Full |
| -                  | Conducted Emission           | 26697 to 26783    | 26697 (814.7MHz),<br>26740 (819.0MHz),<br>26783 (823.3MHz) | 1.4MHz            | QPSK         | 1                 |
|                    |                              | 26705 to 26775    | 26705 (815.5MHz),<br>26740 (819.0MHz),<br>26775 (822.5MHz) | 3MHz              | QPSK         | 1                 |
|                    |                              | 26715 to 26765    | 26715 (816.5MHz),<br>26740 (819.0MHz),<br>26765 (821.5MHz) | 5MHz              | QPSK         | 1                 |
|                    |                              | 26740             | 26740 (819.0MHz)                                           | 10MHz             | QPSK         | 1                 |
| -                  | Radiated Emission Below 1GHz | 26740             | 26740 (819.0MHz)                                           | 10MHz             | QPSK         | 1                 |
| -                  | Radiated Emission Above 1GHz | 26697 to 26783    | 26697 (814.7MHz),<br>26740 (819.0MHz),<br>26783 (823.3MHz) | 1.4MHz            | QPSK         | 1                 |
|                    |                              | 26715 to 26765    | 26715 (816.5MHz),<br>26740 (819.0MHz),<br>26765 (821.5MHz) | 5MHz              | QPSK         | 1                 |
|                    |                              | 26740             | 26740 (819.0MHz)                                           | 10MHz             | QPSK         | 1                 |

Note:

1. For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.
2. For radiated emission above 1GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5MHz & highest channel bandwidth for final test.
3. The output power for QPSK and 16QAM, measured value of QPSK is higher than 16QAM mode. Therefore, only Modulation characteristics, occupied bandwidth and Peak to average ratio items had been tested under QPSK and 16QAM modes, the other test items were performed under worse mode according to the maximum output power.

**Test Condition:**

| Test Item                  | Environmental Conditions | Input Power  | Tested By                 |
|----------------------------|--------------------------|--------------|---------------------------|
| ERP                        | 25deg. C, 60%RH          | 120Vac, 60Hz | Willy Cheng               |
| Modulation characteristics | 25deg. C, 60%RH          | 120Vac, 60Hz | Willy Cheng               |
| Frequency Stability        | 25deg. C, 60%RH          | 3.7Vdc       | Willy Cheng               |
| Occupied Bandwidth         | 25deg. C, 60%RH          | 120Vac, 60Hz | Willy Cheng               |
| Emission Mask              | 25deg. C, 60%RH          | 120Vac, 60Hz | Willy Cheng               |
| Conducted Emission         | 25deg. C, 60%RH          | 120Vac, 60Hz | Willy Cheng               |
| Radiated Emission          | 25deg. C, 60%RH          | 120Vac, 60Hz | Charles Hsiao<br>Karl Lee |

### 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 and References

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

**Test Standard:**

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 90**

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

ANSI 63.26-2015

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

**References Test Guidance:**

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

**KDB 971168 D02 Misc Rev Approv License Devices v02r01**

All test items have been performed as a reference to the above KDB test guidance.

## 4 Test Types and Results

### 4.1 Output Power Measurement

#### 4.1.1 Limits of Output Power Measurement

The output power shall be according to the specific rule Part 90.635 that “Mobile station are limited to 100 watts e.r.p”.

#### 4.1.2 Test Procedures

##### Conducted Power Measurement:

The EUT was set up for the maximum power with 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.

##### Maximum EIRP / ERP

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation as follows:

$$\text{EIRP} = P_{\text{Meas}} + G_T$$

$$\text{ERP} = P_{\text{Meas}} + G_T - 2.15$$

where

ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively

(expressed in the same units as  $P_{\text{Meas}}$ , e.g., dBm or dBW)

$P_{\text{Meas}}$  measured transmitter output power or PSD, in dBm or dBW

$G_T$  gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

#### 4.1.3 Test Setup

Conducted Power Measurement:



#### 4.1.4 Test Results

##### Conducted Output Power (dBm)

| LTE Band 26 |           |                 |           |       |
|-------------|-----------|-----------------|-----------|-------|
| BW          | MCS Index | RB Size         | RB Offset | Mid   |
|             |           | Channel         |           | 26740 |
|             |           | Frequency (MHz) |           | 819   |
| 10M         | QPSK      | 1               | 0         | 23.06 |
|             |           | 1               | 24        | 23.11 |
|             |           | 1               | 49        | 23.08 |
|             |           | 25              | 0         | 22.42 |
|             |           | 25              | 12        | 22.22 |
|             |           | 25              | 25        | 22.06 |
|             |           | 50              | 0         | 22.16 |
| 10M         | 16QAM     | 1               | 0         | 22.25 |
|             |           | 1               | 24        | 22.24 |
|             |           | 1               | 49        | 22.23 |
|             |           | 25              | 0         | 21.36 |
|             |           | 25              | 12        | 21.36 |
|             |           | 25              | 25        | 21.17 |
|             |           | 50              | 0         | -     |

| LTE Band 26 |           |                 |           |       |       |       |
|-------------|-----------|-----------------|-----------|-------|-------|-------|
| BW          | MCS Index | RB Size         | RB Offset | Low   | Mid   | High  |
|             |           | Channel         |           | 26715 | 26740 | 26765 |
|             |           | Frequency (MHz) |           | 816.5 | 819   | 821.5 |
| 5M          | QPSK      | 1               | 0         | 23.10 | 23.06 | 23.16 |
|             |           | 1               | 12        | 23.03 | 23.11 | 23.12 |
|             |           | 1               | 24        | 23.07 | 23.08 | 23.12 |
|             |           | 12              | 0         | 22.39 | 22.42 | 22.43 |
|             |           | 12              | 6         | 22.23 | 22.22 | 22.31 |
|             |           | 12              | 13        | 22.02 | 22.06 | 22.12 |
|             |           | 25              | 0         | 22.21 | 22.16 | 22.24 |
| 5M          | 16QAM     | 1               | 0         | 22.30 | 22.25 | 22.32 |
|             |           | 1               | 12        | 22.28 | 22.24 | 22.34 |
|             |           | 1               | 24        | 22.20 | 22.23 | 22.29 |
|             |           | 12              | 0         | 21.33 | 21.36 | 21.44 |
|             |           | 12              | 6         | 21.34 | 21.36 | 21.38 |
|             |           | 12              | 13        | 21.13 | 21.17 | 21.34 |
|             |           | 25              | 0         | 21.08 | 21.23 | 21.33 |

| LTE Band 26 |           |                 |           |       |       |       |
|-------------|-----------|-----------------|-----------|-------|-------|-------|
| BW          | MCS Index | RB Size         | RB Offset | Low   | Mid   | High  |
|             |           | Channel         |           | 26705 | 26740 | 26775 |
|             |           | Frequency (MHz) |           | 815.5 | 819   | 822.5 |
| 3M          | QPSK      | 1               | 0         | 23.10 | 23.05 | 23.01 |
|             |           | 1               | 7         | 23.05 | 23.05 | 22.97 |
|             |           | 1               | 14        | 23.09 | 22.94 | 23.09 |
|             |           | 8               | 0         | 22.35 | 22.37 | 22.34 |
|             |           | 8               | 3         | 22.25 | 22.07 | 22.21 |
|             |           | 8               | 7         | 22.06 | 21.96 | 22.03 |
|             |           | 15              | 0         | 22.23 | 22.14 | 22.16 |
| 3M          | 16QAM     | 1               | 0         | 22.31 | 22.22 | 22.31 |
|             |           | 1               | 7         | 22.31 | 22.19 | 22.24 |
|             |           | 1               | 14        | 22.20 | 22.12 | 22.28 |
|             |           | 8               | 0         | 21.35 | 21.33 | 21.35 |
|             |           | 8               | 3         | 21.27 | 21.22 | 21.27 |
|             |           | 8               | 7         | 21.16 | 21.17 | 21.18 |
|             |           | 15              | 0         | 21.07 | 21.18 | 21.22 |

| LTE Band 26 |           |                 |           |       |       |       |
|-------------|-----------|-----------------|-----------|-------|-------|-------|
| BW          | MCS Index | RB Size         | RB Offset | Low   | Mid   | High  |
|             |           | Channel         |           | 26697 | 26740 | 26783 |
|             |           | Frequency (MHz) |           | 814.7 | 819   | 823.3 |
| 1.4M        | QPSK      | 1               | 0         | 23.12 | 23.05 | 23.10 |
|             |           | 1               | 2         | 23.00 | 23.00 | 23.07 |
|             |           | 1               | 5         | 23.01 | 23.01 | 23.10 |
|             |           | 3               | 0         | 23.22 | 23.37 | 23.30 |
|             |           | 3               | 1         | 23.08 | 23.20 | 23.21 |
|             |           | 3               | 3         | 23.05 | 22.96 | 23.02 |
|             |           | 6               | 0         | 22.06 | 22.11 | 22.20 |
| 1.4M        | 16QAM     | 1               | 0         | 22.23 | 22.12 | 22.31 |
|             |           | 1               | 2         | 22.22 | 22.09 | 22.34 |
|             |           | 1               | 5         | 22.12 | 22.08 | 22.28 |
|             |           | 3               | 0         | 22.28 | 22.30 | 22.29 |
|             |           | 3               | 1         | 22.35 | 22.36 | 22.24 |
|             |           | 3               | 3         | 22.11 | 22.16 | 22.20 |
|             |           | 6               | 0         | 20.94 | 21.01 | 21.06 |

**ERP Power (dBm)**

| LTE Band 26 |           |                 |           |              |
|-------------|-----------|-----------------|-----------|--------------|
| BW          | MCS Index | RB Size         | RB Offset | Mid          |
|             |           | Channel         |           | 26740        |
|             |           | Frequency (MHz) |           | 819          |
| 10M         | QPSK      | 1               | 0         | 22.01        |
|             |           | 1               | 24        | <b>22.06</b> |
|             |           | 1               | 49        | 22.03        |
|             |           | 25              | 0         | 21.37        |
|             |           | 25              | 12        | 21.17        |
|             |           | 25              | 25        | 21.01        |
|             |           | 50              | 0         | 21.11        |
| 10M         | 16QAM     | 1               | 0         | <b>21.20</b> |
|             |           | 1               | 24        | 21.19        |
|             |           | 1               | 49        | 21.18        |
|             |           | 25              | 0         | 20.31        |
|             |           | 25              | 12        | 20.31        |
|             |           | 25              | 25        | 20.12        |
|             |           | 50              | 0         | -            |

\*ERP = Conducted + antenna gain (1.1dBi)-2.15

| LTE Band 26 |           |                 |           |       |       |              |
|-------------|-----------|-----------------|-----------|-------|-------|--------------|
| BW          | MCS Index | RB Size         | RB Offset | Low   | Mid   | High         |
|             |           | Channel         |           | 26715 | 26740 | 26765        |
|             |           | Frequency (MHz) |           | 816.5 | 819   | 821.5        |
| 5M          | QPSK      | 1               | 0         | 22.05 | 22.01 | <b>22.11</b> |
|             |           | 1               | 12        | 21.98 | 22.06 | 22.07        |
|             |           | 1               | 24        | 22.02 | 22.03 | 22.07        |
|             |           | 12              | 0         | 21.34 | 21.37 | 21.38        |
|             |           | 12              | 6         | 21.18 | 21.17 | 21.26        |
|             |           | 12              | 13        | 20.97 | 21.01 | 21.07        |
|             |           | 25              | 0         | 21.16 | 21.11 | 21.19        |
| 5M          | 16QAM     | 1               | 0         | 21.25 | 21.20 | 21.27        |
|             |           | 1               | 12        | 21.23 | 21.19 | <b>21.29</b> |
|             |           | 1               | 24        | 21.15 | 21.18 | 21.24        |
|             |           | 12              | 0         | 20.28 | 20.31 | 20.39        |
|             |           | 12              | 6         | 20.29 | 20.31 | 20.33        |
|             |           | 12              | 13        | 20.08 | 20.12 | 20.29        |
|             |           | 25              | 0         | 20.03 | 20.18 | 20.28        |

\*ERP = Conducted + antenna gain (1.1dBi)-2.15

| LTE Band 26 |           |                 |           |              |       |              |
|-------------|-----------|-----------------|-----------|--------------|-------|--------------|
| BW          | MCS Index | RB Size         | RB Offset | Low          | Mid   | High         |
|             |           | Channel         |           | 26705        | 26740 | 26775        |
|             |           | Frequency (MHz) |           | 815.5        | 819   | 822.5        |
| 3M          | QPSK      | 1               | 0         | <b>22.05</b> | 22.00 | 21.96        |
|             |           | 1               | 7         | 22.00        | 22.00 | 21.92        |
|             |           | 1               | 14        | 22.04        | 21.89 | 22.04        |
|             |           | 8               | 0         | 21.30        | 21.32 | 21.29        |
|             |           | 8               | 3         | 21.20        | 21.02 | 21.16        |
|             |           | 8               | 7         | 21.01        | 20.91 | 20.98        |
|             |           | 15              | 0         | 21.18        | 21.09 | 21.11        |
| 3M          | 16QAM     | 1               | 0         | <b>21.26</b> | 21.17 | <b>21.26</b> |
|             |           | 1               | 7         | <b>21.26</b> | 21.14 | 21.19        |
|             |           | 1               | 14        | 21.15        | 21.07 | 21.23        |
|             |           | 8               | 0         | 20.30        | 20.28 | 20.30        |
|             |           | 8               | 3         | 20.22        | 20.17 | 20.22        |
|             |           | 8               | 7         | 20.11        | 20.12 | 20.13        |
|             |           | 15              | 0         | 20.02        | 20.13 | 20.17        |

\*ERP = Conducted + antenna gain (1.1dBi)-2.15

| LTE Band 26 |           |                 |           |       |              |       |
|-------------|-----------|-----------------|-----------|-------|--------------|-------|
| BW          | MCS Index | RB Size         | RB Offset | Low   | Mid          | High  |
|             |           | Channel         |           | 26697 | 26740        | 26783 |
|             |           | Frequency (MHz) |           | 814.7 | 819          | 823.3 |
| 1.4M        | QPSK      | 1               | 0         | 22.07 | 22.00        | 22.05 |
|             |           | 1               | 2         | 21.95 | 21.95        | 22.02 |
|             |           | 1               | 5         | 21.96 | 21.96        | 22.05 |
|             |           | 3               | 0         | 22.17 | <b>22.32</b> | 22.25 |
|             |           | 3               | 1         | 22.03 | 22.15        | 22.16 |
|             |           | 3               | 3         | 22.00 | 21.91        | 21.97 |
|             |           | 6               | 0         | 21.01 | 21.06        | 21.15 |
| 1.4M        | 16QAM     | 1               | 0         | 21.18 | 21.07        | 21.26 |
|             |           | 1               | 2         | 21.17 | 21.04        | 21.29 |
|             |           | 1               | 5         | 21.07 | 21.03        | 21.23 |
|             |           | 3               | 0         | 21.23 | 21.25        | 21.24 |
|             |           | 3               | 1         | 21.30 | <b>21.31</b> | 21.19 |
|             |           | 3               | 3         | 21.06 | 21.11        | 21.15 |
|             |           | 6               | 0         | 19.89 | 19.96        | 20.01 |

\*ERP = Conducted + antenna gain (1.1dBi)-2.15

## 4.2 Modulation Characteristics Measurement

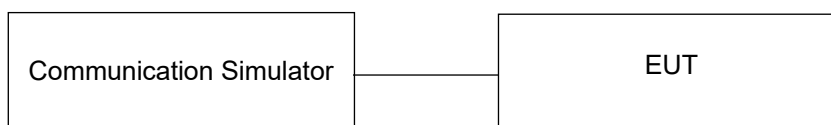
### 4.2.1 Limits of Modulation Characteristics

N/A

### 4.2.2 Test Procedure

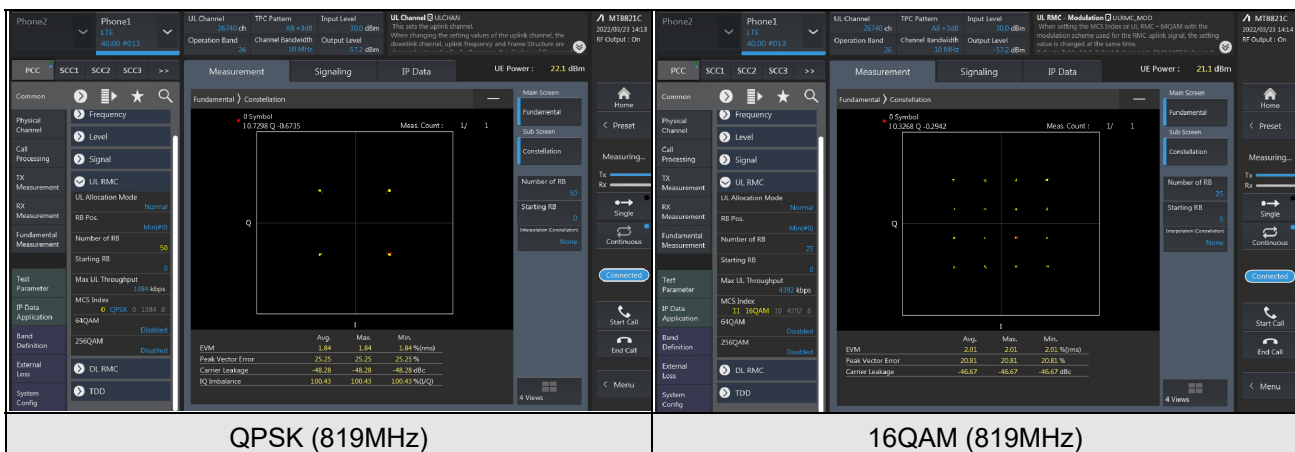
Connect the EUT to Communication Simulator via the antenna connector, The frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

### 4.2.3 Test Setup



### 4.2.4 Test Results

#### LTE Band 26



### 4.3 Frequency Stability Measurement

#### 4.3.1 Limits of Frequency Stability Measurement

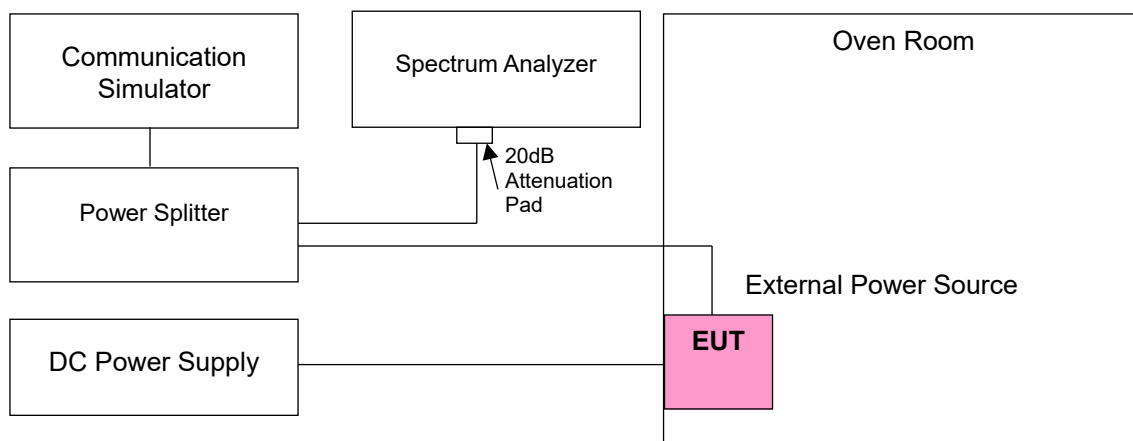
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

#### 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  $\pm 0.5^{\circ}\text{C}$  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>(Vdc) | LTE Band 26                |                       |                 |                       |
|------------------|----------------------------|-----------------------|-----------------|-----------------------|
|                  | Channel Bandwidth: 1.4 MHz |                       |                 |                       |
|                  | Low Channel                |                       | High Channel    |                       |
|                  | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 3.145            | 814.700003                 | 0.004                 | 823.300001      | 0.001                 |
| 3.7              | 814.700003                 | 0.004                 | 823.300002      | 0.002                 |
| 4.255            | 814.700001                 | 0.001                 | 823.300002      | 0.002                 |

Note: The applicant defined the normal working voltage is from 3.145Vdc to 4.255Vdc.

##### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 26                |                       |                 |                       |
|------------|----------------------------|-----------------------|-----------------|-----------------------|
|            | Channel Bandwidth: 1.4 MHz |                       |                 |                       |
|            | Low Channel                |                       | High Channel    |                       |
|            | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30        | 814.700004                 | 0.005                 | 823.300001      | 0.001                 |
| -20        | 814.700001                 | 0.001                 | 823.300003      | 0.004                 |
| -10        | 814.700002                 | 0.002                 | 823.300002      | 0.002                 |
| 0          | 814.700002                 | 0.002                 | 823.300003      | 0.004                 |
| 10         | 814.699999                 | -0.001                | 823.299999      | -0.001                |
| 20         | 814.699999                 | -0.001                | 823.299996      | -0.005                |
| 30         | 814.699996                 | -0.005                | 823.299996      | -0.005                |
| 40         | 814.699997                 | -0.004                | 823.299998      | -0.002                |
| 50         | 814.699998                 | -0.002                | 823.299998      | -0.002                |

#### Frequency Error vs. Voltage

| Voltage<br>(Vdc) | LTE Band 26             |                       |                 |                       |
|------------------|-------------------------|-----------------------|-----------------|-----------------------|
|                  | Channel Bandwidth: 3MHz |                       |                 |                       |
|                  | Low Channel             |                       | High Channel    |                       |
|                  | Frequency (MHz)         | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 3.145            | 815.500004              | 0.005                 | 822.500001      | 0.001                 |
| 3.7              | 815.500001              | 0.001                 | 822.500003      | 0.004                 |
| 4.255            | 815.500003              | 0.004                 | 822.500002      | 0.002                 |

Note: The applicant defined the normal working voltage is from 3.145Vdc to 4.255Vdc.

#### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 26             |                       |                 |                       |
|------------|-------------------------|-----------------------|-----------------|-----------------------|
|            | Channel Bandwidth: 3MHz |                       |                 |                       |
|            | Low Channel             |                       | High Channel    |                       |
|            | Frequency (MHz)         | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30        | 815.500002              | 0.002                 | 822.500003      | 0.004                 |
| -20        | 815.500004              | 0.005                 | 822.500004      | 0.005                 |
| -10        | 815.500004              | 0.005                 | 822.500001      | 0.001                 |
| 0          | 815.500003              | 0.004                 | 822.500001      | 0.001                 |
| 10         | 815.499999              | -0.001                | 822.499999      | -0.001                |
| 20         | 815.499998              | -0.002                | 822.499996      | -0.005                |
| 30         | 815.499999              | -0.001                | 822.499997      | -0.004                |
| 40         | 815.499999              | -0.001                | 822.499998      | -0.002                |
| 50         | 815.499997              | -0.004                | 822.499997      | -0.004                |

#### Frequency Error vs. Voltage

| Voltage<br>(Vdc) | LTE Band 26             |                       |                 |                       |
|------------------|-------------------------|-----------------------|-----------------|-----------------------|
|                  | Channel Bandwidth: 5MHz |                       |                 |                       |
|                  | Low Channel             |                       | High Channel    |                       |
|                  | Frequency (MHz)         | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 3.145            | 816.500004              | 0.005                 | 821.500002      | 0.002                 |
| 3.7              | 816.500003              | 0.004                 | 821.500004      | 0.005                 |
| 4.255            | 816.500001              | 0.001                 | 821.500001      | 0.001                 |

Note: The applicant defined the normal working voltage is from 3.145Vdc to 4.255Vdc.

#### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 26             |                       |                 |                       |
|------------|-------------------------|-----------------------|-----------------|-----------------------|
|            | Channel Bandwidth: 5MHz |                       |                 |                       |
|            | Low Channel             |                       | High Channel    |                       |
|            | Frequency (MHz)         | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30        | 816.500003              | 0.004                 | 821.500001      | 0.001                 |
| -20        | 816.500002              | 0.002                 | 821.500001      | 0.001                 |
| -10        | 816.500002              | 0.002                 | 821.500001      | 0.001                 |
| 0          | 816.500004              | 0.005                 | 821.500001      | 0.001                 |
| 10         | 816.499996              | -0.005                | 821.499997      | -0.004                |
| 20         | 816.499996              | -0.005                | 821.499998      | -0.002                |
| 30         | 816.499996              | -0.005                | 821.499998      | -0.002                |
| 40         | 816.499998              | -0.002                | 821.499999      | -0.001                |
| 50         | 816.499996              | -0.005                | 821.499997      | -0.004                |

#### Frequency Error vs. Voltage

| Voltage<br>(Vdc) | LTE Band 26               |                       |
|------------------|---------------------------|-----------------------|
|                  | Channel Bandwidth: 10 MHz |                       |
|                  | Frequency (MHz)           | Frequency Error (ppm) |
| 3.145            | 819.000004                | 0.005                 |
| 3.7              | 819.000001                | 0.001                 |
| 4.255            | 819.000002                | 0.002                 |

Note: The applicant defined the normal working voltage is from 3.145Vdc to 4.255Vdc.

#### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 26               |                       |
|------------|---------------------------|-----------------------|
|            | Channel Bandwidth: 10 MHz |                       |
|            | Frequency (MHz)           | Frequency Error (ppm) |
| -30        | 819.000001                | 0.001                 |
| -20        | 819.000003                | 0.004                 |
| -10        | 819.000004                | 0.005                 |
| 0          | 819.000004                | 0.005                 |
| 10         | 818.999999                | -0.001                |
| 20         | 818.999998                | -0.002                |
| 30         | 818.999997                | -0.004                |
| 40         | 818.999999                | -0.001                |
| 50         | 818.999999                | -0.001                |

## 4.4 Occupied Bandwidth Measurement

### 4.4.1 Limits of Occupied Bandwidth Measurement

The occupied bandwidth (OBW), that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 % of the total mean power radiated by a given emission.

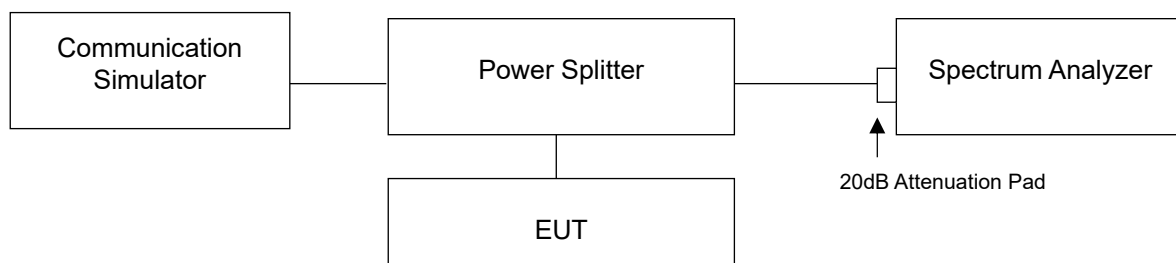
### 4.4.2 Test Procedure

For the 26dBc bandwidth measurement method, please refer to section 5.4.3 of ANSI C63.26.

- The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
- The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set  $\geq 3 \times \text{RBW}$ .
- Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
- The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target “-X dB” requirement, i.e., if the requirement calls for measuring the -26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.
- Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
- Determine the following reference values: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
- Determine the “-X dB amplitude” as equal to (Reference Value - X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.
- Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “-X dB amplitude” determined in step f). If a marker is below this “-X dB amplitude” value it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers.
- The OBW shall be reported by providing plot(s) of the measuring instrument display, to include markers depicting the relevant frequency and amplitude information (e.g., marker table). The frequency and amplitude axis and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

For the occupied bandwidth measurement method, please refer to section 5.4.4 of ANSI C63.26.

### 4.4.3 Test Setup

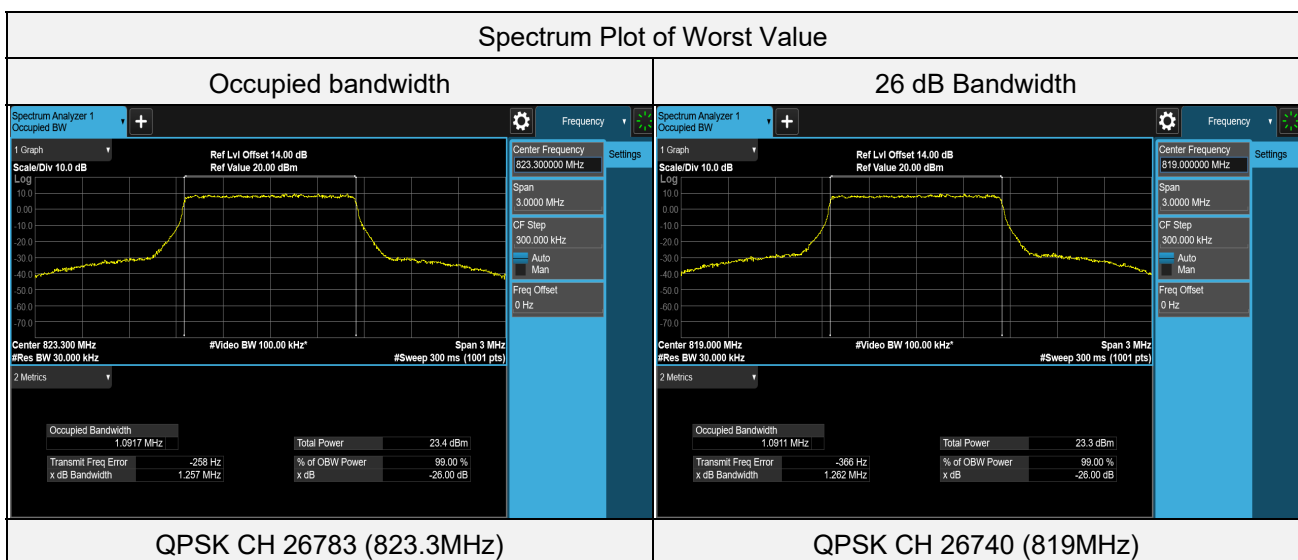


#### 4.4.4 Test Result

LTE Band 26 (Channel Bandwidth 1.4MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|----------------|---------|-----------------|--------------------------|-----------------------|
| QPSK           | 26697   | 814.7           | 1.0878                   | 1.256                 |
| QPSK           | 26740   | 819             | 1.0911                   | 1.262                 |
| QPSK           | 26783   | 823.3           | 1.0917                   | 1.257                 |
| 16QAM          | 26697   | 814.7           | 1.0880                   | 1.248                 |
| 16QAM          | 26740   | 819             | 1.0892                   | 1.251                 |
| 16QAM          | 26783   | 823.3           | 1.0879                   | 1.248                 |

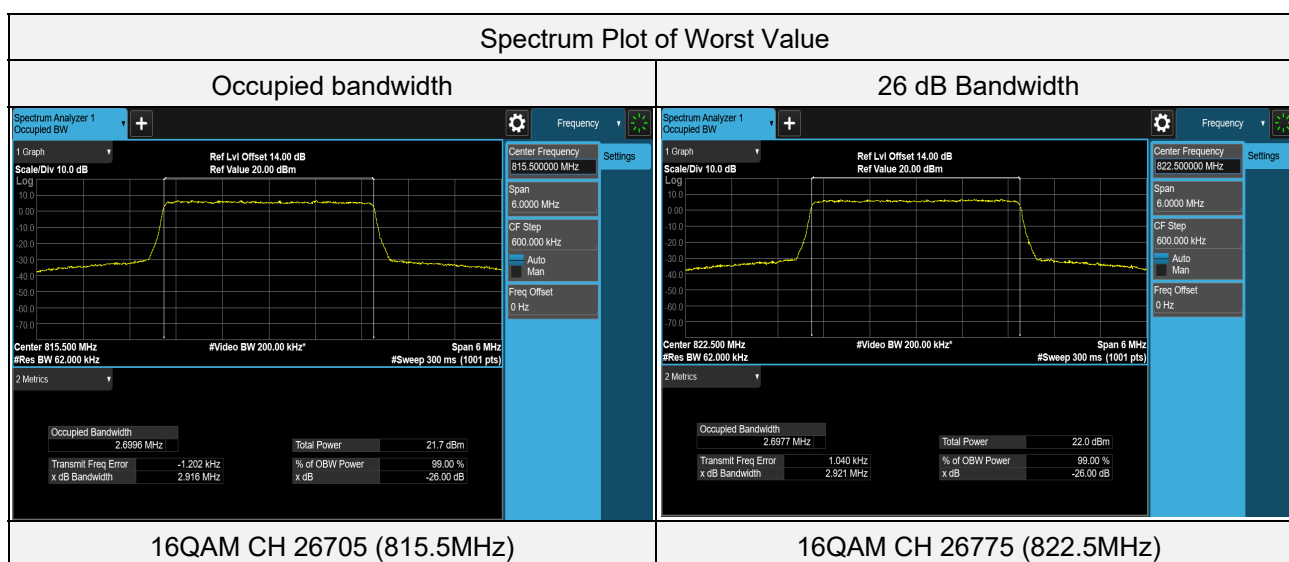
**NOTE:** For the test plots please refer to the below pages.



### LTE Band 26 (Channel Bandwidth 3MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|----------------|---------|-----------------|--------------------------|-----------------------|
| QPSK           | 26705   | 815.5           | 2.6985                   | 2.909                 |
| QPSK           | 26740   | 819             | 2.6990                   | 2.911                 |
| QPSK           | 26775   | 822.5           | 2.6984                   | 2.907                 |
| 16QAM          | 26705   | 815.5           | 2.6996                   | 2.916                 |
| 16QAM          | 26740   | 819             | 2.6984                   | 2.919                 |
| 16QAM          | 26775   | 822.5           | 2.6977                   | 2.921                 |

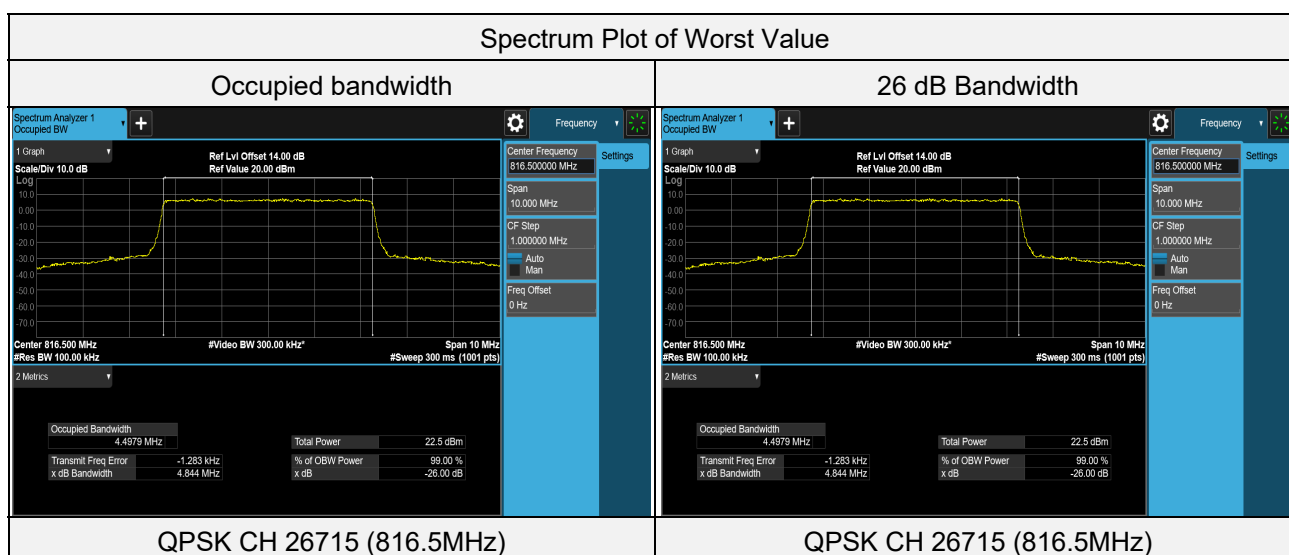
**NOTE:** For the test plots please refer to the below pages.



# LTE Band 26 (Channel Bandwidth 5MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|----------------|---------|-----------------|--------------------------|-----------------------|
| QPSK           | 26715   | 816.5           | 4.4979                   | 4.844                 |
| QPSK           | 26740   | 819             | 4.4942                   | 4.823                 |
| QPSK           | 26765   | 821.5           | 4.4932                   | 4.821                 |
| 16QAM          | 26715   | 816.5           | 4.4928                   | 4.826                 |
| 16QAM          | 26740   | 819             | 4.4927                   | 4.814                 |
| 16QAM          | 26765   | 821.5           | 4.4894                   | 4.813                 |

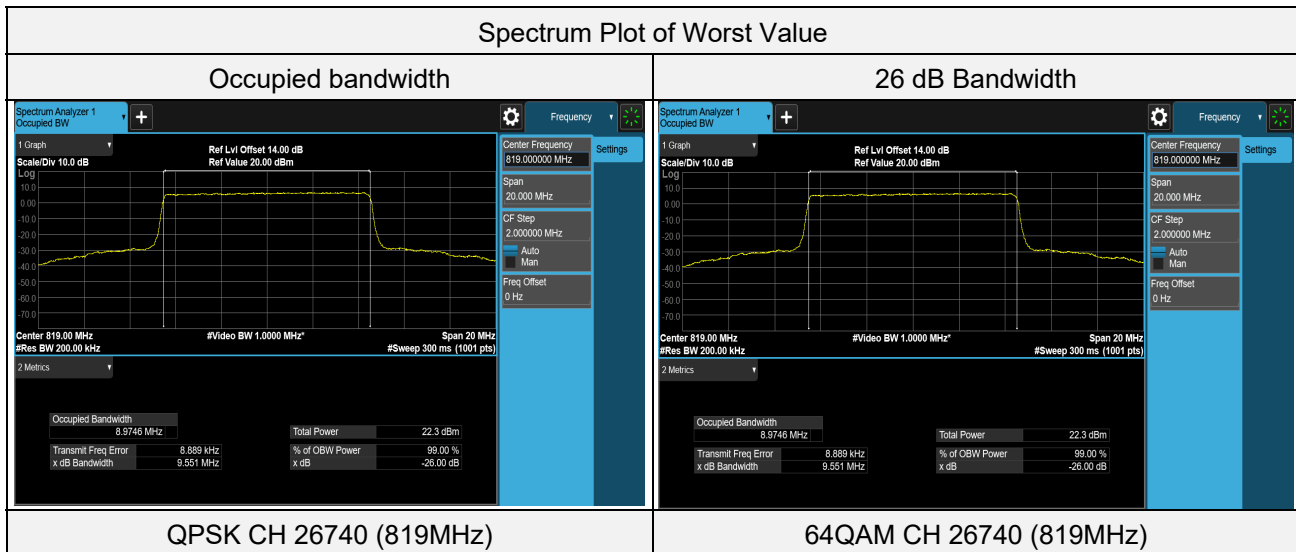
**NOTE:** For the test plots please refer to the below pages.



## LTE Band 26 (Channel Bandwidth 10MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|----------------|---------|-----------------|--------------------------|-----------------------|
| QPSK           | 26740   | 819             | 8.9746                   | 9.551                 |
| 16QAM          | 26740   | 819             | 4.5751                   | 5.109                 |

**NOTE:** For the test plots please refer to the below pages.



## 4.5 Emission Mask Measurement

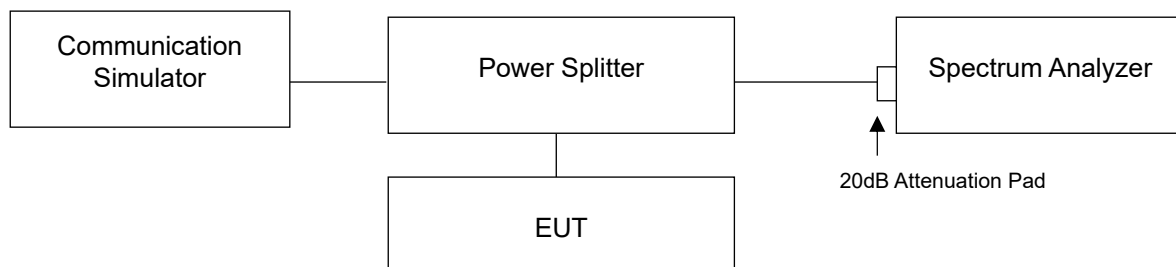
### 4.5.1 Limits of Emission Mask Measurement

According to FCC part 90.691 shall be tested the emission mask. For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \log_{10}(f/6.1)$  decibels or  $50 + 10\log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10\log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

For § 90.691(a), RBW=300 Hz for offset less than 37.5 kHz from channel edge and RBW=100 kHz for offsets greater than 37.5 kHz is allowed, tested in accordance with FCC KDB 971168 D02 section VIII.

### 4.5.2 Test Setup

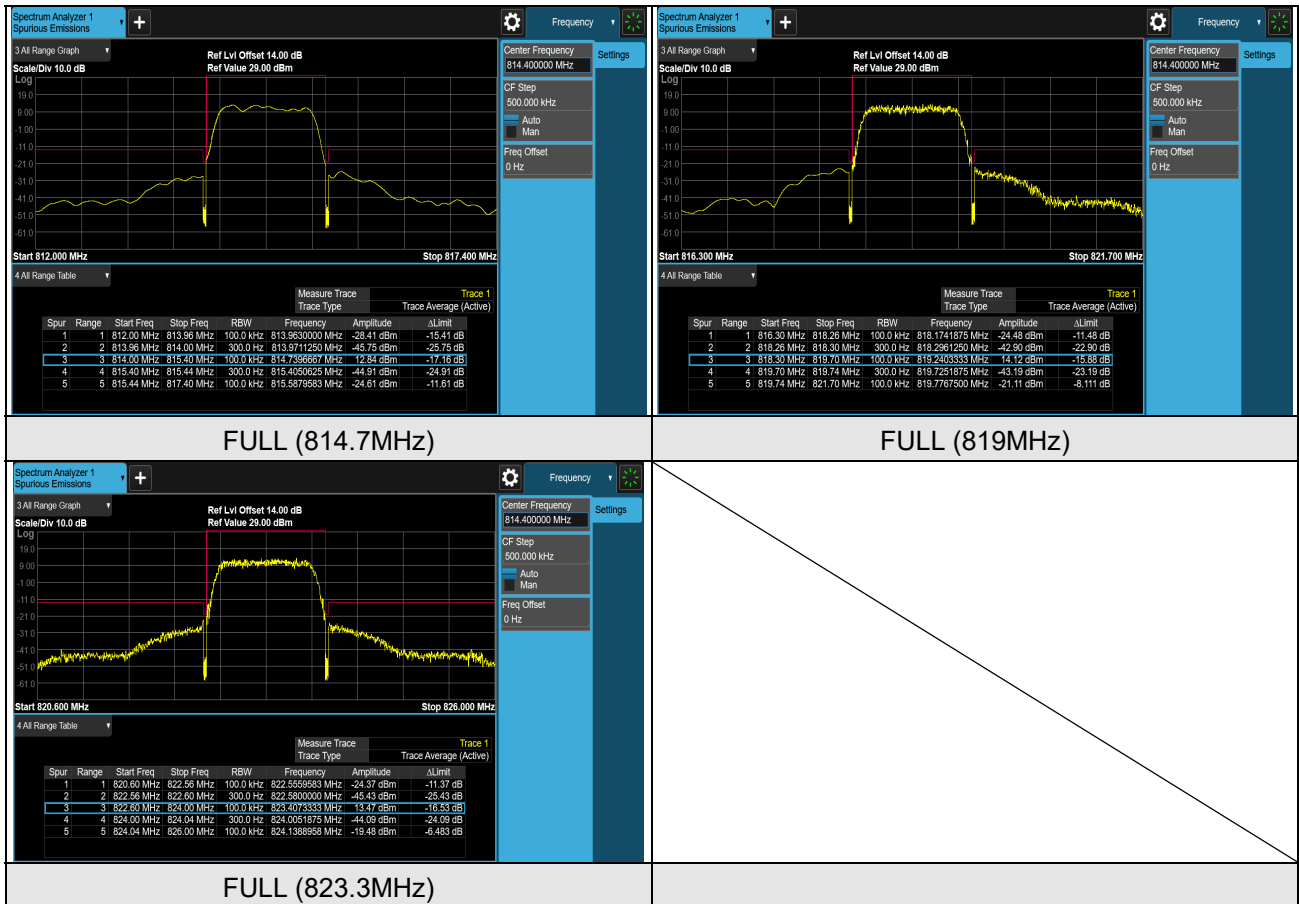


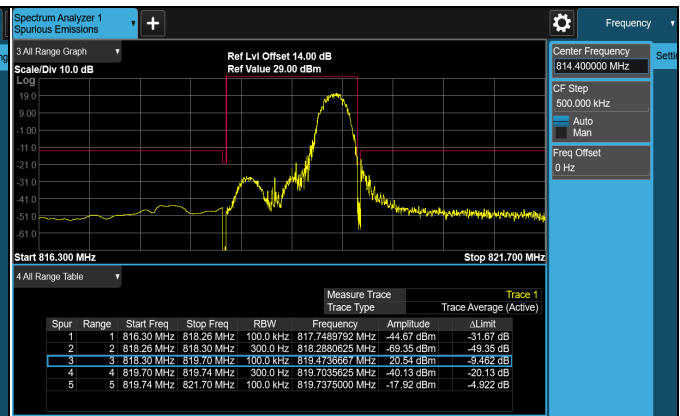
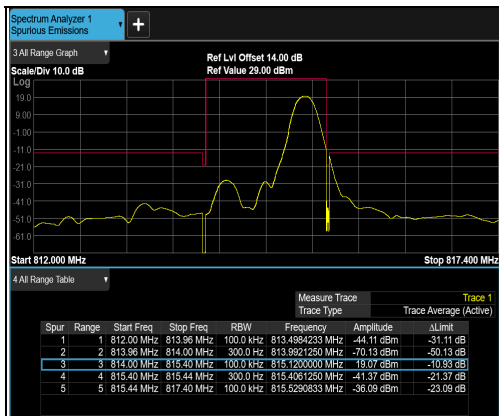
### 4.5.3 Test Procedures

- The measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
- Record the test plot.

## 4.5.4 Test Results

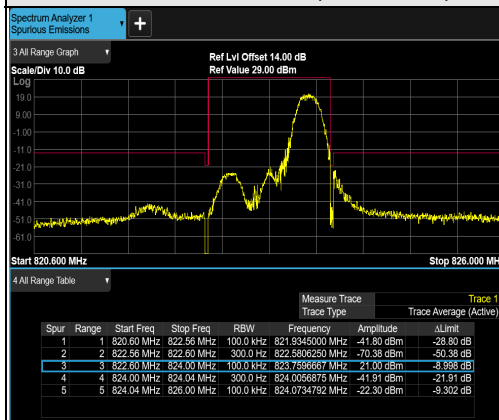
### LTE Band 26 (Channel Bandwidth 1.4MHz)



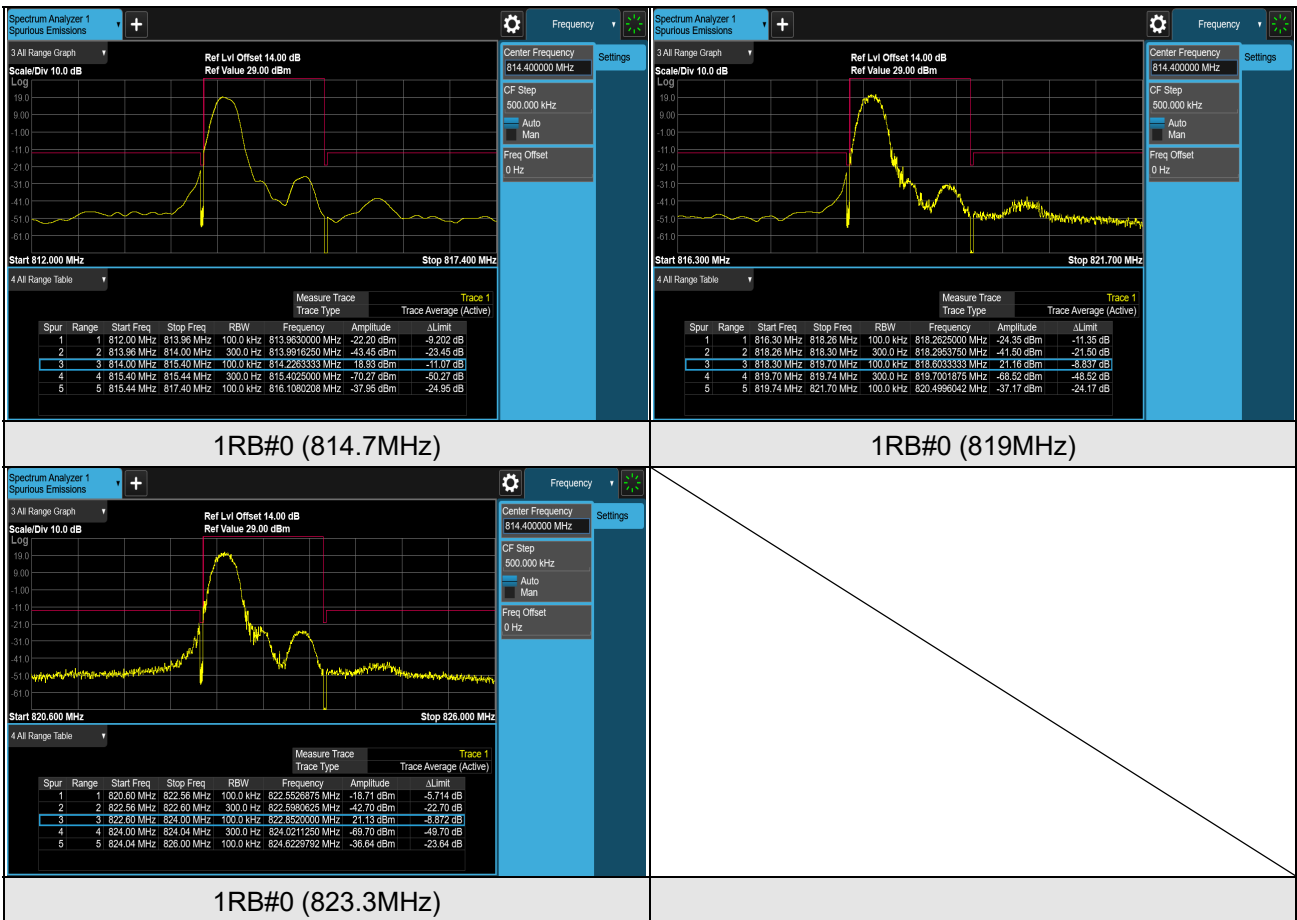


1RB#MAX (814.7MHz)

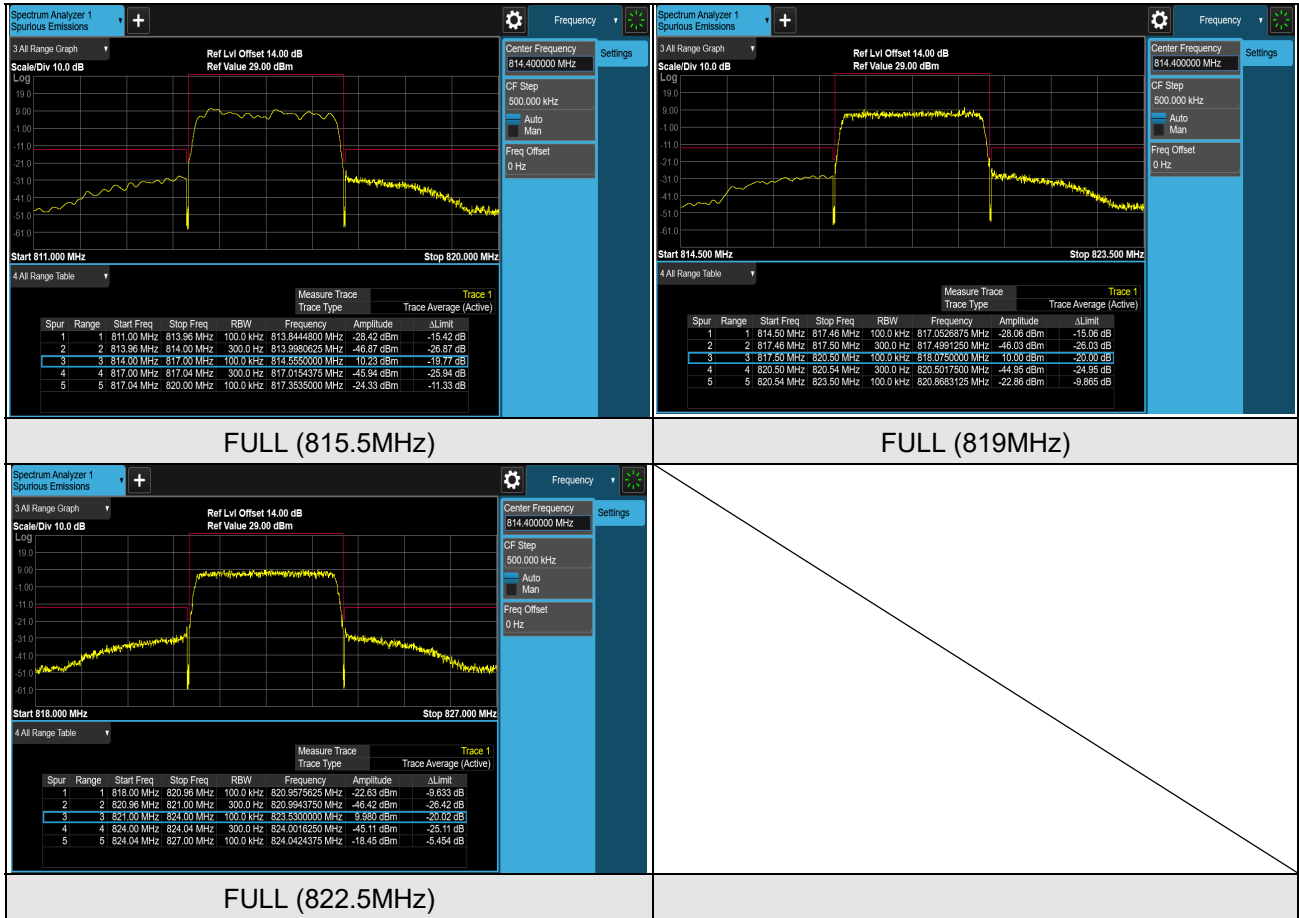
1RB#MAX (819MHz)

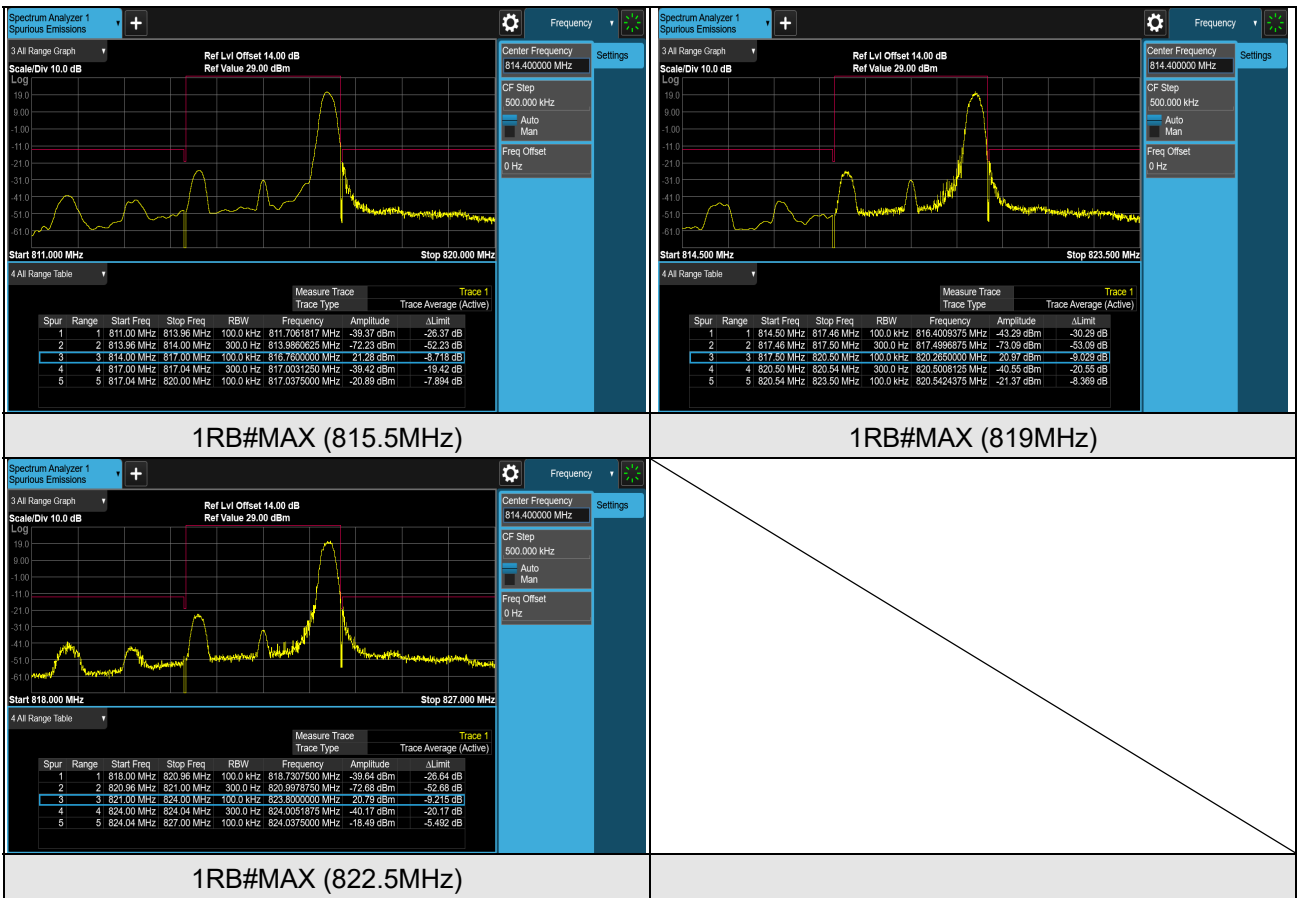


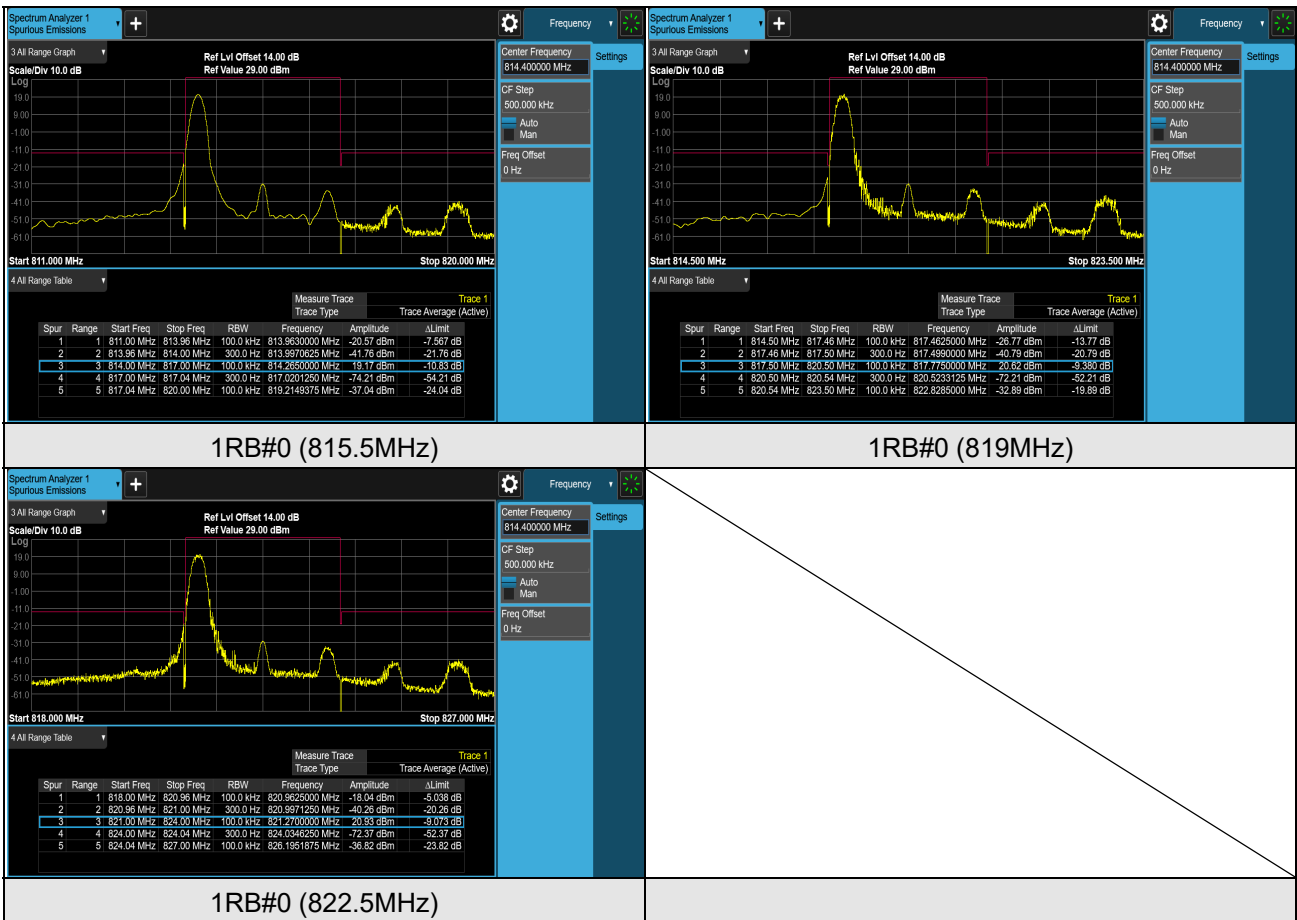
1RB#MAX (823.3MHz)



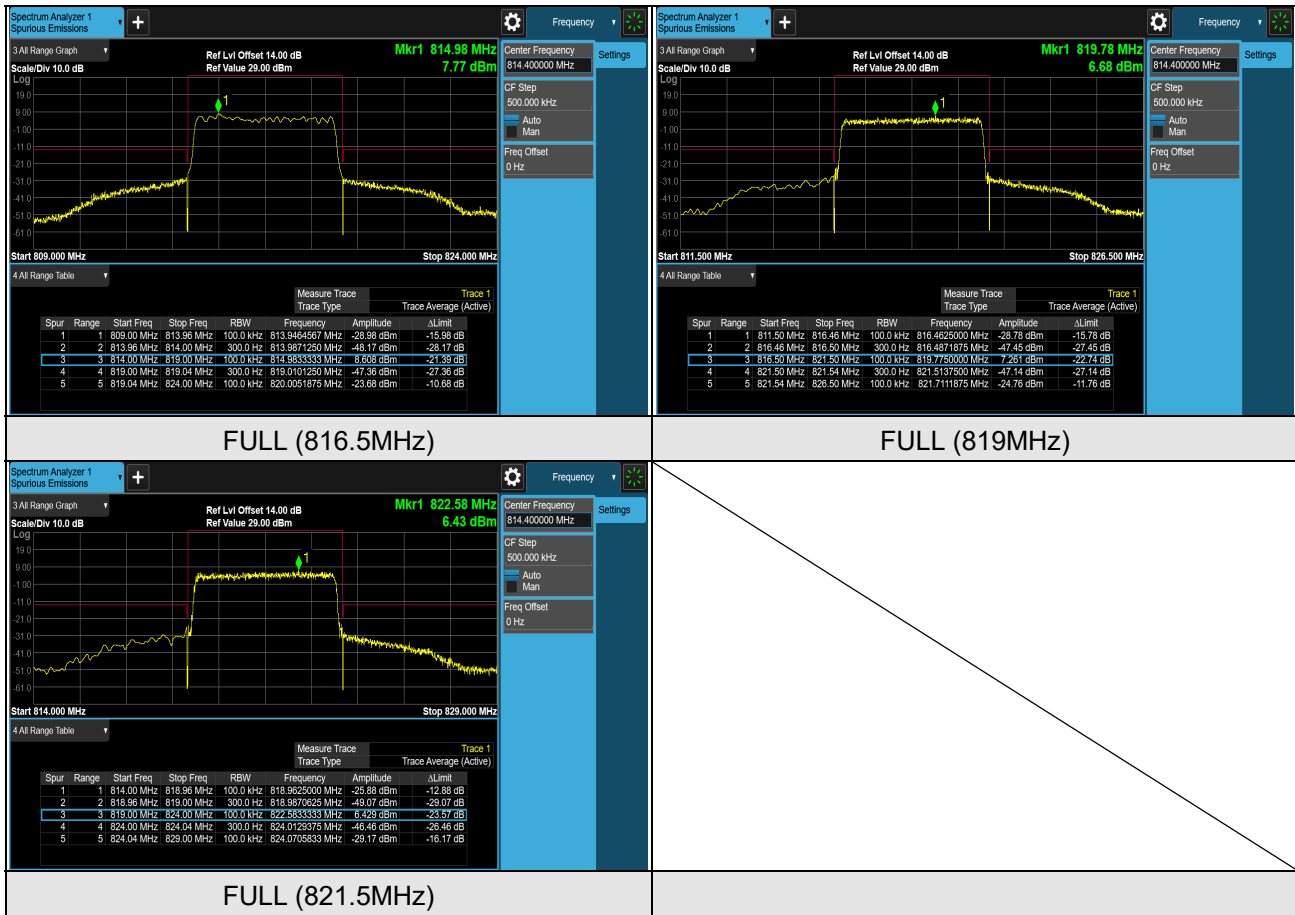
## LTE Band 26 (Channel Bandwidth 3MHz)

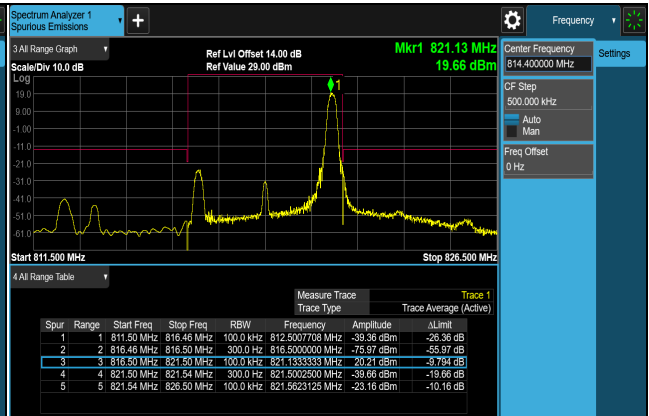
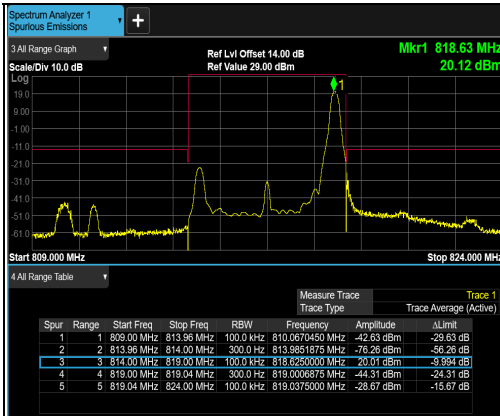






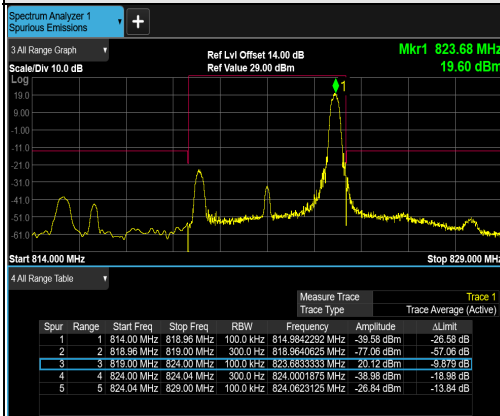
## LTE Band 26 (Channel Bandwidth 5MHz)



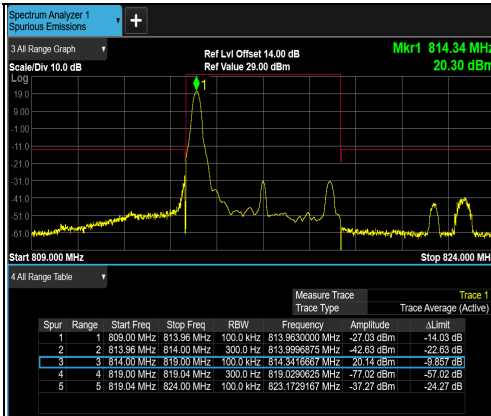


1RB#MAX (816.5MHz)

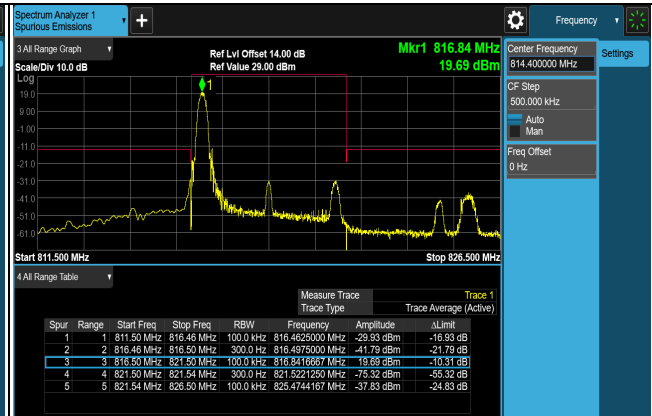
1RB#MAX (819MHz)



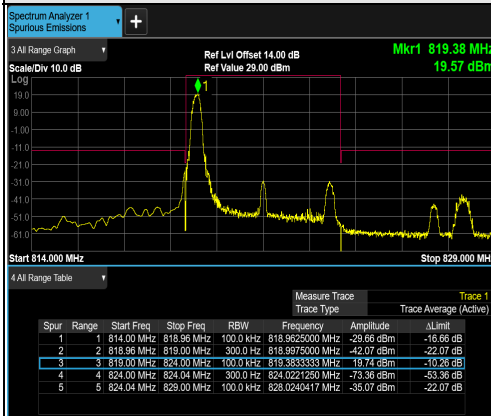
1RB#MAX (821.5MHz)



1RB#0 (816.5MHz)

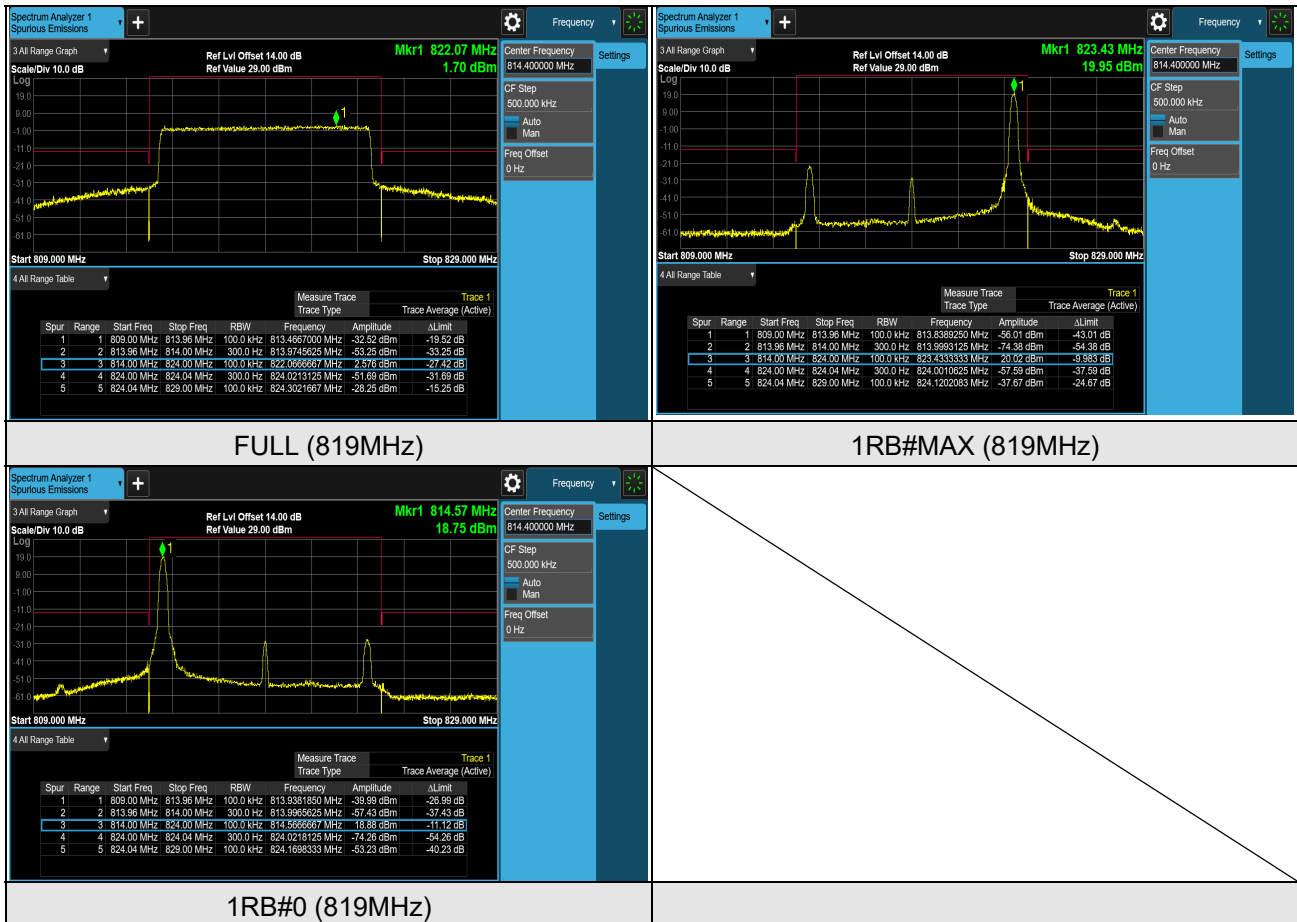


1RB#0 (819MHz)



1RB#0 (821.5MHz)

## LTE Band 26 (Channel Bandwidth 10MHz)

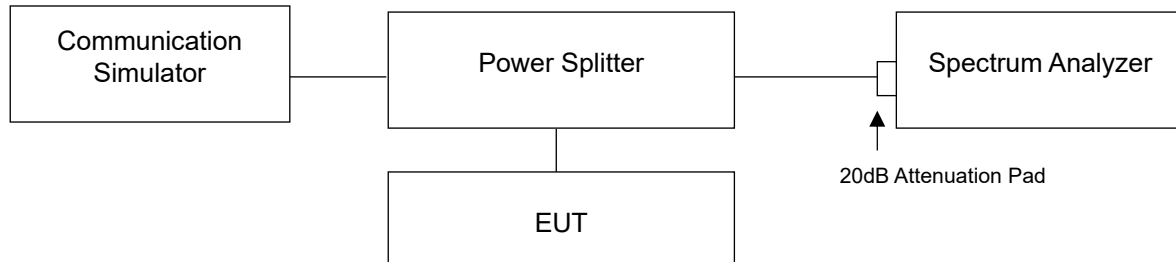


## 4.6 Conducted Spurious Emissions

### 4.6.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB. The limit of emission equal to  $-13\text{dBm}$ .

### 4.6.2 Test Setup

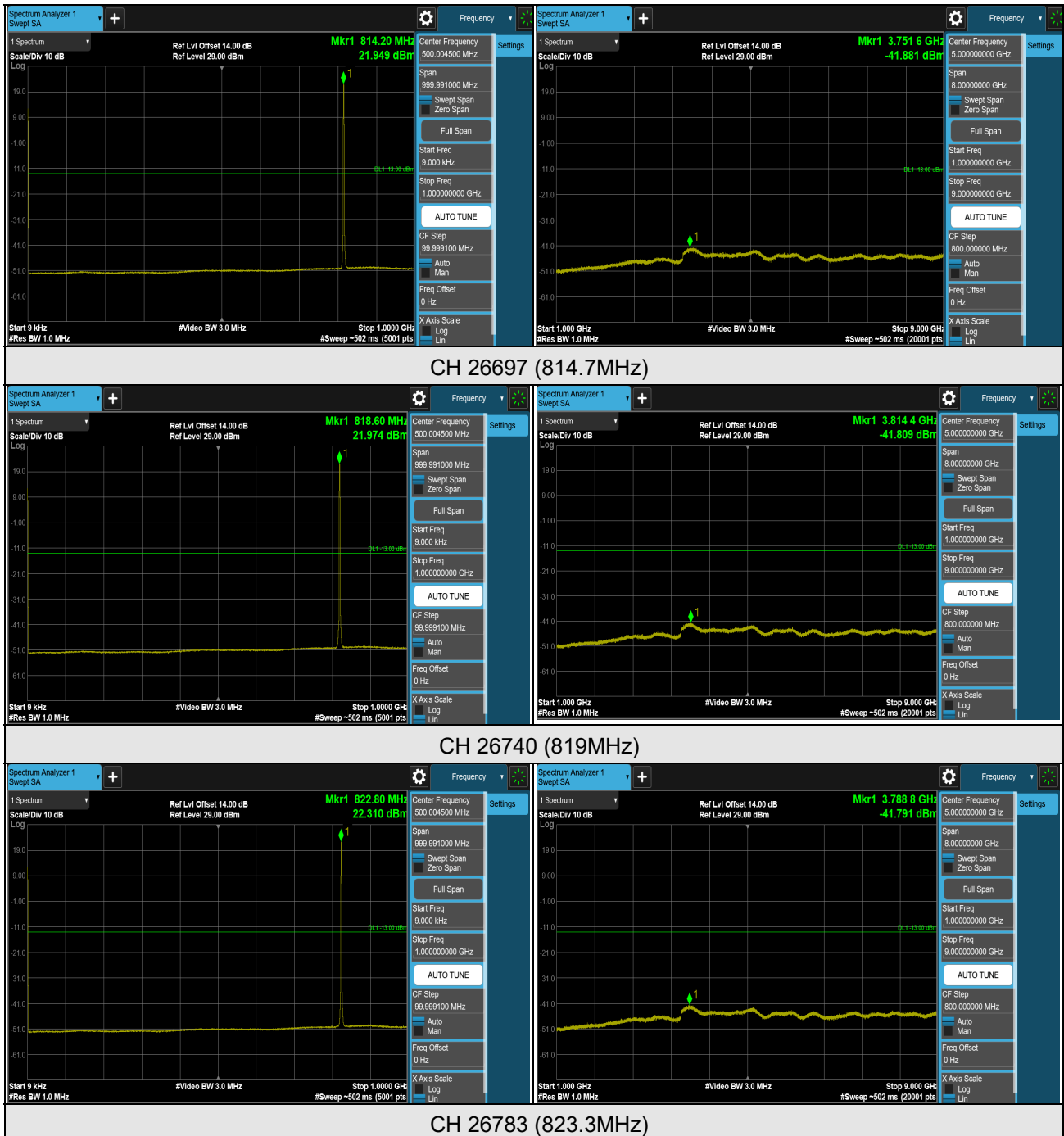


### 4.6.3 Test Procedure

- 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 9kHz to 9GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz for 9kHz to 9GHz are used for LTE band conducted emission measurement.

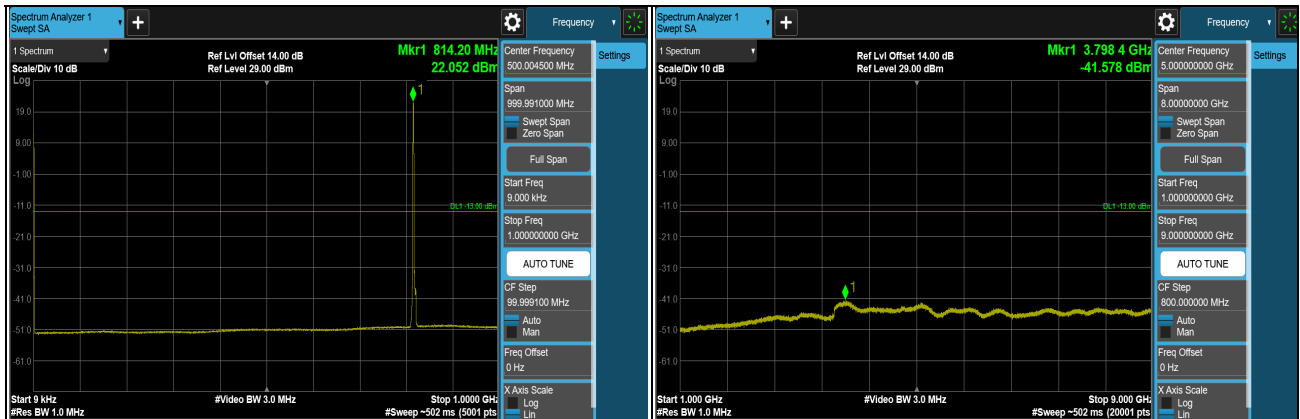
#### 4.6.4 Test Results

##### LTE Band 26 (Channel Bandwidth 1.4MHz)

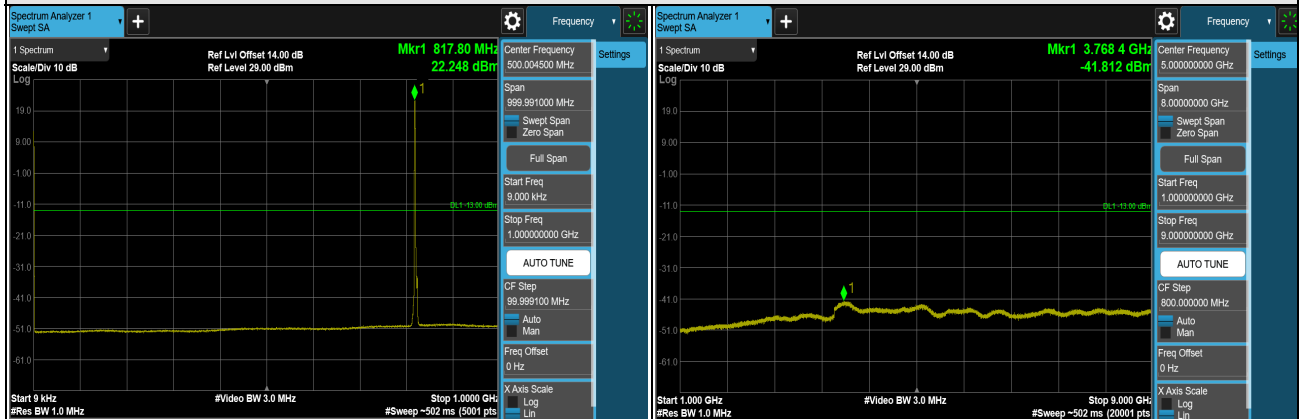


\*The 9kHz signal over the limit is from Spectrum.

## LTE Band 26 (Channel Bandwidth 3MHz)



### CH 26705 (815.5MHz)



### CH 26740 (819MHz)



### CH 26775 (822.5MHz)

\*The 9kHz signal over the limit is from Spectrum.

## LTE Band 26 (Channel Bandwidth 5MHz)



## CH 26715 (816.5MHz)



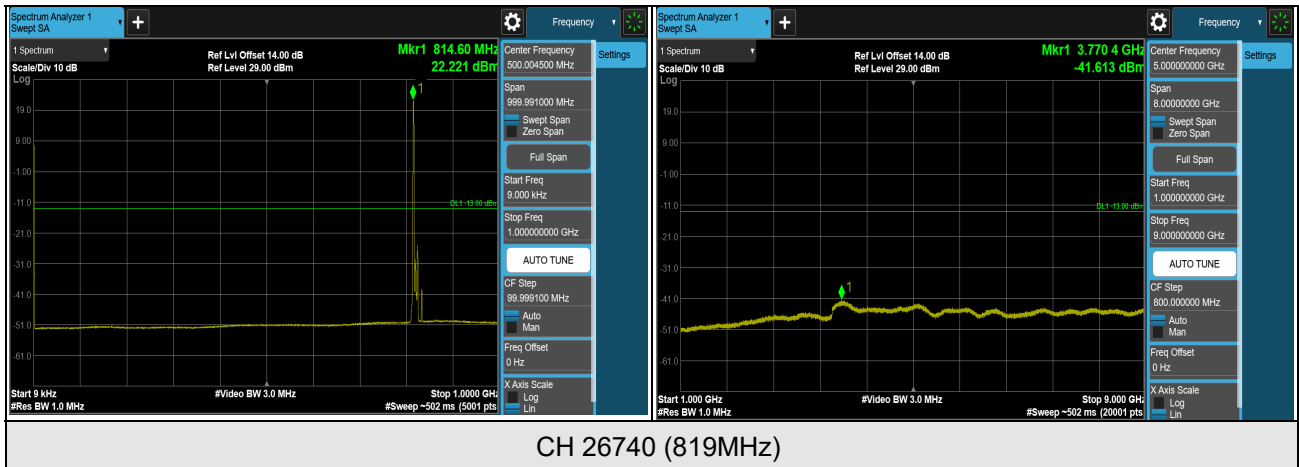
## CH 26740 (819MHz)



## CH 26765 (821.5MHz)

\*The 9kHz signal over the limit is from Spectrum.

## LTE Band 26 (Channel Bandwidth 10MHz)



\*The 9kHz signal over the limit is from Spectrum.

## 4.7 Radiated Emission Measurement

### 4.7.1 Limits of Radiated Emission Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB. The limit of emission equal to  $-13\text{dBm}$ .

### 4.7.2 Test Procedure

- a. In the semi-anechoic chamber, EUT placed on the 0.8m(below or equal 1GHz) and/or 1.5m(above 1GHz) 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 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- c. Perform a field strength measurement and record the worse read value, is the field strength value via a spectrum reading obtained corrected for antenna factor, cable loss and pre-amplifier factor and then mathematically convert the measured field strength level to EIRP/ERP level.
- d. Following C63.26 section 5.5 and 5.2.7
  - $\text{EIRP (dBm)} = E (\text{dB}\mu\text{V/m}) + 20\log(D) - 104.8$ ; where D is the measurement distance (in the far field region) in m.
  - $\text{ERP (dBm)} = E (\text{dB}\mu\text{V/m}) + 20\log(D) - 104.8 - 2.15$ ; where D is the measurement distance (in the far field region) in m.

Note:

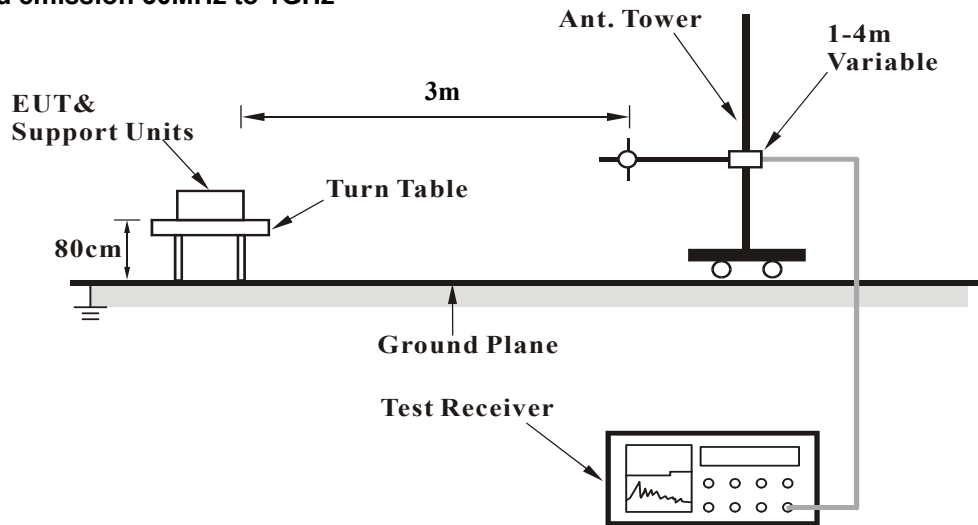
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:  
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

### 4.7.3 Deviation from Test Standard

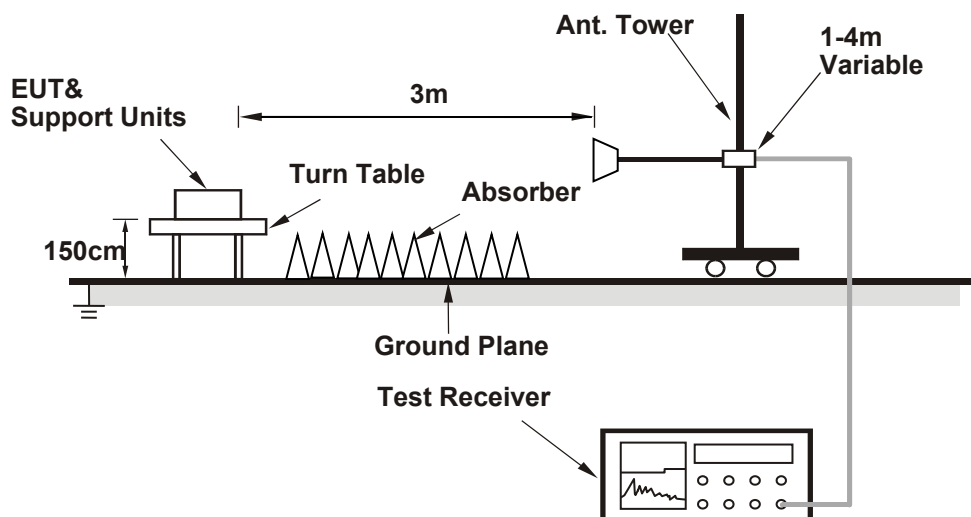
No deviation.

#### 4.7.4 Test Setup

For radiated emission 30MHz to 1GHz



For radiated emission above 1GHz



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

#### 4.7.5 Test Results

Below 1GHz

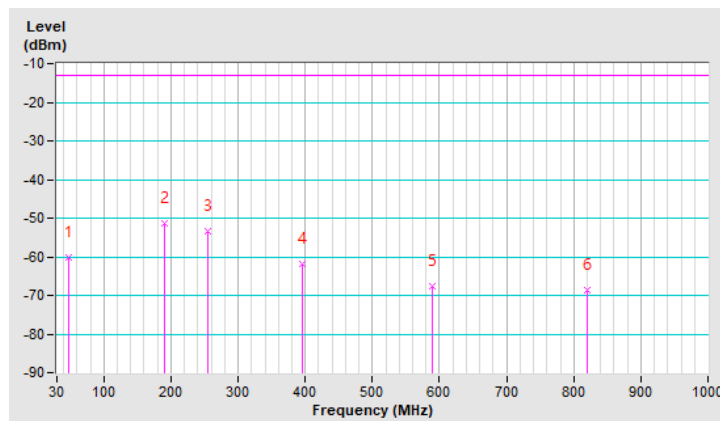
LTE Band 26, Channel Bandwidth 10MHz

|                          |                                |                 |                |
|--------------------------|--------------------------------|-----------------|----------------|
| Mode                     | TX channel 26740<br>(819.0MHz) | Frequency Range | Below 1000 MHz |
| Environmental Conditions | 25deg. C, 60%RH                | Input Power     | 120Vac, 60Hz   |
| Tested By                | Charles Hsiao                  |                 |                |

| Antenna Polarity & Test Distance : Horizontal at 3 m |                    |              |                |                |                          |                            |                        |                                |
|------------------------------------------------------|--------------------|--------------|----------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                    | 47.87              | -60.33       | -13.00         | -47.33         | 1.42 H                   | 215                        | -41.02                 | -19.31                         |
| 2                                                    | 189.90             | -51.44       | -13.00         | -38.44         | 1.88 H                   | 177                        | -29.90                 | -21.54                         |
| 3                                                    | 255.55             | -53.31       | -13.00         | -40.31         | 1.63 H                   | 32                         | -33.66                 | -19.65                         |
| 4                                                    | 395.50             | -61.70       | -13.00         | -48.70         | 1.15 H                   | 240                        | -46.14                 | -15.56                         |
| 5                                                    | 589.98             | -67.56       | -13.00         | -54.56         | 1.16 H                   | 39                         | -56.20                 | -11.36                         |
| 6                                                    | 820.22             | -68.50       | -13.00         | -55.50         | 1.55 H                   | 54                         | -60.88                 | -7.62                          |

Remarks:

1.  $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$ .
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value.
4. The other ERP levels were very low against the limit.

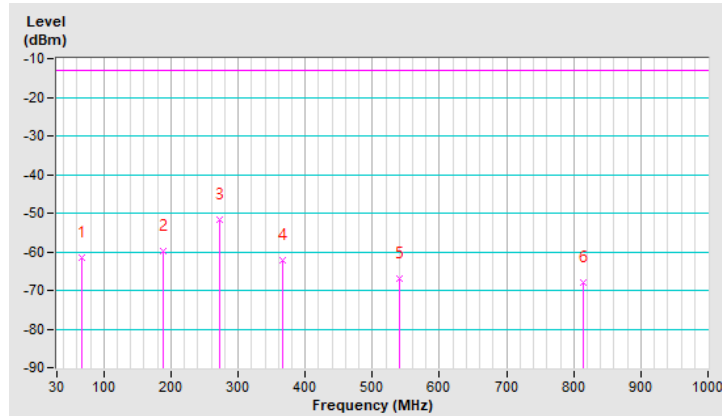


|                          |                                |                 |                |
|--------------------------|--------------------------------|-----------------|----------------|
| Mode                     | TX channel 26740<br>(819.0MHz) | Frequency Range | Below 1000 MHz |
| Environmental Conditions | 25deg. C, 60%RH                | Input Power     | 120Vac, 60Hz   |
| Tested By                | Charles Hsiao                  |                 |                |

| Antenna Polarity & Test Distance : Vertical at 3m |                    |              |                |                |                          |                            |                        |                                |
|---------------------------------------------------|--------------------|--------------|----------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| No                                                | Frequency<br>(MHz) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                 | 66.65              | -61.41       | -13.00         | -48.41         | 1.12 V                   | 258                        | -40.69                 | -20.72                         |
| 2                                                 | 187.80             | -59.80       | -13.00         | -46.80         | 1.63 V                   | 285                        | -38.53                 | -21.27                         |
| 3                                                 | 273.32             | -51.85       | -13.00         | -38.85         | 1.15 V                   | 285                        | -33.05                 | -18.80                         |
| 4                                                 | 366.65             | -62.30       | -13.00         | -49.30         | 1.80 V                   | 117                        | -46.09                 | -16.21                         |
| 5                                                 | 541.14             | -66.90       | -13.00         | -53.90         | 1.63 V                   | 33                         | -54.38                 | -12.52                         |
| 6                                                 | 814.40             | -68.05       | -13.00         | -55.05         | 1.40 V                   | 79                         | -60.28                 | -7.77                          |

Remarks:

1.  $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$ .
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value.
4. The other ERP levels were very low against the limit.



Above 1GHz

LTE Band 26, Channel Bandwidth 1.4MHz

|                          |                                |                 |              |
|--------------------------|--------------------------------|-----------------|--------------|
| Mode                     | TX channel 26697<br>(814.7MHz) | Frequency Range | 1GHz ~ 9GHz  |
| Environmental Conditions | 25deg. C, 60%RH                | Input Power     | 120Vac, 60Hz |
| Tested By                | Charles Hsiao                  |                 |              |

| Antenna Polarity & Test Distance : Horizontal at 3 m |                    |              |                |                |                          |                            |                        |                                |
|------------------------------------------------------|--------------------|--------------|----------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                    | 1629.40            | -55.55       | -13.00         | -42.55         | 1.39 H                   | 9                          | -52.96                 | -2.59                          |
| Antenna Polarity & Test Distance : Vertical at 3m    |                    |              |                |                |                          |                            |                        |                                |
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                    | 1629.40            | -55.08       | -13.00         | -42.08         | 1.44 V                   | 154                        | -52.49                 | -2.59                          |

Remarks:

1.  $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$ .
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value.
4. The other ERP levels were very low against the limit.

|                          |                                |                 |              |
|--------------------------|--------------------------------|-----------------|--------------|
| Mode                     | TX channel 26740<br>(819.0MHz) | Frequency Range | 1GHz ~ 9GHz  |
| Environmental Conditions | 25deg. C, 60%RH                | Input Power     | 120Vac, 60Hz |
| Tested By                | Charles Hsiao                  |                 |              |

| Antenna Polarity & Test Distance : Horizontal at 3 m |                    |              |                |                |                          |                            |                        |                                |
|------------------------------------------------------|--------------------|--------------|----------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                    | 1638.00            | -52.32       | -13.00         | -39.32         | 1.48 H                   | 88                         | -49.83                 | -2.49                          |
| Antenna Polarity & Test Distance : Vertical at 3m    |                    |              |                |                |                          |                            |                        |                                |
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                    | 1638.00            | -54.00       | -13.00         | -41.00         | 1.54 V                   | 188                        | -51.51                 | -2.49                          |

Remarks:

1.  $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$ .
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value.
4. The other ERP levels were very low against the limit.

|                          |                                |                 |              |
|--------------------------|--------------------------------|-----------------|--------------|
| Mode                     | TX channel 26783<br>(823.3MHz) | Frequency Range | 1GHz ~ 9GHz  |
| Environmental Conditions | 25deg. C, 60%RH                | Input Power     | 120Vac, 60Hz |
| Tested By                | Charles Hsiao                  |                 |              |

| Antenna Polarity & Test Distance : Horizontal at 3 m |                    |              |                |                |                          |                            |                        |                                |
|------------------------------------------------------|--------------------|--------------|----------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                    | 1646.60            | -54.96       | -13.00         | -41.96         | 1.87 H                   | 77                         | -52.58                 | -2.38                          |
| Antenna Polarity & Test Distance : Vertical at 3m    |                    |              |                |                |                          |                            |                        |                                |
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                    | 1646.60            | -53.56       | -13.00         | -40.56         | 1.33 V                   | 329                        | -51.18                 | -2.38                          |

Remarks:

1.  $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$ .
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value.
4. The other ERP levels were very low against the limit.

LTE Band 26, Channel Bandwidth 5MHz

|                          |                                |                 |              |
|--------------------------|--------------------------------|-----------------|--------------|
| Mode                     | TX channel 26715<br>(816.5MHz) | Frequency Range | 1GHz ~ 9GHz  |
| Environmental Conditions | 25deg. C, 60%RH                | Input Power     | 120Vac, 60Hz |
| Tested By                | Charles Hsiao                  |                 |              |

| Antenna Polarity & Test Distance : Horizontal at 3 m |                    |              |                |                |                          |                            |                        |                                |
|------------------------------------------------------|--------------------|--------------|----------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                    | 1633.00            | -55.36       | -13.00         | -42.36         | 1.78 H                   | 114                        | -52.82                 | -2.54                          |
| Antenna Polarity & Test Distance : Vertical at 3m    |                    |              |                |                |                          |                            |                        |                                |
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                    | 1633.00            | -55.79       | -13.00         | -42.79         | 1.79 V                   | 241                        | -53.25                 | -2.54                          |

Remarks:

1.  $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$ .
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value.
4. The other ERP levels were very low against the limit.

|                          |                                |                 |              |
|--------------------------|--------------------------------|-----------------|--------------|
| Mode                     | TX channel 26740<br>(819.0MHz) | Frequency Range | 1GHz ~ 9GHz  |
| Environmental Conditions | 25deg. C, 60%RH                | Input Power     | 120Vac, 60Hz |
| Tested By                | Charles Hsiao                  |                 |              |

| Antenna Polarity & Test Distance : Horizontal at 3 m |                    |              |                |                |                          |                            |                        |                                |
|------------------------------------------------------|--------------------|--------------|----------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                    | 1638.00            | -54.36       | -13.00         | -41.36         | 1.16 H                   | 100                        | -51.87                 | -2.49                          |
| Antenna Polarity & Test Distance : Vertical at 3m    |                    |              |                |                |                          |                            |                        |                                |
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                    | 1638.00            | -54.32       | -13.00         | -41.32         | 1.32 V                   | 166                        | -51.83                 | -2.49                          |

Remarks:

1.  $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$ .
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value.
4. The other ERP levels were very low against the limit.

|                          |                                |                 |              |
|--------------------------|--------------------------------|-----------------|--------------|
| Mode                     | TX channel 26765<br>(821.5MHz) | Frequency Range | 1GHz ~ 9GHz  |
| Environmental Conditions | 25deg. C, 60%RH                | Input Power     | 120Vac, 60Hz |
| Tested By                | Charles Hsiao                  |                 |              |

| Antenna Polarity & Test Distance : Horizontal at 3 m |                    |              |                |                |                          |                            |                        |                                |
|------------------------------------------------------|--------------------|--------------|----------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                    | 1643.00            | -54.34       | -13.00         | -41.34         | 1.77 H                   | 154                        | -51.92                 | -2.42                          |
| Antenna Polarity & Test Distance : Vertical at 3m    |                    |              |                |                |                          |                            |                        |                                |
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                    | 1643.00            | -51.05       | -13.00         | -38.05         | 1.49 V                   | 332                        | -48.63                 | -2.42                          |

Remarks:

1.  $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$ .
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value.
4. The other ERP levels were very low against the limit.

LTE Band 26, Channel Bandwidth 10MHz

|                          |                                |                 |              |
|--------------------------|--------------------------------|-----------------|--------------|
| Mode                     | TX channel 26740<br>(819.0MHz) | Frequency Range | 1GHz ~ 9GHz  |
| Environmental Conditions | 25deg. C, 60%RH                | Input Power     | 120Vac, 60Hz |
| Tested By                | Charles Hsiao                  |                 |              |

| Antenna Polarity & Test Distance : Horizontal at 3 m |                    |               |                |                |                          |                            |                        |                                |
|------------------------------------------------------|--------------------|---------------|----------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm)  | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| 1                                                    | 1638.00            | -54.34        | -13.00         | -41.34         | 1.38 H                   | 61                         | -51.85                 | -2.49                          |
| Antenna Polarity & Test Distance : Vertical at 3m    |                    |               |                |                |                          |                            |                        |                                |
| No                                                   | Frequency<br>(MHz) | ERP<br>(dBm)  | Limit<br>(dBm) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV) | Correction<br>Factor<br>(dB/m) |
| <b>1</b>                                             | <b>1638.00</b>     | <b>-51.00</b> | <b>-13.00</b>  | <b>-38.00</b>  | <b>1.12 V</b>            | <b>219</b>                 | <b>-48.51</b>          | <b>-2.49</b>                   |

Remarks:

1.  $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m).$
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value.
4. The other ERP levels were very low against the limit.

## 5 Pictures of Test Arrangements

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

## Appendix – Information of 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 and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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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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